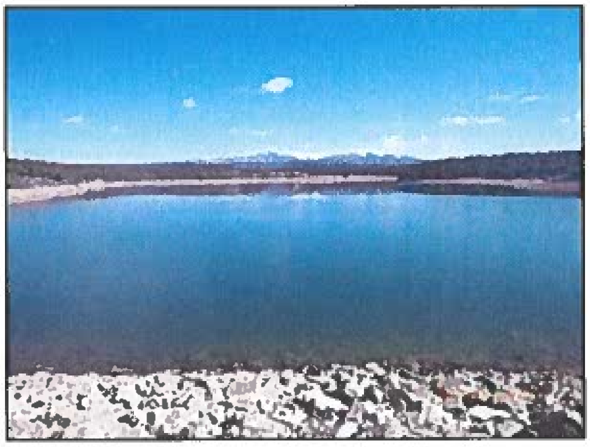
REDMESA RESERVOIR ENLARGEMENT
FINAL FEASIBILITY STUDY



May 2020

Prepared by

SGM

555 RiverGate Lane, Suite B4-82
Durango, CO 81301
970.385.2340
970.385.2341 fax

FEASIBILITY STUDY APPROVAL
Pursuant to Colorado Revised Statutes 37-60-121 &122, and in accordance with policies adopted by the Board, the CWCB staff has determined this Feasibility Study meets all applicable requirements for approval.

Signed

5/19/21
Date

REDMESA RESERVOIR ENLARGEMENT
FINAL FEASIBILITY STUDY

PREPARED BY:

N. JORDAN DIMICK, PE

AMANDA WEBB

REVIEWED BY:

ERIC L. KRCH, PE, CFM, M.ASCE

ERIC BIKIS, PG

SGM Project # 2018-148.001

P:\PROJECT FILES\2018-148.001 REDMESARESERVOR&DITCH COMPANY\E-REPORTS\SGM\2020-FINALFEASIBILITYSTUDY\REDMESARESERVOIRFINALFEASIBILITYSTUDY FINAL.DOCX

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 Executive Summary

The Redmesa Reservoir and Ditch Company (RR&DC) owns and operates the 1,176 acre-foot (AF) Redmesa Reservoir; originally constructed in 1910 and known as the Red Mesa Ward Reservoir and/or Mormon Reservoir. Redmesa Reservoir is an on-channel reservoir located in La Plata County, Colorado on Hay Gulch, tributary to the La Plata River. The water supply stored within Redmesa Reservoir is used for the irrigation of crops by four ditches located below Redmesa Reservoir.

The existing dam and the outlet works configuration are essentially the same as when enlarged in 1945, with repairs over time to the outlet gate tower to address concrete cracking and structural deflection from ice loading that occurs during the winter. Redmesa Reservoir is considered a High Hazard Dam, and on January 5, 2018, the Colorado Division of Water Resources (CDWR) Office of the State Engineer, Dam Safety placed a Reservoir Storage Restriction Order (Order) to a maximum gage height of 26.9 feet, limiting storage to 376 AF, based on the hydraulic inability of the spillway to pass required stormflows.

Multiple studies over the past two decades have contemplated the feasibility and anticipated project costs to rehabilitate Redmesa Reservoir's narrow spillway and aging outlet works to comply with the current Colorado Office of the State Engineer's (SEO) dam safety requirements, while enlarging the reservoir to increase the water supply available for the Reservoir Ditches. The RR&DC, the Reservoir Ditches, and other local stakeholders would like to proceed with the design, permitting, and construction of a future Redmesa Reservoir Enlargement Project.

Over the past twelve years, an overall dry period, Redmesa Reservoir has filled eight times. As such, Redmesa Reservoir is a critical water source for the Reservoir Ditches as it provides supplemental water that can be released as needed to more efficiently meet irrigation demands.

The RR&DC has continued to coordinate with various stakeholders, and in March 2018 and obtained funding from the Colorado Water Conservation Board (CWCB) and the Southwestern Water Conservation District (SWCD) to complete a Final Feasibility Study (FFS) to facilitate the project's implementation by refining project costs and determining funding options for the selected alternative. In May 2019 the RR&DC received additional CWCB funding to complete the FFS once the Dam Safety Branch of the Office of the State Engineer finalized its updated tools and dam safety regulations.

Building upon previous studies, during the 2020 FFS, the RR&DC elected to carry forward five alternatives: two repair alternatives without an enlargement, a 500 AF enlargement, 900 AF enlargement, and a 1,190 AF enlargement project. The La Plata Basin StateMod water allocation model was rerun to verify how often various alternatives would fill, which equated to approximately one third of the time.

The La Plata River basin model results indicated the optimum size for a reservoir enlargement, based on water supply yield, would be approximately 1,170 AF. SGM developed an operations model to simulate how stakeholders in the Redmesa Reservoir Project would use their supplies, including inter-reservoir operations with Bobby K. Taylor Reservoir (BKT Reservoir).

Based on the available survey data, SGM completed a comparison between two no-enlargement alternatives and a 500 AF, 900 AF, or 1,190 AF enlargement alternatives. The 2016 estimated construction costs for the repair without enlargement and 550 AF enlargement alternatives were reviewed and updated with 2020 unit costs and more site-specific data to update the estimated project costs for all alternatives on a 2020 cost-basis. In summary, the estimated 2020 construction costs are:

- Alternative No. 1 (total capacity of 1,176 AF): $2,764,500 ($2,351 per AF)
- Alternative No. 2 (total capacity of 1,176 AF): $2,896,500 ($2,463 per AF)
- Alternative No. 3 (total capacity of 1,676 AF): $6,452,400 ($3,850 per AF)
- Alternative No. 4 (total capacity of 2,076 AF): $7,699,500 ($3,709 per AF)
- Alternative No. 5 (total capacity of 2,366 AF): $8,542,400 ($3,610 per AF)

On a cost per AF of available water, the no-enlargement alternatives are less expensive than enlargement alternatives; however, there will be less regional and state-wide benefits for a project solely benefitting irrigators. A no-enlargement alternative would also reduce the funding opportunities available to the RR&DC. Therefore, the RR&DC and stakeholders have selected to pursue the 1,190 AF enlargement, which has the least expensive unit cost per AF of storage for all enlargement alternatives at $3,610 per AF.

In order to fund enlargement alternatives, project partners are needed. The primary project partners contemplated are the Colorado Division of Water Resources (CDWR) and Colorado Parks and Wildlife (CPW). The RR&DC will paper exchange its Reservoir Ditches irrigation supply in BKT Reservoir with CDWR and CPW's Redmesa Reservoir supplies. The resulting tandem operations with the Long Hollow Project - BKT Reservoir will allow for additional CDWR and CPW supplies to be used for La Plata River Compact compliance and native fisheries. In addition, there are multiple regional benefits, including:

- Increased storage capacity in Redmesa Reservoir will allow stakeholders to increase the storage of available supply on the La Plata River during favorable hydrologic conditions (wet and average years) for use in subsequent dry years, increasing agricultural, Compact, fisheries, and augmentation supplies during time of drought, as observed in 2018.
- The Project will provide additional capacity for the RR&DC and CDWR staff to better manage diversions to during periods with large fluctuations in diurnal flow.
- The ability to complete intra-reservoir paper exchanges will reduce CDWR's administrative transit/stream losses, and further increase the supply available to stakeholders.
    - This includes increasing the supply available to CDWR for Compact compliance and to CPW for native fisheries in the La Plata River below Long Hollow. Both the CDWR and CPW supplies released from BKT Reservoir will bolster the riparian corridor in the La Plata River and will provide additional streamflow in the La Plata River during dry years and seasonally low-flow conditions.
- All increases in irrigation supply will result in additional ditch and reservoir seepage as well as irrigation return flows, all of which would recharge the Redmesa Aquifer. The aquifer recharge will ultimately accrue to the La Plata River, Government Draw and Long Hollow and will generally increase flows in the lower portion of the basin.
- Increased return flows in the lower portion of the basin will benefit irrigators, provide operational flexibility for water managers and CDWR staff, and will provide

supplemental flows benefiting the environmental communities within the river and the adjacent riparian habitat.

- During the winter, BKT Reservoir's bypass requirements could preferentially be made from Redmesa Reservoir. In doing so, the addition of supplemental flow for threatened and endangered fish species in the La Plata River below the confluence with Long Hollow would be bolstered upstream all the way to its confluence with Hay Gulch.
- The RR&DC anticipates providing access to Redmesa Reservoir for recreational uses including non-motorized boating and seasonal waterfowl hunting.
    - CPW does not envision allowing fishing in Redmesa Reservoir, as non-native fish compete with native fish, which are a focal point of this project.

In addition to additional supply being available to CDWR for release from BKT Reservoir to bolster La Plata River streamflow to meet its daily flow delivery requirements to the Compact at the Colorado-New Mexico Stateline, the following state-wide benefits will be realized.

- The Project will further develop Colorado's usage of its La Plata River entitlement under the 1922 La Plata River Compact and increase native/base flows in the La Plata River due to lagged return flows.
- The Project will result in fewer days of Compact over-deliveries from Colorado, as Colorado better manages its portion of its highly variable La Plata River entitlement.
- The Project will result in fewer days of Compact under-deliveries to New Mexico due to increased storage capacity.
- The reduction in under-deliveries to New Mexico reduces the potential of future litigation between the states.

Additional, as a part of the project, SGM completed a wetland delineation report, and submitted an Approved Jurisdictional Determination (AJD) to the U.S. Army Corps of Engineers (Corps). This wetland delineation work found that most of the bottom of the existing reservoir is unconsolidated sediment, with or without some plants, most of which are upland weeds. There is a total of 1.752 acres that technically meets the criteria for wetland under Section 404. This area is dominated by several "facultative" wetland species and upland plants, most of which are weeds and/or poisonous plants. Therefore, this 1.752 acre area is very low value "wetland" with minimal to no aquatic resource functions. Therefore, flooding of the 1.752 acres of low quality wetlands would be considered an impact and require some type of mitigation under Section 404.

Based on mapping of wetlands below the embankment and within the reservoir footprint, along with observations of the extent of wetlands along Hay Gulch upstream of the Redmesa Reservoir, it is estimated that a total of 2.164 acres of wetlands would be impacted from a 1,190 AF expansion, as follows:

- Below embankment: 0.192 acres.
- Within reservoir footprint: 1.752 acres.
- Along hay Gulch upstream of reservoir: 0.22 acres.

Therefore, a Section 404 permit would be required for expansion of Redmesa Reservoir since fill material would be discharged into wetlands and Hay Gulch below the existing embankment; and wetlands within the reservoir footprint upstream along Hay Gulch would be inundated, thus changing their nature (and associated functions). Based on the total estimated impact of 2.164 acres, an Individual Section 404 Permit (IP) would be required. The application for the IP will have to include an alternatives analysis that demonstrates that impacts to wetlands have been avoided and minimized to the extent practicable, and that an alternative does not exist that meets the project purpose and would result in fewer impacts. A mitigation plan would also have to be prepared that fully mitigates the functions of the impacted wetlands.

SGM anticipates the permitting portion of the Redmesa Reservoir Enlargement project can be completed over the following timeframes.

- Section 404 Permit: assume 9 months for preparation of application information and processing of the request by the Corps.
- Other environmental and cultural resources studies and approvals (including 401 Certification) would occur during the same timeframe.

The 2020 estimated total project cost for the 1,190 AF enlargement of Redmesa Reservoir is $9,124,800, which includes engineering, permitting, and construction costs. The RR&DC intends to apply for grants from the Southwestern Water Conservation District, the Colorado Water Conservation Board (both Colorado Water Plan Grants and the Water Supply Reserve Fund), a Department of Homeland Security Pre-Disaster Mitigation program, US Bureau of Reclamation WaterSmart program, and US Fish and Wildlife Service native fish programs. Additionally, RR&DC will apply for a Colorado Water Conservation Board Loan to pay for the project.

In order to repay its future project loan, the RR&DC will increase its shareholder's annual assessments, create new B-class shares for the enlargement pool, provide additional water for augmentation uses, and is considering opening Redmesa Reservoir for recreational purposes, including non-motorized boating and waterfowl hunting, totaling 140 acres. Additionally, RR&DC is working with adjacent landowners and other landowners in the area to open up approximately 1,000 acres of land that could be enrolled through CPW's Walk-in Access Program. The increased annual assessments and new sources of income will allow RR&DC to repay its annual loan payment over the next 30 years and will also provide income for other annual expenses and operations and maintenance costs.

2.0 Introduction

The Redmesa Reservoir and Ditch Company (RR&DC) owns and operates the 1,176 acre-foot (AF) Redmesa Reservoir, historically known as the Red Mesa Ward Reservoir and/or Mormon Reservoir. As shown on Figure 1, Redmesa Reservoir is an on-channel reservoir located in La Plata County, Colorado on Hay Gulch, tributary to the La Plata River. The water supply stored within Redmesa Reservoir is used for the irrigation of crops by four Reservoir Ditches below Redmesa Reservoir including: Old Indian Ditch, Joseph Freed Ditch, Revival Ditch, and the Warren-Vosburgh Ditch.

Multiple studies over the past two decades have contemplated the feasibility and anticipated project costs to rehabilitation Redmesa Reservoir’s narrow spillway and aging outlet works to comply with the current Colorado Office of the State Engineer’s (SEO) dam safety requirements, while enlarging the reservoir to increase the water supply available for the Reservoir Ditches. The RR&DC, the Reservoir Ditches, and other local stakeholders would like to proceed with the design, permitting, and construction of a future Redmesa Reservoir Enlargement Project; however, uncertainties revolving around total project costs, additional potential project partners, and the availability of loan and/or grant monies have prevented the implementation of a reservoir enlargement project.

The RR&DC has continued to coordinate with various stakeholders, and in March 2018 obtained funding from the Colorado Water Conservation Board (CWCB) and the Southwestern Water Conservation District (SWCD) to complete a Final Feasibility Study (FFS) to facilitate the project’s implementation by refining project costs and determining funding options for the selected alternative. SGM was selected by the RR&DC to complete the FFS, given individual staff’s experience with water rights, water supply planning, and reservoir project implementation within the La Plata River basin.

As the 2018 FFS was nearing completion, the RR&DC elected to temporarily stop the this project as the State of Colorado began implementing changes to its dam safety regulations including: the use of the Colorado and New Mexico Regional Extreme Precipitation Study (CO-NM REPS), inclusion of the Reclamation Consequence Estimating Methodology (RCEM) to reduce the hazard classification, and overall revisions to the Rules and Regulations for Dam Safety and Dam Construction. The Dam Safety Branch of the Office of the State Engineer finalized their revisions, analyses, and new tools in January 2020. This report summarizes the work originally started in 2018 that was finalized in 2020 once the new Dam Safety Rules and Regulations were completed.

2.1 Project Purpose and Need

The Redmesa Reservoir was originally built in 1910, and the dam was repaired in the 1920s after being damaged by flooding in 1911. Two reservoir enlargement projects have been completed to Redmesa Reservoir, with the first occurring in the 1920s and the second in 1945. The existing dam and the outlet works configuration are the same as constructed in 1945, with a maximum storage capacity of 1,176 AF. Repairs to the outlet gate tower were performed in 1973 and the 1990s to address concrete cracking and structural deflection from ice loading that occurs during the winter.

Redmesa Reservoir is considered a High Hazard Dam, and on January 5, 2018, the Colorado Division of Water Resources (CDWR) Office of the State Engineer, Dam Safety placed a Reservoir Storage Restriction Order (Order) to a maximum gage height of 26.9 feet, limiting storage to 376 AF. The stated basis for the Order was the hydraulic inadequacy of the existing spillway to convey the 24-hour, 100-year storm event without breaching the dam, as required by the SEO. According to the Order, hydraulic inadequacy was first reported in 1984 by the Soil Conservation Service, and again in 1988 by the Dam Safety Engineer's inspection report and every year thereafter.

After receiving the Order, the RR&DC had emergency spillway modifications completed in February 2018 to significantly increase the spillway capacity. The excavated materials from the spillway were placed atop the Redmesa dam crest to re-establish the original crest elevation. As a result, the Dam Safety Engineer, temporarily waived the Order, allowing the RR&DC to fully operate Redmesa Reservoir during the 2018 irrigation season. The RR&DC acknowledges that a long-term solution is required to repair the aging dam infrastructure and increase the spillway capacity to comply with current dam safety regulations, to ensure continued long-term operation of Redmesa Reservoir.

The most recent Redmesa Reservoir enlargement study completed by AECOM in 2016, estimated the design, permitting, and construction cost associated with repairing the outlet structure and dam, along with spillway modification to be $4,500,000. Importantly, the incremental costs associated with enlarging the dam and spillway to create additional storage capacity within Redmesa Reservoir are relatively minor when compared to the base cost. Additional storage could be used by new project partners and the Reservoir Ditches to offset direct project costs to RR&DC, increase regional and state-wide benefit, and increase water supply within the water-short La Plata River basin.

The purpose of the FFS is to briefly summarize the key findings from previously studied alternatives, refine project costs, identify project partners that could utilize additional water storage for the greatest regional and state-wide benefit; and analyze the ability of each entity to assist in repaying debt along with on-going operations and maintenance (O&M) costs. The RR&DC intends to apply for various grants and will pursue a future CWCB and/ or other loan application. This FFS was completed in accordance with the CWCB's Loan Feasibility Study Requirements to support its future application.

2.2 Project Sponsor

The project sponsor for the Redmesa Reservoir Enlargement FFS is the RR&DC. Relevant information about RR&DC including a description of the organization, its water facilities, water rights, annual revenue sources, existing rates, and service area are summarized within this section of the report.

2.2.1 Redmesa Reservoir and Ditch Company Overview

The RR&DC was originally formed as the Red Mesa Ward Reservoir and Ditch Company (Company) in 1923 and is recognized as a not-for-profit corporation under Colorado law. Article II of the Company RR&DC's Articles of incorporation list the following purposes and objectives for formulating the organization:

- To file on, appropriate or otherwise acquire 4,000 acre feet, more or less, of the flood water of the La Plata River in said county and state, and other waters, for storage in reservoirs, for distribution and for the use of members of the Company and other persons entitled thereto, for domestic and irrigation purposes;

- To acquire by purchase or otherwise the title in the Company of the rights of way for headgates, ditches, flumes and of reservoirs for the carrying and conduction of water from the source of supply thereof to such reservoirs, and the storage of such water in such reservoirs, and the distribution of such waters to the members of the Company and other persons entitled thereto;
- To acquire by purchase or otherwise lands upon which to construct, maintain and operate the reservoirs of the Company for storage of waters therein for domestic and irrigation purposes;
- To construct, maintain and operate irrigation ditches, laterals, reservoirs and irrigation works, together with all necessary gates, dams, flumes, pipes and other appurtenances for the carrying, conveying storage and distribution of waters for irrigation and domestic purposes; and
- Also to levy and collect pro-rata and as may be provided by the by-laws of the Company, such assessments as may from time to time be necessary for the enlargement, repairs, maintenance, operation and superintendence of such irrigation works, ditches and reservoirs, and to provide for the sale of the memberships, membership certificates, rights and interests of the member of the Company and other persons entitled to receive water from said irrigation works, ditches and reservoirs for their default and neglect in payment of much assessments, all as my be provided by the by-laws of the Company.

The RR&DC currently has 1,138 outstanding shares, held by 48 shareholders. Since its incorporation in 1923, the RR&DC has achieved its stated purposes and objectives and continues to operate its water rights and facilities for the beneficial use of its shareholders.

There are approximately 3,198 acres of irrigable land in the RR&DC’s service area. However, given the limited water available in the area, a maximum of 1,600 acres can be practically irrigated, while in most years approximately 1,140 acres of land is irrigated within the RR&DC’s service area. The service area is located mostly around the town of Red Mesa (unincorporated) in the southwestern portion of the La Plata County. The reservoir water is conveyed downstream to its shareholders through the Reservoir Ditches. The project area, Reservoir Ditches, and historically irrigated lands are shown on Figure 2.

2.2.2 Revenue Sources and Existing Rates

The RR&DC’s annual revenue is obtained solely from shareholder assessments, which are currently set at $20.50 per share, totaling $23,329. Between 2016 and 2018, an average of 58 percent ($13,100 per year) of the total income, has been used for the operation and maintenance of the reservoir, taxes, and other administrative expenses, including the labor costs for the dam tender and secretary/treasurer. Annual summary sheets of the RR&DC’s financial sheets are included as Appendix A. As stated in the RR&DC’s Articles of Incorporation, the company does set and collect annual assessments for the ongoing operations and maintenance of its water facilities. The RR&DC will need to increase its annual assessments to pay its portion of any Redmesa Reservoir enlargement project, as its current rates are not sufficient to cover an annual loan repayment.

2.2.3 Water Facilities

As shown on Figure 1, the Redmesa Reservoir is located at the lower end of Hay Gulch, a relatively small watershed of approximately 29.9 square miles. Water is diverted from the La Plata River at the northern point of Hay Gulch through the Hay Gulch diversion structure and is used as an irrigation supply for multiple non-RR&DC ditches upstream of the reservoir. Upstream irrigation return flows diverted by the Hay Gulch and Big Stick Ditches bolster the relatively small amounts of native Hay Gulch flows, all of which are stored in-priority in Redmesa Reservoir when physically and legally available. In addition, the RR&DC owns and operates the Redmesa Supply Ditch diversion structure on the west bank of La Plata River approximately 1.25 to the east of the reservoir, which is shown on Figure 2. This structure was substantially made more efficient and improved in 2017. La Plata River supplies are diverted in-priority when physically and legally available and allow for the conveyance of additional water supply directly into the reservoir.

The RR&DC operates and regularly performs routine maintenance of its facilities, including but not limited to, the Redmesa Reservoir, the Redmesa Supply Ditch headgate and associated ditch, and key appurtenances, such as measurement structures, headgates, valves, and piping.

2.2.4 Summary of Water Rights

The RR&DC’s senior storage water right at Redmesa Reservoir is for 4,074 AF, of which 1,176 AF has been made absolute and the remaining 2,898 AF is conditional. The original storage water right has appropriation date of April 30, 1905. The decreed uses include irrigation, municipal, industrial, recreational, fishery and domestic. The RR&DC and La Plata Water Conservancy District (LPWCD) have a joint refill right for Redmesa Reservoir, of which 656 AF has been made absolute and the remaining 3,418 AF is conditional. The refill right has an appropriation date of December 31, 2000, with the following decreed uses: irrigation, commercial, industrial, recreational, fishery, fire, augmentation, and wildlife.

In addition, the RR&DC holds an absolute water right for its Redmesa Supply Ditch, up to 120 cubic feet per second (cfs) off the La Plata River. The Redmesa Supply Ditch has an appropriation date of April 30, 1905, and is decreed for the following uses: irrigation, municipal, industrial, recreational, and domestic. Table 1 summarizes the water rights owned by the RR&DC.

Given, the RR&DC’s existing storage and refill water rights, a future enlargement (up to 4,074 AF) would not require any new water rights application or filings, provided the stored supply was diverted in-priority and was put to beneficial use under the previously decreed uses. Otherwise, water put to beneficial use for non-decreed uses would need to be diverted during times when the La Plata River was administered under a free river condition. Further, an enlargement of Redmesa Reservoir would allow the RR&DC to increase its absolute water rights amounts after the beneficial use of the increased storage amounts within the ongoing water rights diligence periods.

Since the Redmesa Reservoir is decreed for numerous uses in addition to irrigation, including municipal, commercial, industrial, recreation, fishery, stock, fire, domestic, augmentation water, and wildlife enhancement, supplies stored in a future enlargement of Redmesa Reservoir could be used for non-irrigation purposes. Non-irrigation uses will prove critical in developing additional project partners that may financially support the future enlargement project.

Currently, when Redmesa Reservoir is full at 1,176 AF, the 1,138 outstanding shares in the RR&DC, yield 1 AF of water. Water is delivered on a pro-rata shareholder basis, and in years when the reservoir does not fill, each share yields a pro-rata and equal allotment of the total annual storage volume.

2.2.5 Summary of Water Supply

The La Plata River is considered a severely over-appropriated river and is administered under the 1922 La Plata River Compact (Compact), approved by Congress in 1925. The Compact requires the State of Colorado to deliver one-half of the daily mean flow of the La Plata River measured at the Hesperus stream gage to the La Plata River State Line gage the following day after February 15th until December 1st (Compact period), not to exceed 100 cfs. Each state has an unrestricted right of use to La Plata River water between December 1st and February 15th. Historically, Colorado has not always been able to satisfy the Compact due to a variety of factors, including low stream flows, surface flow loss to groundwater, evapotranspiration and increasing water demands. Moreover, attempting to deliver water to meet the Compact from Hesperus results in significant delivery losses to the system.

In order to help meet Compact requirements and limit delivery losses, the Bobby K. Taylor (BKT) Reservoir and Long Hollow Dam were built in 2014 to provide a more efficient delivery mechanism by allowing Colorado water users to divert water that would otherwise be curtailed by Compact delivery obligations. The LPWCD owns and operates the BKT Reservoir on behalf of its shareholders. While the RR&DC is not directly a shareholder in the BKT Reservoir, the individual Reservoir Ditches are project participants and use their pro-rata allotment(currently 20%) of the supplemental irrigation supply, by exchange, to increase the water delivered to crops. As described in Section 2.3.2, future operations between an enlarged Redmesa Reservoir and the existing BKT Reservoir, will be used to benefit project participants, bolster regional and state-wide benefits, and will facilitate the delivery of New Mexico's entitlement of river flows under the Compact.

Tables 2 through 7, respectively, tabulate the historical Redmesa Reservoir Hay Gulch diversions to storage, Redmesa Supply Ditch Diversions to storage, Old Indian Ditch diversions of Redmesa Reservoir supplies, Joseph Freed Ditch diversions of Redmesa Reservoir supplies, Revival Ditch diversions of Redmesa Reservoir supplies, and the Warren-Vosburgh Ditch diversion of Redmesa Reservoir supplies between 1975 and 2009. This period was selected, as it coincides with the period of record used for the La Plata River StateMod model developed on behalf of the RR&DC. The broad range and variability of tabulated diversions shown in Tables 2 through 7 is consistent with long-term historical diversions, as well as the more recent diversions from 2010 thru 2017.

In summary, the long-term average annual diversions to storage in Redmesa Reservoir amounts to 1,149 AF per year from Hay Gulch and an additional 326 AF per year through the Redmesa Supply Ditch. The total annual average diversion of Redmesa Reservoir supplies by the four Reservoir Ditches is 875 AF per year. Over the past twelve years, an overall dry period, Redmesa Reservoir has filled eight times. As such, Redmesa Reservoir is a critical water source for the Reservoir Ditches, as it provides supplemental water that can be released as needed to more efficiently meet irrigation demands.

Water is physically released from Redmesa Reservoir, conveyed through Hay Gulch and diverted at the respective Reservoir Ditches headgates. The Old Indian Ditch headgate is located on Hay Gulch, and solely receives its irrigation supply through Redmesa Reservoir supplies. The other three ditches that use Redmesa supplies also have water rights that allow for direct diversions from the La Plata River. However, the physical and legal availability of the La Plata River supply is limited and used for seasonal irrigation, primarily in the spring and early summer. The use of the reservoir water extends the irrigation season when adjudicated supplies are no longer available in the La Plata River. Not all water users under the Reservoir Ditches have RR&DC shares.

2.2.6 Summary of Water Demands

As stated in Section 1.2.1, in most years approximately 1,140 acres of land is irrigated under the Reservoir Ditches with a supply-limited maximum amount of 1,600 acres of land. The 1995 Red Mesa Reservoir Enlargement Feasibility Study identified an average irrigation consumptive use demand of 1.97 AF/ac, which including ditch and system losses equates to an average irrigation water requirement of 3.74 AF/ac for alfalfa and irrigated pastures. The irrigation water requirement results in an average annual water demand of 4,264 AF per year for 1,140 acres of lands commonly irrigated by the Reservoir Ditches. For 3,198 acres of irrigated land, the annual water demand increases to 11,960 AF per year. The long-term annual delivery of Redmesa Reservoir supply (875 AF per year) is approximately 21 percent of the average annual water demand, and 7 percent of the maximum annual demand of 11,960 AF per year. Within the project area, the irrigation demand greatly exceeds the available water supply. Generally, the combination of the direct water supply and stored Redmesa Reservoir supply allows irrigators up to 1.5 cuttings of alfalfa hay each year.

The 2016 AECOM report documented that vast shortage of irrigation supplies exists within the La Plata River Basin. Specifically in Section 7.5 it is noted, “Appendix I of the SWSI, which was undertaken by CWCB in 2010, evaluated agricultural water demand vs. supplies for the 10 year period from 1997 through 2006, and concluded that the La Plata River basin (Water District 33) has the greatest water shortage between the irrigation water requirement and supply-limited consumptive use among all basins within the San Juan River drainage system which have an annual irrigation water requirement in excess of 10,000 AF. In fact, the annual agricultural demand is equal to approximately three times the available supply.” Any additional water supply available for irrigation through a Redmesa Reservoir enlargement will be put to beneficial use by irrigators, especially later in the season, when direct diversions from the La Plata River are curtailed to meet the Compact.

3.0 Redmesa Reservoir Enlargement Alternatives Analysis

3.1 Summary of Previous Studies

Three feasibility studies have been completed on behalf of the RR&DC since the mid-1990s. The first study was prepared by Harris Engineering in 1995 which proposed a reservoir enlargement to 4,070 AF. A second study occurred in 2003 by Wright Water Engineers that was sponsored by the La Plata Water Conservancy District (LPWCD), also for an enlargement to 4,070 AF; and the third study was prepared by AECOM in 2016 considering enlargements of 250 AF and 550 AF. SGM briefly summarized the previous studies to provide context for the work completed in the FFS; however, each study is a stand-alone document that was considered and generally built upon by the subsequent feasibility study.

3.1.1 1995 Harris Water Engineering Feasibility Study

The RR&DC received CWCB and SWCD funding to conduct a feasibility study for a reservoir enlargement that would utilize its absolute and conditional storage rights to a capacity of 4,070 AF. It was estimated, the enlargement would include raising the dam and spillway by 29 feet. The dam would have a crest length of approximately 1,450 feet and crest width of 25 feet. The upstream and downstream slopes would be modified to a 3.2:1 slope and 2.5:1 slope, respectfully. The outlet works would also need to be modified, the gate tower and intake would be replaced with hydraulic gates, and the spillway enlarged.

The operation plan included the additional storage to be used primarily for irrigation but a portion for domestic uses such as augmentation for existing wells, direct diversions to a centralized domestic system, or used for exchange of upstream irrigators.

According to the Harris report, the “total annual increase in supply from the enlarged reservoir for all uses was estimated at 1,862 AF, or approximately 64 percent of the increased storage capacity of the reservoir.” It also assumed that the RR&CD would receive “unlimited winter flows from the La Plata River” conveyed through the Redmesa Supply Ditch and/or the Hay Gulch Ditch to the reservoir. To gain unlimited flows during winter, the historical diversions from other sub-basins within the La Plata River basin would need to be modified. The anticipated total cost for the project was estimated at $3,000,000 for an average water supply of 1,872 AF at $1,600 per AF. The RR&DC moved forward in requesting the necessary funding from the CWCB; however, the project was not pursued due to disagreements with users from other sub-basins regarding winter operations.

3.1.2 2003 Wright Water Engineers Feasibility Study

In 2003, the LPWCD obtained CWCB funds to analyze the feasibility of enlarging Redmesa Reservoir for its uses. Wright Water Engineers (WWE) completed the study and proposed a similar enlargement of 4,070 AF to utilize the RR&DC absolute and conditional storage rights. However, WWE used a different approach to fill the Enlarged Redmesa Reservoir and expanded on the spillway construction based on the 2003 SEO dam safety requirements.

LPWCD was evaluating five future reservoir sites and chose Long Hollow as the preferred project with Red Mesa a close second. The purpose of the Long Hollow Project was to better meet Compact requirements and provide supplemental irrigation water to LPWCD ditches and

Red Mesa could not solely meet this primary need. However, the two reservoirs, operating in tandem, provide synergies that allow for efficient water management.

WWE considered two enlargements: 3,000 AF which would require an increase of the surface water elevation by 19.5 feet and the full decreed storage rights of 4,070 AF with a surface water elevation increase of 27 feet. The larger of the two projects was chosen that would have required the dam crest to be raised by 34 feet, the dam crest length increased to 1,250 feet with a crest width of 25 feet. The outlet works would also be modified, the gate tower and intake would be replaced, and the spillway enlarged.

WWE performed a water availability study through the StateMod model program for the La Plata River Basin and developed a period of record from 1989 through 1998. It was concluded that the reservoir would fill approximately 40 percent of the time, and that the water yield could be increased by another 30 percent if basin-wide winter water use could be decreased. The total cost of the two projects were $6.1 million for the 3,000 AF enlargement and $7.1 million for the 4,070 AF enlargement, which were estimated at $3,211 per AF of increased capacity and $2,450 per AF of increased capacity (not total available storage), respectively.

WWE assumed that funding for the enlargement project would be covered under the LPWCD’s available funds; therefore, the RR&DC did not pursue additional funding opportunities. In the end, the LPWCD used all the available funding to construct the BKT Reservoir and Long Hollow Dam, leaving the RR enlargement without funding.

3.1.3 2016 AECOM Feasibility Study

AECOM prepared the most recent feasibility study in July 2016 to assist the RR&DC in designing a spillway compliant with the SEO’s dam safety requirement, along with reservoir enlargements of either 250 AF or 550 AF. It was also determined in this feasibility study that modifications to the outlet works would be needed to meet the current SEO dam safety requirements.

For the 2016 AECOM study, Hertzman Consulting, LLC (HC) was contracted to evaluate water availability for the proposed reservoir enlargements through a StateMod water allocation computer model originally created for the LPWCD during the preliminary stages of the Long Hollow Reservoir Project to assess La Plata River operations. The model considers water rights, along with historical river flows, diversions, precipitation, and irrigation demands over a 35-year period (October 1974-September 2009) to predict the numerous basin-wide river flows, ditch and reservoir diversions, system operations, and water rights yields. The focus of HC in the 2016 AECOM study was to estimate the total monthly volume in storage for each Redmesa Reservoir alternative, along with changes in monthly and annual diversions under each scenario conveyed through the Reservoir Ditches. Based upon the updated La Plata River Model, the 250 AF and 550 AF enlargement alternatives both filled 13 out of 35 years, or 37 percent of the time.

AECOM included a “no-action” scenario, which included the costs associated with breeching the dam, as the baseline to define the different costs of enlargement. AECOM determined that the 550 AF increase was economically viable. Therefore, the larger of the two alternatives was selected. It was estimated the dam crest would need to be raised by 14 feet, the dam crest length increased to 560 feet with a crest width of 25 feet. The upstream and downstream embankment slopes would be 3:1 and 2.5:1 respectively. The outlet works would also be modified, the gate tower and intake would be replaced, and the spillway enlarged. The no-action scenario estimated cost was $1.12 million, and the 550 AF enlargement estimated cost was $5.1 million.

3.2 2018 Analysis of Alternatives

During the 2020 FFS, SGM coordinated with the RR&DC to carry forward the repair without enlargement alternative, a 500 AF enlargement alternative, a 900 AF enlargement alternative, and an enlargement alternative of 1,190 AF. The additional 1,190 AF enlargement alternative would result in a total storage volume of 2,366 AF, effectively double the storage volume of the existing Redmesa Reservoir. The basis for the 1,190 AF enlargement was determined sequentially through the updating, use, and analysis of the La Plata River Basin StateMod model, as described in Section 3.2.1.

3.2.1 2018 La Plata River Basin Modeling

RR&DC representatives noted that both the 250 AF and 550 AF enlargement alternatives both filled 12 out of 35 years. Therefore, the RR&DC requested that SGM use the La Plata River Basin StateMod model to estimate the largest reservoir enlargement alternative that would similarly fill approximately one third of the time. In addition, RR&DC representatives wanted to verify the model had correct Redmesa Reservoir diversion records, as the methods for annotating historical diversion records maintained by the CDWR have varied between 1975 and 2009.

In 2018, SGM coordinated with Randy Hertzman to obtain the 2016 AECOM version of the model and associated files. SGM then verified the model contained the correct historical Redmesa Reservoir and Reservoir Ditch diversion records, which are tabulated in Tables 2 through 7.

Other than increasing the Redmesa Reservoir capacity for each model run, SGM did not alter the modeled La Plata River basin simulations. After verifying the reservoir diversion data, SGM tested the model to ensure HC’s 2016 AECOM output could be replicated. Once completed, the first model run consisted of increasing the Redmesa Reservoir capacity to the maximum decreed capacity of 4,074 AF. The maximum decreed capacity was modeled to fill in three of the 35 years. However, based on the threshold of filling approximately one third of the time (12 out of 35 years), a total maximum reservoir volume of 2,346 AF (enlargement of 1,170 AF) was selected as the largest feasible enlargement for the FFS, solely based on the modeled water supply yield.

Figure 3 compares the end of month (EOM) contents for the modeled period for the following four modeled scenarios: repair without enlargement, 550 AF enlargement, 1,170 AF enlargement, and the maximum decreed storage volume of 4,074 AF. The model output for the repair without enlargement and 550 AF enlargement alternatives are consistent with those developed by HC during the 2016 AECOM study. As illustrated in Figure 3, the modeled diversions to storage for each scenario follow the same pattern, and only change when the modeled hydrology allows for additional storage. Typically, the storage contents at the end of the irrigation season are the same across all modeled scenarios, as the irrigation demand far exceeds the additional supplies.

SGM did not modify the StateMod demands on Redmesa Reservoir, which are entirely agricultural. As described in Section 3.2.2, SGM developed a Microsoft-Excel-based monthly operations model to simulate future reservoir operations for all stakeholders and their uses.

Tables 8 through 10 show the monthly EOM contents' values in AF for all StateMod modeled scenarios, which were then used as the reservoir inflow values for the operations model. In summary, the peak average monthly EOM contents value for all StateMod scenarios occurs in May.

- Repair without enlargement – Average May EOM contents: 900 AF.
- 550 AF enlargement – Average May EOM contents: 1,113 AF (additional 213 AF; average increase equal to 39 percent of the enlargement volume).
- 1,170 AF enlargement – Average May EOM contents: 1,322 AF (additional 422 AF; average increase equal to 36 percent of the enlargement volume).
- Maximum enlargement – Average May EOM contents: 1,546 AF (additional 224 AF; average increase equal to 22 percent of the enlargement volume).

Figure 4 shows the monthly average EOM contents for each of the four StateMod scenarios, which visually illustrates the average increase in available supplies for decreed uses throughout the year.

Comparatively, Figure 5 shows the annual maximum EOM contents between 1975 and 2009 for each of the four modeled scenarios. The increase in the estimated water supply varies greatly year-by-year; which is a function of the variability in southwestern Colorado hydrology, especially within the La Plata River basin. However, increases in the maximum EOM contents for each modeled scenario occur throughout the modeled period of record and do not appear to be limited to a single wetter hydrologic period or cycle. The increase in the average May EOM contents between each modeled scenario generally characterizes the aggregate modeled increase in average annual deliveries to the project stakeholders.

SGM relied upon historical land-based survey information provided by RR&DC and supplemented that data with a new land-based survey to account for the projects completed to widen the spillway and regrade the dam crest. Based upon the available survey data, SGM staff refined the StateMod alternate enlargement sizes based upon incremental dam crest raises. For the engineering analyses, SGM completed preliminary engineering analyses for reservoir enlargements of 500 AF, 900 AF, and 1,190 AF.

3.2.2 2020 La Plata River Basin Modeling

In 2020, SGM developed a monthly Microsoft Excel-based operations model (Operations Model) to approximate all stakeholders' desired operations given historical reservoir inflows. SGM used the La Plata River StateMod output of the physically and legally available inflows for Redmesa and BKT reservoirs to simulate intra-reservoir paper exchanges between Redmesa Reservoir and BKT Reservoir along with evaporation, and separate stakeholders demands. Based on discussions with potential stakeholders both the Colorado Division of Water Resources (CDWR) and Colorado Parks and Wildlife (CPW) expressed interest in the Redmesa Reservoir Enlargement Project. Both CDWR and CPW are ultimately interested in additional supplies in BKT Reservoir for La Plata River Compact Administration and to support native fisheries, respectively. The RR&DC is also interested in additional capacity in the enlarged reservoir to offset historical sedimentation and lost capacity (60 AF), as well as to increase the amount of water available each year for augmentation purposes (30 AF).

Currently, the CDWR is entitled to the first 300 AF that are stored in BKT Reservoir beginning in the non-Compact period (December 1st through February 15th). In discussions with the Division 7 Engineer, he indicated that the CDWR would be interested in as much as 600 AF of capacity within Redmesa Reservoir that could be paper exchanged each year to BKT Reservoir for subsequent release to Long Hollow during the Compact period for La Plata River Compact compliance. In order to model a variable demand each year, SGM analyzed historical streamflow in the La Plata River to calculate a monthly Compact demand, which averaged 1,200 AF over the 1975 through 2009 period of record. Since the construction and operation of BKT Reservoir, the operations of the La Plata River have improved with the availability of Compact and irrigation exchange supplies below the historical dry-up reach of the La Plata River, near Breen, CO. This effectively allows upstream agricultural diversion to continue by releasing an equivalent exchange amount from BKT Reservoir to meet Compact demands and keep the La Plata River flowing at Colorado-New Mexico Stateline. The CDWR's Compact account can be used in conjunction with BKT Reservoir exchange releases, or separately to bolster La Plata River streamflows for Compact compliance. Therefore, SGM estimated the increased efficiency of streamflow management based on current operations and reduced the historical Compact Demand accordingly. For Operations Model, CDWR's participation in the enlarged Redmesa Reservoir was set to 600 AF.

Currently, the BKT Reservoir operations allow for native fish flow releases during the non-Compact period. In discussions with CPW staff, they would like to bolster winter releases from BKT Reservoir to maintain a minimum of 4.0 cfs within the La Plata River below its confluence with Long Hollow. In order to model the variable demand each year, SGM analyzed the historical streamflow in the La Plata River below its confluence with Long Hollow. Conveniently, the available streamflow data after the construction and operation of BKT Reservoir contained representative hydrology of a dry year (2018), a wet year (2017), and an average year (2016). SGM used the streamflow records and desired minimum streamflow of 4.0 cfs to estimate the non-Compact demand for native fisheries following a dry, average, and wet year, as shown in Table 11. For the available period of record, the average native fisheries demand during the non-Compact period is approximately 138 AF/yr. After discussions with CPW staff their portion of the enlarged Redmesa Reservoir was set to 500 AF for the Operations Model.

As discussed in Section 2.2.5, the individual Reservoir Ditches are BKT Reservoir project participants that use their pro-rata allotment (currently 20%) of the supplemental irrigation supply, by exchange, to increase the water delivered to crops. The average annual yield of the BKT Reservoir project is 3,066 AF, of which a 20% share represents an average annual exchange potential of approximately 613 AF for the Reservoir Ditches in BKT Reservoir. To the extent a comparable volume of water is physically available in an enlarged Redmesa Reservoir account for CDWR and/or CPW uses those allocations can be changed between reservoirs, bringing the Reservoir Ditches BKT supply up to Redmesa Reservoir and the CDWR and CPW Redmesa Reservoir supplies down to BKT Reservoir. The purpose of the Operations Model is to simulate this operation and the resulting Redmesa Reservoir storage levels for potential recreational uses, such as non-motorized boating and waterfowl hunting.

Tables 12, 13, 14, and 15 show the annual demand, demand met (AF), and demand met (%) for the Reservoir Ditches, CDWR, CPW, and Augmentation accounts, respectively, under current conditions. Note that the Reservoir Ditches' existing yields and the CDWR releases of its BKT Reservoir pool are included in the current conditions. Tables 16 through 19 show the same values under an enlarged reservoir scenario of 1,190 AF. In summary, by comparing the differences between the two sets of tables, SGM estimates an enlargement of 1,190 AF, will result in the following yields:

- CDWR (600 AF):
  - Average annual increase in yield of 93 AF.
  - Maximum annual increase in yield of 420 AF.
- CPW (500 AF):
  - Average annual increase in yield of 65 AF.
  - Maximum annual increase in yield of 319 AF.
- Reservoir Ditches (60 AF):
  - Average annual increase in yield of 23 AF.
  - Maximum annual increase in yield of 47 AF.
- Augmentation Pool (30 AF):
  - Average annual increase in yield of 7 AF.
  - Maximum annual increase in yield of 17 AF.

Figure 6 shows the Operations Model end-of-month contents compared to the StateMod end-of-month contents for Redmesa Reservoir. Individual stakeholder end-of-month volumes are shown on Figure 7. As illustrated by these figures, the proposed operations for the enlarged Redmesa Reservoir are projected to have carryover water remaining in Redmesa Reservoir in 26 out of 35 years (74%). The proposed operations will result in more consistent water storage throughout the year, which would bolster the opportunities for recreational activities.

Historically, the RR&DC has limited its diversions to storage in Redmesa Reservoir during the winter to minimize icing on the existing tower structure and outlet works. Once the reservoir is enlarged and the outlet works are replaced and improved, the RR&DC anticipates that diversions to storage may increase over the historical diversions to accommodate the physically and legally available inflows. It is possible the actual annual project yield of each scenario will be larger than quantified by the StateMod model.

3.2.3 Alternate No. 1: Zero Enlargement – Cursory Planning Level Engineering

In 2019, SGM received HEC-HMS, HEC-RAS modeling and RCEM preliminary analysis from Colorado Dam Safety (CDS) that investigated the new (pending 2020 meteorology) inflow design flood (IDF) impacts on the existing embankment. SGM reviewed the modeling data for validity and associated impacts and found the RCEM findings to be beneficial to RR&DC. The CDS work allowed a higher frequency design storm to be used for the spillway sizing with the proviso that an early warning system coordination with local and federal agencies was in-place. Note, without the reduction in IDF peak flow, a rehabilitated spillway would have had to provide capacity for a 40,000 cubic foot per second (cfs) peak flow. The reduced IDF flow of 14,000-cfs allowing a considerable reduction in the spillway capacity and associated costs the outweighed the early warning system costs.

Direction from RR&DC focused on providing a preliminary design for a spillway to handle the reduced IDF peak flow. SGM developed a straight crest spillway section and hydraulically appropriate approach and exit channel configuration for a zero-enlargement reservoir. The spillway created using the 5-foot of available headwater was 360-foot long. A schematic plans and related cost estimate were produced for this alternative.

As part of this work SGM contacted state, and county Department of Homeland Security (DHS) staffs about early warning system configuration and support with favorable responses from both agencies. SGM was directed to the National Weather Service (NWS) office in Grand

Junction to assess if Redmesa could tie into NWS GOES early warning system. NWS reviewed the request and provided an affirmative answer. Thus, providing the early warning system organizational framework needed to utilize the lower IDF value for the spillway sizing. CDS was contacted about NWS and DHS agreements to participate in an early warning system.

The excavation volume for the straight spillway crest and related channel is significant and costly; hence, SGM looked into an alternate spillway configuration known as a labyrinth weir spillway crest. SGM developed a spreadsheet for analyzing this spillway configuration with assistance from the Utah Water Research Center and modelled this alternative spillway configuration. The spillway plan was developed along with an associated cost estimate. This alternative while yielding considerably less earthwork had an overall higher cost due primarily to the cost of concrete.

In January 2020, CDS formally adopted the new Rules and Regulation for Dam Safety and Construction. As part of the formal adoption further research into the new tools for rainfall analysis identified that the rainfall for the controlling storm scenario for Red Mesa switched from a 6-hour duration storm to the 2-hour duration storm, suggesting a slightly lower IDF peak flow. Although the IDF peak flow was slightly lower for the controlling storm the allowance for future weather pattern change wasn’t used to determine the peak runoff and subsequent flow rates for the IDF. SGM updated the meteorology model (HEC-HMS) to reflect the 2020 adopted regulatory requirements. The outcome of the modeling identified that the peak flow of the IDF went up slightly to 14,400-cfs.

Communication with CDS in the early 2020 identified that that there was more free board available for the current conditions of the reservoir due to the recent reconstruction of the spillway. RR&DC authorized a verification survey which SGM performed. The findings of the survey identified that 8-feet of total headwater was available, which had an applicable effect on spillway sizing.

SGM analyzed a new straight spillway with the updated headwater information from the survey and IDF peak flow. The spillway was reduced to 195-feet, which is a substantial reduction from 360-feet. A schematic plan and profile of this spillway was prepared along with a cost estimate.

3.2.4 Alternative No. 2: Zero Enlargement – Cursory Planning Level Engineering

CDS identified that they were open to add a concrete crest on the existing dam embankment which would allow the use of additional headwater depth in the analysis of the spillway. SGM modeled a 1-foot concrete crest addition. The additional 1-foot of headwater reduced the spillway to 150-feet in length; however, the cost for the concrete crest added $100,000.00 to the construction costs making this option less attractive.

3.2.5 Alternative No. 3: 500 AF Enlargement – Cursory Planning Level Engineering

The establishment of the construction costs (i.e., Alternatives No. 1 and 2) to bring Redmesa into conformance with CDS regulations provided the baseline to compare enlargement options and develop a cost per acre-foot for each enlargement option. Three enlargement options were analyzed to develop a storage to cost curve. The first enlargement was for 500 AF. The embankment was raised to allow this increase in storage and to address CDS regulations on free board height needed during and IDF vent. The new embankment crest was raised to 11.75 feet from existing allowing 11-feet of headwater for the spillway analysis. The resulting trapezoidal spillway bottom width for this option is 135-feet wide.

3.2.6 Alternative No. 4: 900 AF Enlargement – Cursory Planning Level Engineering

The second enlargement alternative was for 900 AF. The embankment was raised to allow this increase in storage and to address CDS regulations on free board height needed during and IDF event. The new embankment crest was raised to 16.75 feet from existing allowing 11-feet of headwater for the spillway analysis. The resulting trapezoidal spillway bottom width for this option is 80-feet wide. The reduction in spillway width is attributable to the increase storage within the reservoir above the spillway which provides enhanced IDF peak attenuation.

3.2.7 Alternative No. 5: 1,190 AF Enlargement – Cursory Planning Level Engineering

The last enlargement alternative was for 1,190 AF. The embankment was raised to allow this increase in storage and to address CDS regulations on free board height needed during and IDF event. The new embankment crest was raised to 19.5 feet allowing 11-feet of headwater for the spillway analysis. The resulting trapezoidal spillway bottom width for this option is 70-feet wide. The reduction in spillway width is attributable to the increase storage within the reservoir above the spillway.

Alternatives 3, 4, and 5 require the use of a concrete gravity wall parallel to the spillway to terminate the embankment crest at the spillway channel. Schematic level plans for Alternatives Nos. 1 through 5 are provided in Appendix C.

The United States Bureau of Reclamation provides guidance on the determination of fatality risks associated with dams in the document, Reclamation Consequences Estimating Methodology (RCEM) dated 2015. As noted in the 2019 work, CDS provided a preliminary RCEM for the existing dam given the rationale that a higher frequency IDF can be used for the spillway capacity determination. SGM in exploring the three enlargements in 2020, conducted an update of the RCEM for the 1,190-acre foot enlargement. The CDS HEC-RAS model was reconfigured to represent the enlargement. This included updating the geometry files and associated dam breach parameters, as well as introducing the 2-hour duration IDF into the reservoir body.

SGM then reviewed all risk sites used by CDS and looked for others that might be in the way of the overtopping embankment failures flood wave. No new at-risk sites were identified. The revised RCEM identified that the fatality risk remained below one for the upper limit of the suggested range, thus CDS determination will work for the largest of the enlargements. This conclusion can be applied to the remaining two enlargements investigated.

3.2.8 2020 Project Cost Estimates

As a part of the 2020 FFS, SGM reviewed the 2016 AECOM estimated construction costs for the repair without enlargement and 550 AF enlargement alternatives. SGM staff were a part of the BKT Reservoir construction project management team, and compared various project components, unit costs, quantities, and volumes associated with the final construction costs of the BKT Reservoir to those listed in the 2016 AECOM report. While the BKT Reservoir was constructed in 2014 and has an active capacity of approximately 5,309 AF, the proximity of BKT Reservoir to Redmesa Reservoir as well as the underlying geology at both reservoir sites, provides an excellent cost-basis and quantity-basis to complete a comparative analysis. Where applicable, SGM updated unit costs based upon regional West Slope price indexes.

Based upon our experience, BKT Reservoir project costs, and updated 2020-unit costs, SGM estimated the 2020 total project costs for each scenario will increase as compared to the 2016 AECOM estimated construction costs. The primary reasons for the increase in project costs were due to:

- Increases in the foundation preparation and right abutment grouting costs, to be more consistent with the construction costs experienced at BKT Reservoir.
- Increases in the unit costs for the shell and core materials.
- SGM also added a 6-inch layer of aggregate base course materials along the dam crest, based upon the construction of the BKT Reservoir.

In order to expedite the necessary engineering work to comply with the CDS's storage restriction order on Redmesa Reservoir, the RR&DC has elected to separate the engineering and permitting costs associated with an enlargement of Redmesa Reservoir (Phase 1). Currently, the RR&DC must submit final plans and specifications to CDS by March 1, 2021 to avoid a zero restriction order. SGM has prepared a cost estimate for the necessary engineering and permitting work in Phase 1 to comply with the CDS storage restriction order, as shown in Table 20. The Phase 1 work includes schematic design, spillway hazard classification, survey, geotechnical investigations, final design, Section 404 permitting, and NEPA compliance activities.

For the Phase 1 work, the RR&DC has secured $75,000 of emergency grant funding from Southwestern Water Conservation District and is seeking a combined grant application of $275,000 from the Southwest Basin Roundtable and State Water Supply Reserve Fund (WRSF) accounts. Presently, the RR&DC plans to use available funding, share assessments, and CWCB loans to finance the remaining portion of the Phase 1 work (approximately $232,400).

For the actual construction cost estimates (Phase 2) SGM estimated the 2020 total costs using updated unit-cost from the 2016 AECOM study along with additional design considerations from our preliminary engineering analyses. The increased unit costs result in and increased estimated construction costs, which increase the contingency cost, as it is based on a percentage of the direct construction costs. Tables 21 through 25 show the detailed cost estimates for Alternative Nos. 1 through 5, respectively. In summary, the estimated 2020 construction costs are:

- Alternative No. 1 (total capacity of 1,176 AF): $2,764,500 ($2,351 per AF)
- Alternative No. 2 (total capacity of 1,176 AF): $2,896,500 ($2,463 per AF)
- Alternative No. 3 (total capacity of 1,676 AF): $6,452,400 ($3,850 per AF)
- Alternative No. 4 (total capacity of 2,076 AF): $7,699,500 ($3,709 per AF)
- Alternative No. 5 (total capacity of 2,366 AF): $8,542,400 ($3,610 per AF)

As shown, the lease expensive project is Alternative No. 1. This also has the lowest unit cost per AF of total storage capacity. However, Alternative No. 1 would not result in any new storage capacity in Redmesa Reservoir, which would preclude the RR&DC from key funding mechanisms, such as the Colorado Water Plan Grant. Alternative No. 1 would also preclude additional stakeholders from participating in the project and would limit the regional and state-wide values of a project solely benefiting the Reservoir Ditches.

For the Redmesa Reservoir enlargement alternatives, Alternative No. 5 is the most expensive, but has the lowest unit cost per AF of total storage capacity. This would maximize the opportunities for other stakeholders and would increase the regional and state-wide benefits, while optimizing the modeled available yields.

3.3 Selected Alternative

Based upon the completed analyses, the RR&DC and stakeholders have selected to pursue the 1,190 AF enlargement alternative. The selection is primarily based on the modeled optimization of the water rights yield and the increase in the average annual water supply and the modeled average annual increase in yield for all stakeholders.

SGM recommends the RR&DC complete the design of the 1,190 AF enlargement alternative in the near future to fully refine the dam configuration and size, including the normal WSEL for the selected alternative, project quantities, and spillway dimensions. Ultimately, the design of the selected alternative will refine and further constrain the construction cost estimate for the alternative. SGM believes its cursory planning level cost estimate is conservative and may be reduced after additional design work is completed.

For the Redmesa Reservoir enlargement project to be economically viable, it is critical that the RR&DC and stakeholders commit to participation in the project, including equitably sharing project costs amount project participants. The estimated total costs associated with the 1,170 AF enlargement alternative are significantly more than the no enlargement alternative but is the least expensive enlargement alternative on a unit cost-basis.

3.3.1 Summary of Project Stakeholders

At this point in time, the three primary stakeholders for the selected alternative are the RR&DC, CDWR, and CPW. The RR&DC will own, operate, and maintain the enlarged Redmesa Reservoir on behalf of its shareholders. The RR&DC will also need the support and commitment for future operations of BKT Reservoir with the LPWCD Board and its shareholders. RR&DC will need to have an agreement with LPWCD in allow additional CDWR and new CPW supplies in BKT Reservoir; however, no additional capacity will be needed, as the infill of CDWR and CPW capacity in BKT Reservoir will be equal to the Reservoir Ditches exchange allocation each year. For this report, the summary of future operations highlights the anticipated operations possible between RR&DC and the LPWCD.

The La Plata River is carefully administered and operated by the CDWR staff to meet the requirements and Colorado’s obligations specified within the 1922 La Plata River Compact. Therefore, the future operations of the enlarged Redmesa Reservoir with BKT Reservoir will be directly monitored and administered by CDWR staff.

3.3.2 Summary of Future Operations

For each water year, the initial fill (up to 1,176 AF) will be allocated to RR&DC for the distribution to, and beneficial use by, its shareholders. Fills, and refills, above 1,176 AF, up to the total enlarged reservoir volume of 2,366 AF, will be allocated to CDWR, CPW, and the Reservoir Ditches on a pro-rata basis of their enlargement ownership. Historically, Redmesa

Reservoir has had very little year-to-year carryover storage. The primary reason for the lack of carryover is the irrigation demands greatly exceed the irrigation supply. Secondly, the RR&DC has experienced icing conditions during the winter that can damage the existing outlet control tower. Once the Redmesa Reservoir enlargement is completed and future operations of CDWR and CPW's storage accounts occur, an opportunity for carryover storage will likely occur as described in Section 3.2.1.

The net reservoir evaporation will be assessed to the project stakeholders on a pro-rata basis given the stored supplies within each stakeholder's pool. The RR&DC and CDWR/CPW accounts will operate in concert with each other, to the extent that equivalent supplies are available in both Redmesa and BKT Reservoirs. Additional CDWR and CPW supplies above the Reservoir Ditches allocation in BKT Reservoir will remain in Redmesa Reservoir for use in subsequent years. Additional Reservoir Ditches supply above the CDWR and CPW supply available in BKT Reservoir cannot be paper exchanged to the Reservoir Ditches but could be physically released from BKT Reservoir for subsequent exchange on the La Plata River as currently done.

The LPWCD owns, operates, and maintains the BKT Reservoir, which has a maximum operational capacity of 5,309 AF. If full, the BKT Reservoir would provide approximately 5,000 AF of exchange supply to BKT Reservoir shareholders for supplemental irrigation water. The anticipated long-term average annual yield from BKT Reservoir is approximately 3,066 AF. Currently, the combined RR&DC ditches participation in the BKT Reservoir project represents approximately 20% of the annual yield to project shareholder. Given the RR&DC participation in BKT Reservoir the preferred annual operation for the enlarged Redmesa Reservoir in most years will be to complete a paper exchange of supplies in both reservoirs, for the benefit of all RR&DC ditches in Redmesa Reservoir and CDWR and CPW in BKT Reservoir.

For example, if the total BKT Reservoir District Pool volume was set at 2,000 AF in a given year, approximately 400 AF of exchange supply would be available to the RR&DC ditches. If, in that same year, the CDWR and CPW pools in the enlarged Redmesa Reservoir was collectively 600 AF, 400 AF of that could be paper exchanged between the two reservoirs, leaving 200 AF CDWR and CPW supplies in Redmesa Reservoir.

Under the described scenario, CDWR use of supplies from BKT reservoir would be used in the late irrigation season for Compact compliance purposes; any remaining CDWR supply in BKT could be booked over to CPW's BKT volume for subsequent fish releases in the non-Compact season and a comparable amount swapped from CPW's account in Redmesa Reservoir to CDWR's Redmesa Account. Overall, the proposed operations would allow for ample flexibility for stakeholders to put their Redmesa Reservoir supplies to beneficial uses at their desired locations and times of the year.

By completing a reservoir paper exchange, the Reservoir Ditches' BKT Reservoir supplemental irrigation supply would not be subject to the periods with sufficient exchange potential on the La Plata River or Hay Gulch. A paper exchange would not require a release of CDWR and CPW supplies from Redmesa Reservoir, effectively eliminating CDWR assessed transit/stream losses from Hay Gulch down to Long Hollow on their supplies from an enlarged Redmesa Reservoir. Similarly, a paper exchange of CDWR and CPW supplies into BKT Reservoir would eliminate the constraints of physical exchanges, including sufficient streamflow in the La Plata River, inflows into BKT Reservoir, and exchange potential on Long Hollow.

In addition to the preferred operation, the following alternative operations could be completed at various times throughout the year to more effectively convey irrigation supplies during the La Plata River's greatly varying seasonal and annual hydrologic conditions.

In summary, the enlarged Redmesa Reservoir will be able to work in tandem with the BKT Reservoir to the mutual benefit of the Compact, native fisheries, and irrigators. This includes increasing the supply available to CDWR for Compact compliance and to CPW for native fisheries in the La Plata River below Long Hollow. Both the CDWR and CPW supplies released from BKT Reservoir will bolster the riparian corridor in the La Plata River and will provide additional streamflow in the La Plata River during dry years and seasonally low-flow conditions. In addition, RR&DC intends to provide more augmentation water to water users within the La Plata River Basin, including domestic, commercial, industrial, and municipal uses.

3.3.3 Summary of Regional Benefits

As illustrated in Section 2.3.2., the primary benefits of the enlarged Redmesa Reservoir Project is to maintain the historical irrigation supply available to all RR&DC ditches, assist the CDWR in Compact compliance, and to support native fisheries. In addition, the enlarged Redmesa Reservoir Project will directly result in the following regional benefits.

- Increased storage capacity in Redmesa Reservoir will allow stakeholders to increase the storage of available supply on the La Plata River during favorable hydrologic conditions (wet year) for use in subsequent dry years, increasing agricultural, Compact, fisheries, and augmentation supplies during time of drought, as observed in 2018.
- The Project will provide additional capacity for the RR&DC and CDWR staff to better manage diversions to during periods with large fluctuations in diurnal flow.
- The ability to complete intra-reservoir paper exchanges will eliminate CDWR's administrative transit/stream losses down Hay Gulch to the La Plata River for exchange up Long Hollow into BKT Reservoir, and further increase the supply available to stakeholders.
- All increases in irrigation supply will result in additional ditch and reservoir seepage as well as irrigation return flows, all of which would recharge the Redmesa Aquifer. The aquifer recharge will ultimately accrue to the La Plata River, Government Draw and Long Hollow and will generally increase flows in the lower portion of the basin.
- Increased return flows in the lower portion of the basin will benefit irrigators, provide operational flexibility for water managers and CDWR staff, help to meet Compact deliveries, and will provide supplemental flows benefiting the environmental communities within the river and the adjacent riparian habitat.
- During the winter, BKT Reservoir's bypass requirements could preferentially be made from Redmesa Reservoir. In doing so, the addition of supplemental flow for threatened and endangered fish species in the La Plata River below the confluence with Long Hollow would be bolstered upstream all the way to its confluence with Hay Gulch.
- The RR&DC anticipates providing access to Redmesa Reservoir for recreational uses including non-motorized boating and seasonal waterfowl hunting.

    - CPW does not envision allowing fishing in Redmesa Reservoir, as non-native fish compete with native fish, which are a focal point of this project.

3.3.4 Summary of Statewide Benefits

Based on the recent operations of BKT Reservoir since it was completed in 2014, the availability of stored supplies for exchange within the lower portion of the La Plata River basin has increased the operational flexibility of the La Plata River. This flexibility has directly benefitted irrigation users throughout the basin, as well as CDWR staff in managing their Compact requirements for daily flow delivery at the Colorado-New Mexico Stateline. Based on the operational success of BKT Reservoir, the following statewide benefits will occur as a result from the enlarged Redmesa Reservoir Project.

- The Project will further develop Colorado’s usage of its La Plata River entitlement under the 1922 La Plata River Compact.
- The Project will result in fewer days of Compact over-deliveries from Colorado as Colorado better manages its portion of the highly variable La Plata River entitlement.
- The Project will result in fewer days of Compact under-deliveries to New Mexico. The reduction in under-deliveries to New Mexico reduces the potential of future litigation between the states.
- The Project will provide additional irrigation water that is delivered on a timelier basis to New Mexico irrigators.

4.0 Redmesa Reservoir Enlargement Impacts

4.1 Impacts—Wetlands and Aquatic Resources

The area around the reservoir is primarily pinon-juniper; irrigated pastureland occurs upstream of the reservoir. Emergent and scrub-shrub wetlands occur at the base of the embankment for the reservoir. Relatively narrow bands of emergent wetlands also occur along the Hay Gulch channel upstream of the reservoir.

In addition, some wetland plants have invaded portions of the reservoir bottom which are intermittently flooded and exposed as the reservoir fills then drains. Initial work by SGM, including consultations with the local representative with the U.S. Army Corps of Engineers (Corps), indicated the potential for a relatively large area of wetlands within the reservoir footprint, which if present, could have a significant impact on the cost of permitting the project. Therefore, additional work was completed to determine the extent that any of the area within the reservoir footprint is wetlands, as defined by Section 404 of the Clean Water Act. The results of this work are included in the wetland delineation report included as Appendix B, which was provided to the Corps for concurrence in mid-June 2018. SGM asked the Corps to complete an Approved Jurisdictional Determination (AJD) based upon the wetland delineation report, to quantify and limit future impacts solely to the delineated wetlands.

This report found that most of the bottom of the existing reservoir is unconsolidated sediment, with or without some plants, most of which are upland weeds. There is a total of 1.752 acres that technically meets the criteria for wetland under Section 404. This area is dominated by several “facultative” wetland species and upland plants, most of which are weeds and/or poisonous plants. Therefore, this 1.752-acre area is very low value “wetland” with minimal to no aquatic resource functions.

Based on mapping of wetlands below the embankment and within the reservoir footprint, along with observations of the extent of wetlands along Hay Gulch upstream of the RR, it is estimated that a total of 2.164 acres of wetlands would be impacted from a 1,170 AF expansion, as follows:

- Below embankment: 0.192 acres.
- Within reservoir footprint: 1.752 acres.
- Along hay Gulch upstream of reservoir: 0.22 acres.

It is important to note that, under Section 404, impacts to wetlands include those from the discharge of fill material into wetlands, and also from flooding of vegetated wetlands that would change the nature of the aquatic resource, such as would occur with raising the embankment, as is proposed. Therefore, flooding of the 1.752 acres of low quality wetlands would be considered an impact and require mitigation under Section 404.

It should also be noted that the extent of additional wetland impacts upstream along Hay Gulch from a larger reservoir expansion would be relatively small, since most of the wetland impacts would occur at the embankment and within the existing reservoir footprint, and the extent of wetlands along Hay Gulch upstream is relatively small.

4.2 Anticipated Environmental Permitting Requirements

4.2.1 Section 404

Based on consultations with the Corps, Hay Gulch would be considered to be a "waters of the U.S." under Section 404 since it likely has enough natural flow without ditch diversions to be considered as a "relatively permanent water" or a "tributary to a relatively permanent water", which would be the La Plata River. The Corps stated that they have considered the channel of Hay Gulch well upstream of RR to be a water of the U.S. in another permitting matter.

The fact that most of the water in the reservoir is diverted from the La Plata River and used for irrigation was discussed with the Corps. However, the Corps indicated that they would not consider the wetlands within the reservoir to be non-jurisdictional since this designation is only for wetlands that are created and sustained by the direct application of irrigation water—not wetlands that are caused by water stored in a reservoir.

Therefore, a Section 404 permit would be required for expansion of Redmesa Reservoir since fill material would be discharged into wetlands and Hay Gulch below the existing embankment; and wetlands within the reservoir footprint upstream along Hay Gulch would be inundated, thus changing their nature (and associated functions). Based on the total estimated impact of 2.164 acres, an Individual Section 404 Permit (IP) would be required. The application for the IP will have to include an alternatives analysis that demonstrates that impacts to wetlands have been avoided and minimized to the extent practicable, and that an alternative does not exist that meets the project purpose and would result in fewer impacts. A mitigation plan would also have to be prepared that fully mitigates the functions of the impacted wetlands.

4.2.2 Related Approvals

Below is a summary of related approvals that will be required during the Section 404 permitting process.

- 401 Certification: A requirement of an IP is that a project receive "401 Certification" from the Colorado Water Quality Control Division that the proposed project will not adversely affect water quality and State water quality standards. This is a separate, but parallel process that could entail an analysis of possible effects on water quality from the project.

- National Environmental Policy Act (NEPA): Compliance with NEPA is required for every Section 404 permitting action by the Corps. The extent of work required for NEPA compliance depends on the amount of wetland impact and magnitude of related impacts. Based on consultations with the Corps, compliance with NEPA would very likely be met by either preparation of an internal environmental assessment (EA) by the Corps, or worst case, by preparation of a more detailed EA by an outside contractor. It is very unlikely that the proposed enlargement of RR would trigger the need for an environmental impact statement (EIS)—which would be significantly more involved and costly.

- Threatened and Endangered Species Act: It will be necessary to make sure that the project does not adversely affect any federal or CO-state listed threatened or endangered (T&E) species. A combination of research and field work could be required to ensure compliance. Consultation for increased depletions for the San Juan River T&E fishes is also required under Section 7 of the ESA.

- Migratory Bird Treaty Act: Consultation for with the U.S. Fish and Wildlife Service will be necessary to make sure that the project does not adversely affect the nesting and breeding of any migratory birds.

- Cultural Resources: The State Historic Preservation Office (SHPO) requires that any impacts to cultural resources from a project be disclosed prior to issuance of a Section 404 permit. This means that a cultural resource study will have to be completed for the affected area, if one does not already exist. The Corps will consult with SHPO to document if there will be impacts to significant cultural resources.

4.3 Institutional Considerations

The 2016 AECOM report identified several impacts and institutional considerations that will need to be addressed by the RR&DC going forward to implement the design, permitting, and eventual construction of the preferred alternative. Those impacts and institutional considerations are still relevant for the 1,170 AF enlargement of Redmesa Reservoir. In summary key considerations include:

- Lands upstream of the dam will require a flood easement from property owners affected by the enlarged reservoir footprint.
- The reservoir enlargement will increase the depletions to the San Juan River system (including evaporation) and will result in greater consumptive uses of water from the basin. The RR&DC will need to quantify the increased depletions to the San Juan River, consult with the U.S. Fish and Wildlife Service regarding its participation in the San Juan Basin Recovery Implementation Program.
- Modifications to the dam and spillway will need to meet the SEO dam safety requirements, and the spillway will need to pass the 24-hour, 100-year storm event.
- Completion of the final design will require approval by the SEO, prior to putting the project out to bid by construction contractors.
- Coordination with the Williams Company, Inc. regarding the existing pipeline on the left abutment area will be necessary.
- Additional geotechnical activities should be completed in areas where grouting of the abutments will occur. These activities will allow for more detailed engineering and accurate cost estimates to be developed.
- The RR&DC through its Board will need to coordinate with and/or obtain approval from its shareholders to proceed with the engineering, permitting, and construction of the project; allow the RR&DC to encumber debt, develop additional company shares to incorporate additional project participants, and develop operational plans.
- The RR&DC will need to coordinate with the CDWR on the continued and new operations at an enlarged Redmesa Reservoir.
- The RR&DC will likely need to coordinate with Colorado Parks and Wildlife (CPW) regard T&E fish species in the La Plata River and cooperative ways to manage and operate the enlarged reservoir.
- Since most of the project occurs on private lands, local and state permitting will be relatively streamlined; however, consultation with La Plata County and various State agencies will be required for items such as: floodplain development permit, construction dewatering permit, and a fugitive dust permit.

4.4 Estimated Costs for Environmental Permitting

The primary costs for environmental permitting of the reservoir enlargement are associated with obtaining the required Section 404 permit and related requirements, as described in Section 4.2. The Section 404 permit application will have to include a relatively detailed alternatives analysis that meets the requirements of the 404(b)(1) Guidelines and the Corps Public Interest Review Criteria. A Final Mitigation Plan will also likely be required that meets the standards of the 2008 Final Mitigation Rule. The costs for mitigation will depend on the Mitigation Ratio Checklist process that the Corps uses to determine the appropriate amount of mitigation needed to replace lost aquatic resource functions.

The following provides planning-level cost estimates for the project, assuming around 2.2 acres of wetland impact with at least 1:1 mitigation, and no significant issues with T&E species, cultural resources or other unforeseen issues that could trigger the need for an EIS and protracted permitting process:

- Section 404 Permit (including alternative analysis, mitigation plan and 401 certification): $55,000.
- Cultural Resources: $20,000.
- EA for NEPA: $25,000.
- Wildlife and miscellaneous Studies: $15,000.
- Mitigation construction (creation of 2-3 acres of replacement wetlands): $120,000 to $200,000.

4.4.1 Permitting Schedule

Based upon our experience, we anticipate the permitting portion of the Redmesa Reservoir Enlargement project can be completed over the following timeframes.

- <u>Section 404 Permit</u>: assume 9 months for preparation of application information and processing of the request by the Corps.
- Other environmental and cultural resources studies and approvals (including 401 Certification) would occur during the same timeframe.

5.0 Financial Plan

To fully fund the selected alternative to enlarge Redmesa Reservoir by 1,190 AF, the following funding proposal was developed on behalf of the RR&DC and the other Project Partners. Table 26 shows the total project costs, including the Phase 1 engineering and permitting costs along with the Phase 2 construction costs. In summary, the 2020 estimated total project cost for the 1,190 AF enlargement of Redmesa Reservoir is $9,124,800.

5.1 Financial Sources

The RR&DC intends to apply for the following financial sources to fund its portion of the project.

- A SWCD Grant of $75,000 for the final engineering portion (Phase 1) of the project.
- A combined Southwest Basin Roundtable Water Supply Reserve Fund (WSRF) and CWCB Statewide WSRF grant application of $275,000 for the final engineering and permitting portions (Phase 1) of the project.
- A CWCB Colorado Water Project Grant application of $4,000,000, given the regional and state-wide importance of this project along with multi-party project benefits.
    - RR&DC acknowledges the listed amount exceeds the annual Colorado Water Project Grant application amount of $3,000,000 and will seek to coordinate with the Southwest Basin Roundtable and CWCB Board to see if there are ways to fund the project over multiple years.
- A Department of Homeland Security Pre-Disaster Mitigation grant application of $1,000,000 for the spillway portion of the project along with critical infrastructure to minimize the current dam hazards applicable under the competitive federal grant program.
- A US Bureau of Reclamation WaterSmart grant application of $250,000 for the upgrade of the reservoirs outlet works, construction of a SCADA system, and incorporation of power and a remote telemetry system at Redmesa Reservoir.
- Contribution of US Fish and Wildlife Service grant funds of $750,000 for the construction of a compliant reservoir fish screen, and project benefits to native fish species within Hay Gulch and the La Plata River.
- A CWCB Water Project Loan application of $2,774,800 (rounded to $2,775,000), as described in Section 5.2.

The specific loans and grants amounts described are not guaranteed and may change based on the amounts available and awarded. As such, the total anticipated RR&DC financial contribution for the Redmesa Reservoir Enlargement Project is estimated to be $2,775,000 but may change. We also acknowledge that as the final design for the Reservoir Enlargement Project is completed additional information will be gathered, and the design will be advanced for construction purposes. This process will better quantify the actual construction cost and will decrease the planned construction contingency (currently set at 30%).

5.2 Loan Amount

The RR&DC intends to apply for a $2,775,000, 30-year term, loan from the Colorado Water Conservation Board's Water Project Loan Program in May 2020. The current 30-year agricultural interest rate is 1.35 percent; however, the existing CDWR Storage Restriction placed on Redmesa Reservoir allows for an interest rate reduction of 0.5 percent, equating to a fixed 30-year interest rate of 0.85 percent. The resulting annual payment amount for the described loan would equate to $105,184.90, resulting in a total interest amount of $380,547.03 paid over the life of the loan.

5.3 Revenue and Expenditure Projections

SGM will update and provide a detailed schedule of estimated annual revenues and annual expenditures by year for the entire period of debt retirement with CWCB, once all the Project Participants and funding sources are fully vetted and obtained**.**

5.4 Repayment Sources

The RR&DC will repay its annual CWCB loan payment through an increase in RR&DC annual share assessment fees. The current RR&DC shares will become A-class shares and will increase their annual assessment by $16.70. As previously stated, the current RR&DC annual share assessment is $20.50 per share. The RR&DC does not believe its shareholders can afford more than an incremental increase of $16.70 per share, raising the annual share assessment to a total of $37.20 per share. For the existing 1,138 outstanding A-class shares an annual increase of $16.70 per share would generate a maximum annual loan repayment amount of $19,004.60

The RR&DC will create new B-class shares with the enlargement of the reservoir. Each AF of capacity within the enlarged Redmesa Reservoir will be equal to 1 B-class share. The RR&DC anticipates assessing each B-class share an initial annual assessment of $24.25 per share, and a secondary assessment of $18.00 each year water is stored and used within the enlargement pool. Given that hydrologically, the reservoir would completely fill approximately 12 out of 35 years (34-percent of the time), an average annual use amount would be $6.17 per year. On average the B-class shares would generate $30.42 each year, equating to an annual loan repayment amount of $36,199.80

The RR&DC will prioritize the use of up to 30 AF each year for augmentation purposes at an average annual cost of $1,000 per AF. While it is not likely that the full 30 AF would be used each year, the anticipated augmentation demand for known and potential uses in the basin could average 25 AF per year, generating a loan repayment amount of $25,000.

The RR&DC is considering opening up Redmesa Reservoir for recreational purposes, including non-motorized boating and waterfowl hunting, totaling 140 acres. Additionally, RR&DC is working with adjacent landowners and other landowners in the area to open up approximately 1,000 acres of land that could be enrolled through CPW's Walk-in Access Program. Preliminary discussions have occurred, and RR&DC acknowledges that it will take time to vet key parcels that could be used for upland bird, waterfowl, turkey, small game, and big game hunting access. The enrollment process is competitive and requires the appropriation of designed CPW funds for the program through the Colorado legislature. Properties with conservation easements, ideal habitat, and larger tracks of land are more likely to be enrolled in the Walk-in Access Program. Exact repayment amounts are not known at this time, but for planning purposes a placeholder an annual lease amount of $25 per acre each year was used to estimate an annual loan repayment amount of $25,000.

The estimated loan repayment sources total $105,204.40 per year and are excess of the current income generated by the existing shares. Any additional funds collected by the RR&DC will be used to cover current expensed and future operations and maintenance costs.

5.5 Financial Condition of the Borrower and Financial Impacts

The RR&DC does not have any outstanding debt and has remained solvent since its incorporation in 1923. For 95 years, the RR&DC has collected annual assessments and maintained its physical assets and water rights for the benefit of its shareholders. The RR&DC believes its shareholders will financially be able to afford an increase in annual assessments by $30 to a total annual assessment cost of $50 per year.

5.5.1 Annual Financial Statements

The RR&DC's annual financial statements between 2016 and 2018 are attached as Appendix A. Conclusions and Recommendations

6.0 Conclusions and Recommendations

6.1 Conclusions

The following conclusions have been determined through the work completed in the Redmesa Reservoir FFS.

- The historical long-term average annual delivery of Redmesa Reservoir supply to the Reservoir Ditches is 875 AF.
- The modeled hydrology shows an enlargement of Redmesa Reservoir by 1,170 AF (total storage of 2,346 AF) would fill 12 of 35 years, or 34 percent of the time.
- The RR&DC does not believe breaching the existing Redmesa Reservoir dam is a viable alternative for their shareholders, the environment, or other water users within the La Plata River basin.
- An enlargement of 1,190 AF, will result in the following yields:
    - CDWR (600 AF):
        - Average annual increase in yield of 93 AF.
        - Maximum annual increase in yield of 420 AF.
    - CPW (500 AF):
        - Average annual increase in yield of 65 AF.
        - Maximum annual increase in yield of 319 AF.
    - Reservoir Ditches (60 AF):
        - Average annual increase in yield of 23 AF.
        - Maximum annual increase in yield of 47 AF.
    - Augmentation Pool (30 AF):
        - Average annual increase in yield of 7 AF.
        - Maximum annual increase in yield of 17 AF.

- The estimated Redmesa Reservoir Enlargement of 1,190 AF (total capacity of 2,366 AF) has an estimated 2020 construction cost of $8,542,400 ($3,610 per AF).
- The RR&DC and project stakeholders have selected the 1,190 AF enlargement of Redmesa Reservoir as their preferred alternative to pursue.
- For the selected alternative, the Project participants include: RR&DC, CDWR, and CPW.
- Future operations will provide multiple regional and state-wide benefits.
- The total impact to wetlands by the selected alternative is estimated to be less than 2.2 acres of wetlands, as delineated by SGM during the FFS.
    - Most of the delineated wetlands are dominated by weeds and/or poisonous plants that have a very low "wetland" value and provide minimal to no aquatic resources function.
- Based on the total estimated impact of less than 2.2 acres, and Individual Section 404 Permit (IP) would be required.
- All permitting fees, including mitigation at a 1:1 ratio of disturbed wetlands, are estimated to be $300,000 in 2020.

6.2 Recommendations

SGM recommends the RR&DC and other Project Participants begin the identified process of the Financial Plan specified within Section 4 of this FFS to begin the implementation of enlarging Redmesa Reservoir. Specifically, SGM recommends the RR&DC begin Phase 1 of the project to complete the engineering necessary to extent the use of its existing reservoir and avoid the zero storage restriction by CDS. Further, Phase 1 work should begin on the permitting aspect of the project. This will allow the Project Participants to fully vet the estimated construction costs and revise the participation costs and/or grant and loan application amounts based upon the final cost estimate.

7.0 References

AECOM, Draft Report Feasiblity Study Red Mesa Reservoir La Plata County, Colorado Water Division 7, Waer District 33, Dam ID 330105, Prepared for: Red Mesa Reservoir and Ditch Company, 7882 County Road 100, Hesperus, CO 81326, July 25 2016.

Colorado Division of Water Resources, Kevin G. Rein, P.E. *Director/State Engineer*. Reservoir Storage Restriction Order. Denver, January 5. 2018. Letter.

Colorado Division of Water Resources, Mathew J. Gavin. Dam Safety Engineer. Technical Memorandum. Durango, December 19, 2017. Document.

Harris Water Engineering, Inc., Red Mesa Reservoir Enlargement Feasilbity Study, Prepared for Redmesa Ward Reservoir and Ditch Company, Southwestern Water Conservaion District, Colorado Water Conservation Board, January 1995.

Wright Water Engineers, Inc. (WWE), Red Mesa Ward Dam Enlargement Feasibility Study, April 2003.

WWE, Letter to Mr. Brice Lee, Re: Red Mesa Reservoir Enlargement Hydrology: Reservoir Inflow, August 15, 2002.

TABLES

Table 1. Redmesa Reservoir and Ditch Company Water Rights

Name	Case No.[1]	Adjudication Date	Appropriation Date	Administration No.	Priority Number	Absolute / Conditional	Uses	Decreed Volume (AF)	Decreed Amount (cfs)	Action Comment
Redmesa Reservoir	CA0807	3/21/1966	4/30/1905	23914.20208	65-1	Absolute	1,2,4,5,6,8,Q	1,176	-	Storage
	CA0807	3/21/1966	4/30/1905	23914.20208	65-1	Conditional	1,2,4,5,6,8,Q	2,898	-	Storage for enlargement; DD August 2018
	01CW0110; 09CW0066	12/31/2001	12/31/2000	55152.55152	-	Conditional	1,3,4,5,6,7,A,Q,W	3,418	-	Refill; DD February 2024
	01CW0110; 09CW0066	12/31/2001	12/31/2000	55152.55152	-	Absolute	1,3,4,5,6,7,A,Q,W	656	-	Refill
Redmesa Supply Ditch	CA0807-C	3/21/1966	4/30/1905	23914.20208	65-2	Absolute	1,2,4,5,8,Q	-	120	Source-La Plata River

Notes:
cfs = cubic feet per second
AF = acre-feet
Use Types: - 0 - storage; 1 - irrigation; 2 - municipal; 3 - commercial; 4 - industrial; 5 - recreation; 6 - fishery; 7 - fire; 8 - domestic; 9 - stock; A - augmentation; Q - other; W - wildlife.
1) The application in Case No. 01CW0110 was a joint filing between the Red Mesa Ward Reservoir and Ditch Company and the La Plata Water Conservancy District

Table 2. Historical Redmesa Reservoir Hay Gulch Diversions (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	150	808	315	340	362	946	0	0	0	0	0	0	**2,920**
1976	530	246	405	354	489	421	0	0	0	0	0	0	**2,445**
1977	485	370	194	132	206	165	0	0	0	0	0	0	**1,551**
1978	231	188	120	159	159	788	0	0	0	0	0	0	**1,645**
1979	142	276	281	180	161	703	0	0	0	0	0	0	**1,744**
1980	276	137	166	150	129	20	0	0	0	0	0	36	**914**
1981	140	305	287	378	250	76	0	0	0	15	0	25	**1,476**
1982	83	0	269	341	347	100	0	0	0	0	130	259	**1,530**
1983	73	227	178	142	0	0	0	0	0	0	0	0	**620**
1984	292	180	165	153	146	41	0	0	0	0	0	0	**978**
1985	0	29	187	188	198	456	0	0	0	0	0	0	**1,059**
1986	210	59	66	370	503	0	0	0	0	0	0	23	**1,232**
1987	92	0	101	151	179	0	0	0	0	0	0	0	**523**
1988	56	209	219	201	57	342	146	0	0	0	0	0	**1,230**
1989	0	103	218	125	139	888	0	0	0	0	0	0	**1,473**
1990	94	75	95	116	86	91	0	0	0	0	19	0	**576**
1991	76	226	117	113	126	439	0	0	0	0	0	0	**1,096**
1992	0	87	142	108	173	245	0	0	0	0	0	0	**754**
1993	21	0	62	158	46	481	371	239	2	0	0	0	**1,379**
1994	0	0	0	138	185	312	0	34	0	0	1	11	**680**
1995	80	69	109	128	688	178	0	0	0	0	0	0	**1,253**
1996	0	0	35	118	300	283	2	0	0	0	0	14	**752**
1997	54	0	465	78	89	164	353	0	0	44	82	284	**1,612**
1998	0	24	0	70	126	480	0	0	0	0	0	0	**700**
1999	79	293	94	104	118	59	0	60	0	0	374	333	**1,513**
2000	98	18	67	65	32	5	0	0	0	0	0	40	**324**
2001	0	128	77	284	361	65	0	0	0	0	0	0	**915**
2002	0	175	72	92	224	161	0	0	0	0	0	0	**723**
2003	17	81	148	145	153	252	0	0	0	0	0	110	**905**
2004	0	43	52	64	108	814	0	0	0	0	0	0	**1,081**
2005	0	69	295	390	130	0	0	0	0	0	0	0	**884**
2006	111	216	160	147	96	139	70	0	0	0	0	0	**939**
2007	632	72	86	100	175	150	0	0	0	0	0	0	**1,215**
2008	0	62	450	122	64	48	335	175	0	0	0	0	**1,255**
2009	0	45	37	50	83	8	0	92	0	0	0	0	**314**
Average	**115**	**138**	**164**	**170**	**191**	**266**	**36**	**17**	**0**	**2**	**17**	**32**	**1,149**
Total	**4,022**	**4,821**	**5,733**	**5,955**	**6,687**	**9,318**	**1,276**	**598**	**2**	**59**	**605**	**1,136**	**40,211**

Notes:

*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 3. Historical Redmesa Supply Ditch Diversions (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	0	0	0	8	73	293	0	0	0	0	0	0	**373**
1976	0	20	121	117	171	167	0	0	0	0	0	0	**596**
1977	0	0	0	0	52	66	0	0	0	0	0	0	**118**
1978	0	0	0	17	27	276	227	0	12	0	0	0	**559**
1979	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1980	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1981	0	0	0	114	86	0	0	0	0	0	0	0	**200**
1982	0	0	146	267	240	68	0	0	0	0	83	183	**987**
1983	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1984	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1985	0	0	0	0	0	133	0	0	0	0	0	0	**133**
1986	147	0	0	201	382	0	0	0	0	0	0	0	**729**
1987	81	0	0	0	0	0	0	0	0	0	0	0	**81**
1988	0	0	0	0	0	0	105	0	0	0	0	0	**105**
1989	0	60	48	0	0	803	0	0	0	0	0	0	**911**
1990	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1991	0	0	0	0	64	287	0	0	0	0	0	0	**351**
1992	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1993	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1994	0	0	0	0	0	165	0	34	0	0	0	0	**199**
1995	0	0	0	0	521	155	0	0	0	0	0	0	**676**
1996	0	0	0	0	105	112	0	0	0	0	0	0	**216**
1997	0	0	262	0	0	0	0	0	0	44	82	284	**671**
1998	0	0	0	0	0	443	0	0	0	0	0	0	**443**
1999	0	152	0	0	33	0	0	60	0	0	202	238	**685**
2000	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2001	0	0	0	149	266	52	0	0	0	0	0	0	**466**
2002	0	0	0	20	144	60	0	0	0	0	0	0	**224**
2003	0	0	0	0	0	65	0	0	0	0	0	79	**145**
2004	0	0	0	0	35	685	0	0	0	0	0	0	**720**
2005	0	12	184	173	4	0	0	0	0	0	0	0	**373**
2006	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2007	507	0	0	0	0	73	0	0	0	0	0	0	**580**
2008	0	0	276	44	0	0	291	175	0	0	0	0	**786**
2009	0	0	0	0	0	0	0	92	0	0	0	0	**92**
Average	**21**	**7**	**30**	**32**	**63**	**112**	**18**	**10**	**0**	**1**	**10**	**22**	**326**
Total	**735**	**244**	**1,038**	**1,110**	**2,201**	**3,903**	**623**	**359**	**12**	**44**	**367**	**784**	**11,420**

Notes:

*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 4. Historical Old Indian Ditch Diversions from Redmesa Reservoir (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1976	0	0	0	0	0	0	0	0	13	0	0	0	**13**
1977	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1978	0	0	0	0	0	0	0	0	11	0	0	0	**11**
1979	0	0	0	0	0	0	0	0	0	5	0	0	**5**
1980	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1981	0	0	0	0	0	0	0	0	18	0	0	0	**18**
1982	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1983	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1984	0	0	0	0	0	0	0	0	0	10	0	0	**10**
1985	0	0	0	0	0	0	0	0	0	10	0	0	**10**
1986	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1987	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1988	0	0	0	0	0	0	0	0	0	0	3	0	**3**
1989	0	0	0	0	0	0	0	2	24	6	0	0	**31**
1990	0	0	0	0	0	0	0	0	5	0	0	0	**5**
1991	0	0	0	0	0	0	0	0	10	20	0	0	**30**
1992	0	0	0	0	0	0	0	0	2	20	0	0	**22**
1993	0	0	0	0	0	0	0	0	0	15	0	0	**15**
1994	0	0	0	0	0	0	0	0	22	24	0	0	**46**
1995	0	0	0	0	0	0	0	0	0	0	8	0	**8**
1996	0	0	0	0	0	0	0	15	2	0	0	0	**17**
1997	0	0	0	0	0	0	0	0	0	14	0	0	**14**
1998	0	0	0	0	0	0	0	0	12	17	0	0	**29**
1999	0	0	0	0	0	0	0	0	0	15	0	0	**15**
2000	0	0	0	0	0	0	0	0	15	25	0	0	**40**
2001	0	0	0	0	0	0	0	0	36	0	0	0	**36**
2002	0	0	0	0	0	0	26	0	0	0	0	0	**26**
2003	0	0	0	0	0	0	0	2	15	8	0	0	**25**
2004	0	0	0	0	0	0	0	0	36	17	0	0	**52**
2005	0	0	0	0	0	0	0	0	0	50	16	0	**65**
2006	0	0	0	0	0	0	0	0	33	0	0	0	**33**
2007	0	0	0	0	0	0	0	0	35	0	0	0	**35**
2008	0	0	0	0	0	0	0	0	0	2	14	0	**17**
2009	0	0	0	0	0	0	0	0	10	18	0	0	**28**
Average	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**8**	**8**	**1**	**0**	**19**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**26**	**18**	**297**	**275**	**41**	**0**	**657**

Notes:

*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 5. Historical Joseph Freed Ditch Diversions from Redmesa Reservoir (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	0	0	0	0	0	0	0	0	0	72	345	206	**623**
1976	13	0	0	0	0	0	0	95	152	318	96	51	**725**
1977	0	0	0	0	0	0	26	216	79	76	40	192	**630**
1978	4	27	4	0	0	0	0	0	70	323	296	64	**788**
1979	6	0	0	0	0	0	0	0	0	272	203	152	**632**
1980	26	58	0	0	0	0	0	0	0	286	261	161	**792**
1981	10	0	0	0	0	0	0	142	109	167	160	8	**595**
1982	0	0	0	0	0	0	0	0	54	324	143	99	**620**
1983	0	0	0	0	0	0	0	0	0	65	344	249	**658**
1984	10	0	0	0	0	0	0	0	62	429	59	8	**568**
1985	0	46	0	0	0	0	0	0	12	326	81	9	**475**
1986	0	0	0	0	0	0	0	0	3	126	221	44	**394**
1987	0	0	0	0	0	0	0	0	0	378	145	52	**575**
1988	23	0	0	0	0	0	0	0	201	254	72	68	**618**
1989	0	0	0	0	0	0	0	310	159	60	16	0	**545**
1990	59	13	0	0	0	0	0	0	146	72	21	17	**327**
1991	0	0	0	0	0	0	0	7	156	250	62	6	**482**
1992	57	20	0	0	0	0	0	0	14	368	136	40	**634**
1993	0	0	0	0	0	0	0	0	0	284	128	20	**432**
1994	0	0	0	0	0	0	0	0	138	338	43	47	**566**
1995	0	0	0	0	0	0	0	0	0	229	281	53	**564**
1996	0	0	0	0	0	0	0	326	33	40	0	30	**430**
1997	28	0	0	0	0	0	0	0	42	349	149	42	**610**
1998	0	0	0	0	0	0	0	0	282	251	76	17	**626**
1999	3	0	0	0	0	0	1	0	28	405	48	62	**548**
2000	282	0	0	0	0	0	0	52	238	347	4	0	**923**
2001	0	0	0	0	0	0	0	0	207	248	50	35	**540**
2002	0	0	0	0	0	0	0	239	40	6	8	0	**293**
2003	0	0	0	0	0	0	0	156	362	131	31	0	**681**
2004	1	0	0	0	0	0	0	35	193	397	141	16	**783**
2005	9	0	0	0	0	0	0	0	5	430	116	69	**628**
2006	11	0	0	0	0	0	0	355	127	36	0	41	**570**
2007	0	0	0	0	0	0	0	42	292	128	41	21	**525**
2008	0	0	0	0	0	0	0	0	64	254	175	28	**521**
2009	30	0	0	0	0	0	0	31	172	229	145	51	**658**
Average	**16**	**5**	**0**	**0**	**0**	**0**	**1**	**57**	**98**	**236**	**118**	**56**	**588**
Total	**571**	**164**	**4**	**0**	**0**	**0**	**27**	**2,007**	**3,440**	**8,267**	**4,140**	**1,957**	**20,578**

Notes:

*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 6. Historical Revival Ditch Diversions from Redmesa Reservoir (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	0	0	0	0	0	0	0	0	0	1	56	0	**57**
1976	0	0	0	0	0	0	0	2	56	5	0	0	**63**
1977	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1978	0	0	0	0	0	0	0	0	0	40	5	0	**45**
1979	0	0	0	0	0	0	0	0	0	12	0	0	**12**
1980	0	0	0	0	0	0	0	0	0	44	19	3	**66**
1981	0	0	0	0	0	0	0	0	29	42	0	0	**71**
1982	0	0	0	0	0	0	0	0	10	51	0	0	**61**
1983	0	0	0	0	0	0	0	0	0	10	0	0	**10**
1984	0	0	0	0	0	0	0	0	0	68	11	0	**80**
1985	0	0	0	0	0	0	0	0	0	33	7	0	**41**
1986	0	0	0	0	0	0	0	0	0	8	85	2	**95**
1987	0	0	0	0	0	0	0	0	0	74	15	0	**88**
1988	0	0	0	0	0	0	0	0	0	49	53	30	**132**
1989	1	0	0	0	0	0	0	0	16	74	4	0	**95**
1990	0	0	0	0	0	0	0	0	20	5	0	0	**25**
1991	0	0	0	0	0	0	0	0	0	66	20	29	**116**
1992	7	0	0	0	0	0	0	0	0	36	23	0	**66**
1993	0	0	0	0	0	0	0	0	0	38	17	0	**55**
1994	0	0	0	0	0	0	0	0	28	49	0	0	**77**
1995	0	0	0	0	0	0	0	0	0	13	47	33	**93**
1996	0	0	0	0	0	0	0	7	27	0	0	0	**33**
1997	34	0	0	0	0	0	0	0	0	41	10	39	**123**
1998	0	0	0	0	0	0	0	0	1	36	16	16	**69**
1999	13	0	0	0	0	0	0	0	0	0	0	0	**13**
2000	70	0	0	0	0	0	0	0	21	76	14	0	**180**
2001	0	0	0	0	0	0	0	0	8	43	19	0	**70**
2002	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2003	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2004	0	0	0	0	0	0	0	0	0	6	0	0	**6**
2005	15	0	0	0	0	0	0	0	0	25	26	1	**67**
2006	0	0	0	0	0	0	0	24	11	27	0	22	**84**
2007	3	0	0	0	0	0	0	0	28	73	0	0	**104**
2008	0	0	0	0	0	0	0	0	0	58	12	28	**98**
2009	0	0	0	0	0	0	0	0	7	44	9	0	**60**
Average	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**7**	**33**	**13**	**6**	**64**
Total	**142**	**0**	**0**	**0**	**0**	**0**	**0**	**33**	**260**	**1,148**	**468**	**202**	**2,253**

Notes:

*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 7. Historical Warren-Vosburgh Ditch Diversions from Redmesa Reservoir (AF)

Year/ Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1975	0	0	0	0	0	0	0	0	0	29	109	0	**138**
1976	0	0	0	0	0	0	0	42	59	52	0	0	**154**
1977	0	0	0	0	0	0	0	10	7	0	0	0	**18**
1978	0	0	0	0	0	0	0	0	15	117	9	0	**141**
1979	0	0	0	0	0	0	0	0	0	82	114	3	**199**
1980	0	0	0	0	0	0	0	0	0	81	106	0	**186**
1981	0	0	0	0	0	0	0	59	64	78	0	0	**201**
1982	0	0	0	0	0	0	0	0	15	149	45	0	**209**
1983	0	0	0	0	0	0	0	0	0	16	27	52	**95**
1984	0	0	0	0	0	0	0	0	6	185	86	29	**306**
1985	0	0	0	0	0	0	0	0	13	144	55	73	**285**
1986	0	0	0	0	0	0	0	0	0	50	33	0	**83**
1987	0	0	0	0	0	0	0	0	0	133	55	54	**242**
1988	0	0	0	0	0	0	0	0	5	87	120	64	**275**
1989	25	0	0	0	0	0	32	72	69	73	21	0	**293**
1990	0	0	0	0	0	0	0	0	0	50	32	0	**82**
1991	0	0	0	0	0	0	0	3	68	132	25	0	**229**
1992	0	0	0	0	0	0	0	0	18	199	0	0	**218**
1993	0	0	0	0	0	0	0	0	0	217	52	7	**276**
1994	0	0	0	0	0	0	0	0	74	216	22	0	**312**
1995	0	0	0	0	0	0	0	0	0	94	100	50	**244**
1996	0	0	0	0	0	0	0	22	53	0	0	0	**76**
1997	10	0	0	0	0	0	0	0	0	151	24	49	**233**
1998	0	0	0	0	0	0	0	0	85	92	8	0	**185**
1999	0	0	0	0	0	0	0	0	0	61	0	0	**61**
2000	0	0	0	0	0	0	0	9	151	29	0	0	**188**
2001	0	0	0	0	0	0	0	14	161	134	0	0	**309**
2002	0	0	0	0	0	0	0	97	5	0	0	0	**101**
2003	0	0	0	0	0	0	0	27	128	20	0	0	**175**
2004	0	0	0	0	0	0	0	0	81	147	0	0	**227**
2005	0	0	0	0	0	0	0	0	0	191	56	0	**246**
2006	0	0	0	0	0	0	0	141	95	22	0	0	**258**
2007	0	0	0	0	0	0	0	14	80	143	1	0	**238**
2008	0	0	0	0	0	0	0	26	96	172	61	0	**355**
2009	0	0	0	0	0	0	0	0	57	160	86	0	**303**
Average	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**15**	**40**	**100**	**36**	**11**	**204**
Total	**34**	**0**	**0**	**0**	**0**	**0**	**33**	**537**	**1,405**	**3,505**	**1,247**	**381**	**7,142**

Notes:
*Data taken from Colorado Division of Water Resources/Diversion Records website.

Table 8. Redmesa Reservoir End of Month (EOM) Contents
Repair w/o Enlargement (1,176 AF)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg EOM Contents	Max EOM Contents
1974	-	-	-	-	-	-	-	-	-	62	105	283	**38**	**283**
1975	487	634	1,084	1,112	1,154	726	35	5	5	5	182	349	**482**	**1,154**
1976	422	537	542	539	533	-	-	-	-	-	95	95	**230**	**542**
1977	95	95	105	105	102	-	-	-	-	-	-	-	**42**	**105**
1978	-	-	-	123	146	-	-	-	-	-	9	9	**24**	**146**
1979	9	31	431	546	764	384	26	26	23	23	228	473	**247**	**764**
1980	650	814	1,176	1,176	1,176	1,072	34	34	36	36	306	523	**586**	**1,176**
1981	619	715	803	900	898	32	32	-	-	-	125	239	**364**	**900**
1982	480	709	1,076	1,141	1,176	107	31	31	31	31	220	526	**463**	**1,176**
1983	904	1,176	1,176	1,176	1,176	1,062	341	34	33	33	422	688	**685**	**1,176**
1984	881	1,094	1,176	1,174	1,175	201	22	17	17	26	23	312	**510**	**1,176**
1985	681	982	1,176	1,175	1,176	303	36	36	49	51	435	765	**572**	**1,176**
1986	1,176	1,176	1,176	1,176	1,175	214	145	36	36	1,176	1,176	1,176	**820**	**1,176**
1987	1,176	1,176	1,176	1,176	1,171	423	36	17	17	17	537	856	**648**	**1,176**
1988	1,176	1,176	1,176	1,174	1,162	39	32	-	-	-	223	441	**550**	**1,176**
1989	660	776	1,176	1,174	1,159	7	-	-	-	-	6	6	**414**	**1,176**
1990	6	12	99	102	101	-	-	-	-	-	391	396	**92**	**396**
1991	451	598	993	995	982	-	-	-	-	-	216	220	**371**	**995**
1992	272	338	674	832	1,060	154	32	-	-	-	44	44	**288**	**1,060**
1993	58	78	1,176	1,176	1,176	487	35	35	35	35	383	498	**431**	**1,176**
1994	651	855	1,148	1,175	1,176	36	-	-	-	-	2	56	**425**	**1,176**
1995	297	762	1,176	1,170	1,172	937	35	24	24	24	75	216	**493**	**1,176**
1996	350	551	808	804	793	-	-	-	-	2	83	755	**346**	**808**
1997	1,176	1,176	1,176	1,176	1,176	316	39	35	728	353	864	1,176	**783**	**1,176**
1998	1,176	1,176	1,176	1,170	1,156	31	31	12	-	26	247	336	**545**	**1,176**
1999	354	372	907	920	909	29	29	303	31	31	31	81	**333**	**920**
2000	159	208	433	430	424	26	-	-	-	-	-	292	**164**	**433**
2001	629	784	1,118	1,176	1,174	32	-	-	-	-	-	2	**410**	**1,176**
2002	18	41	41	41	41	-	-	-	-	-	-	-	**15**	**41**
2003	199	543	543	540	533	-	-	-	-	-	82	82	**210**	**543**
2004	82	82	1,060	1,174	1,166	-	-	-	-	-	147	211	**327**	**1,174**
2005	565	1,176	1,176	1,176	1,176	63	-	-	-	-	112	523	**497**	**1,176**
2006	835	991	1,063	1,075	1,061	-	-	-	-	327	413	507	**523**	**1,075**
2007	587	822	1,176	1,176	1,162	-	-	-	-	-	15	457	**450**	**1,176**
2008	692	933	1,176	1,176	1,171	24	-	-	-	-	168	183	**460**	**1,176**
2009	303	459	637	635	632	10	-	-	-	-	-	-	**223**	**637**
Avg	**508**	**640**	**867**	**889**	**900**	**187**	**27**	**18**	**30**	**63**	**205**	**355**	**390**	**921**
Max	**1,176**	**1,176**	**1,176**	**1,176**	**1,176**	**1,072**	**341**	**303**	**728**	**1,176**	**1,176**	**1,176**	**820**	**1,176**

Table 9. Redmesa Reservoir End of Month (EOM) Contents
Add 550 AF (1,726 AF)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg EOM Contents	Max EOM Contents
1974	-	-	-	-	-	-	-	-	-	62	105	283	**38**	**283**
1975	487	634	1,084	1,112	1,154	766	44	7	7	7	184	351	**486**	**1,154**
1976	424	539	544	541	535	-	-	-	-	-	95	95	**231**	**544**
1977	95	95	105	105	102	-	-	-	-	-	-	-	**42**	**105**
1978	-	-	-	123	146	1	-	-	-	-	9	9	**24**	**146**
1979	9	31	431	546	763	384	27	27	23	23	228	474	**247**	**763**
1980	652	817	1,203	1,303	1,351	1,348	51	51	53	53	323	541	**646**	**1,351**
1981	637	732	820	917	915	49	49	-	-	-	126	240	**374**	**917**
1982	481	710	1,076	1,142	1,183	109	29	29	29	29	218	525	**463**	**1,183**
1983	903	1,288	1,726	1,726	1,725	1,605	874	101	51	51	440	706	**933**	**1,726**
1984	899	1,113	1,726	1,722	1,724	353	38	33	33	42	39	328	**671**	**1,726**
1985	697	999	1,726	1,725	1,725	808	52	52	65	68	452	782	**763**	**1,726**
1986	1,213	1,726	1,726	1,726	1,725	728	279	128	126	1,588	1,726	1,726	**1,201**	**1,726**
1987	1,726	1,726	1,726	1,726	1,719	932	56	33	33	34	554	873	**928**	**1,726**
1988	1,229	1,505	1,726	1,721	1,705	161	51	-	-	-	223	442	**730**	**1,726**
1989	660	777	1,726	1,723	1,703	28	-	-	-	-	7	7	**553**	**1,726**
1990	7	12	100	103	101	-	-	-	-	-	393	398	**93**	**398**
1991	454	601	996	999	985	-	-	-	-	-	216	220	**373**	**999**
1992	272	338	674	833	1,060	161	33	-	-	-	44	44	**288**	**1,060**
1993	58	78	1,364	1,726	1,725	1,027	51	51	51	51	398	514	**591**	**1,726**
1994	667	871	1,164	1,198	1,202	48	-	-	-	-	2	56	**434**	**1,202**
1995	297	762	1,726	1,715	1,721	1,477	132	42	42	42	93	235	**690**	**1,726**
1996	369	570	827	823	812	-	-	-	-	2	83	755	**353**	**827**
1997	1,217	1,679	1,726	1,726	1,725	859	159	52	748	374	885	1,254	**1,034**	**1,726**
1998	1,418	1,562	1,726	1,715	1,696	129	49	30	-	29	250	339	**745**	**1,726**
1999	357	375	911	924	913	30	30	304	34	34	34	84	**336**	**924**
2000	162	211	437	433	427	31	-	-	-	-	-	292	**166**	**437**
2001	629	784	1,118	1,181	1,211	33	-	-	-	-	-	2	**413**	**1,211**
2002	18	41	41	41	41	-	-	-	-	-	-	-	**15**	**41**
2003	199	543	543	540	533	-	-	-	-	-	82	82	**210**	**543**
2004	82	82	1,060	1,199	1,205	-	-	-	-	-	148	212	**332**	**1,205**
2005	566	1,189	1,726	1,726	1,725	187	-	-	-	-	113	524	**646**	**1,726**
2006	837	992	1,065	1,077	1,063	-	-	-	-	328	415	509	**524**	**1,077**
2007	589	824	1,385	1,394	1,380	10	-	-	-	-	17	459	**505**	**1,394**
2008	694	936	1,726	1,726	1,720	81	-	-	-	-	169	184	**603**	**1,726**
2009	305	461	639	637	634	11	-	-	-	-	-	-	**224**	**639**
Avg	**536**	**711**	**1,064**	**1,099**	**1,113**	**315**	**56**	**26**	**36**	**78**	**224**	**376**	**470**	**1,134**
Max	**1,726**	**1,726**	**1,726**	**1,726**	**1,725**	**1,605**	**874**	**304**	**748**	**1,588**	**1,726**	**1,726**	**1,201**	**1,726**

Table 10. Redmesa Reservoir End of Month (EOM) Contents
Add 1,170 AF (2,346 AF)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg EOM Contents	Max EOM Contents
1974	-	-	-	-	-	-	-	-	-	62	105	283	**38**	**283**
1975	487	634	1,084	1,112	1,154	766	48	8	8	8	185	352	**487**	**1,154**
1976	424	540	545	541	535	-	-	-	-	-	95	95	**231**	**545**
1977	95	95	105	105	102	-	-	-	-	-	-	-	**42**	**105**
1978	-	-	-	123	146	1	-	-	-	-	9	9	**24**	**146**
1979	9	31	431	546	764	384	27	27	24	24	228	474	**247**	**764**
1980	652	817	1,204	1,304	1,351	1,348	59	59	63	63	334	553	**651**	**1,351**
1981	649	744	832	929	927	67	67	18	-	-	126	240	**383**	**929**
1982	481	710	1,077	1,143	1,184	110	29	30	30	30	219	526	**464**	**1,184**
1983	903	1,290	1,808	1,861	1,881	1,812	1,080	174	66	66	455	721	**1,010**	**1,881**
1984	914	1,128	2,346	2,341	2,344	940	55	50	50	59	57	345	**886**	**2,346**
1985	714	1,016	2,023	2,344	2,345	1,407	102	70	83	86	470	800	**955**	**2,345**
1986	1,231	1,768	2,346	2,346	2,344	1,339	457	299	268	1,730	2,346	2,346	**1,568**	**2,346**
1987	2,346	2,346	2,346	2,346	2,338	1,543	194	53	53	53	574	892	**1,257**	**2,346**
1988	1,248	1,524	2,157	2,244	2,225	438	67	5	5	5	229	448	**883**	**2,244**
1989	667	783	2,346	2,342	2,319	46	7	-	-	-	7	7	**710**	**2,346**
1990	7	12	100	103	101	2	-	-	-	-	395	400	**93**	**400**
1991	457	604	999	1,002	989	-	-	-	-	-	217	221	**374**	**1,002**
1992	273	339	675	833	1,061	169	34	-	-	-	44	44	**289**	**1,061**
1993	58	78	1,364	2,244	2,345	1,640	86	68	68	68	415	531	**747**	**2,345**
1994	684	889	1,182	1,216	1,220	66	-	-	-	-	2	56	**443**	**1,220**
1995	297	762	2,346	2,333	2,340	2,087	593	60	60	60	111	253	**942**	**2,346**
1996	387	588	845	841	830	13	-	-	-	2	84	756	**362**	**845**
1997	1,218	1,680	2,346	2,346	2,345	1,471	297	69	769	395	906	1,276	**1,260**	**2,346**
1998	1,440	1,584	2,346	2,333	2,310	375	66	48	-	33	255	343	**928**	**2,346**
1999	361	380	915	929	918	27	27	302	33	33	33	83	**337**	**929**
2000	161	211	436	432	427	31	-	-	-	-	-	292	**166**	**436**
2001	629	784	1,118	1,181	1,211	33	-	-	-	-	-	2	**413**	**1,211**
2002	18	41	41	41	41	-	-	-	-	-	-	-	**15**	**41**
2003	199	543	543	540	533	-	-	-	-	-	82	82	**210**	**543**
2004	82	82	1,060	1,199	1,205	-	-	-	-	-	148	212	**332**	**1,205**
2005	566	1,190	2,346	2,346	2,345	754	14	-	-	-	114	526	**850**	**2,346**
2006	839	995	1,068	1,080	1,066	-	-	-	-	328	416	511	**525**	**1,080**
2007	591	826	1,387	1,396	1,382	12	-	-	-	-	17	460	**506**	**1,396**
2008	695	936	2,345	2,343	2,337	353	21	-	-	-	170	185	**782**	**2,345**
2009	306	462	640	638	636	12	-	-	-	-	-	-	**225**	**640**
Avg	**558**	**734**	**1,243**	**1,306**	**1,322**	**479**	**93**	**37**	**44**	**86**	**246**	**398**	545	1,344
Max	**2,346**	**2,346**	**2,346**	**2,346**	**2,345**	**2,087**	**1,080**	**302**	**769**	**1,730**	**2,346**	**2,346**	1,568	2,346

Table 11. Summary of Potential Supplemental Native Fish Water

La Plata River Below Mouth Long Hollow Near Red Mesa, CO

Supplemental Water Needed (AF) to Maintain 4 cfs Streamflow (1)(2)						
Water Year / Month	**2016**	**2017**	**2018**	**2019**	**Average (AF)**	**Max (AF)**
December	115.3	31.1	18.0	81.1	61.4	115.3
January	26.6	5.6	13.7	161.1	51.7	161.1
February 1st-15th	7.2	1.9	10.2	78.0	24.3	78.0
Total (AF)	**149.1**	**38.7**	**41.9**	**320.2**	**137.4**	**320.2**

Notes:

(1) Period of data 12/1 - 2/15; Data from Colorado Division of Water Resources LAPLONCO gage

(2) Where data was not available, previous day's flow was used for missing values.

Irrigation Account

Table 12a. Total Irrigation Demands
Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	211.0							812.8	2,816.0	2,030.0	1,383.0	1,056.0	**8,308.8**
1976	DRY	119.0							857.5	2,533.0	1,740.0	1,034.0	1,019.0	**7,302.5**
1977	DRY	75.0							895.3	2,121.0	1,387.0	1,501.0	989.0	**6,968.3**
1978	NORMAL	122.0							835.5	3,235.0	2,239.0	1,286.0	609.0	**8,326.5**
1979	WET								851.8	3,012.0	1,465.0	1,911.0	897.0	**8,136.8**
1980	WET	86.0							898.3	3,472.0	1,670.0	1,227.0	662.0	**8,015.3**
1981	DRY	130.0							874.5	1,738.0	1,387.0	1,438.0	421.0	**5,988.5**
1982	NORMAL	168.0							836.3	2,670.0	1,629.0	986.0	782.0	**7,071.3**
1983	WET	188.0							686.8	2,222.0	1,763.0	1,365.0	918.0	**7,142.8**
1984	NORMAL	21.0							730.8	3,030.0	1,189.0	1,402.0	428.0	**6,800.8**
1985	WET	548.0							908.5	2,746.0	1,924.0	750.0	591.0	**7,467.5**
1986	WET	52.0							750.5	1,927.0	1,123.0	823.0	309.0	**4,984.5**
1987	NORMAL	34.0							888.8	2,876.0	1,200.0	1,606.0	494.0	**7,098.8**
1988	NORMAL	168.0							785.3	3,415.0	1,499.0	1,474.0	1,153.0	**8,494.3**
1989	DRY	320.0							877.5	2,798.0	1,626.0	1,659.0	735.0	**8,015.5**
1990	DRY	22.0							867.0	2,503.0	1,627.0	495.0	786.0	**6,300.0**
1991	NORMAL	15.0							788.0	2,660.0	1,905.0	1,005.0	1,022.0	**7,395.0**
1992	NORMAL	206.0							803.0	2,022.0	1,512.0	1,060.0	854.0	**6,457.0**
1993	WET	232.0							793.8	3,448.0	884.0	1,259.0	687.0	**7,303.8**
1994	NORMAL	312.0							846.5	3,319.0	1,877.0	757.0	459.0	**7,570.5**
1995	NORMAL	465.0							773.0	3,144.0	1,765.0	1,609.0	1,174.0	**8,930.0**
1996	DRY	387.0							755.5	3,024.0	2,038.0	1,240.0	156.0	**7,600.5**
1997	WET	196.0							745.5	2,304.0	1,784.0	676.0	835.0	**6,540.5**
1998	NORMAL	150.0							816.8	2,127.0	2,131.0	1,792.0	140.0	**7,156.8**
1999	NORMAL	145.0							789.8	2,357.0	866.0	1,426.0	1,256.0	**6,839.8**
2000	DRY	1,102.0							859.0	3,254.0	1,517.0	1,879.0	231.0	**8,842.0**
2001	NORMAL								880.8	3,028.0	1,143.0	1,853.0	1,004.0	**7,908.8**
2002	DRY	287.0							1,001.8	3,309.0	2,047.0	1,147.0	466.0	**8,257.8**
2003	DRY								869.5	3,652.0	1,405.0	941.0	1,130.0	**7,997.5**
2004	NORMAL	38.0							789.8	2,742.0	1,822.0	513.0	710.0	**6,614.8**
2005	WET	48.0							841.3	3,233.0	1,960.0	458.0	534.0	**7,074.3**
2006	NORMAL	132.0							809.5	2,793.0	1,579.0	1,105.0	441.0	**6,859.5**
2007	NORMAL	126.0							919.5	2,624.0	1,774.0	1,286.0	1,141.0	**7,870.5**
2008	NORMAL	165.0							848.3	3,133.0	1,362.0	1,709.0	1,198.0	**8,415.3**
2009	NORMAL	100.0							783.3	2,701.0	1,501.0	1,337.0		**6,422.3**
Min		**15.0**	-	-	-	-	-	-	**686.8**	**1,738.0**	**866.0**	**458.0**	**140.0**	**4,984.5**
Average		**199.1**							**830.6**	**2,799.7**	**1,610.6**	**1,239.8**	**743.7**	**7,385.1**
Max		**1,102.0**	-	-	-	-	-	-	**1,001.8**	**3,652.0**	**2,239.0**	**1,911.0**	**1,256.0**	**8,930.0**

Table 12b. Irrigation Deliveries: Met Irrigation Demands
Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	80.6							812.8	535.6	-	-	3.4	**1,432.3**
1976	DRY	107.1							822.9	-	-	-	-	**930.0**
1977	DRY	5.0							289.5	23.6	-	-	-	**318.1**
1978	NORMAL	-							442.8	26.2	-	-	-	**469.0**
1979	WET								851.8	486.6	8.0	-	19.4	**1,365.7**
1980	WET	86.0							898.3	871.2	11.8	23.6	57.8	**1,948.7**
1981	DRY	110.0							874.5	389.3	2.0	-	1.2	**1,377.0**
1982	NORMAL	28.0							836.3	733.0	-	-	29.0	**1,626.2**
1983	WET	101.6							686.8	1,153.9	21.4	69.4	78.8	**2,111.9**
1984	NORMAL	21.0							730.8	739.6	68.6	39.0	110.6	**1,709.5**
1985	WET	106.4							908.5	454.1	85.4	57.2	90.2	**1,701.8**
1986	WET	52.0							750.5	801.0	92.6	91.8	105.2	**1,893.1**
1987	NORMAL	34.0							888.8	797.4	78.6	94.8	118.0	**2,011.5**
1988	NORMAL	168.0							785.3	500.0	30.4	-	11.0	**1,494.7**
1989	DRY	127.6							877.5	810.2	-	12.6	26.0	**1,853.9**
1990	DRY	22.0							461.6	-	-	-	-	**483.6**
1991	NORMAL	-							788.0	397.4	-	-	3.0	**1,188.4**
1992	NORMAL	11.6							803.0	766.9	9.4	-	-	**1,590.9**
1993	WET	65.2							793.8	1,192.9	9.0	31.6	104.4	**2,196.9**
1994	NORMAL	156.4							846.5	660.8	10.0	37.4	62.0	**1,773.1**
1995	NORMAL	102.2							773.0	969.8	39.4	80.0	109.6	**2,074.0**
1996	DRY	141.0							755.5	347.0	-	-	-	**1,243.5**
1997	WET	9.0							745.5	1,076.5	-	10.8	91.8	**1,933.6**
1998	NORMAL	150.0							816.8	856.3	28.8	44.6	81.8	**1,978.3**
1999	NORMAL	86.4							789.8	386.7	27.0	297.9	81.6	**1,669.4**
2000	DRY	103.9							859.0	87.1	-	-	-	**1,050.0**
2001	NORMAL								880.8	653.4	-	-	4.2	**1,538.4**
2002	DRY	36.5							287.4	-	-	-	-	**323.9**
2003	DRY								649.1	-	-	-	46.9	**695.9**
2004	NORMAL	-							789.8	587.7	-	-	-	**1,377.4**
2005	WET	-							841.3	655.1	-	-	-	**1,496.4**
2006	NORMAL	31.4							809.5	430.9	-	-	-	**1,271.8**
2007	NORMAL	97.0							919.5	293.3	-	-	-	**1,309.8**
2008	NORMAL	14.3							848.3	530.8	-	-	-	**1,393.4**
2009	NORMAL	-							783.3	52.4	-	-		**835.7**
Min		-	-	-	-	-	-	-	**287.4**	-	-	-	-	**318.1**
Average		**64.2**							**762.8**	**521.9**	**14.9**	**25.4**	**36.3**	**1,419.1**
Max		**168.0**	-	-	-	-	-	-	**919.5**	**1,192.9**	**92.6**	**297.9**	**118.0**	**2,196.9**

Table 12c. Percent of Irrigation Demands Met
Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	38%							100%	19%	0%	0%	0%	17%
1976	DRY	90%							96%	0%	0%	0%	0%	13%
1977	DRY	7%							32%	1%	0%	0%	0%	5%
1978	NORMAL	0%							53%	1%	0%	0%	0%	6%
1979	WET								100%	16%	1%	0%	2%	17%
1980	WET	100%							100%	25%	1%	2%	9%	24%
1981	DRY	85%							100%	22%	0%	0%	0%	23%
1982	NORMAL	17%							100%	27%	0%	0%	4%	23%
1983	WET	54%							100%	52%	1%	5%	9%	30%
1984	NORMAL	100%							100%	24%	6%	3%	26%	25%
1985	WET	19%							100%	17%	4%	8%	15%	23%
1986	WET	100%							100%	42%	8%	11%	34%	38%
1987	NORMAL	100%							100%	28%	7%	6%	24%	28%
1988	NORMAL	100%							100%	15%	2%	0%	1%	18%
1989	DRY	40%							100%	29%	0%	1%	4%	23%
1990	DRY	100%							53%	0%	0%	0%	0%	8%
1991	NORMAL	0%							100%	15%	0%	0%	0%	16%
1992	NORMAL	6%							100%	38%	1%	0%	0%	25%
1993	WET	28%							100%	35%	1%	3%	15%	30%
1994	NORMAL	50%							100%	20%	1%	5%	14%	23%
1995	NORMAL	22%							100%	31%	2%	5%	9%	23%
1996	DRY	36%							100%	11%	0%	0%	0%	16%
1997	WET	5%							100%	47%	0%	2%	11%	30%
1998	NORMAL	100%							100%	40%	1%	2%	58%	28%
1999	NORMAL	60%							100%	16%	3%	21%	6%	24%
2000	DRY	9%							100%	3%	0%	0%	0%	12%
2001	NORMAL								100%	22%	0%	0%	0%	19%
2002	DRY	13%							29%	0%	0%	0%	0%	4%
2003	DRY								75%	0%	0%	0%	4%	9%
2004	NORMAL	0%							100%	21%	0%	0%	0%	21%
2005	WET	0%							100%	20%	0%	0%	0%	21%
2006	NORMAL	24%							100%	15%	0%	0%	0%	19%
2007	NORMAL	77%							100%	11%	0%	0%	0%	17%
2008	NORMAL	9%							100%	17%	0%	0%	0%	17%
2009	NORMAL	0%							100%	2%	0%	0%		13%
Min		-	-	-	-	-	-	-	**29%**	-	-	-	-	**4%**
Average		**43%**							**93%**	**19%**	**1%**	**2%**	**7%**	**20%**
Max		**100%**	-	-	-	-	-	-	**100%**	**52%**	**8%**	**21%**	**58%**	**38%**

DWR Account

Table 13a. Total Compact Demands

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	-	-	-	-	-	-	-	-	-	63.1	-	-	**63.1**
1976	DRY	-	-	-	-	-	120.5	291.0	195.8	225.8	174.0	137.7	315.9	**1,460.6**
1977	DRY	-	-	-	-	-	97.3	272.0	168.6	-	40.1	264.1	184.7	**1,026.8**
1978	NORMAL	33.9	2.2	-	-	-	-	-	385.6	130.7	335.1	190.6	134.0	**1,212.1**
1979	WET	15.2	0.6	-	-	-	-	-	-	105.2	-	113.1	7.0	**241.1**
1980	WET	-	-	-	-	-	-	-	-	548.7	169.5	-	-	**718.2**
1981	DRY	-	-	-	-	-	125.0	171.8	182.3	-	213.2	276.5	19.7	**988.5**
1982	NORMAL	-	-	-	-	-	-	-	739.6	-	-	67.0	-	**806.7**
1983	WET	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1984	NORMAL	-	-	-	-	-	-	-	213.6	202.2	64.9	-	-	**480.7**
1985	WET	-	-	-	-	-	-	-	-	28.1	-	-	-	**28.1**
1986	WET	-	-	-	-	-	-	-	329.5	-	-	-	-	**329.5**
1987	NORMAL	-	-	-	-	-	-	-	-	36.3	-	-	-	**36.3**
1988	NORMAL	-	-	-	-	-	-	171.8	-	-	89.7	57.9	-	**319.3**
1989	DRY	-	-	-	-	-	-	150.0	210.2	147.8	-	-	-	**507.9**
1990	DRY	16.1	0.4	-	-	-	-	73.5	212.5	123.0	302.2	13.3	115.9	**857.0**
1991	NORMAL	117.2	2.9	-	-	-	-	455.7	130.3	160.4	376.8	6.9	26.5	**1,276.7**
1992	NORMAL	-	-	-	-	-	-	-	-	-	142.4	-	-	**142.4**
1993	WET	-	-	-	-	-	-	-	-	58.8	-	-	-	**58.8**
1994	NORMAL	-	-	-	-	-	-	360.9	466.0	-	-	-	-	**826.9**
1995	NORMAL	-	-	-	-	-	-	-	-	176.1	-	-	-	**176.1**
1996	DRY	-	-	-	-	-	-	262.4	-	254.0	17.5	195.6	224.5	**954.0**
1997	WET	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1998	NORMAL	-	-	-	-	-	-	496.7	178.6	-	-	-	-	**675.2**
1999	NORMAL	-	-	-	-	-	-	-	223.1	-	-	-	-	**223.1**
2000	DRY	-	-	-	-	-	-	349.2	-	59.5	64.8	11.5	-	**485.0**
2001	NORMAL	-	-	-	-	-	-	-	-	118.7	101.6	-	-	**220.2**
2002	DRY	-	-	-	-	-	-	20.6	123.7	37.0	27.0	307.4	198.1	**713.8**
2003	DRY	35.4	3.8	-	-	-	-	-	75.1	308.6	262.8	-	64.9	**750.6**
2004	NORMAL	-	-	-	-	-	-	81.5	-	45.0	216.5	244.7	-	**587.7**
2005	WET	-	2.0	-	-	-	-	-	318.8	-	-	-	-	**320.8**
2006	NORMAL	-	-	-	-	-	-	-	-	23.6	58.1	96.0	-	**177.7**
2007	NORMAL	122.3	-	-	-	-	-	201.3	-	3.1	-	-	9.1	**335.8**
2008	NORMAL	-	-	-	-	-	-	-	468.5	-	-	-	-	**468.5**
2009	NORMAL	-	-	-	-	-	-	454.5	6.2	18.9	95.0	149.4	6.4	**730.5**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**9.7**	**0.3**	**-**	**-**	**-**	**9.8**	**108.9**	**132.2**	**80.3**	**80.4**	**60.9**	**37.3**	**520.0**
Max		**122.3**	**3.8**	**-**	**-**	**-**	**125.0**	**496.7**	**739.6**	**548.7**	**376.8**	**307.4**	**315.9**	**1,460.6**

Table 13b. Compact Deliveries: Met Demands

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										63.1			**63.1**
1976	DRY						120.5	169.3	-	-	-	-	-	**289.8**
1977	DRY						97.3	192.3	-		-	-	-	**289.6**
1978	NORMAL	-	-						286.8	-	-	-	-	**286.8**
1979	WET	-	-							105.2		113.1	7.0	**225.3**
1980	WET									284.6	-			**284.6**
1981	DRY						125.0	164.9	-		-	-	-	**289.9**
1982	NORMAL								286.8			-		**286.8**
1983	WET													**-**
1984	NORMAL								213.6	72.6	-			**286.2**
1985	WET									28.1				**28.1**
1986	WET								286.8					**286.8**
1987	NORMAL									36.3				**36.3**
1988	NORMAL							171.8			89.7	24.7		**286.1**
1989	DRY							150.0	137.9	-				**287.9**
1990	DRY	-	-					73.5	212.5	1.3	-	-	-	**287.3**
1991	NORMAL	-	-					288.9	-	-	-	-	-	**288.9**
1992	NORMAL										142.4			**142.4**
1993	WET									58.8				**58.8**
1994	NORMAL							288.9	-					**288.9**
1995	NORMAL									176.1				**176.1**
1996	DRY							262.4		26.1	-	-	-	**288.5**
1997	WET													**-**
1998	NORMAL							288.9	-					**288.9**
1999	NORMAL								223.1					**223.1**
2000	DRY							288.9		-	-	-		**288.9**
2001	NORMAL									118.7	101.6			**220.2**
2002	DRY							20.6	123.7	37.0	27.0	76.2	-	**284.5**
2003	DRY	-	-						75.1	210.0	-		-	**285.2**
2004	NORMAL							81.5		45.0	158.1	-		**284.6**
2005	WET		-						286.8					**286.8**
2006	NORMAL									23.6	58.1	96.0		**177.7**
2007	NORMAL	101.9						201.3		3.1			9.1	**315.4**
2008	NORMAL								286.8					**286.8**
2009	NORMAL							288.9	-	-	-	-	-	**288.9**
Min		**-**	**-**	**-**	**-**	**-**	**97.3**	**20.6**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**17.0**	**-**				**114.3**	**195.5**	**134.4**	**58.4**	**33.7**	**20.7**	**1.3**	**228.3**
Max		**101.9**	**-**	**-**	**-**	**-**	**125.0**	**288.9**	**286.8**	**284.6**	**158.1**	**113.1**	**9.1**	**315.4**

Table 13c. Percent of Compact Demands Met

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										100%			100%
1976	DRY						100%	58%	0%	0%	0%	0%	0%	20%
1977	DRY						100%	71%	0%		0%	0%	0%	28%
1978	NORMAL	0%	0%						74%	0%	0%	0%	0%	24%
1979	WET	0%	0%							100%		100%	100%	93%
1980	WET									52%	0%			40%
1981	DRY						100%	96%	0%		0%	0%	0%	29%
1982	NORMAL								39%			0%		36%
1983	WET													-
1984	NORMAL								100%	36%	0%			60%
1985	WET									100%				100%
1986	WET								87%					87%
1987	NORMAL									100%				100%
1988	NORMAL							100%			100%	43%		90%
1989	DRY							100%	66%	0%				57%
1990	DRY	0%	0%					100%	100%	1%	0%	0%	0%	34%
1991	NORMAL	0%	0%					63%	0%	0%	0%	0%	0%	23%
1992	NORMAL										100%			100%
1993	WET									100%				100%
1994	NORMAL							80%	0%					35%
1995	NORMAL									100%				100%
1996	DRY							100%		10%	0%	0%	0%	30%
1997	WET													-
1998	NORMAL							58%	0%					43%
1999	NORMAL								100%					100%
2000	DRY							83%		0%	0%	0%		60%
2001	NORMAL									100%	100%			100%
2002	DRY							100%	100%	100%	100%	25%	0%	40%
2003	DRY	0%	0%						100%	68%	0%		0%	38%
2004	NORMAL							100%		100%	73%	0%		48%
2005	WET		0%						90%					89%
2006	NORMAL									100%	100%	100%		100%
2007	NORMAL	83%						100%		100%			100%	94%
2008	NORMAL								61%					61%
2009	NORMAL							64%	0%	0%	0%	0%	0%	40%
Min		**-**	**-**	**-**	**-**	**-**	**100%**	**58%**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**14%**	**-**				**100%**	**85%**	**51%**	**56%**	**35%**	**18%**	**17%**	**60%**
Max		**83%**	**-**	**-**	**-**	**-**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

03/04/2020
SGM

CPW Account

Table 14a. Total Fish Flow Demands
Modeled Scenario: Total Reservoir Size = 1176 AF
Irrigation Enlargement Account = 0 AF;   Augmentation Account = 0 AF;   DWR Account = 0 AF;   CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		61.4	51.7	24.3									**137.4**
1976	DRY		24.6	9.7	6.1									**40.3**
1977	DRY		81.1	161.1	78.0									**320.2**
1978	NORMAL		81.1	161.1	78.0									**320.2**
1979	WET		61.4	51.7	24.3									**137.4**
1980	WET		24.6	9.7	6.1									**40.3**
1981	DRY		24.6	9.7	6.1									**40.3**
1982	NORMAL		81.1	161.1	78.0									**320.2**
1983	WET		61.4	51.7	24.3									**137.4**
1984	NORMAL		24.6	9.7	6.1									**40.3**
1985	WET		61.4	51.7	24.3									**137.4**
1986	WET		24.6	9.7	6.1									**40.3**
1987	NORMAL		24.6	9.7	6.1									**40.3**
1988	NORMAL		61.4	51.7	24.3									**137.4**
1989	DRY		61.4	51.7	24.3									**137.4**
1990	DRY		81.1	161.1	78.0									**320.2**
1991	NORMAL		81.1	161.1	78.0									**320.2**
1992	NORMAL		61.4	51.7	24.3									**137.4**
1993	WET		61.4	51.7	24.3									**137.4**
1994	NORMAL		24.6	9.7	6.1									**40.3**
1995	NORMAL		61.4	51.7	24.3									**137.4**
1996	DRY		61.4	51.7	24.3									**137.4**
1997	WET		81.1	161.1	78.0									**320.2**
1998	NORMAL		24.6	9.7	6.1									**40.3**
1999	NORMAL		61.4	51.7	24.3									**137.4**
2000	DRY		61.4	51.7	24.3									**137.4**
2001	NORMAL		81.1	161.1	78.0									**320.2**
2002	DRY		61.4	51.7	24.3									**137.4**
2003	DRY		81.1	161.1	78.0									**320.2**
2004	NORMAL		81.1	161.1	78.0									**320.2**
2005	WET		61.4	51.7	24.3									**137.4**
2006	NORMAL		24.6	9.7	6.1									**40.3**
2007	NORMAL		61.4	51.7	24.3									**137.4**
2008	NORMAL		61.4	51.7	24.3									**137.4**
2009	NORMAL		61.4	51.7	24.3									**137.4**
Min		-	**24.6**	**9.7**	**6.1**	-	-	-	-	-	-	-	-	**40.3**
Average			**57.0**	**69.0**	**33.4**									**159.4**
Max		-	**81.1**	**161.1**	**78.0**	-	-	-	-	-	-	-	-	**320.2**

Table 14b. Fish Flow Deliveries: Met Demands
Modeled Scenario: Total Reservoir Size = 1176 AF
Irrigation Enlargement Account = 0 AF;   Augmentation Account = 0 AF;   DWR Account = 0 AF;   CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		-	-	-									-
1976	DRY		-	-	-									-
1977	DRY		-	-	-									-
1978	NORMAL		-	-	-									-
1979	WET		-	-	-									-
1980	WET		-	-	-									-
1981	DRY		-	-	-									-
1982	NORMAL		-	-	-									-
1983	WET		-	-	-									-
1984	NORMAL		-	-	-									-
1985	WET		-	-	-									-
1986	WET		-	-	-									-
1987	NORMAL		-	-	-									-
1988	NORMAL		-	-	-									-
1989	DRY		-	-	-									-
1990	DRY		-	-	-									-
1991	NORMAL		-	-	-									-
1992	NORMAL		-	-	-									-
1993	WET		-	-	-									-
1994	NORMAL		-	-	-									-
1995	NORMAL		-	-	-									-
1996	DRY		-	-	-									-
1997	WET		-	-	-									-
1998	NORMAL		-	-	-									-
1999	NORMAL		-	-	-									-
2000	DRY		-	-	-									-
2001	NORMAL		-	-	-									-
2002	DRY		-	-	-									-
2003	DRY		-	-	-									-
2004	NORMAL		-	-	-									-
2005	WET		-	-	-									-
2006	NORMAL		-	-	-									-
2007	NORMAL		-	-	-									-
2008	NORMAL		-	-	-									-
2009	NORMAL		-	-	-									-
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average			-	-	-									-
Max		-	-	-	-	-	-	-	-	-	-	-	-	-

Table 14c. Percent of Fish Flow Demands Met
Modeled Scenario: Total Reservoir Size = 1176 AF
Irrigation Enlargement Account = 0 AF;   Augmentation Account = 0 AF;   DWR Account = 0 AF;   CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		0%	0%	0%									-
1976	DRY		0%	0%	0%									-
1977	DRY		0%	0%	0%									-
1978	NORMAL		0%	0%	0%									-
1979	WET		0%	0%	0%									-
1980	WET		0%	0%	0%									-
1981	DRY		0%	0%	0%									-
1982	NORMAL		0%	0%	0%									-
1983	WET		0%	0%	0%									-
1984	NORMAL		0%	0%	0%									-
1985	WET		0%	0%	0%									-
1986	WET		0%	0%	0%									-
1987	NORMAL		0%	0%	0%									-
1988	NORMAL		0%	0%	0%									-
1989	DRY		0%	0%	0%									-
1990	DRY		0%	0%	0%									-
1991	NORMAL		0%	0%	0%									-
1992	NORMAL		0%	0%	0%									-
1993	WET		0%	0%	0%									-
1994	NORMAL		0%	0%	0%									-
1995	NORMAL		0%	0%	0%									-
1996	DRY		0%	0%	0%									-
1997	WET		0%	0%	0%									-
1998	NORMAL		0%	0%	0%									-
1999	NORMAL		0%	0%	0%									-
2000	DRY		0%	0%	0%									-
2001	NORMAL		0%	0%	0%									-
2002	DRY		0%	0%	0%									-
2003	DRY		0%	0%	0%									-
2004	NORMAL		0%	0%	0%									-
2005	WET		0%	0%	0%									-
2006	NORMAL		0%	0%	0%									-
2007	NORMAL		0%	0%	0%									-
2008	NORMAL		0%	0%	0%									-
2009	NORMAL		0%	0%	0%									-
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average			-	-	-									-
Max		-	-	-	-	-	-	-	-	-	-	-	-	-

03/04/2020
SGM

Augmentation Account

Table 15a. Total Augmentation Demands

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1976	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**20.0**
1977	DRY	-	3.3	3.3	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**26.7**
1978	NORMAL	3.3	3.3	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	**23.3**
1979	WET	-	3.3	3.3	-	-	-	-	-	-	3.3	3.3	3.3	**16.7**
1980	WET	-	-	-	-	-	-	-	-	-	3.3	-	3.3	**6.7**
1981	DRY	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
1982	NORMAL	-	-	-	-	-	-	-	-	3.3	-	3.3	3.3	**10.0**
1983	WET	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1984	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	-	**10.0**
1985	WET	-	-	-	-	-	-	-	-	3.3	3.3	-	-	**6.7**
1986	WET	-	-	-	-	-	-	-	-	3.3	3.3	3.3	-	**10.0**
1987	NORMAL	-	-	3.3	-	-	-	-	-	3.3	3.3	3.3	-	**13.3**
1988	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
1989	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**20.0**
1990	DRY	-	3.3	3.3	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**26.7**
1991	NORMAL	-	-	-	-	-	-	3.3	3.3	3.3	3.3	-	3.3	**16.7**
1992	NORMAL	-	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**16.7**
1993	WET	-	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**16.7**
1994	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
1995	NORMAL	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1996	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	-	**16.7**
1997	WET	-	-	-	-	-	-	-	-	-	3.3	-	3.3	**6.7**
1998	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	-	**13.3**
1999	NORMAL	-	-	-	-	-	-	-	3.3	3.3	-	3.3	3.3	**13.3**
2000	DRY	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**23.3**
2001	NORMAL	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**20.0**
2002	DRY	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**23.3**
2003	DRY	3.3	3.3	-	-	-	-	3.3	3.3	3.3	3.3	-	3.3	**23.3**
2004	NORMAL	-	3.3	3.3	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**23.3**
2005	WET	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
2006	NORMAL	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	-	**16.7**
2007	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
2008	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
2009	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.7**
Average		**0.5**	**0.8**	**0.6**	**-**	**-**	**-**	**1.0**	**1.7**	**2.8**	**3.1**	**2.9**	**2.7**	**15.9**
Max		**3.3**	**3.3**	**3.3**	**-**	**-**	**-**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**26.7**

Table 15b. Augmentation Deliveries: Met Demands

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										-	-	-	-
1976	DRY							-	-	-	-	-	-	-
1977	DRY		-	-				-	-	-	-	-	-	-
1978	NORMAL	-	-	-						-	-	-	-	-
1979	WET		-	-							-	-	-	-
1980	WET										-		-	-
1981	DRY								-	-	-	-	-	-
1982	NORMAL									-		-	-	-
1983	WET										-	-	-	-
1984	NORMAL									-	-	-		-
1985	WET									-	-			-
1986	WET									-	-	-		-
1987	NORMAL			-						-	-	-		-
1988	NORMAL								-	-	-	-	-	-
1989	DRY							-	-	-	-	-	-	-
1990	DRY		-	-				-	-	-	-	-	-	-
1991	NORMAL							-	-	-	-		-	-
1992	NORMAL		-							-	-	-	-	-
1993	WET		-							-	-	-	-	-
1994	NORMAL									-	-	-	-	-
1995	NORMAL										-	-	-	-
1996	DRY							-	-	-	-	-		-
1997	WET										-		-	-
1998	NORMAL								-	-	-	-		-
1999	NORMAL								-	-		-	-	-
2000	DRY	-						-	-	-	-	-	-	-
2001	NORMAL	-							-	-	-	-	-	-
2002	DRY	-						-	-	-	-	-	-	-
2003	DRY	-	-					-	-	-	-		-	-
2004	NORMAL		-	-					-	-	-	-	-	-
2005	WET									-	-	-	-	-
2006	NORMAL							-	-	-	-	-		-
2007	NORMAL								-	-	-	-	-	-
2008	NORMAL									-	-	-	-	-
2009	NORMAL								-	-	-	-	-	-
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average		-	-	-				-	-	-	-	-	-	-
Max		-	-	-	-	-	-	-	-	-	-	-	-	-

Table 15c. Percent of Augmentation Demands Met

Modeled Scenario: Total Reservoir Size = 1176 AF

Irrigation Enlargement Account = 0 AF; Augmentation Account = 0 AF; DWR Account = 0 AF; CPW Account = 0 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										0%	0%	0%	-
1976	DRY							0%	0%	0%	0%	0%	0%	-
1977	DRY		0%	0%				0%	0%	0%	0%	0%	0%	-
1978	NORMAL	0%	0%	0%						0%	0%	0%	0%	-
1979	WET		0%	0%							0%	0%	0%	-
1980	WET										0%		0%	-
1981	DRY								0%	0%	0%	0%	0%	-
1982	NORMAL									0%		0%	0%	-
1983	WET										0%	0%	0%	-
1984	NORMAL									0%	0%	0%		-
1985	WET									0%	0%			-
1986	WET									0%	0%	0%		-
1987	NORMAL			0%						0%	0%	0%		-
1988	NORMAL								0%	0%	0%	0%	0%	-
1989	DRY							0%	0%	0%	0%	0%	0%	-
1990	DRY		0%	0%				0%	0%	0%	0%	0%	0%	-
1991	NORMAL							0%	0%	0%	0%		0%	-
1992	NORMAL		0%							0%	0%	0%	0%	-
1993	WET		0%							0%	0%	0%	0%	-
1994	NORMAL									0%	0%	0%	0%	-
1995	NORMAL										0%	0%	0%	-
1996	DRY							0%	0%	0%	0%	0%		-
1997	WET										0%		0%	-
1998	NORMAL								0%	0%	0%	0%		-
1999	NORMAL								0%	0%		0%	0%	-
2000	DRY	0%						0%	0%	0%	0%	0%	0%	-
2001	NORMAL	0%							0%	0%	0%	0%	0%	-
2002	DRY	0%						0%	0%	0%	0%	0%	0%	-
2003	DRY	0%	0%					0%	0%	0%	0%		0%	-
2004	NORMAL		0%	0%					0%	0%	0%	0%	0%	-
2005	WET									0%	0%	0%	0%	-
2006	NORMAL							0%	0%	0%	0%	0%		-
2007	NORMAL								0%	0%	0%	0%	0%	-
2008	NORMAL									0%	0%	0%	0%	-
2009	NORMAL								0%	0%	0%	0%	0%	-
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average		-	-	-				-	-	-	-	-	-	-
Max		-	-	-	-	-	-	-	-	-	-	-	-	-

Irrigation Account

Table 16a. Total Irrigation Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	211.0							812.8	2,816.0	2,030.0	1,383.0	1,056.0	**8,308.8**
1976	DRY	119.0							857.5	2,533.0	1,740.0	1,034.0	1,019.0	**7,302.5**
1977	DRY	75.0							895.3	2,121.0	1,387.0	1,501.0	989.0	**6,968.3**
1978	NORMAL	122.0							835.5	3,235.0	2,239.0	1,286.0	609.0	**8,326.5**
1979	WET								851.8	3,012.0	1,465.0	1,911.0	897.0	**8,136.8**
1980	WET	86.0							898.3	3,472.0	1,670.0	1,227.0	662.0	**8,015.3**
1981	DRY	130.0							874.5	1,738.0	1,387.0	1,438.0	421.0	**5,988.5**
1982	NORMAL	168.0							836.3	2,670.0	1,629.0	986.0	782.0	**7,071.3**
1983	WET	188.0							686.8	2,222.0	1,763.0	1,365.0	918.0	**7,142.8**
1984	NORMAL	21.0							730.8	3,030.0	1,189.0	1,402.0	428.0	**6,800.8**
1985	WET	548.0							908.5	2,746.0	1,924.0	750.0	591.0	**7,467.5**
1986	WET	52.0							750.5	1,927.0	1,123.0	823.0	309.0	**4,984.5**
1987	NORMAL	34.0							888.8	2,876.0	1,200.0	1,606.0	494.0	**7,098.8**
1988	NORMAL	168.0							785.3	3,415.0	1,499.0	1,474.0	1,153.0	**8,494.3**
1989	DRY	320.0							877.5	2,798.0	1,626.0	1,659.0	735.0	**8,015.5**
1990	DRY	22.0							867.0	2,503.0	1,627.0	495.0	786.0	**6,300.0**
1991	NORMAL	15.0							788.0	2,660.0	1,905.0	1,005.0	1,022.0	**7,395.0**
1992	NORMAL	206.0							803.0	2,022.0	1,512.0	1,060.0	854.0	**6,457.0**
1993	WET	232.0							793.8	3,448.0	884.0	1,259.0	687.0	**7,303.8**
1994	NORMAL	312.0							846.5	3,319.0	1,877.0	757.0	459.0	**7,570.5**
1995	NORMAL	465.0							773.0	3,144.0	1,765.0	1,609.0	1,174.0	**8,930.0**
1996	DRY	387.0							755.5	3,024.0	2,038.0	1,240.0	156.0	**7,600.5**
1997	WET	196.0							745.5	2,304.0	1,784.0	676.0	835.0	**6,540.5**
1998	NORMAL	150.0							816.8	2,127.0	2,131.0	1,792.0	140.0	**7,156.8**
1999	NORMAL	145.0							789.8	2,357.0	866.0	1,426.0	1,256.0	**6,839.8**
2000	DRY	1,102.0							859.0	3,254.0	1,517.0	1,879.0	231.0	**8,842.0**
2001	NORMAL								880.8	3,028.0	1,143.0	1,853.0	1,004.0	**7,908.8**
2002	DRY	287.0							1,001.8	3,309.0	2,047.0	1,147.0	466.0	**8,257.8**
2003	DRY								869.5	3,652.0	1,405.0	941.0	1,130.0	**7,997.5**
2004	NORMAL	38.0							789.8	2,742.0	1,822.0	513.0	710.0	**6,614.8**
2005	WET	48.0							841.3	3,233.0	1,960.0	458.0	534.0	**7,074.3**
2006	NORMAL	132.0							809.5	2,793.0	1,579.0	1,105.0	441.0	**6,859.5**
2007	NORMAL	126.0							919.5	2,624.0	1,774.0	1,286.0	1,141.0	**7,870.5**
2008	NORMAL	165.0							848.3	3,133.0	1,362.0	1,709.0	1,198.0	**8,415.3**
2009	NORMAL	100.0							783.3	2,701.0	1,501.0	1,337.0		**6,422.3**
Min		**15.0**	**-**	**-**	**-**	**-**	**-**	**-**	**686.8**	**1,738.0**	**866.0**	**458.0**	**140.0**	**4,984.5**
Average		**199.1**							**830.6**	**2,799.7**	**1,610.6**	**1,239.8**	**743.7**	**7,385.1**
Max		**1,102.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1,001.8**	**3,652.0**	**2,239.0**	**1,911.0**	**1,256.0**	**8,930.0**

Table 16b. Irrigation Deliveries: Met Irrigation Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	169.8							812.8	520.7	28.8	-	3.4	**1,535.5**
1976	DRY	119.0							857.5	2.5	2.6	-	-	**981.7**
1977	DRY	5.0							289.5	23.6	-	-	-	**318.1**
1978	NORMAL	-							442.8	26.2	-	-	-	**469.0**
1979	WET								851.8	486.6	8.0	-	19.4	**1,365.7**
1980	WET	86.0							898.3	812.8	89.4	23.6	65.8	**1,975.8**
1981	DRY	110.0							874.5	410.0	2.0	-	1.2	**1,397.7**
1982	NORMAL	28.0							836.3	751.1	2.4	1.9	29.0	**1,648.6**
1983	WET	101.6							686.8	1,206.4	23.4	69.4	78.8	**2,166.3**
1984	NORMAL	21.0							730.8	817.4	68.6	39.0	110.6	**1,787.3**
1985	WET	117.2							908.5	558.7	85.4	57.2	113.3	**1,840.3**
1986	WET	52.0							750.5	864.6	92.6	91.8	105.2	**1,956.7**
1987	NORMAL	34.0							888.8	945.2	78.6	94.8	118.0	**2,159.3**
1988	NORMAL	168.0							785.3	543.7	30.4	-	11.0	**1,538.3**
1989	DRY	127.6							877.5	864.6	-	12.6	26.0	**1,908.3**
1990	DRY	22.0							491.2	-	-	-	-	**513.2**
1991	NORMAL	-							788.0	418.0	-	-	3.0	**1,208.9**
1992	NORMAL	11.6							803.0	767.1	9.4	-	-	**1,591.1**
1993	WET	37.8							793.8	1,266.7	9.0	31.6	104.4	**2,243.3**
1994	NORMAL	167.3							846.5	713.9	10.0	37.4	62.0	**1,837.1**
1995	NORMAL	102.2							773.0	1,079.0	47.4	80.0	109.6	**2,191.2**
1996	DRY	150.3							755.5	380.5	-	-	-	**1,286.3**
1997	WET	9.0							745.5	1,157.6	0.6	10.8	151.7	**2,075.2**
1998	NORMAL	150.0							816.8	948.9	28.8	44.6	81.8	**2,070.9**
1999	NORMAL	94.5							789.8	414.1	27.0	298.6	81.6	**1,705.5**
2000	DRY	142.6							859.0	126.9	-	-	-	**1,128.5**
2001	NORMAL								880.8	662.2	1.4	-	4.2	**1,548.5**
2002	DRY	24.2							290.5	-	-	-	-	**314.7**
2003	DRY								649.2	-	-	-	46.9	**696.0**
2004	NORMAL	-							789.8	590.4	0.8	-	-	**1,381.0**
2005	WET	-							841.3	731.6	-	-	-	**1,572.9**
2006	NORMAL	86.3							809.5	457.2	-	-	-	**1,353.0**
2007	NORMAL	126.0							919.5	336.1	-	-	-	**1,381.6**
2008	NORMAL	26.9							848.3	586.2	-	-	-	**1,461.4**
2009	NORMAL	-							783.3	69.7	-	-		**853.0**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**289.5**	**-**	**-**	**-**	**-**	**314.7**
Average		**71.6**							**764.7**	**558.3**	**18.5**	**25.5**	**39.0**	**1,470.3**
Max		**169.8**	**-**	**-**	**-**	**-**	**-**	**-**	**919.5**	**1,266.7**	**92.6**	**298.6**	**151.7**	**2,243.3**

Table 16c. Percent of Irrigation Demands Met

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	80%							100%	18%	1%	0%	0%	18%
1976	DRY	100%							100%	0%	0%	0%	0%	13%
1977	DRY	7%							32%	1%	0%	0%	0%	5%
1978	NORMAL	0%							53%	1%	0%	0%	0%	6%
1979	WET								100%	16%	1%	0%	2%	17%
1980	WET	100%							100%	23%	5%	2%	10%	25%
1981	DRY	85%							100%	24%	0%	0%	0%	23%
1982	NORMAL	17%							100%	28%	0%	0%	4%	23%
1983	WET	54%							100%	54%	1%	5%	9%	30%
1984	NORMAL	100%							100%	27%	6%	3%	26%	26%
1985	WET	21%							100%	20%	4%	8%	19%	25%
1986	WET	100%							100%	45%	8%	11%	34%	39%
1987	NORMAL	100%							100%	33%	7%	6%	24%	30%
1988	NORMAL	100%							100%	16%	2%	0%	1%	18%
1989	DRY	40%							100%	31%	0%	1%	4%	24%
1990	DRY	100%							57%	0%	0%	0%	0%	8%
1991	NORMAL	0%							100%	16%	0%	0%	0%	16%
1992	NORMAL	6%							100%	38%	1%	0%	0%	25%
1993	WET	16%							100%	37%	1%	3%	15%	31%
1994	NORMAL	54%							100%	22%	1%	5%	14%	24%
1995	NORMAL	22%							100%	34%	3%	5%	9%	25%
1996	DRY	39%							100%	13%	0%	0%	0%	17%
1997	WET	5%							100%	50%	0%	2%	18%	32%
1998	NORMAL	100%							100%	45%	1%	2%	58%	29%
1999	NORMAL	65%							100%	18%	3%	21%	6%	25%
2000	DRY	13%							100%	4%	0%	0%	0%	13%
2001	NORMAL								100%	22%	0%	0%	0%	20%
2002	DRY	8%							29%	0%	0%	0%	0%	4%
2003	DRY								75%	0%	0%	0%	4%	9%
2004	NORMAL	0%							100%	22%	0%	0%	0%	21%
2005	WET	0%							100%	23%	0%	0%	0%	22%
2006	NORMAL	65%							100%	16%	0%	0%	0%	20%
2007	NORMAL	100%							100%	13%	0%	0%	0%	18%
2008	NORMAL	16%							100%	19%	0%	0%	0%	17%
2009	NORMAL	0%							100%	3%	0%	0%		13%
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**29%**	**-**	**-**	**-**	**-**	**4%**
Average		**47%**							**93%**	**21%**	**1%**	**2%**	**8%**	**20%**
Max		**100%**	**-**	**-**	**-**	**-**	**-**	**-**	**100%**	**54%**	**8%**	**21%**	**58%**	**39%**

03/04/2020
SGM

DWR Account

Table 17a. Total Compact Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF;   Augmentation Account = 30 AF;   DWR Account = 600 AF;   CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	SUM
1975	WET	-	-	-	-	-	-	-	-	-	63.1	-	-	**63.1**
1976	DRY	-	-	-	-	-	120.5	291.0	195.8	225.8	174.0	137.7	315.9	**1,460.6**
1977	DRY	-	-	-	-	-	97.3	272.0	168.6	-	40.1	264.1	184.7	**1,026.8**
1978	NORMAL	33.9	2.2	-	-	-	-	-	385.6	130.7	335.1	190.6	134.0	**1,212.1**
1979	WET	15.2	0.6	-	-	-	-	-	-	105.2	-	113.1	7.0	**241.1**
1980	WET	-	-	-	-	-	-	-	-	548.7	169.5	-	-	**718.2**
1981	DRY	-	-	-	-	-	125.0	171.8	182.3	-	213.2	276.5	19.7	**988.5**
1982	NORMAL	-	-	-	-	-	-	-	739.6	-	-	67.0	-	**806.7**
1983	WET	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1984	NORMAL	-	-	-	-	-	-	-	213.6	202.2	64.9	-	-	**480.7**
1985	WET	-	-	-	-	-	-	-	-	28.1	-	-	-	**28.1**
1986	WET	-	-	-	-	-	-	-	329.5	-	-	-	-	**329.5**
1987	NORMAL	-	-	-	-	-	-	-	-	36.3	-	-	-	**36.3**
1988	NORMAL	-	-	-	-	-	-	171.8	-	-	89.7	57.9	-	**319.3**
1989	DRY	-	-	-	-	-	-	150.0	210.2	147.8	-	-	-	**507.9**
1990	DRY	16.1	0.4	-	-	-	-	73.5	212.5	123.0	302.2	13.3	115.9	**857.0**
1991	NORMAL	117.2	2.9	-	-	-	-	455.7	130.3	160.4	376.8	6.9	26.5	**1,276.7**
1992	NORMAL	-	-	-	-	-	-	-	-	-	142.4	-	-	**142.4**
1993	WET	-	-	-	-	-	-	-	-	58.8	-	-	-	**58.8**
1994	NORMAL	-	-	-	-	-	-	360.9	466.0	-	-	-	-	**826.9**
1995	NORMAL	-	-	-	-	-	-	-	-	176.1	-	-	-	**176.1**
1996	DRY	-	-	-	-	-	-	262.4	-	254.0	17.5	195.6	224.5	**954.0**
1997	WET	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1998	NORMAL	-	-	-	-	-	-	496.7	178.6	-	-	-	-	**675.2**
1999	NORMAL	-	-	-	-	-	-	-	223.1	-	-	-	-	**223.1**
2000	DRY	-	-	-	-	-	-	349.2	-	59.5	64.8	11.5	-	**485.0**
2001	NORMAL	-	-	-	-	-	-	-	-	118.7	101.6	-	-	**220.2**
2002	DRY	-	-	-	-	-	-	20.6	123.7	37.0	27.0	307.4	198.1	**713.8**
2003	DRY	35.4	3.8	-	-	-	-	-	75.1	308.6	262.8	-	64.9	**750.6**
2004	NORMAL	-	-	-	-	-	-	81.5	-	45.0	216.5	244.7	-	**587.7**
2005	WET	-	2.0	-	-	-	-	-	318.8	-	-	-	-	**320.8**
2006	NORMAL	-	-	-	-	-	-	-	-	23.6	58.1	96.0	-	**177.7**
2007	NORMAL	122.3	-	-	-	-	-	201.3	-	3.1	-	-	9.1	**335.8**
2008	NORMAL	-	-	-	-	-	-	-	468.5	-	-	-	-	**468.5**
2009	NORMAL	-	-	-	-	-	-	454.5	6.2	18.9	95.0	149.4	6.4	**730.5**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
Average		**9.7**	**0.3**	**-**	**-**	**-**	**9.8**	**108.9**	**132.2**	**80.3**	**80.4**	**60.9**	**37.3**	**520.0**
Max		**122.3**	**3.8**	**-**	**-**	**-**	**125.0**	**496.7**	**739.6**	**548.7**	**376.8**	**307.4**	**315.9**	**1,460.6**

Table 17b. Compact Deliveries: Met Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF;   Augmentation Account = 30 AF;   DWR Account = 600 AF;   CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	SUM
1975	WET										63.1			**63.1**
1976	DRY						120.5	291.0	173.5	0.1	1.3	-	-	**586.3**
1977	DRY						97.3	192.3	-		-	-	-	**289.6**
1978	NORMAL	-	-						286.8	-	-	-	-	**286.8**
1979	WET	-	-							105.2		113.1	7.0	**225.3**
1980	WET									393.9	76.7			**470.6**
1981	DRY						125.0	171.8	88.1		-	-	-	**384.8**
1982	NORMAL								287.0			7.9		**294.9**
1983	WET													**-**
1984	NORMAL								213.6	202.2	64.9			**480.7**
1985	WET									28.1				**28.1**
1986	WET								329.5					**329.5**
1987	NORMAL									36.3				**36.3**
1988	NORMAL							171.8			89.7	57.9		**319.3**
1989	DRY							150.0	210.2	147.8				**507.9**
1990	DRY	16.1	-					73.5	212.5	123.0	254.6	-	-	**679.7**
1991	NORMAL	-	-					288.9	-	-	-	-	-	**288.9**
1992	NORMAL										142.4			**142.4**
1993	WET									58.8				**58.8**
1994	NORMAL							360.9	374.0					**734.9**
1995	NORMAL									176.1				**176.1**
1996	DRY							262.4		254.0	17.5	140.3	-	**674.2**
1997	WET													**-**
1998	NORMAL							496.7	178.6					**675.2**
1999	NORMAL								223.1					**223.1**
2000	DRY							288.9		-	-	-		**288.9**
2001	NORMAL									118.7	101.6			**220.2**
2002	DRY							20.6	123.7	37.0	27.0	158.1	-	**366.4**
2003	DRY	-	-						75.1	211.4	-		-	**286.5**
2004	NORMAL							81.5		45.0	176.9	-		**303.4**
2005	WET		-						318.8					**318.8**
2006	NORMAL									23.6	58.1	96.0		**177.7**
2007	NORMAL	122.3						201.3		3.1			9.1	**335.8**
2008	NORMAL								468.5					**468.5**
2009	NORMAL							454.5	6.2	18.9	45.1	-	-	**524.8**
Min		**-**	**-**	**-**	**-**	**-**	**97.3**	**20.6**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**23.1**	**-**				**114.3**	**233.7**	**198.3**	**94.4**	**58.9**	**38.2**	**1.3**	**321.4**
Max		**122.3**	**-**	**-**	**-**	**-**	**125.0**	**496.7**	**468.5**	**393.9**	**254.6**	**158.1**	**9.1**	**734.9**

Table 17c. Percent of Compact Demands Met

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF;   Augmentation Account = 30 AF;   DWR Account = 600 AF;   CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	Year	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	SUM
1975	WET										100%			100%
1976	DRY						100%	100%	89%	0%	1%	0%	0%	40%
1977	DRY						100%	71%	0%		0%	0%	0%	28%
1978	NORMAL	0%	0%						74%	0%	0%	0%	0%	24%
1979	WET	0%	0%							100%		100%	100%	93%
1980	WET									72%	45%			66%
1981	DRY						100%	100%	48%		0%	0%	0%	39%
1982	NORMAL								39%			12%		37%
1983	WET													-
1984	NORMAL								100%	100%	100%			100%
1985	WET									100%				100%
1986	WET								100%					100%
1987	NORMAL									100%				100%
1988	NORMAL							100%			100%	100%		100%
1989	DRY							100%	100%	100%				100%
1990	DRY	100%	0%					100%	100%	100%	84%	0%	0%	79%
1991	NORMAL	0%	0%					63%	0%	0%	0%	0%	0%	23%
1992	NORMAL										100%			100%
1993	WET									100%				100%
1994	NORMAL							100%	80%					89%
1995	NORMAL									100%				100%
1996	DRY							100%		100%	100%	72%	0%	71%
1997	WET													-
1998	NORMAL							100%	100%					100%
1999	NORMAL								100%					100%
2000	DRY							83%		0%	0%	0%		60%
2001	NORMAL									100%	100%			100%
2002	DRY							100%	100%	100%	100%	51%	0%	51%
2003	DRY	0%	0%						100%	69%	0%		0%	38%
2004	NORMAL							100%		100%	82%	0%		52%
2005	WET		0%						100%					99%
2006	NORMAL									100%	100%	100%		100%
2007	NORMAL	100%						100%		100%			100%	100%
2008	NORMAL								100%					100%
2009	NORMAL							100%	100%	100%	47%	0%	0%	72%
Min		**-**	**-**	**-**	**-**	**-**	**100%**	**63%**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**33%**	**-**				**100%**	**94%**	**79%**	**78%**	**56%**	**29%**	**17%**	**73%**
Max		**100%**	**-**	**-**	**-**	**-**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

CPW Account

Table 18a. Total Fish Flow Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		61.4	51.7	24.3									**137.4**
1976	DRY		24.6	9.7	6.1									**40.3**
1977	DRY		81.1	161.1	78.0									**320.2**
1978	NORMAL		81.1	161.1	78.0									**320.2**
1979	WET		61.4	51.7	24.3									**137.4**
1980	WET		24.6	9.7	6.1									**40.3**
1981	DRY		24.6	9.7	6.1									**40.3**
1982	NORMAL		81.1	161.1	78.0									**320.2**
1983	WET		61.4	51.7	24.3									**137.4**
1984	NORMAL		24.6	9.7	6.1									**40.3**
1985	WET		61.4	51.7	24.3									**137.4**
1986	WET		24.6	9.7	6.1									**40.3**
1987	NORMAL		24.6	9.7	6.1									**40.3**
1988	NORMAL		61.4	51.7	24.3									**137.4**
1989	DRY		61.4	51.7	24.3									**137.4**
1990	DRY		81.1	161.1	78.0									**320.2**
1991	NORMAL		81.1	161.1	78.0									**320.2**
1992	NORMAL		61.4	51.7	24.3									**137.4**
1993	WET		61.4	51.7	24.3									**137.4**
1994	NORMAL		24.6	9.7	6.1									**40.3**
1995	NORMAL		61.4	51.7	24.3									**137.4**
1996	DRY		61.4	51.7	24.3									**137.4**
1997	WET		81.1	161.1	78.0									**320.2**
1998	NORMAL		24.6	9.7	6.1									**40.3**
1999	NORMAL		61.4	51.7	24.3									**137.4**
2000	DRY		61.4	51.7	24.3									**137.4**
2001	NORMAL		81.1	161.1	78.0									**320.2**
2002	DRY		61.4	51.7	24.3									**137.4**
2003	DRY		81.1	161.1	78.0									**320.2**
2004	NORMAL		81.1	161.1	78.0									**320.2**
2005	WET		61.4	51.7	24.3									**137.4**
2006	NORMAL		24.6	9.7	6.1									**40.3**
2007	NORMAL		61.4	51.7	24.3									**137.4**
2008	NORMAL		61.4	51.7	24.3									**137.4**
2009	NORMAL		61.4	51.7	24.3									**137.4**
Min		-	**24.6**	**9.7**	**6.1**	-	-	-	-	-	-	-	-	**40.3**
Average			**57.0**	**69.0**	**33.4**									**159.4**
Max		-	**81.1**	**161.1**	**78.0**	-	-	-	-	-	-	-	-	**320.2**

Table 18b. Fish Flow Deliveries: Met Demands

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		61.4	51.7	24.0									**137.1**
1976	DRY		24.6	9.7	6.1									**40.3**
1977	DRY		10.3	-	-									**10.3**
1978	NORMAL		-	-	-									**-**
1979	WET		-	-	-									**-**
1980	WET		24.6	9.7	6.0									**40.2**
1981	DRY		24.6	9.7	6.1									**40.3**
1982	NORMAL		-	-	78.0									**78.0**
1983	WET		5.6	-	21.5									**27.1**
1984	NORMAL		24.6	9.7	6.1									**40.3**
1985	WET		61.4	51.7	24.3									**137.4**
1986	WET		-	-	0.0									**0.0**
1987	NORMAL		-	9.7	6.1									**15.7**
1988	NORMAL		12.0	-	-									**12.0**
1989	DRY		61.4	6.6	-									**68.0**
1990	DRY		81.1	161.1	77.3									**319.5**
1991	NORMAL		7.4	-	16.1									**23.5**
1992	NORMAL		50.2	-	0.6									**50.8**
1993	WET		61.4	51.7	23.6									**136.7**
1994	NORMAL		24.6	9.7	6.1									**40.3**
1995	NORMAL		0.0	-	0.0									**0.0**
1996	DRY		61.4	51.7	24.0									**137.1**
1997	WET		-	-	54.0									**54.0**
1998	NORMAL		24.6	9.7	6.1									**40.3**
1999	NORMAL		61.4	51.7	24.1									**137.2**
2000	DRY		61.4	51.7	24.3									**137.4**
2001	NORMAL		-	25.3	25.6									**50.9**
2002	DRY		61.4	34.2	-									**95.6**
2003	DRY		-	-	-									**-**
2004	NORMAL		-	-	-									**-**
2005	WET		14.2	-	-									**14.2**
2006	NORMAL		24.6	9.7	6.1									**40.3**
2007	NORMAL		61.4	51.7	24.0									**137.1**
2008	NORMAL		61.4	51.7	24.1									**137.2**
2009	NORMAL		61.4	29.1	-									**90.5**
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average			**29.4**	**21.3**	**14.7**									**65.4**
Max		-	**81.1**	**161.1**	**78.0**	-	-	-	-	-	-	-	-	**319.5**

Table 18c. Percent of Fish Flow Demands Met

Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET		100%	100%	99%									100%
1976	DRY		100%	100%	100%									100%
1977	DRY		13%	0%	0%									3%
1978	NORMAL		0%	0%	0%									-
1979	WET		0%	0%	0%									-
1980	WET		100%	100%	99%									100%
1981	DRY		100%	100%	100%									100%
1982	NORMAL		0%	0%	100%									24%
1983	WET		9%	0%	88%									20%
1984	NORMAL		100%	100%	100%									100%
1985	WET		100%	100%	100%									100%
1986	WET		0%	0%	0%									0%
1987	NORMAL		0%	100%	100%									39%
1988	NORMAL		20%	0%	0%									9%
1989	DRY		100%	13%	0%									49%
1990	DRY		100%	100%	99%									100%
1991	NORMAL		9%	0%	21%									7%
1992	NORMAL		82%	0%	2%									37%
1993	WET		100%	100%	97%									100%
1994	NORMAL		100%	100%	100%									100%
1995	NORMAL		0%	0%	0%									0%
1996	DRY		100%	100%	99%									100%
1997	WET		0%	0%	69%									17%
1998	NORMAL		100%	100%	100%									100%
1999	NORMAL		100%	100%	99%									100%
2000	DRY		100%	100%	100%									100%
2001	NORMAL		0%	16%	33%									16%
2002	DRY		100%	66%	0%									70%
2003	DRY		0%	0%	0%									-
2004	NORMAL		0%	0%	0%									-
2005	WET		23%	0%	0%									10%
2006	NORMAL		100%	100%	100%									100%
2007	NORMAL		100%	100%	99%									100%
2008	NORMAL		100%	100%	99%									100%
2009	NORMAL		100%	56%	0%									66%
Min		-	-	-	-	-	-	-	-	-	-	-	-	-
Average			**59%**	**53%**	**57%**									**56%**
Max		-	**100%**	**100%**	**100%**	-	-	-	-	-	-	-	-	**100%**

Augmentation Account

Table 19a. Total Augmentation Demands
Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1976	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**20.0**
1977	DRY	-	3.3	3.3	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**26.7**
1978	NORMAL	3.3	3.3	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	**23.3**
1979	WET	-	3.3	3.3	-	-	-	-	-	-	3.3	3.3	3.3	**16.7**
1980	WET	-	-	-	-	-	-	-	-	-	3.3	-	3.3	**6.7**
1981	DRY	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
1982	NORMAL	-	-	-	-	-	-	-	-	3.3	-	3.3	3.3	**10.0**
1983	WET	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1984	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	-	**10.0**
1985	WET	-	-	-	-	-	-	-	-	3.3	3.3	-	-	**6.7**
1986	WET	-	-	-	-	-	-	-	-	3.3	3.3	3.3	-	**10.0**
1987	NORMAL	-	-	3.3	-	-	-	-	-	3.3	3.3	3.3	-	**13.3**
1988	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
1989	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**20.0**
1990	DRY	-	3.3	3.3	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**26.7**
1991	NORMAL	-	-	-	-	-	-	3.3	3.3	3.3	3.3	-	3.3	**16.7**
1992	NORMAL	-	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**16.7**
1993	WET	-	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**16.7**
1994	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
1995	NORMAL	-	-	-	-	-	-	-	-	-	3.3	3.3	3.3	**10.0**
1996	DRY	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	-	**16.7**
1997	WET	-	-	-	-	-	-	-	-	-	3.3	-	3.3	**6.7**
1998	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	-	**13.3**
1999	NORMAL	-	-	-	-	-	-	-	3.3	3.3	-	3.3	3.3	**13.3**
2000	DRY	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**23.3**
2001	NORMAL	3.3	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**20.0**
2002	DRY	3.3	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	3.3	**23.3**
2003	DRY	3.3	3.3	-	-	-	-	3.3	3.3	3.3	3.3	-	3.3	**23.3**
2004	NORMAL	-	3.3	3.3	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**23.3**
2005	WET	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
2006	NORMAL	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	-	**16.7**
2007	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
2008	NORMAL	-	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	**13.3**
2009	NORMAL	-	-	-	-	-	-	-	3.3	3.3	3.3	3.3	3.3	**16.7**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.7**
Average		**0.5**	**0.8**	**0.6**	**-**	**-**	**-**	**1.0**	**1.7**	**2.8**	**3.1**	**2.9**	**2.7**	**15.9**
Max		**3.3**	**3.3**	**3.3**	**-**	**-**	**-**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**26.7**

Table 19b. Augmentation Deliveries: Met Demands
Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										3.3	3.3	3.3	**10.0**
1976	DRY							3.3	2.8	-	-	-	-	**6.1**
1977	DRY		-	-				-	-	-	-	-	-	**-**
1978	NORMAL	-	-	-						-	-	-	-	**-**
1979	WET		-	-							-	-	-	**-**
1980	WET										3.3		3.3	**6.7**
1981	DRY								3.3	2.1	-	-	-	**5.4**
1982	NORMAL									0.7		0.9	-	**1.7**
1983	WET										3.3	3.3	3.3	**10.0**
1984	NORMAL									3.3	3.3	3.3		**10.0**
1985	WET									3.3	3.3			**6.7**
1986	WET									3.3	3.3	3.3		**10.0**
1987	NORMAL			3.3						3.3	3.3	3.3		**13.3**
1988	NORMAL								3.3	3.3	3.3	3.3	3.3	**16.7**
1989	DRY							3.3	3.3	2.7	-	-	-	**9.4**
1990	DRY		-	-				-	-	-	-	-	-	**-**
1991	NORMAL							-	-	-	-		-	**-**
1992	NORMAL		-							-	-	-	-	**-**
1993	WET		-							3.3	3.3	3.3	3.3	**13.3**
1994	NORMAL									3.3	3.3	3.3	3.3	**13.3**
1995	NORMAL										3.3	3.3	3.3	**10.0**
1996	DRY							3.3	3.3	3.3	3.3	3.3		**16.7**
1997	WET										3.3		3.3	**6.7**
1998	NORMAL								3.3	3.3	3.3	3.3		**13.3**
1999	NORMAL								3.3	3.3		3.3	3.3	**13.3**
2000	DRY	0.2						-	-	-	-	-	-	**0.2**
2001	NORMAL	-							1.4	-	-	-	-	**1.4**
2002	DRY	-						-	-	-	-	-	-	**-**
2003	DRY	-	-					-	-	-	-		-	**-**
2004	NORMAL		-	-					1.2	-	-	-	-	**1.2**
2005	WET									3.3	3.3	3.3	3.3	**13.3**
2006	NORMAL							3.3	3.3	3.3	3.3	2.0		**15.4**
2007	NORMAL								3.3	3.3	2.8	-	-	**9.4**
2008	NORMAL									3.3	3.3	3.3	3.3	**13.3**
2009	NORMAL								2.3	-	-	-	-	**2.3**
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**0.0**	**-**	**0.6**				**1.3**	**1.9**	**1.8**	**1.8**	**1.7**	**1.3**	**7.1**
Max		**0.2**	**-**	**3.3**	**-**	**-**	**-**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**3.3**	**16.7**

Table 19c. Percent of Augmentation Demands Met
Modeled Scenario: Total Reservoir Size = 2366 AF

Irrigation Enlargement Account = 60 AF; Augmentation Account = 30 AF; DWR Account = 600 AF; CPW Account = 500 AF

		11	12	1	2	3	4	5	6	7	8	9	10	
Water Year	**Year**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**SUM**
1975	WET										100%	100%	100%	100%
1976	DRY							100%	84%	0%	0%	0%	0%	31%
1977	DRY		0%	0%				0%	0%	0%	0%	0%	0%	-
1978	NORMAL	0%	0%	0%						0%	0%	0%	0%	-
1979	WET		0%	0%							0%	0%	0%	-
1980	WET										100%		100%	100%
1981	DRY								100%	62%	0%	0%	0%	32%
1982	NORMAL									22%		28%	0%	17%
1983	WET										100%	100%	100%	100%
1984	NORMAL									100%	100%	100%		100%
1985	WET									100%	100%			100%
1986	WET									100%	100%	100%		100%
1987	NORMAL			100%						100%	100%	100%		100%
1988	NORMAL								100%	100%	100%	100%	100%	100%
1989	DRY							100%	100%	81%	0%	0%	0%	47%
1990	DRY		0%	0%				0%	0%	0%	0%	0%	0%	-
1991	NORMAL							0%	0%	0%	0%		0%	-
1992	NORMAL		0%							0%	0%	0%	0%	-
1993	WET		0%							100%	100%	100%	100%	80%
1994	NORMAL									100%	100%	100%	100%	100%
1995	NORMAL										100%	100%	100%	100%
1996	DRY							100%	100%	100%	100%	100%		100%
1997	WET										100%		100%	100%
1998	NORMAL								100%	100%	100%	100%		100%
1999	NORMAL								100%	100%		100%	100%	100%
2000	DRY	6%						0%	0%	0%	0%	0%	0%	1%
2001	NORMAL	0%							41%	0%	0%	0%	0%	7%
2002	DRY	0%						0%	0%	0%	0%	0%	0%	-
2003	DRY	0%	0%					0%	0%	0%	0%		0%	-
2004	NORMAL		0%	0%					37%	0%	0%	0%	0%	5%
2005	WET									100%	100%	100%	100%	100%
2006	NORMAL							100%	100%	100%	100%	61%		92%
2007	NORMAL								100%	100%	83%	0%	0%	57%
2008	NORMAL									100%	100%	100%	100%	100%
2009	NORMAL								69%	0%	0%	0%	0%	14%
Min		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Average		**1%**	**-**	**17%**				**40%**	**57%**	**54%**	**54%**	**50%**	**39%**	**57%**
Max		**6%**	**-**	**100%**	**-**	**-**	**-**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

03/04/2020
SGM

Table 20. Phase 1 Redmesa Reservoir Enlargement Engineering and Permitting Cost Estimate

Task No.	Task Description	Notes	Total
1	**Engineering**		
a	Phase 1 - *Schematic Design to Verify Site Accommodation*	Assess downstream hydraulic conditions and identify concern areas; prepare CAD model of proposed embankment; review geologic data; develop schematic construction costs estimate; and meet with Dam Safety Bureau (DSB).	$ 13,500.00
b	Phase 2 - *Determine Spillway Hazard Classification*	Prepare Inflow Design Flood (IDF) model for reservoir; survey existing downstream structures and features; develop mapping data; refine embankment design information; prepare model for spillway probable maximum precipitation (PMP) event; Reclamation Consequence Estimating Methodology (RCEM) analysis; inundation mapping; report preparation and delivery to DSB for review.	$ 23,500.00
c	Phase 3 - *Surveying & Geotechnical Field Investigations*	*Survey:* Stake out schematic embankment location; design level survey of area of impact; and mapping.	$ 49,400.00
		Geotechnical: DSB review and approval of geotechnical engineer; mapping; field investigations; and design reports preparation.	$ 100,000.00
d	Phase 4 - *Design Process*	Prepare hydrology/spillway report for PMP event; analyze water control features; design embankment zone and foundation and prepare associated report, construction plans, and details; prepare instrumentation and monitoring plan and details; prepare cost estimate and technical specifications; prepare Emergency Action Plan (EAP); and prepare and submit application package to DSB.	$ 281,000.00
		Sub-total	$ 467,400.00
2	**Permitting**		
a	Phase 1 - *Section 404 Permitting*	Prepare maps and identify limits of project site; prepare alternative analysis; prepare a mitigation/monitoring plan; submit a Jurisdictional Determination (JD) report; submit pre-construction notification to Army Corps of Engineers (Corps); submit 401 certification application; and apply for an “Individual Permit.”	$ 55,000.00
b	Phase 1 - *NEPA Compliance*	Contract an archaeologist to survey project area and prepare report for compliance with Section 106 of the National Historical Preservation Act; perform Threatened and Endangered and Candidate species survey and prepare report in compliance with Section 7 of the Endangered Species Act; possible additional biologic surveys for New Mexico Meadow Jumping Mouse; and prepare Environmental Assessment (EA).	$ 60,000.00
		Sub-total	$ 115,000.00
		Total	**$ 582,400.00**

Table 21. Redmesa Reservoir Alternate No. 1 - 2020 Estimated Project Cost

New High Hazard Capacity Spillway - Straight Crest (L=195 feet)

3/24/2020

Item/			Description	Quantity	Unit	Unit Cost	Estimated Cost
1			Clearing and Grubbing Spillway Site	4.38	AC	$ 10,000	$ 44,000
2			Main Dam				
3			Spillway				
	a		Mass excavate approach and exit channels	77,440	CY	$ 8.00	$ 620,000
	b		Compacted Fill	205	CY	$ 12.00	$ 2,000
	c		Waste Excess Fill from Spillway Excavation to Reservoir	77,235	CY	$ 4.00	$ 309,000
	d		Reinforced Concrete				
		i	Spillway Crest (L= 235-feet 3-feet W x 5-feet D)	130	CY	$ 350	$ 46,000
	e		3-feet Riprap and Bedding (D50 = 18-inch)	1,305	SY	$ 100	$ 131,000
4			Emergency Warning System - NWS Tied				
	a		NWS Home Radios (GOES)	3	EA	$ 1,500	$ 5,000
	b		Reservoir Level Gage	1	EA	$ 25,000	$ 25,000
	c		Reservoir Inlet Level Gage (remote powered)	1	EA	$ 12,500	$ 12,500
	d		Sirens	3	EA	$ 15,000	$ 45,000
	e		Spillway Level Sensor System w\Telemetry (GOES)	1	LS	$ 50,000	$ 50,000
	f		Power to Dam Crest	1	Allow	$ 75,000	$ 75,000
5			Access Roads	1	LS	$ 25,000	$ 25,000
6			Reclamation	2.5	AC	$ 7,500	$ 18,800
7			Unlisted Items (5%)	1	LS	$ 70,400	$ 70,400
8			Mobilization, Bonds, Insurance (10%)	1	LS	$ 141,000	$ 141,000
						Estimated Direct Construction Cost	**$ 1,619,700**
						Contingency (30%)	$ 486,000
						Construction Engineering	$ 450,000
						Environmental Mitigation/Compliance and Monitoring (Allowance)	$ 200,000
Land Acquisition				2.2	AC	$ 4,000	$ 8,800
Flood Easement				0	AC	$ 4,000	$ -
						Total Estimated Project Cost	**$ 2,764,500**

Table 22. Redmesa Reservoir Alternate No. 2 - 2020 Estimated Project Cost

New High Hazard Capacity Spillway - Straight Crest (L=150 feet) Plus Concrete Embankment Crest

3/24/2020

Item/			Description	Quantity	Unit	Unit Cost	Estimated Cost
1			Clearing and Grubbing Spillway Site	3.55	AC	$ 10,000	$ 35,500
2			Main Dam				
	a		Concrete Embankment Rise (1-foot, El. 6901.3 feet)	1,253	CY	$ 350.00	$ 438,600
3			Spillway				
	a		Mass excavate approach and exit channels	52,125	CY	$ 8.00	$ 417,000
	b		Compacted Fill	205	CY	$ 12.00	$ 2,500
	c		Waste Excess Fill from Spillway Excavation to Reservoir	51,920	CY	$ 4.00	$ 207,700
	d		Reinforced Concrete				
		i	Spillway Crest (L=195-feet 3-feet W x 5-feet D)	110	CY	$ 350	$ 38,500
	e		3-feet Riprap and Bedding (D50 = 18-inch)	1,100	SY	$ 100	$ 110,000
4			Emergency Warning System - NWS Tied				
	a		NWS Home Radios (GOES)	3	EA	$ 1,500	$ 4,500
	b		Reservoir Level Gage	1	EA	$ 25,000	$ 25,000
	c		Reservoir Inlet Level Gage (remote powered)	1	EA	$ 12,500	$ 12,500
	d		Sirens	3	EA	$ 15,000	$ 45,000
	e		Spillway Level Sensor System w\Telemetry (GOES)	1	LS	$ 50,000	$ 50,000
	f		Power to Dam Crest	1	Allow	$ 75,000	$ 75,000
5			Access Roads	1	LS	$ 25,000	$ 25,000
6			Reclamation	1.4	AC	$ 7,500	$ 10,500
7			Unlisted Items (5%)	1	LS	$ 74,900	$ 74,900
8			Mobilization, Bonds, Insurance (10%)	1	LS	$ 149,700	$ 149,700
			Estimated Direct Construction Cost				**$ 1,721,900**
			Contingency (30%)				$ 517,000
			Construction Engineering				$ 450,000
			Environmental Mitigation/Compliance and Monitoring (Allowance)				$ 200,000
			Land Acquisition	1.9	AC	$ 4,000	$ 7,600
			Flood Easement	0	AC	$ 4,000	$ -
			Total Estimated Project Cost				**$ 2,896,500**

Table 23. Redmesa Reservoir Alternate No. 3 - 2020 Estimated Project Cost

500 AF Enlargement (1,676- AF Total Volume)

3/24/2020

Item Number			Description	Quantity	Unit	Unit Cost	Estimated Cost
1			Stream Diversion and Dewatering	1	LS	$ 50,000	$ 50,000
2			Clearing and Grubbing Dam and Spillway Site	4.05	AC	$ 10,000	$ 40,500
3			Borrow Area Preparation and Reclamation	1	LS	$ 50,000	$ 50,000
4			Main Dam				
	a		Existing Embankment Excavation waste to Reservoir	500	CY	$ 5	$ 2,500
	b		Foundation Excavation, Unclassified waste to Reservoir	3,940	CY	$ 5	$ 19,700
	c		Foundation Preparation (Dental Concrete & Spot Fills)	7,085	SY	$ 61.50	$ 435,700
	d		Right Abutment Grouting	1	LS	$ 510,000	$ 510,000
	e	i.	Zone 2 Shell (Source/Spread/Place/Compact) from Spillway Excavation	18,600	CY	$ 9.90	$ 184,100
	e	ii.	Zone 2 Shell (Source/Spread/Place/Compact) from Reservoir Borrow Area	37,625	CY	$ 14.00	$ 526,800
	f		Zone 1 Core (Source/Spread/Place/Compact) from Reservoir Borrow Area	10,885	CY	$ 14	$ 152,400
	g		3-feet Filter - Chimney and Blanket (Source/Deliver/Place/Compact)	5,870	CY	$ 100	$ 587,000
	h		2-feet Riprap and Bedding (D50 = 12-inch)	1,285	CY	$ 100	$ 128,500
	i		Instrumentation	1	LS	$ 50,000	$ 50,000
	j		6-inch Aggregate base course (Dam Crest)	1,650	SY	$ 15	$ 24,800
5			Spillway				
	a		Compacted Fill (Source/Spread/Place/Compact) from Spillway Excavation	5,835	CY	$ 9.90	$ 57,800
	b		Waste Excess Fill from Spillway Excavation to Reservoir	-	CY	$ 4.00	$ -
	c		Reinforced Concrete				
		i	Spillway Crest	55	CY	$ 350	$ 19,300
		ii	Abutment Gravity Wall	45	CY	$ 600	$ 27,000
	d		3-feet Riprap and Bedding (D50 = 12-inch)	805	CY	$ 100	$ 80,500
6			Outlet Works				$ -
	a		Excavation, Unclassified	3,500	CY	$ 6.15	$ 21,500
	b		Demolish and Remove Existing Intake Tower/Bridge/Controls	1	LS	$ 50,000	$ 50,000
	c		Intake Structure	1	LS	$ 65,000	$ 65,000
	d		Intake Gate (21-inch x 21-inch)	1	EA	$ 35,000	$ 35,000
	e		Inlet Structure Trash Rack	1	EA	$ 15,000	$ 15,000
	f		Conduit (Supply/Install) 21-inch Welded Steel Pipe	198	LF	$ 350	$ 69,300
	g		Slip-line and Grout Existing Conduit (Supply/Install) 21-inch Welded Steel Pipe	230	LF	$ 500	$ 115,000
	h		Concrete Encasement	175	CY	$ 500	$ 87,500
	i		Compacted Fill (Source/Spread/Place/Compact)	4,500	CY	$ 9.84	$ 44,300
	j		Controls (Measurement Flumes)	1	LS	$ 50,000	$ 50,000
	k		Impact Basin	1	LS	$ 50,000	$ 50,000
	l		Riprap and Bedding (D50 = 12-inch)	45	CY	$ 100	$ 4,500
7			Access Roads	1	LS	$ 75,000	$ 75,000
8			Reclamation	1	AC	$ 7,500	$ 7,500
9			Emergency Warning System - NWS GOES Tired				$ -
	a		NWS Home Radios (GOES)	3	EA	$ 1,500	$ 4,500
	b		Reservoir Level Gage	1	EA	$ 25,000	$ 25,000
	c		Reservoir Inlet Level Gage (remote powered)	1	EA	$ 12,500	$ 12,500
	d		Sirens	3	EA	$ 15,000	$ 45,000
	e		Spillway Level Sensor System w\Telemetry (GOES)	1	LS	$ 50,000	$ 50,000
	f		Power to Dam Crest	1	Allow	$ 75,000	$ 75,000
10			Unlisted Items (5%)	1	LS	$ 192,000	$ 192,000
11			Mobilization, Bonds, Insurance (10%)	1	LS	$ 385,000	$ 385,000
			Estimated Direct Construction Cost				**$ 4,425,200**
			Contingency (30%)				$ 1,328,000
			Construction Engineering				$ 450,000
			Environmental Mitigation/Compliance and Monitoring (Allowance)				$ 200,000
Land Acquisition				1.9	AC	$ 4,000	$ 7,600
Flood Easement				10.4	AC	$ 4,000	$ 41,600
			Total Estimated Project Cost				**$ 6,452,400**

Table 24. Redmesa Reservoir Alternate No. 4 - 2020 Estimated Project Cost

900 AF Enlargement (2,076 AF Total Volume)

3/24/2020

Item Number			Description	Quantity	Unit	Unit Cost	Estimated Cost
1			Stream Diversion and Dewatering	1	LS	$ 50,000	$ 50,000
2			Clearing and Grubbing Dam Site	3.8	AC	$ 10,000	$ 38,000
3			Borrow Area Preparation and Reclamation	1	LS	$ 50,000	$ 50,000
4			Main Dam				
	a		Existing Embankment Excavation waste to Reservoir	-	CY	$ 5	$ -
	b		Foundation Excavation, Unclassified waste to Reservoir	7,460	CY	$ 5	$ 37,000
	c		Foundation Preparation (Dental Concrete & Spot Fills)	7,750	SY	$ 61.50	$ 477,000
	d		Right Abutment Grouting	1	LS	$ 510,000	$ 510,000
	e	i.	Zone 2 Shell (Source/Spread/Place/Compact) from Spillway Excavation	7,380	CY	$ 9.90	$ 73,000
	e	ii.	Zone 2 Shell (Source/Spread/Place/Compact) from Reservoir Borrow Area	72,285	CY	$ 14.00	$ 1,012,000
	f		Zone 1 Core (Source/Spread/Place/Compact) from Reservoir Borrow Area	26,260	CY	$ 14.00	$ 368,000
	g		3-feet Filter - Chimney and Blanket (Source/Deliver/Place/Compact)	6,660	CY	$ 100	$ 666,000
	h		2-feet Riprap and Bedding (D50 = 12-inch)	1,930	CY	$ 100	$ 193,000
	i		Instrumentation	1	LS	$ 50,000	$ 50,000
	j		6-inch Aggregate base course (Dam Crest)	1,680	SY	$ 15	$ 25,000
5			Spillway				
	a		Compacted Fill (Source/Spread/Place/Compact) from Spillway Excavation	7,225	CY	$ 9.90	$ 72,000
	b		Compacted Fill (Source/Spread/Place/Compact) from Reservoir Borrow Area	-	CY		$ -
	c		Waste Excess Fill from Spillway Excavation to Reservoir	-	CY	$ 4.00	$ -
	d		Reinforced Concrete				
		i	Spillway Crest	60	CY	$ 350	$ 21,000
		ii	Abutment Gravity Wall	75	CY	$ 600	$ 45,000
	e		3-feet Riprap and Bedding (D50 = 12-inch)	625	CY	$ 100	$ 63,000
6			Outlet Works				
	a		Excavation, Unclassified	3,500	CY	$ 6.15	$ 22,000
	b		Demolish and Remove Existing Intake Tower/Bridge/Controls	1	LS	$ 50,000	$ 50,000
	c		Intake Structure	1	LS	$ 65,000	$ 65,000
	d		Intake Gate (21-inch x 21-inch)	1	EA	$ 35,000	$ 35,000
	e		Inlet Structure Trash Rack	1	EA	$ 15,000	$ 15,000
	f		Conduit (Supply/Install) 21-inch Welded Steel Pipe	210	LF	$ 350	$ 74,000
	g		Slip-line and Grout Existing Conduit (Supply/Install) 21-inch Welded Steel Pipe	230	LF	$ 500	$ 115,000
	h		Concrete Encasement	175	CY	$ 500	$ 88,000
	i		Compacted Fill (Source/Spread/Place/Compact)	4,500	CY	$ 9.84	$ 44,000
	j		Controls (Measurement Flumes)	1	LS	$ 50,000	$ 50,000
	k		Impact Basin	1	LS	$ 50,000	$ 50,000
	l		Riprap and Bedding (D50 = 12-inch)	45	CY	$ 100	$ 5,000
7			Access Roads	1	LS	$ 75,000	$ 75,000
8			Reclamation	1	AC	$ 7,500	$ 7,500
9			Emergency Warning System - NWS GOES Tired				
	a		NWS Home Radios (GOES)	3	EA	$ 1,500	$ 4,500
	b		Reservoir Level Gage	1	EA	$ 25,000	$ 25,000
	c		Reservoir Inlet Level Gage (remote powered)	1	EA	$ 12,500	$ 12,500
	d		Sirens	3	EA	$ 15,000	$ 45,000
	e		Spillway Level Sensor System w\ Telemetry (GOES)	1	LS	$ 50,000	$ 50,000
	f		Power to Dam Crest	1	Allow	$ 75,000	$ 75,000
10			Unlisted Items (5%)	1	LS	$ 233,000	$ 233,000
11			Mobilization, Bonds, Insurance (10%)	1	LS	$ 466,000	$ 466,000
			Estimated Direct Construction Cost				**$ 5,356,500**
			Contingency (30%)				$ 1,607,000
			Construction Engineering				$ 450,000
			Environmental Mitigation/Compliance and Monitoring (Allowance)				$ 200,000
Land Acquisition				2.1	AC	$ 4,000	$ 8,400
Flood Easement				19.4	AC	$ 4,000	$ 77,600
			Total Estimated Project Cost				**$ 7,699,500**

03/04/2020
SGM

Table 24. Redmesa Reservoir Alternate No. 5 - 2020 Estimated Project Cost

1,190 AF Enlargement (2,366 AF Total Volume)

3/24/2020

Item Number			Description	Quantity	Unit	Unit Cost	Estimated Cost
1			Stream Diversion and Dewatering	1	LS	$ 50,000	$ 50,000
2			Clearing and Grubbing Dam Site	3.3	AC	$ 10,000	$ 33,000
3			Borrow Area Preparation and Reclamation	1	LS	$ 50,000	$ 50,000
4			Main Dam				
	a		Existing Embankment Excavation waste to Reservoir	5,520	CY	$ 5	$ 28,000
	b		Foundation Excavation, Unclassified waste to Reservoir	6,480	CY	$ 5	$ 32,000
	c		Foundation Preparation (Dental Concrete & Spot Fills)	8,300	SY	$ 61.50	$ 510,000
	d		Right Abutment Grouting	1	LS	$ 510,000	$ 510,000
	e	i.	Zone 2 Shell (Source/Spread/Place/Compact) from Spillway Excavation	1,150	CY	$ 9.90	$ 11,000
	e	ii.	Zone 2 Shell (Source/Spread/Place/Compact) from Reservoir Borrow Area	95,705	CY	$ 14.00	$ 1,340,000
	f		Zone 1 Core (Source/Spread/Place/Compact) from Reservoir Borrow Area	31,910	CY	$ 14	$ 447,000
	g		3-feet Filter - Chimney and Blanket (Source/Deliver/Place/Compact)	7,285	CY	$ 100	$ 729,000
	h		2-feet Riprap and Bedding (D50 = 12-inch)	2,345	CY	$ 100	$ 235,000
	i		Instrumentation	1	LS	$ 50,000	$ 50,000
	j		6-inch Aggregate base course (Dam Crest)	1,750	SY	$ 15	$ 26,000
5			Spillway				
	a		Compacted Fill (Source/Spread/Place/Compact) from Spillway Excavation	7,920	CY	$ 9.90	$ 78,000
	b		Waste Excess Fill from Spillway Excavation to Reservoir	-	CY	$ 4.00	$ -
	c		Reinforced Concrete				
		i	Spillway Crest	45	CY	$ 350	$ 16,000
		ii	Abutment Gravity Wall	150	CY	$ 600	$ 90,000
	d		Riprap and Bedding (D50 = 12-inch)	475	CY	$ 100	$ 48,000
6			Outlet Works				
	a		Excavation, Unclassified	3,500	CY	$ 6.15	$ 22,000
	b		Demolish and Remove Existing Intake Tower/Bridge/Controls	1	LS	$ 50,000	$ 50,000
	c		Intake Structure	1	LS	$ 65,000	$ 65,000
	d		Intake Gate (21-inch x 21-inch)	1	EA	$ 35,000	$ 35,000
	e		Inlet Structure Trash Rack	1	EA	$ 15,000	$ 15,000
	f		Conduit (Supply/Install) 21-inch Welded Steel Pipe	230	LF	$ 350	$ 81,000
	g		Slip-line and Grout Existing Conduit (Supply/Install) 21-inch Welded Steel Pipe	230	LF	$ 500	$ 115,000
	h		Concrete Encasement	175	CY	$ 500	$ 88,000
	i		Compacted Fill (Source/Spread/Place/Compact)	4,500	CY	$ 9.84	$ 44,000
	j		Controls (Measurement Flumes)	1	LS	$ 50,000	$ 50,000
	k		Impact Basin	1	LS	$ 50,000	$ 50,000
	l		3-feet Riprap and Bedding (D50 = 12-inch)	45	CY	$ 100	$ 4,500
7			Access Roads	1	LS	$ 75,000	$ 75,000
8			Reclamation	1	AC	$ 7,500	$ 7,500
9			Emergency Warning System - NWS GOES Tired				
	a		NWS Home Radios (GOES)	3	EA	$ 1,500	$ 4,500
	b		Reservoir Level Gage	1	EA	$ 25,000	$ 25,000
	c		Reservoir Inlet Level Gage (remote powered)	1	EA	$ 12,500	$ 12,500
	d		Sirens	3	EA	$ 15,000	$ 45,000
	e		Spillway Level Sensor System w\ Telemetry (GOES)	1	LS	$ 50,000	$ 50,000
	f		Power to Dam Crest	1	Allow	$ 75,000	$ 75,000
10			Unlisted Items (5%)	1	LS	$ 259,900	$ 260,000
11			Mobilization, Bonds, Insurance (10%)	1	LS	$ 520,000	$ 520,000
			Estimated Direct Construction Cost				**$ 5,977,000**
			Contingency (30%)				$ 1,793,000
			Construction Engineering				$ 450,000
			Environmental Mitigation/Compliance and Monitoring (Allowance)				$ 200,000
Land Acquisition				2.2	AC	$ 4,000	$ 8,800
Flood Easement				28.4	AC	$ 4,000	$ 113,600
			Total Estimated Project Cost				**$ 8,542,400**

03/04/2020
SGM

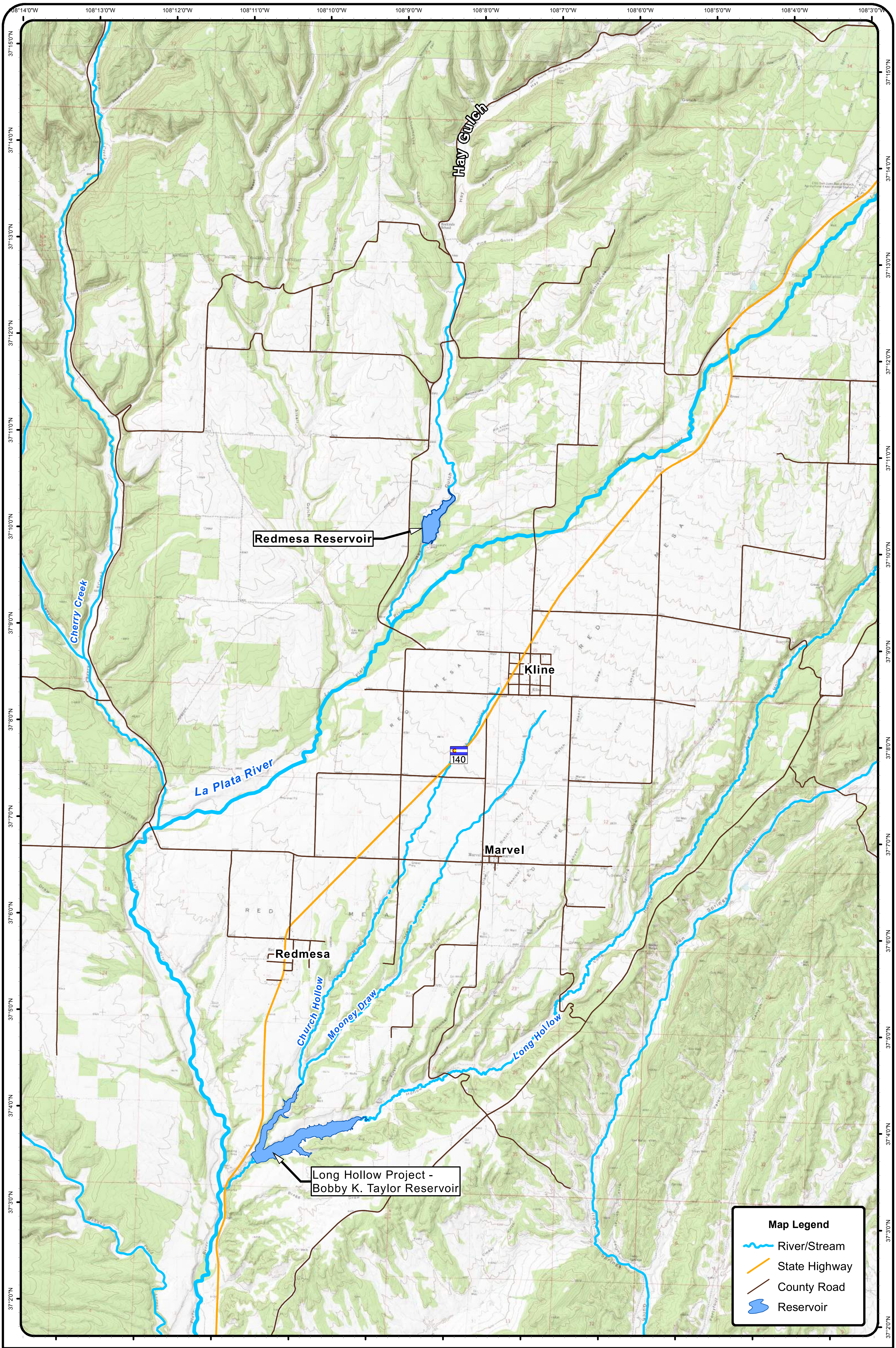
Table 26. Redmesa Reservoir Total Project Cost

Alternate No. 5

1,190 AF Enlargement (2,366 AF Total Volume)
4/10/2020

Phase	Description	Estimated Cost
1	Final Survey, Geotechnical, and Engineering Design	$ 467,400
1	Final Permitting and NEPA Compliance	$ 115,000
	Phase 1 Subtotal	*$ 582,400*
2	Direct Construction Cost	$ 5,977,000
2	Contingency (30%)	$ 1,793,000
2	Construction Engineering	$ 450,000
2	Environmental Mitigation Project	$ 200,000
2	Land and Easement Acquisition	$ 122,400
	Phase 2 Subtotal	*$ 8,542,400*
	Project Total	**$ 9,124,800**

FIGURES



SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

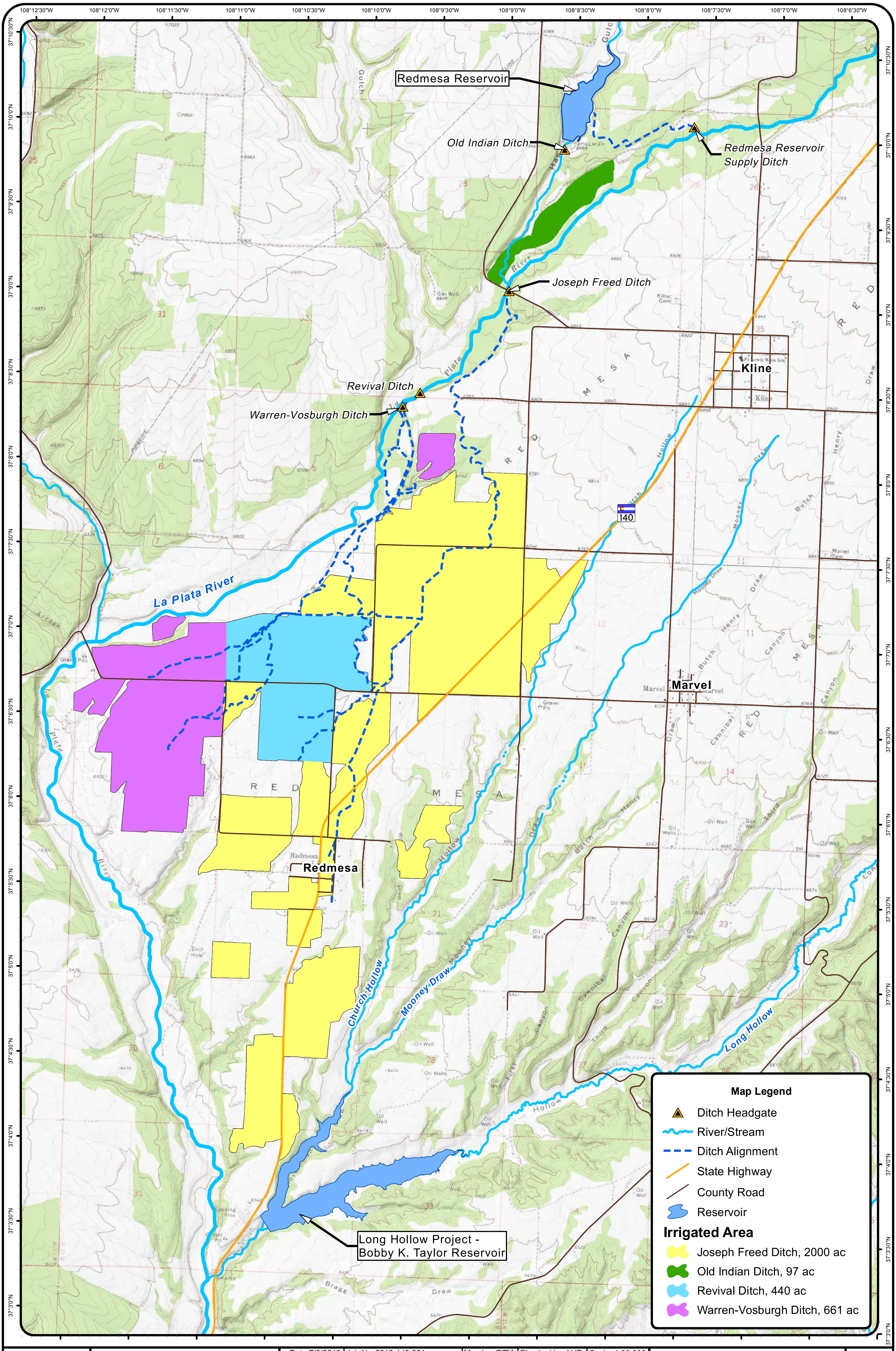
Figure 1
Vicinity Map
Redmesa Study Area

Date:7/6/2018 | Job No. 2018-148.001 | Map by: RZM | Checked by: DBM | Scale: 1:63,360

Data Sources: ESRI, USGS, CDOT

File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\Fig1-VicinityMap.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.



SGM

555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

Figure 2
Project Area
Redmesa Study Area

Date:7/6/2018	Job No. 2018-148.001	Map by: RZM	Checked by: NJD	Scale: 1:36,000

Data Sources: ESRI, USGS, CDOT, CDSS, LPWCD and aerial photography

File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\Fig2-ProjectArea.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 3,000 6,000 Feet

1 inch = 3,000 feet

N

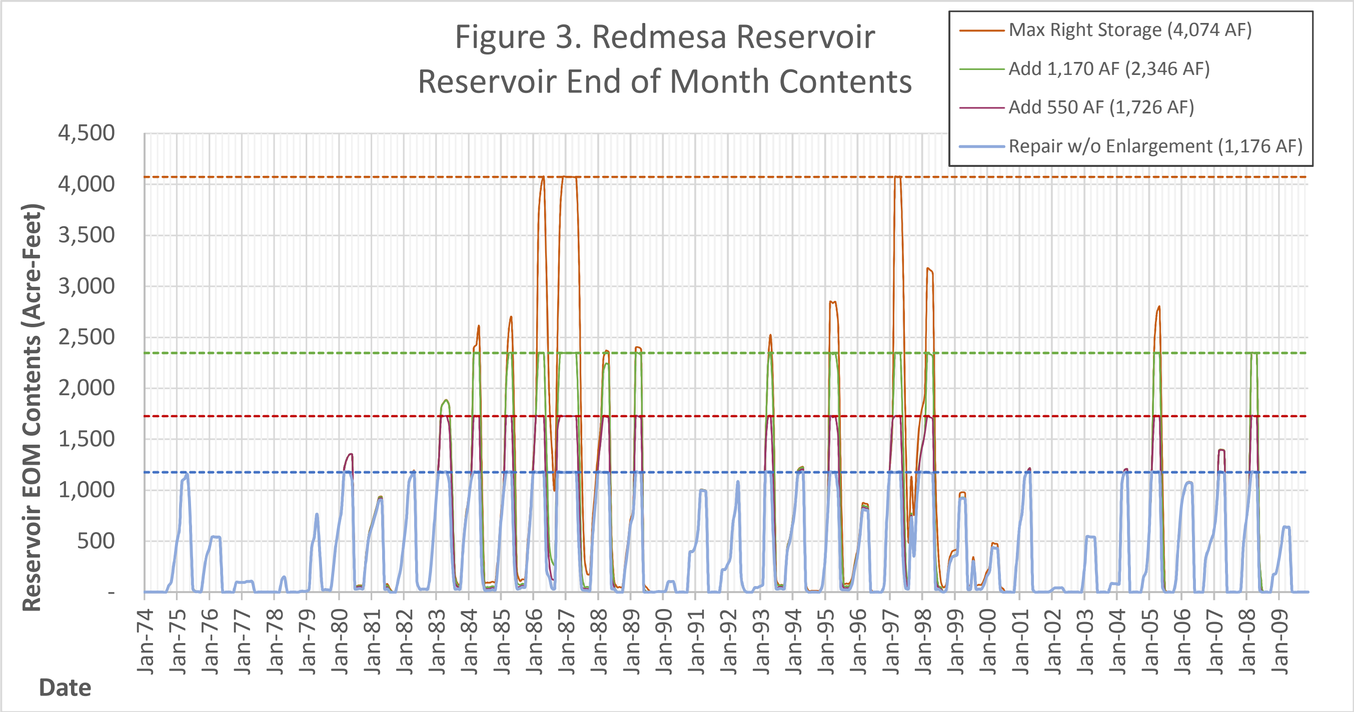


Figure 3. Redmesa Reservoir
Reservoir End of Month Contents

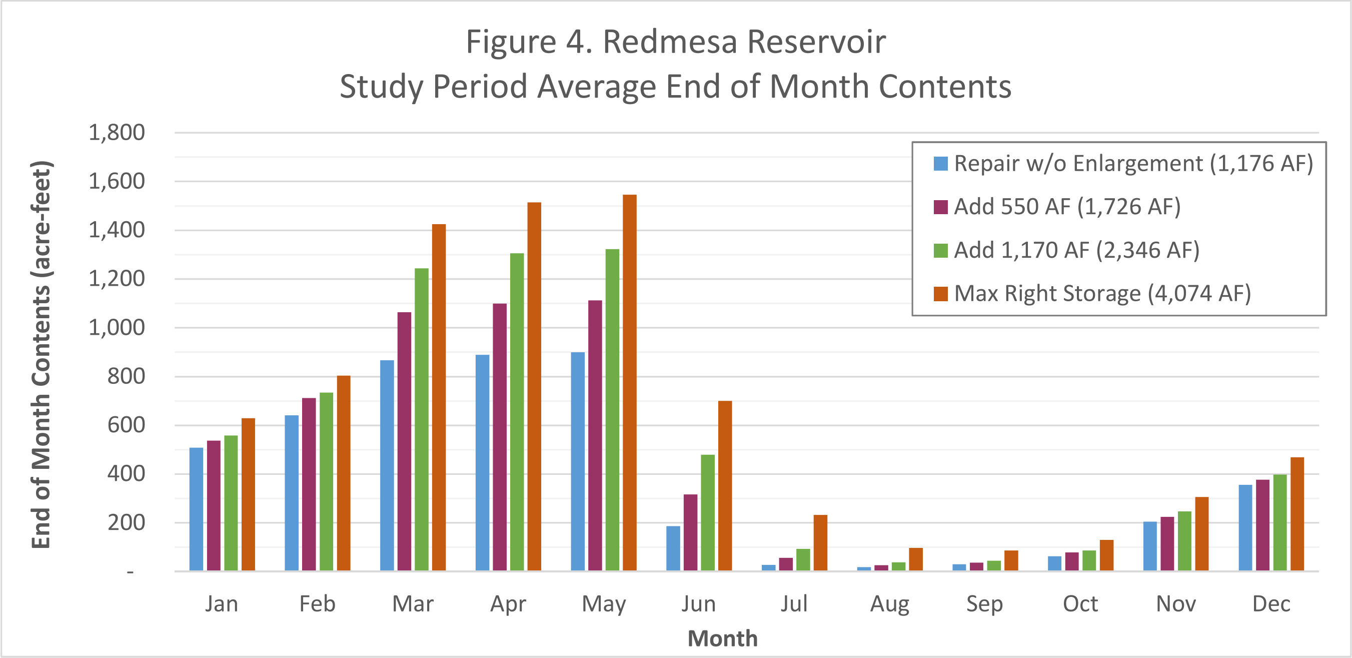


Figure 4. Redmesa Reservoir
Study Period Average End of Month Contents

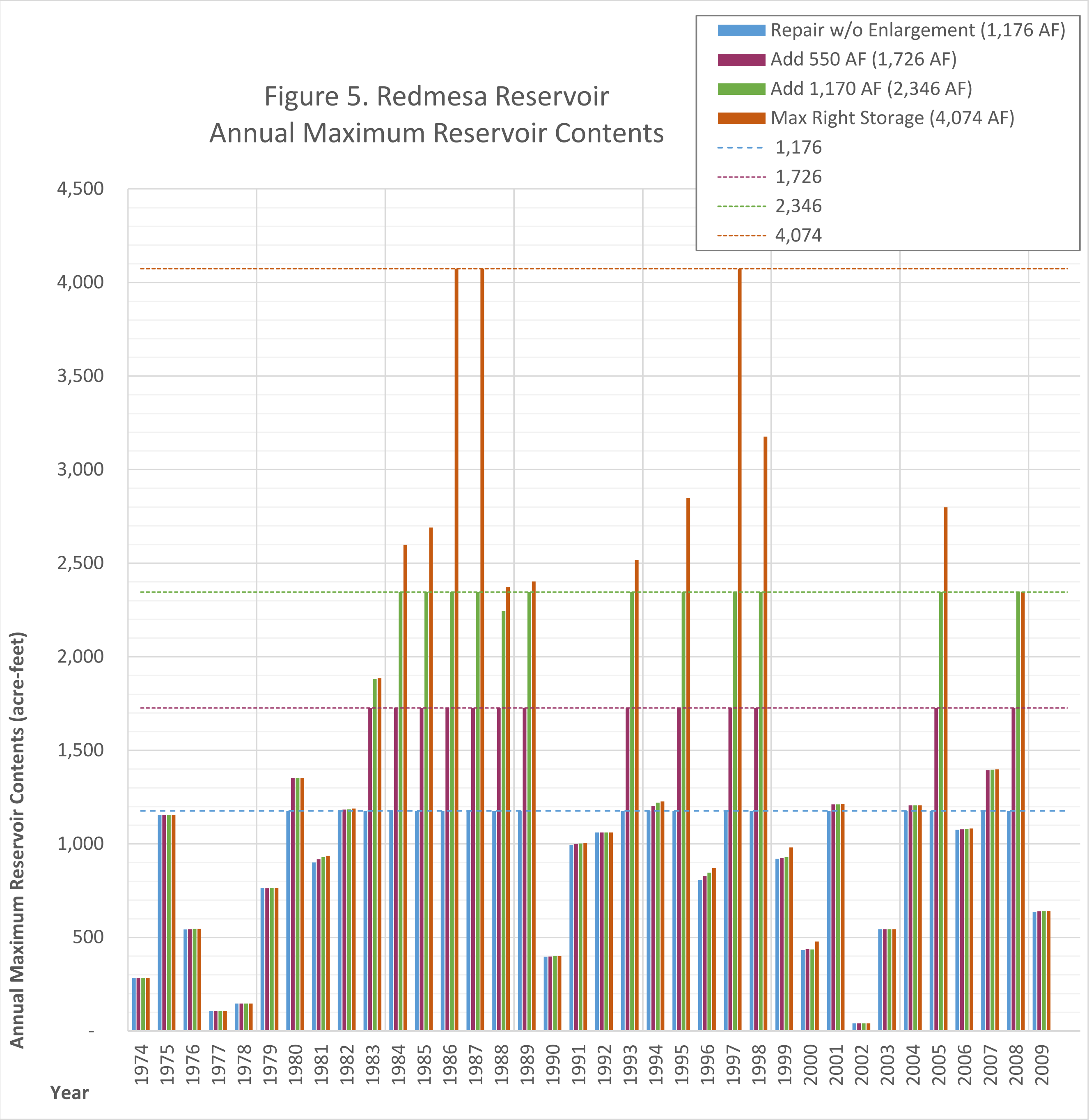


Figure 5. Redmesa Reservoir
Annual Maximum Reservoir Contents

SGM
7/06/2018

P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\E-Reports\SGM\FinalFeasibilityStudy\Tbls&Figs\
ModelResultsGraph-Report

Figure 6. Redmesa Reservoir End of Month Contents

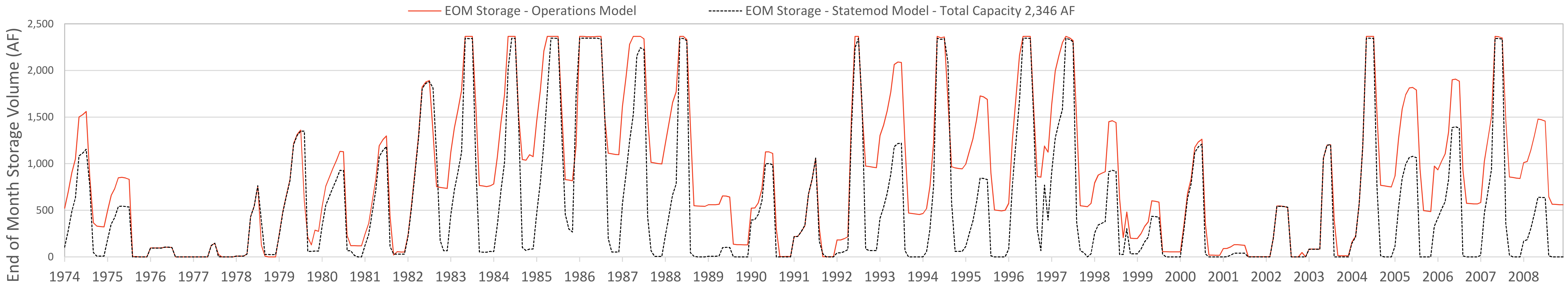
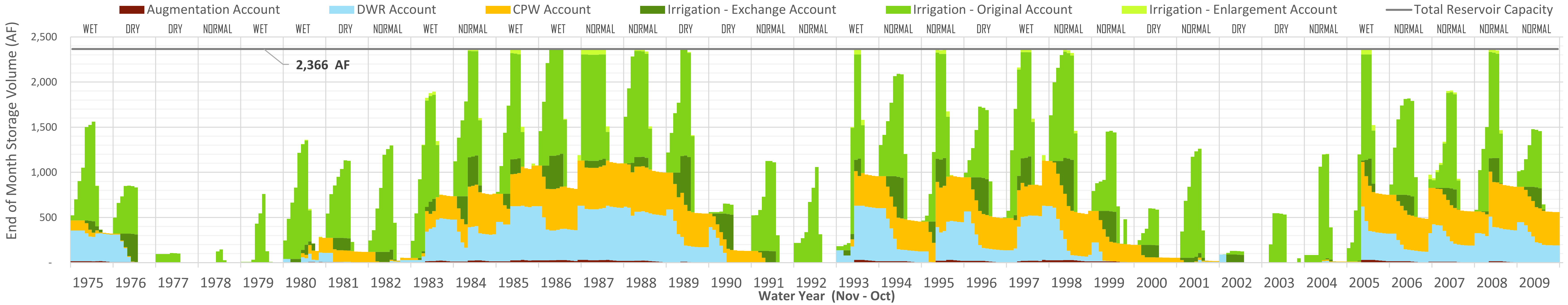
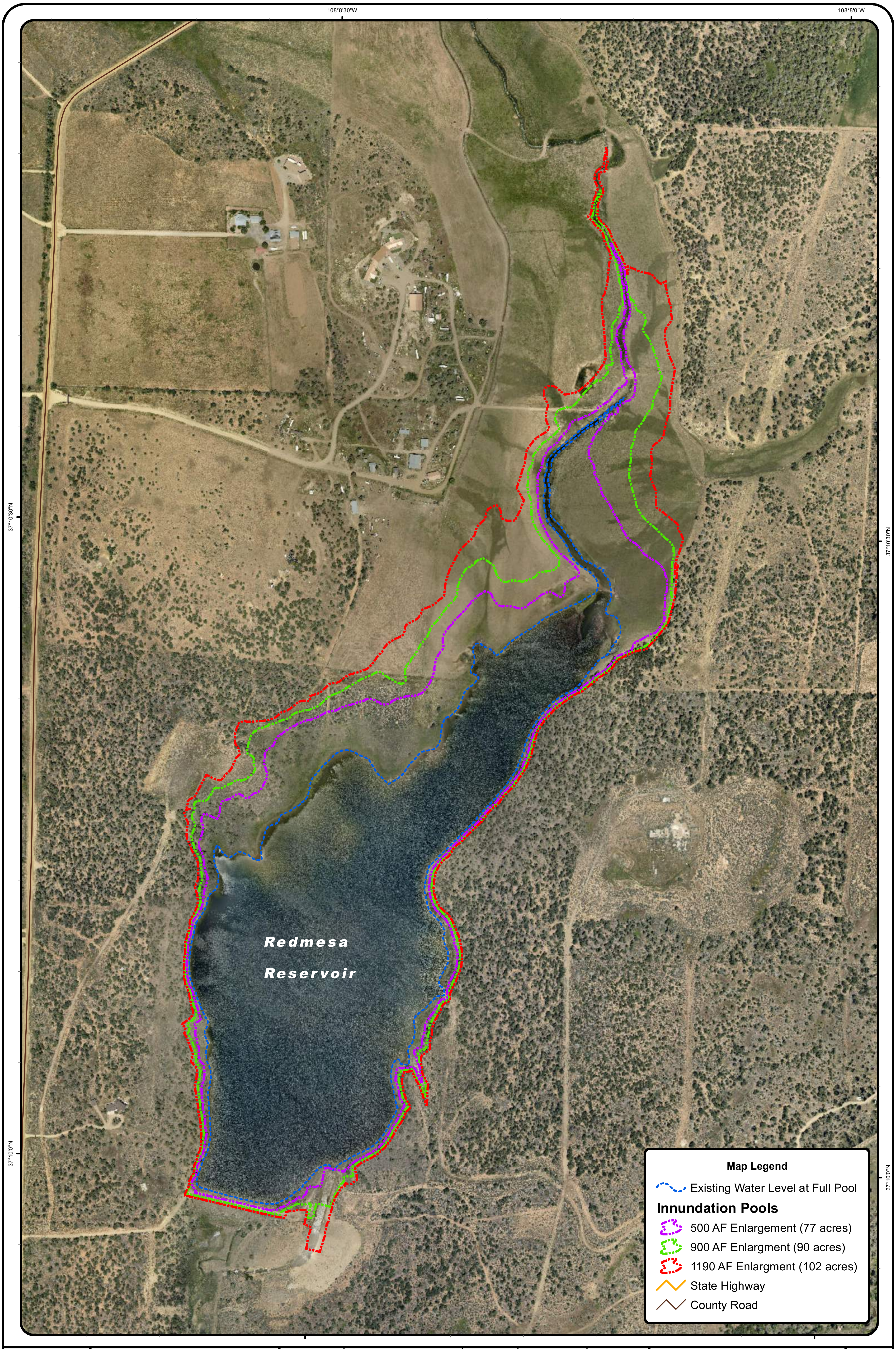


Figure 7. Redmesa Reservoir Storage by Account



SGM
3/26/2020



SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

Figure 8
Redmesa Reservoir Enlargement

Date:12/13/2019 | Job No. 2018-148.001 | Map by: ANW | Checked by: NJD | Scale: 1:4,800

Data Sources: ESRI, Craig Survey, La Plata County GIS

File: P:\Project Files\2018-148.001 RedmesaReservor&Ditch Company\H-Dwgs\GIS\MXDs\Fig10-ReservoirExtent_20191213.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 400 800 Feet

1 inch = 400 feet

N

APPENDIX A. REDMESA RESERVOIR & DITCH COMPANY FINANCIAL SUMMARIES (2016 – 2018)

APPENDIX B. WETLAND DELINEATION REPORT – REDMESA RESERVOIR ENLARGEMENT PROJECT

WETLAND DELINEATION REPORT
REDMESA RESERVOIR ENLARGEMENT PROJECT

REDMESA RESERVOIR, LA PLATA COUNTY, COLORADO

June 2018

Prepared by

SGM

555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
970.385.2341 fax

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES (ALL FIGURES ARE AT THE END OF THE REPORT)

LIST OF APPENDICES

1.0 Executive Summary

This report was prepared consistent with the “1987 Corps of Engineers Wetland Delineation Manual” and “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)” to identify and characterize wetlands and other waters of the U.S. within the ordinary high-water mark (existing “footprint) of Redmesa Reservoir (also known as Mormon Reservoir) to support an Approved Jurisdictional Determination (AJD) for the study area. Preliminary work completed by SGM for a feasibility assessment for enlargement of Redmesa Reservoir indicated the potential presence of a relatively large amount of wetlands within the footprint of the existing reservoir. If the enlargement impacted a relatively large acreage of wetlands (>10 acres), there would be a significant bearing on the cost and feasibility of the project due to the need to obtain a Section 404 permit and provide compensatory mitigation.

Therefore, additional field work was completed by SGM to determine the extent of areas that meet the criteria for wetland within the reservoir footprint. This report includes the results of this additional assessment, and was prepared consistent with the “Minimum Standards for Acceptance of Aquatic Resources Delineation Reports” (U.S. Army Corps of Engineers, January 2016).

This study found that most of the study does not meet the criteria for wetland under Section 404. Most of the bottom of Redmesa Reservoir above the “dead” water storage pool is either bare sediment or sediment dominated by upland weeds, several of which are on the La Plata County (and State of Colorado) noxious weed list. These plants include: field bindweed, yellow sweet clover, absinth wormwood, and leafy spurge. In addition, there are several areas dominated by dogbane, which is not on the noxious weed list, but is a toxic plant.

The “soil” in the reservoir bottom is not native soil, but sediment that has accumulated in the reservoir for over the past 100 years since its original construction. This sediment is generally silty in texture but varies in characteristics throughout the study area. Hydric soil indicators are generally weak and mostly include redox dark surface; and they occur over most of the study area which indicates that the sediment is not a good wetland indicator in the study area.

Lastly, the source of water for the reservoir is mostly artificial–from ditch diversions from the La Plata River. The amount of native flow in Hay Gulch is not known, but it is very likely insufficient to come close to filling the reservoir, since the reservoir does not fill every year, even with the ditch diversions. Therefore, the frequency that the vegetated areas in the bottom of the reservoir have wetland hydrology (are flooded or saturated for at least 2 weeks per year) is not known.

In summary, there are a total of 1.752 acres that meet the three criteria for being wetland under Section 404. These areas are dominated by facultative species, including dogbane which is poisonous, and include noxious weeds. It is questionable the extent to which these "wetlands" provide aquatic resource functions. The remainder of the study area (52.34 acres) is either bare, unconsolidated sediment, or sediment vegetated mainly by upland weeds.

2.0 Introduction/Purpose

SGM is in the process of completing a feasibility study for the enlargement of Redmesa Reservoir, which was originally constructed in 1910 along Hay Gulch, a tributary to the La Plata River. The feasibility study included an evaluation of permitting considerations for the project, including for wetlands and Section 404 permitting. Preliminary work by SGM indicated that wetlands may occur in three areas affected by reservoir enlargement: immediately downstream of the dam; within the footprint of the reservoir; and along Hay Gulch upstream of the reservoir. It was possible to identify wetlands above and below the reservoir; the total amount of wetland in these areas (and potential impacts) is relatively small and would likely not affect project feasibility. However, it was not possible to identify vegetation and determine the presence of wetlands within the reservoir footprint, but preliminary work indicated the possible presence of a relatively large amount of wetlands, which if impacted, could have a significant bearing on project feasibility due to the costs associated with Section 404 permitting and required mitigation.

Therefore, this report was prepared to further evaluate areas within the reservoir footprint in terms of meeting the criteria for wetlands, and to support a request for an AJD for this area.

Key to this delineation is an understanding of the hydrology of Redmesa Reservoir (RMR). RMR was constructed to store water decreed for irrigation in Hay Gulch. Hay Gulch is a relatively dry watershed. Water is diverted by the Hay Gulch Ditch and the Redmesa Supply Ditch from the La Plata River to the reservoir. There is no streamflow data or records for Hay Gulch (without including the diversions); and it is not known whether it was or would be an intermittent or a perennial stream. A preliminary water balance was completed by SGM using the USGS program StreamStats to estimate the yield of Hay Gulch and diversion records for the ditches. This evaluation found that 64 percent of the water in the reservoir, on average, is diverted by the ditches from the La Plata River so that the natural yield of Hay Gulch is relatively small.

2.1 Contact Information

Applicant and property owner:

Redmesa Reservoir and Ditch Company
C/o Trent Taylor, Board Member

970-769-0950
Email: trenttaylor02@gmail.com

Agent:

SGM
C/o Dave Mehan, P.W.S.
Senior Scientist
555 Rivergate Lane, Suite B4-82
Durango, CO 81301

970-385-2340
Email: DaveM@SGM-Inc.com

3.0 Study Area Location

The study area consists of approximately 54 acres within the existing footprint of RMR–which generally coincides with the ordinary high water mark (spillway capacity) of the reservoir. RMR is located along Hay Gulch, approximately 15.2 miles southwest of Durango, Colorado in La Plata County. The study area is located in parts of Section 22 and 27, T 34 North, R 12 West of the NMPM. Figure 1 is a vicinity map of the study area.

The study area is located along Hay Gulch which is a tributary of the La Plata River, which in turn, is tributary to the San Juan River. To reach the study area, take State Highway 160 west from Durango to Hesperus and State Highway 140. Take 140 south around 11.5 miles to Kline. At Kline, take County Road 119 West, then north around 2.7 miles until you are west of RMR. Turn into the private drive to access RMR (Note: The reservoir and surrounding lands are private property and not open to the public. The Redmesa Reservoir Company or a representative should be contacted for access.)

4.0 Description of Study Area - Existing Conditions

RMR is located along Hay Gulch on Red Mesa, which has a semi-arid climate. The elevation of the full pool of the reservoir is 6,892.8 feet above mean sea-level, and the average precipitation for the area is 18.2 inches per year (based on the Fort Lewis Weather Station).

The land immediately adjacent to RMR is mostly pinon-juniper with some upland shrub/grassland. Irrigated meadows (which were likely pinon-juniper or shrub/grassland) occur upstream of the reservoir. The study area itself represents the bottom of the reservoir, part of which does have standing water year-round, and part of which is intermittently-exposed sediment.

Figure 2 shows the National Wetland Inventory (NWI) mapping for the study area and adjacent area. The NWI mapping shows the footprint of the reservoir as being open water. Areas to the north, northwest, east and south of RMR are shown as emergent wetland. Also, the channel of Hay Gulch is shown as intermittent stream channel (R4SBC).

Figure 3 shows the soils mapped within the study area and adjacent area. According to the Natural Resources Conservation Service (NRCS) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov) most of the reservoir areas is shown as open water. Most of the area adjacent to RMR is shown to have Vosburg fine sandy loam soil, which is described as a deep, well-drained soil derived from alluvium with a depth to groundwater of greater than 80 inches. The area to the southeast of the reservoir is shown to be Lazear-rock outcrop complex. None of the soils in the area are listed as hydric soils.

5.0 Methods

This wetland delineation was completed by Dave Mehan of SGM. Mr. Mehan is a Professional Wetland Scientist with over 30 years of experience with wetland delineations and is very familiar with the occurrence and characteristics of wetlands in the Rocky Mountain Region. Assistance was provided by Ms. Kelly Haun, environmental specialist.

Wetlands and other waters of the U.S. were identified and delineated using the methods and criteria in the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region” (Manual), Corps 2010, which is the manual applicable to the study area. A combination of field work and review of existing information was completed. Existing information reviewed included:

- NRCS Web Soil Survey,
- National Wetland Inventory Mapping,
- Aerial photographs (from Google Earth and other sources),
- Diversion Records, and
- Topographic mapping.

Field work was completed on June 7, 2018 and included observations of vegetation communities, soils and hydrologic conditions in the study area. The occurrence of plant species in wetlands was determined using the 2016 "Regional Wetland Plant List for the Arid West Region". In general, the "dominance test" as described in the Manual was used to determine dominance of plant species.

Soils were observed in soil pits dug in the study area to evaluate the presence of hydric soil indicators. Soil colors were determined using Munsell Soil Color charts. The study area was observed for the presence of any wetland hydrologic indicators, as described in "Field Indicators of Hydric Soils in the United States".

Field observations were recorded on Wetland Determination Data Forms (WDDFs) and representative photographs were taken. The locations of features and WDDFs were recorded with a survey-grade GPS.

6.0 Results

Figure 4 shows the results of the delineation. WDDFs are included in Appendix A, and representative photographs are included in Appendix B. Table 1 is a list of plant species in the study area, and Table 2 summarizes the resources present.

Most of the study area is unconsolidated sediment (Photos 1 and 13), with and without upland vegetation, which consists mostly of weeds (field bindweed (*Convolulus arvensis*) and absinth wormwood (*Artemesia absinthium*)) (Photos 7, 12, 17 and 18). Several areas of yellow sweetclover *(Melilotus officinalis*) and leafy spurge (*Euphorbia esula*) also exist within the study area (Photos 16 and 21). All of these species are on the La Plata County (and State of Colorado) noxious weed list.

Patches of two species which are rated as facultative (FAC) occur towards the north end of the study area: Dogbane (*Apocynum cannabinum*) and wild licorice (*Glycyrrhiza lepidota*) (Figure 4)*.* Areas with dogbane are described in WDDFs 2 and 6, and shown in Photos 3, 4, 8 and 20. This species generally occurs with field bindweed and absinth wormwood, which are upland species.

Dogbane is a poisonous plant and is rated FAC in the arid west region (though we question its functions and values as a wetland species). The vegetation criterion is met at WDDF2 if the "dominance test" is used, but it is not met if the "prevalence index" is used.

Absinth wormwood (Photo 7) is not rated as a wetland plant, but is on the List A of the noxious weeds for the county and State of Colorado.

Wild licorice is dominant in two areas (Figure 4) and occurs with field bindweed (WDDF 3). Areas dominated by wild licorice are shown in Photos 5 and 6. This species is not the County Noxious Weed List, but is listed as a weed in "Weeds of the West" (Whitson, et al. 1991).

A small fringe of emergent wetlands dominated by spikerush (*Eleocharis* spp) and reed canary grass (*Phalaris arundinacea)* occurs along the Hay Gulch channel at WDDF 7 (Photo 10). And several relatively small cottonwoods exist at WDDF 10 (Photo 15), though the dominant species in this area are leafy spurge and bindweed.

The soil within the study area is sediment deposited over the years within the reservoir. The texture of the soil is generally silty to a depth of 12 inches. As discussed previously, the Websoil Survey shows areas within the reservoir footprint (and around parts of the reservoir) to be Vosburg fine sandy loam which is a well-drained soil, with reported textures including: fine sandy loam, clay loam, loam and sandy clay loam–which vary from field observations. This soil is not on the hydric soil list.

Relatively weak hydric soil indicators occur in the sediment throughout the study area, regardless of the plant community present. For example, redox dark surface occurs in areas with dogbane and wild licorice at WDDF 2, 3 and 6. However, redox concentrations are significantly more distinct in the area at WDDF 12, which is dominated by upland weeds (see Photos 9 compared to 19). This suggests that the sediment in the study area is not a good indicator of the presence of wetlands.

As discussed previously, RMR is in a relatively dry basin, and most of the water in the reservoir comes from the Hay Gulch and Redmesa Supply Ditches, both of which divert from the La Plata River. There is no evidence of shallow groundwater or lateral flow into the reservoir, so that the sole water supply for the vegetation in the reservoir is likely from surface water.

Aerial photographs so show the reservoir to be full or close to full during the growing season in some years. They also show the reservoir with very little water and most of the bottom as exposed sediment. It is not known whether the study area is inundated or has saturated soil 51 or more out of 100 years (probability of > 50 percent), as required by the delineation manual.

In summary, and as shown in Table 2, there is a total of 1.752 acres of areas within the study area that technically meet the criteria for wetland, per the delineation manual. However, the sediment in the reservoir is not a good indicator of wetlands; and it is assumed that the hydrology parameter is met. Lastly, these areas are dominated by the FAC species dogbane, which is poisonous, and wild licorice, which is weedy; other species present are upland weeds and no other hydrophytes exist. In addition, if the “prevalence index” is used to assess the plant community, the hydrophytic vegetation test is not met (see WDDF2). These factors suggest that these areas provide minimal to no aquatic functions.

7.0 References

- “A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States” (Corps 2008).
- “A Guide to Ordinary High Water Mark Delineation for Non-Perennial Streams….” (Corps 2014).
- “Field Indicators of Hydric Soils in the United States (Version 8.1)” (USDA and NRCS 2017)
- Google Earth.
- Munsell Soil Color Charts. Kollmorgen Instruments Corp.
- National Wetland Plant List 2016.
- “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)” (Corps 2010).
- NRCS WebSoil Survey.
- “Weeds of the West”, T.D. Whitson, et al, 1991. Western Society of Weed Science.

Tables

Table 1. List of Plant Species in Study Area

Redmesa Reservoir Bottom, La Plata County, Colorado

Common Name	Scientific Name	Indicator Status (Mountain West)	Stratum
Absinth wormwood	*Artemesia absinthium*	NR**	Herb
Field bindweed	*Convolvulus arvensis*	FACU**	Herb
Dogbane	*Apocynum cannabinum*	FAC	Herb
Leafy spurge	*Euphorbia esula*	FACU**	Herb
Reed canary grass	*Phalaris arundincea*	FACW	Herb
Spikerush	*Eleocharis spp.*	OBL	Herb
Plains cottonwood	*Populus deltoides*	FACW	Herb
Yellow Sweetclover	*Meliltotus offincinalis*	FACU**	Herb
Wild Licorice	*Glycyrrhiza lepidota*	FAC	Herb
Sandbar willow	*Salix exigua*	FACW	Shrub

NR=not rated (assumed to be FACU)
** Listed noxious weed in La Plata County.
Highlighted cells indicate dominant species.

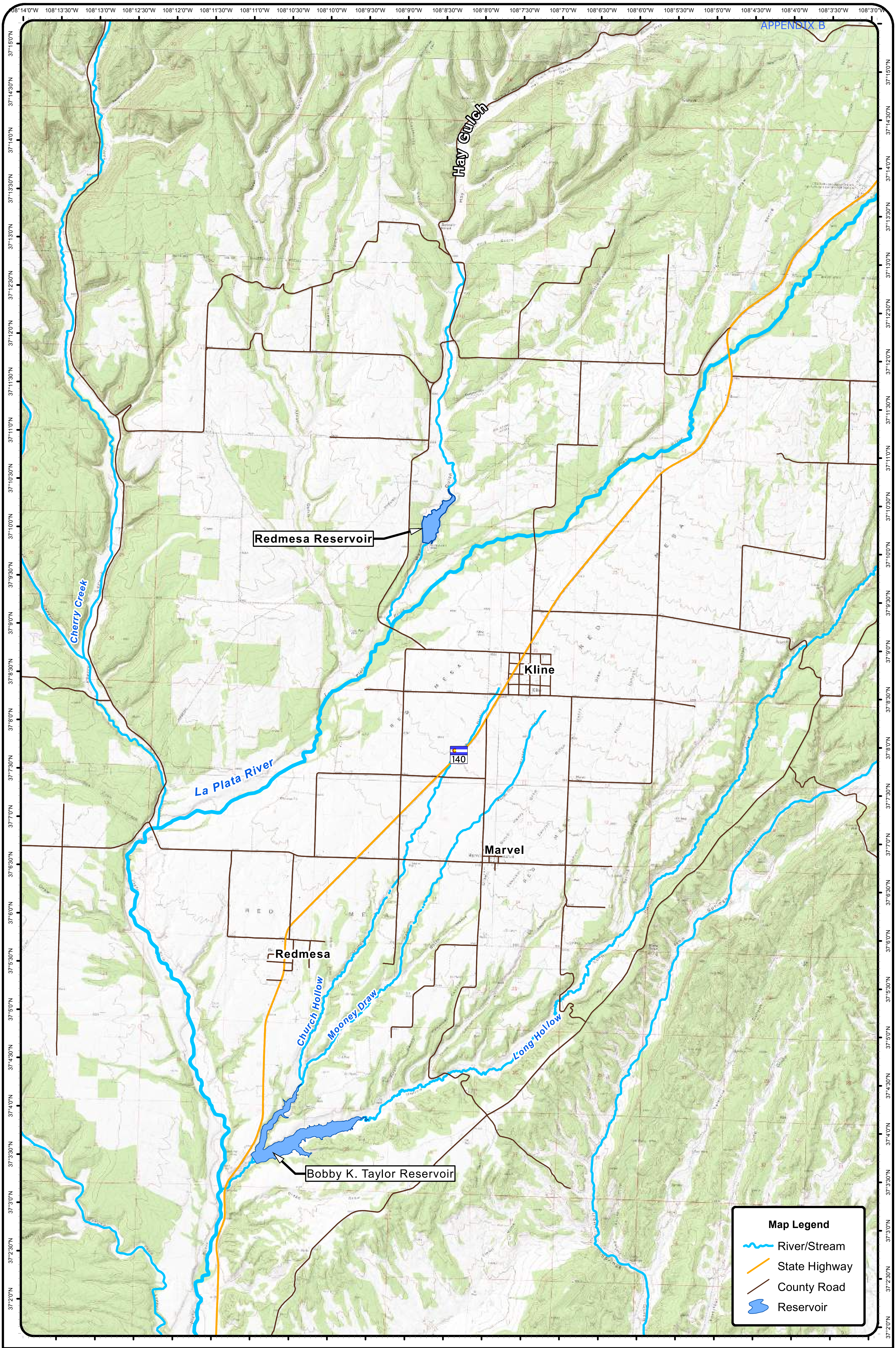
Table 2. Description of Wetlands and Aquatic Resources(1)

Redmesa Reservoir Bottom, La Plata County, Colorado

Label	Type(2)	Latitude/ Longitude	Acres	Notes
Bottom	LUB3K	37°10'6.48"N 108° 8'30.88"W	52.34	Sediment, intermittently flooded. The extent of exposed sediment varies each year depending on hydrologic conditions.
Fringe Emergent	R2EM3	37°10'19.61"N 108° 8'19.88"W	0.002	Small fringe along Hay Gulch
Channel	R2UB5	37°10'13.60"N 108° 8'25.25"W	3,955 L.F.	Hay Gulch channel within reservoir
Emergent	PEMK	37°10'19.47"N 108° 8'20.69"W	1.10	Dominated by dogbane which is poisonous. Of questionable aquatic resource value.
Emergent	PEMK	37°10'20.06"N 108° 8'20.93"W	0.65	Dominated by wild licorice. Of questionable aquatic resource value.
Total Wetlands and Aquatic Resources in Study Area			**54.092**	

Footnotes:
1) See Figure 4 for locations.
2) Per Cowardin et al, 1979.

Figures



SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

Figure 1
Vicinity Map
Redmesa Study Area

Date:6/15/2018 | Job No. 2018-148.001 | Map by: RZM | Checked by: DBM | Scale: 1:63,360

Data Sources: ESRI, USGS, CDOT

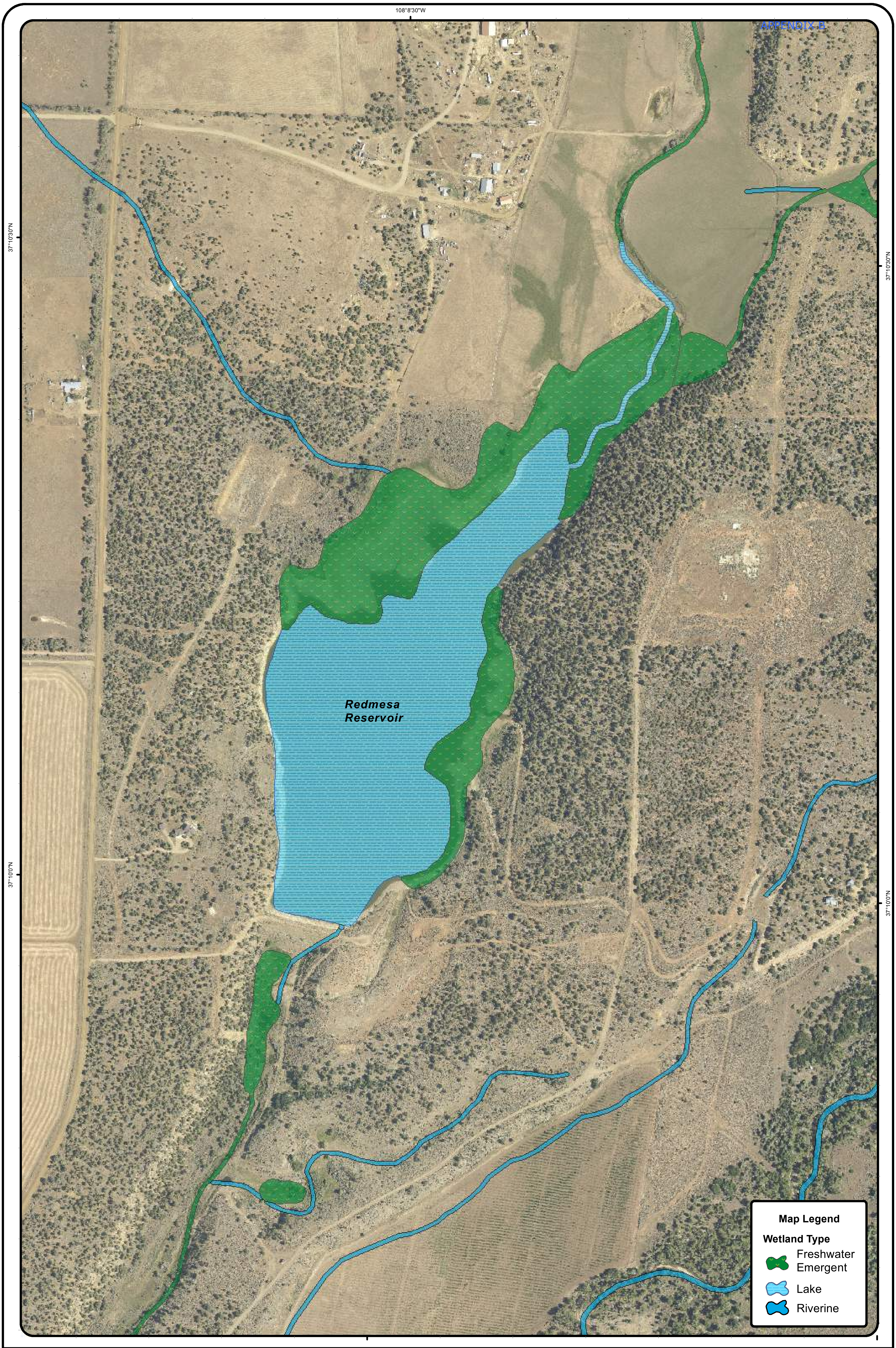
File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\Fig1-VicinityMap.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 1 2 Miles

1 inch = 1 miles

N



SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

Figure 2
NWI Mapping for
Redmesa Reservoir Study Area

Date:6/5/2018 | Job No. 2018-148.001 | Map by: RZM | Checked by: DBM | Scale: 1:4,800

Data Sources: La Plata County GIS, U.S. Fish and Wildlife Services - National Wetland Inventory

File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\Fig2-NWImapping.mxd

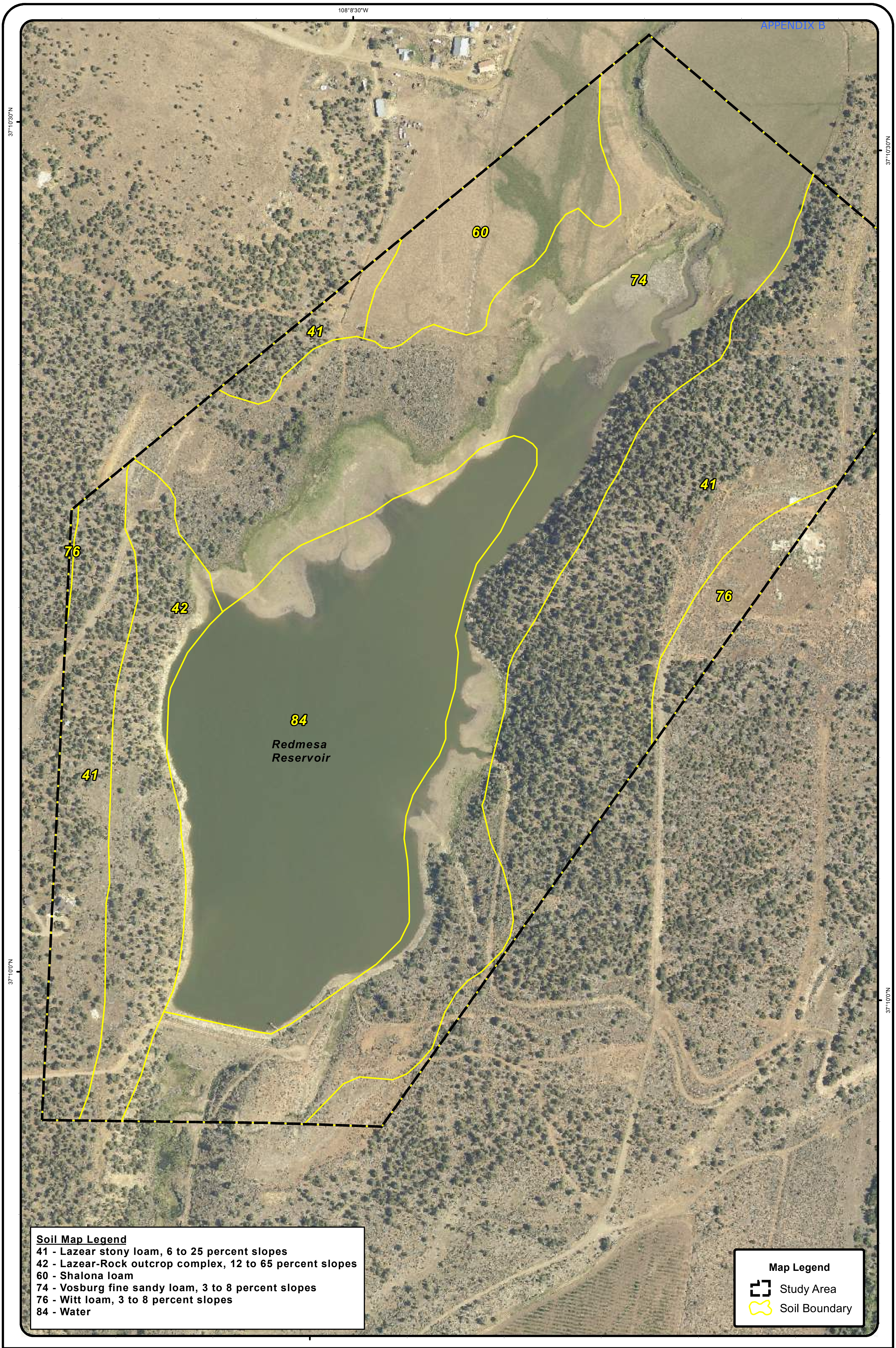
The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 400 800
Feet

1 inch = 400 feet

N

APPENDIX B



Soil Map Legend
41 - Lazear stony loam, 6 to 25 percent slopes
42 - Lazear-Rock outcrop complex, 12 to 65 percent slopes
60 - Shalona loam
74 - Vosburg fine sandy loam, 3 to 8 percent slopes
76 - Witt loam, 3 to 8 percent slopes
84 - Water

SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

Figure 3
Web Soil Survey Map for
Redmesa Reservoir Study Area

Date:6/15/2018 | Job No. 2018-148.001 | Map by: RZM | Checked by: DBM | Scale: 1:3,600

Data Sources: La Plata County GIS, U.S. Fish and Wildlife Services - National Wetland Inventory

File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\Fig3-WebSoilSurvey.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 300 600 Feet

1 inch = 300 feet

N

SGM
555 RiverGate Ln, Suite B4-82
Durango, CO 81301
970.385.2340
www.sgm-inc.com

FIGURE 4.
Redmesa Reservoir Wetland
Delineation Within Bottom

Date: 06/05/2018 | Job No. 2018-148 | Map by: RZM | Checked by: KCH | Scale: 1,800

Data Sources:
Google Earth 8/7/2011, Craig Survey, Field work completed June 7, 2018*

File: P:\Project Files\2018-148.001 Redmesa Reservoir & Ditch Company\H-Dwgs\GIS\MXDs\RedMesaRes-FieldMap-2x3-6122018.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

*** Note: The extent of exposed sediment varies each year depending on hydrologic conditions.**

0 150 300 450 600 Feet

1 inch = 150 feet

N

Appendix A

Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: Redmesa Res. Company State: CO Sampling Point: 1
Investigator(s): Mehan / Haun Section, Township, Range: ____
Landform (hillslope, terrace, etc.): bottom of reservoir Local relief (concave, [✓ convex], none): ____ Slope (%): 1
Subregion (LRR): ____ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No ✓
Hydric Soil Present? Yes ____ No ✓
Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks: Drought year conditions.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Convolvulus arvensis	85	✓	FACU
2. Artemisia absinthium	5		FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	90		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR3/2	98	5YR 5/8	2	C	M	Si	some variability

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks: soil is lake sediment - some variability, sporadic redox features (< 5%).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
✓ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___
Water Table Present? Yes ___ No ✓ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: soil relatively dry. Frequency of inundation assumed > 50%.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018

Applicant/Owner: Red Mesa Res. Company State: CO Sampling Point: 2

Investigator(s): Mehan / Hawn Section, Township, Range: ______

Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ______ Slope (%): 1

Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM

Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ______
Hydric Soil Present?	Yes ✓	No ______
Wetland Hydrology Present?	Yes ✓	No ______

Is the Sampled Area within a Wetland? Yes ✓ No ______

Remarks: dry year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: ______)			
1. Apocynum connabinum	60	✓	FAC
2. Glycyrrhiza lepidota	20		FAC
3. Convolvulus arvensis	20		FACU
4. Artemesia absinthium	10		FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	110	= Total Cover 55/22	
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	80	x 3 =	
FACU species	30	x 4 =	
UPL species		x 5 =	
Column Totals:	110 (A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1] 3.3
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:

→ does not meet prevalence index for hydrophytic vegetation.

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 3/2	95	10YR 3/8	5	C	M	Si	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
☐ Loamy Gleyed Matrix (F2)
☐ Depleted Matrix (F3)
☑ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks: Lake sediment.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

☐ Surface Water (A1)
☐ High Water Table (A2)
☐ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☐ Surface Soil Cracks (B6)
☑ Inundation Visible on Aerial Imagery (B7)
☐ Sparsely Vegetated Concave Surface (B8)
☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☐ Oxidized Rhizospheres along Living Roots (C3)
☐ Presence of Reduced Iron (C4)
☐ Recent Iron Reduction in Tilled Soils (C6)
☐ Stunted or Stressed Plants (D1) **(LRR A)**
☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
☐ Drainage Patterns (B10)
☐ Dry-Season Water Table (C2)
☐ Saturation Visible on Aerial Imagery (C9)
☑ Geomorphic Position (D2)
☐ Shallow Aquitard (D3)
☐ FAC-Neutral Test (D5)
☐ Raised Ant Mounds (D6) **(LRR A)**
☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____

Water Table Present? Yes ____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Soil dry. IN reservoir bottom, but frequency of inundation assumed > 50%.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: RedMesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: RedMesa R.S. Company State: CO Sampling Point: 3
Investigator(s): Methan / Haun Section, Township, Range: ______
Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ______ Slope (%): 1
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ✓	Is the Sampled Area within a Wetland?	Yes ____ No ✓
Hydric Soil Present?	Yes ✓	No ____		
Wetland Hydrology Present?	Yes ✓	No ____		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Glycyrrhiza lepidota	80	✓	FAC
2. Convolvulus arvensis	20	✓	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover	50/20	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	90	5YR 5/6	10	C	M	Si	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- [✓ Depleted Matrix (F3)]
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks: Soil Variable

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- [✓ Inundation Visible on Aerial Imagery (B7)]
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- [✓ Geomorphic Position (D2)]
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018

Applicant/Owner: Redmesa Res. Company State: CO Sampling Point: 4

Investigator(s): MEHAN / HAUN Section, Township, Range: ______

Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ______ Slope (%): 1

Subregion (LRR): ______ Lat: 37°10'08" Long: 108°08'31" Datum: NMPM

Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ______ No ✓

Hydric Soil Present? Yes ✓ No ______

Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? Yes ______ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: ______)			
1. Artemisia absinthium	75	✓	FACU
2. Convolvulus arvensis	10		″
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85	= Total Cover	
		47/m	
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
		= Total Cover	
% Bare Ground in Herb Stratum 15			

Remarks:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR 3/2, 3/1	90·98	5YR 5/6	2·10	C	M	Si	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks: sediment visible.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☑ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: Redmesa Res. Company State: CO Sampling Point: 5
Investigator(s): Mehan / Hawn Section, Township, Range: ____
Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ____ Slope (%): 1
Subregion (LRR): ____ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Melilotus officinalis	90	✓	FACU
2. Convolvulus arvensis	10		"
3. Artemisia absinthium	10		"
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	110	55/22	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
	10YR3/2	95	5yR 5/8	5	C	PL	Si	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
✓ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks: sediment Variable (see photo)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
✓ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______
Water Table Present? Yes ___ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: RedMesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: RedMesa Res. Company State: CO Sampling Point: 6
Investigator(s): Methan / Haun Section, Township, Range: ____
Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ____ Slope (%): 1
Subregion (LRR): ____ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✓ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover			

Herb Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Apocynum cannabinum	90	✓	FAC
2. Convolvulus arvensis	10		
3. Artemesia absinthium	10		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	110		

Woody Vine Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10yr 3/2	95	5yr 5/8	5	C	M	Si	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosol (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Mineral (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
☐ Loamy Gleyed Matrix (F2)
☐ Depleted Matrix (F3)
☑ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

☐ Surface Water (A1)
☐ High Water Table (A2)
☐ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or Crust (B4)
☐ Iron Deposits (B5)
☐ Surface Soil Cracks (B6)
☑ Inundation Visible on Aerial Imagery (B7)
☐ Sparsely Vegetated Concave Surface (B8)
☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☐ Oxidized Rhizospheres along Living Roots (C3)
☐ Presence of Reduced Iron (C4)
☐ Recent Iron Reduction in Tilled Soils (C6)
☐ Stunted or Stressed Plants (D1) **(LRR A)**
☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
☐ Drainage Patterns (B10)
☐ Dry-Season Water Table (C2)
☐ Saturation Visible on Aerial Imagery (C9)
☑ Geomorphic Position (D2)
☐ Shallow Aquitard (D3)
☐ FAC-Neutral Test (D5)
☐ Raised Ant Mounds (D6) **(LRR A)**
☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____
Water Table Present? Yes ____ No ✓ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Soil very dry

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: RedMesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: Red Mesa Res. Company State: CO Sampling Point: 7
Investigator(s): MEHAN / HAUN Section, Township, Range: ______
Landform (hillslope, [✓ terrace], etc.): along Hay Gulch Local relief ([✓ concave], convex, none): ______ Slope (%): 5
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)
Are Vegetation ✓, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ______
Hydric Soil Present? Yes ✓ No ______
Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? Yes ✓ No ______

Remarks: Fringe wetland. Trampled by wildlife, cattle along Hay Gulch

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: ______)			
1. Eleocharis Palustris	40	✓	OBL
2. phalaris arundincea	40	✓	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	80 = Total Cover		

% Bare Ground in Herb Stratum 10-25

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
10	10 YR 8/1	90						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
✓ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks: Also strong redox cones

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______
Water Table Present? Yes ______ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ✓ No ______ Depth (inches): 8

Wetland Hydrology Present? **Yes** ✓ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Located on creek bank

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: RedMesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: RedMesa Res. Company State: CO Sampling Point: 8
Investigator(s): Methan / Hawn Section, Township, Range: ______
Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, [✓ convex], none): ______ Slope (%): 1
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ______ No ✓
Hydric Soil Present? Yes ______ No ✓
Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? Yes ______ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Convolvulus arvensis	60	✓	FACU
2. Artemesia absinthium	15	✓	v
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	75 = Total Cover 37/15		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 25%			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/4	100					Si	
6-12	10YR 3/3							

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ______ No ✓

Remarks:

NO redox features

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ___________
Water Table Present? Yes ______ No ✓ Depth (inches): ___________
Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ___________

Wetland Hydrology Present? Yes ✓ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: Redmesa Res. Company State: CO Sampling Point: R
Investigator(s): Methan / Haun Section, Township, Range: ______
Landform (hillslope, terrace, etc.): reservoir bottom Local relief (concave, convex, [✓ none]): ______ Slope (%): 1
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ______ No ✓
Hydric Soil Present? Yes ✓ No ✓
Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? Yes ______ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Convolvulus arvensis	10		FACU
2. Melilotus officinalis	70	✓	"
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/4	100					Cobbly sl	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Very dry - located at OHWM

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: RedMesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: RedMesa Res. Company State: CO Sampling Point: 10
Investigator(s): MEHAN / HAWN Section, Township, Range: ______
Landform (hillslope, terrace, etc.): reservor bottom Local relief (concave, convex, [✓ none]): ______ Slope (%): 1
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No ✓	Is the Sampled Area within a Wetland?	Yes ______ No ✓
Hydric Soil Present?	Yes ______	No ✓		
Wetland Hydrology Present?	Yes ✓	No ______		

Remarks: scattered, small cottonwoods in area.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Euphorbia. Esula	30	✓	
2. Convolvulus arvensis	30	✓	
3. populus deltoides	10		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover 35 / 14		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 30			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	______	x 1 =	______
FACW species	______	x 2 =	______
FAC species	______	x 3 =	______
FACU species	______	x 4 =	______
UPL species	______	x 5 =	______
Column Totals:	______ (A)		______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ______ No ✓

Remarks:

APPENDIX B

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	5YR 4/4	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ✓

Remarks: Soil redder here

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
✓ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______
Water Table Present? Yes ___ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: located at or above full water level

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata County Sampling Date: 6/7/2018
Applicant/Owner: Redmesa Res. Company State: CO Sampling Point: 11
Investigator(s): METHAN / HAWN Section, Township, Range: ______
Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): ______ Slope (%): ______
Subregion (LRR): ______ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No ✓ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ______ No ✓
Hydric Soil Present? Yes ✓ No ______
Wetland Hydrology Present? Yes ✓ No ______

Is the Sampled Area within a Wetland? **Yes** ______ **No** ✓

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Convolvulus arvensis	45	✓	FACU
2. Artemesia absinthium	45	✓	"
3. Euphorbia esula	10		"
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100 50/20		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks:

APPENDIX B

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	10YR3/3,3/2	95	5YR 5/8	5	C	M	Si	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks: Variable

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ___ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: very dry

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Redmesa Reservoir City/County: La Plata county Sampling Date: 6/7/2018
Applicant/Owner: Red Mesa Res. Company State: CO Sampling Point: 12
Investigator(s): Methan / Haun Section, Township, Range: ___
Landform (hillslope, terrace, etc.): reservoir bottom Local relief ([✓ concave], convex, none): ___ Slope (%): 2
Subregion (LRR): ___ Lat: 37°10'08" Long: -108°08'31" Datum: NMPM
Soil Map Unit Name: Vosburg Fine sandy loam NWI classification: PEMh
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ✓ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ✓ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ___ No ✓
Hydric Soil Present? Yes ✓ No ___
Wetland Hydrology Present? Yes ✓ No ___

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ___)			
1. Convolvulus arvensis	45	✓	FACU
2. Artemesia absinthium	45	✓	"
3. Euphorbia Esula	10		"
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	80	5YR 5/8	20		M	Si	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ___

Remarks:

strong redox features — see photo

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ___ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

soil very dry.

Appendix B

Photographs

Appendix B. Photographs of Study Area - June 7, 2018

Redmesa Reservoir Enlargement Project

Photo 1. Unvegetated sediment in reservoir bottom (LUB3K).

Photo 2. Hay Gulch channel in upper part of reservoir bottom.

Photo 3. Locations of WDDF 1 in foreground and WDDF2 in background.

Photo 4. Close-up of patch of dogbane near WDDF2.

Photo 5. Patch of wild licorice at WDDF3.

Photo 6. Area dominated by wild licorice in foreground and dogbane in background to the right.

Appendix B. Photographs of Study Area – June 7, 2018

Redmesa Reservoir Enlargement Project

Photo 7. Relatively large area dominated by absinth woodworm at WDDF4.

Photo 8. Relatively large area of dogbane at WDDF6.

Photo 9. Close-up of soil at WDDF6 showing some redox concentrations and low matrix chroma.

Appendix B. Photographs of Study Area – June 7, 2018

Redmesa Reservoir Enlargement Project

Photo 10. Hay Gulch channel towards upper end of reservoir bottom with narrow band of emergent wetland (at WDDF7).

Photo 11. Distinct hydric soil at WDDF7 where the soil water saturated.

Appendix B. Photographs of Study Area - June 7, 2018

Redmesa Reservoir Enlargement Project

Photo 12. Area dominated by field bindweed and absinth wormwood at WDDF8 (northeast part of reservoir bottom).

Photo 13. Unvegetated sediment in reservoir bottom toward the dam (LUB3K).

Photo 14. Area at WDDF9 dominated by field bindweed and yellow sweet clover.

Photo 15. Area at WDDF10 dominated by leafy spurge, field bindweed with some young cottonwoods.

Appendix B. Photographs of Study Area - June 7, 2018

Redmesa Reservoir Enlargement Project

Photo 16. Southeast side of reservoir dominated by leafy spurge, yellow sweet clover and field bindweed.

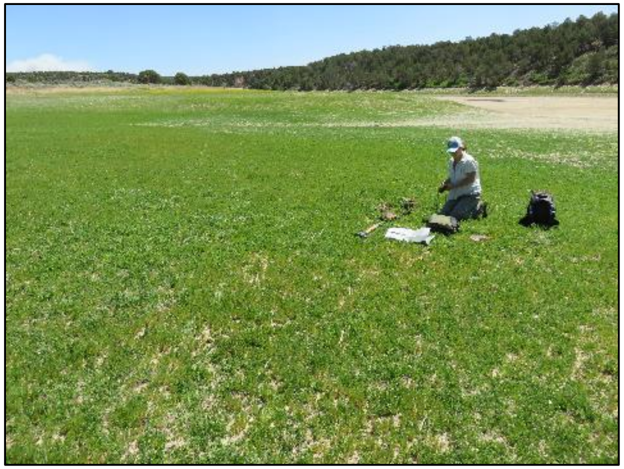


Photo 17. Area at WDDF11 dominated by absinth wormwood.

Photo 18. WDDF12 dominated by upland weeds with strong hydric soil indicators (see photo 19).

Photo 19.Distinct redox concentrations at WDDF12 which is dominated by upland weeds.

Photo 20. Broken stem of dogbane showing milky sap.

Photo 21. Area with leafy spurge and bindweed on west side of study area.

APPENDIX C. PRELIMINARY REDMESA RESERVOIR ENLARGEMENT PLAN AND PROFILE DRAWINGS