4.3.1.2 Sediment Inflow Boundary Conditions

4.3.1.3 Gobernadora Canyon Creek

The inflow curve from the Gobernadora Scour Report (September 2017) was used for the Gobernadora HEC-6T model. The inflow curve was based on data collection conducted by GMU Geotechnical along Gobernadora Canyon Creek along the study reach (2006 and 2016). HEC-6 gradation classifications use the American Geophysical Union Scale. The transport function is selected using the U.S. Army Corps of Engineers (USACOE) SAM Hydraulic Design Package for Channels SAM.AID function.

4.3.1.4 San Juan Creek

The Modified Universal Soil Loss Equation (MUSLE) was generally used as prescribed in the Approved Ultimate ROMP to determine the watershed coarse sediment contributions to San Juan Creek and its tributaries for all applicable conditions to evaluate the streambed stability impacts related to a reduction in coarse sediment production and delivery. The MUSLE was originally parameterized to compute the sediment yield for a total storm, relying on the event peak discharge and total runoff volume. In order to relate the results in the form of a rating curve at inflow points defined within the HEC-6T model format, the exponent coefficient requires adjustment to correlate the summation of computed ordinate-based sediment yields to the computed total storm sediment yield. The total storm sediment yield exponent coefficient is defined as 0.56 for the southern California region. To satisfy the correlation between total storm and ordinate-based calculations, the exponent coefficient was adjusted to a value of 0.46. This approach was used to develop the HEC-6T sediment inflow rating curves for the San Juan Creek local inflow points.

4.3.1.5 Hydraulic Boundary Conditions

The downstream hydraulic controls for San Juan Creek were determined from the hydraulic model previously developed as part of the Approved Ultimate ROMP. The applied rating curve is shown in Table 4-9. The Gobernadora model uses a normal depth water surface elevation based on the slope of 0.0001 as the downstream boundary condition to initiate the hydraulic calculations. Figure 4-2 shows cross section 18111 location.

Table 4-9: San Juan Creek Downstream Hydraulic Control at XS 18111

Q (cfs)	WSE (ft)	Flow Depth (ft)
0	82.72	0.00
1,000	86.79	4.07
2,000	87.79	5.07
3,000	88.79	6.07
4,000	89.79	7.07
5,000	90.78	8.06
6,000	91.38	8.66
7,000	91.98	9.26
8,000	92.57	9.85
9,000	93.17	10.45
10,000	93.77	11.05

Q (cfs)	WSE (ft)	Flow Depth (ft)
11,000	94.12	11.40
12,000	94.47	11.75
13,000	94.81	12.09
14,000	95.16	12.44
15,000	95.51	12.79
16,000	95.86	13.14
17,000	96.21	13.49
18,000	96.55	13.83
19,000	96.90	14.18
20,000	97.25	14.53
21,000	97.45	14.73
22,000	97.65	14.93
23,000	97.84	15.12
24,000	98.04	15.32
25,000	98.24	15.52
26,000	98.44	15.72
27,000	98.64	15.92
28,000	98.83	16.11
29,000	99.03	16.31
30,000	99.23	16.51

4.3.1.6 Bed-material Gradation Curves

The bed-material gradation curves are based on the sampling and analysis presented in the Approved Ultimate ROMP (Section 12.3.2). For San Juan Creek, samples OC3, OC5, OC6, and OC7 were defined in the model at the downstream terminus (XS 18111), downstream of the Gobernadora Canyon confluence (XS 38665), upstream of the Gobernadora confluence (XS 42073), and the upstream terminus (XS 52124) respectively. For Gobernadora Canyon, the distribution data used for the sediment and scour analysis was an average of various samples. The samples are a result of data collection conducted by GMU along Gobernadora Canyon in their 2006 study.

4.3.1.7 Hydrology

Event-based and long-term flood hydrographs were defined for each set of conditions modeled, which include the existing, phased-mitigated, and ultimate-mitigated conditions for San Juan Creek and the existing and ultimate conditions for Gobernadora Canyon.

The main stem upstream inflow boundary for San Juan Creek corresponds to hydrologic Node 126 and hydraulic cross section 52124, located downstream of the PA-4 Outfall 22. The tributary inflow points defined for San Juan Creek are as follows:

- Node 126 (XS 52124) – located immediately downstream from PA-4 Outfall 22
- Node 127 (XS 45373) – located immediately downstream of PA-3 Outfall 13
- Node 133U (39524) – located immediately downstream of regional node 129 and PA-3 Outfall 11

- Node 133T (2096) – located at the confluence of Gobernadora Canyon and San Juan Creek
- Node 133c (XS 39524) – located immediately downstream from the Gobernadora Canyon confluence; includes the hydrologic contribution from PA-2 Outfall 7
- Node 134u (XS 36074) – located immediately upstream from the Chiquita Canyon confluence; includes the hydrologic contribution from PA-2 Outfall 5
- Node 134c (XS 35121) – located immediately downstream from the Chiquita Canyon confluence
- Nodes 137, 138, and 139 (XS 27634, 22946, and 19802, respectively) – located downstream from PA-2 with Node 139 occurring immediately downstream from the La Novia Bridge; these nodes represent the hydrologic contributions received from areas located below the planned development

The main stem upstream inflow boundary for Gobernadora Canyon corresponds to hydrologic node 132C and hydraulic cross section 52124, located northwest of PA-3 Subwatershed A. The tributary inflow points defined for Gobernadora Canyon are as follows:

- Nodes 13222, regional node 132 (XS 14717) – located northwest of PA-3 Subwatershed A
- Node 133t (XS 6873)– located immediately upstream from the San Juan Creek confluence

Event-based flood hydrographs. A sequence of interval-averaged discharges was defined for each flood hydrograph evaluated, which included the 2-, 5-, 10-, 25-, 50-, and 100-year expected value events. Tributary inflows were defined as incremental discharges, which were added to the main stem discharge.

Long-term flood hydrographs. Long-term flood hydrographs were constructed to encompass at least a 60-year planning period. The USGS streamflow records for San Juan Creek were used to develop the long-term flood hydrographs for San Juan Creek and Gobernadora Canyon.

Historical annual maximum and daily mean flows are available for the following:

- USGS gauging station 11046500, Ortega Highway Bridge, WY1929 – 1969 (41 water years)
- USGS gauging station 11046550, Camino Capistrano Bridge, WY1970 – 1985 (16 water years)
- USGS gauging station 11046530, La Novia Bridge, WY1986 – 2012 (27 water years)

Instantaneous flows at 15-minute intervals are available for the following:

- USGS gauging station 11046530, La Novia Bridge, WY1989 – 2007 (19 water years)

The instantaneous flow record only accounts for 19 years, therefore, the daily mean flow record, which spans 84 years, was considered as an alternative for developing the long-term flood hydrographs. To evaluate the sensitivity of time intervals and the influence of peak flows, a test model based on the existing conditions was simulated to compare the following long-term flood hydrographs, which span water years 1989 through 2007:

- Daily mean flows (Qm; 24-hour intervals)
- Daily mean flows (24-hour intervals) combined with annual maximum flows (Qm+p) – for those days where an annual maximum flow occurs, a time interval of 45 minutes (based on County guidance) was assigned to the annual maximum flow, centered within the daily mean flow 24-hour interval; the daily mean flow was applied to the remainder of the 24-hour interval, reduced to offset the volume added by the annual maximum flow, and split evenly on each side of the annual maximum flow interval.
- Instantaneous flow at 15-minute intervals (Q15)

The sensitivity test is not a part of this report, because it was previously completed for the PA-2 ROMP. For further details on the test and the results see The Ranch Plan Planned Community Planning Area 2 Runoff Management Plan – Update. Per the request of the County (during the PA-2 ROMP Update), the long-term flood hydrograph was based on the combined daily mean and annual maximum flow records.

The three available gauged records were combined and assumed to represent the historical flow record at La Novia Bridge (Hydrologic Node 139), spanning 84 water years from 1929-2012. The long-term flood hydrograph record was translated to subsequent hydrologic nodes upstream based on the frequency volume linear relationships between Node 139 and each upstream node.

The ratio of probability-weighted annual average runoff volumes was used to translate discharge values between the modeled conditions:

$$_{m} = 0.015_{100} + 0.015_{50} + 0.04_{25} + 0.08_{10} + 0.2_{5} + 0.4_{2} \text{ (Chang, 1988)}$$

To translate the long-term flood hydrograph from the existing conditions at San Juan Creek (Node 139) to the ultimate-mitigated conditions at Gobernadora (Nodes 133T and 132C), two factors were applied to each existing condition discharge value. A minimum flow threshold was established at 68 cubic feet per second, which is comparable to a 1.25-year event based on Bulletin 17B (USGS 1982); velocities below this threshold are generally well below 3 feet per second are not expected to significantly influence stream behavior.

To model the long-term along Gobernadora Canyon, the 84 years of data was translated from existing San Juan Creek conditions to ultimate Gobernadora conditions with the use of factors. The adjustment factors for Gobernadora Canyon were determined using existing and ultimate condition volumes at nodes 133T and 132C. To translate the long-term record from La Novia to Gobernadora Canyon, the long-term data was first translated up San Juan Creek to the confluence of San Juan and Gobernadora. This translation is described in detail in the previously completed and submitted study – *The Ranch Plan Planned Community Planning Area 2 Runoff Management Plan – Update.* In the study, it was determined that to translate the data to the confluence of San Juan Creek and Gobernadora (Node 133C) it must be multiplied by a factor of 0.92.

The second factor then translates the data from the existing San Juan Creek confluence to the ultimate condition of Gobernadora (133T and 132C). This factor is the relationship between the ultimate conditions at Gobernadora and the existing condition at San Juan Creek. Since the entirety of Gobernadora Canyon hydrology consists of two flow profiles – the flow from the tributary area of Gobernadora and the flow from the basin at the north end of Gobernadora, the long-term data is translated to a combined hydrograph. After converting the long-term data from the San Juan Creek Confluence to Gobernadora with a factor of 0.118, an additional factor is used to translate the new Gobernadora long-term data to account for the flow from the north basin. This additional factor is calculated by plotting the ultimate condition volumes for Node 133T versus 132C for frequency years 2 through 100. The slope of this line results in an adjustment factor for translating the long-term data through Gobernadora to the north basin of 0.7017.

After applying the three factors to the long-term data, shown in Table 4-10 and Table 4-11, this hydrograph is input into the HEC-6 model to run the long-term scour for Gobernadora.

Table 4-10: Gobernadora Long-term Discharge Adjustment Factors

Node Translation	Adjustment Factor	
	Existing Conditions	Ultimate-Mitigated Conditions
139 to 133c	0.92	0.92
133C to 133t	0.118	0.118
133t to 132u	0.7017	0.7017

Table 4-11: San Juan Creek Long-term Discharge Adjustment Factors

Node Translation	Adjustment Factor		
	Existing Conditions	Phased-Mitigated Conditions	Ultimate-Mitigated Conditions
139 to 137	0.98	0.98	0.98
139 to 134C	0.97	0.97	0.97
139 to 134u	0.93	0.93	093
139 to 133c	0.92	0.92	0.92
139 to 133u	0.86	086	0.86
139 to 127	0.85	0.84	0.84
139 to 126	0.84	0.84	0.83

4.3.2 Summary and Discussion of Event-based and Long-term HEC-6T Model Simulation Results

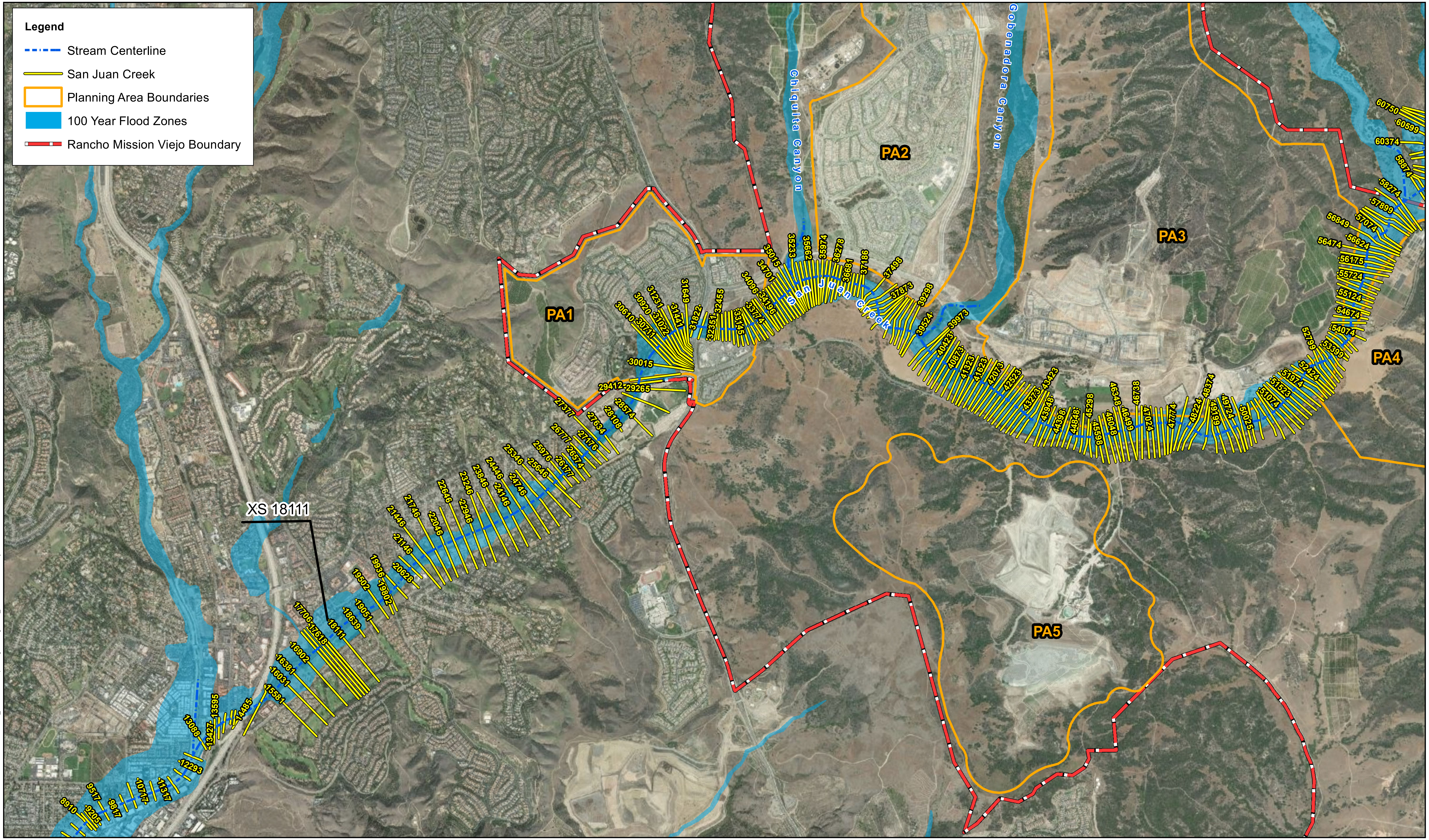
4.3.2.1 San Juan Creek

The HEC-RAS and HEC-6T models used herein were carried over PA-2 ROMP (2014), approved by the County of Orange and extended to include sections up to regional node 119 and the Gibby Road improvements.

Fixed-bed Water Surface Profile Comparison

A fixed-bed version of the HEC-6T existing conditions model was analyzed for unsteady flow based on the 100-year event and the results compared to the 100-year steady flow water surface profile computed using HEC-RAS. The water surface profiles are depicted graphically in Figure 4-3. This comparison for the entire modeled reach is presented in the Appendix J.

The HEC-RAS and HEC-6T water surface profiles are generally consistent except in the vicinity of sections 440+00, 480+00, 520+00, 550+00, where some divergence occurs. The divergence is likely caused by differences in the computational algorithms between HEC-RAS and HEC-6T, which is based on a HEC-2 platform; and more specifically, the program routines related to conveyance and critical depth computations.



2/9/2023 JN M:\Mdata\134519\GIS\MXD\PA3_PA4ROMP\Report Figures\Fig04-02_SJC Downstream Hydraulic Control.mxd JM DR

Michael Baker INTERNATIONAL

0 1,000 2,000 Feet

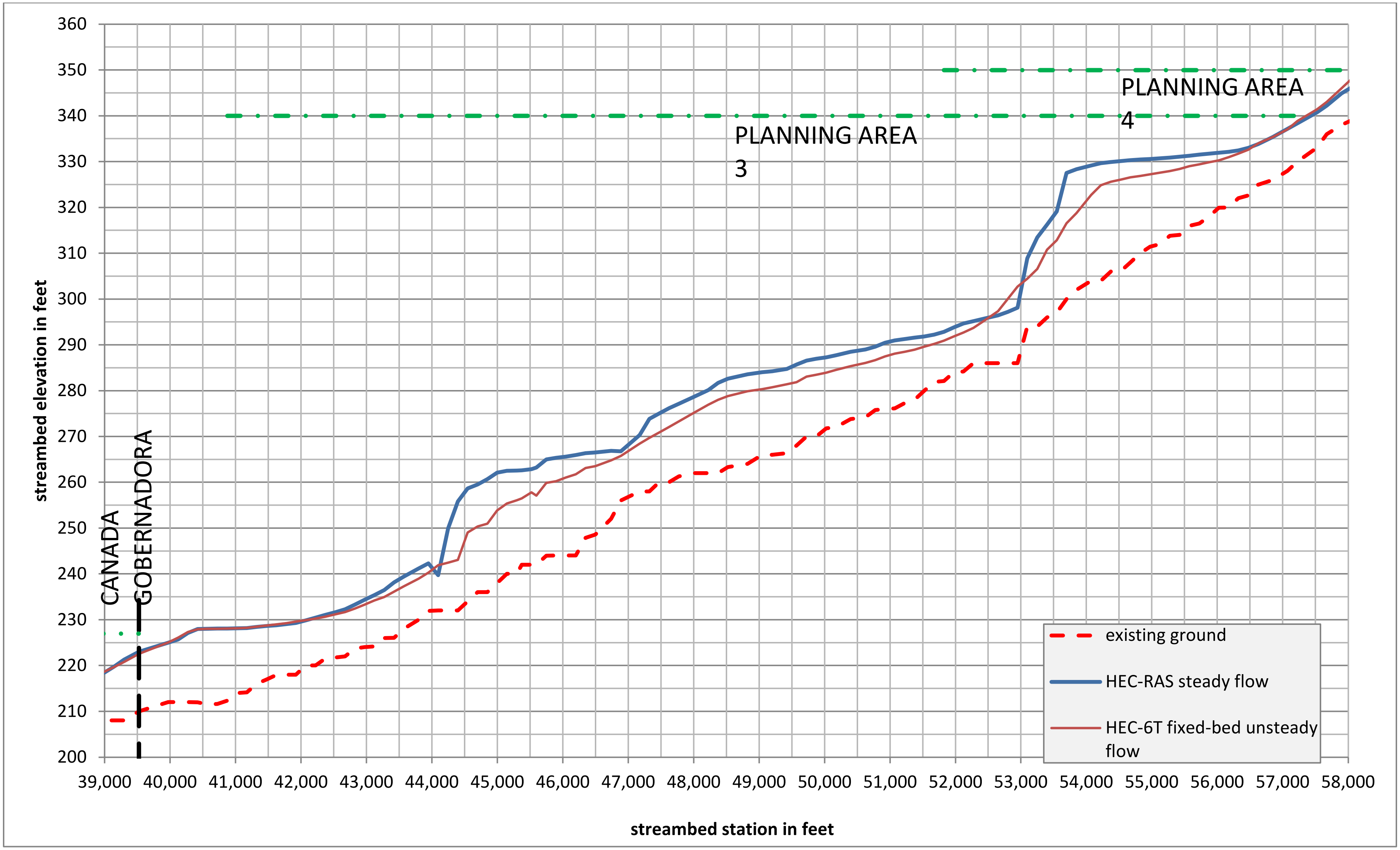
Source: PACE, Huitt-Zollars, Geosyntec, ESRI Online

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

San Juan Creek Downstream Hydraulic Control

Figure 4-2

Figure 4-3: San Juan Creek Existing Condition 100-yr EV Water Surface Profile Comparison



These variations in the water surface profile are generally expected to be transparent in determining the relative changes in the streambed profile between the modeled conditions (existing, phased, and ultimate).

Event-based Sediment Transport Model Simulation Results

Figure 4-4 graphically presents a comparison of event-based and long-term resultant streambed profiles for the existing conditions. The event-based results generally follow the long-term trends and the magnitude of change is proportional to the extreme nature of each event.

Long-term Sediment Transport Model Simulation Results and Trends

Figure 4-5 graphically compares the long-term resultant streambed profiles based on each set of modeled conditions. These results are based the San Juan Creek historical flow record, which far exceeds Orange County hydrology standards, therefore, no event-based flood hydrographs were appended to the long term record to further assess impacts to the watercourse. Model input and output files and supporting technical data are provided in the Technical Appendix J.

The HEC-6T long-term simulations suggest San Juan Creek is, on average, near equilibrium, only appearing to be mildly degrading below the Gobernadora Canyon confluence down to La Novia. Above the Gobernadora Canyon confluence, there is a localized zone of significant deposition, but otherwise, it remains relatively unchanged. There is no change in trends between the modeled conditions and the relative change in streambed profile caused by planned development (phased and ultimate conditions) is insignificant.

Comparison with Previous Studies

The HEC-6T ultimate conditions general simulation performed was compared to the HEC-6T baseline general simulation conducted by PACE (2010) as shown in Figure 4-6. The current baseline is 0.03 ft lower, on average, which can be attributed to the variations in the assumptions related to the hydrograph minimum flow threshold, sediment gradation, local sediment inflow, main stem boundary conditions, and transport function.

Figure 4-4: San Juan Creek Streambed Profile Comparison Based on the Existing Condition Following Selected Events

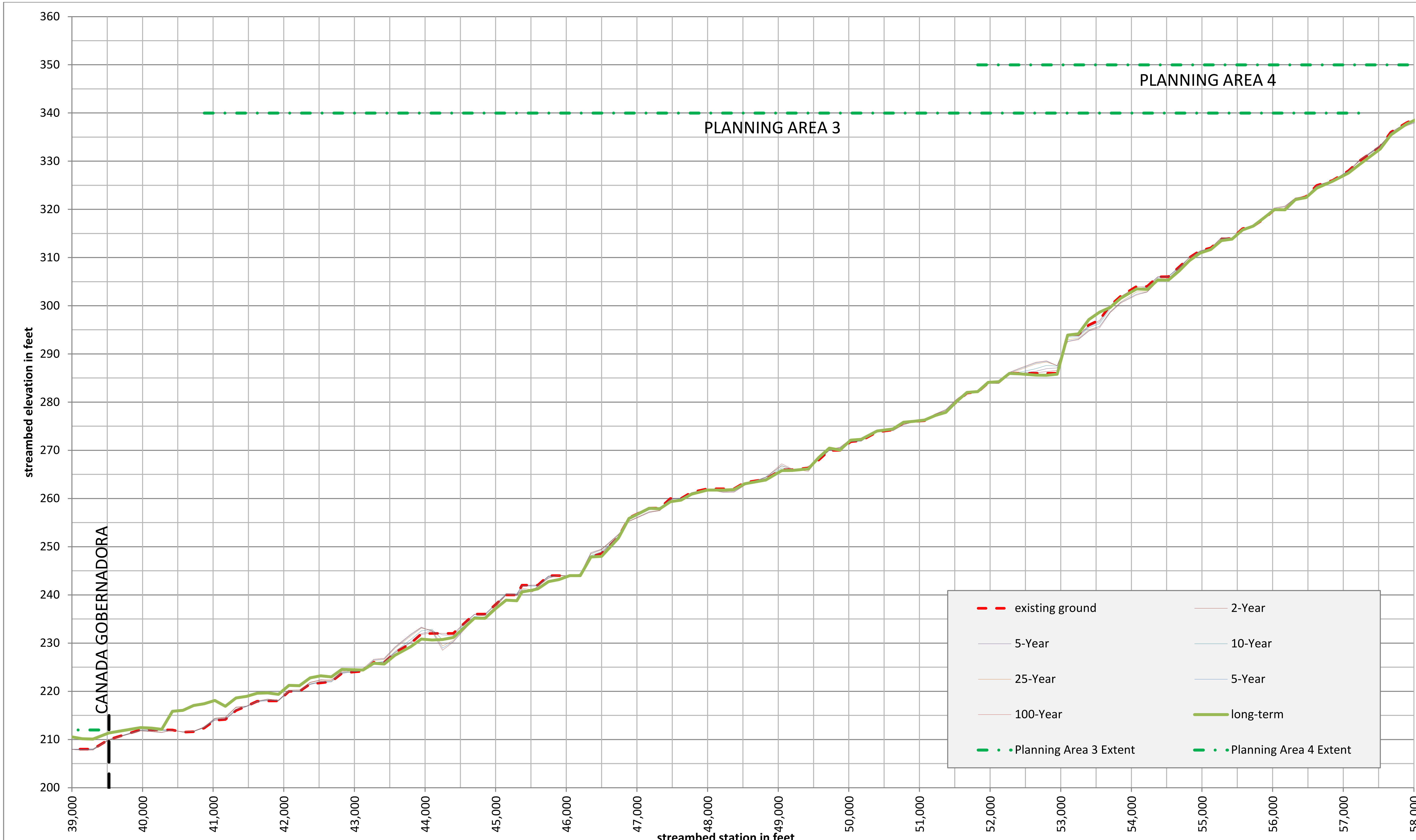


Figure 4-5: San Juan Creek Streambed Profile Comparison of Conditions Following a Continuous Flow Simulation of 84 years (WY1929 – 2012)

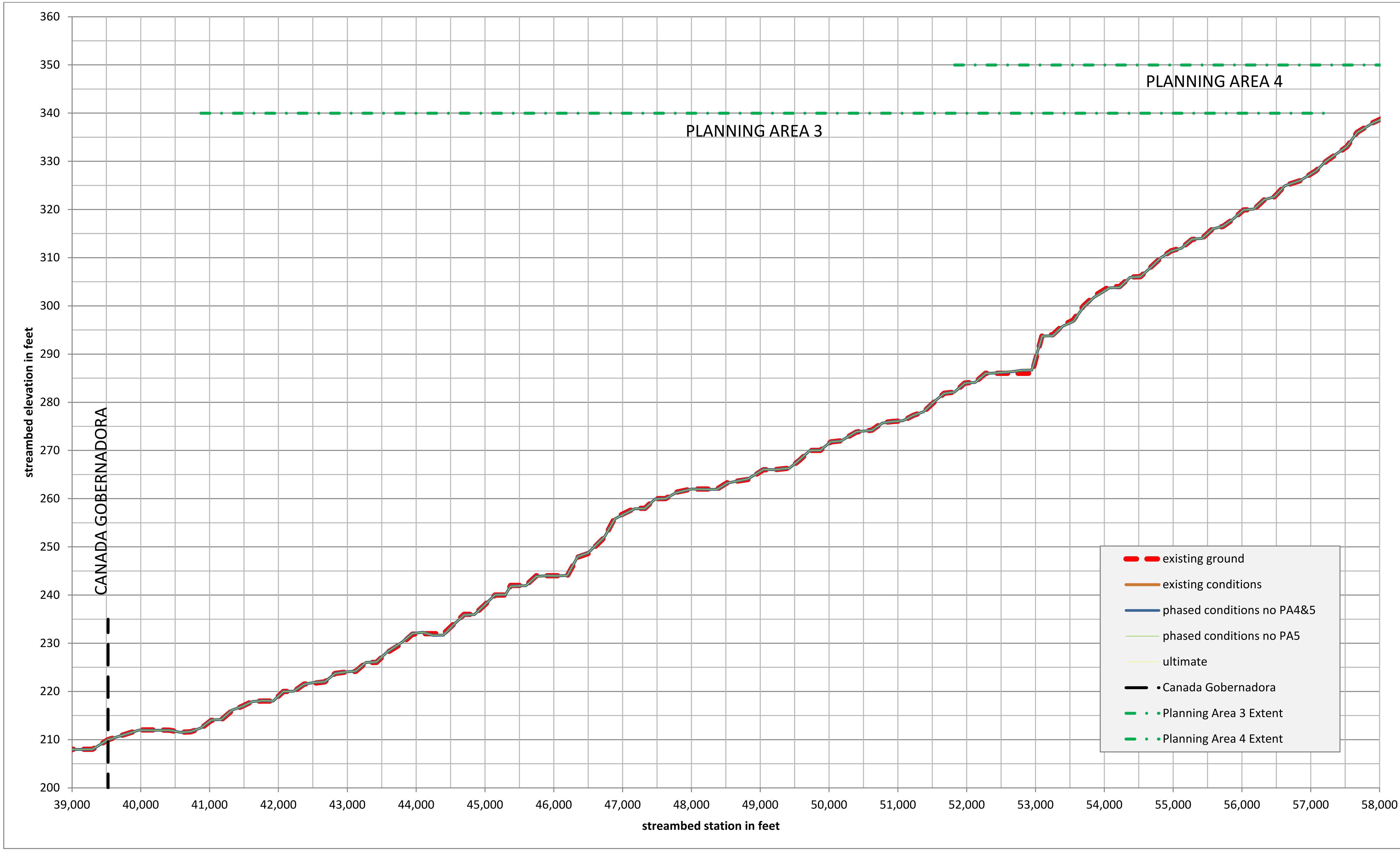
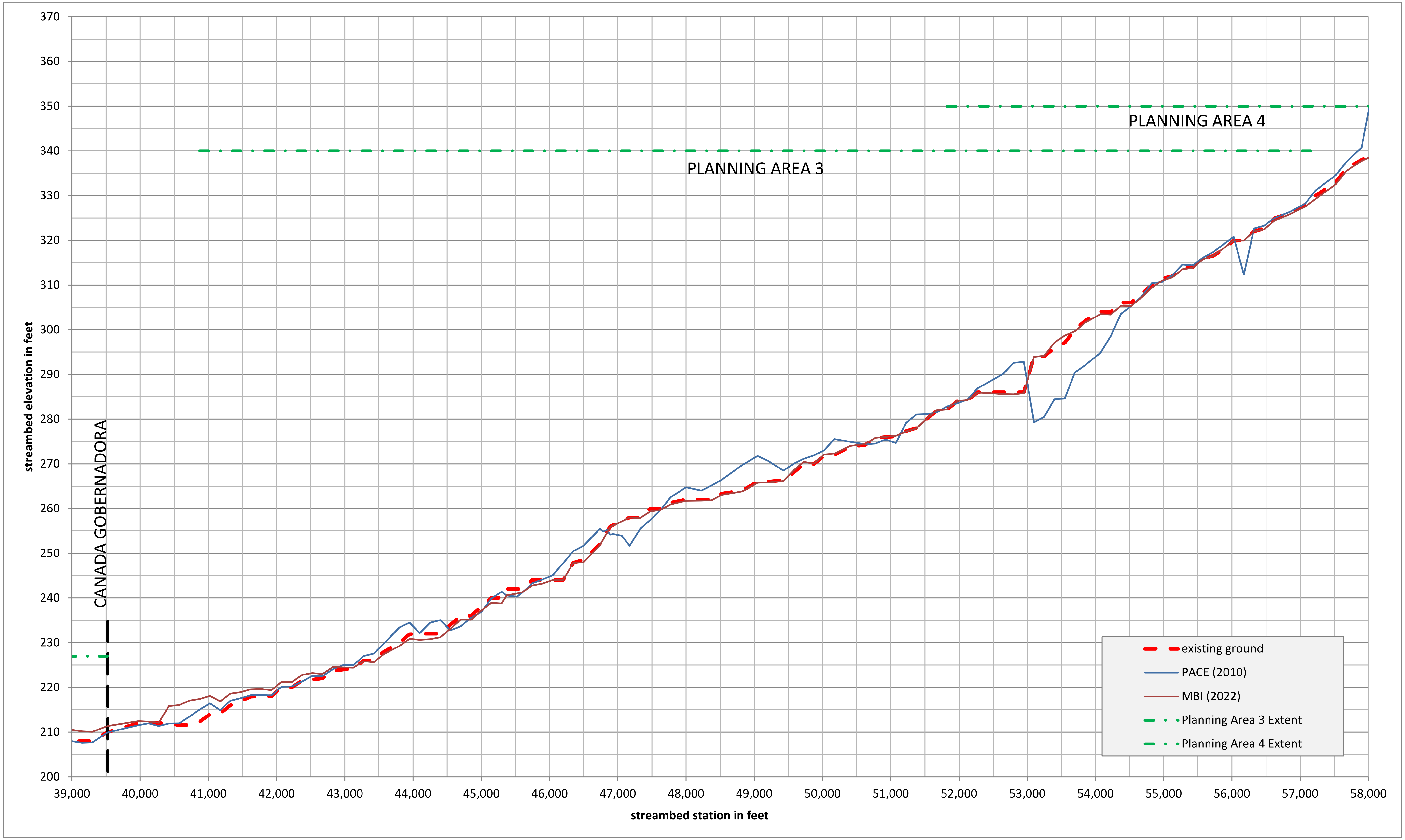


Figure 4-6: San Juan Creek Baseline Streambed Profile Comparison Following a Long-term Continuous Flow Simulation



4.3.2.2 Gobernadora Canyon

The HEC-RAS model and HEC-6T model used herein was carried over from the approved Gobernadora Scour Report (MBI, 2017).

Fixed-bed Water Surface Profile Comparison

A fixed-bed version of the HEC-6T existing conditions model was analyzed for unsteady flow based on the 100-year event and the results compared to the 100-year steady flow water surface profile computed using HEC-RAS. The water surface profiles are depicted graphically in Figure 4-7. This comparison for the entire modeled reach is presented in the Appendix J.

Event-based Sediment Transport Model Simulation Results

Figure 4-8 graphically presents a comparison of event-based and long-term resultant streambed profiles for the existing conditions.

Long-term Sediment Transport Model Simulation Results and Trends

Figure 4-9 graphically compares the long-term resultant streambed profiles based on each set of modeled conditions. These results are based the San Juan Creek historical flow record, which far exceeds Orange County hydrology standards, therefore, no event-based flood hydrographs were appended to the long term record to further assess impacts to the watercourse. Model input and output files and supporting technical data are provided in the Technical Appendix J.

Comparison with Previous Studies

The 100-year event model results were compared between what was performed specifically for the Planning Area 3&4 ROMP herein versus what was prepared for the approved Gobernadora Scour Report (2017), as seen in Figure 4-10.

Figure 4-7: Gobernadora Existing Condition 100-yr EV Water Surface Profile Comparison

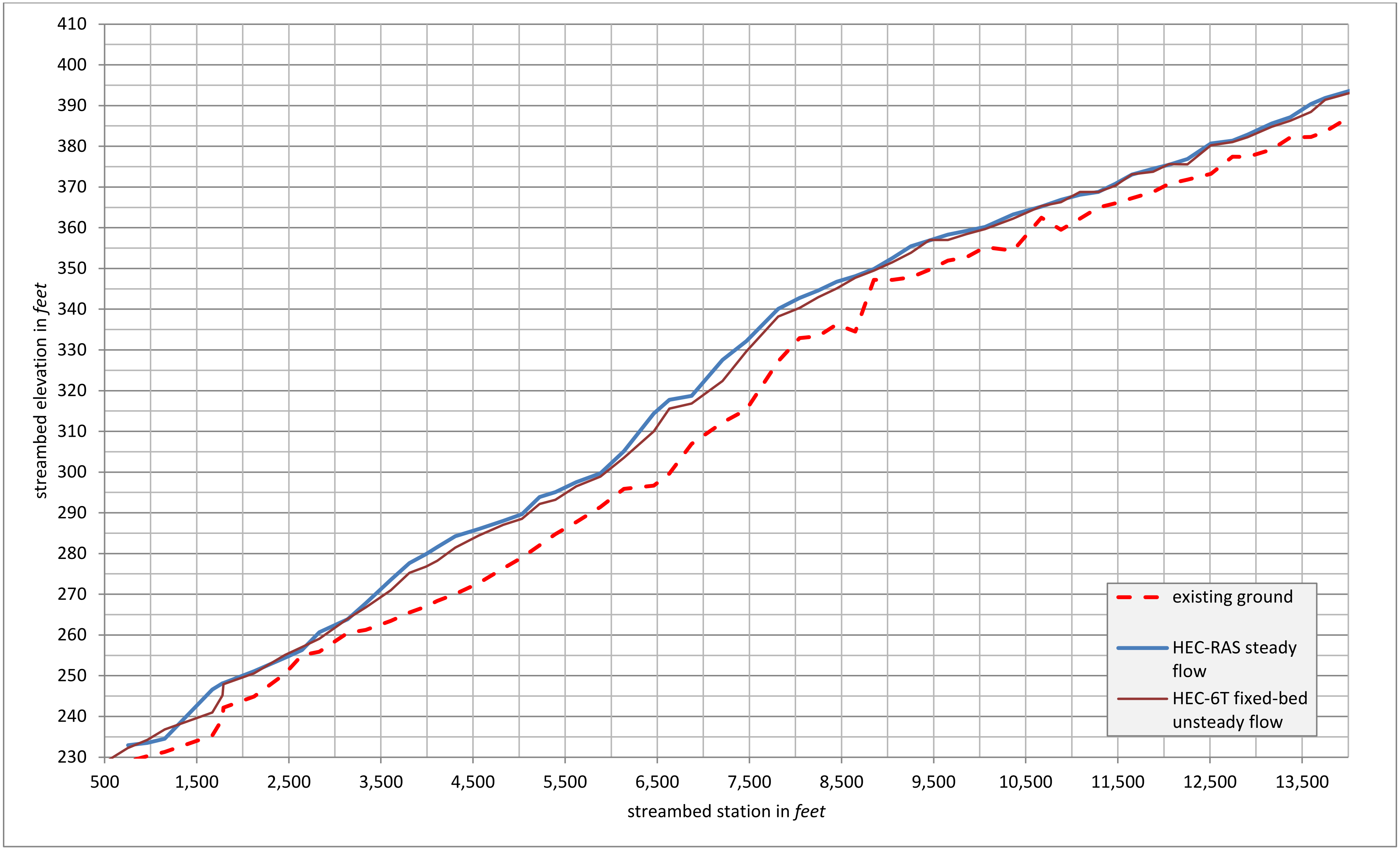


Figure 4-8: Gobernadora Streambed Profile Comparison Based on the Existing Condition Following Selected Events

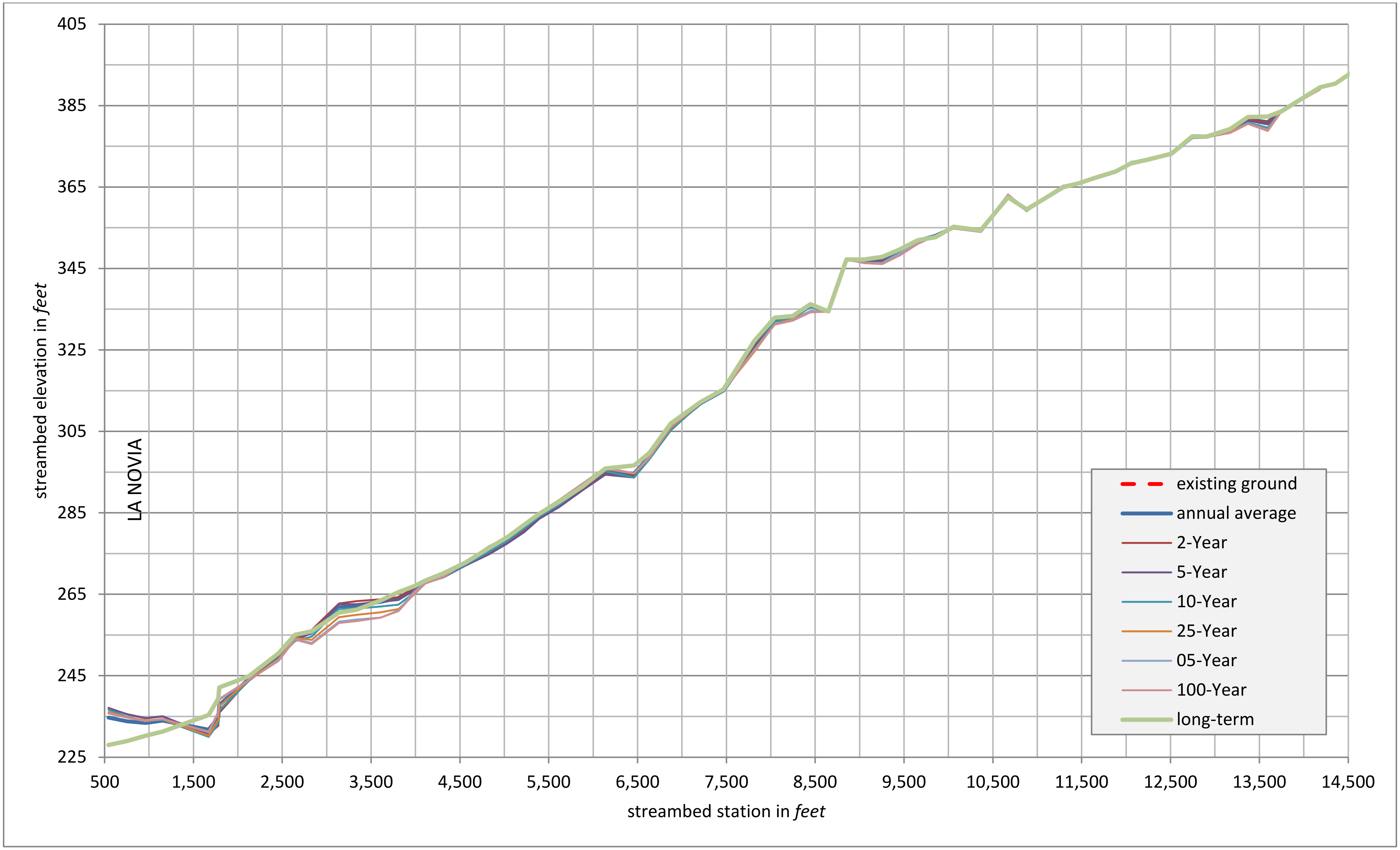


Figure 4-9: Gobernadora Streambed Profile Comparison of Conditions Following a Continuous Flow Simulation of 84 years

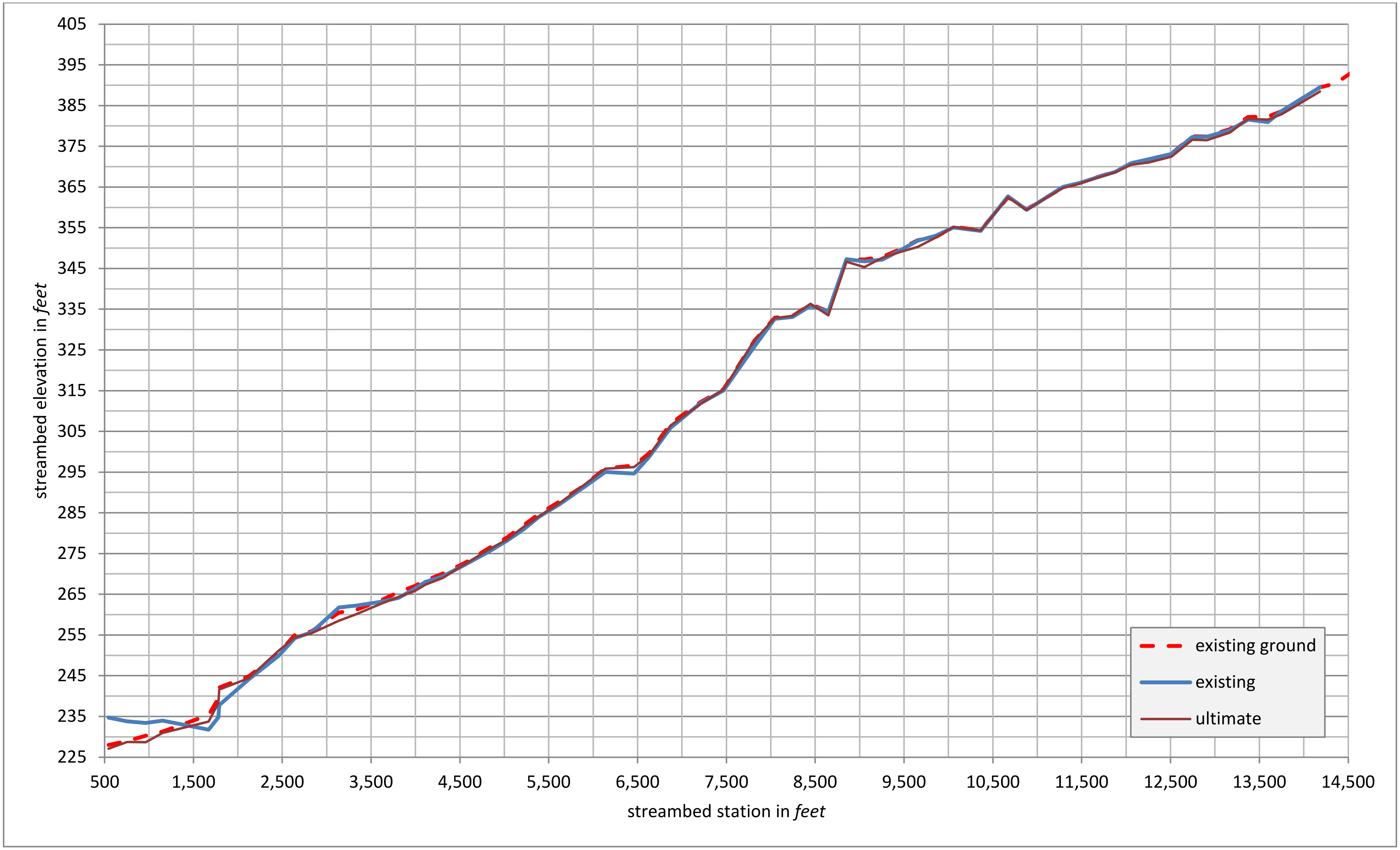
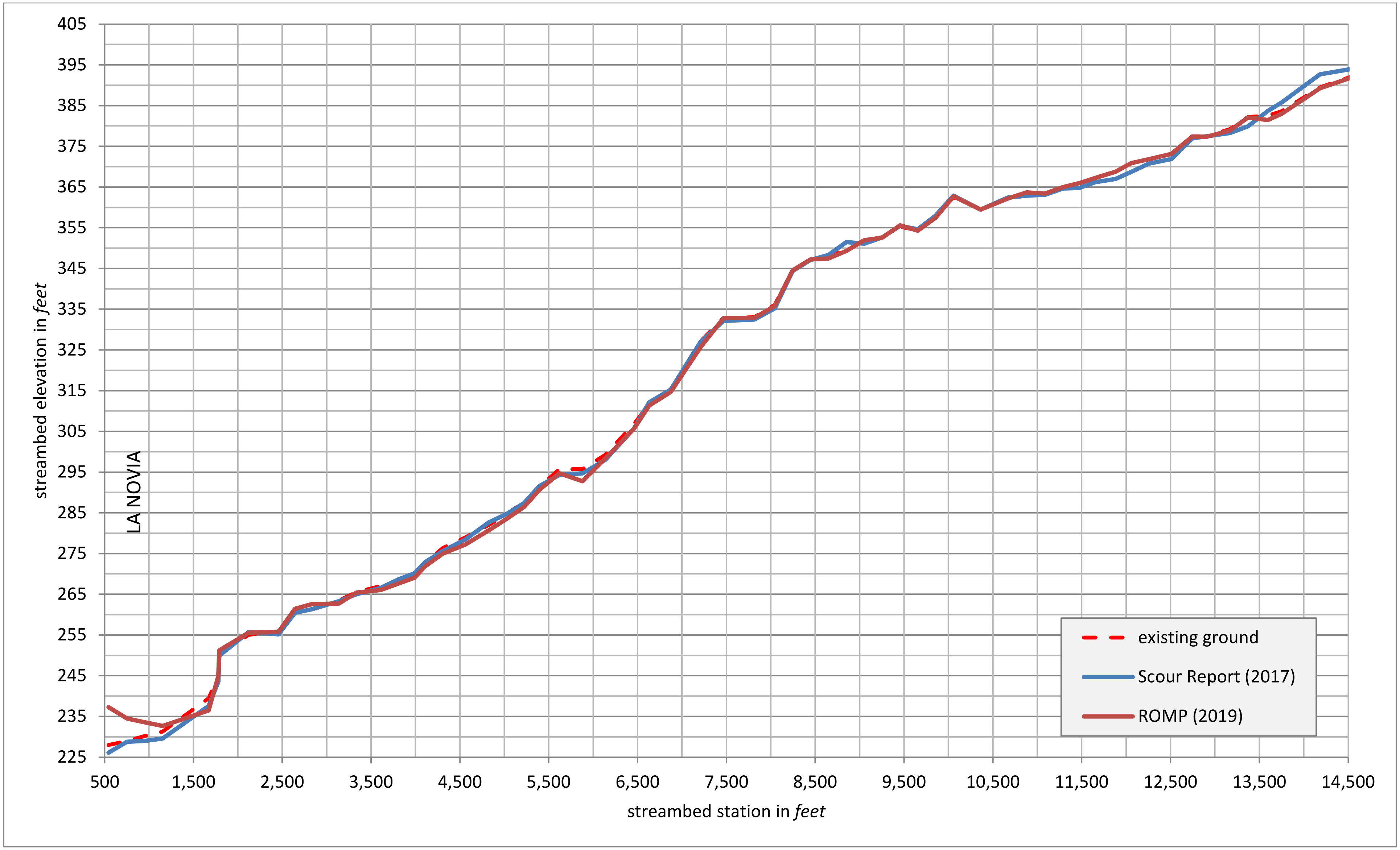


Figure 4-10: Gobernadora Baseline Streambed Profile Comparison Following a Long-term Continuous Flow Simulation



4.4 Lateral Bank Migration

A lateral bank migration analysis is required based on the Ranch Plan ROMP Table 19-1. This section addresses the potential for lateral migration for both San Juan Creek and Gobernadora Canyon.

4.4.1 San Juan Creek

Currently, a technical report titled *San Juan Creek Lateral Erosion Analysis and Streambank Erosion Revetment PA-3 RMV Development Area* (2023) is being completed to revise the lateral erosion limits originally determined for PA-3/PA-4. The original lateral erosion limits, established in a technical report titled *San Juan Creek Streambank Lateral Erosion Analysis PA3/PA4 RMV Development Areas* (2017), are being updated to include the Gibby Road Bridge and associated revetment, which is currently under construction. Both the 2017 and updated 2023 reports apply a specialized procedure to determine the amount of lateral erosion using HEC-6T computed results. This procedure involves using the HEC-6T computed total sediment deficit (scour) or surplus (deposition) for the computation of total eroded sediment volume for each channel cross section during an entire storm hydrograph. This total eroded sediment volume was used to adjust the horizontal erosion boundary of either the right or left bank of the channel cross section. The total volume was divided by the average distance between the next adjacent cross sections to get a representative total area. A trial and error method was then used to determine the lateral distance of eroded bank projecting out from the thalweg of the creek so that the assumed eroded area equals the total area of erosion calculated from the HEC-6T results at each cross section. Although this procedure does not directly analyze the additional erosion forces on the streambank for bends or curves, it does provide a conservative and reasonable estimate of the lateral streambank erosion distance. The PACE procedure, adopted from Maricopa County Flood Control District studies, applies the total eroded volume for the cross section proportionally to each side of the streambank and converts streambed erosion to lateral streambank erosion.

The analysis illustrating the long-term erosion distance is summarized in Appendix O.3 for the study portion of San Juan Creek extending from the downstream Gobernadora Canyon confluence to the upstream RMV boundary. The updated PA-3&4 developments will not have a significant impact on the lateral migration. The flows determined in this ROMP are similar to previous study discharges. See Table 7.1 for the tabulated discharges.

The historical stream bank data for San Juan Creek is plotted on Exhibit 12. The bank erosion lines are shown on Exhibit 13. All permanent engineered structures (i.e., buildings, roadways, utilities, etc.) must be located north or south of this structural setback line. Non-structural improvements (i.e., trails, parks, or landscaped areas) can be placed between the geotechnical setback line and the daylight line produced by the 1:1 cut slope, assuming little or no irrigation.

4.4.2 Gobernadora

The lateral bank erosion for Gobernadora was determined by using the sediment deficit from the HEC-6T models. The bank erosion distance equivalent to the HEC-6T future conditions sediment deficit at each section was applied over an 84-year planning period. This sediment deficit was integrated over the reach length and used to compute the volume of bank erosion required to satisfy the sediment deficit. The deficit was applied to the project-side bank only as if none of the deficit were satisfied from the opposite bank. The bank volume required to satisfy the sediment deficit was accomplished by determining a thalweg offset followed by a 1:1 cut slope beginning at the revised thalweg that would fulfill the sediment deficit computed by HEC-6T. This process was conducted using the hydraulic sections, which form the channel geometry defined in the HEC-RAS and HEC-6T models. If the end of a section was reached prior to satisfying the sediment deficit then the elevation at the zero station was extended horizontally until sediment deficit was satisfied. Once a revised thalweg location was established, a 2:1 cut slope was established, and its daylight location would define the geotechnical setback. All permanent engineered structures (i.e., buildings, roadways, utilities, etc.) must be located east of this structural setback line. Non-structural improvements (i.e., trails, parks, or landscaped areas) can be placed between the geotechnical setback line and the daylight line produced by the 1:1 cut slope, assuming little or no irrigation.

The historical stream bank data for Gobernadora Canyon is plotted on Exhibit 14. The exhibit indicates the location of the east and west bank from 1938 to 2005 based on the available aerial photography. The calculated east bank lateral migration limits are plotted for the existing and ultimate conditions based on the HEC-6T results and sediment deficit analysis. The worst case lateral migration setback from the calculated analysis was also used to compare with the information from the historical data. The worst case at each hydraulic cross section was identified and re-plotted on Exhibit 15. The results of the comparison generally show that the calculated lateral migration is consistent with the variations of the bank based on the historical data. The overall results of the analysis suggest that the PA-3&4 development area is outside of the potential lateral erosion areas along Gobernadora Canyon.

4.5 Stream Monitoring

As part of the sediment transport study, an amendment to the “PA-1 Development Area and the Ranch Development Plan San Juan Creek Watershed Stream Monitoring Program” prepared by PACE dated December 2011 was prepared. The amendment identifies 3 monitoring cross sections on Gobernadora Canyon and extends the annual sight inspection limits along San Juan Creek up through regional node 119. The proposed amendment is included in Appendix L.

5 Water Quality Program

5.1 Previous Studies

The Water Quality Program for PA-3 and PA-4 followed the Ranch Plan ROMP (PACE, 2013) and the Conceptual Master Area Plan Water Quality Management Plan for PA-3&4 dated March 5, 2015, prepared by Michael Baker International (formerly RBF Consulting) (PA-3&4 Conceptual WQMP). The Ranch Plan ROMP provided a foundation to achieve the mitigation measures identified in the FEIR for water quality management. The approved 2019 PA-3&4 ROMP provided more refined modeling and studies for PA-3 and PA-4 than those provided in the Ranch Plan ROMP, and followed the conceptual strategy studied in the PA-3&4 Conceptual WQMP to understand the effects of urbanization on the existing hydrologic conditions of the watershed. The PA-3&4 Conceptual WQMP detailed the planned best management practices (BMPs) to meet the source control, site design, LID / water quality and hydromodification requirements. The technical memorandum for the RMV Stormwater Harvesting Planning Level Assessment for Trampas Reservoir has also identified the potential for stormwater capture and use in this project area (PACE, 2014). The approved 2019 PA-3&4 ROMP summarized calculations for LID/ water quality BMPs and hydromodification management measures.

The approved 2019 PA-3&4 ROMP focused on the water quality and hydromodification management for discharges to Gobernadora Canyon and water quality calculations for discharges to San Juan Creek. The PA-3&4 ROMP Revision 1 provides updates to the water quality analysis (consistent with the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022), integrating the current C-Complex Basins, as well as minor modifications within Subwatershed B. No changes are proposed to Subwatershed A or PA-4.

5.2 Requirements and Standards

The analyses, studies, and plan provided in this PA-3&4 ROMP for water quality management comply with San Diego Regional Water Quality Control Board Order No. R9-2013-0001, as amended by Order Nos. R9-2015-0001 and R9-2015-0100, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) dated November 18, 2015. In addition to conforming to the MS4 permit, the Orange County Technical Guidance Document (TGD) (OC Public Works, 2017) was used as a basis for the water quality facilities proposed in this PA-3&4 ROMP to mitigate the effects of the development within PA-3 and PA-4.

5.3 Water Quality Best Management Practices

Since the approval of the Ranch Plan ROMP, more detailed infiltration tests were performed at several proposed water quality/hydromodification basin locations. The tests showed a high variability in infiltration rates throughout proposed locations within PA-3. Accordingly, infiltration BMPs were placed where the underlying soils allowed, while biofiltration BMPs were placed where infiltration was infeasible. These facilities (referred to as LID BMPs) will be used to meet the LID/ water quality requirements. Local detention basins (referred to as “hydromodification” BMPs) were placed where hydromodification mitigation was needed (i.e., Subwatershed A).

Following the approval of the 2019 PA-3&4 ROMP, the Conceptual PA-3&4 WQMP was prepared and approved in September 2019. The Conceptual WQMP is the first of three levels of WQMP (Conceptual Planning Area, Rough Grade “A” TTM, Project Specific “B” TTM). As of the preparation of this PA-3&4 ROMP Revision 1, Rough Grade “A” TTM WQMPs have been developed and approved for TTM 17931, 17932, and 19163, under the 2019 Conceptual Planning Area 3&4 WQMP. Future Rough Grade WQMPs will be developed and approved based on the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022.

All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies. For example, the infiltration basins are designed to capture and retain the full Design Capture Volume (DCV) for the tributary area. Table 5-1 includes the acreage, imperviousness and DCV associated with each Subarea. Figure 5-1 shows the associated water quality land uses for PA-3 and PA-4, and Figure 5-2 shows the tributary areas associated with each BMP from a water quality perspective.

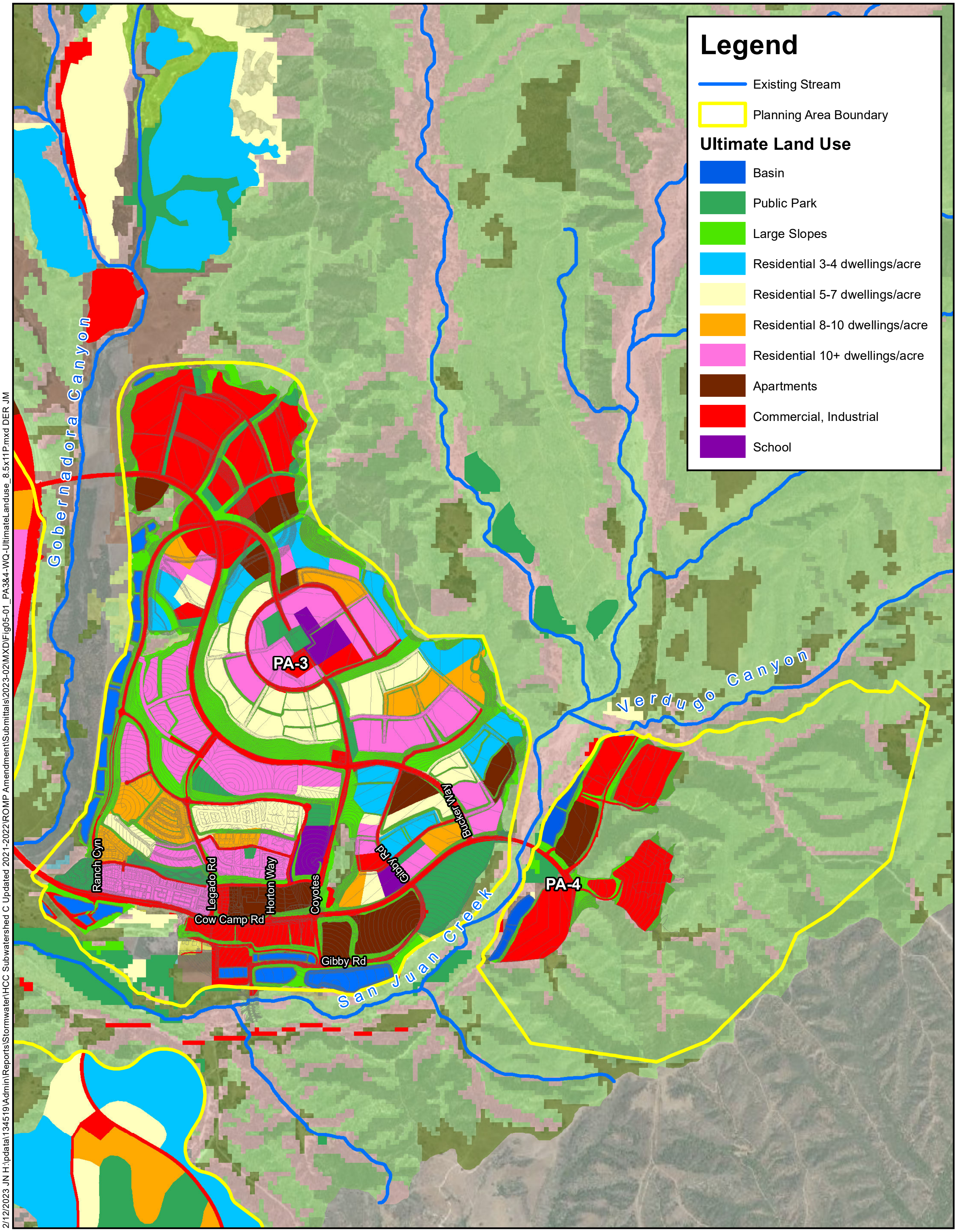
Table 5-1: PA-3 Water Quality Summary

Watershed	Sub Watershed (I.D.)	Area (AC)[a]	Impervious (%)	DCV (AF)
A[c]	**3A-1**[b]	32.6	77%	1.78
	3A-3[b]	27.0	65%	1.56
	3A-4[b]	167.3	65%	9.64
	3A-5[b]	97.5	55%	4.10
	3A-6[b]	60.7	55%	2.55
	3A-7[b]	66.9	55%	2.81
	3A-8a	25.4	22%	0.61
	3A-12	3.2	4%	0.04
B[c]	**3B-5**	35.6	44%	1.55
C[c]	**C1**	681.3	56%	28.62
	C2	462.7	49%	17.62
	C3	37.4	61%	1.69
	C4	73.8	59%	3.25
	C5	9.5	52%	0.38
	C6	8.7	24%	0.21
	C7	31.6	80%	1.76
TOTAL:		**1821.0**	**55%**	**78.16**

[a] The water quality areas do not include offsite tributaries.

[b] Subarea A values are from the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022.

[c] Figure 5-1 and Exhibit 3b were further refined recently, which led to minor changes in areas, and values, when compared to the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022. The DCV values included in the 2022 Conceptual PA-3&4 WQMP are more conservative. Additionally, future Rough Grade WQMPs will be developed and approved based on the 2022 Conceptual PA-3&4 WQMP, and will include a regional BMP tracking form at the end/close-out of a Rough Grade "A" TTM to ensure adequate capacity. See "Updated Guidelines for the Preparation of Water Quality Management Plans for the Ranch Plan Planned Community" (dated December 17, 2019) for additional information.

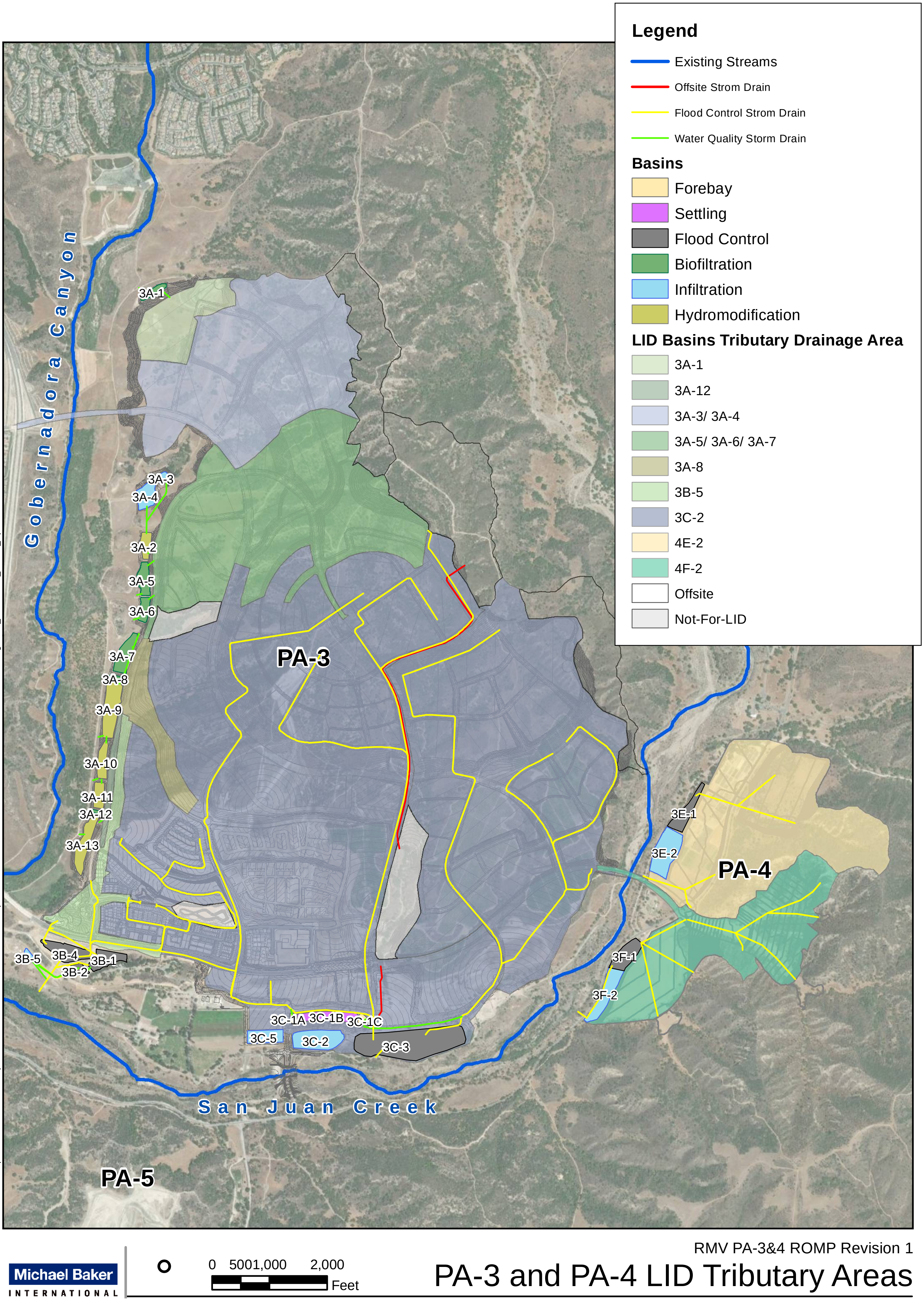


Michael Baker INTERNATIONAL

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

PA-3 and PA-4 Water Quality Land Use

Figure 5-1



5/19/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig05-02_PA3&4-LID_8.5x11_Update.mxd <USER NAME>

Michael Baker INTERNATIONAL

RMV PA-3&4 ROMP Revision 1

PA-3 and PA-4 LID Tributary Areas

Figure 5-2

5.3.1 Gobernadora Canyon Water Quality Plan

The Gobernadora Canyon water quality plan analyzes the areas of PA-3 that discharge to Gobernadora Canyon (i.e., Subwatershed A) and a small portion of subwatershed B where low flows will be diverted into basins along Gobernadora Canyon.

Subwatershed A incudes about 452 acres that drains toward outfall 9, which discharges westward to Gobernadora Canyon. This area includes approximately 4 acres of the bridge over Gobernadora Canyon in the ultimate buildout condition that connects PA-2 to PA-3 as it drains toward PA-3. This area drains to Gobernadora Canyon and is subject to the South Orange County Hydromodification Management Plan (HMP; see Section 5.5.2) requirements. Subwatershed A consists of four water quality systems that work together: three LID and one full hydromodification system. Each of the LID systems will incorporate extra detention storage above the water quality volume to help mitigate the hydromodification impacts. See Figure 5-2 for the layouts of the systems.

It is possible that LID systems, such as LID site design BMPs, smaller bioretention or biofiltration areas, and capture and use BMPs, may be integrated into the future land plan for PA-3 in a more distributed approach to meet the LID/ water quality and hydromodification requirements. The approach taken in this ROMP submittal is the integration of regional and subregional basins (infiltration, biofiltration, detention) to meet the LID/ water quality and hydromodification requirements.

The first system along subwatershed A consists of biofiltration basin 3A-1. This area is located in the north-west portion of PA-3 and includes 32.57 acres of development. Up to 110 percent of the water quality flow from this area is directed to and treated by basin 3A-1. The additional 10 percent increase was added as an effort to take advantage of the treatment capacity at this location in order to buffer downstream facilities and assist with meeting hydromodification standards. For the water quality analysis, up to 110 percent of the calculated water quality flow will be defined as "low flows". Flows higher than 110 percent of the water quality flow will be diverted into the hydromodification system.

The next water quality system consists of basins 3A-2, 3A-3, and 3A-4. This system treats flows from 194.31 acres of the development. Basin 3A-2 is a pretreatment forebay located at grade within the developable pad. This basin will attenuate flows as a hydromodification basin as well as control the hydraulic pressure on the diversion structure that directs flow to the downstream basins. Basin 3A-2 also collects up to 110 percent of the water quality flow from 194.31 acres of the development. The additional 10 percent increase was again included for partial hydromodification mitigation. The outlet of basin 3A-2 will split the flow between the two downstream infiltration basins: 3A-3 and 3A-4. These two basins have been designed to maximize infiltration based on grading constraints and the infiltration rate of the native soil. It was determined that the optimal design uses a greater depth and longer drawdown time (72 hours) to provide a greater fraction of the design capture storm depth equivalent to 1.08 inches. Flows higher than 110 percent of the water quality flow, similar to the first system, will bypass this system and continue downstream to the hydromodification system.

The third LID system consists of biofiltration basins 3A-5, 3A-6, and 3A-7. Similarly, this system will treat up to 110 percent of the water quality flow of the remaining 225.14 acres of the development. Flows will be distributed amongst the three basins to provide treatment. Flows higher than that will bypass the biofiltration basins and be diverted into the hydromodification system.

The hydromodification system consists of three detention basins in series: 3A-9, 3A-10, and 3A-11. This system will mitigate flows from the 452.02 acres of subwatershed A.

Runoff from 51.22 acres of offsite area is collected through a separate pipe which will discharge directly to Gobernadora Canyon. Since development does not occur in this area, treatment is not provided for the offsite areas.

Low flows from 28.52 acres of subwatershed A will be treated using two basins along Gobernadora Canyon: 3A-8a and 3A-12. These basins are sized to treat only the water quality flow of the drainage area and have been incorporated into the hydromodification analysis. Flows greater than that will join Subwatershed B and drain to San Juan Creek via basin 3B-4 and will discharge within the 10-year floodplain resulting in exemption from hydromodification requirements. Properly sized energy dissipation will be implemented during the design phase at the outfall location per Section 15.2.3 of the 2013 Ranch Plan ROMP.

Table 5-2 summarizes the proposed Subwatershed A LID basins per this ROMP and provides hydrologic information about the area tributary to each basin based on the current land use plan as shown in Figure 5-1. Appendix K contains the SOHM report and model.

Figure 5-2 shows the tributary area for each of the LID basins.

Table 5-2: Gobernadora Canyon LID Basin Summary

Basin ID	Tributary Area (ac)	Runoff Coefficient	Rainfall Intensity (in/ hr)	LID Design Storm Depth (in)	Water Quality Flow (cfs)	LID Design Volume (ac-ft)	Design Types	BMP Invert Area Required (ac)	BMP Invert Area Available (ac)	Ponding Depth (ft)	Draw-down time (hrs)	Design Infiltration Rate (in/ hr)
3A-1	32.57	0.73	0.2625	0.90	6.23	1.78	Biofiltration	0.75	0.78	1.5	7.2	N/A
3A-3	27.00	0.64	0.2625	1.08	4.50	1.54	Infiltration	0.36	0.39	4.25	70.1	0.73
3A-4	167.31	0.64	0.2625	1.08	27.89	9.56	Infiltration	2.25	2.33	4.25	70.1	0.73
3A-5	97.53	0.56	0.2625	0.90	14.22	4.06	Biofiltration	1.58	1.71	1.5	7.2	N/A
3A-6	60.73	0.56	0.2625	0.90	8.86	2.53	Biofiltration	0.99	1.18	1.5	7.2	N/A
3A-7	66.88	0.56	0.2625	0.90	9.75	2.79	Biofiltration	1.08	1.57	1.5	7.2	N/A
3A-8a	25.35	0.32	0.2625	0.90	2.12	0.61	Biofiltration	0.17	1.01	1.5	7.2	N/A
3A-12	3.17	0.18	0.2625	0.90	0.15	0.04	Biofiltration	0.004	0.13	1.5	7.2	N/A

Note: A factor of safety was applied to the measured infiltration rate to generate the design infiltration rate. The safety factors were determined by Worksheet 3 of the TGD and are included in Appendix M.

5.3.2 San Juan Creek Water Quality Plan

The remaining areas of PA-3 that discharge to San Juan Creek within the 10-year floodplain (i.e., Subwatersheds B and C) will be exempt from hydromodification requirements as part of the South Orange County Watershed Management Area Water Quality Improvement Plan (The Orange County Copermittees, 2018) that includes the large river exemption for hydromodification management. This allowance exempts discharges to San Juan Creek that occur within the 10-year floodplain from hydromodification mitigation. San Juan Creek is considered as part of the large river exemption due to its documented intrinsic resilience as explained by the Ranch Plan ROMP (PACE, 2013). This reference is directly applicable as the majority of the remaining urban development planned in the San Juan Creek watershed is associated with the RMV projects.

About 1,341 acres of PA-3 drains to outfalls along San Juan Creek. A series of basins will be included along San Juan Creek to meet LID/ water quality and flood control requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies. Water quality management for San Juan Creek is proposed at the southern-most portions of PA-3 along San Juan Creek, and within the development. Water quality management for this area will include the use of forebay (pretreatment), settling basin, and infiltration basins.

Based on the preliminary geotechnical studies prepared by GMU Geotechnical, dated August 6, 2014, September 14, 2017, September 18, 2018, November 16, 2018, and September 15, 2022, (Appendix N), the areas where the PA-3 basins are being proposed have infiltration rates that make it feasible to provide water quality management through infiltration.

The infiltration basins are designed to capture and retain the full DCV for the tributary area. The DCV is the volume of runoff generated from the 85th percentile, 24-hour design storm depth at the project site. Using a design depth of 0.9 inches, the DCV is calculated following the Simple DCV Method. Within Subwatershed B, it was determined to be more optimal if a longer drawdown time of 72 hours was used. Therefore, a design depth of 1.08 was used for basin 3B-5. For basin 3C-2, an updated design depth of 0.89 was used to be consistent with the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022.

Sizing of Infiltration BMPs was determined using the South Orange County Technical Guidance Document (TGD) Appendix E.3.1. Pretreatment devices, such as a settling forebays and pretreatment basins (with capacity of 10 to 20% of the DCV) will be provided for the infiltration per TGD requirements. The forebays will capture sediment and debris and maximize the effectiveness of the infiltration basin. In addition, a settling basin with a retention time of approximately 12 hours at a peak DCV discharge will be provided to remove additional sediments and further protect the infiltration basin. The system as designed meets or exceeds TGD Requirements for the treatment of the DCV. Within Subwatershed B, the tributary area that infiltration basin 3B-5 was designed for includes subwatershed 3B-5.

Within Subwatershed C, the tributary area that infiltration basin 3C-2 was designed for includes subwatersheds C1, C2, C3, C4, C5, C6, and C7. The flow equivalent to the DCV will be diverted from the main storm drain line to the infiltration system for treatment. The infiltration system consists of pretreatment forebays, a settling basin, and one infiltration basin. Details of the infiltration system design will be provided in a separate report titled “Rancho Mission Viejo Ranch Plan – Planning Area 3 Conceptual Level: Water Quality Management Plan (WQMP) 2022 Update Summary & C-Complex Basins“.

Table 5-3: San Juan Creek LID Basin Summary

Basin ID	Tributary Area (ac)	Runoff Coefficient	LID Design Storm Depth (in)	LID Design Volume (ac-ft)	Design Types	BMP Invert Area Required (ac)	BMP Invert Area Available (ac)	Ponding Depth (ft)	Draw-down time (hrs)	Design Infiltration Rate (in/ hr)
3B-5	35.64	0.48	1.08	1.55	Infiltration[1]	0.49	0.58	3.2	71.3	0.53
3C-2	1,304.88	0.55	0.89[3]	53.53	Infiltration[2]	5.76	6.99[3]	9.3[3]	22.3[3]	5.00[3]
4E-2	171.10	0.47	0.90	5.97	Infiltration	5.97	5.99	1.0	34.7	0.35
4F-2	116.19	0.69	1.08	7.18	Infiltration	3.59	3.63	2.0	69.5	0.35

Note: A factor of safety was applied to the measured infiltration rate to generate the design infiltration rate. The safety factors were determined by Worksheet 3 of the TGD and are included in Appendix M.

[1]Infiltration basin has been oversized for the drainage area as shown in this report for anticipation of changes in drainage pattern and land use in the near future.

[2] Current basin grading shows that the basin has a capacity of approximately 60 ac ft. The additional capacity will allow for changes to the land use and/ or the basin's tributary drainage area.

[3] Values are from the 2022 Conceptual PA-3&4 WQMP, approved in December of 2022.

~~Figure 5-3: Advanced Treatment System Cross-Section Schematic~~ REMOVED

~~Figure 5-4: Advanced Treatment System Example 1~~ REMOVED

~~Figure 5-5: Advanced Treatment System Example 2~~ REMOVED

5.3.3 PA-4 Water Quality Plan

Geotechnical information is not yet available at the proposed locations of the infiltration basins in PA-4; therefore, the rates are assumed to be the same as those for the opposite side of San Juan Creek (along PA-3). Developed and offsite runoff will be collected through pipes and routed through flood control basins, which will also act as pretreatment for the infiltration basins. The infiltration basins will only be designed to treat flows from the developed portion of PA-4.

In the event that geotechnical information indicates that infiltration basins are not feasible, the next priority level of water quality BMPs will be designed to meet the LID requirements.

5.3.4 Water Balance

According to the FEIR, volumetric mitigation is required for PA-3 and PA-4 to meet the requirements of provision 4.5-1 of the FEIR and should be addressed at appropriate stages of the development. Based on the 2004 PWA report, Hydrologic Comparison of Baseline and Alternative Land Use Conditions for the San Juan and San Mateo Watersheds:

> "The distributed "infiltration" facilities are intended to provide both water quality management and flow management during small to medium rainstorms. In addition to water quality management, they are designed to mimic the annual water balance, maintain groundwater infiltration, and reduce artificial dry season streamflow during smaller more frequent rainstorm events (generally less than 2-year frequency). They will also provide some peak flow rate and flow volume reduction during larger (2- to 100-year) design events. These facilities are described in the Geosyntec report (Geosyntec, 2004).
>
> During more severe flood events (2- to 100-year events), excess runoff will be temporarily stored in larger detention facilities and released at lower flow rates to prevent flow peak increases to local or regional channel systems. These larger basins will also provide water quality benefits by trapping additional sediment and pollutants prior to discharge into the local and regional streams. This is considered an additional benefit, as the existing water quality management facilities have been designed to provide the required level of treatment. While the water quality and flood management elements will be designed to function as an integral system, they will be considered separately for management and maintenance. The flood facilities will be designed and maintained in accordance with the county flood program directions on sizing, design, and maintenance. The water quality facilities will be designed in accordance with RWQCB requirements, and those of the county water quality program.
>
> The primary mitigation approach for sediment transport/channel stability issues is to manage the hydrologic regime. By minimizing the alteration of channel-forming flow events (up to the 2-year event), preventing an increase in peak flows, and reducing volume increases, the channels will not be subject to significantly altered sediment transport characteristics."

Mitigation measure 4.5-6 from FEIR No. 489 requires the implementation of combined flow and water quality control systems to achieve flow duration matching, address the water balance, and provide for water quality treatment. Exhibit 4.5-3 of the FEIR identifies the hydrologic components of the water cycle that should be included to show the balance between the "deposits", which include precipitation and irrigation, and "withdrawals", which include (1) infiltration into the soils, (2) evapotranspiration and (3) water which runs off the land. In addition to providing water balance for the overall project, RMV has developed a plan to conserve and restore the habitat along the Gobernadora Canyon overbank, known as the Gobernadora Ecological Restoration Area (GERA). PA-3's proposed land use plan alters existing drainage patterns, which may potentially reduce dry weather and wet weather flows at certain locations along the Gobernadora Canyon overbank. The proposed basins are being designed to provide treated flow to meet the GERA's water demands. An environmental study was prepared to determine the optimal locations of these basins. The basins will either be infiltration, biofiltration, or detention basins that provide flow continuation along the overbank in an effort to simulate existing condition drainage patterns.

The monthly water balance is based on a continuous simulation model, SOHM. SOHM is an HSPF-based watershed model that has been specifically calibrated to natural and developed condition subwatersheds in southern Orange County and runs more than 48 years of 15-minute precipitation, evapotranspiration, and irrigation data collected at the Trabuco Canyon meteorological station. Using a simulation that includes a long period of time provides a better water balance model because of the variability in the rainfall events and the number of storms each year. This provides an "average" of the potential runoff quantity generated from the tributary areas.

SOHM models were developed for PA-3's existing and proposed conditions. Each tributary drainage area model consisted of identifying land uses, vegetation types, hydrologic soil types, BMPs, and slopes. The SOHM models for the proposed condition also account for the water balance impact due to hydromodification BMPs and LID BMPs. Table 5-4 and Table 5-5 summarize the SOHM water balance results at each point of compliance (POC). SOHM guidance manual defines "predeveloped" as the flows for the naturally occurring existing conditions, "inflow to mitigated" as the developed condition flow entering the BMP facility, and "mitigated" as the mitigated flow exiting the BMP facility.

Table 5-4: Gobernadora Canyon Annual Water Balance

Total Average Annual Water Balance Volume (ac-ft)					
POC	**Existing Node**	**Proposed Basin ID**	**Predeveloped**	**Inflow to Mitigated**	**Mitigated**
G1	30311		4.91		
G2	30418	3A-1	37.28	28.86	22.04
G3	30538	3A-3, A-4	112.87	152.46	60.64
G4	30560	3A-2, 3A-5, 3A-6	105.94	121.26	123.03
G5	30608	3A-8a	7.53	18.43	14.67
G6	30711, 30809, 30918	3A-9, 3A-10, 3A-11, 3A-12	94.82	130.40	117.82
G7	31010		17.21	3.63	2.92
Total			**380.54**	**455.05**	**341.12**

Table 5-5: San Juan Creek Annual Water Balance

Total Average Annual Water Balance Volume (ac-ft)					
POC	**Existing Node**	**Proposed Basin ID**	**Predeveloped**	**Inflow to Mitigated**	**Mitigated**
SJ1	31113, 31215	3B-1, 3B-2, 3B-4, 3B-5	175.04	69.35	48.49

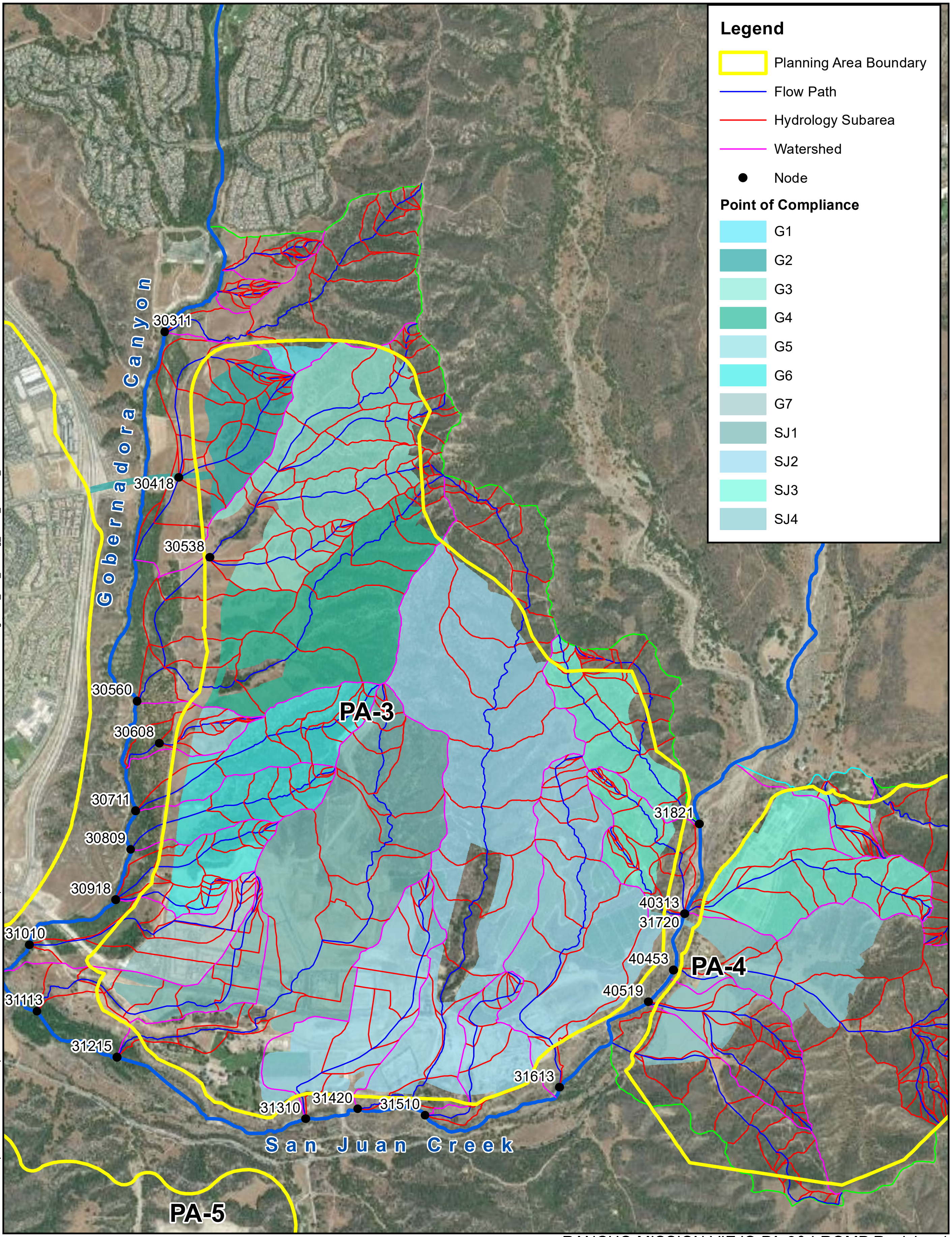
Total Average Annual Water Balance Volume (ac-ft)					
POC	**Existing Node**	**Proposed Basin ID**	**Predeveloped**	**Inflow to Mitigated**	**Mitigated**
SJ2	31310, 31420, 31510, 31613	3C-1A, 3C-1B, 3C-1C, 3C-2, 3C-3, 3C-5	303.28	1130.77	315.60
SJ3	31720, 31821, 40313	4E-1, 4E-2	124.66	257.33	58.70
SJ4	40453, 40519	4F-1, 4F-2	59.20	238.26	49.34
Total			**662.18**	**1,695.71**	**472.13**

Figure 5-6 presents the location and tributary area for each existing POC. POCs for the developed condition are located at the discharge point of the listed facility.

Using the land use, soil type, and basin characteristics of the existing and proposed conditions, hydrographs were created in SOHM to demonstrate the annual water balance. The total amount of volume infiltrated is approximately 136 acre-feet for Gobernadora Canyon and 1,224 acre-feet for San Juan Creek. This value is estimated from the difference between the “inflow to mitigated” and the “mitigated.” The majority of the volume is due to infiltration basins while the remaining amount is due to the native infiltration rate of biofiltration basins per the TGD (0.1 in/hr).

The total annual volume discharged to Gobernadora Canyon and San Juan Creek after the mitigated post development condition are expected to be less than the predeveloped condition. See values for the “predeveloped” and “mitigated” conditions in Tables 5-4 and 5-5. The decrease in volume is anticipated to be insignificant in terms of the entire watershed since this development only accounts for a fraction of the entire Gobernadora Canyon and San Juan Creek watersheds (7% and 2% respectively).

2/9/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig05-06_PA3_Existing_Water_Balance_8.5x11.mxd <USER NAME>



RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Michael Baker INTERNATIONAL

0 500 1,000 2,000 Feet

Source:

PA-3 and PA-4 Existing Water Balance Areas

Figure 5-6

5.3.5 Volume Mitigation

For this PA-3&4 ROMP, volumetric mitigation was performed to compare the runoff volume produced by each drainage in their existing and post-development conditions, for the 2-, 5-, 10-, 25-, 50- and 100-year return period/24-hour duration storm events. The volume mitigation adopts a regional approach, consistent with the 2013 Ranch Plan ROMP. Volumetric mitigation is provided by the ultimate stormwater system for PA-3 and PA-4 consistent with the methods in the 2013 Ranch Plan ROMP. Volumes for mitigation comparison were obtained from the local area hydrograph calculations in Appendix B for existing and proposed conditions. Table 5-6 shows the results of the analysis. A detailed spreadsheet is included in Appendix K.

Table 5-6: Volume Mitigation

Stream	100-year Expected Value Storm Event				50-year Expected Value Storm Event				25-year Expected Value Storm Event				10-year Expected Value Storm Event				5-year Expected Value Storm Event				2-year Expected Value Storm Event			
	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)	Existing (ac-ft)	Ultimate (ac-ft)	Required Volume Mitigation (ac-ft)	Volume Mitigated (ac-ft)
Gobernadora	93.5	86.2	-	17.4	80.5	77.7	-	17.4	67.3	66.9	-	17.4	48.8	53.4	-	17.4	24.5	32.9	-	17.4	9.7	19.5	-	17.4
San Juan Creek	259.8	494.6	-	214.0	238.8	445.0	-	195.9	191.4	388.5	-	192.6	139.4	304.9	-	188.1	64.9	189.7	-	181.8	26.1	114.6	-	117.3
Total	353.3	580.9	227.6	231.4	319.3	522.7	203.5	213.3	258.7	455.5	196.8	210.0	188.2	358.3	170.1	205.5	89.4	222.7	133.3	199.2	35.8	134.1	98.3	134.7

6 Drainage Design Guidelines

The PA-3&4 ROMP provide a planning area scale study that will guide the stormwater mitigation measures that addresses flood control, water quality management and stream stability for facility and project scale planning. The 2013 Ranch Plan ROMP in Chapter 4 Regulatory Requirements and Design Criteria identifies criteria that must be addressed in the phasing or project level. As planning areas 3 and 4 are built out, the final engineering plans and grading plans must adhere to those items and the County requirements. Table 19-1 in Appendix A identifies required items that will need to be addressed in final design plans consistent with EIR 589 provisions SC 4.5-1 and SC 4.5-2 on Drainage Study and improvements compliance matrix. The checklist is not intended to be all inclusive of all drainage/stormwater management requirements and guidelines but only the criteria specific to the Ranch Plan. Design of all future storm drain work shall be in conformance with the latest edition of Orange County Hydrology Manual, OC Local Drainage Manual, and OC Flood Control District Manual as applicable.

Figure 6-1 is a general summary of potential ownership and is subject to change. Special conditions, design, or use of the facilities may dictate different ownership requirements. Detailed ownership of the facilities is not finalized and is not required at this stage of design. Responsibility of maintenance will be determined through consideration of County Maintenance of storm drains prior to the approval of the final plans and designated on the title sheet, plan and profile per Chapter 2 of the Orange County Local Drainage Manual 2nd Edition.

6.1 Tributary to Gobernadora Canyon

6.1.1 Subwatershed A

Subwatershed A is the area of PA-3 that is tributary to Gobernadora Canyon at outfall 9. It is planned to be predominately commercial land use and is subject to hydromodification. Hydromodification mitigation will be provided through a series of hydromodification detention basins which will detain the hydromodification volume. The LID basins will also incorporate extra detention storage above the water quality volume to help with hydromodification mitigation. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

6.1.1.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes, further analysis will need to be conducted to prove the changes will not adversely affect Gobernadora Canyon.
3. Coordination with the County may be required.

6.1.1.2 Discharge to Gobernadora

Design guidelines for the Outfall 9 and other flows to Gobernadora Canyon are not defined in the PA-3&4 ROMP. The final planning of the Subwatershed A must show that hydromodification requirements are met and stable conveyance design to the planning area boundary is proposed. Energy dissipators/riprap should be considered to ensure that flows from the outlets for both onsite and offsite flows are nonerosive. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap.

6.1.1.3 Water Quality Management Plan

Basins are proposed along the development that will discharge to Gobernadora Canyon. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID and hydromodification facilities.

6.1.1.3.1 Hydromodification Basins

To ensure that hydromodification requirements are still met: Compare the land uses and slopes to ensure it does not differ greatly from the ROMP. If the overall breakdown of area based on these categories for a BMP differs significantly from the ROMP values, rerun the hydromodification models.

6.1.1.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, and/or Debris Facilities design criteria per OC LDM Section 9.2 as appropriate, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable (to address undeveloped areas).
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.1.1.5 Regional Flood Facilities

Regional flood facilities are not required for PA-3 areas draining to Gobernadora Canyon as defined by the 2013 Ranch Plan ROMP.

6.1.1.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration rates due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.1.1.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County.
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2 Tributary to San Juan Creek

6.2.1 Subwatershed B

Subwatershed B is one of the three areas of PA-3 tributary to San Juan Creek. Subwatershed B is in the southwest portion of the PA-3 development and it is tributary to 2019 proposed outfall 11. It is planned to have mixed land use which will be mitigated by two smaller flood control basins south of Cow Camp Road. The basin B system will also include water quality treatment basins consisting of pretreatment basins and an infiltration basin south of Cow Camp Road.

6.2.1.1 Land Use and Grading

As final planning for the phase areas continues, the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect San Juan Creek.
3. Coordination with the County may be required.

6.2.1.2 Discharge to San Juan Creek

Design guidelines for the Outfall 11 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should daylight at the 100-year floodplain and outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.1.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.1.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, and/or Debris Facilities design criteria per OC LDM Section 9.2 as appropriate, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.1.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.1.6 Infiltration Basins

Infiltration basin design will need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.1.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County.

- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.2 Subwatershed C

Subwatershed C (C1 and C2) is located in the south-center portion of the PA-3 development and is tributary to 2019 outfall 13.1. This subwatershed is the largest in the development. The land use is mixed, and the runoff is conveyed in four mainline storm drain systems, water quality flows are diverted prior to the runoff outletting to a single flood basin. The offsite pipe system outlets to the natural canyon in Subwatershed C, where flows will be treated with a debris basin, and then conveyed via a culvert under Cow Camp Road to the flood control basin.

6.2.2.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 Hydrology Update/PA-3&4 ROMP Revision 1.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect San Juan Creek.
3. Coordination with the County may be required.

6.2.2.2 Discharge to San Juan Creek

Design guidelines for the Outfall 13.1 and other flows to San Juan Creek are not defined in the PA-3 Hydrology Update/PA-3&4 ROMP Revision 1. Discharge from the development should daylight at approximately the 100-year floodplain and outlet to San Juan Creek via an engineered conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.
- Sensitivity analysis will be performed with subsequent design documents to evaluate the performance of proposed hydraulic structures.

6.2.2.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.2.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, and/or Debris Facilities design criteria per OC LDM Section 9.2 as appropriate, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.
- Per OC LDM 4.4.2.5 pipes with heavy bed load shall be less than 15 fps. Pipes conveying offsite flows should be considered to have heavy bed load. During design of these facilities, offsite pipes should be revised accordingly to reduce velocities to less than 15 fps.

6.2.2.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.2.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.2.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.3 Subwatershed O

Subwatershed O is located on the eastern portion of PA-3. The total drainage area is 51.1 acres. It consists of natural areas with small drainages around the development that will not be disturbed by the proposed development. Subwatershed O will be maintained as a separate watershed from the developed areas in order to maintain natural drainage patterns and minimize impacts to the existing regional watershed S26. Some of the flows from this drainage area will be collected through a separate storm drain system and discharged into San Juan Creek at 2018 outfall 17. The natural runoff flows will be routed through an oversized pipe to deliver flow and sediment to San Juan Creek. Other flows will be routed to the same location through ditches that will only receive the undeveloped area runoff flows.

6.2.3.1 Discharge to San Juan Creek

Design guidelines for the Outfall 17 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour.

6.2.3.2 Debris

The proposed storm drain that intercepts runoff from natural watershed area shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present. The Local Drainage Manual identifies different types of “debris barriers” which should be considered at the inlet of the storm drain during final design.

6.2.4 Subwatershed E

Subwatershed E is located in the north-western portion of PA-4. The current land use for PA-4 is commercial. This subwatershed will collect off-site runoff through the storm drain system and it will comingle with runoff flows from the developed areas. The off-site runoff originates from natural hills that will not be developed. The two basins in subwatershed E will be located in the most downstream portion of this subwatershed. The flood control basin will provide flood mitigation for the entire watershed, while the infiltration basin directly downstream will treat the water quality volume of only the developed areas. The flows will be discharged to San Juan Creek through storm drain outfall 20.

6.2.4.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect San Juan Creek.
3. Coordination with the County may be required.

6.2.4.2 Discharge to San Juan Creek

Design guidelines for the Outfall 20 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the outlet.

6.2.4.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.4.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, and/or Debris Facilities design criteria per OC LDM Section 9.2 as appropriate, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.4.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.4.6 Infiltration Basins

Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.4.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County
- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.

6.2.5 Subwatershed F

Subwatershed F is located in the south-eastern portion of PA-4. Like Subwatershed E the land use is currently planned to be commercial. This subwatershed will collect off-site runoff flow through the storm drain system and it will comingle with runoff flows from the developed areas. The off-site runoff originates from natural hills that will not be developed. A flood control and pretreatment forebay will provide flood mitigation and pretreatment for the infiltration basin. The two basins in subwatershed F will be located in the most downstream portion of this subwatershed. The flood control basin will provide flood mitigation for the entire watershed, while the infiltration basin directly downstream will treat the water quality volume of only the developed areas. The flows will be discharged to San Juan Creek through storm drain outfall 22.

6.2.5.1 Land Use and Grading

As final planning for the phase areas continues the land use and grading will need to be checked to ensure it is consistent with the hydrology provided in the PA-3&4 ROMP.

1. Revisions to land use and grading will be assessed to ensure it does not invalidate previous conclusions regarding peak discharge and runoff volumes from the PA-3 & 4 ROMP.
2. If there are changes to the backbone storm drain hydraulics or required basin volumes further analysis will need to be conducted to prove the changes will not adversely affect San Juan Creek.
3. Coordination with the County may be required.

6.2.5.2 Discharge to San Juan Creek

Design guidelines for the Outfall 22 and other flows to San Juan Creek are not defined in the PA-3&4 ROMP. Discharge from the development should outlet to San Juan Creek via a conveyance channel system to the 10-yr floodplain to prevent erosion. Supporting stable channel calculations should be provided to show that the velocities are non-erodible and does not create local scour. Detailed drainage submittals that include energy dissipators and stabilized conveyance should verify the following:

- Appropriate energy dissipator types are selected in accordance with HEC-14.
- HEC-14 methods are adequate for sizing impact basin.
- The calculated forces do not exceed the allowable design impact load listed in the referenced SPPWC 384-3.
- Riprap sizing meets typical Orange County methods.
- Hydraulic analysis includes energy dissipator and stabilized riprap to the creek outlet.

6.2.5.3 Water Quality Management Plan

Basins are proposed throughout the development that will discharge to San Juan Creek. These basins will be designed to meet water quality requirements. All discharges from the development will be treated following the TGD specifications for LID stormwater management strategies.

- Prior to the development of the project WQMP, consult with OCPW O&M and ER/Watershed to ensure proper direction, frequencies and reporting formats are included.
- Show that current land plans are consistent with latest design for the LID facilities.

6.2.5.4 Debris

Debris basin design will follow guidelines and requirements set in the 2013 Ranch Plan ROMP, and/or Debris Facilities design criteria per OC LDM Section 9.2 as appropriate, the following items should also be considered and analyzed in final design:

- Analysis of burned and bulked flows will be considered at each stage of development where applicable.
- Los Angeles County bulking and burning methodologies can be used to develop flows for design of the desilting or debris basins.
- Appropriate energy dissipators will be applied to pipes going into basins where applicable.
- Storm drains that intercept runoff from natural watershed areas that produce debris shall be sized to convey burned and bulked flows and will have a minimum pipe diameter of 36-inches when a debris basin is not present.

6.2.5.5 Flood Control Facilities

Flood Control facilities are required to mitigate discharges into San Juan Creek.

- Basin design must include appropriate free board, access road requirements, as well as other requirements identified in the 2013 Ranch Plan ROMP.
- Should the County of Orange assume O&M responsibility the basin design must be adjusted to comply with appropriate OCPW standards and requirements.
- Provisions of Division 3 of the California Water Code affecting jurisdiction over dams and reservoirs should be considered.

6.2.5.6 Infiltration Basins

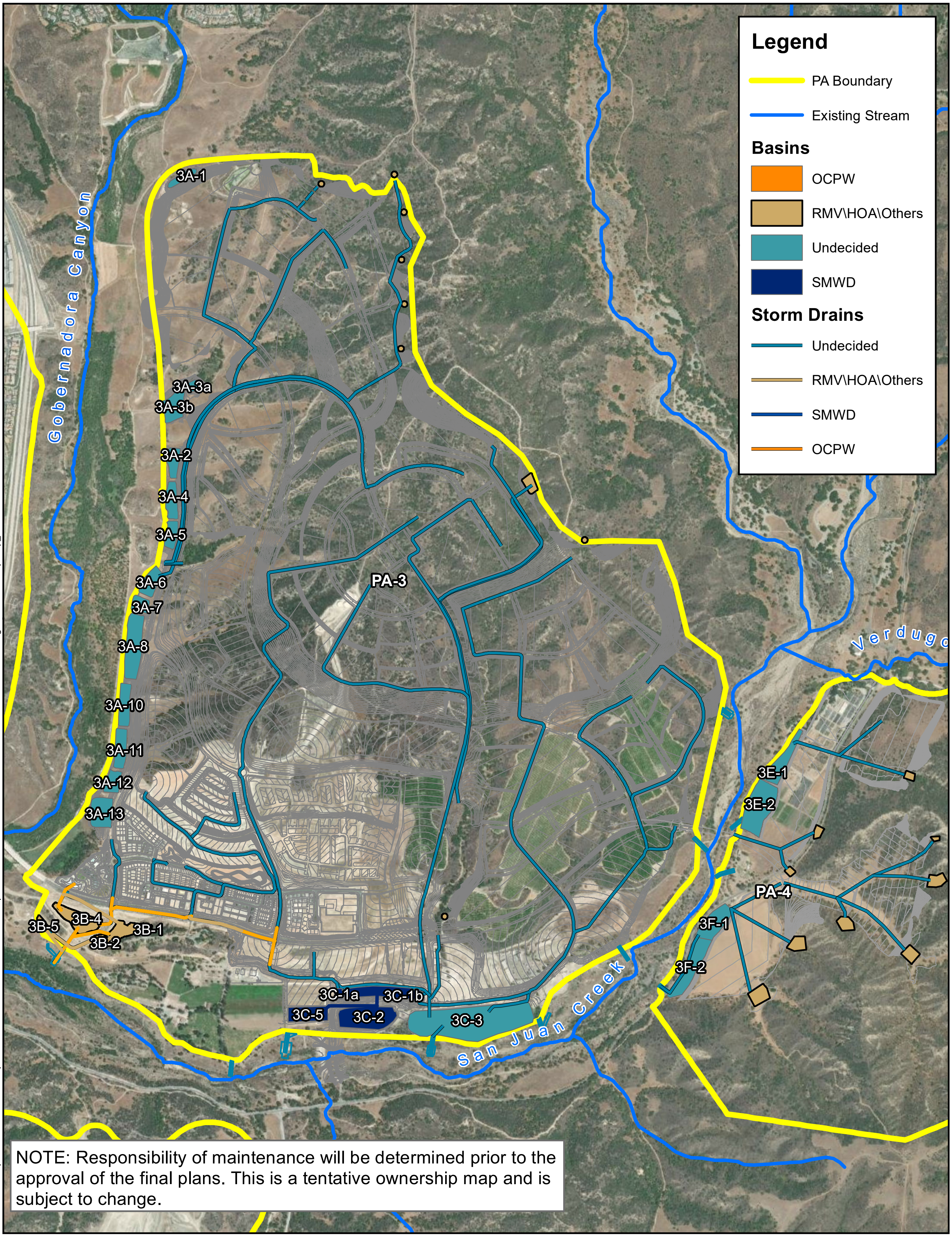
Geotechnical investigation will need to be reevaluated prior to project WQMP. Infiltration basin design will also need to consider reduced infiltration due to clogging potential and compaction requirements. Footprints should be adjusted accordingly during detail design.

6.2.5.7 Operations and Maintenance

The following are additional guidelines for final design plans for the operation and maintenance of facilities within the planning areas.

- Function, ownership, roles and responsibilities of all infrastructure will need to be defined prior to construction.
- Prior to the design of basins, consult with OCPW O&M and ER/Watershed to ensure standard specifications and requirements are being followed.
- Provide future estimated maintenance cost of all drainage or areas of responsibility accepted by the County

- Catch basin systems should be included in review of design plans to see if connector pipe screens are required.



Michael Baker INTERNATIONAL

0 750 1,500 Feet

Source:

RMV PA3&4 ROMP Revision 1

Tentative Ownership Map

Figure 6-1

7 Conclusions

This section provides a discussion of the local and regional analysis results and a comparison between the approved Ranch Plan ROMP and the PA-3&4 ROMP analysis. A regional mitigation summary is shown in Table 7-1. The purpose of Revision 1 is to approve the updated C Basin Complex impact on the Phase Condition PA-1, -2, and -3. The Phase Condition PA-1,-2, -3 and -4 and Ultimate are completed for consistency with the approved 2019 PA-3&4 ROMP. They will be updated in future submittals and are not part of the approval of the PA-3&4 ROMP Revision 1.

The increase in tributary areas to the permitted storm drain outfalls in the development condition is caused by the alteration of the land plan. The areas of this PA-3&4 ROMP, tributary to each storm drain outfall compared to the Ranch Plan ROMP drainage areas, have increased in some cases and decreased in other cases. Tributary areas have changed due to modifications to the overall land plan. The effects of the development will be mitigated with basins that provide flood control mitigation and water quality treatment. The areas tributary to outfalls 20 and 22 within PA-4 have decreased significantly from the Ranch Plan ROMP; however, the majority of the tributary area is undeveloped land. The natural runoff flows will comingle with the development runoff flows and will be routed through basins at outfalls 20 and 22 to improve the regional mitigation goals. The undeveloped area will include debris and pretreatment forebays prior to entering the basin systems.

The Ranch Plan used outfalls 10, 12, and 15 within PA-3. These are not used in the current PA-3&4 ROMP. However, this PA-3&4 ROMP will use outfalls 11 and 1413.1 within PA-3, which were not used in the Ranch Plan ROMP, to optimize the basins' use for mitigation. PA-4 has significantly changed per this PA-3&4 ROMP compared to the Ranch Plan ROMP; only outfalls 20 and 22 will be used to discharge to San Juan Creek. In the current plan, Verdugo Canyon will not receive development discharges.

The regional ultimate and phase hydrology meets the EIR flow mitigation requirements by mitigating ultimate condition flows to the Ranch Plan ROMP ultimate condition models or the PA-3&4 existing condition models using onsite mitigation basins. The Ranch Plan ROMP indicated that peak flow mitigation for San Juan Creek is to be provided by detention basins. Results of the 2023 regional analysis show a minor increase in peak flow for the 50- and 25-year Phased Condition PA-1, -2, -3, & -4 Constructed (No PA-5) as well as the smaller more frequent events (10-year and lower) in all conditions. The phased condition PA-1, -2, & -3 Constructed (No PA-4 &-5) also showed an insignificant increase in flow for a few nodes for the 50-year and 25-year. The increase for the smaller events is acceptable because the flow does not impact flood protection and stream stability analysis shows no adverse impacts to San Juan Creek. The PA-4 basins will be assessed in greater detail closer to design of the basin and will verify that the 0.5% increase for the various nodes is mitigated fully. Full mitigation is required for the 25-, 50-, and 100-year expected value storm events; the target values for the 10-, 5-, and 2-year expected value storm events are the peak discharges from the complex with basin models from the Ranch Plan ROMP.

Volume mitigation is provided through the infiltration basins, flood control basins, and biofiltration and hydromodification basin in the PA-3&4 development. The volume analysis shows no adverse impacts to the storm water runoff volumes on both a regional and local outfall scale. The monthly water balance study completed to address the potential impacts to the biological communities as a result of the phased PA-3 development also showed no significant impact to the development of benthic communities in San Juan Creek and its smaller tributaries.

The sediment transport study was prepared to evaluate the impacts of the PA-3&4 development area on the event-based and long-term response of San Juan Creek and Gobernadora Canyon. The result of the analysis shows no adverse impacts due to the PA-3&4 development. Results of the existing and proposed conditions provide the same trends and little variation in the bed change. The lateral bank migration analysis was completed to demonstrate that the proposed PA-3&4 development area has sufficient setbacks from the creeks, and that the proposed grading for all permanent engineered structures do not encroach into identified riverine erosion hazard areas. As part of the assessment of the of the project impacts on the receiving waters, a stream monitoring program for the PA-3&4 development area was developed in conformance with MM 4.5-8. The program is an amendment to the "PA-1 Development Area and the Ranch Development Plan San Juan Creek Watershed Stream Monitoring Program" prepared by PACE dated December 2011 and the "PA-2 ROMP Stream Monitoring Program Amendment" prepared by Michael Baker International dated March 2014. The amendment extends the stream walk limits along San Juan Creek to upstream of regional node 119 and includes limits for Gobernadora Canyon to upstream of the PA-3&4 development area. The program also identifies the additional cross section monitoring locations along the creeks.

The location of the recommended stormwater facilities associated with the PA-3 development are illustrated in Exhibit 3a.

Based on the results of the hydrology study, volumetric calculations, hydraulics, and the stream stability analysis, the PA-3&4 project in both the phased and ultimate condition will not create adverse impacts to San Juan Creek or Gobernadora Canyon and is in substantial conformance with the FEIR and Ranch Plan ROMP.

Table 7-1: Regional Discharge Comparison

Node		100-year Expected Value Storm Event				50-year Expected Value Storm Event				25-year Expected Value Storm Event				10-year Expected Value Storm Event				5-year Expected Value Storm Event				2-year Expected Value Storm Event			
	PA-3&4 Ultimate Area (ac)	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]	PA-3&4 ROMP Existing	PA-2 ROMP Ultimate	Ranch Plan ROMP	PA-3&4 Ultimate Conditions[1]
		Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model	Existing	w/Basin Model	w/Basin Model	w/Basin Model
119	49496	20326	-	20326[2]	20321[2]	17844	-	17837[2]	17850[2]	14939	-	14921[2]	14918[2]	7239	-	7216[2]	7196[2]	2403	-	2409[2]	2407[2]	534	-	524[2]	525[2]
126	50439	20352	-	20303	20205	17828	-	17811	17748	14924	-	14898	14845	7145	-	7178	7144	2380	-	2429	2360	525	-	534	528
127	52666	20460	-	20283	20371	17925	-	17756	17889	14964	-	14875	14949	6990	-	7159	7112	2314	-	2414	2452	514	-	559	603
133t	6638	3986	2800	3085	2921	3500	2514	2761	2690	2942	2179	2371	2300	1875	1480	1649	1639	786	671	836	842	354	275	417	403
133u	54418	20361	20110	20260	20348	17911	17648	17793	17869	14948	14753	15028	14932	6914	6999	7221	7068	2308	2523	2575	2559	515	643	638	657
133c	61056	21828	21110	21162	21742	19143	18541	18610	19095	15972	15477	15566	15912	7172	7152	7374	7413	2458	2568	2758	2767	583	657	733	722
134t	3860	2415	2262	2422	-	2124	1984	2128	-	1792	1666	1790	-	1039	1003	1103	-	329	317	430	-	121	122	191	-
134u	62747	22000	21316	21310	21935	19284	18708	18723	19265	16080	15618	15657	16050	7148	7162	7265	7427	2415	2629	2702	2767	582	651	713	703
134c	66607	22933	22123	22157	22835	20118	19415	19470	20054	16770	16203	16274	16717	7275	7263	7373	7577	2525	2651	2736	2829	610	672	718	736
137	67799	23080	22274	22352	22977	20237	19534	19634	20174	16869	16299	16415	16815	7267	7275	7433	7593	2501	2653	2796	2851	617	682	732	726
138	69103	23249	22443	22504	23142	20380	19666	19761	20294	16983	16400	16513	16913	7270	7276	7412	7591	2510	2667	2791	2832	625	674	737	774
139	69531	23299	22492	22553	23190	20423	19700	19802	20337	17013	16432	16549	16945	7270	7276	7415	7592	2531	2678	2807	2835	640	679	748	752

[1]Ultimate Conditions (with basin model) shows the results of the PA-3&4 ROMP regional complex hydrology analysis.

[2]Discharge is selected from the higher discharge between the Single Area and Free Draining models.

8 References

Michael Baker International (Formerly RBF Consulting). (2014). *Ranch Plan Planned Community PA-2 Runoff Management Plan Update.*

Michael Baker International. (2019) *The Ranch Plan Planned Community Planning Area 3 and Planning Area 4 Runoff Management Plan.*

OC Public Works. (1986). *Orange County Hydrology Manual.* OC Flood Division. Santa Ana: Orange County Public Works. Retrieved from http://ocflood.com/civicax/filebank/blobdload.aspx?BlobID=8336

OC Public Works. (1996). *Orange County Hydrology Manual, Addendum No. 1.* OC Flood Division. Santa Ana: Orange County Public Works. Retrieved from http://ocflood.com/civicax/filebank/blobdload.aspx?BlobID=8325

OC Public Works. (2017). *Technical Guidance Document (TGD).* OC Watersheds. Retrieved from https://ocgov.app.box.com/v/2017-09-SOCTGD

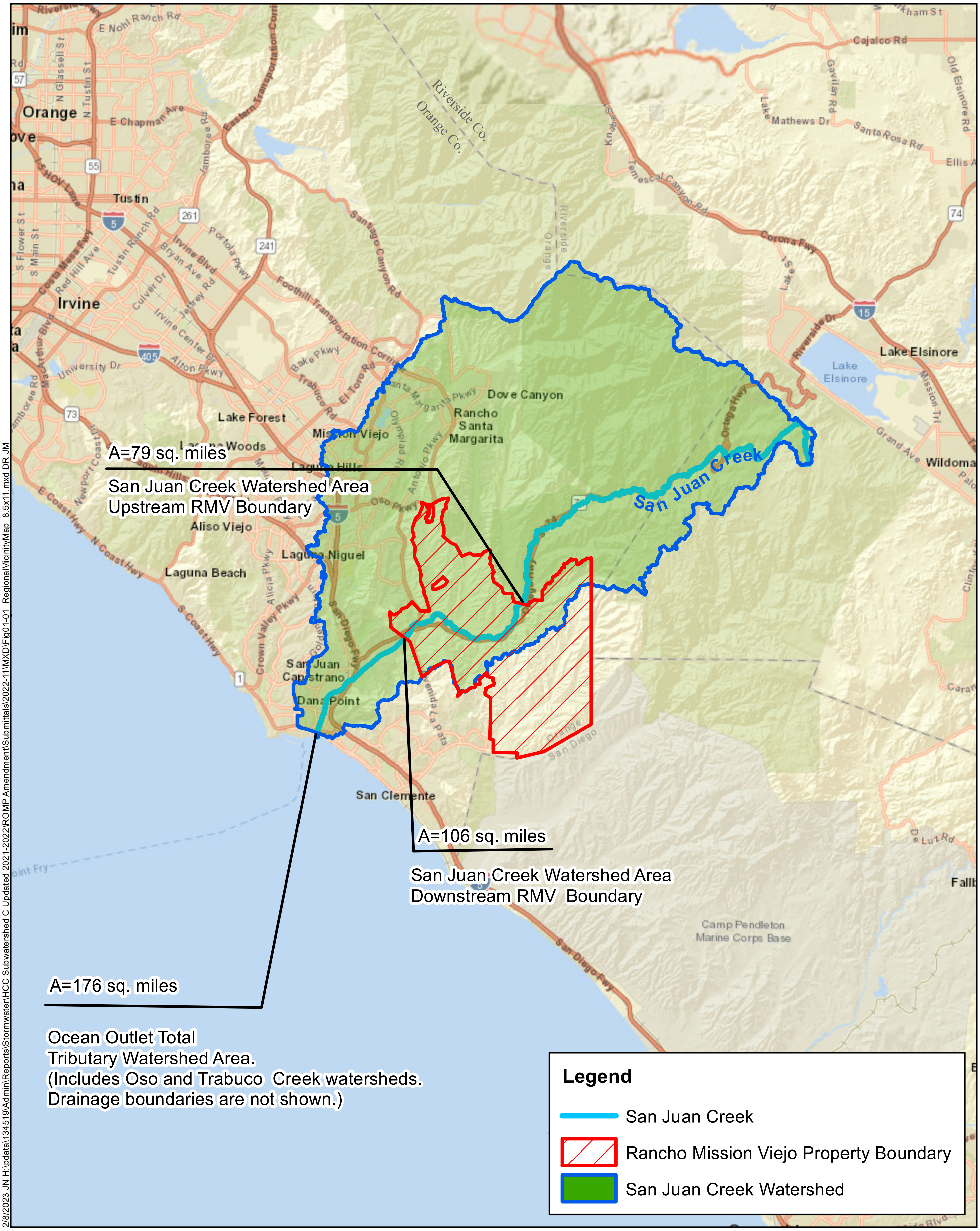
Pacific Advance Civil Engineering Inc. (August 2014). *Gobernadora Basin Engineering Basis of Design Report.*

Pacific Advanced Civil Engineering Inc., Huitt-Zollars, and Geosyntec Consultants. (2013). *Ranch Plan Planned Community, Runoff Management Plan.*

Pacific Advance Civil Engineering Inc. (2018) *RMV Ranch Plan Update Assessment for Lateral Streambank Erosion Analyses for PA1/PA2.*

Pacific Advance Civil Engineering Inc (2008) San Juan Creek Watershed Hydrology Study.

The Orange County Copermittees. (2018). *South Orange County Watershed Management Area Water Quality Improvement Plan.* OC Watersheds. San Diego Water Quality Control Board. Retrieved from https://ocgov.app.box.com/v/WQIP-2019



0 2 4 8 Miles

Source:

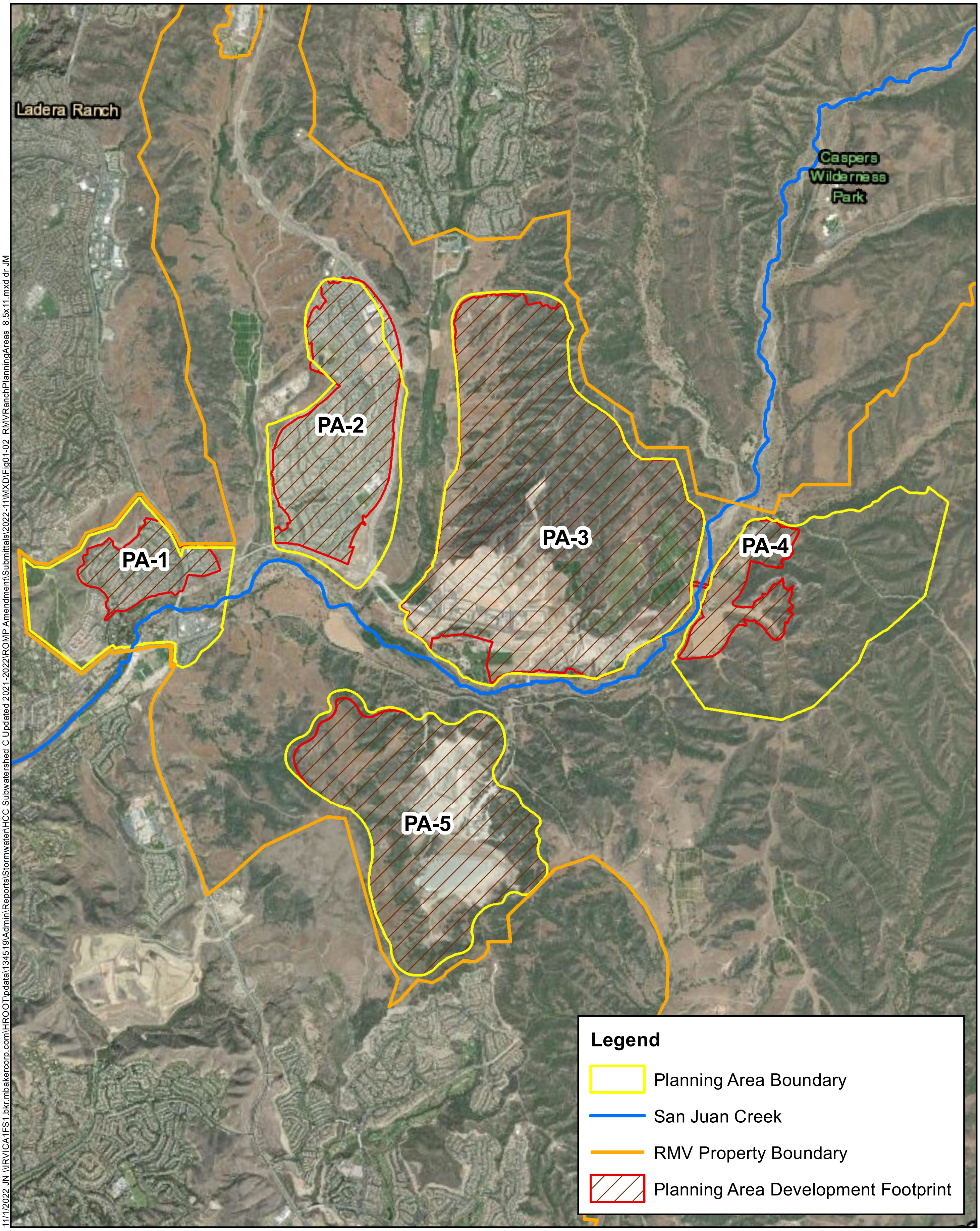
Michael Baker INTERNATIONAL

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Regional Vicinity Map

Figure 1-1

2/8/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2022-11\MXD\Fig01-01_RegionalVicinityMap_8.5x11.mxd DR JM

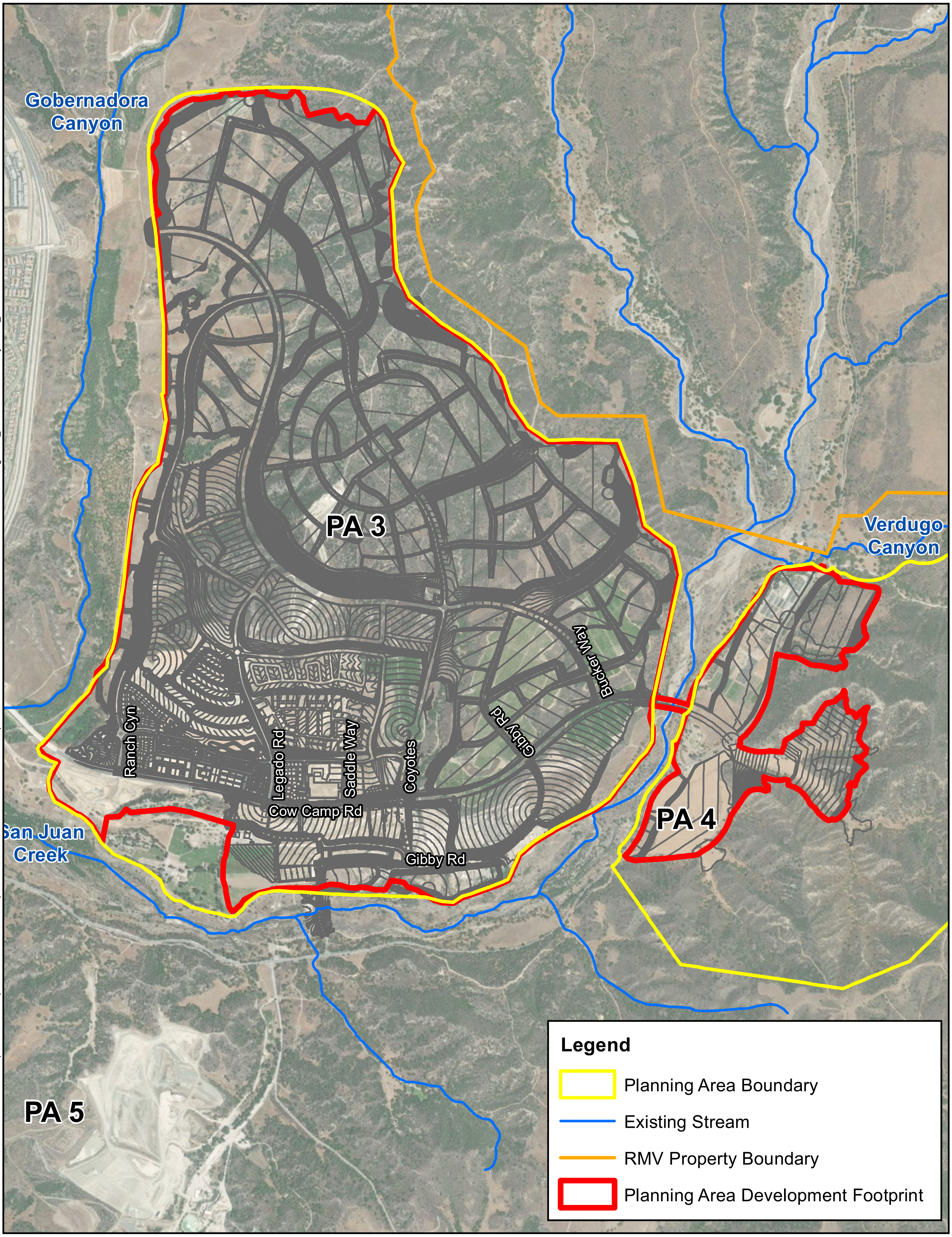


Michael Baker INTERNATIONAL

RMV PA-3&4 ROMP Revision 1

RMV Ranch Plan Development Areas

Figure 1-2



11/14/2022 JN \\IRVICA1FS1.bkr.mbakercorp.com\HROOT\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2022-11\MXD\Fig01-03_PA-3 and PA-4 Study Areas_8.5x11P.mxd DER JM

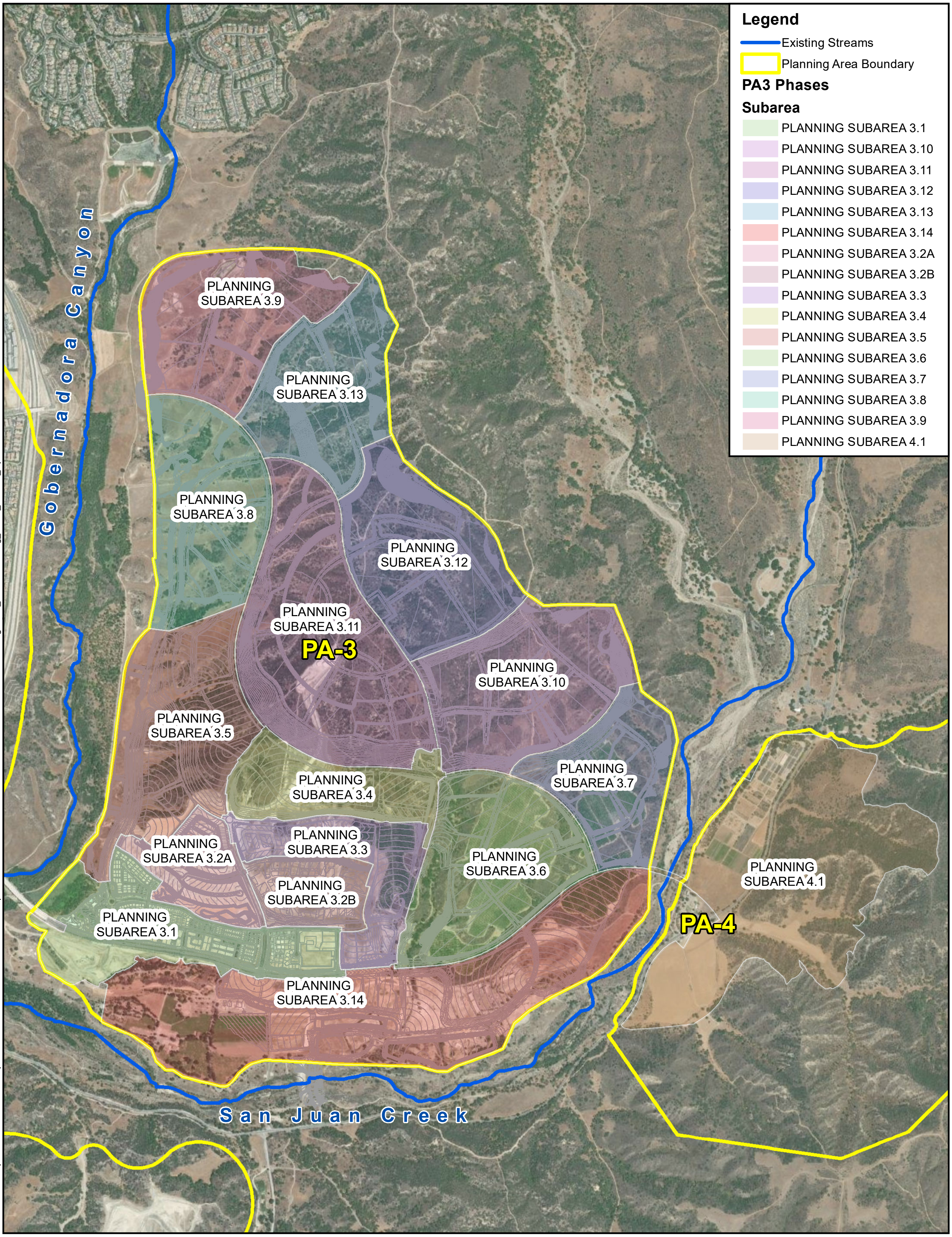
Michael Baker INTERNATIONAL

Source:

RMV PA-3&4 ROMP Revision 1

PA-3 and PA-4 Study Areas

Figure 1-3



2/14/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig01-04_PA3&4-Phasing_Areas_85x11P_Update.mxd <USER NAME>

Michael Baker INTERNATIONAL

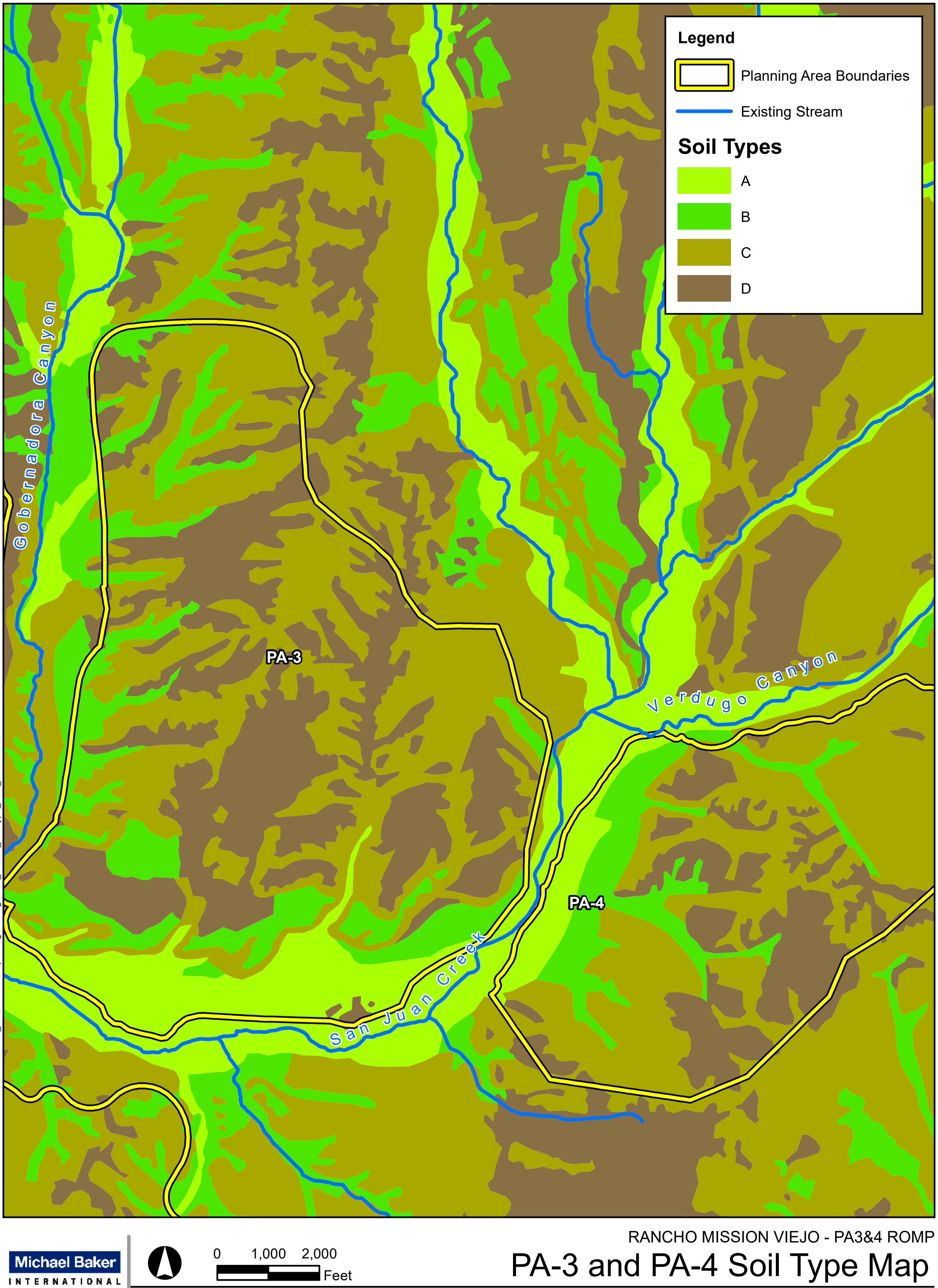
0 500 1,000 2,000 Feet

Source:

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

PA-3 Phasing Areas

Figure 1-4



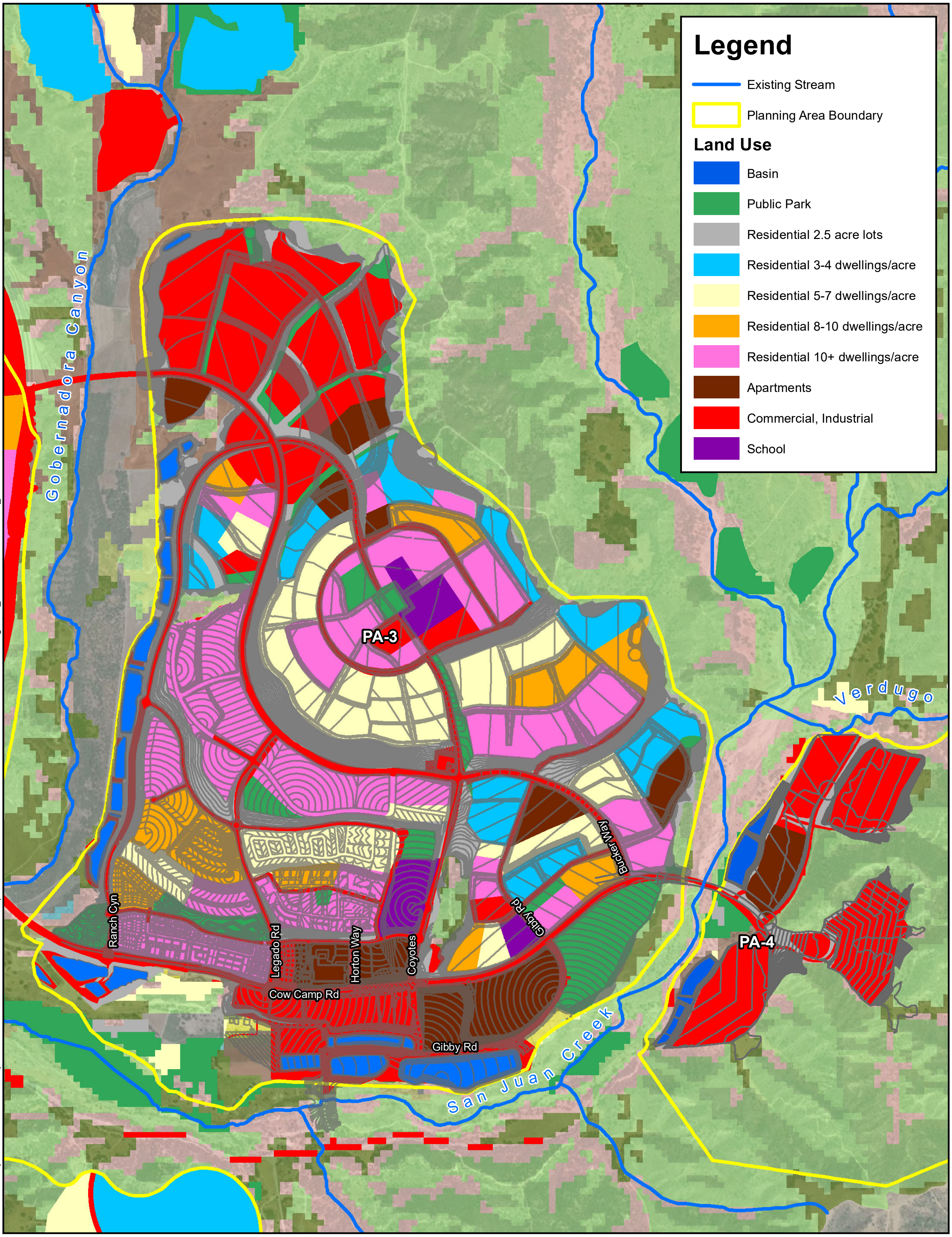
7/31/2019 JN M:\Mdata\134519\GIS\MXD\PA-3_PA-4 ROMP\Report Figures\Fig02-01_PA3&4_SoilType_PC1_85x11P.mxd DER JM

Michael Baker INTERNATIONAL

RANCHO MISSION VIEJO - PA3&4 ROMP

PA-3 and PA-4 Soil Type Map

Figure 2-1



2/13/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-02_PA3&4-UltimateLanduse_8.5x11P.mxd DER JM

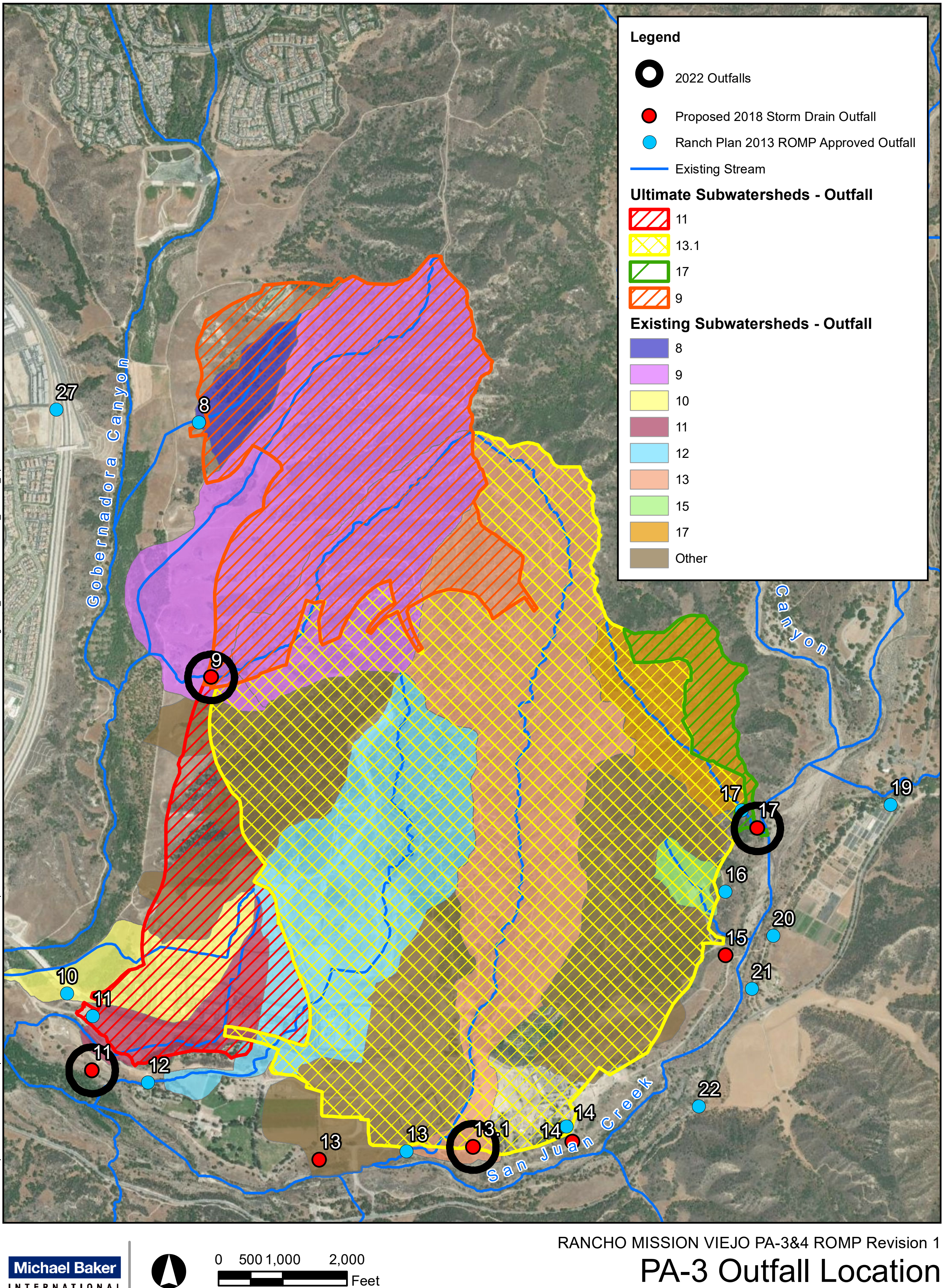
Michael Baker INTERNATIONAL

Source:

RANCHO MISSION VIEJO - PA3&4 ROMP Revision 1

PA-3 and PA-4 Land Use

Figure 2-2



2/9/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-03_PA3-Outfall Location_8.5x11P_Update.mxd

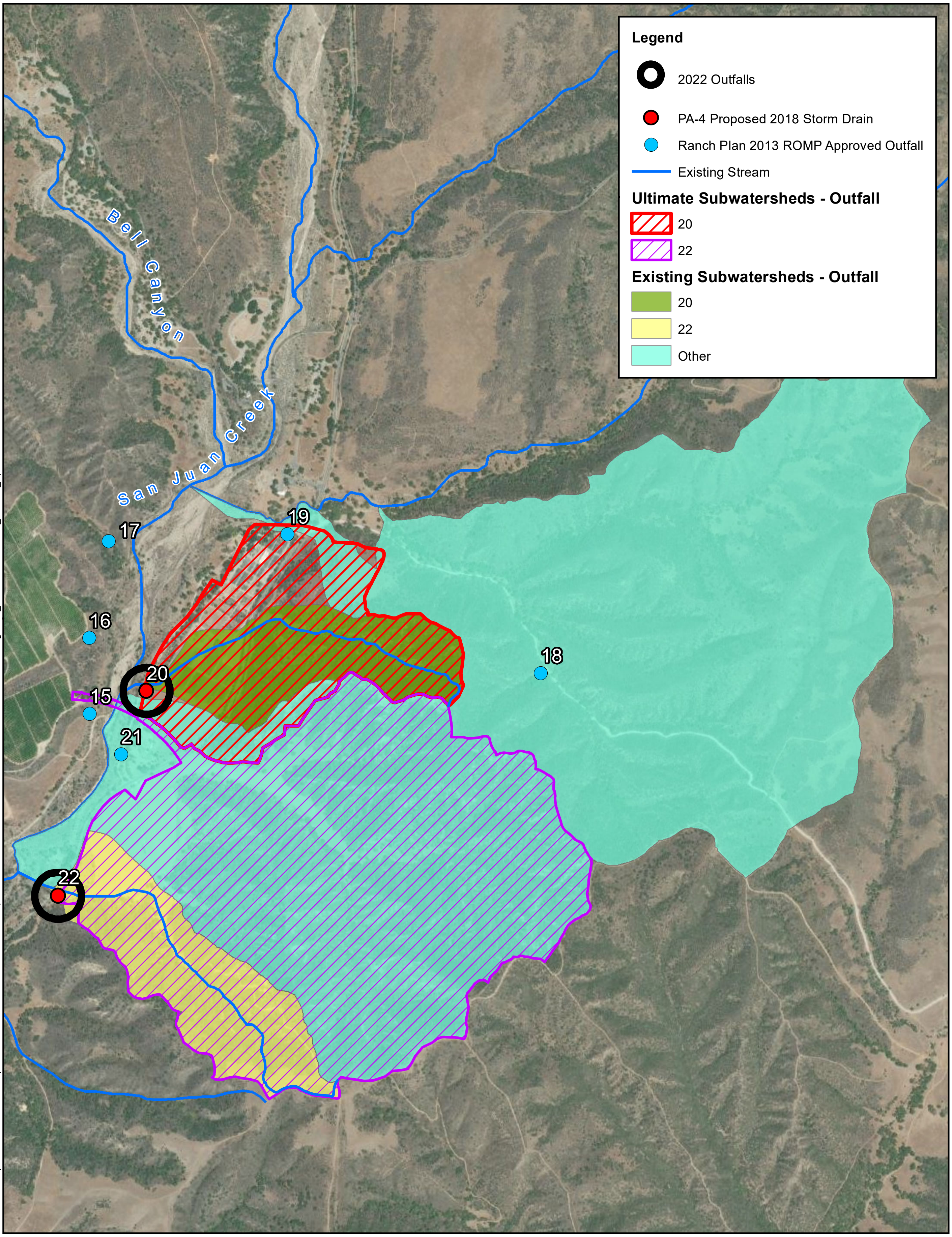
Michael Baker INTERNATIONAL

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

PA-3 Outfall Location

Figure 2-3

2/8/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-04_PA4-Outfall Location_8.5x11P_Update.mxd



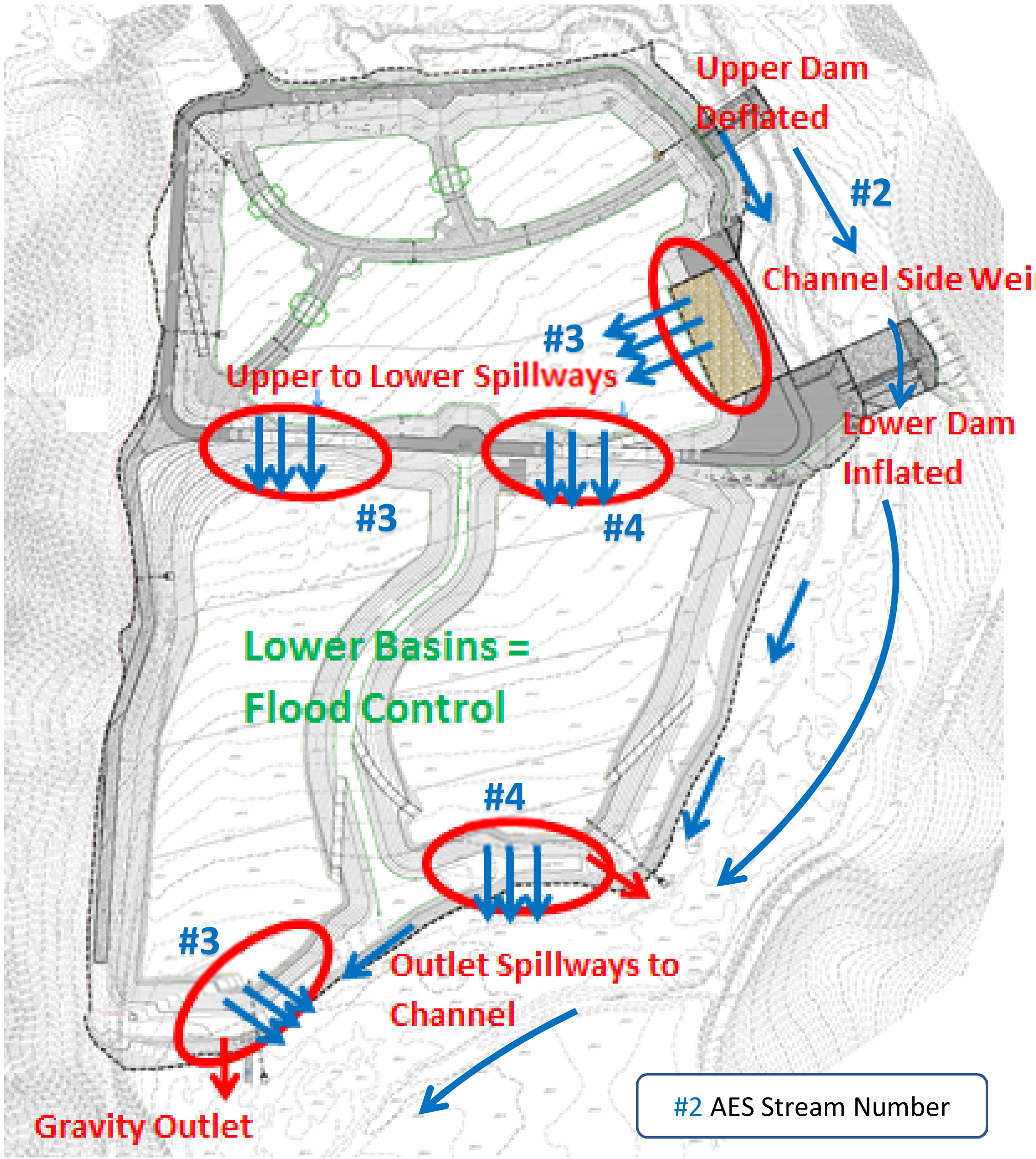
0 500 1,000 2,000
Feet
Source: ArcGIS Online

Michael Baker INTERNATIONAL

RANCHO MISSION VIEJO PA-3&4 ROMP REVISION 1

PA-4 Outfall Location

Figure 2-4



Citation: PACE August 2014 Design Report: Gobernadora Multipurpose Basin

Figure 2.5: Gobernadora Multipurpose Basin Routing

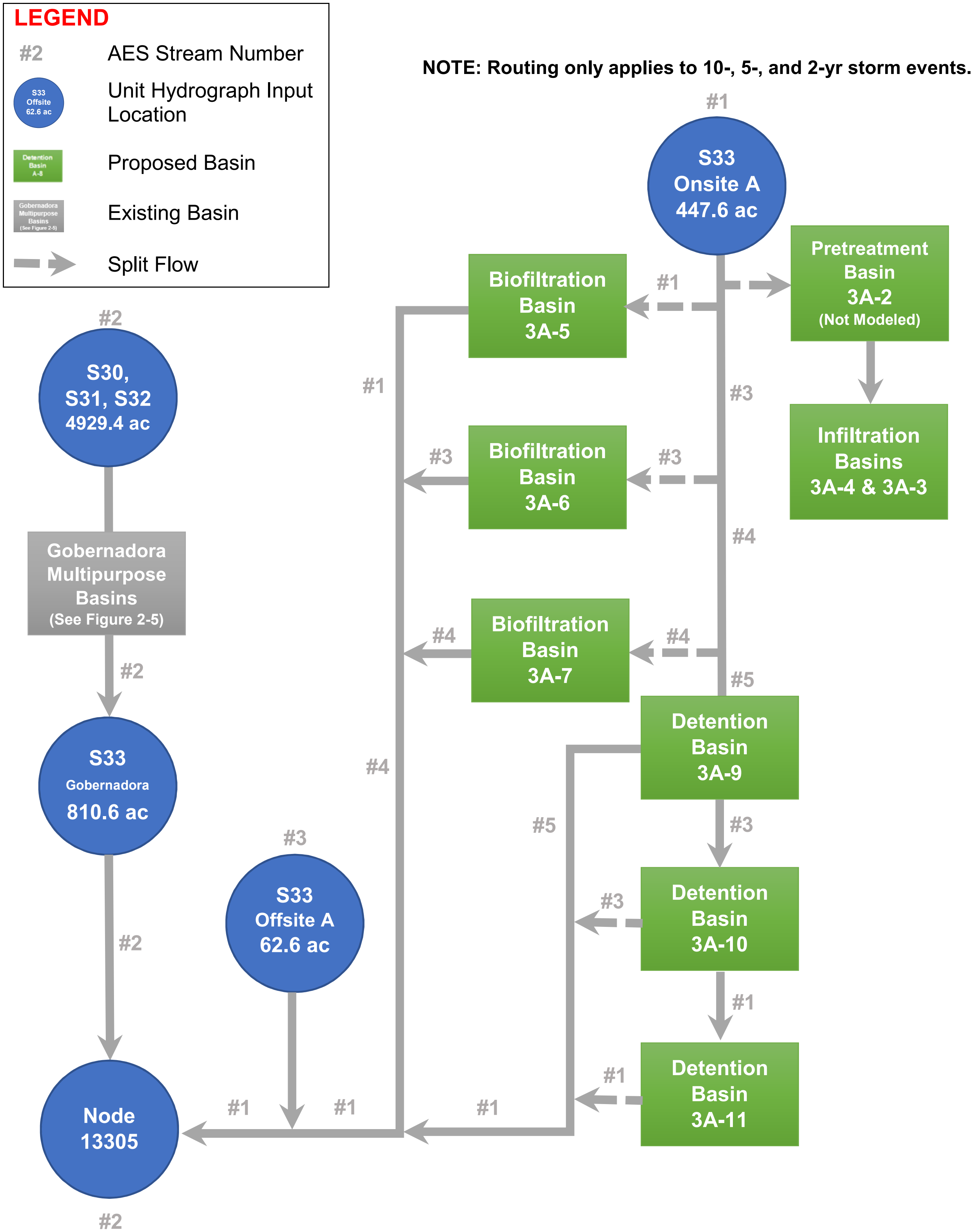
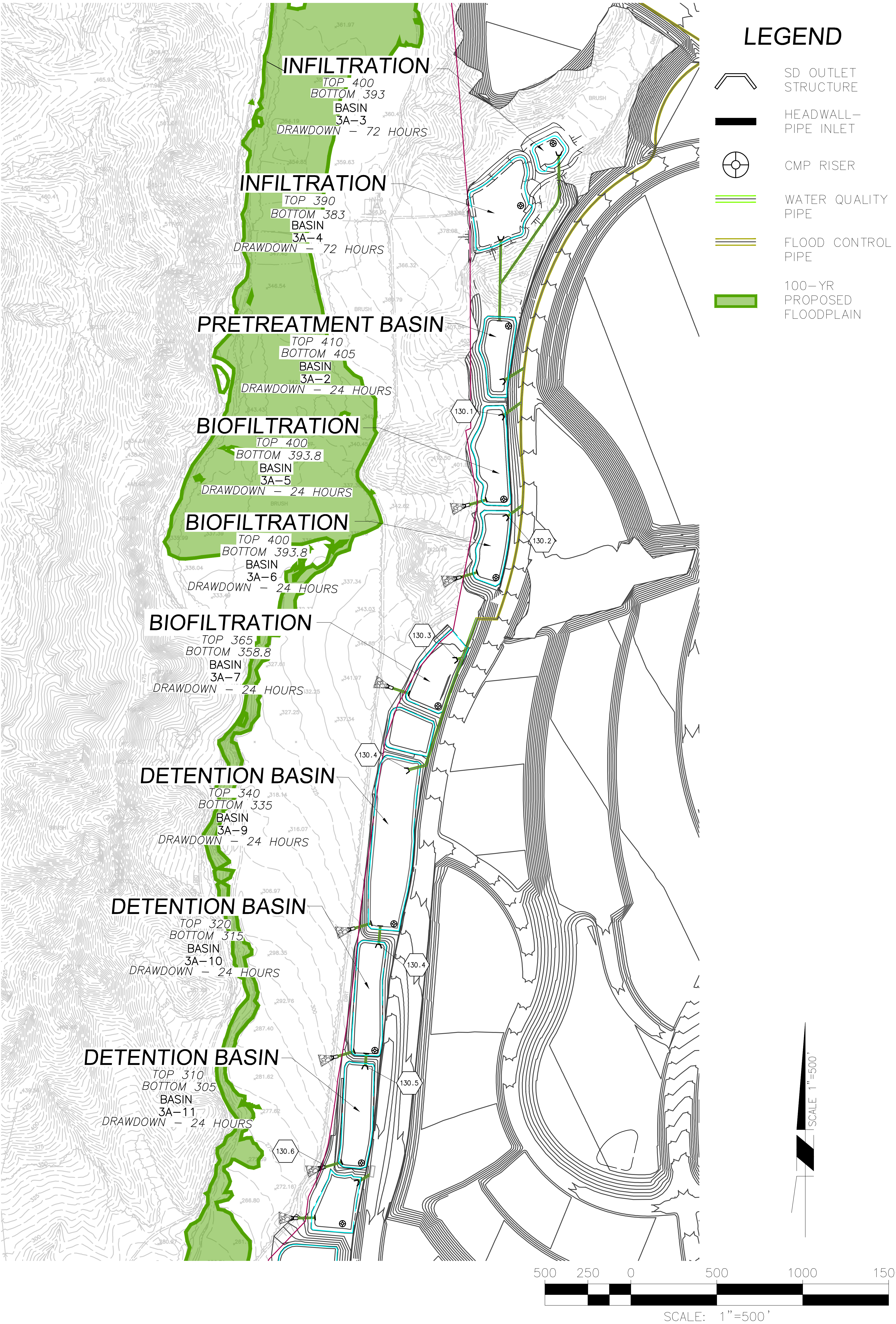


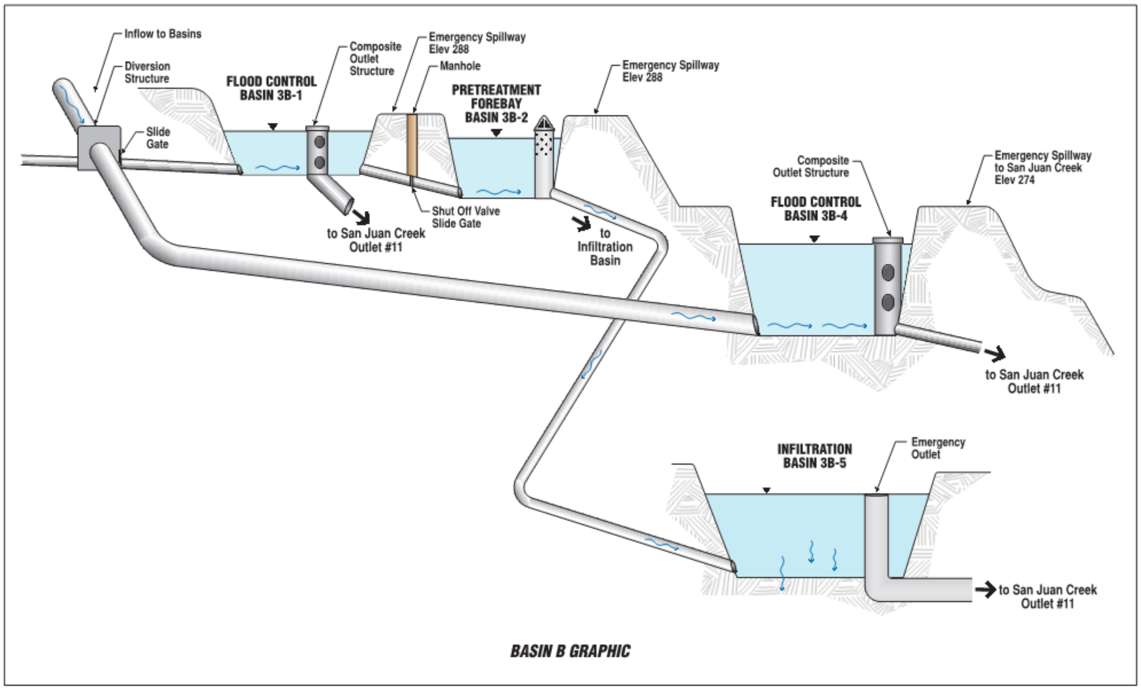
Figure 2-6: Proposed Subwatershed A Basin Routing to Node 13305 PCSWWM Routing



RANCHO MISSION VIEJO PA3&4 ROMP
PROPOSED SUBWATERSHED A BASIN MAP
FIGURE 2-7

Michael Baker
INTERNATIONAL
5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Phone: (949) 472-3505 · MBAKERINTL.COM

Figure 2-8: Proposed Subwatershed B Basin Graphic



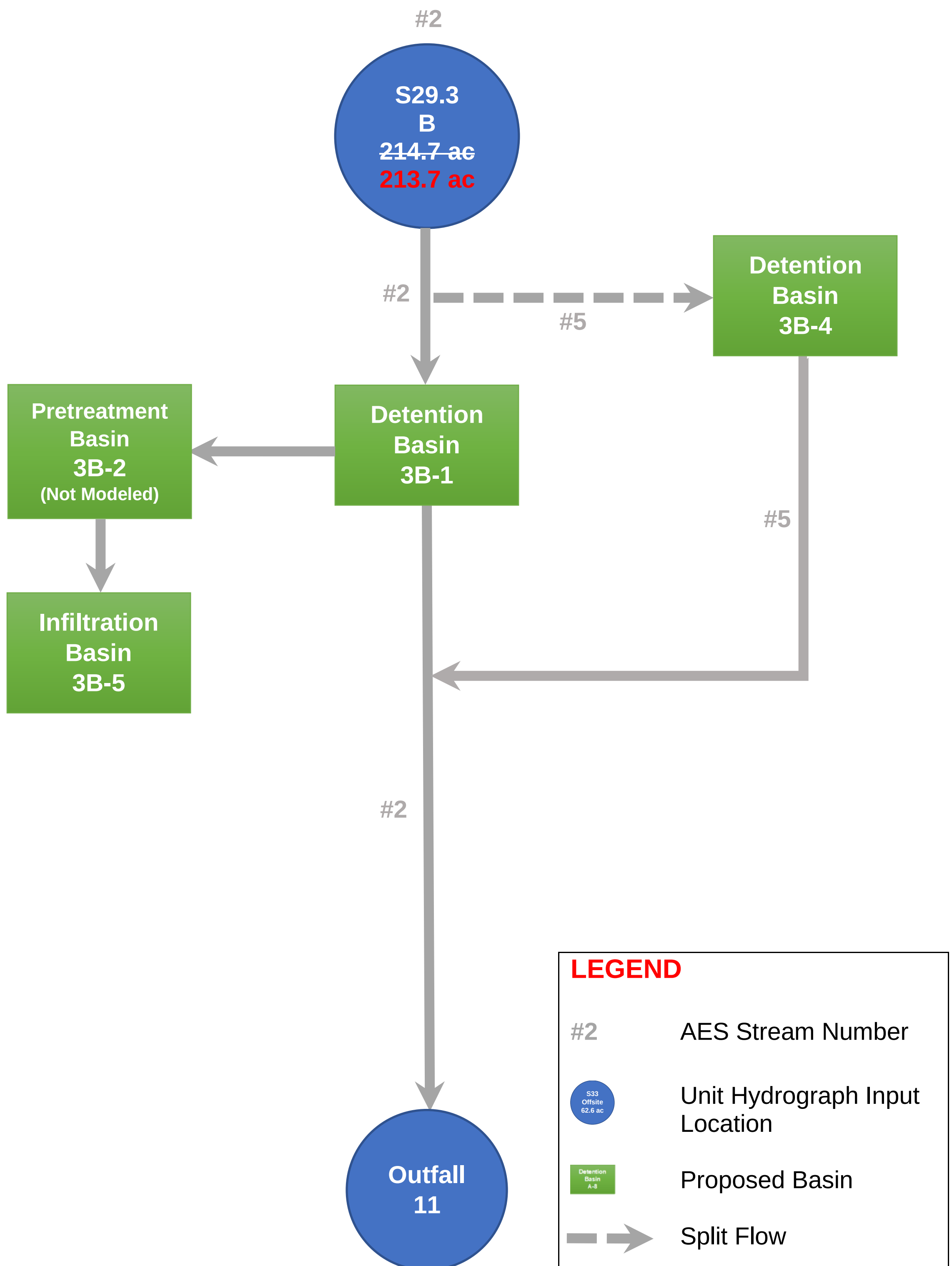
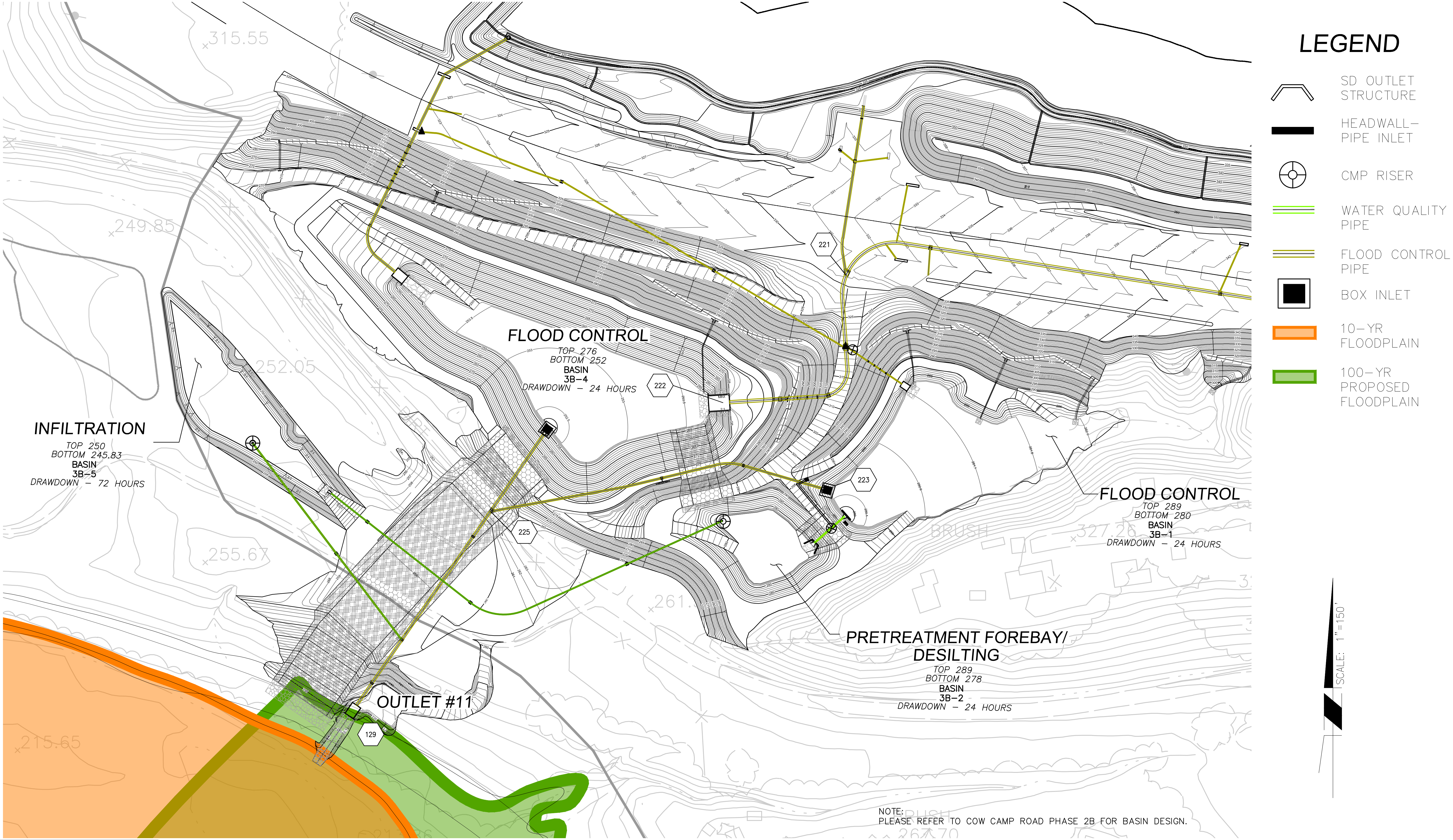


Figure 2-9: Proposed Subwatershed B Basin Routing



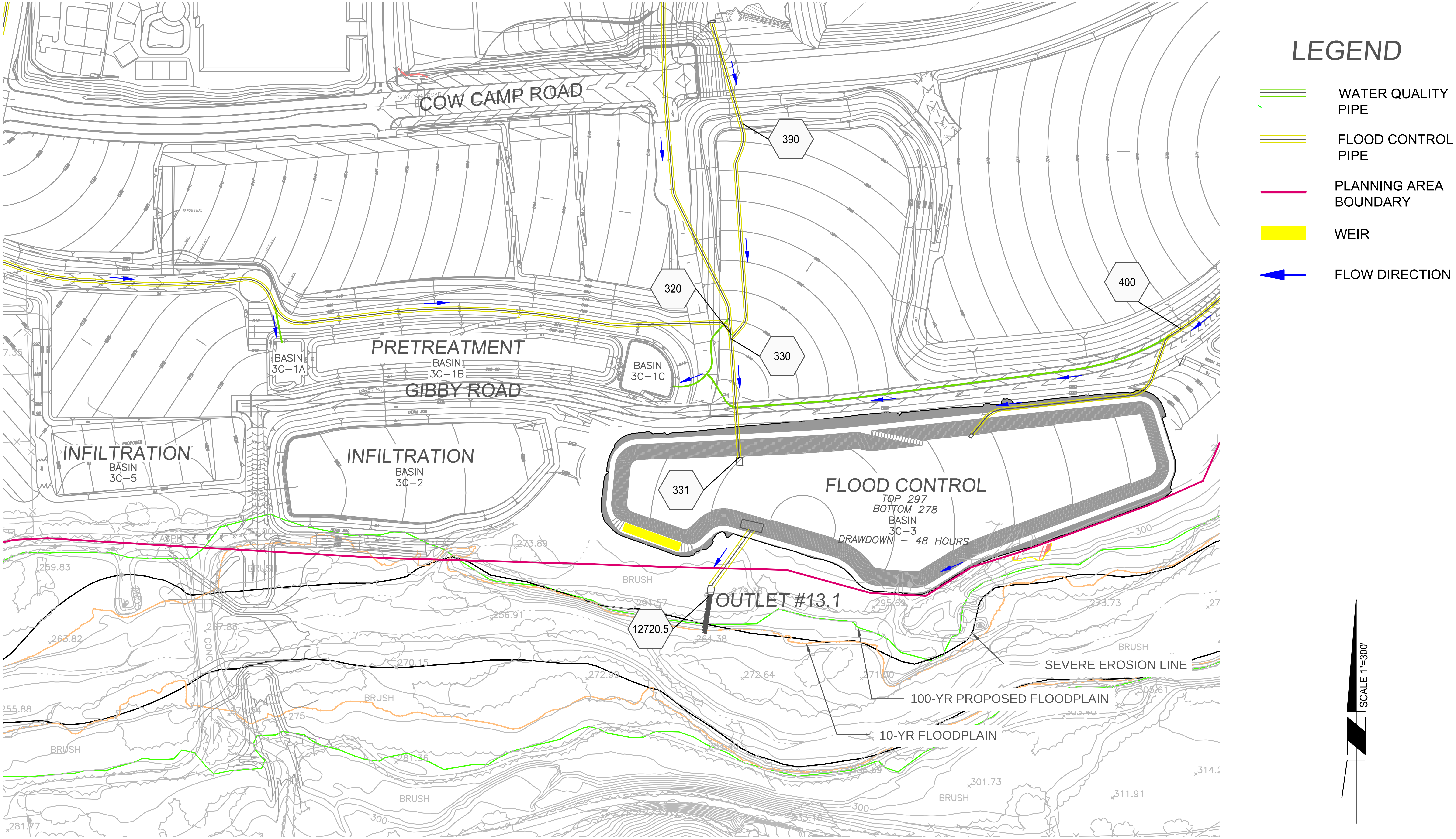
Michael Baker
INTERNATIONAL
5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Phone: (949) 472-3505 · MBAKERINTL.COM

150 75 0 150 300 450

SCALE: 1"=150'

RANCHO MISSION VIEJO PA3&4 ROMP
PROPOSED SUBWATERSHED B BASIN MAP
FIGURE 2-10

Figure 2-11: Proposed Subwatershed C Basin Routing

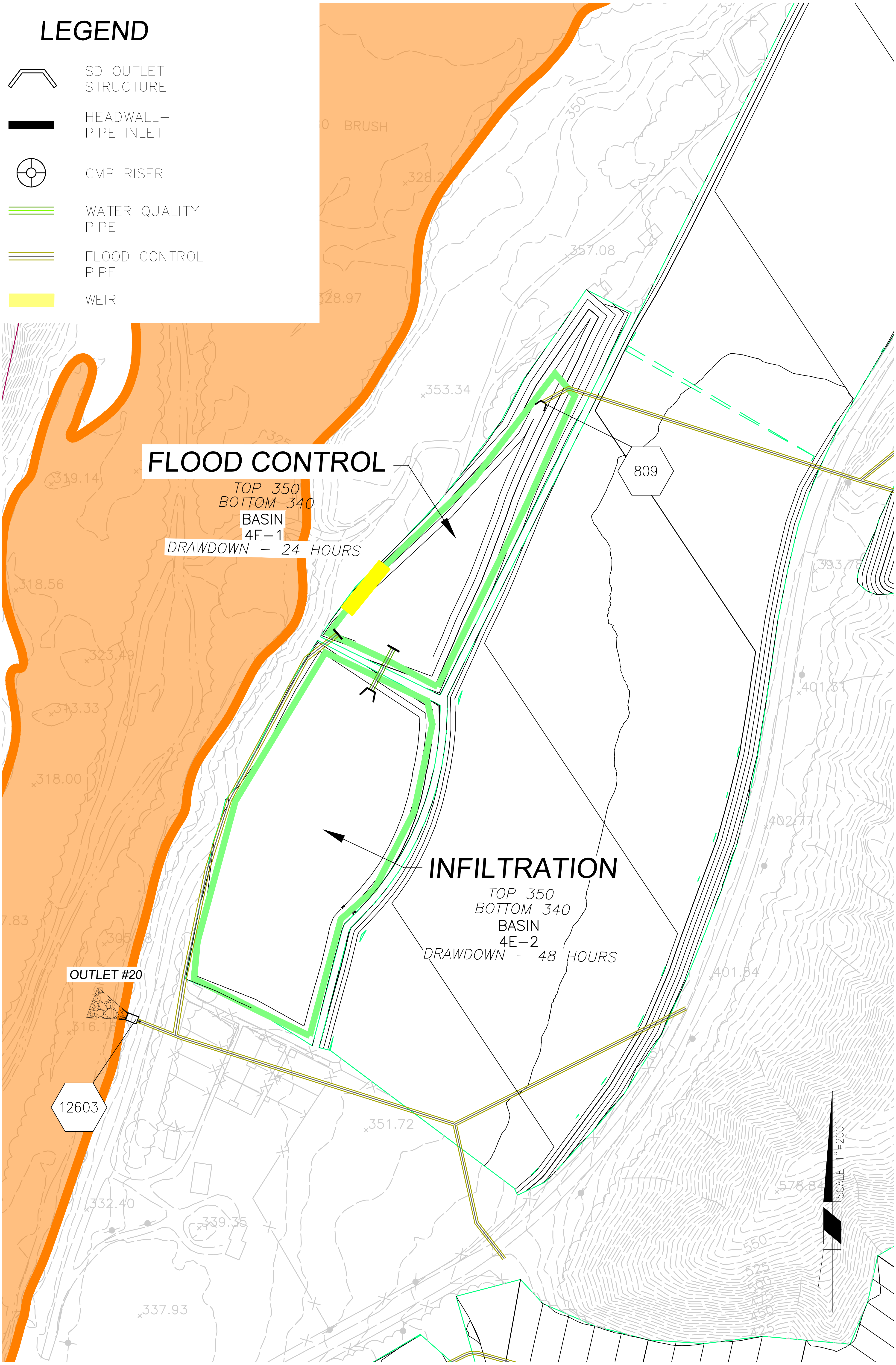


300 150 0 300 600 900

SCALE: 1"=300'

Michael Baker
INTERNATIONAL
5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Phone: (949) 472-3505 · MBAKERINTL.COM

RANCHO MISSION VIEJO PA3&4 ROMP
PROPOSED SUBWATERSHED C BASIN MAP
FIGURE 2-12

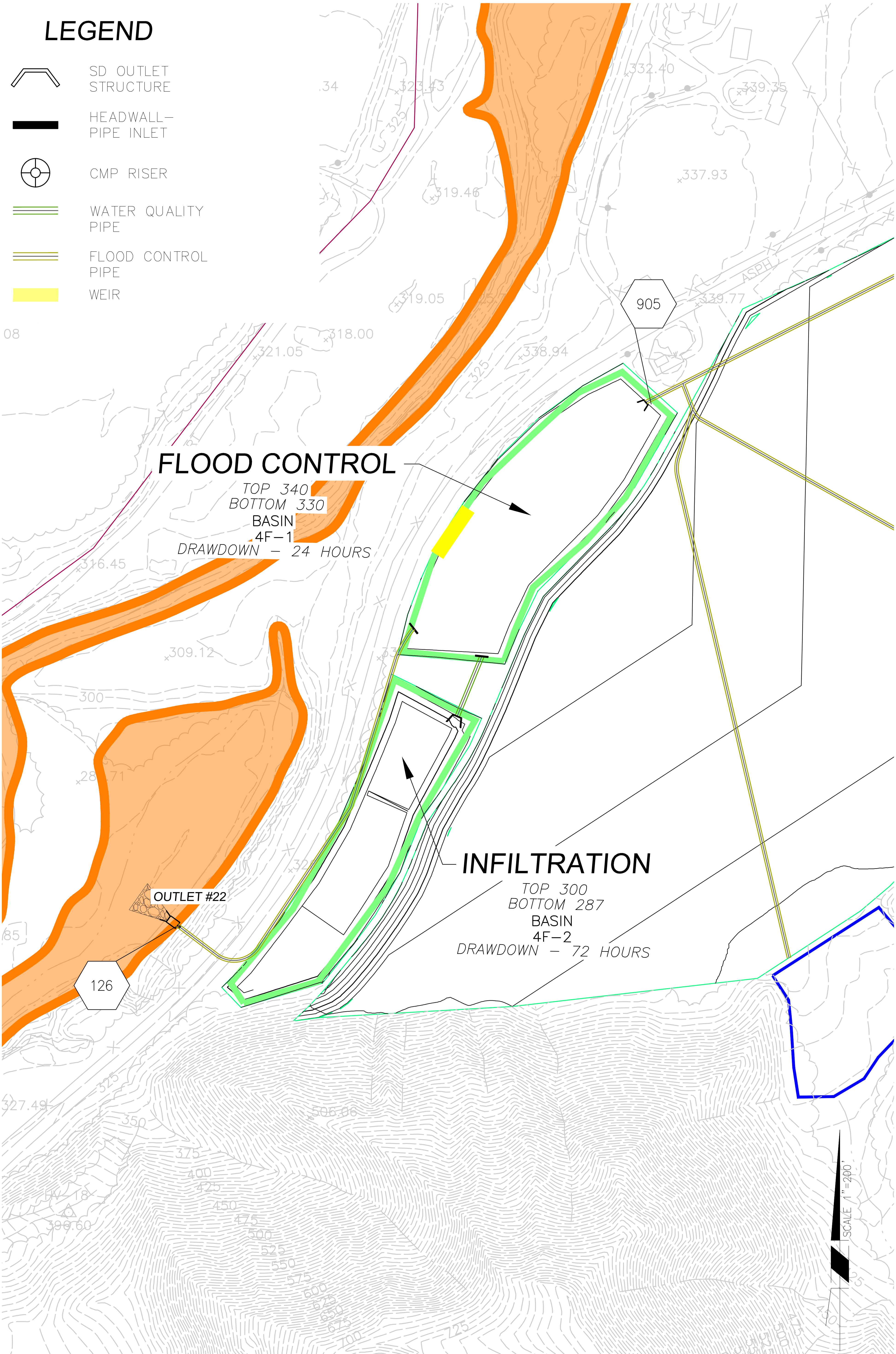


200 100 0 200 400 600

SCALE: 1"=200'

Michael Baker
INTERNATIONAL
5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Phone: (949) 472-3505 · MBAKERINTL.COM

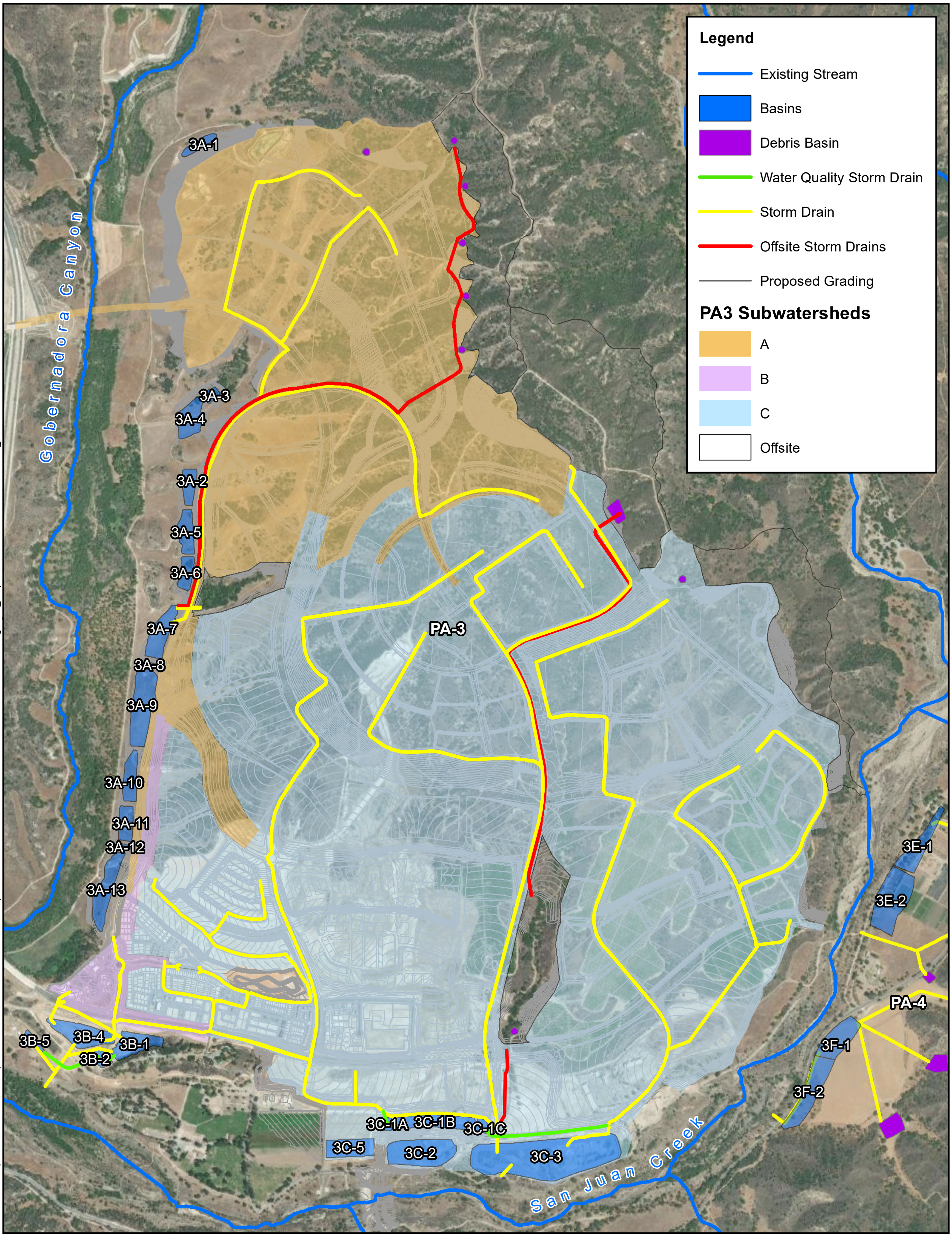
RANCHO MISSION VIEJO PA3&4 ROMP
PROPOSED SUBWATERSHED E BASIN MAP
FIGURE 2-15



Michael Baker
INTERNATIONAL
5 Hutton Centre Drive, Suite 500, Santa Ana, CA 92707
Phone: (949) 472-3505 · MBAKERINTL.COM

200 100 0 200 400 600.001
SCALE: 1"=200'

RANCHO MISSION VIEJO PA3&4 ROMP
PROPOSED SUBWATERSHED F BASIN MAP
FIGURE 2-16



2/14/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-17_Proposed PA-3 Debris Basin Locations_85x11P.mxd DER JM

Michael Baker INTERNATIONAL

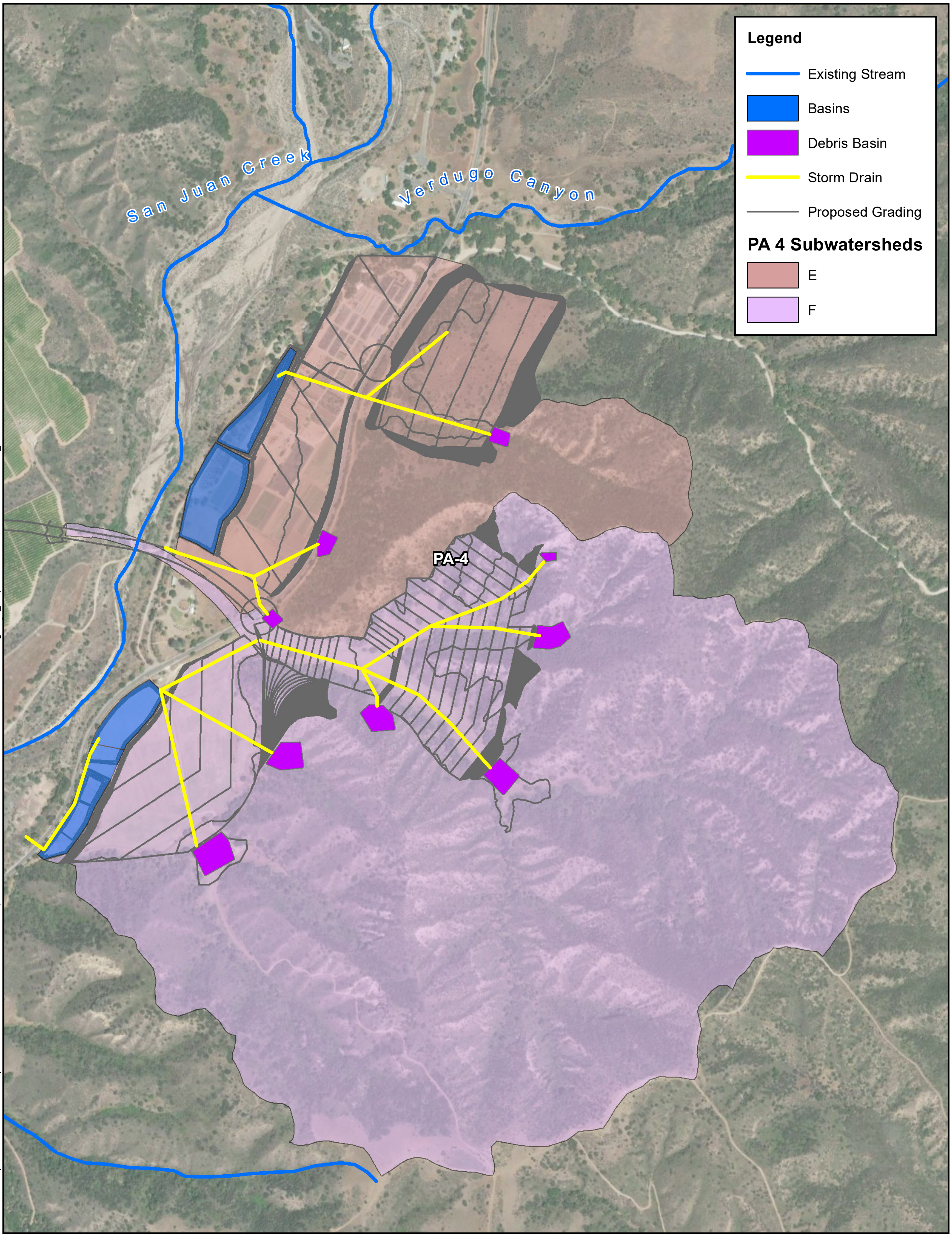
0 750 1,500 Feet

Source:

RANCHO MISSION VIEJO - PA3&4 ROMP Revision 1

Proposed PA-3 Debris Basin Locations

Figure 2-17



2/8/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-18_Proposed PA-4 Debris Basin Locations_85x11P.mxd DER JM

Michael Baker INTERNATIONAL

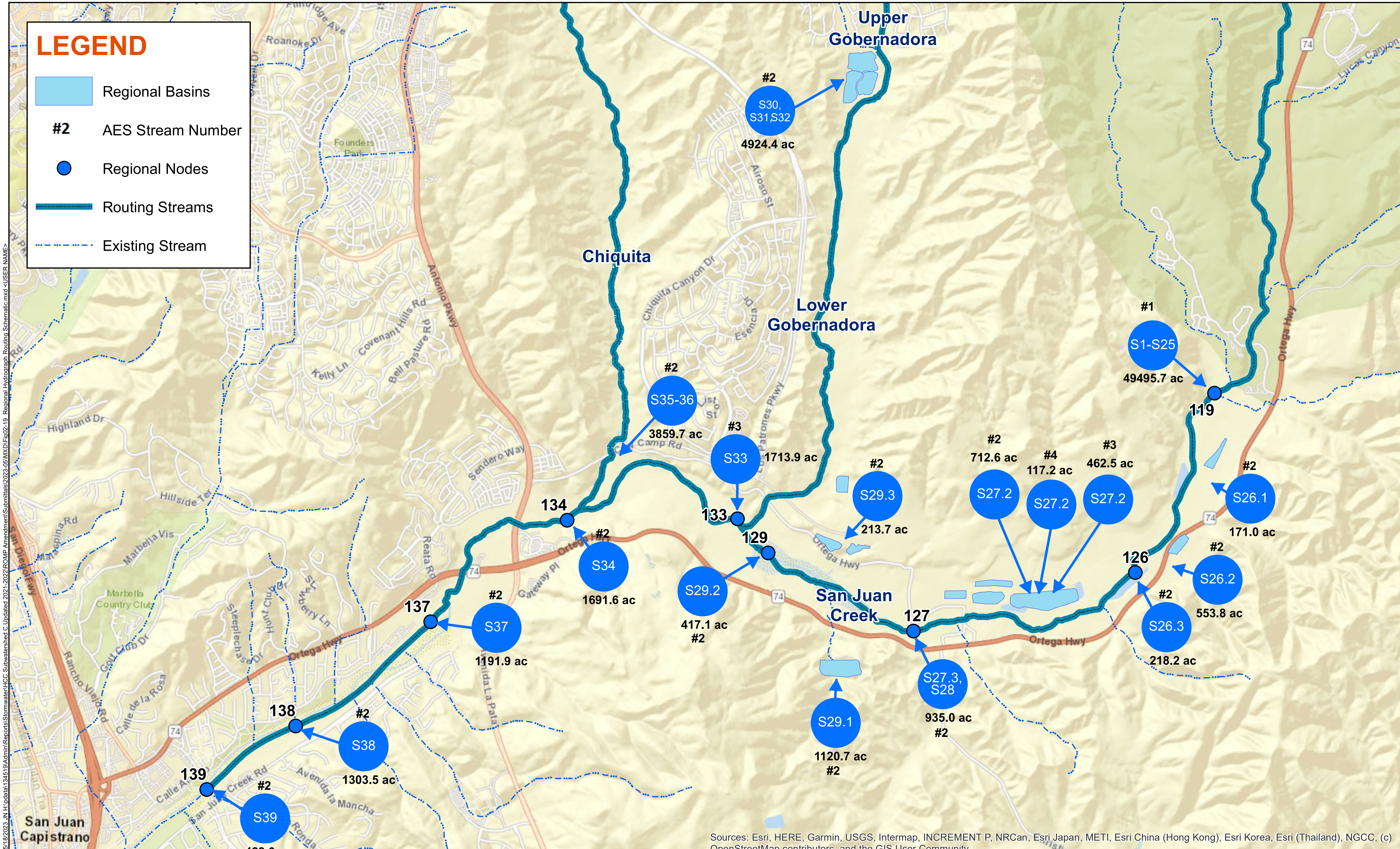
0 750 1,500 Feet

Source:

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Proposed PA-4 Debris Basin Locations

Figure 2-18



5/18/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig02-19_Regional Hydrograph Routing Schematic.mxd <USER NAME>

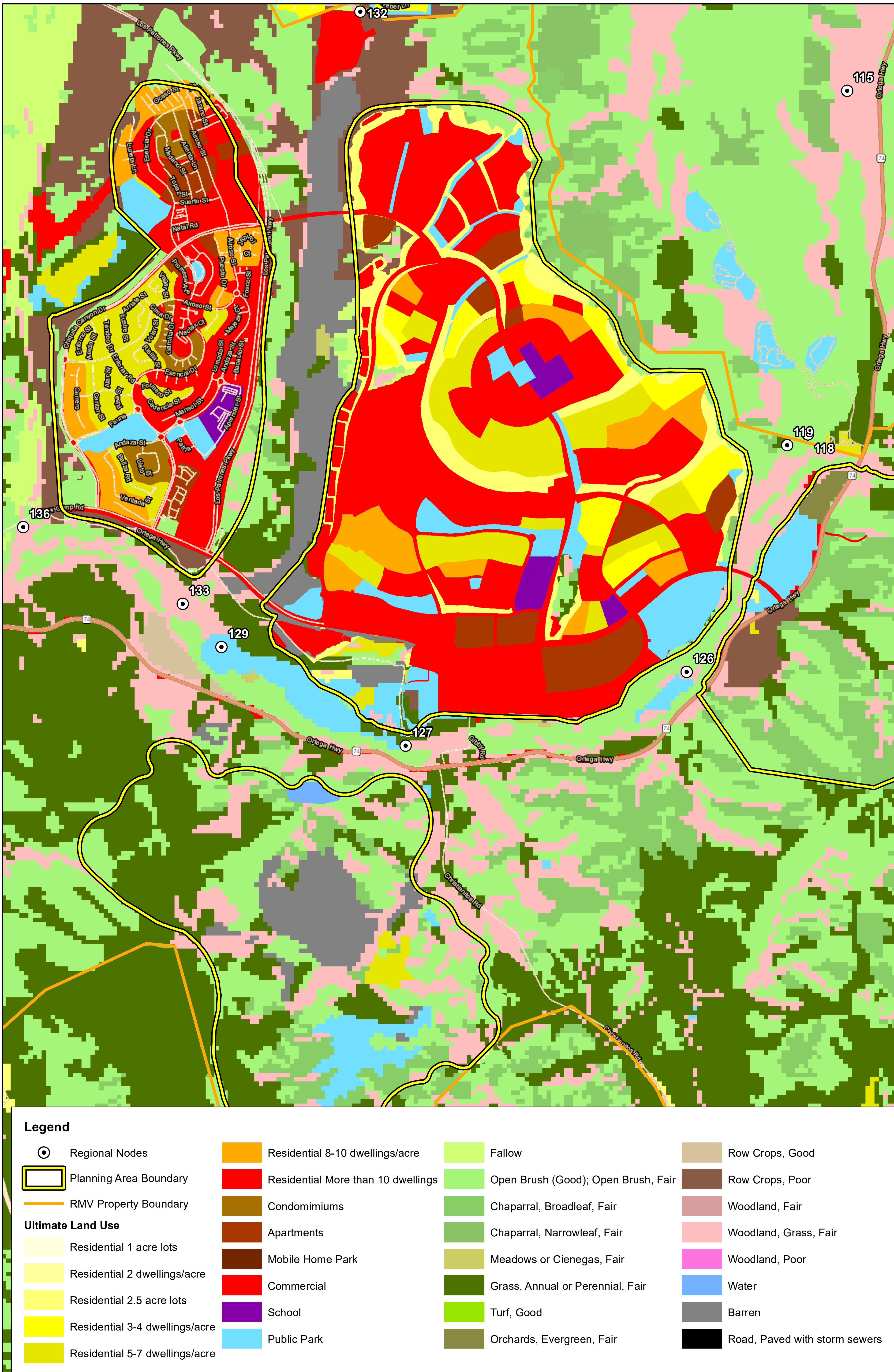
0 1,250 2,500 5,000 Feet

Source:

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Regional Hydrograph Routing Schematic

Figure 2-19



2/8/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\Figures & Exhibits\BoDR\Fig02-20_PhasedCondition_NoPA45_11x17_Update.mxd Michael Baker International

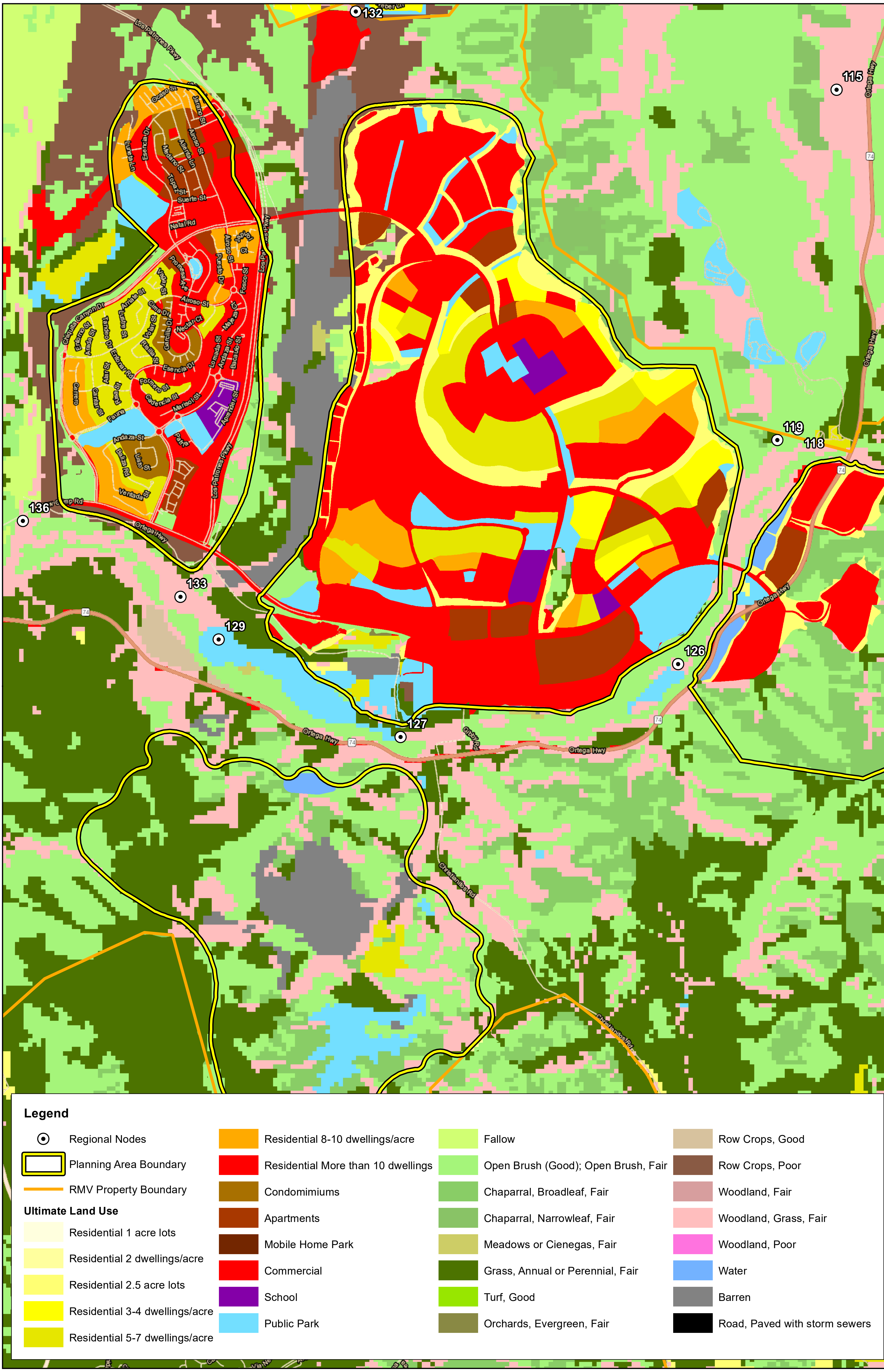
Michael Baker INTERNATIONAL

Source: ArcGIS Online

RANCHO MISSION VIEJO - PA3&4 ROMP REVISION 1

Phased Condition PA-1, -2 and -3 Developed

Figure 2-20



Michael Baker INTERNATIONAL

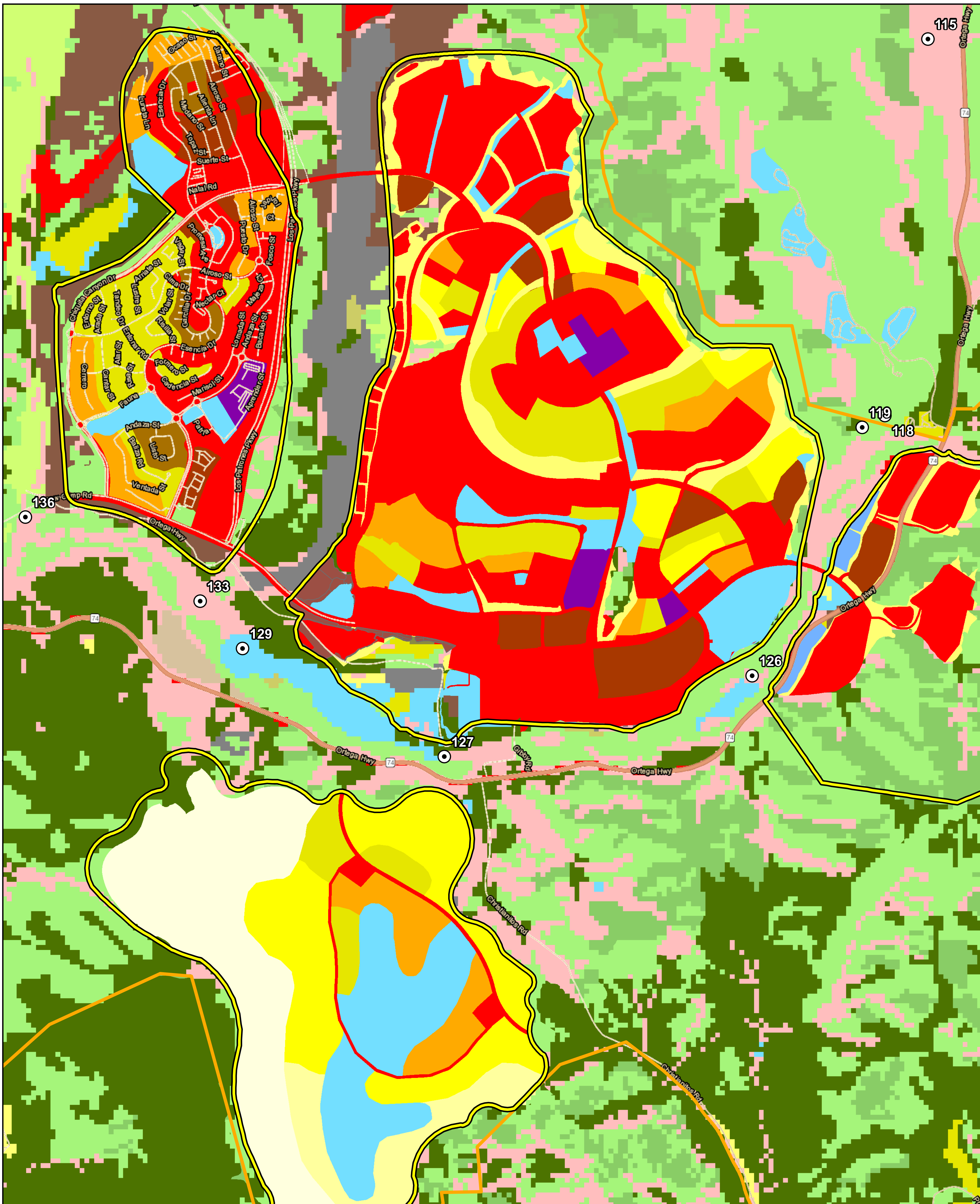
0 2,250 4,500 Feet

Source: ArcGIS Online

RANCHO MISSION VIEJO - PA3&4 ROMP REVISION 1

Phased Condition PA-1, -2, -3 and -4 Developed

Figure 2-21



Legend

- Regional Nodes
- Planning Area Boundary
- RMV Property Boundary

Ultimate Land Use

- Residential 1 acre lots
- Residential 2 dwellings/acre
- Residential 2.5 acre lots
- Residential 3-4 dwellings/acre
- Residential 5-7 dwellings/acre
- Residential 8-10 dwellings/acre
- Residential More than 10 dwellings
- Condomimiums
- Apartments
- Mobile Home Park
- Commercial
- School
- Public Park
- Fallow
- Open Brush (Good); Open Brush, Fair
- Chaparral, Broadleaf, Fair
- Chaparral, Narrowleaf, Fair
- Meadows or Cienegas, Fair
- Grass, Annual or Perennial, Fair
- Turf, Good
- Orchards, Evergreen, Fair
- Row Crops, Good
- Row Crops, Poor
- Woodland, Fair
- Woodland, Grass, Fair
- Woodland, Poor
- Water
- Barren
- Road, Paved with storm sewers

2/8/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig02-22_UltimateCondition_11x17_Update.mxd Michael Baker International

Michael Baker INTERNATIONAL

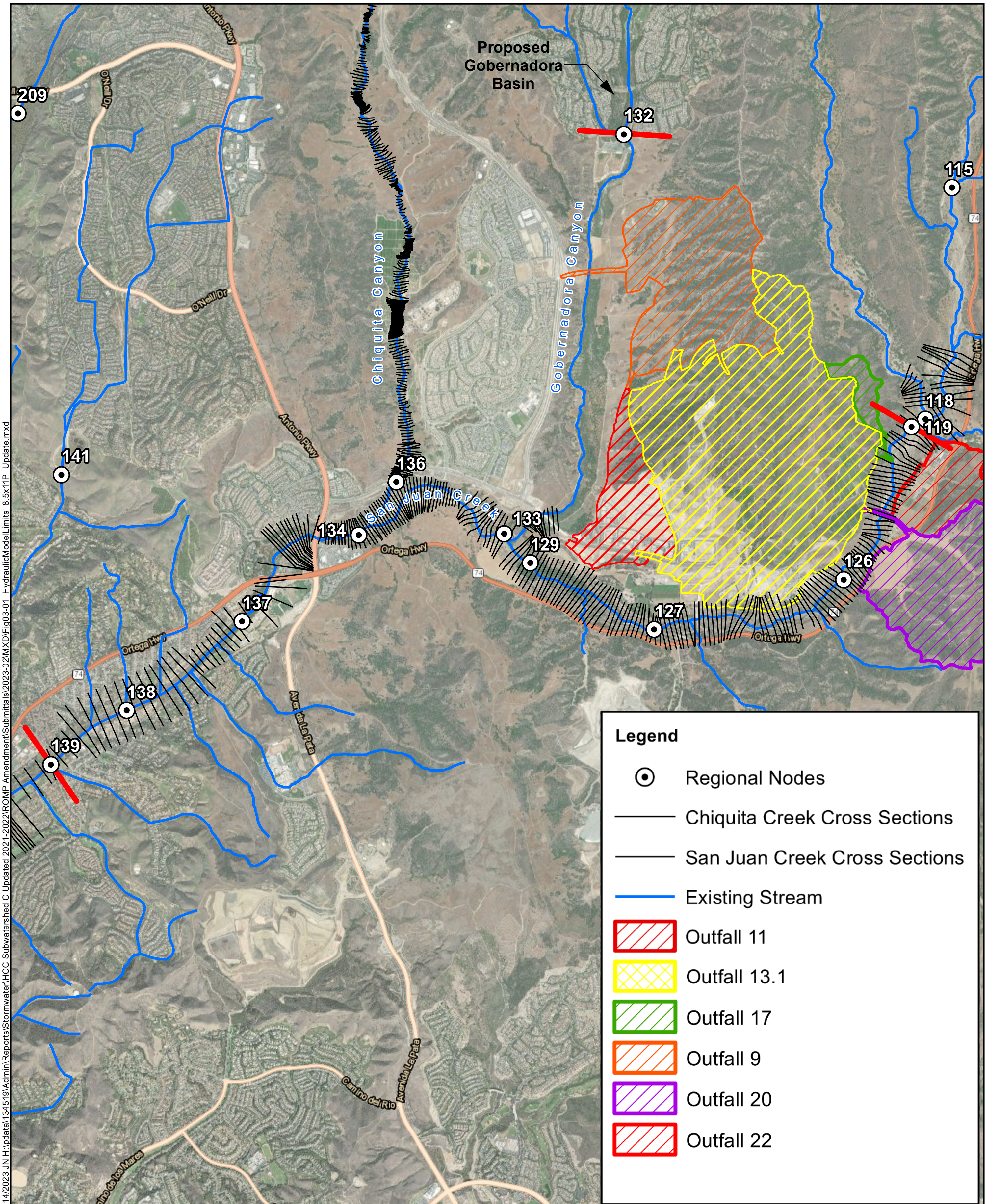
0 2,250 4,500 Feet

Source: ArcGIS Online

RANCHO MISSION VIEJO - PA3&4 ROMP REVISION 1

Ultimate Conditions Land Use

Figure 2-22



2/14/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig03-01_HydraulicModelLimits_8.5x11P_Update.mxd

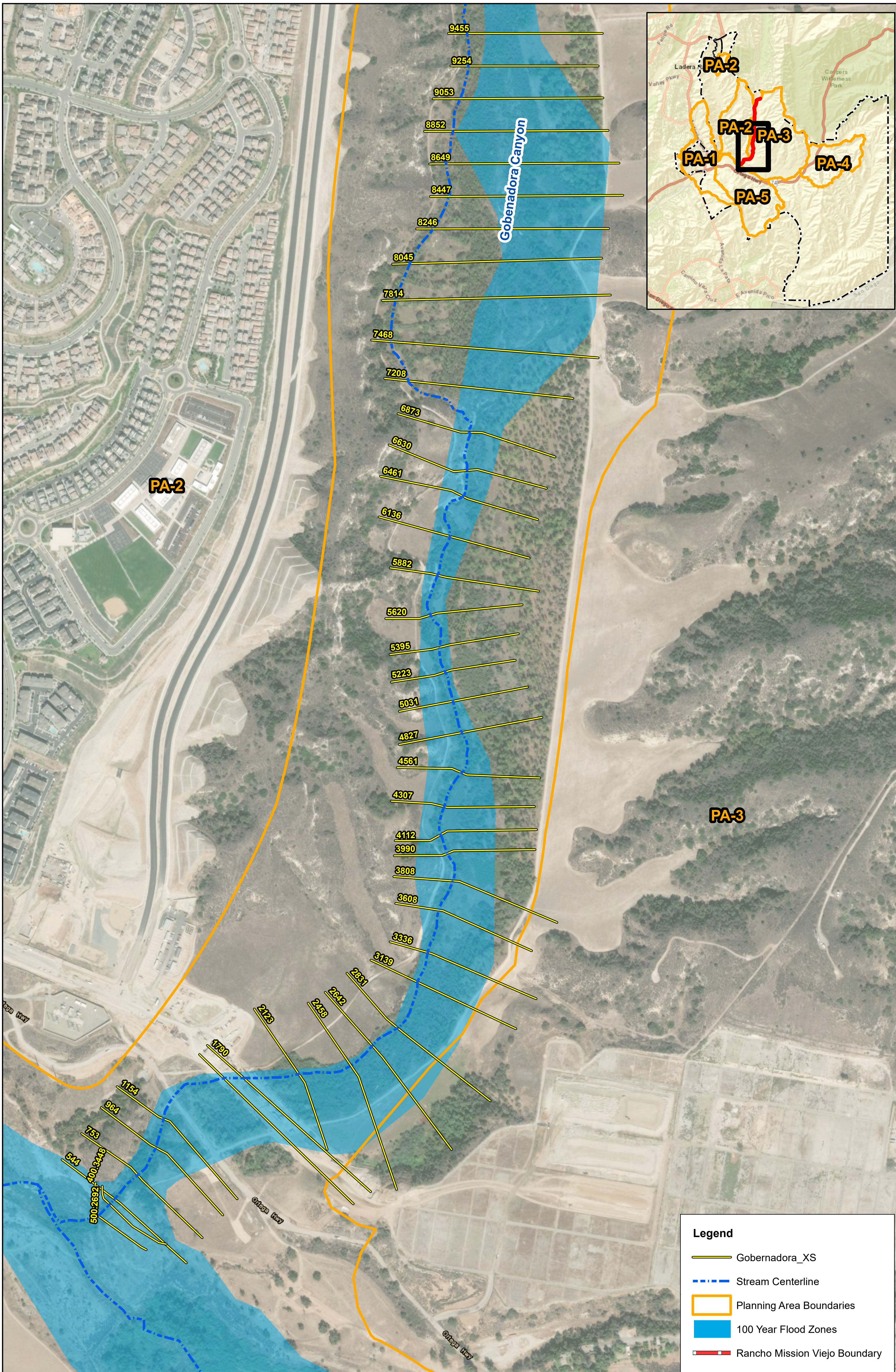
Michael Baker INTERNATIONAL

Source: PACE, Huitt-Zollars, Geosyntec, ESR World and Street Imagery

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Hydraulic Model Limits

Figure 3-1



0 150 300
Feet

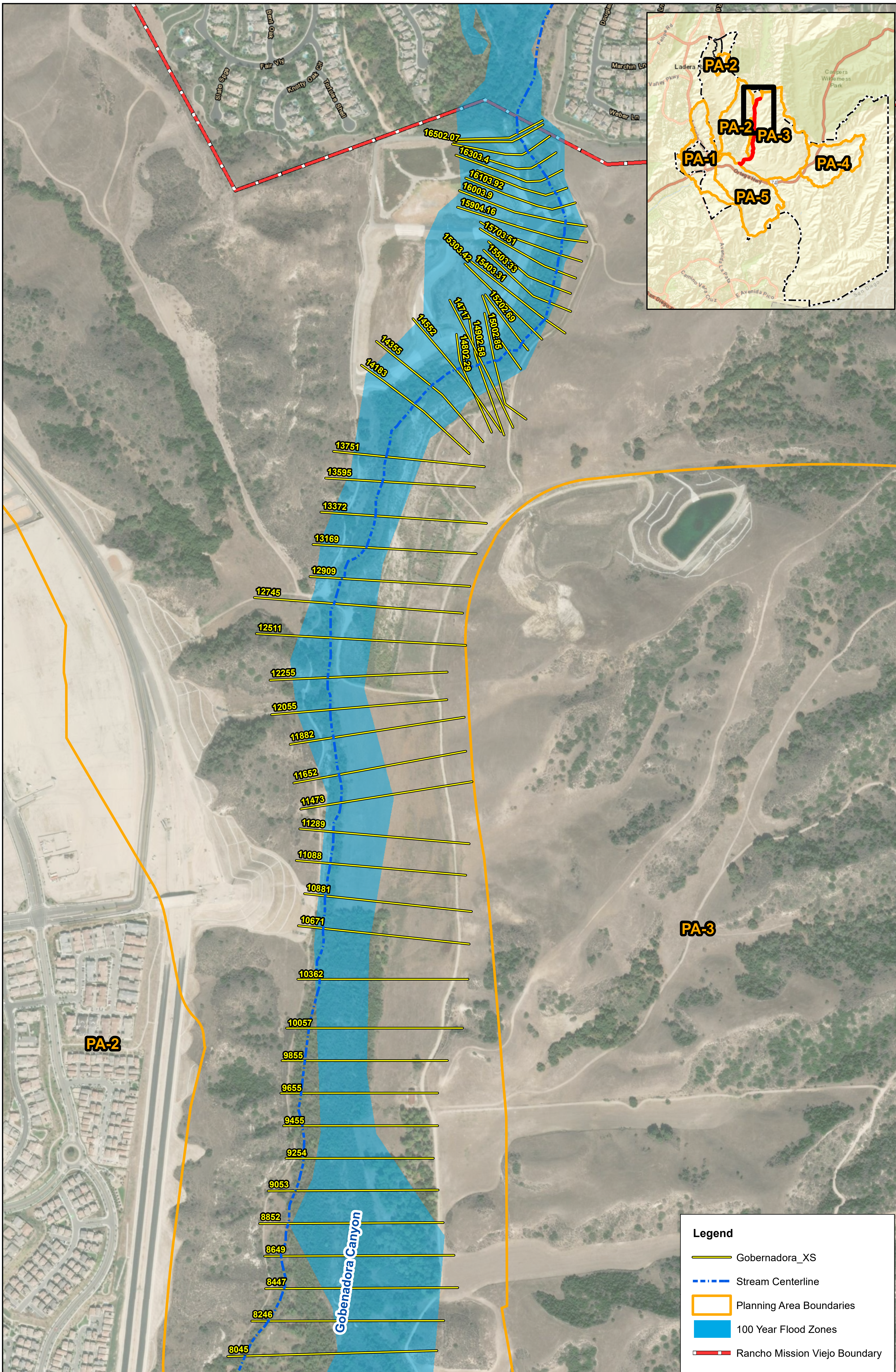
Michael Baker
INTERNATIONAL

Source: PACE, Huitt-Zollars, Geosyntec, FEMA, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP

Gobernadora Cross Section

Figure3-2a



0 150 300 Feet

Michael Baker INTERNATIONAL

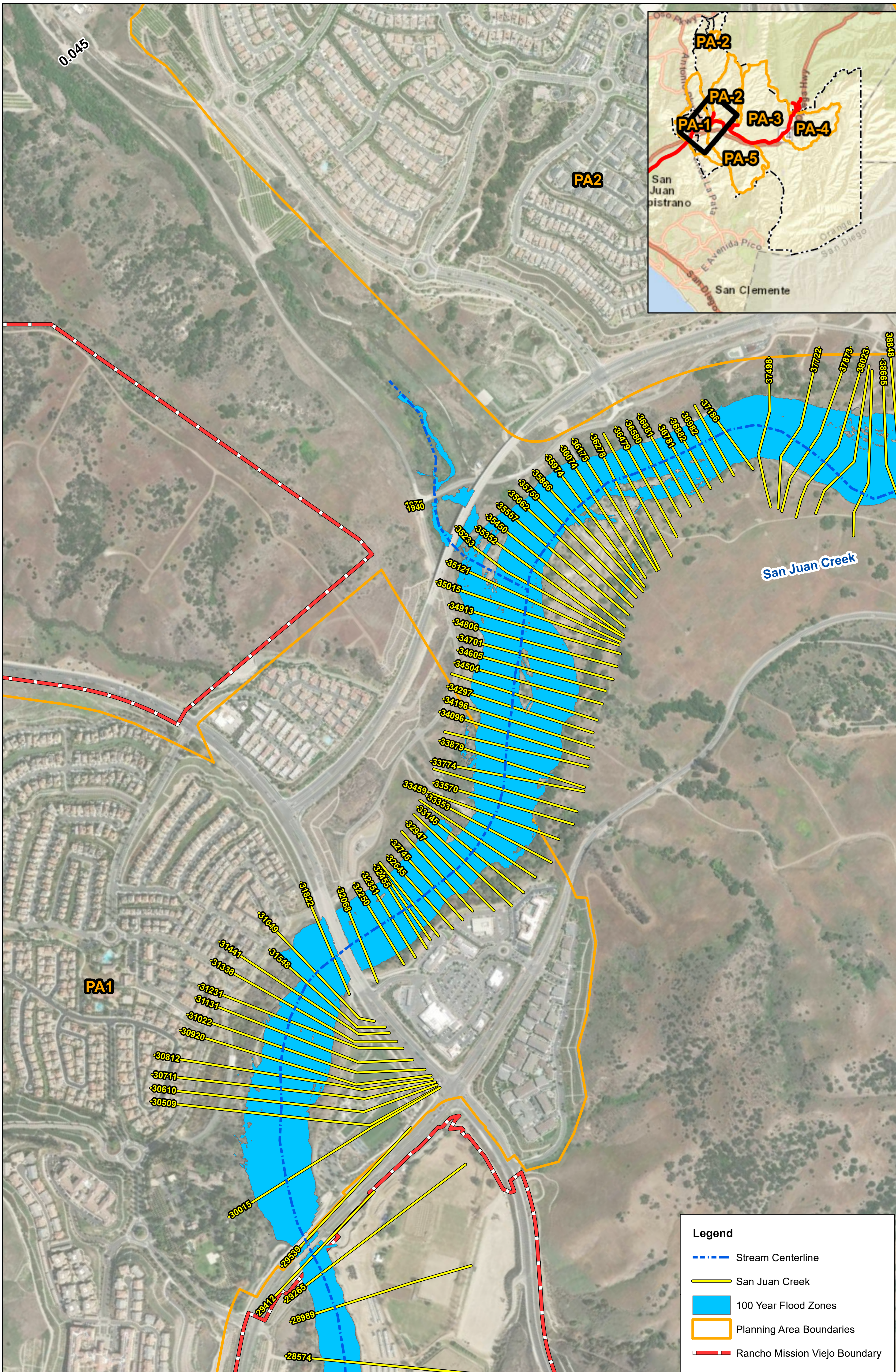
Source: PACE, Huitt-Zollars, Geosyntec, FEMA, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP

Gobernadora Cross Section

Figure3-2b

7/25/2019 JN M:\Mdata\134519\GIS\MXD\PA-3_PA-4 ROMP\Report Figures\Fig03-02b_GobernadoraCrossSection.mxd JM DR



5/18/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig03-03a_SanJuanCreekCrossSection.mxd JM DR

Michael Baker INTERNATIONAL

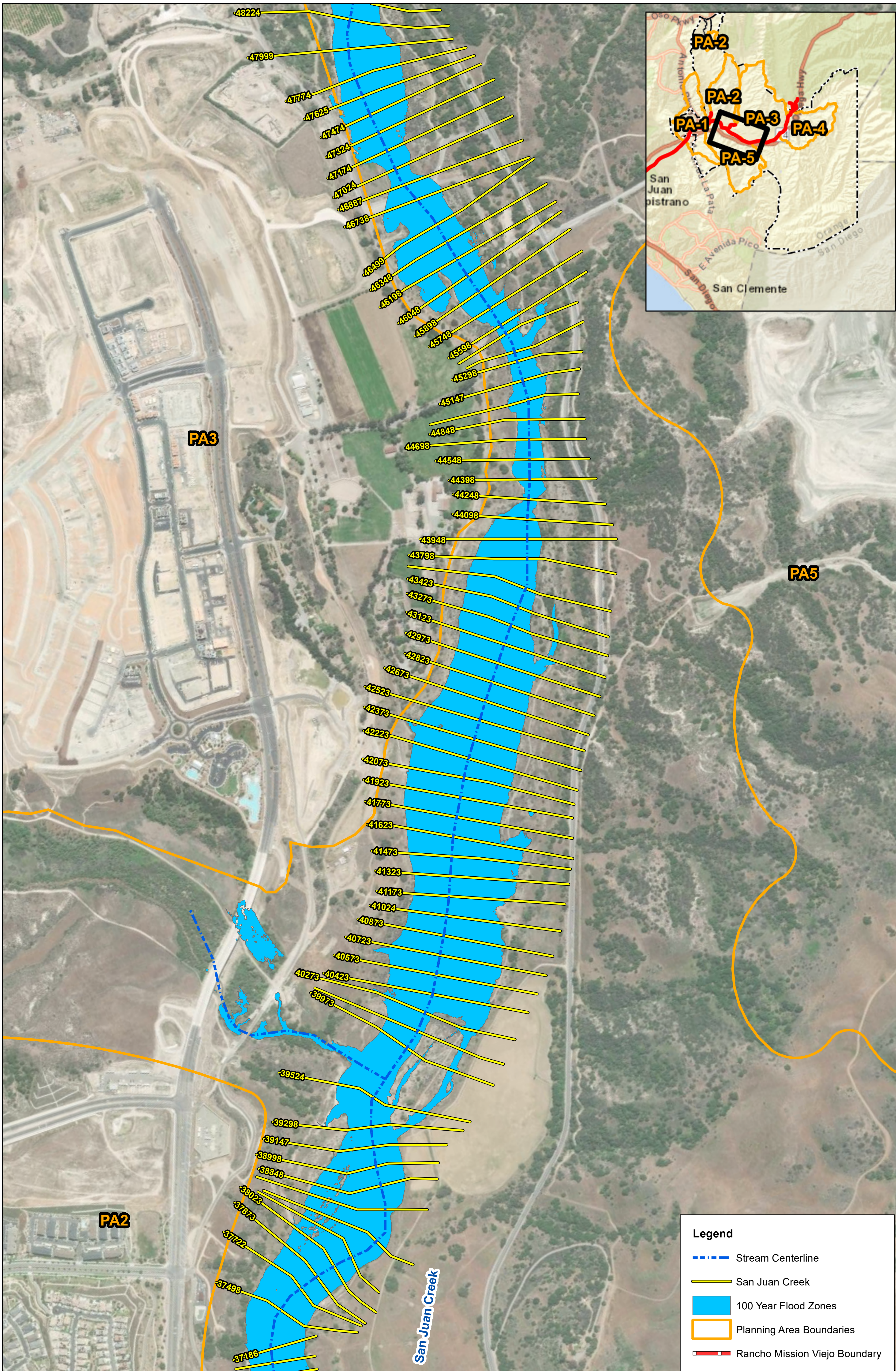
0 150 300 Feet

Source: PACE, Huitt-Zollars, Geosyntec, FEMA, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP Revision 1

San Juan Creek Cross Section

Figure3-3a



5/18/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig03-03b_SanJuanCreekCrossSection.mxd JM DR

Michael Baker INTERNATIONAL

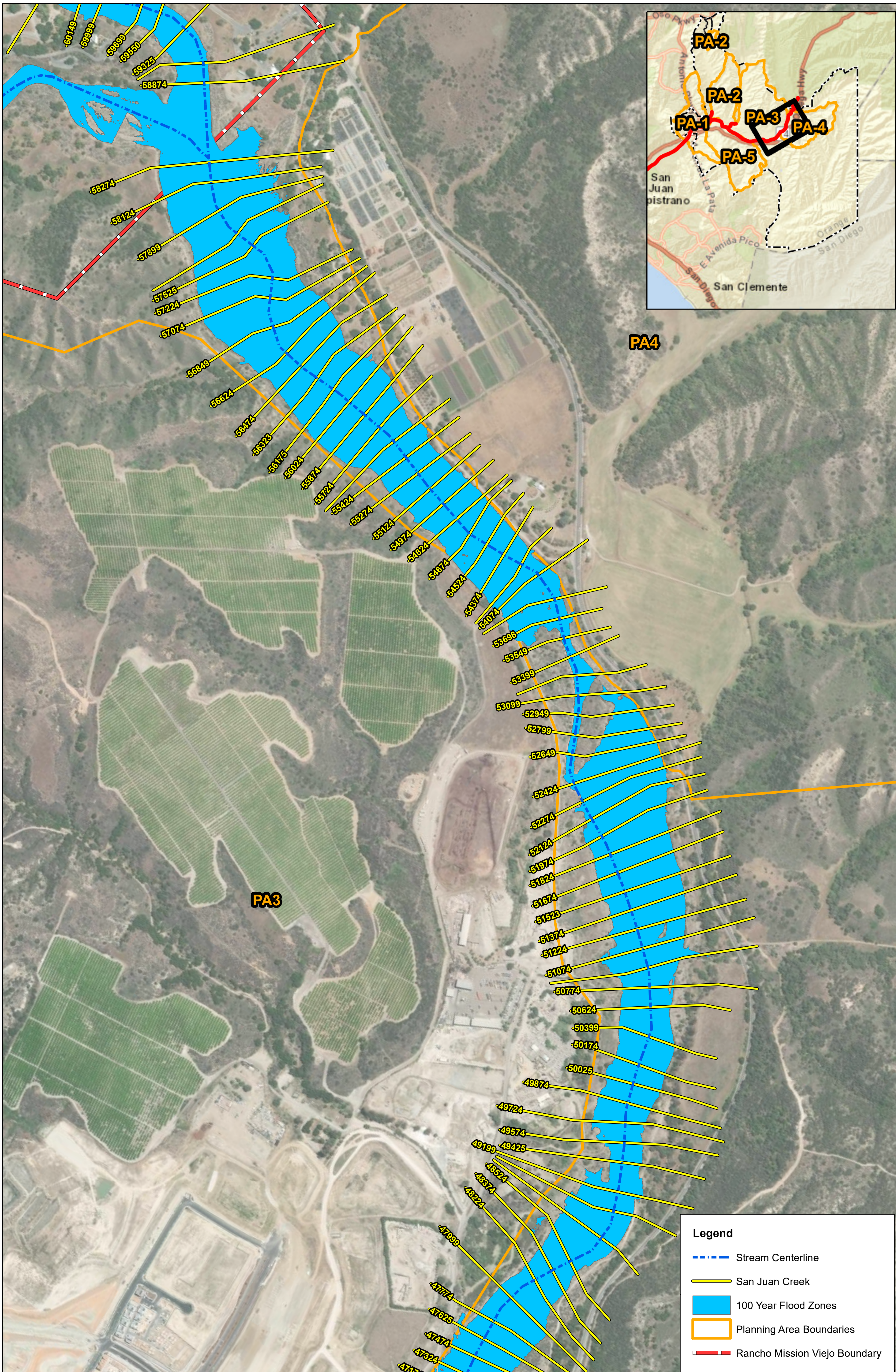
0 150 300 Feet

Source: PACE, Huitt-Zollars, Geosyntec, FEMA, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP Revision 1

San Juan Creek Cross Section

Figure3-3b



5/18/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig03-03c_SanJuanCreekCrossSection.mxd JM DR

Michael Baker INTERNATIONAL

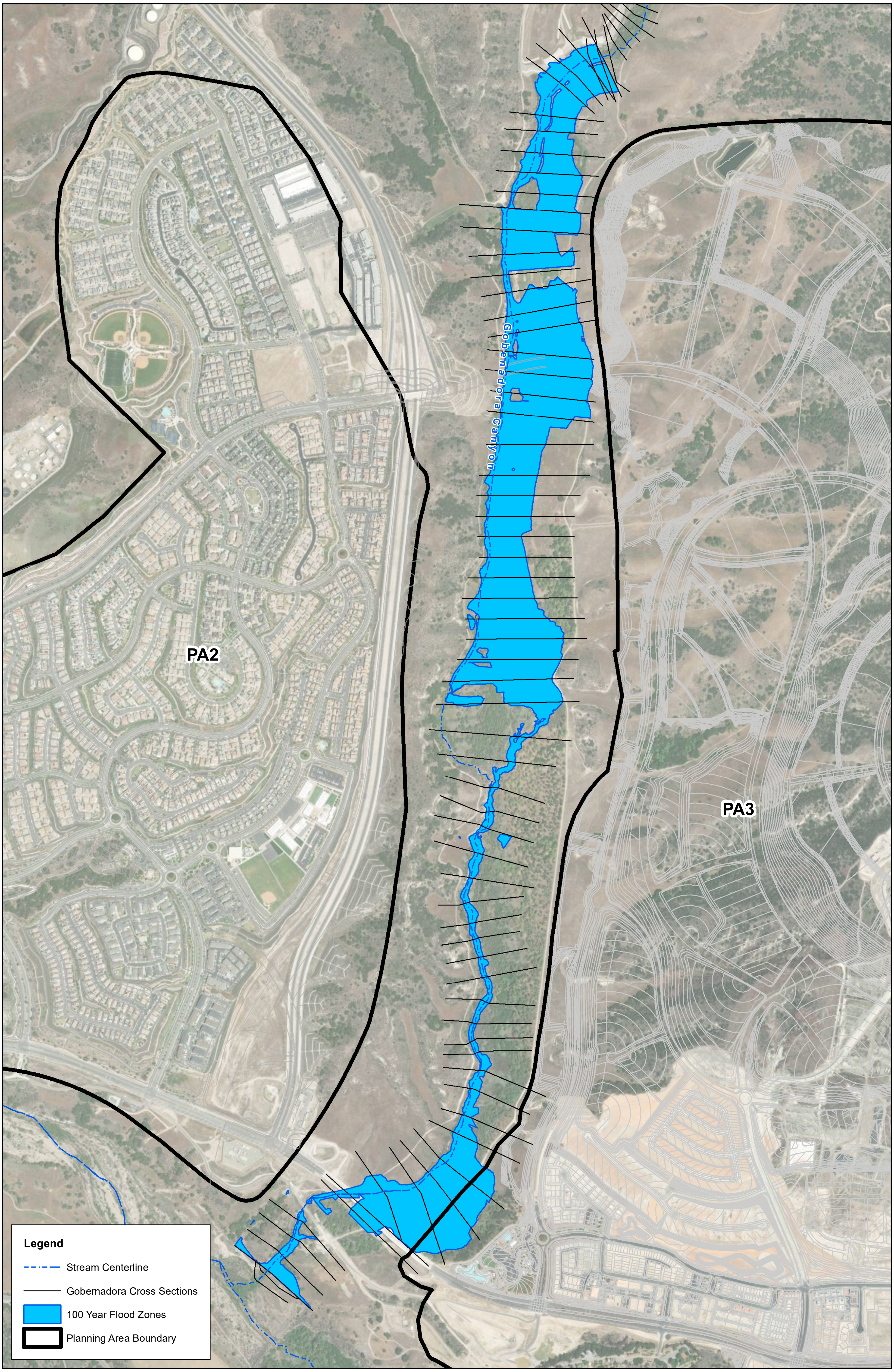
0 150 300 Feet

Source: PACE, Huitt-Zollars, Geosyntec, FEMA, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP Revision 1

San Juan Creek Cross Section

Figure3-3c



Michael Baker INTERNATIONAL

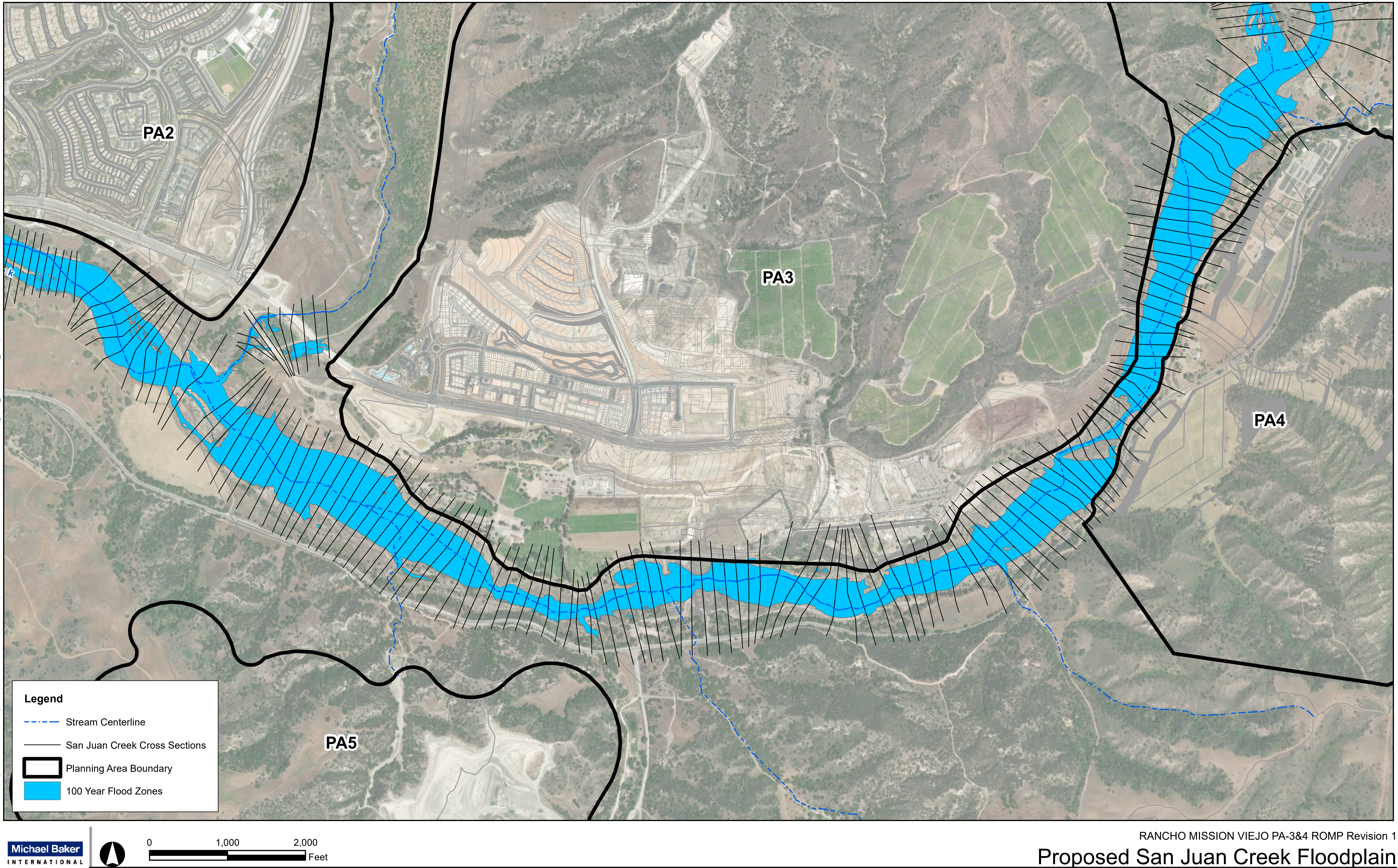
0 1,000 2,000 Feet

Source: PACE, Huitt-Zollars, Geosyntec, ESRI Online

RANCHO MISSION VIEJO - PA3&4 ROMP

Gobernadora Floodplain

Figure 3-4



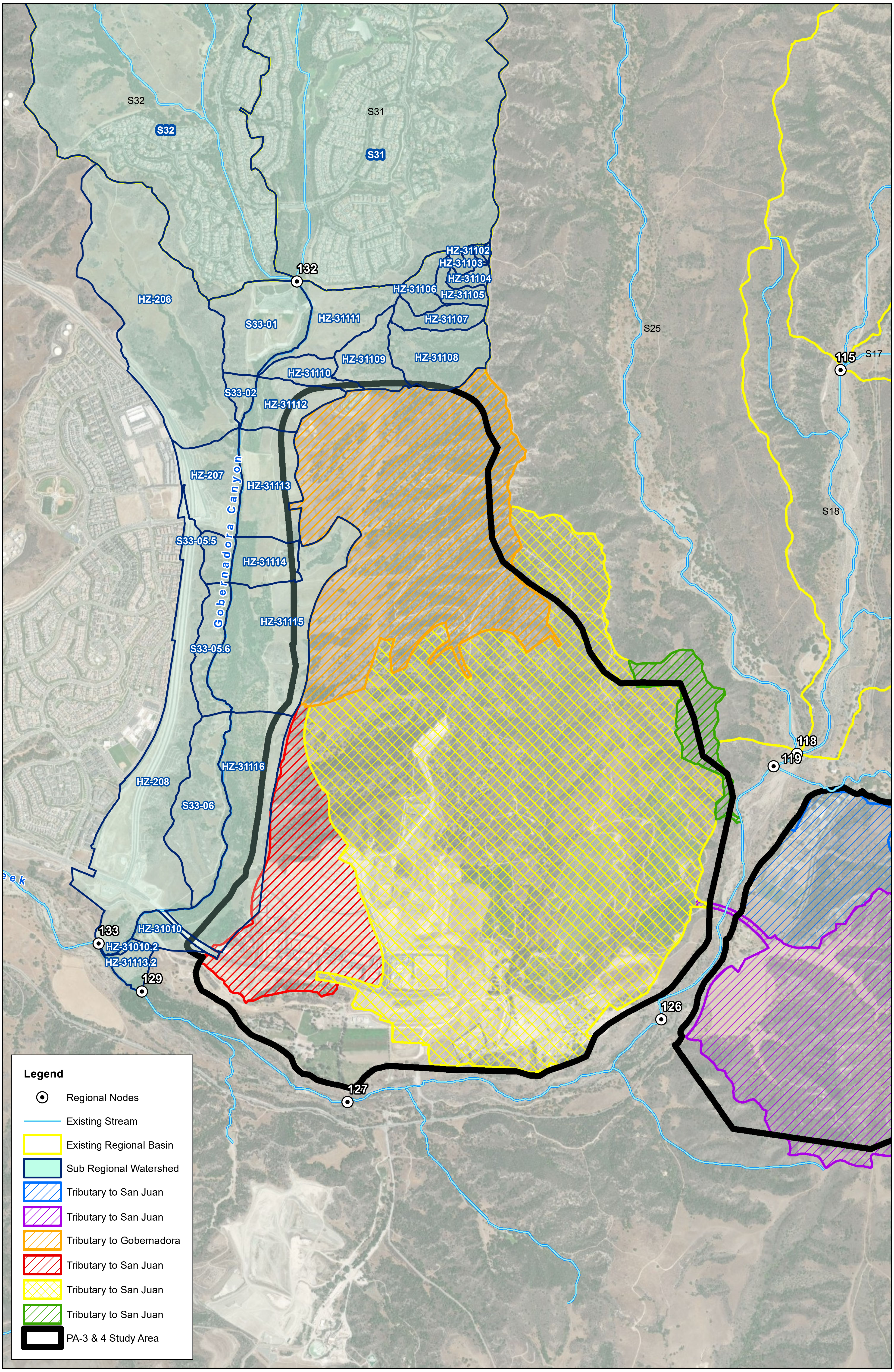
Michael Baker INTERNATIONAL

Source: PACE, Huitt-Zollars, Geosyntec, ESRI Online

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

Proposed San Juan Creek Floodplain

Figure 3-5



12/12/2022 \\N:\RV\CA1FS1.bkr.mbakercorp.com\HROOT\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment Submittals\2022-12\Fig04-01_SedimentWorkmap.mxd dr

Michael Baker INTERNATIONAL

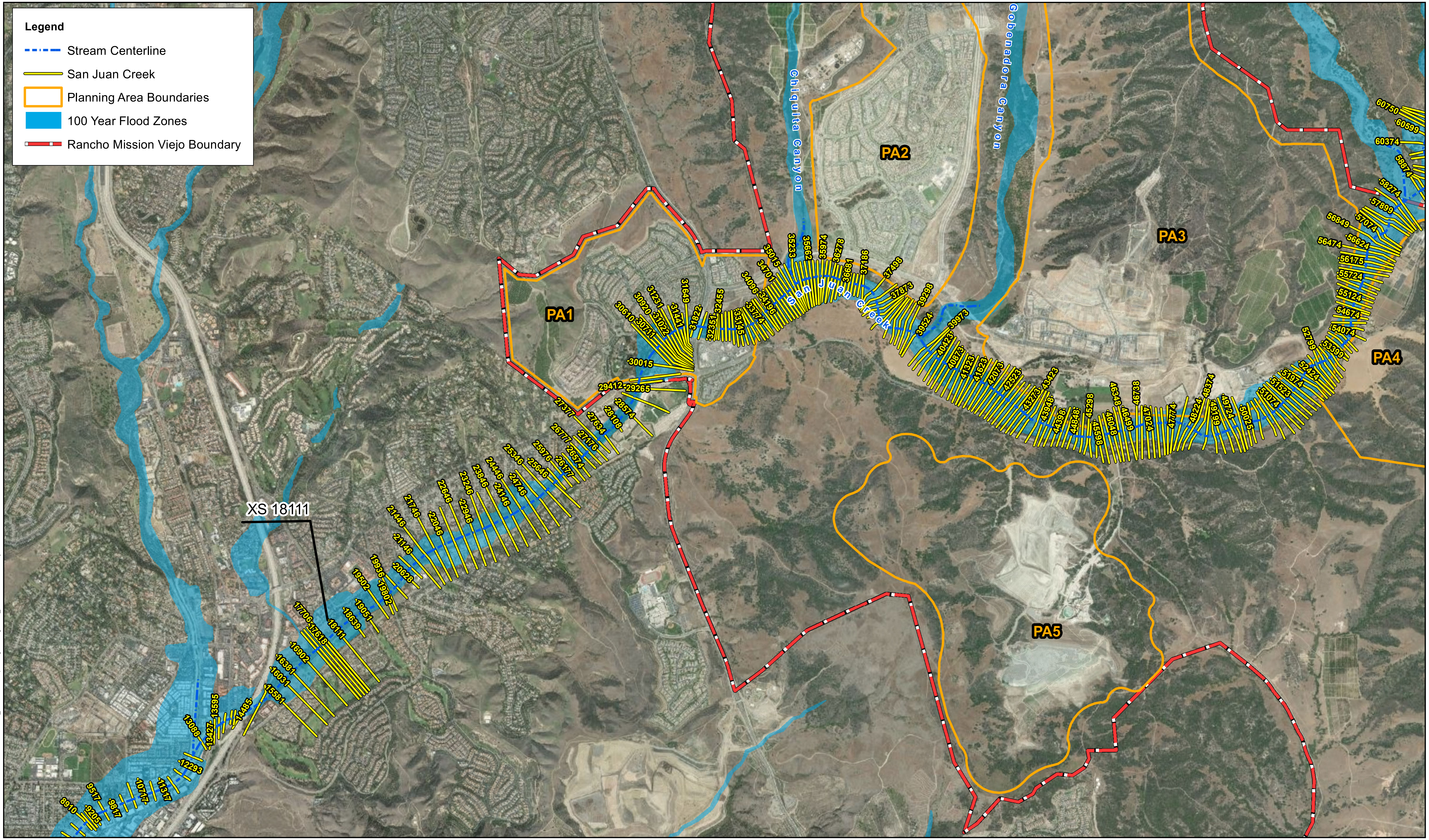
0 750 1,500 Feet

Source: PACE, Huitt-Zollars, Geosyntec, ESRI Online

RANCHO MISSION VIEJO - PA3&4

Sediment Work Map

Figure 4-1



Michael Baker INTERNATIONAL

0 1,000 2,000 Feet

Source: PACE, Huitt-Zollars, Geosyntec, ESRI Online

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

San Juan Creek Downstream Hydraulic Control

Figure 4-2

Figure 4-3: San Juan Creek Existing Condition 100-yr EV Water Surface Profile Comparison

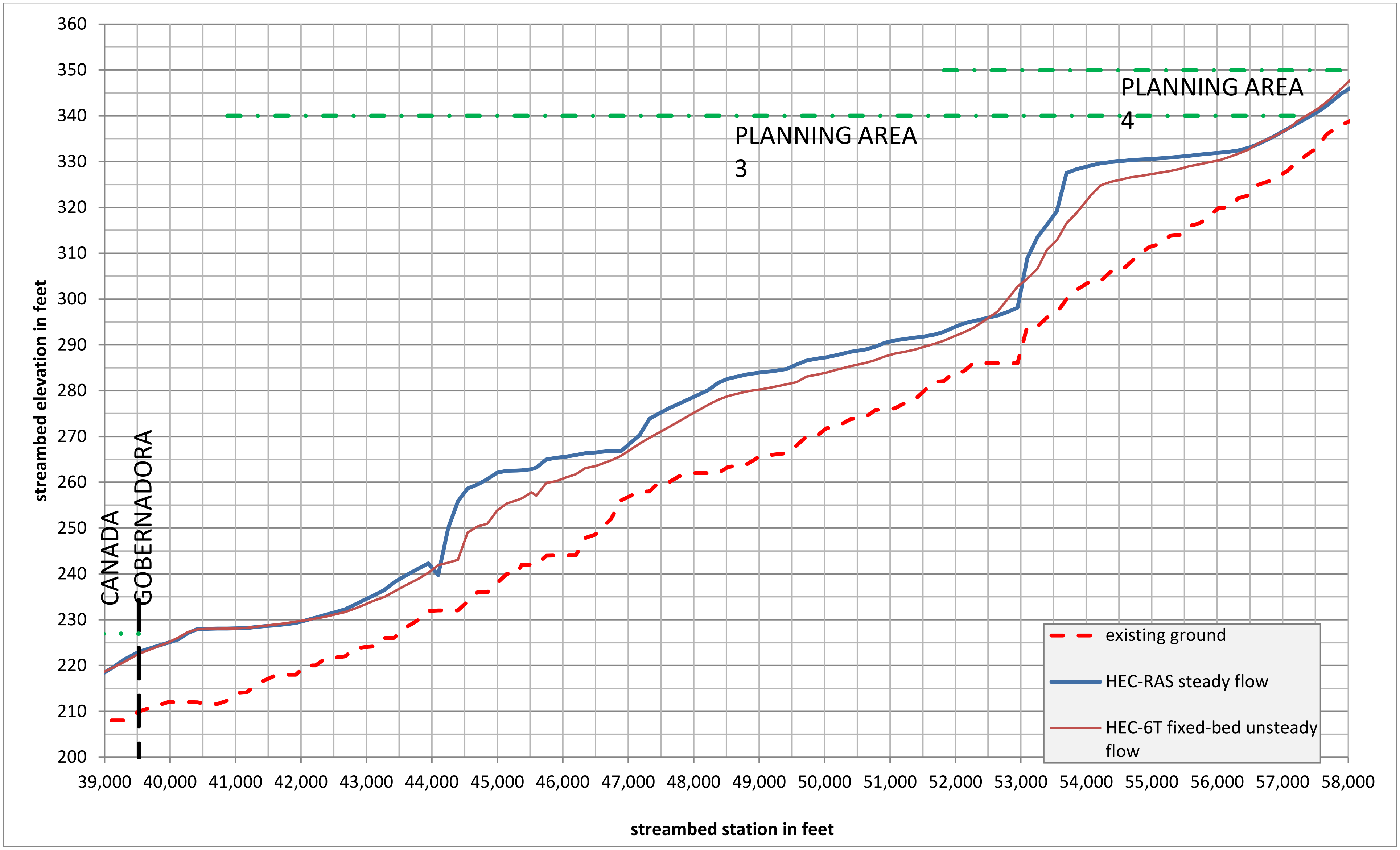


Figure 4-4: San Juan Creek Streambed Profile Comparison Based on the Existing Condition Following Selected Events

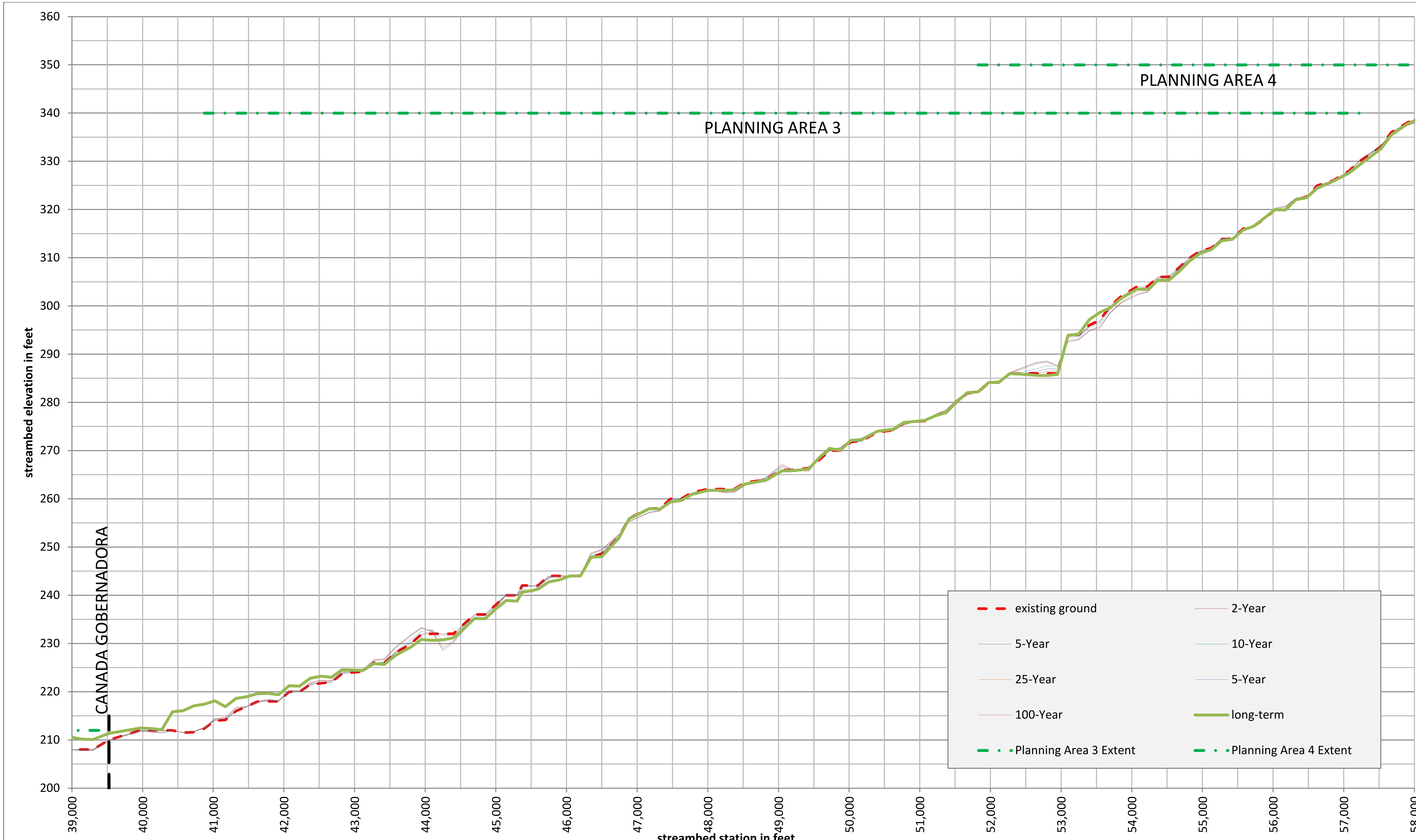


Figure 4-5: San Juan Creek Streambed Profile Comparison of Conditions Following a Continuous Flow Simulation of 84 years (WY1929 – 2012)

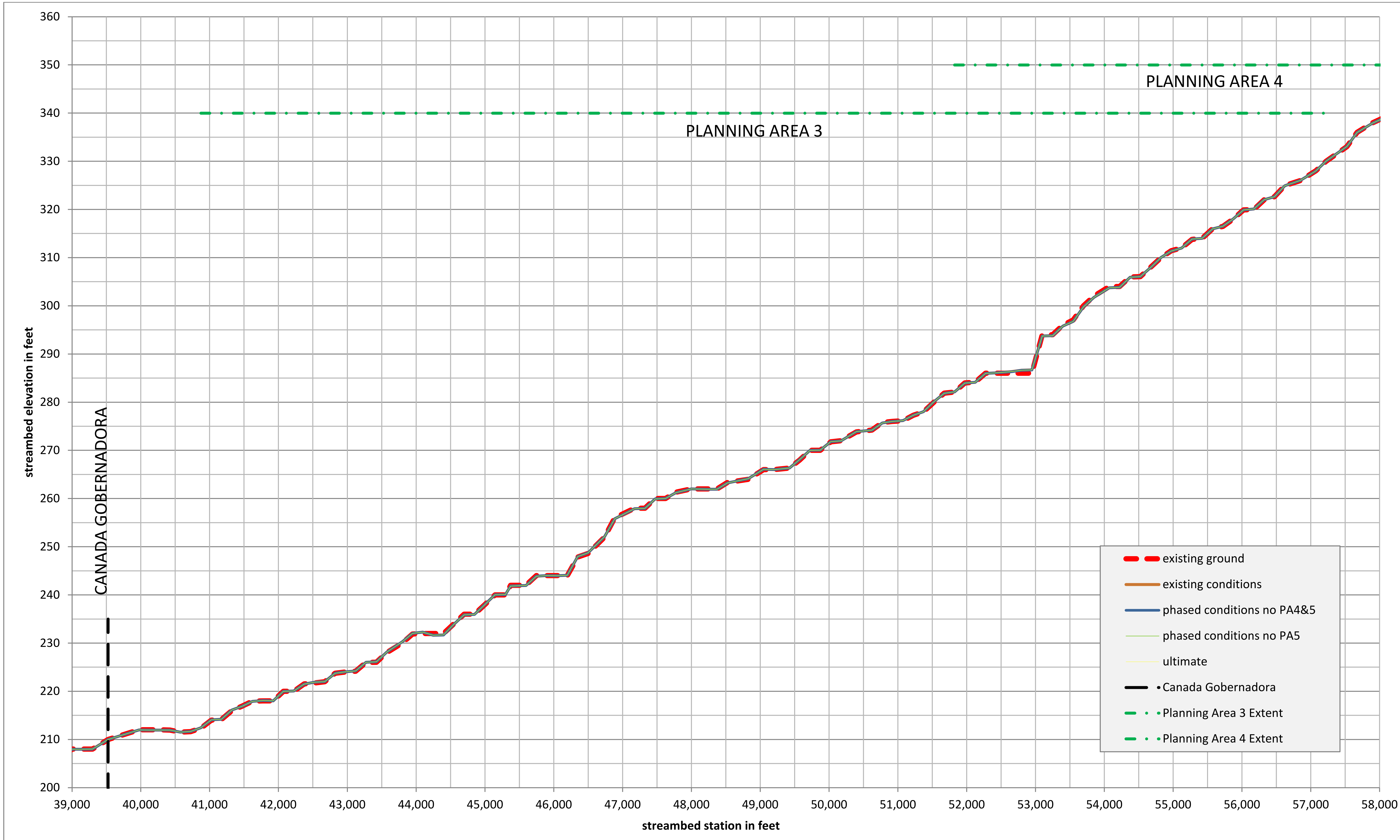


Figure 4-6: San Juan Creek Baseline Streambed Profile Comparison Following a Long-term Continuous Flow Simulation

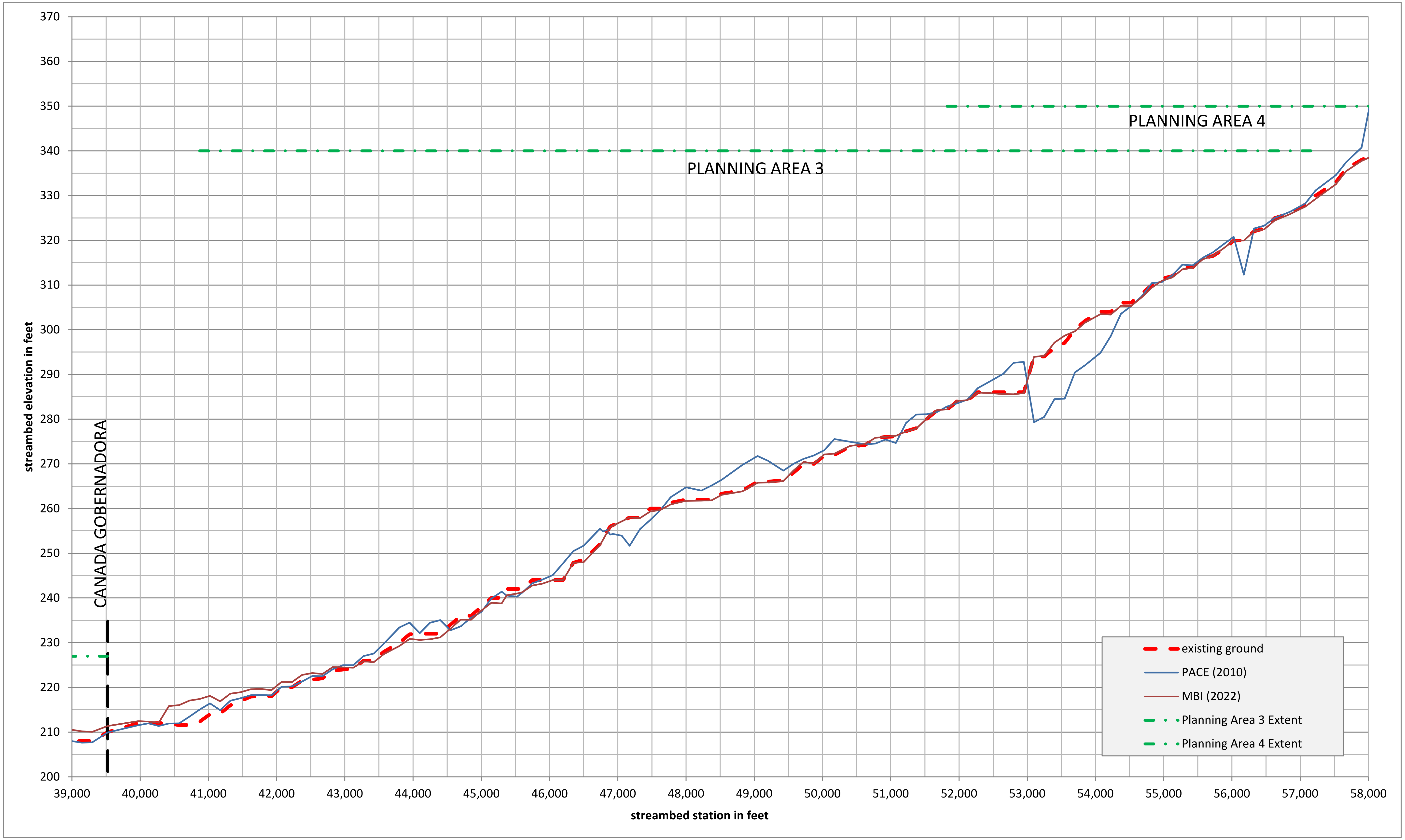


Figure 4-7: Gobernadora Existing Condition 100-yr EV Water Surface Profile Comparison

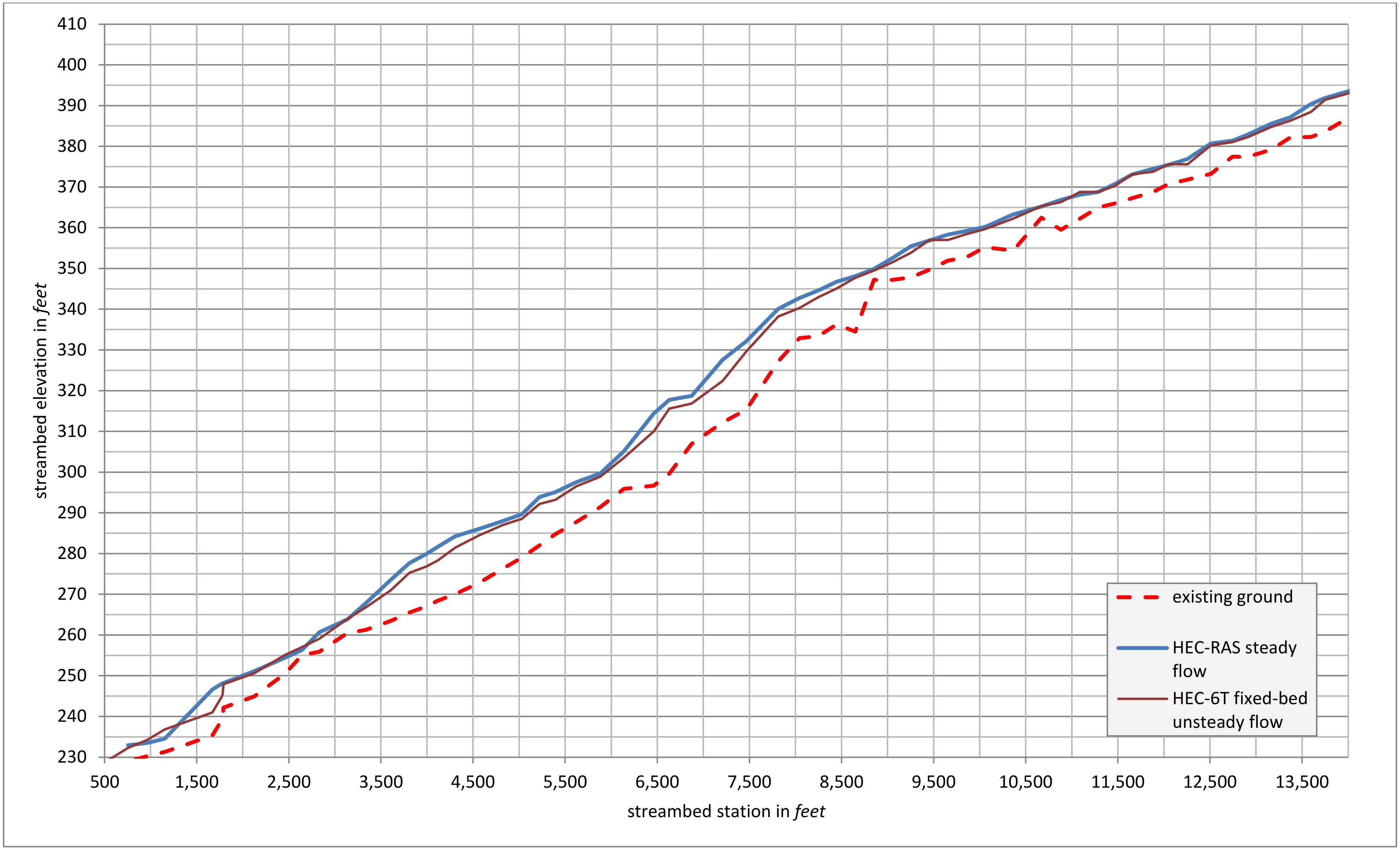


Figure 4-8: Gobernadora Streambed Profile Comparison Based on the Existing Condition Following Selected Events

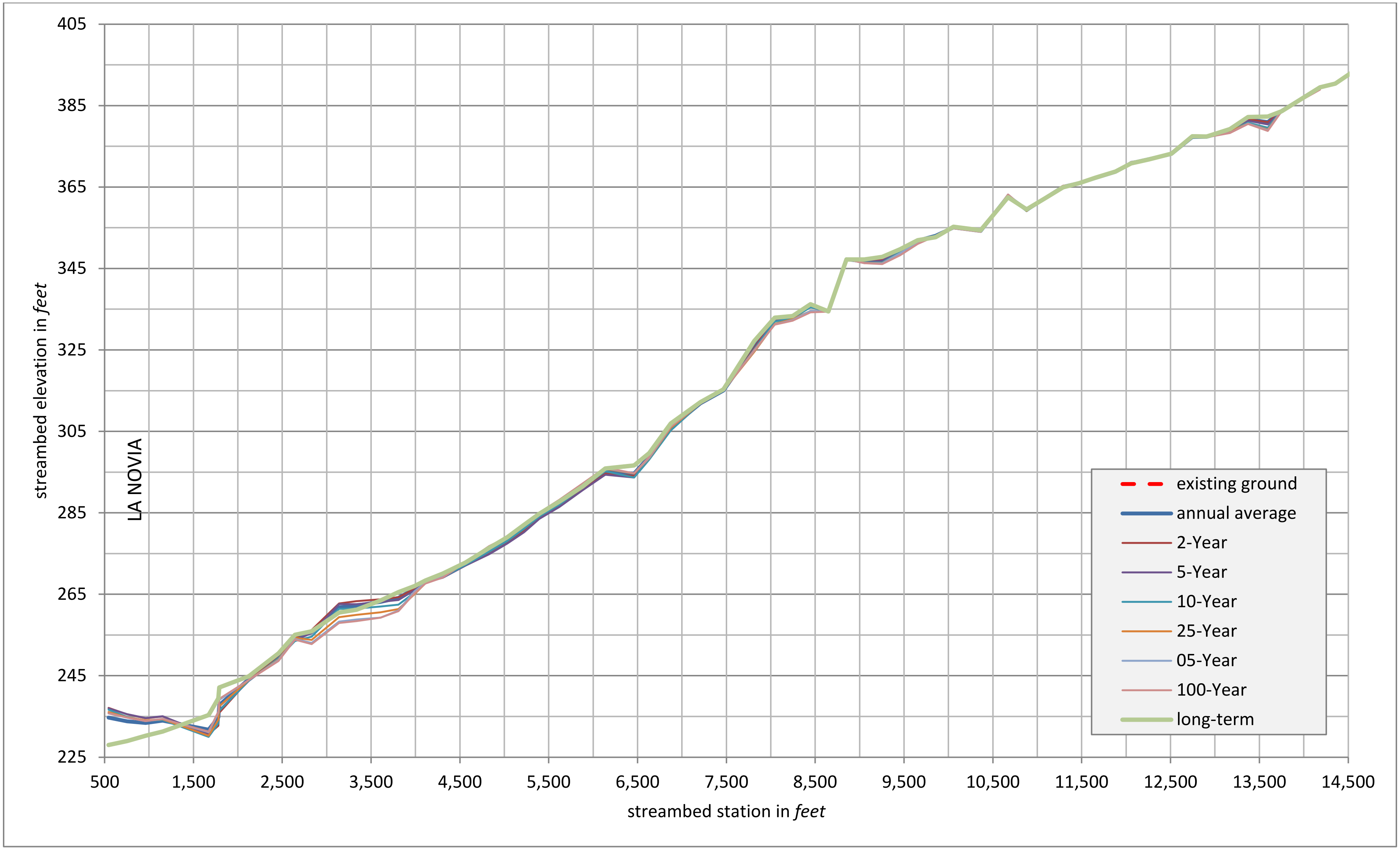


Figure 4-9: Gobernadora Streambed Profile Comparison of Conditions Following a Continuous Flow Simulation of 84 years

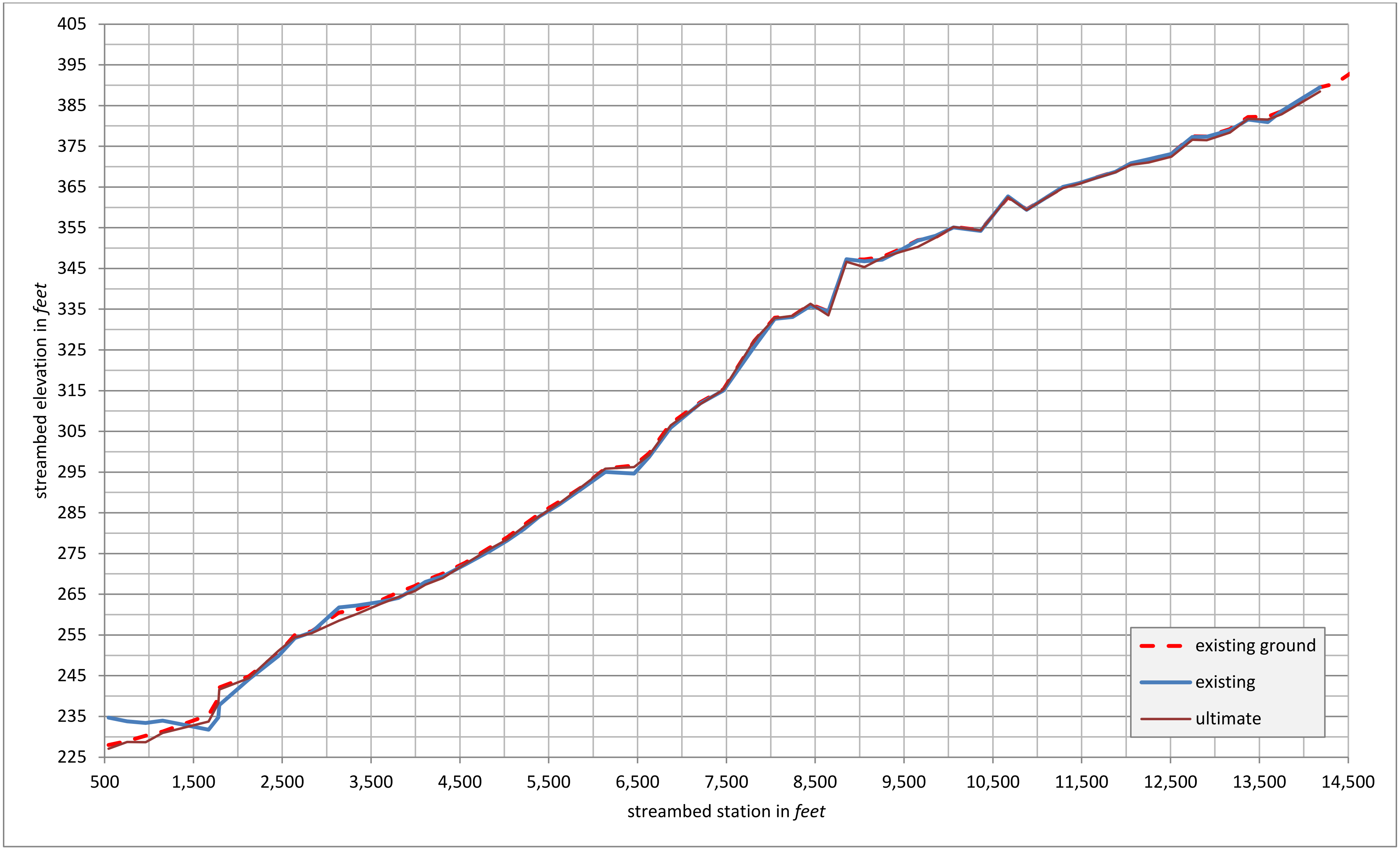
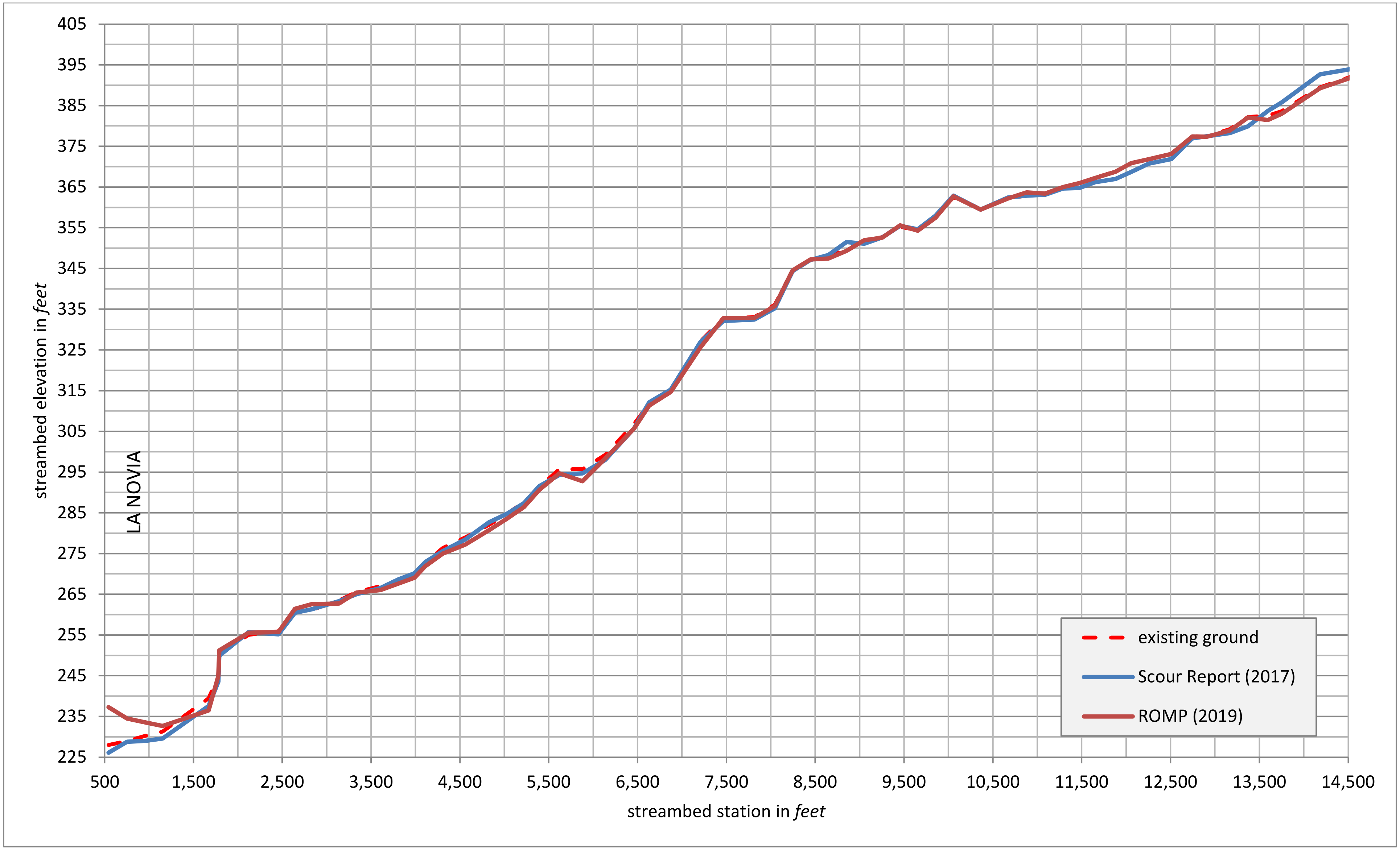
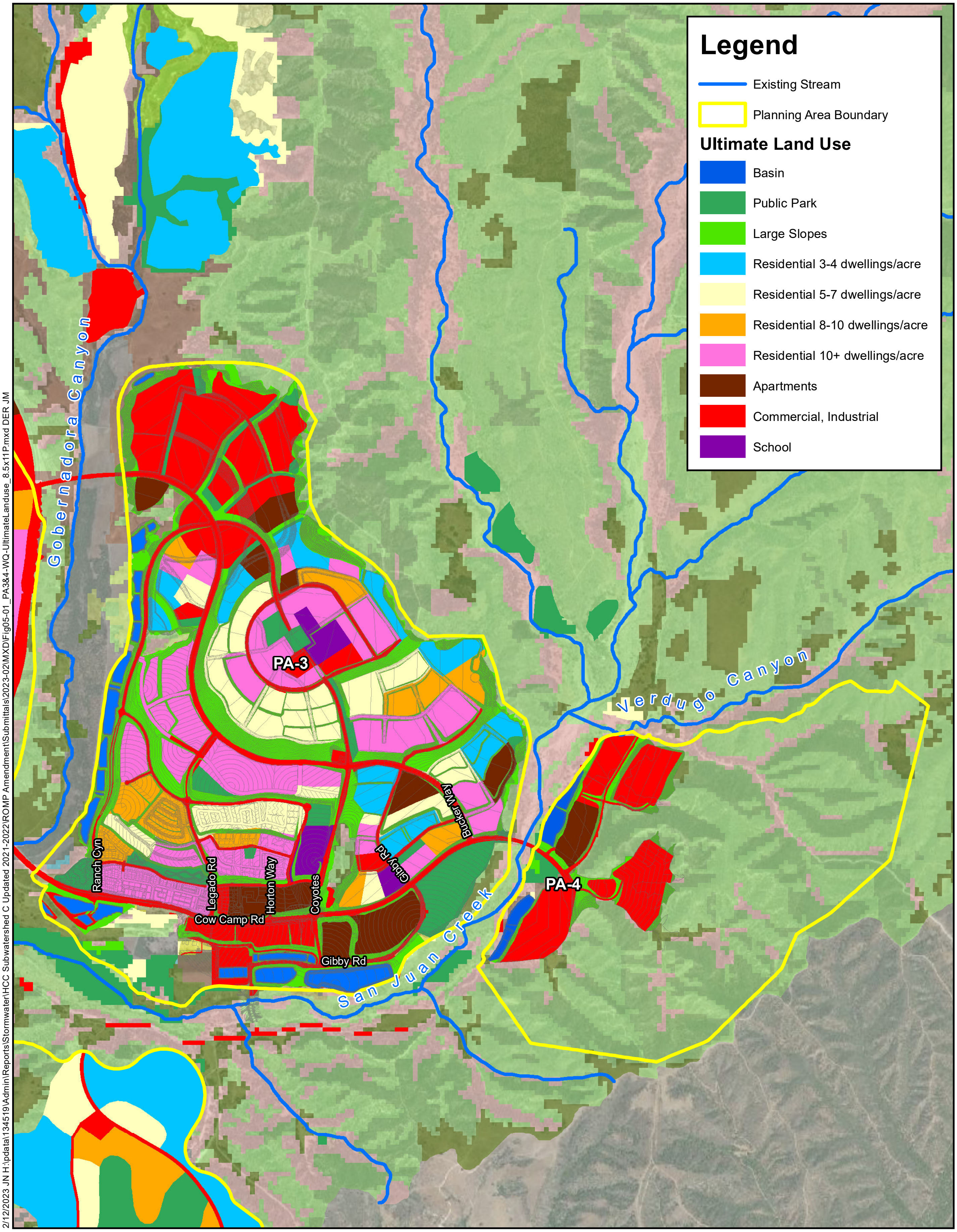


Figure 4-10: Gobernadora Baseline Streambed Profile Comparison Following a Long-term Continuous Flow Simulation





Michael Baker INTERNATIONAL

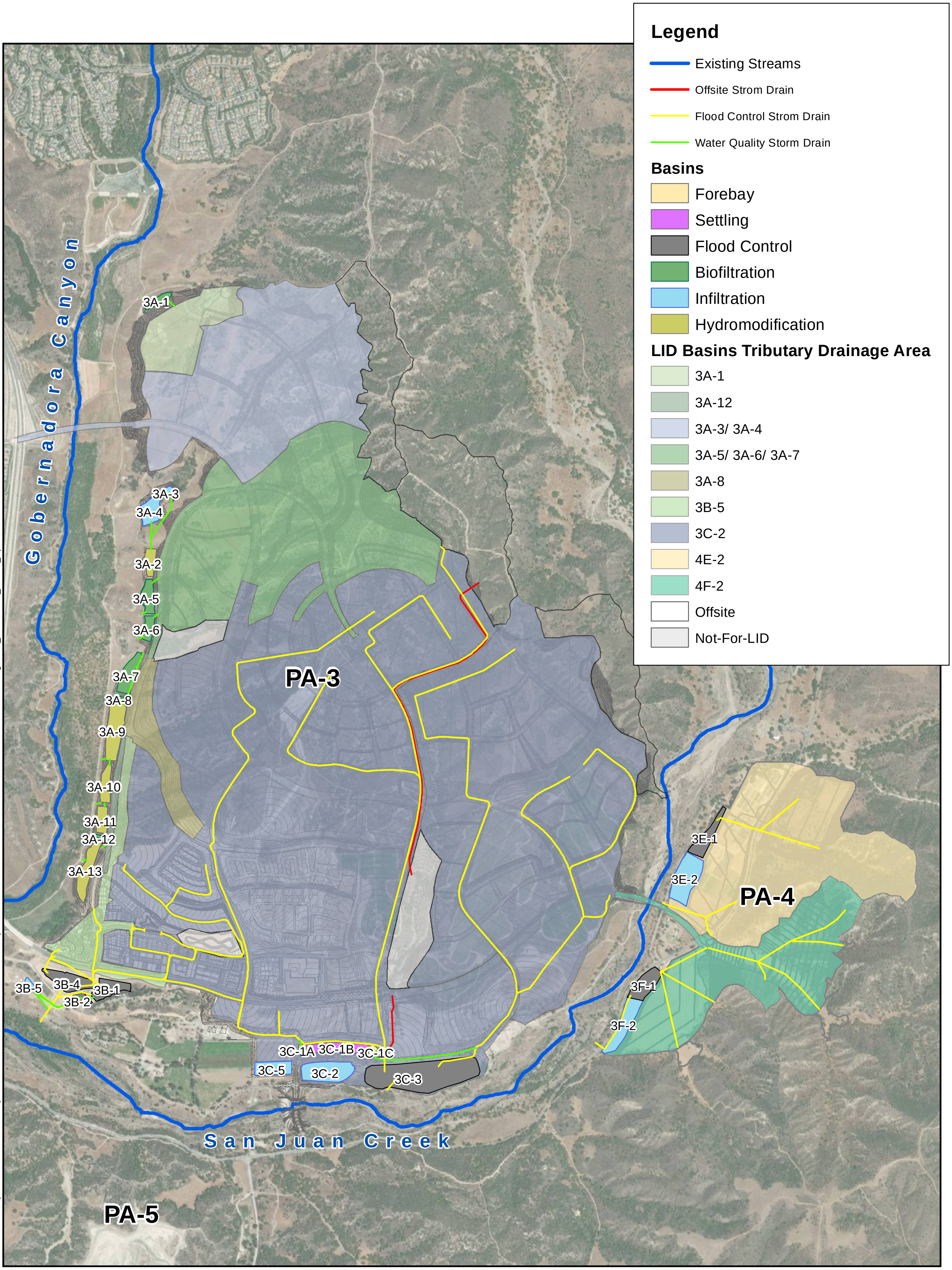
0 750 1,500 Feet

Source:

RANCHO MISSION VIEJO PA-3&4 ROMP Revision 1

PA-3 and PA-4 Water Quality Land Use

Figure 5-1



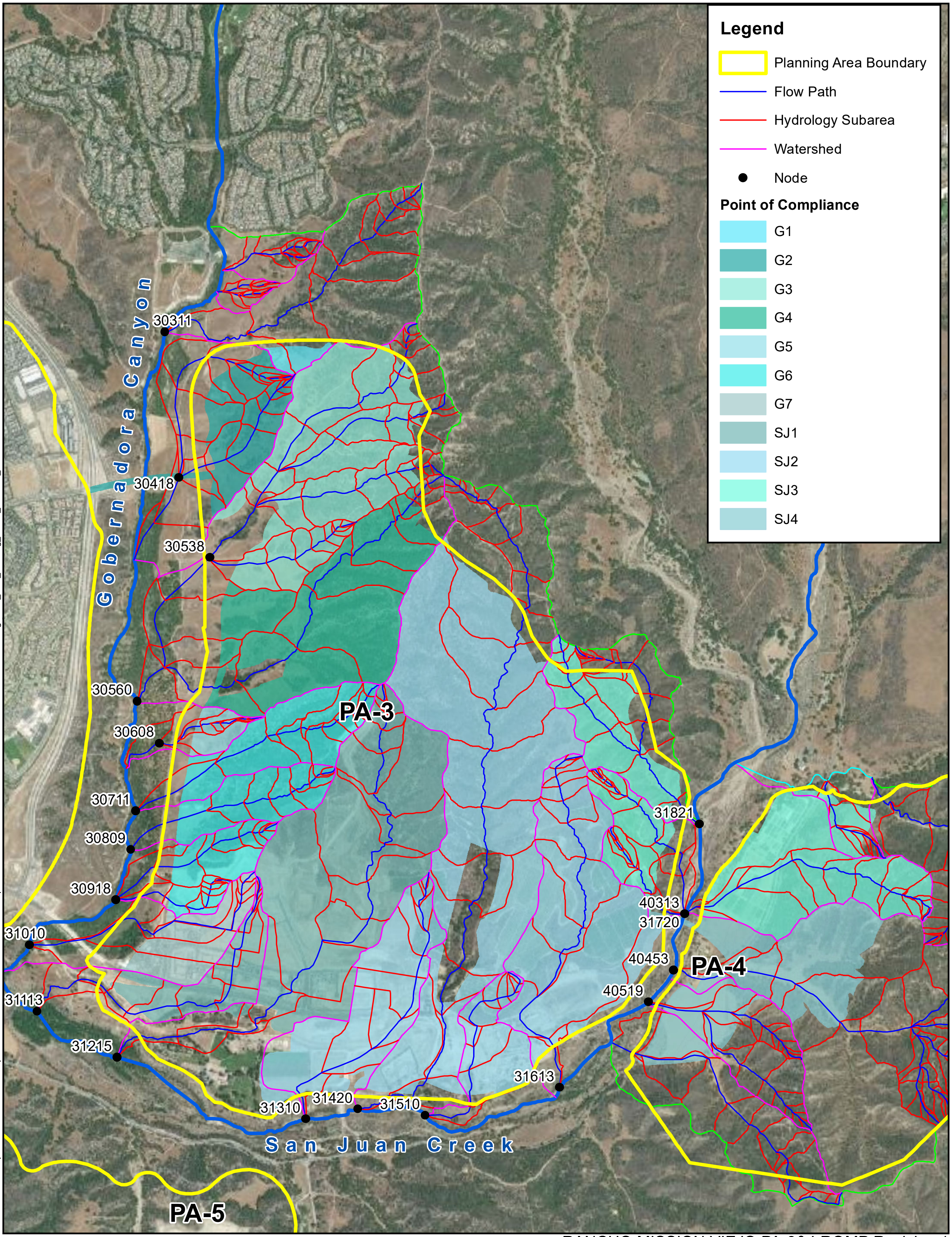
5/19/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-05\MXD\Fig05-02_PA3&4-LID_8.5x11_Update.mxd <USER NAME>

Michael Baker INTERNATIONAL

RMV PA-3&4 ROMP Revision 1

PA-3 and PA-4 LID Tributary Areas

Figure 5-2

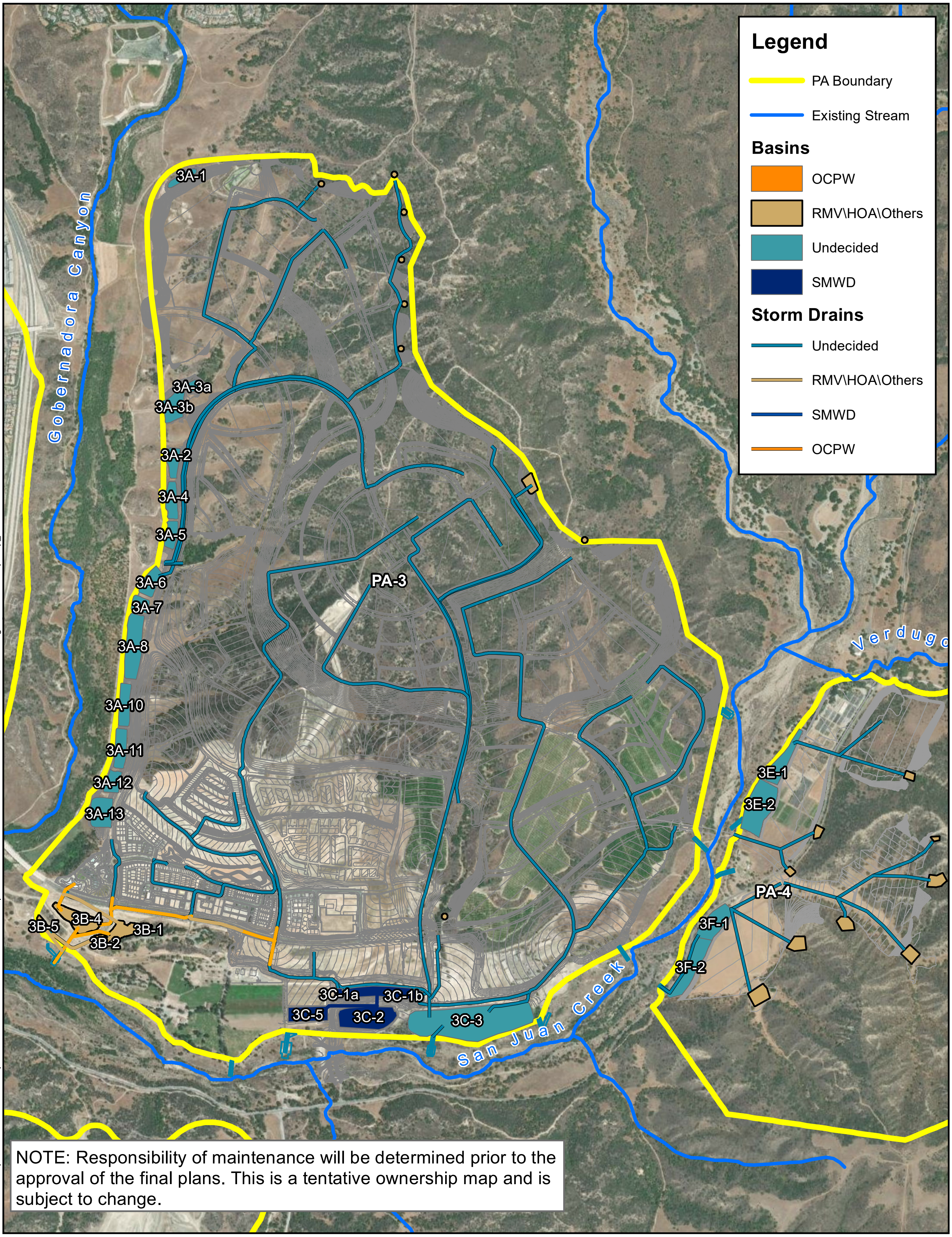


Michael Baker INTERNATIONAL

Source:

PA-3 and PA-4 Existing Water Balance Areas

Figure 5-6



5/13/2023 JN H:\pdata\134519\Admin\Reports\Stormwater\HCC Subwatershed C Updated 2021-2022\ROMP Amendment\Submittals\2023-02\MXD\Fig06-01 Ownership Map_85x11P.mxd DER JM

Michael Baker INTERNATIONAL

Source:

RMV PA3&4 ROMP Revision 1

Tentative Ownership Map

Figure 6-1

Table 2-1: Ranch Plan ROMP Versus PA-3 Ultimate Land Use Data Comparison

Ranch Plan ROMP				PA-3&4 Ultimate Conditions			
Land Use	Soil Type	Area (ac)	A_p	Land Use	Soil Type	Area (ac)	A_p
Commercial, Industrial	A	6.9	10%	Commercial, Industrial	A	95.6	10%
Commercial, Industrial	B	28.1	10%	Commercial, Industrial	B	101.7	10%
Commercial, Industrial	C	83.5	10%	Commercial, Industrial	C	220.9	10%
Commercial, Industrial	D	78.3	10%	Commercial, Industrial	D	144.9	10%
Apartments	A	0.6	20%	Apartments	A	25.4	20%
Apartments	B	1.5	20%	Apartments	B	31.7	20%
Apartments	C	16.1	20%	Apartments	C	32.4	20%
Apartments	D	45.9	20%	Apartments	D	45.5	20%
Residential 1 acre lots	A	4.5	80%	Residential 10+ dwellings/acre	A	1.6	20%
Residential 1 acre lots	B	47.1	80%	Residential 10+ dwellings/acre	B	27.5	20%
Residential 1 acre lots	C	151.2	80%	Residential 10+ dwellings/acre	C	181.6	20%
Residential 1 acre lots	D	109.6	80%	Residential 10+ dwellings/acre	D	170.6	20%
Residential 2 dwellings/acre	A	0.8	70%	Residential 8-10 dwellings/acre	B	20.5	40%
Residential 2 dwellings/acre	B	16.6	70%	Residential 8-10 dwellings/acre	C	78.8	40%
Residential 2 dwellings/acre	C	391.7	70%	Residential 8-10 dwellings/acre	D	22.7	40%
Residential 2 dwellings/acre	D	316.4	70%	Residential 5-7 dwellings/acre	A	4.6	50%
Residential 5-7 dwellings/acre	A	50.4	50%	Residential 5-7 dwellings/acre	B	15.6	50%
Residential 5-7 dwellings/acre	B	25.5	50%	Residential 5-7 dwellings/acre	C	85.4	50%
Residential 5-7 dwellings/acre	C	6.9	50%	Residential 5-7 dwellings/acre	D	117.9	50%
Residential 5-7 dwellings/acre	D	6.3	50%	Residential 3-4 dwellings/acre	B	5.3	60%
Residential 3-4 dwellings/acre	A	6.6	60%	Residential 3-4 dwellings/acre	C	52.9	60%
Residential 3-4 dwellings/acre	B	94.1	60%	Residential 3-4 dwellings/acre	D	52.0	60%
Residential 3-4 dwellings/acre	C	104.5	60%	School	A	0.0	60%
Residential 3-4 dwellings/acre	D	128.0	60%	School	B	3.0	60%
Residential 8-10 dwellings/acre	B	24.2	40%	School	C	18.2	60%
Residential 8-10 dwellings/acre	C	20.5	40%	School	D	19.2	60%
Residential 8-10 dwellings/acre	D	11.1	40%	Public Park	A	36.2	85%
Public Park	A	25.2	85%	Public Park	B	34.5	85%
Public Park	B	1.4	85%	Public Park	C	40.9	85%
Public Park	C	2.6	85%	Public Park	D	55.1	85%
Public Park	D	2.5	85%	Residential 2.5 acre lots	A	8.5	90%
School	A	1.4	60%	Residential 2.5 acre lots	B	45.6	90%
School	B	30.0	60%	Residential 2.5 acre lots	C	135.9	90%
School	C	43.2	60%	Residential 2.5 acre lots	D	97.0	90%
School	D	26.3	60%	Barren	A	12.5	100%
Barren	A	14.2	100%	Barren	B	1.4	100%
Barren	B	0.1	100%	Barren	C	0.0	100%
Chaparral, Broadleaf, Fair	A	0.2	100%	Barren	D	0.8	100%
Chaparral, Broadleaf, Fair	B	0.7	100%	Chaparral, Broadleaf, Fair	A	0.5	100%

Table 2-1: Ranch Plan ROMP Versus PA-3 Ultimate Land Use Data Comparison

Ranch Plan ROMP				PA-3&4 Ultimate Conditions			
Land Use	**Soil Type**	**Area (ac)**	**A_p**	**Land Use**	**Soil Type**	**Area (ac)**	**A_p**
Chaparral, Broadleaf, Fair	C	5.3	100%	Chaparral, Broadleaf, Fair	B	0.0	100%
Chaparral, Broadleaf, Fair	D	0.6	100%	Chaparral, Broadleaf, Fair	C	5.0	100%
Chaparral, Narrowleaf, Fair	B	0.0	100%	Chaparral, Broadleaf, Fair	D	2.2	100%
Chaparral, Narrowleaf, Fair	C	3.5	100%	Chaparral, Narrowleaf, Fair	B	0.1	100%
Chaparral, Narrowleaf, Fair	D	2.7	100%	Chaparral, Narrowleaf, Fair	C	4.5	100%
Grass, Annual or Perennial, Fair	A	32.8	100%	Chaparral, Narrowleaf, Fair	D	4.5	100%
Grass, Annual or Perennial, Fair	B	5.3	100%	Fallow	B	1.8	100%
Grass, Annual or Perennial, Fair	C	14.3	100%	Fallow	C	0.9	100%
Grass, Annual or Perennial, Fair	D	0.1	100%	Fallow	D	0.5	100%
Meadows or Cienegas, Fair	A	2.4	100%	Grass, Annual or Perennial, Fair	A	13.0	100%
Open Brush, Fair	A	8.0	100%	Grass, Annual or Perennial, Fair	B	1.0	100%
Open Brush, Fair	B	6.7	100%	Grass, Annual or Perennial, Fair	C	5.9	100%
Open Brush, Fair	C	43.1	100%	Grass, Annual or Perennial, Fair	D	0.3	100%
Open Brush, Fair	D	5.0	100%	Meadows or Cienegas, Fair	A	1.2	100%
Woodland, Grass, Fair	A	6.3	100%	Open Brush, Fair	A	7.6	100%
Woodland, Grass, Fair	B	7.7	100%	Open Brush, Fair	B	7.7	100%
Woodland, Grass, Fair	C	18.9	100%	Open Brush, Fair	C	39.5	100%
Woodland, Grass, Fair	D	1.0	100%	Open Brush, Fair	D	5.2	100%
Orchards, Evergreen, Fair	B	1.5	100%	Orchards, Evergreen, Fair	B	0.7	100%
Orchards, Evergreen, Fair	C	1.8	100%	Orchards, Evergreen, Fair	C	0.0	100%
Orchards, Evergreen, Fair	D	0.2	100%	Orchards, Evergreen, Fair	D	0.2	100%
Row Crops, Good	D	0.1	100%	Row Crops, Poor	A	0.4	100%
Row Crops, Poor	A	50.5	100%	Row Crops, Poor	B	6.3	100%
Row Crops, Poor	B	18.6	100%	Row Crops, Poor	C	6.4	100%
Row Crops, Poor	C	15.7	100%	Row Crops, Poor	D	2.5	100%
Row Crops, Poor	D	8.5	100%	Woodland, Grass, Fair	A	3.6	100%
				Woodland, Grass, Fair	B	4.6	100%
				Woodland, Grass, Fair	C	13.5	100%
Total Area[1]		**2185.3**	**65%**	**Total Area[1]**		**2185.0**	**44%**
Total Developed Area[2]		**1909.5**		**Total Developed Area[2]**		**1953.6**	

[1]Total Area is the Gross PA area.

[2]Total Developed Area is all graded development area, including basins and outside hillslopes. There is some impervious existing land use within the PA boundaries, such as the houses in Cow Camp.

Table 2-2: Ranch Plan ROMP Versus PA-4 Ultimate Land Use Data Comparison

Ranch Plan ROMP				PA-3&4 Ultimate Conditions			
Land Use	**Soil Type**	**Area (ac)**	**Ap**	**Land Use**	**Soil Type**	**Area (ac)**	**Ap**
Commercial, Industrial	A	8.5	10%	Commercial, Industrial	A	36.5	10%
Commercial, Industrial	B	9.3	10%	Commercial, Industrial	B	70.8	10%
Residential 1 acre lots	A	4.3	80%	Commercial, Industrial	C	23.3	10%
Residential 1 acre lots	B	24.0	80%	Commercial, Industrial	D	21.1	10%
Residential 1 acre lots	C	74.7	80%	Apartments	A	5.6	20%
Residential 1 acre lots	D	77.7	80%	Apartments	B	12.3	20%
Residential 2 dwellings/acre	A	4.3	70%	Residential 5-7 dwellings/acre	A	0.3	50%
Residential 2 dwellings/acre	B	38.7	70%	Public Park	A	6.1	85%
Residential 2 dwellings/acre	C	72.0	70%	Public Park	B	0.3	85%
Residential 2 dwellings/acre	D	108.8	70%	Residential 2.5 acre lots	A	11.1	90%
Residential 5-7 dwellings/acre	A	6.0	50%	Residential 2.5 acre lots	B	16.0	90%
Residential 5-7 dwellings/acre	B	14.7	50%	Residential 2.5 acre lots	C	7.4	90%
Residential 5-7 dwellings/acre	C	1.4	50%	Residential 2.5 acre lots	D	7.9	90%
Residential 3-4 dwellings/acre	B	17.5	60%	Chaparral, Broadleaf, Fair	A	0.3	100%
Residential 3-4 dwellings/acre	C	17.2	60%	Grass, Annual or Perennial, Fair	A	0.6	100%
Residential 3-4 dwellings/acre	D	4.8	60%	Open Brush, Fair	A	1.6	100%
Residential 8-10 dwellings/acre	A	6.8	40%	Row Crops, Poor	A	3.3	100%
Residential 8-10 dwellings/acre	B	12.1	40%	Woodland, Grass, Fair	A	4.8	100%
Public Park	A	22.9	85%	Chaparral, Broadleaf, Fair	B	16.0	100%
Public Park	B	14.3	85%	Grass, Annual or Perennial, Fair	B	7.7	100%
Chaparral, Broadleaf, Fair	A	0.5	100%	Open Brush, Fair	B	21.5	100%
Chaparral, Broadleaf, Fair	B	8.3	100%	Row Crops, Poor	B	0.5	100%
Chaparral, Broadleaf, Fair	C	194.2	100%	Woodland, Grass, Fair	B	13.6	100%
Chaparral, Broadleaf, Fair	D	29.5	100%	Chaparral, Broadleaf, Fair	C	256.8	100%
Grass, Annual or Perennial, Fair	A	0.4	100%	Grass, Annual or Perennial, Fair	C	12.6	100%
Grass, Annual or Perennial, Fair	B	0.0	100%	Open Brush, Fair	C	271.4	100%
Grass, Annual or Perennial, Fair	C	8.7	100%	Woodland, Grass, Fair	C	45.8	100%
Grass, Annual or Perennial, Fair	D	6.3	100%	Chaparral, Broadleaf, Fair	D	90.6	100%
Open Brush, Fair	A	0.8	100%	Grass, Annual or Perennial, Fair	D	8.5	100%
Open Brush, Fair	B	9.1	100%	Open Brush, Fair	D	134.4	100%
Open Brush, Fair	C	221.0	100%	Woodland, Grass, Fair	D	19.1	100%
Open Brush, Fair	D	50.9	100%				
Woodland, Grass, Fair	A	8.3	100%				
Woodland, Grass, Fair	B	10.5	100%				
Woodland, Grass, Fair	C	28.0	100%				
Woodland, Grass, Fair	D	3.4	100%				
Orchards, Evergreen, Fair	A	1.0	100%				
Row Crops, Poor	A	6.4	100%				
Total Area[1]		**1127**	**86%**	**Total Area[1]**		**1127**	**86%**
Total Developed Area[2]		**540.0**		**Total Developed Area[2]**		**218.7**	

[1] Total Area is the Gross PA area (area of the PA boundary)

[2] Total Developed Area is all graded development area within the PA boundary which includes imperviousness, including basins and outside hillslopes. There is some impervious existing land use within the PA boundaries, such as the houses in Cow Camp.

Table 2-3: Proposed Condition Local Rational Method Hydrology Results

Description				Expected Value (cfs)						High Confidence (cfs)	
Planning Area	Sub-watershed	2013 Ranch Plan Outfall # (2018)	Area (ac)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	100-yr	25-yr
3	A	9 (Gobernadora) (9)	510.2	214.0	387.7	636.6	831.1	949.3	1020.7	1356.2	1032.9
3	B	11 (San Juan) (11)	213.7	79.0	147.0	252.0	330.0	374.0	408.0	539.0	411.0
3	C	13.1 (San Juan) (13.1)	1292.3	437.0	814.0	1412.0	1855.0	2109.0	2296.0	3060.0	2325.0
N/A	O	17 (San Juan) (17)	51.1	5.0	26.0	59.0	79.0	90.0	99.0	134.0	101.0
4	E	20 (San Juan) (20)	171.0	94.5	167.2	274.2	358.2	408.3	435.8	573.5	438.6
4	F	22 (San Juan) (22)	553.8	162.3	345.8	646.8	865.7	991.4	1081.3	1468.8	1110.8