JURISDICTIONAL DELINEATION
OF AREAS SUBJECT TO THE JURISDICTION OF THE U.S. ARMY CORPS OF ENGINEERS

PURSUANT TO
SECTION 404 OF THE CLEAN WATER ACT

PREPARED FOR:

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INTRODUCTION

Federal, state and local agencies, in cooperation with local landowners are currently engaged in a comprehensive land use and natural resource planning process for the San Juan Creek and western San Mateo Creek watersheds within southern Orange County. This comprehensive planning process includes preparation of a Special Area Management Plan/Master Streambed Alteration Agreement (SAMP/MSAA). In support of the SAMP/MSAA, the U.S. Army Corps of Engineers conducted a landscape level delineation, to identify areas of potential Corps and CDFG jurisdiction along with the mapping of areas of potential wetlands and riparian habitat within the SAMP/MSAA study area.[1]

In addition to the planning level delineation, Regulatory Specialists from Glenn Lukos Associates (GLA) conducted a project level jurisdictional delineation between October 29, 2002 and November 5, 2003 to identify and quantify the extent of areas subject to the jurisdiction of the (1) U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act and (2) the California Department of Fish and Game pursuant to Section 1600 of the Fish and Game Code. Appendix A includes a list of specific field dates. A total of nine planning areas were evaluated with the maximum potential limits of each planning area subject to the project-level delineation. In addition, all major roadway alignments not included within the nine planning areas were also examined.

METHODOLOGY

Prior to beginning the field delineation a 200-scale color aerial photograph, a 200-scale topographic base map of the property, and the USGS topographic maps Cañada Gobernadora (dated 1968, photo revised in 1988), San Clemente (dated 1968 and photo revised in 1975) and San Juan Capistrano (dated 1968 and photo revised in 1981) were examined to determine the locations of potential areas of Corps/CDFG jurisdiction. Prior to completing the jurisdictional delineation, GLA was provided a copy of a planning level delineation prepared by the Corps in September of 2000. All areas identified as potentially jurisdictional in the planning level delineation were evaluated for Corps and CDFG jurisdiction. All suspected jurisdictional areas were field checked for the presence of definable channels and/or wetland vegetation, soils and hydrology. Suspected wetland habitats on the site were evaluated using the methodology set forth in the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual[2] (Wetland Manual). While in the field the jurisdictional area was recorded onto a 200-scale color aerial photograph using visible landmarks. Other data were recorded onto wetland data sheets.

Beginning on March 11, 2003, Regulatory Specialists from GLA; a representative of Rancho Mission Viejo; representatives of the Corps including Mr. Russell Kaiser, Ms. Corice Farrar, and

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[1] Lichvar, R., G. Gustina, D. MacDonald, and M. Ericsson. 2000. Planning Level Delineation and Geospatial Characterization of Riparian Ecosystems of San Diego Creek Watershed, Orange County California. Prepared for the U.S. Army Corps of Engineers, Engineering and Research Development Center (ERDC) Cold Regions Research and Engineering Laboratory (CRREL), Hanover N.H. September 2000.
[2] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experimental Station, Vicksburg, Mississippi.

Mr. Rob Lawrence; and representatives of CDFG including Mr. Don Chadwick, Mr. Bradley Henderson, and Ms. Donna Cobb conducted a field verification of the project level delineation. Prior to beginning the field-level verification, the Corps representative Mr. Kaiser noted that the Corps would generally assert jurisdiction over drainages that conduct flows during 10-year storm events or less, and that drainages that do not conduct flows during 10-year events are not considered as waters of the United States. Following the initial site visits in early March, the area experienced a rainfall event on March 15, 2003 that averaged over five inches over most of the study area, corresponding very closely with a 10-year event. The 10-year storm event resulted in clear discharge in many of the drainages evaluated, including presence of litter and debris (e.g., oak leaves or other plant materials), sediment deposits, and destruction of terrestrial vegetation (through scouring or buried by sediments). However, many of the features failed to exhibit any signs of discharge. The 10-year storm event recorded on March 15, allowed for determination of (1) presence of an Ordinary High Water Mark (OHWM), and where present (2) the lateral extent of the (OHWM).

The field verification was completed on October 27, 2003 with the exception of specific areas to be addressed during a field review scheduled for November 20, 2003 with senior staff from the Corps. Appendix A includes a list of specific field dates. During the field verification, all areas identified in the Lichevar (2000) planning level delineation as well as by GLA in the project level delineation were examined. The results of the field verification are incorporated into this document. The jurisdictional status of a number of aquatic features remain unresolved and these areas are fully described in this report including discussions as to why certain specific features are not subject to Corps jurisdiction. In most instances, the reason for excluding areas from Corps jurisdiction is because of isolation pursuant to the SWANCC decision; although, the specific reasons for isolation vary. Other areas, such as the Ridgetop Reservoir in Planning Area 5 is excluded from Corps jurisdiction since it is present solely as a result of artificial irrigation and the 7-19 Mining Pit has been excluded because it remains an “active” mine. Areas subject to Corps jurisdiction, for which verification has been provided via an email from Mr. Kaiser (dated August 7, 2003) or verbally by either Mr. Kaiser or Mr. Lawrence, are addressed in summary or tabular form only. Those features or areas for which the Corps and Rancho Mission Viejo (RMV) concur relative to the jurisdictional status are referred to a “Resolved Areas” in this document. Features or areas for which the Corps and RMV have not reached concurrence relative to their jurisdictional status are referred to as “Unresolved Areas”.

SUMMARY OF RESULTS

A total of nine potential development areas or “bubbles” were evaluated plus areas subject to potential impacts associated with major arterials that connect the potential development bubbles. Total Corps jurisdiction identified within the potential development areas and the potential arterial right-of-ways, which are Resolved Areas, is 184.87 acres of which 77.87 acres consist of jurisdictional wetlands. Table 1 summarizes the jurisdictional totals by planning area. An additional 81.55 acres have been evaluated in the field, including 46.21 acres of wetlands, for which RMV and the Corps have not reached concurrence relative to their jurisdictional status. Table 2 summarizes the unresolved totals by planning area. As noted above, these Unresolved Areas are discussed in detail in this report; whereas, Resolved Areas are summarized only and included in tabular form by drainage according to planning area. **It is the opinion of GLA that**

all of the Unresolved Areas are isolated waters pursuant to SWANCC and do not meet the definition of waters of the United States.

TABLE 1: Study Area Jurisdictional Totals for Resolved Features

Planning Area	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
Ortega Gateway	0.04	2.19	2.23
Chiquita	11.44	2.64	14.08
Gobernadora	11.93	8.81	20.74
East Ortega	0.63	15.90	16.53
Trampas	0.82	9.48	10.30
Cristianitos Meadows	5.30	0.88	6.18
Cristianitos Canyon	4.74	7.80	12.54
TRW	1.05	7.71	8.76
O'Neill Ranch	4.57	10.18	14.75
Road Gaps	41.46	44.87	86.33
Totals[4]	**81.98**	**110.46**	**192.44**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

PLANNING AREA 1 (ORTEGA GATEWAY)

Planning Area 1 is located near the western edge of the study area immediately west of Antonio Parkway and includes areas on both sides of Ortega Highway. Much of the area encompassed by the Ortega Gateway area has been previously developed or under long-term agriculture. RMV and the Corps have reached concurrence regarding the jurisdictional status for each of the features summarized in the tables below and all features in this planning area are considered Resolved Areas. Corps jurisdiction in Planning Area 1 totals approximately 2.23 acres of which 0.04 acres consist of jurisdictional wetlands.

TABLE 2: Ortega Gateway Jurisdictional Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
1-1	0.00	0.01	0.01
1-2	0.00	0.03	0.03
1-4	0.00	0.07	0.07
1-6	0.04	0.20	0.24
1-7	0.00	0.03	0.03

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
1-8	0.00	0.03	0.03
1-9	0.00	0.13	0.13
1-10	0.00	0.01	0.01
1-11	0.00	0.01	0.01
1-12	0.00	1.67	1.67
Totals[4]	**0.04**	**2.19**	**2.23**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 3: Ortega Gateway Non-jurisdictional Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
Isolated nursery pond[1]	0.00	0.12	0.12
1-3[1]	0.09	0.02	0.11
1-4[1]	0.00	0.01	0.01
1-5[1]	0.00	0.02	0.02
1-12[1]	0.00	0.004	0.004
Nursery Ponds[2]	0.00	0.03	0.03
Totals	**0.09**	**0.20**	**0.29**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC
[2] This feature has been field verified and the Corps concurs it is not subject to regulation pursuant to Section 404 of the Clean Water Act.

PLANNING AREA 2 (CHIQUITA CANYON)

Planning Area 2 is located at the northwestern corner of the study area immediately west of Antonio Parkway and north of San Juan Creek. The planning area consists of a main canyon (Chiquita Canyon), which generally traverses the western one-third to one-quarter of the study area. The extreme western portion of the study area includes east-facing slopes that drain toward Chiquita Creek, a prominent aquatic feature/drainage that occupies the bottom of this broad canyon. Chiquita Creek supports a mosaic of wetland types including areas of southern arroyo willow riparian forest, alkali marsh, freshwater marsh, and alkali meadow. The area east of Chiquita Creek consists of a series of northeast-to-southwest trending side canyons alternating with gentle hills. Many of the side canyons are broad features that exhibit low gradients and have been subject to decades of farming, consisting mostly of winter barley or orchards (lemons and avocados).

Corps jurisdiction in Planning Area 2 totals approximately 14.08 acres of which 11.44 acres consist of jurisdictional wetlands. A number of the side canyons do not contain drainages that exhibit an OHWM. Other side canyons including those with drainage features 2-1 and 2-7 exhibited the presence of an OHWM in the upper reaches of their respective canyons; however, indicators associated with the presence of an OHWM terminated in the canyons hundreds or thousands of feet from Chiquita Creek and were determined by GLA with concurrence from the Corps to be isolated due to the absence of any hydrologic connection with Chiquita Creek.

TABLE 4: Chiquita Jurisdictional Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
Chiquita	10.88	1.25	12.13
2-6	0.00	0.14	0.14
2-8	0.56	0.18	0.74
2-10	0.00	0.02	0.02
2-11	0.00	0.12	0.12
2-12	0.00	0.01	0.01
2-13	0.00	0.92	0.92
2-14	0.00	0.004	0.004
Totals[4]	**11.44**	**2.64**	**14.08**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 5: Chiquita Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Totals Acreage
2-1[1]	0.00	0.02	0.02
2-2[1]	0.13	0.01	0.14
2-3[1]	0.07	0.01	0.08
2-4[1]	0.36	0.06	0.42
2-5[1]	0.00	0.11	0.11
2-7[1]	0.00	0.02	0.02
2-9[1]	0.00	0.02	0.02
2-10[1]	0.00	0.04	0.04
2-13[1]	0.00	0.04	0.04
Wetland A[1]	0.11	0.00	0.11
Wetland B	0.40	0.00	0.40
Excavated Depression[2]	NA	NA	0.15
Totals	**1.07**	**0.33**	**1.55**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC
[2] This feature has been field verified and the Corps concurs it is not subject to regulation pursuant to Section 404 of the Clean Water Act.

PLANNING AREA 3 (GOBERNADORA)

Planning Area 3 is located near the northern edge of the study area east of Casper's Regional Park and north of San Juan Creek. The planning area generally exhibits steeper topography than Planning Area 2. A ridgeline, that trends from southwest to the northeast divides the planning area into two drainage areas with the northwest half of the planning area draining to Gobernadora Creek and the southeast half of the planning area draining to San Juan Creek. Gobernadora Creek originates in the Cleveland National Forest to the north, traversing Coto de Caza before entering the planning area at the extreme northwest corner of the planning area before exiting the planning area about 3,000 feet from the northern boundary of the planning area. Gobernadora Creek runs parallel to and outside of the planning area after exiting the planning area, ultimately discharging into San Juan Creek beyond the southwest corner of the planning area.

The southeast and southernmost portions of the site drain to the south towards San Juan Creek and all of the drainages were determined to exhibit surface tributary connections by means of an OHWM with San Juan Creek with the exception of a single drainage (San Juan Creek Tributary 4) that was modified prior to regulation under the Clean Water Act and is therefore not subject to Corps jurisdiction (see discussion below under Unresolved Areas)

Corps jurisdiction in Planning Area 3 totals approximately 20.74 acres of which 11.93 acres consist of jurisdictional wetlands. A number of side canyons to the east of Gobernadora Creek do not contain drainages exhibiting an OHWM and therefore are not subject to Corps jurisdiction. Other canyons (e.g., the upper reaches of Gobernadora Tribuary 6) contain drainages with and OHWM; however, the OHWM terminates in scrub or grassland habitat thousands of feet from Gobernadora Creek with no hydrologic connection. These areas have been determined by the Corps to be isolated and not subject to their jurisdiction.

TABLE 6: Gobernadora Jurisdictional Feature Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
Gobernadora	5.06	0.07	5.13
3-5	0.15	0.77	0.92
3-7	0.00	0.46	0.46
3-8	0.00	0.13	0.13
3-9	0.00	0.10	0.10
3-12	0.42	3.99	4.41
3-13	2.32	3.12	5.44
3-14	0.00	0.03	0.03
3-15	0.00	0.10	0.10
3-16	3.98	0.03	4.01
3-17	0.00	0.01	0.01
Totals[4]	**11.93**	**8.81**	**20.74**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 7: Gobernadora Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
3-1	0.00	0.04	0.04
3-2	0.00	0.02	0.02
3-3	0.00	0.29	0.29
3-4	0.00	0.11	0.11
3-5	0.00	0.01	0.01
3-6	2.65	0.11	2.76
3-10	0.02	0.95	0.97
Isolated Willow Seep	0.26	0.00	0.26
Sulfer Canyon	0.26	0.00	0.26
3-11	0.00	0.01	0.01
Mining Pits	4.36	0.00	4.36
Total	**7.55**	**1.54**	**9.09**

[1] All of these feature have been field verified and the Corps concurs they are isolated and therefore not subject to regulation pursuant to SWANCC

Planning Area 4 (East Ortega)

Planning Area 4 is located near the northern edge of the study area immediately south of Ortega Highway and includes Verdugo Canyon. RMV and the Corps have reached concurrence regarding the jurisdictional status for each of the features summarized in the tables below and all features in this planning area are considered Resolved Areas. Corps jurisdiction in Planning Area 4 totals approximately 16.53 acres of which 0.63 acres consist of jurisdictional wetlands.

TABLE 8: East Ortega Jurisdictional Feature Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
San Juan Creek	0.00	0.55	0.55
Verdugo	0.00	11.11	11.11
4-1	0.00	0.10	0.10
4-2	0.00	0.13	0.13
4-3	0.00	0.14	0.14
4-5	0.00	0.21	0.21
4-6	0.00	0.05	0.05
4-7	0.00	0.25	0.25

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
4-8	0.00	0.03	0.03
4-9	0.00	0.04	0.04
4-11	0.00	1.00	1.00
4-12	0.00	0.76	0.76
4-13	0.00	0.45	0.45
4-15	0.00	0.10	0.10
4-17	0.04	0.98	1.02
4-17 Pond	0.59	0.00	0.59
Totals[4]	**0.63**	**15.90**	**16.53**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 9: East Ortega Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
4-10[1]	0.00	0.02	0.02
4-14[1]	0.00	0.07	0.07
4-16[1]	0.00	0.14	0.14
4-18[1]	0.00	0.14	0.14
4-19[1]	0.00	0.64	0.64
Nursery Ditch[2]	0.03	0.00	0.03
Total	**0.03**	**1.01**	**1.04**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC
[2] This feature has been field verified and the Corps concurs it is not subject to regulation pursuant to Section 404 of the Clean Water Act.

PLANNING AREA 5 (TRAMPAS)

Planning Area 5 is located in the San Juan Creek watershed and is located immediately south of Ortega Highway. Much of the planning area is currently occupied by a sand mining and processing operation, that has operated in the southern half of the planning area since the 1960s. Sand mining and processing has required significant modifications to the landscape in the central portion of the planning area including creation of a dam on Trampas Canyon Creek and excavation of a large mining pit (Cell A) and additional areas of influence (Exhibit 5).

In addition to the mining and processing, and prior to the enactment of the Clean Water Act, bermed stockponds associated with ranching activities were created which isolated other drainages within the planning area. Based upon verification visits with the Corps, RMV and the Corps have agreed on the jurisdictional status of all areas or features within the planning area

(Resolved Areas) with three exceptions: the “Tailings Pond/Water Recycling Area”, the “Temporary Storage Pond” and a slope wetland not associated with the mining operation. Because the jurisdictional status of the Tailings Pond/Water Recycling Area and the Temporary Storage Pond is, as discussed in detail below, related to the mining operation, the primary features associated with the mining operation are described below under “Sand Mining Operation”. Resolved Areas are clearly distinguished from Unresolved Areas within the descriptions associated with the sand mining area.

Corps jurisdiction associated with Planning Area 5 totals 10.30 acres of which 0.82 acre consist of jurisdictional wetlands. A summary of features subject to Corps verification for which RMV and the Corps concur relative to their jurisdictional status is provided in Table 13 and 14. Table 13 is a summary of areas subject to Corps jurisdiction and Table 14 is a summary of areas not subject to Corps jurisdiction due to isolation or other regulatory considerations (e.g., non-tidal drainages or non-abandoned mining pits excavated in upland).

TABLE 10: Trampas Jurisdictional Feature Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
5-1A	0.01	0.76	0.77
Seasonal Pond	0.13	0.00	0.13
5-1B	0.00	6.01	6.01
5-2	0.00	0.11	0.11
5-6	0.00	0.15	0.15
5-7	0.03	1.44	1.47
Temporary Storage Pond	0.65	0.00	0.65
5-7B	0.00	1.01	1.01
Totals[4]	**0.82**	**9.48**	**10.30**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 11: Trampas Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
Saltgrass Swale[1]	0.002	0.000	0.002
5-1A[1]	0.00	0.09	0.09
5-3[1]	0.00	0.03	0.03
5-4[1]	0.00	0.19	0.19
5-5[1]	0.00	0.11	0.11
Slope Wetland A[1]	0.04	0.00	0.04
Slope Wetland B[1]	0.17	0.00	0.17

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
5-7A[1]	1.63	0.27	1.90
5-7B[1]	0.00	0.53	0.53
Settling Pond A[2]	NA	NA	0.26
Settling Pond B[2]	NA	NA	1.30
Settling Pond C[2]	NA	NA	1.33
Settling Pond D[2]	NA	NA	2.37
Juncus Patch[2]	NA	NA	0.05
Cell A Mining Pit[2]	11.56	0.00	11.56
Desilting Pond[2]	0.00	0.12	0.12
NJD Erosional Feature[2]	0.00	0.04	0.04
NJD Mining Feature A[2]	0.17	0.00	0.17
NJD Mining Feature B[2]	0.00	0.11	0.11
NJD Mining Feature C[2]	0.00	0.13	0.13
Ridgetop Reservoir[2]	1.86	3.24	5.10
5-7[1]	0.00	0.77	0.77
ONIS Tailings Pond[1, 2]	41.32	29.80	71.12
Thickener[2]	0.18	1.34	1.52
Total	**56.93**	**36.77**	**99.11**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC
[2] This feature has been field verified and the Corps concurs it is not subject to regulation pursuant to Section 404 of the Clean Water Act.

Sand Mining Facilities

As noted above, a substantial portion of the Trampas Planning Area has been affected by sand mining activities since the 1960s. The sand mining operation requires use of water during various steps in the process including 1) washing of the mined materials to separate silts and clays from the sand, and 2) use of water to transport silt and clay tailings to tailings areas via pumps. In order to conserve water through recycling as well as to maintain maximum flexibility in the system, an elaborate system of ponds, pipes, and ditches have been constructed that are used in the washing and recycling processes. These various components of the sand washing operation are described below and are also depicted and appropriately designated on Exhibits 5a and 5b. The features further described below include:

- Trampas Dam and associated “Tailings and Recycle Area”;
- Dam-Face “V”-Ditches
- Dam-Face Leach Field and Associated Drainage Features;
- Thickener;
- Desilting Pond and Associated Recycling Ditches and Pipes;
- Ridgetop Reservor;
- Temporary Storage Pond;
- Cell A;

Trampas Dam and Associated Tailings Pond and Recycle Area

Trampas Dam was constructed in 1975 following preparation of and certification of an Environmental Impact Report (EIR) prepared pursuant to the California Environmental Quality Act. The dam was constructed in a manner that isolated Trampas Creek and its tributaries that consisted of ephemeral drainages (based on a review of historic aerial photographs, Trampas Creek and its tributaries affected by dam construction and the associated Tailings Pond/Recycle Area supported approximately 12 acres of southern coast live oak riparian forest). The extent of the ephemeral drainages isolated behind the dam is estimated to have covered approximately 0.8 to 1.2 acres based on an extrapolation of Corps-verified drainage widths upstream and downstream of the reservoir.

Construction of the Trampas Dam in 1975 did not require authorization from the Corps because ephemeral drainages, tributary to other navigable waters were not regulated pursuant to Section 404 until July 1, 1977 when such waters were "phased" into the Section 404 Regulatory Program.[3] Creation of the dam isolated all of the drainages upstream of the dam, including the Tailings Pond and Recycle Area created by the dam. It is therefore important to note that because the dam was constructed before Trampas Creek was regulated pursuant to Section 404, it does not represent an impoundment of waters of the U.S. A spillway was constructed for the Tailings Pond and Recycle Area at the extreme eastern arm of the facility. The elevation of the Tailings Pond and Recycle Area is maintained at about 30 feet below the elevation of the spillway. During its 28-year period of operation, water has never discharged over the spillway. While the Tailings Pond and Recycle Area is clearly isolated (i.e., it is not connected to downstream jurisdictional waters), the Corps has not provided concurrence that this feature is not subject to jurisdiction under Section 404. The descriptions that follow addressing components in the sand mining and processing operation are intended to clearly demonstrate the isolation of the Tailings Pond and Recycle Area. Following the descriptions of the components associated with the mining operation, further discussion is provided relative to the jurisdictional status of the Tailings Pond.

Because substantial water is lost to evaporation during various steps in the washing process as well as from the Tailings Pondand Recycle Area, it is necessary to pump well water into the pond to maintain water levels. If water is not added to the process, the Tailings Pond Area will eventually dry up. At its current elevation, the Tailings Pond and Recycle Area covers approximately 70 acres and includes approximately 15 acres of open water with the remaining 55 acres consisting of exposed tailings which support various densities of southern cattail (*Typha domingensis*, OBL), and California bulrush (*Scirpus californicus*, OBL).

The Tailings Pond and Recycle Area serves two primary functions in the processing of sand: 1) it receives all of the tailings separated from the sand during the washing process and 2) it serves as a re-circulating water source for the washing process. During the washing process, water is moved through a variety of the facilities noted above with the movement patterns of the water varying according to a number of factors directly related to the needs of the mining operation.

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[3] Federal Register. 1991. "CFR 330.3: Activities occurring before certain dates". Federal Register Vol. 56, No. 226, November 22, 1991, Rules and Regulations, page 59136.

As stated above, the goal to conserve the maximum amount of water during the washing process has resulted in the creation of a series of storage areas and conduits that allow water to be recycled at various points in the process.

Dam Face and Associated "V"-Ditches

Construction of the dam included installation of a series of V-Ditches that capture precipitation falling on the 11.5-acre dam face. There is no hydrologic connection between the Tailings Pond/Recycle Area behind the dam and the water collected on the face of the dam. The primary function of the V-Ditches on the Dam is to prevent damage to the dam through rilling and erosion. These V-Ditches have been designed to discharge all flows to an underground inlet near the face of the dam where a 24-inch pipe was installed to collect the runoff, ultimately directing it to the "Desilting Pond" via pipes and an above-ground artificial drainage ditch (NJD Feature C). By design, all water that originates on the face of the dam is directed into the recycling system for use in the mining process.

During a field visit, conducted on October 3, 2003 with representatives of Oglebay Norton, the operators of the sand mine and processing facility, GLA observed the inlet of the 24-pipe, which had been temporarily buried, and had just been uncovered. The pipe was full of sediments and was in need of maintenance. Because the pipe had become clogged, water was not discharging to NJD Feature C (which carries the water via a second pipe to the Desilting Pond before it is pumped to the "Thickener" (see below). As a result of the pipe being blocked and the resulting accumulation of water, a small area, covering approximately 50 by 100 feet has been colonized by opportunistic cattails. Maintenance of the V-Ditches and the pipe system, including the unclogging of the 24-inch pipe that connects the base of the dam to the Desilting Pond via NJD Mining Feature C, will eliminate the source of water to the opportunistic cattails at the base of the dam face.

Dam Face Leachfield and Associated Pipes

Construction of the dam also included installation of interior drains to protect the dam from seepage. Water is collected in drains, which are in turn are connected to an underground rock and gravel collection field. Much of the water is collected in a four-inch clay pipe and is carried underground to the "Temporary Storage Pond". The leachfield is also designed to drain to the v-ditch and then into the 24-inch pipe, which as noted above had become blocked, preventing the leachfield to drain properly with the resulting colonization of opportunistic cattails. By design, all of the subdrain water from the base of the dam is intended for the "Desilting Pond", which is then pumped to the "Thickener".

Thickener

The Thickener is a constructed circular basin that receives tailings-laden water from the washing operations and also receives fresh water that enters the washing system at this point (well water can be pumped into the system at a number of locations as needed). The thickener is mechanically "stirred" in order to maintain the tailings in suspension so that they can be pumped to the Tailings Pond. The outer rim of the thickener includes a two-foot-wide concrete ditch that directs overflow water (the thickener only rarely overflows) to a metal pipe, which carries the overflow to the "Temporary Storage Pond" from where the water can be pumped back to the thickener or to the "Desilting Pond".

Ridgetop Reservoir

The Ridgetop Reservoir is located immediately adjacent to and substantially above in terms of elevation, the Tailings Pond. This feature receives water that is pumped from the Desilting Pond as well as directly from well water. This feature was constructed entirely on upland. While is supports limited areas of hydrophytic vegetation, the only source of water for this feature (other than direct rainfall) is from pumped water.

Temporary Storage Pond

The Temporary Storage Pond is an artificial basin, constructed on upland and by design, was not constructed as an impoundment of jurisdictional waters. Rather, the Temporary Storage Pond was constructed to receive overflow from the Thickener as well as the minimal discharge from the four-inch clay pipe, generated by the drain at the base of the dam.

Accumulation of sediments generated by the sand mining and processing operation has resulted in a minor diversion of a nearby drainage such that a side channel has developed that flows into the basin during large storm events. The basin has no outlet or spillway and is, by design fully isolated from jurisdictional waters. The bottom of the basin supports California bulrush, mulefat scrub and a few individual arroyo willows.

This feature was excavated and bermed in uplands and has no connection to downstream jurisdictional waters. A side channel that migrated from the mainstem of Drainage 5-7 currently discharges to this feature; however, the feature was not designed with this connection and the feature remains isolated. As such, GLA believes that this feature is not subject to Corps jurisdiction as is an isolated feature.

Desilting Pond and Associated Ditches and Pipes

A Desilting Pond is located immediately west of the Thickener. The Desilting Pond receives tailings-laden wash water that is drained from washed sands located in the washing facilities immediately east of the washing facilities [See exhibit 5b]. From the wet sand piles, water drains through one of two artificial drainage ditches (NJD Feature A and/or NJD Feature B). NJD Feature A is connected directly to the Desilting Pond by means of a pipe. NJD Feature B is connected directly to the Desilting Pond by means of a pipe which discharges into NJD Feature C and a third pipe that connects NJD Feature C with the Desilting Pond.

Cell A

Cell A is located approximately 1,000 feet north of the Trampas Dam. Cell A, which covers approximately 11.56 acres of open water and exposed tailings which support various densities of southern cattail (*Typha domingensis*, OBL), and bulrush (*Scirpus californicus*, OBL). Cell A was excavated from dry land in the 1960s and currently consists of a mining pit that is fully isolated with no potential outlets due to the elevation. Cell A is a potential reservoir for deposition of tailings and recycling of wash water. Upon termination of the mining operations, Cell A would be reclaimed pursuant to the reclamation plan developed for the site.

Abandoned Settling Ponds

A series of five abandoned settling basins occupy a bench below the ridgeline that runs along the western boundary of the planning area. The abandoned basins are isolated and are not connected to jurisdictional waters. None of the basins support a predominance of hydrophytic vegetation and, due to the lack of water subsidies from the mining operation, are reverting to upland habitat.

JURISDICTIONAL STATUS OF TAILINGS POND

As noted above, the Tailings Pond was created by construction of a dam on Trampas Creek. The dam was constructed prior to July 1, 1977 when such waters were "phased" into the Section 404 Regulatory Program.[4] Construction of the dam resulted in the isolation of drainages upstream of the dam as well as the Tailings Pond. The spillway elevation is located approximately 30 feet above the elevation of the Tailings Pond water surface that is maintained through the daily input of well water associated with the sand mining processes. During the 28-years that the dam has been in place, water has never been discharged over the spillway, even during significant rainfall years such as 1983, 1993, 1995 or during the 1998 El Niño event. Given that the dam has not overtopped during significant storm events or storm seasons when it was receiving subsidies of water for the mining processes, it would clearly not overtop once subsidies are eliminated.

Ignoring the clear isolation of the Tailings Pond from jurisdictional waters, the Corps has suggested that the feature may be subject to Section 404 jurisdiction; however, no specific rationale has been put forward. While GLA knows of no regulatory rationale that could be used to rebut the facts regarding isolation of the Tailings Pond, we note that elimination of the artificial irrigation (i.e., water subsidies associated with the mining operation) in the post mining condition would eliminate essentially all wetland vegetation and open water behind the dam. The Preamble to CFR 328.3(b) states that the Corps generally does not consider "artificially irrigated areas which would revert to upland if irrigation ceased" to be waters of the United States. In order to identify the maximum extent of wetland vegetation or open water in the post-mining condition, a water budget based on elimination of subsidies has been prepared by GLA and Wildermuth Environmental. It is important to note that any wetland areas persisting behind the dam in the post-mining phase would be isolated by the dried out tailings, and would not be connected to jurisdictional areas and would themselves not be subject to jurisdiction under Section 404. The detailed water budget, summarized in narrative form in the paragraphs below, is attached as Appendix A.

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[4] Federal Register. 1991. "CFR 330.3: Activities occurring before certain dates". Federal Register Vol. 56, No. 226, November 22, 1991, Rules and Regulations, page 59136.

WATER BUDGET FOR TAILINGS POND

In the post-mining condition, the Tailings Pond will dry out if not subsidized with well water. For purposes of understanding the ambient conditions, GLA and Wildermuth Environmental prepared a water budget for the Tailings Pond/Recycle Area that considers the conditions expected behind the dam in the absence of any water subsidies from mining. Based on rainfall data using the last 75 years, the area occupied by the tailings area would support approximately two to three acres of emergent marsh habitat once all artificial water subsidies are eliminated.

Overall Approach

In order to accurately determine the extent of hydrophytic vegetation and/or open water in the post-mining condition, the following factors were considered/evaluated.

- Post-mining dry-out of the tailings;
- Hydrologic input from watershed runoff;
- Hydrologic input from precipitation;
- Water consumption by hydrophytic vegetation (amounts); and
- Water consumption by hydrophytic vegetation (seasonality)

Post-Mining Dryout of Tailings

Currently, water depths for areas occupied by cattails, which accounts for approximately 55 acres of the Tailings Pond, average less than two feet. Cattails and bulrush will use up to ten feet of water per year when it is available and require a minimum of about four feet of water seasonally to survive and persist on a site. Cattails and bulrush exhibit winter dormancy with most of the water consumption occurring during the period from May to November. Cattails and bulrush are both shallow-rooted species with the entire root zone located in the upper two feet (three feet maximum). Without water subsidies from the mining operation, essentially all of the water within the root zone of the cattails and bulrush would be depleted by the end of one growing season.[5]

While the Tailings Pond is drying out during the first year without water subsidies, the exposed substrate will quickly be colonized by propagules from non-native grasses and forbs that are found throughout the watershed of the Tailings Pond including wild oats (*Avena farua*, UPL), slender oats (*Avena barbata*, UPL), ripgut (*Bromus diandrus*, UPL), soft chess (*Bromus hordeaceus*, UPL), red brome (*Bromus madritensis rubens*, UPL), rattail fescue (*Vulpia myuros*, UPL), Italian ryegrass (*Lolium multiflorum*, UPL), black mustard (*Brassica nigra*, UPL), field mustard (*Brassica rapa*, UPL), wild radish (*Raphanus sativus*, UPL), tocalote (*Centaurea melitensis*, UPL) and three species of filaree (*Erodium* spp., UPL). These species, as a group, germinate during winter and early spring, consuming most available soil moisture by late spring or early summer, meaning that they are most active during the winter dormancy of the cattails and bulrush, substantially limiting soil moisture that might be available to any surviving wetland

[5] This includes surface water up to three feet and subsurface water at depths to three feet.

plants. Direct evaporation and evapotranspiration will consume most direct precipitation falling on the tailings such that water would be available in very limited amounts to wetland plant species.

Input from Watershed Runoff

The hydrological model set forth in Appendix C determined that approximately 43.5 acre-feet of water would reach the tailings during an average rainfall year.[6] Essentially all of the hydrological input from watershed runoff would occur during the rainy season, which is between October 15 and April 15. This runoff would reach the outer edges of the Tailings Pond, at points where the ephemeral drainages intersect the Tailings. Tailings at these locations would be shallowest and much of the water would be stored in the upper few feet, meaning that it would be available to whatever plants are growing at the discharge point. As noted above, substantial amounts of this water would be consumed by opportunistic spring annuals, which germinate as early as November or December (coincident with the first one to two inches of rainfall) and reach their peak growth during February and March (some species such as Italian Rygrass geminate a little later and reach peak growth in March and April). The 43.5 acre feet of runoff would generally be sufficient to support up to seven of cattails, bulrush and other native and non-native hydrophytes. However, direct evaporation coupled with water consumption by spring annuals, which would germinate and reach maximum growth during the winter dormancy period exhibited by the cattails and bulrush, would reduce to amount of wetland vegetation to between five and six acres.

Input from Direct Precipitation

During average rainfall years, approximately 75 acre-feet would fall on the area occupied by the mine tailings. Essentially all of the hydrological input from direct precipitation would occur during the rainy season, which is between October 15 and April 15, which as noted above coincides with the winter dormancy period of native hydrophytes and the germination and maximum growth period of non-native spring annual grasses and forbs. It is expected that direct evaporation and evapotranspiration by the spring annuals would utilize essentially all of the water reaching the tailings.

Summary/Conclusions

In the post-mining condition, the available surface and subsurface water in the Tailings Pond would be consumed by the existing hydrophytic vegetation, which exhibits high water consumption rates, beginning in late spring and continuing until late fall. Natural hydrologic input from storm runoff and direct precipitation would coincide with the germination and maximum growth period of the (mostly) non-native annual grasses and forbs expected to rapidly colonize the drying tailings. Available water for native hydrophytes would be between 30 and

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[6] Wildermuth Environmental has, on a preliminary basis, conducted more detailed modeling of the Tailings Pond, that reduces the estimated watershed runoff (as set forth using the TR-55 methodology) from approximately 43.5 acre feet to between 25 and 30 acre feet. The more conservative number of 43.5 acre feet is incorporated into this analysis because the Wildermuth report has not yet been completed; however, upon its completion, it is expected to reduce the watershed runoff totals.

35 acre feet which would be sufficient to allow persistence of between five and six acres of hydrophytic vegetation.

PLANNING AREA 6 (CRISTIANITOS MEADOWS)

Planning Area 6 is located near the southeastern edge of the study area immediately north of the O'Neill Land Conservancy. RMV and the Corps have reached concurrence regarding the jurisdictional status for each of the features summarized in the tables below and all features in this planning area are considered Resolved Areas. Corps jurisdiction in Planning Area 6 totals approximately 6.18 acres of which 5.30 acres consist of jurisdictional wetlands.

TABLE 12: Cristianitos Meadows Jurisdictional Feature Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
Cristianitos Stock Pond	0.73	0.00	0.73
6-1	0.00	0.01	0.01
6-2	0.04	0.03	0.07
6-3	0.00	0.27	0.27
6-4	4.36	0.57	4.93
Vernal Marsh	0.17	0.00	0.17
Totals[4]	**5.30**	**0.88**	**6.18**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 13: Cristianitos Meadows Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
6-2	0.21	0.16	0.37
Total	**0.21**	**0.16**	**0.37**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC

PLANNING AREA 7 (CRISTIANITOS CANYON)

Planning Area 7 is located near the southern portion of the study area and immediately east of the O'Neill Land Conservancy. For this report, the planning area is divided into two distinct areas: the eastern half which is characterized by fairly steep topography with deep canyons that drain toward Gabino Creek that runs generally parallel to and beyond the limits of the southern planning area boundary. The western half of the planning area exhibits more gentle topography and drains to the upper reach of Cristianitos Creek. Gabino Creek and the upper reach of Cristianitos Creek join just southwest of the planning area boundary.

The southern portion of the planning area exhibits a number of clay mines that have been under operation since the 1930s. Mining is currently not in operation; however the lease holders continue maintenance operations and all but one of the mining operations are subject to reclamation pursuant to plans submitted to and administered by the County of Orange.[7] As recently as September of 2002, representatives of Riverside Cement met with officials of the County of Orange onsite to review reclamation plans and discuss plant palettes to be used upon implementation of the reclamation programs.[8]

Corps jurisdiction in Planning Area 4 totals approximately 12.54 acres of which 4.74 acres consist of jurisdictional wetlands.

TABLE 14: Cristianitos Canyon Jurisdictional Feature Totals

Feature Name	Wetland[1]	Non-wetland Waters[2]	Total Corps[3]
7-1	0.00	0.54	0.54
7-2	0.03	0.64	0.67
7-3	0.00	0.13	0.13
7-4	0.00	0.29	0.29
7-5	0.00	0.09	0.09
7-6	0.07	0.33	0.40
7-7	0.00	2.05	2.05
7-8	0.00	0.08	0.08
7-9	0.00	0.08	0.08
7-10	0.00	0.15	0.15
7-11	0.00	0.04	0.04
7-12	1.33	0.68	2.01
7-13	3.09	2.55	5.64
7-15	0.22	0.02	0.24
7-16	0.00	0.08	0.08
7-17	0.00	0.04	0.04
7-18	0.00	0.01	0.01
Totals[4]	**4.74**	**7.8**	**12.54**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

[7] No jurisdictional waters are associated with clay mine that is not subject to County of Orange reclamation requirements.
[8] Bomkamp, Tony. Personal observation as attendee at two meetings to address reclamation of the sites.

TABLE 15: Cristianitos Canyon Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
Cattail pond[1]	0.01	0.00	0.01
7-6[1]	0.19	0.00	0.19
7-11 Isolated seasonal pond[1]	0.04	0.00	0.04
7-13 Isolated Stock Pond[1]	0.00	0.28	0.28
7-14[1]	0.16	0.00	0.16
7-19[1]	0.00	0.14	0.14
7-19 Mining Pit[2]	0.14	0.77	0.91
Isolated Willow Patch[2]	NA	NA	0.15
Totals	**0.54**	**1.19**	**1.88**

PLANNING AREA 8 (TRW)

Planning Area 8 is located near the southern edge of the study area east of Avenida Pico and north of Talega Creek. RMV and the Corps have reached concurrence regarding the jurisdictional status for each of the features summarized in the tables and examined in the field and all features in this planning area are considered Resolved Areas. The middle reaches of Features 8-1, 8-4 and 8-8, as well as the middle reach of the southern Blind Canyon tributary and the upper reach of northern Blind Canyon tributary eild verification. Corps jurisdiction in Planning Area 8 totals approximately 8.76 acres of which 1.05 acres consist of jurisdictional wetlands.

TABLE 16: TRW Jurisdictional Feature Totals

Feature Name	Wetland[1]	Waters[2]	Total Corps[3]
Blind Canyon	0.64	3.64	4.28
8-1	0.00	0.20	0.20
8-2	0.00	0.01	0.01
8-3	0.00	0.03	0.03
8-4	0.19	0.18	0.37
8-5	0.00	0.10	0.10
8-6	0.00	0.04	0.04
8-7	0.00	0.06	0.06
8-8	0.00	0.09	0.09
8-9	0.00	0.19	0.19
8-10	0.00	0.05	0.05
8-11	0.00	0.06	0.06
8-12	0.00	0.04	0.04

Feature Name	Wetland[1]	Waters[2]	Total Corps[3]
8-13	0.00	0.07	0.07
8-14	0.00	0.05	0.05
8-15	0.12	0.33	0.45
8-16	0.00	0.04	0.04
8-17	0.00	0.05	0.05
8-18	0.00	0.01	0.01
8-19	0.00	0.01	0.01
8-20	0.00	0.07	0.07
8-22	0.00	0.54	0.54
8-23	0.01	0.33	0.34
8-24	0.09	0.64	0.73
8-25	0.00	0.14	0.14
8-26	0.00	0.16	0.16
8-27	0.00	0.10	0.10
8-28	0.00	0.13	0.13
8-29	0.00	0.16	0.16
8-30	0.00	0.004	0.004
8-31	0.00	0.14	0.14
8-32	0.00	0.02	0.02
8-33	0.00	0.02	0.02
8-34	0.00	0.01	0.01
Totals[4]	**1.05**	**7.71**	**8.76**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 17: TRW Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
Isolated Seasonal Pond	0.58	0.00	0.58
8-21	0.00	0.02	0.02
Total	**0.58**	**0.02**	**0.60**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC

PLANNING AREA 9 (O'NEILL RANCH)

Planning Area 9 is located near the eastern edge of the study area within portions of Gabino Canyon. RMV and the Corps have reached concurrence regarding the jurisdictional status for each of the features summarized in the tables below and all features in this planning area are considered Resolved Areas. Corps jurisdiction in Planning Area 9 totals approximately 14.75 acres of which 4.57 acres consist of jurisdictional wetlands.

TABLE 18: O'Neill Ranch Jurisdictional Feature Totals

Feature Name	Wetland[1]	Waters[2]	Total Corps[3]
Gabino	1.01	3.66	4.67
9-1	0.16	0.97	1.13
9-2	0.00	1.25	1.25
9-3	0.00	0.19	0.19
9-4	0.00	0.56	0.56
9-5	0.00	0.08	0.08
9-11	0.00	0.30	0.30
9-12	0.00	0.03	0.03
9-13	0.00	0.12	0.12
9-14	0.58	0.55	1.13
9-15	0.00	0.29	0.29
Gabino/Jerome Lake Wetland	1.87	0.00	1.87
Jerome Lake	0.95	2.18	3.13
Totals[4]	**4.57**	**10.18**	**14.75**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 19: O'Neill Ranch Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total Acreage
9-6	0.00	0.27	0.27
9-7	0.00	0.00	0.00
9-8	0.00	0.01	0.01
9-9	0.00	0.01	0.01
9-10	0.00	0.04	0.04
9-14	0.00	0.04	0.04
Total	**0.00**	**0.37**	**0.37**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC

ROAD GAPS

Road Gaps are located throughout the study area. Corps jurisdiction in the road gaps totals approximately 86.33 acres of which 41.46 acres consist of jurisdictional wetlands. All of the road gap areas are resolved with the exception of three drainages that are also addressed in Planning Area 2, that extend beyond the planning area boundary and are affected by potential road alignments. The drainages that overlap with Planning Area 2 are 5/2-1, 6/2-4 and 7/2-5.

TABLE 20: Road Gap Jurisdictional Feature Totals

Feature Name	Wetland[1]	Waters[2]	Total Corps[3]
Blind Canyon	0.00	0.15	0.15
Chiquita	0.75	0.00	0.75
Chiquita Wetland	12.60	0.00	12.60
Cristianitos Creek	3.88	3.97	7.85
Gabino Creek	0.00	3.29	3.29
Gobernadora	0.57	0.60	1.17
Road Gap-1	0.00	0.07	0.07
Road Gap-9	0.00	0.14	0.14
Road Gap-10/1-7	0.00	0.07	0.07
Road Gap-11/2-11	0.00	0.04	0.04
Road Gap-13/2-14	0.00	0.01	0.01
Road Gap-14/2-13	0.00	0.18	0.18
Road Gap-15/3-16	0.95	0.00	0.95
Road Gap-16/3-13	0.00	0.14	0.14
Road Gap-17/5-1	0.00	0.40	0.40
Road Gap-18	0.00	0.01	0.01
Road Gap-22	0.12	0.96	1.08
San Juan Creek A	1.78	2.12	3.90
San Juan Creek B	1.26	9.57	10.83
San Juan Creek C	2.19	12.78	14.97
San Juan Creek D	16.77	4.05	20.82
San Juan Creek E	0.59	6.32	6.91
Totals[4]	**41.46**	**44.87**	**86.33**

[1] Total area (acres) of three-parameter wetland features subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[2] Total area (acres) of non-wetland tributaries subject to Corps jurisdiction pursuant to Section 404 of the Clean Water Act.

[3] Total area (acres) of features subject to Corps jurisdiction (consists of both wetlands and non-wetland waters).

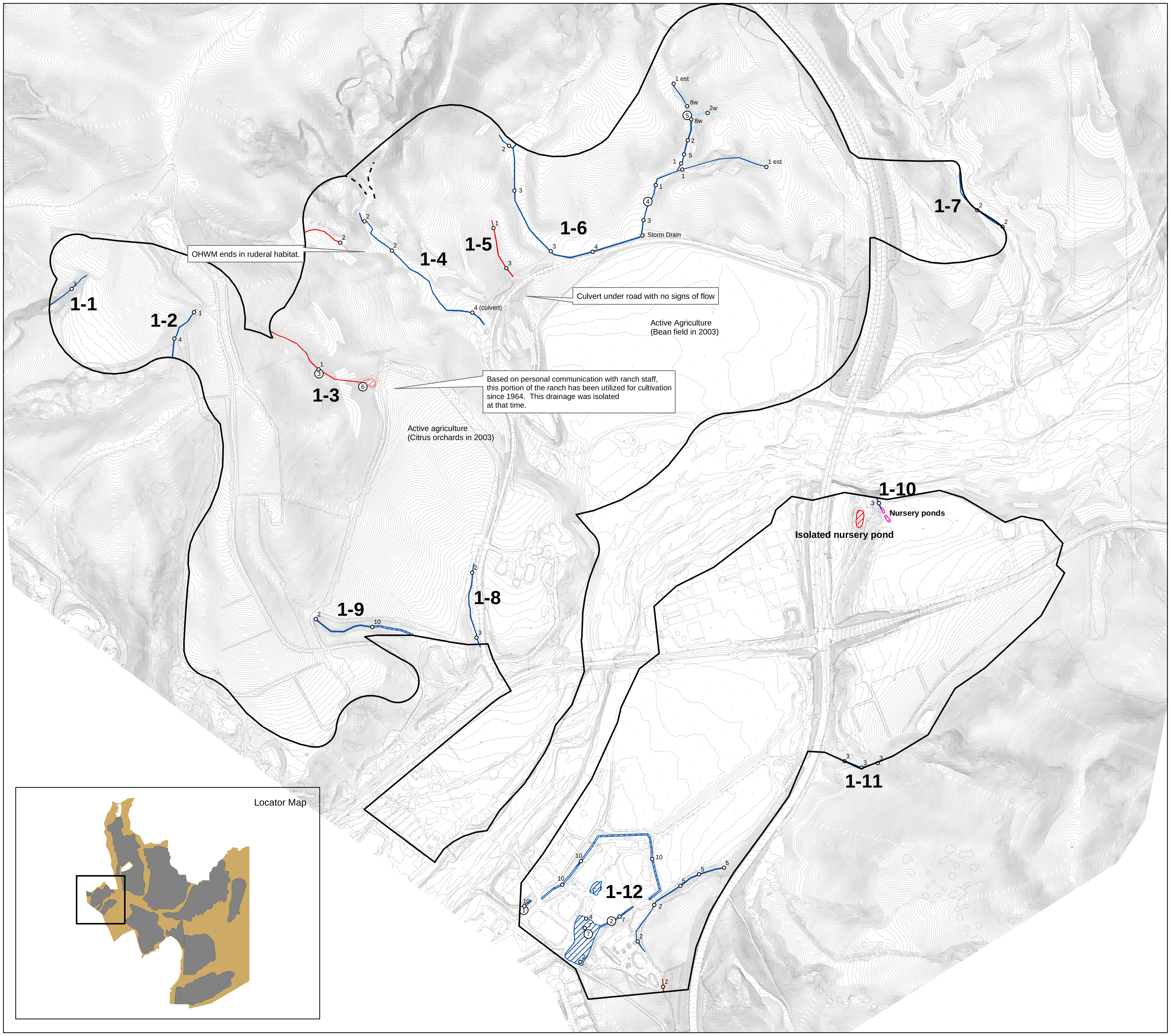
[4] These totals may change depending upon Corps determinations regarding proposed non-jurisdictional and isolated features.

TABLE 22: Road Gap Non-jurisdictional Feature Totals

Feature Name	Wetland (acres)	Non-wetland Waters (acres)	Total acreage
Road Gap-2	0.00	0.02	0.02
Road Gap-3	0.00	0.01	0.01
Road Gap-4	0.00	0.02	0.02
Road Gap-5/2-1	0.00	0.18	0.18
Road Gap-6/2-4	0.00	0.08	0.08
Road Gap-7/2-5	0.00	0.05	0.05
Road Gap-21	0.00	0.01	0.01
Road Gap-8	0.00	0.08	0.08
Sulfer Canyon Creek	1.34	0.08	1.42
Sulfer Slope Wetland	0.00	0.16	0.16
Road Gap-19/5-7A	0.00	0.03	0.03
Road Gap-20/8-21	0.00	0.06	0.06
Totals	**1.34**	**0.78**	**2.12**

[1] This feature has been field verified and the Corps concurs it is isolated and therefore not subject to regulation pursuant to SWANCC

s:0239GENERAL/0239-15/0239-15b.GLAjd.Corps.041804.doc



RANCHO MISSION VIEJO
ORTEGA GATEWAY

Jurisdictional Delineation Map (Corps)

GLENN LUKOS ASSOCIATES

FINAL DRAFT
Supercedes versions dated July 2003

N
W E
S

400 200 0 Feet

Legend

Study Area

Soil Pit Location

OHWM ("w" indicates the presence of wetland)

No OHWM

Jurisdictional Wetlands

Jurisdictional Waters

Isolated Wetlands

Isolated Waters

Non-Jurisdictional Feature

c://GIS PROJECTS/239-15/PA1/Delineation Rev1/rev2/REV2MAPcolor October 29, 2003

RANCHO MISSION VIEJO CHIQUITA

Jurisdictional Delineation Map (Corps)

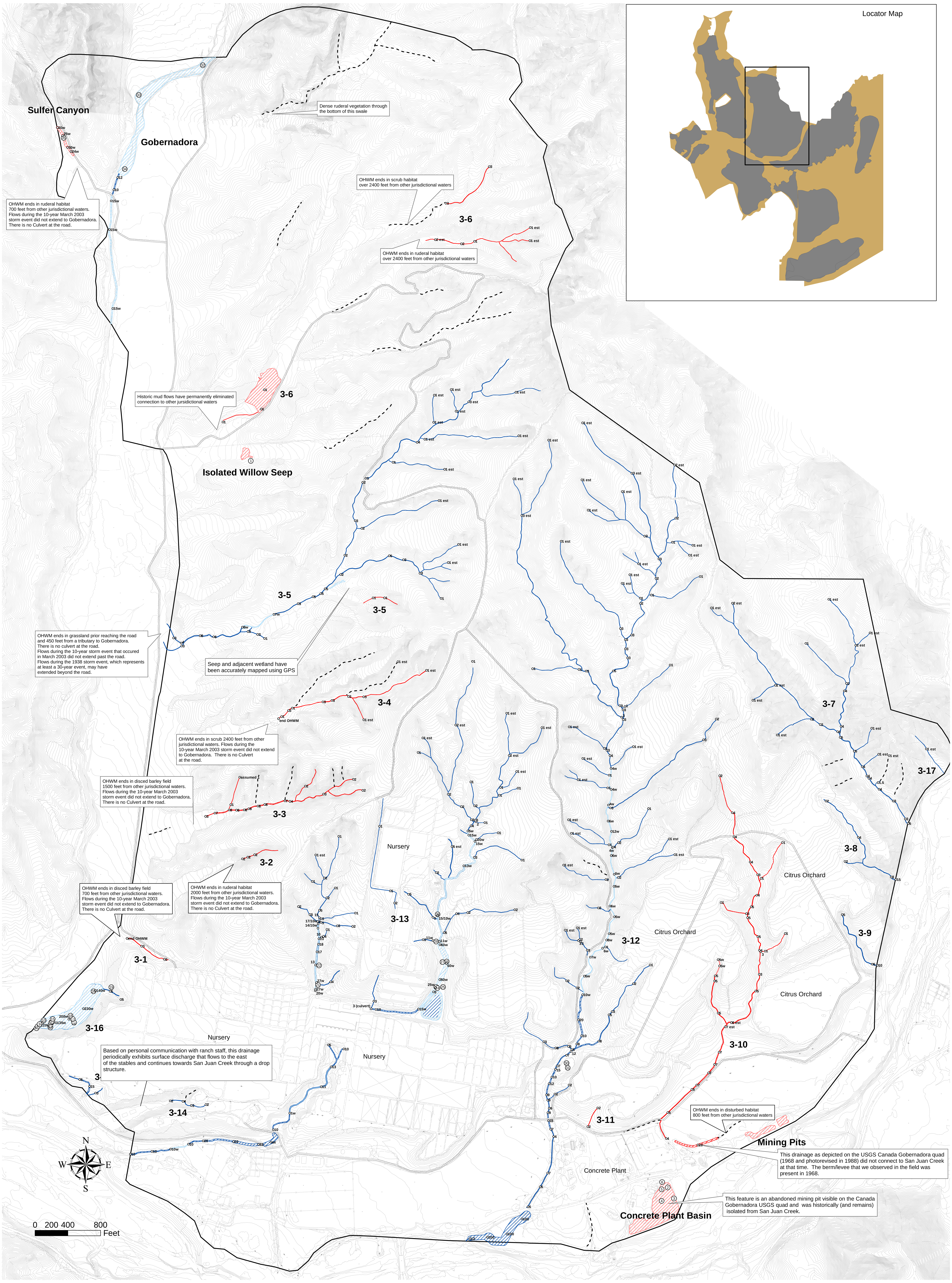
GLENN LUKOS ASSOCIATES

REVISION 4
Supercedes version dated December 1, 2003

Legend

- Study Area Boundary
- Existing Ranch Road
- OHWM ("w" indicates the presence of wetlands)
- Soil Pit Location
- Jurisdictional Wetlands
- Jurisdictional Waters
- No OHWM
- Isolated Wetlands
- Isolated Waters
- Non-Jurisdictional Feature

C://GIS PROJECTS/239-15SAMP/PA2/Delineation REV1/rev2/REV4MAPcolorcorps.mxd February 18, 2004



RANCHO MISSION VIEJO GOBERNADORA

Jurisdictional Delineation Map (Corps)

GLENN LUKOS ASSOCIATES

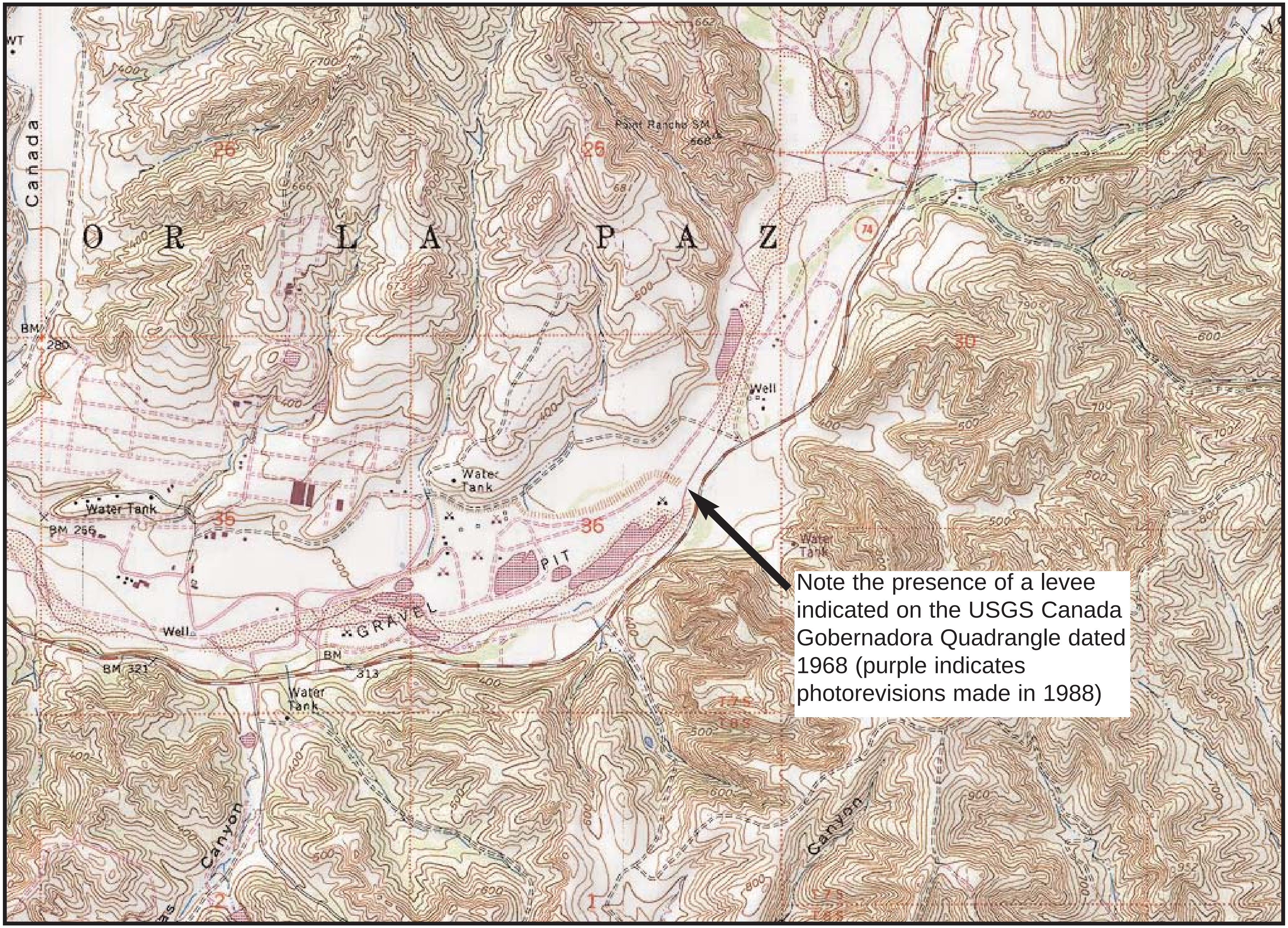
REVISION 3
Supercedes versions dated December 1, 2003

Legend

- Study Area Boundary
- Width of OHWM ("w" indicates the presence of wetlands)
- Existing Ranch Roads
- Soil Pit Location
- No OHWM
- Jurisdictional Wetlands
- Isolated Wetlands
- Isolated Waters
- Jurisdictional Waters

c://GIS PROJECTS/239-15SAMP/PA3/PA3Delineationrev1/PA3CorpsFeb18_04.mxd February 18, 2004

Adapted from USGS Canada Gobernadora quadrangle



NORTH

FEET

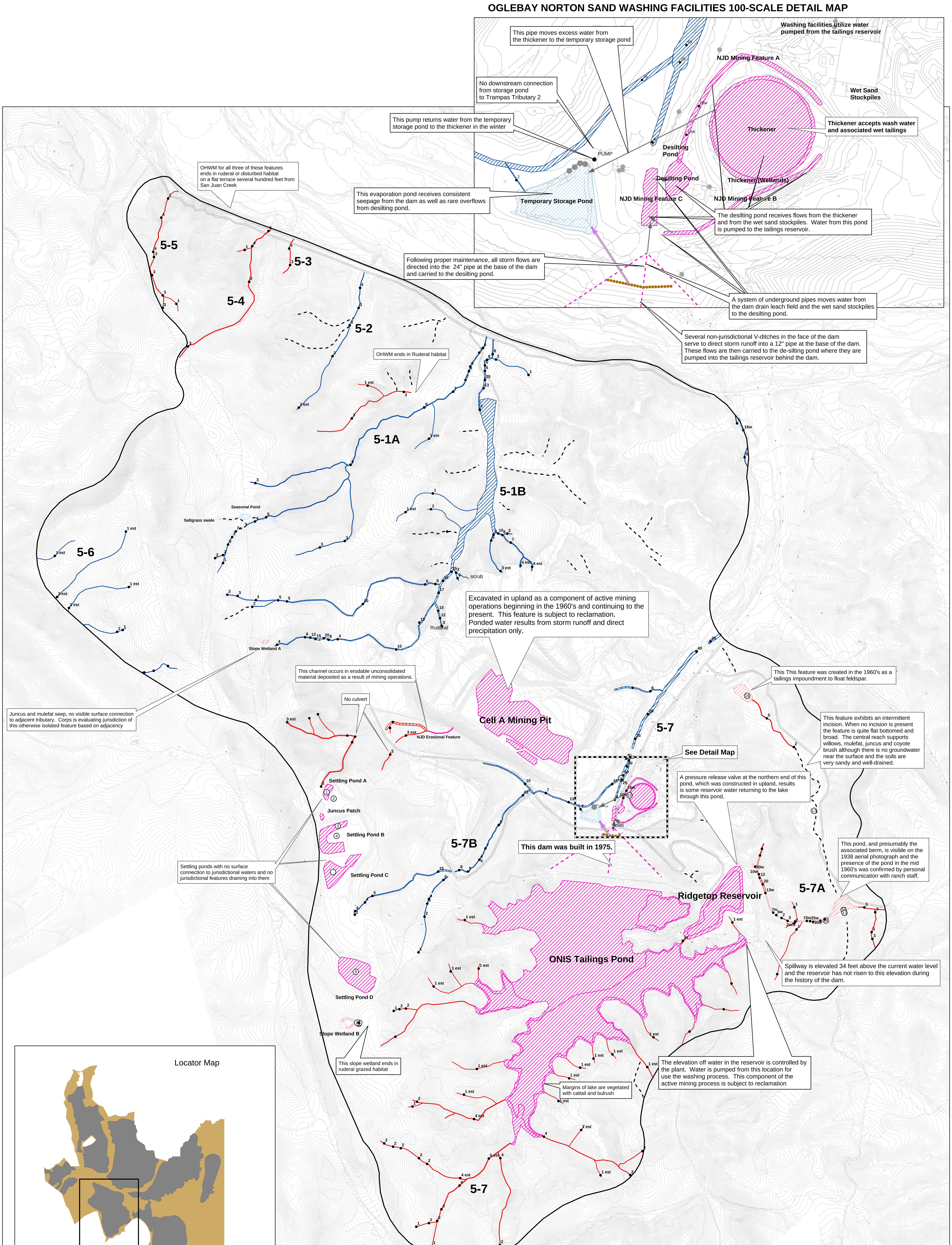
0 1000 2000 3000

RANCHO MISSION VIEJO GOBERNADORA

1968 USGS Canada Gobernadora Quadrangle

GLENN LUKOS ASSOCIATES


Locator Map
Verdugo
4-1
4-2
4-3
4-5
4-6
4-7
4-8
4-9
4-10
4-11
4-12
4-13
4-14
4-15
4-16
4-17
4-18
4-19
Surface connection over road
Standing water
Culvert
No downstream connection to Verdugo Creek was detected in the field even after a recent storm event
Surface Connection by sheet flow. No Culvert at road.
end OHWM
CDFG Riparian Vegetation and Corps OHWM estimates were based on similar more accessible drainages
No culvert and no signs of flow over the road
Ruderal habitat (not farmed)
The OHWM for these features end in ruderal or scrub habitat
San Juan Creek
OHWM ends in ruderal habitat
No signs of flow over road
Culvert connection to San Juan Creek
4-17 Pond
Seep Boundaries have been re-mapped
No connection to San Juan Creek is apparent in the 1938 aerial photograph
end OHWM
start incision
OHWM ends in scrub habitat
N
0 200 400 800
Feet
Legend
Study Area Boundary
"OHWM ("w" indicates the presence of wetland)
Existing Ranch Roads
No OHWM
Soil Pit Locations
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Waters
Non-Jurisdictional Feature
RANCHO MISSION VIEJO
ORTEGA EAST
Jurisdictional Delineation Map (Corps)
GLENN LUKOS ASSOCIATES
FINAL DRAFT
Supercedes versions dated July 2003
c://GIS PROJECTS/PA4/PA4/corpscolor.mxd
October 29, 2003



RANCHO MISSION VIEJO TRAMPAS

Jurisdictional Delineation Map (Corps)

GLENN LUKOS ASSOCIATES

VERIFIED MAP
Supercedes version dated October 29, 2003

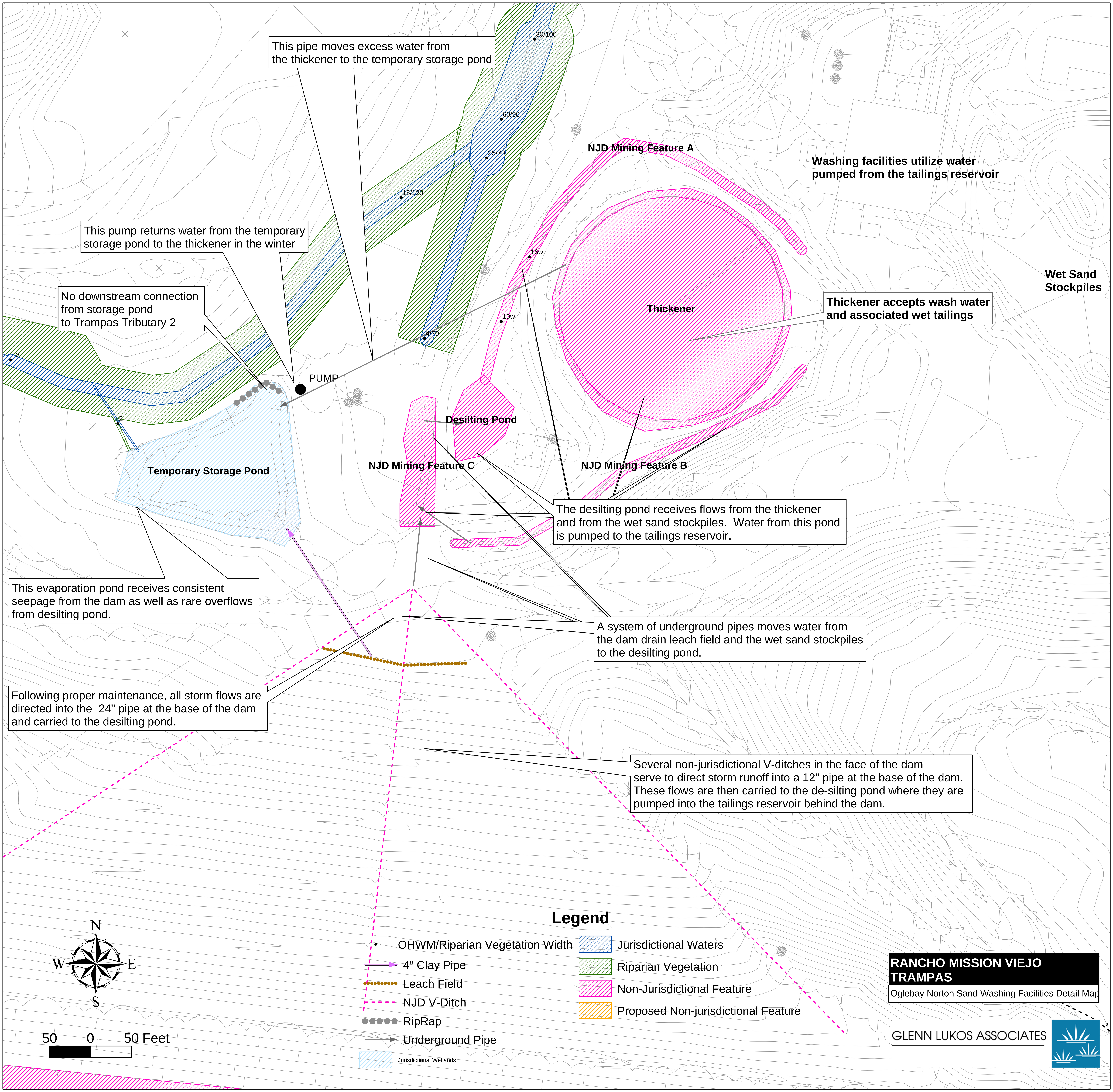
N
W E
S

0 200 400 800
Feet

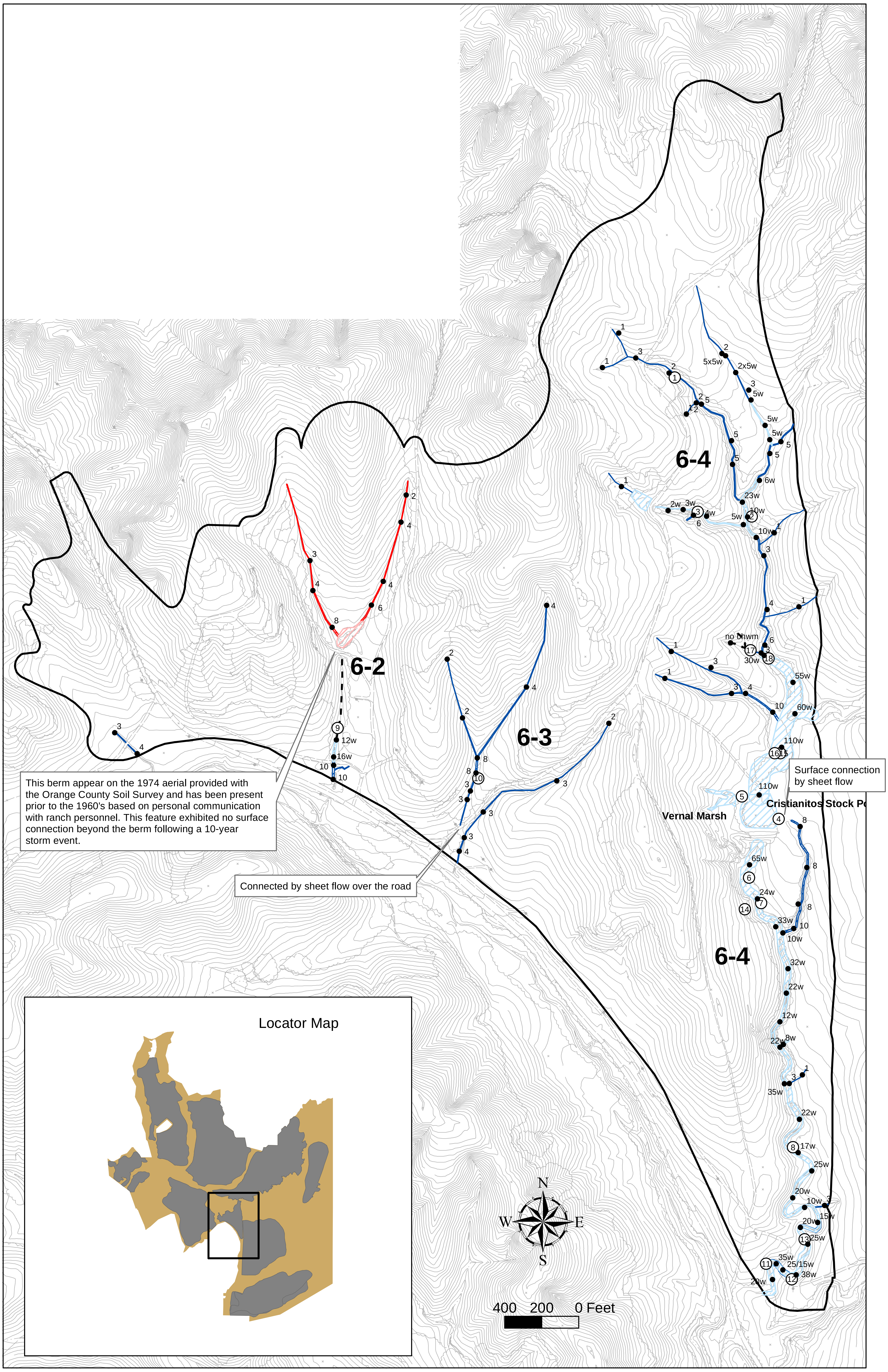
Legend

- Study Area Boundary
- Existing Ranch or Mining Roads
- OHWM ("w" indicates the presence of wetlands)
- Soil Pit Location
- corpsnoOHWM
- Jurisdictional Wetlands
- Isolated Wetlands
- Non-Jurisdictional Feature
- Isolated Waters
- Jurisdictional Waters
- 4" Clay Pipe
- Leach Field
- NJD V-Ditch
- RipRap
- Underground Pipe

c://GIS PROJECTS/239-15SAMP/PA5/PA5corps041804.mxd April 18, 2004



C;GIS PROJECTS/239-15SAMP/PA5/detail041804.mxd April 18, 2004



RANCHO MISSION VIEJO
CHRISTIANITOS MEADOWS

Jurisdictional Delineation Map (Corps)

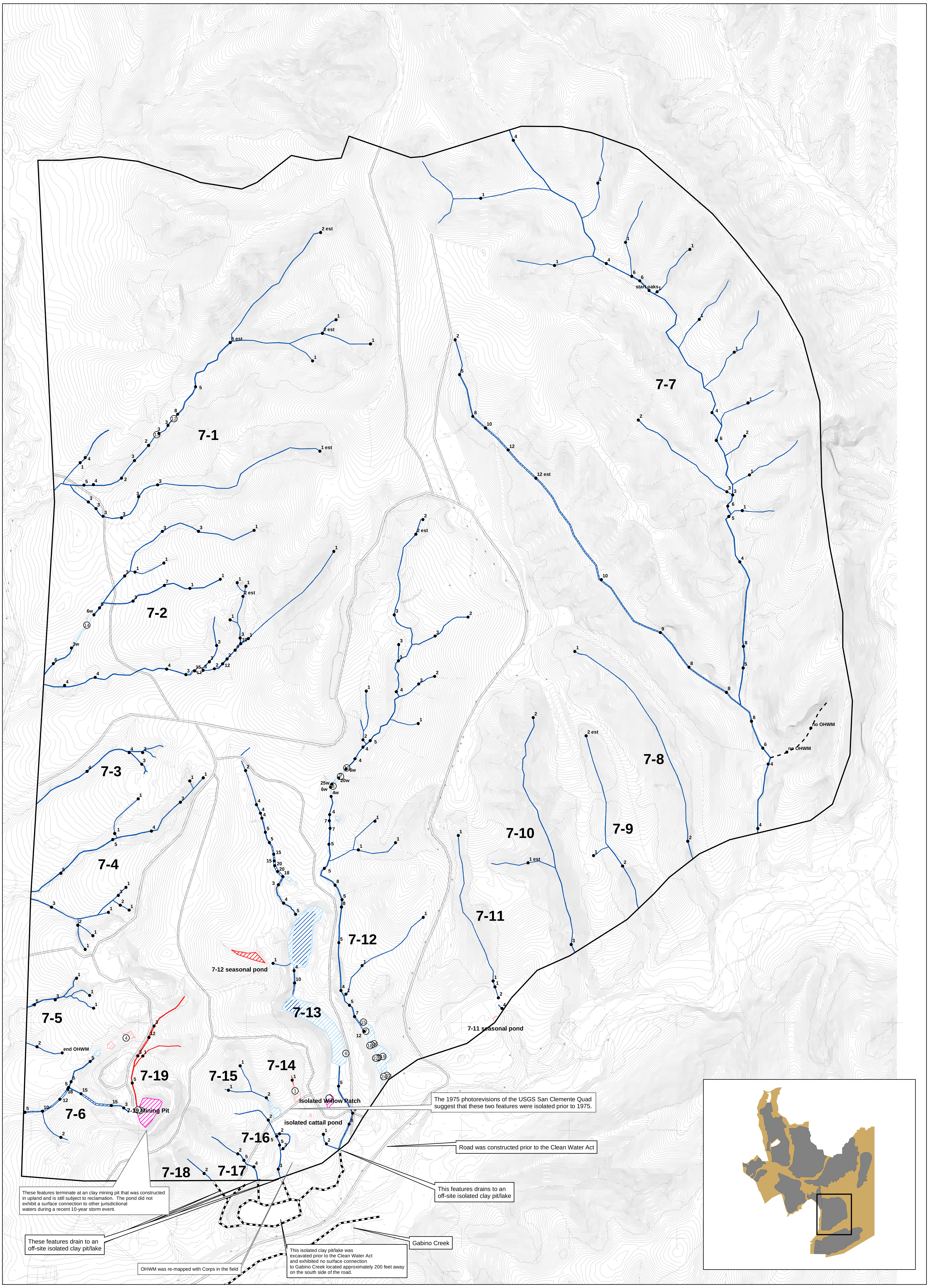
GLENN LUKOS ASSOCIATES

FINAL DRAFT
Supercedes version dated July 2003

Legend

- Study Area Boundary
- Width of OHWM ("w" indicates the presence of wetland)
- Soil Pit Location
- No OHWM
- Jurisdictional Wetlands
- Jurisdictional Waters
- Isolated Wetlands
- Isolated Waters

c://GIS PROJECTS/239-15SAMP/PA6/PA6Corps.mxd October 29, 2003



RANCHO MISSION VIEJO
CRISTIANITOS CANYON

Jurisdictional Delineation Map (Corps)

GLENN LUKOS ASSOCIATES

FINAL REVISION
Supercedes version dateed October 29, 2003

N W E S

400 200 0 Feet

Legend

- Study Area Boundary
- Exisiting or Abandoned Roads
- Width of OHWM ("w" indicates the presence of wetlands)
- Soil Pit Location
- No OHWM, bed or bank
- Jurisdictional Wetlands
- Jurisdictional Waters
- Isolated Wetlands
- Isolated Waters
- Non-Jurisdictional Feature
- Off-Site Features
- No OHWM

C://GIS PROJECTS/239-15SAMP/PA7/PA7Corpsfinal.mxd February 18, 2004

Locator Map
8-1
8-2
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8-20
8-21
8-22
8-23
8-24a
8-24b
8-25
8-26
8-27
8-28
8-29
8-30
8-31
8-32
8-33
8-34
Blind Canyon
Blind Canyon
Blind Canyon
Stock Pond/Impoundment
isolated seasonal pond
no OHWM
Legend
Study Area Boundary
Width of OHWM ("w" indicates the presence of wetlands)
Soil Pit Locations
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Rancho Mission Viejo
TRW
Jurisdictional Delineation Map (Corps)
400 200 0 Feet
GLENN LUKOS ASSOCIATES
FINAL DRAFT
Supercedes versions dated July 2003
c://GIS PROJECTS/239-15SAMP/PA8/delineation/
PA8/PA8corpsfinal.mxd
March 23, 2004

c://GIS PROJECTS/239-15SAMP/PA9/PA9corps.mxd Octoer 29, 2003

RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Key Map

GLENN LUKOS ASSOCIATES

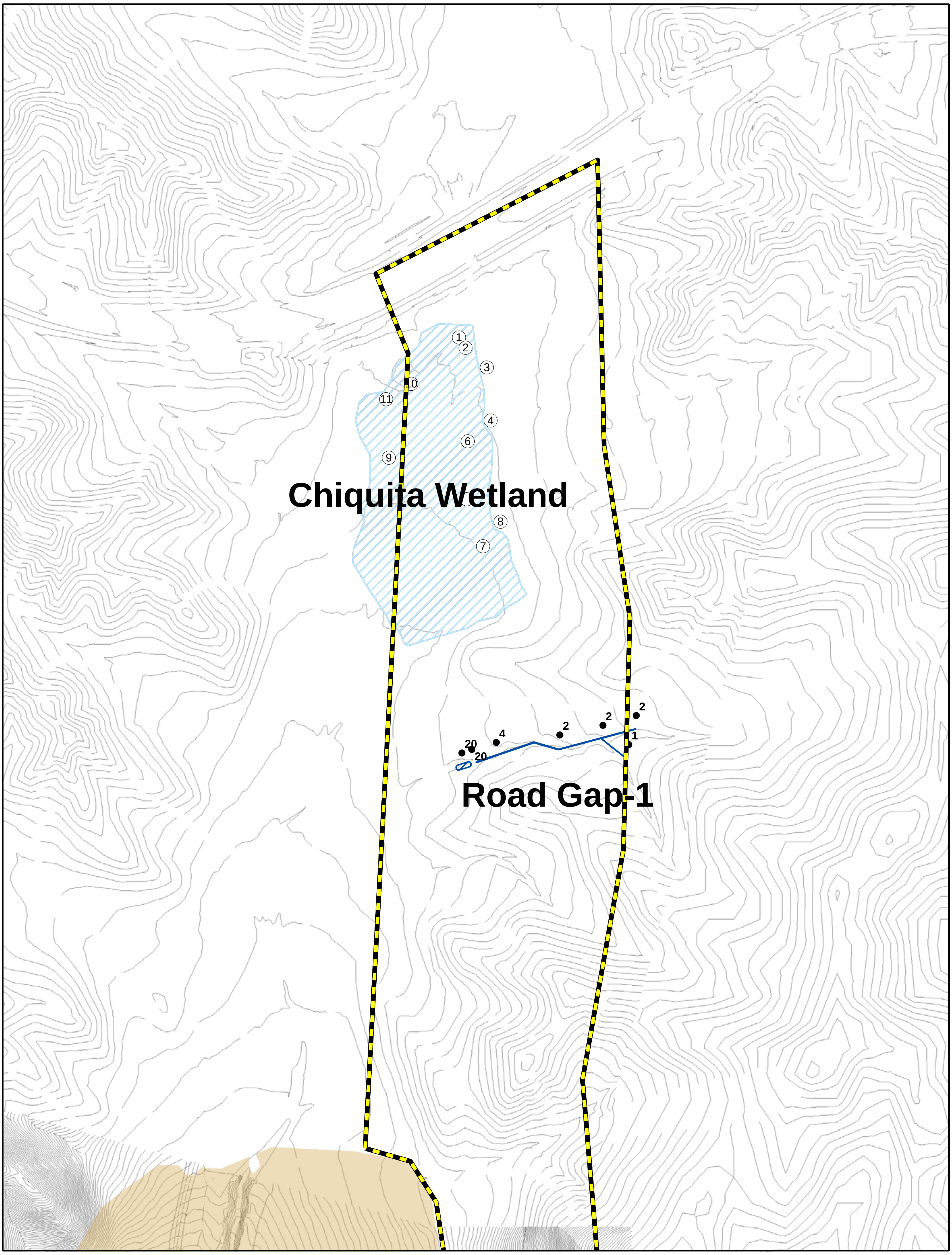
Legend

Conceptual Road Alignments

Study Area Boundaries

Property Boundary

This gap analysis was based on the conceptual road alignments above, which have not yet been subject to final engineereing.



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 1

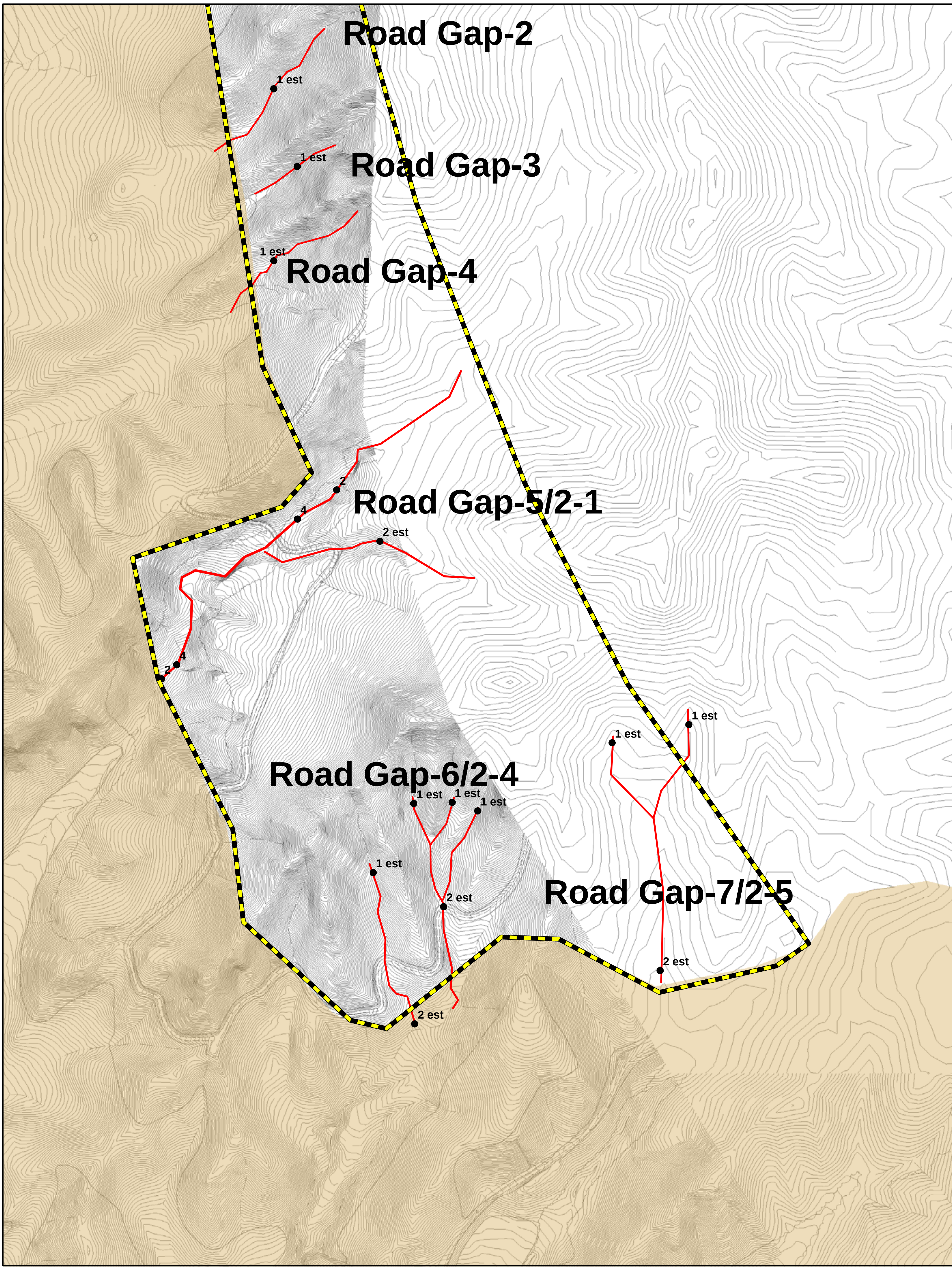
GLENN LUKOS ASSOCIATES

N

400 0 Feet

- Study Area Boundaries
- Soil Pit Location
- Width of OHWM ("w" indicates the presence of wetland)
- No OHWM, bed or bank
- Jurisdictional Wetlands
- Jurisdictional Waters
- Isolated Wetlands
- Isolated Waters
- Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 2

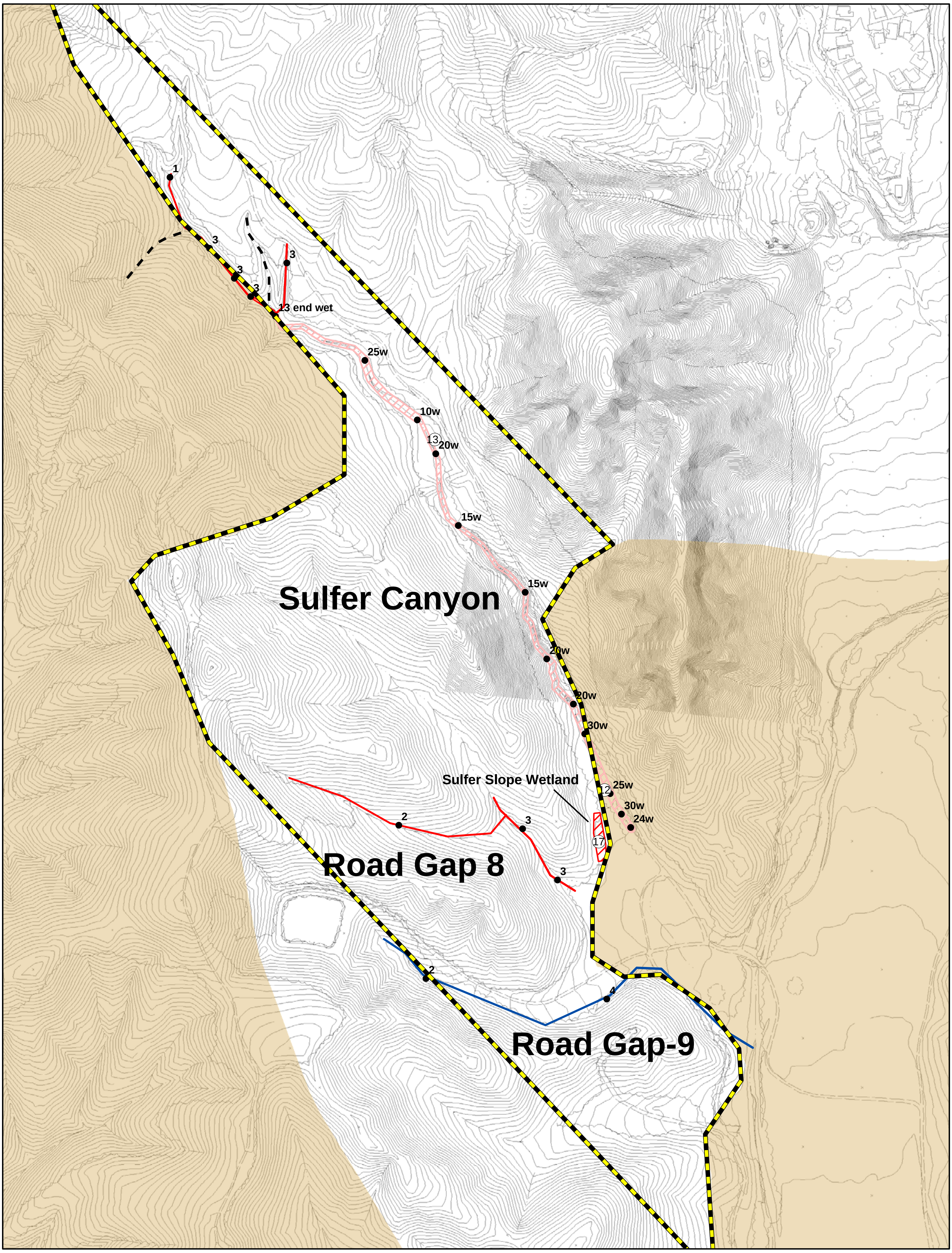
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 3

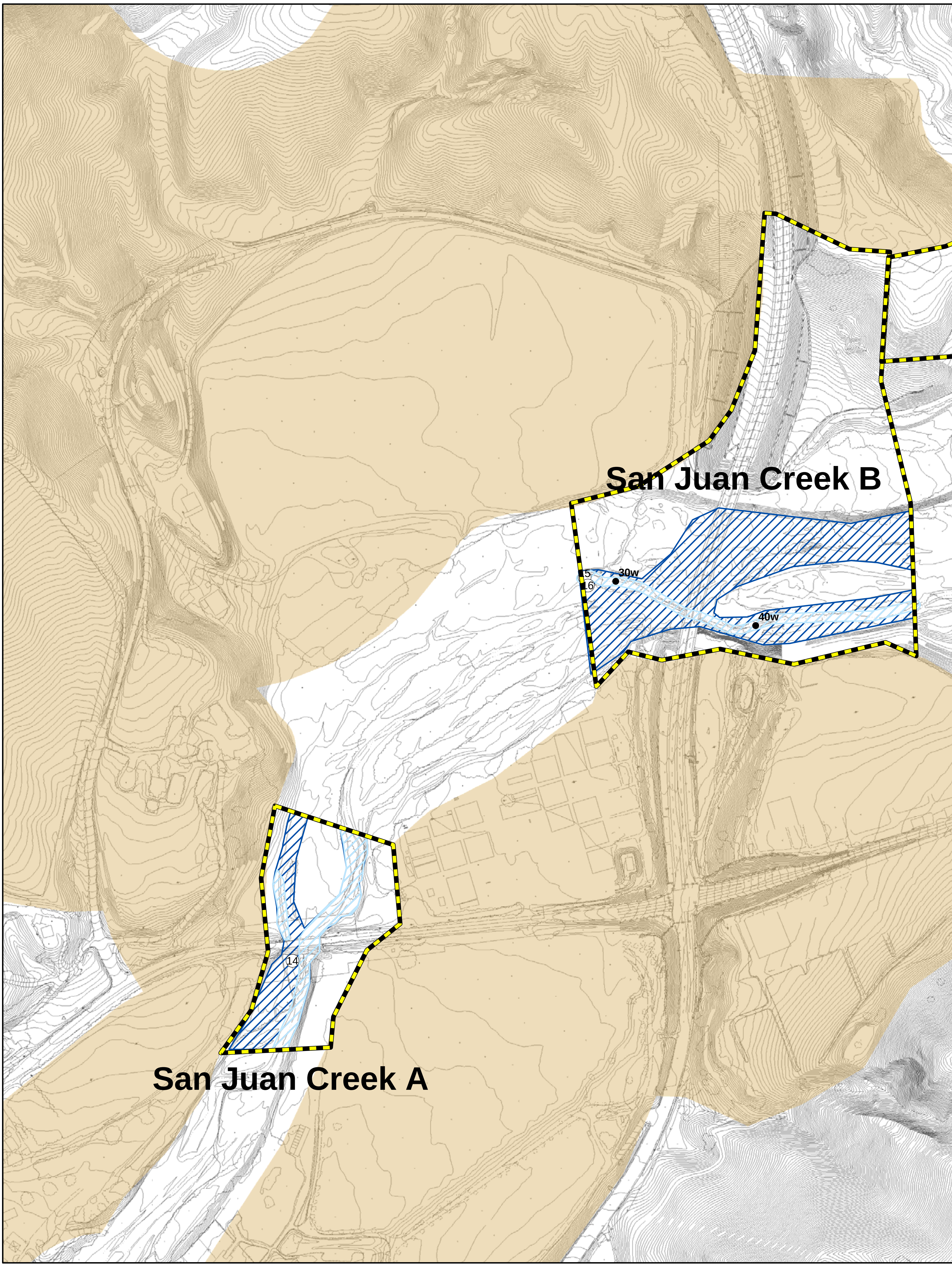
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



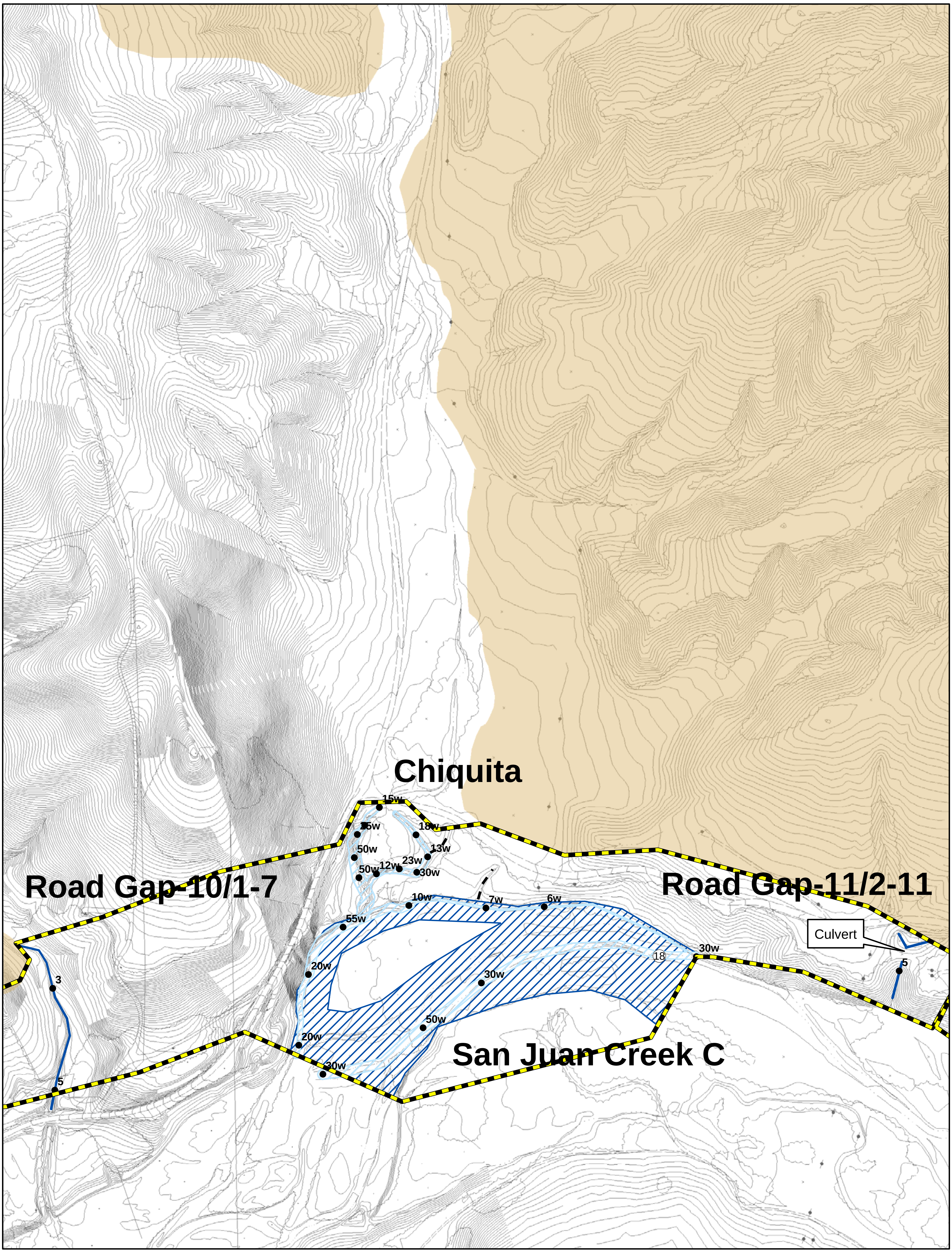
RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 4

GLENN LUKOS ASSOCIATES

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 5

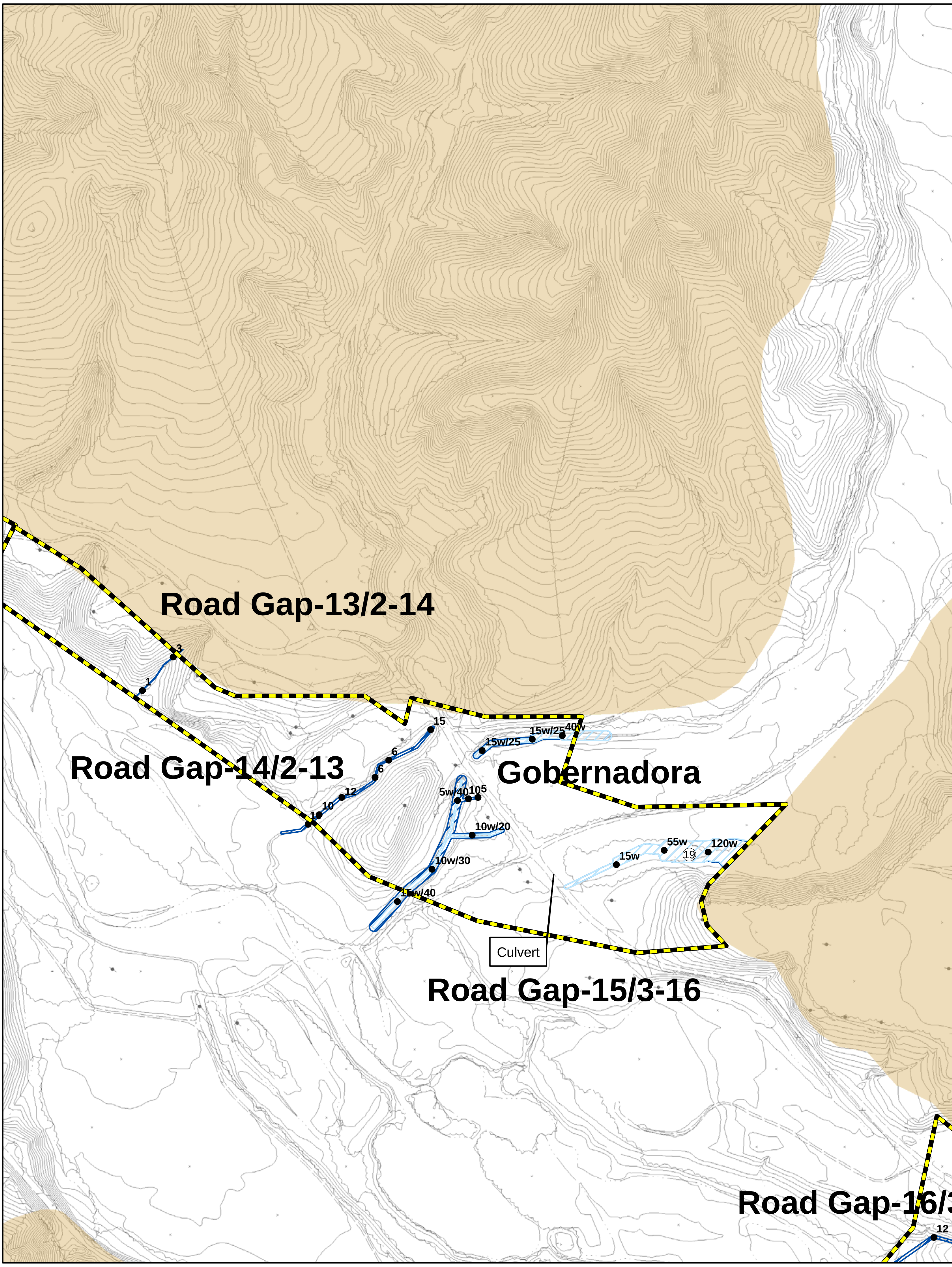
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 6

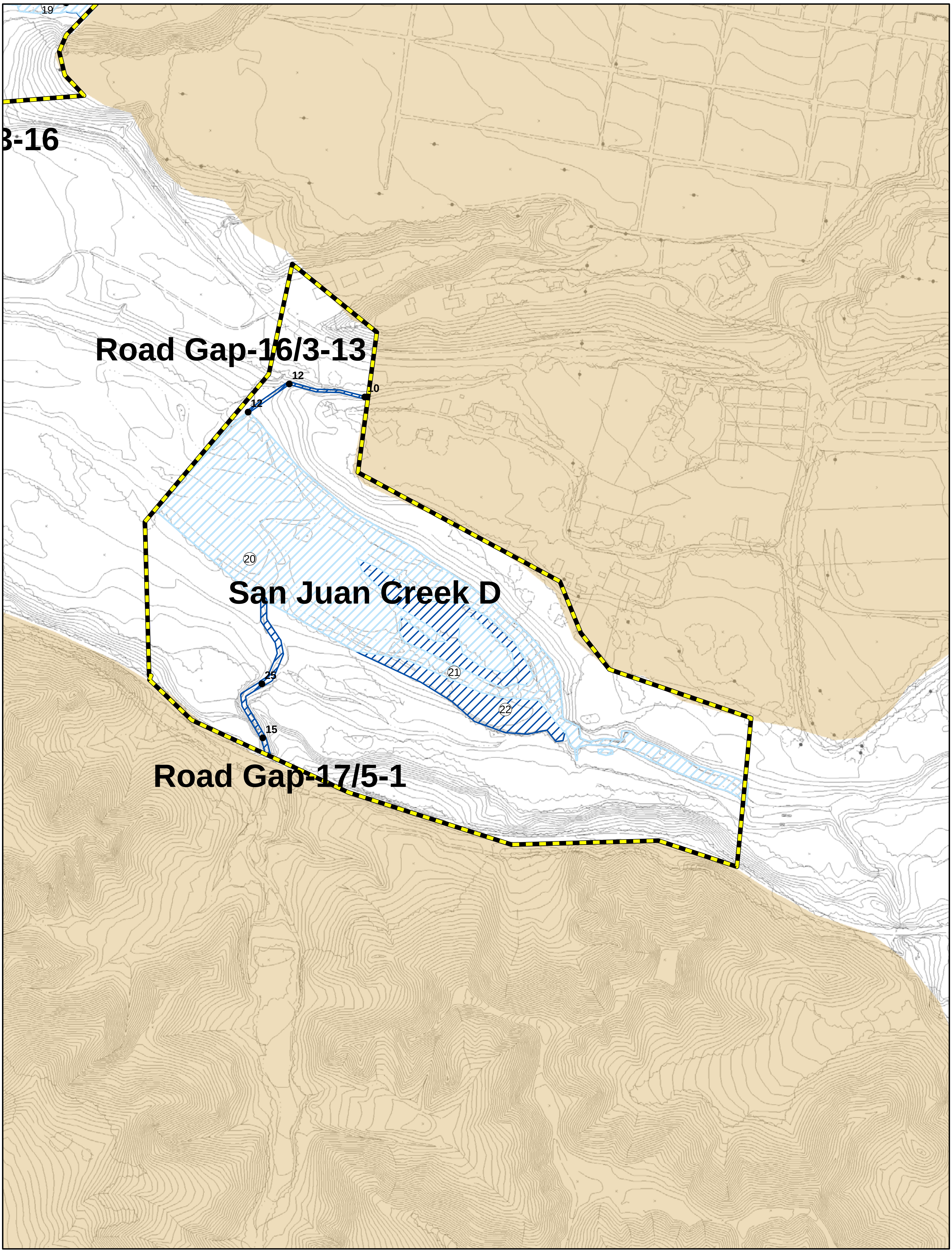
GLENN LUKOS ASSOCIATES

N

400 0 Feet

- Study Area Boundaries
- Soil Pit Location
- Width of OHWM ("w" indicates the presence of wetland)
- No OHWM, bed or bank
- Jurisdictional Wetlands
- Jurisdictional Waters
- Isolated Wetlands
- Isolated Waters
- Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 7

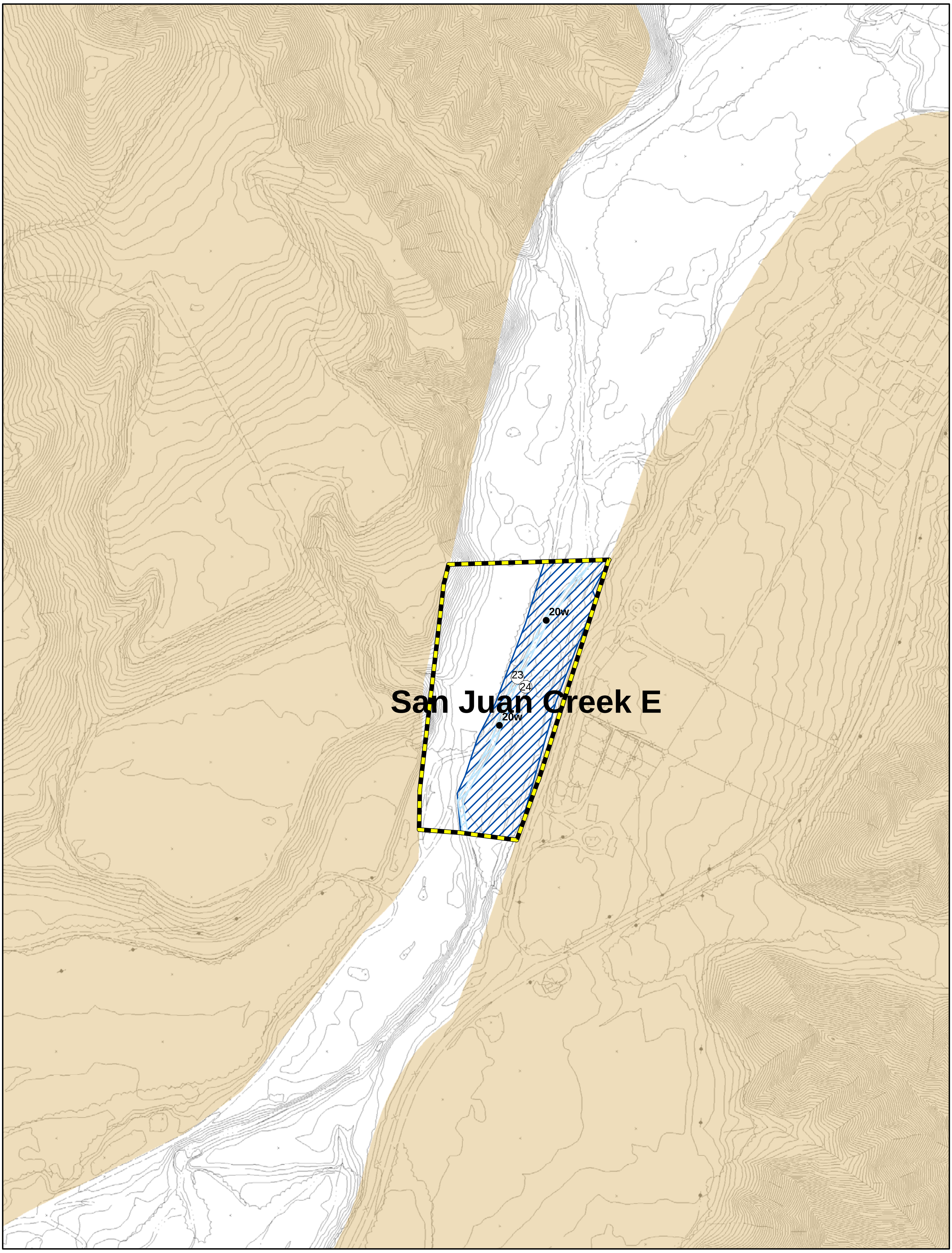
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 8

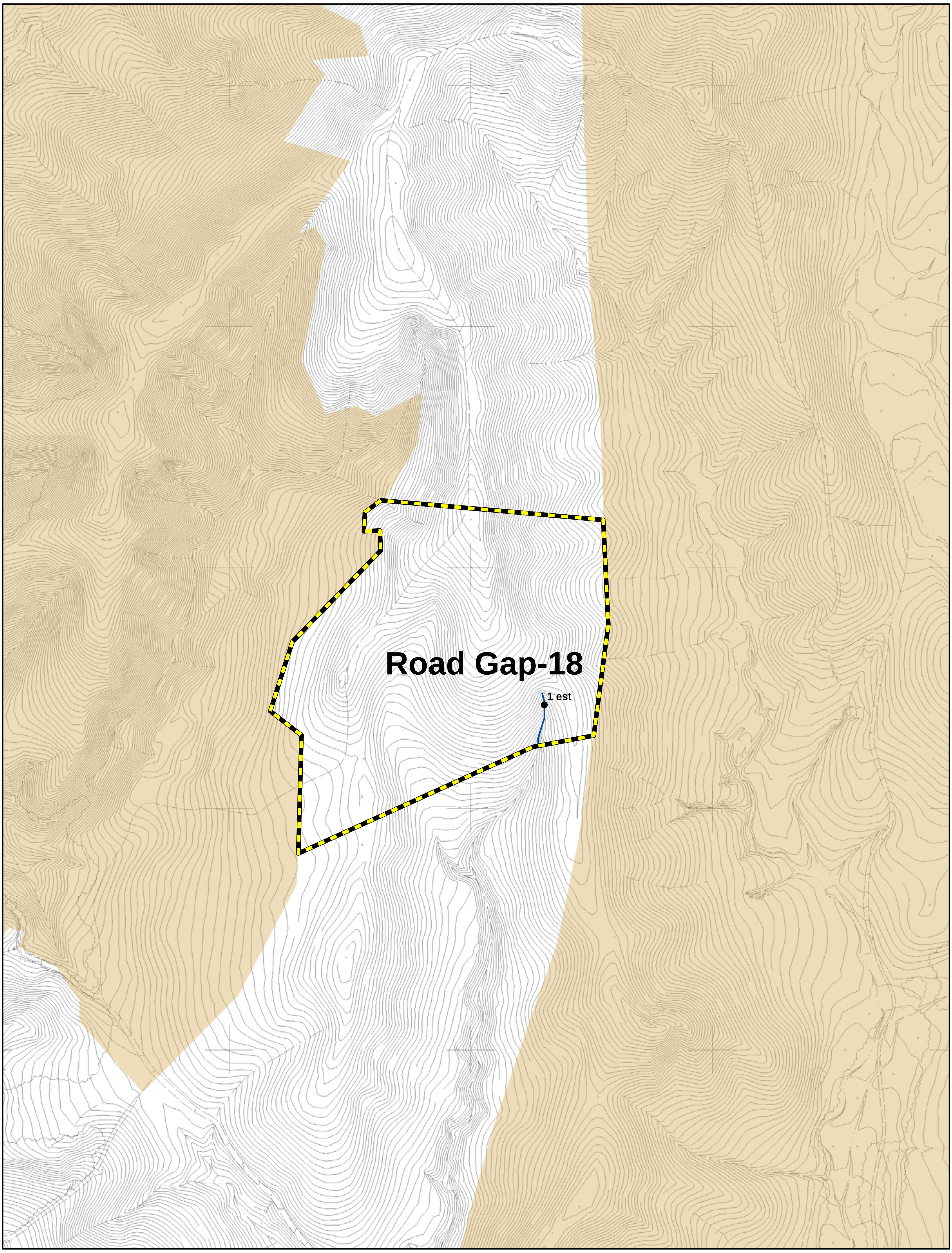
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

RANCHO MISSION VIEJO ROAD GAP ANALYSIS

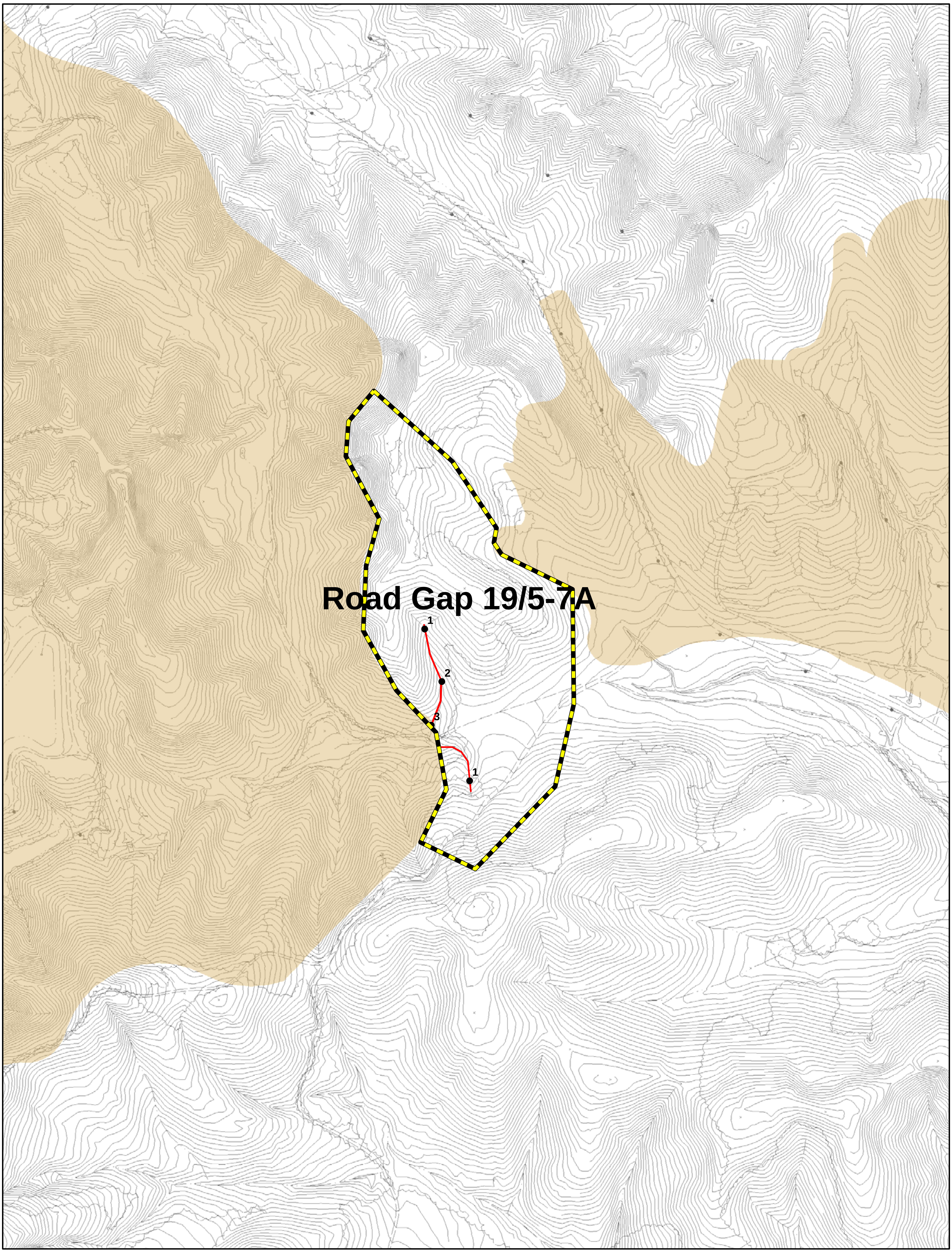
Jurisdictional Delineation Map (Corps) Sheet 9

GLENN LUKOS ASSOCIATES

N

400 0 Feet

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 10

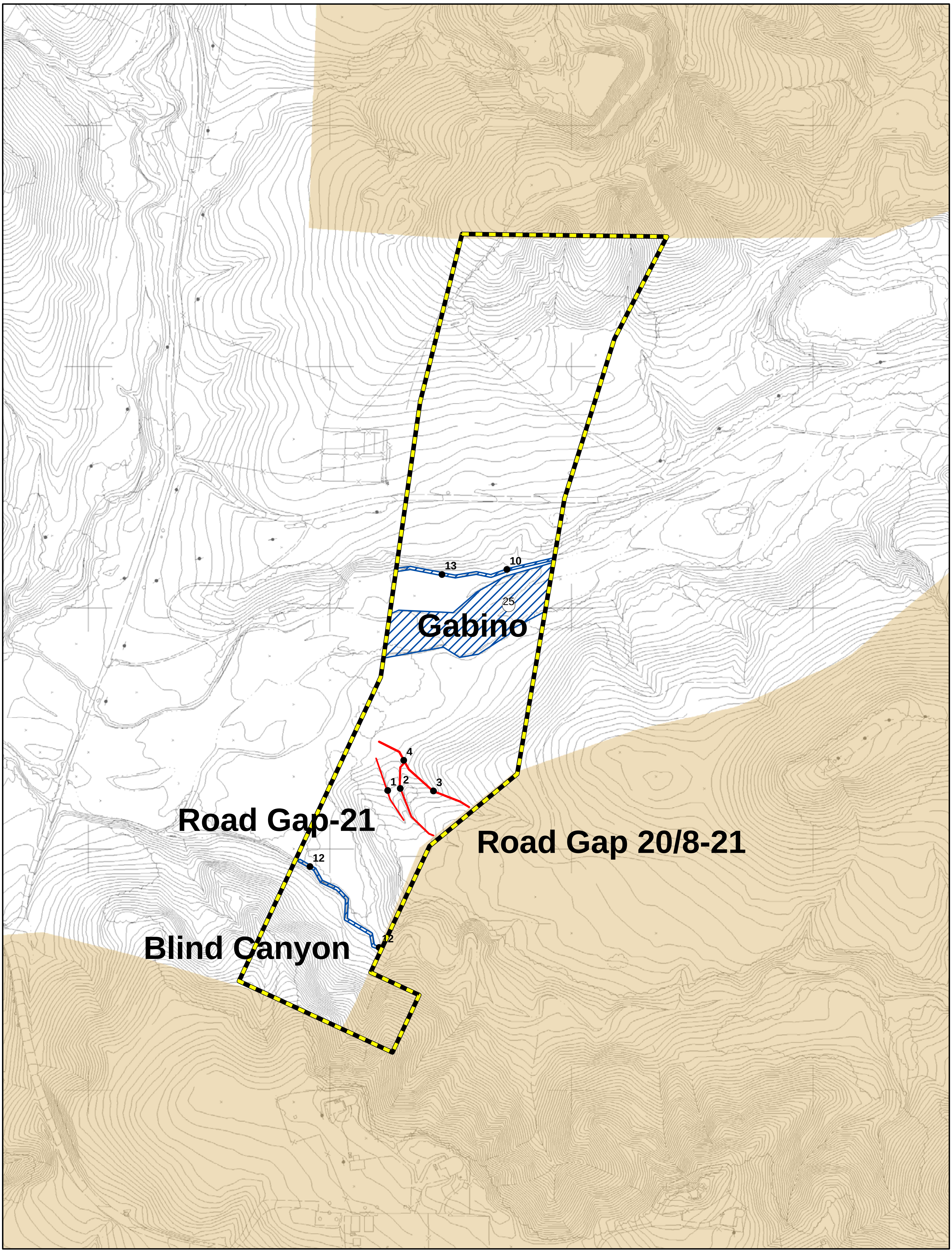
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 11

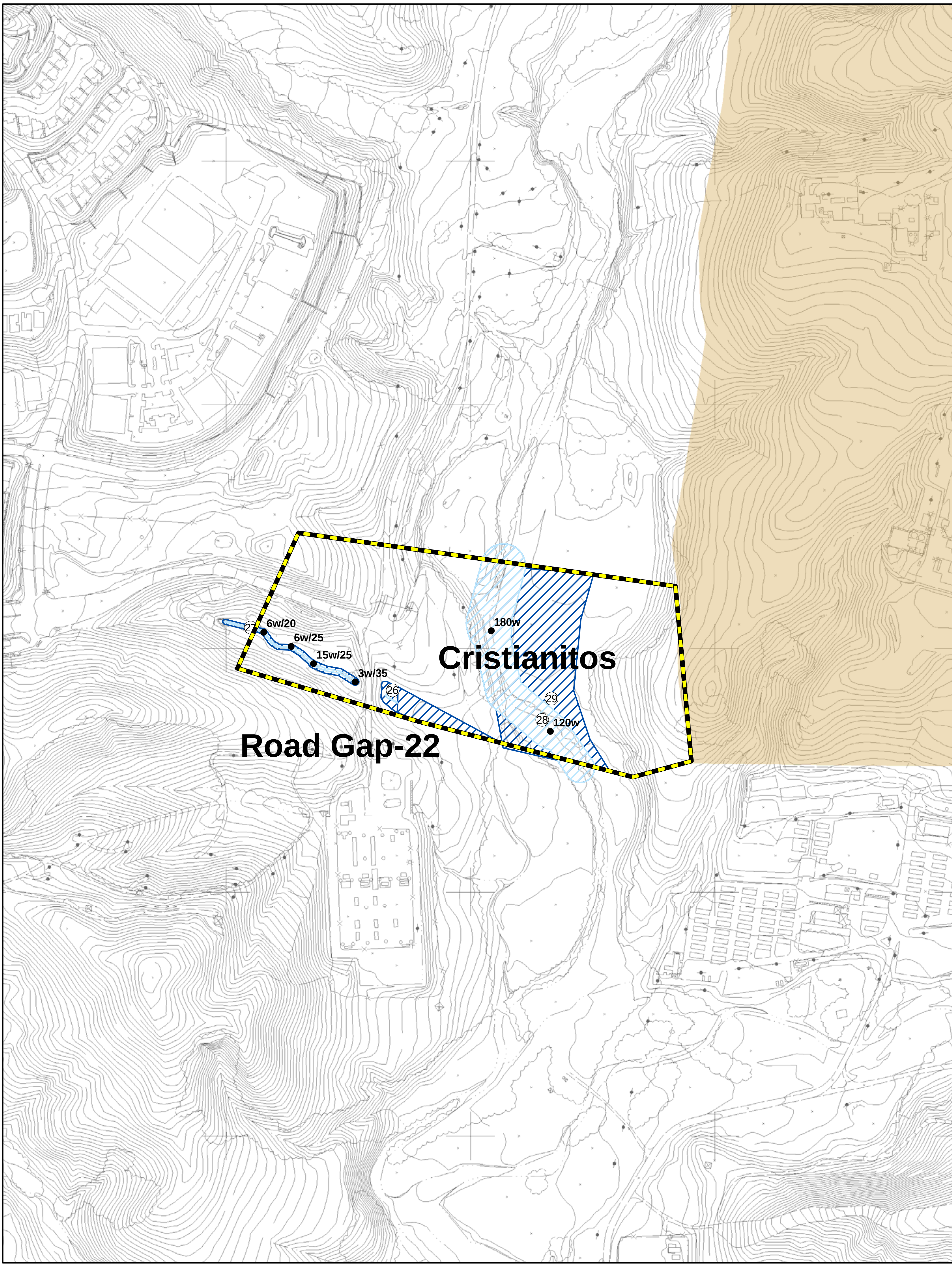
GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003



RANCHO MISSION VIEJO
ROAD GAP ANALYSIS

Jurisdictional Delineation Map (Corps) Sheet 12

GLENN LUKOS ASSOCIATES

N

400 0 Feet

Study Area Boundaries
Soil Pit Location
Width of OHWM ("w" indicates the presence of wetland)
No OHWM, bed or bank
Jurisdictional Wetlands
Jurisdictional Waters
Isolated Wetlands
Isolated Waters
Planning Area (see Study Area Maps)

c: GIS PROJECTS/239-15SAMP/roadgapscorps.mxd November 9, 2003

APPENDIX A
Delineation and Verification Site Visit Dates

Type	Month and Year	Individual Dates
Delineation	October 2002	29, 30, 31
Delineation	November 2003	1, 4, 7, 11, 12, 14, 21, 25, 26
Delineation	December 2002	6, 16
Delineation	January 2003	15
Delineation	February 2003	19, 21, 24, 27
Delineation	March 2003	3, 5, 6, 8, 21, 24, 26
Delineation	April 2003	1, 8, 16, 22, 23, 24, 25, 28
Delineation	May 2003	1, 2, 13, 22, 23
Delineation	June 2003	2, 5, 9, 11, 12, 13, 26, 27
Delineation	July 2003	9, 10, 11, 14
Delineation	October 2003	6, 7, 17
Delineation	November 2003	5
Verification	March 2003	11, 14, 19
Verification	April 2003	1, 11, 29, 30
Verification	May 2003	21, 23
Verification	June 2003	18, 25
Verification	July 2003	2, 3, 8, 9, 14, 22, 23, 30, 31
Verification	August 2003	6, 15
Verification	October 2003	27

APPENDIX A

WETLAND DATA SHEETS ARE AVAILABLE FROM:

GLENN LUKOS ASSOCIATES
29 ORCHARD
LAKE FOREST, CA 92630
(949) 837-0404

November 14, 2003

Laura Coley Eisenberg
Rancho Mission Viejo
P.O. Box 9
San Juan Capistrano, CA 92693

SUBJECT: Graphical Peak Discharge Report, Trampas Dam Watershed, Rancho Mission Viejo, Orange County, California.

Dear Ms. Coley Eisenberg:

Glenn Lukos Associates (GLA) is currently assisting Rancho Mission Viejo (RMV) in preparing a jurisdictional delineation in support of the Special Area Management Plan/Master Streambed Alteration Agreement (SAMP/MSAA) that RMV is preparing in consultation with the U.S. Army Corps of Engineers (Corps) and California Department of Fish and Game (CDFG). The jurisdictional delineation covers all areas identified by the SAMP/MSAA alternatives as potentially developable. A development bubble (Planning Area 5) has been identified in the Trampas sub-basin. Currently Oglebay Norton Industrial Sands (ONIS) is located in this sub-basin, and conducts a sand mining operation on a portion of the sub-basin. Trampas Dam was constructed in 1975, prior to the July 1, 1977 phase-in-date for Section 404 permits for ephemeral tributaries, to support mining operations within this sub-basin. Water used in the sand processing operation, along with the tailings generated by the processing operation, are stored behind the dam. Since construction of the dam isolated all of the area above the dam from downstream jurisdictional waters prior to regulation under the Clean Water Act, the dam does not represent an impoundment of waters of the United States. It is therefore the position of RMV and GLA that the Tailings Pond/Recycle Area behind Trampas Canyon Dam is not subject to Corps jurisdiction as it is isolated pursuant to the recent Supreme Court decision in *Solid Waste Agency of Northernn Cook County v. United States Army Corps of Engineers et al* (SWANCC).

To date, the Corps has not concurred with this position and, during a review of the Tailings Pond/Recycle Area suggested that most effective way to evaluate the post-mining condition would be to “turn off the water”. The analysis summarized in this letter report was performed to respond to the Corps request and models the amount of U.S. Army Corps of Engineers (Corps) and California Department of Fish and Game (CDFG) jurisdiction for the Tailings Pond/Recycle Area in the post mining condition when all artificial water subsidies associated with current mining practices are withdrawn (It is not possible to literally “turn off the water” as the mining operator has a lease with RMV and is expected to continue mining until 2013).

Rather than turning off the water supply, a regulatory specialist/hydrologist GLA conducted an analysis of the amount of water that could potentially accumulate in the "Tailings Pond/Water Recycling Area" under natural hydrological conditions (i.e., with no artificial irrigation provided by the mining operation). As noted, in 1975, the Trampas Dam was constructed in such a manner that it isolated Trampas Canyon Creek and its ephemeral tributaries. It is important to note that prior to construction of the dam, GLA has determined (based on a Corps-verified delineation of upstream and downstream drainages) that the amount of ephemeral drainage channels isolated behind the dam was between 0.8 and 1.2 acres with no wetlands. In the post-mining condition, sufficient hydrology would exist, at the site under natural conditions (i.e., no irrigation subsidies) to support between 5 and 6 acres of hydrophytic vegetation, which would be isolated and not subject to Corps jurisdiction.

The watershed of the Trampas Canyon Dam (Dam) is located in Orange County [Exhibit 1] and covers approximately 362.6 acres of which 71.1 acres is open water or mine tailings [Exhibit 2].

I. METHODOLOGY

The most widely used rainfall-runoff model for routine design purposes in the United States is the SCS method, which was developed by the U.S. Soil Conservation Service (now the U.S. Natural Resources Conservation Service, NRCS). Technical Release 55 (TR-55) presents simplified procedures for estimating runoff and peak discharges in small watersheds. To save time, the procedures in TR-55 are simplified by assumptions, approximations and generalizations about certain parameters, which can provide results that are less refined than more detailed methods.[1] Runoff is determined primarily by the amount of precipitation and by infiltration characteristics related to soil type, soil moisture, antecedent rainfall, cover type, impervious surfaces and surface retention. Travel time is determined using slope, length of flow path, depth of flow, and roughness of flow surfaces. Peak discharges are based on the relationship of these parameters and on the total drainage area of the watershed, the effect of any natural or man-made storage, and the distribution of rainfall during a given storm event. A peak discharge was calculated for the watershed surrounding the Trampas Canyon Dam. The amount of water that would be impounded by the Tailings Pond and Recycle Area was calculated using the Rational Method, which will be discussed below.

[1] Wildermuth Environmental has, on a preliminary basis, conducted more detailed modeling of the Tailings Pond, that reduces the estimated watershed runoff (as set forth using the TR-55 methodology) from approximately 43.5 acre feet to between 25 and 30 acre feet. The more conservative number of 43.5 acre feet is incorporated into this analysis because the Wildermuth report has not yet been completed; however, upon its completion, it is expected to reduce the watershed runoff totals.

In order to determine the amount of wetland habitat that could be sustained in the post-mining condition, it was also necessary to calculate the amount of water that is required by native hydrophytes such as southern cattail (*Typha domingensis*) and California bulrush (*Scirpus californicus*). Water use data for vegetation was obtained from *Bulletin No. 50:Use of Water by Native Vegetation.*[2], Bulletin No. 50, State of California, Department of Public

A. Estimating Runoff

The Soil Conservation Service uses the Runoff Curve Number (CN) method to estimate runoff from storm rainfall. SCS runoff equation is:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

where Q = runoff (in)
P = rainfall (in)
S = potential maximum retention after runoff begins (in) and
I_a = initial abstraction

Initial Abstraction (I_a)

Initial abstraction is all losses before runoff begins. It includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration. I_a is highly variable and is correlated with soil and cover parameters. I_a is approximated in this method by the following empirical equation:

$$I_a = 0.2S$$

Substituting 0.2S for I_a in the runoff equation gives:

$$Q = \frac{(P - 0.2S)^2}{(P - 0.2S) + S}$$

S is related to the soil and cover conditions of the watershed through CN by:

[2] State of California, Department of public Works, Division of Water Resources. 1942. *Bulletin No. 50: Use of Water by Native Vegetation*, 160pp.

$$S = \frac{1000}{CN} - 10$$

Determination of CN depends on the soil and cover conditions of the watershed. Hydrologic soil group (HSG), cover type, treatment, hydrologic condition and antecedent runoff coefficient (ARC) are the five parameters analyzed to represent the soil and cover conditions.

Hydrologic Soil Groups (HSG)

Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting [Exhibit 3]. Soils in Group A have the lowest runoff potential and the highest infiltration rates, while Group D soils exhibit opposite characteristics.

The Soil Conservation Service (SCS) soil survey of the Orange County and Western Riverside Counties (1978) identified the soils in the area of interest. Table 1 lists each of the soil types located in the general vicinity of the study area along with their HSG classification and their watershed composition percentage.

Table 1. Soil Types and HSG Classifications for Watershed

Soil Type	*HSG Classification*	*Composition of Watershed*
Bosanko Clay (128)	Group D	25%
Cieneba Sandy Loam (142)	Group C	60%
Soper Gravelly Loam (202)	Group C	15%

Cover Type

Cover types address vegetation, bare soil and impervious surfaces of the study area. Field reconnaissance and aerial photographs were the methods used to determine the cover types. Arid and semiarid rangelands runoff curve numbers were used for this method [Exhibit 4].

Treatment

Treatment is a cover type modifier that is used to describe the management of cultivated agricultural lands. This is not applicable to the study area.

Hydrologic Condition

Hydrologic Condition indicates the effects of cover type on infiltration and runoff and is generally estimated from density of plant and residue cover on sample areas. Good hydrologic condition indicates that soil usually has a low runoff potential for that specific hydrologic soil group and cover type. Table 2 lists the cover type and hydrologic condition for each of the soils identified for the site.

Table 2. Cover Types and Hydrologic Conditions for Watershed

Soil Type	*Cover Type*	*Hydrologic Condition*
Bosanko Clay (128)	Oak-Aspen	Good
Cieneba Sandy Loam (142)	Oak-Aspen	Good
Soper Gravelly Loam (202)	Oak-Aspen	Good

Antecedent Runoff Condition (ARC)

The index of runoff potential before a storm event is the antecedent runoff condition. CN for the average ARC at a site is the median value as taken from sample rainfall and runoff data. Average runoff condition was assumed for this calculation.

Results

Table 3. Results from Runoff Calculations

Parameter	*Result*
Curve Number (CN)	43
Maximum Potential Retention After Runoff Begins (S)	13.26 in
Runoff (Q)	0.0024 in

Calculations for the runoff curve number and runoff for can be found on Worksheet 2 in Appendix A. The 2-year, 24-hour precipitation event was obtained from the NOAA Atlas 2.

Estimating Time of Concentration and Time of Travel

Travel time (T_t) is the time it takes water to travel from one location to another in a watershed. T_t is a component of time concentration (T_c), which is the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. T_c is computed by summing up all the travel times for consecutive components of the drainage conveyance system.

Time of travel and time of concentration is affected by surface roughness, channel shape, flow patterns, and slopes. Water moves through a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these. Sheet flow is flow over plane surfaces until it becomes shallow concentrated flow and then open channel flow. A detailed description of these types of flow along with the figure to determine average velocity for shallow concentrated flow is in Exhibit 5.

Table 4. Results from Time of Concentration and Travel Calculations

Flow Type	*Segment ID*	T_t
Sheet Flow	AB	0.21 hr
Shallow Concentrated Flow	BC	0.02 hr
Channel Flow	CD	0.02 hr
	T_c	**0.25 hr**

Calculations for the time of travel and time of concentration can be found on Worksheet 3 in Appendix A.

B. Graphical Peak Discharge Method

The graphical peak discharge method computes peak discharge from rural and urban areas. A detailed description of this method is in Exhibit 6, while the calculations can be found on Worksheet 4 in Appendix A.

Results

The peak discharge for the Trampas Dam watershed was determined to be 0.06 cubic feet per second (ft^3/s) or 43.5 af/yr.

C. Rational Method

To calculate the amount of water that will accumulate in the area behind the Dam through direct precipitation, a modified version of the Rational Method was applied.

$$Q = CIA$$

where: Q = peak discharge (ft^3/s)
C = runoff coefficient (dimensionless)
I = average available rainfall (ft/yr)
A = area (acres)

Average available rainfall (I) was calculated by subtracting the average monthly evaporation rates from the average monthly rainfall rates to determine the amount of rainfall that would remain in the Tailings Pond/Recycling Area (see Appendix B). Sulphur Creek Dam data was used because it is the closest recording station to Trampas Canyon Dam.

The peak discharge into the 71.1-acre area behind the dam, calculated from an average available rainfall of 3.58 inches with a runoff coefficient of 1.0 is 21.2 af/yr.

II. CONCLUSIONS/DISCUSSION

Under natural conditions, the area behind Trampas Dam will receive approximately 64.7 acre-feet of water in an average rainfall year including 43.5 acre-feet from the surrounding watershed and an additional 21.2 acres of "available" water from direct precipitation.

A. Overall Approach

In order to accurately determine the extent of hydrophytic vegetation in the post-mining condition, the following factors were considered/evaluated.

- Post-mining dry-out of the tailings;
- Hydrologic input from watershed runoff (provided in detail above);
- Hydrologic input from precipitation (provided in detail above);
- Water consumption by hydrophytic vegetation (amounts); and
- Water consumption by hydrophytic vegetation (seasonality)

B. Post-Mining Dryout of Tailings

Currently, water depths for areas occupied by cattails, which accounts for approximately 55 acres of the Tailings Pond, average less than two feet. Cattails and bulrush will use up to eight feet of water per year when it is available and require a minimum of about five feet of water seasonally to survive and persist on a site.[3] Cattails and bulrush exhibit winter dormancy with most of the water consumption occurring during the period from May to November. Cattails and bulrush are both shallow-rooted species with nearly all of root zone located in the upper two feet.

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[3] California bulrush grown in tanks will use up to 184 inches (15.3 feet) of water per year. In the field, under optimal hydrological conditions the actual water use is substantially less, varying between five and eight feet

Without water subsidies from the mining operation, essentially all of the water within the root zone of the cattails and bulrush would be depleted by the end of one growing season.[4]

While the Tailings Pond is drying out during the first year without water subsidies, the exposed substrate will quickly be colonized by propagules from non-native grasses and forbs that are found throughout the watershed of the Tailings Pond including wild oats (*Avena farua*, UPL), slender oats (*Avena barbata*, UPL), ripgut (*Bromus diandrus*, UPL), soft chess (*Bromus hordeaceus*, UPL), red brome (*Bromus madritensis rubens*, UPL), rattail fescue (*Vulpia myuros*, UPL), Italian ryegrass (*Lolium multiflorum*, UPL), black mustard (*Brassica nigra*, UPL), field mustard (*Brassica rapa*, UPL), wild radish (*Raphanus sativus*, UPL), tocalote (*Centaurea melitensis*, UPL) and three species of filaree (*Erodium* spp., UPL). These species, as a group, germinate during winter and early spring, consuming most available soil moisture by late spring or early summer, meaning that they are most active during the winter dormancy of the cattails and bulrush, substantially limiting soil moisture that might be available to any surviving wetland plants. Direct evaporation and evapotranspiration will consume most direct precipitation falling on the tailings such that water would be available in very limited amounts to wetland plant species.[5]

C. Input from Watershed Runoff

The hydrological model determined that a maximum of 43.5 acre-feet of water would reach the tailings during an average rainfall year.[6] Essentially all of the hydrological input from watershed runoff would occur during the rainy season, which is between October 15 and April 15. This runoff would reach the outer edges of the Tailings Pond, at points where the ephemeral drainages intersect the Tailings. Tailings at these locations would be shallowest and much of the water would be stored in the upper few feet, meaning that it would be available to whatever plants are growing at the discharge point. As noted above, substantial amounts of this water would be consumed by opportunistic spring annuals, which germinate as early as November or December (coincident with the first one to two inches of rainfall) and reach their peak growth during February and March (some species such as Italian Ryegrass geminate a little later and reach peak growth in March and April). The approximately 43.5 acre feet of runoff would generally be

[4] This includes surface water up to three feet and subsurface water at depths to three feet. Evaporation and transpiration combined could account for up to 12 feet of water loss in the first year if sufficient water supplies were available.
[5] According to Water Bulletin 50, native grasses and weeds will use between 10.0 and 15.5 inches of water per year and in most years will use all available soil moisture except in above-average rainfall years when limited amounts of water penetrate to below the root zone before the water is transpired.
[6] As noted in footnote 1 above, a more detailed analysis is expected to reduce the total to between 25 and 30 acre feet.

sufficient to support up to 7.0 acres of cattails, bulrush and other native and non-native hydrophytes. However, direct evaporation coupled with water consumption by spring annuals, which would germinate and reach maximum growth during the winter dormancy period exhibited by the cattails and bulrush, would reduce to amount of wetland vegetation to between 5.0 and 6.0 acres.[7]

D. **D. Input from Direct Precipitation**

During average rainfall years, approximately 75 acre-feet would fall on the area occupied by the mine tailings. Essentially all of the hydrological input from direct precipitation would occur during the rainy season, which is between October 15 and April 15, which as noted above coincides with the winter dormancy period of native hydrophytes and the germination and maximum growth period of non-native spring annual grasses and forbs. Evaporation rates exceed rainfall rates in all months except for February and March, leaving about 21 acre feet of available water. Up to 15 inches of water could be used by the weedy annual vegetation with the rest lost to evaporation leaving essentially no additional water to support wetland vegetation.

E. E. Summary/Conclusions

In the post-mining condition, the available surface and subsurface water in the Tailings Pond would be consumed by the existing hydrophytic vegetation, which exhibits high water consumption rates, beginning in late spring and continuing until late fall. Natural hydrologic input from storm runoff and direct precipitation would coincide with the germination and maximum growth period of the (mostly) non-native annual grasses and forbs expected to rapidly colonize the drying tailings. Available water for native hydrophytes would be a maximum of 30 and 35 acre feet which would be sufficient to allow persistence of between 5.0 and 6.0 acres of hydrophytic vegetation.

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[7] A reduction in the runoff from 43.5 to 25 to 30 acre feet would result in a reduction of potential wetland habitat to between approximately three and four acres.

If you have any questions about this letter report, please contact either Tony Bomkamp or Cherylee Sevilla at (949) 837-0404.

Sincerely,

GLENN LUKOS ASSOCIATES, INC.

Tony Bomkamp
Senior Biologist

s:0239-15TrampasDam2.rpt

Adapted from USGS Santa Ana Quadrangle

NORTH

SCALE IN MILES

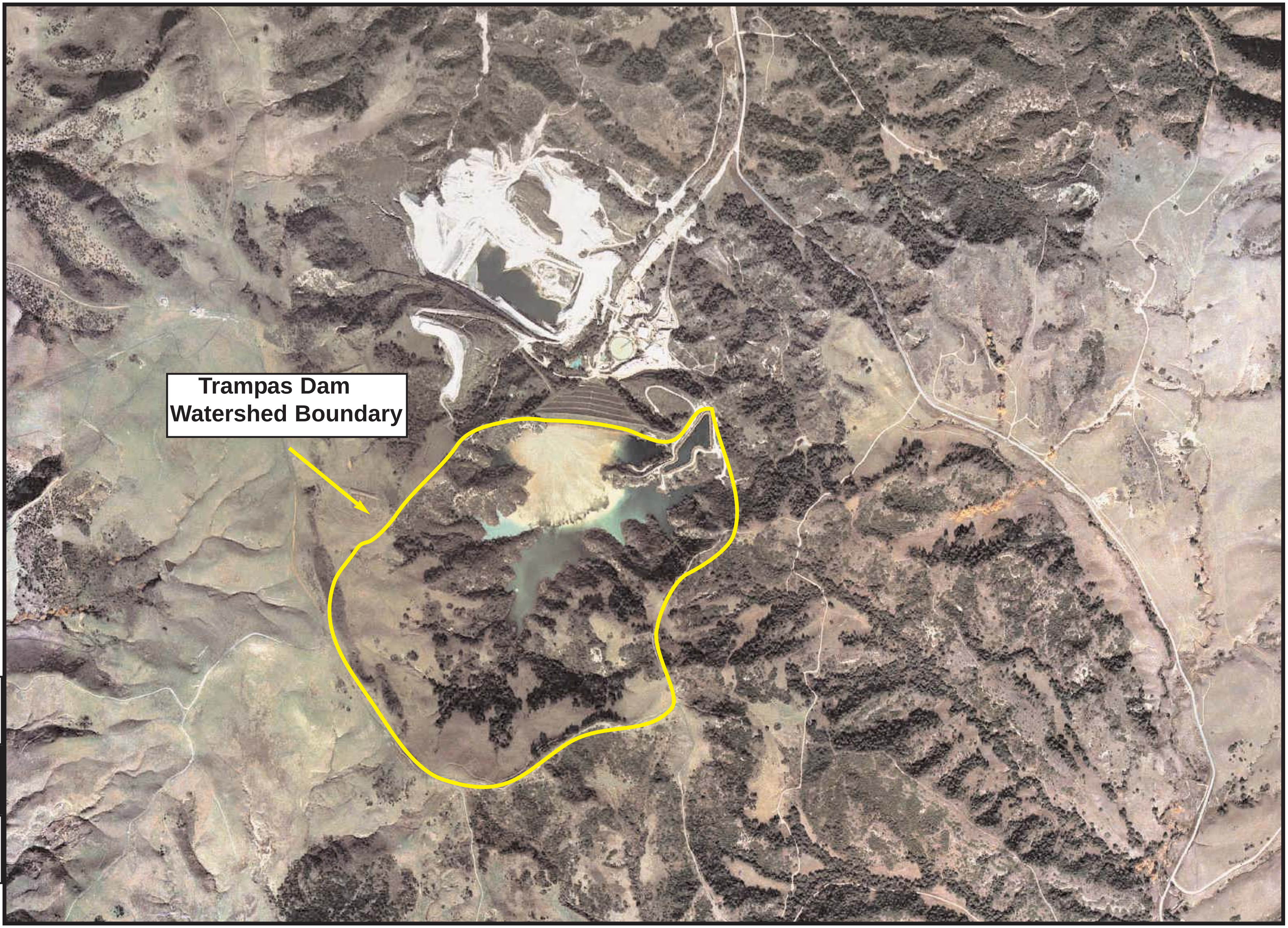
TRAMPAS CANYON DAM

Regional Map

GLENN LUKOS ASSOCIATES

EXHIBIT 1

Adapted from Rancho Mission Viejo Interactive Aerial Photograph GIS Index



TRAMPAS CANYON DAM

Watershed Boundary

GLENN LUKOS ASSOCIATES

EXHIBIT 2

Hydrologic Soil Groups

Soils are classified into hydrologic soil groups (HSG's) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSG's, which are A, B, C, and D, are one element used in determining runoff curve numbers (see chapter 2). For the convenience of TR-55 users, exhibit A-1 lists the HSG classification of United States soils.

The infiltration rate is the rate at which water enters the soil at the soil surface. It is controlled by surface conditions. HSG also indicates the transmission rate—the rate at which the water moves within the soil. This rate is controlled by the soil profile. Approximate numerical ranges for transmission rates shown in the HSG definitions were first published by Musgrave (USDA 1955). The four groups are defined by SCS soil scientists as follows:

Group Asoils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group Bsoils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Group Csoils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr).

Group Dsoils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr).

In exhibit A-1, some of the listed soils have an added modifier; for example, "Abrazo, gravelly." This refers to a gravelly phase of the Abrazo series that is found in SCS soil map legends.

Disturbed soil profiles

As a result of urbanization, the soil profile may be considerably altered and the listed group classification may no longer apply. In these circumstances, use the following to determine HSG according to the texture of the new surface soil, provided that significant compaction has not occurred (Brakensiek and Rawls 1983).

HSG	*Soil textures*
A	Sand, loamy sand, or sandy loam
B	Silt loam or loam
C	Sandy clay loam
D	Clay loam, silty clay loam, sandy clay, silty clay, or clay

Drainage and group D soils

Some soils in the list are in group D because of a high water table that creates a drainage problem. Once these soils are effectively drained, they are placed in a different group. For example, Ackerman soil is classified as A/D. This indicates that the drained Ackerman soil is in group A and the undrained soil is in group D.

Chapter 4 Graphical Peak Discharge Method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation—Hydrology" (SCS 1983). The peak discharge equation used is:

$$q_p = q_u A_m Q F_p \qquad \text{[eq. 4-1]}$$

where:

q_p = peak discharge (cfs)
q_u = unit peak discharge (csm/in)
A_m = drainage area (mi^2)
Q = runoff (in)
F_p = pond and swamp adjustment factor

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a / P is then computed.

If the computed I_a / P ratio is outside the range in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a / P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a / P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

Figure 4-1 Variation of I_a / P for P and CN

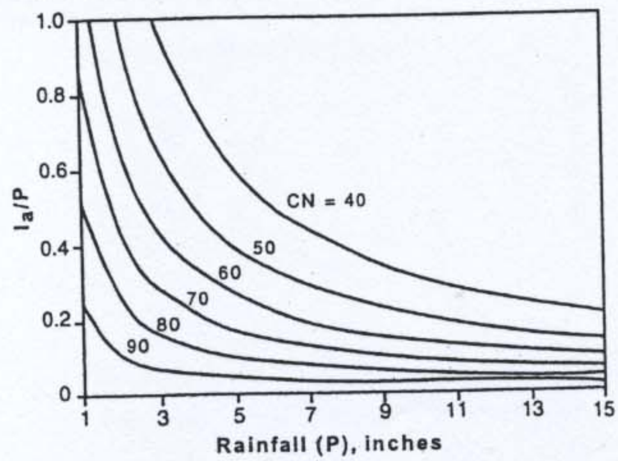


Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Table 2-2d Runoff curve numbers for arid and semiarid rangelands [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition [2]	A [3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

1 Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.
2 Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover.
Good: > 70% ground cover.
3 Curve numbers for group A have been developed only for desert shrub.

Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

Table 3-1 Roughness coefficients (Manning's n) for sheet flow

Surface description	n [1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses [2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

1 The n values are a composite of information compiled by Engman (1986).
2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
3 When selecting n , consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overtop and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} s^{0.4}} \qquad \text{[eq. 3-3]}$$

where:

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Shallow concentrated flow

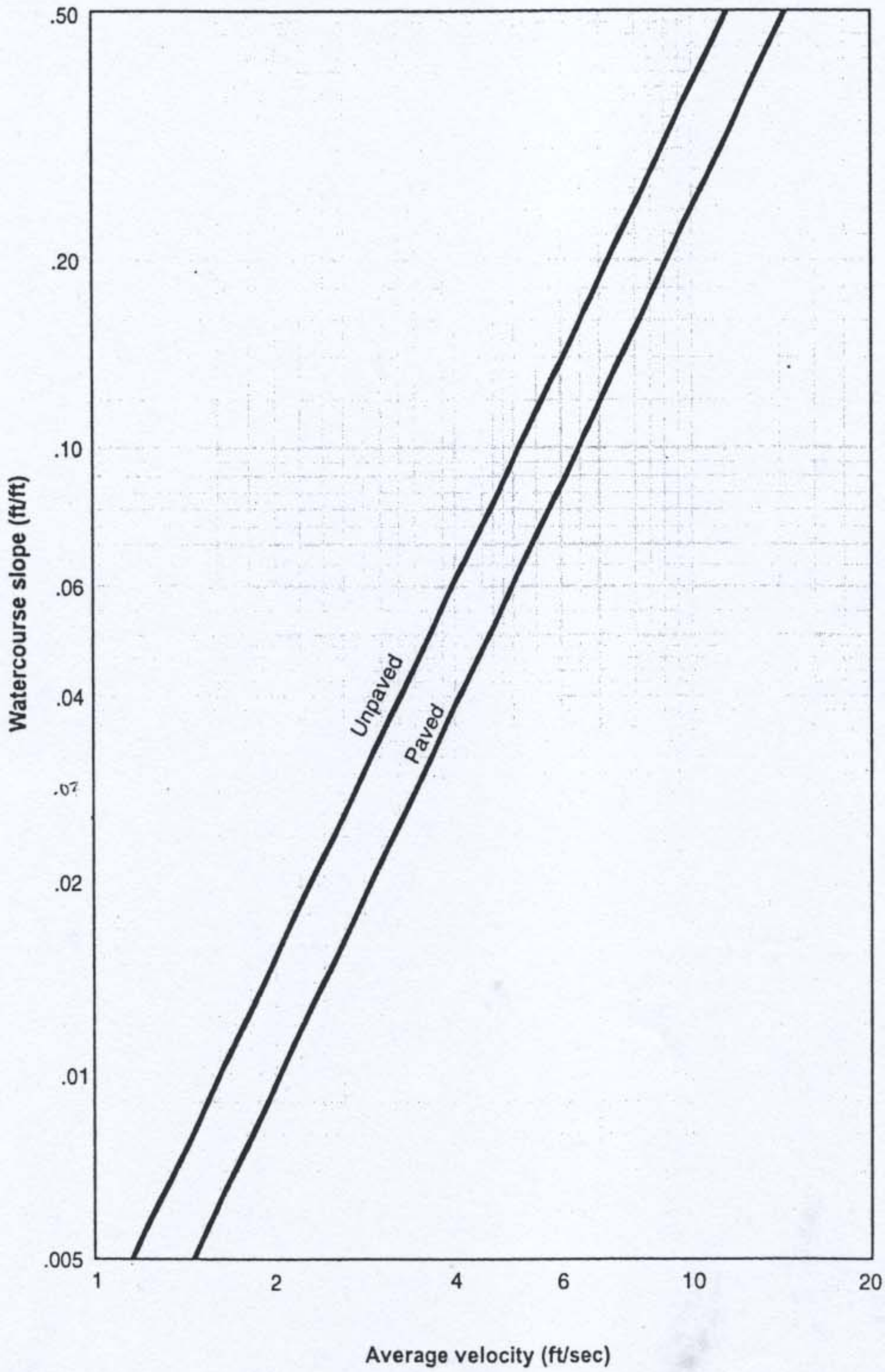
After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bankfull elevation.

Figure 3-1 Average velocities for estimating travel time for shallow concentrated flow



Chapter 4 Graphical Peak Discharge Method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation—Hydrology" (SCS 1983). The peak discharge equation used is:

$$q_p = q_u A_m Q F_p \qquad \text{[eq. 4-1]}$$

where:

q_p = peak discharge (cfs)
q_u = unit peak discharge (csm/in)
A_m = drainage area (mi^2)
Q = runoff (in)
F_p = pond and swamp adjustment factor

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

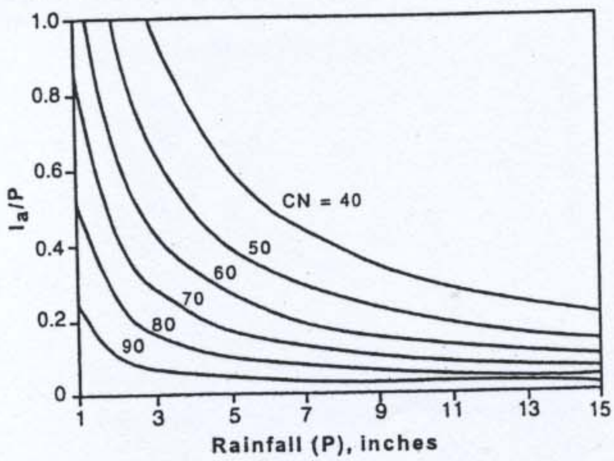
Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a / P is then computed.

If the computed I_a / P ratio is outside the range in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a / P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a / P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

Figure 4-1 Variation of I_a / P for P and CN



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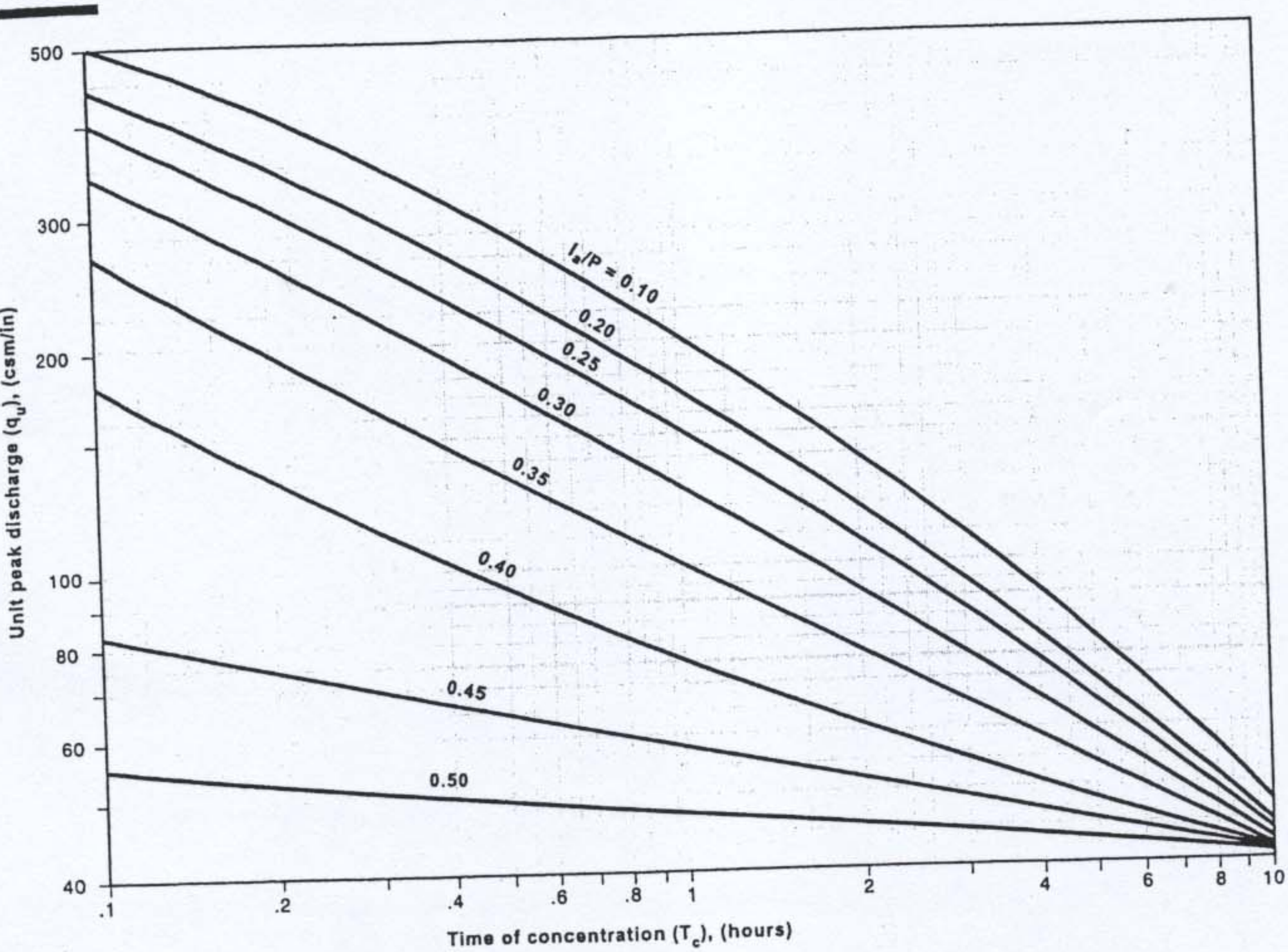
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Exhibit 4-I Unit peak discharge (q_u) for NRCS (SCS) type I rainfall distribution



Worksheet 2: Runoff curve number and runoff

Project Trampas Canyon	By	Date
Location Rancho Mission Viejo	Checked	Date

Check one: ☒ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☐ acres ☐ mi² ☒ %	Product of CN x area
cieneba, C	oak-aspen, good	41			60	2460
Soper, C	oak-aspen, good	41			15	615
Bosanko, D	oak-aspen, good	48			25	1200
						4275

[1/] Use only one CN source per line

Totals ➡ 100 | 4275

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{4275}{100} = 42.75$; Use CN ➡ 43

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency .... yr	2		
Rainfall, P (24-hour) .... in	2.48		
Runoff, Q .... in (Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)	0.0024		

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project Trampas Canyon	By	Date
Location Rancho Mission Viejo	Checked	Date

Check one: ☒ Present ☐ Developed

Check one: ☒ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	AB		
1. Surface description (table 3-1)	Dense grass		
2. Manning's roughness coefficient, n (table 3-1)	0.24		
3. Flow length, L (total L † 300 ft) ... ft	300		
4. Two-year 24-hour rainfall, P_2 ... in	2.48		
5. Land slope, s ... ft/ft	0.33		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ... hr	0.21	+	= 0.21

Shallow concentrated flow

Segment ID	BC		
7. Surface description (paved or unpaved)	unpaved		
8. Flow length, L ... ft	200		
9. Watercourse slope, s ... ft/ft	0.028		
10. Average velocity, V (figure 3-1) ... ft/s	2.8		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr	0.020	+	= 0.02

Channel flow

Segment ID	CD		
12. Cross sectional flow area, a ... ft^2	8		
13. Wetted perimeter, p_w ... ft	8		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ... ft	1		
15 Channel slope, s ... ft/ft	0.18		
16. Manning's roughness coefficient, n ...	0.025		
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ... ft/s	25.03		
18. Flow length, L ... ft	1880		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr	0.021	+	= 0.02
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ... Hr			0.25

Worksheet 4: Graphical Peak Discharge method

Project Trampas Canyon Dam	By	Date
Location Rancho Mission Viejo	Checked	Date

Check one: ☒ Present ☐ Developed

1. Data

Drainage area .... A_m = 0.45 mi^2 (acres/640)

Runoff curve number ....CN = 43 (From worksheet 2)

Time of concentration .... T_c = 0.25 hr (From worksheet 3)

Rainfall distribution .... = I (I, IA, II III)

Pond and swamp areas spread throughout watershed .... = Ø percent of A_m (Ø acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	2		
3. Rainfall, P (24-hour)	in	2.48		
4. Initial abstraction, I_a (Use CN with table 4-1)	in	2.651		
5. Compute I_a/P		1.07		
6. Unit peak discharge, q_u (Use T_c and I_a/P with exhibit 4– 1)	csm/in	55		
7. Runoff, Q (From worksheet 2) Figure 2-6	in	0.0024		
8. Pond and swamp adjustment factor, F_p (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond ans swamp area.)		1.0		
9. Peak discharge, q_p (Where $q_p = q_u A_m Q F_p$)	ft^3/s	0.06		

(ft3/s × 1.984 × 365)

43.45 af/yr + 21.21 af/yr =
64.66 af/yr

Sulphur Creek Dam Rainfall and Evaporation Data (1977-2002)

	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Average Rainfall (in)	0.02	0.13	0.34	0.44	1.25	1.83	3.41	3.72	2.73	0.92	0.22	0.08
Average Evaporation (in)*	5.26	4.87	4.01	3.06	2.27	1.81	1.76	1.81	2.76	3.55	4.22	4.53
Difference (in)	-5.24	-4.74	-3.67	-2.62	-1.02	**0.01**	**1.66**	**1.90**	-0.03	-2.63	-3.99	-4.45

Average Available Rainfall (in) **3.58**

Source: County of Orange Public Facilities and Resources Department, 2002

*These evaporation numbers reflect the Class A land pan coefficient number of 0.70