Options for Definition of Base Flow Conditions in the Santa Ana River for Assessment of Compliance with the Reach 3 Surface Water Objectives

May 24, 2022

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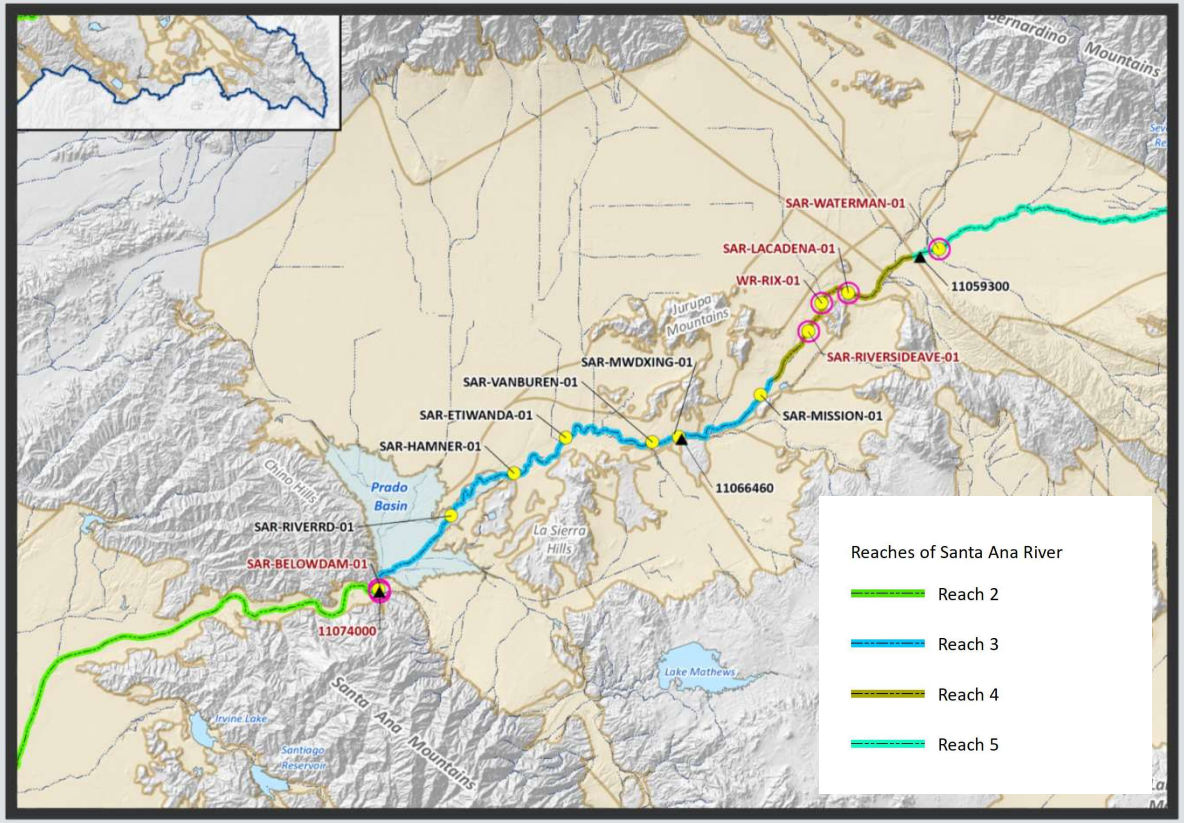
Task 1 – Prepare Updated Surface Water Monitoring Program for TDS/N for Santa Ana Reaches 2, 3, 4, and 5



2022 Workshops for Task 1 - For each Reach we reviewed:

- The TDS/N Objectives defined in Basin Plan
- Metrics for compliance
- The data collected and used
- What is objective protecting
- If the data collected and analyzed is sufficient to access compliance

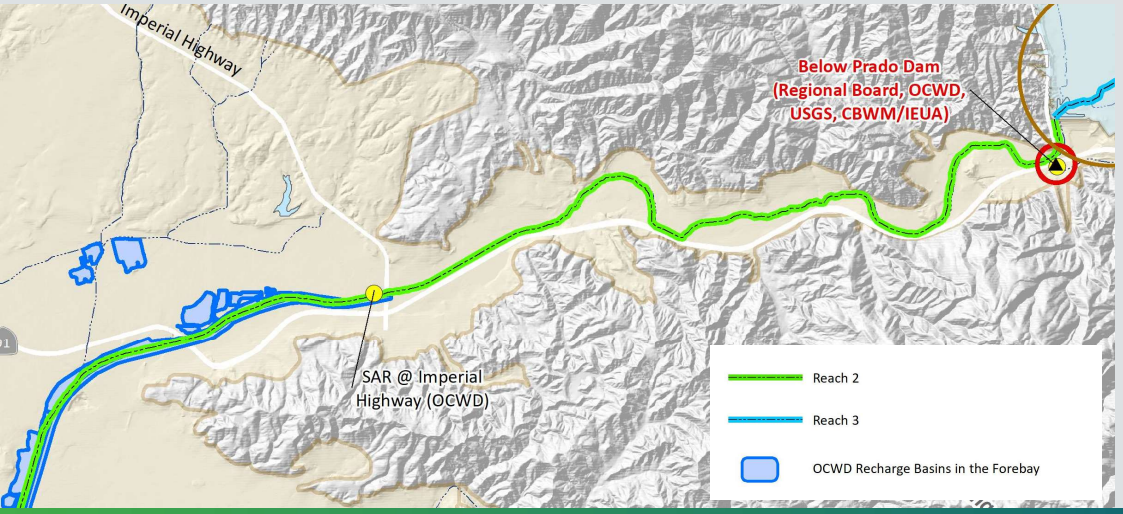
Task 1 – Prepare Updated Surface Water Monitoring Program for TDS/N for Santa Ana Reaches 2, 3, 4, and 5

Reach 2 Surface Water Objectives:

TDS = 650 mgl
TIN = N/A

Basin Plan Description: "*Reach 2 will be based on the five-year moving average of the annual TDS content of total flow.*"

"*The Watermaster's* [SARWM] *annual determination of total flow quality [at Prado] will be used to determine compliance with the total flow objective…*"



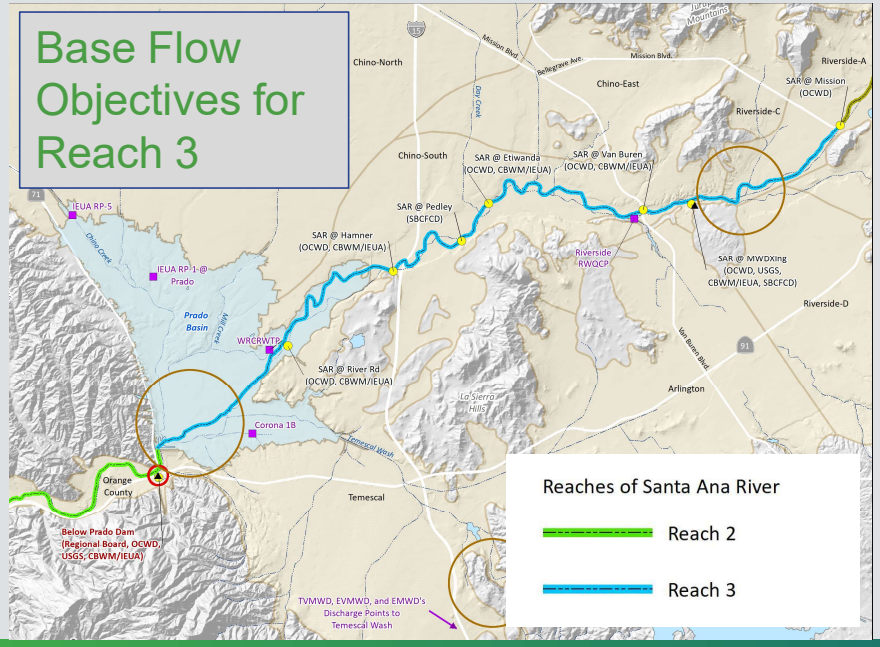
2022 Workshops for Task 1:

- Questions on how TDS/N Objectives and assessment of Objectives are described in the Basin Plan
- Regional Board's need for alignment of monitoring and assessment for Basin Plan and the 303D Listing
- Basin Plan should better clarify the required monitoring and assessment of the TDS/N Objectives
- "Base Flow" – better characterization and definition needed in Basin Plan to assess compliance with Reach 3 TDS/N Objective

Characterization of Santa Ana River Base Flow Conditions in Reach 3

Perform analysis to define Base Flow Conditions in Reach 3, and based on those conditions what data can be used to assess compliance with the Reach 3 TDS/N Objectives

Purpose: potential update to the Basin Plan to better describe what are the conditions in Reach 3 that define Base Flow and data that can be used to assess compliance



Steps:

- Look at daily data to define when there are Base Flow conditions
- With defined baseflow conditions→ evaluate the available data that can be used to assess compliance for Reach 3.
- Perform assessment of compliance with Reach 3 TDS Objective with all Base Flow data
- Determine monitoring needed for compliance

Basin Plan Description of Reach 3 Monitoring and Assessment of Base Flow Surface Water Objectives

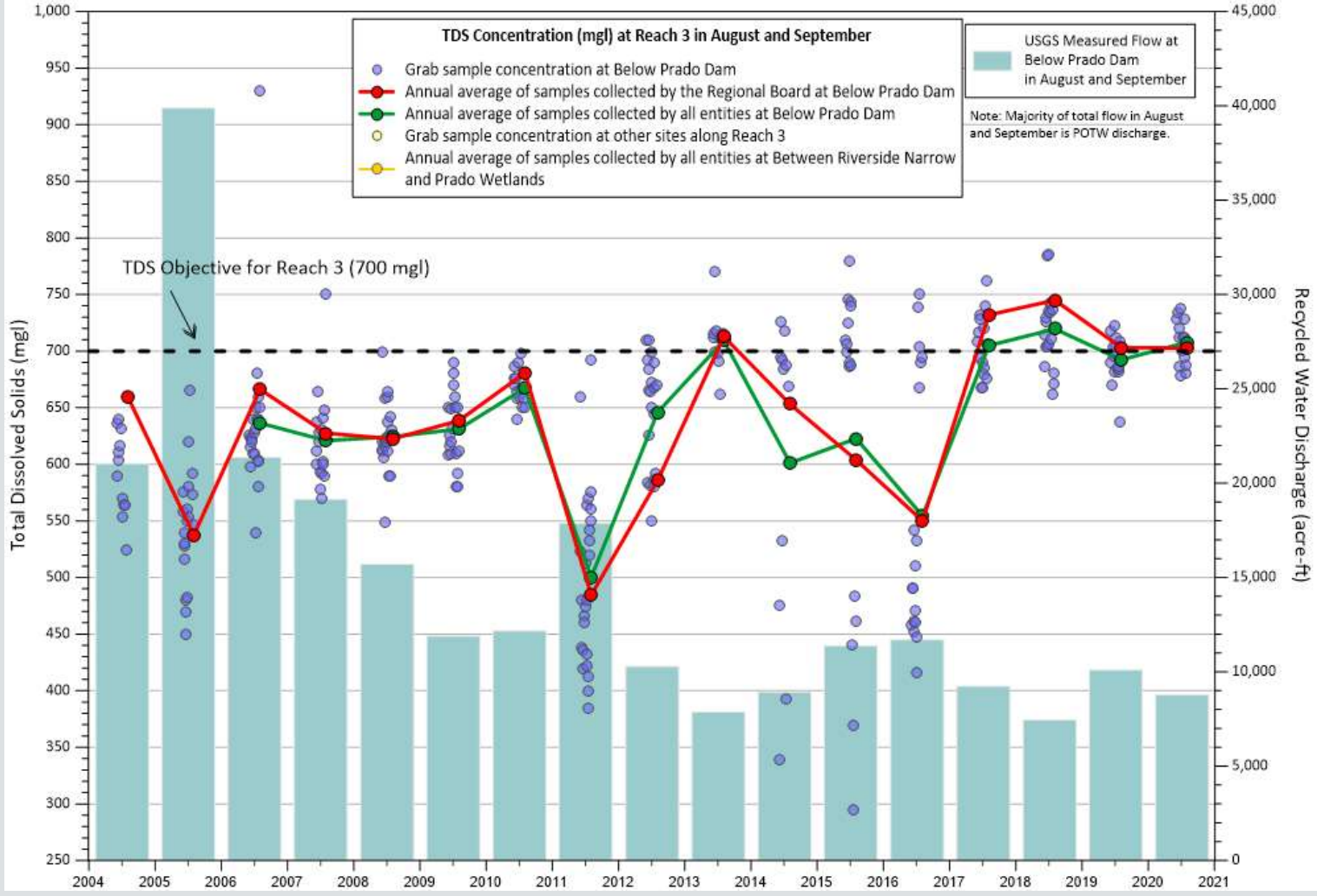
Page 4-28 of the Basin Plan:

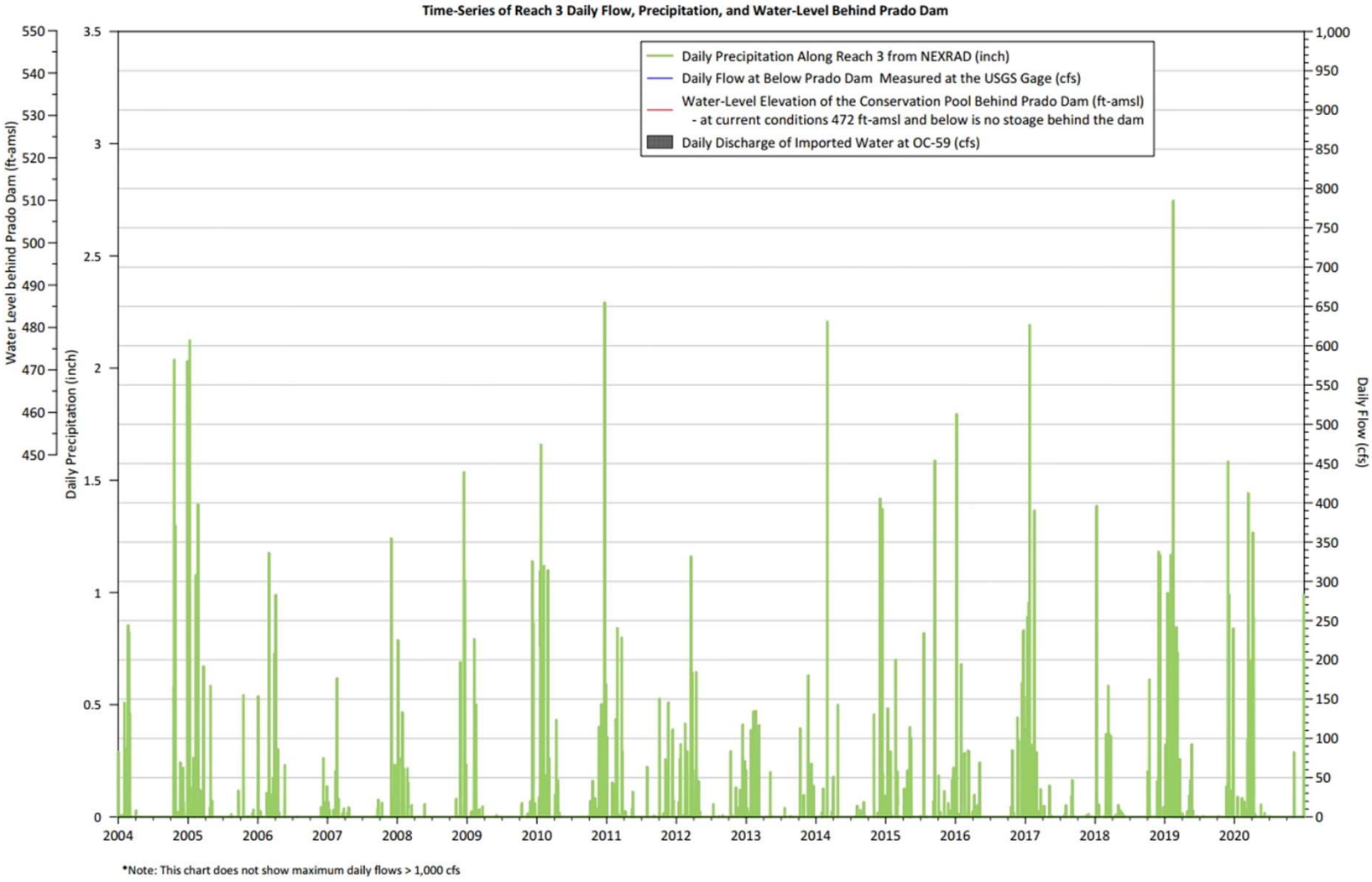
may reach the River via Temescal Creek. Most storms occur during the winter rainy season (December through April). Base flow is composed of wastewater discharges, rising groundwater, and nonpoint source discharges. Wastewater discharges are the

Page 4-29 of the Basin Plan:

In order to determine whether the water quality and quantity objectives for base flow in Reach 3 are being met, the Regional Board will collect a series of grab and composite samples when the influence of storm flows and nontributary flows is at a minimum. This typically occurs during August and September. At this time of year, there is usually no water impounded behind Prado Dam. The volumes of storm flows, rising water and nonpoint source discharges tend to be low. The major component of base flow at this time is municipal wastewater. The results of this sampling will be compared with the continuous monitoring data collected by USGS and data from other sources. These data will be used to evaluate the efficacy of the Regional

Figure X. Time-Series of TDS concentrations and Compliance Determination of Base Flow at Below Prado Dam in August and September at the Santa Ana River Reach 3



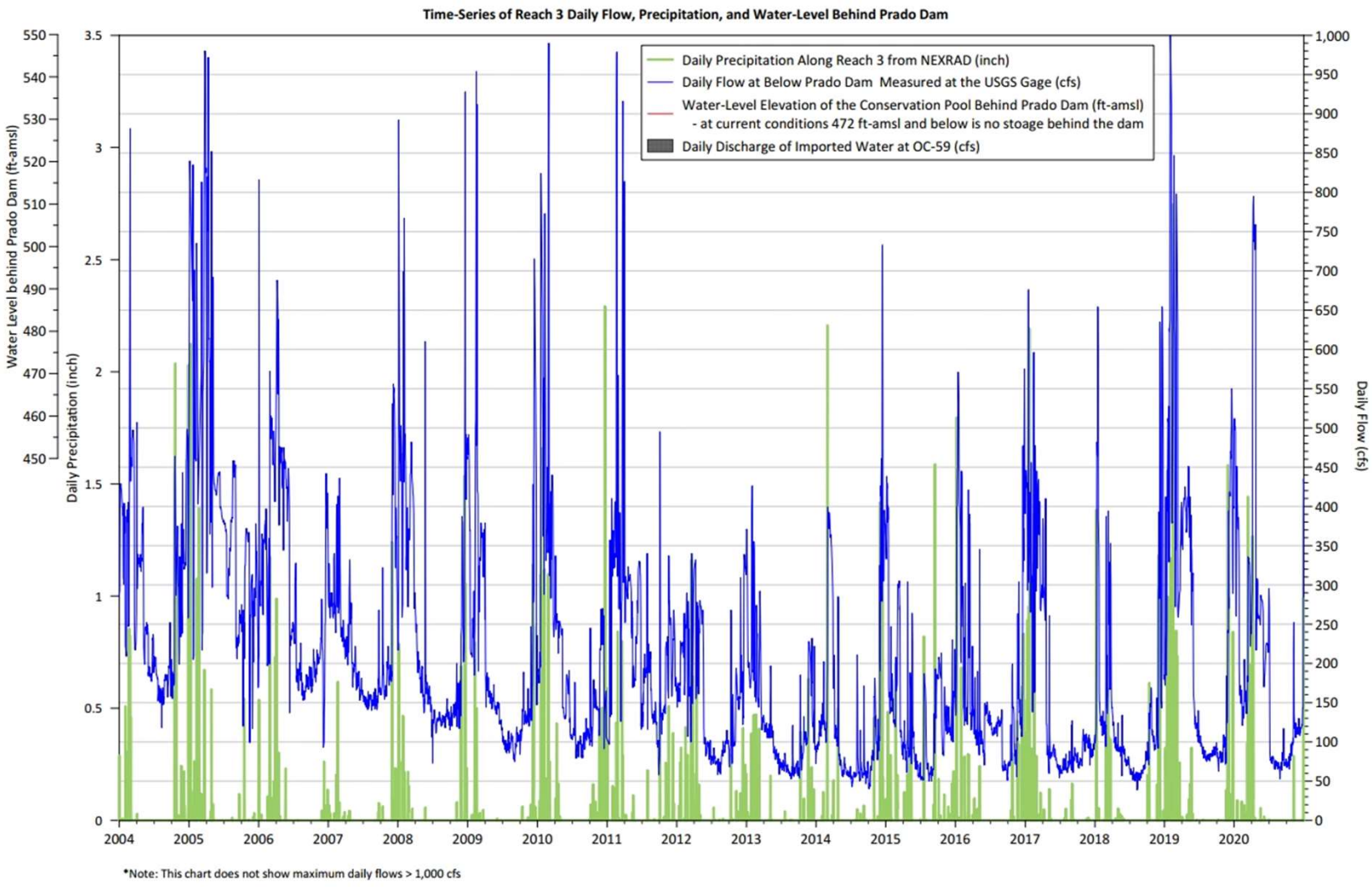


Look at Daily Data to Define When There are Base Flow Conditions.

Basin Plan language:

"… the influence from storm flows and non-tributary flows is at a minimum."

"…usually no water impounded behind Prado Dam"



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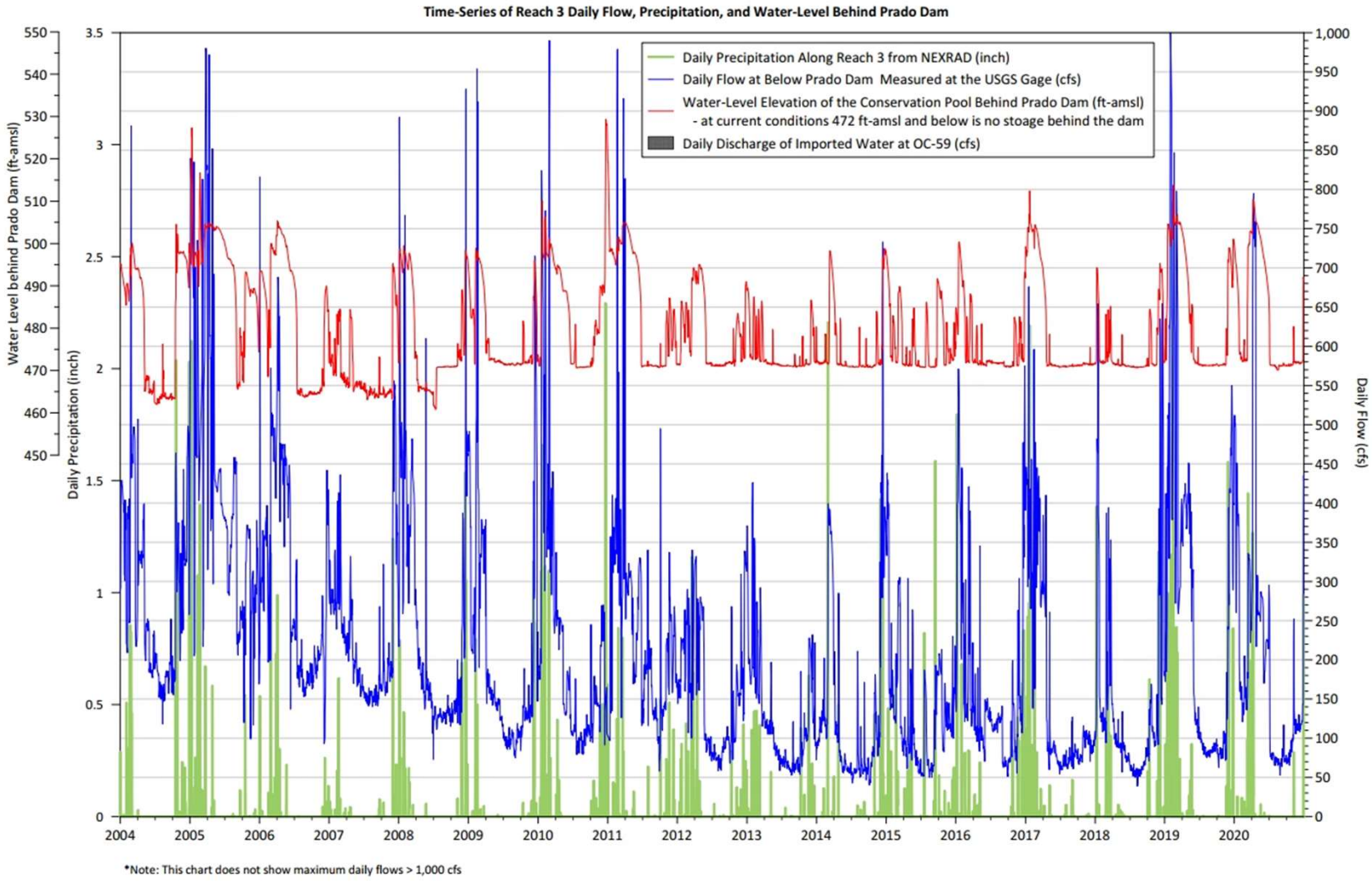

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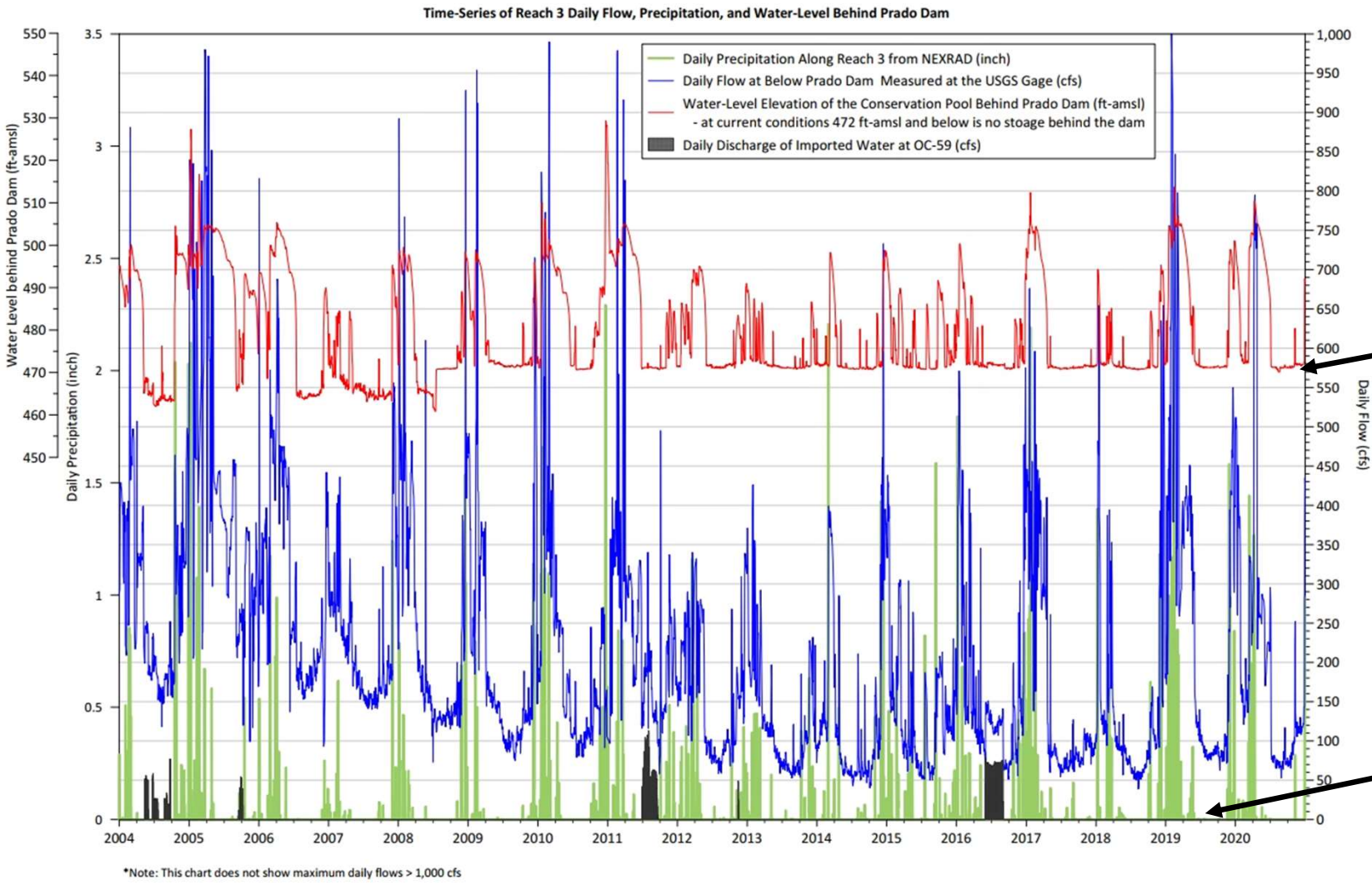
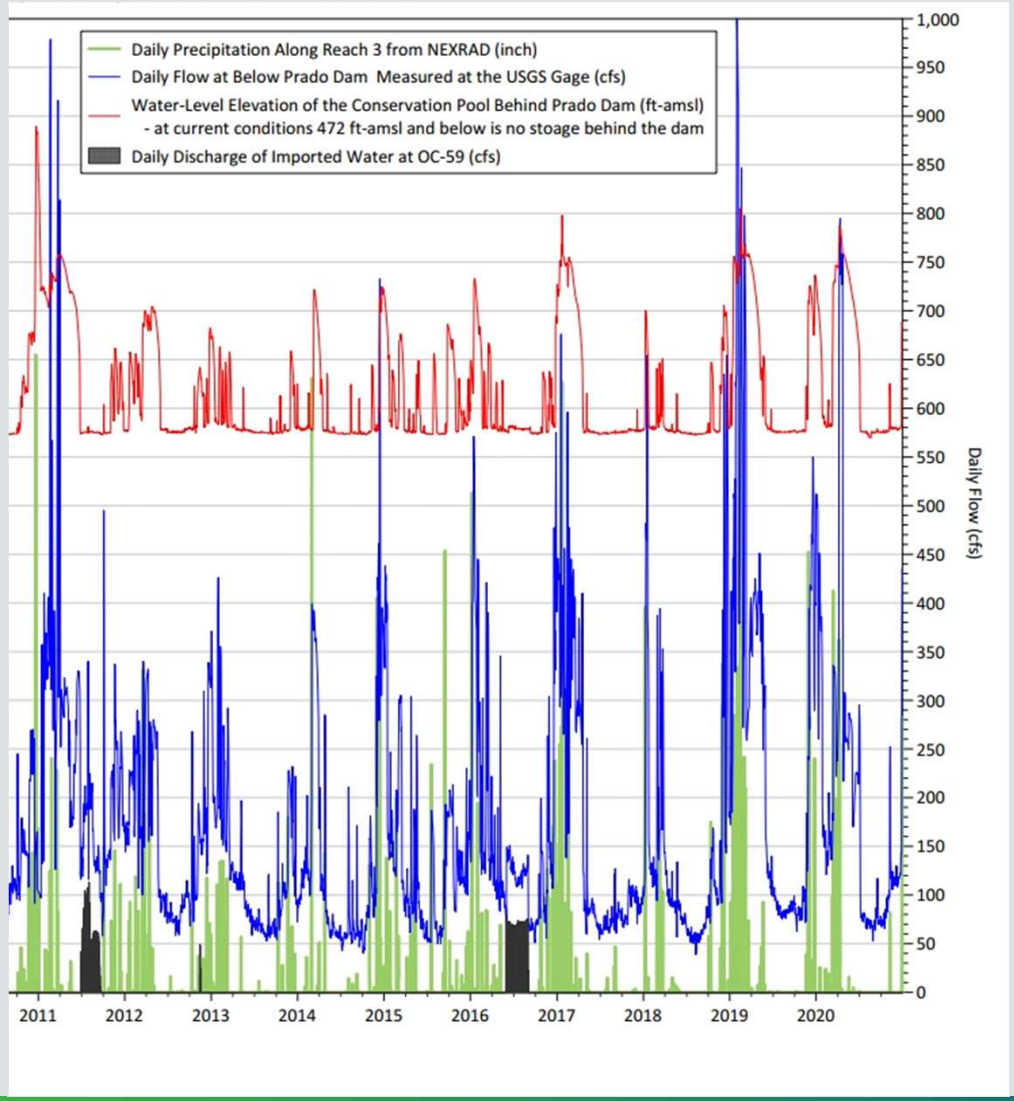


Baseflow Conditions

Water-level elevation at and below 472 ft-amsl is the condition where there is no storage pool behind the dam

No precipitation events or OC-59 discharge (non-tributary flow)



Look at Daily Data to Define When There are Base Flow Conditions

Base Flow Conditions in Reach 3 can be defined as days where:

- There were no precipitation events or OC-59 discharge in the last 4 days
  - *The time of concentration is* the time it takes for runoff from the most distant upstream part of the watershed to reach a specified point of interest → *The time of concentration to Prado Dam for the Santa Ana River is estimated to be between 1 to 2 days.*
- Water-level elevation behind Prado Dam is below 472 ft-amsl (no storage pool behind dam)

Summary of Annual Days and Months with Base Flow Conditions

Year	# of Days	# of Months	Months
2004	67	6	May-Oct
2005	11	1	Sep
2006	132	6	Jul-Dec
2007	223	9	Mar-Dec
2008	199	8	Apr-Nov
2009	138	9	Feb, May-Dec
2010	107	6	Jan, Jun-Oct
2011	36	5	Jun, Sep-Dec
2012	132	6	Jan, Jun-Oct
2013	187	9	Apr-Dec
2014	194	12	Jan-Dec
2015	119	10	Feb-Sep, Nov-Dec
2016	74	8	Feb-May, Sep-Nov
2017	209	9	Apr-Dec
2018	203	11	Jan-Feb, Apr-Dec
2019	120	6	Jun-Nov
2020	155	6	Jul-Dec

Look at Daily Data to Define When There are Base Flow Conditions

Base Flow Conditions in Reach 3 can be defined as days where:

- There were no precipitation events or OC-59 discharge in the last 4 days
- Water-level elevation behind Prado Dam is below 472 ft-amsl (no storage pool behind dam)

Evaluate Data that Can be Used to Assess Compliance with Reach 3 SW Objectives

With defined Base Flow Conditions→ evaluate available data that can be used to assess Reach 3 compliance

Compliance monitoring location for Reach 3 is ***Below Prado Dam*** →the Reach 3 SW Objectives are intended to protect Orange County GMZ

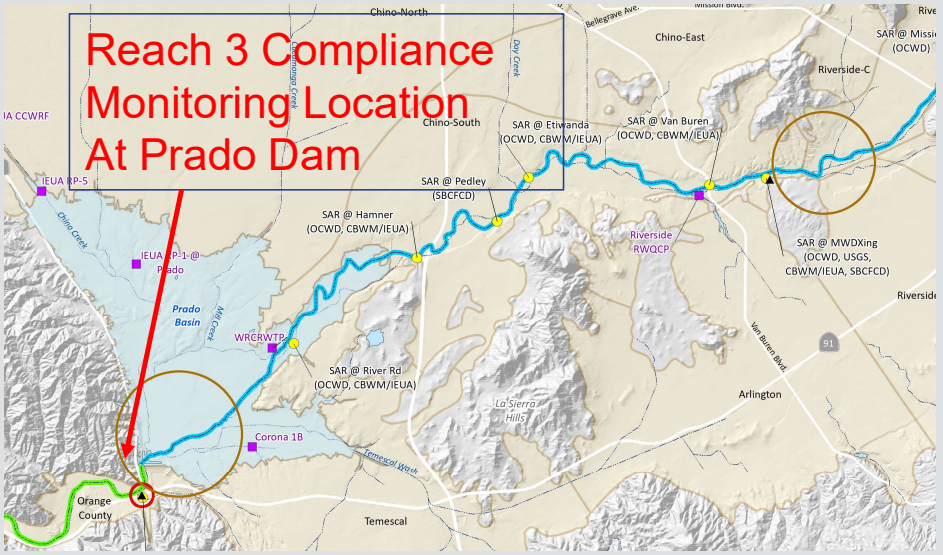
Multiple entities monitor at ***Below Prado Dam***:

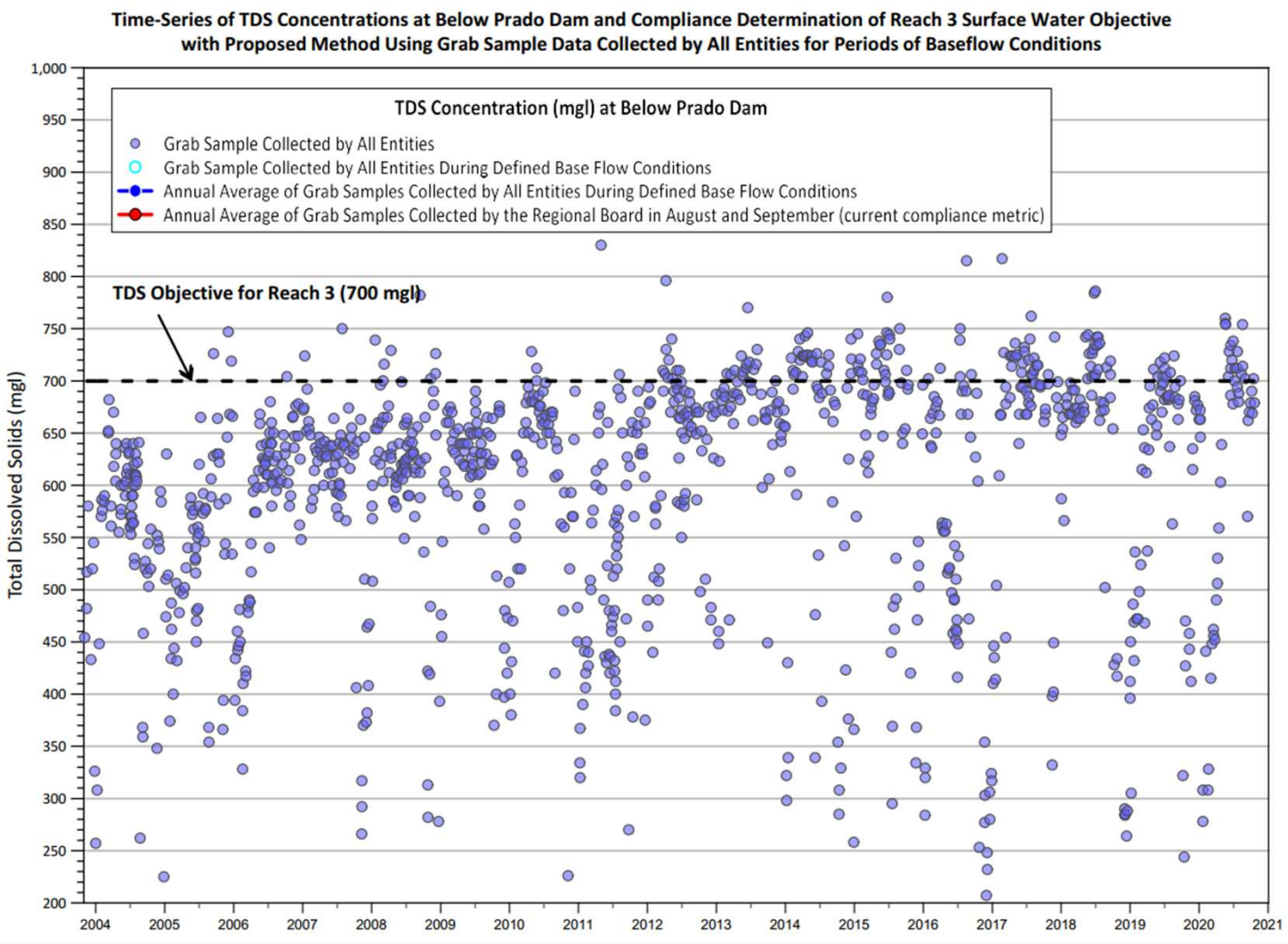
1) Grab samples collect by multiple entities:

- Regional Board (~5 samples in August-September)
  * current samples used for compliance
- OCWD (1-2 samples a month)
- USGS (1-3 samples a month)

2) Daily EC measurements at the USGS gage that can be used to calculate daily TDS

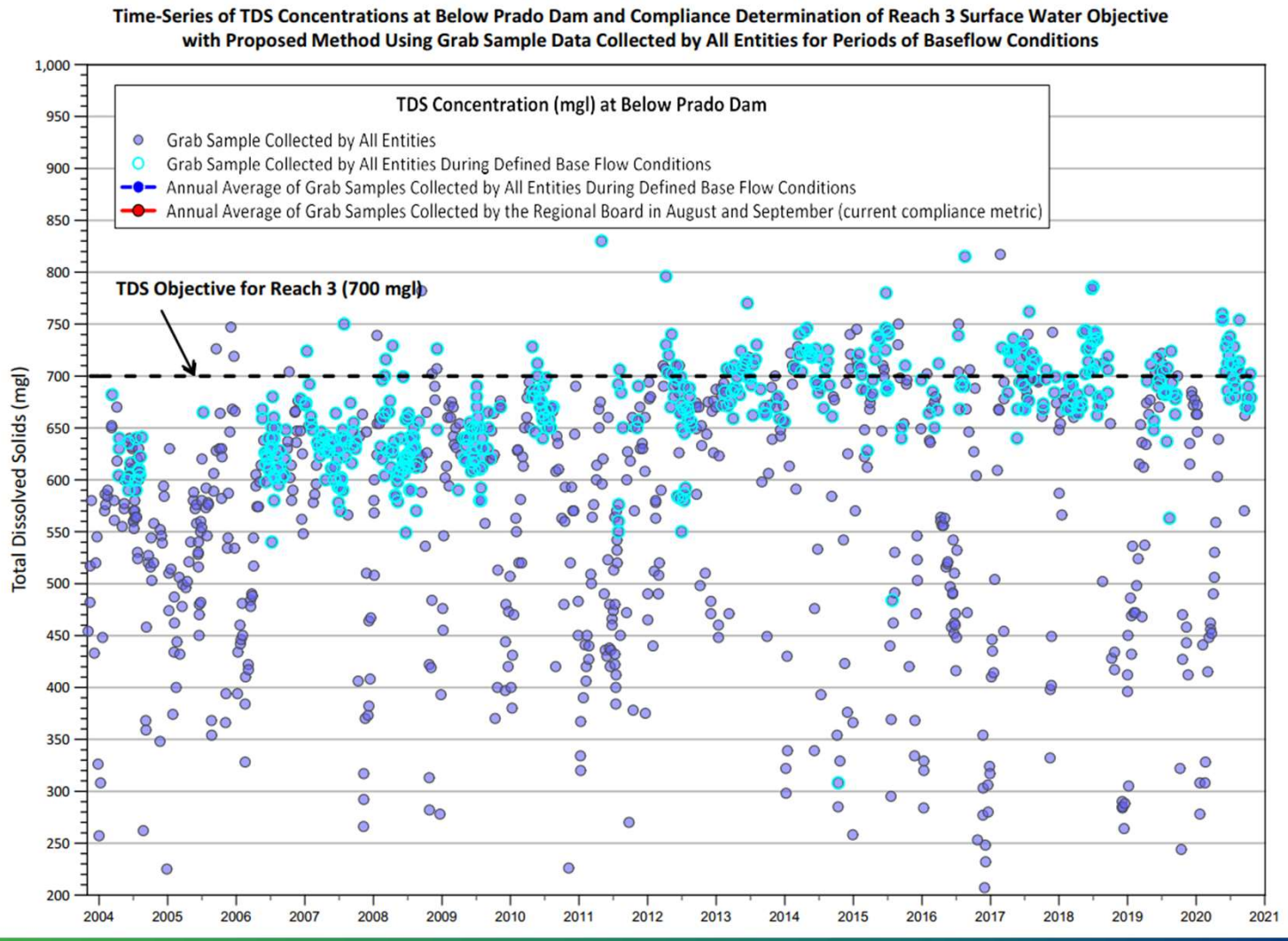
Next: Assess compliance with all available data for 1 & 2 during defined Base Flow Conditions





Perform Assessment of Compliance with Reach 3 SW Objectives with All Available Data During Base Flow Conditions

- All Grab Samples Collected by Multiple Entities



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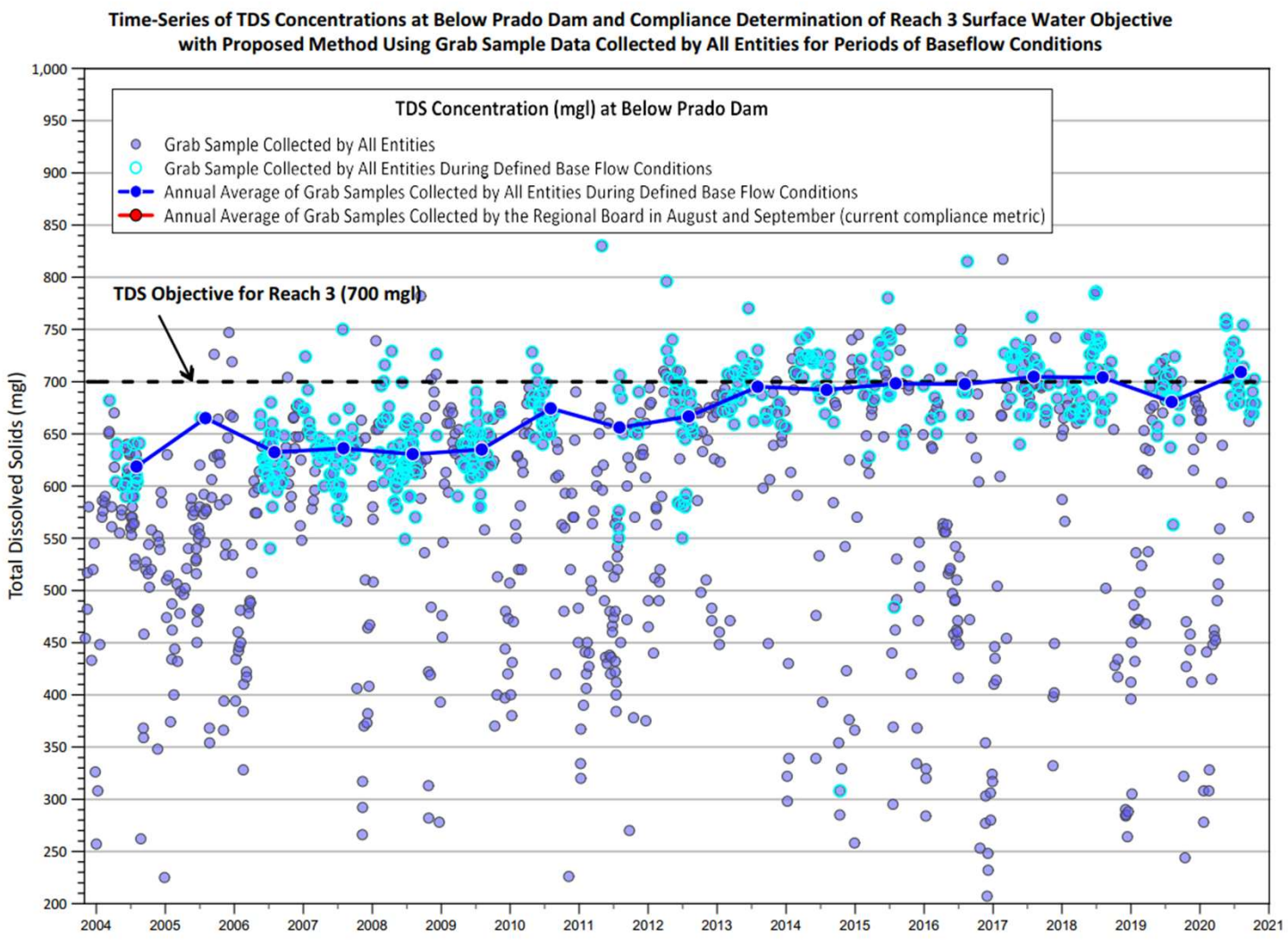

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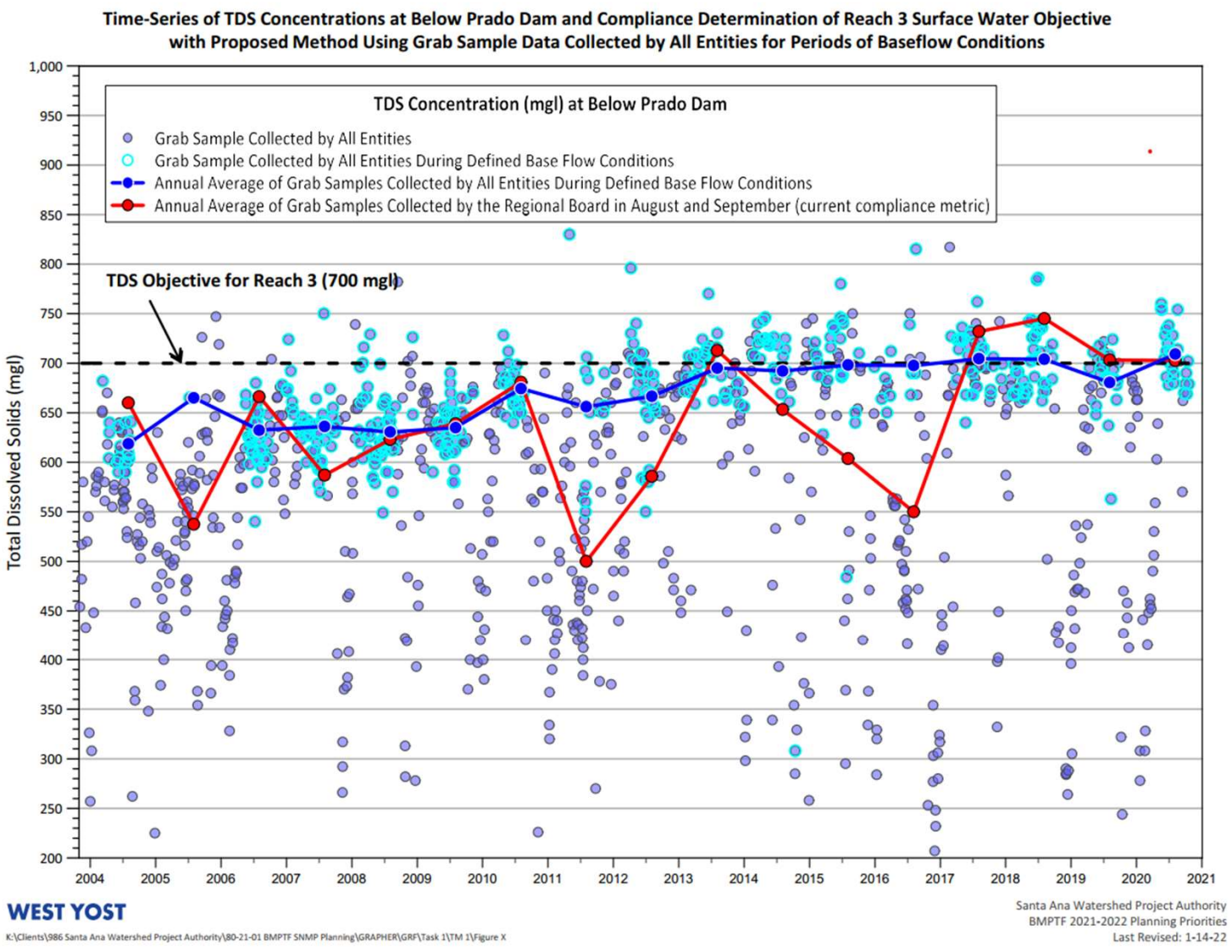

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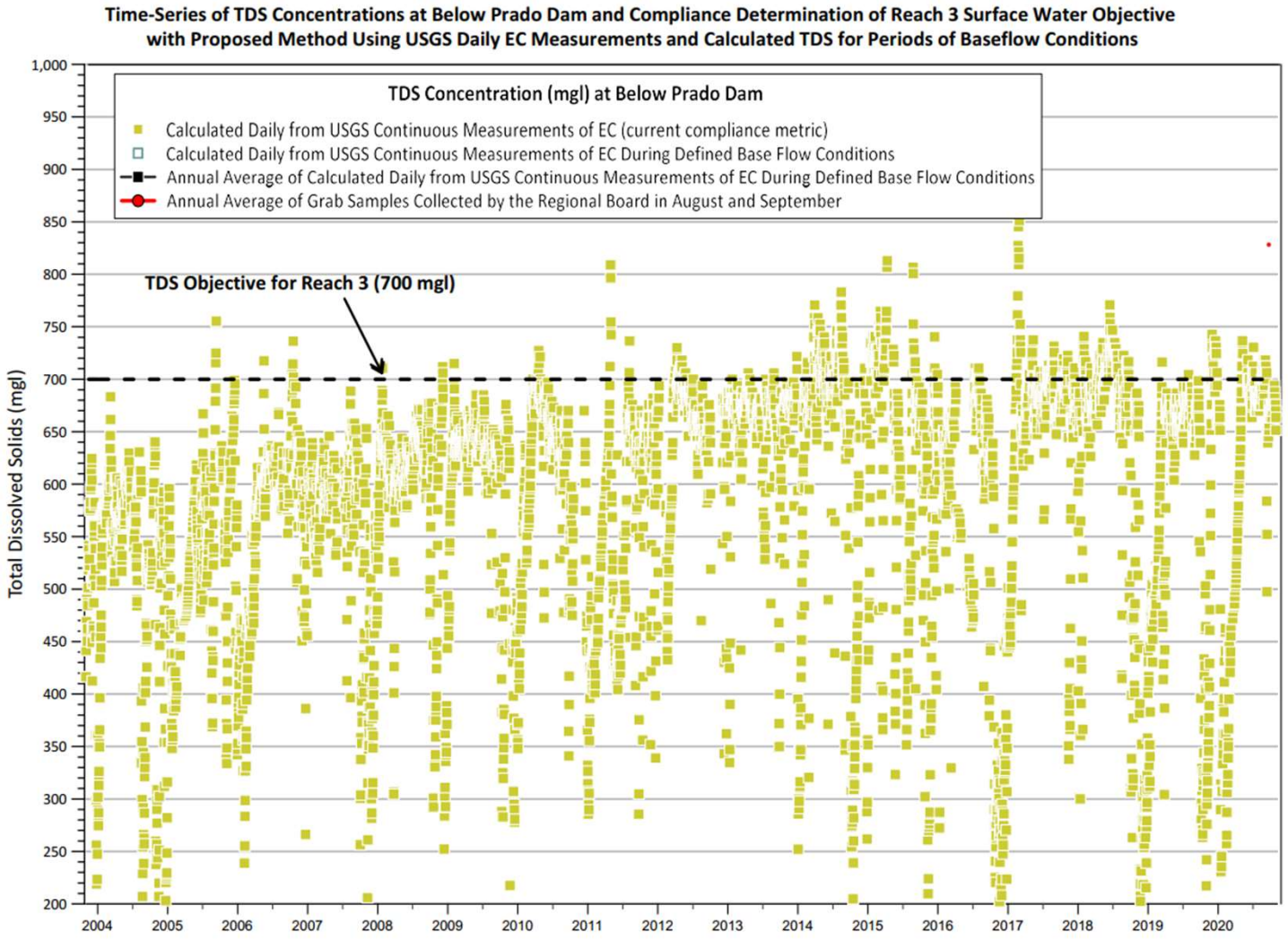
Santa Ana Watershed Project Authority
BMPTF 2021-2022 Planning Priorities
Last Revised: 1-14-22

Perform Assessment of Compliance with Reach 3 SW Objectives with All Available Data During Base Flow Conditions

- All Grab Samples Collected by Multiple Entities



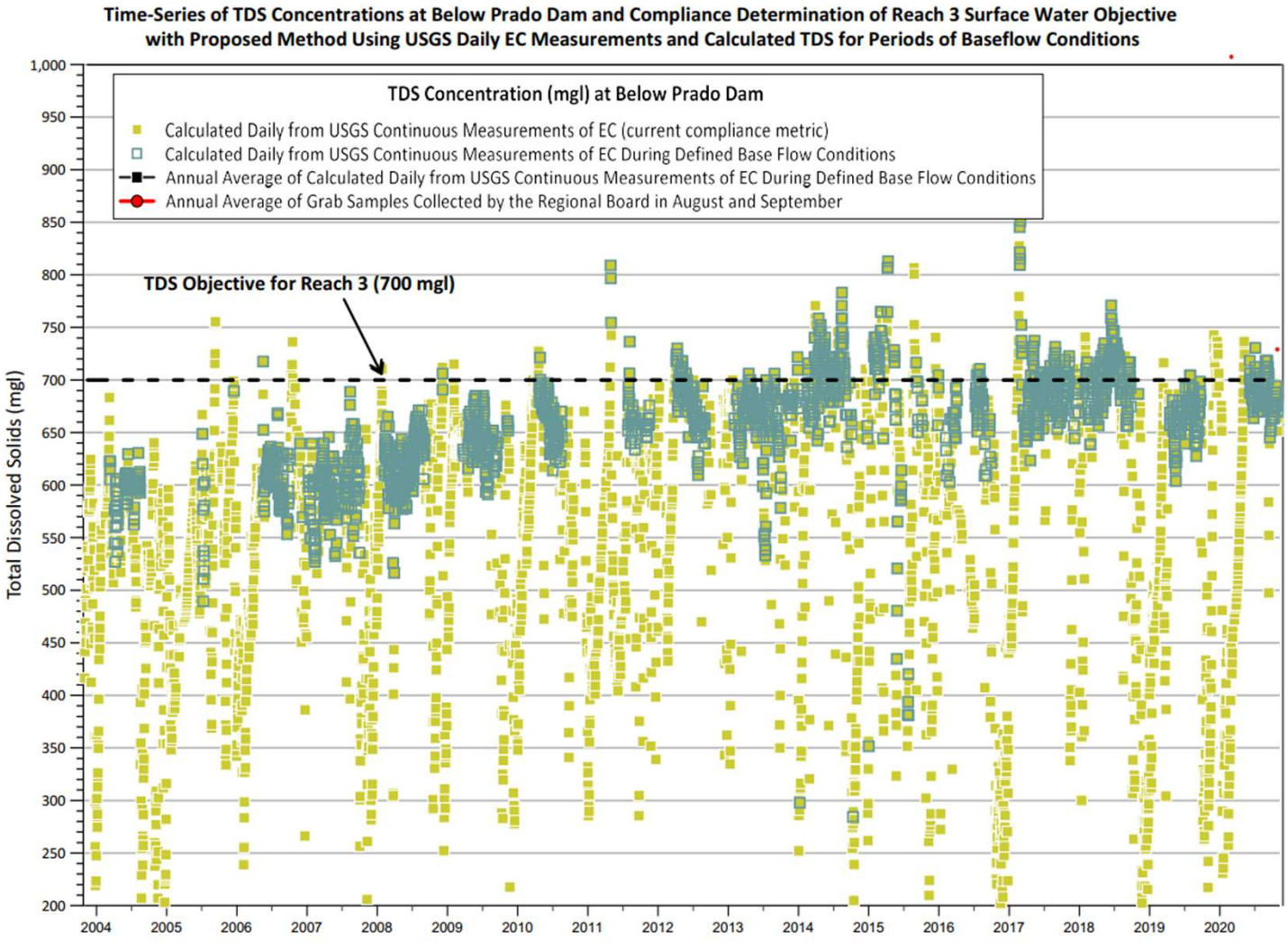
Perform Assessment of Compliance with Reach 3 SW Objectives with All Available Data During Base Flow Conditions

- All Calculated Daily TDS from the USGS EC Measurements

Use the average TDS/EC Ratio from grab samples to calculate daily TDS

October 2018

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]
1	84	1,130	676
2	83	1,100	658
3	81	1,110	664
4	100	1,090	652
5	91	1,070	640
6	80	1,100	658
7	77	1,130	676
8	81	1,140	681



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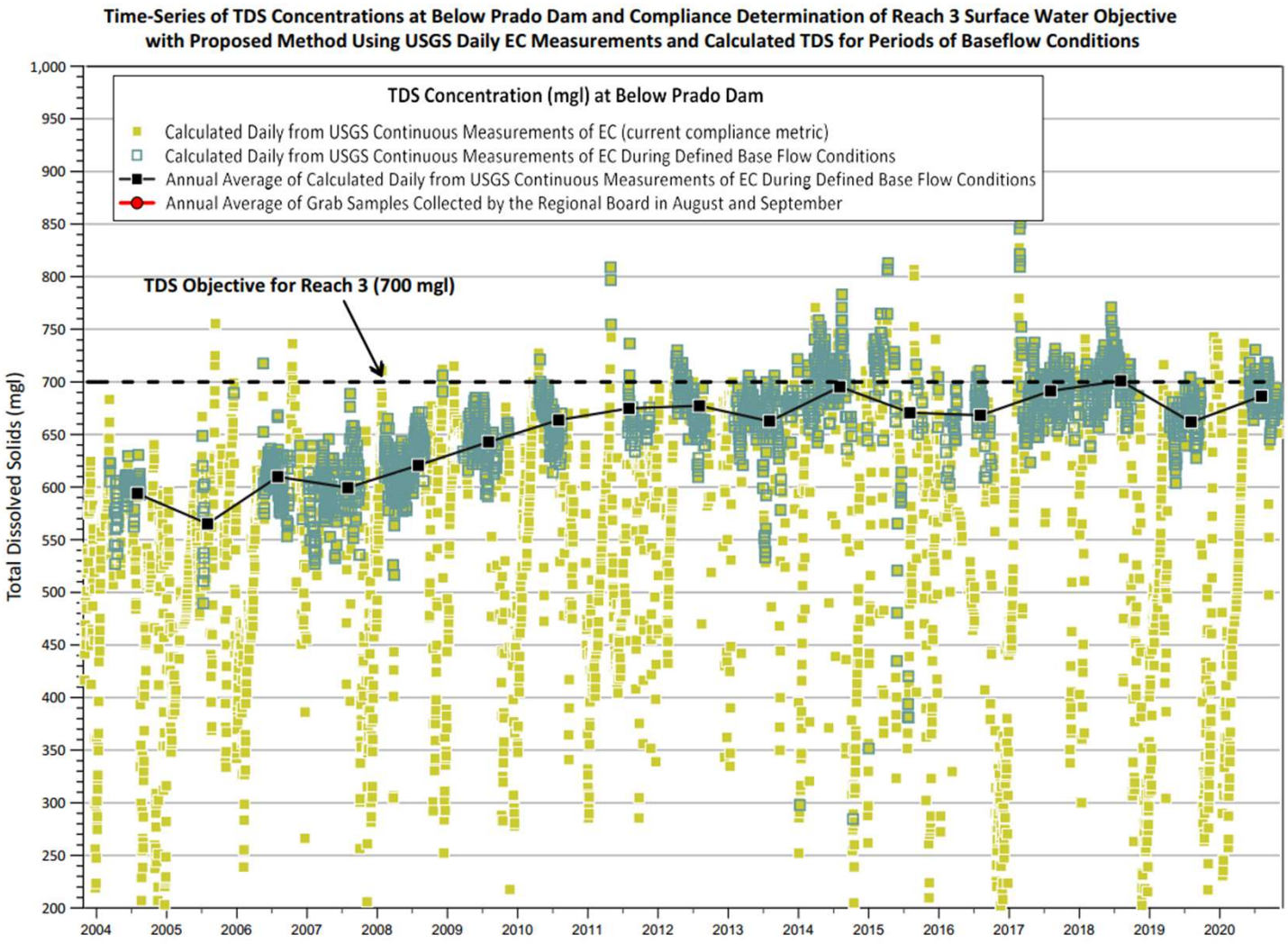

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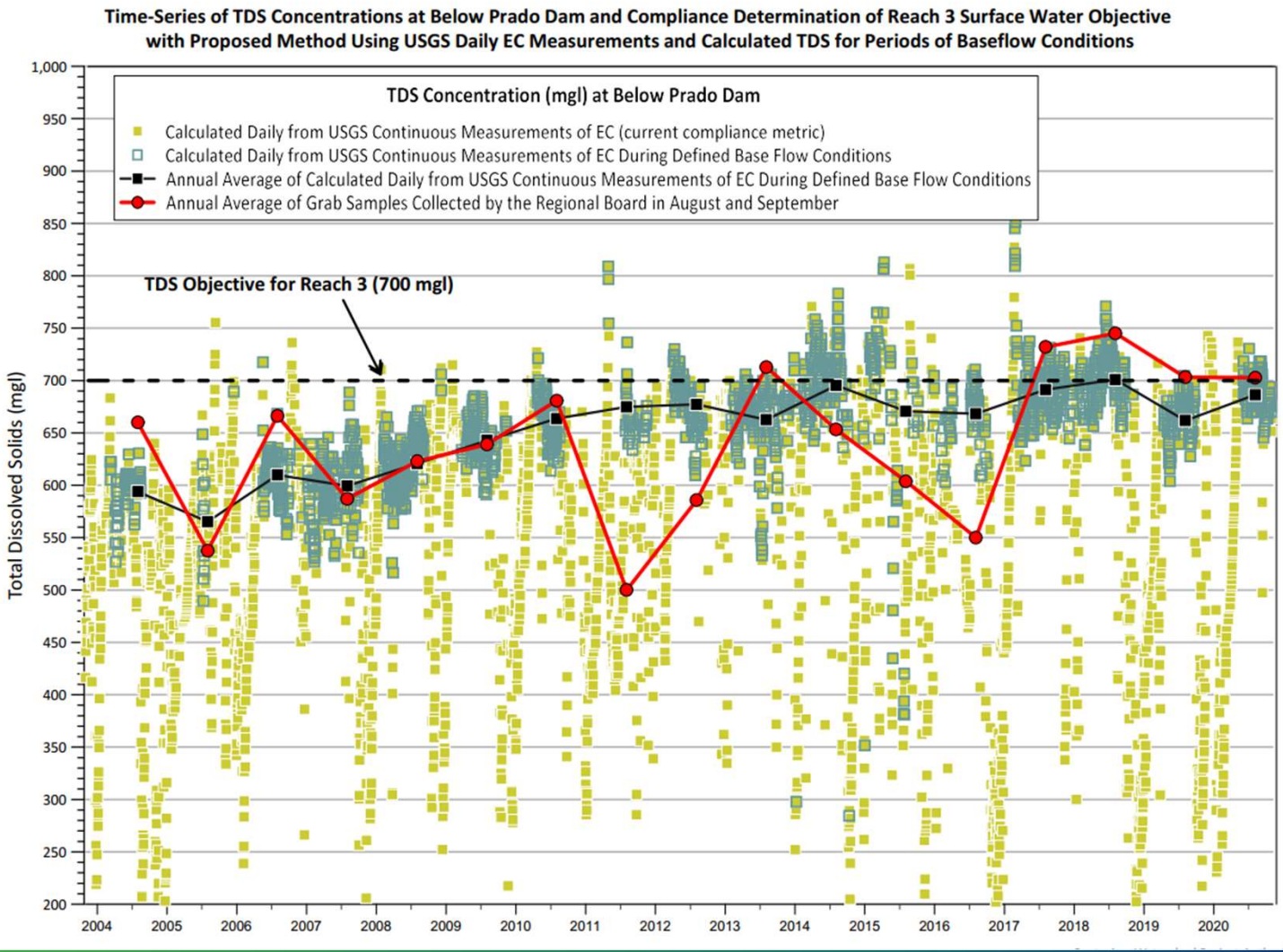
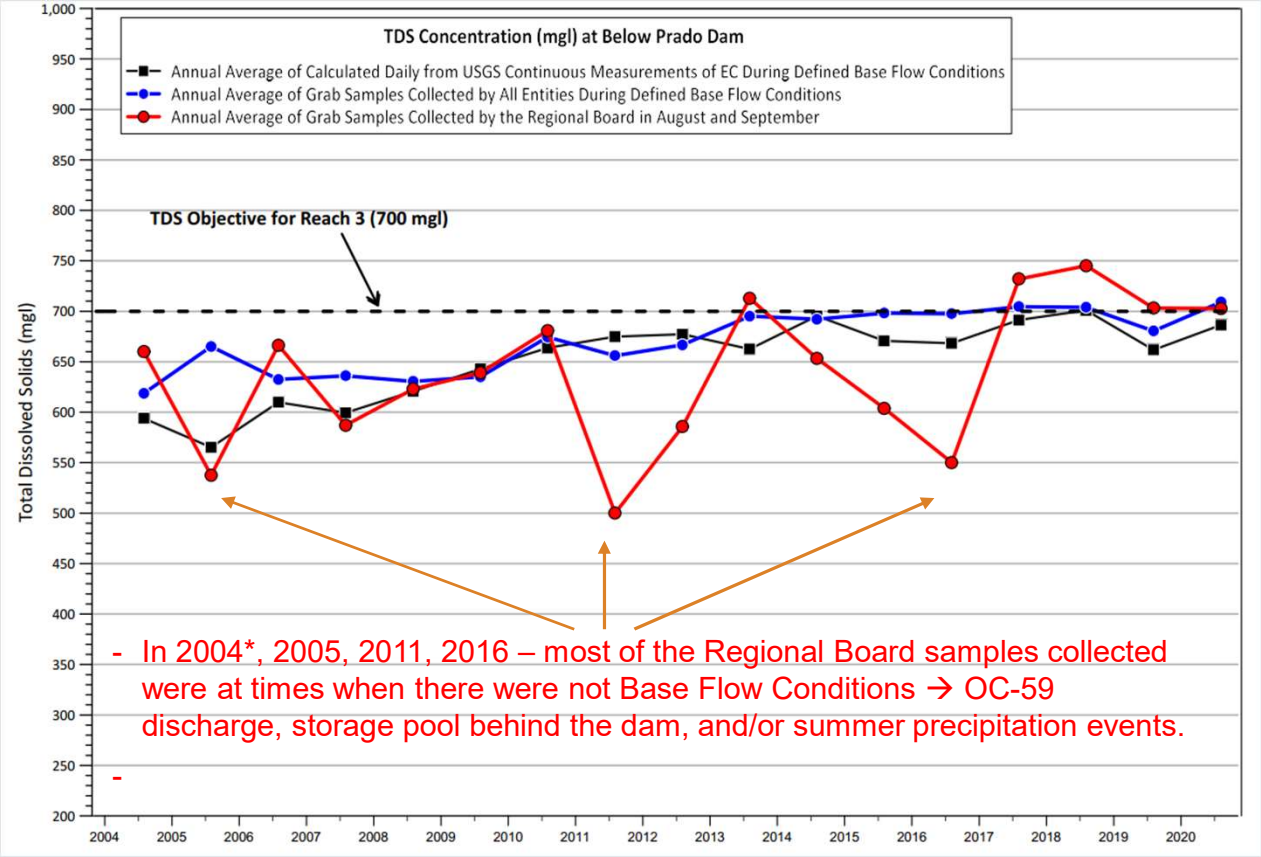


Perform Assessment of Compliance with Reach 3 SW Objectives with All Available Data During Base Flow Conditions

- All Calculated Daily TDS from the USGS EC Measurements

Comparison of Proposed Methods Using all Data for Defined Baseflow Conditions versus Samples Collected by the Regional Board (current method)



Summary of Number of Data Points for the Regional Board Samples and the Two Options for Defined Base Flow Samples

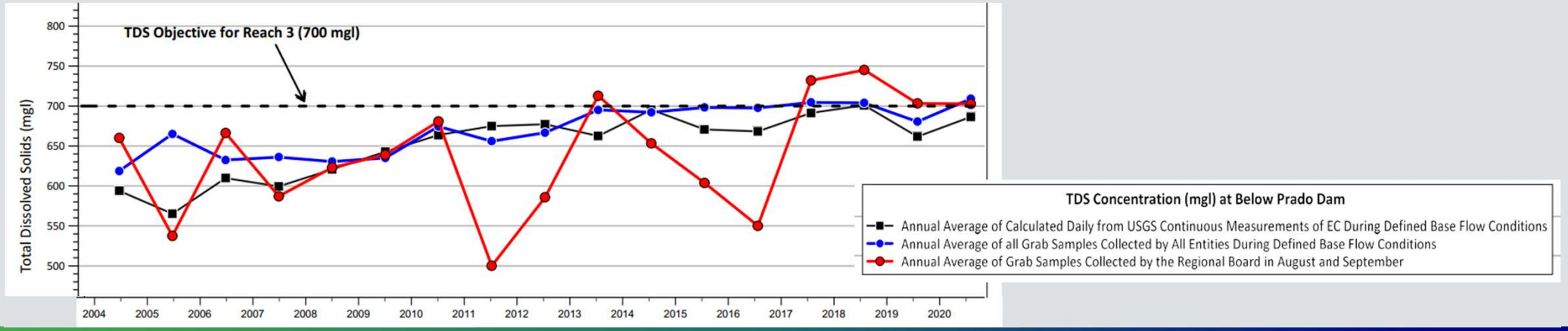
Year	Number of Data Points		
	Regional Board Grab Samples - In Aug/Sept *	Grab Samples by All Entities - During Base Flow Conditions	From Daily USGS Measurements of EC - During Base Flow Conditions
2004	8 (4)	17	67
2005	8 (0)	1	11
2006	8 (8)	33	98
2007	4 (4)	49	164
2008	4 (4)	53	196
2009	7 (7)	36	133
2010	5 (5)	24	107
2011	7 (2)	8	36
2012	7 (6)	34	132
2013	5 (4)	30	187
2014	5 (3)	29	194
2015	5 (3)	24	70
2016	5 (0)	12	74
2017	6 (4)	32	198
2018	6 (6)	40	201
2019	5 (3)	21	116
2020	3 (3)	27	130

(x) – # of Regional Board Aug/Sept samples during Base Flow Conditions

* Current method to assess compliance with Reach 3 objectives

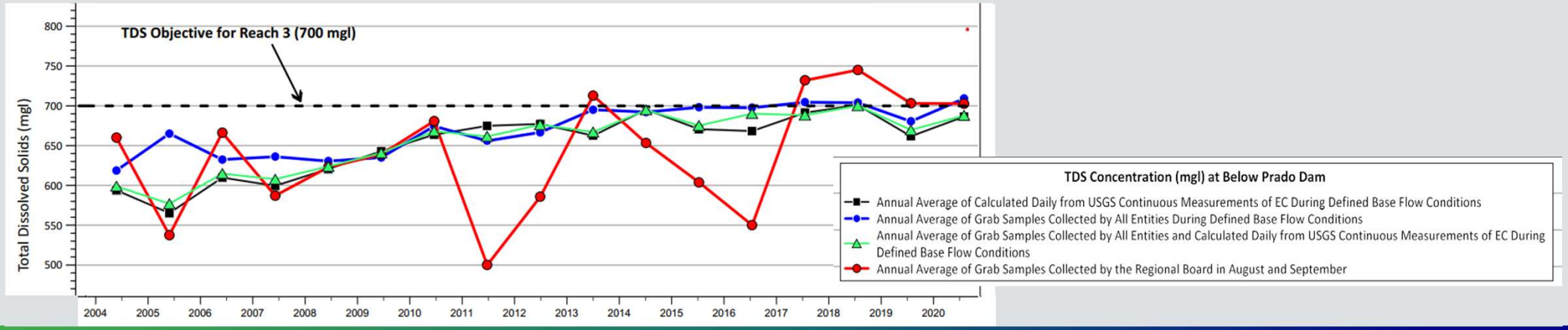
Options for Monitoring and Assessment of Compliance – TDS Reach 3

- **Current Method:** Average of Regional Board grab samples collected in August/September
- **Option A:** Define Base Flow conditions; and use data from **grab samples** collected during Base Flow conditions
- **Option B:** Define Base Flow conditions; and use data from USGS **daily** EC **measurements** collected during Base Flow conditions
- **Option AB:** Define Base Flow conditions; and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow conditions

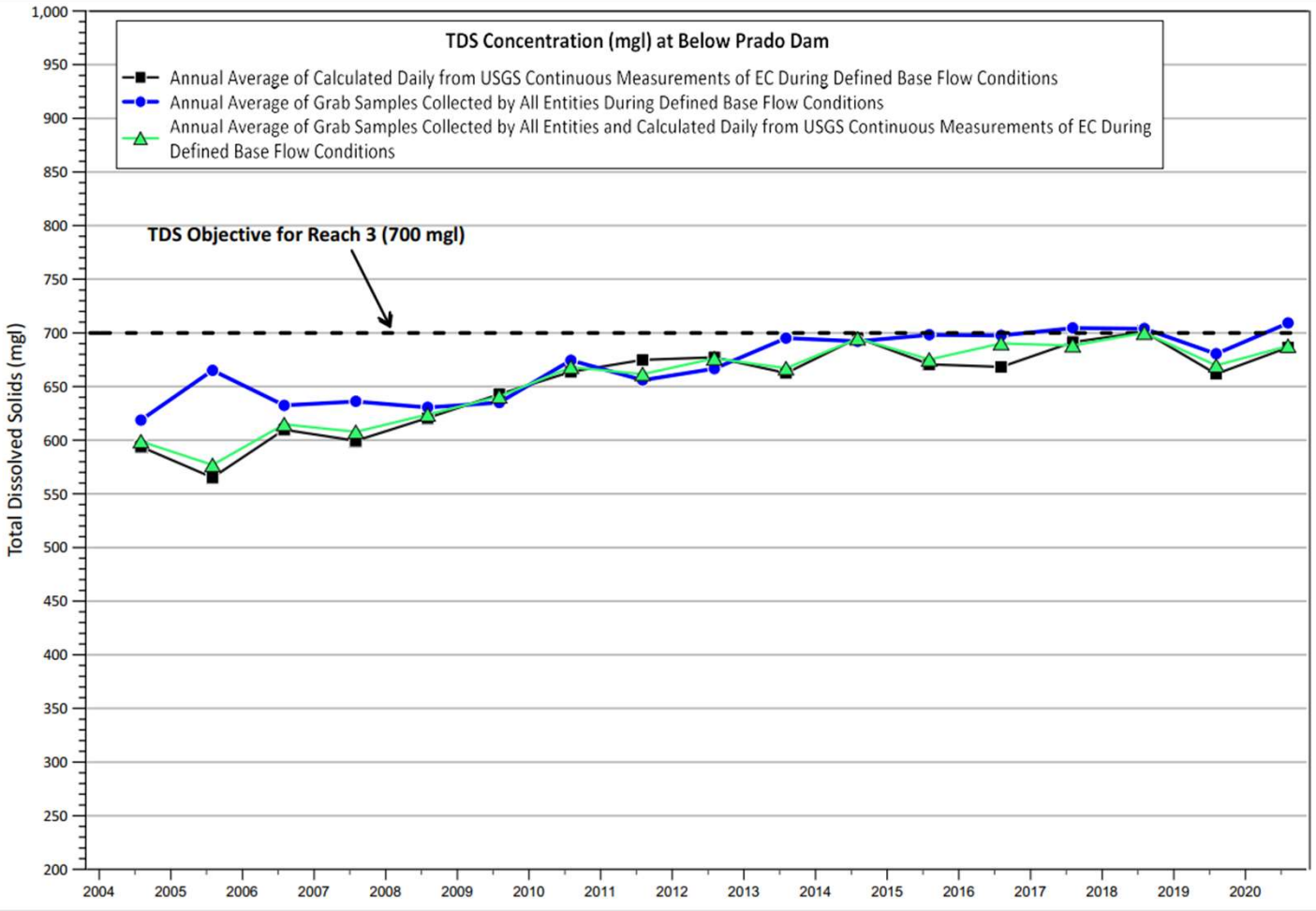


Options for Monitoring and Assessment of Compliance - TDS

- **Current Method:** Average of Regional Board grab samples collected in August/September
- **Option A:** Define Base Flow conditions; and use data from **grab samples** collected during Base Flow conditions
- **Option B:** Define Base Flow conditions; and use data from USGS **daily** EC **measurements** collected during Base Flow conditions
- **Option AB:** Define Base Flow conditions; and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow conditions

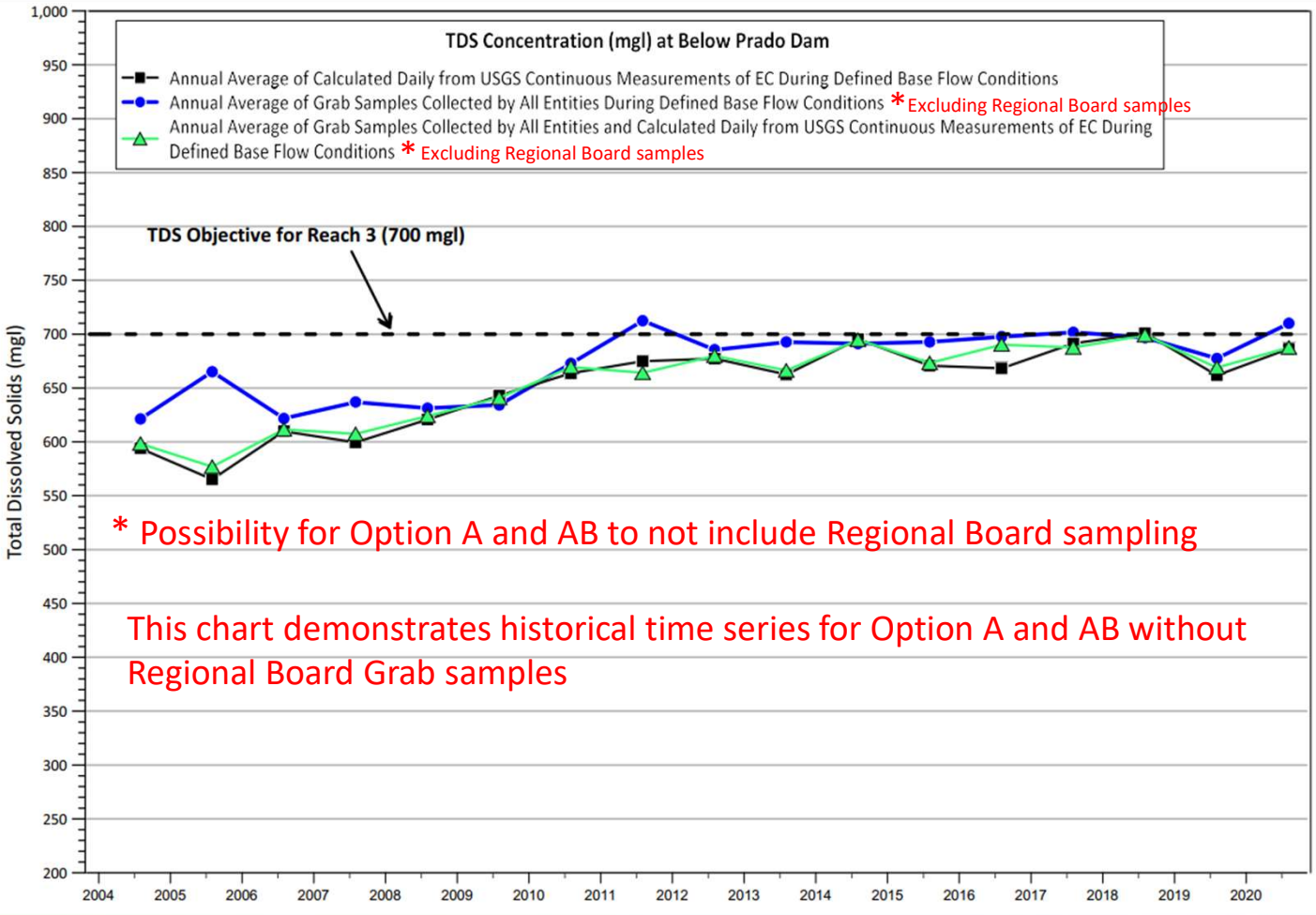


Options for Monitoring and Assessment of Compliance – TDS Reach 3



- **Option A:** Define Base Flow conditions; and use data from **grab samples** collected during Base Flow conditions
- **Option B:** Define Base Flow conditions; and use data from USGS **daily** EC **measurements** collected during Base Flow conditions
- **Option AB:** Define Base Flow conditions; and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow conditions

Options for Monitoring and Assessment of Compliance – TDS Reach 3

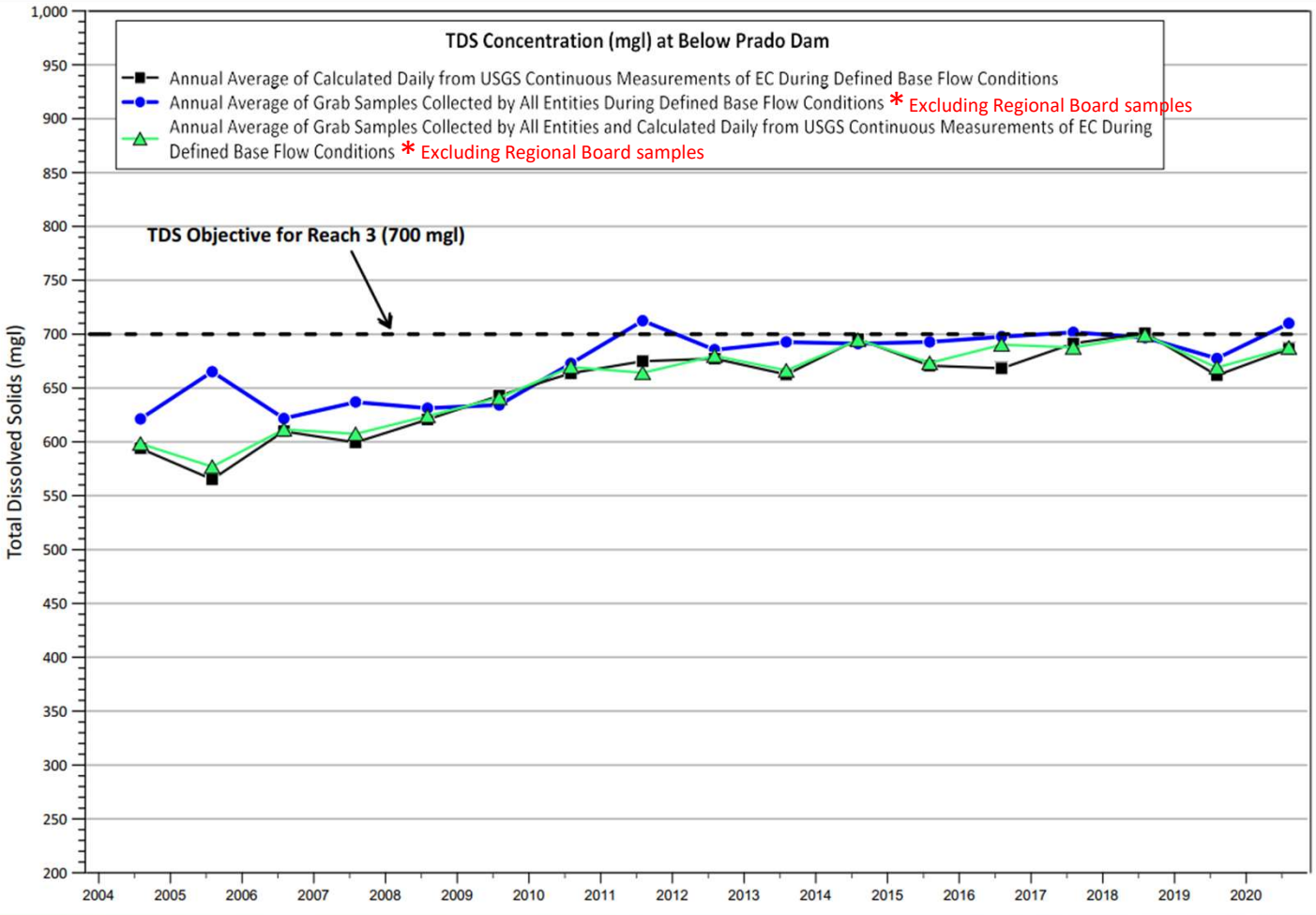


* Possibility for Option A and AB to not include Regional Board sampling

This chart demonstrates historical time series for Option A and AB without Regional Board Grab samples

- **Option A*:** Define Base Flow conditions; and use data from **grab samples** collected during Base Flow conditions
- **Option B:** Define Base Flow conditions; and use data from USGS **daily** EC **measurements** collected during Base Flow conditions
- **Option AB*:** Define Base Flow conditions; and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow conditions

Options for Monitoring and Assessment of Compliance - TDS Reach 3

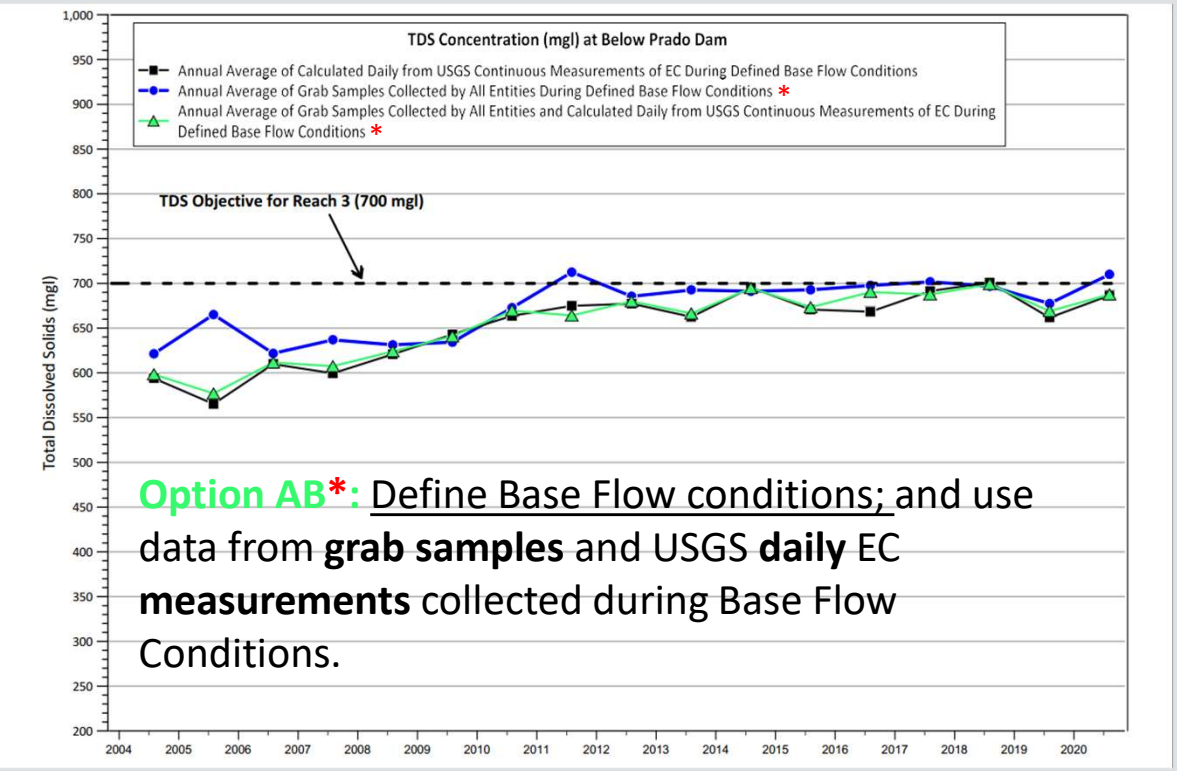


Recommended Option:

- **Option AB*:** <u>Define Base Flow conditions;</u> and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow conditions

*Excluding Regional Board Samples

Recommendation for Monitoring and Assessment of Compliance with the Reach 3 TDS Objective:



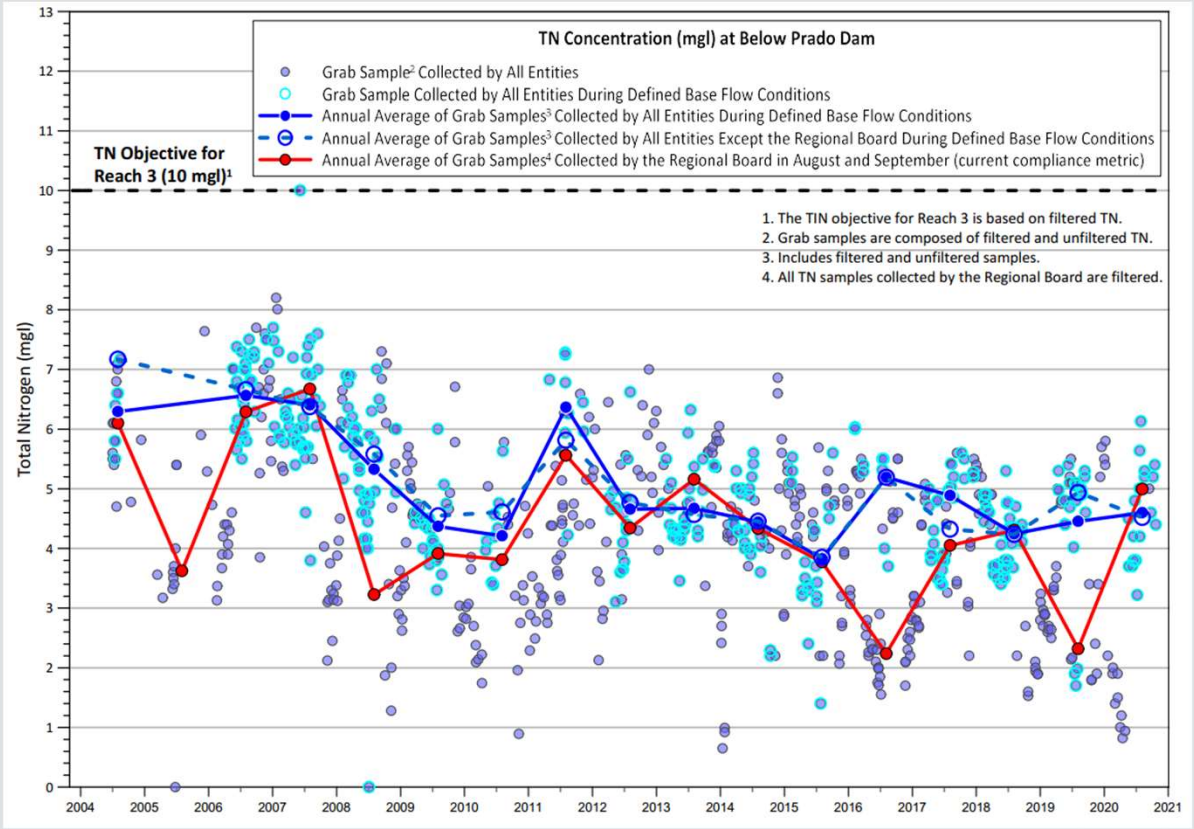
Option AB*: Define Base Flow conditions; and use data from **grab samples** and USGS **daily** EC **measurements** collected during Base Flow Conditions.

*Excluding Regional Board Samples

- Prepare Basin Plan Amendment to clarify the definition of Base Flow Conditions in Reach 3
- Annually, identify which days have Base Flow Conditions using the daily data (precipitation, dam water-level, non-trib.)
- Collect all grab sample data (USGS, OCWD) and USGS daily gage EC data
- Calculate daily EC from daily TDS
- Compile all TDS data for the Base Flow Conditions and evaluate compliance (annual average)

Recommendation for Monitoring and Assessment of Compliance with the Reach 3 TIN Objective:

Reach 3 TIN Objective = 10 mgl *
*Total nitrogen, filtered sample



Option A*: Define Base Flow conditions; and use data from **grab samples** collected during Base Flow Conditions:

*Excluding Regional Board Samples

- Prepare Basin Plan Amendment to clarify the definition of Base Flow Conditions in Reach 3, and to change the TN filtered requirement
- Annually, identify which days have Base Flow Conditions using the daily data (precipitation, dam water-level, non-trib.)
- Collect all grab sample data (USGS, OCWD)
- Compile all TIN data (calculated) for the Base Flow Conditions, and evaluate compliance (annual average)

Next Steps

- Prepare draft 2022 *Santa Ana River Surface Water Quality Work Plan* - draft to Task Force by June 15, 2022 – 3-week review period
- Prepare a Basin Plan Amendment:
  - Clarification on monitoring and assessment of compliance with the surface water objectives for Reaches 2-5
  - Potential updates related to recommended Options AB (TDS) and Option A (TIN) for Reach 3: 1) Characterization and definition of Base Flow Conditions in Reach 3; 2) removal of Regional Board Reach 3 monitoring; and 3) removal of the requirement for TN filtered sample.
- Task Force Meeting is mid to late June 2022, review the draft 2022 *Santa Ana River Surface Water Quality Work Plan*
- Final 2022 *Santa Ana River Surface Water Quality Work Plan* – to Task Force by July 21, 2022
- *August 1, 2022* – submit Final 2022 Work Plan to Regional Board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