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Colorado River Basin Water Supply and Demand Study

Technical Report E – Approach to Develop and Evaluate Options and Strategies

U.S. Department of the Interior
Bureau of Reclamation

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Acronyms and Abbreviations

2007 Interim Guidelines	*Record of Decision for Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead*
2007 Interim Guidelines Final EIS	*Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final Environmental Impact Statement*
Basin	Colorado River Basin
Basin States	Colorado River Basin States
CRSS	Colorado River Simulation System
M&I	municipal and industrial
Mexico	United Mexican States
Reclamation	Bureau of Reclamation
Study	Colorado River Basin Water Supply and Demand Study

Technical Report E — Approach to Develop and Evaluate Options and Strategies

1.0 Introduction

The Colorado River Basin Water Supply and Demand Study (Study), initiated in January 2010, was conducted by the Bureau of Reclamation's (Reclamation) Upper Colorado and Lower Colorado regions and agencies representing the seven Colorado River Basin States (Basin States), in collaboration with stakeholders throughout the Colorado River Basin (Basin). The purpose of the Study is to define current and future imbalances in water supply and demand in the Basin and the adjacent areas of the Basin States that receive Colorado River water over the next 50 years (through 2060), and to develop and analyze adaptation and mitigation strategies to resolve those imbalances. The Study contains four major phases to accomplish this goal: Water Supply Assessment, Water Demand Assessment, System Reliability Analysis, and Development and Evaluation of Options and Strategies for balancing supply and demand.

Spanning parts of Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming, the Colorado River is one of the most critical sources of water in the western United States. The Colorado River is also a vital resource to the United Mexican States (Mexico). It is widely known that the Colorado River, based on the inflows observed over the last century, is over-allocated and that supply and demand imbalances are likely to occur in the future. Up to this point, this imbalance has been managed, and demands have largely been met as a result of the considerable amount of reservoir storage capacity in the system, the fact that the Upper Basin States are still developing into their apportionments, and efforts the Basin States have made to reduce their demand for Colorado River water.

Concerns regarding the reliability of the Colorado River system to meet future needs are even more apparent today. The Basin States include some of the fastest-growing urban and industrial areas in the United States. At the same time, the effects of climate change and variability on the Basin water supply have been the focus of many scientific studies that project a decline in the future yield of the Colorado River. Increasing demand, coupled with decreasing supplies, will certainly exacerbate imbalances throughout the Basin.

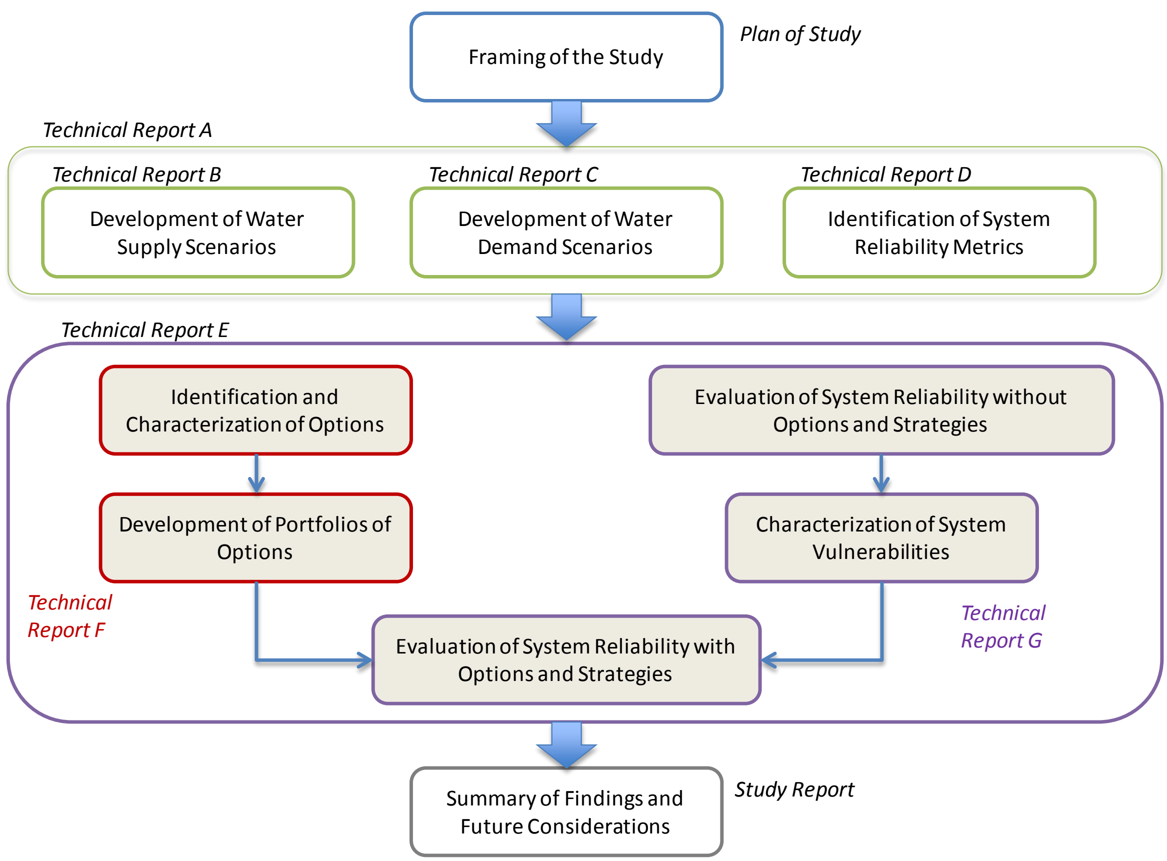
It is against this backdrop that the Study was conducted to establish a common technical foundation from which important discussions can begin regarding possible strategies to reduce future supply and demand imbalances. The content of this technical report is a key component of that technical foundation and provides an overview of the Study's approach to assess system reliability, to develop and evaluate options and strategies for balancing supply and demand, and to assess the effectiveness of various strategies. This technical report is meant to serve as a guide to understand how the multiple technical components of the Study are interconnected. A key component of the overall Study approach was the adoption of a scenario planning process that has resulted in multiple future plausible conditions for both Basin water supply and demand. This scenario planning process and the resulting scenarios are described in other technical reports. This report presents the additional elements of the overall approach, which include the assessment of system reliability, the development of options and strategies for balancing supply and demand, and the assessment of the effectiveness of implementing those options and strategies against multiple plausible future conditions.

Details regarding the quantification and analysis of the water supply and water demand scenarios are presented in *Technical Report B – Water Supply Assessment* and *Technical Report C – Water Demand Assessment*, respectively. Details regarding the development of options and strategies and the system reliability with and without options and strategies are presented in *Technical Report F – Development of Options and Strategies* and *Technical Report G – System Reliability Analysis and Evaluation of Options and Strategies*, respectively.

2.0 Overview of Study Approach

The overall analytical approach followed in the Study is shown in figure E-1. The technical reports that correspond to various elements are denoted in italics in the figure. *Technical Report A – Scenario Development* and *Technical Report E – Approach to Develop and Evaluate Options and Strategies* (this report) describe the overarching technical approaches that guided the specific detailed technical reports.

FIGURE E-1
Overall Study Approach



The purpose and objectives defined in the *Plan of Study* (see *Study Report*, *Appendix 1 – Plan of Study*) were used to frame the focal questions that the Study must address:

1. What is the future reliability of the Colorado River system to meet the needs of Basin resources through 2060?
2. What are the options and strategies to mitigate future risks to these resources?

The first question requires an understanding of the underlying components of future reliability: water supply and water demand. Specifically, what are the factors that will determine the future availability of water, and what are the factors that will determine the future demand for water? The scenario development process, described in Technical Report A, addresses these questions and results in scenarios of the future that define a range of plausible water supply and water demand outcomes. The scenarios for water supply and demand are described in Technical Report B and Technical Report C, respectively. The first question also requires an understanding of the needs for Basin resources. These needs are identified via the system reliability metrics described in Technical Report D. Combined, Technical Reports A through D describe the components needed, i.e., future scenarios of water supply and demand and resource metrics, to address the first question.

The process for evaluating system reliability without options and strategies, and the assessment of the outcome of that process (which can be described as the characterization of system vulnerabilities) is described at a high level in this report and in more detail in Technical Report G, which presents the findings related to the first question.

The second question asks—what are appropriate water management responses to mitigate and adapt to the potential impacts to Basin resources under alternative scenarios of the future? To address this question, water management responses or options were identified and characterized. From those options, four portfolios, or collections of options, were developed to explore various strategies for resolving future supply and demand imbalances. The outcome of these two steps is the focus of Technical Report F. The effectiveness of the portfolios at reducing system vulnerabilities was then assessed through the evaluation of system reliability with options and strategies, and the outcomes of those evaluations are documented in Technical Report G.

A summary of the results presented in each technical report, along with a discussion on future considerations and steps to be taken after the Study's completion are provided in the *Study Report*.

An overview of the approach followed for each of the key steps in the highlighted portion of figure E-1 is presented below.

2.1 Evaluation of System Reliability without Options and Strategies

The reliability of the system under the supply and demand scenarios, without additional management options, was evaluated. The primary evaluation tool used to assess system reliability was Reclamation's Colorado River Simulation System (CRSS), which simulates the long-term operation of the major Colorado River system reservoirs. Modeling results were summarized for the Basin resources according to the metrics described in Technical Report D and a subset of these metrics termed indicator metrics.

The scenario planning approach led to four water supply scenarios that considered observed historical hydrology, direct and conditioned paleo-reconstructions of longer historical hydrologic conditions, and potential future hydrology under projected climate change conditions. To quantify the uncertainty in each scenario relating to the sequencing of wet, dry, or average periods of runoff, various methods were used that resulted in more than 100 different traces (monthly time series of natural flows) for each scenario over the Study period. Table E-1 depicts the scenarios and corresponding number of traces. The water supply scenarios are described in detail in Technical Report B.

TABLE E-1
Water Supply Scenarios and Number of Traces

Water Supply Scenario	Number of Traces	Theme
Observed Resampled	103	Future hydrologic trends and variability are similar to the past approximately 100 years
Paleo Resampled	1,244	Future hydrologic trends and variability are represented by reconstructions of streamflow for a much longer period in the past (nearly 1,250 years) that show expanded variability
Paleo Conditioned	500	Future hydrologic trends and variability are represented by a blend of the wet-dry states of the longer paleo-reconstructed period (nearly 1,250 years), but magnitudes are more similar to the observed period (about 100 years)
Downscaled Global Climate Model Projected	112	Future climate will warm with regional precipitation and temperature trends represented through an ensemble of downscaled Global Climate Model projections

Concurrently, six water demand scenarios were developed that reflect uncertainty in future demographics and land use, technology and economics, and social values and governance. Table E-2 depicts these scenarios, which are described in detail in Technical Report C.

TABLE E-2
Water Demand Scenarios

Water Demand Scenario	Theme
Current Projected (A)	Continuation of growth, development patterns, and institutions following long-term trends
Slow Growth (B)	Slow growth with emphasis on economic efficiency
Rapid Growth (C1 and C2)	Economic resurgence (population and energy) and current preferences toward human and environmental values
Enhanced Environment (D1 and D2)	Expanded environmental awareness and stewardship with growing economy

Last, two operational assumptions were considered to reflect different criteria for the operation of Lakes Powell and Mead beyond 2026, when the *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations of Lakes Powell and Mead* (2007 Interim Guidelines) (U.S. Department of Interior, 2007) expire. Under one operational assumption, these 2007 Interim Guidelines were assumed to be extended through 2060; under the other operational assumption, operations were assumed to revert to the No Action Alternative from the *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final Environmental Impact Statement* (2007 Interim Guidelines Final EIS) (Reclamation, 2007).

The water supply and water demand scenarios, along with the two operational assumptions, were combined to explore a wide range of plausible future conditions. The combination of these scenarios resulted in thousands of future traces that were input into CRSS to simulate the performance of the system under each of these future traces.

Technical Report D describes the process and identification of system reliability metrics for resources of interest in the Basin. Metrics are measures that indicate the ability of the Colorado River system to meet Basin resource needs. Metrics were identified for each of the six resources categories identified: water deliveries, electrical power resources, water quality, flood control, recreational resources, and ecological resources. CRSS results were used to assess the performance of all quantitative metrics identified in Technical Report D, and a subset of these metrics termed indicator metrics. Some metrics were evaluated qualitatively due to their complexity, limitations of the tools, or lack of quantifiable relationships.

Indicator metrics from each of the six resource categories were developed to summarize the performance of the metrics identified in Technical Report D. Through the use of indicator metrics, the performance of Basin resources can be viewed in a more concise manner.

The indicator metrics were developed to represent, as closely as possible, the performance of each individual metric within a resource category. In some cases, statistical analyses were used to develop indicator metrics and in others, individual metrics were selected as indicator metrics based on geographic location. For several resource categories, such as water deliveries or electrical power, indicator metrics that were representative or highly correlated to other individual metrics within the resource category were fairly apparent.

Developing indicator metrics for the ecological resources metrics was challenging because these metrics vary substantially by geographic location, temporal characteristics, and type of vulnerability threshold. Ecological resources indicator metrics were largely chosen based on their location and how well they integrated upstream tributaries. Further, the ecological indicators metrics were limited to those specified in various Biological Opinions. The complete list of indicator metrics is provided in Technical Report G.

2.2 Characterization of System Vulnerabilities

System vulnerabilities, or those conditions in which a particular resource was defined to be vulnerable, were developed from each indicator metric. The system was defined as vulnerable if an indicator metric exceeded or dropped below the specific threshold value. For example, the system is vulnerable with respect to Lower Basin water deliveries if the Lake Mead pool elevation falls below 1,000 feet above mean sea level in any month. The percent of CRSS-simulated traces in which vulnerability occurs was used to summarize the simulated performance of the system under different scenarios without consideration of additional options and strategies, as well as to compare how options and strategies improve the reliability of the system in the future.

After system vulnerabilities were developed, the next step was to identify those conditions leading to vulnerabilities—referred to as vulnerable conditions. Statistical analysis (described in greater detail in Technical Report G) was performed to consider a wide range of conditions, such as natural flow at Lees Ferry or projected water demands, to identify which small set of external conditions concisely define when the system is approaching a vulnerable state. Characterizing the vulnerabilities in this way provided insight into the types of conditions that particularly strain the system. This, in turn, provided insight into the effectiveness of options and strategies at improving the resiliency of the system, or the ability of the system to perform under vulnerable conditions as measured by vulnerabilities. The conditions that cause vulnerabilities may be external and beyond the control of water management entities; however, by improving the resilience of the system through implementing various options and strategies, the ability of the system to withstand such conditions can be improved.

Finally, signposts, or those features of observable system conditions that are good predictors of impending vulnerabilities, were identified. CRSS simulations used these signposts to trigger the model implementation of options to avoid or reduce the occurrence of vulnerabilities. Signposts differ from vulnerable conditions in that they are observable before vulnerability occurs and they incorporate factors that vary with management of the system, reflecting benefits that accrue when options are implemented. Vulnerable conditions, in contrast, may be defined by the entire time sequence of conditions. For example, a combination of the 5-year running mean natural flow at Lees Ferry, coupled with the current-year Lake Mead elevation, was found to be an effective signpost to predict those occurrences in which resources dependent on particular Lake Mead elevations are vulnerable. If this signpost was triggered, additional options could be required to prevent Lake Mead elevations from dropping below certain threshold levels.

Effective signposts were identified by evaluating how well certain observable conditions performed in terms of accurately signaling an early warning when a simulated vulnerability was imminent. In choosing signposts, the inherent tradeoff between the amounts of lead time a signpost provides and the accuracy with which it predicts vulnerability occurrences was assessed. The candidate signposts that best balanced these tradeoffs were used to implement options.

2.3 Identification and Characterization of Options

To address projected future imbalances between supply and demand, the Study considered a range of potential options. Ideas to address the potential future imbalances were solicited from Study participants, interested stakeholders, and the general public from November 2011 through February 2012. Over 150 options were received during this period. The options were reviewed and organized into categories such as importation, desalination, and municipal and industrial (M&I) conservation. From these categories, about 40 representative options were described to capture the range of options submitted and considered. The resulting representative options are shown in table E-3.

TABLE E-3
Summary of Representative Options

Option Type	Option Category	Representative Option
Increase Supply	Importation	Imports to the Colorado Front Range from the Missouri or Mississippi Rivers
		Imports to the Green River from the Bear, Snake, or Yellowstone Rivers
		Imports to Southern California via Icebergs, Waterbags, Tankers, or from the Columbia River[1]
	Desalination	Gulf of California
		Pacific Ocean in California
		Pacific Ocean in Mexico
		Salton Sea Drainwater
		Groundwater in Southern California
		Groundwater in the Area Near Yuma, Arizona
	Reuse	Municipal Wastewater
		Grey Water
		Industrial Wastewater
	Local Supply	Treatment of Coal Bed Methane-Produced Water
		Rainwater Harvesting
	Watershed Management	Brush Control
		Dust Control
		Forest Management
		Tamarisk Control
		Weather Modification
Reduce Demand	M&I Water Conservation	M&I Water Conservation
	Agricultural Water Conservation	Agricultural Water Conservation
		Agricultural Water Conservation with Transfers
	Energy Water Use Efficiency	Power Plant Conversion to Air Cooling
Modify Operations	System Operations	Evaporation Control via Canal Covers
		Evaporation Control via Reservoir Covers
		Evaporation Control via Chemical Covers on Canals or Reservoirs
		Modified Reservoir Operations
		Construction of New Storage
	Water Transfers, Exchanges, and Banking	Water Transfers and Exchanges (same as Agricultural Water Conservation with Transfers)
		Upper Basin Water Banking

[1] Among the more than 150 options submitted to Reclamation as responsive to the *Plan of Study*, additional importation of water supplies from various sources, including importation of water from the Snake and Columbia River systems, were submitted to the Study. Such options were appropriately reflected in the Study but did not undergo additional analysis as part of a regional or river basin plan or any plan for a specific Federal water resource project. This Study is not a regional or river basin plan or proposal or plan for any Federal water resource project

Most of the representative options were then evaluated based on the 17 characterization criteria shown in table E-4, as appropriate. For options that were not amenable to direct characterization based on the criteria, a qualitative description was provided. Option categories not reflected in table E-3 are Water Management and Allocation, Tribal Water, Data and Information. For options and concepts included in these categories, in addition to many options in the System Operations category, a qualitative description was provided rather than through ratings associated with the criteria. The criteria were selected based on those described in the *Plan of Study* and were used to provide a relative comparison among options as well as to express the strategy behind the development of portfolios.

Each representative option assessed using the criteria was assigned either a quantitative value (e.g., dollars per acre-foot for the cost of water) or a qualitative letter score from “A” through “E” for each criterion. For most criteria, “C” is typically designated as mostly neutral; “A” is largely positive; and “E” is largely negative. Although the process of assignment of ratings was structured to be prescriptive, there is the potential for some subjectivity. A detailed description of the options and characterization process and limitations is provided in Technical Report F.

TABLE E-4
Criteria Used to Characterize Representative Options

Criteria	Summary Description of Criteria
Quantity of Yield	The estimated long-term quantity of water generated by the option— either an increase in supply or a reduction in demand
Timing	Estimated first year that the option could begin operation
Technical Feasibility	Technical feasibility of the option based on the extent of the underlying technology or practices
Cost	The annualized capital, operating, and replacement cost per acre-foot of option yield
Permitting	Level of anticipated permitting requirements and precedence of success for similar projects
Legal	Consistency with current legal frameworks and laws, or precedent with success in legal challenges
Policy Considerations	Extent of potential changes to existing federal, state, or local policies that concern water, water use, or land management
Implementation Risk	Risk of achieving implementation and operation of option based on factors such as funding mechanisms, competing demands for critical resources, challenging operations, or challenging mitigation requirements
Long-term Viability	Anticipated reliability of the option to meet the proposed objectives over the long term
Operational Flexibility	Flexibility of option to be idled from year to year with limited financial or other impacts
Energy Needs	Energy required to permit full operation of the option, including treatment, conveyance, and distribution
Energy Source	Anticipated energy source to be used to allow option to be operational

TABLE E-4
Criteria Used to Characterize Representative Options

Criteria	Summary Description of Criteria
Hydropower	Anticipated increases or decreases in hydroelectric energy generation associated with implementation of the option
Water Quality	Anticipated improvements or degradation in water quality associated with implementation of the option.
Recreation	Potential impacts to recreational activities including in-river and shoreline activities
Other Environmental Factors	Other environmental considerations, such as impacts to air quality, or aquatic, wetland, riparian, or terrestrial habitats
Socioeconomics	Potential impacts to socioeconomic conditions in regions within or outside of the Basin as a result of implementing the option

2.4 Development of Portfolios of Options

Recognizing that no single option will be sufficient to resolve future projected supply and demand imbalances, groups of options, or portfolios, were developed to reflect different strategies. Portfolios were developed by prioritizing particular representative options based on their ratings of the criteria in table E-4 according to a specific strategy. For example, a portfolio that relies on options with low implementation risk and high operational feasibility would only include options that meet these criteria.

The portfolios defined the ordering of options to be implemented in response to emerging system vulnerabilities. These portfolios were input to CRSS, which selected and implemented options, generally by cost-effectiveness, as signposts were triggered, indicating that the system was approaching a vulnerable state. The selected options and implementation timing for a given portfolio depended on the future hydrologic trace for which it was being evaluated. For example, a portfolio would implement more options for traces in which hydrologic conditions are dry and lead Lake Mead elevation to drop rapidly.

Four portfolios, each with varying strategies, were considered and are shown in table E-5. It is important to note that these portfolios are meant to be exploratory and illustrative of a range of the types of combinations of options that could be considered in addressing future reliability, and that many portfolios strategies are possible. Once the set of options that was to be included in the portfolio was identified, the options were ordered by annual unit cost expressed as dollars per acre-foot per year of each option. The annual unit cost was calculated as the annualized capital, operating, and replacement cost per acre-foot of option yield.

TABLE E-5
Description of Portfolios Explored in the Study

Portfolio Name	Portfolio Description
Portfolio A	Is the least restrictive in terms of options and contains all options that are in both *Portfolio B* and *Portfolio C*.
Portfolio B	Includes options with high technical feasibility and high long-term reliability; excludes options with high permitting, legal, or policy risks
Portfolio C	Includes only options with relatively low energy intensity; includes options that result in increased instream flows; excludes options that have low feasibility or high permitting risk
Portfolio D	Is the most selective in terms of options and includes only those common to *Portfolio B* and *Portfolio C*

2.5 Evaluation of System Reliability with Options and Strategies

The portfolios were evaluated using CRSS for each combination of the water supply and demand scenarios and the post-2026 Lakes Powell and Mead operations assumptions. For each CRSS-simulated trace, options were implemented according to the order specified by the portfolio in response to system conditions indicative of vulnerabilities. Fewer options were implemented for sequences that led to less-frequent vulnerabilities.

The key results from the portfolio analysis include: (1) performance of the system relative to the full suite of system reliability metrics, indicator metrics, and previously defined vulnerabilities for each trace; and (2) option implementation timing, aggregated costs, and characteristics of options implemented across traces.

The results were analyzed to better understand tradeoffs between the ability of portfolios to reduce vulnerabilities and the costs and characteristics of the implemented options. For example, one portfolio may be more effective at reducing Upper Basin shortages than another. Another portfolio may cost more to reduce vulnerabilities. Other tradeoffs include the types or characteristics of the options used to implement the different strategies. For example, two portfolios might address potential vulnerabilities similarly, but one might have less technically feasible options.

Some options were included in all portfolios, yet were implemented by CRSS under only some future conditions. Some options were included in only some portfolios and were implemented in some or all futures. These final results, reported in Technical Report G provide the quantitative analysis for understanding the different strategies for addressing the future imbalances between supply and demand, but do not lead to a recommended portfolio. Rather, the analysis and discussion is intended to inform future decision making and developing next steps for additional study.

3.0 Summary

This report describes the overall analytical approach taken in the Study to answer the questions that framed the purpose and objectives set forth in the *Plan of Study*. These questions are:

1. What is the future reliability of the Colorado River system to meet the needs of Basin resources through 2060?
2. What are the options and strategies to mitigate future risks to these resources?

In assessing the reliability of the system, multiple plausible future scenarios of water supply and demand were developed to capture a broad range of future conditions. Using the identified system reliability metrics, the reliability of the system was compared under these plausible futures. The system reliability metrics also helped with defining system vulnerabilities, the external conditions that lead to those vulnerabilities, and signposts that can be monitored and indicate that the system is approaching a vulnerable state.

Options and strategies that reduce these vulnerabilities and improve system reliability were explored through the characterization of representative options and the development of portfolios. The criteria used to characterize the representative options include potential yield, cost, technical feasibility, and energy needs. Based on the results of the characterization and the identification of a particular strategy, representative options were combined into portfolios for additional analysis. The Study explored four portfolios that demonstrate different strategies to resolve future supply and demand imbalances. Each portfolio was analyzed using CRSS across all scenario combinations to assess the effects on Basin resources, the effectiveness at reducing system vulnerabilities, and the improved resiliency of the Basin to vulnerable conditions. The implementation of options across alternative futures and the inclusion of options among the portfolios are summarized in Technical Report G.

This analysis did not lead to a recommendation for specific options or a specific portfolio. Rather, it provides quantitative analysis needed to inform future discussions and additional study. A summary of findings and discussion regarding future considerations is provided in the *Study Report*.

4.0 References

Bureau of Reclamation (Reclamation), 2007. *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead Final Environmental Impact Statement*.

U.S. Department of the Interior. 2007. *Record of Decision for Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead.*

Disclaimer

The Colorado River Basin Water Supply and Demand Study (Study) is funded jointly by the Bureau of Reclamation (Reclamation) and the seven Colorado River Basin States (Basin States). The purpose of the Study is to analyze water supply and demand imbalances throughout the Colorado River Basin (Basin) and those adjacent areas of the Basin States that receive Colorado River water through 2060; and develop, assess, and evaluate options and strategies to address the current and projected imbalances.

Reclamation and the Basin States intend that the Study will promote and facilitate cooperation and communication throughout the Basin regarding the reliability of the system to continue to meet Basin needs and the strategies that may be considered to ensure that reliability. Reclamation and the Basin States recognize the Study was constrained by funding, timing, and technological and other limitations, and in some cases presented specific policy questions and issues, particularly related to modeling and interpretation of the provisions of the Law of the River during the course of the Study. In such cases, Reclamation and the Basin States developed and incorporated assumptions to further complete the Study. Where possible, a range of assumptions was typically used to identify the sensitivity of the results to those assumptions.

Nothing in the Study, however, is intended for use against any Basin State, any federally recognized tribe, the federal government or the Upper Colorado River Commission in administrative, judicial or other proceedings to evidence legal interpretations of the Law of the River. As such, assumptions contained in the Study or any reports generated during the Study do not, and shall not, represent a legal position or interpretation by the Basin States, any federally recognized tribe, federal government or Upper Colorado River Commission as it relates to the Law of the River. Furthermore, nothing in the Study is intended to, nor shall the Study be construed so as to, interpret, diminish or modify the rights of any Basin State, any federally recognized tribe, the federal government, or the Upper Colorado River Commission under federal or state law or administrative rule, regulation or guideline, including without limitation the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Treaty Between the United States of America and Mexico (Treaty Series 994, 59 Stat. 1219), the United States/Mexico agreement in Minute No. 242 of August 30, 1973 (Treaty Series 7708; 24 UST 1968), or Minute No. 314 of November 26, 2008, or Minute No. 318 of December 17, 2010, or Minute No. 319 of November 20, 2012, the Consolidated Decree entered by the Supreme Court of the United States in Arizona v. California (547 U.S 150 (2006)), the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774; 43 U.S.C. 618a), the Colorado River Storage Project Act of 1956 (70 Stat. 105; 43 U.S.C. 620), the Colorado River Basin Project Act of 1968 (82 Stat. 885; 43 U.S.C. 1501), the Colorado River Basin Salinity Control Act (88 Stat. 266; 43 U.S.C. 1951) as amended, the Hoover Power Plant Act of 1984 (98 Stat. 1333), the Colorado River Floodway Protection Act (100 Stat. 1129; 43 U.S.C. 1600), the Grand Canyon Protection Act of 1992 (Title XVIII of Public Law 102-575, 106 Stat. 4669), or the Hoover Power Allocation Act of 2011 (Public Law 112-72). In addition, nothing in the Study is intended to, nor shall the Study be construed so as to, interpret, diminish or modify the rights of any federally recognized tribe, pursuant to federal court decrees, state court decrees, treaties, agreements, executive orders and federal trust responsibility. Reclamation and the Basin States continue to recognize the entitlement and right of each State and any federally recognized tribe under existing law, to use and develop the water of the Colorado River system.