TO: SCORING SUBCOMMITTEE

FROM: EXECUTIVE DIRECTOR'S OFFICE

SUBJECT: PATHFINDER MUNICIPAL ACCOUNT RECOMMENDED SCORE AND SCORING ANALYSIS

DATE: JANUARY 23, 2014 (REVISED MARCH 17, 2014)

I. EXECUTIVE SUMMARY

The Pathfinder Modification Municipal Account is an existing Water Action Plan (WAP) project providing an average annual volume of 4,800 acre-feet per year (AFY) to the Platte River Recovery Implementation (Program). The Pathfinder Modification Project recaptures 53,493 AF of permitted storage space in Pathfinder Reservoir that was lost to sedimentation. An "Environmental Account" of 33,493 AF was established as one of the Program's three initial state water projects that collectively provide an average of 80,000 AFY toward the Program's First Increment water objective[1]. The State of Wyoming has the exclusive right to contract with the United States Bureau of Reclamation (USBR) for the use of the remaining 20,000 AF of recaptured capacity that is referred to as the "Wyoming Account" [2]. In 2011, the Program obtained an agreement with the Wyoming Water Development Office (WWDO) to lease an average volume of 4,800 AFY (may range from 0 AFY up to a maximum of 9,600 AFY) from the "Wyoming Account" for the remainder of the Program's First Increment from 2012 through 2019 (referred to as the Municipal Account Lease). Water deliveries under the Municipal Account Lease WAP project were completed in the fall of 2012 and the fall of 2013. The Municipal Account Lease project water (along with the "Environmental Account" water) is routed from Pathfinder Reservoir to Lake McConaughy, where it is entered into the Lake McConaughy "Environmental Account" (EA). Water stored in the EA can be released to reduce shortages to U.S. Fish and Wildlife Service (USFWS) target flows or for other Program purposes.

In 2010, the Program's Governance Committee (GC) established an ad-hoc Scoring Subcommittee to evaluate WAP scoring towards the Program's First Increment milestone of reducing shortages to target flows by an average of 50,000 to 70,000 AFY. The Scoring Subcommittee previously provided recommendations to the GC regarding the J-2 Regulating Reservoir score (accepted by the GC in 2011) and the Phelps Groundwater Recharge project score (accepted by the GC in 2013). In 2014, the Program's Executive Director's Office (ED Office) and the Scoring Subcommittee completed a scoring analysis for the Pathfinder Municipal Account Lease.

The scores from the analysis range from approximately 3,500 AFY to 4,200 AFY, depending on the release pattern from the EA in Lake McConaughy. This memorandum describes the various

[1] The Program's First Increment objective is to provide water capable of reducing shortages to U.S. Fish and Wildlife Service target flows by an average of 130,000 AFY to 150,000 AFY.
[2] The Wyoming Account is also known as the Municipal Account.

alternatives evaluated in the scoring analysis and provides information on the Scoring Subcommittee's recommended score. **The Scoring Subcommittee recommends a score of 4,000 AFY for the Municipal Account Lease.** This score does not represent a specific score model run; however, it represents the following assumptions:

- Routing the lease water from Pathfinder Reservoir to Lake McConaughy in September each year
- Assessing evaporation on the lease water while it is stored in the Lake McConaughy Environmental Account (EA)
- Releasing water in the spring (spring is considered to begin in March)

II. INTRODUCTION

The Governance Committee (GC) of the Platte River Recovery Implementation Program (Program) formed an ad-hoc Scoring Subcommittee to advance Water Action Plan (WAP) project scoring in 2010. The Scoring Subcommittee provided recommendations to the GC regarding the J-2 Regulating Reservoir score and the Phelps Groundwater Recharge project score, which were accepted by the GC in 2011 and 2013, respectively. In 2011, the Program obtained an agreement with the Wyoming Water Development Office (WWDO) to lease an average of 4,800 acre-feet per year (AFY) of the Pathfinder Modification Municipal Account water (referred to as the Municipal Account Lease in this memorandum). The Municipal Account Lease is an active Water Action Plan (WAP) project used towards achieving the Program's First Increment milestone of reducing shortages to U.S. Fish and Wildlife Service (USFWS) target flows by 50,000 to 70,000 AFY. The average lease volume of 4,800 AFY has been released from Pathfinder Reservoir in the past two years (in the fall of 2012 and in the fall of 2013) and delivered to the Lake McConaughy "Environmental Account" (EA) for Program use. As part of the 2009 WAP Update, the annual score for the Municipal Account Lease was estimated to range from 3,250 to 4,500 AFY, depending on the location where the score is calculated, the timing of releases and the hydrologic condition.

In 2014, the Program's Executive Director's Office (ED Office) completed a score analysis for the Municipal Account WAP project with input from the Scoring Subcommittee to determine a final score recommendation to present to the GC. The ED Office used the basic scoring methodology and assumptions that were accepted by the GC in 2010[3], which included the use of OpStudy hydrology and routing losses calculated using the WMC Loss Model. The ED Office also evaluated various alternatives to provide a range of potential scores for the project. Based on the evaluation presented in this memorandum, the range of scores is approximately 3,500 AFY to 4,200 AFY at Grand Island. After review and discussion of this material, the Scoring Subcommittee agreed to recommend a score of 4,000 AFY for the Municipal Account Lease.

III. PROJECT DESCRIPTION

The Pathfinder Modification Municipal Account is a project that involves the recapture of 53,493 AF of permitted storage space in Pathfinder Reservoir that was lost to sedimentation. This was accomplished by raising the elevation of the existing spillway by approximately 2.4 feet. As part

[3] See June 2010 GC meeting minutes.

of the Pathfinder Modification Project, an "Environmental Account" consisting of 33,493 AF was established as one of the Program's three initial state water projects that collectively provide an average of 80,000 AFY toward the Program's First Increment water objective[4]. The State of Wyoming has the exclusive right to contract with the United States Bureau of Reclamation (USBR) for the use of the remaining 20,000 AF of recaptured capacity that is referred to as the "Wyoming Account" [5]. The Wyoming Account may be used to supplement water supply for Wyoming's municipalities during times of water rights regulation, to meet obligations under the *Nebraska v. Wyoming* settlement agreement, toward the Wyoming Depletions Plan, and as part of the Program's WAP (the Municipal Account Lease), under a temporary lease agreement.

Pursuant to Wyoming Statute W.S. 41-2-1301, the WWDO is authorized to lease a maximum of 9,600 AFY of the Wyoming Account in Pathfinder Reservoir to the Program through annual temporary water use agreements. Water in the Wyoming Account will only be leased to the Program if it is not needed as a municipal water supply or a replacement water supply to comply with the Program and the conditions of the *Nebraska v. Wyoming* lawsuit. An agreement was signed in 2011 to lease a total of 38,400 AF of water from the Wyoming Account to the Program over the remainder of the First Increment (2012 through 2019), which produces an average of 4,800 AFY to the Program at Pathfinder Reservoir. The lease is attached as **Appendix A**.

The Municipal Account Lease will be operated by releasing water from Pathfinder Reservoir and routing it to Lake McConaughy, where it will be stored in the EA. Once the water enters the EA in Lake McConaughy, it is no longer distinguished or tracked as an individual project yield, but rather considered a collective water source for Program use. The EA can store up to 200,000 AF of Program water[6].

IV. GENERAL METHODOLOGY

The Scoring Subcommittee previously provided recommendations[7] to the GC regarding the proposed WAP project scoring methodology, based on the J-2 Regulating Reservoir case study[8]. This methodology was also used in the scoring of the Phelps County Canal Groundwater Recharge project. The GC accepted the recommended methodology in 2010[9], which included using the key scoring assumptions listed in **Table 1**.

[4] The Program's First Increment objective is to provide water capable of reducing shortages to USFWS target flows by an average of 130,000 AFY to 150,000 AFY.
[5] The Wyoming Account is also known as the Municipal Account.
[6] Note that when Lake McConaughy is at capacity, the EA is "reset" to 100,000 AF.
[7] Recommendations provided in a memorandum to the GC from the Scoring Subcommittee, "CNPPID Reregulating Reservoir Scoring Recommendation" dated May 12, 2010.
[8] "Water Action Plan Project Scoring Case Study: CNPPID Reregulating Reservoir" by the ED Office dated April 22, 2010.
[9] See June 2010 GC minutes.

Table 1. Key scoring assumptions.

Component	Data
Hydrology	OpStudy Adjusted Present Condition with Three State Projects (without pulse flows)
Analysis Period	1947-1994
Analysis Time Step	Monthly
Excesses/Shortages Calculation	@ Grand Island
Target Flows	Appendix A-5, Column 8
Routing	WMC Loss Model[10]

The ED Office completed the Municipal Account Lease score analysis using the general methodology presented in Table 1, similar to the J-2 Regulating Reservoir[11] and Phelps County Canal Groundwater Recharge project. The methodology was intended for use in future WAP project scoring to maintain consistency; however, the Scoring Subcommittee and GC also recognized each project may have additional assumptions and variations to consider. This memorandum describes the various alternatives the Scoring Subcommittee evaluated during the scoring process for this particular project.

Once the Municipal Account Lease water is stored in the Lake McConaughy EA, the Program models releases during shortage periods only[12]; therefore, all of the water released receives score credit less routing losses calculated using the WMC Loss Model. Since the routing losses are one of the main aspects of scoring this project, additional information regarding the losses is described in the following paragraphs.

Losses from Pathfinder Reservoir to Lake McConaughy

Releases from the Municipal Account Lease and the Environmental Account (initial state water project) in Pathfinder Reservoir were made for the first time in September 2012. Per the lease agreement, water will be released beginning no earlier than September 1st each year, unless an alternative schedule is approved. The Program assumes all losses between the Pathfinder Dam and the Program's point of use; conveyance losses between Pathfinder Dam and the Wyoming/Nebraska Stateline are assessed by the Wyoming State Engineer's Office (WSEO) and conveyance losses between the Wyoming/Nebraska Stateline and the Program's point of use are assessed by the Nebraska Department of Natural Resources (NDNR). Documentation provided to the ED Office by the USBR and the WSEO suggests that the North Platte River (NPR) accounting procedures will be used to account for the routing of releases from Pathfinder Reservoir to Lake McConaughy. Accordingly, the ED Office thought it may be useful to understand how those calculations compare to the WMC Loss Model used in WAP project scoring.

[10] WMC Loss Model is referenced in the Water Management Study (2008) by Boyle Engineering Corporation.
[11] Note the J-2 Regulating Reservoir scoring was completed on a daily basis. The Phelps County Canal Groundwater Recharge and the Municipal Account scoring analyses are monthly.
[12] The EA can be used for Short Duration High Flows (SDHF) or other Program purposes; however, the scoring analysis was based on the reduction to target flow shortages at Grand Island.

The ED Office evaluated the approach for assessing conveyance losses between Pathfinder Reservoir and Lake McConaughy using the NPR accounting procedures described in Exhibit 9 of the *Nebraska v. Wyoming* settlement decree[13]. The scoring analysis was completed by the ED Office using the WMC Loss Model, and the NPR accounting losses are described in this memorandum for comparison purposes only. The NPR accounting does not provide routing information for losses below Lake McConaughy; therefore, only the losses above Lake McConaughy were evaluated using the NPR accounting. The WMC Loss Model and NPR accounting methodologies are briefly summarized and compared in the following sections.

i. WMC Loss Model

The WMC Loss model was developed by the Water Management Committee, as required by milestone W14-1 of the Cooperative Agreement, and updated during the Water Management Study Phase I (by Boyle in 2008). The WMC Loss Model estimates the percent loss per mile for each month for water years 1975 – 2006 for 19 reaches in the Central Platte, North Platte and South Platte Rivers. This is the routing methodology used in the J-2 Regulating Reservoir score model and the Phelps County Canal Groundwater Recharge score model and was accepted as the recommended score methodology by the GC in 2010.

The ED Office used the WMC Loss Model to calculate average monthly conveyance losses for normal, wet and dry hydrologic condition year types for the reach from Pathfinder Reservoir to Lake McConaughy. As described in the 2011 lease agreement, releases from Pathfinder Reservoir to Lake McConaughy are expected to occur in September each year to minimize conveyance losses and avoid conflicts with other North Platte River water users[14]. The timing of releases from Lake McConaughy to the associated habitat is expected to be more variable, as discussed later in this memorandum. Conveyance losses are also dependent on the hydrologic condition year type when releases are made, with lower losses in wet years and higher losses in dry years. The average September loss for normal, wet and dry years at Lake McConaughy is provided in **Table 2**; the conveyance loss ranges from approximately 6% to 8%, depending on the hydrologic condition.

Table 2. Average September routing losses from Pathfinder Reservoir to Lake McConaughy, based on the WMC Loss Model by year type.

Month	Normal	Wet	Dry
September	6%	6%	8%

*Based on releases from Pathfinder Reservoir to Lake McConaughy.

[13] The methodology for conveyance losses in Wyoming is also described in Exhibit 2 of the North Platte Decree Committee Charter, entitled "North Platte River Ownership and Natural Flow Accounting Procedures for Water Year 2000".

[14] Proposed operations are described in Appendix A (see Attachment B in the document) of the Wyoming "State Engineer's Final Opinion and Recommendation on the Application to Export Storage Water from the Pathfinder Modification Project" dated January 14, 2009.

ii. North Platte River (NPR) Accounting

In the NPR Accounting, daily conveyance loss values are provided for the months of May through September for seven North Platte River reaches extending from Alcova Reservoir to the Lewellen, Nebraska gage above Lake McConaughy. The monthly conveyance loss values are static for each reach; however, the values are distributed by the proportion of storage water and natural flow in each reach at the time of the release. For example, the loss rate for the Alcova to Glendo reach is always 50 cfs per day in the month of September. If the total rate of flow is 1,000 cfs, with 100 cfs of natural flow (10%) and 900 cfs (90%) of storage water, then the loss applied to the storage water will be 45 cfs (90% of 50 cfs). A summary of accounting used to track the releases from Pathfinder Reservoir in September 2012 and the losses applied by the USBR, the WSEO and the NDNR is provided in **Table 3**. The 2013 accounting data is not available for comparison at this time.

Table 3. Conveyance losses applied to Pathfinder Reservoir releases made in September 2012 (AFY) by the USBR, WSEO and NDNR.

Pathfinder Release (A)	**Loss to Glendo** (B)	**Evaporation in Glendo** (C)	**Glendo Release** (D)	**Delivered to Stateline** (E)	**Loss to Stateline (%)** (F)	**Delivered to McConaughy** (G)	**Loss to McConaughy (%)** (H)
26,407	791	149	25,467	24,855	6%	24,030	9%

Notes:
(A) Combination of Pathfinder Environmental Account and Municipal Account Lease releases. Values provided by USBR.
(B) Based on North Platte River accounting procedures. Values provided by USBR.
(C) Evaporative losses were applied to Pathfinder Environmental Account water being stored in Glendo Reservoir prior to release. Value provided by USBR.
(D) Value provided by USBR.
(E) Value provided by NDNR.
(F) Total conveyance loss from Pathfinder Reservoir to the WY-NE Stateline. Calculation = 100% - Columns (E ÷ A).
(G) Value provided by NDNR.
(H) Total conveyance loss from Pathfinder Reservoir to Lake McConaughy. Calculation = 100% - Columns (G ÷ A).

iii. Comparison of Conveyance Loss Calculations and Yield

The hydrologic condition for September 2012 was dry. The associated conveyance loss calculated using the WMC Loss Model from Pathfinder Reservoir to Lake McConaughy was 8% (Table 2). Conveyance loss for September 2012 in the NPR accounting was approximately 9% (Table 3). Using the NPR accounting methodology produces a 1% greater loss at Lake McConaughy (or a 1% lower yield at Lake McConaughy). Based on this information, it appears the NPR accounting and the WMC Loss Model routing factors result in a similar yield at Lake McConaughy. A comparison of the routing losses and yield at Lake McConaughy is shown in **Table 4**.

Table 4. Comparison of yields using WMC Loss Model vs. NPR Accounting Loss routing methods in September 2012.

Model	Routing Losses - Pathfinder to Lake McConaughy (%)[1]	Yield at Lake McConaughy (AF)
WMC Loss Model	8%	4,421
NPR Accounting Loss	9%	4,368
Difference (relative to WMC Loss Model)	*-1%*	*53*

[1]In comparison to the 4,800 AF release from Pathfinder Reservoir for the Municipal Account Lease.

Note that a 1% difference in the routing methods will produce less than a 1% impact to the score after additional routing losses are assessed below Lake McConaughy and the project is scored at Grand Island. As previously accepted by the GC, the scoring analysis presented in this memorandum utilizes the WMC Loss Model routing factors from Pathfinder Reservoir to Lake McConaughy and Grand Island to maintain consistency among WAP projects.

A. Releases from Lake McConaughy

Water available in storage at Lake McConaughy provides flexibility for the Program to utilize the water for reductions to target flow shortages throughout the year. The yield of Municipal Account Lease water at the associated habitat will depend on the pattern of the releases as the routing loss values change by month and hydrologic condition. **Table 5** is a summary of the estimated losses using the WMC Loss Model from Lake McConaughy to Grand Island, where the Program score is calculated.

Table 5. Average losses from Lake McConaughy to Grand Island, based on WMC Loss Model data by year type.

Month	Normal	Wet	Dry
Jan	14%	13%	16%
Feb	9%	10%	11%
Mar	5%	5%	7%
Apr	7%	9%	10%
May	10%	9%	11%
Jun	14%	13%	37%
Jul	26%	11%	62%
Aug	28%	16%	74%
Sep	30%	21%	66%
Oct	19%	12%	48%
Nov	14%	10%	27%
Dec	14%	11%	16%

V. ALTERNATIVES CONSIDERED FOR EFFECT ON SCORE

The score analysis assumed the Municipal Account Lease volume of 4,800 AF was available and released from Pathfinder Reservoir each September during the 48-year OpStudy simulation period from 1947-1994. The WMC Loss Model factors were used to route water from Pathfinder Reservoir to Lake McConaughy and to Grand Island in the scoring analyses. The average annual yield at Lake McConaughy is approximately 4,494 AFY, based on the average routing losses for the hydrologic conditions occurring in the 48-year OpStudy simulation period (see **Appendix B, Table B-1**). Note that once project water enters the EA, it is considered part of the EA and is no longer distinguished by specific project.

The ED Office evaluated the score for two scenarios with different Lake McConaughy release patterns to provide a range of potential scores. The scenarios assume the 4,494 AFY was available at Lake McConaughy each year in September. Evaporation losses from the EA in Lake McConaughy were accounted for in the scenarios. The following alternatives were evaluated in regards to the timing of releases from Lake McConaughy, evaporative losses and combined scoring:

- **EA Release Pattern**
    - **Shortage Distribution Release Pattern** – score scenario assumes the Program releases water from Lake McConaughy to reduce shortages to target flows based on the monthly distribution of shortages calculated at Grand Island using OpStudy hydrology.
    - **Spring Release Pattern** – score scenario assumes the Program releases water from Lake McConaughy to reduce shortages to targets flows during the spring season beginning in March.
- **Evaporation Losses in Lake McConaughy** – score scenarios utilize the EA release patterns described above and deduct evaporation from the Municipal Account Lease water while it is stored in the EA.
- **Combined Scoring with J-2 Regulating Reservoir and Phelps Recharge** – brief evaluation of project competition for shortage reduction. The ED Office did not evaluate a combined score for the projects, as it appears the projects can operate simultaneously to reduce target flow shortages, without an impact to the individual project scores.

Previously, Scoring Subcommittee members have inquired about evaluating project scores using data from the OpStudy model. In the scoring analysis, the ED Office did not evaluate OpStudy release patterns of the EA water, as the OpStudy model and the accepted scoring methodology do not coincide at all times. In OpStudy, releases from the EA are governed by many factors that the scoring model does not take into consideration. For example, OpStudy may release water during excesses to target flows in order to slowly "ramp-down" the releases over time, based on the operating rules determined in OpStudy. At this time, the Program scoring models have only been used to evaluate releases during shortages to target flows, including the scores described in this memorandum.

The score analyses completed by the ED Office are described in more detail in the following sections. For each of the EA release pattern scenarios, the ED Office evaluated three different calculation methods to check the sensitivity and variability of the score results. The three calculation methods include: (1). "Modeling period average" score (analysis based on using averages of the full 48-year OpStudy modeling period for each year), (2). "Representative year" score (analysis based on a representative wet, normal and dry year and proportionally applied to the full 48-year modeling period), and (3). "Annual pattern" score (analysis completed on a monthly basis to obtain the variation in annual scores for each year of the modeling period). For simplicity, the "modeling period average" scores are presented in this memorandum and the other evaluations are included as appendices. All of the score results are provided in Section VI.

A. EA Release Pattern (No Evaporation Assessed)

i. Score based on Shortage Distribution

This scoring scenario assumes the Program will release the Municipal Account Lease water stored in the EA based on the average monthly distribution of target flow shortages during the 1947 -1994 OpStudy hydrology period. **Figure 1** shows the average monthly distribution of shortages to target flows using the averages of the full 48-year OpStudy modeling period.

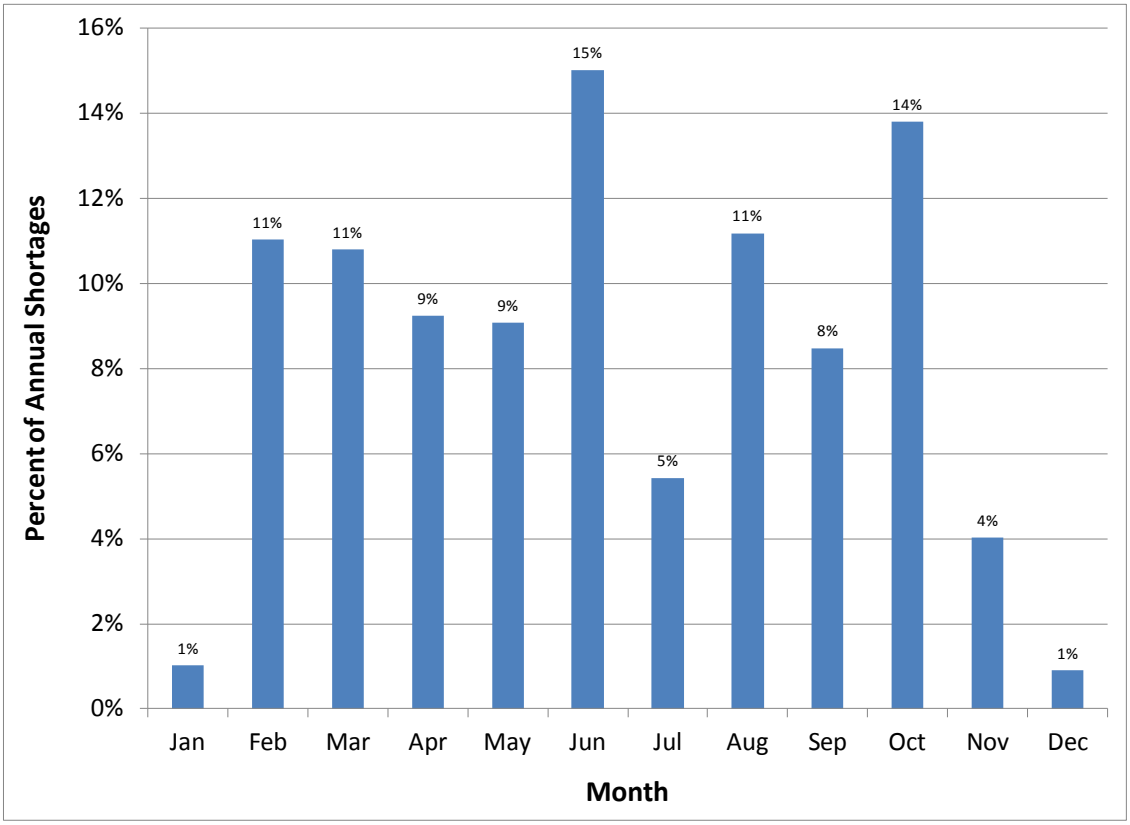

Figure 1. Distribution of monthly total Program target flow shortages (based on average OpStudy hydrology 1947-1994).

The average values in Figure 1 were proportionally applied to the yield at Lake McConaughy on a monthly basis to determine the release pattern, for the "modeling period average" calculation. The water was routed downstream to Grand Island to reduce target flow shortages based on the average monthly WMC Loss Model values per hydrologic condition. The score for this scenario is approximately 3,637 AFY. Note that this scenario is an example based on averages and this specific release pattern will not necessarily occur on an annual basis. For example, it may be unlikely for the Program to release water from the EA in December or January if the shortages are minimal during these months; instead, water could be released in a lump sum volume during critical periods with higher shortages. **Appendix B** shows a summary of the score analysis (see Table B-2).

To verify the results of this scenario, the ED Office also evaluated the project score using "representative year" and "annual pattern" calculation methods. For the "representative year" analysis, the ED Office utilized specific data for a representative dry (1964), normal (1975) and wet (1986) hydrologic condition years. The representative years were selected during the J-2 Regulating Reservoir pre-feasibility study[15] and were used in the Phelps Groundwater Recharge project scoring. For the analysis, the ED Office set the monthly EA release pattern to the pro-rated proportion of shortages occurring in each representative year. The distribution of hydrologic condition year types during the 48-year OpStudy modeling period was used to calculate a weighted score[16]. The weighted score is within 3%[17] of the "modeling period average" score described above. **Appendix C** provides summary tables of the "representative year" calculations (see Tables C-1 through C-3).

For the "annual pattern" score, the ED Office calculated the score using a release schedule based on the proportion of shortages for individual years during the OpStudy modeling period. This was completed to show the variation in releases from year to year. The score is within 3%[18] of the "modeling period average" score and is similar to the "representative year" score. **Appendix D** provides summary tables of the "annual pattern" calculations (see Table D-3). Based on the evaluation of the three score calculation methods, the score is not particularly sensitive to differences in the calculation methodology.

ii. Score based on Spring Release from Lake McConaughy

The Program may choose to route the Municipal Account Lease water in September and hold it in the Lake McConaughy EA until spring, when the full lease amount would then be released to reduce target flow shortages. A spring release is consistent with operation of the EA from 2007 through 2012, as spring is one of the critical periods for increasing flows in the river for Program purposes. For the purpose of the scoring analysis, releases from Lake McConaughy in the spring were assumed to begin in March. Shortages in March occur in approximately 65% of the years in the OpStudy simulation period, which includes wet, normal and dry hydrologic conditions. Since the hydrology shows there are not necessarily shortages in March of every year, the ED Office

[15] "CNPPID Reregulating Reservoir: Elwood and J-2 Alternatives Analysis Project Report" by Olsson Associates and Black & Veatch in 2010.
[16] Proportion of years in modeling period: 25% dry years, 42% normal years, 33% wet years.
[17] (3,637 AFY – 3,529 AFY) ÷ 3,637 AFY = 3%.
[18] (3,637 AFY – 3,539 AFY) ÷ 3,637 AFY = 3%.

assumed that when there are no shortages in March (35% of the years), the Program would release in April. The "modeling period average" score was calculated assuming the Program released the full Municipal Account Lease water available in the EA in March for 65% of the 1947-1994 simulation period and in April for the remaining 35% of the period. This assumes there is a shortage in either March or April each year, which occurs in about 80% of the years. The score this scenario is approximately 4,206 AFY. **Appendix B** includes a summary of the score analysis (see Table B-4).

The ED Office also evaluated the "representative year" and "annual pattern" score calculation methods. This was completed to check the validity of the score estimate on an annual basis, since the "modeling period average" analysis described in the previous paragraph utilizes averages over the 48-year OpStudy modeling period. The "representative year" weighted average score for this scenario corresponds well with the 48-year "modeling period average" method, resulting in a score that is approximately 1%[19] greater. The "annual pattern" analysis resulted in a score approximately 5%[20] lower than the "modeling period average". Again, the utilization of a different calculation method does not produce significantly different results. **Appendices C and D** include summary tables (see Tables C-4 and D-6). The Scoring Subcommittee agreed that a spring release is appropriate to score the Municipal Account Lease.

B. EA Evaporation in Lake McConaughy

The ED Office evaluated the evaporation assessed on the EA in OpStudy for both of the EA release pattern scenarios described in Section V.A. Evaporation is calculated in the OpStudy model by averaging the previous and current months' EA content and assessing evaporation as a pro-rated percentage of the total Lake McConaughy storage content. The Program Document states, "Storage losses for Lake MCConaughy and other Approved Storage Facilities shall be calculated by the NEDWR and assigned monthly to the EA using the following formula: ((average monthly storage in the EA) divided by the (average monthly storage in total)) times the total losses for the storage facility for that month, or by another mutually agreed upon formula,"[21] which is consistent with the calculation in OpStudy. **Table 6** shows the proportion of evaporation per month based on OpStudy modeling data. The values in Table 6 were used to deduct evaporation from the Municipal Account Lease water stored in the EA, for the release scenarios.

[19] (4,253 AFY – 4,206 AFY) ÷ 4,206 AFY = 1%.
[20] (4,206 AFY – 3,992 AFY) ÷ 4,206 AFY = 5%.
[21] See page 3 of the Nebraska Environmental Account Document in the "Final Platte River Recovery Implementation Program" in 2006.

Table 6. Average monthly percentage of evaporation from the EA based on OpStudy data.

Month	Average percent of evaporation
Jan	0.1%
Feb	0.2%
Mar	0.2%
Apr	0.4%
May	0.4%
Jun	0.4%
Jul	0.8%
Aug	0.7%
Sep	0.4%
Oct	0.2%
Nov	0.1%
Dec	0.0%

Evaporation losses were accounted for in each month the Municipal Account Lease water remained in the EA in Lake McConaughy, until released to reduce shortages. Evaporation losses are assumed to begin in September, when the Municipal Account Lease water is routed from Pathfinder Reservoir to Lake McConaughy. The scores for the "modeling period average" were reduced to approximately 3,577 AFY when released per the shortage distribution and 4,150 AFY when released in the spring. The scores with evaporation are shown in **Appendix B** for the shortage distribution scenario and spring release scenario (see Tables B-3 and B-5). The "representative year" and "annual pattern" score calculations with evaporation assessed on the EA are included in **Appendices C and D** (see Tables C-1 through C-4, D-4 and D-7). The Scoring Subcommittee agreed to assess evaporation on the Municipal Account Lease water stored in the EA.

The ED Office compared the OpStudy calculated losses with the data from the NDNR for Lake McConaughy in Water Year 2012 and 2013. Based on these two years of data, the monthly evaporation losses range from approximately 0.0% to 1.5% per month, which may result in higher losses than those used for the score analysis. The NDNR losses were not evaluated further and the OpStudy calculated losses were used to calculate the recommended score of 4,000 AFY.

Seepage losses from the EA in Lake McConaughy were not evaluated in this memorandum as it appears these losses are negligible. The ED Office evaluated seepage losses from NDNR accounting data for Lake McConaughy and there was a 2% seepage loss on average in Water Years 2012 and 2013. Since losses are minimal and water is not stored in the EA for a full year, seepage losses were not included in the scoring evaluation.

C. Combined Scoring with J-2 Regulating Reservoir and Phelps Recharge

The J-2 Regulating Reservoir score for the Program is 30,600 AFY and the Phelps recharge project score for the program is 1,800 AFY for a total of 32,400 AFY. Since the water in the Municipal Account Lease water stored in the EA can be controlled and released during shortage periods only, all of the releases provide a score at Grand Island (less routing losses).

The ED Office evaluated how often the J-2 Regulating Reservoir and Phelps recharge are able to meet all of the shortages at Grand Island. The J-2 Regulating Reservoir scoring was completed on a daily basis; therefore, shortages and excesses can occur in the same month. The Phelps recharge and Pathfinder Municipal Account Lease score models are monthly; therefore, there is either a shortage or excess in a given month. The J-2 Regulating Reservoir daily score was summed per month and compared to shortages calculated from monthly hydrology data to compare with the Phelps recharge score. In approximately 9% of the shortage months during the OpStudy period, the J-2 Regulating Reservoir and Phelps recharge projects are able to meet all the shortages. In general, it appears both the EA releases and the J-2 Regulating Reservoir releases will be able to reduce shortages simultaneously or the EA could be scheduled for release on a later day or month. As shown in **Figure 2,** there are typically shortages at Grand Island each month, which could be reduced by releases of the Municipal Account Lease water. The red bars represent the shortages met by J-2 Regulating Reservoir releases and the blue bars represent the remaining shortages at Grand Island. **Appendix E** show the wet and dry year graphs. Appendix E also includes graphs showing the monthly shortages and shortages met by the J-2 Regulating Reservoir and Phelps recharge projects during the 48-year modeling period.

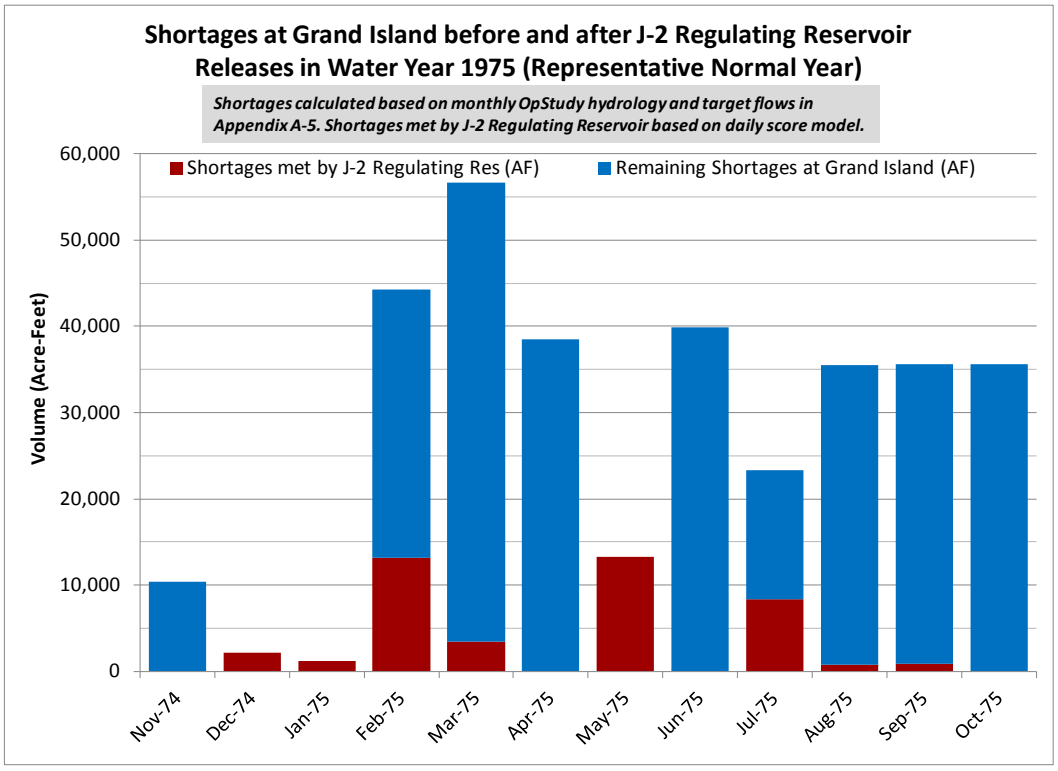

Figure 2. Shortages met by J-2 Regulating Reservoir during representative normal year.

The ED Office did not further evaluate combined operations as it is anticipated that the Municipal Account Lease in the EA, the J-2 Regulating Reservoir and Phelps recharge projects can operate together to reduce shortages at Grand Island. Further, the ED Office did not evaluate combined operations with the three initial state water projects for the purpose of this memorandum.

VI. SCORE ANALYSIS RESULTS

The average annual Program yield at Pathfinder Reservoir is approximately 4,800 AFY per the lease with the WWDO. In the scoring analysis, the 4,800 AFY was released from the Pathfinder Reservoir and routed to Lake McConaughy in September each year during the modeling period, using WMC Loss Model data. The Program intends to release the Municipal Account Lease water stored in the EA in Lake McConaughy during target flow shortage periods; therefore, the score is considered the yield at Lake McConaughy less routing losses calculated using the WMC Loss Model to Grand Island. The scores for the Municipal Account Lease WAP project range from an average of approximately 3,500 AFY – 4,200 AFY[22], depending on the release schedule, calculation method and whether evaporation is assessed during storage periods in the EA. The average of all of the scores described in this memorandum is 3,850 AFY (this is also the average of the lowest and highest scores[23]), which equates to a 21% loss from the yield in Pathfinder Reservoir to the yield at Grand Island as shown in **Table 7**. The average scores listed in the table are consistent with the mid-range score from the 2009 WAP Update, which is 3,875 AFY[24].

[22] Rounded to nearest 100 AFY.
[23] (3,500 AFY + 4,200 AFY) ÷ 2 = 3,850 AFY.
[24] (3,250 AFY + 4,500 AFY) ÷ 2 = 3,875 AFY.

Table 7. Score analysis results for alternative scenarios (values in AFY).

Scenarios		Calculation Methods			Average	Average Rounded
		Modeling Period Average (E)	Representative Year (F)	Annual Pattern (G)		(H)
Releases per Shortage Distribution	(A)	3,637	3,529	3,539	3,568	3,600
Releases per Shortage Distribution *with Evaporation Losses in EA*	(B)	3,577	3,458	3,488	3,507	3,500
Spring Releases (begin in March)	(C)	4,206	4,253	3,992	4,150	4,200
Spring Releases *with Evaporation Losses in EA*	(D)	4,150	4,168	3,932	4,083	4,100
				Overall average:	3,827	3,850
				Average without evaporation:	3,859	3,900
				Average with evaporation losses in EA:	3,795	3,800

Notes:

All scenarios represent releasing water from Pathfinder Reservoir in September and routing to Lake McConaughy using the WMC Loss Model factors. Releases from Lake McConaughy are also routed to Grand Island using the WMC Loss Model factors. Various calculation methods were used to evaluate the sensitivity of the score analysis and to provide a range of scores. Note that some scores were revised from the preliminary score analysis during the final review. The rounded score results remain the same.

(A) Releases from Lake McConaughy are proportionally distributed throughout the year, based on the distribution of shortages calculated at Grand Island. No evaporation assessed while water is stored in the EA.

(B) Same as (A) but with evaporation assessed (using OpStudy data) while water is stored in the EA.

(C) Releases from Lake McConaughy begin in March. No evaporation assessed while water is stored in the EA.

(D) Same as (C) but with evaporation assessed (using OpStudy data) while water is stored in the EA.

(E) Calculation method using an average value per month over the 48-year simulation period. See Appendix B tables for calculations.

(F) Calculation method using representative wet (WY 1986), normal (WY 1975) and dry (WY 1964) year scores, proportionally applied to the 48-year simulation period by hydrologic condition year types. See Appendix C tables for calculations.

(G) Calculation method evaluating the score on a month-by-month basis for the 48-year simulation period. See Appendix D tables for calculations.

(H) Values rounded to the nearest 100 AFY (except in overall average; this is the average of the rounded values).

VII. RECOMMENDED SCORE

The Scoring Subcommittee recommends a score of 4,000 AFY for the Municipal Account Lease. This score does not reflect a specific score model run but instead represents a combination of analyses that use the following assumptions:

- Routing the Municipal Account Lease water from Pathfinder Reservoir to Lake McConaughy in September each year and storing it in the EA
- Assessing evaporation on the lease water for the duration of time it is stored in the EA before it is released
- Releasing the leased water from the EA in the spring time, beginning in March (note that there is no specific release dataset to represent the 4,000 AFY score, as it is a combination of alternatives)

The Scoring Subcommittee had a conference call on February 26, 2014 and discussed their initial review of the score analysis. The final recommended score of 4,000 AFY was decided after the conference call through email consultation and phone discussion among the group members. The Scoring Subcommittee decided to recommend a score between the "representative year" analysis (rounded to 4,200 AFY[25]) and the "annual pattern" analysis (rounded to 3,900 AFY[26]) for the spring release with evaporation scenario. The Subcommittee agreed that the 4,000 AFY score was an acceptable compromise of this score range and embodied the various opinions of the group members. The Scoring Subcommittee provided the recommended score to the GC for approval at the March 2014 meeting. See **Appendix F** for the memorandum to the GC and the Scoring Subcommittee meeting minutes from the February 26, 2014 conference call.

VIII. LIST OF APPENDICES

Several appendices are included to provide additional detail regarding the Municipal Account Lease score analysis and recommendation:

Appendix A: Agreement between the Program and WWDO

Appendix B: Score Analysis – Modeling Period Average Pattern Scenario

Appendix C: Score Analysis – Representative Year Analysis

Appendix D: Score Analysis – Annual Pattern Release Scenario

Appendix E: Wet & Dry Year Shortage Reduction Graphs

Appendix F: Memorandum – Score Recommendation to the GC, with Scoring Subcommittee Meeting Minutes

[25] See Appendix C, Table C-4.
[26] See Appendix D, Table D-7.

APPENDIX A:

AGREEMENT BETWEEN THE PROGRAM AND WWDO

AGREEMENT BETWEEN
PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
AND
WYOMING WATER DEVELOPMENT OFFICE

The parties to this Agreement ("Contract") are THE STATE OF WYOMING, acting through the Wyoming Water Development Office ("WWDO"), whose address is 6920 Yellowtail Road, Cheyenne, Wyoming 82002, hereinafter referred to as "State," and THE NEBRASKA COMMUNITY FOUNDATION, representing all signatories to the Platte River Recovery Implementation Program, acting on behalf of the Platte River Recovery Implementation Program, whose address is 4111 4th Avenue, Suite 6, Kearney, Nebraska 68845, hereinafter referred to as "PRRIP." The State and the PRRIP are sometimes referred to herein jointly as "the Parties."

WITNESSETH THAT:

The following preliminary statements are made for the purpose of explanation:

EXPLANATORY RECITALS

WHEREAS, the Consolidated Natural Resource Act of 2008 (Public Law 110-229, Title V, Section 515) authorizes the Secretary of the Department of Interior ("Secretary") to construct, operate, and maintain the modification of the existing Pathfinder Dam and Reservoir, North Platte Project, with financial and managerial participation by the State as provided for in Contract No. 10XX6A0040, "Contractual Agreement Between the United States of America and the State of Wyoming, North Platte Project, Wyoming," dated June 14, 2010 ("Federal Contract").

WHEREAS, the United States completed construction of the existing Pathfinder Dam and Reservoir in 1909, which serves as the main water storage feature of the North Platte Project. Wyoming Permit No. 609R, with a priority date of December 6, 1904, is adjudicated for a total storage right to the United States of 1,070,000 acre-feet.

WHEREAS, Appendix F to the Final Settlement Stipulation of the settlement of the Nebraska v. Wyoming lawsuit, amending the 1953 Order Modifying and Supplementing Decree of October 8, 1945 ("Pathfinder Modification Stipulation") authorizes and describes the Modification of Pathfinder Dam and Reservoir.

WHEREAS, Chapter 105 of the 2006 Wyoming Session Laws, as amended in Chapter 25 of the 2009 Wyoming Session Laws, (W.S. 99-3-1105(b)), authorized the State to enter into an agreement with the United States for modification of the existing Pathfinder Dam and Reservoir, required approval of the Contract by the Governor and authorized funding for the modification of Pathfinder Dam.

WHEREAS, the State and the United States of America entered into the Federal Contract, which, in part, provides the State the right to provide water from the Wyoming Account to the PRRIP under annual temporary water use agreements and to recover all

costs associated with providing such water, so long as that use complies with the purposes of the Wyoming Account as specified in the Pathfinder Modification Stipulation.

WHEREAS, the original uses designated under Wyoming Permit No. 609R included irrigation and domestic use for the entire permitted capacity of 1,070,000 acre-feet. On January 26, 2009, the United States obtained a change of use (for additional uses) for 53,493 acre-feet of the permitted capacity of 1,070,000 acre-feet for Pathfinder Reservoir from the Wyoming State of Board of Control. The new uses for 33,493 acre-feet of the original storage right are environmental and fish and wildlife purposes for the establishment of the Environmental Account in Pathfinder Reservoir ("Environmental Account"). The new uses for 20,000 acre-feet of the original storage water right are municipal, environmental, and fish and wildlife purposes for the establishment of the Wyoming Account in Pathfinder Reservoir ("Wyoming Account") for which the State has the exclusive right to contract with the United States pursuant to Appendix F to the Final Settlement Stipulation in Nebraska v. Wyoming, 534 U.S. 40 (2001). The original designated uses under Wyoming Permit No. 609R, irrigation and domestic, are maintained for the entire permitted capacity of 1,070,000 acre-feet.

WHEREAS, W.S. 41-2-1301(b) states:

> "Pursuant to W.S. 41-3-115, and the Wyoming water development office is hereby authorized to transfer a maximum of nine thousand six hundred (9,600) acre feet of storage water per year from the Wyoming account in the Pathfinder Modification Project within Pathfinder reservoir to the Wyoming-Nebraska state line through annual temporary water use agreements with the Platte River Recovery Implementation Program in any year the storage water in the Wyoming account is not needed by the state of Wyoming as a municipal water supply or a replacement water supply to meet the state of Wyoming's obligations in the Nebraska v. Wyoming settlement agreement and the Platte River Recovery Implementation Program."

WHEREAS, the United States, acting through the Bureau of Reclamation, will operate the Wyoming Account to insure an annual estimated firm yield of 9,600 acre feet per year.

NOW THEREFORE, in consideration of the premises and mutual promises of the Parties, it is agreed as follows:

I. PURPOSE OF CONTRACT.

A. The Parties wish to enter into this Contract whereby the State will provide water to the PRRIP, through annual temporary water use agreements, from the Wyoming Account to which the State has a right under the Federal Contract, in accordance with the provisions herein.

B. This Contract is entered into pursuant to and subject to the court decrees, compacts, laws, permits and Federal Contract hereinabove described which are, by reference, incorporated herein.

C. The water contracted for by the PRRIP under the provisions of this Contract shall be deemed, for the purposes of said Federal Contract, to have been used by the State.

II. TERM OF CONTRACT.

A. Effective Date. This Contract is effective on the date of the signature last affixed to the signature page.

B. Term. The term of this Contract shall extend until December 31, 2019 or the date that the State withdraws from the PRRIP, whichever comes first. The Contract may be extended if approved by the Parties.

III. SERVICES AND PAYMENTS.

A. Purchase Price.

The PRRIP shall purchase thirty-eight thousand four hundred (38,400) acre feet of water ("Purchase Water Amount") from the Wyoming Account. The price of the Purchase Water Amount is based on a unit price of fifty-one dollars ($51.00) per acre foot and the total purchase price is one million nine hundred fifty-eight thousand four hundred dollars ($1,958,400.00). Payment of this amount is due on or before July 1, 2012.

1. If more than the Purchase Water Amount is delivered to the PRRIP during the term of this Contract, the price per acre foot of the overrun will be sixty-five dollars ($65.00) and the PRRIP shall be annually obligated to take delivery of a minimum of four thousand eight hundred (4,800) acre feet or the amount of water available determined in accordance with subsection III.B.1, whichever is less. As an alternative, the Parties may negotiate another prepayment option based on the circumstances at the time the overrun occurs.

2. If less than the Purchase Water Amount is delivered to the PRRIP during the term of this Contract, the State shall reimburse the PRRIP for the underrun at a unit price of fifty-one dollars ($51.00) per acre foot of underrun on or before November 1, 2019.

The purchase price shall be increased if the Bureau of Reclamation assesses the State for a share of costs related to major repair and construction relating to Pathfinder Dam. In the event of major dam repair and construction, the price will be increased by the 37.4% (20,000/53,493) of the State's actual allocation of major dam repair and construction costs assessed by the Bureau of Reclamation for the Pathfinder Modification Project amortized at a rate of 6% for the remaining term of this Contract and divided by nine thousand six hundred (9,600) acre feet and multiplied by the amount of water yet to be delivered under the Contract. A lump sum payment for the increase will be made by the PRRIP within thirty (30) days after receipt of an invoice from the WWDO. The unit price described in subsection III.A.2 will be increased to compensate for the increase in the purchase price resulting from major dam repair and construction costs.

B. Terms.

1. On or before the first of May of each year, the Director of the WWDO ("Director"), in consultation with the Wyoming Area Manager of the Bureau of Reclamation ("Area Manager") and the Wyoming State Engineer, will provide an estimate of the water in the Wyoming Account that may be available to the PRRIP. The deliberations will be based on the amount of water needed by the State to meet its obligations to its municipal customers, the State's obligations under the Nebraska v. Wyoming settlement or the PRRIP, and carryover requirements in the Wyoming Account to ensure a reliable supply for the following year. The estimate ("Available Water Amount") will be provided to the Executive Director of the PRRIP ("Executive Director") and the Environmental Account Manager of U.S. Fish and Wildlife Service ("EA Manager").

2. On or before the first day of June of each year, the Executive Director, in consultation with the EA Manager, will respond to the Director with the quantity of water of the Available Water Amount the PRRIP would like to have released from the Wyoming Account ("Delivery Water Amount"). The Delivery Water Amount shall not be less than four thousand eight hundred (4,800) acre feet or the Available Water Amount, whichever is less. The Delivery Water Amount shall not be more than the Available Water Amount.

3. The Director will ensure the accuracy of the May estimate and advise the Executive Director by the fifteenth of June if there have been changes to the Available Water Amount and if the Delivery Water Amount must be revised.

4. The Director will secure the necessary annual temporary water use agreements from the Wyoming State Engineer.

5. There is a possibility that the demand from the WWDO's municipal customers will be less than anticipated. If this is the case, additional water will added to the Available Water Amount on or before September 1. If the total is less than or equal to 4,800 acre feet, the Delivery Water Amount will be increased and the temporary use agreement will be revised accordingly. If the total is greater than 4,800 acre feet, the PRRIP has the option to add the additional water to the Delivery Water Amount. If this option is exercised, the Delivery Water Amount will be increased and the temporary use agreement will be revised accordingly.

6. The Delivery Water Amount will be released beginning no earlier than the first of September each year unless the Executive Director and EA Manager request an alternative release schedule. The alternative release schedule must be approved by the Director and Area Manager. No releases will be made that could result in or exacerbate flooding below Pathfinder Dam.

7. The Delivery Water Amount will annually be credited against the Purchase Water Amount. The Delivery Water Amount will be annually tabulated and agreed to by the Director and the Executive Director.

8. Release by the State of the Delivery Water Amount into the North Platte River at the Pathfinder Dam shall constitute delivery of the Delivery Water Amount to the PRRIP. The Delivery Water Amount shall be measured and accounted for at the Pathfinder Dam. The PRRIP shall assume any loss of any nature whatsoever occurring to the Delivery Water Amount between the Pathfinder Dam and the PRRIP's point of use. Conveyance loss from Pathfinder Dam to the Wyoming/Nebraska state line shall be assessed by the Wyoming State Engineer. In accordance with Nebraska law, conveyance losses from the Wyoming/Nebraska state line to the PRRIP point of use will be assessed by the Nebraska Department of Natural Resources.

9. The State makes no warranty with respect to the quality of the Delivery Water Amount released to serve the PRRIP, it being understood that this is raw, untreated water as it naturally occurs in the North Platte River at Pathfinder Dam. In the use of the Delivery Water Amount, the PRRIP agrees to comply with all applicable State and Federal laws. The PRRIP agrees that it will comply fully with all laws, orders, standards, or regulations under federal, State and local jurisdictions now or hereafter in force as may be applicable to the facilities at which the Purchase Water Amount may be used.

IV. SPECIAL PROVISIONS.

A. Assignability

1. The PRRIP shall not make any sale, gift, delivery, assignment or other disposition of this Contract or the whole or any part of the Purchase Water Amount except to any entity or entities associated with or retained by the PRRIP for purposes and operations advantageous to the PRRIP as determined by the Governance Committee of the PRRIP.

2. Nothing contained herein relating to the assignability of this Contract shall preclude the PRRIP from entering into arrangements with others for the installation, construction, operation and maintenance of water diversion, carriage and distribution facilities by which the Purchase Water Amount, separately or together with other permitted water appropriations, may be applied for PRRIP purposes.

3. Neither party hereto shall be, or be considered as, the agent, servant, or employee of the other party or be held responsible or liable for damages for the acts or conduct of the other.

4. Wherever in this Contract a time for performance of an obligation is established, then it is agreed that time is of the essence.

B. Delivery.

1. The State shall exercise all rights under the Federal Contract to arrange for release to the PRRIP of the Purchase Water Amount. In the event that the schedule for release creates operational problems for the State which cannot be overcome by the exercise of reasonable effort and expense and which require a change in the specified schedule (e.g., rate of flow, timing of flow, etc.), then the State shall notify the

PRRIP at the earliest time reasonable under the circumstances. The Parties will use their best efforts to develop a schedule that will accommodate the PRRIP's needs and avoid the operational problems being experienced by the State.

2. The State will comply with all applicable provisions of the Federal Contract and will make all required payments to the United States when they become due. If the United States withholds from the State scheduled deliveries of the Purchase Water Amount to the PRRIP, the PRRIP shall be credited for payments made for water not delivered.

V. Provisions Required by the Federal Contract.

A. The provisions of Section V shall apply only to water delivered from the Wyoming Account within the terms of the Federal Contract.

B. The Parties agree that the delivery of water or the use of federal facilities is pursuant to the Federal Contract.

C. The United States, through its Contracting Officer, shall have the right to make determinations necessary to administer the Federal Contract, the laws of the United States and the State of Wyoming and the rules and regulations promulgated by the Secretary of the Interior. Such determinations shall be made in consultation with the State. If such determinations affect this Contract, the State will consult with the PRRIP as soon as practicable.

D. The PRRIP agrees that it will comply fully with air and water pollution control laws, orders, standards, or regulations under federal, state and local jurisdictions now or hereafter in force.

E. During the performance of this Contract, the PRRIP agrees as follows:

1. The PRRIP will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or disability. The PRRIP will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, national origin, or disability. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The PRRIP agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the United States setting forth the provisions of this Equal Opportunity clause.

2. The PRRIP will, in all solicitations or advertisements for employees placed by or on behalf of the PRRIP, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or disability.

3. The PRRIP will send to each labor union or representative of workers within which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the United States, advising the labor union or workers' representative of the PRRIP's commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The PRRIP will comply with all provisions of Executive Order No. 11246 of September 24, 1965 as amended, and of the rules, regulations and relevant orders of the Secretary of Labor.

5. The PRRIP will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records and accounts by the contracting officers under the Federal Contract and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

6. In the event of PRRIP noncompliance with the Equal Opportunity clause of this Contract or with any of the said rules, regulations or orders, this Contract may be canceled, terminated or suspended, in whole or in part, and the PRRIP may be declared ineligible for further United States Government contracts in accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rules, regulations, or order of the Secretary of Labor, or as otherwise provided by law.

7. The PRRIP will include the provisions of paragraphs 1 through 7 in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The PRRIP will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: provided, however, that in the event the PRRIP becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the PRRIP may request the United States to enter into such litigation to protect the interests of the United States.

F. The State shall comply with Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d), Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112, as amended), the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq.), Title II of the Americans with Disabilities Act of 1990, and any other applicable civil rights laws, as well as with their respective implementing regulations and guidelines imposed by the U.S. Department of the Interior and/or the Bureau of Reclamation.

G. In its operation of Pathfinder Dam and Reservoir, the United States, through its Contracting Officer, will use all reasonable means to guard against a condition of shortage in the quantity of water to be made available to the State pursuant to the Federal

Contract. In the event the Contracting Officer determines that a condition of shortage appears probable, the Contracting Officer will notify the State of said determination as soon as practicable. In turn, the State will notify the PRRIP of said determination as soon as practicable.

H. If there is a condition of shortage because of errors in physical operations of Pathfinder Dam and Reservoir, drought, other physical causes beyond the control of the United States, through its Contracting Officer, or actions taken by the Contracting Officer to meet current and future legal obligations, then no liability shall accrue against the United States or the State or any of their officers, agents, or employees for any damage, direct or indirect, arising therefrom.

VI. GENERAL PROVISIONS.

A. Amendments. Any changes, modifications, revisions or amendments to this Contract which are mutually agreed upon by the Parties shall be incorporated by written instrument, executed and signed by all Parties.

B. Default. No Purchase Water Amount shall be released to the PRRIP under this Contract if the PRRIP is in default in making any payment due the State under this Contract.

C. Americans with Disabilities Act. The PRRIP shall not discriminate against a qualified individual with a disability and shall comply with the Americans with Disabilities Act, P.L. 101-336, 42 U.S.C. 12101, *et seq.,* and/or any properly promulgated rules and regulations related thereto.

D. Applicable Law/Venue. The construction, interpretation and enforcement of this Contract shall be governed by the laws of the State of Wyoming. The courts of the State of Wyoming shall have jurisdiction over this Contract and the Parties, and the venue shall be the First Judicial District, Laramie County, Wyoming.

E. Compliance with Laws. The PRRIP shall keep informed of and comply with all applicable federal, State and local laws and regulations in the performance of this Contract.

F. Entirety of Contract. This Contract, consisting of eleven (11) pages, represents the entire and integrated Contract between the Parties and supersedes all prior negotiations, representations, and agreements, whether written or oral.

G. Force Majeure. Neither Party shall be liable for failure to perform under this Contract if such failure to perform arises out of causes beyond the control and without the fault or negligence of the nonperforming Party. Such causes may include, but are not limited to, acts of God or the public enemy, fires, floods, epidemics, quarantine restrictions, freight embargoes, and unusually severe weather. This provision shall become effective only if the Party failing to perform immediately notifies the other Party of the extent and

nature of the problem, limits delay in performance to that required by the event, and takes all reasonable steps to minimize delays. This provision shall not be effective unless the failure to perform is beyond the control and without the fault or negligence of the nonperforming Party.

H. Indemnification. The PRRIP shall release, indemnify, and hold harmless the State of Wyoming, the WWDO, its officers, agents, employees, successors, and assignees from any cause of action, or claims, charges or costs, including attorney's fees and expert witness fees, or demands of any sort arising out of, directly or indirectly, the PRRIP's performance or failure to perform under this Agreement.

I. Notices. Any notice, demand, or request authorized or required by this Contract shall be deemed to have been given, on behalf of the PRRIP, when mailed, postage prepaid, or delivered to the:

Executive Director
Platte River Recovery Implementation Program
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845

and on behalf of the State, when mailed, postage prepaid, or delivered to the:

Director
Wyoming Water Development Office
6920 Yellowtail Road
Cheyenne, WY 82002

The designation of the addressee or the address may be changed by notice given in the same manner as provided in this Article for other notices.

J. Sovereign Immunity. The State of Wyoming and the Wyoming Water Development Office do not waive sovereign immunity by entering into this Contract, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyo. Stat. § 1-39-104(a) and all other state law.

K. Termination. Upon failure of the PRRIP to make timely payments in accordance with of this Contract, and upon thirty (30) days written notice to the PRRIP by the State and failure to cure such non-payment by the PRRIP, this Contract may be terminated at the option of the State.

L. Third Party Beneficiary Rights. The Parties do not intend to create in any other individual or entity the status of third party beneficiary, and this Contract shall not be construed so as to create such status. The rights, duties and obligations contained in this Contract shall operate only between the Parties , and shall inure solely to the benefit of the Parties. The provisions of this Contract are intended only to assist the Parties in determining and performing their obligations under this Contract.

M. Titles Not Controlling. Titles of paragraphs are for reference only, and shall not be used to construe the language in this Contract.

N. Waiver. The waiver of any breach of any term or condition in this Contract shall not be deemed a waiver of any prior or subsequent breach.

O. Officials Not To Benefit. No Member of or Delegate to the Congress, or state or federal officials shall benefit from this Contract other than as a water user or landowner in the same manner as other water users or landowners.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK

VII. SIGNATURES. In witness thereof, the Parties, either personally or through their duly authorized representatives, have executed this Contract on the days and dates set out below, and certify that they have read, understood, and agreed to the terms and conditions of this Contract.

The effective date of this Contract is the date of the signature last affixed to this page.

NEBRASKA COMMUNITY FOUNDATION

_____ 7/27/2011

Diane M. Wilson — Date
Chief Financial and Administrative Officer

STATE OF NEBRASKA) ss.
COUNTY OF Lancaster)

The foregoing instrument was acknowledged before me by Diane Wilson, CFO & Administrative officer of Nebraska Community Foundation, this 27 day of July of 2011.

Witness my hand official seal.

_____
Notary Public

My Commission expires: 10/28/14

GENERAL NOTARY - State of Nebraska
JULIANN M. ROSSO
My Comm. Exp. Oct. 28, 2014

STATE OF WYOMING

_____ July 26, 2011

Michael K. Purcell — Date
Director, Wyoming Water Development Office

STATE OF WYOMING) ss.
COUNTY OF LARAMIE)

The foregoing instrument was acknowledged before me by Michael K. Purcell, Director, Water Development Office of the State of Wyoming, this 26th day of July of 2011.

Witness my hand official seal.

_____
Notary Public

ANDREA ODELL NOTARY PUBLIC
COUNTY OF LARAMIE STATE OF WYOMING
MY COMMISSION EXPIRES OCT. 14, 2014

My Commission expires: 10-14-14

WYOMING ATTORNEY GENERAL'S OFFICE APPROVAL AS TO FORM

S. Jane Caton #7612 6-28-11

S. Jane Caton — Date
Senior Assistant Attorney General

APPENDIX B:

SCORE ANALYSIS – MODELING PERIOD AVERAGE PATTERN SCENARIO

Appendix B

Score Analysis - Modeling Period Average Pattern (Shortage Distribution Release Scenario)

Table B-1: Average losses from Pathfinder Reservoir to Lake McConaughy in September.

Month	Release from Pathfinder Reservoir (AFY)	Avg Water Reaching Lake McConaughy- Normal Year	Avg Water Reaching Lake McConaughy - Wet Year	Avg Water Reaching Lake McConaughy- Dry Year	% Normal Yrs in Period	% Wet Yrs in Period	% Dry Yrs in Period	Yield @ Lake McConaughy (AFY)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
Sep	4,800	94%	94%	92%	42%	33%	25%	4,494

Notes:

(A) Municipal Account Lease water released from Pathfinder Reservoir and routed to Lake McConaughy in September of each year.

(B) - (D) Average proportion of water reaching Lake McConaughy in normal, wet and dry years based on the WMC Loss Model.

(E) - (G) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(H) The proportion of Column (A) reaching Lake McConaughy, based on the proportion of normal, wet and dry years and the September routing loss for each hydrologic condition.

Table B-2: Shortage distribution scenario score summary, based on modeling period average release pattern.

Month	Avg Monthly Shortages (kAF)	Proportion of Annual Shortages	Releases from Lake McConaughy per Shortages (AF)	Avg Water Reaching Grand Island- Normal Year	Avg Water Reaching Grand Island - Wet Year	Avg Water Reaching Grand Island- Dry Year	% Normal Yrs in Period	% Wet Yrs in Period	% Dry Yrs in Period	Score at Grand Island (AFY)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Jan	2.5	1%	46	86%	87%	84%	42%	33%	25%	39
Feb	26.9	11%	495	91%	90%	89%				446
Mar	26.4	11%	485	95%	95%	93%				459
Apr	22.5	9%	415	93%	91%	90%				380
May	22.2	9%	408	90%	91%	89%				368
Jun	36.7	15%	675	86%	87%	63%				544
Jul	13.3	5%	244	74%	89%	38%				172
Aug	27.3	11%	502	72%	84%	26%				325
Sep	20.7	8%	381	70%	79%	34%				244
Oct	33.7	14%	620	81%	88%	52%				471
Nov	9.8	4%	181	86%	90%	73%				152
Dec	2.2	1%	40	86%	89%	84%				35
Total	244.0	100%	4,494							3,637

Notes:

(A) Average monthly shortages to target flows based on 1947-1994 monthly OpStudy hydrology and the target flows from Appendix A-5 Column 8 in the Water Plan Reference Material.

(B) Calculation = Column (A) monthly value ÷ Column (A) total annual value.

(C) Calculation = Column (B) × the yield at Lake McConaughy in Table B-1 Column (H).

(D) - (F) Average proportion of water reaching Grand Island in normal, wet and dry years based on the WMC Loss Model.

(G) - (I) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(J) The proportion of Column (C) reaching Grand Island, based on the proportion of normal, wet and dry years and the routing loss for each hydrologic condition.

Appendix B

Score Analysis - Modeling Period Average Pattern (Shortage Distribution Release Scenario with Evaporation)

Table B-3: Shortage distribution scenario score summary, based on modeling period average release pattern, with evaporation losses in EA.

Month	Avg Monthly Shortages (kAF)	Proportion of Annual Shortages	Releases from Lake McConaughy per Shortages (AF)	Percentage of Evaporation from EA	Releases from Lake McConaughy after Evaporation (AF)	Avg Water Reaching Grand Island- Normal Year	Avg Water Reaching Grand Island - Wet Year	Avg Water Reaching Grand Island- Dry Year	% Normal Yrs in Period	% Wet Yrs in Period	% Dry Yrs in Period	Score at Grand Island (AFY)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Sep	20.7	8%	381	0.4%	380	70%	79%	34%	42%	33%	25%	243
Oct	33.7	14%	620	0.2%	616	81%	88%	52%				469
Nov	9.8	4%	181	0.1%	180	86%	90%	73%				151
Dec	2.2	1%	40	0.0%	40	86%	89%	84%				35
Jan	2.5	1%	46	0.1%	46	86%	87%	84%				39
Feb	26.9	11%	495	0.2%	490	91%	90%	89%				442
Mar	26.4	11%	485	0.2%	480	95%	95%	93%				454
Apr	22.5	9%	415	0.4%	408	93%	91%	90%				374
May	22.2	9%	408	0.4%	400	90%	91%	89%				361
Jun	36.7	15%	675	0.4%	659	86%	87%	63%				531
Jul	13.3	5%	244	0.8%	236	74%	89%	38%				166
Aug	27.3	11%	502	0.7%	483	72%	84%	26%				313
Total	244	100%	4,494		4,418							3,577

Notes:

(A) Average monthly shortages to target flows based on 1947-1994 monthly OpStudy hydrology and the target flows from Appendix A-5 Column 8 in the Water Plan Reference Material.

(B) Calculation = Column (A) monthly value ÷ Column (A) total annual value.

(C) Calculation = Column (B) × the yield at Lake McConaughy (from Table B-1).

(D) Percentage of evaporation from EA content, based on OpStudy output.

(E) Calculation = Column (C) × evaporation for current month and all preceding months in Column (D).

(F) - (H) Average proportion of water reaching Grand Island in normal, wet and dry years based on the WMC Loss Model.

(I) - (K) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(L) The proportion of Column (E) reaching Grand Island, based on the proportion of normal, wet and dry years and the routing loss for each hydrologic condition.

Appendix B
Score Analysis - Modeling Period Average Pattern (Spring Release Scenario)

Table B-4: Spring release scenario score summary, based on modeling period average release pattern.

Month	Estimated Proportion of Release from Lake McConaughy	Releases from Lake McConaughy (AF)	Avg Water Reaching Grand Island- Normal Year	Avg Water Reaching Grand Island - Wet Year	Avg Water Reaching Grand Island- Dry Year	% Normal Yrs in Period	% Wet Yrs in Period	% Dry Yrs in Period	Score at Grand Island (AFY)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
Mar	65%	2,921	95%	95%	93%	42%	33%	25%	2,764
Apr	35%	1,573	93%	91%	90%				1,442
Total	100%	4,494							4,206

Notes:

(A) In the OpStudy hydrology, 65% of the years have a shortages in March. It was assumed the Program would release in April for the remaining 35% of the years.

(B) Calculation = Column (A) × the yield at Lake McConaughy in Table B-1 Column (H).

(C) - (E) Average proportion of water reaching Grand Island in normal, wet and dry years based on the WMC Loss Model.

(F) - (H) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(I) The proportion of Column (B) reaching Grand Island, based on the proportion of normal, wet and dry years and the routing loss for each hydrologic condition.

Table B-5: Spring release scenario score summary, based on modeling period average release pattern, with evaporation losses in EA.

Month	Estimated Proportion of Release from Lake McConaughy	Releases from Lake McConaughy (AF)	Percentage of Evaporation from EA	Releases from Lake McConaughy after Evaporation (AF)	Avg Water Reaching Grand Island- Normal Year	Avg Water Reaching Grand Island - Wet Year	Avg Water Reaching Grand Island- Dry Year	% Normal Yrs in Period	% Wet Yrs in Period	% Dry Yrs in Period	Score at Grand Island (AFY)
	(A)	(B)			(C)	(D)	(E)	(F)	(G)	(H)	(I)
Mar	65%	2,921	1%	2,886	95%	95%	93%	42%	33%	25%	2,731
Apr	35%	1,573	2%	1,548	93%	91%	90%				1,418
Total	100%	4,494		4,434							4,150

Notes:

(A) In the OpStudy hydrology, 65% of the years have a shortages in March. It was assumed the Program would release in April for the remaining 35% of the years.

(B) Calculation = Column (A) × the yield at Lake McConaughy in Table B-1 Column (H).

(C) - (E) Average proportion of water reaching Grand Island in normal, wet and dry years based on the WMC Loss Model.

(F) - (H) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(I) The proportion of Column (B) reaching Grand Island, based on the proportion of normal, wet and dry years and the routing loss for each hydrologic condition.

APPENDIX C:

SCORE ANALYSIS – REPRESENTATIVE YEAR ANALYSIS

Appendix C
Score Analysis - Representative Year Analysis

Shortage Distribution Release Scenario

Table C-1: Representative normal year score summary.

Mo-Yr	Shortages at GI (AF)	Proportion of Shortages	Release Pattern (AF)	Score at Grand Island (AF)
	(A)	(B)	(C)	(D)
Sep-74	17,600	6%	260	182
Oct-74	36,200	12%	535	432
Nov-74	10,400	3%	154	132
Dec-74	0	0%	0	0
Jan-75	0	0%	0	0
Feb-75	44,300	15%	655	593
Mar-75	56,700	19%	839	801
Apr-75	38,500	13%	570	527
May-75	1,400	0%	21	19
Jun-75	39,900	13%	590	507
Jul-75	23,300	8%	345	256
Aug-75	35,500	12%	525	379
Total	303,800	100%	4,494	3,828

Table C-2: Representative dry year score summary.

Mo-Yr	Shortages at GI (AF)	Proportion of Shortages	Release Pattern	Score at Grand Island (AF)
	(A)	(B)	(C)	(D)
Sep-63	13,700	12%	536	184
Oct-63	15,000	13%	587	306
Nov-63	0	0%	0	0
Dec-63	0	0%	0	0
Jan-64	0	0%	0	0
Feb-64	18,600	16%	727	650
Mar-64	15,300	13%	598	555
Apr-64	0	0%	0	0
May-64	0	0%	0	0
Jun-64	7,900	7%	309	196
Jul-64	21,200	18%	829	316
Aug-64	23,200	20%	907	240
Total	114,900	100%	4,494	2,447

Table C-3: Representative wet year score summary.

Mo-Yr	Shortages at GI (AF)	Proportion of Shortages	Release Pattern	Score at Grand Island (AF)
	(A)	(B)	(C)	(D)
Sep-85	0	0%	0	0
Oct-85	5,700	9%	396	349
Nov-85	6,000	9%	417	376
Dec-85	0	0%	0	0
Jan-86	0	0%	0	0
Feb-86	0	0%	0	0
Mar-86	9,700	15%	674	640
Apr-86	0	0%	0	0
May-86	0	0%	0	0
Jun-86	0	0%	0	0
Jul-86	18,700	29%	1,299	1,162
Aug-86	24,600	38%	1,709	1,439
Total	64,700	100%	4,494	3,966

Score based on proportion of wet/norm/dry years:	**3,529**
Score with average evaporation (2%) (H):	**3,458**

Spring Release Scenario

All three years have shortages in March.

Table C-4: Representative year spring release score summary.

Year	Hydrologic Condition	Score at G.I. (AFY)	Prop. of Yrs	Prop. of Score (AFY)
		(E)	(F)	(G)
WY 1964	Dry	4,170	25%	1,042
WY 1975	Normal	4,291	42%	1,788
WY 1986	Wet	4,268	33%	1,423
Score based on proportion of wet/norm/dry years:				**4,253**
Score with average evaporation (2%) (H):				**4,168**

Notes:

(A) Average monthly shortages to target flows based on OpStudy hydrology and the target flows from Appendix A-5 Column 8 in the Water Plan Reference Material.

(B) Calculation = Monthly Column (A) ÷ Column (A) Total.

(C) Calculation = Column (B) × the yield at Lake McConaughy in Table B-1 Column (H).

(D) Volume of water reaching Grand Island based on WMC Loss Model, during shortages in Column (A).

(E) Score at Grand Island, based on March release (March shortages occur each year). Calculation = yield at Lake McConaughy in Table B-1 Column (H) less routing losses in WMC Loss Model.

(F) Proportion of normal, wet and dry years during the 1947-1994 OpStudy modeling period.

(G) Calculation = Column (E) × Column (G).

(H) Score total in Column G (line above) less a 2% average evaporation loss (based on evaporation losses in Modeling Period Average and Annual Pattern scenarios).

APPENDIX D:

SCORE ANALYSIS – ANNUAL PATTERN RELEASE SCENARIO

Appendix D
Score Analysis

Table D-1: Shortages at Grand Island (AF).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	0	0	10,300	0	1,300	0	0	24,000	17,500	5,500	0	0	58,600
1948	0	0	0	13,300	10,400	87,000	23,300	39,800	51,300	49,100	10,200	0	284,400
1949	0	48,600	0	0	14,400	0	0	24,300	16,900	0	0	0	104,200
1950	0	0	10,700	28,600	1,900	87,200	0	27,000	9,400	0	5,200	0	170,000
1951	0	16,100	73,200	28,300	22,200	4,500	0	27,400	0	0	0	0	171,700
1952	0	0	0	0	22,100	86,700	15,100	24,200	17,400	81,700	23,700	0	270,900
1953	0	0	0	0	0	0	18,000	6,800	11,900	34,600	0	0	71,300
1954	0	0	34,600	24,700	0	6,400	29,600	10,000	9,300	46,500	7,900	0	169,000
1955	0	34,600	32,500	55,300	24,500	5,000	18,000	21,400	18,000	77,000	31,000	0	317,300
1956	0	46,000	71,600	61,600	12,900	32,300	24,800	26,700	17,100	67,100	32,700	0	392,800
1957	16,000	39,000	59,400	28,100	0	0	0	8,100	0	0	0	0	150,600
1958	0	56,200	27,900	0	0	0	0	24,200	17,600	16,300	7,600	0	149,800
1959	0	14,000	0	0	0	0	5,500	21,100	27,800	14,100	0	0	82,500
1960	0	30,100	0	2,300	26,800	55,700	23,400	42,700	24,000	53,300	10,100	0	268,400
1961	0	0	14,700	5,900	0	0	0	16,200	36,100	19,400	0	0	92,300
1962	0	0	0	43,500	82,200	0	0	12,100	35,600	35,800	5,800	0	215,000
1963	0	0	0	0	0	0	38,000	33,900	13,700	15,000	0	0	100,600
1964	0	18,600	15,300	0	0	7,900	21,200	23,200	29,400	43,500	14,900	0	174,000
1965	13,800	88,900	77,900	43,600	81,200	0	0	28,500	0	0	0	0	333,900
1966	0	0	9,500	9,100	38,000	107,400	39,500	44,900	58,200	47,100	10,900	1,700	366,300
1967	0	54,800	84,800	76,300	81,800	0	0	33,900	35,500	39,100	4,200	0	410,400
1968	0	37,800	72,300	37,600	77,300	87,200	24,200	20,900	35,600	45,000	0	3,000	440,900
1969	0	40,900	0	23,100	1,400	25,400	0	24,300	17,800	14,900	0	0	147,800
1970	0	0	32,500	0	22,200	60,700	0	24,200	17,700	51,500	9,600	6,900	225,300
1971	0	24,700	27,900	1,300	22,200	0	0	24,500	17,600	32,600	0	0	150,800
1972	0	0	9,500	20,400	22,500	86,700	24,900	14,300	35,500	60,000	5,400	0	279,200
1973	0	0	19,300	0	0	0	400	24,000	0	0	0	0	43,700
1974	0	0	0	0	19,300	70,400	23,600	41,000	17,600	36,200	10,400	0	218,500
1975	0	44,300	56,700	38,500	1,400	39,900	23,300	35,500	35,600	35,600	200	0	311,000
1976	0	0	0	0	0	0	24,100	26,700	25,800	38,300	14,800	0	129,700
1977	26,200	74,500	82,500	11,800	22,500	89,200	23,600	34,600	38,000	34,900	5,300	0	443,100
1978	16,900	71,100	0	21,800	14,900	87,000	48,700	44,000	39,000	78,200	43,000	27,300	491,900
1979	25,000	90,700	8,800	26,600	26,300	0	0	23,600	17,600	47,500	0	0	266,100
1980	0	0	0	4,700	0	0	24,900	24,600	17,700	39,000	35,000	0	145,900
1981	0	38,000	32,600	29,900	0	0	8,300	0	11,900	38,300	2,200	0	161,200
1982	13,700	71,300	88,700	55,700	62,500	87,000	23,800	42,700	36,100	16,200	20,700	0	518,400
1983	0	0	11,200	0	0	0	0	24,000	0	0	0	0	35,200
1984	0	0	0	0	0	0	0	24,000	0	0	0	0	24,000
1985	0	0	0	0	16,700	39,000	25,300	27,300	0	5,700	6,000	0	120,000
1986	0	0	9,700	0	0	0	18,700	24,600	0	0	0	0	53,000
1987	0	0	0	0	0	0	0	24,400	0	0	0	0	24,400
1988	0	0	10,200	18,200	1,400	99,100	0	30,400	17,700	26,200	0	0	203,200
1989	0	60,200	60,400	68,200	45,500	96,200	0	47,500	0	50,300	24,800	28,400	481,500
1990	0	57,500	70,400	72,200	42,100	86,800	50,100	46,700	43,900	93,800	49,500	34,600	647,600
1991	0	4,800	34,300	51,900	0	0	17,400	23,900	21,100	52,800	7,900	0	214,100
1992	0	68,300	83,700	94,900	115,600	131,300	18,600	73,800	65,500	59,500	37,800	0	749,000
1993	0	84,000	0	44,100	103,200	87,400	0	0	0	54,500	23,800	0	397,000
1994	8,100	75,700	32,000	39,400	27,500	105,800	0	37,400	34,700	59,700	10,800	3,100	434,200
Avg	2,494	26,890	26,356	22,519	22,171	36,650	13,256	27,277	20,690	33,663	9,821	2,188	243,973

Average monthly shortages to target flows based on OpStudy hydrology and the target flows from Appendix A-5 Column 8 in the Water Plan Reference Material.

Appendix D
Score Analysis - Annual Pattern (Shortage Distribtution Release Scenario)

Table D-2: Releases from Lake McConaughy, per annual shortage distribution, no evaporation (AF).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	0	0	790	0	100	0	0	1,841	1,342	422	0	0	4,494
1948	0	0	0	210	164	1,375	368	629	811	776	161	0	4,494
1949	0	2,096	0	0	621	0	0	1,048	729	0	0	0	4,494
1950	0	0	283	756	50	2,305	0	714	248	0	137	0	4,494
1951	0	421	1,916	741	581	118	0	717	0	0	0	0	4,494
1952	0	0	0	0	367	1,438	250	401	289	1,355	393	0	4,494
1953	0	0	0	0	0	0	1,135	429	750	2,181	0	0	4,494
1954	0	0	920	657	0	170	787	266	247	1,237	210	0	4,494
1955	0	490	460	783	347	71	255	303	255	1,091	439	0	4,494
1956	0	526	819	705	148	370	284	305	196	768	374	0	4,494
1957	477	1,164	1,773	839	0	0	0	242	0	0	0	0	4,494
1958	0	1,686	837	0	0	0	0	726	528	489	228	0	4,494
1959	0	763	0	0	0	0	300	1,149	1,514	768	0	0	4,494
1960	0	504	0	39	449	933	392	715	402	892	169	0	4,494
1961	0	0	716	287	0	0	0	789	1,758	945	0	0	4,494
1962	0	0	0	909	1,718	0	0	253	744	748	121	0	4,494
1963	0	0	0	0	0	0	1,698	1,514	612	670	0	0	4,494
1964	0	480	395	0	0	204	548	599	759	1,124	385	0	4,494
1965	186	1,197	1,048	587	1,093	0	0	384	0	0	0	0	4,494
1966	0	0	117	112	466	1,318	485	551	714	578	134	21	4,494
1967	0	600	929	836	896	0	0	371	389	428	46	0	4,494
1968	0	385	737	383	788	889	247	213	363	459	0	31	4,494
1969	0	1,244	0	702	43	772	0	739	541	453	0	0	4,494
1970	0	0	648	0	443	1,211	0	483	353	1,027	191	138	4,494
1971	0	736	831	39	662	0	0	730	525	972	0	0	4,494
1972	0	0	153	328	362	1,396	401	230	571	966	87	0	4,494
1973	0	0	1,985	0	0	0	41	2,468	0	0	0	0	4,494
1974	0	0	0	0	397	1,448	485	843	362	745	214	0	4,494
1975	0	640	819	556	20	577	337	513	514	514	3	0	4,494
1976	0	0	0	0	0	0	835	925	894	1,327	513	0	4,494
1977	266	756	837	120	228	905	239	351	385	354	54	0	4,494
1978	154	650	0	199	136	795	445	402	356	714	393	249	4,494
1979	422	1,532	149	449	444	0	0	399	297	802	0	0	4,494
1980	0	0	0	145	0	0	767	758	545	1,201	1,078	0	4,494
1981	0	1,059	909	834	0	0	231	0	332	1,068	61	0	4,494
1982	119	618	769	483	542	754	206	370	313	140	179	0	4,494
1983	0	0	1,430	0	0	0	0	3,064	0	0	0	0	4,494
1984	0	0	0	0	0	0	0	4,494	0	0	0	0	4,494
1985	0	0	0	0	625	1,461	947	1,022	0	213	225	0	4,494
1986	0	0	822	0	0	0	1,586	2,086	0	0	0	0	4,494
1987	0	0	0	0	0	0	0	4,494	0	0	0	0	4,494
1988	0	0	226	403	31	2,192	0	672	391	579	0	0	4,494
1989	0	562	564	637	425	898	0	443	0	469	231	265	4,494
1990	0	399	489	501	292	602	348	324	305	651	344	240	4,494
1991	0	101	720	1,089	0	0	365	502	443	1,108	166	0	4,494
1992	0	410	502	569	694	788	112	443	393	357	227	0	4,494
1993	0	951	0	499	1,168	989	0	0	0	617	269	0	4,494
1994	84	784	331	408	285	1,095	0	387	359	618	112	32	4,494
Avg	36	432	498	329	304	522	294	860	428	621	149	20	4,494

Yield at Lake McConaughy distributed by the proportion of shortages on an annual basis. No evaporation is assessed on the yield in the EA in Lake McConaughy.

Appendix D

Score Analysis - Annual Pattern (Shortage Distribution Release Scenario)

Table D-3: Score Grand Island, no evaporation (AF).

Year	Yr Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	Normal	0	0	754	0	90	0	0	1,329	938	340	0	0	3,451
1948	Normal	0	0	0	195	148	1,181	273	454	567	626	138	0	3,581
1949	Wet	0	1,890	0	0	566	0	0	882	573	0	0	0	3,911
1950	Normal	0	0	270	700	45	1,980	0	515	174	0	118	0	3,802
1951	Wet	0	380	1,819	678	529	102	0	604	0	0	0	0	4,113
1952	Wet	0	0	0	0	334	1,251	224	338	227	1,195	355	0	3,924
1953	Dry	0	0	0	0	0	0	433	113	258	1,136	0	0	1,940
1954	Dry	0	0	854	593	0	108	300	70	85	644	153	0	2,807
1955	Dry	0	438	427	707	310	45	97	80	88	568	320	0	3,080
1956	Dry	0	470	760	636	132	234	108	81	67	400	273	0	3,162
1957	Dry	399	1,040	1,645	757	0	0	0	64	0	0	0	0	3,905
1958	Normal	0	1,527	799	0	0	0	0	524	369	394	195	0	3,809
1959	Dry	0	682	0	0	0	0	114	304	521	400	0	0	2,021
1960	Normal	0	456	0	36	403	801	291	516	281	720	145	0	3,649
1961	Dry	0	0	664	259	0	0	0	208	605	492	0	0	2,229
1962	Normal	0	0	0	842	1,543	0	0	183	520	604	104	0	3,796
1963	Dry	0	0	0	0	0	0	647	400	211	349	0	0	1,607
1964	Dry	0	429	367	0	0	129	209	158	261	585	281	0	2,420
1965	Wet	162	1,079	996	537	996	0	0	323	0	0	0	0	4,092
1966	Normal	0	0	111	103	419	1,132	360	398	499	466	114	18	3,621
1967	Normal	0	543	887	774	805	0	0	268	272	345	39	0	3,933
1968	Normal	0	349	704	355	708	763	183	154	254	370	0	26	3,866
1969	Normal	0	1,126	0	650	38	663	0	533	378	365	0	0	3,756
1970	Wet	0	0	616	0	403	1,053	0	406	277	906	173	123	3,957
1971	Wet	0	664	790	35	603	0	0	615	412	857	0	0	3,975
1972	Wet	0	0	145	300	330	1,214	359	194	449	851	78	0	3,921
1973	Wet	0	0	1,885	0	0	0	37	2,078	0	0	0	0	4,000
1974	Wet	0	0	0	0	362	1,260	434	710	284	656	193	0	3,900
1975	Normal	0	580	782	515	18	495	250	370	360	415	2	0	3,788
1976	Dry	0	0	0	0	0	0	318	244	308	691	374	0	1,936
1977	Normal	229	684	799	111	205	777	178	253	269	286	46	0	3,837
1978	Normal	133	588	0	184	122	683	330	290	249	576	336	215	3,708
1979	Normal	364	1,387	142	416	399	0	0	288	208	647	0	0	3,851
1980	Wet	0	0	0	132	0	0	686	638	428	1,059	973	0	3,917
1981	Dry	0	947	843	753	0	0	88	0	114	556	45	0	3,346
1982	Normal	102	560	734	447	487	648	153	267	219	113	154	0	3,884
1983	Wet	0	0	1,358	0	0	0	0	2,580	0	0	0	0	3,938
1984	Wet	0	0	0	0	0	0	0	3,784	0	0	0	0	3,784
1985	Wet	0	0	0	0	570	1,271	848	861	0	188	203	0	3,940
1986	Wet	0	0	781	0	0	0	1,419	1,756	0	0	0	0	3,956
1987	Wet	0	0	0	0	0	0	0	3,784	0	0	0	0	3,784
1988	Normal	0	0	215	373	28	1,883	0	485	274	467	0	0	3,725
1989	Normal	0	509	538	589	381	771	0	320	0	379	198	229	3,915
1990	Normal	0	361	466	464	262	517	258	234	213	525	294	207	3,803
1991	Dry	0	90	668	984	0	0	139	133	152	577	121	0	2,864
1992	Normal	0	371	480	527	623	677	83	320	275	288	194	0	3,837
1993	Wet	0	858	0	457	1,064	861	0	0	0	544	243	0	4,026
1994	Normal	72	710	316	378	256	941	0	279	251	498	96	28	3,824
Avg		30	390	471	302	275	447	184	612	248	439	124	18	3,539

Releases in Table D-2 routed to Grand Island using the WMC Loss Model.

Appendix D

Score Analysis - Annual Pattern (Shortage Distribtution Release Scenario)

Table D-4: Score at Grand Island, after assessing evaporation on the EA (AF).

Year	Yr Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	Normal	0	0	747	0	88	0	0	1,286	938	339	0	0	3,398
1948	Normal	0	0	0	192	145	1,157	267	439	567	623	137	0	3,528
1949	Wet	0	1,875	0	0	557	0	0	854	573	0	0	0	3,859
1950	Normal	0	0	267	692	44	1,941	0	499	174	0	117	0	3,733
1951	Wet	0	377	1,801	669	521	100	0	584	0	0	0	0	4,053
1952	Wet	0	0	0	0	329	1,226	219	327	227	1,190	353	0	3,871
1953	Dry	0	0	0	0	0	0	422	110	258	1,132	0	0	1,921
1954	Dry	0	0	845	586	0	106	293	68	85	642	152	0	2,776
1955	Dry	0	434	423	698	305	44	95	77	88	566	318	0	3,049
1956	Dry	0	467	752	628	130	230	106	78	67	398	271	0	3,127
1957	Dry	396	1,032	1,628	748	0	0	0	62	0	0	0	0	3,866
1958	Normal	0	1,515	791	0	0	0	0	507	369	393	194	0	3,769
1959	Dry	0	676	0	0	0	0	111	294	521	399	0	0	2,001
1960	Normal	0	453	0	35	397	785	284	500	281	717	144	0	3,595
1961	Dry	0	0	657	256	0	0	0	202	605	490	0	0	2,210
1962	Normal	0	0	0	832	1,519	0	0	177	520	601	103	0	3,752
1963	Dry	0	0	0	0	0	0	631	387	211	348	0	0	1,577
1964	Dry	0	426	363	0	0	127	204	153	261	583	279	0	2,396
1965	Wet	161	1,071	986	530	980	0	0	313	0	0	0	0	4,039
1966	Normal	0	0	110	102	412	1,109	351	385	499	464	114	18	3,565
1967	Normal	0	539	878	764	792	0	0	259	272	344	39	0	3,887
1968	Normal	0	346	697	351	696	748	179	149	254	369	0	26	3,814
1969	Normal	0	1,117	0	642	38	650	0	516	378	364	0	0	3,706
1970	Wet	0	0	609	0	397	1,032	0	393	277	902	172	122	3,905
1971	Wet	0	659	782	35	593	0	0	595	412	853	0	0	3,929
1972	Wet	0	0	144	297	325	1,190	350	188	449	848	78	0	3,867
1973	Wet	0	0	1,866	0	0	0	36	2,011	0	0	0	0	3,913
1974	Wet	0	0	0	0	356	1,235	424	687	284	654	192	0	3,832
1975	Normal	0	575	774	509	18	485	244	358	360	413	2	0	3,739
1976	Dry	0	0	0	0	0	0	311	237	308	689	372	0	1,915
1977	Normal	228	679	791	109	202	762	173	245	269	284	46	0	3,788
1978	Normal	132	584	0	182	120	669	322	281	249	574	334	214	3,662
1979	Normal	362	1,376	140	411	393	0	0	279	208	645	0	0	3,813
1980	Wet	0	0	0	131	0	0	670	617	428	1,055	967	0	3,868
1981	Dry	0	939	835	743	0	0	86	0	114	554	44	0	3,316
1982	Normal	102	555	727	442	479	635	149	259	219	113	153	0	3,832
1983	Wet	0	0	1,344	0	0	0	0	2,497	0	0	0	0	3,841
1984	Wet	0	0	0	0	0	0	0	3,662	0	0	0	0	3,662
1985	Wet	0	0	0	0	561	1,245	827	833	0	187	202	0	3,855
1986	Wet	0	0	773	0	0	0	1,384	1,700	0	0	0	0	3,857
1987	Wet	0	0	0	0	0	0	0	3,662	0	0	0	0	3,662
1988	Normal	0	0	213	368	27	1,845	0	470	274	466	0	0	3,663
1989	Normal	0	505	533	582	375	756	0	310	0	377	197	227	3,862
1990	Normal	0	358	462	458	258	507	252	226	213	523	292	206	3,756
1991	Dry	0	89	661	971	0	0	136	128	152	575	120	0	2,834
1992	Normal	0	368	475	521	613	663	81	309	275	287	193	0	3,785
1993	Wet	0	851	0	451	1,047	844	0	0	0	542	242	0	3,976
1994	Normal	72	704	313	373	252	922	0	270	251	497	95	28	3,776
Avg		30	387	466	298	270	438	179	593	248	438	123	18	3,488

Releases in Table D-2 less evaporation losses from the EA in Lake McConaughy, routed to Grand Island using the WMC Loss Model.

Appendix D
Score Analysis - Annual Pattern (Spring Release Scenario)

Table D-5: Releases from Lake McConaughy in the spring, no evaporation (AF).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1948	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1949	0	0	0	0	4,494	0	0	0	0	0	0	0	4,494
1950	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1951	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1952	0	0	0	0	4,494	0	0	0	0	0	0	0	4,494
1953	0	0	0	0	0	0	4,494	0	0	0	0	0	4,494
1954	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1955	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1956	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1957	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1958	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1959	0	0	0	0	0	0	4,494	0	0	0	0	0	4,494
1960	0	0	0	2,300	2,194	0	0	0	0	0	0	0	4,494
1961	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1962	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1963	0	0	0	0	0	0	4,494	0	0	0	0	0	4,494
1964	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1965	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1966	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1967	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1968	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1969	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1970	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1971	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1972	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1973	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1974	0	0	0	0	4,494	0	0	0	0	0	0	0	4,494
1975	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1976	0	0	0	0	0	0	4,494	0	0	0	0	0	4,494
1977	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1978	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1979	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1980	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1981	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1982	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1983	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1984	0	0	0	0	0	0	0	4,494	0	0	0	0	4,494
1985	0	0	0	0	4,494	0	0	0	0	0	0	0	4,494
1986	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1987	0	0	0	0	0	0	0	4,494	0	0	0	0	4,494
1988	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1989	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1990	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1991	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1992	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
1993	0	0	0	4,494	0	0	0	0	0	0	0	0	4,494
1994	0	0	4,494	0	0	0	0	0	0	0	0	0	4,494
Avg	0	0	2,902	610	420	0	375	187	0	0	0	0	4,494

Release schedule assumes yield in Lake McConaughy is released during shortages beginning in March for a spring release. If there are no shortages in March, water is released in April, etc.

Table D-6: Score Grand Island, no evaporation (AF).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1948	0	0	0	4,162	0	0	0	0	0	0	0	0	4,162
1949	0	0	0	0	4,095	0	0	0	0	0	0	0	4,095
1950	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1951	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1952	0	0	0	0	4,095	0	0	0	0	0	0	0	4,095
1953	0	0	0	0	0	0	1,713	0	0	0	0	0	1,713
1954	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1955	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1956	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1957	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1958	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1959	0	0	0	0	0	0	1,713	0	0	0	0	0	1,713
1960	0	0	0	2,130	1,971	0	0	0	0	0	0	0	4,101
1961	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1962	0	0	0	4,162	0	0	0	0	0	0	0	0	4,162
1963	0	0	0	0	0	0	1,713	0	0	0	0	0	1,713
1964	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1965	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1966	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1967	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1968	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1969	0	0	0	4,162	0	0	0	0	0	0	0	0	4,162
1970	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1971	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1972	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1973	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1974	0	0	0	0	4,095	0	0	0	0	0	0	0	4,095
1975	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1976	0	0	0	0	0	0	1,713	0	0	0	0	0	1,713
1977	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1978	0	0	0	4,162	0	0	0	0	0	0	0	0	4,162
1979	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1980	0	0	0	4,111	0	0	0	0	0	0	0	0	4,111
1981	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1982	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1983	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1984	0	0	0	0	0	0	0	3,784	0	0	0	0	3,784
1985	0	0	0	0	4,095	0	0	0	0	0	0	0	4,095
1986	0	0	4,268	0	0	0	0	0	0	0	0	0	4,268
1987	0	0	0	0	0	0	0	3,784	0	0	0	0	3,784
1988	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1989	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1990	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1991	0	0	4,170	0	0	0	0	0	0	0	0	0	4,170
1992	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
1993	0	0	0	4,111	0	0	0	0	0	0	0	0	4,111
1994	0	0	4,291	0	0	0	0	0	0	0	0	0	4,291
Avg	0	0	2,747	562	382	0	143	158	0	0	0	0	3,992

Releases in Table D-5 routed to Grand Island using the WMC Loss Model. No evaporation is assessed on the yield in the EA in Lake McConaughy.

Appendix D
Score Analysis - Annual Pattern (Spring Release Scenario)

Table D-7: Score at Grand Island, after assessing evaporation on the EA (AF).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1947	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1948	0	0	0	4,096	0	0	0	0	0	0	0	0	4,096
1949	0	0	0	0	4,014	0	0	0	0	0	0	0	4,014
1950	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1951	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1952	0	0	0	0	4,014	0	0	0	0	0	0	0	4,014
1953	0	0	0	0	0	0	1,659	0	0	0	0	0	1,659
1954	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1955	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1956	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1957	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1958	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1959	0	0	0	0	0	0	1,659	0	0	0	0	0	1,659
1960	0	0	0	2,104	1,939	0	0	0	0	0	0	0	4,043
1961	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1962	0	0	0	4,096	0	0	0	0	0	0	0	0	4,096
1963	0	0	0	0	0	0	1,659	0	0	0	0	0	1,659
1964	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1965	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1966	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1967	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1968	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1969	0	0	0	4,096	0	0	0	0	0	0	0	0	4,096
1970	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1971	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1972	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1973	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1974	0	0	0	0	4,014	0	0	0	0	0	0	0	4,014
1975	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1976	0	0	0	0	0	0	1,659	0	0	0	0	0	1,659
1977	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1978	0	0	0	4,096	0	0	0	0	0	0	0	0	4,096
1979	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1980	0	0	0	4,045	0	0	0	0	0	0	0	0	4,045
1981	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1982	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1983	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1984	0	0	0	0	0	0	0	3,637	0	0	0	0	3,637
1985	0	0	0	0	4,014	0	0	0	0	0	0	0	4,014
1986	0	0	4,215	0	0	0	0	0	0	0	0	0	4,215
1987	0	0	0	0	0	0	0	3,637	0	0	0	0	3,637
1988	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1989	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1990	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1991	0	0	4,119	0	0	0	0	0	0	0	0	0	4,119
1992	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
1993	0	0	0	4,045	0	0	0	0	0	0	0	0	4,045
1994	0	0	4,238	0	0	0	0	0	0	0	0	0	4,238
Avg	0	0	2,713	554	375	0	138	152	0	0	0	0	3,932

Releases in Table D-5 less evaporation losses from the EA in Lake McConaughy, routed to Grand Island using the WMC Loss Model.

APPENDIX E:

WET & DRY YEAR SHORTAGE REDUCTION GRAPHS

APPENDIX E

WET & DRY YEAR SHORTAGE REDUCTION GRAPHS

The red bars represent the amount of shortage reduction by the J-2 Regulating Reservoir releases at Grand Island (after routing losses) and the blue bars represent the remaining shortages at Grand Island. The bars are stacked together so the total shortages in a given month (shortages met by the J-2 Regulating Reservoir and remaining shortages) are the sum of both bars. In both the representative dry and wet years, the Wyoming Account water stored in the EA could be released to reduce shortages in conjunction with the J-2 Regulating Reservoir. There may be months when the J-2 Regulating Reservoir releases are meeting the total volume of shortages; however, since the EA water is controlled, the EA could be released at a later time during the year to reduce shortages. In general, there are enough shortages for both projects to release simultaneously (there isn't "competition" for shortage reduction). See Figures D-1 and D-2.

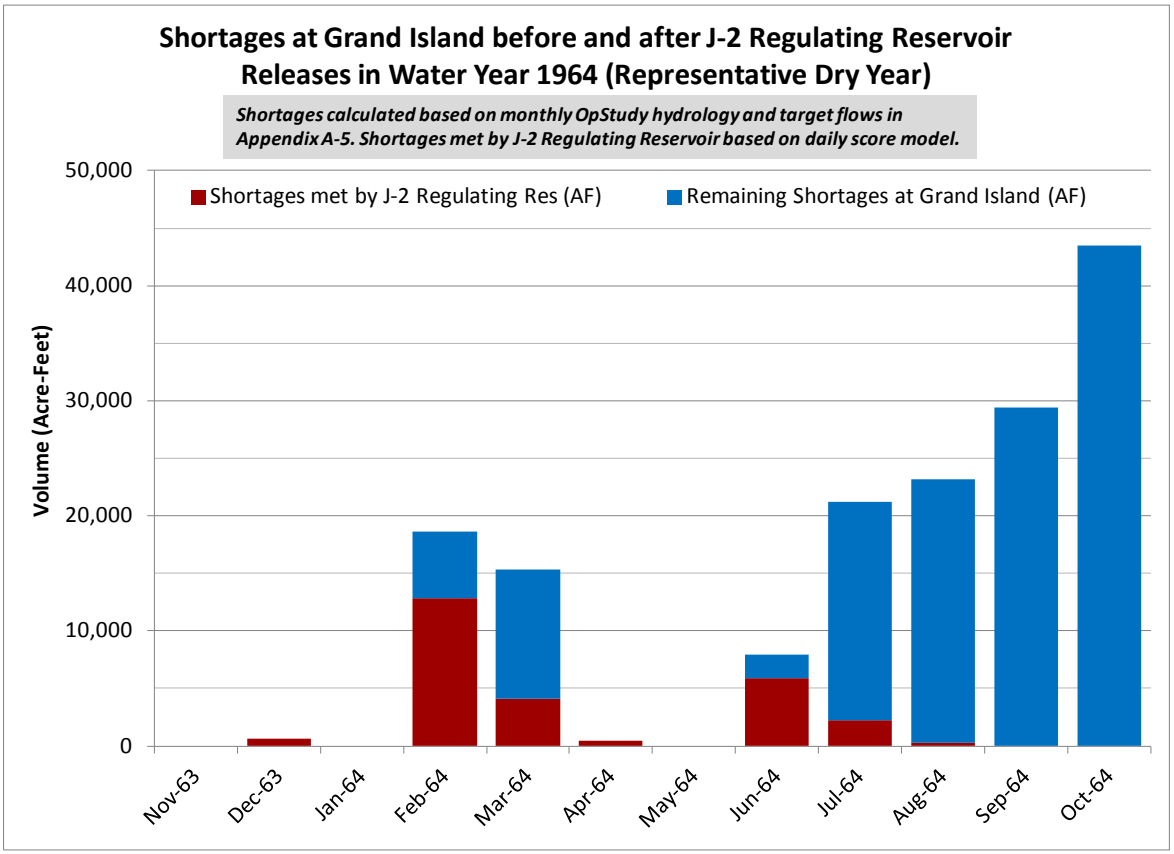

Figure E-1. Shortages met by J-2 Regulating Reservoir during representative dry year.

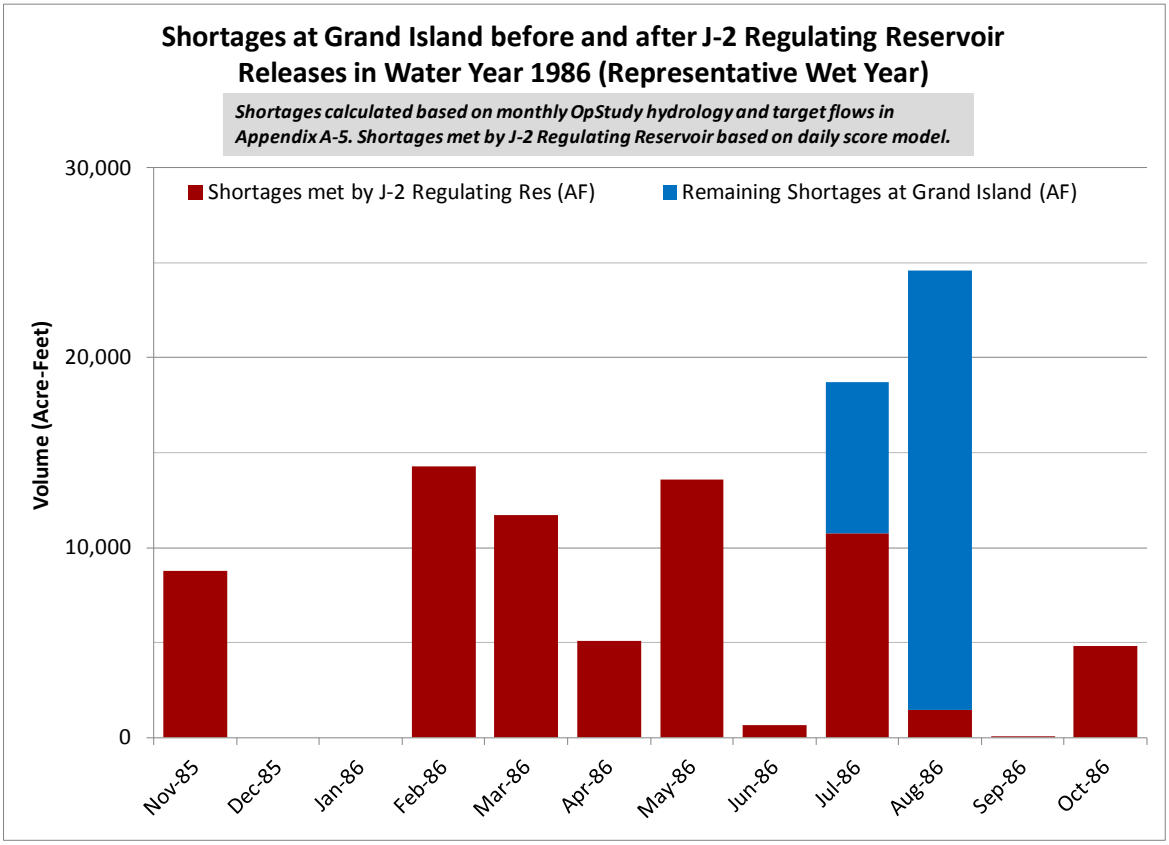

Figure E-2. Shortages met by J-2 Regulating Reservoir during representative wet year.

10-YEAR SHORTAGE REDUCTION GRAPHS

The ED Office also graphed shortages at Grand Island and the yields from the J-2 Regulating Reservoir and Phelps recharge project that are credited towards meeting the shortages to target flows, per the score models for each project. These were completed for 5 increments during the 48-year simulation period. In general, there are enough shortages each year that the Pathfinder Municipal Account Lease and other WAP projects can release water to meet shortages without a negative impact to the Program score. Note that the J-2 Regulating Reservoir score model is daily and the shortages shown in these graphs are based on monthly data. During monthly excesses but daily shortages, the J-2 Regulating Reservoir releases are not shown. See Figures D-3 through D-7.

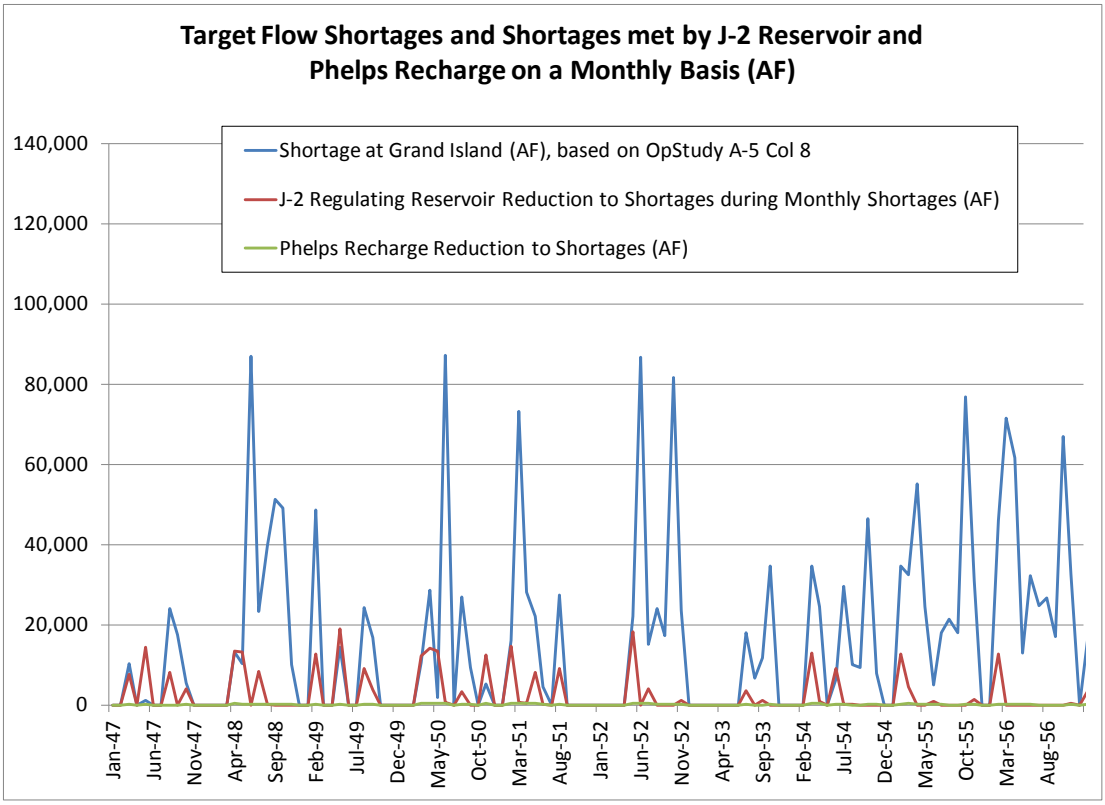

Figure E-3. Shortages at Grand Island and WAP project scores from 1947-1956.

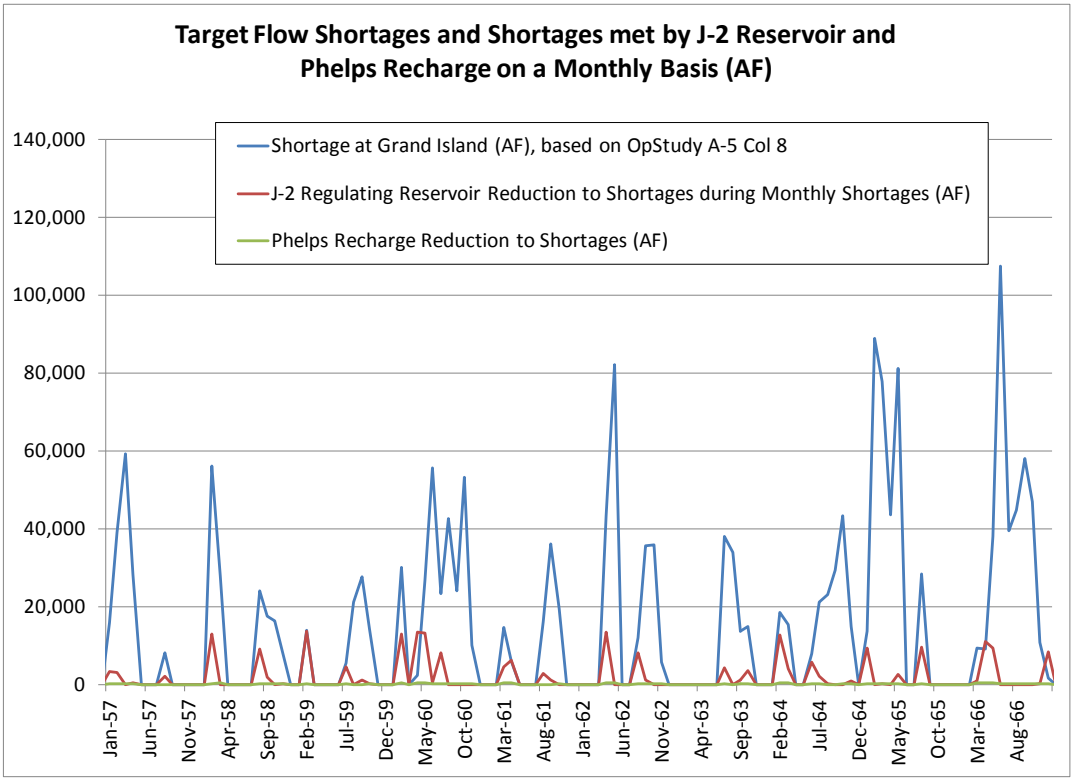

Figure E-4. Shortages at Grand Island and WAP project scores from 1957-1966.

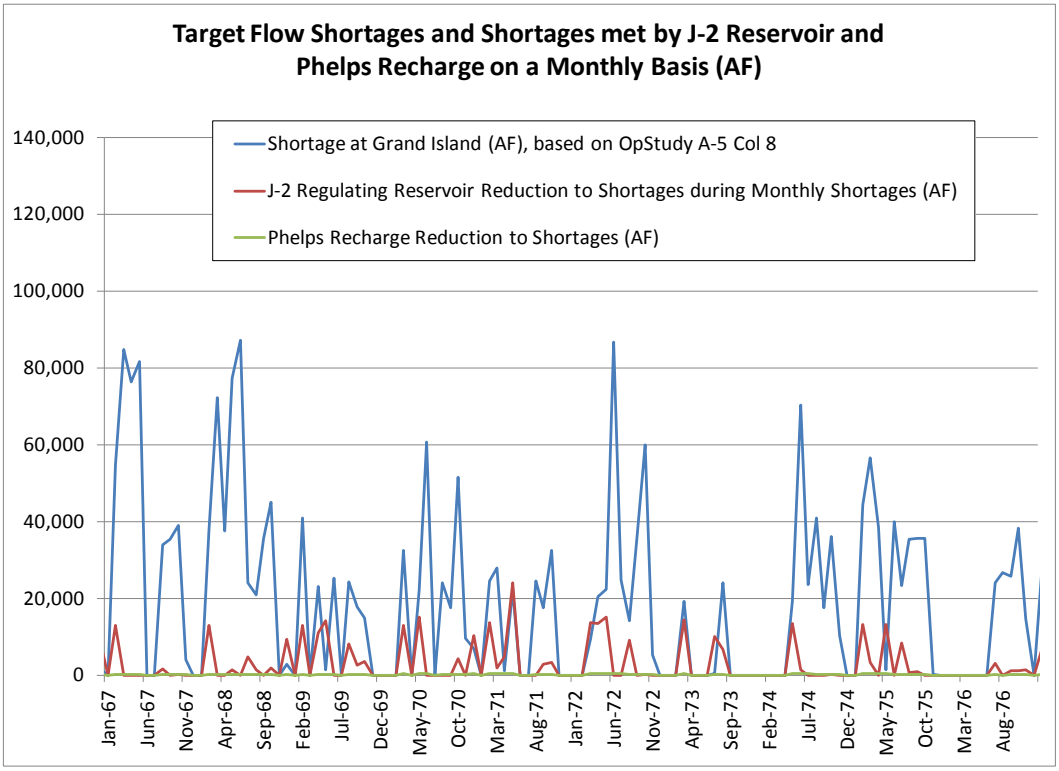

Figure E-5. Shortages at Grand Island and WAP project scores from 1967-1976.

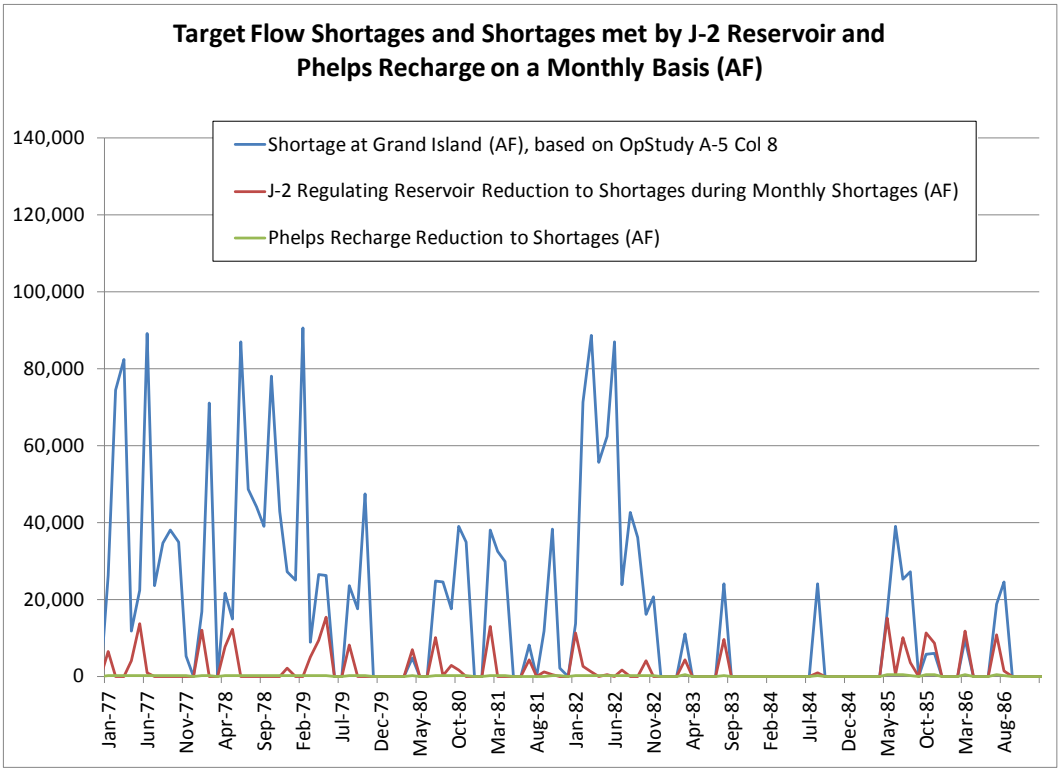

Figure E-6. Shortages at Grand Island and WAP project scores from 1977-1986.

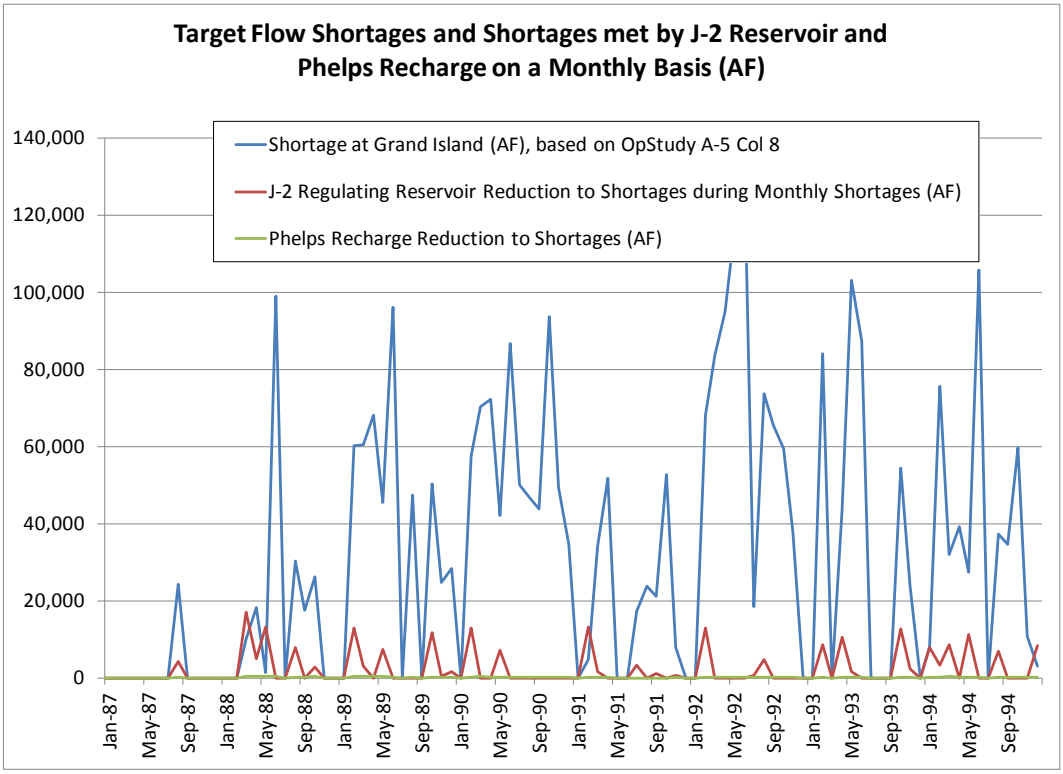

Figure E-7. Shortages at Grand Island and WAP project scores from 1987-1994.

APPENDIX F:

SCORE RECOMMENDATION TO THE GC

WITH SCORING SUBCOMMITTEE MEETING MINUTES

TO: GOVERNANCE COMMITTEE

FROM: SCORING SUBCOMMITTEE

SUBJECT: SCORE RECOMMENDATION FOR PATHFINDER MODIFICATION MUNICIPAL ACCOUNT LEASE PROJECT

DATE: MARCH 7, 2014

The Governance Committee (GC) formed an ad-hoc Scoring Subcommittee to advance discussions related to scoring of proposed Water Action Plan Projects (WAP) for the Platte River Recovery Implementation Program (Program) in 2009. The Scoring Subcommittee previously recommended scores for the J-2 Regulating Reservoir and the Phelps County Canal Groundwater Recharge project and proposed the methodology to score projects, which were all accepted by the GC. The Scoring Subcommittee has been working with the Executive Director's Office (ED Office) of the Program to determine a score for the Pathfinder Modification Municipal Account Lease WAP project. The ED Office completed the technical analyses to support the Scoring Subcommittee's evaluation of scores. This memorandum provides a summary of the score analysis results and the Scoring Subcommittee's recommendation for the Municipal Account Lease project score. The Municipal Account Lease has been actively delivering water to the Platte River since 2012.

Background

The Pathfinder Modification Project recaptures 53,493 acre-feet (AF)[1] of permitted storage space in Pathfinder Reservoir that was lost due to sedimentation. In 2011, the Program and the Wyoming Water Development Office entered into an agreement [2] to lease an average volume of 4,800 acre-feet per year (AFY) from the "Wyoming Account" for the remainder of the Program's First Increment (2012-2019). Water deliveries under the Municipal Account Lease were completed in the fall of 2012 and the fall of 2013. The Municipal Account Lease water is routed from Pathfinder Reservoir to Lake McConaughy, and entered into the Lake McConaughy "Environmental Account" (EA). Water stored in the EA can be released to reduce shortages to U. S. Fish and Wildlife Service target flows or for other Program purposes[3].

The Scoring Subcommittee based the score recommendation presented in this memorandum on several score analyses and sensitivity analyses performed by the ED Office. The basic score model assumptions were based on similar methodology as the J-2 Regulating Reservoir and the Phelps County Canal Groundwater Recharge project, including:

- OpStudy 1947-1994 adjusted Three State hydrology
- Target flows from the Water Plan Reference Materials Appendix A-5 (Column 8 used for Municipal Account Lease scoring)
- Excesses and shortages calculated at Grand Island, utilizing the WMC Loss model to route project yields to Grand Island

[1] As part of the Pathfinder Modification Project, an "Environmental Account" consisting of 33,494 AF was established as one of the Program's three initial state water projects. The State of Wyoming has the exclusive right to contract with the U.S. Bureau of Reclamation for the use of the remaining 20,000 AF of recaptured capacity that is referred to as the "Wyoming Account".

[2] Pursuant to Wyoming Statute W.S. 41-2-1301, the Wyoming Water Development Office is authorized to lease a maximum of 9,600 AFY of the "Wyoming Account" water in Pathfinder Reservoir to the Program through temporary water use agreements. An agreement was signed in 2011 to lease a total of 38,400 AF to the Program, which produces an average of 4,800 AFY from 2012-2019.

[3] The EA can be used for Short Duration High Flows (SDHF) or other Program purposes; however, WAP projects are scored based on the reduction to target flow shortages at Grand Island only.

Various alternatives were analyzed to provide a range of scores for the Scoring Subcommittee to evaluate. Water was routed from Pathfinder Reservoir to Lake McConaughy in September of each year. Since the Municipal Account Lease water is stored in the EA and can be controlled and released during shortage periods only, all of the releases provide a score at Grand Island (less routing losses). Two release patterns from Lake McConaughy were evaluated: 1. Releases distributed throughout the year based on the proportion of shortages at Grand Island each month, and 2. Releases completed in the spring, typically March, or the earliest shortage month thereafter. Three different calculation methods were considered for each scenario to check the sensitivity of the evaluation. Each scenario was also evaluated with and without evaporation losses from Lake McConaughy. A habitat adjustment was not considered as all of the water is released above Overton and benefits the full habitat reach.

Results

Based on the various analyses completed, the Municipal Account Lease score ranged from approximately **3,500 AFY to 4,200 AFY**, depending on the release pattern from Lake McConaughy, the calculation method and whether evaporation was assessed while in storage. **Table 1** is a summary of the score analysis results.

Recommendations

The Scoring Subcommittee recommends the GC assign a score for the Pathfinder Modification Municipal Account Lease project of 4,000 AFY for the Program. This score does not represent a specific score model run; however, it represents the following assumptions:

- Routing the Municipal Account Lease water to Lake McConaughy in September each year
- Assessing evaporation on the lease water while it is stored in the EA
- Releasing water in the spring (spring is considered to begin in March)

Though email consultation and phone discussions following the 2/26/14 conference call, the Scoring Subcommittee came to an agreement to recommend a score of 4,000 AFY as it is between the "representative year" score (rounds to 4,200 AFY) and the "annual pattern" score (rounds to 3,900 AFY) in Table 1. The Subcommittee recognizes that there is some uncertainty in the score but agreed that the 4,000 AFY value was an acceptable and appropriate compromise.

Enclosure:
Scoring Subcommittee Conference Call Minutes – February 26, 2014

Table 1: Summary of Score Alternatives Evaluated

Scenarios		Calculation Methods			Average	Average Rounded*
		Modeling Period Average (E)	Representative Year (F)	Annual Pattern (G)		
Releases per Shortage Distribution	(A)	3,637	3,538	3,539	3,571	3,600
Releases per Shortage Distribution *with Evaporation Losses in EA*	(B)	3,577	3,466	3,488	3,510	3,500
Spring Releases (begin in March)	(C)	4,206	4,253	3,992	4,150	4,200
Spring Releases *with Evaporation Losses in EA*	(D)	4,150	4,162	3,933	4,081	4,100

Notes:

*Values rounded to nearest 100 AFY.

All scenarios represent releasing water from Pathfinder Reservoir in September and routing to Lake McConaughy using the WMC Loss Model factors. Releases from Lake McConaughy are also routed to Grand Island using the WMC Loss Model factors.

Various calculation methods were used to evaluate the sensitivity of the score analysis and to provide a range of scores.

(A) Releases from Lake McConaughy are proportionally distributed throughout the year, based on the distribution of shortages calculated at Grand Island. No evaporation assessed while water is stored in the EA.

(B) Same as (A) but with evaporation assessed (using OpStudy data) while water is stored in the EA.

(C) Releases from Lake McConaughy begin in March. No evaporation assessed while water is stored in the EA.

(D) Same as (C) but with evaporation assessed (using OpStudy data) while water is stored in the EA.

(E) Calculation method using an average value per month over the 48-year simulation period.

(F) Calculation method using representative wet (WY 1986), normal (WY 1975) and dry (WY 1964) year scores, proportionally applied to the 48-year simulation period by hydrologic condition year types.

(G) Calculation method evaluating the score on a month-by-month basis for the 48-year simulation period.

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
GC Scoring Subcommittee Meeting Minutes
Conference Call
February 26, 2014

Meeting Attendees

Scoring Subcommittee

State of Colorado
Suzanne Sellers – Member

State of Nebraska
Jesse Bradley – Member

State of Wyoming
Mike Besson – Member (Chair)

Downstream Water Users
Mike Drain – Member
Duane Woodward – Interested Party

Executive Director's Office (ED Office)
Jerry Kenny, Executive Director (ED)
Sira Sartori

Colorado Water Users
Jon Altenhofen – Member

U.S. Fish and Wildlife Service (USFWS)
Tom Econopouly – Member

U.S. Bureau of Reclamation
Brock Merrill – Member

Introduction

Besson briefly introduced the topic of the call, which was the Pathfinder Modification Municipal Account Lease Water Action Plan (WAP) project scoring. The ED Office provided the Scoring Subcommittee with a preliminary score analysis memorandum[1] before the meeting. Besson explained the basic methodology used to score WAP projects and suggested that if the Scoring Subcommittee could agree on a score, it could be presented Governance Committee (GC) for approval at the March 2014 meeting. Besson asked the Subcommittee members to provide comments and thoughts on the scoring analysis.

Drain asked the ED Office whether the WMC Loss Model or the North Platte Accounting model routing losses were applied to the scores in the memorandum. Sartori responded that the WMC Loss Model factors were used to calculate the scores.

Drain stated that he believes the spring release scenario[2] described in the memorandum is appropriate to use for the scoring analysis, as it represents the original OpStudy modeling assumptions and more closely matches how the Program conceptually scores projects. The Program scores WAP projects based on their potential to reduce target flow shortages. The

[1] Memorandum from the ED Office to the Scoring Subcommittee dated January 23, 2014 entitled, "Preliminary Pathfinder Municipal Account Scoring".
[2] The spring release scenario represents the Municipal Account Lease water routed from Pathfinder Reservoir to the Lake McConaughy EA in September and subsequently released from the EA in the spring months beginning in March. Three methods to evaluate a spring release score were presented in the memorandum.

Environment Account (EA) Manager may make operational decisions that differ from the modeling; however, management decisions are not considered in the score. He recalls that this is how the EA was operated in OpStudy. Besson agreed with using the score that represents a spring release.

Drain proposed a score of 4,100 acre-feet per year (AFY), which represents releasing the Municipal Account Lease water stored in the EA in Lake McConaughy in the spring months beginning in March, and applying evaporation losses on the EA. Altenhofen, Merrill, Bradley, Sellers and Besson agreed with using a score of 4,100 AFY. Econopouly expressed that he was uncomfortable with this decision. He said he would agree to using an average of 3,900 AFY, as presented in the memorandum, which represents a combination of spring releases and releases throughout the year.

Drain was concerned that using an approach distributing releases throughout the year is different than the assumptions used in the OpStudy modeling to reach the First Increment milestone. Drain and Besson described that the score is based on the potential to reduce target flow shortages, even if the EA Manager decides to use the water in a different way, such as a Short Duration High Flows (SDHF); however, it was agreed that SDHF would not be considered in the score. Drain did not think the Program should discount the score based on the EA Manager's operational decisions.

Econopouly thought that in the past, water in the EA has been released during the summer months in addition to the spring. He said he would like to review the OpStudy modeling documentation and files to make sure the spring release is consistent with OpStudy assumptions. He will provide information to Besson by Tuesday, March 4, 2014. Depending on Econopouly's findings, the Scoring Subcommittee members intend to present a score to the GC at the March 2014 meeting, unless additional discussion is warranted. The Scoring Subcommittee will communicate via email about the recommended score to propose to the GC. The ED Office will then prepare a memorandum to provide to the GC, which is intended for the March 2014 meeting but may be postponed if there are additional items the Subcommittee needs to discuss.

Subcommittee Chair

Besson retires on April 8, 2014. A new Scoring Subcommittee Chair needs to be designated. After discussion among the Subcommittee members, Drain said he will consider the position.

Action Items

General Subcommittee

- Review documentation provided by Econopouly and/or Besson and the ED Office regarding the Municipal Account Lease score recommendation for the GC.

ED Office

- Prepare memorandum regarding the Scoring Subcommittee's final recommended score to propose to the GC, if the Subcommittee agrees to propose a score for the March meeting.