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TECHNICAL MEMORANDUM

DATE: October 16, 2025 **PROJECT #:** 9100.78

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PROJECT: Castroville & Eastside Canals and Alternatives Project

SUBJECT: Historical Salinas River Flow Analysis

INTRODUCTION

Monterey County Water Resources Agency (MCWRA) holds water right Permit 11043 (Permit), which authorizes conditional diversion of Salinas River water for irrigation and municipal use (California State Water Resources Control Board, Division of Water Rights, 2013). By diverting available Salinas River water according to the Permit, water that would otherwise reach the ocean could be redirected to areas experiencing low groundwater levels or seawater intrusion.

To advance development of a potential river diversion project, the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA)—in collaboration with MCWRA—is conducting the Castroville and Eastside Canals and Alternatives (C&E Canals) Preliminary Feasibility Study (Study). The C&E Canals Study is designed to review historical project concepts, develop project concepts through which the Permit could be used, and conduct preliminary feasibility of the most viable concepts. Diversion of Salinas River water could help mitigate seawater intrusion or raise groundwater levels in the Eastside Aquifer (Eastside), 180/400-Foot Aquifer (180/400), and/or Langley Area (Langley) Subbasins. A river diversion project could be considered part of a portfolio of projects and actions that jointly achieve groundwater sustainability goals.

As part of the C&E Canals Study, Montgomery & Associates (M&A) analyzed historical Salinas River flow data to estimate an upper bound quantity and timing of potential diversion under the Permit. Unless specified otherwise in this document, references to diversion imply they are related to the Permit. The C&E Canals Study will also evaluate additional options for obtaining surface water rights to divert water from the Salinas River for use. Future feasibility work will refine estimates of flow that could be diverted, such as through considering non-11043 Permit

flow obligations. This may lower the estimated volume of water available for diversion under the Permit compared to the analysis reported herein.

The analysis expands on previous work conducted by M&A in 2019 and 2021 for the 180/400 and Eastside Subbasin Groundwater Sustainability Plans. The 2019 analysis evaluated Salinas River flows from water years (WY) 1969 through 2018 at United States Geological Survey (USGS) Salinas River at Soledad gage (gage number 11151700). In 2021, M&A expanded the analysis to include WY 2019 through WY 2024 and evaluated Salinas River flows at a second USGS gage, Salinas River near Chualar (gage number 11152300).

The Permit allows diversion rates up to 400 cubic feet per second (cfs) and 135,000 acre-feet per year (AF/yr). The analysis used Microsoft Excel and computer scripts to compile historical data on Salinas River flow, releases from the Nacimiento and San Antonio Reservoirs, and Permit diversion conditions. This information was then used to estimate an upper bound amount of surface water that could have been diverted at various diversion rates. For an initial estimate of the upper bound of flow, it was assumed that diversion would occur at only 1 of the 2 permitted diversion locations. Additional evaluation with diversions at both locations may be considered in the next phase of the C&E Canals Study.

HISTORICAL SALINAS RIVER FLOW CONDITIONS

Figure 1 shows the location of the 2 USGS surface water monitoring gages used in this analysis: Soledad and Chualar. Figure 1 also shows the location of the USGS Arroyo Seco gage (gage number 11152000) because flow data from this gage are used to assign the water year type for the Salinas Valley (water year spans from October 1 through September 30), which was used for this analysis. Table 1 shows the criteria used to determine water year type, which is based on indexing the unimpaired average annual flow rates from the Arroyo Seco watershed as described in the Nacimiento Dam Operation Policy (MCWRA, 2018).

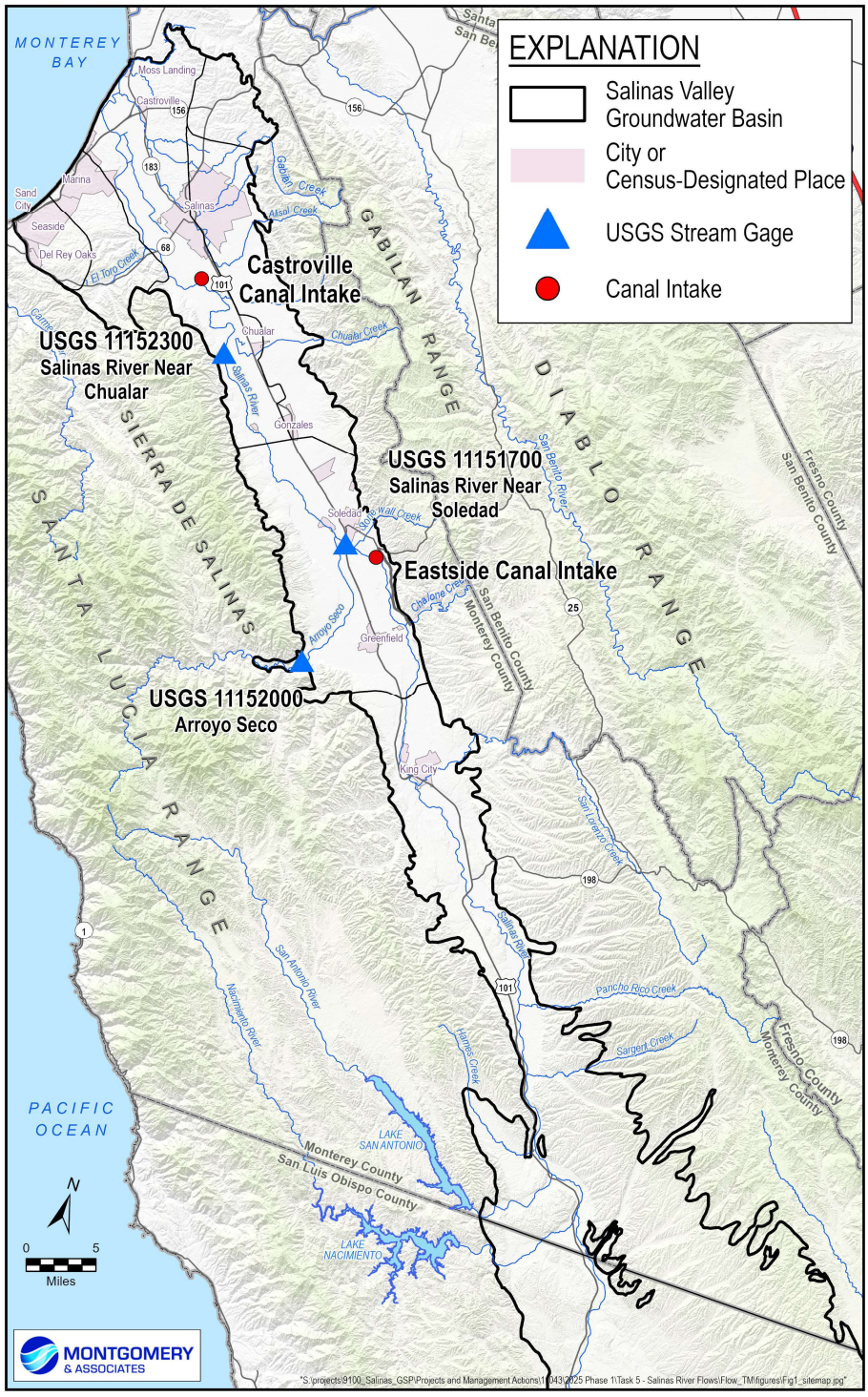

Figure 1. Study Area Map

Table 1. Criteria for Determining Water Year Type

Water Year Type	Percentile Range of Average Daily Flow (exceedance probability)
Wet	0% to and including 25%
Wet-Normal	Over 25% to and including 41.7%
Normal	Over 41.7% to and including 58.3%
Dry-Normal	Over 58.3% to and including 75%
Dry	Over 75% to and including 100%

Daily average flow data from the Salinas River Soledad and Chualar gages were used to evaluate the magnitude and variation in river flow rates. These gages are near the locations of the permitted points of diversion, shown as red circles on Figure 1. The Salinas River Soledad gage is near the Eastside Canal Intake diversion location, and the Salinas River Chualar gage is near the Castroville Canal Intake diversion location. The USGS has recorded flow, surface water level, and selected water quality parameters at the Soledad gage since WY 1969 and at the Chualar gage since WY 1977.

Table 2 shows the average flow rate at the 2 gages for various periods, including from the start of available data through WY 1999 (historical period) and from WY 2000 through WY 2024 (recent period). The recent period was used for all analyses reported herein.

Table 2. Daily Average Salinas River Flow Rates

Time Period Water Years (WY)	Gage	Average Flow Rate (cfs)
Historical Period (WY 1969 – WY 1999)	Soledad [a]	442
Historical Period (WY 1977 – WY 1999)	Soledad	424
Historical Period (WY 1977 – WY 1999)	Chualar	527
Recent Period (WY 2000 – WY 2024)	Soledad	239
Recent Period (WY 2000 – WY 2024)	Chualar	245

[a] – a data gap exists at the Soledad Gage from 1979 to 1983

The recent period was evaluated to assess changes in average flow rates over time and to evaluate data from both gages over a common recent timeframe. The average surface water flow rate at the 2 gages in the recent period is approximately half of the rate in the historical period. The analysis later shows 5 large flow events in the historical period that raise the average flow rate. For the recent period, the similarity of average flow rates at the 2 gages likely reflects the net result of several counterbalancing hydrologic factors including infiltration and evapotranspiration losses and watershed inflows to the Salinas River between Soledad and Chualar.

Figure 2 is a graph of daily average flows at the Soledad and Chualar gages superimposed on the color-coded water year type for the period of record.

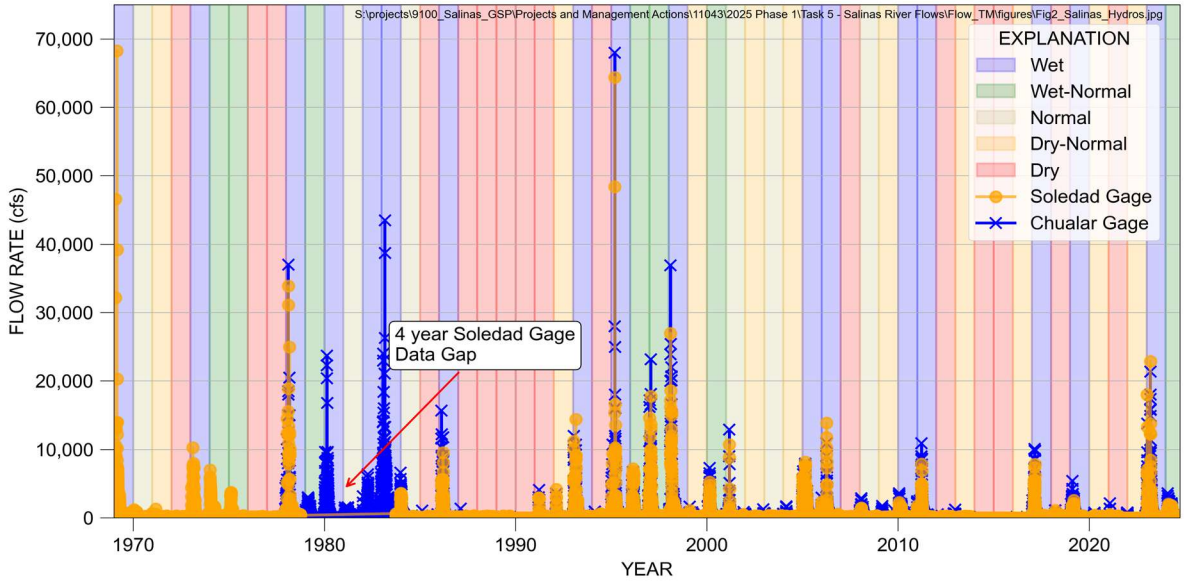

Figure 2. Daily Average Flow (cfs) at the Soledad and Chualar Gages on the Salinas River, WY 1969–2024

The graph shows lower peak flows in the recent period at the 2 gages compared to the historical period. Prior to WY 2000, there were 5 high flow events that exceeded 30,000 cfs at 1 or both gages, whereas there were none after WY 2000. The lower average daily peak flow rates in the recent period reflect an extended period of fewer high flow events. In the recent period, there are also a small number of days with high flows above 10,000 cfs—large outliers that raise the average.

Figure 3 is a graph of average monthly flow rates at the Soledad (orange bars) and Chualar (blue bars) gages for the recent period.

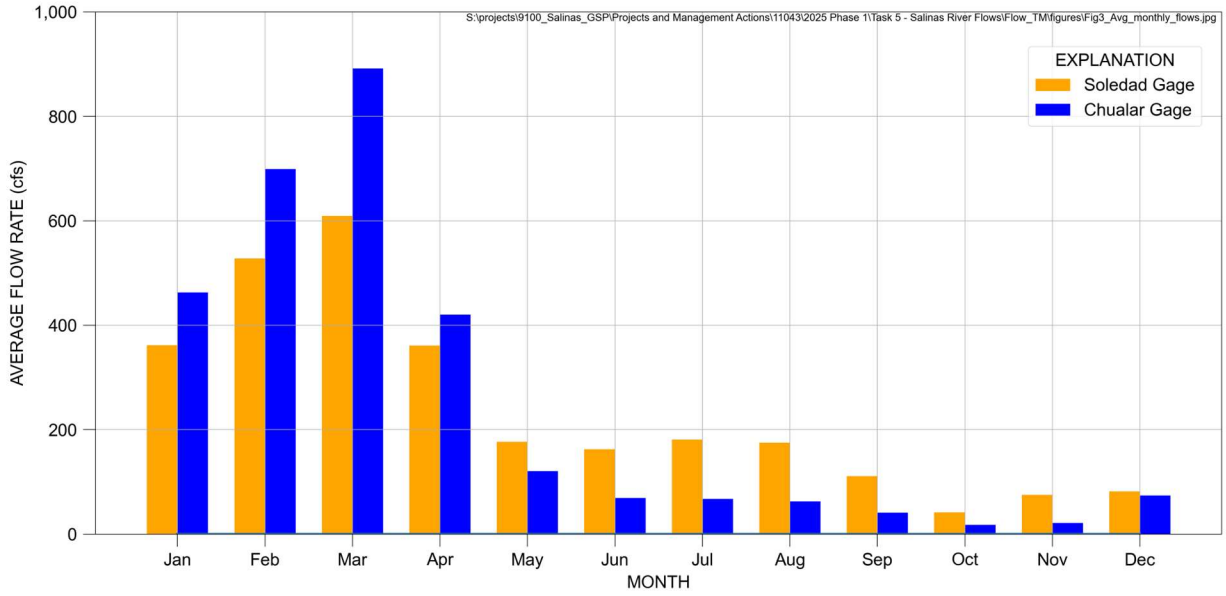

Figure 3. Average Monthly Salinas River Flow Rates for the Recent Period

The graph indicates that the highest average flow rates occurred in January through April, which coincides with most of the typical wet period in the Salinas Valley. After April, average Salinas River flow rates are less than 200 cfs.

RESERVOIR RELEASES

The Nacimiento and San Antonio Reservoirs are operated by MCWRA for multiple purposes and are regulated by various State and Federal Agencies. Daily total release data for the Nacimiento and San Antonio Reservoirs were obtained from the MCWRA's website. Release data are available from WY 1959 for the Nacimiento Reservoir and WY 1967 for the San Antonio Reservoir.

Reservoir operational considerations include groundwater recharge, flood protection, water supply, operation of the Salinas River Diversion Facility (SRDF), environmental flows for habitat and fish passage, agriculture, recreation, and dam safety. MCWRA accounts for the water at its reservoirs using the 30-day rule pursuant to its water rights, which is standard practice for storage water rights. This accounting categorizes water flowing from the reservoir (release) as either withdrawal or regulation. Withdrawal is the release of water that has been stored for 30 days or more and generally occurs when storage is decreasing and when releases are made to meet an intended use such as rediversion at the SRDF, instream flow requirements, or groundwater recharge. Flows that are withdrawn from the reservoir for an intended use would not be available downstream for diversion pursuant to another water right. At times, withdrawal of previously stored water may occur for flood control purposes (without another intended

use) to ensure adequate space is maintained in the reservoirs for additional incoming flows. Regulation is generally water that moves through the reservoir, such as inflow that is bypassed or spilled when the reservoir is full. Withdrawal for flood control purposes and regulation would generally be available downstream for diversion pursuant to another water right, such as Permit 11043. But available flows from the Nacimiento and San Antonio Rivers would likely coincide with wet periods and high flow conditions in the Salinas River. Regardless of withdrawal or regulation, instream flow requirements must first be met.

For this analysis, all flow from the Nacimiento and San Antonio Rivers were subtracted from the Salinas gaged river flow rates at Soledad regardless of how long the water was stored in the reservoirs. Future analysis could differentiate stored water from other reservoir releases, which may increase the estimated flow available for diversion under the Permit.

An important complicating factor that is difficult to assess and is not addressed in this analysis is the degree to which additional reservoir releases would be needed to compensate for any diversion of natural flows under the Permit to meet downstream flow requirements stipulated in MCWRA's water rights for Nacimiento and San Antonio Reservoirs. Separately, Endangered Species Act requirements related to the Permit have not been evaluated and could significantly impact quantities of available excess water. More evaluation of the implications of additional flow obligations will be conducted in Phase 2 of the C&E Canals Study.

EXCESS FLOW AND PERMIT TERMS AND CONDITIONS

Water can be diverted under the Permit at either diversion location only after both of the following conditions are met:

- Flow recorded at the Soledad gage is greater than the total releases from the Nacimiento and San Antonio Reservoirs. This is designated as natural flow.
- The 3-day running average of natural flow at the Soledad gage is greater than the specified minimum monthly natural flow rate requirement in the Permit, shown in Table 3.

Excess Flow: When both conditions are met, the water is considered excess flow**.** This is calculated after reservoir releases are subtracted from Soledad gage flow and the 3-day running average is above specified minimum flows that must be left in the River. Regardless of whether Permit 11043 or a new water right is used, it is assumed that some water would be needed to meet environmental flows.

The required minimum monthly flow rates in the Permit are for unspecified downstream uses, which may not include all flow obligations on the Salinas River. Other obligations could further limit the timeframe and quantity of water that could be diverted using the Permit.

Excess flow can occur at the Chualar gage once the minimum flow requirement is met at the Soledad gage. Excess flow at the Chualar gage is calculated as the difference between the 3-day average of natural flow at the Chualar gage flow and minimum flow requirement at the Soledad gage. This provision potentially enables the diversion of additional watershed flow at the Castroville Canal Intake, including Arroyo Seco flows entering the Salinas River between the Soledad and Chualar gages.

Additional Key Permit 11043 Terms and Conditions: Permit 11043 limits the amount of water that can be diverted to a rate of 400 cfs and a cumulative total of 135,000 AF/yr. Excess flow can only be diverted under the Permit within these the maximum diversion rates. These provisions are analyzed after consideration of all excess flows.

Table 3. Minimum Required Natural Flow Requirement at the Soledad Gage

Month	Minimum Flow Rate (cfs)
January	3.3
February	6.2
March	6.41
April	16.43
May	17.21
June	20.62
July	24.02
August	18.89
September	20.97
October	10.51
November	4.56
December	2.64

ANALYSIS RESULTS

The historical river flow and reservoir release data were used to estimate and study the variability of average monthly and annual excess flow rates for the recent period. Despite uncertainty about additional instream flow obligations that could limit the quantity of available water, the excess flow would theoretically be available for diversion under the Permit. The maximum diversion limits specified in the Permit were not considered to evaluate excess flows;

however, they were considered in the evaluation of potential diversion maximums allowable by the Permit.

Average Monthly Excess Flow Rates

Figure 4 shows the monthly average excess flow rates for the recent period on a 2-axis graph with flow rate in cfs on the left axis and flow rate in AF per month (AF/mo) on the right axis. The latter is helpful for understanding how much water could be available monthly for diversion. This calculation of excess flow is not limited by the maximum diversion allowed under Permit 11043 so would require an additional water right to capture it fully.

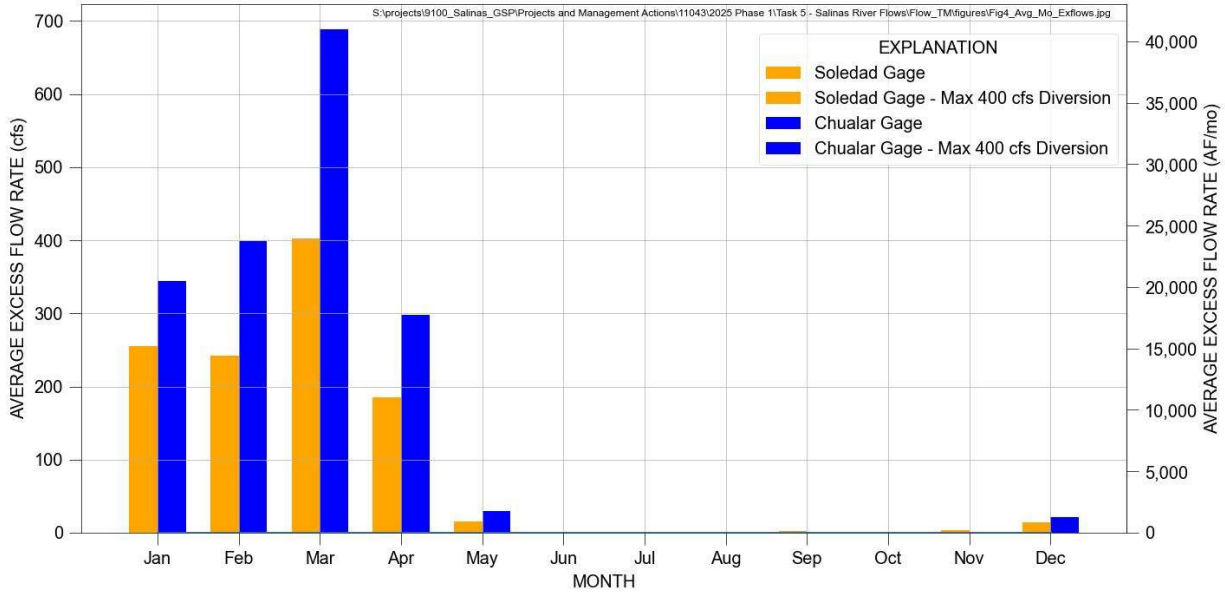

Figure 4. Average Excess Flow Rate for Recent Period

The graph indicates that most of the excess flow occurs from January through April; it is not limited by all of the terms and conditions in Permit 11043. During this time, the average monthly excess flow volumes were between approximately 11,000 and 24,000 AF at the Soledad gage and approximately 18,000 and 41,000 AF at the Chualar gage. The graph also indicates that small amounts of excess water (less than 1,500 AF per month at each gage) occur outside of this time window, mostly within the months of May and December. Excess water in May likely results from recessional flows that follow wet winters. Wet Decembers are common, but runoff response is muted by high percolation rates in seasonally dry channels. On average, the total amount of excess flow from May through December was approximately 2,200 AF at Soledad and 3,200 AF at Chualar.

Flow in the Salinas River is highly variable at daily, monthly, and annual intervals. Variability in potentially divertible excess flow will be an important factor when developing potential

diversion projects on the river. Figure 5 is a box and whisker plot of excess flow rates grouped by month at the Soledad gage. Table 4 summarizes the statistical metrics presented on Figure 5.

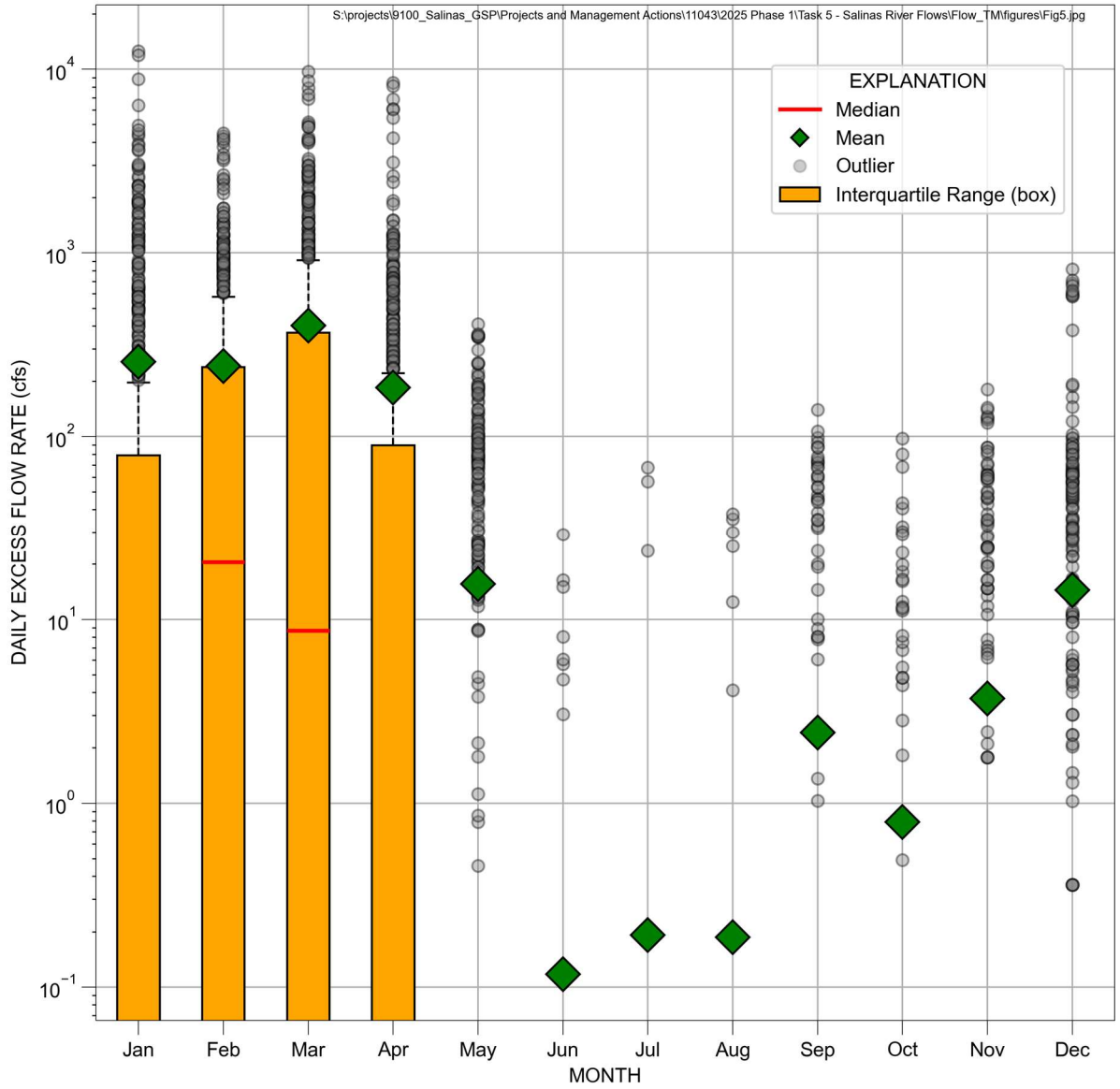

Figure 5: Box and Whisker Plot of Excess Flow Rate Distribution at Soledad for Recent Period

Table 4. Summary Statistics for Flow Rate for the Soledad Gage

Month	Summary Statistics of Flow Rate at Soledad (cfs)					
	Minimum	First Quartile	Median	Mean	Third Quartile	Maximum
Jan	0	0	0	255	79	12,550
Feb	0	0	20	242	238	4,471
Mar	0	0	9	402	368	9,690
Apr	0	0	0	185	90	8,431
May	0	0	0	16	0	408
Jun	0	0	0	<1	0	29
Jul	0	0	0	<1	0	68
Aug	0	0	0	<1	0	38
Sep	0	0	0	2	0	140
Oct	0	0	0	<1	0	97
Nov	0	0	0	4	0	180
Dec	0	0	0	14	0	815

Together, Figure 5 and Table 4 provide a comprehensive view of the variability in excess flow rates at the Soledad gage for the recent period. The box and whisker plot on Figure 5 visually demonstrates that most months have a median excess flow rate of zero (i.e., the median line is absent), meaning that on at least half the days in each month, no excess flow was available for potential diversion under the Permit. This is confirmed by the monthly statistics in Table 4, where the median value is zero for most months.

Despite these low medians, the mean flow rates are much higher, which is due to a small number of days with very high flows—large outliers that raise the average but do not reflect typical daily conditions. The interquartile range (the box) on Figure 5 represents the middle 50% of the data, while the whiskers show the spread of values outside this range. The maximum values in Table 4 further illustrate the impact of these rare, high-flow events.

This pattern reveals that excess flow in the Salinas River is highly variable: most days have little or no excess flow, but a few days experience substantial excess flows. Such variability means that averages alone can be misleading, and planning for diversion facilities must account for both typical and extreme conditions. In summary, while excess flows (and therefore diversion opportunities) exist, they are limited and highly dependent on infrequent, high-flow events, making it essential to consider the full distribution of flow rates—not just the averages—when evaluating diversion project feasibility.

Figure 6 is a box and whisker plot of excess flow rates grouped by month at the Chualar gage. Table 5 summarizes the statistical metrics presented on Figure 6.

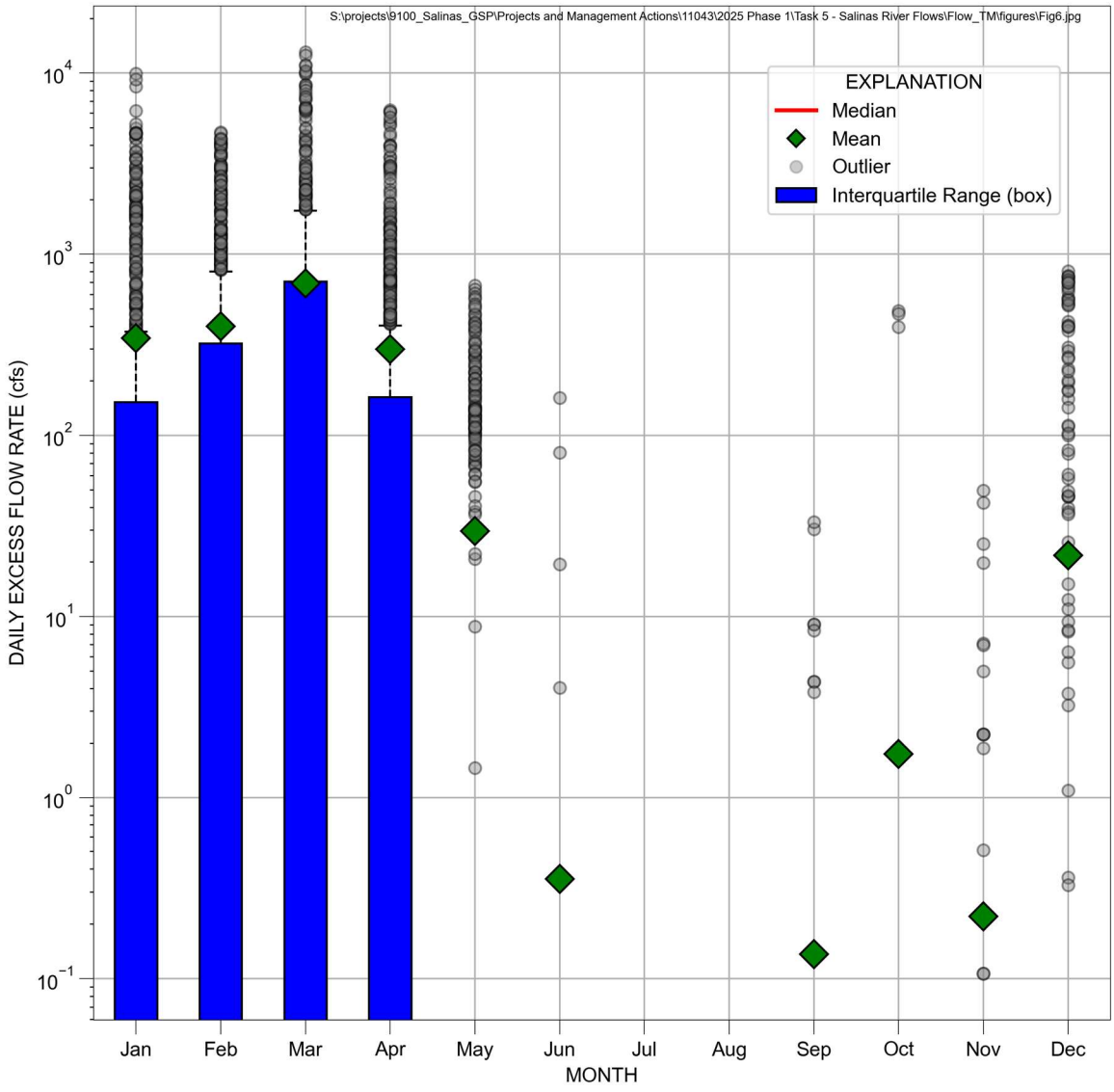

Figure 6. Box and Whisker Plot of Calculated Excess Flow Rate Distribution at Chualar for Recent Period

Table 5. Summary Statistics for Flow Rate at the Chualar Gage

Month	Summary Statistics of Flow Rate at Chualar (cfs)					
	Minimum	First Quartile	Median	Mean	Third Quartile	Maximum
Jan	0	0	0	344	152	9,908
Feb	0	0	0	399	321	4,707
Mar	0	0	0	689	704	13,040
Apr	0	0	0	299	162	6,237
May	0	0	0	30	0	671
Jun	0	0	0	<1	0	161
Jul	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sep	0	0	0	<1	0	33
Oct	0	0	0	2	0	485
Nov	0	0	0	<1	0	49
Dec	0	0	0	22	0	804

Flow conditions in the recent period at the Soledad and Chualar gages have been similar. Like Soledad, the Chualar gage showed highly variable flow rates with most months having a median excess flow rate of zero, and elevated mean flow rates caused by infrequent, high-flow events. The Chualar gage generally recorded higher maximum and mean excess flows compared to Soledad, especially in months with significant watershed contributions. This difference is directly related to the net effect of additional watershed flows downstream of the Soledad gage, notably from the Arroyo Seco River. These flows increase the potential for excess flow at Chualar, particularly during wet periods. The higher potential for excess flow at Chualar may make it a more favorable location for larger diversion facilities.

Table 6 shows the average number of days per month when excess flows occurred over the recent period.

Table 6. Average Number of Days of Excess Flows per Month for the Recent Period

Month	Soledad	Chualar
January	11	9
February	13	11
March	13	13
April	9	9
May	4	4
June	0	0
July	0	0
August	0	0
September	1	0
October	0	0
November	2	0
December	4	2

As indicated on the table, excess flow only occurred an average of 57 days at the Soledad gage and 48 days at the Chualar gage over an entire year. This indicates that a diversion facility could, at most, have operated less than approximately 15% of the time annually. From January through April during the high precipitation period, excess flow occurred an average of 46 days at the Soledad gage and 42 days at the Chualar gage. While there was a substantial amount of excess flow during winter and early spring, a diversion facility could have operated only 35% to 38% of that 4-month period at the Chualar and Soledad gages, respectively.

Annual Amount and Variability in Excess Flow

Figure 7 is a graph of annual excess flow over the recent period; this is not limited by the terms and conditions of the Permit. The graph indicates that the amount of excess flow will vary significantly from year to year based on the water year type. Wet years tend to have 100,000 AF or more of excess flow while dry years would have little to no excess flow.

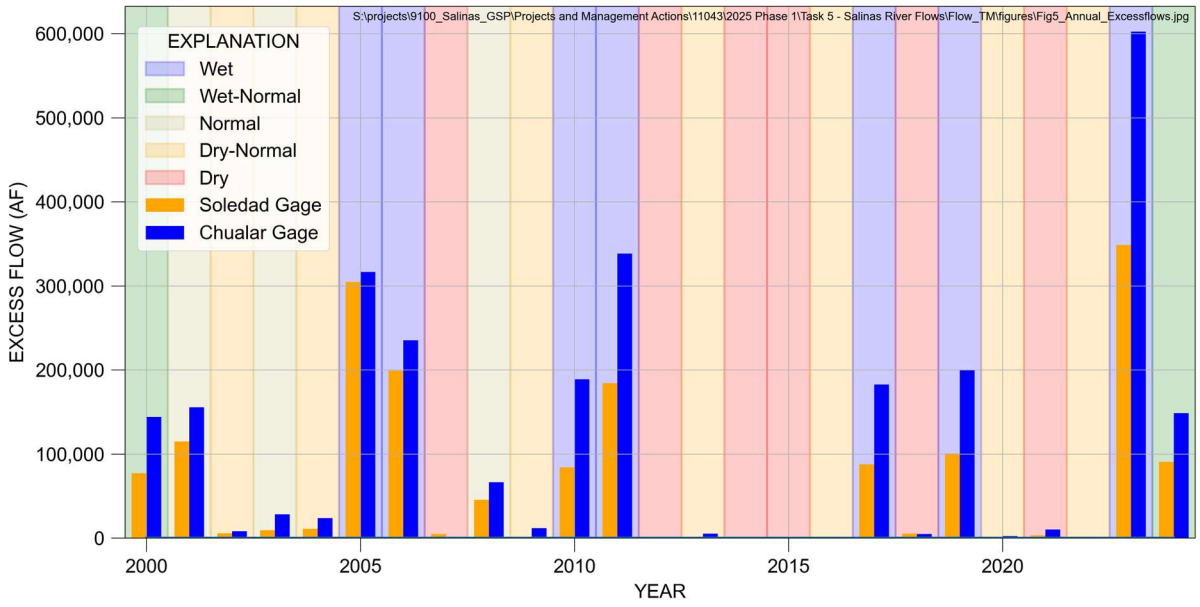

Figure 7. Annual Excess Flow for Recent Period

Table 7 presents annual excess flow volumes and the number of days with excess flow at the Soledad and Chualar gages, along with the difference between the two, for each water year from 2000 to 2024. It also includes summary statistics (mean and standard deviation) for the period.

Table 7. Total Calculated Excess Flow for Recent Period

Water year	Water Year Type	Soledad		Chualar		Difference Between Gage Excess Flow (AF) Soledad minus Chualar
		Excess Flow (AF)	Days with Excess Flow	Excess Flow (AF)	Days with Excess Flow	
2000	Wet-Normal	77,187	119	143,976	99	-66,790
2001	Normal	114,827	127	155,803	108	-40,977
2002	Dry-Normal	5,946	59	8,080	30	-2,134
2003	Normal	9,453	108	28,197	72	-18,744
2004	Dry-Normal	10,966	78	23,669	56	-12,702
2005	Wet	304,864	139	316,824	135	-11,960
2006	Wet	199,062	187	235,484	155	-36,422
2007	Dry	4,922	64	871	27	4,052
2008	Normal	45,525	106	66,589	87	-21,064
2009	Dry-Normal	349	12	11,778	7	-11,429
2010	Wet	84,211	150	188,723	120	-104,512
2011	Wet	184,374	160	338,521	155	-154,147
2012	Dry	1,321	23	671	11	650
2013	Dry-Normal	98	17	5,270	11	-5,172
2014	Dry	71	3	0	0	71
2015	Dry	0	0	0	0	0
2016	Dry-Normal	0	0	0	0	0
2017	Wet	88,001	70	182,661	67	-94,660
2018	Dry	5,394	17	5,008	5	386
2019	Wet	100,471	80	199,461	75	-98,990
2020	Dry-Normal	1,461	11	2,457	9	-995
2021	Dry	3,405	22	10,088	9	-6,682
2022	Dry-Normal	0	0	0	0	0
2023	Wet	348,732	138	602,336	128	-253,604
2024	Wet-Normal	90,715	119	148,732	97	-58,017
	Mean	67,254	72	107,008	59	-39,754
	Standard Deviation	95,872	58	145,467	53	60,135

The information in Table 7 indicates the following:

Flow Variability

- Annual excess flow varies significantly depending on the water year type.
- Wet years show very high excess flows—often exceeding 100,000 AF at both gages, and sometimes much more.

- Dry years show minimal or even zero excess flow.
- Over the recent period, there would have been 3 years with no excess flow near Soledad and 4 years with no excess flow near Chualar.

Flow Differences

- Chualar gage consistently had higher excess flows than Soledad, especially in wet years. For example, in 2023, Chualar recorded 602,336 AF compared to Soledad's 348,732 AF—a difference of over 250,000 AF. The difference is related to additional watershed flows entering the Salinas River between the 2 gages, notably from the Arroyo Seco River.

Excess Flow Frequency

- The number of days with excess flow also varies widely. Wet years can have more than 100 days with excess flow, while dry years may have fewer than 20 days, or none at all.
- Chualar generally has fewer days with excess flow than Soledad, but the volume per event is often higher at Chualar.

Summary Statistics

- Mean annual excess flow at the Chualar gage is higher than the Soledad gage, with average flow at the Chualar gage nearly 40,000 AF/yr higher.
- Large standard deviation at both gages indicates substantial flow variability from year to year.

Table 8 shows the average number of days per year that excess flow occurred for the different water year types. Wet years had an average of 132 days of excess flow at Soledad and 110 days at Chualar, whereas dry years had excess flow as few as 22 days per year at Soledad and 9 days per year near Chualar, with 3 years having no excess flow at Soledad and 4 years at Chualar.

Table 8. Average Number of Days with Excess Flows by Water Year Type for the Recent Period

Water Year Type	Soledad	Chualar
Dry	22	9
Dry-Normal	25	16
Normal	114	89
Wet-Normal	119	98
Wet	132	119

Average Monthly Excess Flow Rates Under Permit Terms and Conditions

Permit 11043 restricts water diversion to a maximum rate of 400 cfs and a cumulative total of 135,000 AF/yr. Excess flow can only be diverted under the Permit within these the maximum diversion rates. Figure 8 shows the same average monthly excess flow as on Figure 4, calculated by subtracting reservoir releases from the Soledad gage flow. This calculation only includes days when the 3-day running average exceeds the minimum required instream flows.

The darker bands in Figure 8 represent the volume of water that could have been diverted under the Permit's terms and conditions, including the 400 cfs cap. Because the bars reflect monthly averages of daily excess flows – and many days fall below the 400 cfs threshold – the average excess flow remains under the permitted maximum rate.

The analysis illustrates that, historically, significantly less water could have been diverted under the Permit than without the 400 cfs diversion limit. Future analyses can refine these monthly averages by differentiating stored water from other reservoir releases and incorporating downstream flow requirements.

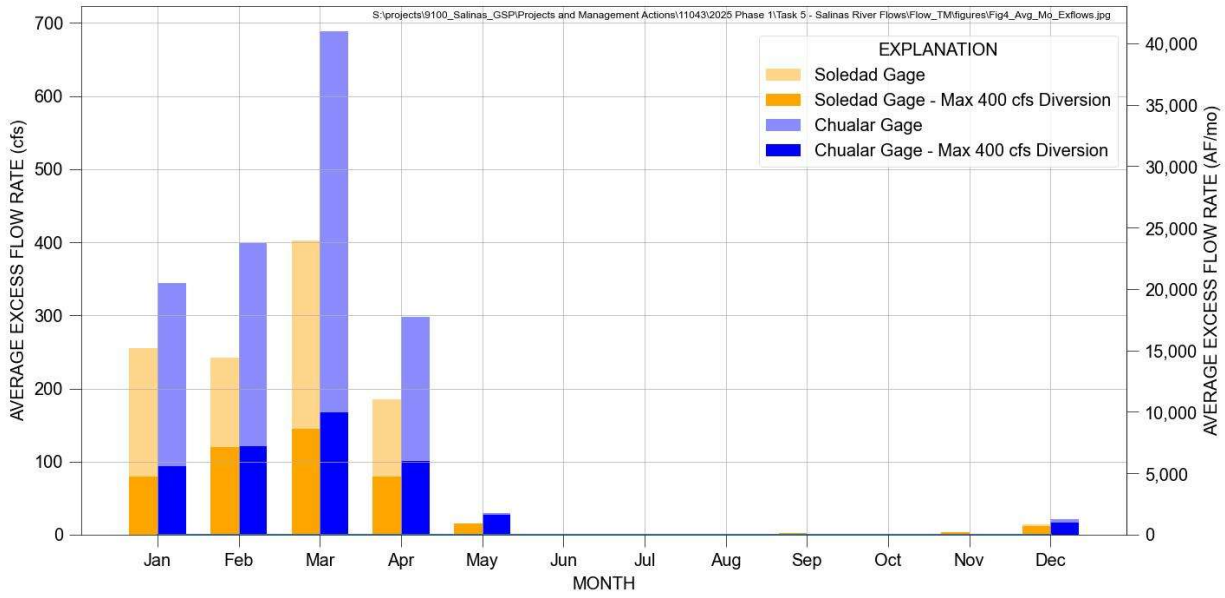

Figure 8. Average Excess Flow Rate Under Permit Conditions for Recent Period

Implications of Recent Period Excess Flow Condition on Diversion Facility Operation

Potential diversion facility sizes from 10 to 400 cfs were considered to estimate the annual average volume of excess flow that could potentially be diverted. As shown in Table 9, an annual average of 1,400 to 27,300 AF could have been diverted at the Eastside Canal Intake near Soledad for diversion sizes ranging from 10 to 400 cfs, respectively. Similarly, an annual

average of 1,100 to 31,700 AF could have been diverted at the Castroville Canal Intake near Chualar for diversion sizes ranging from 10 to 400 cfs, respectively. These volumes were calculated by tallying the calculated diversion amounts for a given diversion facility size over the entire recent period and then dividing by the length of the recent period (25 years). For comparison, a 35 cfs diversion is similar in size to the existing SRDF, which has a maximum diversion capacity of 36 cfs.

Table 9. Annual Average Volume of Potential Diverted Excess Flow by Diversion Size for the Recent Period

Diversion Size (cfs)	Annual Average Potential Diversion Volume (AF)	
	Eastside Canal Intake (near Soledad)	Castroville Canal Intake (near Chualar)
10	1,400	1,100
20	2,700	2,200
35	4,400	3,800
50	6,100	5,300
75	8,500	7,700
200	17,500	18,200
400	27,300	31,700

Figure 9 is a graph of diversion rate versus diversion size for the recent period.

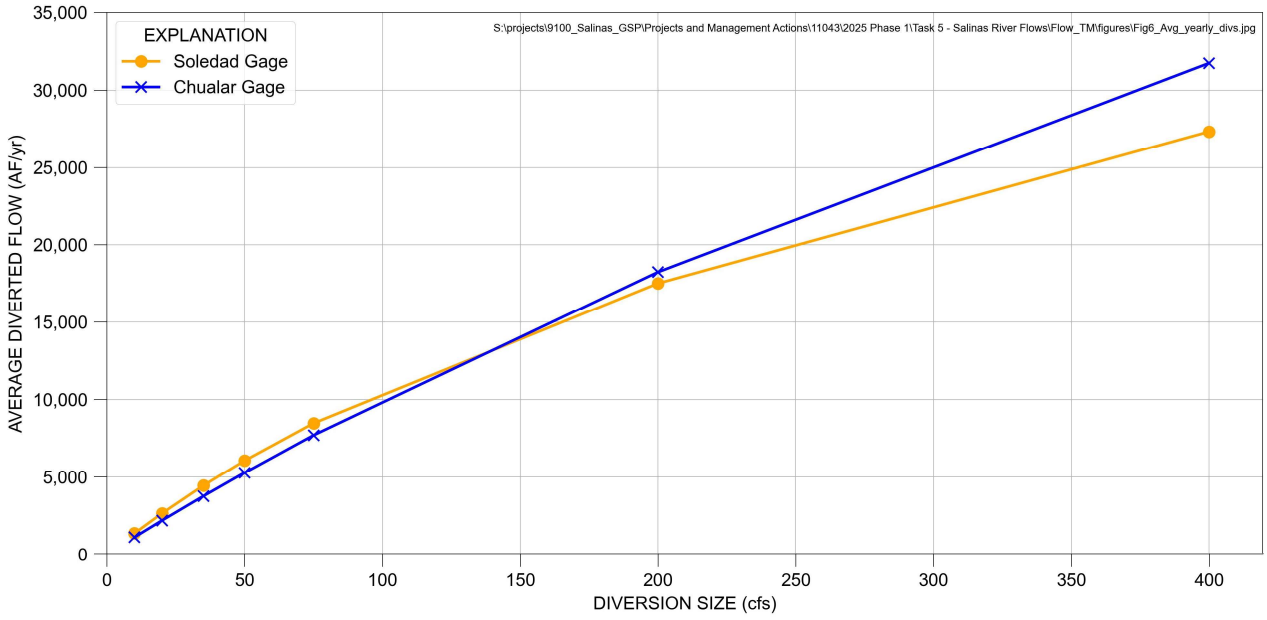

Figure 9. Average Annual Potential Diverted Flow vs Diversion Size for the Recent Period

As indicated on the graph, for diversions smaller than 200 cfs, the annual diverted volumes would be similar at each of the 2 diversion locations. For diversions larger than 200 cfs, more water could be diverted near Chualar than near Soledad due to the influence of Arroyo Seco flows. A 400 cfs diversion near Chualar could divert an average of approximately 4,000 AF/yr more than a diversion near Soledad.

CONCLUSIONS

The following conclusions were made based on the analysis of historical Salinas River flow:

1. Long-Term Flow Trends and Hydrologic Shifts

- **Decline in Average Flows:** The average daily flow rates at both the Soledad and Chualar gages have dropped by about half in the recent period (WY 2000–2024) compared to the historical period (WY 1969–1999 for Soledad, WY 1977–1999 for Chualar). This suggests a substantial long-term reduction in river flows.
- **Fewer Extreme Flow Events:** Before WY 2000, 5 flow events exceeded 30,000 cfs at 1 or both gages; after WY 2000, no such events occurred.

2. Seasonal Patterns and Monthly Flow Distribution

- **Wet Season Dominance:** The highest average monthly flows occurred from January through April, when demand is low. Flows drop below 200 cfs after April.
- **Monthly Excess Flow (not limited by Permit terms and conditions):** During January through April, average monthly excess flows for the recent period at Soledad range from approximately 11,000 to 24,000 AF, and at Chualar from approximately 18,000 to 41,000 AF. After April, excess flows are much smaller.

3. Excess Flow Amount, Variability, and Statistical Insights

- **Annual Excess Flow:** Wet years show very high excess flows (often exceeding 100,000 AF at both gages), while dry years show minimal or even zero excess flow. Over the recent period, there were 3 years with no available potential diversions at Soledad and 4 years with none at Chualar.
- **Median vs. Mean:** Most months have a median excess flow rate of zero, meaning that on at least half the days, no excess flow is available. However, the mean is much higher due to a few days with very high flows—these outliers skew the average and highlight the importance of considering full data distributions, not just averages.

- **Box and Whisker Analysis:** The interquartile range (middle 50% of data) of excess flow rate is often very low, while maximum values can be extremely high, showing that diversion opportunities are rare but sometimes substantial.

4. Comparison of Diversion Locations

- **Chualar vs. Soledad:** The Chualar gage generally records higher maximum and mean excess flows than Soledad, especially in wet months. This is due to additional watershed inflows (notably from Arroyo Seco). Chualar may be more favorable for larger diversion facilities, while Soledad offers more frequent but smaller diversion opportunities.

5. Operational Windows and Frequency

- **Limited Days for Potential Diversion:** On average, excess flow occurred only 46 days at Soledad and 42 days at Chualar from January through April, less than 40% of those 4 months. Over a full year, excess flows would have occurred less than 15% of the year.
- **Annual and Water Year Type Variability:** Wet years can have over 100 days with excess flow, while dry years may have fewer than 20 days, or none. Some years would have had no excess flows at either gage.

6. Permit 11043 Rules and Flow Accounting

- **Permit Terms and Conditions:** Diversion is only allowed when the flow at Soledad exceeds reservoir releases and the 3-day running average of natural flow is above the monthly minimum specified in the permit. In addition, 400 cfs is the maximum diversion rate. These conditions, along with other downstream obligations, restrict the timing and quantity of water available for diversion.
- **Flow Accounting:** All flow released from the Nacimiento and San Antonio Reservoirs is subtracted from the Soledad flow to determine "natural flow." Only flow conditions meeting Permit conditions are considered available for diversion under Permit 11043. Future analysis could differentiate stored water from other reservoir releases which may increase the estimated flow available for diversion under the Permit. Future analysis could also consider the degree to which additional reservoir releases would be needed to compensate for any diversion of natural flows under the Permit to meet environmental flow requirements, and the Endangered Species Act may decrease the estimated flow available for diversion under the Permit.

7. Excess Flow Under Permit 11043 and Potential Diversion Yields

- **Diversion Amount**: On average, diversions on the Salinas River pursuant to Permit 11043 could have diverted approximately 1,100 to 31,700 AF/yr depending on the

diversion facility size, ranging from 10 to 400 cfs. The largest permissible diversion rate of 400 cfs would on average have diverted less than 25% of the total annual permitted diversion amount of 135,000 AF.

- **Importance of Diversion Facility Size:** For the Permit diversion sizes less than 200 cfs, annual average volumes diverted are similar at both locations. For larger facilities (up to 400 cfs), more water could have been diverted near Chualar due to additional watershed inflows. For example, a 400 cfs diversion near Chualar could divert an average of approximately 4,400 AF/yr more than near Soledad.
- **Operating Below Capacity:** Most of the time, a Permit 11043 diversion facility would have operated at less than 10 cfs, and a large facility capable of diverting more than 200 cfs would have operated near its capacity less than 5% of the time.

8. Implications for Project Planning

- **Infrastructure Sizing:** The variability in flow rates and operational windows means that diversion infrastructure must be sized and managed to accommodate both typical and extreme conditions. Planning should consider not just averages, but the full range of observed and calculated flows.
- **Regulatory and Environmental Constraints:** The analysis does not account for all downstream obligations or environmental requirements, which may further limit diversion opportunities and reduce the quantities of water available for diversion under the subject permit.

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