Appendix D

Volumetric Retention Studies

CIVIL ENGINEERING
SOLUTIONS, INC.

590 E Street
Lincoln Ca. 95648
916.645-5700
Fax: 916.645-5706

Technical Memorandum

To: Placer County

Attn: Dan Dottai

Date: September 25, 2017

Regarding: North Canal Tributaries Mitigation – Lakeview Farms @ Coon Creek

Dear Dan;

CESI has been working with the City of Lincoln to develop a Volumetric Mitigation Facility at the Lakeview Farms Property Adjacent to and east of the Scilacci Farms property, north of Coon Creek. (shown on Exhibit PL-1)

The City's General Plan identifies a need for roughly 2800 acre feet of mitigation for the 8-day 100-year event for the City's ultimate 50-year buildout plan. The facility would be built in phases. The City plans to complete the 1st phase (see Exhibit LA1) in 2018 in order to accredit the initial 1080 acre feet of retention as in service. Currently the excavation and embankments have been constructed, however, final improvements are still necessary for the accreditation of the facility. A second phase (See Exhibit LA3) is proposed which would expand the facility to 2800 acre feet, in the future. The City collects fees as part of its Public Facilities Element to pay for this project as a Capital Improvement Project. An ultimate phase was originally identified which could expand the facility to store as much as 4000 acre feet by adding pumps and increasing the height of the storage embankments.

The Placer Ranch Specific Plan(PRSP) has identified a need for 17.4 acre feet of mitigation for North Tributaries of the Natomas Cross Canal (Orchard Creek/Auburn Ravine). The Sunset Industrial Area (SIA) has identified an impact of 374.8 acre feet, for the 8-day 100-year event. This indicates a total potential need for the expansion of Lakeview Farms of **392.2 acre feet**.

The expansion from 2800 AF to 3200 AF needed for PRSP and SIA would be accommodated by expanding the footprint of the basin, and deepening some of the excavation areas in the bottom. Roughly 695,000 CY of excavation would be needed in the expansion, and roughly 1600 LF of containment embankments would need to be constructed. The Lakeview Farms site has no onsite location for excess excavation to be placed, so either the project phases need to be timed with other

projects that require import materials, or the materials need to be exported by the contractor (costly). Exhibit LA4 shows the Phase 4 expanded basin for PR and SIA. Phases 1-3 of the facility relate to City of Lincoln development of the project as shown in Exhibits LA-1 to LA-3. For the included cost estimate the export option is included. The estimated costs are shown below. The PRSP/SIA portion of the project would be 12.5% of the total basin. In the cost estimate there are shared cost items in “Construction Soft Costs” and “Misc. Program Costs” that this expansion would need to pay their fair share of the cost of at 12.5% of the total costs. (at the time of this writing of this Tech Memo, the City was still assembling their documentation of the shared cost items, and the amounts shown below in red were estimates.)

The Phase 1 completion estimated in 2018, would provide the City of Lincoln with an additional 1080 acre feet of volumetric mitigation. This would be an estimated 400 acre feet in excess of their current needs. The City would likely de-commission their existing Orchard Creek Mitigation facility so that it could be converted to reclaimed water storage. The City of Lincoln could accommodate interim development impacts from the PRSP and SIA in their excess capacity following the completion of the 2018 improvements.

Lakeview Farms - Phase 4 Expansion from 2800 AF to 3200 AF

(A Prevailing Wage Project)

Item	Description	Quantity	Unit	Unit $	Cost $	Task $
1	**Site Preparation**					
	Mobilization	1	LS	$ 200,000.00	$ 200,000.00	
	Clear and Grub	51.6	AC	$ 2,000.00	$ 103,260.00	
						$ 303,260.00
2	**Channel/Basin Improvements**					
	Shaped Excavation	25000	CY	$ 4.00	$ 100,000.00	
	Excavated Storage Volume (Bucket to Truck)	670378	CY	$ 1.50	$ 1,005,567.00	
						$ 1,105,567.00
3	**Containment Embankment and Fill**					
	Foundation Work	1600	LF	$ 18.00	$ 28,800.00	
	Embankment Fill-Shaping from Local Cut Source	50567.8	CY	$ 6.00	$ 303,406.80	
	Export of Excess Materials (shrink)	540503.5	CY	$ 10.00	$ 5,405,035.00	
						$ 5,737,241.80
4	**Control Structures and Piping**					
	Pipe	0	LF	$ 144.00	$ -	
	Outlet Pipe Valve	0	EA	$ 22,500.00	$ -	
	Telemetry and control for outlet pipe	0	EA	$ 25,000.00	$ -	
	Gate Control Structure (Inlet)	0	EA	$ 150,000.00	$ -	
	Gate Control Structure (Outlet)	0	EA	$ 100,000.00	$ -	
	Telemetry and control for Inlet	0	EA	$ 25,000.00	$ -	
	Armorflex Weir	0	SF	$ 22.00	$ -	
						$ -
5	**Site Appurtenances**					
	Access Road (12')	1600	LF	$ 25.00	$ 40,000.00	
	Perimeter Fencing	1600	LF	$ 22.00	$ 35,200.00	
	Protection Fencing	0	LF	$ 20.00	$ -	
	Access Ramps	2	EA	$ 20,000.00	$ 40,000.00	
	Landscaping	0	SF	$ 3.00	$ -	
	Hydroseed	51.6	AC	$ 5,500.00	$ 283,965.00	
	Slope Protection	0	SF	$ 2.00	$ -	
	SWPPP	1	LS	$ 5,000.00	$ 5,000.00	
	Erosion Protection and Winterization	1	LS	$ 50,000.00	$ 50,000.00	
						$ 454,165.00
					CONSTRUCTION SUB-TOTAL	**$ 7,600,233.80**
6	**CONSTRUCTION SOFT COSTS**					
	Engineering and Design (7.5% of Const)	1	LS	$ 570,018	$ 570,017.54	
	Permitting					
	Project Level EIR preparation (12.5%)	0.125	LS	$ 800,000.00	$ 100,000.00	
	Habitat Mitigation (12.5%)	0	AC	$ 250,000.00	$ -	
	Division of Dam Safety (12.5%)	0.125	LS	$ 250,000.00	$ 31,250.00	
	Permits (12.5%)	0.125	LS	$ 200,000.00	$ 25,000.00	
	Construction Management (5% of Const)	1	LS	$ 380,011.69	$ 380,011.69	
					Construction Soft Costs Subtotal =	**$ 1,106,279.23**
					SUB-TOTAL CONSTRUCTION COSTS =	**$ 8,706,513.03**
					CONTINGENCIES (20%) =	**$ 1,741,302.61**
					TOTAL CONSTRUCTION COSTS =	**$ 10,447,815.63**
7	**MISC. PROGRAM COSTS**					
	Program Updates and Fee Monitoring					
	Placer Program Cost Reimbursements	1	LS	$ 100,000.00	$ 100,000.00	
	Lincoln Staff Participation (12.5%)	0.125	LS	$ 150,000.00	$ 18,750.00	
	Lincoln Property Purchase (12.5%)	0.125	LS	$ 3,800,000.00	$ 475,000.00	
					TOTAL MISC. PROGRAM COSTS=	**$ 593,750.00**
					TOTAL PROJECT COSTS =	**$ 11,041,565.63**
					Additional $'s Needed to Fund Project =	**$ 11,041,565.63**

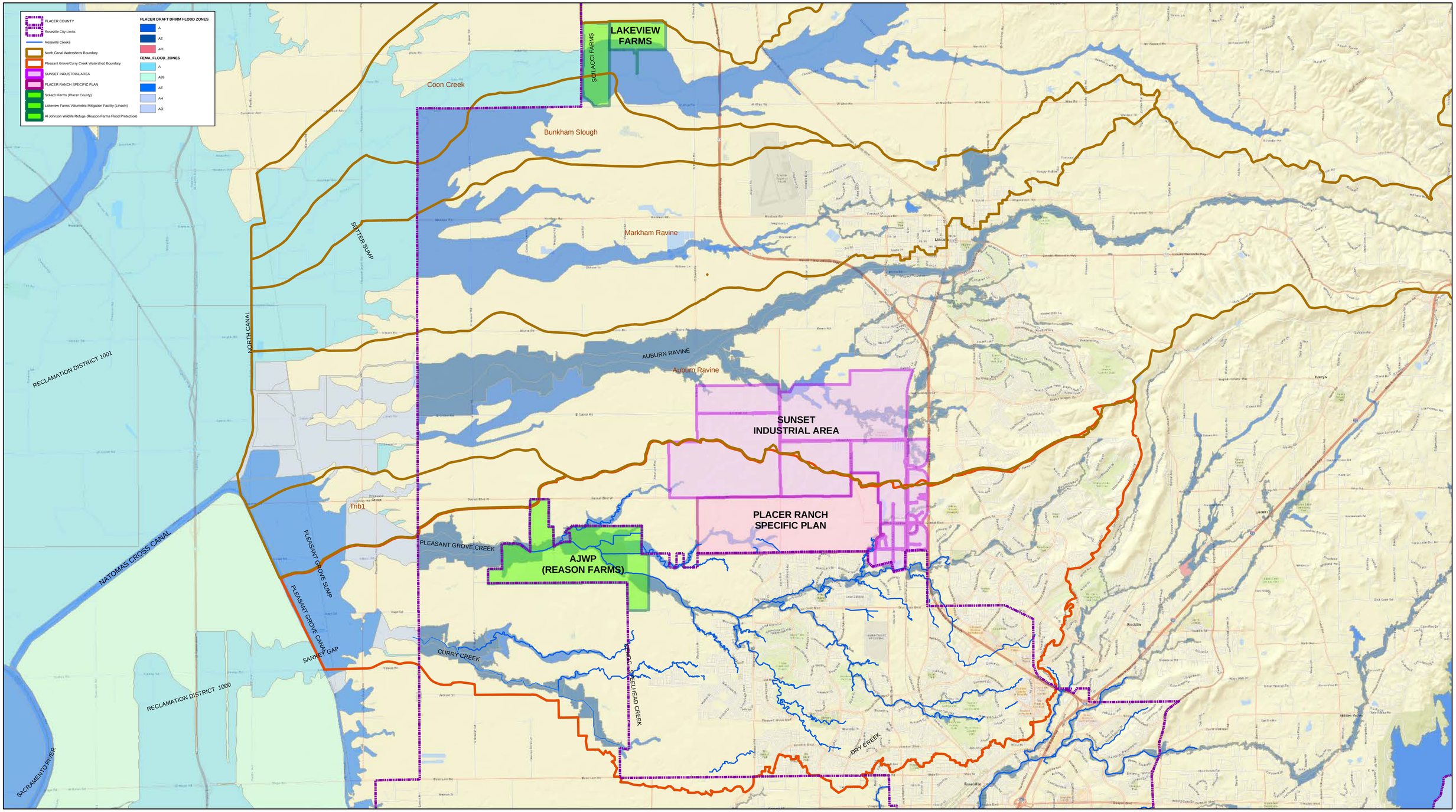
The Lakeview Farms property is an environmentally-cleared volumetric retention basin to be operated by the City of Lincoln for purposes of mitigating drainage impacts for projects within the City's jurisdiction. The basin has capacity to expand, and Lincoln has agreed to offer excess retention volume mitigation to projects outside of the City's jurisdiction. Construction of some basin components has started, with the City looking to have the first phase operable for storage by fall of 2018.

Please let us know if there is any additional information you require, please contact me at (916) 645-5700.

Sincerely,

Thomas S. Plummer, P.E., CFM

2017 PLACER RANCH SPECIFIC PLAN AND SUNSET INDUSTRIAL AREA



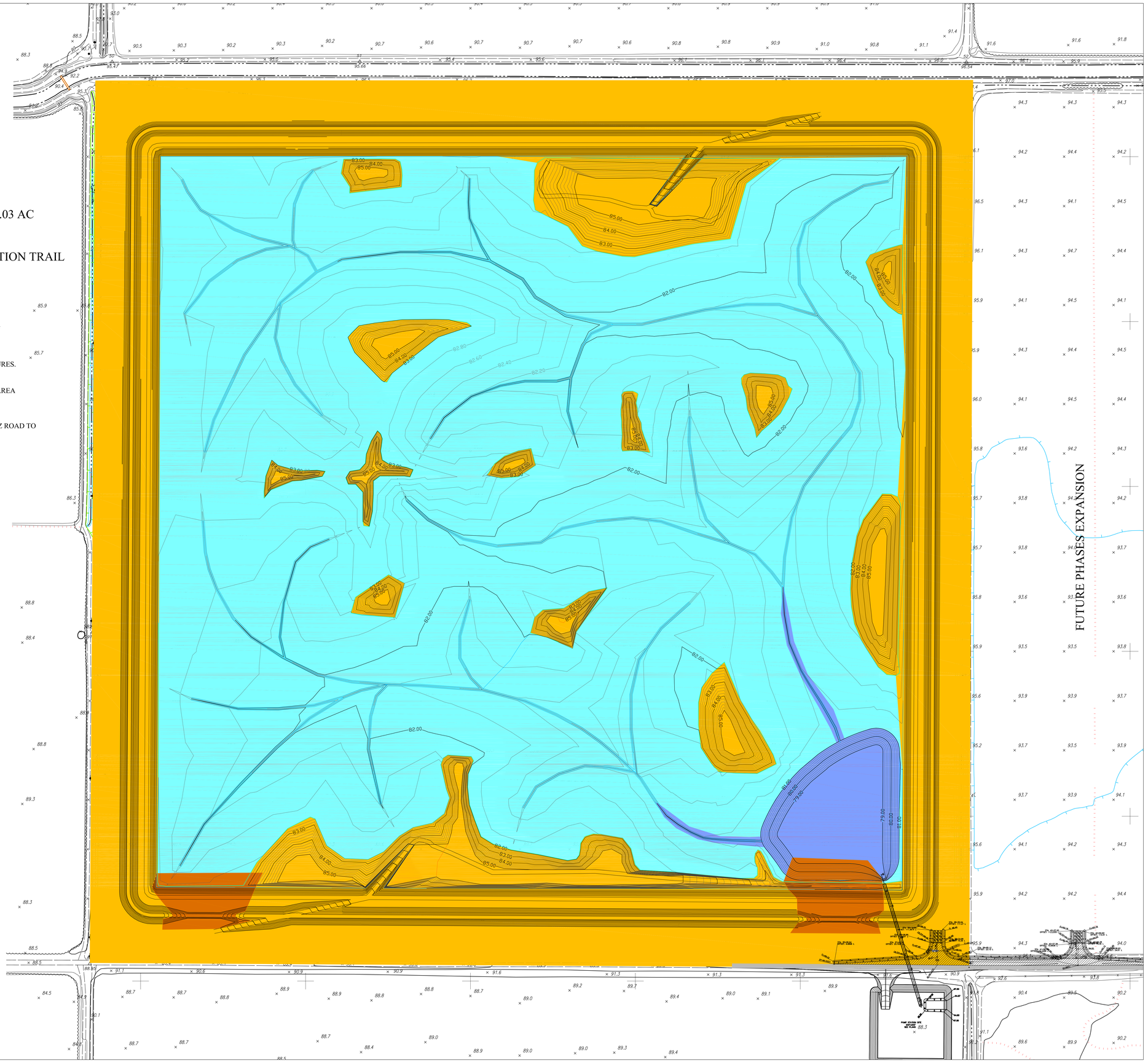
CIVIL ENGINEERING SOLUTIONS, INC.

PLACER COUNTY

0 4,625 9,250 18,500 Feet

8-DAY 100-YEAR VOLUMETRIC RUNOFF
REGIONAL CONTEXT MAP
SEPTEMBER 2017

PL-1



LEGEND:

- MARSH/LAKE 3.95 AC
- UPLANDS 64.32 AC
- SEASONAL WETLANDS 93.03 AC
- RIP/RAP AREAS
- MAINTENANCE & INSPECTION TRAIL

WORK ITEMS:

PHASE I:

- CLEAR AND GRUB WESTERN 161.3 ACRES + 10 ACRE STOCKPILE SITE.
- TOPSOIL TO REMOVED AND STOCKPILED PER DRAWING, AND REPLACED ONCE BASIN IS EXCAVATED TO PROPOSED GRADE.
- SOIL EXCAVATION AND EXPORT BY SR-65 BYPASS PROJECT. EST EXPORT=1,200,000 CY (SIZE OF HOLE)
- TWO DRIVEWAYS FOR SITE ACCESS WILL BE CONSTRUCTED AT WALTZ ROAD.
- TWO CROSSINGS OF CENTER DITCH WILL BE CONSTRUCTED
- SITE WILL BE STABILIZED BY HYDROSEEDING AND OTHER EROSION CONTROL MEASURES.
- TOPSOIL WILL BE REPLACED AT BASIN INVERT & BASIN INVERT SHAPING GRADING IMRPOVEMENTS.
- MAINTENANCE ACCESS AND INSPECTION TRAILS WILL BE ADDED TO PHASE I BASIN AREA
- WETLAND RESTORATION IMPROVEMENTS TO PHASE I BASIN AREA
- 2 WEIR LOCATIONS WILL BE STABILIZED WITH ROCK SLOPE PROTECTION
- DRIVEWAY @ WALTZ ROAD WILL BE ADDED FOR ACCESS TO PUMP STATION SITE
- CULVERT FROM PHASE I RETENTION FACILITY WILL BE CONSTRUCTED UNDER WALTZ ROAD TO THE PUMP STATION SITE

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CHECKED BY: TSP DWG: Phase I
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REVISION	DATE	DESCRIPTION	APPROVED	DATE

CIVIL ENGINEERING SOLUTIONS, INC.
1325 Howe Avenue, Suite 202
Sacramento CA. 95825
(916) 563 - 7300
fax (916) 563 - 7362

LAKEVIEW FARMS VOLUMETRIC MITIGATION FACILITY
PHASE I - IMPROVEMENTS

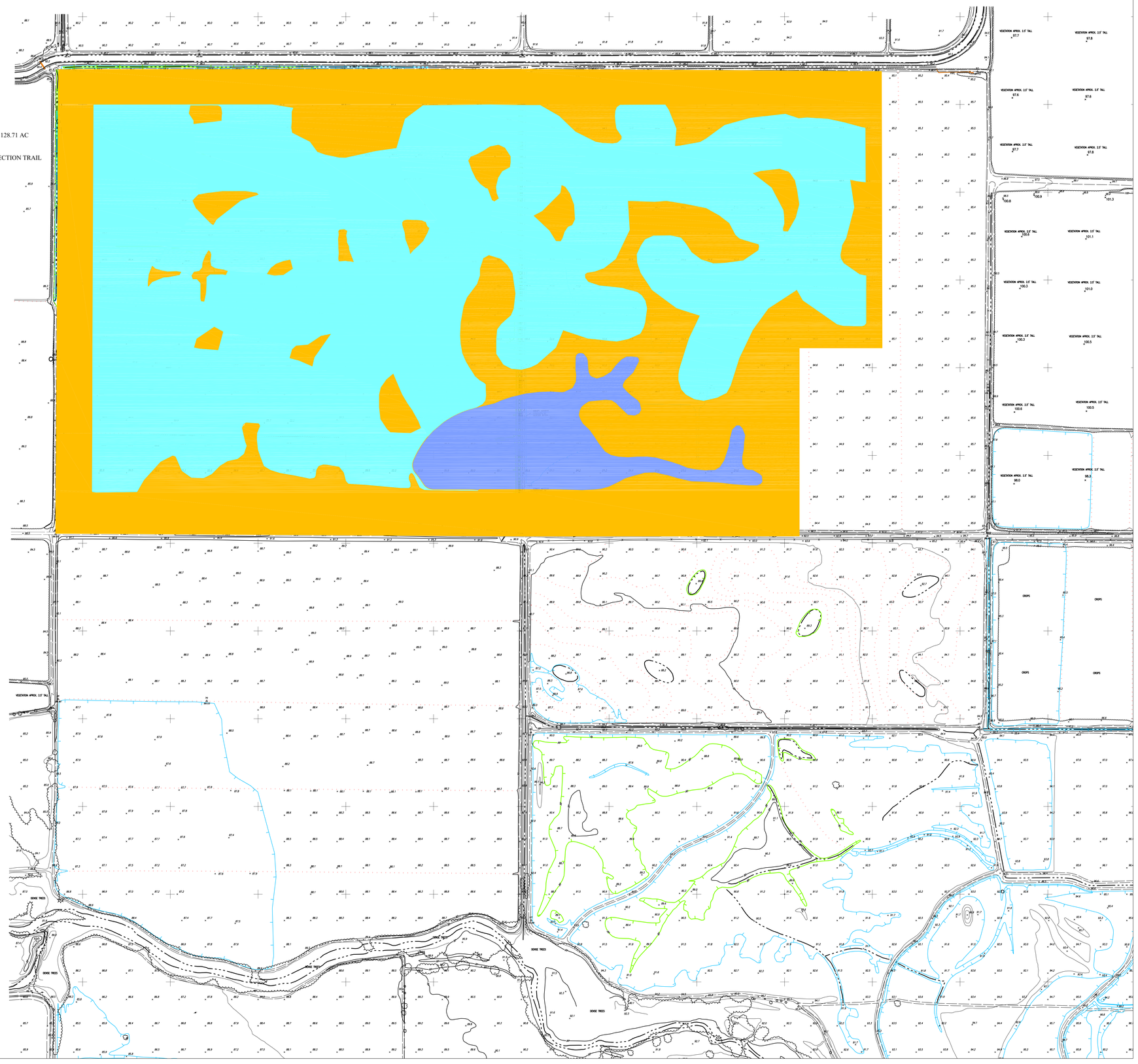
CITY OF LINCOLN PLACER COUNTY CALIFORNIA

DATE: SEP 2017
SCALE: 1"=100'
W.O. NO. 2013.11

SHEET LA1 OF 4

LEGEND:

- MARSH/LAKE 19.36 AC
- UPLANDS 125.88 AC
- SEASONAL WETLANDS 128.71 AC
- RIP/RAP AREAS
- MAINTENANCE & INSPECTION TRAIL



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PHASE 2:

- CLEAR AND GRUB EASTERN BASIN EXPANSION AREA
- PHASE 1 AREAS WILL BE DEEPENED 1 TO 4 FEET.
- SOIL EXCAVATION AND EXPORT BY PRIVATE OPERATION, OR MAY BE PERFORMED BY CITY OR SR-65 CONTRACTOR. EST. EXPORT=1,800,000 CY
- PHASE 2 EASTERN EXPANSION AREA INVERT GRADING IMPROVEMENTS
- MAINTENANCE ACCESS AND INSPECITON TRAILS WEILL BE ADDED TO PHASE II AREAS
- WETLAND RESTORATION IMPROVEMETNS TO PHASE 2 BASIN AREA
- AN OUTFALL CHANNEL TO COON CREEK WILL BE CONSTRUCTED FOR 500 CFS CAPACITY.
- PUMP STATION SITE WILL BE GRADED AND PREPARED, and APPROX 75CFS of PUMPING CAPACITY WILL BE ADDED.

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REVISION	DATE	DESCRIPTION	APPROVED	DATE

CIVIL ENGINEERING SOLUTIONS, INC.
1325 Howe Avenue, Suite 202
Sacramento CA. 95825
(916) 563 - 7300
fax (916) 563 - 7362

LAKEVIEW FARMS VOLUMETRIC MITIGATION FACILITY PHASE 2 IMPROVEMENTS

CITY OF LINCOLN PLACER COUNTY CALIFORNIA

DATE: FEB 2007

SCALE: 1"=200'

W.O. NO. 2013.11

SHEET LA2 OF 4

LEGEND:

- MARSH/LAKE 24.05 AC
- UPLANDS 168.68 AC
- SEASONAL WETLANDS 130.27 AC
- RIP/RAP AREAS
- MAINTENANCE & INSPECTION TRAIL

WORK ITEMS:

PHASE I:

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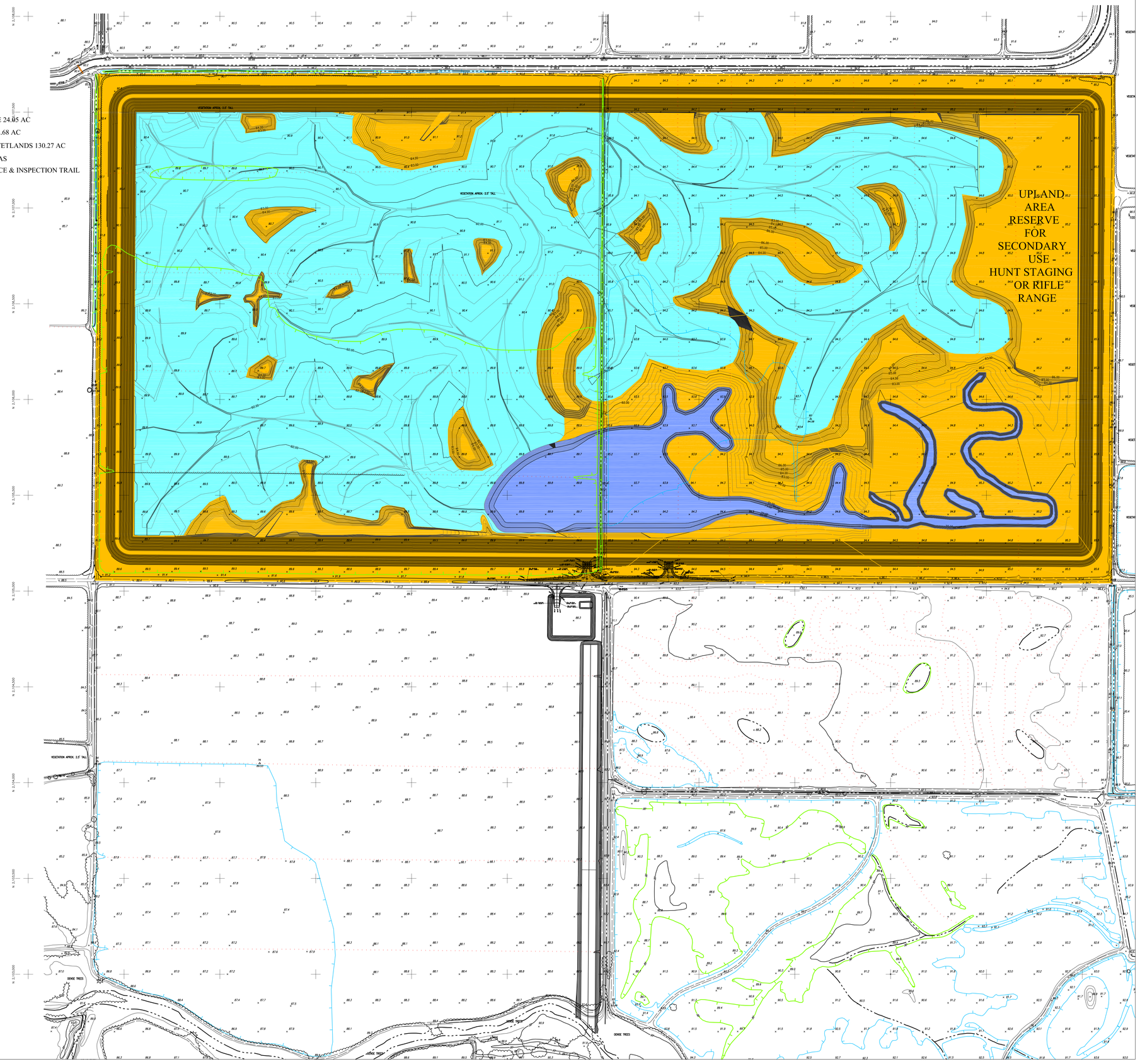
PHASE 3:

- LINCOLN ULTIMATE BUILDOUT SOUTH EASTERN EXPANSION OF THE RETENTION FACILITY, EXCAVATION AND EXPORT EST. = 1,000,000 CY.
- LEVEES ARE INCREASED TO ULTIMATE HEIGHT, REQUIRES DOSD APPROVAL
- WETLAND AND MARSH AREAS WILL BE EXPANDED INTO THE NEW EXCAVATION AREA
- MAINTENANCE AND INSPECTION TRAILS WILL BE EXPANDED.



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fax (916) 563 - 7362

LAKEVIEW FARMS VOLUMETRIC MITIGATION FACILITY PHASE 3 IMPROVEMENTS

CITY OF LINCOLN PLACER COUNTY CALIFORNIA

DATE: AUG 2017
SCALE: 1"=200'
W.O. NO. 2016.11

SHEET LA3 OF 4

LEGEND:

- MARSH/LAKE 19.36 AC
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- SEASONAL WETLANDS 128.71 AC
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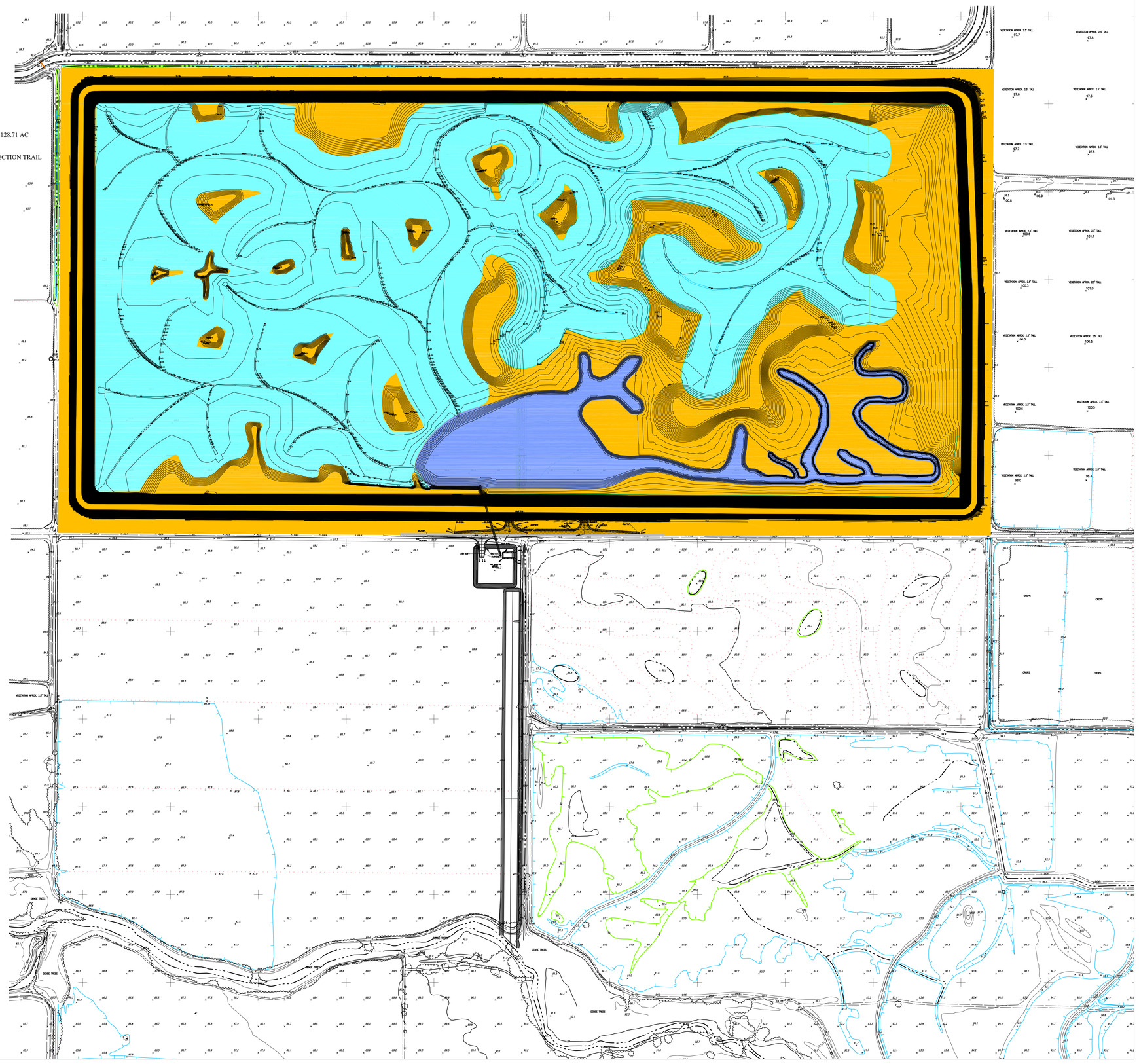

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- MAINTENANCE AND INSPECTION TRAILS WILL BE EXPANDED.

PHASE 4:

- NORTH EASTERN EXPANSION FOR PLACER RANCH SPECIFIC PLAN AND SUNSET INDUSTRIAL AREA NORTH CANAL TRIBUTARY IMPACTS. 3200 AF TOTAL CAPACITY.

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CHECKED BY: TSP DWG: Phase1

Dwg.

REVISION	DATE	DESCRIPTION	APPROVED	DATE

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fax (916) 563 - 7362

LAKEVIEW FARMS VOLUMETRIC MITIGATION FACILITY PHASE 4 IMPROVEMENTS

CITY OF LINCOLN PLACER COUNTY CALIFORNIA

DATE: AUG 2017

SCALE: 1"=200'

W.O. NO. 2016.11

SHEET LA4 OF 4

CIVIL ENGINEERING
SOLUTIONS, INC.

590 E Street
Lincoln Ca. 95648
916.645-5700
Fax: 916.645-5706

Technical Memorandum

To: Placer County

Attn: Dan Dottai

Date: September 18, 2017
Revised September 26, 2017

Regarding: Placer Ranch Onsite Mitigation

Dear Dan;

We have confirmed the consultants calculation methodology for the Placer Ranch Specific Plan Volumetric increased runoff volumes for the 8-day 100-year event, per the Storm Drainage Master Plan dated May, 2017, prepared by Mackay and Somps. The Master Plan uses the equation based approximation methodology, which has previously been reviewed by: The City of Roseville, Placer County Flood Control and Water Conservation District, and a 3rd party peer review by a consultant (Michael Thomas 2017). The equation methodology is a best fit approximation of direct results computed from the water balance methodology developed in the Pleasant Grove Watershed Mitigation Fee update (2017).

The Placer Ranch Specific Plan Master Drainage Plan identified 276.77 acre feet of increased runoff volume in areas which drain to University Creek, 81.64 acre feet of increased runoff volume directly to Pleasant Grove Creek, for a total of 358.41 acre feet of increased runoff draining to the Pleasant Grove Canal area of the Natomas Cross Canal Watershed. Additionally the report identifies 17.36 acre feet of runoff increases draining to Orchard Creek which is a tributary to Auburn Ravine, which ultimately drains to the North Canal area of the Natomas Cross Canal watershed.

The Pleasant Grove Canal sump area contains significantly less flood storage volumes than the North Canal Sump area as there is less land near the pleasant Grove canal which is near or below the floodplain elevations. As a result of the differences in sump storage volumes, it is recommended that Pleasant Grove Canal tributary runoff volume increases be mitigated within the Pleasant Grove Canal watershed area, and the North Canal tributaries runoff volumes increases be mitigated within the North Canal watershed. The existing FEMA floodplains, and the watershed limits are shown on exhibit PL-1.

Exhibit 8 of the Master Plan shows the areas that the consultant identified that Volumetric Mitigation could occur onsite. For the areas immediately adjacent to modeled creek corridors we were able to verify, and/or modify the amount of expected mitigation that could be obtained within the basin areas identified, based on the local hydraulics of each location in an unsteady state HEC-RAS analysis of the 8-day 100-year event. For the hydrology input for the 8-day event, Mackay and Somps model was adapted for the longer term event. Table 1 below identifies the originally estimated storage volumes at each site, and the adjusted volumes from the modeling.

For the analysis of the retention basin capacity, a storage area was created in the model adjacent to the creek in the location indicated on the consultants exhibit, and set to the size specified in acres. A lateral weir was setup in the model to connect the storage area to the channel. The weir was set elevated so as to not be overtopped. A pipe connection was included through the weir near the existing channel invert which would allow flows to be diverted to the storage area, however, a flap gate setting was used to not let flows trapped in the basin release back into the channel, when the channel flood levels receded between events. The 8-day 100-year event was run, and the captured volumes for each facility are reported in Tables 1 and 2.

TABLE 1 – Master Plan Proposed Retention Volumes vs. Modeled Retention Volumes

Location	**Original Volume (AF)**	**Revised Volume (AF)**
Orchard Creek 17.4 (4.4 ac)	17.4	17.4 (not modeled)
Total of 17.4 AF equals the needed volume for North Canal Runoff		
Pleasant Grove 32.1 (8 ac)	32.1	32.1 (not modeled)
Pleasant Grove 23.5 (5.9 ac)	23.5	23.5 (not modeled)
Pleasant Grove 2.1 (0.6 ac)	2.1	2.1 (not modeled)
Pleasant Grove 5.2 (1.3 ac)	5.2	5.2 (not modeled)
University 44.0 (13.0 ac)	44.0	10.5
University 13.1 (3.3 ac)	13.1	7.1
University 35.3 (11.8 ac)	35.3	47.2
University 40.0 (13.3 ac)	40.0	35.7
University 163.1 (20.4 ac)	163.1	150.2
Total of 313.6 is less than 358.4 needed for Pleasant Grove Canal Runoff		

Of note is that we were not able to obtain the storage volumes proposed at the University 44 basin. It would only accept 10 acre feet, even when we maximized the inflow characteristics. This was because this section of the creek doesn't have much volume of flow passing through it, and doesn't stay at high water elevations for very long when the peak events pass through. Similarly, but to lesser extent, this same issue occurred at University 13.1 and University 40.0. It was also found that more water could be diverted into University 35.3 than originally proposed. We suggest increasing the size of University 163.1 in order to make up the difference.

Additionally, Exhibit 8 of the Master Plan shows that University 163.1 will require pumping. In the included modeling we have modified this basin's connections such that pumping should not be required to vacate the basin.

There is not a model available for the full extents of the Pleasant Grove Creek which can model the

8-day 100-year event due to stability issues with the geometry and the HEC-RAS software. As a result the hydraulic connectivity of the proposed basins along Pleasant Grove Creek could not be verified. A hydraulic model for these reaches, for the 8-day 100-year event would be needed at the time of design to verify that the basins could fill to the required volumes within the event. Table 2 modifies the area of University 163.1 to pickup the necessary volumes needed for the project:

TABLE 2 – Master Plan Proposed Retention Volumes vs. Modified Modeled Retention Volumes

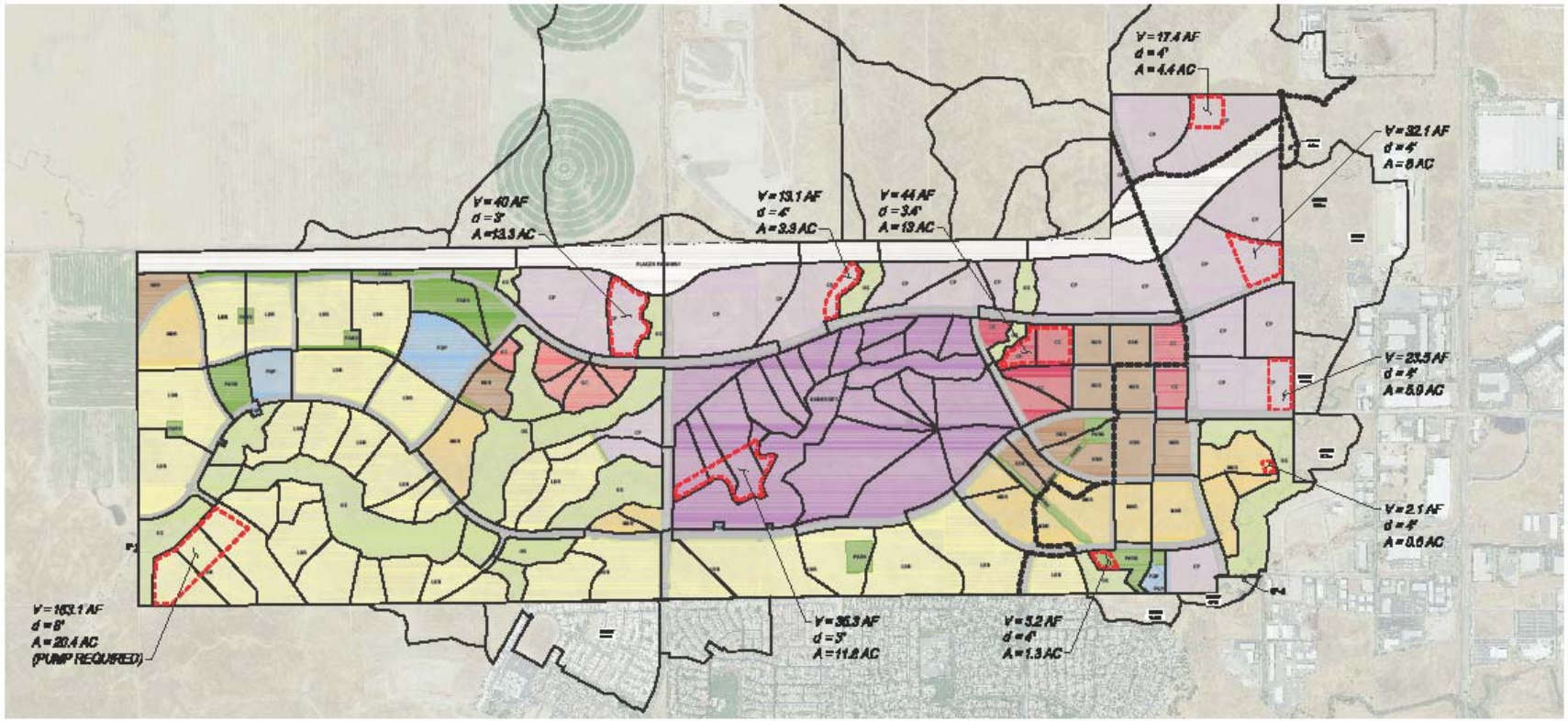
Location	**Original Volume (AF)**	**Revised Volume (AF)**
Orchard Creek 17.4 (4.4 ac)	17.4	17.4 (not modeled)
Total of 17.4 AF equals the needed volume for North Canal Runoff		
Pleasant Grove 32.1 (8 ac)	32.1	32.1 (not modeled)
Pleasant Grove 23.5 (5.9 ac)	23.5	23.5 (not modeled)
Pleasant Grove 2.1 (0.6 ac)	2.1	2.1 (not modeled)
Pleasant Grove 5.2 (1.3 ac)	5.2	5.2 (not modeled)
University 44.0 (13.0 ac)	44.0	10.5
University 13.1 (3.3 ac)	13.1	7.1
University 35.3 (11.8 ac)	35.3	47.2
University 40.0 (13.3 ac)	40.0	35.7
University 163.1 **(27.0 ac)**	163.1	**195.9**
Total of 359.3 is more than 358.4 needed for Pleasant Grove Canal Runoff		

All the data used in this analysis is posted at the following link:
http://www.civilsolutions.com/workspaces/PlacerCo/PRSP_SIA/PRSP_Onsite_TM/

Please let us know if there is any additional information you require, please contact me at (916) 645-5700.

Sincerely,

Thomas S. Plummer, P.E., CFM



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0 1500 3000

SCALE: 1"=1500'

NOTES:

1. POTENTIAL INTERIM ON-SITE RETENTION FACILITIES ARE LOCATED TO SUPPORT A PHASED BUILDOUT.
2. FURTHER DETAILED STUDY AND HYDRAULIC ANALYSIS NEEDED TO VERIFY PROPOSED INTERIM FACILITIES.

LEGEND

———	SUBSHED BOUNDARY
— — —	PLACER RANCH PROJECT BOUNDARY
⬚	POTENTIAL INTERIM RETENTION FACILITY LOCATION
V = 163.1 AF d = 8' A = 20.4 AC	APPROXIMATE VOLUME, DEPTH, & AREA OF INTERIM RETENTION FACILITY

Exhibit 8

Potential Interim Retention Facility Locations

Placer Ranch Storm Drainage Master Plan

Placer County
Scale 1"=1500'

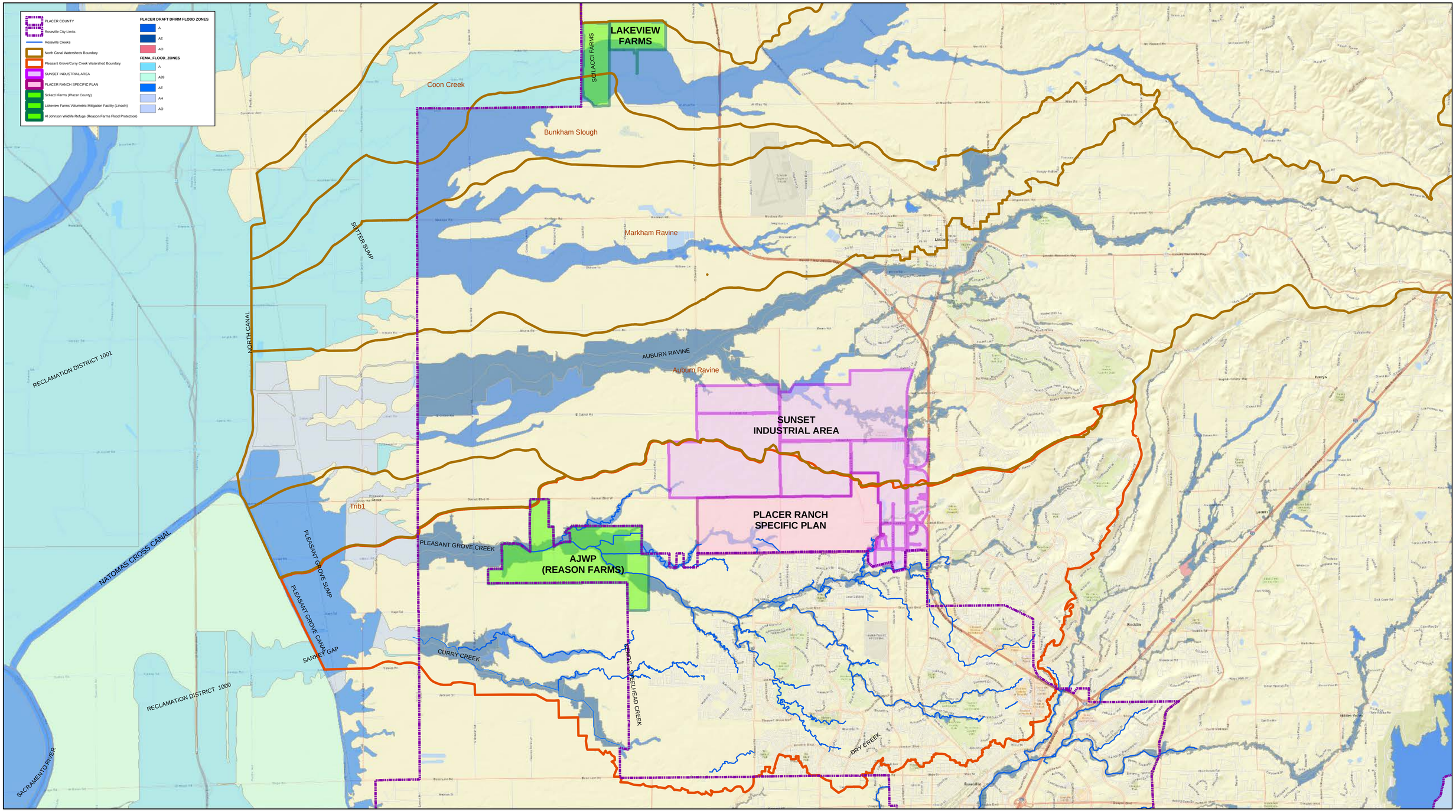
MacKay & Somps

California
May 2017
18458.C80

PRELIMINARY - Subject to Revision

MacKay and Somps is not responsible for the accuracy or completeness of reproductions of this document generated by others from electronic media.

2017 PLACER RANCH SPECIFIC PLAN AND SUNSET INDUSTRIAL AREA



CIVIL ENGINEERING SOLUTIONS, INC.

PLACER COUNTY

0 4,625 9,250 18,500 Feet

8-DAY 100-YEAR VOLUMETRIC RUNOFF
REGIONAL CONTEXT MAP
SEPTEMBER 2017

PL-1

CIVIL ENGINEERING
SOLUTIONS, INC.

590 E Street
Lincoln Ca. 95648
916.645-5700
Fax: 916.645-5706

Technical Memorandum

To: Placer County

Attn: Dan Dottai

Date: September 20, 2017
Revised September 26, 2017

Regarding: North Canal Tributaries Mitigation – Scilacci Farms @ Coon Creek

Dear Dan;

In 2007/2008, CESI performed a review of the Scilacci Farms property's potential to be used for volumetric mitigation by the Placer County Flood Control and Water Conservation District. The Property is located adjacent to Coon Creek, directly adjacent to the Placer County/Sutter County Boundary, within Placer County. The location is identified on Exhibit PL-1.

The flow split of Coon Creek and Bunkham Slough occurs within this property. Exhibit 1 shows the property and potential storage areas that were analyzed. There was some survey information covering the project site that was provided from adjacent projects, and prior analysis of Coon Creek. Volumetric mitigation for the North Canal Tributaries was shown in the City of Lincoln's Lakeview Farms Analysis (http://www.civilsolutions.com/workspaces/lakeview/H_H/) to be beneficial to occur within the Coon Creek Watershed, which is the largest watershed tributary to the North Canal, and Natomas Cross Canal.

The analysis of the survey information available in 2007 indicated that the checks could retain water in the fields of varying depth from 9 inches to 2 feet. While it was stated (by others) to the District that the property should be capable of storing between 500 acre feet and 800 acre feet as it is today, we found the existing rice checks could hold less than 300 acre feet. We believe the claim may have been based on an estimate of storage from the 100-year water surface elevations (FEMA) to ground, however, the existing checks do not rise to the 100-year flood elevation for containment, and if they did, the flood waters from Coon Creek would be blocked from being able to access the fields for flooding.

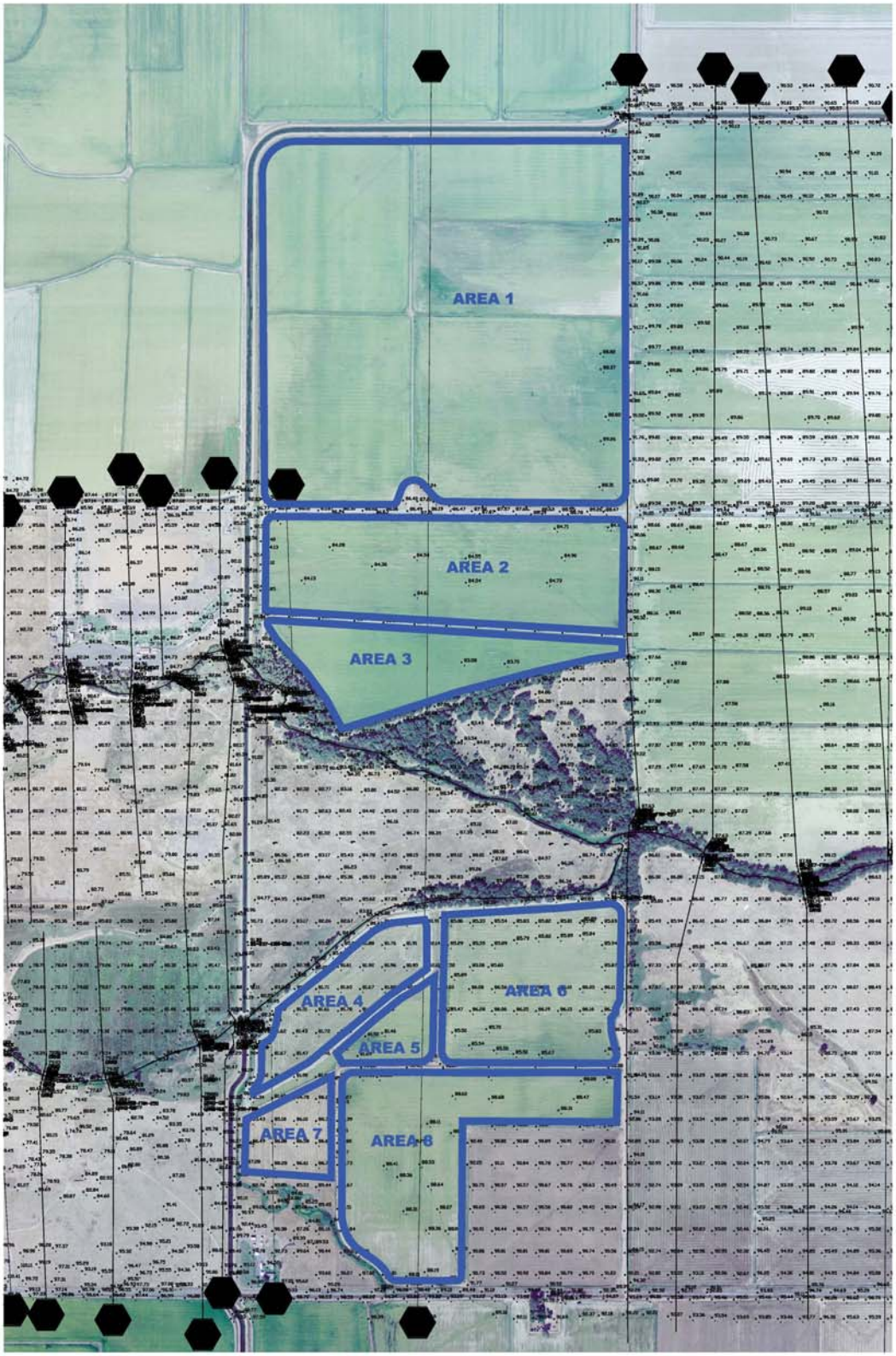
It was also noted that rice check type of containment which currently exists may not provide adequate assurance of facility operation to full capacity during a flood event, and after (containment

may need to occur without leakage for 45 days following the event). As a result it was concluded that engineered facilities would need to be added/reconstructed in order to be assured that storage failures would be less likely to occur. Engineered containments perms were recommended to isolate each field storage area to certain storage depth per the exhibit attached. In addition, piped connections would be needed to allow flood waters to enter the storage areas, with valving such that the valves would close when flood waters reached their maximum state.

The District requested that we prepare a cost estimate for feasible design to provide 500+ acre feet of storage. At the time, the estimate was prepared it was estimated that if the project were constructed as a prevailing wage project, with public funding, it would cost $3.1 million. We have revised the cost estimate to be consistent with current prices (leaving the quantities the same) to $3.75 Million (see included estimate). The updated estimate does not include any land costs, mitigation costs or environmental permitting, as those are unknown for this site.

2017 Updated Cost Estimate:

PRELIMINARY ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST VOLUMETRIC MITIGATION FACILITY - PHASE I					
	Description	Amount	Unit	Unit Cost	Total
A. Grading:					
1.	Mobilization, Bonds & Insurance	1	LS	$75,000.00	$75,000.00
2.	Clearing & Grubbing	1	LS	$75,000.00	$75,000.00
3.	Stockpile Topsoil	100,000	CY	Inc 6	$0.00
4.	Replace Topsoil	100,000	CY	Inc 6	$0.00
5.	Swale Grading (driveways)	270	CY	Inc 6	$0.00
6.	Excavation & Offhaul (By Others)	91,820	CY	$18.00	$1,652,760.00
7.	Keyway Construction	4,300	CY	$4.00	$17,200.00
8.	Levee/Containemnet Berm	91,820	CY	$6.00	$550,920.00
				Subtotal:	**$2,370,880.00**
B. Street & Surface:					
1.	Sawcut & Remove Existing Pavem	1,052	SF	$7.50	$7,890.00
2.	2.5" AC	19,501	SF	$3.00	$58,503.00
3.	9" AB	19,501	SF	$3.00	$58,503.00
4.	Traffic Control	1	LS	$10,000.00	$10,000.00
				Subtotal:	**$134,896.00**
C. Storm Drain:					
1.	12" CMP Storm Drain	179	LF	$75.00	$13,425.00
2.	Rock Rip Rap	720	SF	$20.00	$14,400.00
				Subtotal:	**$27,825.00**
D. Erosion Control:					
1.	Fiber Roll	11,273	LF	$2.00	$22,546.00
2.	Hydroseed Disturbed Areas	1,126,690	SF	$0.13	$146,469.70
				Subtotal:	**$169,015.70**
Improvements A-D Subtotal					**$2,702,616.70**
Engineering Design, Permitting, and Specifications					**$216,209.34**
Construction Management					**$216,209.34**
City Oversight					**$216,209.34**
15% Contingency					**$405,392.51**
Grand Total					**$3,756,637.21**



DRAWN BY: TP	REVISION	DATE	DESCRIPTION	APPROVED	DATE
CHECKED BY: SM					
DESIGN BY: SM					

CESI
Infrastructure
590 E Street (916) 645 - 5700
Lincoln, CA. 95648 fax (916) 645 - 5706

EXHIBIT
SCILACI STORAGE FACILITY

CITY OF LINCOLN PLACER COUNTY CALIFORNIA

DATE: 10/12/07
SCALE: 1"=300'
W.O. NO. 2007.57

SHEET 1 OF 1

The Scilacci Farms property has the potential to be an optional volumetric mitigation facility for Coon Creek as needed to mitigate for the Placer Ranch Specific Plan and the Sunset Area Plan development in the North Canal Tributaries of the Natomas Cross Canal (generally the northern half of the Sunset Area project boundary). At an estimated capital cost of $3.7M, and assuming a conservative volumetric storage capacity of 300 acre-feet, a unit cost of approximately $12,500 per acre-foot of storage might be expected. This is largely commensurate with volumetric mitigation unit costs being forecasted for Sunset Area Plan impacts in the Pleasant Grove watershed (generally the southern half of the Sunset Area project boundary, flows of which will be captured and retained at Reasons Farms). The included analysis is performed to assess the feasibility. Additional engineering to further identify the project improvements needed and environmental assessments are needed in order to define the project. Right of way and environmental clearances/permits would also need to be obtained before construction could proceed.

This Technical Memorandum simply demonstrates Scilacci Farms as a possible volumetric mitigation option.

Please let us know if there is any additional information you require, please contact me at (916) 645-5700.

Sincerely,

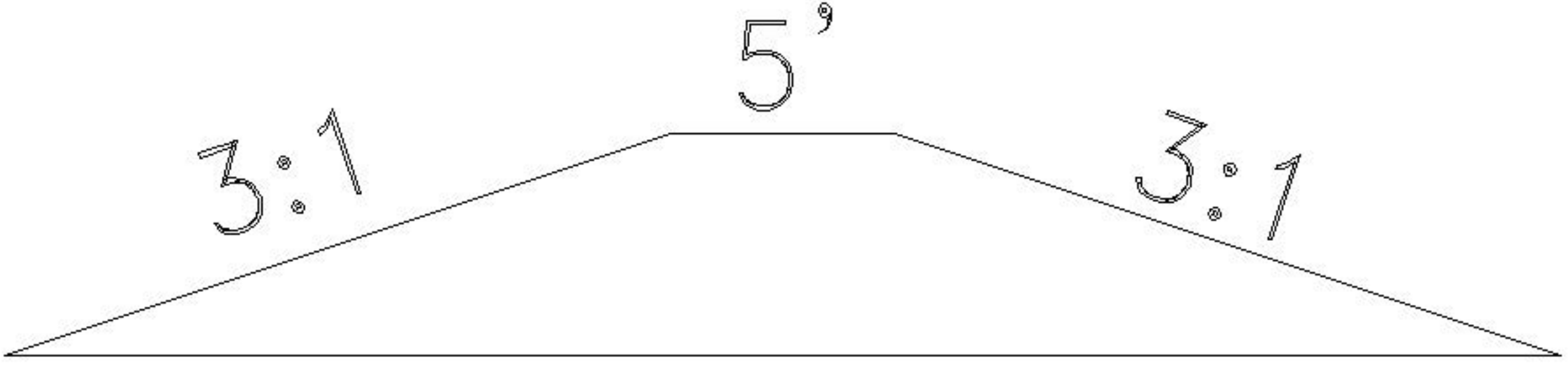
Thomas S. Plummer, P.E., CFM

Detention Volume for Scilacci Site

Berm Height	Volume CF	Volume AF	Boundary Length
Area 1			
1'	5,143,554	118	10050
2'	6,022,728	138	
3'	6,094,062	140	
Area 2			
1'	1,188,297	27	6310
2'	2,785,671	64	
3'	4,475,736	103	
4'	6,227,793	143	
5'	7,990,056	183	
6'	9,752,400	224	
Area 3			
1'	994,086	23	5550
2'	1,989,117	46	
3'	2,983,203	68	
4'	4,972,320	114	
5'	7,955,523	183	
6'	12,927,843	297	
Area 4			
1'	568,593	13	3800
2'	1,137,186	26	
3'	2,274,372	52	
4'	4,548,744	104	
5'	9,097,488	209	
6'	18,194,976	418	
Area 5			
1'	214,983	5	2165
2'	429,966	10	
3'	644,949	15	
4'	859,932	20	
5'	1,074,915	25	
6'	1,289,898	30	

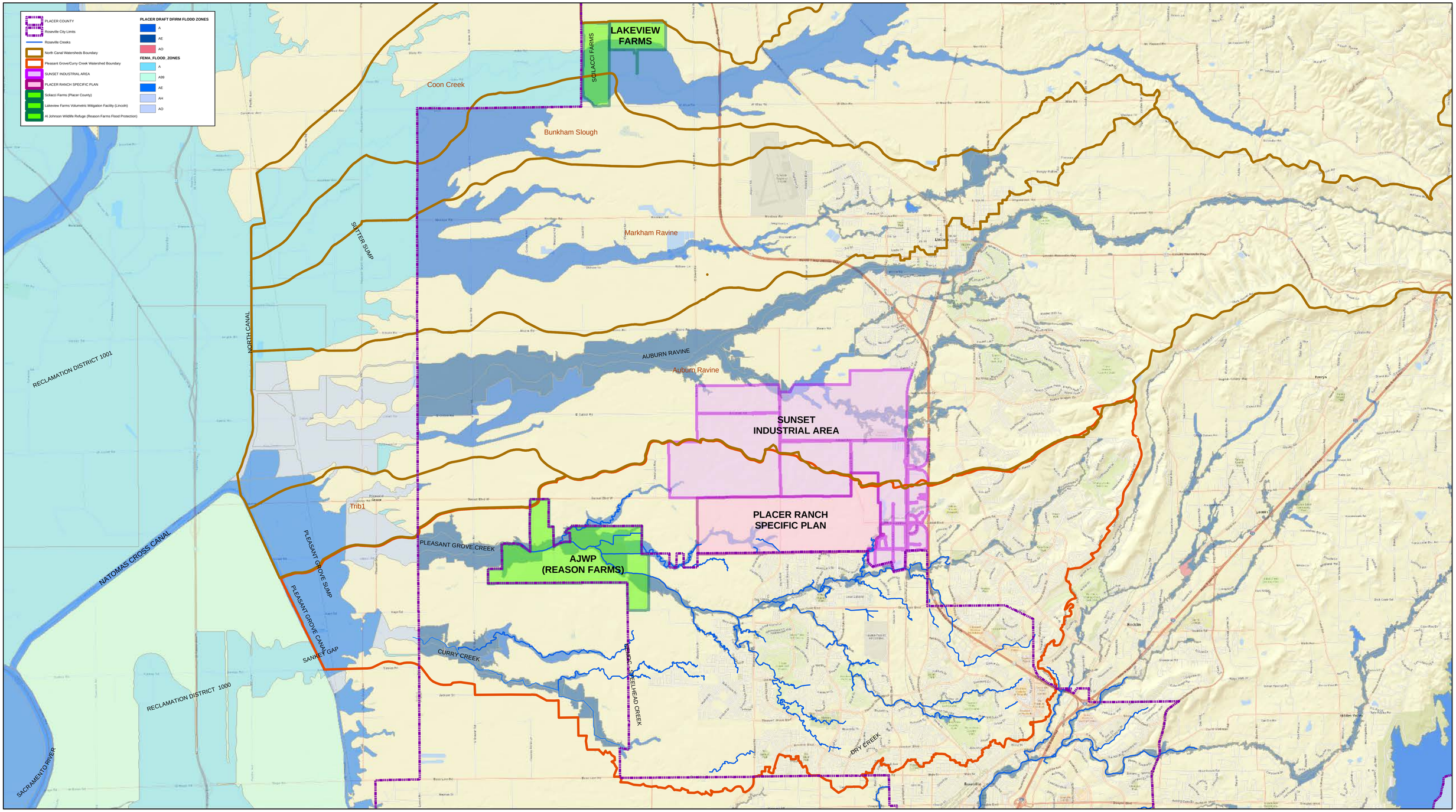
Berm Height	Volume CF	Volume AF	Boundary Length
Area 6			
1'	1,208,898	28	4500
2'	2,414,529	55	
3'	3,620,160	83	
4'	4,825,791	111	
5'	6,031,422	138	
Area 7			
1'	216,000	5	2750
2'	592,987	14	
3'	969,974	22	
4'	1,346,961	31	
5'	1,723,948	40	
Area 8			
1'	1,503,360	35	6430
2'	3,006,720	69	
3'	4,510,080	104	
Overall			
1'	11,037,771	253	41555
2'	18,378,904	422	
3'	25,572,536	587	
4'	33,385,683	766	
5'	44,477,494	1,021	
6'	60,524,629	1,389	

358.41



BERM SECTION

2017 PLACER RANCH SPECIFIC PLAN AND SUNSET INDUSTRIAL AREA



CIVIL ENGINEERING SOLUTIONS, INC.

PLACER COUNTY

0 4,625 9,250 18,500 Feet

8-DAY 100-YEAR VOLUMETRIC RUNOFF
REGIONAL CONTEXT MAP
SEPTEMBER 2017

PL-1

CIVIL ENGINEERING
SOLUTIONS, INC.

590 E Street
Lincoln Ca. 95648
916.645-5700
Fax: 916.645-5706

Technical Memorandum

To: Placer County

Attn: Dan Dottai

Date: September 18, 2017
Revised September 26, 2017
Revised September 29, 2017

Regarding: Pleasant Grove Creek – Regional Volumetric Mitigation

Dear Dan;

We have performed the analysis for the Regional Volumetric Mitigation alternatives at the City of Roseville's Al Johnson Wildlife Preserve (formerly Reason Farms).

Per the Master Plan documentation provided to us, the Volumetric Mitigation needs for the Pleasant Grove Canal tributary areas are:

- City of Roseville - 2221 Acre Feet
- Placer Ranch Specific Plan - 358.4 Acre Feet
- Sunset Industrial Area – 654.8 Acre Feet.

For the alternative plan where City and PRSP are to be fully mitigated a combined storage volume of **2579.4 AF** is required. For the alternative plan where City, PRSP and SIA are to be fully mitigated at Reason Farms, a combined storage volume of **3234.2 AF** is required.

The Reason Farms Volumetric Mitigation Facility includes the construction of two basin areas, one south of Pleasant Grove Creek and one north of Pleasant Grove Creek.

The **Southern Basin** area is the main storage area. The southern basin includes extensive channel and weir improvements (offsite) extending more than 3900 feet upstream of the Reason Farms Property area. The Creekview Bypass Channel improvements are necessary to collect flows from Pleasant Grove Creek, upstream of the basin, for discharge into the facility during storage events. Near the upstream end of the bypass channel the City will build a culvert connection to Pleasant Grove Creek which would allow low flow connectivity to the creek for events above the 2-year, but

below the level that the weirs will exchange water between the Creek and the Bypass Channel. Downstream of this point of connection, the existing embankment between the Creek and the Bypass channel will include several constructed weir locations which will concentrate flow exchange between the Creek and the Bypass Channel during high flood events. The Creekview Bypass Channel will be constructed by others. Approximately 1000 feet into the Reason Farms property, a low flow return channel will be built which would allow low flows to be returned to the Creek, such that they wouldn't have to be passed through the storage facility. A gated flow through structure is constructed downstream of the flow return, such that when the gates are opened, flows will enter the storage facility site. Flows entering the storage site will be conveyed through the site by a channel to the discharge structure. When gates at the discharge structure are closed flows backup in the storage area and are "retained". Following downstream flooding events, the discharge gates can be opened and stored waters would be discharged back into Pleasant Grove Creek. The entire storage facility will be surrounded by a containment embankment (levee), engineered to contain retained waters in the basin, as well as protect the basin from the flood waters of Pleasant Grove Creek, during non-operation flooding. It is currently estimated that the maximum storage this site could retain is 2850 acre feet.

The **Northern Basin** collects flood waters from University Creek, and discharges them into Pleasant Grove Creek. The existing man made University Creek ditch will be restored to a more natural stream form and similar to the historic location through the Reason Farms property. Embankments (levees) will be constructed around the storage areas of the north basin to contain the flood waters of University Creek during a high flood event in the downstream systems of the Natomas Cross Canal. At the downstream end of the stream restoration a gate structure and overflow weir will be constructed. The gate will normally be set open to allow creek flows to pass out into Pleasant Grove Creek. During operation events, the gate will be closed to hold back flood volumes, until the weir is overtopped, allowing creek flows to discharge over the weir into Pleasant Grove Creek. The current layout for the north basin would be able to contain 611 acre feet.

See Exhibit PL-2E for the layout of the ultimate basin configuration for the North Basin, and South Basin at Reason Farms.

We have performed site layouts and analysis for 3 design plans as follows:

Description	**HEC-RAS Plan Name**	**Exhibits Plan Name**
City Alternative for an excavated basin design for 2250 AF of storage	"p02" "8-DAY-100-YEAR_w_Reasons-CITYONLY"	Exhibit 2B
Placer Ranch Specific Plan Added Alternative to add their Pleasant Grove Canal tributary volumes to Reason Farms Facility for 2600 AF of storage.	".p01" "8-DAY-100-YEAR_w_Reasons-PRSP"	Exhibit 2C1
City+PRSP+SIA Alternative Plan for 3236 AF of storage.	".p12" "8-DAY-100-YEAR_w_Reasons-PLACERALL"	Exhibit 2E

The exhibits are included at the end of the document and are oversized.

For the PRSP alternative, the excavation areas of the South Basin at Reason Farms would be expanded per Exhibit 2C1, in order to increase the total storage capacity to 2600 acre feet. The operating peak storage elevation would be reduced from 75.81 to 74.22 feet in order to increase the amount of water entering the basin in the event. The total mitigation need would be 2221 for the City of Roseville + 358.4 acre feet for the PRSP which equals 2579.4 acre feet minimum storage. This expansion would excavate 1,251,900 cubit yards of material from 93 acres of the basin area, and place that material as fill on 154 acres of upland area on the site.

For the PRSP+SIA alternative, the Northern Basin would be constructed providing 611 acre feet of mitigation. An additional expansion of the Southern Basin of approximately 25 acre feet (to 2623 AF) would be needed to accommodate the total 3234.2 acre feet. See Exhibit PL-2E. The operating peak storage elevation would be reduced from 74.22 to 74.02 feet in order to increase the amount of water entering the basin in the event. The expansion would excavate 171,200 cubic yards of material from 10 acres of basin area and place it in an uplands area of the site on 10 acres.

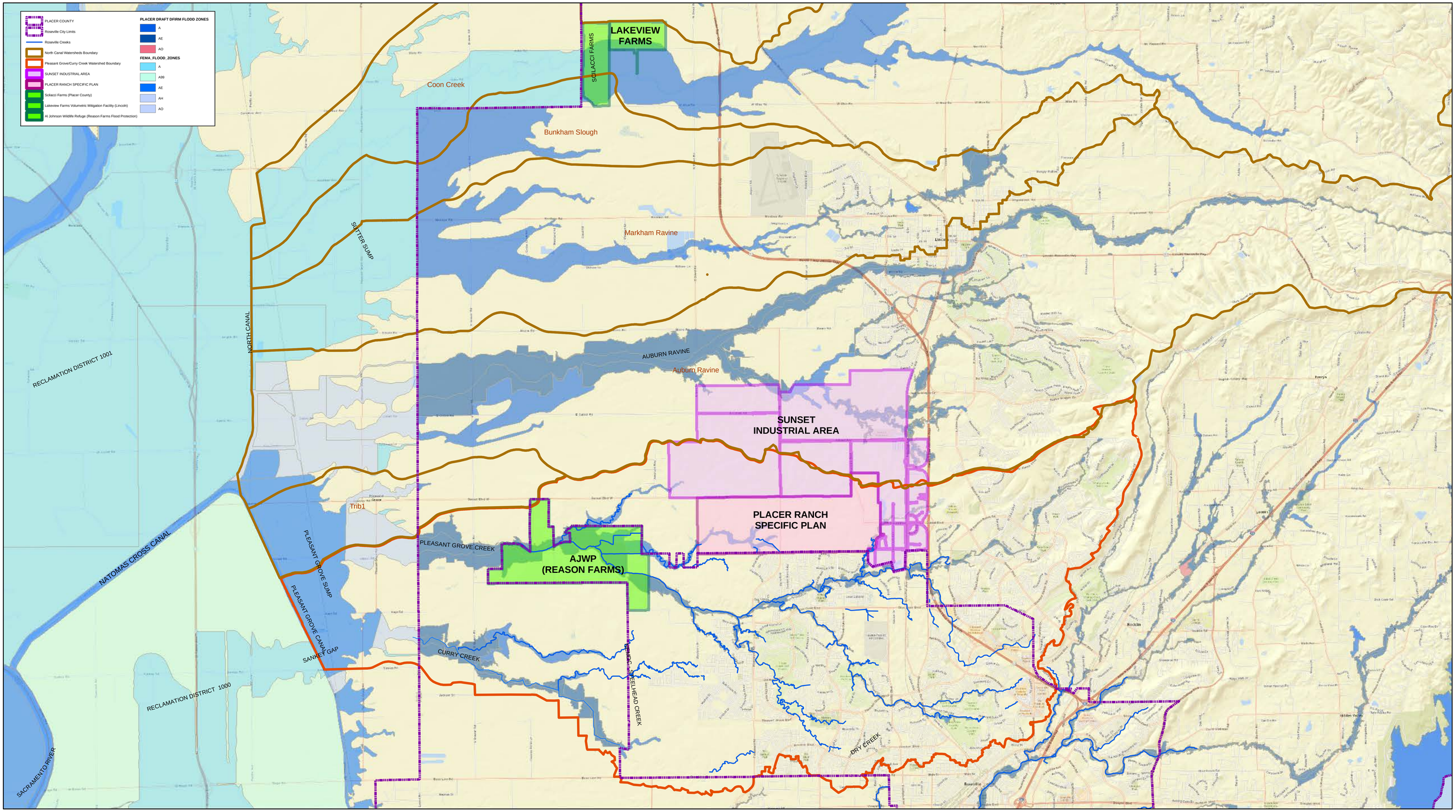
This Technical Memorandum supplies the analysis to support the above information. Another TM will be provided with cost and fee basis information separately. All the data used in this analysis is posted at the following link:
http://www.civilsolutions.com/workspaces/PlacerCo/PRSP_SIA/Pleasant_Grove_Reg_Mit/

Please let us know if there is any additional information you require, please contact me at (916) 645-5700.

Sincerely,

Thomas S. Plummer, P.E., CFM

2017 PLACER RANCH SPECIFIC PLAN AND SUNSET INDUSTRIAL AREA



CIVIL ENGINEERING SOLUTIONS, INC.

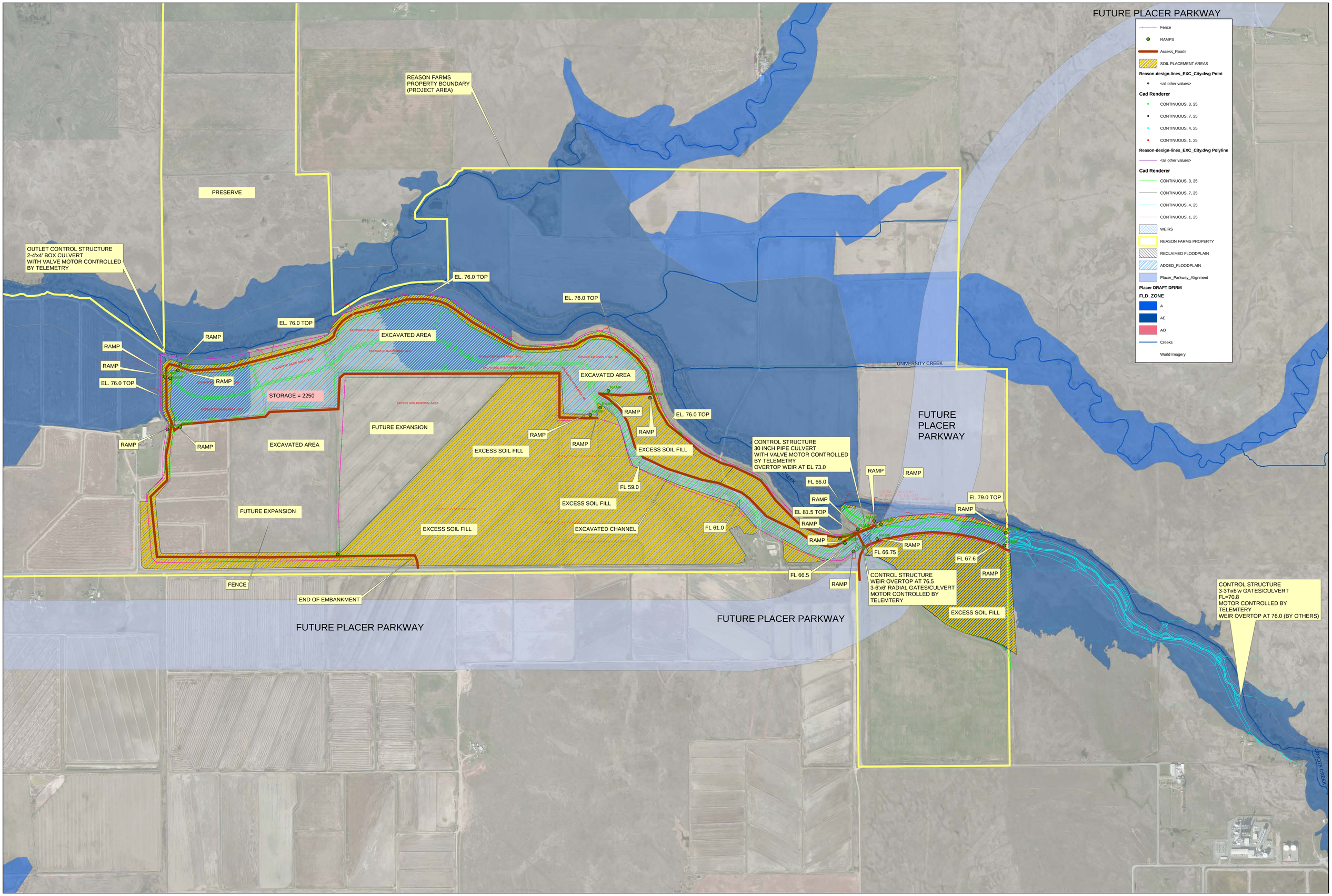
PLACER COUNTY

0 4,625 9,250 18,500 Feet

8-DAY 100-YEAR VOLUMETRIC RUNOFF
REGIONAL CONTEXT MAP
SEPTEMBER 2017

PL-1

REGIONAL FLOOD VOLUME MITIGATION



CIVIL ENGINEERING SOLUTIONS, INC.

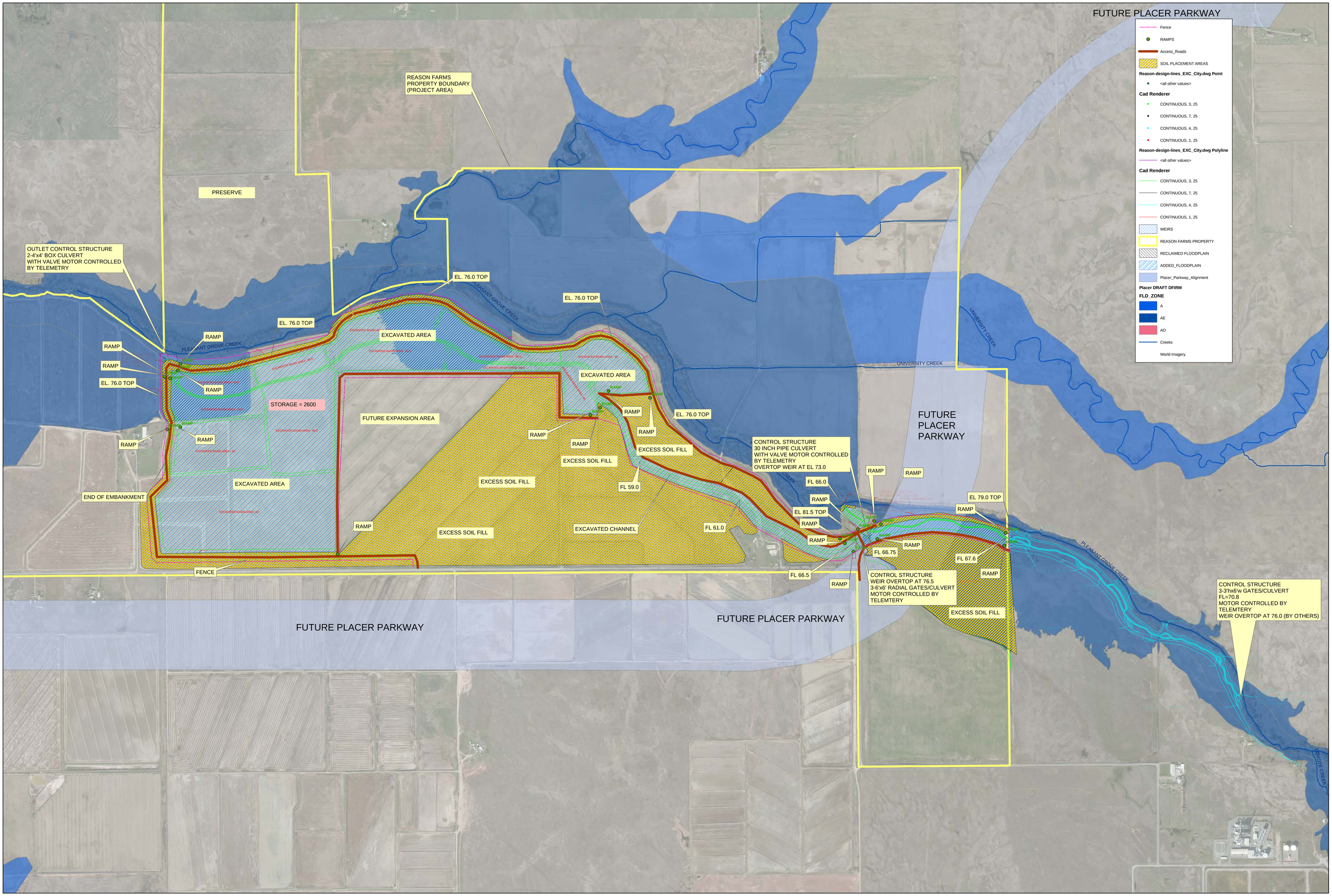
PLEASANT GROVE CREEK
CURRY CREEK

0 435 870 1,740 Feet

PGWMF - ROSEVILLE "CITY PLAN"
2221AF EXCAVATED PLAN
SEPTEMBER 2017

PL-2B

REGIONAL FLOOD VOLUME MITIGATION



CIVIL ENGINEERING SOLUTIONS, INC.

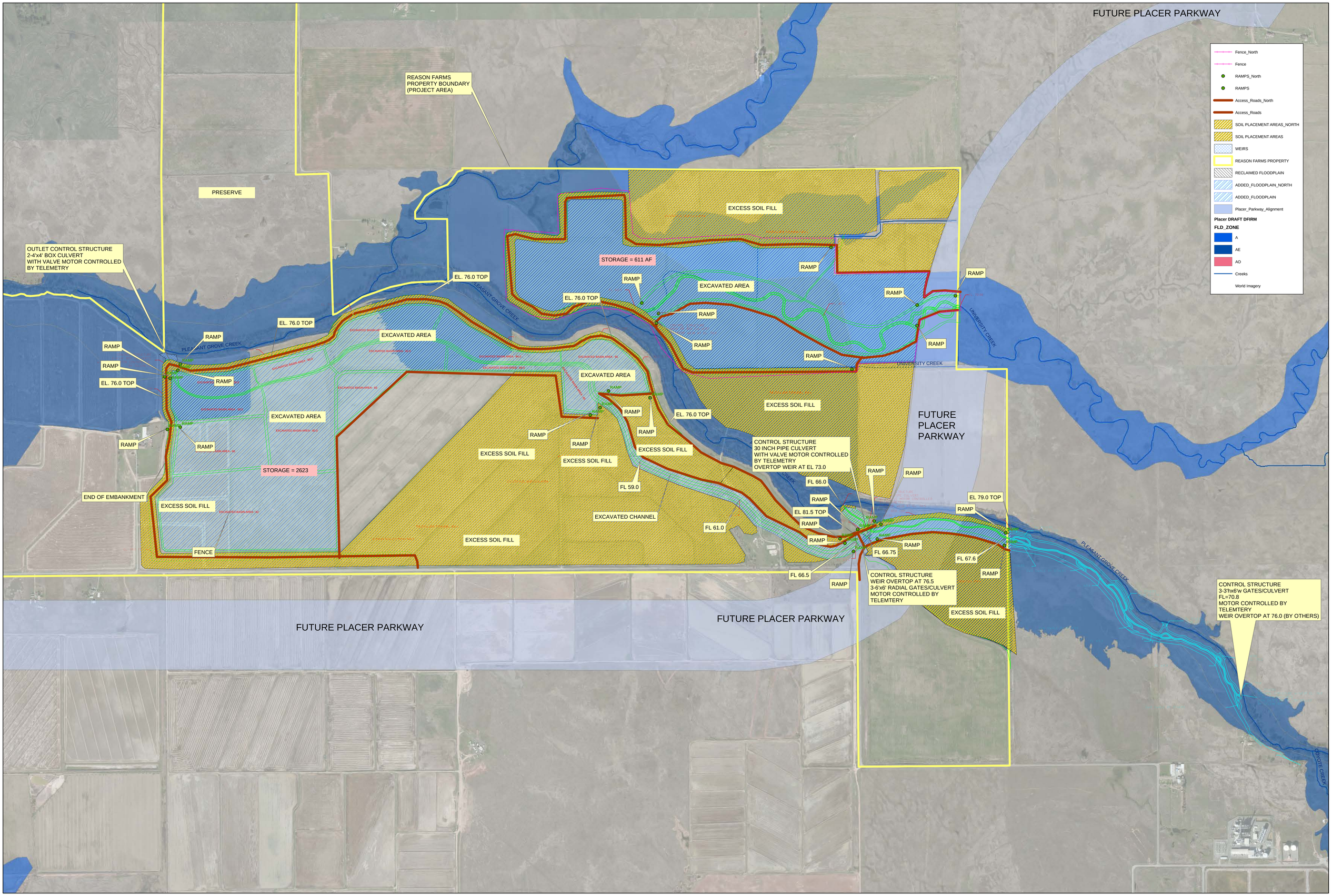
PLEASANT GROVE CREEK
CURRY CREEK

0 435 870 1,740 Feet

PGWMF - "CITY PLAN" + PLACER RANCH MITIGATION
2600+/- AF EXCAVATED PLAN
SEPTEMBER 2017

PL-2C1

REGIONAL FLOOD VOLUME MITIGATION



CIVIL ENGINEERING SOLUTIONS, INC.

PLEASANT GROVE CREEK
CURRY CREEK

0 445 890 1,780 Feet

PGWMF - ROSEVILLE "CITY PLAN" + PLACER RANCH + SIA MITIGATION
3234+/- AF EXC SOUTH + NORTH BASIN PLAN
SEPTEMBER 2017

PL-2E