Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
February 19-20, 2014

Agenda Item

Updates on the 2013 High Flow Experiment

Action Requested

✓ Information item only.

Presenter

Glen Knowles, Adaptive Management Group Chief, Bureau of Reclamation, Upper Colorado Region

Jack Schmidt, Chief, U. S. Geological Survey Grand Canyon Monitoring and Research Center

Previous Action Taken

N/A

Relevant Science

The Environmental Assessment and Finding of No Significant Impact for Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020 can be found here: http://www.usbr.gov/uc/envdocs/index.html

Repeat digital photography of sandbars following the 2012 and 2013 HFEs can be found here:
2012: http://www.gcmrc.gov/gis/sandbartour2012/index.html
2013: http://www.gcmrc.gov/gis/sandbartour2013/index.html

Sediment mass balance data concerning the HFEs can be found at:
http://www.gcmrc.gov/discharge_qw_sediment/?

Background Information

The Finding of No Significant Impact for the Development and Implementation of a Protocol for High-Flow Experimental Releases from Glen Canyon Dam, Arizona, 2011 through 2020 (HFE Protocol) was completed in May of 2012 along with a directive from the Secretary of the Interior on the implementation of the HFE Protocol and Non-native Fish Control in Grand Canyon. The second HFE conducted under the HFE Protocol was completed in November 2013. The planning for this event under the Secretarial Directive was comprehensive, and resulted in a thorough review of all Glen Canyon Dam Adaptive Management Program resources.

Approximately 1.80 x 10^6 metric tons (mt) entered the Colorado River between July 1 and November 10, 2013. This was an unusually large amount of sand delivered from the Paria; the last time such large inputs had occurred was in the late 1990s. Between 1.3 and 2.3 x 10^6 mt of sand, including sand from the Paria and from lesser tributaries, accumulated on the channel bed and in eddies of upper Marble Canyon during that period. The peak flow of 37,000 ft^3/s of this HFE lasted for 3 days. In response, more than half of those eddy sand bars (21 of 40) monitored by time lapse cameras noticeably increased in area and volume of sand. Approximately 530,000 mt of sand were transported in suspension out of upper Marble Canyon past the River Mile (RM) 30 gage during the 6 days of this controlled flood; approximately 340,000 mt were transported out of lower Marble

Canyon past the RM60 gage. Approximately 780,000 mt of sand were transported by the HFE past the Diamond Creek gage at RM225 into Lake Mead reservoir. Since the beginning of the implementation period for the HFE Protocol in July 1, 2012, between 0.65 and 2.2 x 10^6 mt of sand have accumulated in upper Marble Canyon and between 0.25 and 0.53 x 10^6 mt have accumulated in lower Marble Canyon. During the same period, between 2.9 and 3.2 x 10^6 mt of sand have accumulated in Lake Mead reservoir. There is no evidence that the 2012 and 2013 HFEs caused the number of trout in Marble Canyon to increase nor to increase the downstream migration rate from Glen Canyon to the mouth of the Little Colorado River.

Reclamation will provide a presentation on the HFE planning and implementation process, as well as lessons learned during the process in 2013. GCMRC will provide a summary of preliminary findings to date from the 2012 and 2013 HFEs.

RECLAMATION

Managing Water in the West

Update on the Fall 2013 HFE

Glen Knowles
Bureau of Reclamation

Glen Canyon Dam
Adaptive Management Program
AMWG Meeting
February 19, 2014

U.S. Department of the Interior
Bureau of Reclamation

HFE Protocol Parameters

Possible Timing

- **March-April and October-November through 2020**
- **Spring HFEs will not be considered until 2015**

Duration range

- **1 hr – 96 hrs (at full magnitude)**
- **1 ½ days – 6 ½ days (including ramping)**

Magnitude range

- **31,500 cfs – 45,000 cfs (depends on maintenance)**

Ramping rates

- **Ramping rates are defined by 1996 ROD and 1997 Glen Canyon Dam Operating Criteria (62 FR 9447, 4,000 cfs up and 1,500 cfs down)**

Model Constraints

- **"the Leadership Team's view is that it would be inappropriate to adjust the model output in a way that would increase the amount of water to be released or increase power costs associated with an HFE release." November 7, 2012 memo from Anne Castle**

RECLAMATION

HFE Decision Making Process

1. Planning and Budgeting Component
   - Annual resource status assessment
   - GCDAMP Annual Reporting (Jan 28-29, 2013, Jan 29-30, 2013)
   - GCDAMP Budget and Work Plan Process
2. Modeling Component
3. Decision and Implementation Component
   - Review Modeling Component
   - Review Status of Resources
   - GCDAMP- Consultation with agencies and tribes, AMWG and TWG presentations
   - Basin States Consultation
   - DOI/DOE Technical Team Recommendation/DOI GCD Leadership Team Decision (Oct 25, 2013)

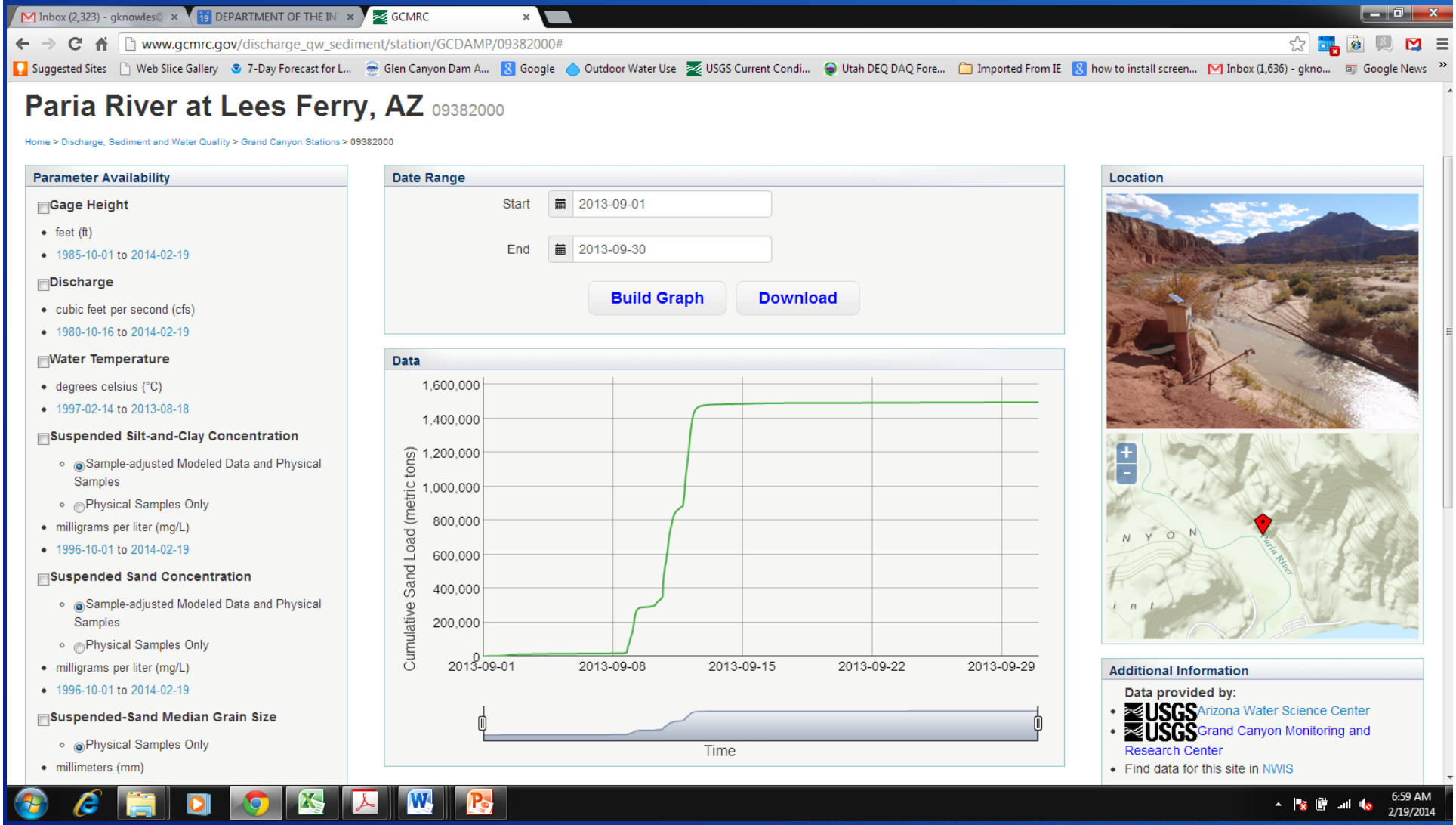
RECLAMATION

HFE Protocol Reporting

1. GCDAMP Annual Reporting meeting every January (Jan 29-30, 2014).
2. Updates at TWG/AMWG GCDAMP meetings.
3. Meet with the HFE MOA consulting parties and consult with tribes as needed (Feb. 12, 2014).
4. The HFE Technical Team report to the Secretary's Glen Canyon Leadership Team for their consideration in HFE decisions (Oct. 23. 2013), and Leadership Team memos.
5. US Fish and Wildlife Service report early each year on the effects of prior HFEs and conservation measures of the FWS biological opinion (first report Feb 2014).

RECLAMATION

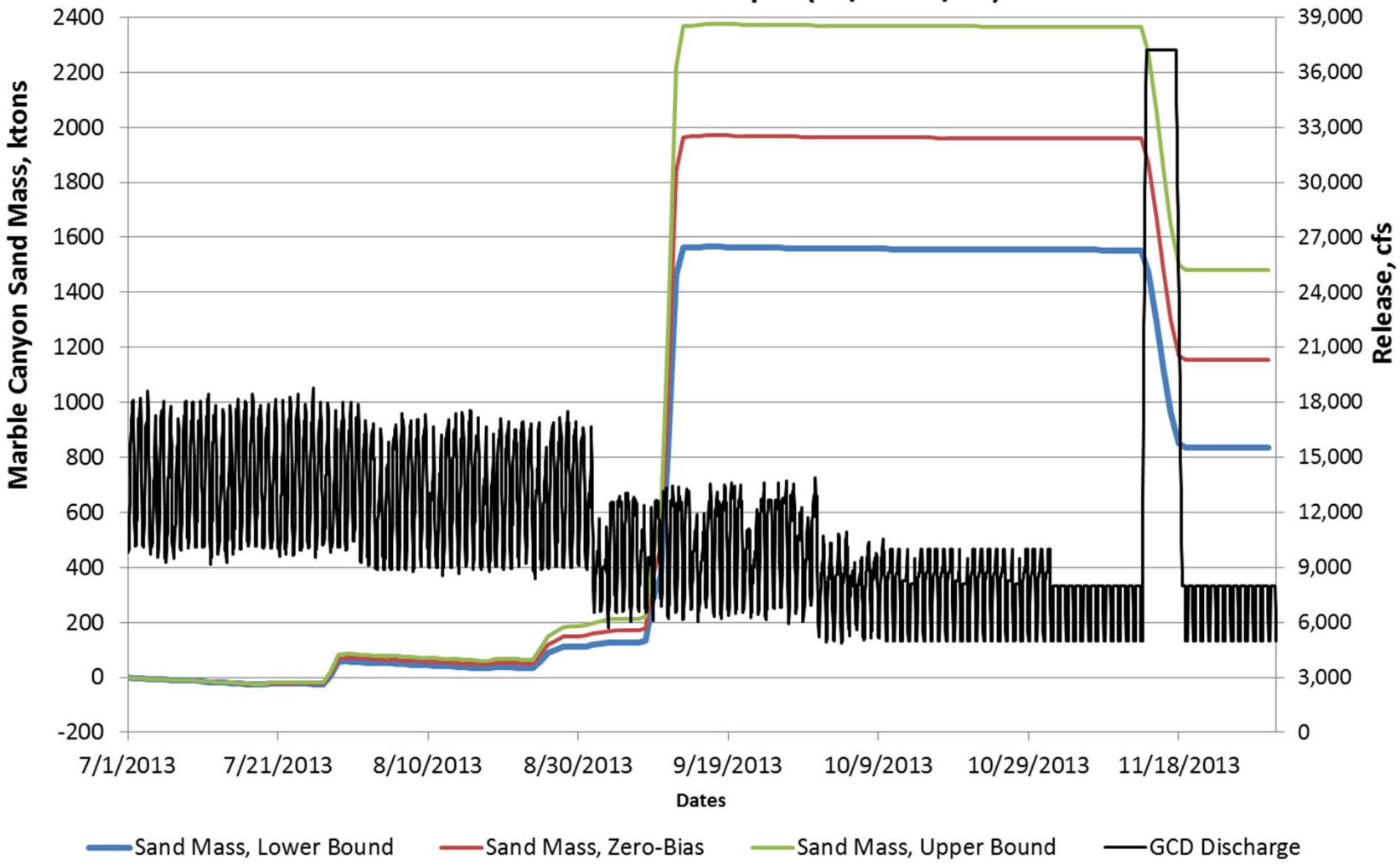
GCMRC website: real-time discharge, sediment and water quality monitoring



RECLAMATION

****PROVISIONAL****

Sand Budget Model Results, 2013 Jul - Nov
Paria Sand Input through 9/30/2013
Zero Future Paria Sand Input (10/1 - 11/30)



RECLAMATION

Resource Status Assessment

Sediment Resources
In-channel sediment storage
Sandbar campable area
High-elevation sand deposits

Cultural Resources
Archaeological site condition and stability
Access to archaeological sites by tribes

Biological Resources
Aquatic food base
Lees Ferry trout population
Lees Ferry fishery recreation experience quality
Endangered humpback chub and other fish abundance
Riparian vegetation

Hydropower and water delivery
Water quality
Water delivery
Dam maintenance
Hydropower production and marketable capacity

RECLAMATION

October 23, 2013

To: Department of the Interior (DOI) Glen Canyon Leadership Team for the High Flow Experimental Protocol (HFE Protocol) and Non-Native Fish Control (NNFC)

From: DOI Glen Canyon Technical Team

Re: Recommendation to Implement a Fall 2013 High Flow Experiment at Glen Canyon Dam

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United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

OCT 2 5 2013

MEMORANDUM

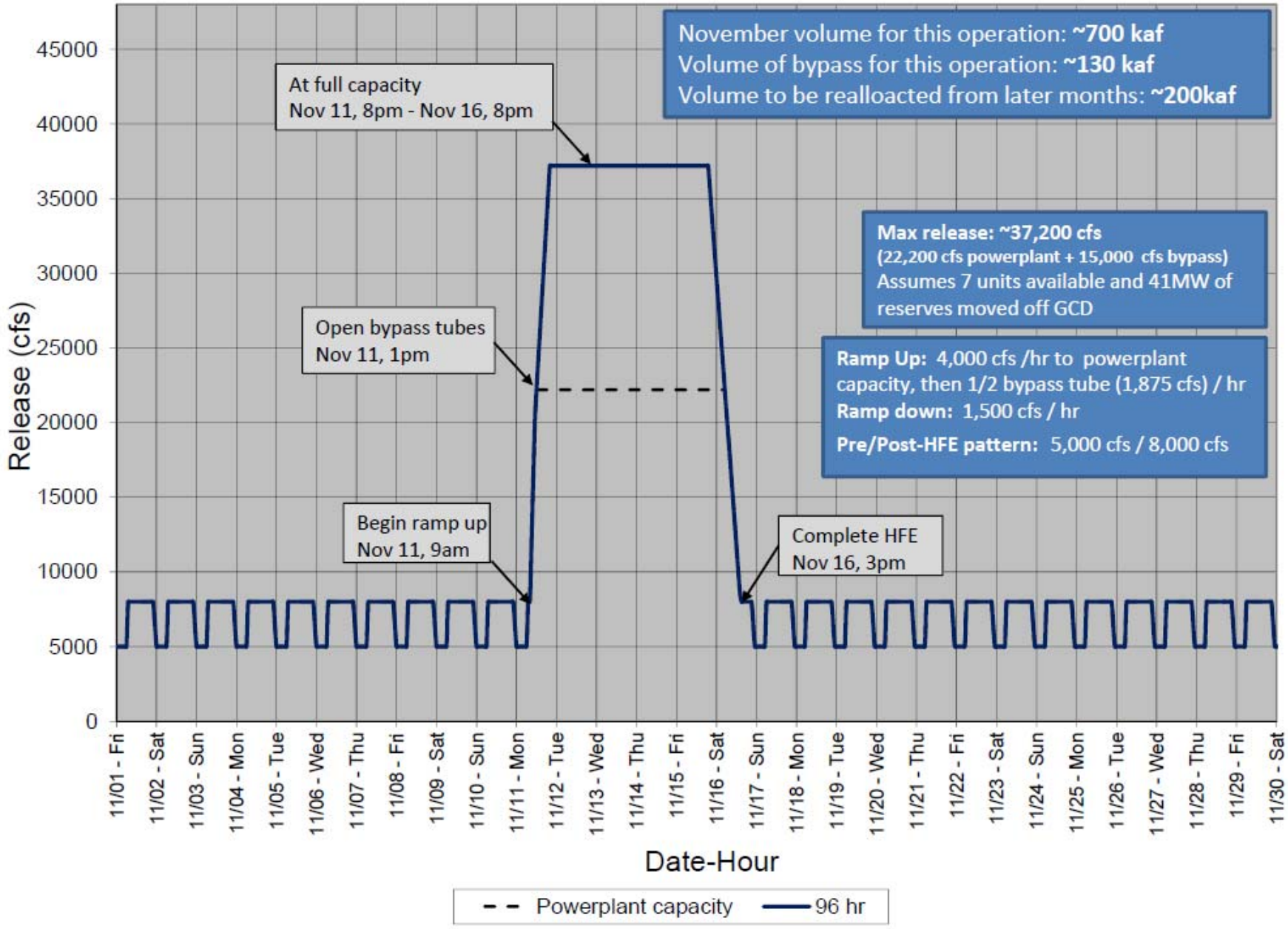
To: Regional Director
Upper Colorado Region, Bureau of Reclamation

From: Anne J. Castle
Chair, Glen Canyon Leadership Team
Assistant Secretary - Water and Science

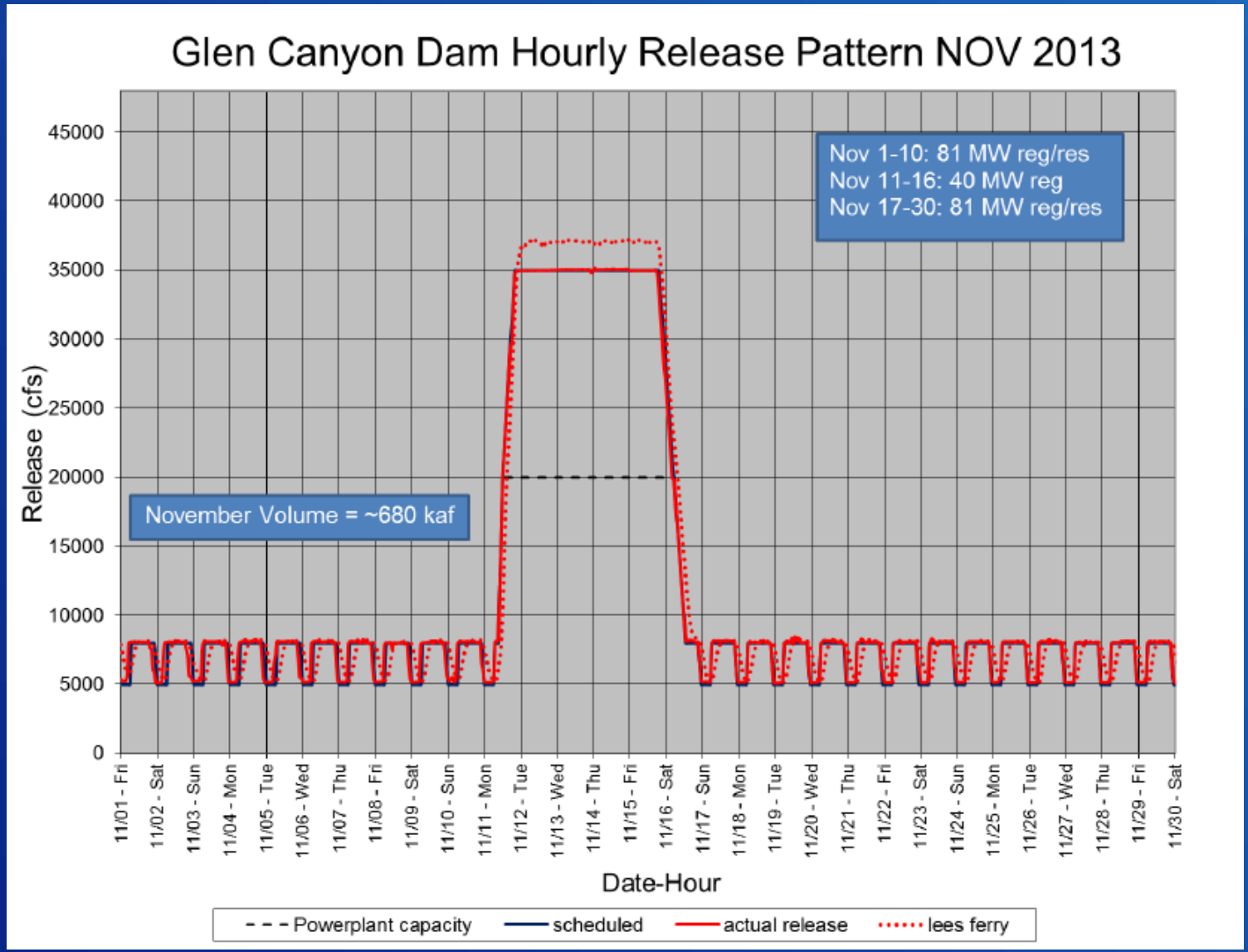
Subject: Approval of Recommendation for High-Flow Experimental Release from Glen Canyon Dam, November 2013

RECLAMATION

Possible Glen Canyon Dam HFE Release Pattern

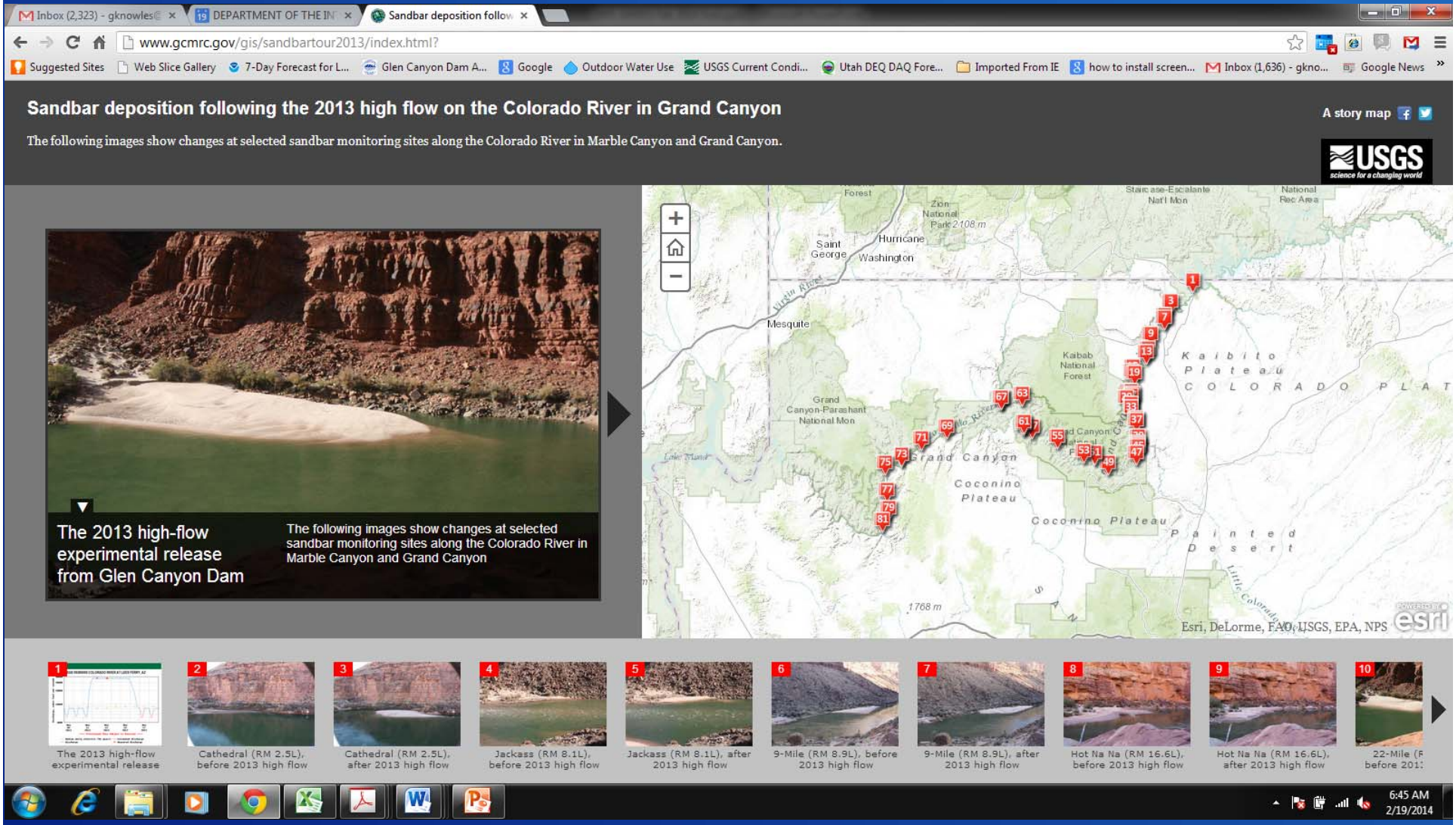


2013 High Flow Experiment



RECLAMATION

Sandbar Images now on GCMRC website



Cultural Resources

- HFE-caused erosion is a consideration, most sites already mitigated.
- The HFE MOA requires reporting and consultation after HFEs.
- Reclamation met with MOA signatories Feb. 12-13, 2013, and on Feb 12, 2014.
- No impacts to sites were identified from the 2012 HFE, no reports of issues with access to sites.
- The MOA for the HFE Protocol requires notification to all the consulting parties at least 30 days in advance of a HFE and will consult with tribes to resolve any issues.

A 30-day letter was sent notifying MOA signatories of a possible HFE in November 2013 on September 30, 2013.

RECLAMATION

Hydropower/Socioeconomic Impacts

- HFEs effect hydropower production negatively:
  - Water released during an HFE counts against the annual release and is not available to be programmed in peaking releases during high demand months (HFE windows of Mar/Apr and Oct/Nov are low-demand shoulder months).
  - 30-40% of HFE releases bypass the power plant.
  - Lake Powell is lowered, reducing hydrologic head.
- Other impacts – Hualapai Enterprise, regional.

Western Area Power Administration estimate hydropower impact of $1.74M from Fall 2013 HFE

(2012 HFE was $1.318).

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Lessons Learned, Key Questions, Next Steps

1. The Protocol is working, with some caveats.
2. The Protocol is easier to implement because stakeholders understand it better.
3. Stakeholders want more reporting.

Key Questions

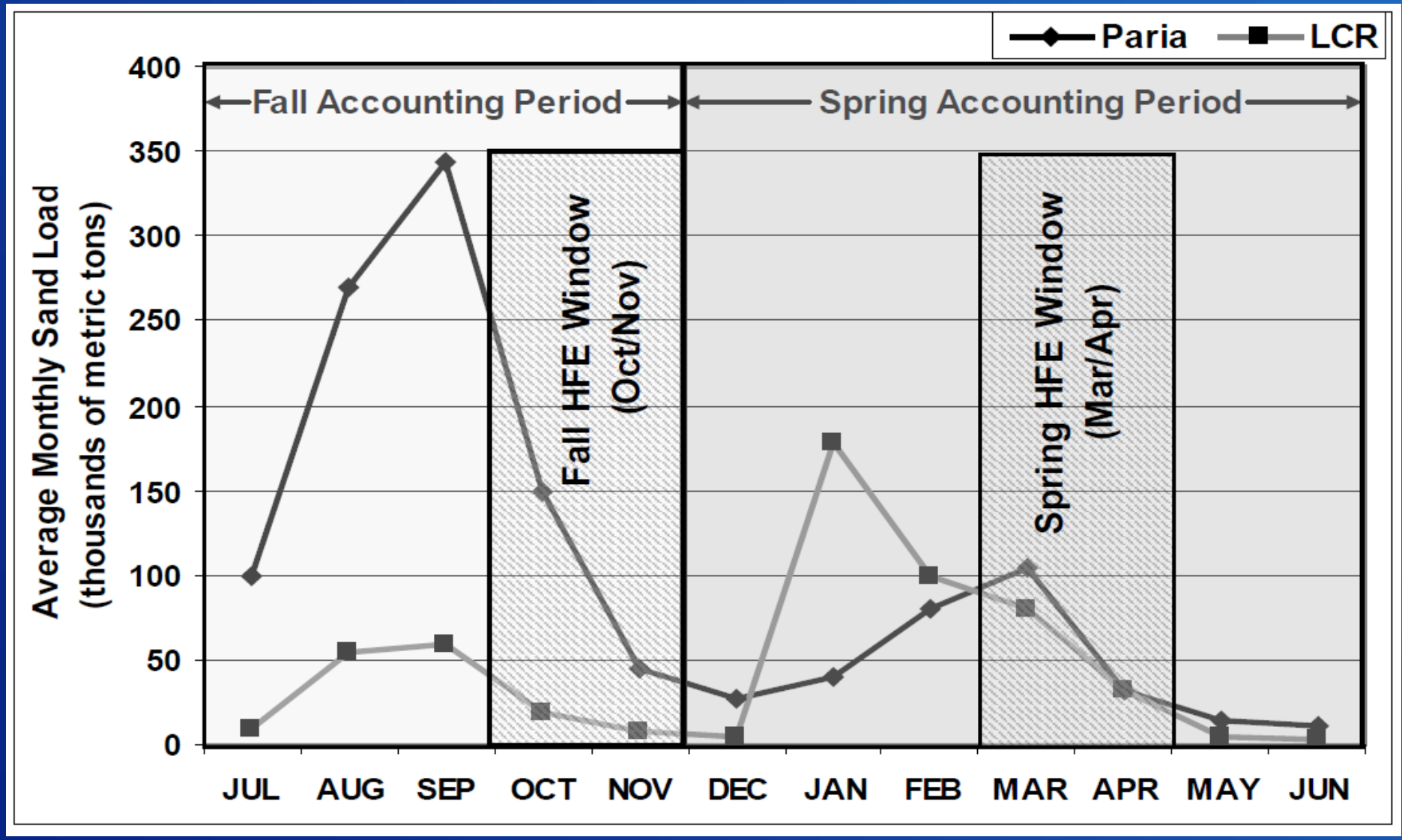
1. Will we can continue to see a rebuilding of sand bars?
2. Do effects to hydropower get passed on to ratepayers?
3. How are HFEs affecting cultural sites?
4. Are HFEs creating trout at the LCR?

Next Steps

1. Keep implementing the Protocol.

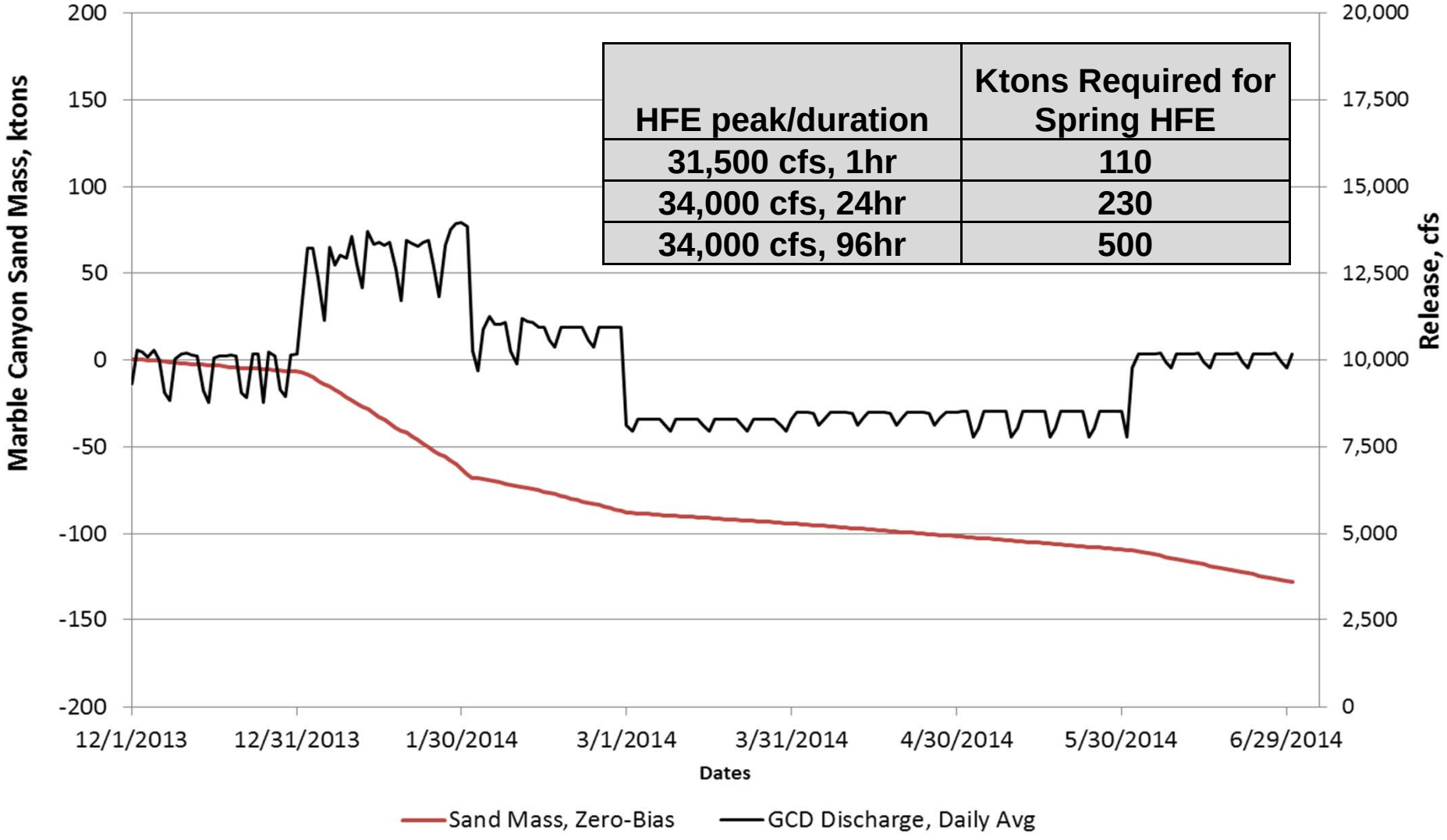
RECLAMATION

Modeling Component



RECLAMATION

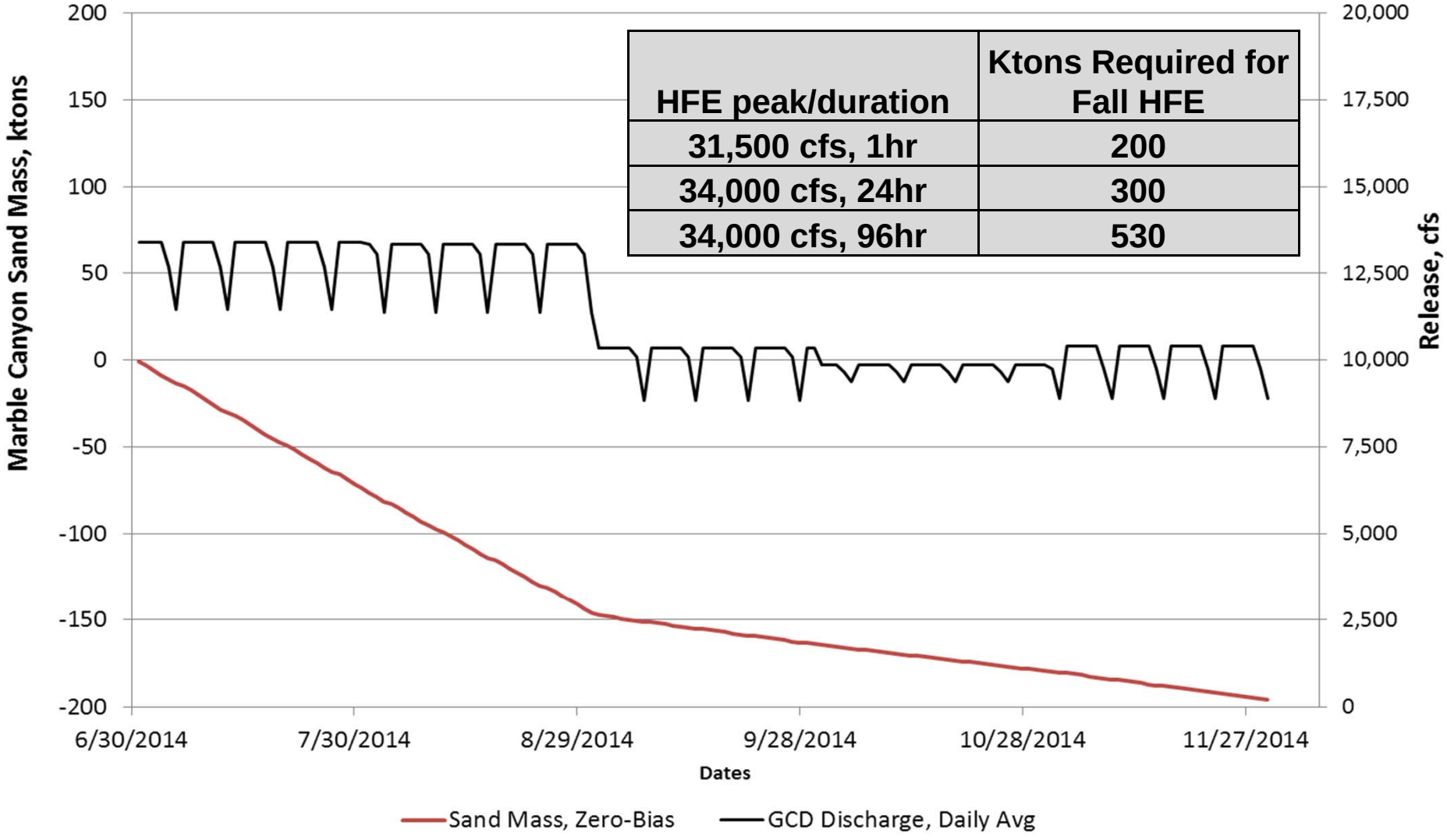
Sand Budget Model Results, 2013 Dec -2014 Jun
Paria Sand Input through 2/12/2014
Zero Future Paria Sand Input (2/13 - 6/30)



HFE peak/duration	Ktons Required for Spring HFE
31,500 cfs, 1hr	110
34,000 cfs, 24hr	230
34,000 cfs, 96hr	500

RECLAMATION

Sand Budget Model Results, 2014 Jul - Nov
Zero Future Paria Sand Input (7/1 - 11/30)



HFE peak/duration	Ktons Required for Fall HFE
31,500 cfs, 1hr	200
34,000 cfs, 24hr	300
34,000 cfs, 96hr	530

RECLAMATION