STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY **GAVIN NEWSOM,** *Governor*

DEPARTMENT OF WATER RESOURCES
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July 15, 2020 *Electronically Filed*

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street Northeast
Washington, DC 20426

FERC Project No. 14797—Devil Canyon Project Relicensing,
San Bernardino County—Response to Additional Information Request

Dear Ms. Bose:

On November 20, 2019, the California Department of Water Resources (DWR) filed with the Federal Energy Regulatory Commission (FERC) its *Final Application for New License Major Project—Existing Dam for the Devil Canyon Project Relicensing, FERC Project No. 14797*. By letter dated April 16, 2020, FERC accepted DWR's license application, and requested additional information and studies by July 15, 2020. This letter responds to FERC's April 16, 2020 request for additional information and studies.

By letter dated April 24, 2020, DWR confirmed with FERC that DWR, as FERC's designated non-federal representative for day-to-day consultation under Section 106 of the National Historic Preservation Act, intends to continue consultation with the State Historic Preservation Officer (SHPO) and that it had notified SHPO of receipt of FERC's April 16, 2020, *Acceptance Letter and Request for Additional Information and Studies.*

On July 9, 2020, DWR electronically filed, under separate cover, its response to Item 5 of Schedule A (electronically filed the 11 final relicensing studies). In this filing, DWR electronically files the remaining responses to FERC's Schedule A request (Additional Information) as Enclosure 1 and Schedule B request (Additional Studies) as Enclosure 2.

If you have any questions or would like to discuss this further, please contact me at (916) 557-4554 or your staff may contact Jeremiah McNeil, DWR's Relicensing Program Manager at (916) 557-4555.

Sincerely,

Gwen Knittweis, Chief
Hydropower License Planning and Compliance Office
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Enclosures

cc: (See attached Distribution List.)

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ENCLOSURE 1

DWR's RESPONSE TO SCHEDULE A - ADDITIONAL INFORMATION[1]

Exhibit D

1. FERC-1 Comment:

[P]lease provide the net investment value for the project as of December 31, 2019.

DWR Response:

The net investment value for the Project as of December 31, 2019 is $202,642,000.

2. FERC-2 Comment:

[P]lease: (a) revise section 6.1.1 to include a separate table (new table 6.1-1) comparable to the content of the current table 6.1-1 that provides only the measures and associated costs that are being continued; and (b) revise section 6.1.2 to include a new table (new table 6.1-2) comparable to the content of the current table 6.1-1 that only includes new measures and their associated costs and/or other additional measures and costs above and beyond what is provided in the new table for section 6.1.1 that would constitute only those additional costs associated with the DWR proposed project.

DWR Response:

Table 6.1-1 in revised Section 6.1.1, included here as Appendix A, provides a breakdown and cost of existing environmental and recreation measures that the California Department of Water Resources (DWR) proposes to be continued in the new license. Table 6.1-2 in revised Section 6.1.2, included here as Appendix A, provides a breakdown and cost of new measures and existing measures that would have costs above and beyond the environmental and recreational costs provided in Table 6.1.1. DWR proposes for inclusion in the new license. Table 6.1-2 shows DWR's estimated cost to implement the new measures and the costs for the existing measures that are in addition to the costs shown in Table 6.1-1.

3. FERC-3 Comment:

When you revise Exhibit D, sections 6.1.1 and 6.1.2, please provide a table showing how the costs for recreation measure RR1 will be implemented each

[1] For each of the Additional Information Requests (AIR) in FERC's August 27, 2020 letter, DWR has assigned an alpha-numeric designation to the AIR (e.g., FERC-1), repeated the salient parts of the AIR here, and provided DWR's response to the AIR here or in appendices to this Enclosure.

year of the first 30 years of the new license term, consistent with the schedule provided in the Recreation Management Plan table 4.0-1.

DWR Response:

Table 6.1-3 in revised Section 6.1.2, included here as Appendix A, provides DWR's anticipated annual cost over the first 30 years of the new license for new measures in DWR's proposed Recreation Management Plan.

4. FERC-4 Comment:

Please provide the capacity rate in $/kW-year and capacity in kW used to compute the annual capacity value.

DWR Response:

The capacity rate used to compute the annual capacity value of $3,067,000 in Table 6.2-1 of Exhibit D under the No Action Alternative is $3.48/kW-month. This rate is provided in the California Public Utilities Commission's (CPUC) 2017RAReport.pdf report file. This rate is converted to $/kW-year by multiplying it by 12 to arrive at $41.76/kW-year. The CPUC's Resource Adequacy (RA) program requires load serving entities, such as DWR, to procure capacity so that capacity is available to the California Independent System Operator when and where needed. The dependable capacity is calculated using five years of DWR's reported RA data for the Devil Canyon Powerplant. Capacity data submitted for each month through monthly filings were averaged for the calendar years 2013 through 2017. A five-year average of these data was then used to arrive at the yearly RA capacity. The yearly RA capacity was then multiplied by the local Los Angeles Basin area RA price ($3.48/kW-year) found in CPUC's 2017RAReport.pdf report file to calculate a yearly benefit. These values are shown in Appendix A.

Final Study Reports

5. FERC-5 Comment:

[P]lease file the final study for the studies listed below.

Study 4.1.1 Aquatic Invasive Species

Study 4.1.2 Botanical Resources

Study 4.1.3 Non-Native Invasive Plants

Study 4.1.4 ESA-Listed Plants

Study 4.1.5 Special-Status Terrestrial Wildlife Species – California Wildlife Habitat Relationships

Study 4.1.6 ESA-Listed Terrestrial Wildlife Species – California Wildlife Habitat Relationships

Study 4.1.7 ESA-Listed Bird Species Riparian Habitat Evaluation

Study 4.1.8 Water Quality and Temperature

Study 4.1.9 Recreation Facilities Condition and Demand Assessment

Study 4.1.10 Cultural Resources

Study 4.1.11 Tribal Resources

DWR Response:

DWR eFiled with FERC the 11 final study reports on July 9, 2020. The studies were eFiled individually and include the data summary and associated data files related to each study.

Cultural Resources

6. FERC-6 Comment:

In section 5.2 of the draft historic properties management plan (HPMP) associated with your final license application, it is not clear if all eight of the unevaluated archaeological sites are accounted for in the narrative. Please clarify and be more precise on what particular project-related adverse effects could be occurring on these particular sites, and what the proposed specific management measures would be for each site.

DWR Response:

DWR revised Section 5.2 of the HPMP to include a table (Table 5.2-1) that lists each of the eight unevaluated archaeological sites, plus two additional archaeological sites DWR considers to be unevaluated, and the observed Project effects, if any, identified at each of the 10 sites, as well as the proposed site-specific management measures. This information is further summarized in the text immediately following the table under Section 5.2 of the HPMP.

7. FERC-7 Comment:

Please remove the narrative in section 6.7 of the HPMP, and simply state that any potential dispute would be addressed in the dispute resolution clause of the associated programmatic agreement that would implement the HPMP, upon license issuance.

DWR Response:

DWR replaced the narrative in Section 6.7 of the HPMP with the text provided by FERC, and updated the HPMP to incorporate comments provided by participating Native American tribes and agencies that were received in 2019 and during the recent February 6, 2020 Section 106 consultation meeting. The HPMP was recently re-distributed to participating agencies and tribes for another 30-day

review on June 1, 2020 as well as coordination with the State Historic Preservation Officer (SHPO) occurred for requesting SHPO's review of the HPMP on June 15, 2020. Following the conclusion of those reviews, which are anticipated to conclude on July 1, 2020 and July 15, 2020 respectively, DWR intends to update the HPMP accordingly with any comments received from the participating tribes and agencies, and SHPO. DWR will then submit the updated HPMP to the SHPO for additional review and concurrence. Once consultation with the SHPO on the HPMP is completed, DWR will file the final HPMP with FERC by September 30, 2020. On April 24, 2020, DWR filed with FERC a notice advising FERC that the filing of the HPMP is expected to be delayed until September 30, 2020.

8. FERC-8 Comment:

Please seek concurrence from the California State Historic Preservation Office (SHPO) on all National Register of Historic Places (NRHP) eligibility determinations made in the draft HPMP and associated cultural resources studies.

DWR Response:

DWR provided the technical reports, that were prepared to document the results of the Cultural Resources Study and the Tribal Resources Study, to the SHPO for review and concurrence with the identification efforts for historic properties and NRHP eligibility recommendations. The SHPO provided its concurrence on the NRHP recommendations for all archaeological, tribal, and built environment resources that are discussed in the technical reports. The HPMP was updated accordingly, and as discussed above, DWR recently redistributed the HPMP to the participating tribes and agencies, and SHPO for review. Upon the conclusion of those consultations, DWR will then submit the updated HPMP to the SHPO for additional review and concurrence. Once consultation with the SHPO on the HPMP is completed, DWR will file the final HPMP with FERC by September 30, 2020. Additionaly, on June 25, 2020, DWR filed the technical reports with FERC that were recently updated to include the results of DWR's consultation with the SHPO on the NRHP eligibilities and the status of remaining ongoing consultation with the SHPO on historic properties identification efforts and the findings of effect.

9. FERC-9 Comment:

Please ensure that all comments made on the draft HPMP have been addressed, and revise the HPMP, accordingly. If you did not adopt any particular recommendation on the draft HPMP, give your reasons why. Add a new section to the HPMP that accounts for all comments received on the draft HPMP, and where you made the appropriate revisions. Add all correspondences made on the draft HPMP in this section, or add an appendix to the revised HPMP with these correspondences.

DWR Response:

The final HPMP will include responses to the four HPMP-related Schedule A additional information requests. The additional information request responses relative to the HPMP, along with all other comments received previously, are included in Appendix N of the HPMP. Copies of correspondences with the participating tribes and agencies received to date are included in the HPMP as Appendices A, B, and C, as appropriate. As mentioned above, the HPMP will be updated and re-submitted to the SHPO for review following the completion of the additional consultation with tribes and agencies and after incorporating any comments received from SHPO that was provided as part of recent distributions.

APPENDIX A

DWR'S RESPONSE TO SCHEDULE A EXHIBIT D, REVISED SECTIONS 6 AND 7

6.0 ANNUAL COST OF OPERATIONS AND VALUE OF PROJECT POWER UNDER THE NO ACTION ALTERNATIVE AND DWR'S PROPOSAL

Section 6.0 is divided into two major sections, each of which addresses the No Action Alternative and DWR's Proposal. Section 6.1 discusses Project costs, and Section 6.2 presents Project power benefits.

6.1 ANNUAL COST OF OPERATIONS

6.1.1 No Action Alternative

DWR estimates that, based on historical expenditures, the average annual operations and maintenance (O&M) cost under the No Action Alternative is $27,015,000. The estimated average annual cost includes three components. The first component is $20,754,000, incurred by DWR for normal O&M, station power, annual renewals and replacements, major infrastructure repairs/improvements and capital components. The second component is $5,821,000 for environmental and recreational measures. On average, the California Department of Parks and Recreation (DPR) expends $4,949,000 annually and DWR expends $372,000 annually on Project-related recreation within the Silverwood Lake State Recreation Area, for an annual total of $5,321,000. In addition, DWR expends approximately $500,000 each year related to environmental measures. The third component is that, under the No Action Alternative, DWR intends to recover its cost to obtain a new license for the Project. DWR estimates this cost is $13,200,000, or $440,000 annually, over 30 years (see Section 8 of this Exhibit D).

As a State of California agency, DWR is not subject to payment of any State, local, or federal taxes associated with the Project.

DWR does not have shareholders and, therefore, does not finance projects, including the relicensing, with equity capital. Any new construction, as well as the relicensing, is financed through various financial instruments, mainly the issuance of Revenue Bonds. DWR has maintained an exceptional bond rating throughout the years, including maintaining a AAA Standard and Poor's rating since 2001. Costs of borrowing for new construction since the original Project facilities were completed are reported in Bulletin 132, an annual publication produced by DWR and available on the following web site: http://www.water.ca.gov/.

Table 6.1-1 provides a breakdown of estimated environmental and recreational costs under the No Action Alternative that DWR anticipates will continue, at least in part, under DWR's Proposal for the new license.

Table 6.1-1. Estimated Costs Related to Implementation of Environmental and Recreation Measures in DWR's Existing License that are Anticipated to Continue Under the New License

Existing License	Proposed for Continuation in Some Part under DWR's Proposed Measure	Total Capital Cost Over 30 Years (2018 U.S. Dollars)	Total O&M Cost Over 30 Years (2018 U.S. Dollars)	Annualized Cost Over 30 Years[1] (2018 U.S. Dollars)
Environmental- and Non-DPR-Recreational-Related Measures				
Article 50, Exhibit R, Recreation Facilities - DWR	RR1, Recreation Facilities Plan	$0	$10,710,000	$357,000
Article 51, Exhibit S, Fish Stocking in Silverwood Lake	AR1, Implement Silverwood Lake Fish Stocking Measure	$0	$8,820,000	$294,000
Article 51, Exhibit S, Use of Algicides in Silverwood Lake	AR2, Implement Aquatic Invasive Species Management Plan	$0	$3,000,000	$100,000
Article 57, Revegetation	TR1, Implement Integrated Vegetation Management Plan Integrated	$0	$600,000	$20,000
Article 58, Maintain Silverwood Lake Surface Water Levels for Recreation	WR1, Maintain Silverwood Lake Elevations	$0	$450,000	$15,000
Articles 59, 60 & 402, Public Safety	LU3, Develop and Implement Project Safety Plan	$0	$2,580,000	$86,000
Subtotal		$0	$26,160,000	$872,000
DPR Recreational-Related Measures				
Article 50, Exhibit R, Recreation Facilities - DPR	RR1, Implement Recreation Management Plan	$0	$148,470,000	$4,949,000
Subtotal		$0	$148,470,000	$4,949,000
Total		**$0**	**$174,630,000**	**$5,821,000**

Notes:
[1]Total annualized costs are calculated by summing Capital Cost and Total O&M Cost, and dividing the sum by 30.
Key:
DPR = California Department of Parks and Recreation
DWR = California Department of Water Resources
O&M = operations and maintenance
U.S. = United States

6.1.2 DWR's Proposal

DWR estimates that the average annual O&M cost under DWR's Proposal is approximately $28,001,000. Under DWR's Proposal, the non-environmental and non-recreational average annual cost of $20,754,000 would continue, as would DWR's recovery of the relicensing costs, annualized at $440,000, that are both described in Section 6.1.1. The environmental and recreational average annual cost of $5,821,000 under the No Action Alternative, shown in Table 6.1-1, would continue under the new license.

In addition, DWR estimates that its proposal would cost on average an additional $986,000 annually - costs that would be above and beyond the environmental and recreational costs related to the No Action Alternative shown in Table 6.1-2, and that need to be added to the expected cost under the new license. This incremental cost is due to a continuation or expansion of some articles in the existing license or proposed new measures. Refer to Appendix E of Exhibit E for the full text of each of DWR's proposed measures, and to the resource sections in Exhibit E for a description of how each measure was developed. Table 6.1-2 provides DWR's estimated costs related to the implementation of DWR's proposed new measures and costs for existing measures that are above and beyond the costs for the existing measures shown in Table 6.1-1.

Table 6.1-2. Estimated Costs Related to Implementation of DWR's Proposed Measures That Are Above and Beyond Those Costs Shown in Table 6.1-1

DWR's Proposed Measure[1]		Total Capital Cost Over 30 Years (2018 U.S. Dollars)	Total O&M Cost Over 30 Years (2018 U.S. Dollars)	Annualized Cost Over 30 Years[2] (2018 U.S. Dollars)
Designation	**Description**			
Environment Related Measures				
GS1	Implement Erosion and Sediment Control Plan	$0	$0	$0
WR1	Implement Silverwood Lake Water Surface Elevation Restrictions	$0	$0	$0
WR2	Implement Hazardous Materials Management Plan	$0	$0	$0
AR1	Implement Silverwood Lake Fish Stocking Measure	$0	$0	$0
AR2	Implement Aquatic Invasive Species Management Plan	$0	$510,000	$17,000
TR1	Implement Integrated Vegetation Management Plan	$0	$1,112,000	$37,000
RR1	Recreation Management Plan	$14,837,000	$10,800,000	$855,000
LU1	Implement Transportation System Management Plan	$0	$0	$0
LU2	Implement Fire Prevention and Response Plan	$0	$0	$0
LU3	Develop and Implement Project Safety Plan	$0	$0	$0
VR1	Implement Visual Resources Management Plan	$0	$0	$0
CR1	Implement Historic Properties Management Plan (HPMP)	$0	$2,296,000	$77,000
	Total	**$14,837,000**	**$14,718,000**	**$986,000**

Notes:
[1]Refer to Appendix E of Exhibit E in the Application for New License for the complete text of each of DWR's proposed measures.
[2]Total annualized costs are calculated by summing Capital Cost and Total O&M Cost, and dividing the sum by 30.
Key:
DWR = California Department of Water Resources
O&M = operations and maintenance
U.S. = United States

DWR normally includes costs related to erosion and sediment control, hazardous materials management, and conformance with scenic integrity in the costs for new projects as they are developed. Since such projects are unknown at this time, Table 6.1-2 shows no costs related to DWR's Proposed Measures GS1, WR2 and VR1. Similarly, DWR normally includes costs for fire prevention, safety, and maintenance of Project roads under its non-environmental O&M costs. Therefore, Table 6.1-2 shows no costs related to DWR's Proposed Measures LU1, LU2, and LU3, since these will be covered under continuing non-environmental O&M costs.

Costs related to Silverwood Lake fish stocking and water surface elevations overlap entirely with Articles 51 and 58, respectively, in the existing license. Therefore, no incremental costs are shown in Table 6.1-1 for DWR's Proposed Measures WR1 and AR1, since these are continuation of articles in the existing license and costs shown in Table 6.1-2.

DWR's Proposed Measures AR2 and TR1 include measures related to aquatic invasive species and vegetation management that are above and beyond those measures in Articles 51 and 57, respectively, in the existing license. Therefore, the costs shown in Table 6.1-1 for these measures are in addition to those cost shown in Table 6.1-2 to cover the additional new measures in DWR's Proposed Measures AR2 and TR1.

The costs related to the protection of historic properties through implementation of a HPMP are entirely new costs, since the related measures are not included in the existing license, except for minor costs related to surveys, report preparation, and consultation for new projects. Costs in Table 6.1-2 for DWR's Proposed Measure CR1 are entirely new.

The costs shown in Table 6.1-2 for recreation are new costs for the recreation improvements identified in the Recreation Management Plan that are above and beyond the costs for recreation shown in Table 6.1-1. Table 6.1-3 provides DWR's anticipated annual cost (i.e., sum of new costs in Table 6.1-2) over each of the first 30 years of the new license for implementation of DWR's proposed Recreation Management Plan, consistent with the schedule of implementation provided in Table 4.0-1 of the plan.

Table 6.1-3. Anticipated Annual Cost Over the First 30 Years of the New License for Implementation of the Recreation Management Plan Proposed (Estimated Cost for each Year after License Issuance)

1- $2,233,666	2- $2,233,666	3- $2,233,666	4- $2,012,000	5- $2,012,000	6- $1,650,000	7- $1,650,000	8- $1,650,000	9- $1,381,000	10- $1,381,000
11- $360,000	12- $360,000	13- $360,000	14- $360,000	15- $360,000	16- $360,000	17- $360,000	18- $360,000	19- $360,000	20- $360,000
21- $360,000	22- $360,000	23- $360,000	24- $360,000	25- $360,000	26- $360,000	27- $360,000	28- $360,000	29- $360,000	30- $360,000

6.2 VALUE OF PROJECT POWER

6.2.1 No Action Alternative

The Project's installed and dependable capacities under the No Action Alternative are 272,796 kilowatts (kW) and 250,100 kW, respectively. DWR calculated dependable capacity by multiplying the Devil Canyon Powerplant's average monthly Resource Adequacy (RA) data for 2013 through 2017 by the yearly RA capacity. DWR used the California Public Utility Commission's 2017RAReport.pdf report file and multiplied the local Los Angeles Basin area RA price by the annual RA average capacity to estimate the yearly benefit of dependable capacity.

The Project generates on average 836,000 megawatt-hours (MWh) of energy annually. This is based on multiplying the Project's installed capacity by the reported Devil Canyon Powerplant operating availability average of 89.31 percent for the 2010 through 2017 period. DWR allocated the daily generation values among the California Independent System Operator (CAISO) definition for peak energy, partial peak energy, off-peak energy, and super off-peak energy to calculate generation in each of these periods. The value of the generation in each period was based on the monthly Locational Marginal Price (LMP) forecast.

The Project provides ancillary services to CAISO in the form of regulation-up, regulation-down, and spinning reserves. The amount of these services in terms of MWh was averaged over the 2015 through 2017 period. The value of the ancillary service was based on the monthly LMP price for these services. Capacity, energy and ancillary service values under the No Action Alternative are provided in Table 6.2-1. Capacity, energy and ancillary service benefits under the No Action Alternative are provided in Table 6.2-1.

Under the No Action Alternative, the Project's capacity and capacity rate are 272,796 kW and $41.76/kW-year, and the Project's generation and generation rate are 836,000,000 kW and $0.0323/kW-year.

Table 6.2-1. Average Annual Project Power Under the No Action Alternative and DWR's Proposal

Value	No Action Alternative and DWR's Proposal[1]
Annual Capacity	
Installed (kW)	272,796
Dependable (kW)	250,100
Total Average Annual Value of Capacity (2018 U.S. Dollars)	**$3,067,000**
Average Annual Energy	
Peak Energy (MWh)	203,500
Partial Peak Energy (MWh)	32,100
Off-Peak Energy (MWh)	526,200
Super Off-Peak (MWh)	74,200
Total Average Annual Value of Energy (2018 U.S. Dollars)	**$27,623,000**
Average Annual Ancillary Services	
Regulation-Up (MWh)	98,850
Regulation-Down (MWh)	102,447
Spinning Reserve (MWh)	194,810
Total Average Annual Value of Ancillary Services (2018 U.S. Dollars)	**$3,069,000**
Total Project Power Value (2018 U.S. Dollars)	**$33,759,000**

Note:
[1]Refer to Section 6.2.1 regarding how DWR calculated the values in this table.
Key:
DPR = California Department of Parks and Recreation
kW = kilowatt
MWh = megawatt hours
U.S. = United States

6.2.2 DWR's Proposal

DWR does not propose to add or remove generation facilities from the Project, and proposes to operate the Project as it has been operated historically. Therefore, under DWR's Proposal, the amount and value of the Project's capacity, energy, and ancillary services will not change from the amounts and values under the No Action Alternative shown in Table 6.2-1. The Project's capacity, capacity rate, and generation would not change from the No Action Alternative, but the Project's generation rate under DWR's Proposal would increase to $0.335/kW-year.

7.0 CHANGES IN PROJECT COST, POWER, AND VALUE

Table 7.0-1 compares the annual Project benefits and costs between the No Action Alternative and DWR's Proposal.

Table 7.0-1. Comparison of Average Annual Power Benefits and Costs Between the No Action Alternative and DWR's Proposal

Value	No Action Alternative	DWR's Proposal	Change[1]
Average Annual Gross Benefits (2018 U.S. Dollars)[2]			
Capacity	$3,067,000	$3,067,000	$0
Energy	$27,623,000	$27,623,000	$0
Ancillary Services	$3,069,000	$3,069,000	$0
Total Gross Benefits	**$33,759,000**	**$33,759,000**	**$0**
Average Annual Costs (2018 U.S. Dollars)[3]			
Non-Environmental / Recreation O&M Costs	$20,754,000	$20,754,000	$0
Recovery of Relicensing Costs	$440,000	$440,000	$0
Environmental and Recreation Costs	$5,821,000	$6,807,000	$986,000
Total Costs	**$27,015,000**	**$28,001,000**	**$986,000**
Average Annual Net Benefits (2018 U.S. Dollars)[4]			
Net Benefits	$6,744,000	$5,758,000	-$986,000

Note:
[1]Calculated by subtracting the No Action Alternative from the value of DWR's Proposal.
[2]Refer to Section 6.2 for source of Average Annual Benefits.
[3]Refer to Section 6.1 for Average Annual Costs.
[4]Calculated by subtracting Average Annual Cost from the Average Annual Gross Benefits.
Key:
DPR = California Department of Parks and Recreation
kW = kilowatt
MWh = megawatt hours
PM&E = Protection, Mitigation, and Enhancement

In summary, DWR's Proposal would not affect Project power or generation, but would increase annual Project costs by $986,000, and thereby decreasing the net Project benefit from $6,744,000 to $5,758,000, or by 14.6 percent.

ENCLOSURE 2

DWR's RESPONSE TO SCHEDULE B – STUDY REQUESTS[1]

Exhibit E

1. FERC-1 Comment:

Surveys for Plant Species, Aquatic Invasive Species, State/Federally Listed Species within the West Fork of the Mojave River from Cedar Springs Dam to Deep Creek

[W]e are requiring that you conduct a desktop study that examines the relationship between the distribution of potential suitable habitat for the aquatic and riparian species of interest, wetlands, and any potential effects of flow releases on them. The study should address the following:

1. *Information provided in the record indicates that flows released from Cedar Springs Dam may range from zero for several months of the year up to several thousand cubic feet per second (cfs) during flood conditions, and that at least half of the West Fork Mojave River reach below the dam may be dry during many months of the year, with flow going subsurface. Because the distribution of aquatic species would depend on the extent and duration of time the West Fork Mojave River provides wetted habitat for both listed and invasive species, which may vary by season, please provide the information. The study should use existing aquatic, vegetation community mapping, and wildlife habitat data (e.g. CalVeg, CWHR data) and other existing information and, if necessary, consultation with relevant resource agencies. The study area should encompass the West Fork Mojave River between Cedar Springs Dam and Deep Creek and adjacent uplands.*
    a. *An estimate, by month, of the extent of the reach that would be wetted, dry, and have subsurface flow, with an estimate of at what volume would flow go subsurface.*
    b. *Describe and map the distribution and extent of the suitability of wetted habitat, by season, for all potentially occurring, or known to occur federally listed and special-status species and known aquatic invasive species (American bullfrog, red swamp crayfish, Asian clam, and Eurasian watermilfoil), that occur or may occur in the study area. This information should include:*
        i. *aquatic, riparian, wetland, and adjacent upland habitat types including acreage estimates, where applicable; and*

[1] For each of the Additional Information Requests (AIR) in FERC's April 16, 2020 letter, DWR has assigned an alpha-numeric designation to the AIR (e.g., FERC-1), repeated the salient parts of the AIR, and provided DWR's response to the AIR here or in appendices to this Enclosure 2.

ii. potential sites used during critical life stages such as egg laying, rearing/development of young (e.g., tadpoles), etc. for the listed and special-status species including descriptions, potential suitability and threats.

2. Together with information developed from item (1), prepare a report that describes the effects of flow releases from Cedar Springs Dam on species and habitat that may occur in the West Fork Mojave River between Cedar Springs Dam and Deep Creek, and any proposed mitigative measures, as necessary. The report should include study methods and information sources, documentation of any consultation, analysis, results, and maps.

DWR Response:

The California Department of Water Resources (DWR) completed the study and prepared the requested report, which is included as Appendix A to Enclosure 2.

2. FERC-2 Comment:

Surveys and Habitat Assessments for State Special-status Terrestrial Species Throughout the Project

[Y]our FLA does not include information regarding potential effects of the project for each special-status species, as you describe in your response letter. For example, Section 5.4.1, Botanical and Terrestrial Wildlife of Exhibit E, includes descriptions of each special-status species including locations where any individuals were observed during relicensing surveys, lists of suitable habitat types within the project boundary, and California Natural Diversity Database records in the project vicinity. Section 5.4.1.2, Effects of DWR's Proposal and Section 5.4.1.3, Unavoidable Adverse Effects address potential effects of the project in general terms but are not species specific. These sections do not identify where project-related activities, if any, would occur relative to suitable habitat identified in the study or assess potential effects of project activities for each species and its habitat. This information is needed for staff to evaluate potential effects of the project on special-status wildlife species and any relevant proposed or recommended measures for their protection. We also note that the final study report for the Terrestrial Wildlife Species-California Wildlife Habitat Relationship Study as well as the 10 other final study reports have not been filed with the Commission. Therefore, we are requiring that you provide this information, along with the study reports, so that staff can fully evaluate any potential project-related effects on special-status wildlife species in the EA.

DWR Response:

Appendix B to this Enclosure 2 provides for each special-status wildlife species potentially affected by the Project: a description of the species, including locations where any individuals were observed during relicensing surveys; lists of suitable habitat types within the proposed Project boundary; California Natural

Diversity Database records of the species' occurrence within the boundary; Project-related activities, if any, that would occur relative to suitable habitat; and an assessment of potential effects of Project activities on the species. DWR eFiled with FERC the *Terrestrial Wildlife Species-California Wildlife Habitat Relationship Study* (Study) and the 10 other final study reports on July 09, 2020.

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Appendix A

Supplemental West Fork Mojave River Report

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DEVIL CANYON PROJECT RELICENSING
FERC PROJECT NO. 14797

Response to Schedule B
Supplemental West Fork Mojave River Report

July 2020

State of California
California Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Hydropower License Planning and Compliance Office

GAVIN NEWSOM	**WADE CROWFOOT**	**KARLA A. NEMETH**
Governor	Secretary for	Director
State of California	California Natural Resources	Department of Water Resources

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EXECUTIVE SUMMARY

This supplemental report responds to the Federal Energy Regulatory Commission's April 16, 2020 Schedule B study request for a desktop study to examine the distribution and extent of potential suitable habitat for associated federally or state-listed species and aquatic invasive species within the West Fork Mojave River (WFMR) from Cedar Springs Dam to Deep Creek and any potential effects of Cedar Springs Dam flow releases on them. The Devil Canyon Project (Project) does not contribute Project flows to the WFMR downstream of Cedar Springs Dam. The Project is an energy recovery project that generates electricity as State Water Project (SWP) water is being delivered through SWP conveyance facilities to water users downstream of the Devil Canyon afterbays. The surface water in the WFMR is fully allocated and the Mojave Water Agency (MWA), as the court appointed Watermaster, oversees the management of the adjudicated natural water supplies within the Mojave Basin Area. The Project has no rights to the natural inflow to Silverwood Lake and must release such inflow into the WFMR in accordance with existing water rights and water delivery agreements that are not related to electricity generation.

The non-Project releases of water from Cedar Springs Dam occur sporadically. This is due to the nature of the water rights and delivery agreements governing release of natural inflow. The Las Flores Ranch (LFR) holds senior rights to the first 23 cubic feet per second (cfs) that enters Silverwood Lake. Through an agreement with LFR an exchange occurs where LFR receives water from a turnout off of the non-Project Mojave Siphon located north of Silverwood Lake, instead of a direct release from Cedar Springs Dam. This amount varies daily when flows are less than 23 cfs. The water is sent to a control structure where LFR will either divert the water for use or return the water to the WFMR. DWR does not maintain or operate the control structure, and it does not control how LFR decides to use or return the water to the WFMR. The return is not gaged.

From water year (WY) 2006 through WY 2019, Cedar Springs Dam did not spill, seepage was very minor, and, in half the years, releases of non-Project water from Cedar Springs Dam's low-level outlet occurred on less than 19 days in that given year. When releases were made, most of the releases were in February (11 out of 14 years), with flows infrequent (in 5 or fewer years out of 14 years) from May through December. In addition, sustained periods of no non-Project releases from Cedar Springs Dam occur every year. In every year from WY 2006 through WY 2019, at least 70 continuous days of no release occurred, and in seven of the 14 years, there was no release continuously for about half the year. Further, when releases do occur, the flow rates vary widely. From WY 2006 through WY 2019, sustained releases were typically between 40 to 50 cfs, but short-term releases were in excess of 2,000 cfs.

The 6.4-mile-long section of the WFMR between Cedar Springs Dam and Deep Creek (i.e. study area) receives very little precipitation: on average, between WY 2006 and WY 2019, precipitation occurred on 24 days each year for an annual average of 7.5 inches of water. Only one discharge to the river occurs, releases from the LFR discussed

above, and this is ungaged and believed to be intermittent. No diversions occur in the reach, but flow is known to go subsurface and then reappear, and much of the reach is periodically dry. For instance, a correlation of flow was conducted using 20 high quality aerial images of the study area from 1994 through 2019. Six of these 20 images showed that when a non-Project release of water from Cedar Springs Dam occurred, the entire 6.4-mile-long reach appeared to be wetted. However, the entire reach was wetted in only four of the remaining 14 aerials without a non-Project release from Cedar Springs Dam, and no or very little flow measured at the downstream gage in the reach. In the other 10 aerials, between 0.4 and 4.9 miles of the reach appeared to be wetted.

DWR reviewed existing, relevant, and reasonably available information to determine the distribution and extent of suitable aquatic, wetland, riparian, and upland habitat available in the 6.4-mile-long section of the WFMR for federally listed and special-status aquatic and semi-aquatic species and aquatic invasive species (AIS), with particular emphasis on how habitat changes when non-Project releases from Cedar Springs Dam occur. The study area extended approximately 900 feet from the channel and included about 1,440 acres and six distinct sub-reaches. DWR reviewed flow and precipitation gage data, literature on species habitat preferences, and aerial imagery. DWR also relied on information it collected during a late December 2018 reconnaissance survey of the study area.

With regard to federally listed species, no habitat was found to be suitable for the endangered Mohave tui chub (*Gila bicolor* ssp. *mohavensis*) or the endangered southern California Distinct Population Segment (DPS) of southern mountain yellow-legged frog (*Rana muscosa*) (SMYLF), which both require perennial aquatic habitat free of introduced aquatic predators and other habitat conditions not present in the study area. There are no recent records of either species in or near the study area. Mohave tui chub is considered by the United States Department of the Interior, Fish and Wildlife Service to be extirpated in the Mojave River and tributaries. SMYLF is also likely extirpated in the drainage, with known occurrences restricted to a few perennial headwater streams with upstream fish barriers. The western spadefoot (*Spea hammondii*), which is a special-status species that is a California species of concern, is not known to occur in the study area, anywhere in the Mojave River drainage, or in comparable habitat, being limited in southern California to coastal watersheds. If assumed to be present despite this contrary evidence, aquatic stages of western spadefoot (i.e., eggs and larvae) might be disrupted by non-Project releases of water from Cedar Springs Dam that increase flow velocity in intermittent pools during the brief western spadefoot breeding period.

Habitat potentially suitable for the federally listed arroyo toad (*Anaxyrus californicus*) was identified within parts of the study area. Arroyo toad breeding has been documented by prior surveys (e.g., Cadre Environmental 2007 and inferred by detection of juveniles in 2014 [Helix 2014]), but is limited by beaver dam impoundments that hold water too deep for arroyo toad breeding, promote excessively dense shoreline vegetation, and create habitat for non-native predatory species. Potentially suitable breeding habitat for arroyo toad occurs in Sub-Reaches 2 and 3 of the WFMR, although

interspersed with deeper pools, and may occur more widely. Habitat suitability in the upper sub-reaches is supported in shallow pools during the general April-June breeding period, and in surface water during the summer aestivation period in most years. The total area of pools in Sub-Reaches 2 and 3 identified as potentially suitable for arroyo toad breeding was more than 4 acres at the time of DWR's 2018 reconnaissance survey, 11 months after the last non-Project release from Cedar Springs Dam. Because suitably shallow pools were often proximate to deeper pools where predatory American bullfrogs (*Lithobates catesbeianus*) may occur, this analysis may overestimate suitable habitat. Source data were generally inadequate to reliably predict habitat suitability related to water depth and velocity under changing flow conditions. This limitation is particularly acute within the lower sub-reaches that were dry during DWR's 2018 field reconnaissance. Significant non-Project releases from Cedar Springs Dam in April or later in the breeding season rarely occur. Rare significant non-Project releases occur this late only in wet years, which could displace arroyo toad eggs or larvae, but may also increase the extent of available suitable breeding habitat in overflow pools or if the peak flows result in sufficient scouring of emergent vegetation and sediment movement to transform previously unsuitable pools.

Similarly, potentially suitable habitat for the federally listed California red-legged frog (*Rana draytonii*; CRLF) was identified within parts of the study area, although the species presence has not been documented. Potentially suitable habitat for CRLF egg laying and larval development, which require sustained aquatic habitat for an estimated period that can begin as early as mid-February and extend through at least July, was identified in pools more than 2 feet deep in Sub-Reaches 2 and 3, and to a much lesser extent in Sub-Reach 6, with a total area of approximately 7 acres. The hydrology analysis suggests that at least some of the pools in Sub-Reaches 2 and 3 hold water for prolonged periods even in dry years in the absence of non-Project releases. The timing and magnitude of non-Project releases from Cedar Springs Dam has the potential to either enhance habitat suitability by maintaining aquatic habitat during the period when CRLF aquatic stages are present or, conversely, diminish habitat suitability in this period when the Watermaster of the Mojave Basin Area requires large volume releases, which rarely occur except in the wettest years. Increases in water velocity that diminish habitat suitability during these infrequent large releases are possible, but cannot be quantified from the source data.

Regarding AIS, potentially suitable habitat for the four known species within the study area was identified. Potentially suitable habitat for American bullfrog egg laying and larval development was identified only in Sub-Reach 1, with a total area of approximately 8.40 acres. American bullfrog require sustained aquatic habitat which typically contains emergent and/or aquatic wetland vegetation. However, post-metamorphic American bullfrogs could temporarily utilize all the aquatic habitat (73.23 acres) in the study area when it is wet, at least for dispersal, and retreat to wetted pools when sections dry. Red swamp crayfish *(Procambarus clarkii*) is extremely adaptable and can burrow into the channel to the sub-surface water in response to drying. Therefore, it can potentially use all of the aquatic habitat in the study area. On the other hand, Asian clam (*Corbicula fluminea*) and Eurasian watermilfoil (*Myriophyllum*

spicatum) both require a long-term wetted area to survive and reproduce and are, therefore, predominantly limited to areas within Sub-Reaches 1 through 3 that hold water for prolonged periods even in dry years in the absence of non-Project releases. Although shells of Asian clams were observed in low numbers in Sub-Reaches 4 and 5, indicating occasional suitable conditions, they do not persist in areas that dry: their population size may be small during wetted periods of occupation. At maximum extent during wetted periods, a total of 66.70 acres of aquatic habitat from Sub-Reach 1 to Sub-Reach 5 is potential habitat for the species. Aquatic habitat for Eurasian watermilfoil was limited to the area within Sub-Reaches 1 through 3 (31.59 acres), where water is generally perennial.

The non-Project releases of water from Cedar Springs Dam do not provide additional suitable habitat for AIS. In the wettest years, the Watermaster could require the release of large volumes of water in near real time or storage levels in Silverwood Lake at the time of a large storm event may require an instant release of high inflows. Since water would already be available in wet years, these flows would not contribute to the extent of aquatic habitat. Additionally, in years when there are no non-Project releases in dry months, Sub-Reaches 1 to 3 remain wet, at least partially, continuing to provide suitable aquatic habitat to the four AIS. Non-Project releases occurring outside of precipitation events and wet years are not regular or prolonged enough to provide water consistently in areas, where AIS do not currently inhabit, that would allow AIS to colonize.

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ACRONYMS AND ABBREVIATIONS

Above Normal WY	Precipitation accumulation between 4.2 and 11.7 inches within a given water year
AIS	aquatic invasive species
Alliance	A category of vegetation classification which describes repeating patterns of plants across a landscape. Each Alliance is defined by plant species composition, and reflects the effects of local climate, soil, water, disturbance, and other environmental factors.
Below Normal WY	Precipitation accumulation between 4.2 and 3.3 inches within a given water year
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CRLF	California red-legged frog (*Rana draytonii*)
DPS	Distinct Population Segment
Dry WY	Precipitation accumulation less than 3.3 inches within a given water year
DWR	California Department of Water Resources
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FR	Federal Register
in.	inch
NWI	National Wetlands Inventory
Project	Devil Canyon Project, FERC Project No. 14797
R3UBF	Riverine Perennial Unconsolidated Bottom Semipermanently Flooded
R4SBC	Riverine Intermittent Streambed, Seasonally Flooded
R5UBF	Riverine Unknown Perennial Unconsolidated Bottom Semipermanently Flooded
SMYLF	Southern California Distinct Population Segment of southern mountain yellow-legged frog (*Rana muscosa*)

study area	The 6.4-mile-long section of the West Fork Mojave River between Cedar Springs Dam and the Saddle Dike Diversion Dam at the Mojave River Forks Reservoir
Sub-Reach 1	Cedar Springs Dam Spillway Tailrace
Sub-Reach 2	West Fork Mojave River above Horsethief Creek; extends from the downstream end of Sub-Reach 1 to the confluence with Horsethief Creek
Sub-Reach 3	West Fork Mojave River below Horsethief Creek; approximately 1.5-mile section of the West Fork Mojave River downstream of Horsethief Creek to just beyond the Hesperia Venture I (Las Flores Ranch) property boundary with US Army Corps of Engineers' property
Sub-Reach 4	West Fork Mojave River upstream of Grass Valley Creek
Sub-Reach 5	West Fork Mojave River downstream of Grass Valley Creek
Sub-Reach 6	West Fork Mojave River Mature Riparian Corridor; the last 0.5-mile of the West Fork Mojave River before reaching the confluence with Deep Creek at the Saddle Dike Diversion Dam at Mojave River Forks Reservoir
Supplemental Report	Supplemental West Fork Mojave River Report
SWP	State Water Project
U.S.	United States
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VegCAMP	California Department of Fish and Wildlife's Vegetation Classification and Mapping Program
Watermaster	One who allocates the legal right to use water from certain sources. As used here in this document, the Watermaster for the Mojave Basin Area which includes the West Fork Mojave River.
WFMR	West Fork Mojave River
Wet WY	Precipitation accumulation greater than 11.7 inches within a given water year
WY	water year
WY Type	Classifications based on precipitation accumulation: Wet, Above Normal, Below Normal, Dry

1.0 INTRODUCTION

The purpose of this Supplemental West Fork Mojave River Report (Supplemental Report) is to provide the Federal Energy Regulatory Commission (FERC) with the requested information contained in FERC's April 16, 2020 filing that was provided in response to the California Department of Water Resources (DWR) November 20, 2019 filing of the *Final Application for New License for Major Project—Existing Dam* for the Devil Canyon Project Relicensing, FERC Project No. 14797. DWR provides the following information included in this Supplemental Report, as requested in FERC's April 16, 2020 response to CDFW's Request for Additional Studies, Schedule B Study Request: "Surveys for Plant Species, Aquatic Invasive Species, State/Federally Listed Species within the West Fork of the Mojave River from Cedar Springs Dam to Deep Creek":

1. …[for] the West Fork Mojave River between Cedar Springs Dam and Deep Creek and adjacent uplands.

    a. An estimate, by month, of the extent of the reach that would be wetted, dry, and have subsurface flow, with an estimate of at what volume would flow go subsurface.

    b. Describe and map the distribution and extent of the suitability of wetted habitat, by season, for all potentially occurring, or known to occur federally ESA [Endangered Species Act]-listed species (specifically Mohave tui chub [*Gila bicolor ssp. mohavensis*], arroyo toad [*Anaxyrus californicus*], California red-legged frog [CRLF] [*Rana draytonii*], and southern California DPS [Distinct Population Segment] of southern mountain yellow-legged frog [*Rana muscosa*] [SMYLF]) and special-status species (western spadefoot [*Spea hammondii*]) and known aquatic invasive species (American bullfrog [*Lithobates catesbeianus*], red swamp crayfish [*Procambarus clarkii*], Asian clam [*Corbicula fluminea*], and Eurasian watermilfoil [*Myriophyllum spicatum*]), that occur or may occur in the study area.[1] This information should include:

[1] DWR's understanding of the scope of FERC's AIR is to provide information that focuses on the aquatic resources including amphibian and fish special-status species and aquatic invasive species known to occur or potentially occurring in the West Fork Mojave River (WFMR) as addressed in DWR's 2019 West Fork Mojave River Reconnaissance Survey Report. In addition to those species, two ESA-listed species associated with riparian habitats may occur, least Bell's vireo (*Vireo bellii pusillus*) and southwestern willow flycatcher (*Empidonax traillii extimus*). Both species nest in dense riparian habitat along streams, particularly willow-dominated stands or thickets, and willows under a tree canopy. Neither species is directly associated with wetted habitat. Potential habitat for least Bell's vireo and southwestern willow flycatcher is associated with VegCAMP vegetation alliances found mostly in sub-reaches 2, 3, 4, and 6: Fremont cottonwood forest, Gooding's willow-red willow riparian woodland, and Sandbar willow thicket (CWHR 2020). Neither species is reported in the CNDDB (CDFW 2020) or were found during surveys (HELIX 2014, Aspen Environmental Group 2006) in parts of the WFMR or earlier surveys referenced in

i. aquatic, riparian, wetland, and adjacent upland habitat types including acreage estimates, where applicable; and

ii. potential sites used during critical life stages such as egg laying, rearing/development of young (e.g., tadpoles), etc. for the listed and special-status species including descriptions, potential suitability and threats.

2. Together with information developed from item (1), prepare a report that describes the effects of flow releases from Cedar Springs Dam on species and habitat that may occur in the West Fork Mojave River between Cedar Springs Dam and Deep Creek, and any proposed mitigative measures, as necessary. The report should include study methods and information sources, documentation of any consultation, analysis, results, and maps.

In this Supplemental Report, the West Fork Mojave River (WFMR) area between Cedar Springs Dam and Deep Creek and adjacent uplands is referred to as the "study area." As described below, the study area includes 6.4 miles of the WFMR, about 1,437.90 acres,[2] and six distinct sub-reaches.

Material included in the California Department of Water Resources' (DWR) November 2019 West Fork Mojave River Reconnaissance Survey Report (DWR 2019) is not repeated here, but included by reference.

Besides this introductory material, this Supplemental Report includes Section 2, which describes sources of information DWR used to develop this Supplemental Report, and Section 3, which describes the methods DWR used to analyze the hydrology within the study area. DWR's analysis of the potential available habitat within the study area is described in Section 4. Section 5 describes DWR's conclusions based on the analysis performed, and Section 6 provides a list of references cited in this Supplemental Report.

the two latter reports, although a single singing least Bell's vireo was noted along the adjacent Horsethief Creek in 2013 (HELIX 2014). Southwestern willow flycatcher critical habitat Unit 6 downstream of Horsethief Creek was considered unoccupied at the time of listing (78 FR 344). As discussed below, non-Project water releases mostly mimic the natural availability of water and are not likely to measurably affect riparian habitat or seasonal use of these habitats by least Bell's vireo or southwestern willow flycatcher.

[2] Acreages represented are the sum of the areas of aquatic, riparian, wetland, and upland habitats within 900 feet of the wetted channel, excluding steep slopes, which occur along parts of Sub-Reaches 3 and 4, and areas mapped as Urban Alliance (a small area adjacent to Sub-Reach 1).

Figure 1.0-1 shows the study area, including the location of existing streamflow gages, tributaries, and nearby features. In addition, the figure shows the following six sub-reaches, each of which is described in detail in DWR 2019, discussed in this Supplemental Report:

1. Sub-Reach 1: Cedar Springs Dam Spillway Tailrace; a 0.5-mile-long section of the WFMR that starts at the Cedar Springs Dam Spillway and ends at a natural break in habitat conditions; the study area in Sub-Reach 1 contains 146.12 acres

2. Sub-Reach 2: WFMR above Horsethief Creek; a 0.9-mile-long section of the WFMR from the end of Sub-Reach 1 to the confluence with Horsethief Creek; the study area in Sub-Reach 2 contains 250.06 acres

3. Sub-Reach 3: WFMR below Horsethief Creek; a 1.5-mile-long section of the WFMR from the Horsethief Creek confluence to the Hesperia Venture I (also known as Las Flores Ranch [LFR]) property boundary with the United States (U.S.) Department of Defense, Army Corps of Engineers' (USACE) property; the study area in Sub-Reach 3 contains 355.26 acres

4. Sub-Reach 4: WFMR above Grass Valley Creek; a 1.0-mile-long section of the WFMR from the Hesperia Venture I property to the confluence with Grass Valley Creek; the study area in Sub-Reach 4 contains 234.94 acres

5. Sub-Reach 5: WFMR below Grass Valley Creek; a 1.9-mile-section of the WFMR from Grass Valley Creek to a point where mature riparian vegetation borders the channel, and WFMR downstream of Grass Valley Creek; the study area in Sub-Reach 5 contains 386.11 acres

6. Sub-Reach 6: WFMR Mature Riparian Corridor; a 0.5-mile-long section of the WFMR from the end of Sub-Reach 5 to the confluence with Deep Creek at the Saddle Dike Diversion Dam at Mojave River Forks Reservoir; the study area in Sub-Reach 6 contains 65.41 acres

Figure 1.0-1. West Fork Mojave River Study Area

2.0 SOURCE INFORMATION

2.1 NON-PROJECT WATER CONTRIBUTIONS TO SURFACE FLOW

The Devil Canyon Project (Project) contributes no flows to the WFMR downstream of Cedar Springs Dam. The Project is an energy recovery project that offsets the costs of State Water Project (SWP) operations in the form of electricity generation. The Project generates electricity as SWP waters are delivered to State Water Contractors member agencies downstream of the Devil Canyon afterbays. The surface water in the WFMR is fully allocated, and the Mojave Water Agency (MWA), as the court appointed watermaster, oversees the management of the adjudicated natural water supplies within the Mojave Basin Area. The Project has no rights to the natural inflow into Silverwood Lake and must release such inflow into the WFMR in accordance with existing water rights and water delivery agreements that are not related to electricity generation. Refer to Exhibit B in DWR's Final License Application for agreements and contracts relating to the natural flow and surface water uses in the WFMR.

This non-Project water is released by DWR from Cedar Springs Dam into the WFMR in three ways: (1) releases from the dam's low-level outlet works; (2) uncontrolled spill over the Cedar Springs Dam spillway; and (3) seepage through Cedar Springs Dam. Non-Project water releases through Cedar Spring's Dam's low-level outlet works are measured at U.S. Geological Survey (USGS) Gage 10260820 (referred to as *WFMR below Silverwood Lake*) (USGS 2020b). This gage consists of a flow meter on the release valve (Figure 1.0-1). The low-level outlet works consist of a 30-inch (in.) diameter cone valve for storm releases, two 5 inch by 9 inch gates for heavy storm releases, and a structure for low flow sustained releases. The maximum capacity of the low-level outlet works is 5,000 cubic feet per second (cfs). Average daily flow data from this gage for water year (WY) 2006 through WY 2019 are provided in Appendix 1.

Non-Project flows through the Cedar Springs Dam Spillway are computed based on a theoretical rating of an ogee weir at the entrance to the spillway. USGS reports flows from spills in combination with non-Project releases from the low-level outlet works at USGS Gage 10260820. However, periods of spill can be assumed to occur when the Silverwood Lake elevation is greater than the elevation of the spillway invert elevation of 3,355 feet. Silverwood Lake elevation data are measured at the *Lake Silverwood* station (CDEC 2020a), which is located at the same location as USGS Gage 10260820 (Figure 1.0-1). Reservoir elevation data from WY 2006 through 2019 indicate that Silverwood Lake elevations have never been greater than the spillway invert. This shows that spills have not occurred during this 14-year-long period, and suggests that spills very rarely occur. Silverwood Lake elevation data from WY 2006 through WY 2019 are provided in Appendix 1.

Seepage through Cedar Springs Dam is monitored by DWR on a daily basis at seven locations and recorded in DWR's monthly water accounting reports. Seepage volumes are not added to USGS Gage 10260820. Measured seepage is very minor and ranges

from 0 to approximately 2 cfs, with a long-term average of 0.24 cfs per day (DWR 2019).

Given that a spill event occurs infrequently and seepage is low, one can assume that most releases of non-Project water from Cedar Springs Dam are through the low-level outlet works. Table 2.1-1 provides the number of days when releases were made through the low-level outlet works from WY 2006 through WY 2019. In seven of the 14 years between WY 2006 and 2019, releases though the low-level outlet works occurred on less than 19 days – less than 5 percent of the days in a year.

Table 2.1-1. Non-Project Releases from Low-Level Outlet Works of Cedar Springs Dam for Water Years 2006 through 2019

Water Year	Total Number of Release Days
2006	136
2007	8
2008	65
2009	19
2010	177
2011	240
2012	4
2013	16
2014	8
2015	17
2016	7
2017	92
2018	57
2019	120
Minimum Release Days in a Year	**4**
Maximum Release Days in a Year	**240**
Average Release Days During WY 2006-2019	**69**

2.2 OTHER CONTRIBUTIONS OR DEPLETIONS TO SURFACE FLOW IN STUDY AREA

Other contributions to flow in the study area include direct releases into the study area by third parties, and contributions from tributaries, seeps, and accretion. DWR is aware of only one release from a third party, LFR, which enters the study area at the upstream end of Sub-Reach 4. The release is not gaged and believed to occur intermittently.

Two named tributaries, Horsethief Creek and Grass Valley Creek, also enter the study area. Neither tributary is gaged. Seeps contribute and are not directly measured.

Accretion due to precipitation can be inferred based on measurements from a local USACE precipitation gage. Daily precipitation is measured at the USACE precipitation gage *Mojave River Dam*, or MJD, (CDEC 2020b), which is representative of rainfall within the study area. The amount of precipitation recorded at this rain gage provides some additional insight on how much water contributes to the study area during different water year types. Data from WY 2006 through WY 2019 are provided in Appendix 1. Table 2.2-1 shows the number of days in each WY from 2006 through 2019 when precipitation occurred and the total accumulation.

Table 2.2-1. Precipitation from 2006 through 2019

Water Year	Mojave River Dam (MJD)[2]	
	Number of Days When Precipitation Occurred (days)	Total WY Precipitation (in.)
2006	23	7.1
2007	19	3.6
2008	21	7.9
2009[1]	0	0.0
2010[1]	0	0.0
2011	29	17.5
2012	23	5.7
2013	25	3.0
2014	17	6.3
2015	23	5.7
2016	25	5.4
2017	30	12.4
2018	13	3.2
2019	37	12.3
Average	**24**	**7.5**
Median	**23**	**6.0**

Note:
[1]The rain gage appears to be offline in this year.
[2]Rain gage data provided by USACE gage Mojave River Dam (MJD).

DWR is unaware of any diversion of surface flow in the study area. Therefore, depletions to surface flow in the study area can be attributed solely to surface flow going subsurface, which DWR observed as well as the reemergence of flow (DWR 2019).). As an approximation, one can estimate accretion and depletion through the study area by

comparing flow at USGS Gage 10260820 at the upstream end of the study area with flow at USGS Gage 10260950 (USGS 2020c) located 4.9 miles downstream of Cedar Springs Dam, 1.4 miles upstream from the downstream end of the study area (Figure 1.0-1). Average daily flow data from WY 2006 through WY 2019 are provided in Appendix 1. The difference between the two gages can be attributed to accretions, ungaged releases from LFR, and depletions. Table 2.2-2 shows the number of days in each year from WY 2006 through WY 2019 when the differences were positive (accretion) and negative (depletion).

Table 2.2-2. Accretion and Depletion Gage Comparison

	Number of Days with Non-Project Release from Cedar Springs Dam (# of Days)				Number of Release Days with No Release from Cedar Springs Dam (# of Days)		
WY	**Total**	**Accretion[1]**	**Depletion[2]**	**Flow at Both Gages Same and Greater than 0 cfs**	**Total**	**Accretion[1]**	**No Flow at Both Gages**
2006	136	44	83	9	229	146	83
2007	8	1	7	0	357	3	354
2008[3]	65	52	13	0	301	121	180
2009	19	17	2	0	346	82	264
2010	177	135	30	12	188	52	136
2011	240	184	53	3	125	10	115
2012[3]	4	1	2	1	362	106	256
2013	16	0	16	0	349	53	296
2014	8	8	0	0	357	190	167
2015	17	3	10	4	348	159	189
2016[3]	7	6	1	0	359	156	203
2017	92	55	37	0	273	240	33
2018	57	7	50	0	308	9	299
2019	120	90	29	1	245	42	203
Average	**69**	**43**	**24**	**2**	**296**	**98**	**198**
Median	**38**	**13**	**15**	**0**	**327**	**94**	**196**

Notes:
[1]Days with accretion are days when the average daily flow at the downstream gage is greater than the average daily flow at the upstream gage.
[2]Days with depletion are days when the average daily flow at the downstream gage is less than the average daily flow at the upstream gage.
[3]Leap year (366 days)

2.3 WETTED AREA

Ideally, a hydraulic model would be available for the study area to develop a flow versus wetted area correlation. However, DWR is not aware of such a model being available. DWR amassed all publicly available, high quality aerial images of the study area from

1994 through 2019. This grouping included a total of 20 different images which were used to estimate wetted area at various flows. A non-Project release of water from Cedar Springs Dam occurred in six of the aerials, and in each one, the entire reach appeared to be wetted. In 12 of the aerials, no release was made from Cedar Springs Dam and no or very little (i.e., less than 1 cfs) flow was measured at the downstream gage. In three of these, the entire reach is wetted. In the remaining two aerials, there were no non-Project release of water from Cedar Springs Dam, and a flow of more than 1 cfs was measured at the downstream gage. In each case, the entire reach was wetted. Table 2.3-1 lists the images reviewed.

Table 2.3-1. Available Imagery of Study Area from 1994 through 2019

Calendar Year	Date	Flow at USGS Gage 10260820, WFMR below Silverwood Lake (cfs)	Flow at USGS Gage 10260950, WFMR above Mojave River Forks Reservoir (cfs)	Downstream Extent of Wetted Area (miles)
1994	5/31	0.15	0.58	6.40
2002	6/1	0	0	2.96
2003	6/4	0	0.67	6.40
	11/13	0	0	3.06
2004	12/31	159.8	404	6.40
2005	6/18	0.5	9.4	6.40
2006	1/3	175	384	6.40
2009	1/31[1]	0	0	6.40
	5/24	0	0	4.48
	6/20	0	0	4.47
2010	4/24	50	81	6.40
2012	4/29	16	34	6.40
2013	3/21	0	0	3.81
2014	5/27	0	0.19	4.91
2015	1/1	0	6.6	6.40
2016	5/3	0	0	3.17
	9/4[2]	0	0	0.42
2017	6/13	0	5.55	6.40
	12/28	0	0	3.86
2018	8/3[3]	0	0	1.20

Notes:
[1]Aerial image of fully wetted reach extent does not match gage data
[2]Isolated pools in portions of Sub-Reach 2 and part of Sub-Reach 3
[3]Isolated pools through much of Sub-Reach 3
Key:
cfs = cubic feet per second
WFMR = West Fork Mojave River
USGS = U.S. Geological Survey

The high-quality aerial photographs provide a glimpse of what can occur during different months and seasons from year to year, and inform on the role of accretion and releases from third parties in maintaining channel wetness. Half of the photographs show that a broad range of flows can wet the full extent of the reach. The other half of the photographs provide some insight into where flows become subsurface as well as how dry the reach can be in drier months of some years.

2.4 HABITAT

Identifying potentially suitable habitat for ESA-listed species, special-status species, and aquatic invasive species (AIS) involved a three-step process. First, existing information was used to identify the types and distribution of (1) aquatic habitat, (2) wetland habitat, (3) riparian habitat, and (4) upland habitat within the study area. Second, information was assembled on the habitat requirements, known occurrences, and other relevant data for special-status species and AIS. Third, the available habitat was analyzed for its potential to be suitable for each species and critical life stages, as well as how habitat suitability may vary seasonally. Descriptions of primary information sources are presented below in Section 2.4.1 pertaining to general habitat, those pertaining to ESA-listed and special-status species in Section 2.4.2, and AIS in Section 2.4.3.

2.4.1 General Habitat Information Sources

DWR used the following sources to identify the general habitat in the study area. Discussion and analysis of habitat is in 4.0 Habitat Analysis.

1. *Aerial Information Systems, Inc. 2016. California Vegetation Map in Support of Desert Renewable Energy Conservation Plan (2014-2016 Additions). Prepared for the California Department of Fish and Wildlife Energy Program and the California Energy Commission. Sacramento, California.*

   This report summarizes the results of analysis of vegetation Alliances according to the California Department of Fish and Wildlife's (CDFW) Vegetation Classification and Mapping Program (VegCAMP) for the Mojave Desert. This particular report includes the study area and describes the vegetation alliances analyzed from 2014 through 2016. An Alliance is loosely defined as "a vegetation classification describing repeating patterns of plants across a landscape, defined by plant species composition caused by a variety of environmental factors." Several of the VegCAMP Alliances located during the second step were not covered in the initial report described below. Information on what Alliances were present in the study area, the main species composition of the Alliances, the rarity of each alliance (whether it is considered a Sensitive Natural Community), and the general locations of each alliance was used in this report. The 2016 VegCAMP data were used to depict and quantify upland riparian, wetland, and aquatic habitat described here. The source data are based on April 2010 aerial imagery.

2. Aerial *Information Systems, Inc. 2013. California Vegetation Map in Support of Desert Renewable Energy Conservation Plan. Prepared for the California Department of Fish and Wildlife Energy Program and the California Energy Commission. Sacramento, California*.

This report summarizes results of the initial analysis of VegCAMP alliances in the Mojave Desert. Although this report does not include the study area, there is overlap in the VegCAMP alliances, some of which are described in detail only in the original report, which is referred to in the 2016 report. For those alliances present in the study area that were described in the 2013 document, information on the main species composition and the rarity of each alliance was gathered from this document for the report.

3. *California Native Plant Society (CNPS). 2020. A Manual of California Vegetation. Available online: http://vegetation.cnps.org/. Accessed: May 14, 2020. Last updated 2020. CNPS, Sacramento, California.*

The Manual of California Vegetation contains the master descriptions of all known VegCAMP Alliances in California, including species composition, distribution throughout California, rarity, and crossover to other vegetation classifications. For the study report, this information was used to further describe Alliances and determine if any were a Sensitive Natural Community, meaning they are rare in California and potentially elsewhere.[3]

4. *Department of Water Resources (DWR). 2019. West Fork River Reach — Reconnaissance Report. Written for Relicensing of Devil Canyon Project. January 2019.*

This report details the results of DWR's 2018 reconnaissance of the study area, including descriptions of the sub-reaches (vegetation, presence of waters, habitat features, species seen, etc.). This document is the foundation for the overall Supplemental Report; and for habitat, is used for additional information in support of descriptions from VegCAMP and the National Wetlands Inventory (NWI) described below that were based on aerial imagery, rather than on the ground surveys. At the time of DWR's December 2018 reconnaissance survey, there had been no non-Project release of water from Cedar Springs Dam since January 2018. Precipitation was recorded within the two weeks preceding the reconnaissance survey.

5. *HELIX Environmental Planning, Inc. 2014. Tapestry Project. Biological Technical Report.* November 2014. 160 pp.

This report includes information on various biological resources studies performed for the Tapestry Specific Plan, a proposed residential and community

[3] None of the identified alliances were classified as a Sensitive Natural Community.

development project. These studies including mapping vegetation communities within and surrounding Sub-reach 1, 2, and 3, and adjacent Horsethief Creek. This information was used as support to the main VegCAMP mapping done for the WFMR by AIS.

6. *Ramirez, Jr. R.S. 2003. Arroyo toad (Bufo californicus) hydrogeomorphic habitat baseline analysis/radio telemetry study, Rancho Las Flores, San Bernardino County, California. Final Report*. Unpublished report 110 pp.

These reports summarize the results of studies conducted for arroyo toad within LFR, including portions of the study area in Sub-Reaches 2, 3, and 4, Grass Valley Creek, and Horsethief Creek. The reports provide some data for riparian vegetation within the study area. Information from this report was used as additional support on riparian vegetation that has been mapped and observed within these three sub-reaches.

7. *U.S. Fish and Wildlife Service (USFWS). 2020. National Wetlands Inventory, Wetlands Mapper. 2020. Available online: https://www.fws.gov/wetlands/Data/Mapper.html. Accessed: May 14, 2020. Last updated May 4, 2020. USFWS, Washington D.C.*

This online portal contains the most current mapped areas of wetlands and waters using analysis of high-altitude imagery. Wetlands are identified based on vegetation, visible hydrology, and geography/soil classification. Cowardin classifications, the system used by the USFWS for classifying wetlands into five classes (i.e., marine, estuarine, riverine, lacustrine, and palustrine), are used to describe each identified wetland area as thoroughly as possible. The information from this website is used as a part of the description of the aquatic and wetland habitat identified in the study area.

2.4.2 Information Sources for Potential Habitat Suitability for ESA-listed and Special-Status Species

To identify potentially suitable aquatic habitat for ESA-listed and special-status species, DWR developed mapping criteria based on documented habitat use patterns of the species, including life history timing, particularly from the study area or areas comparable to the study area within the species' range. Source data for Mohave tui chub, arroyo toad, CRLF, and SMYLF included USFWS' Recovery Plans, critical habitat designations, and five-year reviews, as available. These sources describe physical and biological features of essential habitat for each species, and summarize life history information, historical and current distribution, locations of designated critical habitat, and pertinent recovery actions, such as potential for reintroduction. For western spadefoot, DWR reviewed information particularly focused on establishing whether the study area is within the range of this species, including Jennings and Hayes (1994), Morey (2005), Stebbins and McGinnis (2012), and Baumberger et al. (2019). Key documents presenting information from the study area are briefly described below.

Discussion and analysis of special status species is presented in Section 4.1.5 (Habitat Suitable for ESA-listed and Special-Status Species).

1. *Aspen Environmental Group and Hunt & Associates Biological Consulting. 2005. Arroyo Toad Survey and Habitat Evaluation Along Horsethief Creek and Check 66 Access Road, DWR Mojave Siphon, Summit Valley, San Bernardino County, California. January.*

   This report summarizes the results of surveys conducted for arroyo toad in the vicinity of Sub-Reaches 1, 2, and 3, and adjacent Horsethief Creek as part of DWR's Horsethief Creek Bridge Mojave Siphon Maintenance Access Road Construction Project. Information from this report, as well as the following two reports, was used to help determine current habitat use and life history timing in the study area, as well as providing context to occurrence data and other information about arroyo toad within the study area.

2. *Cadre Environmental. 2007. Arroyo toad (Bufo californicus) hydrogeomorphic habitat baseline analysis/radio telemetry study, Rancho Las Flores — West Fork Mojave River & Grass Valley Creek, San Bernardino County, California. Final Report. Unpublished report 116 pp.*

3. *Ramirez, Jr. R.S. 2003. Arroyo toad* (*Bufo californicus*) *hydrogeomorphic habitat baseline analysis/radio telemetry study, Rancho Las Flores, San Bernardino County, California. Final Report.* Unpublished report 110 pp.

   These reports summarize the results of radio tracking/telemetry studies conducted on arroyo toad within LFR, including portions of the study area in Sub-Reaches 2, 3, and 4, Grass Valley Creek, and Horsethief Creek. The reports also provide information on hydrogeomorphic and habitat baseline data within the study area and literature reviews for existing information on arroyo toads in the vicinity of the study area. Information from this report was used to help determine how arroyo toads utilize upland and aquatic habitat, including the average and maximum distance traveled, and location details.

4. *HELIX Environmental Planning, Inc. 2014. Tapestry Project. Biological Technical Report.* November 2014. 160 pp.

   This report includes information on various biological resources studies performed for the Tapestry Specific Plan, a proposed residential and community development project. These studies including mapping vegetation communities, surveys for beaver dams and activity, arroyo toad surveys, and other focused species surveys within and surrounding Sub-reach 1, 2, and 3, and adjacent Horsethief Creek.

In addition to the sources listed above, information in the California Natural Diversity Database (CNDDB) (CDFW 2020) was reviewed for recent mapped occurrences and

associated metadata describing life stages detected, date of observation, and descriptions of habitat that might indicate habitat for critical life stages. Information collected during DWR's 2018 reconnaissance survey (DWR 2019) was also used, particularly to identify locations with surface water, aquatic macrohabitat type, depth of pools, and vegetation characteristics. NWI classification, VegCAMP maps of riparian vegetation, and the hydrology analysis described above were also reviewed for consistency with field determinations. Within sub-reaches that were dry at the time of the 2018 reconnaissance survey, locations of potential critical life stage habitat could not be identified because a critical component, pool depths, was not measured. However, general conclusions regarding the presence of potential suitable habitat and relationship to flow conditions were based on the hydrology analysis and VegCAMP mapping. Information in the CNDDB was also reviewed for recent mapped occurrences and associated metadata describing life stages detected, date of observation, and descriptions of habitat that might indicate habitat for critical life stages.

2.4.3 Information Sources for Potential Habitat for Aquatic Invasive Species

After DWR identified the distribution and types of aquatic, wetland, riparian, and upland habitat within the study area in Step 1, DWR evaluated potential habitat in the study area as part of step 2, for the four identified AIS based on their habitat preferences. DWR overlaid habitat identified in Step 1 for each of the different sub-reaches to determine which areas each AIS could use for habitat and if there were any known restrictions on their use of the areas. Information sources used in Step 2 for AIS are described below. Discussion and analysis of aquatic invasive species is presented in Section 4.1.8 (Aquatic Invasive Species).

1. California Invasive P*lant Council (Cal-IPC). 2020.* California Invasive Plant *Profiles.* A*vailable online: http://www.cal-*ipc.org/ip/manage*ment/plant_profiles/index.php.* Accessed*:* May 12, 2020. *Last updated 2020.* Cal-IPC, Sacramento, C*alifornia*.

   The California Invasive Plant Profiles contain detailed profiles for the majority of invasive weed species known in California. This includes information on habitat that these species prefer, how they impact native species, and management options. For the purpose of this Supplemental Report, information on Eurasian watermilfoil habitat use and water requirements was factored into the consideration of the study area's suitability for the species.

2. *California of Department of Fish and Wildlife. 2014. California's Invaders: American Bullfrog (Lithobates catesbeianus). Available online: https://www.wildlife.ca.gov/Conservation/Invasives/Species/Bullfrog. Accessed: May 15, 2020. Last updated 2020. CDFW, Sacramento, California.*

   The CDFW's profile on American bullfrog includes a description of the species, its current distribution in California, habitat preferences, how it spreads, and its impact on native species and resources. Habitat preferences and bullfrog vectors

of introduction were incorporated into the analysis of where portions of the study area contain suitable habitat for the American bullfrog exists.

3. *Department of Water Resources (DWR). 2019. West Fork River Reach — Reconnaissance Report. Written for Relicensing of Devil Canyon Project. January 2019.*

This report details the results of DWR's December 2018 reconnaissance of the study area, including descriptions of where individuals of AIS were observed in the study area and what kind of habitat was seen in each sub-reach. For each of the AIS, DWR 2019 was used as support for habitat analysis and as the backbone for their occurrence in the study area.

4. *DiTomaso, J.M., G.B. Kyser, S.R. Oneto, R.G. Wilson, S.B. Orloff, L.W. Anderson, S.D. Wright, J.A. Roncoroni, T.L. Miller, T.S. Prather, C. Ransom, K.G. Beck, C. Duncan, K.A. Wilson, and J.J. Mann. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp.*

This book discusses all invasive weeds in the Western United States, including species descriptions, habitat requirements, vectors of introduction, impacts on agricultural and native species, and management strategies. Information in this book was used to support the habitat analysis in the study area for Eurasian watermilfoil.

5. *HELIX Environmental Planning, Inc. 2014. Tapestry Project. Biological Technical Report. November 2014. 160 pp.*

This report includes information on various biological resources studies performed for the Tapestry Specific Plan, a proposed residential and community development project. These studies including some information on AIS within and surrounding Sub-reach 1, 2, and 3, and adjacent Horsethief Creek. This information was used as support for descriptions of AIS use of WFMR, particularly American bullfrog.

6. *United States Geological Survey (USGS). 2020. Nonindigenous Aquatic Species.* Available online: http://nas.er.usgs.gov/*.* Accessed*:* May 15, *2020. Last updated 2020.* USGS, Washington, D.C.

This USGS website includes information on a wide variety of known AIS in the United States, including maps of their locations and complete descriptions of each species, their habitat requirements, their vectors of introduction, how they impact natural resources and the economy, management options, and their history of spread. This information was used to assist in the analysis of each of the aquatic habitat in the study area for their suitability for each AIS.

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3.0 HYDROLOGY ANALYSIS

Comparison of the hydrograph from WY 2006 through WY 2019 shows that in all instances of a non-Project release of water from Cedar Springs Dam, USGS Gage 10260820, stream flows are recorded downstream at the WFMR above Mojave Forks Reservoir gage, USGS Gage 10260950 (Table 2.2-2). Hydrographs from each WY are provided in Appendix 1. With review of correlating aerial imagery discussed further in Section 3.2, the entire reach was inundated to Deep Creek in most times when non-Project releases of water from Cedar Springs Dam were as low as 16 cfs. The inundation may be due to the release or the release plus accretion.

The positioning of the two primary stream gages in the reach limits accuracy and quantification of wetted extent. Without non-Project release of water from Cedar Springs Dam, there is no flow recorded at the WFMR below the Silverwood Lake Gage. During non-release periods, stream flows from accretion are only recorded at the lower gage. Partial inundation between the two gages, a distance of approximately 4.5 river miles, can only be discussed qualitatively using the available aerial imagery. Periods in the hydrograph prior to the date of the aerial image date further inform this qualitative discussion. There are insufficient data to quantify the amount of flow associated with partial inundation of the WFMR between the two gages. The analysis required to provide a monthly estimate of wetted extent and subsurface flow is impaired by the amount of data available and variability in annual hydrological conditions. The analysis sections below describe each component used to determine the typical state of the reach as well as the variability observed in a given year.

3.1 NON-PROJECT RELEASES FROM CEDAR SPRINGS DAM

Review of all gage data for WY 2006 through WY 2019 details a high variability between WYs (Table 2.2-2). Figure 3.1-1 presents the hydrograph for the WFMR below Silverwood Gage by WY, where all data are associated with non-Project releases of water from Cedar Springs Dam. The figure details a high degree of annual and monthly variation in non-Project release of water from Cedar Springs Dam among WYs. Further, the figure identifies that there have been non-Project Cedar Springs Dam releases in all months. In those instances when a non-Project release of water from Cedar Springs Dam occurs, it typically occurs in winter and spring, and sometimes fall. Only three total non-Project releases of water from Cedar Springs Dam have occurred in the summer and are variably spread across the months of July, August, and September in different WYs. The magnitude of non-Project releases of water from Cedar Springs Dam is generally less than 100 cfs, with sustained releases of between approximately 40 to 50 cfs being the most common. Less frequent, sustained non-Project release of water from Cedar Springs Dam can be higher or lower, and short-term events have exceeded 2,000 cfs.

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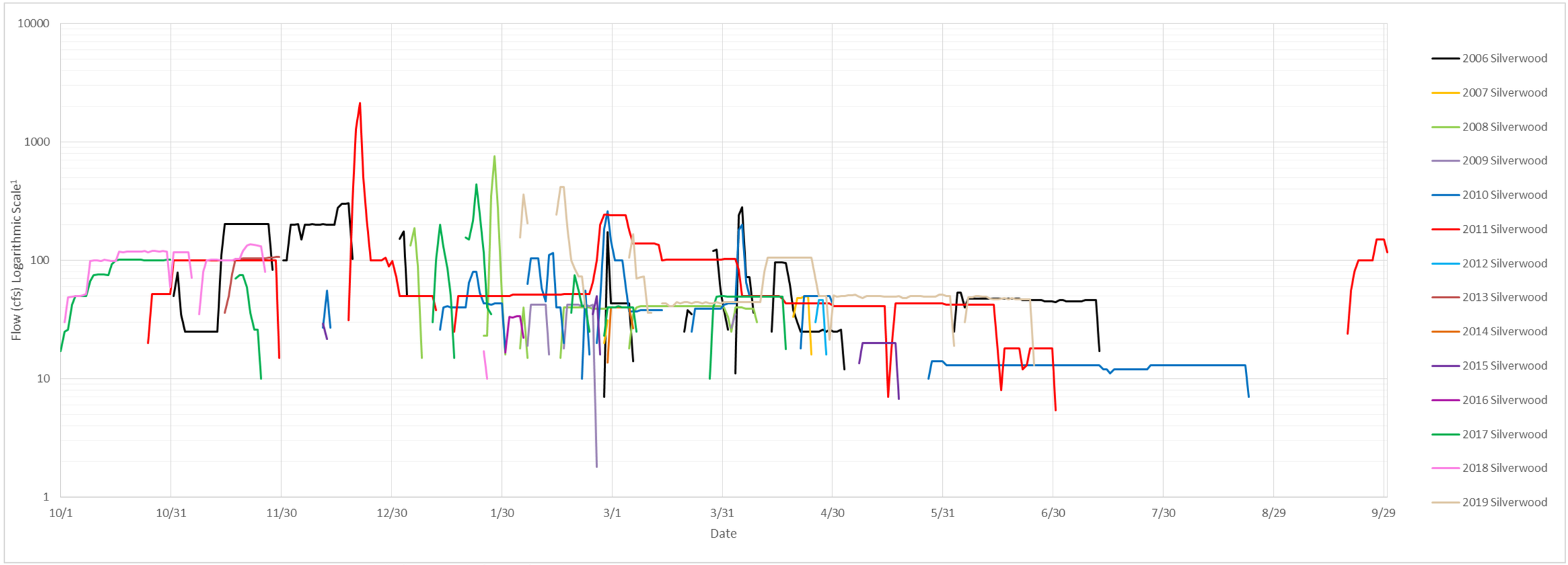

[1]*Disconectivity in each WY hydrograph details an average daily flow record of zero cfs and is not plotted on the logarithmic scale*

Figure 3.1-1. Annual Non-Project Release of Water from Cedar Springs Dam from WY 2006 through WY 2019

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Monthly and seasonal non-Project releases of water from Cedar Springs Dam are highly variable by WY, as evidenced by seasonal releases from 2006 through 2019 (Table 2.2-2). Daily non-Project releases of water from Cedar Springs Dam in a given WY range from four days in WY 2012 to 240 days in WY 2011 (Table 3.1-1). Over the period of record that was reviewed, the average number of days in which a non-Project release occurred in a given month ranged from a low of 1 day in September to a high of 11 days in April. During the period of record, each month had no daily releases in at least three separate WYs. This further underlines the fact that the WFMR is a flashy system with highly variable monthly and seasonal hydrology and any month could encounter a situation where no release was observed.

Regularity of non-Project release of water from Cedar Springs Dam was further assessed using monthly box plots of all hydrology data (Figure 3.1-2 and Table 3.1-2). The median flow recorded at the WFMR below Silverwood Gage is zero for all months, meaning that at least half the days in the month had no releases. In the months of October, December, January, May, July, August, and September, all measured flows are identified as outliers (beyond 2.5 quartiles from the median), detailing that releases can happen, but are infrequent. Comparatively, non-Project releases of water from Cedar Springs Dam are more regular in February, March, and April as well as November and June. Figure 3.1-2 shows a similar month-to-month pattern for the WFMR above Mojave Forks gage and for the WFMR below Silverwood gage, but with some medians above zero in fall, winter, and spring months, and with a high median of 11 cfs for March. These differences between box plots identify the role of third party water rights and their releases, tributary flows, and accretion in maintaining increased wetted extent. While the WFMR can be partially dry in any month, the reach is not entirely dependent on non-Project release of water from Cedar Springs Dam to produce flows that would reach the downstream gage. In some years, third party releases, tributary flows, and accretion can be high enough to sustain a wetted channel through the entire reach in February, March, and April.

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Table 3.1-1. Non-Project Releases from Cedar Springs Dam (Days)

Water Year	Days with Releases by Month												Longest Release (days)	Longest Number of Days with No Release	Total Number of Release Days
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP			
2006	0	28	20	3	2	13	25	4	28	13	0	0	41	79	136
2007	0	0	0	0	2	0	6	0	0	0	0	0	6	158	8
2008	0	0	0	11	18	26	10	0	0	0	0	0	36	173	65
2009	0	0	0	0	17	0	2	0	0	0	0	0	10	179	19
2010	0	0	3	19	18	24	23	6	30	31	23	0	89	72	177
2011	7	30	13	27	28	31	30	31	30	1	0	12	166	79	240
2012	0	0	0	0	0	0	4	0	0	0	0	0	4	208	4
2013	0	16	0	0	0	0	0	0	0	0	0	0	16	304	16
2014	0	0	0	0	1	7	0	0	0	0	0	0	8	207	8
2015	0	0	2	0	3	0	0	12	0	0	0	0	12	134	17
2016	1	0	0	1	5	0	0	0	0	0	0	0	6	238	7
2017	31	8	0	15	8	12	18	0	0	0	0	0	31	165	92
2018	30	25	0	2	0	0	0	0	0	0	0	0	36	247	57
2019	0	0	0	0	12	24	30	31	23	0	0	0	81	126	120
Number of Years without Release	10	9	10	7	3	7	5	9	10	11	13	13	--	--	--
Number of Years with Release	4	5	4	7	11	7	9	5	4	3	1	1	--	--	--

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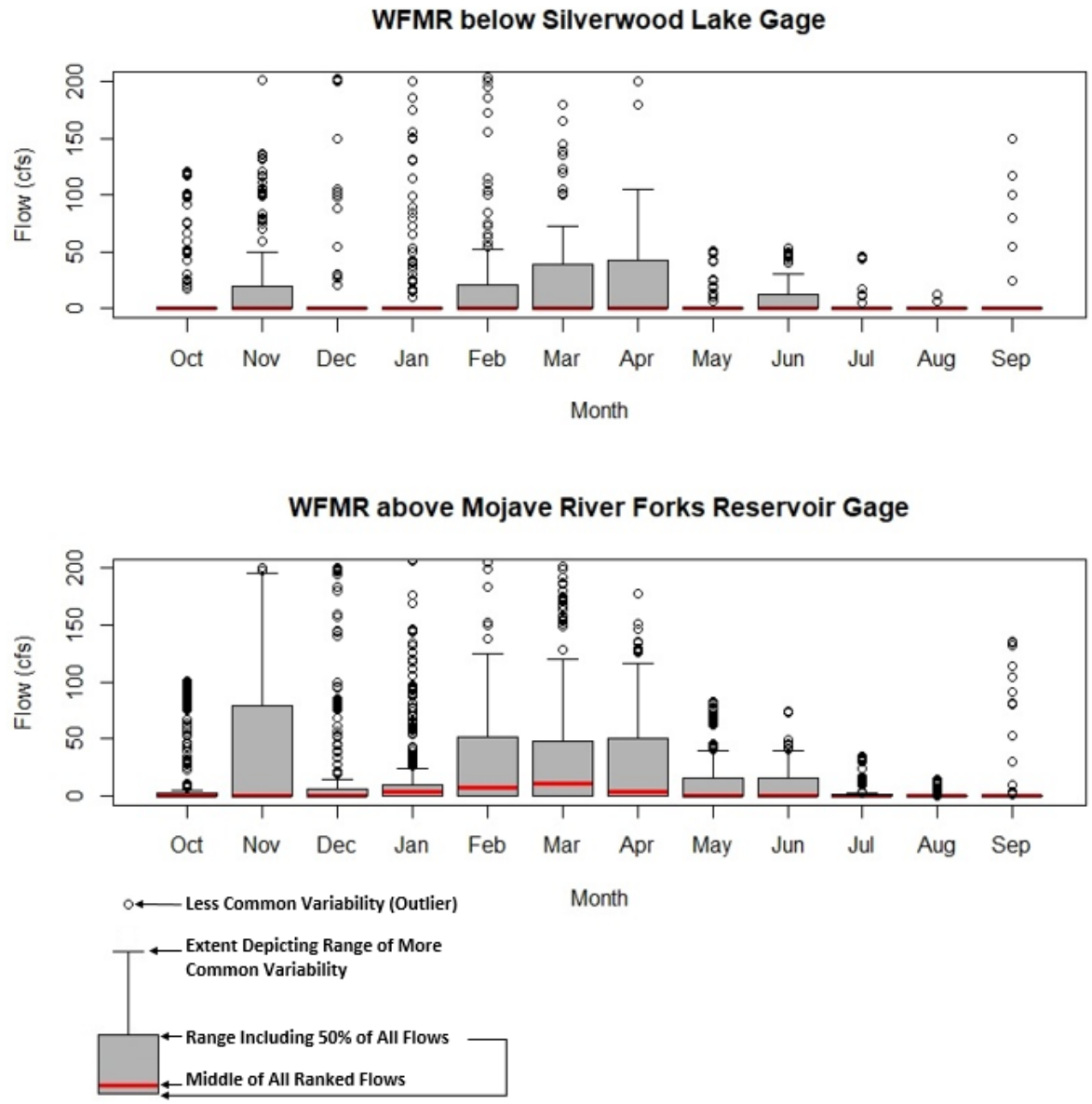

Figure 3.1-2. Distribution of Daily Flows Observed in a Given Month between WY 2006 and WY 2019

Table 3.1-2. Distribution Statistics of Flows Observed between WY 2006 and WY 2019

Flow Statistics (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
WFMR below Silverwood (cfs)												
Upper Whisker (1.5 Quartiles)	0	50	0	0	52	73	105	0	30	0	0	0
Third Quartile	0	20	0	0	21.1	39	43	0	13	0	0	0
Median	0	0	0	0	0	0	0	0	0	0	0	0
First Quartile	0	0	0	0	0	0	0	0	0	0	0	0
Lower Whisker (1.5 Quartiles)	0	0	0	0	0	0	0	0	0	0	0	0
WFMR above Mojave Forks (cfs)												
Upper Whisker (1.5 Quartiles)	4.8	196	14	24	125	120	116	40	39.5	2.24	0	0
Third Quartile	2.6	79	6.1	10	52	48	50	16	16	0.9	0	0
Median	0	0.06	0	3.5	6.7	11	2.95	0.2	0	0	0	0
First Quartile	0	0	0	0	0	0	0	0	0	0	0	0
Lower Whisker (1.5 Quartiles)	0	0	0	0	0	0	0	0	0	0	0	0

Key:
cfs = cubic feet per second
WFMR = West Fork Mojave River

3.2 AERIAL IMAGERY

Twenty aerial images (aerials) were sourced from Google Earth (Google 2020) and ESRI (ESRI 2020) that detail a variety of downstream wetted extents. Ten of the aerials capture 10 different instances of a fully wetted reach. The downstream extent of the wetted channel for each aerial is detailed in Figure 3.2-1. Aerials showing the two driest occasions – August 3, 2018 and September 4, 2016 – are the only available aerials from summer months. In both instances, non-Project releases of water from Cedar Springs Dam or stream flows were not recorded for five months. On the date of the aerial showing the driest conditions, September 4, 2016, the study reach had not received a sustained non-Project release of water from Cedar Springs Dam for nine months. Wetted extent shown in the remaining aerials varied between full reach inundation down to the confluence with Deep Creek, and partial reach inundation to terminus locations within Sub-Reach 4, and from the bottom of Sub-Reach 4 to the Arrowhead Lake Road crossing, within the upper portion of Sub-Reach 5. These later terminus locations are clustered in a manner that suggests a common surface to subsurface transition zone with multiple terminus locations clustered together in the same general vicinity. Sub-Reaches 1, 2, and 3 are wet in 18 out of 20 aerials. In 10 aerials the full reach is wet. The transition zone to Arrowhead Lake Road varies

depending on conditions related to past non-Project release of water from Cedar Springs Dam timing and accretion. Aside from the aerial on May 27, 2014 at 0.19 cfs, and immediately downstream of Arrowhead Lake Road, the aerials provide no evidence of partial flow downstream of the road.

To determine if the upstream reaches are usually dry in summer months, supplemental hydrology from WY 2002 and WY 2003 was reviewed. The terminus in the aerial from November 2003 is clustered with two other aerials at the top of the transition zone. No non-Project release of water from Cedar Springs Dam or accretion was recorded for nearly five months prior to the November 2003 aerial.

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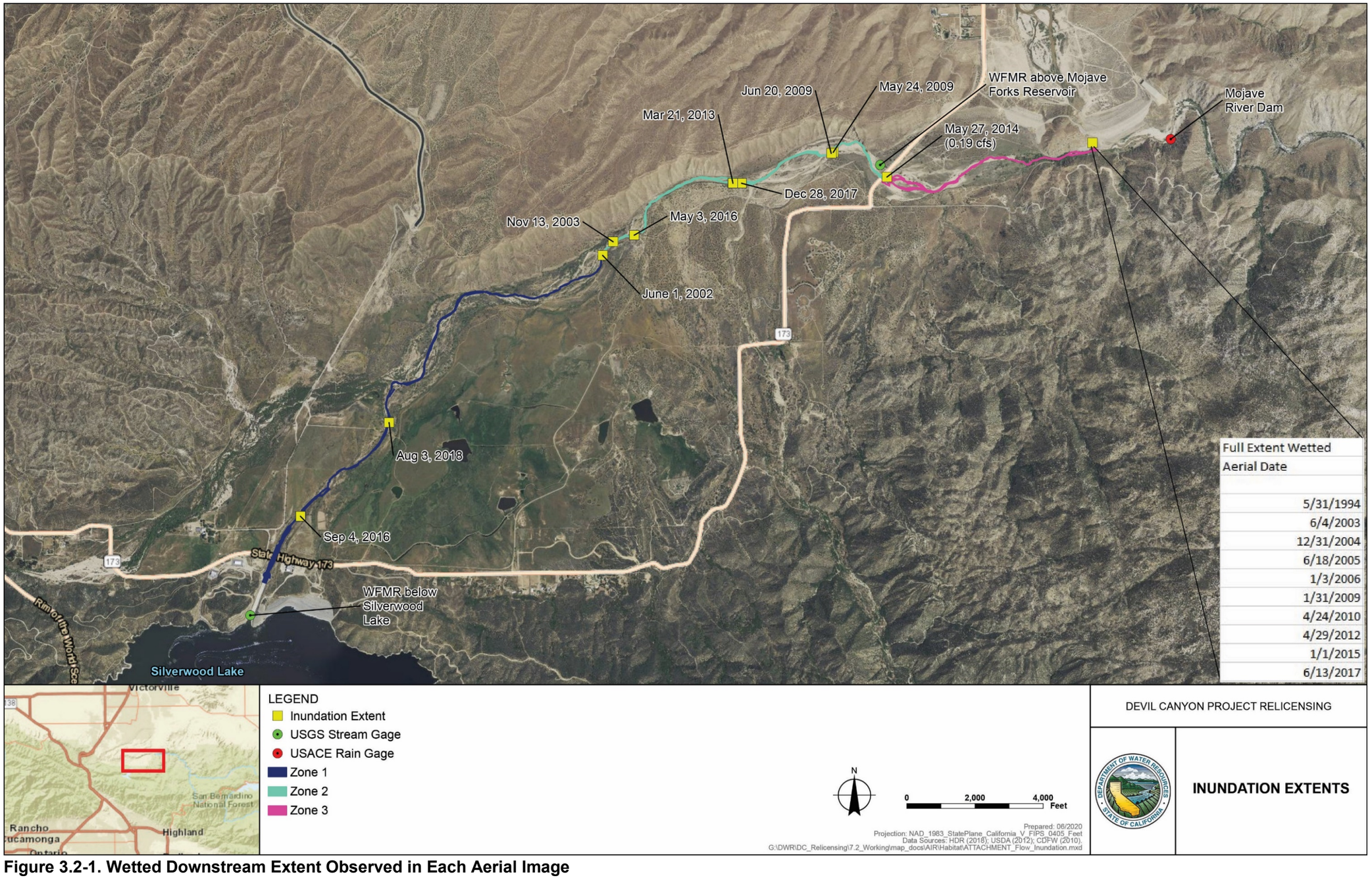

Figure 3.2-1. Wetted Downstream Extent Observed in Each Aerial Image

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Based on the wetted extents observed in the aerials, the reach can be divided into three zones. Zone 1 includes Sub-Reaches 1, 2, and 3, and is typically wet year-round, except in drier years. Zone 2 is a transition zone between Sub-Reach 4 and the top of Sub-Reach 5, where a wetted channel can persist through the spring months in drier years, and persist through the summer and fall in wetter years or with higher sustained accretion. Zone 3 includes Sub-Reach 5, downstream of Arrowhead Lake Road, and all of Sub-Reach 6 and is wetted during all non-Project release of water from Cedar Springs Dam events, and periods of higher accretion through the spring. During a release, all zones are wet. Without a release the extent that reach is wet is dependent on tributary flows, third party releases, and accretion.

3.3 PRECIPITATION

The frequency and magnitude of precipitation events shows some direct correlation to the regularity of non-project releases. The hydrograph for WY 2011 (Figure 3.3-1) shows long and stable non-project releases and is an indication of wetter stream conditions. Precipitation records for WY 2011 show some larger daily rain totals (above two inches daily) in December, and some more regular mid-level daily rain totals (near and above one inch and less than two inches daily) through the late winter and early spring. The hydrograph for WY 2018 shows no stable releases except for the beginning of the WY, and is indicative of drier stream conditions. Precipitation records for WY 2018 show very few precipitation events and all but one are well below one inch of daily accumulation.

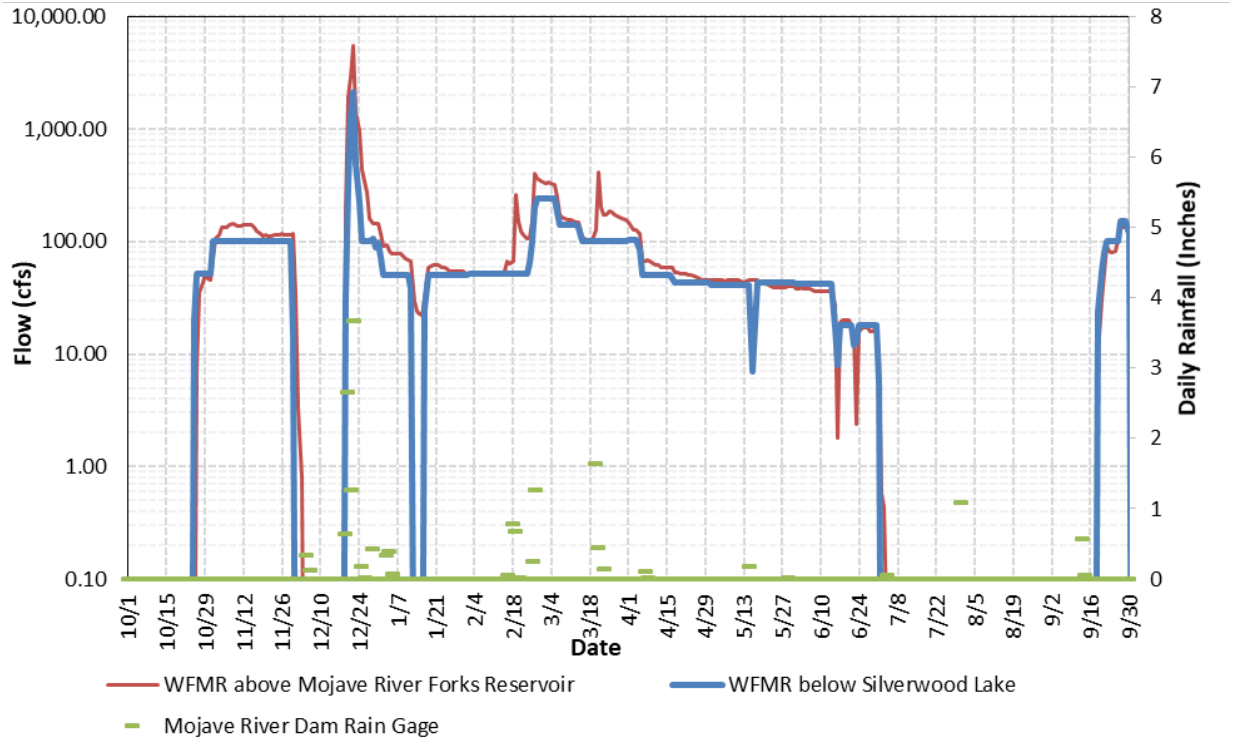


Figure 3.3-1. Average Daily Flow and Daily Precipitation Accumulation in WY 2011

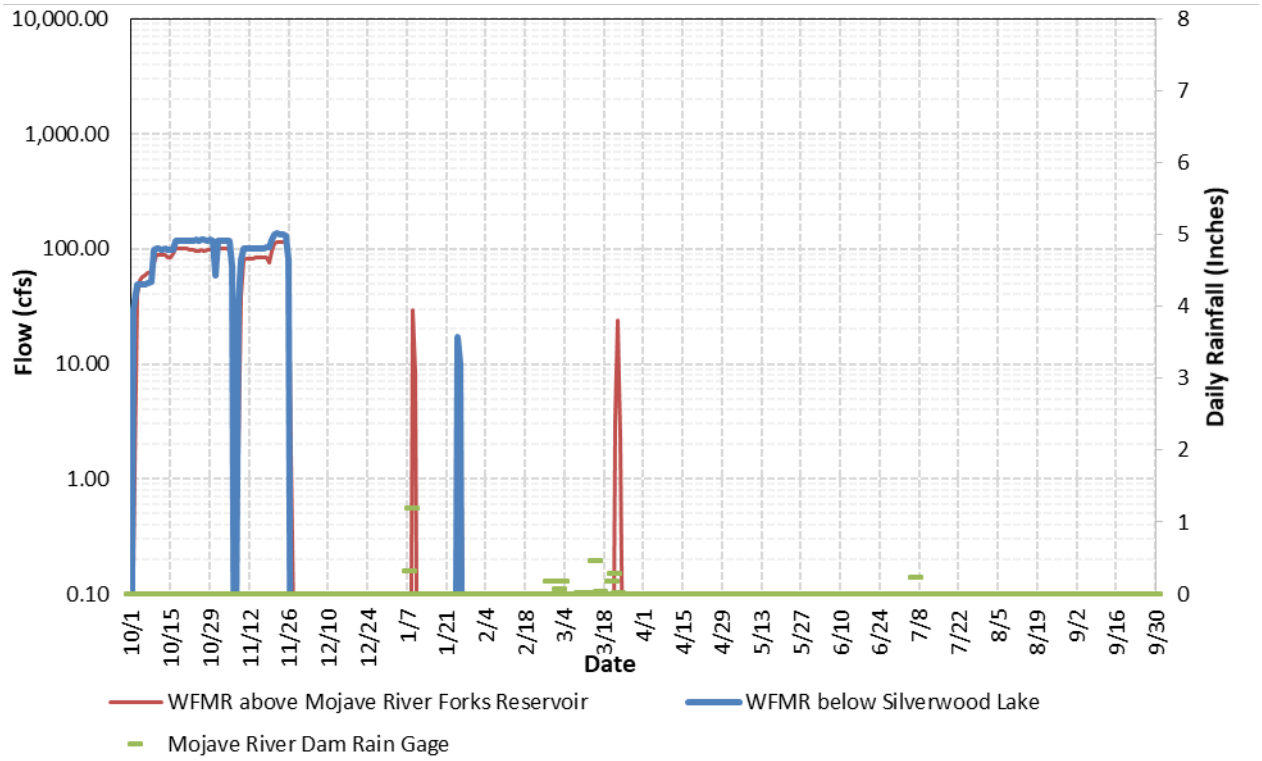


Figure 3.3-2. Average Daily Flow and Daily Precipitation Accumulation in WY 2018

Precipitation accumulations at the MJD rain gage for WY 2006 through WY 2019 were assimilated to determine a classification of WY type to better evaluate habitat in the study area (Table 3.3-1). Monthly accumulations, WY totals, WY type classification, and monthly average rainfall over the reviewed period of record are provided in Table 3.3-2. Between WY 2006 and WY 2019, there are two WYs where no data was recorded. The following water year types from WY 2006 through WY 2019 were observed: two Dry WYs, seven Below Normal WYs, one Above Normal WY, and four Wet WYs. Monthly average rainfall totals indicate that most rainfall in the study area occurs from October to April, with averages of near 1.5 inches occurring in December, January, and February. For the two years where no datum was recorded (WY 2009 and WY 2010), hydrographs, provided in Appendix 1, were reviewed to provide a qualitative designation of WY type. From this qualitative assessment, WY 2009 was determined to be a Below Normal WY, and WY 2010 was determined to be a Wet WY; these are not included in the summary of WY types above.

Table 3.3-1. Water Year Characterizations

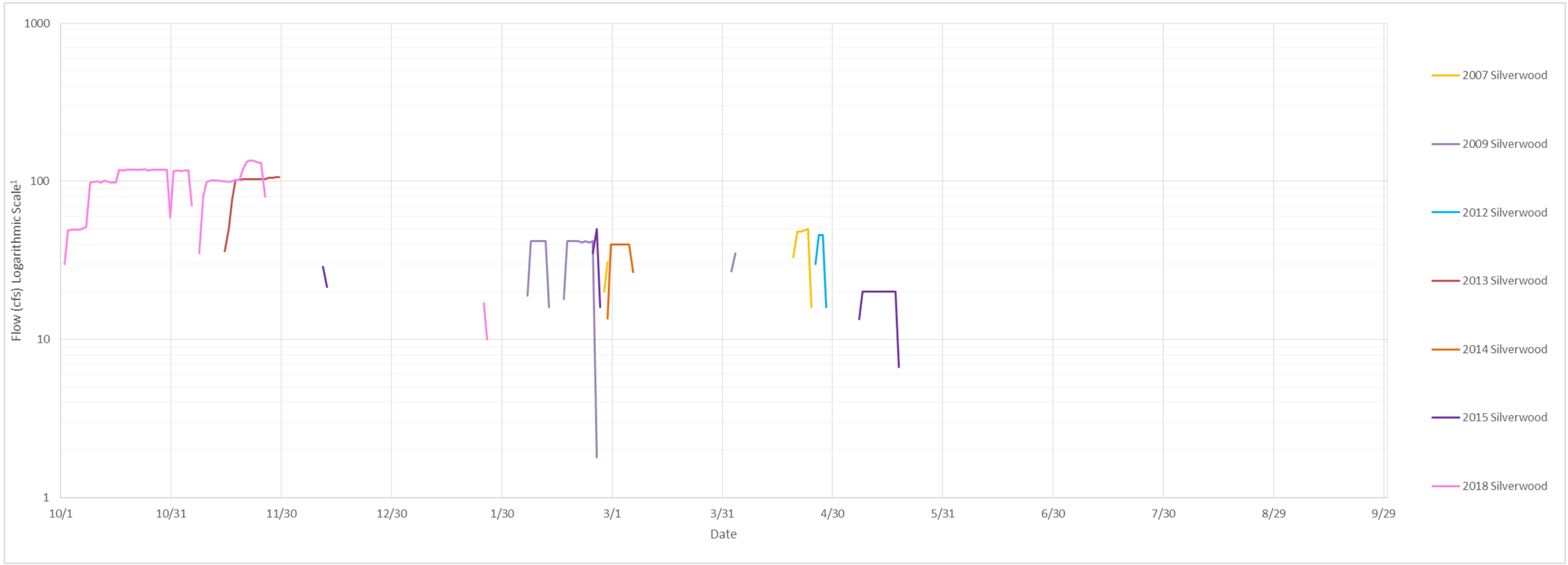
WY Type Classification	Precipitation Accumulation
Wet	Greater than 11.7 Inches
Above Normal	Between 7.5 and 11.7 Inches
Below Normal	Between 7.5 and 3.3 Inches
Dry	Less than 3.3 Inches

Table 3.3-2. WY Rainfall Accumulation, and Monthly Average Rainfall at the Mojave River Dam Rain Gage (inches)

WY	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	WY Type
2006	--	--	--	--	1.67	2.47	2.65	--	0.04	0.27	--	--	7.10	Below Norm.
2007	0.17	0.17	0.74	0.08	0.95	0.08	0.23	--	--	--	1.13	0.03	3.58	Below Norm.
2008	0.02	1.65	0.47	5.14	0.24	0.42	--	--	--	--	--	--	7.94	Above Norm.
2009	--	--	--	--	--	--	--	--	--	--	--	--	--	Below Norm.[2]
2010	--	--	--	--	--	--	--	--	--	--	--	--	--	Wet[2]
2011	--	--	9.34	0.81	3.02	2.22	0.11	0.20	--	1.15	--	0.62	17.47	Wet
2012	0.08	1.03	0.31	0.01	0.71	1.72	1.23	--	--	0.32	0.33	--	5.74	Below Norm.
2013	--	0.12	1.17	0.96	0.50	0.04	--	0.01	--	--	0.08	0.09	2.97	Dry
2014	0.32	1.39	0.51	0.05	2.30	0.50	0.27	0.01	--	--	0.93	0.01	6.29	Below Norm.
2015	--	0.32	0.98	0.76	0.46	0.08	--	0.32	0.29	2.30	--	0.24	5.75	Below Norm.
2016	1.07	0.22	0.36	2.48	0.20	0.80	0.30	--	0.02	--	--	--	5.45	Below Norm.
2017	1.05	0.36	4.31	3.90	2.02	0.03	--	0.65	--	--	0.02	0.05	12.39	Wet
2018	--	--	--	1.52	0.18	1.26	--	--	--	0.23	--	--	3.19	Dry
2019	0.75	0.82	2.07	1.69	4.87	1.70	--	0.43	--	--	--	--	12.33	Wet
Monthly Avg.	0.29	0.51	1.69	1.45	1.43	0.94	0.40	0.14	0.03	0.36	0.21	0.09	7.52	--

Notes:
[1]The rain gage appears to be offline in this year.
[2]WY type designation is based on a qualitative assessment of the hydrographs.
Key:
Norm. = Normal
Avg.= Average

To further assess the variability of non-Project releases of water from Cedar Springs Dam between WYs, Figure 3.1-1 was reproduced with Wet and Above Normal precipitation WYs removed from the source data (Figure 3.3-3). The result of these omissions details the infrequency of releases in Below Normal and Dry WYs and the monthly variability between WYs; additionally, the result further confirms which months tend to see the most frequent wet conditions in the study area. In Below Normal and Dry WYs releases occur most regularly in the winter and spring, but have occurred in the fall of some years, WY 2013 and WY 2018, both Dry water years. The magnitude of winter and spring releases in these WY types remains similar to all years with most sustained releases ranging between 40 and 50 cfs. Some brief releases in the winter and spring are in the range of 10 to 30 cfs. Releases in the fall appear to be more atypical and with a specific water resource or recharge objective. Sustained release magnitudes in 2013 and 2018 range from 50 to 135 cfs.



[1]*Disconectivity in each WY hydrograph details an average daily flow record of zero cfs and is not plotted on the logarithmic scale*

Figure 3.3-3. Annual Silverwood Lake Non-Project Releases from Cedar Springs Dam between WY 2006 and WY 2019 with Wet and Above Normal Precipitation Years Omitted

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3.4 SUB-SURFACE FLOW

Assessment of subsurface flow between WY 2006 and WY 2019 is limited to eight occurrences of stable multi-day, non-Project releases from Cedar Springs Dam where depletion was observed between the two primary gages. During these occurrences, less flow was recorded at the downstream gage and there was little to no precipitation that would cause accretion. During each occurrence, the daily release remained relatively stable and the portion of stream flow determined to go subsurface, or difference between the two gages, also remained relatively stable. Figure 3.4-1 details the magnitude of discharge released during each occurrence and what volume of flow goes sub-surface. The full WY, and in some cases the preceding WY, has some effect on how much stream flow goes sub-surface. In all assessed occurrences, initial subsurface flows are noticeably higher than those through the remainder of the occurrence. This is likely due to the initial need to saturate dry substrates. In drier conditions where no release or accretion flows have occurred for some time, the difference between the two gages, subsurface flow, is notably higher for the first one to three days of the occurrence. Travel time is also a component that affects this analysis, but the omission of initial data points and utilization of stable flow data guards against the possibility of travel time affecting the relationship. In all occurrences, the first two to three days and the last day were omitted from each occurrence to ensure a more accurate calculation of related subsurface flow.

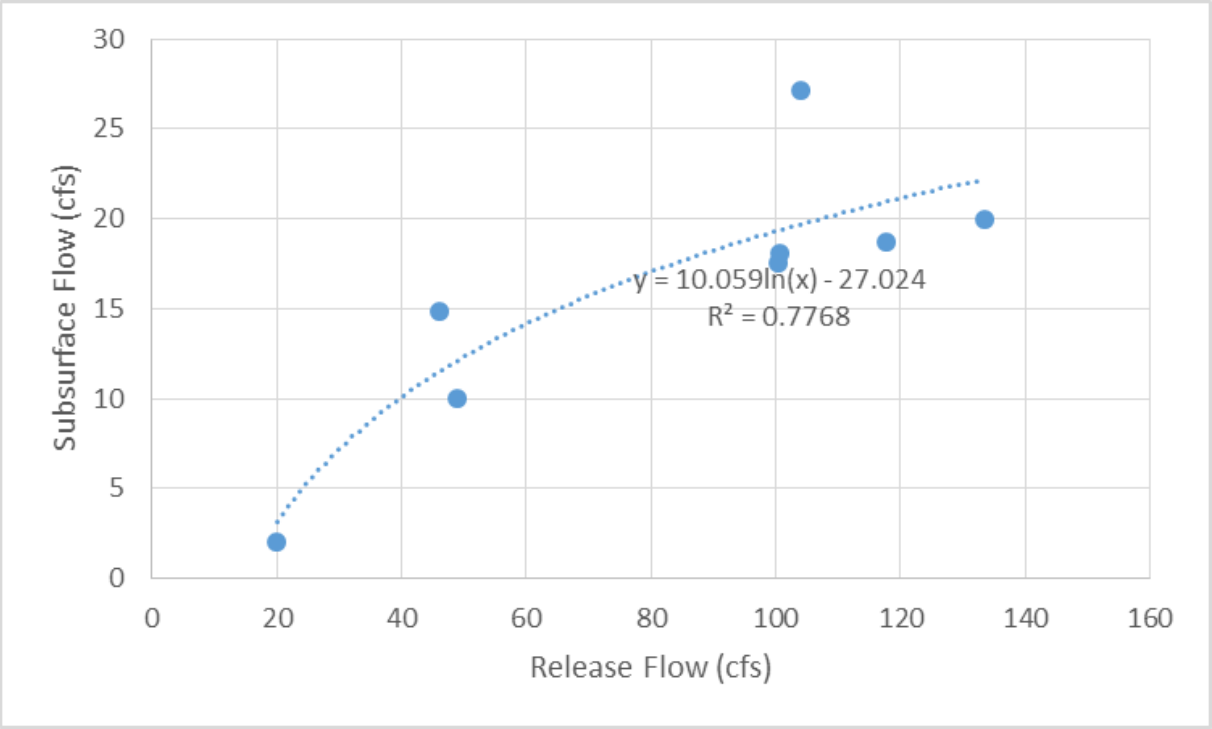

Figure 3.4-1. Relationship of Non-Project Releases from Cedar Springs Dam and Subsurface Flows

A curve was applied to the data to provide and extrapolate how much flow goes subsurface with different magnitudes of release (Table 3.4-1). These subsurface flow estimates should be considered on the higher end of what occurs given the only useable data to produce each point in the figure followed drier stream conditions. With wetter conditions preceding a release, the upper substrates would already be more saturated and less subsurface flow would be expected at the same release than the same release under drier conditions. A logarithmic curve was determined to be the most appropriate. A polynomial curve results in a slightly better R^2 value, but produces comparatively lower subsurface flow estimates at higher flows that would not reasonably reflect actual estimates of conditions.

Table 3.4-1. Subsurface Flow Predictions

Release (cfs)	Subsurface Flow (cfs)	
	Polynomial Curve	Logarithmic Curve
20	2.5	3.1
30	6.3	7.2
40	9.7	10.1
50	12.7	12.3
60	15.1	14.2
70	17.1	15.7
80	18.7	17.1
90	19.8	18.2
100	20.4	19.3
110	20.6	20.3
120	20.3	21.1
130	19.5	21.9
140	18.3	22.7
150	16.7	23.4
200	1.4	26.3

Key:
cfs = cubic feet per second

Based on review of aerial images, and the regularity of the upstream three sub-reaches being wet, it is assumed that most subsurface flow occurs in Sub-Reaches 4, 5, and 6 (Zone 2 and Zone 3). This analysis quantifies and estimates the amount of subsurface flow observed after drier conditions and between the two primary gages. Additional subsurface flow volumes are assumed to occur between the WFMR above Mojave Forks Gage and the confluence with Deep Creek, within the lower half of Sub-Reach 5 and most of Sub-Reach 6 (Zone 3).

4.0 HABITAT ANALYSIS

The habitat analysis is divided into two components: general habitat by sub-reach in the study area and suitable habitat for each species, also separated into sub-reaches.

4.1 SUMMARY OF HABITAT

Based on the information sources cited in Sections 2.2.1 to 2.2.3, aquatic, wetland, riparian, and adjacent upland habitat was calculated for the study area (Step 1) using 900 feet as a bound for the habitat area on either side from the wetted edge. 900 feet is the maximum distance any of the ESA-listed or special-status species are known to use for habitat, as described below. Areas of extreme slope and all areas classified as the Urban Alliance were not included in the acreages, as they were not considered to be suitable habitat (based on arroyo toad radio-tracking data collected by Cadre Environmental [2007]). Table 4.1-1 includes the acres of each of the four habitat types – aquatic, wetlands, riparian and uplands – within each of the six sub-reaches. Habitat maps are included in Appendix 2.

Table 4.1-1. Acres of Aquatic, Wetland, Riparian, and Upland Habitat

Sub-Reach #	Aquatic	Wetland	Riparian	Upland	Total
Sub-Reach 1	8.40[1]	8.40[1]	0	137.72	146.12
Sub-Reach 2	7.43[1]	37.04[1]	68.35	109.00	221.82
Sub-Reach 3	15.99	15.10	133.67	190.50	355.26
Sub-Reach 4	10.61	0	20.31	204.02	234.94
Sub-Reach 5	21.61	0	23.04	341.46	386.11
Sub-Reach 6	2.66	0	11.74	51.01	65.41
Total	**66.70**	**60.94**	**257.11**	**1,033.71**	**1,409.66**

[1]Some of the habitat identified as wetland was also aquatic in nature, as determined by NWI. Therefore, 9.61 acres of habitat were identified as both aquatic and wetland.

4.1.1 Aquatic Habitat

A total of 66.70 acres of aquatic habitat was identified in the study area (USFWS 2020; AIS 2016). Within the study area, aquatic habitat was identified by the NWI as three types of riverine areas: Riverine Intermittent Streambed, Seasonally Flooded (R4SBC), which was the most abundant type and found in all sub-reaches, except Sub-Reach 1; and Riverine Perennial Unconsolidated Bottom, Semipermanently Flooded (R3UBF, and Riverine Unknown Perennial Unconsolidated Bottom, Semipermanently Flooded [R5UBF], both of which were present only in Sub-Reach 2) (USFWS 2020). It is not anticipated that the acreage of aquatic habitat would be impacted much by the flows from Cedar Springs Dam. Sub-Reaches 1 and 2 are nearly always wet, except in the driest years, as is the majority of Sub-Reach 3. Sub-Reach 6 is always dry during the driest times of year. Only Sub-Reaches 4 and 5 demonstrate fluctuation in water

amounts, even so they are generally dry in the driest times of year, containing water only during the wettest years. The non-Project releases from Cedar Springs Dam generally coincide with wetter WYs and precipitation, when water would already be available in the study area. Additionally, releases from other sources, as described above, are responsible for keeping Sub-Reaches 1, 2, and 3 perennially wet.

4.1.2 Wetland Habitat

A total of 73.23 acres[4] of wetland habitat was identified by the NWI and VegCAMP within the study area. Sub-Reach 1 was identified by the NWI as 8.40 acres of Freshwater Emergent Wetland habitat and Sub-Reach 2 had a smaller area (1.21 acres) of Freshwater Emergent Wetland identified by the NWI as well (USFWS 2020). There were also wetland habitat identified by VegCAMP in and in the vicinity (within 900 feet) of Sub-Reaches 1, 2 and 3. These included a rush-dominated Alliance in Sub-Reach 2 (35.57 acres) and Sub-Reach 3 (15.10 acres). A small amount of a cattail-dominated Alliance (0.26 acre) also occurs in Sub-Reach 2. Sub-Reaches 4, 5 and 6 had no wetland habitat. Wetland habitat present in the WFMR channel coincides mostly with existing aquatic habitat (primarily in Sub-Reaches 1 and 2). All of the sub-reaches with defined wetland habitat are wet year-round or have secondary sources of water. Therefore, wetland acreages and vegetation assemblages would also not be impacted by non-Project release of water from Cedar Springs Dam.

4.1.3 Riparian Habitat

There was a total of 257.11 acres of riparian habitat in the study area. All of the sub-reaches, except Sub-Reach 1, had riparian vegetation identified by VegCAMP mapping and verified during the 2018 reconnaissance survey for relicensing (DWR 2019). There were five riparian alliances identified by VegCAMP mapping in the study area: two tree-dominated and three shrub-dominated. The Fremont cottonwood forest Alliance (*Populus fremontii-Fraxinus velutina-Salix gooddingii*), was the most common, occurring in Sub-Reaches 2, 3, 4, 5 and 6. The other tree-dominated Alliance, Goodding's willow – red willow riparian woodlands Alliance (*Salix gooddingii – Salix laevigata*), occurred in Sub-Reaches 2 and 3. Of the three shrub-dominated riparian Alliances, the Sandbar willow thickets alliance (*Salix exigua*) was found in Sub-Reaches 2, 3, 4, and 6. The Arroyo willow thickets Alliance (*Salix lasiolepis*) was located in Sub-Reaches 3 and 4, while the Mulefat thickets Alliance (*Baccharis salicifolia*a) was mapped in Sub-Reaches 4 and 5 (AIS 2016; DWR 2019). Riparian vegetation would be most prone to acreage changes due to non-Project releases of water from Cedar Springs Dam, especially heavy flows in unusual times of year that might rip out or damage vegetation on or near the wetted edges. However, desert ecosystems are prone to large volume, short duration water events (Sub-Reach 5 has an area designated as unvegetated wash due to these floods), so the vegetation type and density reflects seasonal exposure to flashy desert storms. Since the majority of non-Project releases of water from Cedar Springs

[4] Some of the habitat identified as wetland was also aquatic in nature, as determined by NWI. Therefore, 9.61 acres of habitat were identified as both aquatic and wetland.

Dam occur in wet years or during precipitation events, they mostly mimic the natural availability of water and would not affect riparian vegetation in the study area.

4.1.4 Upland Vegetated Habitat

There was a total of 1,050.47 acres of upland vegetated habitat in the study area, consisting of 10 Alliances identified by VegCAMP mapping. Two unvegetated Alliances were Unvegetated wash and river bottom, and Urban. There were eight upland vegetation Alliances: one tree-dominated, five shrub-dominated, and two herbaceous-dominated. The one tree-dominated Alliance, California juniper woodland Alliance (*Juniperus californica*), was mapped along every sub-reach, except for Sub-Reach 1 The most common shrub-dominated Alliance, Rubber rabbitbrush scrub (*Ericameria nauseosa*), occurred along every sub-reach, except 6. California buckwheat - Parish's goldeneye scrub Alliance (*Eriogonum fasciculatum - Viguiera parishii*), the second most frequently mapped shrub-dominated Alliance in the adjacent uplands of the study area, was located along Sub-Reaches 3 through 6. Three of the shrub-dominated Alliances were located along only one sub-reach: Scale broom scrub Alliance (*Lepidospartum squamatum*) along Sub-Reach 3, and Chamise chaparral Alliance (*Adenostoma fasciculatum*) and Birch leaf mountain mahogany chaparral Alliance (*Cercocarpus montanus*) along Sub-Reach 6. The first herbaceous Alliance cohort, California Annual and Perennial Grassland, was located along every Sub-Reach, except Sub-Reach 4. The other herbaceous Alliance cohort, Mediterranean California naturalized annual and perennial grassland, was located in a very small occurrence at the end of Sub-Reach 6. Of the unvegetated areas, the Urban Alliance was located along Sub-Reaches 1 and 6, and the unvegetated wash was located in Sub-Reach 5 (AIS 2016). The upland habitat are too distant from the wetted area of the WFMR to be impacted from releases from Cedar Springs Dam, except perhaps at the very fringes. Even very small adjustments in vegetation within uplands habitat at the fringes from changes in the wetted area and water availability would require years to occur and require more than just non-Project releases of water from Cedar Springs Dam to accomplish, unless they changed drastically from current operations.

Habitat within each of the sub-reaches are discussed in more detail below.

4.1.4.1 Sub-Reach 1

Sub-Reach 1 was the least complex of the sub-reaches in the study area, with no aquatic habitat distinct from wetlands, no riparian habitat, and only two vegetated upland habitat vegetation Alliances identified within 900 feet of the wetted edge. Based on WY 2006 through WY 2019 hydrology data, this sub-reach is wet year-round (Section 3.2).

Wetland Habitat

Sub-Reach 1 was identified by the NWI as including 8.40 acres of Freshwater Emergent Wetland habitat within the wetted reach (USFWS 2020). This coincides with the

description of Sub-Reach 1 from the reconnaissance survey, which characterized it as a long, deep, perennial pool, bordered on both sides by large mats of common reed (*Phragmites australis*) (DWR 2019).

The NWI defines the Freshwater Emergent Wetland habitat in Sub-Reach 1 as Palustrine Emergent Persistent Semipermanently Flooded Wetlands, Excavated. These habitat include non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Emergent wetlands have erect, rooted herbaceous, perennial hydrophytes dominant within the vegetation. Persistent means that vegetation is dominated by plant species that remain through the beginning of the next growing season after sprouting. Finally, Semipermanently Flooded means that water is present most of the growing season in most years. Finally, in Sub-Reach 1, the wetland is indicated to be Excavated, meaning that it was man-made (USFWS 2020).

There were two wetland vegetation classifications identified by VegCAMP in the area within 900 feet of the wetted edge of Sub-Reach 1: Baltic and Mexican rush marshes Alliance (*Juncus arcticus*)[5] and Hardstem and California bulrush marshes Alliance (*Schoenoplectus* spp.) (CNPS 2020; AIS 2016). The Baltic and Mexican rush marshes Alliance requires Baltic or Mexican rush (*Juncus balticus* or *Juncus mexicanus*) to have more than 50 percent relative cover in the herbaceous layer. This Alliance occurs in wet meadows, along streambanks, rivers, marshes, and lakes. In the Mojave Desert region, this Alliance has been found in wet, grazed areas (CNPS 2020).

Upland Habitat

Rubber rabbitbrush scrub Alliance was the only shrub Alliance located in Sub-Reach 1. This Alliance is characterized by having 50 percent relative cover of rubber rabbitbrush (*Ericameria nauseosa*) in the shrub layer and it grows in many areas, but mostly with preference toward disturbed areas. The height of the shrub canopy tends to be less than 10 feet. In the Mojave Desert region, the Alliance occupies intermittent watercourses, fallow agricultural fields and old mine tailings (CNPS 2020). Shrub cover varied from 5 to 50 percent (AIS 2016). There were 45.45 acres of this Alliance in Sub-Reach 1.

The only herbaceous-dominated vegetated Alliance cohort mapped along the Sub-Reach 1 was California annual and perennial grassland Mapping Unit (Native component). These stands occur throughout the Mojave Desert region, usually containing a portion of native species (e.g., desert stipa [*Achnatherum speciosum*], nodding needlegrass [*Stipa cernua*], pine bluegrass [*Poa secunda*]), as well as non-native species (e.g., red brome [*Bromus rubens*], Chilean chess [*Bromus berteroanus*], stork's-bill [*Erodium* spp.], schismus [*Schismus* spp.]) (AIS 2013). Herbaceous cover varied from 15 to 40 percent (AIS 2016). There were 92.27 acres of this Alliance in Sub-Reach 1.

[5] According to the Jepson Interchange (UC Berkeley 2020), *Juncus arcticus* has been erroneously identified in California and is either *Juncus balticus* or *Juncus mexicanus*.

A relatively large area of unvegetated Urban Alliance was located along Sub-Reach 1 as well.

4.1.4.2 Sub-Reach 2

This sub-reach had the most complex aquatic habitat in the study area, as well as some unusual VegCAMP Alliances. The sub-reach includes three aquatic habitat, two wetland habitats, three riparian habitats, and three upland habitats. This sub-reach is wet year-round (Section 3.2).

Aquatic Habitat

The NWI identified R4SBC, R3UBF and R5UBF aquatic habitats in this sub-reach. R3UBF and R5UBF are not present anywhere else in the study area. Aquatic acreage in this sub-reach was mapped at 7.43 acres.

R4SBC encompasses all wetlands and deepwater[6] habitat contained within a channel, except wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses, or lichens. Channels are further defined as natural or man-made conduits that move water or link waterbodies. Intermittent channels do not carry water year-round, but may have still pools when not flowing (R4SB). Finally, the Seasonally Flooded (C) classification means water is present for extended periods in these channels, especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface (Cowardin et al. 1979). This matches the hydrological analyses of the study area as not being perennially wet throughout all of the sub-reaches.

R3UBF and R5UBF are very similar, differing only in their subsystem description. R3UBF is characterized as high gradient, with some water flow year-round and little to no floodplain. The typical substrate consists of rock, cobbles, gravel and occasional patches of sand. R5UBF is given to those waters where a subsystem determination cannot be made. The Unconsolidated Bottom (UB) designation is given to aquatic habitat with at least 25 percent cover of particles smaller than 6-7 centimeters and vegetative cover less than 30 percent. Finally, in Semipermanently Flooded (F) systems, water is present during the growing season in most years, and the water table is usually at or very near the land surface (Cowardin et al. 1979). These additional descriptions of Sub-Reach 2 from the NWI indicate that areas of the sub-reach are wet year-round or nearly so, as the hydrologic analyses and 2018 relicensing reconnaissance survey indicated.

[6] Deepwater habitat is any open water deeper than 6.6 feet (Cowardin et al. 1979).

Wetland Habitat

Sub-Reach 2 had a smaller area (1.21 acres)[7] of Freshwater Emergent Wetland identified by the NWI, similar to that in Sub-Reach 1, but is natural and not man-made (USFWS 2020). There was also an area (35.56 acres) of Baltic and Mexican rush marshes Alliance located in areas around Sub-Reach 2 (AIS 2016). There was also a small area of Hardstem and California bulrush marshes Alliance in Sub-Reach 2, (12.96 acres). This Alliance has more than 50 percent relative cover of either hardstem bulrush (*Schoenoplectus acutus*) or California bulrush (*Schoenoplectus californicus*) in the herbaceous layer, or more than 30 percent relative cover if codominant with cattails (*Typha* spp.). This Alliance occurs in marshes, along streams, ponds, and lakes and in sloughs, swamps, estuaries, and roadside ditches. There is no specific information on this Alliance in the Mojave Desert region (CNPS 2020).

Riparian Habitat

Unlike Sub-Reach 1, Sub-Reach 2 supports riparian habitat. Fremont cottonwood forest Alliance, the most common in the study area, is dominated (50% relative cover in the tree layer) by Fremont's cottonwoods (*Populus fremontii*) with willows (*Salix* spp.) and velvet ash (*Fraxinus velutina*) also present in the tree canopy (CNPS 2020). The 2018 reconnaissance survey (DWR 2019) also observed Western sycamore (*Platanus racemosa*) in this Alliance in Sub-Reaches 2 and 3. Fremont's cottonwoods grow on average up to 65 feet tall along streams, rivers, and alluvial bottomlands throughout California (UC Berkeley 2020). This Alliance has been found in all but the western section of the Mojave Desert region (CNPS 2020). There were 51.76 acres of this Alliance in the sub-reach.

Sub-Reach 2 also had an unusual riparian Alliance: the Goodding's willow – red willow riparian woodlands Alliance, which occurred along a stretch of the northern side of the river at the very end of Sub-Reach 2 (12.96 acres). This Alliance is co-dominated (with one, the other, or both species making up 50 percent of the relative cover throughout the canopy) by Goodding's willow (*Salix gooddingii*) and red willow (*Salix laevigata*). Both species are common, widespread trees in California along rivers, floodplains, and lakes. In the Mojave Desert region, they have been located in scattered areas along permanent streams and springs, including multiple dammed rivers (CNPS 2020). Willows observed in the sub-reaches were more likely to grow in the shrub layer, with scattered mature trees present. Cover in the tree/shrub layer varied from 15 to 25 percent, but overall vegetation was sparse in the area of the Alliance (AIS 2016; DWR 2019). Although healthier in areas that mimic natural flow regimes, this Alliance has spread in areas below dammed rivers (CNPS 2020).

The final riparian Alliance present in Sub-Reach 2, the Sandbar willow thickets Alliance, although mapped in four sub-reaches (2, 3, 4 and 6), was not common in any of the reaches. A small patch (3.63 acres) was mapped on the southern side of the river in

[7] This is also part of the aquatic habitat acreage.

Sub-Reach 2, behind a large area of Fremont cottonwood forest Alliance (AIS 2016; DWR 2019). This Alliance is dominated (greater than 50 percent relative cover) by sandbar willow (*Salix exigua*), a shrubby willow seldom over 13 feet tall that are short-lived, though clones over 100 years old have been found. In the Mojave Desert region, this Alliance is known along permanent and seasonal rivers and streams (CNPS 2020). Overall cover varied throughout the four sub-reaches, with the lowest in Sub-Reach 2 (between 5 and 15 percent) (AIS 2016; DWR 2019). This Alliance is sensitive to flood-controlling dams and has been replaced by longer living willow Alliances in some areas behind dams (CNPS 2020).

Upland Habitat

There were three upland habitats identified in the area of Sub-Reach 2, all of them also present in Sub-Reach 1: the California juniper woodland Alliance (12.88 acres), rubber rabbitbrush scrub alliance (36.35 acres), and the California annual and perennial grassland mapping unit (Native component) (37.08 acres). California juniper woodland alliance is only minimally present in Sub-Reach 2, but the densest coverage of rubber rabbitbrush scrub alliance is present here (same cover as in Sub-Reach 4).

4.1.4.3 Sub-Reach 3

Sub-Reach 3's defining feature is the heavy influence from beaver (*Castor canadensis*) activities, which formed large, complex pools that would not be present without the beaver dams (DWR 2019). Hydrologic conditions that maintain beavers in this sub-reach are associated with third party releases and natural flows from Horsethief Creek. There is one wetland Alliance (associated with this sub-reach), as well as four riparian Alliances and five upland Alliances. One of the upland Alliances was unique to this sub-reach. The majority of Sub-Reach 3 is wet year-round, but the reach is dry (water going subsurface) during parts of the year near the junction of Sub-Reach 4 (Section 3.2).

Aquatic Habitat

This entire sub-reach was identified by NWI as R4SBC (USFWS 2020). Refer to Section 4.1.4.2 Sub-Reach 2, Aquatic habitat for a description of R4SBC. Aquatic habitat acreage in this sub-reach was mapped at 15.99 acres.

Wetland Habitat

An area of Baltic and Mexican rush marshes Alliance was located in Sub-Reach 3 (15.10 acres), similar to the ones in Sub-Reaches 1 and 2.

Riparian Habitat

Of the five riparian Alliances present in Sub-Reach 3, Fremont cottonwood, was the largest at 100.86 acres. An area of the Goodding's willow – red willow riparian woodlands Alliance occurred along a stretch of the northern side of the river at the start

of Sub-Reach 3 (22.12 acres). A very small patch (0.36 acre) of the Sandbar willow thickets Alliance was mapped along the southern bank.

A new riparian Alliance for the study area, the Arroyo willow thickets Alliance, was located in an area that spanned the northwest river's edge at the junction of Sub-Reaches 3 (10.33 acres) and 4, with the larger area occurring in Sub-Reach 3 (AIS 2016; DWR 2019). This Alliance, dominated by (more than 50 percent relative cover in the shrub and tree canopy) arroyo willow (*Salix lasiolepus*) with few to no other willow species present, is unusual in the Mojave Desert region (CNPS 2020). Arroyo willow typically grows no more than 26 feet tall (and generally less) on seasonally and intermittently flooded areas (CNPS 2020). All vegetation in this Alliance grew in the shrub and herbaceous layers, getting no more than 16 feet tall, with total vegetation cover ranging from 15 to 25 percent. Mule fat (*Baccharis salicifolia*) grew intermittently in the stands of willow (AIS 2016; DWR 2019). This Alliance does not appear to be sensitive to dams and indeed is considered weedy in some locations (CNPS 2020).

Upland Habitat

California juniper (64.70 acres), Rubber rabbitbrush (46.92 acres), and California annual and perennial grassland Mapping Unit (Native component) (34.93 acres) are all present around Sub-Reach 3, similar to the areas in other sub-reaches, except that the grassland's vegetative cover is highest in this sub-reach, measured as 40 to 100 percent (AIS 2016).

Sub-Reach 3 supports California buckwheat - Parish's goldeneye scrub Alliance (41.09 acres). This Alliance is characterized by having California buckwheat (*Eriogonum fasciculatum*) or Parish's goldeneye (*Viguiera parishii*) with more than 30 percent relative cover in the shrub canopy, and inhabits the margins of washes and arroyos, canyon walls, and moderate to steep slopes and ridges (CNPS 2020). Plants in this Alliance tend to get no more than 6.5 feet tall with low overall vegetative cover. In the Mojave Desert region, this Alliance has been found along washes and on rocky slopes (CNPS 2020). This Alliance was mapped in Sub-Reaches 3 through 6 on steep canyon walls. Over the five sub-reaches, shrub canopy cover varied from 1 to 25 percent (AIS 2016).

Scale broom scrub Alliance occurred only along Sub-Reach 3 (2.86 acres). This Alliance is characterized by growing on the edges of streams and washes, which are rarely flooded, and has at least 1 percent overall vegetative cover of Scale broom (*Lepidospartum squamatum*). Plants in this Alliance are generally less than 6.5 feet tall. In the Mojave Desert region, the majority of the known stands are from eastern boundaries of the southern Sierra Nevada and northern boundaries of the Transverse Ranges, Red Rock Canyon State Recreation Area, Fremont and Indian Wells Valleys, lower El Paso Mountains, and the north side of the Lava Mountains (CNPS 2020). Shrub canopy cover varied from 1 to 15 percent in the Alliance (AIS 2016).

4.1.4.4 Sub-Reach 4

Sub-Reach 4 included one additional riparian Alliance from those seen in Sub-Reaches 1 through 3, but otherwise included riparian and upland habitat seen in other upstream sub-reaches. No wetland habitat is located in this reach. This sub-reach is dry, with subsurface flow, during the drier months of most years (Section 3.2).

Aquatic Habitat

This entire sub-reach was identified by NWI as R4SBC (USFWS 2020). Based on DWR's reconnaissance survey (DWR 2019), shallow pools, run-like sections, low-gradient riffles, and high-gradient riffles were all present in the aquatic habitat (DWR 2019). Aquatic acreage in this sub-reach was mapped at 10.61 acres.

Riparian Habitat

There were 20.31 acres of riparian vegetation mapped in Sub-Reach 4. The Sandbar willow thickets alliance had 3.32 acres in Sub-Reach 4. This was also the only other sub-reach, along with Sub-Reach 3, that had a presence of the Arroyo willow thickets Alliance (1.67 acres). Additionally, Sub-Reach 4 had 5.28 acres of Fremont cottonwood forest Alliance.

Mulefat thickets Alliance was mapped first in Sub-Reach 4 (10.04 acres) (AIS 2016; DWR 2019). Mulefat, an evergreen shrub with leaves similar to willows, occurs at 50 percent or more relative vegetative cover in this Alliance. The Alliance grows in seasonally and intermittently flooded areas, primarily in southern California (CNPS 2020). The Mulefat thickets Alliance grew in the least vegetated riparian areas along all of the six described sub-reaches of the WFMR (Sub-Reach 1 had no described riparian Alliances), with little or no tree cover (less than 1 percent) and overall vegetative cover no higher than 15 percent (AIS 2016; DWR 2019). This Alliance does not appear to be sensitive to dams (CNPS 2020).

Upland Habitats

There were no new uplands habitats in the sub-reach. California juniper was common in Sub-Reach 4 (86.45 acres), along with Rubber rabbitbrush scrub Alliance (26.54 acres), which had its densest cover in Sub-Reach 4. Finally, there was a large presence of California buckwheat - Parish's goldeneye scrub Alliance (91.03 acres). In the study area along Sub-Reach 4, chaparral yucca (*Hesperoyucca whipplei*) is a noticeable presence in the Alliance. This Alliance is located in the area of a 2007 fire that burned extensive California juniper. Isolated surviving California juniper trees are present (AIS 2016).

4.1.4.5 Sub-Reach 5

Sub-reach 5 included several large areas of unvegetated wash and was the only sub-reach with those areas identified. Otherwise, this sub-reach consisted of habitat types,

which are described above, that occur in the upstream reaches. However, the sub-reach was not very diverse, with only two riparian and two upland Alliances identified. This sub-reach is dry, with subsurface flow, during the drier months of most years (Section 3.2).

Aquatic Habitat

This entire sub-reach was identified by NWI as R4SBC (USFWS 2020). When wetted, this sub-reach consisted of meandering flat-water habitat with intermittent steps at increased gradients, with some areas of shallow pools. (DWR 2019). Aquatic acreage in this sub-reach was mapped at 21.61 acres.

Riparian Habitat

There were only two riparian Alliances identified in this sub-reach, with a total area of 23.04 acres: Fremont cottonwood forest Alliance (9.59 acres) and Mulefat thickets Alliance (13.45 acres) (DWR 2019; AIS 2016).

Upland Habitat

Sub-Reach 5 has a dense cover of California juniper woodland Alliance (136.46 acres), Rubber rabbitbrush (37.17 acres), and California annual and perennial grassland Mapping Unit (Native component) (66.14 acres), along with fairly extensive areas of California buckwheat - Parish's goldeneye scrub Alliance (101.69 acres) surrounding it. Similar to Sub-Reach 4, chaparral yucca (*Hesperoyucca whipplei*) is a noticeable presence in the California buckwheat - Parish's goldeneye scrub Alliance, which is located in the area of a 2007 fire that burned extensive California juniper. Isolated surviving California juniper trees are present in this Alliance (AIS 2016).

4.1.4.6 Sub-Reach 6

Sub-Reach 6 was surrounded by the most diverse upland habitat of any sub-reach in the study area, but was fairly simplistic from an aquatic and riparian habitat standpoint. The majority of the sub-reach is dry, with subsurface flow, during the drier months of most years (Section 3.2).

Aquatic Habitat

This entire sub-reach was identified by NWI as R4SBC (USFWS 2020). One isolated pool was encountered before the confluence with Deep Creek appears to be perennial (DWR 2019). Aquatic acreage in this sub-reach was mapped at 2.66 acres (AIS 2016).

Riparian Habitat

There was little riparian vegetation in Sub-Reach 6, with Fremont cottonwood forest Alliance present at 11.19 acres and Sandbar willow thickets Alliance present at 0.55

acres, though it had the highest vegetative cover observed (approximately 25 percent) (AIS 2016; DWR 2019).

Upland Habitat

Sub-Reach 6 has three upland habitats otherwise unique to the study area surrounding it, along with two common Alliances: California juniper woodland Alliance (16.04 acres) and California buckwheat - Parish's goldeneye scrub Alliance (7.24 acres).

Chamise chaparral Alliance was mapped only along the southern side of Sub-Reach 6 of the study area (AIS 2016). This Alliance is characterized by having at least 50 percent relative cover of chamise (*Adenostoma fasciculatum*), which grows no more than 13 feet tall. This Alliance is one of the most widespread in the State, growing in a wide variety of areas, and has not been described specifically in the Mojave Desert region (CNPS 2020). Shrub cover was fairly thick in the occurrence, averaging from 25 to 50 percent in the occurrence (AIS 2016). Acreage for this Alliance was not calculated because it was all located on inaccessible steep slopes and not useable as habitat.

The last of the shrub Alliances, Birch leaf mountain mahogany chaparral Alliance, also was located only along Sub-Reach 6 in the study area (AIS 2016). This Alliance is characterized as having over 30 percent relative cover of Birch leaf mountain mahogany (*Cercocarpus montanus*) and has a shrub layer up to 16.5 feet tall on ridges and upper slopes. Specific occurrence information in the Mojave Desert region has not been described (CNPS 2020). Within the small occurrence on the southern side of Sub-Reach 6, the shrub cover varied from 15 to 25 percent (AIS 2016). Acreage for this Alliance was not calculated because it was all located on inaccessible steep slopes and not useable as habitat.

The last vegetated Alliance, Mediterranean California naturalized annual and perennial grassland, was also located in the farthest corner of Sub-Reach 6 (AIS 2016). These grasslands are usually characterized by having less than 5 percent native species, instead dominated by non-natives, including annual brome (*Bromus* spp.), schismus, oats (*Avena* spp.), and other species. These grasslands are common throughout California, including in the Mojave Desert region (AIS 2013). Vegetation cover in this occurrence ranged from 15 to 40 percent. There were 27.73 acres of this habitat (AIS 2016).

4.1.5 Habitat Suitable for ESA-listed and Special-Status Species

Habitat potentially suitable or known to be suitable for two ESA-listed species with aquatic life stages, arroyo toad and CRLF, including potential aquatic breeding habitat, were identified within sub-reaches of the study area (Table 4.1-2 and Appendix 3) and some of these areas are known to be suitable for arroyo toad based on recent documented occurrences. However, pools suitably shallow for arroyo toad were often proximate to deeper pools where predatory American bullfrogs may occur, which may diminish actual suitable habitat. Areas mapped as riparian habitat were considered as

potentially suitable non-breeding habitat for both of these species, and upland habitat within 900 feet of the water's edge, except for steep slopes or classified as Urban, was considered to be suitable upland habitat for arroyo toad and are potentially suitable upland habitat for CRLF (up to within 200 feet of riparian areas) if suitable small mammal burrows or other moist sheltering sites occur. These criteria were based on arroyo toad radio-tracking information from the study area summarized by Cadre Environmental (2007).

Table 4.1-3 provides the total acreage of aquatic, riparian, and adjacent upland habitat within each sub-reach, along with acreage of critical life stage aquatic habitat for arroyo toad and CRLF, where calculable from the available source data. As indicated above, total acreage of aquatic habitat is based on VegCAMP map data, which depict conditions in April 2010 when non-Project releases of water from Cedar Springs Dam were approximately 50 cfs. Pools potentially suitable for arroyo toad or CRLF are based on locations and depths recorded during the December 2018 reconnaissance (DWR 2019) and confirmed by review of August 2018 aerial imagery (Google 2020). At the time of DWR's December 2018 reconnaissance survey, there had been no non-Project releases of water from Cedar Springs Dam since January 2018, but precipitation had occurred in the two weeks preceding the survey, and slowly flowing water was observed in Sub-Reaches 1, 2, and 3.

No habitat suitable for Mohave tui chub, SMYLF, or western spadefoot were identified in the study area and there are no recent records of these three species. The following accounts summarize the available pertinent information used to identify, describe, and map potentially suitable habitat for each species, including potential sites for critical life stages, including descriptions, potential suitability and threats.

These analyses required development of mapping criteria for each species supported by published life history accounts and known habitat associations. Recent records of occurrence and distribution within the study area were also considered, but were limited to the one species known to occur: arroyo toad. Mapping criteria could not be developed for SMYLF and western spadefoot for reasons described below.

Table 4.1-2. Habitat Summary and Potential Suitability Within the Study Area for ESA-Listed and State Special-Status Species

Sub-Reach	Habitat Summary Based on December 2018 Reconnaissance and Other Sources	Potential or Known Habitat Suitability Within the Study Area by Species				
		Mohave Tui Chub	Western Spadefoot	SMYLF	CRLF	Arroyo Toad
1. Cedar Springs Dam Spillway Tailrace	A long, deep perennial pool is the only aquatic habitat type. Predatory fish likely occur persistently. Both sides of the channel are bordered by emergent vegetation (giant reed and tule), with no riparian-associated shrubs or trees.	No	No	No	No	No
2. WFMR above Horsethief Creek	Well-defined, shallow to medium depth pools are distributed throughout the sub-reach: 10 pools with depths between 1-4 feet and two pools with depths less than 1 foot. Fairly well-defined riparian corridor consisting of cottonwood, ash, and sycamore, with areas of mule fat and willows, and ranging from 10-100 feet from edge of bank.	No	No	No	Potential breeding and non-breeding	Known breeding
3. WFMR below Horsethief Creek	Multiple beaver dams form 11 moderately deep (1-4 feet) perennial pools throughout the reach, and three shallow pools (less than 1 foot). Many of the deeper pools occurred in long sections. Evidence of multiple channels during high flows, which could also create shallow pools on recession. Riparian zone from 10-100 feet wide, consisting of willow and mule fat with lone mature willow, white alder, cottonwood, ash and sycamore in some locations, and common reed present throughout.	No	No	No	Potential breeding and non-breeding	Known breeding
4. WFMR above Grass Valley Creek	Sub-reach dry mostly during the field reconnaissance. Multiple braided channels occur, consisting of shallow pools, runs, low-gradient riffles, and high-gradient riffles, with two small, isolated perennial pools near the upper end of the sub-reach. The riparian zone is narrow throughout, ranging from 10-30 feet wide and predominantly willow and mule fat shrubs, with some small ashes. Common reed sparsely distributed in some areas.	No	No	No	No	Known (limited)/ potential breeding (most wet years)
5. WFMR below Grass Valley Creek	Sub-reach dry during the field reconnaissance. Multiple braided channels consisting of meandering flat-water habitat with intermittent steps at increased gradients. Shallow pools form when wetted. Riparian vegetation generally lacking, with large areas of unvegetated wash, and where present, composed of mule fat and willow shrubs with lone sycamores throughout, and ranged from 8-60 feet wide. In addition to Grass Valley Creek, two small unnamed tributaries flow into this sub-reach.	No	No	No	No	Potential breeding (in wet years)
6. WFMR Mature Riparian Corridor	Sub-reach mostly dry during the field reconnaissance. Transitions from wide shallow to deeper, entrenched canyon. Habitat consisted of run and glide-like flat water sections and low-gradient riffle sections. Dry pool-like features present in multiple locations. One isolated wetted pool was observed just upstream of the confluence with Deep Creek. Riparian vegetation zone, consisting of large cottonwoods and willows, ranged in width from 20-60 feet on the southern bank and from 120 to approximately 300 feet on the northern bank in the upstream, less confined portion of the sub-reach; whereas riparian vegetation was confined to the area between steep canyon walks in the downstream portion.	No	No	No	Potential breeding and non-breeding, (limited)	Potential breeding (in wet years)

Key:
CRLF = California red-legged frog
SMYLF = southern California Distinct Population Segment of Rana muscosa (southern mountain yellow-legged frog)
WFMR = West Fork Mojave River

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Table 4.1-3. Total Acreages of Habitat Categories by Sub-Reach

Habitat Category	Acres by Sub-Reach					
	1	2	3	4[1]	5[1]	6[1]
Aquatic (total area)[2]	8.40	7.43	15.99	10.61	21.61	2.66
Potential arroyo toad breeding pools[3]	0	1.08	2.97	--	--	--
Potential CRLF breeding pools[3]	0	0.74	6.19	--	--	0.03
Riparian	0	68.35	133.67	20.31	23.04	11.74
Associated upland within 900 feet, excluding steep slopes	137.72	125.76	190.50	204.02	341.46	51.01

Notes:

[1]Sub-Reaches 4, 5, and 6 were almost entirely dry at the time of the 2018 reconnaissance and therefore could not be classified by the presence of pools or their depths.

[2]Includes areas within the stream channel mapped by NWI as wetlands

[3]Pools mapped as potential arroyo toad or CRLF breeding pools were identified from locations and recorded water depths during the 2018 reconnaissance survey (DWR 2019), and acreages calculated from the VegCAMP map of aquatic habitat.

Key:

CRLF = California red-legged frog

4.1.5.1 Mohave Tui Chub

The Mohave tui chub has been extirpated from nearly all of its native range for more than 50 years and it is not currently known to occur in the Mojave River or its tributaries (USFWS 2009b; CDFW 2020). Extirpation resulted from the introduction of the related arroyo chub; introduction of other fish that predate on Mohave tui chub; and groundwater over-drafting and water projects which substantially reduced suitable aquatic habitat. The effects of introduced arroyo chub were particularly deleterious because arroyo chub are better adapted for current conditions within the Mojave River drainage and interbreed with Mohave tui chub. All of the current populations of Mohave tui chub are derived from a single, off-channel location, MC Spring at Soda Springs, which was free of introduced fishes. Existing habitat within the Mojave River are generally unsuitable, because few sections are perennial and these are generally too shallow, and support introduced fish (Hughson and Woo 2004, USFWS 2009b).

Mohave tui chub is adapted for lacustrine (lake) environments and is associated with deep pools and sloughs. USFWS (2009b) indicates that suitable pools to sustain a population of Mojave tui chub should be at least 4 feet deep and not stagnant, should be vegetated with at least moderate amounts of aquatic plants, and have at least limited riparian or wetland vegetation for partial shading. Mohave tui chub spawns in March or April when the water temperature reaches 64 degrees Fahrenheit and may spawn again in the fall if conditions are ideal. The species is capable of surviving low-oxygen, high-alkaline environments, and is not adapted for warm, shallow, highly oxygenated conditions. Based on these parameters, Sub-Reach 1 is the only portion of the study area with water more than 4 feet deep, but cannot be considered suitable because of the presence of arroyo chub and other non-native species. Sub-Reach 1 is perennial

regardless of flow from non-Project releases of water from Cedar Springs Dam. Large non-Project releases of water from Cedar Springs Dam may increase flow velocity within Sub-Reach 1; however, vegetation conditions appear largely unchanged year to year in the historical aerial imagery reviewed as part of this study.

4.1.5.2 Western Spadefoot

Western spadefoot is not known to occur in the study area, the Mojave Desert physiographic province, or in comparable habitat. As such, mapping criteria for this species could not be developed. The study area is not within the known or suspected range of the western spadefoot, which includes all or parts of the following geographic zones of California, as well as adjacent Baja California, Mexico: the Central Valley, Sierra Nevada (western foothills only), South Coast Range (south of Monterey Bay), and Coastal Southern California (Stebbins and McGinnis 2012; Morey 2005). There are also records on the southern fringe of the Transverse Range in Los Angeles County, but no records on the desert-facing slopes. As reported in the Final License Application, western spadefoot occurs near Devil's Canyon Road in the City of San Bernardino (Coastal Southern California geographic zone) more than 8 miles from the study area. However, there are no verified records of this species in the Mojave Riven basin. Although Aspen Environmental Group and Hunt & Associates Biological Consulting (2005) reported hearing a call which may have been of this species during the Horsethief Creek Bridge Replacement Surveys, no verifying evidence was collected nor has any other source suggested the species occurs in the vicinity of the study area despite substantial amphibian-focused fieldwork in the area for arroyo toad, including numerous surveys of the study area and tributaries, and related radio-tracking and habitat mapping.

Western spadefoot is terrestrial outside of the breeding season and is primarily associated with grasslands, and less frequently found in open valley-foothill hardwood woodlands and open chaparral. Use of upland habitat types that occur in the vicinity of the study area has not been reported. Upland habitat use is also related to the presence of soils suitable for deep burrows and the presence of suitable breeding habitat. Dispersal distances to burrows have not been widely studied. Baumberger et al. (2019) found that most radio-tracked western spadefoot burrowed within 80 meters of breeding pools, but some were located at distances of up to 200 meters. Breeding habitat are primarily seasonally wetted, including vernal pools, vernal playas, rainwater pools, stock ponds, and pools in intermittent streams and washes. Less frequently, permanent ponds are used. Absence of fish is usually a prerequisite for successful breeding. Western spadefoot typically breeds within one or two days after relatively warm winter or spring rains. Eggs are laid in small masses attached to stems and other objects and hatch in a few days. Larvae complete metamorphosis in 30 to 79 days (Morey 2005). Similar to other spadefoot species, western spadefoot larvae are capable of feeding on animal tissue and may be cannibalistic. After metamorphosis, juvenile and adult western spadefoot are terrestrial and primarily fossorial, and may spend long periods buried in loose soil or occasionally in existing mammal burrows.

If the species is assumed to be present despite the contrary evidence, pools suitable for breeding might occur in the lower sub-reaches where flow is intermittent or in overflow pools in Sub-Reaches 2 or 3. Hydrology and geomorphic data are insufficient to predict specific locations that might be suitable. Depending on when breeding occurred, aquatic stages of western spadefoot (i.e., eggs and larvae) could also be displaced by abrupt increases in water velocity associated with non-Project releases of water from Cedar Springs Dam.

4.1.5.3 Southern California Distinct Population Segment of Southern Mountain Yellow-Legged Frog

Conditions within the study area are dissimilar to any other sites where SMYLF currently occurs, and there is no historical information to describe life history and habitat use at comparable elevations and habitat. As such, mapping criteria to analyze potential effects of non-Project releases of water from Cedar Springs Dam on potential SMYLF habitat in the study area could not be developed. However, available information strongly indicates that neither the species nor areas of suitable habitat occur in the study area.

SMYLF is a highly aquatic species during all life stages and only occur in areas with suitable perennial aquatic habitat. No such habitat occurs in the study area. Adults and juveniles are rarely found more than 3 feet from water (Stebbins and McGinnis 2012; USFWS 2012). As summarized by USFWS (2018b): (1) adults are active from May to October; (2) egg-laying is believed to occur in May, with egg masses deposited in shallow water attached or unattached to substrates; (3) first-year larvae have not been detected at any site before June; and (4) based on information from the few known extant populations, larvae overwinter and do not metamorphose until the end of their second summer.

The SMYLF has been extirpated from much of its historical range and is not known to currently occur in the Mojave River drainage. Historical habitat in the San Jacinto, San Bernardino, San Gabriel, and Palomar Mountains are described as shaded streams characterized by cool water fed by springs or snowmelt, as well as ponds, lakes, larger streams, and marshes at elevations ranging from 1,200 to 7,500 feet (USFWS 2018b). Currently, the only known extant populations are associated with perennial headwater streams with upstream barriers restricting access to predatory non-native trout. Most of these sites are within narrow canyons with deep plunge pools. The only known extant population in the San Bernardino Mountains is located within a coastal drainage, with no connection to the Mojave River basin (i.e., East Fork City Creek) (USFWS 2018a). Backlin et al. (2013) hypothesized that the current distribution of SMYLF is attributable to multiple factors that eliminated or greatly reduced populations in most of the species' range. These factors included severe flood events in winter 1968 and 1969, the disease chytridiomycosis which emerged in the 1960s, the long period of fish stocking by CDFW, recreational over-use, and loss of habitat from water development projects. Surviving populations are all very small, vulnerable to extinction from stochastic events, and unable to re-occupy historical habitat because of apparently low recruitment, which

keeps populations small. Populations are isolated by introduced fish in downstream reaches and by long distance from other, once-occupied stream systems. Historically, SMYLF occurred over longer stream reaches to lower elevations (USFWS 2018b), but the downstream limits of suitable habitat historically are unknown and are not described in the literature. However, as long as introduced predatory fish are present, habitat cannot be regarded as suitable, except for rare occurrences of individual adult frogs utilizing these areas with fish. In addition, seasonal drying occurs for long periods, especially in the lower sub-reaches or more widely in the driest years, and fish are likely to occur when water is present for long periods. Based on this information, there is no suitable habitat for SMYLF in the study area.

The CNDDB (CDFW 2020) includes one old record from August 1947 of SMYLF that may be from the study area. All other records of SMYLF from the region are from higher in the Mojave River watershed or in coastal draining watersheds. The location of this August 1947 occurrence is described as “West Fork Mojave River at Horsethief Canyon, near Silverwood Lake and Summit Valley.” However, the exact location of the occurrence and whether it represented a population at the site or a transient individual downstream of a population (e.g., from Little Horsethief Canyon) is unknown.

It is not reasonably plausible that a SMYLF population could currently exist in the study area and has escaped detection given the substantial amphibian-focused fieldwork in the area for arroyo toad, including numerous surveys, radio-tracking, and habitat mapping. Despite small population size, the ad hoc probability of detecting SMYLF by a survey at the known occupied sites was determined to be very high (i.e., 89 percent detection rate) (Backlin et al. 2013). Diurnal activity of this species, including conspicuous basking, and the prolonged presence of larvae may explain the high detection rate at these occupied sites.

4.1.5.4 California Red-Legged Frog

CRLF has been documented in the study area. However, there is no evidence that the species currently occurs there despite the substantial amphibian-focused fieldwork in the study area for arroyo toad. This fieldwork includes numerous surveys, radio-tracking, and habitat mapping that would have provided increased opportunities for detection. An old historical occurrence (date unknown) included in CNDDB records (CDFW 2020) is from the area of Mojave River Camp, which is located adjacent to Grass Valley Creek and across State Highway 173 from Sub-Reach 5. There have been no subsequent observations at this location, elsewhere within the study area, or in the surrounding area. Although a historical record indicates that habitat was suitable for CRLF in the past, it is not evident that current conditions are suitable. Populations within the Mojave River drainage are regarded by USFWS (2002) as extirpated. Irrespective of evidence that the species has been extirpated in the Mojave River drainage, the following information was used to map and describe potentially suitable habitat for CRLF within the study area, including potential critical life stage habitat.

The CRLF is capable of using multiple habitat types, including various aquatic, riparian and upland habitat types, and in some cases, may complete the entire life cycle in aquatic habitat. It is primarily associated with perennial ponds or pools, slow-moving perennial or seasonal streams or pools within streams, or other water bodies that typically become inundated during winter rains and hold water continuously for a minimum of 20 weeks in all but the driest of years (i.e., sufficiently long enough for breeding to occur and larvae to complete development) (Jennings and Hayes 1994; 71 Federal Register [FR] 19244; 75 FR 12816). The CRLF may use habitat that typically change in extent and suitability in response to the dynamic nature of floodplains and fluvial processes which create, modify and eliminate deep pools (75 FR 12816). The species is also adapted to natural variations in annual hydrology and may not breed in dry years or delay breeding in response to precipitation patterns.

Breeding pools are typically more than 2 feet deep (USFWS 2002). Dense, shrubby riparian vegetation (e.g., willow and bulrushes) and bank overhangs typically occur in breeding habitat. Emergent vegetation, undercut banks, and semi-submerged root wads may provide hiding cover for larvae. Suitable aquatic habitats include natural and man-made ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds. At San Francisquito Creek in Los Angeles County, egg laying is estimated to have begun as early as February 5 and eggs hatched as late as March 20 in three years when eggs were found (Alvarez et al. 2013). The latter study also found that breeding occurred slightly later at four stream sites compared to four lotic sites, a behavior that may avoid disruption of breeding by high flows during winter. Egg masses are attached to emergent vegetation such as cattails (*Typha* spp.) and bulrushes. Larvae remain in these aquatic habitat until metamorphosis is complete. Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae typically metamorphose between July and September, and most likely feed on algae (Jennings and Hayes 1994).

Outside of the breeding season, adults may disperse upstream, downstream, or upslope of a breeding habitat to forage and seek sheltering habitat, which may consist of small-mammal burrows, leaf litter, and other moist sites in or near (up to 200 feet from) riparian areas (Jennings and Hayes 1994; 71 FR 19244). During wet periods, long-distance dispersal of 1 mile or more may occur between aquatic habitats, including movement through upland habitat or ephemeral drainages (71 FR 19244). Seeps and springs in open grasslands can function as foraging habitat or refuges for dispersing frogs (USFWS 2005). Suitable dispersal habitat consists of all upland and wetland habitat that connect two or more patches of suitable aquatic habitat within 1.25 miles of one another. Dispersal habitat must be at least 500 feet wide and free of such barriers as heavily traveled roads (roads with more than 30 cars per hour), moderate- to high-density urban or industrial developments, and large reservoirs (Allen and Tennant 2000).

Based on the information above, potentially suitable habitat for CRLF critical life stages is associated with aquatic breeding (egg-laying and larval rearing). Other components of potential habitat are non-breeding aquatic and riparian habitat for foraging, predator

avoidance, and aestivation; and aquatic and upland dispersal habitat. Multiple pools that are potentially suitable as breeding habitat were identified in Sub-Reaches 2 and 3, along with one small pool in Sub-Reach 6 (Appendix 3). These were pools with observed average depths greater than 1 foot to more than 3 feet deep (DWR 2019) and detectable on recent aerial imagery. Potential non-breeding aquatic habitat may occur throughout much of Sub-Reaches 2 and 3, but is scarce in the lower sub-reaches, particularly in Sub-Reaches 4 and 5, where associated riparian vegetation is sparse. During wetted periods, when aquatic habitat may occur continuously from Cedar Springs Dam to Saddle Dike Diversion Dam, the entire area could function as aquatic dispersal habitat. Habitat conditions within each sub-reach are described below.

Sub-Reach 1 is not regarded as potentially suitable aquatic breeding habitat because of the presence of predatory fish species and American bullfrogs. In addition, the sub-reach lacks any associated riparian habitat, which limits suitability as non-breeding habitat.

Sub-Reach 2 contains 10 pools mapped as potentially suitable CRLF aquatic breeding habitat. These pools were distributed throughout the sub-reach and ranged from 55 to 313 feet in length, with average depths ranging from 1.1 feet to 3.5 feet, and maximum depths ranging from 1.3 feet to 3.8 feet, as measured during the 2018 reconnaissance survey (DWR 2019). This sub-reach had slow flowing water during the 2018 reconnaissance survey and the pools are presumed to hold water for a period sufficient to sustain larval development. Aquatic dispersal habitat is present throughout the sub-reach within the wetted channel. Riparian vegetation along the sub-reach is relatively sparse, which may limit suitability of upland dispersal habitat.

Sub-Reach 3 also contains potentially suitable aquatic breeding habitat for CRLF in 13 pools. These pools were largely formed by active and abandoned beaver dams and were distributed throughout the sub-reach. The pools ranged from 69 to 605 feet in length, with average depths ranging from 1.2 feet to 2.4 feet, and maximum depths ranging from 1.8 feet to 3.5 feet deep, at the time of the 2018 reconnaissance survey (DWR 2019). This sub-reach had flowing water during the 2018 reconnaissance survey and the pools are presumed to hold water for a period sufficient to sustain larval development. As within Sub-Reach 2, this sub-reach appears to have flowing water or discontinuous pools except in the driest years, which could support CRLF breeding, as well as larval development and juvenile rearing. Horsethief Creek and associated riparian habitat adjacent to the study area contain suitable aquatic and upland dispersal habitat.

Sub-Reach 4 does not contain suitable aquatic breeding habitat for CRLF. The sub-reach was dry during the 2018 reconnaissance survey, but physical features indicated that several pools of undetermined depth are present under wetted conditions. Based on the hydrology analysis and scarcity of riparian vegetation, it is unlikely that these pools hold water for a sufficient period to sustain larval development. As such, no areas of potentially suitable aquatic breeding habitat were mapped. The absence or scarcity of associated vegetation also limits potential suitability as both breeding and non-breeding

aquatic habitat. Flow is seasonally intermittent in this sub-reach. Conditions for dispersal habitat may be limited to periods of flow, with limited adjacent hiding cover.

Sub-Reach 5 also does not contain suitable aquatic breeding habitat for CRLF. The sub-reach was dry during the 2018 reconnaissance survey, but physical features indicated that pools of undetermined depth are present under wetted conditions. Evidence of insufficient persistence of aquatic habitat include a scarcity of associated riparian vegetation and large areas mapped as “desert wash.” As such, no areas of potentially suitable aquatic breeding habitat were mapped. Flow is seasonally intermittent in this sub-reach. Conditions for dispersal habitat may be limited to periods of flow, with limited adjacent hiding cover.

Sub-Reach 6 contains at least one pool identified as potentially suitable aquatic breeding habitat for CRLF at the downstream end of the sub-reach near the confluence with Deep Creek; the only part of the sub-reach with surface water during the 2018 reconnaissance survey. Flow within the majority of the sub-reach is seasonally intermittent. Potentially other pools form during wetted periods in the lower end of the sub-reach. This sub-reach has a well-developed riparian canopy and may also support non-breeding aquatic habitat during wetted periods.

Summary of CRLF Habitat Suitability by Season

Aquatic habitat use by CRLF related to breeding (egg-laying through the completion of larval stages) typically requires a minimum period of 20 weeks in all but the driest years. Because there are no known extant CRLF populations in the Mojave River and historical information is lacking, the potential season for breeding in the study area is unknown and can only be estimated. Although CRLF may breed as early as November in some coastal areas, breeding elsewhere mostly occurs from mid-January through March, and occasionally as late as April (Alvarez et al. 2013). Stream-breeding populations of CRLF are also known to breed slightly later than populations not associated with streams (Alvarez et al. 2013). On this basis, although CRLF breeding behavior has not been documented in the study area, it is possible that the potential breeding season in the study area may be in March or April, depending on annual variations in precipitation-related flow, and habitat suitable for larvae to reach metamorphosis may have to persist until July or August. Potentially suitable breeding habitat is contained within Sub-Reaches 2 and 3, and to a much lesser extent Sub-Reach 6. If CRLF are present, significant non-Project releases of water from Cedar Springs Dam during the CRLF breeding season could potentially displace egg masses or larvae, which are not adapted for fast-flowing water. However, because the releases are mostly related to natural precipitation events, CRLF if present would likely delay breeding until the flows subside as observed in stream-breeding CRLF populations described by Alvarez et al. (2013).

The period of CRLF non-breeding aquatic habitat use by post-metamorphic life stages may include most of the year in perennial waters and more limited periods in areas where habitat are seasonally dry. Adults and juveniles utilize aquatic habitat during this

period to feed, hydrate, escape predators, and to move between aquatic seasonal habitat. Non-Project releases of water from Cedar Springs Dam might affect potential non-breeding aquatic habitat in various ways, including increasing flow velocity, temporarily expanding wetted width, and providing flow in the lower sub-reaches that would otherwise be dry. These changes in the locations of potentially suitable habitat would presumably have corresponding effects on patterns of habitat use by CRLF, if present, but not adversely so for the same reason: post-metamorphic CRLF are mobile and capable of moving into more suitable adjacent locations. In addition, CRLF utilize adjacent aquatic and upland habitat, primarily during periods of wet weather (Jennings and Hayes 1994; 71 FR 19244). Patterns of use are likely influenced by numerous features, including water depth, instream hiding cover (e.g., overhanging banks), and vegetation density within riparian habitat and adjacent uplands. Potentially suitable non-breeding habitat may occur most reliably in Sub-Reaches 2 and 3. Within the lower reaches, potentially suitable non-breeding habitat may be largely limited to Above Normal and Wet WYs or for short periods in other years. During the driest period (i.e., July to the onset of autumn rains), CRLF may aestivate within small mammal burrows in upland and riparian habitat, where conditions are suitably moist.

4.1.5.5 Arroyo Toad

An arroyo toad population, described by Ramirez (2003) as “substantial,” is known to exist within parts of the study area as well as contiguous with Horsethief Creek within Summit valley; and there is ample information from surveys, site-specific life history, and radio-tracking with which to develop mapping criteria (Ramirez 2003; Aspen Environmental Group and Hunt & Associates Biological Consulting 2005; DWR 2005, Cadre Environmental 2007). However, it must be cautioned that habitat conditions for arroyo toad within the study area are dynamic and cannot be fully predicted by current or recent breeding occurrences and habitat distribution. Conditions are subject to change from channel reconfiguration and vegetation scouring from periodic flood events, patterns of beaver activity, and annual variation of flows. Past uses including cattle grazing on the LFR have degraded arroyo toad habitat (USFWS 2009a), and taken together with the effects from future planned residential development of the ranch may further modify habitat conditions. Current habitats are likely less suitable than reported by Cadre Environmental (2007) because the number of beaver dams has subsequently increased and aquatic predators such as American bullfrogs continue to be present (HELIX 2014). Designated critical habitat unit Sub-Unit 22a includes a large part of the study area from Highway 173 downstream to Mojave River Forks Dam, as well as sections of Horsethief Creek, Little Horsethief Creek, Grass Valley Creek, Deep Creek, and Kinley Creek (76 FR 7245).

Local data indicate that habitat regularly used by arroyo toad along the study area are within flood prone areas and adjacent uplands with loose sandy or loam soils suitable for daily or prolonged burrowing (i.e., aestivation) (Cadre Environmental 2007). The latter study found that radio-tracked arroyo toads remained within flood prone areas during most of the non-breeding season; however, more than 40 percent of tracked individuals in the study area and adjacent Horsethief Creek occasionally utilized upland

benches vegetated with Great Basin sage scrub and Great Basin sage/Utah juniper scrub at distances rarely up to about 900 feet from the active channel. Upland terraces used by arroyo toad tended to have well-developed overstories with both trees and shrubs including mule fat, Western sycamore, cottonwoods, coast live oak (*Quercus agrifolia*), and willows. Toad burrows, particularly burrows used for prolonged periods, were often under shrubs, including arroyo willow, mule fat, Utah juniper (*Juniperus osteosperma*), and Great Basin sagebrush (*Artemisia tridentata*). During these aestivation periods, which typically begin in July, arroyo toads may be forced to emerge from burrows in order to rehydrate, which may limit upland habitat use to areas with nearby surface water. Metamorphosed young-of-year arroyo toads less than 1 inch in body length, which do not burrow and may begin to occur as early as May, were observed to utilize gravel and sand bars along the river (Cadre Environmental 2007).

Arroyo toad breeds in low-gradient, broad, open streams. Breeding habitats are located within the active channel or immediately adjacent in overflow pools, old flood channels, shallow pools, and margins with little or no flow. Deep pools associated with beaver dams are not arroyo toad breeding habitat, but provide habitat for non-native predators including American bullfrog, fish, and crayfish. According to Cadre Environmental (2007), active channels used as breeding habitat in the study area and two tributaries (Horsethief Creek and Grass Valley Creek) were generally no more than about 6 meters in width. Substrates in breeding areas are usually sand or gravel with little or no emergent vegetation. Egg-laying sites were characterized by still or very slow flowing, shallow water 10 to 30 centimeters deep. Other studies indicate that the unattached eggs laid in long, tangled strings are typically displaced by water velocities >0.2 meters/second (Sweet 1992, as cited by Sweet and Sullivan 2005). Arroyo toads are active from approximately February or March to July or August and inactive later in the year beginning around September. The peak breeding season in the study area is mostly between April and June, but may extend from March through July in some years (Cadre Environmental 2007). Breeding behavior may be interrupted by flooding, but typically resumes when flows are again favorable. Streams with water for as little as two months in the spring during most years (the minimum required for some larvae to complete metamorphosis) are considered suitable (76 FR 7245). Larvae may utilize areas with water velocities of up to 1.3 feet per second (Sweet 1992, as cited by Sweet and Sullivan 2005).

Riparian habitats are important to all post-metamorphic life stages. Favored riparian habitat include sand bars, alluvial terraces, and sparsely to moderately vegetated streamside benches. Typically, banks are vegetated with willow and mulefat. Within the study area, riparian habitat of this kind occurs primarily in Sub-Reaches 2, 3, and 4, and in the upper part of Sub-Reach 5.

Suitable aquatic and riparian habitat is maintained and supported by fluvial processes, including a natural flood regime or conditions similar to a natural regime. Periodic large flows are important to scour vegetation, redistribute fine sediments, and reform shallow pools that may become available breeding habitat. In the study area, the largest non-Project release of water from Cedar Springs Dam of between 400 to more than 2,000

cfs occurred infrequently in autumn or early winter during the period of record. During the breeding season, releases have been generally less than 40 cfs, but in wetter years sometimes were more 100 cfs. Cadre Environmental (2007) indicated that increased flows during the breeding season can disrupt breeding and are a potential source of mortality to eggs and small larvae from stranding when water levels drop or displacement when flooding occurs. During the 2006-2019 period of record, non-Project releases of water from Cedar Springs Dam during the months of April, May, and June occurred most frequently in 2006, 2010, 2011, and 2019, which were years when releases were also frequent in other months. Three of these years were notable by higher total winter precipitation than in most other years (i.e., WYs were categorized as "Wet" in 2010, 2011, and 2019) and 2006 was at the high end of "Below Normal," with all of the precipitation occurring in February-April and June-July. In the other 10 years during the period of record, releases occurred in 5 of the 10 years in April, in only one year in May, and never in June or later in the summer. These non-Project releases of water from Cedar Springs Dam are driven by precipitation in April, but are usually brief in duration and relatively low volume (i.e., less than 15 cfs). In Wet or Above Normal WYs when larger releases associated with natural precipitation events sometimes occur during the breeding season, potential for effects associated with high flow velocities and comparable to natural flows might be minimized by releasing water over a longer, sustained period, which could also help maintain breeding pools in the lower sub-reaches later into the summer. Alternatively, higher flows may create additional habitat in some locations (e.g., in overflow pools or by removing excessive or encroaching vegetation and redistributing sediments). Current non-Project releases appear to generally occur outside of the April-July period in most years, with the exception of releases in April, which are more frequent than the other months.

Sub-Reach 1 contains no suitable habitat for arroyo toad. The deep perennial pool that comprises this sub-reach is not potential aquatic breeding habitat and adjacent upland areas are unlikely to be used for foraging or aestivation. Riparian vegetation is absent. In addition to excessive depths, the margins are densely vegetated with emergent plants, and predatory fish and bullfrogs likely occur. Unsuitability is based on the lack of suitable pools and excess vegetation, not related to non-Project releases of water from Cedar Springs Dam.

Sub-Reach 2 contains suitable aquatic breeding and riparian habitat for arroyo toad. Two pools that met the criteria for arroyo toad breeding habitat were identified based on the 2018 reconnaissance survey (DWR 2019) within the sub-reach. Both were located in the lower half of the sub-reach and were 571 feet and 154 feet in length, with average depths of 0.3 and 0.8 feet, and maximum depths of 1.5 feet and 0.6 feet, respectively, at the time of the 2018 survey. According to Ramirez (2003), the WFMR upstream of the confluence of Horsethief Creek did not contain suitable aquatic breeding habitat during the 1999-2001 study period; however, habitat suitability increased after floods in the winter of 2004/2005, which removed beaver dams (Cadre Environmental 2007). The latter study documented one observation of arroyo toad clutches or larvae in the lower portion of the sub-reach. HELIX (2014) reported that on April 24, 2014 almost all shallow pools in sub-reaches 2 and 3 were unlikely to be used by arroyo toad for

breeding because of low flow, high levels of algae or other vegetation, or unsuitable adjacent habitat. In addition, deeper pools were associated with mostly inactive or old beaver dams (i.e., only one active beaver dam was noted) that supported American bullfrog larvae. Riparian habitat and adjacent upland terraces along the sub-reach are evidently suitable and some of the adult arroyo toads that were radio-tracked in 2005 and 2006 used these areas. Cadre Environmental (2007) indicates that the lower part of Sub-Reach 2 and all of Sub-Reach 3, “exhibited perennial characteristics” that were favorable for non-breeding habitat use. This sub-reach generally retains surface water throughout the year, supported by LFR releases and accretion. Breeding habitat likely remain wetted for a sufficient period to support successful breeding in most years, as well as for non-breeding habitat use in adjacent riparian and upland areas, including foraging and aestivation.

Sub-Reach 3 contains more potential arroyo toad breeding habitat than any other sub-reach. Six pools that met the criteria for arroyo toad breeding habitat were delineated based on the 2018 reconnaissance survey. These pools were distributed throughout the sub-reach and ranged from 69 to 605 feet in length, with average depths ranging from 0.1 feet to 0.5 feet, and maximum depths ranging from 0.7 feet to 1.8 feet deep at the time of the 2018 reconnaissance survey. Arroyo toad surveys in 2005 and 2006 indicated multiple locations where masses or larvae were observed. As noted above, current interspersion of deeper pools associated with beaver dams may diminish actual suitability for arroyo toad breeding. HELIX (2014) identified only one pool in sub-reach 2 or 3 with potential, although rated low, to support arroyo toad breeding at that time (April 2014), though it should be noted that 2014 was a below normal water year. Arroyo toad surveys by Helix (2014) found a total of 4 second-year juvenile arroyo toads just downstream of the confluence of Horsethief Creek, providing evidence of earlier breeding somewhere in the study area. Riparian and upland terraces along the entire sub-reach were also used by radio-tracked adult arroyo toads during the non-breeding season. Hydrology of the sub-reach is supported by inflow from Horsethief Creek as well as LFR releases and accretion, the sub-reach retains flowing water throughout the year, and may be sufficient to support successful breeding in most years.

Sub-Reach 4 was dry during the 2018 reconnaissance survey. As a result, pool depths were not measured. Several pools of unknown depth were identified during the survey. It is likely that several pools within the upper half of this sub-reach constitute suitable breeding habitat for arroyo toad. Arroyo toad masses and larvae have been recorded within the upper portion of the reach (Cadre Environmental 2007) and it is likely that suitable flow exists to support successful breeding in most years. Riparian and upland terraces along the upper part of the sub-reach were also used by radio-tracked adult arroyo toads in the same area during the non-breeding season. Arroyo toad occurs in Grass Valley Creek, where surveys, radio-tracking, and habitat assessments have been performed (Cadre Environmental 2007, Helix 2014); however, these studies did not extend further into the sub-reach. The hydrology assessment detailed above indicates that surface water frequently dries in this area before the end of May, except in wet years. Seasonally scarce surface water, minimal riparian vegetation, and sparsely

vegetated upland terraces likely also limit suitability as non-breeding habitat for foraging and aestivation.

Sub-Reach 5 was also dry during the 2018 reconnaissance survey and, therefore, pools were not measured. Arroyo toads have been recorded within the lower portion of the reach (CNDDB occurrence number 28, based on Brown and Fisher [2002]) and it is likely that suitable flow exists to support successful breeding, at least in some years. The preceding record included one occurrence of an unspecified number of arroyo toad larvae and one adult from Sub-Reach 5. Brown and Fisher (2002) noted that habitat conditions in this area were degraded by extensive recreational off-road vehicle use. Although the geographic scope of historical arroyo toad surveys in Sub-Reaches 5 and 6 appears to be limited to the area downstream of Arrowhead Lake Road, this single CNDDB occurrence may indicate breeding is infrequent in these lower sub-reaches. The hydrology analysis indicates the surface water persists for a longer period in this sub-reach than in Sub-Reach 4, but there is insufficient information to determine when drying regularly occurs. Seasonally scarce surface water, minimal riparian vegetation and sparsely vegetated upland terraces likely limit suitability as non-breeding habitat for foraging and aestivation.

Sub-Reach 6 was largely dry during the 2018 reconnaissance survey, with the exception of one pool at the downstream end of the sub-reach. As with Sub-Reach 5, arroyo toad has been recorded (CNDDB occurrence number 28), although not including direct evidence of breeding. However, it is likely that suitable flow exists to support successful breeding in wet years. This sub-reach is adjacent to Deep Creek, which may contain a source population of dispersing juveniles and adults making long-distance movements (i.e., 0.5-0.6 miles, as per USFWS 2014) in search of breeding habitat. The sub-reach is distinct from the other sub-reaches by its well-developed riparian canopy, and is presumably suitable for foraging and aestivation.

Summary of Arroyo Toad Habitat Suitability by Season

Aquatic habitat use by arroyo toad is primarily related to breeding, including oviposition and larval development, which has a peak period of April through June in the study area. Suitable habitat is associated with shallow pools within or adjacent to the active channel that persist for a minimum of two months for larvae to reach metamorphosis and mostly where active channels are no more than about 6 meters wide. Suitability is reduced or absent in areas that are heavily shaded or support emergent vegetation, dry in less than two months, or that experience flow velocities greater than about 0.2 meters per second when eggs are present (Cadre Environmental 2007). Suitable aquatic habitat for these life stages is known to regularly occur in Sub-Reaches 2 and 3, and likely occurs, at least in some years, on parts of Sub-Reaches 4 and 6. Habitat within Sub-Reaches 2 and 3 is supported by LFR releases and accretion, and by tributary inflow from Horsethief Creek in Sub-Reach 3 only, which suggests that breeding pools in these sub-reaches likely tend to regularly remain wetted for a sufficient period. Site-specific information does not exist to characterize the frequency of flows that may displace arroyo toad clutches or larvae. However, as described above, during the period

of record, non-Project releases of water from Cedar Springs Dam were infrequent during the April-June period, except in the four wettest years (2006, 2010, 2011, and 2019) and occasional relatively low volumes in April in other years, largely related to precipitation. Thus, should arroyo toad breeding occur in the WFMR, there are reduced instances of clutches or larvae displacement due to non-Project releases.

Within much of the lower reaches (e.g., Sub-Reaches 5 and 6), the active channel is generally dry for prolonged periods in most years, but there is insufficient information to suggest how long water tends to persist in potential breeding habitat. Within the period of record, it is unlikely that suitable habitat occurred in the lower sub-reaches in the Dry WYs (2013 and 2018) or most of the Below Normal WYs (2007, 2009, 2012, 2014, 2015, and 2016). Non-Project releases of water from Cedar Springs Dam in these years were generally infrequent and brief, or did not occur at all and, therefore, had no effect in either sustaining or disrupting potential habitat. An exception to this pattern was WY 2006, a Below Normal WY, but near the upper limit of the WY classification and with all of the precipitation occurring relatively late (i.e., February-April, and June-July).

Within Above Normal (2008) and Wet WYs (2010, 2011, 2017, and 2019), flows that reached the lower stream gage generally occurred for a longer period and were associated with non-Project releases of water from Cedar Springs Dam as well as apparently higher levels of LFR releases and accretion, except in 2008, when Cedar Springs Dam releases did not contribute to summer flows. This is illustrated by comparison of conditions in 2010, when non-Project releases of water from Cedar Springs Dam occurred into August and flows at the lower gage also show contribution from other inputs (Figure 4.1-1) and in 2008, when there were no Cedar Springs Dam releases after April (Figure 4.1-1).

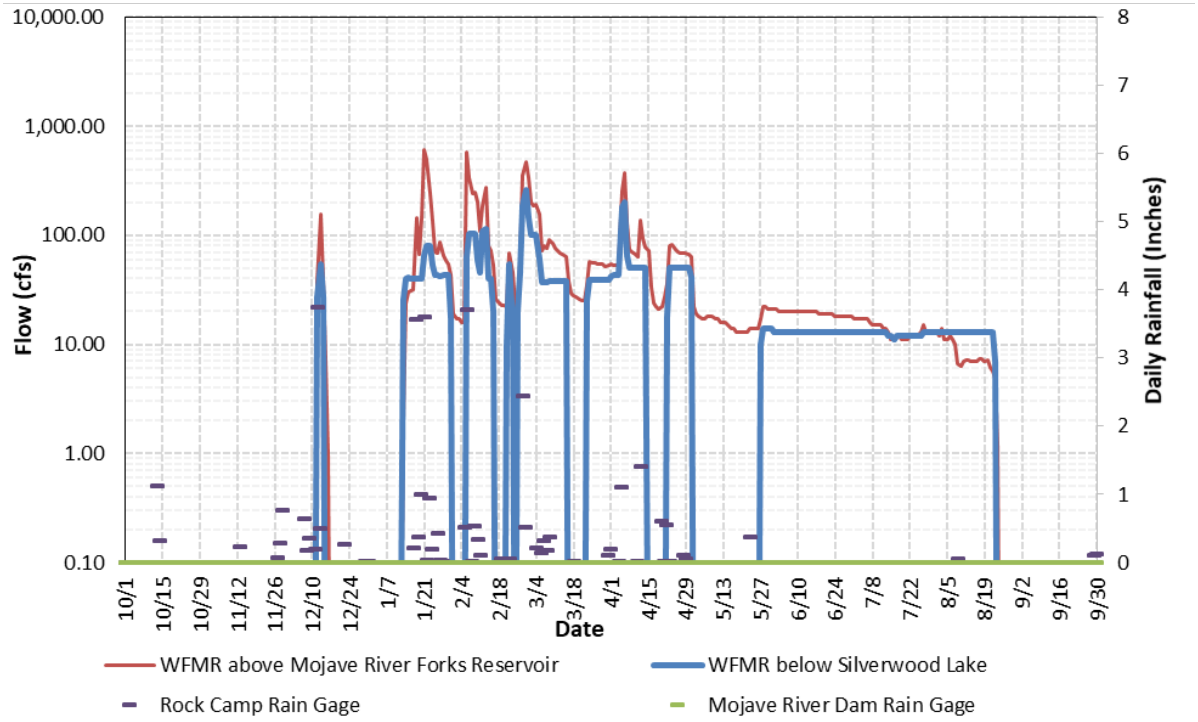

Figure 4.1-1. Stream Gage Flows and Daily Rainfall in 2010 (Wet WY)

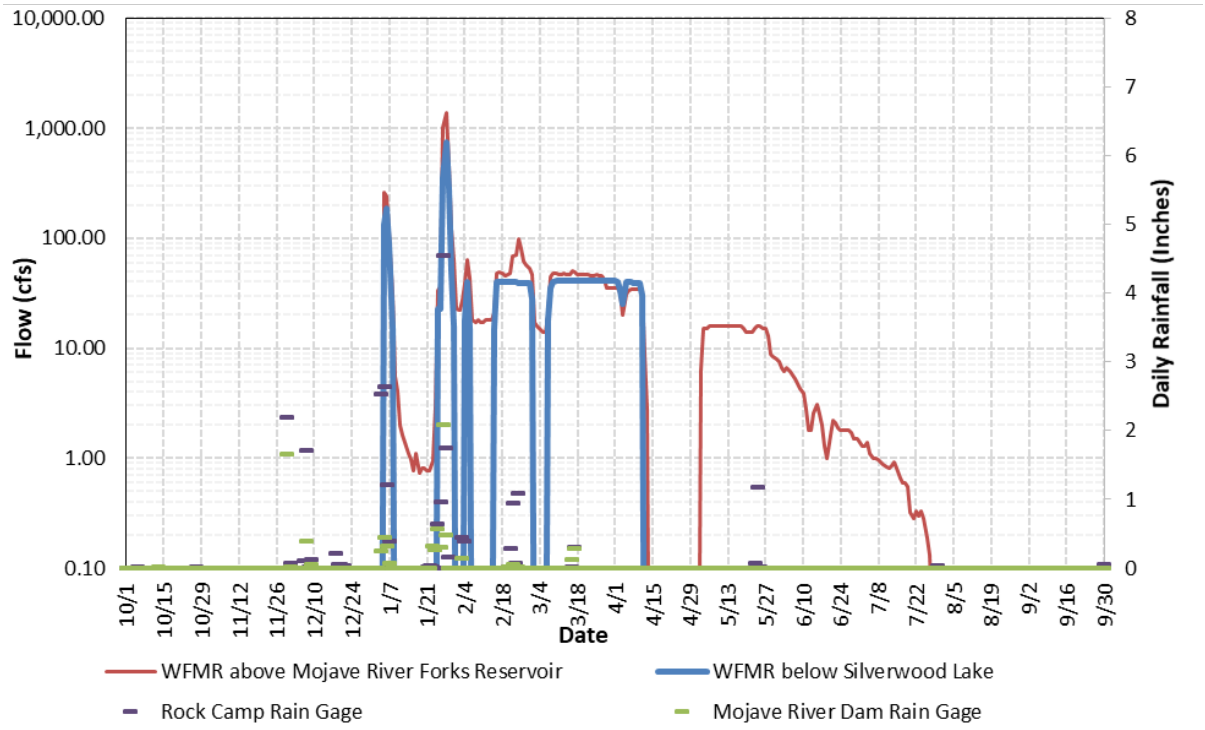

Figure 4.1-2. Stream Gage Flows and Daily Rainfall in 2008 (Above Normal WY)

During other periods, conditions within wetted habitat may also affect non-breeding habitat use. This is primarily related to the need for arroyo toads to rehydrate, including newly metamorphosed toads, which do not burrow and tend to remain close to the breeding pools. Older toads are active until July and burrow each day within 3 meters of the active channel. Similarly, during the July-December aestivation period, when toads are typically not active, habitat suitability may be reduced by distance from sources of water. This is particularly true during hot or dry years, when toads will go into aestivation in their burrows and they may emerge from deep burrows temporarily in response to a disturbance or a precipitation event to rehydrate or forage, but are more likely to stay in their burrows from mid-August to January (Ramirez 2003). Non-Project releases of water from Cedar Springs Dam during the aestivation period are infrequent in most years, but sometimes occur, and may be beneficial to arroyo toads as a source of hydration in dry years. Aestivating arroyo toads are not otherwise affected by non-Project releases because aestivation sites are situated outside of the stream channel in riparian and upland habitats.

4.1.6 Aquatic Invasive Species

The following discussion summarizes potentially suitable habitat for AIS, including American bullfrog, red swamp crayfish, Asian clam, and Eurasian watermilfoil within the study area. Table 4.1-4 summarizes habitat suitability for each AIS per the individual sub-reaches within the study area, which are the same regardless of non-Project releases of water from Cedar Springs Dam. Appendix 4 displays potential habitat for AIS in each sub-reach.

Table 4.1-4. Maximum Extent of Potential Habitat for AIS of Aquatic, Wetland, and Riparian Habitats by Acreage Within Each Sub-Reach.

	Habitat Suitability (Acres) Within Each Sub-Reach					
Species	**Sub-Reach 1[1]**	**Sub-Reach 2**	**Sub-Reach 3**	**Sub-Reach 4**	**Sub-Reach 5**	**Sub-Reach 6**
American bullfrog	Aquatic: 8.40	Aquatic: 7.43	Aquatic: 15.99	Aquatic: 10.61	Aquatic: 21.61	Aquatic: 2.66
	Wetland: 8.40	Wetland: 49.73	Wetland: 15.10	Wetland: N/A	Wetland: N/A	Wetland: N/A
Red swamp crayfish	Aquatic: 8.40	Aquatic: 7.43	Aquatic: 15.99	Aquatic: 10.61	Aquatic: 21.61	Aquatic: 2.66
	Wetland: 8.40	Wetland: 49.73	Wetland: 15.10	Wetland: N/A	Wetland: N/A	Wetland: N/A
Asian clam	Aquatic: 8.40	Aquatic: 7.43	Aquatic: 15.99	Aquatic: 10.61	Aquatic: 21.61	--
	Wetland: 8.40	Wetland: 1.21	Wetland: 15.10	Wetland: N/A	Wetland: N/A	--
Eurasian watermilfoil	Aquatic: 8.40	Aquatic: 7.43	Aquatic: 15.99	--	--	--
	Wetland: 8.40	Wetland: 1.21	Wetland: 15.10	--	--	--

[1]*Within Sub-Reach 1, the aquatic habitat is also mapped as wetland*

4.1.6.1 American Bullfrog

The American bullfrog has been documented in the study area at multiple locations since at least 1989. American bullfrogs are highly aquatic and closely associated with permanent or semi-permanent water bodies, including ponds, lakes, reservoirs, irrigation ditches, streams, and marshes; are capable of dispersing long distances during wet periods; and may occur for periods in seasonal aquatic habitat (CDFW 2014). In California, breeding can occur as early as March and as late as July, depending on local conditions, but generally later than native amphibians in the same areas and over a longer period of time (Jones et al. 2005; Cook and Jennings 2007). Breeding sites are often characterized by abundant submerged aquatic or emergent vegetation. Tadpoles are found primarily in warm, shallow water, and grow to large sizes before metamorphosing, often in their second year (Jones et al. 2005).

Suitable habitat for American bullfrog occurs primarily in Sub-Reaches 1, 2, and 3, particularly associated with perennial, deep pools. The extent of suitable breeding habitat is uncertain, but HELIX (2014) reported deeper pools associated with beaver dams in Sub-Reach 3 supported American bullfrog larvae. Breeding habitat also likely includes Sub-Reach 1, where emergent vegetation is abundant. Non-Project releases of water from Cedar Springs Dam and accretion, as well as the presence of beaver, help maintain suitable conditions for American bullfrog in these sub-reaches. Hibernating bullfrogs were observed in Sub-Reaches 2 and 3 during the 2018 reconnaissance survey (DWR 2019). Bullfrogs may also occur seasonally in other sub-reaches when there is water present. In addition, multiple ponds and ditches east of the study area likely represent suitable breeding habitat, from which bullfrogs may regularly disperse.

All of the sub-reaches might be used as aquatic habitat by American bullfrog when water is present; therefore, the entire calculated wetted area (66.70 acres) would be available to the species. Additionally, American bullfrogs may utilize the wetland habitat throughout the study area, calculated at 73.23 acres.

Non-Project releases of water from Cedar Springs Dam do not provide additional suitable habitat for this AIS because flows from other sources, as well as surrounding ponds, pools, ditches, and other wet areas, maintain about the same amount of habitat by quality and abundance as occurs with Cedar Springs Dam non-Project releases. Even when scouring flows might reduce American bullfrog populations, the ponding effects from beavers would protect occurrences and maintain suitable habitat.

4.1.6.2 Red Swamp Crayfish

The red swamp crayfish inhabits freshwaters, including rivers, lakes, ponds, streams, canals, seasonally flooded swamps and marshes, and ditches with mud or sand bottoms and plenty of organic debris. Additionally, the red swamp crayfish has been known to colonize rice fields, irrigation channels, and reservoirs. The species is an ecosystem engineer, primarily constructing simple burrows. The species is tolerant of a variety of water quality parameters, including salinities less than 12 parts per thousand,

pH from 5.8 to 10, dissolved oxygen levels greater than 3 parts per million, variable water temperatures, and variable pollution levels. In times of drought, red swamp crayfish can burrow down 3 feet to reach the water table and plug the top of the burrow to prevent water loss (USGS 2020a).

Exoskeletons of red swamp crayfish were observed in Sub-Reaches 2 through 5 during the 2018 reconnaissance survey (DWR 2019). The abundance of red swamp crayfish exoskeletons appeared to be lower in Sub-Reaches 4 and 5, and increased in Sub-Reaches 2 and 3, where surface flows increased and became more permanent. Evidence of this species was not observed within the upper 600 feet of Sub-Reach 2 (DWR 2019); however, the species is most likely present throughout all six sub-reaches, as all of the aquatic habitat would be suitable for the species (66.70 acres). Additionally, red swamp crayfish may utilize the wetland habitat throughout the study area, calculated at 72.23 acres.

Non-Project releases of water from Cedar Springs Dam do not provide additional suitable habitat because other sources of water keep the sub-reaches inhabited by the crayfish wet enough for their survival. Since crayfish are also able to withstand drought by burrowing to reach subsurface flow, they can survive in lower flow conditions than many AIS, leaving them even less dependent on sources like the somewhat unpredictable non-Project releases of water from Cedar Springs Dam.

4.1.6.3 Asian Clam

The Asian clam is known to inhabit lakes, reservoirs, and streams, often covering themselves in sandy, bottom sediments. These bivalves cause serious structural damage by weakening dams and related structures. The species has a low tolerance to cold water, which causes fluctuations in population numbers. Additionally, the Asian clam exhibits sensitivity to salinity, drying, low pH, and siltation. They can die off in large numbers during low flow and periods of warm temperatures during summer drought (USGS 2020a).

Asian clam shells (i.e., no live clams) were observed in Sub-Reach 2 through Sub-Reach 5, but were noticeably absent from Sub-Reaches 1 and 6. Additionally, while Asian clam shells were observed within Sub-Reach 2, they were absent from the upper 600 feet of this sub-reach. Abundance of Asian clam shells appeared to be lower in Sub-Reach 5 and Sub-Reach 4 and increased moving upstream into Sub-Reach 3 and Sub-Reach 2, where surface flows increased and became more permanent. Since Sub-Reach 6 was dry at the time of reconnaissance, and no signs of Asian clam were seen there, it is likely the sub-reach does not stay wet long enough to support the species (USGS 2020a). However, it would be anticipated that Sub-Reach 1 would also be potential aquatic habitat for the species, since it stays wet throughout the year (DWR 2019: USGS 2020a). Therefore, all of the sub-reaches, except Sub-Reach 6, have potential aquatic habitat for Asian clam (total 66.70 acres). They may also use wetland habitat connected to the wetted area in Sub-Reaches 1 and 2 (9.61 acres), but would not be anticipated in riparian zones or other habitat.

Non-Project release of water from Cedar Springs Dam do not provide additional suitable habitat for this AIS. The sub-reaches in the study area that remain wet long enough to support Asian clam do so due to other sources, rather than releases. Most non-Project releases of water from Cedar Springs Dam occur in wet years or during precipitation events, when water would already be available. There are also other water sources that keep sub-reaches wet long enough for the Asian clam to occur persistently. Non-project releases do not occur with regularity or for prolonged periods to expand the distribution of suitable habitat. Therefore, flow releases do not influence the proliferation of Asian clam.

4.1.6.4 Eurasian Watermilfoil

Eurasian watermilfoil grows submerged, rooted in mud or sand, with branching stems 12 to 20 feet long (Cal-IPC 2020; DiTomaso et al. 2013). Establishment of Eurasian watermilfoil is dependent upon still water (Donaldson and Johnson 2002). The species can tolerate a range of environmental conditions, including low light, nutrient variations, and near-freezing water temperatures. The species is capable of creating its own habitat by trapping sediment and producing a favorable environment for further establishment. The species can grow on sandy, silty, or rocky substrates (Cal-IPC 2020).

Eurasian watermilfoil was observed in Sub-Reaches 2 and 3, where water was present. It was found throughout Sub-Reach 3 and the majority of Sub-Reach 2, with the exception of the upper 600 feet of the sub-reach (DWR 2019).

Given its reliance on perennial, still water, Eurasian watermilfoil could use aquatic habitat found only in those sub-reaches where water normally lasts year-round: Sub-Reach 1 through Sub-Reach 3 (Donaldson and Johnson 2002). This would include 8.40 acres in Sub-Reach 1, 7.43 acres in Sub-Reach 2 and 15.99 acres in Sub-Reach 3, for a total of 31.59 acres of aquatic habitat throughout the study area. Additionally, Eurasian watermilfoil may utilize the wetland habitat connected to the wetted extent of the sub-reaches (9.61 acres).

Non-Project releases of water from Cedar Springs Dam do not provide additional suitable habitat for this AIS. The sub-reaches in the study area that remain wet enough to support Eurasian watermilfoil do so due to other sources, rather than releases. Most releases occur in wet years or during precipitation events, when water would already be available for the species. There are also other water sources that keep sub-reaches wet enough for the Eurasian watermilfoil to inhabit them. Non-project releases do not occur with regularity or for prolonged periods to expand the distribution of suitable habitat. Although fragments of Eurasian watermilfoil may be conveyed downstream by flows, these occurrences are temporary and do not persist when stream sections dry. Therefore, flow releases do not influence the proliferation of Eurasian watermilfoil.

4.1.7 Summary of the Seasonal Nature of AIS Habitat Suitability

Seasonally, American bullfrogs may be more prevalent in Sub-Reach 1 during the breeding seasons, since it has appropriate breeding habitat. They are not anticipated to be present in Sub-Reaches 4, 5, and 6 in the drier months of the year (beginning in June July) since these reaches usually dry up during these periods.

Seasonally, some red swamp crayfish may move to wetter reaches in drier months, but due to their burrowing abilities, the majority likely are not influenced by seasons for any specific movement between sub-reaches.

Asian clams would not be anticipated to move in response to seasonal changes, except in their larval form, veligers, which move with flow. In wetter seasons and during higher flows, veligers would be anticipated to move downstream. Additionally, Asian clams may only survive briefly in Sub-Reaches 4 and 5, when water is present during the wetter times of year, and die out when these sub-reaches dry. They may still successfully breed in Sub-Reaches 4 and 5 if water is present for long enough during the year and veligers move to the sub-reaches that remain wet, but growth and development may be limited or restricted and, in some cases, ceased altogether if the sub-reaches are dry.

Eurasian watermilfoil would not be anticipated to respond to seasonal changes in water availability due to non-Project releases of water from Cedar Springs Dam (or other factors), as they can only establish where water is perennially present. Sub-reaches that are dry in most years do not provide suitable habitat for the species.

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5.0 DISCUSSION

No habitat in the study area was found to be suitable for Mohave tui chub, SMYLF, or western spadefoot, but habitats suitable for arroyo toad are known to occur and may potentially occur for CRLF. Habitat suitability for arroyo toad is corroborated by documented use of habitat over a long period of surveys and other related studies, including radio-tracking. Conclusions for the other four species are derived by comparison of study area conditions to literature accounts of habitat use elsewhere. By necessity, analysis of potential habitat suitability largely relied on a few measurable characteristics, which likely oversimplifies more complex, multivariate relationships. Even for species known to have occurred historically in the study area, but now regarded as extirpated (i.e., Mohave tui chub, SMYLF, and CRLF), analysis was further complicated by a general absence of contemporaneous habitat and life history information when those populations were present. For SMYLF and CRLF, the study area is located on the periphery of their respective historical ranges, where populations might have been marginal and prone to periodic loss, or conversely, may have exhibited unknown local adaptations that contradict current habitat suitability assumptions. The conclusion for western spadefoot was based on the best available evidence that the study area is not within the known range of the species, which does not include the Mojave River drainage. Occurrences of western spadefoot in southern California are limited to coastal watersheds, including the Santa Ana River watershed near the Devil Canyon afterbays. Consideration of the results herein should be accompanied by awareness of these limitations.

Habitat suitability for arroyo toad and CRLF within the study area varies by location (i.e., by sub-reach) and annual variations in hydrology. These variations are associated with differences in annual precipitation as well as geomorphic conditions affecting subsurface flow. The hydrology analysis indicates that non-Project releases of water from Cedar Springs Dam can range from zero for several months of the year up to several thousand cfs in response to large storm events, and two thirds of the study area below the dam can be dry during many months of the year. The extent of the study area that is wetted, dry, or has subsurface flow in any month, is highly variable, and depends on the magnitude and frequency of precipitation preceding it. This is typically reflective of the WY type. Between 2006 and 2019, sustained non-Project releases of water from Cedar Springs Dam occurred at least once in each month, and every month has experienced multiple WYs without a single release. In all years, releases are most consistent in the wetter months during the fall, winter, and early spring, but in all Wet and some Above Normal WYs, releases do occur later in the year. In Dry and Below Normal WYs, releases are confined to the wetter months and are less regular, occurred only once in May (2015), and never occurred between June and October in any of these years.

Other sources of inflow also increase wetted extent and affect habitat suitability. A comparison of data from the two gages and review of available aerial imagery indicate that the combination of LFR releases, tributary flows, and accretion increased wetted extent in the absence of non-Project releases of water from Cedar Springs Dam,

although the relative contribution of each of these inputs to wetted extent is unknown. The frequency and magnitude of precipitation also increases the volume and regularity of LFR releases, tributary flows, and accretion. The study area can be partially dry in any month, but the study area is not entirely dependent on non-Project Cedar Springs Dam releases to produce flows that would reach the downstream gage or wet the full study area. In some years, typically Wet or Above Normal WY types, some combination of LFR releases, tributary flows, and accretion can be high enough to sustain a wetted channel through the entire study area.

Aerial imagery suggests that the three most upstream sub-reaches are typically wet year-round, but become geographically intermittent in the summer in Dry or Below Normal WYs. A full suite of aerial imagery depicting wetted conditions for all seasons in different WY types is not available and most aerials only show conditions between November and June. The two late summer aerials available show the wetted extent in a Dry WY (2018), and in a Below Normal WY (2016). Late summer aerials for wetter WY types were not available.

The combination of aerial imagery and gage data indicate that during any sustained non-Project release of water from Cedar Springs Dam, all sub-reaches are wet. In Above Normal and Wet WYs, all sub-reaches are wet, typically in February, March, and April. In Below Normal WYs, all sub-reaches can be wet in February, March, and April depending on precipitation timing and magnitude. Higher accretion conditions, LFR releases and tributary flows, typical of Above Normal and Wet years, can extend wetted conditions in all sub-reaches through May and into June.

In Below Normal and Dry WYs, the wetted extent of the reach in May and June is often reduced to terminus locations in Sub-Reach 4 and Sub-Reach 5 (Zone 2). The amount of LFR releases, tributary flows, and accretion in the system during these WY types affect the additional wetted channel extent downstream of Sub-Reach 3. Between July and October, wet conditions are less common. Through the summer and into the fall, Sub-Reaches 4, 5 and 6 are typically dry regardless of WY type.

Sub-surface flow can only be estimated with observed depletion, and when non-Project releases of water from Cedar Springs Dam have occurred after a prolonged dry period. The predictions provided in the analysis section likely overestimate subsurface flow under wetter conditions. The lack of available data limit determination of the specific location where stream flows go subsurface. From the aerial assessment, Zone 2 appears to be a losing section of the study area and a typical location where surface flows begin to go subsurface. Zone 3 is likely also a losing reach and would increase the total volume of subsurface flow through Sub-Reach 5 and to where subsurface flows meet the Deep Creek water table in Sub-Reach 6. The infiltration conditions through Zone 3 are likely very similar to the documented conditions through most of the greater Mojave River, but on a smaller scale by area.

Sub-Reaches 2 and 3, and the upper portion of Sub-Reach 4, contain potentially suitable breeding habitat for arroyo toad, as verified by surveys (summarized by Cadre

Environmental 2007) and is contiguous with extensive arroyo toad habitat within Horsethief Creek. Potential habitat for CRLF in the same two sub-reaches was also identified and is associated with pools deeper than those suitable for arroyo toad, including pools supported by beaver dams, as well as pools without the influence of beaver dams. The combination of LFR releases, Horsethief Creek inflow, and accretion within these upper sub-reaches provides adequate flow during the arroyo toad breeding season and surface water during the summer aestivation period in most years. The perennial characteristics of this section are generally favorable, including shallow pools that remain wetted for a sufficient period for larval development, adjacent moist substrates for recently metamorphosed young, a water source (surface or sub-surface) for rehydration during the driest part of summer, and associated riparian vegetation for foraging habitat and burrow sites. However, these same perennial characteristics also support beaver activity, and the resulting dams (including inactive and old dams that are still partially functional) eliminate potential arroyo toad breeding habitat and could create habitat for non-native predators. As noted by Cadre Environmental (2007), prior to high flows in the winter of 2004/2005 that removed beaver dams from the stream channel, suitable habitat for arroyo toad breeding did not occur in the upper part of the study area from at least 1998 to 2004. By 2014, suitable habitat for arroyo toad breeding was again reportedly scarce (HELIX 2014).

Periodic high non-Project releases of water from Cedar Springs Dam following autumn or winter precipitation act as flushing flows, scouring the channel and clearing beaver dams, recontouring the streambed, and redistributing sediment. These high flow events are likely essential processes to maintaining suitable habitat conditions for arroyo toad in the upper sub-reaches and, if consistent with other requirements, should be allowed to occur, mimicking the natural hydrograph. Large non-Project releases of water from Cedar Springs Dam during the breeding season (at least April-June in most years) may be detrimental to arroyo toad breeding, but are generally infrequent. As described by Cadre Environmental (2007), large releases in this period sometimes “destroy sand bars used during the breeding season, and reconfigure, and in some cases eliminate, suitable breeding pools, thus disrupting clutch and larval development.” Non-Project releases of water from Cedar Springs Dam in April or later in the breeding season rarely occur, except in the wettest years, when they could displace arroyo toad eggs or larvae, but may also increase the extent of suitable breeding habitat. However, source data were generally inadequate to reliably predict habitat suitability related to water depth and velocity under changing flow conditions. If feasible, potential adverse effects of large releases required by the Mojave Basin Area Watermaster during arroyo toad breeding season necessitated by precipitation might be reduced by releasing flows gradually over a longer period.

In contrast, the lower sub-reaches of the study area are typically dry during a large portion of most years. During the wettest years, conditions that allow arroyo toad breeding may occur and can be supported by non-Project releases of water from Cedar Springs Dam as well as by LFR releases and accretion. Under certain conditions, flows in the lower sub-reaches are apparently maintained solely or largely by LFR releases and accretion, although tributaries to the West Fork Mojave River may contribute flows.

As such, the lower sub-reaches likely do not consistently support arroyo toad breeding. Potentially suitable habitat for CRLF is even scarcer. Although arroyo toad survey data are generally lacking and other source data is insufficient to describe the occurrence of potentially suitable breeding pools, dry conditions during the breeding season likely limits successful breeding in most years in much of Sub-Reaches 4 and 5. Conditions within Sub-Reach 6 differ, including indications of hydrologic support from Deep Creek, a highly developed riparian zone, and evidence of at least one deeper pool that may be suitable for CRLF. Non-Project releases of water from Cedar Springs Dam do wet the entire WFMR, including these sub-reaches. However, sustained flow in these sub-reaches does not appear to occur regularly enough to support either species.

The distribution of AIS in the study area similarly reflects the perennial characteristics of the upper sub-reaches where wetted conditions are typically maintained regardless of non-Project releases of water from Cedar Springs Dam. Sub-Reach 1, which supports potential breeding for American bullfrogs, is a perennial pool that remains so regardless of releases. Other pools in Sub-Reaches 2 and 3 are also likely perennial, even in dry years, and could support the four AIS considered in this report. This indicates that changes to release schedules would not be expected to reduce or eliminate AIS already established in the study area. During periods of more extensive flow to the lower sub-reaches, AIS may be transported downstream and temporarily occur, as evident by Asian clam shells and red swamp crayfish exoskeletons observed along the lower sub-reaches during the 2018 field reconnaissance. However, AIS generally cannot persist in the lower sub-reaches during prolonged dry periods, which occur frequently. Red swamp crayfish may survive dry periods by burrowing to subsurface water, whereas post-metamorphic American bullfrogs could move from drying sub-reaches to the wetter upper sub-reaches or surrounding waterbodies; however, Asian clam, Eurasian watermilfoil, and American bullfrog larvae would not survive prolonged periods of desiccation.

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Appendix 1

Hydrology Source Data

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1.0 STREAM FLOW AND PRECIPITATION DATA

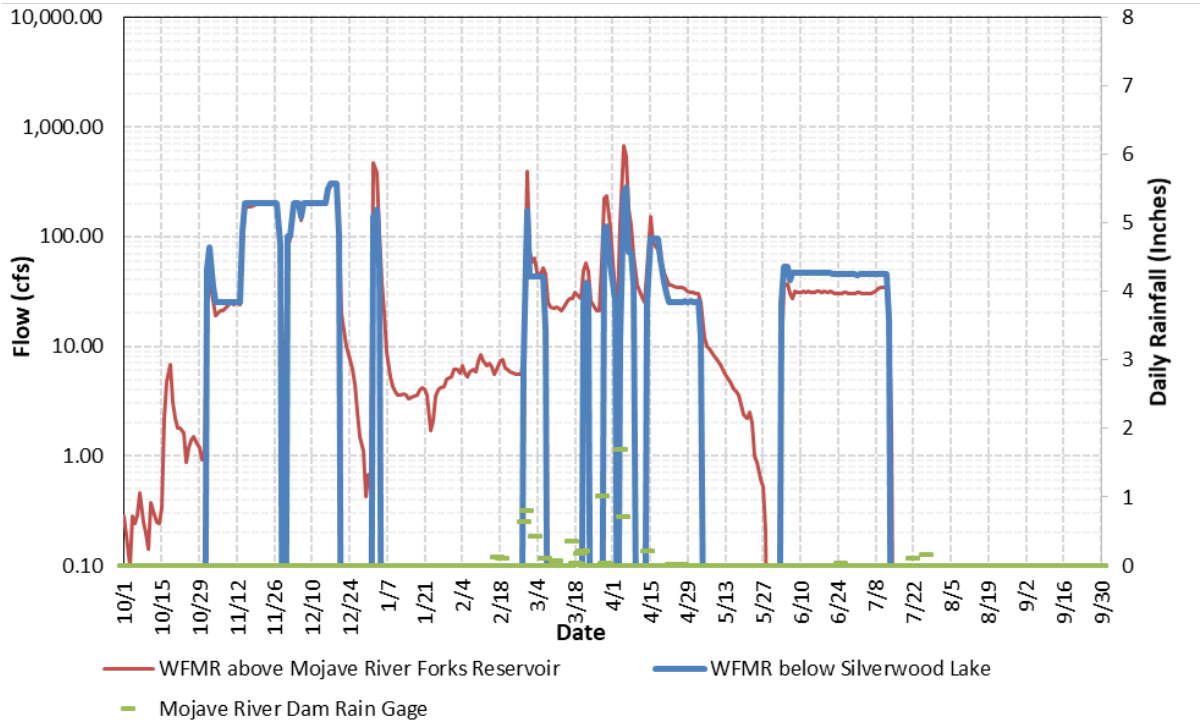

Figure A-1. Water Year 2006 (Below Normal, 7.1 inches)

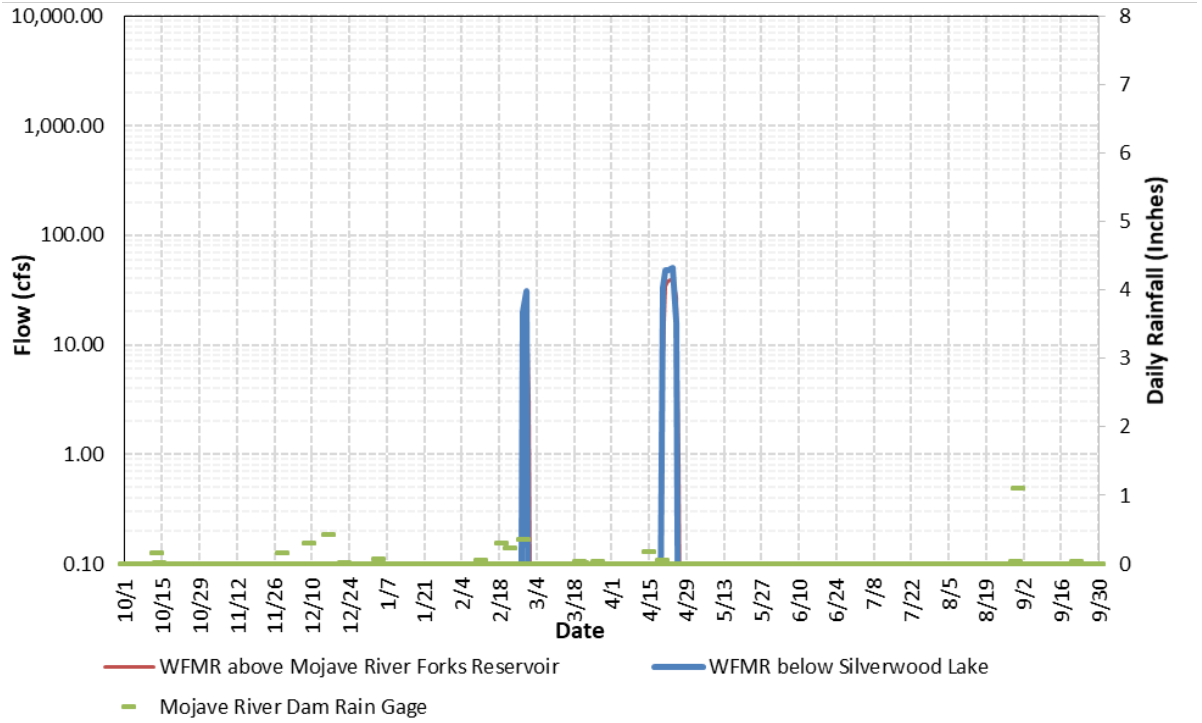

Figure A-2. Water Year 2007 (Below Normal, 3.58 inches)

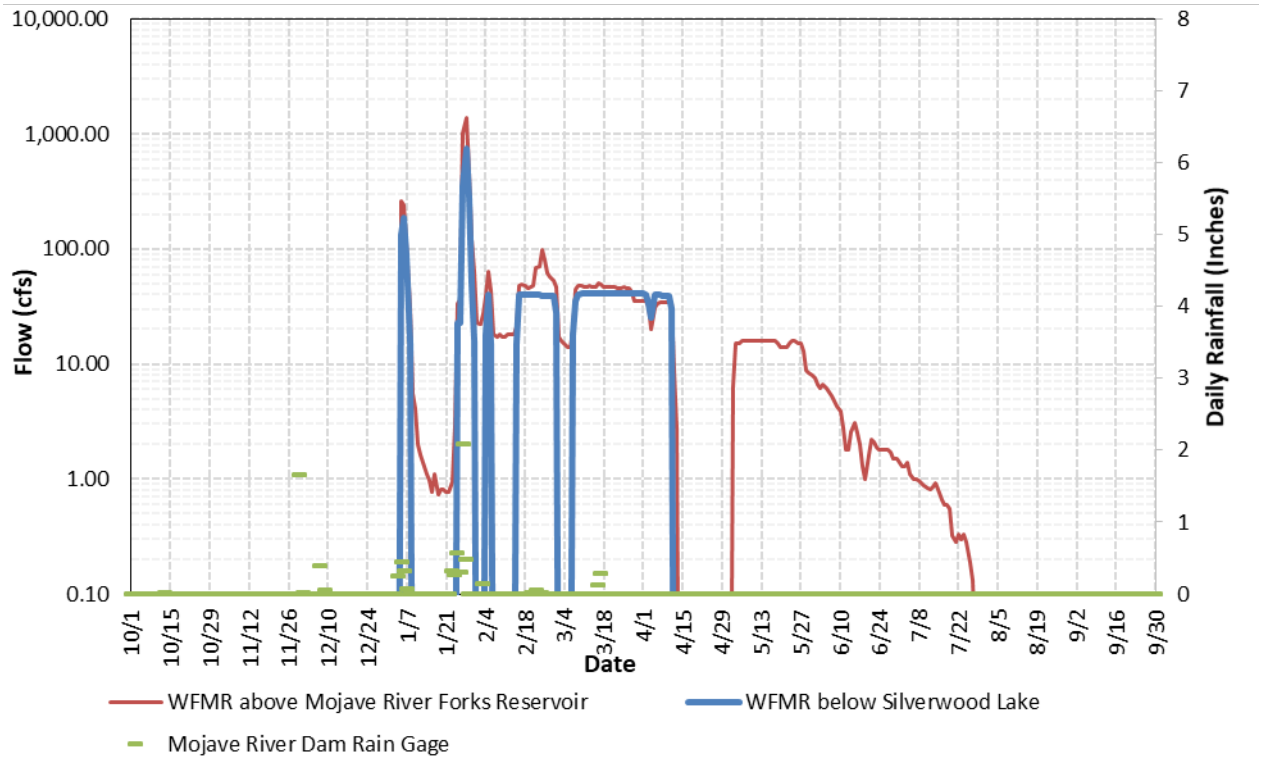

Figure A-3. Water Year 2008 (Above Normal, 7.94 inches)

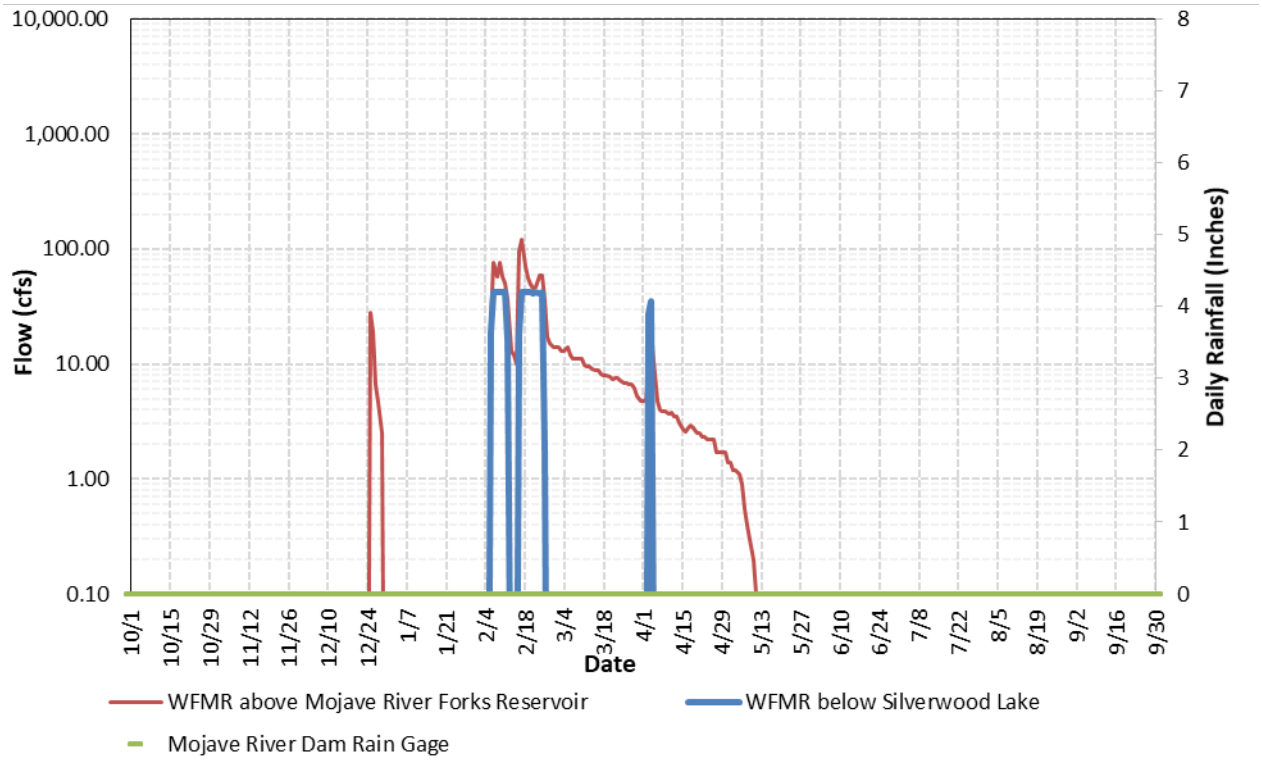

Figure A-4. Water Year 2009 (Below Normal, Qualitative Determination)

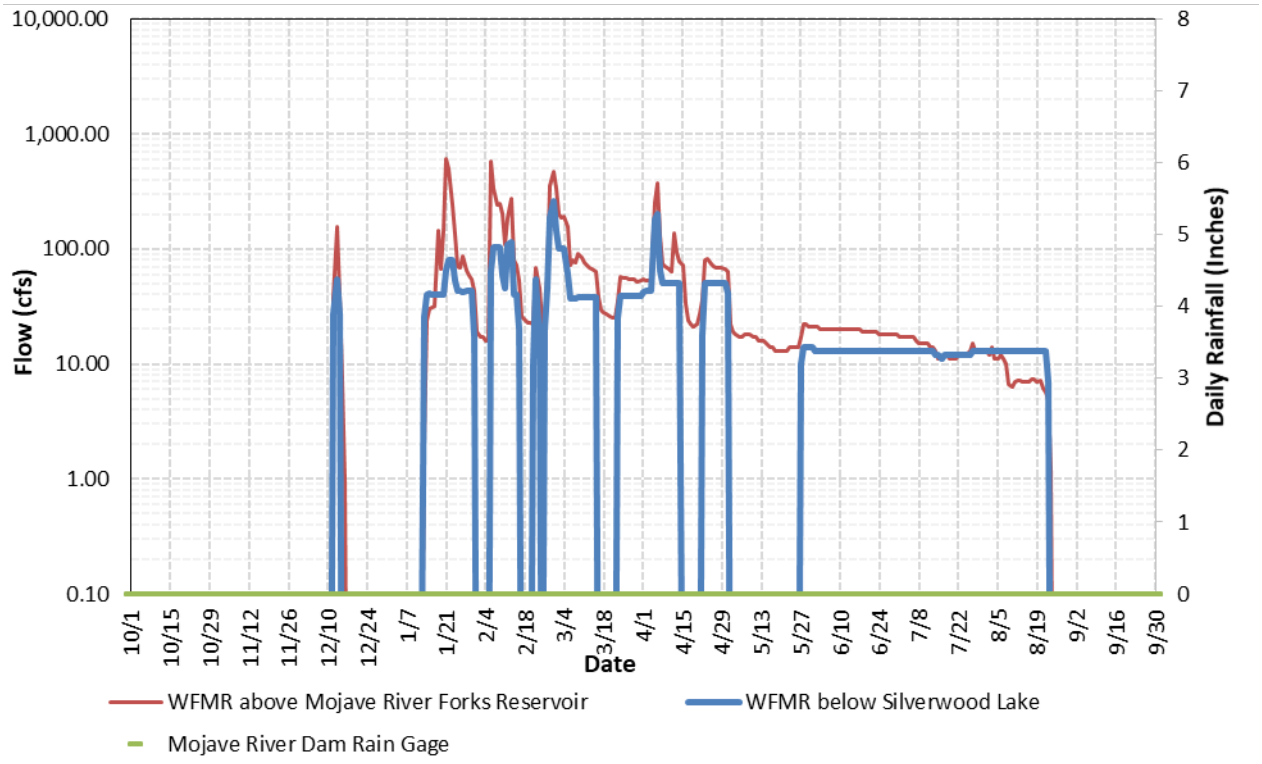

Figure A-5. Water Year 2010 (Wet, Qualitative Determination)

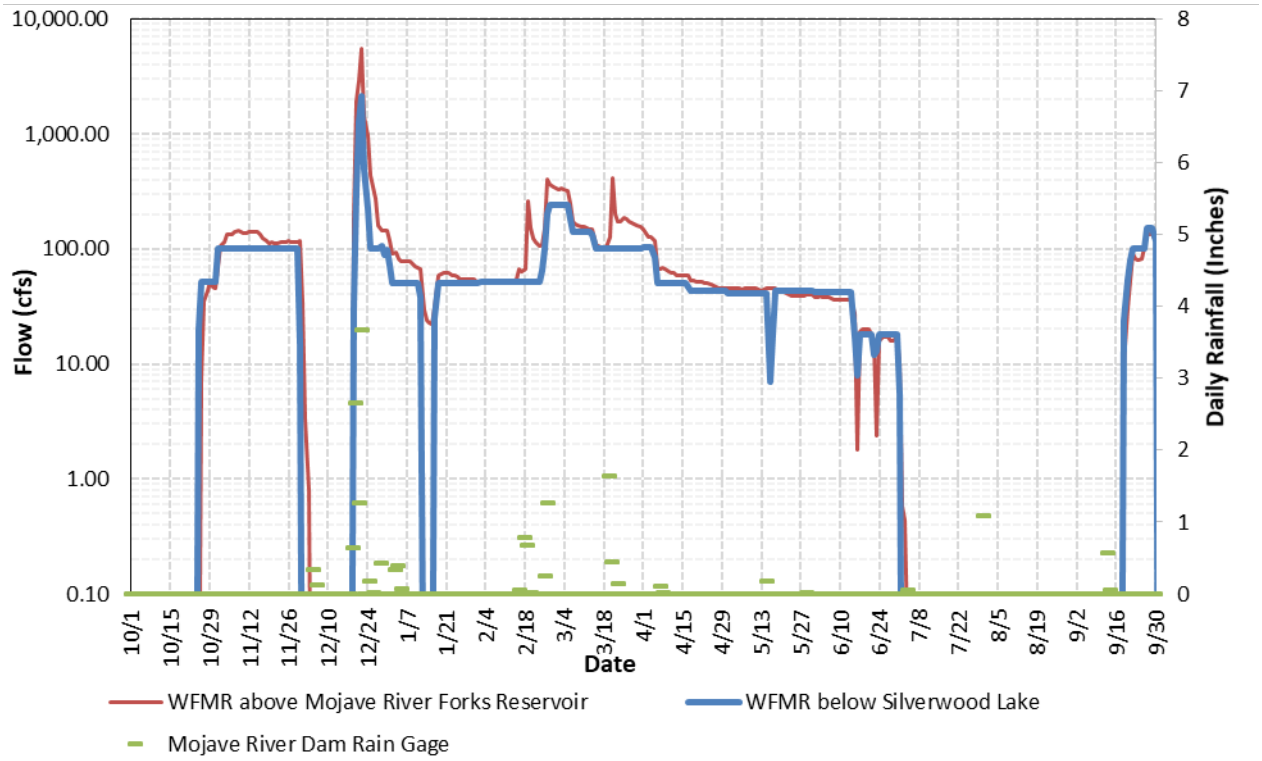

Figure A-6. Water Year 2011 (Wet, 17.47 inches)

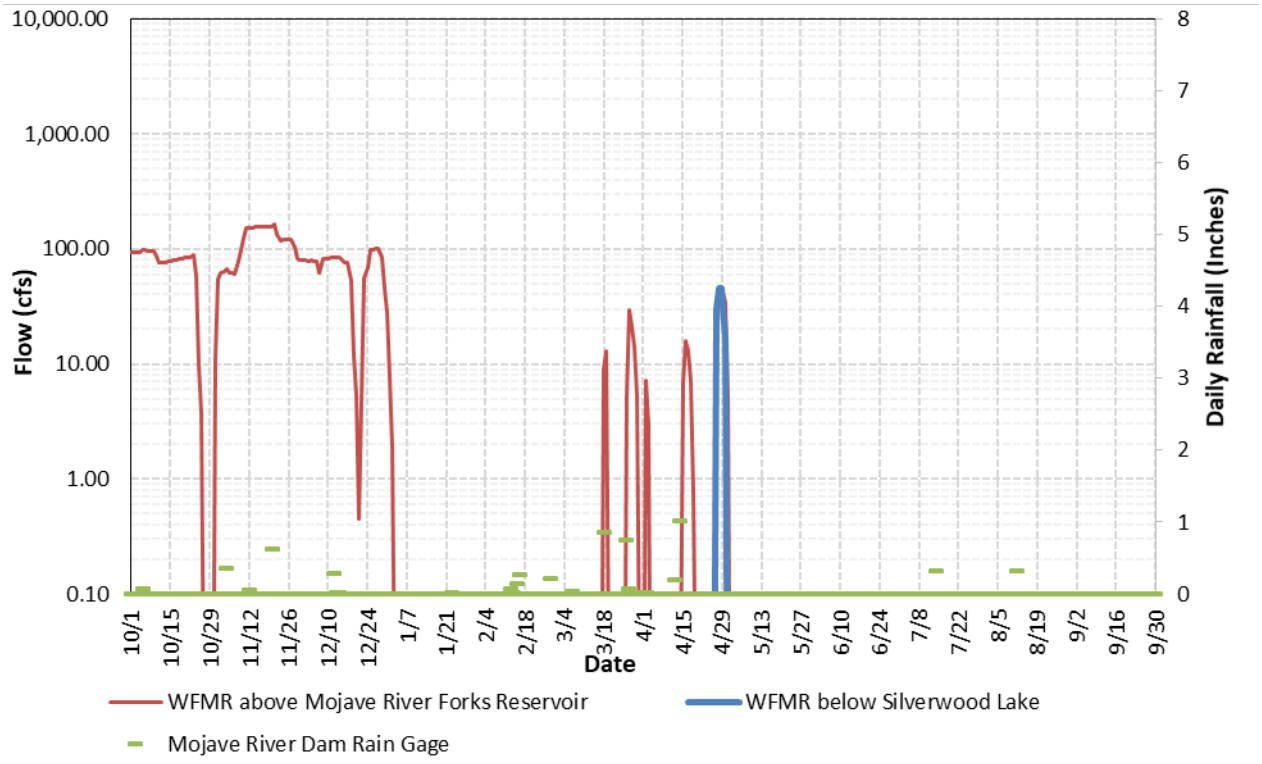

Figure A-7. Water Year 2012 (Below Normal, 5.74 inches)

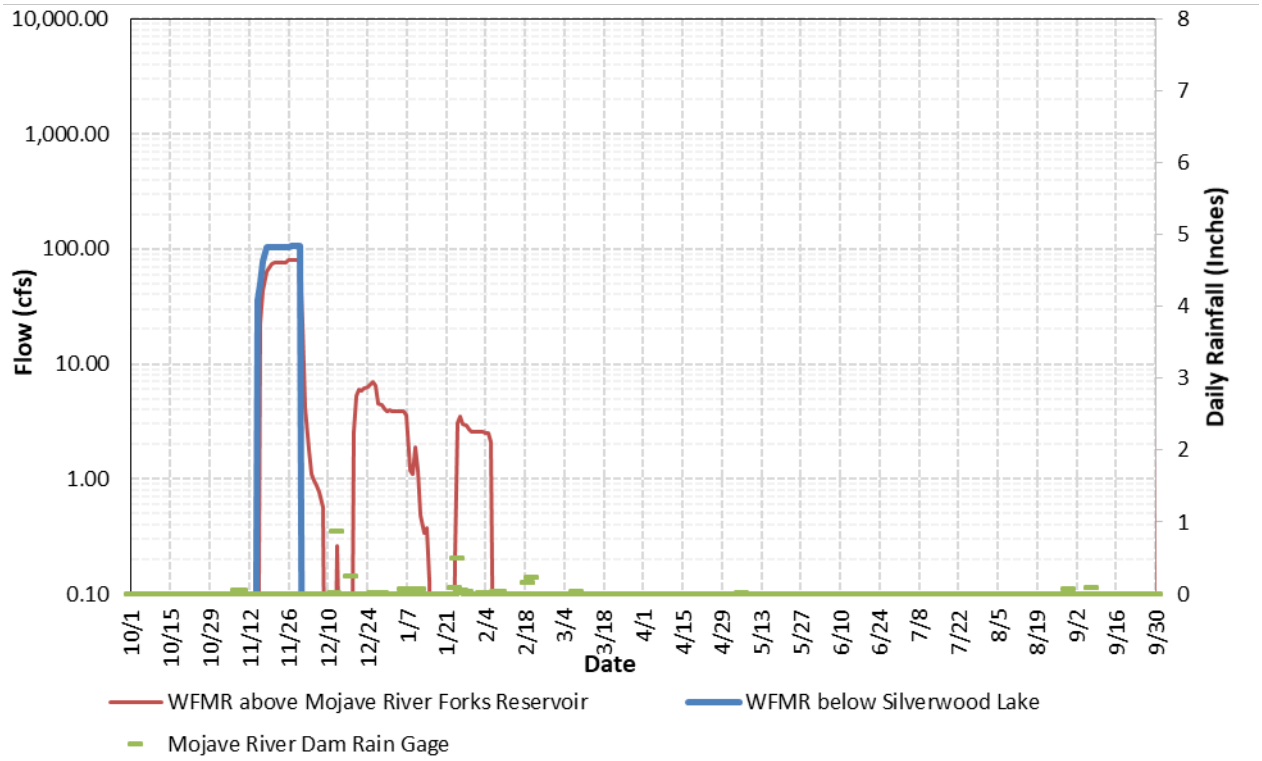

Figure A-8. Water Year 2013 (Dry, 2.97 inches)

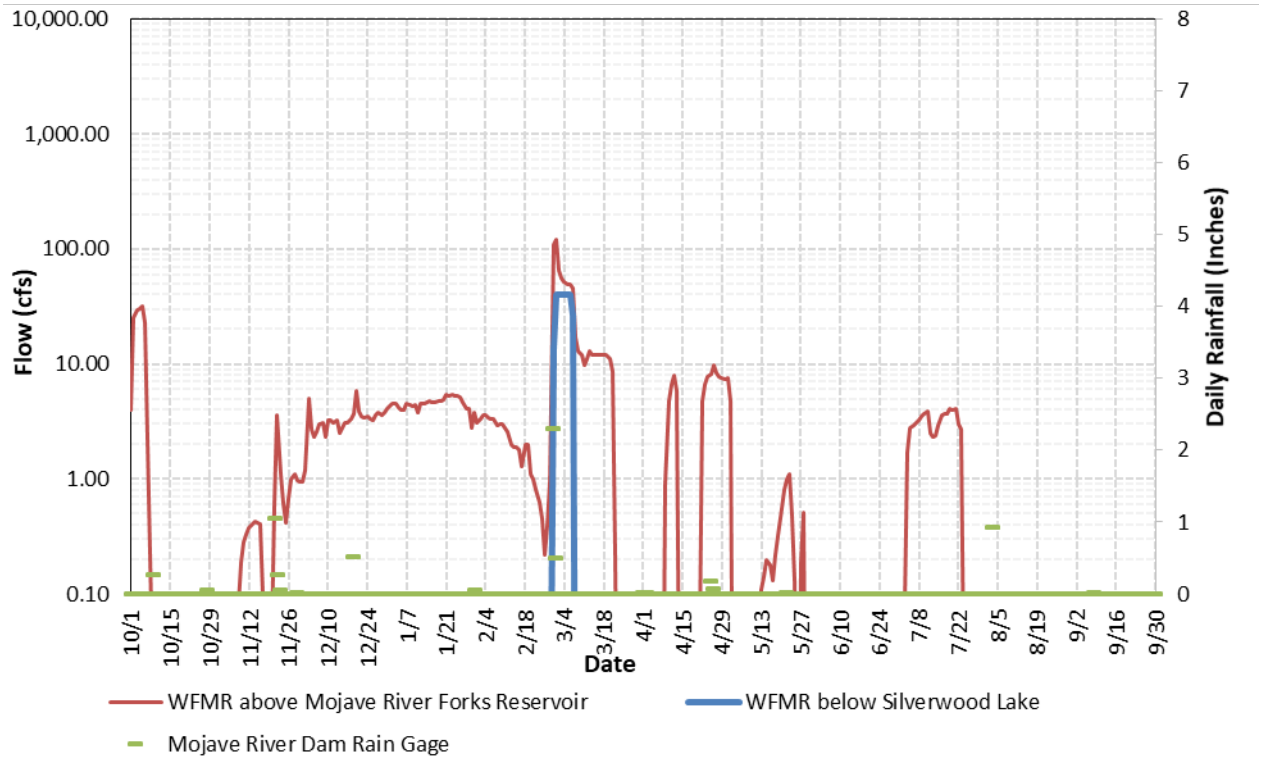

Figure A-9. Water Year 2014 (Below Normal, 6.29 inches)

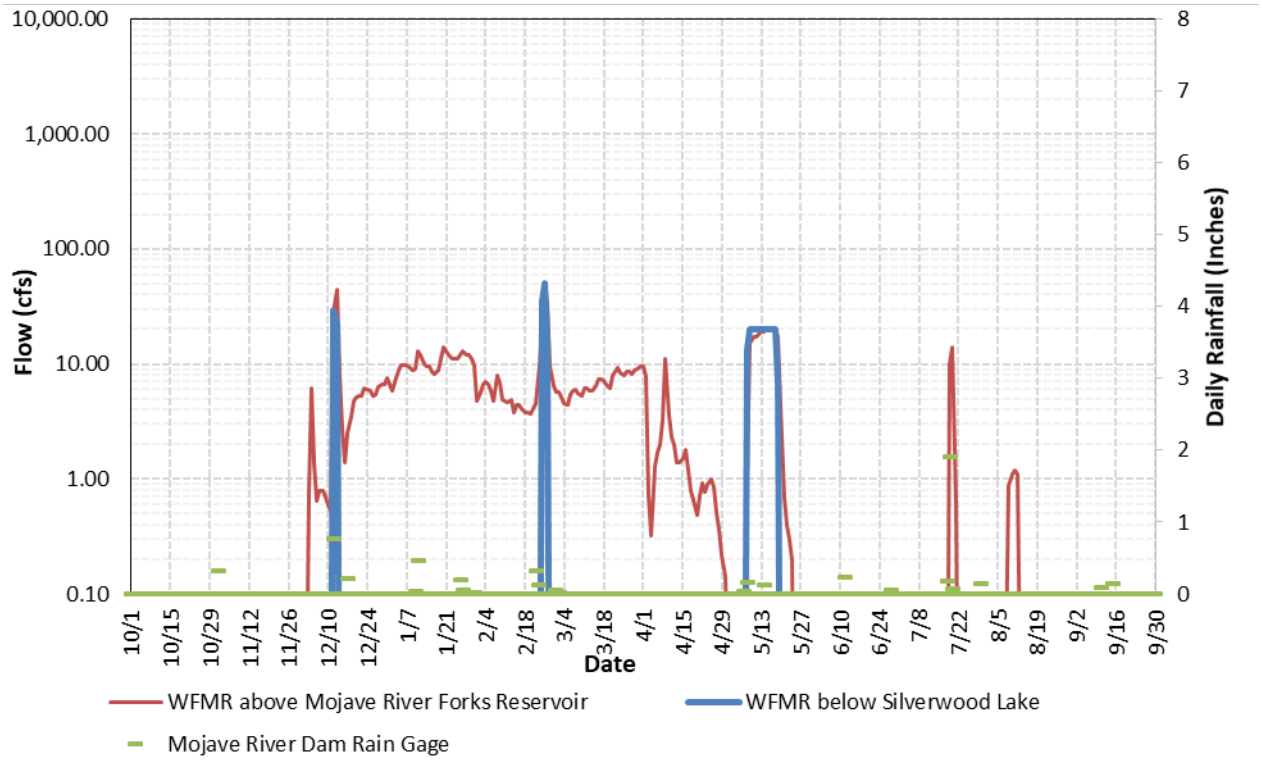

Figure A-10. Water Year 2015 (Below Normal, 5.75 inches)

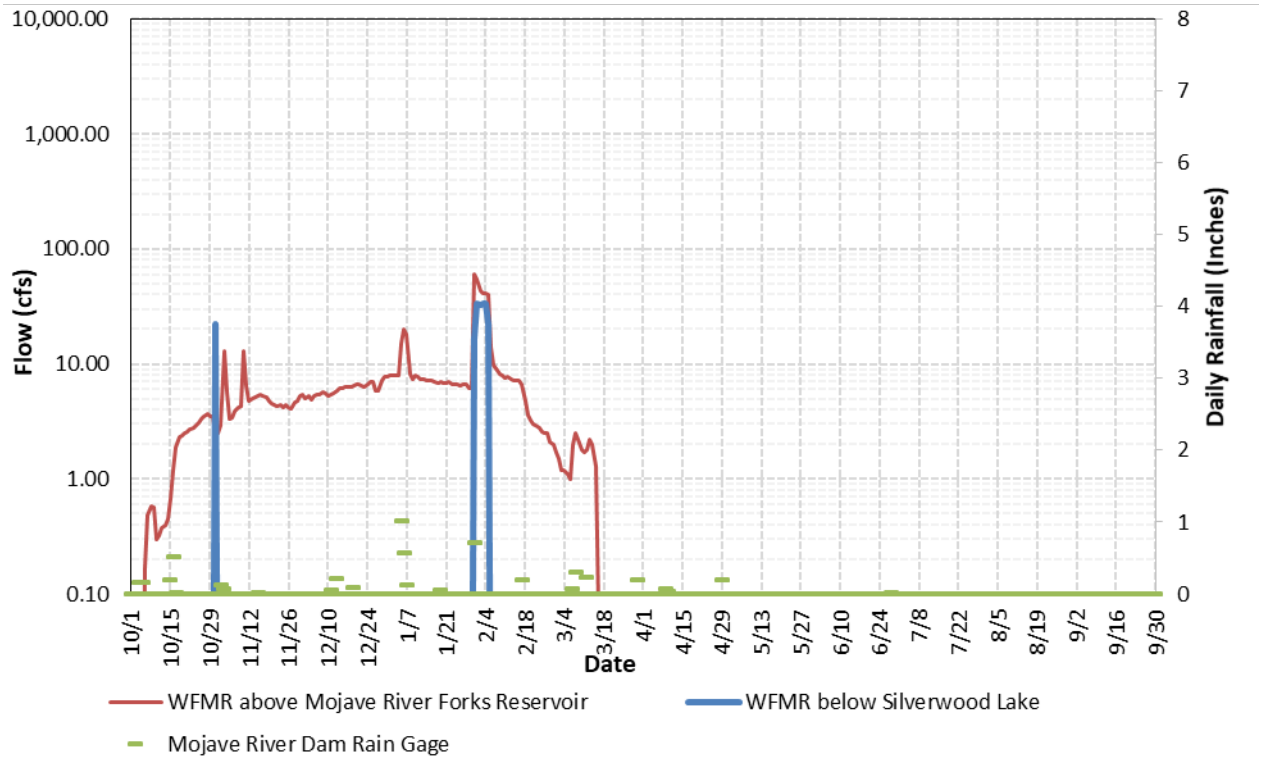

Figure A-11. Water Year 2016 (Below, 5.45 inches)

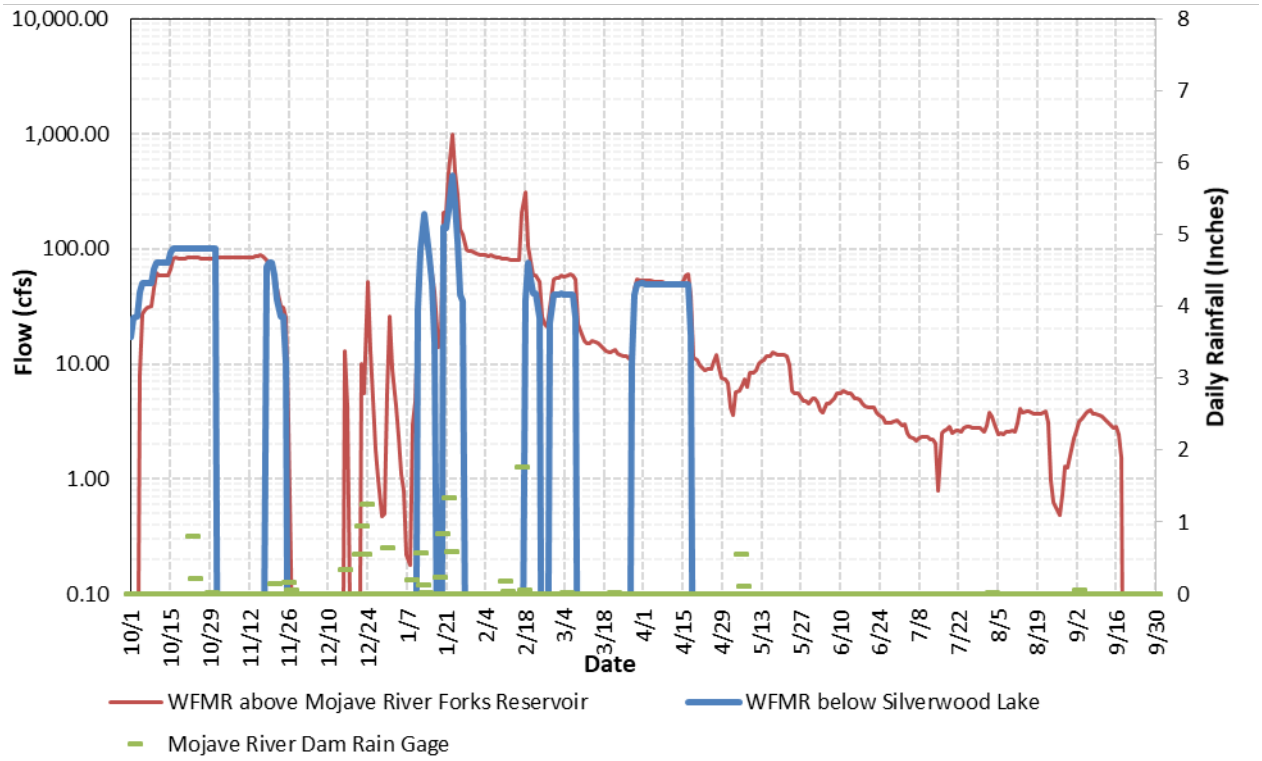

Figure A-12. Water Year 2017 (Wet, 12.39 inches)

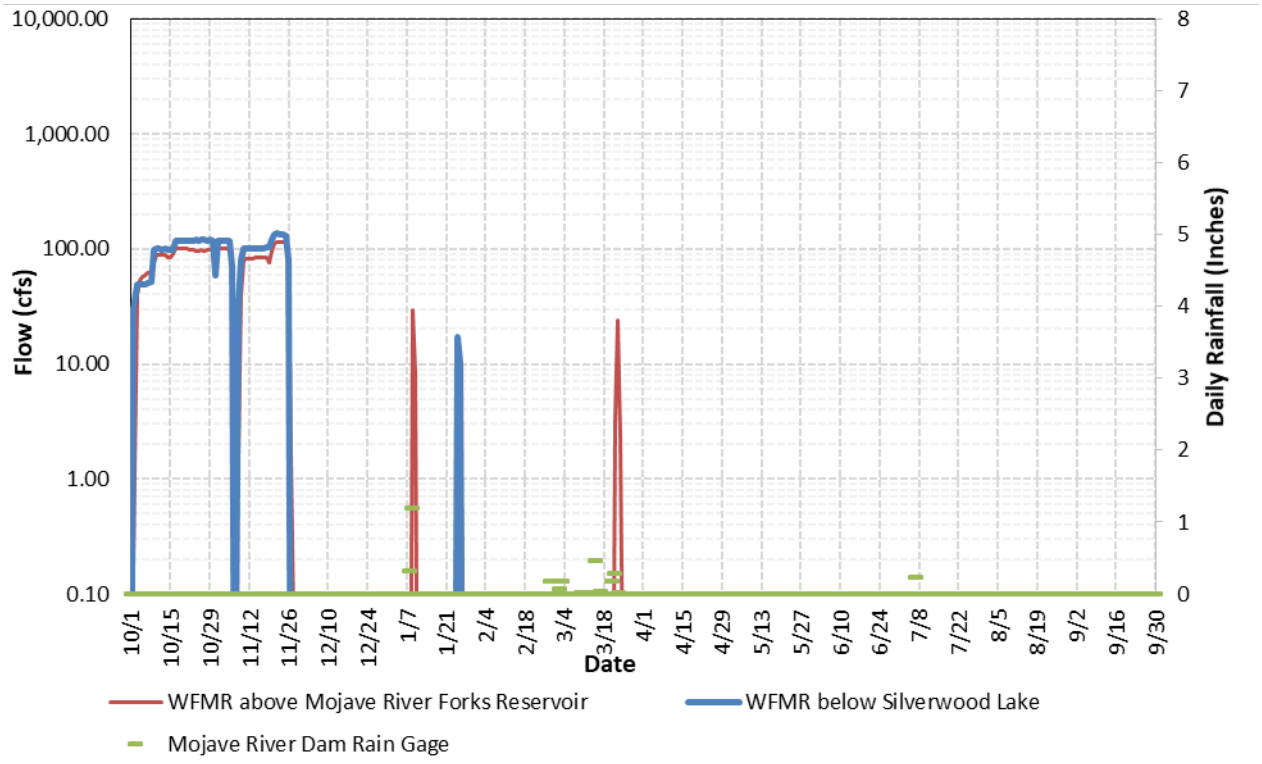

Figure A-13. Water Year 2018 (Dry, 3.19 inches)

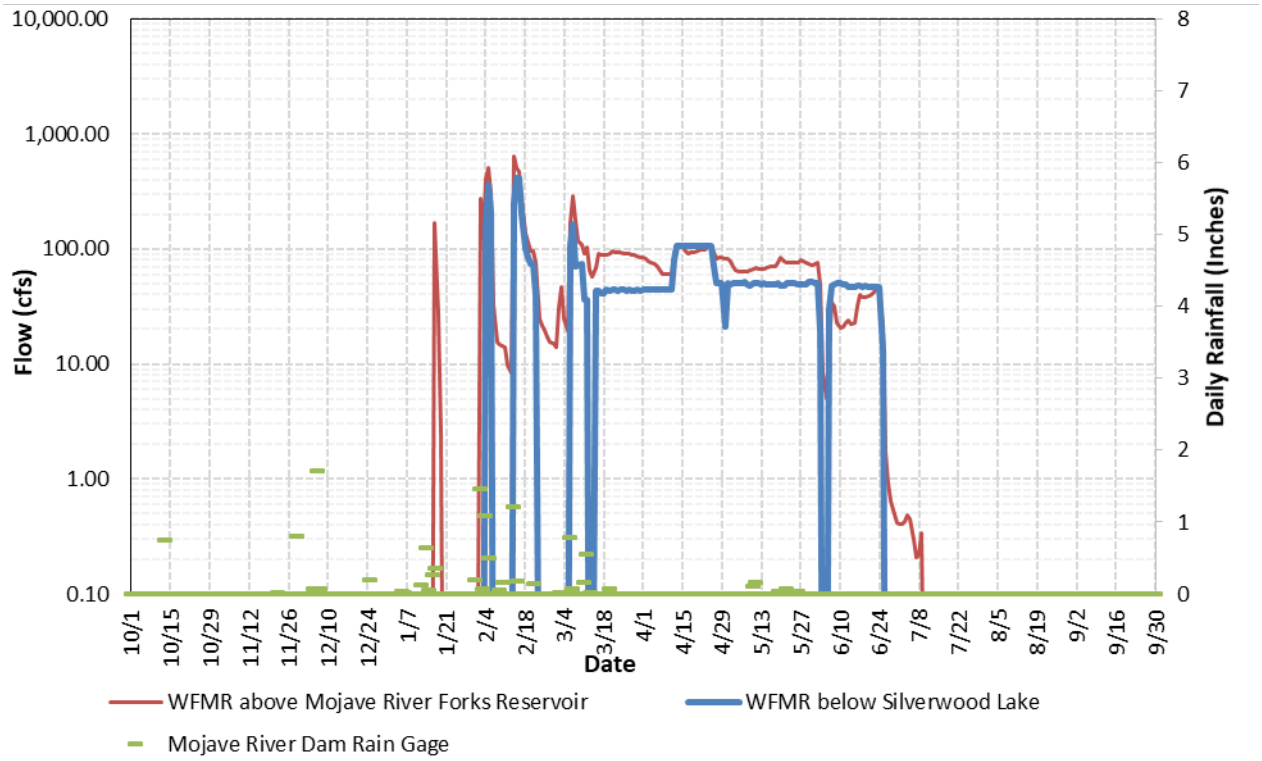

Figure A-14. Water Year 2019 (Wet, 12.33 inches)

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2.0 RESERVOIR WATER SURFACE ELEVATION

Table A-1. Silverwood Lake Reservoir Elevation in Water Year 2006

Water Year 2006	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3351.51	3352.16	3350.25	3351.88	3350.61	3352.78	3348.9	3348.45	3350.95	3348.06	3345.64	3350.61
2	3351.43	3351.48	3350.28	3352.47	3350.22	3352.95	3348.56	3348.48	3350.53	3348.45	3345.31	3350.16
3	3350.7	3351.54	3350.98	3351.71	3350.05	3352.33	3347.69	3348.37	3350.31	3348.93	3346.23	3349.91
4	3350.25	3351.49	3351.96	3352.24	3350.36	3352.24	3348.45	3348.26	3349.91	3349.01	3346.23	3350.28
5	3350.16	3352.36	3351.15	3351.26	3350.67	3352.78	3349.38	3348.45	3349.49	3348.9	3346.82	3350
6	3350.16	3352.64	3349.32	3351.09	3350.87	3352.95	3348.7	3349.6	3348.9	3349.38	3347.47	3349.72
7	3349.69	3351.51	3349.07	3351.09	3350.61	3352.61	3347.95	3350.61	3346.46	3349.6	3347.92	3349.86
8	3349.83	3351.26	3348.03	3351.06	3350.61	3352.75	3348.68	3351.65	3346.12	3349.74	3348.37	3349.88
9	3350.39	3351.18	3347.36	3351.51	3350.45	3352.47	3349.38	3352.66	3346.01	3350.61	3348.82	3349.43
10	3349.91	3350.61	3347.44	3351.09	3349.83	3351.93	3349.18	3352.75	3346.83	3351.12	3349.18	3349.86
11	3349.83	3350.59	3348.65	3351.15	3349.86	3351.51	3348.26	3352.3	3347.58	3351.6	3349.72	3349.91
12	3349.6	3351.57	3347.97	3351.4	3350.39	3351.26	3348.26	3352.3	3348.48	3351.74	3349.88	3349.74
13	3349.69	3352.07	3347.58	3350.95	3350.25	3351.46	3347.86	3351.93	3349.1	3350.39	3350.5	3350.05
14	3349.72	3351.65	3346.79	3351.32	3350.25	3352.05	3347.69	3352.07	3349.43	3350.36	3351.09	3349.6
15	3349.94	3350.45	3346.71	3352.02	3349.86	3352.05	3347.81	3352.64	3349.6	3350.81	3351.18	3349.94
16	3350.28	3349.43	3346.88	3352.24	3349.83	3351.6	3348.23	3352.75	3349.07	3351.65	3351.63	3350.67
17	3350.81	3348.68	3346.74	3352.69	3349.94	3351.4	3347.64	3352.05	3348.82	3352.07	3351.65	3351.09
18	3351.18	3347.81	3346.54	3352.92	3350.25	3352.41	3346.57	3351.2	3349.24	3351.93	3351.68	3351.26
19	3351.29	3347.55	3347.22	3352.89	3350.87	3352.86	3345.67	3351.26	3349.29	3351.15	3351.23	3352.07
20	3351.18	3348.62	3347.89	3352.55	3351.51	3352.47	3345.42	3351.65	3349.38	3350.92	3351.63	3351.63
21	3352.38	3349.07	3348.34	3352.5	3352.02	3352.1	3345.53	3351.74	3348.8	3350.52	3351.77	3351.91
22	3353.14	3349.15	3349.15	3352.52	3352.19	3351.65	3346.65	3350.7	3348.56	3350.5	3351.57	3351.99
23	3353.31	3349.04	3349.41	3351.29	3352.16	3351.32	3348.31	3349.97	3348.23	3350.47	3351.6	3352.47
24	3352.69	3350.56	3350.31	3351.29	3351.57	3350.67	3347.58	3349.35	3348.11	3350.19	3351.37	3352.75
25	3353.03	3349.63	3350.7	3350.73	3350.87	3350.25	3347.89	3349.07	3348.45	3349.91	3350.95	3352.64
26	3352.75	3349.1	3351.04	3350.47	3351.2	3350.25	3347.86	3349.27	3347.89	3347.24	3350.87	3352.91
27	3351.71	3350.08	3351.12	3349.91	3351.37	3350.28	3347.69	3349.86	3348.03	3346.65	3351.12	3352.52
28	3351.68	3349.83	3350.59	3350.33	3352.38	3350.81	3347.41	3350.39	3348.26	3345.56	3351.06	3352.05
29	3352.02	3350.08	3350.31	3350.39	--	3350.87	3347.55	3351.51	3348.11	3345.56	3350.92	3351.51
30	3352.86	3350.02	3350.87	3350.5	--	3350.14	3348.56	3351.18	3347.81	3345.11	3350.64	3351.82
31	3352.19	--	3351.15	3350.67	--	3349.38	--	3350.84	--	3345.22	3350.39	--

Table A-2. Silverwood Lake Reservoir Elevation in Water Year 2007

Water Year 2007	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3351.63	3352.16	3345.81	3352.5	3349.72	3346.88	3348.93	3351.06	3352.44	3346.26	3352.3	3352.61
2	3351.26	3352.16	3346.77	3352.47	3348.64	3349.04	3349.18	3350.5	3350.94	3346.64	3351.96	3352.5
3	3350.98	3351.18	3347.75	3351.37	3347.69	3350.61	3349.46	3350.61	3350.92	3346.37	3351.85	3349.72
4	3350.05	3350.75	3348.45	3350.73	3346.37	3352.75	3347.55	3351.04	3350.89	3346.88	3351.63	3348.28
5	3350.02	3350.84	3349.04	3351.04	3345.28	3352.07	3344.77	3350.45	3350.56	3346.85	3351.63	3348.26
6	3350	3350.25	3349.6	3351.4	3344.16	3351.15	3344.91	3350.28	3350.31	3346.85	3351.4	3348.4
7	3349.94	3349.49	3350.61	3350.98	3342.3	3350.87	3345.98	3350.19	3349.6	3346.88	3351.34	3348.48
8	3350.05	3348.79	3350.14	3351.06	3340.84	3351.4	3347.16	3350.11	3349.6	3346.68	3350.84	3349.13
9	3350.33	3346.99	3351.29	3350.92	3339.35	3350.16	3348.48	3350.16	3350	3346.43	3350.84	3350.36
10	3350.33	3345.75	3352.3	3350.67	3337.64	3350.02	3349.35	3349.91	3350.59	3346.01	3350.67	3350.28
11	3350.45	3345.74	3352.75	3350.28	3335.87	3351.29	3349.83	3349.91	3350.84	3346.26	3350.7	3349.83
12	3350.25	3344.69	3352.97	3350.33	3333.65	3352.07	3350.95	3349.9	3350.84	3346.91	3351.4	3346.85
13	3350.47	3343.96	3353.23	3350.25	3331.66	3351.48	3351.4	3350.16	3350.53	3346.54	3349.72	3343.87
14	3351.06	3342.61	3353.42	3350.14	3329.47	3350.81	3352.27	3350.22	3349.72	3347.1	3349.74	3341.07
15	3351.54	3341.88	3353.14	3350.05	3327.25	3350.45	3352.95	3349.8	3348.79	3347.81	3350.19	3341.77
16	3352.05	3340.9	3353.53	3349.91	3325.09	3350.02	3353.53	3349.69	3347.92	3348.65	3350.25	3343.51
17	3352.24	3340.05	3353.87	3350.11	3322.87	3350.36	3353.57	3349.77	3346.85	3349.35	3350.56	3343.51
18	3352.05	3339.04	3354.26	3349.63	3324.86	3351.06	3353.42	3350.05	3346.63	3350.25	3350.84	3343.65
19	3351.85	3340.08	3353.42	3352.3	3326.55	3351.06	3353.17	3350.19	3344.74	3350.59	3351.63	3343.57
20	3351.4	3340.5	3352.89	3349.38	3328.77	3351.15	3352.95	3349.63	3344.21	3351.04	3352.38	3344.46
21	3351.32	3341.29	3352.64	3350.1	3330.14	3351.71	3352.41	3349.77	3343.65	3351.65	3352.52	3345.25
22	3351.57	3342.05	3352.19	3350.61	3331.85	3351.32	3352.66	3350.75	3342.61	3351.82	3352.47	3346.99
23	3352.05	3343.17	3352.05	3350.87	3334.61	3351.63	3353.2	3350.56	3342.81	3352.38	3352.72	3348.87
24	3351.43	3343.9	3351.93	3351.63	3336.66	3352.13	3352.42	3350.5	3343.28	3352.52	3352.24	3350.61
25	3351.29	3345.14	3352.65	3351.82	3338.48	3352.52	3353.73	3350.67	3343.51	3352.52	3352.3	3352.3
26	3351.12	3346.77	3352.24	3352.47	3340.73	3352.52	3353.42	3351.2	3344.44	3352.3	3352.72	3352.61
27	3350.92	3347.64	3352.38	3353.31	3343.23	3351.43	3352.66	3351.99	3344.32	3352.16	3352.55	3353.76
28	3350.84	3345.76	3352.55	3353.85	3345.19	3350.7	3353.45	3352.89	3344.66	3352.37	3352.41	3353.09
29	3350.53	3343.99	3351.93	3352.55	--	3349.83	3352.75	3353.25	3345.25	3352.44	3352.07	3353.2
30	3350.97	3345.22	3352.16	3351.85	--	3349.27	3352.89	3353.87	3345.64	3352.38	3351.71	3353.42
31	3351.85	--	3352.19	3350.25	--	3348.82	--	3353.09	--	3352.47	3352.33	--

Table A-3. Silverwood Lake Reservoir Elevation in Water Year 2008

Water Year 2008	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3352.41	3351.4	3352.07	3352.55	3354.07	3351.91	3351.96	3351.48	3351.29	3351.04	3349.72	3351.63
2	3352.05	3352.07	3352.21	3352.55	3353.79	3352.66	3351.93	3351.96	3350.53	3351.09	3349.55	3351.93
3	3351.93	3352.3	3352.19	3352.71	3353.84	3352.21	3351.63	3352.16	3349.91	3350.75	3350.5	3352.05
4	3352.19	3353.42	3351.77	3353	3353.45	3351.67	3351.55	3352.13	3349.86	3351.63	3350.05	3351.46
5	3352.05	3353.42	3350.73	3353.45	3352.97	3351.43	3351.57	3352.07	3349.74	3351.09	3349.97	3351.06
6	3351.93	3352.16	3349.91	3353.59	3352.5	3350.84	3351.63	3352.47	3349.24	3351.71	3349.91	3350.95
7	3351.88	3352.13	3350.5	3353.42	3351.96	3350.78	3351.48	3352.3	3349.04	3350.64	3350.02	3351.54
8	3351.99	3352.72	3351.01	3352.97	3351.4	3349.77	3351.4	3352.52	3350.25	3349.94	3350.25	3350.92
9	3352.19	3352.5	3351.2	3352.27	3351.37	3350.67	3351.77	3352.5	3350.75	3350.36	3350.25	3350.5
10	3352.41	3352.96	3351.46	3351.82	3351.71	3350.61	3351.57	3352.16	3351.85	3350.14	3351.65	3350.05
11	3351.96	3353.42	3351.85	3351.29	3351.93	3350.14	3351.63	3352.27	3352.05	3349.83	3351.48	3349.43
12	3351.63	3353.03	3351.29	3351.47	3351.98	3350.73	3351.71	3352.36	3351.71	3348.54	3351.51	3348.45
13	3351.51	3353	3350.7	3352.41	3351.82	3350.45	3351.06	3351.95	3351.29	3349.24	3351.51	3348.2
14	3352.36	3352.72	3351.01	3352.36	3351.71	3350.7	3351.18	3351.96	3350.73	3350.77	3351.63	3349.91
15	3352.75	3352.5	3351.09	3352.27	3352.05	3350.95	3351.91	3351.93	3352.02	3349.97	3351.18	3349.58
16	3352.95	3352.52	3351.4	3352.27	3353.09	3351.87	3352.78	3351.26	3351.74	3350.42	3350.75	3349.86
17	3352.86	3351.88	3351.15	3351.85	3353.45	3351.82	3351.88	3351.2	3351.63	3349.88	3352.02	3349.91
18	3353.09	3352.24	3351.4	3351.63	3352.86	3351.93	3351.96	3351.77	3351.82	3349.88	3351.77	3349.52
19	3352.89	3352.05	3351.34	3351.57	3352.86	3352.05	3351.04	3351.48	3351.4	3349.83	3351.82	3348.76
20	3352.66	3352.16	3351.63	3352.72	3352.47	3352.41	3351.43	3351.18	3350.67	3351.04	3351.71	3348.54
21	3352.64	3351.82	3352.07	3352.74	3351.85	3351.91	3351.37	3350.87	3349.63	3351.4	3352.02	3350.45
22	3352.1	3352.47	3352.38	3352.75	3351.51	3351.29	3351.2	3349.83	3350.99	3351.15	3352.4	3350.45
23	3352.05	3352.27	3353.87	3352.33	3351.4	3351.12	3351.37	3350.16	3350.97	3350.84	3351.93	3350.36
24	3352.04	3352.66	3354.15	3352.55	3352.97	3350.75	3351.71	3350.59	3350.89	3350.56	3352.7	3349.97
25	3350.33	3352.75	3354.88	3352.72	3352.97	3350.36	3351.2	3351.23	3351.09	3350.45	3352.55	3349.43
26	3349.77	3352.64	3354.29	3353	3352.5	3350.45	3351.37	3352.13	3350.59	3350.45	3352.24	3348.87
27	3349.6	3352.41	3353.2	3353.84	3351.63	3350.59	3351.12	3352.19	3350.56	3351.18	3351.93	3348.76
28	3350.87	3352.17	3352.95	3353.25	3350.98	3350.14	3351.29	3351.91	3350.61	3350.5	3351.29	3350.5
29	3351.98	3352.52	3352.52	3353.82	3351.15	3350.19	3351.63	3351.91	3351.04	3350.39	3350.89	3350.56
30	3351.15	3352.05	3352.52	3353.93	--	3351.63	3351.48	3351.74	3350.92	3350.22	3350.56	3350.81
31	3351.26	--	3352.52	3353.98	--	3351.99	--	3351.51	--	3350	3351.93	--

Table A-4. Silverwood Lake Reservoir Elevation in Water Year 2009

Water Year 2009	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3350.61	3349.38	3352.07	3350.02	3349.69	3351.4	3351.4	3350.75	3351.01	3351.71	3350.92	3350.92
2	3350.7	3350.39	3352.16	3349.94	3349.72	3351.37	3351.37	3350.42	3350.47	3351.57	3351.63	3351.18
3	3350.39	3350.47	3352.13	3349.83	3349.86	3351.37	3351.37	3351.4	3350.25	3351.04	3351.4	3350.61
4	3350.02	3350.16	3351.82	3350.05	3349.88	3351.63	3351.63	3351.06	3349.83	3350.89	3350.92	3350.36
5	3351.4	3349.24	3351.68	3350.22	3349.91	3351.37	3351.37	3350.7	3349.58	3350.75	3351.2	3350.36
6	3350.95	3349.27	3351.63	3350.25	3350.25	3351.8	3351.8	3350.22	3348.73	3350.39	3350.19	3351.32
7	3349.49	3349.01	3351.65	3350.14	3350.64	3351.32	3351.32	3349.94	3349.35	3350	3349.43	3351.29
8	3347.75	3348.56	3351.26	3349.97	3350.81	3350.98	3350.98	3349.72	3349.88	3350.14	3348.59	3350.84
9	3347.92	3348.65	3350.81	3349.88	3351.29	3350.82	3350.82	3350.56	3349.38	3350.56	3349.52	3350.67
10	3347.86	3348.42	3350.56	3349.83	3351.18	3350.53	3350.53	3352.92	3349.27	3350.19	3350.25	3350.36
11	3348	3348.23	3350.16	3349.77	3350.92	3350.25	3350.25	3352.72	3349.24	3349.97	3350.16	3350.25
12	3349.94	3348.31	3349.69	3349.69	3350.95	3350.31	3350.31	3352.38	3349.18	3350.92	3350.28	3351.06
13	3349.83	3348.28	3349.35	3349.66	3351.09	3350.02	3350.02	3351.82	3349.46	3350.56	3350.16	3352.16
14	3349.94	3347.86	3349.24	3349.8	3351.06	3349.97	3349.97	3351.46	3349.69	3350.56	3349.94	3352.21
15	3349.29	3347.64	3349.38	3349.94	3351.09	3349.83	3349.83	3351.32	3350	3350.47	3350.89	3351.68
16	3348.23	3349.52	3349.29	3349.93	3351.65	3349.66	3349.66	3350.78	3348.59	3350.47	3351.79	3351.63
17	3347.83	3349.43	3349.13	3350.08	3351.91	3349.55	3349.55	3350.75	3347.89	3350.16	3352.5	3351.12
18	3347.1	3349.49	3349.15	3350	3351.82	3349.41	3349.41	3350.84	3346.96	3350.42	3351.88	3351.32
19	3349.18	3349.27	3349.1	3349.94	3351.93	3349.27	3349.27	3350.22	3346.96	3351.23	3351.29	3350.95
20	3348.93	3348.9	3348.93	3349.91	3351.82	3349.01	3349.01	3349.83	3347.33	3350.73	3350.61	3350.84
21	3348.48	3348.59	3349.52	3350.19	3352.05	3348.48	3348.48	3349.46	3348.9	3350.45	3350.56	3350.84
22	3348.23	3348.45	3349.21	3349.86	3351.79	3348.11	3348.11	3349.27	3349.01	3350.05	3350.5	3351.34
23	3348.2	3349.24	3348.48	3349.86	3351.74	3347.53	3347.53	3349.46	3348.96	3349.6	3350.25	3350.87
24	3347.89	3348.93	3348.23	3349.77	3351.71	3346.88	3346.88	3349.86	3349.55	3349.72	3350.25	3351.4
25	3347.78	3348.68	3348.82	3349.6	3351.65	3346.23	3346.23	3350.45	3350.22	3350.47	3350.31	3349.58
26	3349.18	3348.45	3348.76	3349.83	3351.54	3345.47	3345.47	3350.45	3350.39	3351.23	3350.02	3350.28
27	3348.96	3348.48	3348.79	3349.69	3351.51	3345.08	3345.08	3350.42	3351.18	3351.18	3349.38	3350.53
28	3349.07	3349.66	3349.74	3349.69	3351.37	3344.89	3344.89	3350.56	3351.15	3351.34	3349.01	3350.28
29	3348.93	3350.87	3350.02	3349.6	--	3347.69	3347.69	3350.73	3352.05	3351.18	3349.63	3349.77
30	3348.93	3352.08	3350.02	3349.72	--	3349.94	3349.94	3350.73	3351.88	3350.84	3350.25	3349.86
31	3349.07	--	3350.02	3349.83	--	3350.42	--	3350.92	--	3350.53	3350.39	--

Table A-5. Silverwood Lake Reservoir Elevation in Water Year 2010

Water Year 2010	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3349.83	3352.13	3351.37	3349.66	3339.47	3350.67	3349.86	3350.73	3352.78	3349.94	3350.73	3350.5
2	3349.91	3351.79	3351.63	3349.43	3339.55	3350.5	3350.05	3350.7	3352.19	3349.83	3351.04	3350.75
3	3351.29	3351.48	3351.71	3349.07	3339.41	3350.33	3350.14	3350.75	3351.99	3350.29	3351.37	3350.73
4	3352.61	3350.98	3351.48	3348.68	3339.47	3350.31	3350.1	3351.01	3352.16	3350.25	3351.4	3350.75
5	3350.39	3350.16	3351.4	3348.37	3339.49	3350.31	3350.5	3350.98	3352.24	3350.21	3351.4	3350.75
6	3347.58	3349.69	3351.37	3347.92	3341.57	3350.56	3350.11	3350.93	3352.24	3350.5	3351.29	3350.61
7	3345.87	3350.56	3351.48	3347.44	3341.6	3350.67	3350.05	3350.9	3352.02	3350.81	3351.32	3350.61
8	3346.12	3351.4	3351.63	3347.08	3341.74	3350.56	3349.69	3350.86	3351.63	3350.64	3350.92	3350.61
9	3346.6	3350.59	3351.73	3346.63	3341.94	3350.67	3349.86	3350.82	3351.77	3350.7	3351.06	3350.75
10	3347.92	3350.11	3351.63	3346.12	3342.11	3350.81	3349.58	3350.78	3351.93	3350.84	3351.32	3350.61
11	3349.01	3349.86	3351.63	3345.64	3342.3	3350.75	3349.55	3350.74	3352.16	3350.89	3351.29	3350.16
12	3350.11	3349.49	3352.1	3345.11	3342.39	3350.56	3349.72	3352.07	3352.24	3351.4	3351.82	3349.86
13	3350.84	3349.43	3352.24	3344.21	3342.25	3350.36	3348.68	3351.73	3352.19	3351.15	3351.82	3349.74
14	3350.92	3349.6	3352.21	3343.42	3342.3	3350.25	3348.54	3351.71	3352.95	3351.01	3352.05	3349.94
15	3351.06	3351.09	3351.09	3342.44	3342.47	3350.28	3348.59	3352.07	3352.61	3350.7	3352.05	3349.94
16	3350.56	3350.98	3351.01	3341.4	3342.39	3350.25	3348.17	3352.13	3352.55	3350.61	3352.16	3349.66
17	3351.18	3351.26	3351.74	3340.79	3342.53	3349.77	3349.07	3352.36	3352.04	3349.91	3352.27	3349.49
18	3352.16	3350.5	3351.51	3339.83	3343.28	3349.72	3350.67	3352.47	3351.54	3349.38	3352.3	3349.94
19	3351.13	3349.66	3351.18	3338.85	3344.13	3349.86	3350.67	3351.82	3351.29	3349.58	3352.41	3349.83
20	3351.82	3349.43	3351.09	3338.06	3343.93	3349.86	3350.33	3351.57	3352.07	3349.24	3352.05	3350.11
21	3351.32	3349.97	3351.01	3339.1	3345.17	3349.83	3350.39	3351.2	3351.93	3349.07	3351.63	3350.39
22	3351.15	3350.92	3351.29	3339.61	3345.64	3349.88	3350.25	3351.26	3351.63	3349.18	3351.12	3350.11
23	3350.81	3351.15	3351.29	3339.21	3346.26	3349.58	3351.43	3352.61	3351.63	3349.24	3351.06	3349.94
24	3351.18	3351.51	3351.01	3339.16	3346.85	3349.66	3351.38	3352.55	3350.81	3349.6	3351.06	3350.33
25	3350.47	3351.54	3350.78	3339.18	3347.19	3349.63	3351.35	3352.33	3350.7	3349.94	3351.18	3350.75
26	3350.14	3351.51	3350.36	3339.24	3347.86	3349.88	3351.62	3351.91	3350.39	3349.77	3351.06	3350.98
27	3350.33	3351.34	3350.28	3339.18	3349.63	3349.58	3351.43	3351.4	3350.56	3350.25	3350.73	3350.38
28	3349.86	3351.29	3350.42	3339.13	3350.53	3349.6	3351.46	3351.29	3350.59	3350.25	3350.67	3350.19
29	3349.74	3351.37	3350.56	3339.66	--	3349.83	3351.79	3351.63	3350.14	3349.91	3350.56	3349.88
30	3349.69	3351.4	3350.25	3339.32	--	3349.83	3350.73	3352.38	3350.02	3350.28	3350.45	3349.77
31	3350.87	--	3350	3339.49	--	3349.97	--	3352.64	--	3350.61	3350.39	--

Table A-6. Silverwood Lake Reservoir Elevation in Water Year 2011

Water Year 2011	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3349.32	3345.62	3349.38	3352.02	3336.68	3350.17	3350.95	3351.51	3351.57	3352.16	3349.46	3351.88
2	3349.29	3345.33	3348.54	3351.93	3336.49	3349.69	3351.09	3351.01	3351.48	3352.66	3349.15	3351.57
3	3349.46	3345.05	3347.24	3352.19	3336.99	3349.38	3351.63	3350.7	3351.63	3353	3348.48	3351.57
4	3346.96	3345.08	3344.86	3352.13	3337.67	3349.52	3351.34	3350.64	3351.99	3352.86	3348.28	3351.79
5	3344.44	3344.97	3342.61	3352.18	3338.59	3349.6	3351.26	3350.39	3352.16	3352.66	3348.34	3352.19
6	3342.02	3346.23	3340.22	3352.47	3339.89	3350.33	3351.29	3349.94	3352.55	3352.3	3348.03	3352.05
7	3339.55	3347.55	3337.53	3352.02	3341.23	3350.11	3350.61	3350.05	3352.72	3352.38	3348.17	3352.1
8	3337.33	3347.97	3334.58	3350.67	3342.02	3350.08	3350.5	3350.02	3352.58	3352.19	3348.42	3351.99
9	3338.03	3348.79	3332.16	3349.24	3342.86	3349.83	3351.37	3350.14	3351.93	3352.05	3348.76	3351.63
10	3339.07	3348.76	3329.16	3347.47	3343.68	3348.82	3352.16	3350.19	3351.77	3352.16	3348.93	3350.67
11	3340	3348.56	3327.7	3344.86	3344.74	3348.7	3352.24	3350.5	3351.74	3352.13	3349.07	3350.25
12	3340.98	3348.93	3328.2	3342.13	3346.32	3348.34	3353	3350.02	3351.63	3352.19	3349.41	3350.5
13	3341.88	3349.07	3328.23	3339.77	3347.69	3348.48	3353.17	3350.22	3351.82	3351.79	3349.49	3351.18
14	3342.36	3349.13	3327.39	3337.08	3349.35	3348.68	3352.69	3350.33	3351.18	3352.13	3350.02	3351.88
15	3342.58	3349.32	3326.04	3334.78	3350.33	3349.77	3352.78	3351.18	3351.85	3351.79	3350.33	3352.78
16	3343.28	3348.79	3325.59	3332.28	3350.56	3350.59	3353.14	3350.73	3352.1	3351.68	3350.98	3352.89
17	3343.62	3347.97	3327.31	3332.58	3350.84	3350.47	3353.7	3351.15	3351.6	3351.71	3351.34	3352.64
18	3344.07	3348.03	3328.93	3333.12	3351.01	3350.5	3353.59	3352.1	3352.24	3351.82	3351.99	3353.25
19	3344.44	3348.76	3332.7	3333.65	3351.01	3350.56	3353.76	3352.61	3352.55	3351.65	3351.63	3353.2
20	3345.47	3350.67	3337.13	3334.07	3350.39	3351.01	3353.31	3353.84	3352.5	3351.79	3351.79	3352.86
21	3345.92	3351.85	3338.65	3334.72	3351.18	3351.37	3352.86	3353.42	3352.44	3351.09	3352.19	3352.24
22	3345.98	3352.13	3341.88	3335.47	3351.21	3351.71	3352.44	3353.84	3352.64	3351.15	3351.82	3352.05
23	3345.67	3352.07	3341.88	3335.95	3352.27	3351.48	3352.75	3353.65	3352.47	3350.42	3351.63	3352.05
24	3345.81	3351.77	3343.09	3336.57	3351.46	3351.29	3352.38	3353.62	3352.02	3350.16	3351.43	3352.24
25	3345.87	3351.65	3345.22	3337.02	3351.4	3351.4	3352.07	3353.11	3352.24	3349.69	3351.2	3352.24
26	3345.9	3351.51	3347.16	3337.11	3351.74	3351.15	3352.07	3353.11	3352.55	3348.7	3350.81	3352.41
27	3345.76	3351.43	3349.6	3336.99	3350.21	3351.51	3351.54	3352.97	3352.52	3348.62	3351.32	3352.19
28	3345.9	3350.59	3351.26	3337.13	3350.18	3351.32	3351.71	3352.52	3352.33	3348.37	3351.91	3351.71
29	3345.59	3350.59	3351.51	3336.94	--	3351.26	3351.15	3352.5	3351.96	3348.76	3352.33	3350.39
30	3345.81	3350.25	3351.85	3337.08	--	3351.18	3351.29	3352.33	3351.99	3348.99	3352.72	3350.59
31	3345.84	--	3351.71	3336.74	--	3351.12	--	3351.77	--	3349.27	3353.03	--

Table A-7. Silverwood Lake Reservoir Elevation in Water Year 2012

Water Year 2012	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3351.34	3340.9	3345.03	3349.6	3350.95	3351.63	3349.21	3348.93	3353.17	3352.13	3350.84	3350.81
2	3352.24	3341.37	3345.36	3351.71	3350.73	3351.54	3348.93	3349.15	3353.42	3352.21	3350.53	3351.63
3	3352.21	3341.6	3345.78	3352.44	3350.56	3351.63	3349.15	3349.32	3353.87	3351.18	3350.33	3351.71
4	3352.78	3341.77	3345.73	3352.92	3351.48	3351.63	3348.84	3349.72	3353.79	3351.29	3350.02	3352.47
5	3352.89	3342.92	3345.64	3353	3352.07	3352.02	3348.65	3350	3353.37	3351.46	3350.64	3353.11
6	3352.83	3344.46	3345.59	3352.92	3351.57	3351.63	3348.03	3350.39	3352.89	3351.4	3350.61	3352.89
7	3352.69	3346.01	3345.78	3352.61	3351.18	3351.71	3349.15	3350.61	3352.52	3351.29	3350.61	3352.52
8	3352.47	3347.33	3345.7	3352.41	3351.09	3351.93	3349.69	3350.84	3352.19	3351.85	3350.95	3352.27
9	3352.41	3348.56	3346.23	3352.24	3351.01	3351.91	3350	3350.98	3352.16	3351.63	3350.7	3352.36
10	3352.07	3350.14	3347.16	3352.3	3351.09	3351.79	3349.07	3350.61	3351.93	3351.32	3349.94	3352.16
11	3351.82	3351.29	3348.45	3352.16	3351.4	3351.77	3349.52	3350.89	3351.85	3350.75	3349.72	3351.63
12	3351.71	3351.96	3349.72	3352.16	3351.48	3351.71	3349.69	3351.2	3351.74	3349.86	3349.83	3351.4
13	3351.88	3352.36	3348.37	3351.93	3351.63	3351.48	3349.97	3352.19	3351.71	3349.41	3349.94	3351.79
14	3352.05	3352.36	3348.99	3352.02	3351.99	3351.04	3351.4	3352.72	3351.85	3349.83	3350.02	3351.12
15	3352.38	3351.09	3347.02	3352.44	3352.47	3350.42	3352.55	3352.58	3351.51	3350.61	3349.52	3350.08
16	3352.66	3349.77	3346.32	3352.66	3352.3	3350.14	3352.78	3352.8	3351.71	3350.5	3349.72	3350.53
17	3352.24	3348.57	3345.81	3352.97	3352.44	3350.45	3352.69	3352.89	3352.61	3349.83	3349.94	3350.61
18	3351.4	3348.31	3347.78	3353	3352.47	3350.73	3352.78	3352.44	3352.58	3349.41	3350.28	3350.64
19	3351.4	3346.23	3347.95	3352.69	3352.52	3350.78	3352.78	3352.19	3352.05	3349.72	3350.73	3350.28
20	3351.71	3347.44	3349.04	3352.16	3352.61	3351.18	3352.8	3352.3	3351.71	3349.66	3350.53	3349.55
21	3352.05	3347.67	3349.83	3351.93	3352.52	3350.87	3352.72	3352.27	3351.51	3350.16	3350.73	3348.65
22	3352.16	3347.33	3350.64	3352.3	3352.61	3350.14	3353.03	3352.27	3351.54	3351.23	3350.61	3349.18
23	3353.11	3347.13	3349.72	3351.93	3352.47	3349.43	3352.16	3352.52	3351.74	3351.32	3349.94	3350.39
24	3351.2	3346.23	3349.07	3351.77	3352.19	3348.93	3350.3	3352.66	3352.52	3351.4	3350.08	3351.4
25	3348.68	3345.28	3348.28	3351.93	3351.71	3348.82	3348.4	3352.83	3352.44	3351.29	3350.02	3351.93
26	3345.92	3344.8	3347.3	3352.38	3351.71	3348.93	3347.13	3353.17	3352.27	3350.73	3350.64	3351.77
27	3343.23	3344.38	3346.09	3351.48	3351.4	3348.84	3347.13	3353.11	3351.85	3350.47	3350.61	3350.89
28	3341.04	3344.38	3346.32	3351.23	3350.95	3348.76	3347.36	3353.28	3351.63	3350.61	3350.84	3350.08
29	3340.84	3343.78	3346.26	3351.99	3350.87	3348.7	3348.03	3353.25	3351.37	3350.92	3350.39	3350.53
30	3341.35	3344.52	3346.88	3351.71	--	3348.17	3348.73	3353.14	3351.63	3350.92	3350.16	3351.12
31	3341.82	--	3347.69	3351.48	--	3348.4	--	3353.17	--	3350.84	3349.94	--

Table A-8. Silverwood Lake Reservoir Elevation in Water Year 2013

Water Year 2013	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3351.18	3352.19	3351.37	3350.11	3352.41	3351.12	3351.18	3352.66	3351.29	3351.71	3351.32	3351.28
2	3351.15	3352.64	3351.37	3350.42	3352.97	3351.18	3351.15	3353.28	3351.91	3351.18	3351.26	3351.73
3	3350.53	3352.52	3348.62	3350.81	3353.09	3351.4	3350.59	3352.58	3351.2	3351.18	3351.46	3351.8
4	3348.79	3353.25	3347.55	3351.23	3353.42	3351.43	3349.83	3352.19	3350.95	3351.09	3352.07	3351.54
5	3348.34	3350.98	3346.37	3352.92	3351.71	3351.51	3349.94	3351.96	3350.53	3351.37	3351.91	3351.17
6	3348.87	3348.11	3345.33	3353.14	3350.42	3351.51	3349.83	3351.91	3350.61	3351.63	3352.07	3350.86
7	3349.38	3345.28	3344.46	3352.22	3350.53	3351.63	3350.47	3351.74	3350.73	3352.07	3351.93	3351.11
8	3349.94	3342.44	3344.89	3352.13	3350.92	3351.65	3350.53	3351.63	3350.61	3352.21	3351.93	3351.77
9	3350.56	3339.47	3345.22	3351.4	3351.19	3351.96	3349.94	3351.74	3351.63	3352.3	3351.71	3351.31
10	3350.31	3339.94	3345.78	3350.95	3350.59	3352.41	3349.27	3351.51	3351.46	3352.66	3352.07	3350.84
11	3350.61	3341.57	3346.6	3350.39	3350.11	3352.47	3348.79	3351.85	3351.15	3352.52	3352.58	3350.54
12	3351.65	3343.28	3347.36	3350.42	3349.43	3352.19	3347.89	3352.83	3351.15	3352.21	3352.66	3350.07
13	3352.07	3345	3348.34	3351.12	3348.4	3351.96	3347.75	3353.03	3351.46	3352.21	3352.52	3349.63
14	3352.69	3346.35	3349.07	3351.01	3348.48	3351.71	3347.89	3352.8	3351.23	3352.75	3352.36	3349.87
15	3352.97	3347.36	3350.45	3350.87	3348.65	3351.63	3347.81	3352.66	3350.87	3352.66	3352.44	3350.02
16	3353.42	3347.89	3352.33	3350.47	3349.15	3351.74	3348.17	3352.44	3350.73	3352.36	3352.21	3350.02
17	3353.25	3348.48	3353.25	3349.91	3349.26	3352.19	3348.26	3352.16	3350.61	3351.99	3352.44	3350.09
18	3353.42	3348.93	3352.92	3350.05	3349.52	3351.88	3348.4	3352.21	3350.39	3351.54	3352.58	3350.54
19	3353.25	3348.84	3352.41	3350.19	3349.52	3351.63	3349.01	3351.99	3350.45	3351.46	3352.6	3350.91
20	3353.56	3348.93	3351.85	3350.02	3349.6	3351.88	3348.79	3351.85	3350.39	3351.68	3351.76	3350.77
21	3353.31	3349.32	3351.65	3349.88	3350.36	3352.07	3350.14	3351.51	3350.16	3352.3	3351.74	3351
22	3352.58	3349.43	3351.93	3349.13	3351.04	3352.19	3351.82	3351.23	3350.08	3352.21	3351.51	3351.56
23	3352.21	3350.71	3352.24	3348.45	3351.63	3352.19	3351.46	3350.92	3349.72	3351.93	3351.06	3351.3
24	3351.46	3350.73	3352.19	3348.03	3352.24	3352.41	3351.12	3350.75	3349.27	3351.63	3351.49	3351.38
25	3350.42	3350.45	3352.19	3348.03	3352.38	3352.86	3351.34	3350.16	3348.82	3351.48	3351.47	3351.31
26	3350.45	3352.05	3352.19	3349.55	3351.77	3352.33	3350.53	3350.98	3349.04	3351.23	3351.99	3351.3
27	3350.87	3352.3	3351.93	3351.12	3351.71	3352.19	3352.21	3351.91	3349.58	3351.96	3351.52	3351.06
28	3351.43	3352.72	3351.85	3351.79	3351.18	3351.82	3352.89	3351.46	3349.63	3352.3	3351.05	3351.6
29	3351.63	3352.89	3351.57	3351.57	--	3351.63	3353.2	3350.84	3350.16	3352.07	3350.98	3351.91
30	3351.79	3352.13	3350.7	3352.07	--	3351.18	3352.97	3350.47	3351.51	3351.63	3350.67	3351.99
31	3352.19	--	3349.83	3351.79	--	3351.15	--	3350.5	--	3351.37	3351.03	--

Table A-9. Silverwood Lake Reservoir Elevation in Water Year 2014

Water Year 2014	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3351.82	3351.97	3351.35	3351.92	3351.32	3352.5	3349.39	3352.41	3350.06	3350.33	3349.54	3350.41
2	3351.91	3352.5	3350.53	3353.17	3351.33	3352.38	3349.44	3352.24	3349.95	3350.77	3349.86	3350.25
3	3351.2	3353.02	3349.46	3353.05	3351.28	3352.25	3349.57	3352.23	3350	3350.04	3350	3350.21
4	3350.61	3352.8	3348.71	3352.93	3351.2	3352.05	3349.64	3352.32	3350	3349.99	3350.15	3350.25
5	3350	3352.28	3347	3352.78	3351.07	3351.89	3350.2	3352.17	3350.07	3349.97	3350.1	3350.18
6	3350.13	3352.1	3346.97	3352.54	3351.03	3351.66	3350.17	3352.23	3350.11	3349.91	3350.2	3350.19
7	3349.32	3352.27	3346.21	3352.13	3350.94	3351.53	3350.26	3352.15	3350.05	3350.07	3350.2	3350.78
8	3348.49	3352.34	3345.61	3351.69	3351.59	3351.25	3350.72	3352.2	3350.33	3349.91	3350.14	3350.44
9	3348.92	3352.34	3345.17	3351.76	3352.16	3351.12	3350.69	3352.09	3350.09	3349.76	3349.83	3350.3
10	3348.54	3352.73	3344.99	3351.66	3352.08	3350.98	3350.53	3352.24	3349.98	3349.5	3349.77	3350.24
11	3348.09	3352.88	3344.8	3352.03	3352.02	3350.76	3350.42	3352.54	3350.06	3349.48	3349.59	3350.06
12	3349.17	3352.49	3344.53	3351.81	3352	3350.48	3350.26	3352.29	3350	3349.45	3349.73	3350
13	3349.7	3352.41	3344.23	3351.64	3352	3350.23	3350.19	3351.7	3349.94	3349.8	3349.71	3349.93
14	3350.15	3352.57	3343.66	3351.69	3351.97	3350.24	3350.13	3351.25	3349.96	3349.81	3349.58	3350.04
15	3349.92	3352.64	3343.05	3351.43	3351.81	3350.19	3349.86	3350.94	3350.17	3349.95	3349.66	3350.14
16	3350.08	3352.79	3342.24	3351.31	3351.8	3349.93	3349.8	3350.26	3350.24	3349.98	3349.78	3350.1
17	3349.99	3352.93	3341.23	3351.29	3351.63	3349.78	3349.72	3350.04	3350.23	3350.39	3349.7	3350.2
18	3350.08	3352.94	3339.92	3351.56	3351.59	3349.54	3349.66	3350	3350.14	3350.1	3349.65	3350.08
19	3351.04	3353.02	3338.94	3352.23	3351.53	3349.35	3349.67	3349.55	3349.94	3349.95	3349.78	3350.23
20	3351.68	3352.93	3337.94	3351.89	3350.68	3349.3	3349.64	3349.72	3349.84	3350.02	3349.66	3351.06
21	3351.52	3353.02	3337.93	3351.59	3351.45	3349.24	3349.77	3349.64	3349.41	3349.9	3349.65	3351.97
22	3351.37	3352.19	3339.14	3351.4	3351.45	3349.49	3350.05	3350.04	3349.49	3350	3349.79	3351.89
23	3351.22	3351.95	3340.32	3351.29	3352.3	3349.49	3350.23	3350.1	3349.13	3349.8	3349.99	3351.35
24	3351.08	3353.77	3341.5	3351.11	3352.09	3349.5	3350.3	3350.31	3349.45	3349.71	3350.29	3350.84
25	3351.06	3353.99	3343.15	3351.26	3352.25	3349.41	3350.53	3350.44	3349.78	3349.74	3350.37	3350.44
26	3351.37	3353.84	3344.31	3351.28	3352.05	3349.39	3350.89	3350.4	3350.25	3349.84	3350.44	3350.03
27	3351.96	3353.83	3345.42	3351.33	3351.88	3349.3	3351.32	3350.42	3350.56	3350.15	3350.48	3350.01
28	3351.89	3353.8	3346.52	3351.28	3352.33	3349.32	3351.64	3350.39	3350.56	3350.16	3350.59	3350.66
29	3352.11	3353.09	3347.81	3351.3	--	3349.3	3352.02	3350.33	3350.58	3350	3350.74	3350.64
30	3351.8	3352.2	3348.64	3351.24	--	3349.29	3352.23	3350.28	3350.5	3349.69	3350.61	3350.63
31	3351.81	--	3350.08	3351.21	--	3349.29	--	3350.22	--	3349.45	3350.43	--

Table A-10. Silverwood Lake Reservoir Elevation in Water Year 2015

Water Year 2015	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3350.57	3352.48	3350.56	3349.85	3350.96	3349.97	3347.28	3350.59	3351.11	3350.32	3351	3350.35
2	3350.47	3352.43	3350.61	3349.67	3350.8	3350.01	3347.68	3350.72	3351.24	3350.27	3351.3	3350.25
3	3350.96	3352.29	3350.72	3349.74	3350.59	3350.05	3347.54	3350.8	3350.86	3350.03	3351.6	3349.96
4	3350.93	3352.07	3351.08	3349.91	3350.4	3349.67	3347.73	3350.89	3350.9	3350.53	3351.92	3349.75
5	3350.7	3351.81	3351.07	3349.98	3350.54	3349.7	3348.2	3351.04	3350.62	3351.01	3351.5	3350.16
6	3350.7	3351.59	3350.82	3349.98	3350.51	3349.6	3347.94	3351.08	3351.35	3350.94	3351.48	3350.71
7	3350.44	3351.31	3350.5	3350.06	3350.13	3349.54	3348.24	3350.84	3351.93	3350.73	3351.23	3350.73
8	3350.42	3351.21	3350.5	3349.92	3350.08	3349.75	3348.25	3350.77	3351.44	3350.54	3351.79	3350.69
9	3350.43	3351.04	3350.35	3349.68	3350.05	3349.58	3348.09	3350.67	3351.48	3350.04	3352.44	3350.34
10	3350.29	3350.78	3350.24	3349.67	3350	3348.93	3348.02	3350.67	3351.55	3349.85	3352.22	3350.1
11	3350.32	3350.58	3349.78	3350.1	3350.04	3348.61	3348.23	3350.79	3351.3	3350.26	3351.93	3349.55
12	3350.26	3350.4	3350.37	3350.28	3349.85	3348.02	3348.71	3350.65	3351.17	3350.48	3351.61	3349.54
13	3350.1	3350.7	3350.23	3350.39	3349.79	3347.85	3348.39	3351.02	3351.37	3350.17	3351.64	3349.27
14	3350.12	3350.58	3349.72	3350.27	3349.47	3348.16	3348.32	3351.41	3351.13	3350.65	3351.19	3349.26
15	3350.2	3350.49	3349.39	3350.32	3349.4	3348.06	3349.22	3351.66	3350.93	3350.33	3350.68	3349.35
16	3350.35	3350.15	3349.46	3350.46	3349.17	3348	3349.05	3351.93	3350.76	3350.04	3351.14	3349.31
17	3350.36	3350.12	3349.83	3350.58	3349.03	3348.37	3349.94	3352.16	3350.54	3349.79	3350.97	3349.27
18	3350.81	3350	3350	3350.83	3349	3348.09	3350.39	3352.44	3350.27	3350.67	3350.77	3348.99
19	3350.69	3349.99	3349.93	3351.05	3349.07	3347.91	3350.24	3352.6	3350	3351.69	3350.54	3348.85
20	3350.92	3350.11	3349.82	3351.05	3349.12	3347.92	3349.97	3352.69	3350.48	3351.66	3350.34	3348.6
21	3351.13	3350.4	3349.69	3351	3349.23	3347.98	3349.67	3352.88	3350.86	3351.56	3349.97	3348.54
22	3351.18	3350.51	3349.63	3351.04	3349.52	3348.37	3349.52	3352.92	3350.7	3351.8	3350.06	3348.32
23	3351.12	3350.66	3349.61	3350.75	3349.79	3348.28	3348.95	3352.72	3350.8	3351.67	3350.82	3348.11
24	3351.19	3350.91	3349.63	3350.81	3349.87	3348.25	3348.45	3352.87	3350.4	3351.31	3350.71	3348.32
25	3351.15	3351.01	3349.63	3350.9	3349.98	3347.42	3349.45	3352.9	3350.1	3351.6	3350.59	3348.12
26	3351.08	3350.96	3349.62	3351.02	3349.75	3347.62	3350.38	3352.69	3349.81	3351.85	3350.51	3348.15
27	3351.04	3350.94	3349.59	3350.97	3349.79	3347.3	3350.36	3352.26	3350.29	3351.61	3350.3	3348.05
28	3351.16	3350.85	3349.56	3350.85	3349.88	3347.67	3350.42	3351.8	3350.83	3351.49	3350	3347.83
29	3351.5	3350.8	3349.56	3350.81	--	3348.35	3350.48	3351.71	3350.67	3351.17	3350.21	3347.73
30	3352.11	3350.59	3349.35	3350.79	--	3347.96	3350.56	3351.49	3350.57	3350.91	3350.72	3347.59
31	3352.2	--	3349.48	3350.92	--	3347.4	--	3351.31	--	3350.8	3350.59	--

Table A-11. Silverwood Lake Reservoir Elevation in Water Year 2016

Water Year 2016	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3347.42	3337.53	3336.85	3346.05	3345.86	3339.87	3345.78	3346.09	3350.1	3347.99	3352.13	3349.77
2	3347.13	3337.11	3337.01	3346.18	3345.83	3340.28	3346.03	3346.31	3349.61	3347.75	3352.34	3349.67
3	3346.72	3336.76	3336.93	3346.58	3345.66	3340.38	3346.72	3346.86	3350.12	3348.21	3351.95	3349.66
4	3346.4	3336.2	3336.94	3346.7	3345.65	3340.5	3346.49	3346.95	3350.41	3348.77	3351.73	3349.81
5	3345.93	3335.71	3337.19	3346.69	3345.72	3340.95	3346.68	3346.93	3350.95	3349.31	3351.44	3349.33
6	3345.57	3335.76	3337.68	3346.61	3345.75	3341.79	ND	3347.04	3350.36	3349.4	3351.68	3348.73
7	3345.13	3335.85	3338.12	3346.5	3345.85	3342.42	3345.62	3347.25	3349.44	3349.67	3351.73	3348.13
8	3344.67	3335.81	3338.34	3346.75	3345.86	3342.77	3345.25	3347.89	3348.5	3349.03	3351.8	3347.87
9	3344.24	3335.85	3338.95	3347.16	3345.95	3342.43	3345.15	3347.92	3347.47	3349.29	3351.57	3347.81
10	3343.85	3336.28	3339.42	3347.85	3346.03	3342.17	3345.79	3347.35	3346.47	3349.39	3351.63	3348.01
11	3343.91	3336.24	3340.2	3348.04	3345.76	3342.48	3346.05	3347.21	3346.6	3349.67	3351.86	3348.03
12	3343.91	3336.05	3341.16	3347.88	3345.41	3343.56	3346.01	3347.38	3347.06	3349.86	3352.03	3348.25
13	3343.86	3335.93	3342.34	3347.75	3345.23	3345.14	3346.05	3347.62	3347.67	3349.9	3351.06	3348.34
14	3343.94	3336.09	3341.87	3347.61	3344.84	3345.8	3345.92	3347.64	3348.22	3349.82	3351.16	3348.81
15	3343.94	3335.9	3340.5	3347.45	3344.53	3347.03	3345.46	3347.96	3348.85	3350.15	3351.14	3349.35
16	3343.52	3335.82	3339.34	3347.3	3344.06	3346.94	3346.16	3348.29	3349.46	3350.37	3350.51	3350.04
17	3343.14	3336.09	3338.52	3347.24	3343.06	3347.03	3346.5	3348.23	3349.02	3350.7	3350.25	3349.88
18	3342.76	3336.01	3337.56	3347.06	3342.33	3345.79	3346.45	3347.52	3348.56	3350.27	3350	3350.01
19	3342.45	3336.16	3338.55	3346.92	3341.1	3345.67	3345.96	3347.48	3347.93	3348.92	3349.83	3350.2
20	3342.03	3336.64	3339.48	3346.67	3340.06	3345.43	3345.43	3347.6	3347.03	3347.36	3349.82	3350.05
21	3341.58	3336.65	3340.14	3346.51	3339.07	3345.33	3345	3347.75	3346.58	3346.95	3349.68	3350.49
22	3341.21	3336.65	3341.24	3346.33	3338.08	3345.12	3344.36	3348.66	3347.09	3346.82	3349.69	3350.9
23	3340.77	3336.51	3341.85	3346.38	3337.15	3346.6	3344.83	3348.84	3347.73	3347.24	3349.61	3351.12
24	3340.36	3336.43	3342.74	3346.41	3335.71	3346.18	3345.22	3349.14	3348.57	3348.38	3349.57	3351.58
25	3340	3336.48	3343.7	3346.21	3334.15	3346.97	3345.53	3349.22	3349.53	3350.53	3349.49	3351.71
26	3339.63	3336.52	3343.5	3345.99	3332.52	3347.83	3344.64	3349.31	3349.92	3351.4	3349.48	3351.93
27	3339.31	3336.63	3343.87	3345.66	3333.85	3348.65	3344.71	3348.07	3350.22	3351.52	3349.67	3352.19
28	3338.95	3336.52	3343.97	3345.82	3336.19	3348.32	3345.01	3348.52	3348.77	3351.89	3349.43	3352.61
29	3338.66	3336.67	3344.82	3345.55	3338.47	3347.29	3345.23	3348.95	3347.08	3352.18	3349.67	3352.95
30	3338.16	3336.78	3345.32	3345.39	--	3346	3345.64	3349.52	3348.23	3351.88	3349.99	3353
31	3337.85	--	ND	3345.89	--	3345.42	--	3350.16	--	3351.95	3349.91	--

Table A-12. Silverwood Lake Reservoir Elevation in Water Year 2017

Water Year 2017	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3353.2	3345.46	3351	3350.51	3346.71	3350.02	3347.56	3345.01	3348.16	3348.76	3352.29	3349.64
2	3353.24	3346.99	3350.85	3350.59	3346.34	3349.52	3347.49	3345.21	3348.01	3348.69	3352.03	3349.17
3	3353.18	3348.42	3350.97	3350.92	3345.72	3349.25	3347.54	3344.81	3348.49	3348.67	3351.92	3349.3
4	3353.03	3349.05	3350.65	3350.75	3345.96	3348.79	3347.61	3345.59	3349.2	3348.48	3351.94	3349.06
5	3352.29	3349.28	3350.24	3350.68	3346.26	3349.1	3347.21	3346.05	3349.25	3348.44	3352.07	3349.47
6	3351.71	3349.52	3349.7	3350.24	3346.32	3349.38	3347.24	3346.25	3349.39	3348.46	3352.02	3350.32
7	3350.98	3349.51	3349.5	3349.9	3346.35	3349.81	3347.2	3346.78	3348.61	3348.17	3352.07	3350.45
8	3350.02	3349.31	3349.45	3349.79	3346.94	3349.77	3347.15	3347.28	3348.76	3348.24	3351.99	3350.28
9	3349.85	3349.26	3349.36	3349.38	3347.69	3349.7	3347.35	3347.74	3348.8	3348.11	3351.5	3349.84
10	3349.98	3349	3349.39	3349.31	3348.05	3349.91	3347.52	3348.26	3348.92	3348.16	3351.36	3349.51
11	3349.09	3349.06	3349.36	3349.34	3348.5	3350.35	3347.3	3348.34	3348.79	3348.17	3351.15	3349.95
12	3348.35	3348.89	3349.28	3349.43	3348.96	3350.76	3347.38	3348.63	3348.93	3348.36	3351	3350.7
13	3347.4	3348.53	3349.17	3349.13	3349.05	3350.78	3348.3	3349.31	3348.86	3348.2	3351.46	3351.17
14	3346.77	3348.37	3349.56	3348.8	3348.96	3350.43	3348.5	3349.74	3348.85	3348.21	3352.04	3352.29
15	3347.49	3348.41	3349.2	3348.45	3349.31	3349.43	3348.5	3349.53	3348.83	3348.36	3352.15	3353.06
16	3347.84	3348.16	3349.2	3348.27	3349.77	3349.26	3348.54	3349.67	3349.25	3348.54	3351.97	3353.63
17	3348.28	3348.45	3349.53	3348.31	3350.58	3348.52	3348.19	3349.29	3350.3	3348.74	3351.9	3353.08
18	3349.05	3347.98	3349.67	3348.34	3350.65	3348.32	3348.44	3349.15	3350.31	3349.05	3351.89	3352.61
19	3350.14	3348.23	3349.68	3348.32	3350.03	3348.15	3348.93	3349.19	3350.41	3349.21	3351.81	3352.05
20	3351.05	3348.32	3349.88	3348.84	3349.72	3348.04	3348.99	3349.28	3350.22	3349.5	3351.45	3351.48
21	3352	3348.51	3351.79	3349.09	3349.25	3347.7	3348.93	3349.65	3350.03	3349.75	3351.4	3351.22
22	3351.05	3348.51	3352.2	3349.79	3349.08	3347.49	3348.86	3349.99	3350.09	3350.14	3351.43	3350.95
23	3349.25	3349.51	3351.93	3349.76	3349.41	3347.51	3348.77	3350.29	3350.14	3350.57	3351.45	3349.79
24	3347.33	3349.84	3352.15	3349.6	3349.46	3347.48	3347.97	3350.31	3349.89	3351	3351.49	3349.3
25	3345.05	3350.31	3352	3349.05	3349.51	3347.35	3347.04	3350.59	3349.7	3351.11	3351.15	3349.13
26	3342.81	3350.64	3352.1	3348.96	3349.39	3347.25	3346.17	3351.07	3349.42	3351.33	3350.93	3349.27
27	3340.43	3351.27	3351.79	3348.85	3349.36	3347.8	3345.2	3351.12	3349.52	3351.69	3351.26	3349.36
28	3338.23	3352.08	3351.07	3348.54	3349.64	3348	3345.09	3351.02	3349.4	3351.96	3351.46	3348.21
29	3339.55	3351.51	3350.87	ND	--	3347.93	3345.15	3350.2	3349.27	3351.99	3351	3348.17
30	3341.71	3351.19	3350.86	3347.92	--	3347.9	3345.17	3349.51	3349.17	3352.07	3349.98	3348.43
31	3343.85	--	ND	3347.18	--	3347.6	--	3348.69	--	3352.26	3349.84	--

Table A-13. Silverwood Lake Reservoir Elevation in Water Year 2018

Water Year 2018	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3348.26	3347.22	3347.35	3347.15	3347.2	3351.68	3346.15	3348.11	3349.15	3349.55	3350.9	3351.15
2	3348.28	3347.07	3347.47	3347.2	3347.05	3351.89	3346.56	3348.32	3349.04	3350.35	3351	3351.41
3	3348.43	3346.5	3347.64	3346.53	3347.27	3352.01	3348.18	3348.4	3349.64	3350.4	3350.97	3351.69
4	3348.24	3346.13	3347.6	3346.69	3347.53	3352.02	3349.65	3348.8	3349.27	3350.25	3351.38	3351.68
5	3347.82	3345.94	3347.58	3346.79	3347.11	3352.02	3349.88	3349.36	3349.63	3349.89	3352.35	3351.51
6	3347.49	3345.85	3347.81	3346.76	3346.29	3351.84	3349.3	3349.96	3349.66	3349.3	3351.94	3351.27
7	3348.05	3345.99	3347.78	3347	3346.66	3351.3	3349.16	3350.04	3349.59	3348.88	3351.59	3351.13
8	3348.58	3346.19	3347.99	3347.97	3346.68	3351.45	3348.87	3349.7	3349.98	3349.08	3351.39	3351.14
9	3348.48	3346.23	3348.12	3347.96	3347.09	3351.21	3349.32	3349.44	3350.78	3348.76	3350.89	3351.3
10	3348.9	3345.94	3348.22	3347.47	3347.24	3350.9	3348.46	3349.16	3351.83	3348.08	3350.45	3351
11	3348.89	3345.89	3347.84	3347.4	3347.47	3350.88	3347.86	3348.99	3351.5	3347.88	3350.92	3350.91
12	3348.68	3345.75	3347.8	3347.18	3347.7	3351.04	3347.66	3349.27	3350.52	3347.82	3351.4	3350.69
13	3349.11	3345.84	3347.68	3347	3348.4	3351.02	3347.62	3349.84	3350.09	3347.63	3351.58	3350.5
14	3349.66	3345.88	3347.51	3346.85	3349.01	3351.38	3347.52	3349.44	3349.8	3347.2	3351.41	3350.42
15	3349.83	3345.46	3347.36	3346.63	3349.28	3352.32	3347.75	3349.19	3348.85	3347.53	3351.15	3350.57
16	3349.68	3345.34	3347.06	3346.49	3349.8	3352.79	3347.67	3349	3348.55	3348.06	3351	3351.15
17	3349.75	3345.22	3347.02	3346.44	3350	3352.89	3347.5	3348.59	3348.78	3348.72	3350.86	3351.21
18	3349.57	3345.26	3346.78	3346.34	3350.25	3352.87	3347.7	ND	3348.67	3348.98	3350.87	3351.04
19	3349.57	3345.19	3346.9	3346.83	3350.21	3352.13	3347.73	3349.32	3348.79	3349.24	3350.92	3350.83
20	3349.72	3345.25	3346.8	3347.33	3350.17	3350.96	3347.98	3349.98	3349.06	3349.09	3350.74	3350.94
21	3349.95	3345.19	3347.04	3347.84	3349.95	3349.93	3348.09	3350	3348.78	3349.58	3350.66	3351.07
22	3350.1	3345.22	3346.96	3347.93	3349.91	3348.98	3348.14	3349.74	3348.15	3350.68	3350.74	3351.51
23	3349.87	3345.4	3347.05	3347.98	3349.9	3347.88	3348.44	3349.77	3347.97	3350.78	3350.13	3352.05
24	3349.58	3345.5	3347.21	3346.64	3350.37	3347.57	3348.55	3349.83	3348.56	3350.61	3349.87	3351.93
25	3349.58	3345.46	3347.2	3346.45	3350.78	3347.63	3348.44	3349.96	3348.63	3350.06	3350.32	3350.77
26	3349.46	3345.74	3347.19	3346.66	3351.1	3347.5	3348.34	3349.93	3348.97	3349.49	3350.97	3350.58
27	3349.39	3346.02	3347.05	3346.82	3350.97	3347.14	3348.17	3350.12	3348.76	3349.37	3350.82	3350.82
28	3349.24	3346.52	3346.96	3346.83	3351.01	3347.07	3348.03	3350.08	3348.43	3350.46	3350.65	3350.98
29	3348.43	3347.01	3346.89	3346.46	--	3346.76	3348.29	3349.79	3349.07	3351.24	3350	3351.75
30	3347.46	3347.02	3346.76	3346.65	--	3346.5	3347.99	3349.63	3348.91	3351.03	3350.52	3352.3
31	3347.08	--	ND	3347.03	--	3346.18	--	3349.38	--	3350.95	3350.87	--

Table A-14. Silverwood Lake Reservoir Elevation in Water Year 2019

Water Year 2019	Month											
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3352.59	3351.26	3348.08	3350.59	3345.6	3341.53	3346.34	3345.66	3350.77	3351.16	3347.97	3351.9
2	3350.6	3351.43	3348.24	3350.03	3347.31	3341.74	3346.43	3345.94	3350.74	3351.44	3348.65	3352.05
3	3351.05	3351.67	3348.05	3349.92	3349.62	3342.08	3346.38	3346.36	3351.21	3351.4	3349.17	3352.03
4	3351.09	3352.33	3347.96	3350.06	3350.94	3342.07	ND	3347.04	3351.66	3351.37	3349.35	3352.17
5	3351.67	3350.56	3348	3350.3	3350.8	3342.46	ND	3347.52	3351.66	3351.45	3349.87	3352.3
6	3351.57	3348.22	3348.09	3350.95	3350.38	3343.4	ND	3348.02	3351.86	3351.68	3350.17	3352.23
7	3351.58	3345.86	3347.96	3351.2	3350.22	3343.81	ND	3348.39	3352	3351.66	3350.34	3352.48
8	3351.54	3343.74	3348.04	3351.02	3349.99	3344.44	ND	3348.93	3351.82	3351.59	3350.46	3352.58
9	3351.6	3342.02	3347.92	3350.79	3350.14	3345.11	ND	3349.41	3351.31	3351	3350.62	3352.65
10	3351.25	3342.47	3347.92	3350.63	3350.02	3345.57	ND	3349.99	3351.54	3350.9	3351.01	3352.24
11	3351.32	3342.99	3348.19	3350.65	3350.22	3345.75	ND	3350.72	3351.61	3350.96	3351	3351.77
12	3351.3	3343.67	3348.47	3350.89	3349.73	3346.66	ND	3351.59	3351.94	3350.89	3351.27	3351.76
13	3351.17	3344.52	3348.27	3350.77	3349.24	3344.71	ND	3351.91	3351.96	3350.96	3351.45	3351.97
14	3351.12	3345.53	3348.08	3350.35	3350.92	3345.09	ND	3351.95	3351.84	3350.85	3351.53	3351.93
15	3351.41	3344.63	3348.25	3349.87	3350.46	3342.76	3342.61	3351.86	3351.68	3350.98	3351.68	3351.9
16	3351.72	3344.85	3348.74	3350	3349.64	3343.65	3342.61	3351.82	3351.5	3350.9	3351.92	3351.99
17	3352.21	3345.23	3348.29	3350.86	3348.6	3343.77	3342.92	3351.69	3351.28	3350.87	3352.03	3351.88
18	3352.68	3345.75	3348.19	3350.77	3348.5	3343.68	3342.8	3351.49	3351.43	3350.7	3352.07	3351.5
19	3352.51	3345.9	3348.36	3350.53	3348.57	3344.96	3343.09	3351.65	3351.3	3350.01	3351.82	3351.71
20	3352.36	3346.24	3348.53	3350.03	3348	3347.31	3343.04	3351.72	3350.95	3350.04	3351.53	3351.61
21	3352.38	3346.51	3348.58	3349.59	3348.11	3347.98	3343.38	3351.7	3351	3349.96	3351.4	3351.55
22	3350.93	3346.73	3348.71	3349.16	3348.47	3348.55	3343.39	3351.57	3350.16	3349.99	3351.15	3351.61
23	3351.04	3346.79	3349.44	3348.74	3349.78	3350.04	3343.62	3351.55	3350.81	3349.98	3350.79	3351.77
24	3350.85	3346.99	3349.26	3348.39	3348.67	3350.74	3343.87	3352.06	3350.85	3348	3351.1	3351.67
25	3350.76	3347.44	3349.68	3347.9	3347.5	3351.1	3343.8	3352.26	3350.41	3345.66	3351.22	3351.7
26	3350.41	3347.8	3349.66	3347.56	3345.65	3350.79	3344.26	3352.07	3350.95	3345.24	3351.51	3351.94
27	3350.94	3347.62	3349.46	3347.21	3344.88	3348.81	3344.71	3352.11	3350.89	3345.15	3351.65	3351.64
28	3351.21	3347.81	3349.84	3346.89	3343.33	3347.93	3344.63	3351.88	3350.71	3345.64	3351.43	3351.93
29	3351.19	3348.04	3350	3346.56	--	3347.55	3344.78	3352.09	3350.71	3346.48	3351.5	3352.03
30	3350.99	3348.23	3350.18	3346.19	--	3347.2	3345.16	3351.84	3350.75	3346.73	3351.69	3352.55
31	3351.21	--	ND	3345.86	--	3346.57	--	3351.07	--	3347.45	3351.64	--

Appendix 2

VegCAMP Alliances Maps

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Sub-Reach 1

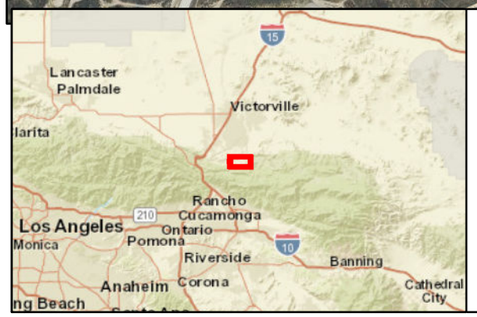
Sub-Reach 2

Sub-Reach 3

Sub-Reach 4

Sub-Reach 5

Sub-Reach 6



LEGEND

Sub-Reach Break

NWI Classification

Freshwater Emergent Wetland

Freshwater Pond

Riverine

N

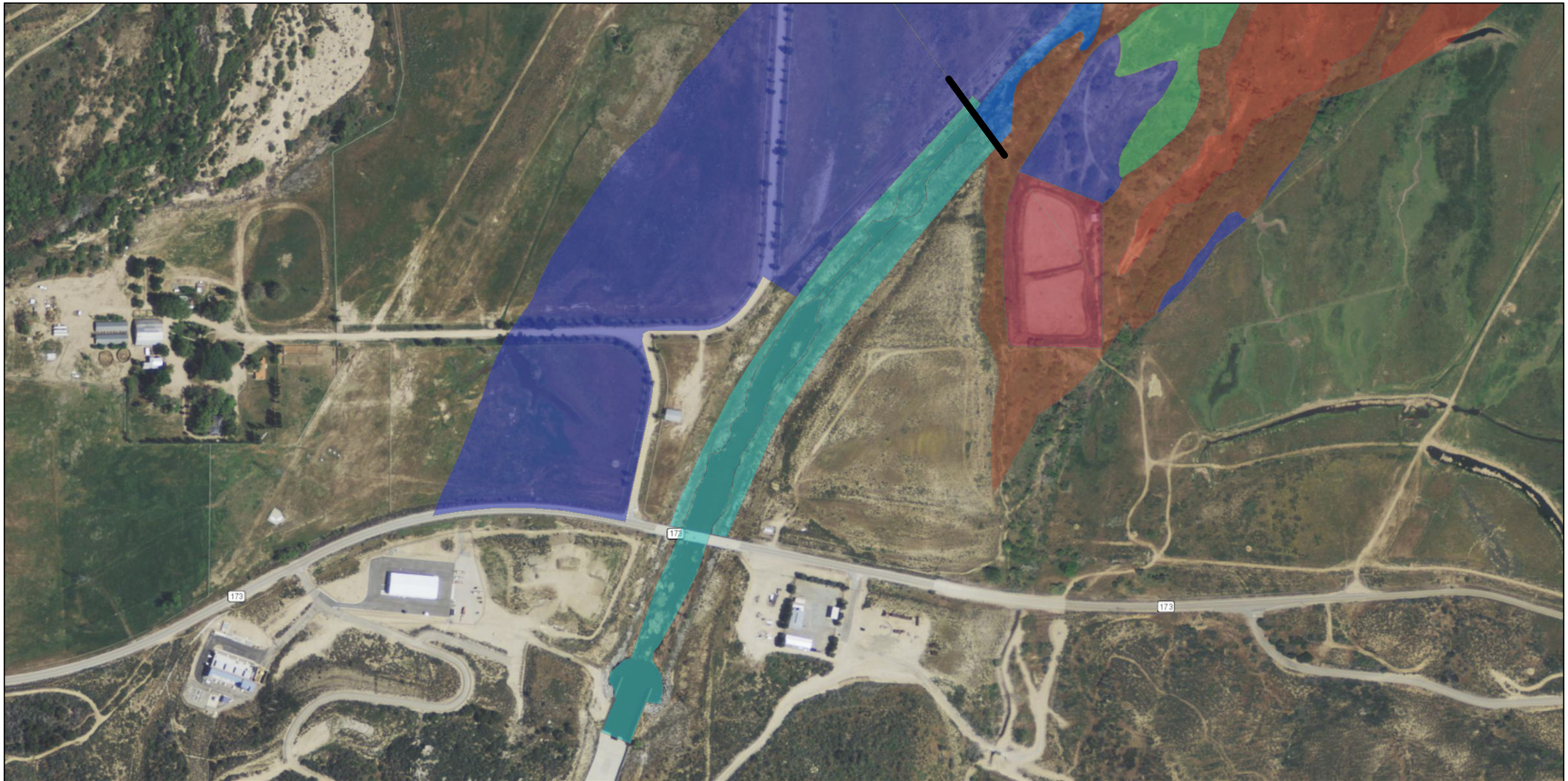
0 2,000 4,000 Feet

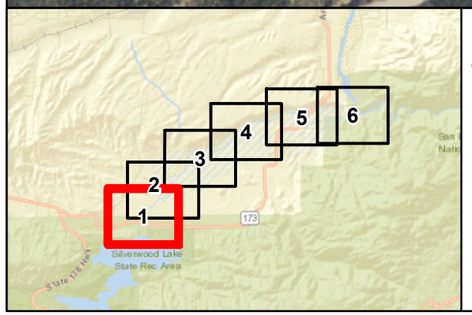
Prepared: 06/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USFW (2019); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_NWI.mxd

DEVIL CANYON PROJECT RELICENSING

WEST FORK MOJAVE RIVER

NATIONAL WETLAND INVENTORY CLASSIFICATIONS





LEGEND

- Sub-Reach Break

VegCAMP Alliances

- California annual and perennial grassland Mapping Unit (181.15 acres)
- Juncus arcticus (50.66 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Salix exigua (7.85 acres)
- Schoenoplectus (12.00 acres)
- Water Impoundment Feature (5.35 acres)

N

0 500 1,000 Feet

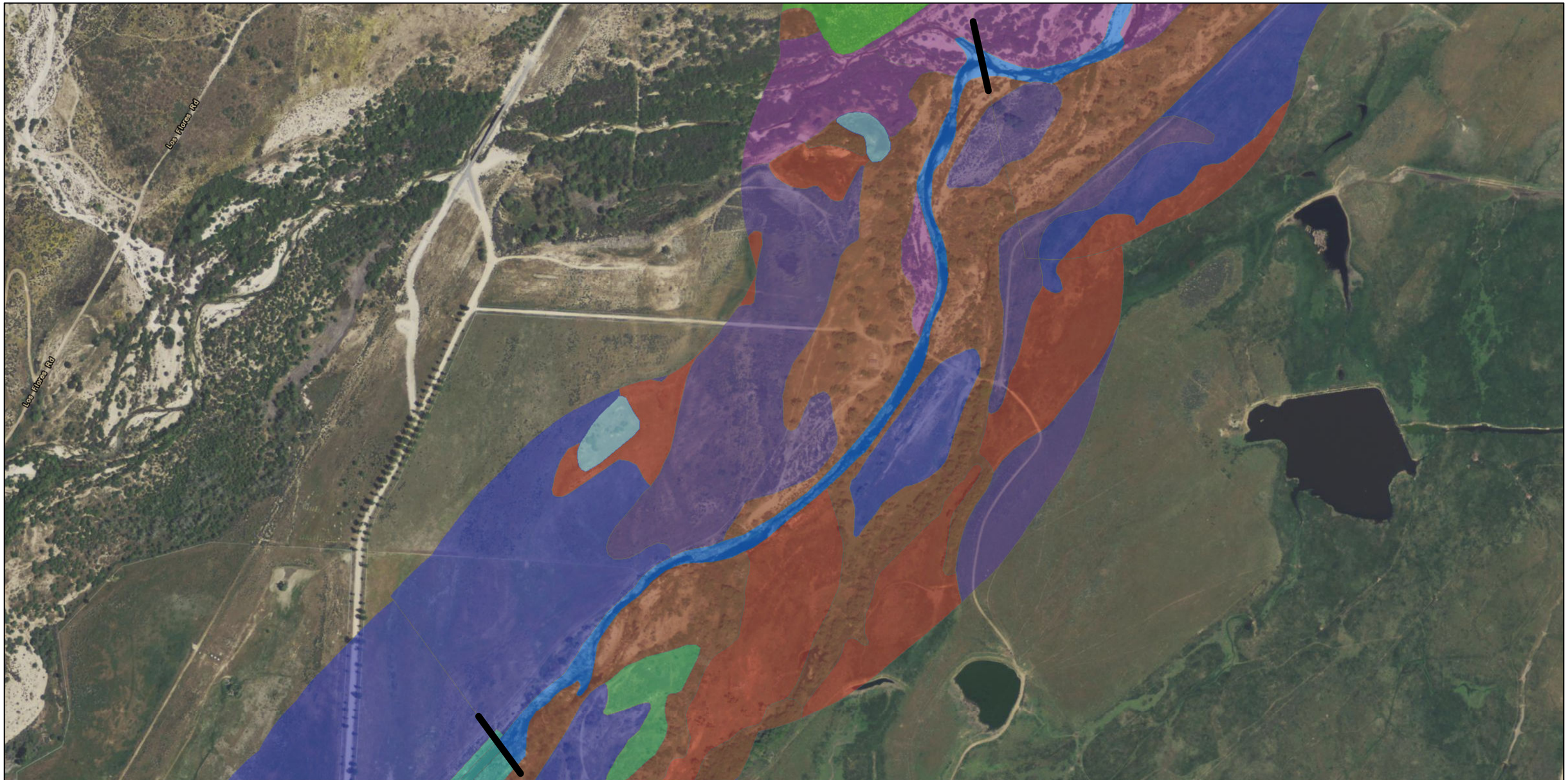
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

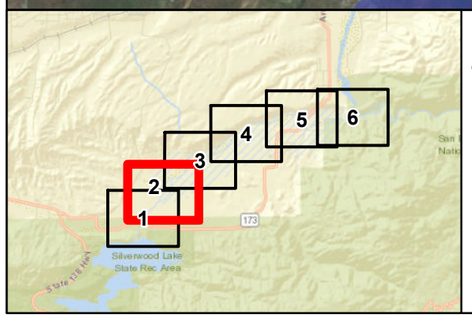
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 1





LEGEND

Sub-Reach Break

VegCAMP Alliances

- California annual and perennial grassland Mapping Unit (181.15 acres)
- Ericameria nauseosa (146.98 acres)
- Juncus arcticus (50.66 acres)
- Juniperus californica (281.49 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Salix exigua (7.85 acres)
- Salix laevigata (35.08 acres)
- Schoenoplectus (12.00 acres)
- Water (2.34 acres)

N

0 500 1,000 Feet

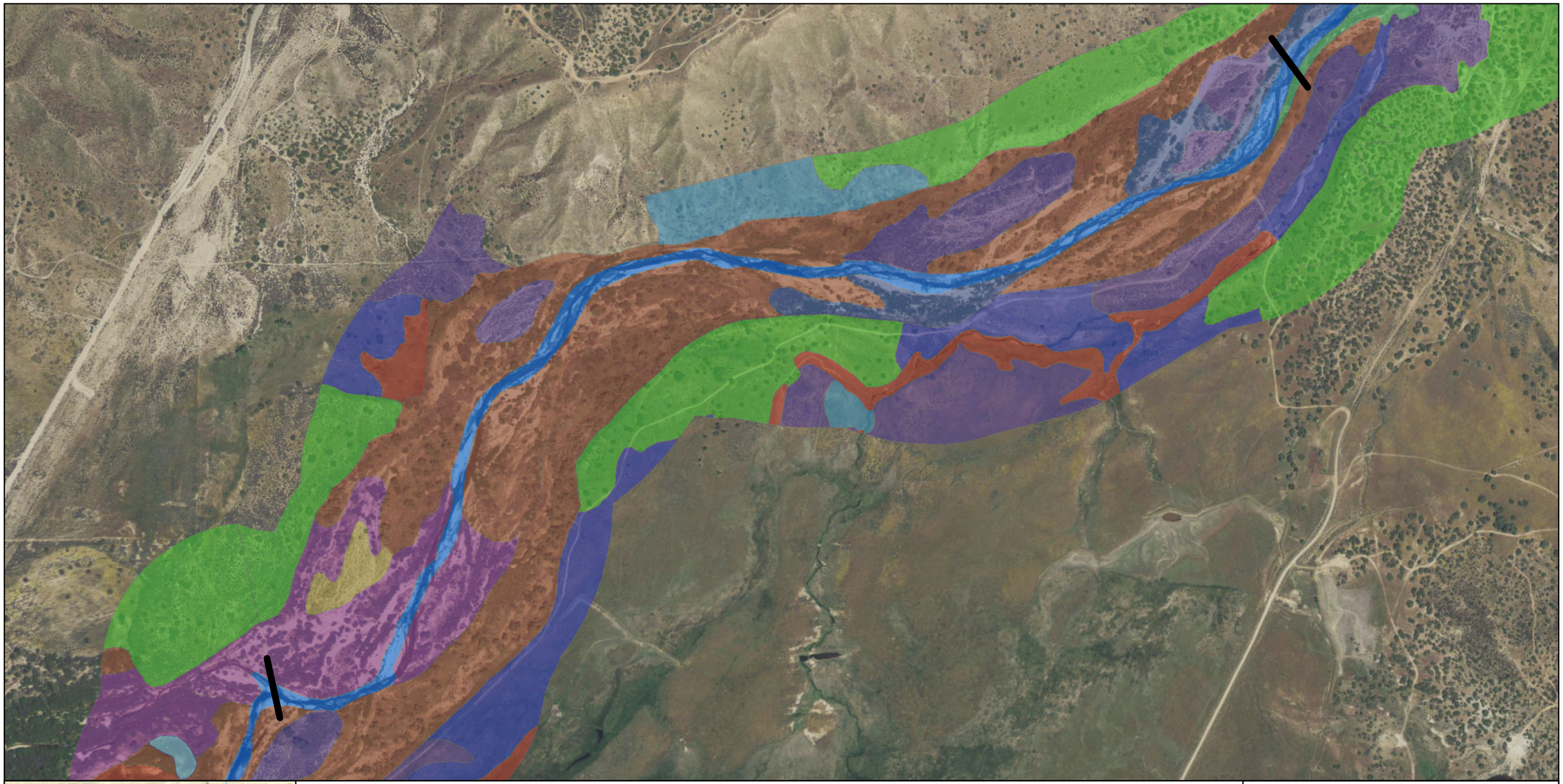
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 2



LEGEND

Sub-Reach Break

VegCAMP Alliances

- California annual and perennial grassland Mapping Unit (181.15 acres)
- Ericameria nauseosa (146.98 acres)
- Eriogonum fasciculatum (52.35 acres)
- Juncus arcticus (50.66 acres)
- Juniperus californica (281.49 acres)
- Lepidospartum squamatum (2.86 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Salix exigua (7.85 acres)
- Salix laevigata (35.08 acres)
- Salix lasiolepis (12.01 acres)
- Water (2.34 acres)

N

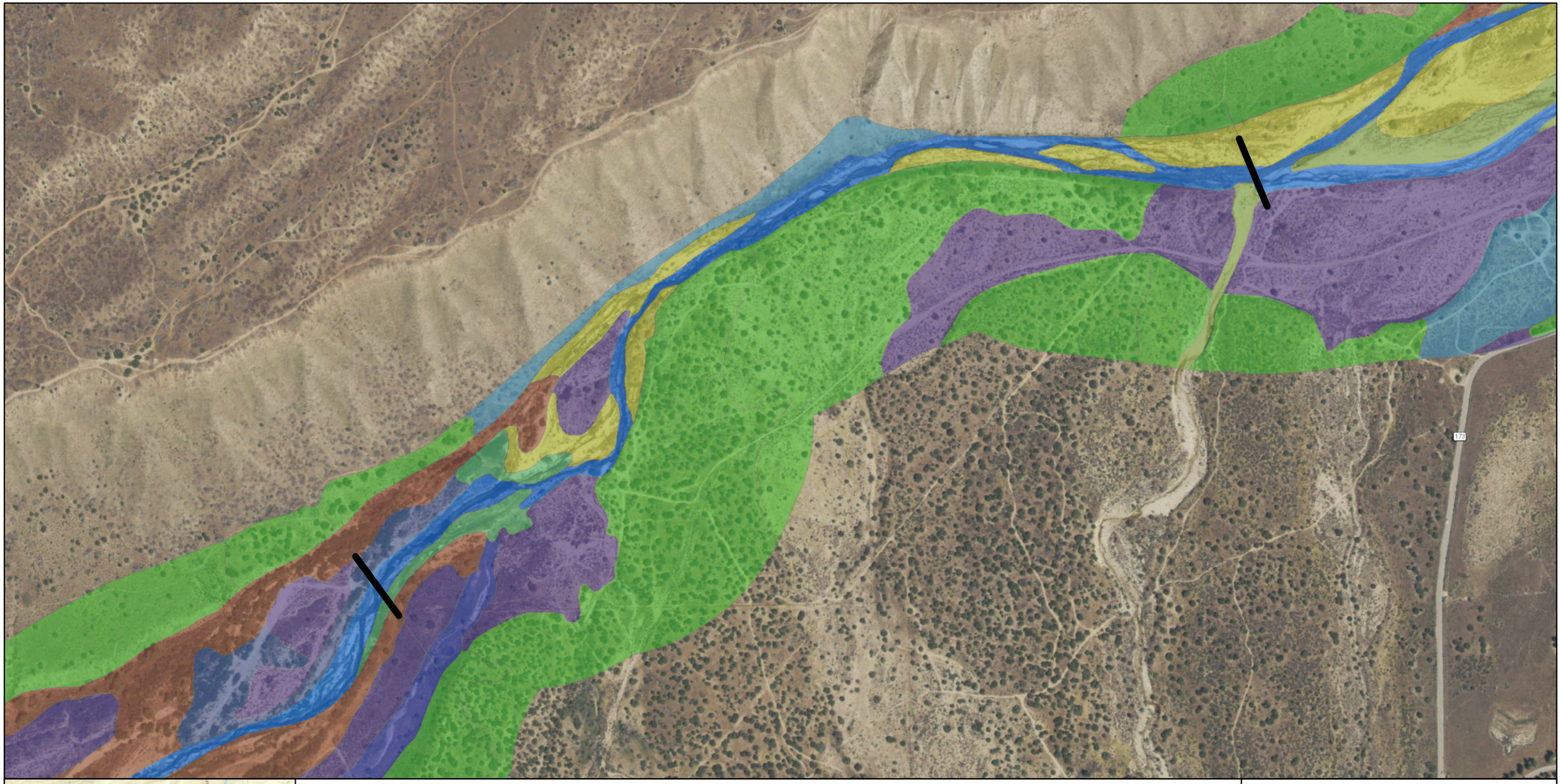
0 500 1,000 Feet

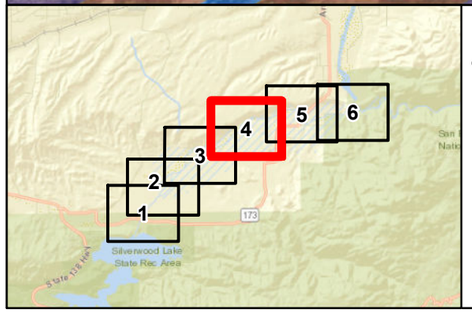
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

DEVIL CANYON PROJECT RELICENSING

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 3





LEGEND

Sub-Reach Break

VegCAMP Alliances

- Baccharis salicifolia (23.49 acres)
- California annual and perennial grassland Mapping Unit (181.15 acres)
- Ericameria nauseosa (146.98 acres)
- Eriogonum fasciculatum (52.35 acres)
- Juniperus californica (281.49 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Salix exigua (7.85 acres)
- Salix lasiolepis (12.01 acres)
- Unvegetated wash and river bottom (40.82 acres)

N

0 500 1,000 Feet

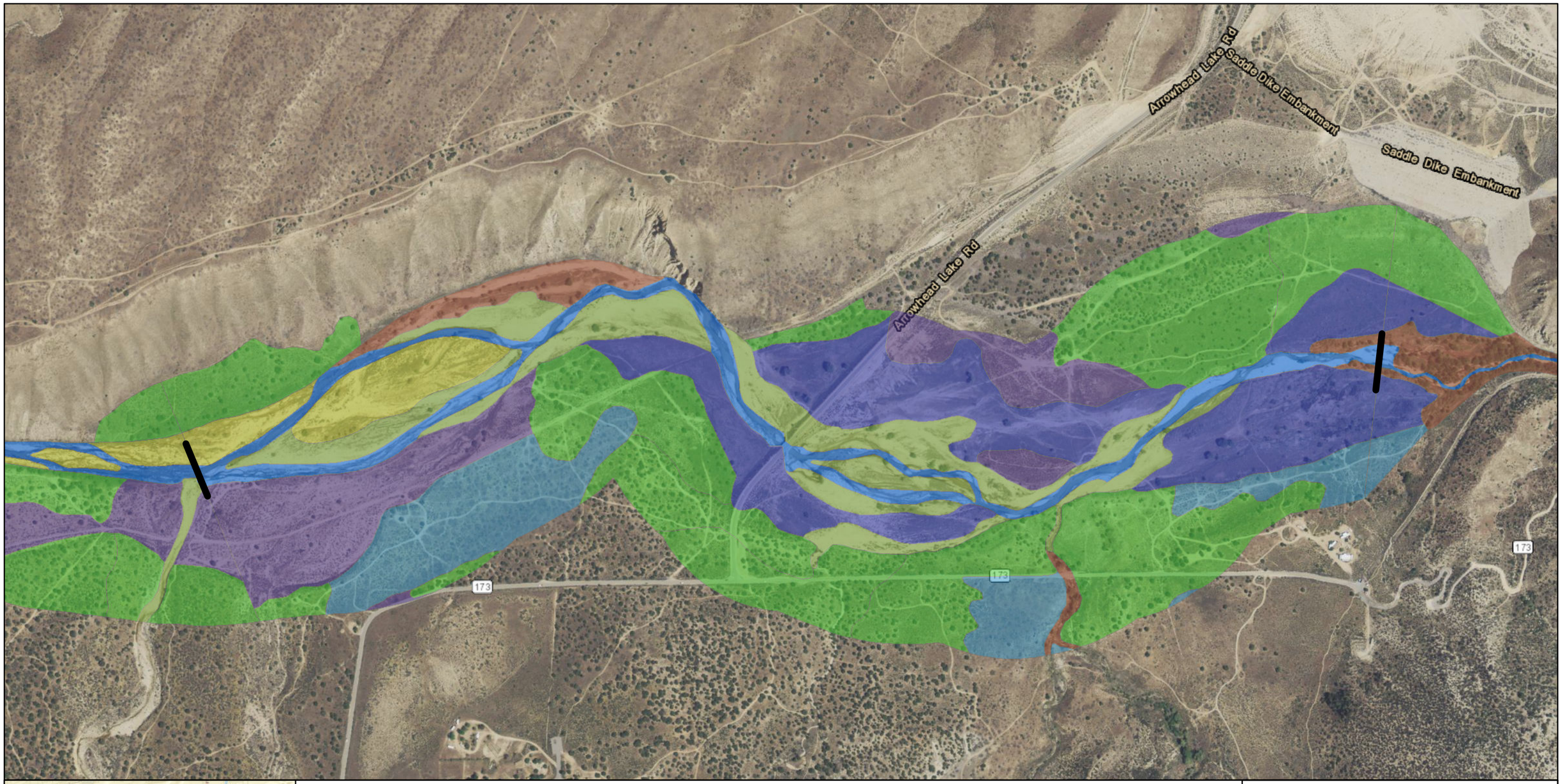
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

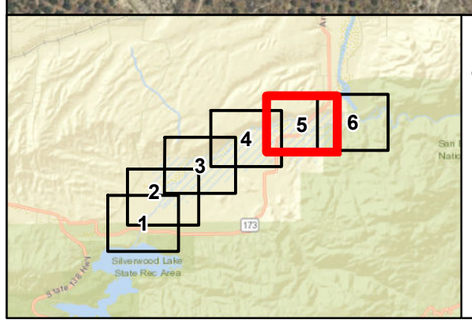
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 4





LEGEND

Sub-Reach Break

VegCAMP Alliances

- Baccharis salicifolia (23.49 acres)
- California annual and perennial grassland Mapping Unit (181.15 acres)
- Ericameria nauseosa (146.98 acres)
- Eriogonum fasciculatum (52.35 acres)
- Juniperus californica (281.49 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Unvegetated wash and river bottom (40.82 acres)

N

0 500 1,000 Feet

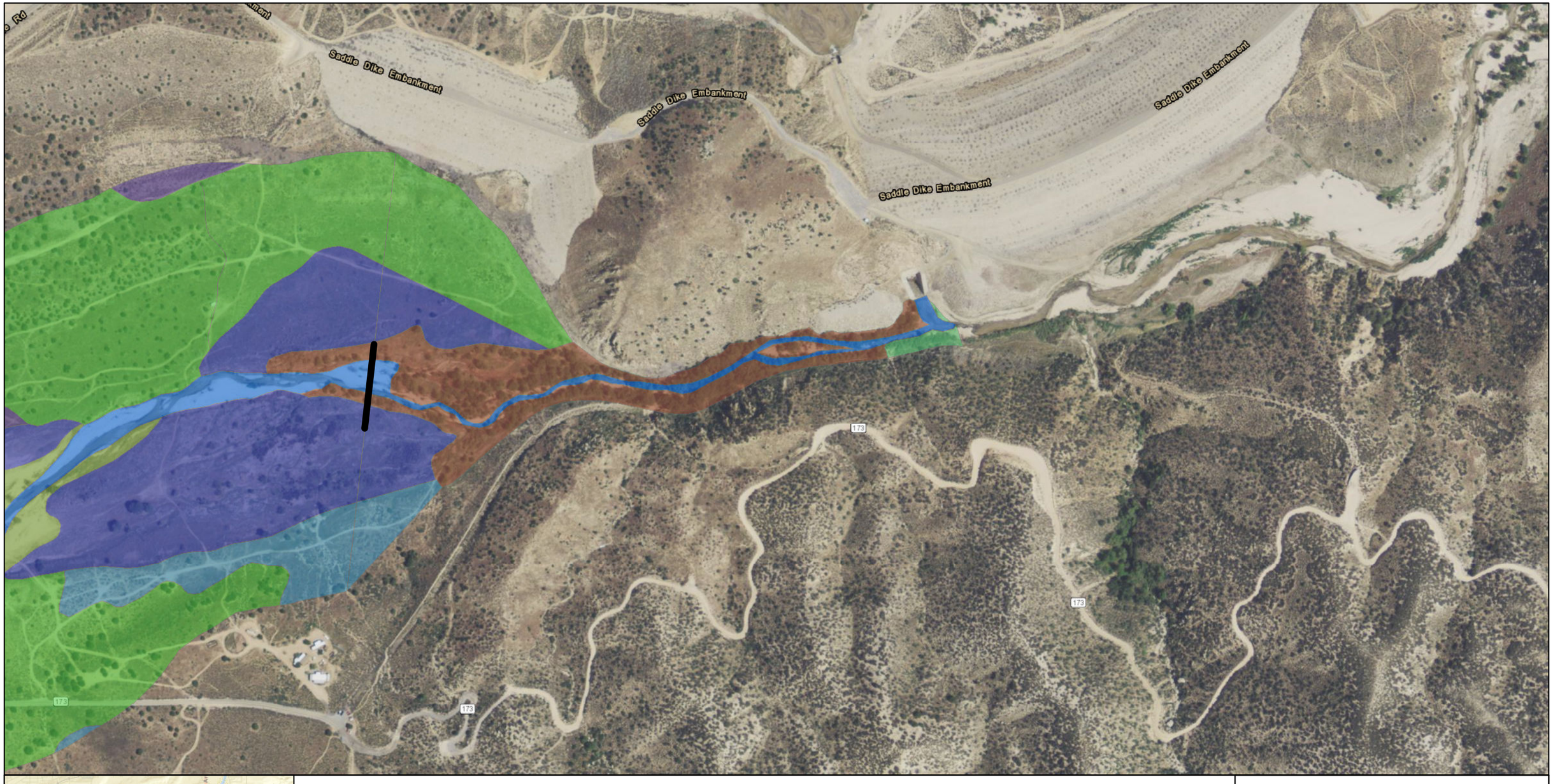
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

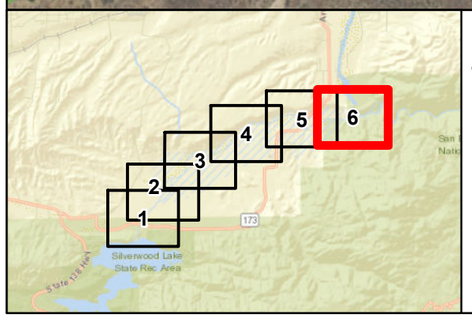
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 5





LEGEND

Sub-Reach Break

VegCAMP Alliances

- California annual and perennial grassland Mapping Unit (181.15 acres)
- Ericameria nauseosa (146.98 acres)
- Eriogonum fasciculatum (52.35 acres)
- Juniperus californica (281.49 acres)
- Perennial Stream Channel (58.29 acres)
- Populus fremontii (182.95 acres)
- Salix exigua (7.85 acres)
- Unvegetated wash and river bottom (40.82 acres)

N

0 500 1,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_VegCamp_Habitats.mxd

DEVIL CANYON PROJECT RELICENSING

WEST FORK MOJAVE RIVER VEGCAMP ALLIANCES

SUB-REACH 6

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Appendix 3

Potential Habitat for ESA-listed and Special-status Species Maps

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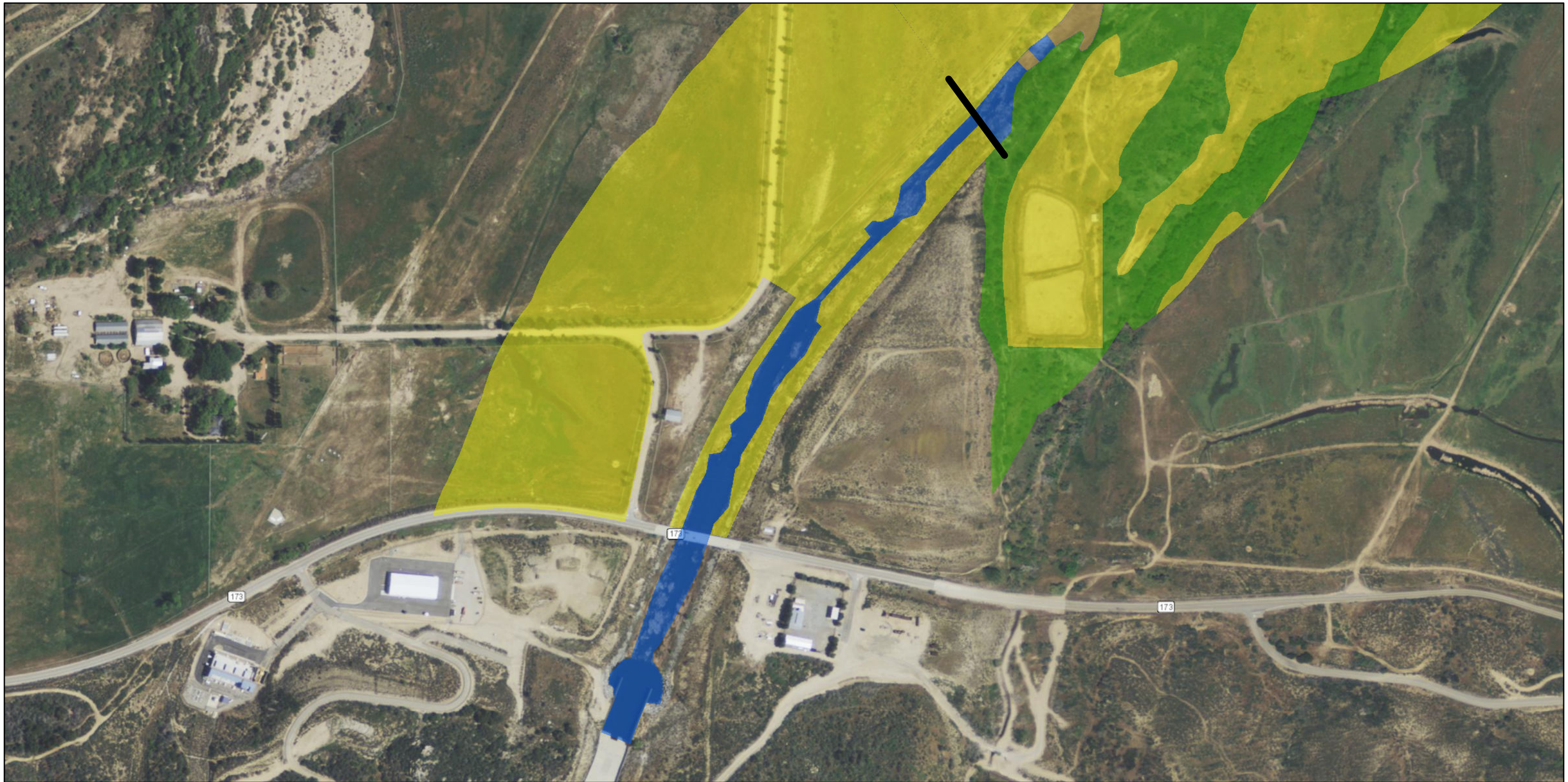
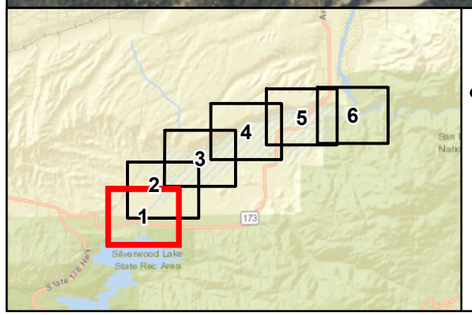




LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

0 500 1,000 Feet

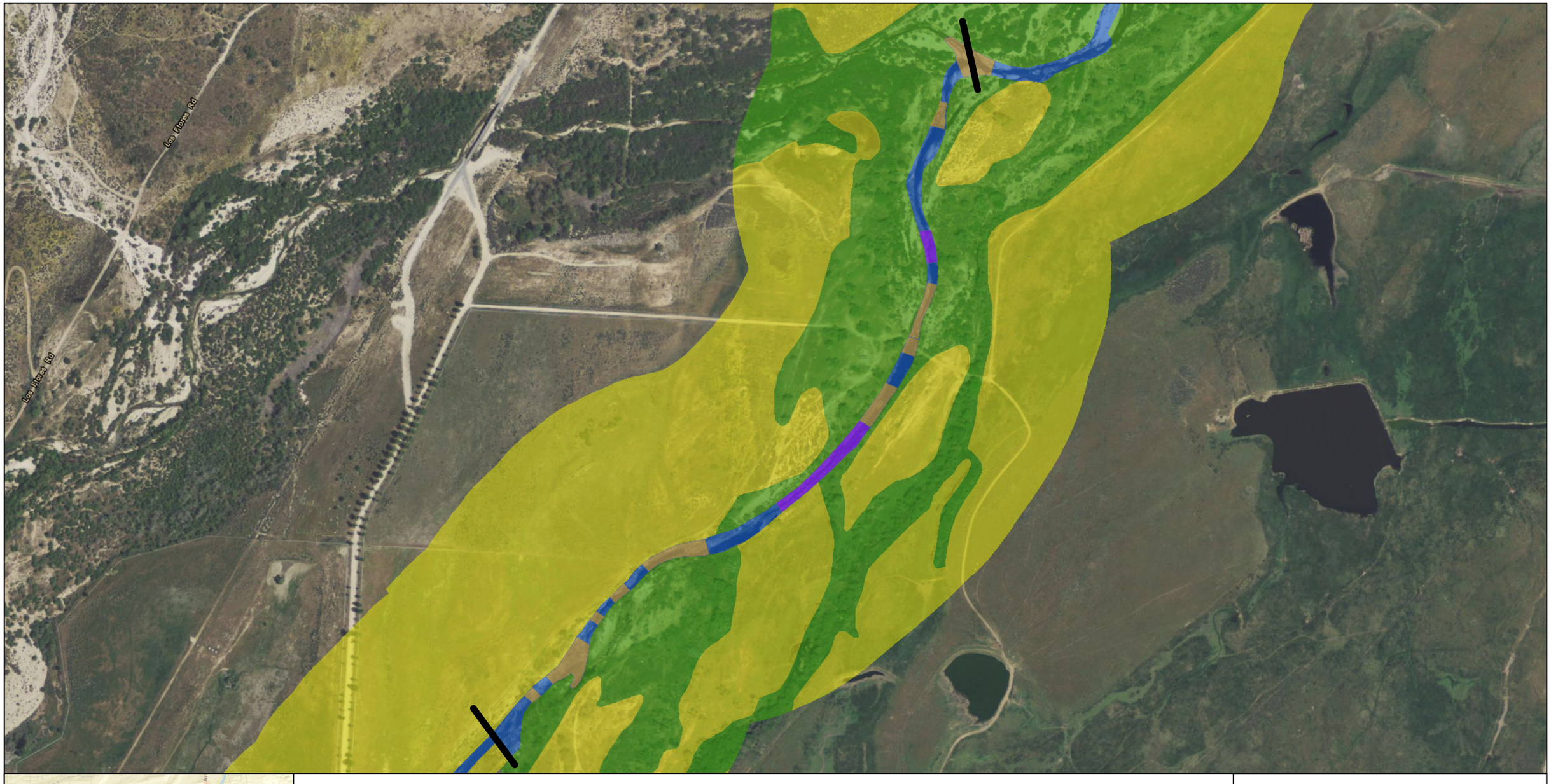
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_PotentialHabitats.mxd

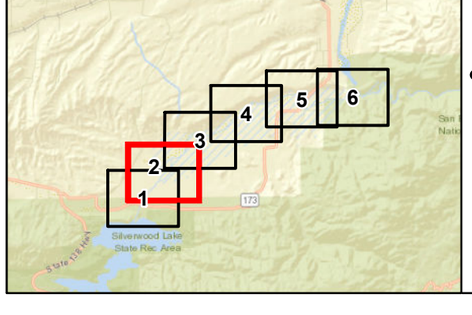
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 1





LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

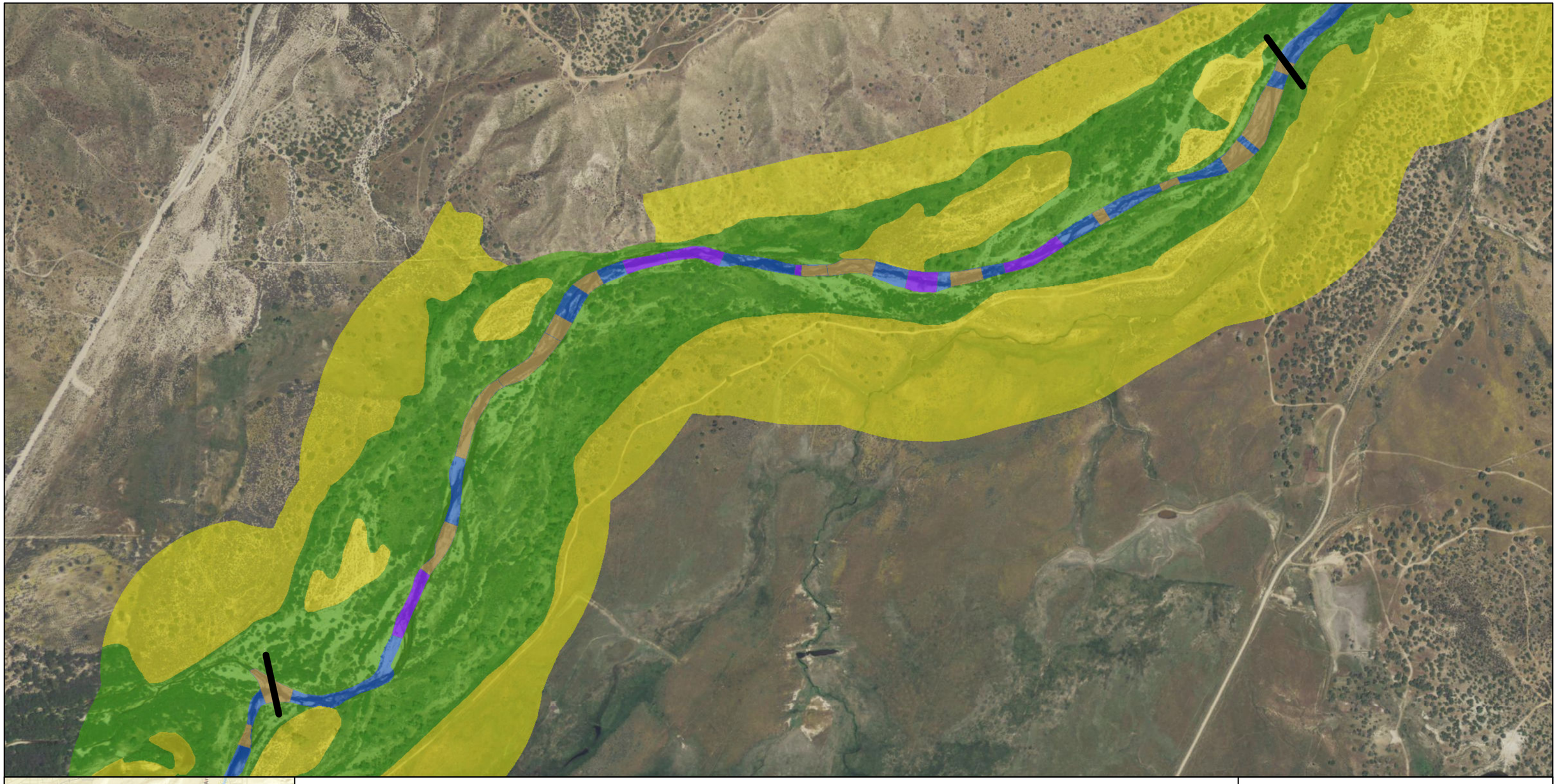
0 500 1,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_PotentialHabitats.mxd

DEVIL CANYON PROJECT RELICENSING

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 2



LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

0 500 1,000 Feet

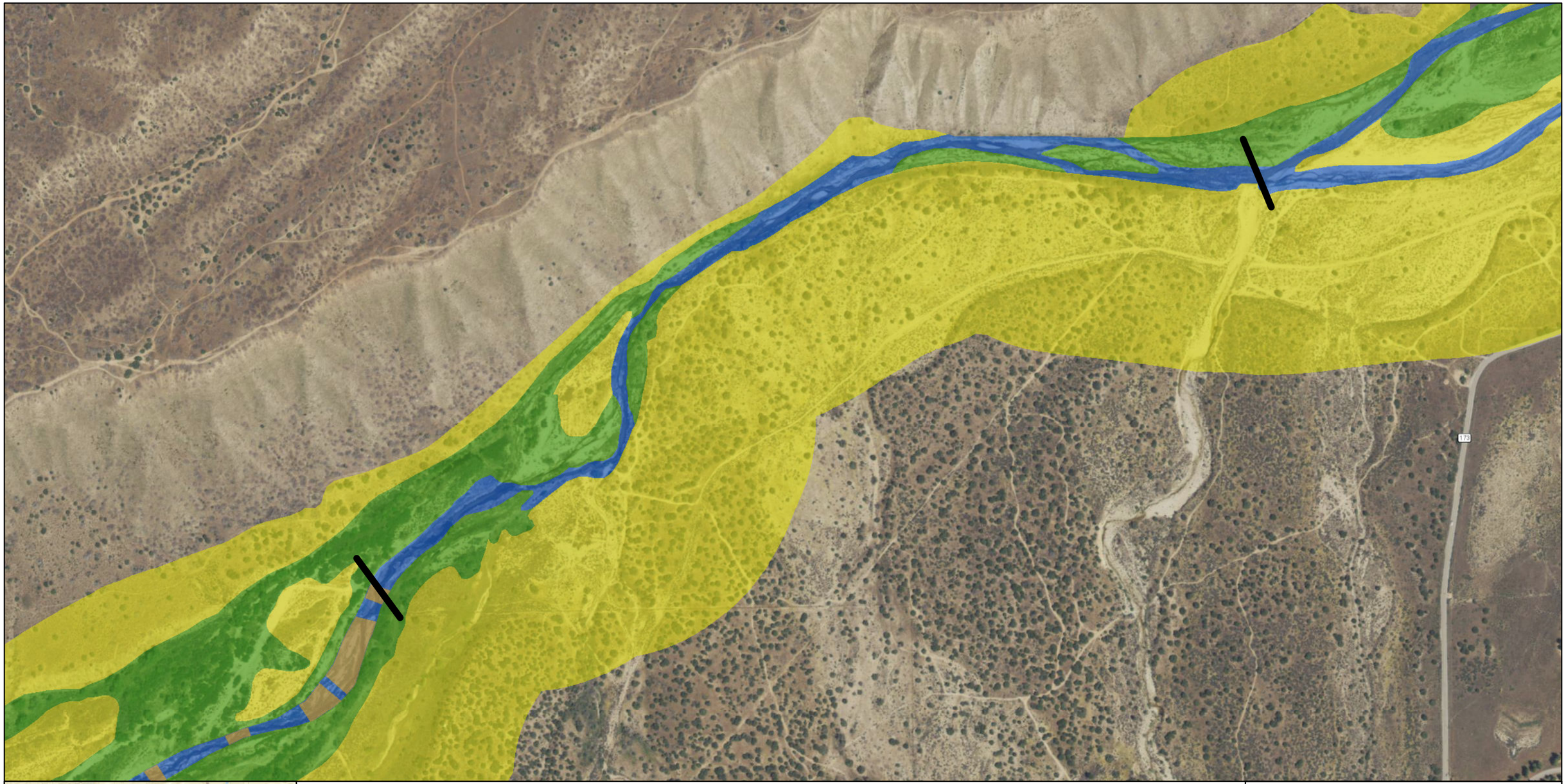
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_PotentialHabitats.mxd

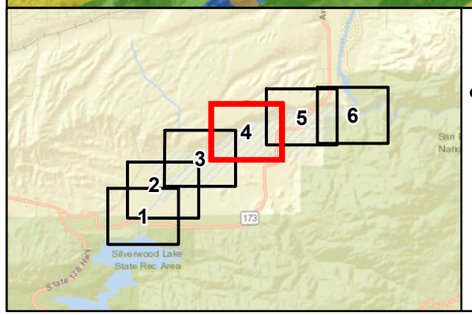
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 3





LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

0 500 1,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
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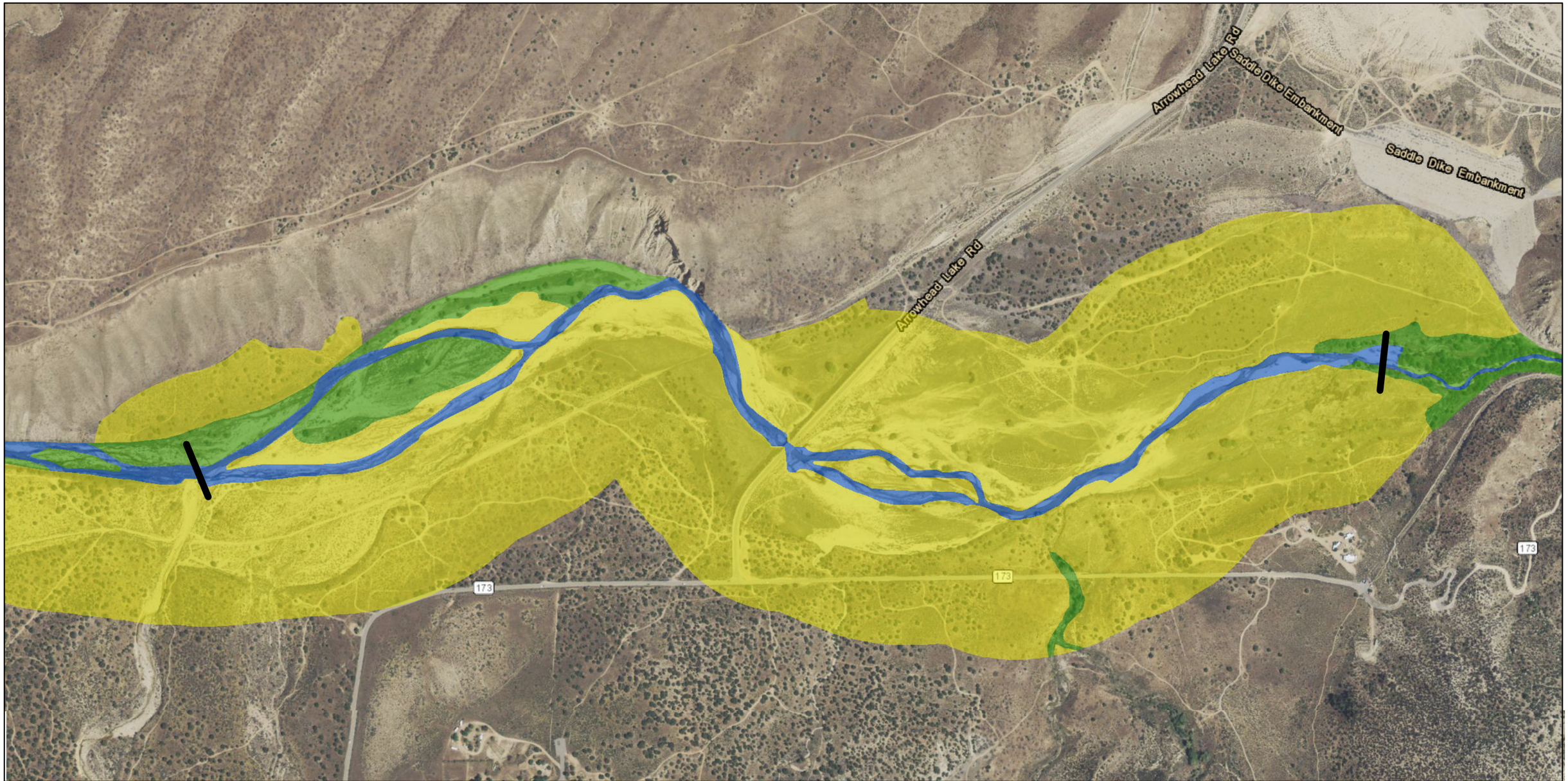
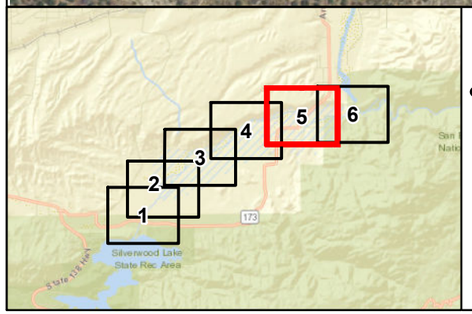
DEVIL CANYON PROJECT RELICENSING

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 4





LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

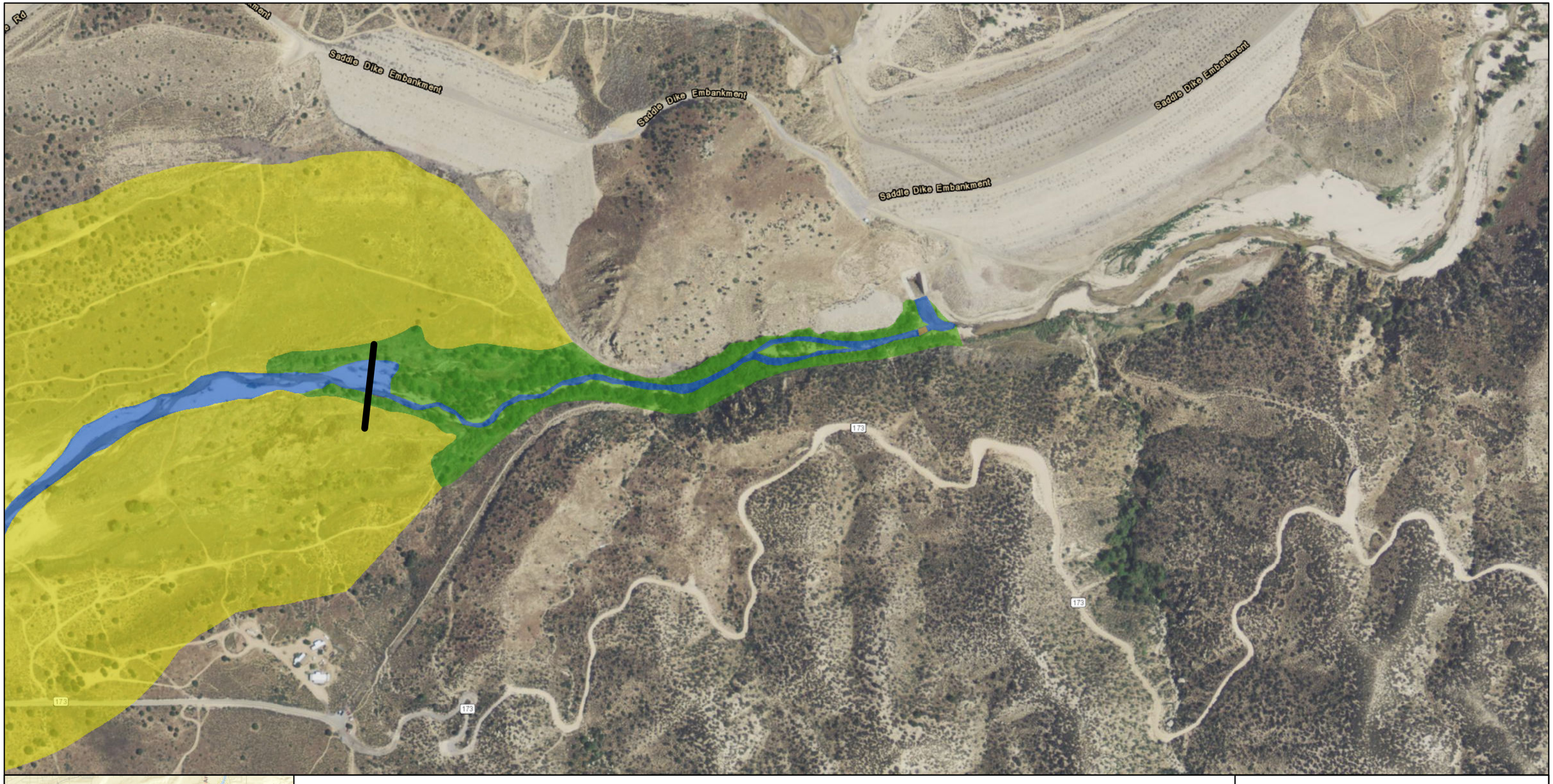
0 500 1,000 Feet

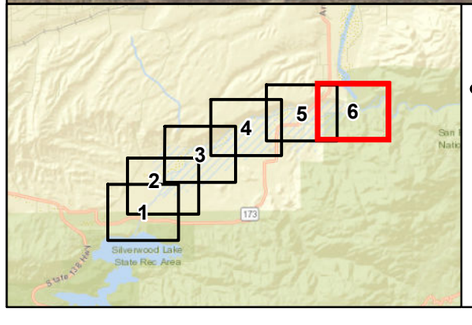
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_PotentialHabitats.mxd

DEVIL CANYON PROJECT RELICENSING

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 5





LEGEND

Sub-Reach Break

Potential Breeding Pools

Arroyo Toad (4.05 acres)

California Red-Legged Frog (9.22 acres)

Potential Habitat Type

Aquatic (64.13 acres)

Riparian (261.38 acres)

Usable Upland (770.16 acres)

N

0 500 1,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Dara Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_PotentialHabitats.mxd

DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

ESA-LISTED SPECIES POTENTIALLY SUITABLE HABITATS

SUB-REACH 6

Appendix 4

Potential Habitat for Aquatic Invasive Species Maps

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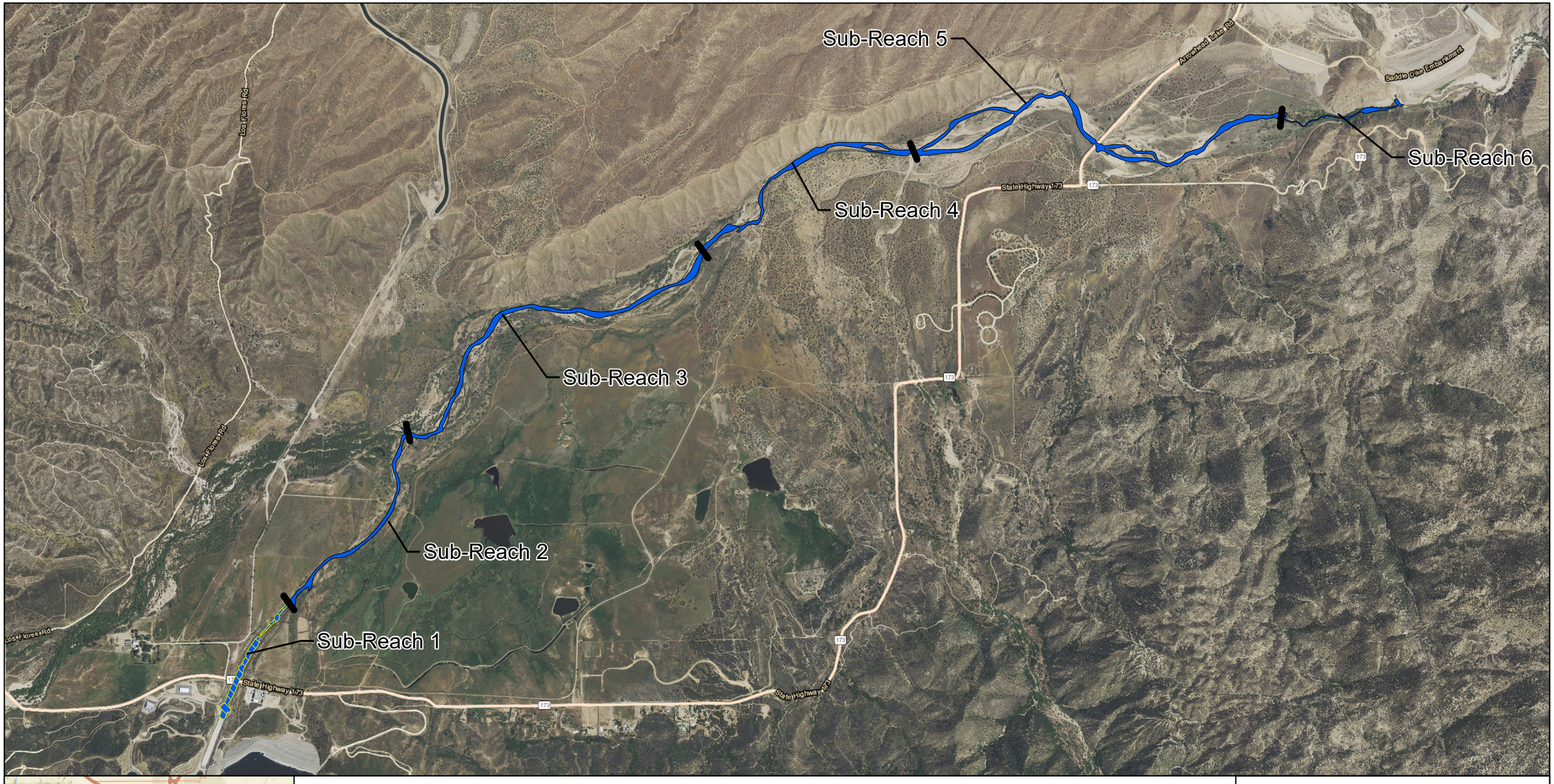
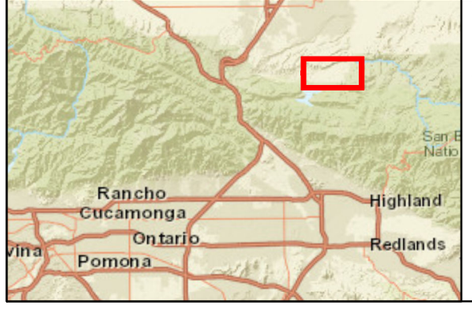




LEGEND

Sub-Reach Break

Potential Aquatic Habitat - American bullfrog

Aquatic Habitat - 64.13 acres

Breeding Habitat - 5.84 acres

N

0 2,000 4,000 Feet

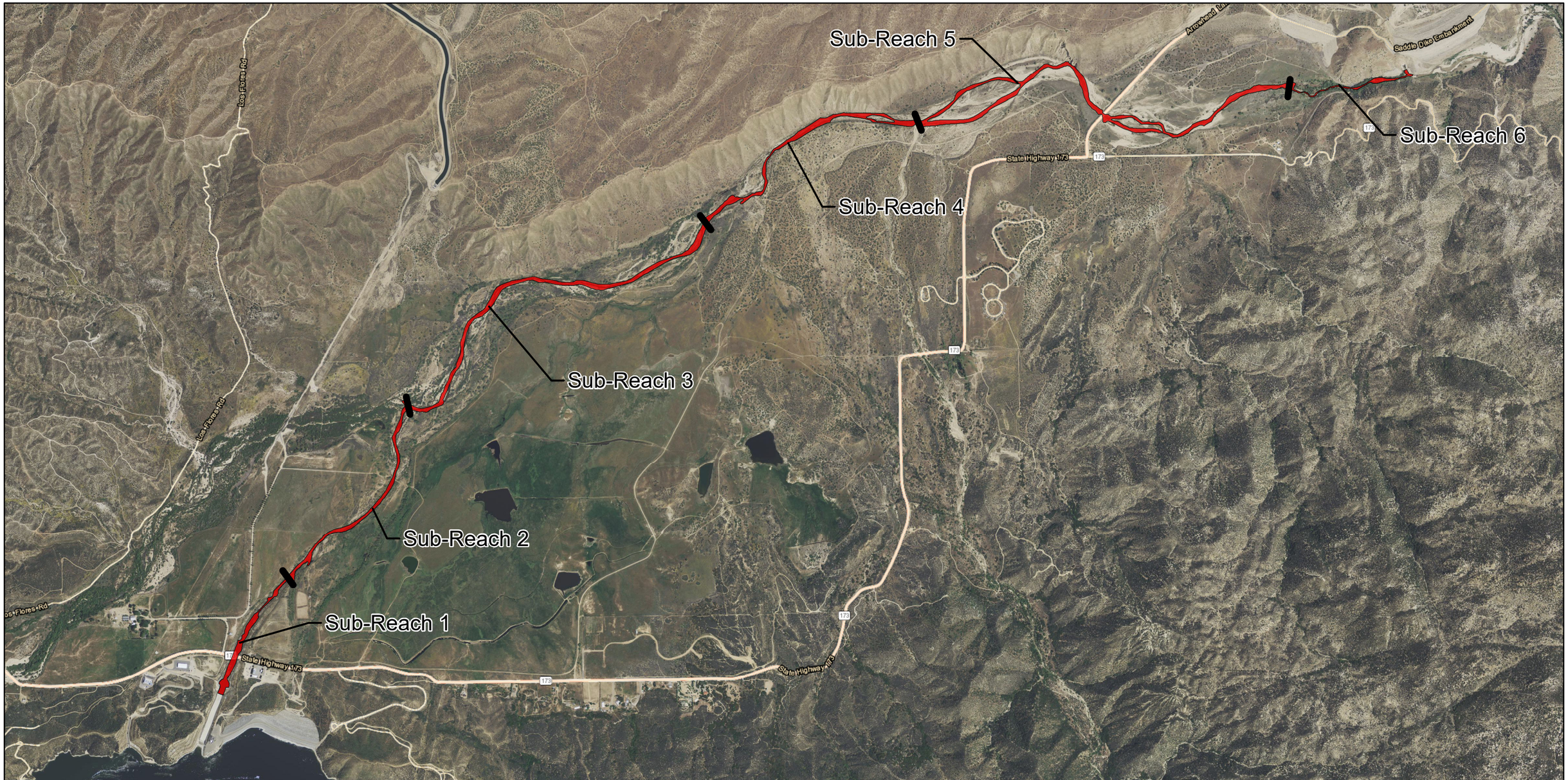
Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_AIS_Bullfrog.mxd

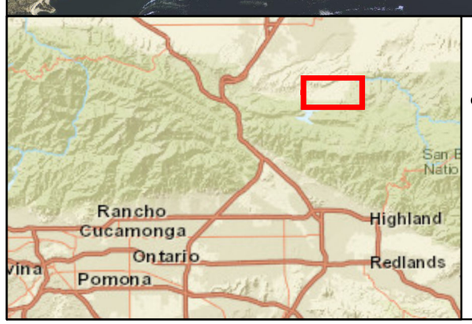
DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

APPENDIX 4A

POTENTIAL AMERICAN BULLFROG AQUATIC HABITAT





LEGEND

Sub-Reach Break

Potential Aquatic Habitat

Red swamp crayfish - 64.13 acres

N

0 2,000 4,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_AIS_Crayfish.mxd

DEVIL CANYON PROJECT RELICENSING

APPENDIX 4B

POTENTIAL RED SWAMP CRAYFISH AQUATIC HABITAT

Sub-Reach 5

Sub-Reach 4

Sub-Reach 3

Sub-Reach 2

Sub-Reach 1

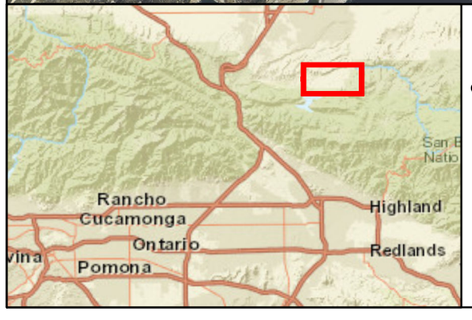
Los Flores Rd

Arrowhead Lake Rd

Saddle Dike Embankment

State Highway 173

173



LEGEND

Sub-Reach Break

Potential Aquatic Habitat

Asian clam - 61.48 acres

N

0 2,000 4,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
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DEVIL CANYON PROJECT RELICENSING

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

APPENDIX 4C

POTENTIAL ASIAN CLAM AQUATIC HABITAT

Sub-Reach 3

Sub-Reach 2

Sub-Reach 1

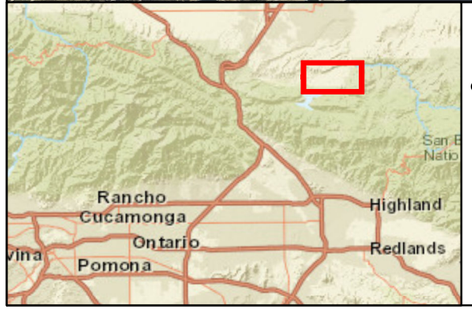
Los Flores Rd

Arrowhead Lake Rd

Saddle Dike Embankment

State Highway 173

173



LEGEND

Sub-Reach Break

Potential Aquatic Habitat

Eurasian milfoil - 29.26 acres

N

0 2,000 4,000 Feet

Prepared: 05/2020
Projection: NAD_1983_StatePlane_California_V_FIPS_0405_Feet
Data Sources: HDR (2018); USDA (2012); CDFW (2010).
G:\DWR\DC_Relicensing\7.2_Working\map_docs\AIR\Habitat\ATTACHMENT_AIS_Milfoil.mxd

DEVIL CANYON PROJECT RELICENSING

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APPENDIX 4D

POTENTIAL EURASIAN MILFOIL AQUATIC HABITAT

Appendix B

Impacts to Special Status Wildlife

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APPENDIX B

DWR'S RESPONSE TO SCHEDULE B – STUDY REQUESTS, SURVEYS AND HABITAT ASSESSMENTS FOR STATE SPECIAL-STATUS TERRESTRIAL SPECIES THROUGHOUT THE PROJECT

IMPACTS TO SPECIAL-STATUS WILDLIFE

In DWR's *Special-Status Terrestrial Wildlife Species Study Approach* (Study Approach) that was prepared in 2017, a list was prepared with a total of 54 special-status wildlife species that were initially determined to have the potential to occur within the proposed Project boundary at that time. There were changes to the list from the time between the preparation of the Study Approach, during the implementation of field surveys, and the development to the Final License Application (FLA), that resulted in DWR updating the list by removing 11 special-status wildlife species from further consideration due to: (1) study results found that the species' habitat(s) did not occur within the proposed Project boundary (i.e., Ponderosa Pine, Sagebrush, Montane Chaparral, Desert Wash, Desert Scrub), (2) the species were removed from listing by a regulatory agency, (3) additional analysis of information on range and habitat requirements for each special-status wildlife species determined the species would not occur on the Project, or (4) a combination of these.

The 11 special-status wildlife species removed from the list included:

1. San Gabriel slender salamander (*Batrachoseps gabrieli*),
2. Orange-throated whiptail (*Aspidoscelis hyperythra*),
3. Southern rubber boa (*Charina umbratica*),
4. Northern three-lined rosy boa (*Lichanura trivirgata*),
5. Northern goshawk (*Accipiter gentilis*),
6. Prairie falcon (*Falco mexicanus*),
7. Gray vireo (*Vireo vicinior*),
8. Bell's sage sparrow (*Amphispiza belli*),
9. Summer tanager (*Piranga rubra*),
10. Spotted bat (*Euderma maculatum*), and
11. Monterey dusky-footed woodrat (*Neotoma macrotis luciana*).

Eight new species were added to the list between the time when the Study Approach was implemented and during preparation of the FLA including:

1. San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*),
2. Southern California legless lizard (*Anniella pulchra*),
3. California glossy snake (*Arizona elegans*),
4. Red diamond rattlesnake (*Crotalus ruber*),
5. Short-eared owl (*Asio flammeus*),
6. Mountain plover (*Charadrius montanus*),
7. Lucy's warbler (*Oreothlypis luciae*), and
8. Mohave river vole (*Microtus californicus mohavensis*).

Upon further review, two species, Mohave ground squirrel (*Xerospermophilus mohavensis*) and Mojave river mole, were removed from consideration during the preparation of this AIR, as their range is not found within the proposed Project boundary or the adjacent surrounding areas. The added species are discussed in Section 5.4.1.1 of the FLA (starting on page 5-187). As a result, the current list of special-status wildlife with the potential to occur within the proposed Project Boundary and that may potentially be affected by DWR's Proposal includes 47 species: 1 amphibian, 8 reptiles, 26 birds, and 12 mammals.

Project operations and maintenance (O&M) and Project-related recreation activities that may potentially impact special-status wildlife species were analyzed for all 47 species with the potential to occur in the proposed Project boundary. Additionally, DWR considered the potential for rodenticides, although infrequently used, to impact special status scavenger species that may potentially occur within the proposed Project boundary. Non-restricted rodenticides are used to protect public health and the safe operation of Project infrastructure through their application in accordance with label instructions. Rodent activity at Project facilities threatens public safety by compromising the structural integrity of facilities and heightening the potential for the spreading of disease (including plague) if rodent populations are left unchecked. Prior to administering a rodenticide, the feasibility of using non-chemical methods will be evaluated in order to avoid potential effects of carcass consumption by scavenging wildlife. All rodenticides are used in concurrence with the California Department of Pesticides Regulation statutes and regulations. Due to their limited use, it is anticipated that any potential impacts to special-status scavenger species from the use of rodenticides will be less than significant.

Special-Status Amphibians

Large-blotched Ensatina (Ensatina eschscholtzii klauberi)

Large-blotched ensatina (or large-blotched salamander) is designated as Forest Service Sensitive (FSS) by the U.S. Department of Agriculture, Forest Service (USFS) (USFS 2013b). It is found in the Peninsular Ranges of southern California and part of the eastern San Bernardino Mountains (where it intergrades with the more common Monterey ensatina), and south to northern Baja California (NatureServe 2017). Habitat types include both evergreen and deciduous forests, as well as oak woodlands. Specifically, this species requires a moist environment, which could include damp pockets under logs, rocks, or other debris, as well as burrows. This animal remains underground or under rocks, logs, bark, or other debris during hot, dry periods as well as extreme cold periods, and is typically active above ground at night when it is wet and temperatures are moderate (Nafis 2020).

There are no California Natural Diversity Database (CNDDB) records or other known occurrences of this species within the proposed Project boundary. The California Wildlife Habitat Relationships (CWHR) terrestrial habitat types considered suitable for large-blotched ensatina include Coastal Scrub (CSC), Mixed Chaparral (MCH), and Valley Riparian (VRI) (CDFW 2018b). Within the proposed Project boundary large-

blotched ensatina is considered sensitive only in habitats overlapping National Forest System (NFS) lands (a total of 7.93 acres of CSC and 64.81 acres of MCH). Potential suitable habitat on NFS lands is limited to areas around the Devil Canyon Powerplant Penstocks, San Bernardino Tunnel Surge Chamber, and associated service roads.

The areas of potential suitable habitat for this species are located on NFS lands within the proposed Project boundary where there are no developed Project recreation facilities and these areas are not open to recreationists, and therefore, no effects would occur as a result of recreation activities. Project operations and maintenance (O&M) activities that may potentially affect large-blotched ensatina include ground-disturbing activities, such as grading of dirt roads or vegetation management, which can lead to disturbances of habitat features (e.g., burrows, rocks, logs or other debris) used for cover through most of the year. Large-blotched ensatina is largely fossorial and requires a damp environment most of the year. It is unlikely this species is present along roadways, as these areas are regularly maintained and cleared of debris and shrubby vegetation to a distance of 15 feet off the roads that could cultivate a damp environment. However, downed logs and debris are typically left in place unless deemed a safety hazard, so this habitat would remain undisturbed and available to the species. In addition, no effects to the species or its habitat are expected as a result of the penstock and San Bernardino Tunnel inspection processes, as no ground disturbance is associated with those activities. Although Project O&M activities have the potential to impact a small number of individuals if present, those activities are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities[1] that may occur will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Special-Status Reptiles

Coast Horned Lizard (Phrynosoma blainvillii)

The coast horned lizard is designated as a California Species of Special Concern (SSC) by the CDFW (CDFW 2019). The coast horned lizard may be found in California at elevations up to 4,000 feet west of the southern California deserts and the Sierra Nevada crest from the Baja California border to the San Francisco Bay area, and inland to the northern Sacramento Valley. Its range also extends into Baja California at elevation ranges up to 8,000 feet (Nafis 2020). Habitat types occupied by the coast horned lizard include valley foothill hardwood, conifer, riparian, and annual grasslands. This species will often burrow into loose sandy soil to escape from predators and

[1] Non-routine Project O&M includes major transmission pole replacements (>5 consecutive poles in a single area), reconductoring multiple spans (non-emergency), road and facility construction or reconstruction, ground-disturbing activities of greater than 0.5 acres, vegetation management/ removal projects outside of areas described in DWR Application for New License, and other activities not described in Exhibit B of DWR Application for New License.

extreme heat, or use logs, rocks, mammal burrows, or crevices during periods of inactivity and winter hibernation (Zeiner et al. 1988-1990).

Coast horned lizard was widely reported, with 25 CNDDB occurrences within 2 miles north of Silverwood Lake, and can be presumed to occur within or near the proposed Project boundary due to the presence of potential suitable habitat and nearby occurrences (CDFW 2018a). Appropriate CWHR habitat types for coast horned lizard include Annual Grassland (AGS), MCH, and VRI (CDFW 2018b). These potential suitable habitat types are found around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around Cedar Springs Dam. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

O&M activities that may potentially affect coast horned lizard primarily include ground-disturbing activities, such as grading of dirt roads and vegetation management. These activities can lead to disturbance of habitat features, including loose sandy soil, burrows, and rocks or logs which the species uses for escape, cover, or winter hibernation. Additionally, recreation activities, such as fishing, swimming, and hiking along the shoreline of Silverwood Lake can potentially affect this species. The occasional coast horned lizard individual may also potentially be killed or injured by vehicles travelling on Project access roads. Project O&M ground-disturbing activities are tied to already developed areas, and areas subject to more frequent recreation use, such as campground and day use areas. These areas are already highly developed; therefore, these activities are not expected to result in adverse effects to this species or its habitat. Other recreation activities are dispersed across the shoreline area, and when threatened, this species' first defense is to run quickly to cover (Nafis 2020) and would likely flee when recreationists enter an area. Dispersed recreation would also not be expected to adversely impact potential suitable habitat. Therefore, Project activities may have the potential to impact a small number of individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Diegan Tiger Whiptail (Aspidoscelis tigris stejnegeri)

San Diegan tiger whiptail (or coastal whiptail) is designated as SSC (CDFW 2019). It is found in coastal southern California, west of the Peninsular Ranges and south of the Transverse Ranges, from Ventura County south into Baja California up to 7,000 feet. Habitat types occupied by San Diegan tiger whiptail include chaparral, woodland, and riparian areas. This species is active during the day and digs while foraging (Nafis 2020).

The four CNDDB records for the San Diegan tiger whiptail are from streams with riparian and alluvial fan scrub vegetation located within 4 to 7 miles of the Devil Canyon

Powerplant (CDFW 2018a). CWHR does not include habitat types for this species, but areas of chaparral, woodlands, and riparian vegetation provide potential suitable habitat within the proposed Project boundary (CDFW 2018b). These areas of potential suitable habitat are found around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around Cedar Springs Dam. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel, San Bernardino Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

O&M activities that may potentially affect San Diegan tiger whiptail primarily include ground-disturbing activities, such as grading of dirt roads or vegetation management, that can lead to minor disturbances of habitat features. Additionally, recreation activities, such as fishing, swimming, and hiking along the shoreline of Silverwood Lake could potentially affect this species. The occasional San Diegan tiger whiptail individual may also be killed or injured by vehicles travelling on project access roads. Project O&M ground-disturbing activities are tied to already developed areas, and areas subject to more frequent recreation use, such as campground and day use areas. These areas are already highly developed; therefore, such activities are not expected to result in adverse effects to this species or its habitat. As other recreation activities are dispersed across the shoreline area, and this species is wary and difficult to approach (Nafis 2020), most individuals would likely flee when recreationists enter an area. Dispersed recreation would also not be expected to adversely impact potential suitable habitat. Therefore, Project activities may have the potential to impact a small number of individuals, but are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Southern California Legless Lizard (Anniella stebbinsi)

Southern California legless lizard is designated as SSC (CDFW 2019). It is found in southwestern California, south of the Transverse Ranges, with separate populations to the north in the Tehachapi and Piute mountains and south into northwestern Baja California. Habitat types include areas with moist, warm, and loose soil that are sparsely vegetated, including grassland, beach dunes, chaparral, pine-oak woodland, conifer woodland, desert scrub, sandy washes, and terraces of riparian areas containing sycamores, cottonwoods, or oaks. This animal spends most of its time underground in burrows, foraging in loose soil, leaf litter, and fallen logs during the morning and evening (NatureServe 2017; Nafis 2020).

The three CNDDB records for the Southern California legless lizard are located less than 1.5 miles south and east of Devil Canyon Powerplant, consistent with expectations that this species is largely confined to the coastal bioregion south of the Transverse Ranges (Zeiner et al. 1988-1990; Stebbins and McGinnis 2012; Papenfuss and Parham 2013). There are no known occurrences of this species within the proposed Project

boundary. Southern California legless lizard is not linked with a particular habitat type in the CWHR program; however, it may be associated with any habitats underlain by loose soils. (CDFW 2018b).

Southern California legless lizards are mostly fossorial species associated with loose, sandy, or loamy soils. Although not known within the proposed Project boundary, the likely presence of potential suitable habitat and nearby occurrences indicates the potential for this species to use habitats within the proposed Project boundary. Habitat areas that may be used by the Southern California legless lizard occur along the shoreline of Silverwood Lake, including among camping and recreation areas. Potential suitable habitat may also occur adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

O&M activities that may affect Southern California legless lizard primarily include grading of dirt roads, vegetation management, and other ground-disturbing activities that can lead to minor disturbances of habitat, including underground burrows, should they be present. Southern California legless lizard individuals may also be killed or injured by vehicles travelling on project access roads. Additionally, recreation activities, such as fishing, swimming, and hiking along the shoreline of Silverwood Lake can potentially affect this species. However, areas of Project O&M and those subject to more frequent recreation use, such as campground and day use areas, are already highly developed, and their ongoing use is not expected to result in adverse effects to this species or its habitat. Therefore, although Project O&M and Project-related recreation activities may have the potential to impact a small number of individuals, they are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

California Glossy Snake (Arizona elegans occidentalis)

California glossy snake is designated as SSC (CDFW 2019). It is found throughout southern California up to 6,000 feet. Habitat types include open sandy habitats, such as deserts, chaparral, sagebrush, valley-foothill hardwood, pine-juniper, and annual grasslands. This animal is primarily nocturnal, spending inactive periods during the day and winter in mammal burrows and rock outcrops (Zeiner et al. 1988-1990).

There are nine CNDDB records of California glossy snake associated with alluvial fan sage scrub and grassland habitat, within a few miles of the Devil Canyon Powerplant (CDFW 2018a). CWHR does not report on this species, but areas of chaparral and annual grassland provide potential suitable habitat and are found within the proposed Project boundary (CDFW 2018b). These areas of potential suitable habitat are found around the shoreline of Silverwood Lake, including among day use areas. Potential suitable habitat is also found south of the Devil Canyon Afterbay.

Project O&M activities that may potentially affect California glossy snake primarily include ground-disturbing activities, such as grading of dirt roads or vegetation management, which can lead to disturbances of burrows, rock outcrops, or other habitat features. Additionally, recreation activities along the shoreline of Silverwood Lake can potentially affect this species. The occasional California glossy snake individual may also be killed or injured by vehicles travelling on project access roads. However, Project O&M ground-disturbing activities are tied to existing facilities, and areas subject to more frequent recreation use, such as campground and day use areas, are already highly developed, so these activities are not expected to result in adverse effects to this species or its habitat. With additional mitigation measures outlined in the Recreation Management Plan (Final License Application [FLA] Exhibit E, Appendix E), such as those related to improving litter control, recreation use monitoring, and signage that can help avoid conflicts between users and habitat, , it is not expected that these activities will adversely impact habitat. Therefore, Project activities may impact a small number of individuals, but are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Bernardino Ring-Necked Snake (Diadophis punctatus modestus)

San Bernardino ring-necked snake is designated as FSS (USFS 2013b; CDFW 2019). This common snake occurs in California (in Kern, Los Angeles, Riverside, and San Bernardino Counties) except the Central Valley, high mountains, and desert up to 7,000 feet mean sea level (msl) (NatureServe 2017). Habitats include open, rocky areas of valley-foothill, mixed chaparral, and annual grassland. This animal forages on and under the ground surface in areas with leaf litter and herb cover during the day (Zeiner et al. 1988-1990).

There are four records of San Bernardino ring-necked snake associated with the dried, boulder-strewn bed of Grass Valley Creek, located within a few miles northeast of Silverwood Lake (CDFW 2018a). CWHR listed potentially suitable terrestrial habitats for San Bernardino ring-necked snake within the proposed Project boundary include AGS, Chamise-Redshank Chaparral (CRC), CSC, MCH, Urban (URB), and VRI (CDFW 2018b). Of these, CSC, MCH, and URB are present on NFS lands within the proposed Project boundary. These areas of potential suitable habitat are found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, and associated service roads.

San Bernardino ring-necked snake's current status is limited to FSS on NFS lands; thus, effects on this species are only considered where this species may occur on NFS lands within the proposed Project boundary. Although potential suitable habitat for this species does occur on NFS lands within the proposed Project boundary, there are no Project-related recreation facilities in these specific areas. Because those areas are not

open to recreation, no adverse effects as a result of recreation activities are expected to occur.

O&M activities that may potentially affect San Bernardino ring-necked snake primarily include ground-disturbing activities, such as road maintenance and vegetation management, that can lead to minor disturbance of habitat, including leaf litter and herb cover. The occasional San Bernardino ring-necked snake individual may also be killed or injured by vehicles travelling on project access roads. Project O&M ground-disturbing activities are tied to already developed areas, so these activities are not expected to result in adverse effects to this species or its habitat. Therefore, although Project activities may impact a small number of individuals, these activities are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Bernardino Population of California Mountain Kingsnake (Lampropeltis zonata parvirubra)

San Bernardino Mountain kingsnake is designated as FSS (USFS 2013b, CDFW 2019). This snake occurs in southern California in the San Jacinto, Santa Rosa, San Bernardino, Santa Susana, and San Gabriel Mountains at elevations up to 9,000 feet, and in the Verdugo Hills. Habitat types include coniferous forest, oak-pine woodland, riparian woodland, chaparral, and coastal sage scrub. This secretive animal spends most of its time underground, inside rock crevices, or under surface objects, typically visible above ground when temperatures are more moderate (Nafis 2020).

During DWR's relicensing studies, a single San Bernardino Mountain kingsnake was observed on a multiuse trail near the San Bernardino Tunnel Intake on Silverwood Lake. Of the habitat types present within the proposed Project boundary and on NFS lands the CWHR identifies MCH as potentially suitable terrestrial vegetation for the San Bernardino Mountain kingsnake (CDFW 2018b). These areas of potential suitable habitat are found adjacent to the areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, and associated service roads.

California mountain kingsnake's current status is limited to FSS; thus, effects on this species are only considered on NFS lands. Although potential suitable habitat for this species does occur on NFS lands within the proposed Project boundary, there are no Project-related recreation facilities in these specific areas. Because those areas are not open to recreation, no adverse effects as a result of recreation activities are expected to occur.

Project O&M activities that may potentially affect California mountain kingsnake primarily include ground-disturbing activities, such as road maintenance and vegetation management, that can lead to disturbance of habitat, including rock and other debris used for cover. The occasional California mountain kingsnake individual may also be

killed or injured by vehicles travelling on project access roads. However, these Project O&M activities occur in areas that are already developed. Therefore, although the activities may impact a small number of individuals, these activities are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Coast Patch-nosed Snake (Salvadora hexalepis virgultea)

Coast patch-nosed snake is designated as SSC (CDFW 2019). This snake occurs in southern California from San Luis Obispo County south to coastal northern Baja California at elevations up to 7,000 feet. Habitat types include semi-arid brush and chaparral, typically in canyons, on rocky hillsides, and in flat areas. This diurnal animal burrows into loose soil, but is also active above ground even during extreme heat (Nafis 2020).

There are no CNDDB records of coast patch-nosed snake within or near the proposed Project boundary (CDFW 2018a). AGS, Barren (BAR), CRC, CSC, MCH, and VRI are all potential suitable terrestrial habitats designated by the CWHR for this species and are located within the proposed Project boundary (CDFW 2018b). Areas of potential suitable habitat are found along the shoreline of Silverwood Lake, in camping and recreation areas, and at the Cedar Springs Dam. Potential suitable habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, and associated service roads.

Project O&M activities that might affect coast patch-nosed snake, if any are present, include road grading, vegetation management, or other ground-disturbing activities that can lead to disturbances of habitat, including loose soil and other debris used for cover. Additionally, recreation activities along the shoreline of Silverwood Lake can potentially affect this species. The occasional coast patch-nosed snake individual may also be killed or injured by vehicles travelling on project access roads. However, Project O&M ground-disturbing activities are tied to existing facilities, and areas subject to more frequent recreation use, such as campground and day use areas, are already highly developed, so these activities are not expected to result in adverse effects to this species or its habitat. Due to mitigation measures outlined in the Recreation Management Plan (FLA Exhibit E, Appendix E), such as monitoring, cleanup, and implementing user restriction to areas of dispersed recreation, it is not expected that these activities will adversely impact habitat. Therefore, Project activities may have the potential to impact a small number of individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Red Diamond Rattlesnake (Crotalus ruber)

Red diamond rattlesnake is designated as SSC and FSS (USFS 2013b; CDFW 2019). This snake occurs in southwestern California from San Bernardino County south to San Diego County, and Baja California at elevations up to 4,000 feet. Habitats include chaparral, woodland, and desert habitats with rocky areas and dense vegetation. It seeks shelter in rodent burrows, under surface objects, and in rock crevices, and is most commonly observed in the spring when it is active during the day and at dusk (NatureServe 2017; Zeiner et al. 1988-1990).

There are no CNDDB records of red diamond rattlesnake within or near the proposed Project boundary (CDFW 2018a). The CWHR identifies the following habitat types within the proposed Project boundary as potentially suitable terrestrial habitat for this species, AGS, BAR, CRC, CSC, MCH, and VRI (CDFW 2018b). Potential suitable habitat for this species is found throughout most areas in the proposed Project boundary.

Project O&M activities that may affect red diamond rattlesnake, if any are present, include road grading, vegetation management, or other ground-disturbing activities that can lead to disturbances of habitat, including burrows and surface objects used for cover. Additionally, recreation activities along the shoreline of Silverwood Lake can potentially affect this species. The occasional red diamond rattlesnake individual may also be killed or injured by vehicles travelling on project access roads. However, Project O&M ground-disturbing activities are tied to existing facilities, and areas subject to more frequent recreation use, such as campground and day use areas, are already highly developed, so these activities are not expected to result in adverse effects to this species or its habitat. Due to mitigation measures outlined in the Recreation Management Plan (FLA Exhibit E, Appendix E), such as monitoring, cleanup, and implementing user restriction to areas of dispersed recreation, it is not expected that these activities will adversely impact potential suitable habitat that may support this species. Therefore, Project activities may have the potential to impact a small number of individuals, but are not expected to have an adverse overall impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Special-Status Birds

Common Loon (Gavia immer)

The common loon is designated as SSC (CDFW 2019). The common loon breeds on remote freshwater lakes with both shallow and deep, clear water, in the northern United States and Canada (NatureServe 2017). From May to September, the common loon can be seen in estuarine and subtidal marine habitats along the California coast, but are uncommon on large, deep lakes in valley and foothills throughout the State (Zeiner et al.

1988-1990). Northeastern California is considered to be within the historical breeding range of this species. Courtship begins shortly after territory reoccupation and involves shared displays, including simultaneous swimming, head posturing, and short dives. Many times, a nesting pair will reuse the same site in the following year. Nests are nearly always built at the water's edge in a quiet, protected hidden area and made of aquatic and terrestrial vegetation. Both the male and female build the nest together over the course of a week in May or early June. In winter and during migration, the common loon can be found on lakes, rivers, estuaries, and coastlines. Some individuals will overwinter in inland lakes and rivers. Up to 80 percent of their diet is fish, while the remaining 20 percent consists of crustaceans and aquatic plants (Zeiner et al. 1988-1990).

The proposed Project boundary is not within the historical breeding range of this species; however, the common loon is known to winter within the proposed Project boundary at Silverwood Lake (DPR 2016). DWR incidentally observed a single juvenile common loon in the cove where Sawpit Creek enters Silverwood Lake during relicensing studies in 2018. CWHR reported only water (LAC) as potential suitable habitat for common loon within the proposed Project boundary (CDFW 2018b). Areas of LAC habitat within the proposed Project boundary include Silverwood Lake and the Devil Canyon afterbays.

While common loon has the potential to occur within the proposed Project boundary, it is likely this species only uses this area for wintering as it does not overlap with this species' breeding range. Recreation activities, especially water-based recreational activities involving boats or fishing on Silverwood Lake, may have the potential to temporarily disturb individuals in wintering areas should they be present. These effects are expected to be temporary and minimal. There are no Project O&M activities occurring on the lake that could adversely impact the species; thus, no mitigation measures would be implemented. Therefore, the Project will have less than significant adverse effects to this species.

American White Pelican (Pelecanus erythrorhynchos)

The American white pelican is designated as SSC (CDFW 2019). Its habitat includes rivers, lakes, reservoirs, estuaries, bays, and open marshes (NatureServe 2017). Nesting sites require flat or gently sloped topography, without shrubs or other obstructions that would impede taking flight; are free of human disturbances; and usually have loose earth suitable for constructing nest-mounds (Zeiner et al. 1988-1990). According to Zeiner et al. (1988-1990) and NatureServe (2017), this species currently nests at large lakes in the Klamath Basin of northern California. Outside of nesting season (i.e., April to August), migrant flocks are often seen throughout California.

A group of six adult American white pelicans was incidentally observed in flight over Silverwood Lake near Sycamore Landing during DWR's relicensing studies. The Project is located outside any known breeding areas for American white pelicans; therefore, observed occurrences are likely related to migratory flocks moving between nesting

habitat and wintering habitat elsewhere in California. Per the CWHR, potential suitable layover habitat for the pelican within the proposed Project boundary includes LAC and BAR (CDFW 2018b). These areas of potential suitable habitat include Silverwood Lake and the Devil Canyon afterbays.

While American white pelican has the potential to occur within the proposed Project boundary, it is likely this species only uses this area for wintering as it does not overlap with this species' breeding range. Recreation activities, especially water-based recreational activities such as boating or fishing on Silverwood Lake, may have the potential to temporarily flush individuals from wintering areas should they be present. These effects are temporary and minimal. No Project O&M activities are expected that would adversely impact the species; thus, no mitigation measures would be implemented. Therefore, the Project will have less than significant adverse effects to this species.

Least Bittern (Ixobrychus exilis)

Least bittern is designated as SSC (CDFW 2019). It is a common summer resident in southern California at the Salton Sea and Colorado River, a rare to uncommon breeder in the Owens Valley and Mojave Desert, and a rare to uncommon summer resident in San Diego County, the Sacramento and San Joaquin Valleys, and northeastern California. A small part of the population in southern California is nonmigratory; the rest migrate to Mexico in the winter. Habitat types include dense emergent wetlands near freshwater and desert riparian. It typically nests in tules or cattails over water at least 1 foot deep. It eats a variety of insects, fish, amphibians, and small mammals (NatureServe 2017; Zeiner et al. 1988-1990).

There are no CNDDB records of this species in the Project vicinity (CDFW 2018a). Within the proposed Project boundary, LAC is the only habitat considered suitable for least bittern per the CWHR (CDFW 2018b). LAC habitat within the proposed Project boundary includes Silverwood Lake and the Devil Canyon afterbays, in addition to any adjacent emergent wetlands.

No vegetation management occurs in areas where least bitterns would be expected to occur, but dispersed recreation activities around the lakeshore may affect least bittern, if present. Potential effects on nesting least bitterns may include mortality of young through forced fledging or nest abandonment by adults. Impacts of recreation activities outside of the nesting season are limited to temporary disturbances of occasional individuals. However, it can be assumed that nesting least bitterns adjacent to Project facilities are acclimated to the level of disturbance and not likely to be disturbed by ongoing activities. DWR's Proposal does not include any changes to the Project that would significantly increase recreation use beyond existing levels. If non-routine Project O&M activities are planned that may occur within the emergent wetlands, the activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to the species.

Redhead (Aythya americana)

The redhead is designated as SSC (CDFW 2019). Redhead occurrences range from uncommon to locally common during the winter months from Modoc County to Mono County in eastern California in lacustrine waters, where it is a common breeder during the summer months. It can also be found in the Central Valley, central California foothills and coastal lowlands, and along the coast from Monterey County to Ventura County during the winter months. Breeding also occurs locally in the Central Valley, coastal southern California, and eastern Kern County (Zeiner et al. 1988-1990). This species' habitat includes large marshes, lakes, lagoons, rivers, and bays. Nesting sites can be found in dense bulrush or cattail (*Typha* spp.) stands that are interspersed with small areas of open water (NatureServe 2017). Necessary foraging habitat includes large freshwater marshes with persistent emergent vegetation (NatureServe 2017). Redheads dive for food primarily eating leaves, stems, seeds and tubers of aquatic plants with smaller amounts of aquatic insects (Zeiner et al. 1988-1990).

There are no CNDDB records of redhead within or near the proposed Project boundary (CDFW 2018a). Although the Project is located outside any known breeding areas for this species, per the CWHR potentially suitable foraging habitat for redhead within the proposed Project boundary include LAC (CDFW 2018b). LAC habitat within the proposed Project boundary includes Silverwood Lake and the Devil Canyon afterbays, in addition to any adjacent emergent wetlands.

While redhead has the potential to occur within the proposed Project boundary, it is likely this species only uses this area for foraging as it does not overlap with its breeding range. Current recreation activities, especially water-based recreational activities such as boating or fishing on Silverwood Lake, may have the potential to temporarily flush individuals from wintering areas should they be present. These effects are temporary and minimal. Project O&M activities that occur on the lake include regular cleaning and maintenance of three floating restroom facilities at the Sawpit Canyon Marina, maintenance of buoys near the dam and swim beaches, repair and replacement of boat docks near the shoreline. The floating restrooms are cleaned at least once a day during business days, and may be cleaned as often as hourly during busy days. However, these activities would be concentrated at the specific restrooms and are not likely to have the potential to adversely impact the species, thus, no mitigation measures would be implemented. Therefore, the Project will have less than significant adverse effects to this species.

Golden Eagle (Aquila chrysaetos)

The golden eagle is designated as Fully Protected (FP) and protected under the Bald and Golden Eagle Protection Act (CDFW 2019; 16 United States Code [USC] Sections [§] 668-668c). Its soaring range is up to 11,500 feet in elevation and it can be found throughout California, except in the center of the Central Valley (Zeiner et al. 1988-1990). Throughout the Sierra Nevada and foothills adjacent to the Central Valley, golden eagle may be found in sparse woodlands, grasslands, savannas, lower successional forest stages, and shrubland; cliffs, large trees, and man-made structures

with a commanding view (e.g., electric transmission towers) are used for nesting (NatureServe 2017).

During relicensing studies, a single golden eagle adult was incidentally observed soaring in the Chamise Cove area of the lake. There are no known occurrences of nesting golden eagles or evidence of nesting activities within the proposed Project boundary, which suggests that golden eagles are visitors to the Project area (CDFW 2019). Per the CWHR, potential suitable habitat within the proposed Project boundary for golden eagle includes AGS, BAR, CRC, CSC, MCH, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are found around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable habitat is also found adjacent to the areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads. However, nesting golden eagles would likely be limited to areas around Silverwood Lake due to the presence of potential suitable nest sites and the proximity to prey within the reservoir.

If golden eagles were to nest within the Project boundary, routine road maintenance, vegetation management, and Project-related recreation activities within and immediately adjacent to potential suitable nesting habitat may affect golden eagle via mortality of young through forced fledging or nest abandonment by adult golden eagles. Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season. Additionally, as there are no planned changes to O&M activities (which occur only at or directly around facilities) or recreation capacity, it can be assumed that golden eagles nesting adjacent to Project facilities are acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Furthermore, the lack of known nesting golden eagles within the proposed Project boundary indicates nesting occurs rarely, if at all, further lowering the likelihood of impacts to nesting golden eagles. Potential impacts of ground disturbance and O&M activities outside of the nesting season are limited to temporary disturbances of occasional individuals, as are year-round recreation effects. Various habitats within the proposed Project boundary provide foraging value for golden eagle; however, only temporary impacts from Project O&M and recreation activities would be expected, such as flushing. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbing activities, and avoidance and mitigation measures will be determined on a project-by-project basis. This discussion will also include consultation with the CDFW if there is the potential for a project to impact golden eagle, pursuant to California Fish and Game Code Section 3511.Therefore, the Project will have less than significant adverse effects to this species.

Northern Harrier (Circus cyaneus)

The northern harrier is designated as SSC (CDFW 2019). In California, the northern harrier ranges up to 5,700 feet in elevation and can be found in the Central Valley and Sierra Nevada. Potential suitable habitat for this species includes meadows, grasslands,

open rangelands, desert sinks, and fresh and saltwater emergent wetlands (Zeiner et al. 1988-1990). According to NatureServe (2017), northern harrier may also be found in wheat fields, ungrazed or lightly grazed pastures, and some croplands (alfalfa, grain, sugar beets [*Beta* spp.], tomatoes [*Solanum* spp.] and melons [*Benincasa* spp., *Citrullus* spp., *Cucumis* spp., *Momordica* spp.]). Nesting habitat includes shrubby vegetation along the edges of marshes, emergent wetlands, or along rivers and lakes. It has been known to nest in grasslands, grain fields or on sagebrush (*Artemisia* spp.) flats several miles from water. Nests are constructed out of a large mound of sticks in wet areas, or a smaller cup of grasses in drier areas (Zeiner et al. 1988-1990).

There are no CNDDB records of this species in the Project vicinity (CDFW 2018a). Aspen Environmental Group (2006) reported northern harriers within 1 mile north of Silverwood Lake. Per the CWHR, potential suitable habitats within the proposed Project boundary for this species include AGS, BAR, CRC, CSC, LAC, MCH, and URB (CDFW 2018b). Potential suitable habitat for this species is found throughout most areas in the proposed Project boundary.

Road maintenance, vegetation management, and recreation activities within and immediately adjacent to potential suitable nesting habitat may have the potential to affect northern harrier through mortality of young through forced fledging or nest abandonment by adults. Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and occur at or near existing Project facilities and recreation areas. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that northern harriers nesting adjacent to Project facilities may be acclimated to the level of disturbance and not likely to be disturbed by ongoing and future Project activities. Various habitats within the proposed Project boundary also provide foraging value for northern harrier; however, only temporary impacts from recreation activities would be expected. Ground disturbance and O&M activities outside of the nesting season are limited to temporary disturbances of occasional individuals. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

White-Tailed Kite (Elanus leucurus)

The white-tailed kite is designated as FP (CDFW 2019). The white-tailed kite is a common to uncommon, year-long resident in the Sierra Nevada foothills and adjacent valley lowlands within California. The species has increased in numbers and extended its range in recent decades (Zeiner et al. 1988-1990).

White-tailed kite feeds mostly on voles and other small, diurnal mammals, and occasionally on birds, insects, reptiles, and amphibians. They forage in undisturbed, open grasslands, meadows, farmlands, and emergent wetlands. Trees with dense canopies provide cover, and nests are usually placed near the top of dense oaks, willows, or other tree stands near foraging areas. Breeding occurs from February to

October, with the peak from May to August. The average clutch is composed of four to five eggs, and the incubation period is about 28 days. Young fledge 35 to 40 days after hatching. The female incubates eggs and broods young exclusively, while the male supplies her with food (Zeiner et al. 1988-1990).

There are no CNDDB records for white-tailed kite near or within the proposed Project boundary (CDFW 2018a). While there are no known occurrences of nesting white-tailed kite or evidence of nesting activities within the proposed Project boundary, white-tailed kite has the potential to occur in a variety of habitats within the proposed Project boundary. Potential suitable CWHR habitat for white-tailed kite within the proposed Project boundary includes AGS, BAR, CRC, CSC, MCH, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are found around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and associated Low Level Outlet Works. Potential suitable habitat is also found adjacent to including the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat may have the potential to affect white-tailed kites if individuals are present. Potential effects on nesting kites may include mortality of young through forced fledging or nest abandonment by adults. Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season, and occur only at or near existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that white-tailed kites nesting adjacent to Project facilities may be acclimated to the current level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Various habitats within the proposed Project boundary also provide foraging value for white-tailed kite; however, any effects on foraging habitats are temporary in nature. Project O&M activities outside of the nesting season are limited to temporary disturbances of occasional individuals, as are year-round recreation use effects. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbing activities, and avoidance and mitigation measures will be determined on a project-by-project basis. This discussion will also include consultation with the CDFW if there is the potential for a project to impact white-tailed kite, pursuant to California Fish and Game Code Section 3511. Therefore, the Project will have less than significant adverse effects to this species.

American Peregrine Falcon (Falco peregrinus anatum)

The American peregrine falcon is designated as FP (CDFW 2019). The American peregrine falcon is a medium-sized raptor with a wingspan of 3 to 3.5 feet, and can weigh over 3 pounds. They may be found throughout the United States, utilizing cliffs and man-made structures, such as buildings and bridges, for nesting. American peregrine falcon typically breeds at two to three years of age, and pairs are usually bonded for life. Breeding begins in early March, and clutch size ranges from three to seven eggs, with an average of three to four eggs. A second clutch may be laid if eggs

are destroyed or removed early in the breeding season. Incubation takes about 29 to 32 days, followed by a nestling period of 35 to 42 days. Primary prey includes birds that range in size from medium-sized passerines up to small waterfowl. American peregrine falcon uses various hunting methods, including stooping, level pursuit, and hunting on the ground (NatureServe 2017).

There are no CNDDB records of American peregrine falcon near the proposed Project boundary (CDFW 2018a). While there are no known occurrences of nesting American peregrine falcon or evidence of nesting activities within the proposed Project boundary, potential suitable habitat for this species is present within the proposed Project boundary. Potentially suitable habitat for American peregrine falcon identified by CWHR within the proposed Project boundary includes AGS, BAR, CRC, CSC, LAC, MCH, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat include Silverwood Lake and the Devil Canyon afterbays, and their shorelines, the camping and day use areas around Silverwood Lake, the Cedar Springs Dam, and associated Low Level Outlet Works, as well as the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat may affect peregrine falcons, if individuals are present. Effects on nesting peregrine falcons may include mortality of young through forced fledging or nest abandonment by adults. Project O&M activities that may disrupt vegetation are typically timed to avoid nesting season and occur only at or near existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that American peregrine falcons nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by ongoing and future Project activities. Project O&M activities outside of the nesting season are limited to temporary disturbances of occasional individuals, as are year-round recreation effects. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. This discussion will also include consultation with the CDFW if there is the potential for a project to impact American peregrine falcon, pursuant to California Fish and Game Code Section 3511. Therefore, the Project will have less than significant adverse effects to this species.

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is listed as California Endangered (CE), FP, and FSS, and is also protected under the Bald and Golden Eagle Protection Act (USFS 2013b; CDFW 2019; USFS 2013b; 16 USC §§ 668-668c). The bald eagle is a large raptor with a wingspan between 6 and 8 feet, and can weigh up to 14 pounds. It typically nests within 1 mile of water bodies. The bald eagle breeds and winters throughout California, except for the desert areas, and the statewide population is increasing (CDFG 2005). Most breeding in the State occurs in the northern Sierra Nevada, Cascades, and north Coast Ranges. California's breeding population is a resident year-round in most areas where the climate is relatively mild (Jurek 1988). Between mid-October and December, migratory

bald eagles from areas north and northeast of California arrive in the State. Wintering populations remain through March or early April. Based on annual wintering and breeding surveys, it is estimated that between 100 and 300 eagles winter in the Sierra Nevada National Forests, and at least 151 to 180 pairs remain year-round to breed (USFS 2007). Data from statewide breeding surveys conducted since 1973 indicate that the number of breeding pairs in the State continues to increase on an annual basis (USFWS 2015). The breeding range in California expanded from portions of eight counties in 1981 to 27 of the State's 58 counties in 2000. Breeding generally occurs from February to July, but can be initiated as early as January via courtship, pair bonding, and territory establishment. The breeding season normally ends around August 31, as the fledglings are no longer attached to their nest area.

Counts of bald eagles wintering at Silverwood Lake are performed annually by the California Department of Parks and Recreation (DPR) and the San Bernardino National Forest (SBNF), supported by volunteers. Opportunities for recreational bald eagle viewing at Silverwood Lake include barge tours that occur once a week from January through March. The U.S. Fish and Wildlife Service (USFWS 1994) indicated that as many as 10 bald eagles per year wintered at Silverwood Lake. DWR funded bald eagle studies for four years under the terms of the 1994 Biological Opinion issued by the USFWS for the San Bernardino Tunnel Intake Reconstruction Project. Those studies monitored for possible disturbance of bald eagles during construction, with no evidence of significant effects reported (Walton et al. 2000).

Walton (2002) developed a bald eagle territory management plan for Silverwood Lake, although no nesting attempts have been reported to the CNDDB since 1993 (CDFW 2018a). The management plan summarized information collected for DWR by Walton, including inspection of prey remains, annual monitoring results including data from telemetry surveys, and locations of areas frequented by bald eagles. These observations indicated that bald eagles arrived at the lake as early as October and departed no later than April each year. Prey of wintering bald eagles documented by Walton included fish (e.g., carp, goldfish, crappie, bass, and other fish species), American coot, western grebes, mallard ducks, ground squirrels, and carrion, including fish and cattle. Communal roosts were located outside of the proposed Project boundary in forests south of the lake, in upper Miller Canyon east of the lake, and on the Las Flores Ranch north of the lake; whereas perch sites were more widely distributed within the proposed Project boundary along the shores, but concentrated on the south shore of the Miller Canyon Arm, the south side of the Cleghorn Arm, and the vicinity of Sycamore Landing (Walton 2002). As stated above, no nest sites were found.

During DWR’s 2017 relicensing surveys, one immature bald eagle was observed perched in upland habitat near Jamajab Point and one adult was observed flying overhead near Quarry Cove. Potential CWHR habitat types for bald eagles within the proposed Project boundary include AGS, BAR, CRC, CSC, LAC, MCH, and VRI (CDFW 2018b). These areas of potential suitable habitat are found around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon

Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads. However, any nesting eagles are likely limited to areas around Silverwood Lake.

Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat may have the potential to affect bald eagles, should they nest in the future within the proposed Project boundary. Potential effects on nesting bald eagles may include mortality of young through forced fledging or nest abandonment by adults. Project O&M activities that may disrupt vegetation are typically scheduled to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that bald eagles nesting adjacent to Project facilities may be acclimated to the level of disturbance and not likely to be disturbed by any ongoing and future Project activities. However, if bald eagles are found nesting near Project facilities or in areas of Project O&M, DWR will consult with a qualified biologist to determine if buffers or other protective measures are needed. This may include consultation with the USFWS and CDFW pursuant to CESA and California Fish and Game Code Section 3511. Current Project O&M activities and recreation activities may have the potential to temporarily flush individuals from wintering areas should they be present. Various habitats within the proposed Project boundary also provide foraging value for bald eagle; however, any effects on foraging habitats are temporary in nature. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to ground disturbance, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Long-eared Owl (Asio otus)

The long-eared owl is designated as SSC (CDFW 2019). In California, this species can be found from the Sierra Nevada foothills up to dense conifer stands at higher elevations. For roosting and nesting, long-eared owls require dense riparian and live oak thickets that contain densely canopied trees (Zeiner et al. 1988-1990). Resident populations in California have been declining since the 1940s, especially in southern California (Grinnell and Miller 1944; Remsen 1978, as cited by Zeiner et al. 1988-1990). While specific reasons for its decline are unknown, habitat fragmentation of riparian habitat and live oak groves are thought to be major factors. The long-eared owl hunts in open areas for voles and other rodents (Zeiner et al. 1988-1990).

There are two CNDDB records of long-eared owl dating from around 1950 from 3 miles south and 6 miles southwest of Hesperia, both occurrences are approximately 6 miles from the proposed Project boundary (CDFW 2018a). Per the CWHR long-eared owl's potential suitable habitat within the proposed Project boundary includes AGS, CRC, MCH, and VRI (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

The limited proposed Project O&M and recreation activities outside developed areas within and immediately adjacent to potential suitable woodland nesting habitat may have the potential to affect long-eared owl. Potential effects on nesting owls could include mortality of young through forced fledging or nest abandonment by adult long-eared owls. However, Project O&M activities that may potentially disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that long-eared owls nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Various habitats within the proposed Project boundary also provide foraging value for long-eared owl; however, any potential effects on foraging habitats would be temporary in nature and limited to recreation use outside of developed areas. The potential effect of Project activities outside of the nesting season are limited to temporary disturbances of occasional individuals, if present. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Short-eared Owl (Asio flammeus)

The short-eared owl is designated as SSC (CDFW 2019). According to Zeiner et al. (1988-1990), the short-eared owl inhabits open areas nearly absent of trees, such as annual grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh emergent wetlands. Nests are depressions on dry ground that are lined with grasses, forbs, sticks, and feathers, and concealed by surrounding grasses and shrubs. This species is known to breed in the coastal areas of Del Norte and Humboldt Counties, the San Francisco Bay Delta, northeastern Modoc plateau, east side of the Sierra Nevada between Lake Tahoe and Inyo Counties, as well as the San Joaquin Valley. The short-eared owl migrates from breeding areas in September or October to wintering areas in the Central Valley, western Sierra Nevada foothills, and along the California coast (Zeiner et al. 1988-1990).

There are no CNDDB records of short-eared owl within or near the proposed Project boundary (CDFW 2018a). Per the CWHR short-eared owl's potential suitable habitat within the proposed Project boundary includes Montane Hardwood-Conifer (MHC), AGS, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are located in several isolated locations around Silverwood Lake, including day use areas and adjacent to camping areas. Potential suitable habitat is also found adjacent to the Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads. However, it is likely this species only uses this area for wintering as the proposed Project boundary does not overlap with this species' breeding range.

Project O&M and recreation activities may have the potential to temporarily flush individuals from wintering areas, should they be present. These effects are temporary and minimal, and do not result in adverse effects to the species. Various habitats within

the proposed Project boundary may also provide foraging value for short-eared owl; however, any potential Project effects on foraging habitats are limited and temporary in nature, caused primarily by recreation use outside developed areas. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Burrowing Owl (Athene cunicularia)

The burrowing owl is designated as SSC (CDFW 2019). Typical habitat for this small ground-dwelling owl includes open grassland, open lots near human habitation, and areas along roadsides. Within California, the breeding range of burrowing owl includes the northeastern plateau, Central Valley, San Joaquin Valley, Imperial Valley, Mojave and Colorado Deserts, the southwest corner of San Diego County, and a few coastal counties between Los Angeles and San Francisco. Burrowing owls nest in abandoned burrows dug by small mammals, such as ground squirrels (*Spermophilus* spp.), as well as larger mammals, such as foxes (*Vulpes* spp.) and badgers (*Taxidea taxus*). If burrows are unavailable, burrowing owls may dig their own in soft soil, or utilize pipes, culverts and/or nest boxes (Zeiner et. al. 1988-1990).

There were 17 CNDDB records of burrowing owl in the Project vicinity (CDFW 2018a), but were all outside of the proposed Project boundary. The closest three of these CNDDB records for burrowing owl are approximately 6 miles southwest of the Devil Canyon Powerplant (CDFW 2018a). The burrowing owl is not known to breed or nest within the proposed Project boundary, which does not appear to be within its current or historical breeding range. No occurrences of burrowing owl were observed during relicensing studies or have been reported within or adjacent to the proposed Project boundary. However, potential suitable habitat is found within the proposed Project boundary and includes CHWR habitat types AGS, BAR, CRC, CSC, MCH, and URB (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable habitat is also found adjacent to areas near the Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

In the unlikely event that burrowing owls were to nest within the Project boundary, current Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat could have the potential to affect burrowing owls. Effects on nesting burrowing owls may include mortality of young through burrow abandonment by adult burrowing owls. However, Project O&M activities that may disrupt burrows are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that, if burrowing owls were to nest adjacent to Project facilities, they would be acclimated to the level of disturbance and would not likely to be disturbed by any ongoing and future Project activities. Ground

disturbance and O&M activities outside of the nesting season are limited to temporary disturbances of occasional individuals wintering or foraging within the proposed Project boundary. Year-round recreation effects are also limited to the flushing of occasional individuals from burrows or perches. However, Project O&M ground-disturbing activities are tied to existing facilities, and in some areas that are subject to more frequent recreation use, such as campground and day use areas, which are already highly developed and disturbed, so these activities are not expected to result in adverse effects to this species or its habitat. Therefore, the Project will have less than significant adverse effects to this species.

California Spotted Owl (Strix occidentalis occidentalis)

The California spotted owl is designated as SSC and FSS (CDFW 2019; USFS 2013b). The species was under review for federal Endangered Species Act listing, but the USFWS determined listing was not warranted (USFWS 2017; 84 Federal Register [FR] 60371). Typical habitat for California spotted owl is dense, diverse, multi-layered evergreen forests with open areas under the canopy. Nests are constructed on broken treetops, cliff ledges, in natural tree cavities, and this species often can be found using abandoned hawk nests. Foraging habitat includes areas of larger trees with canopy closures of 40 percent and greater, as well as areas characterized by multiple vegetative strata (NatureServe 2017).

A CNDDB search of nine USGS quadrangle maps (about 509-630 square miles) reported no occurrences of California spotted owl (CDFW 2018a). Nevertheless, the SBNF has established a U.S. Department of Agriculture, Forest Service Protected Activity Center (PAC) for California spotted owl on NFS lands near approximately 1.5 miles of the southern edge of Silverwood Lake. Per the CWHR potential suitable habitat for the species within the proposed Project boundary is VRI (CDFW 2018b). This area of potential suitable habitat is located along portions of the southern shore of Silverwood Lake and near some Project facilities such as the Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

If California spotted owl were to occupy potential suitable forest nesting habitat, Project O&M and recreation activities within and immediately adjacent to the habitat may affect the owl. Potential effects on nesting California spotted owls may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may have the potential to disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that California spotted owls, if present, nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Project O&M and recreation activities outside of the nesting season may temporarily disturb occasional individuals. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and

mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Olive-sided Flycatcher (Contopus cooperi)

The olive-sided flycatcher is designated SSC (CDFW 2019). This species is a common to uncommon summer resident in a wide variety of forest and woodland habitats below 9,000 feet throughout California. It is not found in the deserts, the Central Valley, or other lowland valleys and basins (Zeiner et al. 1988-1990). The olive-sided flycatcher will breed at forest edges and openings such as meadows and ponds (Kaufman 1996). Nests are made of twigs, rootlets and lichens placed out near the tip of horizontal branches of trees. Its winter habitat is also forest edges and clearings where tall trees or snags are present (Altman and Sallabanks 2000). These flycatchers forage primarily by hovering or sallying forward, concentrating on prey via aerial attack. This bird is a passive searcher as well as an active pursuer. Its diet consists of mostly flying insects, with a fondness for wild honeybees and other Hymenopterans (NatureServe 2017).

There are no CNDDB records or other known occurrences of this species in the Project vicinity (CDFW 2018a). Per the CWHR potential suitable habitat within the proposed Project boundary includes CRC and MCH (CDFW 2018b). Areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

If olive-sided flycatcher were to occupy Project lands, O&M and recreation activities within and immediately adjacent to potential suitable woodland and forest nesting habitat may have the potential to affect flycatcher if individuals are present. Potential effects on nesting olive-sided flycatcher may include mortality of young through forced fledging or nest abandonment by adult birds. However, Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that olive-sided flycatchers nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Habitats within the proposed Project boundary also provide foraging value for olive-sided flycatcher; however, any effects on foraging habitats are temporary in nature, and are restricted mainly to visitor recreational activities. This may cause temporary disturbances of occasional individuals if present. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Vermilion Flycatcher (Pyrocephalus rubinus)

Vermilion flycatcher is designated as SSC (CDFW 2019). It is a rare year-round resident along the Colorado River and nests throughout central southern California, central Arizona, central New Mexico, western Oklahoma, and central Texas. It winters in southern California, northern Arizona, central New Mexico, central Texas, and the Gulf Coast (NatureServe 2017). Habitat types include desert riparian habitats (with cottonwoods, willows, and mesquites), chaparral, and hardwood woodland adjacent to irrigated fields, ditches, or other open wet areas. Vermilion flycatcher nests in willows, cottonwoods, mesquite, or other large trees or shrubs from 8 to 20 feet above ground. It feeds primarily on insects (NatureServe 2017; Zeiner et al. 1988-1990).

There are no CNDDB records for vermilion flycatcher from the Project vicinity (CDFW 2018a). HELIX Environmental Planning (2014) reported vermilion flycatcher north of the Project. Although no potential suitable habitat types are present within the proposed Project boundary according to CWHR, potential suitable riparian, chaparral, and woodland habitat likely occurs in the proposed Project boundary (CDFW 2018b).

Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat may affect vermilion flycatcher, should they be present. Possible effects on nesting vermilion flycatcher may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may have the potential to disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that flycatchers nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Potential effects from Project activities outside of the nesting season are limited to temporary disturbances of occasional individuals. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Purple Martin (Progne subis)

The purple martin is designated as SSC (CDFW 2019). This species is a long distance migrant, arriving in California from South America in late March and departing by late September. This species is described by Zeiner et al. (1988-1990) as an uncommon to rare local summer resident of various wooded, low-elevation habitats comprising montane hardwood, valley foothill and montane hardwood-conifer, and riparian habitats. Purple martin also occurs in coniferous habitats, including closed-cone pine-cypress, ponderosa pine, Douglas-fir, and redwood (*Sequoia sempervirens*). These habitats vary structurally and may be old growth, multi-layered or open, and may also have snags. Purple martin most often nest in old woodpecker cavities found in tall, old, isolated trees or snags in open forests or woodlands. However, they may use man-made structures, such as bridges and culverts, for nesting.

There are no CNDDB records of purple martin within or near the proposed Project boundary (CDFW 2018a). However, per the CWHR, potential suitable habitat for purple martin is found within the proposed Project boundary and includes AGS, LAC, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities within and immediately adjacent to potential suitable woodland and forest nesting habitat may have the potential to affect purple martin, should they be present. Potential effects on nesting purple martins may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that purple martins nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Potential effects from Project activities outside of the nesting season are limited to temporary disturbances of occasional individuals. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Le Conte's Thrasher (Toxostoma lecontei)

Le Conte's thrasher is designated as SSC (CDFW 2019). It is an uncommon resident in California deserts from southern Mono County south to the border with Mexico, and also occurs in the western and southern San Joaquin Valley. Habitat types include sparsely vegetated desert wash, desert scrub (including areas with alkaline soils), desert succulent scrub, and Joshua tree woodland. Le Conte's thrasher typically nests in dense, spiny shrubs or densely branched cacti in desert washes from 2 to 8 feet above ground. It subsists on fruits, invertebrates, lizards, and snakes (NatureServe 2017; Zeiner et al. 1988-1990).

Le Conte's thrasher had four CNDDB records in the Project vicinity (CDFW 2018a) and an individual has been observed by DWR on Silverwood Lake during routine Project O&M activities. The species is most likely an occasional visitor to the Project area. While the CWHR does not identify any potential suitable habitat for this species within the Project area, scrub habitat located within the proposed Project boundary is potentially suitable for the species (CDFW 2018b). These areas of potential suitable habitat (coastal scrub) are located in a few scattered locations around Silverwood Lake and near the Devil Canyon Powerplant and Devil Canyon afterbays.

Project O&M and recreation activities within and immediately adjacent to potential suitable riparian nesting habitat may have the potential to affect Le Conte's thrasher, should they be present. In the unlikely event that nesting occurs within the Project boundary, effects on nesting Le Conte's thrasher may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may disrupt vegetation are typically timed to avoid nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that Le Conte's thrashers nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Project activities outside of the nesting season may have the potential to temporarily disturb occasional individuals by way of flushing. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Loggerhead Shrike (Lanius ludovicianus)

The loggerhead shrike is designated as SSC (CDFW 2019). It is a common resident and winter visitor in lowland and foothills throughout California. This species prefers habitats that include open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper and juniper (*Juniperus* spp.), desert riparian, and Joshua tree (*Yucca brevifolia*) habitats (Zeiner et. al. 1988-1990). Loggerhead shrike may often be found perched on poles, wires, or fenceposts.

Loggerhead shrike has been observed by DWR personnel at Silverwood Lake during relicensing studies. Additionally, an individual loggerhead shrike was seen about 1 mile north of the proposed Project boundary by Aspen Environmental Group (2006). Per the CWHR, potential suitable habitat for loggerhead shrike within the proposed Project boundary includes AGS, BAR, CRC, CSC, MCH, URB, and VRI (CDFW 2018b). Due to its use of a wide variety of habitats, loggerhead shrike has the potential to occur within or adjacent to the proposed Project boundary.

Project O&M and recreation activities within and immediately adjacent to potential suitable nesting habitat may have the potential to affect loggerhead shrike. Potential effects on nesting loggerhead shrike may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and could occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that loggerhead shrikes nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Project activities outside of the nesting season would be limited to temporary disturbances of occasional individuals by way of flushing, as are potential year-round recreation effects. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and

avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Mountain Plover (Charadrius montanus)

Mountain plover is designated as SSC (CDFW 2019). It is a fairly common winter resident in California from Sutter and Yuba Counties south to Los Angeles and western San Bernardino Counties to Baja California below 3,200 feet. Habitat types include open grasslands, plowed agricultural fields with little vegetation, heavily grazed rangelands, alkali flats, and open sagebrush areas. Mountain plover does not nest in California. It feeds primarily on insects (NatureServe 2017; Zeiner et al. 1988-1990).

There are no CNDDB records of mountain plover within or near the proposed Project boundary (CDFW 2018a), and no occurrences of this species in the Project area have been reported. Additionally, the species does not nest in California (Shuford 2008). However, per the CWHR, potential suitable habitat for mountain plover within the proposed Project boundary includes AGS and BAR (CDFW 2018b). These areas of potential suitable habitat are located in several scattered locations around Silverwood Lake and near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities may have the potential to temporarily flush individuals from wintering areas should they be present. There would be no expected impacts to potential suitable habitat from Project activities. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Yellow Warbler (Setophaga petechia)

The yellow warbler is designated as SSC (CDFW 2019). The yellow warbler is a migrant, found in California between April and October. Yellow warblers construct nests from 2 to 16 feet above ground in riparian deciduous habitat along the western slope of the Sierra Nevada. These riparian deciduous habitats comprise cottonwoods, willows, alders, and other small trees and shrubs found in low, open-canopy woodland. This species breeds in montane shrubbery in open conifer forests. Territory occupied by yellow warbler usually contains tall trees for singing and foraging, and heavy brush in the understory for nesting (Zeiner et. al. 1988-1990). Forage consists mostly of insects and spiders taken from the upper canopy of deciduous trees and shrubs. Yellow warbler has also been known to eat berries (Zeiner et. al. 1988-1990). Brood parasitism by brown-headed cowbirds (*Molothrus ater*) is thought to be a major cause of population decline in lowland localities in recent decades (Remsen 1978).

An adult yellow warbler was incidentally observed in riparian habitat near a day-use area adjacent to Silverwood Lake during the 2017 relicensing surveys. Potential suitable CWHR habitat types within the proposed Project boundary for the yellow warbler

include CRC, CSC, MCH, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities within and immediately adjacent to potential suitable riparian nesting habitat may have the potential to affect yellow warbler. Potential effects on nesting yellow warbler may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that yellow warblers nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Project activities outside of the nesting season would be limited to temporary disturbances of occasional individuals by way of flushing, as are potential year-round recreation effects. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Lucy's Warbler (Oreothlypis luciae)

Lucy's warbler is designated as SSC (CDFW 2019). It is an uncommon to common summer resident and breeder along the Colorado River and in desert areas, and is rare near the Salton Sea. It breeds in southeastern California, southern Nevada, Utah, southwestern Colorado, south to northeastern Baja California, southern Arizona, northern Sonora, and east to western Texas. Habitat types include desert wash, desert riparian (especially mesquite dominant, but also including willows and cottonwoods), chaparral, hardwood woodland, and saltcedar thickets. This bird typically nests in natural cavities such as woodpecker holes, behind bark, or along banks from 1 to 15 feet above ground, and feeds on insects and plants (NatureServe 2017).

A single Lucy's warbler was incidentally observed in a riparian area adjacent to Live Oak Landing during DWR's relicensing botanical surveys in 2017. Potential suitable habitat within the proposed Project boundary for this species is present and includes CWHR habitat type URB (CDFW 2018b). Potential suitable habitat is found throughout the proposed Project boundary.

Project O&M and recreation activities within and immediately adjacent to potential suitable habitat may have the potential to affect Lucy's warbler. Potential effects on nesting birds may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may potentially disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M

activities or recreation capacity, it can be assumed that warblers nesting adjacent to Project facilities may be acclimated to the level of disturbance and not likely to be disturbed by any ongoing and future Project activities. Project activities outside of the nesting season are limited to temporary disturbances of occasional individuals by way of flushing, as are potential year-round recreation effects. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Yellow-breasted Chat (Icteria virens)

The yellow-breasted chat is designated as SSC (CDFW 2019). It is an uncommon summer resident and migrant to coastal California and the foothills of the Sierra Nevada. This species uses thickets of willow and other brushy vegetation in riparian areas near watercourses for cover, and may be found in elevations up to 4,800 feet in the Sierra Nevada foothills. During migration, yellow-breasted chat may occupy riparian habitat in the lower elevations of mountains (Zeiner et. Al. 1988-1990). Foraging occurs in low trees and shrubs and consists of insects, spiders, berries, and other fruits. Breeding occurs in early May, and continues into early August, with peak activity in June. Breeding normally takes place in dense shrubs along stream or river courses.

There are no CNDDB records of yellow-breasted chat within or near the proposed Project boundary (CDFW 2018a). However, potential suitable habitat is found within the proposed Project boundary and appropriate CWHR habitat types include CSC and VRI (CDFW 2018b). These areas of potential suitable habitat include scattered locations around the shoreline of Silverwood Lake, and in the vicinity of the Devil Canyon Afterbay and other Project facilities where potential suitable habitat may be present.

There are limited Project O&M and recreation activities located near identified riparian habitat; however, if any Project activities occurred near riparian habitat, they could potentially affect nesting yellow-breasted chat. Potential effects on nesting yellow-breasted chat may include mortality of young through forced fledging or nest abandonment by adults. Project O&M activities that may disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that yellow-breasted chat nesting adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by ongoing and future Project activities. Potential effects outside of the nesting season are limited to temporary disturbances of occasional individuals by way of flushing, if present. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Grasshopper Sparrow (Ammodramus savannarum)

The grasshopper sparrow is designated as SSC (CDFW 2019). The grasshopper sparrow prefers grassland habitat, but can also be found in old fields, savannahs, and shortgrass prairies. During the breeding season, clumped vegetation of intermediate height, interspersed in grasslands is required (NatureServe 2017). They are an uncommon and local summer resident in foothills and lowlands west of the Cascade-Sierra Nevada crest from Mendocino and Trinity Counties south to San Diego County (Zeiner et al. 1988-1990). They arrive at nesting areas between March and June in eastern Washington, central Nevada, and southern California. Departure for the wintering grounds in central California, southern Arizona, and south through Mexico and Central America occurs in mid-September. The grasshopper sparrow eats insects, other small invertebrates, grain, and seeds that are picked up from the ground (NatureServe 2017).

There are no CNDDB records of grasshopper sparrow within or near the proposed Project boundary (CDFW 2018a). However, AGS is potential suitable habitat for grasshopper sparrow which is found within the proposed Project boundary (CDFW 2018b). This potential suitable habitat includes scattered locations around Silverwood Lake and near the Devil Canyon Afterbay.

Project O&M including vegetation management, road maintenance, and recreation activities within and immediately adjacent to potential suitable grassland nesting habitat may have the potential to affect grasshopper sparrow. Potential effects on nesting grasshopper sparrow could include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may have the potential disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that nesting grasshopper sparrows adjacent to Project facilities may be acclimated to the level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Grasslands within the proposed Project boundary also provide foraging value for grasshopper sparrow; however, any effects on foraging birds would be limited to flushing, as there would be limited, if any, habitat modification associated with Project O&M, since vegetation management is limited to areas already modified for Project use. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Oregon Vesper Sparrow (Pooecetes gramineus affinis)

The Oregon vesper sparrow is designated as SSC (CDFW 2019). This species is a common summer resident east of the Cascade crest in Oregon, and breeds from the Inyo Mountains south to the San Bernardino Mountains. It winters in the southern United States and occur north to Owens Valley, Carrizo Plain, and Antelope Valley. It is a ground-dwelling species, preferring dry grass fields, with some shrubs or similar

structure, and is found in old fields, grasslands, and cultivated crops. Shallow nests made of woven grasses are placed on the ground. Forage items include seeds of grasses, weeds, grain crops, and during the breeding season, insects (Jones and Cornely 2002).

There are no CNDDB records of vesper sparrow within or near the proposed Project boundary (CDFW 2018a). However, AGS is potential suitable habitat for vesper sparrow which is found within the proposed Project boundary (CDFW 2018b). This area of potential suitable habitat includes scattered locations around Silverwood Lake and near the Devil Canyon Afterbay. However, it is likely this species only uses this area for wintering as it does not overlap with this species' breeding range.

Project O&M and recreation activities may have the potential to temporarily flush individuals from wintering areas, should they be present. These potential effects are temporary and minimal. Grassland habitats within the proposed Project boundary may also provide foraging value for Oregon vesper sparrow; however, any potential Project effects on foraging habitats are typically limited in scope and temporary in nature. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Tricolored Blackbird (Agelaius tricolor)

The tricolored blackbird is currently designated as both SSC and California Threatened (CDFW 2019). A highly gregarious species, the tricolored blackbird can be found roosting and foraging in flocks. Colonies can sometimes be found within short distances of one another (NatureServe 2017). This species can be found in herbaceous wetland areas, as well as cropland and hedgerow habitats. Tricolored blackbird is known to breed in fresh-water marshes, consisting of cattails, tule, bulrushes, and sedges (*Carex* spp.) (NatureServe 2017). Tricolored blackbird feeds on insects, seeds and grain.

There are no CNDDB records of tricolored blackbird within the Project vicinity (CDFW 2018a). However, potential suitable habitat for tricolored blackbird is found within the proposed Project boundary and appropriate CWHR habitat types include AGS, URB, and VRI (CDFW 2018b). These areas of potential suitable habitat are located in scattered locations around Silverwood Lake and a small riparian area near the Devil Canyon Afterbay.

Project vegetation management, road maintenance, and recreation activities within and immediately adjacent to potential suitable riparian nesting habitat may have the potential to affect tri-colored blackbird. Potential effects on nesting tri-colored blackbird could include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may potentially disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that tri-colored blackbirds nesting adjacent to Project facilities may be

acclimated to the existing level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Potential effects outside of the nesting season are limited to temporary disturbances of occasional individuals by way of flushing, if present. Non-routine O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis through consultation with CDFW. Therefore, the Project will have less than significant adverse effects to this species.

Yellow-headed Blackbird (Xanthocephalus xanthocephalus)

The yellow-headed blackbird is designated as SSC (CDFW 2019). This species breeds commonly, but locally, in fresh-water marshes of cattail, tule (*Schoenoplectus* spp.) or bulrush east of the Cascade Range and Sierra Nevada (Zeiner et al. 1988-1990). Nests are basketlike structures of wet grasses, reeds, and cattails woven around stems. Nests are placed within a male's territory and are always overhanging the water (Twedt and Crawford 1995). During migration and winter, open, cultivated lands, pastures, and fields are used. The yellow-headed blackbird feeds on insects, seeds, and grain in fields, on muddy ground near water or at the water's surface during the breeding season (NatureServe 2017). Foraging outside of the breeding season takes place in upland areas, eating grains and weed seeds (Twedt and Crawford 1995).

There are no CNDDB records of yellow-headed blackbird within or near the proposed Project boundary (CDFW 2018a). However, potential suitable habitat for yellow-headed blackbird is found within the proposed Project boundary and appropriate CWHR habitat types include AGS and LAC (CDFW 2018b). These areas of potential suitable habitat include Silverwood Lake, Devil Canyon Afterbay, their surrounding shorelines, and scattered grassland habitat around Silverwood Lake and south of the Devil Canyon Afterbay.

Project O&M and recreation activities within and immediately adjacent to potential suitable wetland nesting habitat may affect yellow-headed blackbird, should they be present. Potential effects on nesting yellow-headed blackbird may include mortality of young through forced fledging or nest abandonment by adults. However, Project O&M activities that may potentially disrupt vegetation are typically timed to avoid the nesting season and occur in or around existing Project facilities. Additionally, as there are no planned changes to O&M activities or recreation capacity, it can be assumed that yellow-headed blackbirds nesting adjacent to Project facilities may be acclimated to the existing level of disturbance and are not likely to be disturbed by any ongoing and future Project activities. Outside of the nesting season, potential Project effects would be limited to temporary disturbances of occasional individuals. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Special-Status Mammals

Pallid Bat *(Antrozous pallidus)*

The pallid bat is designated SSC and FSS (CDFW 2019; USFS 2013b). It occurs throughout California. Preferred habitats include low elevation (below 6,000 feet) rocky arid deserts and canyonlands, shrub-steppe grasslands, karst formations, and coniferous forests above 7,000 feet. Common roost locations include crevices in rocky outcrops and cliffs, caves, mines, trees, and various human structures, such as bridges, barns, porches and attics. Roosts may be occupied by one or up to hundreds of pallid bats. Pallid bats typically breed from October to February, with one or two pups born between late April and July and weaned in August (WBWG 2017).

One CNDDB occurrence of pallid bat is documented near the Project, while a second occurrence is located approximately 12 miles south of the Project from 1929 (CDFW 2018a). Pallid bat has the potential to occur throughout a variety of different habitats within the proposed Project boundary; however, no occurrences of this species have been reported within the proposed Project boundary. Appropriate CWHR habitat types within the proposed Project boundary include AGS, BAR, CRC, CSC, MCH, and Montane Hardwood (MHW), year-round (CDFW 2018b). Due to the presence of previous occurrences and potential suitable habitat, there is the potential for this species to use any appropriate cover within the proposed Project boundary for roosting and breeding. In addition, most habitats could be used for foraging. Areas of potential suitable roosting and breeding habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable roosting and breeding habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities may affect pallid bat individuals, should they be present. This species is sensitive to various disturbances and can be directly or indirectly affected by human activities at roost sites, including maternity roosts. Potential roost sites include rocky outcrops and crevices, trees, and various man-made structures associated with Project facilities and recreation areas. While roosts in rocky areas are unlikely to be affected by Project-related activities as none are known around developed facilities, roosts in vegetation or man-made structures have the potential to be affected should individuals be present. Vegetation management conducted as part of routine O&M is limited to existing Project facilities, roads, and recreation areas with a buffer of 20 to 75 feet around facilities and within up to 15 feet on either side of roads and trails adjacent to Project facilities; and within and adjacent to recreation areas depending on site conditions and landowner agreements. Since routine Project O&M vegetation management has been ongoing under the existing license, the vegetation in these areas is already expected to be disturbed and not preferred habitat for bats. Therefore, impacting maternal roosts through vegetation removal or management would be unlikely.

Additionally, ongoing routine maintenance is generally minor and would not be expected to potentially impact maternal roosts that were already contained in a man-made structure where human activity is common. Vegetation removal and other O&M activities may potentially lead to temporary disturbances of occasional individuals in temporary solitary roosts, but would be limited in the same way as impacts to maternal roosts. Year-round recreation effects outside of man-made structures are also limited to the flushing of occasional individuals within a small buffer of recreational facilities. Habitats within the proposed Project boundary also provide foraging value for pallid bats; however, any potential effects on foraging habitats are limited to areas of vegetation management, where the work is ongoing and vegetation is already disturbed and less likely to be utilized by pallid bats. Like all other potential Project O&M effects, nighttime lighting would be confined to Project facilities and recreation areas. These areas have been developed for multiple years and bats are likely naturalized to this nighttime lighting. There are no proposed changes to facilities or Project O&M that would cause a change in lighting.

At Project recreation sites, vegetation management activities may include the removal of vegetation, hazardous branches, and hazard trees, as identified by DPR and DWR, to facilitate recreation activities, protect public safety, and reduce fire hazards. The Integrated Vegetation Management Plan (Measure TR1) includes surveys for this species prior to the removal of hazard trees. Therefore, current Project activities may potentially impact individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Townsend's Big-eared Bat (Corynorhinus townsendii)

Townsend's big-eared bat is designated as SSC and FSS (CDFW 2019; USFS 2013b). This species can occur throughout California, with the exception of the highest elevations of the Sierra Nevada crest (CDFW 2018b). Preferred habitats include coniferous forests, mixed mesophytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. This species forages along edge habitats associated with streams and wooded habitats (WBWG 2017). Caves and abandoned mines are primary roosting habitat, but roosts in buildings, bridges, rock crevices, and hollow trees have been reported. Maternity colonies vary in size and can have a few individuals up to several hundred individuals. Mating occurs between October and February, and a single pup is born between May and June (WBWG 2017).

There are no CNDDB occurrences of Townsend's big-eared bat within the proposed Project boundary. The closest known occurrence (Occurrence #302) is located approximately 23 miles from the proposed Project boundary, north of Silverwood Lake (CDFW 2020). Appropriate CWHR habitat types within the proposed Project boundary include BAR, CRC, CSC year-round, and AGS in the summer (CDFW 2018b). Although

Townsend's big-eared bat has not been recorded within the proposed Project boundary, the presence of potential suitable habitat, paired with the existence of occurrences within 25 miles and the difficulty in identifying the species, results in the potential for this species to use any part of the area within the proposed Project boundary with appropriate cover for roosting and breeding. In addition, most habitats could be used for foraging. These areas of potential suitable habitat for roosting and breeding are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low-Level Outlet Works areas. Potential suitable roosting and breeding habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

O&M and recreation activities may affect Townsend's big-eared bat individuals, if present. This species is sensitive to various disturbances and can be directly or indirectly affected by human activities at roost sites, including maternity roosts. Potential roost sites include rocky outcrops and crevices, trees, and various man-made structures associated with Project facilities and recreation areas. While roosts in rocky areas are unlikely to be affected by Project-related activities as none are known around developed facilities, roosts in vegetation or man-made structures have the potential to be affected should they be present. Vegetation management conducted as routine O&M is limited to existing Project facilities, roads, and recreation areas with a buffer of 20 to 75 feet around facilities and within up to 15 feet on either side of roads and trails adjacent to Project facilities; and within and adjacent to recreation areas depending on site conditions and landowner agreements. Since vegetation management has been ongoing in these areas for a period of time under the existing license, the vegetation would be expected to be disturbed and not preferred habitat for bats. Therefore, impacting maternal roosts through vegetation removal or management would be very unlikely.

Additionally, DWR proposes to continue to operate the Project as it has operated historically and ongoing maintenance is generally minor and would not be expected to impact maternal roosts that were already contained in a man-made structure where human activity is common. Vegetation removal and other O&M activities may potentially lead to temporary disturbances of occasional individuals in temporary solitary roosts, but would be limited in the same way as impacts to maternal roosts. Year-round recreation effects outside of man-made structures are also limited to the flushing of occasional individuals within a small buffer of recreational facilities. Habitats within the proposed Project boundary also provide foraging value for Townsend's big eared bats; however, any potential effects on foraging habitats are limited to areas of vegetation management. Like all other potential Project O&M effects, nighttime lighting would be confined to Project facilities and recreation areas. These areas have been developed for multiple years and bats are likely naturalized to this nighttime lighting. There are no proposed changes to facilities or Project O&M that would cause a change in lighting.

At Project recreation sites, vegetation management activities include the removal of vegetation, hazardous branches, and hazard trees, as identified by DPR and DWR, to facilitate recreation activities, protect public safety, and reduce fire hazards. The

Integrated Vegetation Management Plan (Measure TR1) includes surveys for this species prior to the removal of hazard trees. Project activities may potentially impact individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

***Western Red Bat (Lasiurus blossevillii*)**

Western red bat is designated as SSC (CDFW 2019). In California, this species can be found along most of the coast and west of the Sierra Nevada crest (CDFW 2018b). Western red bats are often solitary and roost primarily among foliage of trees or shrubs adjacent to streams, open fields and, occasionally, in urban areas. This species migrates in groups and forages in close proximity with one another. Males and females appear to occupy different summer ranges and differ in the timing of their migration. Winter behavior is poorly understood, but it is believed that western red bats occasionally wake from hibernation on warm days to feed. Mating occurs in late summer or early fall, and females postpone pregnancy until spring. Gestation is about 80 to 90 days, and up to five pups may be born (WBWG 2017). Based on documentation of eastern red bat hibernating in leaf litter during the winter, western red bat may also do the same (Texas Parks and Wildlife 2019).

There are no known CNDDB occurrences of western red bat within the proposed Project boundary. The closest known occurrence (Occurrence #120) is located approximately 45 miles west of the proposed Project boundary, near Pasadena (CDFW 2020). However, appropriate CWHR habitat types within the proposed Project boundary include AGS, CRC, and CSC year-round (CDFW 2018b). The presence of potential suitable habitat, paired with the existence of an occurrence 45 miles away, indicates the potential for this species to use vegetation within the proposed Project boundary for roosting and breeding. In addition, most habitats could be used for foraging. Areas of potential suitable breeding and roosting habitat are located in scatted locations around Silverwood Lake, including day use areas and adjacent to camping areas, as well as in the vicinity of the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M and recreation activities may affect western red bat individuals, if present. This species is sensitive to various disturbances and can be directly or indirectly affected by human activities at roost sites, including maternity roosts. Potential roost sites include leaf litter and hollow logs in winter and vegetation throughout the year. Roosts in vegetation, hollow logs, and leaf litter have the potential to be affected by vegetation management, should they be present. However, vegetation management is limited to existing Project facilities, roads, and recreation areas with a buffer of 20 to 75 feet around facilities and within up to 15 feet on either side of roads and trails adjacent to Project facilities; and within and adjacent to recreation areas depending on site conditions and landowner agreements. Since this vegetation management has been

ongoing for a period of time under the existing license, the vegetation in this area is already expected to be disturbed and may not be preferred habitat for bats. Additionally, controlled burn activities, identified as the primary cause of harm to bats roosting in leaf litter (Texas Parks and Wildlife 2019), is not performed at the Project. Therefore, potential Project impacts to roosts through vegetation management would be unlikely.

Year-round recreation effects are also limited to the flushing of occasional individuals within a small buffer of recreational facilities. Habitats within the proposed Project boundary also provide foraging value for western red bats; however, any potential effects on foraging habitats are limited to areas of vegetation management. Like all other potential Project O&M effects, nighttime lighting would be confined to Project facilities and recreation areas. These areas have been developed for multiple years and bats are likely naturalized to this nighttime lighting. There are no proposed changes to facilities or Project O&M that would cause a change in lighting. Therefore, Project activities may potentially impact individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat. Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Diego Black-tailed Jackrabbit (Lepus californicus bennettii)

San Diego black-tailed jackrabbit is designated as SSC (CDFW 2019). It occurs in cismontane and transmontane areas in southern California, including Los Angeles, Riverside, San Bernardino, and San Diego Counties, and south to northern Baja California (NatureServe 2017). Habitat types include open plains, fields, deserts with scattered patches of shrubs, open chaparral, scrub, and grasslands (Zeiner et al. 1988-1990).

There were two CNDDB records for San Diego black-tailed jackrabbit south of the Project. One is located within the Lytle Creek wash approximately 5 miles south of the Project, while the other is located in Fontana, California, approximately 7.5 miles southwest of the Project (CDFW 2018a). Per the CWHR, potential suitable habitat for the San Diego black-tailed jackrabbit includes AGS, CRC, CSC, MCH, and URB (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam and Low Level Outlet Works. Potential suitable habitat is also found adjacent to areas near the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Proposed Project O&M activities that may result in habitat disturbance, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect San Diego black-tailed jackrabbit. Potential impacts from these types of activities are typically limited in scope and duration, infrequent, and focused on already disturbed or developed areas. Any jackrabbits living adjacent to Project facilities

may be accustomed to existing levels of disturbance from Project activities, and as there are no planned changes to O&M activities or recreation capacity, there would be no expected new or increased impacts to the species. Therefore, Project activities may potentially impact a small number of individuals but are not expected to have an overall adverse impact on the species' viability or its habitat.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Bernardino Northern Flying Squirrel (Glaucomys oregonensis californicus)

San Bernardino northern flying squirrel is designated as SSC and FSS (USFS 2013b; CDFW 2019). It historically occurred in the San Gabriel, San Bernardino, and San Jacinto Mountains from 3,960 to 8,250 feet; however, there is only current information on the San Bernardino population. Habitat types include a variety of coniferous and deciduous forests, including riparian forest and mixed conifer forests with black oak. Although primarily active year-round in trees, this nocturnal, secretive animal also forages on the ground. It nests in tree cavities of Jeffrey pine and white fir, and eats a variety of tree seeds, fruits, insects, fungi, and sap (NatureServe 2017; Bolster 1998).

San Bernardino northern flying squirrel occurs in geographically isolated populations in high elevation forests of the San Bernardino and San Jacinto Mountains (possibly extirpated, 77 FR 4973). Records for San Bernardino northern flying squirrel are distributed from Lake Arrowhead to Sawpit Canyon on the south side of Silverwood Lake within the proposed Project boundary (CDFW 2018a).

San Bernardino northern flying squirrel has six CNDDB records in the Project vicinity, including one within the proposed Project boundary along the south side of Silverwood Lake (CDFW 2018a). Potential suitable habitat within the proposed Project boundary, as reported by CWHR, includes MHC and VRI (CDFW 2018b). Potential suitable habitat for this species occurs along Silverwood Lake.

Project O&M activities that could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect San Bernardino northern flying squirrel. Since San Bernardino northern flying squirrel nests in trees, any removal of hazard trees during their breeding season could result in the loss of young. However, Project O&M activities that may potentially disrupt vegetation are typically timed to avoid the breeding season and occur in or around existing Project facilities. Additionally, the Integrated Vegetation Management Plan (Measure TR1) includes measures for conducting surveys prior to the removal of hazard trees for special-status species and measures that would allow for individuals to relocate on their own volition, as well as protective measures during emergencies. Other impacts from Project activities may potentially affect occasional individuals by way of temporary disturbance. Overall, Project activities may potentially

impact individuals, but are not expected to have an overall adverse impact on the species' viability or its habitat.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Northwestern San Diego Pocket Mouse (*Chaetodipus fallax fallax*)

Northwestern San Diego pocket mouse is designated as SSC (CDFW 2019). It occurs in southwestern California on the coastal side of the mountains from Los Angeles County to San Diego County, including the San Bernardino Mountains, in elevations up to 6,000 feet (NatureServe 2017; County of Riverside 2003). Habitats include open, sandy, herbaceous areas in coastal scrub, chaparral, sagebrush, desert scrub and washes, and annual grassland (Zeiner et al. 1988-1990). This nocturnal mouse subsists on primarily seeds.

Northwestern San Diego pocket mouse has seven CNDDB records in the Project vicinity (CDFW 2018a), but none within the proposed Project boundary. Potential suitable habitat for the northwestern San Diego pocket mouse, as reported by CWHR, includes AGS, CRC, and CSC (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas. Potential suitable habitat is also found adjacent to areas nears the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M activities that could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect Northwestern San Diego pocket mouse. Potential impacts from these types of activities are typically limited in scope and duration, infrequent, and concentrated at already disturbed developed sites. O&M and recreation activities may potentially affect occasional individuals; however, these activities likely will not adversely affect the species as a whole.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Tehachapi Pocket Mouse (Perognathus alticola inexpectatus)

Tehachapi pocket mouse is designated as SSC (CDFW 2019). It occurs in isolated areas of the Tehachapi Mountains and in the San Bernardino Mountains near Strawberry Peak from elevations of 3,500 to 5,900 feet. This animal was last collected in 1938 in the San Bernardino Mountains; however, the population may no longer exist.

Habitat types include ponderosa and Jeffrey pine forest, mixed chaparral, and sagebrush habitats. This nocturnal mouse feeds on plant seeds and insects, and burrows in loose soil, aestivating in very hot weather and hibernating in very cold weather (Zeiner et al. 1988-1990).

CNDDB records for Tehachapi pocket mouse from the Strawberry Peak area south of Lake Arrowhead are not recent (i.e., 1920 to 1934) and may represent an isolated population that has since been extirpated (CDFW 2018a; Naylor and Roach 2017). There are no known occurrences of this species within the proposed Project boundary. Potential suitable habitat within the proposed Project boundary, as reported by CWHR, is MCH (CDFW 2018b). This area of potential suitable habitat is located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M activities that could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect Tehachapi pocket mouse. Potential impacts from these types of activities are typically limited in scope and duration, infrequent, and concentrated at already disturbed developed sites. Ongoing O&M and recreation activities may potentially affect occasional individuals; however, the impacts likely will not adversely affect the species as a whole.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Los Angeles Pocket Mouse (*Perognathus longimembris brevinasus*)

Los Angeles pocket mouse is designated as SSC (CDFW 2019). It occurs in the Los Angeles Basin and is uncommon in the San Bernardino, San Jacinto, and Temecula Valleys from elevations of 550 to 2,900 feet. Habitats include low elevation grasslands, alluvial sage scrub, chaparral, and coastal sage scrub (NatureServe 2017). This nocturnal mouse burrows in sandy soils and is relatively inactive above ground from fall to spring (Zeiner et al. 1988-1990).

The nearest known location is a 1993 CNDDB occurrence that is presumed to be extant at the base of the San Bernardino Mountains, approximately 1.75 miles southeast of the Devil Canyon Powerplant (CDFW 2018a). There are no known occurrences of this species within the proposed Project boundary. Silverwood Lake occurs above the known elevation range of this species. Potential CWHR suitable habitat within the proposed Project boundary at the Devil Canyon Powerplant includes AGS, CSC, and MCH. Potential suitable habitat is located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, and adjacent to areas near

the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M activities that could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect Los Angeles pocket mouse. Potential impacts from these types of activities are typically limited in scope and duration, infrequent, and concentrated at already disturbed developed sites. Ongoing O&M and recreation activities may potentially affect occasional individuals; however, the impacts likely will not adversely affect the species as a whole.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Southern Grasshopper Mouse (Onychomys torridus ramona)

Southern grasshopper mouse is designated as SSC (CDFW 2019). This mouse is found in the Mojave Desert and arid habitats in the southern Central Valley of California with low to moderate shrub cover, as well as in Los Angeles and San Diego Counties. Habitat types include alkali desert scrub, desert scrub, succulent desert scrub, desert wash, desert riparian, coastal scrub, mixed chaparral, sagebrush scrub, and bitterbrush scrub. The species is less common in valley foothill and montane riparian. This nocturnal animal is active year-round and eats invertebrates (NatureServe 2017; Zeiner et al. 1988-1990).

There are no CNDDB records for southern grasshopper mouse within or near the proposed Project boundary (CDFW 2018a). However, potential CWHR suitable habitat for southern grasshopper mouse is found within the proposed Project boundary and includes AGS, CSC, MCH, and VRI (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads..

Project O&M activities that could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect southern grasshopper mouse. Potential impacts from these types of activities are typically limited in scope and duration, infrequent, and concentrated at already disturbed developed sites. Ongoing O&M and recreation activities may potentially affect occasional individuals; however, the impacts likely will not adversely affect the species as a whole.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance

activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

San Diego Desert Woodrat (Neotoma lepida intermedia)

San Diego desert woodrat is designated as SSC (CDFW 2019). It occurs in southwestern California from San Luis Obispo County south to northwestern Baja California, as well as in the southern San Joaquin Valley and southern Sierra Nevada. Habitat types include sagebrush scrub and chaparral. This nocturnal animal is active year-round and eats fruits and seeds (NatureServe 2017). It builds houses used for nesting, caching food, and escaping from predators; these houses are built with twigs, sticks, and rocks positioned against a rock crevice, at the base of a shrub, or in the lower branches of trees (Zeiner et al. 1988-1990).

There are two CNDDB records within the Project vicinity for San Diego desert woodrat. One from alluvial fan scrub habitat about two miles east of the Devil Canyon Powerplant at the base of the San Bernardino Mountains, and the second from about four miles south of the Devil Canyon Powerplant at the confluence of Cajon and Lytle Creek washes (CDFW 2018a). Although no San Diego desert woodrats were observed during the 2017 relicensing surveys, stick houses were incidentally observed throughout the upland areas surrounding Silverwood Lake that may potentially indicate their presence. Potential suitable CWHR habitat within the proposed Project boundary for the woodrat includes CRC, CSC, and MCH (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M activities that lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat, may have the potential to affect San Diego desert woodrats resulting in the displacement of individuals and modifications to potential suitable habitat that could be used for shelter or foraging. These activities include pedestrian and vehicle traffic on trails and roadways, as well as the general use of beaches and other recreation areas. While these activities are not likely to impact individuals, they could pose an impact if they occur during the reproductive season or result in damage or destruction of a nest. These activities may potentially impact individuals but are not expected to have an overall adverse impact on the species' viability or habitat.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

Ringtail (Bassariscus astutus)

The ringtail is designated as FP (CDFW 2019). Ringtail is a widely distributed, common to uncommon, permanent resident of California. This species is nocturnal and can be found in low to mid-elevation up to 5,000 feet. Potential suitable habitat for this species includes riparian and forest, and shrub habitats in close proximity to water (less than 0.6 miles). Important elements of ringtail habitat include rocky areas with cliffs or crevices, hollow trees, logs and snags, all of which are used for daytime shelter. Ringtail den in rock crevices, hollow trees, logs and snags, burrows dug by other animals, and remote buildings (NatureServe 2017). Ringtail breeds between February and May, with gestation lasting between 51 and 54 days. Litters contain between one and four young, and at 60 to 100 days, young begin to forage with their mother. By the end of their first summer, young are weaned and leave their mother. Both adult and young ringtails are omnivorous, but prefer animal matter (NatureServe 2017).

Ringtail was reported to occur in Silverwood Lake State Recreation Area by DPR (2016) and California Watchable Wildlife (2018); however, there are no CNDDB records for this species in the Project vicinity (CDFW 2018a). Potential suitable CWHR habitat within the proposed Project boundary for ringtail includes AGS, BAR, CRC, CSC, MCH, and VRI (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project activities that may have the potential to affect ringtail primarily include road maintenance, vegetation management, recreation activities, and other disturbances within potential suitable habitat. However, the majority of all activities are located around developed areas, where ringtail (except for ones adapted to human presence) would typically not be present. Additionally, ringtail is mostly active nocturnally and there are no nighttime Project activities that could potentially affect this species. Removal of hazard trees might be expected to potentially impact a ringtail beyond occasional flushing if individuals are present.

DWR's proposed Integrated Vegetation Management Plan (Measure TR1) has a provision for surveying hazard trees prior to removal and for avoiding harm to denning or sleeping ringtails including the development of measures in consultation with CDFW. Pre-construction surveys prior to non-routine Project activities will also ensure ringtails are not present prior to any ground disturbance. This combination of measures would be expected to minimize potential effects on ringtail and would not result in take pursuant to California Fish and Game Code Section 4700.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. This discussion will also include consultation with the CDFW if there is the

potential for a project to impact ringtail. Therefore, the Project will have less than significant adverse effects to this species.

American Badger (Taxidea taxus)

The American badger is designated as SSC (CDFW 2019). An uncommon, but permanent resident found throughout most of California, except in the North Coast area (Zeiner et al. 1988-1990), the American badger is found most abundantly in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. This species' diet consists primarily of rodents: rats (*Rattus* spp.), mice, chipmunks, pocket gophers (Geomyidae family), and ground squirrels. The American badger will also take some reptiles, insects, earthworms, eggs, birds, and carrion as prey items when ground squirrel populations are low (NatureServe 2017). Seasonal dietary shifts in response to prey availability have been observed.

There are two CNDDB reports American badger within the project vicinity including one from occurrences two miles northwest of Silverwood Lake and the second six miles to the east of the proposed Project boundary, around Lake Arrowhead (CDFW 2018a). Suitable CWHR habitat for the American badger within the proposed Project boundary includes AGS, BAR, CRC, and MCH (CDFW 2018b). These areas of potential suitable habitat are located around much of the shoreline of Silverwood Lake, including throughout the camping and day use areas, as well as around the Cedar Springs Dam. Potential suitable habitat is also found adjacent to the San Bernardino Tunnel and Surge Chamber, Devil Canyon Powerplant Penstocks, Devil Canyon Afterbay, and associated service roads.

Project O&M activities could lead to disturbance of habitat, and recreational activities within and immediately adjacent to potential suitable habitat may have the potential to affect American badger by resulting in the displacement of individuals and modifications to potential suitable habitat that could be used for shelter or foraging. These activities include pedestrian and vehicle traffic on trails and roadways, as well as the general use of beaches and other recreation areas. These activities could potentially pose an impact if they occur during the reproductive season or result in damage or destruction of a den. However, most Project activities are located at or around existing facilities, where badgers may be acclimated to existing Project activities; there are no planned changes to O&M activities or recreation capacity that might increase impacts beyond the existing conditions. Overall, Project activities may have the potential to impact individuals, but are not expected to have an overall adverse impact on the species' viability or habitat.

Non-routine Project O&M activities will be evaluated for potential resource impacts, including any effects on special-status species, prior to any ground disturbance activities, and avoidance and mitigation measures will be determined on a project-by-project basis. Therefore, the Project will have less than significant adverse effects to this species.

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