

Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 26-27, 2015

Agenda Item

Basin Hydrology and Water Year (WY) 2016 Hydrograph

Action Requested

- ✓ Motion requested. The attached motion is recommended by TWG. However, no motion is officially made unless and until an AMWG member makes the motion in accordance with the AMWG Operating Procedures.

Presenters

Katrina Grantz, Hydraulic Engineer, Bureau of Reclamation, Upper Colorado Region
Vineetha Kartha, State of Arizona AMWG Alternate and Technical Work Group Chair

Previous Action Taken

- ✓ **June 11, 2015** – TWG passed the WY2016 Hydrograph motion (as stated below) by consensus:
- ✓ **August 27, 2014** – At the August 2014 meeting, the AMWG passed a motion to recommend to the Secretary of the Interior her approval of the DOI-DOE Proposed Hydrograph for Water Year 2015. Previous year hydrographs (water years 2012, 2013 and 2014) were also reviewed by the TWG, and the AMWG and approved by the Secretary of the Interior

Relevant Science

The TWG has been presented with sediment and financial results from the DOI-DOE analysis of operational scenarios for the WY 2016 Hydrograph. The anticipated range of conditions and objectives for 2016 remain similar to previous years, therefore, the targeted approach adopted as the 2012, 2013, 2014 and 2015 Hydrographs is recommended again for the WY 2016 Hydrograph.

Summary of Presentation and Background Information

Basin Hydrology

The first portion of the presentation is intended to provide pertinent information to AMWG members on current water supply and forecasted hydrologic conditions within the Upper Colorado River Basin. The presentation will focus on projected reservoir conditions and operations at Lake Powell/Glen Canyon Dam for the remainder of WY 2015 and provide an outlook for WY 2016.

WY 2016 Hydrograph

The second portion of the presentation will cover the potential range of annual release volumes from Lake Powell in WY 2016 and the proposed WY 2016 Hydrograph. Vineetha Kartha, TWG Chair, will provide a brief summary of the TWG deliberation and motion.

Basin Hydrology and WY 2016 Hydrograph, continued

Motion requested: The following proposed motion is based on the recommendation from the TWG. However, no motion is presumed to be made unless and until an AMWG member makes the motion in accordance with the AMWG Operating Procedures.

AMWG recommends to the Secretary of the Interior for her approval the WY2016 Hydrograph for Glen Canyon Dam.

- Annual Release Volumes will be determined by the 2007 Interim Guidelines and shall be reviewed and adopted through the normal annual operating plan process (in consultation with the Basin States as appropriate).
- Monthly Release Volumes are anticipated to shift depending upon: (1) the projected Annual Release Volume, (2) power plant capacity, and (3) the magnitude of a potential High Flow Experiment.
- Monthly Release Volumes may vary within the targets identified below. Any remaining monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS and in compliance with all applicable NEPA compliance documents (HFE EA, NNFC EA, 2007 Interim Guidelines). Monthly release volumes proposed in this hydrograph will not affect operating tier determinations for Lakes Powell and Mead under the 2007 Interim Guidelines.
- Release objective for June is:
 - 600 to 650 kaf for annual releases below 9.0 maf
 - 800 kaf for annual releases of 9.0 maf to less than 9.5 maf
 - 900 kaf for annual releases of 9.5 maf to less than 10 maf
 - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for August is:
 - 800 kaf for annual release below 9.0 maf
 - 900 kaf for annual releases of 9.0 maf to less than 10 maf
 - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for September is:
 - 600 kaf for annual releases below 9.0 maf
 - 700 kaf for annual releases of 9.0 maf to less than 10.0 maf
 - 800 kaf or greater for annual releases of 10.0 maf or greater; up to power plant capacity for high equalization releases
- Monthly Release Volumes will generally strive to maintain 600 kaf levels in the shoulder months (spring and fall) and 800 kaf in the December/January and July/August timeframe.

Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies and in consultation with the Basin States as appropriate, to consider changing conditions and adjust projected operations in a manner consistent with the objectives of these parameters as stated above and pursuant to the Law of the River.

RECLAMATION

Managing Water in the West

Basin Hydrology, Operations and 2016 Hydrograph

Adaptive Management Work Group
August 26, 2015



U.S. Department of the Interior
Bureau of Reclamation

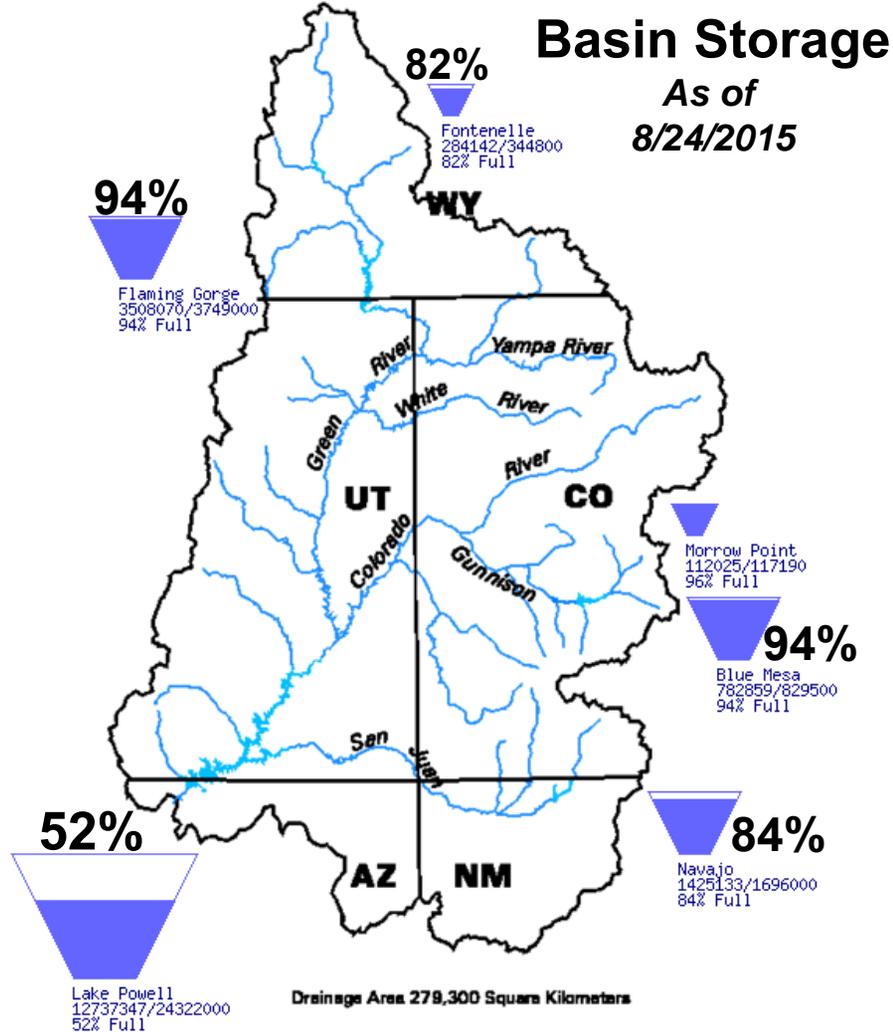
Presentation Overview

- Hydrology and Operations
- 2016 Hydrograph

Upper Basin Storage

Data Current as of:
08/24/2015

Upper Colorado River Drainage Basin



April to July 2015 Observed Inflow

Reservoir	Apr-Jul Observed (KAF)	Percent of Average ¹
Fontenelle	768	106%
Flaming Gorge	1,036	106%
Blue Mesa	708	105%
Navajo	619	84%
Powell	6,714	94%

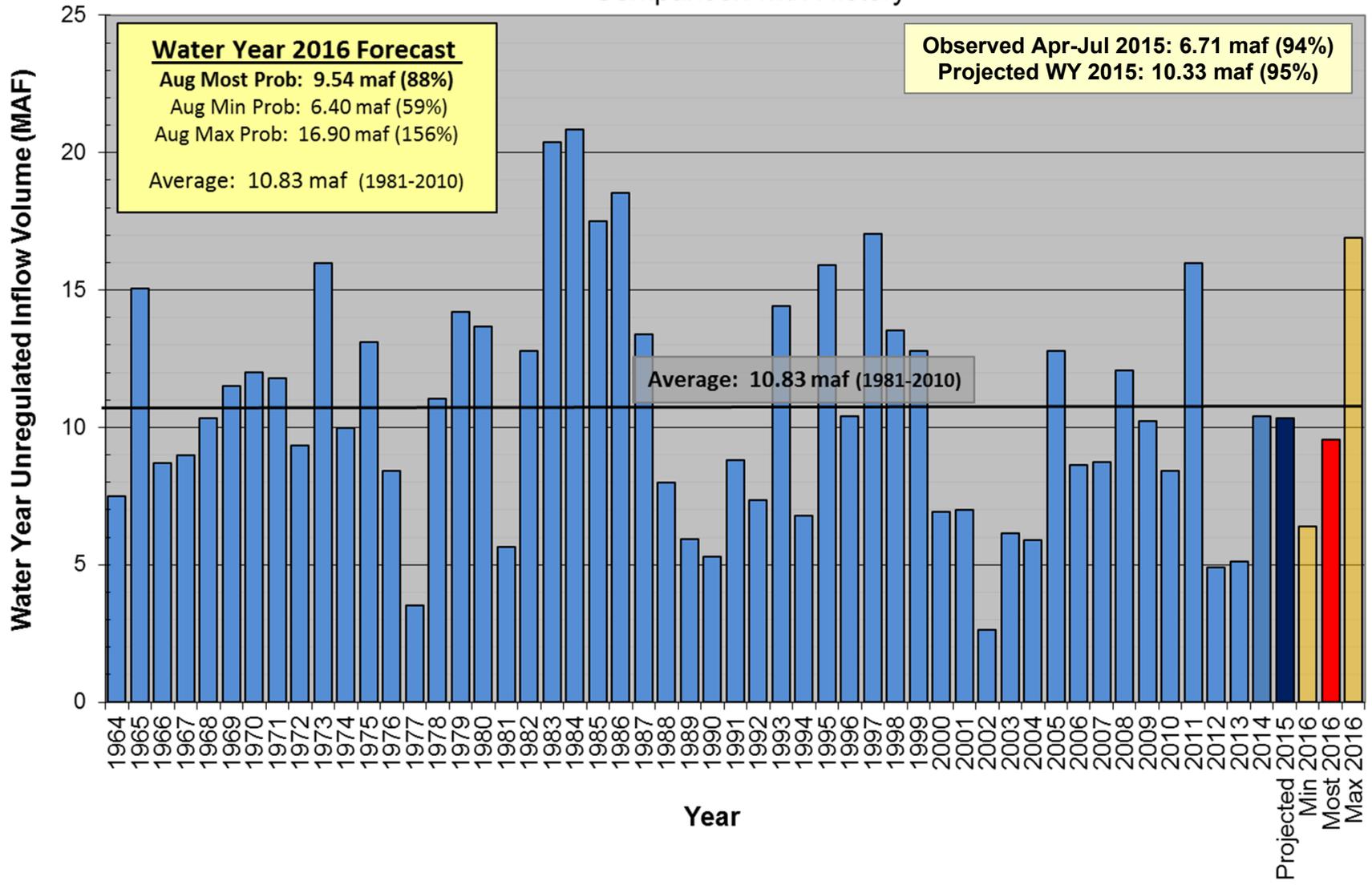
¹ percent of average based on period 1981-2010.

http://www.usbr.gov/uc/water/basin/tc_cr.html

Lake Powell Unregulated Inflow

Water Year 2016 Forecast *(issued Aug 3)*

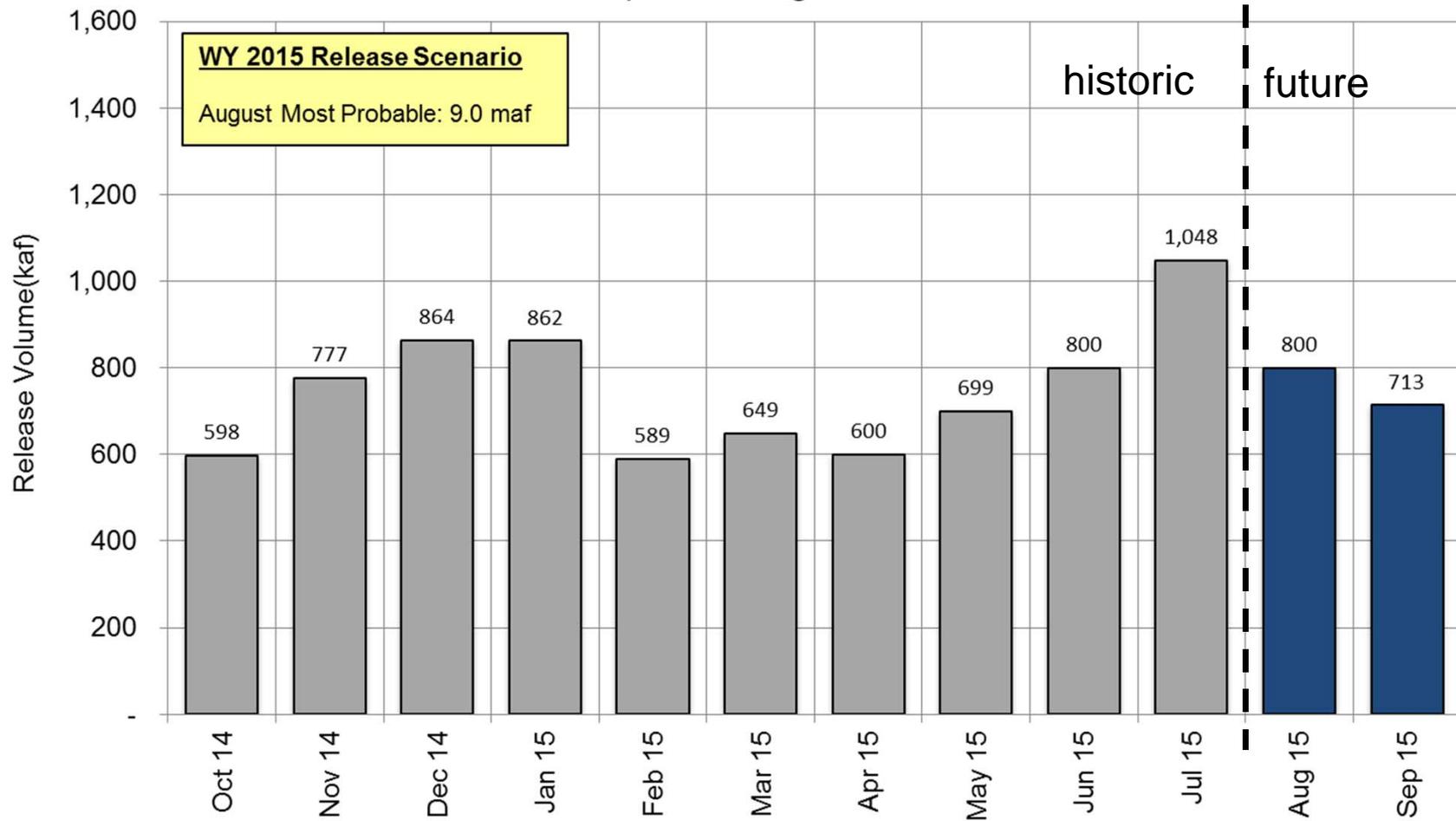
Comparison with History



Projected Lake Powell Monthly Release Volume Distribution

Release Scenario for Water Year 2015

Updated August 2015



RECLAMATION

Water Year 2016 Operating Tier

Operating Tier determined with the August 2015 24-Month Study

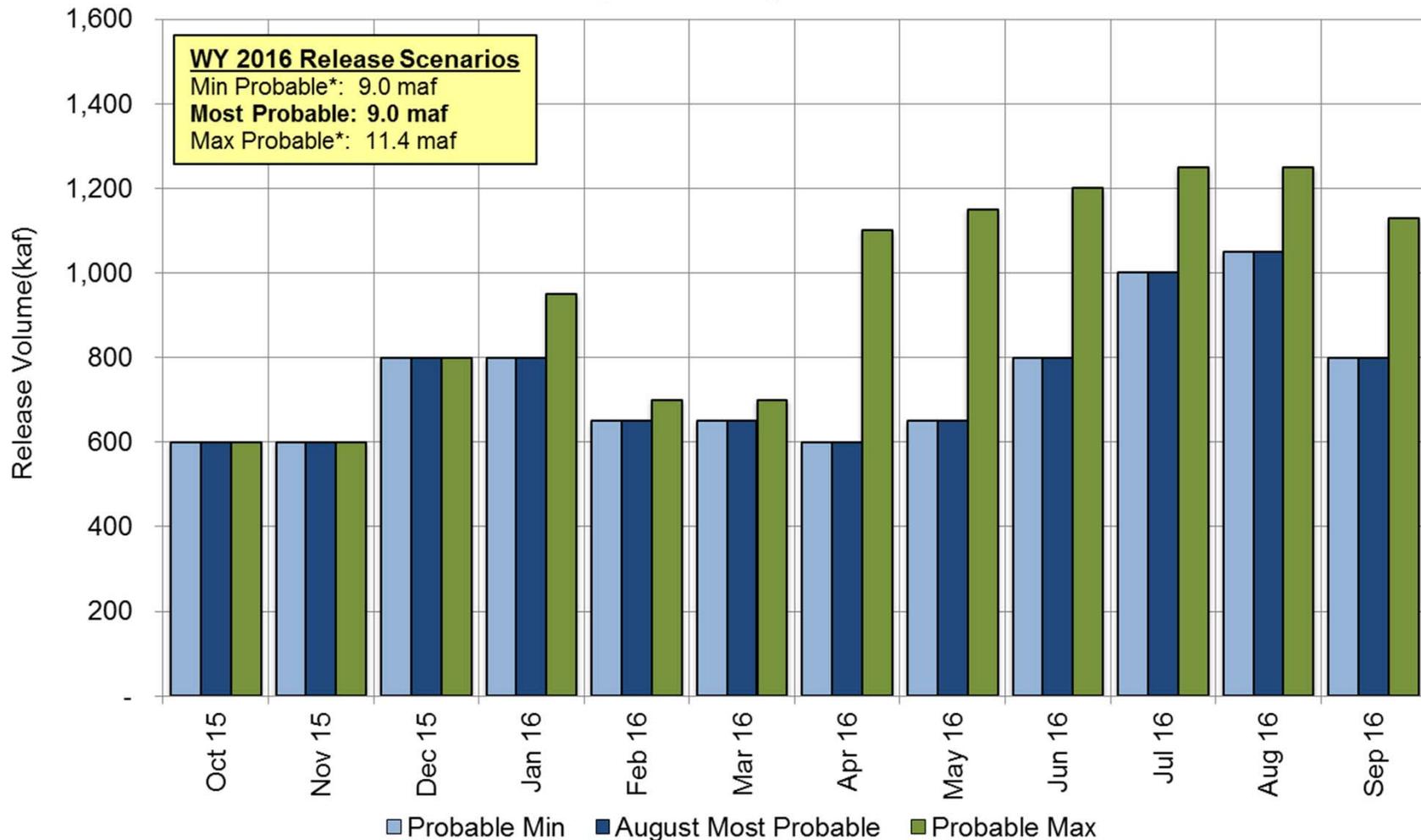
Powell Inflow Scenario	WY 2016 Release Projection
Probable Minimum	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release
Most Probable	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release
Probable Maximum	Upper Elevation Balancing Tier w/ Projected April shift to Equalization 11.4 maf release

RECLAMATION

Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2016

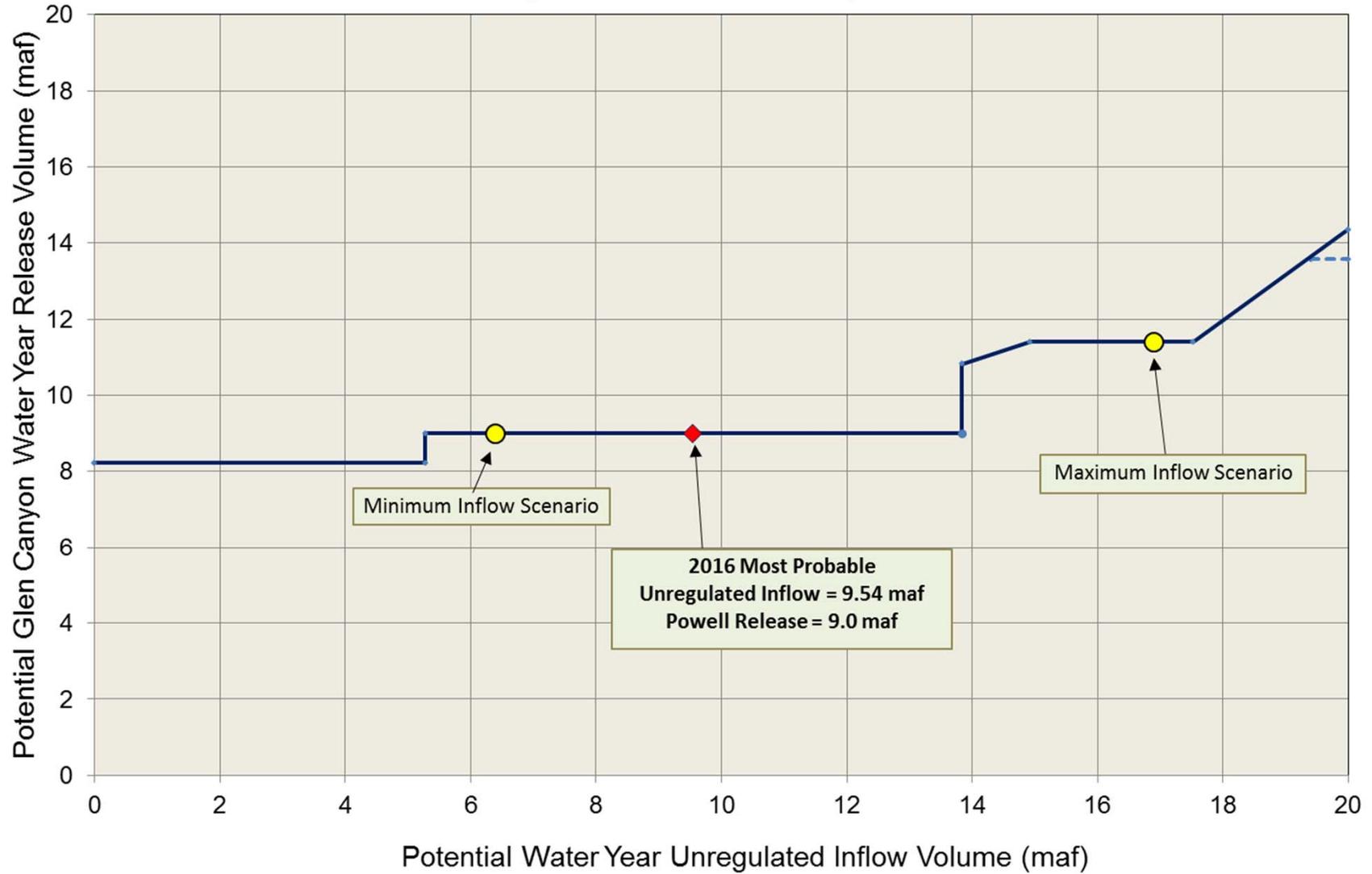
Updated August 2015



* Probable min and max annual release volume is based on August probable min and max inflow forecasts

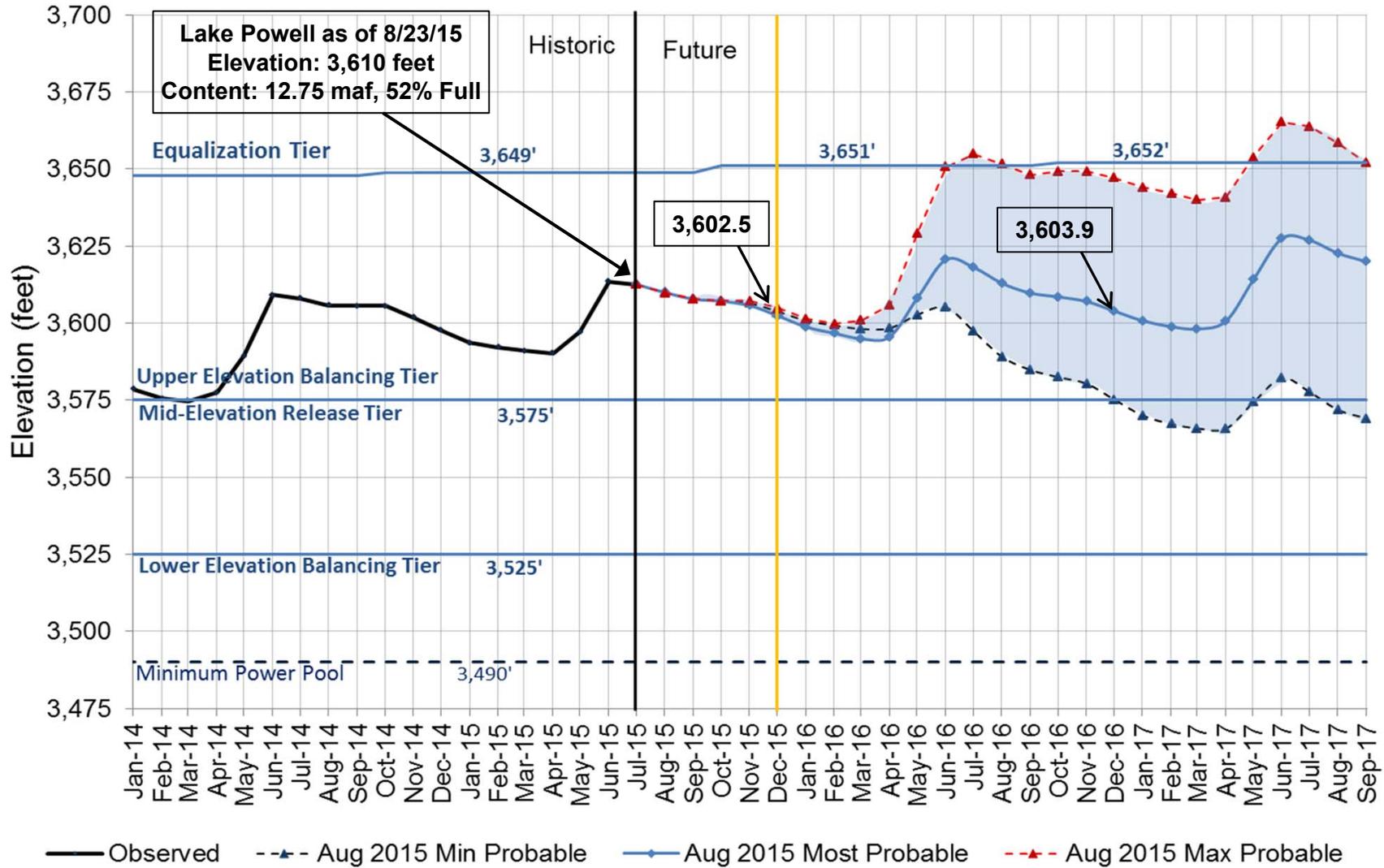
Potential Lake Powell Release Scenarios

Water Year 2016 Release Volume as a Function of Unregulated Inflow Volume
based on August 2015 24-Month Study Conditions



Lake Powell End of Month Elevations

Historic and projected based on August 2015 modeling



Lake Mead as of 8/23/15
Elevation: 1,078 feet
Content: 9.85 maf, 38% Full

End of CY 2015
Projection:
1,082.3 feet

End of CY 2016
Projection:
1,079.6 feet

Glen Canyon Power Plant Provisional Unit Outage Schedule for Water Year 2016

Unit Number	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	
1													
2													
3													
4													
5													
6													
7													
8													
Units Available	6	7	6	7	5	5	7	6	7	6	7	5	
Capacity (cfs)	18,100	21,500	18,100	21,500	14,900	14,800	21,500	17,900	21,500	18,000	21,400	14,300	
Capacity (kaf/month)	1,130	1,270	1,080	1,270	900	960	1,280	1,100	1,290	1,130	1,290	940	
Max (kaf) ¹	600	600	800	950	700	700	1,100	1,150	1,200	1,250	1,250	1,128	11.4
Most (kaf) ²	600	600	800	800	650	650	600	650	800	1,000	1,050	800	9.0
Min (kaf) ¹	600	600	800	800	650	650	600	650	800	1,000	1,050	800	9.0

¹ Projected release, based on August 2015 Min and Max Probable Inflow Projections and 24-Month Study model runs

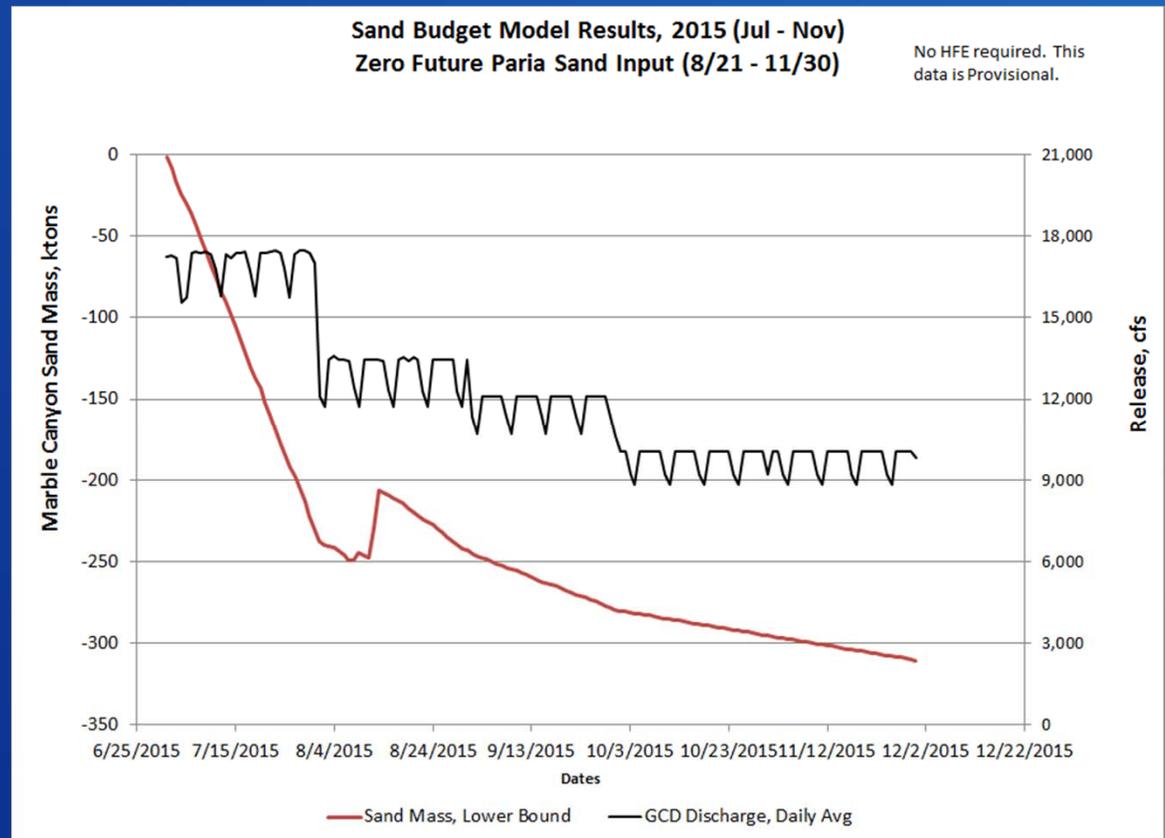
² Projected release, based on August 2015 Most Probable Inflow Projections and 24-Month Study model runs

(updated 8-18-2015)

RECLAMATION

Sand Budget Model Results

- As of 8-21-2015, not enough sediment input to trigger a fall 2015 HFE
- Still early in the season



RECLAMATION

Percent of Traces with Event or System Condition

Results from June 2015 CRSS^{1,2,3,4} (values in percent)

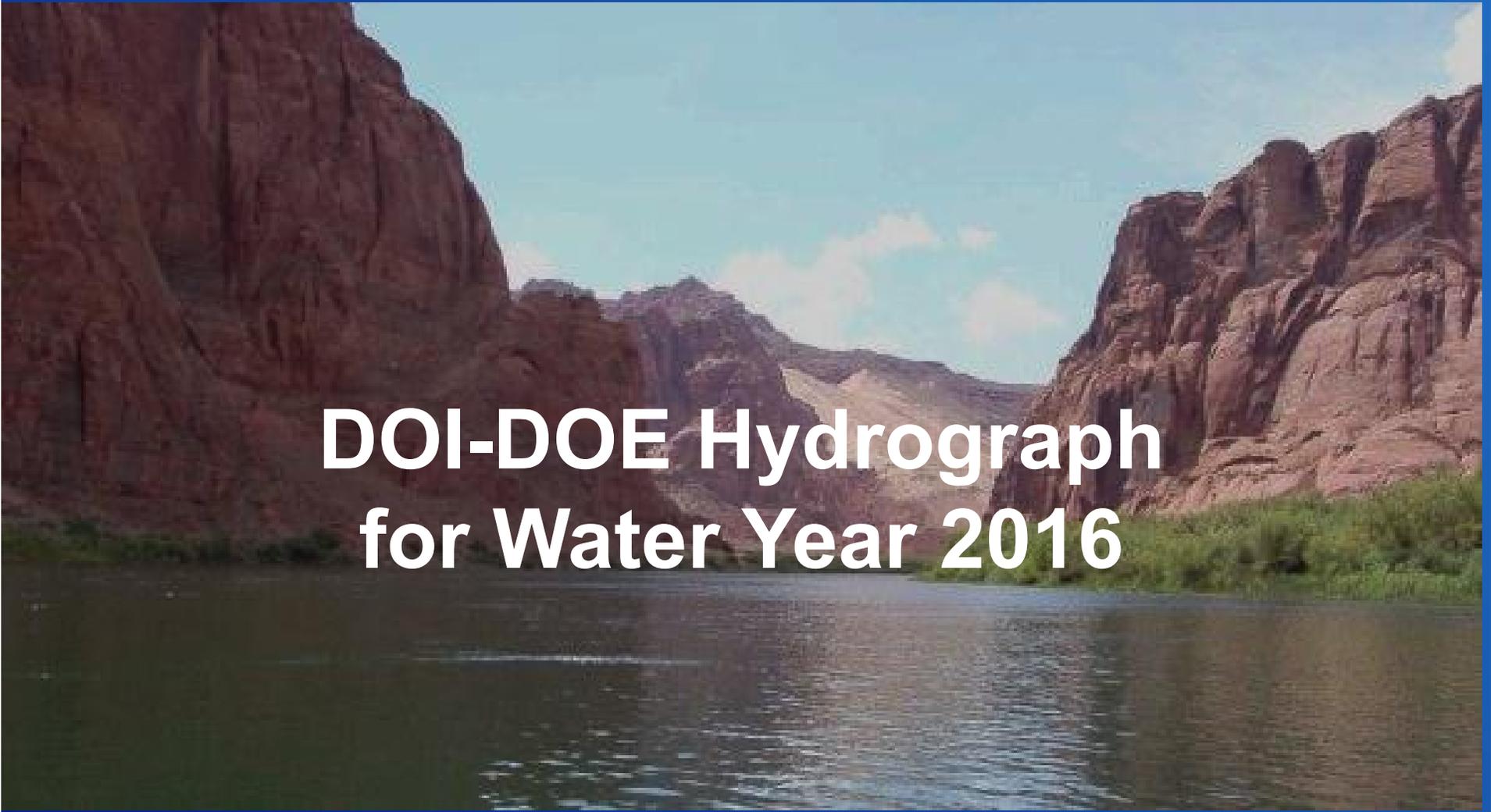
	Event or System Condition	2016	2017	2018	2019	2020
Upper Basin – Lake Powell	Equalization Tier	1	16	18	24	27
	<i>Equalization annual release > 8.23 maf</i>	1	16	18	23	25
	<i>Equalization annual release = 8.23 maf</i>	0	0	0	1	2
	Upper Elevation Balancing Tier	99	49	54	51	45
	<i>Upper Elevation Balancing annual release > 8.23 maf</i>	77	44	44	43	37
	<i>Upper Elevation Balancing annual release 8.23 maf</i>	22	5	9	8	8
	<i>Upper Elevation Balancing annual release < 8.23 maf</i>	0	0	1	0	0
	Mid-Elevation Release Tier	0	35	21	14	16
	<i>Mid-Elevation Release – annual release 8.23 maf</i>	0	0	0	0	1
	<i>Mid-Elevation Release – annual release 7.48 maf</i>	0	35	21	14	15
Lower Elevation Balancing Tier	0	0	7	11	12	
Lower Basin – Lake Mead	Shortage Condition any amount (Mead ≤ 1,075 ft)	0	47	65	66	63
	<i>Shortage – 1st level (Mead ≤ 1,075 and ≥ 1,050)</i>	0	47	46	40	34
	<i>Shortage – 2nd level (Mead < 1,050 and ≥ 1,025)</i>	0	0	19	21	20
	<i>Shortage – 3rd level (Mead < 1,025)</i>	0	0	0	5	9
	Surplus Condition any amount (Mead ≥ 1,145 ft)	0	0	3	8	12
	<i>Surplus – Flood Control</i>	0	0	0	1	2
	Normal or ICS Surplus Condition	100	53	32	26	25

¹ Reservoir initial conditions based on results from 30 simulations of December 31, 2015 conditions using the Mid-term Probabilistic Operations Model.

² Each of the 30 initial conditions were coupled with 107 hydrologic inflow sequences based on resampling of the observed natural flow record from 1906-2012 for a total of 3,210 traces analyzed.

³ Percentages shown may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

These projections will be updated by the end of August



DOI-DOE Hydrograph for Water Year 2016

RECLAMATION

**Glen Canyon Dam
2016 Water Year
Annual Hydrograph:
Background**

1992 Grand Canyon Protection Act

- * Sec. 1804(c) ADOPTION OF CRITERIA AND PLANS.—
- * (1) Based on the findings, conclusions, and recommendations made in the environmental impact statement ..., **the Secretary shall-**
- * **(A) adopt criteria and operating plans separate from and in addition to those specified in section 602(b) of the Colorado River Basin Project Act of 1968;**



United States Department of the Interior
OFFICE OF THE SECRETARY
Washington, DC 20060

DECISION MEMORANDUM FOR THE SECRETARY

From: Anne Cagle  SEP 28 2014
Secretary's Designee, Glen Canyon Dam Adaptive Management Work Group
Assistant Secretary - Water and Science

Subject: Report and Recommendations from the Glen Canyon Dam Adaptive Management Work Group (AMWG) Federal Advisory Committee Meetings held on February 19-20, 2014, May 27, 2014, and August 27-28, 2014

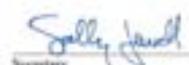
I. RECOMMENDATION

The AMWG brings a wealth of dedication, passion, and knowledge to help guide our efforts to appropriately manage the operations of Glen Canyon Dam. The group makes it possible for the Secretary to consider multiple views about how to protect downstream resources and to reach an appropriate balancing of interests on river operations. The Department of the Interior (Department) agencies and my staff and I work very closely with the AMWG to ensure good dialogue and informed and practical recommendations to you. The two recommendations forwarded to you from the AMWG meeting in August 2014 were adopted by consensus. I recommend you approve both recommendations, and the Department agencies will then work to carry them out.

II. SECRETARY'S DECISION

APPROVE
 DISAPPROVE

SEP 30 2014
Date


Secretary

1968 Colorado River Basin Project Act

- * Sec. 602(b) [Submission of Criteria to States-Report required.] -
- * ... **Beginning January 1, 1972, and yearly thereafter, the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected operation for the current year.**

RECLAMATION

Managing Water in the West

Annual Operating Plan for Colorado River Reservoirs 2015



Proposed 2016 Hydrograph

Annual Release Volume	June	August	September
less than 9.0 maf	600 kaf - 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf	900 kaf	700 kaf
9.5 maf – less than 10 maf	900 kaf	900 kaf	700 kaf
10 maf and greater	900 kaf or more	900 kaf or more	800 kaf or more

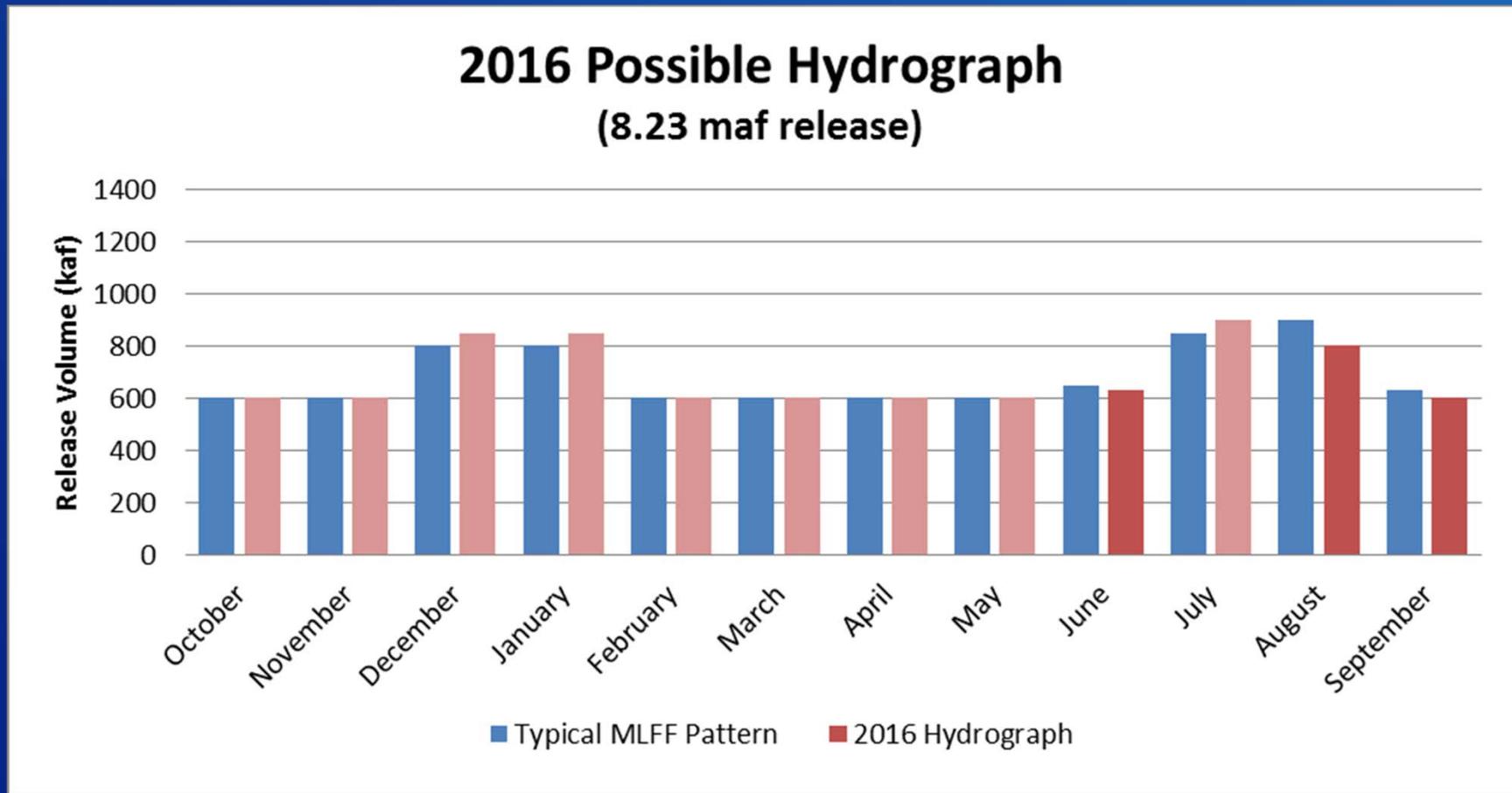
2016 Projected Release Scenarios

Based on August 2015 24-Month Study Inflow Scenarios

Powell Inflow Scenario	WY 2016 Release Projection
Probable Minimum	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release
Most Probable	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release
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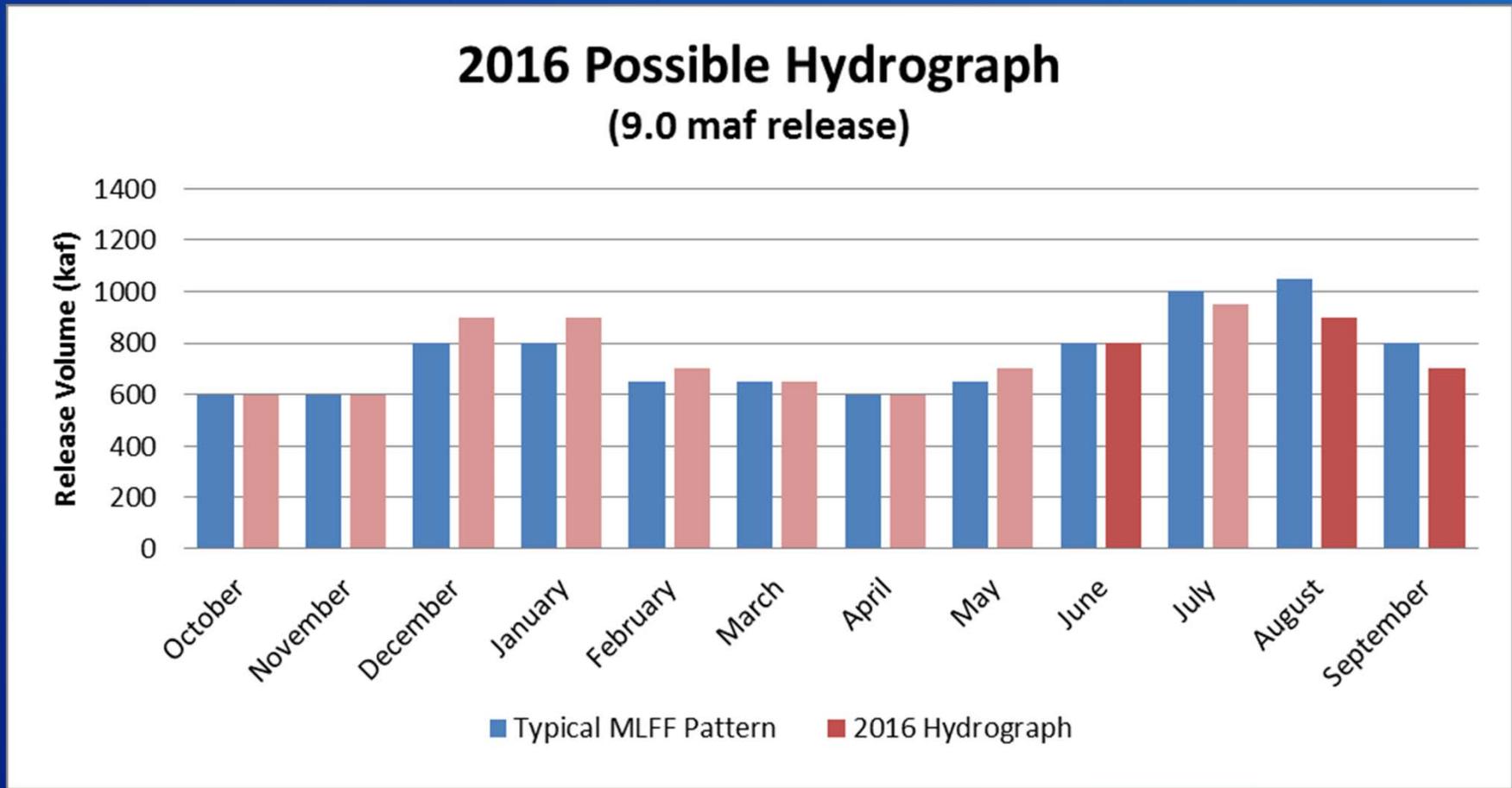
2016 Possible Hydrograph

8.23 maf release scenario



2016 Proposed Hydrograph

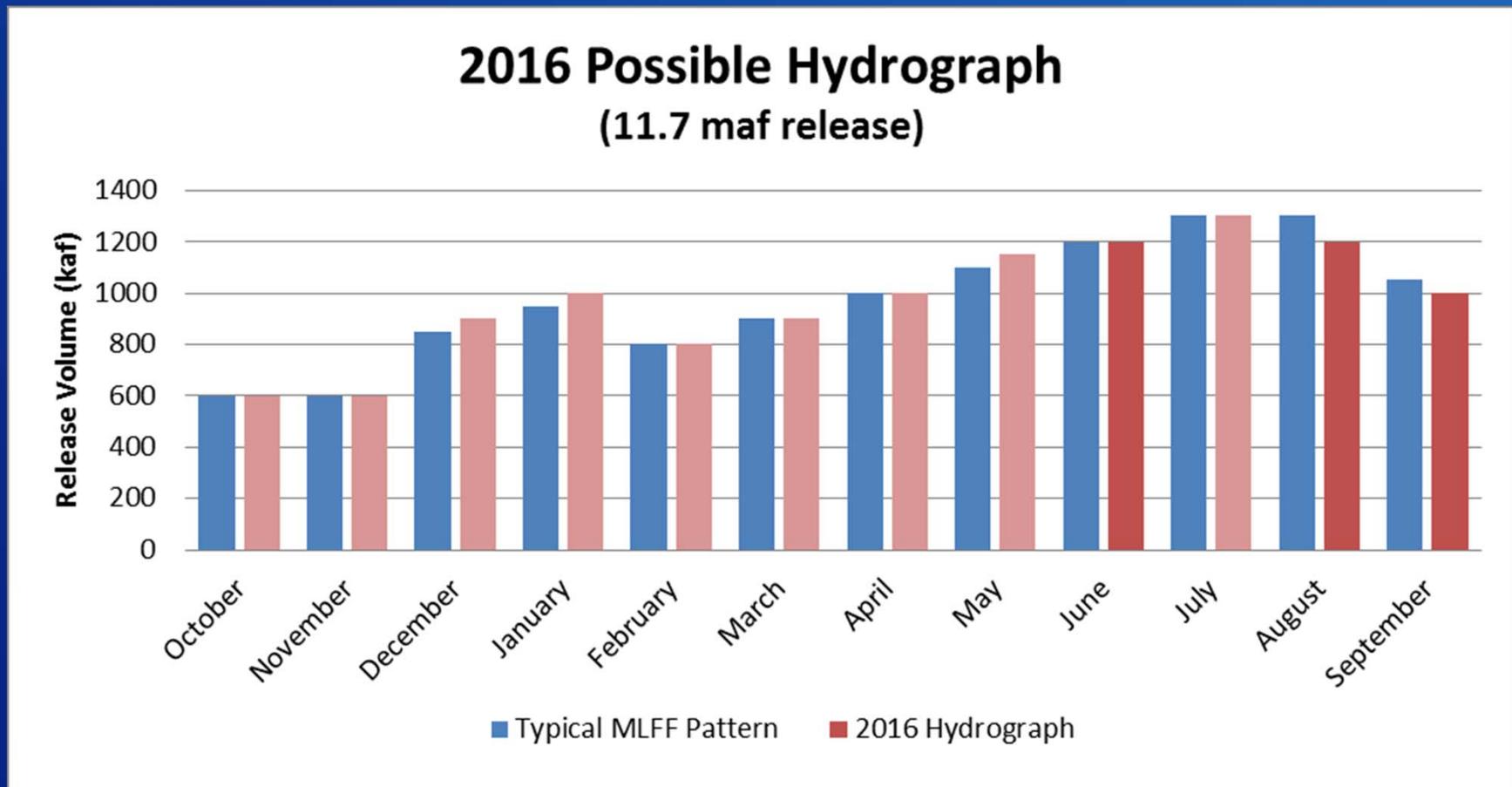
9.0 maf release scenario



2016 Proposed Hydrograph

11.7 maf release scenario

- Lots of water to move: limited flexibility, minimal difference



2016 Hydrograph Motion

RECLAMATION

Hydrograph motion (slide 1 of 2)

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- Annual Release Volumes will be determined by the 2007 Interim Guidelines and shall be reviewed and adopted through the normal annual operating plan process (in consultation with the Basin States as appropriate).
- Monthly Release Volumes are anticipated to shift depending upon: (1) the projected Annual Release Volume, (2) power plant capacity, and (3) the magnitude of a potential High Flow Experiment.
- Monthly Release Volumes may vary within the targets identified below. Any remaining monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS and in compliance with all applicable NEPA compliance documents (HFE EA, NNFC EA, 2007 Interim Guidelines). Monthly release volumes proposed in this hydrograph will not affect operating tier determinations for Lakes Powell and Mead under the 2007 Interim Guidelines.

Hydrograph motion (slide 2 of 2)

- Release objective for June is:
 - 600 kaf for annual releases below 9.0 maf
 - 800 kaf for annual releases of 9.0 maf to less than 9.5 maf
 - 900 kaf for annual releases of 9.5 maf to less than 10 maf
 - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for August is:
 - 800 kaf for annual release below 9.0 maf
 - 900 kaf for annual releases of 9.0 maf to less than 10 maf
 - Greater than 900 kaf for annual releases 10 maf and greater
- Release objective for September is:
 - 600 kaf for annual releases below 9.0 maf
 - 700 kaf for annual releases of 9.0 maf to less than 10.0 maf
 - 800 kaf or greater for annual releases of 10.0 maf or greater; up to power plant capacity for high equalization releases
- Monthly Release Volumes will generally strive to maintain 600 kaf levels in the shoulder months (spring and fall) and 800 kaf in the December/January and July/August timeframe.

Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies and in consultation with the Basin States as appropriate, to consider changing conditions and adjust projected operations in a manner consistent with the objectives of these parameters as stated above and pursuant to the Law of the River.

RECLAMATION

Questions?

Katrina Grantz

801-524-3635

kgrantz@usbr.gov

Hydraulic Engineer, Glen Canyon
Reclamation, Upper Colorado Region
Resource Management Division
Water Resources Group

RECLAMATION

- Extra slides follow

RECLAMATION

Timing of Operational Decisions

- August 24-Month Study projections of January 1 elevations sets the operating tiers for Lake Powell and Lake Mead
- When Lake Powell is in Upper Elevation Balancing Tier, April 24-Month Study projections of September 30 elevations may result in an adjustment to Powell's operations

Lake Powell & Lake Mead Operating Tiers

Operational Tiers for Water/Calendar Year 2016 determined with the August 2015 24-Month Study

Lake Powell			Lake Mead		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹	Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹
3,700	Equalization Tier Equalize, avoid spills or release 8.23 maf	24.3	1,220	Flood Control Surplus or Quantified Surplus Condition Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	Upper Elevation Balancing Tier³ Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)	1,200 (approx.) ²	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	22.9 (approx.) ²
3,575	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5	1,145	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf	15.9
3,525	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	5.9	1,105	Shortage Condition Deliver 7.167 ⁴ maf	11.9
3,490		4.0	1,075	Shortage Condition Deliver 7.083 ⁵ maf	9.4
3,370		0	1,050	Shortage Condition Deliver 7.0 ⁶ maf Further measures may be undertaken ⁷	7.5
			1,025		5.8
			1,000		4.3
			895		0

Diagram not to scale

¹ Acronym for million acre-feet

² This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

³ Subject to April adjustments which may result in a release according to the Equalization Tier

⁴ Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

⁵ Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada

⁶ Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada

⁷ Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

RECLAMATION

August 2015 determination

Current projection of what may happen in April 2016

B. Upper Elevation Balancing Tier

1. In Water Years when the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet, the Secretary shall release 8.23 maf from Lake Powell if the projected January 1 Lake Mead elevation is at or above 1,075 feet.
2. If the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet and the projected January 1 Lake Mead elevation is below 1,075 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 7.0 maf from Lake Powell in the Water Year.
3. When operating in the Upper Elevation Balancing Tier, if the April 24-Month Study projects the September 30 Lake Powell elevation to be greater than the elevation in the Lake Powell Equalization Elevation Table, the Equalization Tier will govern the operation of Lake Powell for the remainder of the Water Year (through September).
4. When operating under Section 6.B.1, if the April 24-Month Study projects the September 30 Lake Mead elevation to be below 1,075 feet and the September 30 Lake Powell elevation to be at or above 3,575 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 8.23 maf from Lake Powell in the Water Year.
5. When Lake Powell is projected to be operating under Section 6.B.2. and more than 8.23 maf is projected to be released from Lake Powell during the upcoming Water Year, the Secretary shall recalculate the August 24-Month Study projection of the January 1 Lake Mead elevation to include releases above 8.23 maf that are scheduled to be released from Lake Powell during the months of October, November, and December of the upcoming Water Year, for the purposes of determining Normal or Shortage conditions pursuant to Sections 2.A. or 2.D. of these Guidelines.

Glen Canyon Power Plant Provisional Unit Outage Schedule for Water Year 2015

Unit Number	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015	Jul 2015	Aug 2015	Sep 2015	
1													
2													
3													
4													
5													
6													
7													
8													
Units Available	5	7	6	6	4 6	4 6	6	6 5	6	6 7	7	5	
Capacity (cfs)	14,400	21,500	18,000	18,000	11,400 18,000	11,300 18,000	18,000	18,000 14,500	18,000	18,000 21,400	21,400	14,500	
Capacity (kaf/month)	910	1,280	1,110	1,110	690	750	1,070	980	1,070	1,200	1,310	910	
Max (kaf) ¹	--	--	--	--	--	--	--	--	--	--	800	713	9.0
Most (kaf) ²	598	776	864	862	589	649	600	699	800	1,048	800	713	9.0
Min (kaf) ¹	--	--	--	--	--	--	--	--	--	--	800	713	9.0

(updated 8-17-2015)

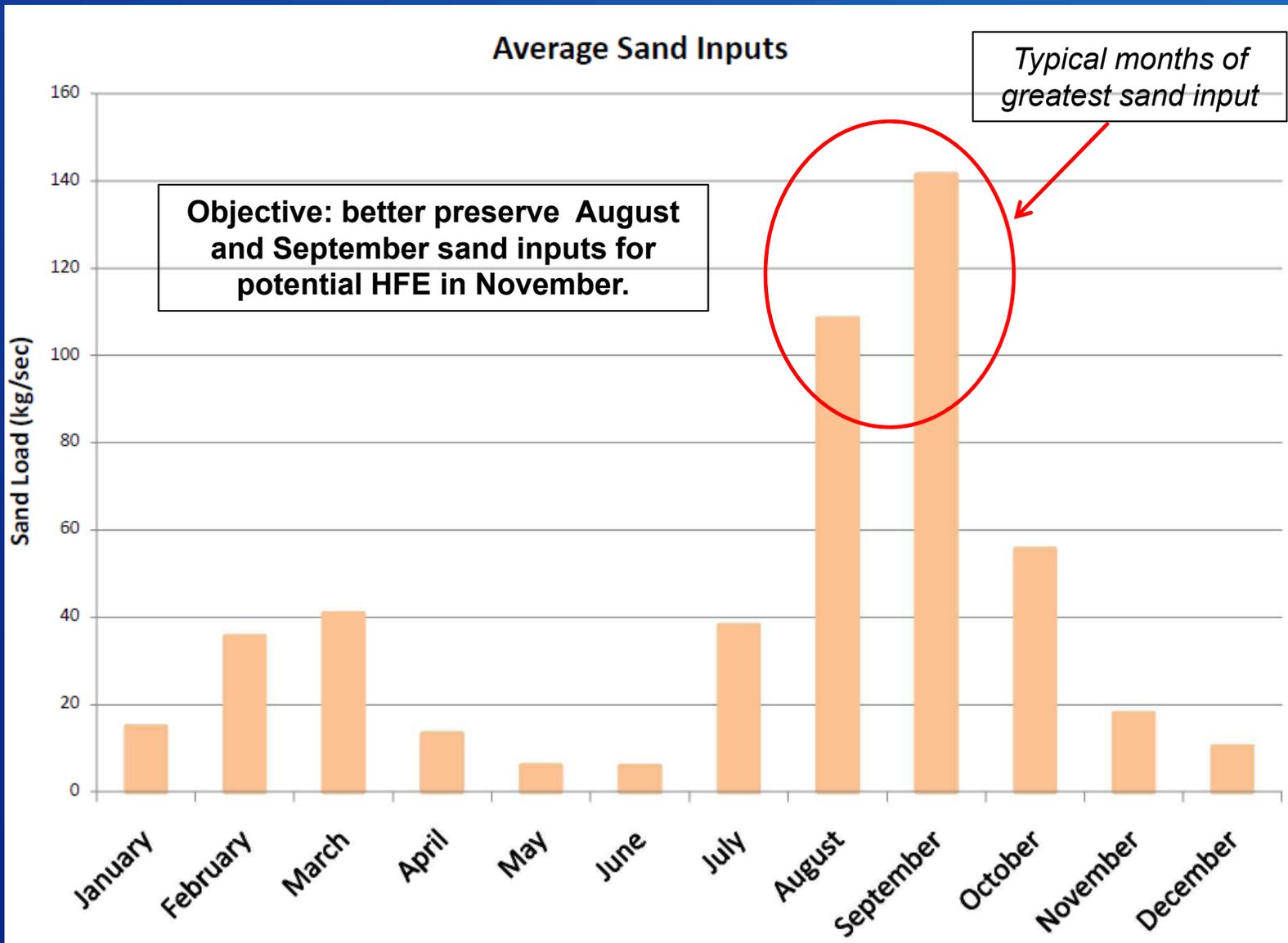
¹ Projected release, based on August 2015 Min and Max Probable Inflow Projections and 24-Month Study model runs

² Projected release, based on August 2015 Most Probable Inflow Projections and 24-Month Study model runs

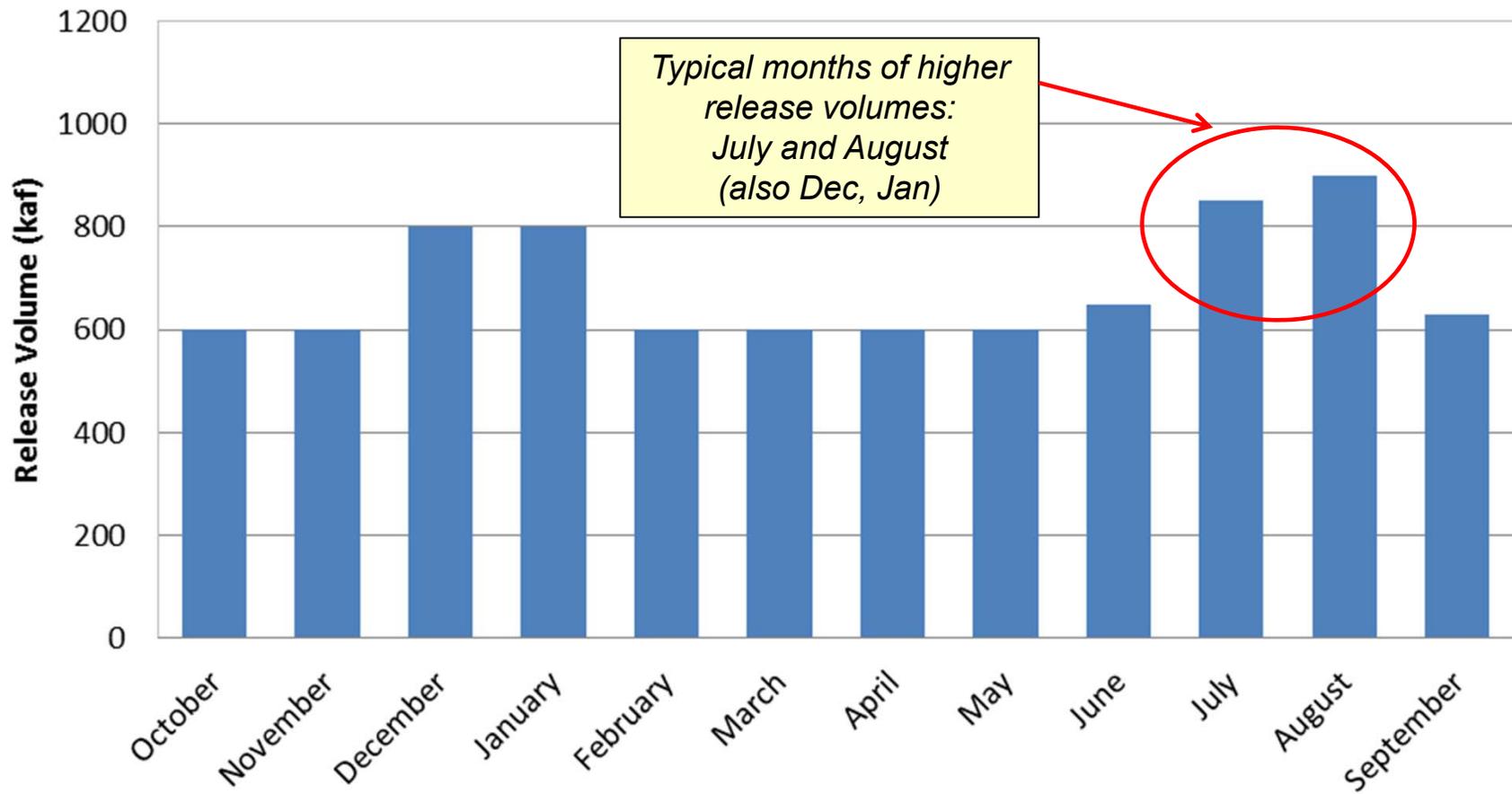
RECLAMATION

Very draft scenarios with HFE and/or changing hydrology (start out assuming 9.0, but end up in 8.23)

2016 Release Scenarios with Hydrograph						
	Typical pattern (9.0 maf)	Proposed 2016 Hydrograph (9.0 maf)	<i>Possible monthlies after maintenance considerations and discussions with Western (maintaining 2016 Hydrograph targets)</i>			
			9.0 maf	96 hr HFE 9.0 maf	8.23 maf	96 hr HFE 8.23 maf
October	600	600	600	600	600	600
November	600	600	600	770	600	770
December	800	900	900	900	900	900
January	800	900	900	900	900	900
February	650	700	700	665	700	665
March	650	650	650	615	650	615
April	600	600	600	600	540	540
May	650	700	700	600	540	500
June	800	800	800	800	600	600
July	1000	950	950	950	800	800
August	1050	900	900	900	800	800
September	800	700	700	700	600	540
	9000	9000	9000	9000	8230	8230

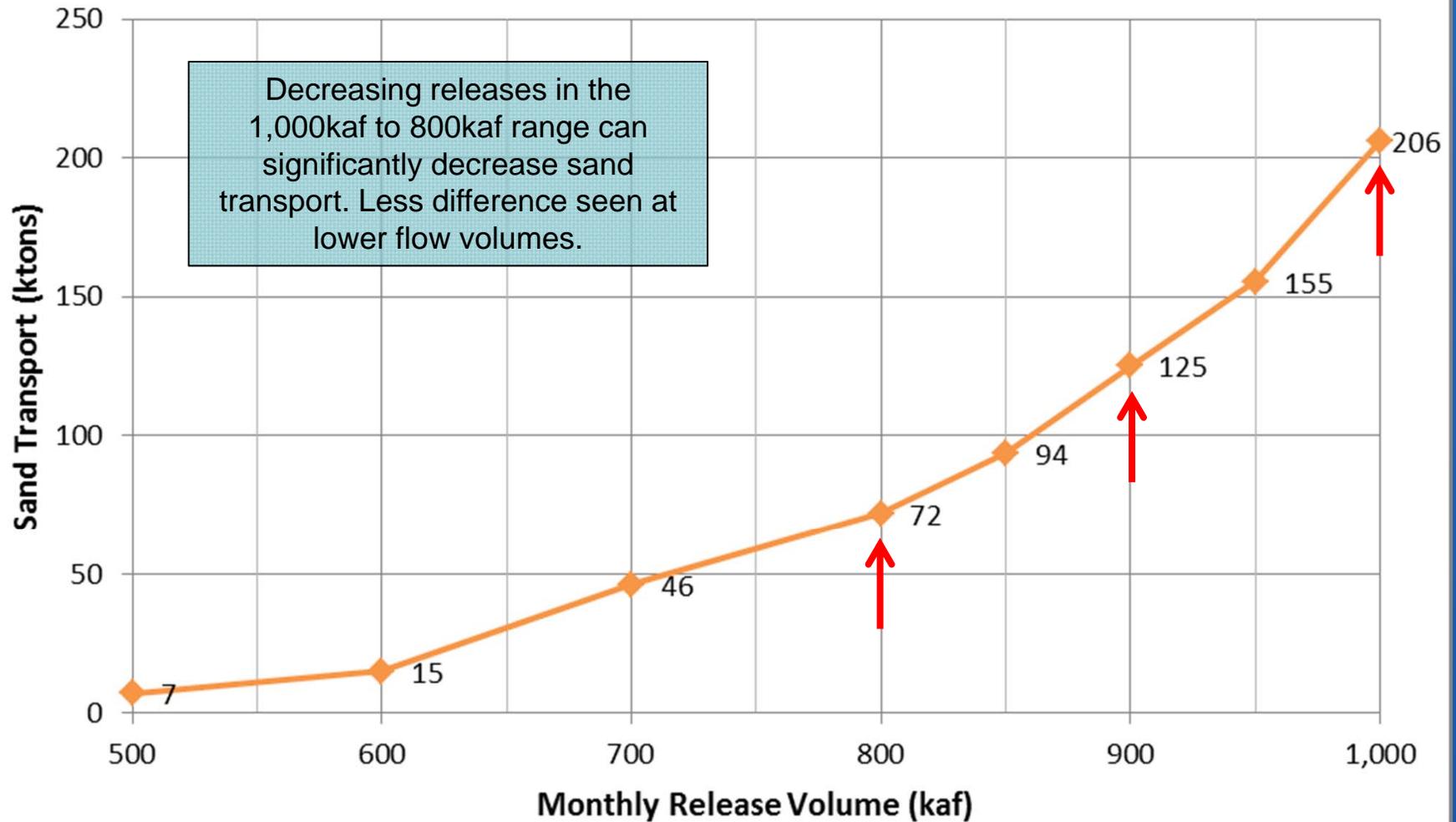


Typical Annual Release Pattern 8.23 maf year



Sand Budget Model - Marble Canyon Reach

(based on Dec-2013 initial conditions)



RECLAMATION

2015 Hydrograph

Monthly Release Objectives

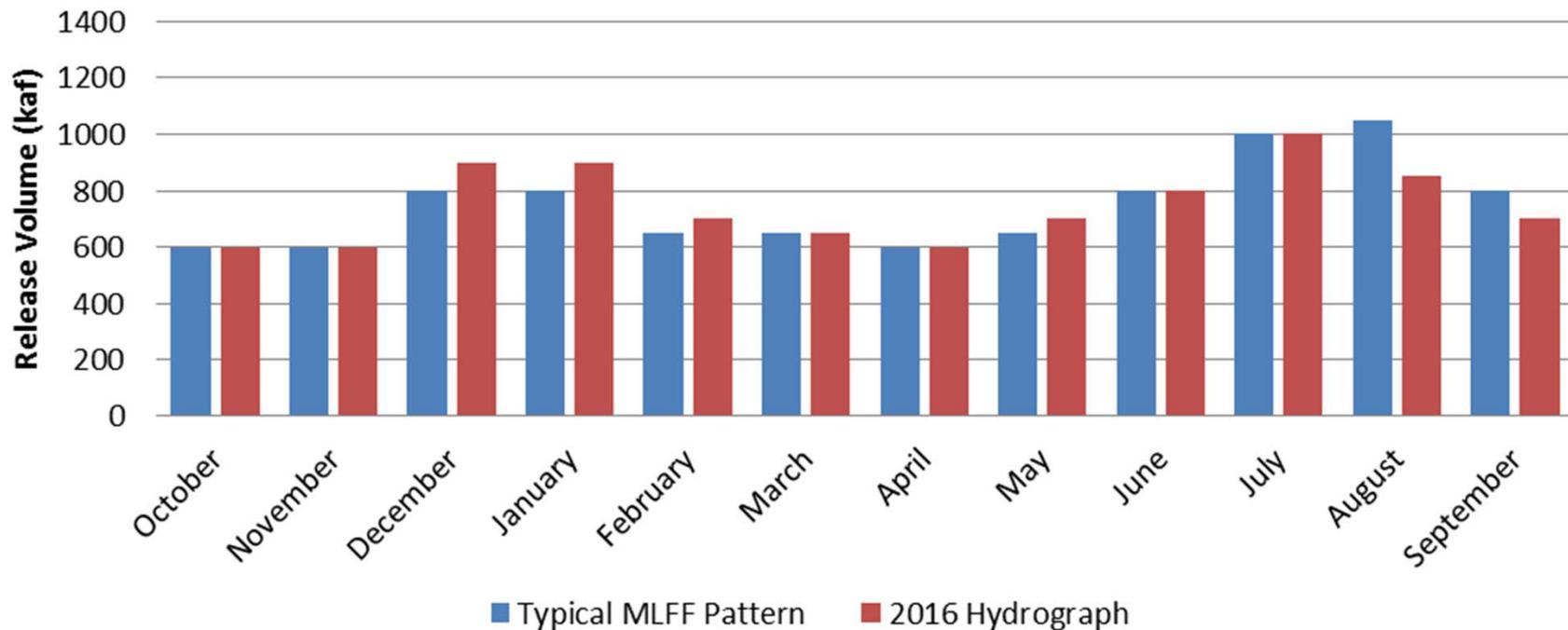
Annual Release Volume	June	August	September
less than 9.0 maf	600 kaf - 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf		700 kaf
9.5 maf – less than 10 maf	900 kaf		700 kaf
10 maf and greater	more than 900 kaf		800 kaf or more

RECLAMATION

2016 Possible Hydrograph

9.0 maf release – initial consideration
presented at Feb AMWG meeting

2015 Possible Hydrograph (9.0 maf release)



Screening Tool Analysis

Typical MLFF

Month	Number of Days	Monthly Volume (kaf)	Temperature at RM61	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)
October	31	600	11.4	14,614	15,858
November	30	600	10.6	15,869	15,343
December	31	800	10.0	41,620	20,972
January	31	800	9.9	41,620	19,536
February	28	600	10.3	18,941	14,716
March	31	600	10.8	14,614	14,322
April	30	600	11.3	15,869	13,209
May	31	600	11.9	14,614	13,779
June	30	650	12.4	21,119	16,079
July	31	850	12.4	63,078	26,415
August	31	900	12.1	77,431	28,169
September	30	630	12.1	18,875	17,863
Total	365	8230	annual	358,266	216,262
			Jul-Nov	189,867	
			Aug-Sep	96,306	

Proposed 2016 Hydrograph

Month	Number of Days	Monthly Volume (kaf)	Temperature at RM61	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)
October	31	600	11.4	14,614	15,858
November	30	600	10.6	15,869	15,343
December	31	850	10.0	63,078	22,502
January	31	850	9.9	63,078	20,919
February	28	600	10.3	18,941	14,716
March	31	600	10.8	14,614	14,322
April	30	600	11.3	15,869	13,209
May	31	600	11.9	14,614	13,779
June	30	630	12.4	18,875	15,633
July	31	900	12.3	77,431	27,806
August	31	800	12.3	41,620	24,729
September	30	600	12.2	15,869	17,069
Total	365	8230	annual	374,474	215,885
			Jul-Nov	165,404	
			Aug-Sep	57,489	

RECLAMATION

Screening Tool Analysis

Typical 9.0 MLFF					Modified 9.0 year Proposal				
Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)	Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)
Oct	600	14,614	15,858	11.4	Oct	600	14,614	15,858	11.4
Nov	600	15,869	15,343	10.6	Nov	600	15,869	15,343	10.6
Dec	800	41,620	20,972	10.0	Dec	900	77,431	23,762	10.0
Jan	800	41,620	19,536	9.9	Jan	900	77,431	22,102	9.9
Feb	650	25,345	15,906	10.3	Feb	700	33,365	17,096	10.3
Mar	650	19,397	15,459	10.8	Mar	650	19,397	15,459	10.8
Apr	600	15,869	13,209	11.3	Apr	600	15,869	13,209	11.3
May	650	19,397	14,825	11.8	May	700	25,355	15,871	11.7
Jun	800	45,598	19,428	12.1	Jun	800	45,598	19,428	12.1
Jul	1000	113,929	30,588	12.1	Jul	950	94,279	29,197	12.2
Aug	1050	136,707	32,491	11.9	Aug	900	77,431	28,169	12.1
Sep	800	45,598	22,360	11.8	Sep	700	27,671	19,715	12.0
Total	9000	535,564	235,977		Total	9000	524,310	235,210	
									-767 hydropower diff
	Annual	535,564				Annual	524,310		-11,254 sed diff (annual
	Jul-Nov	326,718				Jul-Nov	229,864		-96,854 sed diff (Jul-Nov)
	Aug-Sep	182,305				Aug-Sep	105,102		-77,203 sed diff (Aug - Sep)

RECLAMATION

2016 Proposed Hydrograph

7.48 maf release

Release is already low in June, Aug and Sep, no difference

