NARROWS PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX H

COMMENTS AND RESPONSES

Appendix H

Narrows Project
Final Environmental Impact Statement
Comments and Responses

1. INTRODUCTION

Under the Council on Environmental Quality's regulations implementing the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] 1503.1), an agency that publishes a draft environmental impact statement (EIS) is required to obtain the comments of any Federal agency with jurisdiction by law or special expertise and to request comments from appropriate agencies at all levels of government, Indian tribes, and the public. The agency has a responsibility to solicit comments from those persons and organizations that may be interested or affected by a Proposed Action.

This Comments and Responses Appendix is the result of the Bureau of Reclamation's comment-response process for the supplemental draft environmental impact statement (SDEIS) for the Narrows Project, Sanpete County, Utah (Narrows Project). Section 1 describes how public comments were acquired, summarized, and indexed by the Bureau of Reclamation (Reclamation) during the comment period following publication of the SDEIS. It also describes how the SDEIS was distributed to agencies and members of the public and how public meetings were conducted. Section 2 describes how comments were categorized, addressed, and documented. Section 3 provides instructions for readers on how to use this document to find particular comments and responses. Section 4 summarizes the major comments received on the SDEIS. Section 5 describes the changes to the SDEIS that resulted from the public comment response process. The following section provides indexes of all comments received during the 63-day comment period, including the public hearings. Before turning to these sections, readers are encouraged to review the following definitions used in this comment-response document.

1.1 Terms Used in Process

Several terms need to be defined to assist the reader in finding their respective comment.

Comment – A distinct statement or question about a particular topic, such as:

- Purpose and need for action
- Merits of the Proposed Action or any of the alternatives

- Any aspect of potential environment impacts arising from the proposed action or alternatives
- Reclamation's use of facts, methods, or analyses in the EIS
- Reclamation's implementation of the NEPA process
- Matters outside the scope of the EIS

Comment document – The written version of comments submitted by a commenter. This could be a letter, postcard, email, or transcript of oral comments at a public hearing. A comment document may contain any number of comments.

Comment category – The topic or issue (e.g., the NEPA process, the affected environment section of the EIS, water quality, etc.) to which a comment is addressed.

Comment index – The alphabetized list of commenters' names (individuals and organizations) or comment topics with information on where to find the comment document and Reclamation's responses to the comment(s).

Duplicate comment document – A comment document that is the same in wording or so similar as to be virtually identical to another comment document. Examples are a postcard emailed as part of an organized campaign to encourage people to comment on the DEIS or a petition through which more than one individual indicates agreement with the same comment.

Public – A term broadly used to include any and all potentially interested or affected parties, whether private citizens; State, local, and tribal governments; environmental groups; water or irrigation districts; civic and community organizations; businesses; and independent experts from the scientific, technical, and academic communities.

Substantive comment – A comment that is relevant to the EIS scope, analysis, or process and requires a response.

Summary comment – A summary capturing the essence of similar comments on a given topic.

2. PUBLIC COMMENT ANALYTICAL PROCESS FOR THE NARROWS SDEIS

The Narrows Project SDEIS updated information and analyses contained in the Narrows Project Draft EIS (DES 98-10) published in March 1998 and disclosed the direct, indirect, and cumulative effects of the Proposed Action and alternative

actions for water development in northern Sanpete County, Utah. A notice of intent to prepare the Narrows Project SDEIS was published in the *Federal Register* (FR) on November 25, 2003 (68 FR 66123–66124). The SDEIS was mailed to 438 individuals and agencies. A 63-day public review period began with publication of the Notice of Availability in the *Federal Register* on March 29, 2009. Reclamation allowed a formal, 63-day public comment period, through June 2010. Two public hearings were held: one on April 28, 2010, in Manti, Utah, and the other on April 29, 2010, in Price, Utah. There were 10 people who provided comments at the Manti meeting and 12 people at the Price meeting.

Following the comment period, Reclamation logged in all comment documents received, including letters, hearing transcripts, emails, and faxes, and listed the attachments and supplemental material in a spreadsheet log.

Through administrative error, three letters (numbers 694, 695, and 696) were not originally included in the appendix. They were reviewed and considered in the FEIS and did not have substantive comments that needed to be addressed or that had not been addressed in similar letters. These letters are listed at the end of the appendix under the section, Additional Letters.

Each comment document was scanned electronically, and originals were maintained for the administrative record. The copies were given a unique number to make it easier to track through the process. Each comment document was read by the EIS interdisciplinary team in its entirety to understand the overall intent and perspective of the commenter. Again, all forms of comment documents were included in this process, including emails, letters, and transcripts from public meetings. Attachments to comment documents also were reviewed to determine whether they contained information relevant to the SDEIS. Substantive comments were identified and submitted to the EIS interdisciplinary team for responses. All comment documents received are appended here, and all substantive comments are numbered within the comment document. In compliance with 40 CFR 1503.4, possible responses to substantive comments may include the need to:

- Modify alternatives including the Proposed Action
- Develop and evaluate alternatives not previously given serious consideration
- Supplement, improve, or modify the analyses
- Make factual corrections to the document
- Explain why no further response is necessary

3. INSTRUCTIONS TO READERS ON HOW TO USE THIS COMMENT RESPONSE DOCUMENT

To allow the individual commenter or reader to locate their comments and Reclamation's response(s), there is a table showing the commenter's identification number assigned to those persons or organizations that submitted comments. These numbers were consecutive and arranged alphabetically within the following categories: Federal agencies, State agencies, local agencies, water user agencies and organizations, organizations, businesses, individuals, and public hearings.

To find one's own comments, the reader should first open the Commenter pdf file to locate a commenter's name and note the corresponding commenter identification number associated with that name. This document contains the scanned letter of each individual. Comments are numbered consecutively within the letter. The reader can "click" on the comment number within the letter, and this, in turn, will take them to the comment response, within the Response table. This table is in numeric order by commenter identification number and the corresponding comment number within the comment document.

4. MAJOR COMMENTS RECEIVED

4.1 Summary of Public Comments Received on the SDEIS

Reclamation received 696 comment documents since the SDEIS was published in March 2010. Several of these letters were received after the 63-day comment period ending on June 1, 2010; all letters were reviewed and considered prior to finalizing the final environmental impact statement (FEIS). Forty-nine comment documents included substantive comments that required a response and/or clarifying edits to the FEIS. No new issues were raised that required further analysis. The following general comments and responses are summarized here and then fully addressed in this appendix.

Climate Change

Issue Summary – Nine comments. The impact of climate change was not sufficiently addressed in the SDEIS.

General Response – Climate change models have not been developed with sufficient detail or sensitivity to capture small projects such as the proposed Narrows Project, which involves storage and distribution of up to 5,400 acre-feet of water per year. Section 1.7 of the FEIS states that, without downscaled models addressing climate change at this project level, at this time, a meaningful analysis of a small project cannot be achieved.

Cultural Resources

Issue Summary – Sixteen comments. Only a portion of the area associated with the dam, reservoir, and project features were inventoried in 1979 before a decision was made.

General Response – The NEPA process does not require completion of the 36 CFR 800 process but, rather, consideration of the potential effects on historic properties. An environmental commitment requiring Reclamation to conduct consultations with the appropriate State Historic Preservation Officer (SHPO), tribes, and additional consulting parties is in the FEIS. It is anticipated that the entire area of potential effects (APE) will be inventoried to current standards if the project is approved.

Economics

Issue Summary – Fifty-one comments. The SDEIS did not sufficiently address economic impacts associated with the Narrows Project. The project depends on conversion of water to finance the project. How will the conversion of water from irrigation water to municipal and industrial (M&I) water be accomplished?

General Response – To the extent there is available information, economic effects are analyzed in section 3.17 of the FEIS. All of the costs of the proposed project are included in the loan application, which is updated and appended to the FEIS.

The conversion of water from irrigation to M&I use will occur in stages. It is unknown at this time when water will be needed and how much water will be needed.

Fisheries

Issue Summary – Thirty-nine comments. The impacts to fish in small streams inundated by the reservoir, the stream below the dam, Scofield Reservoir, and the Price River are underestimated and not sufficiently mitigated.

General Response – The impacts to fish are most pronounced near the dam. The FEIS acknowledges that negative effects will occur to fisheries in the inundation area, below the dam and in certain stream reaches within the project area. The FEIS has designed mitigation measures in the Proposed Action to compensate to the extent possible for these impacts.

Scofield fishery is not expected to be impacted significantly. The *Eutrophication Study, Flow and Phosphorus Impacts of Proposed Narrows Project on Scofield Reservoir* (October 2006, revised) determined that overall water quality in Scofield Reservoir will be degraded by the Proposed Action without mitigation. Mitigation measures are designed to offset this potential impact. Lowered water

quality standards (e.g., water temperature, phosphorous loading) can affect the aquatic food chain within the reservoir. If water quality effects are slight, then their effect to the food chain and the fishery will be slight as well.

Scofield Reservoir will be operated within the range of historic operations. Peak flows may be reduced in some years; but, in general, the flow below Scofield Dam will not be severely impacted; therefore, the fishery below Scofield Dam will not be severely impacted.

Specific Proposed Action fish and wildlife mitigation measures include the following:

- Restoring year-round flows in two small tributaries to Gooseberry Creek (above the proposed Narrows Reservoir); providing minimum instream flows of 1.0 cubic feet per second (cfs) in Gooseberry Creek below Narrows Dam.
- Providing a multilevel outlet at Narrows Dam to regulate the temperature of releases to Gooseberry Creek from Narrows Reservoir.
- Modifying and/or stabilizing streambanks and associated riparian zones along Middle Gooseberry Creek.
- Providing releases from the Narrows Reservoir into Gooseberry Creek for flushing flows.
- Acquiring and/or improving stream channel for fish habitat (Middle Gooseberry Creek).
- Providing winter releases to Cottonwood Creek.
- Providing summer flows in lower Cottonwood Creek.
- Constructing a pipeline in the Upper Cottonwood Creek area to convey project water outside the stream channel (from the tunnel outlet to a point 300 feet downstream from the confluence of Cottonwood Creek and Left Hand Fork)
- Providing a minimum 2,500-acre-foot conservation pool in Narrows Reservoir for fish.
- Reducing external phosphorus loading to Scofield Reservoir.
- Providing mitigation and enhancement of upland habitat (quantified in terms of mule deer and Brewer's sparrow habitat units, each of which represent other wildlife species dependent on similar habitat) in the following ways:
    - Acquiring conservation easements around the Narrows Reservoir.

- Acquiring and fencing land adjacent to the Price River below Scofield Reservoir to protect wildlife habitat.
- Creating new wetlands and enhancing existing wetlands to mitigate for 100 acres of wetlands areas inundated by the reservoir and affected by changes in the stream channels.

Geologic

Issue Summary – Twenty comments. The seismic standards to which the Narrows Dam is proposed are out of date.

General Response – These Federal and State guidelines for dam design were not introduced in the SDEIS due to the expected time lag between issuing the document and the probable date of final design. Should the project be approved and Sanpete Water Conservancy District (SWCD) proceeds, current standards will be required. Final design is not required in an EIS.

Land Use

Issue Summary – Twenty-four comments. Private land will be impacted by the project. Is it legal for the Government to allow a non-Federal project on Federal lands?

General Response – SWCD will purchase or lease any private lands needed for the project, which includes compensation for impacts. SWCD will evaluate and compensate landowners to the extent possible for all of the impacts to privately owned land.

Reclamation made the decision to keep the lands initially reserved for the Gooseberry Project under withdrawal and has the authority to issue licenses, permits, or other land use grants on withdrawn lands under Section 10 of the Reclamation Project Act of 1939 (53 Statute 1187, 43 United States Code 485a).

Mitigation

Issue Summary – Twenty-seven comments. Can Reclamation ensure that mitigation measures are met? Who will pay for mitigation? The U.S. Department of Agriculture Forest Service (USDA Forest Service) wants mitigation completed on their land. Proposed mitigation is insufficient and will not compensate for adverse impacts.

General Response – The mitigation measures will be included in construction contracts and other agreements to ensure implementation. Mitigation is required by Reclamation to enter into a license agreement. SWCD will pay for all mitigation.

Mitigation for the Narrows Project does not need to be exclusively on USDA Forest Service lands. Mitigation will be completed primarily within the area of project influence, which could be lands both inside and outside USDA Forest Service lands.

It is SWCD's intention to totally mitigate all impacts, where possible and to the extent possible, to find mitigation measures that could be implemented "in place" and "in kind."

NEPA Process

Issue Summary – Forty-four comments. Information seems outdated and incomplete. There was insufficient opportunity for the public to comment during the NEPA process and have an influence on the decision.

General Response – Reclamation considers that the information in the FEIS is accurate and complete. All data in the FEIS were reviewed by resource specialists and updated based on the comments received and as new data became available.

Reclamation made a diligent effort to involve the public in the NEPA process, including scoping, public comment periods, and public hearings. The public has been provided notice of the availability of environmental documents and given the opportunity to comment. All comments submitted have been fully considered in the decision and, where appropriate, incorporated into the document.

Proposed Action/Alternatives

Issue Summary – Seven comments. The range of alternatives is too limited. Reclamation adopted SWCD's purpose and need statement and, thus, overly restricted the scope and range of alternatives. More variability in the reservoir sizes and locations should have been explored and considered.

General Response – Reclamation's action is deciding whether to approve the loan application and/or use of the withdrawn land; thus, the range of alternatives, size, and location were driven by SWCD's request and loan application and to enable the U.S. Army Corps of Engineers (USACE) to determine the Least Environmentally Damaging Practicable Alternative (LEDPA). Thirteen alternate damsites and other ways to meet the purpose and need are analyzed and discussed at length in the SDEIS. All practical alternatives based on the outcome of the 1984 Compromise Agreement and the requirements for late season irrigation have been explored, and the preferred alternative satisfies those requirements. The range of alternatives meets the legal and regulatory definition of a reasonable range of alternatives.

Public Health and Safety

Issue Summary – Seven comments. Dam safety is a concern. Who will be responsible to keep the dam safe? The negative impact to drinking water, especially during drought years, is a concern as well as the increased potential for West Nile virus and gastrointestinal disease.

General Response – The responsibility for operation and maintenance oversight, which includes all facility inspections and oversight of dam safety, will fall under the Utah State Engineer's office.

The EIS team does not expect a significant change in the mosquito population; therefore, the risk of contracting West Nile virus will remain the same.

Additional discussion of the gastrointestinal effects was added to the public health and safety section of the FEIS. The analysis does not indicate water quality issues for Price.

Recreation

Issue Summary – Ten comments. The Narrows Project is touted as necessary and needed to help offset the increasing demand for recreation facilities in the area. This is an expensive project just to satisfy that need. What will the Narrows Reservoir provide to the public that Scofield does not already provide? Adjacent landowners are concerned that dispersed recreation will increase in the area. Scofield Reservoir will suffer because the Narrows Reservoir will draw away public recreational use. Who will manage the Narrows recreation facilities, and will they have a fee?

General Response – The justification of the Narrows Project is to provide needed water and enable SWCD to act on its non-Federal Narrows water right. The justification for the Narrows Project is not to be 'different' from other developed recreation areas but to help offset the projected future pressure from an increasing population. Fishing and recreation are not "needs" in the sense that, standing alone, they would warrant construction of a dam. In the FEIS, these functions are described in section 1.4 as "additional benefits."

The dispersed recreational classification of the project area will not change. There would be some changes in recreational use; however, these are disclosed in section 3.15 of the FEIS.

Since the Narrows Reservoir is not a Federal project, it is unclear who will manage recreation, or if fees will be collected. These specific details will need to be negotiated among the interested parties and those agencies with jurisdiction.

Threatened and Endangered Species

Issue Summary – Twenty-six comments. The final 2000 Biological Opinion is old, and consultation should be reinitiated. Instream flow requirements should be considered in the lower Price River, and impacts to endangered species need to be sufficiently mitigated.

General Response – The U.S. Fish and Wildlife Service (Service) responded to Reclamation in writing during scoping but did not request a new consultation. The Proposed Action and predicted impacts have not changed since the final Biological Opinion was issued. Reclamation considers that the final Biological Opinion, prepared in 2000, adequately addresses impacts of the proposed project to threatened, endangered, and candidate species. The FEIS has considered other information regarding each of these species' current listing, status, and ranges.

A position paper, entitled "The Upper Colorado River Endangered Fish Recovery Program's Position on the Role of the Price River in Recovery of Endangered Fish and the Need for Flow Management," was drafted during 2011. The results of the draft study included having the Recovery Implementation Program (RIP) investigate opportunities to protect existing flows and to avoid dewatering the lower Price River. The report is being finalized at this time. Instream flow requirements are a function of Utah water law and beyond the scope of the FEIS.

The Narrows Project relies on the RIP as the reasonable and prudent alternative for depletion impacts. The RIP determines what actions to take and funds these actions with payments made under the Section 7 consultation agreement process.

Visual Resources

Issue Summary – Two comments. Reservoir basin below the high water mark (bathtub ring) will be an eye sore and detract from the beautiful valley. Why didn't Reclamation assess visual impacts to private land?

General Response – It is anticipated that the visual impact of exposed mud flat or shoreline will be negligible, due to steeper topography and angle of view. In general, water bodies tend to attract people and are an asset to an area.

Generally, only public lands or lands viewed from public lands, which could include private lands, are given visual quality objective ratings. The rating in the SDEIS included private lands.

Water Quality

Issue Summary – Eighty-four comments. Water quality needs to be monitored. Mitigation should be sufficient to ensure water quality impacts are fully compensated. There will be an increased potential for disease. There will be an increase in algae blooms in Scofield Reservoir. Water quality in Scofield

Reservoir will be severely impacted. Release temperatures will be higher than normal and negatively impact the stream below Narrows Dam. Water quality data is out dated and incomplete.

General Response – There might be adverse impacts on water quality in lower Gooseberry Reservoir and Scofield Reservoir, and specific measures are identified and planned to mitigate any possible impact on water quality. The most significant measures that address water quality include the following:

- Providing a multilevel outlet at the proposed Narrows Dam
- Stabilizing stream banks along middle Gooseberry Creek
- Providing winter releases to lower Gooseberry Reservoir
- Reducing external phosphorus loading to Scofield Reservoir

The improvements will be jointly designed on a site-specific basis, and joint approval by the agencies listed will ensure that the most effective measures will be selected.

A water quality monitoring program will be developed and implemented as an environmental commitment. Monitoring will take place prior to implementation of the mitigation measures to identify specific locations for streambank improvements and to determine the reduction in phosphorus loading that the identified improvements will have. Water quality monitoring and identification of mitigation measures will be done in coordination with the Utah Division of Water Quality and other Federal, State, and local agencies. Water quality monitoring will continue following implementation of the proposed mitigation measures to verify the effectiveness of those measures.

The SDEIS analyzes the impact the project may have on the potable water supply in Scofield Reservoir. Implementation of proposed mitigation measures is expected to reduce phosphorus levels to preproject conditions, which also are expected to maintain algal growth at preproject conditions. Drinking water treatment costs are not expected to increase since water quality is maintained at preproject conditions.

The *Eutrophication Study, Flow and Phosphorus Impacts of Proposed Narrows Project on Scofield Reservoir* (October 2006, revised) determined that overall water quality in Scofield Reservoir will be degraded by the Proposed Action without mitigation. Mitigation measures are designed to offset this potential impact.

Scofield Reservoir will maintain phosphorus levels at preproject conditions so as to not have an adverse impact on water quality, including the approved total maximum daily load. The determination of phosphorus load reduction for the

mitigation measures was made based on water quality data from 1978–2005. This represents current data.

The proposed project entails a relatively small, high altitude dam and reservoir. The release temperatures from such a facility through the selective withdraw structure are not expected to deviate very far from those naturally occurring in streams in the area due to the selective withdrawal structure. The multilevel release structure (unusual for a small, high altitude reservoir) would simply provide a means of fine tuning such aspects of release operations. Warmer water could be released during colder periods of the year, and somewhat cooler water could be released during summer months to maintain optimum downstream temperatures for the fishery.

The water quality data presented in the SDEIS was the most current available through the U.S. Environmental Protection Agency STORET Web site at the time of the writing and editing. As shown in the footnotes of tables in the water quality section, data through 2007 are represented.

Water Resources

Issue Summary – Fifty-six comments. The hydrologic data is old and incomplete. The last drought was not included in the analysis. Sanpete residents should practice conservation to recover needed water rather than build a dam. Low flows below Narrows Dam will negatively impact streams. Low flows in the Price River will negatively impact Price and the surrounding area. Power generation at PacifiCorp will be impacted by reduced flows in the Price River, and the lost power will need to be replaced adding extra cost to users. Instream flows should be required below Narrows and Scofield Reservoirs.

General Response – The recent drought is not reflected in the data. Averages are based on the 1960–2002 hydrologic period of record. The hydrologic analysis uses U.S. Geological Survey (USGS) stream gauge data, and a majority of the USGS stream gauge data was discontinued in 1989 and 2003. The additional effort to add 1 year (2003) of stream gauge data resulted in an insignificant improvement in the overall analysis.

Water conservation alone will not increase the volume of water that Sanpete County farmers need during late season irrigation.

The FEIS recognizes that flow reductions in Lower Gooseberry Creek and Fish Creek will negatively affect aquatic resources. These impacts are addressed to the extent possible through mitigation measures.

The Narrows Project will have minimal effects on the Price River. Historically, Carbon County has shut off the releases from Scofield Reservoir every year. The frequency or degree to which this will occur in the future is likely to continue.

Price River flows below Scofield Reservoir that could impact the municipal water supply for Helper and Price were analyzed, and there was no significant difference from the flow analysis outlined in the SDEIS.

Concern with replacement power and potential increased costs to rate payers is noted. Ensuring cost-effective and long-term water supplies to its customers is part of Reclamation's mission, and we understand the concern.

Minimum flows will be released from the proposed Narrows Reservoir, but no minimum flows have been established below Scofield Dam. Instream flows are a Utah water law issue and are beyond the scope of this FEIS.

Water Rights

Issue Summary – Twenty comments. The Narrows Project will infringe on Carbon County water rights. Sanpete County wants to take Carbon County water that has been in use for decades. Sanpete County is already diverting more than their share. Who will be responsible to measure flows diverted through the tunnel?

General Response – The Proposed Action will impact only storage releases. Direct flow rights that have a senior priority date to the Narrows water rights will be unaffected by the project.

Concerns regarding SWCD's current use of its water rights are outside the scope of this FEIS and should be directed to the Utah State Engineer and the appointed River Commissioner. The State Engineer has jurisdiction over the amounts and legality of any transbasin diversions.

The development of the Narrows Project should have a limited impact on the already developed Carbon County water right holder. First, the 5,400-acre-foot annual depletion of the Narrows water rights represents only about 6.6 percent of the average annual yield of the Price River above the city of Price, and, secondly, because of the manner in which Scofield Reservoir is operated (i.e., it is shut off completely for flood control when the White River is running high and then opened as needed to meet the downstream agricultural demands).

All flow measurements will be monitored by the River Commissioner to ensure that the Narrows Project is operated in a manner consistent with its underlying water rights.

Wetlands

Issue Summary – Twenty-four comments. The Service and USACE need to approve the wetland mitigation plan. Wetland resource will be significantly impacted in the inundation area and below the Narrows Dam. Wetland mitigation

needs to be long term and provide the same kind of habitat that presently exists. Function and service provided by wetlands need to be fully mitigated.

General Response – For mitigation purposes, SWCD will follow the approved USACE Mitigation Guidelines. SWCD will work with the USACE and the Service to find alternatives that will ensure a permanent hydrology source to help with the establishment and success of the hydrolytic vegetation and not impair the wetland function.

Impacts to wetlands have been fully identified in the study conducted in 2009 by Franson Civil Engineers on the "Effects of the Narrows Project on the Riparian Vegetation in Fish and Gooseberry Creeks." This information will be used in designing the final mitigation plan.

The SDEIS identifies the wetlands to be impacted and their functions and values. Wetland mitigation measures are included in the description of the project alternatives and are required. The wetland mitigation measures will provide similar wildlife habitat values lost due to the inundation of the reservoir and reduction of flows downstream.

Wildlife

Issue Summary – Thirteen comments. Construction of Narrows Dam and other project features will have negative impacts on wildlife. It is not clear how wildlife habitat will be mitigated to achieve current values for wildlife. A new consultation under the Fish and Wildlife Conservation Act should be initiated.

General Response – All of the project features have been analyzed in the FEIS. Construction activity will have short-term negative impacts to wildlife habitat. These effects will occur during construction when wildlife will be displaced to other nearby similar habitats. Wildlife will continue to be affected until these areas are revegetated and restored, to the extent possible, to preproject conditions.

The proposed mitigation replaces a quantity of habitat units for an equal or larger quantity of habitat units lost. The method used to evaluate the effects is a Habitat Evaluation Procedure, which is a "species habitat" approach to impact assessment and habitat quality. The program uses selected species as indicators to evaluate habitat for a host of other species, assuming that these indicator (evaluation) species are functioning units of an ecosystem. Impacts to a particular indicator species presumes that there also will be impacts to the group of species it represents. Habitat Suitability Indices' (HSI) were ascertained for each evaluation (indicator) species. The project includes a comprehensive monitoring and maintenance program and a list of detailed mitigation commitments, designed to ensure that the actual functions of the lost aquatic and wildlife habitat values are replaced by mitigation measures.

The Fish and Wildlife Coordination Act Report, prepared in 1997, adequately addresses impacts of the proposal on fish and wildlife resources and proposes appropriate mitigation.

5. CHANGES MADE TO THE SDEIS

Changes made in finalizing the SDEIS are listed below. The number is the comment that generated the change to the document. For example, 1.01 is the first comment or question in letter number one.

Cultural Resources

5.62 A memorandum of understanding (MOA) would be developed only to resolve adverse effects to any historic properties found within the APE for the Proposed Action. The text in the SDEIS related to the criteria necessary to warrant the development of an MOA and the protocols to be included in a potential MOA was inconsistent. The text in the FEIS was updated to reflect the accurate purpose of a potential MOA or a programmatic agreement wherein inventory would be stipulated.

51.20, 51.42 Reclamation clarified that a Federal undertaking has not been initiated; and, therefore, the 36 CFR 800 process is not yet required. Reclamation does not need to conduct an inventory as stated in this comment but rather, given the requirements of NEPA, to project the likely effects to historic properties and Indian sacred sites should the undertaking be initiated. A commitment to comply with 36 CFR 800 was included in a mitigation measure.

Economics

3.10, 21.05, 22.02, 51.13, 51.69 To the extent there is available information, economic effects are analyzed in section 3.17. Reclamation considered the economic impact of the project in the FEIS. All of the costs of the proposed project, ability to repay, cost/benefit data, and assessment of effects have been included in the loan application appended to the FEIS, which should sufficiently address these concerns.

3.11, 65.09, 510.28 The criteria for approval of a loan under the Small Reclamation Projects Act of 1956 (SRPA) and approval for the use of the land have been clarified and added to chapter 1. This is one of the criteria for approval of the SRPA loan and is used to evaluate the potential for the SWCD to repay its obligation to the United States.

5.48 There currently is not an estimated construction date. The costs of the project are disclosed in the loan application that the proponent submitted with the FEIS.

21.04 The EIS team complied with 40 CFR 1502.22 and acknowledges that some information is unavailable.

65.10 The rehabilitation of the tunnel has proceeded without the Narrows Project, so it will not be a factor in assessing the loan application and proposed use of Federal land.

81.01, 620.12 The costs in the FEIS are indexed from previous estimates. Also, the loan application was updated by SWCD with more current costs and is appended to the FEIS.

510.24 The $40.3 million in 2008 dollars would be approximately $40.7 million in 2010 dollars. The table is using the most updated numbers. The text has been updated to reflect this amount.

Fisheries

4.26 The EIS has been updated and now identifies blue ribbon fishery areas. Scofield Reservoir would be operated within the range of historic operations. Peak flows may be reduced in some years. Riparian and aquatic habitats and animals dependant on these habitats, including fish, would not be significantly affected by these changes.

5.52 The Service responded to Reclamation during scoping in writing but did not request a new consultation. Reclamation considers that the Biological Opinion, prepared in 2000, adequately addresses impacts of the proposed project on threatened, endangered, and candidate species. The FEIS has considered other information regarding these species current listing, status, and ranges.

5.58 A listing of fish populations found in the various creeks has been added to the FEIS in Section 3.10, “Fisheries.”

10.17, 510.10 A position paper entitled “The Upper Colorado River Endangered Fish Recovery Program’s Position on the Role of the Price River in Recovery of Endangered Fish and the Need for Flow Management” was drafted during 2011. The results of the draft study included having the RIP describe flow conditions they believe are conducive to Colorado pikeminnow use of the lower Price River, to investigate opportunities to protect existing flows and to avoid dewatering the lower Price River. The report is being finalized at this time. Instream flow requirements are a function of Utah water law and beyond the scope of this FEIS.

Geologic

1.03 Section 3.6, “Geologic Resources,” of the FEIS has been edited to include all seismic events, including mining.

419.01 It is possible to get leakage from a reservoir along a fault zone and into a coal deposit. A mitigation measure has been added to study this potential. A reservoir study that would require drilling to assess the likely seepage rate into the fault zones has been added to an appendix. Depending on the type of bedrock involved in the faulting, the zone could be either composed of crushed rock, which is quite permeable, or clayey gouge, which is not so permeable. The overlying material is also very important. If the faults are located in a sequence of sandstone, it would be possible for seepage along the fault and through the overlying material. If a layer of thick clay was found in the basin, it would effectively cap the faults and fissures in the reservoir basin and prevent seepages from the reservoir. Permeability testing in the overburden and in the fault zone would be evaluated to assess the seepage rates.

686.03 State guidelines would be followed for the dam and reservoir site that reflects the current standard of care prescribed. Additional geologic field evaluation and assessment of the dam and reservoir site would be completed that address the proximal active faults associated with the site and further characterize the earth materials underlying the damsite, reservoir, and reservoir rim to evaluate engineering properties to ensure adequate design of features associated with the dam and reservoir. Designs would incorporate maximum accelerations associated with natural and/or manmade seismic events that are determined or probable to potentially occur in the area. Mitigation for other potential geologic hazards also would be integrated into design. An environmental commitment has been added to appendix F of the FEIS requiring this seismic study.

Mitigation

3.02, 3.09, 51.32 Mitigation measures will be implemented prior to storage and diversion of water as part of the Proposed Action. The FEIS has been edited to include details of adaptive management regarding identification and implementation of mitigation measures.

NEPA Process

4.11 Reclamation's purpose and need is described as considering approval of SWCD's SRPA loan application to build the Narrows Project and SWCD's request for authorization to use withdrawn lands to construct and operate the proposed dam and reservoir (section 1.4 of the FEIS). SWCD has stated its primary purpose of the project is to supply additional irrigation water to lands that are serviceable, and the secondary purpose is to deliver water for municipal and industrial (M&I) purposes. The projections for Sanpete County show that additional M&I water may be needed in the future; however, there is no current plan for such a conversion. Based on the U.S. Department of the Interior NEPA regulations, the lack of a definite plan or proposal for such a conversion means the M&I water conversion would not be reasonably foreseeable; therefore, analysis of such a conversion would be speculative. Based on this, SWCD has

determined that it could convert irrigation water over to M&I uses based on that need if it materializes. Existing water supplies for the area are not sufficient to cover the anticipated needs.

5.06 All data in the EIS were reviewed by resource specialists and updated based on the comments received and as new data became available.

5.70 The reservoir release scenario that mimics the natural flow regime does provide late season irrigation. Different operational or release strategies change the presumptions of SWCD's purpose and need, which is that the existing land users in Sanpete County need and want additional water in late season. In the absence of some form of storage, water available in the early season would not be available for late season use; only direct flows would be available for late season irrigation. Those flows currently are insufficient. There are no reservoirs in the project area to store early season water. Therefore, the early season water would not be available to offset late season shortages. Also, the reason for analyzing different sized reservoirs was to enable USACE to determine the LEDPA. New text was added to section 1.6, in response to this and other comments.

51.02 The November 25, 2003, *Federal Register* Notice of Intent identifies what is being updated in the SDEIS. It states that the SDEIS will incorporate comments received on the DEIS in 1998 as well as new information received since that time. Reclamation has addressed and incorporated comments received on the 1998 DEIS and engaged in written and oral communication with the interested public, including its cooperating agencies, and other State and Federal regulatory agencies throughout the NEPA process.

51.36 Section 1.8 has been updated to include all required permits anticipated for the project.

51.57, 65.03 The Federal action is described in chapter 1. Reclamation examined different reservoir sizes to ensure a reasonable range of action alternatives were analyzed and to enable USACE to determine the LEDPA. The purpose and need section was clarified.

658.02 The organization for chapter 3 was reordered; it is now physical, natural (by trophic level), cultural, and socioeconomic.

686.02 Section 4.3 of the FEIS describes how previous comments were addressed and incorporated into the FEIS. After the 1995 Record of Decision was rescinded, a new DEIS was prepared, beginning in 1996, and was published in 1998. Comments were received on that DEIS (and public hearings were held to receive comments); those comments were analyzed and responded to, and the 1998 DEIS was revised based on input from those comments. Since a decision was made in 2003 to prepare this SDEIS in lieu of publishing a FEIS based on the 1998 DEIS, it should be noted that the SDEIS does capture revisions made earlier based on public comments and input.

686.05 The purpose and need section has been clarified to explain that Reclamation's action is making a decision on the loan application and use of Federal land. In addition, Reclamation analyzed the size of the reservoir to ensure a reasonable range of alternatives and to enable USACE to determine the LEDPA. SWCD's proposal is to build a reservoir to store its water supply—this is not Reclamation's proposal. The aquifer recharge alternative was provided to SWCD and analyzed in the SDEIS. The USACE is a cooperating agency on this NEPA analysis, and they will be responsible for compliance related to the Clean Water Act and the 404 Permit.

Proposed Action/Alternatives

5.70, 65.11 Given that Reclamation is making a decision on approving the loan and use of Federal land, the range of alternatives to be analyzed in the FEIS is defined in part by the applicant's proposal. Chapter 1 has been updated to clarify that Reclamation examined a range of reservoir sizes to ensure that a reasonable range of alternatives was considered and to enable USACE to determine the LEDPA. Also, the reason for analyzing different sized reservoirs was added to Section 1.6, "Decisions To Be Made Based on this Analysis."

Public Health and Safety

1.02, 51.15, 51.72, 81.03, 620.13 The text has been edited in section 3.6. Should the dam be approved for construction, it would be built to appropriate Federal or State seismic standards (i.e., Federal Guidelines for Dam Safety, Federal Emergency Management Agency, 2005; and Requirements for the Design, Construction, and Abandonment of Dams, Utah Administrative Code Rule R655-11, respectively).

67.04 Additional discussion of the gastrointestinal effects was added to the public health and safety section (3.19).

51.30, 71.01 and 72.01 This discussion was added to Section 3.3, "Water Quality." Price River flows below Scofield Reservoir that would impact the municipal water supply for Helper and Price were analyzed, and there was no significant difference from the flow analysis outlined in the EIS. No further flow analysis is needed.

419.17 Cobalt concentrations discussed for the project area were reported in the National Geochemical Database from the National Uranium Resource Evaluation Survey. Clarification has been added to the FEIS regarding cobalt concentrations.

690.03, 690.04 The FEIS has been edited in section 3.3 to reflect the impacts increased phosphorus would have on other resources, including culinary water. Also, the use of municipal drinking water was addressed in Section 3.19, "Public Health and Safety."

Recreation

5.26 The Narrows FEIS has been updated to include the 2009 State Comprehensive Recreation Plan.

8.04 There will be effects to the trout fishery, and there could be a negative effect on tourism related to the sport fishery. However, based on the updated Section 3.15, "Recreation and Visuals," in the FEIS, the losses to that industry should be offset by the increases due to the new boating and reservoir angling opportunities.

510.04 The recreational impacts were recalculated, but there were no firm data to use for the fishing days on Upper Fish Creek, Lower Fish Creek, and the Price River below Scofield Reservoir.

684.04 Recreational user days were recalculated. See section 3.15 of the FEIS.

Threatened and Endangered Species

3.15, 4.14, 51.68, 67.18 The analysis was updated and included in the text under Section 3.12, "Threatened and Endangered Species." Reclamation and the project applicant would cooperate in implementing the measures prescribed in the Spotted Frog Conservation Agreement and Strategy (Final, 1998).

4.04 Mitigation measures have been appended to the FEIS to address this impact. As stated in Section 3.12, "Threatened and Endangered Species," of the FEIS,

> *"Prior to construction of the proposed project, greater sage-grouse habitat would be surveyed for any use by these birds. If active nests are found in the area, construction would be delayed until these birds have left their nests, probably in early June. A survey for golden eagle nest use would be conducted prior to construction. If active nests are found, construction activities within 0.5 miles of the nest would not be allowed from January 1–August 31."*

5.05, 5.51, 51.67 The Service responded to Reclamation in writing during scoping but did not request additional consultation. Reclamation considers that the Biological Opinion, prepared in 2000, adequately addresses impacts of the proposed project on threatened, endangered, and candidate species. The FEIS has considered other information regarding these species current listing, status, and ranges.

10.14, 51.22 Section 3.12 of the FEIS incorporates updated information and effects analysis for all Endangered Species Act listed or otherwise sensitive species within the project area.

51.35 The Recovery Implementation Program's recommendations are incorporated into section 3.12 (Threatened and Endangered Species) of the FEIS.

Visual Resources

419.05 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 text of the visual resources section (3.15) was modified to indicate that the presence of the reservoir would alter the view.

Water Quality

3.02, 3.08, 10.08, 51.32, 65.25, 65.29 A water quality monitoring program is included as an environmental commitment and will be developed and implemented if the project is approved.

3.09 Section 3.3 of the FEIS identifies an annual phosphorus load reduction target of 805 kilograms per year (kg/year). The load reduction was identified from the eutrophication study. Mitigation measures were proposed and evaluated by an interagency team of water quality specialists. Specific locations for mitigation will be identified by a water quality monitoring program. If identified improvements do not meet the required phosphorus load reduction target identified in the FEIS, then additional mitigation measures will be identified and implemented. Mitigation measures will be implemented prior to storage and diversion of water as part of the Proposed Action. The FEIS has been edited to include details of adaptive management regarding identification and implementation of mitigation measures.

4.43 The description of cumulative effects on water quality in the FEIS has been edited accordingly.

10.01 If the project is approved, all necessary requirements relating to discharge from the dam will be met to obtain certification from the Utah Department of Water Quality (UDWQ). The predicted water quality effects section of the FEIS (section 3.3.3) has been updated to address predicted water quality effects of discharges from the Narrows Dam.

10.12 The EIS team agrees that the estimated evaporation for Narrows Reservoir is high. The team re-ran the reservoir operation studies with the reduced evaporation rates recommended by the UDWQ but found that the differences in project yield and in downstream flows were very minor. Using the higher evaporation rates produces slightly conservative results. Therefore, we chose to continue to use the operation studies and flow values described in the EIS.

51.03 Total organic carbon data collected by UDWQ have been added to Section 3.3, "Water Quality."

51.10 During the writing and editing of the EIS document, the most current available information regarding Scofield Reservoir's trophic state was from the *Utah 2006 Integrated Report Volume I – 305(b) Assessment*. At the writing of this response, the most current available information regarding the trophic state was from the *Part 2 Draft 2010 Utah Integrated Report Water Quality Assessment 305(b) Report*. The FEIS (section 3.6.3) has been updated to reflect the most current information.

51.25 The water quality impacts identified during scoping were the potential for increased sedimentation during construction, increased phosphorus loading, and increased eutrophication in Scofield Reservoir. These impacts and proposed mitigation are discussed in section 3.3, and some of the discussion has been modified to address similar comments.

51.27 The FEIS has been edited to reflect the impacts the project may have on the potable water supply in Scofield Reservoir. Implementation of proposed mitigation measures (see appendices) is expected to reduce phosphorus levels to preproject conditions, which also are expected to maintain algal growth at preproject conditions. Drinking water treatment costs would not be expected to be affected if water quality is maintained at preproject conditions. Additionally, Scofield Reservoir was enlarged to mitigate any potential adverse effects of the Proposed Action; therefore, any potential impacts already are mitigated in part by the reservoir enlargement.

51.63 Drinking water concerns are addressed in the change to section 3.3 about Scofield Reservoir.

51.73 The salinity control program related to the Narrows Project being a participating project in the Colorado River Storage Project was added to Section 3.3, "Water Quality."

65.16 Surface water temperature data collected in July and August by UDWQ on Scofield Reservoir between 1981–2007 does not show differences in temperature between low storage and high storage years. Summer surface water temperatures are determined primarily by solar input and wind mixing. Surface water temperatures would be expected to be similar between the Proposed Action and the No Action Alternative. The Proposed Action will reduce the volume of the hypolimnion and metalimnion of Scofield Reservoir due to the reduced storage.

Reduction in volume in these zones will result in warmer temperatures through the entire water column during the summer. Discussion of these changes has been included in the FEIS.

66.13, 65.29 The total phosphorus load to Scofield Reservoir will decrease as a result of the Proposed Action, but the in-lake phosphorus concentration will increase due to depletions. Due to the acknowledged increase in phosphorus concentration, which is considered an adverse impact, specific mitigation

measures are proposed to offset this impact. These measures are discussed in section 3.3 of the FEIS and will reduce phosphorus loading to Scofield Reservoir by 805 kg/yr. Water clarity may be affected by decreased storage in Scofield Reservoir. Additional discussion has been added to the FEIS discussing these potential effects. Scofield Reservoir was enlarged to mitigate any potential adverse effects of the Narrows Project; therefore, any potential impacts are already mitigated in part by the reservoir enlargement.

Water Resources

4.19, 5.07, 65.18, 66.17 The Water resource section (3.1) has been updated using available information. Averages are based on the 1960–2002 hydrologic period of record. The hydrologic analysis uses USGS stream gauge data, and a majority of the USGS stream gauge data was discontinued in 1989 and 2003. The additional effort to add 1 year of stream gauge data results in an insignificant improvement in the overall analysis.

5.09, 5.14 Price River flows below Scofield Reservoir that would impact the municipal water supply for Helper and Price were analyzed, and there was no significant difference from the flow analysis outlined in the SDEIS. The EIS team searched for additional data, and most of those years were not available. Available data was added, and the FEIS was updated. The new data made no significant difference in the results. No further analysis is needed.

5.33 The 1968 average year was determined by ranking water volume for each year from 1960–2002 and choosing the corresponding median volume of water. Modeling methodology is disclosed in a new appendix that describes the modeling in detail.

5.80 Text has been added to section 2.2.2.2.3.10 to emphasize that the minimum pool is 2,500 acre-feet of water with a surface area of 144 acres.

5.83, 51.71 Monthly averages are a reasonable way to display the modeling outputs. Modeling information is available in the project files at the Provo Area Office. Limitations of the models are disclosed in a new appendix that describes the modeling in detail.

51.52 The operational studies have been updated, and the FEIS has been revised.

Water Rights

4.22 We updated section 3.1 to be more explanatory. The Proposed Action would impact only storage releases. Direct flow rights that have a senior priority date to the Narrows water rights would be unaffected by the project.

22.05 A water rights section (section 3.2) was added. Section 3.3.3 of the FEIS evaluates the impacts of proposed alternatives to the water available to

downstream water rights in the Gooseberry Creek, Fish Creek, Cottonwood Creek, Price River, Green River, and San Pitch River systems.

51.16, 689.02, 686.06 A section on water rights has been added to the FEIS. The Narrow's water rights have a 1941 priority date that makes them senior to the Flaming Gorge Reservoir, Central Utah Project, and many other water rights in the Colorado River Basin.

Wetlands

4.02 The reference to mountain riparian habitat was added to Section 3.13, "Vegetative Resources." The FEIS incorporates mitigation to fully compensate for adverse impacts to wetland resources.

4.37 The status of willows in the creeks was added to the text.

51.18 The wetland delineation history, section 3.14, was altered in response to this comment. Should SWCD proceed with its project, consultation and coordination with the USACE and the Utah Division of Water Quality would be required.

67.07 Wetland effects were updated in the FEIS (see section 3.14).

Wildlife

3.15, 4.14 The analysis was updated and included in the text under section 3.12. Reclamation and the project applicant would cooperate in implementing the measures prescribed in the Spotted Frog Conservation Agreement and Strategy (Final, 1998).

4.01, 4.04, 409, 4.13, 51.23 The FEIS has been revised in section 3.12 to include the greater sage grouse. Sage grouse habitat lost due to the proposed project would be replaced by habitat improvements to other areas.

4.03 Section 3.11, "Wildlife," of the FEIS has been revised to include effects to migratory birds. Mitigation measures for these effects have been specified in the FEIS.

4.06 Raptor protection measures have been incorporated into appendix G of the FEIS.

4.12 A discussion has been added to Section 3.11, "Wildlife," covering the possible use of the project area by eagles; and appropriate mitigation measures have been included in an appendix.

NARROWS PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX I

NARROWS ENVIRONMENTAL IMPACT STATEMENT MODELING METHODOLOGY

Appendix I

Narrows Project
Final Environmental Impact Statement
Narrows Environmental Impact Statement
Modeling Methodology

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ENGINEERS

Technical Memorandum

DATE: November 20, 2011

TO: Files

FROM: Richard M. Noble, P.E.

PROJECT NO.: 2011 Narrows Project Final Environmental Impact Statement
Hydrology and Water Resources Technical Memorandum

REGISTERED PROFESSIONAL ENGINEER
No. 168241
RICHARD M. NOBLE
11-20-11
STATE OF UTAH

This Hydrology and Water Resources Technical Memorandum provides a summary description of the methodology used in Narrows Project operation studies. The operation studies include operational analysis of Narrows Reservoir, Narrows Tunnel, Gooseberry Creek, Fish Creek, Scofield Reservoir, and the Price River under historical, No Action Alternative, and the various Narrows Project alternative conditions. The purposes of this analysis are as follows:

1. Verify water supply for the Narrows Project
2. Identify historical and future without project stream flows and reservoir contents which serve as a baseline for environmental impact analysis
3. Identify stream flows and reservoir contents with project alternatives in place
4. Identify changes in stream flow and reservoir contents for use in identifying environmental impacts

Historical Records

The operation studies are based on monthly historical records for the 1960 through 2002 time period. This period of record is assumed to be representative of potential future conditions, as it contains a wide range of dry and wet years and multiple periods of consecutive dry and wet years. Historical records are available for 12 USGS gaging stations within the project area of influence. The locations of these gaging stations are shown on Figure 1 and the ranges of available data are summarized in Table 1.

In many cases, the available USGS data is incomplete for the period of study. In those instances missing data were provided from Reclamation and River Commissioner records (Table 2) or estimated by correlating with other gaging stations (Table 3).

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Operation Studies

Impacts to water resources were determined by using seven distinct and detailed operation studies, which simulate stream flows and reservoir operations under historical, future without project, and project conditions. As mentioned previously, these studies are based on the 1960-2002 hydrologic period of record and utilize USGS stream gage data. A majority of the USGS stream gage data was discontinued in 1989 and 2003. Because analyses had been completed for the 1960 – 2002 period, the additional effort to add one year of stream gage data results in an insignificant improvement in the overall analysis.

These operation studies are Microsoft Excel spreadsheets that were developed specifically for the Narrows Project. The spreadsheets are accounting-type models that track changes in reservoir inflow, outflow, and change in storage at reservoirs, and changes in flow at key stream locations based on water demands on the Price River and transmountain diversions to the San Pitch River basin. The analysis is not an "operations model" that can be used to forecast potential future conditions or be used as a tool in operations decision making. The seven operation studies are briefly described as follows:

- **Scofield Reservoir Historical Operation Study** – The Scofield Reservoir historical operation study was performed to simulate the historical operation of Scofield Reservoir and to calculate ungaged inflow and outflow data. The study is based on historical data on Fish Creek immediately upstream from the reservoir, the reservoir contents, and the reservoir outflow. Calculated data include: total inflow minus evaporation, evaporation, total inflow, and other inflow (inflow other than from Fish Creek).

- **Scofield Reservoir Demand Study** – The Scofield Reservoir demand study was performed to segregate the outflow from Scofield Reservoir to separate the releases for downstream demands from spills and operational releases (releases made in anticipation of a large spill). The releases for downstream demands are then used as demands on Scofield Reservoir for the Future Without Narrows Project Operation Study and the Future With Narrows Project Operation Study. In performing this study the historical releases from Scofield Reservoir, as well as all other intervening tributary inflows, were compared against the maximum diversion capacity at each point of diversion. The maximum diversion capacity was assumed to be the largest diversion recorded in 1983 and 1984. It was assumed that surplus water was available in these years and the canals were at their capacity. For diversions that did not have data for 1983 or 1984, the maximum water right was used as the diversion capacity.

  When reservoir outflow added to the intervening inflows was less than or equal to the diversion capacity, the total reservoir outflow was assumed to be a legitimate release for downstream demand. When reservoir outflow added to the intervening inflows was greater than the diversion capacity, the excess reservoir outflow was assumed to be a spill or operational release.

  This analysis ignores the State Engineer's irrigation duty in the Price area. The study could underestimate spills and operational releases in years when diversions exceeded the irrigation duty. However, this approach was assumed to be conservative and represents the worst case scenario for determining impacts of the Narrows Project.

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- **Future without Project Operation Study** – This study shows the flows of Gooseberry and Fish Creeks and the Price River below Scofield Dam and the operation of Scofield Reservoir under the future without Narrows Project conditions. These conditions are the same as the No Action Alternative. The study also calculates reach gains between Gooseberry Creek Near Fairview, Utah (09309800) and Gooseberry Creek Near Scofield Utah (09310000) and between Gooseberry Creek Near Scofield Utah (09310000) and Fish Creek Above Reservoir Near Scofield, Utah (09310500).

  Historical inflows, evaporation (calclulated based on previous end-of-month reservoir surface area), and demands identified in the Scofield Reservoir Dam and Study are used to operate Scofield Reservoir. Releases are made to satisfy all demands unless there is insufficient inflow and active storage available. Additionally, controlled releases from storage are limited to the 30,000-acre-foot water right, which does not include bypasses for direct flow rights. Spills occur when the previous end-of-month active contents plus the inflow minus the controlled releases exceeds the reservoir active capacity.

  The study is based on the existing Scofield Reservoir capacity allocation which includes a minimum or inactive pool of 7,800 acre-feet and an active storage capacity of 65,700 acre-feet for a total reservoir capacity of 73,500 acre-feet.

  Stream flows and reservoir contents under the Future Without Project operation are generally the same as those that occurred historically. The primary exception is that the active storage content of Scofield Reservoir is limited to 65,700 acre-feet to ensure that the reservoir is operated in accordance with existing water rights and operating agreements.

- **Future with Narrows Project Operation Study** – This study shows the flows of Gooseberry and Fish Creeks and the Price River below Scofield Dam and the operation of Narrows Reservoir and Scofield Reservoir under the Proposed Action. Transmountain releases to Cottonwood Creek through tne Narrows Tunnel also are modeled.

  The study relies on information in the Future without Project Operation Study, the Scofield Reservoir Historical Operation Study, and the Scofield Reservoir Demand Study.

  Inflows, evaporation (calclulated based on previous end-of-month reservoir surface area), and a 5,400 acre-feet per year demand for transmountain releases through Narrows Tunnel are used to operate Narrows Reservoir. Releases through the Narrows Tunnel are made to satisfy demands in the Narrows Project area unless there is insufficient inflow and active storage available. A 1 cfs minimum stream flow release to Gooseberry Creek below Narrows Dam is always maintained. An additional 300-acre-feet release to Gooseberry Creek for channel maintenance flows is also made in May of each year. Spills occur when the previous end-of-month active contents plus the inflow minus the controlled releases exceeds the reservoir active capacity.

  The study is based on the Narrows Reservoir capacity allocation described in the 1984 Compromise Agreement which includes a minimum or inactive pool of 2,500 acre-feet, an active water supply storage capacity of 10,000 acre-feet, and an active capacity of 4,500 acre-feet to be used exclusively for minimum stream flow in Gooseberry Creek for a total reservoir capacity of 17,000 acre-feet.

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Stream flow at Gooseberry Creek Near Scofield, Utah (09310000) is calculated by adding the stream flow below Narrows Dam to the reach gains calculated in the Future Without Project Operation Study. Stream flow at Fish Creek Above Reservoir Near Scofield, Utah (09310500) is calculated by using the previously calculated stream flow at Gooseberry Creek Near Scofield, Utah and adding the reach gains calculated in the Future Without Project Operation Study.

Modified Fish Creek inflows, evaporation (calclulated based on previous end-of-month reservoir surface area), and demands identified in the Scofield Reservoir Demand Study are used to operate Scofield Reservoir. Releases are made to satisfy all demands unless there is insufficient inflow and active storage available, in which case shortages are calculated. However, controlled releases from storage are limited to the 30,000-acre-foot water right, which does not include bypasses for direct flow rights. Spills occur when the previous end-of-month active contents plus the inflow minus the controlled releases exceeds the reservoir active capacity.

The study is based on the existing Scofield Reservoir capacity allocation which includes a minimum or inactive pool of 7,800 acre-feet and an active storage capacity of 65,700 acre-feet for a total reservoir capacity of 73,500 acre-feet.

Stream flows belows Scofield Dam and Scofield Reservoir contents under the Future With Narrows Project operation vary from the Future Without Project due to decreased reservoir spills and when shortages occur to Scofield Reservoir demands.

- **Mid-Sized Reservoir Alternative Operation Study** – This study is similar to the Future with Narrows Project Operation Study, except that it is based on the Mid-Sized Reservoir Alternative instead of the Proposed Action. With this alternative the Narrows Reservoir has an inactive capacity of 2,500 acre-feet, a water supply pool of 9,950 acre-feet, and no minimum streamflow pool. The 1 cfs minimum stream flow release to Gooseberry Creek and the additional 300 acre-feet supplemental release in May for channel maintenance are provided by this alternative.

- **Small Reservoir Alternative Operation Study** – This study is similar to the Future with Narrows Project Operation Study, except that it is based on the Small Reservoir Alternative instead of the Proposed Action. With this alternative the Narrows Reservoir has an inactive pool of 2,500 acre-feet, a water supply pool of 5,400 acre-feet and no minimum streamflow pool. The 300 acre-foot per year supplemental release to Gooseberry Creek for channel maintenance is not provided by this alternative. Only the 1 cfs minimum release is made.

- **Small Scofield Study** – The Small Scofield Reservoir operation study is intended to show the water supply available to Carbon County and the monthly Scofield Reservoir contents that would have occurred if Scofield Reservoir had not been enlarged to accommodate the Narrows Project. The study uses historical inflows to Scofield Reservoir and water release demands identified in the Scofield Reservoir demand study. Scofield Reservoir capacity is limited to 30,000 acre-feet active capacity and no inactive capacity.

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Price River at Woodside Analysis

An evaluation of flows for the Price River at Woodside, Utah (09314500) was not included in the operation studies described above. Instead, differences in flows between the Future without Project and the Future with Narrows Project were evaluated separately based on results from the Future without Project and Future with Narrows Project operation studies.

The first attempt was to start the analysis at Scofield Reservoir and move down the river, factoring in diversions, return flows, and reach gains. However, due to limited streamflow data and diversion records, the correlation on Price River near Heiner was inadequate. And this method was not successful. Instead, the approach described below was used.

Under the Future With Narrows Project there are several months when shortages to Carbon County water users occur due to Scofield Reservoir having water available in storage. In these months, the change in outflow was not directly subtracted from the flow at Woodside because if the water had been available, it would have been diverted by Carbon County water users. In those months, the following assumptions were used to adjust the flow of the Price River at Woodside:

- the irrigation efficiency is 50%,
- the diversion consumption by phreatophytes is 10%
- the return flow to the river is 40%, with 20% returning in the first month, and 20% in the second month.

It was also proposed that during the high runoff months, the change in flows at Woodside be calculated by subtracting the change in spills at Scofield Reservoir from the historical flow of the Price River at Woodside. However, a concern was expressed that a change in spills might also cause a change in diversion. If a change in diversions occurred, then other factors such as consumptive use and return flows would need to be considered in determining the flows at Woodside. This study was performed to determine if project changes in Scofield Reservoir spills could cause a change in diversions.

To determine this, the Future Without Project flows and spills below Scofield Dam were used because they are the baseline conditions for the environmental impact analysis. The diversions and tributary inflows between the reservoir and the gage at Heiner were taken into account to determine the estimated flow of Price River at Heiner. The total capacity of the canals below Heiner (Canals 14-21) was compared against the estimated Price River flow without the diversions. This study shows that in most cases, there is not enough flow in the river to fill the canals to capacity. When there is enough flow, the No Action spills were examined. In all cases except for May 1971, the spills were less than the difference between the Price River flow below Wildcat Canyon and the canals' capacity. Therefore, the reduced spills under the Future with Narrows Project will not change the canal diversions. Changes in flow during high runoff months were calculated directly subtracting the reduction in spills under the Future With Narrows Project from the Future Without Narrows Project flow at Woodside.

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Flow comparisons for Dry, Wet, and Average Years

For convenience of the reader in evaluating project effects on stream flows and other flow-dependent resources such as fisheries, comparisons are presented in the EIS at various locations for dry, wet and average years. The rationale behind this methodology is that this comparison not only provides a comparison under average conditions, but also under the dry and wet extreme conditions.

In selecting which years represent the dry and wet extremes and "average" or typical year, the annual flows of Gooseberry Creek Near Scofield, Utah (09310000) were examined for water years 1960 – 1989. This was the period of record used in the 1993 Draft EIS. During this period 1977 had the lowest annual flow and 1984 had the highest flow. The average annual flow was 13,970 acre-feet. The years closest to this numeric average were 1967 and 1968 with 13,948 acre-feet and 14,176 acre-feet, respectively. Because 1967 had incomplete data (there was no recorded flow for Fairview Ditch or Tunnel) 1968 was selected to represent "typical" or "average" conditions for evaluating project effects on stream flows.

When the period of record was updated for the Final EIS to water years 1960 – 2002, 1977 and 1984 were still the driest and wettest years for this extended period. The average annual flow for this period decreased slightly to 13,574 acre-feet. However, 1968 with an annual flow of 14,176 acre-feet was within 5 percent of the average for this extended period and 1968 was therefore considered to be representative of "average" conditions.

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Table 1. Summary of USGS Data Used in Narrows Project Operation Studies

USGS Station ID	Station Name	Range of Data Available for Water Years 1960 - 2002
09309500	Fairview Ditch Near Fairview, Utah	October 1959 – September 1965
09309600	Fairview Tunnel Near Fairview, Utah	October 1967 – September 2002
09309800	Gooseberry Creek Near Fairview, Utah	October 1959 – September 1963, October 1964 – June 1969
09310000	Gooseberry Creek Near Scofield, Utah	October 1959 – September 2002
09310500	Fish Creek Above Reservoir Near Scofield, Utah	October 1959 – September 2002
09311000	Scofield Reservoir Near Scofield, Utah	October 1965 – September 1970, October 1990 – September 1993
09311500	Price River Near Scofield, Utah	October 1959 – July 1969, October 1979 – September 1980
09312600	White River Below Tabbyune Creek Near Soldier Summit, Utah	October 1967 – September 2002
09312700	Beaver Creek Near Soldier Summit, Utah	October 1960 – September 1989
09312800	Willow Creek Near Castle Gate, Utah	October 1962 – September 1989
09313000	Price River Near Heiner, Utah	October 1959 – September 1969, October 1979 – September 1981, October 1990 – September 2002
09314500	Price River At Woodside, Utah	October 1959 – September 1992, August 2000 – September 2002

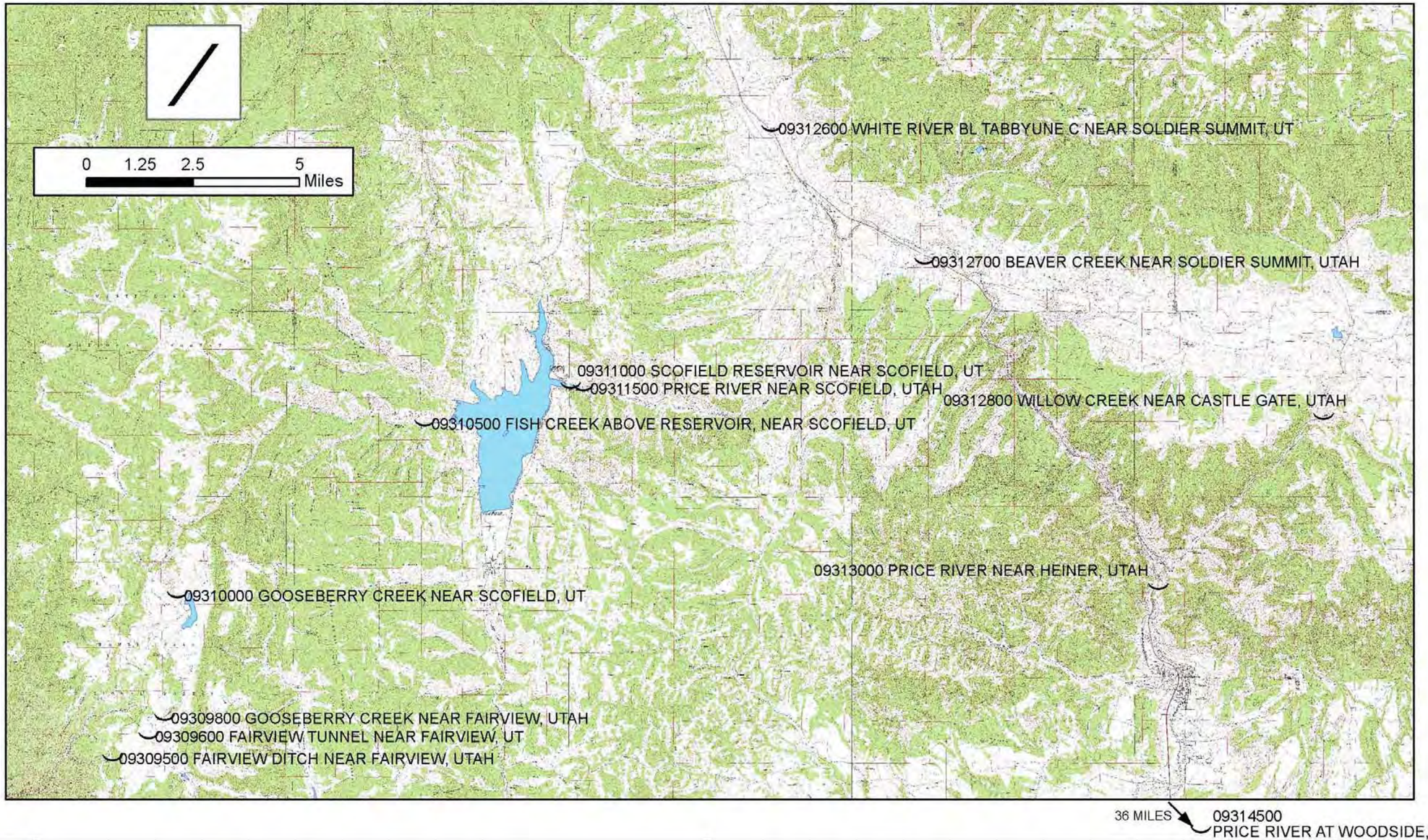
Table 2. Summary of Reclamation and River Commissioner Data Used in Narrows Project Operation Studies

USGS Station ID	Station Name	Range of Data Used for Water Years 1960 - 2002
09311000	Scofield Reservoir Near Scofield, Utah	October 1959 – September 1965, October 1970 – September 1990, October 1993 – September 2002
09311500	Price River Near Scofield, Utah	August 1969 – September 1979, October 1980 – September 2002

Table 3. Summary Estimated Data Used in Narrows Project Operation Studies

USGS Station ID	Station Name	Method of Estimating Missing Data
09309500	Fairview Ditch Near Fairview, Utah	Estimated
09309800	Gooseberry Creek Near Fairview, Utah	Estimated by correlation with Gooseberry Creek Near Scofield, Utah (09310000) using linear regression
09312600	White River Below Tabbyune Creek Near Soldier Summit, Utah	Estimated by correlation with Price River Near Heiner, Utah (09313000) using linear regression
09312700	Beaver Creek Near Soldier Summit, Utah	Estimated by correlation with Price River Near Heiner, Utah (09313000) using linear regression
09312800	Willow Creek Near Castle Gate, Utah	Estimated by correlation with Price River Near Heiner, Utah (09313000) using linear regression
09314500	Price River At Woodside, Utah	None - no accurate method of estimating flows

6771 South 900 East · Midvale, Utah 84047 · (801) 566-5599 · Fax (801) 566-5581



HANSEN ALLEN & LUCE INC ENGINEERS	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	STREAM GAGES USED FOR PROJECT OPERATION STUDIES LOCATION MAP	FIGURE 1

NARROWS PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX J

SMALL RECLAMATION PROJECTS ACT
LOAN APPLICATION

Sanpete Water Conservancy District

NARROWS PROJECT

Loan Application Report

Submitted to the United States Department of the Interior, Bureau of Reclamation, Under the Guidelines of the Small Reclamation Projects Act, PL 84-984

March 2012

SANPETE WATER CONSERVANCY DISTRICT

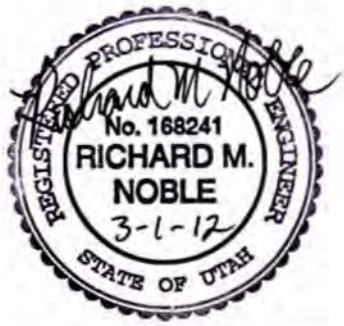
NARROWS PROJECT

LOAN APPLICATION REPORT

(HAL Project No.: 321.01.100)

Submitted to:

U.S. Bureau of Reclamation
Under the Guidelines of the
Small Reclamation Projects Act, PL 84-984

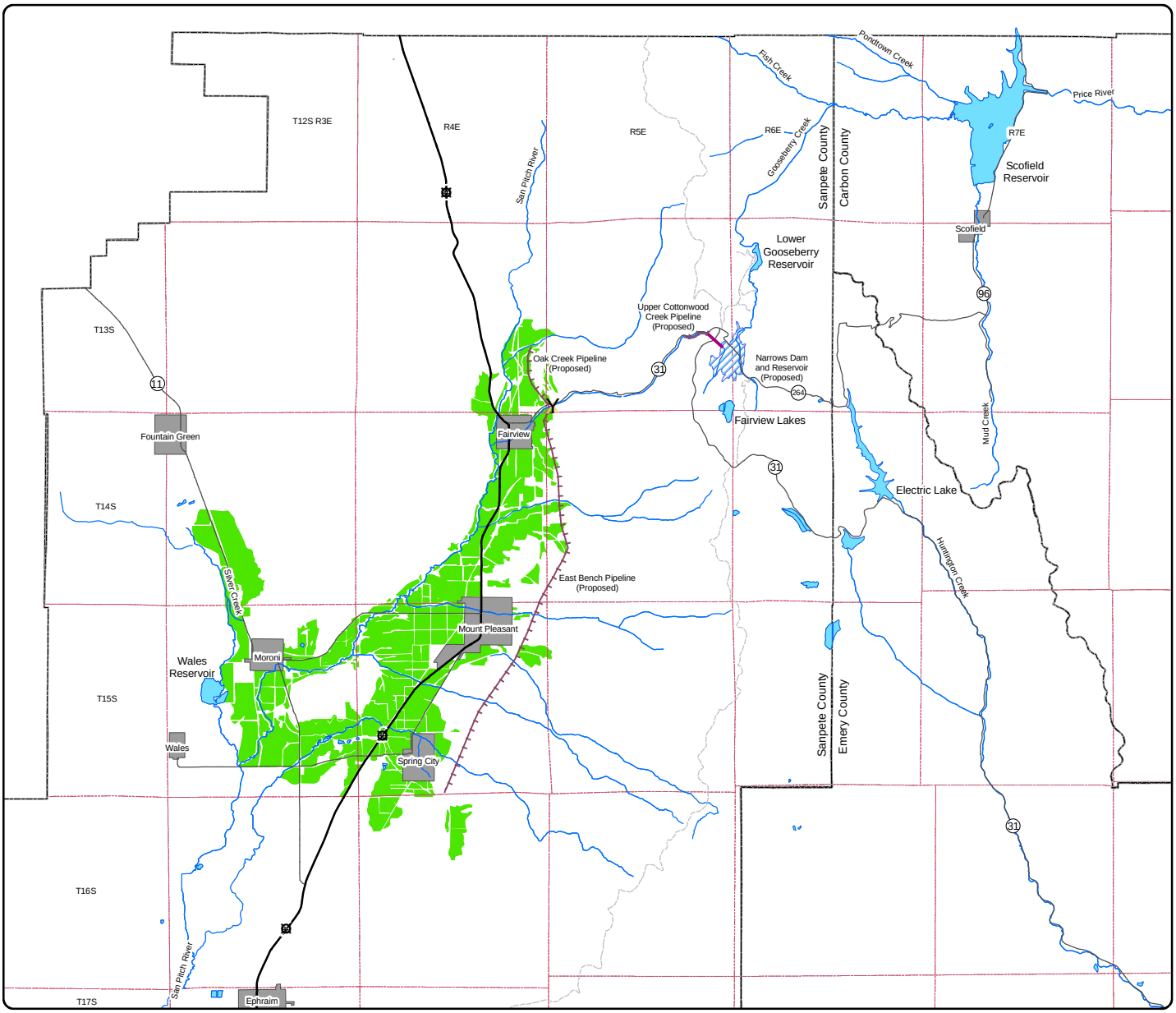


Richard M. Noble, P.E.

Project Manager

HANSEN ALLEN & LUCE inc
ENGINEERS

March 2012



Legend

- Municipalities
- Lakes and Reservoirs
- Proposed Reservoir
- Lands to Receive Project Water
- County Boundaries
- Township and Range
- East Bench Diversion Dam
- Proposed Pipeline
- Unimproved Roads
- State Route
- U.S. Highway
- Narrows Tunnel

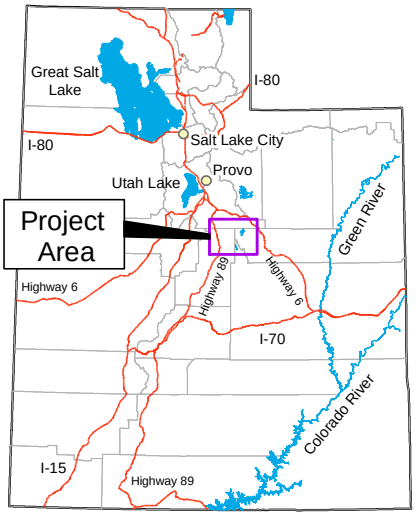
3

0 1 2 3 4 5 Miles

Narrows Project

GENERAL MAP

Sanpete Water Conservancy District



PREFACING MATERIAL

Sanpete Water
Conservancy District

Sanpete Water Conservancy District

90 West Union Street

Manti, Utah 84642

435/835-5671

435/835-5678 fax

March 1, 2011

Mr. Larry Walkoviak
Regional Director
U.S. Bureau of Reclamation
125 South State, Room 6107
Salt Lake City, Utah 84138-1102

Dear Mr. Walkoviak:

Enclosed is the updated Small Reclamation Loan Application Report for the Narrows Project. The document was prepared for Sanpete Water Conservancy District and is submitted under the guidelines of the Small Reclamation Projects Act, PL 84-984.

The Sanpete Water Conservancy District is seeking $21,792,000 in loans and $3,692,000 in grants from the United States under the provisions of P.L. 84-984 as amended. The District proposes to build a multiple purpose water development project that would provide water for irrigation and municipal use. In addition to providing a water supply, the project would include recreation opportunities and measures to improve fish and wildlife habitat. Water from the project would come from a transmountain diversion from upper Gooseberry Creek and its tributaries which are located in the Price River drainage. The water would be used in north Sanpete County.

Please let me know if you have any questions regarding this document.

Sincerely yours,

Edwin B. Sunderland
Chairman

Enclosure

RESOLUTION - LOAN

RESOLUTION APPROVING APPLICATION REPORT AND AUTHORIZING THE FILING OF APPLICATION FOR LOAN AND GRANT UNDER PUBLIC LAW 84-984, AS AMENDED

WHEREAS, the SANPETE WATER CONSERVANCY DISTRICT desires to secure a Federal loan and grant under the Small Reclamation Projects Act. P.L. 84-984, as amended, and has authorized its consulting engineers, HANSEN, ALLEN & LUCE, INC., to prepare a feasibility report in support of an application for said loan and grant to finance construction of a dam and reservoir, pipelines to convey project water to areas of use, rehabilitation of the existing Narrows Tunnel, relocation of State Road-264, and construction of recreation facilities; and

WHEREAS, said consulting engineers have prepared a supporting Loan Application Report, as required under the Small Reclamation Projects Act, entitled "Narrows Project, Small Reclamation Loan Application Report," dated March 2012; and

WHEREAS, the Board of Trustees of the SANPETE WATER CONSERVANCY DISTRICT concurs in and approves said application report which proposes a project having a total estimated cost of $37,401,000 of which $21,792,000 would be obtained by a loan from the United States under provisions of P.L. 84-984 as amended, to be repaid within a 30-year period; $3,692,000 in grants from the United States; a $3,692,000 contribution from the State of Utah; a $4,300,000 loan from the Utah Division of Water Resources to be repaid within a 30-year period; and $3,925,000 expended to date by the Recipient.

NOW, THEREFORE, BE IT RESOLVED by the Board of Trustees of the SANPETE WATER CONSERVANCY DISTRICT that the Chairman be and is hereby authorized and directed to make application to the U.S. Department of the Interior, Bureau of Reclamation, for said loan, and that he and the engineering consultants are further authorized and directed to perform any other acts necessary in connection with the filing of such application.

BE IT FURTHER RESOLVED that a copy of this resolution be transmitted to the U.S. Department of the Interior, Bureau of Reclamation, with the application report.

PASSED, ADOPTED AND APPROVED by the Board of Trustees of the SANPETE WATER CONSERVANCY DISTRICT at a special meeting of said Board held on March 1, 2012, by the following roll call vote:

AYES: Trustees Chad Olson, Ken Bench, Dave Cox, and Edwin Sunderland, Joe Frischknecht

NOES: Trustees_____

ABSENT: Richard Dyreng, Kenneth Palmer

(Chairman of the Board of Trustees)

* * * * * * * * *

ATTEST:

I HEREBY CERTIFY THAT I am the Secretary of **SANPETE WATER CONSERVANCY DISTRICT** and that the foregoing resolution was duly adopted by the Board of Trustees of said District at a special meeting thereof duly held at Manti, Utah, on March 1, 2012, at which meeting a quorum of said Board of Trustees was at all times present and acting.

SANPETE WATER CONSERVANCY DISTRICT

Secretary

State of Utah
DEPARTMENT OF NATURAL RESOURCES

Michael O. Leavitt
Governor
Ted Stewart
Executive Director

1636 West North Temple, Suite 316
Salt Lake City, Utah 84116-3193
801-538-7200
801-538-7315 (Fax)

February 14, 1994

Mr. David L. Peterson, President
Sanpete Water Conservancy District
1484 S. 70 W.
Mt. Pleasant, UT 84647

Dear Mr. Peterson:

Re: Narrows Project, Sanpete County

To comply with the Bureau of Reclamation's Small Reclamation Project Act, I am responding for the Governor concerning the state's views on the Narrows Project, its financial feasibility, and the validity and accuracy of the water rights claimed by your district.

The Division of Water Resources is finalizing a financial and technical feasibility report on the Narrows Project for which you seek funding from the Utah Board of Water Resources; it will be presented at a future meeting. Much of the information of the Division's report will come from your loan application report to the Bureau of Reclamation. You must attend that meeting, and the public will be welcome to attend and comment on the final report.

Based on my conversations with you and members of the staff of Water Resources, it appears the Narrows Project is financially feasible as it is proposed in the loan application report to the Bureau. The project demands a considerable commitment by members of the district to pay for the water, but a sacrifice of developing the water today will provide a significant advantage to future water users.

The water rights for your project have been properly filed in accordance with Utah State Law. They have been amended by a Compromise Settlement Agreement of June 28, 1984, and are sufficient for the project you are proposing.

Concurrent with your loan application to the Bureau of Reclamation, the Division and Board will move ahead with your application to the state. Additional state comments and reviews will come during the Division's preparation of its final report and its work with both your district and engineer.

I am pleased to know your project is moving ahead and wish you much success as you move toward realization of this worthwhile undertaking.

Sincerely,

Ted Stewart

Ted Stewart
Executive Director

U.S. Department of the Interior
Bureau of Reclamation

ASSURANCE OF COMPLIANCE
WITH CIVIL RIGHTS LAWS AND REGULATIONS

Sanpete Water Conservancy District (hereinafter called "Recipient")

HEREBY AGREES THAT IT will comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), section 504 of the Rehabilitation Act of 1975 (P.L. 93-112, as amended, the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq) and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or Bureau of Reclamation.

These statutes require that no person in the United States shall, on the grounds of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the Bureau of Reclamation. The recipient HEREBY GIVES ASSURANCE THAT IT will immediately take any measures necessary to implement this assurance, including permitting officials to inspect premises, programs, and documents.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property discounts or other Federal financial assistance extended after the date hereof to the Recipient by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Recipient, its successors, transferees, an assigns. The person or persons whose signature appears below are authorized to sign this assurance on behalf of the Recipient.

1/3/12
Date

Chairman of the Board of Trustees

SANPETE WATER CONSERVANCY DISTRICT
90 W. Union
Manti, Utah 84642

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Sanpete Water Conservancy District

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PROJECT SUMMARY

Sanpete Water Conservancy District

PROJECT SUMMARY

NARROWS PROJECT

LOAN APPLICATION REPORT

SANPETE WATER CONSERVANCY DISTRICT

LOCATION

The Sanpete Water Conservancy District is located in the northern portion of Sanpete County in central Utah (see Frontispiece Map). The project area includes lands surrounding the small rural communities of Fairview on the north, Mount Pleasant and Spring City on the south, and Moroni to the west.

ORGANIZATION

The Sanpete Water Conservancy District was established January 1, 1964, under the laws of the State of Utah. It has authority to execute a contract with the United States for repayment of the loan; power of eminent domain, and the authority to levy such taxes as necessary for repayment of the loan. The District's assets and liabilities as of December 2010 are shown below:

Assets

Current Assets:	
Cash and Investments	$359,332
Accounts Receivable	15,300
Taxes Receivable	972,514
Total Current Assets	1,347,146
Noncurrent Assets:	
Capital Assets (Net of Accumulated Depreciation):	
Water Metering System	21,297
Construction in Progress	3,924,739
Total Noncurrent Assets	3,946,036
TOTAL ASSETS	$5,293,182

Liabilities and Net Assets

Current Liabilities:	
Accounts Payable	61,713
Noncurrent Liabilities:	
Note Payable – Due More Than One Year	49,566
TOTAL LIABILITIES	111,279
Net Assets	
Invested In Capital Assets, Net of Related Debt	3,896,470
Restricted for Capital Projects	1,198,958
Unrestricted	86,475
TOTAL NET ASSETS	5,181,903
TOTAL LIABILITIES AND NET ASSETS	5,293,182

PROPOSAL

PROPOSAL		
Total Project Cost		$ 37,401,000
Federal Loan (30-year repayment)		21,792,000
Federal Grant		3,692,000
Local Contribution		11,917,000
Engineering investigations, water rights, legal fees, acquisition of rights-of-way, loan application report and EIS	$3,925,000	
State Loan	4,300,000	
State Grant	3,692,000	

PLAN

Purpose and Need

The primary purpose of the Narrows Project is to enable Sanpete Water Conservancy District (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 accommodate 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.

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.

History of the 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.

The earliest efforts to appropriate Gooseberry Creek water and transport it to use in north Sanpete County began in the early 1900s. In 1924, predecessors to SWCD filed an application with the Utah State Engineer to appropriate 15,000 acre-feet of Gooseberry Creek water and deliver it via a transmountain tunnel to Sanpete County.

Beginning in the 1930s, Reclamation, the Utah Water Storage Commission, and local Sanpete County interests undertook cooperative studies to formulate a water development plan and enhance water supplies in Sanpete County. The first published cooperative study, undertaken

by Reclamation and released in May 1933, outlined what would become known as the Gooseberry Project. This report defined the Gooseberry Project as:

- Construction of a reservoir on Gooseberry Creek with an active capacity of 15,000 acre-feet and an annual yield of 9,400 acre-feet.
- Construction of a transmountain tunnel.
- Construction of feeder canals to deliver waters from other streams to the dam for transmountain diversion.

In September 1940, Reclamation released another cooperative study that revised the original plan and included expanding Scofield Reservoir as a principal feature of the Gooseberry Project. On November 2, 1940, the Utah Water Storage Commission recommended construction of the Gooseberry Project, defined as:

- Construction of a dam on Gooseberry Creek providing an annual average yield of 10,800 acre-feet to Sanpete County.
- Construction of a transmountain tunnel to deliver the water.
- Construction of feeder canals.
- Enlargement of Scofield Reservoir to provide exchange water for the unrestricted diversion of Gooseberry Creek water to Sanpete County.

On March 6, 1941, the lands necessary to complete the Gooseberry Project were withdrawn from public entry under a First Form Reclamation Withdrawal, 32 Statute (Stat.) 388; 43 United States Code (U.S.C.) Section (§) 372, et seq.

On January 2, 1942, Reclamation released a draft report outlining the Gooseberry Project Plan, including constructing an additional 43,000 acre-feet of storage capacity in Scofield Reservoir to support the unrestricted transmountain diversion of Gooseberry Creek water to Sanpete County.

In 1943, the United States decided that the Scofield Dam and Reservoir portion of the Gooseberry Project Plan should be completed first because of the hazardous conditions the existing structure posed to the war effort and the health, welfare, and safety of Carbon County residents. Reconstruction of Scofield Dam began the same year and was completed in 1946.

On October 11, 1943, and February 28, 1944, the United States entered into reconstruction and repayment contracts on Scofield Dam and Reservoir with local sponsors. The October 11, 1943, contract has subsequently become known as the “Tripartite Agreement.” Among the conditions identified for reconstructing and enlarging Scofield Dam and Reservoir, the agreement:

- Described the United States’ intent to construct and operate the remaining Gooseberry Project works.
- Stipulated that the Gooseberry Project has the right to divert and store all flows of Gooseberry Creek at or above the confluence with Cabin Hollow.
- Stipulated that Carbon County’s storage rights in Scofield Reservoir are subordinate to those of the Gooseberry Project.

On April 11, 1956, Congress enacted the Colorado River Storage Project Act (CRSP). Priority planning was directed for the Gooseberry Project at 43 U.S.C. 620a.

In September 1961, the Soil Conservation Service of the U.S. Department of Agriculture proposed the North Sanpete Watershed Work Plan to complete the 1942 Gooseberry Project Plan.

In 1962, the USDA Forest Service issued a Special Use Permit to the Gooseberry Project sponsors to construct, operate, and maintain a tunnel and appurtenances for transmountain diversion of water from the proposed Narrows Reservoir in Gooseberry Creek to Cottonwood Creek for irrigation purposes.

On July 22, 1975 with the Federal Gooseberry Project remaining un-built, Reclamation assigned the Narrow's portion of the Gooseberry Project water right to SWCD to complete the Gooseberry Project Plan.

On March 13, 1981, SWCD filed a notice of intent (NOI) to apply for a SRPA loan to help finance the Narrows Project. The project would include:

- The Narrows Reservoir with a capacity of 17,000 acre-feet (10,000 acre-feet active storage and 7,000 acre-feet for fish and recreation).
- Two hydropower plants to provide power for project purposes.
- Improved flows in the San Pitch River by improving select facilities that would allow for more reliable exchanges without interfering with existing water rights.
- An additional 10 to 12 exchange wells in the San Pitch River Basin to provide exchange water to municipalities.
- Rehabilitation of the existing Gooseberry (Narrows) Tunnel.

On June 28, 1984, Reclamation approved the 1984 Compromise Agreement by and among the SWCD, the Price River Water Users' Association, and the Carbon Water Conservancy District (appendix A). According to the agreement's terms, among other things, SWCD:

- Relinquished and withdrew certain water rights.
- Agreed to a much lower transmountain diversion figure than previously contemplated (reduced to 5,400 acre-feet per year).
- Restricted sources of the water supply by excluding certain stream sources of water from the project plan.
- Limited the active and inactive storage capacity of the reservoir.
- Agreed to locate the dam and reservoir site further up the drainage of the Narrows Project site, thereby relinquishing the historic Mammoth site.

On November 1, 1984, SWCD filed an amended NOI to apply for a SRPA loan. The project had been reformulated in response to the 1984 Compromise Agreement. Specifically, SWCD proposed to:

- Construct the Narrows Reservoir to a capacity of no more than 14,500 acre-feet of active storage and 2,500 acre-feet of dead storage for fish and recreation purposes.
- Construct four hydropower plants to provide power for project purposes.
- Improve flows of the San Pitch River by improving select facilities that would allow for more reliable exchanges without interference with existing water rights.

- Drill 5 to 10 exchange wells in the San Pitch River Basin to provide exchange water to municipalities and irrigation companies.
- Rehabilitate the existing Gooseberry Tunnel.
- Enlarge the existing Gunnison Reservoir by at least 5,400 acre-feet.

On January 7, 1985, the Utah State Engineer approved both the Narrows and Scofield portion of the Gooseberry Project Plan water rights. With respect to the Narrows Project water rights, among other things, the approval:

- Set the approximate physical location of the Narrows damsite and its active storage capacity (14,500 acre-feet).
- Reduced the amount of an annual transmountain diversion to 5,400 acre-feet.
- Set the instream flow requirements.
- Restricted the sources of water supply that could be used for project purposes.

With respect to the Scofield Project water rights, the approval provided the legal authority to use 43,000 acre-feet of additional storage water in Scofield Reservoir. Both approvals were expressly made subject to the terms of the 1984 Compromise Agreement.

The effect of this decision was to give SWCD the right to divert the first 5,400 acre-feet of water occurring in Gooseberry Creek at the Narrows damsite. The decision also established a Scofield Project water right for the additional 43,000 acre-feet of storage capacity in the enlarged Scofield Reservoir. Of the 43,000 acre-feet, 8,000 acre-feet is for fish propagation. The remaining 35,000 acre-feet of capacity is for Scofield Project purposes (i.e., project water for use in Carbon County), subject only to an obligation to satisfy early water rights that otherwise would be impaired by the diversion and storage of the Narrows Project. Delays in completing the Narrows Project allow the 5,400 acre-feet of Narrows Project water to be delivered to Scofield Reservoir on a temporary basis for storage and use in Carbon County.

At this time, the hydropower plants, exchange wells, and expansion of Gunnison Reservoir were dropped as part of the project plan because of the technical and financial infeasibility of these components.

On March 7, 1985, the USDA Forest Service notified the Utah State Engineer of its claim to Federal reserved water rights in the Gooseberry Creek drainage. Because of potential conflict between water use under the Federal reserved water rights and the Gooseberry Project water rights, the United States and the Sanpete Water Conservancy District agreed on July 13, 1989, to a water use plan to allow for continued development of the Gooseberry Project Plan. This agreement stipulated that all Federal reserved water rights, which fall within the Gooseberry Creek drainage, shall be subordinate to the Gooseberry Project water rights.

On July 20, 1990, SWCD filed a second amended NOI to apply for a SRPA loan. The project had been reformulated to conform to the agreements and stipulations contained in the 1984 Compromise Agreement and the State Engineer's Memorandum Decision. SWCD proposed to:

- Construct the 17,000-acre-foot Narrows Reservoir with an active capacity of 14,500 acre-feet supporting an annual transmountain diversion of 5,400 acrefeet.

- Rehabilitate the existing 3,100-foot-long Narrows Tunnel to facilitate releases from Narrows Reservoir.
- Relocate about 2.9 miles of State highway around the Narrows Reservoir.

On May 19, 1992, the draft SRPA Loan Application Report and Environmental Report were submitted to Reclamation for review and comment.

On September 20, 1993, Reclamation released a draft environmental impact statement (DEIS) for public review and comment. Approximately 60 letters of comment were received from various Federal, State, and local agencies as well as members of the public. These comments and accompanying responses were included in the January 1995 final environmental impact statement (1995 FEIS).

On December 23, 1994, SWCD submitted the final Loan Application Report for processing. On January 23, 1995, Reclamation filed the 1995 FEIS with the United States Environmental Protection Agency (EPA).

On May 8, 1995, Reclamation's Upper Colorado Regional Director signed a Record of Decision (ROD). The ROD's recommendation was to proceed with the recommended plan identified in the 1995 FEIS.

On July 28, 1995, a Complaint was filed in United States Federal District Court, District of Utah, by the Carbon Water Committee, Utah Rivers Conservation Council, Utah Wilderness Association, and three individuals (Plaintiffs) against officials of the U.S. Department of the Interior (Interior), alleging that Reclamation failed to comply with the National Environmental Policy Act (NEPA) in preparing the environmental impact statement (EIS).

In response, Reclamation hired the Environmental Chemical Corporation (ECC), an environmental consultant, to conduct an independent review of the 1995 FEIS. ECC concluded that "the Narrows Project FEIS was complete and technically complied with NEPA, fulfilling most requirements of the Council on Environmental Quality (CEQ), Reclamation, and Department of the Interior guidelines."

In September 1995, a Civil Complaint was filed in the Sixth Judicial District Court of Sanpete County, State of Utah by SWCD (Plaintiff) against Carbon Water Conservancy District and Pacificorp, also known as Utah Power and Light (Defendants). The Plaintiffs alleged a breach of contract by the Defendants by willfully interfering and hindering the Plaintiff's attempts to develop its Gooseberry Creek water rights and construct the Narrows Project. In June 1999, the court dismissed the suit, and SWCD appealed to the Tenth Circuit Court of Appeals of the United States. The court of appeals upheld the original district court ruling.

On September 11, 1995, Reclamation published a Federal Register Notice for recision of the ROD on the 1995 FEIS for the Narrows Project, due to certain procedural errors in the final environmental impact statement (FEIS) process.

On February 8, 1996, Reclamation published a Federal Register NOI to prepare a new DEIS, wherein it announced that the new DEIS and subsequent FEIS would supersede the 1995 FEIS. Reclamation said it would use the 1995 FEIS, along with other materials submitted by SWCD,

as the basis for preparing the new DEIS but would prepare the new EIS itself, rather than use a contractor.

Reclamation's new DEIS was published in March 1998. Comments were received by mail and at public hearings in Price and Mount Pleasant, Utah, on April 22 and 23, 1998, respectively.

On November 25, 2003, Reclamation published a NOI to prepare a Supplemental Draft EIS (SDEIS) in the Federal Register. Based on scoping results, discussions with interested parties and cooperating agencies, existing laws and regulations, and comments on the 1998 DEIS, Reclamation updated or added the hydrology, water quality, population and demographics, water usage, recreation, discussion regarding Skyline Mine water development, fisheries, project cost estimates, wetlands delineations, Wild and Scenic Rivers, and Endangered Species Act compliance in the SDEIS.

Reclamation's SDEIS was published in March 2010. Comments were received by mail and at public hearings in Manti and Price, Utah, on April 28 and 29, 2010, respectively.

This document updates the Final Loan Application Report submitted in December 1994. Major updates include updated cost estimates and elimination of most of the cost associated with the Narrows Tunnel rehabilitation. Narrows Tunnel was rehabilitated in 2010-2012 using funding from other sources.

Physical Works

Principal features of the Narrows Project are:

- Narrows Dam and Reservoir constructed on Gooseberry Creek, about 9 miles east of Fairview, Utah. Narrows Dam will be a zoned earthfill embankment structure, 120 feet high, with a crest length of 550 feet and a crest width of 30 feet. Narrows Reservoir will have a total capacity of 17,000 acre-feet with 14,500 acre-feet of active capacity and 2,500 acre-feet of inactive and dead storage.
- Construction of East Bench, Oak Creek, and Upper Cottonwood Creek Pipelines with a total length of 16.8 miles to convey project water to areas of use.
- Rehabilitation of the Narrows Tunnel inlet and gate structure. The tunnel is an existing water conveyance facility approximately 3,100 feet long. The tunnel has a discharge capacity of 60 cfs.
- Relocation of 2.9 miles of State Road-264.
- Construction of recreation facilities along the northwest shore of Narrows Reservoir.
- Numerous wetlands, fishery and wildlife measures to mitigate project impacts.
- A 60-unit campground and recreation area.

Design data for project features are summarized in Table S-1.

Construction Costs

Narrows Dam and Reservoir	$9,153,000
Narrows Tunnel Inlet Rehabilitation	211,000
Upper Cottonwood Creek Pipeline	534,000
East Bench Pipeline	7,079,000
Oak Creek Pipeline	354,000
Highway SR-264 Relocation	2,138,000
Recreation Facilities	835,000
Wetlands, Wildlife and Fishery Mitigation	3,600,000
Subtotal	$23,904,000
Contingencies	$2,349,000
Projected Cost Increase	3,095,000
Engineering & Administration	3,938,000
Reimbursable Interest During Construction	190,000
Costs Spent to Date	3,925,000
Total Project Cost	$37,401,000

Table S-1

Design Data Summary

Item	Unit	Project
Dam		
Height	feet	120
Crest length	feet	550
Crest width	feet	30
Material volume	cu. yds.	363,000
Discharge capacity		
Outlet works	cfs	305
Spillway	cfs	775
Reservoir capacity		
Active storage	acre-feet	14,500
Inactive and dead storage	acre-feet	2,500
Total	acre-feet	17,000
Surface area		
At top of active capacity	acres	604
At top of inactive and dead capacity	acres	144
Average during recreation season 1/	acres	454
Drawdown		
Average annual	feet	12
Average during recreation season 1/	feet	9
Maximum	feet	18
Drawdown		
Average annual	acre-feet	5,058
Average during recreation season 1/	acre-feet	4,043
Pipelines		
Oak Creek		
Length	miles	2.5
Capacity	cfs	2.5
Diameter	inches	10
East Bench		
Length	miles	13.5
Capacity	cfs	21.5
Diameter	inches	27.18
Upper Cottonwood Creek		
Length	miles	0.8
Capacity	cfs	50
Diameter	inches	30
Narrows Tunnel Inlet Rehabilitation		
Capacity	cfs	60
SR-264 Relocation		
Length	miles	2.9
Width	feet	24

(1) June through September

OM&R Costs

Personnel	$28,000
Equipment	8,000
Supplies and materials	4,000
Total	$40,000

LAND

Land Classification

Class[1]	Net Acres		
	Irrigated	Non-irrigated	Total
2	8,790	1,870	10,660
3	6,630	2,760	9,390
Subtotal	15,420	4,630	20,050
6w	7,760	0	7,760
6/std	0	16,430	16,430
ROW, etc.	0	5,190	5,190
Total	23,180	26,250	49,430

(1) Class 1 lands were not identified in the project area due to climatic constraints.

Project Cropping Patterns

	Crops (Unit--percent)					
Area	**Small Grains**	**Pasture**	**Hay**	**Alfalfa**	**Fallow and Idle**	**Total**
Group 1 (Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, Oak Creek)	5	49	9	33	4	100
Group 2 (Horseshoe, Cedar Creek Twin Creek)	10	39	8	35	8	100
Group 3 (Meadow, Sheep, Mower, Brady, Graveyard, San Pitch, Miner & Turpin, M&M, Olsen & Seely, Frandsen McArthur, Moroni, Rock Dam)	10	39	8	35	8	100

Land Ownership

The District has 23,180 irrigated acres. Within the District, there are 892 acres of irrigated land (about .038 percent) which are held in excess of 320 acres per ownership; 20,870 acres in tracts of 10 to 320 acres; and 1,418 acres in small tract ownerships of 10 acres or less.

WATER

Water Supply (average year)	Volume (acre-feet)
Irrigation	
Present supply	44,159
Project supply	4,750
Total Irrigation Water Supply (Net)	48,909
Project M&I	500

Consumptive Use of Water

	Average annual consumptive use requirement (Unit--acre-feet per acre)				
Area	Small Grains	Pasture	Hay	Alfalfa	Weighted average
Group 1 (Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, Oak Creek)	1.39	1.53	1.53	2.23	1.69
Group 2 (Horseshoe, Cedar Creek Twin Creek)	1.39	1.53	1.53	2.23	1.64
Group 3 (Meadow, Sheep, Mower, Brady, Graveyard, San Pitch, Miner & Turpin, M&M, Olsen & Seely, Frandsen-McArthur, Moroni, Rock Dam)	1.39	1.53	1.53	2.23	1.64

Water Rights

Water rights for the Narrows Project are based on three approved filings subject to the Compromise Agreement of June 28, 1984.

Application No.	Claimed Date of Priority	Nature and Amount of Claimed Right
14025 (91-130) Change Application a-9237	January 16, 1941	Storage 30 cfs
14026 (91-131) Change Application a-9236	January 16, 1941	Storage 17,000 acre-feet
1447 (91-132) Change Application a-9238	September 6, 1941	Storage 130 cfs

PAYMENT RESOURCES

The weighted payment capacity is $12.75 per acre-foot of project water and $15.91 per acre on 23,180 acres. The annual irrigation payment capacity associated with the project will be $429,356. Revenue from municipal water sales will average $355.14 per acre-foot. Total revenue from municipal water sales will increase over time with population growth and will average $344,379 per year. In addition, $476,481 of ad-valorem tax revenues will be available from the District to repay project costs.

FINANCIAL PROGRAM

Item	Annual Amount	
Period of repayment, years	0 - 5	6 - 30
Average annual loan repayment		
SRPA[1] loan ($21,792,000)		
(30 years)	$ 566,456[2]	$ 809,545[2]
SRPA interest[3]		
(maximum year)	28,224	77,138
State loan ($4,300,000)		
(30 years)	191,995	191,995
State loan interest[4]		
(maximum year)	86,000	74,968
O&M costs	40,000	40,000
Operating reserve[5]	8,000	0
Total average annual cost[2]	$ 806,451	$ 1,041,540

[1] Small Reclamation Projects Act.
[2] The annual rates are variables. These amounts are average for the time periods.
[3] At 5.75 percent interest on interest-bearing portion of unpaid balance.
[4] At 2.0 percent interest on unpaid balance
[5] To accumulate emergency operating reserve during first 5 years of repayment period.

CHAPTER 1

GENERAL INFORMATION

Sanpete Water Conservancy District

CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

The Narrows Project will be located in central Utah in Sanpete and Carbon Counties, Utah. Features of the project and the service area will be located in Sanpete County. Because the dam and diversion diminish the water flows in the Price River drainage and there are critical water-rights contracts and agreements with water users downstream in Carbon County, that county will also be considered as part of the project study area. The service area encompasses about 49,000 acres. The project features and project area are shown on the Frontispiece Map.

The eastern portion of the project area is in the Manti-La Sal National Forest along the Wasatch Plateau. The service area will be situated in the San Pitch River (a northern tributary of the Sevier River) drainage. The project will include a transbasin diversion from the Price--Green--Colorado River Basins. Head waters of the San Pitch River are located on the mountainous Wasatch Plateau at elevations reaching over 11,000 feet. Cottonwood Creek, a major tributary of the San Pitch River, is on the northeastern edge of the Sanpete Valley. There are numerous smaller streams that are tributary to the San Pitch River and all are diverted for irrigation in the project area. Gooseberry Creek is just across the ridge in the Price River drainage.

The Wasatch Plateau Range is the principal topographic feature of both counties and separates them geographically (north-south). The Great Basin, Colorado Plateau, and Rocky Mountains all converge near north Sanpete County. The San Pitch River valley lies at the eastern edge of the Basin and Range Province of North America. It is a narrow north-south trending valley bordered on the east by the high Wasatch Plateau and on the north by the low Cedar Hills, part of the Wasatch Range; and on the west by the San Pitch Mountains.

Relationship of Application to Water Rights Contracts and Agreements

As early as May 31, 1933, the U.S. Bureau of Reclamation recognized the need to develop a comprehensive water development plan on the Price River system to meet the water needs of both Carbon and Sanpete Counties. The plan which evolved became known as the Gooseberry Project Plan and constitutes the basis upon which the Scofield Dam and Reservoir were reconstructed and enlarged to their present size.

Originally, the Gooseberry Project Plan included three major features: (1) a dry dam on Gooseberry Creek with feeder canals from Brooks Canyon and Cabin Hollow Creeks; (2) a transmountain tunnel; and (3) an enlarged Scofield Reservoir to provide water by exchange to support the unrestricted transmountain diversion of water at Narrows Dam site. The following measures were taken to implement this plan:

- In 1940, the U.S. Bureau of Reclamation (Reclamation) filed the requisite applications with the Utah State Engineer to appropriate water for transmountain diversion to the San Pitch River system.
- On March 6, 1941, the Gooseberry Project lands (now Narrows Project lands) were withdrawn from public domain.
- In 1942, Reclamation issued its Gooseberry Project Report which explained how the Scofield Reservoir will provide replacement storage for the water of the transmountain diversion. Reclamation also filed its application with the Utah State Engineer to enlarge the storage capacity of Scofield Reservoir to also permit the transmountain diversion of water.
- On October 11, 1943 and February 28, 1944, the United States entered into Reconstruction and Repayment Contracts on Scofield Reservoir. Significant points of each contract included:

Reconstruction Contract

1. Additional storage capacity will be built into Scofield Reservoir to implement the Gooseberry Plan.
2. To facilitate the Gooseberry plan, the Price River water rights were subordinated to Reclamation rights on Gooseberry Creek.

Repayment Contract

1. The Carbon Water Conservancy District, sponsor of the reconstruction project, agreed to operate Scofield in accordance with the Gooseberry Project plan.
2. Sanpete interests will pay in excess of one-half reimbursable costs if the Gooseberry plan is fully implemented.

Because the original Scofield Dam was unsafe and posed an immediate threat to the war effort in the event of failure, i.e., loss of life, and disruption of rail service and access to coal supplies, Reclamation and the State of Utah recommended that this portion of the Gooseberry Project Plan be constructed first, ahead of the Narrows Dam and transmountain tunnel. The new Scofield Reservoir, authorized June 24, 1943, included 30,000 acre-feet of replacement storage capacity (replacing the then existing 30,000 acre-foot structure), 8,000 acre-feet of dead storage (conservation pool), and 35,000 acre-feet of exchange capacity to support the unrestricted transmountain diversion of Gooseberry Creek water at the Narrows damsite. Significantly, the reconstruction efforts also included the following considerations:

1. The near doubling in size of Scofield Reservoir was originally accomplished for the sole purpose of implementing the Gooseberry Project Plan - with the full 35,000 acre-feet of additional active storage capacity being expressly reserved to support, by exchange, the transmountain diversion of water at the Narrows site.

2. A second feature of the Gooseberry Project Plan, the transmountain tunnel, was constructed in 1962 as a precursor to the North Sanpete Watershed Work Plan. The plan was sponsored by the U.S. Department of Agriculture to implement the final two portions of the Gooseberry Project Plan. But, controversy developed over the use of the Gooseberry Creek water for transmountain diversion. Further work on the North Sanpete Watershed Work Plan ground to a halt. That controversy has now been resolved. Specifically:

   - On July 29, 1982, the Utah Supreme Court affirmed a declaratory judgment of the trial court holding the Price River Water Users Association and the Carbon Water Conservancy District bound by the terms of a 1943 tripartite contract among the United States Bureau of Reclamation, the Carbon Water Conservancy District, and the Price River Water Conservancy District (predecessor to Price River Water Users Association) and to a 1944 repayment contract involving the reconstruction of Scofield Dam and Reservoir.

   - On June 8, 1984, a compromise agreement resolving the long-standing controversy concerning the building of storage and diversion works on the Price River System for transmountain diversion of Gooseberry Creek water to the San Pitch River system was entered into by and between Sanpete Water Conservancy District, the Carbon Water Conservancy District, and the Price River Water Users Association.

   - On January 7, 1985, the Utah State Engineer issued memorandum of decision approving the water applications covering the Gooseberry Project waters--both for Scofield Reservoir and for the proposed Narrows Project. That decision incorporated many of the terms agreed upon in the June 8, 1984, Compromise Agreement, described above. In addition, the memorandum of decision memorialized an agreement reached by and between Sanpete Water Conservancy District and the Utah Division of Wildlife Resources over instream flows and fishery releases from the proposed Narrows Dam.

   - An agreement was reached, July 13, 1989, by and between Sanpete Water Conservancy District and the United States of America acting through its Department of Justice which resolved the reserved rights claims of the United States to the Gooseberry Project waters.

In summary, when Scofield Reservoir was reconstructed in 1944, it was clearly recognized that the Narrows Dam and the transmountain tunnel would be completed at a later date. The operational agreement covering the reconstruction effort on Scofield Reservoir specifically recognized this and allowed the Carbon County interests to utilize the excess storage capacity being built into the reservoir until the remaining features of the Gooseberry Project Plan were

completed. In this respect, for 50 years Carbon County has reaped a tremendous economic benefit from the Gooseberry Project. It received and has placed to use up to 35,000 acre-feet of water annually that it would not otherwise have had. It began reaping the economic benefit of the Gooseberry Project Plan in 1944, when Scofield Reservoir was reconstructed. It did not have to wait -- as Sanpete County has -- for the completion of the other project features to realize its benefit. However, Carbon County is not entitled to all the economic benefit of the Gooseberry Project Plan. The plan anticipated benefits for both counties by providing additional water to both counties. The completion of the plan simply means that Scofield Reservoir will spill less often and Carbon County will no longer have the use of a small amount of water meant for Sanpete County. Carbon County still received a new dam, over 35,000 acre-feet of storage capacity it did not otherwise have and would not have otherwise received, and another party to help defray the repayment costs of its dam. The use of this storage capacity, both directly and by way of carry-over storage, represents a clear benefit to Carbon County.

It should also be noted that following the Scofield reconstruction effort, Sanpete County agreed to take even less water transmountain than was anticipated by the original Gooseberry Project Plan. By virtue of the Compromise Agreement of 1984, Sanpete County agreed to reduce its annual transmountain diversions by over two-thirds of what was originally contemplated -- the original water filings contemplated Sanpete County diverting up to 17,000 acre-feet of water annually. Carbon County is receiving even more water, and thus a greater economic benefit, than was originally anticipated when it negotiated for the reconstruction of Scofield Reservoir and agreed to the Gooseberry Project Plan.

In view of the above, it appears clear that Carbon County has received a tremendous economic advantage by having signed agreements to the Gooseberry Project Plan. The benefits began immediately with the reconstruction of Scofield Dam and will continue after the project plan is fully implemented.

Location

Sanpete Valley, where the land to be served by irrigation is situated, is bordered on the east by the Wasatch Plateau and on the west by the San Pitch Mountains. Elevations in the valley range from 6200 feet at the community of Oak Creek on the north to 5500 feet at Spring City on the south and average 5900 feet at Mount Pleasant. These elevations include benches, terraces, washes, uplands, badlands, and flood plains, all cut from soft sedimentary rocks.

Sanpete County is separated from the main Utah route (I-15) south to California by the high mountains and plateaus. The project area includes lands surrounding the small rural communities of Fairview on the north, Mount Pleasant and Spring City on the south, and Moroni to the west. U.S. Highway 89 extends through the Narrows Project service area, connecting Fairview; Mount Pleasant; Ephraim; and Manti, the county seat; with Salt Lake City about 130 miles to the north. Utah State Highway 30 connects the other three principal communities in the area, Spring City, Moroni, and Fountain Green, with Interstate Highway 15 at Nephi. State Road-31 climbs up Fairview Canyon out of the Sanpete Valley to intersect with State Road-264 (SR-264). Both highways have been designated as National and State Scenic byways. Portions of SR-264 will be rerouted to cross the proposed Narrows Dam. U.S. Highway 50/6 extends through Carbon County. It connects Price, the county seat, with Salt Lake City to the

north about 120 miles. Only Carbon County is served by railroads and regularly scheduled interstate buses. Both counties are served by regularly scheduled trucklines but have no regularly scheduled airline service.

Climate

The climate of the project service area is semiarid to arid. It is characterized by wide daily and annual variations in both temperature and precipitation. There are four, well-defined seasons. The summers are warm with occasional hot spells. Winters are cold with some severe temperatures below zero. The spring and fall seasons are mild and balmy.

Precipitation in the valley varies with elevation, but ranges from 10 to 14 inches annually, which is sufficient to support only light growths of native brush and trees. Irrigation is essential to crop production. The growing season averages 125 days, with only about 50 percent of the annual precipitation occurring during the growing season. Precipitation in the mountainous high water shed areas surrounding the valley ranges from 14 to 35 inches per year and a little more than half occurs in the winter as falling snow.

The following table presents climatological data recorded at three local weather stations in or near the Narrows Project lands.

Table 1-1
Climatological Data

			Average precipitation			
Station	**Years of record**	**Elevation (feet)**	**Annual (inches)**	**May to September (inches)**	**Frost-free period (days)**	**Growing season (days)**
Ephraim Sorenson Field	77	5670	10.60	3.61	98	128
Fairview	12[1]	6750	15.07	5.35	NA[2]	NA
Moroni	103	5525	10.70	3.43	98	98

[1] Precipitation data only
[2] NA – data not available

CHAPTER 2

THE DISTRICT

Sanpete Water Conservancy District

CHAPTER 2

SANPETE WATER CONSERVANCY DISTRICT

HISTORY OF DISTRICT

The Sanpete Water Conservancy District (District) is the sponsoring agency for the Narrows Project. The District was established January 1, 1964, to assist the water users of Sanpete County in developing, managing, supplying, and distributing water. The District is governed by a board of directors appointed by the Sanpete County Commission. Representatives from the entire county serve on the Sanpete Water Conservancy District board.

In accordance with the above-referenced Act, the District has entered into several agreements to facilitate the completion of the Gooseberry and Scofield Projects. Those agreements were discussed in the previous chapter. In addition, the District entered into an agreement with the U.S. Department of the Interior, Bureau of Reclamation on July 22, 1975, for the purposes of securing the requisite water rights and establishing a plan by which the Gooseberry and Scofield Projects could be completed.

Law Under Which Organized

The Sanpete Water Conservancy District was organized and exists under the Water Conservancy Act of the State of Utah.

Description of Powers and Authorities of the District

The District has all the powers set forth in the Water Conservancy Act, including but not limited to the right to contract with any agency of the United States (Utah Code Annotated 73-9-13). The Water Conservancy Act also provides the District the powers of eminent domain; the authority to hold water rights; to construct and operate irrigation works; the right to contract with political entities other than the Federal Government; the right to sell bonds; and the power to tax water users within the District.

Financial Status

The Sanpete Water Conservancy District is in good financial condition and operates on a calendar year basis. Detailed financial statements for calendar year 2010 are included in Attachment A, Sanpete Water Conservancy District Financial Statements.

Operating revenues are currently derived from Class A ad valorem taxes. The District has all other means of collecting revenue as is particularly provided for in the Water Conservancy Act.

The District conducts an annual audit. A copy of the 2010 audit is included in Attachment A, Sanpete Water Conservancy District Financial Statements.

The District has not had a need for a bond rating and therefore does not have one at the present time. For comparison purposes, the following information is provided. The bond rating for North Sanpete School District, which encompasses most of the project area, has a Moody Investor's Service "Aaa" bond rating. Because of the District's lack of debt, its rating would probably be comparable.

Physical Assets

A major purpose in creating the Sanpete Water Conservancy District was to pursue the completion of the Narrows Project. That project has not yet created a need for physical assets and the Board of Directors has postponed purchase of physical assets until a future time, when it becomes necessary.

CHAPTER 3

LAND RESOURCES AND OWNERSHIP

Sanpete Water Conservancy District

CHAPTER 3

LAND RESOURCES AND OWNERSHIP

PROJECT LAND SUITABILITY DETERMINATION

Land Classification and Soil Survey

The land area to receive supplemental service is shown on the frontispiece map and in Attachment B, Land Classification Maps. A semi-detailed land classification was made of the area in the early 1940's by Reclamation. The survey was conducted as part of the Gooseberry Project investigations and involved the determination and delineation of the irrigated and nonirrigated lands. The irrigable lands totaled 16,400 acres.

A Soil Survey of Sanpete Valley Area, Utah, undated, was published by the U.S. Department of Agriculture, Soil Conservation Service (SCS). This survey was a joint effort and included other State and Federal agencies in cooperation with the Utah Agricultural Experiment Station and Utah State Department of Wildlife Resources. Field work was accomplished in the period 1964-1970. Soil names and descriptions were approved in 1971. This work was used extensively in the updated land use and land classification data in this report.

For this report, a land use study and an update of the 1940 semi-detailed land classification was conducted and completed in the fall of 1990. Aerial photographs with a scale of 1 inch equals 660 feet or 1:7920 were used as base maps. The land use study was conducted on presently irrigated lands within the boundaries of the proposed Narrows Project. The updated land classification resulted in a reduction of about 980 acres of land from that reported in the 1940 survey. It reflects the higher standards for project land as presently required by Reclamation.

Soils in the project area have developed under semi-arid conditions. They are highly calcareous, high in inherent plant nutrients, have weak to moderate developed soil profiles, and 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 is also found in the flat valley or river bottom areas west and southwest of Moroni.

The refinement of the 1940 land classification was conducted using updated specifications as shown on Table 3-1. These refined land classification specifications were developed incorporating the previous investigations and specifications and then updating the information to allow for recent restrictions developed by Reclamation for an arable land class. The specifications properly typify the local physical and economic conditions, including climatic constraints.

Class 1 lands were not identified in the project area due to climatic constraints. The arable or project lands were delineated as Class 2 and Class 3. Nonarable lands included Class 6w.

Table 3-1
Narrows Project
Specifications for Semi-Detailed Land Classification

Land Characteristics	Class 1 Arable	Class 2 Arable	Class 3 Arable
SOILS 0-8 feet "s"			
Texture			
0-3 feet	Sandy loam to friable clay loam	Loamy fine sand to very permeable clay	Loamy sand to permeable clay
3-8 feet	Sandy loam to clay loam	Loamy sand to permeable clay	Loamy sand to permeable clay
Salinity and alkalinity	Less than 4 millimhos or equivalent percent salt	Less than 8 millimhos or equivalent percent salt	Less than 8 millimhos per cm. or equivalent percent salt. May be as high as 12 millimhos under conditions of good drainability.
Exchangeable sodium percentage	Less than 10 percent	Less than 15 percent	Less than 15 percent
Depth to:			
Sand or gravel (water washed)	48 inches for sandy loams 42 inches for loam and clay loams	42 inches for loamy sands 36 inches for sandy loams	36 inches for loamy sands 30 inches for sandy loams 24 inches for loams, clay loams, and clays.
Gravel or cobble with a soil matrix[1]	48 inches	36 inches	12 inches for cropland
Creviced sandstone	60 inches	48 inches	30 inches
Shale	96 inches	96 inches	96 inches
TOPOGRAPHY "t"			
Slope	0.5 to 3 percent in general gradient. Smooth slopes in one plane.	Up to 5 percent in general gradient. Smooth slopes in one plane.	Up to 8 percent in general gradient. Smooth slopes in one plane.
Surface	Areas greater than 500 feet in direction of irrigation runs leveled by moving less than 300 cubic yards per acre. Minimum depths required after leveling.	Areas greater than 300 feet in direction of irrigation runs leveled by moving less than 400 cubic yards per acre. Minimum depths required after leveling.	Areas greater than 200 feet in direction of irrigation runs leveled by moving less than 500 cubic yards per acre. Minimum depths required after leveling.
Rock and stony soil	No surface rock or stony soil to interfere with cultivation.	No surface rock or stony soil to interfere with ordinary cultivation.	Some surface rock and stony soil will limit cultivation practices.
DRAINAGE "d"			
Farm drainage	No farm drainage anticipated.	No farm drainage anticipated.	No farm drainage anticipated.

Note: Class 6 - Nonarable lands which do not meet the minimum requirements for a higher land class.
Class 6w - Nonarable lands possessing water rights but with insufficient payment capacity to justify their inclusion in a higher land class .
[1] Gravel or cobble generally absent to these depths for cropping classes. May have some gravel and cobble mixed with soil to this depth for grass hay and pasture class 3 lands.

Those are irrigated lands that fail to meet an arable class because of one or more deficiencies in soil, drainage, and/or topography. Class 6/std were lands that failed to meet arable requirements because of more than one deficiency in soils, topography, and drainage. Table 3-2 is a summary of the gross area investigated and classified. This table shows a total of 49,430 acres classified, of which 20,050 acres are arable.

Table 3-2
1990 Land Classification Refinement
(acres)

Land Class	Irrigated	Non-irrigated	Total
Class 2	8,790	1,870	10,660
Class 3	6,630	2,760	9,390
Subtotal	15,420	4,630	20,050
Class 6w	7,760	0	7,760
Class 6/std	0	16,430	16,430
Rights-of-Way	0	450	450
Townsite/Homestead	0	4,740	4,740
Subtotal	0	21,620	21,620
Total	23,180	26,250	49,430

Most of the project lands are Class 2. Slopes are long to moderately long, smooth to slightly undulating, and range from less than 1 to 5 percent in gradient. Soil textures range from loamy sand to friable clay. Both surface and internal drainage is good. Soils are deep, 48 to 96 inches, and are well suited for all crops grown in the area.

The remaining portion of lands that would receive project water are Class 3. These lands are usually located on the upper slopes of the alluvial fans. Slopes may range from 3 to 8 percent. They are slightly undulating, rolling, and uneven. Because of their location on alluvial fans and terraces, the soils are shallow with stony sub-soils and may contain some surface rock. They are somewhat limited in their suitability and cropping patterns. Some Class 3 lands include low-lying lands affected with high water tables during part of the irrigation season and utilized as rotation pasture and grass hay lands.

The Class 6w lands are presently irrigated but fail to meet the minimum requirements for an arable land class. They are not included as project lands. These lands usually have one or more deficiencies in soil, drainage, and/or topography. They are interspersed throughout the area, principally in the valley bottoms adjacent to the river.

The Class 6/std lands fail to meet the minimum requirements for arable land. They are considered permanently nonarable due to one or more deficiencies in soil, topography, or drainage characteristics and are not included as project lands.

Land classification designations for the project area are shown on the maps in Attachment B, Land Classification Maps.

Trace Element Studies

A trace element study was conducted as part of the 1990 land classification update. It included a generalized screening approach in which the area soils were included as land form represented by (1) the deep phased soils of the lower slopes and valley fill material, (2) moderately deep soils found on the terraces, and coalesced alluvial fans, and (3) the shallow phased soils of the upper alluvial fans and rolling foothills.

Three sites were selected: one for each soil phase which represented an overall assessment of the project lands. A total of 11 samples were collected from those sites and forwarded to Reclamation's Interregional Soil and Water Laboratory, Denver, Colorado, for analysis. The results are shown in Table 3-3 for arsenic, mercury, and selenium and are from three representative sites in the project area.

Table 3-3
Trace Elements
Total Concentrations in Soil

Site and Sample Number	Arsenic (ppm)	Mercury (ppm)	Selenium (ppm)
Upper Alluvial Fans Shallow Phase			
1	6.4	0.02	0.2
2	7.6	N0.02	0.2
Alluvial Fans Mod to Deep Phase			
3	6.2	0.02	0.2
4	6.3	0.02	0.2
5	5.3	N0.02	0.2
6	4.9	N0.02	0.1
Valley Fill Deep Phase			
7	4.0	N0.02	0.2
8	3.7	0.02	0.2
9	4.5	N0.02	0.2
10	5.0	N0.02	<0.1
11	5.6	N0.02	<0.1
Geometric Mean Concentration of 733 Western Soils[1]	5.5	0.046	0.23
Common Range in Western Soils[2]	1.2-22.0	0.0085-0.25	0.039-1.4

[1] Shacklette and Boerngen, USGS Paper 1270, 1984.
[2] Values chosen to represent an expected 95 percent range. (Tidball and Ebens, 1976).

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 Data Base 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. A total of 59 soil sampling sites from this data base was located in the vicinity of the survey area. 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.

Although silver, molybdenum, uranium, and selenium 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.

Return flow water quality data was also included as part of the trace element study. This data is presented in Table 3-4.

Benefitted Area

The Narrows Project will provide 4,920 acre-feet of irrigation water to northern Sanpete County, Utah. Project water will be delivered from project facilities to existing irrigation companies, who will in turn deliver it to individual water users. The Project will furnish late season water except in years of extreme drought. Normally stream flows meet irrigation demands until mid-July. Project supplies are needed after mid-July to supplement natural stream flows.

Sprinkler and furrow irrigation are the two methods of irrigation used for major crops in the area. With the exception of pastures and meadows, about 60 percent of the irrigated crops are under sprinkler irrigation. Side rolls are very prominent on the sprinkler irrigation systems. Pressurization is by gravity head from ponds. Furrow irrigation is the method used on about 40 percent of the project area.

The Sanpete Water Conservancy District will be responsible for project operation and repayment. The District will maintain a close relationship with the irrigation companies so that water can be delivered and collections for water deliveries can be made in the most efficient manner.

Lands to receive project water are shown on the Frontispiece Map.

Table 3-4
Water Quality Data for the San Pitch River near the Narrows Project Area

			Soluble Cations, (meq/L)				Soluble Anions, (meq/L)				Toxic Elements, (µg/L)			
STORET Station Location	**EC at 25 °C**	**SAR**	**Ca**	**Mg**	**Na**	**K**	**CO_3**	**HCO_3**	**SO_4**	**Cl**	**Arsenic**	**Boron**	**Mercury**	**Selenium**
Above Narrows Project														
San Pitch River 1 mile West of Milburn	1300.8	0.25	11.41	4.36	0.70	0.10	0.03	5.36	10.93	0.24	1.70	121	0.06	0.38
Cottonwood Creek 1.5 miles East of Fairview	459.0	0.19	2.63	1.80	0.29	0.04	0.00	4.38	0.58	0.09	0.93	89	0.05	0.40
Fountain Green Hatchery - East Outflow	426.0	1.00	1.70	1.48	1.26	0.03	0.00	4.36	0.10	0.14	1.00	50	0.10	1.00
Fountain Green Hatchery - West Outflow	431.9	0.28	2.30	1.48	0.39	0.03	0.00	4.30	0.16	0.11	1.00	50	0.10	1.00
Within Narrows Project														
San Pitch River above Moroni WWTP Outfall	791.8	0.64	3.06	4.50	1.25	0.09	0.01	6.76	1.41	0.81	2.47	75	0.14	0.97
San Pitch River 2.5 miles West of Mt. Pleasant	771.4	0.56	3.33	4.23	1.09	0.08	0.00	6.72	1.47	0.54	3.09	155	0.14	1.32
Just Below Narrows Project														
San Pitch River 1 mile West of Chester	1111.0	1.07	3.55	5.08	2.22	0.21	0.08	7.02	2.09	1.34	3.42	220	0.00	0.45
Below Narrows Project														
San Pitch River Northwest of Manti	1272.0	2.28	4.28	8.31	5.71	0.13	0.00	8.12	6.15	2.20	5.00	260	0.07	1.00
San Pitch River below Gunnison Reservoir	1630.8	2.46	2.61	10.26	6.23	0.14	0.28	9.26	6.17	3.86	6.00	N/A	0.10	1.00
San Pitch River at U-137 Crossing	2591.3	6.78	4.26	6.85	15.99	0.14	0.07	6.87	5.73	11.59	5.54	349	0.15	1.07

LAND USE

Present 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. Land use is devoted almost exclusively to production of livestock feeds. This use is not expected to change under project development.

The principle crops grown in the project area in order of importance are: pasture, alfalfa hay, small grains (barley, oats, and wheat), and meadow hay. Under present conditions, two crops of alfalfa are harvested each year and in some years, when weather conditions are favorable, three crops are harvested. One crop of meadow hay is normally harvested and the aftermath used as late summer and fall pasture. Small grains are used as rotation crops for hay and pasture. Small grains are also sometimes used as a nurse crop for alfalfa. The most common small grain crop is barley. Corn silage, which makes up less than 1 percent of the irrigated area, is raised primarily by dairymen and livestock feeding operations. Present and project crop distribution and yields in Sanpete County are summarized in Table 3-5 below.

Table 3-5
Crop Distribution and Yields Summary
Sanpete County

			Project Yields	
Crop/Unit	**Distribution (%)[1]**	**1990 Yields[2]**	**w/Full Water Supply[3]**	**Average**
Pasture/AUM	41	5.0	8.0	5.3
Alfalfa hay/ton	34	3.5	5.2	3.7
Small grains/bu.	10	80.0	85.0	82.0
Meadow hay/ton	8	2.0	2.5	2.2
Other crops	1	NA[4]	NA	NA
Fallow and idle	6	NA	NA	NA

[1] Distribution would be essentially the same for present and project conditions.
[2] Estimates were generated by Sanpete Water Conservancy District for this study.
[3] Estimates for irrigators purchasing enough project water to obtain a full water supply.
[4] NA = Not applicable.

Other land uses include large garden spots, potatoes, raspberries, and Christmas or ornamental trees. Of major importance to the local economy and employment is the turkey industry, which includes a large processing plant at Moroni, Utah.

Cropping patterns will not be significantly altered under project conditions. Irrigators who purchase the water, however, will be able to rotate their alfalfa crops more often and a few irrigators may expand their alfalfa acreage. The relatively small amount of water available for use on the project's 15,420 acres will result in insignificant changes to the crop distribution shown earlier in Table 3-5.

Crop yields will be significantly increased by the use of project water. Water shortages presently occur almost every year after July 10 to 15. Storage water delivered from the project in the latter part of the irrigation season will make it possible for those who purchase project water to harvest a third crop of alfalfa almost every year. Yields for other crops will also be increased, but the biggest effect will be on alfalfa yields.

The project irrigation water supply of 4,920 acre-feet, when added to nonproject supplies, will provide enough supplemental water to furnish 6,336 acres a full water supply. Irrigators who purchase enough project water to obtain a full supply may expect to obtain crop yields similar to those shown earlier in Table 3-5.

LAND OWNERSHIP

Excess Lands

Irrigable project lands are held in both private and corporate ownership. Reclamation law permits participation in SRPA projects by individuals or husband and wife joint ownerships of up to 320 acres interest free. Corporations may also receive interest-free project water for up to 320 acres of project land. Individuals or corporations may receive project water for more than 320 acres if they pay full cost including interest. It is not anticipated that project water will be sold for use on acreage in excess of 320 acres.

Small Tracts

The Small Reclamation Projects Act requires that noncommercial irrigation service to small tracts be charged full cost, including interest. A small tract, as defined by the law, is any ownership less than 2 acres, and those ownerships between 2 and 10 acres in size which produce less than $5,000 in gross annual sales. All ownerships less than 10 acres, within the Narrows Project, will be charged full cost. About 1,418 acres of the project acreage, or about 6 percent, is in ownerships of less than 10 acres.

Most of the land to receive service in the project area is in ownerships of small family farms or part-time farms. A summary of project land ownership is presented in Table 3-6.

Table 3-6
Land Ownership Distribution

Size of farms (acres)	Holdings (number)	Amount of acres	Average size of ownership (acres)
0 - 2	121	133	1.1
2 - 5	122	416	3.4
5 - 10	124	869	7.0
10 - 320	422	20,870	49.5
Over 320	2	892	446.0
Total	791	23,180	29.3

CHAPTER 4

WATER SUPPLY

Sanpete Water Conservancy District

CHAPTER 4

WATER SUPPLY

WATER REQUIREMENTS

Irrigation Water Requirement

As indicated in the previous chapter, there are 23,180 acres of irrigated farmland within the project area. Of that acreage, 15,420 acres have been identified as irrigable or eligible to receive supplemental water from the project.

In determining water requirements and for clarity and convenience of discussion, the project lands were divided into three groups which are described below.

Group 1 lands include the areas serviced by the Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, and Oak Creek Irrigation Companies. Group 1 contains 9,777 acres of presently irrigated land. Of that acreage, 5,705 acres were identified as irrigable. The land in this group is primarily irrigated by sprinkler.

Group 2 lands include the areas served by the Horseshoe, Cedar Creek, and Twin Creek Irrigation Companies. Group 2 contains 6,407 acres of irrigated farmland, including 4,644 acres of irrigable land. Group 2 lands are mostly flood irrigated.

Group 3 lands use the San Pitch River as their principal water supply. The Meadow Ditch, Sheep Ditch, Mower Ditch, Brady Ditch, Graveyard Ditch, San Pitch Ditch, Miner & Turpin, Moroni & Mount Pleasant (M&M), Olsen & Seely, Frandsen-McArthur, Moroni, and Rock Dam Phillip Irrigation Companies serve this land. Group 3 includes 6,996 acres of irrigated land, 5,071 acres of which are irrigable. Group 3 lands are irrigated by a combination of flood and sprinkler methods.

Table 4-1 presents the cropping patterns for the project area. As shown in the table, the principle crops that are grown in the area include pasture, alfalfa, grass hay, and small grains.

Crop consumptive use requirements were estimated using the modified Blaney-Criddle method as summarized in the Soil Conservation Service publication "Technical Release No. 21, Irrigation Water Requirements, April 1967, Revised September 1970." Attachment C, Water Supply, contains supporting data used to calculate consumptive use and effective precipitation. Consumptive use values were based on average monthly temperatures for the period of study. Table 4-2 shows the average annual consumptive use requirements for each crop type on Group 1, Group 2, and Group 3 lands.

Effective precipitation was calculated for each month of the 1960 through 1989 period of study. This was also calculated according to the Technical Release No. 21 method. The project receives an average of 11.69 inches of precipitation annually. Of the total precipitation, an average of 3.03 inches is effective in meeting consumptive use requirements.

Table 4-1
Project Cropping Patterns

Crops (Unit--percent)						
Area	**Small Grains**	**Pasture**	**Hay**	**Alfalfa**	**Fallow and Idle**	**Total**
Group 1 (Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, Oak Creek)	5	49	9	33	4	100
Group 2 (Horseshoe, Cedar Creek Twin Creek)	10	39	8	35	8	100
Group 3 (Meadow, Sheep, Mower, Brady, Graveyard, San Pitch, Miner & Turpin, M&M, Olsen & Seely, Frandsen McArthur, Moroni, Rock Dam)	10	39	8	35	8	100

Table 4-2
Consumptive Use of Water

	Average annual consumptive use requirement (Unit--acre-feet per acre)				
Area	**Small Grains**	**Pasture**	**Hay**	**Alfalfa**	**Weighted average**
Group 1 (Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, Oak Creek)	1.39	1.53	1.53	2.23	1.69
Group 2 (Horseshoe, Cedar Creek Twin Creek)	1.39	1.53	1.53	2.23	1.64
Group 3 (Meadow, Sheep, Mower, Brady, Graveyard, San Pitch, Miner & Turpin, M&M, Olsen & Seely, Frandsen-McArthur, Moroni, Rock Dam)	1.39	1.53	1.53	2.23	1.64

Table 4-3 summarizes the average annual diversion requirements and shortages per acre for the project area. These average values are based on the 1960 through 1989 period of study. Farm delivery requirements shown in the table are based on an on-farm irrigation efficiency of 60 percent. This efficiency may be higher than farmers currently achieve, particularly on Group 2 lands which are flood irrigated. However, the District has adopted a policy which will only allow farmers who implement conservation measures to receive project water. This policy should result in an overall increase in irrigation efficiency on land that receives project water. Head of canal diversion requirements shown in the table are based on a conveyance efficiency of 98 percent on Group 1 lands and 80 percent on Group 2 and Group 3 lands. Water is delivered to Group 1 lands through pipeline systems; whereas, Group 2 and Group 3 lands receive their water through open canals and ditches.

Municipal Water Requirement

There are four cities within the project area: Fairview, Mount Pleasant, Spring City, and Moroni. Each of these cities has two water systems, a municipal system and an irrigation system. This practice allows the untreated surface water to be strictly used for outdoor irrigation of lawns and gardens, freeing up the limited amount of high quality water for inside municipal use.

Because each of these cities rely on the same water sources and the irrigation companies, they experience similar late-season water shortages in their irrigation systems. Average shortages for these systems are about 30 percent. The cities' drinking water sources gave adequate capacity for indoor demands; however, when these late season shortages occur, the municipal water systems become overtaxed as residents try to keeps their lawns and gardens alive by using drinking water.

Based on the average household and lot size in the north Sanpete County area, a total water supply of about 270 gallons per capita per day (GCD) is required. Of this amount about 70 GCD is used indoors and 200 GCD, or 0.22 acre-feet per year per capita is used outdoors. According to the 2010 census the combined population of Fairview, Mt. Pleasant, Moroni, and Spring City is 7,152. This combined population has an outdoor water requirement of 1,573 acre-feet per year. By applying the 30 percent shortage rate, the combined shortage is 472 acre-feet per year. For convenience, this amount was rounded to 500 acre-feet per year.

In addition to satisfying existing shortages, the need for increased municipal water will increase in proportion to population growth. In order to provide 270 GCD supply, 0.3 acre-feet per year will be required for each person of increased population. Table 4-4 summarizes population growth projections for Fairview, Mt. Pleasant, Moroni, and Spring City. These population projections are based on 2010 Census data and growth rates obtained from the Governor's Office of Planning and Budget 2008 sub-county projections.

Table 4-5 summarizes the projected future M&I water use based on the increased population and the 270 GCD water requirement.

Table 4-3
Summary of Average Annual Diversion Requirements and Shortages

Area	Weighted Average Consumptive Use (ac-ft/acre)	Effective Precipitation (ac-ft/acre)	To be supplied by irrigation (ac-ft/acre)	Farm Irrigation Efficiency (percent)	Farm Delivery Requirement (ac-ft/acre)	Conveyance Efficiency (percent)	Head of Canal Diversion Requirement (ac-ft/acre)	Usable Existing Irrigation Supply (ac-ft/acre)	Remaining Demand (ac-ft/acre)
Group 1 (Cottonwood-Gooseberry, Birch Creek, Spring Canyon, North Creek, Pleasant Creek, Oak Creek)	1.69	0.25	1.45	60	2.41	98	2.46	1.53	0.93
Group 2 (Horseshoe, Cedar Creek Twin Creek)	1.64	0.25	1.39	60	2.32	80	2.90	2.09	0.81
Group 3 (Meadow, Sheep, Mower, Brady, Graveyard, San Pitch, Miner & Turpin, M&M, Olsen & Seely, Frandsen McArthur, Moroni, Rock Dam)	1.64	0.25	1.39	60	2.32	80	2.90	2.27	0.63
Weighted Average on Total Area	1.66	0.25	1.41	60	2.35	87	2.74	1.94	0.80

Table 4-4
Estimated Population Growth
Based on 2010 Census and GOPB Growth Rates

	2010[1]	2020[2]	2030[2]	2040[2]	2050[2]	2060[2]
Fairview City	1,247	1,427	1,635	1,821	2,067	2,403
Moroni City	1,657	1,895	2,173	2,417	2,742	3,187
Mount Pleasant City	3,260	3,731	4,276	4,757	5,398	6,278
Spring City	988	1,129	1,293	1,440	1,633	1,899
Total	7,152	8,182	9,377	10,434	11,840	13,768

1 Source: 2010 US Census.
2 Growth rates from Governor's Office of Planning and Budget 2008 Sub-County Projections applied to 2010 Census data to obtain population growth projections.

Table 4-5
Projected Narrows Project Future M&I Water Usage

	2010	2020	2030	2040	2050	2060
Project M&I Water Use (acre-feet per year)	500	809	1,167	1,485	1,906	2,485

SURFACE WATER SUPPLY

Price River Drainage

The area that drains into the Narrows Reservoir is about 7.6 square miles. Although this area is relatively small, an average of about 8,185 acre-feet of water will flow into the reservoir annually. This inflow is a result of snow accumulation that occurs within the drainage area and is in addition to the water that is presently collected in Fairview Lakes and diverted through Fairview Tunnel.

The gaging station "Gooseberry Creek Near Fairview, Utah," which is located near the proposed dam site, recorded the streamflow from 1960 through 1963 and from 1965 through 1969. Another gaging station, "Gooseberry Creek Near Scofield, Utah," is located 4.25 miles downstream, and has recorded flows from May 1940 to the present. Records for Gooseberry Creek Near Fairview were extended to include 1960 through 1992 by correlation with Gooseberry Creek Near Scofield. These streamflow records are included in Attachment C, Water Supply.

About 0.6 square mile drains into the reservoir downstream from the Gooseberry Creek Near Fairview. This additional inflow was estimated in accordance with the ratio of the drainage area below the gage to the area above the gage.

A simulated operation study for the proposed Narrows Reservoir and Scofield Reservoir is also included in Attachment C, Water Supply, Table C-9. The purposes of study are as follows:

1. Verify water supply for the Narrows Project
2. Identify stream flows and reservoir contents with the Narrows Project
3. Identify changes in stream flow and reservoir contents for use in identifying environmental impacts

The operation study is based on hydrologic data for the 1960 through 2002 period. The study did not go beyond 2002 because several key stream gauging stations were discontinued after that year. As shown in the operation study, Narrows Reservoir will fill and spill in 8 of the 33 years studied. Figure 4-1 illustrates the fluctuations that will occur in the reservoir during the period of study.

Scofield Reservoir will generally operate at a lower level due to implementation of the Narrows Project. Figure 4-2 shows a comparison of Scofield Reservoir contents with and without the Narrows Project.

Depletions to the Price River drainage will average 5,674 acre-feet per year. These reductions in flow will occur primarily as a result of decreased spills out of Scofield Reservoir. During most years, controlled releases from Scofield Reservoir will remain unaltered. However, under prolonged drought conditions, irrigation releases from Scofield Reservoir will be reduced due to lack of water in the reservoir. These reductions occurred in 10 of the 43 years simulated. The reductions for the 1960 through 2002 period averaged 871 acre-feet or less than 2 percent of the historical release. The maximum reduction occurred in year 1992 of the study, when it was about 9,900 acre-feet or 46 percent of the historical release for that year. The project will only impact storage releases. Direct flow rights will be unaffected by the project.

It should be noted, however, that the above reductions in storage releases are based on the 65,700 acre-foot Scofield Reservoir, which was enlarged to accommodate the Gooseberry Project (Narrows Project). Without this enlargement and the associated water rights agreements, the usable capacity of Scofield Reservoir would have remained at 30,000 acre-feet. If the reservoir capacity had remained at 30,000 acre-feet and without the Narrows Project, the storage releases would have been reduced by an average of 970 acre-feet. These reductions would have occurred in 10 of the 33 years simulated with the largest single-year reduction being over 12,000 acre-feet. Therefore, the reductions in storage caused by the Narrows Project are in fact less than the reductions that would have occurred without the enlargement of Scofield Reservoir and the associated water right agreements.

Furthermore, it is important to note that Scofield water users agreed to this reduction in three separate agreements that are discussed later in this chapter.

Figure 4-1

Narrows Reservoir Operation

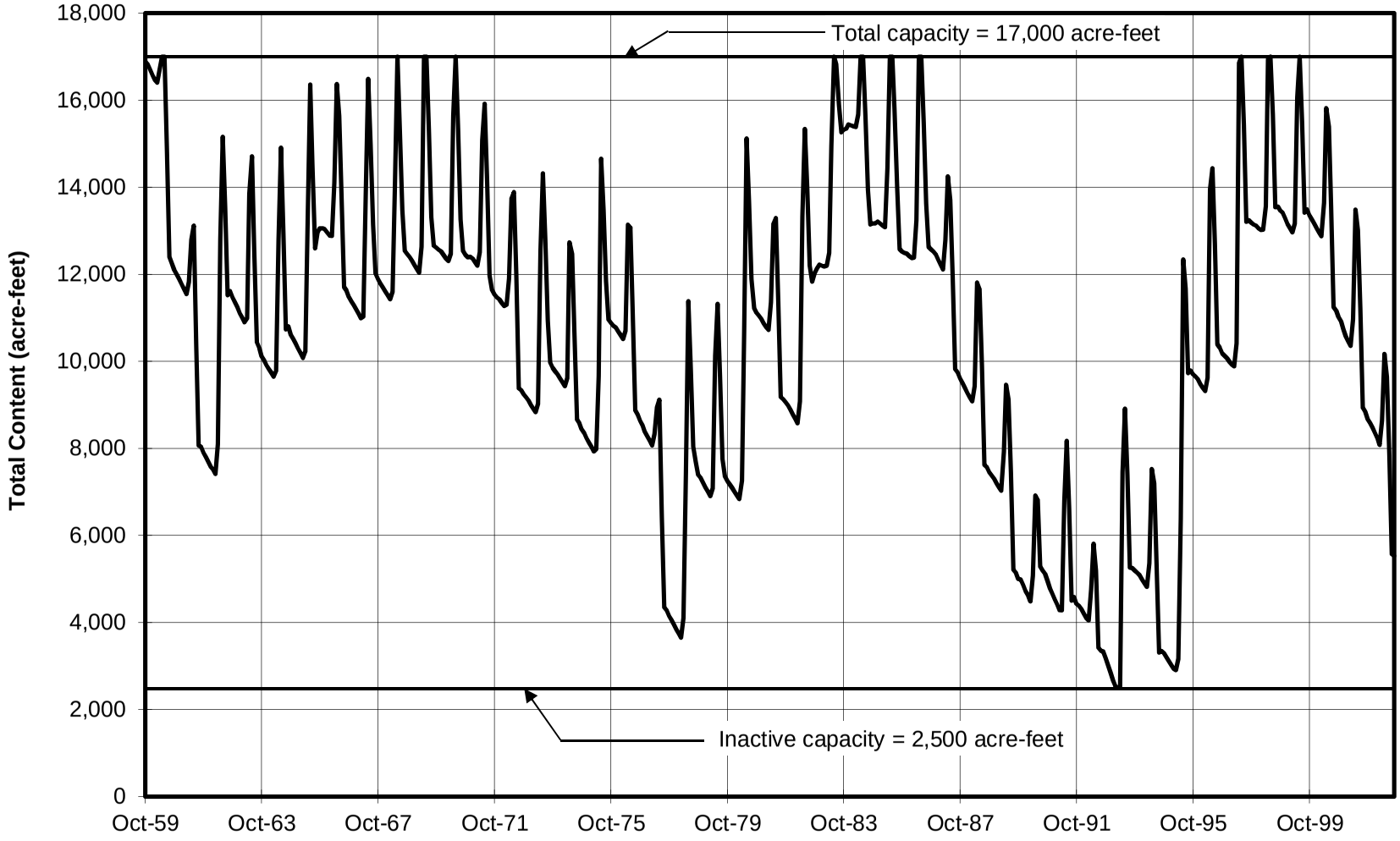
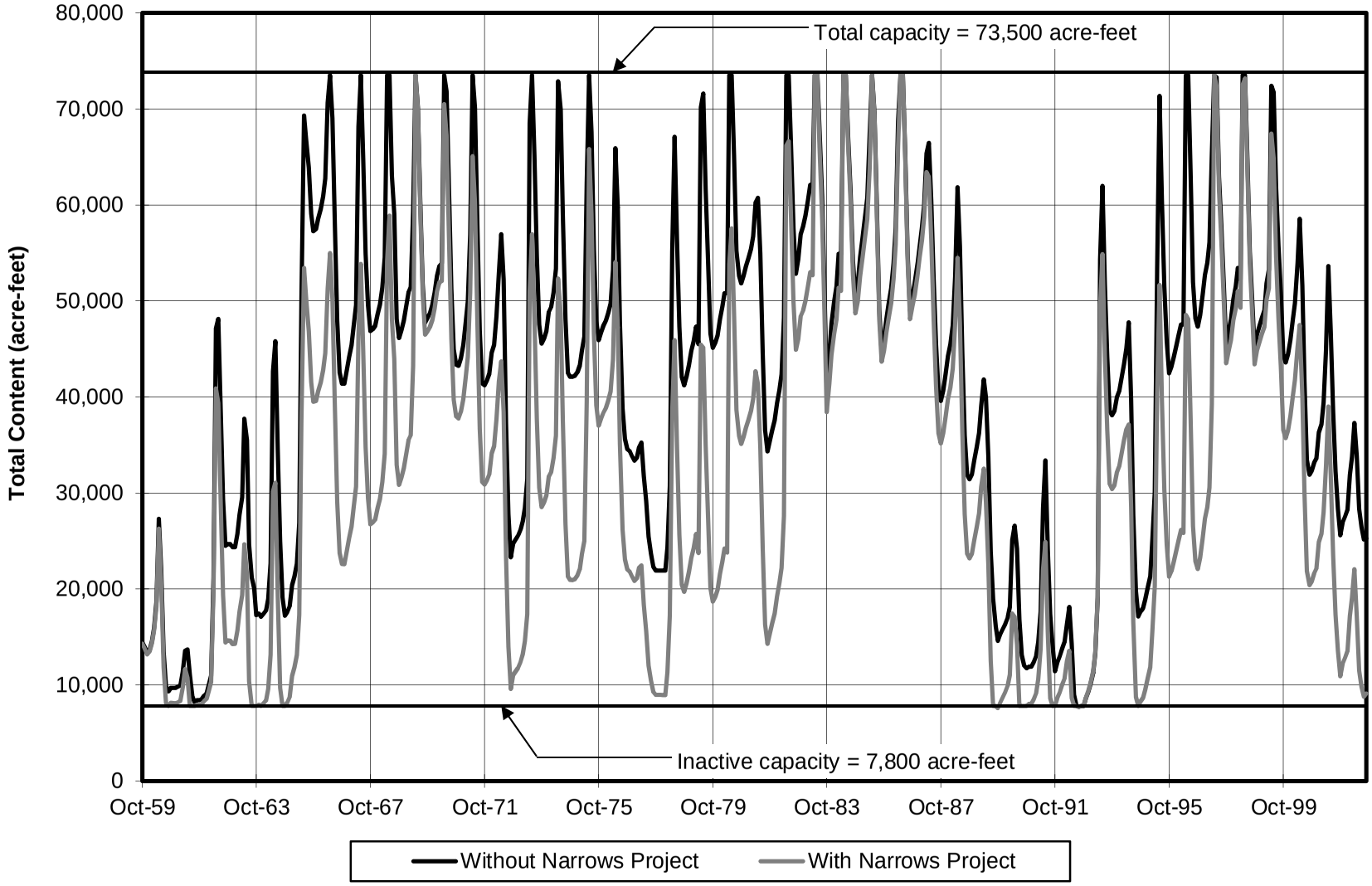


Figure 4-2

Scofield Reservoir

Operation Comparison



San Pitch River Drainage

Lands that will receive project water receive their existing supplies from numerous sources. For clarity and convenience of discussion, the lands have been categorized into three groups.

Group 1 Lands

Group 1 lands receive their present supply of water from Oak Creek, Cottonwood Creek, Spring Creek, Birch Creek, Cove Creek, Pleasant Creek, and transbasin diversions from the Price and San Rafael River drainages. The transbasin diversions include water delivered through Fairview Tunnel, Candland Ditch, and Coal Fork Ditch.

Table 4-6 summarizes the available recorded data and the methods used to extend missing data. Monthly flow data for Oak, Cottonwood, Spring, Birch, Cove, and Pleasant Creeks are shown in Attachment C, Water Supply. Table 4-7 summarizes the average annual water supply produced by these sources. As shown in the table, the average water supply during the irrigation season for Group 1 lands is 35,198 acre-feet.

Table 4-6
Streamflow Data Summary for Group 1 Lands

Water Source	Historical Record	Record Extended by Correlation With
Oak Creek Near Fairview	1965 - Present	Pleasant Creek Near Mt. Pleasant
Cottonwood Creek	1990 - Present	Oak Creek Near Fairview
Fairview Tunnel	1951 - 1965 1968 - Present	Gooseberry Creek Near Fairview
Spring Creek	None	Oak Creek Near Fairview
Birch Creek	None	Oak Creek Near Fairview
Cove Creek	None	Oak Creek Near Fairview
Pleasant Creek	1955 - 1970	Oak Creek Near Fairview
Candland Ditch	1950 - 1958	Spring City Tunnel Near Spring City
Coal Fork Ditch	Sept. 1949 - Sept. 1950	Spring City Tunnel Near Spring City

Table 4-7
Average Water Supply for All Group 1 Lands

Month	Acre-feet
April	1,475
May	14,830
June	11,042
July	3,707
August	1,953
September	1,350
October	841
Total	35,198

Group 2 Lands

Group 2 lands obtain their present water supply from Twin Creek, Cedar Creek, Oak Creek (near Spring City), Canal Creek, and five transbasin diversions from the San Rafael River drainage. The transbasin diversions include Twin Creek Tunnel, Black Canyon Ditch, Cedar Creek Tunnel, Spring City Tunnel, and Horseshoe Tunnel.

Table 4-8 summarizes the available recorded data and the methods used to extend missing data for Group 2 lands. Monthly flow data for Twin, Cedar, Oak, and Canal Creeks are included in Attachment C, Water Supply. The average annual water supply for Group 2 lands is summarized in Table 4-9. As shown in that table, the average supply during the irrigation season is 23,622 acre-feet.

Table 4-8
Streamflow Data Summary for Group 2 Lands

Water Source	Historical Record	Record Extended by Correlation With
Twin Creek	1955 - 1960	Oak Creek Near Fairview
Twin Creek Tunnel	1951 - 1958	Spring City Tunnel Near Spring City
Cedar Creek	1950 - 1958	Oak Creek Near Fairview
Black Canyon Ditch	1950 - 1958	Spring City Tunnel Near Spring City
Cedar Creek Tunnel	1950 - 1958	Spring City Tunnel Near Spring City
Oak Creek Near Spring City	1965 - 1974 July 1979 - Present	Oak Creek Near Fairview
Spring City Tunnel	1950 - Present	NA[1]
Canal Creek	None	Oak Creek Near Fairview
Horseshoe Tunnel	1950 - 1958	Spring City Tunnel Near Spring City

[1] NA = Not Applicable.

Table 4-9
Average Water Supply for All Group 2 Lands

Month	Acre-feet
April	818
May	3,756
June	9,685
July	4,356
August	1,945
September	1,845
October	1,217
Total	23,622

Group 3 Lands

Group 3 lands receive their water supply from the San Pitch River. Historical diversion records are available for these companies for 1960 through 1983 and 1988 to present. These diversion records are contained in Attachment C, Water Supply.

Average monthly diversion for Group 3 lands are summarized in Table 4-10. As shown in the table, the average annual water supply during the irrigation season is 24,204 acre-feet.

Table 4-10
Average Water Supply for All Group 3 Lands

Month	Acre-feet
April	2,592
May	4,620
June	4,455
July	3,999
August	3,590
September	3,289
October	1,659
Total	24,204

Project Water Deliveries

Attachment C, Water Supply, Table C-37 contains a monthly operation study for the 1960 through 1989 period. Key stream gauging stations in the Sanpitch drainage were discontinued after 1989. The purpose of this study is primarily to document existing water supplies and to demonstrate the need for a supplemental water supply. This study shows pre-project remaining demands and project water deliveries. The typical monthly water deliveries are summarized in Table 4-11. As shown in the table, the typical annual water delivery is 5,400 acre-feet. This amount is limited by water right agreements.

Table 4-11
Typical Monthly Project Releases

Month	Acre-feet
April	0
May	6
June	373
July	2,250
August	2,325
September	442
October	4
Total	5,400

During initial operation of the project 500 acre-feet of water per year will be provided for municipal use and 4,900 acre-feet for agricultural use. Over time, as a result of population growth, a portion of the agricultural water will be converted to municipal use.

WATER RIGHTS

Background

To understand the water rights for the Narrows Dam and Reservoir Project, one must understand its genesis. It is part of the original Gooseberry Project plan, a plan formulated in the 1930's which included three major features:

- A dam on Gooseberry Creek with feeder canals from Brooks Canyon and Cabin Hollow Creeks;
- A transmountain tunnel to transport the stored water to the San Pitch River basin; and
- An enlarged Scofield Reservoir to provide water by exchange to support the transmountain diversion of water from Gooseberry Creek.

Due to a variety of factors, including the unsafe condition of the original Scofield Dam structure, the reconstruction effort on Scofield Dam was undertaken first, ahead of the Narrows Dam and transmountain tunnel. The new Scofield Dam, authorized June 24, 1943, included 30,000 acre-feet of replacement storage capacity (replacing the existing 30,000 acre-foot structure), 8,000 acre-feet of dead storage (conservation pool), and 35,000 acre-feet of exchange capacity to support the transmountain diversion of Gooseberry Creek water from the Narrows Dam. As a part of the reconstruction effort, several significant agreements and understandings were reached. They include:

Tripartite Contract of 1943

The contract of October 11, 1943, between the United States of America, the Carbon Water Conservancy District, and the Price River Water Conservancy District (predecessor to the Price River Water Users Association) is generally known as the Tripartite Contract. It is a contract whereby the United States of America acting through its Bureau of Reclamation conditionally

promised to undertake the reconstruction of Scofield Dam. The contract also established the relative rights of the parties to the use of waters of the Price River both at the Narrows Project site and at the Scofield Reservoir site. The operational plan includes:

- An operational plan on Scofield Reservoir that specifically recognizes the principal features of the Gooseberry Project plan. It expressly gives the United States the right to store and divert in any year all waters arising in the Price River system above the confluence of Cabin Hollow and Gooseberry Creeks for transmountain diversion to the San Pitch River system.
- A subordination of the Price River Water Users Association's water rights to the water rights filed by the U.S. Bureau of Reclamation to cover the additional storage capacity being built into Scofield Reservoir to support the Gooseberry transmountain diversion.
- Subject to certain limitations, the Price River Water Users Association was given the right to full use of the active capacity of Scofield Reservoir, but was required to release such water from Scofield Reservoir as might be necessary to offset any adverse effects resulting from the Gooseberry Creek transmountain diversion.

Scofield Reservoir Repayment Contract of February 28, 1944

The contract covering the repayment obligation on Scofield Reservoir was entered into February 28, 1944, by and between the United States of America and the Carbon Water Conservancy District. Therein, the Carbon District agreed to operate Scofield Dam and Reservoir in accordance with the Gooseberry plan as set forth in the Tripartite Contract. Upon implementation of the Gooseberry Project plan, the Project Sponsor of such plan is required to assume a portion of the reimbursable construction costs on Scofield Reservoir.

Compromise Agreement of June 8, 1984

On June 8, 1984, a compromise agreement was reached by and between the Sanpete Water Conservancy District, the Carbon Water Conservancy District, and the Price River Water Users Association. This agreement concerned the construction of storage and diversion works on the Price River system for transmountain diversion of Gooseberry Creek water to the San Pitch River system. The agreement was approved by the United States under the Tripartite Contract, except that the Narrows Project is substituted for the Gooseberry plan mentioned therein. The operational plan developed for distributing the water includes:

Narrows Reservoir

- The Price River Water Users Association again subordinated its water rights to the Narrows Project water rights and reconfirmed the right of the Narrows Project to divert and store each year on a first priority basis all the waters of Gooseberry Creek and its tributaries arising above the Narrows Project site.

However, the Narrows Project is now limited to a transmountain diversion of 5,400 acre-feet of water per year for use in the San Pitch River system.

- The total active storage capacity of the Narrows Project Reservoir, including water stored for minimum streamflow purposes, is limited to 14,500 acre-feet.
- Water from Brooks Canyon and Cabin Hollow Creeks can be diverted, stored, and used to provide minimum streamflows in Gooseberry Creek.

Scofield Reservoir

The parties agreed that the Price River Water Users Association and the Carbon Water Conservancy District should be entitled to use the entire storage capacity of Scofield Reservoir. However, storage releases from Scofield are limited to 30,000 acre-feet annually for use by the Price River Water Users Association and the Carbon Water Conservancy District. That amount is exclusive of replacement water needed to supply prior water rights.

Water Right Filings

Water rights for the Narrows Project are based on three filings made by the Bureau of Reclamation for the Gooseberry Project. These applications were assigned to the Sanpete Water Conservancy District in an agreement dated July 22, 1975. Table 4-11 provides a summary description of these filings. The filings are now subject to the Compromise Agreement of June 8, 1984.

Table 4-12
Water Right Filings Associated With the Narrows Project

Application No.	Claimed Date of Priority	Nature and Amount of Claimed Right
14025 (91-130) Change Application a-9237	January 16, 1941	Storage 30 cfs
14026 (91-131) Change Application a-9236	January 16, 1941	Storage 17,000 acre-feet
14477 (91-132) Change Application a-9238	September 6, 1941	Storage 130 cfs

WATER QUALITY

The San Pitch River and its many tributaries with their headwaters in the high Wasatch Plateau are the present water source for irrigation on most of the project lands. There are a few irrigation wells in the area, but their use is limited. Melt water from the winter snowpack and mountain springs are the main sources of water.

Water quality data indicates that the water used for irrigation in the area is well suited and of good quality for any crop adapted to the area. The water quality data presented earlier in Table 3-4 indicates the normal trend in that water quality deteriorates somewhat as return flows enter the river. This trend is shown by the data from the San Pitch River at Chester Bridge site.

CHAPTER 5

DRAINAGE CONDITIONS

Sanpete Water Conservancy District

CHAPTER 5

DRAINAGE CONDITIONS

Drainage conditions for Narrows Project lands were appraised during early investigations and are reflected in land classifications. Only those irrigated lands that have good production and that would not require additional drainage facilities under present project conditions have been selected for supplemental service.

The drainage deficient lands, which were excluded from the project, are comprised of low lying meadows and wetland areas adjacent to the San Pitch River and its numerous tributaries as they crossed the project area. These lands were classified as 6w and 6/std.

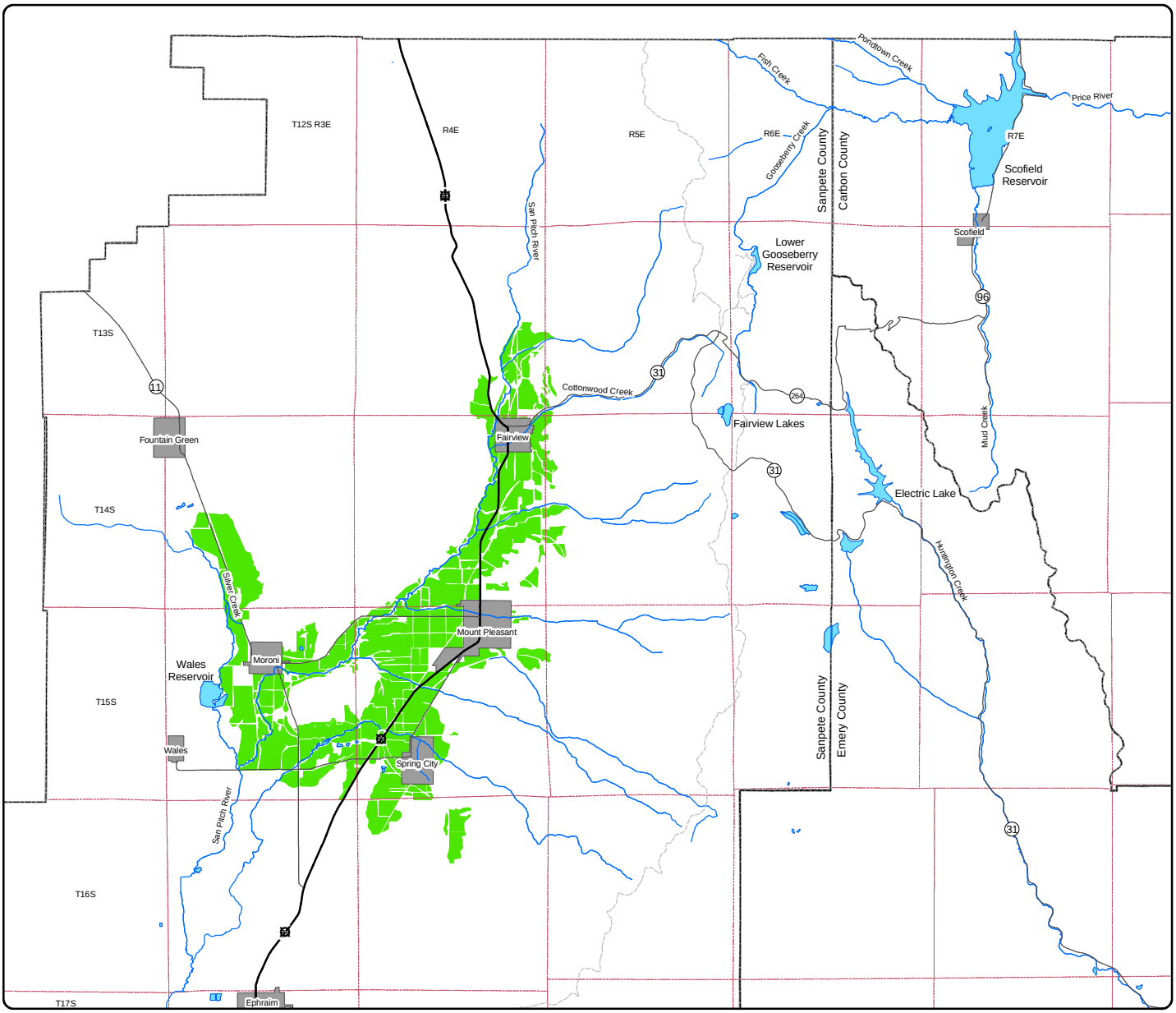
The San Pitch River as it flows south and west through the project lands is deeply entrenched and forms the natural outlet for both surface and subsurface waters. The many tributaries to the river flow from the mountains on the east across the project area and they and the many deep dry washes in the area form an adequate and stable collector system for surface flows.

During the spring of 1984, the area experienced an extremely high runoff and most natural drainage systems were scoured and renewed. Figure 5-1 shows the natural drainage system for the project area.

The wet meadows and grass hay lands are a valuable part of most farm units and fit in well with the existing farm practices of the area. Depth to barrier was not determined for the irrigated wet meadows and topographic low lying lands, either adjacent to or above the river. These lands will continue to be part of the farm economy and will not change under project development.

During the land classification update of project land, water tables were not encountered to depths of 10 feet, as described in the Land Classification Appendix on file in the offices of the Sponsor's consulting engineers, Franson-Noble & Associates, Inc. Lands that had high water tables and lands of low-lying topography were not included as project lands.

No salinity or water table problems are anticipated since project lands have been irrigated for more than 120 years and project development will constitute only one additional irrigation turn per irrigation season.



3

Legend

- Municipalities
- Lakes and Reservoirs
- Lands to Receive Project Water
- County Boundaries
- Township and Range
- Unimproved Roads
- State Route
- U.S. Highway

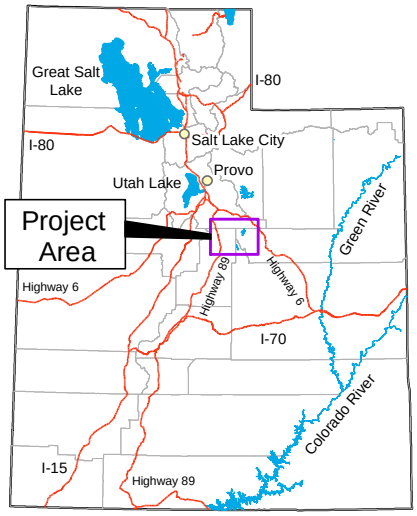
0 1 2 3 4 5 Miles

Figure 5-1

Narrows Project

Natural Drainage System

Sanpete Water Conservancy District



CHAPTER 6

PLAN OF DEVELOPMENT

Sanpete Water Conservancy District

CHAPTER 6

PLAN OF DEVELOPMENT

PROJECT PURPOSE AND OBJECTIVES

General

This SRPA loan application is for a multi-purpose project that will provide supplemental irrigation water, municipal water, and improve recreation, and fishery opportunities. The project will provide an average annual supply of 4,900 acre-feet of irrigation water for 15,420 acres of presently irrigated farmland and 500 acre-feet of municipal water. Long-standing water rights contracts and agreements will also be honored.

Irrigated farmland within the project area currently experiences average shortages of 30 percent of the annual diversion requirement. Municipal water supplies used for irrigation of lawns and gardens also run short by a similar amount. The Narrows Project will provide a supplemental water supply for these purposes.

There is also a shortage of recreation facilities near the project area. Existing recreation facilities including campgrounds, boat ramps, and reservoirs are overcrowded and inadequate. The Narrows Project will provide improved recreation facilities, including campgrounds, a boat ramp, picnic sites, and restrooms, at Narrows Reservoir. The reservoir will also provide a minimum pool for fish habitat.

Multipurpose Projects

The SRPA loan program requires that irrigation be a purpose of the proposed project in order to be eligible for SRPA funding. As has been explained previously, this project will provide a supplemental supply of irrigation water for 15,420 acres of farmland.

Water management and conservation will also occur as an indirect project benefit. The District has adopted a resolution which requires irrigators to use sprinklers or other improved efficiency irrigation methods in order to be eligible to receive project water. As a result, the overall efficiency of water use within the project area is expected to increase. The project plan also includes improved outdoor recreation facilities and a minimum pool in Narrows Reservoir for fish habitat.

PHYSICAL PLAN

General

The project plan will be accomplished by constructing a dam and reservoir on Gooseberry Creek, a tributary of the Price River, about 9 miles east of Fairview, Utah. Water stored in the reservoir will be released to north Sanpete County through the existing Narrows Tunnel.

Pipelines will be constructed to deliver the water to existing water distribution systems. Oak Creek Pipeline will convey water to the Oak Creek Irrigation Company, north of the community of Fairview. East Bench Pipeline will convey project water from an existing diversion dam on Cottonwood Creek southward to areas of use along the east bench. Upper Cottonwood Creek Pipeline will carry project water from the Narrows Tunnel outlet to the confluence of Cottonwood Creek and Left Hand Fork to protect the stream channel from increased flows that will occur without the pipeline. Another important feature of the project will be the relocation of State Road (SR)-264.

Recreation facilities will be developed adjacent to the reservoir and a minimum pool for fish habitat will be provided. Mitigation measures will be implemented to offset adverse impacts to wetlands, terrestrial wildlife, and stream fisheries. In addition to mitigation measures to offset project impacts, other measures will be included to enhance or improve fish and wildlife habitat. The Frontispiece Map shows the Narrows Project general plan.

Design and Operation

Narrows Dam and Reservoir

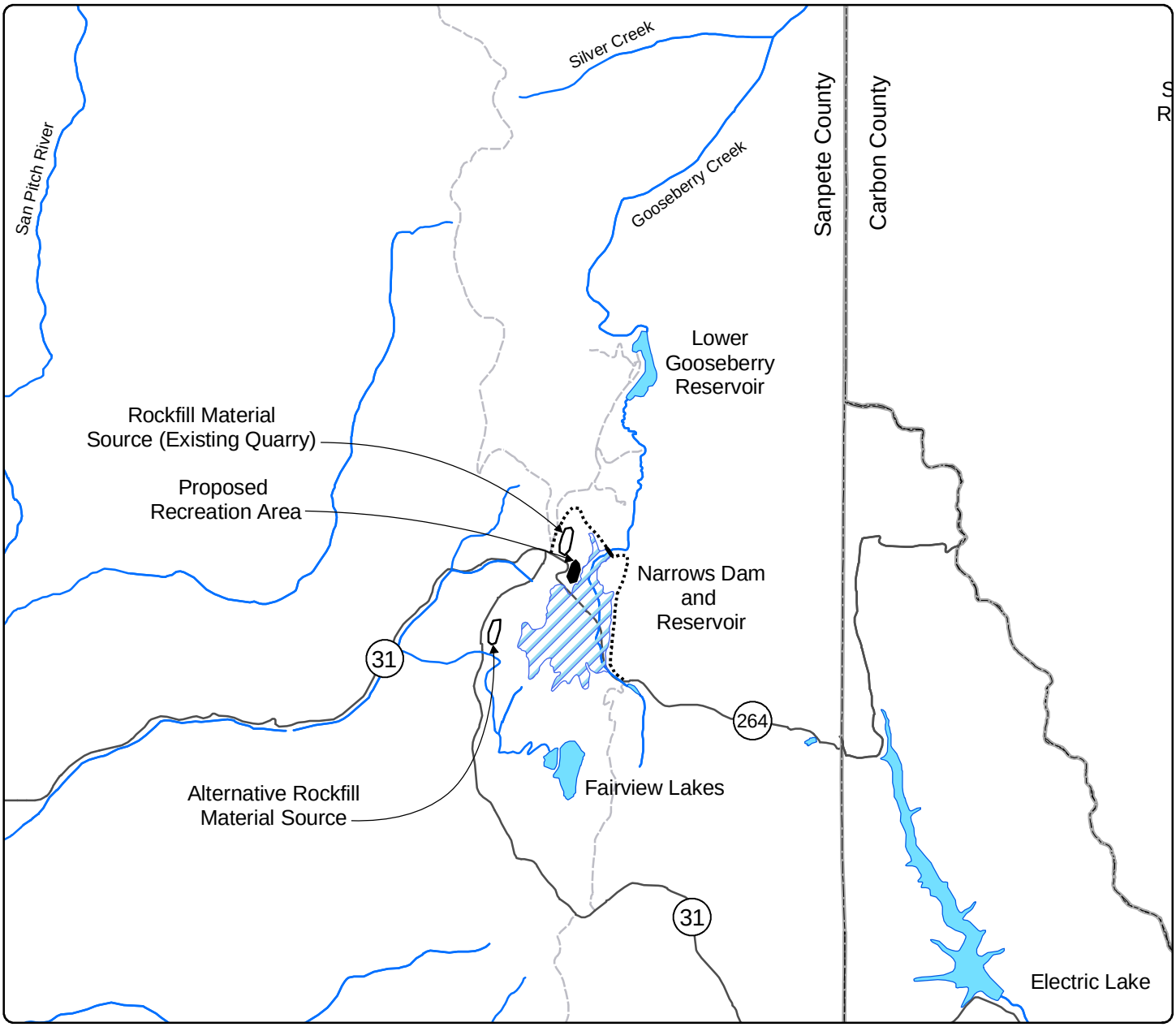
Narrows Dam will be a zoned earthfill embankment structure using locally available earth material. The embankment will have 3:1 (horizontal to vertical) slopes upstream and downstream. The proposed crest width of 30 feet will allow Highway SR-264 to cross the dam. The embankment zones will consist of a relatively impervious core, a random zone both upstream and downstream of the core, and a rockfill zone on the upstream face for slope protection. The embankment will contain a total volume of 363,000 cubic yards of material.

Narrows Reservoir will have two outlets. A Gooseberry Creek outlet will be constructed through the dam to provide downstream releases for fisheries and emergency evacuation of the reservoir. This outlet will have a capacity of 305 cubic feet per second (cfs). Multiple level outlets will be provided to allow temperature control of water released to Gooseberry Creek. Narrows Tunnel, with a capacity of 60 cfs, will serve as the other reservoir outlet and will accommodate releases through the mountain ridge for the transbasin diversion.

Preliminary designs for the dam call for separate low-flow outlets at three different levels within the reservoir. These outlets will have their own gates and will be able to deliver up to a 10 cfs release even when the main outlet is being inspected or maintained.

The spillway will be a drop inlet (morning glory) structure and will have a discharge capacity of 775 cfs. The probable maximum thunderstorm flood could be safely stored in the reservoir without overtopping the dam. However, the spillway will protect the dam against the 100- and 10,000-year snowmelt floods.

Most of the embankment material for the dam will be obtained from the reservoir basin, as shown in Figure 6-1. Rockfill material for upstream slope protection will be obtained from an existing quarry on National Forest System lands near State Road-264. An alternative rockfill material quarry site, located on private land, is also shown on the figure. Granular material for drains will be hauled from commercial pits in Sanpete Valley, near Wales, Utah. Concrete for the outlet works, spillway, and other structures will be batched in Sanpete Valley and hauled to



N

0 1 2
Miles

Legend

- Proposed Reservoir
- Lakes and Reservoirs
- County Boundaries
- Highway Relocation
- State Route
- Unimproved Roads

Figure 6-1

Narrows Project

Narrows Dam and Reservoir

Project Area and Facilities

Sanpete Water Conservancy District

the damsite in transit mixers. Other materials such as pipe, steel gates and structures, electric motors, and operating and control equipment will be manufactured or processed outside the project area. The materials will be hauled to the construction sites by truck.

The reservoir's active capacity, or that portion of stored water that will be used to satisfy project water needs, will consist of 14,500 acre-feet. The dead and inactive capacities of about 2,500 acre-feet will form the reservoir's minimum pool and will not be drawn upon in order to benefit recreation and fishing use at the reservoir. The reservoir is designed for long-term carry-over storage. The dead and inactive storage will be more than adequate to store the 100-year inflow of sediment into the reservoir. Less than 20 acre-feet of sediment will accumulate in a 100-year period, which is less than 1 percent of the inactive capacity. A summary of the design data for Narrows Project facilities is shown in Table 6-1.

Narrows Reservoir will fluctuate on a seasonal basis as water is released during the irrigation season. The drawdown will average about 12 feet annually. Under existing water rights agreements, a maximum of 5,400 acre-feet (without evaporation) per year of project water will be released through Narrows Tunnel. The reservoir will provide long-term carryover storage for consecutive drought years.

Automated flow measurement devices will be installed to collect data in real time using radio or satellite communications. These devices will measure flow at the following locations:

- Discharges from Fairview Lakes
- Discharge from Narrows Dam to Gooseberry creek
- Flow of Gooseberry Creek at USDA Forest Service campground
- Discharge from Narrows Tunnel
- Flow of Cottonwood Creek near the mouth of the canyon

Oak Creek Pipeline

The Oak Creek Pipeline will be a 10-inch and 12-inch diameter HDPE buried pipeline with a capacity of 2.5 cfs and a length of 2.3 miles. The pipeline will convey water to the Oak Creek Irrigation Company, north of Fairview. A right-of-way 30 feet wide and 2.5 miles long will be required.

East Bench Pipeline

The East Bench Pipeline will convey project water from an existing diversion dam on Cottonwood Creek southward to areas of use along the east bench between Fairview and Spring City. The pipeline will have a total length of 14.5 miles and will have a capacity at its head of 21.5 cfs. The pipeline diameter will vary from 30 inches at the head to 20 inches at the downstream end and will be constructed with HDPE pipe materials. The pipeline will deliver water to the Spring Creek, Birch Creek, North Creek, Pleasant Creek, Twin Creek, Cedar Creek, and Horseshoe Irrigation Companies. Water delivered to each irrigation company will be discharged from the pipeline into the regulating pond for each company’s pressurized irrigation system. This pipeline will also have a 30-foot-wide right of way.

Table 6-1
Design Data Summary

Item	Unit	Proposed Plan
Dam		
Height	feet	120
Crest length	feet	550
Crest width	feet	30
Material volume	cu. yds.	363,000
Discharge capacity		
Outlet works	cfs	305
Spillway	cfs	775
Reservoir capacity		
Active storage	acre-feet	14,500
Inactive and dead storage	acre-feet	2,500
Total	acre-feet	17,000
Surface area		
At top of active capacity	acres	604
At top of inactive and dead capacity	acres	144
Average during recreation season[1]	acres	454
Drawdown		
Average annual	feet	12
Average during recreation season[1]	feet	9
Maximum	feet	18
Drawdown		
Average annual	acre-feet	5,058
Average during recreation season[1]	acre-feet	4,043
Pipelines		
Oak Creek		
Length	miles	2.5
Capacity	cfs	2.5
Diameter	inches	10
East Bench		
Length	miles	13.5
Capacity	cfs	21.5
Diameter	inches	27.18
Upper Cottonwood Creek		
Length	miles	0.8
Capacity	cfs	50
Diameter	inches	30
Narrows Tunnel Rehabilitation		
Length	feet	3,100
Capacity	cfs	60
Diameter	inches	36
SR-264 Relocation		
Length	miles	2.9
Width	feet	24

[1] June through September

Upper Cottonwood Creek Pipeline

A 50-cfs-capacity pipeline will be constructed from the Narrows Tunnel outlet to the confluence of Cottonwood Creek and Left Hand Fork. The 30-inch diameter pipeline will carry project water outside the stream to prevent damage to the channel. It will be constructed in the shoulder of SR-31, a National and State designated Scenic Byway. It and will have a length of about 0.8 mile. At the tunnel outlet, a control structure will divide the flow. A portion of the flow, that desired for instream flow and the flow in excess of the pipeline capacity, will be released to Cottonwood Creek to improve the fishery. The remainder of the flow will be conveyed in the pipeline. The pipeline flow will be discharged into Cottonwood Creek at the confluence with Left Hand Fork. A right-of-way 30 feet wide and 0.8 mile long will be required.

Narrows Tunnel

The Narrows Tunnel is an existing water conveyance tunnel approximately 3,100 feet long. The tunnel, which was originally completed in 1968, was constructed to convey irrigation water from Fairview Lakes to the Fairview area and to eventually serve as the outlet for Narrows Reservoir. After its construction, the tunnel began to experience severe stability problems. Steel sets with wooden lagging were installed in selected areas of the tunnel to support the unstable areas. The steel sets, however, were widely spaced and loose rubble significantly loaded the wooden lagging between sets. With time, the lagging began to fail, permitting roof and rib sloughing over significant portions of the tunnel. When it became evident that the tunnel could eventually close, 36-inch corrugated metal pipe (CMP) was installed through the least stable tunnel sections to maintain a waterway. However, this was only a temporary fix because the over time the CMP began to collapse due to rust and excessive earth loads.

During July 2010 through May 2012 the tunnel was rehabilitated by the Cottonwood-Gooseberry Irrigation Company. This work was accomplished by mucking out the tunnel and installing timbers for temporary support. Once the tunnel was fully open and clear, a 54-inch-diameter corrugated high-density polyethylene (HDPE) pipe was installed through the tunnel and backfilled with 3/8-inch gravel to within 1 to 2 feet of the tunnel roof. The backfill provides lateral pipe support and protects the pipe from impact loads in the event of additional collapse of the tunnel roof. The tunnel rehabilitation was designed to provide a discharge capacity of 60 cfs.

Narrows Tunnel Inlet Rehabilitation

Before the tunnel can be used as an outlet for Narrows Reservoir, additional rehabilitation work is needed near the tunnel inlet. The existing gate shaft concrete is deteriorated and there are significant voids behind the concrete. This concrete will be removed and replaced. All voids will be backfilled with concrete. A new 48-inch control gate will be installed in the gate shaft. An energy dissipation structure will be installed immediately downstream from the control gate. A new guard gate structure will be constructed at the inlet portal of the tunnel. During the tunnel rehabilitation the old 60-inch control gate was removed. This gate and frame will be refurbished and installed at the portal structure where it will serve as the guard gate. Both the control gate and the guard gate will be hydraulically operated. A control building will be constructed at the top of the gate shaft. This building will house the hydraulic gate controls, and SCADA equipment. A small generator set will provide electrical power to operate the hydraulic system

and to recharge a bank of batteries that will operate the SCADA system. Video surveillance and security fencing will also be provided.

State Road-264 Relocation

Narrows Reservoir will inundate about 0.8 mile of SR-264, a National and State designated Scenic Byway. It provides access between Fairview and Scofield, Utah. Under the project, the road will be relocated by constructing 2.6 miles of new road and providing asphalt surfacing for 0.3 mile of the existing gravel road to Lower Gooseberry Reservoir. The new road will cross Narrows Dam. The road relocation will increase the travel distance between Fairview and Scofield by 1.2 miles. The relocated road will have a total pavement width of 24 feet and will be designed to the same standard as the existing road.

Recreation Facilities

Public recreation facilities for the Narrows Project will be located along the northwest shore of Narrows Reservoir as shown earlier on Figure 6-1. The facilities will include a boat ramp, boat slips, a day-use area with 10 picnic sites, restroom facilities, and a 60-unit campground. Access for the handicapped will be provided. Municipal water for the recreation facility will be supplied by developing a spring and pumping water to a new storage tank with a hydraulic ram. All recreation facilities will be constructed to Forest Service standards. The Forest Service will operate and maintain the recreation facilities.

Fishery Measures

A total of 11 fishery measures have been included in the project to mitigate for adverse impacts that have been identified with the project. To the extent possible, an attempt was made to mitigate "in place" and "in kind." The 11 mitigation measures are:

Restore Streamflow in Gooseberry Creek Tributaries. Implementation of this aquatic mitigation procedure will consist of altering the release of water from Fairview Lakes, which is owned and operated by the Cottonwood-Gooseberry Irrigation Company. Presently, during the spring runoff period, water is stored in Fairview Lakes and released for irrigation use in the Fairview area. This release is a transbasin diversion of water to the San Pitch River drainage. With the historic operational pattern, the small tributaries to Gooseberry Creek located downstream from Fairview Lakes are dry several months each year. This mitigation measure involves providing year-round releases, averaging about 2.6 cfs, from Fairview Lakes into two of these tributaries to Gooseberry Creek. This amounts to an average flow of 1.3 cfs per channel. The total annual amount of water that is released from Fairview Lakes will not be changed. However, the flow will be dispersed during the entire year rather than the present 18- to 20-week discharge period.

Water released from Fairview Lakes during the year will be captured and stored in Narrows Reservoir. Upon call by the Cottonwood-Gooseberry Irrigation Company, their water will be released through the Narrows Tunnel to the San Pitch River drainage. This mitigation measure not only provides aquatic mitigation benefits to the Narrows Project, but will provide both aesthetic and recreational benefits to Fairview Lakes. These benefits will be a result of the lakes being maintained at a higher water level during the prime summer recreational season.

The District will be responsible for entering into operating agreements necessary to implement these year-round releases. The District will also ensure that the releases are made according to environmental commitments.

Implementation of this mitigation measure will result in the creation of approximately 2.3 stream miles of spawning and rearing habitat for cutthroat trout.

Provide Minimum Flows Below Narrows Dam. The Project plan calls for a minimum year-round release of 1 cfs from Narrows Reservoir to Gooseberry Creek. That flow, combined with flows from springs located immediately below the dam, is expected to produce a stream flow of at least 1.5 cfs at the Gooseberry Campground. If the flow at the campground is less than the expected 1.5 cfs, then up to an additional 0.25 cfs will be released to achieve that flow rate.

Provide a Multiple-Level Outlet at Narrows Dam. A multiple-level outlet will be provided at Narrows Dam to regulate the temperature of water released to Gooseberry Creek. The outlet will be designed with a capacity of 10 cfs.

Stabilize Stream Banks Along Middle Gooseberry Creek. This mitigation measure will involve narrowing the channel of Gooseberry Creek between Gooseberry Reservoir and Narrows Dam so it will provide better habitat with the reduced flows. It is expected that the channel will eventually narrow by itself due to the decreased flow. However, in order to expedite the process, certain man-made improvements will be made. Prior to construction of these improvements by the District, a detailed design will be developed by the District with coordination with the Forest Service, the U.S. Fish and Wildlife Service, the Corps of Engineers, the Utah Division of Wildlife Resources, and the Utah Division of Water Rights. A 40-acre parcel of private land that the stream runs through will be acquired. Fencing will also be provided where needed to protect the stream from livestock. Middle Gooseberry Creek will be used as spawning and rearing habitat for cutthroat trout.

Provide Flushing Flows and Other Releases to Gooseberry Creek. The project will provide releases from Narrows Reservoir to Gooseberry Creek in excess of the minimum 1 cfs release described above. These additional releases will be used to provide additional instream flows in excess of the 1 cfs minimum release or to flush accumulated silt and fine sediments from the streambed to enhance spawning habitat. The Utah Division of Wildlife Resources has expressed interest in using this water to provide additional inflow to Lower Gooseberry Reservoir during critical winter period when dissolved oxygen levels in the reservoir are low. The project will provide an average of 300 acre-feet per year of additional water for release to Gooseberry Creek. This water, released from carryover storage in Narrows Reservoir, may be used for fish habitat or flushing flows. The District in cooperation with the Utah Division of Wildlife Resources will determine the timing and quantity of water to be released each year.

Acquire and/or Improve Stream Segments. This measure will involve improving fishery habitat and fencing 15.5 miles of stream, 11.5 miles in the Price River drainage and 4 miles in the Spanish Fork River drainage. Most of these stream segments are on private land, therefore approximately 303 acres of right-of-way will be acquired. A corridor, averaging approximately 200-feet wide, will be acquired. Fishery habitat improvements such as riparian plantings and some minor channel work will be performed. About 2 miles of stream will be

improved in conjunction with the Mud Creek wetland restoration area and 1 mile of stream will be improved in conjunction with the acquisition of 640 acres of wildlife habitat adjacent to the Price River below Scofield Reservoir. The various parcels of land will be contiguous with other public lands and will be managed in conjunction with those public lands. Memoranda of Understanding will be required between the District and the managing agencies. The corridor will be fenced with a pole top fence to protect the stream banks and riparian zone from damage caused by grazing. Where the adjacent land is used for grazing, selected stream access points for livestock watering will be provided or other alternative livestock watering means will be provided. Table 6-2 is a list of stream segments that have been recommended for this measure and the proposed managing agencies. Additional parcels will be identified and evaluated if necessary in order to achieve the mitigation goal. The streams improved and protected under this measure will provide habitat for all life stages of cutthroat, rainbow, and/or brown trout. A monitoring program will be established to ensure that the stream segments are acquired, improved, fenced, and maintained as planned.

Provide Winter Releases to Cottonwood Creek. A release sufficient to maintain a minimum flow of 2 cfs will be made from Narrows Reservoir to Cottonwood Creek to increase the available fish habitat. Water released during the winter months will be stored in Wales Reservoir on a space-available basis.

Provide Summer Flows in Lower Cottonwood Creek. A minimum instream flow of 2 cfs will be provided in lower Cottonwood Creek from the canyon mouth to the confluence with the San Pitch River. This measure will provide year-round flows in the stream which will support fish habitat and create a fishery for local residents and enhance the riparian corridor. This segment of stream has been historically dewatered during the irrigation season.

Construct Upper Cottonwood Creek Pipeline. Upper Cottonwood Creek Pipeline will be constructed as described earlier in this chapter.

Table 6-2
Stream Segments to be Acquired and/or Improved for Fishery Habitat

Stream Reach	Length of Stream (miles)	Proposed Managing Agency
Price River Basin		
Mud Creek	4.0	UDWR[1]
Winterquarters Creek	2.5	UDWR
Pondtown Creek	2.0	FS[2]
Fish Creek above Scofield Reservoir	1.0	FS
Price River below Scofield Reservoir	2.0	UDWR
Spanish Fork River Basin		
Starvation Creek	4.0	UDWR

[1] Utah Division of Wildlife Resources
[2] U.S. Forest Service

Provide a Minimum Pool in Narrows Reservoir. A minimum pool of 2,500 acre-feet will be provided in Narrows Reservoir for fish habitat. This pool will not be drawn upon for irrigation. At the minimum pool, the reservoir will have a surface area of 144 acres and a maximum depth of 58 feet.

Reduce External Phosphorus Loading to Scofield Reservoir. This measure will help improve the water quality in Scofield Reservoir by reducing phosphorus loading and will be implemented in conjunction with the improvement of stream segments on tributary streams above Scofield Reservoir. About 9.5 miles of stream segments will be improved. The improvements will consist of bank stabilization, primarily through riparian plantings. The stream segments will also be fenced to protect them from grazing impacts. This measure will reduce the amount of sediment and animal waste and hence the amount of phosphorus flowing into the reservoir. Historically fish kills have occurred in Scofield Reservoir due to poor water quality. Phosphorus has been identified as the limiting nutrient in the eutrophication of the reservoir. Phosphorus loading occurs through several methods including inflow of sediments which are naturally high in phosphorus and animal waste. The Utah Division of Water Quality in a report entitled "Scofield Reservoir Restoration through Phosphorus Control" concluded that:

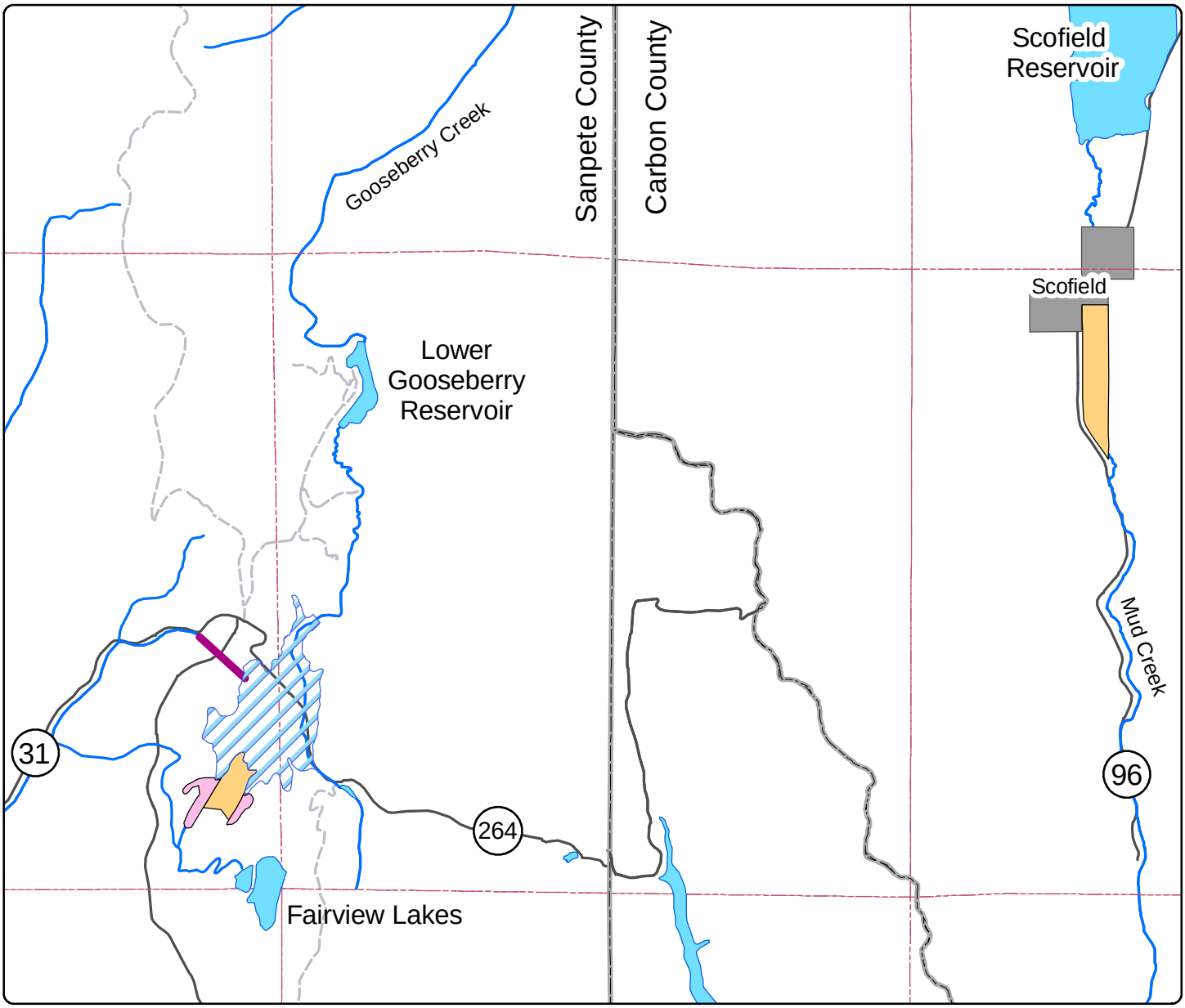
> *The most pragmatic and effective means to control the further eutrophication of Scofield Reservoir, or possibly to effect a moderate reversal of the eutrophication process, appears to be a reduction of the phosphorus load to the lake.*

The District will have primary responsibility for implementation of all fishery measures described above. The District will be responsible for funding and acquiring all lands and rights-of-way. The District will fund and construct all improvements such as fencing and stream channel improvements. The District will provide water from its water rights or enter into operating agreements for all in-stream flows described above. This work will be performed concurrently with construction of other project facilities such as the dam, tunnel rehabilitation, and pipelines. All lands and rights-of-way will be acquired and initial construction of fishery measures will be completed prior to initial filling of the reservoir. The District will be responsible to fund all operation and maintenance costs of mitigation facilities. The District will be responsible to enter into a Memorandum of Agreement with the Utah Division of Wildlife Resources and other appropriate agencies for all fishery measures. The Memorandum of Agreement will clearly define the roles and responsibilities of the District, the Utah Division of Wildlife Resources, and other parties for implementation, monitoring, and maintenance of the fishery measures.

Wetlands Measures

Wetlands measures will be included in the project to mitigate for unavoidable adverse impacts to wetlands that have been identified with the project. Four alternative wetland mitigation sites have been identified. The actual mitigation that is implemented could be from one or a combination of these alternatives. A brief description of each alternative follows.

Restore Wetlands Adjacent to Mud Creek Near Scofield. This measure will entail purchasing about 220 acres of private land adjacent to Mud Creek, south of the town of Scofield, as shown in Figure 6-2. This land is a former wetland that has been severely damaged by cattle. It is anticipated that by removing the cattle the wetland vegetation will return on its own with little or no other outside measures. All or a portion of the required wetland



Legend

- Municipalities
- Lakes and Reservoirs
- Proposed Reservoir
- Proposed Alternative Wetlands Mitigation Area
- Existing Wetland Area
- County Boundaries
- Township and Range
- State Route
- Unimproved Roads
- Narrows Tunnel

N

0 1 2 Miles

Figure 6-2

Narrows Project

Alternative Wetlands Mitigation Sites Located Adjacent to Mud Creek and Narrows Reservoir

Project Area and Facilities

Sanpete Water Conservancy District

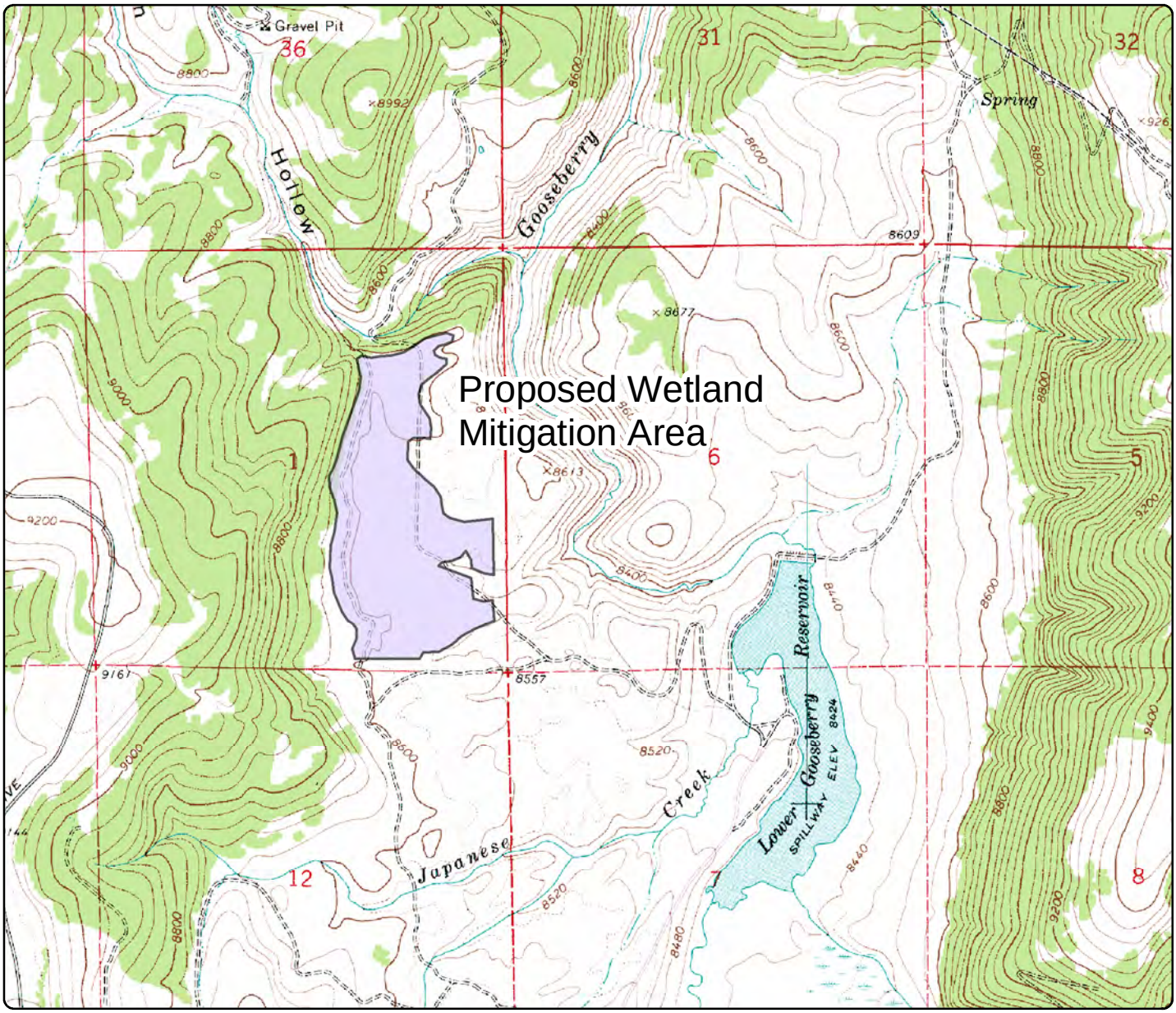
mitigation could be performed at this site. This wetland area will be maintained by the District under a Memorandum of Agreement with the Utah Division of Wildlife Resources.

Area West of Lower Gooseberry Reservoir. This alternative, as shown in Figure 6-3, would be developed near Lower Gooseberry Reservoir with an approximate elevation of 8,600 feet above msl. Approximately 120 acres of private land would be acquired west of the reservoir. The land currently is used for grazing sheep, and there are few existing wetlands. Water would be diverted from an existing diversion structure on Cabin Hollow, transported to the site through an existing open ditch, and would cause no additional adverse impacts to Cabin Hollow Creek. The water planned for mitigation purposes is an existing diversion now used for pasture irrigation at the same site. The water would be diverted from the ditch at several locations and allowed to flow across the uplands and the surrounding wetlands. The existing wetlands on this site appear to have been created and maintained by the existing irrigation system. Some earth work would need to be done to create small berms and swales that would create cells of wetlands. The area around the perimeter would be excavated somewhat deeper and to a 20-foot-minimum width and a wider width in some areas so that the edge of the swale is not abrupt but serpentine.

Enlarge and Create New Wetlands Adjacent to Narrows Reservoir. This alternative will include enlarging existing wetland areas and creating new wetlands adjacent to Narrows Reservoir. This site is also shown in Figure 6-2. About 100 acres of new wetlands will be created adjacent to Narrows Reservoir. This will be accomplished by releasing water from Narrows Reservoir and spreading it out over land adjacent to existing wetlands. A new outlet from Fairview Lakes will be provided. The outlet will be designed to automatically begin releasing water once Fairview Lakes reaches a certain level. The releases will stop as the water level recedes in the fall. The water will be conveyed to and distributed within the wetland area by a system of open ditches. Some recontouring will be performed to ensure that the soils become saturated. All or a portion of the required wetland mitigation may be performed at this site. This wetland area will be maintained by the Utah Division of Wildlife Resources under a Memorandum of Agreement with the District.

Manti Meadows. Under this alternative, return flows from the Narrows Project in the San Pitch River drainage would be made available to UDWR to use at the Manti Meadows Waterfowl Management Area located southwest of Manti as shown in Figure 6-4. The elevation of this site is approximately 5,460 feet above msl. The water would be delivered by diverting Sixmile Creek water, which belongs to the Gunnison Irrigation Company and flows into Gunnison Reservoir, and delivering it to the Manti Meadows area through existing facilities belonging to the Manti Irrigation and Reservoir Company. Narrows Project return flows arising in the San Pitch River would be delivered to Gunnison Reservoir in exchange for the water delivered to Manti Meadows. The water would be used to create at least 100 acres of new wetlands and to improve wetland habitat values of existing wetlands in the area. Some excavation and ground recontouring of existing uplands would be required to control drainage and encourage wetland development.

A final wetlands mitigation plan will be prepared in conjunction with the Clean Water Act Section 404 Permit that will be obtained from the US Army Corps of Engineers. The wetlands measures will need to provide similar functions as the wetlands that will be inundated by the reservoir.



N

0 0.1 0.2 0.3 0.4 0.5
Miles

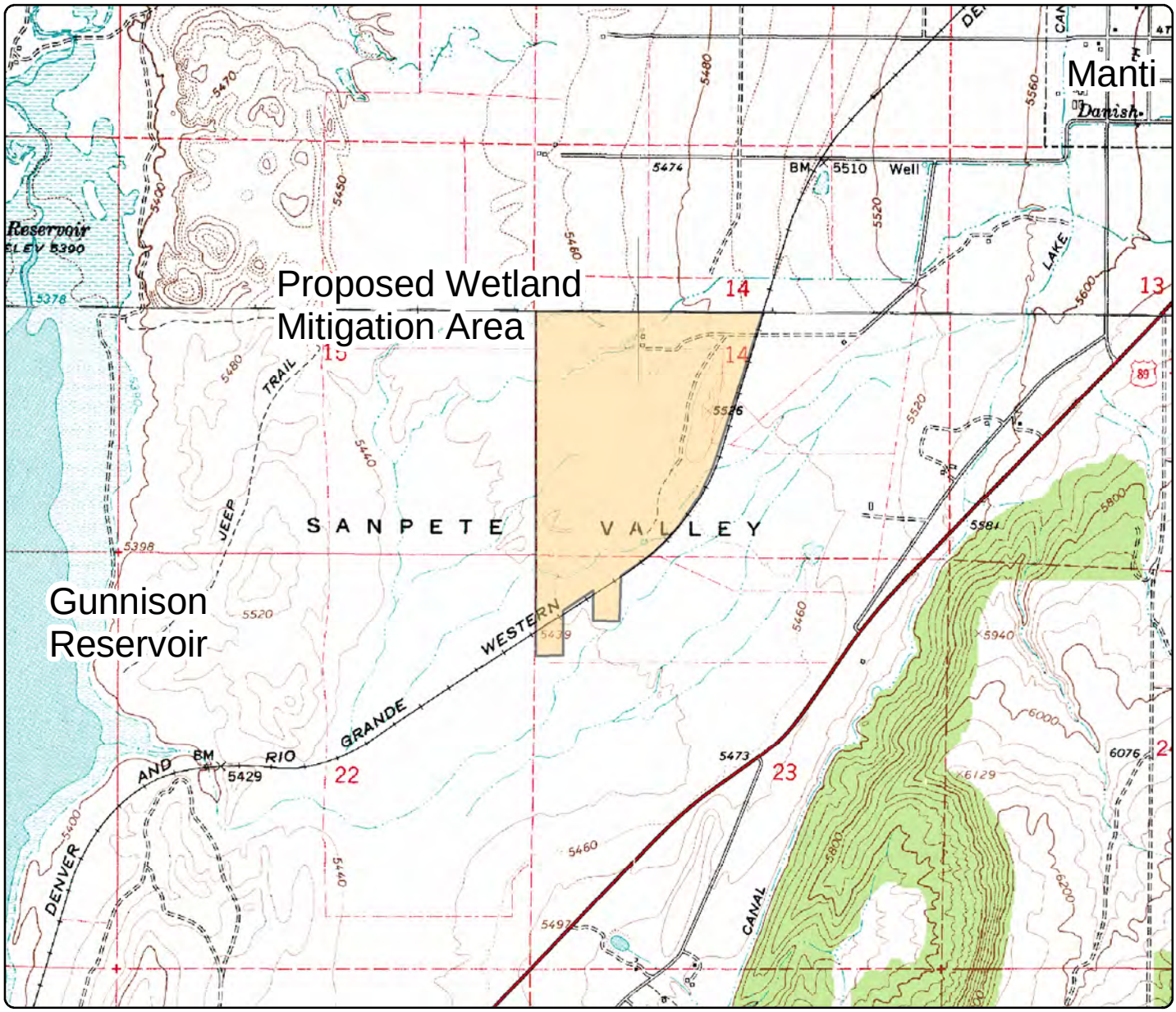
Figure 6-3

Narrows Project

Alternative Wetland Mitigation Area
West of Lower Gooseberry Reservoir

Project Area and Facilities

Sanpete Water Conservancy District



N

0 0.25 0.5 Miles

Figure 6-4

Narrows Project

Alternative Wetland Mitigation Area
Manti Meadows

Sanpete Water Conservancy District

Careful monitoring of the mitigation sites will be conducted to ensure that the value of the mitigation sites is at least equal to the value of the wetlands lost. This determination will be accomplished by function assessment that will be conducted before and after implementation of the mitigation.

The District will have primary responsibility for implementation of the wetlands measures described above. The District will be responsible for funding and acquiring all lands and rights-of-way. The District will provide and transplant any plantings needed. The District will be responsible to ensure that all fences are in good repair and are maintained properly. The District will also be responsible to install and maintain any diversion and/or irrigation facilities. This work will be performed concurrently with construction of other project facilities such as the dam, tunnel rehabilitation, and pipelines. All lands and rights-of-way will be acquired and initial construction of wetlands measures will be completed prior to initial filling of the reservoir. The District will also be responsible to fund the monitoring of the wetland mitigation. The District will be responsible to enter into Memorandums of Agreement with the Utah Division of Wildlife Resources, Corps of Engineers, and other appropriate agencies for all wetlands measures. The Memorandums of Agreement will clearly define the roles and responsibilities of the District, the Utah Division of Wildlife Resources, the Corps of Engineers, and other parties for implementation and maintenance of the wildlife measures.

Wildlife Measures

The wetlands measures described above will offset any losses to wetland habitat caused by inundation. Impacts to upland habitat (mule deer and Brewer's sparrow habitat) will be mitigated by the District in the following ways:

Watershed and Range Improvement. Participation in watershed and range improvement projects on the Manti-La Sal National Forest such as the tarweed eradication program. Mitigation credit will be obtained by supplementing the Forest Service's seed mixture with other species to provide bio-diversity and to improve habitat for impacted species. Seeds that could be added to the mixture include big sagebrush and a variety of forbs. The District could also assist the Forest Service in increasing the treatment area.

Conservation Easements. Acquisition of 150 acres of conservation easements adjacent to the Narrows Reservoir. These easements will include restrictions on land use that will benefit impacted species. In addition, the conservation easements will provide a setback of about 500 feet for any new development or construction of private land adjacent to the reservoir.

Acquire Private Land. Acquisition of 640 acres of private land adjacent to the Price River below Scofield Reservoir. Wildlife values will be enhanced by fencing the land to protect it from livestock grazing.

As with fishery mitigation, the goal of the wildlife mitigation will be to provide as near as possible full mitigation to each impacted species.

As part of the conservation easements for the 150 acres adjacent to Narrows Reservoir, certain restrictions on the landowners' use of their lands will be needed. These restrictions will include

the prohibition of such things as further construction of residential structures; commercial uses such as motels, cafes, hunting or fishing clubs, subdivisions, etc.; livestock grazing; and the storing or use of pesticides, herbicides, or chemical agents, either directly or indirectly lethal to wildlife. In addition, these lands will be made available to the general public for hunting, fishing, or other recreational uses without permit or charge of fees by the landowners. Specific measures or restrictions will be developed individually as part of the easement negotiation process with each involved landowner.

As part of the wildlife mitigation plan, a monitoring program will be developed. Existing wildlife values on mitigation lands will be identified using the same models that were used to identify project impacts. These same models will also be used to measure the success of any wildlife mitigation programs. If the proposed mitigation programs are not as successful as anticipated, additional mitigation will be required. This procedure will apply to both wetland and upland wildlife habitat.

The District will have primary responsibility for implementation of all wildlife measures described above. The District will be responsible for funding and acquiring all lands and easements. The District will provide seed to supplement the Forest Service seed mixture for the watershed and range improvement projects. The District will fund and construct all improvements such as fencing. This work will be performed concurrently with construction of other project facilities such as the dam, tunnel rehabilitation, and pipelines. All lands and rights-of-way will be acquired and initial construction of wildlife measures will be completed prior to initial filling of the reservoir. The District will also be responsible for funding the mitigation monitoring. The District will be responsible to enter into Memorandums of Agreement with the Utah Division of Wildlife Resources, Forest Service, and other appropriate agencies for all wildlife measures. The Memorandums of Agreement will clearly define the roles and responsibilities of the District, the Utah Division of Wildlife Resources, the Forest Service, and other parties for implementation and maintenance of the wildlife measures.

Construction Materials

Locations of materials necessary for construction of Narrows Dam and Reservoir were shown earlier in Figure 6-1. Most of the embankment material for the Narrows Dam will be obtained from the reservoir basin. Rockfill material for upstream slope protection will be obtained from an existing quarry on National Forest land near SR-264. An alternative rockfill material quarry site is located on private land and was also shown in Figure 6-1. Granular material for drains will be hauled from commercial pits in Sanpete Valley, near Wales, Utah. Concrete for the outlet works, spillway, and other structures will be batched in Sanpete Valley and hauled to the damsite in transit mixers. Other materials such as pipe, steel gates and structures, electric motors, and operating and control equipment will be manufactured or processed outside the project area. The materials will be hauled to the construction sites by truck.

LANDS FOR PROJECT FEATURES AND RELOCATION

About 1,868 acres of land will be required for project features, wetland mitigation, fishery and wildlife enhancement and mitigation, and material source areas. About 0.8 mile of SR-264 will be inundated by Narrows Reservoir, as described earlier in this chapter. The amounts of land by present ownership or administration and proposed project use are shown in Table 6-3. There will be no relocation of persons, families, businesses, farms, or nonprofit organizations resulting from construction of the Narrows Project.

National Forest System lands will be obtained for project uses by (1) Reclamation withdrawal, (2) Forest Service right-of-way permits, or (3) Forest Service special-use permits. The District will acquire private lands for project uses from owners by perpetual easement.

The acquisition of private lands required for fish and wildlife mitigation will be primarily by fee title. The conservation area adjacent to the reservoir will be created through conservation easements. These lands will be administered by the District under a cooperative agreement with the Utah Division of Wildlife Resources. To assure proper management of easement lands needed to mitigate fish and wildlife losses attributed to the project, certain restrictions on the landowners' use of their lands will be needed. Specific measures or restrictions, including those to protect fish and wildlife values, will be developed by the Utah Division of Wildlife Resources as part of the easement negotiation process with each involved landowner. If adequate easements cannot be secured, a fee-title acquisition of the lands will be made.

Access to Features

Construction access is fairly good for all project features. The proposed damsite is near an existing paved highway. This highway should be adequate for hauling materials and equipment to the site. Temporary haul roads will need to be constructed within the reservoir basin to move material from the borrow area to the damsite.

Construction Program

Construction of the Narrows Project will be under the supervision of the District, with overall supervision furnished by Reclamation's Regional Director in Salt Lake City, Utah. All recreational facilities on National Forest System lands will be built cooperatively by the District and the Forest Service. Temporary construction offices will be located within the proposed reservoir basin.

Table 6-3
Right-of-Way Requirements for Project Features
(Unit--acres)

Project Feature Type of Acquisition	Ownership or Administration		
	Private	**Reclamation Withdrawal**	**Total**
Narrows Dam & Reservoir			
Reclamation withdrawal	428	176	604
East Bench Pipeline			
Perpetual easement	51		51
Oak Creek Pipeline			
Perpetual easement	9		9
Upper Cottonwood Creek Pipeline	1.5	1.5	3.0
SR-264 Relocation		34	34
Recreation area		12	12
Fishery mitigation			
Perpetual conservation easement	206		206
Wildlife mitigation			
Fee title purchase of fish and wildlife enhancement area	640		640
Perpetual conservation easement adjacent to reservoir	150		150
Wetlands mitigation			
Perpetual easement or fee title	220		220
Material source area[1]		2	2
Total	1,705.5	225.5	1,931

[1] Embankment material for the dam would be obtained from the reservoir basin. Rockfill material for upstream slope protection would be obtained from an existing quarry located on withdrawn land. An alternative rockfill material quarry site may be located on private land.

GEOLOGIC INVESTIGATIONS

The site of the proposed Narrows Dam and Reservoir is located 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.

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. The North Horn formation is overlain by the Flagstaff Limestone formation which consists primarily of micro-crystalline 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 is generally 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 is generally covered by a mantle of residual soils (weathered bedrock) and/or colluvium. These unconsolidated sediments are about 5 to 10 feet in thickness with some areas in excess of 27 feet. The unconsolidated sediments are comprised 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 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 approximately 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 6-5, are all north-trending normal faults, and from west to east are the West Gooseberry Fault, the Fairview Lakes Fault, and the East Gooseberry Fault.

Observed earthquakes in the region of the Narrows damsite date back to the year 1853, giving an historical data base of about 140 years. A network of seismograph stations throughout the region currently provides 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 will produce a maximum acceleration of approximately 0.35g. Earthquake activity related to mining activities will not be expected to produce events which exceed magnitude 4.5 and, therefore, will not produce the maximum earthquake. Earthquake epicenters are shown on Figure 6-6.

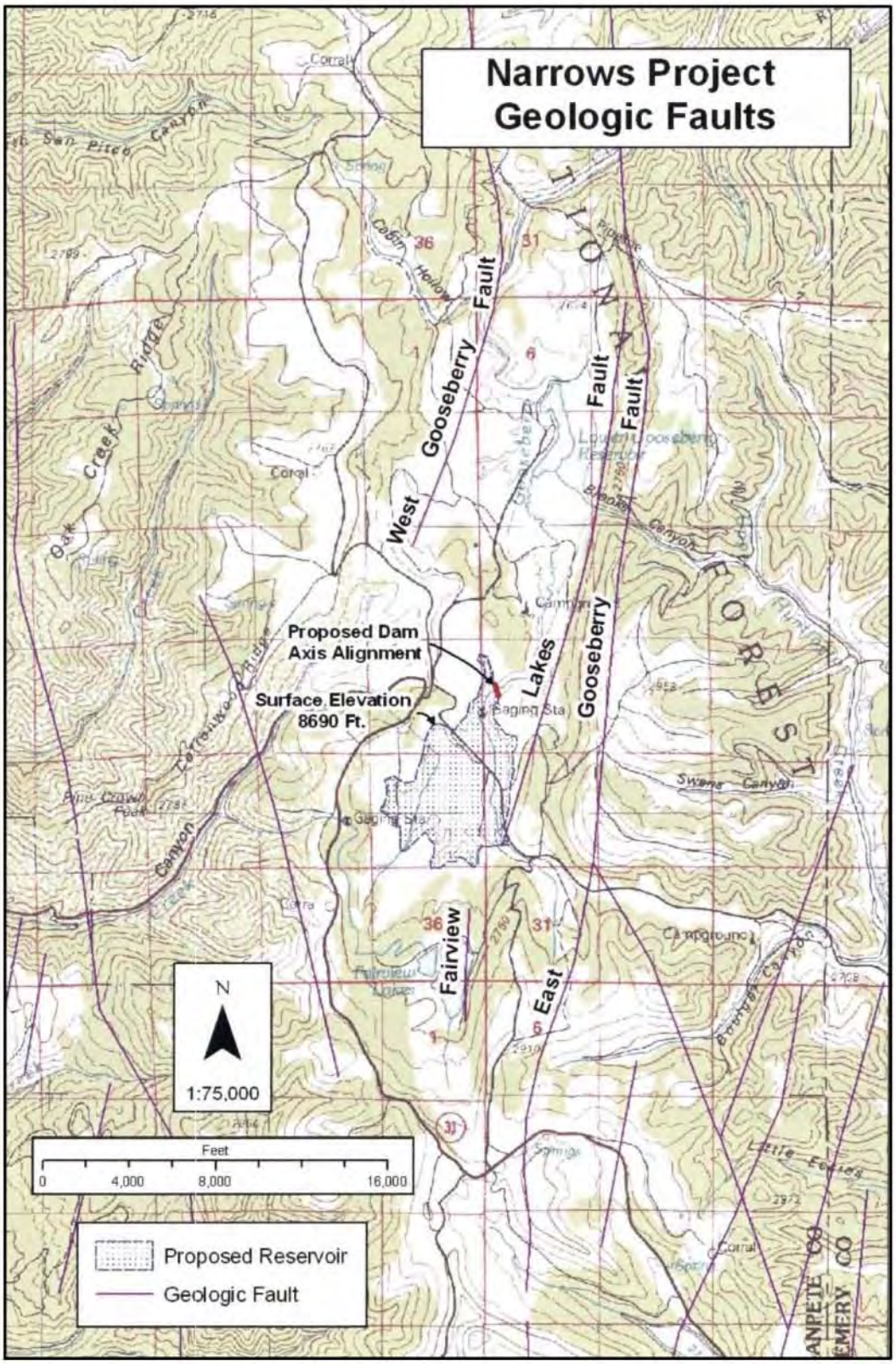


Figure 6-5. Fault Location Map

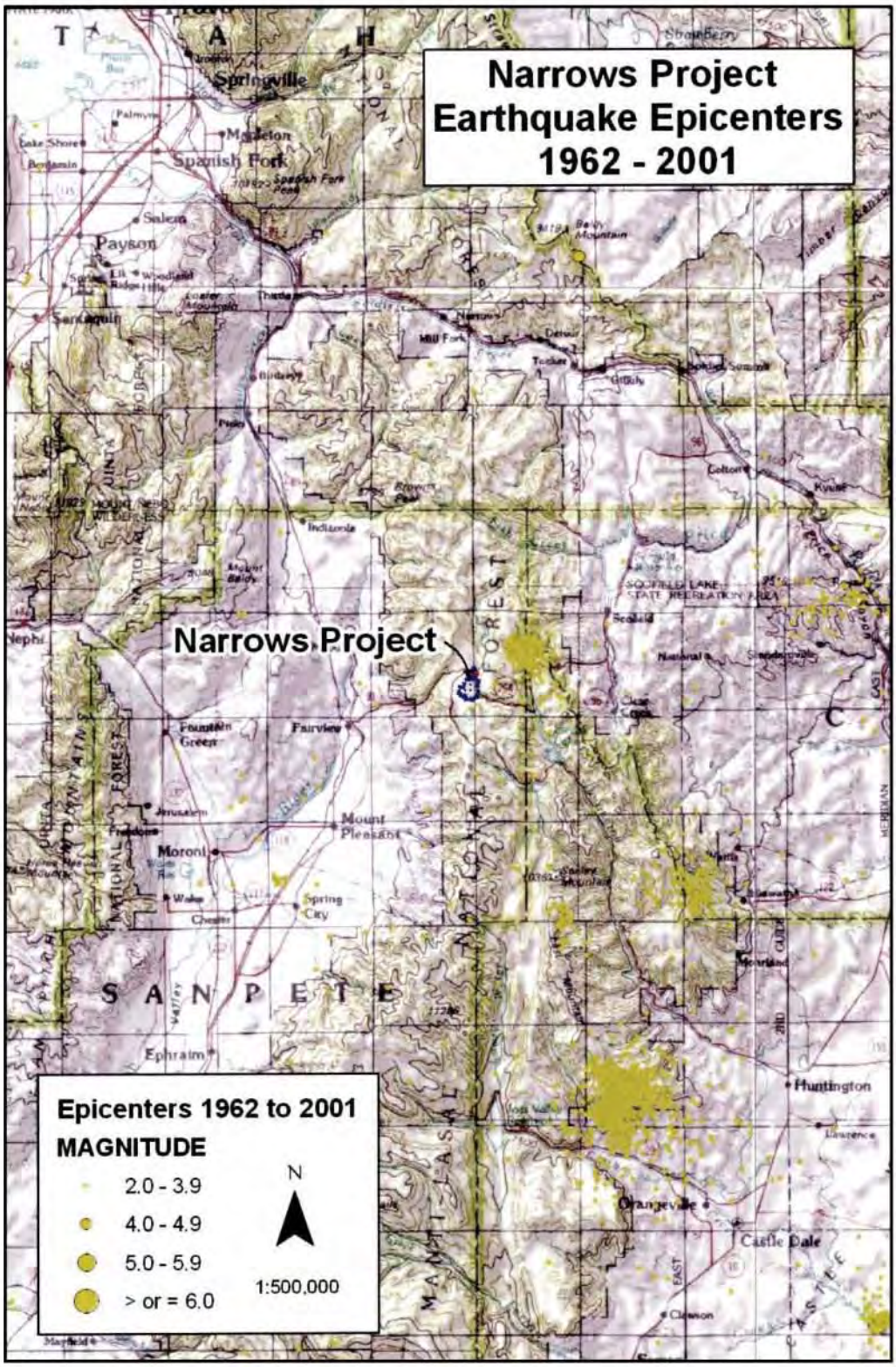


Figure 6-4. Earthquake Epicenters

Detailed geologic and materials investigations were performed by Dames & Moore in 1984. The results of these investigations are summarized in a report entitled "Engineering Geology and Geotechnical Engineering Studies, Narrows Dam and Reservoir Near Fairview, Sanpete County, Utah," dated December 4, 1986. Geotechnical field work for the Narrows Project consisted of:

Drilling, logging, and sampling a total of 19 exploration borings at the proposed dam site and within the proposed reservoir area;

Excavation, logging, and sampling of 13 test pits within the proposed borrow area;

Performing field permeability pressure tests in six of the borings (five in the dam foundation area and one in the reservoir);

Performing constant dead permeability tests in five of the reservoir borings; and

Performing 13 seismic refraction line surveys.

The existing, unlined Narrows Tunnel was also examined and mapped.

Further geologic and geotechnical investigations were performed by Woodward-Clyde Consultants during 1993. These investigations are summarized in a report entitled "Geotechnical Investigations, Narrows Dam and Reservoir Near Fairview, Utah," dated February 1994. These investigations included the following:

1) Geotechnical investigation at the dam site.
   a) Two core holes were drilled, one each on the left and right abutments, including packer testing.
   b) Four seismic refraction traverses were conducted to expand previously conducted geophysical survey data.
2) Borrow investigation in the reservoir area.
   a) Fourteen test pits were excavated within the reservoir area and samples obtained to identify types and quantities of borrow available.
   b) Four seismic refraction traverses were conducted to provide additional information for estimating borrow quantities.
3) Geotechnical investigations at the quarry sites.
   a) Three core holes were drilled at the existing quarry. Samples of the rock were obtained for testing, for potential use for riprap and drain materials.
   b) Two seismic refraction traverses were conducted at the existing quarry site to provide information regarding soil cover and rock characteristics.
   c) Two core holes were drilled at the alternate quarry site and samples of the rock, for potential use as rip rap, were obtained for testing.
   d) Two seismic refraction traverses were conducted at the alternate quarry site to provide information regarding soil cover and rock characteristics.

In addition to the above-referenced reports, the following reports are also available as supporting data to this report.

- Preliminary Stability Analyses, April 27, 1979, Dames & Moore
- Seismic Risk Study, October 5, 1979, Dames & Moore
- Supplemental Field and Laboratory Evaluation of Proposed Construction Materials, July 26, 1989, Sergent, Hoskins & Beckwith
- Reconnaissance-Level Study, Narrows Dam and Reservoir Near Fairview, Utah, December 1990, Woodward-Clyde Consultants

ENGINEERING DESIGNS

Engineering designs for this report have been conducted at feasibility and reconnaissance levels. Major structures have been designed to a greater level of detail than the minor structures.

Design Standards and Criteria

Each facility for the Narrows Project will be designed and constructed according to the most recent state-of-the-art design criteria. The design standards that will be used for each major type of facility are described below.

Narrows Dam and Reservoir

Narrows Dam and Reservoir have been designed to provide a total storage capacity of 17,000 acre-feet. This capacity is in accordance with the water right agreement and has been demonstrated to be adequate through operation studies. The dam embankment will be a zoned earthfill structure. This dam type selection was made based on a cost comparison of earthfill and roller-compacted-concrete structures. In making this comparison, the local availability of construction materials was a consideration.

The embankment will be designed to withstand static and seismic loading conditions. Preliminary studies indicate that a maximum earthquake of magnitude 5.5, occurring directly beneath the site, and producing a maximum acceleration of approximately 0.35g will be appropriate for the site. Further review of the maximum credible earthquake (MCE) will be performed prior to final design of the dam. The MCE will be used for the final design of critical facilities -- that is facilities for which the failure will cause a loss of the pool. During construction, detailed observations of the subsurface conditions will be monitored by qualified personnel.

An operating-basis earthquake, represented by ground motion which has a 50 percent probability of not being exceeded during the 100-year structural lifetime of the dam, will be used. A value of 0.12g will be used for design of noncritical engineering items.

The spillway will be designed to accommodate a 10,000-year snowmelt event. Historical records show that almost all of the annual flood peaks resulted from snowmelt. A flood flow frequency analysis was made of the annual peak flood flows using a log normal distribution. The 10,000-year flood hydrograph has a peak discharge of 838 cfs and a 30-day runoff volume of 34,241 acre-feet.

The probable maximum precipitation for the Narrows Reservoir is 9.61 inches. The flood hydrograph for this event has a peak discharge of 15,550 cfs and a runoff volume of 3,704 acre-feet. The flood from this event could be entirely contained within the reservoir without overtopping the dam.

Because of the very small drainage area above the dam, sediment inflow into the reservoir is expected to be minimal. The 2,500 acre-foot inactive and dead storage pool will be more than adequate to accommodate the sediment inflow that will occur over the 100-year life of the project. Less than 20 acre-feet of sediment will accumulate in a 100-year period, which is less than 1 percent of the inactive capacity.

Narrows Tunnel, East Bench, Oak Creek and Upper Cottonwood Creek Pipelines

The existing Narrows Tunnel will be rehabilitated to provide a total capacity of 60 cfs. The East Bench and Oak Creek Pipelines will have a combined capacity of 24 cfs. These capacities are equivalent to approximately 1.75 gallons per minute per acre for the tunnel and 1.25 gallons per minute per acre for the pipelines. These capacities are admittedly much less than the peak demand which will be approximately 8 gallons per minute per acre. However, the project delivers only supplemental irrigation water to existing systems. Furthermore, because the water supply is limited to 5,400 acre-feet and because the average annual shortage is in excess of 12,000 acre-feet, the project area will still experience shortages with the project in place, regardless of the conveyance capacity. The selected capacities will allow the project water supply to be delivered during the peak demand months of July and August. Upper Cottonwood Creek Pipeline will have a capacity of 50 cfs. Its purpose is to convey project water outside the stream channel to prevent erosion and stream degradation.

Turnouts for the Oak Creek and East Bench Pipelines will discharge into existing regulating ponds. The turnout gates will be designed to operate slowly to reduce water hammer in the pipelines. They will also be designed so that they cannot slam shut with an operator failure.

State Road-264 Relocation

The relocation of SR-264 will be designed according to the same standards as the existing road. The highway has two asphalt-surfaced, 12-foot-wide travel lanes with 9 inches of gravel base.

Structural Plans and Drawings

Preliminary plans and drawings for the major features of the Narrows Project are included in Attachment D, Preliminary Design Drawings. These facilities include Narrows Dam embankment, outlet works, and spillway; Narrows Tunnel Inlet Rehabilitation; East Bench Pipeline Headworks, and the East Bench and Oak Creek Pipelines.

Operation and Maintenance Facilities

The project plan does not include any specific facilities for operation and maintenance. The only equipment and/or vehicles required will be a pickup truck for the dam tender. Any other equipment needed for maintenance will be rented or contracted for on an as-needed basis.

Turnout and other control gates for the pipelines will be designed so that automated controls may be added at a future date.

CONSTRUCTION CONSIDERATIONS

There are no particularly unusual construction requirements associated with the Narrows Project. Specific construction considerations are described as follows.

Construction Materials

Materials investigations have identified about 500,000 to 600,000 cubic yards of soils suitable for construction of an embankment dam. About 360,000 cubic yards are required for the dam. The borrow area is located near the center of the reservoir basin. Drain and other granular materials will need to be hauled from the Sanpete Valley. Materials for the construction of an upstream rock zone are available from a limestone rock outcropping along the ridge north and west of the proposed reservoir. About 13,000 cubic yards of rockfill are needed for the dam. Concrete will likely be batched at a ready mix plant near Mount Pleasant and hauled about 15 to 20 miles to the site.

River Care and Diversion During Construction

It is anticipated that construction of the river-level outlet works will take place prior to construction of the dam embankment. The outlet works could then serve as a conduit for diversion of the stream during construction.

Special Site Conditions

Construction access is fairly good for all project features. The proposed damsite is near an existing paved highway. Temporary haul roads will need to be constructed within the reservoir basin to move material from the borrow area to the damsite. At the damsite the expected construction period is June through October. The pipelines will have a longer construction season, March through mid-December.

There is an adequate labor force located along the Wasatch Front with several contractors that are qualified to build a project of this nature. Construction will be accomplished by contract and a competitive bidding process will be used to select contractors. Construction management and inspection will be provided by the District's engineer to assure quality control. A resident engineer will be provided during the construction of the project.

RIGHTS-OF-WAY AND RELOCATION OF PROPERTY

About 1,868 acres of land will be required for project features, wetland mitigation, fish and wildlife enhancement, and material source areas. About 0.8 miles of SR-264 will be inundated by Narrows Reservoir as described earlier in this chapter. The amounts of land by present ownership or administration and proposed project use were shown earlier in Table 6-3.

National Forest System lands will be obtained for project use by (1) Reclamation withdrawal, (2) Forest Service right-of-way permits, or (3) Forest Service special-use permits. Private lands for project use will be acquired from owners by perpetual easement.

The acquisition of private lands required for fish and wildlife mitigation will be primarily by fee title. The construction area adjacent to the reservoir will be created through construction easements. These lands will be administered by the District under a memorandum of agreement with the Utah Division of Wildlife Resources. To assure proper management of easement lands needed to mitigate fish and wildlife losses attributed to the project, certain restrictions on the landowners' use of their lands will be needed. Specific measures or restrictions, including those to protect fish and wildlife values, will be developed by Utah Division of Wildlife Resources as part of the easement negotiation process with each involved landowner. If adequate easements cannot be secured, a fee title acquisition of the lands will be made.

There will be no relocations of persons, families, businesses, farms, or nonprofit organizations resulting from construction of the Narrows Project.

Narrows Reservoir will inundate about 0.8 mile of State Road 264, which provides access between Fairview and Scofield, Utah. Under the project, the road will be relocated by constructing 2.6 miles of new road and providing asphalt surfacing for 0.3 mile of the existing gravel road to Lower Gooseberry Reservoir.

DAM SAFETY CONSIDERATIONS

Dam construction will be subject to the requirements of the Utah Dam safety act. The Sanpete Water Conservancy District will develop a Safety of Dams program that will satisfy the requirements of the State of Utah. A Dam Safety Permit will be acquired from the Utah State Engineer. Areas of consideration include the designs, standard operating procedures, and emergency action plans. The District, with supervision by the State Engineer, will be responsible for monitoring structural performance and conducting safety inspections during construction and initial filling of the reservoir. Once the reservoir is operational, the State Engineer will conduct annual dam safety inspections. The District will prepare standard operating procedures and an emergency action plan prior to completion of construction. The designs, standing operating procedures, and emergency action plan will be reviewed by the State Engineer.

PROPOSED WETLANDS AND FISH AND WILDLIFE MITIGATION MEASURES

Environmental measures and features have been added to the Narrows Project plan to accommodate environmental and conservation concerns. These measures have been developed through coordination with various Federal and State agencies and have been described earlier in this chapter.

OTHER ENVIRONMENTAL CONSIDERATIONS

Clean Air, Clean Water, and Waste Management

Several water quality permits must be obtained prior to construction of the project. The Clean Water Act of 1977 (Public Law 95-217) requires that Section 402 permits be obtained from the Environmental Protection Agency for the discharge of any wastewater or process water. In accordance with Section 404 of Public Law 95-217, permits must be obtained from the Corps of Engineers to discharge dredge-and-fill material below the normal high water level of streams and other water bodies.

The objective of Section 303 of the clean Water Act will also be met. That objective directs the Environmental Protection Agency to "develop comprehensive programs for preventing, reducing, or eliminating the pollution of navigable waters and ground waters."

The project will meet antipollution requirements of the Clean Water Act, which defines "pollution" to mean the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water. The project will reduce salt pollution by reducing salt-laden return flows, and will, accordingly, restore and maintain water quality as derived by the Environmental Protection Agency from the Act. The Clean Water Act's policies and regulations require that all existing instream beneficial uses be maintained and protected.

Approval by the Utah State Division of Water Quality is required before the installation of any sanitary or industrial pollution control facilities, including turbidity control equipment. This approval will also be obtained before dewatering, diversion, and other such facilities can be constructed. In addition, a temporary waiver of the turbidity standard will be requested from the State Division of Water Quality during those periods of construction when it is physically impossible to provide turbidity control. A State Engineer's permit to alter a natural stream channel will also be requested for the proposed dam.

Cultural Resources

An on-site cultural resources survey has been conducted for the reservoir basin. Prior to initiation of final design and construction, detailed cultural resource surveys will be performed along the proposed alignments of the Oak Creek, East Bench, and Cottonwood Creek Pipelines. If cultural resource sites are found, the pipelines will be re-routed where possible to avoid the impact. If the pipeline cannot be re-routed, appropriate mitigation will be developed through coordination with the State Historic Preservation Officer.

Contractors will be required to cease work immediately if they should discover prehistoric, historical, or archeological evidence during construction. Work will not be resumed until such evidence is properly evaluated by qualified cultural resource specialists.

Endangered Species

Project impacts to threatened or endangered species were evaluated by Reclamation in a biological assessment and submitted to the U.S. Fish and Wildlife Service. Subsequently, the Service issued a final biological opinion on August 24, 2000, 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 willow flycatcher 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 to the Recovery Implementation Plan). The current depletion charge is $18.29 per acre-foot (2009 figure); and when multiplied by the project's 5,597-acre-foot average, annual depletion of flows to the Colorado River system amounts to a financial contribution of $102,369 to the RIP. The Service will notify SWCD of the current depletion charge by September 1 each year. On July 13, 1995, SWCD made a partial payment of $7,063, 10 percent of the total depletion charge as identified in the January 9, 1995, Biological Opinion.

Reliance on the RIP to serve as the reasonable and prudent alternative for project impacts is dependent upon sufficient progress toward recovery being made by the RIP. In the event sufficient progress is not made by the RIP, re-initiation of consultation would be required. Payment of the depletion charge will be made by SWCD prior to beginning construction.

CONSIDERATION OF PROPOSALS FROM OTHER AGENCIES

In developing the plan for the Narrows Project, an interagency/interdisciplinary team was organized to address environmental and conservation issues. Suggestions and recommendations of this team have been implemented into the project plan. Additional proposals received during the review process were considered and, where appropriate, integrated into the final plan. Those proposals pertained mostly to fish and wildlife measures.

CHAPTER 7

ESTIMATED COSTS

Sanpete Water Conservancy District

CHAPTER 7

ESTIMATED COSTS

The estimated construction costs for the described project are included in this chapter. The costs are indexed to October 2011. The direct and indirect costs for construction are included, as well as applicable interest during construction

CONSTRUCTION COSTS

The direct and indirect construction costs are described in the following two sections. The direct costs for each of the major facilities described in Chapter 6 are presented.

Direct Costs

The direct costs for the proposed project were developed for each of the major facilities based on feasibility- and reconnaissance-level designs. The costs are allocated to: Narrows Dam and Reservoir; Narrows Tunnel Inlet Rehabilitation; Upper Cottonwood Creek Pipeline; East Bench Pipeline; Oak Creek Pipeline; State Road 264 Relocation; Narrows Reservoir Recreation Area; and wetlands, wildlife, and fishery mitigation. A detailed breakdown of costs is presented in Attachment E, Preliminary Cost Estimates and Local Contributions.

Narrows Dam and Reservoir

The cost estimate for the proposed Narrows Dam and Reservoir is based on designs prepared by Woodward-Clyde Consultants (WCC) and Franson-Noble & Associates, Inc. (Franson-Noble). Design of the dam embankment was performed by WCC and design of the outlet works and spillway was performed by Franson-Noble.

Narrows Tunnel Inlet Rehabilitation

The Narrows Tunnel inlet rehabilitation cost estimate is based on a reconnaissance-level design prepared by Hansen, Allen & Luce, Inc.

Upper Cottonwood Creek, East Bench, and Oak Creek Pipelines

Cost estimates for Upper Cottonwood Creek, East Bench, and Oak Creek Pipelines are based on a feasibility-level design prepared by Hansen, Allen & Luce.

State Road-264 Relocation

The cost estimate for relocation of SR-264 is a reconnaissance-level estimate based on a typical roadway cross section and corresponding quantities prepared by Hansen, Allen & Luce.

Narrows Reservoir Recreation Area

The Narrows Reservoir Recreation Area cost estimate is a feasibility-level estimate prepared by Franson-Noble.

Wetlands, Wildlife, and Fishery Mitigation

Mitigation cost estimates are feasibility-level and were developed in coordination with the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

Direct Cost Summary

The total estimated October 2011 direct costs are shown in Table 7-1.

Table 7-1
Total Direct Costs Summary

Facility	2011 Direct Cost
Narrows Dam and Reservoir	$9,152,884
Narrows Tunnel Rehabilitation	211,493
Upper Cottonwood Creek Pipeline	534,225
East Bench Pipeline	7,079,462
Oak Creek Pipeline	354,120
Highway SR-264 Relocation	2,138,352
Recreation Area	834,605
Wetlands, Wildlife, and Fishery	
Mitigation	3,600,191
Total Direct Cost	$23,905,333

Indirect Costs

Contingencies

An amount for contingencies of 10 percent was used for all features except for the recreation area where a contingency amount of 5 percent was used. The total contingency amount is $2,348,803.

Projected Cost Increase

The increase in construction cost from 2011 until each of the facilities is constructed is estimated to be $3,094,706 based on a yearly increase of 5 percent. A construction schedule from FY 2013 through FY 2015 was used to estimate the increase. Table E-7 in Attachment E, Preliminary Cost Estimates and Local Contributions, shows the estimate of the cost increase and the yearly budget requirement including the cost increase.

Engineering and Administration

This cost includes construction designs, the bidding process, contract administration, and construction inspection. An amount of 15 percent of the total direct and indirect costs is included. The allocation for engineering and administration totals $3,938,120.

Reimbursable Interest During Construction

Costs allocated to municipal water will be funded by a loan from the Utah Board of Water Resources and remaining costs allocated to recreation and fish and wildlife will be funded by a grant from the State of Utah. The State loan for municipal water will be interest-free and concurrent with construction. However, interest during construction will become reimbursable as the use of water changes from irrigation to M&I. This reimbursable component of interest during construction is estimated to be $190,000.

Applicant's Local Contributions

The District has incurred costs for preparation of the loan application report and EIS and other costs including engineering investigations and legal fees. These costs total $3,925,000. Additionally, $4,300,000 will be provided by the Utah Board of Water Resources as a low interest loan for municipal water. An additional $3,692,000 will be provided by the State of Utah as a grant for the remaining costs allocated to recreation and fish and wildlife. Including costs already incurred by the District and the contribution that will be made by the State of Utah, the total local contribution towards the Narrows Project is $11,917,000.

FUND REQUIREMENT SCHEDULE

Table 7-2 shows the estimated project costs for fiscal years 2013 through 2015. The costs shown in the schedule reflect an increase in costs of 5 percent per year from 2011 until a construction contract is awarded.

Table 7-2
Estimated Funding
Requirement Schedule
(Unit - $1,000)

	FY 2013	FY 2014	FY 2015
Federal	0	16,869	8,426
Local	1,496	6,496	0
Total	1,496	23,365	8,426

Table 7-3 summarizes all of the costs described in the previous section of this chapter. The "Total Project Cost" is shown, which is $37,401. The "Total District Contributions" are $11,917,000. The requested loan amount is $21,792,000. In addition, grants totaling $3,692,000 are requested for recreation and fish and wildlife.

OPERATION, MAINTENANCE AND REPLACEMENT COSTS

Because the Narrows Project will deliver a supplemental water supply to existing systems which are now being operated and maintained, OM&R costs should be minimal. It is expected that the Cottonwood-Gooseberry Irrigation Company, which owns and operates the nearby Fairview Lakes, and the Sanpete Water Conservancy District will be able to share a dam tender for the two reservoirs. The total OM&R cost for the Narrows Project is estimated to be $85,000 per year. The estimate for the reservoir and water delivery system is based on a part-time dam tender/ditch rider who will monitor and adjust gates during the irrigation season and perform routine maintenance. The recreation area OM&R estimate is based on a comparison with other similar recreation areas in the state. The annual OM&R costs are summarized in Table 7-4.

Table 7-3

Estimated Project Costs Summary

(Unit - $1,000)

Item	Amount
Project Costs	
Total Direct Costs	23,905
Contingencies (approximately 10%)	2,348
Subtotal	26,253
Cost Escalation from 1994 to Construction	3,095
Engineering and Administration (15%)	3,938
Base Construction Cost	33,286
Other Project Costs	
Reimbursable Interest During Construction	190
Sunk Costs	3,925
Total Project Cost	37,401
District Contributions	
Sunk Costs	3,925
Other Local Contributions	7,992
Total District Contributions	11,917
Total Federal Share of Project	25,484
Recreation Grant	814
Fish and Wildlife Grant	2,878
Total Loan Obligation	21,792
Reimbursable Interest During construction	190
Total Federal Appropriation requirement	21,602

Table 7-4
Estimated Annual Operation, Maintenance and Replacement Costs

Item	Cost
Reservoir & water delivery facilities	
Personnel	$28,000
Equipment	8,000
Supplies and materials	4,000
Subtotal	40,000
Recreation area	45,000
Total	$85,000

EMERGENCY RESERVE FUND

The emergency reserve fund is for unexpected costs to repair facilities that may be damaged from floods, wind, etc. The fund amount is estimated to be $40,000, based on annual OM&R for the project of $40,000 (not including the recreation area OM&R). The fund would be fully developed in 5 years, which will require a yearly contribution of $8,000.

CHAPTER 8

PROJECT EVALUATION

Sanpete Water Conservancy District

CHAPTER 8

PROJECT EVALUATION

INTRODUCTION

The Narrows Project is evaluated in this chapter in both non-economic and economic terms. Presented first is a discussion of the merits of the project in non-economic terms as they are perceived to relate to environmental effects and to the goals and objectives of the Sanpete Water Conservancy District. Following that material is a discussion of economic benefits under SRPA criteria arising from construction and operation of the project and an allocation of project costs.

AGENCY RESOURCE MANAGEMENT OBJECTIVES

The Narrows Project has been formulated to contribute toward meeting the District's objectives, as defined in Chapter 2, and to include facilities or actions, discussed in Chapter 6, recommended by agencies participating in the project. As a consequence, the proposed project has attributes that are perceived to contribute to meeting the Department of Interior's resource management objectives in addition to those of the District's. This introductory material discusses those items.

Partnerships

Formulation of the Narrows Project included the cooperative efforts of not only the Sanpete Water Conservancy District and Reclamation, but the other resource management agencies that normally participate in Federal water resource management endeavors such as the Forest Service and Fish and Wildlife Service. The recreation facilities at Narrows Reservoir will be administered by the Forest Service. The Forest Service will also manage the improved wildlife habitat areas and stream fisheries in the Manti-La Sal National Forest. Along with the District's efforts, participation of the Utah Divisions of Water Resources and Wildlife Resources has been frequent. Private lands acquired for wildlife mitigation will be administered by the District under a cooperative agreement with the Utah Division of Wildlife Resources. The Utah Department of Transportation has also provided assistance in planning a portion of the project.

Water Conservation

Reclamation’s mission of managing water in the West has at its core better water management by making more efficient use of existing supplies. Reclamation emphasizes water conservation to achieve this goal. Water users in Sanpete County are already actively implementing improved and more efficient irrigation systems. In recent years, there has been a significant shift from the flood method of irrigation to the sprinkler method. Presently about 60 percent of the irrigated land is under sprinkler irrigation. Under project development, the sprinkler irrigation system will be improved. Water saved will not be used on new lands but will be used to alleviate existing shortages. In addition to increased efficiency in water deliveries, the

Narrows Project will save for municipal use high quality water that presently must be used for irrigation.

Maintaining and Enhancing the Environment

Environmental enhancement is a key element of the Federal Government's stewardship program. To accommodate environmental and conservation concerns, several environmental measures and features have been added to the Narrows Project plan. Fishery measures include the following:

- Restoring year-round flows in two small tributaries of Gooseberry Creek;
- Providing minimum flows in Gooseberry Creek below Narrows Dam;
- Providing a multiple-level outlet at Narrows Dam to regulate the temperature of releases to Gooseberry Creek from Narrows Reservoir;
- Stabilizing stream banks along middle Gooseberry Creek so better habitat will be provided with the reduced flows;
- Providing releases from the Narrows Reservoir for flushing flows and for fish habitat during critical periods;
- Improving and protecting stream channels and riparian zones by acquiring easements on private land and fencing private and Forest Service land;
- Providing winter releases to Cottonwood Creek to maintain a minimum flow so that available fish habitat may be increased;
- Providing summer flows in lower Cottonwood Creek to provide year-round flows in the stream;
- Constructing a pipeline in the upper Cottonwood Creek area to convey project water outside the stream channel;
- Providing a minimum pool in Narrows Reservoir for fish; and
- Reducing external phosphorus loading to Scofield Reservoir.

Wetlands measures have been included in the project. Four alternative wetlands mitigation measures have been identified to ensure no net loss of wetlands and to make certain that impacted wetlands functions and values are fully replaced.

Wildlife measures will include:

- Acquiring conservation easements around the Narrows Reservoir; and
- Acquiring and fencing private land adjacent to the Price River below Scofield Reservoir to protect wildlife habitat.

Rural Development

The Federal Government's policy is to improve the economic and social well-being of rural America. Economic and social conditions in the project area are underscored by a century-long dependence upon agriculture. The valley was originally developed for agricultural use and agriculture remains the principal economic activity today. About 44 percent of the land in Sanpete County is in farms. From 1992 to 2002, the census of agriculture data shows the number of farms increased by 9 percent, whereas the number of acres in production changed by less than 1 percent. The average farm size decreased from 643 acres in 1992 to 471 acres in 2002.

Following construction of the project, the economy of the agricultural sector of the project area will benefit. The project will serve to maintain or improve the economic position of agriculture relative to other economic sectors of the area.

Most residents of the area are involved in beliefs and values that are based in rural farm attitudes. These attitudes are traditionally associated with rural farm areas of the United States. This rural-agrarian orientation consists of four basic assertions: (1) a farm person is viewed as a self-reliant and self-sufficient person; (2) agriculture is viewed as the basic industry on which all progress and prosperity is based; (3) the agricultural life is considered natural and morally desirable; and (4) rural values have been characterized as emphasizing the family, especially the extended family. Sanpete County communities also view the family farm as being basic to the economy. Completion of the project will help preserve the economic soundness and strong work ethic, as well as the high moral beliefs and values, of rural America.

ENVIRONMENTAL EFFECTS

Environmental effects of implementing the Narrows Project are summarized in the Environmental Impact Statement (EIS) prepared by Reclamation. The EIS compares the environmental consequences of the Proposed Action and two other action alternatives against the No Action Plan. The EIS identifies several environmental issues related to the Narrows Project and the associated project effects. These issues and effects are summarized in Table 8-1. For a more detailed discussion of these issues and effects, please refer to the EIS.

Table 8-1
Summary of Narrows Project Environmental Issues and Effects

Issue	Project Effect	
Water Resources		
Acre-feet of depletion to the Price River drainage	5,674 acre-feet	
Acre-feet of water available to San Pitch River drainage	5,250 acre-feet	
Water Rights		
Appropriations	No change	
Water Quality		
Change in Scofield Reservoir Trophic State Index	+3.5	
Change in average phosphorus level in Scofield Reservoir based on external phosphorus loading (milligrams per liter)	+0.003 (+10.8%)	
Air Quality		
Number of days project will exceed National Ambient Air Quality Standards for PM10	0	
Slopes and Channel Stability		
Exceed 50-year channel-forming discharge	0	
Lateral and vertical degradation	0	
Geologic Hazards		
Known geologic hazards within vicinity of dam and reservoir	3	
Paleontological Resources		
Paleontological resources inundated or otherwise impacted	Undetermined until completion of environmental commitments	
Soils		
Acres of new soil disturbance	668 acres	
Change in sediment loads in Gooseberry Creek	-400 tons	
Trace Elements		
Increase in levels of select trace elements in ground water	0	
Fisheries		
Instream		
Change in weighted usable area in fish habitat as measured by instream flow incremental methodology for the following life stages:	Postproject	(Percent Change)
▪ Adult ▪ Juvenile ▪ Spawning ▪ Fry	10,958.04 2,312.67 69.9 373.25	(-8.17) (-11.86) (+1.11) (-12.68)
Reservoir		
Change in surface area in Scofield Reservoir (average)	-290	

Table 8-1
Summary of Narrows Project Environmental Issues and Effects

Issue	Project Effect	
Wildlife	Species	Without Mitigation (with Mitigation)
Change in habitat units for the following species: mule deer, Brewer's sparrow, beaver, Richardson vole, yellow warbler	Mule deer Brewer's sparrow Beaver Richardson vole Yellow warbler	-135 (0) -477 (0) -13 (0) -63 (0) -26 (0)
Threatened and Endangered Species		
Acre-feet depletion from Colorado River system	5,491 acre-feet	
Vegetative Resources		
Miles of stream lost due to inundation of the reservoir	5.3 miles	
Number of miles of stream affected by flow: ▪ Increase in flow ▪ Decrease in flow	 4.9 miles 16.1 miles	
Wetland Resources		
Acres of wetlands lost	100 acres (without mitigation) 0 acres (with mitigation)	
Recreation and Visual		
Change in projected fisherman days in Scofield	-6,800	
Increase in developed recreation visitor days at Narrows (including fishing)	+46,400	
Increase in dispersed recreation visitor days at Narrows (including fishing)	+910	
Change in visual quality objective	Partial retention	
Cultural Resources		
Cultural resources inundated or otherwise impacted	Undetermined until completion of environmental commitments	
Economic and Social Resources		
Number of jobs (Carbon, Sanpete) created during construction	50–100	
Change in farm income	11% increase	
Land Resources		
Change in number of AUMs of forage	-240 AUMs	
Acres of mineable coal reserves not available for mining	0	
Health and Safety		
Percent change in the volume of traffic in the project area	19% increase	
Indian Trust Assets		
Number of Indian trust assets affected	None	
Environmental Justice		
Number of minority communities disproportionately affected by the Narrows Project	None	

ECONOMIC STUDIES

Irrigation Benefits

Irrigation benefits are based on the increase in net incomes to farmers coming as a result of improving crop production on approximately 4,395 acres of Irrigated alfalfa that is now affected by water shortages. Alfalfa is the highest value crop in the project area and 4,395 acres the area that could have a full water supply with Narrows Project supplemental water. In computing irrigation benefits the increased net income to farmers was calculated based on crop production data obtained from local sponsors. This information, along with crop budgets from the Economics Department at Utah State University and sponsor's water supply data were used to model effects of the project improvements on local farmers and ranchers. The analysis was completed using the Utah Division of Water Resources' HYCON computer program which was developed to evaluate the economic benefits of irrigation projects developed by the Utah Board of Water Resources. This program has the capability of analyzing the hydrologic and economic effects of changing irrigation systems, efficiencies, timing, and/or water supplies, including the effect of constructing a reservoir. A description of the HYCON computer program and the output for the Narrows Project are included in Attachment F.

Net income is assumed to increase immediately upon completion of project construction by $657,900 annually, or $138.31 per acre-foot. The analysis assumed that there will be no conversion of irrigation systems to sprinkler as most project farmers already have efficient water application systems.

Municipal Water Benefits

Some project water will be used for municipal purposes. As municipalities continue to grow in the future an increasing amount of project water will be converted to lawn and garden use. The municipal water use and benefit is phased in over the 83 years after which all water developed by the project will be municipal and industrial uses. Consequently, as the municipal use is increasing the amount of water going to irrigation is decreasing by the same amount.

The municipal benefit is estimated as the cost of the next best alternative source of water to serve this need. In the absence of the project, it is assumed additional wells will be needed to serve all additional municipal needs through the culinary water system in each municipality. Water rights would also need to be acquired for these new wells. The estimated cost of water to meet all future lawn and garden demands through the culinary system is $448 per acre-foot. This calculated cost is used to estimate the municipal benefit of the proposed project.

Recreation and Fish and Wildlife Benefits

Recreation and fish and wildlife benefits for the Narrows Project were estimated based on the unit-day value method as described in the Federal Register of December 14, 1979. In the unit-day value method, points are assigned based on several criteria including quality of the recreation experience, availability of opportunity, carrying capacity, accessibility, and environmental quality. The total point score assigned to the Narrows Project was 50 of a possible 100.

A Corps of Engineers memorandum of November 5, 2010 (copy attached) provides a table for converting points to dollar values. According to the table, a 50-point score is equivalent to $7.62 per user-day for general recreation and $8.29 per user-day for general fishing and hunting in 2011 dollars.

Recreation use rates at Narrows Reservoir would be expected to approximate the use rates at Joe's Valley Reservoir based on the number of campsites and other such facilities per acre of water surface area (1,170 acres). Based on information gathered from the Forest Service annual visitor days at Joe's Valley Reservoir from 2003 – 2008 is 85,000. With 1,170 surface acres, this equates to 72.7 visitor days per year half of which is for general recreation and half for fishing. Joes Valley has a total of 64 campsites, essentially the same as the 60 sites in the Proposed Action. A preliminary estimate includes 46 sites located in the campground and 18 near the boat ramp, of which 10 are picnic sites. Using this visitor-day rate proportioned by the ration of the reservoir surface areas yields an estimate of 43,911 visitor-days at Narrows Reservoir.

Implementing the Narrows Project 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. Therefore, the net increase in recreation and fishing due to the Narrows Project is estimated to be 31,202 visitor-days total or 15,601 for general recreation and 15,601 for fishing.

As shown in Table 8-1, the annual benefit for recreation is projected to by $118,880 for recreation and $129,332 for fish and wildlife.

Table 8-2
Recreation and Fish and Wildlife Benefits

Purpose	Annual user-days	Value per user-day ($)	Annual benefit ($)
General Recreation	15,601	7.62	118,880
Fish and Wildlife	15,601	8.29	129,332
Total	31,202		248,212

CHAPTER 9

FINANCIAL PROGRAM

Sanpete Water Conservancy District

CHAPTER 9

FINANCIAL PROGRAM

COST ALLOCATION

Introduction

The objective of the cost allocation is to equitably distribute the costs of the multipurpose project among the purposes served. Purposes to which Narrows project costs will be allocated are irrigation, municipal and industrial water, recreation, and fish and wildlife. Allocation methods used in this report reflect procedures specified for use in SRPA projects as outlined in the Bureau of Reclamation publication Loan Program Guidelines - Small Reclamation Projects Act of 1956, dated September 1990. Costs to be allocated include (1) construction costs; (2) interest during construction; and (3) operation, maintenance, and replacement costs.

Method of Allocation

The separable cost-remaining benefit (SCRB) method of cost allocation has been used in combination with the use of facilities (UOF) method for allocating costs in this report. The SCRB method is used for the initial allocation to determine costs associated with each of the project purposes. At this stage of the allocation, the "irrigation" and "municipal and industrial" (M&I) water purposes are combined and labeled "water supply." The second stage of the allocation uses the UOF method to sub-allocate costs allocated to water supply to irrigation and M&I water functions.

Costs to be Allocated

Construction Costs

Construction costs total $37,211,000. A breakdown of these costs by project feature is shown in Table 9-1.

Interest During Construction

Interest during construction (IDC) was calculated on total project costs by feature. Interest is calculated at 5.75 percent compounded, which is the current repayment rate for SRPA Loans. Expenditures by project feature and construction year are shown in Table 9-2 based on a 3-year development period. Total IDC is estimated at $2,706,000.

Operation, Maintenance, and Replacement Costs

Annual operation, maintenance and replacement (OM&R) costs are estimated at $40,000 annually for water storage and conveyance facilities and $45,000 annually for recreation facilities. These costs are detailed in Chapter 7, Estimated Cost.

Table 9-1
Construction Costs
(Unit - $1,000)

Item	Costs
Narrows Dam and Reservoir	12,765
Narrows Tunnel Inlet Rehabilitation	295
Upper Cottonwood Creek Pipeline	745
East Bench Pipeline	9,873
Oak Creek Pipeline	494
Highway SR-264 Relocation	2,982
Recreation Area	1,111
Wetlands, Wildlife, and Fishery Mitigation	5,021
Costs Spent to Date	3,925
Total	37,211

Separable Cost Remaining Benefit (SCRB) Method of Cost Allocation

The SCRB method of cost allocation assigns costs to project purposes in two steps. The first step is to identify costs associated with one purpose and assign them to that purpose.

The second step divides joint costs between the purposes. This method allows each project purpose to share in the economy of the multipurpose project. Each project purpose is allocated at least its separable cost, but not more than its justifiable expenditure.

Justifiable Expenditure

The justifiable expenditure of each purpose is the lesser of the present worth values of the annual benefits accruing to that purpose or the cost of the most likely single-purpose alternative means of providing comparable services and benefits in the absence of the project. In the case of the Narrows Project, the benefits were limiting for all project purposes, resulting in a total justifiable expenditure smaller than the total costs to be allocated. Justifiable expenditures for each individual purpose are, however, larger than separable costs. In order to make the allocation, the rule cited above, "costs cannot be allocated to a purpose in excess of its justifiable expenditure" was ignored.

Single Purpose Alternative Costs

Costs of single-purpose alternative projects have been estimated for a water supply for irrigation, recreation, and fish and wildlife. In each case the single-purpose projects were sized to furnish essentially the same benefits to essentially the same geographic area. Costs for these alternative projects were estimated using the same price level, interest rate, and estimating procedures as the multi-purpose project.

Table 9-2
Interest During Construction
(Interest rate = 5.75%)
(Unit 1,000)

Features	Year of Construction FY 2013	FY 2014	FY 2015	Total
Narrows Dam and Reservoir	763	8,041	3,961	12,765
EAC[1]	382	4,805	10,785	
IDC[2]	22	276	620	918
Narrows Tunnel Inlet Rehabilitation	18	277		295
EAC	9	157	305	
IDC	1	9	18	27
Upper Cottonwood Pipeline	45	700	-	745
EAC	23	395	769	
IDC	1	23	44	68
East Bench Pipeline	592	9,281		9,873
EAC	296	5,250	9,873	
IDC	17	302	568	887
Oak Creek Pipeline	29	465		494
EAC	15	262	510	
IDC	1	15	29	45
Highway Relocation	179	2,803		2,982
EAC	90	1,586	3,078	
IDC	5	91	177	273
Recreation Facilities	744	367		1,111
EAC	372	949	1,187	
IDC	21	55	68	144
Fish and Wildlife Mitigation	-	3,365	1,656	5,021
EAC		1,683	4,290	
IDC		97	247	343
Costs Spent to Date	3,925	-	-	3,925
EAC				
IDC				
Total Construction Costs				37,211
Total IDC				2,706

[1] Expenditure average cumulative
[2] Interest during construction

Single Purpose Water Supply Project. The most likely single-purpose project to furnish the same water supply as the multipurpose project, would be a reservoir at the project site that would include only enough capacity for water supply. This would result in a reservoir slightly smaller than the multipurpose project. Other project features would remain the same as in the multipurpose plan except that recreation facilities would be deleted. This project would result in construction costs of $31,442,000; interest during construction of $2,002,000; and operation, maintenance, and replacement costs of $35,000. These values are shown by feature in Table 9-3.

Single Purpose Recreation Project. The most likely single-purpose project to furnish the same recreation benefits as the multipurpose project would be a reservoir at the same site and essentially the same capacity as the multipurpose project. Other multipurpose features would not be required. Construction costs for this alternative are estimated at $18,017,000; interest during construction at $1,027,000; and operation, maintenance, and replacement costs at $21,000. These values are summarized by feature in Table 9-3.

Single Purpose Fish and Wildlife Project. The single purpose fish and wildlife project would consist of a reservoir at the project site of about 2,500 acre-feet capacity. Project features associated with water delivery and recreation facilities would not be required. However, environmental studies and fish and wildlife mitigation would be required in the same amount as the multipurpose project. Construction costs for this alternative are estimated at $9,733,000. Interest during construction is estimated at $567,000 and OM&R is estimated at $14,000 annually. This alternative is also shown in Table 9-3.

Benefits

Project benefits have been evaluated for use in cost allocation. Water supply benefits are estimated at $881,874 annually. Irrigation benefits are based on an increase in net farm income of $657,000 annually or $138.31 per acre-foot. Municipal water benefits are $448 per acre-foot as explained in Chapter 8. Recreation benefits are estimated at $118,880 annually and Fish and Wildlife benefits are estimated at $129,332. As discussed previously, total project benefits are less than total costs to be allocated as demonstrated in Table 9-4.

Table 9-3
Single Purpose Alternatives - Indexed to 2011
(Unit - $1,000)

Feature	Water Supply Construction Costs	IDC	Recreation Construction Costs	IDC	Fish & Wildlife Construction Costs	IDC
Narrows Dam and Reservoir	$12,032	$747	$12,765	$793	$5,130	$393
Narrows Tunnel Rehabilitation	$295	$22	$0	$0	$0	$0
Upper Cottonwood Creek Pipeline	$745	$58	$0	$0	$0	$0
East Bench Pipeline	$9,873	$767	$0	$0	$0	$0
Oak Creek Pipeline	$494	$37	$0	$0	$0	$0
Highway SR-264 Relocation	$2,982	$81	$2,982	$81	$2,982	$81
Recreation Area	$0	$0	$1,111	$86	$0	$0
Wetlands, Wildlife, and Fishery Mitigation	$5,021	$290	$1,159	$67	$1,621	$93
Total	$31,442	$2,002	$18,017	$1,027	$9,733	$567

Table 9-4
Project Benefits
(Unit - $)

Purpose	Annual Benefits	Capitalized Benefits (100 yrs @ 5.75%)
Water Supply	881,874	15,280,000
Recreation	118,880	2,060,000
Fish & Wildlife	129,332	2,241,000
Total		19,581,000
Total Costs to be Allocated		42,107,000

Separable Joint and Specific Costs

The separable cost for any purpose of the multipurpose project is the difference between the cost of the multipurpose project and the cost of the project with that purpose omitted. Thus, the separable costs for each purpose include the cost of those facilities used solely for that purpose (specific costs) plus the difference in costs of the joint use facilities that would change in size or design with the purpose omitted (separable joint costs). Separable costs are determined by assuming each purpose in turn as the last purpose added to the multipurpose project. The remaining joint costs are the costs remaining after the sum of the separable costs for the various purposes are subtracted from the total project costs. The derivation and summary of separable costs for each purpose are shown on Table 9-5.

Project Without Water Supply. Without the project water supply, the project would serve recreation and fish and wildlife purposes. The same size reservoir would be required to generate the same recreation benefits as the multi-purpose project. All other project costs would also remain the same except the distribution pipelines could be deleted. Cost decreases resulting from omitting water supply as a project purpose are $11,629,000 in construction costs; $1,000,000 in interest costs; and $21,000 in annual operation, maintenance, and replacement costs. Separable costs for water supply are shown in Table 9-5.

Project Without Recreation. Without recreation, the project would serve the water supply functions (irrigation and municipal and industrial water) and fish and wildlife. These project purposes would require a reservoir of about the same size and cost as the multipurpose project. The main cost change without the recreation purpose would be the cost of recreation facilities, which could be deleted entirely. This would result in separable costs to recreation of $1,628,000 in construction costs, $144,000 for interest during construction, and zero for OM&R. Separable costs for recreation are shown in Table 9-5.

Table 9-5
Summary of Separable and Remaining Joint Costs
(Interest Rate 5.75%)
(Unit -$ 1,000)

Features	Const. Cost	IDC	Annual OM&R	Multipurpose Project Without Water Supply Const. Cost	IDC	Annual OM&R	Multipurpose Project Without Recreation Const. Cost	IDC	Annual OM&R	Multipurpose Project Without Fish & Wildlife Const. Cost	IDC	Annual OM&R
Narrows Dam & Reservoir	12,765	918		12,248	918		12,248	918		12,030	830	
Narrows Tunnel Inlet Rehabilitation	295	27		295	27		295	27		295	22	
Upper Cottonwood Pipeline	745	68		0			745	68		745	68	
East Bench Pipeline	9,873	887		0			9,873	887		9,873	887	
Oak Creek Pipeline	494	45		0			494	45		494	45	
Highway Relocation	2,982	273		2,982	273		2,982	273		2982	273	
Recreation Facilities	1,111	144		1,111	144		0	0		1,111	144	
Fish & Wildlife Mitigation	5,021	343		5,021	343		5,021	343		0	0	
Costs spent date	3,925	0		3,925	0		3,925	0		3,925	0	
Total Project Cost	37,211	2705	85	25,582	1705	64	35,583	2561	85	31,455	2269	40
Separable Costs	19,013	1580	66	11,629	1000	21	1,628	144	0	5,756	436	45
Remaining Joint Costs	18,198	1125	19									

Project Without Fish and Wildlife. Without fish and wildlife, the project would serve recreation and the water supply functions (irrigation and M&I). This would require a slightly smaller reservoir of about 14,500 acre-feet at the Narrows site. This reduction is the inactive capacity included in the multipurpose reservoir for fishery. All fish and wildlife mitigation would also be deleted from the project. All other project costs would remain the same. The resulting separable costs to fish and wildlife include $5,756,000 for construction costs, $436,000 interest during construction, and $45,000 for OM&R. Separable costs for fish and Wildlife are shown in Table 9-5.

Allocation of Costs

Allocation of project costs is shown in Table 9-6. Separable costs for each purpose were subtracted from the justifiable expenditure to obtain the remaining justifiable expenditure. Because there was no remaining justifiable expenditure for recreation and fish and wildlife, all remaining joint costs were allocated to water supply.

Sub-allocation of Water Supply Costs

As discussed earlier in this chapter, the water supply function is sub-allocated to commercial irrigation and M&I purposes by the “use of facilities” (UOF) method of cost allocation. This method assigns specific costs to each purpose and then divides the costs remaining after specifics have been deducted in proportion to water used. The Narrows Project does not have costs specific to either of these purposes. Therefore, the total “water supply allocation” is divided to irrigation and M&I on the basis of water use. The SRPA requires that interest be paid on M&I costs, and that M&I use be determined each year of the repayment period so that interest charges can be assessed. This requires what is termed a “rolling allocation” between irrigation and M&I. A rolling allocation is one that reflects a change in water use as it occurs over time.

It is anticipated that project M&I water use will increase over time with a corresponding decrease in commercial irrigation use. Estimates of project water use over the 30-year repayment period are shown in Table 9-7. Commercial irrigation is defined as water deliveries to ownerships of over 10 acres. These estimates are included to illustrate concepts. Under the terms of the repayment contract, actual use will be determined as it occurs during the repayment period.

Current M&I water use (about 500 acre-feet) will be financed by a low-interest loan from the State of Utah. The State loan is expected to be for $4,300,000. It is anticipated that additional water will convert to M&I use during the repayment period. This conversion has been estimated and displayed in Table 9-7.

The annual values for M&I conversion in Table 9-7 are used to calculate the rolling allocation displayed in Table 9-8. It is expected that urban M&I water will increase each year based on population growth. The total annual increase of M&I water financed by the SRPA loan at the end of the repayment period is estimated at 951 acre-feet.

Water use by year was used to develop the rolling allocation factors shown in Table 9-8.

Table 9-6
Narrows Project Cost Allocation
Separable Costs - Remaining Benefits Method
(100 Years, 5.75 Percent Interest)

Items	Water Supply	Recreation	Fish & Wildlife	Total Project Costs
Costs to be Allocated				$41,390,000
Construction				$37,211,000
IDC				$2,706,000
OM&R (Capitalized)				$1,473,000
Annual OM&R				$85,000
Benefits				
Capitalized	$15,280,000	$2,060,000	$2,241,000	$19,581,000
Annual Benefits	$881,874	$118,880	$129,332	
Single Purpose Alternative	$34,156,000	$19,471,000	$10,585,000	
Construction	$31,442,000	$18,017,000	$9,733,000	
IDC	$2,002,000	$1,027,000	$567,000	
OM&R (Capitalized)	$712,000	$427,000	$285,000	
Annual OM&R	$35,000	$21,000	$14,000	
Justifiable Expenditure	$15,280,000	$2,060,000	$2,241,000	$19,581,000
Separable Costs	$12,906,000	$2,552,000	$6,192,000	$21,650,000
Construction	$11,629,000	$1,628,000	$5,756,000	$19,013,000
IDC	$1,000,000	$144,000	$436,000	$1,580,000
OM&R (Capitalized)	$277,000	$780,000	$0	$1,057,000
Annual OM&R	$16,000	$45,000	$0	$61,000
Remaining Justifiable Expenditure	$2,374,000	$0	$0	$2,374,000
Percent	100%	0%	0%	100%
Remaining Joint Costs	$19,740,000	$ -	$ -	$19,740,000
Construction	$18,198,000	$ -	$ -	$18,198,000
IDC	$ 1,126,000	$ -	$ -	$1,126,000
OM&R (Capitalized)	$ 416,000	$ -	$ -	$416,000
Annual OM&R	$ 24,000	$ -	$ -	$24,000
Total Allocated Costs	$32,646,000	$ 2,552,000	$6,192,000	$ 41,390,000
Construction	$29,827,000	$ 1,628,000	$5,756,000	$ 37,211,000
IDC	$ 2,126,000	$ 144,000	$ 436,000	$ 2,706,000
OM&R (Capitalized)	$ 693,000	$ 780,000	$ -	$ 1,473,000
Annual OM&R	$ 40,000	$ 45,000	$ -	$ 85,000

Table 9-7
Water Use

Year of Repayment	Fiscal Year	Commercial Irrigation (AF)	M&I Water Financed By State (AF)	M&I Water Financed By SRPA Loan (AF)	Total M&I (AF)	**Project Total** (AF)
1	2016	4,750	500	0	500	5,250
2	2017	4,721	500	29	529	5,250
3	2018	4,691	500	59	559	5,250
4	2019	4,662	500	88	588	5,250
5	2020	4,631	500	119	619	5,250
6	2021	4,601	500	149	649	5,250
7	2022	4,570	500	180	680	5,250
8	2023	4,538	500	212	712	5,250
9	2024	4,506	500	244	744	5,250
10	2025	4,474	500	276	776	5,250
11	2026	4,441	500	309	809	5,250
12	2027	4,407	500	343	843	5,250
13	2028	4,373	500	377	877	5,250
14	2029	4,339	500	411	911	5,250
15	2030	4,304	500	446	946	5,250
16	2031	4,268	500	482	982	5,250
17	2032	4,232	500	518	1,018	5,250
18	2033	4,195	500	555	1,055	5,250
19	2034	4,158	500	592	1,092	5,250
20	2035	4,121	500	629	1,129	5,250
21	2036	4,083	500	667	1,167	5,250
22	2037	4,052	500	698	1,198	5,250
23	2038	4,022	500	728	1,228	5,250
24	2039	3,991	500	759	1,259	5,250
25	2040	3,960	500	790	1,290	5,250
26	2041	3,928	500	822	1,322	5,250
27	2042	3,896	500	854	1,354	5,250
28	2043	3,864	500	886	1,386	5,250
29	2044	3,832	500	918	1,418	5,250
30	2045	3,799	500	951	1,451	5,250
Totals		128,409	15,000	14,091	29,091	157,500
Percent of Total		81.53%	9.52%	8.95%	18.47%	100%
Percent of Irrigation		100%				
Percent of M&I			51.56%	48.44%	100%	

LOAN AND GRANT CALCULATIONS

Loan and grant calculations are displayed in Table 9-9. Allocated capital costs used as a basis for loan and grant calculations were extracted from Table 9-6. Nonreimbursable costs specified by Public Law 84-984, are calculated from figures comprised of the following: (1) interest during construction for irrigation, (2) one-half of the interest during construction for recreation, and (3) one-half of interest during construction for fish and wildlife.

Public Law 84-984 further provides that 50 percent of construction costs allocated to recreation and fish and wildlife are eligible for Federal grant money. Costs remaining after non-reimbursable costs and Federal grants are deducted are the reimbursable costs. State grants are anticipated in the amount of $814,000 for recreation, and $2,878,000 for fish and wildlife. Since the State grants will be funded during the construction period, no interest during construction is charged and repayment schedules for these purposes will not be necessary.

In addition to the State grants, the District will procure an interest-free loan from the State for the portion of the allocated costs assigned to current M&I water costs, or 500 acre-feet. The amount of this loan is estimated at $4,300,000, and will also be funded concurrent with the Federal loan.

Additional local contributions total $3,925,000, which is the amount of District funds that have been spent to date. This results in a total of $11,917,000 that will be funded from local sources concurrent with Federal expenditures.

Since grants from the State are specified for Recreation and Fish and Wildlife, the full amount of the grants were deducted from those purposes. The State loan is specified for M&I water and was deducted from costs allocated to that purpose. Costs spent to date were deducted proportionately between Irrigation and M&I because they are the only two purposes still requiring Federal funding.

The Federal loan amount is the result of reimbursable costs, less local contributions and the State loan plus reimbursable interest during construction. The Federal loan amount is estimated at $21,792,000. The amount of the Federal loan by project purpose is shown on Table 9-10.

Table 9-8
Rolling Allocation: Portion of SRPA Loan Allocated
M&I Water Supply

Year of Repayment	Total M&I (acre feet)	M&I Financed by SRPA Loan (acre feet)	Total Project Water Financed by SRPA Loan (acre feet)	M&I Portion Of Total Project Water	Portion Of M&I Water Financed by SRPA Loan	M&I Water Financed by State (acre feet)	M&I Water Financed by SRPA Loan (acre feet)	Total Project (acre feet)
1	500	0	4750	9.52%		500	0	5250
2	529	29	4750	10.08%	0.61%	500	29	5250
3	559	59	4750	10.65%	1.24%	500	59	5250
4	588	88	4750	11.20%	1.85%	500	88	5250
5	619	119	4750	11.79%	2.51%	500	119	5250
6	649	149	4750	12.36%	3.14%	500	149	5250
7	680	180	4750	12.95%	3.79%	500	180	5250
8	712	212	4750	13.56%	4.46%	500	212	5250
9	744	244	4750	14.17%	5.14%	500	244	5250
10	776	276	4750	14.78%	5.81%	500	276	5250
11	809	309	4750	15.41%	6.51%	500	309	5250
12	843	343	4750	16.06%	7.22%	500	343	5250
13	877	377	4750	16.70%	7.94%	500	377	5250
14	911	411	4750	17.35%	8.65%	500	411	5250
15	946	446	4750	18.02%	9.39%	500	446	5250
16	982	482	4750	18.70%	10.15%	500	482	5250
17	1018	518	4750	19.39%	10.91%	500	518	5250
18	1055	555	4750	20.10%	11.68%	500	555	5250
19	1092	592	4750	20.80%	12.46%	500	592	5250
20	1129	629	4750	21.50%	13.24%	500	629	5250
21	1167	667	4750	22.23%	14.04%	500	667	5250
22	1198	698	4750	22.82%	14.69%	500	698	5250
23	1228	728	4750	23.39%	15.33%	500	728	5250
24	1259	759	4750	23.98%	15.98%	500	759	5250
25	1290	790	4750	24.57%	16.63%	500	790	5250
26	1322	822	4750	25.18%	17.31%	500	822	5250
27	1354	854	4750	25.79%	17.98%	500	854	5250
28	1386	886	4750	26.40%	18.65%	500	886	5250
29	1418	918	4750	27.01%	19.33%	500	918	5250
30	1451	951	4750	27.64%	20.02%	500	951	5250
					Total	15000	14091	157500
					Percent of Total	9.52%	8.95%	100

Table 9-9
Calculation of Grants, Distributed Contributions,
RIDC, and Loan Amounts
(Unit - $1,000)

	Water Supply	Recreation	F&WL	Total
Project Construction Costs	29,827	1,628	5,756	37,211
Less Federal Grant		814	2,878	3,692
Less State Grant		814	2,878	3,692
Less State Loan	4,300	0	0	4,300
Remaining Construction Costs	25,527	0	0	25,527
Less Amount Spent by District	3,925	0	0	3,925
Loan Amount Construction Costs	21,602	0	0	21,602
Allocated IDC	2,126	144	436	2,706
Less Grants Credit --Federal		72	218	290
Less Grants Credit -- State		72	218	290
Less IDC State Loan	202	0	0	202
Less non-reimbursable IDC	1734			
Reimbursable IDC	190	0	0	190
Total Loan Amount	21,792	0	0	21,792

Table 9-10
Distribution of Loan and Calculation of RIDC
(Unit - $1,000)

	Commerical Irrigation	M&I	Total
Construction Cost	19,669	1,933	21,602
Remaining IDC	1,734	190	1,924
Less Nonreimbursable IDC	1,734		1,734
RIDC		190	190
Total Loan	19,669	2,123	21,792

Cost Sharing

Based on the preceding cost allocation and loan and grant calculation, a cost sharing summary is shown on Table 9-11. The table shows that 32 percent of the total project costs, including RIDC, will be provided by local funding; 10 percent will be provided by Federal grants; and the remaining 58 percent will be funded by a Public Law 84-984 loan.

Of the total SRPA loan amount, a total of $18,719,000, or about 86 percent, will be repaid by irrigators without interest. About $3,073,000, or 14 percent, will be repaid by municipal and industrial water users with interest. About 50 percent of construction costs for fish and wildlife and recreation will be funded concurrent with construction from local sources. Concurrent funding for these purposes amounts to $3,692,000. A State loan of $4,300,000 will also be concurrently funded. Costs already expended by the District amount to $3,925,000.

Table 9-11
Cost Sharing Summary

Item	Amount ($)	Percent
Local Funding	11,917,000	32
Federal Grants	3,692,000	10
Public Law 84-984 Loan (Includes RIDC)	21,792,000	58
Total Project Costs & RIDC	37,401,000	100
Repaid by:		
Irrigation	18,719,470	86
M&I Water	3,072,530	14
Total Federal Loan & RIDC	21,792,000	100

REPAYMENT PROGRAM

The terms and conditions for repayment presented in this section provide a basis for contract negotiations. Until a repayment contract is finally executed, the proposed terms and conditions are to be considered preliminary and subject to change.

Revenues

Project revenues will accrue to the Sanpete Water Conservancy District from (1) the sale of irrigation water, (2) the sale of municipal and industrial water, and (3) ad valorem tax revenues.

Irrigation Repayment Ability

Irrigation repayment ability is based on 16 percent of the increased net farm income as detailed in Chapter 8. The 16 percent factor is based on the ratio of the payment capacity to net farm income from the 1994 Narrows Loan Application Report. That report included detailed farm budgets for repayment and benefits. The irrigation payment ability is assumed to represent 100 percent of payment capacity required by Reclamation policy outlined in Loan Program Guidelines - Small Reclamation Projects Act of 1956, dated September 1990.

The Narrows Project area consists of about 23,180 irrigated acres of which 15,420 acres are irrigable. The average water shortage for the project area is about 0.85 acre-feet per acre. The project commercial irrigation water supply of 4,900 acre-feet in the first year of project water delivery would amount to .31 acre-feet per acre if spread evenly over the 15,420 acres of irrigable land. Since it is not known at this time which acres will receive the water, the entire 23,180 acres of presently irrigated land has been included in the repayment analysis. A summary of this analysis is included in Table 9-12.

Data for nonproject OM&R, and debt service for loans currently being amortized by the canal companies were collected from the companies in the fall of 1990. Current loans are primarily for pressurization of all or part of existing nonproject water supplies, and almost all are interest-free loans from the State of Utah. It was found that most of the irrigation companies in the project area are in good financial condition with relatively low debt.

Income from irrigation was determined by multiplying 23,180 acres by the average per acre value of 1990 assessment of $ 15.91 resulting in $368,794. This value is added to $60,563 which is the total payment capacity from 4,750 acre-feet of project irrigation water as shown in Table 9-12.

Costs are deducted from total irrigation income for: (1) irrigation company OM&R, (2) contract obligations, and (3) contributions to a reserve fund. The value remaining for amortizing the Federal loan is $60,500 as shown in Table 9-12. This value is for the first year of the repayment period for commercial irrigation and changes each year as irrigation water use changes over time.

Table 9-12
Irrigation SRPA Loan Repayment Ability
(Unit - $)

	Irrigators	Ad Valorem Tax
Income		
Revenue from 23,180 Acres@ 15.91	$ 368,794	
Payment Capacity from 4750 A F @ 12.75	$ 60,563	
Total Irrigation Payment Capacity	$ 429,356	
Ad Valorem Tax		$ 493,481
Total Revenue	$ 429,356	$ 493,481
OM&R and existing obligations		
District OM&R		$ 5,000
District Revenues reserved for Other Water Conservation Activities		$ 12,000
Irrigation Company Loan payments	$ 214,600	
Irrigation Company OM&R	$ 139,300	
Reserve Fund Contribution for Canal Companies	$ 15,000	
Total Obligations	$ 368,900	$ 17,000
Irrigation Amortization Capacity	$ 60,456	$ 476,481

Payment capacity currently being used for debt retirement by the individual canal companies will become available for other uses as current debts are retired. Revenues from this source will become available beginning in the year 2013. About 50 percent of these revenues are used to assist in repayment of the irrigation portion of the Federal loan as they become available. The remaining 50 percent will be used by the canal companies for additional upgrading of their irrigation systems. Additional work is necessary because many of the canal systems are in need of upgrading to more efficiently use existing supplies. This type of activity is especially important because the project does not bring the area up to a full supply. As discussed earlier in this chapter, irrigation water shortages in the project area amount to .85 acre-feet per acre, and the project will supply about .31 acre-feet per acre. A schedule of payments from this source is shown in Table 9-13.

Table 9-13
Irrigation Company Existing Loans Payout Summary

Irrig Co.	BWRE Funding	Current Loan	Annual Payment	Final Year
Brady Ditch Irrigation Co.	Y	Y	$ 4,000	2013
Horseshoe Irrigation Co	Y	Y	$ 17,960	2017
Graveyard Ditch Co.	Y	Y	$ 1,950	2019
Chester Irrigation Co	Y	Y	$ 4,750	2023
Fountain Green Irrigation Co	Y	Y	$ 9,200	2024
Fountain Green Irrigation Co	Y	Y	$ 11,050	2025
Cedar Creek Irrigtion Co.	Y	Y	$ 15,600	2026
Horshoe Irrigation Co.	Y	Y	$ 24,000	2026
Devils Pass Water Co	Y	Y	$ 13,000	2028
M&M Irrigation Co.	Y	Y	$ 42,100	2031
Fountain Green Irrigation Co	Y	Y	$ 9,700	2032
Twin Creek Irrigation Co.	Y	Y	$ 15,900	2036
Cottonwood- Gooseberry Irrigation Company	Y	Y	$ 43,600	2036

Municipal and Industrial Water Sales

Demands for project M&I water in the first year of project delivery are estimated at 500 acre-feet, as shown earlier in Table 9-8. A loan will be acquired from the State to finance this portion of the M&I water supply. It is assumed that this would be a 30-year loan at 2 percent interest. Revenues of $191,995 will be required to amortize this loan over 30 years, or about $384 per acre-foot.

Additional M&I demands are expected to occur over time. Future M&I demands will be financed by the SRPA loan and repaid with interest. Estimated future demands start at zero for the first year and increase to 941 acre-feet by year 30 of the SRPA loan repayment period. An average rate of about $324 per acre-foot is required to repay the M&I obligation over the 30-year repayment period at 5.75 percent interest. This interest rate is specified SRPA repayment rate for the Narrows Project.

Ad Valorem Tax

The Sanpete Water Conservancy District has tax-levying authority up to .0004 of assessed valuation. This tax-levying authority is granted by the Conservancy District Act of the State of Utah.

The assessed valuation of the district in 2003 was $734,718,000. This includes all of Sanpete County. A study of the assessed valuation from 2003 to 2010 shows an average growth rate of about 6.93 percent annually. It is anticipated that this same growth rate will continue in the near future. Therefore, assessed valuation and District income were projected by the historical growth rate to the first year of project repayment estimated to be the year 2015. Projections were not made beyond 2015 because of the uncertainty of growth in the area. Estimated revenues to the District from ad valorem tax is shown in Table 9-14.

Table 9-14
Estimated Ad Valorem Tax Revenues to
Sanpete Water Conservancy District

Year	Total Real Property Assessed Valuation ($1,000)	Tax Rate	Potential Tax Revenue ($1,000)	Growth Rate
Historical Data				
2003	734,718	0.0004	294	N/A[1]
2004	766,626	0.0004	307	4.3%
2005	796,952	0.0004	319	4.0%
2006	845,388	0.0004	338	6.1%
2007	945,853	0.0004	378	11.9%
2008	1,091,367	0.0004	437	15.4%
2009	1,138,745	0.0004	455	4.3%
2010	1,167,114	0.0004	467	2.5%
			Average growth rate =	6.93%
Projected Data				
2011	1,247,940	0.0004	499	6.93%
2012	1,334,363	0.0004	534	6.93%
2013	1,426,772	0.0004	571	6.93%
2014	1,525,580	0.0004	610	6.93%
2015	1,631,231	0.0004	652	6.93%

[1] N/A = Not applicable.

Flow of Revenues

Flow of Revenues consists of OM&R, emergency reserve, and Federal and State loan repayment. These figures are shown in Table 9-15, at the end of this chapter. Because of the rolling allocation discussed earlier, revenues by purpose vary according to water supply for each year of repayment. Table 9-15 details these revenues by year for each project repayment purpose. The values shown on this table are used in the repayment schedule, Table 9-16, also found at the end of this chapter.

EXPENDITURES

Expenditures for the project are comprised of OM&R costs for each purpose, emergency reserves, and Public Law 84-984 loan payments.

Table 9-15
Flow of Revenues for Irrigation and M&I

1 Year of Repayment	2 Fiscal Year	3 Acre-Feet	4 Farmers Increased Net Income $	5 Farmers Increased Net Income Available 16%	6 Revenues Available After State Loans Repayment $	7 Ad Valorem Tax Revenues $	8 Total $
1	2016	4750	$ 657,874	$ 105,260	$ 4,000	$ 476,481	$ 585,741
2	2017	4721	$ 639,059	$ 102,249	$ 4,000	$ 476,481	$ 582,730
3	2018	4691	$ 620,782	$ 99,325	$ 21,960	$ 476,481	$ 597,766
4	2019	4662	$ 603,027	$ 96,484	$ 21,960	$ 476,481	$ 594,925
5	2020	4631	$ 585,781	$ 93,725	$ 23,910	$ 476,481	$ 594,116
6	2021	4601	$ 569,027	$ 91,044	$ 23,190	$ 476,481	$ 590,715
7	2022	4570	$ 552,753	$ 88,440	$ 23,190	$ 476,481	$ 588,111
8	2023	4538	$ 536,945	$ 85,911	$ 23,190	$ 476,481	$ 585,582
9	2024	4506	$ 521,588	$ 83,454	$ 28,660	$ 476,481	$ 588,595
10	2025	4474	$ 506,670	$ 81,067	$ 28,660	$ 476,481	$ 586,208
11	2026	4441	$ 492,180	$ 78,749	$ 39,710	$ 476,481	$ 594,940
12	2027	4407	$ 478,103	$ 76,496	$ 79,310	$ 476,481	$ 632,287
13	2028	4373	$ 464,430	$ 74,309	$ 79,310	$ 476,481	$ 630,100
14	2029	4339	$ 451,147	$ 72,184	$ 92,310	$ 476,481	$ 640,975
15	2030	4304	$ 438,244	$ 70,119	$ 92,310	$ 476,481	$ 638,910
16	2031	4268	$ 425,710	$ 68,114	$ 92,310	$ 476,481	$ 636,905
17	2032	4232	$ 413,535	$ 66,166	$ 134,410	$ 476,481	$ 677,057
18	2033	4195	$ 401,708	$ 64,273	$ 144,110	$ 476,481	$ 684,864
19	2034	4158	$ 390,219	$ 62,435	$ 144,110	$ 476,481	$ 683,026
20	2035	4121	$ 379,059	$ 60,649	$ 144,110	$ 476,481	$ 681,240
21	2036	4083	$ 368,218	$ 58,915	$ 144,110	$ 476,481	$ 679,506
22	2037	4052	$ 357,687	$ 57,230	$ 212,810	$ 476,481	$ 746,521
23	2038	4022	$ 347,457	$ 55,593	$ 212,810	$ 476,481	$ 744,884
24	2039	3991	$ 337,520	$ 54,003	$ 212,810	$ 476,481	$ 743,294
25	2040	3960	$ 327,867	$ 52,459	$ 212,810	$ 476,481	$ 741,750
26	2041	3928	$ 318,490	$ 50,958	$ 212,810	$ 476,481	$ 740,249
27	2042	3896	$ 309,381	$ 49,501	$ 212,810	$ 476,481	$ 738,792
28	2043	3864	$ 300,532	$ 48,085	$ 212,810	$ 476,481	$ 737,376
29	2044	3832	$ 291,937	$ 46,710	$ 212,810	$ 476,481	$ 736,001
30	2045	3799	$ 283,588	$ 45,374	$ 212,810	$ 476,481	$ 734,665
Totals		128,409	$ 13,370,518	$ 2,139,281	$ 3,304,120	$ 14,294,423	$ 19,737,824

Table 9-15 (Continued)
Flow Of Revenues for Irrigation and M&I Water

9	10	11	12	13	14	15
	Commercial Irrigation			Loan From State		
Commercial Irrigation Portion of Water	OM&R ($)	Emergency Fund Acre-Feet	Total Commercial Increased Net Income ($)	M&I Water Financed By State (Acre- Feet)	Loan Payment [1] ($)	OM&R $7.619/af
90.48%	$ 36,190	$ 8,000	$ 44,190	500	$ 191,995	$ 3,810
89.92%	$ 35,970	$ 8,000	$ 43,970	500	$ 191,995	$ 3,810
89.35%	$ 35,741	$ 8,000	$ 43,741	500	$ 191,995	$ 3,810
88.80%	$ 35,520	$ 8,000	$ 43,520	500	$ 191,995	$ 3,810
88.21%	$ 35,284	$ 8,000	$ 43,284	500	$ 191,995	$ 3,810
87.64%	$ 35,055		$ 35,055	500	$ 191,995	$ 3,810
87.05%	$ 34,819		$ 34,819	500	$ 191,995	$ 3,810
86.44%	$ 34,575		$ 34,575	500	$ 191,995	$ 3,810
85.83%	$ 34,331		$ 34,331	500	$ 191,995	$ 3,810
85.22%	$ 34,088		$ 34,088	500	$ 191,995	$ 3,810
84.59%	$ 33,836		$ 33,836	500	$ 191,995	$ 3,810
83.94%	$ 33,577		$ 33,577	500	$ 191,995	$ 3,810
83.30%	$ 33,318		$ 33,318	500	$ 191,995	$ 3,810
82.65%	$ 33,059		$ 33,059	500	$ 191,995	$ 3,810
81.98%	$ 32,792		$ 32,792	500	$ 191,995	$ 3,810
81.30%	$ 32,518		$ 32,518	500	$ 191,995	$ 3,810
80.61%	$ 32,244		$ 32,244	500	$ 191,995	$ 3,810
79.90%	$ 31,962		$ 31,962	500	$ 191,995	$ 3,810
79.20%	$ 31,680		$ 31,680	500	$ 191,995	$ 3,810
78.50%	$ 31,398		$ 31,398	500	$ 191,995	$ 3,810
77.77%	$ 31,109		$ 31,109	500	$ 191,995	$ 3,810
77.18%	$ 30,872		$ 30,872	500	$ 191,995	$ 3,810
76.61%	$ 30,644		$ 30,644	500	$ 191,995	$ 3,810
76.02%	$ 30,408		$ 30,408	500	$ 191,995	$ 3,810
75.43%	$ 30,171		$ 30,171	500	$ 191,995	$ 3,810
74.82%	$ 29,928		$ 29,928	500	$ 191,995	$ 3,810
74.21%	$ 29,684		$ 29,684	500	$ 191,995	$ 3,810
73.60%	$ 29,440		$ 29,440	500	$ 191,995	$ 3,810
72.99%	$ 29,196		$ 29,196	500	$ 191,995	$ 3,810
72.36%	$ 28,945		$ 28,945	500	$ 191,961	$ 3,810
	$ 978,354	40,000	$ 1,018,354		$ 5,759,816	$ 114,300

[1] Amortized over 30 years at 2% interest

Table 9-15 (continued)
Flow of Revenues for Irrigation and M&I Water

16	17	18	19	20
	M&I Water Financed by SRPA Loan			
Total Revenues To State $	Acre-Feet	Revenues $324.43	OM&R $7.619/af	Total Project (Acre-Feet)
$ 195,805	0	$ -	0	5250
$ 195,805	29	$ 9,408	$ 221	5250
$ 195,805	59	$ 19,141	$ 450	5250
$ 195,805	88	$ 28,550	$ 670	5250
$ 195,805	119	$ 38,607	$ 907	5250
$ 195,805	149	$ 48,340	$ 1,135	5250
$ 195,805	180	$ 58,397	$ 1,371	5250
$ 195,805	212	$ 68,779	$ 1,615	5250
$ 195,805	244	$ 79,161	$ 1,859	5250
$ 195,805	276	$ 89,543	$ 2,103	5250
$ 195,805	309	$ 100,249	$ 2,354	5250
$ 195,805	343	$ 111,279	$ 2,613	5250
$ 195,805	377	$ 122,310	$ 2,872	5250
$ 195,805	411	$ 133,341	$ 3,131	5250
$ 195,805	446	$ 144,696	$ 3,398	5250
$ 195,805	482	$ 156,375	$ 3,672	5250
$ 195,805	518	$ 168,055	$ 3,947	5250
$ 195,805	555	$ 180,059	$ 4,229	5250
$ 195,805	592	$ 192,063	$ 4,510	5250
$ 195,805	629	$ 204,066	$ 4,792	5250
$ 195,805	667	$ 216,395	$ 5,082	5250
$ 195,805	698	$ 226,452	$ 5,318	5250
$ 195,805	728	$ 236,185	$ 5,547	5250
$ 195,805	759	$ 246,242	$ 5,783	5250
$ 195,805	790	$ 256,300	$ 6,019	5250
$ 195,805	822	$ 266,681	$ 6,263	5250
$ 195,805	854	$ 277,063	$ 6,507	5250
$ 195,805	886	$ 287,445	$ 6,750	5250
$ 195,805	918	$ 297,827	$ 6,994	5250
$ 195,771	951	$ 308,533	$ 7,246	5250
$5,874,116	14,091	$ 4,571,543	$ 107,359	

Operation, Maintenance, and Replacement (OM&R) Costs

Annual OM&R costs for each project purpose were determined by the cost allocation (refer to Table 9-6). These costs are estimated to be $40,000 for irrigation and M&I purposes which will be paid in full by the District. Annual OM&R costs of $45,000 for recreation will be paid by the entities that operate the recreation facilities.

Emergency Reserve

An emergency reserve fund is required to be set aside to cover operating costs that may occur beyond the normal OM&R costs for the project. A $40,000 reserve is suggested to be built up over a 5-year period by setting aside $8,000 per year. The emergency reserve is shown in Table 9-16, at the end of this Chapter.

Federal Loan Repayment

The Federal loan of $21,792,000 will be repaid over a 30-year period. As discussed previously, the loan has been allocated to irrigation and municipal and industrial water. The allocation to these functions was made by sub-allocating the water supply function by the “use of facilities” method on the basis of water use for each year of the repayment period. This is called a "rolling allocation" and is used to calculate annual payments for irrigation and M&I shown in the repayment schedule (Table 9-16), at the end of this chapter. This process is described below in the paragraph entitled “Payout Schedule.” Irrigation costs will be repaid over a period of 30 years without interest, and M&I will be repaid over the same repayment period with interest at 5.75 percent. All values shown in this chapter are preliminary and will be used as a basis for contract negotiations between the District and the Federal government. Final values will be included in the repayment contract.

A State loan of $4,300,000 will be repaid over a 30-year period at 2 percent interest. This loan is specified by the State for M&I. The amortization of this loan is a shown on Table 9-16.

PAYOUT SCHEDULE

The financial program and payout schedule for this loan application are shown in Table 9-16, at the end of this chapter. Table 9-17 presents a brief description of each column. Flow of revenues by year used in the repayment schedule are shown in Table 9-15.

Table 9-16
Financial Program Repayment Schedule

Year of Study 1	FY 2	M&I Financed by State 3	M&I Financed by SRPA Loan 4	Total M&I 5	Commercial Irrigation 6	Total 7
			Revenues			
0	2015					
1	2016	$ 195,805	$ -	$ 195,805	$ 585,741	$ 781,546
2	2017	$ 195,805	$ 9,629	$ 205,434	$ 582,730	$ 788,164
3	2018	$ 195,805	$ 19,591	$ 215,396	$ 597,766	$ 813,162
4	2019	$ 195,805	$ 29,220	$ 225,025	$ 594,925	$ 819,950
5	2020	$ 195,805	$ 39,514	$ 235,319	$ 594,116	$ 829,435
6	2021	$ 195,805	$ 49,475	$ 245,280	$ 590,715	$ 835,995
7	2022	$ 195,805	$ 59,769	$ 255,574	$ 588,111	$ 843,685
8	2023	$ 195,805	$ 70,394	$ 266,199	$ 585,582	$ 851,781
9	2024	$ 195,805	$ 81,020	$ 276,825	$ 588,595	$ 865,420
10	2025	$ 195,805	$ 91,646	$ 287,451	$ 586,208	$ 873,658
11	2026	$ 195,805	$ 102,603	$ 298,408	$ 594,940	$ 893,348
12	2027	$ 195,805	$ 113,893	$ 309,698	$ 632,287	$ 941,985
13	2028	$ 195,805	$ 125,182	$ 320,987	$ 630,100	$ 951,087
14	2029	$ 195,805	$ 136,472	$ 332,277	$ 640,975	$ 973,252
15	2030	$ 195,805	$ 148,094	$ 343,899	$ 638,910	$ 982,809
16	2031	$ 195,805	$ 160,048	$ 355,853	$ 636,905	$ 992,757
17	2032	$ 195,805	$ 172,001	$ 367,806	$ 677,057	$ 1,044,863
18	2033	$ 195,805	$ 184,287	$ 380,092	$ 684,864	$ 1,064,956
19	2034	$ 195,805	$ 196,573	$ 392,378	$ 683,026	$ 1,075,404
20	2035	$ 195,805	$ 208,859	$ 404,664	$ 681,240	$ 1,085,904
21	2036	$ 195,805	$ 221,477	$ 417,282	$ 679,506	$ 1,096,787
22	2037	$ 195,805	$ 231,770	$ 427,575	$ 746,521	$ 1,174,096
23	2038	$ 195,805	$ 241,732	$ 437,537	$ 744,884	$ 1,182,420
24	2039	$ 195,805	$ 252,025	$ 447,830	$ 743,294	$ 1,191,124
25	2040	$ 195,805	$ 262,319	$ 458,124	$ 741,750	$ 1,199,873
26	2041	$ 195,805	$ 272,944	$ 468,749	$ 740,249	$ 1,208,998
27	2042	$ 195,805	$ 283,570	$ 479,375	$ 738,792	$ 1,218,167
28	2043	$ 195,805	$ 294,195	$ 490,000	$ 737,376	$ 1,227,376
29	2044	$ 195,805	$ 304,821	$ 500,626	$ 736,001	$ 1,236,627
30	2045	$ 195,771	$ 315,779	$ 511,550	$ 734,665	$ 1,246,214
Total		$ 5,874,116	$ 4,678,902	$ 10,553,018	$ 19,737,830	$ 30,290,848

Table 9-16 (Continued)
Financial Program Repayment Schedule

OM&R			Emergency Reserve		
M&I Financed by SRPA Loan 8	M&I Financed by State 9	Commercial Irrigation 10	Annual Payments 11	Accumulated Total 12	Total OM&R Commercial Irrigation 13
$ -	$ 3,810	$ 36,190	$ 8,000	$ 8,000	$ 44,190
$ 221	$ 3,810	$ 35,970	$ 8,000	$ 16,000	$ 43,970
$ 450	$ 3,810	$ 35,741	$ 8,000	$ 24,000	$ 43,741
$ 670	$ 3,810	$ 35,520	$ 8,000	$ 32,000	$ 43,520
$ 907	$ 3,810	$ 35,284	$ 8,000	$ 40,000	$ 43,284
$ 1,135	$ 3,810	$ 35,055			$ 35,055
$ 1,371	$ 3,810	$ 34,819			$ 34,819
$ 1,615	$ 3,810	$ 34,575			$ 34,575
$ 1,859	$ 3,810	$ 34,331			$ 34,331
$ 2,103	$ 3,810	$ 34,088			$ 34,088
$ 2,354	$ 3,810	$ 33,836			$ 33,836
$ 2,613	$ 3,810	$ 33,577			$ 33,577
$ 2,872	$ 3,810	$ 33,318			$ 33,318
$ 3,131	$ 3,810	$ 33,059			$ 33,059
$ 3,398	$ 3,810	$ 32,792			$ 32,792
$ 3,672	$ 3,810	$ 32,518			$ 32,518
$ 3,947	$ 3,810	$ 32,244			$ 32,244
$ 4,229	$ 3,810	$ 31,962			$ 31,962
$ 4,510	$ 3,810	$ 31,680			$ 31,680
$ 4,792	$ 3,810	$ 31,398			$ 31,398
$ 5,082	$ 3,810	$ 31,109			$ 31,109
$ 5,318	$ 3,810	$ 30,872			$ 30,872
$ 5,547	$ 3,810	$ 30,644			$ 30,644
$ 5,783	$ 3,810	$ 30,408			$ 30,408
$ 6,019	$ 3,810	$ 30,171			$ 30,171
$ 6,263	$ 3,810	$ 29,928			$ 29,928
$ 6,507	$ 3,810	$ 29,684			$ 29,684
$ 6,750	$ 3,810	$ 29,440			$ 29,440
$ 6,994	$ 3,810	$ 29,196			$ 29,196
$ 7,246	$ 3,810	$ 28,945			$ 28,945
$ 107,359	$ 114,285	$ 978,354	$ 40,000		$ 1,018,354

Table 9-16 (Continued)
Financial Program Repayment Schedule

Total OM&R M&I Water ($) 14	Total OM&R State ($) 15	Interest Payments: M&I Portion of SRPA Loan % 16	Interest Payments: M&I Interest ($) 17	Principal Payments on Federal Loan: Irrigation $ 18	Principal Payments on Federal Loan: M&I $ 19	Principal Payments on Federal Loan: Total Principal Payments $ 20
$ 3,810	$ 3,810	0.00%	-	$ 541,550	$ -	$ 541,550
$ 4,030	$ 3,810	0.61%	7,460	$ 538,760	$ 1,948	$ 540,709
$ 4,259	$ 3,810	1.24%	14,791	$ 554,025	$ 4,350	$ 558,375
$ 4,480	$ 3,810	1.85%	21,467	$ 551,405	$ 7,083	$ 558,488
$ 4,716	$ 3,810	2.51%	28,224	$ 550,832	$ 10,383	$ 561,215
$ 4,945	$ 3,810	3.14%	34,327	$ 555,660	$ 14,013	$ 569,672
$ 5,181	$ 3,810	3.79%	40,228	$ 553,292	$ 18,170	$ 571,461
$ 5,425	$ 3,810	4.46%	45,913	$ 551,007	$ 22,866	$ 573,873
$ 5,669	$ 3,810	5.14%	51,148	$ 554,263	$ 28,013	$ 582,276
$ 5,912	$ 3,810	5.81%	55,910	$ 552,120	$ 33,632	$ 585,752
$ 6,164	$ 3,810	6.51%	60,404	$ 561,104	$ 39,845	$ 600,948
$ 6,423	$ 3,810	7.22%	64,556	$ 598,710	$ 46,724	$ 645,434
$ 6,682	$ 3,810	7.94%	68,009	$ 596,782	$ 54,301	$ 651,083
$ 6,941	$ 3,810	8.65%	70,903	$ 607,916	$ 62,437	$ 670,353
$ 7,208	$ 3,810	9.39%	73,322	$ 606,117	$ 71,374	$ 677,491
$ 7,482	$ 3,810	10.15%	75,287	$ 604,387	$ 81,088	$ 685,474
$ 7,756	$ 3,810	10.91%	76,612	$ 644,813	$ 91,442	$ 736,255
$ 8,038	$ 3,810	11.68%	77,138	$ 652,902	$ 102,921	$ 755,822
$ 8,320	$ 3,810	12.46%	76,864	$ 651,346	$ 115,198	$ 766,544
$ 8,602	$ 3,810	13.24%	75,832	$ 649,842	$ 128,235	$ 778,077
$ 8,891	$ 3,810	14.04%	74,131	$ 648,397	$ 142,264	$ 790,661
$ 9,128	$ 3,810	14.69%	70,895	$ 715,648	$ 155,557	$ 871,205
$ 9,356	$ 3,810	15.33%	66,265	$ 714,240	$ 169,920	$ 884,160
$ 9,592	$ 3,810	15.98%	60,963	$ 712,886	$ 185,280	$ 898,166
$ 9,829	$ 3,810	16.63%	54,863	$ 711,578	$ 201,436	$ 913,015
$ 10,072	$ 3,810	17.31%	48,001	$ 710,321	$ 218,681	$ 929,002
$ 10,316	$ 3,810	17.98%	40,265	$ 709,108	$ 236,798	$ 945,906
$ 10,560	$ 3,810	18.65%	31,629	$ 707,936	$ 255,816	$ 963,752
$ 10,804	$ 3,810	19.33%	22,062	$ 706,805	$ 275,765	$ 982,570
$ 11,055	$ 3,810	20.02%	11,543	$ 705,720	$ 296,990	$ 1,002,710
$ 221,644	$ 114,285		1,499,013	18,719,470	3,072,530	21,792,000

Table 9-16 (continued)
Financial Program Repayment Schedule

Total SRPA Loan Balance $ 21	Interest Payments on State Loan $ 22	Principal Payments on State Loan $ 23	State Loan Balance $ 24	SRPA Loan Payments $ 25	Operating Expenditures $ 26	Total Revenues SRPA Loan $ 27	Year of Study 28
21,792,000			$ 4,300,000				
21,250,450	86,000	$ 105,996	$ 4,194,005	541,550	$ 48,000	585,741	1
20,709,741	83,880	$ 108,115	$ 4,085,889	548,169	$ 48,000	592,359	2
20,151,366	81,718	$ 110,278	$ 3,975,611	573,166	$ 48,000	617,357	3
19,592,878	79,512	$ 112,483	$ 3,863,128	579,955	$ 48,000	624,145	4
19,031,663	77,263	$ 114,733	$ 3,748,395	589,439	$ 48,000	633,630	5
18,461,990	74,968	$ 117,028	$ 3,631,368	604,000	$ 40,000	640,190	6
17,890,529	72,627	$ 119,368	$ 3,511,999	611,689	$ 40,000	647,880	7
17,316,656	70,240	$ 121,756	$ 3,390,244	619,786	$ 40,000	655,976	8
16,734,380	67,805	$ 124,191	$ 3,266,053	633,424	$ 40,000	669,615	9
16,148,627	65,321	$ 126,674	$ 3,139,379	641,663	$ 40,000	677,853	10
15,547,679	62,788	$ 129,208	$ 3,010,171	661,352	$ 40,000	697,543	11
14,902,246	60,203	$ 131,792	$ 2,878,379	709,989	$ 40,000	746,180	12
14,251,163	57,568	$ 134,428	$ 2,743,951	719,092	$ 40,000	755,282	13
13,580,810	54,879	$ 137,116	$ 2,606,834	741,256	$ 40,000	777,447	14
12,903,319	52,137	$ 139,859	$ 2,466,976	750,813	$ 40,000	787,004	15
12,217,844	49,340	$ 142,656	$ 2,324,320	760,762	$ 40,000	796,952	16
11,481,589	46,486	$ 145,509	$ 2,178,811	812,868	$ 40,000	849,058	17
10,725,767	43,576	$ 148,419	$ 2,030,391	832,961	$ 40,000	869,151	18
9,959,223	40,608	$ 151,388	$ 1,879,004	843,408	$ 40,000	879,599	19
9,181,146	37,580	$ 154,415	$ 1,724,588	853,908	$ 40,000	890,099	20
8,390,485	34,492	$ 157,504	$ 1,567,084	864,792	$ 40,000	900,982	21
7,519,279	31,342	$ 160,654	$ 1,406,431	942,101	$ 40,000	978,291	22
6,635,119	28,129	$ 163,867	$ 1,242,564	950,425	$ 40,000	986,615	23
5,736,953	24,851	$ 167,144	$ 1,075,419	959,129	$ 40,000	995,319	24
4,823,938	21,508	$ 170,487	$ 904,932	967,878	$ 40,000	1,004,068	25
3,894,937	18,099	$ 173,897	$ 731,036	977,003	$ 40,000	1,013,193	26
2,949,031	14,621	$ 177,375	$ 553,661	986,171	$ 40,000	1,022,362	27
1,985,279	11,073	$ 180,922	$ 372,738	995,381	$ 40,000	1,031,571	28
1,002,710	7,455	$ 184,541	$ 188,198	1,004,631	$ 40,000	1,040,822	29
0	3,764	$ 188,198	$ 0	1,014,253	$ 40,000	1,050,443	30
	1,459,831	4,300,000		23,291,013	1,239,999	24,416,726	

Table 9-17

Payout Schedule Column Description

Column 1	Year of study.
Column 2	Fiscal year.
Column 3	Revenues from M&I water financed by the State, extracted from column 14, Table 9-15, plus column 15, Table 9-15.
Column 4	M&I revenues financed by SRPA loan, extracted from column 18, Table 9-15, plus column 19 Table 9-15.
Column 5	Total of columns 3 and 4.
Column 6	Commercial Irrigation revenues from column 8, Table 9-15.
Column 7	Column 5 plus column 6.
Column 8	OM&R for M&I water financed by SRPA loan from column 19, Table 9-15.
Column 9	OM&R for M&I water financed by State, column 15, Table 9-15.
Column 10	OM&R for commercial irrigation from column 10, Table 9-15.
Column 11	Emergency reserve fund annual payment estimated at $8,000/yr.
Column 12	Accumulated emergency reserve fund, accumulated to a total of $40,000.
Column 13	Total OM&R for commercial irrigation, column 12, Table 9-15.
Column 14	Column 8 plus column 9.
Column 15	Total OM&R for M&I water financed by the State from column 9.
Column 16	Portion of M&I water financed by Federal loan extracted from column 6, Table 9-8 of this chapter.
Column 17	Interest payments for M&I water repayment are calculated as follows: column 16, times previous year's value from column 21, times 5.75 percent.
Column 18	Irrigation principal payments on Federal loan, column 6 minus column 13.
Column 19	M&I principal payments on Federal loan, column 4 minus column 8, minus column 17.

Table 9-17 (continued)

Payout Schedule Column Description

Column 20	Total principal payments are calculated as follows: column 18 plus column 19.
Column 21	The total Federal loan from Table 9-9, this chapter, reduced each year by principal payments from column 20.
Column 22	Interest payments on State loan calculated as follows: column 24 amount from previous year multiplied by 2 percent.
Column 23	Principal payments on State loan: column 3 minus column 22.
Column 24	State loan balance: The total State loan from Table 9-9, this chapter, reduced each year by principal payments from column 23.
Column 25	Federal loan payments: column 17 plus column 20.
Column 26	Operating expenditure: column 13 plus column 14.
Column 27	Total revenues Federal loan: column 25, plus column 26, minus column 9.
Column 28	Year of study.

Loan Factor

The loan factor has been adopted by the Secretary of Interior as a measure of Federal subsidy for the approval and funding of loan applications. The loan factor is basically a measure of the proportion of the total Federal outlay for a project which is not ultimately returned to the United States Treasury by the applicant. In general terms, the total Federal outlay is considered to be comprised of the loan obligation plus the interest paid by the United States Treasury during the construction period. Of that total, a portion will be returned to the Treasury by the District's annual loan payments. The difference between the total outlay and total return to the Treasury is a financial contribution or subsidy to the project. The loan factor is the amount of that difference, divided by the total project cost. Table 9-18 shows the computation of the SRPA loan factor.

The loan factor for the Narrows Project as presented in this report is calculated at 0.038. This factor qualifies the Narrows Project as a Category I Project as described in the Loan Program Guidelines - Small Reclamation Projects Act of 1956, dated September 1990. Category I Projects can be sent forward to the Congress by the Department of Interior without OMB review or approval.

Table 9-18
Computation of SRPA Loan Factor

1. Total Project Cost	37,401,000
2. Amount of SRPA Grant	3,692,000
3. Applicant's Contribution	11,917,000
4. RIDC	190,000
5. Appropriation Requirement	21,602,000
6. Federal Discount Interest Rate	0.75%
7. SRPA Repayment Interest Rate	5.75%

8. Compute FIDC Using Rate on Line 6:

Year	Appro-priation	1/2 Current Years Approp.	Sum of Previous Years Approp.	Sum of Previous Years Interest	Amount for Computing Interest	Interest
1	-	-	-	-	-	-
2	14,406,077	7,203,000	-	-	7,203,000	54,023
3	7,195,923	3,598,000	14,406,077	54,023	18,058,100	135,436

9. FIDC	189,459
10. Line 1 less Line 2 (TPC - G)	33,709,000
11. Line 10 less (Line 3 + Line 4) (TLO)	21,602,000
12. Line 9 plus Line 11 (TLO + FIDC)	21,791,459
13. Present Worth of Payments (PWP)	20,515,084
14. Line 12 minus Line 13 (TLO + FIDC - PWP)	1,276,375
15. Loan Factor (Line 14/Line 10)	0.038

ATTACHMENT A

SANPETE WATER CONSERVANCY DISTRICT FINANCIAL DATA

1. 2010 AUDIT REPORT AND FINANCIAL STATEMENTS

Sanpete Water Conservancy District

SANPETE COUNTY WATER CONSERVANCY DISTRICT

FINANCIAL STATEMENTS

DECEMBER 31, 2010

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Kimball & Roberts
Certified Public Accountants
A Professional Corporation
Box 663
Richfield, Utah 84701
Phone 896-6488

INDEPENDENT AUDITOR'S REPORT

Honorable Board Members
Sanpete County Water Conservancy District
P. O. Box 265
Mt. Pleasant, Utah 84647

We have audited the accompanying financial statements of the governmental activities of Sanpete County Water Conservancy District as of and for the year ended December 31, 2010, which collectively comprise the District's basic financial statements as listed in the table of contents. These financial statements are the responsibility of Sanpete County Water Conservancy District's management. Our responsibility is to express opinions on these financial statements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinions.

In our opinion, the financial statements referred to above, present fairly, in all material respects, the respective financial position of the government activities of Sanpete County Water Conservancy District as of December 31, 2010, and the respective changes in financial position thereof for the year then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with *Government Auditing Standards*, we have also issued our report dated January 12, 2011, on our consideration of Sanpete County Water Conservancy District's internal control over financial reporting and our tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements, and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be considered in assessing the results of our audit.

The Management's Discussion and Analysis and budgetary comparison information on pages 4 through 7 and 25 through 26, respectively, are not a required part of the basic financial statements but are supplementary information required by accounting principles generally accepted in the United States of America. We have applied certain limited procedures, which consisted principally of inquiries of management regarding the methods of measurement and presentation of the required supplementary information. However, we did not audit the information and express no opinion on it.

Kimball & Roberts

KIMBALL & ROBERTS, P. C.
Certified Public Accountants

January 12, 2011
Richfield, Utah

Sanpete County Water Conservancy District
Management's Discussion and Analysis

This discussion and analysis of Sanpete County Water Conservancy District's (District) financial performance provides an overview of the District's financial activities for the year ending December 31, 2010. This report is in conjunction with the District's financial statements, which are part of this report.

The purpose of the Sanpete County Water Conservancy District is to develop water for Sanpete County.

Financial Highlights:

- The District has one depreciable asset, a water metering system. The District has expended $184,765 on the narrows dam project in 2010. This is in addition to previous years expenditures on this project of $3,739,974.
- At the close of the current year, the District reported ending net assets of $5,181,903 of which $1,198,958 was restricted for capital projects.
- The District does not have any full-time employees and expended 60% of revenues on operating expenditures leaving 40% of the funds for capital additions on the narrows project in upper Gooseberry east of Fairview, Utah.
- The District generates revenues through property tax assessments in Sanpete County. This year the District received $328,316 in property taxes and $37,860 in fee-in-lieu of taxes. It also earned $6,684 in unrestricted investment earnings (interest) on its idle funds. The District received a grant from the State of Utah for $150,000 for engineering work on several projects.

Using This Annual Report
This discussion and analysis is intended to serve as an introduction to Sanpete County Water Conservancy District's financial statements. The basic financial statements comprise three components: 1) government-wide financial statements, 2) fund financial statements, and 3) notes to the financial statements. This report also contains other supplementary information in addition to the basic financial statements themselves.

Government-wide financial statements
The government-wide financial statements are designed to provide readers with a broad overview of the District's finances, in a manner similar to a private-sector business.

The statement of net assets presents information on all of the District's assets and liabilities, with a difference between the two reported as net assets. Over time, increases and decreases in net assets may serve as a useful indicator of whether the financial position of the District is improving or deteriorating.

The statement of activities present information showing how the government's net assets changed during the most recent fiscal year. All changes in net assets are reported as soon as the underlying event giving rise to the change occurs, regardless of the timing of related cash flows. Thus, revenues and expenses are reported in this statement for some items that will only result in cash flows in future periods.

Sanpete County Water Conservancy District
Management's Discussion and Analysis (Continued)

Governmental Funds:
Governmental funds are used to account for essentially the same functions reported as governmental activities in the government-wide financial statements. However, unlike the government-wide financial statements, governmental fund financial statements focus on near-term inflows and outflows of spendable resources, as well as on balance of spendable resources available at the end of the year.

The district has two governmental funds, the general fund and the capital projects fund. The general fund at year end has unassigned fund balance of $86,475. The capital projects fund has a fund balance of $1,198,958, which is restricted for planned capital projects. The unassigned fund balance in the general fund is available for expenditures in future years budgets. Unassigned fund balance is 19% of total expenditures in the general fund.

Reporting the District as a Whole
The District realizes revenues from several sources; 1) property tax revenue, 2) fee-in-lieu taxes, 3) unrestricted investment earnings and 4) capital grants from the State of Utah.

Contacting the District
This financial report is designed to provide the citizens with a general overview of the District's finances and to show accountability for the money it receives. If you have questions about this report or need additional financial information, contact Secretary David R. Cox, 90 West Union Manti, UT 84642.

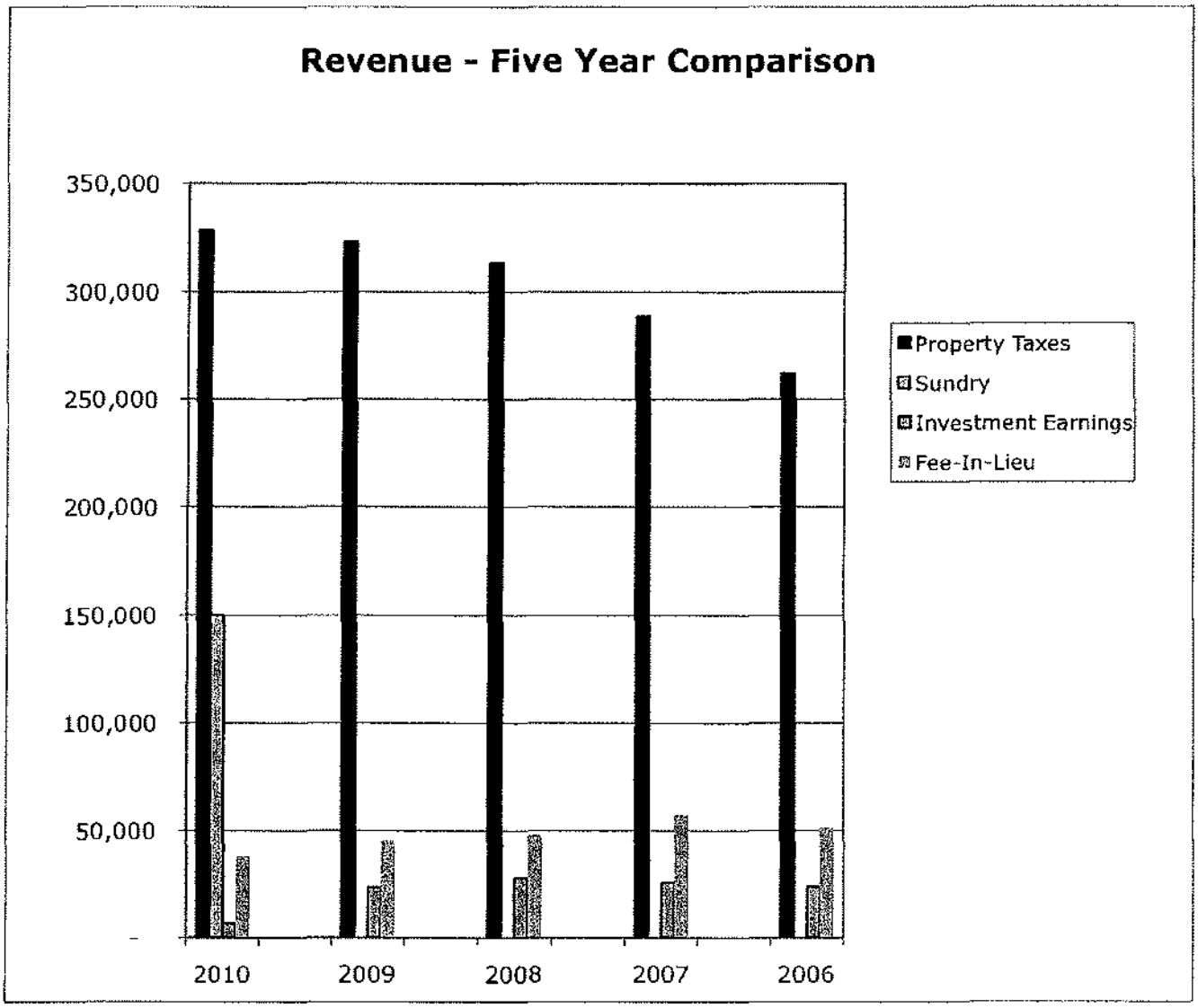
Condensed Financial Statements:
A comparative analysis is provided for 2010 and 2009.

	2010	2009
Assets:		
Current	1,347,146	1,231,848
Non-Current	3,946,036	3,763,047
Total Assets	5,293,182	4,994,895
Liabilities:		
Current	61,713	-
Long-Term	49,566	49,566
Total Liabilities	111,279	49,566
Net Assets:		
Invested in Capital Assets	3,896,470	3,713,481
Restricted	1,198,958	748,958
Unrestricted	86,475	474,466
Net Assets	5,181,903	4,936,905

	2010	2009
Revenues:		
Property Taxes	328,316	323,221
Other Taxes	37,860	45,123
State Grant	150,000	150,000
Investment Earnings	6,684	23,382
Total Revenues	522,860	541,726
Expenditures:		
Current	277,862	192,683
Total Expenditures	277,862	192,683
Change in Net Assets	244,998	349,043
Beginning Net Assets	4,936,905	4,587,862
Ending Net Assets	5,181,903	4,936,905

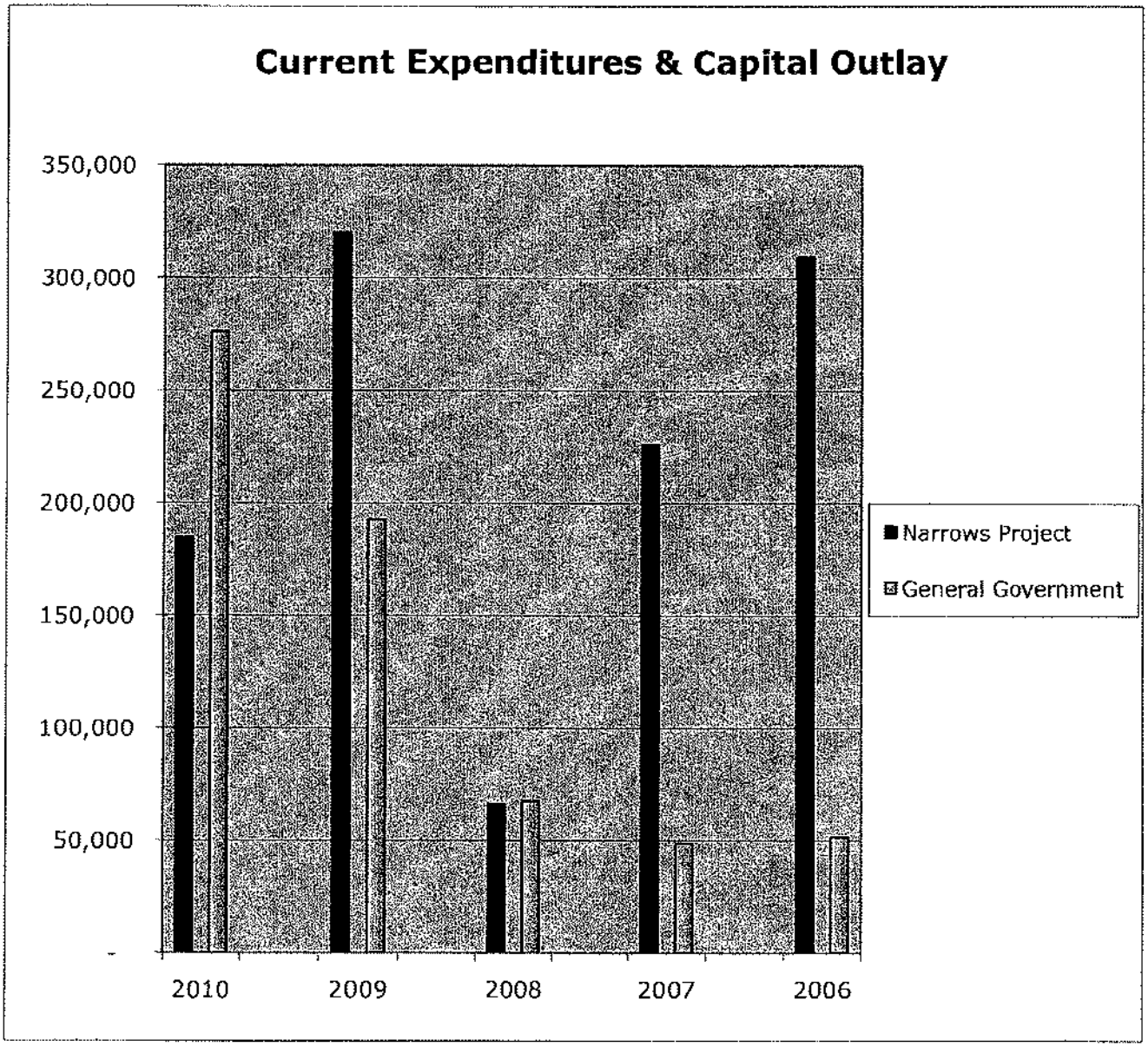
Sanpete County Water Conservancy District
Revenue - Five Year Comparison

	2010	2009	2008	2007	2006
Property Taxes	328,316	323,221	313,443	288,577	262,036
Fee-In-Lieu	37,860	45,123	47,762	57,234	51,437
Sundry	150,000	150,000	-	-	-
Investment Earnings	6,684	23,382	27,877	25,534	23,785
Total	522,860	541,726	389,082	371,345	337,258



Sanpete County Water Conservancy District
Expenditures - Five Year Comparison

	2010	2009	2008	2007	2006
Narrows Project	184,765	320,165	66,220	226,014	309,339
General Government	276,086	192,683	67,566	48,786	51,517
Total	460,851	512,848	133,786	274,800	360,856



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BASIC FINANCIAL STATEMENTS

SANPETE COUNTY WATER CONSERVANCY DISTRICT
STATEMENT OF NET ASSETS
December 31, 2010

	Governmental Activities
ASSETS	
Current Assets:	
Cash and Investments	359,332
Accounts Receivable	15,300
Taxes Receivable	972,514
Total Current Assets	1,347,146
Noncurrent Assets:	
Capital Assets (Net of Accumulated Depreciation):	
Water Metering System	21,297
Construction-In-Progress	3,924,739
Total Noncurrent Assets	3,946,036
TOTAL ASSETS	5,293,182
LIABILITIES	
Current Liabilities:	
Accounts Payable	61,713
Noncurrent Liabilities:	
Note Payable - Due More Than One Year	49,566
TOTAL LIABILITIES	111,279
NET ASSETS	
Invested In Capital Assets, Net of Related Debt	3,896,470
Restricted for Capital Projects	1,198,958
Unrestricted	86,475
TOTAL NET ASSETS	5,181,903
TOTAL LIABILITIES AND NET ASSETS	5,293,182

The notes to the financial statements are an integral part of this statement.

SANPETE COUNTY WATER CONSERVANCY DISTRICT
STATEMENT OF ACTIVITIES
For The Year Ended December 31, 2010

		Program Revenues		Net (Expense) Revenue and Changes in Net Assets
	Expenses	Charges for Services	Operating Grants/ Contributions	Governmental Activities
Functions/Programs:				
Governmental Activities:				
Water Conservancy Operations	277,861	-	150,000	(127,861)
TOTAL REVENUES	277,861	-	150,000	(127,861)

General Revenues:	
Property Taxes	328,316
Other Taxes	37,860
Unrestricted Investment Earnings	6,684
Total General Revenues	372,860
Changes in Net Assets	244,999
Net Assets - Beginning	4,936,904
Net Assets - Ending	5,181,903

The notes to the financial statements are an integral part of this statement.

SANPETE COUNTY WATER CONSERVANCY DISTRICT
BALANCE SHEET
GOVERNMENTAL FUNDS
December 31, 2010

	General Fund	Capital Projects Fund	Total Governmental Funds
ASSETS			
Cash and Investments:			
Restricted	-	359,332	359,332
Accounts Receivable	15,300	-	15,300
Taxes Receivable	972,514	-	972,514
Due From Other Funds	-	839,626	839,626
TOTAL ASSETS	987,814	1,198,958	2,186,772
LIABILITIES AND FUND EQUITY			
Liabilities:			
Accounts Payable	61,507	-	61,507
Accrued Liabilities	206	-	206
Due To Other Funds	839,626	-	839,626
Total Liabilities	901,339	-	901,339
Fund Equity:			
Restricted For:			
Capital Projects	-	1,198,958	1,198,958
Unassigned	86,475	-	86,475
Total Fund Equity	86,475	1,198,958	1,285,433
TOTAL LIABILITIES AND FUND EQUITY	987,814	1,198,958	2,186,772

The notes to the financial statements are an integral part of this statement.

SANPETE COUNTY WATER CONSERVANCY DISTRICT
BALANCE SHEET RECONCILIATION TO STATEMENT OF NET ASSETS
December 31, 2010

Total Fund Balances - Governmental Fund Types		1,285,433
Amounts reported for governmental activities in the statement of net assets are different because:		
Capital assets used in governmental activities are not financial resources and, therefore, are not reported in the funds:		
Water Metering System	21,297	
Construction-In-Progress	3,924,739	
Total (Net of Depreciation)		3,946,036
Long-term liabilities, including bonds payable, are not due and payable in the current period and, therefore, are not reported in the funds:		
Revenue Bonds Payable		(49,566)
Net Assets of Government Activities		5,181,903

SANPETE COUNTY WATER CONSERVANCY DISTRICT
STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE
GOVERNMENTAL FUNDS
For The Year Ended December 31, 2010

	General Fund	Capital Projects Fund	Total Governmental Funds
Revenues:			
Property Taxes	294,671	-	294,671
Delinquent Property Taxes	33,645	-	33,645
Fee-In-Lieu	37,860	-	37,860
State Grant	150,000	-	150,000
Interest	6,684	-	6,684
Total Revenues	522,860	-	522,860
Expenditures:			
Current Expenditures:			
Engineering Fees	169,656	-	169,656
Engineering Fees - Narrows	147,760	-	147,760
Attorney Fees - Narrows	37,005	-	37,005
Cloud Seeding	14,077	-	14,077
Board of Directors Expense	1,125	-	1,125
Secretary Expenses	1,500	-	1,500
Insurance and Bonds	232	-	232
Reimbursements	1,091	-	1,091
Subscriptions	250	-	250
Advertising	161	-	161
Audit Reports	11,000	-	11,000
Public Relations	76,832	-	76,832
Other	162	-	162
Total Expenditures	460,851	-	460,851
Excess of Revenues Over (Under) Expenditures	62,009	-	62,009
Other Financing Sources (Uses):			
Transfers In (Out)	(450,000)	450,000	-
Net Change in Fund Balance	(387,991)	450,000	62,009
Fund Balance - Beginning	474,466	748,958	1,223,424
Fund Balance - Ending	86,475	1,198,958	1,285,433

The notes to the financial statements are an integral part of this statement.

SANPETE COUNTY WATER CONSERVANCY DISTRICT
RECONCILIATION OF THE STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCES OF GOVERNMENTAL FUNDS TO THE STATEMENT OF ACTIVITIES
For The Year Ended December 31, 2010

Amounts reported for governmental activities in the statement of activities are different because:

Net Changes in Fund Balances - Total Governmental Funds		62,009
Governmental funds report capital outlays as expenditures. However, in the statement of activities the cost of those assets is allocated over their estimated useful lives and reported as depreciation expense. This is the amount by which capital outlays exceeded depreciation in the current period:		
Capital Outlay	184,765	
Depreciation	(1,775)	
Total		182,990
Changes In Net Assets of Governmental Activities		244,999

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The Sanpete County Water Conservancy District was organized in 1961 for the purpose of developing water for the County.

A. Reporting Entity

For financial reporting purposes, Sanpete County Water Conservancy District has included all funds. The District has also considered all potential component units for which it is financial accountable and that exclusion would cause the District's financial statements to be misleading or incomplete. The Governmental Accounting Standards Board has set forth criteria to be considered in determining financial accountability. These criteria include appointing a voting majority of an organization's governing body and (1) the ability of the District to impose its will on that organization or (2) the potential for the organization to provide specific financial benefits to, or impose specific financial burdens on the District.

As required by generally accepted accounting principles, these financial statements present Sanpete County Water Conservancy District, the reporting entity.

B. Government-Wide and Fund Financial Statements

The Statement of Net Assets and the Statement of Activities display information about the District, the primary government, as a whole. Governmental activities, which normally are supported by taxes and intergovernmental revenues, are reported separately from business-type activities, which rely to a significant extent on fees and charges for support.

The statement of activities demonstrates the degree to which the direct expenses of a given function or segment are offset by program revenues. Direct expenses are those that are clearly identifiable with a specific function or segment. Program revenues include 1) charges to customers or applicants who purchase, use or directly benefit from goods, services or privileges provided by a given function or segment and 2) grants and contributions that are restricted to meeting the operational or capital requirements of a particular function or segment. Taxes and other items not properly included among program revenues are reported instead as general revenues.

Separate financial statements are provided for governmental funds and fiduciary funds, even through the latter are excluded from the government-wide financial statements. Major individual governmental funds are reported as separate columns in the fund financial statements.

C. Measurement Focus, Basis of Accounting and Financial Statement Presentation

The government-wide financial statements are reported using the economic resources measurement focus and accrual. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flows. Grants and similar items are recognized as revenue as soon as all eligibility requirements imposed by the provider have been met.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Governmental fund financial statements are reported using the current financial resources measurement focus and the modified accrual basis of accounting. Revenues are recognized as soon as they are both measurable and available. Revenues are considered to be available when they are collectible within the current period or soon enough thereafter to pay liabilities of the current period. For this purpose, the government considers revenues to be available if they are collected within 60 days of the end of the current fiscal period. Expenditures generally are recorded when a liability is incurred, as under accrual accounting. However, debt service expenditures, as well as expenditures related to compensated absences and claims and judgments, are recorded only when payment is due.

State revenue sources and interest associated with the current fiscal period are considered to be susceptible to accrual and so have been recognized as revenues of the current fiscal period. All other revenues items are considered to be measurable and available only when cash is received by the government.

The government reports the following major governmental funds:

The General Fund is the government's primary operating fund. It accounts for all financial resources of the general government.

The Capital Projects Fund accounts for the acquisition of fixed assets or construction of major capital projects.

D. Assets, Liabilities and Net Assets or Equity

Deposits and Investments:

The government's cash and cash equivalents are considered to be cash on hand, demand deposits and short-term investments with original maturities of three months or less from the date of acquisition.

State statutes authorize the government to invest in obligations of the U. S. Treasury, commercial paper, corporate bonds, repurchase agreements and the State Treasurer's Investment Pool.

Investments for the government are reported at fair value. The State Treasurer's Investment Pool operates in accordance with appropriate state laws and regulations. The reported value of the pool is the same as the fair value of the pool shares.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

Capital Assets:

Capital assets, which include property, plant, equipment, and infrastructure assets (e.g., roads, bridges, sidewalks and similar items), are reported in the applicable governmental activities column in the government-wide financial statements. Capital assets are defined by the government as assets with an initial, individual cost of more than $5,000 and an estimated useful life in excess of two years. Such assets are recorded at historical cost or estimated historical cost if purchased or constructed. Donated capital assets are recorded at estimated fair market value at date of donation.

The cost of normal maintenance and repairs that do not add to the value of the asset or materially extend assets lives are not capitalized.

Major outlays for capital assets and improvements are capitalized as projects are constructed.

Property, plant and equipment of the primary government is depreciated using the straight line method over the following estimated useful lives:

Water Metering System	25 Years

Long-Term Obligations:

In the government-wide financial statements long-term debt and other long-term obligations are reported as liabilities in the applicable governmental activities statement of net assets.

In the fund financial statement, governmental fund types recognize bond premiums and discounts, as well as bond issuance costs, if any, during the current period. The face amount of debt issued is reported as other financing sources. Premiums received on debt issuances are reported as other financing sources while discounts on debt issuance are reported as other financing uses. Issuance costs, whether or not withheld from the actual debt proceeds received, are reported as debt service expenditures.

Equity Classifications:

Equity is classified in the government-wide financial statements as net assets and is displayed in three components:

a. Invested in capital assets, net of related debt - consists of capital assets including restricted capital assets, net of accumulated depreciation and reduced by the outstanding balances of any bonds, mortgages, notes, or other borrowings that are attributable to the acquisition, construction, or improvement of those assets.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

b. Restricted net assets - consists of net assets with constraints placed on the use either by (1) external groups such as creditors, grantors, contributors, or laws or regulations of other governments; or (2) law through constitutional provisions or enabling legislation.

c. Unrestricted net assets - All other net assets that do not meet the definition of "restricted" or "invested in capital assets, net of related debt".

In the fund financial statements governmental fund equity is classified as fund balance. Fund balance is further classified as Nonspendable, Restricted, Committed, Assigned or Unassigned.

Nonspendable fund balance classification includes amounts that cannot be spent because they are either (a) not in spendable form, or (b) legally or contractually required to be maintained intact.

Restricted fund balance classification are restricted by enabling legislation. Also reported if, (a) externally imposed by creditors, grantors, contributors, or laws or regulations of other governments, or (b) imposed by law through constitutional provisions or enabling legislation.

Committed fund balance classification include those funds that can only be used for specific purposes pursuant to constraints imposed by formal action of the government's highest level of decision making authority.

Assigned fund balance classification include amounts that are constrained by the government's intent to be used for specific purposes, but are neither restricted nor committed. Also includes all remaining amounts that are reported in governmental funds, other than the general fund that are not classified as nonspendable, restricted nor committed or in the General Fund, that are intended to be used for specific purposes.

Unassigned fund balance classification is the residual classification for the General Fund. This classification represents fund balance that has not been assigned to other funds and that has not been restricted, committed, or assigned to specific purposes within the General Fund.

E. Use of Estimates:

The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

NOTE 1 - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)

F. Property Taxes

Property taxes are assessed and collected for the District by Sanpete County and remitted to the District shortly after collection. Property taxes become a lien on January 1 and are levied on the first Monday in August. Taxes are due and payable on November 1, and are delinquent after November 30. All dates are in the year of levy.

NOTE 2 - BUDGETARY COMPLIANCE

Excess of Expenditures over Appropriations - The Fiscal Procedures Act requires expenditures be restricted to authorized budgets. The statement of revenues, expenditures and changes in fund balance, budget and actual, identifies the accounts which have overexpended budgeted amounts if any and, therefore, do not comply with appropriate fiscal procedures.

NOTE 3 - DEPOSITS AND INVESTMENTS

Deposits:

At year-end the carrying amount of the Districts deposits was $261,897 and the bank balances were $278,480. Of this amount $278,480 was covered by federal depository insurance. Utah State statutes do not require deposits to be collateralized, however, financial institutions must be approved by the State Money Management Council.

Cash and investments as of December 31, 2010, consist of the following:

	Fair Value
Demand Deposits	261,897
Demand Deposits	97,435
Demand Deposits	359,332

Cash and investments listed above are classified in the accompanying government-wide statement of net assets as follows:

Governmental Activities - Restricted	359,332
Total Cash and Cash Equivalents	359,332

The Utah Money Management Act (UMMA) established specific requirements regarding deposits of public funds by public treasurers. UMMA requires that District funds be deposited with a qualified depository which includes any depository institution which has been certified by the Utah State Commissioner of Financial Institutions as having met the requirements specified in UMMA Section 51, Chapter 7.

NOTE 3 - DEPOSITS AND INVESTMENTS (CONTINUED)

UMMA provides the formula for determining the amount of public funds which a qualified depository may hold in order to minimize risk of loss and also defines capital requirements which an institution must maintain to be eligible to accept public funds. UMMA lists the criteria for investments and specifies the assets which are eligible to be invested in, and for some investments, the amount of time to maturity.

UMMA enables the State Treasurer to operate the Public Treasurer's Investment Pool (PTIF). PTIF is managed by the Utah State Treasurer's investment staff and comes under the regulatory authority of the Utah Money Management Council. This council is comprised of a select group of financial professionals from units of local and state government and financial institutions doing business in the state. PTIF operations and portfolio composition is monitored at least semi-annually by Utah Money Management Council. PTIF is unrated by any nationally recognized statistical rating organizations. Deposits in PTIF are not insured or otherwise guaranteed by the State of Utah. Participants share proportionally in any realized gains or losses on investments which are recorded an amortized cost basis. The balance available for withdrawal is based on the accounting records maintained by PTIF. The fair value of the investment pool is approximately equal to the value of the pool shares.

Custodial Credit Risk:

Deposits - Custodial credit risk for deposits is the risk that in the event of a bank failure, the local government's deposits may not be recovered. The local government's policy for managing custodial credit risk is to adhere to the Money Management Act. The Act requires all deposits of the local government to be in a qualified depository, defined as any financial institution whose deposits are insured by an agency of the federal government and which has been certified by the Commissioner of Financial Institutions as meeting the requirements of the Act and adhering to the rules of the Utah Money Management Council. As of December 31, 2010, $0 of the local government's bank balances of $278,480 were uninsured and uncollateralized.

Credit Risk:

Credit risk is the risk that the counterparty of an investment will not fulfill its obligations. The local government's policy for limiting the credit risk of investments is to comply with the Money Management Act.

The local government is authorized to invest in the Utah Public Treasurer's Investment Fund (PTIF), an external pooled investment fund managed by the Utah State Treasurer and subject to the Act and Council requirements. The PTIF is not registered with the SEC as an investment company, and deposits in the PTIF are not insured or otherwise guaranteed by the State of Utah. The PTIF operates and reports to participants on an amortized cost basis. The income, gains and losses, net of administration fees, of the PTIF are allocated based upon the participants' average daily balances.

NOTE 3 - DEPOSITS AND INVESTMENTS (CONTINUED)

For the year ended December 31, 2010, the local government has investments of $97,435 with the PTIF. The entire balance had a maturity less than one year. The PTIF pool has not been rated.

Deposit and Investment Risk:

The District maintains no investment policy containing any specific provisions intended to limit the District's exposure to interest rate risk, credit risk and concentration of credit risk other than that imposed by UMMA. The District's compliance with the provisions of UMMA addressed each of these risks.

Interest Rate Risk:

Interest rate risk is the risk that changes in interest rates of debt investments will adversely affect the fair value of an investment. The local government manages its exposure to declines in fair value by investments mainly in the PTIF and by adhering to the Money Management Act. The act requires that the remaining term to maturity of investments may not exceed the period of availability of the funds to be invested.

Concentration of Credit Risk:

Concentration of credit risk is the risk of loss attributed to the magnitude of a government's investments in a single issuer. The District deposits in two institutions, Far West Bank and Moroni Feed Credit Union.

NOTE 4 - TAXES RECEIVABLES

Taxes receivable are funds held by Sanpete County due to Sanpete County Water Conservancy District at December 31, 2010.

NOTE 5 - CONSTRUCTION IN PROGRESS

Narrows:

Construction in Progress - Narrows represents legal, engineering, and construction costs associated with the anticipated building of a dam in Upper Gooseberry, east of Fairview, Utah.

NOTE 6 - CAPITAL ASSETS

Capital Assets activity for the year ended December 31, 2010, was as follows:

	Beginning Balance	Additions	Deletions	Ending Balance
Governmental Activities:				
Capital Assets Not Being Depreciated:				
Construction-in-Progress	3,739,974	184,765	-	3,924,739
Capital Assets Being Depreciated:				
Water Metering System	44,372	-	-	44,372
Less Accumulated Depreciation For:				
Water Metering System	21,300	1,775	-	23,075
Total Capital Assets Being Depr. (Net)	23,072	(1,775)	-	21,297
Governmental Activities Capital Assets (Net)	3,763,046	182,990	-	3,946,036

Depreciation was charged to functions of the Government as follows:

General Fund	1,775.00

NOTE 7 - NOTE PAYABLE DIVISION OF WATER RESOURCES

On May 1, 1994, the State of Utah, Department of Natural Resources, Division of Water Resources, approved funding to provide financial assistance for completion of the final Environmental Impact Statement for the Narrows Project in Carbon and Sanpete Counties.

The State approved a $75,000 loan to be repaid when the Narrows Dam is constructed. At this time there are no terms set for repayment, nor has an interest rate been set. On November 21, 1994, the District received an advance from the State in the amount of $52,465, leaving an undisbursed approved amount of $22,535. Additional funds of $22,101 were advanced during 1995. The total amount of advanced funds at December 31, 1995 was $74,566. During 1996 the District repaid $25,000 leaving a balance due of $49,566. These funds are advanced upon submission of approved expenditures for the Environmental Impact Statement. The advanced funds of $49,566 are shown as a note payable at December 31, 2010.

NOTE 7 - NOTE PAYABLE DIVISION OF WATER RESOURCES (CONTINUED)

The following is statement of changes in the note payable:

	Balance December 31, 2009	Additions	Deletions	Balance December 31, 2010
Note Payable - Division of Water Resources	49,566	-	-	49,566

NOTE 7 - TRANSFERS

Description	Transfers In	Transfers Out
General Fund	-	450,000
Capital Project Fund	450,000	-
Total	450,000	450,000

Transfers were made for the following purposes:

* The General Fund transferred $450,000 to the Capital Project Fund for future Narrows Project costs.

REQUIRED SUPPLEMENTARY INFORMATION "UNAUDITED"

SANPETE COUNTY WATER CONSERVANCY DISTRICT
NOTES TO REQUIRED SUPPLEMENTARY INFORMATION
For The Year Ended December 31, 2010

Budgetary Comparison Schedules:

The Budgetary Comparison Schedules presented in this section of the report are for the District's General Fund.

Budgeting and Budgetary Control:

Budgets for the General Fund are legally required and are prepared and adopted on the modified accrual basis of accounting.

Original budgets represent the revenue estimates and spending authority authorized by the District's Board prior to the beginning of the year. Final budgets represent the original budget amounts plus any amendments made to the budget during the year by the Board through formal resolution. Final budgets do not include unexpended balances from the prior year because such balances automatically lapse to unreserved fund balance at the end of each year.

Current Year Budgetary Compliance:

For the year ended December 31, 2010, spending for General Fund of the District was within the approved budget.

SANPETE COUNTY WATER CONSERVANCY DISTRICT
BUDGETARY COMPARISON SCHEDULE
GENERAL FUND
For The Year Ended December 31, 2010

	Budgeted Amounts			Variance with Final Budget
	Original	Final	Actual Amounts	Positive (Negative)
Revenues:				
Property Taxes	298,154	298,154	294,671	(3,483)
Fee-In-Lieu	54,000	54,000	37,860	(16,140)
Delinquent Property Taxes	23,000	23,000	33,645	10,645
Interest	16,000	16,000	6,684	(9,316)
State Grant	117,419	117,419	150,000	32,581
Total Revenues	508,573	508,573	522,860	14,287
Expenditures:				
Current:				
Attorney Fees	40,500	40,500	37,005	3,495
Audit Fees	3,700	11,000	11,000	-
Engineering Fees	100,000	170,000	169,656	344
Engineering Fees - Narrows Project	100,000	162,167	147,760	14,407
Board of Directors Expenses	2,200	2,200	1,125	1,075
Secretary Expenses	1,500	1,500	1,500	-
Insurance and Bonds	500	500	232	268
Cloud Seeding	16,000	16,000	14,077	1,923
Payroll Taxes	300	300	-	300
Subscriptions	250	250	250	-
Advertising	250	250	161	89
Alternative Water Projects	5,000	5,000	-	5,000
Public Relations	40,000	76,832	76,832	-
Administrative Expenses	18,000	18,000	1,091	16,909
Construction and Labor	178,323	2,024	-	2,024
Other	2,050	2,050	162	1,888
Total Expenditures	508,573	508,573	460,851	47,722
Excess Revenues Over (Under) Expenditures	-	-	62,009	62,009
Other Financing Sources (Uses):				
Transfers In (Out)			(450,000)	
Excess Revenues Over (Under) Expenditures After Transfers			(387,991)	
Fund Balance - Beginning of Year			474,466	
Fund Balance - End of Year			86,475	

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is used to assist in formatting for easier reading)

COMPLIANCE SECTION

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is used to assist in formatting for easier reading)

Kimball & Roberts
Certified Public Accountants
A Professional Corporation
Box 663
Richfield, Utah 84701
Phone 896-6488

REPORT ON COMPLIANCE AND ON INTERNAL CONTROL OVER FINANCIAL REPORTING BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

Honorable Board Members
Sanpete County Water Conservancy District
P. O. Box 265
Mt. Pleasant, Utah 84647

We have audited the financial statements of the governmental activities of Sanpete County Water Conservancy District as and for the year ended December 31, 2010, which collectively comprise Sanpete County Water Conservancy District's basic financial statements and have issued our report thereon dated January 12, 2011. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States.

Internal Control Over Financial Reporting

In planning and performing our audit, we considered Sanpete County Water Conservancy District's internal control over financial reporting as a basis for designing our auditing procedures for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of Sanpete County Water Conservancy District's internal control over financial reporting. Accordingly, we do not express an opinion on the effectiveness of Sanpete County Water Conservancy District's internal control over financial reporting.

Our consideration of the internal control over financial reporting was for the limited purpose described in the preceding paragraph and would not necessarily identify all deficiencies in internal control over financial reporting that might be significant deficiencies or material weaknesses. However, as discussed below, we identified certain deficiencies in internal control over financial reporting that we consider to be significant deficiencies.

A control deficiency exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect misstatements on a timely basis. A significant deficiency is a control deficiency or combination of control deficiencies, that adversely affects Sanpete County Water Conservancy District's ability to initiate, authorize, record, process, or report financial data reliably in accordance with generally accepted accounting principles such that there is more than a remote likelihood that a misstatement of Sanpete County Water Conservancy District's financial statements that is more than inconsequential will not be prevented or detected by Sanpete County Water Conservancy District's internal control. We consider the deficiencies described in the accompanying schedule of findings and recommendations to be significant deficiencies in internal control over financial reporting.

2010-1 Uncorrected Accounts
2010-2 Sufficient Accounting Experience and Expertise

A material weakness is a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the financial statements will not be prevented or detected by Sanpete County Water Conservancy District's internal control.

Our consideration of the internal control over financial reporting was for the limited purpose described in the first paragraph of this section and would not necessarily identify all deficiencies in internal control that might be significant deficiencies and, accordingly, would not necessarily disclose all significant deficiencies that are also considered to be material weaknesses. However, of the significant deficiencies described above, we consider item 2010-1 to be a material weakness.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether Sanpete County Water Conservancy District's financial statements are free of material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance that are required to be reported under *Government Auditing Standards.*

We noted a certain matter that we reported to management of Sanpete County Water Conservancy District in a separate letter dated January 12, 2011.

The District's response to the findings identified in our audit is described in the accompanying schedule of findings and recommendations. We did not audit the District's response and, accordingly, we express no opinion on it.

This report is intended solely for the information and use of management, board members and others within the entity and is not intended to be and should not be used by anyone other than these specified parties.

Kimball & Roberts

KIMBALL & ROBERTS, P. C.
Certified Public Accountants

January 12, 2011
Richfield, Utah

Kimball & Roberts
Certified Public Accountants
A Professional Corporation
Box 663
Richfield, Utah 84701
Phone 896-6488

AUDITOR'S REPORT ON STATE LEGAL COMPLIANCE

Honorable Board Members
Sanpete County Water Conservancy District
P. O. Box 265
Mt. Pleasant, Utah 84647

We have audited the accompanying financial statements of the Governmental Activities of Sanpete County Water Conservancy District, for the year ended December 31, 2010, and have issued our report thereon dated January 12, 2011. The District received the following nonmajor grant, which is not required to be audited for specific compliance requirements: (However, this program was subject to testwork as part of the audit of Sanpete County Water Conservancy District's financial statements.)

Planning Grant (Department of Natural Resources)

Our audit included testwork on the District's compliance with the following general compliance requirements identified in the State of Utah Legal Compliance Audit Guide, including:

Public Debt
Cash Management
Purchasing Requirements
Budgetary Compliance
Truth in Taxation and Property Tax Limitations
Special Districts
Other General Issues

The District did not receive any major State grants during the year ending December 31, 2010.

The management of Sanpete County Water Conservancy District is responsible for the District's compliance with all compliance requirements identified above. Our responsibility is to express an opinion on compliance with those requirements based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America and *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether material noncompliance with the requirements referred to above occurred. An audit includes examining, on a test basis, evidence about the District's compliance with those requirements. We believe that our audit provides a reasonable basis for our opinion.

Our audit does not provide a legal determination on the District's compliance with these requirements.

The results of our audit procedures disclosed an immaterial instance of noncompliance with the requirements referred to above, which is described in a separate management letter. We considered this instance of noncompliance in forming our opinion on compliance, which is expressed in the following paragraph.

Honorable Board Members
Sanpete County Water Conservancy District

In our opinion, Sanpete County Water Conservancy District, complied, in all material respects, with the general compliance requirements identified above for the year ended December 31, 2010.

The District's written response to the finding identified in our audit is described in the accompanying management letter. We did not audit the District's response and, accordingly, we express no opinion on it.

This report is intended solely for the information and use of management of the District and is not intended to be and should not be used by anyone other than the specified parties. However, the report is a matter of public record and its distribution is not limited.

Kimball & Roberts

KIMBALL & ROBERTS, P. C.
Certified Public Accountants

January 12, 2011
Richfield, Utah

Kimball & Roberts
Certified Public Accountants
A Professional Corporation
Box 663
Richfield, Utah 84701
Phone 896-6488

FINDINGS AND RECOMMENDATIONS

Honorable Board Members
Sanpete County Water Conservancy District
Mt. Pleasant, Utah 84647

During our audit of the financial statements of Sanpete County Water Conservancy District for the year ended December 31, 2010, we found circumstances that, if improved, would strengthen the District's accounting system and control over its assets. These items are discussed below for your consideration:

Material Weakness Finding and Recommendation:

2010-1 Uncorrected Accounts

Finding:

Sanpete County Water Conservancy District is not maintaining its own depreciation schedules nor recording depreciation properly. Statements on Auditing Standards #112 indicate that this control weakness is a material weakness in the District's internal control.

Recommendation:

We recommend that the District prepare appropriate depreciation schedules by the use of spreadsheets or depreciation software. The District's personnel should be properly trained on its use and application. Also, the District should properly record depreciation in its financial statements at least on an annual basis.

Sanpete County Water Conservancy District's Response:

Sanpete County Water Conservancy District plans to review and approve depreciation methods, estimated life of assets and related salvage values, if any.

Significant Deficiency Finding and Recommendation:

2010-2 Sufficient Accounting Experience and Expertise

Finding:

Statement on Auditing Standards #112 indicates that it is a significant deficiency in the District's internal controls when the District's personnel may not have sufficient experience or expertise to select and apply generally accepted accounting principles. The District's personnel may not have sufficient training or experience in the accounting field, specifically in the preparation of the District's financial statements and related notes to the financial statements.

Honorable Board Members
Sanpete County Water Conservancy District

Recommendation:

We would suggest that the District provide the training necessary for the present accounting personnel to properly prepare the financial statements and related notes to the financial statements. If the District believes that the cost of preparing the financial statements and related notes to the financial statement is prohibitive then the District should consider other alternatives to comply with Statement on Auditing Standards #112.

Sanpete County Water Conservancy District's Response:

The cost to prepare full disclosures and financial statements is prohibitive for our District. We will continue to prepare our financial statements and full disclosures as in the past years.

This report is intended solely for the information and use of management and District Board members and is not intended to be and should not be used by anyone other than these specified parties.

We thank you for the opportunity to perform the audit of the District this past fiscal year. We would like to express a special thanks to those who have given us assistance in this year's audit. If you have any questions throughout the year that we may help with, please give us a call. We look forward to a continued professional relationship with the District.

Respectfully submitted,

Kimball & Roberts

KIMBALL & ROBERTS, P. C.
Certified Public Accountants

January 12, 2011
Richfield, Utah

SANPETE COUNTY WATER CONSERVANCY DISTRICT

MANAGEMENT LETTER

DECEMBER 31, 2010

Kimball & Roberts
Certified Public Accountants
A Professional Corporation
Box 663
Richfield, Utah 84701
Phone 896-6488

January 12, 2011

Honorable Board Members
Sanpete County Water Conservancy District
90 West Union Street
Manti, Utah 84642

During our audit of the funds of Sanpete County Water Conservancy District for the year ended December 31, 2010, we noted an area needing corrective action in order for the District to be in compliance with state laws and regulations. This item is discussed below for your consideration.

COMPLIANCE:

Public Treasurer's Fidelity Bond

Every public treasurer is required to secure a fidelity bond based on the previous year's budgeted gross revenues, which includes all funds collected or handled by the public treasurer.

Finding:

We noted that the present fidelity bond amount is less than the amount required by the Utah Money Management Council. The required fidelity bond is $40,000. The present fidelity bond is $22,000.

Recommendation:

We recommend that the fidelity bond be increased to $40,000.

Response:

The District will contact our insurance company and increase the fidelity bond coverage on the Treasurer to $40,000 as required.

We would like to thank Sanpete County Water Conservancy District's personnel for the cooperation and assistance given to us during the course of our examination.

Kimball & Roberts

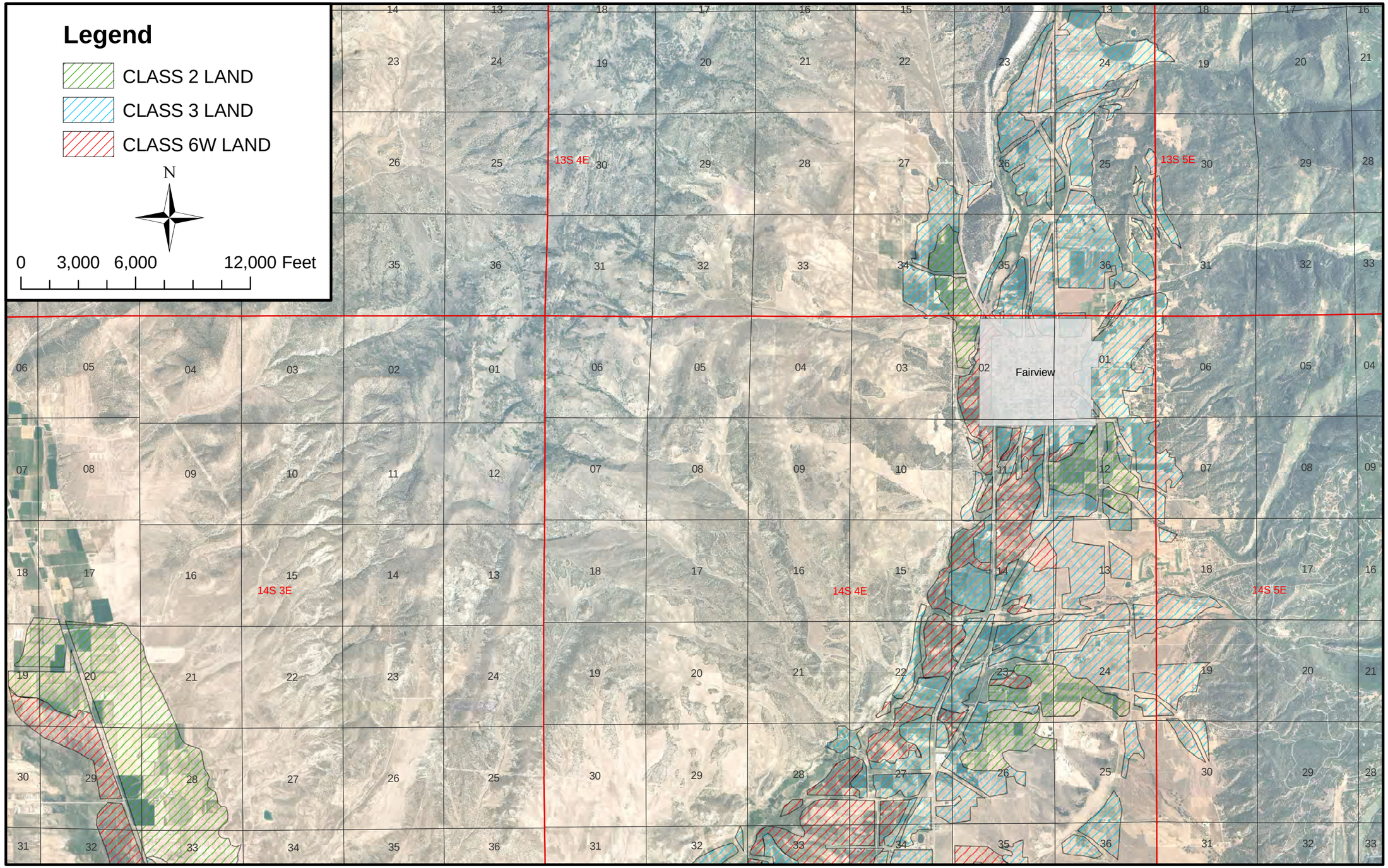
KIMBALL & ROBERTS
Certified Public Accountants

RGR/vl

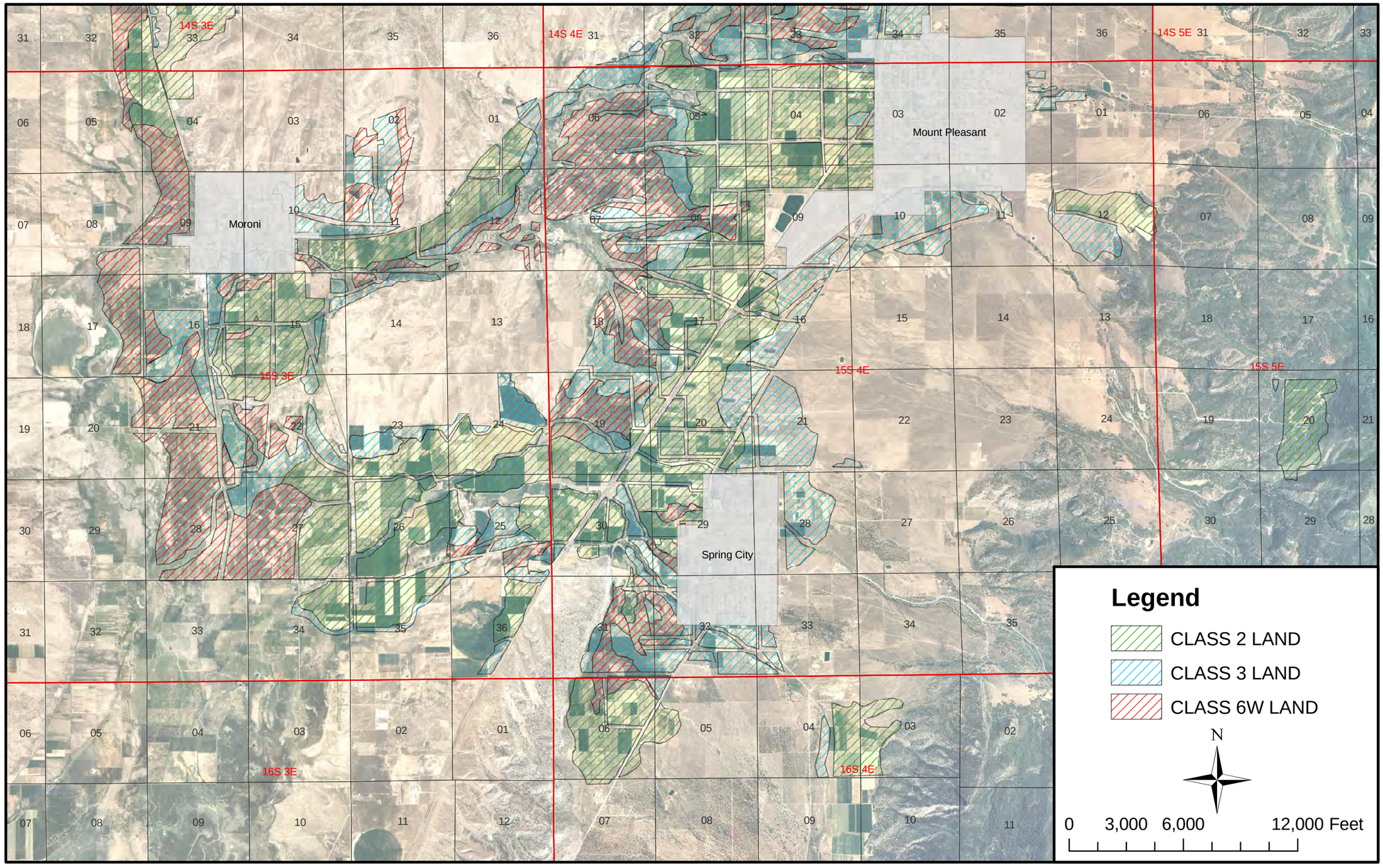
ATTACHMENT B

LAND CLASSIFICATION
MAPS

Sanpete Water
Conservancy District



	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	CLASSIFICATION OF PROJECT LANDS	FIGURE 1 of 2



	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	CLASSIFICATION OF PROJECT LANDS	FIGURE 2 of 2

ATTACHMENT C

WATER SUPPLY

1. SUPPORTING DATA – TEMPERATURE, CONSUMPTIVE USE, AND EFFECTIVE PRECIPITATION

Sanpete Water Conservancy District

Table C-1
Average temperature data for Moroni, Utah
(degrees Farenheit)

	January	February	March	April	May	June	July	August	September	October	November	December
Average Daily Maximum	35.8	41.6	51.0	61.3	71.3	82.0	89.5	87.1	79.2	66.7	50.1	38.6
Average Daily Minimum	10.1	15.1	22.4	28.6	35.9	42.3	49.4	47.9	39.5	30.5	21.2	12.8
Average	22.9	28.3	36.7	45.0	53.6	62.1	69.4	67.5	59.4	48.6	35.7	25.7

Table C-2
Monthly Precipitation at Ephraim, Utah
(inches)

Year	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
1960	0.57	2.02	0.82	0.58	0.79	0.40	0.36	0.23	1.00	1.16	1.00	0.05	8.98
1961	0.12	0.39	3.07	1.44	0.34	0.00	0.24	2.09	4.52	0.99	1.30	0.54	15.04
1962	0.77	3.03	0.83	0.58	0.72	0.04	0.35	0.05	0.49	0.44	0.28	0.67	8.25
1963	1.44	0.52	0.57	1.99	0.21	1.24	0.14	1.04	1.90	0.50	0.97	0.52	11.04
1964	0.59	0.24	1.26	1.90	2.17	1.00	0.35	0.25	0.53	0.13	1.14	1.99	11.55
1965	0.45	0.82	0.87	0.67	1.69	0.96	1.59	1.80	1.85	0.29	1.35	0.85	13.19
1966	0.22	0.64	0.11	0.28	0.88	0.40	0.48	1.38	0.71	1.49	0.43	3.26	10.28
1967	0.95	0.22	0.67	1.34	2.14	1.37	0.51	0.03	1.29	0.28	0.47	1.10	10.37
1968	0.12	1.92	0.57	2.72	0.32	0.53	1.19	1.78	0.14	1.10	0.32	0.44	11.15
1969	2.82	1.32	0.34	0.69	0.11	2.05	0.18	0.31	0.88	1.86	0.50	0.70	11.76
1970	0.92	0.14	1.46	0.87	0.27	2.62	1.25	0.50	0.71	1.18	1.11	0.55	11.58
1971	0.44	0.63	0.17	1.05	0.57	0.24	0.24	1.00	0.75	2.48	0.61	1.46	9.64
1972	0.16	0.17	0.11	0.92	0.44	0.66	0.43	1.05	1.83	2.35	1.12	0.55	9.79
1973	0.67	0.48	1.39	1.18	1.27	0.64	0.81		0.52	0.53	1.33	1.21	10.03
1974	1.73	0.51	0.75	0.75	0.06	0.00	0.81	0.30	0.07	1.07	0.59	0.65	7.29
1975	0.50	0.43	2.31	0.92	2.20	1.32	0.14	0.25	0.10	0.77	0.92	0.35	10.21
1976	0.27	0.66	0.69	1.02	0.47	0.00	0.65	0.16	1.18	0.00	0.11	0.00	5.21
1977	0.39	0.25	0.69	0.06	1.09	0.24	1.70	1.04	0.62	1.28	0.81	1.11	9.28
1978	2.10	1.64	1.98	1.39	0.57	0.00	0.16	0.45	1.80	0.30	1.80	0.98	13.17
1979	1.50	1.15	1.87	0.87	1.72	0.08	0.52	0.59	0.15	1.06	1.17	0.33	11.01
1980	2.07	3.82	2.00	0.88	2.72	0.17	0.18	0.37	2.06	1.58	0.87	0.06	16.78
1981	0.30	0.25	1.74	0.68	2.75	0.18	0.95	0.63	1.55	2.66	0.35	1.10	13.14
1982	1.54	0.52	2.05	0.10	0.95	0.57	1.05	0.31	4.52	1.41	1.49	1.17	15.68
1983	2.02	1.47	2.52	1.59	1.61	0.21	0.72	1.52	1.44	1.12	3.07	2.60	19.89
1984	0.22	1.30	1.45	1.60	0.89	2.63	1.30	0.85	0.83	3.18	1.01	1.47	16.73
1985	0.64	0.62	1.44	1.90	1.06	0.97	1.81	0.01	0.52	1.91	2.75	1.06	14.69
1986	0.29	1.70	1.59	2.73	0.97	0.29	0.46	1.93	1.13	0.80	0.20	0.33	12.42
1987	0.62	0.96	1.80	0.38	1.36	0.54	2.06	0.78	0.42	1.45	0.59	1.13	12.09
1988	1.12	0.18	1.79	1.45	1.08	0.38	0.22	0.61	0.90	1.05	0.99	1.03	10.80
1989	0.78	0.57	1.39	0.65	0.46	0.72	0.67	1.15	1.22	0.98	0.63	0.41	9.63
Average	0.88	0.95	1.28	1.11	1.06	0.68	0.72	0.77	1.19	1.18	0.98	0.92	11.69

Table C-3
Narrows Project Consumptive Use Estimates 1/

Month or Period	Midpoint of Period	Accum. Days to Midpoint	Percent of Growing Season	Mean Air Temp (t)	Daylight Hours % (p)	Cons. Use Factor (f)	Climatic Coeff. (kt)	Growth Stage Coeff. (kc)	Cons. Use Coeff. (k)	Monthly CU (inches)	Daily CU (in/day)
Pasture											
15-Apr											
	23-Apr	8	6.0	47.3	4.47	2.11	0.50	0.87	0.44	0.93	0.058
01-May											
	16-May	32	23.7	53.6	10.01	5.37	0.61	0.90	0.55	2.96	0.096
01-Jun											
	16-Jun	62	46.6	62.1	10.09	6.27	0.76	0.92	0.70	4.38	0.146
01-Jul											
	16-Jul	93	69.5	69.4	10.22	7.09	0.89	0.93	0.82	5.85	0.189
01-Aug											
	13-Aug	121	90.6	67.4	8.00	5.39	0.85	0.91	0.78	4.18	0.167
26-Aug											
									Season total =	**18.30**	
Small Grains											
15-Apr											
	23-Apr	8	6.1	47.3	4.47	2.11	0.50	0.37	0.19	0.39	0.025
01-May											
	16-May	31.5	24.0	53.6	10.01	5.37	0.61	0.80	0.49	2.63	0.085
01-Jun											
	16-Jun	62	47.3	62.1	10.09	6.27	0.76	1.29	0.98	6.15	0.205
01-Jul											
	16-Jul	92.5	70.6	69.4	10.22	7.09	0.89	1.02	0.90	6.41	0.207
01-Aug											
	12-Aug	119.5	91.2	67.3	7.39	4.97	0.85	0.26	0.22	1.10	0.048
24-Aug											
									Season total =	**16.69**	

Table C-3 (continued)
Narrows Project Consumptive Use Estimates 1/

Month or Period	Midpoint of Period	Accum. Days to Midpoint	Percent of Growing Season	Mean Air Temp (t)	Daylight Hours % (p)	Cons. Use Factor (f)	Climatic Coeff. (kt)	Growth Stage Coeff. (kc)	Cons. Use Coeff. (k)	Monthly CU (inches)	Daily CU (in/day)
Hay											
15-Apr											
	23-Apr	8	6.0	47.3	4.47	2.11	0.50	0.87	0.44	0.93	0.058
01-May											
	16-May	31.5	23.7	53.6	10.01	5.37	0.61	0.90	0.55	2.96	0.096
01-Jun											
	16-Jun	62	46.6	62.1	10.09	6.27	0.76	0.92	0.70	4.38	0.146
01-Jul											
	16-Jul	92.5	69.5	69.4	10.22	7.09	0.89	0.93	0.82	5.85	0.189
01-Aug											
	13-Aug	120.5	90.6	67.4	8.00	5.39	0.85	0.91	0.78	4.18	0.167
26-Aug											
									Season total =	**18.30**	
Alfalfa											
02-May											
	17-May	15	8.6	53.9	9.69	5.22	0.62	1.09	0.67	3.52	0.117
01-Jun											
	16-Jun	45	25.7	62.1	10.09	6.27	0.76	1.13	0.86	5.38	0.179
01-Jul											
	16-Jul	75.5	43.1	69.4	10.22	7.09	0.89	1.11	0.98	6.98	0.225
01-Aug											
	16-Aug	106.5	60.9	67.5	9.55	6.45	0.85	1.06	0.90	5.83	0.188
01-Sep											
	16-Sep	137	78.3	59.4	8.39	4.98	0.71	0.99	0.71	3.52	0.117
01-Oct											
	12-Oct	163.5	93.4	50.1	6.00	3.01	0.55	0.91	0.50	1.51	0.066
24-Oct											
									Season total =	**26.75**	

1/ Weather data period of record: 1948-1990

Table C-4
Effective Precipitation for Group 1
(unit--inches)

	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	TOTAL
1959	0.27	0.25	0.24	0.06	0.53	0.66	0.24	2.24
1960	0.12	0.43	0.03	0.22	0.23	0.76	0.52	2.32
1961	0.27	0.13	0.00	0.49	1.41	1.16	0.51	3.96
1962	0.19	0.56	0.20	0.32	0.06	0.59	0.16	2.08
1963	0.45	0.17	0.58	0.28	0.49	0.73	0.04	2.73
1964	0.42	0.85	0.50	0.03	0.77	0.41	0.00	2.98
1965	0.00	0.68	0.38	0.50	0.94	1.03	0.00	3.53
1966	0.00	0.44	0.08	0.27	0.22	0.16	0.52	1.69
1967	0.08	1.02	1.08	0.48	0.13	0.69	0.05	3.52
1968	0.55	0.37	0.58	0.59	1.78	0.07	0.27	4.21
1969	0.05	0.00	0.83	0.52	0.17	0.44	0.52	2.52
1970	0.06	0.00	1.25	0.00	0.54	0.00	0.05	1.90
1971	0.30	0.52	0.34	0.05	0.88	0.28	0.52	2.87
1972	0.20	0.25	0.20	0.20	0.23	0.53	0.52	2.14
1973	0.47	0.95	0.39	1.00	0.00	0.29	0.00	3.10
1974	0.42	0.08	0.00	1.31	0.00	0.00	0.35	2.15
1975	0.00	1.29	0.46	0.44	0.15	0.37	0.00	2.71
1976	0.06	0.20	0.07	0.12	0.15	0.40	0.24	1.25
1977	0.00	0.82	0.00	0.81	0.76	0.29	0.40	3.08
1978	0.35	0.41	0.00	0.00	0.34	0.79	0.08	1.98
1979	0.00	0.60	0.00	0.35	0.53	0.00	0.29	1.77
1980	0.14	1.06	0.00	0.64	0.84	1.00	0.49	4.16
1981	0.03	1.02	0.00	0.83	1.18	0.81	0.52	4.39
1982	0.00	0.83	0.10	0.55	0.53	1.16	0.52	3.69
1983	0.37	0.56	0.01	0.44	1.43	1.16	0.35	4.32
1984	0.35	0.30	1.79	1.37	0.57	0.63	0.52	5.52
1985	0.39	0.67	0.52	1.59	0.00	0.37	0.52	4.06
1986	0.56	0.35	0.39	0.30	0.29	0.84	0.52	3.25
1987	0.00	0.83	0.15	0.74	0.57	0.18	0.46	2.92
1988	0.21	0.94	0.25	0.44	0.40	0.59	0.35	3.18
1989	0.16	0.30	0.55	0.29	0.83	0.64	0.32	3.08
1990	0.00	0.04	1.32	0.19	0.31	0.53	0.47	2.86

Table C-5
Effective Precipitation for Groups 2 and 3
(unit--inches)

	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	
1959	0.27	0.25	0.24	0.06	0.52	0.66	0.24	2.23
1960	0.12	0.43	0.03	0.22	0.23	0.77	0.56	2.35
1961	0.27	0.13	0.00	0.48	1.38	1.23	0.51	4.00
1962	0.19	0.56	0.19	0.31	0.06	0.59	0.16	2.07
1963	0.45	0.17	0.58	0.28	0.46	0.73	0.04	2.72
1964	0.42	0.84	0.50	0.03	0.76	0.41	0.00	2.96
1965	0.00	0.68	0.38	0.50	0.92	1.03	0.00	3.51
1966	0.00	0.44	0.08	0.27	0.22	0.16	0.56	1.73
1967	0.08	1.01	1.08	0.47	0.13	0.69	0.05	3.51
1968	0.48	0.37	0.58	0.58	1.75	0.07	0.27	4.11
1969	0.05	0.00	0.83	0.52	0.16	0.44	0.56	2.55
1970	0.06	0.00	1.25	0.00	0.53	0.00	0.05	1.89
1971	0.30	0.52	0.33	0.04	0.86	0.28	0.56	2.90
1972	0.20	0.25	0.20	0.20	0.23	0.53	0.56	2.18
1973	0.47	0.94	0.39	0.99	0.00	0.29	0.00	3.09
1974	0.41	0.07	0.00	1.30	0.00	0.00	0.35	2.14
1975	0.00	1.28	0.46	0.44	0.15	0.37	0.00	2.70
1976	0.06	0.20	0.07	0.12	0.15	0.41	0.24	1.24
1977	0.00	0.81	0.00	0.80	0.75	0.29	0.40	3.06
1978	0.35	0.41	0.00	0.00	0.34	0.80	0.08	1.97
1979	0.00	0.59	0.00	0.35	0.52	0.00	0.29	1.75
1980	0.14	1.05	0.00	0.63	0.83	1.01	0.49	4.15
1981	0.03	1.02	0.00	0.82	1.16	0.81	0.56	4.40
1982	0.00	0.83	0.10	0.54	0.52	1.23	0.56	3.78
1983	0.37	0.56	0.01	0.44	1.40	1.18	0.35	4.30
1984	0.35	0.30	1.79	1.35	0.56	0.63	0.56	5.53
1985	0.38	0.67	0.52	1.57	0.00	0.37	0.56	4.08
1986	0.48	0.35	0.39	0.29	0.29	0.85	0.53	3.18
1987	0.00	0.82	0.15	0.73	0.56	0.18	0.46	2.90
1988	0.21	0.93	0.25	0.44	0.39	0.60	0.35	3.16
1989	0.15	0.30	0.54	0.29	0.81	0.65	0.32	3.06
1990	0.00	0.04	1.32	0.19	0.30	0.53	0.47	2.85

ATTACHMENT C

WATER SUPPLY

2. GOOSEBERRY CREEK STREAMFLOW RECORDS AND NARROWS RESERVOIR SIMULATED OPERATION STUDY

Sanpete Water Conservancy District

Table C-6
Recorded Flow of Gooseberry Creek Near Fairview
(Acre-Feet)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1960	155	131	56	49	46	117	336	2,970	951	431	188	105	5,535
1961	90	89	75	58	50	59	313	1,370	558	263	93	124	3,142
1962	95	89	66	61	93	81	678	4,850	2,410	845	538	266	10,072
1963	109	80	63	37	60	73	143	3,090	1,110	460	356	240	5,821
1964	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]	NA[1]
1965	118	93	73	61	59	64	189	3,070	3,300	751	617	531	8,926
1966	323	179	150	92	85	155	1,150	2,540	537	170	98	108	5,587
1967	95	93	89	72	62	77	87	3,020	2,650	522	239	144	7,150
1968	123	87	89	78	74	83	210	2,780	3,670	439	301	189	8,123
1969	160	122	98	105	98	102	526	5,900	1,340	NA[1]	NA[1]	NA[1]	8,451
Total	1,268	963	759	613	627	811	3,632	29,590	16,526	3,881	2,430	1,707	62,807
Ave	141	107	84	68	70	90	404	3,288	1,836	485	304	213	6,979

[1] NA = Not Available

Table C-7
Natural Flow of Gooseberry Creek Near Fairview
(Acre-Feet)

	R=0.84	R=0.77	R=0.82	R=0.61	R=0.69	R=0.78	R=0.96	R=0.99	R=0.98	R=0.85	R=0.78	R=0.98	
	A=-4.87	A=26.75	A=0.54	A=35.01	A=35.79	A=22.09	A=-33.64	A=520.55	A=-232.51	A=66.67	A=72.35	A=-7.26	
	B=0.50	B=0.34	B=0.41	B=0.19	B=0.19	B=0.30	B=0.49	B=0.46	B=0.62	B=0.37	B=0.30	B=0.53	
Year	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Total**
1960	103	92	52	54	53	89	309	2,883	803	313	144	88	4,984
1961	99	99	80	62	60	73	289	1,688	313	209	119	122	3,212
1962	125	121	95	76	91	117	894	4,890	2,338	543	272	230	9,792
1963	132	106	63	53	59	66	123	3,338	1,185	351	245	203	5,925
1964	97	91	68	71	70	80	140	3,329	2,082	463	253	222	6,967
1965	114	90	108	87	80	91	268	3,313	3,430	586	393	452	9,012
1966	300	174	136	92	90	152	1,040	2,828	833	272	253	183	6,352
1967	240	129	110	76	73	104	365	3,599	2,862	471	257	192	8,479
1968	145	112	107	85	83	107	208	3,193	3,556	407	277	217	8,498
1969	191	131	102	76	74	105	652	6,425	1,901	459	239	219	10,573
1970	223	153	133	95	83	120	247	4,185	1,865	411	194	168	7,875
1971	182	145	179	128	79	109	356	3,286	1,399	346	188	159	6,556
1972	171	134	149	110	95	228	718	2,567	646	231	147	136	5,332
1973	176	142	126	91	85	147	374	4,280	2,054	394	192	185	8,246
1974	154	127	122	98	85	109	253	4,200	994	281	157	103	6,681
1975	132	116	94	84	78	95	125	2,782	5,465	677	251	176	10,074
1976	190	142	136	98	91	102	232	3,109	1,169	302	150	88	5,808
1977	98	87	55	63	64	73	297	1,010	167	161	111	56	2,243
1978	124	113	95	78	78	106	652	3,709	4,463	454	257	162	10,292
1979	23	122	79	71	68	80	255	3,736	2,150	329	188	114	7,215
1980	113	108	99	81	78	94	465	4,003	4,887	489	217	192	10,826
1981	160	129	106	82	78	123	747	2,470	1,182	263	155	122	5,615
1982	203	138	101	72	69	102	722	4,975	2,807	518	243	285	10,234
1983	422	268	211	118	108	173	318	2,880	8,769	1,186	341	328	15,122
1984	350	228	248	135	124	165	323	6,361	6,640	727	295	258	15,854
1985	304	198	211	127	107	143	1,470	5,787	1,791	454	220	180	10,993
1986	229	179	171	113	113	198	1,102	6,297	4,653	449	229	209	13,941
1987	235	173	124	69	65	90	896	2,397	728	265	162	117	5,322
1988	157	126	97	78	75	102	620	3,254	651	263	169	124	5,715
1989	132	134	116	88	78	130	1,121	2,392	502	258	152	130	5,233
1990	114	195	96	78	76	106	1,068	2,317	630	283	148	108	5,218
1991	132	122	100	81	81	104	448	3,563	2,240	389	211	205	7,678
1992	136	123	104	71	66	117	687	1,493	373	195	128	101	3,592
1993	215	149	131	95	95	194	940	5,580	2,304	431	216	186	10,538
1994	164	120	111	77	74	107	597	3,129	653	214	165	135	5,545
1995	197	125	127	91	86	162	514	4,089	6,259	879	324	232	13,085
1996	161	137	116	72	77	116	371	4,821	2,169	359	165	120	8,684
1997	126	142	122	88	87	137	579	6,979	2,724	374	187	210	11,754
1998	190	144	138	96	104	168	587	4,293	2,519	513	233	198	9,183
1999	178	141	74	57	68	105	282	3,478	2,582	422	274	240	7,902
2000	140	118	80	66	65	102	767	2,906	756	232	160	126	5,518
2001	135	107	38	43	50	109	854	3,333	415	203	153	95	5,536
2002	76	103	69	50	43	48	686	2,206	223	175	117	90	3,883
Ave.	177	137	119	87	81	116	519	3,639	2,409	418	216	181	8,099
Total	5,322	4,105	3,572	2,608	2,437	3,475	15,583	109,167	72,284	12,532	6,469	5,421	242,974

Table C-8
Recorded Flow of Gooseberry Creek Near Scofield Utah
(acre-feet)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1960	199	173	111	86	81	209	655	4,840	1,550	614	218	164	8,900
1961	195	201	188	135	122	157	619	2,250	788	347	143	234	5,379
1962	211	228	183	184	258	277	1,740	8,940	3,950	1,200	630	390	18,191
1963	264	223	144	87	110	131	233	5,680	2,090	710	543	377	10,592
1964	185	174	154	184	173	184	337	5,690	3,580	1,020	562	404	12,647
1965	225	174	251	260	219	215	592	5,660	5,650	1,330	1,030	837	16,443
1966	579	408	297	265	255	402	2,110	4,240	943	372	461	245	10,577
1967	360	209	201	154	139	184	339	5,740	4,780	1,010	512	320	13,948
1968	251	224	233	244	230	260	447	5,040	5,470	784	613	380	14,176
1969	352	272	210	179	166	235	1,330	12,050	2,590	938	459	368	19,149
1970	419	343	301	295	230	303	437	6,740	3,120	834	359	294	13,675
1971	325	307	401	454	202	255	744	5,230	2,270	659	343	280	11,470
1972	306	274	307	329	286	650	1,430	3,720	1,100	352	201	232	9,187
1973	290	276	233	215	194	263	497	7,300	3,430	803	352	309	14,162
1974	271	251	258	295	229	246	505	6,830	1,430	452	225	158	11,150
1975	208	200	164	184	167	184	201	3,250	8,840	1,540	539	308	15,785
1976	364	314	311	307	272	243	517	5,230	1,180	447	193	142	9,520
1977	187	160	117	130	132	158	648	791	583	231	120	112	3,369
1978	150	162	164	154	147	191	1,030	6,480	7,240	914	546	256	17,434
1979	40	261	173	172	156	172	476	6,280	3,050	609	327	200	11,916
1980	229	201	215	215	201	215	946	6,630	7,800	1,050	432	346	18,480
1981	309	282	237	226	205	317	1,510	3,650	1,590	437	237	213	9,213
1982	337	255	185	140	123	185	1,160	8,760	4,500	1,110	508	498	17,761
1983	830	691	500	427	374	491	638	4,530	14,210	2,950	861	599	27,101
1984	624	520	552	481	424	427	663	12,230	9,620	1,480	654	439	28,114
1985	561	458	464	440	338	366	3,010	10,350	2,400	914	434	314	20,049
1986	386	380	347	348	357	533	1,880	11,050	7,530	900	458	362	24,531
1987	448	398	271	150	126	183	1,740	3,150	915	461	259	204	8,305
1988	214	193	168	188	176	222	907	5,170	1,200	418	257	197	9,310
1989	231	278	248	241	186	318	2,180	3,060	950	436	217	221	8,566
1990	179	423	169	164	163	197	1,687	3,118	1,146	473	197	160	8,076
1991	204	114	177	179	172	196	323	5,395	3,540	687	386	338	11,713
1992	258	268	230	169	138	293	1,432	1,473	555	264	140	163	5,383
1993	245	157	145	185	209	350	903	9,882	3,671	786	374	242	17,148
1994	311	258	254	199	177	244	1,188	4,591	1,028	313	266	243	9,072
1995	328	227	246	245	223	406	826	6,629	10,217	2,118	773	393	22,629
1996	293	299	253	168	194	268	731	8,593	2,709	548	219	195	14,470
1997	225	301	263	256	245	350	1,158	12,951	4,425	761	354	384	21,674
1998	371	319	312	301	340	458	1,170	7,120	4,069	1,142	506	355	16,463
1999	333	309	151	88	141	236	539	5,794	4,176	859	626	435	13,687
2000	249	230	176	155	137	236	1,568	4,475	1,081	342	214	198	9,060
2001	231	192	56	14	50	242	1,503	5,236	832	303	228	153	9,040
2002	133	200	161	75	29	58	1,289	3,038	636	256	120	165	6,161
Ave.	300	274	237	218	198	272	1,019	6,020	3,545	795	398	298	13,574
Total	12,910	11,787	10,184	9,366	8,496	11,710	43,838	258,857	152,433	34,172	17,097	12,826	583,677

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
										Narrows Reservoir Operation										
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
1959	OCT	169	14	14	169	123	123	0	0		78	9968	0	61	17	4422	94	14390	0	61
	NOV	143	12	12	143	119	119	0	0		23	9969	0	59	5	4357	28	14326	0	59
	DEC	64	8	5	61	123	123	0	0			9907	0	61	0	4296		14203	0	61
1960	JAN	55	6	4	53	123	123	0	0			9838	0	61	0	4235		14072	0	61
	FEB	52	6	4	50	111	111	0	0			9777	0	55	0	4179		13956	0	55
	MAR	132	15	11	128	123	123	0	0			9782	0	61	0	4118		13899	0	61
	APR	383	47	31	367	0	0	0	0			10000	149	59	0	4207		14207	0	59
	MAY	3318	348	269	3239	0	0	0	0		173	10000	3066	361	36	4500	209	14500	2375	2737
	JUN	1063	112	86	1037	14	14	0	0		210	10000	814	59	46	4500	256	14500	708	768
	JUL	475	44	38	469	2310	2310	0	0		219	7940	0	61	48	4391	267	12331	0	61
	AUG	204	16	17	205	2351	2351	0	0		168	5626	0	61	47	4282	215	9908	0	61
	SEP	117	12	9	114	3	3	0	0	55	105	5578	0	59	40	4182	145	9760	0	114
	TOTAL	6175	640	500	6035	5400	5400	0	0	55	975		4028	1023	239		1214		3083	4161
	OCT	109	19	9	99	123	123	0	0		55	5498	0	61	21	4100	76	9598	0	61
	NOV	109	20	9	98	119	119	0	0		16	5461	0	59	6	4035	22	9496	0	59
	DEC	94	19	8	83	123	123	0	0			5421	0	61	0	3973		9394	0	61
1961	JAN	71	13	6	64	123	123	0	0			5361	0	61	0	3912		9273	0	61
	FEB	62	12	5	55	111	111	0	0			5305	0	55	0	3856		9162	0	55
	MAR	74	15	6	65	123	123	0	0			5247	0	61	0	3795		9042	0	61
	APR	374	61	30	343	0	0	0	0			5591	0	59	0	3736		9326	0	59
	MAY	1592	222	129	1499	0	0	0	0		124	6966	0	361	42	3332	167	10297	0	361
	JUN	636	78	52	610	14	14	0	0		170	7391	0	59	43	3229	213	10620	0	59
	JUL	297	34	24	287	2501	2501	0	0	226	184	4767	0	61	42	3126	226	7893	0	287
	AUG	107	14	9	102	2161	2161	0	0	41	126	2542	0	61	42	3023	167	5564	0	102
	SEP	147	23	12	136	3	3	0	0		70	2605	0	59	34	2929	104	5534	0	59
	TOTAL	3672	530	297	3439	5400	5400	0	0	267	745		0	1023	231		976		0	1290
	OCT	111	16	9	104	123	123	0	0		38	2548	0	61	18	2850	55	5398	0	61
	NOV	106	17	9	98	119	119	0	0		11	2516	0	59	5	2786	16	5301	0	59
	DEC	79	13	6	72	123	123	0	0			2465	0	61	0	2724		5190	0	61
1962	JAN	75	14	6	67	123	123	0	0			2409	0	61	0	2663		5072	0	61
	FEB	112	19	9	102	111	111	0	0			2401	0	55	0	2607		5008	0	55
	MAR	101	20	8	89	123	123	0	0			2367	0	61	0	2546		4913	0	61
	APR	806	128	65	743	0	0	0	0			3110	0	59	0	2487		5597	0	59
	MAY	5507	657	446	5296	89	89	0	0		91	8226	0	361	33	2092	124	10318	0	361
	JUN	2700	290	219	2629	14	14	0	0		187	10000	653	59	26	2660	213	12660	0	59
	JUL	933	88	76	921	2226	2226	0	0		219	8475	0	61	30	2568	249	11044	0	61
	AUG	584	46	47	585	2346	2346	0	0		174	6541	0	61	28	2479	202	9019	0	61
	SEP	295	29	24	290	3	3	0	0		114	6714	0	59	23	2396	138	9109	0	59
	TOTAL	11409	1337	924	10996	5400	5400	0	0	0	835		653	1023	163		998		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
1959	OCT	30	92	244	336	305	262	1291	748		2039	0	6520	0	2039	290	31	42	2402
	NOV	30	90	276	366	35	73			891	891	0	5956	0	891	345	40	53	1329
	DEC	50	111	278	389	-78				891	891	0	5376	0	891	224	40	54	1209
1960	JAN	33	94	283	377	726				805	805	0	5674	0	805	266	54	73	1198
	FEB	31	86	264	350	777				242	242	0	6560	0	242	372	30	40	684
	MAR	81	143	559	702	861				249	249	0	7873	0	249	525	66	88	928
	APR	288	347	2165	2512	1580		0	1620		1620	0	10346	0	1620	2033	243	326	4222
	MAY	1601	4338	6700	11038	3069	625	0	5353		5353	0	18475	0	5353	7993	436	585	14367
	JUN	513	1280	1830	3110	769	903	4370	4149		8519	0	12932	0	8519	3844	425	570	13359
	JUL	145	206	536	742	-269	843	7658	881		8539	0	4023	0	8539	979	99	133	9751
	AUG	13	75	245	320	-463	558	3009	0		3009	0	313	0	3009	3	47	63	3122
	SEP	50	164	141	305	184	355	175	489		664	216	0	0	448	136	0	0	583
	TOTAL	2865	7026	13521	20547	7497	3619	16502	13241	3078	32821	216		0	32605	17010	1512	2027	53154
	OCT	96	158	245	403	554	185	0	428		428	0	344	0	428	144	0	0	572
	NOV	103	163	415	578	81	56			636	636	0	310	0	636	327	13	18	994
	DEC	105	167	403	570	95				686	686	0	289	0	686	201	20	27	934
1961	JAN	71	133	295	428	-9				301	301	0	407	0	301	475	0	0	777
	FEB	67	122	211	333	40				243	243	0	537	0	243	438	2	3	687
	MAR	92	153	224	377	1185				176	176	0	1924	0	176	527	42	56	802
	APR	276	335	501	836	1550		0	450		450	0	3860	0	450	1156	161	216	1983
	MAY	751	1112	1960	3072	693	501	0	4207		4207	0	2917	0	4207	6929	79	106	11321
	JUN	178	238	572	810	-281	582	2035	1079		3114	250	0	0	2864	3827	10	13	6714
	JUL	60	347	205	552	37	523	1528	589		2117	2050	0	0	67	847	5	6	924
	AUG	41	144	169	313	399	458	194	711		905	651	0	0	254	0	12	16	282
	SEP	98	157	222	379	630	349	0	499		499	0	162	0	499	76	28	38	640
	TOTAL	1940	3229	5422	8651	4975	2653	3756	7964	2042	13762	2951		0	10811	14947	372	499	26629
	OCT	107	168	169	337	277	187	0	462		462	0	127	0	462	112	2	3	579
	NOV	130	190	174	364	406	55			640	640	0	201	0	640	321	5	7	973
	DEC	111	172	134	306	495				474	474	0	528	0	474	167	2	3	646
1962	JAN	117	178	123	301	224				301	301	0	753	0	301	402	24	32	759
	FEB	156	211	125	336	786				199	199	0	1676	0	199	140	35	47	421
	MAR	188	249	151	400	837				375	375	0	2538	0	375	522	55	74	1026
	APR	997	1056	8180	9236	422		0	62		62	0	12134	0	62	7704	869	1165	9800
	MAY	3644	4005	13050	17055	5741	655	1200	0		1200	0	33076	0	1200	14874	2030	2722	20826
	JUN	1321	1381	3830	5211	3304	1077	0	8949		8949	0	31564	0	8949	3881	549	736	14115
	JUL	279	341	750	1091	985	1110	8297	2935		11232	0	21299	0	11232	1074	91	122	12519
	AUG	45	106	302	408	774	863	8332	1706		10038	0	11580	0	10038	303	18	24	10383
	SEP	100	160	339	499	602	544	4189	1331		5520	0	6616	0	5520	361	13	17	5911
	TOTAL	7195	8218	27327	35545	14851	4490	22019	15444	1989	39452	0		0	39452	29860	3693	4953	77959

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	132	23	11	120	123	123	0	0		62	6649	0	61	12	2323	73	8971	0	61
	NOV	99	19	8	88	119	119	0	0		18	6600	0	59	3	2260	21	8859	0	59
	DEC	75	12	6	69	123	123	0	0			6546	0	61	0	2198		8744	0	61
1963	JAN	44	7	4	41	123	123	0	0			6463	0	61	0	2137		8600	0	61
	FEB	69	9	6	66	111	111	0	0			6418	0	55	0	2082		8500	0	55
	MAR	84	11	7	80	123	123	0	0			6375	0	61	0	2020		8395	0	61
	APR	163	20	13	156	0	0	0	0			6531	0	59	0	1961		8492	0	59
	MAY	3576	486	290	3380	0	0	0	0		136	9775	0	361	22	1577	158	11352	0	361
	JUN	1289	179	104	1214	72	72	0	0		207	10000	710	59	18	2210	225	12210	0	59
	JUL	521	61	42	502	2310	2310	0	0		219	7974	0	61	25	2123	244	10097	0	61
	AUG	402	46	33	389	2294	2294	0	0		168	5900	0	61	24	2038	193	7938	0	61
	SEP	272	32	22	262	3	3	0	0	203	108	5849	0	59	20	1958	128	7807	0	262
	TOTAL	6726	905	545	6366	5400	5400	0	0	203	917		710	1023	126		1042		0	1226
	OCT	110	11	9	108	123	123	0	0	47	57	5730	0	61	10	1886	67	7616	0	108
	NOV	106	11	9	104	119	119	0	0		17	5698	0	59	3	1824	19	7522	0	59
	DEC	77	9	6	74	123	123	0	0			5649	0	61	0	1763		7412	0	61
1964	JAN	91	11	7	87	123	123	0	0			5614	0	61	0	1701		7315	0	61
	FEB	89	11	7	85	111	111	0	0			5588	0	55	0	1646		7234	0	55
	MAR	97	11	8	94	123	123	0	0			5559	0	61	0	1585		7143	0	61
	APR	200	21	16	195	0	0	0	0			5754	0	59	0	1525		7279	0	59
	MAY	3588	349	291	3530	0	0	0	0		126	9157	0	361	18	1146	144	10303	0	361
	JUN	2419	220	196	2395	14	14	0	0		199	10000	1339	59	14	2411	213	12411	0	59
	JUL	688	63	56	681	2355	2355	0	0		219	8107	0	61	28	2322	246	10430	0	61
	AUG	372	34	30	368	2307	2307	0	0		170	5999	0	61	26	2235	196	8233	0	61
	SEP	268	25	22	265	3	3	0	0		109	6152	0	59	22	2153	131	8306	0	59
	TOTAL	8105	776	657	7986	5400	5400	0	0	47	896		1339	1023	121		1017		0	1070
	OCT	130	12	11	129	123	123	0	0	68	59	6031	0	61	11	2081	70	8112	0	129
	NOV	103	10	8	101	119	119	0	0		17	5996	0	59	3	2018	20	8015	0	59
	DEC	87	14	7	80	123	123	0	0			5953	0	61	0	1957		7910	0	61
1965	JAN	75	14	6	67	123	123	0	0			5897	0	61	0	1896		7793	0	61
	FEB	71	12	6	65	111	111	0	0			5851	0	55	0	1840		7691	0	55
	MAR	76	12	6	70	123	123	0	0			5798	0	61	0	1779		7577	0	61
	APR	222	33	18	207	0	0	0	0			6005	0	59	0	1719		7725	0	59
	MAY	3383	313	274	3344	0	0	0	0		129	9220	0	361	20	1338	149	10558	0	361
	JUN	3613	313	293	3593	14	14	0	0		200	10000	2599	59	16	3861	216	13861	0	59
	JUL	825	74	67	818	2325	2325	0	0		219	8274	0	61	42	3758	261	12032	0	61
	AUG	674	57	55	672	2336	2336	0	0		172	6437	0	61	40	3656	212	10093	0	61
	SEP	577	46	47	578	3	3	0	0		113	6899	0	59	33	3563	147	10462	0	59
	TOTAL	9836	910	797	9723	5400	5400	0	0	68	909		2599	1023	166		1075		0	1091

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	144	206	372	578	446	249	0	556		556	0	6834	0	556	161	22	30	768
	NOV	135	194	378	572	108	74			613	613	0	6828	0	613	335	22	30	1000
	DEC	75	136	245	381	177				921	921	0	6465	0	921	221	17	23	1181
1963	JAN	46	108	300	408	-106				281	281	0	6486	0	281	409	2	2	695
	FEB	44	100	441	541	944				95	95	0	7876	0	95	259	12	16	382
	MAR	51	113	490	603	1562				183	183	0	9857	0	183	522	116	156	976
	APR	77	136	1127	1263	1722		0	1282		1282	0	11560	0	1282	1760	182	244	3468
	MAY	2300	2662	7180	9842	3584	645	0	7478		7478	0	16863	0	7478	7661	500	671	16309
	JUN	876	935	1920	2855	1757	877	1175	5767		6942	0	13655	0	6942	3852	71	95	10960
	JUL	208	269	500	769	272	857	9780	1482		11262	0	2577	0	11262	944	7	9	12221
	AUG	154	216	356	572	1016	523	2649	1915		4564	923	0	0	3641	209	15	20	3885
	SEP	115	377	298	675	636	349	542	1311		1853	891	0	0	962	211	19	25	1217
	TOTAL	4226	5452	13607	19059	12116	3575	14147	19790	2093	36030	1813		0	34217	16543	984	1320	53064
	OCT	77	185	291	476	446	185	2515	922		3437	2699	0	0	738	394	15	20	1167
	NOV	70	130	315	445	147	54			385	385	0	153	0	385	315	14	19	733
	DEC	80	141	225	366	2				721	721	200	0	0	521	190	1	1	713
1964	JAN	97	158	123	281	536				503	503	0	314	0	503	415	0	0	918
	FEB	88	143	115	258	262				230	230	0	604	0	230	415	0	0	645
	MAR	90	152	123	275	1135				242	242	0	1772	0	242	527	9	12	791
	APR	142	201	713	914	2798		0	148		148	0	5336	0	148	1504	305	409	2366
	MAY	2160	2522	9870	12392	5298	532	0	154		154	0	22340	0	154	7350	877	1176	9557
	JUN	1185	1244	3910	5154	3187	959	0	6458		6458	0	23264	0	6458	3851	428	574	11311
	JUL	339	401	790	1191	-796	1013	10141	1014		11155	0	11490	0	11155	1013	22	30	12219
	AUG	194	255	311	566	-707	712	8589	166		8755	0	1882	0	8755	408	0	0	9163
	SEP	139	199	234	433	706	386	5255	1344		6599	3963	0	0	2636	355	0	0	2991
	TOTAL	4661	5731	17020	22751	13014	3841	26499	10207	2081	38787	6863		0	31924	16737	1671	2241	52573
	OCT	96	226	280	506	583	185	1615	1088		2703	1799	0	0	904	285	0	0	1189
	NOV	73	132	184	316	967	54			853	853	0	375	0	853	330	0	0	1183
	DEC	171	232	82	314	832				565	565	0	957	0	565	210	0	0	775
1965	JAN	193	254	47	301	1986				93	93	0	3151	0	93	399	19	25	536
	FEB	154	210	84	294	686				89	89	0	4042	0	89	357	41	55	542
	MAR	145	206	414	620	770				99	99	0	5333	0	99	527	82	110	818
	APR	385	444	1578	2022	2305		0	175		175	0	9485	0	175	2854	371	498	3898
	MAY	2316	2677	12430	15107	5789	610	231	0		231	0	29541	0	231	8989	2180	2923	14323
	JUN	2057	2117	7690	9807	8640	1044	0	1314		1314	0	45630	0	1314	3913	2130	2856	10213
	JUL	512	574	1660	2234	2540	1221	1196	5530		6726	0	42457	0	6726	1117	792	1062	9697
	AUG	358	420	750	1170	2094	1049	1775	3874		5649	0	39022	0	5649	391	262	351	6654
	SEP	259	319	473	792	1744	783	3962	3054		7016	0	33758	0	7016	317	127	170	7630
	TOTAL	6720	7811	25672	33483	28936	4946	8779	15035	1699	25513	1799		0	23714	19689	6004	8051	57458

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	446	123	36	359	123	123	0	0		63	7073	0	61	17	3485	80	10558	0	61
	NOV	266	87	22	201	119	119	0	0		19	7136	0	59	5	3421	24	10556	0	59
	DEC	213	63	17	167	123	123	0	0			7180	0	61	0	3359		10539	0	61
1966	JAN	148	56	12	104	123	123	0	0			7161	0	61	0	3298		10459	0	61
	FEB	139	54	11	96	111	111	0	0			7146	0	55	0	3242		10389	0	55
	MAR	241	86	20	175	123	123	0	0			7198	0	61	0	3181		10379	0	61
	APR	1600	450	130	1280	0	0	0	0			8477	0	59	0	3122		11599	0	59
	MAY	3444	904	279	2819	0	0	0	0		158	10000	1139	361	31	3868	188	13868	0	361
	JUN	738	201	60	597	1020	1020	0	0		210	9367	0	59	40	3769	250	13135	0	59
	JUL	249	79	20	190	1808	1808	0	0		211	7538	0	61	43	3664	254	11202	0	61
	AUG	196	98	16	114	1847	1847	0	0		163	5642	0	61	41	3561	204	9204	0	61
	SEP	160	52	13	121	3	3	0	0		105	5655	0	59	34	3468	139	9123	0	59
	TOTAL	7840	2253	635	6222	5400	5400	0	0	0	927		1139	1023	211		1138		0	1023
	OCT	156	61	13	108	123	123	0	0		56	5584	0	61	18	3389	74	8973	0	61
	NOV	129	36	10	103	119	119	0	0		16	5552	0	59	5	3324	21	8877	0	59
	DEC	123	34	10	99	123	123	0	0			5528	0	61	0	3263		8791	0	61
1967	JAN	98	26	8	80	123	123	0	0			5485	0	61	0	3202		8687	0	61
	FEB	86	24	7	69	111	111	0	0			5443	0	55	0	3146		8589	0	55
	MAR	108	31	9	86	123	123	0	0			5406	0	61	0	3085		8491	0	61
	APR	145	58	12	99	0	0	0	0			5505	0	59	0	3025		8530	0	59
	MAY	3998	978	324	3344	0	0	0	0		123	8726	0	361	35	2629	158	11354	0	361
	JUN	3465	815	281	2931	14	14	0	0		194	10000	1448	59	31	3987	225	13987	0	59
	JUL	694	172	56	578	1777	1777	0	0		219	8583	0	61	43	3882	262	12465	0	61
	AUG	326	87	26	265	1811	1811	0	0		175	6862	0	61	41	3780	216	10642	0	61
	SEP	199	55	16	160	1077	1077	0	0		117	5828	0	59	34	3687	151	9515	0	59
	TOTAL	9527	2377	772	7922	5400	5400	0	0	0	901		1448	1023	207		1108		0	1023
	OCT	156	33	13	136	123	123	0	0		57	5784	0	61	19	3607	75	9391	0	61
	NOV	117	30	9	96	119	119	0	0		17	5745	0	59	5	3542	22	9287	0	59
	DEC	120	31	10	99	123	123	0	0			5720	0	61	0	3481		9201	0	61
1968	JAN	110	32	9	87	123	123	0	0			5684	0	61	0	3419		9104	0	61
	FEB	104	30	8	82	111	111	0	0			5656	0	55	0	3364		9020	0	55
	MAR	117	34	9	92	123	123	0	0			5625	0	61	0	3303		8928	0	61
	APR	269	59	22	232	0	0	0	0			5857	0	59	0	3243		9100	0	59
	MAY	3445	665	279	3059	0	0	0	0		127	8788	0	361	37	2845	164	11634	0	361
	JUN	4392	722	356	4026	14	14	0	0		195	10000	2606	59	33	4500	228	14500	858	917
	JUL	542	103	44	483	1878	1878	0	0		219	8386	0	61	48	4391	267	12777	0	61
	AUG	382	81	31	332	1850	1850	0	0		173	6694	0	61	46	4283	219	10978	0	61
	SEP	239	50	19	208	936	936	0	0		116	5851	0	59	38	4186	154	10037	0	59
	TOTAL	9993	1870	809	8932	5400	5400	0	0	0	903		2606	1023	226		1129		858	1881

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	220	281	481	762	721	400	1359	1781		3140	0	31701	0	3140	484	135	181	3940
	NOV	207	267	502	769	248	116			828	828	0	31774	0	828	396	133	178	1535
	DEC	130	191	314	505	1354				865	865	0	32769	0	865	322	111	149	1447
1966	JAN	161	222	220	442	754				239	239	0	33726	0	239	211	106	142	698
	FEB	159	214	189	403	997				141	141	0	34985	0	141	294	97	130	662
	MAR	227	289	768	1057	870				140	140	0	36772	0	140	513	205	275	1133
	APR	830	890	3990	4880	2316		0	516		516	0	43452	0	516	3043	482	646	4687
	MAY	1421	1782	6040	7822	3911	955	0	7057		7057	0	47174	0	7057	9218	673	902	17850
	JUN	346	406	1367	1773	1066	1179	3176	3376		6552	0	42281	0	6552	3870	230	308	10961
	JUL	182	243	658	901	-1030	1198	9582	0		9582	0	31372	0	9582	1046	70	94	10792
	AUG	347	409	282	691	-743	969	9076	0		9076	0	21274	0	9076	414	32	43	9565
	SEP	124	183	233	416	277	657	4594	755		5349	0	15962	0	5349	416	46	62	5873
	TOTAL	4355	5378	15044	20422	10741	5474	27787	13484	2213	43484	0		0	43484	20227	2320	3111	69143
	OCT	252	314	387	701	380	319	799	1127		1926	0	14798	0	1926	313	53	71	2363
	NOV	106	165	361	526	425	92			877	877	0	14780	0	877	349	44	59	1329
	DEC	102	163	398	561	1596				795	795	0	16142	0	795	228	91	122	1236
1967	JAN	74	135	399	534	952				105	105	0	17524	0	105	379	66	89	639
	FEB	70	125	361	486	762				62	62	0	18710	0	62	339	65	87	553
	MAR	98	160	514	674	1347				45	45	0	20686	0	45	522	106	142	815
	APR	240	300	1141	1441	1525		0	805		805	0	22846	0	805	2107	179	240	3331
	MAY	2396	2758	9330	12088	6471	798	0	2001		2001	0	38606	0	2001	6390	768	1030	10189
	JUN	1849	1909	7250	9159	7313	1122	0	7910		7910	0	46045	0	7910	5910	1100	1475	16395
	JUL	432	493	1620	2113	1148	1223	7377	3778		11155	0	36928	0	11155	2220	365	489	14229
	AUG	247	308	598	906	-1110	1013	8749	0		8749	0	26962	0	8749	832	103	138	9822
	SEP	160	219	390	609	-392	707	4530	318		4848	0	21624	0	4848	464	76	102	5490
	TOTAL	6026	7049	22749	29798	20415	5273	21456	15938	1884	39278	0		0	39278	20053	3016	4044	66391
	OCT	115	177	401	578	115	351	2272	767		3039	0	18928	0	3039	461	67	90	3657
	NOV	128	187	379	566	544	99			821	821	0	19118	0	821	418	45	60	1344
	DEC	134	196	323	519	720				921	921	0	19435	0	921	318	96	129	1464
1968	JAN	157	218	340	558	949				333	333	0	20610	0	333	309	75	101	818
	FEB	148	203	385	588	690				305	305	0	21583	0	305	330	67	90	792
	MAR	168	229	635	864	1218				313	313	0	23352	0	313	745	94	126	1278
	APR	215	275	783	1058	2148		0	278		278	0	26279	0	278	2440	206	276	3200
	MAY	1981	2342	10650	12992	7909	833	0	0		0	0	46349	0	0	14140	1530	2052	17722
	JUN	1444	2362	8240	10602	6361	1174	2966	8085		11051	0	51086	0	11051	5100	1270	1703	19124
	JUL	301	362	1456	1818	1719	1255	9096	3959		13055	0	40314	0	13055	1550	302	405	15312
	AUG	281	342	737	1079	1541	1036	2881	2891		5772	0	36127	0	5772	746	166	223	6907
	SEP	172	231	495	726	-422	767	10093	453		10546	0	25118	0	10546	395	86	115	11142
	TOTAL	5244	7124	24824	31948	23494	5515	27307	16434	2693	46434	0		0	46434	26952	4004	5369	82759

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	211	41	17	187	123	123	0	0		57	5858	0	61	21	4104	78	9962	0	61
	NOV	153	31	12	134	119	119	0	0		17	5857	0	59	6	4039	23	9896	0	59
	DEC	115	24	9	100	123	123	0	0			5834	0	61	0	3977		9812	0	61
1969	JAN	93	21	8	80	123	123	0	0			5791	0	61	0	3916		9707	0	61
	FEB	89	19	7	77	111	111	0	0			5757	0	55	0	3860		9618	0	55
	MAR	121	27	10	104	123	123	0	0			5738	0	61	0	3799		9537	0	61
	APR	747	153	61	655	0	0	0	0			6392	0	59	0	3740		10132	0	59
	MAY	7139	1389	578	6328	0	0	0	0		134	10000	2587	361	41	4500	175	14500	1424	1786
	JUN	1850	299	150	1701	14	14	0	0		210	10000	1477	59	46	4500	256	14500	1372	1431
	JUL	667	108	54	613	1952	1952	0	0		219	8442	0	61	48	4391	267	12833	0	61
	AUG	324	53	26	297	2042	2042	0	0		174	6524	0	61	46	4284	219	10808	0	61
	SEP	255	42	21	234	671	671	0	0		114	5973	0	59	38	4186	152	10159	0	59
	TOTAL	11764	2207	953	10510	5400	5400	0	0	0	924		4064	1023	245		1169		2796	3819
	OCT	255	60	21	216	123	123	0	0		58	6008	0	61	21	4104	78	10112	0	61
	NOV	189	49	15	155	119	119	0	0		17	6027	0	59	6	4039	23	10066	0	59
	DEC	173	43	14	144	123	123	0	0			6048	0	61	0	3977		10026	0	61
1970	JAN	134	42	11	103	123	123	0	0			6028	0	61	0	3916		9944	0	61
	FEB	112	33	9	88	111	111	0	0			6005	0	55	0	3860		9866	0	55
	MAR	152	43	12	121	123	123	0	0			6004	0	61	0	3799		9803	0	61
	APR	268	62	22	228	0	0	0	0			6231	0	59	0	3740		9971	0	59
	MAY	4385	960	355	3780	62	62	0	0		132	9818	0	361	41	3337	173	13155	0	361
	JUN	2272	444	184	2012	14	14	0	0		208	10000	1609	59	36	4500	244	14500	350	410
	JUL	613	119	50	544	1892	1892	0	0		219	8433	0	61	48	4391	267	12824	0	61
	AUG	265	51	21	235	2017	2017	0	0		174	6478	0	61	46	4284	219	10761	0	61
	SEP	206	42	17	181	694	694	0	0		114	5851	0	59	38	4186	152	10037	0	59
	TOTAL	9024	1948	731	7807	5400	5400	0	0	0	920		1609	1023	236		1156		350	1373
	OCT	199	45	16	170	123	123	0	0		57	5841	0	61	21	4104	78	9945	0	61
	NOV	172	42	14	144	119	119	0	0		17	5849	0	59	6	4038	23	9888	0	59
	DEC	233	55	19	197	123	123	0	0			5923	0	61	0	3977		9900	0	61
1971	JAN	188	63	15	140	123	123	0	0			5940	0	61	0	3916		9856	0	61
	FEB	102	28	8	82	111	111	0	0			5912	0	55	0	3860		9772	0	55
	MAR	132	35	11	108	123	123	0	0			5896	0	61	0	3799		9695	0	61
	APR	438	103	35	370	0	0	0	0			6267	0	59	0	3739		10006	0	59
	MAY	3547	723	287	3111	0	0	0	0		132	9246	0	361	41	3337	173	12583	0	361
	JUN	1659	314	134	1479	349	349	0	0		201	10000	176	59	37	3416	238	13416	0	59
	JUL	496	91	40	445	1884	1884	0	0		219	8342	0	61	38	3317	257	11659	0	61
	AUG	253	47	20	226	2140	2140	0	0		173	6256	0	61	36	3219	209	9476	0	61
	SEP	195	39	16	172	305	305	0	0		111	6012	0	59	30	3130	141	9142	0	59
	TOTAL	7614	1585	617	6646	5400	5400	0	0	0	909		176	1023	209		1118		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	165	226	499	725	711	367	1576	1562		3138	0	23049	0	3138	409	101	135	3783
	NOV	138	197	525	722	1038	105			891	891	0	23813	0	891	377	98	131	1497
	DEC	110	171	300	471	954				464	464	0	24774	0	464	149	74	99	786
1969	JAN	99	161	276	437	1339				294	294	0	26255	0	294	123	87	117	621
	FEB	89	144	246	390	1569				481	481	0	27734	0	481	106	83	111	781
	MAR	131	193	466	659	753				921	921	0	28224	0	921	489	102	137	1649
	APR	675	735	4730	5465	5270		0	3497		3497	0	35462	0	3497	8330	771	1034	13632
	MAY	5722	7508	15730	23238	13209	907	4132	0		4132	0	65700	1170	5302	12000	2770	3715	23786
	JUN	889	2320	3670	5990	4918	1294	2081	11178		13259	0	62055	0	13259	2520	874	1172	17825
	JUL	325	386	1302	1688	490	1324	8496	2730		11226	0	51684	0	11226	908	260	349	12743
	AUG	162	223	611	834	-115	1101	7405	955		8360	0	42942	0	8360	496	122	164	9142
	SEP	134	194	412	606	-780	802	3259	0		3259	0	38707	0	3259	329	83	111	3782
	TOTAL	8639	12458	28767	41225	29356	5900	26949	19922	3051	49922	0		1170	51092	26236	5425	7275	90028
	OCT	203	265	489	754	804	415	0	800		800	0	39050	0	800	444	126	169	1539
	NOV	188	247	356	603	-11	122			60	60	0	39460	0	60	331	94	126	611
	DEC	157	218	344	562	155				0	0	0	40177	0	0	329	92	123	544
1970	JAN	192	254	320	574	685				0	0	0	41436	0	0	223	113	152	488
	FEB	142	197	325	522	1245				0	0	0	43203	0	0	300	98	131	529
	MAR	182	243	556	799	161				20	20	0	44143	0	20	414	146	196	776
	APR	209	269	863	1132	874		0	1874		1874	0	44275	0	1874	1110	191	256	3431
	MAY	2960	3321	11090	14411	19861	959	5941	8958		14900	0	62688	0	14900	7400	953	1278	24531
	JUN	1108	1518	5510	7028	1677	1273	393	10307		10700	0	59421	0	10700	2560	552	740	14552
	JUL	290	352	1546	1898	-502	1306	8706	1878		10584	0	48926	0	10584	970	159	213	11926
	AUG	124	185	556	741	-915	1086	9376	0		9376	0	38290	0	9376	464	56	75	9971
	SEP	113	173	525	698	-819	779	5504	0		5504	0	31886	0	5504	323	53	71	5951
	TOTAL	5868	7241	22480	29721	23216	5941	29920	23818	80	53818	0		0	53818	14868	2633	3531	74849
	OCT	155	216	410	626	-735	394	1200	0		1200	0	30183	0	1200	413	65	87	1765
	NOV	163	222	477	699	-298	114			500	500	0	29970	0	500	349	55	74	978
	DEC	204	266	769	1035	-170				200	200	0	30635	0	200	398	79	106	783
1971	JAN	314	375	796	1171	150				0	0	0	31956	0	0	328	86	115	529
	FEB	120	175	918	1093	1180				0	0	0	34229	0	0	299	86	115	500
	MAR	147	209	1225	1434	720				0	0	0	36383	0	0	925	132	177	1234
	APR	374	433	3866	4299	2727		0	337		337	0	43072	0	337	5250	270	362	6219
	MAY	2119	2480	11720	14200	3543	953	0	2600		2600	0	57262	0	2600	8440	1040	1395	13475
	JUN	791	850	4330	5180	297	1239	2103	6897		9000	0	52500	0	9000	2710	474	636	12820
	JUL	214	275	1081	1356	-1740	1263	10770	0		10770	0	40084	0	10770	774	79	106	11729
	AUG	117	178	502	680	-770	1035	10005	75		10080	0	28879	0	10080	391	19	25	10515
	SEP	108	168	323	491	-603	721	4706	0		4706	0	23340	0	4706	280	16	21	5023
	TOTAL	4824	5847	26417	32264	4301	5718	28784	9909	700	39393	0		0	39393	20557	2401	3220	65571

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	194	53	16	157	123	123	0	0		58	5988	0	61	16	3053	74	9040	0	61
	NOV	161	48	13	126	119	119	0	0		17	5978	0	59	5	2989	22	8967	0	59
	DEC	182	53	15	144	123	123	0	0			5998	0	61	0	2927		8926	0	61
1972	JAN	149	57	12	104	123	123	0	0			5980	0	61	0	2866		8846	0	61
	FEB	133	50	11	94	111	111	0	0			5962	0	55	0	2811		8773	0	55
	MAR	304	113	25	216	123	123	0	0			6055	0	61	0	2749		8804	0	61
	APR	843	249	68	662	0	0	0	0			6717	0	59	0	2690		9407	0	59
	MAY	2786	647	226	2365	0	0	0	0		138	8944	0	361	30	2299	167	11243	0	361
	JUN	850	191	69	728	297	297	0	0		197	9178	0	59	27	2212	224	11390	0	59
	JUL	302	61	24	265	1909	1909	0	0		208	7326	0	61	27	2124	235	9450	0	61
	AUG	165	35	13	143	2469	2469	0	0		160	4840	0	61	25	2037	185	6877	0	61
	SEP	163	40	13	136	3	3	0	0		96	4877	0	59	21	1957	118	6834	0	59
	TOTAL	6232	1597	505	5140	5400	5400	0	0	0	874		0	1023	150		1025		0	1023
	OCT	181	44	15	152	123	123	0	0		51	4854	0	61	11	1885	62	6739	0	61
	NOV	159	42	13	130	119	119	0	0		15	4850	0	59	3	1822	18	6672	0	59
	DEC	133	35	11	109	123	123	0	0			4836	0	61	0	1761		6597	0	61
1973	JAN	107	33	9	83	123	123	0	0			4796	0	61	0	1699		6495	0	61
	FEB	100	29	8	79	111	111	0	0			4764	0	55	0	1644		6408	0	55
	MAR	136	40	11	107	123	123	0	0			4748	0	61	0	1583		6330	0	61
	APR	304	76	25	253	0	0	0	0			5000	0	59	0	1523		6524	0	59
	MAY	4726	1110	383	3999	0	0	0	0		117	8883	0	361	19	1143	135	10026	0	361
	JUN	2514	522	204	2196	134	134	0	0		196	10000	749	59	14	1818	210	11818	0	59
	JUL	597	122	48	523	1749	1749	0	0		219	8555	0	61	21	1736	240	10291	0	61
	AUG	263	54	21	230	1826	1826	0	0		175	6784	0	61	19	1655	195	8439	0	61
	SEP	219	47	18	190	969	969	0	0		117	5888	0	59	16	1580	132	7468	0	59
	TOTAL	9439	2154	765	8050	5400	5400	0	0	0	890		749	1023	103		993		0	1023
	OCT	177	55	14	136	123	123	0	0		57	5844	0	61	8	1510	66	7354	0	61
	NOV	153	51	12	114	119	119	0	0		17	5823	0	59	2	1448	19	7271	0	59
	DEC	155	52	13	116	123	123	0	0			5816	0	61	0	1387		7202	0	61
1974	JAN	139	60	11	90	123	123	0	0			5783	0	61	0	1325		7108	0	61
	FEB	116	47	9	78	111	111	0	0			5750	0	55	0	1270		7020	0	55
	MAR	134	50	11	95	123	123	0	0			5722	0	61	0	1208		6931	0	61
	APR	321	103	26	244	0	0	0	0			5966	0	59	0	1149		7115	0	59
	MAY	4634	1388	375	3621	0	0	0	0		129	9459	0	361	14	774	142	10233	0	361
	JUN	1119	291	91	919	922	922	0	0		203	9252	0	59	9	705	212	9958	0	59
	JUL	377	92	31	316	1766	1766	0	0		209	7592	0	61	9	635	218	8227	0	61
	AUG	185	46	15	154	1987	1987	0	0		163	5595	0	61	8	566	171	6161	0	61
	SEP	109	32	9	86	3	3	0	0		105	5574	0	59	6	501	110	6075	0	59
	TOTAL	7619	2267	617	5969	5400	5400	0	0	0	883		0	1023	56		939		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	149	211	395	606	177	359	0	686		686	0	23077	0	686	421	16	21	1144
	NOV	148	207	480	687	-77	105			56	56	0	23527	0	56	357	62	83	558
	DEC	163	225	327	552	66				0	0	0	24144	0	0	378	74	99	551
1972	JAN	225	286	246	532	1625				0	0	0	26302	0	0	297	46	62	405
	FEB	192	248	301	549	213				0	0	0	27063	0	0	338	41	55	434
	MAR	434	496	1300	1796	1050				0	0	0	29909	0	0	2650	141	189	2980
	APR	768	827	2440	3267	1314		0	684		684	0	33806	0	684	3670	191	256	4801
	MAY	1355	1717	6020	7737	2651	895	0	7389		7389	0	35910	0	7389	4520	319	428	12656
	JUN	372	432	1590	2022	1353	1101	3514	4043		7557	0	30626	0	7557	1420	178	239	9394
	JUL	87	148	462	610	-589	1100	13773	225		13998	0	15549	0	13998	424	15	20	14457
	AUG	58	119	319	438	775	781	8505	1295		9800	0	6181	0	9800	216	3	4	10023
	SEP	96	155	352	507	730	462	3861	1314		5175	0	1782	0	5175	267	4	6	5452
	TOTAL	4047	5070	14232	19302	9289	4804	29653	15636	56	45345	0		0	45345	14958	1091	1462	62856
	OCT	138	200	474	674	1383	204	0	400		400	0	3235	0	400	316	135	181	1032
	NOV	146	206	436	642	191	64			400	400	0	3603	0	400	239	64	86	789
	DEC	124	186	457	643	110				400	400	0	3955	0	400	275	68	91	834
1973	JAN	132	194	565	759	120				300	300	0	4534	0	300	308	68	91	767
	FEB	115	170	472	642	534				300	300	0	5410	0	300	287	61	82	730
	MAR	156	217	479	696	958				300	300	0	6765	0	300	506	99	133	1038
	APR	244	304	1153	1457	1509		0	159		159	0	9571	0	159	3240	395	530	4324
	MAY	3301	3663	21900	25563	8661	612	0	0		0	0	43183	0	0	17700	4620	6195	28515
	JUN	1234	1294	5340	6634	15300	1154	5654	9165		14819	0	49144	0	14819	4820	1490	1998	23127
	JUL	280	341	1087	1428	1137	1243	7032	3027		10059	0	40407	0	10059	1180	345	463	12047
	AUG	122	183	509	692	-196	1037	9312	665		9977	0	29889	0	9977	504	154	207	10842
	SEP	119	179	343	522	-289	728	6302	363		6665	0	22729	0	6665	319	109	146	7239
	TOTAL	6112	7135	33215	40350	29418	5041	28300	13779	1700	43779	0		0	43779	29694	7608	10202	91284
	OCT	135	196	443	639	-153	356	1581	561		2142	0	20717	0	2142	352	101	135	2730
	NOV	137	196	406	602	836	102			869	869	0	21184	0	869	309	89	119	1386
	DEC	142	204	357	561	657				472	472	0	21930	0	472	320	92	123	1007
1974	JAN	205	266	320	586	1815				430	430	0	23901	0	430	307	92	123	952
	FEB	151	206	326	532	334				389	389	0	24378	0	389	242	86	115	832
	MAR	151	213	462	675	1202				410	410	0	25844	0	410	644	119	160	1333
	APR	261	320	1335	1655	2425		0	1765		1765	0	28160	0	1765	3660	276	370	6071
	MAY	3209	3570	13000	16570	7023	850	0	6386		6386	0	44517	0	6386	10680	810	1086	18962
	JUN	511	571	2160	2731	1208	1163	1651	4798		6448	0	40845	0	6448	3200	144	193	9985
	JUL	136	198	868	1066	-93	1188	9661	1227		10888	0	29741	0	10888	739	55	74	11756
	AUG	71	132	420	552	-645	955	9733	0		9733	0	18961	0	9733	319	11	15	10078
	SEP	72	132	261	393	172	633	4804	591		5395	0	13497	0	5395	161	7	9	5571
	TOTAL	5181	6204	20358	26562	14780	5247	27430	15327	2570	45327	0		0	45327	20933	1882	2523	70665

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	135	36	11	110	123	123	0	0		55	5506	0	61	3	436	58	5942	0	61
	NOV	125	34	10	101	119	119	0	0		16	5472	0	59	1	376	17	5848	0	59
	DEC	92	28	7	71	123	123	0	0			5420	0	61	0	315		5735	0	61
1975	JAN	98	32	8	74	123	123	0	0			5371	0	61	0	254		5625	0	61
	FEB	93	29	8	72	111	111	0	0			5332	0	55	0	198		5530	0	55
	MAR	105	32	9	82	123	123	0	0			5290	0	61	0	137		5427	0	61
	APR	140	35	11	116	0	0	0	0			5406	0	59	0	77		5484	0	59
	MAY	2518	560	204	2162	0	0	0	285		122	7162	0	76	1	0	123	7162	0	361
	JUN	6523	1523	528	5528	304	304	0	59		173	10000	2153	0	0	2153	173	12153	0	59
	JUL	1104	265	89	928	1799	1799	0	0		219	8910	0	61	25	2067	244	10977	0	61
	AUG	393	93	32	332	1706	1706	0	0		179	7357	0	61	22	1983	202	9340	0	61
	SEP	223	53	18	188	869	869	0	0		122	6554	0	59	18	1906	140	8460	0	59
	TOTAL	11549	2720	935	9764	5400	5400	0	344	0	887		2153	678	70		957		0	1023
	OCT	234	74	19	179	123	123	0	0		61	6549	0	61	10	1835	70	8384	0	61
	NOV	183	64	15	134	119	119	0	0		18	6546	0	59	3	1772	21	8319	0	59
	DEC	189	63	15	141	123	123	0	0			6564	0	61	0	1711		8276	0	61
1976	JAN	144	62	12	94	123	123	0	0			6535	0	61	0	1650		8185	0	61
	FEB	130	55	11	86	111	111	0	0			6510	0	55	0	1594		8104	0	55
	MAR	132	49	11	94	123	123	0	0			6480	0	61	0	1533		8013	0	61
	APR	328	105	27	250	0	0	0	0			6730	0	59	0	1474		8203	0	59
	MAY	3708	1059	300	2949	0	0	0	0		138	9541	0	361	17	1095	155	10637	0	361
	JUN	930	239	75	766	559	559	0	0		204	9545	0	59	13	1023	217	10568	0	59
	JUL	374	91	30	313	1844	1844	0	0		213	7801	0	61	13	949	226	8750	0	61
	AUG	162	39	13	136	2272	2272	0	0		166	5498	0	61	11	876	177	6375	0	61
	SEP	96	29	8	75	3	3	0	0		104	5467	0	59	9	808	113	6275	0	59
	TOTAL	6610	1929	535	5216	5400	5400	0	0	0	903		0	1023	75		979		0	1023
	OCT	120	28	10	102	123	123	0	0		55	5391	0	61	4	742	59	6133	0	61
	NOV	105	24	9	90	119	119	0	0		16	5345	0	59	1	681	17	6027	0	59
	DEC	61	17	5	49	123	123	0	0			5271	0	61	0	620		5891	0	61
1977	JAN	77	19	6	64	123	123	0	0			5213	0	61	0	559		5771	0	61
	FEB	80	20	6	66	111	111	0	0			5168	0	55	0	503		5671	0	55
	MAR	92	23	7	76	123	123	0	0			5122	0	61	0	442		5563	0	61
	APR	388	96	31	323	0	0	0	0			5445	0	59	0	382		5827	0	59
	MAY	1126	117	91	1100	0	0	0	0		122	6423	0	361	5	16	127	6439	0	361
	JUN	461	86	37	412	14	14	0	43		163	6615	0	16	0	0	163	6615	0	59
	JUL	216	34	17	199	2642	2642	0	61		173	3939	0	0	0	0	173	3939	0	61
	AUG	108	18	9	99	2019	2019	0	61		113	1844	0	0	0	0	113	1844	0	61
	SEP	68	17	6	57	3	3	0	59		61	1777	0	0	0	0	61	1777	0	59
	TOTAL	2902	499	235	2638	5400	5400	0	226	0	703		0	797	11		714		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	98	159	347	506	639	302	6	1194		1200	0	13140	0	1200	313	40	54	1607
	NOV	99	158	503	661	213	88			800	800	0	13125	0	800	308	48	64	1220
	DEC	93	154	404	558	432				921	921	0	13194	0	921	206	31	42	1200
1975	JAN	110	171	409	580	507				700	700	0	13582	0	700	238	25	34	997
	FEB	95	151	388	539	745				600	600	0	14266	0	600	260	70	94	1024
	MAR	102	164	431	595	1585				600	600	0	15846	0	600	409	80	107	1196
	APR	85	144	485	629	1014		0	300		300	0	17189	0	300	1260	154	207	1921
	MAY	1088	1449	7520	8969	6427	729	0	200		200	0	31656	0	200	11590	1210	1623	14623
	JUN	3312	3371	17140	20511	12341	1064	4108	1320		5428	0	58016	0	5428	9600	1870	2508	19406
	JUL	612	673	1650	2323	6642	1297	4568	9832		14400	0	51284	0	14400	2500	508	681	18089
	AUG	207	269	691	960	-235	1099	11102	995		12097	0	38813	0	12097	908	111	149	13265
	SEP	120	179	583	762	-107	782	6595	784		7379	0	31307	0	7379	459	63	84	7985
	TOTAL	6021	7043	30551	37594	30203	5362	26379	14625	3621	44625	0		0	44625	28051	4210	5646	82531
	OCT	185	246	554	800	5	392	1577	923		2500	0	29221	0	2500	420	82	110	3112
	NOV	180	240	519	759	692	113			600	600	0	29958	0	600	390	87	117	1194
	DEC	170	231	550	781	339				500	500	0	30578	0	500	418	92	123	1133
1976	JAN	213	275	554	829	139				500	500	0	31046	0	500	410	95	127	1132
	FEB	186	242	533	775	395				400	400	0	31816	0	400	302	113	152	967
	MAR	149	211	624	835	563				430	430	0	32784	0	430	661	123	165	1379
	APR	267	327	1053	1380	2426		0	496		496	0	36093	0	496	2550	210	282	3538
	MAY	2281	2642	8740	11382	5186	911	0	5510		5510	0	46240	0	5510	4960	743	996	12209
	JUN	414	473	1710	2183	1198	1173	4927	4088		9015	0	39432	0	9015	1250	203	272	10740
	JUL	134	195	673	868	676	1177	10696	1796		12492	0	27307	0	12492	353	53	71	12969
	AUG	57	118	421	539	1740	931	7907	2354		10261	0	18395	0	10261	172	26	35	10494
	SEP	67	127	336	463	1086	627	2463	1564		4027	0	15289	0	4027	151	26	35	4239
	TOTAL	4304	5326	16267	21593	14445	5326	27570	16731	2430	46731	0		0	46731	12037	1853	2485	63106
	OCT	85	147	319	466	431	314	713	937		1650	0	14221	0	1650	194	32	43	1919
	NOV	70	130	338	468	94	90			678	678	0	14014	0	678	170	32	43	923
	DEC	68	129	331	460	-391				557	557	0	13527	0	557	90	4	6	657
1977	JAN	66	127	213	340	-343				492	492	0	13032	0	492	39	0	0	532
	FEB	66	121	175	296	378				393	393	0	13313	0	393	130	2	2	527
	MAR	82	143	191	334	1108				357	357	0	14398	0	357	215	6	8	585
	APR	325	384	1072	1456	428		0	1648		1648	0	14634	0	1648	338	104	139	2229
	MAY	-309	52	649	701	2752	693	2659	4192		6851	0	10543	0	6851	269	73	98	7291
	JUN	171	230	273	503	656	761	1612	1512		3124	0	7818	0	3124	116	8	10	3258
	JUL	32	93	189	282	742	732	2720	1162		3882	0	4227	0	3882	29	2	3	3916
	AUG	21	83	130	213	1185	562	967	1435		2402	0	2660	0	2402	1	1	1	2404
	SEP	55	115	95	210	322	400	780	529		1309	0	1483	0	1309	7	0	0	1316
	TOTAL	731	1754	3975	5729	7362	3554	9450	11416	2477	23343	0		0	23343	1598	263	353	25557

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	96	17	8	87	123	123	0	61		32	1647	0	0	0	0	32	1647	0	61
	NOV	104	18	8	94	119	119	0	59		9	1554	0	0	0	0	9	1554	0	59
	DEC	87	18	7	76	123	123	0	61			1445	0	0	0	0		1445	0	61
1978	JAN	84	17	7	74	123	123	0	61			1335	0	0	0	0		1335	0	61
	FEB	83	16	7	74	111	111	0	55			1242	0	0	0	0		1242	0	55
	MAR	103	21	8	90	123	123	0	61			1148	0	0	0	0		1148	0	61
	APR	582	114	47	515	0	0	0	59			1604	0	0	0	0		1604	0	59
	MAY	4143	715	336	3764	0	0	0	361		69	4937	0	0	0	0	69	4937	0	361
	JUN	5070	799	411	4682	537	537	0	59		140	8882	0	0	0	0	140	8882	0	59
	JUL	649	101	53	601	1892	1892	0	61		205	7325	0	0	0	0	205	7325	0	61
	AUG	378	60	31	349	1913	1913	0	61		160	5539	0	0	0	0	160	5539	0	61
	SEP	171	28	14	157	336	336	0	59		104	5196	0	0	0	0	104	5196	0	59
	TOTAL	11550	1924	936	10562	5400	5400	0	1023	0	719		0	0	0		719		0	1023
	OCT	34	6	3	31	219	219	0	61		53	4894	0	0	0	0	53	4894	0	61
	NOV	153	42	12	123	119	119	0	59		15	4824	0	0	0	0	15	4824	0	59
	DEC	97	28	8	77	123	123	0	61			4716	0	0	0	0		4716	0	61
1979	JAN	93	28	8	73	123	123	0	61			4604	0	0	0	0		4604	0	61
	FEB	88	25	7	70	111	111	0	55			4508	0	0	0	0		4508	0	55
	MAR	99	28	8	79	123	123	0	61			4403	0	0	0	0		4403	0	61
	APR	294	76	24	242	0	0	0	59			4585	0	0	0	0		4585	0	59
	MAY	4186	1006	339	3519	0	0	0	361		111	7632	0	0	0	0	111	7632	0	361
	JUN	2256	489	183	1950	523	523	0	59		180	8819	0	0	0	0	180	8819	0	59
	JUL	471	98	38	411	1825	1825	0	61		204	7140	0	0	0	0	204	7140	0	61
	AUG	247	52	20	215	1883	1883	0	61		158	5253	0	0	0	0	158	5253	0	61
	SEP	137	32	11	116	351	351	0	59		101	4858	0	0	0	0	101	4858	0	59
	TOTAL	8155	1910	661	6906	5400	5400	0	1023	0	821		0	0	0		821		0	1023
	OCT	139	22	11	128	123	123	0	61		51	4750	0	0	0	0	51	4750	0	61
	NOV	120	19	10	111	119	119	0	59		15	4668	0	0	0	0	15	4668	0	59
	DEC	116	21	9	104	123	123	0	61			4588	0	0	0	0		4588	0	61
1980	JAN	104	21	8	91	123	123	0	61			4495	0	0	0	0		4495	0	61
	FEB	99	19	8	88	111	111	0	55			4416	0	0	0	0		4416	0	55
	MAR	112	21	9	100	123	123	0	61			4332	0	0	0	0		4332	0	61
	APR	530	91	43	482	0	0	0	59			4754	0	0	0	0		4754	0	59
	MAY	4179	640	338	3877	0	0	0	361		113	8157	0	0	0	0	113	8157	0	361
	JUN	5391	753	437	5075	364	364	0	59		187	10000	2622	0	0	2622	187	12622	0	59
	JUL	727	101	59	685	1827	1827	0	0		219	8639	0	61	30	2531	249	11170	0	61
	AUG	302	42	24	284	1799	1799	0	0		176	6948	0	61	28	2442	204	9390	0	61
	SEP	235	33	19	221	688	688	0	0		118	6363	0	59	22	2360	141	8723	0	59
	TOTAL	12054	1783	976	11247	5400	5400	0	841	0	880		2622	182	80		959		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	63	125	178	303	714	201	73	1042		1115	0	1184	0	1115	99	0	1	1215
	NOV	68	127	209	336	98	58			373	373	0	1187	0	373	161	1	1	536
	DEC	88	149	321	470	-117				368	368	0	1172	0	368	181	0	1	550
1978	JAN	80	142	338	480	-124				368	368	0	1160	0	368	184	0	0	552
	FEB	73	129	329	458	-143				333	333	0	1141	0	333	167	0	0	501
	MAR	101	162	889	1051	1475				155	155	0	3512	0	155	926	16	21	1118
	APR	515	574	2030	2604	3340		0	0		0	0	9457	0	0	5650	170	228	6048
	MAY	2716	3078	14480	17558	4229	610	0	0		0	0	30634	0	0	10710	669	897	12276
	JUN	2558	2618	9310	11928	5085	1054	0	8465		8465	0	38127	0	8465	3500	341	457	12763
	JUL	313	375	1236	1611	-92	1167	9342	2058		11400	0	27078	0	11400	736	23	31	12190
	AUG	197	259	414	673	-360	929	8050	600		8650	0	17812	0	8650	303	7	9	8969
	SEP	99	159	383	542	-465	621	4426	174		4600	0	12667	0	4600	194	1	2	4797
	TOTAL	6872	7895	30117	38012	13639	4640	21892	12338	1597	35827	0		0	35827	22811	1229	1649	61516
	OCT	9	71	348	419	361	297	491	749		1240	0	11910	0	1240	223	1	1	1465
	NOV	138	197	304	501	674	86			218	218	0	12781	0	218	285	1	2	506
	DEC	96	158	220	378	1051				244	244	0	13965	0	244	291	1	2	538
1979	JAN	99	161	33	194	1479				184	184	0	15454	0	184	108	1	1	293
	FEB	86	141	55	196	1213				424	424	0	16440	0	424	199	1	1	624
	MAR	93	154	248	402	1264				184	184	0	17922	0	184	450	5	6	645
	APR	234	294	1214	1508	1604		1800	3294		5094	0	15940	0	5094	3390	157	211	8852
	MAY	2761	3122	14350	17472	5134	712	198	0		198	0	37636	0	198	9820	1430	1918	13366
	JUN	1100	1160	5010	6170	7817	1115	386	12790		13176	0	37331	0	13176	2980	611	819	17586
	JUL	198	259	1051	1310	-296	1161	8611	1364		9975	0	27209	0	9975	984	137	184	11280
	AUG	112	173	403	576	396	930	6312	1126		7438	0	19813	0	7438	395	69	93	7995
	SEP	84	143	249	392	-449	642	6815	0		6815	0	12299	0	6815	171	18	24	7028
	TOTAL	5010	6033	23485	29518	20247	4943	24613	19323	1254	45190	0		0	45190	19296	2431	3260	70177
	OCT	101	162	272	434	614	294	1070	1115		2185	0	10868	0	2185	220	10	13	2428
	NOV	90	150	345	495	499	83			421	421	0	11357	0	421	269	9	12	711
	DEC	111	172	379	551	645				439	439	0	12114	0	439	194	8	10	651
1980	JAN	124	185	370	555	1521				406	406	0	13784	0	406	321	4	6	737
	FEB	113	168	365	533	1106				372	372	0	15052	0	372	292	3	4	671
	MAR	115	176	381	557	1723				921	921	0	16411	0	921	352	3	4	1279
	APR	464	523	3614	4137	1120		0	5680		5680	0	15988	0	5680	5010	385	516	11591
	MAY	2753	3114	22640	25754	5031	713	0	0		0	0	46061	0	0	17070	3410	4573	25053
	JUN	2725	2785	11970	14755	6393	1172	8795	7482		16277	0	49759	0	16277	4590	1520	2038	24425
	JUL	365	426	1610	2036	1810	1246	6990	4470		11460	0	40899	0	11460	1540	249	334	13583
	AUG	148	209	648	857	103	1040	8808	1183		9991	0	30829	0	9991	542	28	38	10599
	SEP	125	184	592	776	1088	735	1778	2026		3804	0	28154	0	3804	695	18	24	4541
	TOTAL	7233	8255	43186	51441	21653	5284	27441	21956	2559	51956	0		0	51956	31095	5646	7572	96269

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	196	55	16	157	123	123	0	0		60	6337	0	61	12	2287	72	8624	0	61
	NOV	165	50	13	128	119	119	0	0		18	6329	0	59	3	2224	21	8553	0	59
	DEC	138	42	11	107	123	123	0	0			6313	0	61	0	2162		8475	0	61
1981	JAN	113	40	9	82	123	123	0	0			6272	0	61	0	2101		8373	0	61
	FEB	106	36	9	79	111	111	0	0			6240	0	55	0	2046		8285	0	55
	MAR	162	56	13	119	123	123	0	0			6236	0	61	0	1984		8220	0	61
	APR	891	268	72	695	0	0	0	0			6931	0	59	0	1925		8856	0	59
	MAY	2753	649	223	2327	0	0	0	0		140	9118	0	361	21	1542	162	10660	0	361
	JUN	1214	283	98	1029	620	620	0	0		199	9328	0	59	18	1464	217	10792	0	59
	JUL	361	78	29	312	1942	1942	0	0		210	7488	0	61	18	1385	228	8872	0	61
	AUG	189	42	15	162	2113	2113	0	0		162	5375	0	61	17	1307	179	6682	0	61
	SEP	149	38	12	123	3	3	0	0		102	5393	0	59	13	1234	116	6627	0	59
	TOTAL	6437	1637	521	5321	5400	5400	0	0	0	891		0	1023	103		995		0	1023
	OCT	205	44	17	178	123	123	0	0		54	5393	0	61	7	1166	61	6559	0	61
	NOV	147	33	12	126	119	119	0	0		16	5384	0	59	2	1104	18	6489	0	59
	DEC	101	24	8	85	123	123	0	0			5346	0	61	0	1043		6389	0	61
1982	JAN	80	18	6	68	123	123	0	0			5292	0	61	0	982		6274	0	61
	FEB	76	16	6	66	111	111	0	0			5247	0	55	0	926		6173	0	55
	MAR	102	24	8	86	123	123	0	0			5210	0	61	0	865		6075	0	61
	APR	664	152	54	566	0	0	0	0			5776	0	59	0	805		6582	0	59
	MAY	5446	1150	441	4737	0	0	0	0		126	10000	387	361	10	821	136	10821	0	361
	JUN	3227	591	261	2897	604	604	0	0		210	10000	2083	59	9	2836	219	12836	0	59
	JUL	788	146	64	706	1749	1749	0	0		219	8738	0	61	32	2742	251	11480	0	61
	AUG	360	67	29	322	1837	1837	0	0		177	7045	0	61	30	2651	207	9697	0	61
	SEP	357	65	29	321	488	488	0	0		119	6759	0	59	24	2568	143	9327	0	59
	TOTAL	11553	2330	936	10159	5400	5400	0	0	0	922		2470	1023	114		1035		0	1023
	OCT	453	37	37	453	123	123	0	0		62	7027	0	61	13	2494	74	9521	0	61
	NOV	322	31	26	317	119	119	0	0		19	7207	0	59	4	2431	22	9638	0	59
	DEC	268	22	22	268	123	123	0	0			7351	0	61	0	2370		9721	0	61
1983	JAN	167	19	14	162	123	123	0	0			7390	0	61	0	2308		9698	0	61
	FEB	149	17	12	144	111	111	0	0			7423	0	55	0	2253		9676	0	55
	MAR	213	22	17	208	123	123	0	0			7508	0	61	0	2191		9700	0	61
	APR	350	29	28	349	0	0	0	0			7858	0	59	0	2132		9989	0	59
	MAY	2961	203	240	2998	0	0	0	0		151	10000	705	361	22	2453	173	12453	0	361
	JUN	9328	638	756	9446	979	979	0	0		210	10000	8257	59	27	4500	237	14500	6123	6182
	JUL	1841	132	149	1858	1708	1708	0	0		219	9931	0	61	48	4391	267	14322	0	61
	AUG	548	39	44	553	1189	1189	0	0		191	9105	0	61	41	4288	232	13393	0	61
	SEP	399	27	32	404	801	801	0	0		138	8569	0	59	33	4196	171	12765	0	59
	TOTAL	16999	1216	1377	17160	5400	5400	0	0	0	989		8961	1023	187		1176		6123	7146

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	152	214	530	744	97	380	365	936		1301	0	27313	0	1301	419	9	12	1741
	NOV	154	213	445	658	499	111			298	298	0	28061	0	298	330	8	11	647
	DEC	130	191	689	880	381				307	307	0	29015	0	307	244	4	5	560
1981	JAN	144	205	381	586	500				307	307	0	29795	0	307	298	3	3	611
	FEB	126	182	568	750	505				278	278	0	30772	0	278	327	3	4	612
	MAR	198	259	743	1002	686				446	446	0	32014	0	446	460	10	13	929
	APR	815	874	2510	3384	690		0	1210		1210	0	34878	0	1210	1770	159	213	3352
	MAY	1323	1684	3770	5454	3005	903	0	8910		8910	0	33524	0	8910	1880	47	63	10900
	JUN	561	620	2690	3310	-316	1081	4605	3964		8569	0	26868	0	8569	1440	7	9	10024
	JUL	125	186	528	714	130	1059	9122	1095		10217	0	16436	0	10217	468	3	4	10691
	AUG	75	136	283	419	1219	795	7030	1739		8769	0	8511	0	8769	139	1	1	8910
	SEP	90	149	397	546	-39	499	1476	571		2047	0	6473	0	2047	168	1	2	2218
	TOTAL	3892	4914	13534	18448	7357	4828	22598	18425	1636	42659	0		0	42659	7943	254	340	51196
	OCT	159	221	460	681	1364	248	0	672		672	0	7597	0	672	404	2	2	1080
	NOV	129	188	403	591	858	76			300	300	0	8670	0	300	368	2	2	672
	DEC	100	161	419	580	696				300	300	0	9647	0	300	121	3	3	427
1982	JAN	72	133	355	488	1605				300	300	0	11440	0	300	103	3	3	409
	FEB	57	112	315	427	1262				300	300	0	12829	0	300	116	3	3	422
	MAR	99	160	401	561	1314				300	300	0	14404	0	300	579	3	4	886
	APR	594	654	2560	3214	2480		0	300		300	0	19798	0	300	5360	140	188	5988
	MAY	4023	4384	14400	18784	20575	763	0	0		0	0	58394	0	0	19740	1950	2615	24305
	JUN	1603	1662	5440	7102	16848	1245	11151	11132		22283	0	58815	0	22283	4960	737	988	28969
	JUL	404	466	1420	1886	4340	1302	6281	6870		13151	0	50587	0	13151	1410	110	148	14819
	AUG	186	247	712	959	884	1095	7192	2104		9296	0	42039	0	9296	668	14	19	9997
	SEP	177	236	642	878	983	798	3875	2123		5998	0	37105	0	5998	486	22	30	6536
	TOTAL	7602	8625	27527	36152	53207	5527	28500	23200	1500	53200	0		0	53200	34315	2987	4005	94508
	OCT	377	439	810	1249	1115	411	0	813		813	0	38245	0	813	664	34	46	1557
	NOV	374	433	1019	1452	1320	122			298	298	0	40597	0	298	589	17	23	927
	DEC	232	294	610	904	374				684	684	0	41191	0	684	486	8	10	1188
1983	JAN	265	327	557	884	1065				921	921	0	42218	0	921	435	6	8	1371
	FEB	230	285	491	776	1495				832	832	0	43658	0	832	289	6	8	1135
	MAR	283	344	679	1023	1430				921	921	0	45190	0	921	573	27	36	1557
	APR	289	348	1452	1800	2653		0	4743		4743	0	44900	0	4743	3080	175	235	8233
	MAY	1532	1894	14190	16084	10536	962	0	0		0	0	65700	4857	4857	21680	3570	4787	34895
	JUN	4764	10947	29310	40257	34952	1294	2812	0		2812	0	65700	71104	73915	12440	4990	6692	98037
	JUL	1092	1153	3170	4323	12022	1350	8613	13867		22480	0	58215	0	22480	2530	703	943	26656
	AUG	308	369	1449	1818	1779	1136	5853	4089		9942	0	50734	0	9942	1400	277	371	11990
	SEP	195	254	1001	1255	1831	835	9067	3431		12498	0	40488	0	12498	648	136	182	13464
	TOTAL	9941	17087	54738	71825	70572	6110	26344	26944	3656	56944	0		75961	132905	44814	9949	13342	201009

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	361	62	29	328	123	123	0	0		71	8704	0	61	18	4117	89	12820	0	61
	NOV	262	52	21	231	119	119	0	0		21	8795	0	59	5	4052	26	12847	0	59
	DEC	313	55	25	283	123	123	0	0			8955	0	61	0	3991		12946	0	61
1984	JAN	192	48	16	160	123	123	0	0			8992	0	61	0	3930		12921	0	61
	FEB	171	42	14	143	111	111	0	0			9023	0	55	0	3874		12898	0	55
	MAR	197	42	16	171	123	123	0	0			9071	0	61	0	3813		12884	0	61
	APR	380	66	31	345	0	0	0	0			9416	0	59	0	3753		13170	0	59
	MAY	7142	1215	579	6506	0	0	0	0		167	10000	5754	361	34	4500	201	14500	4613	4974
	JUN	6656	956	539	6239	14	14	0	0		210	10000	6016	59	46	4500	256	14500	5910	5970
	JUL	1002	147	81	936	2004	2004	0	0		219	8714	0	61	48	4391	267	13104	0	61
	AUG	443	65	36	414	1794	1794	0	0		177	7156	0	61	45	4284	222	11441	0	61
	SEP	304	44	25	285	866	866	0	0		120	6454	0	59	37	4188	157	10642	0	59
	TOTAL	17423	2794	1411	16040	5400	5400	0	0	0	985		11770	1023	232		1218		10523	11545
	OCT	333	71	27	289	123	123	0	0		60	6560	0	61	20	4107	80	10667	0	61
	NOV	239	58	19	200	119	119	0	0		18	6624	0	59	6	4042	24	10665	0	59
	DEC	268	58	22	232	123	123	0	0			6732	0	61	0	3980		10712	0	61
1985	JAN	182	55	15	142	123	123	0	0			6751	0	61	0	3919		10670	0	61
	FEB	146	43	12	115	111	111	0	0			6755	0	55	0	3863		10618	0	55
	MAR	176	46	14	144	123	123	0	0			6776	0	61	0	3802		10578	0	61
	APR	1675	379	136	1432	0	0	0	0			8208	0	59	0	3743		11950	0	59
	MAY	6282	1303	509	5488	0	0	0	0		155	10000	3541	361	37	4500	191	14500	2386	2747
	JUN	1733	302	140	1571	14	14	0	0		210	10000	1348	59	46	4500	256	14500	1242	1302
	JUL	657	115	53	595	1468	1468	0	0		219	8909	0	61	48	4391	267	13299	0	61
	AUG	311	55	25	281	1815	1815	0	0		179	7196	0	61	44	4285	224	11481	0	61
	SEP	218	40	18	196	1382	1382	0	0		121	5889	0	59	37	4189	158	10078	0	59
	TOTAL	12220	2525	990	10685	5400	5400	0	0	0	961		4889	1023	237		1199		3628	4651
	OCT	231	46	19	204	123	123	0	0		57	5912	0	61	21	4107	78	10019	0	61
	NOV	202	45	16	173	119	119	0	0		17	5950	0	59	6	4041	23	9991	0	59
	DEC	196	41	16	171	123	123	0	0			5998	0	61	0	3980		9978	0	61
1986	JAN	150	41	12	121	123	123	0	0			5996	0	61	0	3919		9914	0	61
	FEB	151	42	12	121	111	111	0	0			6006	0	55	0	3863		9869	0	55
	MAR	243	63	20	200	123	123	0	0			6083	0	61	0	3802		9884	0	61
	APR	1050	224	85	911	0	0	0	0			6994	0	59	0	3742		10736	0	59
	MAY	6624	1315	537	5846	0	0	0	0		141	10000	2698	361	39	4500	180	14500	1540	1901
	JUN	5312	896	430	4846	14	14	0	0		210	10000	4623	59	46	4500	256	14500	4517	4577
	JUL	644	107	52	589	1784	1784	0	0		219	8587	0	61	48	4391	267	12977	0	61
	AUG	324	55	26	295	1865	1865	0	0		175	6841	0	61	45	4284	221	11125	0	61
	SEP	252	43	20	229	1015	1015	0	0		117	5938	0	59	38	4187	155	10125	0	59
	TOTAL	15379	2918	1246	13707	5400	5400	0	0	0	936		7321	1023	243		1179		6057	7080

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	296	357	806	1163	1910	420	9180	3340		12520	0	30621	0	12520	619	175	235	13549
	NOV	289	348	680	1028	2931	115			891	891	0	33575	0	891	470	125	168	1654
	DEC	269	330	628	958	2020				0	0	0	36553	0	0	502	111	149	762
1984	JAN	321	383	619	1002	1200				0	0	0	38755	0	0	472	91	122	685
	FEB	281	337	716	1053	460				0	0	0	40268	0	0	568	115	154	837
	MAR	256	317	743	1060	3143				921	921	0	43550	0	921	875	171	229	2196
	APR	318	378	2217	2595	1542		0	4422		4422	0	43265	0	4422	4530	528	708	10188
	MAY	5724	10698	27130	37828	25226	954	0	0		0	0	65700	39665	39665	25560	3920	5257	74402
	JUN	3381	9350	12110	21460	35747	1294	3027	6746		9773	0	65700	46141	55914	6560	1370	1837	65681
	JUL	544	605	2550	3155	7925	1350	5160	11955		17115	0	58315	0	17115	2070	491	658	20334
	AUG	240	301	1026	1327	1706	1137	4360	3386		7746	0	52466	0	7746	1300	246	330	9622
	SEP	154	214	811	1025	153	842	6462	1403		7865	0	44938	0	7865	591	155	208	8819
	TOTAL	12074	23619	50036	73655	83965	6111	28188	31253	1812	61253	0		85806	147059	44117	7498	10055	208729
	OCT	272	333	939	1272	1119	431	3363	2619		5982	0	40916	0	5982	732	205	275	7194
	NOV	258	317	852	1169	1077	124			891	891	0	42148	0	891	517	167	224	1799
	DEC	232	294	716	1010	2412				792	792	0	44778	0	792	396	131	176	1495
1985	JAN	298	360	560	920	1000				0	0	0	46697	0	0	437	152	204	793
	FEB	223	279	350	629	1412				0	0	0	48738	0	0	350	94	126	570
	MAR	222	283	954	1237	1572				792	792	0	50755	0	792	1200	205	275	2472
	APR	1578	1638	5560	7198	4354		0	6264		6264	0	56042	0	6264	9660	294	394	16612
	MAY	4862	7609	13300	20909	17085	1017	0	1389		1389	0	65700	25930	27319	10960	1630	2186	42095
	JUN	829	2130	2920	5050	8628	1294	2599	13948		16548	0	61537	0	16548	2520	498	668	20233
	JUL	319	380	1106	1486	1643	1320	7213	3663		10876	0	52470	0	10876	1020	181	243	12320
	AUG	153	214	576	790	293	1105	10838	1303		12141	0	40307	0	12141	442	70	94	12747
	SEP	118	178	535	713	93	789	3511	942		4453	0	35870	0	4453	379	90	121	5043
	TOTAL	9364	14015	28368	42383	40688	6080	27525	30128	2475	60128	0		25930	86058	28613	3717	4984	123372
	OCT	182	244	654	898	1354	407	0	672		672	0	37043	0	672	413	89	119	1293
	NOV	207	266	521	787	1525	121			300	300	0	38934	0	300	384	82	110	876
	DEC	176	238	434	672	1334				615	615	0	40325	0	615	328	94	126	1163
1986	JAN	227	288	608	896	1359				615	615	0	41965	0	615	329	72	97	1113
	FEB	236	291	597	888	1946				300	300	0	44499	0	300	1130	151	202	1783
	MAR	333	395	2097	2492	2005				921	921	0	48075	0	921	3380	340	456	5097
	APR	969	1028	6370	7398	5630		0	2807		2807	0	58296	0	2807	10050	1010	1354	15222
	MAY	5204	7106	17510	24616	16161	1028	0	0		0	0	65700	32345	32345	14090	2560	3433	52428
	JUN	2684	7260	6640	13900	20110	1294	6062	9863		15925	0	65700	16791	32717	4260	1160	1556	39692
	JUL	311	372	2010	2382	2210	1350	6787	5120		11907	0	57035	0	11907	1440	282	378	14007
	AUG	163	224	902	1126	1106	1130	9308	2466		11774	0	46364	0	11774	612	128	172	12686
	SEP	133	192	708	900	662	817	5093	1732		6825	0	40285	0	6825	532	130	174	7661
	TOTAL	10824	17904	39051	56955	55403	6146	27249	22661	2751	52661	0		49136	101797	36948	6098	8177	153021

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	296	111	24	209	123	123	0	0		57	5967	0	61	21	4105	78	10072	0	61
	NOV	231	99	19	151	119	119	0	0		17	5981	0	59	6	4040	23	10021	0	59
	DEC	170	67	14	117	123	123	0	0			5975	0	61	0	3978		9953	0	61
1987	JAN	89	37	7	59	123	123	0	0			5911	0	61	0	3917		9828	0	61
	FEB	81	31	7	57	111	111	0	0			5857	0	55	0	3861		9718	0	55
	MAR	109	45	9	73	123	123	0	0			5807	0	61	0	3800		9607	0	61
	APR	1083	433	88	738	0	0	0	0			6545	0	59	0	3741		10285	0	59
	MAY	2577	783	209	2003	0	0	0	0		136	8412	0	361	40	3339	176	11751	0	361
	JUN	757	227	61	591	850	850	0	0		190	7963	0	59	39	3240	229	11203	0	59
	JUL	396	115	32	313	1796	1796	0	0		192	6288	0	61	41	3138	233	9426	0	61
	AUG	215	64	17	168	2030	2030	0	0		147	4280	0	61	39	3038	185	7318	0	61
	SEP	152	51	12	113	3	3	0	0		90	4301	0	59	32	2947	122	7247	0	59
	TOTAL	6156	2063	499	4592	5400	5400	0	0	0	829		0	1023	218		1047		0	1023
	OCT	144	47	12	109	123	123	0	0		48	4238	0	61	16	2869	64	7107	0	61
	NOV	126	42	10	94	119	119	0	0		14	4200	0	59	5	2805	19	7004	0	59
	DEC	99	37	8	70	123	123	0	0			4147	0	61	0	2743		6890	0	61
1988	JAN	102	41	8	69	123	123	0	0			4093	0	61	0	2682		6775	0	61
	FEB	98	39	8	67	111	111	0	0			4049	0	55	0	2627		6675	0	55
	MAR	125	49	10	86	123	123	0	0			4012	0	61	0	2565		6577	0	61
	APR	564	199	46	411	0	0	0	0			4423	0	59	0	2506		6928	0	59
	MAY	3714	1132	301	2883	0	0	0	0		109	7196	0	361	31	2113	140	9310	0	361
	JUN	958	263	78	773	657	657	0	0		174	7139	0	59	28	2026	201	9165	0	59
	JUL	358	92	29	295	1804	1804	0	0		180	5449	0	61	28	1937	208	7386	0	61
	AUG	209	56	17	170	2214	2214	0	0		135	3270	0	61	26	1850	161	5119	0	61
	SEP	142	43	12	111	3	3	0	0		79	3299	0	59	21	1769	99	5068	0	59
	TOTAL	6639	2040	538	5137	5400	5400	0	0	0	739		0	1023	155		893		0	1023
	OCT	153	49	12	116	123	123	0	0		42	3250	0	61	11	1697	53	4948	0	61
	NOV	167	59	14	122	119	119	0	0		12	3241	0	59	3	1635	15	4876	0	59
	DEC	150	53	12	109	123	123	0	0			3227	0	61	0	1574		4800	0	61
1989	JAN	121	51	10	80	123	123	0	0			3183	0	61	0	1512		4696	0	61
	FEB	101	39	8	70	111	111	0	0			3143	0	55	0	1457		4600	0	55
	MAR	166	67	13	112	123	123	0	0			3132	0	61	0	1395		4528	0	61
	APR	1312	462	106	956	0	0	0	0			4088	0	59	0	1336		5424	0	59
	MAY	2470	649	200	2021	0	0	0	0		105	6005	0	361	17	957	122	6962	0	361
	JUN	763	202	62	623	735	735	0	0		156	5737	0	59	14	884	170	6621	0	59
	JUL	368	92	29	305	1758	1758	0	0		159	4125	0	61	14	809	173	4934	0	61
	AUG	180	46	15	149	2183	2183	0	0		116	1974	0	61	12	736	128	2710	0	61
	SEP	161	47	13	127	3	3	0	0	68	63	1968	0	59	9	668	72	2635	0	127
	TOTAL	6112	1816	494	4790	5400	5400	0	0	68	653		0	1023	79		733		0	1091

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	239	300	712	1012	1268	419	0	496		496	0	41650	0	496	559	188	252	1495
	NOV	247	307	570	877	460	124			0	0	0	42863	0	0	438	82	110	630
	DEC	154	216	500	716	1029				0	0	0	44607	0	0	359	46	62	467
1987	JAN	91	152	444	596	1506				0	0	0	46710	0	0	344	52	70	466
	FEB	69	125	340	465	1334				0	0	0	48509	0	0	302	48	64	414
	MAR	110	172	454	626	1763				0	0	0	50897	0	0	723	113	152	988
	APR	1002	1062	2400	3462	2361		0	1101		1101	0	55619	0	1101	2760	841	1128	5830
	MAY	1147	1509	3720	5229	2811	1015	0	7535		7535	0	55108	0	7535	2740	665	892	11832
	JUN	324	383	915	1298	887	1226	4771	2717		7488	0	48579	0	7488	942	416	558	9404
	JUL	148	209	481	690	1429	1239	6868	2371		9239	0	40220	0	9239	466	172	231	10108
	AUG	91	152	318	470	246	1035	5762	823		6585	0	33316	0	6585	290	94	126	7095
	SEP	91	150	258	408	135	751	4034	597		4631	0	28478	0	4631	218	46	62	4957
	TOTAL	3713	4736	11112	15848	15230	5810	21434	15641	0	37075	0		0	37075	10141	2763	3705	53684
	OCT	105	167	342	509	357	382	696	913		1609	0	27353	0	1609	245	83	111	2048
	NOV	99	158	371	529	656	111			0	0	0	28427	0	0	238	128	172	538
	DEC	98	159	332	491	1200				0	0	0	30118	0	0	249	76	102	427
1988	JAN	119	180	306	486	1406				0	0	0	32010	0	0	285	66	89	440
	FEB	109	165	320	485	704				0	0	0	33199	0	0	286	57	76	419
	MAR	136	197	458	655	1320				0	0	0	35174	0	0	614	171	229	1014
	APR	496	556	9043	9599	-4850		0	0		0	0	39923	0	0	3070	548	735	4353
	MAY	2287	2649	4980	7629	4967	935	0	4895		4895	0	46688	0	4895	4050	982	1317	11244
	JUN	427	487	1800	2287	1271	1176	4899	4271		9170	0	39900	0	9170	1170	313	420	11073
	JUL	123	184	612	796	57	1181	9920	1087		11007	0	28565	0	11007	489	121	162	11779
	AUG	87	148	395	543	-267	944	7531	385		7916	0	19982	0	7916	181	47	63	8207
	SEP	86	146	454	600	-204	644	3391	447		3838	0	15895	0	3838	160	33	44	4075
	TOTAL	4173	5196	19413	24609	6616	5372	26438	11997	0	38435	0		0	38435	11037	2625	3520	55617
	OCT	115	176	283	459	108	318	126	622		748	0	15396	0	748	211	49	66	1074
	NOV	156	216	252	468	357	93			276	276	0	15852	0	276	196	52	70	594
	DEC	139	200	344	544	1032				124	124	0	17305	0	124	181	59	79	443
1989	JAN	161	223	209	432	974				124	124	0	18586	0	124	141	63	84	412
	FEB	116	171	181	352	1245				112	112	0	20071	0	112	177	81	109	479
	MAR	206	267	203	470	2403				124	124	0	22820	0	124	810	151	202	1287
	APR	1224	1283	2440	3723	2127		0	3947		3947	0	24723	0	3947	2950	201	270	7368
	MAY	1039	1400	4280	5680	1460	817	995	8800		9795	0	21251	0	9795	1610	108	145	11658
	JUN	327	387	800	1187	1181	944	5061	2931		7992	0	14683	0	7992	549	38	51	8630
	JUL	131	192	237	429	-508	877	8844	165		9009	0	4718	0	9009	209	14	19	9251
	AUG	68	130	367	497	443	574	4138	1027		5165	80	0	0	5085	121	4	6	5216
	SEP	94	221	451	672	-242	349	2357	430		2787	2706	0	0	81	114	7	10	213
	TOTAL	3776	4866	10047	14913	10580	3971	21521	17922	760	40203	2786		0	37417	7269	828	1110	46623

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	132	59	11	83	123	123	0	0		33	1894	0	61	4	602	38	2496	0	61
	NOV	230	72	19	178	119	119	0	0		10	1943	0	59	1	541	11	2485	0	59
	DEC	114	64	9	60	123	123	0	0			1880	0	61	0	480		2360	0	61
1990	JAN	101	62	8	47	123	123	0	0			1804	0	61	0	419		2222	0	61
	FEB	97	48	8	57	111	111	0	0			1749	0	55	0	363		2113	0	55
	MAR	128	82	10	56	123	123	0	0			1683	0	61	0	302		1984	0	61
	APR	1120	561	91	650	0	0	0	0			2332	0	59	0	242		2575	0	59
	MAY	2564	787	208	1985	0	0	0	0		80	4237	0	61	3	177	84	4414	0	61
	JUN	913	244	74	742	657	657	0	0		129	4193	0	59	3	115	132	4309	0	59
	JUL	401	112	32	321	1804	1647	157	0		134	2734	0	61	2	52	136	2785	0	61
	AUG	174	56	14	133	2214	0	2214	10	72	95	2689	0	51	1	0	96	2689	0	133
	SEP	127	57	10	80	3	0	3	59	21	72	2617	0	0	0	0	72	2617	0	80
	TOTAL	6100	2204	499	4390	5400	3026	2374	70	93	553		0	653	15		567		0	816
	OCT	150	70	12	93	123	123	0	61	32	38	2455	0	0	0	0	38	2455	0	93
	NOV	165	165	13	13	119	119	0	59		11	2280	0	0	0	0	11	2280	0	59
	DEC	120	66	10	63	123	123	0	61			2158	0	0	0	0		2158	0	61
1991	JAN	106	64	9	50	123	123	0	61			2024	0	0	0	0		2024	0	61
	FEB	104	64	8	49	111	111	0	55			1907	0	0	0	0		1907	0	55
	MAR	125	77	10	59	123	123	0	61			1781	0	0	0	0		1781	0	61
	APR	660	660	53	53	0	0	0	59			1775	0	0	0	0		1775	0	59
	MAY	3864	1220	313	2958	0	0	0	361		72	4299	0	0	0	0	72	4299	0	361
	JUN	2537	448	206	2294	735	735	0	59		130	5670	0	0	0	0	130	5670	0	59
	JUL	567	185	46	428	1758	1758	0	61		158	4120	0	0	0	0	158	4120	0	61
	AUG	296	77	24	243	2183	2183	0	61		116	2002	0	0	0	0	116	2002	0	61
	SEP	249	62	20	207	3	3	0	59		63	2084	0	0	0	0	63	2084	0	59
	TOTAL	8944	3159	718	6509	5400	5400	0	1023	32	588		0	0	0		588		0	1055
	OCT	154	24	13	143	123	123	0	61	82	34	1926	0	0	0	0	34	1926	0	143
	NOV	145	14	12	143	119	119	0	59		10	1880	0	0	0	0	10	1880	0	59
	DEC	124	21	10	113	123	123	0	61			1809	0	0	0	0		1809	0	61
1992	JAN	90	21	7	76	123	123	0	61			1700	0	0	0	0		1700	0	61
	FEB	82	20	7	68	111	111	0	55			1601	0	0	0	0		1601	0	55
	MAR	141	23	11	129	123	123	0	61			1546	0	0	0	0		1546	0	61
	APR	741	38	60	763	0	0	0	59			2250	0	0	0	0		2250	0	59
	MAY	1705	641	138	1201	0	0	0	61		79	3311	0	0	0	0	79	3311	0	61
	JUN	654	421	53	286	735	611	124	59		114	2812	0	0	0	0	114	2812	0	59
	JUL	263	82	21	203	1758	0	1758	61	142	110	2701	0	0	0	0	110	2701	0	203
	AUG	136	46	11	101	2183	0	2183	61	40	94	2606	0	0	0	0	94	2606	0	101
	SEP	118	40	10	87	3	0	3	59		71	2563	0	0	0	0	71	2563	0	59
	TOTAL	4351	1392	352	3311	5400	1333	4067	723	264	512		0	0	0		512		0	987

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	95	157	250	407	-429	185	1224	0		1224	1224	-207	0	0	162	54	73	290
	NOV	245	305	291	596	209	54			179	179	0	365	0	179	136	25	34	375
	DEC	110	171	304	475	238				191	191	0	887	0	191	152	19	26	389
1990	JAN	117	178	259	438	301				204	204	0	1421	0	204	153	23	31	411
	FEB	106	162	149	311	459				51	51	0	2140	0	51	130	21	28	229
	MAR	141	202	187	389	882				176	176	0	3235	0	176	372	58	78	684
	APR	1037	1097	3193	4290	4305		0	2195		2195	0	9635	0	2195	3190	972	1303	7661
	MAY	1134	1195	5452	6647	1286	613	0	7638		7638	0	9317	0	7638	2270	551	739	11198
	JUN	404	463	1754	2217	736	735	1511	3636		5147	0	6387	0	5147	725	320	429	6622
	JUL	151	213	727	940	456	698	6431	1656		8087	1001	0	0	7086	328	121	162	7697
	AUG	64	198	358	556	14	458	3085	569		3654	3542	0	0	112	161	52	70	395
	SEP	80	160	296	456	221	349	618	677		1295	967	0	0	328	133	28	38	527
	TOTAL	3685	4501	13220	17721	8677	3091	12870	16370	801	30041	6734		0	23307	7912	2246	3012	36477
	OCT	112	205	305	510	-177	185	57	332		389	241	0	0	148	147	50	67	411
	NOV	101	160	287	447	-25	54			141	141	0	226	0	141	123	66	89	419
	DEC	114	176	282	457	-345				114	114	0	225	0	114	120	37	49	320
1991	JAN	129	190	362	552	351				432	432	0	696	0	432	109	25	34	600
	FEB	123	179	377	556	192				111	111	0	1333	0	111	112	22	30	275
	MAR	137	199	430	629	884				40	40	0	2805	0	40	168	47	63	318
	APR	270	329	1787	2116	2210		0	1170		1170	0	5961	0	1170	1200	214	287	2871
	MAY	2438	2799	6625	9424	5335	544	0	5929		5929	0	14246	0	5929	4270	1035	1388	12623
	JUN	1246	1305	3920	5225	4728	832	0	6286		6286	0	17081	0	6286	2890	773	1037	10986
	JUL	260	321	1123	1444	-624	919	8194	1186		9380	0	7601	0	9380	791	196	262	10629
	AUG	144	205	471	676	220	636	5968	1077		7045	0	815	0	7045	341	89	119	7593
	SEP	131	191	361	552	328	365	2779	1027		3806	2476	0	0	1330	218	45	60	1654
	TOTAL	5203	6258	16328	22586	13076	3537	16998	17007	838	34843	2717		0	32126	10489	2599	3485	48699
	OCT	115	259	67	326	-286	185	2421	39		2460	2460	-145	0	0	183	42	57	282
	NOV	126	185	434	619	595	54			301	301	0	713	0	301	197	52	70	620
	DEC	118	179	344	523	353				307	307	0	1282	0	307	186	61	81	635
1992	JAN	93	154	291	446	657				307	307	0	2077	0	307	185	83	111	686
	FEB	70	125	271	397	529				288	288	0	2715	0	288	191	87	117	684
	MAR	163	225	539	764	1098				40	40	0	4537	0	40	641	119	160	961
	APR	669	728	2118	2847	834		0	2594		2594	0	5624	0	2594	1130	77	103	3904
	MAY	272	333	1867	2200	285	537	3230	3625		6855	0	716	0	6855	834	56	75	7820
	JUN	270	329	715	1044	-961	522	4644	309		4953	4676	0	0	277	384	27	36	723
	JUL	61	265	425	690	102	523	1093	791		1884	1616	0	0	268	163	11	15	457
	AUG	39	141	126	267	99	458	585	365		950	950	-92	0	0	43	1	2	46
	SEP	76	136	196	331	402	347	0	506		506	212	0	0	294	83	5	7	390
	TOTAL	2072	3059	7393	10451	3707	2626	11973	8229	1243	21445	9913		0	11532	4220	622	834	17209

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	235	195	19	59	123	123	0	61		37	2401	0	0	0	0	37	2401	0	61
	NOV	203	203	14	14	119	119	0	59		11	2226	0	0	0	0	11	2226	0	59
	DEC	174	174	13	13	123	123	0	61			2054	0	0	0	0		2054	0	61
1993	JAN	128	128	10	10	123	123	0	61			1880	0	0	0	0		1880	0	61
	FEB	127	104	10	32	111	111	0	55			1746	0	0	0	0		1746	0	55
	MAR	234	222	19	32	123	123	0	61			1593	0	0	0	0		1593	0	61
	APR	1085	1085	88	88	0	0	0	59			1622	0	0	0	0		1622	0	59
	MAY	5968	1116	483	5335	0	0	0	361		70	6526	0	0	0	0	70	6526	0	361
	JUN	2602	421	211	2392	735	735	0	59		164	7960	0	0	0	0	164	7960	0	59
	JUL	632	200	51	483	1758	1758	0	61		192	6432	0	0	0	0	192	6432	0	61
	AUG	305	106	25	224	2183	2183	0	61		149	4263	0	0	0	0	149	4263	0	61
	SEP	226	124	18	120	3	3	0	59		90	4231	0	0	0	0	90	4231	0	59
	TOTAL	11920	4079	962	8802	5400	5400	0	1023	0	712		0	0	0		712		0	1023
	OCT	183	27	15	171	123	123	0	61		48	4170	0	0	0	0	48	4170	0	61
	NOV	142	17	12	136	119	119	0	59		14	4114	0	0	0	0	14	4114	0	59
	DEC	134	16	11	129	123	123	0	61			4058	0	0	0	0		4058	0	61
1994	JAN	99	20	8	86	123	123	0	61			3960	0	0	0	0		3960	0	61
	FEB	94	23	8	79	111	111	0	55			3872	0	0	0	0		3872	0	55
	MAR	129	38	10	101	123	123	0	61			3789	0	0	0	0		3789	0	61
	APR	652	99	53	606	0	0	0	59			4335	0	0	0	0		4335	0	59
	MAY	3411	1079	276	2609	0	0	0	361		108	6475	0	0	0	0	108	6475	0	361
	JUN	936	401	76	611	735	735	0	59		163	6129	0	0	0	0	163	6129	0	59
	JUL	294	86	24	232	1758	1758	0	61		165	4376	0	0	0	0	165	4376	0	61
	AUG	206	41	17	182	2183	2183	0	61		120	2193	0	0	0	0	120	2193	0	61
	SEP	162	26	13	148	3	3	0	59		66	2214	0	0	0	0	66	2214	0	59
	TOTAL	6439	1872	522	5089	5400	5400	0	1023	0	683		0	0	0		683		0	1023
	OCT	217	76	18	158	123	123	0	61		35	2152	0	0	0	0	35	2152	0	61
	NOV	148	64	12	97	119	119	0	59		10	2060	0	0	0	0	10	2060	0	59
	DEC	154	62	12	104	123	123	0	61			1980	0	0	0	0		1980	0	61
1995	JAN	121	49	10	82	123	123	0	61			1878	0	0	0	0		1878	0	61
	FEB	113	44	9	78	111	111	0	55			1790	0	0	0	0		1790	0	55
	MAR	196	60	16	152	123	123	0	61			1757	0	0	0	0		1757	0	61
	APR	570	292	46	324	0	0	0	59			2021	0	0	0	0		2021	0	59
	MAY	4413	1129	357	3642	0	0	0	361		76	5226	0	0	0	0	76	5226	0	361
	JUN	6590	253	534	6871	735	735	0	59		145	10000	1158	0	0	1158	145	11158	0	59
	JUL	1329	77	108	1360	1758	1758	0	0		219	9383	0	61	14	1083	233	10466	0	61
	AUG	513	65	42	489	2183	2183	0	0		185	7504	0	61	12	1010	196	8514	0	61
	SEP	284	60	23	247	3	3	0	0		124	7625	0	59	9	941	133	8566	0	59
	TOTAL	14646	2230	1186	13602	5400	5400	0	841	0	793		1158	182	35		828		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	186	247	224	471	162	185	0	422		422	0	26	0	422	147	0	0	569
	NOV	143	202	212	414	753	55			232	232	0	906	0	232	272	0	0	504
	DEC	132	193	245	438	571				335	335	0	1580	0	335	207	0	0	542
1993	JAN	175	236	217	453	804				309	309	0	2527	0	309	187	16	22	534
	FEB	177	232	156	388	996				279	279	0	3631	0	279	176	37	50	543
	MAR	318	380	399	779	1457				177	177	0	5690	0	177	853	75	101	1205
	APR	815	874	1301	2175	3597		0	0		0	0	11463	0	0	5251	366	490	6107
	MAY	4547	4908	17739	22647	8265	644	0	0		0	0	41731	0	0	14915	1935	2595	19446
	JUN	1279	1339	4942	6281	4842	1144	0	4642		4642	0	47068	0	4642	3748	557	747	9695
	JUL	302	364	1123	1487	221	1230	8913	2130		11043	0	36503	0	11043	970	193	259	12465
	AUG	150	211	541	752	1069	1010	6594	1984		8578	0	28736	0	8578	465	74	100	9217
	SEP	121	181	307	487	132	720	4834	680		5514	0	23122	0	5514	260	51	68	5893
	TOTAL	8345	9368	27405	36773	22868	4988	20341	9858	1332	31531	0		0	31531	27451	3305	4432	66720
	OCT	140	201	365	566	365	358	63	1040		1103	0	22591	0	1103	330	34	46	1513
	NOV	122	181	211	392	474	105			373	373	0	22980	0	373	308	40	53	773
	DEC	125	187	275	462	1141				307	307	0	24277	0	307	295	34	46	681
1994	JAN	113	174	325	499	472				307	307	0	24940	0	307	202	59	79	646
	FEB	99	154	998	1152	495				273	273	0	26314	0	273	237	41	54	606
	MAR	143	204	1536	1740	-315				53	53	0	27686	0	53	712	72	96	934
	APR	582	641	2228	2869	799		0	2548		2548	0	28806	0	2548	1538	255	342	4684
	MAY	1983	2344	4002	6346	3458	856	0	8436		8436	0	29318	0	8436	1743	548	735	11462
	JUN	416	476	962	1438	780	1041	6988	2769		9758	0	20737	0	9758	606	518	695	11576
	JUL	81	143	344	487	-573	977	10821	84		10905	0	8768	0	10905	163	126	169	11363
	AUG	85	146	207	353	293	660	7044	766		7810	0	944	0	7810	88	77	103	8079
	SEP	95	154	97	251	-126	367	2129	214		2343	1642	0	0	701	83	12	16	810
	TOTAL	3983	5006	11549	16554	7263	4365	27046	15857	1313	44217	1642		0	42574	6306	1814	2433	53128
	OCT	170	231	236	467	831	185	0	599		599	0	513	0	599	204	0	0	804
	NOV	130	190	235	424	629	56			649	649	0	861	0	649	189	5	7	850
	DEC	142	203	260	463	692				307	307	0	1709	0	307	222	0	0	528
1995	JAN	163	224	276	501	934				180	180	0	2963	0	180	210	9	13	411
	FEB	144	200	359	559	642				111	111	0	4054	0	111	278	36	48	473
	MAR	254	316	1196	1511	2408				123	123	0	7850	0	123	822	76	102	1123
	APR	502	561	2816	3377	1571		0	331		331	0	12467	0	331	2578	224	301	3434
	MAY	2987	3349	12337	15686	5292	660	0	123		123	0	32663	0	123	12030	1171	1570	14894
	JUN	3346	3405	14731	18137	6522	1074	6336	6036		12372	0	43876	0	12372	6653	1400	1878	22303
	JUL	758	819	2289	3109	6431	1209	9600	10838		20438	0	31768	0	20438	1792	536	719	23485
	AUG	285	346	657	1003	2068	973	7816	3499		11315	0	22552	0	11315	749	63	84	12210
	SEP	146	205	528	733	442	669	4879	1363		6242	0	16817	0	6242	496	100	133	6971
	TOTAL	9027	10050	35920	45970	28461	4826	28631	22788	1369	52788	0		0	52788	26224	3620	4854	87486

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	179	37	15	156	123	123	0	0		66	7592	0	61	5	875	71	8467	0	61
	NOV	162	26	13	149	119	119	0	0		19	7603	0	59	1	814	21	8417	0	59
	DEC	140	28	11	123	123	123	0	0			7603	0	61	0	753		8356	0	61
1996	JAN	92	28	7	71	123	123	0	0			7551	0	61	0	692		8243	0	61
	FEB	99	25	8	82	111	111	0	0			7522	0	55	0	636		8158	0	55
	MAR	140	46	11	105	123	123	0	0			7504	0	61	0	575		8079	0	61
	APR	427	94	35	367	0	0	0	0			7872	0	59	0	515		8387	0	59
	MAY	5177	756	419	4840	0	0	0	0		151	10000	2561	361	6	2709	157	12709	0	361
	JUN	2465	1165	200	1500	735	735	0	0		210	10000	556	59	29	3176	239	13176	0	59
	JUL	519	242	42	319	1758	1758	0	0		219	8343	0	61	35	3079	254	11422	0	61
	AUG	206	88	17	134	2183	2183	0	0		173	6121	0	61	34	2984	206	9105	0	61
	SEP	142	45	11	109	3	3	0	0		110	6117	0	59	28	2896	138	9013	0	59
	TOTAL	9748	2581	790	7957	5400	5400	0	0	0	948		3116	1023	138		1086		0	1023
	OCT	144	37	12	119	123	123	0	0		58	6055	0	61	15	2820	73	8875	0	61
	NOV	167	38	14	143	119	119	0	0		17	6062	0	59	4	2757	21	8818	0	59
	DEC	147	32	12	127	123	123	0	0			6066	0	61	0	2695		8761	0	61
1997	JAN	116	21	9	104	123	123	0	0			6047	0	61	0	2634		8681	0	61
	FEB	114	25	9	98	111	111	0	0			6034	0	55	0	2579		8613	0	55
	MAR	166	34	13	145	123	123	0	0			6057	0	61	0	2517		8574	0	61
	APR	634	93	51	593	0	0	0	0			6650	0	59	0	2458		9108	0	59
	MAY	7428	1089	602	6941	0	0	0	0		137	10000	3454	361	27	4500	164	14500	1023	1384
	JUN	3025	343	245	2927	735	735	0	0		210	10000	1982	59	46	4500	256	14500	1877	1936
	JUL	543	69	44	517	1758	1758	0	0		219	8541	0	61	48	4391	267	12931	0	61
	AUG	248	28	20	241	2183	2183	0	0		175	6423	0	61	45	4284	220	10707	0	61
	SEP	255	25	21	251	3	3	0	0		113	6558	0	59	39	4186	152	10744	0	59
	TOTAL	12987	1833	1052	12206	5400	5400	0	0	0	929		5436	1023	224		1153		2900	3922
	OCT	210	19	17	208	123	123	0	0		61	6582	0	61	20	4105	81	10687	0	61
	NOV	170	25	14	158	119	119	0	0		18	6604	0	59	6	4040	24	10643	0	59
	DEC	168	22	14	160	123	123	0	0			6640	0	61	0	3978		10619	0	61
1998	JAN	130	21	10	119	123	123	0	0			6636	0	61	0	3917		10553	0	61
	FEB	140	20	11	131	111	111	0	0			6656	0	55	0	3861		10517	0	55
	MAR	204	29	16	191	123	123	0	0			6724	0	61	0	3800		10524	0	61
	APR	642	97	52	597	0	0	0	0			7321	0	59	0	3741		11062	0	59
	MAY	4626	1081	375	3919	0	0	0	0		145	10000	1096	361	39	4436	183	14436	0	361
	JUN	2818	370	228	2677	735	735	0	0		210	10000	1733	59	45	4500	255	14500	1564	1624
	JUL	759	64	61	756	1758	1758	0	0		219	8780	0	61	48	4391	267	13171	0	61
	AUG	337	30	27	335	2183	2183	0	0		178	6754	0	61	45	4285	222	11039	0	61
	SEP	240	32	19	228	3	3	0	0		116	6863	0	59	38	4187	154	11050	0	59
	TOTAL	10443	1810	846	9479	5400	5400	0	0	0	946		2829	1023	240		1186		1564	2587

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	137	198	560	758	-184	324	2919	669		3587	0	13479	0	3587	479	118	158	4342
	NOV	150	209	473	682	760	89			770	770	0	14063	0	770	444	97	130	1441
	DEC	130	192	379	570	1075				614	614	0	15095	0	614	404	18	24	1060
1996	JAN	97	158	513	672	780				351	351	0	16195	0	351	233	23	30	638
	FEB	112	168	518	686	1255				832	832	0	17304	0	832	281	51	68	1232
	MAR	162	224	948	1171	793				921	921	0	18347	0	921	589	86	115	1712
	APR	363	423	3505	3927	2031		0	6267		6267	0	18039	0	6267	4604	565	758	12193
	MAY	3753	4115	13626	17741	7269	740	1571	0		1571	0	40738	0	1571	11110	1819	2439	16939
	JUN	1209	1268	3291	4559	4271	1138	0	8138		8138	0	40293	0	8138	2412	537	719	11805
	JUL	228	290	895	1185	1132	1184	8831	2574		11405	0	30021	0	11405	804	126	169	12504
	AUG	85	146	438	584	-75	957	10221	582		10803	0	18769	0	10803	296	74	99	11273
	SEP	86	146	399	545	316	631	2971	910		3881	0	15118	0	3881	267	29	38	4215
	TOTAL	6513	7536	25544	33080	19425	5063	26512	19140	3488	49140	0		0	49140	21924	3541	4749	79353
	OCT	106	168	444	612	438	313	457	1107		1564	0	14290	0	1564	327	33	44	1969
	NOV	157	217	484	700	1057	91			495	495	0	15462	0	495	325	72	96	988
	DEC	136	198	325	522	1394				0	0	0	17378	0	0	263	0	0	263
1997	JAN	152	213	322	535	1617				0	0	0	19530	0	0	261	26	34	321
	FEB	147	202	381	583	1249				644	644	0	20719	0	644	229	38	51	961
	MAR	204	266	638	904	2067				921	921	0	22769	0	921	1983	120	161	3185
	APR	565	624	2988	3612	5065		0	0		0	0	31446	0	0	6890	428	574	7892
	MAY	6011	7395	15468	22862	13889	878	192	0		192	0	65700	1428	1620	16450	2275	3050	23395
	JUN	1499	3435	4247	7682	6951	1294	3101	11444		14545	0	64494	0	14545	3754	917	1230	20447
	JUL	244	305	1062	1367	1256	1341	9027	3079		12106	0	53671	0	12106	1271	281	377	14034
	AUG	113	174	770	944	566	1111	4033	1690		5722	0	48347	0	5722	675	77	104	6579
	SEP	134	193	709	902	2180	825	5122	3273		8395	0	42209	0	8395	560	93	125	9173
	TOTAL	9467	13390	27837	41227	37728	5853	21932	20593	2060	44584	0		1428	46012	32987	4360	5847	89206
	OCT	164	225	580	805	1038	424	5931	1989		7920	0	35707	0	7920	471	256	343	8990
	NOV	161	220	501	721	667	120			0	0	0	36976	0	0	391	38	51	480
	DEC	153	214	344	559	597				0	0	0	38131	0	0	239	30	41	309
1998	JAN	182	243	331	575	1484				0	0	0	40190	0	0	206	46	62	314
	FEB	209	264	453	717	493				0	0	0	41400	0	0	232	37	49	318
	MAR	267	328	696	1024	1738				921	921	0	43242	0	921	1172	98	131	2323
	APR	573	632	2020	2652	1817		1209	5007		6216	0	41495	0	6216	4384	572	766	11937
	MAY	3201	3562	11417	14979	9227	944	22	0		22	0	64735	0	22	13504	1839	2466	17831
	JUN	1392	3016	6683	9698	5502	1287	1297	11985		13282	0	65367	0	13282	3249	910	1221	18662
	JUL	385	447	2609	3055	551	1348	7346	4301		11646	0	55979	0	11646	1191	161	216	13214
	AUG	171	232	691	923	1751	1124	8487	2948		11435	0	46094	0	11435	570	72	97	12173
	SEP	128	187	447	634	667	816	4788	1469		6257	0	40322	0	6257	400	66	89	6811
	TOTAL	6984	9571	26771	36342	25532	6062	29079	27698	921	57698	0		0	57698	26007	4125	5532	93363

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	197	33	16	180	123	123	0	0		62	6858	0	61	20	4106	82	10964	0	61
	NOV	167	28	14	152	119	119	0	0		18	6872	0	59	6	4041	24	10914	0	59
	DEC	85	28	7	64	123	123	0	0			6813	0	61	0	3980		10793	0	61
1999	JAN	67	27	5	46	123	123	0	0			6736	0	61	0	3919		10655	0	61
	FEB	85	30	7	62	111	111	0	0			6687	0	55	0	3863		10550	0	55
	MAR	127	41	10	96	123	123	0	0			6660	0	61	0	3802		10462	0	61
	APR	339	105	27	262	0	0	0	0			6922	0	59	0	3742		10665	0	59
	MAY	3776	636	306	3446	0	0	0	0		140	10000	228	361	39	3569	180	13569	0	361
	JUN	2882	363	233	2751	735	735	0	0		210	10000	1807	59	38	4500	247	14500	779	839
	JUL	618	102	50	566	1758	1758	0	0		219	8589	0	61	48	4391	267	12980	0	61
	AUG	416	45	34	404	2183	2183	0	0		176	6635	0	61	45	4284	221	10919	0	61
	SEP	293	32	24	285	3	3	0	0		115	6803	0	59	38	4187	153	10989	0	59
	TOTAL	9052	1471	733	8315	5400	5400	0	0	0	940		2035	1023	234		1174		779	1802
	OCT	158	41	13	130	123	123	0	0		62	6748	0	61	20	4106	82	10853	0	61
	NOV	139	38	11	112	119	119	0	0		18	6723	0	59	6	4040	24	10763	0	59
	DEC	94	19	8	83	123	123	0	0			6682	0	61	0	3979		10661	0	61
2000	JAN	82	11	7	78	123	123	0	0			6638	0	61	0	3918		10555	0	61
	FEB	80	17	7	70	111	111	0	0			6596	0	55	0	3862		10458	0	55
	MAR	123	29	10	104	123	123	0	0			6577	0	61	0	3801		10378	0	61
	APR	821	66	67	821	0	0	0	0			7398	0	59	0	3741		11140	0	59
	MAY	3179	711	257	2725	0	0	0	0		146	9977	0	361	38	3342	184	13319	0	361
	JUN	1040	513	84	611	735	735	0	0		209	9644	0	59	36	3247	245	12891	0	59
	JUL	322	106	26	242	1758	1758	0	0		214	7914	0	61	37	3148	251	11063	0	61
	AUG	196	77	16	135	2183	2183	0	0		167	5699	0	61	35	3052	203	8751	0	61
	SEP	150	53	12	108	3	3	0	0		106	5700	0	59	30	2963	135	8662	0	59
	TOTAL	6383	1681	517	5220	5400	5400	0	0	0	923		0	1023	201		1124		0	1023
	OCT	153	49	12	117	123	123	0	0		56	5637	0	61	15	2886	71	8524	0	61
	NOV	127	45	10	92	119	119	0	0		16	5594	0	59	4	2822	21	8416	0	59
	DEC	38	35	3	7	123	123	0	0			5478	0	61	0	2761		8239	0	61
2001	JAN	46	30	4	19	123	123	0	0			5374	0	61	0	2700		8073	0	61
	FEB	58	27	5	36	111	111	0	0			5299	0	55	0	2644		7943	0	55
	MAR	131	46	11	96	123	123	0	0			5271	0	61	0	2583		7854	0	61
	APR	907	308	73	672	0	0	0	0			5944	0	59	0	2523		8467	0	59
	MAY	3624	879	294	3039	0	0	0	0		128	8854	0	361	29	2133	158	10987	0	361
	JUN	696	212	56	540	735	735	0	0		196	8464	0	59	25	2048	221	10512	0	59
	JUL	277	67	22	232	1758	1758	0	0		199	6739	0	61	26	1960	225	8700	0	61
	AUG	184	42	15	157	2183	2183	0	0		153	4561	0	61	24	1875	177	6436	0	61
	SEP	110	39	9	80	3	3	0	0		93	4545	0	59	20	1796	113	6341	0	59
	TOTAL	6353	1780	515	5087	5400	5400	0	0	0	841		0	1023	144		986		0	1023

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	153	214	435	649	106	419	4176	873		5049	0	35608	0	5049	482	159	214	5904
	NOV	157	216	552	769	984	119			198	198	0	37044	0	198	386	63	85	732
	DEC	87	148	462	610	536				307	307	0	37883	0	307	260	22	30	619
1999	JAN	42	103	428	531	614				307	307	0	38722	0	307	257	63	85	712
	FEB	79	134	96	230	842				277	277	0	39517	0	277	182	45	60	564
	MAR	140	201	439	640	2596				426	426	0	42327	0	426	816	76	102	1419
	APR	278	337	1326	1663	1555		0	1980		1980	0	43565	0	1980	1241	223	299	3743
	MAY	2349	2710	8323	11033	7953	955	0	1967		1967	0	59628	0	1967	5929	366	490	8753
	JUN	1424	2263	4378	6641	5024	1253	22	12988		13010	0	57030	0	13010	2982	769	1031	17791
	JUL	293	355	1105	1460	1056	1291	8428	3020		11447	0	46807	0	11447	755	158	212	12572
	AUG	222	283	559	842	1215	1075	5045	2400		7445	0	40344	0	7445	398	77	103	8023
	SEP	150	209	421	630	636	790	4037	1491		5528	0	35292	0	5528	284	67	90	5969
	TOTAL	5372	7175	18522	25696	23117	5902	21707	24720	1515	47941	0		0	47941	13973	2088	2800	66802
	OCT	118	180	525	705	-773	405	6026	0		6026	0	28792	0	6026	253	124	166	6570
	NOV	118	177	625	802	-796	113			789	789	0	27898	0	789	234	102	136	1260
	DEC	93	155	505	660	476				309	309	0	28724	0	309	254	0	0	563
2000	JAN	76	138	563	701	1082				309	309	0	30198	0	309	197	9	13	528
	FEB	67	123	529	652	1435				20	20	0	32265	0	20	147	39	52	257
	MAR	133	194	543	737	954				0	0	0	33957	0	0	602	68	91	762
	APR	747	806	2406	3212	1278		0	1054		1054	0	37393	0	1054	2447	271	364	4136
	MAY	1750	2111	4610	6721	4279	920	0	7789		7789	0	39684	0	7789	2449	629	843	11711
	JUN	470	529	1325	1854	1263	1130	5746	3669		9415	0	32256	0	9415	731	576	772	11494
	JUL	100	161	517	679	645	1116	8765	1504		10269	0	22194	0	10269	221	62	82	10634
	AUG	79	140	346	486	63	874	7185	623		7808	0	14061	0	7808	125	76	103	8112
	SEP	89	149	355	504	233	577	851	786		1637	0	12584	0	1637	130	4	5	1776
	TOTAL	3840	4863	12850	17713	10139	5134	28573	15426	1427	45426	0		0	45426	7790	1960	2628	57804
	OCT	114	176	395	570	757	296	0	659		659	0	12957	0	659	243	11	14	927
	NOV	100	160	450	609	962	88			579	579	0	13862	0	579	188	48	64	878
	DEC	49	111	346	456	339				309	309	0	14348	0	309	176	32	42	559
2001	JAN	0	61	227	288	2754				309	309	0	17081	0	309	202	18	24	554
	FEB	14	70	305	375	773				279	279	0	17950	0	279	209	37	49	575
	MAR	147	208	457	666	1573				0	0	0	20189	0	0	773	76	102	952
	APR	830	890	1859	2749	2125		0	80		80	0	24983	0	80	2429	267	358	3134
	MAY	2197	2558	5383	7941	3698	820	0	4594		4594	0	31209	0	4594	3149	639	857	9239
	JUN	292	351	1259	1610	740	1060	5673	2831		8504	0	23995	0	8504	843	509	682	10538
	JUL	70	132	459	590	759	1023	7143	1520		8663	0	15659	0	8663	386	26	35	9111
	AUG	71	132	306	439	1560	783	5266	2095		7361	0	9514	0	7361	265	78	104	7808
	SEP	73	132	213	345	481	514	3253	847		4100	0	5726	0	4100	134	35	47	4316
	TOTAL	3959	4981	11659	16640	16523	4584	21335	12625	1477	35437	0		0	35437	8997	1775	2380	48589

Water Supply Pool Capacity (acre-feet) = 10000
Min. Streamflow Pool Capacity (acre-feet) = 4500

Table C-9

Future With Narrows Project
Simulated Operation Study
(Unit--acre-feet)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
		Narrows Reservoir Operation																		
Year	Month	Natural Flow Gooseberry Creek Nr. Fairview	Diversion by Cottonwood-Gooseberry	Other Inflow to Narrows Reservoir	Net Inflow to Narrows Reservoir	Project Irrigation Demand	Project Irrigation Release	Project Irrigation Shortage	Release from Wtr Sply Pool for Min. Streamflow	Bypass of Direct Flow Rights	Evaporation (Water Supply Pool)	End of Month Contents (Water Supply Pool)	Inflow to Min. Streamflow Pool	Fishery Release to Gooseberry Creek	Evaporation (Min. Streamflow Pool)	End of Month Contents (Min. Streamflow Pool)	Evaporation	Total End of Month Contents	Spills	Stream Flow Below Narrows Dam
	OCT	92	28	7	72	123	123	0	0		50	4445	0	61	10	1724	60	6169	0	61
	NOV	121	23	10	108	119	119	0	0		14	4420	0	59	3	1662	17	6082	0	59
	DEC	79	7	6	79	123	123	0	0			4376	0	61	0	1600		5976	0	61
2002	JAN	56	2	5	59	123	123	0	0			4311	0	61	0	1539		5851	0	61
	FEB	46	6	4	44	111	111	0	0			4244	0	55	0	1484		5728	0	55
	MAR	58	29	5	34	123	123	0	0			4155	0	61	0	1422		5577	0	61
	APR	740	179	60	621	0	0	0	0			4776	0	59	0	1363		6138	0	59
	MAY	2448	625	198	2021	0	0	0	0		114	6683	0	361	17	984	131	7668	0	361
	JUN	503	99	41	444	735	735	0	0		166	6226	0	59	14	911	180	7138	0	59
	JUL	232	36	19	215	1758	1758	0	0		167	4517	0	61	14	836	180	5353	0	61
	AUG	114	27	9	95	2183	2183	0	0		122	2307	0	61	12	763	134	3070	0	61
	SEP	104	18	8	94	3	3	0	0		67	2332	0	59	9	694	76	3026	0	59
	TOTAL	4593	1079	372	3886	5400	5400	0	0	0	700		0	1023	79		778		0	1023
	AVERAGE	9039	1875	732	7896	5400	5250	150	190	26	844	6036	1765	819	135	2200	979	8236	899	1933

Table C-9

Future With Narrows Project
Simulated Operation Study

A	B	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
					Scofield Reservoir Operation														
Year	Month	Reach Gains Between Dam Site and Gooseberry nr. Scofield	Stream Flow at Gooseberry Nr. Scofield	Reach Gains Above Fish Creek Above Reservoir	Stream Flow at Fish Creek Above Reservoir	Other Inflow to Scofield Reservoir	Evaporation	Irrigation Season Demand on Storage	Direct Flow Rights Releases	Non-Irrigation Season Demand on Storage	Total Demand on Storage	Shortage	End of Month Contents	Spills	Total Flow in Price River below Scofield Dam	White River	Beaver Creek	Lower Fish Creek Below Scofield Gains	Price River Above PRWID Treatment Plant
	OCT	61	122	332	454	855	241	2373	1321		3693	0	3101	0	3693	185	23	31	3932
	NOV	92	152	245	397	1702	64			709	709	0	4427	0	709	201	65	87	1061
	DEC	82	144	166	309	605				309	309	0	5032	0	309	174	16	22	522
2002	JAN	16	78	189	267	720				309	309	0	5710	0	309	183	16	21	530
	FEB	0	55	162	217	3732				279	279	0	9380	0	279	184	35	47	545
	MAR	25	86	350	437	1676				210	210	0	11283	0	210	296	65	88	659
	APR	668	727	1764	2492	1491		0	1012		1012	0	14253	0	1012	1378	196	263	2850
	MAY	1017	1378	3836	5215	2838	688	3133	9167		12299	0	9319	0	12299	1099	406	545	14349
	JUN	192	251	1111	1362	1206	735	4503	2952		7455	0	3696	0	7455	372	441	592	8861
	JUL	41	103	286	389	-290	629	938	252		1190	0	1976	0	1190	87	32	43	1352
	AUG	25	86	173	259	1657	508	444	1951		2395	0	990	0	2395	10	77	104	2586
	SEP	70	130	277	407	1637	368	0	1350		1350	0	1316	0	1350	53	5	7	1415
	TOTAL	2290	3312	8891	12203	17829	3233	11390	18004	1816	31210	0		0	31210	4222	1379	1849	38660
	AVERAGE	5679	7612	22231	29843	21672	4892	22903	17414	1769	42085	871	24124	5568	46783	19718	3033	4067	73600

Average June 30 Contents = 36115

Narrows Project
Future With Narrows Project Operation Study
Explanation of Columns

Introduction

The Future With Project operation study is intended to show the flows of Gooseberry and Fish Creeks and the Price River below Scofield Dam and the operation of Scofield Reservoir under the future with Narrows Project conditions.

The study is based on historical hydrologic data from the 1960 through 2002 period and relies on information in the Future Without Project Operation Study, the Scofield Reservoir Historical Operation Study, and the Scofield Reservoir Demand Study.

Column Explanation

Column

A Year - data in the study is grouped according to water years with the water year beginning in October.

B Month - monthly values are provided for each year of the study.

C Natural Flow of Gooseberry Creek Near Fairview - the calculated natural flow of Gooseberry Creek at the USGS gaging station "Gooseberry Creek Near Fairview, Utah" (Sta. No. 09309800). Equal to Column C of the Future Without Project operation study.

D Diversion by Cottonwood-Gooseberry - the amount of Column C that was stored in Fairview Lakes or diverted through the Fairview Tunnel or Fairview Ditch as described under Column C, item 3. Equal to Column D of the Future Without Project operation study.

E Other Inflow to Narrows Reservoir - inflow to the reservoir below the "Gooseberry Creek Near Fairview, Utah" gage. Equal to Column F of the Future Without Project operation study.

F Net Inflow to Narrows Reservoir - Column C plus Column E minus Column D.

G Project Irrigation Demand - based on the remaining demand after existing supplies with a maximum release through Narrows Tunnel of 50 cfs. The 1984 Compromise Agreement limits this release to 5,400 acre-feet per year.

H Project Irrigation Release - equal to Column G provided there is sufficient water from Narrows Reservoir and inflow, otherwise it is limited to Narrows Reservoir contents plus inflow.

I Project Irrigation Shortage - Column G minus Column H.

Column Explanation (continued)

Column

J Release from Water Supply Pool for Minimum Streamflow - when there is insufficient water in the minimum streamflow pool, a minimum release of 1 cfs for fish habitat plus 300 acre-feet per year supplemental release for fish and channel maintenance is made from the water supply pool in Narrows Reservoir. The 300 acre-feet release is assumed to occur each year in May.

K Bypass of Direct Flow Rights - the amount of inflow bypassed for downstream direct flow rights when there is insufficient storage in Scofield Reservoir to satisfy those demands. These bypasses only occur when Scofield Reservoir is empty and there are unmet direct flow rights demands. The direct flow demands were identified in the Scofield Reservoir Demand Study, Column Q.

L Evaporation (Water Supply Pool) - the amount of Narrows Reservoir evaporation attributable to the water stored in the inactive and water supply pools. These calculated evaporation losses from Narrows Reservoir are based on the following evaporation rates: October - 0.17 ft., November - 0.05 ft., May - 0.38 ft., June - 0.46 ft., July - 0.48 ft., August - 0.42 ft., September - 0.32 ft. Evaporation losses in the remaining months were assumed to be zero due to ice cover on the reservoir.

M End of Month Contents (Water Supply Pool) - equal to the previous month's water supply pool content plus Column F minus Columns H, J, K, and L and is limited to a maximum of 10,000 acre-feet in accordance with the water rights agreement.

N Inflow to Minimum Streamflow Pool - when the calculated value of Column M exceeds 10,000 acre-feet, the excess is assumed to flow into the minimum streamflow pool where it can be stored for that purpose.

O Fishery Release to Gooseberry Creek - a minimum release of 1 cfs for fish habitat plus 300 acre-feet per year supplemental release for fish and channel maintenance is made from the minimum streamflow pool in Narrows Reservoir. If there is insufficient water in the minimum streamflow pool, the release will be made from the water supply pool. The 300 acre-feet release is assumed to occur in May of each year.

P Evaporation (Minimum Streamflow Pool) - the amount of Narrows Reservoir evaporation attributable to the water stored in the minimum streamflow pool.

Q End of Month Contents (Minimum Streamflow Pool) - equal to the previous month's minimum streamflow pool content plus Column N minus Columns O and P and is limited to a maximum of 4,500 acre-feet in accordance with the water rights agreement.

R Evaporation - the total evaporation from Narrows Reservoir. equal to Column L plus Column P.

Column Explanation (continued)

Column

S Total End of Month Contents - Column M plus Column Q.

T Spills - occur when the results of Column Q exceed the minimum streamflow pool capacity of 4,500 acre-feet, in which case the spill is equal to the calculated value of Column Q minus 4,500.

U Stream Flow Below Narrows Dam - equal to the sum of Columns J, K, O, and T.

V Reach Gains Between Dam Site and Gooseberry Near Scofield - equal to Column H of Future Without Project operation study.

W Stream Flow at Gooseberry Near Scofield - Column U plus Column V.

X Reach Gains Above Fish Creek Above Reservoir - Column J of Future Without Project operation study.

Y Stream Flow at Fish Creek Above Reservoir - Column W plus Column X.

Z Other Inflow to Scofield Reservoir - Column L of Future Without Project operation study.

AA Evaporation - calculated evaporation losses from Scofield Reservoir based on the following evaporation rates: October - 0.17 ft., November - 0.05 ft., May - 0.38 ft., June - 0.46 ft., July - 0.48 ft., August - 0.42 ft., September - 0.32 ft. Evaporation losses in the remaining months were assumed to be zero due to ice cover on the reservoir.

AB Irrigation Season Demand on Storage - Column AE from the Scofield Reservoir Demand Study.

AC Direct Flow Rights Releases - Column AC from the Scofield Reservoir Demand Study.

AD Non-Irrigation season Demand on Storage - Column AD from the Scofield Reservoir Demand Study.

AE Total Demand on Storage - the sum of Columns AB, AC, and AD.

AF Shortage - the amount of unsatisfied demand from Columns AB, AC, and AD due to insufficient storage.

AG End of Month Contents - equal to the previous month's active content plus Columns Y and Z minus Columns AA and AE plus Column AF minus Column AI. Limited to a maximum of 65,700 acre-feet in accordance with the reservoir active capacity and water rights.

Column Explanation (continued)

Column

AH Spills - occur when the results of Column AG exceed the maximum active content of 65,700 acre-feet, in which case the spill is equal to the calculated value of Column AG minus 65,700.

AI Total Flow in Price River Below Scofield Dam - equal to Column AE minus Column AF plus Column AH and represents the flow in the Price River below Scofield Dam under the Future With Narrows Project condition.

AI Total Flow in Price River Below Scofield Dam - equal to Column AE minus Column AF plus Column AH and represents the flow in the Price River below Scofield Dam under the Future With Narrows Project condition.

AJ White River - equal to Column E from the Scofield Reservoir Demand Study.

AK Beaver Creek - equal to Column H from the Scofield Reservoir Demand Study.

AL Lower Fish Creek Below Scofield Gains - equal to Column I from the Scofield Reservoir Demand Study.

AM Price River Above PRIWID Treatment Plant - equal to the sum of Columns U, V, W, and X.

ATTACHMENT C

WATER SUPPLY

3. EXISTING WATER SUPPLIES FOR GROUPS 1,2 AND 3 LANDS
   PROJECT WATER DELIVERIES FOR GROUPS 1,2,AND 3 LANDS

Sanpete Water Conservancy District

TABLE C-10
TOTAL EXISTING WATER SUPPLY FOR
GROUP 1 LANDS
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	906	863	892	936	904	1,257	1,183	2,846	4,135	1,847	954	877	17,600
1961	850	906	959	859	663	751	719	1,982	2,829	1,257	972	1,087	13,834
1962	905	1,062	951	902	870	982	1,800	4,002	7,722	4,254	1,840	1,343	26,633
1963	1,057	1,129	1,002	988	854	994	829	2,229	3,586	2,114	1,783	1,202	17,767
1964	893	891	921	902	806	919	817	2,464	6,001	2,804	1,512	1,233	20,163
1965	796	852	840	968	781	869	1,488	14,427	16,570	3,960	1,929	1,549	45,029
1966	1,104	1,131	1,157	1,112	951	1,461	5,686	10,324	2,563	1,227	713	785	28,214
1967	1,020	1,005	987	960	872	1,178	1,439	12,268	13,869	3,680	1,610	1,237	40,125
1968	931	957	928	865	945	1,202	1,390	15,125	18,021	3,594	2,404	1,263	47,625
1969	1,143	1,225	1,230	1,234	880	952	6,593	31,007	7,094	3,828	2,233	1,425	58,844
1970	1,193	1,284	1,209	1,159	1,088	1,265	1,075	15,117	10,068	4,346	1,944	1,010	40,758
1971	868	1,071	1,083	1,071	918	1,089	3,008	16,098	8,175	3,289	1,841	1,249	39,760
1972	1,081	1,045	1,110	1,112	924	1,687	2,416	8,561	3,536	2,028	921	792	25,213
1973	801	838	954	880	762	969	1,342	23,580	11,236	4,109	2,216	1,122	48,809
1974	898	878	799	865	723	1,052	1,290	17,467	5,318	2,692	1,536	742	34,260
1975	680	804	861	804	691	832	784	10,227	24,720	5,716	2,808	2,103	51,030
1976	1,343	1,164	1,143	1,132	989	1,008	1,437	12,206	3,980	2,601	1,254	778	29,035
1977	735	813	780	628	677	787	1,208	1,699	2,215	892	572	631	11,637
1978	548	685	814	831	696	1,132	3,070	20,371	21,672	4,247	2,237	1,703	58,006
1979	1,083	1,198	1,276	1,275	1,043	1,089	1,890	17,568	8,107	3,619	2,011	1,079	41,238
1980	758	953	1,069	1,078	912	869	2,149	18,133	24,435	7,177	3,360	2,624	63,517
1981	1,565	1,204	676	981	951	1,121	3,628	10,187	5,631	2,848	1,478	1,159	31,429
1982	1,109	1,238	995	914	1,022	1,411	3,896	28,774	17,270	4,988	2,490	1,582	65,689
1983	1,977	2,322	1,768	1,705	1,459	2,247	3,200	24,117	44,459	12,197	4,994	2,850	103,295
1984	2,133	1,783	1,808	1,677	1,491	1,599	3,037	39,353	22,126	6,328	3,403	2,636	87,374
1985	1,705	1,696	1,593	1,472	1,140	1,649	9,883	26,315	6,344	4,284	2,570	1,801	60,452
1986	1,362	1,271	1,304	1,323	1,271	3,393	8,166	33,418	20,232	4,058	2,667	1,872	80,337
1987	1,537	1,682	1,982	1,787	1,524	1,825	4,737	10,907	4,907	3,061	2,101	1,358	37,408
1988	854	1,011	894	901	801	1,013	2,350	11,574	4,014	2,986	1,676	1,297	29,371
1989	921	1,039	854	750	691	952	2,450	2,560	432	1,185	572	98	12,504
AVERAGE	1,092	1,133	1,095	1,069	943	1,252	2,765	14,830	11,042	3,707	1,953	1,350	42,232

TABLE C-11
FLOW AT OAK CREEK NEAR FAIRVIEW, UTAH
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	150	130	133	137	139	200	246	643	706	217	148	119	2,968
1961	140	136	143	126	102	119	149	445	454	165	148	143	2,270
1962	148	160	141	132	134	156	373	910	1,338	537	230	178	4,437
1963	174	170	149	145	131	158	172	511	652	246	210	154	2,872
1964	148	134	137	132	124	146	171	571	1,120	345	186	157	3,371
1965	131	128	125	142	120	138	310	3,420	3,170	439	241	188	8,552
1966	181	170	172	163	146	232	1,190	2,420	493	178	110	110	5,565
1967	169	151	147	141	134	187	301	2,910	2,690	532	252	173	7,787
1968	154	144	138	127	145	191	291	3,580	3,450	383	249	165	9,017
1969	189	184	183	181	135	151	1,380	7,280	1,220	419	239	176	11,737
1970	198	193	180	170	167	201	225	3,590	1,870	478	188	133	7,593
1971	143	161	161	157	141	173	630	3,810	1,500	329	192	163	7,560
1972	178	157	165	163	142	268	506	1,990	534	160	108	104	4,475
1973	133	126	142	129	117	154	281	5,570	2,120	413	192	145	9,522
1974	149	132	119	127	111	167	270	4,120	887	226	115	93	6,516
1975	113	121	128	118	106	132	164	2,430	4,760	692	261	206	9,231
1976	223	175	170	166	152	160	301	2,870	598	226	123	105	5,269
1977	122	122	116	92	104	125	253	395	323	121	86	84	1,943
1978	91	103	121	122	107	180	643	4,840	4,170	472	212	182	11,243
1979	180	180	190	187	160	173	396	4,140	1,550	375	171	113	7,815
1980	126	143	159	158	140	138	450	4,290	4,740	853	367	361	11,925
1981	260	181	111	144	146	178	760	2,410	1,070	287	130	110	5,787
1982	184	186	148	134	157	224	816	6,810	3,210	509	235	212	12,825
1983	328	349	263	250	224	357	670	5,730	8,680	1,760	643	389	19,643
1984	354	268	269	246	229	254	636	9,350	4,170	800	368	274	17,218
1985	283	255	237	216	175	262	2,070	6,220	1,090	490	247	206	11,751
1986	226	191	194	194	195	539	1,710	7,940	3,760	472	275	231	15,927
1987	255	253	295	262	234	290	992	2,570	856	301	213	170	6,691
1988	142	152	133	132	123	161	492	2,750	639	280	179	156	5,339
1989	153	156	127	110	106	151	513	608					1,924
AVERAGE	181	170	163	157	145	199	579	3,504	2,132	438	218	172	7,959

TABLE C-12
TOTAL FLOW IN COTTONWOOD CREEK
(INCLUDES NATURAL FLOW AND IMPORTS THROUGH FAIRVIEW TUNNEL)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	80	85	84	91	86	129	185	495	830	544	100	77	2,786
1961	75	89	90	84	63	77	112	342	733	290	107	92	2,154
1962	79	104	90	88	83	101	281	749	1541	851	505	150	4,622
1963	93	111	95	96	81	102	130	393	595	564	553	177	2,990
1964	79	88	87	88	77	94	129	450	897	577	439	214	3,219
1965	70	84	79	94	74	89	234	2630	2478	673	488	275	7,268
1966	97	111	109	108	90	150	897	1861	363	117	69	71	4,043
1967	90	99	93	93	83	121	227	2238	1978	348	158	111	5,639
1968	82	94	88	84	90	123	219	2765	2758	1152	975	199	8,629
1969	101	120	116	120	84	98	1040	5702	1503	1090	862	290	11,126
1970	106	126	114	113	103	130	170	2760	1837	1198	859	128	7,644
1971	77	105	102	104	87	112	475	2930	1303	1109	719	148	7,271
1972	95	103	105	108	88	173	381	1530	1045	970	287	79	4,964
1973	71	82	90	86	72	99	212	4283	1855	1320	1081	142	9,393
1974	80	86	75	84	69	108	204	3168	1282	1178	847	104	7,285
1975	61	79	81	78	66	85	124	1868	3806	1445	1263	710	9,666
1976	119	114	108	110	94	103	227	2207	1164	1088	523	67	5,924
1977	65	80	74	61	64	81	191	304	747	98	65	60	1,890
1978	49	67	77	81	66	116	485	3722	3066	1194	994	477	10,394
1979	96	118	120	124	99	112	298	3183	1140	1208	1002	305	7,805
1980	67	94	101	105	87	89	339	3299	3485	1519	1222	232	10,639
1981	139	118	0.1	95	90	115	573	1853	787	1015	711	406	5,902
1982	99	122	94	89	97	145	615	5236	2912	1383	1095	136	12,023
1983	176	228	167	166	139	231	505	4406	6382	1652	1235	250	15,537
1984	190	175	171	163	142	164	479	7189	3756	1280	1228	789	15,726
1985	152	167	150	143	108	169	1560	4783	1404	1209	1129	429	11,403
1986	121	125	123	129	121	348	1289	6105	3795	1319	1088	386	14,949
1987	137	165	187	174	145	187	748	1976	1049	1193	859	226	7,046
1988	76	99	84	88	76	104	371	2115	1046	1169	625	255	6,108
1989	82	102	81	73	66	98	387	467	338	1040	549	61	3,344
AVERAGE	97	111	101	104	90	128	436	2,700	1,863	993	721	235	7,580

TABLE C-13
FLOW IN SPRING CREEK
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	10	15	13	16	14	28	88	269	223	29	18	9	732
1961	9	16	14	14	10	17	53	186	144	22	17	11	513
1962	10	19	14	15	13	22	134	381	423	73	27	13	1,144
1963	11	20	14	17	13	22	62	214	206	33	25	12	649
1964	10	16	13	15	12	21	61	239	354	47	22	12	822
1965	9	15	12	16	12	19	111	1,432	1,003	60	29	14	2,732
1966	12	20	17	19	15	33	428	1,013	156	24	13	8	1,758
1967	11	18	14	16	13	26	108	1,218	851	72	30	13	2,390
1968	10	17	13	15	15	27	105	1,499	1,091	52	29	12	2,885
1969	12	22	18	21	14	21	496	3,047	386	57	28	13	4,135
1970	13	23	17	19	17	28	81	1,503	592	65	22	10	2,390
1971	9	19	16	18	14	24	226	1,595	474	45	23	12	2,475
1972	12	19	16	19	14	38	182	833	169	22	13	8	1,345
1973	9	15	14	15	12	22	101	2,332	671	56	23	11	3,281
1974	10	16	11	15	11	24	97	1,725	281	31	14	7	2,242
1975	7	14	12	13	11	19	59	1,017	1,506	94	31	15	2,798
1976	15	21	16	19	15	23	108	1,201	189	31	15	8	1,661
1977	8	15	11	11	10	18	91	165	102	16	10	6	463
1978	6	12	12	14	11	25	231	2,026	1,319	64	25	14	3,759
1979	12	21	18	21	16	24	142	1,733	490	51	20	8	2,556
1980	8	17	15	18	14	19	162	1,796	1,499	116	43	27	3,734
1981	17	22	11	16	15	25	273	1,009	338	39	15	8	1,788
1982	12	22	14	15	16	32	293	2,851	1,015	69	28	16	4,383
1983	22	42	25	29	22	50	241	2,399	2,746	239	76	29	5,920
1984	23	32	26	28	23	36	229	3,914	1,319	109	44	20	5,803
1985	19	30	23	25	18	37	744	2,604	345	67	29	15	3,956
1986	15	23	19	22	20	76	615	3,324	1,189	64	33	17	5,417
1987	17	30	28	30	23	41	357	1,076	271	41	25	13	1,952
1988	9	18	13	15	12	23	177	1,151	202	38	21	12	1,691
1989	10	19	12	13	11	21	184	255	-	-	-	-	525
AVERAGE	12	20	16	18	15	28	208	1,467	652	58	25	12	2,530

TABLE C-14
FLOW IN BIRCH CREEK
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	118	120	122	130	124	178	207	518	605	198	131	114	2,565
1961	111	126	131	119	91	106	125	358	388	150	130	137	1,972
1962	117	148	130	125	119	139	314	733	1,145	489	203	170	3,832
1963	138	157	137	137	117	141	145	412	558	224	186	147	2,499
1964	117	124	126	125	110	130	144	460	958	314	164	150	2,922
1965	104	119	115	134	107	123	261	2,754	2,713	400	213	179	7,222
1966	143	158	158	154	130	207	1,001	1,949	422	162	97	105	4,686
1967	134	140	135	133	119	167	253	2,343	2,302	485	222	165	6,598
1968	122	133	127	120	129	170	245	2,883	2,953	349	220	157	7,608
1969	150	171	168	171	120	135	1,161	5,862	1,044	382	211	168	9,743
1970	157	179	165	161	149	179	189	2,891	1,600	435	166	127	6,398
1971	113	149	148	149	126	154	530	3,068	1,284	300	170	155	6,346
1972	141	145	152	154	126	239	426	1,602	457	146	95	99	3,782
1973	105	117	130	122	104	137	236	4,485	1,814	376	170	138	7,934
1974	118	122	109	120	99	149	227	3,317	759	206	102	89	5,417
1975	89	112	118	112	94	118	138	1,957	4,074	630	230	196	7,868
1976	176	162	156	157	135	143	253	2,311	512	206	109	100	4,420
1977	97	113	107	87	93	111	213	318	276	110	76	80	1,681
1978	72	95	111	115	95	160	541	3,897	3,569	430	187	174	9,446
1979	142	167	174	177	143	154	333	3,333	1,327	342	151	108	6,551
1980	100	133	146	150	125	123	379	3,454	4,057	777	324	344	10,112
1981	206	168	102	136	130	159	639	1,941	916	261	115	105	4,878
1982	146	172	136	127	140	200	687	5,483	2,747	464	207	202	10,711
1983	260	323	241	237	200	318	564	4,614	7,429	1,604	568	371	16,729
1984	280	248	247	233	204	226	535	7,529	3,569	729	325	261	14,386
1985	224	236	218	204	156	234	1,741	5,008	933	446	218	196	9,814
1986	179	177	178	184	174	480	1,439	6,393	3,218	430	243	220	13,315
1987	202	234	271	248	208	258	835	2,069	733	274	188	162	5,682
1988	112	141	122	125	110	143	414	2,214	547	255	158	149	4,490
1989	121	145	117	104	94	135	432	490	-	-	-	-	1,638
AVERAGE	143	158	150	148	129	177	487	2,822	1,764	386	186	159	6,708

TABLE C-15
FLOW IN COVE CREEK
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	56	61	60	65	61	95	154	423	422	104	67	54	1,622
1961	52	64	64	60	45	57	93	292	271	79	67	64	1,208
1962	55	75	64	63	59	74	233	598	800	257	104	80	2,462
1963	65	80	67	69	58	75	108	336	390	118	95	69	1,530
1964	55	63	62	63	55	69	107	375	669	165	84	70	1,837
1965	49	60	56	68	53	66	194	2,247	1,894	210	109	84	5,090
1966	68	80	78	78	65	110	744	1,590	295	85	50	49	3,292
1967	63	71	66	67	59	89	188	1,912	1,607	255	114	77	4,568
1968	58	68	62	60	64	91	182	2,352	2,062	183	113	74	5,369
1969	71	87	82	86	60	72	863	4,784	729	201	108	79	7,222
1970	74	91	81	81	74	95	141	2,359	1,117	229	85	60	4,487
1971	54	76	73	75	62	82	394	2,504	896	158	87	73	4,534
1972	67	74	74	78	63	127	316	1,308	319	77	49	47	2,599
1973	50	59	64	61	52	73	176	3,660	1,267	198	87	65	5,812
1974	56	62	54	60	49	79	169	2,707	530	108	52	42	3,968
1975	42	57	58	56	47	63	103	1,597	2,844	331	118	92	5,408
1976	84	83	77	79	67	76	188	1,886	357	108	56	47	3,108
1977	46	58	52	44	46	59	158	260	193	58	39	38	1,051
1978	34	49	55	58	47	85	402	3,180	2,492	226	96	82	6,806
1979	67	85	86	89	71	82	248	2,720	926	180	78	51	4,683
1980	47	68	72	75	62	66	281	2,819	2,832	408	166	162	7,058
1981	97	85	50	69	65	85	475	1,584	639	137	59	49	3,394
1982	69	88	67	64	69	106	510	4,475	1,918	244	107	95	7,812
1983	123	165	119	119	99	169	419	3,765	5,187	843	291	174	11,473
1984	133	127	121	117	101	121	398	6,144	2,492	383	167	123	10,427
1985	106	120	107	103	77	124	1,295	4,087	651	235	112	92	7,109
1986	85	90	87	92	86	256	1,070	5,217	2,247	226	125	103	9,684
1987	96	119	133	125	104	138	620	1,689	512	144	97	76	3,853
1988	53	72	60	63	54	76	308	1,807	382	134	81	70	3,160
1989	57	74	57	52	47	72	321	400	-	-	-	-	1,080
AVERAGE	68	80	74	75	64	94	362	2,303	1,231	203	95	75	4,724

TABLE C-16
FLOW IN PLEASANT CREEK
(NATURAL FLOW PLUS IMPORTS FROM CANDLAND DITCH AND COAL FORK DITCH)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	492	452	480	497	480	627	303	498	1,349	755	490	504	6,927
1961	463	475	517	456	352	375	187	359	839	551	503	640	5,717
1962	496	556	512	479	462	490	465	631	2,475	2,047	771	752	10,136
1963	576	591	540	524	454	496	212	363	1,185	929	714	643	7,227
1964	484	466	496	479	428	459	205	369	2,003	1,356	617	630	7,992
1965	433	446	453	514	415	434	378	1,944	5,312	2,178	849	809	14,165
1966	603	592	623	590	505	729	1,426	1,491	834	661	374	442	8,870
1967	553	526	532	510	464	588	362	1,647	4,441	1,988	834	698	13,143
1968	505	501	500	459	502	600	348	2,046	5,707	1,475	818	656	14,117
1969	620	641	663	655	467	475	1,653	4,332	2,212	1,679	785	699	14,881
1970	645	672	652	615	578	632	269	2,014	3,052	1,941	624	552	12,246
1971	472	561	583	568	488	544	753	2,191	2,718	1,348	650	698	11,574
1972	588	547	598	590	491	842	605	1,298	1,012	653	369	455	8,048
1973	433	439	514	467	405	484	336	3,250	3,509	1,746	663	621	12,867
1974	485	460	431	459	384	525	323	2,430	1,579	943	406	407	8,832
1975	368	421	464	427	367	415	196	1,358	7,730	2,524	905	884	16,059
1976	726	609	616	601	526	503	360	1,731	1,160	942	428	451	8,653
1977	397	425	420	333	360	393	302	257	574	489	296	363	4,609
1978	296	359	438	441	370	566	768	2,706	7,056	1,861	723	774	16,358
1979	586	627	688	677	554	544	473	2,459	2,674	1,463	589	494	11,828
1980	410	498	576	572	484	434	538	2,475	7,822	3,504	1,238	1,498	20,049
1981	846	630	402	521	505	559	908	1,390	1,881	1,109	448	481	9,680
1982	599	648	536	485	543	704	975	3,919	5,468	2,319	818	921	17,935
1983	1,068	1,215	953	904	775	1,122	801	3,203	14,035	6,099	2,181	1,637	33,993
1984	1,153	933	974	890	792	798	760	5,227	6,820	3,027	1,271	1,169	23,814
1985	921	888	858	781	606	823	2,473	3,613	1,921	1,837	835	863	16,419
1986	736	665	703	702	675	1,694	2,043	4,439	6,023	1,547	903	915	21,045
1987	830	881	1,068	948	810	911	1,185	1,527	1,486	1,108	719	711	12,184
1988	462	529	482	478	426	506	588	1,537	1,198	1,110	612	655	8,583
1989	498	543	460	398	367	475	613	340	94	145	23	37	3,993
AVERAGE	591	593	591	567	501	625	694	2,035	3,472	1,644	715	702	12,731

TABLE C-17
TOTAL EXISTING WATER SUPPLY FOR
GROUP 2 LANDS
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	1,330	1,215	1,283	1,323	1,280	1,661	682	2,004	4,936	1,968	1,300	1,324	20,306
1961	1,271	1,297	1,396	1,225	950	1,004	426	1,536	3,094	1,437	1,375	1,672	16,683
1962	1,391	1,518	1,384	1,285	1,241	1,302	1,054	2,051	8,277	5,416	2,067	1,976	28,962
1963	1,575	1,624	1,475	1,413	1,219	1,319	479	1,241	4,085	2,447	1,940	1,692	20,509
1964	1,298	1,259	1,342	1,285	1,145	1,205	455	1,002	6,429	3,594	1,639	1,667	22,320
1965	1,178	1,224	1,227	1,387	1,118	1,155	846	3,216	14,416	5,895	2,393	2,122	36,177
1966	1,669	1,578	1,649	1,549	1,329	1,899	3,154	3,496	2,679	1,732	1,017	1,167	22,918
1967	1,478	1,401	1,413	1,350	1,228	1,540	801	2,666	11,739	5,247	2,209	1,843	32,915
1968	1,353	1,370	1,349	1,208	1,320	1,563	767	3,491	15,028	3,900	2,147	1,736	35,232
1969	1,665	1,718	1,746	1,720	1,229	1,236	3,653	8,908	7,215	4,459	2,061	1,847	37,457
1970	1,708	1,762	1,717	1,614	1,521	1,645	595	3,108	8,003	5,164	1,657	1,453	29,947
1971	1,281	1,470	1,536	1,491	1,283	1,417	1,662	3,853	8,757	3,583	1,762	1,831	29,926
1972	1,604	1,434	1,574	1,549	1,293	2,195	1,335	3,634	3,772	1,725	1,011	1,190	22,316
1973	1,145	1,151	1,355	1,226	1,065	1,261	741	6,129	9,424	4,661	1,832	1,630	31,620
1974	1,283	1,206	1,135	1,207	1,011	1,367	712	4,810	5,126	2,505	1,146	1,066	22,574
1975	973	1,105	1,221	1,121	965	1,081	432	2,055	19,371	6,648	2,511	2,319	39,802
1976	1,919	1,598	1,622	1,576	1,383	1,310	794	3,755	4,390	2,503	1,194	1,182	23,226
1977	1,051	1,114	1,107	875	947	1,023	668	710	2,140	1,288	816	952	12,691
1978	783	940	1,154	1,159	974	1,474	1,696	4,088	19,394	4,937	1,976	2,031	40,606
1979	1,549	1,643	1,812	1,776	1,457	1,417	1,045	5,017	7,911	3,874	1,626	1,294	30,421
1980	1,084	1,306	1,516	1,501	1,274	1,130	1,186	4,421	20,327	9,346	3,343	3,942	50,376
1981	2,237	1,653	1,059	1,368	1,329	1,457	2,005	2,482	5,891	2,930	1,240	1,260	24,911
1982	1,585	1,699	1,413	1,274	1,430	1,834	2,152	6,928	15,333	6,235	2,280	2,412	44,575
1983	2,823	3,187	2,509	2,375	2,039	2,923	1,768	4,839	34,449	16,007	5,916	4,303	83,138
1984	3,046	2,447	2,566	2,336	2,084	2,080	1,678	7,893	17,422	8,010	3,511	3,066	56,139
1985	2,436	2,328	2,261	2,052	1,592	2,145	5,458	6,680	6,036	4,850	2,261	2,270	40,369
1986	1,945	1,743	1,850	1,842	1,775	4,413	4,509	6,703	14,704	4,041	2,367	2,421	48,313
1987	2,194	2,311	2,814	2,489	2,131	2,373	2,616	3,116	4,648	2,912	1,945	1,870	31,419
1988	1,222	1,388	1,269	1,253	1,119	1,319	1,298	2,325	4,317	2,940	1,678	1,721	21,849
1989	1,317	1,424	1,213	1,045	965	1,236	1,354	518	1,223	406	128	88	10,917
AVERAGE	1,580	1,570	1,566	1,496	1,323	1,633	1,534	3,756	9,685	4,355	1,945	1,845	32,287

TABLE C-18
TOTAL FLOW IN TWIN CREEK
(NATURAL FLOW PLUS IMPORTS FROM TWIN CREEK TUNNEL)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	239	219	235	242	234	302	115	144	640	345	237	232	3,184
1961	223	231	252	222	171	181	70	103	460	261	238	279	2,691
1962	236	270	250	233	225	236	175	171	1,080	964	369	346	4,555
1963	278	287	264	255	221	239	81	96	598	427	338	301	3,385
1964	236	226	242	233	209	221	80	90	923	632	297	306	3,695
1965	209	216	221	250	202	209	146	459	2,333	1,019	392	366	6,022
1966	289	287	304	287	246	351	559	379	484	298	177	214	3,875
1967	270	255	260	248	226	283	141	386	1,998	936	403	337	5,743
1968	246	244	244	224	245	289	137	487	2,523	689	397	321	6,046
1969	302	311	324	319	228	229	648	1,086	995	786	381	342	5,951
1970	316	326	318	299	282	304	106	476	1,430	911	301	259	5,328
1971	228	272	285	276	238	262	296	525	1,191	627	309	317	4,826
1972	284	266	292	287	240	406	238	346	518	293	174	202	3,546
1973	212	213	251	227	197	233	132	796	1,605	817	310	282	5,275
1974	238	223	210	224	187	253	127	599	761	432	187	181	3,622
1975	180	205	226	208	179	200	77	322	3,419	1,195	422	401	7,034
1976	356	296	301	292	256	242	141	433	564	432	200	204	3,717
1977	195	206	205	162	175	189	119	60	367	215	139	163	2,195
1978	145	174	214	215	181	273	302	642	3,028	874	342	354	6,744
1979	287	304	336	329	270	262	186	611	1,218	683	276	220	4,982
1980	201	242	281	278	236	209	211	596	3,412	1,660	589	702	8,617
1981	415	306	196	253	246	270	357	330	887	513	210	214	4,197
1982	294	315	262	236	265	339	383	949	2,366	1,089	381	412	7,291
1983	524	590	465	440	378	541	315	760	6,113	2,921	1,033	757	14,837
1984	565	453	476	433	386	385	299	1,240	3,015	1,436	595	533	9,816
1985	452	431	419	380	295	397	972	882	901	864	397	401	6,791
1986	361	323	343	341	329	816	803	1,053	2,726	747	438	449	8,729
1987	407	428	522	461	395	439	466	375	737	514	342	331	5,417
1988	227	257	235	232	207	244	231	365	591	513	289	303	3,694
1989	244	264	225	194	179	229	241	81	148	48	4	0	1,857
AVERAGE	289	288	289	276	244	301	272	495	1,568	771	339	324	5,455

TABLE C-19
TOTAL FLOW IN CEDAR CREEK
(INCLUDES NATURAL FLOW AND IMPORTS FROM BLACK CANYON DITCH AND CEDAR CREEK TUNNEL)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	256	234	244	252	244	314	118	362	932	377	243	263	3,839
1961	247	253	267	235	183	191	75	282	540	271	254	346	3,144
1962	275	296	265	246	238	247	184	349	1595	1047	385	393	5,520
1963	306	318	284	272	234	250	83	215	733	474	360	333	3,862
1964	248	243	257	246	219	227	77	160	1190	699	306	319	4,191
1965	228	240	235	267	215	219	145	377	2615	1178	438	428	6,585
1966	327	302	312	292	251	356	530	520	423	336	188	223	4,060
1967	282	268	268	256	233	290	135	307	2077	1011	413	354	5,894
1968	259	267	258	228	249	293	128	421	2688	756	403	330	6,280
1969	319	330	330	324	232	232	613	1229	1360	869	387	350	6,575
1970	324	332	324	304	287	309	100	339	1370	1007	310	285	5,291
1971	248	277	290	281	242	266	278	476	1669	701	327	368	5,423
1972	311	270	297	292	244	412	223	585	688	339	187	243	4,091
1973	217	217	256	231	201	237	124	798	1657	915	338	328	5,519
1974	243	227	214	227	191	256	119	648	928	492	209	218	3,972
1975	184	208	231	211	182	203	72	219	3406	1275	462	467	7,120
1976	363	301	306	297	261	246	133	536	826	492	219	238	4,218
1977	199	210	209	165	179	192	112	115	336	254	150	193	2,314
1978	148	177	218	218	184	276	284	435	3584	959	366	406	7,255
1979	293	309	342	335	275	266	175	689	1440	752	300	264	5,440
1980	205	246	286	283	240	212	199	553	3654	1823	622	774	9,097
1981	423	311	200	258	251	273	336	311	1068	569	228	257	4,485
1982	300	320	267	240	270	344	360	859	2836	1234	419	490	7,939
1983	534	600	474	448	385	548	296	515	6082	3040	1098	854	14,874
1984	576	461	484	440	393	390	281	841	3085	1545	647	614	9,757
1985	461	438	427	387	300	402	914	857	1099	935	420	449	7,089
1986	368	328	349	347	335	828	755	714	2516	759	445	458	8,202
1987	415	435	531	469	402	445	438	429	816	561	361	369	5,671
1988	231	261	240	236	211	247	217	247	795	573	310	341	3,909
1989	249	268	229	197	182	232	227	55	198	93	19	32	1,981
AVERAGE	301	298	296	283	250	307	258	481	1,740	845	360	366	5,787

TABLE C-20
TOTAL FLOW IN OAK CREEK NEAR SPRING CITY
(INCLUDES NATURAL FLOW AND IMPORTS FROM SPRING CITY TUNNEL)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	334	298	310	319	309	403	167	963	1,817	488	318	341	6,067
1961	332	326	346	300	235	248	111	756	1,011	343	381	461	4,850
1962	384	382	343	314	303	318	267	897	2,990	1,414	534	510	8,656
1963	407	413	372	349	298	322	118	558	1,341	639	528	427	5,772
1964	319	312	333	314	277	287	102	396	2,123	957	407	401	6,228
1965	302	311	306	343	274	283	200	706	4,025	1,742	740	560	9,792
1966	446	382	393	365	313	446	702	1,223	668	448	277	281	5,944
1967	360	339	338	322	293	366	180	559	3,041	1,354	541	446	8,139
1968	332	345	333	284	311	367	169	812	3,966	1,025	507	412	8,863
1969	411	420	411	405	289	290	811	2,719	2,479	1,197	486	437	10,355
1970	405	415	405	380	358	386	131	578	1,920	1,396	410	366	7,150
1971	326	346	362	351	302	333	366	946	3,039	974	474	480	8,299
1972	413	337	371	365	304	515	294	1,455	1,329	471	282	320	6,456
1973	270	271	319	289	251	296	163	1,675	2,450	1,286	530	428	8,228
1974	303	284	268	284	238	321	157	1,403	1,642	689	356	287	6,232
1975	230	260	288	264	227	254	95	360	4,674	1,688	738	610	9,688
1976	453	376	382	371	326	308	175	1,218	1,634	688	355	311	6,597
1977	248	262	261	206	223	240	147	285	594	351	233	253	3,303
1978	185	221	272	273	229	346	373	717	5,675	1,314	548	528	10,681
1979	366	387	427	418	343	333	230	1,519	2,392	1,026	467	348	8,256
1980	256	307	357	353	300	265	261	1,114	5,345	2,538	889	992	12,977
1981	528	389	250	322	313	342	441	626	1,847	773	358	339	6,528
1982	374	400	333	300	337	431	474	1,712	4,569	1,779	679	644	12,032
1983	666	750	591	559	480	686	389	849	8,183	3,923	1,607	1,104	19,787
1984	719	576	605	550	491	488	369	1,385	4,360	2,079	1,017	800	13,439
1985	575	548	533	483	375	504	1,201	1,773	1,910	1,254	606	579	10,341
1986	459	410	436	434	418	1,036	992	1,176	3,232	949	556	572	10,670
1987	518	544	663	586	502	557	576	945	1,375	746	519	476	8,007
1988	288	327	299	295	264	310	286	407	1,517	787	470	440	5,690
1989	311	335	286	246	227	290	298	90	521	169	99	55	2,927
AVERAGE	384	376	373	355	314	386	342	994	2,722	1,150	530	474	8,398

TABLE C-21
TOTAL FLOW IN CANAL CREEK
(INCLUDES NATURAL FLOW AND IMPORTS FROM HORSESHOE TUNNEL)
(ACRE-FEET)

YEAR	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	TOTAL
1960	501	464	494	510	493	642	282	535	1,547	758	502	488	7,216
1961	469	487	531	468	361	384	170	395	1,083	562	502	586	5,998
1962	496	570	526	492	475	501	428	634	2,612	1,991	779	727	10,231
1963	584	606	555	537	466	508	197	372	1,413	907	714	631	7,490
1964	495	478	510	492	440	470	196	356	2,193	1,306	629	641	8,206
1965	439	457	465	527	427	444	355	1,674	5,443	1,956	823	768	13,778
1966	607	607	640	605	519	746	1,363	1,374	1,104	650	375	449	9,039
1967	566	539	547	524	476	601	345	1,414	4,623	1,946	852	706	13,139
1968	516	514	514	472	515	614	333	1,771	5,851	1,430	840	673	14,043
1969	633	657	681	672	480	485	1,581	3,874	2,381	1,607	807	718	14,576
1970	663	689	670	631	594	646	258	1,715	3,283	1,850	636	543	12,178
1971	479	575	599	583	501	556	722	1,906	2,858	1,281	652	666	11,378
1972	596	561	614	605	505	862	580	1,248	1,237	622	368	425	8,223
1973	446	450	529	479	416	495	322	2,860	3,712	1,643	654	592	12,598
1974	499	472	443	472	395	537	309	2,160	1,795	892	394	380	8,748
1975	379	432	476	438	377	424	188	1,154	7,872	2,490	889	841	15,960
1976	747	625	633	616	540	514	345	1,568	1,366	891	420	429	8,694
1977	409	436	432	342	370	402	290	250	843	468	294	343	4,879
1978	305	368	450	453	380	579	737	2,294	7,107	1,790	720	743	15,926
1979	603	643	707	694	569	556	454	2,198	2,861	1,413	583	462	11,743
1980	422	511	592	587	498	444	515	2,158	7,916	3,325	1,243	1,474	19,685
1981	871	647	413	535	519	572	871	1,215	2,089	1,075	444	450	9,701
1982	617	664	551	498	558	720	935	3,408	5,562	2,133	801	866	17,313
1983	1,099	1,247	979	928	796	1,148	768	2,715	14,071	6,123	2,178	1,588	33,640
1984	1,186	957	1,001	913	814	817	729	4,427	6,962	2,950	1,252	1,119	23,127
1985	948	911	882	802	622	842	2,371	3,168	2,126	1,797	838	841	16,148
1986	757	682	722	720	693	1,733	1,959	3,760	6,230	1,586	928	942	20,712
1987	854	904	1,098	973	832	932	1,136	1,367	1,720	1,091	723	694	12,324
1988	476	543	495	490	437	518	564	1,306	1,414	1,067	609	637	8,556
1989	513	557	473	408	377	485	588	292	356	96	6	1	4,152
AVERAGE	606	608	607	582	515	639	663	1,786	3,654	1,590	715	681	12,647

Table C-22
Total Historical Diversions for
Group 3 Lands
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	1,612	3,957	3,156	2,043	1,614	1,630	1,029	15,041
1961	1,114	1,927	1,681	1,587	1,495	1,877	711	10,392
1962	3,022	6,226	5,397	4,487	3,890	3,248	1,930	28,199
1963	2,170	4,427	4,660	3,069	2,362	2,172	1,385	20,245
1964	2,591	4,948	5,004	4,288	3,185	2,506	1,654	24,175
1965	3,107	4,500	5,469	5,075	4,421	4,433	1,984	28,988
1966	2,146	4,570	3,942	2,964	2,685	2,345	1,370	20,021
1967	2,817	4,005	5,511	4,676	3,999	3,478	1,798	26,283
1968	3,026	4,507	4,900	4,844	4,570	4,456	1,932	28,234
1969	3,113	4,712	4,673	5,036	4,886	4,642	1,988	29,050
1970	2,921	4,638	4,518	4,576	4,465	4,273	1,865	27,255
1971	2,302	4,628	4,539	4,752	4,084	3,713	1,534	25,553
1972	1,921	3,276	3,336	2,284	2,056	1,949	993	15,815
1973	2,421	5,003	4,842	4,671	4,320	3,724	1,861	26,842
1974	2,331	4,710	4,500	4,039	3,723	3,077	1,801	24,179
1975	2,141	4,767	4,467	4,399	4,251	3,764	1,883	25,672
1976	1,971	4,429	4,085	2,976	2,817	2,370	1,235	19,881
1977	3,562	3,131	1,967	1,521	1,473	1,435	772	13,860
1978	2,433	4,731	4,619	4,407	4,212	3,569	1,838	25,808
1979	2,420	5,083	4,643	4,398	4,099	3,678	1,839	26,161
1980	2,460	5,083	4,919	4,891	4,495	4,181	2,091	28,119
1981	2,348	4,185	4,035	3,622	3,252	2,979	1,503	21,924
1982	2,460	4,771	4,379	4,711	4,250	4,199	2,065	26,835
1983	1,900	3,967	3,839	3,967	3,967	3,839	1,899	23,378
1984	3,892	6,937	6,690	6,004	5,391	4,939	2,492	36,345
1985	3,153	5,621	5,420	4,865	4,368	4,002	2,019	29,448
1986	3,718	6,626	6,390	5,735	5,150	4,718	2,380	34,717
1987	2,470	4,402	4,245	3,810	3,421	3,134	1,581	23,064
1988	4,386	4,625	4,587	3,399	2,627	2,542	1,321	23,488
1989	1,831	4,201	3,243	2,860	2,182	1,811	1,026	17,154
Total	77,757	138,593	133,655	119,956	107,707	98,681	49,778	726,126
Average	2,592	4,620	4,455	3,999	3,590	3,289	1,659	24,204

Table C-23
Historical Diversions
Meadow Ditch
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	196	106	42	19	18	N/A	381
1961	N/A	26	15	15	12	14	N/A	82
1962	N/A	205	154	88	51	38	N/A	535
1963	N/A	138	136	69	40	15	N/A	398
1964	N/A	151	196	66	36	15	N/A	464
1965	N/A	195	278	200	104	78	N/A	855
1966	N/A	158	113	70	57	34	N/A	430
1967	N/A	152	201	133	93	60	N/A	639
1968	N/A	140	135	78	78	90	N/A	520
1969	N/A	140	100	104	106	100	N/A	551
1970	N/A	102	99	102	102	99	N/A	505
1971	51	99	96	99	77	72	22	516
1972	53	90	95	37	20	16	8	320
1973	50	102	99	102	99	86	42	580
1974	50	102	80	60	52	48	24	415
1975	50	102	100	75	51	45	23	446
1976	44	99	102	67	47	33	15	407
1977	0	0	0	0	0	0	0	0
1978	50	102	99	96	82	70	32	531
1979	50	102	99	99	83	72	36	541
1980	50	102	99	102	94	81	41	569
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	50	102	99	102	96	89	45	583
1983	50	102	99	102	102	99	49	604
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	50	102	94	26	N/A	N/A	N/A	272
1989	43	88	77	67	16	N/A	N/A	292
1990	49	100	89	58	31	N/A	N/A	327

N/A - Data not available

Table C-24
Historical Diversions
Sheep Ditch 1/
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	56	16	0	0	0	N/A	72
1961	N/A	0	0	0	0	0	N/A	0
1962	N/A	149	108	87	83	76	N/A	503
1963	N/A	57	90	84	64	68	N/A	363
1964	N/A	54	96	89	76	30	N/A	345
1965	N/A	60	224	114	70	54	N/A	522
1966	N/A	112	90	0	0	0	N/A	202
1967	N/A	42	117	101	62	45	N/A	367
1968	N/A	28	124	118	65	60	N/A	395
1969	N/A	0	0	0	0	0	N/A	0
1970	N/A	93	90	93	93	90	N/A	459

1/ After 1970 this water was transferred to the Brady Ditch
N/A - Data not available.

Table C-25
Historical Diversions
Mower Ditch
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	75	106	65	42	43	N/A	331
1961	N/A	71	92	84	49	47	N/A	343
1962	N/A	187	114	84	82	73	N/A	540
1963	N/A	125	125	84	64	66	N/A	463
1964	N/A	140	134	108	76	60	N/A	518
1965	N/A	91	222	144	145	118	N/A	720
1966	N/A	171	217	93	93	75	N/A	648
1967	N/A	150	222	180	128	60	N/A	740
1968	N/A	160	150	155	124	150	N/A	739
1969	N/A	144	129	148	142	142	N/A	705
1970	N/A	136	132	136	136	132	N/A	673
1971	66	136	132	136	124	124	51	770
1972	66	117	119	87	87	81	42	599
1973	66	136	132	136	130	126	63	790
1974	66	136	126	109	105	106	0	649
1975	60	136	132	136	136	132	66	799
1976	56	132	136	105	94	97	50	670
1977	96	72	47	48	48	46	23	380
1978	66	136	132	134	124	119	59	771
1979	66	136	132	132	132	119	59	777
1980	66	136	132	136	136	132	66	805
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	66	136	132	136	136	132	66	805
1983	66	136	132	136	136	132	66	805
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	132	133	131	108	82	79	40	705
1989	58	118	100	91	74	61	26	528
1990	67	133	118	79	53	54	32	535

N/A - Data not available

Table C-26
Historical Diversions
Brady Ditch
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	183	141	120	76	69	N/A	589
1961	N/A	87	89	89	73	74	N/A	411
1962	N/A	300	262	229	195	137	N/A	1,124
1963	N/A	206	255	137	109	101	N/A	806
1964	N/A	307	283	228	146	120	N/A	1,084
1965	N/A	240	338	296	248	171	N/A	1,293
1966	N/A	274	227	135	135	132	N/A	903
1967	N/A	196	300	276	210	102	N/A	1,084
1968	N/A	217	240	28	217	236	N/A	938
1969	N/A	149	80	145	175	180	N/A	729
1970	N/A	159	154	159	159	154	N/A	786
1971	77	159	154	159	149	149	51	898
1972	77	133	143	106	83	78	39	659
1973	77	159	154	159	149	144	72	915
1974	77	159	146	126	121	119	93	841
1975	105	217	210	217	217	210	105	1,281
1976	91	210	210	157	148	126	63	1,004
1977	158	184	96	88	88	85	43	742
1978	114	236	228	236	236	205	103	1,357
1979	114	236	228	236	228	205	103	1,350
1980	114	236	228	236	236	228	114	1,391
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	114	236	228	236	236	228	114	1,391
1983	94	236	228	236	236	228	94	1,351
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	228	230	229	186	141	137	68	1,220
1989	99	202	178	158	128	101	44	908
1990	113	230	204	134	92	97	53	924

N/A - Data not available

Table C-27
Historical Diversions
Graveyard Ditch
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	107	101	66	63	50	N/A	388
1961	N/A	49	47	49	41	38	N/A	223
1962	N/A	173	158	120	87	73	N/A	610
1963	N/A	190	106	67	59	54	N/A	474
1964	N/A	288	130	91	61	45	N/A	614
1965	N/A	170	218	142	124	84	N/A	738
1966	N/A	0	85	93	48	0	N/A	226
1967	N/A	94	142	153	118	90	N/A	597
1968	N/A	0	88	109	109	180	N/A	485
1969	N/A	117	140	139	124	120	N/A	640
1970	N/A	109	105	109	109	105	N/A	536
1971	52	109	105	109	102	102	53	631
1972	53	88	98	55	52	47	24	417
1973	52	109	105	109	102	99	50	625
1974	52	109	105	108	105	101	51	630
1975	51	109	105	109	109	105	54	640
1976	47	102	102	76	71	60	30	489
1977	68	57	37	38	38	37	18	293
1978	53	109	105	109	109	95	47	626
1979	53	109	105	107	105	95	47	621
1980	53	109	105	109	109	105	53	641
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	53	109	105	109	109	105	53	641
1983	53	109	105	109	109	105	53	641
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	105	106	98	86	65	63	32	555
1989	46	94	82	71	57	49	20	418
1990	52	106	94	69	43	44	25	433

N/A - Data not available

Table C-28
Historical Diversions
San Pitch Ditch Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	155	134	92	80	64	N/A	525
1961	N/A	58	116	64	58	57	N/A	352
1962	N/A	212	194	160	141	138	N/A	845
1963	N/A	152	151	108	91	138	N/A	640
1964	N/A	252	154	129	90	60	N/A	685
1965	N/A	158	240	78	164	136	N/A	776
1966	N/A	205	133	83	93	120	N/A	634
1967	N/A	117	168	154	118	111	N/A	668
1968	N/A	200	180	186	179	150	N/A	895
1969	N/A	161	180	185	163	153	N/A	842
1970	N/A	158	153	158	158	153	N/A	780
1971	77	158	153	158	149	147	77	918
1972	77	135	143	87	79	75	39	634
1973	77	158	153	158	155	150	75	926
1974	77	158	153	157	155	149	75	923
1975	69	158	153	158	158	153	77	926
1976	64	138	138	103	117	106	41	707
1977	98	82	54	56	56	54	27	427
1978	77	158	153	158	158	138	69	911
1979	77	158	153	156	153	138	69	904
1980	77	158	153	158	158	153	77	933
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	77	158	153	158	158	153	77	933
1983	77	158	153	158	158	153	77	933
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	153	154	152	126	95	92	46	817
1989	67	136	119	106	84	70	29	611
1990	77	155	141	89	62	65	36	624

N/A - Data not available.

Table C-29
Historical Diversions
Miner & Turpin Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	87	94	97	97	94	N/A	468
1961	N/A	97	94	97	97	94	N/A	477
1962	N/A	97	94	97	97	94	N/A	477
1963	N/A	59	94	97	97	66	N/A	412
1964	N/A	50	94	97	97	94	N/A	430
1965	N/A	43	75	97	97	94	N/A	405
1966	N/A	97	94	97	97	94	N/A	477
1967	N/A	97	94	97	97	94	N/A	477
1968	N/A	41	94	97	97	94	N/A	421
1969	N/A	97	93	97	97	93	N/A	475
1970	N/A	97	94	97	97	94	N/A	477
1971	47	97	94	97	97	94	39	563
1972	47	94	85	64	53	46	24	413
1973	47	97	94	97	97	94	47	571
1974	47	97	94	95	97	94	47	569
1975	42	97	94	97	97	94	47	566
1976	43	94	94	70	66	56	28	450
1977	75	64	41	43	43	42	21	330
1978	47	97	94	97	97	84	42	557
1979	47	97	94	95	94	84	42	552
1980	47	97	94	97	97	94	47	571
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	47	97	94	97	97	94	47	571
1983	47	97	94	97	97	94	47	571
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	94	94	93	77	58	56	28	500
1989	41	84	73	65	52	43	18	376
1990	46	94	87	55	38	40	22	383

N/A - Data not available.

Table C-30
Historical Diversions
M&M Ditch Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	749	648	396	322	276	N/A	2,390
1961	N/A	239	212	250	229	303	N/A	1,232
1962	N/A	1,388	1,040	858	707	627	N/A	4,619
1963	N/A	691	789	543	403	288	N/A	2,713
1964	N/A	908	793	787	646	480	N/A	3,615
1965	N/A	992	1,172	930	680	1,020	N/A	4,794
1966	N/A	798	537	538	478	420	N/A	2,771
1967	N/A	752	1,434	870	854	780	N/A	4,690
1968	N/A	914	900	930	868	840	N/A	4,452
1969	N/A	918	911	916	875	870	N/A	4,490
1970	N/A	820	793	820	820	793	N/A	4,045
1971	397	820	793	820	820	793	325	4,767
1972	339	616	683	471	429	407	209	3,154
1973	397	820	793	820	820	793	397	4,839
1974	397	805	793	820	739	638	397	4,588
1975	338	805	793	805	805	793	397	4,735
1976	365	793	793	538	528	476	238	3,731
1977	494	466	280	286	286	276	138	2,226
1978	300	655	793	820	820	610	357	4,354
1979	397	820	793	809	795	714	357	4,684
1980	397	820	793	820	820	793	397	4,838
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	397	820	793	820	820	793	397	4,838
1983	397	820	793	820	820	793	397	4,838
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	793	798	786	650	492	476	238	4,233
1989	359	751	617	548	457	366	153	3,252
1990	681	801	711	527	381	392	221	3,714

N/A - Data not available.

Table C-31
Historical Diversions
Olsen & Seely Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	62	60	62	62	60	N/A	306
1961	N/A	58	60	62	62	60	N/A	302
1962	N/A	48	60	62	62	60	N/A	292
1963	N/A	62	60	62	62	60	N/A	306
1964	N/A	62	60	62	62	60	N/A	306
1965	N/A	62	60	62	42	62	N/A	288
1966	N/A	62	60	62	62	60	N/A	306
1967	N/A	62	60	62	62	60	N/A	306
1968	N/A	62	60	62	62	60	N/A	306
1969	N/A	62	60	62	62	60	N/A	306
1970	N/A	62	60	62	62	60	N/A	306
1971	30	62	60	62	62	60	24	360
1972	30	62	60	62	62	60	30	366
1973	30	62	60	62	62	60	30	366
1974	30	62	60	62	54	49	29	345
1975	26	62	60	62	62	60	30	362
1976	26	57	57	42	39	33	17	270
1977	39	35	21	22	22	21	10	170
1978	30	62	60	62	62	54	27	357
1979	30	62	60	61	60	54	27	354
1980	30	62	60	62	62	60	30	366
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	30	62	60	62	62	60	30	366
1983	30	62	60	62	62	60	30	366
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	60	61	60	49	37	36	18	321
1989	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1990	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A - Data not available.

Table C-32
Historical Diversions
Frandsen McArthur Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	396	324	203	137	189	N/A	1,251
1961	N/A	215	194	188	195	290	N/A	1,082
1962	N/A	499	445	390	311	281	N/A	1,925
1963	N/A	394	368	270	227	226	N/A	1,484
1964	N/A	403	390	383	306	282	N/A	1,764
1965	N/A	337	471	470	396	390	N/A	2,064
1966	N/A	381	370	269	248	90	N/A	1,357
1967	N/A	397	387	403	381	360	N/A	1,928
1968	N/A	413	420	414	403	390	N/A	2,040
1969	N/A	426	445	457	450	414	N/A	2,192
1970	N/A	403	390	403	403	390	N/A	1,989
1971	195	403	390	403	403	390	160	2,344
1972	135	308	340	225	201	191	98	1,498
1973	195	403	390	403	403	390	195	2,379
1974	195	403	390	403	363	291	195	2,240
1975	165	403	390	403	403	390	195	2,349
1976	179	390	390	301	276	134	117	1,788
1977	258	266	196	136	136	132	66	1,190
1978	195	403	390	403	403	360	177	2,331
1979	195	403	390	398	371	351	176	2,283
1980	195	403	390	403	403	390	195	2,379
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	195	403	390	403	403	390	195	2,379
1983	195	403	390	403	403	390	195	2,379
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	390	394	378	320	242	234	117	2,074
1989	161	384	306	229	214	179	76	1,547
1990	335	394	337	227	147	161	92	1,692

N/A - Data not available.

Table C-33
Historical Diversions
Moroni Irrigation City Ditch
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	534	468	307	211	254	N/A	1,774
1961	N/A	304	229	246	250	326	N/A	1,355
1962	N/A	722	782	591	506	454	N/A	3,055
1963	N/A	571	553	396	305	328	N/A	2,153
1964	N/A	696	558	572	427	360	N/A	2,613
1965	N/A	564	308	696	620	580	N/A	2,768
1966	N/A	577	518	419	341	351	N/A	2,206
1967	N/A	581	716	620	594	480	N/A	2,991
1968	N/A	684	620	620	620	600	N/A	3,144
1969	N/A	631	586	645	651	600	N/A	3,113
1970	N/A	620	600	620	620	600	N/A	3,060
1971	300	620	600	620	620	600	247	3,607
1972	183	474	516	347	310	297	150	2,278
1973	300	620	600	620	620	600	300	3,660
1974	300	620	600	620	578	480	300	3,498
1975	255	620	600	620	620	600	300	3,615
1976	276	600	600	448	422	360	180	2,886
1977	504	448	320	210	204	198	100	1,984
1978	300	620	600	620	620	550	270	3,580
1979	300	620	600	612	603	540	270	3,545
1980	300	620	600	620	620	600	300	3,660
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	300	620	600	620	620	600	300	3,660
1983	300	620	600	620	620	600	300	3,660
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	600	606	595	492	372	360	180	3,205
1989	262	595	472	430	329	277	116	2,481
1990	515	606	538	353	234	204	141	2,590

N/A - Data not available.

Table C-34
Historical Diversions
Moroni Irrigation Spring Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	259	212	145	101	105	N/A	822
1961	N/A	155	124	113	107	141	N/A	639
1962	N/A	246	247	223	237	187	N/A	1,141
1963	N/A	275	253	169	140	135	N/A	971
1964	N/A	264	270	257	161	120	N/A	1,072
1965	N/A	234	290	298	258	240	N/A	1,320
1966	N/A	270	242	155	142	146	N/A	955
1967	N/A	212	270	198	146	150	N/A	976
1968	N/A	279	270	279	279	270	N/A	1,377
1969	N/A	227	279	308	248	270	N/A	1,332
1970	N/A	279	270	279	279	270	N/A	1,377
1971	135	279	270	279	279	270	112	1,624
1972	135	222	223	154	142	134	69	1,079
1973	135	279	270	279	279	270	135	1,647
1974	135	279	270	279	249	222	135	1,568
1975	114	279	270	279	279	270	135	1,626
1976	124	270	270	202	180	162	93	1,301
1977	226	188	142	92	80	78	40	846
1978	135	279	270	279	279	205	123	1,570
1979	135	279	270	275	271	243	122	1,595
1980	135	279	270	279	279	270	135	1,647
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	135	279	270	279	279	270	135	1,647
1983	135	279	270	279	279	270	135	1,647
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	270	273	268	221	167	162	81	1,442
1989	118	268	212	193	147	125	52	1,116
1990	232	273	241	155	105	110	64	1,179

N/A - Data not available.

Table C-35
Historical Diversions
Moroni Irrigation Canal Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	874	661	392	358	361	N/A	2,645
1961	N/A	420	328	263	281	381	N/A	1,672
1962	N/A	1,104	1,004	828	775	575	N/A	4,285
1963	N/A	654	852	548	433	448	N/A	2,935
1964	N/A	628	892	851	586	480	N/A	3,437
1965	N/A	813	946	809	821	806	N/A	4,195
1966	N/A	836	770	518	465	468	N/A	3,057
1967	N/A	708	822	874	704	558	N/A	3,666
1968	N/A	750	900	930	930	840	N/A	4,350
1969	N/A	946	890	941	899	921	N/A	4,596
1970	N/A	942	912	942	942	912	N/A	4,651
1971	456	942	912	942	942	912	375	5,482
1972	427	718	770	528	476	455	232	3,605
1973	456	942	912	942	942	912	456	5,563
1974	456	942	912	942	868	780	456	5,356
1975	387	942	912	942	942	912	456	5,494
1976	420	912	912	681	641	547	274	4,387
1977	766	764	484	306	286	270	136	3,012
1978	458	946	915	946	946	839	412	5,460
1979	458	946	951	954	917	823	412	5,459
1980	458	946	915	946	946	915	458	5,582
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	458	946	915	946	946	915	458	5,582
1983	458	946	915	946	946	915	458	5,582
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	912	921	904	748	565	547	274	4,872
1989	398	876	718	654	500	421	176	3,743
1990	783	921	833	596	345	371	234	4,083

N/A - Data not available.

Table C-36
Historical Diversions
Rock Dam Phillip Co.
(unit--acre-feet)

	Apr	May	June	July	Aug	Sept	Oct	Total
1960	N/A	224	86	56	46	47	N/A	459
1961	N/A	149	82	69	42	54	N/A	396
1962	N/A	897	736	671	557	436	N/A	3,297
1963	N/A	854	830	438	270	180	N/A	2,572
1964	N/A	745	954	568	416	300	N/A	2,983
1965	N/A	542	628	740	652	600	N/A	3,162
1966	N/A	630	487	434	428	355	N/A	2,334
1967	N/A	446	578	556	432	528	N/A	2,540
1968	N/A	620	720	839	540	496	N/A	3,215
1969	N/A	696	780	889	894	720	N/A	3,979
1970	N/A	657	666	596	484	421	N/A	2,824
1971	420	744	780	868	260	N/A	N/A	3,072
1972	300	220	60	62	62	60	30	794
1973	540	1,116	1,080	784	462	N/A	N/A	3,982
1974	450	837	771	258	239	N/A	N/A	2,555
1975	480	837	648	496	372	N/A	N/A	2,833
1976	236	632	280	186	186	180	90	1,790
1977	780	504	248	196	186	196	150	2,260
1978	610	928	780	448	278	240	120	3,404
1979	500	1,116	768	464	288	240	120	3,496
1980	540	1,116	1,080	924	536	360	180	4,736
1981	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1982	540	804	540	744	290	370	150	3,438
1983	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1988	600	752	800	310	310	300	200	3,272
1989	180	606	288	248	124	120	316	1,882
1990	543	811	423	185	185	179	407	2,730

N/A - Data not available.

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-59	394	906	394	-	-	360	1,327	360	-	-
Nov-59	-	-	-	-	-	-	-	-	-	-
Dec-59	-	-	-	-	-	-	-	-	-	-
Jan-60	-	-	-	-	-	-	-	-	-	-
Feb-60	-	-	-	-	-	-	-	-	-	-
Mar-60	-	-	-	-	-	-	-	-	-	-
Apr-60	604	631	604	-	-	401	363	363	38	28
May-60	3,569	2,846	2,846	723	422	2,735	2,004	2,004	731	530
Jun-60	6,358	4,136	4,136	2,222	1,297	5,026	4,936	4,936	90	65
Jul-60	8,035	1,847	1,847	6,188	3,611	6,252	1,968	1,968	4,284	3,105
Aug-60	5,903	954	954	4,949	2,888	4,420	1,299	1,299	3,121	2,262
Sep-60	551	876	551	-	-	516	1,324	516	-	-
Total	25,414	12,196	11,332	14,082	8,217	19,710	13,221	11,446	8,264	5,990
Oct-60	-	702	-	-	-	-	1,030	-	-	-
Nov-60	-	-	-	-	-	-	-	-	-	-
Dec-60	-	-	-	-	-	-	-	-	-	-
Jan-61	-	-	-	-	-	-	-	-	-	-
Feb-61	-	-	-	-	-	-	-	-	-	-
Mar-61	-	-	-	-	-	-	-	-	-	-
Apr-61	391	384	384	7	4	230	228	228	2	1
May-61	3,993	1,984	1,984	2,009	1,172	3,073	1,536	1,536	1,537	1,114
Jun-61	6,402	2,828	2,828	3,574	2,085	5,061	3,094	3,094	1,967	1,426
Jul-61	7,666	1,258	1,258	6,408	3,739	5,959	1,438	1,438	4,521	3,277
Aug-61	4,274	973	973	3,301	1,926	3,132	1,376	1,376	1,756	1,273
Sep-61	-	1,087	-	-	-	-	1,671	-	-	-
Total	22,726	9,216	7,427	15,299	8,927	17,455	10,373	7,672	9,783	7,091
Oct-61	19	658	19	-	-	58	984	58	-	-
Nov-61	-	-	-	-	-	-	-	-	-	-
Dec-61	-	-	-	-	-	-	-	-	-	-
Jan-62	-	-	-	-	-	-	-	-	-	-
Feb-62	-	-	-	-	-	-	-	-	-	-
Mar-62	-	-	-	-	-	-	-	-	-	-
Apr-62	508	961	508	-	-	324	562	324	-	-
May-62	3,391	4,002	3,391	-	-	2,593	2,050	2,050	543	394
Jun-62	6,131	7,722	6,131	-	-	4,844	8,277	4,844	-	-
Jul-62	7,903	4,254	4,254	3,649	2,129	6,147	5,415	5,415	732	531
Aug-62	6,136	1,840	1,840	4,296	2,507	4,604	2,067	2,067	2,537	1,839
Sep-62	792	1,343	792	-	-	711	1,976	711	-	-
Total	24,880	20,780	16,935	7,945	4,636	19,281	21,331	15,469	3,812	2,763

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-62	495	701	495	-	-	441	1,077	441	-	-
Nov-62	-	-	-	-	-	-	-	-	-	-
Dec-62	-	-	-	-	-	-	-	-	-	-
Jan-63	-	-	-	-	-	-	-	-	-	-
Feb-63	-	-	-	-	-	-	-	-	-	-
Mar-63	-	-	-	-	-	-	-	-	-	-
Apr-63	144	442	144	-	-	33	255	33	-	-
May-63	3,935	2,228	2,228	1,707	996	3,026	1,240	1,240	1,786	1,294
Jun-63	5,602	3,585	3,585	2,017	1,177	4,421	4,086	4,086	335	243
Jul-63	7,955	2,113	2,113	5,842	3,409	6,189	2,447	2,447	3,742	2,712
Aug-63	5,546	1,782	1,782	3,764	2,196	4,138	1,940	1,940	2,198	1,593
Sep-63	600	1,202	600	-	-	556	1,691	556	-	-
Total	24,277	12,053	10,947	13,330	7,778	18,804	12,736	10,743	8,061	5,843
Oct-63	663	820	663	-	-	577	1,219	577	-	-
Nov-63	-	-	-	-	-	-	-	-	-	-
Dec-63	-	-	-	-	-	-	-	-	-	-
Jan-64	-	-	-	-	-	-	-	-	-	-
Feb-64	-	-	-	-	-	-	-	-	-	-
Mar-64	-	-	-	-	-	-	-	-	-	-
Apr-64	185	436	185	-	-	66	243	66	-	-
May-64	2,999	2,466	2,466	533	311	2,280	1,002	1,002	1,278	926
Jun-64	5,711	6,002	5,711	-	-	4,508	6,429	4,508	-	-
Jul-64	8,295	2,803	2,803	5,492	3,205	6,459	3,593	3,593	2,866	2,077
Aug-64	5,158	1,512	1,512	3,646	2,127	3,831	1,639	1,639	2,192	1,589
Sep-64	1,038	1,233	1,038	-	-	909	1,666	909	-	-
Total	24,049	15,272	14,378	9,671	5,643	18,630	15,791	12,294	6,336	4,592
Oct-64	721	691	691	30	18	623	1,004	623	-	-
Nov-64	-	-	-	-	-	-	-	-	-	-
Dec-64	-	-	-	-	-	-	-	-	-	-
Jan-65	-	-	-	-	-	-	-	-	-	-
Feb-65	-	-	-	-	-	-	-	-	-	-
Mar-65	-	-	-	-	-	-	-	-	-	-
Apr-65	770	793	770	-	-	534	451	451	83	60
May-65	3,229	14,426	3,229	-	-	2,463	3,216	2,463	-	-
Jun-65	5,879	16,570	5,879	-	-	4,643	14,416	4,643	-	-
Jul-65	7,642	3,959	3,959	3,683	2,149	5,940	5,895	5,895	45	33
Aug-65	4,920	1,929	1,929	2,991	1,745	3,643	2,393	2,393	1,250	906
Sep-65	180	1,550	180	-	-	217	2,122	217	-	-
Total	23,341	39,918	16,637	6,704	3,912	18,063	29,497	16,685	1,378	999

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-65	721	616	616	105	61	623	912	623	-	-
Nov-65	-	-	-	-	-	-	-	-	-	-
Dec-65	-	-	-	-	-	-	-	-	-	-
Jan-66	-	-	-	-	-	-	-	-	-	-
Feb-66	-	-	-	-	-	-	-	-	-	-
Mar-66	-	-	-	-	-	-	-	-	-	-
Apr-66	770	3,033	770	-	-	534	1,682	534	-	-
May-66	3,559	10,324	3,559	-	-	2,727	3,496	2,727	-	-
Jun-66	6,288	2,562	2,562	3,726	2,174	4,970	2,678	2,678	2,292	1,661
Jul-66	7,968	1,227	1,227	6,741	3,933	6,199	1,731	1,731	4,468	3,238
Aug-66	5,915	713	713	5,202	3,035	4,430	1	1	4,429	3,210
Sep-66	1,384	785	785	599	350	1,188	1,167	1,167	21	15
Total	26,605	19,260	10,232	16,373	9,554	20,671	11,667	9,461	11,210	8,125
Oct-66	-	854	-	-	-	-	1,291	-	-	-
Nov-66	-	-	-	-	-	-	-	-	-	-
Dec-66	-	-	-	-	-	-	-	-	-	-
Jan-67	-	-	-	-	-	-	-	-	-	-
Feb-67	-	-	-	-	-	-	-	-	-	-
Mar-67	-	-	-	-	-	-	-	-	-	-
Apr-67	660	768	660	-	-	446	427	427	19	14
May-67	2,760	12,268	2,760	-	-	2,089	2,666	2,089	-	-
Jun-67	4,906	13,869	4,906	-	-	3,865	11,739	3,865	-	-
Jul-67	7,678	3,680	3,680	3,998	2,333	5,968	5,247	5,247	721	523
Aug-67	6,042	1,610	1,610	4,432	2,586	4,530	2,208	2,208	2,322	1,683
Sep-67	649	1,237	649	-	-	596	1,842	596	-	-
Total	22,695	34,286	14,265	8,430	4,919	17,494	25,420	14,432	3,062	2,219
Oct-67	654	790	654	-	-	570	1,145	570	-	-
Nov-67	-	-	-	-	-	-	-	-	-	-
Dec-67	-	-	-	-	-	-	-	-	-	-
Jan-68	-	-	-	-	-	-	-	-	-	-
Feb-68	-	-	-	-	-	-	-	-	-	-
Mar-68	-	-	-	-	-	-	-	-	-	-
Apr-68	14	741	14	-	-	-	409	-	-	-
May-68	3,651	15,125	3,651	-	-	2,800	3,491	2,800	-	-
Jun-68	5,602	18,020	5,602	-	-	4,421	15,028	4,421	-	-
Jul-68	7,524	3,594	3,594	3,930	2,293	5,845	3,900	3,900	1,945	1,410
Aug-68	3,754	2,404	2,404	1,350	788	2,721	2,148	2,148	573	415
Sep-68	1,514	1,264	1,264	250	146	1,293	1,736	1,293	-	-
Total	22,713	41,938	17,183	5,530	3,227	17,650	27,857	15,132	2,518	1,825

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-68	342	721	342	-	-	318	1,047	318	-	-
Nov-68	-	-	-	-	-	-	-	-	-	-
Dec-68	-	-	-	-	-	-	-	-	-	-
Jan-69	-	-	-	-	-	-	-	-	-	-
Feb-69	-	-	-	-	-	-	-	-	-	-
Mar-69	-	-	-	-	-	-	-	-	-	-
Apr-69	707	3,516	707	-	-	469	1,948	469	-	-
May-69	4,171	31,007	4,171	-	-	3,215	8,907	3,215	-	-
Jun-69	5,250	7,094	5,250	-	-	4,139	7,214	4,139	-	-
Jul-69	7,618	3,827	3,827	3,791	2,212	5,921	4,459	4,459	1,462	1,060
Aug-69	5,990	2,233	2,233	3,757	2,192	4,489	2,060	2,060	2,429	1,761
Sep-69	1,002	1,424	1,002	-	-	880	1,848	880	-	-
Total	25,080	49,822	17,532	7,548	4,404	19,431	27,483	15,540	3,891	2,820
Oct-69	-	885	-	-	-	-	1,289	-	-	-
Nov-69	-	-	-	-	-	-	-	-	-	-
Dec-69	-	-	-	-	-	-	-	-	-	-
Jan-70	-	-	-	-	-	-	-	-	-	-
Feb-70	-	-	-	-	-	-	-	-	-	-
Mar-70	-	-	-	-	-	-	-	-	-	-
Apr-70	689	573	573	116	68	469	317	317	152	110
May-70	4,171	15,117	4,171	-	-	3,215	3,108	3,108	107	78
Jun-70	4,670	10,068	4,670	-	-	3,676	8,003	3,676	-	-
Jul-70	8,341	4,346	4,346	3,995	2,331	6,496	5,164	5,164	1,332	965
Aug-70	5,471	1,944	1,944	3,527	2,058	4,078	1,657	1,657	2,421	1,755
Sep-70	1,607	1,010	1,010	597	348	1,368	1,453	1,368	-	-
Total	24,949	33,943	16,714	8,235	4,805	19,302	20,991	15,290	4,012	2,908
Oct-70	654	924	654	-	-	570	1,323	570	-	-
Nov-70	-	-	-	-	-	-	-	-	-	-
Dec-70	-	-	-	-	-	-	-	-	-	-
Jan-71	-	-	-	-	-	-	-	-	-	-
Feb-71	-	-	-	-	-	-	-	-	-	-
Mar-71	-	-	-	-	-	-	-	-	-	-
Apr-71	352	1,604	352	-	-	199	886	199	-	-
May-71	3,450	16,097	3,450	-	-	2,639	3,852	2,639	-	-
Jun-71	5,937	8,175	5,937	-	-	4,689	8,756	4,689	-	-
Jul-71	8,279	3,288	3,288	4,991	2,912	6,446	3,583	3,583	2,863	2,075
Aug-71	5,008	1,840	1,840	3,168	1,849	3,713	1,762	1,762	1,951	1,414
Sep-71	1,224	1,249	1,224	-	-	1,059	1,831	1,059	-	-
Total	24,904	33,177	16,745	8,159	4,761	19,315	21,993	14,501	4,814	3,489

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-71	-	672	-	-	-	-	992	-	-	-
Nov-71	-	-	-	-	-	-	-	-	-	-
Dec-71	-	-	-	-	-	-	-	-	-	-
Jan-72	-	-	-	-	-	-	-	-	-	-
Feb-72	-	-	-	-	-	-	-	-	-	-
Mar-72	-	-	-	-	-	-	-	-	-	-
Apr-72	487	1,289	487	-	-	307	712	307	-	-
May-72	3,822	8,561	3,822	-	-	2,936	3,633	2,936	-	-
Jun-72	6,118	3,536	3,536	2,582	1,507	4,834	3,772	3,772	1,062	770
Jul-72	8,062	2,027	2,027	6,035	3,521	6,274	1,725	1,725	4,549	3,297
Aug-72	5,903	921	921	4,982	2,907	4,420	1,012	1,012	3,408	2,470
Sep-72	870	791	791	79	46	773	1,191	773	-	-
Total	25,262	17,797	11,584	13,678	7,981	19,544	13,037	10,525	9,019	6,537
Oct-72	-	837	-	-	-	-	1,242	-	-	-
Nov-72	-	-	-	-	-	-	-	-	-	-
Dec-72	-	-	-	-	-	-	-	-	-	-
Jan-73	-	-	-	-	-	-	-	-	-	-
Feb-73	-	-	-	-	-	-	-	-	-	-
Mar-73	-	-	-	-	-	-	-	-	-	-
Apr-73	117	716	117	-	-	11	395	11	-	-
May-73	2,857	23,579	2,857	-	-	2,166	6,130	2,166	-	-
Jun-73	5,856	11,236	5,856	-	-	4,625	9,425	4,625	-	-
Jul-73	6,956	4,110	4,110	2,846	1,661	5,394	4,661	4,661	733	531
Aug-73	6,221	2,215	2,215	4,006	2,338	4,672	1,832	1,832	2,840	2,058
Sep-73	1,205	1,123	1,123	82	48	1,044	1,630	1,044	-	-
Total	23,212	43,816	16,278	6,934	4,046	17,912	25,315	14,339	3,573	2,590
Oct-73	721	620	620	101	59	623	886	623	-	-
Nov-73	-	-	-	-	-	-	-	-	-	-
Dec-73	-	-	-	-	-	-	-	-	-	-
Jan-74	-	-	-	-	-	-	-	-	-	-
Feb-74	-	-	-	-	-	-	-	-	-	-
Mar-74	-	-	-	-	-	-	-	-	-	-
Apr-74	195	688	195	-	-	73	380	73	-	-
May-74	4,067	17,467	4,067	-	-	3,132	4,810	3,132	-	-
Jun-74	6,402	5,318	5,318	1,084	633	5,061	5,126	5,061	-	-
Jul-74	6,520	2,692	2,692	3,828	2,234	5,047	2,506	2,506	2,541	1,842
Aug-74	6,221	1,535	1,535	4,686	2,734	4,672	1,147	1,147	3,525	2,555
Sep-74	1,607	741	741	866	505	1,368	1,066	1,066	302	219
Total	25,733	29,061	15,168	10,565	6,165	19,976	15,921	13,608	6,368	4,616

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-74	240	695	240	-	-	236	993	236	-	-
Nov-74	-	-	-	-	-	-	-	-	-	-
Dec-74	-	-	-	-	-	-	-	-	-	-
Jan-75	-	-	-	-	-	-	-	-	-	-
Feb-75	-	-	-	-	-	-	-	-	-	-
Mar-75	-	-	-	-	-	-	-	-	-	-
Apr-75	770	418	418	352	205	534	231	231	303	220
May-75	2,386	10,227	2,386	-	-	1,791	2,055	1,791	-	-
Jun-75	5,766	24,720	5,766	-	-	4,552	19,370	4,552	-	-
Jul-75	7,727	5,717	5,717	2,010	1,173	6,007	6,649	6,007	-	-
Aug-75	6,016	2,809	2,809	3,207	1,871	4,509	2,511	2,511	1,998	1,448
Sep-75	1,093	2,105	1,093	-	-	953	2,319	953	-	-
Total	23,998	46,691	18,429	5,569	3,250	18,582	34,128	16,281	2,301	1,668
Oct-75	721	527	527	194	113	623	753	623	-	-
Nov-75	-	-	-	-	-	-	-	-	-	-
Dec-75	-	-	-	-	-	-	-	-	-	-
Jan-76	-	-	-	-	-	-	-	-	-	-
Feb-76	-	-	-	-	-	-	-	-	-	-
Mar-76	-	-	-	-	-	-	-	-	-	-
Apr-76	683	767	683	-	-	464	423	423	41	30
May-76	3,889	12,206	3,889	-	-	2,990	3,756	2,990	-	-
Jun-76	6,302	3,980	3,980	2,322	1,355	4,981	4,390	4,390	591	428
Jul-76	8,175	2,601	2,601	5,574	3,252	6,363	2,503	2,503	3,860	2,798
Aug-76	6,016	1,253	1,253	4,763	2,779	4,509	1,194	1,194	3,315	2,403
Sep-76	1,047	778	778	269	157	916	1,182	916	-	-
Total	26,833	22,112	13,711	13,122	7,657	20,846	14,201	13,039	7,807	5,659
Oct-76	394	1,040	394	-	-	360	1,486	360	-	-
Nov-76	-	-	-	-	-	-	-	-	-	-
Dec-76	-	-	-	-	-	-	-	-	-	-
Jan-77	-	-	-	-	-	-	-	-	-	-
Feb-77	-	-	-	-	-	-	-	-	-	-
Mar-77	-	-	-	-	-	-	-	-	-	-
Apr-77	770	644	644	126	74	534	356	356	178	129
May-77	3,036	1,699	1,699	1,337	780	2,309	709	709	1,600	1,160
Jun-77	6,402	2,215	2,215	4,187	2,443	5,061	2,141	2,141	2,920	2,116
Jul-77	7,216	893	893	6,323	3,689	5,601	1,289	1,289	4,312	3,125
Aug-77	5,168	572	572	4,596	2,682	3,839	817	817	3,022	2,190
Sep-77	1,205	632	632	573	334	1,044	952	952	92	67
Total	24,191	7,695	7,049	17,142	10,002	18,748	7,750	6,624	12,124	8,787

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-77	162	569	162	-	-	173	813	173	-	-
Nov-77	-	-	-	-	-	-	-	-	-	-
Dec-77	-	-	-	-	-	-	-	-	-	-
Jan-78	-	-	-	-	-	-	-	-	-	-
Feb-78	-	-	-	-	-	-	-	-	-	-
Mar-78	-	-	-	-	-	-	-	-	-	-
Apr-78	279	1,637	279	-	-	141	904	141	-	-
May-78	3,600	20,371	3,600	-	-	2,759	4,088	2,759	-	-
Jun-78	6,402	21,672	6,402	-	-	5,061	19,394	5,061	-	-
Jul-78	8,341	4,247	4,247	4,094	2,389	6,496	4,937	4,937	1,559	1,130
Aug-78	5,749	2,237	2,237	3,512	2,049	4,298	1,975	1,975	2,323	1,684
Sep-78	511	1,702	511	-	-	484	2,032	484	-	-
Total	25,044	52,435	17,438	7,606	4,438	19,412	34,143	15,530	3,882	2,814
Oct-78	611	424	424	187	109	534	606	534	-	-
Nov-78	-	-	-	-	-	-	-	-	-	-
Dec-78	-	-	-	-	-	-	-	-	-	-
Jan-79	-	-	-	-	-	-	-	-	-	-
Feb-79	-	-	-	-	-	-	-	-	-	-
Mar-79	-	-	-	-	-	-	-	-	-	-
Apr-79	770	1,008	770	-	-	534	557	534	-	-
May-79	3,343	17,570	3,343	-	-	2,554	5,018	2,554	-	-
Jun-79	6,402	8,107	6,402	-	-	5,061	7,911	5,061	-	-
Jul-79	7,852	3,618	3,618	4,234	2,471	6,106	3,874	3,874	2,232	1,618
Aug-79	5,492	2,011	2,011	3,481	2,031	4,095	1,625	1,625	2,470	1,790
Sep-79	1,607	1,078	1,078	529	309	1,368	1,293	1,293	75	54
Total	26,077	33,816	17,646	8,431	4,919	20,252	20,884	15,475	4,777	3,462
Oct-79	320	839	320	-	-	300	1,199	300	-	-
Nov-79	-	-	-	-	-	-	-	-	-	-
Dec-79	-	-	-	-	-	-	-	-	-	-
Jan-80	-	-	-	-	-	-	-	-	-	-
Feb-80	-	-	-	-	-	-	-	-	-	-
Mar-80	-	-	-	-	-	-	-	-	-	-
Apr-80	577	1,146	577	-	-	379	633	379	-	-
May-80	2,708	18,132	2,708	-	-	2,048	4,421	2,048	-	-
Jun-80	6,402	24,436	6,402	-	-	5,061	20,326	5,061	-	-
Jul-80	7,454	7,177	7,177	277	162	5,790	9,347	5,790	-	-
Aug-80	5,058	3,361	3,361	1,697	990	3,752	3,343	3,343	409	296
Sep-80	219	2,623	219	-	-	248	3,942	248	-	-
Total	22,738	57,714	20,764	1,974	1,152	17,578	43,211	17,169	409	296

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-80	46	588	46	-	-	80	840	80	-	-
Nov-80	-	-	-	-	-	-	-	-	-	-
Dec-80	-	-	-	-	-	-	-	-	-	-
Jan-81	-	-	-	-	-	-	-	-	-	-
Feb-81	-	-	-	-	-	-	-	-	-	-
Mar-81	-	-	-	-	-	-	-	-	-	-
Apr-81	731	1,935	731	-	-	503	1,069	503	-	-
May-81	2,752	10,186	2,752	-	-	2,082	2,482	2,082	-	-
Jun-81	6,402	5,631	5,631	771	450	5,061	5,891	5,061	-	-
Jul-81	7,194	2,849	2,849	4,345	2,535	5,584	2,930	2,930	2,654	1,924
Aug-81	4,586	1,479	1,479	3,107	1,813	3,379	1,240	1,240	2,139	1,550
Sep-81	486	1,159	486	-	-	464	1,260	464	-	-
Total	22,197	23,827	13,974	8,223	4,798	17,153	15,712	12,360	4,793	3,474
Oct-81	-	1,212	-	-	-	-	1,733	-	-	-
Nov-81	-	-	-	-	-	-	-	-	-	-
Dec-81	-	-	-	-	-	-	-	-	-	-
Jan-82	-	-	-	-	-	-	-	-	-	-
Feb-82	-	-	-	-	-	-	-	-	-	-
Mar-82	-	-	-	-	-	-	-	-	-	-
Apr-82	770	2,078	770	-	-	534	1,148	534	-	-
May-82	3,018	28,775	3,018	-	-	2,294	6,927	2,294	-	-
Jun-82	6,261	17,271	6,261	-	-	4,948	15,333	4,948	-	-
Jul-82	7,582	4,988	4,988	2,594	1,514	5,892	6,235	5,892	-	-
Aug-82	5,492	2,490	2,490	3,002	1,752	4,095	2,280	2,280	1,815	1,316
Sep-82	-	1,582	-	-	-	-	2,412	-	-	-
Total	23,123	58,396	17,527	5,596	3,265	17,763	36,068	15,948	1,815	1,316
Oct-82	-	858	-	-	-	4	1,226	4	-	-
Nov-82	-	-	-	-	-	-	-	-	-	-
Dec-82	-	-	-	-	-	-	-	-	-	-
Jan-83	-	-	-	-	-	-	-	-	-	-
Feb-83	-	-	-	-	-	-	-	-	-	-
Mar-83	-	-	-	-	-	-	-	-	-	-
Apr-83	260	1,706	260	-	-	126	942	126	-	-
May-83	3,391	24,117	3,391	-	-	2,593	4,839	2,593	-	-
Jun-83	6,388	44,459	6,388	-	-	5,050	34,448	5,050	-	-
Jul-83	7,727	12,196	7,727	-	-	6,007	16,006	6,007	-	-
Aug-83	4,247	4,994	4,247	-	-	3,111	5,917	3,111	-	-
Sep-83	-	2,850	-	-	-	58	4,302	58	-	-
Total	22,013	91,180	22,013	-	-	16,949	67,680	16,949	-	-

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-83	240	1,529	240	-	-	236	2,186	236	-	-
Nov-83	-	-	-	-	-	-	-	-	-	-
Dec-83	-	-	-	-	-	-	-	-	-	-
Jan-84	-	-	-	-	-	-	-	-	-	-
Feb-84	-	-	-	-	-	-	-	-	-	-
Mar-84	-	-	-	-	-	-	-	-	-	-
Apr-84	289	1,620	289	-	-	149	894	149	-	-
May-84	3,757	39,353	3,757	-	-	2,884	7,893	2,884	-	-
Jun-84	3,916	22,126	3,916	-	-	3,072	17,422	3,072	-	-
Jul-84	6,449	6,328	6,328	121	71	4,991	8,010	4,991	-	-
Aug-84	5,438	3,402	3,402	2,036	1,188	4,053	3,510	3,510	543	394
Sep-84	733	2,636	733	-	-	663	3,066	663	-	-
Total	20,822	76,994	18,665	2,157	1,259	16,048	42,981	15,505	543	394
Oct-84	-	1,651	-	-	-	-	2,359	-	-	-
Nov-84	-	-	-	-	-	-	-	-	-	-
Dec-84	-	-	-	-	-	-	-	-	-	-
Jan-85	-	-	-	-	-	-	-	-	-	-
Feb-85	-	-	-	-	-	-	-	-	-	-
Mar-85	-	-	-	-	-	-	-	-	-	-
Apr-85	237	5,271	237	-	-	107	2,911	107	-	-
May-85	3,239	26,315	3,239	-	-	2,471	6,680	2,471	-	-
Jun-85	5,678	6,345	5,678	-	-	4,482	6,036	4,482	-	-
Jul-85	6,142	4,284	4,284	1,858	1,084	4,747	4,850	4,747	-	-
Aug-85	6,221	2,570	2,570	3,651	2,130	4,672	2,261	2,261	2,411	1,747
Sep-85	1	1,802	1	-	-	953	2,269	953	-	-
Total	21,518	48,238	16,009	5,509	3,215	17,432	27,366	15,021	2,411	1,747
Oct-85	-	1,320	-	-	-	-	1,886	-	-	-
Nov-85	-	-	-	-	-	-	-	-	-	-
Dec-85	-	-	-	-	-	-	-	-	-	-
Jan-86	-	-	-	-	-	-	-	-	-	-
Feb-86	-	-	-	-	-	-	-	-	-	-
Mar-86	-	-	-	-	-	-	-	-	-	-
Apr-86	-	4,355	-	-	-	-	2,405	-	-	-
May-86	3,683	33,418	3,683	-	-	2,825	6,703	2,825	-	-
Jun-86	5,856	20,232	5,856	-	-	4,625	14,704	4,625	-	-
Jul-86	7,929	4,058	4,058	3,871	2,259	6,168	4,041	4,041	2,127	1,542
Aug-86	5,819	2,666	2,666	3,153	1,840	4,353	2,367	2,367	1,986	1,439
Sep-86	438	1,874	438	-	-	425	2,422	425	-	-
Total	23,725	67,923	16,701	7,024	4,099	18,396	34,528	14,283	4,113	2,981

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Oct-86	-	1,054	-	-	-	31	1,506	31	-	-
Nov-86	-	-	-	-	-	-	-	-	-	-
Dec-86	-	-	-	-	-	-	-	-	-	-
Jan-87	-	-	-	-	-	-	-	-	-	-
Feb-87	-	-	-	-	-	-	-	-	-	-
Mar-87	-	-	-	-	-	-	-	-	-	-
Apr-87	770	2,526	770	-	-	534	1,395	534	-	-
May-87	3,027	10,907	3,027	-	-	2,302	3,115	2,302	-	-
Jun-87	6,195	4,907	4,907	1,288	752	4,895	4,647	4,647	248	180
Jul-87	7,317	3,061	3,061	4,256	2,483	5,681	2,912	2,912	2,769	2,007
Aug-87	5,438	2,101	2,101	3,337	1,947	4,053	1,945	1,945	2,108	1,528
Sep-87	1,363	1,358	1,358	5	3	1,171	1,870	1,171	-	-
Total	24,110	25,914	15,224	8,886	5,185	18,667	17,390	13,542	5,125	3,715
Oct-87	80	1,189	80	-	-	107	1,699	107	-	-
Nov-87	-	-	-	-	-	-	-	-	-	-
Dec-87	-	-	-	-	-	-	-	-	-	-
Jan-88	-	-	-	-	-	-	-	-	-	-
Feb-88	-	-	-	-	-	-	-	-	-	-
Mar-88	-	-	-	-	-	-	-	-	-	-
Apr-88	482	1,253	482	-	-	303	692	303	-	-
May-88	2,874	11,574	2,874	-	-	2,180	2,325	2,180	-	-
Jun-88	6,056	4,014	4,014	2,043	1,192	4,785	4,317	4,317	467	339
Jul-88	7,727	2,987	2,987	4,740	2,766	6,007	2,940	2,940	3,067	2,223
Aug-88	5,669	1,677	1,677	3,992	2,329	4,235	1,678	1,678	2,557	1,853
Sep-88	784	1,296	784	-	-	704	1,721	704	-	-
Total	23,672	23,990	12,898	10,775	6,287	18,321	15,372	12,229	6,091	4,415
Oct-88	240	662	240	-	-	236	946	236	-	-
Nov-88	-	-	-	-	-	-	-	-	-	-
Dec-88	-	-	-	-	-	-	-	-	-	-
Jan-89	-	-	-	-	-	-	-	-	-	-
Feb-89	-	-	-	-	-	-	-	-	-	-
Mar-89	-	-	-	-	-	-	-	-	-	-
Apr-89	555	1,306	555	-	-	362	721	362	-	-
May-89	3,757	2,559	2,559	1,198	699	2,884	518	518	2,366	1,715
Jun-89	5,645	432	432	5,213	3,042	4,456	1,223	1,223	3,233	2,343
Jul-89	7,942	1,185	1,185	6,757	3,942	6,178	406	406	5,772	4,183
Aug-89	5,078	572	572	4,506	2,629	3,768	128	128	3,640	2,638
Sep-89	716	98	98	618	360	649	88	88	562	407
Total	23,933	6,814	5,641	18,292	10,672	18,533	4,030	2,961	15,573	11,286

Table C-37
Remaining Demands and Project Water Deliveries

	1	2	3	4	5	6	7	8	9	10
	Group 1 Lands					Group 2 Lands				
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)
Average										
Oct	281	852	261	21	12	256	1,233	256	-	-
Nov	-	-	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-	-	-
Jan	-	-	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-
Apr	485	1,475	465	20	12	310	818	283	27	20
May	3,403	14,830	3,153	250	146	2,602	3,756	2,270	332	240
Jun	5,906	11,042	4,872	1,034	604	4,664	9,684	4,224	440	319
Jul	7,641	3,707	3,558	4,082	2,382	5,938	4,355	3,767	2,172	1,574
Aug	5,465	1,953	1,928	3,537	2,064	4,074	1,911	1,818	2,256	1,635
Sep	814	1,350	665	149	87	753	1,845	718	35	25
Total	23,994	35,209	14,902	9,093	5,306	18,597	23,603	13,335	5,262	3,814

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-59	393	1,659	393	-	-	-	-	-
Nov-59	-	-	-	-	-	-	-	-
Dec-59	-	-	-	-	-	-	-	-
Jan-60	-	-	-	-	-	-	-	-
Feb-60	-	-	-	-	-	-	-	-
Mar-60	-	-	-	-	-	-	-	-
Apr-60	438	1,612	438	-	-	28	6	21
May-60	2,986	3,957	2,986	-	-	952	215	737
Jun-60	5,488	3,156	3,156	2,332	1,690	3,052	689	2,363
Jul-60	6,827	2,043	2,043	4,784	3,467	10,183	2,300	7,883
Aug-60	4,826	1,614	1,614	3,212	2,328	7,478	1,689	5,789
Sep-60	564	1,630	564	-	-	-	-	-
Total	21,522	15,671	11,194	10,328	7,486	21,692	4,900	16,792
Oct-60	-	1,029	-	-	-	-	-	-
Nov-60	-	-	-	-	-	-	-	-
Dec-60	-	-	-	-	-	-	-	-
Jan-61	-	-	-	-	-	-	-	-
Feb-61	-	-	-	-	-	-	-	-
Mar-61	-	-	-	-	-	-	-	-
Apr-61	252	1,114	252	-	-	6	1	4
May-61	3,356	1,927	1,927	1,429	1,036	3,322	656	2,666
Jun-61	5,526	1,681	1,681	3,845	2,787	6,298	1,244	5,054
Jul-61	6,507	1,587	1,587	4,920	3,566	10,582	2,091	8,491
Aug-61	3,420	1,495	1,495	1,925	1,395	4,594	908	3,686
Sep-61	-	1,877	-	-	-	-	-	-
Total	19,061	10,710	6,942	12,119	8,784	24,802	4,900	19,902
Oct-61	63	711	63	-	-	-	-	-
Nov-61	-	-	-	-	-	-	-	-
Dec-61	-	-	-	-	-	-	-	-
Jan-62	-	-	-	-	-	-	-	-
Feb-62	-	-	-	-	-	-	-	-
Mar-62	-	-	-	-	-	-	-	-
Apr-62	354	3,022	354	-	-	-	-	-
May-62	2,831	6,226	2,831	-	-	394	196	198
Jun-62	5,290	5,397	5,290	-	-	-	-	-
Jul-62	6,712	4,487	4,487	2,225	1,613	4,272	2,128	2,144
Aug-62	5,028	3,890	3,890	1,138	825	5,170	2,576	2,595
Sep-62	776	3,248	776	-	-	-	-	-
Total	21,054	26,981	17,691	3,363	2,438	9,836	4,900	4,936

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-62	482	1,930	482	-	-	-	-	-
Nov-62	-	-	-	-	-	-	-	-
Dec-62	-	-	-	-	-	-	-	-
Jan-63	-	-	-	-	-	-	-	-
Feb-63	-	-	-	-	-	-	-	-
Mar-63	-	-	-	-	-	-	-	-
Apr-63	36	2,170	36	-	-	-	-	-
May-63	3,304	4,427	3,304	-	-	2,291	624	1,666
Jun-63	4,828	4,660	4,660	168	122	1,541	420	1,121
Jul-63	6,758	3,069	3,069	3,689	2,674	8,795	2,397	6,398
Aug-63	4,519	2,362	2,362	2,157	1,563	5,353	1,459	3,894
Sep-63	607	2,172	607	-	-	-	-	-
Total	20,534	20,790	14,520	6,014	4,359	17,980	4,900	13,080
Oct-63	630	1,385	630	-	-	-	-	-
Nov-63	-	-	-	-	-	-	-	-
Dec-63	-	-	-	-	-	-	-	-
Jan-64	-	-	-	-	-	-	-	-
Feb-64	-	-	-	-	-	-	-	-
Mar-64	-	-	-	-	-	-	-	-
Apr-64	72	2,591	72	-	-	-	-	-
May-64	2,490	4,948	2,490	-	-	1,237	468	770
Jun-64	4,923	5,004	4,923	-	-	-	-	-
Jul-64	7,052	4,288	4,288	2,764	2,003	7,285	2,754	4,531
Aug-64	4,184	3,185	3,185	999	724	4,440	1,678	2,762
Sep-64	992	2,506	992	-	-	-	-	-
Total	20,343	23,907	16,580	3,763	2,727	12,963	4,900	8,063
Oct-64	680	1,654	680	-	-	18	14	3
Nov-64	-	-	-	-	-	-	-	-
Dec-64	-	-	-	-	-	-	-	-
Jan-65	-	-	-	-	-	-	-	-
Feb-65	-	-	-	-	-	-	-	-
Mar-65	-	-	-	-	-	-	-	-
Apr-65	583	3,107	583	-	-	60	50	10
May-65	2,690	4,500	2,690	-	-	-	-	-
Jun-65	5,070	5,469	5,070	-	-	-	-	-
Jul-65	6,486	5,075	5,075	1,411	1,023	3,204	2,646	558
Aug-65	3,978	4,421	3,978	-	-	2,651	2,190	462
Sep-65	237	4,433	237	-	-	-	-	-
Total	19,724	28,659	18,313	1,411	1,023	5,933	4,900	1,033

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-65	680	1,984	680	-	-	61	13	48
Nov-65	-	-	-	-	-	-	-	-
Dec-65	-	-	-	-	-	-	-	-
Jan-66	-	-	-	-	-	-	-	-
Feb-66	-	-	-	-	-	-	-	-
Mar-66	-	-	-	-	-	-	-	-
Apr-66	583	2,146	583	-	-	-	-	-
May-66	2,977	4,570	2,977	-	-	-	-	-
Jun-66	5,427	3,942	3,942	1,485	1,076	4,912	1,043	3,869
Jul-66	6,769	2,964	2,964	3,805	2,758	9,930	2,109	7,821
Aug-66	4,837	2,685	2,685	2,152	1,560	7,805	1,658	6,148
Sep-66	1,297	2,345	1,297	-	-	365	77	287
Total	22,570	20,636	15,128	7,442	5,394	23,073	4,900	18,173
Oct-66	0	1,370	-	-	-	-	-	-
Nov-66	0	0	-	-	-	-	-	-
Dec-66	0	0	-	-	-	-	-	-
Jan-67	0	0	-	-	-	-	-	-
Feb-67	0	0	-	-	-	-	-	-
Mar-67	0	0	-	-	-	-	-	-
Apr-67	487	2,817	487	-	-	14	7	6
May-67	2,281	4,005	2,281	-	-	-	-	-
Jun-67	4,220	5,511	4,220	-	-	-	-	-
Jul-67	6,517	4,676	4,676	1,841	1,334	4,190	2,242	1,948
Aug-67	4,946	3,999	3,999	947	686	4,955	2,651	2,304
Sep-67	650	3,478	650	-	-	-	-	-
Total	19,101	25,856	16,313	2,788	2,021	9,159	4,900	4,259
Oct-67	622	1,798	622	-	-	-	-	-
Nov-67	0	0	-	-	-	-	-	-
Dec-67	0	0	-	-	-	-	-	-
Jan-68	0	0	-	-	-	-	-	-
Feb-68	0	0	-	-	-	-	-	-
Mar-68	0	0	-	-	-	-	-	-
Apr-68	0	3,026	-	-	-	-	-	-
May-68	3,058	4,507	3,058	-	-	-	-	-
Jun-68	4,828	4,900	4,828	-	-	-	-	-
Jul-68	6,383	4,844	4,844	1,539	1,115	4,818	3,828	990
Aug-68	2,971	4,570	2,971	-	-	1,203	956	247
Sep-68	1,411	4,456	1,411	-	-	146	116	30
Total	19,273	28,101	17,734	1,539	1,115	6,167	4,900	1,267

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-68	347	1,932	347	-	-	-	-	-
Nov-68	-	-	-	-	-	-	-	-
Dec-68	-	-	-	-	-	-	-	-
Jan-69	-	-	-	-	-	-	-	-
Feb-69	-	-	-	-	-	-	-	-
Mar-69	-	-	-	-	-	-	-	-
Apr-69	528	3,113	528	-	-	-	-	-
May-69	3,510	4,712	3,510	-	-	-	-	-
Jun-69	4,520	4,673	4,520	-	-	-	-	-
Jul-69	6,465	5,036	5,036	1,429	1,036	4,307	2,552	1,756
Aug-69	4,902	4,886	4,886	16	12	3,964	2,348	1,616
Sep-69	961	4,642	961	-	-	-	-	-
Total	21,233	28,994	19,788	1,445	1,047	8,272	4,900	3,372
Oct-69	-	1,988	-	-	-	-	-	-
Nov-69	-	-	-	-	-	-	-	-
Dec-69	-	-	-	-	-	-	-	-
Jan-70	-	-	-	-	-	-	-	-
Feb-70	-	-	-	-	-	-	-	-
Mar-70	-	-	-	-	-	-	-	-
Apr-70	512	2,921	512	-	-	178	91	86
May-70	3,510	4,638	3,510	-	-	78	40	38
Jun-70	4,013	4,518	4,013	-	-	-	-	-
Jul-70	7,093	4,576	4,576	2,517	1,824	5,121	2,631	2,490
Aug-70	4,453	4,465	4,453	-	-	3,813	1,959	1,854
Sep-70	1,494	4,273	1,494	-	-	348	179	169
Total	21,075	27,379	18,558	2,517	1,824	9,537	4,900	4,637
Oct-70	622	1,865	622	-	-	-	-	-
Nov-70	-	-	-	-	-	-	-	-
Dec-70	-	-	-	-	-	-	-	-
Jan-71	-	-	-	-	-	-	-	-
Feb-71	-	-	-	-	-	-	-	-
Mar-71	-	-	-	-	-	-	-	-
Apr-71	217	2,302	217	-	-	-	-	-
May-71	2,882	4,628	2,882	-	-	-	-	-
Jun-71	5,120	4,539	4,539	581	421	421	200	221
Jul-71	7,039	4,752	4,752	2,287	1,658	6,645	3,152	3,493
Aug-71	4,054	4,084	4,054	-	-	3,263	1,548	1,715
Sep-71	1,157	3,713	1,157	-	-	-	-	-
Total	21,091	25,883	18,223	2,868	2,079	10,329	4,900	5,429

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-71	-	1,534	-	-	-	-	-	-
Nov-71	-	-	-	-	-	-	-	-
Dec-71	-	-	-	-	-	-	-	-
Jan-72	-	-	-	-	-	-	-	-
Feb-72	-	-	-	-	-	-	-	-
Mar-72	-	-	-	-	-	-	-	-
Apr-72	335	1,921	335	-	-	-	-	-
May-72	3,206	3,276	3,206	-	-	-	-	-
Jun-72	5,279	3,336	3,336	1,943	1,408	3,685	850	2,835
Jul-72	6,851	2,284	2,284	4,567	3,310	10,129	2,336	7,793
Aug-72	4,826	2,056	2,056	2,770	2,008	7,385	1,703	5,681
Sep-72	844	1,949	844	-	-	46	11	35
Total	21,341	16,356	12,061	9,280	6,726	21,244	4,900	16,344
Oct-72	-	993	-	-	-	-	-	-
Nov-72	-	-	-	-	-	-	-	-
Dec-72	-	-	-	-	-	-	-	-
Jan-73	-	-	-	-	-	-	-	-
Feb-73	-	-	-	-	-	-	-	-
Mar-73	-	-	-	-	-	-	-	-
Apr-73	12	2,421	12	-	-	-	-	-
May-73	2,365	5,003	2,365	-	-	-	-	-
Jun-73	5,050	4,842	4,842	208	151	151	90	61
Jul-73	5,890	4,671	4,671	1,219	884	3,075	1,830	1,246
Aug-73	5,101	4,320	4,320	781	566	4,962	2,952	2,010
Sep-73	1,140	3,724	1,140	-	-	48	28	19
Total	19,558	25,974	17,350	2,208	1,600	8,236	4,900	3,336
Oct-73	680	1,861	680	-	-	59	21	38
Nov-73	-	-	-	-	-	-	-	-
Dec-73	-	-	-	-	-	-	-	-
Jan-74	-	-	-	-	-	-	-	-
Feb-74	-	-	-	-	-	-	-	-
Mar-74	-	-	-	-	-	-	-	-
Apr-74	80	2,331	80	-	-	-	-	-
May-74	3,420	4,710	3,420	-	-	-	-	-
Jun-74	5,526	4,500	4,500	1,026	744	1,376	496	880
Jul-74	5,511	4,039	4,039	1,472	1,067	5,142	1,854	3,288
Aug-74	5,101	3,723	3,723	1,378	999	6,288	2,267	4,021
Sep-74	1,494	3,077	1,494	-	-	724	261	463
Total	21,812	24,241	17,936	3,876	2,809	13,590	4,900	8,690

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-74	258	1,801	258	-	-	-	-	-
Nov-74	-	-	-	-	-	-	-	-
Dec-74	-	-	-	-	-	-	-	-
Jan-75	-	-	-	-	-	-	-	-
Feb-75	-	-	-	-	-	-	-	-
Mar-75	-	-	-	-	-	-	-	-
Apr-75	583	2,141	583	-	-	425	284	141
May-75	1,955	4,767	1,955	-	-	-	-	-
Jun-75	4,971	4,467	4,467	504	365	365	244	121
Jul-75	6,560	4,399	4,399	2,161	1,566	2,739	1,829	910
Aug-75	4,924	4,251	4,251	673	488	3,807	2,543	1,264
Sep-75	1,041	3,764	1,041	-	-	-	-	-
Total	20,292	25,590	16,954	3,338	2,419	7,337	4,900	2,437
Oct-75	680	1,883	680	-	-	113	30	84
Nov-75	-	-	-	-	-	-	-	-
Dec-75	-	-	-	-	-	-	-	-
Jan-76	-	-	-	-	-	-	-	-
Feb-76	-	-	-	-	-	-	-	-
Mar-76	-	-	-	-	-	-	-	-
Apr-76	507	1,971	507	-	-	30	8	22
May-76	3,265	4,429	3,265	-	-	-	-	-
Jun-76	5,439	4,085	4,085	1,354	981	2,765	724	2,040
Jul-76	6,948	2,976	2,976	3,972	2,879	8,929	2,339	6,590
Aug-76	4,924	2,817	2,817	2,107	1,527	6,709	1,758	4,951
Sep-76	1,000	2,370	1,000	-	-	157	41	116
Total	22,763	20,531	15,330	7,433	5,387	18,703	4,900	13,803
Oct-76	393	1,235	393	-	-	-	-	-
Nov-76	-	-	-	-	-	-	-	-
Dec-76	-	-	-	-	-	-	-	-
Jan-77	-	-	-	-	-	-	-	-
Feb-77	-	-	-	-	-	-	-	-
Mar-77	-	-	-	-	-	-	-	-
Apr-77	583	3,562	583	-	-	203	37	165
May-77	2,521	3,131	2,521	-	-	1,940	356	1,583
Jun-77	5,526	1,967	1,967	3,559	2,580	7,139	1,312	5,827
Jul-77	6,116	1,521	1,521	4,595	3,330	10,145	1,864	8,281
Aug-77	4,192	1,473	1,473	2,719	1,971	6,843	1,257	5,586
Sep-77	1,140	1,435	1,140	-	-	401	74	327
Total	20,471	14,324	9,598	10,873	7,881	26,671	4,900	21,771

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-77	189	772	189	-	-	-	-	-
Nov-77	-	-	-	-	-	-	-	-
Dec-77	-	-	-	-	-	-	-	-
Jan-78	-	-	-	-	-	-	-	-
Feb-78	-	-	-	-	-	-	-	-
Mar-78	-	-	-	-	-	-	-	-
Apr-78	154	2,433	154	-	-	-	-	-
May-78	3,013	4,731	3,013	-	-	-	-	-
Jun-78	5,526	4,619	4,619	907	657	657	316	342
Jul-78	7,093	4,407	4,407	2,686	1,947	5,466	2,624	2,841
Aug-78	4,693	4,212	4,212	481	349	4,082	1,960	2,122
Sep-78	528	3,569	528	-	-	-	-	-
Total	21,196	24,743	17,122	4,074	2,953	10,205	4,900	5,305
Oct-78	584	1,838	584	-	-	109	49	60
Nov-78	-	-	-	-	-	-	-	-
Dec-78	-	-	-	-	-	-	-	-
Jan-79	-	-	-	-	-	-	-	-
Feb-79	-	-	-	-	-	-	-	-
Mar-79	-	-	-	-	-	-	-	-
Apr-79	583	2,420	583	-	-	-	-	-
May-79	2,789	5,083	2,789	-	-	-	-	-
Jun-79	5,526	4,643	4,643	883	640	640	287	353
Jul-79	6,668	4,398	4,398	2,270	1,645	5,734	2,569	3,165
Aug-79	4,472	4,099	4,099	373	270	4,092	1,833	2,259
Sep-79	1,494	3,678	1,494	-	-	363	163	200
Total	22,116	26,159	18,590	3,526	2,556	10,938	4,900	6,038
Oct-79	328	1,839	328	-	-	-	-	-
Nov-79	-	-	-	-	-	-	-	-
Dec-79	-	-	-	-	-	-	-	-
Jan-80	-	-	-	-	-	-	-	-
Feb-80	-	-	-	-	-	-	-	-
Mar-80	-	-	-	-	-	-	-	-
Apr-80	414	2,460	414	-	-	-	-	-
May-80	2,236	5,083	2,236	-	-	-	-	-
Jun-80	5,526	4,919	4,919	607	440	440	737	-
Jul-80	6,322	4,891	4,891	1,431	1,037	1,199	2,008	-
Aug-80	4,097	4,495	4,097	-	-	1,287	2,155	-
Sep-80	271	4,181	271	-	-	-	-	-
Total	19,194	27,868	17,156	2,038	1,477	2,925	4,900	-

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-80	87	2,091	87	-	-	-	-	-
Nov-80	-	-	-	-	-	-	-	-
Dec-80	-	-	-	-	-	-	-	-
Jan-81	-	-	-	-	-	-	-	-
Feb-81	-	-	-	-	-	-	-	-
Mar-81	-	-	-	-	-	-	-	-
Apr-81	549	2,348	549	-	-	-	-	-
May-81	2,274	4,185	2,274	-	-	-	-	-
Jun-81	5,526	4,035	4,035	1,491	1,081	1,531	654	876
Jul-81	6,097	3,622	3,622	2,475	1,794	6,253	2,673	3,580
Aug-81	3,690	3,252	3,252	438	317	3,681	1,573	2,108
Sep-81	507	2,979	507	-	-	-	-	-
Total	18,730	22,512	14,326	4,404	3,192	11,464	4,900	6,564
Oct-81	-	1,503	-	-	-	-	-	-
Nov-81	-	-	-	-	-	-	-	-
Dec-81	-	-	-	-	-	-	-	-
Jan-82	-	-	-	-	-	-	-	-
Feb-82	-	-	-	-	-	-	-	-
Mar-82	-	-	-	-	-	-	-	-
Apr-82	583	2,460	583	-	-	-	-	-
May-82	2,505	4,771	2,505	-	-	-	-	-
Jun-82	5,403	4,379	4,379	1,024	742	742	540	202
Jul-82	6,434	4,711	4,711	1,723	1,249	2,762	2,010	752
Aug-82	4,472	4,250	4,250	222	161	3,228	2,349	879
Sep-82	-	4,199	-	-	-	-	-	-
Total	19,397	26,273	16,428	2,969	2,152	6,733	4,900	1,833
Oct-82	5	2,065	5	-	-	-	-	-
Nov-82	-	-	-	-	-	-	-	-
Dec-82	-	-	-	-	-	-	-	-
Jan-83	-	-	-	-	-	-	-	-
Feb-83	-	-	-	-	-	-	-	-
Mar-83	-	-	-	-	-	-	-	-
Apr-83	137	1,900	137	-	-	-	-	-
May-83	2,831	3,967	2,831	-	-	-	-	-
Jun-83	5,514	3,839	3,839	1,675	1,214	1,214	1,923	-
Jul-83	6,560	3,967	3,967	2,593	1,879	1,879	2,977	-
Aug-83	3,397	3,967	3,397	-	-	-	-	-
Sep-83	63	3,839	63	-	-	-	-	-
Total	18,507	23,544	14,239	4,268	3,093	3,093	4,900	-

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-83	258	1,899	258	-	-	-	-	-
Nov-83	0	0	-	-	-	-	-	-
Dec-83	0	0	-	-	-	-	-	-
Jan-84	0	0	-	-	-	-	-	-
Feb-84	0	0	-	-	-	-	-	-
Mar-84	0	0	-	-	-	-	-	-
Apr-84	162	3,892	162	-	-	-	-	-
May-84	3,149	6,937	3,149	-	-	-	-	-
Jun-84	3,354	6,690	3,354	-	-	-	-	-
Jul-84	5,450	6,004	5,450	-	-	71	209	-
Aug-84	4,425	5,391	4,425	-	-	1,582	4,691	-
Sep-84	724	4,939	724	-	-	-	-	-
Total	17,522	35,752	17,522	-	-	1,652	4,900	-
Oct-84	0	2,492	-	-	-	-	-	-
Nov-84	0	0	-	-	-	-	-	-
Dec-84	0	0	-	-	-	-	-	-
Jan-85	0	0	-	-	-	-	-	-
Feb-85	0	0	-	-	-	-	-	-
Mar-85	0	0	-	-	-	-	-	-
Apr-85	117	3,153	117	-	-	-	-	-
May-85	2,698	5,621	2,698	-	-	-	-	-
Jun-85	4,894	5,420	4,894	-	-	-	-	-
Jul-85	5,183	4,865	4,865	318	230	1,315	1,125	189
Aug-85	5,101	4,368	4,368	733	531	4,409	3,775	635
Sep-85	1,041	4,002	1,041	-	-	-	-	-
Total	19,034	29,921	17,983	1,051	762	5,724	4,900	824
Oct-85	0	2,019	-	-	-	-	-	-
Nov-85	0	0	-	-	-	-	-	-
Dec-85	0	0	-	-	-	-	-	-
Jan-86	0	0	-	-	-	-	-	-
Feb-86	0	0	-	-	-	-	-	-
Mar-86	0	0	-	-	-	-	-	-
Apr-86	0	3,718	-	-	-	-	-	-
May-86	3,085	6,626	3,085	-	-	-	-	-
Jun-86	5,050	6,390	5,050	-	-	-	-	-
Jul-86	6,735	5,735	5,735	1,000	725	4,525	2,841	1,684
Aug-86	4,754	5,150	4,754	-	-	3,279	2,059	1,220
Sep-86	465	4,718	465	-	-	-	-	-
Total	20,089	34,356	19,089	1,000	725	7,804	4,900	2,904

Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Oct-86	34	2,380	34	-	-	-	-	-
Nov-86	-	-	-	-	-	-	-	-
Dec-86	-	-	-	-	-	-	-	-
Jan-87	-	-	-	-	-	-	-	-
Feb-87	-	-	-	-	-	-	-	-
Mar-87	-	-	-	-	-	-	-	-
Apr-87	583	2,470	583	-	-	-	-	-
May-87	2,513	4,402	2,513	-	-	-	-	-
Jun-87	5,345	4,245	4,245	1,100	797	1,729	697	1,032
Jul-87	6,203	3,810	3,810	2,393	1,734	6,224	2,508	3,716
Aug-87	4,425	3,421	3,421	1,004	728	4,203	1,694	2,509
Sep-87	1,279	3,134	1,279	-	-	3	1	2
Total	20,382	23,862	15,885	4,497	3,259	12,159	4,900	7,259
Oct-87	117	1,581	117	-	-	-	-	-
Nov-87	-	-	-	-	-	-	-	-
Dec-87	-	-	-	-	-	-	-	-
Jan-88	-	-	-	-	-	-	-	-
Feb-88	-	-	-	-	-	-	-	-
Mar-88	-	-	-	-	-	-	-	-
Apr-88	331	4,386	331	-	-	-	-	-
May-88	2,381	4,625	2,381	-	-	-	-	-
Jun-88	5,225	4,587	4,587	638	462	1,993	655	1,338
Jul-88	6,560	3,399	3,399	3,161	2,291	7,280	2,394	4,886
Aug-88	4,624	2,627	2,627	1,997	1,447	5,629	1,851	3,779
Sep-88	769	2,542	769	-	-	-	-	-
Total	20,007	23,747	14,211	5,796	4,201	14,903	4,900	10,003
Oct-88	258	1,321	258	-	-	-	-	-
Nov-88	-	-	-	-	-	-	-	-
Dec-88	-	-	-	-	-	-	-	-
Jan-89	-	-	-	-	-	-	-	-
Feb-89	-	-	-	-	-	-	-	-
Mar-89	-	-	-	-	-	-	-	-
Apr-89	395	1,831	395	-	-	-	-	-
May-89	3,149	4,201	3,149	-	-	2,414	432	1,982
Jun-89	4,865	3,243	3,243	1,622	1,176	6,561	1,175	5,385
Jul-89	6,746	2,860	2,860	3,886	2,817	10,942	1,960	8,981
Aug-89	4,114	2,182	2,182	1,932	1,400	6,667	1,194	5,473
Sep-89	709	1,811	709	-	-	767	137	630
Total	20,236	17,449	12,796	7,440	5,393	27,351	4,900	22,451

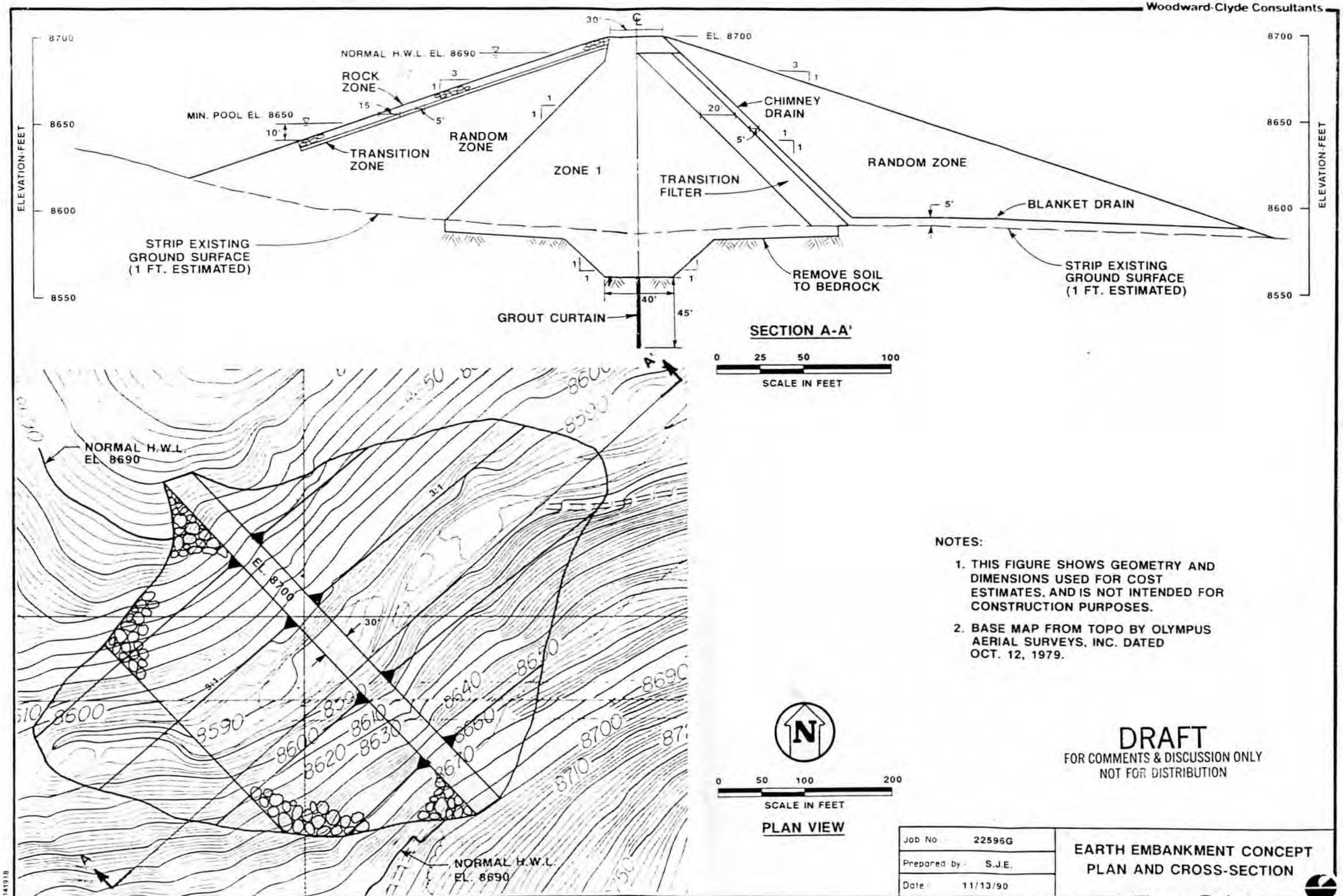
Table C-37
Remaining Demands and Project Waer Deliveries

	11	12	13	14	15	16	17	18
	Group 3 Lands					Total Irrigable Area		
	Head of Canal Diversion Requirement (ac-ft)	Local Supplies (ac-ft)	Beneficial Local Supplies (ac-ft)	Remaining Demand Total Area (ac-ft)	Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Total Remaining Demand on Land Eligible to Receive Project Water (ac-ft)	Project Irrigation Release (ac-ft)	Irrigation Shortage (ac-ft)
Average								
Oct	280	1,680	280	-	-	12	4	8
Nov	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-
Jan	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-
Apr	339	2,592	339	-	-	31	16	15
May	2,841	4,620	2,793	48	35	421	100	321
Jun	5,093	4,455	4,195	898	651	1,574	477	1,131
Jul	6,485	3,999	3,980	2,504	1,815	5,771	2,293	3,547
Aug	4,448	3,590	3,443	1,005	729	4,427	1,974	2,586
Sep	822	3,289	822	-	-	112	36	76
Total	20,308	24,226	15,852	4,456	3,229	12,349	4,900	7,683

ATTACHMENT D

PRELIMINARY DESIGN
DRAWINGS

Sanpete Water
Conservancy District



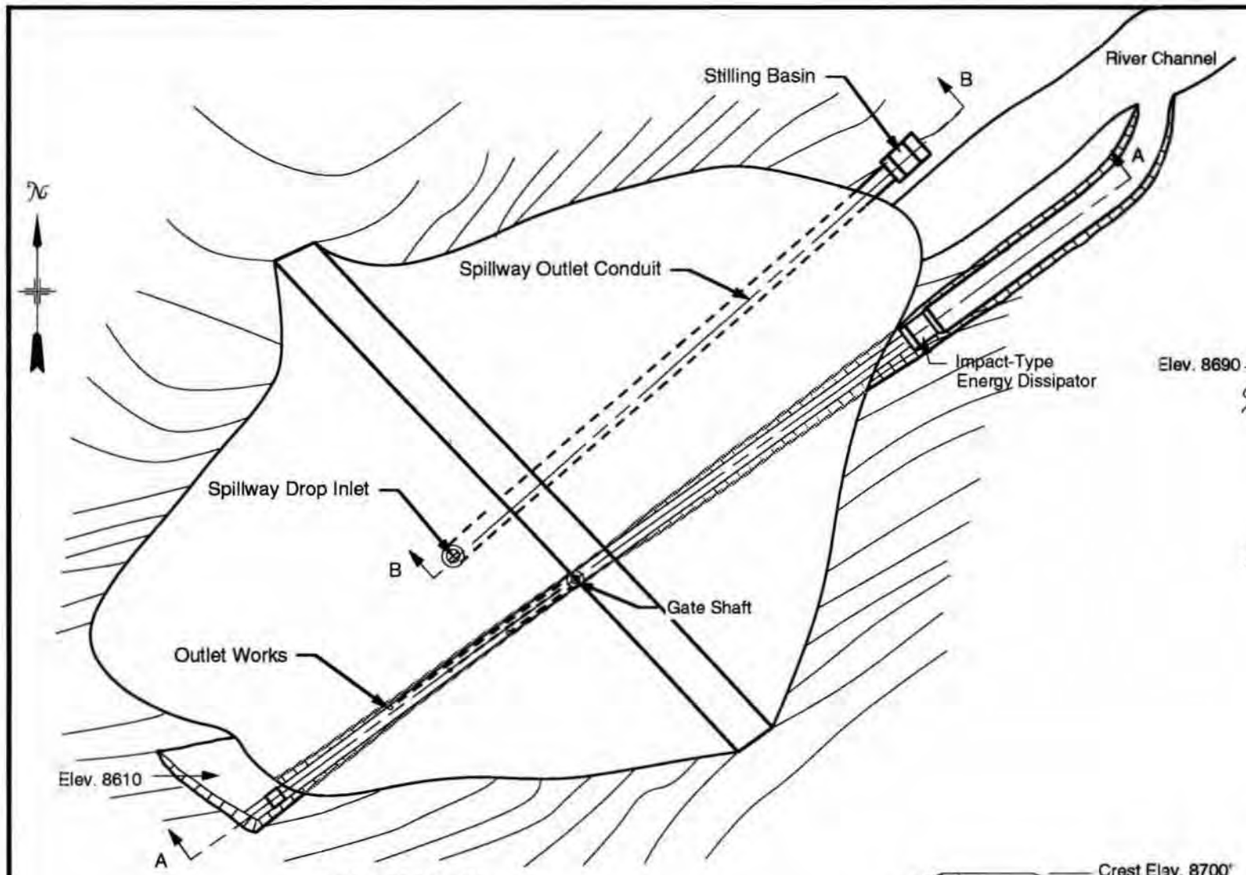
NOTES:

1. THIS FIGURE SHOWS GEOMETRY AND DIMENSIONS USED FOR COST ESTIMATES, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.
2. BASE MAP FROM TOPO BY OLYMPUS AERIAL SURVEYS, INC. DATED OCT. 12, 1979.

DRAFT
FOR COMMENTS & DISCUSSION ONLY
NOT FOR DISTRIBUTION

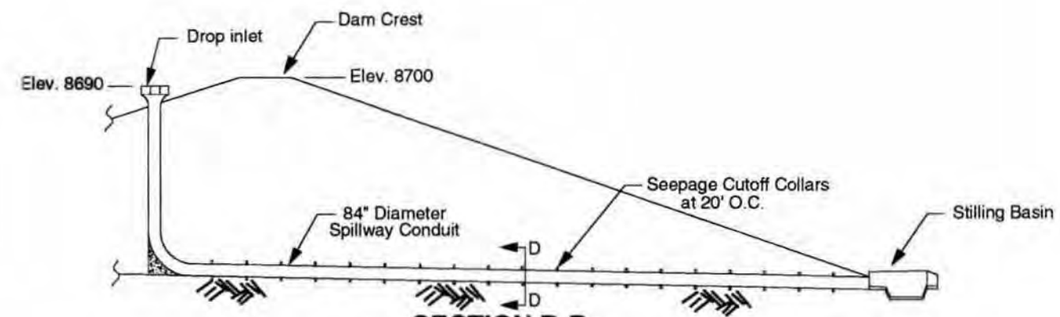
Job No. 22596G	EARTH EMBANKMENT CONCEPT PLAN AND CROSS-SECTION
Prepared by S.J.E.	
Date 11/13/90	

Figure D-1



PLAN VIEW

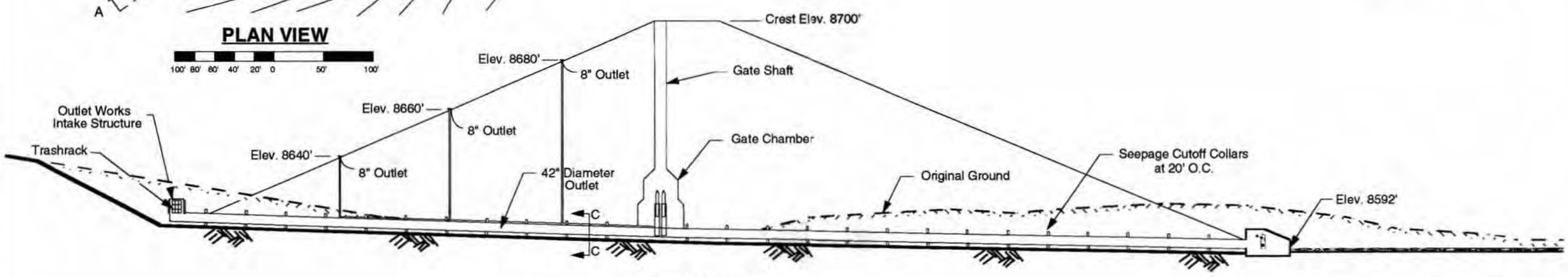
100' 80' 60' 40' 20' 0 50' 100'



SECTION B-B
THROUGH DROP INLET SPILLWAY

50' 40' 30' 20' 10' 0 25' 50'

PRELIMINARY
NOT FOR CONSTRUCTION



SECTION A-A
SECTION THROUGH OUTLET WORKS

50' 40' 30' 20' 10' 0 25' 50'

NARROWS DAM
RECONNAISSANCE LEVEL
NARROWS SITE - EMBANKMENT ALTERNATIVE
OUTLET WORKS AND SPILLWAY

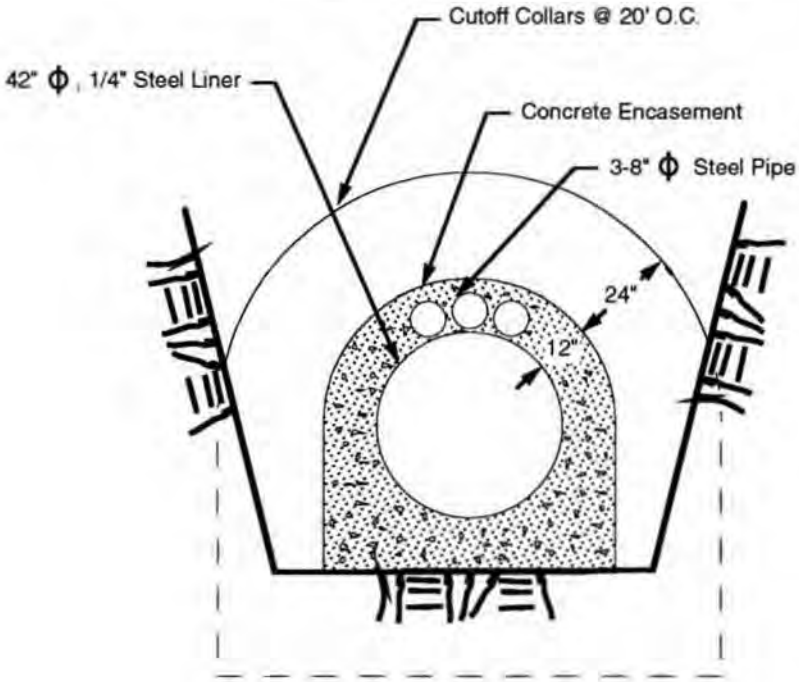
PREPARED FOR
SANPETE WATER CONSERVANCY DISTRICT

DRAWING NO: 90-200-007	DECEMBER 19, 1990
DESIGNED BY: R. NOBLE	DRAWN BY: P. WRIGHT

Figure D-2

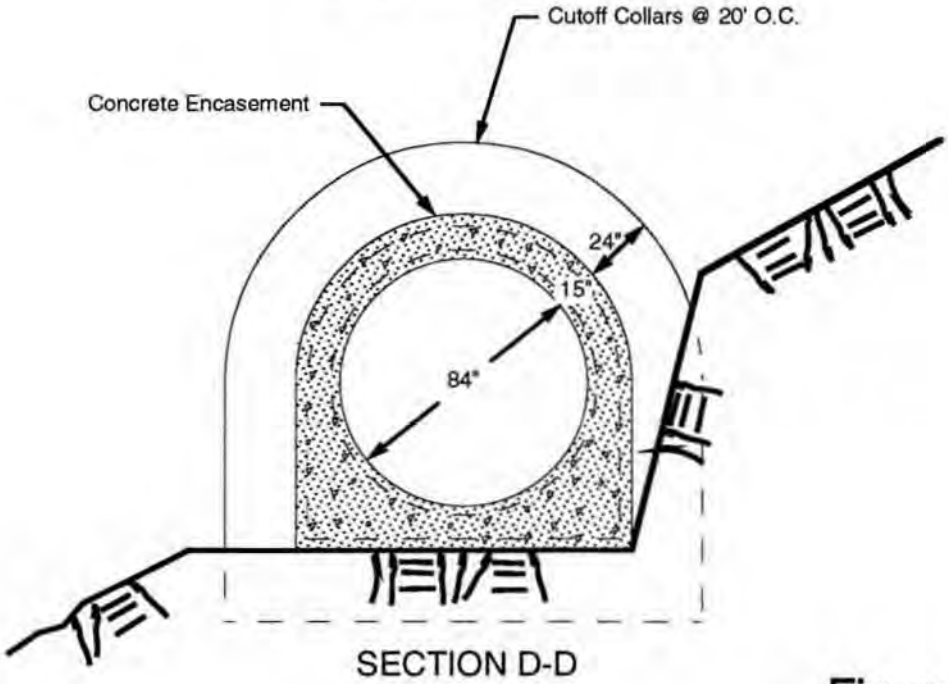
TYPICAL SECTIONS

Outlet Works



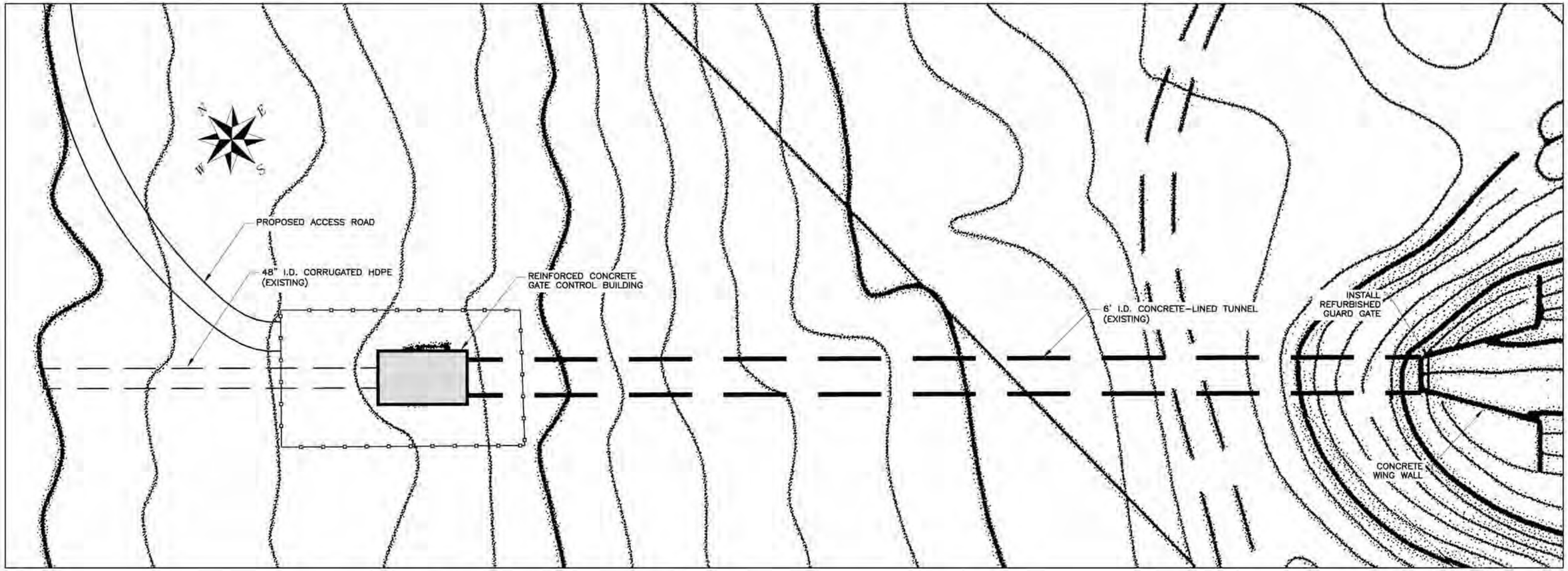
SECTION C-C

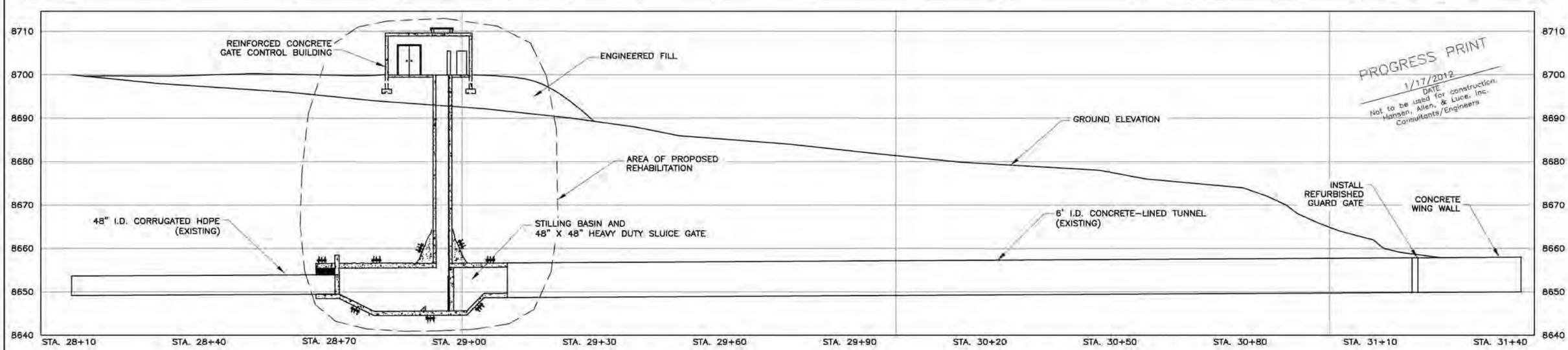
Drop Inlet Spillway



SECTION D-D

Figure D-3

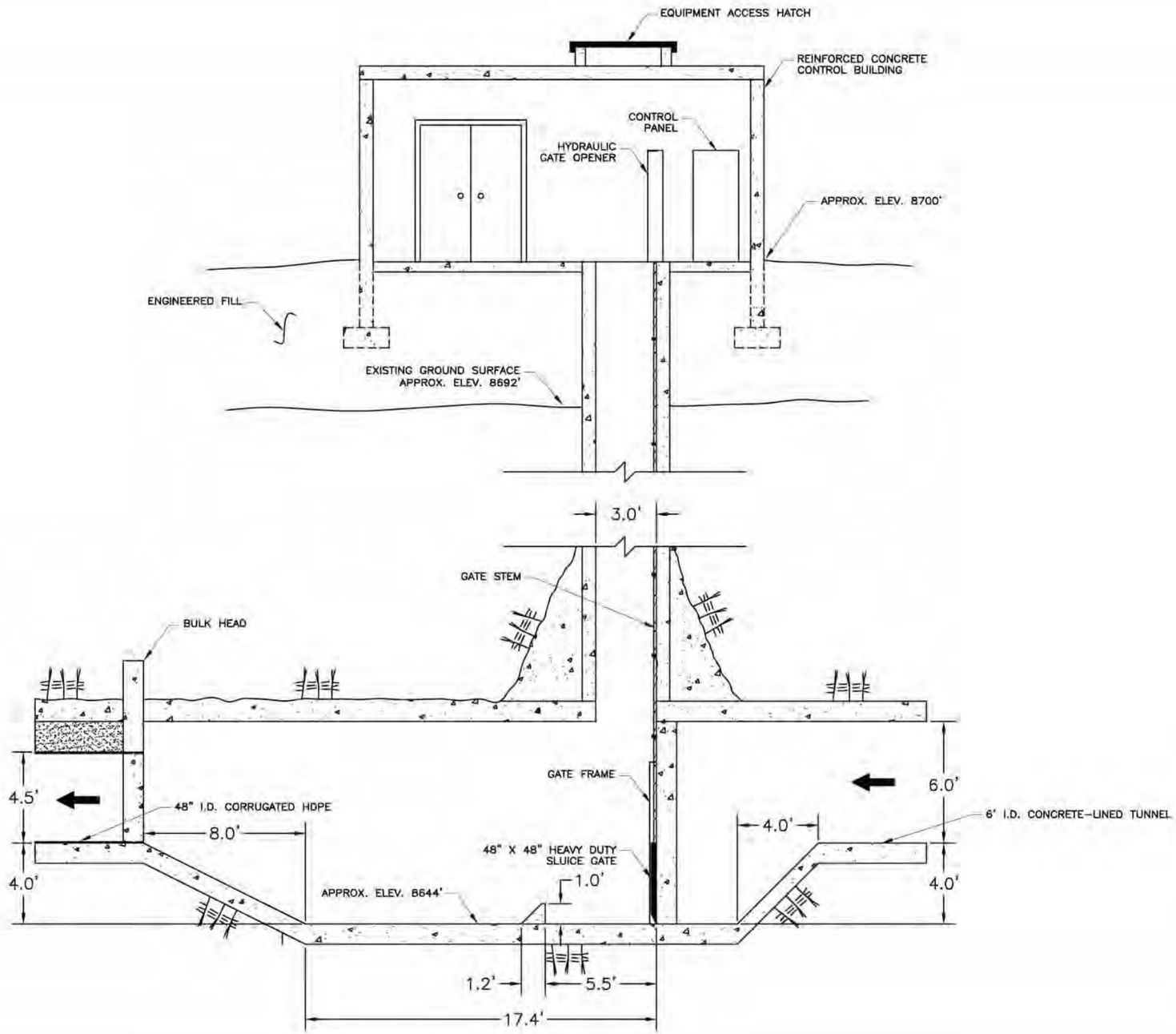




PROGRESS PRINT
1/17/2012
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME:
FILE DATE:

HANSEN ALLEN & LUCE ENGINEERS	PROJECT ENGINEER	DESIGNED RMN	3					SCALE: NTS	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	NARROWS TUNNEL INLET REHABILITATION CONCEPTUAL DESIGN PLAN AND PROFILE	SHEET D-4
		DRAFTED TBB	2								
		CHECKED	1								
		DATE	NO.	DATE	REVISIONS	BY	APVD.				



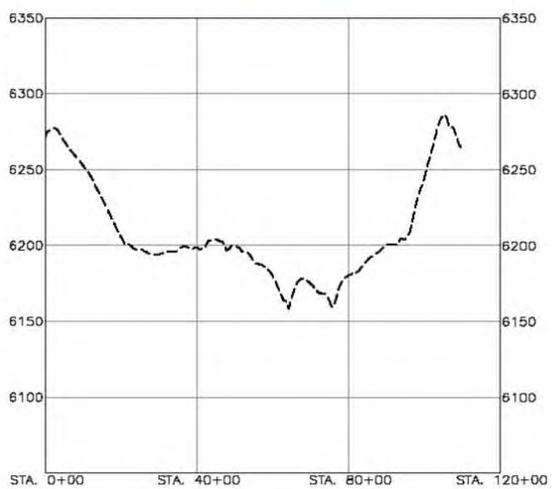
PROGRESS PRINT
1/17/2012
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

HANSEN ALLEN & LUCE ENGINEERS	PROJECT ENGINEER	DESIGNED RMN	3					SCALE NTS	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	NARROWS TUNNEL INLET REHABILITATION CONCEPTUAL DESIGN ELEVATION VIEW	SHEET D-5
		DRAFTED TBB	2								
		CHECKED	1								
		DATE	NO.	DATE	REVISIONS	BY	APVD.				

HANSEN ALLEN & LUCE INC ENGINEERS

EAST BENCH PIPELINE HEADWORKS

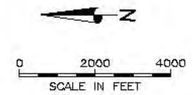
FIGURE D-6

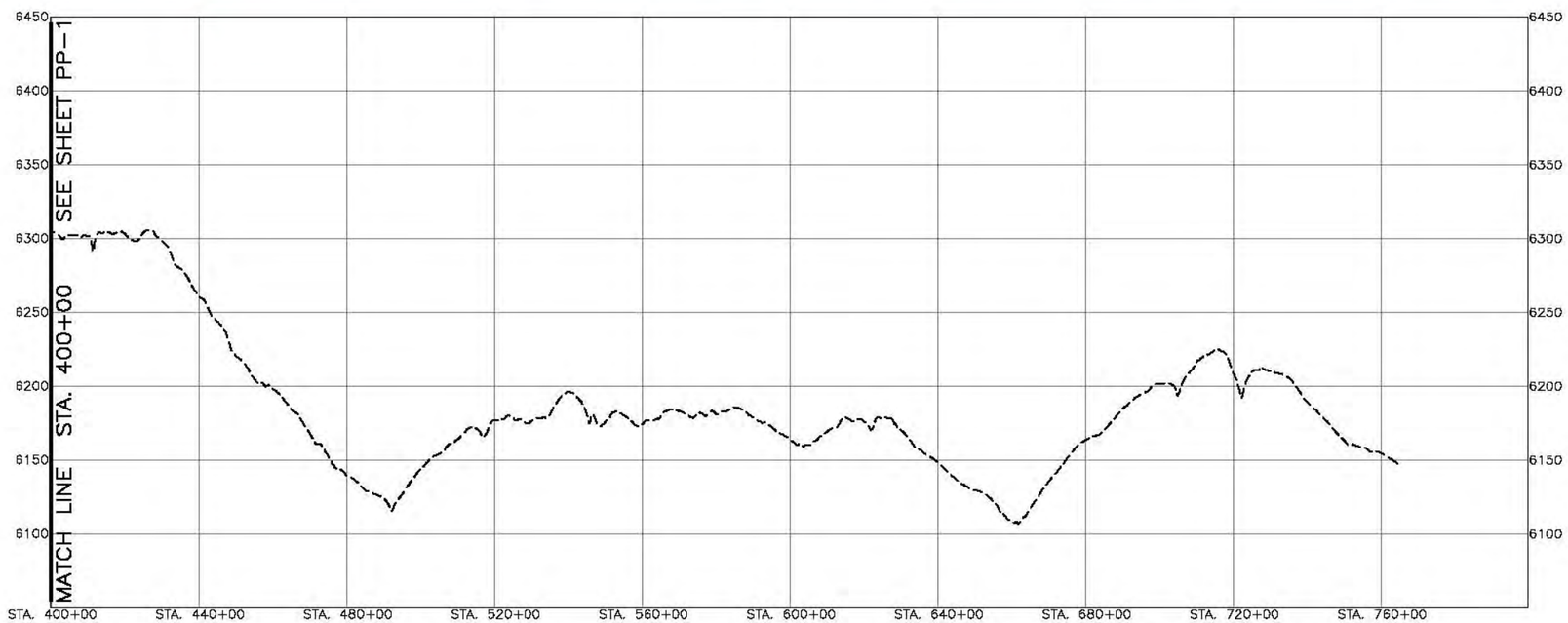


FILE NAME:
FILE DATE:

HANSEN ALLEN & LUCE ENGINEERS	PROJECT ENGINEER	DESIGNED RMN	3					SCALE NTS	SANPETE WATER CONSERVANCY DISTRICT NARROWS PROJECT	EAST BENCH & OAK CREEK PIPELINES	SHEET D-7
		DRAFTED TBB	2								
		CHECKED	1								
		DATE	NO.	DATE	REVISIONS	BY	APV'D.				321.10.100

7/04





FILE NAME:
FILE DATE:

HANSEN ALLEN & LUCE inc ENGINEERS

PROJECT ENGINEER

DESIGNED	RMN	3				
DRAFTED	TBB	2				
CHECKED		1				
DATE		NO.	DATE	REVISIONS	BY	APVD.

SCALE: NTS

SANPETE WATER CONSERVANCY DISTRICT
NARROWS PROJECT

EAST BENCH & OAK CREEK PIPELINES

SHEET D-8

321.10.100

7/04

ATTACHMENT E

PRELIMINARY COST ESTIMATES

Sanpete Water Conservancy District

Table E-1
Narrows Dam and Reservoir
Estimate of Direct Construction Costs
(based on 2006 unit prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Dam Structure				
Mobilization	1	LS	165,600	165,600
Diversion	1	LS	90,000	90,000
Clearing	1	LS	50,000	50,000
Foundation stripping	7,800	CY	3.00	23,400
Unclassified excavation/bedrock	12,250	CY	20.00	245,000
Dewatering	1	LS	25,000	25,000
Foundation preparation	5,000	SY	45.00	225,000
Foundation grouting	2,500	LF	75.00	187,500
Zone I	125,000	CY	8.00	1,000,000
Random zone	184,000	CY	4.00	736,000
Drain	16,800	CY	60.00	1,008,000
Filter	19,700	CY	40.00	788,000
Upstream rock zone	13,100	CY	35.00	458,500
Upstream transition	4,200	CY	15.00	63,000
Crest surfacing	300	CY	25.00	7,500
Instrumentation	1	LS	50,000	15,000
Reclamation	5	AC	4,000.00	20,000
Unlisted items (10%)	1	LS	510,750	510,750
Subtotal - Dam Structure				**5,618,250**
Outlet Works				
Mobilization	1	LS	31,000	31,000
Excavation, rock	10,900	CY	35.00	381,500
Steel Liner 38"Ø x 1/4"	550	ft	186.41	102,526
Concrete, casing	312	CY	350.00	109,200
Reinforcement, casing	8,100	lb.	0.81	6,561
Concrete, cutoff collar	50	CY	450.00	22,500
Reinforcement, cutoff collar	4,900	CY	0.81	3,969
8" Steel Pipe for multiple-level outlet	600	ft	50.00	30,000
Concrete Casing (Pipe and racks)	6	CY	350.00	2,100
Reinforcement, casing	600	lb.	0.81	486
8" Line Gate	3	ea.	750.00	2,250
Concrete, gate shaft	108	CY	550.00	59,400
Reinforcement, gate shaft	13,685	lb.	0.81	11,085
Miscellanneous metalwork, gate shaft	6,050	lb.	3.40	20,570

Table E-1 (continued)
Narrows Dam and Reservoir
Estimate of Direct Construction Costs
(based on 2006 prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Outlet Works (continued)				
Slide gates, 38" high pressure (2)	28,000	lb.	2.72	76,160
Concrete, intake structure	16	CY	450.00	7,200
Reinforcement, intake tower	2,325	lb.	0.81	1,883
Concrete, stilling basin	88	CY	450.00	39,375
Reinforcement, stilling basin	8,750	lb.	0.81	7,088
Trash racks	600	lb.	6.28	3,768
Controls	1	LS	10,000	10,000
Unlisted items (10%)	1	LS	92,862	92,862
Subtotal - Outlet Works				**1,021,482**
Spillway				
Mobilization (5%)	1	LS	43,600	43,600
Excavation, rock	560	CY	20.00	11,200
Concrete, backfill	104	CY	250.00	26,000
Concrete	1,200	CY	550.00	660,000
Reinforcement	162,224	lb.	0.81	131,401
Unlisted items (10%)	1	LS	87,220	87,220
Subtotal - Spillway				**959,422**
Total Direct Costs - Narrows Dam and Reservoir				**7,599,154**

Table E-2
Narrows Tunnel Inlet Rehabilitation
Estimate of Direct Construction Costs
(based on 2011 unit prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Gate shaft concrete demolition	20	C.Y.	$700.00	$14,311
Stilling Basin Rock Excavation	43	C.Y.	$690.00	$29,644
Control House Structural Fill	365	C.Y.	$18.05	$6,589
Fill Hauling	365	C.Y.	$4.78	$1,745
Concrete in Control House	36	C.Y.	$400.00	$14,237
Concrete in Stilling Basin and Gate Shaft	75	C.Y.	$600.00	$44,956
Reinforcing Steel	10,125	LB	$0.89	$9,011
48" Sluice Gate with Controls	1	L.S.	$35,000	$35,000
Gate controls	1	L.S.	$25,000	$25,000
Refurbish and Install Guard Gate	1	L.S.	$20,000	$20,000
Power and SCADA System	1	L.S.	$11,000	$11,000
Total Direct Costs - Narrows Tunnel Rehabilitation				**$211,493**

Table E-3
Upper Cottonwood Creek, East Bench, and Oak Creek Pipelines
Estimate of Direct Construction Costs
(based on 2011 unit prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Upper Cottonwood Creek Pipeline				
Material				
30" HDPE, PE4710	4,400	LF	71	312,400
Installation				
30" HDPE, PE4710	4,400	LF	30	132,000
Manholes, 6-foot deep	7	ea.	2,975.00	20,825
Stilling basin	1	LS	20,000	20,000
Unlisted Items (10%)	1	LS		49,000
Total Direct Costs - Upper Cottonwood Creek Pipeline				**534,225**
East Bench Pipeline				
Right-of-way, perpetual easement	51	AC	500	25,500
Material				
30" HDPE, PE4710	9,650	LF	71	685,150
28" HDPE, PE4711	29,850	LF	56	1,671,600
26" HDPE, PE4712	8,800	LF	48	422,400
24" HDPE, PE4713	10,600	LF	47	498,200
22" HDPE, PE4714	12,900	LF	42	541,800
20" HDPE, PE4715	4,931	LF	32	157,792
Installation				
30" HDPE, PE4710	9,650	LF	30	289,500
28" HDPE, PE4711	29,850	LF	30	895,500
26" HDPE, PE4712	8,800	LF	24	211,200
24" HDPE, PE4713	10,600	LF	24	254,400
22" HDPE, PE4714	12,900	LF	22	283,800
20" HDPE, PE4715	4,931	LF	20	98,620
Appurtenant valves and gates	1	LS	400,000	400,000
Unlisted Items (10%)	1	LS		644,000
Total Direct Costs - East Bench Pipeline				**7,079,462**
Oak Creek Pipeline				
Right-of-way, perpetual easement	9	AC	100	900
Material				
12" HDPE, DR 21, PR 101, PE4710	3,800	LF	12	45,705
12" HDPE, DR 19, PR 112, PE4710	5,900.0	LF	13	78,029
10" HDPE, DR 32.5, PR 64, PE4710	400.0	LF	6	2,251
10" HDPE, DR 26, PR 81, PE4710	1,900	LF	7	13,235
Installation				
12" HDPE, DR 21, PR 101, PE4710	3,800	LF	14	53,200
12" HDPE, DR 19, PR 112, PE4710	5,900.0	LF	14	82,600
10" HDPE, DR 32.5, PR 64, PE4710	400.0	LF	14	5,600
10" HDPE, DR 26, PR 81, PE4710	1,900	LF	14	26,600
Appurtenant valves and gates	1	LS	14,000	14,000
Unlisted Items (10%)	1	LS		32,000
Total Direct Costs - Oak Creek Pipeline				**354,120**

Table E-4

Highway SR-264 Relocation

Estimate of Direct Construction Costs

(based on 2008 unit prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Mobilization	1	LS	$210,000.00	$210,000
Traffic Control	1	LS	$10,000.00	$10,000
Dust Control & Watering	500	1000 gal	$20.00	$10,000
Survey	1	LS	$21,000.00	$21,000
Roadway Excavation	23,251	CY	$8.00	$186,008
Clearing and Grubbing	18	ac.	$2,400.00	$43,200
Untreated Base Course 3/4 inch or 1 inch Max	36,175	ton	$11.00	$397,925
Hot-Mix Asphalt - 3/4 Inch	14,642	ton	$85.00	$1,244,570
Strip, Stockpile, and Spread Topsoil	30,624	SY	$0.77	$23,580
Broadcast Seed	6	ac.	$442.00	$2,652
24 Inch Pipe Culvert, Class C	600	LF	$24.79	$14,874
Total Direct Costs - Highway Relocation				**$2,163,809**

Table E-5
Narrows Reservoir Recreation Area
Estimate of Direct Construction Costs
(based on 2006 unit prices)

Item	Quantity	Unit	Unit Price ($)	Cost ($)
Day Use Area				
Parking	2,600	SF	1.86	4,836
10 Tables w/ shelter	10	ea.	5,600.00	56,000
6 concrete pads	1,458	SF	3.18	4,636
6 upright grills	6	ea.	210.00	1,260
6 unit posts	6	ea.	65.00	390
1-Inch water line (furnished and installed	600	LF	14.97	8,982
2 Frostproof hydrants	2	ea.	785.00	1,570
Restroom (double vault unit)	2	ea.	29,000.00	58,000
60 Tables 8 ft.	60	ea.	1,015.00	60,900
60 Concrete pads	21,780	SF	3.18	69,260
60 Fire circles	60	ea.	214.00	12,840
60 Asphalt spurs	34,223	SF	1.86	63,655
60 Unit posts	60	ea.	65.00	3,900
Restroom (double vault unit)	4	ea.	29,000.00	116,000
1-Inch water line (furnished and installed	6,000	LF	14.97	89,820
10 Frostproof hydrants	10	ea.	785.00	7,850
Developed spring	1	LS	25,000.00	25,000
Storage tank (10,000 gal.)	1.0	LS	20,000.00	20,000
Boat Ramp	10,000	SF	3.37	33,700
Unlisted Items (10%)	1	LS		63,860
Total Direct Costs - Recreation Area				**702,460**

Table E-6
Wetlands, Wildlife, and Fishery Mitigation
Estimate of Direct Construction Costs
(based on 2006 unit prices)

Item	Quantity	Unit	Unit Price	Cost
Wetland Mitigation Area	220	AC	5,822.00	1,280,840
Plantings and improvements on wetland mitigation areas	1	LS	500,000.00	500,000
Wildlife conservation easement adjacent to Reservoir	150	AC	500.00	75,000
Acquire section of land on Price River below Scofield Reservoir	640	AC	500.00	320,000
Fencing for section of land on Price River below Scofield Reservoir	4	mile	10,455.00	41,820
Acquire land on middle Gooseberry Creek	6	AC	2,000.00	12,000
Fencing on middle Gooseberry Creek	0.25	mile	10,455.00	2,614
Middle Gooseberry Creek channel rehabilitation	3	mile	9,886.00	29,658
Monitoring mitigation	1	LS	40,353.00	40,353
Depletion charge for F&WLS endangered fishes recovery implementation program	5,717	AC-FT	15.25	87,184
Acquire stream segments (Mud Creek 4 mi., Lower Fish Creek 2 mi., Upper Fish Creek 1 mi., Winterquarters Creek 2.5 mi., Pondtown Creek 2 mi.)	206	AC	1,000.00	206,000
Fence stream segments	25.00	mile	10,455.00	261,375
Enhance stream segments	13.50	mile	12,106.00	163,431
Upper Gooseberry Creek Tributaries planting & channel improvements	1	LS	9,886.00	9,886
Total Direct Costs - Wetlands, Wildlife, and Fishery Mitigation				**3,030,161**

Table E-7
Summary of Direct Costs
Narrows Project
(Unit -- $)

Facility	Direct Cost	Oct 2011 Index	Index 2[1]	Indexed Oct 2011 Direct Cost
Narrows Dam and Reservoir	7,599,154	324	269	9,152,884
Narrows Tunnel Inlet Rehabilitation	211,493	365	365	211,493
Upper Cottonwood Creek Pipeline	534,225	369	369	534,225
East Bench Pipeline	7,079,462	369	369	7,079,462
Oak Creek Pipeline	354,120	369	369	354,120
Highway SR-264 Relocation	2,163,809	336	340	2,138,352
Recreation Area	702,460	360	303	834,605
Wetlands, Wildlife, and Fishery Mitigation	3,030,161	360	303	3,600,191
Total Direct Cost	**21,674,883**			**23,905,333**

[1] Index varies by item. Oct 2006 index used for dam, recreation area and mitigation, Oct 2008 used for highway. Oct 2011 used for tunel inlet and pipelines.

Table E-8
Estimated Construction Funding Schedule
Narrows Project
(Unit -- $)

Facility	2011 Direct Cost	Contingencies	Engineering & Administration	Estimated Cost Increase to Contract Award	Total w/ Cost Increase	Estimated Funding Requirements FY 2013	FY 2014	FY 2015
Narrows Dam and Reservoir	9,152,884	915,288	1,510,226	1,186,786	12,765,000	755,113	8,046,624	3,963,263
Narrows Tunnel Inlet Rehabilitation	211,493	21,149	34,896	27,423	295,000	17,448	277,552	
Upper Cottonwood Creek Pipeline	534,225	53,423	88,147	69,269	745,000	44,074	700,926	
East Bench Pipeline	7,079,462	707,946	1,168,111	917,941	9,873,000	584,056	9,288,944	
Oak Creek Pipeline	354,120	35,412	58,430	45,916	494,000	29,215	464,785	
Highway SR-264 Relocation	2,138,352	213,835	352,828	277,264	2,982,000		176,414	2,805,586
Recreation Area	834,605	41,730	131,450	103,298	1,111,000	65,725	1,045,275	
Wetlands, Wildlife, and Fishery Mitigation	3,600,191	360,019	594,032	466,810	5,021,000		3,364,070	1,656,930
Total Direct Cost	**23,905,332**	**2,348,803**	**3,938,120**	**3,094,706**	**33,286,000**	**1,495,630**	**23,364,591**	**8,425,779**
							GRAND TOTAL =	**$33,286,000**

ATTACHMENT F

UTAH DIVISION OF WATER RESOURCES HYCON COMPUTER MODEL

1. PROGRAM DOCUMENTATION
2. MODEL OUTPUT

Sanpete Water Conservancy District

A COMPUTER PROGRAM FOR HYDROLOGIC AND ECONOMIC ANALYSES OF WATER RESOURCE PROJECTS (HYCON)

David B. Cole
Norman E. Stauffer, Jr.
Utah Division of Water Resources
February, 1982

1567 B

A COMPUTER PROGRAM FOR HYDROLOGIC AND ECONOMIC ANALYSES OF WATER RESOURCE PROJECTS

The HYCON program was developed and modified for use on the WANG VS-100 Computer System. This program has the capability of analyzing the hydrologic and economic effects of changing irrigation systems, efficiencies, timing, and/or water supplies. The effect of constructing a reservoir and/or well may also be evaluated.

The program will ~~evaluate~~ do the evaluation using mean annual values or may analyze the hydrology and economics over a number of years. If a multi-year evaluation is to be performed, the monthly streamflow data must be stored in a data file using the standard format. The precipitation data may also be varied each year and must be stored in a data file if mean annual precipitation is not used. The consumptive use may be read in for each crop instead of computed. If this option is used the values must be stored in a data file before the HYCON program is executed.

The HYCON program is accessed by running a procedure called HYCON in Library PROGRAMS on Volume VOL666. A screen will appear describing the program and allowing previously saved data to be read from a file. When the data preparation portion of the program is complete, the data may be saved in a file. If previously saved data is to be retrieved, the next screen will allow the file, Library, and Volume Names of the data file to be entered. The next screen allows the program options to be set. If the number of years is less than 2, a mean monthly analysis will be performed. The following screen allows the project name, per cent daylight hours, mean monthly temperatures and precipitation, and various other options and data to be entered.

If a mean monthly analysis is to be performed, the next screen allows the input of the mean monthly water supplies in acre-feet for the pre-project and project conditions. The primary water supplies may be routed through a reservoir, the secondary supplies are not.

The following screens allow the crop data to be entered. The crop data has been regionalized by dividing it into areas with different growing seasons. If use of crops other than those shown is desired, additional data must be added to the basic data file describing the crops.

If the operation of a reservoir is to be simulated with HYCON, a screen will appear allowing the reservoir parameters to be input. The area-capacity relationship is in the form of two power curve equations as follows:

$$\text{Area} = \begin{cases} C1 * VOL^{C2} & \text{for } VOL \leq C5 \\ C3 * VOL^{C3} & \text{for } VOL > C5 \end{cases}$$

The reservoir capacities, mean monthly temperatures and precipitation, and minimum outflow are also entered on this screen. The net evaporation for the reservoir is computed from the temperatures and precipitation.

After the data has been entered a final screen will appear allowing the data to be stored in a data file and/or the HYCON program analysis computed. The only other screen that will appear for a mean monthly analysis is a screen allowing the print file to be named. If a multi-year analysis is being performed, other screens will appear requesting the names of the files containing the water supply and precipitation data, depending on the options being used.

PROGRAM DESCRIPTION

HYCON is a Fortran IV computer program linked to a BASIC program which accepts, formats, and stores the data. The programs were developed for use on the WANG VS-100 Computer System.

The HYCON program was developed to aid in analyzing the hydrologic and economic effects of changing an irrigation water supply, timing of the supply, reservoir storage, well development, and/or changing the irrigation efficiencies. An earlier version of this program (developed in 1974 and described in 'A Fortran IV Computer Program for Hydrologic and Economic Analyses for Project Feasibility Reports') did the analysis computations using mean monthly water supplies and yields. The newer version of the program described in this report has the capability of analyzing and summarizing the data on a monthly basis over a series of years.

The program first performs a hydrologic analysis comparing the water supply to the computed irrigation requirements to determine crop yields with and without the project. The two different yield levels are used as input to an economic crop budget which computes the economic returns. The economic returns are used as a measure of the direct benefits of constructing a project.

HYDROLOGIC ANALYSIS

The hydrologic analysis section of the program operates on a monthly basis. Mean monthly values for temperature, precipitation, and streamflow may be used on a calendar year basis or the hydrologic analyses may be performed on changing streamflow and/or precipitation data over a series of years. The program will compute consumptive used based on the Modified Blaney-Criddle equation described in the Soil Conservation Service Technical Release 21 or the consumptive use in feet may be read in for each crop.

When operating on a mean monthly basis the water supply may be included from two sources, primary and secondary. The primary source may be routed through a reservoir. The secondary source may be a separate surface supply or an underground source produced by wells.

When simulating a series of years the water supply is read from a data file with a value in acre-feet for each month of the analysis. The data file must be set up using the Division of Water Resources standard format (8X,I4,I2,12F5.0,F6.0) on a water year basis. The program will

convert water years to calendar years. An option has been provided which allows the same water supply data to be used with and without the project when only the efficiencies are different. Otherwise, the data is read from two separate files. The precipitation may be included on a mean monthly basis or may be read from a data file with different values each year. The precipitation must be stored in the data file in the same format as the streamflow with the exception that it is on a calendar year basis.

The program operates on a crop priority concept. A different analysis is performed each year for the without and with project conditions. The net irrigation requirement is computed for each crop for each month based on the temperature and precipitation. ~~Divisions~~ Diversions are made to the crops in the order they are included in the data; the last crops getting water only after the requirements of the first crops are satisfied. A monthly accounting of soil moisture storage is made for each crop. If a crop runs out of water during the growing season, the program reduces the acreage of that crop by matching the available moisture to the crop's consumptive use. Once a crop's acreage has been reduced during a given month, it remains at that reduced level for the rest of the growing season.

The average yield for each crop is computed for each year by applying the yield curves in the basic data file to the reduced crop acreage for each month. These yields are used in the economic analysis section of the program.

ECONOMIC ANALYSIS

The economic analysis is performed for each year using without and with project yields. The gross income for each crop is computed by multiplying the crop production by the unit price. The base cash costs and payments to labor are interpolated from the data in the basic data file based on the yield computed for that crop. The ~~specified~~ interest rate is applied to the total of the base cash cost and payment to labor to compute the interest on the operating capital.

The fixed equipment is computed from an equation based on the typical farm size. The net returns are computed by subtracting property taxes, existing water costs, base cash costs, payment to labor, interest on operating capital and the fixed equipment cost ~~for~~ from the gross income for each crop. The net returns are weighted by acreage to obtain a weighted net return without and with the project. These weighted net returns are multiplied by the acreage and the without project return subtracted from the with project return to compute the return to water which is a measure of the economic benefits of constructing a project.

If a number of years are being analyzed the economic analysis is performed each year and summarized in a table. The yields are averaged for the period of record and an additional analysis is performed using the average yields.

PROGRAMMERS NOTES

The source code for the program is stored in Library HYCONXXX on Volume VOL666. The object code is stored in Library HYCONOBJ. The program consists of a Fortran subroutine called HYCON linked to a basic program called HYCONEDT. The HYCONEDT program accepts, formats and stores the data in a data file. It will also store the data in a scratch file and call the HYCON program which reads the scratch file and performs the computations. The HYCON program may also be run independent of HYCONEDT. The format and notation for the input data is the same as described in 'A Fortran IV Computer Program for Hydrologic and Economic Analyses for Project Feasibility Reports' with the exception that an additional record (card) must be provided as the first record in the data. Notation and formatting for this record are in Table 1. The notation and format for the rest of the data is attached.

Table 1 Notation and Format for Additional Record

Variable	Format	Description
NYYRS	I5	Number of years to be analyzed-if less than 2 a mean monthly analysis will be performed.
INYEAR	I5	Initial year for multi-year analysis
IREDCU	~~F5.0~~ I5	Logic variable: if set equal to 1 consumptive use values will be read in for each crop; if not equal to 1 consumptive use will be computed.
ISAMEQ	I5	Logic variable: If set equal to 1 the without and with project water supplies will be the same for a multi-year analysis.
NPRINT	I5	Logic variable: Sets amount of print to be generated by the program as follows:

		10 or more: A hydrologic and economic report will be printed for each year along with the summary tables and input data. 5 - 9: An economic report will be printed for each year along with the summary tables and input data. 2 - 4: Summary tables and input data will be printed. 1 or less: Only summary table will be printed.
IPREC	I5	Logic variable: If set equal to 1 precipitation will be read each year.
PRECF	F5.0	Precipitation factor used to compute effective precipitation.

The HYCON program will use up to 8 different data files depending on the program options. If a multi-year analysis is to be performed a number of times, it is convenient to assign the files in a procedure. The files are described in Table 2.

Table 2 File Descriptions

Unit No.	Description
1	Basic data file contains KC value, yield curve, and yield-labor-base cash cost curves for each crop.
5	General data file containing with and without project information. May be created by HYCONEDT.
3	Without project water supply in acre-feet
4	With project water supply in acre-feet
6	Print file
8	Precipitation data file

9	Consumptive use data file (Format is 16F5.0 one ~~and~~ card for each crop without and with project).
16	Scratch file; saves summary table for multi-year simulation.

The procedure which executes the program is stored in a file named HYCON in Library PROGRAMS on Volume VOL666. This file may be copied and the file assignments changed to fit a specific problem.

An example printout, the HYCON procedure, and a complete listing of the computer programs follow.

NOTATION

Basic Data Input

NCROPS	Number of crops in the basic data portion of the program.
VAR(N)	Abbreviated monthly names based on a calendar year.
CKCJ(I,K)	Monthly consumptive use coefficients reflecting the growth stage of the crop.
YCURJ(I,K)	Monthly crop yield values assuming moisture is available to the crop.
XI(I,M)	Crop yield values for base cash cost and labor and management cost curves.
YI(I,M)	Base cash cost curve values based on crop yield.
ZI(I,M)	Labor and management cost curve values based on crop yield.

General Input Data

PNAME(N)	Project name.
PLD(K)	Monthly percentage of daylight hours in the year.
TFS	Typical farm size in acres.
OCI	Interest on operating capital.
WCOST	Local water cost per acre.
VCLND	Crop land value per acre.
VPAST	Pasture value per acre.
TAXC	Local taxes on crop land per acre.

TAXP	Local taxes on pasture per acre.
CIX	Production cost index(CIX=1.0 for 19~~XX~~81)
TEMP(K)	Project area mean monthly temperature in degrees Fahrenheit.
PREC(K)	Project area mean monthly precipitation in inches.

Non-Project and Project Data

IRES(J)	Reservoir logic (IRES=1 for reservoir; IRES=0 if no reservoir.
ISMS(J)	Soil moisture logic (ISMS=1 to divert water for soil moisture storage; ISMS=0 no diversions for soil moisture storage).
NC(J)	Number of crops.
EFOF(J)	On farm irrigation efficiency.
EFCV(J)	Canal conveyance efficiency.
IP(I,J)	Crop logic (IP=1 for pasture; IP=0 for other crops).
IDCP(I,J)	Crop identification logic (See Table 1 and Table 2 for crop identification numbers).
CNAME(I,J,N)	Crop name.
UT(I,J)	Crop production units (i.e. TON, BU, AUM, etc.).
YIELDI(I,J)	Crop production potential yield per acre.
UP(I,J)	Unit price value of crops.
ACRES(I,J)	Crop acres.
SMC(I,J)	Crop soil moisture capacity in inches.
SMICI(I,J)	Crop initial soil moisture in inches.
KS(I,J)	Diversion logic (KS=month in which diversions are to begin).

KE(I,J)	Diversion logic (KE=month in which diversions are to end).
QX(1,J,K)	Mean monthly values of primary water supply in acre-feet.
QX(2,J,K)	Mean monthly values of secondary water supply in acre-feet.
C1,C2,C3,C4,C5	Reservoir surface area - capacity coefficients (for ~~S=C5A=C1S^C2~~; for S>C5 A=C3S^C4). $S \leq C5$ $A = C1 \times S^{C2}$
SMX(J)	Reservoir maximum storage capacity in acre-feet.
SMN(J)	Reservoir minimum storage in acre-feet.
STOIC(J)	Reservoir initial storage in acre-feet.
TEMPR(J,K)	Reservoir mean monthly temperature in degrees Fahrenheit.
PRECR(J,K)	Reservoir mean monthly precipitation in inches.
QRMN(J,K)	Reservoir monthly minimum releases in acre-feet.

BASIC DATA INPUT AND FORMAT

Card #1

Column	Variable	Format
1-10	NCROPS	I10

Card #2

Column	Variable	Format
1-52	VAR(N)	13A4

Card #3

Column	Variable	Format
1-60	CKCJ(I,K)	12F5.0

Card #4

Column	Variable	Format
1-60	YCURJ(I,K)	12F5.0

Card #5

Column	Variable	Format
1-80	XI(I,M)	8F10.0

Card #6

Column	Variable	Format
1-80	YI(I,M)	8F10.0

Card #7

Column	Variable	Format
1-80	ZI(I,M)	8F10.0

Note: Cards #3 through #7 are repeated for each crop and each area.

INPUT DATA AND FORMAT

General Input Data:

Card #1

Column	Variable	Format
1-80	PNAME(N)	20A4

Card #2

Column	Variable	Format
1-70	PDL(K)	12F5.0, F10.0

Card #3

Column	Variable	Format
1-10	TFS	F10.0
11-20	OCI	F10.0
21-30	WCOST	F10.0
31-40	VCLND	F10.0
41-50	VPAST	F10.0
51-60	TAXC	F10.0
61-70	TAXP	F10.0
71-80	CIX	F10.0

Card #4

Column	Variable	Format
1-70	TEMP(K)	12F5.0, F10.0

Card #5

Column	Variable	Format
1-70	PREC(K)	12F5.0, F10.0

Non-Project and Project Data:

Card #6

Column	Variable	Format
1-10	IRES(J)	I10
11-20	ISMS(J)	I10
21-30	NC(J)	I10

Card #7

Column	Variable	Format
1-10	EFOF(J)	F10.0
11-20	EFCV(J)	F10.0

Card #8

Column	Variable	Format
1- 2	IP(I,J)	I2
3- 4	IDCP(I,J)	I2
5-16	CNAME(I,J,N)	3A4
17-20	UT(I,J)	A4
21-30	YIELD(I,J)	F10.0
31-40	UP(I,J)	F10.0
41-50	ACRES(I,J)	F10.0
51-60	SMC(I,J)	F10.0
61-70	SMICI(I,J)	F10.0
71-75	KS(I,J)	15
76-80	KE(I,J)	15

Card #9

Column	Variable	Format
1-80	QX(I,J,K)	12F6.0, F8.0

Card #10

Column	Variable	Format
1-80	QX(2,J,K)	12F6.0, F8.0

Card #11

Column	Variable	Format
1-50	C1,C2,C3,C4,&C5	5F10.0
51-60	SMX(J)	F10.0
61-70	SMN(J)	F10.0
71-80	STOIC(J)	F10.0

Card #12

Column	Variable	Format
1-70	TEMPR(J,K)	12F5.0, F10.0

Card #13

Column	Variable	Format
1-70	PRECP(J,K)	12F5.0, F10.0

Card #14

Column	Variable	Format
1-80	QRMN(J,K)	12F6.0, F8.0

Notes:

(1) Card #8 is repeated for each crop.

(2) Cards #11, 12, 13 & 14 are required only if the project (or non-project) has a reservoir (IRES(J)=1).

(3) Cards #6 through #14 are for non-project conditions. Repeat cards #6 through #14 for project conditions; i.e., cards #15 through #23 are for project conditions.

Economic Analysis Worksheet

Project: Narrows Project

Crop Production Costs and Benefits

Crop	Acres	Per-cent	Yield per Acre		Unit Price	Return per Acre	Prop. Taxes	Water Cost	Fixed & Varib. Costs	Int. Oper. Cap.	Total Cash Cost	Net Return Water	Wt Net Return Water
Pre-Project													
Barley	469.	9.	100.0	Bu	4.86	486.00	10.00	10.00	270.14	10.81	300.95	185.05	15.75
Alfalfa 1 Cutting	469.	9.	2.5	Ton	82.00	205.00	10.00	10.00	242.15	9.69	271.84	-66.84	-5.69
Alfalfa 3 Cutting	2052.	37.	4.4	Ton	163.90	727.32	10.00	10.00	211.80	8.47	240.27	487.05	181.32
Pasture	2522.	46.	1.6	AUM	54.63	90.10	10.00	10.00	24.95	1.00	45.95	44.15	20.20
Total =	5512.											Total =	211.58
Project													
Barley	469.	9.	100.0	Bu	4.86	486.00	10.00	10.00	270.14	10.81	300.95	185.05	15.75
Alfalfa 3 Cutting	2052.	37.	6.0	Ton	163.90	983.40	10.00	10.00	232.89	9.32	262.21	721.19	268.48
Alfalfa 1 Cutting	469.	9.	2.5	Ton	82.00	205.00	10.00	10.00	242.15	9.69	271.84	-66.84	-5.69
Pasture	2522.	46.	3.0	AUM	54.60	163.79	10.00	10.00	28.17	1.13	49.29	114.50	52.39
Total =	5512.											Total =	330.93

Cropland Consumptive use from Diversions

Project	9116.
Pre-Project	6190.
Increase	2926. ac-ft

Total Return to Water ($)

Project	1824085.62
Pre-Project	1166212.00
Return to Water $	657873.63

Return to Water per ac-ft Increased CU =$224.85

Return to Water per Project Acre =$119.35

Hydrologic Data and Analysis

Pre-Project Conditions: Narrows Project

Irrigation Efficiencies Conveyance =1.00 On Farm =0.60 Combined =0.60

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Cropland Climatic Data													
KT Coefficient	0.30	0.30	0.32	0.46	0.61	0.78	0.92	0.88	0.71	0.53	0.31	0.30	
Daylight Hours	6.74	6.92	8.28	8.92	10.00	10.06	10.21	9.54	8.36	7.71	6.71	6.55	
Temperature	22.77	28.20	36.68	44.71	53.42	63.41	71.50	68.78	59.45	48.94	36.23	25.18	46.61
Precipitation	0.87	0.94	1.32	1.13	1.05	0.73	0.72	0.77	1.20	1.18	0.98	0.96	11.83
Water Supply													
Primary	0.	0.	0.	275.	2079.	3362.	2860.	1827.	567.	202.	0.	0.	11172.
Secondary	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	0.	0.	0.	275.	2079.	3362.	2860.	1827.	567.	202.	0.	0.	11172.
Diversion Requirement	0.	0.	0.	30.	1671.	3473.	4847.	3532.	1641.	0.	0.	0.	15194.
Water Shortage													
Root Zone	0.	0.	0.	0.	0.	66.	1192.	1023.	644.	0.	0.	0.	2926.
Point of Diversion	0.	0.	0.	0.	0.	111.	1987.	1705.	1074.	0.	0.	0.	4877.
Crop Soil Moisture													
Barley	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Alfalfa 1 Cutting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Alfalfa 3 Cutting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Crop Acreage													
Barley	0.	0.	0.	0.	469.	469.	469.	469.	0.	0.	0.	0.	
Alfalfa 1 Cutting	0.	0.	0.	469.	469.	469.	469.	469.	469.	469.	0.	0.	
Alfalfa 3 Cutting	0.	0.	0.	2052.	2052.	2052.	2034.	1934.	1128.	1128.	0.	0.	
Pasture	0.	0.	0.	2522.	2522.	2323.	0.	0.	0.	0.	0.	0.	
KC Coefficient													
Barley	0.49	0.57	0.73	0.85	0.46	1.03	1.13	0.22	0.87	0.79	0.67	0.55	
Alfalfa 1 Cutting	0.63	0.73	0.86	0.99	1.08	1.13	1.11	1.06	0.99	0.91	0.78	0.64	
Alfalfa 3 Cutting	0.63	0.73	0.86	0.99	1.08	1.13	1.11	1.06	0.99	0.91	0.78	0.64	
Pasture	0.49	0.57	0.73	0.85	0.90	0.92	0.92	0.91	0.87	0.79	0.67	0.55	
Consumptive Use													
Barley	0.000	0.000	0.000	0.000	0.069	0.428	0.636	0.051	0.000	0.000	0.000	0.000	
Alfalfa 1 Cutting	0.000	0.000	0.000	0.082	0.293	0.470	0.623	0.507	0.293	0.000	0.000	0.000	
Alfalfa 3 Cutting	0.000	0.000	0.000	0.082	0.293	0.470	0.623	0.507	0.293	0.000	0.000	0.000	
Pasture	0.000	0.000	0.000	0.071	0.244	0.383	0.517	0.436	0.257	0.000	0.000	0.000	

Hydrologic Data and Analysis

Project Conditions: Narrows Project

Irrigation Efficiencies Conveyance =1.00 On Farm =0.60 Combined =0.60

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Cropland Climatic Data													
KT Coefficient	0.30	0.30	0.32	0.46	0.61	0.78	0.92	0.88	0.71	0.53	0.31	0.30	
Daylight Hours	6.74	6.92	8.28	8.92	10.00	10.06	10.21	9.54	8.36	7.71	6.71	6.55	
Temperature	22.77	28.20	36.68	44.71	53.42	63.41	71.50	68.78	59.45	48.94	36.23	25.18	46.61
Precipitation	0.87	0.94	1.32	1.13	1.05	0.73	0.72	0.77	1.20	1.18	0.98	0.96	11.83
Water Supply													
Primary	0.	0.	0.	30.	1671.	3473.	4847.	3532.	1641.	207.	0.	0.	15401.
Secondary	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Total	0.	0.	0.	30.	1671.	3473.	4847.	3532.	1641.	207.	0.	0.	15401.
Diversion Requirement	0.	0.	0.	30.	1671.	3473.	4847.	3532.	1641.	0.	0.	0.	15194.
Water Shortage													
Root Zone	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Point of Diversion	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
Crop Soil Moisture													
Barley	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Alfalfa 3 Cutting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Alfalfa 1 Cutting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Crop Acreage													
Barley	0.	0.	0.	0.	469.	469.	469.	469.	0.	0.	0.	0.	
Alfalfa 3 Cutting	0.	0.	0.	2052.	2052.	2052.	2052.	2052.	2052.	2052.	0.	0.	
Alfalfa 1 Cutting	0.	0.	0.	469.	469.	469.	469.	469.	469.	469.	0.	0.	
Pasture	0.	0.	0.	2522.	2522.	2522.	2522.	2522.	2522.	2522.	0.	0.	
KC Coefficient													
Barley	0.49	0.57	0.73	0.85	0.46	1.03	1.13	0.22	0.87	0.79	0.67	0.55	
Alfalfa 3 Cutting	0.63	0.73	0.86	0.99	1.08	1.13	1.11	1.06	0.99	0.91	0.78	0.64	
Alfalfa 1 Cutting	0.63	0.73	0.86	0.99	1.08	1.13	1.11	1.06	0.99	0.91	0.78	0.64	
Pasture	0.49	0.57	0.73	0.85	0.90	0.92	0.92	0.91	0.87	0.79	0.67	0.55	
Consumptive Use													
Barley	0.000	0.000	0.000	0.000	0.069	0.428	0.636	0.051	0.000	0.000	0.000	0.000	
Alfalfa 3 Cutting	0.000	0.000	0.000	0.082	0.293	0.470	0.623	0.507	0.293	0.000	0.000	0.000	
Alfalfa 1 Cutting	0.000	0.000	0.000	0.082	0.293	0.470	0.623	0.507	0.293	0.000	0.000	0.000	
Pasture	0.000	0.000	0.000	0.071	0.244	0.383	0.517	0.436	0.257	0.000	0.000	0.000	

NARROWS PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX K

SECTION 404(B)(1) ANALYSIS
NARROWS PROJECT,
SANPETE WATER CONSERVANCY DISTRICT

Section 404(b)(1) Analysis
Narrows Project
Sanpete Water Conservancy District
March 2012

1.0 PROJECT DESCRIPTION

1.1 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.

1.2 PURPOSE AND NEED

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 accommodate 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.

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 have been evaluated thoroughly to fully comply with NEPA requirements and CFR 40 Part 230 Section 404(b)(1) Guidelines. The complete alternatives analysis is included in Chapter 2 of the Final Environmental Impact Statement (FEIS). A summary of the alternatives is included below. Potential impacts for the Proposed Action Alternative are addressed in Chapter 3 of the FEIS.

1.3 ALTERNATIVES CONSIDERED

1.3.1 Process Used to Develop Alternatives

The National Environmental Policy Act requires all agencies to write a detailed statement for major Federal actions having a significant effect on the environment, which must include a discussion of alternatives to the proposed action (see section 102(2)(c) of the Act). In addition, all Federal agencies must study, develop, and describe appropriate alternatives to recommended courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources. To be considered reasonable, each alternative in the array (except "no action") must meet the proposal objectives (purpose & need) and the environmental standards (selection criteria).

Reclamation, as the lead agency, formed an interdisciplinary team that consisted of various Federal and State agencies and the SWCD. This team was formed to develop a set of selection criteria that could be used to formulate alternatives to the Narrows Project that would meet the purpose of and need for the proposed project. The selection criteria are:

1. The project must include an agricultural and municipal irrigation water supply as a project purpose and provide expected project benefits for at least the duration of the loan repayment period.
2. The project must provide an additional water supply to north Sanpete County during the season when it is needed.
3. The project must comply with all statutory and regulatory requirements and guidelines including Section 404 of the Clean Water Act, the National Historic Preservation Act (NHPA), and the Endangered Species Act.
4. The project must satisfy Small Reclamation Project Act requirements. The SRPA requires that a project be technically and financially feasible and in compliance with environmental requirements. To be considered financially feasible, the following would apply:
    a. The project sponsor should pay a minimum of 25% of the project costs at the time of construction.
    b. Loan repayment must use 100% of the project's irrigation amortization capacity (with certain exceptions), and repayment must be completed in 40 years or less. The amortization capacity is a measure of farmers' and ranchers' ability to repay.
    c. The loan factor (a measure of Federal interest subsidy) for the project must be 0.5 or less.
5. The project must divert and store water under legal claim of right and priority in full compliance with State law.

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 chapter 1 of the FEIS.

1.3.2 Description of Alternatives

1.3.2.1 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.

1.3.2.2 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.

1.3.2.3 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.

1.3.2.4 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.

1.3.3 Alternatives Considered and Eliminated from the Study

Several alternatives considered were determined to be nonviable because they did not meet the project's purpose and need. Specifically, they failed to meet one or more of the identified selection criteria listed above. The eliminated alternatives are listed below and described in detail in Chapter 2 of the FEIS.

- 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

1.3.4 Comparison of Alternatives

Table 2-8 in the FEIS 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.

1.4 GENERAL DESCRIPTION OF FILL MATERIAL

The project area includes Gooseberry Creek and its tributaries for construction of the Narrows Reservoir and also includes Cottonwood Creek and the area along the Oak Creek and the East Bench pipeline alignments.

1.4.1 Fill Material Characteristics

All fill materials used for construction of Narrows Dam would consist on naturally-occurring soils in the vicinity of the project area. Borrow materials for an earthfill embankment, available in the reservoir area, consist of clayey silts. Sand and gravel materials would be used in filter, drain and transition zones. Quarried rock would be used as riprap to protect the upstream face of the dam from wave action.

1.4.2 Source of Fill Material

Earthfill material for the Narrows Dam will be developed from a borrow area within the reservoir basin. Development of this area will affect wetlands and Gooseberry Creek. However, the impacts will occur with development of the reservoir regardless of whether the borrow area is used. It is estimated that 6.5 acres of stream and wetland areas will be impacted by excavation

of borrow material. During excavation of the borrow area, portions of Gooseberry Creek within the borrow area will be moved to the east using a membrane-lined channel. Following completion of the dam, Gooseberry Creek will be used to fill the reservoir basin and the membrane liner will be removed.

Sand and gravel materials to be used in filter, drain, and transition zones would be imported from commercial pits located in Sanpete Valley.

Rockfill material for the dam will be developed from a source area outside of the reservoir basin. Development of rockfill material would disturb approximately 2.0 acres. Following construction, the rockfill material source area will be recontoured, topsoil will be replaced, and the area will be revegetated. Virtually all runoff from disturbed areas will flow into Narrows Reservoir that will act as a trap for all upstream sediment. The current sediment load in Gooseberry Creek downstream from the proposed Narrows Reservoir will be reduced by about 400 tons per year with construction of the Proposed Action. This sediment would accumulate in the reservoir.

1.4.3 Construction Activities and Fill Quantities

Dam foundation excavation will be the first work associated with construction of the Narrows Reservoir. Gooseberry Creek will be left undisturbed during excavation and construction of the right side (facing downstream) of the dam foundation. Abutment excavation will proceed concurrently with the foundation excavation. The outlet works will be constructed in the right abutment. Following completion of the outlet works, Gooseberry Creek will be diverted through it, bypassing the dam foundation. With Gooseberry Creek diverted through the outlet works, the left side of the dam foundation will be excavated.

A small (less than 3-foot-high) temporary coffer dam may be constructed to train Gooseberry Creek into the temporary channel connecting to the outlet works. This could affect as much as 3,000-square-feet of stream and wetlands. The estimated volume of coffer dam embankment to be placed in Gooseberry Creek and adjacent wetlands within the reservoir basin is 200 cubic yards.

The footprint of the dam within wetland and stream areas is estimated to be 39,000 square-feet. The total estimated volume of embankment material to be placed above the existing wetlands and Gooseberry Creek, and within the footprint of the Narrows Dam, is 83,400 cubic yards. The total dam volume is estimated at 363,000 cubic yards.

1.5 DISCHARGE METHOD

The fill material would discharged primarily by cut and fill operations using bulk scrapers. Fill materials would be transported as necessary by haul truck from the point of excavation to the discharge site. Excavated material would be sorted and handled on site prior to placement in the discharge area. Placement of fill material would be accomplished in suitable lifts and would be compacted as required for structural and soil stability design criteria.

2.0 FACTUAL DETERMINATIONS

Other than the No Action alternative, the only practicable alternatives are the Proposed Action, Mid-sized Reservoir, and Small Reservoir alternatives. The Mid-sized and Small Reservoir alternatives are essentially the same as the Proposed Action Alternative except the size of the reservoir is progressively smaller. Environmental impacts from these three alternatives are very

similar with just slightly smaller affected areas for the Mid-sized and Small Reservoir alternatives. Mitigation measures for the alternatives are proportional to the affected areas for each. The Proposed Action more fully meets the stated purpose and need at a lower cost per acre-foot of water supplied as compared to the other two alternatives. Factual determinations are applicable to the Proposed Action Alternative.

2.1 PHYSICAL SUBSTRATE DETERMINATIONS

2.1.1 Substrate Elevation and Slope

The outlet from the Narrows Reservoir will tie into Gooseberry Creek at the same elevation as the existing channel. There are no expected changes in substrate elevation and slope upstream from the high water level of the proposed reservoir or downstream from the outlet of the reservoir.

2.1.2 Sediment Type

The origin of the fill to be discharged is primarily within the reservoir basin and does not represent a change from the historic sediment type within Gooseberry Creek. The exception to this is a relatively minor amount (less than 9 percent of the total embankment volume) of sand and gravel that would be imported from Sanpete Valley.

2.1.3 Fill Material Movement

The Narrows Reservoir is expected to act as a trap for sediments upstream from the dam effectively reducing sediment loads by 400 tons per year from the existing condition. Fill material discharged into the stream channel for construction of the dam will be permanently stabilized to prevent movement of the fill downstream.

2.1.4 Physical Effects on Benthos

There would be temporary effects on benthos as Gooseberry Creek is modified during construction of the dam. Since fill materials are of the same type as historic materials, and because benthic organisms tend to rapidly recolonize disturbed areas, it is expected that the lost benthic habitat of the stream channel that is inundated by the proposed reservoir will be replaced with new benthic habitat that will be developed within the reservoir. There will essentially be a shift from benthic organisms associated with flowing water habitat to those more adapted to lake conditions with the reservoir. It is anticipated that there will essentially be no change in benthic habitat upstream or downstream from the proposed reservoir.

2.1.5 Actions Taken to Minimize Impacts

Efforts were made to preserve the aquatic and terrestrial habitat while still accomplishing the goals of the project. Construction impacts would be minimized through implementation of erosion control measures and storm water pollution prevention. Measures include silt fences, soil stabilization practices, and turbidity barriers. Unavoidable adverse impacts will be compensated for through the construction of wetlands mitigation sites and through stream channel restoration and enhancement along Gooseberry Creek below the proposed dam.

2.2 WATER CIRCULATION, FLUCTUATIONS, AND SALINITY DETERMINATIONS

2.2.1 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.

2.2.1.1 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 of the FEIS, "Fisheries."

2.2.1.2 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 of the FEIS 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 of the FEIS). 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 of the FEIS.

2.2.1.3 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 onehalf 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.

2.2.1.4 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, Narrows Project 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.

2.2.1.5 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 of the FEIS), 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 of the FEIS, 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.

2.2.2 Current Patterns, Circulation, and Water Level Fluctuations

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 of the FEIS 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 of the FEIS, 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 of the FEIS. 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 of the FEIS. 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).

2.2.3 Salinity Gradients

Not applicable.

2.2.4 Actions to be Taken to Minimize the Impacts

A summary of the actions that will be taken to minimize impacts of the proposed project are listed below:

1. Contractor required to comply with applicable Federal and State laws, orders, and regulations concerning the control and abatement of water pollution including development and implementation of
    a. A Water Quality Management Plan (Erosion Control Plan),
    b. A Storm Water Pollution Prevention Plan, and
    c. Best Management Practices (BMPs) for nonpoint source water pollution control.

2. Mitigation for potential decrease in overall DO level in Lower Gooseberry Reservoir by including additional storage in the Narrows Reservoir and requiring minimum streamflow releases as discussed in section 3.4 of the FEIS, “Fisheries.”
3. Mitigation for slight increase in in-lake phosphorus concentration in Scofield Reservoir by:
    a. stabilizing the Gooseberry Creek channel,
    b. Providing 300 acre-feet of water from Narrows Reservoir to augment winter flows into Lower Gooseberry Reservoir, and
    c. Making improvements for 9.5 miles of stream segments tributary to Scofield Reservoir to reduce external phosphorus loading.
4. Protection of water quality in the proposed Narrows Reservoir 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.
5. 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.

2.3 SUSPENDED PARTICULATE/TURBIDITY DETERMINATIONS

2.3.1 Expected Changes at Discharge Sites

Any potential temporary increases in suspended particulate and turbidity levels during construction and prior to permanent stabilization would be minimized through implementation of the Water Quality Management Plan, Storm Water Pollution Prevention Plan, and BMPs. After permanent stabilization measures are implemented, the Narrows reservoir is expected to act as a trap for sediments, having a beneficial effect upon downstream suspended particulates and turbidity.

2.3.2 Effects on Chemical and Physical Properties of the Water Column

The proposed project, along with the proposed mitigation measures, is not expected to significantly alter the chemical or physical properties of the water column. The project would not introduce new sources of toxic metals and organics, pathogens, or other parameters that would affect light penetration, dissolved oxygen levels, or aesthetics.

2.3.3 Effects on Biota

There are no anticipated measurable effects to important biota related to water quality changes attributable to the project.

2.3.4 Actions Taken to Minimize Impacts

The actions proposed to minimize impacts related to suspended particulates and turbidity are discussed above in section 2.2.4.

2.4 CONTAMINATION DETERMINATIONS

As discussed above, naturally-occurring fill materials proposed for this project will originate primarily within the Narrows Reservoir basin. These materials are located in an area that has not been affected by human activities that would result in contaminated soils. Discharge of the fill materials is proposed using BMPs to prevent the movement of fill materials from the

discharge site. Additionally, permanent stabilization of disturbed areas will prevent long term movement of discharged materials.

2.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

2.5.1 Threatened and Endagered 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).

2.5.2 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 of the FEIS 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.

2.5.3 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 in the FEIS). 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 of the FEIS.

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 of the FEIS. 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 of the FEIS). 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 streambased 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 of the FEIS. Table 3-11 of the FEIS 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.

2.5.4 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 FEIS, 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.

2.6 PROPOSED DISCHARGE SITE DETERMINATIONS

Placement of fill materials into waters of the United States would occur during construction of the Narrows damsite on Gooseberry Creek, during construction of the outlet structure from the pipeline on Cottonwood Creek, and during construction of the stream crossings for the East Bench Pipeline as described in Chapter 2 of the FEIS. Several alternatives were evaluated to determine whether they would meet the purpose and need of the project. The only practicable alternatives required discharge at each of the indicated sites. None of the other alternatives could meet the purpose and need of the project.

2.7 DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

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 of the FEIS). 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 FEIS under the headings of fisheries, threatened and endangered species, and water resources, use, and quality.

2.8 DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

Secondary impacts include reasonably foreseeable impacts that are caused by an action but do not occur until a later time or at a further distance. The FEIS considered secondary effects such as changes in land use, economic vitality, traffic, air quality and noise, water quality, public safety, and other resources. Secondary impacts were identified and evaluated as part of the EIS and mitigation measures were planned as necessary to result in no significant overall adverse effects on the aquatic ecosystem.

3.0 FINDINGS OF COMPLIANCE FOR THE NARROWS PROJECT

No significant adaptations of the guidelines were made relative to this evaluation.

Including the No Action Alternative, there were 17 alternatives evaluated in the EIS. It was determined that the No Action Alternative along with 13 of the other alternatives were not practicable because they do not meet the purpose and need for the project. The evaluation took into account cost, existing technology, and logistics in light of the overall project purposes. The only practicable alternatives included the Proposed Action, the Mid-Sized Reservoir, and the Small Reservoir alternatives. The only significant difference between these three alternatives was the size of the Narrows Reservoir and, consequently, the volume of water supplied for the purpose and need. The Proposed Action Alternative specified the largest reservoir. Because of this, the impacts of this alternative were slightly greater than the Mid-sized and Small reservoir alternatives. However, mitigation measures for the Proposed Action Alternative were increased to compensate for all impacts, effectively reducing the overall impact to zero. Also, with the Mid-sized and Small reservoir alternatives, the cost per acre-foot of water supplied was much greater than for the Proposed Action Alternative making them less practicable from a financial perspective.

Based on the project's compliance with the USACE 404 Permit and the State of Utah Stream Alteration Permit requirements, the proposed disposal of materials at the locations identified in the EIS would not violate any applicable State water quality standards.

Use of the selected disposal sites will not affect any federally listed threatened or endangered species or their critical habitat.

The proposed disposal will not result in significant adverse effects on human health and welfare, recreational fishing, plankton, fish, shellfish, wildlife or special aquatic sites provided the proposed mitigation measures and environmental improvements are incorporated into the project.

Appropriate steps were taken to minimize adverse effects during construction including development and implementation of a Water Quality Management Plan, Storm Water Pollution Prevention Plan, and Best Management Practices for minimization of suspended particulates and turbidity.

On the basis of the guidelines, the proposed disposal sites for the discharge of dredged or fill material is specified as complying with the requirements of CFR 40 Part 230 Section 404(b)(1)

with the inclusion of appropriate and practicable discharge conditions to minimize pollution or adverse effects to the affected aquatic ecosystems.