

Smelt Working Group
January 19, 2016

Meeting Summary

The Working Group reviewed current Delta Smelt distribution, salvage data, and Delta conditions. The Working Group considers the proposed current operations to carry a high risk of Delta Smelt continued entrainment and likely to result in salvage.

The Working Group described the risk of entrainment under the Service-provided advice framework. Under this framework the relative risk of entrainment for OMR flow ranges is discussed and assessed. For the current week, the risk of entrainment of delta smelt all the way to the fish facilities for each of the flow ranges is characterized as follows:

- -1250 to -2000 cfs has a low risk of entrainment,
- -2000 to -3500 cfs has a moderate to high risk of entrainment,
- -3500 to -5000 cfs has a high risk of entrainment.

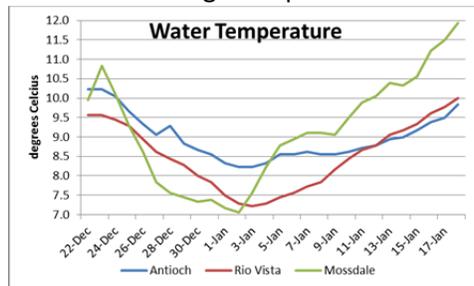
The Working Group indicated that should turbidity extend to the facilities, the risk of entrainment to the facilities would be elevated to *moderate* at -1250 to -2000 cfs, and *high* at -2000 to -3500 cfs. Less negative OMR flows are expected to provide conditions that encourage fish to both remain in the lower San Joaquin River, as well as shorten the length of time that turbidities in the Old River corridor remain high.

The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, January 25, 2016 at 10am.

Reported Data

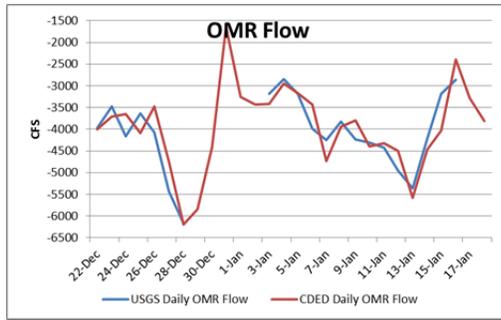
1. Current environmental data
 - a. Temperature

Combined average temperature for January 18 is 10.6°C



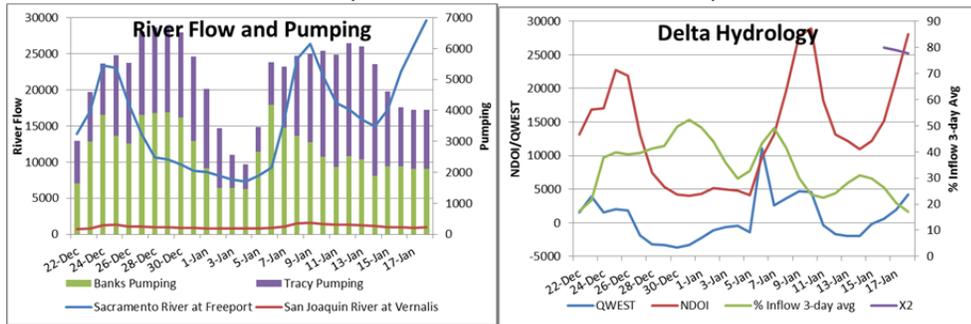
- b. OMR flow

USGS OMR daily average flow on January 16 is -2862. CDEC OMR daily average flow for January 18 is -3809 cfs.

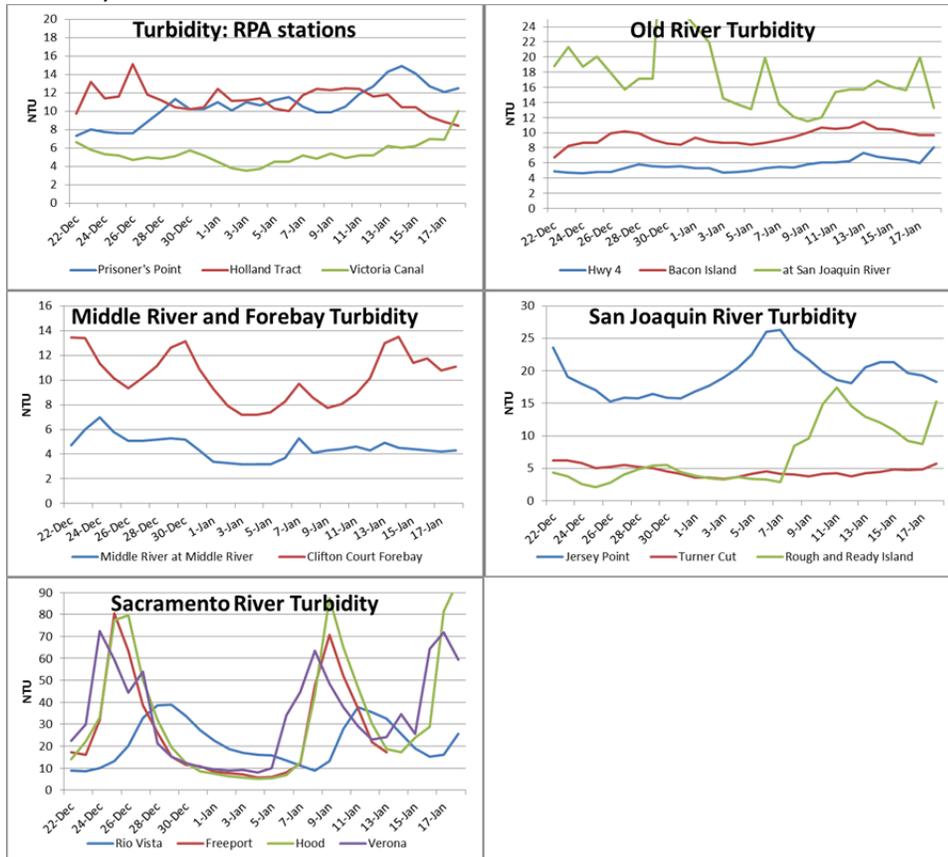


c. River Flows and pumping

Sacramento River at Freeport flow for January 18 was 29,626 cfs. San Joaquin River at Vernalis river flow for January 18 was 971 cfs. Combined exports are 4150 cfs today.



d. Turbidity



DWR boat turbidity transect data from January 15, 2016 were reviewed (see attached).

2. Delta fish monitoring

CDFW has released the 2015 FMWT indices:

The 2015 Delta Smelt annual FMWT index is 7.

The 2015 Longfin Smelt annual FMWT index is 4.

Both indices are the lowest on record (i.e. since 1967).

The 2016 Spring Kodiak Trawl #1 survey was in the field last week. A total of seven Delta Smelt were collected, three females and four males (all prespawn conditions). Sizes ranged from 60 to 74 mm. Fish were caught in the lower Sacramento River and downstream of the confluence. For comparison, survey # 1 catches from SKT 2002-2016 were provided. The January SKT catches are only 1/3 the previous low for a January survey and follow on the very low December catch of two fish, suggesting very low reproductive potential available for the coming spring.

SKT Survey # 1 Catches

Year	Start date	Total Catch	Annual Index
2016	1/11/2016	7	NA
2015	1/12/2015	21	13.8
2014	1/13/2014	148	30.1
2013	1/7/2013	100	20.4
2012	1/17/2012	320	130.2
2011	1/10/2011	177	18.8
2010	1/11/2010	88	27.4
2009	1/12/2009	579	43.8
2008	1/7/2008	132	24.1
2007	1/8/2007	109	32.5
2006	1/17/2006	44	18.2
2005	1/24/2005	220	52.9
2004	1/12/2004	380	99.7
2003	2/18/2003	232	NA
2002	1/7/2002	261	NA

SKT #2 is in the field February 8.

Smelt Larva Survey #1 was in the field the week of January 4. Processing is complete. No Delta Smelt were collected.

The Bay Study last week collected one Delta Smelt.

The Early Warning Survey began November 30.

Early Warning Survey Results, January 12 through 19

Date	Location	Delta Smelt Catch
1/12	Jersey Point	4
1/13	Prisoner's Point	2

1/14	Jersey Point	0
1/15	Prisoner's Point	2
1/16	Prisoner's Point	6
1/17	Prisoner's Point	1
1/18	Jersey Point	9
01/19	No Sample due to conditions	N/A

3. Modeling

No DWR turbidity modeling was requested or will be requested for the time being given the low model accuracy discussed in previous notes.

No Particle Tracking modeling runs were requested or reviewed.

4. Salvage

There has been no salvage of Delta Smelt or Longfin Smelt at either the federal or state Delta pumping facilities during the current water year.

5. Expected Project Operations

Jones pumping plant is pumping 1900 cfs. The daily average intake to Clifton Court (CC) is 2250 cfs. Combined pumping is 4100 cfs. Pumping is targeting an OMR indexed flow of no more negative than -3500 cfs for today and tomorrow.

6. Delta Conditions Team

DCT met on 01/15; data summaries were provided to the SWG for review:

(See attachments: "Delta Turbidity 7-Day Trend Updated 1/15/2016 8:50:09 AM, "DCT Data 1-15-16, entitled Preliminary Data," and "Turbidity, Catch and Salvage 2014-2016.")

7. Assessment of Risk:

WY 2016 adult Delta Smelt incidental take

The WY 2016 adult Delta Smelt incidental take (IT) is 56, as is stated in the Service's December 23, 2015 memo to the Bureau of Reclamation. The method to calculate the IT is described on p 386 of the 2008 BiOp, with the corrections described in both the February 22, 2013, and December 23, 2015 memos. The alternative approach that the Service presented to the 2015 independent review panel at the Long-term Operation Biological Opinions annual science review will be piloted this year.

BiOp Background:

RPA Component 1, Action 2 states, "An action implemented using an adaptive process to tailor protection to changing environmental conditions after Action 1. As in Action 1, the intent is to protect pre-spawning adults from entrainment and, to the extent possible, from adverse hydrodynamic conditions." "The range of net daily OMR flows will be no more negative than -1,250 to -5,000 cfs. Depending on extant conditions specific OMR flows within this range are recommended by the Working Group from the onset of Action 2 through its termination..."

The Service stated in its January 14, 2016 Determination that "...we have moved into Action 2 of Component 1 of the 2008 Biological Opinion..." According to the Biological Opinion, "Action 2 reflects the period when OMR prescriptions for pre-spawning adult delta smelt are still required

to protect parental stock" once "the main pulse of fish migration has occurred and adults are holding more tightly to their selected spawning areas" (p 355).

Discussion:

The Working Group concluded that entrainment risk would remain high at current levels (OMR flows of -3500 or more negative) because recent catches at Jersey Point and Prisoner’s Point indicate fish are moving into areas where they will become vulnerable to entrainment, and turbidity in Old River is higher than 10 NTU from the mouth of Old River to at least the southern end of Bacon Island, as seen in the continuous turbidity transects and from fish survey point estimates. Another storm is forecast to elevate Sacramento River flow at Bend to possibly greater than 60,000 cfs, which is anticipated to increase sediment delivery and distribution in the south Delta, and the current wind event (01/19/2016) is expected to further exacerbate turbidities throughout the Delta. Both of these events are likely to result in widespread turbidity from the lower San Joaquin River, down Old River, and to the pumping facilities. Thus, both current conditions and conditions forecast for later this week will continue to encourage the movement of Delta Smelt into Old River and other locations in the south Delta where turbidity is elevated. The Working Group indicated last week that some Delta Smelt likely have already moved into the interior Delta, including the Old River where turbidity has surpassed around 10 NTU. However, these have not been detected in the SWP and CVP and are significantly less likely to be detected relative to past years due to the extremely low population size of Delta Smelt (e.g., a threefold decline of the January 2016 SKT catch relative to the previous record low in 2015). Because significant entrainment could be occurring in the absence of salvage or the triggering of the 3 day average salvage criterion, new protective criteria based on early warning surveys are required to minimize entrainment risk.

2015 Delta Smelt abundance indices

The four primary 2015 annual abundance indices for all Delta Smelt life stages are the lowest on record.

	2014	2015
SKT	30.1	13.8
20-mm	1.1	0.3
TNS	0.5	0.0
FMWT	9	7

Early Warning Survey as an indicator of upstream movements and entrainment risk

Previously, members of the Working Group stated that elevated catch in the Jersey Point south lane trawl or at Prisoners Point would indicate increased Delta Smelt movement and increased risk of entrainment into interior Delta channels. The Working Group particularly is concerned about these locations since the south lane at Jersey Point is more hydrodynamically linked to tidal flow into these interior Delta channels, and presence of fish at Prisoners Point reinforces the evidence that Delta smelt are moving upriver. Fish in these areas are considered at greater risk of entrainment into Old River than fish distributed downstream or along the Sacramento River. Delta Smelt have been consistently collected at Prisoner’s Point in the past week with six individuals collected on January 16. Given that only two Delta Smelt were collected in the December SKT and only seven in the January SKT, catching six fish only at Prisoner’s Point may be evidence of substantial use of the San Joaquin River by Delta Smelt thus far in WY 2016.

Members agreed that the Early Warning catches suggest Delta Smelt have begun upstream spawning movement. The January SKT #1 indicated low densities of Delta Smelt in the Lower Sacramento River and west of the Confluence and all Delta Smelt were classified as pre-spawning. Conditions conducive to such a mass spawning movement have already started or are likely to occur later this week. Therefore, it is essential that actions are implemented this week to minimize Delta Smelt distribution into the Old River and Middle River prior to spawning. With the detection of a female expressing eggs in the Early Warning Survey over the weekend, the start of spawning season could happen at any time, although spawning season rarely begins prior to February and SKT 1 did not detect any evidence of imminent spawning

Salvage

The Working Group believes that any salvage observed at either facility will be of high concern because Delta Smelt abundance is so low that it is probably contributing to low detection probability of Delta Smelt in salvage under RPA compliant operations even in the fish facilities (BiOp page 338). With the IT of 56 adults, and given the typical expansion rates for salvage operations at the facilities, members are concerned that just a few fish detected in salvage, when expanded, could push the projects close to reaching a concern level for take with two and half months left in the typical adult salvage 'season'. Our concern is for both direct mortality and indirect mortality of the spawning stock, which are 2 of the 3 factors affecting Delta Smelt (BiOp, page 325):

“1) direct mortality associated with entrainment of pre-spawning adult delta smelt by CVP/SWP operations; 2) direct mortality of larval and early juvenile delta smelt associated with entrainment by CVP/SWP operations; and 3) indirect mortality and reduced fitness through reductions to and degradation of Delta habitats by CVP/SWP operations.”

The Working Group indicated the Service should not wait for Delta Smelt to be detected in salvage to reduce their risk of entrainment to the export facilities. The Working Group indicated that abundance levels for 2016 no longer support waiting for increased salvage, as the BiOp is written (refer to salvage triggering criteria in BiOp attachment B, beginning on p 324), given that at such low abundance levels, detection in salvage is unlikely unless a substantial proportion of the existing population has already distributed into areas of high entrainment risk.

Turbidity and Delta Smelt Distribution

The four primary Delta Smelt abundance indices, as well as catches from the December 2015 and January 2016 SKT all indicate that abundance has been at a record low all last year and remains so. As a result, the Working Group expects that salvage and single tow trawl surveys are increasingly unreliable indicators of Delta Smelt distribution. As members of the Working Group have stressed in previous meetings, sporadic, low catch in surveys from record low abundance makes using those survey results for assessing the species' distribution and risk of entrainment very challenging. The Working Group has used turbidity as a proxy for location of Delta Smelt, based on well documented associations of the fish with turbid water, its migration response to turbidity (BiOp pages 146 and 347 and EWS results) and more than two decades of salvage events which have occurred in association with the dispersal of turbidity from the San Joaquin River into the South Delta to the export facilities.

Given the high turbidities (> 10 NTU) that were recorded in the Old River to at least the southern end of Bacon Island, and the relatively small section of channel possessing lower turbidity

separating the 10 NTU turbidity front from the export facilities, members indicated their concern for the high likelihood that high turbidity will continue to move to the export facilities and that these conditions are conducive to a Delta Smelt distribution concurrent with these areas of elevated turbidity. Members indicated their interest in encouraging Delta Smelt to remain in the lower San Joaquin River and to discourage fish from moving upstream into the Old River corridor. The main issue expressed was the desire for spawning to occur downstream of Old River, therefore potentially reducing the risk of entrainment for adults in active pre-spawn movement, and later of hatching larvae and juveniles in the coming weeks/months. Members indicated that should fish spawn in the Old River corridor, management of OMR flow to reduce the risk of entrainment for young of year fish would be exceptionally challenging.

Given these considerations, the Working Group would like to minimize the length of time that elevated turbidities occur in the Old River corridor. Members indicated that turbidities can drop faster in Old River south of Bacon Island than in the central Delta, so taking immediate action during turbidity events can assist in minimizing elevated turbidities within the influence of the pumps.

Turbidity

The DWR Turbidity Transect data from January 15 indicated that elevated turbidity (10-12 NTU) had encroached upstream to at least the south end of Bacon Island in the Old River corridor. There appears to be an area of lower turbidity between Hwy 4 and the export facilities, but the Working Group agreed that at an OMR flow of ~3500 cfs, the higher turbidities likely will continue to encroach to the export facilities. High winds today and additional storms later in the week are anticipated to further increase turbidity levels in the Old River corridor. Given current turbidity levels and the predicted weather systems, the Working Group suspects that turbidity will increase in the central and south Delta. On January 4, the Working Group indicated that should turbidities greater than 10 NTU extend upstream in the Old River past Bacon Island, the Working Group would need to meet again to reassess the risk of entrainment. Existing conditions have met and exceeded this indicators.

Additionally, during the January 4 Working Group meeting, members indicated that the extension of turbid water from the San Joaquin River further upstream into Old and Middle rivers in conjunction with repeated catch at San Joaquin EWS Prisoner's Point and the Jersey Point south lane, would be considered a clear indicators of high risk of entrainment into Old and Middle rivers, and from there, into the SWP and CVP intake facilities. These indicators have been met or exceeded.

Members discussed the different turbidity readings on different days of DWR's Turbidity Transect. Higher turbidities were recorded when the survey was in the field at the peak of the incoming tide, and lower turbidities at the ebb tide, which is expected based on the gauge data viewed at an hourly time-step. Data from the peak of the incoming tide indicated turbidities at 10-12 NTU had encroached in the Old River corridor to the south end of Bacon Island on January 15. Some Working Group members agreed that during migration, Delta Smelt are more likely to be riding the incoming tide to move upstream and then moving to lower velocity waters in an attempt to move upstream. It is possible that some downstream movement for Delta Smelt occurs with the outgoing tide, but members indicated that if Delta Smelt are 'tide-surfing' their Upstream movement in association with flood tide would be much greater than their downstream movement because of both the weaker ebb and their assumed attempt to move

out of the high velocity parts of the channel. Although it remains impossible to model or predict precise movements, the Working Group believes that it is possible the fish that moved into the Old River corridor with the turbidity pulse will remain even as turbidities recede.

Given these considerations, the Working Group would like to minimize the length of time that elevated turbidities occur in the Old River corridor by trying to manage OMR flow during the pulses of turbid water that will accompany this week's storms. Members indicated that turbidities can drop faster in the south end of Old River than in the central Delta, so taking appropriate action now can limit the entrainment that the Group believes has been occurring for the past two weeks.

Comparison to last winter

The first salvage of Delta Smelt last season occurred on January 2, after a period of OMR flows that ranged from around -6000 to -4000 (see SWG notes, 01/05/2015). The start of the salvage season began one to two weeks after increased inflow and turbidity was observed in the Delta. Although some hydrological conditions are presently different from this time last season, higher flows, elevated turbidity, and presence of Delta Smelt at Prisoner's Point suggest the migration "season" has started. Especially given the exceedingly low abundance and sporadic catch in surveys, the Working Group indicated the increased catch at Prisoner's Point over the weekend clearly indicates that fish are currently moving upstream into the south Delta.

OMR Flow

Scheduled OMR flow for the week (-3500 cfs) is anticipated to represent a higher risk of entrainment to fish than last week. The Working Group suspects that some fish may have already been entrained, but have not been detected— either because they have not yet moved that far south or they are too dilute to have much likelihood of being sampled in the salvage counts.

The Working Group indicated that should turbidity extend to the facilities, risk of entrainment would be elevated to moderate at -1250 to -2000, and elevated to high at -2000 to -3500. Some members also indicated a recommendation should be made to the Service that OMR flows should be no more negative than -2000 cfs to provide conditions that encourage fish to not only remain in the lower San Joaquin River, but also that shorten the length of time that turbidities in the Old River corridor remain high.

The above discussion points influenced and contributed to all three flow ranges described below:

Advice Framework OMR Level Risk Ranking and Discussion

- OMR flow of -1250 to -2000 cfs: There is a low risk of entrainment to the facilities under this flow range. This is the most protective range for Delta Smelt.
 - Risk factors: lowest annual indices on record, confirmed Delta Smelt presence in central Delta based upon Jersey Point and Prisoner's Point catch data.
 - Salvage: Zero salvage this water year, geographic influence of the pumps does not extend to central Delta under this flow range
 - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes; low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River)

- Persistence of risk: unlikely to change prior to January 25
- OMR flow of -2000 to -3500 cfs: There is a medium to high risk of entrainment to the facilities under this flow range, given conditions listed below:
 - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in central Delta based upon Jersey Point and Prisoner's Point catches from the Early Warning Survey.
 - Salvage: Zero salvage this water year, influence of pump not likely to extend to the lower San Joaquin River under this OMR flow range.
 - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes, low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River), turbidity trend is expected to increase in the Old River corridor this week. A high risk of entrainment for this flow range is anticipated should elevated turbidities reach the export facilities.
 - Persistence of risk: unlikely to change prior to January 25.
- OMR flow of -3500 to -5000 cfs: There is a high risk of entrainment to the facilities under this flow range.
 - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in Prisoner's Point catch data, elevated turbidity in the San Joaquin River extending into the Old River.
 - Risk factors: lowest annual index on record, confirmed Delta Smelt presence in central Delta based upon Jersey Point and Prisoner's Point catch data.
 - Salvage: Zero salvage this water year, geographic influence of the pumps could extend to the lower San Joaquin River at the more negative end of this flow range, especially affecting the southern bank near Jersey Point.
 - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes; low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River), turbidity trend is expected to increase in the Old River corridor this week.
 - Persistence of risk: expected to continue through at least January 25, as long as expected operations are implemented.

The risk factors considered most pertinent to the above assessment of risk were extremely low population abundance (detailed above), confirmed Delta Smelt presence in the San Joaquin River based upon Early Warning Survey, and the distribution of turbidity greater than 10 NTU into the south Delta.

The Working Group will continue to monitor conditions and smelt distribution and will meet again on Monday, January 25, 2016.

WEEKLY ADVICE FOR THE DEPARTMENT OF FISH AND WILDLIFE FOR LONGFIN SMELT

Advice for week of January 19, 2016:

The Smelt Working Group does not have any advice for Longfin Smelt based on recent information.

No Barker Slough operations advice is warranted at this time (see #5 below).

Basis for advice:

The 2009 State Water Project 2081 for Longfin Smelt states that advice to WOMT and the DFW Director shall be based on:

1. Adult Salvage – total adult (≥ 80 mm) Longfin Smelt salvage (SWP+CVP) for December through February > 5 times the Fall Midwater Trawl Longfin Smelt annual abundance index.
2. Adult abundance, distribution or other information indicates that OMR flow advice is warranted.
3. Larva distribution in the Smelt Larva Survey or the 20-mm Survey finds Longfin Smelt larvae present at 8 of 12 central and south Delta sampling stations in 1 survey (809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919; see Figure 1).
4. Larva catch per tow exceeds 15 Longfin Smelt larvae or juveniles in 4 or more of the 12 survey stations listed.
5. During the period January 15 through March 31 of a dry or critically dry water year only, advice for Barker Slough pumping plant operations may be warranted if larval Longfin Smelt are detected at station 716 and other information indicates risk of entrainment.

Discussion of Criteria

1. As of January 18, 2016, no Longfin Smelt has been salvaged for the water year. The **Longfin Smelt adult salvage threshold for advice is 20** based on a Fall Midwater Trawl abundance index of 4 for 2015 (see criterion in #1 above). No advice is warranted based on this criterion.
2. January Bay Study sampling detected no Longfin Smelt in the lower San Joaquin or Sacramento rivers. December Bay Study sampling collected no Longfin Smelt in the San Joaquin River. The December Fall Midwater Trawl sampled the region and did not detect Longfin Smelt in the San Joaquin River or the south Delta. Distribution information does not indicate advice is warranted based on this criterion.
- 3 & 4. The first Smelt Larva Survey (SLS) of 2016 was completed during the week of January 4th and sample processing is complete. Longfin Smelt larvae were detected in low numbers at 3 of 12 criteria stations (Table 1, Figure 1). Neither the distribution (Basis for advice #3) nor the catch density (Basis for advice #4) criterion was achieved.
5. The January 1 water supply index forecast at 90 percent exceedance remains within the “critical” range of water year types, and triggers review of larva distribution and Barker Slough

operations. No larvae were detected at station 716. Four larvae were caught at 723 in the vicinity (Table 1, Figure 1). Barker Slough exports remained below 30 cfs since January 1. These results were not sufficient to warrant advice for Barker Slough operations.

Current conditions: The Sacramento River flow is on the rise at 29,913 cfs on January 18. The San Joaquin at Vernalis is flowing at 978 cfs, a decline from recent flows >1,000 cfs January 7 through 15. X2 has been <81 in the past three days. Qwest turned positive on January 16 and became increasingly positive to 4,258 on January 18. On January 15, combined State and federal exports reached about 4,100 cfs targeting an OMR of -3,500 cfs. Barker Slough exports have been ≤ 20 cfs for the past two weeks and < 30 cfs since January 1, 2016.

Bay Study detected no Longfin Smelt within the Delta and Suisun Bay during January sampling. For the week of January 3 through January 9, no additional Longfin Smelt were collected by the Chipps Island Trawl. Only three Longfin Smelt have been reported to date by Chipps Island Trawl sampling: two adults on December 18 and the third adult on December 23. For comparison, by this date in water year 2015, the Chipps Island Trawl achieved 50% (over 50 fish) of its catch of yearling and adult Longfin Smelt for the season. Thus, we reached the mid-point in adult migration for spawning and only 3 adult Longfin Smelt have been detected. In December, a few Longfin Smelt were collected by the Fall Midwater Trawl, one each in Carquinez Strait, Grizzly Bay and just upstream of Chipps Island. These were the first and only collections of Longfin Smelt by the Fall Midwater Trawl this year. Also in December, a single Longfin Smelt was collected by the Bay Study in Carquinez Strait. No Longfin Smelt was collected in the San Joaquin River or south Delta by either survey in December.

The Smelt Larva Survey #1 caught 47 larvae, based on complete processing of all samples (Table 1). Larvae were detected at three stations in the central and south Delta but did not achieve either trigger criterion (Table 1, Criteria 3 & 4 above). No larvae were detected at station 716, the criterion station for potential advice on Barker Slough operations during dry and critical water-year types.

No Longfin Smelt has been salvaged this water year.

Summary of Risk: Risk of entrainment is very low due to a substantially positive Qwest and the few larvae detected in the lower San Joaquin River and south Delta by the Smelt Larva Survey (Table 1). Increased hatching is expected in upcoming weeks, but we currently have no information indicating much or any spawning in the central or south Delta.

Current Qwest flows are positive and favorable for downstream transport away from the export pumps. Exports will target -3,500 cfs OMR in the absence of a more protective action by the USFWS to protect Delta Smelt.

The Barker Slough distribution trigger, that is larvae present at Smelt Larva Survey station 716, was not achieved, though larvae were detected in the vicinity at station 723 (see Table 1, Figure 1). Nonetheless, Barker Slough exports have been low (<30 cfs) throughout the month of January, so risk of entrainment remains very low.

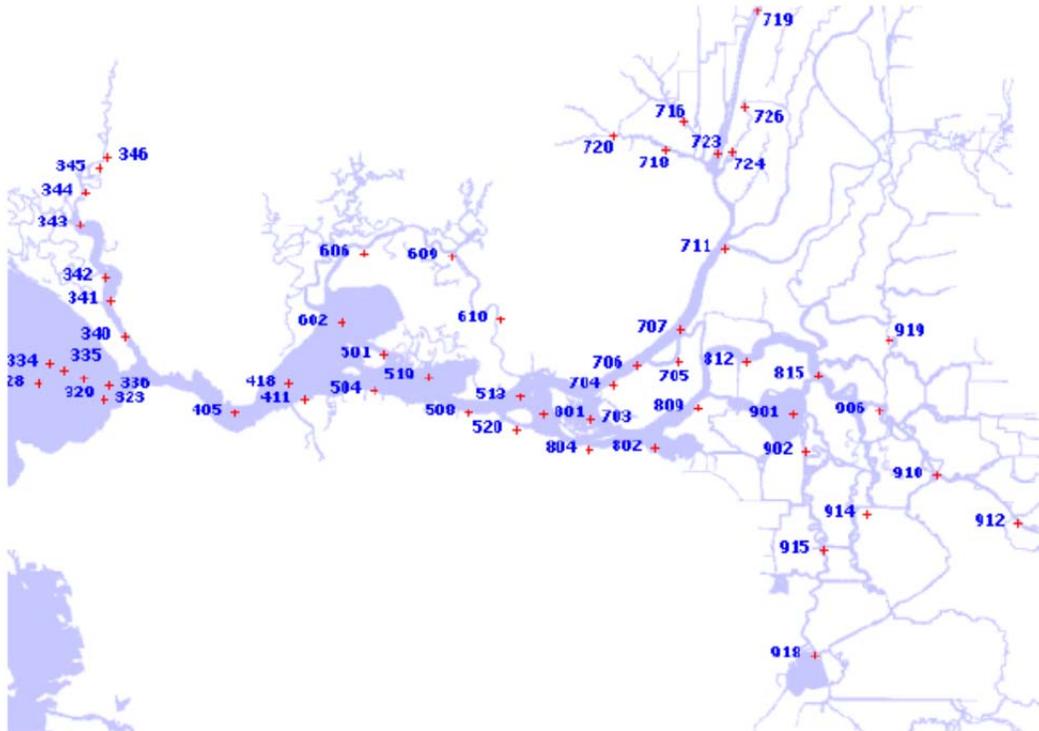
Table 1. Longfin Smelt catch by station in the Smelt Larva Survey 1. Sample processing is complete.

Study Year	Survey #	SLS Station	Sample Status	Species	Smelt Catch
2016	1	340	Processed		No Smelt Catch
2016	1	342	Processed		No Smelt Catch
2016	1	343	Processed		No Smelt Catch
2016	1	344	Processed		No Smelt Catch
2016	1	345	Processed		No Smelt Catch
2016	1	346	Processed		No Smelt Catch
2016	1	347	Processed		No Smelt Catch
2016	1	348	Processed		No Smelt Catch
2016	1	349	Processed		No Smelt Catch
2016	1	405	Processed		No Smelt Catch
2016	1	411	Processed		No Smelt Catch
2016	1	418	Processed		No Smelt Catch
2016	1	501	Processed		No Smelt Catch
2016	1	504	Processed	Longfin Smelt	1
2016	1	508	Processed		No Smelt Catch
2016	1	513	Processed	Longfin Smelt	1
2016	1	519	Processed		No Smelt Catch
2016	1	520	Processed	Longfin Smelt	3
2016	1	602	Processed	Longfin Smelt	1
2016	1	606	Processed	Longfin Smelt	1
2016	1	609	Processed	Longfin Smelt	1
2016	1	610	Processed	Longfin Smelt	1
2016	1	703	Processed	Longfin Smelt	1
2016	1	704	Processed	Longfin Smelt	3
2016	1	705	Processed	Longfin Smelt	1
2016	1	706	Processed	Longfin Smelt	11
2016	1	707	Processed		No Smelt Catch
2016	1	711	Processed	Longfin Smelt	2
2016	1	716	Processed		No Smelt Catch
2016	1	723	Processed	Longfin Smelt	4
2016	1	801	Processed	Longfin Smelt	1
2016	1	804	Processed		No Smelt Catch
2016	1	809	Processed	Longfin Smelt	9
2016	1	812	Processed	Longfin Smelt	3
2016	1	815	Processed		No Smelt Catch
2016	1	901	Processed	Longfin Smelt	3
2016	1	902	Processed		No Smelt Catch
2016	1	906	Processed		No Smelt Catch
2016	1	910	Processed		No Smelt Catch
2016	1	912	Processed		No Smelt Catch
2016	1	914	Processed		No Smelt Catch
2016	1	915	Processed		No Smelt Catch
2016	1	918	Processed		No Smelt Catch
2016	1	919	Processed		No Smelt Catch

SWP ITP Criteria Stations

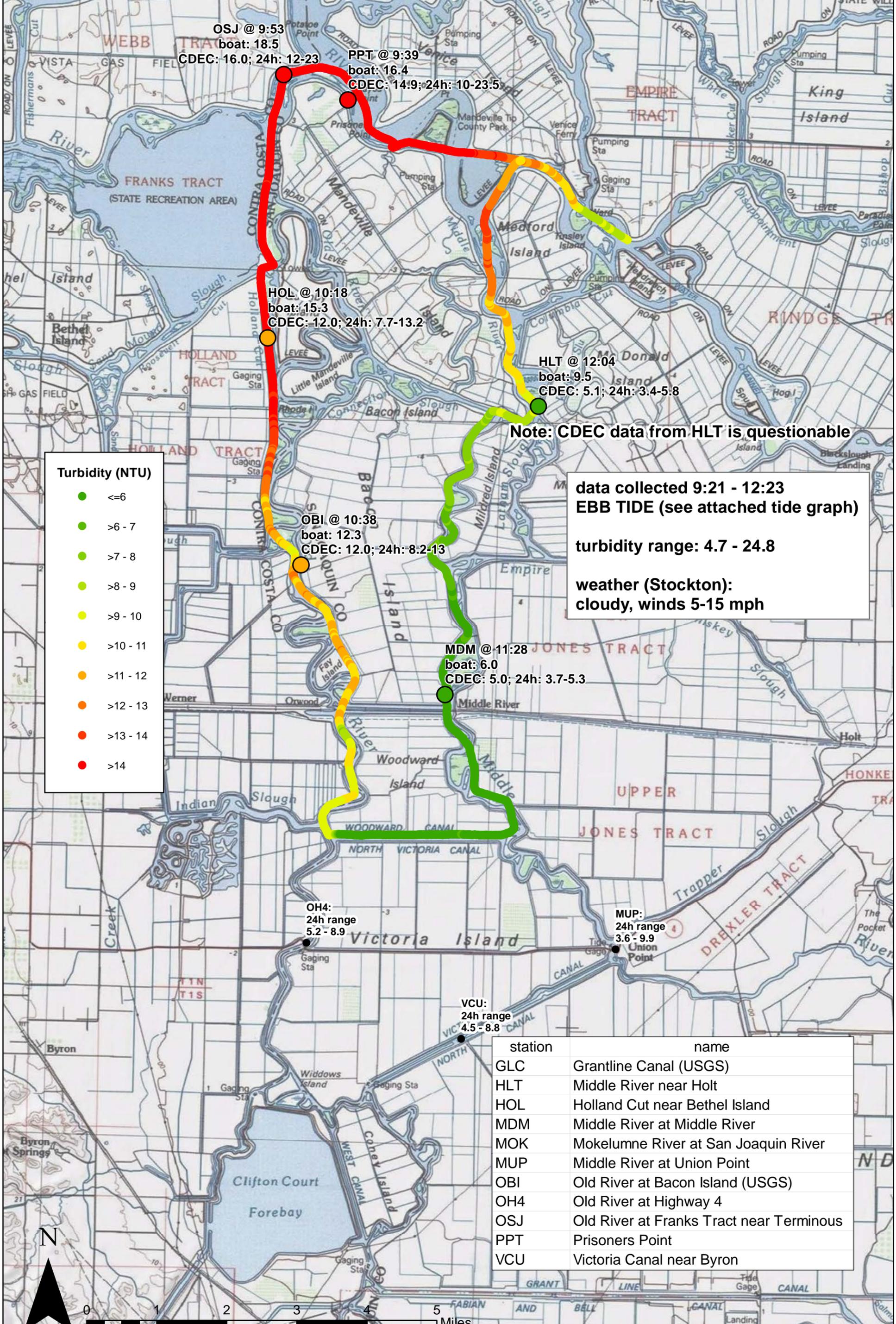
Processing is complete through 1/15/16.

Figure 1. DFW's Smelt Larva Survey/20-mm Survey station locations.



Old and Middle River turbidity, Jan. 15, 2016

NOTE: Data have not undergone initial quality assurance and quality control procedures.



OSJ @ 9:53
boat: 18.5
CDEC: 16.0; 24h: 12-23

PPT @ 9:39
boat: 16.4
CDEC: 14.9; 24h: 10-23.5

HOL @ 10:18
boat: 15.3
CDEC: 12.0; 24h: 7.7-13.2

HLT @ 12:04
boat: 9.5
CDEC: 5.1; 24h: 3.4-5.8

OBI @ 10:38
boat: 12.3
CDEC: 12.0; 24h: 8.2-13

MDM @ 11:28
boat: 6.0
CDEC: 5.0; 24h: 3.7-5.3

OH4:
24h range
5.2 - 8.9

MUP:
24h range
3.6 - 9.9

VCU:
24h range
4.5 - 8.8

Note: CDEC data from HLT is questionable

data collected 9:21 - 12:23
EBB TIDE (see attached tide graph)

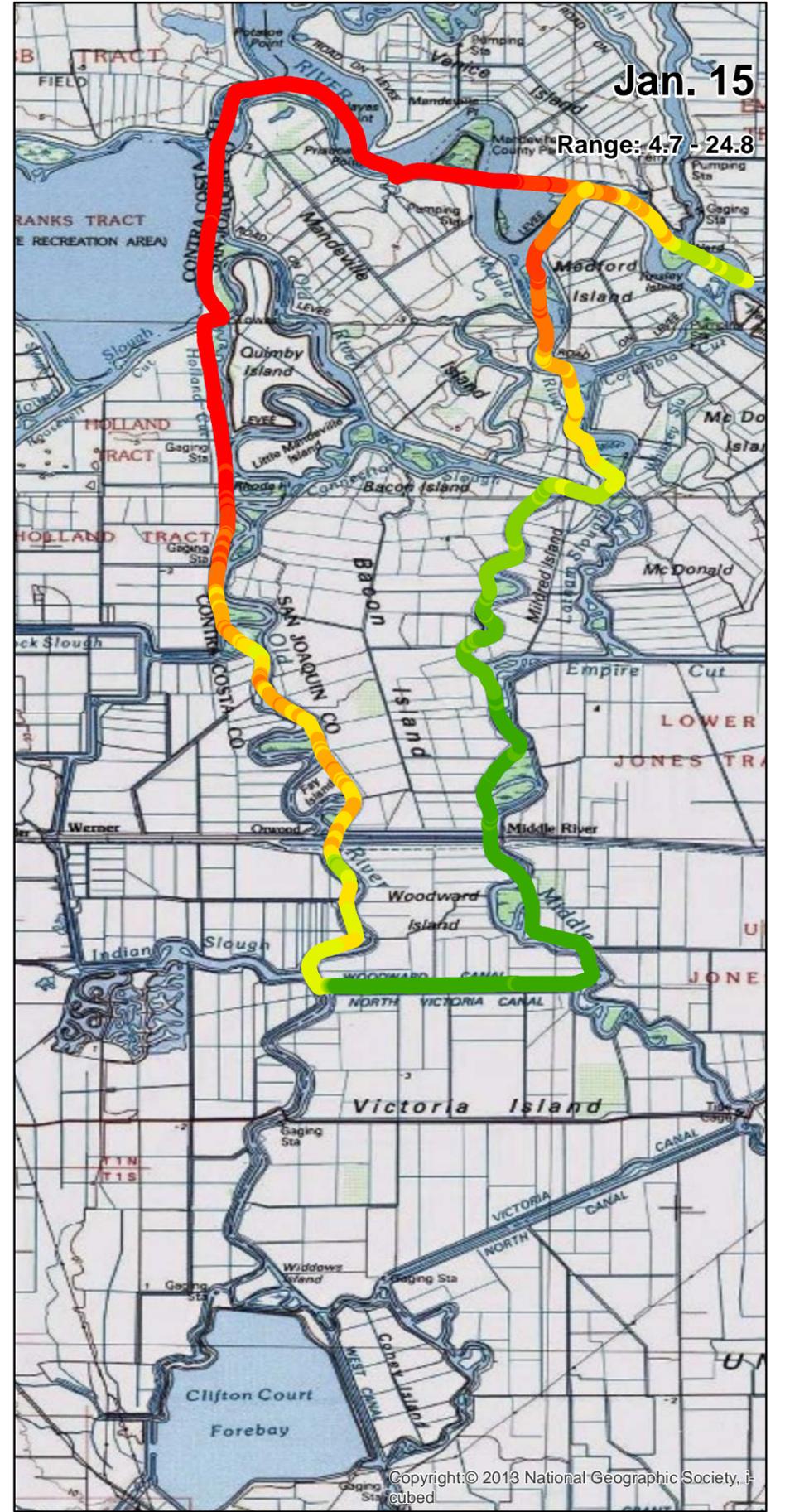
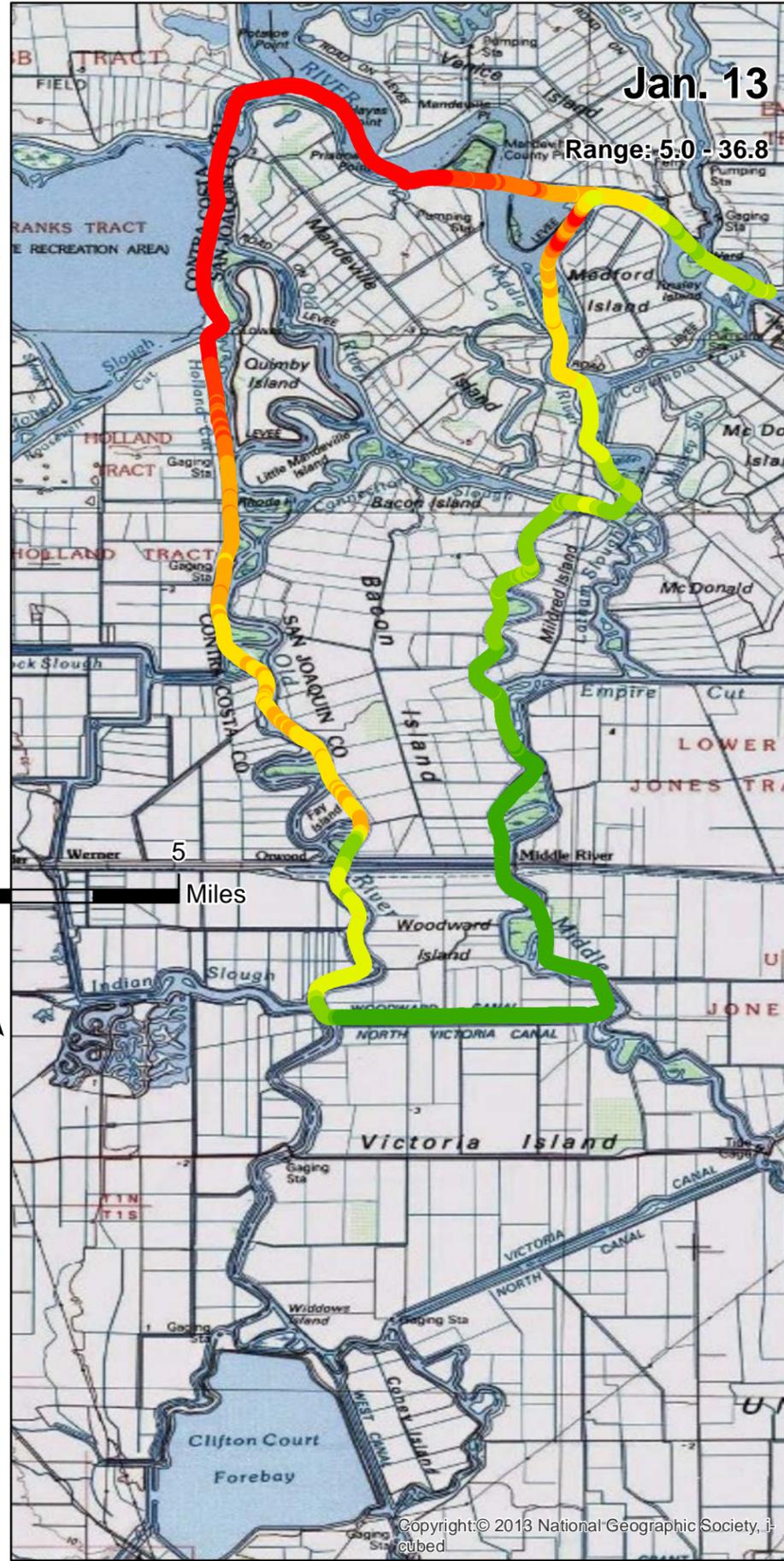
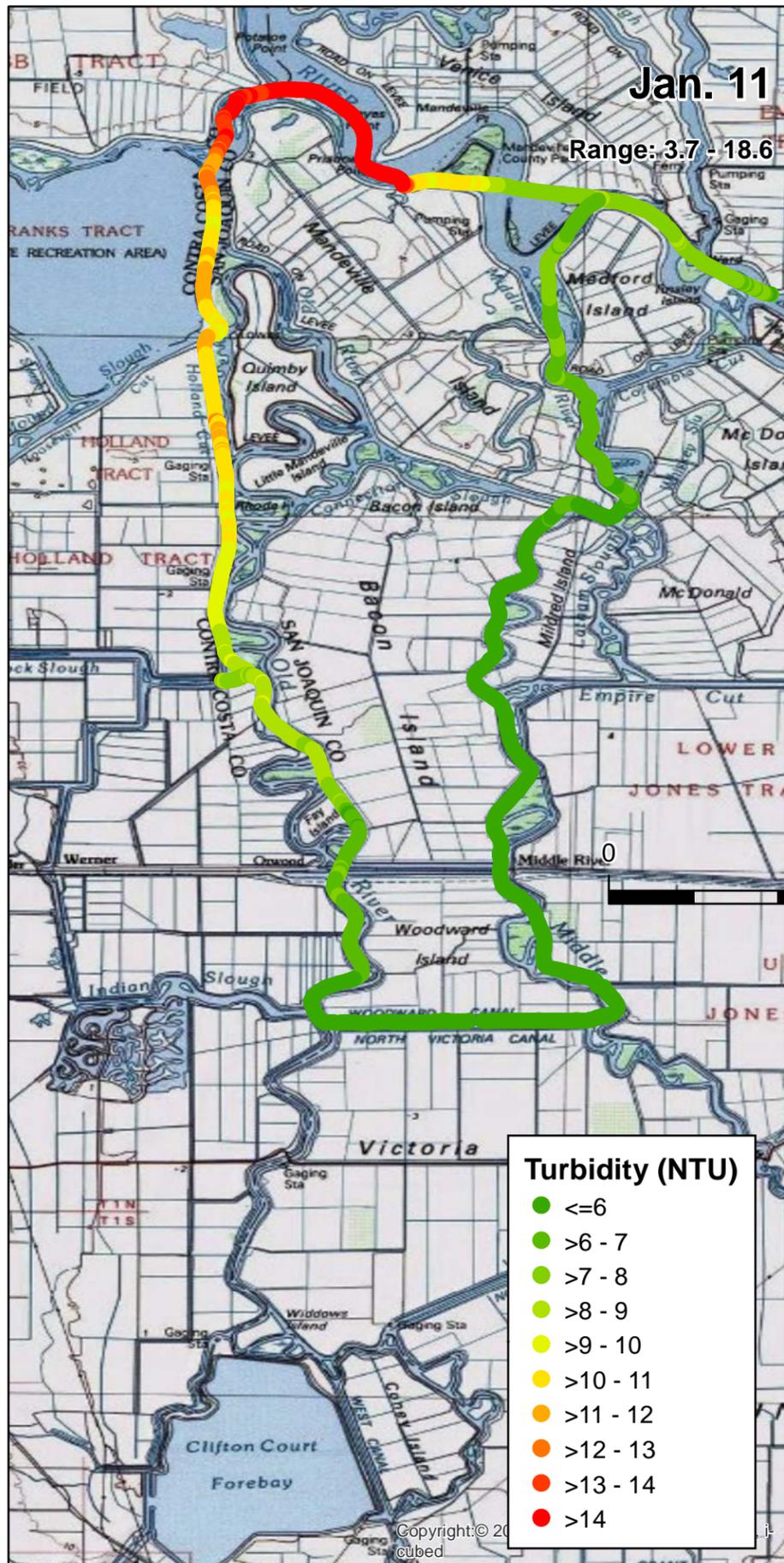
turbidity range: 4.7 - 24.8

weather (Stockton):
cloudy, winds 5-15 mph

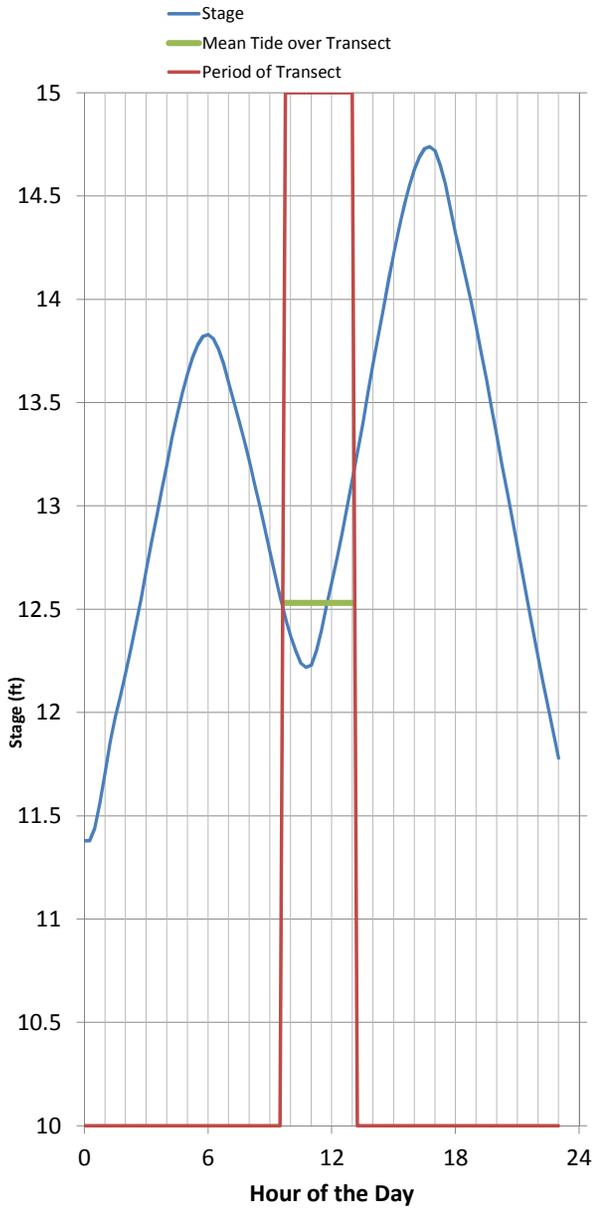


station	name
GLC	Grantline Canal (USGS)
HLT	Middle River near Holt
HOL	Holland Cut near Bethel Island
MDM	Middle River at Middle River
MOK	Mokelumne River at San Joaquin River
MUP	Middle River at Union Point
OBI	Old River at Bacon Island (USGS)
OH4	Old River at Highway 4
OSJ	Old River at Franks Tract near Terminous
PPT	Prisoners Point
VCU	Victoria Canal near Byron

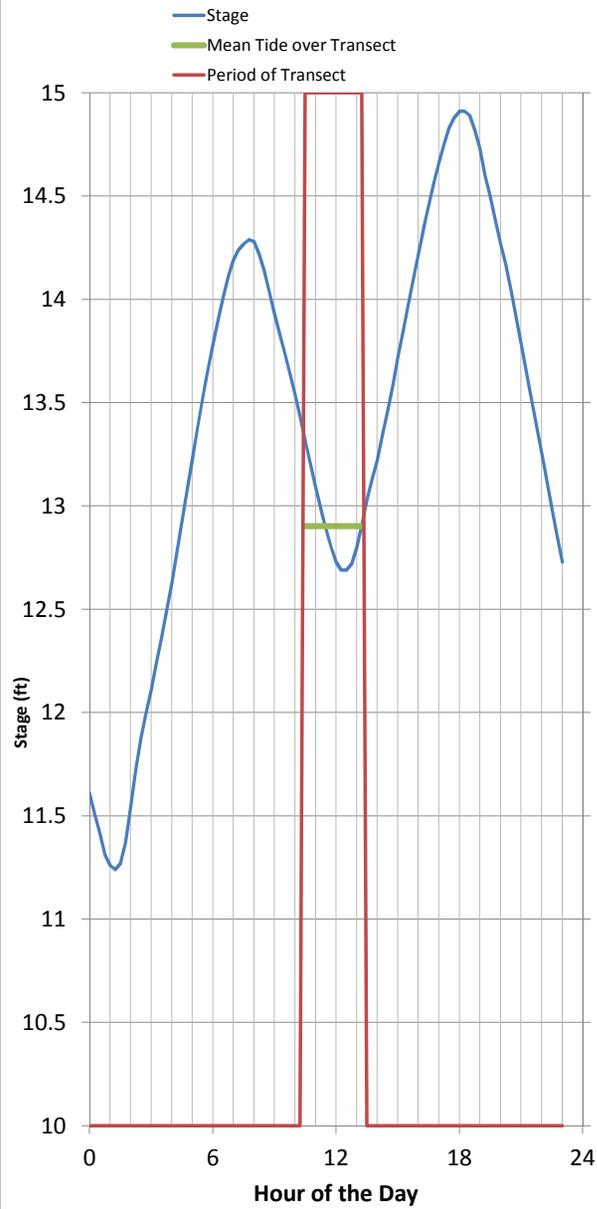




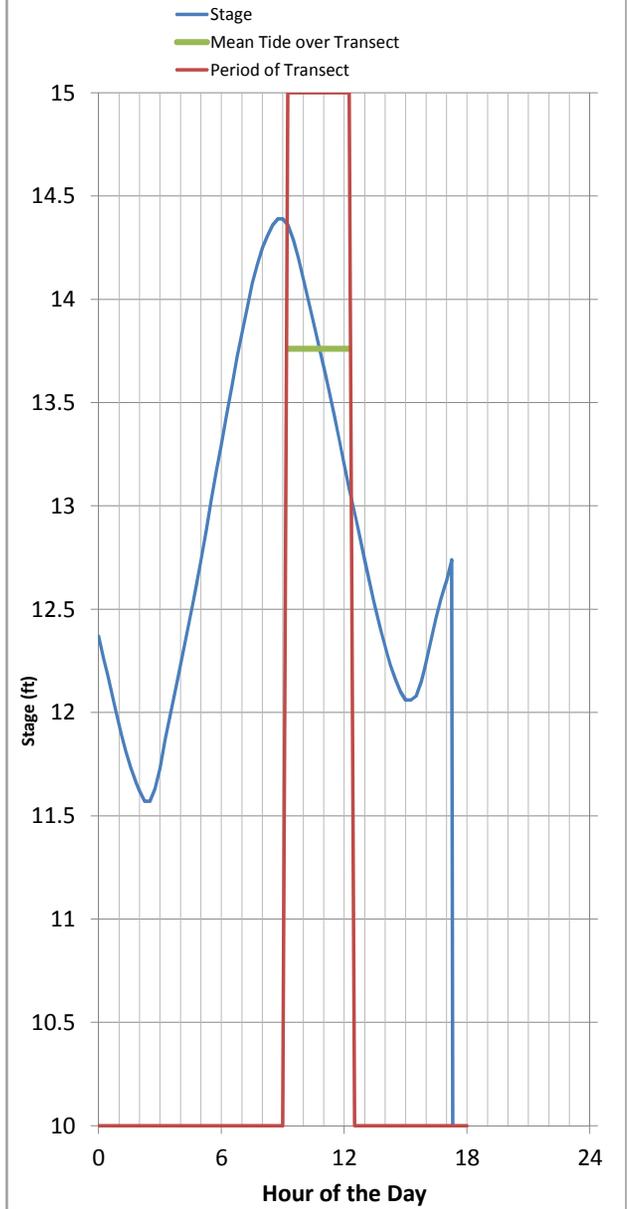
Turbidity Transect on 1/11/2016



Turbidity Transect on 1/13/2016



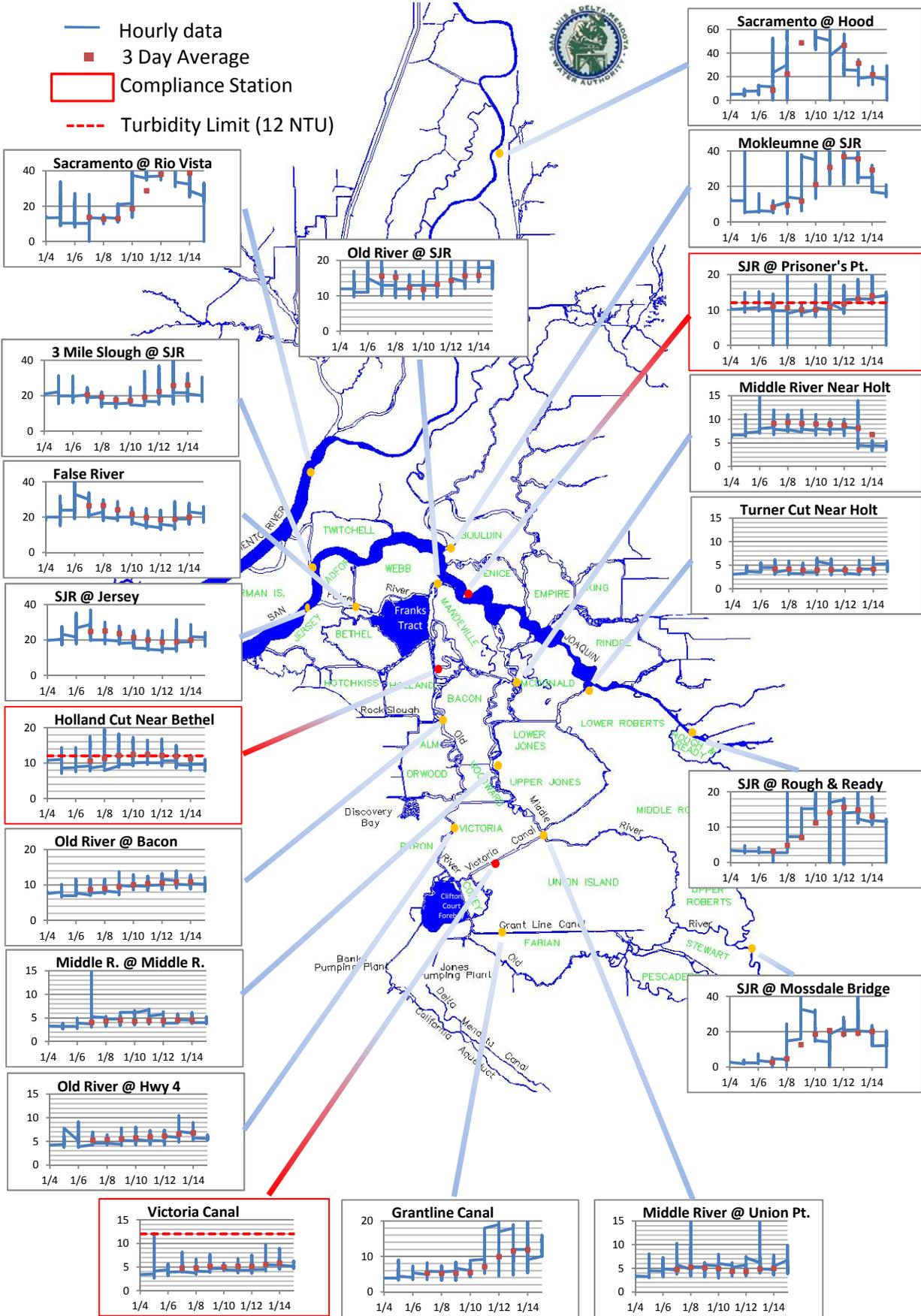
Turbidity Transect on 1/15/2016



Delta Turbidity 7-Day Trend
 Updated 1/15/2016 8:50:09 AM



- Hourly data
- 3 Day Average
- Compliance Station
- - - Turbidity Limit (12 NTU)



PRELIMINARY DATA
SUBJECT TO REVISION WITHOUT NOTICE

EXECUTIVE OPERATIONS SUMMARY ON 1/14/2016

This summary can also be found at:

<http://www.water.ca.gov/swp/operationscontrol/docs/delta/deltaops.pdf>

SCHEDULED EXPORTS FOR TODAY

Clifton Court Inflow	=	2,200 cfs
Jones Pumping Plant	=	3,600 cfs

State Water Project Informational Data can be found at:

<http://www.water.ca.gov/swp/operationscontrol/projectwide.cfm>

ESTIMATED DELTA HYDROLOGY

Total Delta Inflow	~	17,778 cfs
Sacramento River	=	15,988 cfs
San Joaquin River	=	1,216 cfs

Data for previous 30-days is available at:

<http://www.water.ca.gov/swp/operationscontrol/docs/delta/DeltaWQ.pdf>

DELTA OPERATIONS

Delta Conditions	=	Excess
Delta x-channel Gates (% of day is open)	=	0%
Outflow Index	~	10,900 cfs
% Inflow Diverted	=	37.1% (14-day avg)
X2 Position	>	81 km
Controlling Factor(s)	=	OMR

RESERVOIR STORAGES (AS OF MIDNIGHT)

Shasta Reservoir	=	1,537 TAF
Folsom Reservoir	=	272 TAF
Oroville Reservoir	=	1,065 TAF
San Luis Res. Total	=	549 TAF
SWP Share	=	447 TAF

Reservoir data and reports are available at:

<http://cdec.water.ca.gov/reservoir.html>

Reservoir Releases

Keswick	=	3,250 cfs
Nimbus	=	500 cfs
Oroville	=	950 cfs

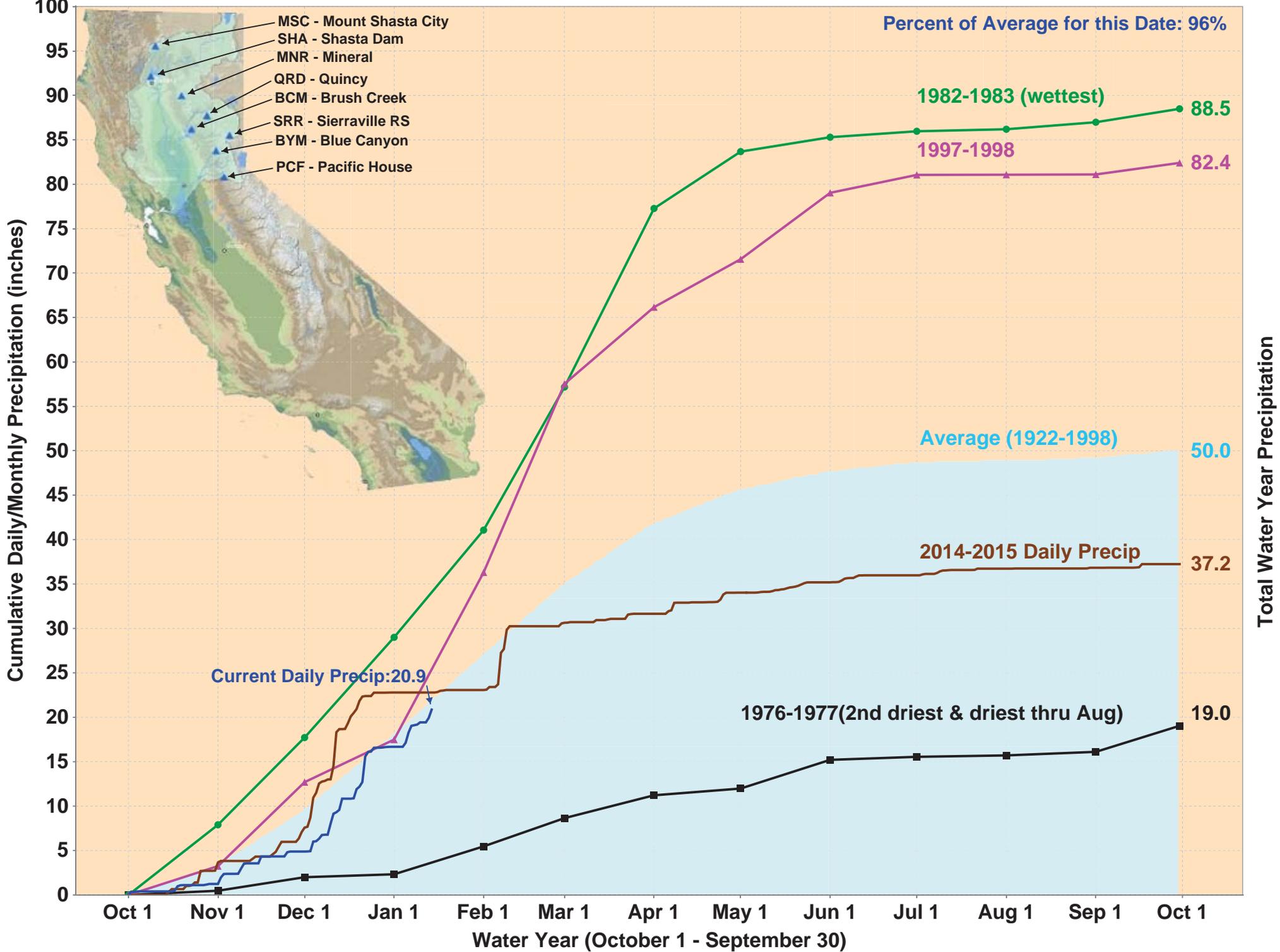
Provisional Old River & Middle River Flows (as of 1/13/2016)

Based on USGS stations 11312676 & 11313405 via CDEC available at:

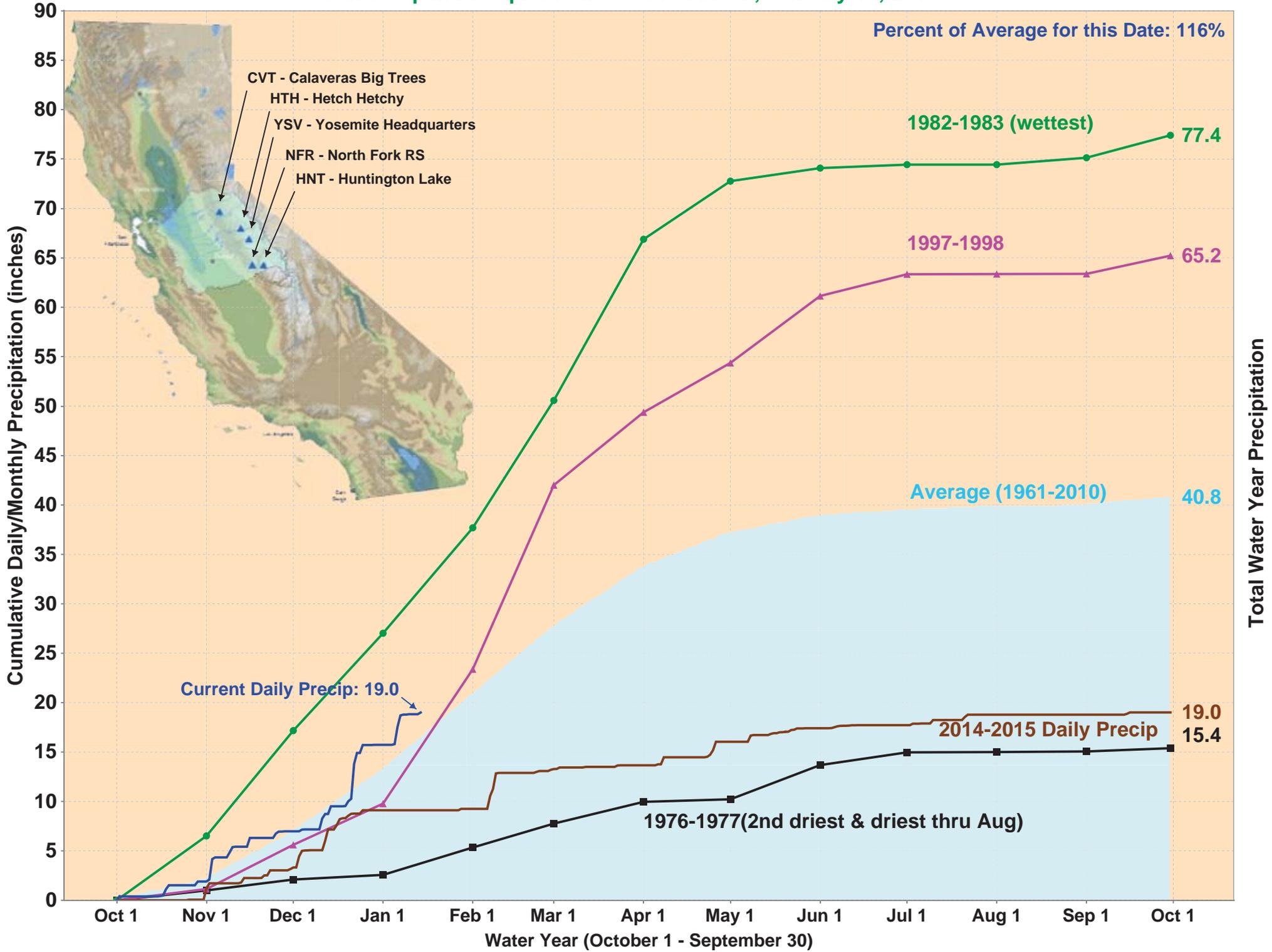
http://www.usbr.gov/mp/cvo/vungvari/OMR_Jan2016.pdf

If you have any questions regarding the preliminary data in this report, please contact OCO_Export_Management@water.ca.gov

North Sierra Precipitation: 8-Station Index, January 14, 2016



San Joaquin Precipitation: 5-Station Index, January 14, 2016

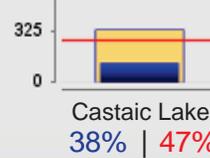
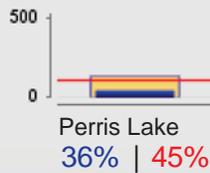
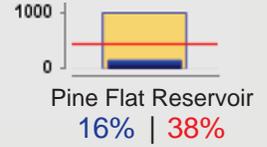
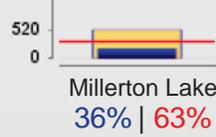
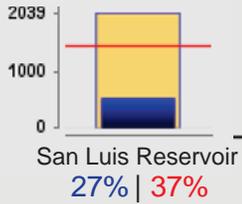
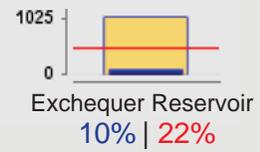
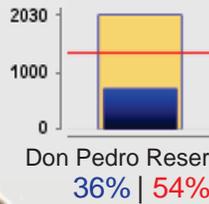
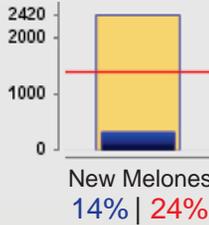
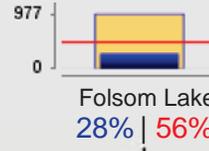
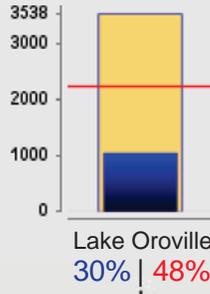
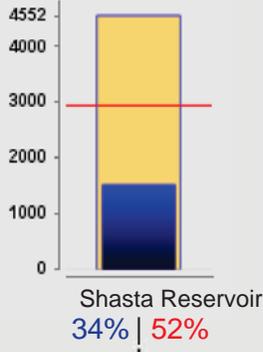
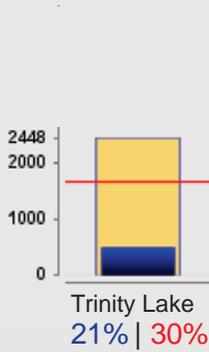
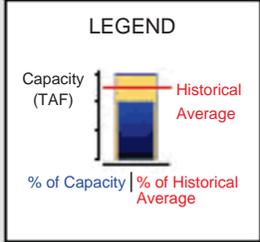




Reservoir Conditions

Ending At Midnight - January 13, 2016

CURRENT RESERVOIR CONDITIONS



Turbidity Forecast 1/12/2016

General Information

The attached model run results cover the period of January 12, through February 1, and are based on the following assumptions:

Common Assumptions

1. CCFB Gates are operating to Priority 3 throughout the forecast period.
2. The Delta Cross Channel gates will be closed throughout the forecast period.
3. Suisun Marsh salinity control flashboards are in, and the three Suisun Marsh Salinity Control Gates are in tidal operation.

INPUT FLOW DATA (-3500 cfs OMR)

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood-bridge pr.day	New Hogan pr.day		
12-Jan-16	18,294	42	170	0	1,368	197	110	16	2,294	3,637
13-Jan-16	17,465	31	170	0	1,294	171	109	10	2,398	3,647
14-Jan-16	15,988	112	170	0	1,216	165	114	13	2,200	3,600
15-Jan-16	15,049	30	170	0	1,040	560	100	10	1,600	2,500
16-Jan-16	19,864	110	170	0	890	720	100	10	2,100	2,000
17-Jan-16	23,065	140	170	0	790	850	100	10	2,100	2,000
18-Jan-16	24,268	180	170	0	760	1,220	100	10	2,100	2,000
19-Jan-16	22,450	870	170	0	800	1,110	100	10	2,100	2,000
20-Jan-16	20,450	100	170	0	800	600	100	10	2,100	2,000
21-Jan-16	18,450	100	170	0	800	400	100	10	2,100	2,000
22-Jan-16	16,450	100	170	0	800	150	100	10	2,100	2,000
23-Jan-16	14,450	100	170	0	800	150	100	10	2,100	2,000
24-Jan-16	12,450	100	170	0	800	150	100	10	2,100	2,000
25-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
26-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
27-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
28-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
29-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
30-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
31-Jan-16	10,450	100	170	0	800	150	100	10	2,100	2,000
01-Feb-16	10,450	100	170	0	800	150	100	10	2,100	2,000

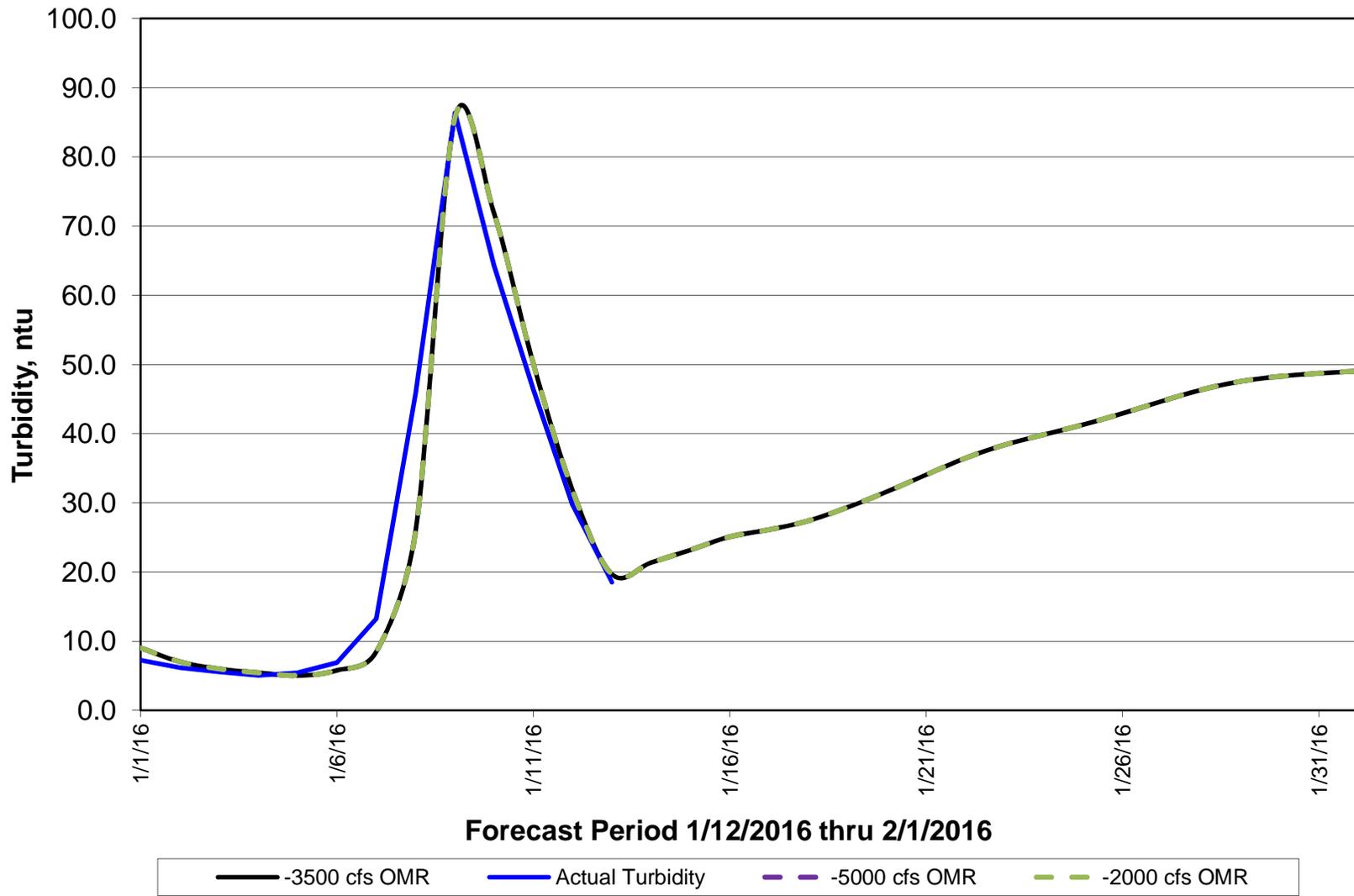
INPUT FLOW DATA (-5000 cfs OMR)

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood-bridge pr.day	New Hogan pr.day		
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14-Jan-16	15,988	112	170	0	1,216	165	114	13	2,200	3,600
15-Jan-16	15,049	30	170	0	1,040	560	100	10	1,600	2,500
16-Jan-16	19,860	110	170	0	890	720	100	10	2,100	2,000
17-Jan-16	23,065	140	170	0	790	850	100	10	2,100	2,000
18-Jan-16	24,268	180	170	0	760	1,220	100	10	2,100	2,000
19-Jan-16	22,450	870	170	0	800	1,110	100	10	2,300	3,500
20-Jan-16	20,450	100	170	0	800	600	100	10	2,300	3,500
21-Jan-16	18,450	100	170	0	800	400	100	10	2,300	3,500
22-Jan-16	16,450	100	170	0	800	150	100	10	2,300	3,500
23-Jan-16	14,450	100	170	0	800	150	100	10	2,300	3,500
24-Jan-16	12,450	100	170	0	800	150	100	10	2,300	3,500
25-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
26-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
27-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
28-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
29-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
30-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
31-Jan-16	10,450	100	170	0	800	150	100	10	2,300	3,500
01-Feb-16	10,450	100	170	0	800	150	100	10	2,300	3,500

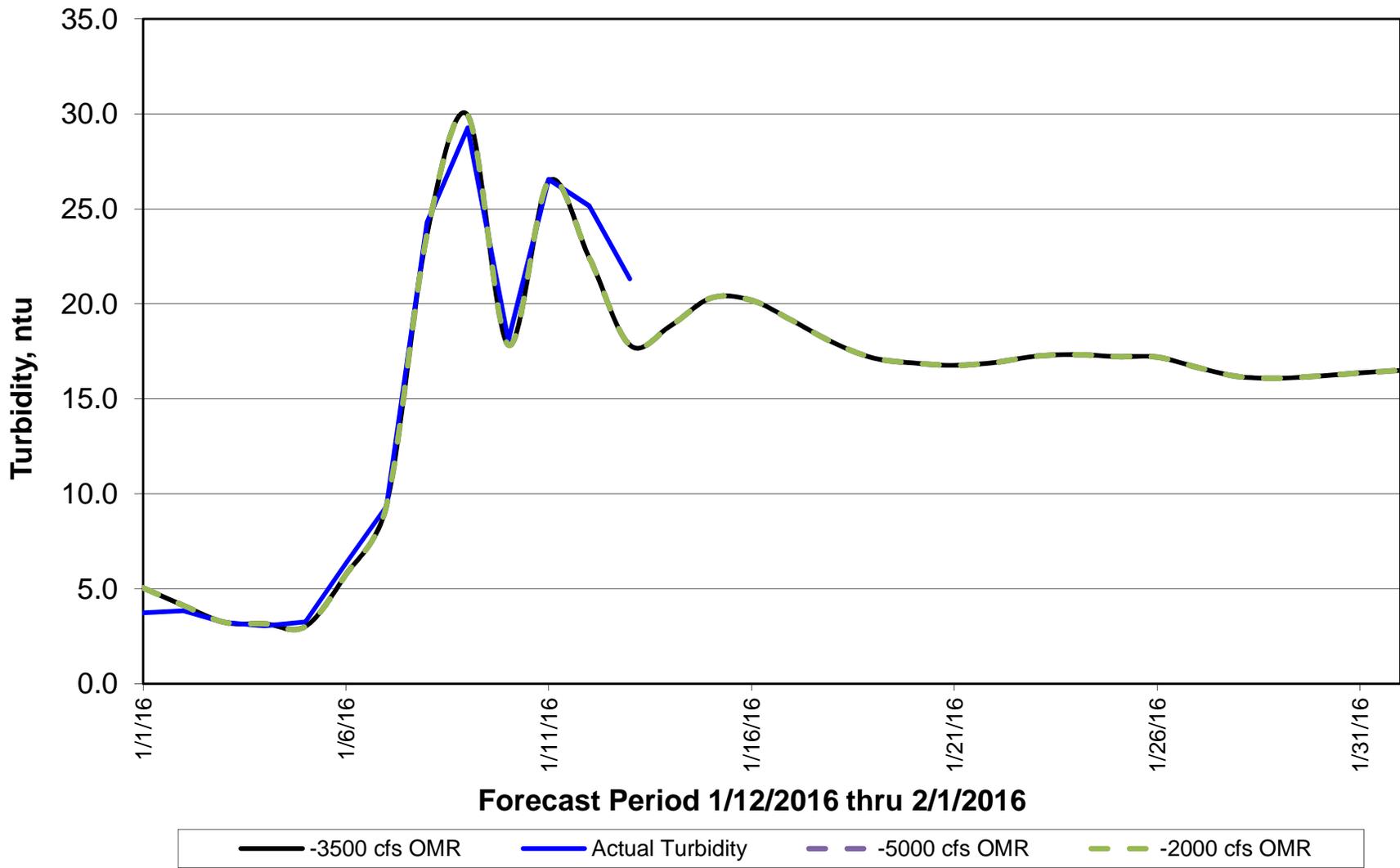
INPUT FLOW DATA (-2000 cfs OMR)

Date	Delta Inflows [cfs]								Delta Exports [cfs]	
	Sacram. River	Yolo bypass	Sacto Treat. rel.	DXC Gate ops	San Joaquin River	Cosum River	Mokel. River	Calaver River	Clifton Court intake	Jones pump
	Freeport prev.day FPT	Cache &weirs pr.day	estim. week avg pr.day	% of day open current day	Vernalis prior day VNS	Michigan Bar pr. Day	Wood-bridge pr.day	New Hogan pr.day		
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15-Jan-16	15,049	30	170	0	1,040	560	100	10	1,600	2,500
16-Jan-16	19,860	110	170	0	890	720	100	10	2,100	2,000
17-Jan-16	23,065	140	170	0	790	850	100	10	2,100	2,000
18-Jan-16	24,268	180	170	0	760	1,220	100	10	2,100	2,000
19-Jan-16	22,450	870	170	0	800	1,110	100	10	1,200	1,300
20-Jan-16	20,450	100	170	0	800	600	100	10	1,200	1,300
21-Jan-16	18,450	100	170	0	800	400	100	10	1,200	1,300
22-Jan-16	16,450	100	170	0	800	150	100	10	1,200	1,300
23-Jan-16	14,450	100	170	0	800	150	100	10	1,200	1,300
24-Jan-16	12,450	100	170	0	800	150	100	10	1,200	1,300
25-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
26-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
27-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
28-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
29-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
30-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
31-Jan-16	10,450	100	170	0	800	150	100	10	1,200	1,300
01-Feb-16	10,450	100	170	0	800	150	100	10	1,200	1,300

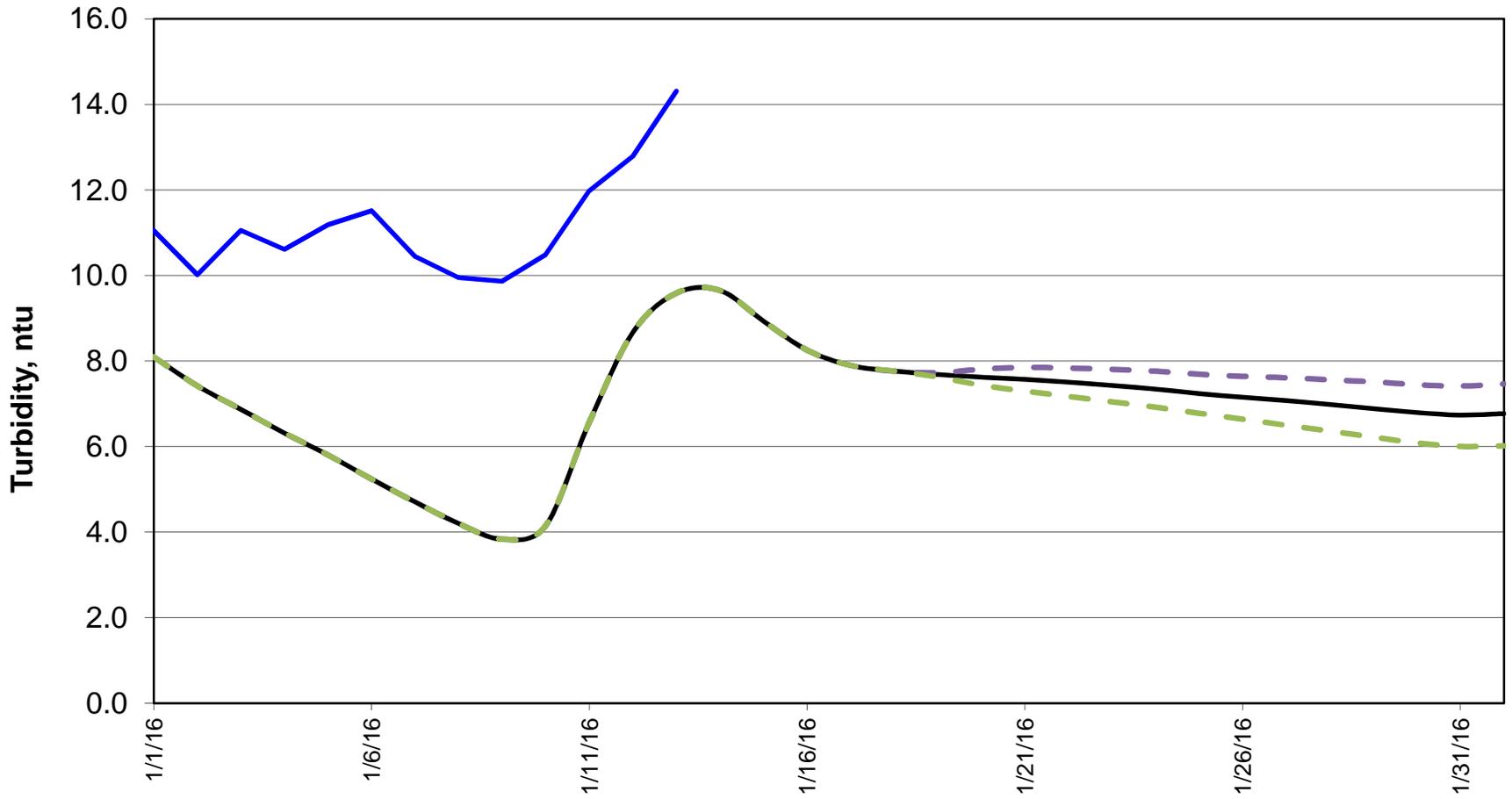
Forecasted Turbidity @ Sacramento River @ Hood



Forecasted Turbidity @ San Joaquin River @ Vernalis



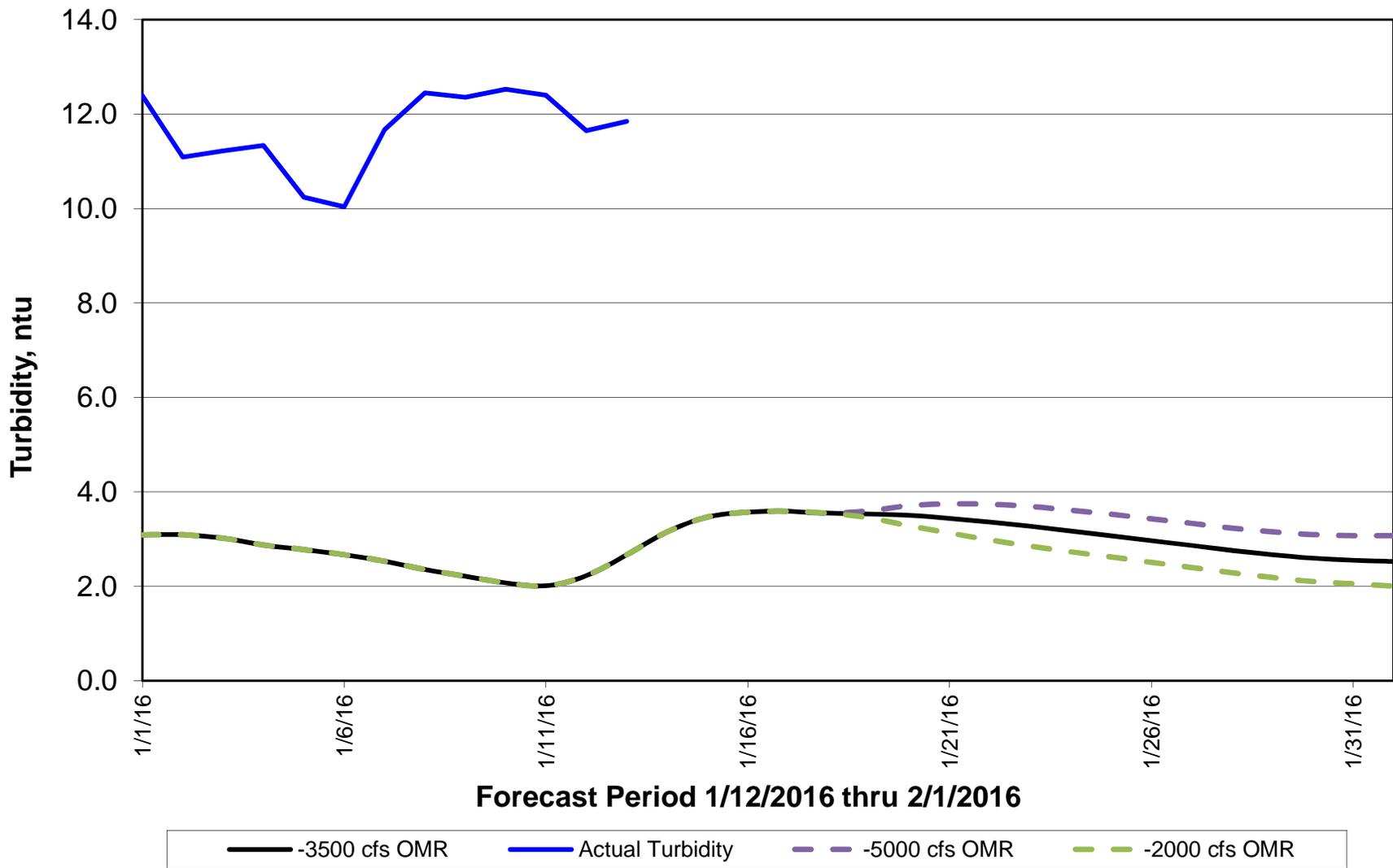
Forecasted Turbidity @ Prisoners Point



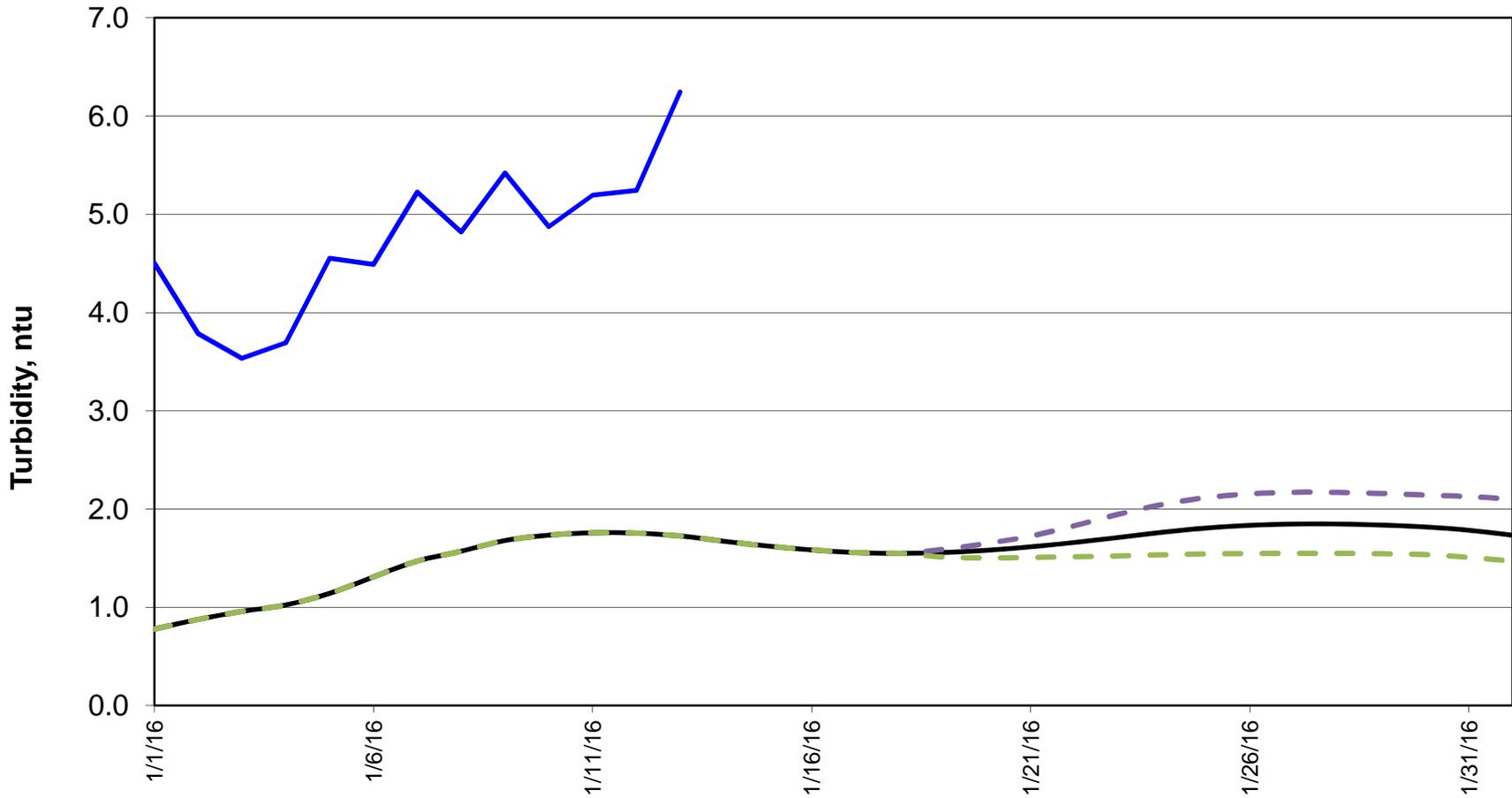
Forecast Period 1/12/2016 thru 2/1/2016



Forecasted Turbidity @ Holland



Forecasted Turbidity @ Victoria Canal

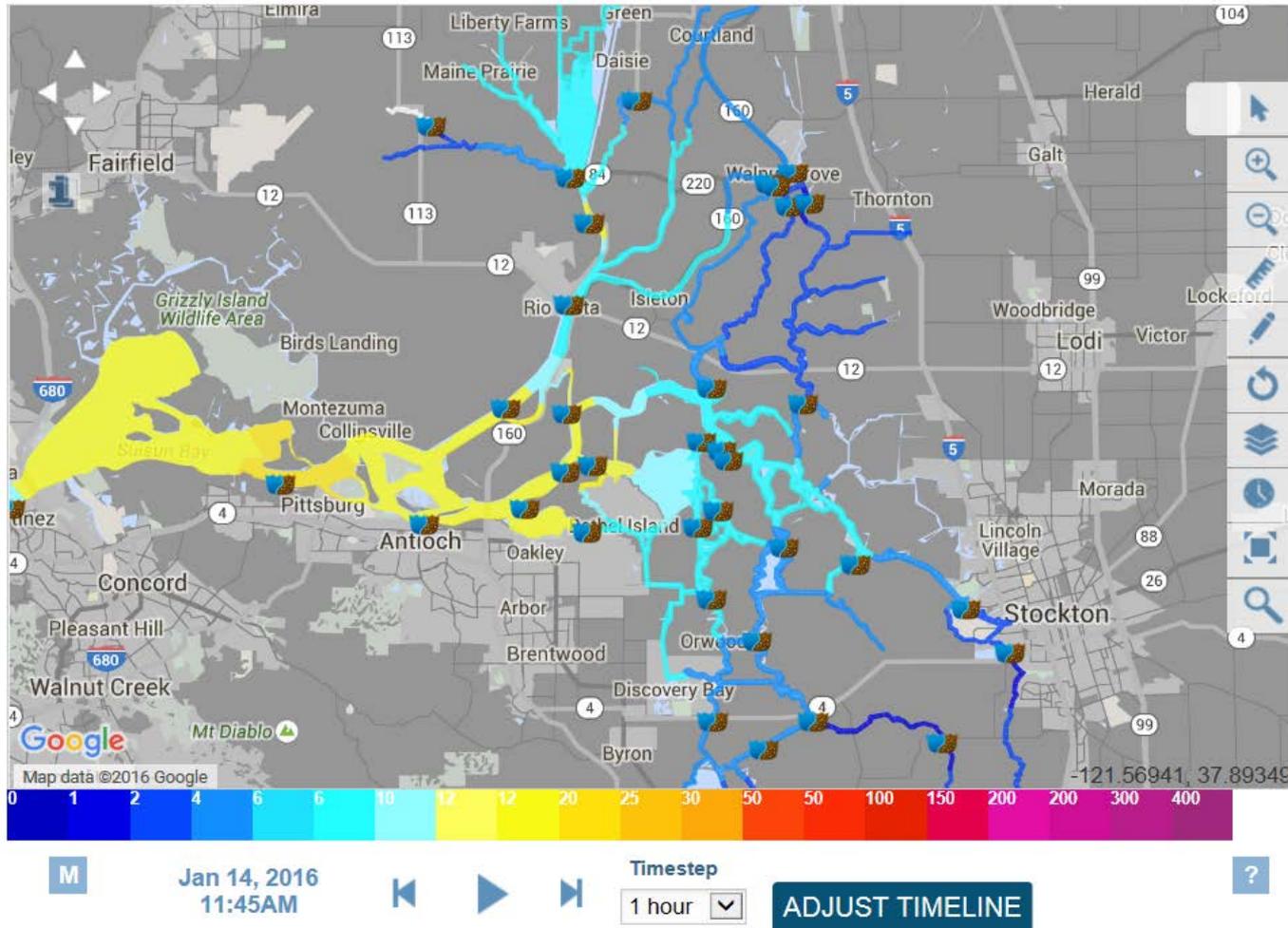


Forecast Period 1/12/2016 thru 2/1/2016

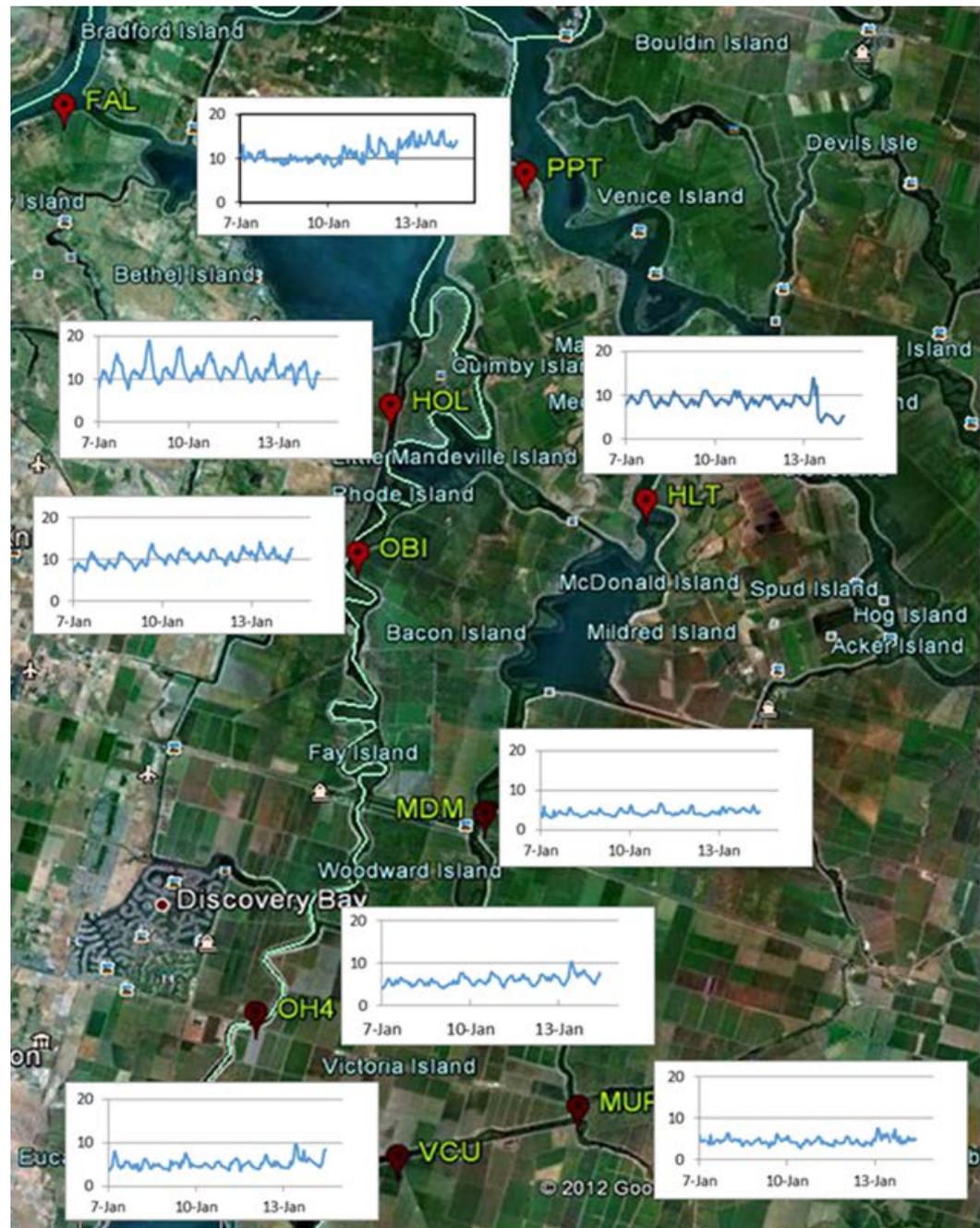


Turbidity, Catch, and Salvage 2014 - 2016

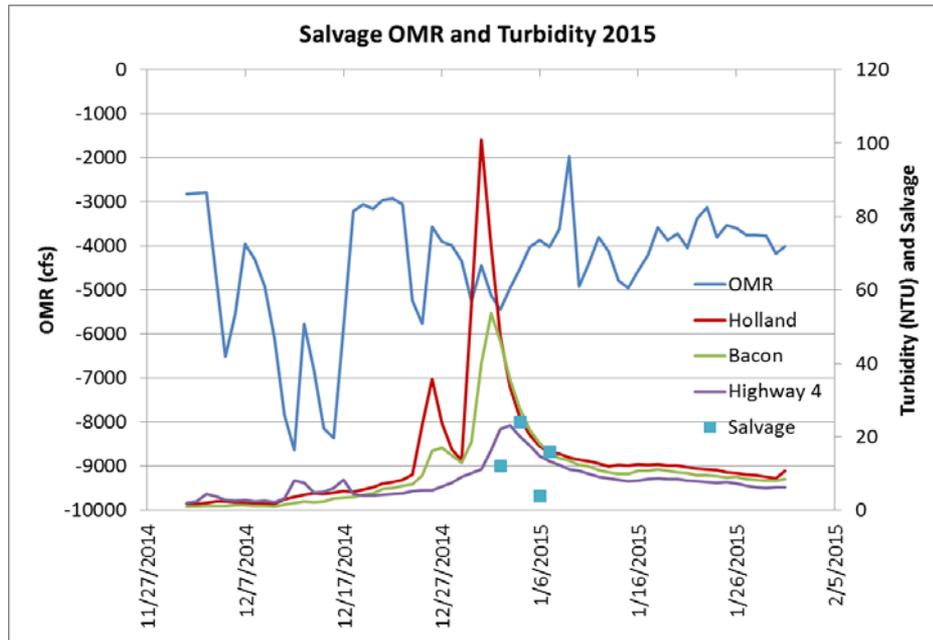
Turbidity Map as of 11:45 AM on January 14th, 2016



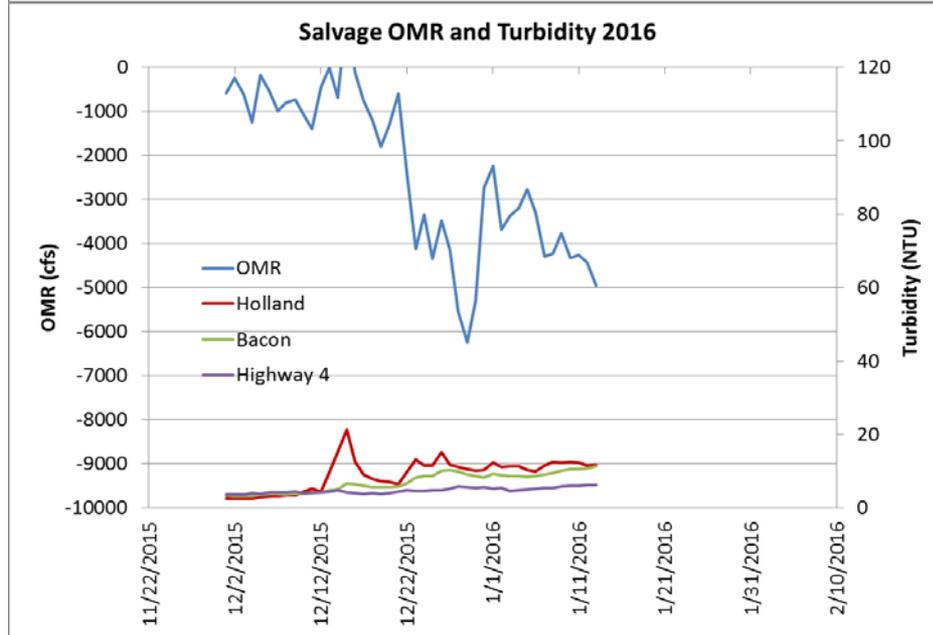
Turbidity History 2016



Turbidity Event 2015

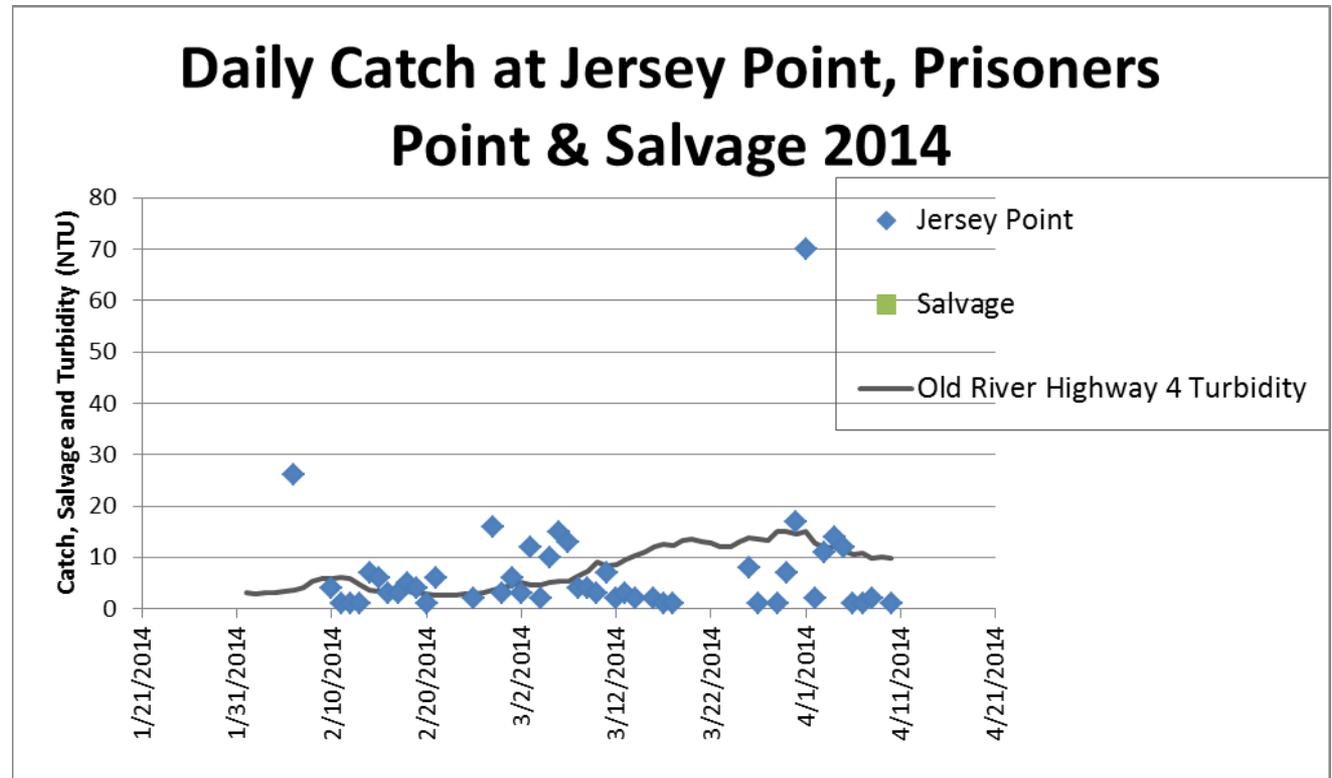


Turbidity Non Event 2016



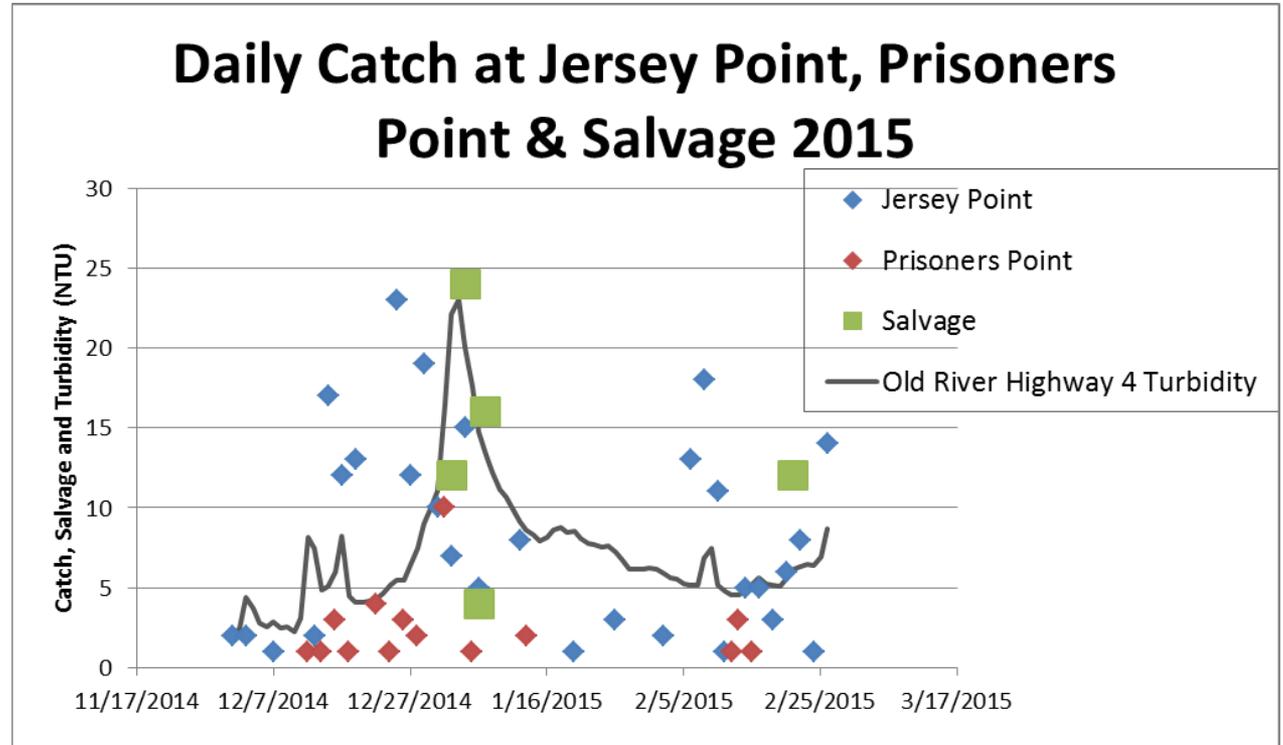
Salvage V Jersey Catch and Turbidity 2014

No salvage
despite
high Jersey
Point Catch



Salvage V Jersey Catch and Turbidity 2015

Continuous
Jersey Point
catch, but
Salvage only
during Turbidity
Event



Salvage V Jersey Catch and Turbidity 2016

Continuous
Jersey Point
catch, but no
turbidity event
and no salvage

