



MEMORANDUM

To: Neal Hay & Alex Brown– Sutter County Development Services

From: Fareed S. Pittalwala, P.E. & Mark Falgout, P.E.
Kimley-Horn and Associates, Inc.

Date: May 8, 2020

Subject: Third Review – Lakeside at Sutter Pointe Master Plan Documents

Kimley-Horn has conducted a 3rd high-level review of the following documents associated with the Lakeside at Sutter Pointe master plan development:

- Conceptual Drainage Analysis, dated February 24, 2020 – (not updated since last submittal)
- Level 2 Sewer Study, dated February 22, 2020 - (not updated since last submittal)
- Level 3 Sewer Study, dated February 22, 2020 - (not updated since last submittal)
- Domestic Water Study, dated April 22, 2020

As outlined in our scope of work, the intent of our review is to identify any fatal flaws that may be present in the proposed design. We reviewed the reports for general conformance with our own knowledge of engineering standards and design principals related to residential master plans, the available standards of Sutter County, the approved Specific Plan for the Sutter Pointe development, and the design standards of neighboring jurisdictions and utility providers, as applicable. The review did not include traditional detailed engineering plan check.

Domestic Water Study

There are no further substantial comments on the study. However, the follow considerations should be taken into consideration as the design progresses.

Future Considerations

- Once well development is undertaken data from the developed monitoring well and the existing production wells should be documented and reported to the County. If the data varies greatly from the 2,000 gpm assumption, re-design for the project may be required.
- It is our understanding that a new/updated WSA is being prepared by Golden State Water Company. We recommend that Kimley-Horn review the WSA once available.

Level 2 Sewer Study

There are no further substantial comments on the Level 2 sewer study.

Level 3 Sewer Study – Phase 1

There are no further substantial comments on the Level 2 sewer study.

Conceptual Drainage Analysis

There are no further substantial comments on the study. However, the follow considerations should be taken into consideration as the design progresses.

Future Considerations

- This report is very general in nature and confirms the standards already set by Sutter County. We recommend that Kimley-Horn review subsequent, more detailed studies.
- The emergency spillway for all lakes appear to be at the normal summer elevation with no freeboard and the Stage-Storage tables provide storage volumes well above the emergency spillway and top of headwall. In addition, the max stage for both the 10 and 100-year events are well above the emergency spillway. It appears that these basins are not designed to detain the 10 and 100-year events as each will use the emergency spillway. Since the design hinges on utilizing pumps to control the discharge to RD 1000 to a maximum of 62 cfs, these spillway elevations do not appear to accomplish the design goal. Recommend the basins be designed to contain up to the 100-year event to control flow and limit the use of emergency spillways.
- Future plans should show how the lakes are connected hydraulically.
- Future design plans should consider the erosive velocities for the 10-year channel and consider the material (earthen vs. concrete). If it's to maintain drainage at very low flows, consider allowing the nuisance flows to infiltrate.

Phase 1A Grading Layout

Future Considerations

- Ensure that the High Point/Low Point labels are correct. There are a few throughout the plan that appear incorrect.
- Ensure that the cul-de-sacs are not Low Points. The cul-de-sacs should be graded to flow out to the main streets
- There are numerous text conflicts/overlaps on the drawing, please cleanup for future submittals.
- In general, it appears that overland release has been provided, but the addition of overland release arrows (as shown in the legend) would be helpful. Please add these arrows on the next iteration of the grading plan, or as an exhibit in the drainage analysis.



March 17, 2020

Jeffrey M. Carpenter
Wood Rodgers, Inc.
3301 C Street, Bldg. 100-B
Sacramento, CA 95816

Subject: Lakeside at Sutter Pointe (900 acres +/-) – Drainage Analysis Review

Dear Jeff,

Reclamation District 1000 (RD1000) tasked Mead & Hunt to review the Lakeside at Sutter Pointe Drainage Analysis Technical Memorandum (dated June 17, 2019) prepared by Wood Rodgers. Our comments were delivered to you on December 6, 2019. Wood Rodgers responded to our comments in Dave Mueller's January 17, 2020 letter which included an update to the Lakeside at Sutter Pointe – Drainage Analysis Technical Memorandum (dated January 15, 2020). Mead & Hunt has confirmed the review comments on the drainage analysis were addressed. The RD1000 review of the Drainage Analysis is complete with no downstream improvements to the existing RD1000 facilities required.

We understand that subsequent submittals will be provided that include design details for the pumped outfall into the RD1000 drainage system. These details should consider necessary reliability and conveyance upgrades to the 1,700 LF of drainage ditch along the north side of West Riego Road to main canal flowing south.

If you have any questions or require additional information, please contact me.

Sincerely,
Reclamation District 1000

Kevin L. King
General Manager

cc: David Mueller, Wood Rodgers
Tom Makris, Wood Rodgers
Vince Geronimo, Mead & Hunt
Jeff Kashiwada, Mead & Hunt

Prepared for: Bob Shattuck, Shattuck Community Planning

CC: Jeff Carpenter, Wood Rodgers

Prepared by: David Mueller, Wood Rodgers

Date: February 24, 2020

INTRODUCTION

Wood Rodgers, Inc. (Wood Rodgers) has prepared a Conceptual Drainage Analysis for Phases 1A, 1B, and 1C of the proposed South Sutter Pointe development. The focus of this analysis is to state Project design standards, provide a regional hydrologic analysis for design of the detention basins, and provide conceptual design for the channels and pipes to convey proposed condition flows to the proposed detention areas. The analysis is based on planning documents developed as of June 2019. The results of this analysis will be used as a starting point for the final design of drainage facilities for Phases 1A, 1B, and 1C. The final design of Phases 1A and 1B are currently under development.

The study area is shown on **Figure 1**.

DESIGN STANDARDS

The drainage design standards for the proposed development are based on Chapter 9, Storm Drainage, from the Sutter County Improvement Standards, developed by the Sutter County Department of Public Works; and from discussions with the Project team and RD 1000.

Structures

Per the Sutter County Improvement Standards, lowest floor elevations of new structures shall be at least 1-foot above all sources of 100-year flooding. The regional hydrologic analysis will identify the 100-year water surface elevation (WSE) for each of the detention areas, and adjacent pad elevations will need to be placed at least 1-foot above the 100-year WSE. Upon development of the final design of the storm drain system, a WSE will be determined to show pad elevations a minimum of 1-foot above the 100-year WSE adjacent to streets.

Roadways

Per the Sutter County Improvement Standards, for arterial roadways, one lane of travel in each direction must be protected from the 100-year flood event and all public roads must be protected from the 10-year flood event by maintaining the hydraulic grade line a minimum of one-half foot

(0.5') below the elevation of inlet grates and manhole rims. Upon development of the final design of the storm drain system, Wood Rodgers will develop a hydraulic model to show a minimum of one dry lane in the 100-year storm event for arterial roadways and a minimum of 0.5' of freeboard for storm drain structures in the 10-year storm event.

Storm Drainage

Per Chapter 9 of the Sutter County Improvement Standards, the storm drain system will be designed to convey the 10-year storm event. However, in certain instances, the storm drain may be required to convey flows larger than the 10-year event, depending on site grading. For example, pipe networks near detention basins or at low points may be required to convey the full 100-year design flow. In all cases, an overflow path for flows larger than the design storm event will be provided to convey flows to the Lake/Detention Basins.

Storm drain inlets and pipe networks will be designed to provide a minimum of 1 dry lane for arterial roadways in the 100-year storm event, and 0.5-foot of freeboard in the 10-year storm event. Upon final design of each Phase of development, a hydraulic model will be developed in XPSWMM which will include a dual drainage analysis of the pipe networks and roadway hydraulics to show a minimum of 1-foot of freeboard for all pad elevations for the 100-year storm event. In this analysis, conceptual designs will be provided for both the 10-year and 100-year peak flows at each flow concentration point in the regional hydrologic analysis, and a sensitivity analysis can be performed to evaluate the performance of the spillway in large storm events. The minimum full flow velocity shall be no less than two (2) feet per second. The maximum velocity, at maximum pipe system capacity, shall not exceed 10 feet per second.

Outfall to RD 1000 Channel

Based on the Sutter Pointe Specific Plan Drainage Master Plan, the maximum allowable flow into the receiving water for the Project is 0.067 cfs/acre. As the watershed area to the outfall location located near Lake C is approximately 924 acres, the maximum allowable inflow to the RD 1000 channel is $924 \times 0.067 = 62$ cfs. The South Sutter Pointe development is at the time of this analysis assuming offsite flows passing through the project will be required to mitigate down to 0.067 cfs/acre. The developed runoff from the development of project is expected to be larger pre-project flow into the existing G2 canal, and the G2 canal will require enhancement.

Lake/Detention Basin

For each Lake/Detention Basin, the maximum stage in a 10-year, 24-hour or 10-year, 10-day storm event shall not exceed the headwall elevation of the lake. The regional hydrologic evaluation determines the maximum stage in each storm event. The lakes will be operated with a summer

elevation and a slightly lower winter water surface elevation for the purposes of flood storage. The maximum stage in the 10-year, 24-hour event and the 10-year, 10-day event should be no higher than the headwall elevation. Per Sutter County Improvement Standards, the adjacent pad elevations should be 1-foot above the 100-year WSE, per discussions with the Project team the adjacent pad elevations will be placed a minimum of 3-feet above the 100-year WSE as an additional factor of safety for the adjacent properties.

Open Channels

Open channels will be designed to convey the 100-year flood event with a minimum of 1-foot of freeboard. The minimum velocity for open channels will be 2.0 feet/second, and the maximum channel velocity shall be determined by the final material used in accordance with Sutter County Standards. Per Sutter County Improvement Standards, a HEC-RAS hydraulic model will be prepared for each of the open channels upon final design. For the purposes of this analysis, normal depth calculations have been provided where open channels are specified.

EXISTING CONDITIONS

The Existing Flood Hazard Map is presented in **Figure 2**. The proposed Project Site consists of approximately 924 acres bounded to the west by Highway 99, and to the East by the levee. All but the very northern of Phase 1C edge is located outside of any 1-percent annual chance Special Flood Hazard Areas as delineated by FEMA FIRM panel 0603940820F. The existing site is agricultural land, and runoff from the existing site drains to the south and west and is conveyed via drainage channels and pump stations owned and operated by RD 1000 out of the Natomas Basin.

PROPOSED CONDITIONS ANALYSIS

Figure 3 presents the Proposed Condition Watershed Map. The regional hydrologic analysis was performed using a Sac Calc Hydrologic model in accordance with the Sutter Pointe Specific Plan Drainage Master Plan. Normal depth pipe and channel calculations were prepared for this conceptual analysis. The design storms used in the analysis are a 10-year, 24-hour storm, a 10-year, 10-day storm, a 100-year, 24-hour storm, and a 100-year, 10-day storm. The maximum peak flow rate for the 10-year and 100-year storms will be utilized for conceptual designs of pipes and channels, respectively. Phase 1C is located within the 1-percent annual chance Special Flood Hazard Areas as delineated by FEMA FIRM panel 0603940820F, and the mitigation plan will be addressed with the development of Phase 1C.

Regional Hydrologic Analysis

The results of the proposed condition hydrologic analysis are presented in **Table 1**.

Table 1			
Hydrologic Summary			
NAME	AREA (AC)	Q10 (cfs)	Q100 (cfs)
C-1A	50.4	80	127
C-1	117.6	158	248
C-2	204.6	246	390
C-3A	37.5	47	76
C-3	100.3	124	205
C-4	186.8	237	400
C-5	74.4	92	160
C-6A	76.1	106	178
C-6	95.7	133	222
C-7	28.1	40	66
C-8	19.2	28	45
C-9	297.3	360	615
C-10	337.2	393	668
C-11	143.7	194	323
C-12	289.4	54	126
C-LAKE- A	268.4	310	501
A-OUT	268.4	51	119
C-LAKE- B	924.5	836	1409
C-OUT	924.5	62	62

A total of 924.5 acres ultimately drains to the pump station outfall at Lake B/C. A maximum flow rate of 62 cfs is allowed to flow from the pump station at Lake B/C to the adjacent RD 1000 drainage channel, G2.

Lake/Detention Basin – Lake A

The typical section for Lake A is presented in **Exhibit 1**. This exhibit was modified from a previous development to present the elevations used in the regional hydrologic analysis. Lake A includes a 2.5-foot tall headwall with a top of wall elevation of 18.9 feet, and a 5-foot bench at the foot of the headwall at an elevation of 16.4 feet. The Lake A summer WSE is to be set at 17.9 feet, and the winter WSE is to be set at 16.9 feet. The regional hydrological model assumes the starting water surface elevation for Lake A is 16.9 feet, corresponding to the winter WSE. A Stage-storage table

was developed using this typical section and the lake footprint from current planning documents. **Table 2** presents the stage-storage curve developed for Lake A. The Lake A outlet is assumed to be a 2.5 square foot opening at elevation 15.5, and the Lake A Spillway is assumed to be an 8-foot wide, 3.1-foot deep spillway at elevation 17.9 that drains to the roadway.

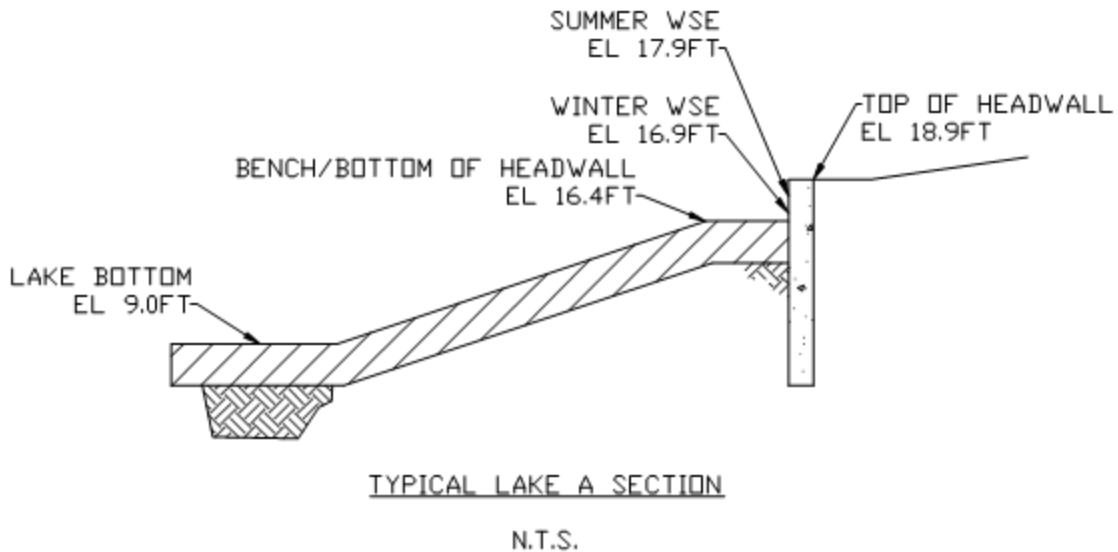


Exhibit 1, Lake A Typical Section

Table 2	
Lake A Stage-Storage	
Elevation (ft)	Storage (AC-FT)
9	0.00
15	42.15
16	49.83
17	57.80
18	65.97
19	74.17
20	82.71
21	91.70

Lake/Detention Basin – Lake B/C

The typical section for Lake B and Lake C is presented in **Exhibit 2**. Lake B and Lake C include a 2.5-foot tall headwall at an elevation of 21.9 feet, with a 5-foot bench at an elevation of 19.4 feet. The Lake B and Lake C summer WSE is assumed to be 20.9 feet, and the winter WSE is assumed to be 19.9 feet. The regional hydrological model assumes the starting water surface elevation for Lake B and Lake C is 19.9 feet, corresponding to the winter WSE. A Stage-storage table was developed using this typical section and the lake footprint from current planning documents. For the purposes of this analysis the total volumes for Lake B and Lake C were combined to develop a Stage Storage Curve for both Lake B and Lake C. **Table 3** presents the stage-storage curve developed for Lake B/C. Lake B/C are assumed to drain via pump station with a peak flow of 62 cfs, corresponding with a flow rate of 0.067 cfs/acre into the RD1000 G2 channel. A detailed detention basin, pump station sizing, and the G2 channel capacity analysis will be performed for the final design. The Lake B/C outlet and spillway are not assumed to be active in the regional hydrologic analysis, although an emergency overflow spillway will be designed during the final design of Phase 1A and 1B. The emergency spillway invert is projected to be at the summer WSE of 20.9, but is subject to change in final design.

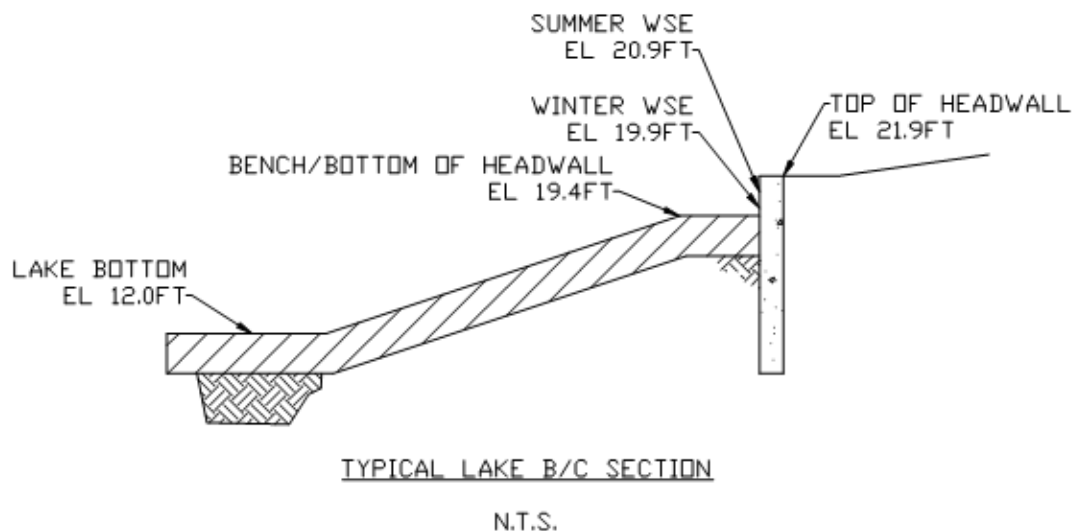


Exhibit 2, Lake B/C Typical Section

Table 3	
Lake B/C Stage-Storage	
Elevation (ft)	Storage (AC-FT)
12	0.00
13	24.84
19	188.92
20	219.23
21	250.31
22	281.58
23	314.33
24	347.43

Lake/Detention Basin – Analysis Summary

Table 4 presents the results of the detention basin analysis within the regional hydrologic analysis. The Lake A maximum stage in the 10-year storm events is 18.9 feet, which is at the headwall elevation. The Lake A maximum stage in the 100-year storm events is 20.3 feet, which means the minimum pad elevations for pads adjacent to Lake A should be 23.3 feet. The Lake B/C maximum stage in the 10-year storm events is 21.9 feet, which is at the headwall elevation. The Lake B/C maximum stage in the 100-year storm events is 24.3 feet, which means the minimum pad elevations for pads adjacent to Lake B/C should be 27.3 feet.

Table 4							
Detention Basin Summary							
DETENTION BASIN	Q100_IN (cfs)	Q100_OUT (cfs)	Q10_IN (cfs)	Q10_OUT (cfs)	MAX STORAGE (Q100, AC-FT)	MAX STAGE (Q100, ft)	MAX STAGE (Q10, ft)
LAKE A	501	119	310	51	85	20.3	18.9
LAKE B/C	1409	62	836	62	356	24.3	21.9

The final Lake A spillway and outlet sizes and elevations will be determined with an XPSWMM model of the storm drain network, including the entire storm drain network, and final grading of the Lake A detention basin. At this stage, Wood Rodgers has determined that a pump station at Lake A may be required. Wood Rodgers will verify this assumption with the final grading design of Lake A and final design of Phase 1C.

Conceptual Pipe Hydraulics

Table 5 presents the conceptual 10-year pipe designs for the various flow concentration points in the proposed condition regional hydrologic analysis. The pipes were designed assuming an 80% full pipe at normal depth with a Manning’s n of 0.015. Per Sutter County Improvement Standards, the pipe storm drain systems will be designed to convey the peak flow rate from the 10-year storm.

Table 5					
Conceptual Pipe Design -Q10					
LOCATION	Q10 (cfs)	Pipe Size (in)	Slope	Normal Depth (ft)	Percent Full
A-OUT	51	36	0.82%	2.4	80%
C-1A	80	42	0.88%	2.8	80%
C-3A	47	36	0.69%	2.4	80%
C-3	124	54	0.55%	3.6	80%
C-4	237	66	0.69%	4.4	80%
C-5	92	48	0.57%	3.2	80%
C-6A	106	48	0.76%	3.2	80%
C-6	133	54	0.64%	3.6	80%
C-7	40	36	0.50%	2.4	80%
C-8	28	30	0.65%	2	80%
C-9	360	78	0.66%	5.2	80%
C-10	393	78	0.78%	5.2	80%
C-11	194	60	0.77%	4	80%
C-12	54	36	0.91%	2.4	80%

Table 6 presents the conceptual 100-year pipe designs for the various flow concentration points in the proposed condition regional hydrologic analysis. The pipes were designed assuming an 80% full pipe at normal depth. Per Sutter County Improvement Standards, the pipe storm drain systems will be designed to convey the peak flow rate from the 10-year storm. However, in some areas the pipe network may need to convey the 100-year event where grading restrictions apply.

Table 6					
Conceptual Pipe Design -Q100					
LOCATION	Q100 (cfs)	Pipe Size (in)	Slope	Normal Depth (ft)	Percent Full
A-OUT	119	48	0.96%	3.2	80%
C-1A	127	54	0.58%	3.6	80%
C-3A	76	42	0.80%	2.8	80%
C-3	205	60	0.86%	4	80%
C-4	400	78	0.81%	5.2	80%
C-5	160	60	0.53%	4	80%
C-6A	178	60	0.65%	4	80%
C-6	222	66	0.61%	4.4	80%
C-7	66	42	0.60%	2.8	80%
C-8	45	36	0.63%	2.4	80%
C-9	615	90	0.89%	6	80%
C-10	668	96	0.75%	6.4	80%
C-11	323	72	0.81%	4.8	80%
C-12	126	54	0.57%	3.6	80%
C-OUT	62	42	0.53%	2.8	80%

Note: Table assumes all flows are contained in the pipe network.

Conceptual Channel Hydraulics

Table 7 presents the 100-year conceptual channel designs at flow concentration points C-1 and C-2 in the proposed condition regional hydrologic analysis. Per Sutter County Improvement Standards, the open channel systems will be designed to convey the 100-year flood event with a minimum of 1-foot of freeboard. The minimum velocity for open channels will be 2.0 feet/second.

Table 7										
Conceptual Channel Design										
CP	Event (year)	Q (cfs)	BW (ft)	SS	Depth (ft)	TW (ft)	Slope	Normal Depth (ft)	Velocity (ft/s)	Freeboard (ft)
C-1	10	158	62	4:01	6	150	0.21%	2.63	2.55	3.37
	100	248	62	4:01	6	150	0.21%	3.08	2.95	2.92
C-2	10	146	62	4:01	6	150	0.50%	2.64	3.94	3.36
	100	390	62	4:01	6	150	0.50%	3.1	4.58	2.9

Channels C-1 and C-2 are compound, trapezoidal open channels designed to span the 150-foot wide park corridor upstream of Lake A. The channel bottom is not expected to be below the ground water level, but if the ground water level is found to impede the open channel the channel will be redesigned to account for the incursions. Alternatively, the low-flow channel may be replaced with an underground pipe system to convey either the 10-year or more frequent storm events. Channel materials have not been finalized and will be determined in subsequent designs. Exhibit 3 and Exhibit 4 present a conceptual cross section of the compound channels at flow concentration points C-1 and C-2, respectively.

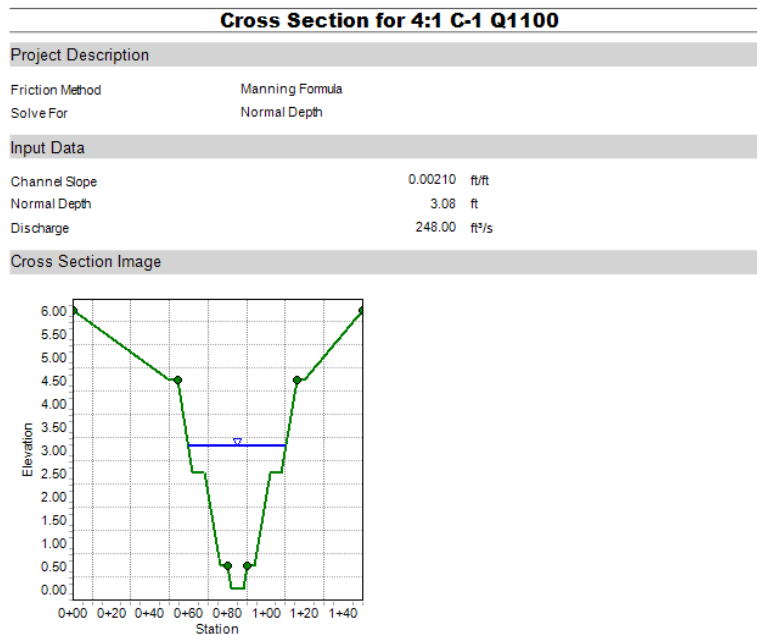


Exhibit 3, Flowmaster Normal Depth Cross Section, C-1

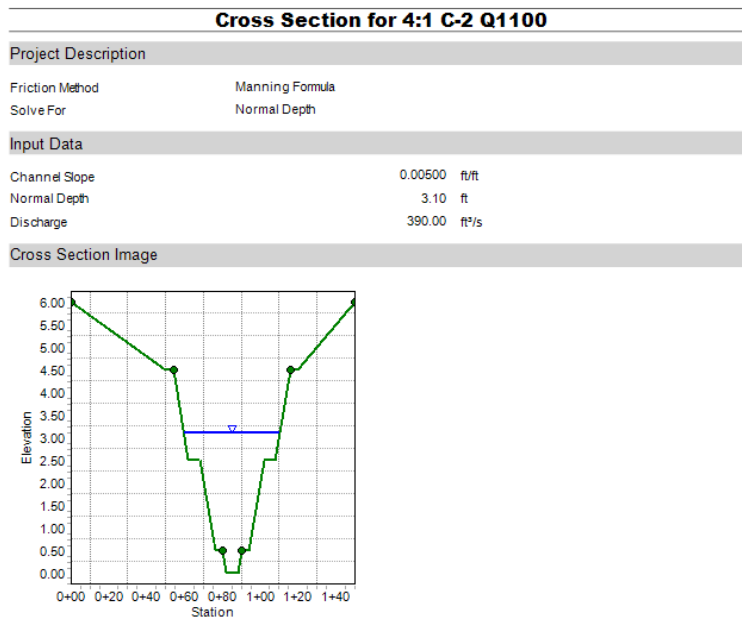


Exhibit 4, Flowmaster Normal Depth Cross Section, C-2

SUMMARY

Wood Rodgers has prepared this conceptual drainage analysis technical memo to present design parameters and to support final design of Phases 1A, 1B, and 1C of the South Sutter Pointe Development.

The analysis determined recommended pad elevations adjacent to Lake A and Lakes B and C, and conceptual pipe and channel sizes for both the 10-year and 100-year design storm events. The analysis shows that a pump station may be required for Lake A, and a pump with a peak flow rate of 62 cfs will be required at Lakes B/C. It is expected that the developed peak flow rate will exceed the capacity of RD-1000 maintained G2 corridor the project drains into, which will require improvements to the G2 corridor. Wood Rodgers will use the information in the memo to develop final pipe sizes and pond grading for the final design of Phases 1A, 1B, and 1C. At this time, final design of Phases 1A and 1B are underway and the results of the regional hydrologic analysis are used to verify pad elevations adjacent to Lake B. An XPSWMM hydraulic analysis will be performed with final design to verify the assumptions and results in this memo.

Enclosures:

Figures

Figure 1 – Location Map

Figure 2 – Existing Condition Flood Hazard Map

Figure 3 – Proposed Condition Drainage Map

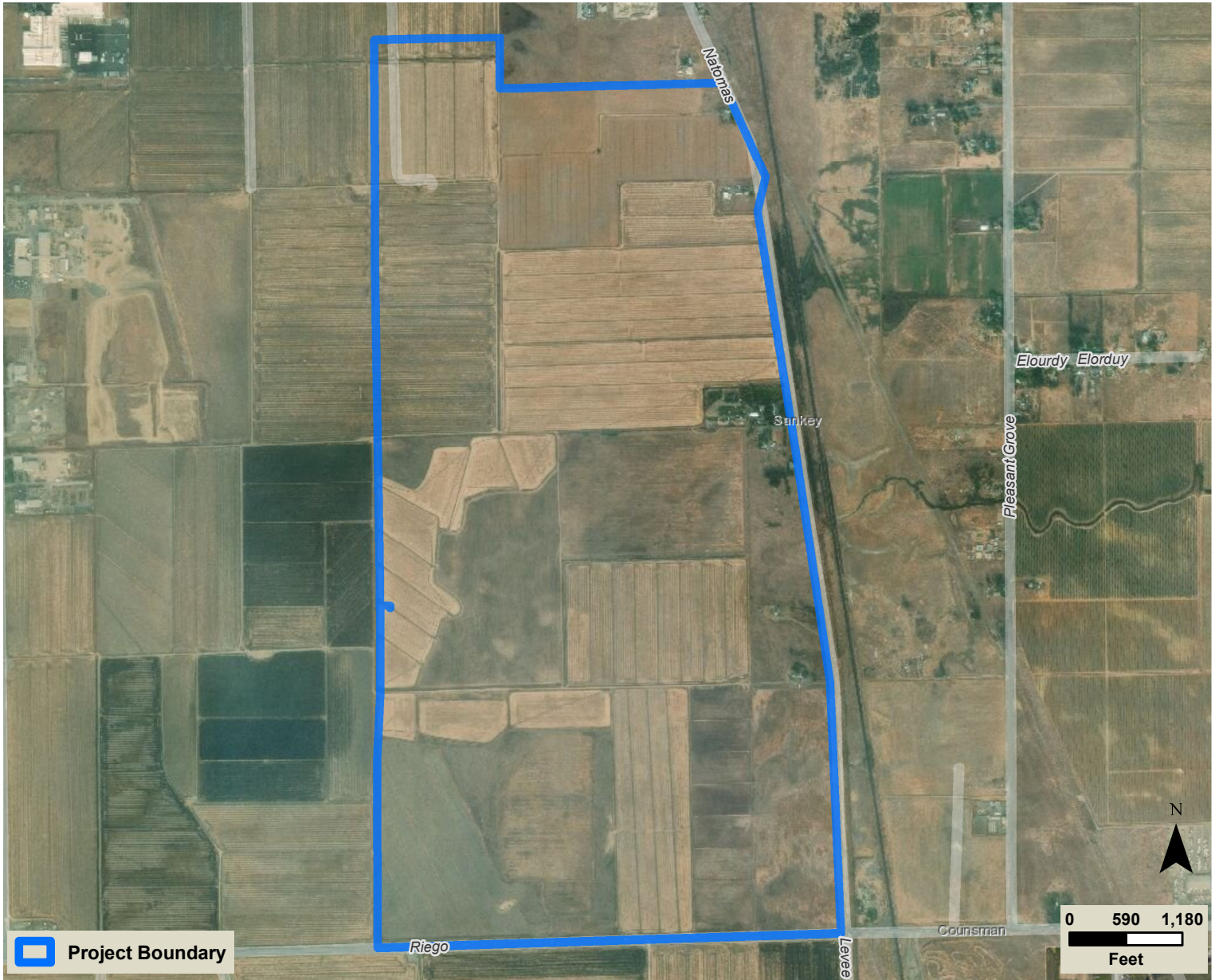
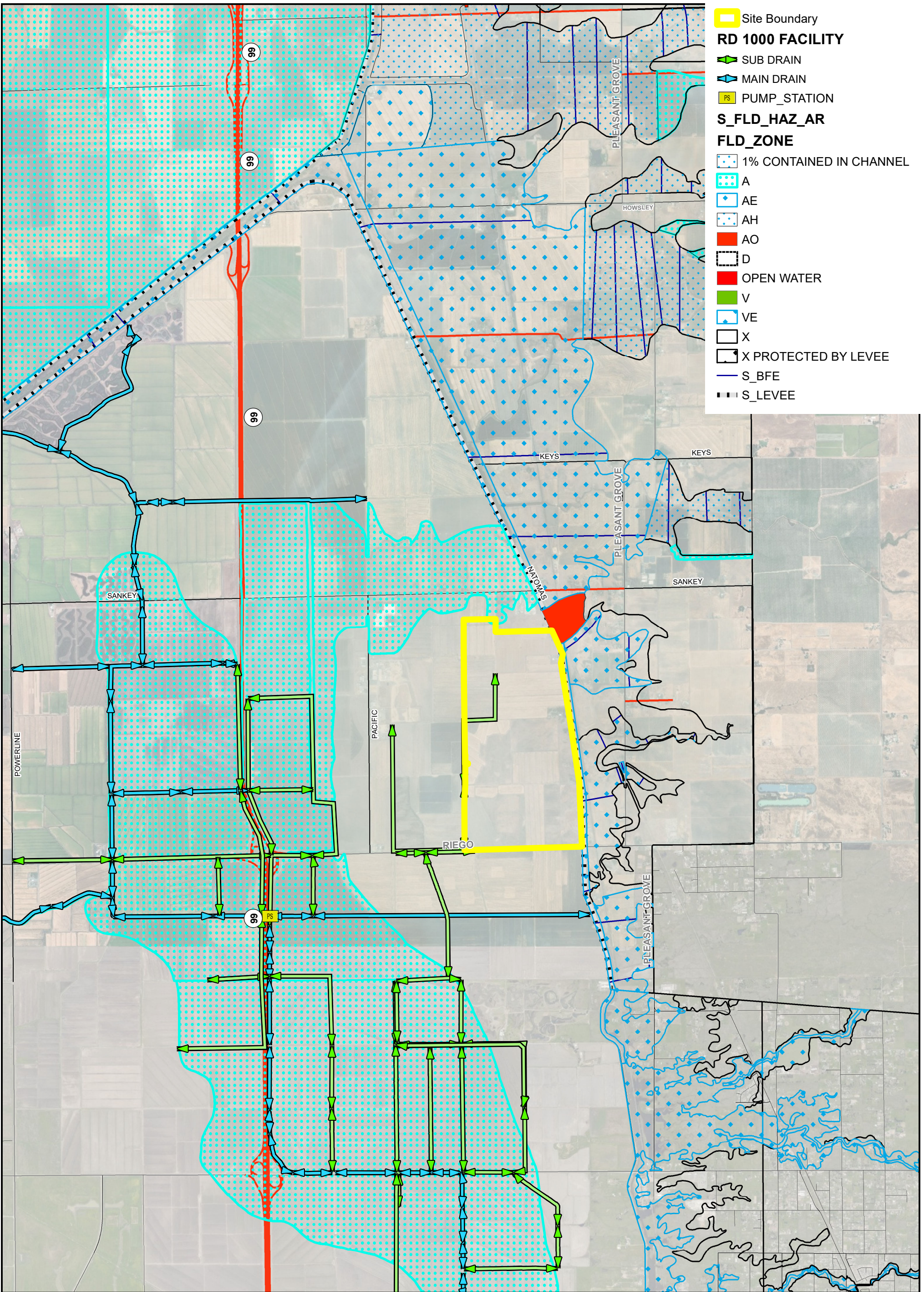


Fig. 1
Vicinity Map

South Sutter Pointe
Sutter County, California
January 2020

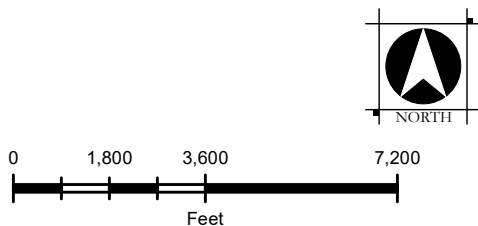
Prepared By: DMM Checked By: DMM





EXISTING CONDITION FLOOD HAZARD MAP

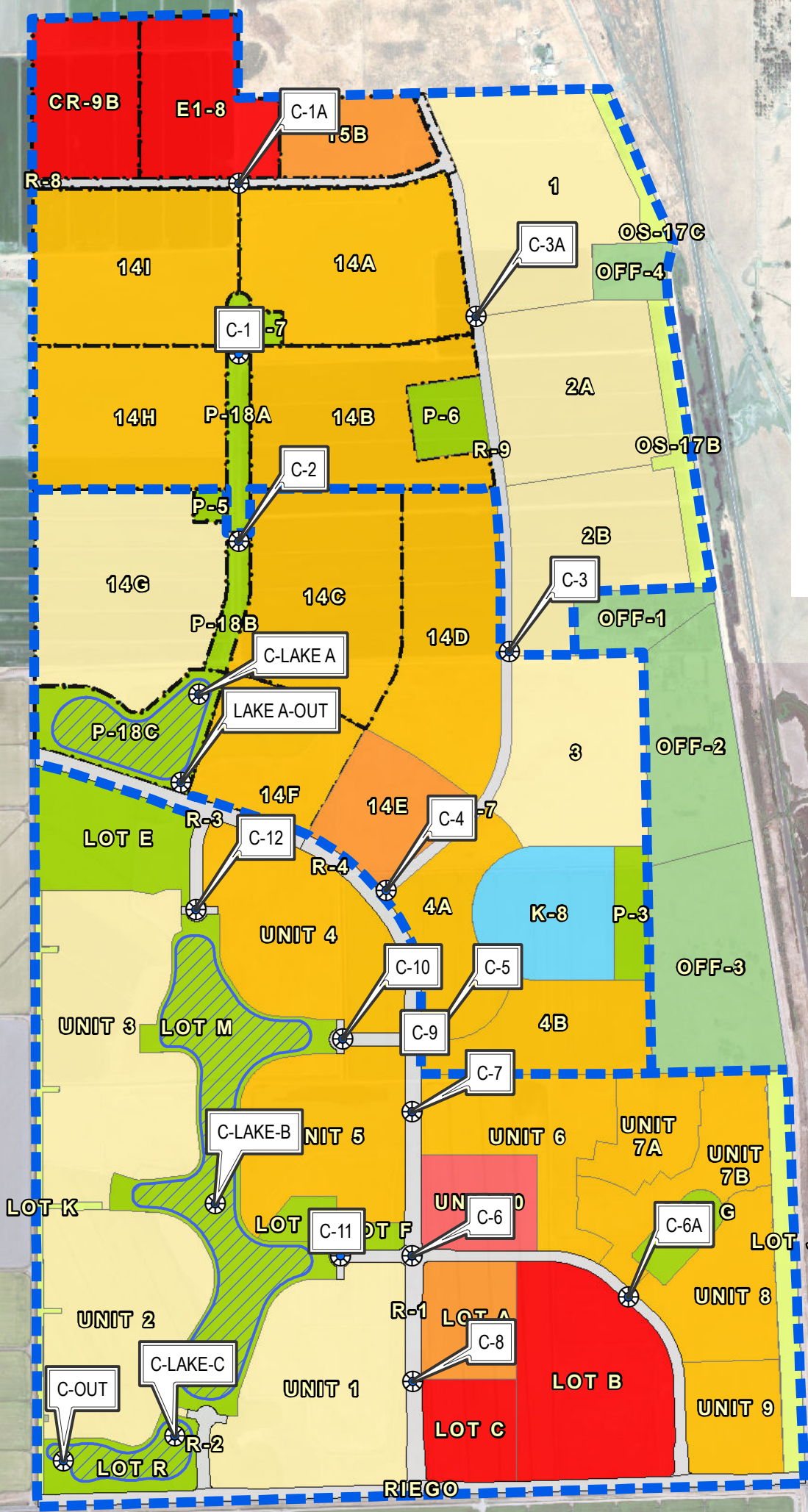
**SOUTH SUTTER POINTE PHASE 1-ABC
CONCEPTUAL DRAINAGE ANALYSIS
SUTTER COUNTY, CALIFORNIA
JANUARY 2020**



PRELIMINARY
WOOD RODGERS

DETENTION BASIN	Q100_IN (cfs)	Q100_OUT (cfs)	Q10_IN (cfs)	Q10_OUT (cfs)	MAX STORAGE (Q100, AC-FT)	MAX STAGE (Q100, ft)	MAX STAGE (Q10, ft)
LAKE A	501	119	310	51	85	20.3	18.9
LAKE B	1409	62	836	62	356	24.3	21.9

■ Phase Line
⊗ Combination_pt
Watershed
LU_Type, DB
■ AG RES, LAKE B
■ COM, LAKE A
■ COM, LAKE B
■ HDR, LAKE A
■ HDR, LAKE B
■ LDR, LAKE A
■ LDR, LAKE B
■ MDR CLUSTER, LAKE B
■ MDR, LAKE A
■ MDR, LAKE B
■ OS, LAKE B
■ PARK, LAKE A
■ PARK, LAKE B
■ ROAD, LAKE A
■ ROAD, LAKE B
■ SCHOOL, LAKE B
■ Lake



NAME	AREA (AC)	Q10 (cfs)	Q100 (cfs)
C-1A	50.4	80	127
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C-OUT	62	42	0.53%	2.8	80%

PROPOSED CONDITION WATERSHED MAP

SOUTH SUTTER POINTE PHASE 1-ABC
 CONCEPTUAL DRAINAGE ANALYSIS
 SUTTER COUNTY, CALIFORNIA
 FEBRUARY 2020

