2013 RA INTERIM FLOW PROGRAM RECOMMENDATIONS

INTRODUCTION AND PURPOSE

The San Joaquin River Restoration Program Restoration Administrator (RA) is required under the Stipulation of Settlement in *NRDC* v. *Rodgers* (CIV-S- 88-1658-LKK/GGH) (the Settlement) to develop recommendations for "implementation of a program of Interim Flows in order to collect relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture and reuse". Interim Flows are defined by the Settlement as those flow releases from Friant Dam that began October 1, 2009, and end when the Restoration Flows commence (no later than January 1, 2014). The Draft Restoration Flow Guidelines (Draft RFG, December 2011 version) require Reclamation to transmit an Allocation and Default Flow Schedule (Allocation) to me by January 20 each year. Based on my receipt of the January 20, 2013 Allocation and Default Flow Schedule from Reclamation, the Draft RFG requires me to prepare and transmit Interim Flow recommendations to the Secretary of the Interior by January 31 each year for the period that begins on March 1 of the same year and ends on February 28 of the following year.

Recommendation Goals and Objectives

The purpose of the Interim Flows Program is to collect relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture and reuse to inform and improve implementation of the Settlement in order to achieve the two primary goals of the Settlement (Paragraph 2) as set forth below:

1) *Restoration Goal*: The Parties agree that a goal of this Settlement is to restore and maintain fish populations in good condition in the mainstem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally-reproducing and self-sustaining populations of salmon and other fish.
2) *Water Management Goal*: The Parties also agree that a goal of this Settlement is to reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in this Settlement.

Developing an effective restoration program for salmon and other fish in the San Joaquin River requires that a number of uncertainties and potentially limiting factors affecting salmon and other fish within the river be identified and addressed. Paragraph 15 of the Settlement, as noted above, requires the RA to ". . . develop and recommend to the Secretary implementation of a program of Interim Flows in order to collect relevant data concerning temperatures, fish needs, seepage losses, recirculation, recapture and reuse." My Interim Flow Program recommendations are based on consultation with the Technical Advisory Committee (TAC) and Implementing Agency staff including representatives of the Fish Management Work Group responsible for implementing the 2013 MAP experimental studies. These recommendations reflect an interdisciplinary approach to collecting data that includes consideration and experimentation focused on fish biology, hydrology, geomorphology, terrestrial biology, water project operations, engineering, geohydrology, water quality, recirculation, recapture and reuse. These recommendations are intended to inform and improve future SJRRP implementation actions by:

- Reducing scientific uncertainties;
- Providing information needed to enable real-time flow management;
- Identifying refinements to the existing flow and water quality monitoring program;

- Providing information to inform decisions on fish migration pathways (e.g., Reach 4B versus Eastside Bypass) and design of physical facilities (e.g., headgates, channel modifications) to better achieve flow routing and fish migration objectives;
- Providing information that will shape and refine the seasonal instream flow releases (hydrographs) under inter- and intra-annual variation in hydrology, including the decision process necessary to accommodate hydrologic and forecasting uncertainties;
- Providing field-based information to calibrate, validate, and/or improve predictive models for guiding future recommendations and management (e.g., hydraulic models, groundwater models);
- Providing information that will assist planning and decisions regarding potential mechanisms for recirculation, recapture, and reuse;
- Identifying additional information needed prior to reintroduction of salmon into the river;
- Providing baseline information on channel conditions upon which future changes can be documented; and
- Establishing a foundation for future management decisions and program refinements as part of long-term adaptive management for the river consistent with the terms of the Settlement.

Paragraph 15 of the Settlement requires the RA to consult with the TAC prior to finalizing these recommendations. My consultation efforts included discussions during TAC meetings in December 2012 and January 2013 relating to alternative strategies for managing flows during 2013, including a range of illustrative Interim Flow hydrographs for different Water Year types, preliminary modeling and monitoring measures, Monitoring and Analysis Plan (MAP) studies and objectives, and the availability of instrumentation and staff resources for the coming year. I also conducted conference calls with TAC members and agency staff during this time to better coordinate the 2013 Interim Flow release strategy with agency study needs for 2013. Because the TAC includes member representatives from the California Department of Fish and Wildlife (CDFW) and Department of Water Resources (DWR), and liaison representatives from the three federal liaison agencies (Reclamation, NOAA/NMFS, USFWS), and because members of the Fish Management Work Group (FMWG) also were consulted directly by me and through the agency representatives attending the TAC meetings prior to finalizing my recommendations, I believe that my Interim Flow Program recommendations for 2013 are based on the best information available at this time.

The Interim Flow recommendations contained in this document address the information needs and purposes identified above, with an emphasis on achieving the following objectives:

- Conducting experimental studies to assess a) relationships between river flow and the migration rate and survival of juvenile fall-run Chinook salmon, b) reach-specific survival and the risk of predation mortality, and c) the movement of fall-run Chinook salmon fry produced naturally as progeny of adult salmon that were trapped upstream of the Hills Ferry Barrier during Fall 2012 and relocated to Reach 1;
- Identifying processes needed to refine annual Interim Flow and Restoration Flow releases;
- Identifying short-term monitoring, modeling, and studies needed to address specific areas of uncertainty in implementing required actions of the Settlement, including refinement of Interim and Restoration Flows;
- Identifying baseline monitoring needed to document and refine specified management objectives;

- Providing for effective coordination between the RA and Reclamation for Friant Dam release management;
- Assessing the ecological and hydrologic responses to the Interim Flow releases; and
- Preparing for the potential need to amend my initial recommendations to reflect changes in the amount of inflow to Millerton Reservoir that could result in a change in the Allocation by Reclamation for the 2013 Water Year.

Requirements that Must Be Addressed During Preparation of Interim Flow Recommendations
Recommendations for implementing the Interim Flow Program for a given year must be prepared in a manner that is consistent with substantive provisions of the:

- Controlling provisions contained in the body of the Settlement;
- Restoration flow allocations identified in Exhibit B of the Settlement;
- Most recent flow conveyance capacity constraints along the mainstem of the San Joaquin River identified by Reclamation;
- Smoothed Restoration Flow allocations and capped Interim Flow allocations identified in the Draft RFG;
- Most recent Allocation and Default Flow Schedule transmitted by Reclamation to the RA;
- San Joaquin River Restoration Settlement Act (SJRRSA) affecting Interim Flows; and
- State Water Resources Control Board (SWRCB) permit guiding releases of restoration flows from Friant Dam from October 1, 2012 through March 31, 2013.

In addition, Interim Flow recommendations must be prepared in accordance with the process and timing provisions contained in the latest version of the Draft RFG and the provisions of Reclamation's March 2010 letter to me relating to implementation of Interim Flows. All of the documents and sources referenced as part of this discussion of Interim Flow guidance are available on the SJRRP web site for those desiring specific information.

RA INTERIM FLOW PROGRAM RECOMMENDATIONS FOR 2013

As required by the Draft RFG, the 2013 Interim Flow Program accounts for the total Water Year volume (March 1, 2013 through February 28, 2014). Based on the February 1 Allocation provided to me by Reclamation on January 20, 2013, my recommendations focus first on Normal-Dry Year conditions and constraints (Table 1). However, the Department of Water Resources (DWR) will summarize the San Joaquin River runoff forecast on February 1 and at regular intervals between now and early June. As meteorology and snow conditions change during the course of the spring, Reclamation will continue to evaluate changes in predicted runoff to Millerton Reservoir and, as appropriate, issue additional Water Year Allocation updates. In addition, if I determine that I need an updated Allocation prior to the time Reclamation proposes to prepare an Allocation update, I can request that the Allocation be updated by Reclamation. Whenever I receive an updated Allocation from Reclamation, I will update my Interim Flow recommendations and transmit a revised Interim Flow Program Recommendations to Reclamation within two weeks of receipt of their updated Allocation.

My recommendation provides specific timing and release rates for Interim Flow releases from Friant Dam (Table 2). My recommendations also address, based on consultation with affected Implementing Agencies, the modeling and monitoring measures recommended to be implemented during the 2013

Water Year, taking into consideration the availability of needed instrumentation, MAP studies, and Implementing Agency staffing capabilities.

Flow Period	Releases from Friant Dam (cfs)	Flows Targets at Gravelly Ford (cfs)	SJRRP Flows at Gravelly Ford (cfs)	Release Volume from Friant Dam for the SJRRP (TAF)
Mar 1 - Mar 15	500	375	370	11.008
Mar 16 - Mar 31	1,500	1,375	1,370	43.478
Apr 1 - Apr 15	1,500	1,355	1,350	40.165
Apr 16 - Apr 30	350	205	200	5.950
May 1 - Jun 30	350	165	160	19.359
Jul 1 - Aug 31	350	125	120	14.757
Sept 1 - Sept 30	350	145	140	8.331
Oct 1 - Oct 31	350	195	190	11.683
Nov 1 - Nov 6	700	575	570	6.783
Nov 7 - Nov 10	700	575	570	4.523
Nov 11 - Dec 31	350	235	230	23.266
Jan 1 - Feb 28	350	255	250	29.256
Totals (TAF):	**335.504**	**222.179**	**218.559**	**218.559**

TABLE 1. Reclamation Default Flow Schedule for Normal-Dry year

RA Strategy for Implementing the 2013 Interim Flow Program

The recommended strategy to implement 2013 Interim Flow releases also reflects related agency water management needs, including modeling and monitoring measures. In addition, the 2013 strategy reflects 2012 trap and haul of adult fall-run Chinook salmon trapped upstream of the Hills Ferry Barrier. These salmon were translocated to Camp Pashayan in November and December 2012, and have either spawned naturally in Reach 1, or were manually spawned and incubated in streamside incubators in Reach 1. The production of San Joaquin River specific fall-run fry provides additional monitoring opportunities for 2013. Accordingly, after extensive consultations with the TAC and agency staff cited earlier in this report, I am submitting recommendations that reflect the following considerations:

- Multiple conveyance capacity constraints will continue to limit releases from Friant Dam both above the Mendota Pool and below Sack Dam, thus exacerbating the limits imposed by what is expected to be a drier water year (Note: the initial Restoration Flow Allocation from Reclamation is based on Normal-Dry Water Year);
- During drier years, the focus of management and monitoring will shift to site-specific predation (*e.g.*, near the gravel pits) and overall survival of hatchery produced juvenile fall-run Chinook salmon below Friant Dam;
- Hatchery produced fall-run juvenile Chinook salmon will be released below Friant Dam, tagged using a combination of PIT and acoustic tags;
- Downstream movement of naturally and manually-spawned San Joaquin River fall-run Chinook salmon fry will be monitored using rotary screw traps;
- Additional juvenile outmigration monitoring will be conducted in Reach 5 and downstream of the Merced River to document movement of tagged fish placed in Reach 5, and translocation (trucking) of recaptured juveniles from Reach 1 around passage barriers and placed in Reach 5;

- A 350 cfs flow bench should be implemented concurrent with the PIT tag experiment in early March when hatchery pre-smolts are large enough for PIT tags and when water temperatures are beginning to warm to assess migration and survival at a low baseflow;
- A flow bench of approximately 1,000 cfs should be implemented concurrent with the paired PIT tag and acoustic tag experiments, and should be timed for late March through late May so that juveniles have time to grow large enough to carry the acoustic and PIT tags;
- Flow benches should be a minimum of seven days long to enable fish to fully traverse the site-specific experimental areas;
- Respond to the Reclamation request to add a day of 700 cfs between the 350 cfs bench and 1,000 cfs bench for operational purposes (K. Harrison, pers. Comm.).

RA Interim Flow Program Recommendations

Based on the February 1, 2013 Allocation provided by Reclamation on January 20, my recommended Interim Flow release schedule from Friant Dam for the Normal-Dry Year is discussed below. Reclamation's Allocation forecast is based on a 90 percent probability that there would be at least 1,020 thousand acre feet (TAF) of unimpaired runoff into Millerton Reservoir during the 2013 Water Year. This forecast results in a declaration that 2013 will be classified as Normal-Dry Year based on the provisions of Exhibit B of the Settlement and the Draft RFG if precipitation/runoff conditions do not change significantly during the course of the 2013 Water Year. A Normal-Dry Water Year is a year (March 1, 2013 through February 28, 2014) where Millerton Reservoir receives between 930 TAF and a maximum of 1,450 TAF of unimpaired runoff from upstream sources in the San Joaquin River watershed. My recommendation is based on using all of the capped Normal-Dry Water Year allocation for Interim Flow releases.

Unless the forecast is amended by Reclamation, I am obligated to limit the amount (volume) of Interim Flow releases to a maximum of 218.559 TAF (335.504 TAF Friant Dam release), during the 2013 Water Year, in accordance with the Settlement Exhibit hydrograph for a Normal-Dry Year. However, pursuant to Settlement Exhibit B, I also am able to recommend releases from Friant Dam during "flexible flow" periods at rates, and on a schedule that differs from the Exhibit B hydrograph, as long as I do not exceed the total allocated volume (218.559 TAF). I can elect to recommend implementing the "flexible flow" provisions of the Settlement to extend Interim Flow releases beyond April 30 to as late as May 28, or commence Interim Flow releases as early as February 1.

For the projected Normal-Dry Water Year, my Spring Interim Flow recommendations are discussed below and also presented in Table 2 (RA Recommended Friant Dam Interim Flow Releases), Figure 1 (RA Recommended Friant Dam Annual Interim Flow Hydrograph) and Figure 2 (RA Recommended Friant Dam Spring Interim Flow Hydrograph). I do not have authority to make recommendations that affect Riparian Flow releases from Friant Dam. Accordingly, all of the following Friant Dam release recommendations assume that the Riparian Releases used in Reclamation's Default Flow Schedule are incorporated without change for the entire Water Year. In addition, I assume that the actual Friant releases will be sufficient to meet actual riparian demands in accordance with the then current Reclamation method for achieving target flows at Gravelly Ford. The narrative of my recommendations below describe daily average flow releases from Friant Dam (cfs), and Interim Flow allocation volumes (TAF) measured at Gravelly Ford, assuming that the Gravelly Ford volumes are the Friant Dam release volumes minus the seasonal Riparian Release demands minus the volume of the 5 cfs compliance flow at Gravelly Ford.

Spring Flow Recommendations (March 1 through May 28, 2013): I am recommending that a "flexible flow" schedule be implemented during the Spring of 2013 to enable Interim Flow releases to continue from March 1 through May 28, 2013 (Table 1 and Figure 2). I recommend the following Friant Dam release rates and timing:

- Initiate 350 cubic feet per second (cfs) releases from Friant Dam on March 1 and continue the 350 cfs releases from Friant Dam through March 21 (assumes Interim Flow flows releases of 220 cfs at Gravelly Ford);
- Increase Friant Dam releases to 700 cfs on March 22 and to 1,040 cfs on March 23, then maintain the 1,040 cfs release from Friant Dam through March 31 (assumes Interim Flow daily flows of 910 cfs at Gravelly Ford);
- Increase Friant Dam releases to 1,060 cfs on April 1 and maintain the 1,060 cfs releases through April 30 (assumes Interim Flow daily flows of 910 cfs at Gravelly Ford);
- Increase Friant Dam releases to 1,100 cfs on May 1 and maintain the 1,100 cfs releases through May 11 (assumes Interim Flow daily flows of 910 cfs at Gravelly Ford);
- Decrease Friant Dam releases at a 20% daily flow reduction from 1,100 cfs to 350 cfs between May 12 and May 16 (assumes Interim Flow daily flows between 860 cfs and 160 cfs at Gravelly Ford);
- Maintain the 350 cfs releases until May 28, 2013 (assumes Interim Flow daily flows of 160 cfs at Gravelly Ford).

Begin Date	End Date	Recommended Friant Dam Release (cfs)	Exhibit B Riparian Release (cfs)	Gravelly Ford Flow Target (cfs)	Gravelly Ford Flow Allocation (cfs)	Estimated Flows Entering Mendota Pool (cfs)
3/1/13	3/21/13	350	130	225	220	145
3/22/13	3/22/13	700	130	575	570	475
3/23/13	3/31/13	1,040	130	915	910	806
4/1/13	4/30/13	1,060	150	915	910	806
5/1/13	5/11/13	1,100	190	915	910	806
5/12/13	5/12/13	1,050	190	865	860	760
5/13/13	5/13/13	840	190	655	650	555
5/14/13	5/14/13	670	190	485	480	385
5/15/13	5/15/13	540	190	355	350	265
5/16/13	5/16/13	430	190	245	240	165
5/17/13	5/28/13	350	190	165	160	85
5/29/13	6/30/13	350	190	165	160	85
7/1/13	8/31/13	350	230	125	120	45
9/1/13	9/30/13	350	210	145	140	65
10/1/13	10/31/13	350	160	195	190	115
11/1/13	11/10/13	700	130	575	570	475
11/11/13	12/31/13	350	120	235	230	155
1/1/14	2/28/14	350	100	255	250	175
Totals (TAF):		**335.484**	**116.945**	**222.159**	**218.539**	**160.803**

TABLE 2: RA Interim 2013 Flow Release Recommendations for Normal-Dry Water Year

As of May 28, the volume of released Interim Flows released from Friant Dam (measured at Gravelly Ford) will total approximately 109.468 TAF. The remaining unused balance of Interim Flows will be about 109.071 TAF for the remainder of the Water Year, if the February 1 Restoration Allocation remains unchanged.

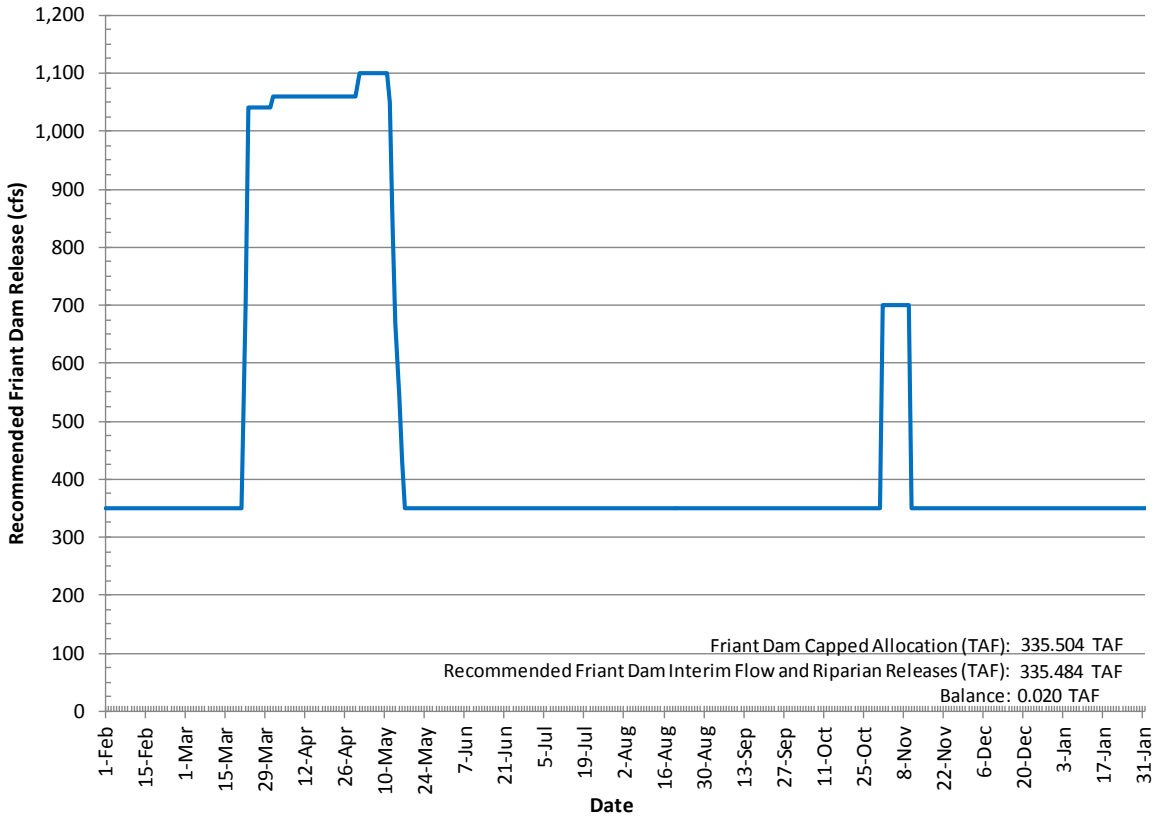

FIGURE 1: RA Recommended Annual Interim Flow Schedule for Normal-Dry Water Year

Summer Base Flows (May 17 through October 31, 2013): During the Summer Base Flow period, Friant Dam releases would be 350 cfs; Riparian Releases would range from 190 cfs to 230 cfs, and corresponding Interim Flow releases from Friant Dam (measured at Gravelly Ford) would range from 45 cfs to 115 cfs for a Normal-Dry year during this time period (Table 2). Because we are not in a Wet year (Riparian Recruitment releases) or Critical Dry year (lower summer baseflows), my Interim Flow release recommendations are identical to the Exhibit B flows for a Normal-Dry year (Table 2).

As of October 31, the Summer Base Flow releases include about 45.243 TAF (May 29 through Oct 31) of Interim Flow releases, increasing the total volume of Interim Flows released from Friant Dam to about 154.711 TAF. The remaining balance of unused Interim Flows will be reduced to about 63.828 TAF on November 1 if the February 1, 2013 Restoration Allocation remains unchanged (Normal-Dry year).

Fall Pulse Flow Recommendations (November 1 through November 10, 2013): I recommend that the Friant Dam releases be increased to 700 cfs starting on November 1 and continuing at 700 cfs through November 10 (Table 2 and Figure 1). The Fall Pulse releases from Friant Dam would include 570 cfs of Interim Flow releases. The Fall Pulse Flow releases from Friant Dam will include about 11.306 TAF of Interim Flow releases, increasing the total released Interim Flows to about 166.017 TAF resulting in a remaining unused Interim Flow Allocation of about 52.522 TAF.

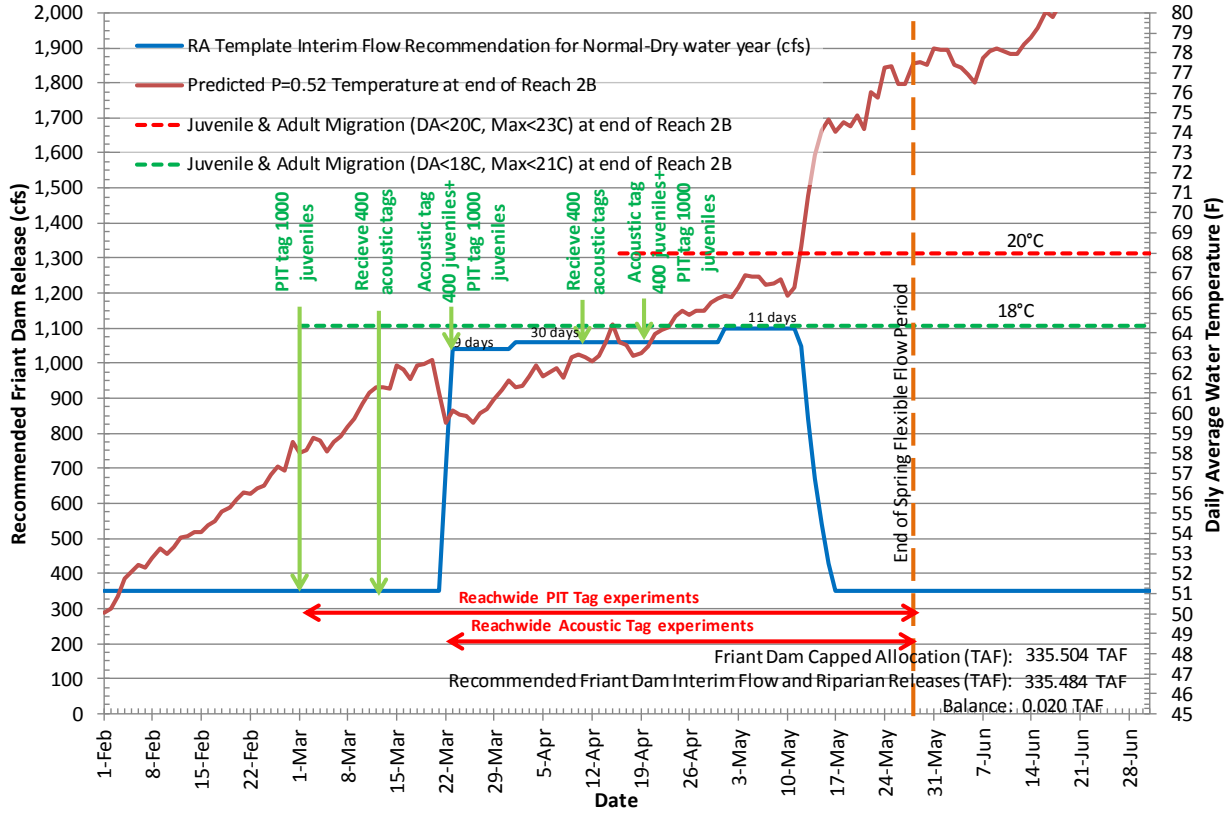

FIGURE 2: RA Recommended 2013 Spring Interim Flow Schedule for Normal-Dry Water Year

Fall-Run Spawning and Incubation Flows, and Winter Base Flows (November 11, 2013 through February 28, 2014): I recommend that the Friant Dam releases be 350 cfs during the Fall-run Spawning and Incubation period and Winter Base Flow period. Interim Flow releases from Friant Dam (measured at Gravelly Ford)ranging from 230 cfs to 250 cfs during this time period, will use the remaining Interim Flow Allocation of approximately 52.522 TAF, reducing the total remaining unused Interim Flow Allocation to about 20 acre feet (Figure 1). Thus, my recommended Interim Flow release recommendations can be achieved within the total volume of Interim Flow water provided for under the February 1, 2013 Allocation and Default Flow Schedule.

Recommendation Concerning Downstream Extent of Interim Flows: Significant constraints on conveyance capacities have been identified in Reach 2B and below Sack Dam in Reach 4A. While I acknowledge these constraints, I recommend that Reclamation continue to evaluate flow conditions, inspect seepage conditions, evaluate shallow groundwater data, and consider the recommendations in the Seepage Management Plan peer review so that the 2013 Interim Flow releases could continue to be routed downstream past Mendota Dam and Sack Dam, and through the Eastside and Mariposa bypasses, into the downstream half of Reach 4B and past the confluence with the Merced River, if Reclamation determines that Interim Flows can be conveyed consistent with the terms of the Settlement and SJRRSA.

The ability to provide for continuous flows would provide important information for future implementation of the SJRRP. Flow losses are expected to be greatest in Reach 2A. Flow accretions and losses are also expected in downstream reaches, and there is even less data available to estimate the

location and magnitude of those possible accretions and losses. While these accretions and losses in downstream reaches are expected to occur on a much smaller scale than in Reach 2A, there is substantial need to gain a better quantitative understanding of the location and scale of those accretions and losses. In addition, the ability to release Interim Flows through all reaches will enable additional data collection on adult fall-run Chinook migration dynamics, including migration timing and rates, pre-spawn survival from migration, comparison of migration survival with trap and haul survival, and other information.

Recommendation Related to Downstream Flow Capacities: SJRRP staff should continue to investigate conveyance capacities in Reaches 2, 3, and 4 and potential seepage impacts of mainstem flows on agricultural lands adjacent to these reaches. At this time, based on the February 1, 2013 Allocation provided by Reclamation, a conveyance capacity constraint of 810 cfs appears to exist at the top of Reach 2B and information needed to enable specific Interim Flow recommendations below Mendota Pool continues to be compiled and evaluated. I expect that evolving information on seepage impacts will continue to constrain releases downstream of Mendota Pool and Sack Dam in 2013.

The Reach 2A and Reach 2B conveyance capacity limitations are based on the latest LiDAR-based elevation comparisons and hydraulic model predictions of water surface elevations. To evaluate these potential capacity limitations, I recommend that DWR conduct field inspections during Interim Flow releases, and continue to investigate and refine conveyance capacity calculations for these downstream reaches in an effort to determine whether the existing conveyance capacity constraints are appropriate. To date, the Program has been accepting remote sensing data (LiDAR) and a 1-D hydraulic model as the best available information. I recommend that DWR provide monthly updates at TAC meetings beginning in March (2013) and continuing through June (2013) to address field conditions observed in comparison to the LiDAR/1-D modeling data.

RA Monitoring Recommendations for the Normal-Dry Year

If precipitation and runoff conditions do not change significantly during the course of the year, the available Interim Flows will impose limits on the scope of monitoring and experimentation tasks that can be accomplished during the Normal-Dry Water Year. With this constraint in mind, and subject to changes that could be necessary if flood control releases occur during March, April, or May, I recommend the following experimentation and monitoring actions:

- Continue ongoing temperature and water quality monitoring in all reaches;
- Continue to monitor seepage from the mainstem of the San Joaquin River to adjacent lands, particularly in Reach 2 and Reach 4A;
- Continue monitoring levee integrity in areas subject to seepage and erosive impacts related to changing mainstem flows;
- Install rotary screw traps in Reach 1, and if feasible, in Reach 2 to document fry movement of naturally and artificially spawned fall-run Chinook salmon from fall 2012;
- Obtain the largest feasible population of suitable fall-run Chinook salmon juveniles from the Feather River Fish Hatchery or other suitable donor source as determined by USFWS, NMFS and CDFW, and transfer the juveniles to the CDFW San Joaquin Fish Hatchery;
- Install available PIT tag and acoustic tag transmitters on the fall-run juveniles, with the timing of installing the tags as shown in Figure 1;

- Obtain permission where necessary to install acoustic receivers and PIT tag arrays in locations similar to those in previous years, and additional locations within gravel pits to better understand juvenile movement and survival in and through the gravel pits;
- Conduct experimental investigations using both PIT and acoustically tagged juvenile fall-run Chinook salmon to determine the relationship between river flow, water temperature, and survival and migration rate/behavior in addition to assessing reach-specific survival rates for juvenile salmon that can be used to identify sources of juvenile mortality (e.g., predation mortality in gravel pits, etc.);
- If there are sufficient PIT tags and/or acoustic tags, install tags in predators (largemouth and smallmouth bass) in the gravel pit reach, and use mobile acoustic tag receivers and/or PIT tag arrays to document predator (bass) and prey (fall-run Chinook salmon juveniles) movement and habitat use as flows and water temperatures change during the spring release period; and
- Conduct trap and haul experiments with a portion of the fry and juvenile Chinook salmon trapped in the rotary screw traps to test the response of juveniles to trap and haul to Reach 5, and gather additional information on the logistics and potential success of juvenile trap and haul measures if conditions necessitate such actions in the future.

With respect to installation of acoustic receivers, it would be desirable to have additional acoustic tag detectors in those gravel pits that appear to have the highest likelihood of predation. Completion of the recommended experimentation and monitoring measures would be especially useful to fishery agencies and better inform future SJRRP flow management.

Preliminary Recommendations In the Event of Significant Changes in Unimpaired Runoff Forecasts

If the snow surveys and updated forecast data indicate an increase in projected precipitation and runoff, and I receive an updated Reclamation Allocation indicating a wetter or drier hydrologic condition than previously predicted, I will update my Interim Flow Program recommendation to reflect the latest Allocation that I receive. In view of the water forecast information available at this early point in the Water Year, conditions have been dry after the January 1, 2013 DWR runoff forecast, and thus are likely to continue to be drier than normal into February. Accordingly, I am including an illustrative Dry year recommendation in the event that the water year becomes drier.

There is also the possibility that the water year forecast will be wetter through the spring if the storm track changes in February and continues to provide for storms through March and early April, and as the runoff forecast transitions from a 90% forecast to a 50% forecast. Accordingly, I am including an illustrative Normal-Wet year recommendation that addresses the prospect of a future Reclamation Allocation that is wetter than the February 1, 2013 Allocation. In the event that precipitation and runoff conditions increase sufficiently to generate even wetter Water Year allocations, I will address those conditions and the resulting Reclamation Allocation as it arises.

Prospective Interim Flow Program Recommendations Based on a Dry Year Allocation

For discussion purposes, I am providing illustrative RA recommendations for a mid-point Dry Water Year scenario with the understanding that at this point, they are only hypothetical and would be subject to revision as specific runoff forecasts become available. The illustrative Dry Water Year scenario assumes a mid-point unimpaired runoff of 800 TAF, for an Allocation of 301 TAF at Friant Dam, or 184.3 TAF at Gravelly Ford (Figure 3, Table 3).

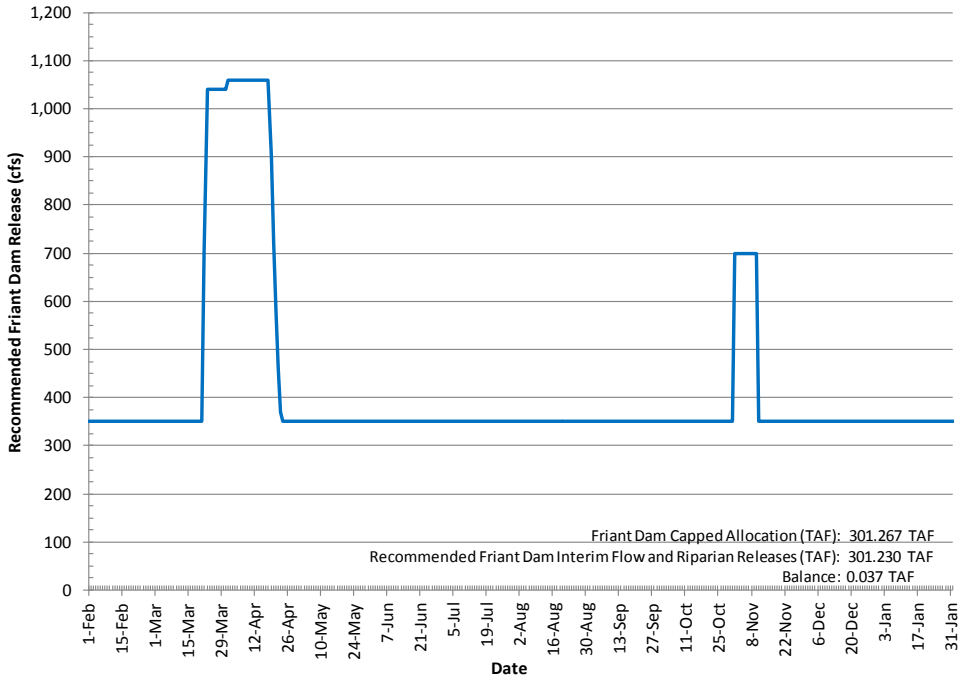

FIGURE 3: Illustrative RA Interim Flow hydrograph for a Mid-Point Dry water year (runoff=800 TAF, Friant Dam Release volume=301.267 TAF, Gravelly Ford Interim Flow Allocation=184.322 TAF).

Begin Date	End Date	Recommended Friant Dam Release (cfs)	Exhibit B Riparian Release (cfs)	Gravelly Ford Flow Target (cfs)	Gravelly Ford Flow Allocation (cfs)	Estimated Flows Entering Mendota Pool (cfs)
3/1/13	3/21/13	350	130	225	220	145
3/22/13	3/22/13	700	130	575	570	475
3/23/13	3/31/13	1,040	130	915	910	806
4/1/13	4/18/13	1,060	150	915	910	806
4/19/13	4/19/13	900	150	755	750	655
4/20/13	4/20/13	720	150	575	570	475
4/21/13	4/21/13	580	150	435	430	335
4/22/13	4/22/13	460	150	315	310	225
4/23/13	4/23/13	370	150	225	220	145
4/24/13	4/30/13	350	150	205	200	125
5/1/13	5/28/13	350	190	165	160	85
5/29/13	6/30/13	350	190	165	160	85
7/1/13	8/31/13	350	230	125	120	45
9/1/13	9/30/13	350	210	145	140	65
10/1/13	10/31/13	350	160	195	190	115
11/1/13	11/10/13	700	130	575	570	475
11/11/13	12/31/13	350	120	235	230	155
1/1/14	2/28/14	350	100	255	250	175
Totals (TAF):		**301.230**	**116.945**	**187.904**	**184.284**	**127.871**

TABLE 3: Illustrative RA Interim Flow Release Schedule for Mid-Point Dry Water Year (runoff=800 TAF).

The approximately 1,000 cfs bench illustrated in the Normal-Dry year hydrograph (Figure 2) would begin on the same day (March 23), but would end on April 18 instead of May 12, resulting in a reduced bench duration of 27 days. The Interim Flows over the Summer Base Flow, Fall-run Attraction Flow, Fall-Run Spawning and Incubation, and Winter Baseflows would remain the same as the Normal-Dry year. All of the Restoration Allocation would be used under the illustrative mid-point Dry Year hydrograph and flow schedule included in this illustration.

Prospective Interim Flow Program Recommendations Based on a Normal-Wet Year Allocation

For discussion purposes, I am also providing illustrative RA recommendations for a mid-point Normal-Wet Water Year scenario in the event that the water year becomes wetter and/or we transition from 90% runoff forecast to a 50% forecast later this spring. Again, this Normal-Wet year illustrative hydrograph is only hypothetical and would be subject to revision as specific runoff forecasts become available. The illustrative Normal-Wet Water Year scenario assumes a mid-point unimpaired runoff of 1,975 TAF, for an Allocation of 369.4 TAF at Friant Dam, or 252.5 TAF at Gravelly Ford (Figure 4, Table 4). The primary changes in the illustrative hydrograph would be: 1) initiating the approximately 1,000 cfs pulse flow earlier, on March 12; and 2) extending end date of the 1,000 cfs pulse to May 24. The duration of the 1,000 cfs bench in the Normal-Dry year hydrograph (Figure 2) would be increased from 51 days to 74 days. The Interim Flows over the Summer Base Flow, Fall-run Attraction Flow, Fall-Run Spawning and Incubation, and Winter Baseflows would remain the same as the Normal-Dry year. All of the Restoration Allocation would be used under the illustrative Mid-Point Dry Year hydrograph and flow schedule included in this illustration.

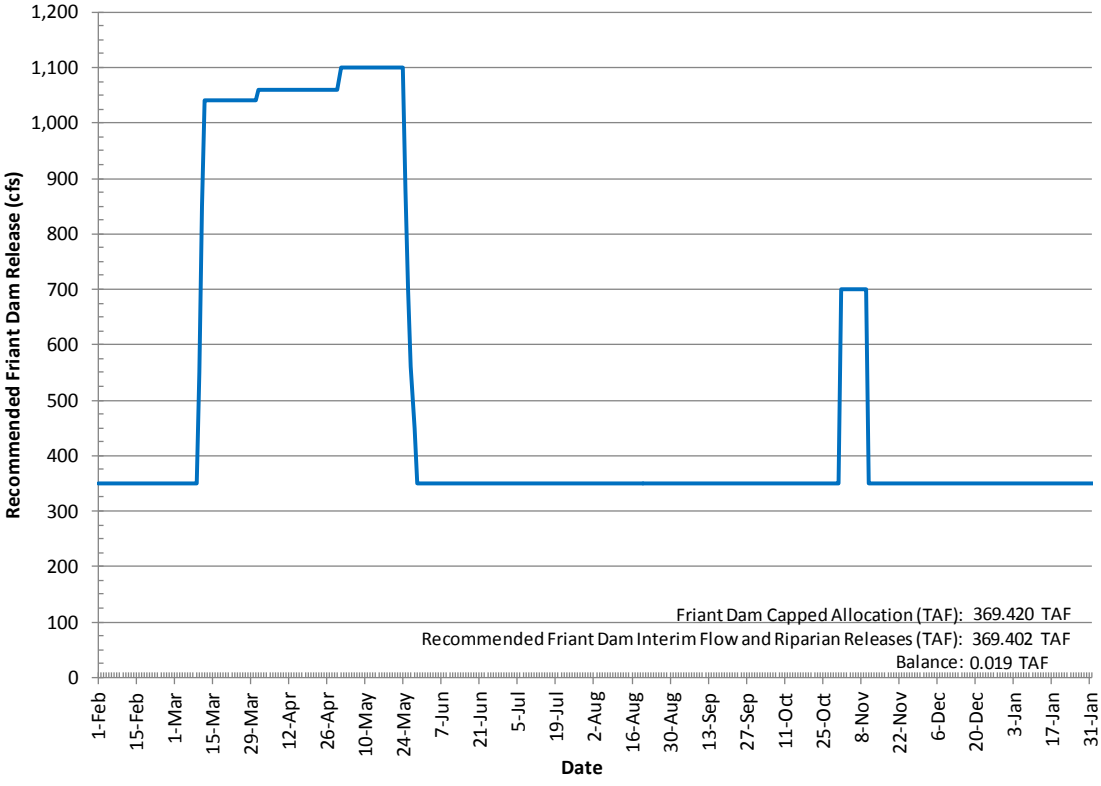

FIGURE 4: Illustrative RA Hydrograph for Mid-Point Normal-Wet Water Year (runoff=1,975 TAF, Friant Dam Release volume=369.4 TAF, Gravelly Ford Interim Flow Allocation=252.5 TAF).

Begin Date	End Date	Recommended Friant Dam Release (cfs)	Exhibit B Riparian Release (cfs)	Gravelly Ford Flow Target (cfs)	Gravelly Ford Flow Allocation (cfs)	Estimated Flows Entering Mendota Pool (cfs)
3/1/13	3/9/13	350	130	225	220	145
3/10/13	3/10/13	550	130	425	420	325
3/11/13	3/11/13	850	130	725	720	625
3/12/13	3/31/13	1,040	130	915	910	806
4/1/13	4/30/13	1,060	150	915	910	806
5/1/13	5/24/13	1,100	190	915	910	806
5/25/13	5/25/13	880	190	695	690	595
5/26/13	5/26/13	700	190	515	510	415
5/27/13	5/27/13	560	190	375	370	285
5/28/13	5/28/13	450	190	265	260	185
5/29/13	6/30/13	350	190	165	160	85
7/1/13	8/31/13	350	230	125	120	45
9/1/13	9/30/13	350	210	145	140	65
10/1/13	10/31/13	350	160	195	190	115
11/1/13	11/10/13	700	130	575	570	475
11/11/13	12/31/13	350	120	235	230	155
1/1/14	2/28/14	350	100	255	250	175
Totals (TAF):		**369.402**	**116.945**	**256.076**	**252.456**	**193.361**

TABLE 4: Illustrative RA Interim Flow Release Schedule for a Mid-Point Normal-Wet Water Year (runoff = 1,975 TAF)