Appendix H Hydrology & Preliminary Water Quality Management Reports

Appendices

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HYDROLOGY & WATER QUALITY REPORT

for

AGUA MANSA COMMERCE PARK
Jurupa Valley, California

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1.0 INTRODUCTION

The purpose of this report is to assist the City of Jurupa Valley and Crestmore Redevelopment LLC, an indirect subsidiary of VCP Management, LLC ("Viridian Partners"), and inform the Hydrology and Water Quality section of the Draft Environmental Impact Report for the Agua Mansa Commerce Park Development Project (the "Project"). This report identifies potential surface water hydrology and water quality impacts that may be associated with development of the Project, including changes in the amount or movement of surface and groundwater and flood hazard impacts. The report provides technical information and responds to the relevant thresholds of significance listed in Appendix G of the California Environmental Quality Act ("CEQA") Guidelines relating to hydrology and water quality.

2.0 PROJECT DESCRIPTION

2.1 Site Description

The site is the existing Riverside Cement Plant (the "Site") located in the northeast quadrant of the City, specifically east of Rubidoux Boulevard, south of El Rivino Road, west of Hall Avenue, and north of Agua Mansa Road. The Project Site is 276.5 +/- acres (see Figure 1 Site Location Map) and is comprised of the following 14 Assessor's Parcel Numbers (APN): 175-170-025, 035, 036, 040, 043, 175-180-001, 175-200-001 through 005, 007, 008, 009, and a portion of 175-170-041 (east of rail line).

Having been in operation since 1906, the existing Riverside Cement Plant contains the cement plant itself, a quarry for the mining of limestone for the manufacture of cement and cement products, and various support buildings. In July of 2014, Martin Marietta Materials purchased the Cement Plant, as part of a corporate acquisition of the previous owner, Texas Industries, and now intends to close the facility, provided the land can be redeveloped for a productive use. The Riverside Cement Plant is a Brownfield site and is in need of environmental remediation, specifically to address fugitive dust, former Cement Kiln Dust disposal areas, and metal concentrations in soils.

2.2 Planned Development

In order to redevelop the site, the environmental issues resulting from over 100 years of cement production must be remediated. Integral to the remediation, the proposed development of the site consisting of the buildings and paved areas will serve as the final "cap" over the site.

The intent of the Project is to provide the necessary remediation and prepare the majority of the site, approximately 205 +/- acres, for redevelopment of up to 4,500,000 square feet (sf) of business park use. In order to underwrite the cost of remediating the Project Site, predictable and marketable land uses must be allowed. The uses proposed include a variety of business park uses such as manufacturing, research & development, fulfillment centers, e-commerce centers, high-cube and/or general warehousing and distribution, cross-dock facilities, and the potential for up to 25,000 square feet for retail and food service uses to serve the development site.

3.0 REGULATORY

The amended Clean Water Act of 1987 required stormwater discharges to be in compliance with a National Pollution Discharge Elimination System (NPDES) Permit. In California this permit is issued through the State Water Resources Control Board (SWRCB) which is made up of nine (9) Regional Water Quality Control Boards (RWQCB). The Santa Ana Regional Water Quality Control Board adopted the Municipal Separate Storm Sewer System (MS4) Permit NPDES Permit Order R8-2010-0033 NPDES Permit No. CAS618033 amended as Order No. R8-2013-0024 (2010 SAR MS4 Permit).

The Riverside County Flood Control and Water Conservation District (RCFC & WCD) along with, the cities of Beaumont, Calimesa, Canyon Lake, Corona, Country of Riverside (County), Eastvale, Hemet, Jurupa Valley, Lake Elsinore, Menifee, Moreno Valley, Murrieta, Norco, Perris, Riverside, San Jacinto, and Wildomar form the Santa Ana Region. RCFC & WCD as the Principal Permittee and the mentioned cities as the Co-Permittees share the MS4 Permit.

In accordance with Federal regulation 40 CFR 122.26(d)(2)(i), a Permittee is required to regulate the discharge of pollutants into the MS4 that may cause or contribute to the pollution of receiving waters. The MS4 permit contains requirements for mitigating potential impacts from new developments and redevelopment projects. The goal is to prevent increased runoff flows and storm water pollution from new development and redevelopment projects. To accomplish this goal the implementation of both low impact development (LID) and best management practices (BMP) methods will be used in the development.

The Water Quality Management Plan (WQMP) for the Santa Ana Region (SAR) of Riverside County is the guidance document for the project's stormwater design in compliance with Santa Ana Regional Water Quality Control Board (Santa Ana Regional Board) requirements for a Priority Development Projects. The 2010 SAR MS4 Permit requires that a WQMP be prepared for all projects within the SAR that meet the "Priority Development Project", for which a final map or permit for discretionary approval is sought. A Project Specific WQMP is required for the project to address the following:

- Design the site to minimize imperviousness, detain runoff, and infiltrate, reuse or evapotranspire runoff where feasible.
- Cover or control sources of stormwater Pollutants.
- Use LID to infiltrate, evapotranspire, harvest and re-use, or treat runoff.
- Ensure runoff does not create a Hydrologic Condition of Concern (HCOC).
- Maintain Stormwater BMPs.

The WQMP design goal is to maintain or replicate the pre-development hydrologic regime through the use of design techniques that create a functionally equivalent post-development hydrologic regime through site preservation techniques and the use of integrated and distributed infiltration, retention, detention, evapotranspiration, filtration and treatment systems. The 2010 SAR MS4 Permit requires the design capture volume (DCV) to be retained and infiltrated on-site. When on-site LID Infiltration BMP methods are proven to be infeasible, then a feasibility analysis regarding harvest and reuse must be considered. When such retention methods are infeasible, the remainder of the DCV can be treated via processes such as bioretention. The intent behind these prioritization requirements is to maximize on-site

retention, so as to reduce the volume of urban runoff and pollutant loads entering receiving waters.

In addition, the project will disturb one or more acres of soil and is required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit, 2009-0009-DWQ). Construction activity subject to this permit includes clearing, grading and disturbances to the ground (e.g., stockpiling or excavation). The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPP). The SWPP should contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography (both before and after construction) and drainage patterns across the project. The SWPPP must list BMPS that will be used to protect stormwater runoff and the placement of those BMPs. In addition, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed in the Clean Water Act Section 303(d) list for specific water bodies in California.

4.0 SITE ASSESSMENT

4.1 Surface Water Hydrology

The RCFC & WCD Hydrology Manual documents the design hydrology methods and criteria that will be used for the project. A complete drainage study (preliminary and final) including, but not limited to, hydrologic and hydraulic calculations for the final project development will be submitted to the RCFC & WCD for review and approval. The storms to be studied will include the 1-hour, 3-hour, 6-hour and 24-hour duration events for the 2-year, 10-year and 100-year return frequencies. Detention basin(s), the water quality BMPs and outlet(s) sizing will ensure that none of these storm events has a higher peak discharge in the post-development condition than in the pre-development condition and/or that the capacity of off-site infrastructure is not exceeded.

Regional Conditions

The site is within the Santa Ana Region, which is a group of connected inland basins and open coastal basins drained by surface streams flowing generally southwestward to the Pacific Ocean (See Figure 2 – Santa Ana Hydrologic Basin Planning Area[1]). The Santa Ana Region is the smallest of the nine regions in the state (2800 square miles) and is located in southern California, roughly between Los Angeles and San Diego. The climate of the Santa Ana Regions is classified as Mediterranean: generally dry in the summer with mild, wet winters. The average annual rainfall in the region is about fifteen inches, most of it occurring between November and March. Much of the area would be near-desert were it not for the influence of modern civilization.

[1] Figure 1-1 Santa Ana Hydrologic Basin Planning Area from the Water Quality Control Plan for the Santa Ana River Basin updated February 2016)

The boundaries between California's nine regions are usually hydrologic divides that separate watersheds, but the boundary between the Los Angeles and Santa Ana Regions is the Los Angeles County Line. Since that county line only approximates the hydrologic divide, part of the Pomona area drains into the Santa Ana Region, and in Orange County, part of the La Habra drains into the Los Angeles Region. The east-west alignment of the crest of the San Gabriel and San Bernardino Mountains separates the Santa Ana River basin from the Mojave Desert, which is part of the Lahontan Basin. In the south, the regional boundary divides the Santa Margarita River drainage area from that of the San Jacinto River, which normally terminates in Lake Elsinore. Near Corona, the Santa Ana River has cut through the Santa Ana Mountains and flows down onto the Orange County coastal plain. The Pacific Ocean coast of the Santa Ana Region extends from just north of Laguna Beach up to Seal Beach and the Los Angeles County line.

The main stem of the Santa Ana River is divided into six reaches (See Figure 3 – Santa Ana River and Tributaries[2]). Each reach is generally a hydrologic and water quality unit. Reach 6 includes the river upstream of Seven Oaks Dam. Flows consist largely of snowmelt and storm runoff. Water quality tends to be very high. Reach 5 extends from Seven Oaks Dam to San Bernardino, to the San Jacinto Fault (Bunker Hill Dike), which marks the downstream edge of the Bunker Hill groundwater basin. Most of this reach tends to be dry, except as a result of storm flows, and the channel is largely operated as a flood control facility. The extreme lower end of this reach includes rising water and intermittently, San Timoteo Creek flows. Reach 4 includes the river from the Bunker Hill Dike down to Mission Boulevard Bridge in Riverside. That bridge marks the upstream limit of rising water induced by the flow constriction in the Riverside Narrows. Until about 1985, rising water from upstream and wastewater discharges percolated and the lower part of the reach was dry. Flows are now perennial, but may not remain so as new projects are built. Much of this reach is also operated as a flood control facility. Reach 3 includes the river from Mission Bridge to Prado Dam. In the Narrows, rising water feeds several small tributaries (Sunnyslope Channel, Tequesquite Arroyo, and Anza Park Drain) which are important breeding and nursery areas for the native fish. Temescal, Chino, and Mill/Cucamonga Creeks in Prado Basin are also important river tributaries. Reach 2 carries all the upstream flows down through Santa Ana Canyon to Orange County where as much of the water as possible is recharged into the Orange County groundwater basin. The downstream end of the forebay/recharge area and, therefore, the ordinary limit of surface flow is at 17th Street in Santa Ana. Reach 1 is a normally dry flood control facility, part of the US Army Corps of Engineers' Santa Ana River Project. This reach extends from 17th Street to the tidal prism at the ocean.

Local Conditions

The Project Site is directly tributary to the Santa Ana River via existing infrastructure owned and operated by the RCFC & WCD. The infrastructure includes the Belltown Market Street Storm Drain system, the Agua Mansa Brown Avenue Storm Drain, Wilson Street Storm Drain and Laterals and Outlet Erosion Control Basins. The as-built drawings for these systems are included as Appendix A.

[2] Figure 1-2 Santa Ana River and Tributaries from the Water Quality Control Plan for the Santa Ana River Basin updated February 2016)

The Belltown Market system drainage area is generally bounded by El Rivino Road (County Line) on the north, 20th Street on the south, the Jurupa Mountains on the west and the Project Site to the east. The system also currently collects runoff from areas within San Bernardino County, north of El Rivino Road. However, as discussed herein, development plans and infrastructure improvements in El Rivino Road may reduce or eliminate this tributary flow. The RCFC & WCD Hydrology Map is included as Figure 4. The Project will connect to the existing system at the southwest corner of the Site, which is the terminus of the RCFC & WCD "Line A" at the Rubidoux Boulevard and Union Pacific Railroad intersection.

The Agua Mansa Brown system drainage area is generally bounded by El Rivino Road (County Line) and Hall Avenue to the north, Holly Street to the east and Agua Mansa Road and Wilson Street to the west and south. The Project will connect to the existing system at the northeast corner of the site, which is the upstream end of the system at a recently constructed (2005) concrete drop inlet.

4.2 Site Hydrology

The existing Site conditions include the existing Riverside Cement Plant, which is the cement plant itself, a quarry for the mining of limestone for the manufacture of cement and cement products, and various support buildings. There is a mix of paved roadways, open space, soil and material stockpiles, machinery and buildings. Concrete and steel structures that were used in the cement manufacturing process remain on-site and are not in operation. Structures that remain on-site from the plant operations include white and grey cement production lines, storage silos and sheds, a cement bagging building, empty tanks, conveyor belts, utility tunnels, a control center and an administration building. A Southern California Edison substation is present near the northern part of the Project and Union Pacific railroad tracks cross the Project on the west.

As documented by RCFC & WCD[3], the peak design flow rates for the Belltown Market system were reviewed and verified. At the Project's proposed point of connection, the 100-year flow rate was determined to be 780 cfs. The design flow for the 84 inch diameter reinforced concrete pipe (RCP) in Rubidoux Boulevard, as documented on the as-built drawings for the Belltown Market Street Storm Drain (Project No. 1-0-0148 Sheet 18), was determined to be 800 cfs. This 84 inch RCP terminates at a 45 ft long 48 inch RCP at a 26% slope, which is connected to an existing open channel.

The design flow rate for the Agua Mansa Brown system was documented on the RCFC & WCD design drawings for the Agua Mansa Brown Avenue / Wilson Avenue Storm Drains Stage 2 (Project No. 1-0-335). The 100-year design flow for the 42 inch diameter RCP that terminates at a concrete drop inlet on the property boundary between the Site and Plot Plan 18592[4] is 50 cfs.

The southern portion of the Site includes an existing body of water, large open "pits" and significant elevation relief. Figures 5 to 8 shows the hydrology within and surrounding the Site.

[3] RCFC & WCD Market Street Channel Memorandum dated 27 April 2004.
[4] Hydrology and Capacity Calculations for Plot Plan 18592 dated 8 December 2004 by KCT Consultants, Inc.

Approximately 172 acres of the Site is tributary to the Belltown Market system, 22 acres is tributary to the Agua Mansa Brown system and 91 acres is retained within the site.

The existing surface water hydrology includes approximately 92 acres from San Bernardino County (City of Rialto) north of El Rivino Road. We understand that a development is planned for this site, a former golf course, which may include the installation of a storm drain within El Rivino Road to collect and convey the surface water runoff to the east along El Rivino Road pursuant to the City of Rialto (Rialto Commerce Center Environmental Impact Report). If constructed, the 92 acre tributary area would be removed from the Project's hydrology. For purposes of this report, it assumed that the off-site area will be collected and conveyed to the Santa Ana River by off-site improvements to be constructed as part of the Rialto Commerce Center Project.

The existing surface water hydrology also includes approximately 322 acres of the Jurupa Mountains, west of Rubidoux Boulevard. This off-site area includes a newly constructed solar farm on an approximate 4.2 acre site along the west side of Rubidoux Boulevard. The northern section (approximately 283 acres) area directs surface water runoff to Rubidoux Boulevard, which is hydraulically connected to an existing basin within the site (Parcel 15). The southern section of the off-site area (approximately 39 acres) directs surface water runoff directly to the Belltown Market system.

The existing site is zoned Heavy Industrial. The new Specific Plan for the Project would identify the zoning, development standards, design guidelines, review and approval processes, and will create a 200+ acre business park. The Specific Plan and associated Development Agreement would allow for a wide range of land uses, including manufacturing, research & development, fulfillment centers, e-commerce centers, high-cube and/or general warehousing and distribution, and cross-dock facilities. Accordingly the design of the existing off-site storm drainage infrastructure accounted for the Project and its associated impervious coverage. Even though there will be an increase in impervious coverage caused by the project, the project will be designed in accordance with the current limitations set by the existing infrastructure and hence not require off-site storm drainage improvements. Furthermore, areas within the final site design will be allocated to provide water quality treatment (per WQMP requirements) and detention for the difference in stormwater runoff volume for the 2, 10 and 100 year storm events.

Based on the preliminary development plans, the most conservative development scenario that would have the maximum potential stormwater impacts were determined. The following tables provide the results of the preliminary hydrologic analysis for the on-site pre-development and post-development conditions for each proposed point-of-connection. The on-site pre-development Belltown Market system watershed is approximately 264 acres. Based on initial discussions with the RCFC & WCD, the project is required to collect and convey off-site flows generated by the area west of Rubidoux Boulevard in the post-development condition on-site (approximately 283 acres). This requirement will ultimately increase the drainage area tributary to the Belltown Market Street Storm Drain from the project to approximately 508 acres. The pre-development Agua Mansa Brown system watershed is approximately 22 acres and the post-development area is approximately 15 acres. The overall post development drainage area tributary to the Belltown Market Street Storm Drain will be reduced to 563 acres from 586 acres in the pre-development condition. This can be attributed to the 92 acres of drainage area

being removed in the post-development condition. The development planned north of El Rivino Road proposes the construction of a storm drain within El Rivino Road that would collect the 92 acres mentioned before and convey flows to the Santa Ana River to the east. The two tables show the preliminary hydrologic information as dictated by the RCFC & WCD Hydrology Manual. The preliminary storage volumes shown will be provided on-site as part of the stormwater management system for the Project. The preliminary calculations are included as Appendix C and the final calculations will be included in the Hydrologic and Hydraulic Study and Stormwater Management that will be prepared for the Project.

Table 1
Belltown Market System

Return Event	Storm Duration	Pre-Development		Post-Development		Comparison of Post- vs Pre-	
(yr)	(hr)	Flow (cfs)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)
100	Rational	444.52	-	836.44	-	391.92	-
100	24	122.46	68.2	242.25	123.7	119.79	55.5
100	6	276.86	37.5	504.24	70	227.38	32.5
100	3	293.55	27	533.32	51.4	239.77	24.4
100	1	471.11	20	763.67	39.5	292.57	19.5
10	Rational	275.49	-	367.33	-	91.84	-
10	24	69.68	43.8	121.75	72.9	52.08	29.1
10	6	177.49	25.3	321.49	45.3	144.00	20
10	3	192.98	18.4	350.52	33.5	157.55	15.1
10	1	301.01	12.6	484.19	24.2	183.17	11.6
2	Rational	164.82	-	225.00	-	60.18	-
2	24	43.70	27.5	70.22	45.4	26.51	17.9
2	6	110.63	17.4	201.63	30.4	91.00	13
2	3	124.93	12.7	228.71	22.8	103.79	10.1
2	1	190.22	8	296.05	14.8	105.82	6.8

Table 2
Agua Mansa Brown System

Return Event	Storm Duration	Pre-Development		Post Development		Comparison of Post- vs Pre-	
(yr)	(hr)	Flow (cfs)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)
100	Rational	36.86	-	34.65	-	-2.21	-
100	24	5.40	1.3	9.40	5.5	4.00	4.2
100	6	21.37	1.3	21.80	2.8	0.43	1.5
100	3	22.96	1.1	22.91	2.0	-0.05	0.9
100	1	46.41	1.2	43.64	1.3	-2.76	0.1
10	Rational	22.23	-	23.04	-	0.80	-
10	24	1.09	0.7	5.93	3.6	4.84	2.9
10	6	11.68	0.6	14.94	2.0	3.25	1.4
10	3	13.06	0.6	15.99	1.4	2.93	0.8
10	1	27.58	0.6	29.13	0.9	1.55	0.3
2	Rational	12.64	-	15.02	-	2.39	-
2	24	0.68	0.4	3.72	2.3	3.04	1.9
2	6	5.02	0.3	10.16	1.4	5.13	1.1
2	3	6.36	0.3	11.16	1.0	4.80	0.7
2	1	15.22	0.3	19.16	0.6	3.94	0.3

4.3 Flooding Potential

The Site is located within Zone X "Other Flood Areas" identified as areas of 0.2% chance of flood, areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood. The existing body of water within the southern portion of the Site, which is outside the developable area of the Project is shown as Zone A "Special Flood Hazard Area" with no base flood elevation determined. Based on recent aerial topography, the elevation of body of water is more than approximately 80 ft lower than the lowest elevation within the development. The FEMA Flood Insurance Rate Map Number 06065C0045G dated August 28, 2008 is included as Appendix B.

The Site is approximately 1 mile from the limits of the Santa Ana River and approximately 20 miles downstream of the Seven Oaks Dam. The Seven Oaks Dam is a 550 ft high earth and rock fill embankment dam across the Santa Ana River in the San Bernardino Mountains. It impounds Seven Oaks Reservoir in the San Bernardino National Forest. The Dam was proposed in response to major floods in the mid–20th century, and was constructed between 1993 and 2000. Seven Oaks is a dry dam that serves almost exclusively for flood protection. The Army Corps of Engineers and the RCFC &WCD have prepared downstream inundation maps as part of the dam's emergency action plan. The Site is outside the limits of inundation limits. Copies of the inundation maps are included as Appendix C.

4.4 Surface Water Quality

Section 303(d) of the 1972 Federal Clean Water Act requires States to identify water bodies that do not meet water quality objectives and are not supporting their beneficial uses. Each State must submit an updated list, called the 303(d) list, to the U.S. EPA every two years. In addition to identifying the water bodies that are not supporting beneficial uses, the list also identifies the pollutant or stressor causing impairment, and establishes a priority for developing a control plan to address the impairment. The list also identifies water bodies where 1) a Total Maximum Daily Load (TMDL) has been approved by the U.S. EPA and an implementation is available, but water quality standards are not yet met, and 2) water bodies where the water quality problem is being addressed by an action other than a TMDL and water quality standards are not yet met.

Once a water body is placed on the 303(d) list, Regional Board staff evaluates the nature of the impairment and begins developing a TMDL, if appropriate and necessary. For each TMDL developed, staff will also develop an implementation or water quality control plan for each water body and associated pollutant/stressor on the list. The TMDL and the implementation plan serves as the means to attain and maintain water quality standards for the impaired water body.

In accordance with the 2010 Integrated Report, prepared by the State Water Resources Control Board, the relevant section of the Santa Ana River is Reach 4. Currently, this section, as listed on the California 303(d), is a Category 5 water segment which states as follows: "A water segment where standards are not met and a TMDL is required, but not yet completed, for at least one of the pollutants listed." The water quality impairments listed for the Santa Ana River,

Reach 4 are pathogens from a nonpoint source. The available information from the Regional Board 8 indicates a TMDL completion date of 2019.

5.0 PROJECT ANALYSIS

5.1 Methodology

We reviewed information about the Site including location, topography, soil types, impervious and pervious surfaces, surface runoff direction and rate and adjacent storm drain infrastructure from available resources to understand the existing (i.e., pre-development) conditions. The development characteristics of the Project, as defined in the Project Description and on Concept Plans, were extracted to understand the proposed (i.e., post-development) conditions. Within the regulatory framework previously described, the hydrology and water quality aspects of Project were evaluated by comparing the existing and proposed pervious/impervious coverage conditions and preliminary peak storm water flow rates and volumes. The Rational Method, as prescribed in the RCFC & WCD Hydrology Manual, was the method used to compute the preliminary peak storm water flow rates. Based on the results, the potential impacts were assessed and final design recommendations were provided to address and mitigate potential hydrology and water quality impacts.

5.2 CEQA Thresholds of Significance

The CEQA thresholds of significance regarding hydrology and water quality factors are presented below with a corresponding analysis of the Project's potential to have a significant impact on these factors.

- ***Would the project violate any water quality standards or waste discharge requirements?***

  The Project currently envisioned will provide the necessary remediation and prepare the majority of the site, approximately 205 +/- acres, for redevelopment of up to 4,500,000 square feet of business park use. The uses proposed include a variety of business park uses such as manufacturing, research & development, fulfillment centers, e-commerce centers, high-cube and/or general warehousing and distribution, cross-dock facilities, and the potential for up to 25,000 square feet for retail and food service uses to serve the development site and the surrounding area.

  In order to prevent both short term (construction) and long term (post-construction/operational) impacts to water quality, the Project would be designed to comply with the requirements of the Santa Ana Regional Water Quality Control Board Municipal Regional Stormwater NPDES Permit Order R8-2010-0033 NPDES Permit No. CAS 618033 (2010 SAR MS4 Permit), the Construction General Permit Water Quality Order 2009-0009-DWQ (as amended by Order No. 2010-0014-DWQ and 2012-006-DWQ) and the Riverside County Flood Control and Water Conservation District (RCFC & WCD) requirements. A SWPPP to address the construction impacts and a Project Specific Water Quality Management Plan (WQMP) to address permanent water quality controls and operational impacts would be prepared, implemented and enforced.

The California Stormwater Quality Association has provided a list of anticipated and potential storm water pollutants generated by development land use type that are identified in the Clean Water Act Section 303(d) list for specific water bodies in California. Pollutants frequently identified include metals, nitrogen, nutrients (i.e., nitrogen or phosphorus), indicator bacteria (i.e., fecal coliform), pesticides and trash. Less common pollutants include sediment, PAHs, PCBs, and dioxin. As noted, the Site is within the Santa Ana Basin and tributary to the Santa Ana River, which is on the 303(d) list of impaired water bodies.

As the Project would be an industrial/warehouse type use, and possibly a small amount of retail, the anticipated pollutants could include pathogens, nutrients, pesticides, sediments, trash and debris, oxygen demanding substances, oil and grease. Source control measures, including treatment BMPs, would be implemented and documented in the SWPPP and Project WQMP to reduce the Project's potential for water quality impacts. Both plans would also include Best Management Practices (BMP) maintenance arrangements in the form of covenants or specific maintenance agreements to ensure the long-term operation of the BMPs and water quality protection.

Since the Project would be designed and maintained in accordance with the NPDES, Riverside County and RWQCB water quality requirements, the Project would not violate any water quality or waste discharge requirements.

- ***Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?***

  The measured depth to groundwater at two on-site wells was 134 ft (approximate elevation 818) and 184 ft (approximate elevation 701). The elevations were recorded using a water level meter. The anticipated groundwater elevation within the Site is significantly below the lowest surface elevations planned for the development.

  The Project would be serviced by the existing Rubidoux Community Services District water and sewer system, and no production wells for a source of water would be installed. There are several existing on-site wells being used by the current facility, however no potable water is recovered. The Project may include the relocation and/or abandonment of these existing wells in accordance with RWQCB requirements.

  Therefore, the Project would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge.

- ***Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site? Or substantially increase the rate or amount of surface runoff in a manner which would result in flooding?***

The existing (pre-development) drainage patterns for the Site include the discharge of surface runoff to the Santa Ana River via two piped conveyance systems owned and operated by the Riverside County Flood Control and Water Conservation District (RCFC & WCD). The two systems are the Belltown Market system and the Agua Mansa Brown system. Of the total watershed area (563 acres), which includes the Site and the off-site areas from the west, approximately 97% is tributary to the Belltown Market system and 3% is tributary to the Agua Mansa Brown system. The Project would alter the on-site drainage patterns with the development of the buildings, roadways and associated site improvements due to the modification of the elevations of the Site, thus altering surface water runoff patterns.

The Project would include an on-site storm water collection, detention, and potentially retention/re-use system consisting of a series of drainage inlet structures, piped conveyance systems and water quality treatment systems designed in accordance with the RCFC & WCD and NPDES requirements. The surface runoff would be conveyed from the Project to the existing storm drainage infrastructure and ultimately discharged to the existing Santa Ana River at the same locations.

Furthermore, the approximately 92 acres of off-site area to the north of the Project that is currently tributary to the Belltown Market system may be removed from the watershed area via a neighboring development that is not part of this Project. For purposes of the hydrologic and hydraulic analysis performed herein, the off-site is assumed to be collected and conveyed to the Santa Ana River by a proposed storm drain as part of the Rialto Commerce Center project.

The surface runoff from the Jurupa Mountains, west of the site, will be collected and conveyed through the Site through the construction of the RCFC & WCD master planned facility Belltown MDP Line A Stage 2. The on-site stormwater management facilities will be designed accordingly so to not alter the existing drainage pattern and will drain to the Belltown MDP Line A Stage 2 to ensure that an adequate outlet for on-site facilities is provided. The preliminary alignment of Belltown MDP Line A Stage 2 is shown in Figure 9.

As the Site would continue to discharge surface water runoff to the existing waterways and storm drainage infrastructure, the Project would not substantially alter the existing drainage pattern of the surrounding area in a manner which would result in erosion or siltation.

The Site does not contain any streams or rivers. Therefore, the Project would not alter the course of a stream or river.

The Project will minimize, to the extent possible, the potential increase in rate and amount of surface runoff via the implementation of site specific Best Management Practices (BMPs), both during and post construction, including Low Impact Development (LID) techniques. LID is a sustainable practice that benefits water supply and contributes to water quality protection. Unlike traditional storm water management, which collects and conveys storm water runoff through storm drains, pipes, or other conveyances to a centralized storm water facility, LID takes a different approach by using site design and storm water management and attempts to maintain the site's pre-development runoff rates and volumes. The goal of the LID would be to mimic the site's predevelopment hydrology

by using design techniques that filter, store, evaporate, and detain runoff close to the source of rainfall. LID includes specific techniques, tools, and materials to control the amount of impervious surface, increase infiltration, improve water quality by reducing runoff from developed sites, and reduce costly infrastructure. The LID practices being considered for and that will likely be included in the Project are: bioretention facilities or rain gardens (lined with underdrains as necessary), extended detention basins, lined grass swales and channels, vegetated filter strips, and rainwater harvesting and re-use.

In addition to LID, on-site extended detention basins would be designed to ensure that the post-development flows do not exceed the capacity of the existing RCFC & WCD storm drainage infrastructure systems. The Project would connect to the Belltown Market and Agua Brown systems at the same locations that are currently being utilized, in the southwest and northeast corners of the Site, respectively.

The Project would implement LID and on-site detention and therefore, would not substantially increase the rate or amount of surface runoff in a manner which would result in flooding.

- ***Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?***

  There are no planned improvements to the Belltown Market system or the Agua Mansa Brown system. As shown on the RCFC & WCD as-built and design plans for these systems (provided in Appendix A) they were constructed and completed circa 1991 and 2010, respectively. These systems were designed for the 100 year storm event assuming the Site being zoned as General Industrial. Accordingly the Project would be developed in accordance with the new Specific Plan, Development Agreement and the limitations set by the existing infrastructure. The Project would include LID stormwater management techniques as well as on-site extended detention basins to ensure that the post-development flows do not exceed the capacity of the existing RCFC & WCD storm drainage infrastructure systems. Therefore, the Project would not create nor contribute runoff water which would exceed the capacity of the existing or planned storm water drainage systems.

  There are no additional sources of runoff that could be created by the Project. In fact, if the off-site tributary areas from the City of Rialto are removed from the Project due to a neighboring development and associated storm drainage infrastructure in the City of Rialto, San Bernardino County, then the total tributary watershed area for the Belltown Market system would be reduced. Therefore, the Project would not provide substantial additional sources of polluted runoff.

- ***Would the project otherwise substantially degrade water quality?***

  It is during the demolition and construction phase when the Project would have the greatest potential to impact water quality, particularly during site and building demolition, mass excavation, grading and foundation construction. However, the combination of strict storm water management and treatment measures that would be required by the SWPPP and WQMP, implemented by the Project and duly enforced via QSP monitoring, reporting and

covenants and agreements for BMP operation and maintenance, would improve, not degrade, the quality of the surface water runoff from the Project.

Currently, the surface water runoff from the Site is uncontrolled and untreated. The Project would include temporary SWPPP controls to address and mitigate water quality during construction and permanent LID BMP measures to address and mitigate water quality post-development. The removal of the existing use on the Site and its uncontrolled and untreated surface water combined with temporary and permanent management and treatment of surface water would have a positive impact on water quality. Therefore, the Project would not otherwise substantially degrade water quality.

The following summarizes the key elements of the SWPPP and Project Specific WQMP:

SWPPP

The Project would disturb greater than 1 acre of land which necessitates the preparation of a SWPPP. The SWPPP would address construction impacts, especially during soil disturbing activities when soils are exposed to wind, rain and concentrated flows that cause erosion, to minimize the transmission of sediment into the separate storm sewer system (MS4) and adjacent waterways. The proper usage and storage of common construction materials such as vehicle fluids (oil, grease, etc.), asphalt concrete and Portland cement concrete, paints, solvents and thinners, metals and plated products and fertilizers would also be addressed. Finally, the SWPPP would address construction related waste such as wastewater from vehicle cleaning operations, trash from material packaging, employee's meal breaks, slurries from sawing and grinding operations, wastewater/waste from concrete washout operations and sanitary waste.

As part of the SWPPP preparation, the Risk Level would be determined for the Project. The Risk Level would define the extent of effluent monitoring and reporting during construction and its determination would include an assessment of the sediment risk and the receiving water risk. The following is a list of permit requirements associated with the respective Risk Levels:

- Risk 1: Minimum – BMPs and visual monitoring.
- Risk 2: Minimum – BMPs, visual monitoring, testing for Numeric Action Levels (NAL) and runoff monitoring.
- Risk 3: Minimum – BMPs, visual monitoring, testing for Numeric Action Levels (NAL), testing for Numeric Effluent Limitations (NEL), runoff monitoring and receiving water monitoring.

Based on the potential that the Project construction would be phased and occur during a rainy season, the Site may have a medium to high sediment risk. The receiving waters are the Santa Ana River (Reach 4) and ultimately the Pacific Ocean. The Water Quality Control Plan for the Santa Ana River Basin updated February 2016 and the State Water Resources Control Board Section 303(d) List of Water Quality Limited Segments Requiring TMDLs do not list the Santa Ana River Reach 4 as impaired by Sedimentation/Siltation. In addition, these waterways are not designated as having a spawn, cold or migratory beneficial use as defined in the Construction General Permit. Therefore, the receiving water risk is low.

Based on this combination of sediment and receiving water risk, the minimum Risk Level would likely be Level 2. The final Risk Level for inclusion in the SWPPP would be confirmed during final design.

WQMP

The Water Quality Management Plan (WQMP) would include permanent control measures to reduce the long-term impacts of the Project on water quality and the tributary waterways. The LID strategies that would be designed reduce water quality impacts by preserving and re-creating natural landscape features, storing, detaining, evapotranspiring and biotreating the surface water runoff on-site. The LID measures would include site design measures, source control measures and stormwater treatment measures. Some examples of these measures that may be incorporated into the Project are as follows:

- Minimize impervious surfaces that are directly connected to the storm drain system by routing runoff to landscaped areas;
- Use landscaping as a drainage features;
- Roofed trash enclosures;
- Connecting areas used for washing equipment to the sanitary sewer;
- Marking storm drain inlets with a "No Dumping" message;
- Street and parking lot sweeping;
- Regular inspection and cleaning of storm drain inlets;
- Engineering treatment measures including:
    - Bioretention Areas
    - Extended Detention Basins
    - Rainwater Harvesting and Reuse
    - Lined Grass Swales
    - Vegetated Filter Strips

- ***Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?***

The Site is located within Zone X "Other Flood Areas" identified as areas of 0.2% chance of flood, areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood. The existing body of water within the southern portion of the Site, which is outside the developable area of the Project is shown as Zone A "Special Flood Hazard Area" with no base flood elevation determined. Furthermore, the Project does not include the development of housing.

Therefore, the Project would not place housing within a 100-year flood hazard area as mapped on a FIRM.

- ***Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?***

  The Project would not place structures within a 100-year flood hazard area as the planned development area within the Site is not located in a 100-year flood hazard area. The one area of the Site mapped as a Zone A "Special Flood Hazard Area" is more than 80 ft lower than the lowest elevation of the planned development. Therefore, there is no potential for Project structures to impede or redirect flood flows.

- ***Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?***

  The Site is approximately 1 mile from the limits of the Santa Ana River. The elevation of the Site is higher than the elevation of the River levees. Therefore, the Project would not expose people of structure to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee.

  The Seven Oaks Dam is located approximately 20 miles upstream of the Site. The Site is outside the limits of the Emergency Action Plan Inundation Area as mapped by the Army Corps of Engineers and RCFC & WCD. Therefore, since the failure of the dam is considered remote, the Project does not present a significant risk of loss, injury or death to people or structures involving flooding as a result of the failure of a dam.

- ***Would the project be subject to inundation by seiche, tsunami or mudflow?***

  The Site is not within a planned tsunami inundation area as depicted on the Tsunami Inundation Map for Emergency Planning prepared by the California Emergency Management Agency California Geological Survey. Therefore, the Project is not subject to inundation by a tsunami.

  The Site is not located within a designated landslide area. Therefore, the Project would not be subject to mudflows.

  The existing open water area located just to the south of the industrial development portion of the Project is over 80 ft lower than the lowest elevation of the planned development. Therefore, the Project would not be prone to inundation by a seiche.

6.0 SUMMARY OF RECOMMENDATIONS

The Project would be designed and operated in compliance with the relevant City of Jurupa Valley and Riverside County requirements. The recommendations provided herein to address and mitigate hydrology and water quality impacts for the Project are summarized below:

- The existing infrastructure systems servicing the Site, any off-site infrastructure improvements and the connection by the Project to the infrastructure will be confirmed as part of final project design;

- A SWPPP will be prepared as part of the final project design; the SWPPP Certification would be signed by the landowner and Qualified SWPPP Developer/Practitioner (QSP/QSD) to ensure the BMPs effectively minimize any potential negative impacts of the construction activities on storm water quality;
- A Hydrologic and Hydraulic Study and Stormwater Management Report will be prepared in accordance with the Riverside County Hydrology Manual as part of the final Project design.
- A preliminary and final NPDES Permit Provision C.3 Water Quality Management Plan will be prepared as part of the final project design; the Plan would include covenants and agreements for the operation and maintenance of the LID BMPs incorporated into the Project;
- Final project design will include the preparation of land development engineering plans consisting of site plans, grading plans, drainage plans, utility plans, landscape and lighting plans and construction detail plans;
- The Project will obtain the requisite permits for the discharge of stormwater to the existing waterways, including approvals from the City of Jurupa Valle, Riverside County Flood Control and Water Conservation District and Regional Water Quality Control Board.
- Strict adherence to and monitoring of the SWPPP and Stormwater Management Plan both during and after construction will be enforced.

7.0 LIMITATIONS

This report has been prepared to assist the City of Jurupa Valley in their preparation of a Project Environmental Impact Report for the proposed Crestmore Redevelopment LLC Project. The conclusions and recommendations provided in this report are based on available information obtained from the various sources referenced herein.

REFERENCES

1. Water Quality Control Plan for the Santa Ana River Basin updated February 2016

2. RCFC & WCD Market Street Channel Memorandum dated 27 April 2004.

3. Hydrology and Capacity Calculations for Plot Plan 18592 dated 8 December 2004 by KCT Consultants, Inc.

4. Santa Ana Regional Water Quality Control Board adopted the Municipal Separate Storm Sewer System (MS4) Permit NPDES Permit Order R8-2010-0033 NPDES Permit No. CAS 618033 (2010 SAR MS4 Permit).

5. Riverside County Flood Control & Water Conservation District Hydrology Manual

6. FEMA Flood Insurance Rate Map (FIRM)

7. Tsunami Inundation Map for Emergency Planning, State of California Emergency Management Agency, California Geological Survey, 2009.
   http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Pages/Statewide_Maps.aspx

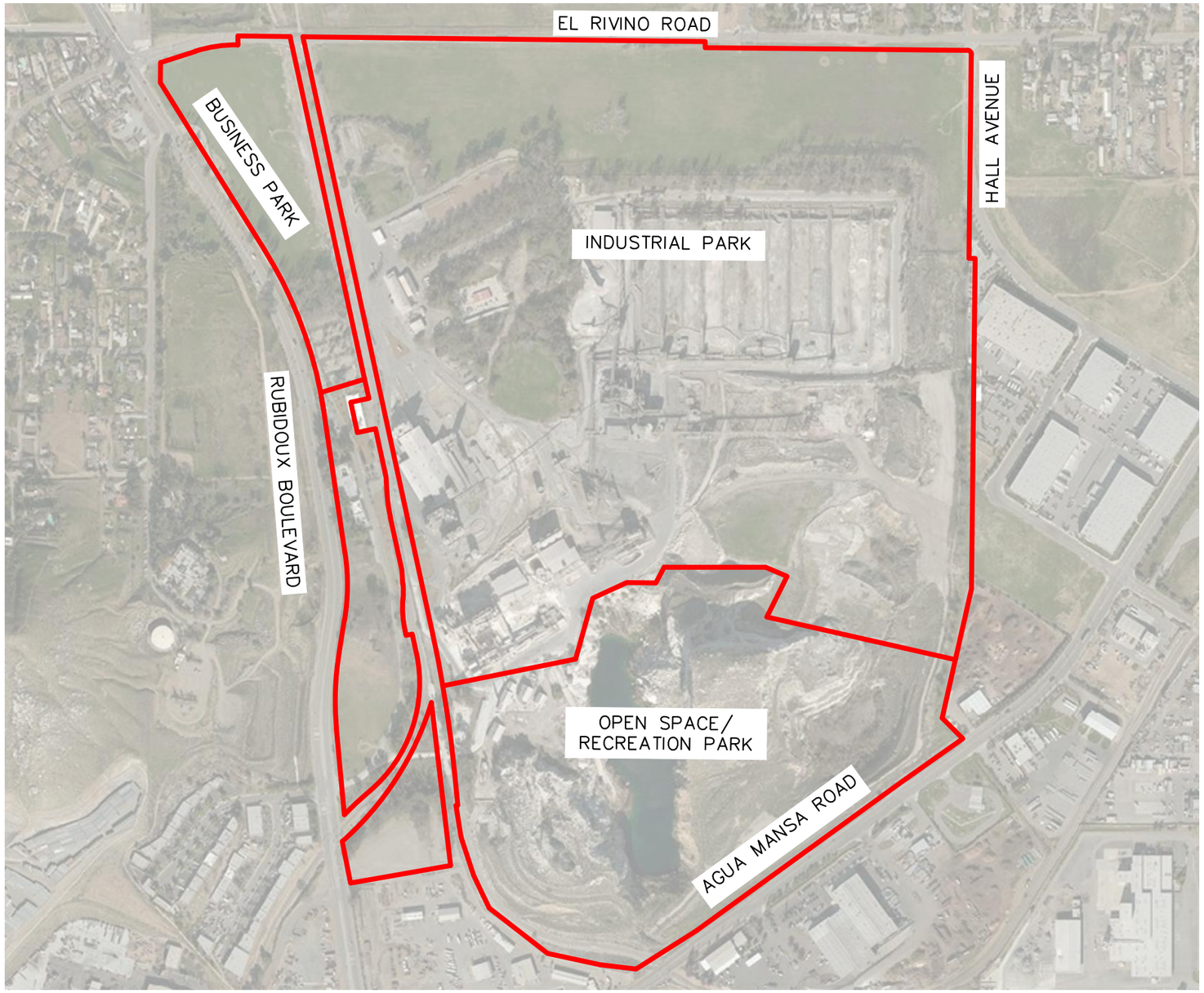
8. State Water Resources Board, General Permit for Stormwater Discharges Associated with Construction Activities, Water Quality Order 2009-0009-DWQ, as amended by Order No. 2010-0014-DWQ and 2012-006-DWQ.
   http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml

9. California Stormwater Quality Association Handbook, 2011

10. State Water Resources Board, 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)

11. State of California "Title 14 California Code of Regulations, Chapter 3, Guidelines for the Implementation of the California Environmental Quality Act."
    http://ceres.ca.gov/ceqa/guidelines/index.html

FIGURES



NOTES:

1. BACKGROUND IMAGE REFERENCED FROM AERIAL DATADOORS DESKTOP ON 28 APRIL 2016.
2. APPROXIMATE SITE LIMITS REFERENCED FROM PLAN TITLED "CRESTMORE REDEVELOPMENT, JURUPA VALLEY, CA – PRELIMINARY SITE PLAN – SCHEME A.01," PREPARED BY RGA OFFICE OF ARCHITECTURAL DESIGN, DATED 11 MAY 2016.

LEGEND:

APPROXIMATE LIMITS OF PROPOSED PROJECT

600 0 300 600

SCALE IN FEET

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Figure Title
SITE LOCATION MAP

Project No. 700045404
Date 20 NOV 2018
Scale 1" = 600'
Drawn By djh

Figure No. 1

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Filename: \\langan.com\data\IRV\data4\700045404\Cadd Data - 700045404\2D-DesignFiles\Civil\Site Location Map 2018.11.20.dwg Date: 11/21/2018 Time: 10:00 User: jeleung Style Table: Langan.stb Layout: Site Location Map

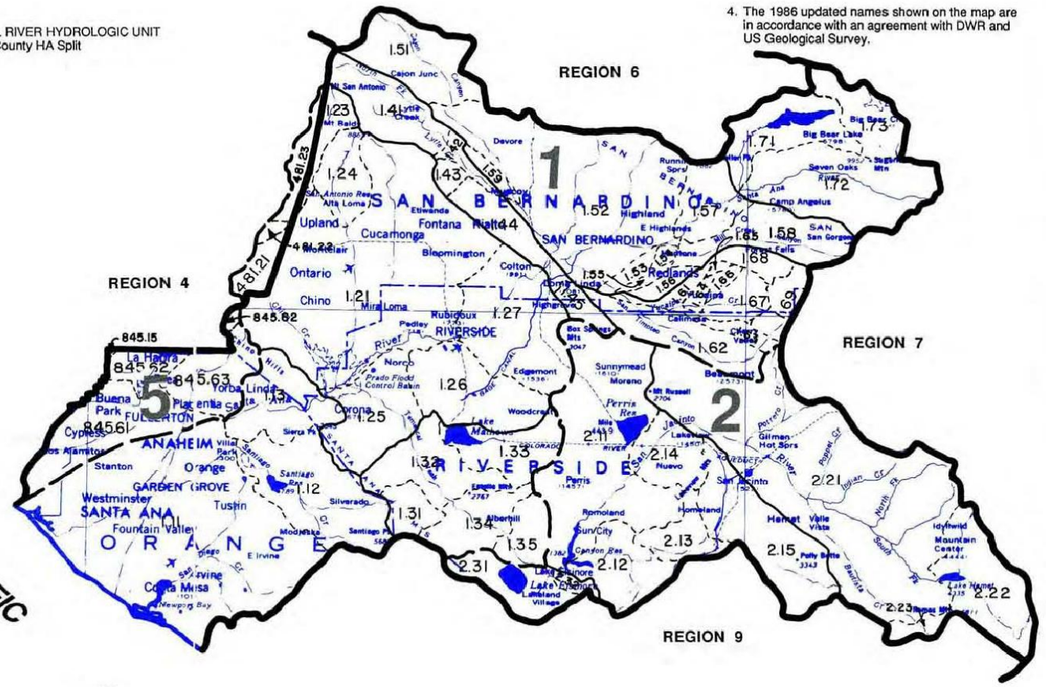
REGION 8 INDEX

801.00	SANTA ANA RIVER HYDROLOGIC UNIT
801.10	Lower Santa Ana River HA
1.11	East Coastal Plain HSA
1.12	Santiago HSA
1.13	Santa Ana Narrows HSA
801.20	Middle Santa Ana River HA Split
801.21	Chino HSA Split
481.21	Chino HSA Split
481.22	Harrison HSA
801.23	Claremont Heights HSA Split
481.23	Claremont Heights HSA Split
801.24	Cucamonga HSA
1.25	Temescal HSA
1.26	Arlington HSA
1.27	Riverside HSA
801.30	Lake Matthews HA
1.31	Coldwater HSA
1.32	Bedford HSA
1.33	Cajalco HSA
1.34	Lee Lake HSA
1.35	Terra Colta HSA
801.40	Colton-Rialto HA
1.41	Upper Lytle HSA
1.42	Lower Lytle HSA
1.43	Rialto HSA
1.44	Colton HSA
1.45	Reche HSA
801.50	Upper Santa Ana River HA
1.51	Cajon HSA
1.52	Bunker Hill HSA
1.53	Redlands HSA
1.54	Mentone HSA
1.55	Reservoir HSA
1.56	Crafton HSA
1.57	Santa Ana Canyon HSA
1.58	Mill Creek HSA
1.59	Sycamore HSA
801.60	San Timoteo HA
1.61	Yucaipa HSA
1.62	Beaumont HSA
1.63	Cherry Valley HSA
1.64	Chicken Hill HSA
1.65	Gateway HSA
1.66	Oak Glen HSA
1.67	South Mesa HSA
1.68	Triple Falls Creek HSA
1.69	Noble Creek HSA
801.70	San Bernardino Mountain HA
1.71	Bear Valley HA
1.72	Seven Oaks HSA
1.73	Baldwin HSA

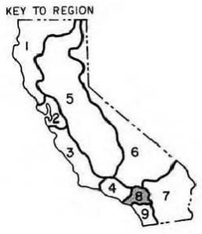
802.00	SAN JACINTO VALLEY HYDROLOGIC UNIT
802.10	Perris HA
2.11	Perris Valley HSA
2.12	Menifee HSA
2.13	Winchester HSA
2.14	Lakeview HSA
2.15	Hemet HSA
802.20	San Jacinto HA
2.21	Gilman Hot Springs HSA
2.22	Hemet Lake HSA
2.23	Bautista HSA
802.30	Elsinore Valley HA
2.31	Elsinore HSA
2.32	Railroad HSA
805.00	LOS ANGELES-SAN GABRIEL RIVER HYDROLOGIC UNIT
805.10	Coastal Plain of Los Angeles County HA Split
845.15	Central HSA Split
845.60	Anaheim HA Split
845.61	Anaheim HSA Split
845.62	La Habra HSA Split
845.63	Yorba Linda HSA Split

NOTE:

1. The names and areas shown on this map are the same as used by the Department of Water Resources (DWR) in their Bulletin 130 Series except as explained below.
2. The numbering system used on this map is an adaptation of the numbering system used in the 130 Series.
3. The boundary between Region 8 and Region 4 follows the boundary between Los Angeles County and Orange or San Bernardino Counties, not the Hydrologic Boundary. The San Bernardino County line splits Hydrologic Unit 1 (Santa Ana River HU) so that Sub-Areas 481.21, 481.22, and 481.23 are legally in Region 4 but drain into Region 8. The Orange County line splits Hydrologic Unit 5 (Los Angeles-San Gabriel River HU) so that Sub-Areas 845.15, 845.61, 845.62 and 845.63 are legally in Region 8 but drain into Region 4. Therefore, a 5 digit number on the map indicates that a regional boundary divides a hydrologic unit, area or subarea. In these cases the second digit is the number of the region from which the hydrologic area has been separated by the regional boundary. All other digits are as described in the legend.
4. The 1986 updated names shown on the map are in accordance with an agreement with DWR and US Geological Survey.

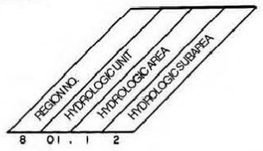


KEY TO REGION



LEGEND

- STREAM
- REGIONAL BOUNDARY
- HYDROLOGIC UNIT BOUNDARY (HU)
- HYDROLOGIC AREA BOUNDARY (HA)
- HYDROLOGIC SUBAREA BOUNDARY (SA)
- 5 — HYDROLOGIC UNIT NUMBER



April 1973
Revised: July 1976
Revised: August 1986

State Water Resources Control Board
Surveillance and Monitoring Section
T.E. Lavenda, P.E. T E Lavenda

State of California
REGIONAL WATER QUALITY CONTROL BOARD

Santa Ana Region (8)

SANTA ANA HYDROLOGIC BASIN PLANNING AREA (SA)

Scale in miles
8 0 8 16 24 32
Scale 1:500,000

INFORMATION TAKEN FROM THE 2008 WATER QUALITY CONTROL PLAN (BASIN PLAN) FOR THE SANTA ANA RIVER BASIN.

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Figure Title
SANTA ANA HYDROLOGIC BASIN PLANNING AREAS

Project No. 700045404
Date 16 OCT 2017
Scale N.T.S.
Drawn By djh

Figure No. 2

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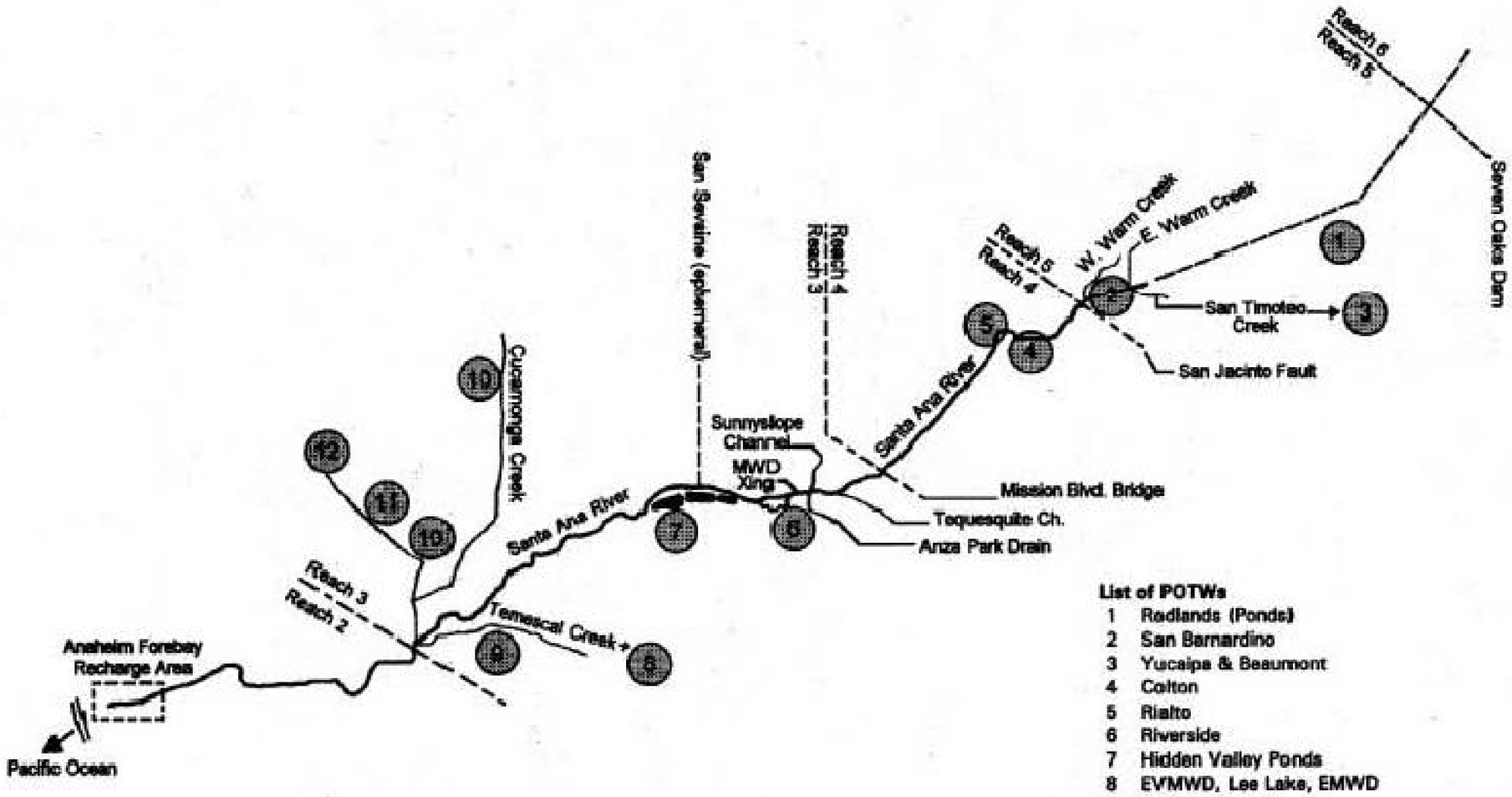
FIGURE 1-2
SANTA ANA RIVER AND TRIBUTARIES



List of POTWs

1 Redlands (Ponds)
2 San Bernardino
3 Yucaipa & Beaumont
4 Colton
5 Rialto
6 Riverside
7 Hidden Valley Ponds
8 EVMWD, Lee Lake, EMWD
9 Corona (Ponds)
10 CBMWD RP-1
11 CBMWD RP-2
12 CBMWD Carbon Cyn.

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Figure Title
SANTA ANA RIVER

Project No. 700045404
Date 16 OCT 2017
Scale N.T.S.
Drawn By djh
Figure No. 3

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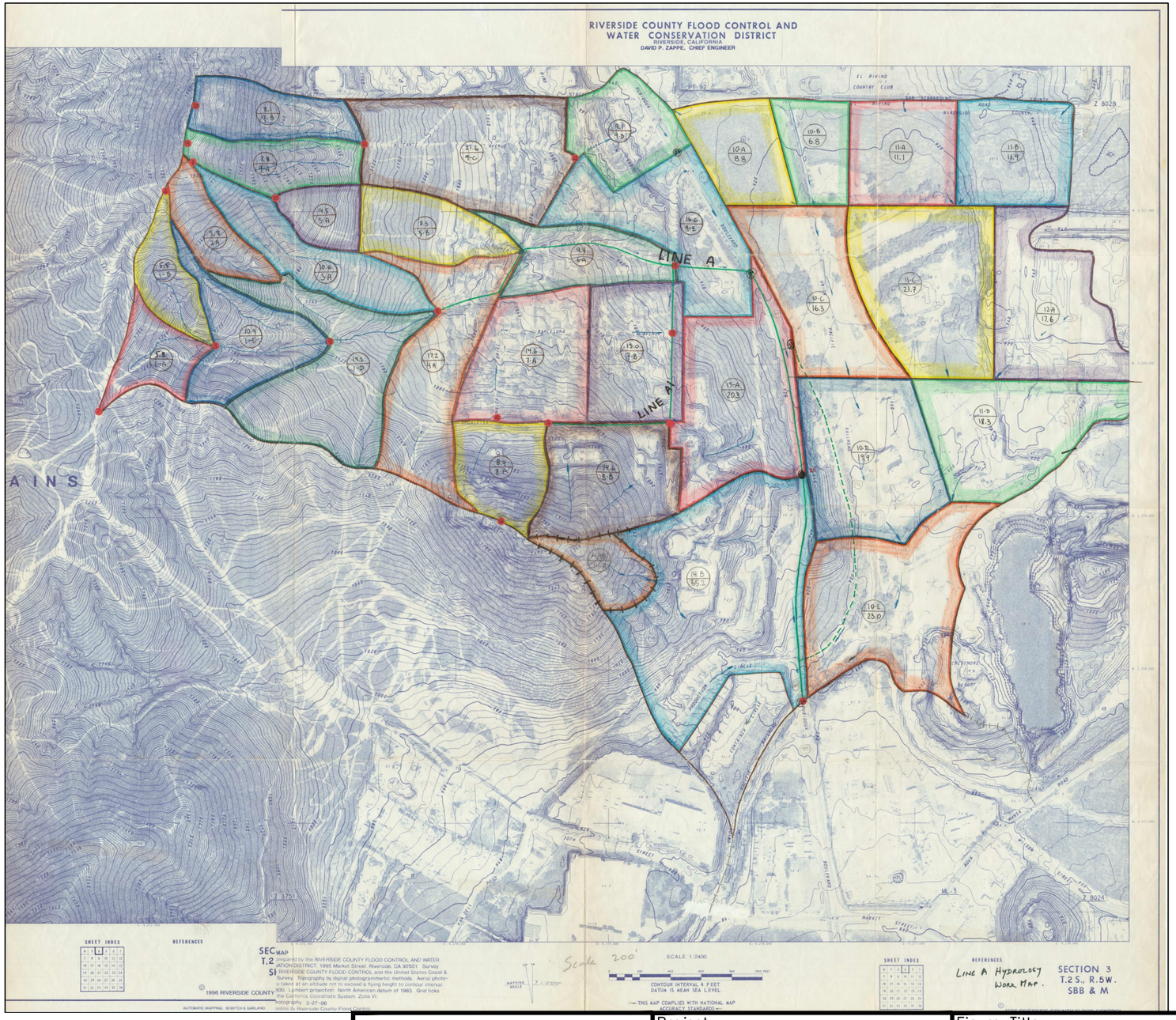

INFORMATION TAKEN FROM THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT RECORDS

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Figure Title

RCFC & WCD HYDROLOGY MAP

Project No. 700045404	Figure No. 4
Date 16 OCT 2017	
Scale N.T.S.	
Drawn By djh	

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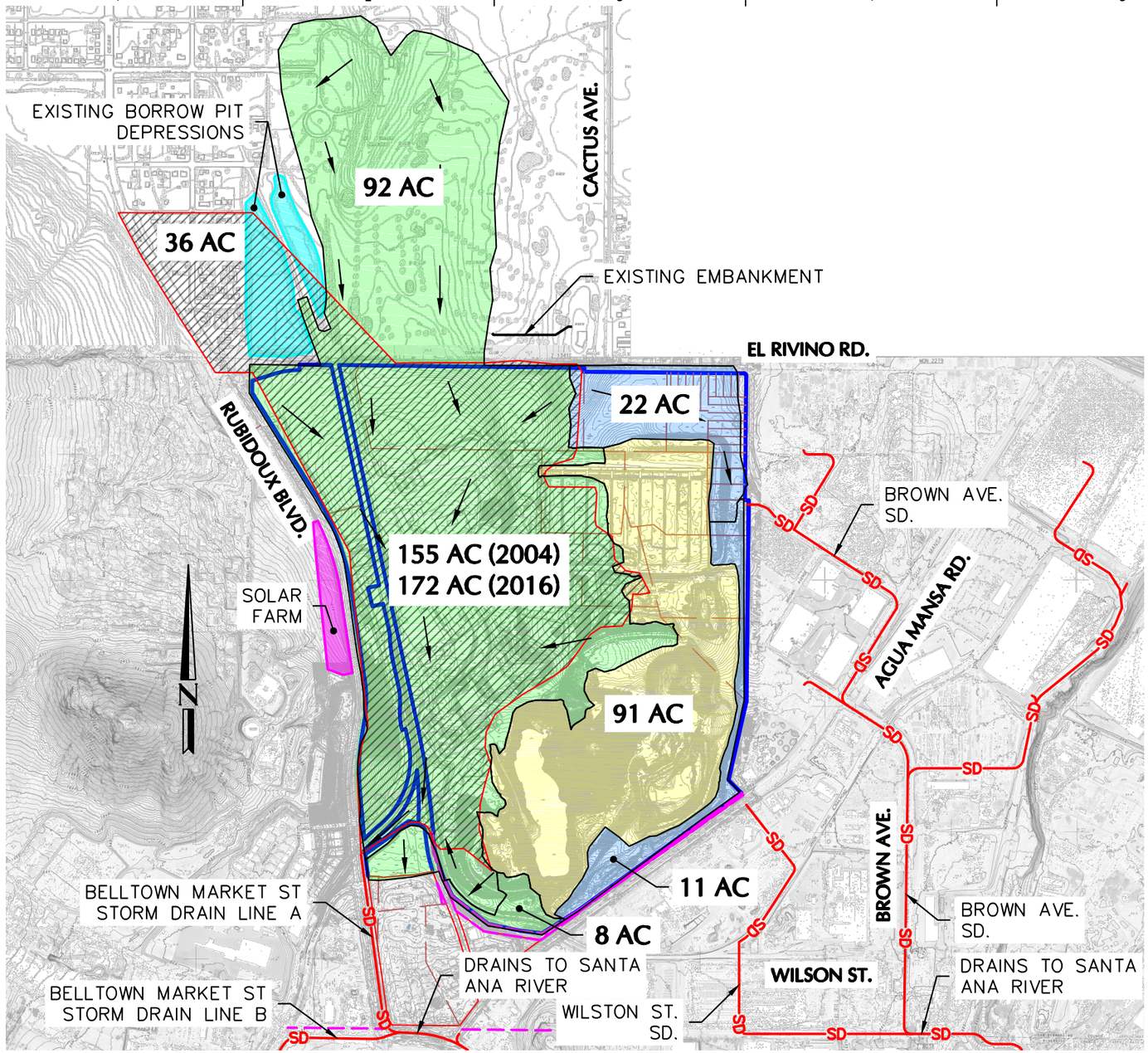

1000 500 0 1000 2000 3000

SCALE: 1"=1000'

LEGEND:

- MARKET STREET CHANNEL DRAINAGE AREA (RCFC 2004)
- REVISED MARKET STREET CHANNEL DRAINAGE AREA
- BROWN AVENUE STORMDRAIN DRAINAGE AREA
- SELF RETAINING AREAS
- PROPERTY BOUNDARY
- —SD— EXISTING STORM DRAIN

NOTES:

1. THE DRAINAGE AREAS TRIBUTARY TO THE MOST UPSTREAM PORTION OF THE MARKET STREET STORM DRAIN (REFERENCED FROM THE 2004 RCFC MARKET STREET CHANNEL HYDROLOGY REPORT) ARE SHOWN ON THIS FIGURE DUE TO THE LARGE DISCREPANCY IN AREA BETWEEN THE RCFC HYDROLOGY MAP AND THE DRAINAGE AREAS DELINEATED FROM THE LATEST SURVEY AND AVAILABLE TOPOGRAPHY MAPS.
2. TOPOGRAPHY SHOWN ON THIS FIGURE FOR AREAS WITHIN SAN BERNARDINO COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAP SECTION 34 8 E 1/4 OF SECTION 33 T1S, R5W SBB&M, DATED JAN. 5, 1966.
3. TOPOGRAPHY SHOWN ON FIGURE FOR AREAS OUTSIDE OF THE PROPERTY WITHIN RIVERSIDE COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAPS SECTION 2 T.2S., R.5W. SBB&M AND SECTION 3 T.2S., R.5W. SBB&M, DATED 06-16-2008.
4. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN WITHIN THE PROPERTY IS BASED ON "ENCUMBRENCE MAP VACANT COMMERCIAL PROPERTY JURUPA VALLEY, CALIFORNIA", PERFORMED BY DRC ENGINEERING, INC., DATED 03/29/16.

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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY CALIFORNIA

Drawing Title: EXISTING HYDROLOGY OVERALL

Project No. 700045401	Figure No. 5
Date 16 OCT 2017	
Scale 1"=1000'	
Drawn By TEAM / Checked By TEAM	
Submission Date	

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Filename: \\langan.com\data\IRV\data4\700045404\Cadd Data - 700045404\SheetFiles\HYDROLOGY\Existing Overall Hydrology.dwg Date: 10/16/2017 Time: 11:06 User: jjoh Style Table: Langan.stb Layout: OVERALL HYDROLOGY (11X17)



LEGEND:

- REVISED MARKET STREET CHANNEL DRAINAGE AREA
- BROWN AVENUE STORMDRAIN DRAINAGE AREA
- SELF RETAINING AREAS
- PROPERTY BOUNDARY
- FLOW LINES
- 2998 NODE I.D.

SUB-WATERSHED
SUB-AREA
AREA (AC) ##-X ##.#
X XXXX
SOIL TYPE AND PERCENTAGE
LANDUSE

ABBREVIATIONS:

Q100	100-YEAR PEAK FLOW
Tc	TIME OF CONCENTRATION
COMM	COMMERCIAL LANDUSE
UNDEV	UNDEVELOPED LANDUSE

NOTES:

1. TOPOGRAPHY SHOWN ON THIS FIGURE FOR AREAS WITHIN SAN BERNARDINO COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAP SECTION 34 8 E 1/4 OF SECTION 33 T1S, R5W SBB&M, DATED JAN. 5, 1966.
2. TOPOGRAPHY SHOWN ON FIGURE FOR AREAS OUTSIDE OF THE PROPERTY WITHIN RIVERSIDE COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAPS SECTION 2 T.2S., R.5W. SBB&M AND SECTION 3 T.2S., R.5W. SBB&M, DATED 06-16-2008.
3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN WITHIN THE PROPERTY IS BASED ON "ENCUMBRENCE MAP VACANT COMMERCIAL PROPERTY JURUPA VALLEY, CALIFORNIA", PERFORMED BY DRC ENGINEERING, INC., DATED 03/29/16.

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Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY CALIFORNIA

Drawing Title: EXISTING RATIONAL HYDROLOGY

Project No. 700045401	Figure No. 6
Date 16 OCT 2017	
Scale 1"=400'	
Drawn By TEAM / Checked By TEAM	
Submission Date 11/01/2016	

SUBMISSION DATE: ##/##/#### PROJECT NO. ########

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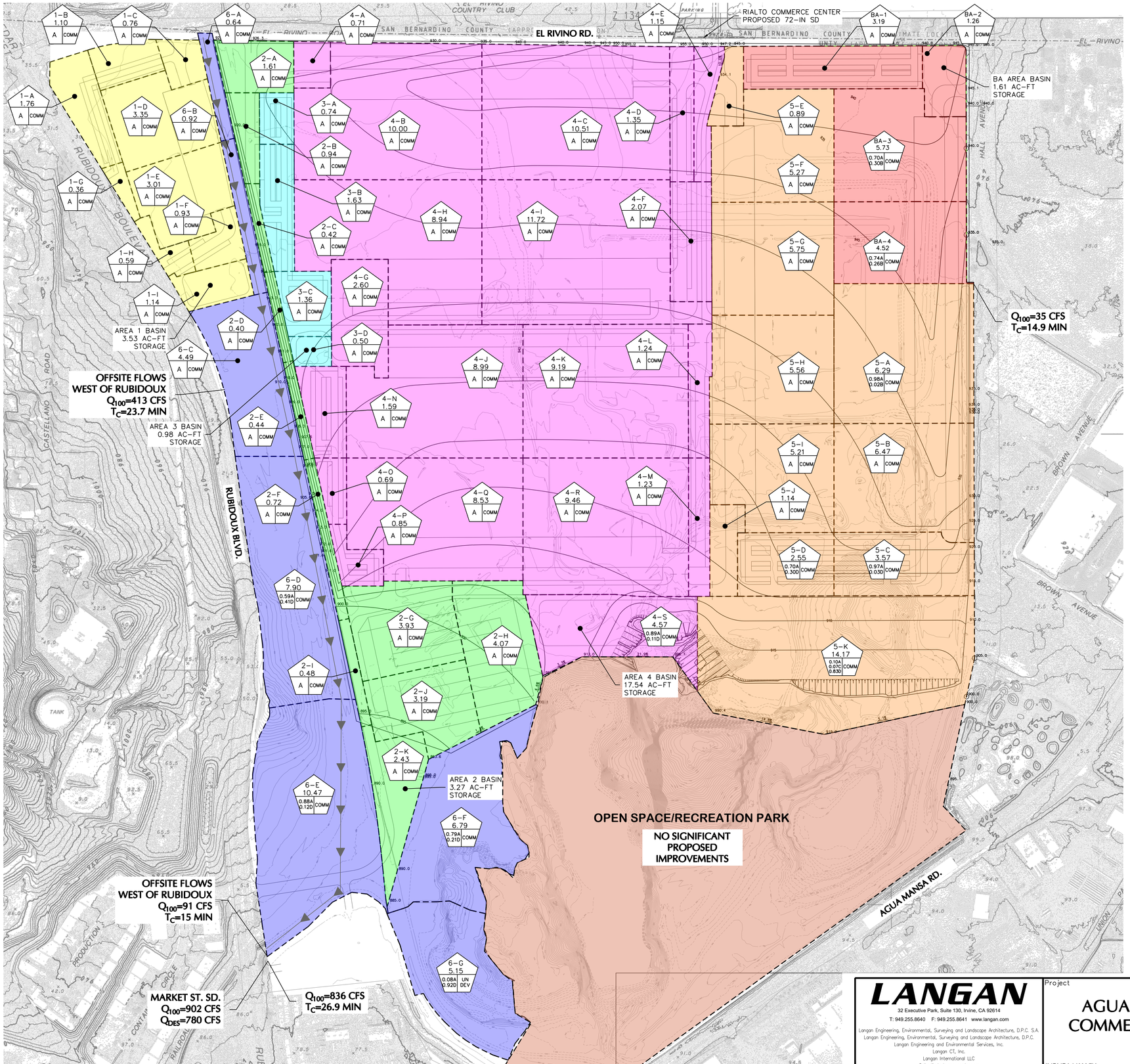

LEGEND:

- PROPOSED MARKET STREET CHANNEL DRAINAGE AREA
- PROPOSED BROWN AVENUE STORMDRAIN DRAINAGE AREA
- PROPOSED STORM DRAIN SYSTEM
- PROPERTY BOUNDARY
- FLOW LINES
- NODE I.D.

SUB-WATERSHED
SUB-AREA
AREA (AC) ##-X ##.#
SOIL TYPE AND PERCENTAGE X XXXX LANDUSE

ABBREVIATIONS:

Q100	100-YEAR PEAK FLOW
Tc	TIME OF CONCENTRATION
COMM	COMMERCIAL LANDUSE
UNDEV	UNDEVELOPED LANDUSE

NOTES:

1. TOPOGRAPHY SHOWN ON THIS FIGURE FOR AREAS WITHIN SAN BERNARDINO COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAP SECTION 34 8 E 1/4 OF SECTION 33 T1S, R5W SBB&M, DATED JAN. 5, 1966.
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N

200 100 0 200 400 600
SCALE: 1"=200'

SUBMISSION DATE: XX/XX/##,#### LANGAN
PROJECT NO. ######## LANGAN

LANGAN
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Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY CALIFORNIA

Drawing Title: PROPOSED RATIONAL HYDROLOGY

Project No.	700045401
Date	21 NOV 2018
Scale	1"=200'
Drawn By	TEAM
Checked By	TEAM
Submission Date	

Figure No. 7

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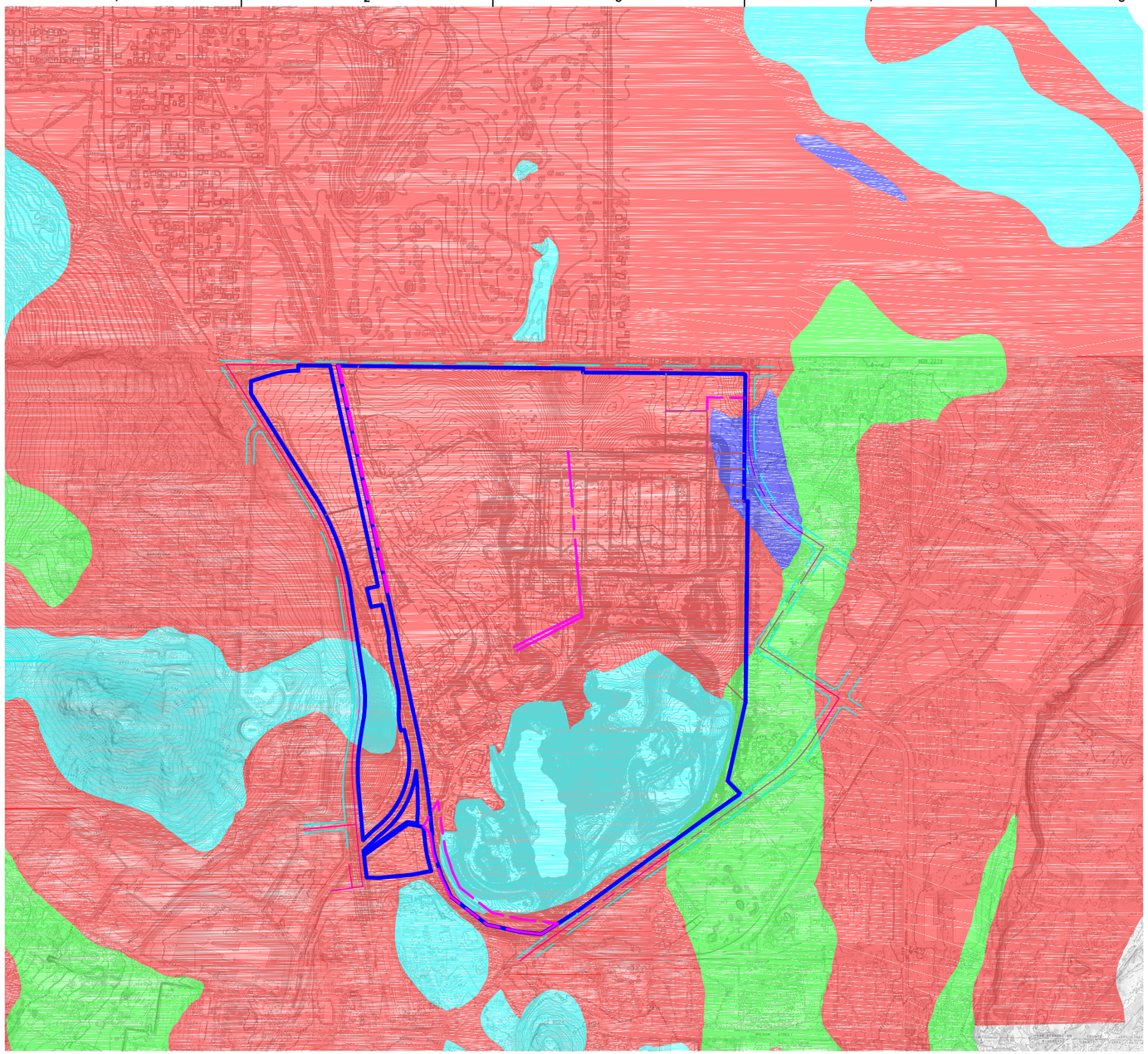

LEGEND:

- SOIL TYPE A
- SOIL TYPE B
- SOIL TYPE C
- SOIL TYPE D
- PROPERTY BOUNDARY

NOTES:

1. TOPOGRAPHY SHOWN ON THIS FIGURE FOR AREAS WITHIN SAN BERNARDINO COUNTY ARE OBTAINED FROM SAN BERNARDINO FLOOD CONTROL MAP SECTION 34 8 E 1/4 OF SECTION 33 T1S, R5W SBB&M, DATED JAN. 5, 1966.
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3. EXISTING TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN WITHIN THE PROPERTY IS BASED ON "ENCUMBRENCE MAP VACANT COMMERCIAL PROPERTY JURUPA VALLEY, CALIFORNIA", PERFORMED BY DRC ENGINEERING, INC., DATED 03/29/16.
4. SOILS INFORMATION REFERENCED FROM LATEST AVAILABLE NRCS WEB SOIL SURVEY DATA, OBTAINED 09/23/2016.

1000 500 0 1000 2000 3000

SCALE: 1"=1000'

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Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY CALIFORNIA

Drawing Title: HYDROLOGIC SOILS MAP

Project No. 700045401	Figure No. 8
Date 16 OCT 2017	
Scale 1"=1000'	
Drawn By TEAM / Checked By TEAM	
Submission Date	

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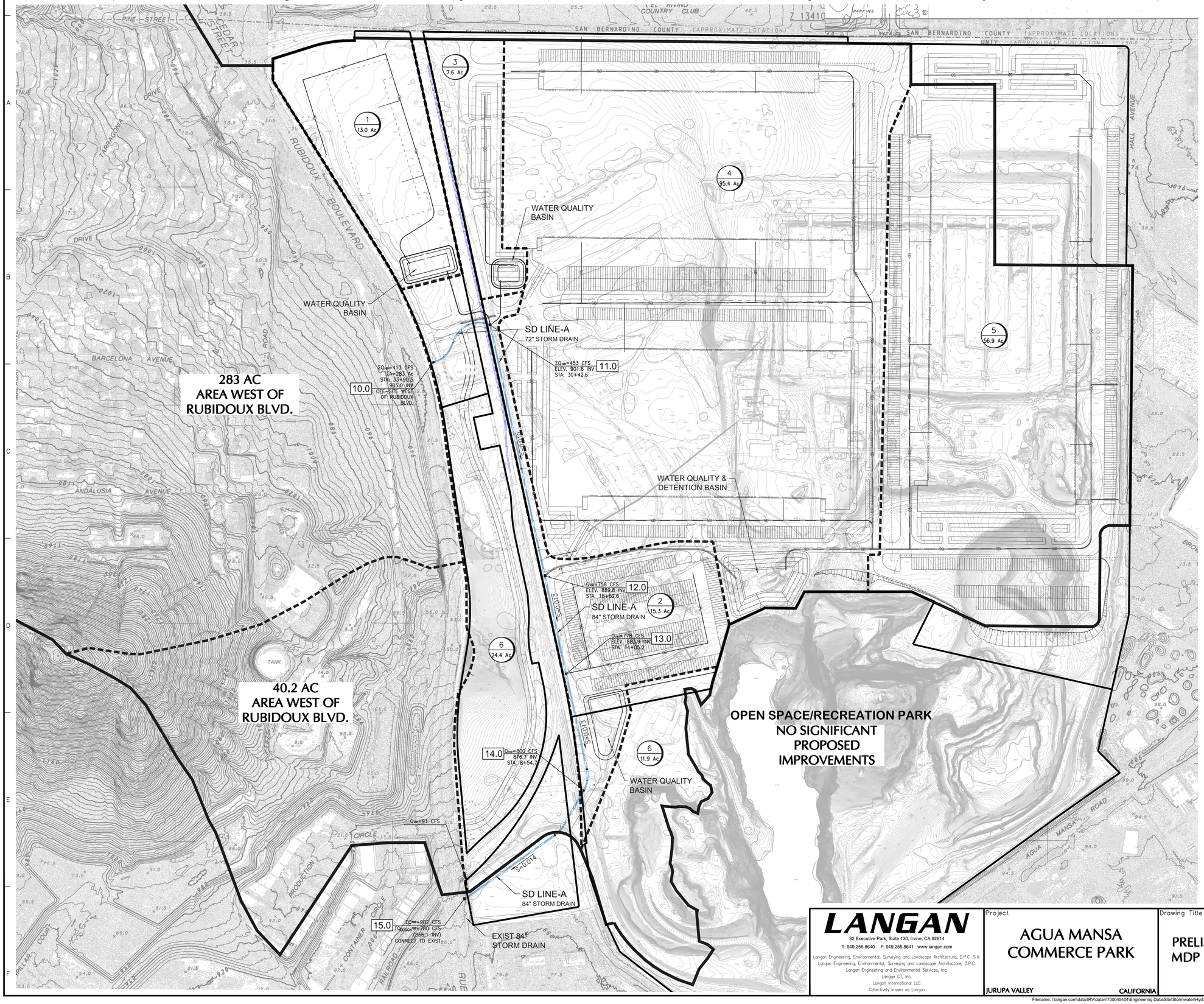
Filename: \\langan.com\data\IRV\data4\700045404\Cadd Data - 700045404\SheetFiles\HYDROLOGY\SOILS MAP.dwg Date: 5/18/2017 Time: 11:18 User: dhodson Style Table: Langan.stb Layout: SOIL MAP(24X36)



LEGEND

AREA BOUNDARY

SUB-AREA BOUNDARY

Q_{100}=XX.XX CFS ELEV. XXX.XX XXX — SURFACE FLOW NODE / PIPE FLOW NODE

1 / Ac — SUB-AREA DESIGNATION / SUB-AREA (ACRES) — AREA NODE

200 100 0 200 400 600

SCALE: 1"=200'

LANGAN

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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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Project	Drawing Title	Project No.	Figure No.
AGUA MANSA COMMERCE PARK	PRELIMINARY BELLTOWN MDP LINE-A ALIGNMENT	700045401	9
		Date: 21 NOV 2018	
		Scale: AS SHOWN	
		Drawn By: TEAM / Checked By: TEAM	
JURUPA VALLEY CALIFORNIA		Submission Date	

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PROJECT NO. ######### SUBMISSION DATE: XXXXX ##,####

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APPENDIX A

RCFC & WCD As-Built Infrastructure Plans

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

STORM DRAIN IMPROVEMENT PLANS FOR PARCEL MAP 24088 AND PARCEL MAP 12104 (SAN BERNARDINO COUNTY)

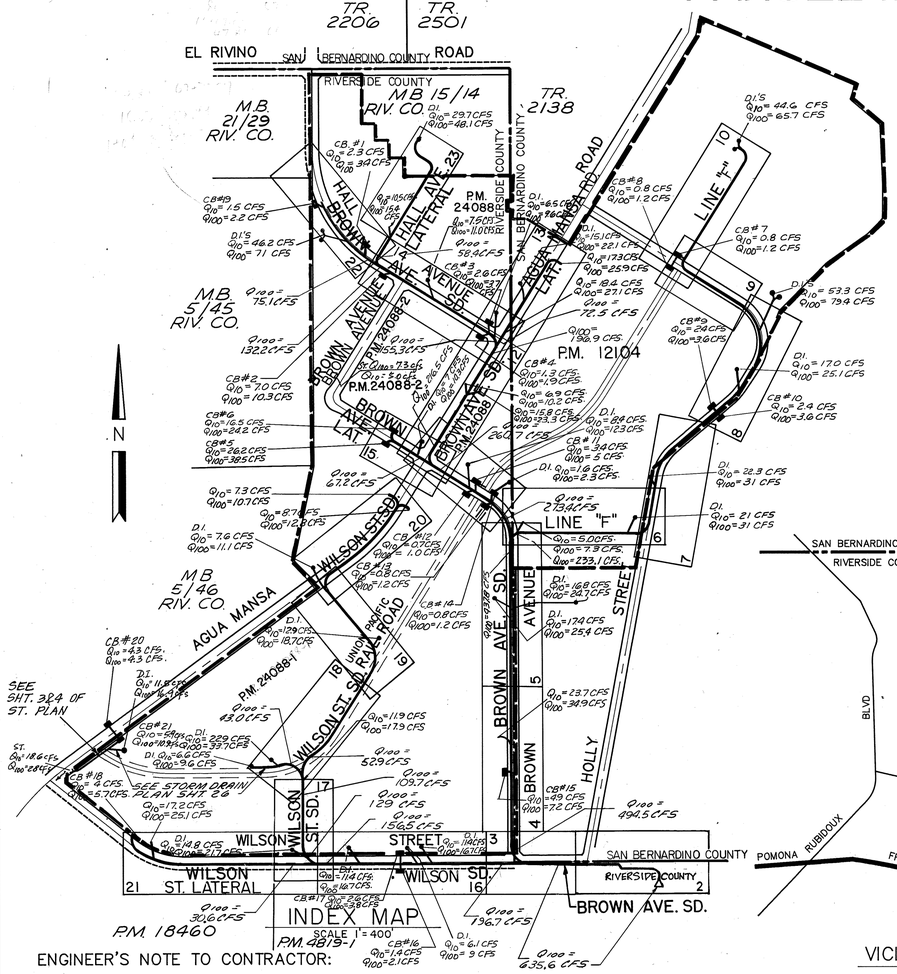
SPECIAL NOTES

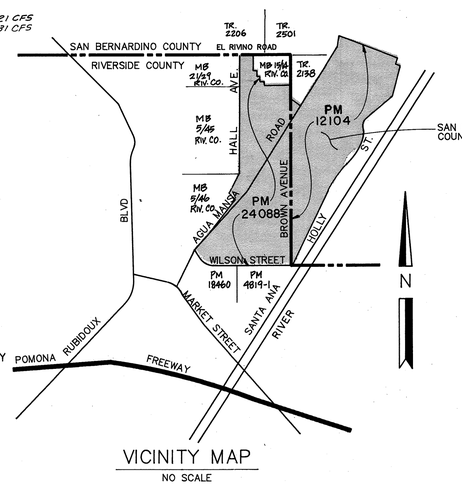
THE FOLLOWING ITEMS ARE TO BE INSPECTED AND MAINTAINED BY RIVERSIDE CO. FLOOD CONTROL AND WATER CONSERVATION DISTRICT:

78 RCP FROM STA 20+90.00 TO 11+40.05 AS SHOWN ON SHT 2
84 RCP FROM STA 11+52.05 TO 15+32.05 AS SHOWN ON SHT. 2\3
18 RCP FROM STA 15+48.85 TO 21+57.57 AS SHOWN ON SHT. 3\4
75 RCP FROM STA 21+65.12 TO 36+36.41 AS SHOWN ON SHT 4\5
66 RCP FROM STA 10+15.76 TO 15+69.15 AS SHOWN ON SHT. 3\4
66 RCP FROM STA 36+54.27 TO 44+80.57 AS SHOWN ON SHT 5\11
60 RCP FROM STA 15+78.15 TO 23+37.55 AS SHOWN ON SHT 16\17
54 RCP FROM STA 44+92.57 TO 53+68.84 AS SHOWN ON SHT 11\12
54 RCP FROM STA 23+45.55 TO 30+37.11 AS SHOWN ON SHT. 17\18
51 RCP FROM STA 53+80.16 TO 63+57.61 AS SHOWN ON SHT. 14
48 RCP FROM STA 10+09.01 TO 12+40.26 AS SHOWN ON SHT. 15
48 RCP FROM STA 30+47.81 TO 34+06.62 AS SHOWN ON SHT 18\19
42 RCP FROM STA 63+68.81 TO 66+67.21 AS SHOWN ON SHT 14\22
42 RCP FROM STA. 38+15.03 TO 43+88.39 AS SHOWN ON SHT. 19
39 RCP FROM STA. 1+07.68 TO 9+94.17 AS SHOWN ON SHT. 23

SPECIAL NOTE
The concrete cover on the inside of all reinforced concrete pipe must be increased to provide a minimum of 1-1/2" over the reinforcing when the design velocities exceed 20 feet per second. The concrete design strength in these reaches shall be f_c = 4,000 psi for velocities exceeding 20 feet per second.

ALL MANHOLES AND OTHER STRUCTURES REQUIRED TO COMPLETE THE CONSTRUCTION OF THE ABOVE MENTIONED MAINLINE PIPE, EXCLUDING ALL CATCH BASINS AND CONNECTOR PIPES.





GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S M.O.U. STANDARD SPECIFICATIONS DATED SEPTEMBER 1984, AND DESIGN MANUAL STANDARD DRAWINGS DATED MAY 1971.
2. AN ENCROACHMENT PERMIT IS REQUIRED FROM RIVERSIDE COUNTY FLOOD CONTROL. CONTACT HOWARD DICKERSON AT (714) 275-1277. AFTER THE PERMIT IS ISSUED, THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
3. CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. CONTACT LEONARD DUNN AT (714) 275-1288. THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
4. ALL STATIONING REFERS TO THE CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE-CENTERLINE INTERSECTION STATION.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT 1-800-422-4133.
7. ALL ELEVATIONS SHOWN ARE IN FEET AND DECIMALS THEREOF BASED ON U.S.C. & G.S. DATUM.

GENERAL NOTES CONTINUED

8. ALL CROSS-SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
9. ELEVATIONS OF UTILITIES ARE APPROXIMATE UNLESS OTHERWISE NOTED.
10. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6 INCHES OF CLASS "B" CONCRETE.
11. PIPE CONNECTED TO THE MAINLINE PIPE SHALL CONFORM TO JUNCTION STRUCTURE NO. 4 (JS 229) UNLESS OTHERWISE NOTED.
12. BEDDING PIPE WITH LESS THAN TWO FEET OF COVER SHALL CONFORM TO LOS ANGELES COUNTY FLOOD CONTROL DISTRICT STANDARD DRAWINGS 2-D213.3 AND 2-D177 FOR CONCRETE BACKFILL IN TRENCHES. ALL OTHER PIPE SHALL CONFORM TO RCFC&WCD STD. DWG. M815.
13. BH-1 INDICATES SOIL BORING LOCATIONS BASED ON THE SOILS REPORT DATED SEPT. 16, 1988 BY GEO-ETKA, INC. LOCATIONS SHOWN ARE APPROXIMATE.
14. "V" IS THE DEPTH OF INLET OF CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
15. CATCH BASINS SHALL BE LOCATED SO THAT LOCAL DEPRESSION SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
16. ALL CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
17. HYDRAULIC GRADE LINES SHOWN IN PROFILES ARE FOR 100 YEAR FREQUENCY FLOWS, UNLESS OTHERWISE NOTED.
18. THE CONTRACTOR SHALL COMPLY WITH THE STATE AND LOCAL SAFETY CODES DURING THE PROGRESS OF WORK.
19. THE DEVELOPER SHALL MAINTAIN ADJACENT STREETS IN A NEAT, SAFE, CLEAN AND SANITARY CONDITION AT ALL TIMES AND TO THE SATISFACTION OF THE COUNTY'S OR DISTRICT'S INSPECTOR. THE ADJACENT STREETS SHALL BE KEPT CLEAN OF DEBRIS, WITH DUST AND OTHER NUISANCE BEING CONTROLLED AT ALL TIMES. THE DEVELOPER SHALL BE RESPONSIBLE FOR ANY CLEAN-UP ON ADJACENT STREETS AFFECTED BY HIS CONSTRUCTION. METHOD OF STREET CLEANING SHALL BE BY DRY SWEEPING OF ALL PAVED AREAS.
20. THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, R.C.F.C.D., COUNTY ROAD DEPARTMENT, AND THE DEVELOPER'S ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIBILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNERS, OR THE DEVELOPER'S ENGINEER.
21. ADJUST ALL STORM DRAIN AND SEWER MANHOLES, AND WATER VALVES TO GRADE.
22. ALL PIPE LENGTHS ARE HORIZONTAL PROJECTIONS (NOT TRUE LENGTHS OF PIPE) AND ARE THE BASIS OF THE ESTIMATES OF QUANTITIES. THE CONTRACTOR SHALL DETERMINE THE TRUE QUANTITY OF PIPE REQUIRED FOR THIS PROJECT PRIOR TO PLACING ORDER.
23. ALL ELEVATIONS SHOWN ARE TO THE INVERT OF PIPE, EXCEPT WHERE OTHERWISE NOTED.
24. *THE CONCRETE COVER ON THE INSIDE OF ALL REINFORCED CONCRETE PIPE MUST BE INCREASED TO PROVIDE A MINIMUM OF 1 1/2" OVER THE REINFORCING WHEN THE DESIGN VELOCITIES EXCEED 20 FEET PER SECOND. THE CONCRETE DESIGN STRENGTH IN THESE REACHES SHALL BE f_c = 4,000 PSI FOR VELOCITIES EXCEEDING 20 FPS.*

ENGINEER'S NOTE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES, PIPES, AND/OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR SHALL ASCERTAIN THE TRUE VERTICAL AND HORIZONTAL LOCATION AND SIZE OF THOSE TO BE USED OF ANY UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR DAMAGE TO MANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON.

CONTRACTOR SHALL NOTIFY THE COUNTY OR DISTRICT IN WRITING A MINIMUM OF TWO WEEKS BEFORE BEGINNING CONSTRUCTION, AND SHALL NOT BEGIN CONSTRUCTION BEFORE OBTAINING AUTHORIZATION TO PROCEED.

INDEX

	SHEET NO.
TITLE SHEET	1
MAIN LINE PLAN AND PROFILE SHEETS	2 TO 23
CONNECTOR PIPE PROFILES	24 TO 28
MISCELLANEOUS DETAILS	29, 30

R.C.F.C.D. STANDARD DRAWINGS (P.M. 240 88)

		QUANTITY	UNIT
CB 100	CATCH BASIN NO. 1	15	EA.
CB 103	MANHOLE FRAME AND COVER FOR CATCH BASINS		
CB 105	DETAIL OF CATCH BASIN OPENING		
CB 108	INLET TYPE X	19	EA.
JS 227	JUNCTION STRUCTURE NO. 2		EA.
JS 229	JUNCTION STRUCTURE NO. 4	4	EA.
MH 251	MANHOLE NO. 1	4	EA.
MH 252	MANHOLE NO. 2	16	EA.
MH 254	MANHOLE NO. 4	18	EA.
MH 255	MANHOLE FRAME AND COVER, NON-ROCKING		
MH 257	MANHOLE SHAFT FOR CAST PIPE		
MH 259	STANDARD DROP STEP		
TS 303	TRANSITION STRUCTURE NO. 3	6	EA.
M 803	CONCRETE COLLARS FOR PIPES 12 INCHES THROUGH 66 INCHES	1	
M 815	BEDDING AND PAY LINES		
M 816	CONCRETE BULKHEAD	14	EA.

L.A.C.F.C.D. STANDARD DRAWINGS (P.M. 12104)

2-D102	MANHOLE NO. 1	1	EA.
2-D107	CONCRETE RINGS, REDUCER AND PIPE FOR MANHOLE SHAFT		
2-D112	JUNCTION STRUCTURE NO. 2	2	EA.
2-D113	MANHOLE NO. 4	2	EA.
2-D156	MANHOLE FRAME AND COVER FOR CATCH BASINS		
2-D160	CATCH BASIN NO. 1	4	EA.
2-D177	PIPE BEDDING IN TRENCHES		
2-D184	MANHOLE NO. 2	8	EA.
2-D193	JUNCTION STRUCTURE NO. 4	1	EA.
2-D393	CONCRETE COLLAR FOR PIPES 12 INCHES THROUGH 66 INCHES		
2-D430	MANHOLE SHAFT SAFETY LEDGE	3	EA.
	CONSTRUCT 84-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	365.33	L.F.
	CONSTRUCT 78-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	1256.12	L.F.
	CONSTRUCT 75-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	1449.43	L.F.
	CONSTRUCT 72-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	750.87	L.F.
	CONSTRUCT 69-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	641.08	L.F.
	CONSTRUCT 66-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	1364.61	L.F.
	CONSTRUCT 60-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	721.24	L.F.
	CONSTRUCT 54-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	2642.85	L.F.
	CONSTRUCT 51-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	941.39	L.F.
	CONSTRUCT 42-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	1086.30	L.F.
	CONSTRUCT 39-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	2315.84	L.F.
	CONSTRUCT 48-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.	1002	L.F.

APPROVED BY:
DATE: 4/11/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVENO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVENO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISC IN THE TOP OF A CONCRETE POST AND MARKED M.L. -64 ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

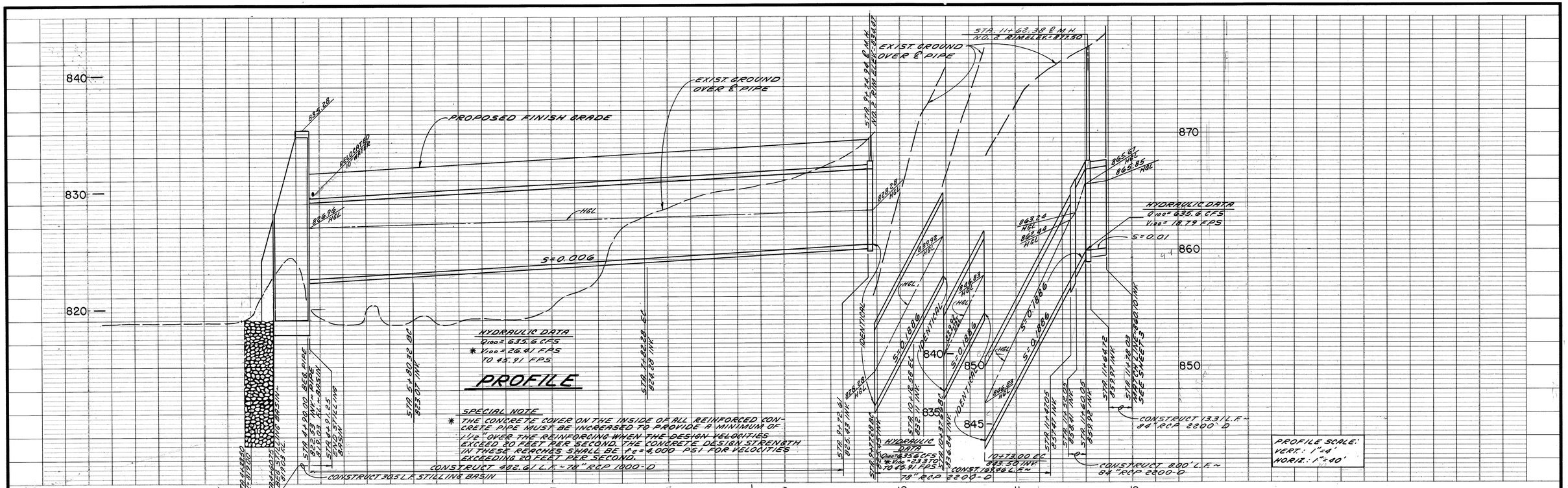
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: PLANNING ENGINEER DATE:
APPROVED BY: CHIEF ENGINEER DATE:

AGUA MANSA
BROWN AVENUE STORM DRAIN
WILSON STREET STORM DRAIN AND LATERALS
TITLE SHEET
P.M. 24088 ; P.M. 12104-(SAN BERNARDINO) COUNTY

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 1 OF 30

TITLESHT\R-SIDESD



CURVE DATA				
	Δ	R	L	T
A	77°08'37"	150.00'	201.97'	119.62'
B	44°56'50"	45.00'	35.30'	18.62'
C	45°00'00"	45.00'	35.34'	18.64'

NOTE

UNGROUTED RIP RAP SECTION STA. 4+91.25 TO STA. 9+80.00

CONSTRUCTION NOTES

1. CONSTRUCT 84-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
2. CONSTRUCT 78-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
11. CONSTRUCT T.S. NO. 3 PER R.C.F.C.D. STD. DWG. NO. TS 303
20. CONSTRUCT MANHOLE NO. 2 PER R.C.F.C.D. STD. DWG. NO. MH 252
24. CONSTRUCT 2 TON RIP RAP APRON PER SECTION "A-A" ON SHT. 2A
29. CONSTRUCT STILLING BASIN PER DETAIL ON SHT. 2A
40. CONSTRUCT 2 TON RIP RAP IN SECTIONS A-A & B-B WITH 1' THICK FILTER BLANKET PER R.C.F.C.-W.C.D. STD. SPECS.
41. RELOCATE EXISTING 10" WATER MAIN (SEE DETAIL "A" THIS SHT.)
42. CONSTRUCT 6" LAYER OF SLAG

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. IFFLAND No. 31787 CIVIL STATE OF CALIFORNIA Exp: 12/31/92

APPROVED BY: Edwin A. Ballinger
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER
DATE: 9/11/91

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Iffland 8/8/90
R.C.E. 31787

BENCH MARK

REVISIONS			
REF.	DESCRIPTIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY:
DRAWN BY:
DATE DRAWN:
CHECKED BY:

RECOMMENDED FOR APPROVAL BY: Frank O'Hanis
PLANNING ENGINEER
DATE: 2-3-92

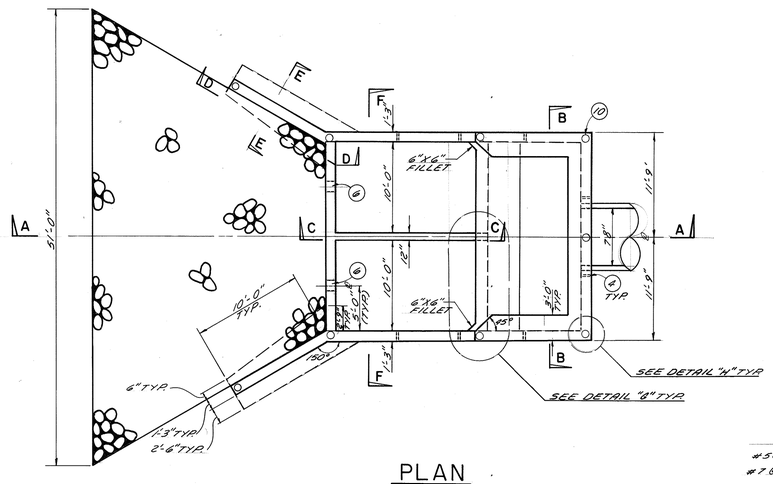
APPROVED BY: Kenneth L. Brandt
CHIEF ENGINEER
DATE: 2-4-92

AGUA MANSA
BROWN AVE. STORM DRAIN
STA. 4+91.25 TO STA. 11+78.03

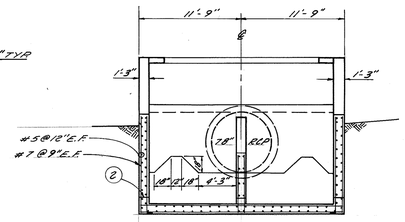
PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 2 OF 30

RIP-RAP CONSTRUCTION NOTES

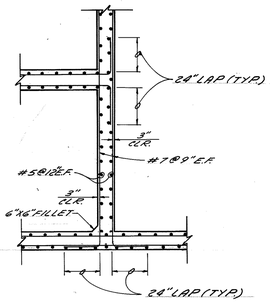
1. Rock for Grouted Rip-Rap Shall be Good Quality River Run Rock with 50-100% Larger than 43" (2 Ton) The Smallest Dimension Shall Exceed 34" (1 Ton) & The Largest Dim. Shall Not Exceed 54" (4 Ton)
2. There Shall be a Grout Bed at The Lower 2/3 Layer of Rip-Rap Apron. All The Voids Between The Rocks be Filled with Grout. Max. Spacing Between Rocks Shall be 2 inches.
3. Surface Rocks Shall be Embedded 2/3 Their Max. Dim.



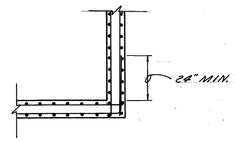
PLAN
N.T.S.



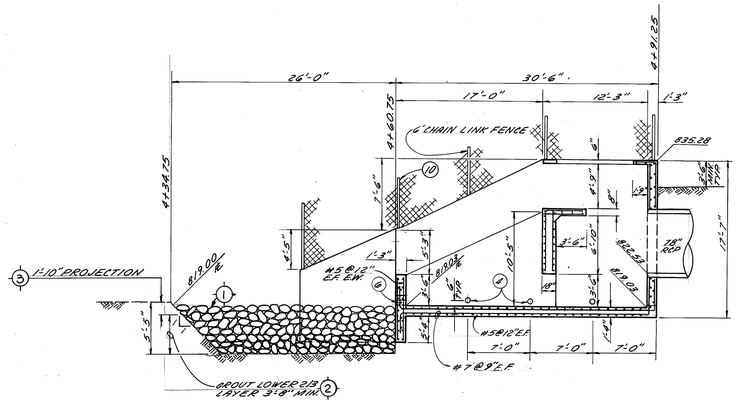
SECTION F·F
N.T.S.



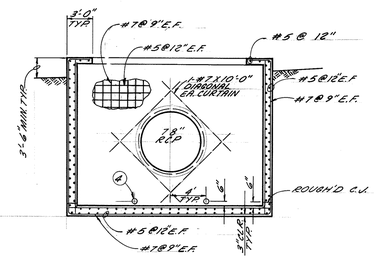
DETAIL "G"
N.T.S.



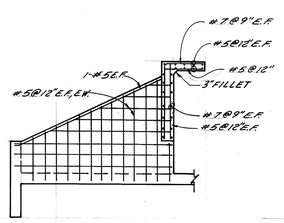
DETAIL "H"
N.T.S.



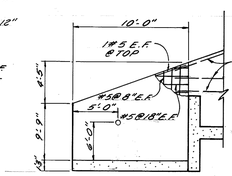
SECTION A·A
N.T.S.



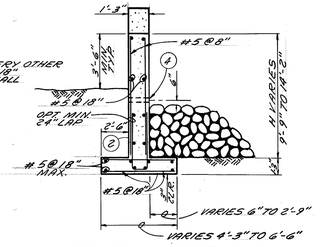
SECTION B·B
N.T.S.



SECTION C·C
N.T.S.



SECTION D·D
N.T.S.



SECTION E·E
N.T.S.

NOTES

1. ALL STEEL SHALL HAVE 2" COVER UNLESS OTHERWISE NOTED.
2. 6" STARTER WALL WITH CONST. JOINT TO BE USED IN ALL CASES.
3. 2 TON ROCK SLOPE PROTECTION.
4. CONST. 3" DIAM WEEPHOLES WITH RODENT SCREENS AND 1 CU. FOOT OF FILTER MATERIAL WRAPPED IN FILTER CLOTH AT EACH HOLE
5. ALL EXPOSED CONC. EDGES SHALL HAVE A 3/4" CHAMFER.
6. 12" SQUARE OPENING.
7. INTERSECTING WALL & CORNER DETAILS "G" & "H" TYP FOR ALL CORNERS & INTERSECTIONS.
8. REINFORCING STEEL SHALL CONFORM TO ASTM A615/60.
9. USE MINIMUM 3000 PSI CONCRETE.
10. CHAIN LINK FENCE POST.

REGISTERED PROFESSIONAL ENGINEER HENRY M. FEILEN No. 29153 Exp. 3-31-91 CIVIL STATE OF CALIFORNIA

APPROVED BY: Robert F. Dallmann
DATE: 9/11/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 3-31-91
Henry M. Feilen 10-1-90
HENRY M. FEILEN R.C.E. 29153

BENCH MARK

REVISIONS			
REF.	DESCRIPTIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY:
DRAWN BY:
DATE DRAWN:
CHECKED BY:

RECOMMENDED FOR APPROVAL BY: Frank J. Davis, PLANNING ENGINEER, DATE: 1/23/92
APPROVED BY: Kenneth A. Edwards, CHIEF ENGINEER, DATE: 2-1-92

AGUA MANSA
BROWN AVE. STORM DRAIN
STILLING BASIN
PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 2A OF 30

EXIST. SURFACE OVER E S.D.
FINISHED SURFACE OVER E S.D.
NOTE: VERTICAL SCALE IS MODIFIED
HGL
S=0.01
IDENTICAL
HYDRAULIC DATA
Q_{100}= 635.6 CFS
V_{100}= 17.37 0 18.8 FPS
STA 11+78.03 860.10 INV.
STA 13+10.00 862.32 INV.
CONSTRUCT 344.02 LF ~ 84" RCP 2200-D
STA 15+46.52 ℄ M.H. SHAFT
STA 15+46.52 EL 899.00
EXIST SURFACE OVER E S.D.
FINISHED SURFACE OVER E S.D.
SEWER
STA 15+33.05 ℄ INT. BROWN AVE. S.D.= STA 10+00.16 WILSON ST. S.D.
STA 15+32.05 EC
STA 15+32.05 863.32 INV.
END 84" RCP
STA 15+48.85 BC
BEG 78" RCP
S=0.01
HYDRAULIC DATA
Q_{100}=499.5 CFS
V_{100}=14.90 FPS
STA 16+41.44 EC
865.08 INV.
STA 12+00.00 MATCH LINE - SEE SHT NO. 16
CONST. 92.59 LF ~ 78" RCP 2200-D
PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'
EXIST SURFACE OVER E S.D.
STA 15+33.05 ℄ INT. BROWN AVE. S.D.= STA 10+00.16 WILSON ST. S.D.
FINISHED SURFACE OVER E S.D.
NOTE: VERTICAL SCALE IS MODIFIED
HGL
66" RCP
S=0.003
HYDRAULIC DATA
Q_{100}=196.8 CFS
V_{100}= 8.3 FPS
STA 10+00.00 865.19 INV.
STA 10+00.00 BEG 66" RCP
STA 10+00.00 ELEV. 874.24
CONSTRUCT 184.24 L.F. ~ 66" RCP 2500-D
STA 12+00.00 MATCH LINE - SEE SHT NO. 16

PROFILE
BROWN AVE. STORM DRAIN

PROFILE
WILSON ST. STORM DRAIN

CONSTRUCTION NOTES

1. CONSTRUCT 84-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
2. CONSTRUCT 78-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
6. CONSTRUCT 66-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
18. CONSTRUCT MANHOLE NO. 4 PER RCFCD STD. DWG. NO. M.H. 254
25. CONSTRUCT MANHOLE SHAFT SAFETY LEDGE PER RCFCD STD. DWG. NO. 2-0430.

PLAN

RIVERSIDE COUNTY
BROWN AVE. STORM DRAIN (1)
FUTURE C & G
FUTURE R/W
FUTURE ℄ WILSON
SAN BERNARDINO COUNTY
WILSON ST. STORM DRAIN (6) (66" RCP)
N89°49'50"E
N89°34'35"E
N64°25'25"W
STA 15+33.05 ℄ INT. BROWN AVE. S.D.= STA 10+00.16 WILSON ST. S.D.
STA 15+46.52 ℄ M.H. SHAFT
STA 15+48.85 BC BEG 78" RCP
STA 16+41.44 EC
MATCH LINE - SEE SHT. NO. 2
MATCH LINE - SEE SHT. NO. 16
MATCH LINE - SEE SHT. NO. 4
STA 11+78.03
STA 12+00.00
FLITCRAFT & HOLLY
HOLLY STREET
BROWN AVENUE
WILSON STREET
SAN BERNARDINO COUNTY / RIVERSIDE COUNTY
SCALE IN FEET 40 0 40 80

M.H. NO. 4 DETAIL

BROWN AVE. ℄ 84" RCP
STA 15+33.05 ℄ INT. BROWN AVE. S.D.= STA 10+00.16 WILSON ST. S.D.
STA 15+32.05 EC END 84" RCP
30°
STA 10+15.76 BEG 66" RCP
STA 15+46.52 ℄ M.H. SHAFT
STA 15+48.85 BC BEG 78" RCP
66" RCP WILSON ST. S.D.
78" RCP BROWN AVE. S.D.

SECTION AT S.D. STA. 14+50.00

SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
FUTURE R/W
FUTURE R/W
℄ FUTURE WILSON
44'
44'
12'
32'
32'
12'
6'
84" RCP
20' 0 20'

CURVE DATA				
	Δ	R	L	T
(A)	58°56'41"	90.00'	92.59'	50.86'
(B)	04°15'11"	150.00'	11.13'	5.57'
(C)	20°24'18"	90.00'	32.05'	16.20'

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. HSU No. 31787 CIVIL STATE OF CALIFORNIA 8/10/92

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Hsu 8/10/92
R.C.E. 31787

BENCH MARK: M.L. I-64
AT THE SOUTHWEST CORNER OF EL RAVINO ROAD AND HALL AVENUE 220 FEET SOUTH OF EL RAVINO ROAD 270 FEET WEST OF HALL AVENUE 3.0 FEET NORTH TELE-PHONE POLE # 75259-H 10 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED ML I-64 ELEV. 946.687 DATE 5-71

REVISIONS:			
REF.	DESCRIPTION	APPR.	APPR. DATE

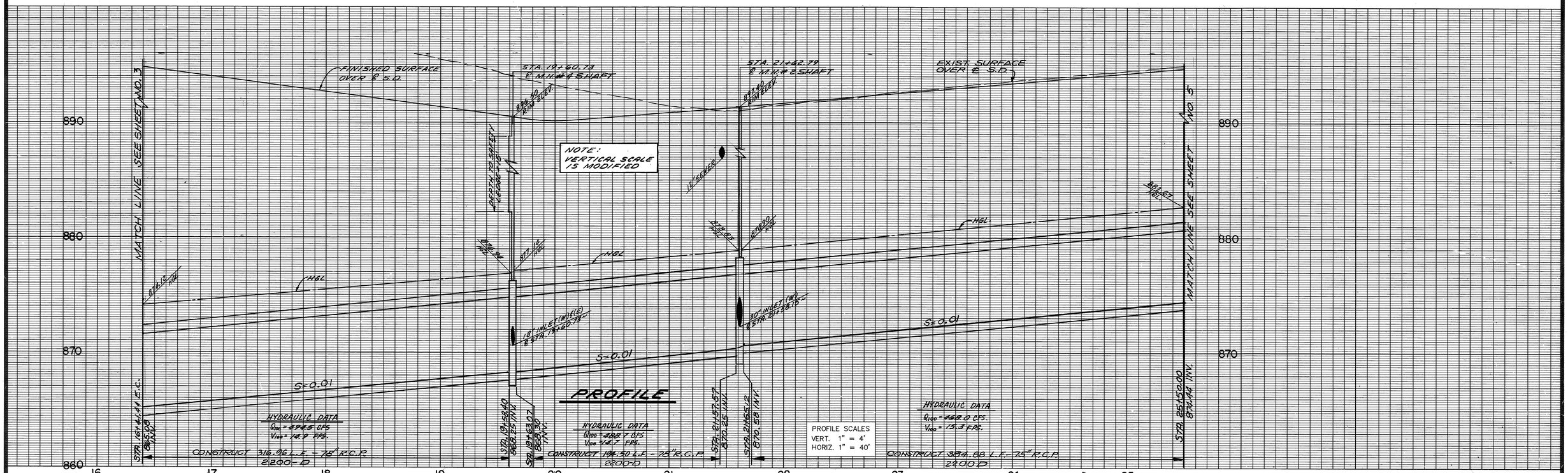
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: PLANNING ENGINEER
DATE: 12/23/92
APPROVED BY: CHIEF ENGINEER
DATE: 2-1-93

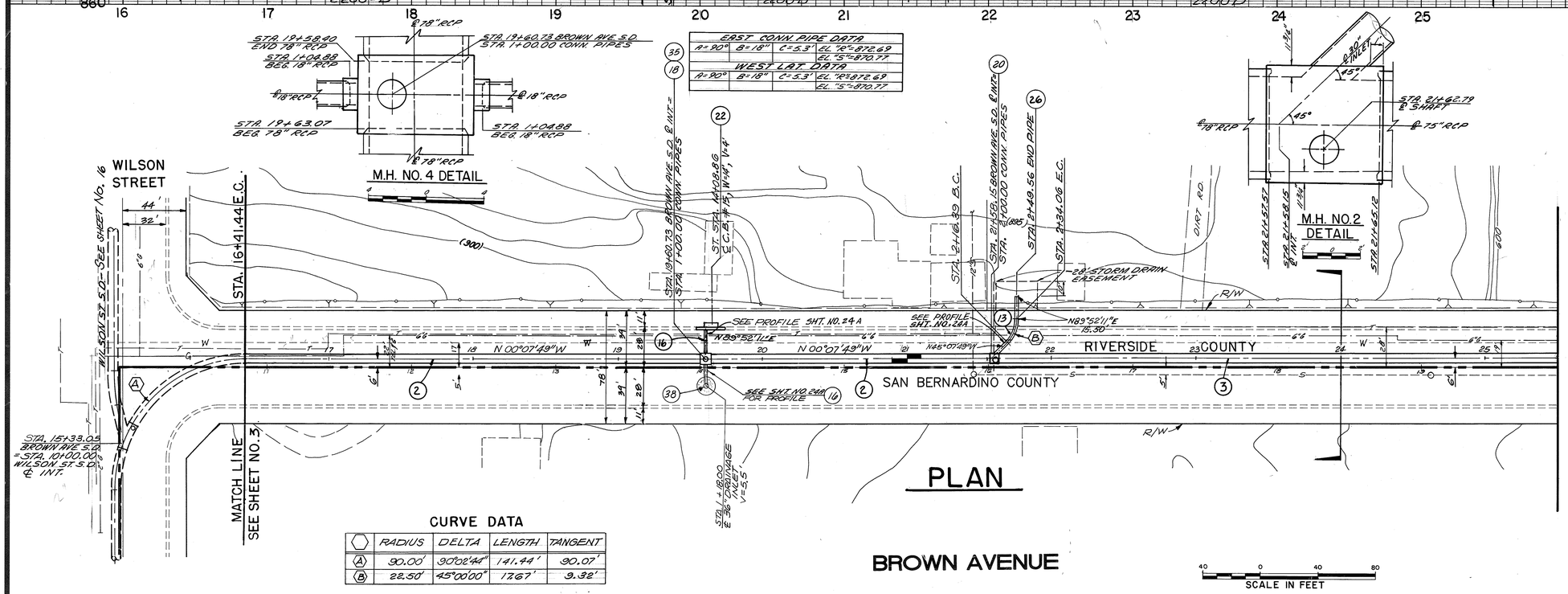
APPROVED BY: RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER
DATE: 9/11/91

AGUA MANSA BROWN AVE. & WILSON ST. STORM DRAIN
STA. 10+00.16 TO STA. 12+00.00
STA. 11+78.03 TO STA. 16+41.44 PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 3 OF 30

MADISON\SD-HALLS



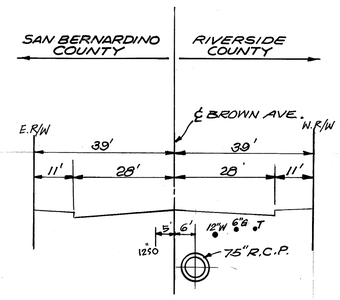


CURVE DATA

	RADIUS	DELTA	LENGTH	TANGENT
A	90.00'	90°02'44"	141.44'	90.07'
B	22.50'	45°00'00"	17.67'	9.32'

CONSTRUCTION NOTES

(2) CONSTRUCT 78 INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(3) CONSTRUCT 75 INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(13) CONSTRUCT 30 INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(16) CONSTRUCT 18 INCH RCP STORM DRAIN, CLASS II
(18) CONSTRUCT MANHOLE NO. 4 PER RCFCD STD. DWG. NO. 254
(20) CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. M.H. 252
(22) CONSTRUCT C.B. NO. 1 PER RCFCD STD. DWG. NO. CB 100
(26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M 816
(35) CONSTRUCT MANHOLE SHAFT SAFETY LEDGE PER LACFCD STD. DWG. NO. 2-D430
(38) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 25



SECTION @ S.D. STA. 24+00.00

20 0 20

APPROVED BY: Kenneth L. Richards
DATE: 9/24/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Zinn 8/8/90
R.C.E. 21787

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. ZINN No. 21787 Exp: 12/31/92 CIVIL STATE OF CALIFORNIA

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: Frank V. Keane, PLANNING ENGINEER, DATE: 1/23/92
APPROVED BY: Kenneth L. Richards, CHIEF ENGINEER, DATE: 2-1-92

AGUA MANSA BROWN AVE. STORM DRAIN

STA. 16+41.44 TO STA. 25+50.00
PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 4 OF 30

BASESHT\SD-BRN1

PROFILE

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

STA. 25+50.00 MATCH LINE - SEE SHEET NO. 4

STA. 37+05.01 MATCH LINE - SEE SHEET NO. 11

STA. 25+62.33 ℄ M.H.

STA. 25+62.30 ℄ M.H. #2 SHAFT

EXIST. F.S. OVER ℄ S.D.

STA. 29+62.33 ℄ M.H. #3 SHAFT

FINISHED SURFACE OVER ℄ S.D.

STA. 31+29.75 ℄ M.H. #4 SHAFT

STA. 36+51.92 ℄ M.H. NO. 2 SHAFT

NOTE: VERTICAL SCALE IS MODIFIED

885

875

895

HGL

S=0.01

S=0.0

S=0.005

S=0.0110

80" SR I.M. 36" RCP
℄ STA. 30+ 24" TP

90° INLETS (2) 0.74 (W)
℄ STA. 31+55.50

HYDRAULIC DATA
Q_{100} = 468.0 cfs.
V_{100} = 13.3 FPS.

HYDRAULIC DATA
Q_{100} = 227 cfs.
V_{100} = 11.5 FPS.

HYDRAULIC DATA
Q_{100} = 497.9 CFS.
V_{100} = 14.3 FPS.

CONSTRUCT 10 L.F. 75" R.C.P. 2000-D

CONSTRUCT 396.94 L.F. 75" R.C.P. 1800-D

CONSTRUCT 219.82 L.F. 75" R.C.P. 1800-D

CONSTRUCT 429.59 L.F. 75" R.C.P. 1800-D

CONSTRUCT 50.74 L.F. 66" R.C.P. 1800 D

STA. 29+60.00 ℄ STORM DRAIN

STA. 29+64.65 ℄ STORM DRAIN

STA. 31+67.88 ℄ STORM DRAIN

STA. 31+67.88 ℄ STORM DRAIN

STA. 36+37.68 ℄ STORM DRAIN

STA. 36+37.68 ℄ STORM DRAIN

STA. 36+37.68 2nd RCVD

STA. 36+37.68 ℄ STORM DRAIN

STA. 36+37.68 ℄ STORM DRAIN

STA. 37+05.01 BC-MATCH LINE SEE SHEET NO. 11

LINE "F" SEE SHT. 6

STA. 36+37.68 ℄ BROWN AVE. S.D. (INT.) = STA. 36+37.68 ℄ STORM DRAIN (IN RIVERSIDE COUNTY) MATCH LINE SEE SHT. NO. 6

STA. 36+62.86 SEE M.H.P.

PLAN

BROWN AVENUE

SAN BERNARDINO COUNTY | RIVERSIDE COUNTY

℄ BROWN AVE.

39' 39' 11' 28' 28' 11' 25' 3' 17' 5' 6' 12"W 6% T

75" R.C.P.

SECTION @ S.D. STATION 29+00.00

20' 0 20'

M.H. NO. 4 DETAIL

30°

WEST CONN PIPE DATA
A=30° B=30° C=12.2' ℄ 5"= 883.03
℄ 12"= 883.81

EAST CONN PIPE DATA
A=45° B=30° C=8.6' ℄ 5"= 883.01
℄ 12"= 883.04

	RADIUS	DELTA	LENGTH	TANGENT
A	22.50'	60°08'25"	23.58'	13.00'
B	45.00'	45°00'00"	35.34'	18.64'

LAT. DATA
A=30° B=72° C=15.6 ℄ 5"= 884.02
D=75° D_c=66° ℄ 12"= 884.10

N 89°52'11" E

N 00°07'49" W

N 30°01'49" W

N 44°32'11" E

CONSTRUCTION NOTES

(3) CONSTRUCT 75-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(6) CONSTRUCT 66-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(13) CONSTRUCT 30-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(18) CONSTRUCT MANHOLE NO 4 PER RCFCD STD. DWG. NO. MH 254
(20) CONSTRUCT MANHOLE NO 2 PER RCFCD STD. DWG. NO. MH 252
(27) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26

EP# 1-0-0335-2639
MAY 1, 2003
TRUSWEL, INC.

SCALE IN FEET
40 0 40 80

APPROVED BY: Edward T. Edwards
DATE: 9/4/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. ZUR No. 31787 CIVIL STATE OF CALIFORNIA
60: 12/31/92

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Zur 8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 732584-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 948.687 DATE 5-71

REVISIONS:
1 CONTRACT J.S. NO. 4 PER STD DWG NO JS229

REF.	DESCRIPTION	APPR.	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Frank G Revelle
PLANNING ENGINEER
DATE: 1/23/92

APPROVED BY: Edward T. Edwards
CHIEF ENGINEER
DATE: 2-1-92

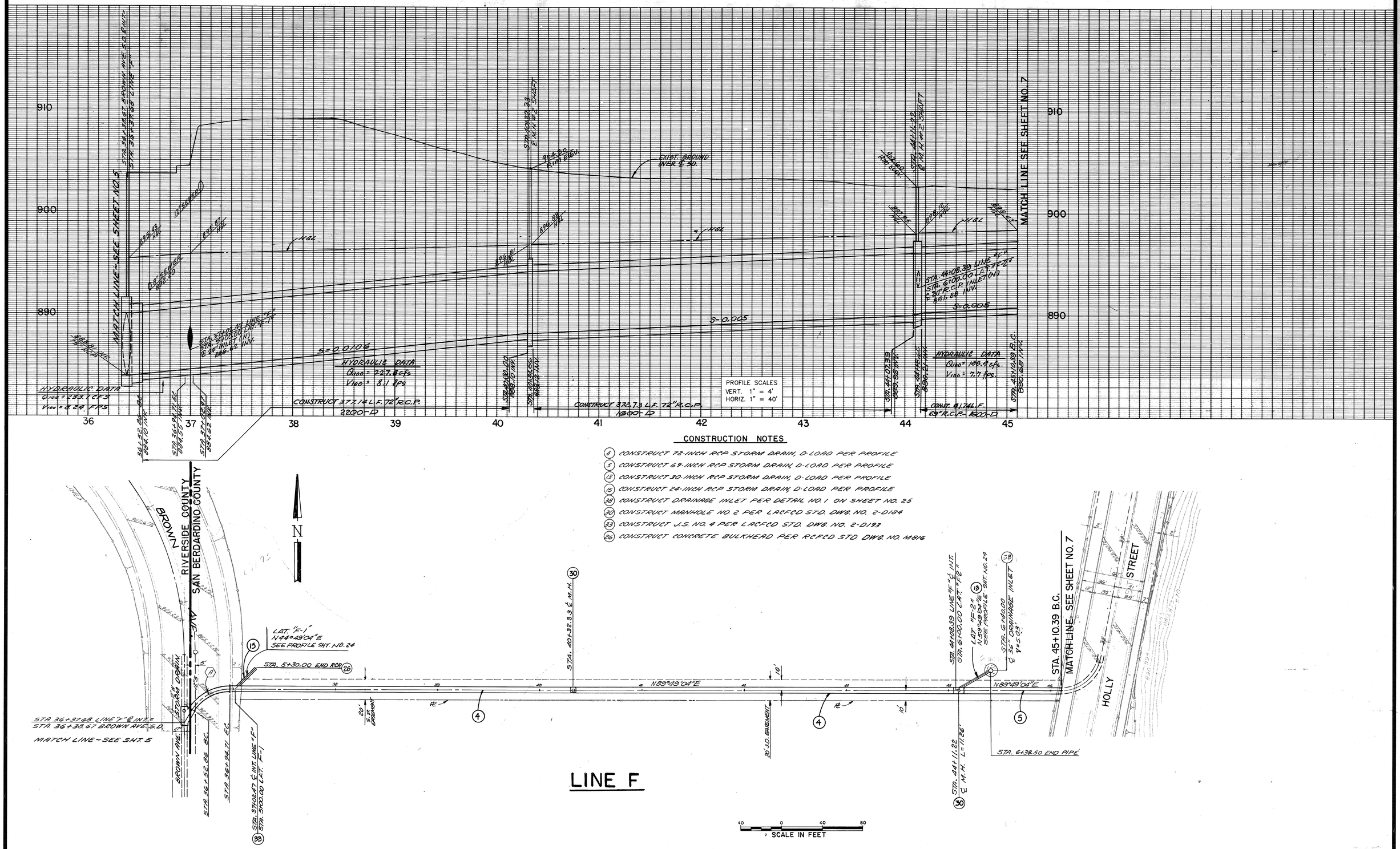
AGUA MANSA BROWN AVE. STORM DRAIN

STA. 25+50.00 TO STA. 37+05.01
PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 5 OF 30

MADISON\SD-BRN2

52937 0335 01



LINE F

CONSTRUCTION NOTES

(4) CONSTRUCT 72-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(5) CONSTRUCT 69-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(13) CONSTRUCT 30-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(38) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 25
(30) CONSTRUCT MANHOLE NO. 2 PER LACFCD STD. DWG. NO. 2-0184
(33) CONSTRUCT J.S. NO. 4 PER LACFCD STD. DWG. NO. 2-0193
(26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M816

CURVE DATA				
	Δ	R	L	T
(4)	59°56'53"	40.00'	41.85'	23.07'

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. HSU No. 31787 EXP: 12/31/92 CIVIL STATE OF CALIFORNIA

PREPARED BY
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Hsu 8/8/90
R.C.E. 31787

BENCH MARK: M.L. I-64
AT THE SOUTHWEST CORNER OF EL RIVINO RD. AND HALL AVE. 42.0 FEET SOUTH OF EL RIVINO RD. 27.0 FEET WEST OF HALL AVE. 3.0 FEET NORTH OF TELEPHONE POLE #752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONC. POST AND MARKED M.L. I-64, ELEV. 946.687 DATE 5-71

REVISIONS:

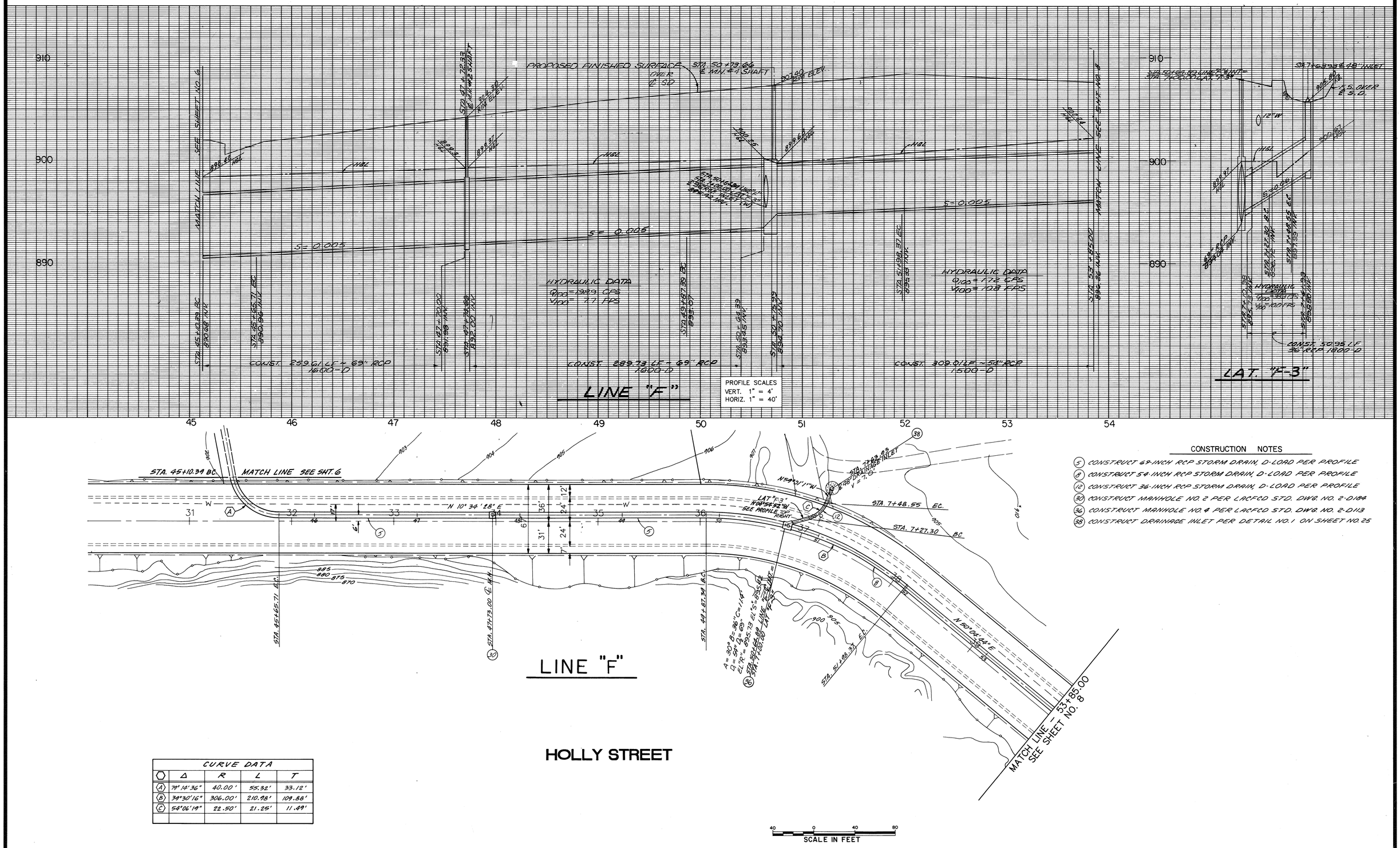
REF.	DESCRIPTION	APPR.	APPR. DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT
APPROVED BY:
DATE: 3-30-92

AGUA MANSA STORM DRAIN LINE "F"

STA. 36+37.68 TO STA. 45+10.39

PROJECT NO.
DRAWING NO. 1-514
SHEET NO. 6 OF 30



CONSTRUCTION NOTES

(5) CONSTRUCT 69-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(8) CONSTRUCT 54-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(12) CONSTRUCT 36-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(30) CONSTRUCT MANHOLE NO. 2 PER LACFCD STD. DWG. NO. 2-0.01B4
(36) CONSTRUCT MANHOLE NO. 4 PER LACFCD STD. DWG. NO. 2-0.0113
(38) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 25

CURVE DATA				
	Δ	R	L	T
(A)	79° 14' 36"	40.00'	55.32'	33.12'
(B)	39°30'16"	306.00'	210.98'	109.88'
(C)	54°06'19"	22.50'	21.25'	11.49'

40 0 40 80
SCALE IN FEET

N

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Yin 8/8/90
R.C.E. 31787

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. YIN No. 31787 EXP. 12-31-92 CIVIL STATE OF CALIFORNIA

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD, 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 948.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

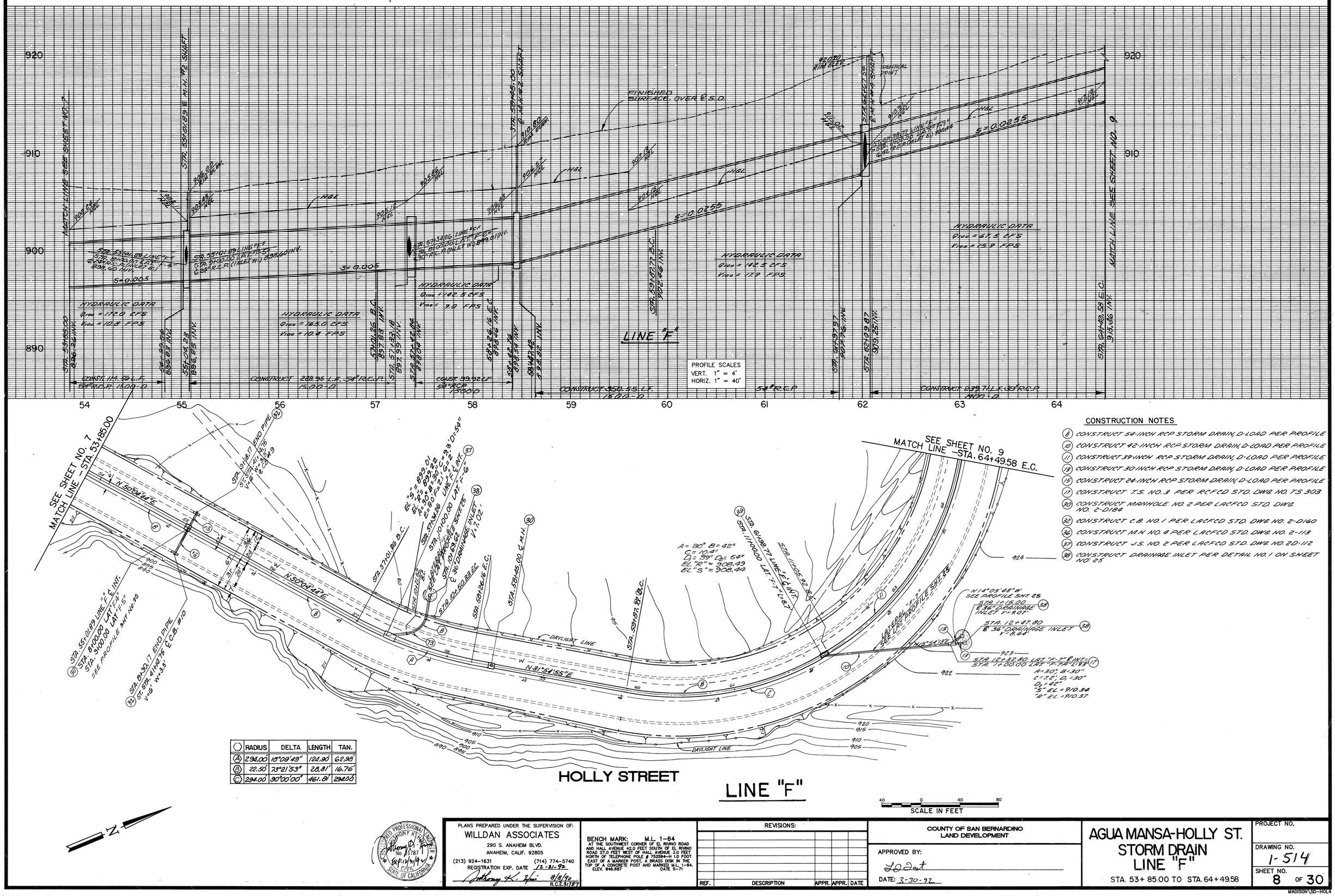
COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT
APPROVED BY:
DATE: 3-30-92

AGUA MANSA-HOLLY ST. STORM DRAIN LINE "F"

STA. 45 + 10.39 TO STA. 53 + 85.00

PROJECT NO.
DRAWING NO. 1-514
SHEET NO. 7 OF 30

MADISON\SD-HOL3


920
910
900
890
54
55
56
57
58
59
60
61
62
63
64
MATCH LINE SEE SHEET NO. 7
STA. 53+85.00
STA. 53+60.00
STA. 54+00.00
STA. 54+34.00
STA. 54+68.00
STA. 55+01.89 LINE "F"
STA. 9400.00 LAT. "F-4"
STA. 8100.00 LAT. "F-5"
SEE PROFILE SHT. NO. 25
STA. 55+10.89 LINE "F" & INT.
STA. 9400.00 LAT. "F-4"
STA. 8100.00 LAT. "F-5"
SEE PROFILE SHT. NO. 25
STA. 55+30.00 (APPROX. C.L.)
STA. 54+60.00 (APPROX. C.L.)
STA. 54+00.00 (APPROX. C.L.)
STA. 53+60.00 (APPROX. C.L.)
STA. 53+40.00 (APPROX. C.L.)
STA. 53+00.00 (APPROX. C.L.)
STA. 52+60.00 (APPROX. C.L.)
STA. 52+20.00 (APPROX. C.L.)
STA. 51+80.00 (APPROX. C.L.)
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STA. 17+00.00 (APPROX. C.L.)
STA. 16+60.00 (APPROX. C.L.)
STA. 16+20.00 (APPROX. C.L.)
STA. 15+80.00 (APPROX. C.L.)
STA. 15+40.00 (APPROX. C.L.)
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STA. 14+20.00 (APPROX. C.L.)
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STA. 12+60.00 (APPROX. C.L.)
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STA. 8+60.00 (APPROX. C.L.)
STA. 8+20.00 (APPROX. C.L.)
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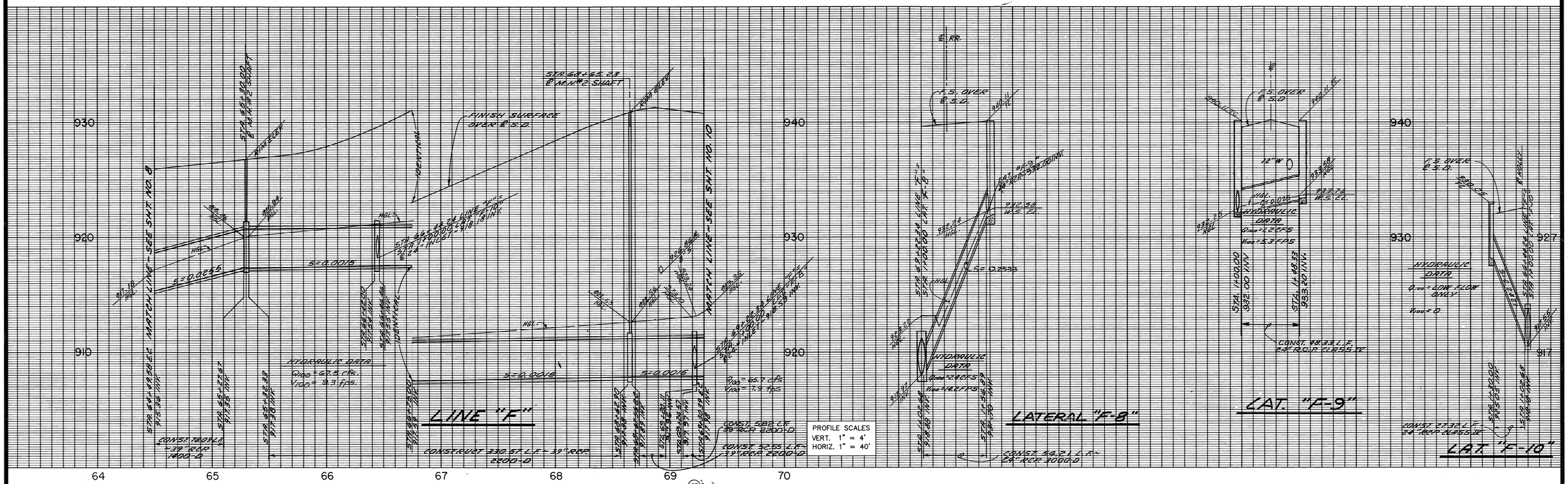
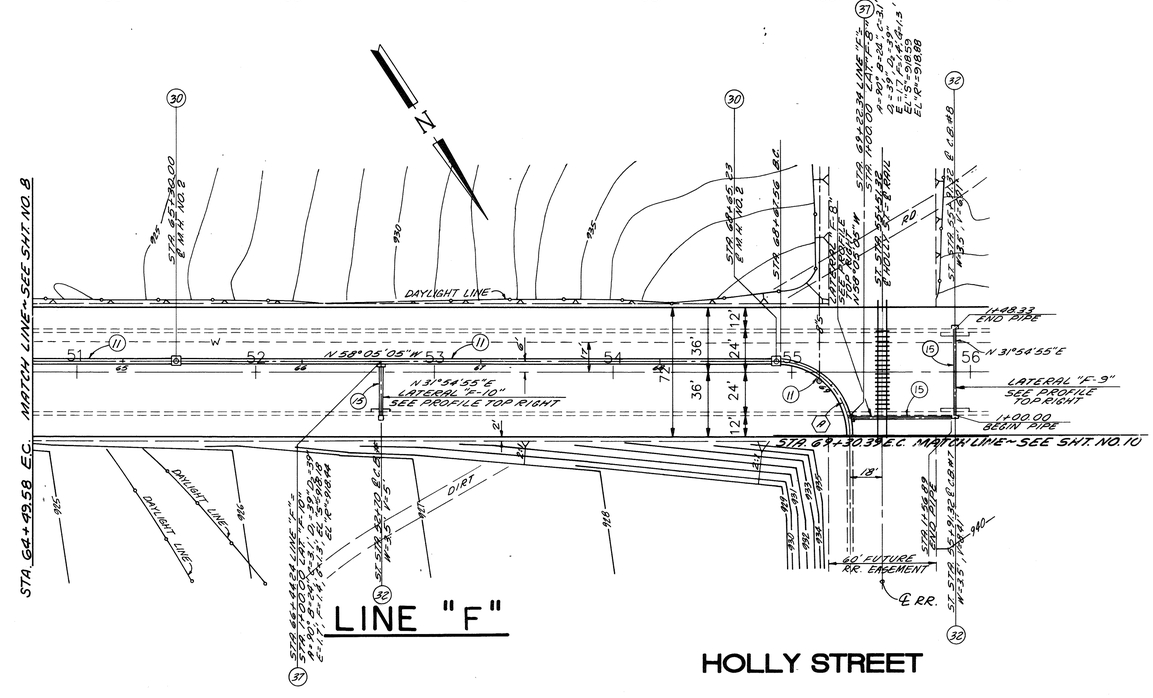
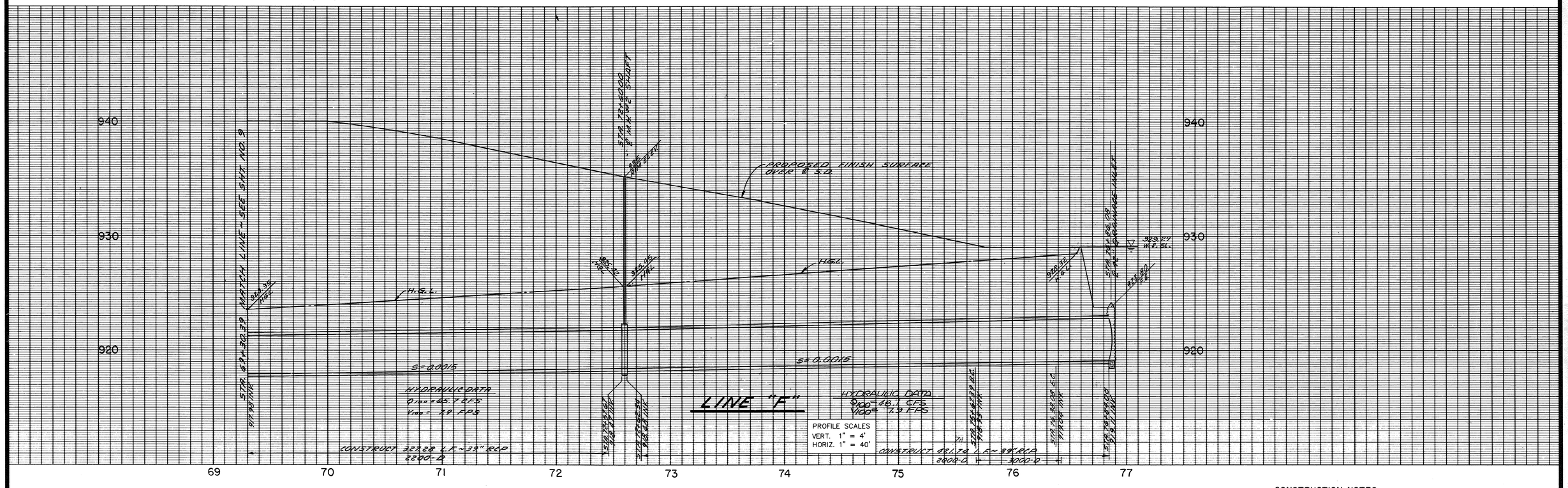
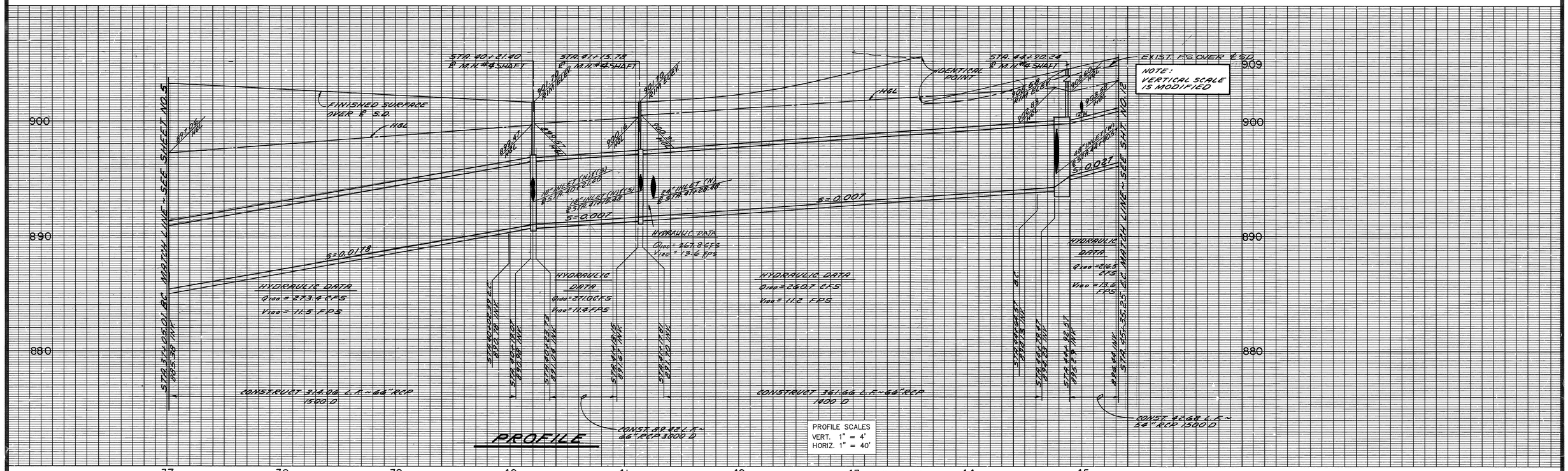
STA. 0+20.00 (APPROX. C.L.)
STA. 0




LINE "F"
HOLLY STREET
STA. 64+49.58 ℄ MATCH LINE - SEE SHT. NO. 8
STA. 69+30.39 ℄ MATCH LINE - SEE SHT. NO. 10
DAYLIGHT LINE
DIRT
N 58°05'05"W
N 31°54'55"E
LATERAL "F-10" SEE PROFILE TOP RIGHT
LATERAL "F-9" SEE PROFILE TOP RIGHT
+88.23 END PIPE
+00.00 BEGIN PIPE
40' FUTURE R/R EASEMENT
℄ R.R.
STA. 69+22.34 LINE "G" EL. 1-5=918.59 EL. 2-4=918.88
STA. 69+22.34 LINE "F-8" EL. 1-3=918.59 EL. 2-4=920.43
STA. 69+65.23 ℄ M.H. NO. 2
STA. 69+67.06 ℄
STA. 69+65.23 ℄ M.H. NO. 2
STA. 69+30.39 ℄ M.H. NO. 2
STA. 69+30.39 ℄ M.H. NO. 2
STA. 69+30.39


940
930
920
69
70
71
72
73
74
75
76
77
PROPOSED FINISH SURFACE OVER E.G.
H.G.L.
H.G.L.
S=0.0015
S=0.0015
HYDRAULIC DATA
Q100=45.7 CFS
V100= 2.9 FPS
HYDRAULIC DATA
Q100=48.1 CFS
V100= 1.9 FPS
LINE "F"
PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'
CONSTRUCT 327.28 L.F.-39" RCP S=0.0015
CONSTRUCT 421.74 L.F.-39" RCP S=0.0015
MATCH LINE STA 69+30.39
MATCH LINE STA 72+60.00
MATCH LINE STA 76+38.08
383.29 W.S. EL.
382.39 H.G.L.
382.60 H.G.L.
382.39 H.G.L.
382.60 H.G.L.
382.39 H.G.L.
382.60 H.G.L


PROFILE
PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'
NOTE: VERTICAL SCALE IS MODIFIED
EXIST. F.G. OVER ℄ S.D.
IDENTICAL POINT
HGL
STA. 40+21.40 ℄ M.H. #4 SHAFT
STA. 41+15.78 ℄ M.H. #4 SHAFT
STA. 44+20.28 ℄ M.H. #4 SHAFT
FINISHED SURFACE OVER ℄ S.D.
S=0.007
S=0.0178
S=0.0037
HYDRAULIC DATA
Q100 = 273.4 CFS
V100 = 11.5 FPS
HYDRAULIC DATA
Q100 = 247.8 CFS
V100 = 13.6 FPS
HYDRAULIC DATA
Q100 = 271.0 CFS
V100 = 11.4 FPS
HYDRAULIC DATA
Q100 = 260.7 CFS
V100 = 11.2 FPS
HYDRAULIC DATA
Q100 = 216.5 CFS
V100 = 13.6 FPS
CONSTRUCT 314.06 L.F. ~ 66" RCP 1500 D
CONSTRUCT 361.66 L.F. ~ 66" RCP 1800 D
CONST. 92.68 L.F. ~ 54" RCP 1500 D
CONST. 88.42 L.F. ~ 66" RCP 3900 D
STA. 40+21.40 ℄ INT.
WEST'LY CONN. PIPE DATA
A=90° B=18" C=4.7' EL. 16'=893.23
EL. 5'=893.01
STA. 40+21.40 ℄ INT.
EAST'LY CONN. PIPE DATA
A=90° B=18" C=4.7' EL. 16'=893.62
EL. 5'=894.00
STA. 44+80.57 ℄ INT.
CONN. PIPE DATA
A=30° B=48" C=12.2' EL. 16'=894.49
D1=54° D2=66" EL. 5'=895.45
STA. 41+15.48 BROWN AVE. S.D. ℄ INT. = STA. 1+00.00 CONN. PIPES
STA. 1+04.28 BEG. 18" RCP
STA. 40+21.40 BROWN AVE. S.D. ℄ INT. = STA. 1+00.00 CONN. PIPES
STA. 1+04.28 BEG. 18" RCP
℄ 66" RCP
℄ 18" RCP
M.H. NO. 4
STA. 41+17.81 BEG. 78" RCP
STA. 41+15.15 2ND 78" RCP
STA. 41+13.15 3RD 78" RCP
STA. 40+89.39 ST. CONNECTOR PIPE PROFILE SHT. 26
STA. 40+23.65 ST. STR. DRAINAGE
STA. 40+23.65 ST. CONNECTOR PIPE PROFILE SHT. 26
STA. 40+23.65 BROWN AVE. S.D. ℄ INT. = STA. 1+00.00 CONN. PIPES
STA. 40+21.40 BEG. 78" RCP
STA. 41+15.48 BROWN AVE. S.D. ℄ INT. = STA. 1+00.00 CONN. PIPES
STA. 41+13.48 BEG. 78" RCP
STA. 41+13.48 2ND 78" RCP
STA. 41+11.48 3RD 78" RCP
STA. 41+09.48 4TH 78" RCP
STA. 41+07.48 5TH 78" RCP
STA. 41+05.48 6TH 78" RCP
STA. 41+03.48 7TH 78" RCP
STA. 41+01.48 8TH 78" RCP
STA. 40+99.48 9TH 78" RCP
STA. 40+97.48 10TH 78" RCP
STA. 40+95.48 11TH 78" RCP
STA. 40+93.48 12TH 78" RCP
STA. 40+91.48 13TH 78" RCP
STA. 40+89.48 14TH 78" RCP
STA. 40+87.48 15TH 78" RCP
STA. 40+85.48 16TH 78" RCP
STA. 40+83.48 17TH 78" RCP
STA. 40+81.48 18TH 78" RCP
STA. 40+79.48 19TH 78" RCP
STA. 40+77.48 20TH 78" RCP
STA. 40+75.48 21ST 78" RCP
STA. 40+73.48 22ND 78" RCP
STA. 40+71.48 23RD 78" RCP
STA. 40+69.48 24TH 78" RCP
STA. 40+67.48 25TH 78" RCP
STA. 40+65.48 26TH 78" RCP
STA. 40+63.48 27TH 78" RCP
STA. 40+61.48 28TH 78" RCP
STA. 40+59.48 29TH 78" RCP
STA. 40+57.48 30TH 78" RCP
STA. 40+55.48 31ST 78" RCP
STA. 40+53.48 32ND 78" RCP
STA. 40+51.48 33RD 78" RCP
STA. 40+49.48 34TH 78" RCP
STA. 40+47.48 35TH 78" RCP
STA. 40+45.48 36TH 78" RCP
STA. 40+43.48 37TH 78" RCP
STA. 40+41.48 38TH 78" RCP
STA. 40+39.48 39TH 78" RCP
STA. 40+37.48 40TH 78" RCP
STA. 40+35.48 41ST 78" RCP
STA. 40+33.48 42ND 78" RCP
STA. 40+31.48 43RD 78" RCP
STA. 40+29.48 44TH 78" RCP
STA. 40+27.48 45TH 78" RCP
STA. 40+25.48 46TH 78" RCP
STA. 40+23.48 47TH 78" RCP
STA. 40+21.48 48TH 78" RCP
STA. 40+19.48 49TH 78" RCP
STA. 40+17.48 50TH 78" RCP
STA. 40+15.48 51ST 78" RCP
STA. 40+13.48 52ND 78" RCP
STA. 40+11.48 53RD 78" RCP
STA. 40+09.48 54TH 78" RCP
STA. 40+07.48 55TH 78" RCP
STA. 40+05.48 56TH 78" RCP
STA. 40+03.48 57TH 78" RCP
STA. 40+01.48 58TH 78" RCP
STA. 39+99.48 59TH 78" RCP
STA. 39+97.48 60TH 78" RCP
STA. 39+95.48 61ST 78" RCP
STA. 39+93.48 62ND 78" RCP
STA. 39+91.48 63RD 78" RCP
STA. 39+89.48 64TH 78" RCP
STA. 39+87.48 65TH 78" RCP
STA. 39+85.48 66TH 78" RCP
STA. 39+83.48 67TH 78" RCP
STA. 39+81.48 68TH 78" RCP
STA. 39+79.48 69TH 78" RCP
STA. 39+77.48 70TH 78" RCP
STA. 39+75.48 71ST 78" RCP
STA. 39+73.48 72ND 78" RCP
STA. 39+71.48 73RD 78" RCP
STA. 39+69.48 74TH 78" RCP
STA. 39+67.48 75TH 78" RCP
STA. 39+65.48 76TH 78" RCP
STA. 39+63.48 77TH 78" RCP
STA. 39+61.48 78TH 78" RCP
STA. 39+59.48 79TH 78" RCP
STA. 39+57.48 80TH 78" RCP
STA. 39+55.48 81ST 78" RCP
STA. 39+53.48 82ND 78" RCP
STA. 39+51.48 83RD 78" RCP
STA. 39+49.48 84TH 78" RCP
STA. 39+47.48 85TH 78" RCP
STA. 39+45.48 86TH 78" RCP
STA. 39+43.48 87TH 78" RCP
STA. 39+41.48 88TH 78" RCP
STA. 39+39.48 89TH 78" RCP
STA. 39+37.48 90TH 78" RCP
STA. 39+35.48 91ST 78" RCP
STA. 39+33.48 92ND 78" RCP
STA. 39+31.48 93RD 78" RCP
STA. 39+29.48 94TH 78" RCP
STA. 39+27.48 95TH 78" RCP
STA. 39+25.48 96TH 78" RCP
STA. 39+23.48 97TH 78" RCP
STA. 39+21.48 98TH 78" RCP
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STA. 39+17.48 100TH 78" RCP
STA. 39+15.48 101ST 78" RCP
STA. 39+13.48 102ND 78" RCP
STA. 39+11.48 103RD 78" RCP
STA. 39+09.48 104TH 78" RCP
STA. 39+07.48 105TH 78" RCP
STA. 39+05.48 106TH 78" RCP
STA. 39+03.48 107TH 78" RCP
STA. 39+01.48 108TH 78" RCP
STA. 38+99.48 109TH 78" RCP
STA. 38+97.48 110TH 78" RCP
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STA. 38+63.48 127TH 78" RCP
STA. 38+61.48 128TH 78" RCP
STA. 38+59.48 129TH 78" RCP
STA. 38+57.48 130TH 78" RCP
STA. 38+55.48 131ST 78" RCP
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STA. 38+49.48 134TH 78" RCP
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STA. 27+53.48 682ND 78" RCP
STA. 27+51.48 683RD 78" RCP
STA. 27+49.48 684TH 78" RCP
STA. 27+47.48 685TH 78" RCP
STA. 27+45.48 686TH 78" RCP
STA. 27+43.48 687TH 78" RCP
STA. 27+41.48 688TH 78" RCP
STA. 27+39.48 689TH 78" RCP
STA. 27+37.48 690TH 78" RCP
STA. 27+35.48 691ST 78" RCP
STA. 27+33.48 692ND 78" RCP
STA. 27+31.48 693RD 78" RCP
STA. 27+29.48 694TH 78" RCP
STA. 27+27.48 695TH 78" RCP
STA. 27+25.48 696TH 78" RCP
STA. 27+23.48 697TH 78" RCP
STA. 27+21.48 698TH 78" RCP
STA. 27+19.48 699TH 78" RCP
STA. 27+17.48 700TH 78" RCP
STA. 27+15.48 701ST 78" RCP
STA. 27+13.48 702ND 78" RCP
STA. 27+11.48 703RD 78" RCP
STA. 27+09.48 704TH 78" RCP
STA. 27+07.48 705TH 78" RCP
STA. 27+05.48 706TH 78" RCP
STA. 27+03.48 707TH 78" RCP
STA. 27+01.48 708TH 78" RCP
STA. 26+99.48 709TH 78" RCP
STA. 26+97.48 710TH 78" RCP
STA. 26+95.48 711TH 78" RCP
STA. 26+93.48 712TH 78" RCP
STA. 26+91.48 713TH 78" RCP
STA. 26+89.48 714TH 78" RCP
STA. 26+87.48 715TH 78" RCP
STA. 26+85.48 716TH 78" RCP
STA. 26+83.48 717TH 78" RCP
STA. 26+81.48 718TH 78" RCP
STA. 26+79.48 719TH 78" RCP
STA. 26+77.48 720TH 78" RCP
STA. 26+75.48 721ST 78" RCP
STA. 26+73.48 722ND 78" RCP
STA. 26+71.48 723RD 78" RCP
STA. 26+69.48 724TH 78" RCP
STA. 26+67.48 725TH 78" RCP
STA. 26+65.48 726TH 78" RCP
STA. 26+63.48 727TH 78" RCP
STA. 26+61.48 728TH 78" RCP
STA. 26+59.48 729TH 78" RCP
STA. 26+57.48 730TH 78" RCP
STA. 26+55.48 731ST 78" RCP
STA. 26+53.48 732ND 78" RCP
STA. 26+51.48 733RD 78" RCP
STA. 26+49.48 734TH 78" RCP
STA. 26+47.48 735TH 78" RCP
STA. 26+45.48 736TH 78" RCP
STA. 26+43.48 737TH 78" RCP
STA. 26+41.

STA. 45+35.25 E.C. MATCH LINE - SEE SHT. NO. 11

STA. 45+93.21 E NHH #2 SHAFT

EXIST GROUND OVER E S.D.

FINISHED SURFACE OVER E S.D.

HGL

S= 0.0199

S= 0.0270

HYDRAULIC DATA
Q_{100} = 216.5 CFS
V_{100} = 13.61-19.83 FPS

CONST. 155.69 L.F. - 54" RCP
1500-D

HYDRAULIC DATA
Q_{100} = 216.5 CFS
V_{100} = 14.80 TO 18.8 FPS

CONSTRUCT 263.22 L.F. - 54" RCP
1500-D

910
900
890

45 46 47 48 49

PROFILE

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

VERTICAL

STA. 49+56.16 E NHH #3 SHAFT

EXIST GROUND OVER E S.D.

FINISHED SURFACE OVER E S.D.

HGL

S= 0.0177

HYDRAULIC DATA
Q_{100} = 186.9 cfs
V_{100} = 13.0-17.2 fps

CONSTRUCT 400.50 L.F. - 54" RCP
1400-D

50 51 52 53 7 8 9

STA. 9+28.54 MATCH LINE - SEE SHT. NO. 13

EXIST GROUND OVER E S.D.

FINISHED SURFACE OVER E S.D.

HGL

S= 0.02

S= 0.0161

54" RCP

HYDRAULIC DATA
Q_{100} = 45.5 CFS
V_{100} = 9.3 FPS

HYDRAULIC DATA
Q_{100} = 72.5 CFS
V_{100} = 10.7 FPS

MAINTAINED BY ROAD DEPARTMENT

CONST. 102.54 L.F. - 30" RCP 1800-D

CONST. 81.56 L.F. - 36" RCP 1500-D

930
920
910

AGUA MANSA RD. LAT. PROFILE

STA. 8+17.80 AGUA MANSA RD. LAT.
STA. 1+00.00 CONN. PIPE

STA. 8+26.00 BEG. RCP

STA. 8+17.02 END RCP

36" RCP

30" RCP

30°

11' MIN.

STA. 1+07.88

T.S. NO. 3

STA. 46+92.21 E NHH

STA. 47+03.25 E.C. MATCH LINE - SEE SHT. NO. 11

BROWN AVE. STORM DRAIN - SEE SHT. 11

BROWN AVENUE

STA. 1+90.59 END PIPE

STORM DRAIN EASEMENT

SEE CONNECTOR PIPE PROFILE SHT. 26

N 58°05'05" W
STA. 1+40.59 E.C.

N 1°54'55" E

N 31°34'35" E

S 61°54'55" W

STA. 1+45.21 E.C.

STA. 1+90.30 END PIPE

STORM DRAIN EASEMENT

STA. 1+03 E.C.

STA. 1+28.59 E.C.

STA. 1+53.03 B.C.

STA. 7+55.22 E.C.

STA. 7+36.81 B.C.

STA. 7+25.38 B.C.

STA. 53+43.28 E.C.

STA. 53+69.26 BROWN AVE. & AGUA MANSA RD. LAT. INTERSECTION

STA. 53+80.26 BROWN AVE. & AGUA MANSA RD. LAT. INTERSECTION

STA. 53+79.36 B.C.

STA. 53+68.26 E.C.

STA. 54+86.62 E.C.

AGUA MANSA RD. LAT.

SEE DETAIL I ABOVE LEFT

SEE DETAIL ON SHT. 12

SEE DETAIL ON SHT. 12

SEE CONNECTOR PIPE PROFILE SHT. 26

RIVERSIDE COUNTY
SAN BERNARDINO COUNTY

STA. 9+28.54 MATCH LINE - SEE SHT. NO. 13

925
920
915
910
905

PLAN
AGUA MANSA ROAD

SCALE IN FEET
40 0 40 80

CONN. PIPE DATA			
A=30°	B=36"	C=10.5'	EL. "A"= 915.31
Q_{100}=51"	Q_{25}=58"		EL. "B"= 915.20

20 10.64'

WEST'LY CONN. PIPE DATA			
A=30°	B=24"	C=21'	EL."C"= 908.63
Q_{100}=54"	Q_{25}=54"		EL."B"= 908.82

EAST'LY CONN. PIPE DATA			
A=30°	B=24"	C=21'	EL."C"= 908.63
Q_{100}=54"	Q_{25}=54"		EL."B"= 908.82

CONSTRUCTION NOTES

(8) CONSTRUCT 54-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(12) CONSTRUCT 36-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(13) CONSTRUCT 30-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(17) CONSTRUCT T.S. NO. 3 PER RCFCD STD. DWG. NO. TS 303
(18) CONSTRUCT MANHOLE NO. 4 PER RCFCD STD. DWG. NO. MH 254
(20) CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. M 8.16
(26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M 8.16

(17) STA. 8+17.80 AGUA MANSA RD. LAT.
STA. 1+00.00 CONN. PIPE
A=30° B=30° C=84' D_1=30" D_2=36"
EL. "1"= 917.06, EL. "2"= 917.71

S. R/W — AGUA MANSA RD. — N. R/W

52' 52'
12' 40' 40' 12'
34' 17' 16'
6'6" 12"W 6' 5" 12'6"
54" RCP (1) 8" SEWER

SECTION AT S.D. STA. 52+43.00
20 0 20

BROWN AVENUE
39' 39'
11' 28' 28' 11'

HALL AVENUE
8'8"
44' 44'
12' 32' 32' 12'

SEE SHT. 14

CURVE DATA				
	Δ	R	L	T
(A)	60°00'00"	22.50'	23.56'	12.99'
(B)	60°00'00"	22.50'	23.56'	12.99'
(C)	60°00'00"	22.50'	23.56'	12.99'
(D)	15°54'56"	90.00'	25.00'	12.58'
(E)	61°00'49"	90.00'	105.26'	59.59'
(F)	10°32'57"	100.00'	18.45'	9.23'

REGISTERED PROFESSIONAL ENGINEER
ANTHONY K. HSIA
No. 31787
EXP: 12/31/92
CIVIL
STATE OF CALIFORNIA

APPROVED BY: [signature]
DATE: 9/11/91
RIVERSIDE COUNTY, CALIF.
FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
[signature] 8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

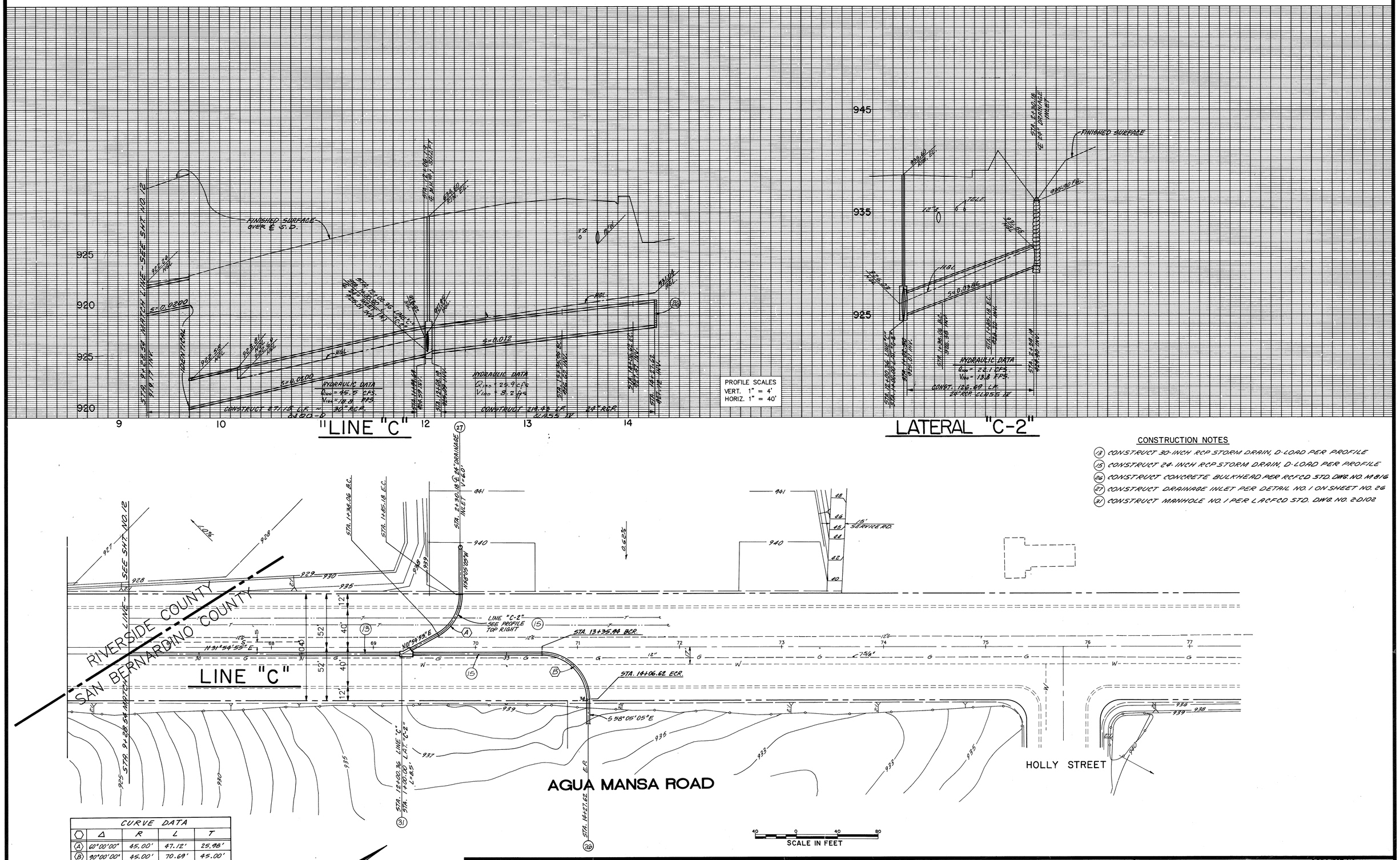
RECOMMENDED FOR APPROVAL BY: [signature] PLANNING ENGINEER
DATE: 6/23/92

APPROVED BY: [signature] CHIEF ENGINEER
DATE: 2-1-93

AGUA MANSA BROWN AVE. STORM DRAIN & AGUA MANSA RD. LAT.
STA. 45+35.25 TO STA. 53+69.26
STA. 7+25.38 TO STA. 9+28.54 PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 12 OF 30

MADISON\SD-MAN5



CONSTRUCTION NOTES

(13) CONSTRUCT 30-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M816
(27) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26
(31) CONSTRUCT MANHOLE NO. 1 PER LACFCD STD. DWG. NO. 2D102

CURVE DATA

⬡	Δ	R	L	T
(A)	60°00'00"	45.00'	47.12'	25.98'
(B)	90°00'00"	45.00'	70.69'	45.00'

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST. A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64.
ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT

APPROVED BY:
DATE: 3-30-92

AGUA MANSA
AGUA MANSA ROAD
STORM DRAIN
LINE "C"
STA. 9+70.00 TO STA. 14 + 27.62

PROJECT NO.
DRAWING NO. 1-514
SHEET NO. 13 OF 30

MADISON\SD-MAN8

PROFILE

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

EXIST. SURFACE OVER S.D.

FINISHED SURFACE OVER S.D.

EXIST. F.S. OVER S.D.

HGL

S=0.006

S=0.0086

54" RCP

"A" SEWER

HYDRAULIC DATA
Q100 = 155.3 CFS
V100 = 11.0 FPS

CONST. 166.85 L.F. - 51" RCP 1000-D

HYDRAULIC DATA
Q100 = 146.0 CFS
V100 = 10.3 FPS

CONST. 25.38 L.F. - 51" RCP 1000-D

HYDRAULIC DATA
Q100 = 139.2 CFS
V100 = 9.8 FPS

CONSTRUCT 291.86 L.F. - 51" RCP 1000-D

HYDRAULIC DATA
Q100 = 132.2 CFS
V100 = 9.3 FPS

CONSTRUCT 284.11 L.F. - 51" RCP 1000-D

CONST. 175.72 L.F. - 51" RCP 1000-D

CONST. 12.99 L.F. 42" RCP 1700 "D"

HYD. DATA
Q100 = 125 CFS
V100 = 7.5 FPS

STA. 53+80.16 BEG. CONST.

STA. 54+86.68 EC.

STA. 55+79.26 ℄ INT.

STA. 55+73.06 MH RIM 1422.40 INV. 1411.90

STA. 55+73.06 MH RIM 1422.40 INV. 1411.90

STA. 55+84.60 MH RIM 1422.40 INV. 1411.90

STA. 55+84.60 MH RIM 1422.40 INV. 1411.90

STA. 56+18.16 MH RIM 1422.40 INV. 1411.90

STA. 56+18.16 MH RIM 1422.40 INV. 1411.90

STA. 56+22.16 MH RIM 1422.40 INV. 1411.90

STA. 56+22.16 MH RIM 1422.40 INV. 1411.90

STA. 56+46.16 MH RIM 1422.40 INV. 1411.90

STA. 56+46.16 MH RIM 1422.40 INV. 1411.90

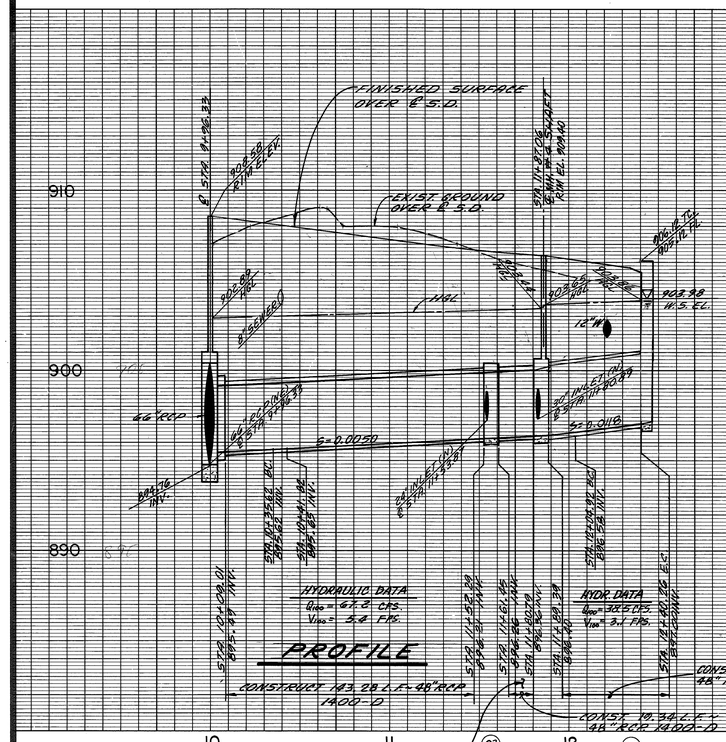
STA. 56+50.16 MH RIM 1422.40 INV. 1411.90

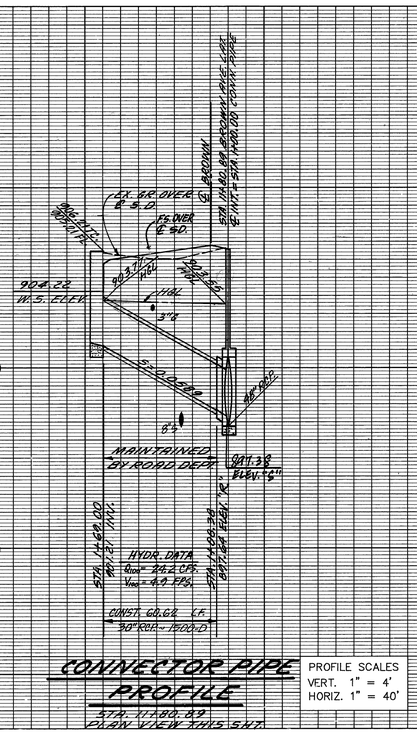
STA. 56+50.16 MH RIM 1422.40 INV. 1411.90

STA. 56+54.16 MH RIM 1422.40 INV. 1411.90

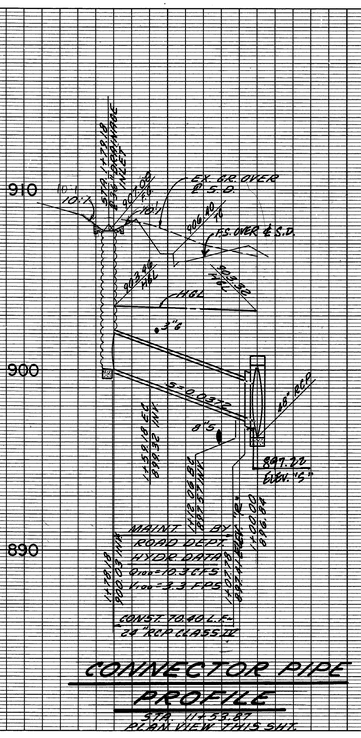
STA. 56+54.16 MH RIM 1422.40 INV. 1411.90

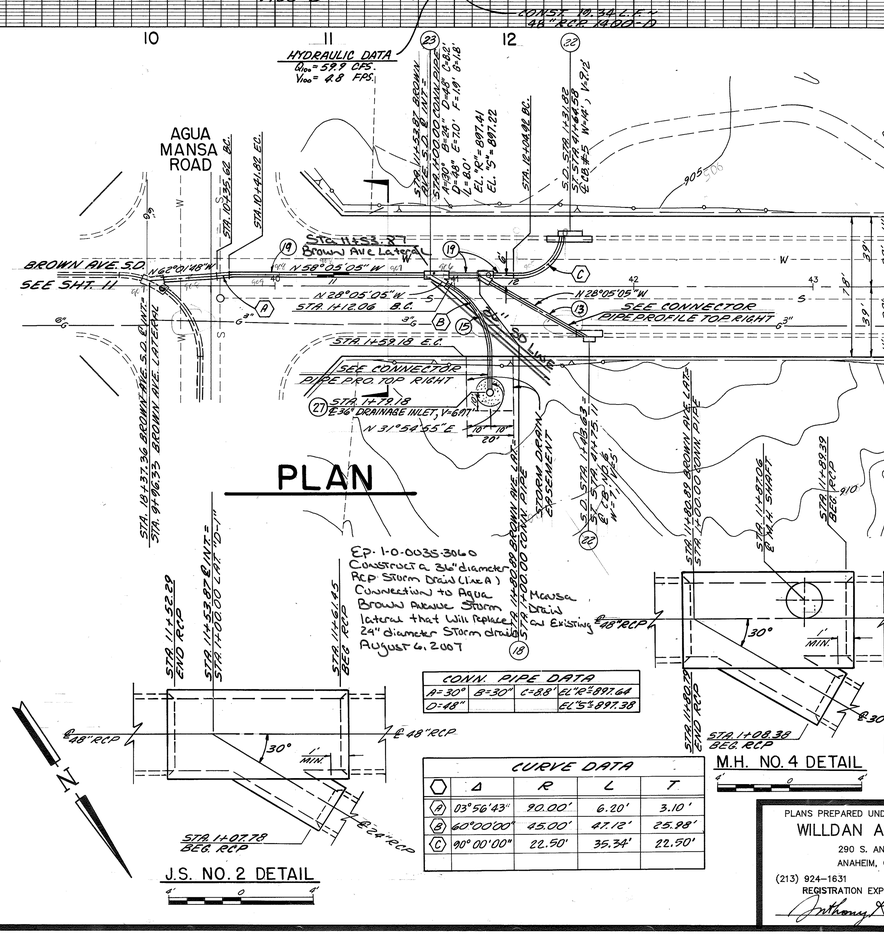
STA.





PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'




AGUA MANSA ROAD
BROWN AVE. S.D.
SEE SHT. 11
STA. 10+33.62 E.C.
STA. 10+41.82 E.C.
STA. 11+53.27 Brown Ave Lateral
N 58°05'05" W
N 28°05'05" W
STA. 11+12.08 B.C.
R=50.00'
Δ=90°00'00"
L=78.54'
T=50.00'
STA. 11+58.18 E.C.
SEE CONNECTOR PIPE PRO. TOP RIGHT
STA. 11+79.18 ℄ 36" DRAINAGE INLET, V=6.11
N 31°54'55" E
10'
20'
SEE CONNECTOR PIPE PROFILE TOP RIGHT
STA. 11+80.89 ℄ 30" RCP TO BROWN AVE. S.D.

NOTE
VERTICAL SCALE
IS MODIFIED

EXIST. SURFACE OVER E.S.D.

FINISHED SURFACE OVER E.S.D.

STA. 12+00.00 MATCH LINE - SEE SHT. NO. 3

STA. 22+50.00 MATCH LINE - SEE SHT. NO. 17

HGL

HAL

S=0.003

S=0.005

HYDRAULIC DATA
Q100 = 193.5 CFS
V100 = 7.7 FPS

HYDRAULIC DATA
Q100 = 170.6 CFS
V100 = 8.7 FPS

HYDRAULIC DATA
Q100 = 156.5 CFS
V100 = 8.0 FPS

HYDRAULIC DATA
Q100 = 172.6 CFS
V100 = 5.8 FPS

HYDRAULIC DATA
Q100 = 76.2 CFS
V100 = 9.0 FPS

HYDRAULIC DATA
Q100 = 196.7 CFS
V100 = 8.3 FPS

IDENTICAL

CONSTRUCT 120.38 L.F. - 66" RCP 1300-D

CONSTRUCT 268.16 L.F. - 66" RCP 1300-D

CONSTRUCT 351.81 L.F. - 60" RCP 1800-D

CONSTRUCT 311.98 L.F. - 60" RCP 1800-D

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

PROFILE

890 880 870 860

12 13 14 15 16 17 18 19 20 21 22

CONSTRUCTION NOTES

(6) CONSTRUCT 66-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
(7) CONSTRUCT 60-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
(15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE.
(16) CONSTRUCT 18-INCH RCP STORM DRAIN, CLASS III
(20) CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. M.H. 252.
(22) CONSTRUCT C.B. NO. 1 PER RCFCD STD. DWG. NO. C.B. 100.
(24) CONSTRUCT J.S. NO. 4 PER RCFCD STD. DWG. NO. J.S. 229.
(27) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26.
(35) CONSTRUCT MANHOLE SHAFT SAFETY LEDGE PER LACFCD STD. DWG. NO. 2-D430.
(28) INSTALL 30" DRAINAGE BASIN W/2'x3' GRATE - UNLESS NOTED OTHERWISE (PER NYLOPLAST OR EQUAL)

N00°10'14"W

N06°51'27"W

N60°10'14"W

STA. 1+22.06 BC

STA. 1+69.18 EC

SEE CONNECTOR PIPE PROFILE SHT. 28A

SEE CONNECTOR PIPE PROFILE SHT. 28

SEE DETAIL FOR LEFT

LAT. PROFILE SHT. 28

R/W

LOT 3

LOT 28

STORM DRAIN EASEMENTS

STORM DRAIN EASEMENT

RUBIDOUX COMM. SERV. DIST. CONST. AN 18" ϕ CONN. AT STA. 15+40 PER ENC. PERMIT #1-0-335-2100

REMOVE AND REPLACE EXIST INLET WITH 30" DRAINAGE BASIN W/ SOLID COVER (PER NYLOPLAST OR EQUAL)

REMOVE AND REPLACE EXIST INLET WITH 30" DRAINAGE BASIN W/2'x3' GRATE (PER NYLOPLAST OR EQUAL)

N

PLAN

WILSON STREET

ADDED BY Scott R. Hildebrandt 10-15-03
SCOTT R. HILDEBRANDT
ALBERT A. WEBB ASSOCIATES

M.H. NO. 2

MANHOLE NO. 2

SECTION AT S.D. STA. 17+00.00

SCALE IN FEET

CURVE DATA				
	Δ	R	L	T
(A)	60°00'00"	45.00'	47.12'	25.98'
(B)	60°00'00"	45.00'	47.12'	25.98'
(C)	60°00'00"	45.00'	47.12'	25.98'

REGISTERED PROFESSIONAL ENGINEER SCOTT R. HILDEBRANDT No. 64782 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. FLINN No. 31787 CIVIL STATE OF CALIFORNIA

APPROVED BY: Robert T. Hargrave DATE: 4/11/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Flinn 8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 7525984-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE
1	MODIFIED INLETS PP# 18637	SRH	AAW	10/15/03

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Frank G. Davis PLANNING ENGINEER DATE: 1/23/92

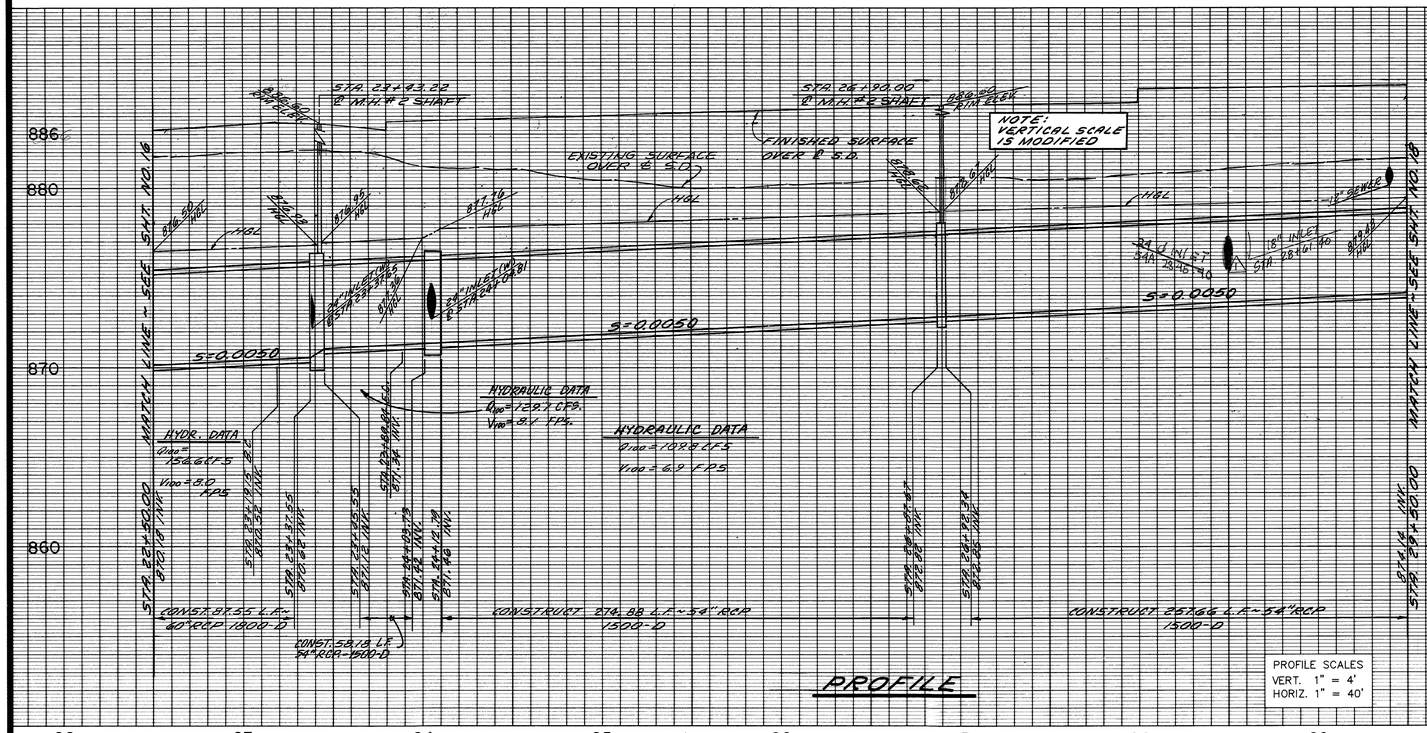
APPROVED BY: Kenneth Edwards CHIEF ENGINEER DATE: 2-4-92

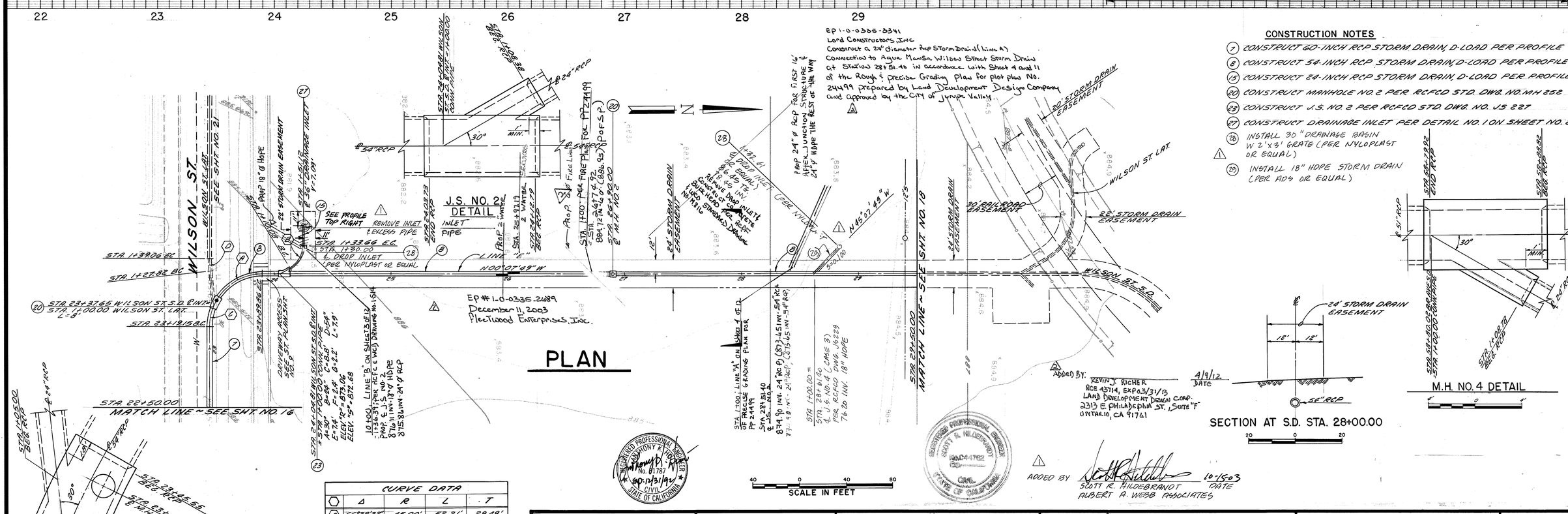
AGUA MANSA WILSON ST. STORM DRAIN

STA. 12+00.00 TO STA. 22+50.00
P.M. 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 16 OF 30

MADISON\SD-HALL3





CONSTRUCTION NOTES

7. CONSTRUCT 60-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
8. CONSTRUCT 54-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
15. CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
20. CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. MH 252
23. CONSTRUCT J.S. NO. 2 PER RCFCD STD. DWG. NO. JS 227
27. CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26
28. INSTALL 30" DRAINAGE BASIN W 2'x3' GRATE (PER NYLOPLAST OR EQUAL)
29. INSTALL 18" HDPE STORM DRAIN (PER ADS OR EQUAL)

CURVE DATA				
	Δ	R	L	T
(A)	66°28'33"	45.00'	52.21'	29.49'
(B)	60°02'25"	22.50'	23.58'	13.00'
(C)	23°33'37"	45.00'	18.50'	9.38'
(D)	06°26'23"	100.00'	11.24'	5.63'

PREPARED BY
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Lin 8/18/90
R.C.E. 31787

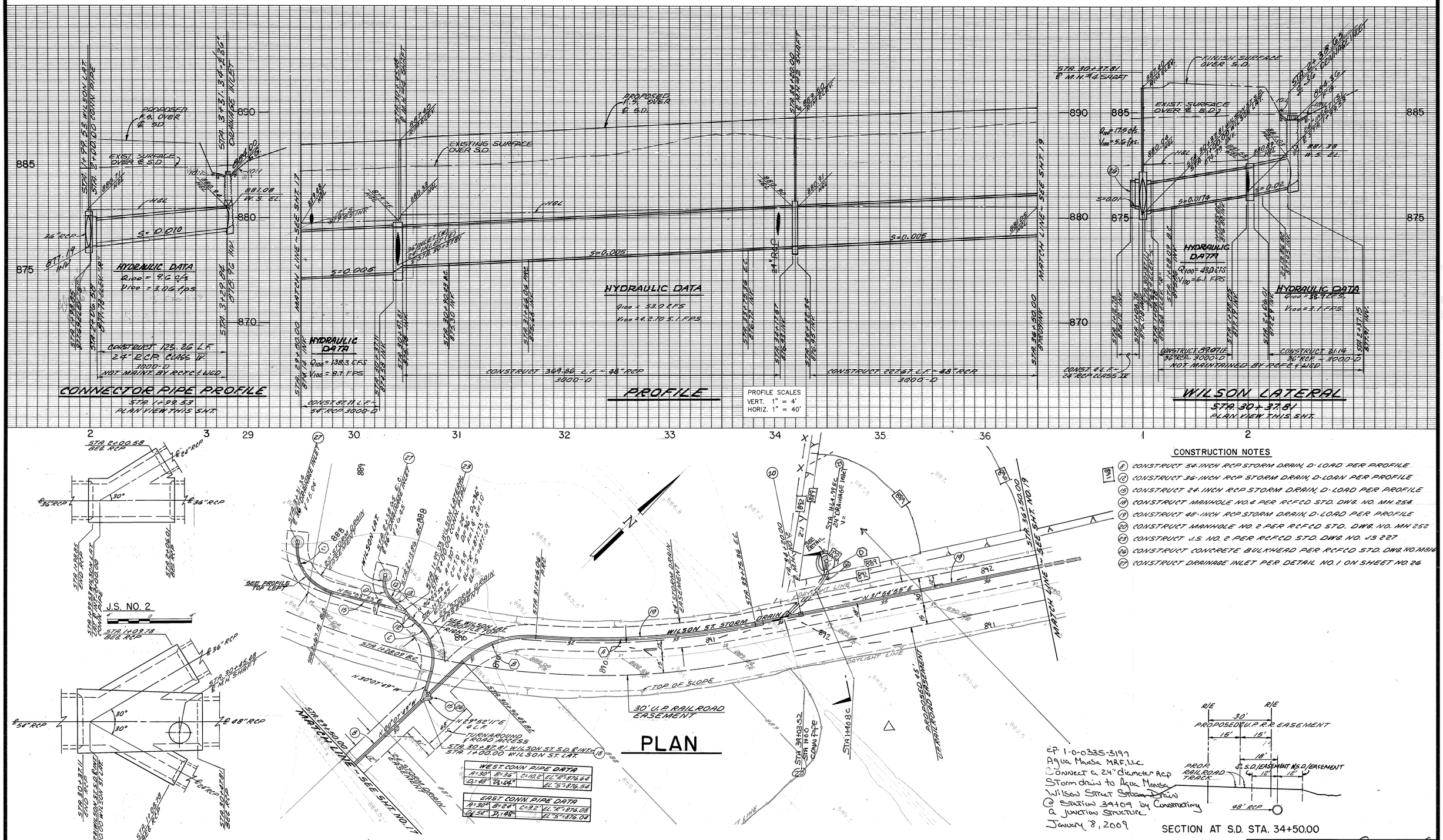
BENCH MARK: M.L. I-64
AT THE SOUTHWEST CORNER OF EL RIVINO RD. AND HALL AVE., 42.0 FEET SOUTH OF EL RIVINO RD. 27.0 FEET WEST OF HALL AVE. 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H I.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONC. POST AND MARKED M.L. I-64. ELEV. 946.687 DATE 5-71

REVISIONS:				
REF.	DESCRIPTION	APPR.	APPR.	DATE
1	MODIFIED INLETS OF # 18637	SH	SRH	10/14/03

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: PLANNING ENGINEER
DATE: 10/31/92
APPROVED BY: CHIEF ENGINEER
DATE: 2-1-93

AGUA MANSA WILSON ST. STORM DRAIN
STA. 22+50.00 TO STA. 29+50.00
PM 24088

PROJECT NO. I-0-335
DRAWING NO. I-514
SHEET NO. 17 OF 30



CONSTRUCTION NOTES

- (8) CONSTRUCT 54-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
- (12) CONSTRUCT 36-INCH RCP STORM DRAIN, D-LOAN PER PROFILE
- (15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
- (18) CONSTRUCT MANHOLE NO. 4 PER RCFCD STD. DWG. NO. MH 254
- (19) CONSTRUCT 48-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
- (20) CONSTRUCT MANHOLE NO. 2 PER RCFCD STD. DWG. NO. MH 252
- (23) CONSTRUCT J.S. NO. 2 PER RCFCD STD. DWG. NO. JS 227
- (26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M816
- (27) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26

EP 1-0-0335-3197
Agua Mansa MRF, LLC
Connect a 24" diameter RCP Storm drain to Agua Mansa Wilson Street Storm Drain @ Station 34+09 by Constructing a Junction Structure
January 8, 2009

CURVE DATA				
	Δ	R	L	T
(A)	16°06'12"	744.68'	209.30'	105.34'
(B)	48°08'56"	90.00'	75.63'	40.21'
(C)	62°58'18"	45.00'	49.46'	27.56'
(D)	63°07'58"	22.50'	24.79'	13.82'
(E)	81°43'47"	45.00'	64.19'	38.92'

APPROVED BY: [signature] RIVERSIDE COUNTY CALIF. FOR ROAD COMMISSIONER
DATE: 9/11/91

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. HUNT No. 31787 EXP. 12/31/92 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
[signature] 8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVENO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVENO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE #752594 H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISC IN THE TOP OF A CONCRETE POST & MARKED M.L. 64
ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

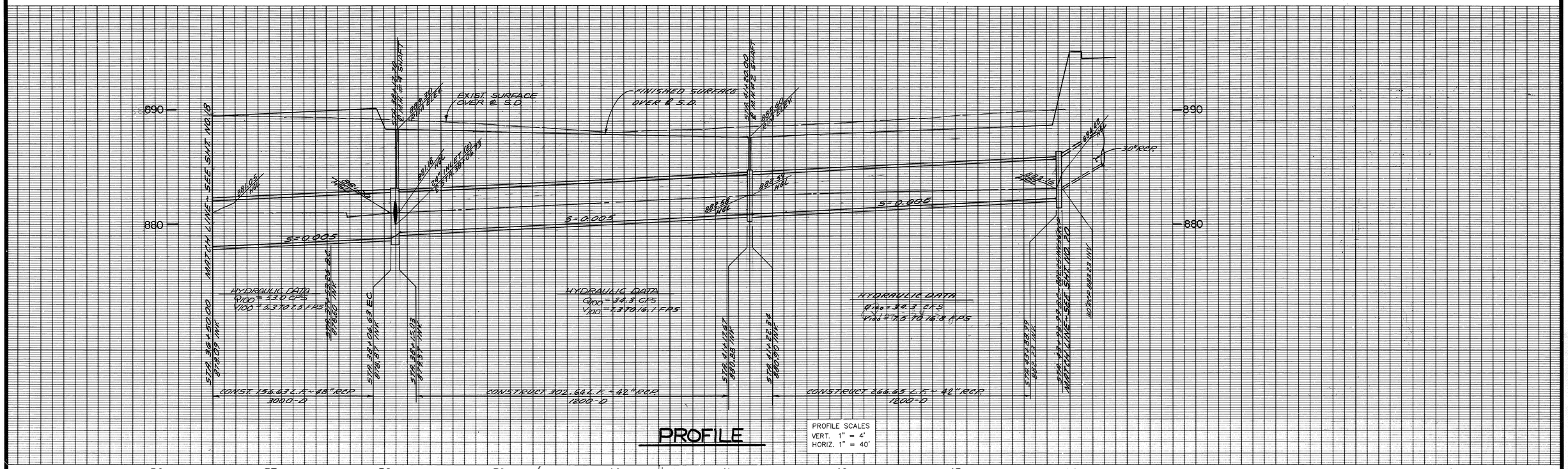
RECOMMENDED FOR APPROVAL BY [signature] PLANNING ENGINEER DATE: 1/23/92

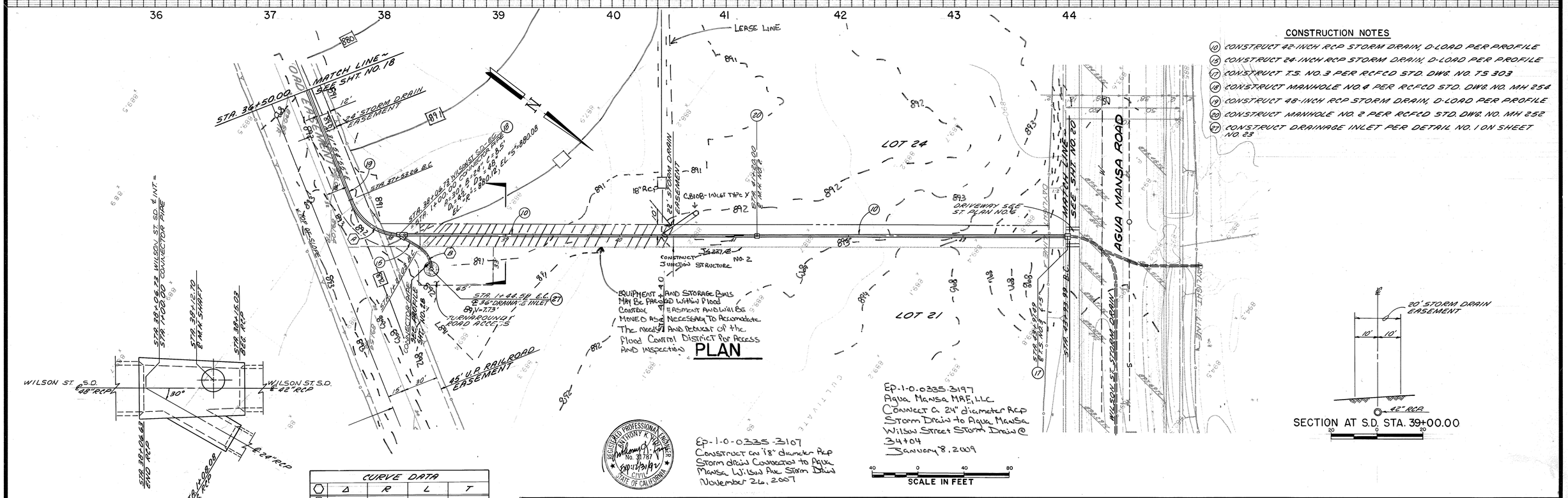
APPROVED BY: [signature] CHIEF ENGINEER DATE: 2-1-92

AGUA MANSA WILSON ST. STORM DRAIN & WILSON LATERAL

STA. 29+50.00 TO STA. 36+50.00
PM 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO 18 OF 30




LEASE LINE
MATCH LINE~ SEE SHT. NO. 18
STA 36+50.00
12' STORM DRAIN EASEMENT
STA 37+56.36 B.C.
STA 38+33.03 E.C.
STA 38+46.08 CONNECTION RING
STA 38+46.08 WILSON ST. S.D. & INT.= 8'WIDE
STA 38+46.08 TO 8'WIDE
STA 38+46.08 SEE SHT. NO. 18
WILSON ST. S.D. Ø48"RCP
WILSON ST. S.D. Ø42"RCP
30°
CREEK ONE
STA 41+28.08 Ø24"RCP
STA 41+28.08 SEE SHT. NO. 18
M.H. NO. 4 DETAIL
4' 0 4'
CURVE DATA
(1) Δ 68°04'30" R 45.00' L 53.47' T 30.40'
(2) Δ 60°00'00" R 22.50' L 23.56' T 12.99'
STA 39+00.00 ℄ 18"RCP
CB(OB-INLET TYPE X
22' STORM DRAIN EASEMENT
CONSTRUCT JUNCTION STRUCTURE NO. 2
EQUIPMENT AND STORAGE BINS MAY BE PLACED WITHIN FLOOD CONTROL EASEMENT AND WILL BE MOVED AS NECESSARY TO ACCOMMODATE THE NEEDS AND PRODUCT OF THE FLOOD CONTROL DISTRICT FOR ACCESS AND INSPECTION
PLAN
STA 41+22.00 ℄ 30"RCP
STA 41+22.00 ℄ 24"RCP
STA 41+22.00 ℄ 18"RCP
STA 41+22.00 ℄ 8"WATER
STA 41+22.00 ℄ 8"SEWER
STA 41+22.00 ℄ 8"GAS
STA 41+22.00 ℄ 8"ELEC.
STA 41+22.00 ℄ 8"TEL.
STA 41+22.00 ℄ 8"CATV
STA 41+22.00 ℄ 8"RECL.
STA 41+22.00 ℄ 8"IRR.
STA 41+22.00 ℄ 8"STORM DRAIN
STA 41+22.00 ℄ 8"SEWER
STA 41+22.00 ℄ 8"WATER
STA 41+22.00 ℄ 8"GAS
STA 41+22.00 ℄ 8"ELEC.
STA 41+22.00 ℄ 8"TEL.
STA 41+22.00 ℄ 8"CATV
STA 41+22.00 ℄ 8"RECL.
STA 41+22.00 ℄ 8"IRR.
LOT 24
LOT 21
AGUA MANSA ROAD
MATCH LINE~ SEE SHT. NO. 20
891
892
893
894
895
896
897
898
899
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901
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929
930

PROFILE

MAINTAINED BY ROAD DEPT.

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

CONSTRUCT 2660 ± L.F. - 27" RCP 2300-D

CONSTRUCT 299.87 ± L.F. - 27" RCP 2300-D

CONST. 71 ± L.F. - 30" RCP 1300-D

HYDRAULIC DATA
Q_{100} = 23.3 CFS
V_{100} = 6.5 FPS

HYDRAULIC DATA
Q_{100} = 23.3 CFS
V_{100} = 14.2 TO 6.5 FPS

HYDR. DATA
Q_{100} = 18.8 CFS
V_{100} = 41.7 TO 31.7 FPS

HYDR. DATA
Q_{100} = 10.7 CFS
V_{100} = 34.1 TO 11.3 FPS

HYDR. DATA
Q_{100} = 11.1 CFS
V_{100} = 35.7 TO 11.8 FPS

CONST. 72 ± L.F. - 24" RCP CLASS III

CONST. 65 ± L.F. - 24" RCP CLASS III

CONST. 91 ± L.F. - 24" RCP CLASS III

PLAN VIEW THIS SHT.

MAINTAINED BY ROAD DEPT.

CONN. PIPE PROFILE
STA 50+09.78
PLAN VIEW THIS SHT.

CONN. PIPE PROFILE
STA 44+25.40
PLAN VIEW THIS SHT.

CONSTRUCTION NOTES

(3) CONSTRUCT 30-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(14) CONSTRUCT 27-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(2) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(18) CONSTRUCT MANHOLE NO. 4 PER RCFCD STD. DWG. NO. MH 254
(21) CONSTRUCT MANHOLE NO. 1 PER RCFCD STD. DWG. NO. MH 251
(25) CONSTRUCT CONCRETE COLLAR PER RCFCD STD. DWG. NO. M 803
(26) CONSTRUCT CONCRETE BULKHEAD PER RCFCD STD. DWG. NO. M 816
(27) CONSTRUCT DRAINAGE INLET PER DETAIL NO. 1 ON SHEET NO. 26

WEST'LY CONN. PIPE DATA			
A=45°	B=26°	L=46'	EL. 1'=888.95
D=27"			EL. 5'=888.53

EAST'LY CONN. PIPE DATA			
A=45°	B=26°	L=46'	EL. 1'=888.67
D=27"			EL. 5'=888.53

M.H. NO. 4 DETAIL

M.H. NO. 4 DETAIL

CONNECTOR PIPE SEE PROFILE TOP RIGHT

STA 1+30.00 ℄ CONC. COLLAR

STA 1+30.78 EC

STA 1+63.90 EC

STA 1+90.15 END 18" RCP

STA 1+83.16 END 18" RCP

STA 1+94.18 BEG. RCP

STA 50+08.30 END M.H.

CONC. BULKHEAD M 816 E.W.

STA 50+06.75 ℄ M.H. SHAFT

STA 44+56.81 EC

STA 44+33.21 BC

STA 44+28.11 EC

STA 44+25.40 BC

STA 44+38.11 BEG. RCP

STA 44+25.40 ℄ STORM DRAIN INLET

STA 44+38.11 BC

STA 44+32.30 EC

STA 44+19.60 BEG. 18" RCP

STA 44+06.28 BEG. RCP

STA 43+93.99 ℄ STORM DRAIN INLET

STA 44+28.11 BC

STA 44+32.30 EC

STA 44+38.11 BC

STA 44+56.81 EC

STA 1+47.90 EC

STA 1+36.85 BC

STA 1+00.00 ℄ 30" RCP

STA 1+00.00 ℄ 27" RCP

STA 1+00.00 ℄ 24" RCP

STA 1+00.00 ℄ 18" RCP

STA 1+00.00 ℄ 12" RCP

STA 1+00.00 ℄ 8" RCP

STA 1+00.00 ℄ 6" RCP

STA 1+00.00 ℄ 4" RCP

STA 1+00.00 ℄ 2" RCP

STA 1+00.00 ℄ 1" RCP

STA 1+00.00 ℄ 1/2" RCP

STA 1+00.00 ℄ 3/4" RCP

STA 1+00.00 ℄ 1 1/2" RCP

STA 1+00.00 ℄ 2 1/2" RCP

STA 1+00.00 ℄ 3" RCP

STA 1+00.00 ℄ 4" RCP

STA 1+00.00 ℄ 6" RCP

STA 1+00.00 ℄ 8" RCP

STA 1+00.00 ℄ 12" RCP

STA 1+00.00 ℄ 18" RCP

STA 1+00.00 ℄ 24" RCP

STA 1+00.00 ℄ 27" RCP

STA 1+00.00 ℄ 30" RCP

STA 1+00.00 ℄ 36" RCP

STA 1+00.00 ℄ 42" RCP

STA 1+00.00 ℄ 48" RCP

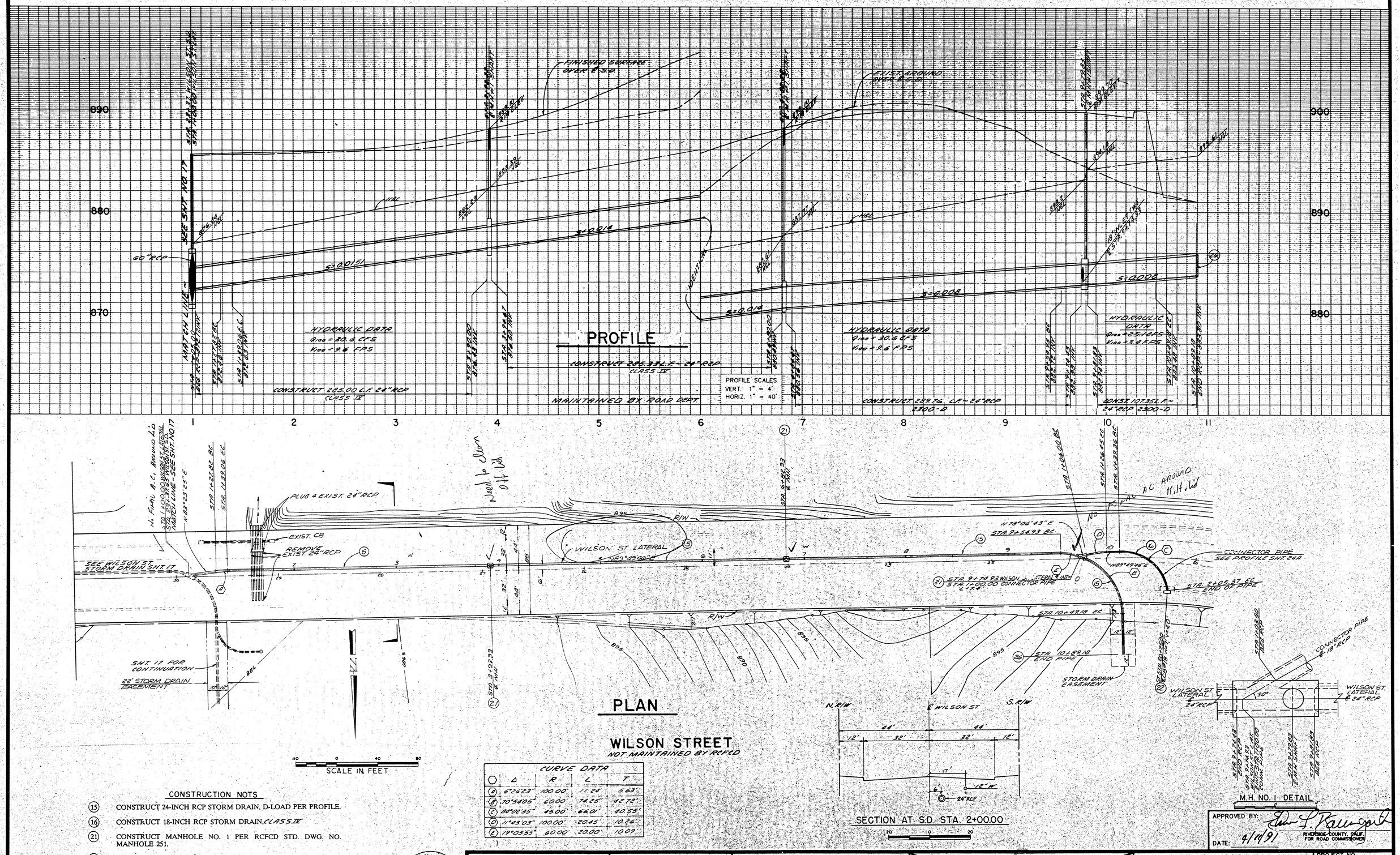
STA 1+00.00 ℄ 54" RCP

STA 1+00.00 ℄ 60" RCP

STA 1+00.00 ℄ 66" RCP

STA 1+00.00 ℄ 72" RCP

STA 1+00.00 ℄


890
880
870
900
890
880
1
2
3
4
5
6
7
8
9
10
11
22" STORM DRAIN NO. 17
60" RCP
S=0.015
S=0.014
S=0.008
S=0.014
FINISHED SURFACE OVER E.S.D.
EXIST. GROUND OVER E.S.D.
HGL
EL. 877.00
EL. 878.00
EL. 879.00
EL. 880.00
EL. 881.00
EL. 882.00
EL. 883.00
EL. 884.00
EL. 885.00
EL. 886.00
EL. 887.00
EL. 888.00
EL. 889.00
EL. 890.00
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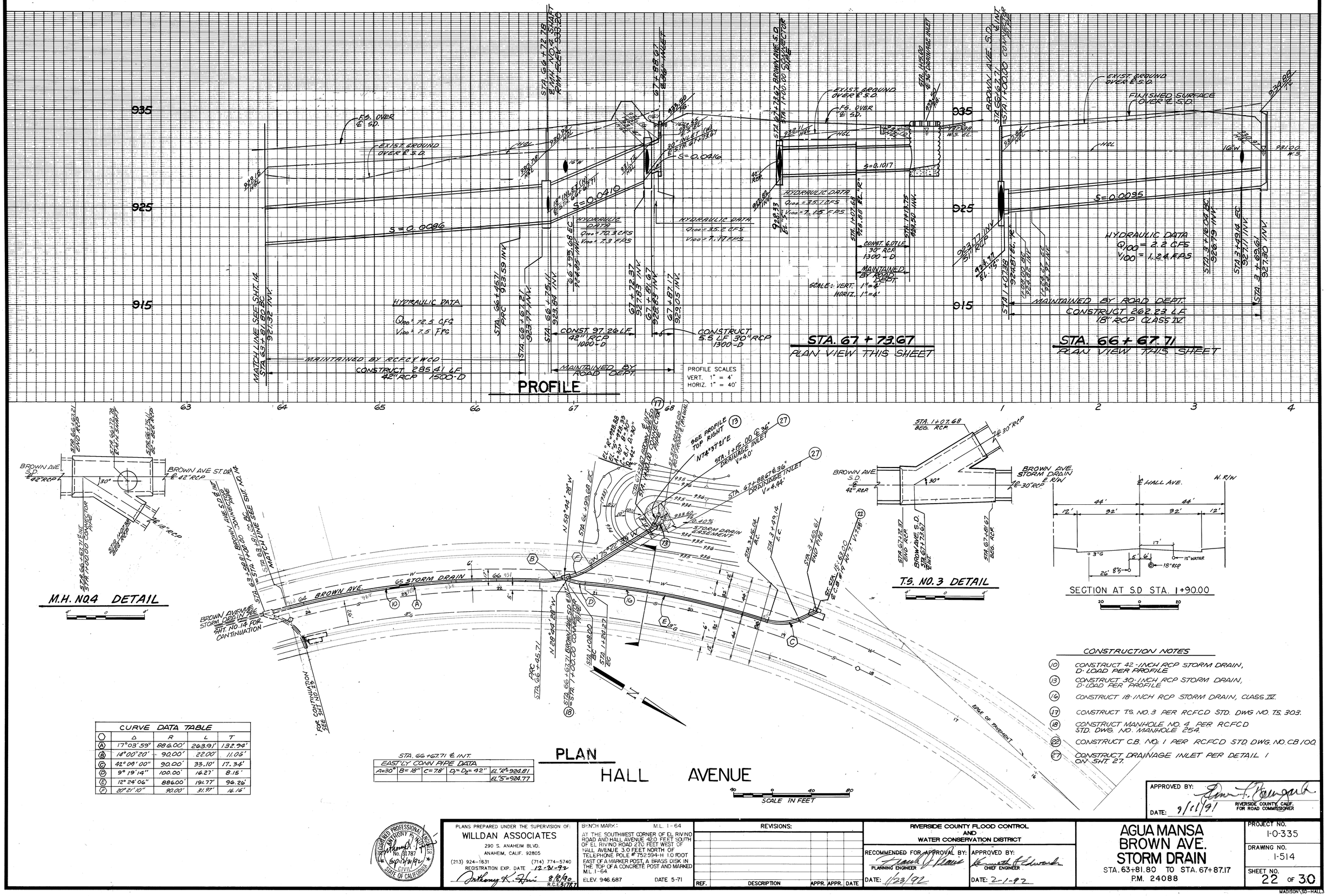
EL. 893.00
EL. 894.00
EL. 895.00
EL. 896.00
EL.



M.H. NO.4 DETAIL
T.S. NO. 3 DETAIL
SECTION AT S.D STA. 1+90.00
PLAN
HALL AVENUE
SCALE IN FEET
BROWN AVE. S.D. 42" RCP
BROWN AVE ST. DR. 42" RCP
30"
18" RCP
BROWN AVE. STORM DRAIN
30" RCP
HALL AVE.
12" WATER
18" RCP
65 STORM DRAIN
BROWN AVE.
BROWN AVENUE STORM DRAIN SEE SHT. NO. 14 FOR CONTINUATION
SEE SHT. NO. 14 FOR CONTINUATION
EDGE OF PAVEMENT
N 55°44'28"W
N 28°44'28"W
N 75°24'28"W
PRC STA. 66+45.71
STA. 66+67.71 & INT.
STA. 1+08.00 EC
STA. 1+20.27 CC
STA. 1+07.68 BEG. RCP
STA. 1+15.00 ℄ 36" DRAINAGE INLET V=4.0'
STA. 67+88.61 ℄ 36" DRAINAGE INLET V=4.44'
STA. 67+73.67 BROWN AVE. S.D. ℄ INT.
STA. 67+49.14 E.C.
STA. 67+63.61 END PIPE
STA. 67+63.10 BEG. 18" RCP CLASS IV
STA. 67+49.67 BEG. RCP
STA. 67+73.67 END RCP
BROWN AVE. S.D. STA. 67+73.67
STA. 67+49.67 BEG. RCP
STA. 3+49.14 E.C.
STA. 3+63.61 END PIPE
STA. 3+63.10 BEG. 18" RCP CLASS IV
STA. 67+63.10 BEG. 18" RCP CLASS IV
STA. 67+49.67 BEG. RCP
STA. 1+07.68 BEG. RCP
STA. 1+15.00 ℄ 36" DRAINAGE INLET
STA. 1+49.67 BEG. RCP
STA. 1+63.67 END RCP
STA. 1+49.67 BEG. RCP
STA. 1+63.67 END RCP
STA. 1+63.67 BEG. RCP
STA. 1+49.67 BEG. RCP
STA. 1+63.67 END

PROFILE

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

PLAN

SCALE IN FEET

CONSTRUCTION NOTES

(11) CONSTRUCT 39-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(15) CONSTRUCT 24-INCH RCP STORM DRAIN, D-LOAD PER PROFILE
(17) CONSTRUCT TS. NO.3 PER RC.F.C.D. STD. DWG. NO. TS-303
(18) CONSTRUCT M.H. NO. 4 PER RC.F.C.D. STD. DWG. NO. MH 254
(20) CONSTRUCT M.H. NO. 2 PER RC.F.C.D. STD. DWG. NO. MH 252
(22) CONSTRUCT C.B. NO. 1 PER RC.F.C.D. STD. DWG. NO. CB 100
(23) CONSTRUCT J.S. NO. 2 PER RC.F.C.D. STD. DWG. NO. JS 227
(26) CONSTRUCT CONCRETE BULKHEAD PER RC.F.C.D STD DWG. NO. M816
(27) CONSTRUCT DRAINAGE INLET PER DETAIL 1 SHEET NO. 27
(39) CONSTRUCT 33" RCP STORM DRAIN D-LOAD PER PROFILE.

J.S. NO. 2 DETAIL

SECTION AT S.D. STA. 5+00.00

T.S. NO. 3 DETAIL

M.H. NO. 4 DETAIL

STA. 1+46.44 ℄ INT.

CONN. PIPE DATA			
A=65°	B=24"	C=3.8'	D=39" EL"R"=923.48
E=2.5'	F=0.7'	G=1.59'	L=6.5' EL"S"=923.10

STA. 9+95.79 ℄ INT.

CONN. PIPE DATA			
A=30°	B=33"	C=8.8'	EL"R"=926.90
D=33"	D=39"		EL"S"=926.86

STA. 1+66.92 ℄ INT.

CONN. PIPE DATA			
A=30°	B=24"	C=7.9	EL"R"=922.56
D=39"	D=39"		EL"S"=922.53

CURVE DATA				
	Δ	R	L	T
(A)	12°56'43"	60.00'	127.7'	108.12'
(B)	90°00'00"	45.00	70.69'	45'
(C)	13°17'51"	45.00'	10.44'	5.25'
(D)	46°39'12"	45.00'	36.64'	19.40'

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. FAHMI No. 31787 CIVIL STATE OF CALIFORNIA

APPROVED BY: [signature]
DATE: 9/11/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924 1631 (714) 774 5740
REGISTRATION EXP. DATE 12-31-92
[signature] 8/8/90
R.C.E. 31787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVENO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVENO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISC IN THE TOP OF A CONCRETE POST AND MARKED M.L.-64
ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

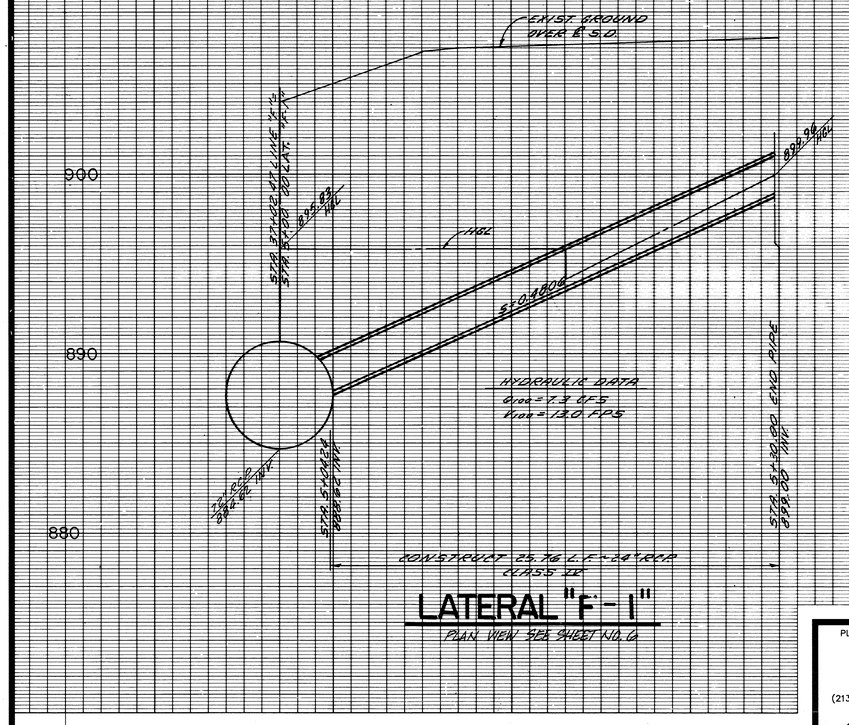
RECOMMENDED FOR APPROVAL BY PLANNING ENGINEER
DATE: 11/23/92

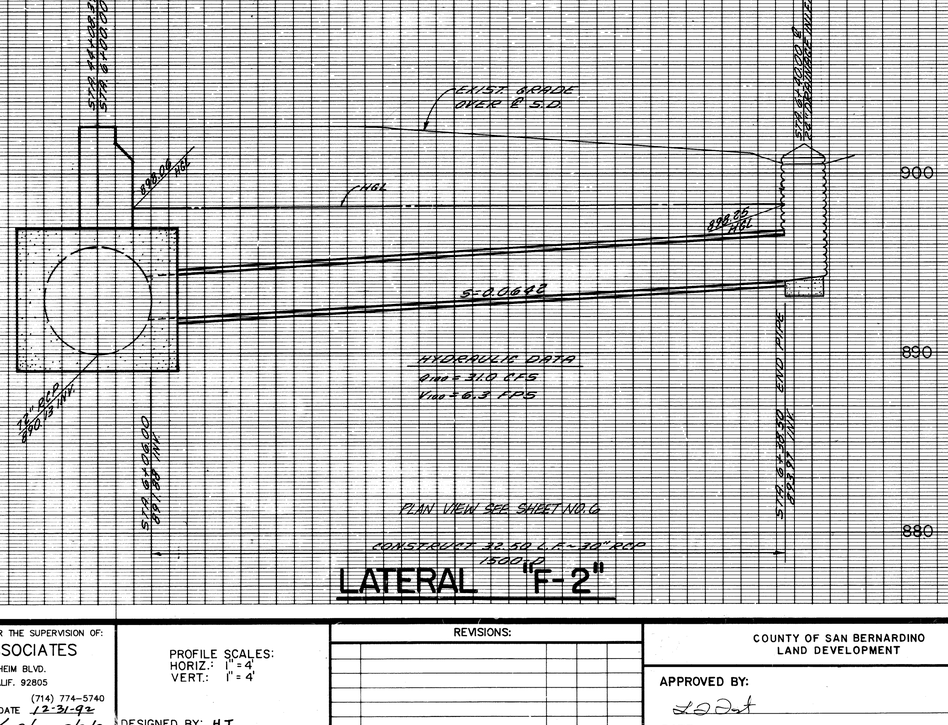
APPROVED BY CHIEF ENGINEER
DATE: 2-1-93

AGUA MANSA
HALL AVE. LATERAL

STA. 1 + 00.00 TO STA. 10+08.29
P.M. 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 23 OF 30





PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Hui 3/6/90
R.C.E. 31787

PROFILE SCALES:
HORIZ.: 1" = 4'
VERT.: 1" = 4'

DESIGNED BY: H.T.
CHECKED BY: A.K.H.

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR. DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT

APPROVED BY:
[signature]
DATE: 3-30-92

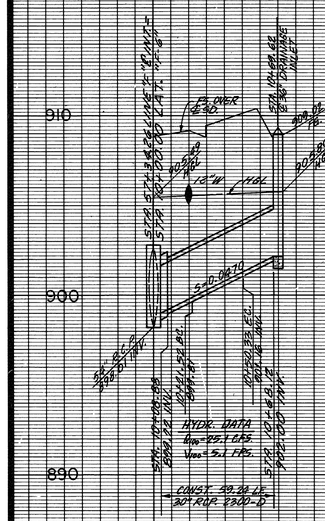
Anthony K. Hui R.C.E. 31787 EXP: 12/31/90

AGUA MANSA BROWN AVE. STORM DRAIN CONNECTOR PIPE PROFILES

PARCEL MAP 12104
(SAN BERNARDINO COUNTY)

PROJECT NO.
DRAWING NO. 1-514
SHEET NO. 24 OF 30

TITLESHT(R-SIDES)

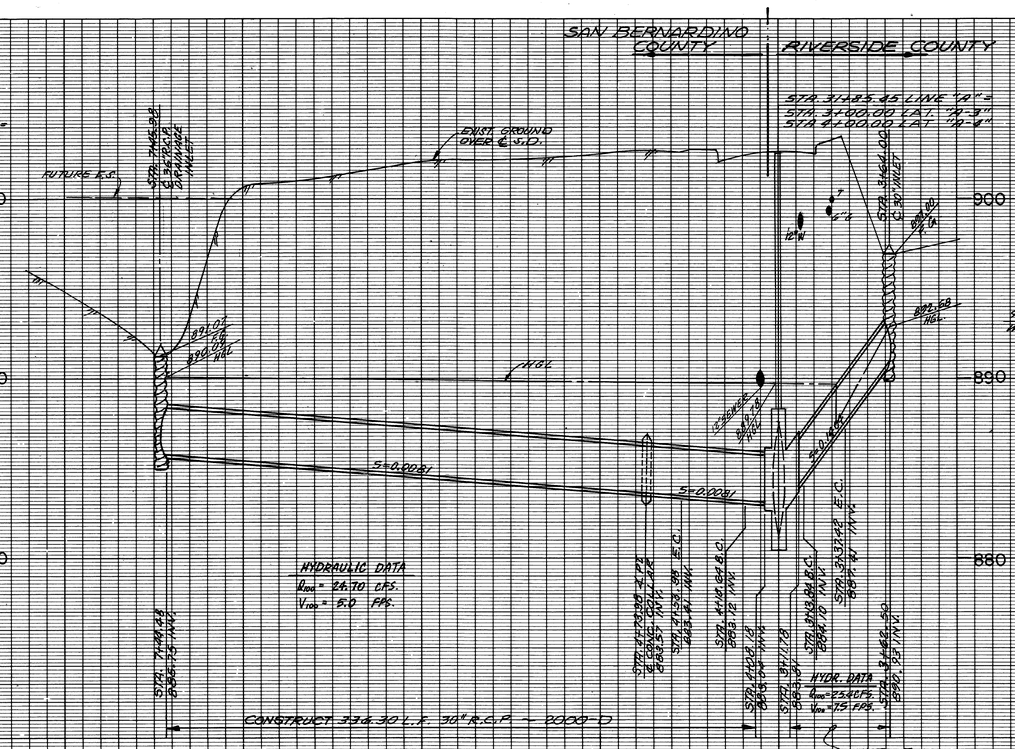


LATERAL "F-6"

PLAN VIEW SEE SHEET NO. 8

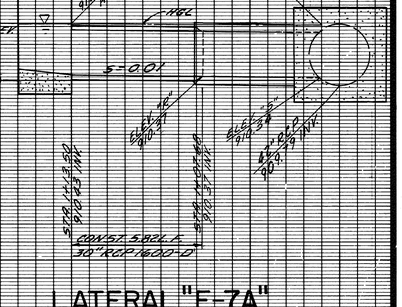
LATERAL F-7

PLAN VIEW SEE SHEET NO. 8



LATERAL "A-4"

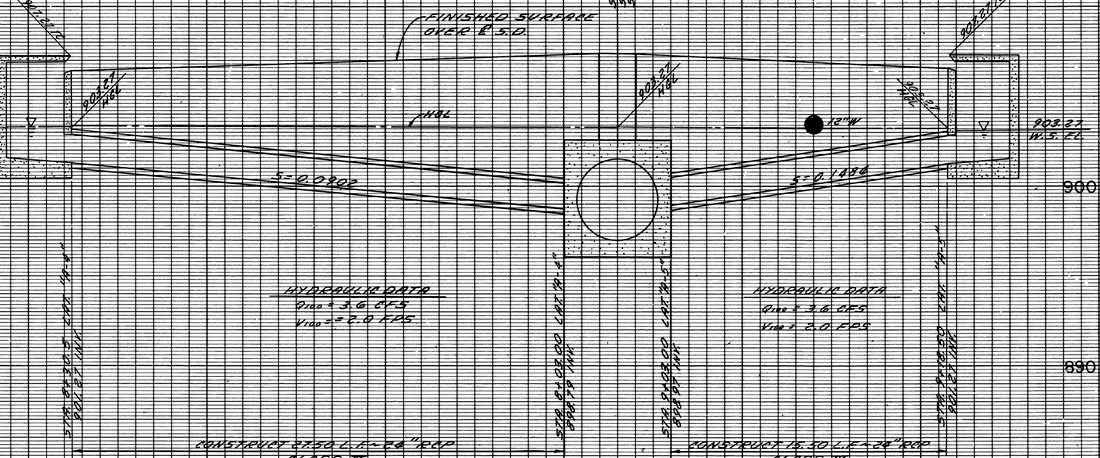
PLAN VIEW SEE SHEET NO. 5



LATERAL "F-7A"

PROFILE SCALE:
HORIZ. 1" = 4'
VERT. 1" = 4'

PLAN VIEW SEE SHT. NO. 6



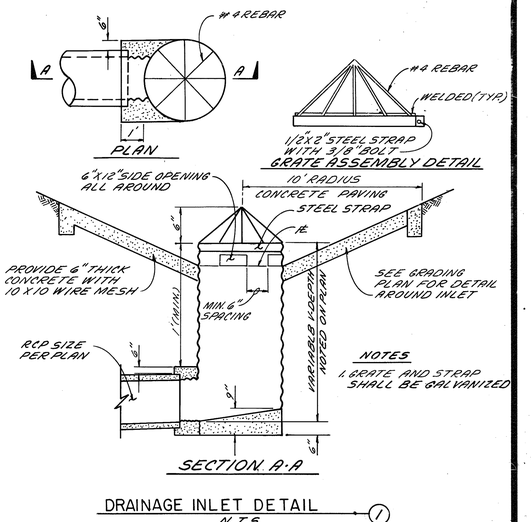
LATERAL "F-4"

PLAN VIEW SEE SHT. NO. 8

LATERAL "F-5"

PLAN VIEW SEE SHT. NO. 8

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'



DRAINAGE INLET DETAIL
N.T.S. (1)

REGISTERED PROFESSIONAL ENGINEER ANTHONY K. HSU No. 21787 EXP: 12/31/92 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Hsu 8/8/90
R.C.E. 21787

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

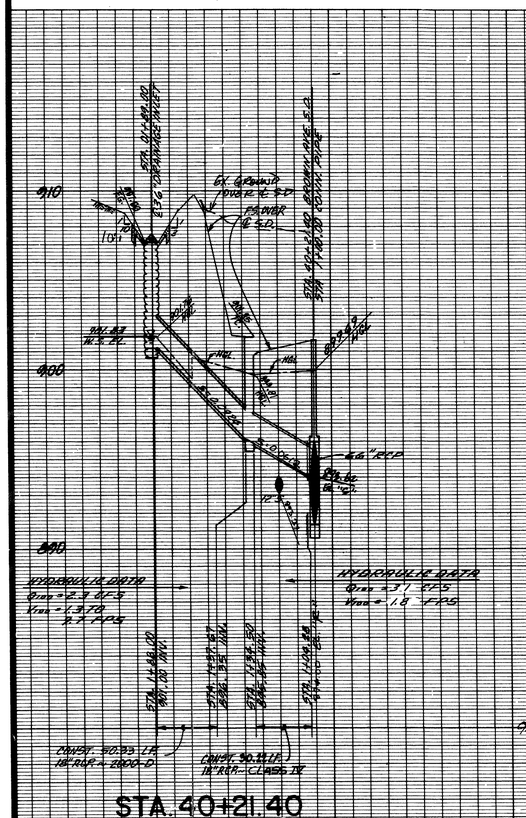
REVISIONS:				
REF.	DESCRIPTION	APPR.	APPR.	DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT
APPROVED BY:
DATE: 3-30-92

AGUA MANSA
CONNECTOR PIPE PROFILES
PARCEL MAP 24088 PARCEL MAP 12104
(SAN BERNARDINO COUNTY)

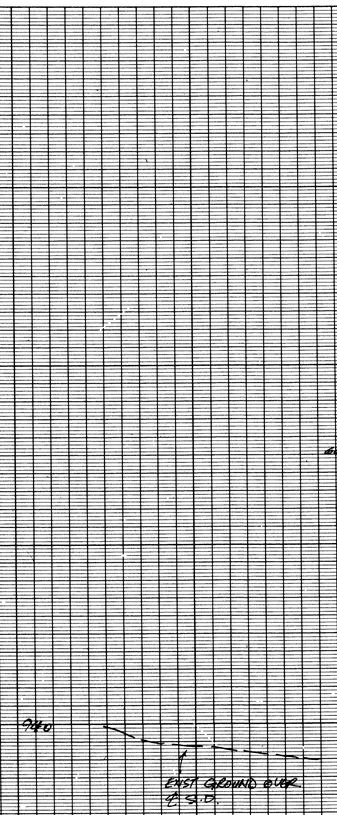
PROJECT NO. 1-0-355
DRAWING NO. 1-514
SHEET NO. 25 OF 30

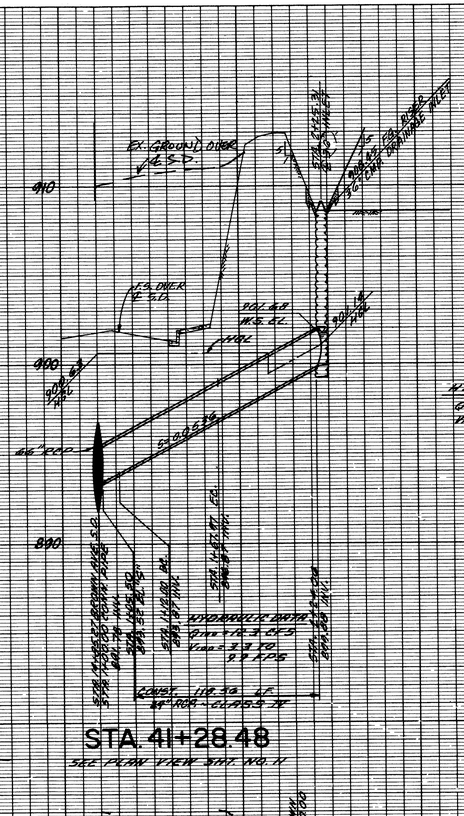
BASESHT (SD-SANBR



STA. 40+21.40

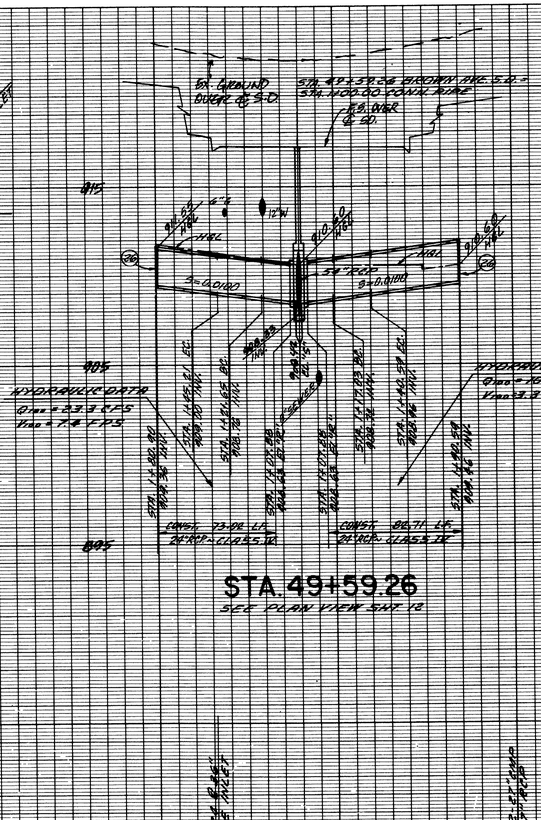
SEE PLAN VIEW SHT. NO. 11





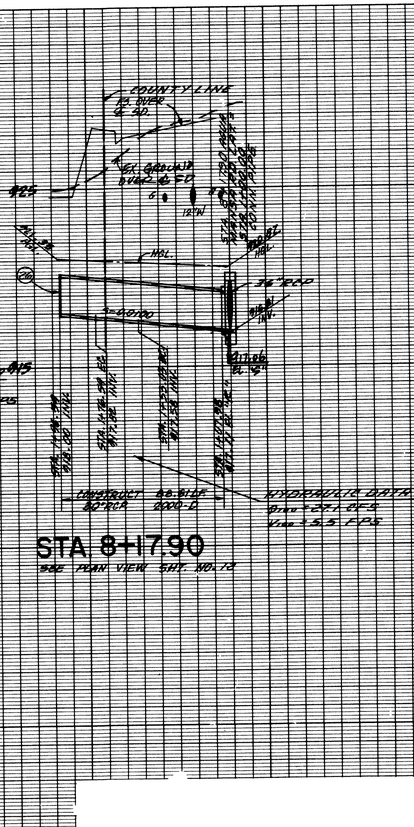
STA. 41+28.48

SEE PLAN VIEW SHT. NO. 11



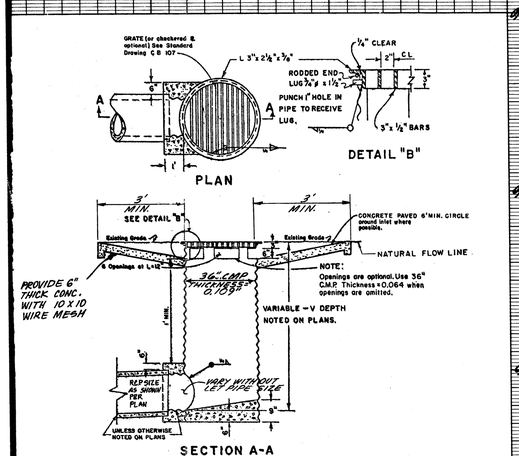
STA. 49+59.26

SEE PLAN VIEW SHT. 12



STA. 8+17.90

SEE PLAN VIEW SHT. NO. 12

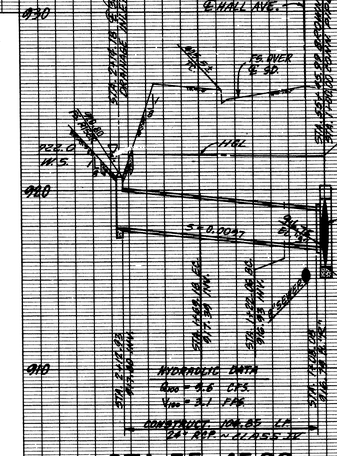


NOTES:

1. PLACE GRATE BARS PARALLEL TO FLOW.
2. GRATE AND FRAME SHALL BE GALVANIZED.

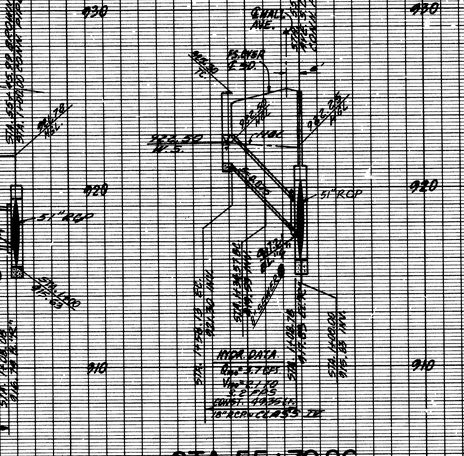
DRAINAGE INLET TYPE X (1)

N.T.S.



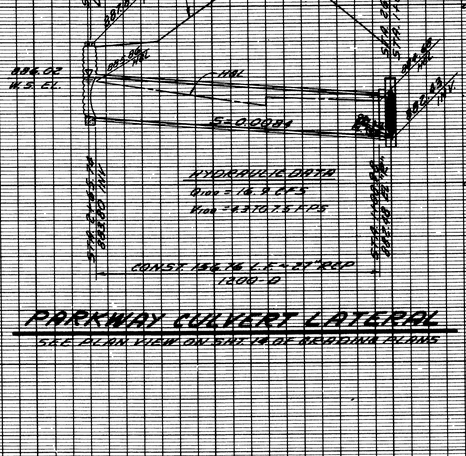
STA. 55+45.99

PLAN VIEW SHEET NO. 14



STA. 55+79.26

PLAN VIEW SHEET NO. 14



PARKWAY CULVERT LATERAL

SEE PLAN VIEW ON SHT. 14 OF BADDWA PLANS

PROFILE SCALES
VERT. 1" = 4'
HORIZ. 1" = 40'

APPROVED BY: _____
DATE: 9/16/91
RIVERSIDE COUNTY, CALIF. FOR ROAD COMMISSIONER

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Shin 8/8/90
R.C.E. 34787
Exp: 12/31/91 CIVIL STATE OF CA

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 1.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

REVISIONS:

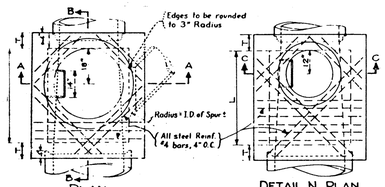
REF.	DESCRIPTION	APPR.	APPR.	DATE

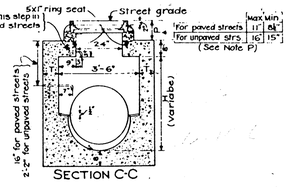
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL BY: _____ PLANNING ENGINEER
DATE: _____
APPROVED BY: _____ CHIEF ENGINEER
DATE: _____

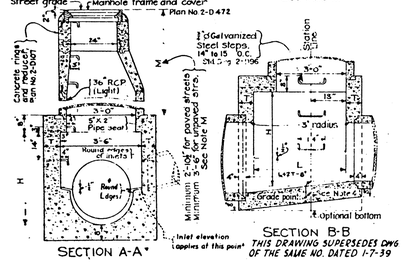
AGUA MANSA
CONNECTOR PIPE PROFILES
PARCEL MAP 24088

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 26 OF 30

BASESHT\SD-RSIDE







NOTES:

H- HEIGHT H (in Sec A-A and Sec B-B) shall be not less than 4'-0", but may be increased provided that the value of H shall be not less than the minimum specified & that the required cover shall be used. For H (in Sec. C-C) see note P

L- LENGTH L shall be 4 feet unless otherwise shown on plan. L may be increased at location of manhole with two or more pipe ends.

M- SHAFT shall be constructed as per Sec C-C and Detail N when depth H from street grade to top of box is less than 2'-10" for paved streets or 3'-6" for unpaved streets.

P- DEPTH P may be reduced to an absolute limit of 6" when larger values of P would reduce H (in Sec C-C) to 3'-6" or less.

T- T shall be 8" for values of H up to and including 8 feet.
T shall be 10" for values of H over 8 feet.

7- Where Pressure Manhole No 4 is specified on plans see Std Dwg. 2-0210 note 3

1- STEPS shall be ¾" round, galvanized steel and anchored not less than 6 inches in the wall of structure. Unless otherwise shown, steps shall be spaced 16" to 18" c-c. The lowest step shall be not more than 2 feet above the ledge at side of manhole floor. See Std Dwg 2-096.

2- f'c = 3000 psi at 28 days

3- REINFORCING STEEL shall be per 2-0171, straight bars 1½" clear from face of concrete.

4- STATIONS of manholes shown on Plan apply at center line of shaft. Elevations are given at shaft center and refer to the prolonged invert grade line. See Note L pointing location.

5- FLOOR of manhole shall be steel-troweled.

6- RINGS, reducer and pipe for access shaft shall be seated in mortar and neatly pointed or wiped inside shaft

MANHOLE NO. 1
PLAN, SECTION AND DETIAL
N.T.S.

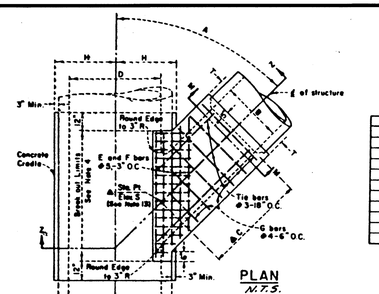
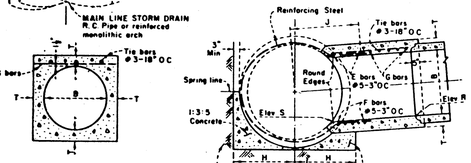


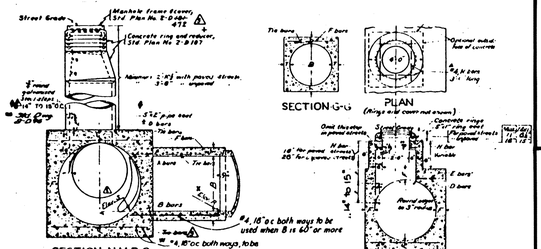
TABLE OF VALUES FOR T	
8	1'
12"	5"
15"	5"
18"	5"
21"	5"
24"	5½"
27"	5½"
30"	6"
33"	6½"
36"	6½"
39"	7"



NOTES:

1 Junction Structure No. 2 is to be used when O.D. of B is greater than ⅓ the I.D. of D, or B is greater than 24 inches. B shall not exceed ¾ D, or 39 inches.
NOTE: No more than one opening shall be made in one section of pipe.
2 Values of A, B, C and D are shown on project drawings. Elevation "R" and Elevation "S" are shown when required per Note 12.
3 Elevation S applies at inside wall of structure.
4 Breakout limits shall be determined as follows:
Upstream Limit - At the intersection of the outside of the spur wall with the main line pipe wall.
Downstream Limit - 6 inches downstream of the intersection of the spur wall with the main line pipe wall.
The opening shall be rectangular, cut normal to pipe surface and without damaging reinforcing steel. If a joint in the main line pipe falls within the limits of the concrete cradle, provide a concrete encasement one foot above the top of the main line pipe to the limits of the cradle.
5 The transverse reinforcement in pipe shall be cut at center of opening and bent into top and bottom slabs of spur.
6 The main line pipe shall be cradled and encased in 1:3:5 concrete mix, extending longitudinally 12 inches beyond the limits of breakout (See Note 4), and transversely a distance of H on each side of the centerline of pipe. H = ½ O.D. of pipe + 3 inches minimum.
Cradle may be omitted on side opposite lateral inlet when constructed in connection with existing storm drain.
7 Reinforcing steel shall be per 2-D171, and placed 1½ inches clear from face of concrete, unless otherwise shown.
8 E and F bars shall be carried to a point not less than J distance from centerline. J = ⅞ D + 6 inches.
9 Concrete strength shall be 3,000 psi at 28 days except as otherwise noted.
10 Floor of structure shall be steel-troweled to spring line.
11 When Junction Structure No. 2 is specified with reinforced monolithic arch storm drain, value D shall refer to the clear span of the arch.
Reinforcing steel shall be cut and bent into Junction Structure in the same manner as for pipe. Concrete cradle under reinforced monolithic arch is not required.
12 When Elevation "R" and Elevation "S" are not shown on project drawings, inlet pipe shall enter main line radially. When inlet pipe enters main line other than radially, Elevation "S" shall be shown on project drawings, and inlet pipe shall be laid on a straight grade from Elevation "S" to catch basin or grade break in line. Elevation "R" shall be shown on project drawings only when stub is to be provided in main line for future construction of inlet pipe.
13. Stations specified on drawings apply at the intersection of center lines of main line and laterals, except that stations for catch basin connector pipe apply at inside wall of structure.
14. Use Transition Structure No. 3, Std. Dwg. 2-D188, when A.C. Pipe is used for mainline.

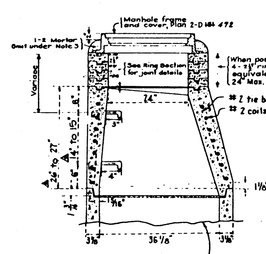
JUNCTION STRUCTURE NO. 2

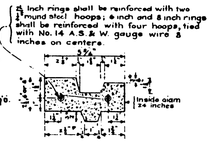


NOTES

1 - VALUES for A, B, C, D, Q, Elevation R, and Elevation S are shown on the plan. TABLE of values for E and F shown hereon.
2 - LATERALS: If laterals enter on both sides of manhole, access shaft shall be located on side receiving the smaller lateral.
3 - CENTER OF MANHOLE SHAFT shall be located over center line of Storm Drain when D1 is 48" or less, in which case place 42" bars symmetrically around shaft 45° with centerline.
4 - LENGTH of manhole may be increased at option to meet pipe ends, but any change in location of spur must be approved by the District Engineer.
5 - DETAIL M When depth of manhole from street to top of box is less than 2'-10" for paved streets or 3'-6" for unpaved streets, construct monolithic shaft as per Detail M. Construction of shaft as per Detail M for any depth of manhole is optional. When diameter D1 is 45" or less, center of shaft shall be located as per Note 3.
6 - REINFORCING STEEL shall be per 2-D171, straight bars, 1½" clear from face of concrete unless shown otherwise. Tie bars shall be #3, and spaced 18" on centers or closer. Steel schedule detailed on plan.
7 - EMBEDMENT, P, shall be 5" for D1 = 96" or less and 8" for D1 over 96"
8 - STEPS shall be ¾" round, galvanized steel anchored not less than 6 inches in the walls of structure. Unless otherwise shown the spacing shall be 14" to 15" o.c. The lowest step shall be not more than 2 feet above the invert. 16" on CL of 96.
9 - RINGS, REDUCER, AND PIPE for access shaft shall be seated in 1:2 mix mortar and neatly pointed or wiped inside shaft.
11 - FLOOR of manhole shall be steel troweled to spring line.
12 - BODY of manhole, including spur, shall be poured in one continuous operation, except that a construction joint at the springing line with a longitudinal keyway is permitted.
13 - ELEVATION "S" applies at inside wall of structure.
14 - f'c = 3000 psi at 28 days.
15. Where Pressure Manhole No. 4 is specified on plans see Std. Dwg. 2-D210 note 3.

MANHOLE NO. 4





NOTES

1-

2- ALL JOINTS shall be filled with 1-2 mortar and neatly pointed or wiped on inside of shaft.

3- COLLAR of 1-2 mortar around cover frame shall be omitted in rock and oil streets and in paved streets.

4-

5- STEPS shall be ¾ inch round galvanized steel. Top step shall be placed directly beneath the manhole cover frame.
Width of all steps shall be 14 inches between leg centers. Except where shown otherwise, spacing of steps in shaft shall be 14" to 15" △ inches on center. See Std Dwg 2-D96.

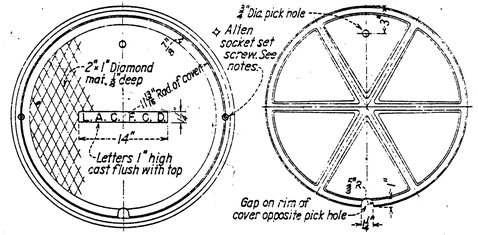
6- ECCENTRIC MANHOLE shaft, reducer, and rings may be plain concrete.
For unreinforced sections, the minimum thickness shall be 6 inches. The concrete used shall be of such strength so as to develop 3500 psi or greater in 28 days.

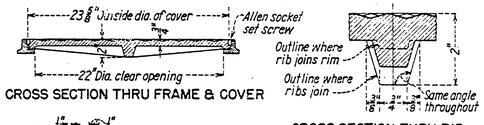
7- The precast concrete manhole structures will be inspected by the Engineer ~~prior to shipment to the job site,~~ and he will indicate acceptance by marking the structures with the District's stamp. (for shipment to the job.)

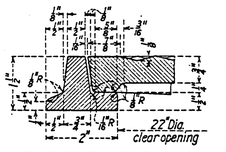
CONCRETE RINGS, REDUCER AND PIPE
N.T.S.

NOTES "CONTINUED"

8. The surfaces of cones and shafts shall be smooth and neatly finished. Cones or shafts with imperfect molding or honeycomb surfaces will not be accepted



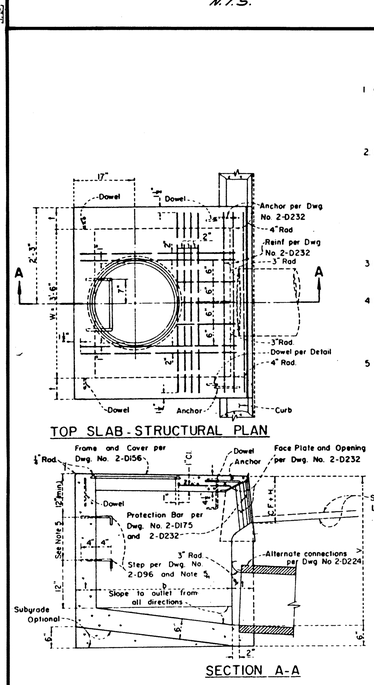




NOTES

Frame and cover shall be gray cast iron conforming to the latest A.S.T.M. standard A 48, class 30 or better.
Install two ¾ x ¾" Allen socket set screws, 90° to pick hole, in holes drilled and tapped 1" in depth
All parts of the frame and cover except machined surfaces shall be coated with asphaltum paint.
Frame and cover shall be tested for accuracy of fit and shall be marked in sets before delivery.
Frame and cover shall be positioned such that the identification lettering is parallel with and readable from the street-side of the curb.

MANHOLE FRAME AND COVER FOR CATCH BASINS
N.T.S.



CATCH BASIN NO. 1
N.T.S.

NOTES

1 CONNECTOR PIPE
Locate pipe on any alignment around the walls of the basin as shown on the general plan
Pipe shall be trimmed to the final shape and length before the placement of concrete

2 CONCRETE:
Design, f'c = 3,000 psi compressive strength at 28 days
Floor of the basin shall slope from all walls to the outlet and shall be given a steel-troweled surface finish
Curvature of the sill and side walls at the gutter opening shall be formed by curved forms
Surface of all exposed concrete shall conform in slope, grade, color, and finish to the existing, or proposed, curb and walk adjacent to the basin.

3 REINFORCEMENT: (Std Dwg No 2-D171)
Top Slab - No 3 or No 4 bars required as spaced on the Structural Plan
Walls and Floor - As required by Standard Drawing No. 2-D172

4 DIMENSIONS
Curb face at catch basin opening (Exist C.F.+H) shall be as required by Standard Drawings Nos 2-D88, 2-D45, or as shown on the general plan
V = 3'-6", H = 6 inches, and b = 3'-2" unless otherwise shown.

5 STEPS: (Std Dwg No 2-D96)
V to 3'-0" (incl.), place one step 12 inches above the floor of the basin
V over 3'-0", place steps at 12-inch intervals from the floor of the basin with the top step at 12 inches (minimum) below the top surface of the top slab

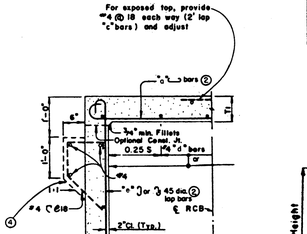
D 80

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

CHIEF, OFFICE OF STRUCTURE DESIGN
REGISTERED CIVIL ENGINEER

J. E. ROBERTS
No. 11428
Exp. 12-31-88
CIVIL
STATE OF CALIFORNIA

January 4, 1988
PLANS APPROVAL DATE



TYPICAL SECTION-SPANS 4' THRU 8'

	SPAN	8
	HEIGHT	4
	Maximum Earth Cover	10
Conc.	Roof T1	8½
Conc.	Walls T2	6
Conc.	Invert T3	8
Reinf.	Spacing	6
Reinf.	"a" Size	Bar # 7
Reinf.	"c" Size	Bar # 5
Quan.	Concrete	CF/LF 16.4
Quan.	Reinforcement	lbs/LF 123

"d" bars, for earth covers of 2' and less							
Span	4'	5'	6'	7'	8'	10'	12'	14'
Number	5	6	7	8	9	10	12	16

GENERAL NOTES

1. Quantities are approximate and for design purposes only.
2. It is permissible to eliminate the 180° hooks on every other bar.
3. For design and details not shown, see Standard Plan "D83", Box Culvert Miscellaneous Details
4. Provide paving notch when top is exposed and when pavement is P.C.C., and adjust quantities.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
SINGLE BOX CULVERT
N.T.S.

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-90
R.C.E. 17871

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT

APPROVED BY:

DATE: 3-30-92

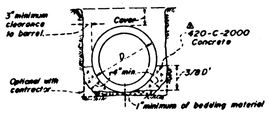
AGUA MANSA-BROWN AVE.
MISCELLANEOUS DETAILS
(L.A C.F.C. STD. DRAWINGS)

PROJECT NO.

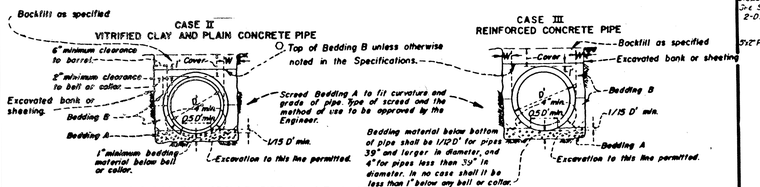
DRAWING NO. 1-514

SHEET NO. 29 OF 30

CASE I

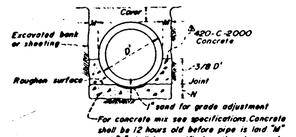


1. CASE I BEDDING (Load Factor 2.1)
shall be used where specified on plans or where required as an alternative to Case II or Case III Bedding as provided hereon. Case IV Bedding shall be used instead of Case I against sheeting or unstable trench sides if so required by the Engineer.



2. CASE II BEDDING & BACKFILL AROUND PIPE (Load Factor 1.8)
- (a) "W" at springing line shall not be less than 6" for any depth of trench. This dimension may include the thickness of any sheeting.
- (b) Where cover is 8' or less, "W" measured at top of pipe may be any dimension greater than 6".
- (c) Where cover is greater than 8', "W" measured at top of pipe shall not be greater than 8" unless the contractor at his own expense provides Case I bedding or stronger pipe. The stated 8" includes the thickness of any sheeting.

CASE IV



For concrete mix see specifications. Concrete shall be 12 hours old before pipe is laid "W" and "h" shall be specified on the plans or by the Engineer.

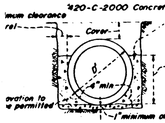
3. CASE III BEDDING & BACKFILL AROUND PIPE (Load Factor 1.8)
- (a) "W" at springing line shall not be less than the following: 6" for pipe 60" or less in diameter, 10" for pipe 63" to 108" inclusive in diameter, and 12" for pipe larger than 108" in diameter. These dimensions may include the thickness of any sheeting.
- (b) Where cover is 10' or less, "W" measured at the top of the pipe may be any dimension greater than the above specified minimum, unless otherwise specified on the project drawing.
- (c) Where cover is greater than 10' "W" measured at the top of the pipe shall not be greater than 10" for pipe 108" in diameter or less, or 12" for pipe over 108" in diameter unless the contractor at his own expense provides Case I bedding or stronger pipe. These dimensions include the thickness of any sheeting.

4. CASE IV BEDDING (Load Factor 3.0)
Where required by the Engineer as an alternative to Case I or Case II to meet conditions arising during construction.

5. CASE V BEDDING (Load Factor 2.7)
shall be used where specified on the plans. Case IV Bedding shall be used instead of Case V against sheeting or unstable trench walls

3-Edge Bearing Test Load Factor 1.0 if so required by the Engineer.

CASE V

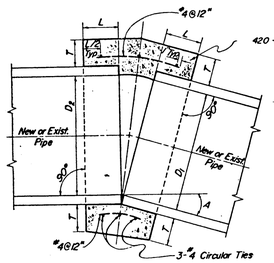


GENERAL NOTES
1. Use Case IV for R.C.P. and A.C.P., Case II for vitrified clay and plain concrete pipe unless otherwise specified or shown on the project drawings.
2. Bedding A shall be composed of sand, 3/4-inch or 1/2-inch crushed rock, No. 3 or No. 4 concrete aggregate or gravel, or other granular material as specified, unless otherwise approved by the Engineer. Any of the materials listed with a gradation no coarser than that of No. 3 concrete aggregate shall be used for pipe 27 inches in diameter and larger, and materials with a gradation no coarser than that of 1/2-inch crushed rock shall be used for pipe smaller than 27 inches in diameter.
   Bedding B shall be composed of sand or other granular material as specified, unless otherwise approved by the Engineer, and shall be completed prior to placing balance of backfill.
3. Concrete backfill, where called for on Std. Dwg. 2-D213 or where specified on the project drawings, shall be 420-C-2000 concrete poured wall to wall of trench from top of Bedding A to a minimum depth of 4" over top of pipe. Concrete backfill shall be used for R.C.P. and A.C.P. as required on Std. Dwg. No. 2-D213.

GENERAL NOTES (CONT'D)
4. Bedding B shall contain no rocks larger than 4-inch in greatest dimension
5. Where rocks are included in the bedding, "nesting" thereof will not be permitted.

PIPE BEDDING IN TRENCHES
N.T.S.

D	L	T
12"	10'	4"
18"	10'	5"
24"	10'	6"
36"	15'	8"
48"	15'	10"
52"	15'	10"
60"	175'	11"
66"	175'	11"



CONCRETE COLLAR
N.T.S.

NOTES
1. A concrete collar is required where the change in grade exceeds 0.10 ft. per foot.
2. Where pipes of different diameters are joined with a concrete collar, L and T shall be those of the larger pipe. D=D_1 or D_2, whichever is greater.
3. For pipe larger than 66" a special collar detail is required.
4. For pipe size not listed use next size larger.
5. Omit reinforcing on pipes 24" and less in diameter and on all pipes where angle A is less than 10°.
6. Where reinforcing is required the diameter of the circular ties shall be D+(2 x wall thickness) + 8".
7. When D_1 is equal to or less than D_2, join inverts and when D_1 is greater than D_2, join soffits.
8. Pipe may be corrugated metal pipe, concrete pipe, or reinforced concrete pipe, or asbestos cement pipe.
9. Not to be used for a size change on the mainline.

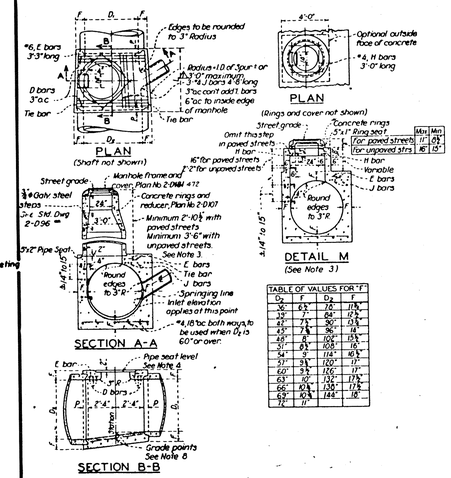
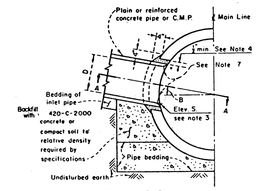
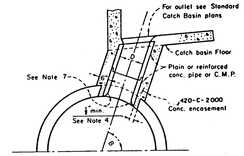


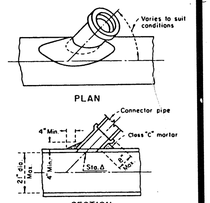
TABLE OF VALUES FOR "F"			
D_2	F	D_2	F
30"	5"	78"	11½"
36"	7"	84"	12"
42"	7"	90"	13"
48"	6½"	96"	13½"
54"	8"	102"	15"
60"	8½"	108"	16"
66"	9"	114"	16½"
72"	9½"	120"	17"
78"	10"	126"	17"
84"	10½"	132"	17½"
90"	10½"	138"	17½"
96"	10½"	144"	18"
102"	11"		

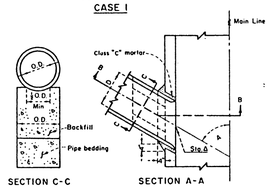
NOTES
1. TABLE of values for "F" are on this plan.
2. CENTER OF MANHOLE SHAFT shall be located over center line of storm drain when diameter D_1 is 48" or less, in which case place E bars symmetrically around shaft at 45° with centerline and omit J bars.
3. DETAIL M: When depth of manhole from street grade to top of box is less than 2'-10½" for paved street or 3'-6" for unpaved street, construct monolithic shaft as per Detail M. Shaft for any depth of manhole may be constructed as per Detail M. When diameter D_1 is 48" or less, center of shaft may be located as per note 2.
4. THICKNESS OF DECK shall vary when necessary to provide level pipe seat, but shall not be less than tabular values for T shown on this plan
5. REINFORCING STEEL to be per 2-D171, 1½" clear from face of concrete unless shown otherwise.
6. STEPS shall be ¾" round, galvanized steel and anchored not less than 6" inches in the walls of structure. Unless otherwise shown the spacing shall be 14" to 15" c-c. The lowest step shall not be more than 2'-6" above the invert. See Std. Dwg. 2-D 96.
7. RINGS, REDUCER AND PIPE for access shaft shall be seated in mortar and neatly pointed or wiped inside the shaft.
8. STATIONS of manholes shown on plan apply at center of shaft. Elevations shown at stations refer to prolonged invert grade lines
9. FLOOR of manhole shall be steel-troweled to "springing" line.
10. BODY of manhole shall be poured in one continuous operation, except that a construction joint with a longitudinal keyway may be placed at the springing line.
11. LENGTH L AND EMBEDMENT P shall have the following values unless otherwise shown on plan
    for D_2 = 96" or less, L = 5'-6", P = 5"
    D_2 over 96", L = 6'-0", P = 6"
    L may be increased or location of manhole shifted to meet pipe ends. When L greater than that shown above is specified, D bars shall be continued 6" o.c.
12. D BARS shall be #4 for D_2 = 39" or less, #5 for D_2 = 42" to 84" inclusive and #6 for D_2 = 90" or over. Tie bars shall be #3 bars
13. f'c = 3000 p.s.i. at 28 days
14. Centerline of inlet pipe to intersect inside face of cone at springing line unless otherwise shown
15. Where Pressure Manhole No. 2 is specified on plans see Std. Dwg. 2-D210 note 3.

MANHOLE NO. 2
PLAN SECTION AND DETAIL
N.T.S.









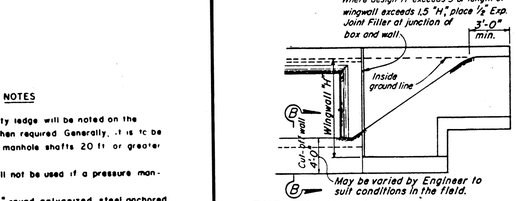
CASE 2

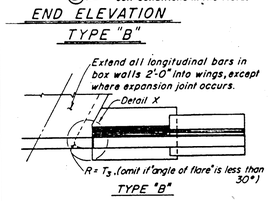
Note: All connector pipes (within the angles specified for Case 2) shall be encased when laid within the main line excavated trench, or when laid on fill which has not been densified.

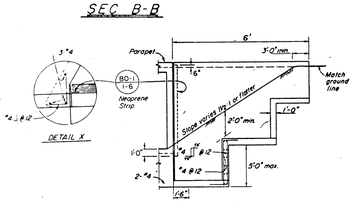
NOTES: CASE I AND CASE 2
1. Angle A shall be between 45° degrees and 90 degrees and D shall be 24 inches or less. For smaller values of A and larger values of D, use appropriate standard structure.
2. In no case shall the outside diameter of the inlet pipe exceed one-half the inside diameter of the main storm drain.
3. Center line of inlet shall be on radius of main storm drain except where Elevation S is shown on project drawings.
4. The opening into the main storm drain shall be the outside diameter of the inlet pipe plus one inch minimum or 3 inch maximum.
5. All corrugated metal pipe and fittings shall be galvanized.
6. If Angle B is 45 degrees or less, use Case 1. If Angle B is greater than 45 degrees, use Case 2.
7. Burn or chip end of connector pipe flush with inner surface of mainline pipe. Round edge of concrete pipe or reinforced concrete pipe.
8. Station specified on drawings applies at the intersection of inside wall of main storm drain and center line of inlet pipe.

NOTES: CASE 3
1. Connections to pipes 21 inches or less in diameter without junction structures or precast Y branches shall be made with saddles
2. Trim or cut saddle to fit snugly over the outside of the main pipe, and so its axis will be on the line and grade of the connecting pipe.
3. The opening into the pipe shall be cut and trimmed to fit the saddle so that no part will project within the bore of the saddle pipe.
4. The connecting pipe shall be supported as shown in Cases 1 and 2.

JUNCTION STRUCTURE NO. 4
N.T.S.

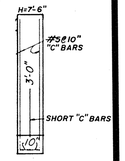






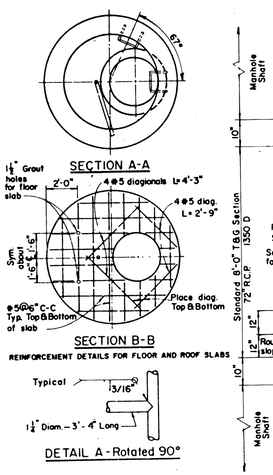
Design Notes:
Unit Stresses: f_s = 24,000 p.s.i, f_c = 1300 p.s.i, n=10
Maximum Toe Pressure = 1½ Tons/sq.ft.
Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field. Walls designed for 2' liveload surcharge, 1½:1 sloping surcharge not to exceed 5' in elevation plus 2' liveload surcharge, or unlimited 2:1 surcharge.
Dimensions "H," "L," "M" "N," Elev. "a" and "Angle of flare" (as apply) are shown on the plans.
Wall height may be exceeded by 6" before going to next greater "H"
Eliminate cut-off wall if adjacent channel is paved and skew is 20° maximum.

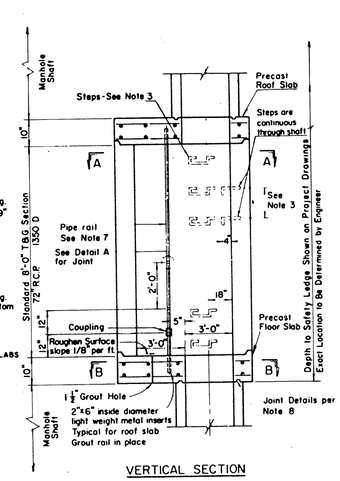
Figures at top of "c" bars indicates distance from top of footing to upper end of "c" bars.



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BOX CULVERT WINGWALLS TYPE "B"
N.T.S.





NOTES
1. Manhole shaft safety ledge will be noted on the project drawings when required. Generally, it is to be constructed in deep manhole shafts 20 ft. or greater in depth
2. A safety ledge shall not be used if a pressure manhole is required.
3. Steps shall be 3/4" round galvanized steel anchored 4" in the wall of the structure. Steps shall be placed to match the spacing of the manhole shaft. See District Drawing 2-D96
4. Concrete shall develop 3000 p.s.i. or greater in 28 days
5. Reinforcement shall be per ASTM A615, Grade 40. Reinforcing steel shall terminate 2" clear of concrete surfaces unless otherwise shown
6. Grout holes, pipe, and fittings shall be provided in the floor slab. Pressure grouting shall be used to fill voids and to secure uniform bearing. The grout shall be neat cement grout and grouting pressures shall be as determined in the field by the Engineer
7. Pipe rail shall be fabricated of 1-1/4" standard galvanized pipe composed of two sections 7.5 & 15' in length joined by a galvanized coupling. The coupling shall be threaded a minimum of 2" on each pipe length
8. Roof and floor slabs shall be precast and keyed for reinforced concrete pipe sections as shown. All joints shall be filled with 1-2 mortar and neatly pointed or wiped on the inside
9. 72" R.C.P. shall be provided with two circular cages of reinforcement

MANHOLE SHAFT SAFETY LEDGE
N.T.S.

D 84	DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Chief Office of Structure Design
Registered Civil Engineer
January 4, 1988
Plans Approval Date
J.E. ROBERTS
No. 11428
Exp. 12-31-88
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:
WILLDAN ASSOCIATES
290 S. ANAHEIM BLVD.
ANAHEIM, CALIF. 92805
(213) 924-1631 (714) 774-5740
REGISTRATION EXP. DATE 12-31-92
Anthony K. Lin 8/8/90
R.C.E. 21787
Exp: 12/31/92

BENCH MARK: M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE 42.0 FEET SOUTH OF EL RIVINO ROAD 27.0 FEET WEST OF HALL AVENUE 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64. ELEV. 946.687 DATE 5-71

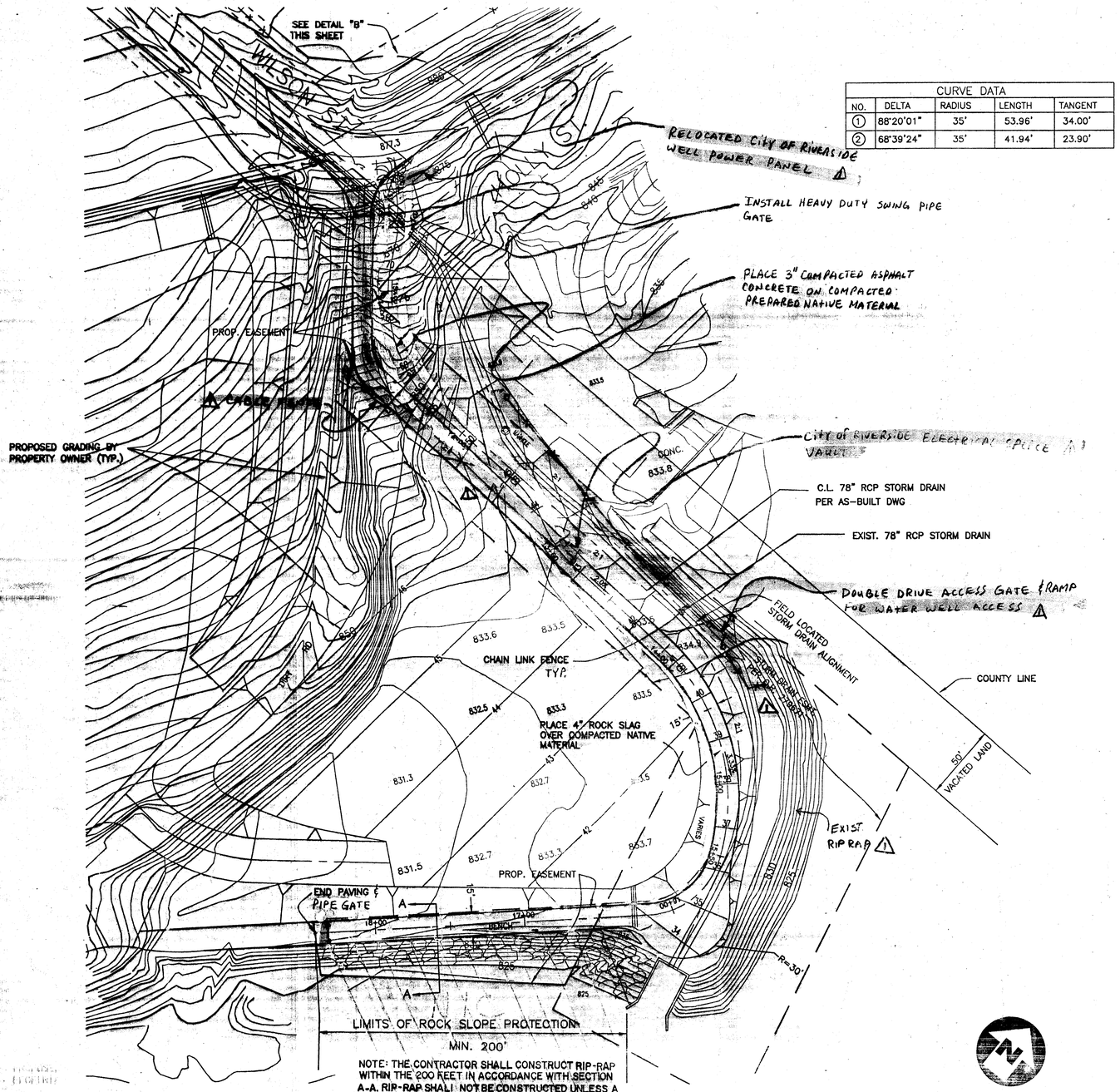
REVISIONS:

REF.	DESCRIPTION	APPR.	APPR.	DATE

COUNTY OF SAN BERNARDINO
LAND DEVELOPMENT
APPROVED BY:
DATE: 3-30-92

AGUA MANSA-BROWN AVE.
MISCELLANEOUS DETAILS
(L.A.C.F.C. STD. DRAWINGS)

PROJECT NO.
DRAWING NO. 1-514
SHEET NO. 30 OF 30



CURVE DATA				
NO.	DELTA	RADIUS	LENGTH	TANGENT
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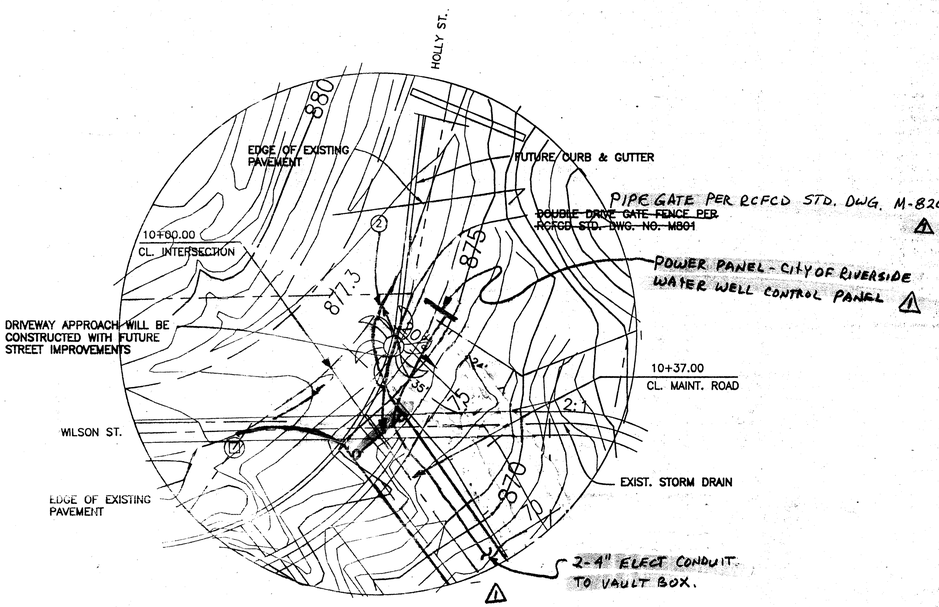
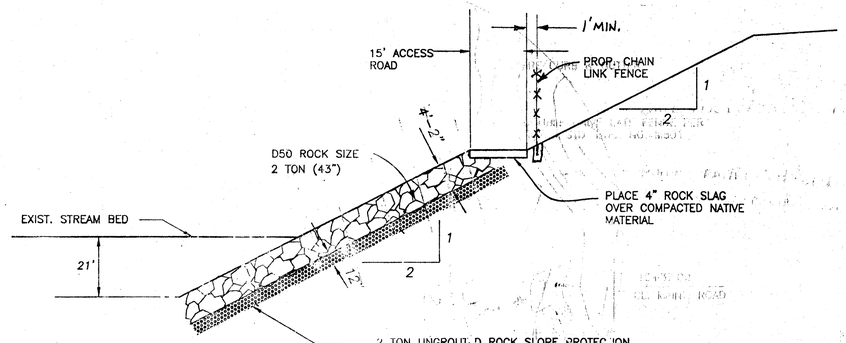
②	68°39'24"	35'	41.94'	23.90'



DETAIL "B"

DRIVEWAY FOR MAINTENANCE ROAD

1" = 20'



SECTION A–A

UNGROUTED RIP-RAP LEVEE SECTION

NTS

0' 20' 40' 80' 120' 160'

GRAPHIC SCALE IN FEET

CONSTRUCTION DRAWINGS

DUPLICATE OF ORIGINAL – DO NOT REVISE

COUNTY OF SAN BERNARDINO SPECIAL DISTRICTS DEPARTMENT
APPROVED BY: JAMES IKEN
DATE: 6-26-07

PREPARED BY: MICHAEL J. STEARNS RCE NO. 26406 EXP. 3/31/04 DATE: 4-25-01

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC. 3500 E. Florida Avenue, Suite B Hemet, California 92544 (909) 765-6822 Fax (909) 765-6621

BENCH MARK

RIV. CO. # 23350 ELEV.=834.893
TRIANGULATION STATION, FOUND 3/4" I.P. DN. 0.25' STATION 320+00 EAST LEVEE NEAR SOUTH CORNER MOD. 6

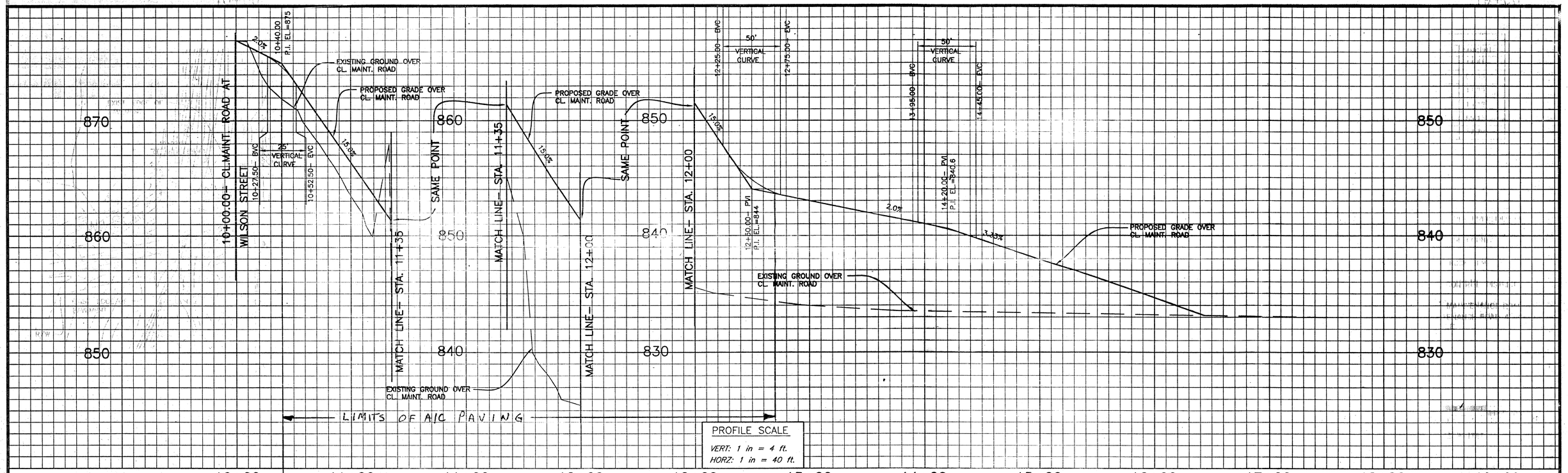
REVISIONS			
REF.	DESCRIPTION	APPR.	DATE
⚠	"AS-BUILT"	[illegible]	10-6-08

DESIGNED BY:
DRAWN BY:
DATE DRAWN:
CHECKED BY:

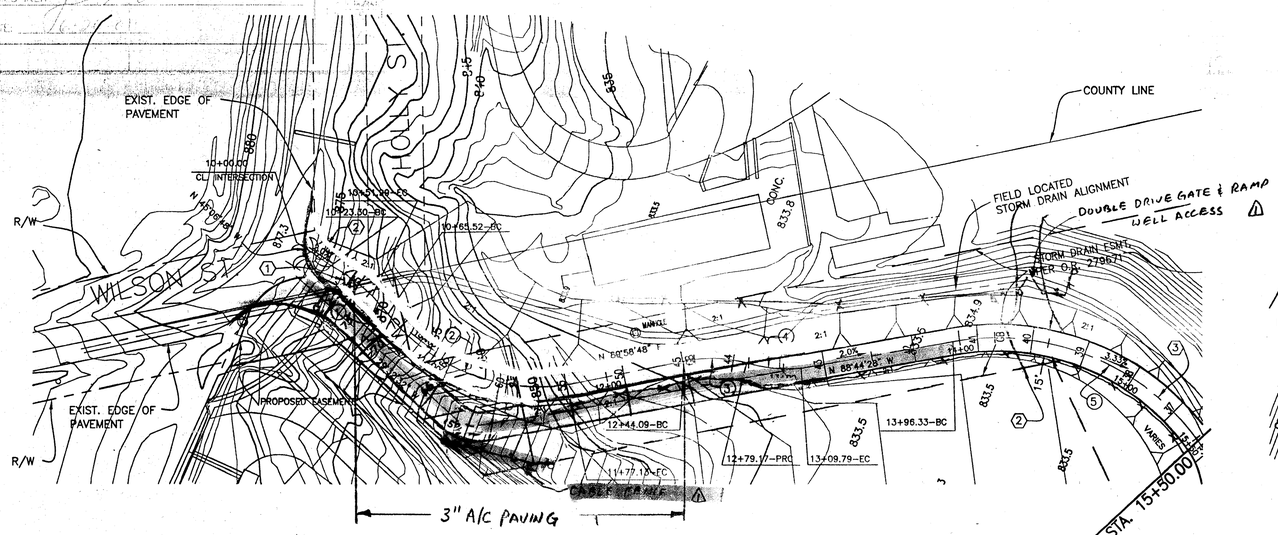
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
RECOMMENDED FOR APPROVAL: DATE: 6-26-2007
APPROVED BY: DATE: 6/26/07

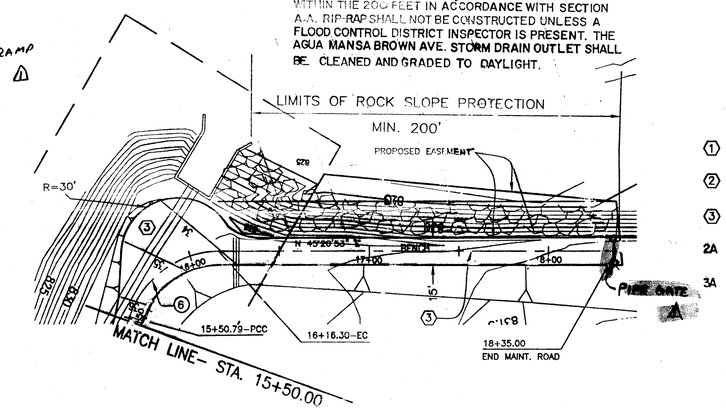
AGUA MANSA BROWN AVENUE STORM DRAIN

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 30A OF 30?



COUNTY OF SAN BERNARDINO SPECIAL DISTRICTS DEPARTMENT
APPROVED BY:
JAMES IKEN
DATE:





CURVE DATA				
NO.	DELTA	RADIUS	LENGTH	TANGENT
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2	59°29'35"	107.49'	111.62'	61.43'
3	27°39'51"	72.64'	35.07'	17.89'
4	19°38'50"	89.29'	30.62'	15.16'
5	63°12'49"	140'	154.46'	86.15'
6	71°29'39"	52.50'	65.51'	37.79'

CONSTRUCTION NOTE

1. CONSTRUCT DOUBLE DRIVE CHAIN LINK FENCE PER RIVERSIDE COUNTY FLOOD CONTROL STD. DWG. NO. M801
2. CONSTRUCT 6' CHAIN LINK FENCE PER RIVERSIDE COUNTY FLOOD CONTROL STD. DWG. NO. M818
3. CONSTRUCT 15' MAINTENANCE ROAD WITH 4" ROCK SLAG OVER COMPACTED NATIVE MATERIAL

2A VERIFY LOCATION OF FENCE WITH FLOOD CONTROL DISTRICT INSPECTOR BEFORE CONSTRUCTION.

3A PLACE ASPHALT CONCRETE AND BASE ON MAINTENANCE ROAD AT 15% GRADE AND CLASS II BASE ON MAINTENANCE ROAD AT 2% TO 3.33% GRADE IF ROCK SLAG ISN'T AVAILABLE.

0' 20' 40' 80' 120' 160'
GRAPHIC SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER MICHAEL J. STEARNS NO. C26406 CIVIL STATE OF CALIFORNIA

CONSTRUCTION DRAWINGS

PREPARED BY:
MICHAEL J. STEARNS RCE NO. 26406 EXP. 1/31/04 DATE: 6-25-01

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.
3550 E. Florida Avenue, Suite B
Hemet, California 92544
(909) 765-6222 Fax (909) 765-6621

BENCH MARK
RIV. CO. # 23350 ELEV.=834.893
TRIANGULATION STATION, FOUND 3/4" I.P. DN. 0.25' STATION 320+00 EAST LEVEE NEAR SOUTH CORNER MOD. 6

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE
1	"AS-BUILT"	JB	10-6-03

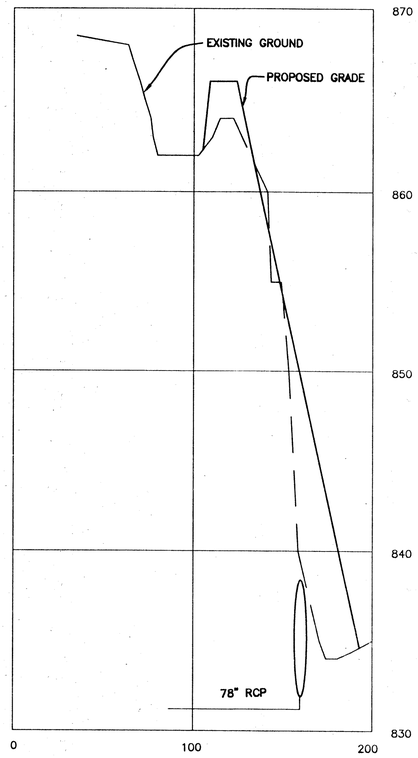
DESIGNED BY:
DRAWN BY:
DATE DRAWN:
CHECKED BY:

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

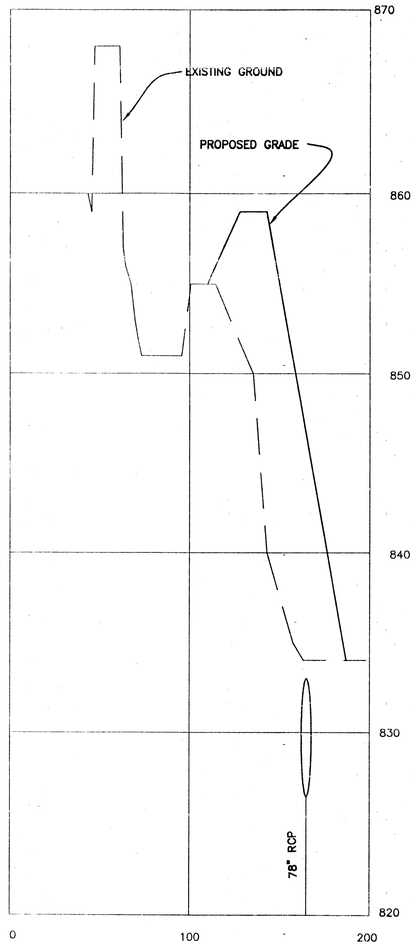
RECOMMENDED FOR APPROVAL BY: DATE: 6-06-2001
APPROVED BY: DATE: 6/6/01

AGUA MANSA BROWN AVENUE STORM DRAIN MAINTENANCE ROAD

PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 30B OF 30C



SECTION AT STA. 11+00



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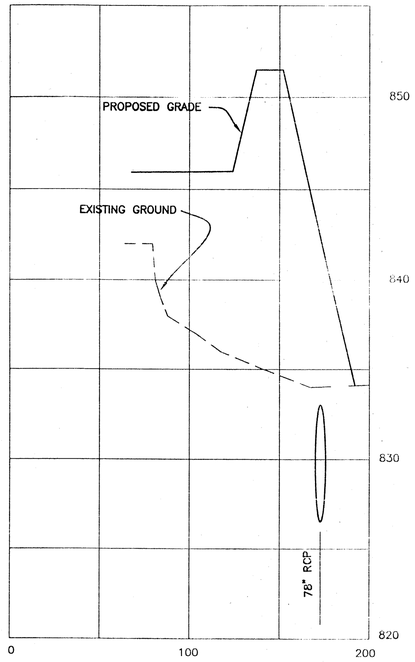
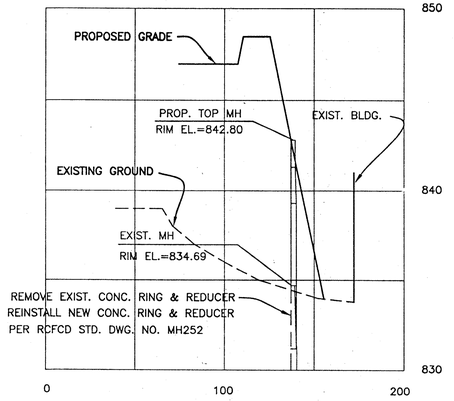
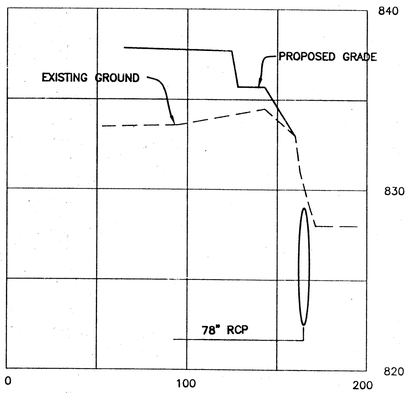


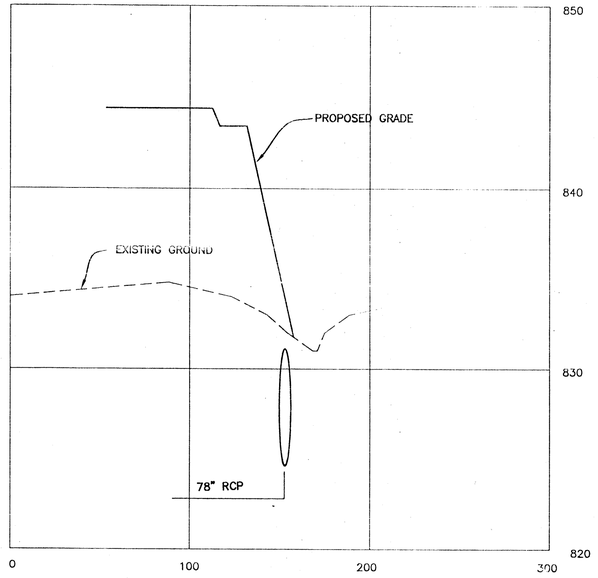
SECTION AT STA. 12+00



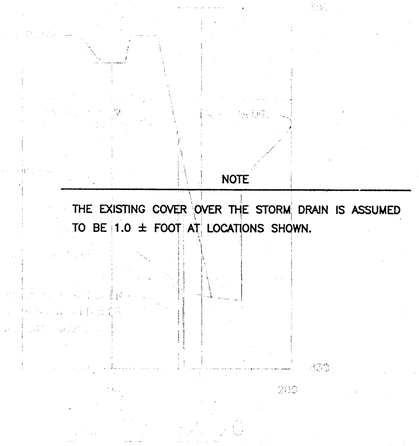
SECTION AT STA. 12+20



SECTION AT STA. 14+00



SECTION AT STA. 13+00



SCALE: HORIZ.: 1"=40'
VERT.: 1"=4'

REGISTERED PROFESSIONAL ENGINEER MICHAEL J. STEARNS NO. C26404 CIVIL STATE OF CALIFORNIA

CONSTRUCTION DRAWINGS

COUNTY OF SAN BERNARDINO SPECIAL DISTRICTS DEPARTMENT
APPROVED BY: JAMES IKEN
DATE: 6-26-01

PREPARED BY: MICHAEL J. STEARNS RCE NO. 26406 EXP. 3/31/04 DATE: 6-25-01

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC. 3550 E. Florida Avenue, Suite H Hemet, California 92544 (909) 765-6622 Fax (909) 765-6621

BENCH MARK
RIV. CO. # 23350 ELEV.=834.893
TRIANGULATION STATION, FOUND 3/4" I.P. DN. 0.25' STATION 320+00 EAST LEVEE NEAR SOUTH CORNER MOD. 6

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

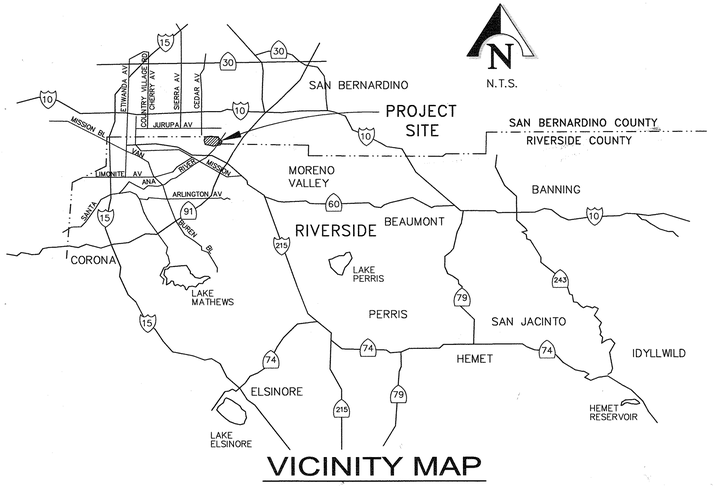
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: BOONTHOU
DRAWN BY:
DATE DRAWN:
CHECKED BY:
RECOMMENDED FOR APPROVAL BY: DATE: 6-06-2002
APPROVED BY: DATE: 6/6/02

AGUA MANSA BROWN AVENUE MAINTENANCE ROAD CROSS SECTIONS

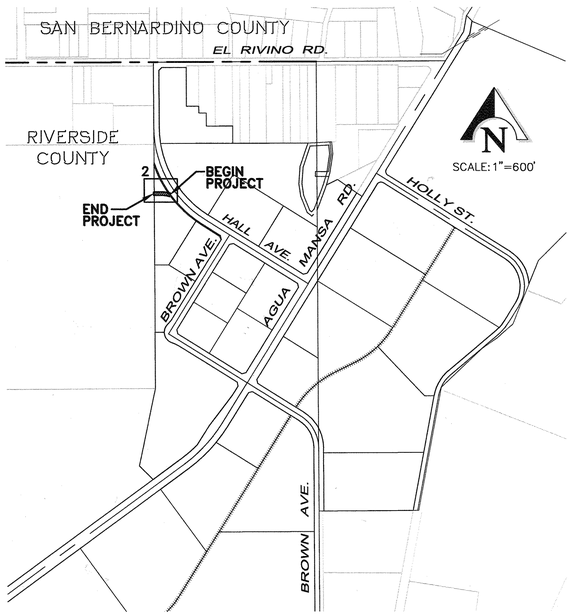
PROJECT NO. 1-0-335
DRAWING NO. 1-514
SHEET NO. 30C OF 32C

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT



VICINITY MAP

N.T.S.



LOCATION MAP

SCALE: 1"=600'

GENERAL NOTES

1. THE CONTRACTOR SHALL CONSTRUCT THE FLOOD CONTROL IMPROVEMENTS SHOWN ON THE DRAWINGS IN CONFORMANCE WITH THE REQUIREMENTS OF THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT'S M.O.U. STANDARD SPECIFICATIONS DATED SEPT. 1984, AND DESIGN MANUAL STANDARD DRAWINGS DATED APRIL 2004 AND CALTRANS STANDARD SPECIFICATIONS, LATEST EDITION (WITHIN CALTRANS RIGHT-OF-WAY).
2. AN ENCROACHMENT PERMIT IS REQUIRED FROM RIVERSIDE COUNTY FLOOD CONTROL. CONTACT ED LOTZ AT (951) 955-1266. AFTER THE PERMIT IS ISSUED, THE DISTRICT MUST BE NOTIFIED ONE WEEK PRIOR TO CONSTRUCTION.
3. CONSTRUCTION INSPECTION WILL BE PERFORMED BY RIVERSIDE COUNTY FLOOD CONTROL. CONTACT DALE ANDERSON AT (951) 955-1288. THE DISTRICT MUST BE MUST BE NOTIFIED 20 DAYS PRIOR TO CONSTRUCTION.
4. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE NOTED.
5. STATIONING FOR LATERALS AND CONNECTOR PIPE REFER TO THE CENTERLINE INTERSECTION STATIONS.
6. FORTY-EIGHT HOURS BEFORE EXCAVATION, CALL UNDERGROUND SERVICE ALERT AT 1-800-227-2600.
7. ALL ELEVATIONS SHOWN ARE IN FEET AND DECIMALS THEREOF BASED ON U.S.C.&G.S. DATUM.
8. ALL CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
9. ELEVATIONS OF UTILITIES ARE APPROXIMATE UNLESS OTHERWISE NOTED. 48 HOURS BEFORE EXCAVATION CALL UNDERGROUND SERVICE ALERT AT 1-800-227-2600. ALL UTILITIES SHALL BE PROTECTED IN PLACE EXCEPT AS NOTED ON PLANS AND SPECIFICATIONS.
10. OPENINGS RESULTING FROM THE CUTTING OR PARTIAL REMOVAL OF EXISTING CULVERTS, PIPES OR SIMILAR STRUCTURES TO BE ABANDONED SHALL BE SEALED WITH 6" OF CLASS "B" CONCRETE.
11. PIPE CONNECTED TO THE MAINLINE PIPE SHALL CONFORM TO JUNCTION STRUCTURE NO. 4 (JS229) UNLESS OTHERWISE NOTED.
12. BEDDING PIPE SHALL CONFORM TO RCFC&WCD STD. M815, EXCEPT FOR COVER LESS THAN 2 FEET. FOR COVER LESS THAN 2 FEET, CONCRETE SLURRY (2,000 PSI-2 SACK) SHALL BE USED. THE ENTIRE TRENCH SHALL BE SLURRY EXTENDING 4 INCHES MINIMUM AND 12 INCHES MAXIMUM ABOVE THE TOP OF THE PIPE.
13. "V" IS THE DEPTH OF INLET OF CATCH BASINS MEASURED FROM THE TOP OF CURB TO INVERT OF CONNECTOR PIPE.
14. CATCH BASINS SHALL BE LOCATED SO THAT LOCAL DEPRESSION SHALL BEGIN AT EXISTING CURB RETURN JOINT, UNLESS OTHERWISE SPECIFIED.
15. ALL CURBS, GUTTERS, SIDEWALKS, DRIVEWAYS AND OTHER EXISTING IMPROVEMENTS TO BE RECONSTRUCTED IN KIND AND AT THE SAME ELEVATION AND LOCATION AS THE EXISTING IMPROVEMENTS UNLESS OTHERWISE NOTED.
16. STANDARD DRAWINGS CALLED FOR ON THE PLAN AND PROFILE SHALL CONFORM TO RCFC&WCD STD. DRAWINGS OR APWA STANDARD PLANS.

INDEX

	SHEET NO.
TITLE SHEET	1
PLAN AND PROFILE	2
DETAILS/SECTIONS	2

R.C.F.C. & W.C.D. STANDARD DRAWINGS

M803	CONCRETE COLLAR
M815	BEDDING AND PAY LINES

A.P.W.A. STANDARD DRAWINGS

311-1	FRAME AND GRATING FOR CATCH BASINS

MAINTENANCE NOTE:

THE FOLLOWING ITEMS ARE TO BE MAINTAINED BY RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT:

* 42" RCP STORM DRAIN FROM STA. 67+33.23 TO STA. 68+63.02
* CONCRETE DROP INLET FROM STA. 68+63.02 TO STA. 68+66.69

AS BUILT
APPROVED BY Teresito Tabiolo
DATE 11-7-05

PLOT PLAN 18592

Underground Service Alert
Call: TOLL FREE 1-800 227-2600
TWO WORKING DAYS BEFORE YOU DIG

KCT CONSULTANTS, INC.
Civil Engineers - Surveyors - Planners
P.O. Box 5705 Riverside, CA 92517-5705
4344 Latham St., Suite 200, Riverside, CA 92501
Phone: 951/341-8940 Fax: 951/341-8945
e-mail: kctinc@pacbell.net

PREPARED UNDER THE SUPERVISION OF:
Teresito Tabiolo DATE 3-17-05
TERESITO N. TABIOLO, R.C.E. NO. 38826 EXP. DATE 3-31-~~06~~ 07

REGISTERED PROFESSIONAL ENGINEER — TERESITO N. TABIOLO — RCE No. 38826 — Exp. 3-31-07 — CIVIL — STATE OF CALIFORNIA

BENCHMARK:
M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE, 42.0 FEET SOUTH OF EL RIVINO ROAD, 27.0 FEET WEST OF HALL AVENUE, 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H, 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64
ELEVATION: 946.687

REVISIONS

REF.	DESCRIPTION	APPR	DATE	APPR	DATE

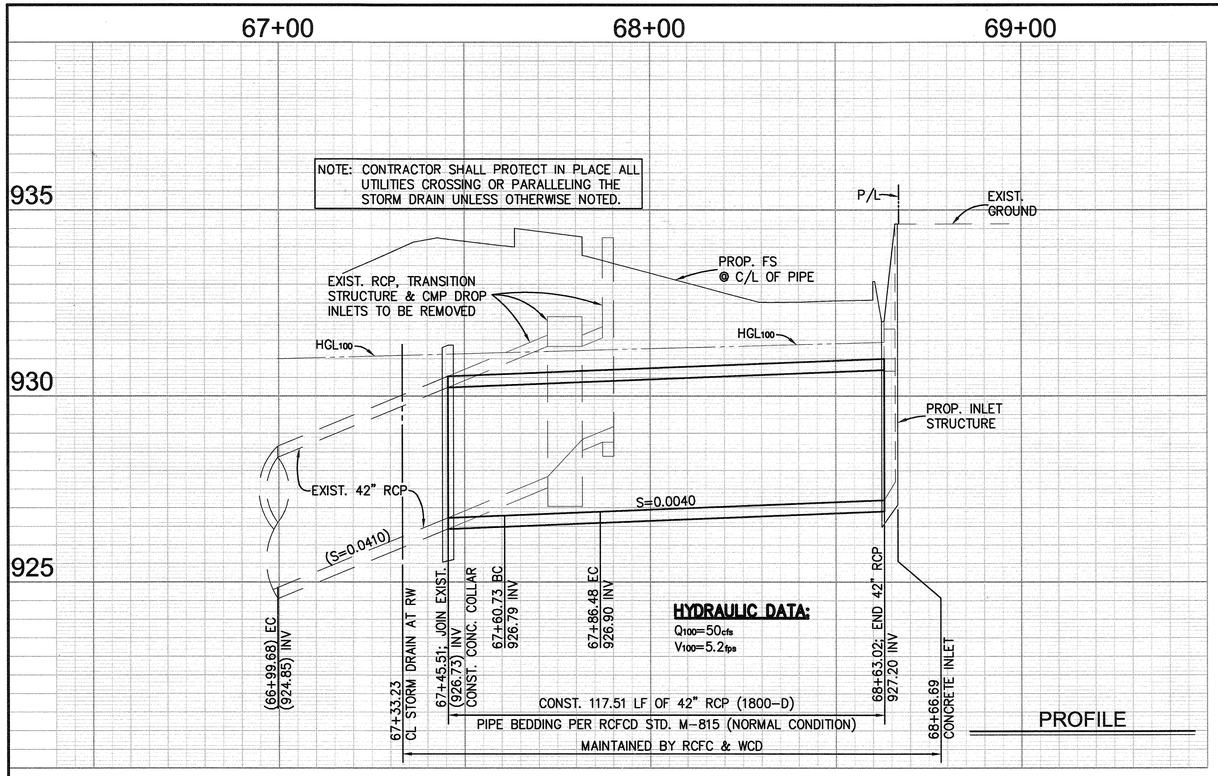
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

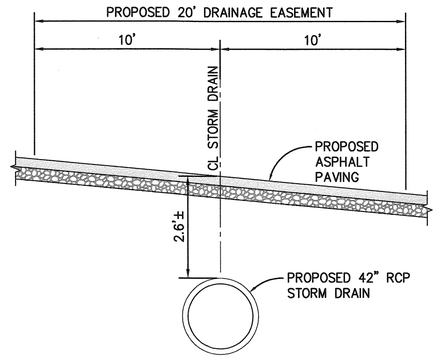
RECOMMENDED FOR APPROVAL BY: Stuart E. McKibbin DATE: 5-13-2005
APPROVED BY: Marshall Gunsolley DATE: 5-13-05

AGUA MANSA BROWN AVENUE / WILSON STREET STORM DRAINS STAGE 2
TITLE SHEET

PROJECT NO. 1-0-335
DRAWING NO. 1-630
SHEET NO. 1 OF 2

P:\1335\Ut\Plans Manual\Stuart\Stuart\Ut-rcfc-sht1-01.dwg
Plot Date: March 16, 2005 - 10:39am - Plotted by: Norma Tavera by:



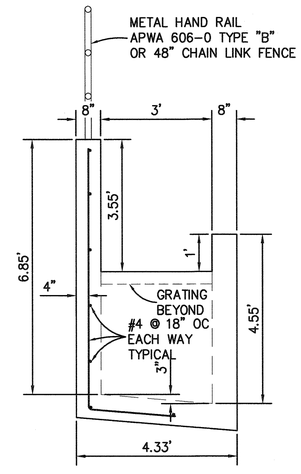


SECTION AT STATION 68+00

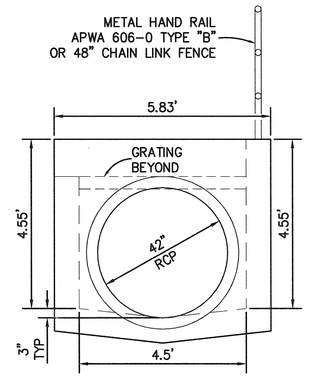
SCALE: 1"=4'

CONSTRUCTION NOTES:

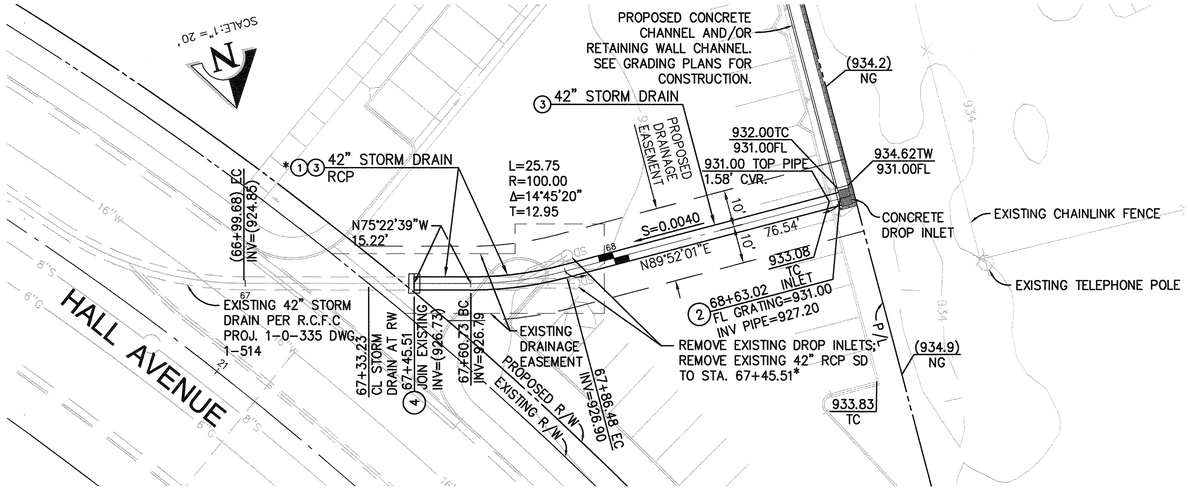
1. REMOVE EXISTING 42" RCP TO NEAREST DOWNSTREAM JOINT BELOW JOIN STATION.
2. CONSTRUCT CONCRETE DROP INLET PER DETAILS ON SHEET 2; PROVIDE GRATING PER APWA STD. 311-1.
3. CONSTRUCT 42" RCP (1800-D); PIPE BEDDING PER RIV. CO. FLOOD STD. M815 (NORMAL CONDITION).
4. CONSTRUCT CONCRETE COLLAR PER RIV. CO. FLOOD STD. M803.



SOUTH ELEVATION



EAST ELEVATION



PLAN VIEW

SCALE: 1"=20'

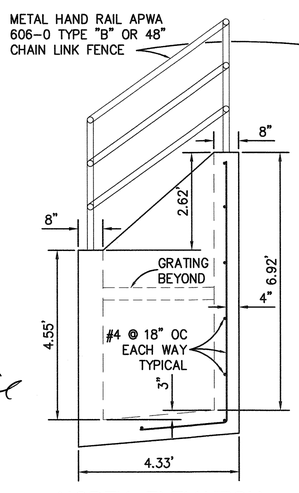
0 10 20 40 60 80

SCALE: 1 INCH = 20 FEET

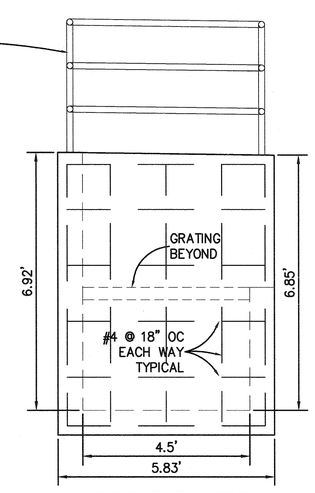
AS BUILT

APPROVED BY: Teresito Tabiolo

DATE 11-7-05



NORTH ELEVATION



WEST ELEVATION

PLOT PLAN 18592

Underground Service Alert
Call: TOLL FREE 1-800 227-2600
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KCT CONSULTANTS, INC.
Civil Engineers - Surveyors - Planners
P.O. Box 5705 Riverside, CA 92517-5705
4344 Latham St., Suite 200, Riverside, CA 92501
Phone: 951/341-8940 Fax: 951/341-8943
e-mail: kctinc@kctinvsmp.com

PREPARED UNDER THE SUPERVISION OF: Teresito Tabiolo DATE 3-17-05
TERESITO N. TABIOLO, R.C.E. NO. 38826 EXP. DATE 3-31-~~05~~07

REGISTERED PROFESSIONAL ENGINEER TERESITO N. TABIOLO RCE No. 38826 Exp. 3-31-~~07~~09 CIVIL STATE OF CALIFORNIA

BENCHMARK:
M.L. 1-64
AT THE SOUTHWEST CORNER OF EL RIVINO ROAD AND HALL AVENUE, 42.0 FEET SOUTH OF EL RIVINO ROAD, 27.0 FEET WEST OF HALL AVENUE, 3.0 FEET NORTH OF TELEPHONE POLE # 752594-H, 1.0 FOOT EAST OF A MARKER POST, A BRASS DISK IN THE TOP OF A CONCRETE POST AND MARKED M.L. 1-64

ELEVATION: 946.687

REVISIONS					
REF.	DESCRIPTION	APPR	DATE	APPR	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Teresito Tabiolo DATE: 5/11/05

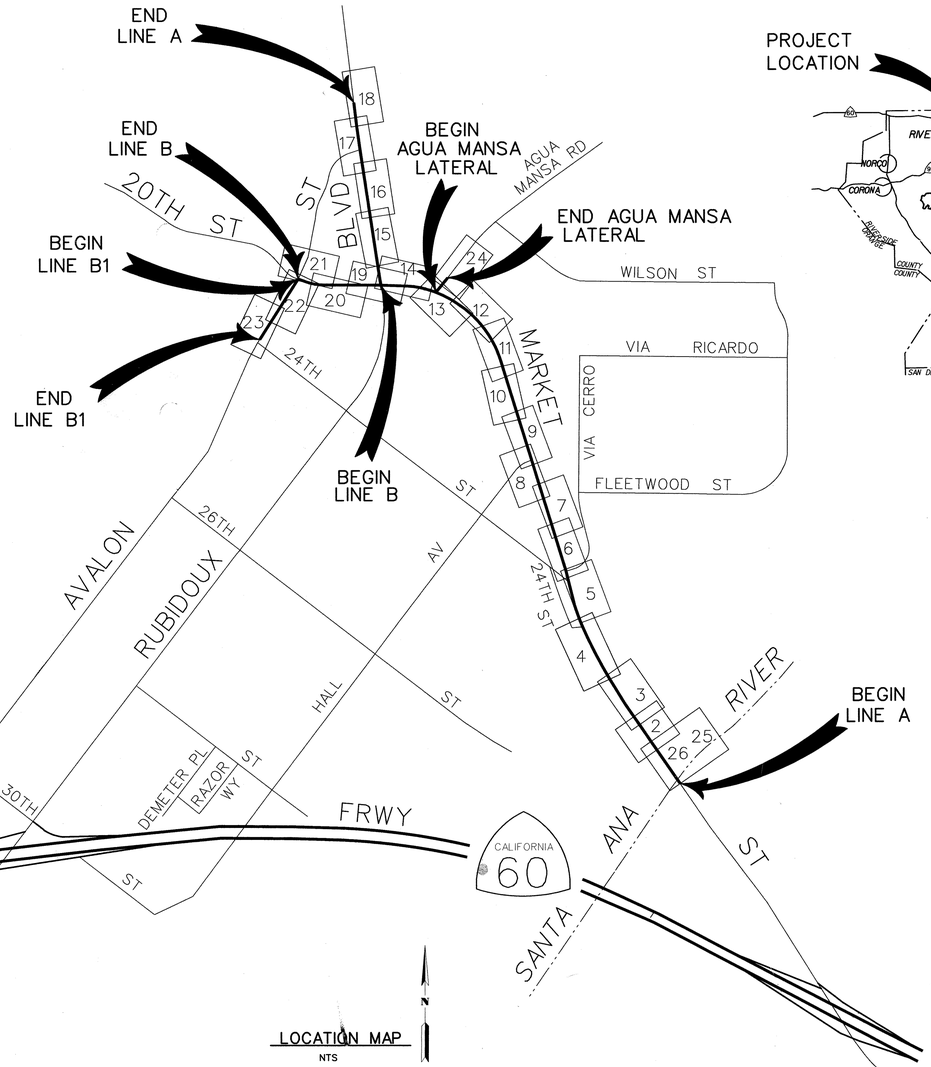
APPROVED BY: Stuart E McKibbin DATE: 5-13-2005

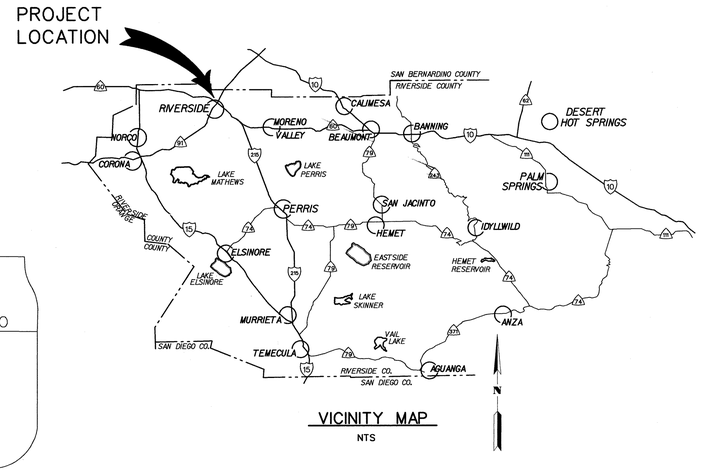
AGUA MANSA
BROWN AVENUE / WILSON STREET STORM DRAINS
STAGE 2
FROM STA. 67+45.51 TO 68+63.02

PROJECT NO. 1-0-335
DRAWING NO. 1-630
SHEET NO. 2 OF 2

H:\1330\Wr\Agua Mansa\Dgn\1330wrdrn01.dgn 11-JAN-05 [01:14:09] Saved by: Jesse Mendez [H:\1330\Wr\-Agua Mansa\Dgn\1330wrdrn01.dgn] Plotted by: Jesse Mendez [H:\1330\Wr\-Agua Mansa\Dgn\1330wrdrn01.dgn] 11-JAN-05 [01:14:09] Saved by: Jesse Mendez [H:\1330\Wr\-Agua Mansa\Dgn\1330wrdrn01.dgn] Plotted by: Jesse Mendez [H:\1330\Wr\-Agua Mansa\Dgn\1330wrdrn01.dgn]

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT





GENERAL NOTES

1. BEDDING AND PAYLINES ARE SHOWN ON RCFC STANDARD DRAWING M815 UNLESS SHOWN OTHERWISE ON THESE PLANS.
2. ALL STATIONING REFERS TO CENTERLINE OF CONSTRUCTION.
3. ALL CHANNEL/STORM DRAIN REFERENCES AND CROSS SECTIONS ARE TAKEN LOOKING DOWNSTREAM.
4. TOPOGRAPHY BY DIGITAL PHOTOGRAMMETRIC METHODS. AERIAL PHOTOGRAPHS TAKEN AT AN ALTITUDE NOT TO EXCEED A FLYING HEIGHT TO CONTOUR INTERVAL RATIO OF 1800. PHOTOGRAPHY DATED 11-30-04 UNLESS OTHERWISE NOTED.
5. THE VERTICAL DATUM IS DERIVED FROM NAVD 88. THE HORIZONTAL DATUM IS DERIVED FROM NAD 83.
6. STANDARD DRAWINGS CALLED FOR ON THE PLAN & PROFILE SHALL CONFORM TO RCFC & WCD STD DRAWINGS, UNLESS OTHERWISE NOTED.
7. ELEVATIONS AND LOCATIONS OF UTILITIES WERE OBTAINED FROM AVAILABLE INFORMATION AND ARE SHOWN APPROXIMATELY ON THESE PLANS. 48 HOURS BEFORE EXCAVATION CALL UNDERGROUND SERVICE ALERT AT 1-800-227-2600. ALL UTILITIES SHALL BE PROTECTED IN PLACE EXCEPT AS NOTED ON PLANS AND SPECIFICATIONS.
8. THE CONTRACTOR IS REQUIRED TO CONTACT ALL UTILITY AGENCIES REGARDING TEMPORARY SUPPORT AND SHORING REQUIREMENTS FOR THE VARIOUS UTILITY LINES SHOWN ON THESE PLANS.
9. ALL OPENINGS RESULTING FROM CUTTING OR PARTIAL REMOVAL OF EXIST. CULVERTS, PIPES, OR SIMILAR STRUCTURES TO BE ABANDONED, SHALL BE SEALED AT BOTH ENDS WITH 6" MIN CLASS "B" CONCRETE.
10. ALL PAVEMENT DELINEATION, CURBS, SIDEWALKS AND OTHER IMPROVEMENTS ARE TO BE RECONSTRUCTED IN KIND AT THE SAME LOCATIONS AND ELEVATIONS AS THE EXISTING IMPROVEMENTS, UNLESS OTHERWISE NOTED.
11. ◔ INDICATES APPROX. SOIL BORING LOCATION PER SOILS REPORT DATED 3/16/06.
12. FOR COMPLETE RIGHT-OF-WAY REFER TO RECORDED PARCEL NO. 1148-1A, 1B AND TEMPORARY EASEMENT REFER TO THE RIGHT OF ENTRY AND TEMPORARY CONSTRUCTION EASEMENT AGREEMENT, RCFC PARCEL NO. 1148-1AT, 1BT, T.

INDEX

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R.C.F.C. & W.C.D. STANDARD DRAWINGS

CB 109	SPECIAL CONNECTIONS TO CATCH BASIN
CB 110	CONCRETE DROP INLET
JS 226	JUNCTION STRUCTURE NO. 1
JS 227	JUNCTION STRUCTURE NO. 2
JS 228	JUNCTION STRUCTURE NO. 3
JS 229	JUNCTION STRUCTURE NO. 4
MH 252	MANHOLE NO. 2
MH 253	MANHOLE NO. 3
MH 254	MANHOLE NO. 4
MH 259	STANDARD DROP STEP
TS 301	TRANSITION STRUCTURE NO. 1
TS 303	TRANSITION STRUCTURE NO. 3
CH 326	TRAPEZOIDAL CHANNEL STRUCTURAL DETAILS (WEEPHOLES)
CH 327	RECTANGULAR CHANNEL STRUCTURAL DETAILS (WEEPHOLES)
M 801	DOUBLE DRIVE GATE
M 803	CONCRETE COLLAR
M 815	BEDDING AND PAY LINES
M 816	CONCRETE BULKHEAD
M 820	PIPE SWING GATE
M 826	CABLE FENCE

CALTRANS STANDARDS

D80	CAST IN PLACE REINFORCED CONCRETE SINGLE BOX CULVERT
A73-A	OBJECT MARKERS TYPE L-1
D84	BOX CULVERT WINGWALLS TYPE A
B11-47	CABLE RAILING
ES-5A	ELECTRICAL SYSTEMS AND (DETECTORS)
A77-A1	METAL BEAM GUARD RAILING STD RAILING SECTION (WOOD POST WITH WOOD BLOCKS)
A77-B1	METAL BEAM GUARD RAILING STANDARD HARDWARE
A77-C1	METAL BEAM GUARD RAILING WOOD BLOCK AND WOOD POST DETAILS
A77-E1	METAL BEAM GUARD RAILING TYPICAL LAYOUTS FOR EMBANKMENTS
A77-L1	METAL BEAM TERMINAL SYSTEM
A77-(C3 C4, H1)	OTHER METAL BEAM GUARD RAILING DETAILS

COUNTY STANDARDS

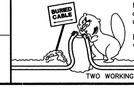
NO. 202	TYPE C CURB
NO. 211	CURB TRANSITION
NO. 212	ASPHALT CONCRETE DIKES
NO. 300	CURB INLET CATCH BASIN
NO. 302	COMBINATION INLET CATCH BASIN NO. 2
NO. 304	CURB SUPPORT DETAIL
NO. 305	GRATE AND FRAME DETAIL
NO. 311	GUTTER DEPRESSION FOR CURB OPENING CATCH BASIN
NO. 312	GUTTER DEPRESSION FOR CURB OPENING CATCH BASIN
NO. 608	MANHOLE FRAME AND COVER

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER WARREN D. WILLIAMS No. 32336 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2014

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY: Tatiana Romo
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/14/09

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.


TWO WORKING DAYS BEFORE YOU DIG

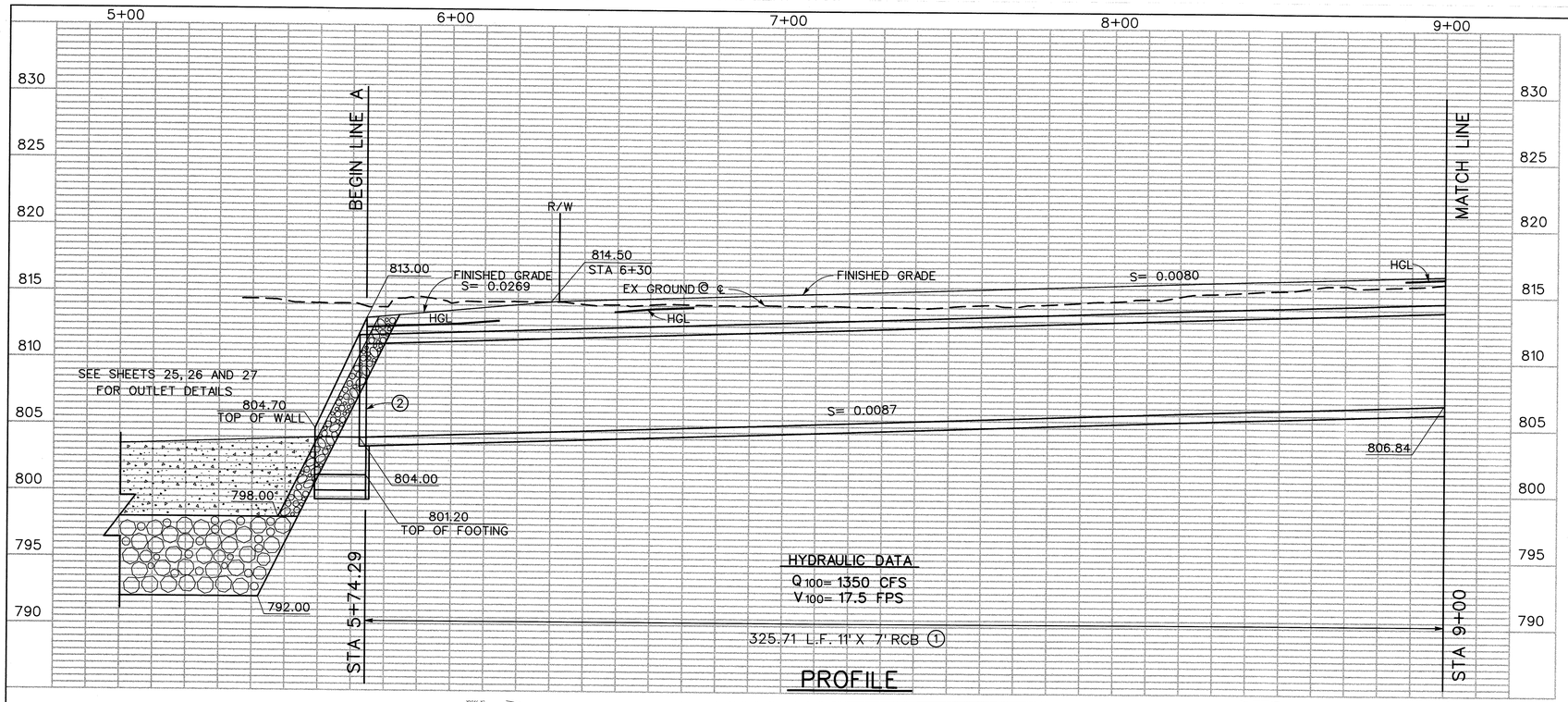
BENCH MARK
B.M. NO. Z 10761
NAIL WITH RCFC&WCD TAG FLUSH
N 2312688.57
E 6218650.51
ELEV = 828.35

REF.	REVISIONS	APPR.	DATE
4	DELETED SHEETS 61 THROUGH 78 (TRAFFIC CONTROL PLANS)	DG	8/26/11

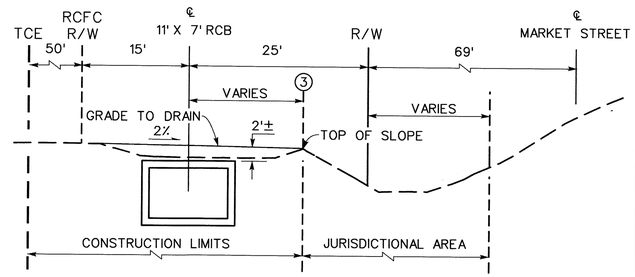
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: DATE: 22-APR-09 R.E. No. 44684
APPROVED BY: DATE: 5/18/09 R.E. NO. 32336

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 LINE A, B & B-1
TITLE SHEET

PROJECT NO. 1-0-0148 1-0-0156 1-0-0157
DRAWING NO. 1-637
SHEET NO. 1 OF 78

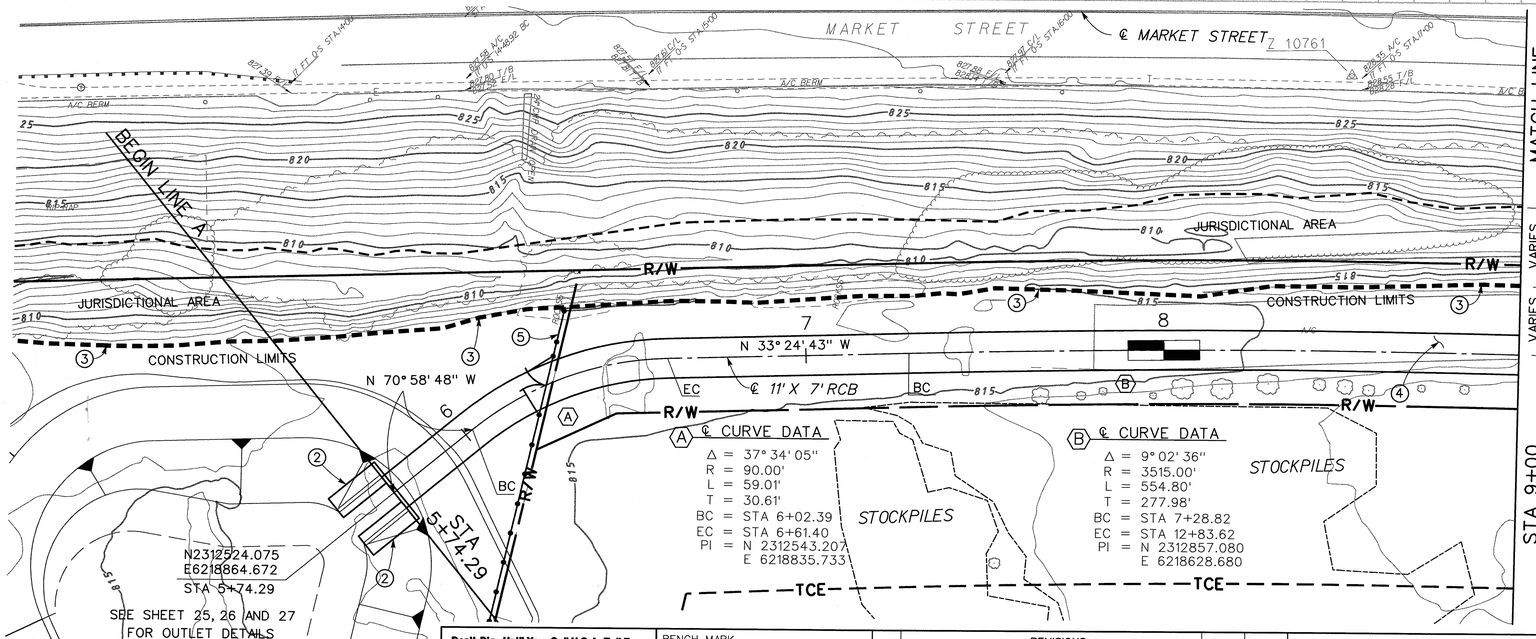


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 8+00

10' 0 10'



PLAN

20' 0 20'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER.
2. CONSTRUCT BOX CULVERT WINGWALLS TYPE "A" PER CALTRANS STD D84, H= 11', L= M= 15.4', ELEV "a"= 804.7, ANGLE OF FLARE= 0°.
3. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
4. WITHIN TRENCH EXCAVATION LIMITS, REMOVE AND DISPOSE BURIED AC OFFSITE.
5. FOR FENCE INSTALLATION SEE SHEET 27.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10761

SEE SHEET 1

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

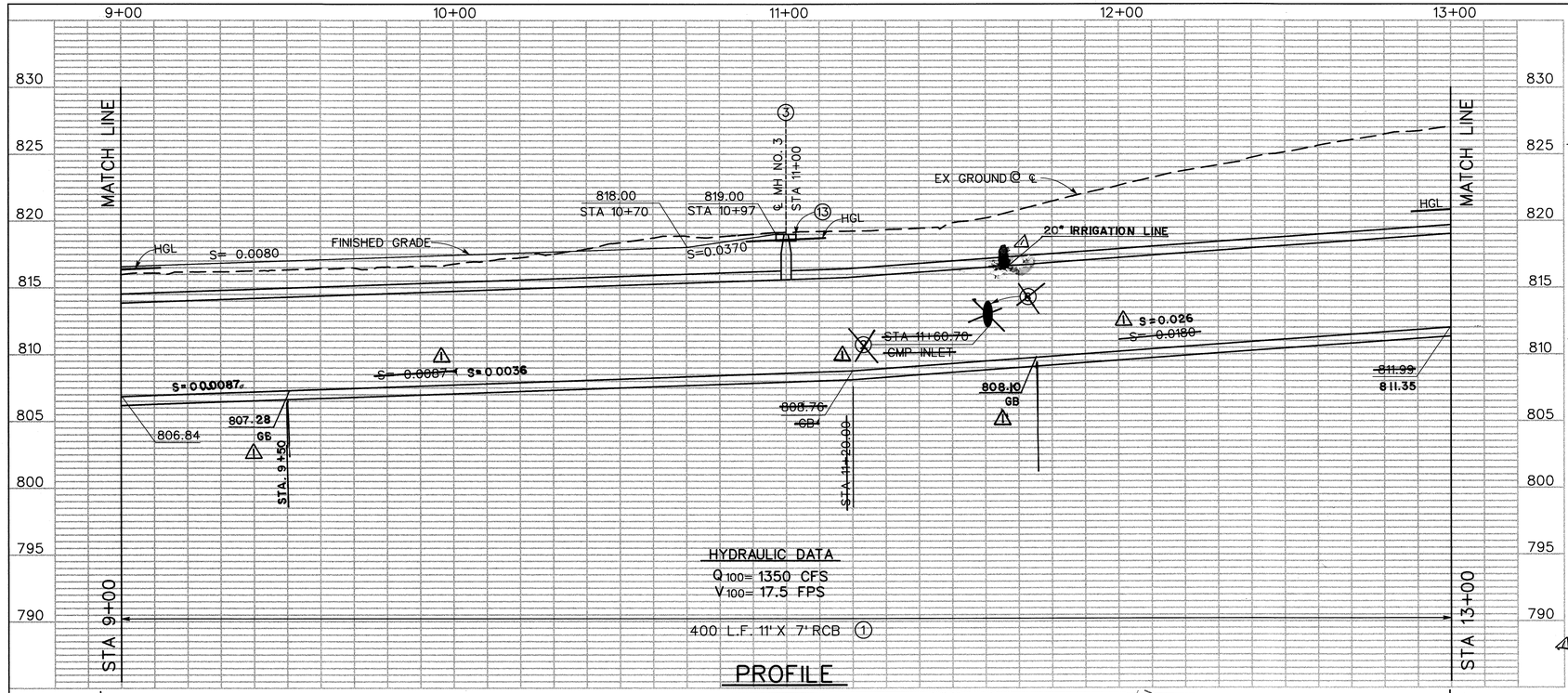
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

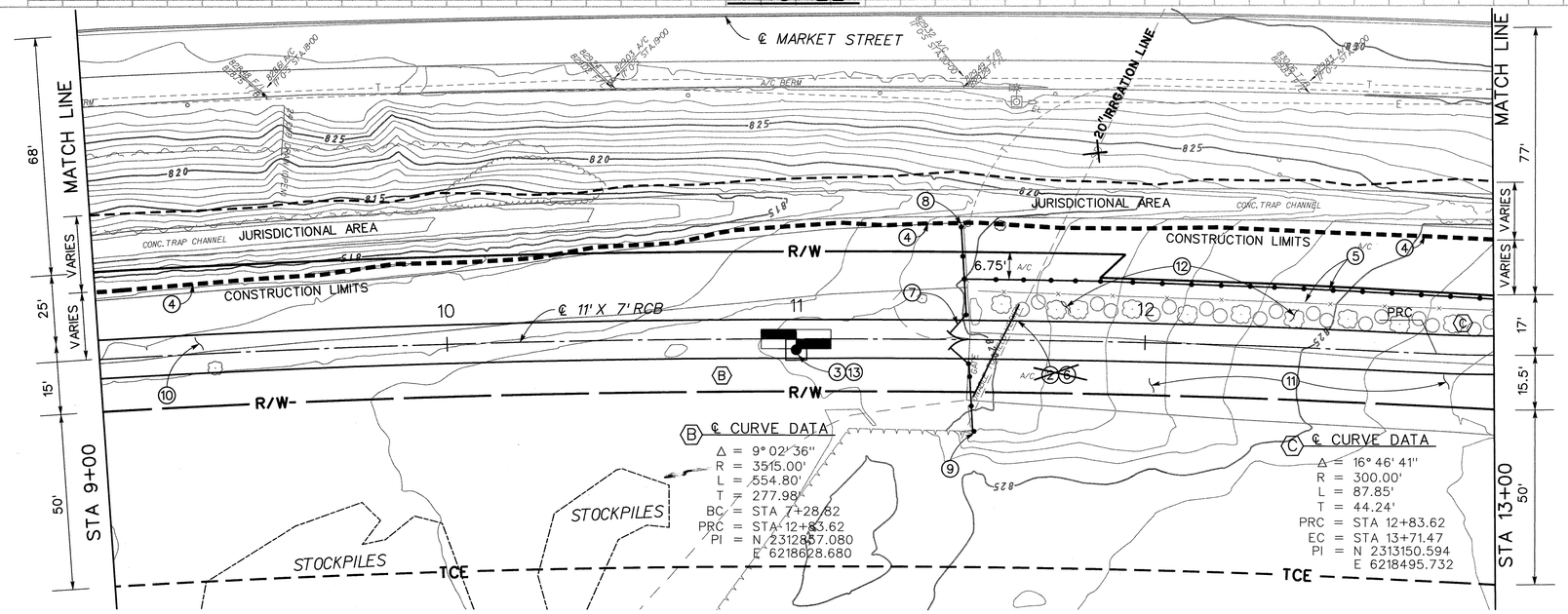
APPROVED BY:
DATE: 22 APR 09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 5+74.29 TO STA 9+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 2 OF 78



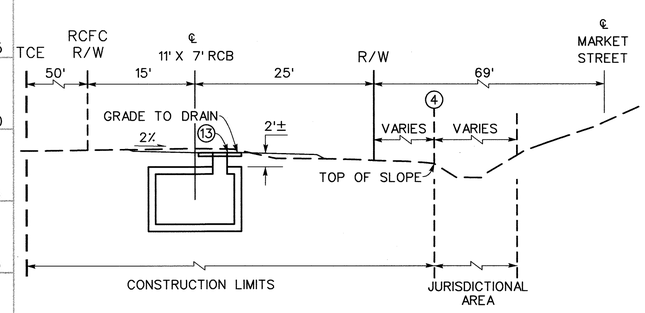
PROFILE



PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 11+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER.
2. ~~REMOVE INTERFERING PORTION OF EXISTING STORM DRAIN AND CONSTRUCT JS NO. 3 PER STD JS22B.~~
3. CONSTRUCT MH NO. 3 PER STD MH253.
4. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
5. REMOVE AND REPLACE EXISTING PILASTER AND WROUGHT IRON FENCE WITH CHAINLINK AT PROPERTY LINE AND AS SHOWN.
6. ~~CONTRACTOR TO POTHOLE CMP AT BEGINNING OF JOB.~~
7. INSTALL DOUBLE DRIVE GATE PER STD M801.
8. PLACE FENCE SOUTH OF EXISTING TELEPHONE POLE.
9. PLACE FENCE AT THE END OF THE EXISTING RETAINING WALL.
10. REMOVE AND DISPOSE OF OFFSITE BURIED AC WITHIN TRENCH EXCAVATION LIMITS.
11. REMOVE AND REPLACE EXISTING AC PAVING.
12. REMOVE AND DISPOSE TREE STUMPS AND BOULDERS ALONG EXISTING FENCE.
13. CONSTRUCT 6' X 6' X 6" CONCRETE PAD PER DETAIL ON SHEET 34.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2014

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z10764

SEE SHEET 4

REF.	REVISIONS	APPR.	DATE
1	SLOPE CHANGE	DK	8/24/11
2	ELIMINATE CMP INLET, PROTECT 20" IRRIGATION LINE IN PLACE	DK	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

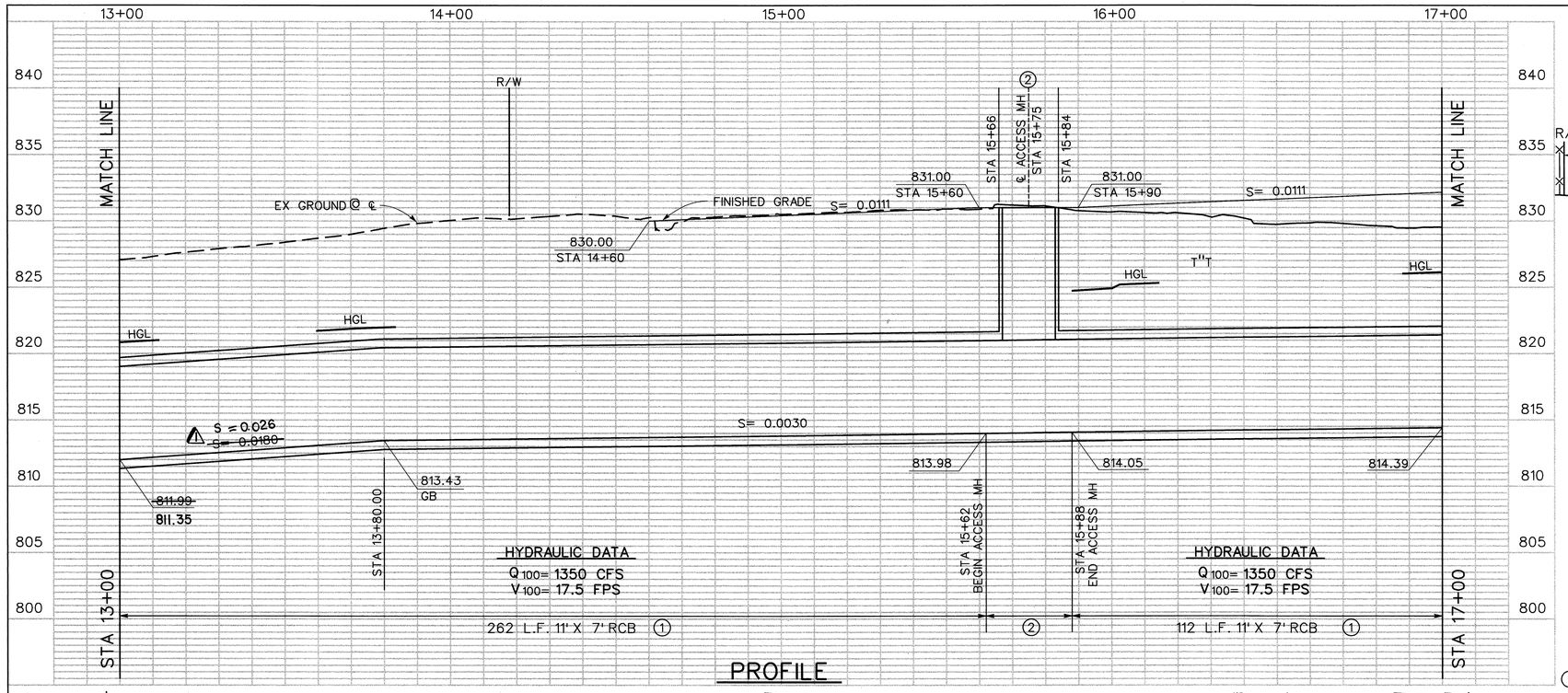
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

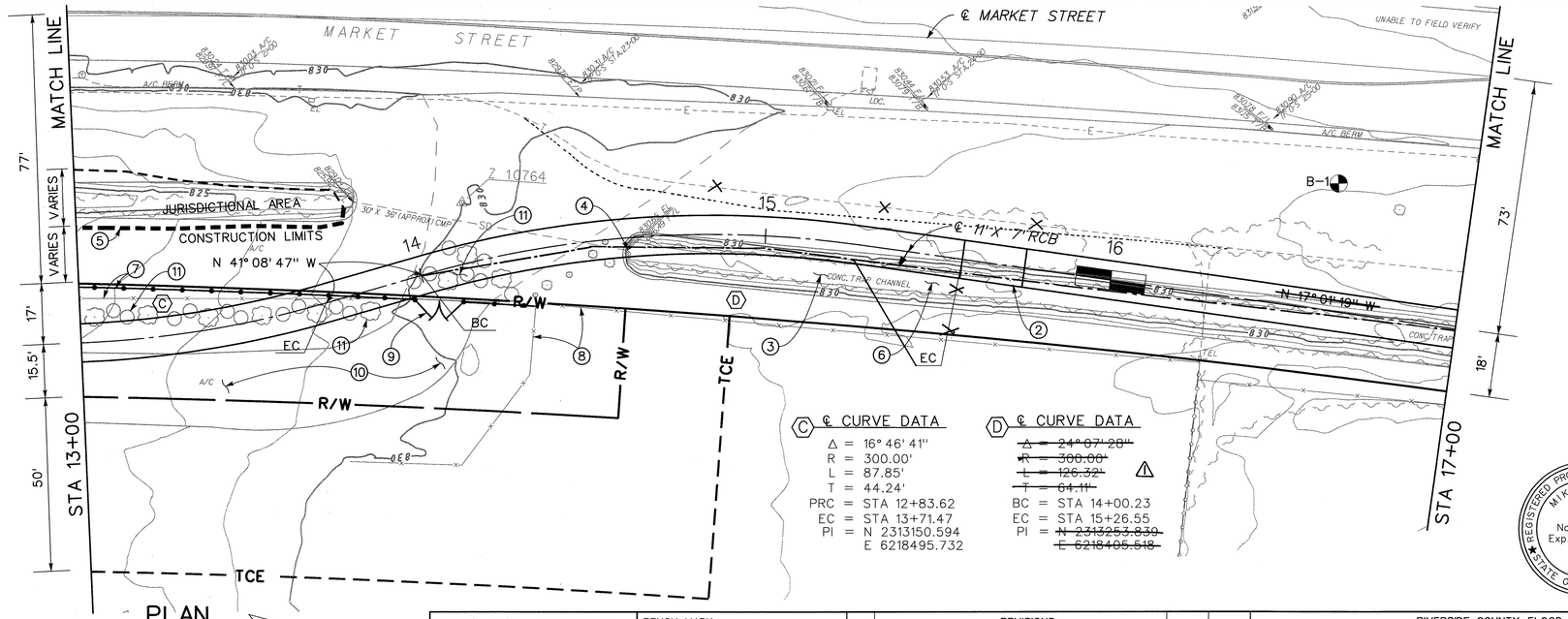
APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 9+00 TO STA 13+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 3 OF 78

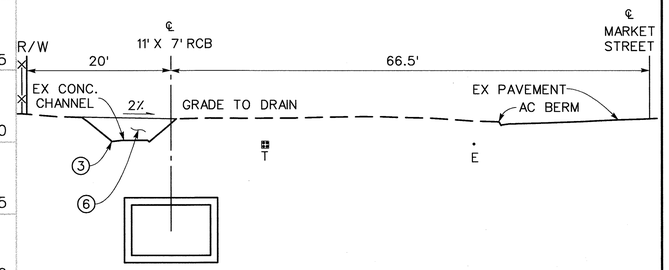


PROFILE



PLAN

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 16+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER.
2. CONSTRUCT ACCESS MANHOLE PER STRUCTURAL DETAILS ON SHEET 32. TOP OF ACCESS MANHOLE ELEV= 831.00.
3. REMOVE AND DISPOSE OF EXISTING CONCRETE TRAP CHANNEL.
4. REMOVE AND PLUG INTERFERING PORTIONS OF CMP PIPE.
5. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
6. FILL, COMPACT AND GRADE TO MEET SURROUNDING GROUND.
7. REMOVE EXISTING PILASTER AND WROUGHT IRON FENCE AND REPLACE WITH CHAINLINK AT PROPERTY LINE.
8. PROTECT EXISTING FENCE IN PLACE.
9. INSTALL DOUBLE DRIVE GATE PER STD M801.
10. REMOVE AND REPLACE EXISTING AC PAVING AS DIRECTED BY ENGINEER.
11. REMOVE AND DISPOSE TREE STUMPS AND BOULDERS ALONG EXISTING FENCE.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10764
NAIL WITH RCFC&WCD TAG FLUSH
N 2313207.10
E 6218423.98
ELEV = 830.00

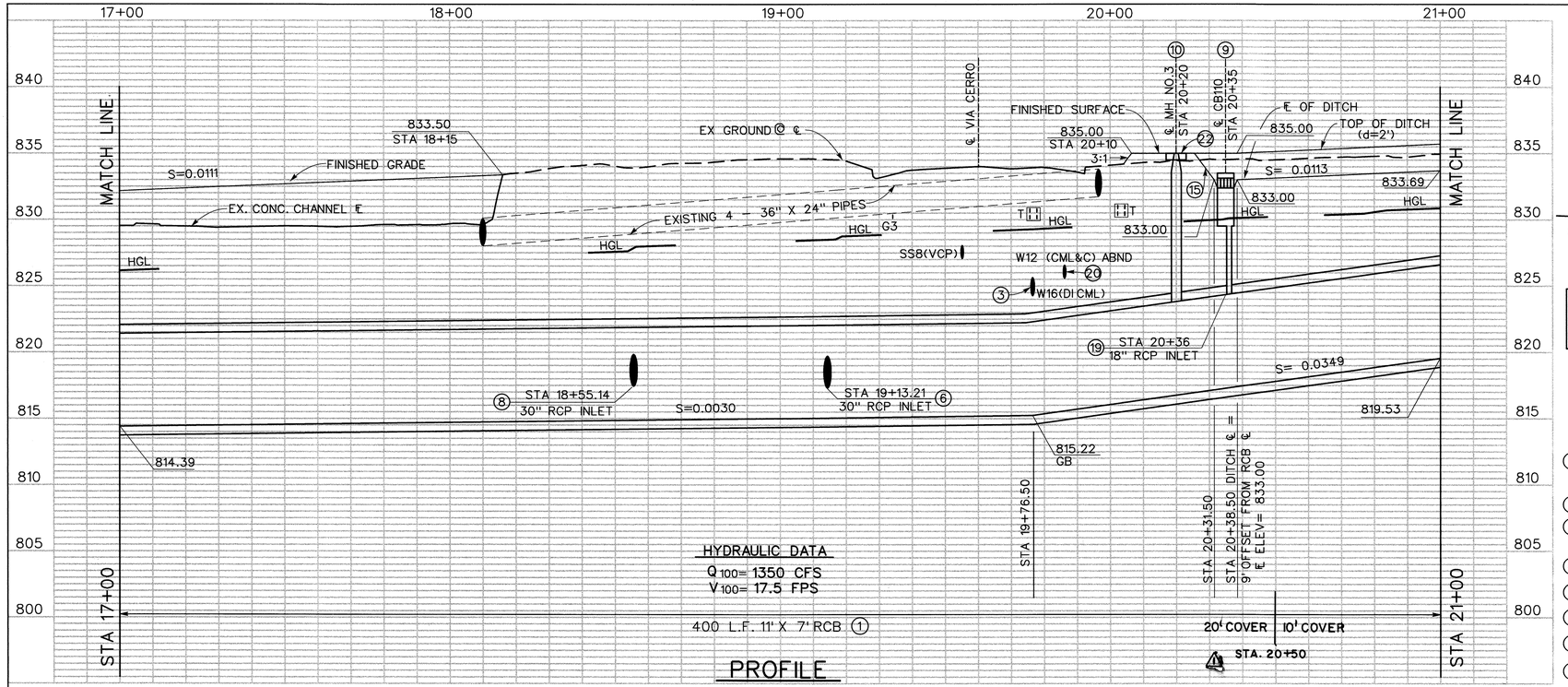
REF.	REVISIONS	APPR.	DATE
1	SLOPE CHANGE CURVE DATA CHANGE	DLB	8/26/11

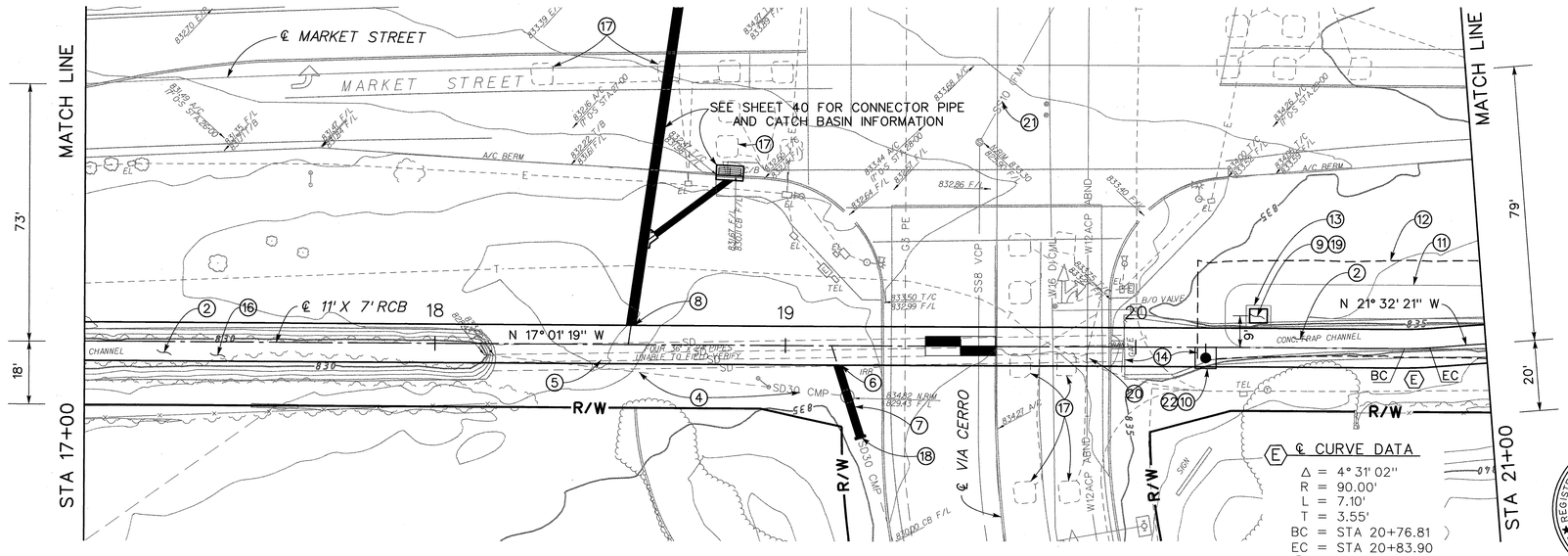
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355
APPROVED BY: DATE: 22-APR-09 R.E. No. 44684

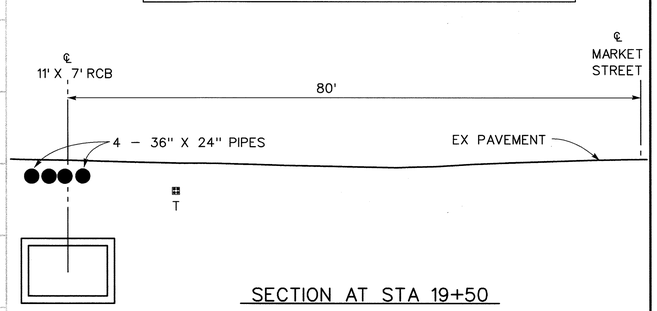
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 13+00 TO STA 17+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 4 OF 78





NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 19+50

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER FROM STA 17+00 TO STA 20+50. USE 10' COVER FROM STA 20+50 TO STA 21+00.
2. REMOVE AND DISPOSE OF EXISTING CONCRETE TRAP CHANNEL.
3. CONTRACTOR TO POTHOLE WATERLINE AT BEGINNING OF JOB. CONTRACTOR TO PROTECT WATERLINE IN PLACE DURING CONSTRUCTION.
4. CUT AND PLUG EXISTING 30" CMP AND REMOVE CMP RISER.
5. REMOVE AND DISPOSE OF EXISTING 4– 36" X 24" STORM DRAIN PIPES.
6. CONSTRUCT JS NO. 3 PER STD JS228. A= 72.1°, D= 30", ELEV S= 817.25.
7. CONSTRUCT ~~24~~ 28 LF – 30" RCP 2000D. SEE PROFILE ON SHEET 41.
8. CONSTRUCT JS NO. 3 PER STD JS228. A= 81.8°, D= 30", S= 817.35.
9. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND WEST SIDES, V= 4', W= 4' FOR EAST AND WEST SIDES, 8.5LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 41.
10. CONSTRUCT MH NO. 3 PER STD MH253.
11. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
12. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
13. GRADE TO DRAIN AND CONSTRUCT 1' WIDE, 3" THICK AC APRON AS DIRECTED BY ENGINEER.
14. REMOVE EXISTING CONCRETE DITCH AND FILL TO ELEVATION 835.00.
15. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
16. FILL, COMPACT AND GRADE TO MEET SURROUNDING GROUND.
17. REMOVE AND REPLACE TRAFFIC LOOPS.
18. CONSTRUCT CONCRETE COLLAR PER STD M803.
19. CONSTRUCT JS NO. 3 CASE 3 PER STD JS228. A= 90°, D= 18".
20. CUT, PLUG AND REMOVE INTERFERING PORTION OF ABANDONED 12" CML&C WATERLINE.
21. NOTE EXISTING 10" SEWER IS A FORCE MAIN.
22. CONSTRUCT 6' X 6' X 6" CONCRETE PAD PER DETAIL ON SHEET 34.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12–31–10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3–31–10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 5/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10764

SEE SHEET 4

REVISIONS			
⚠ CHANGE LENGTH		DK	5/26/11
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

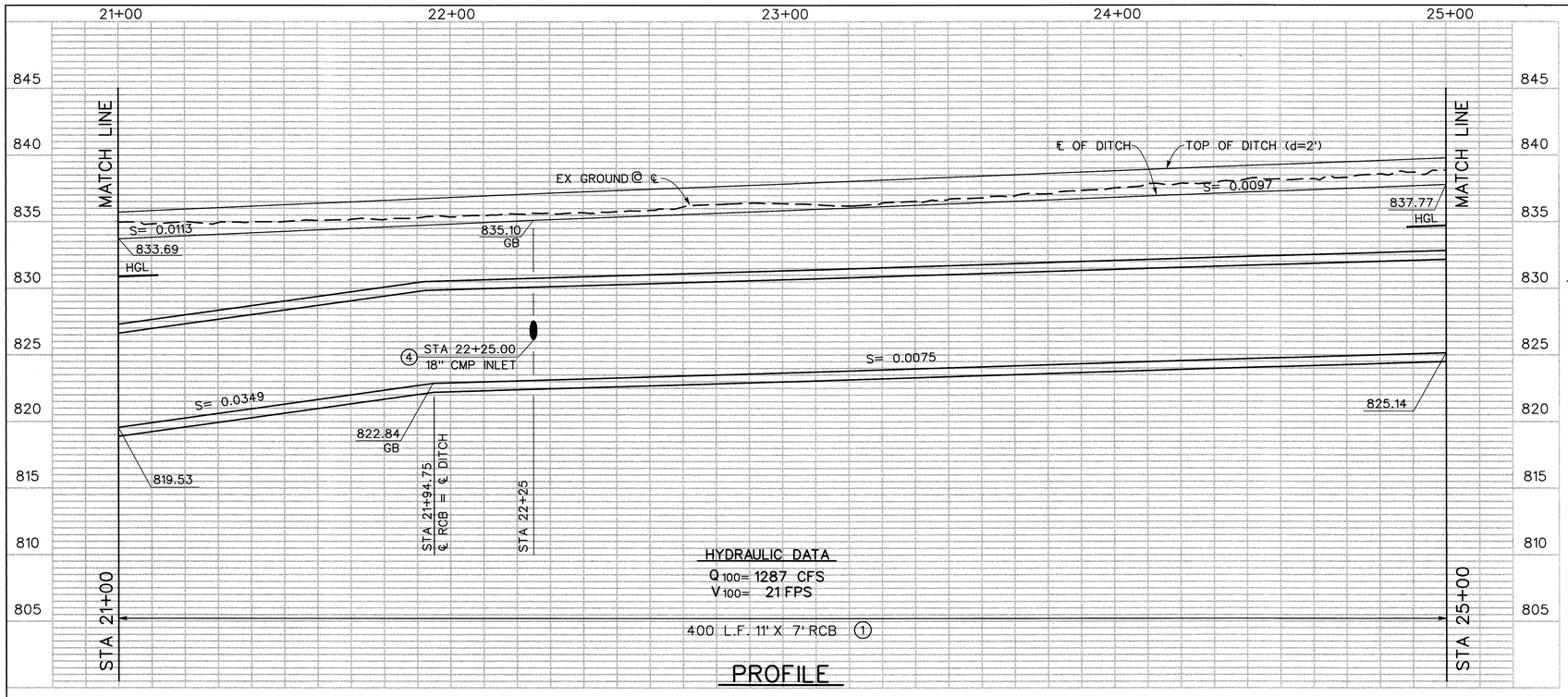
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

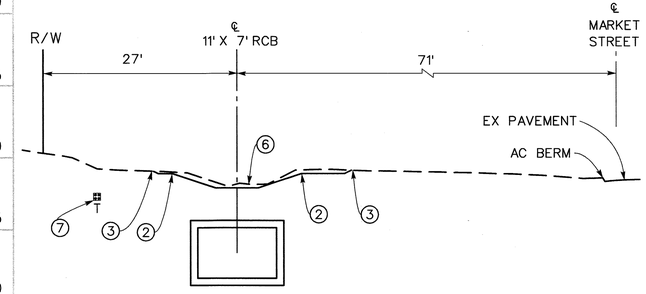
APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 17+00 TO STA 21+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 5 OF 78



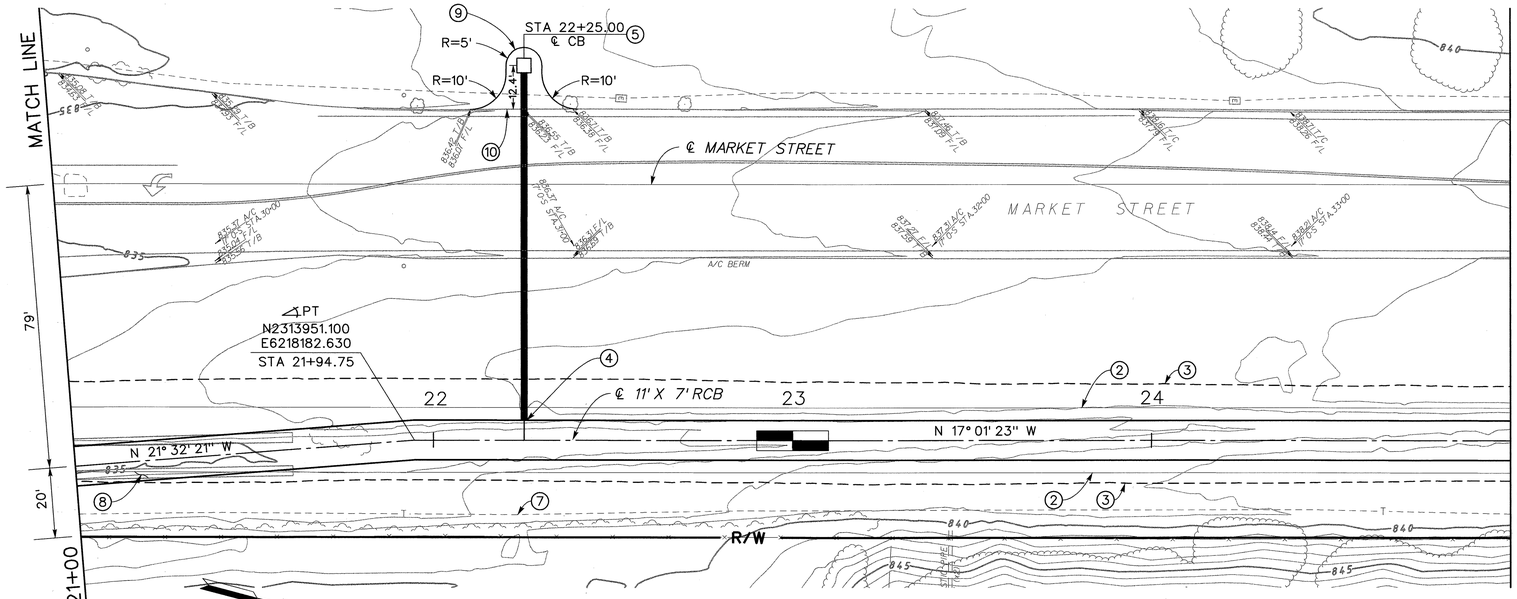
PROFILE



SECTION AT STA 23+00

10' 0 10'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



PLAN

20' 0 20'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
3. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
4. CONSTRUCT JS NO. 3 PER STD JS228. A= 90°, D= 18", ELEV S= 826.10.
5. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND SOUTH SIDES, V= 5', 97LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 43.
6. EXISTING GROUND APPROXIMATE, MINOR GRADING HAS OCCURRED SINCE MAPPING DATE.
7. MULTIPLE FACILITIES MAY BE PRESENT.
8. REMOVE AND DISPOSE OF EXISTING CONCRETE TRAP CHANNEL.
9. CONSTRUCT 6" AC DIKE PER COUNTY STD 212.
10. REMOVE EXISTING AC BERM.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12–31–10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3–31–10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1–800–227–2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10762

SEE SHEET 7

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

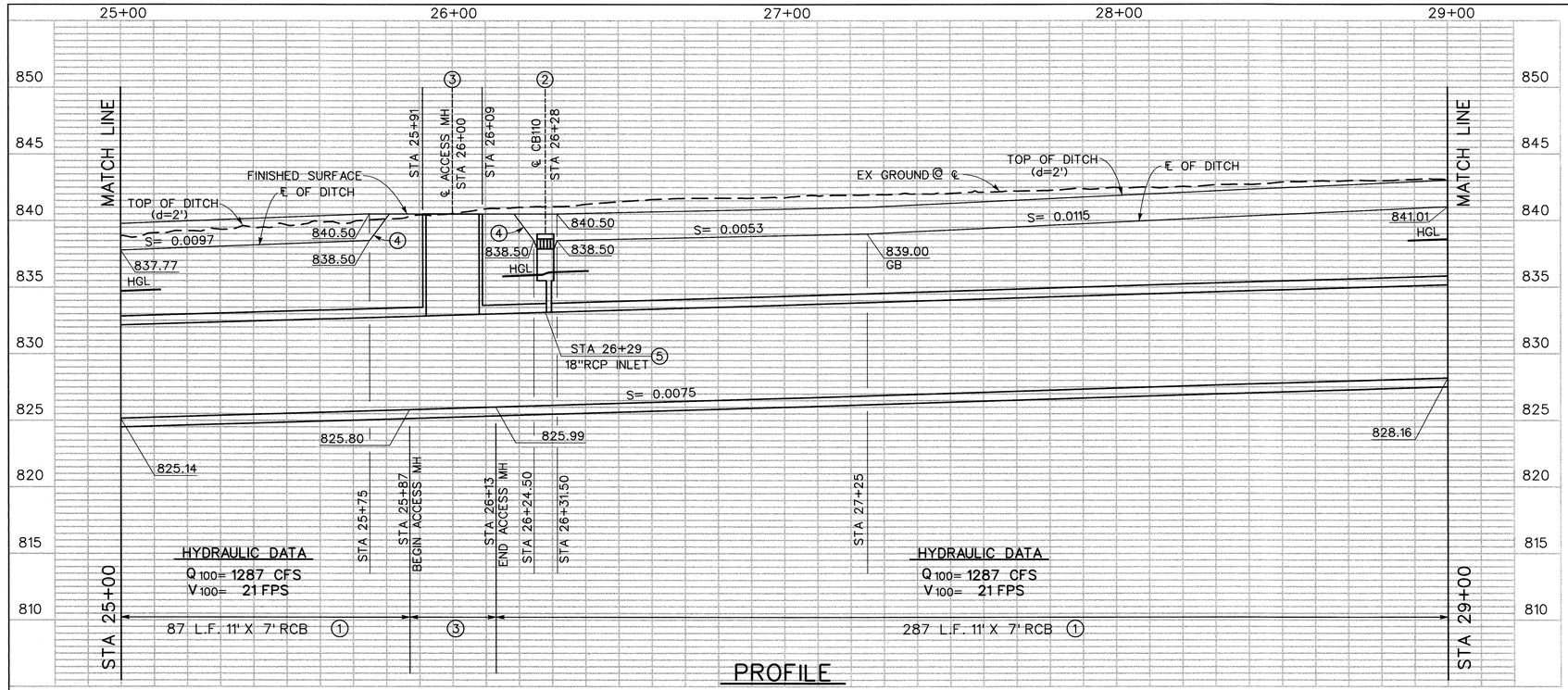
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

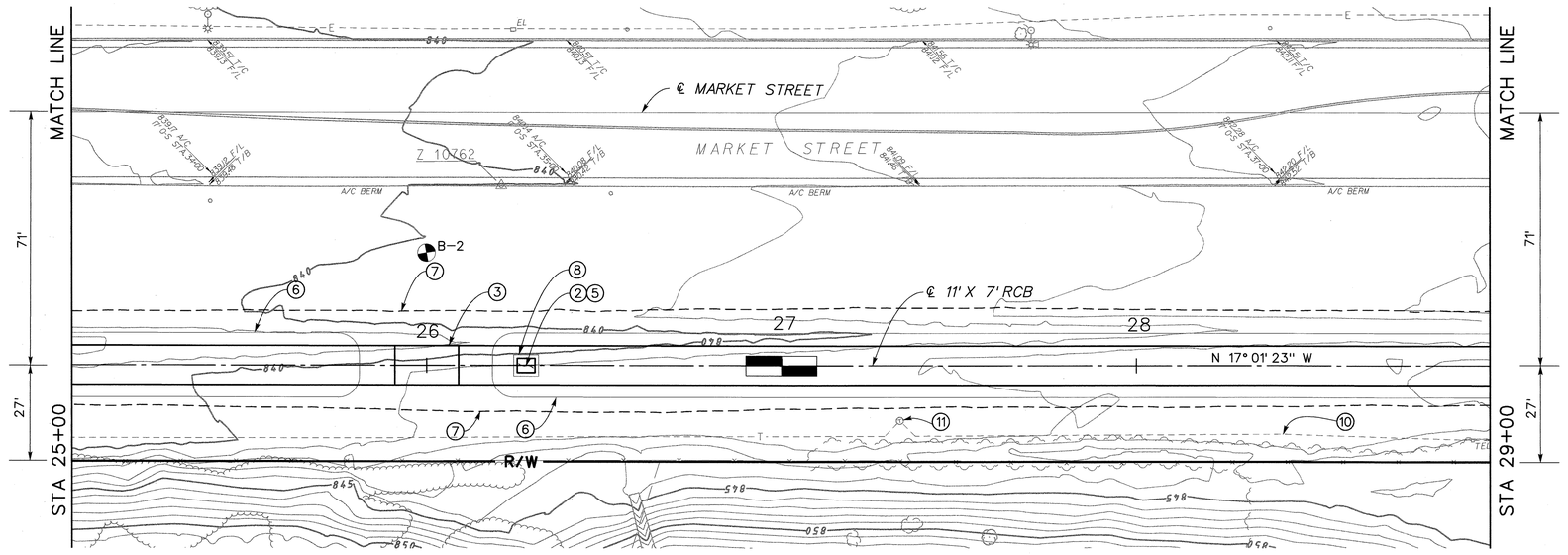
APPROVED BY: Robert Cullen
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 21+00 TO STA 25+00

PROJECT NO. 1–0–0148
DRAWING NO. 1–637
SHEET NO. 6 OF 78



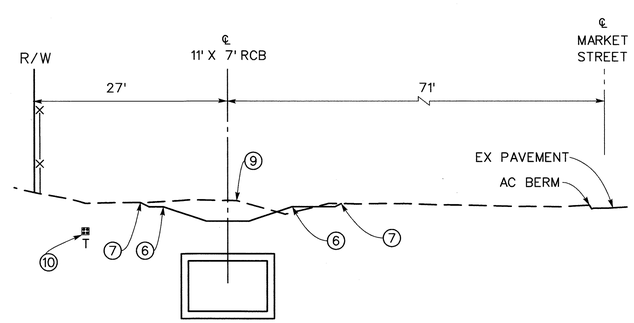
PROFILE



PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 27+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND WEST SIDES, V= 3.5', W= 4' FOR EAST AND WEST SIDES, 2LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 41.
3. CONSTRUCT ACCESS MANHOLE PER STRUCTURAL DETAILS ON SHEETS 32. TOP OF ACCESS MANHOLE ELEV= 840.50.
4. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
5. CONSTRUCT JS NO. 3 CASE 3 PER STD JS228 A= 90°, D= 18".
6. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
7. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
8. GRADE TO DRAIN AND CONSTRUCT 1' WIDE, 3" THICK AC APRON AS DIRECTED BY ENGINEER.
9. EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.
10. MULTIPLE FACILITIES MAY BE PRESENT.
11. PROTECT IN PLACE, TELEPHONE BOX NEAR PROPOSED DITCH LIMITS.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 5/24/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10762
NAIL WITH RCFC&WCD TAG FLUSH
N 2314343.96
E 6218009.61
ELEV = 840.27

REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

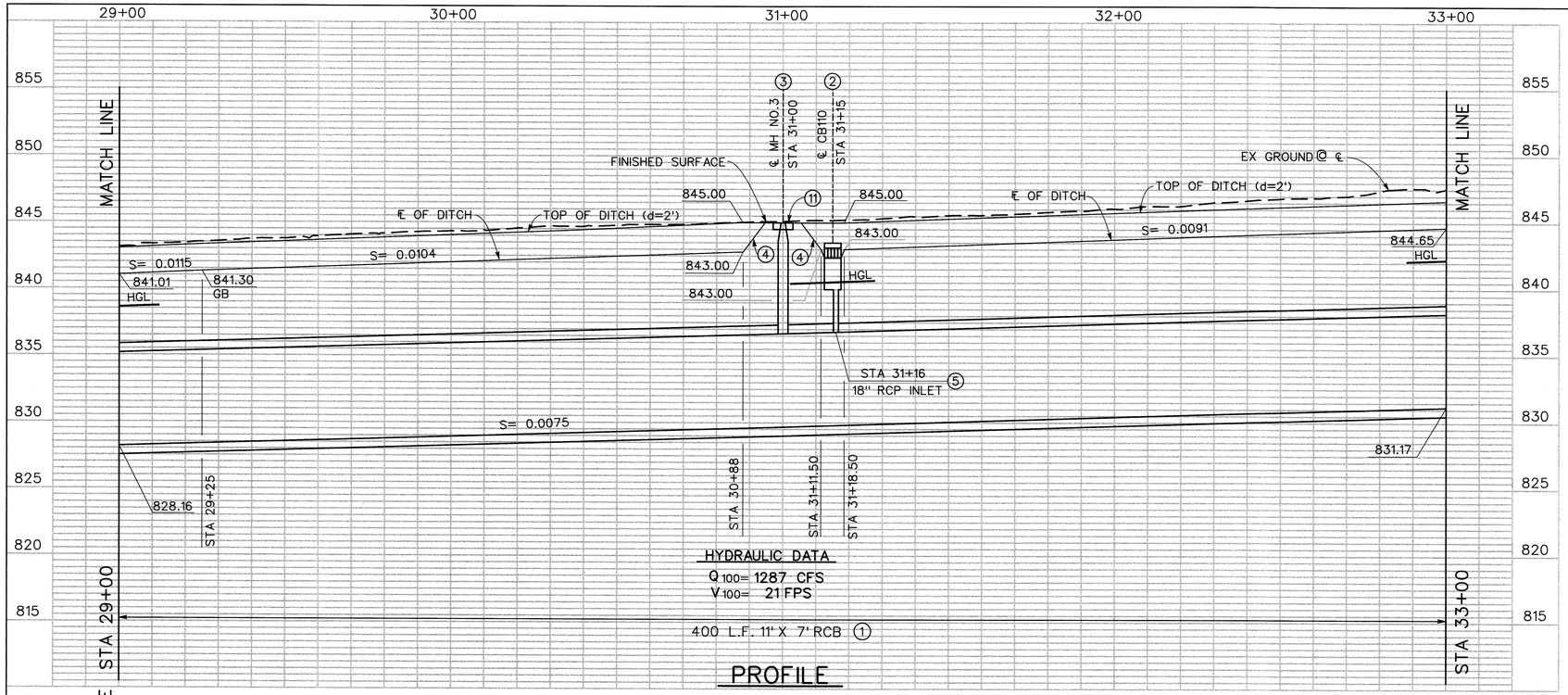
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

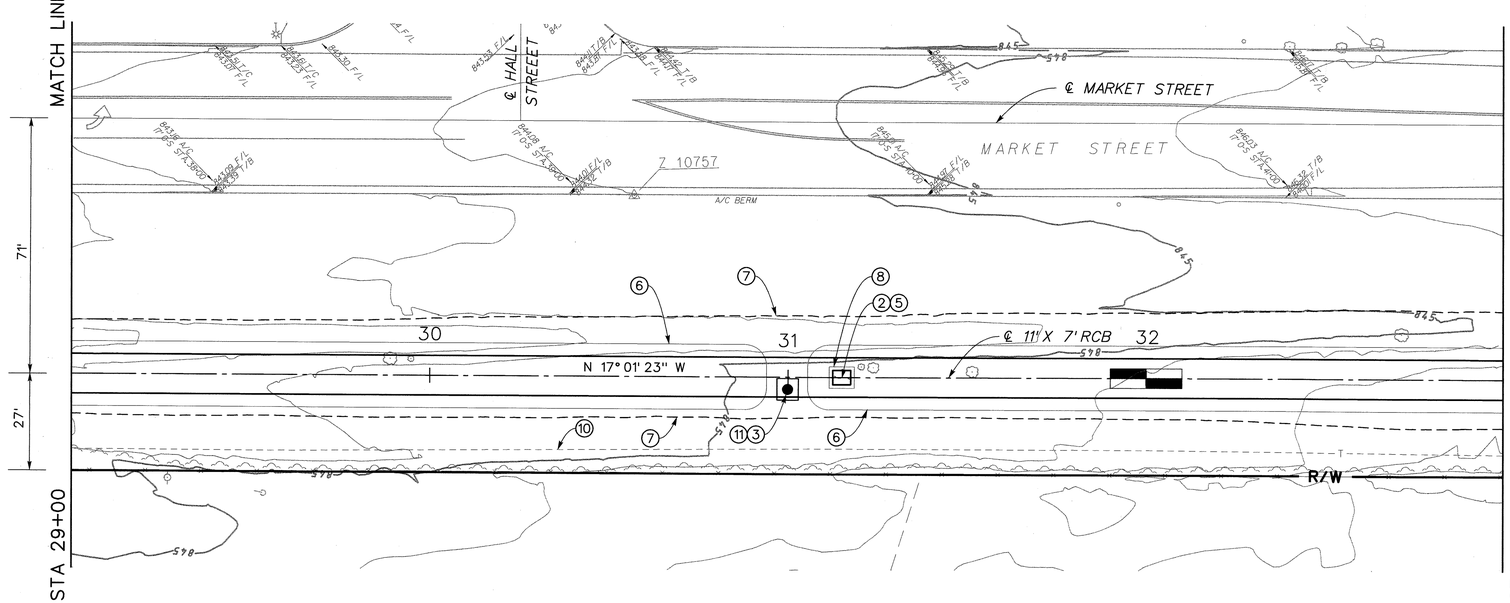
APPROVED BY:
DATE: 22-MAY-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 25+00 TO STA 29+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 7 OF 78



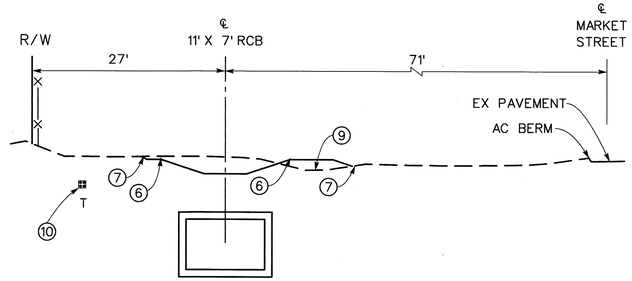
PROFILE



PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 32+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND WEST SIDES, V= 3.5', W= 4' FOR EAST AND WEST SIDES, 3LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 41.
3. CONSTRUCT MH NO.3 PER STD MH253.
4. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
5. CONSTRUCT JS NO. 3 CASE 3 PER STD JS228, A= 90°, D= 18".
6. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
7. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
8. GRADE TO DRAIN AND CONSTRUCT 1' WIDE, 3" THICK AC APRON AS DIRECTED BY ENGINEER.
9. EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.
10. MULTIPLE FACILITIES MAY BE PRESENT.
11. CONSTRUCT 6' X 6' X 6" CONCRETE PAD PER DETAIL ON SHEET 34.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12–31–10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3–31–10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1–800–227–2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10757
NAIL WITH RCFC&WCD TAG FLUSH
N 2314760.75
E 6217882.12
ELEV = 844.46

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

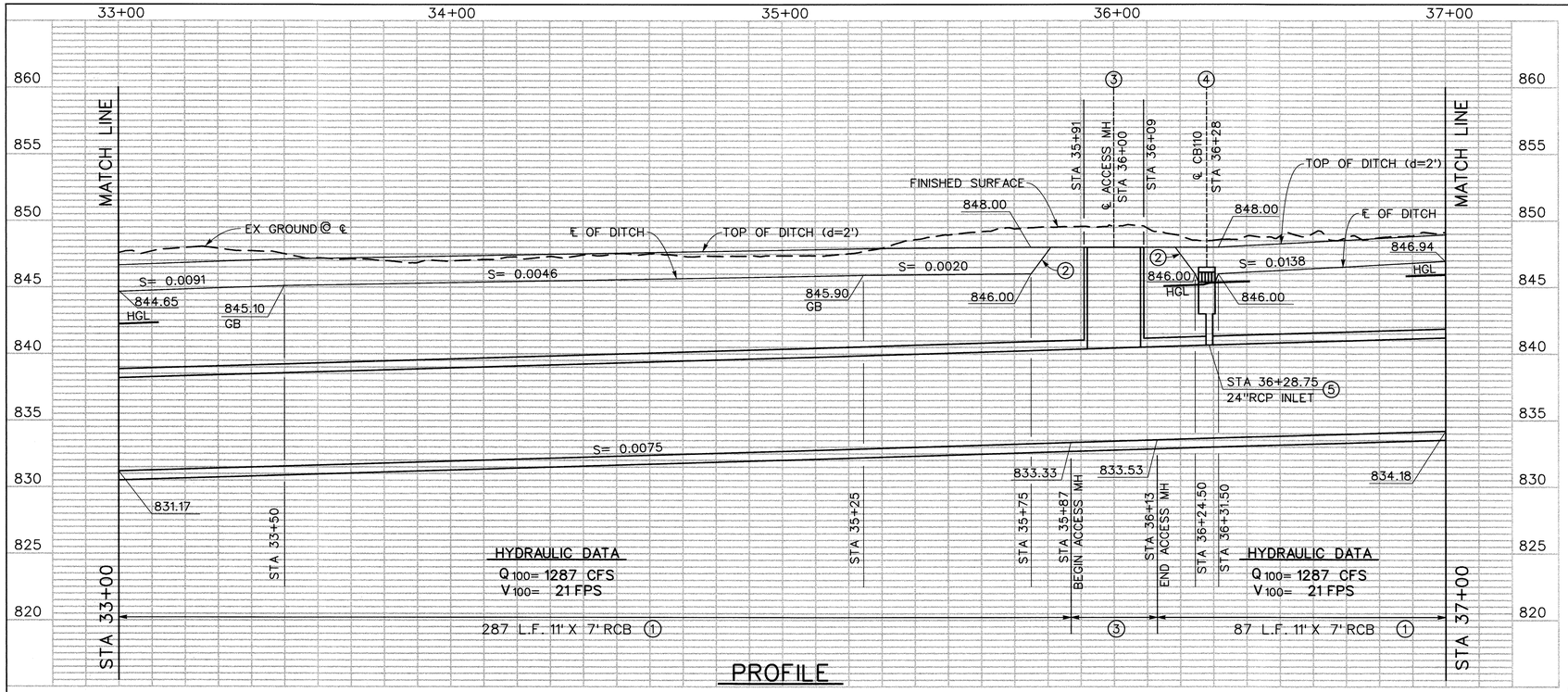
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

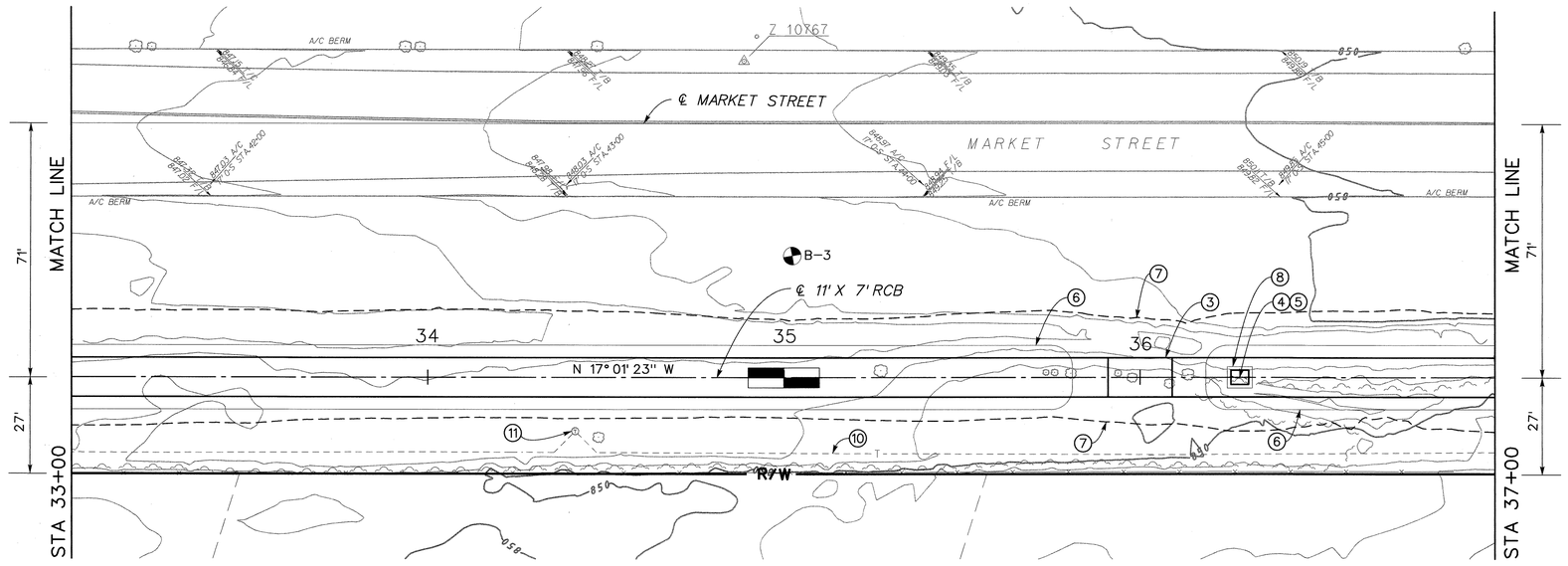
APPROVED BY: Robert Cullen
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 29+00 TO STA 33+00

PROJECT NO. 1–0–0148
DRAWING NO. 1–637
SHEET NO. 8 OF 78



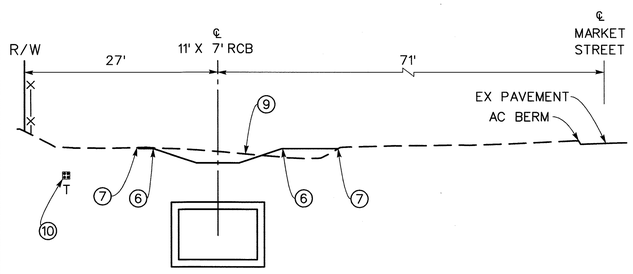
PROFILE



PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 35+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
3. CONSTRUCT ACCESS MANHOLE PER STRUCTURAL DETAILS ON SHEET 32. TOP OF ACCESS MANHOLE ELEV= 848.00.
4. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND WEST SIDES, V= 3.5', W= 4' FOR EAST AND WEST SIDES, 2LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 42.
5. CONSTRUCT JS NO. 3 CASE 3 PER STD JS228 A= 90°, D= 24".
6. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
7. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
8. GRADE TO DRAIN AND CONSTRUCT 1' WIDE, 3" THICK AC APRON AS DIRECTED BY ENGINEER.
9. EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.
10. MULTIPLE FACILITIES MAY BE PRESENT.
11. PROTECT IN PLACE, TELEPHONE BOX NEAR PROPOSED DITCH LIMITS.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/24/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10767
NAIL WITH RCFC&WCD TAG FLUSH
N 2315162.61
E 6217719.15
ELEV = 848.46

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

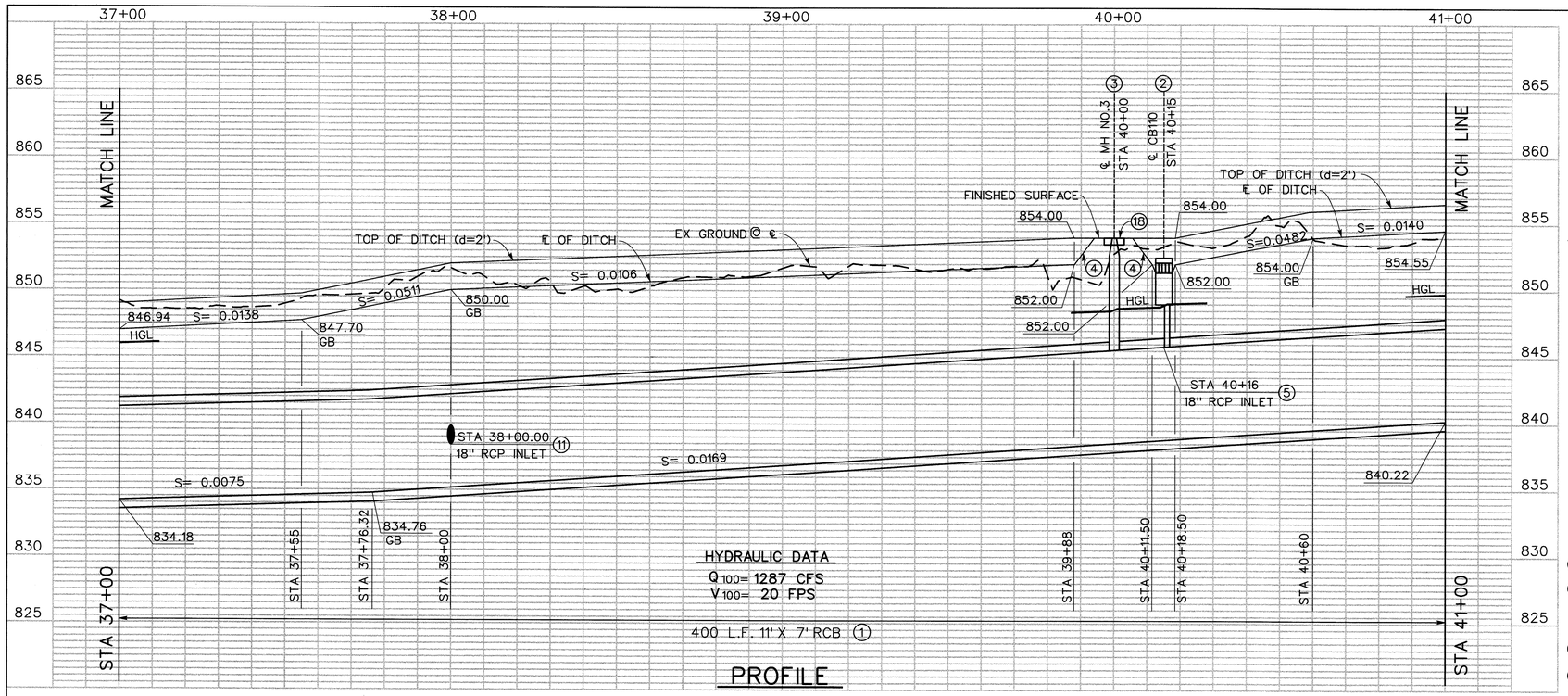
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

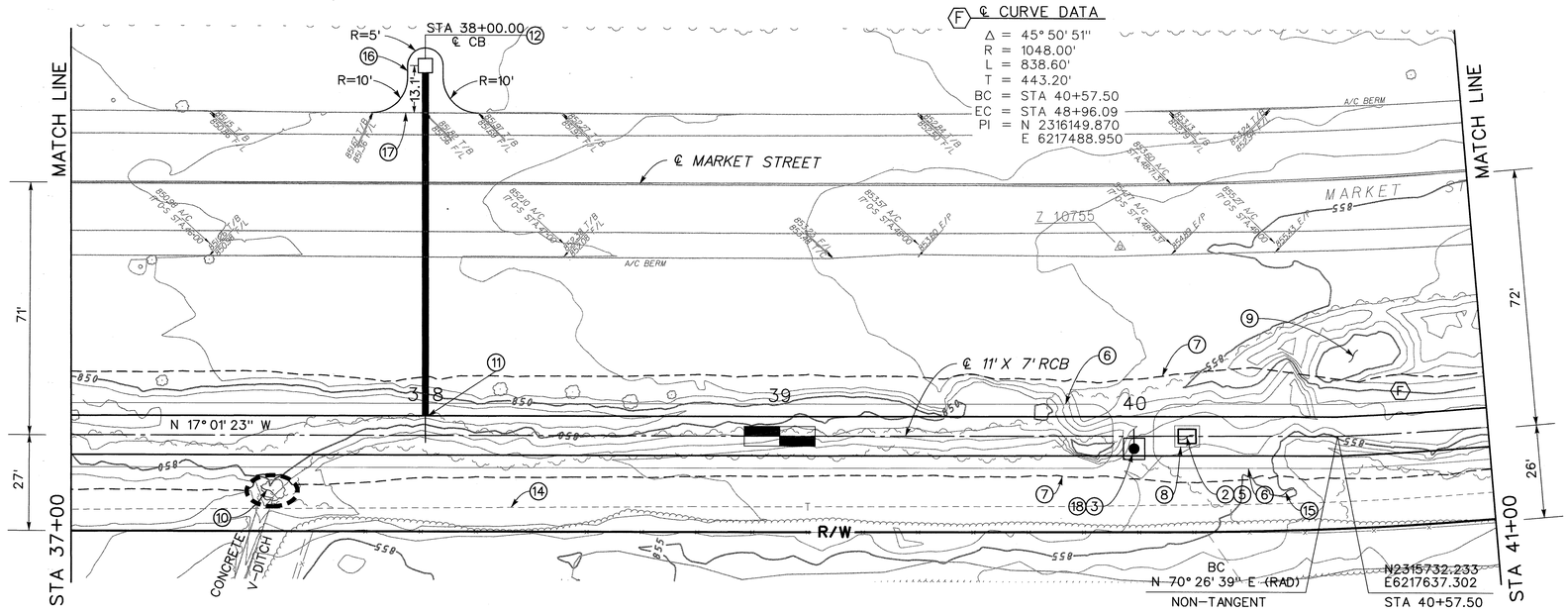
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert Cullen
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 33+00 TO STA 37+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 9 OF 78





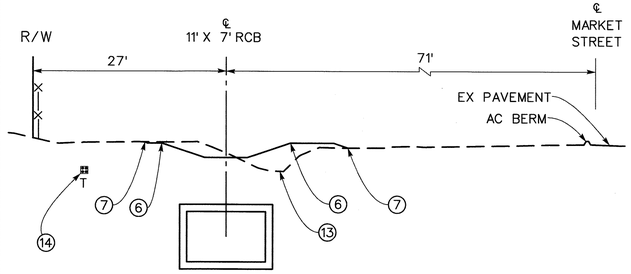
℄ CURVE DATA

Δ = 45° 50' 51"
R = 1048.00'
L = 838.60'
T = 443.20'
BC = STA 40+57.50
EC = STA 48+96.09
PI = N 2316149.870
E 6217488.950

PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 39+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND WEST SIDES, V= 3.5', W= 4' ON EAST AND WEST SIDES, 3LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 42.
3. CONSTRUCT MH NO. 3 PER STD MH253.
4. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
5. CONSTRUCT JS NO. 3 CASE 3 PER STD JS228 A= 90°, D= 18".
6. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
7. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
8. GRADE TO DRAIN AND CONSTRUCT 1' WIDE, 3" THICK AC APRON AS DIRECTED BY ENGINEER.
9. FILL DEPRESSION TO ELEV 857.0 AND GRADE TO DRAIN AS DIRECTED BY ENGINEER.
10. AVOID VEGETATION (MULEFAT).
11. CONSTRUCT JS NO. 3 PER STD JS228, A= 90°, D= 18", ELEV S= 838.36.
12. CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING NORTH, EAST AND SOUTH SIDES, V= 5', 97.5LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 43.
13. EXISTING GROUND APPROXIMATE, MINOR GRADING OCCURRED SINCE MAPPING DATE.
14. MULTIPLE FACILITIES MAY BE PRESENT.
15. GRADE TO DRAIN AS DIRECTED BY ENGINEER.
16. CONSTRUCT 6" AC DIKE PER COUNTY STD 212.
17. REMOVE EXISTING AC BERM.
18. CONSTRUCT 6' X 6' X 6" CONCRETE PAD PER DETAIL ON SHEET 34.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12–31–10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3–31–10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10755
NAIL WITH RCFC&WCD TAG FLUSH
N 2315657.92
E 6217604.37
ELEV = 854.51

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

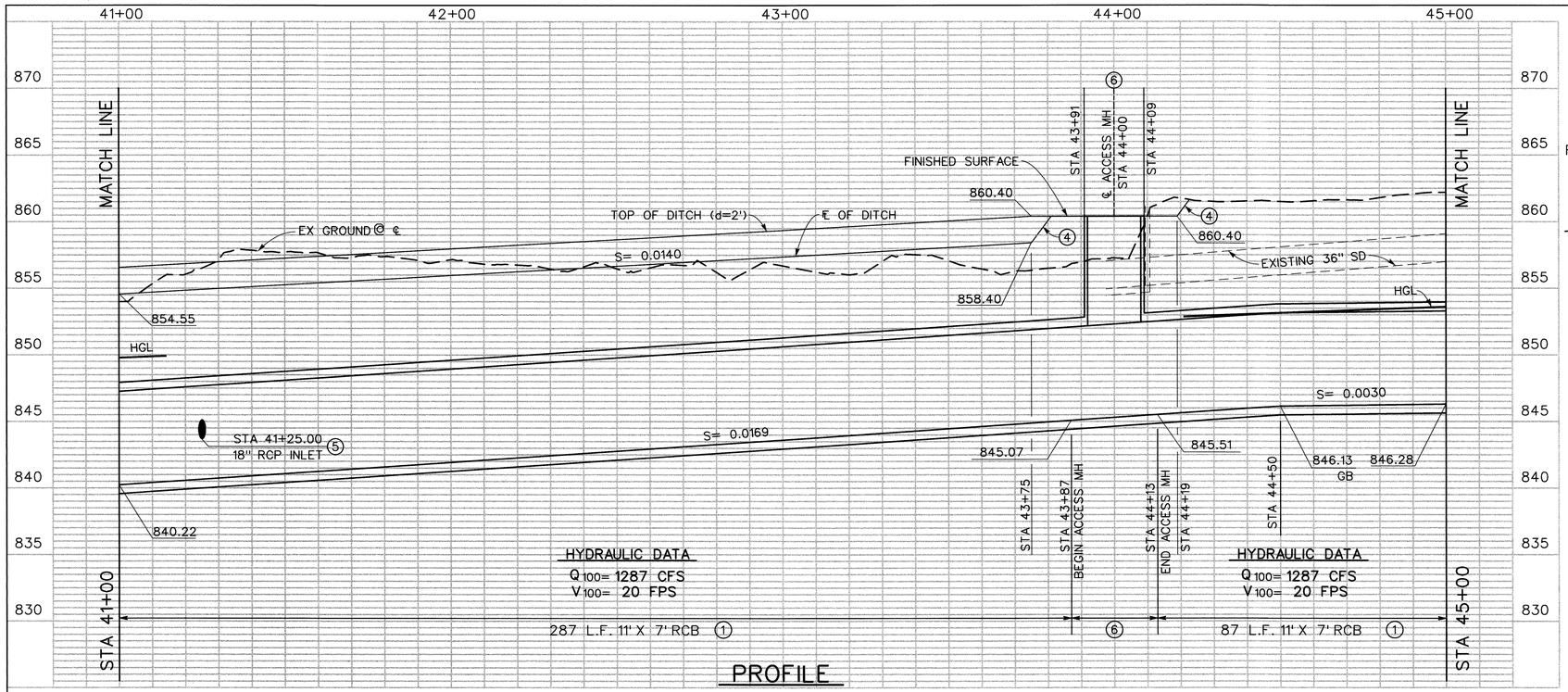
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

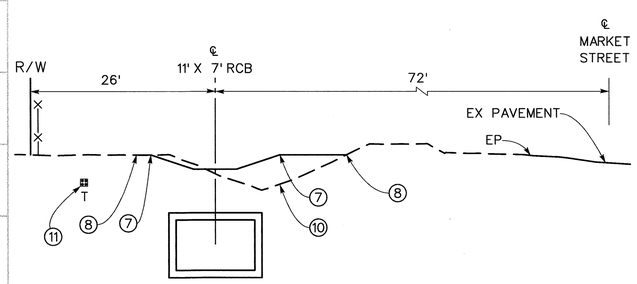
APPROVED BY: Robert J. Cullen
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 37+00 TO STA 41+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 10 OF 78



NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

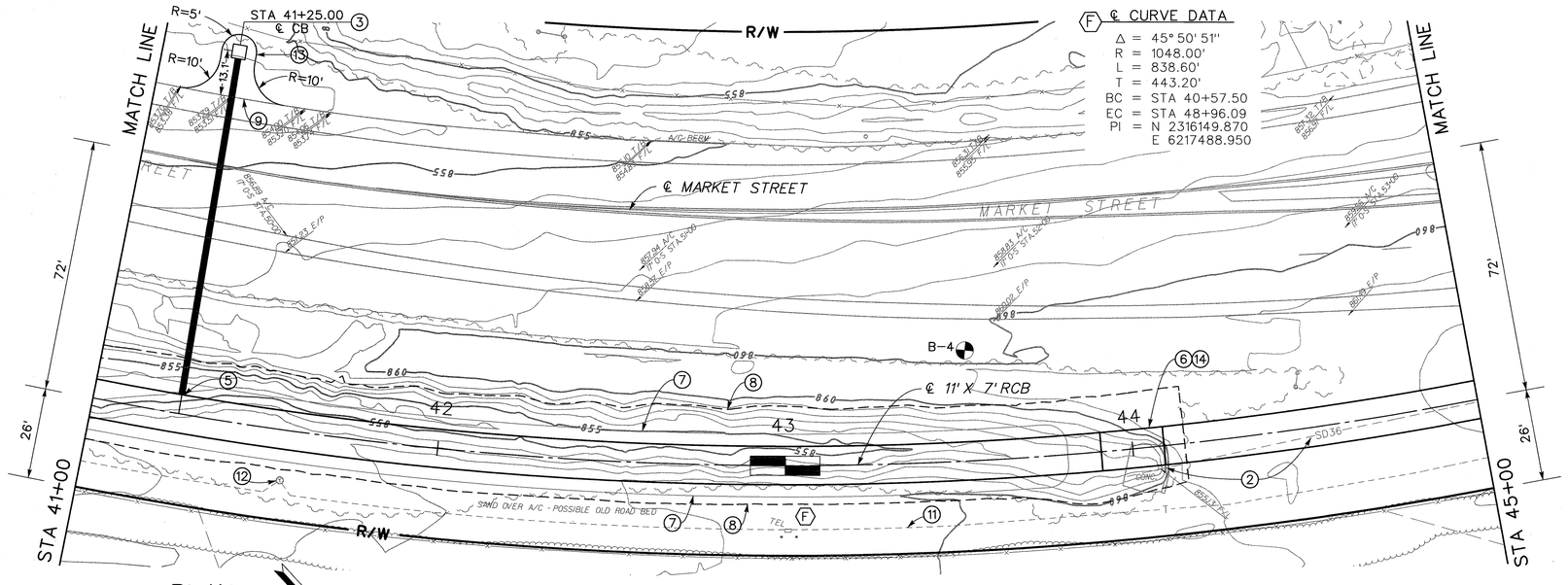


SECTION AT STA 43+00

10' 0 10'

NOTES

1. CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER.
2. REMOVE EXISTING STORM DRAIN AND CONCRETE OUTLET STRUCTURE.
3. CONSTRUCT CONCRETE DROP INLET PER STD CB110 OPENING NORTH, WEST AND SOUTH SIDES. V= 5', 98LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 44.
4. GRADE 3:1 SLOPE FROM ℄ DITCH TO FINISHED SURFACE.
5. CONSTRUCT JS NO. 3 PER STD JS228, A= 90°, D= 18", ELEV S= 843.65.
6. CONSTRUCT ACCESS MANHOLE PER STRUCTURAL DETAILS ON SHEET 32. TOP OF ACCESS MANHOLE ELEV= 860.40.
7. TOP OF DITCH LIMITS. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
8. GRADE DITCH TO MEET EXISTING GROUND. SEE CROSS SECTION DETAILS ON SHEETS 38–39.
9. REMOVE EXISTING AC BERM.
10. EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.
11. MULTIPLE FACILITIES MAY BE PRESENT.
12. PROTECT IN PLACE, TELEPHONE BOX NEAR PROPOSED DITCH LIMITS.
13. CONSTRUCT 6" AC DIKE PER COUNTY STD 212.
14. CONSTRUCT ACCESS MANHOLE IN ONE CORD/SECTION LENGTH. DO NOT ADD ANGLE POINT.



PLAN

20' 0 20'

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.

TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10755

SEE SHEET 10

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/24/09 R.E. No. 46355

APPROVED BY: Robert J. Cullen
DATE: 22-APR-09 R.E. No. 44684

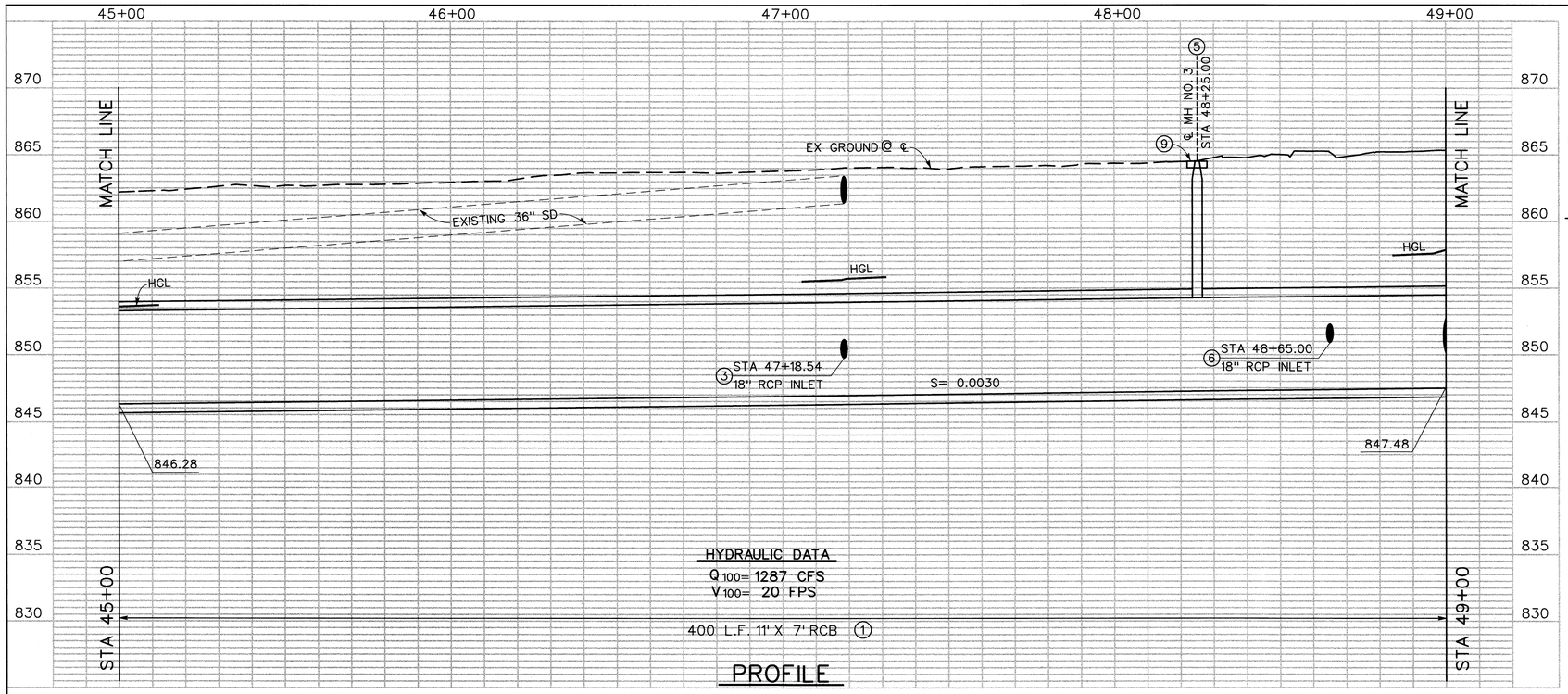
REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 C/V IL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 C/V IL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

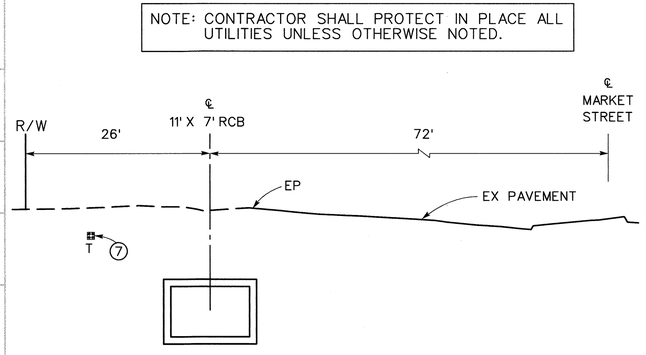
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 41+00 TO STA 45+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 11 OF 78



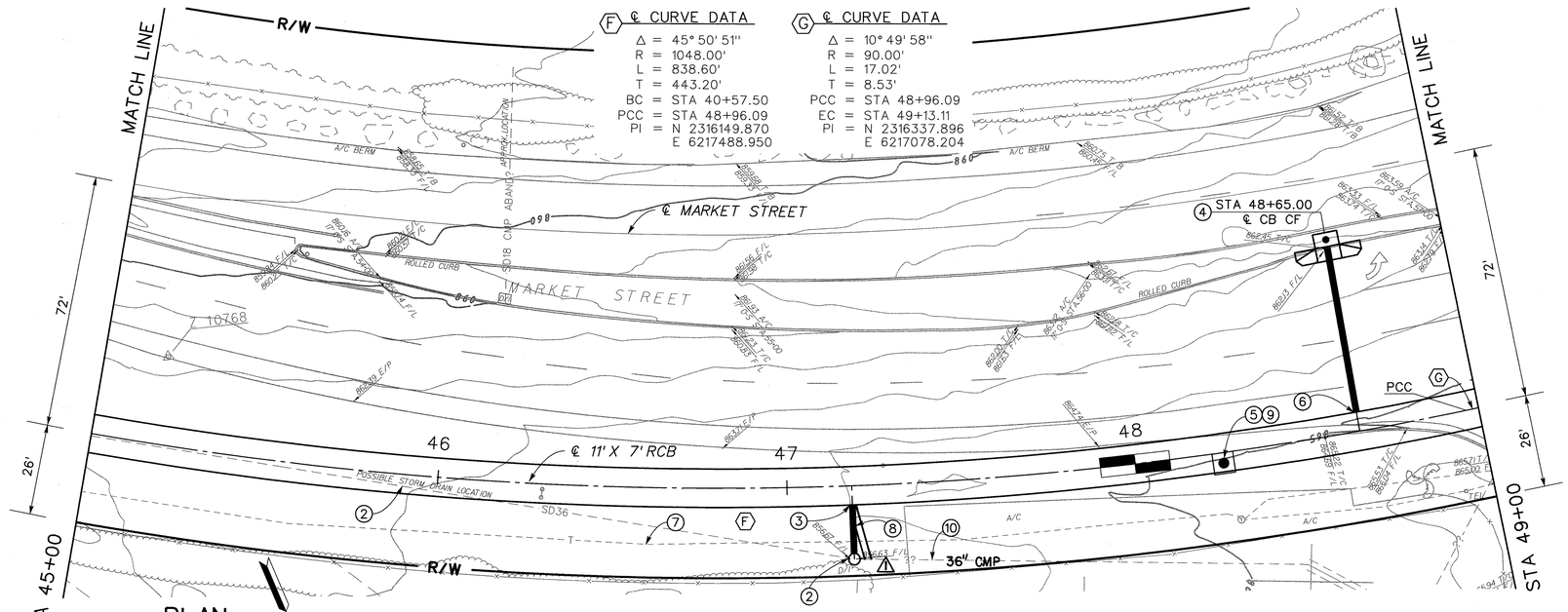
PROFILE

HYDRAULIC DATA
Q_{100}= 1287 CFS
V_{100}= 20 FPS



SECTION AT STA 48+00

10' 0 10'



PLAN

20' 0 20'

NOTES

① CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 10' COVER FROM STA 45+00 TO STA 46+00. USE 20' COVER FROM STA 46+00 TO STA 49+00.

② REMOVE AND PLUG INTERFERING PORTION OF CMP PIPE.

③ CONSTRUCT JS NO. 3 PER STD JS228, A= 90°, D= 18", ELEV S= 849.72.

④ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H=5', W= 7', 49LF – 18" RCP CLASS IV, SEE PROFILE ON SHEET 44.

⑤ CONSTRUCT MH NO. 3 PER STD MH253.

⑥ CONSTRUCT JS NO. 3 PER STD JS228, A= 90°, D= 18", ELEV S= 850.87.

⑦ MULTIPLE FACILITIES MAY BE PRESENT.

⑧ CONSTRUCT 15LF – 18" RCP CLASS IV. TIE INTO EXISTING ⚠ 36" CMP ~~CMP RISER~~. SEE PROFILE ON SHEET 42.

⑨ CONSTRUCT 6' X 6' X 6" CONCRETE PAD PER DETAIL ON SHEET 34.

⑩ PROTECT EXISTING CMP TIED TO CMP RISER IN PLACE.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10768
NAIL WITH RCFC&WCD TAG FLUSH
N 2316101.54
E 6217376.01
ELEV = 861.83

REF.	REVISIONS	APPR.	DATE
⚠	NOTE CHANGE	JB	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

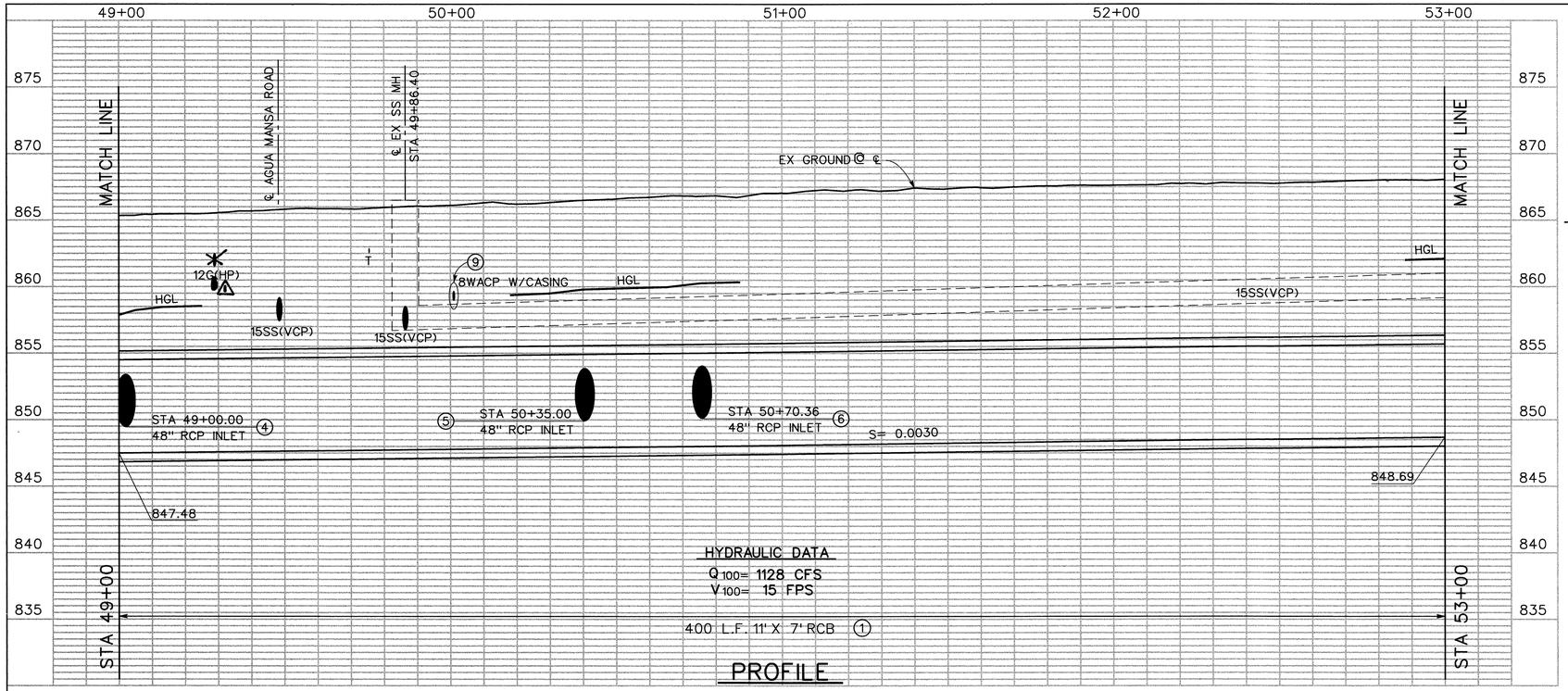
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

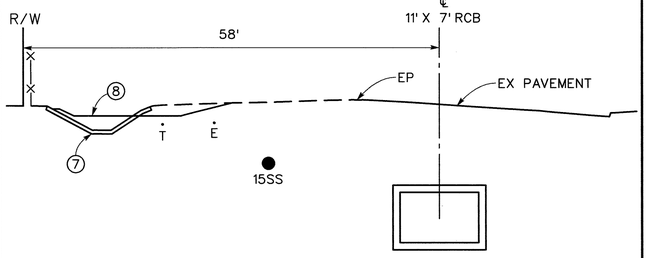
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 45+00 TO STA 49+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 12 OF 78





SECTION AT STA 52+00

10' 0 10'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

NOTES

① CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER.

② SEE CONNECTOR PIPE PROFILES ON SHEET 45.

③ REMOVE AND DISPOSE OF EXISTING AC TRAP CHANNEL. FILL TO ADJACENT GROUND AND GRADE TO DRAIN. L= 205', S= 0.0037, SS= 20:1, W= 10'.

④ CONSTRUCT JS NO. 1 PER STD JS226, A= 47.5°, B= 48", C= 12.42', ELEV R= 849.64, ELEV S= 849.39.

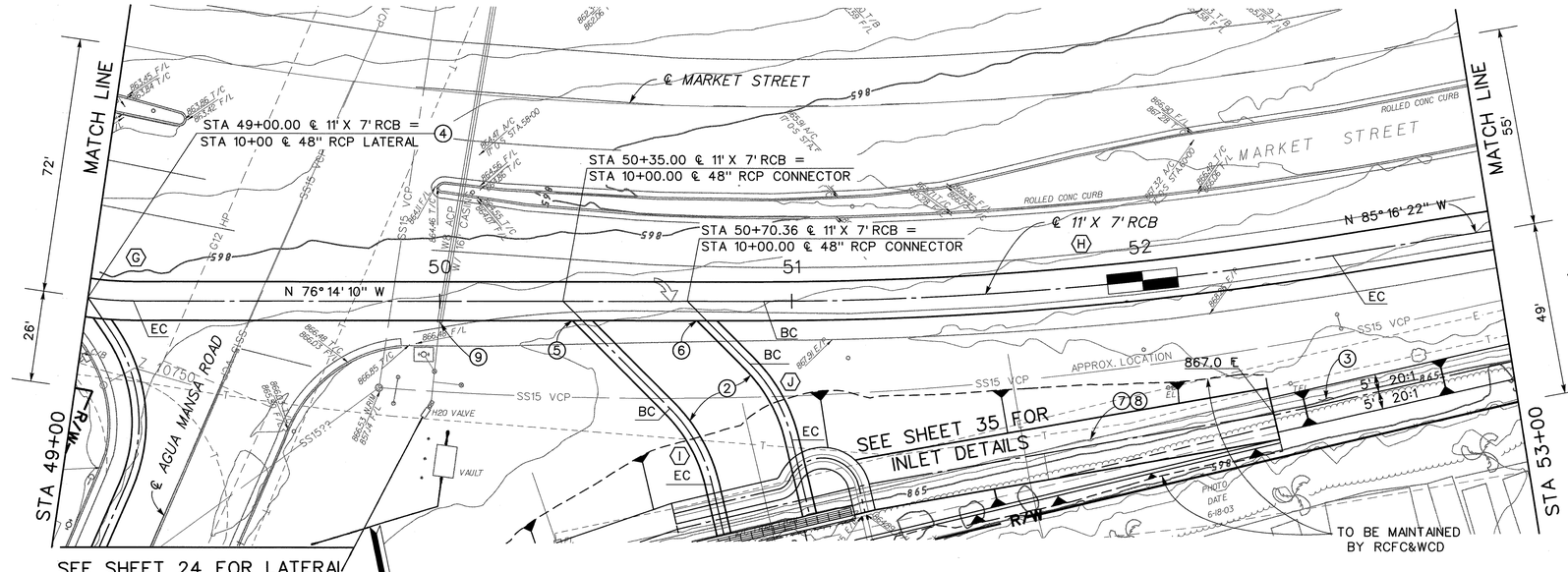
⑤ CONSTRUCT JS NO. 1 PER STD JS226, A= 45°, B= 48", C= 12.86', ELEV R= 850.19, ELEV S= 849.89.

⑥ CONSTRUCT JS NO. 1 PER STD JS226, A= 45°, B= 48", C= 12.86', ELEV R= 850.43, ELEV S= 850.08.

⑦ REMOVE AND DISPOSE OF EXISTING AC TRAP CHANNEL.

⑧ MARKET STREET INLET FINISHED SURFACE. SEE MARKET STREET INLET DETAILS ON SHEET 35.

⑨ PROTECT WATERLINE IN PLACE, ADDITIONAL SUPPORT MAY BE NEEDED TO STABILIZE END OF CASING OVER EXCAVATION TRENCH.



PLAN

20' 0 20'

℄ CURVE DATA	℄ CURVE DATA	℄ CURVE DATA	℄ CURVE DATA
Δ = 10° 49' 58"	Δ = 9° 02' 12"	Δ = 31° 48' 59"	Δ = 31° 48' 56"
R = 90.00'	R = 1030.00'	R = 45.00'	R = 45.00'
L = 17.02'	L = 162.45'	L = 24.99'	L = 24.99'
T = 8.53'	T = 81.39'	T = 12.83'	T = 12.83
BC = STA 48+96.09	BC = STA 50+92.03	BC = STA 10+42.89	BC = STA 10+25.01
EC = STA 49+13.11	EC = STA 52+54.49	EC = STA 10+67.88	EC = STA 10+50.00
PI = N 2316337.896 E 6217078.204	PI = N 2316401.861 E 6216817.073	PI = N 2316416.562 E 6216922.628	PI = N 2316409.690 E 6216897.558

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — C IV IL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — C IV IL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE: 6/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10750
LEAD AND TACK WITH RCFC TBM TAG FLUSH IN TOP OF CURB
N 2316361.00
E 6217084.00
ELEV = 865.77

REF.	DESCRIPTION	APPR.	DATE
1	NOT FIELD VERIFIED ELEV. CHANGE	MB	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

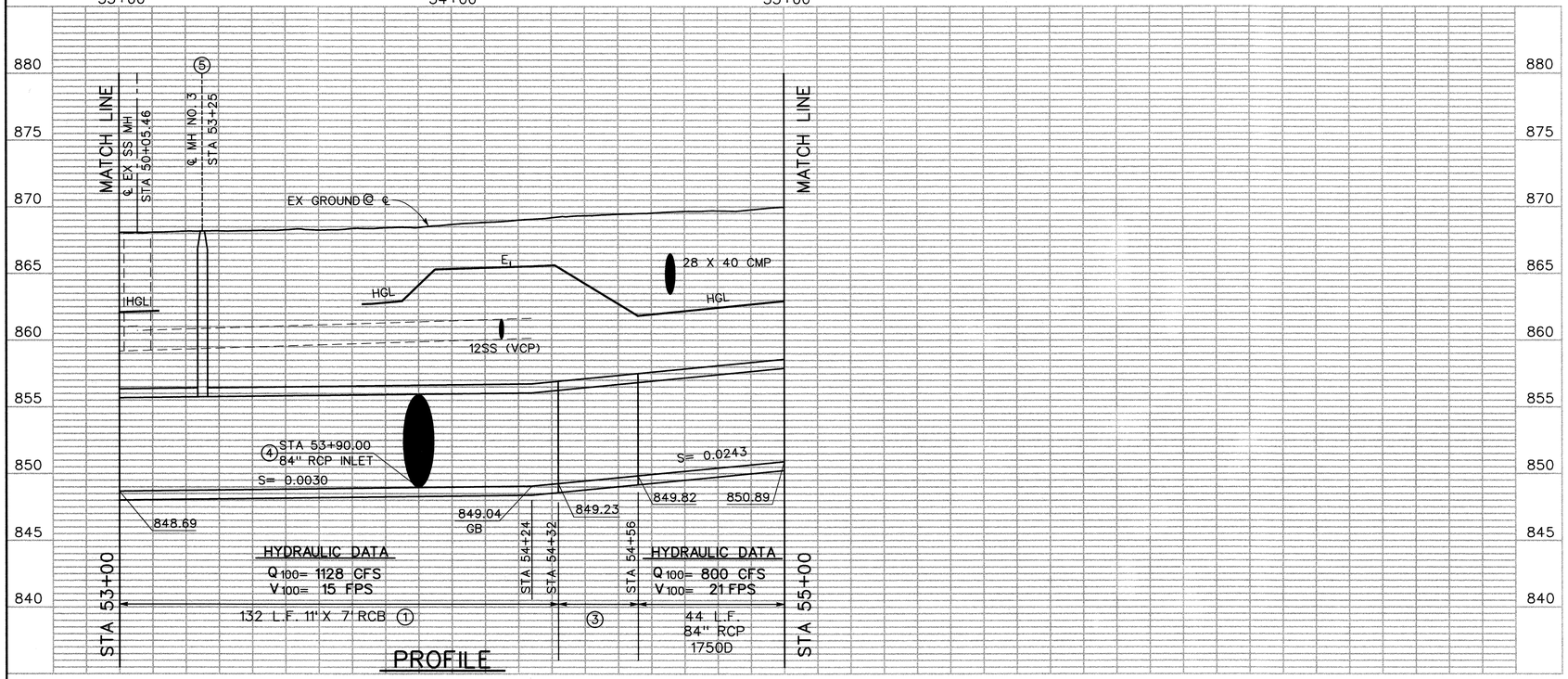
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

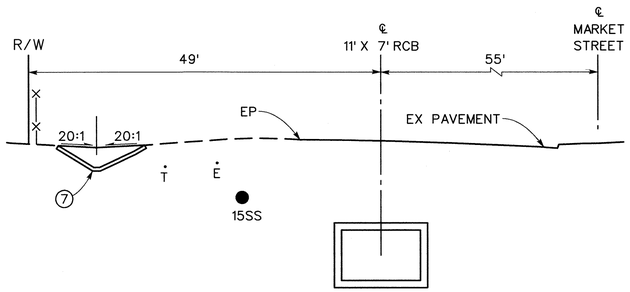
APPROVED BY:
DATE: 2-24-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 49+00 TO STA 53+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 13 OF 78



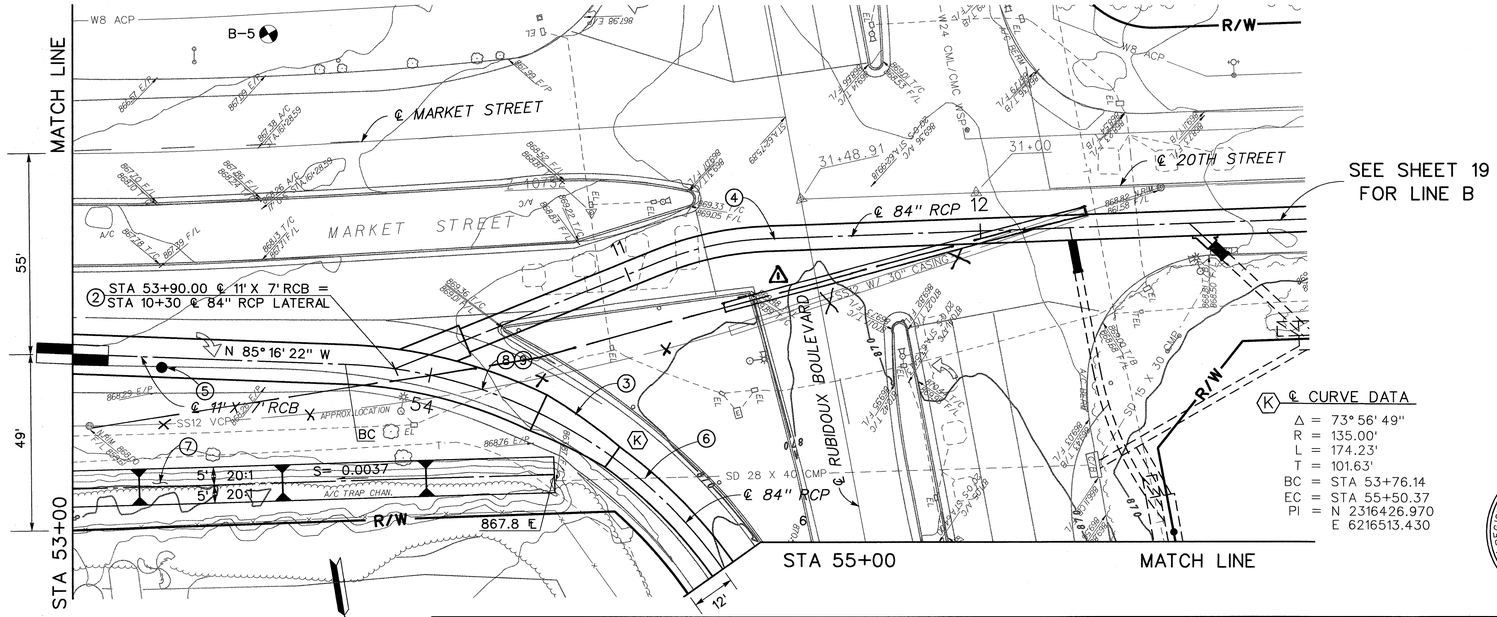
PROFILE



SECTION AT STA 53+00

10' 0 10'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



PLAN

20' 0 20'

NOTES

① CONSTRUCT 11' X 7' RCB, FLAT INVERT PER CALTRANS STD D80. USE 20' COVER.

② CONSTRUCT MODIFIED JS NO. 1, A= 30°, B= 84", C= 21.87', ELEV R= 849.03, ELEV S= 848.97. SEE STRUCTURAL DETAILS ON SHEET 33.

③ CONSTRUCT TS NO. 1 PER STD TS301, MAX CORD= 6'.

④ INSTALL 84" RCP PER DETAILS ON SHEET 19.

⑤ CONSTRUCT MH NO. 3 PER STD MH253.

⑥ REMOVE AND PLUG INTERFERING PORTIONS OF CMP PIPE.

⑦ REMOVE EXISTING AC TRAP CHANNEL, FILL TO ADJACENT GROUND AND GRADE TO DRAIN. L= 205', S= 0.0037, SS= 20:1, W= 10'.

⑧ DUE TO SEWER CROSSING AT LARGE SKEW, CONTRACTOR SHALL SUBMIT PROTECTION PLAN PRIOR TO EXCAVATION.

⑨ CONTRACTOR TO POTHOLE 12" VCP SEWER AT BEGINNING OF JOB TO VERIFY HORIZONTAL LOCATION.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2014

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10752
NAIL WITH RCFC&WCD TAG FLUSH
N 2316379.50
E 6216544.22
ELEV = 869.19

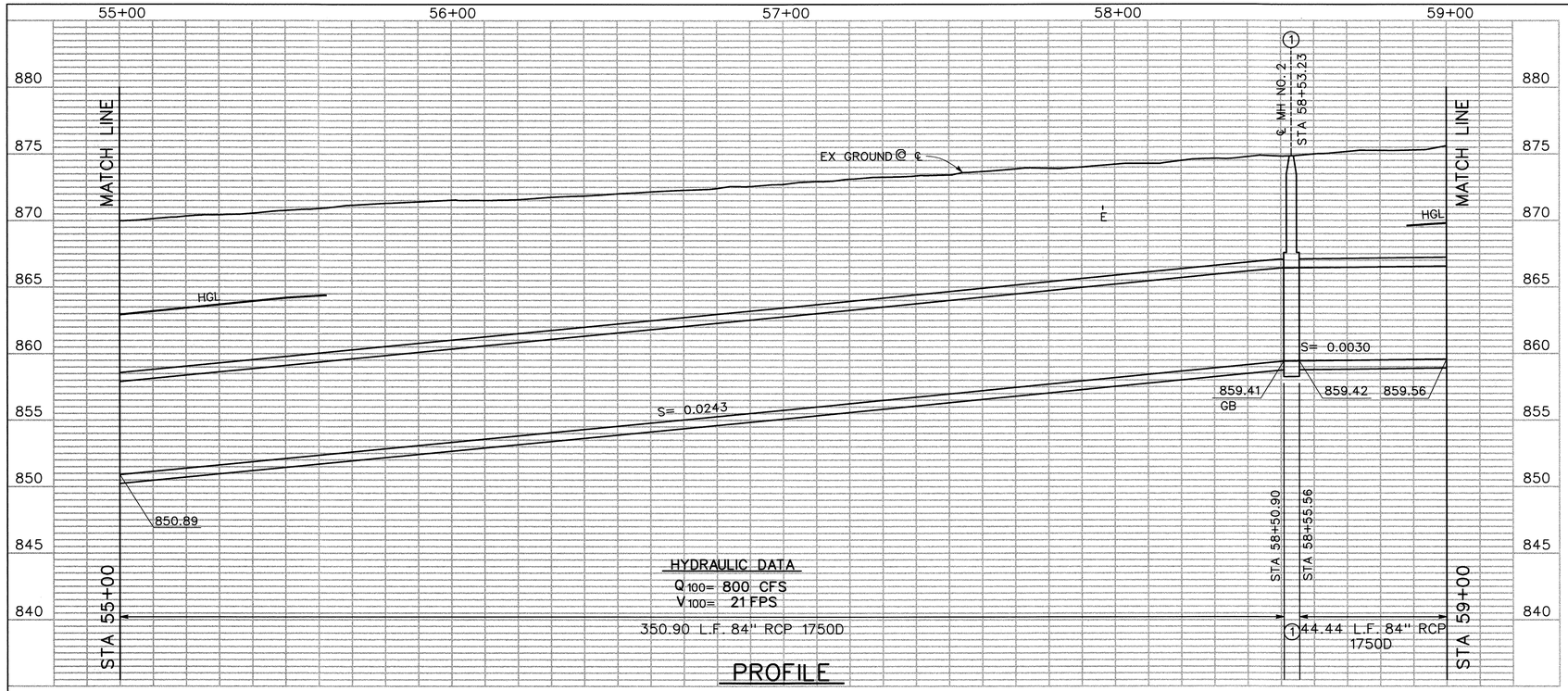
REVISIONS			
REF.	DESCRIPTION	APPR.	DATE
2	SSI2 LOCATION VERIFIED	DK	8/14/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

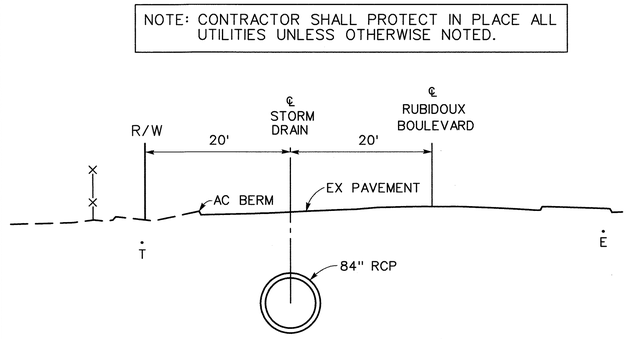
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/24/09 R.E. No. 46355
APPROVED BY: DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 53+00 TO STA 55+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 14 OF 78

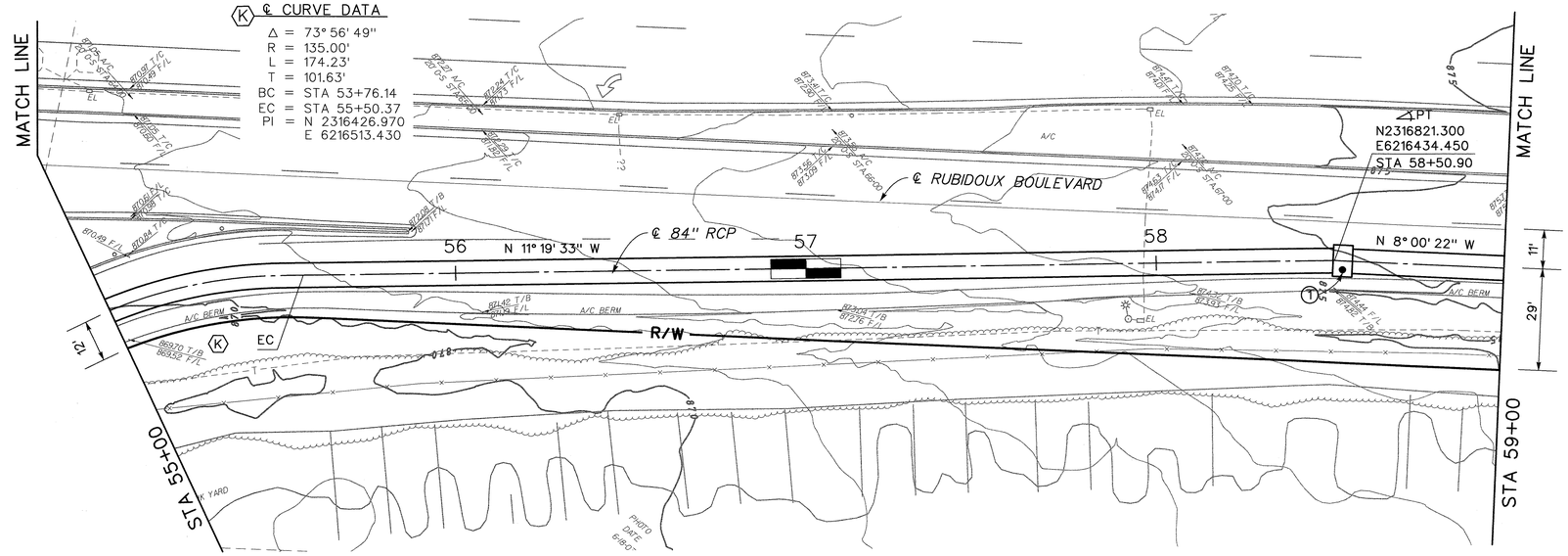


PROFILE



SECTION AT STA 57+00

10' 0 10'



PLAN

20' 0 20'

NOTES

1. CONSTRUCT MH NO. 2 PER STD MH252, $D_1 = D_2 = 84"$.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10769

SEE SHEET 16

REF.	DESCRIPTION	APPR.	DATE
	REVISIONS		

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

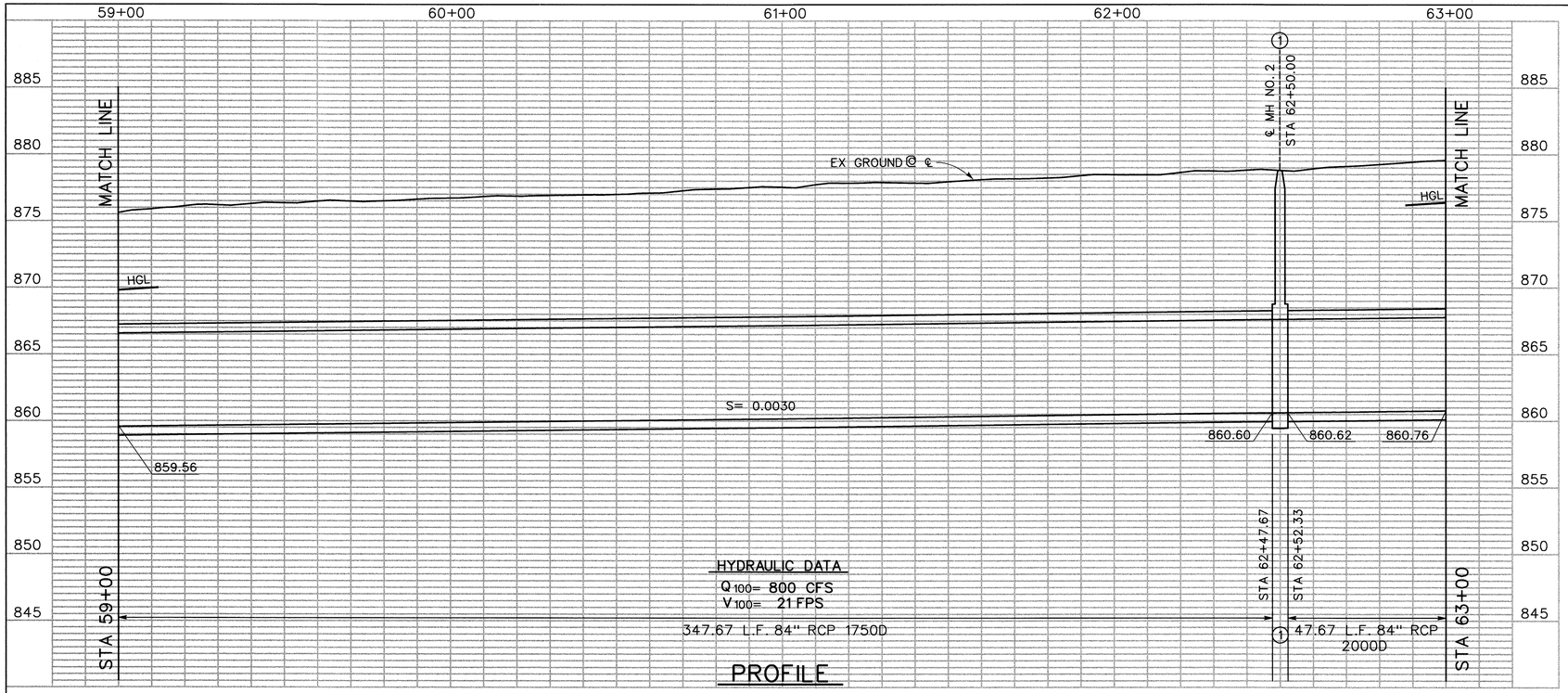
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

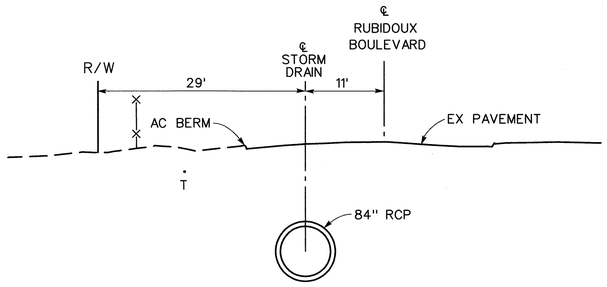
APPROVED BY:
DATE 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 55+00 TO STA 59+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 15 OF 78

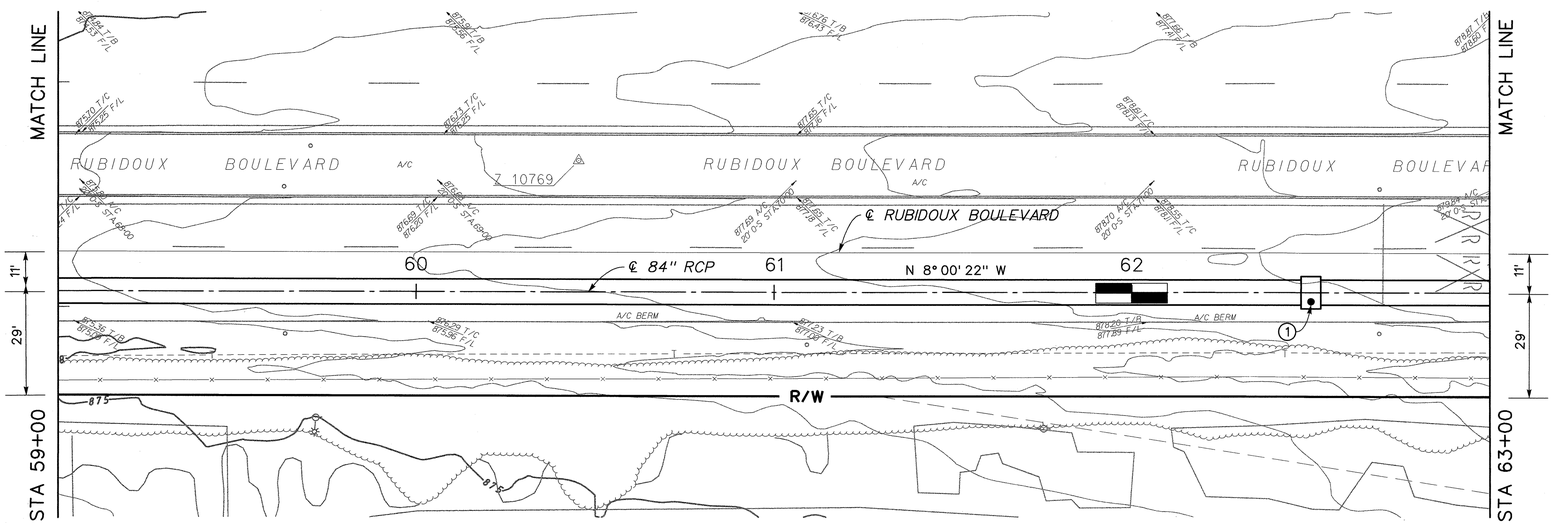


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 62+00

10' 0 10'



PLAN

20' 0 20'

NOTES

① CONSTRUCT MH NO. 2 PER STD MH252, $D_1 = D_2 = 84"$.

AS BUILT
APPROVED BY:
DATE 5/26/2011

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10769
NAIL WITH RCFC&WCD TAG FLUSH
N 2317008.82
E 6216371.16
ELEV = 877.07

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

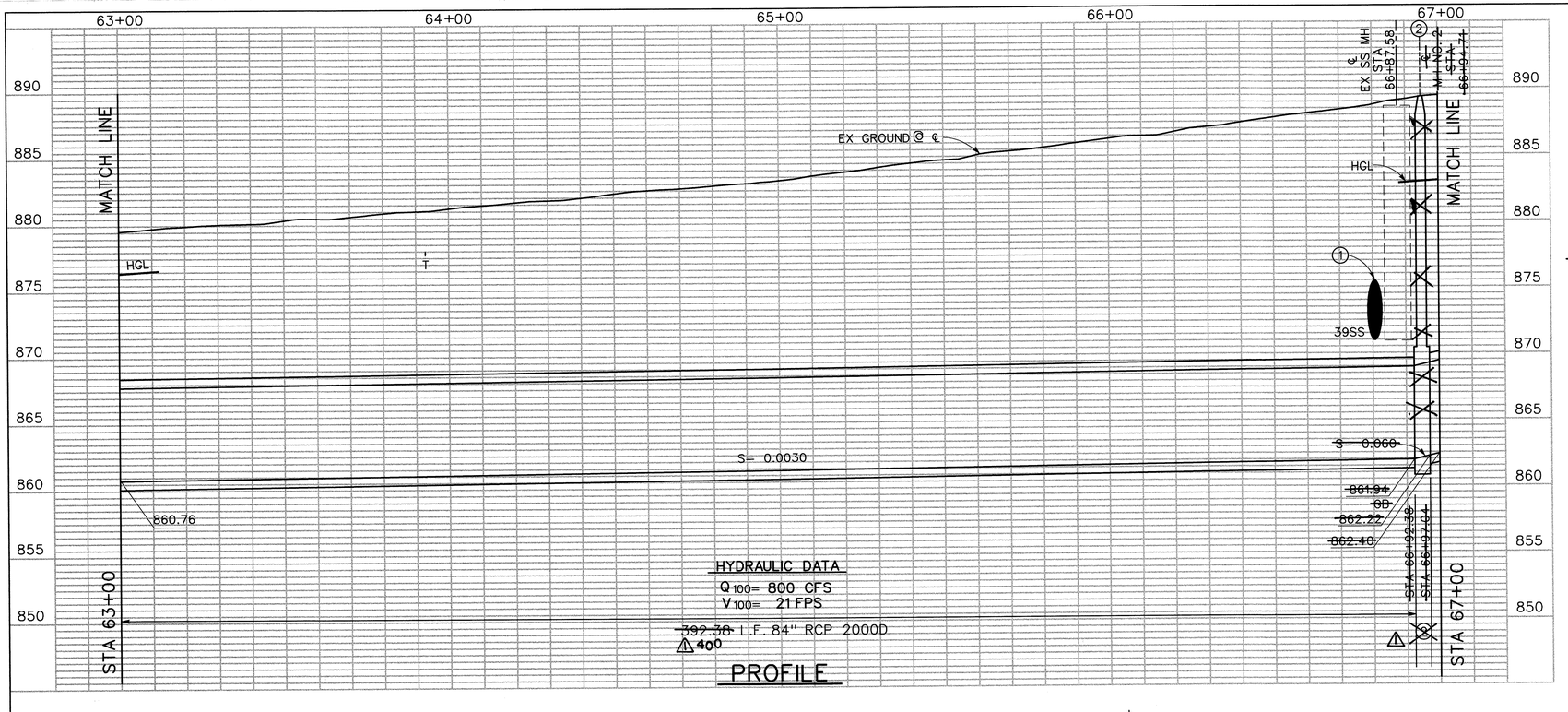
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

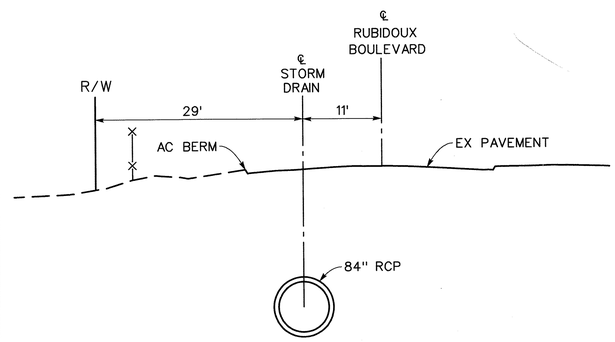
APPROVED BY: Robert Cullen
DATE 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 59+00 TO STA 63+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 16 OF 78

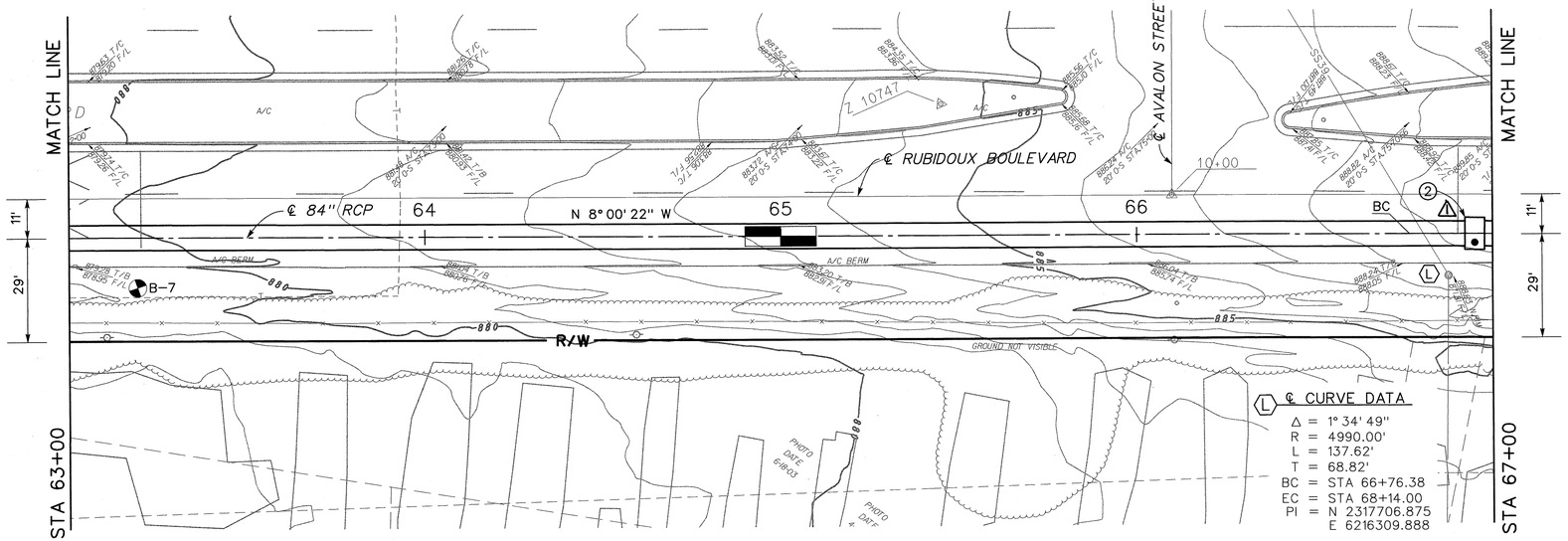


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 65+00

10' 0 10'



PLAN

20' 0 20'

NOTES

1. SPECIAL CARE TO PROTECT IN PLACE 39" SEWER MAINLINE (SARI LINE).
2. ~~CONSTRUCT MH NO. 2 PER STD MH252, $D_1 = D_2 = 84"$.~~

AS BUILT
APPROVED BY:
DATE 5/26/2011

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10747
NAIL WITH RCFC&WCD TAG FLUSH
N 2317503.62
E 6216301.28
ELEV = 884.72

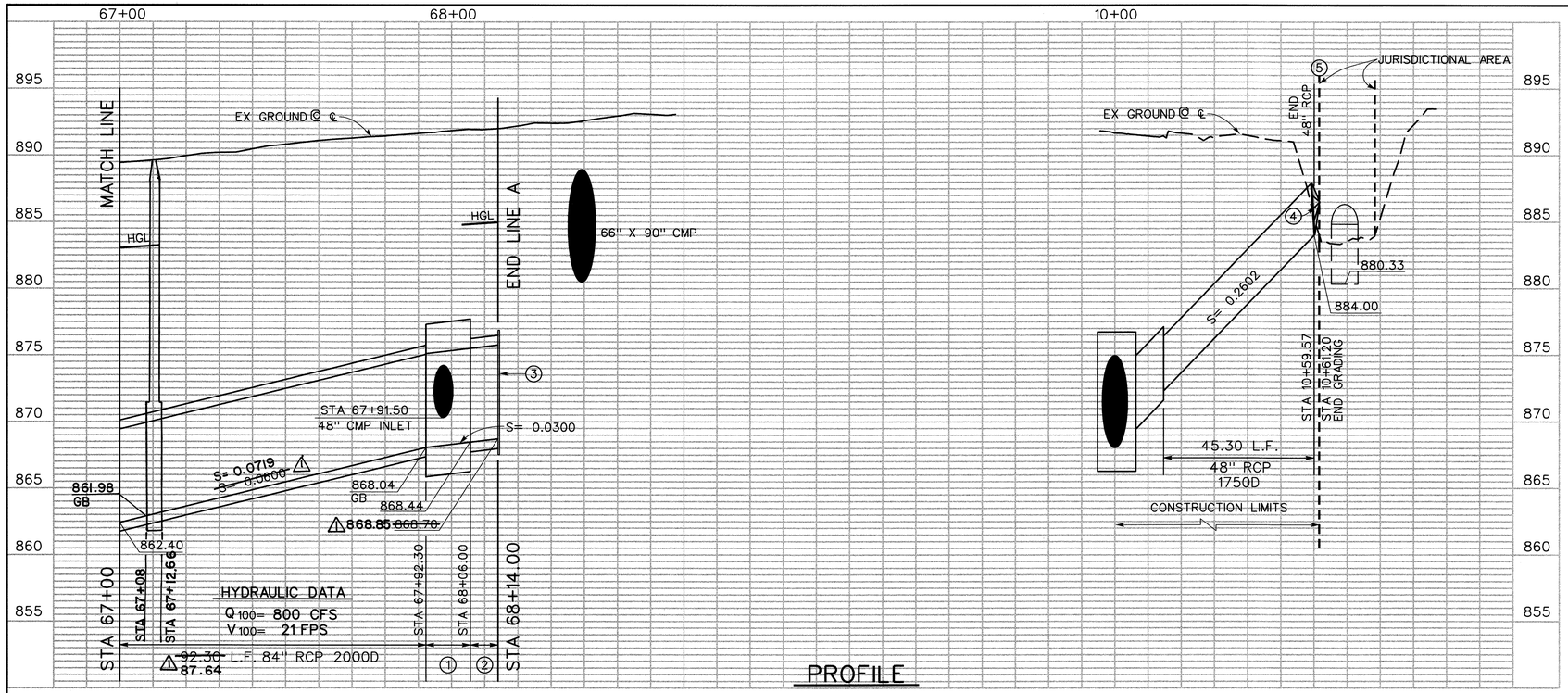
REF.	REVISIONS	APPR.	DATE
1	MH MOVED	DK	5/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355
APPROVED BY: DATE 22 APR 09 R.E. No. 44684

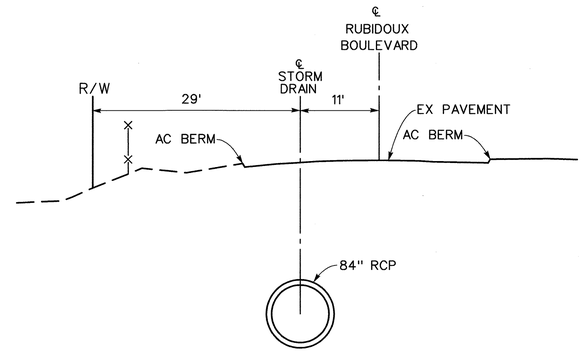
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 63+00 TO STA 67+00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 17 OF 78



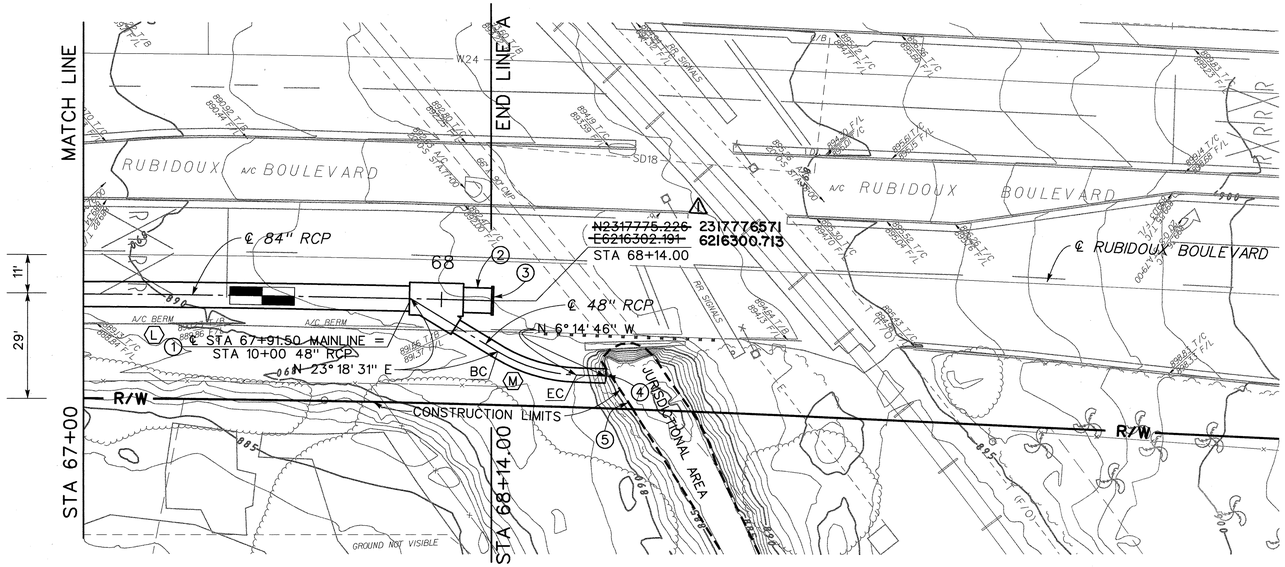
PROFILE

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 67+50

10' 0 10'



PLAN

20' 0 20'

℄ CURVE DATA

Δ = 1° 34' 49"
R = 4990.00'
L = 137.62'
T = 68.82'
BC = STA 66+76.38
EC = STA 68+14.00
PI = N 2317706.875
E 6216309.888

℄ CURVE DATA

Δ = 29° 31' 17"
R = 45.00
L = 23.19'
T = 11.86'
BC = STA 10+28.38
EC = STA 10+51.57
PI = N 2317789.860
E 6216320.674

NOTES

1. CONSTRUCT TS NO.3 PER STD TS303, A= 30°, B= 48", C= 14.70 $D_1 = D_2 =$ 84", ELEV R= 872.91, ELEV S= 870.59.
2. INSTALL 84" RCP 2000D JOINT.
3. CONSTRUCT CONCRETE BULKHEAD PER STD M816.
4. INSTALL GRATE ASSEMBLY PER DETAILS ON SHEET 34.
5. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
6. **CONSTRUCT MH NO. 2 PER STD MH252, $D_1 = D_2 =$ 84".**

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 C/V IL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 C/V IL STATE OF CALIFORNIA

AS BUILT
APPROVED BY
DATE 5/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10747

SEE SHEET 17

REF.	REVISIONS	APPR.	DATE
1	ELEV. CHANGE BEARINGS CHANGE	DB	5/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

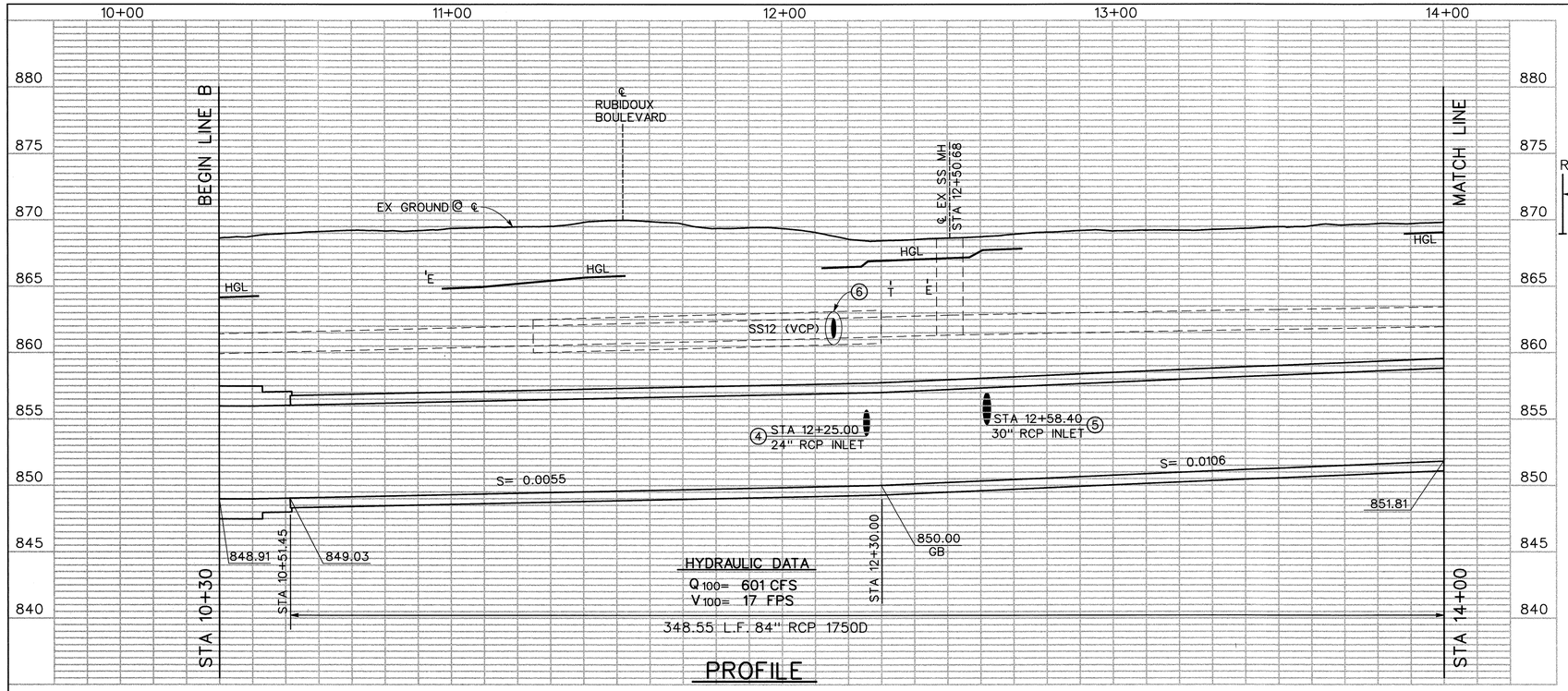
DESIGNED BY: E.D., L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Jun-09 R.E. No. 44684

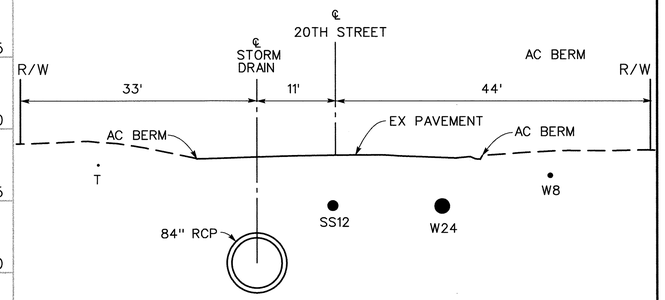
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1 (LINE A)
STA 67+00 TO STA 68+14.00

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 18 OF 78



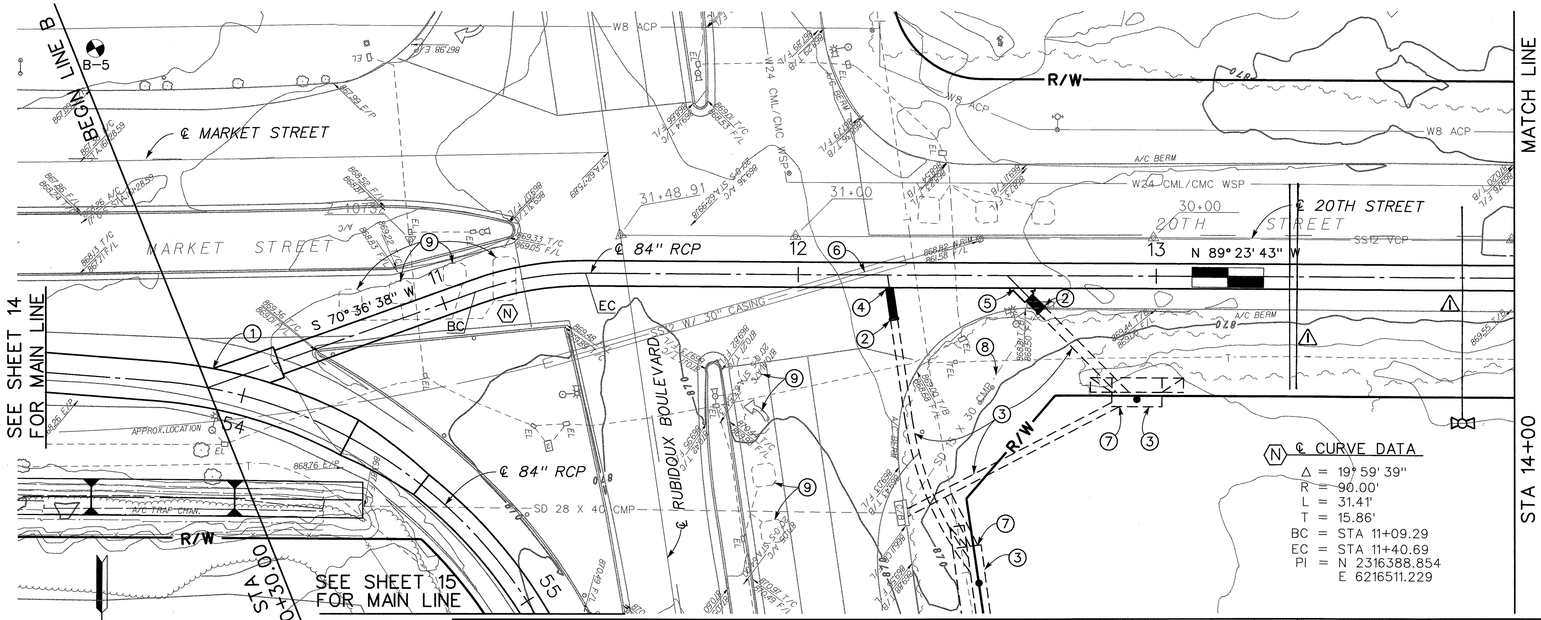
PROFILE

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 13+20

10' 0 10'



PLAN

N

20' 0 20'

Ⓝ ℄ CURVE DATA
Δ = 19° 59' 39"
R = 90.00'
L = 31.41'
T = 15.86'
BC = STA 11+09.29
EC = STA 11+40.69
PI = N 2316388.854
E 6216511.229

NOTES

① CONSTRUCT MODIFIED JS NO. 1, A= 30°, B= 84", C= 21.87', ELEV R=849.03, ELEV S= 848.97. SEE STRUCTURAL DETAILS ON SHEET 33.

② CONSTRUCT CONCRETE COLLAR PER STD M803.

③ EXISTING CATCH BASINS AND CONNECTOR PIPES.

④ CONSTRUCT JS NO.4 PER STD JS229, A= 81.389°, D= 24", ELEV S= 853.72. SEE PROFILE ON SHEET 47.

⑤ CONSTRUCT JS NO. 2 PER STD JS227, A= 45°, B= 30", C= 8.73, D= 84", E= 6.7', F= 2.82', G= 3.50', L= 4.95', ELEV R= 855.97, ELEV S= 854.54. SEE PROFILE ON SHEET 47.

⑥ PROTECT IN PLACE. ADDITIONAL SUPPORT MAY BE NEEDED TO STABILIZE END OF CASING OVER EXCAVATION TRENCH.

⑦ CLEAR OUT BOTTOM OF CATCH BASINS AND SEAL INTERIM CONNECTOR PIPE CONNECTION.

⑧ TO BE REMOVED BY OTHERS.

⑨ REMOVE AND REPLACE TRAFFIC LOOPS.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE: 6/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10752

SEE SHEET 14

REF.	REVISIONS	APPR.	DATE
⚠	2 3/8" COPPER WATER LINES 3' DP 6" STEEL LINE TO HYDRANT 5' DP	DK	4/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

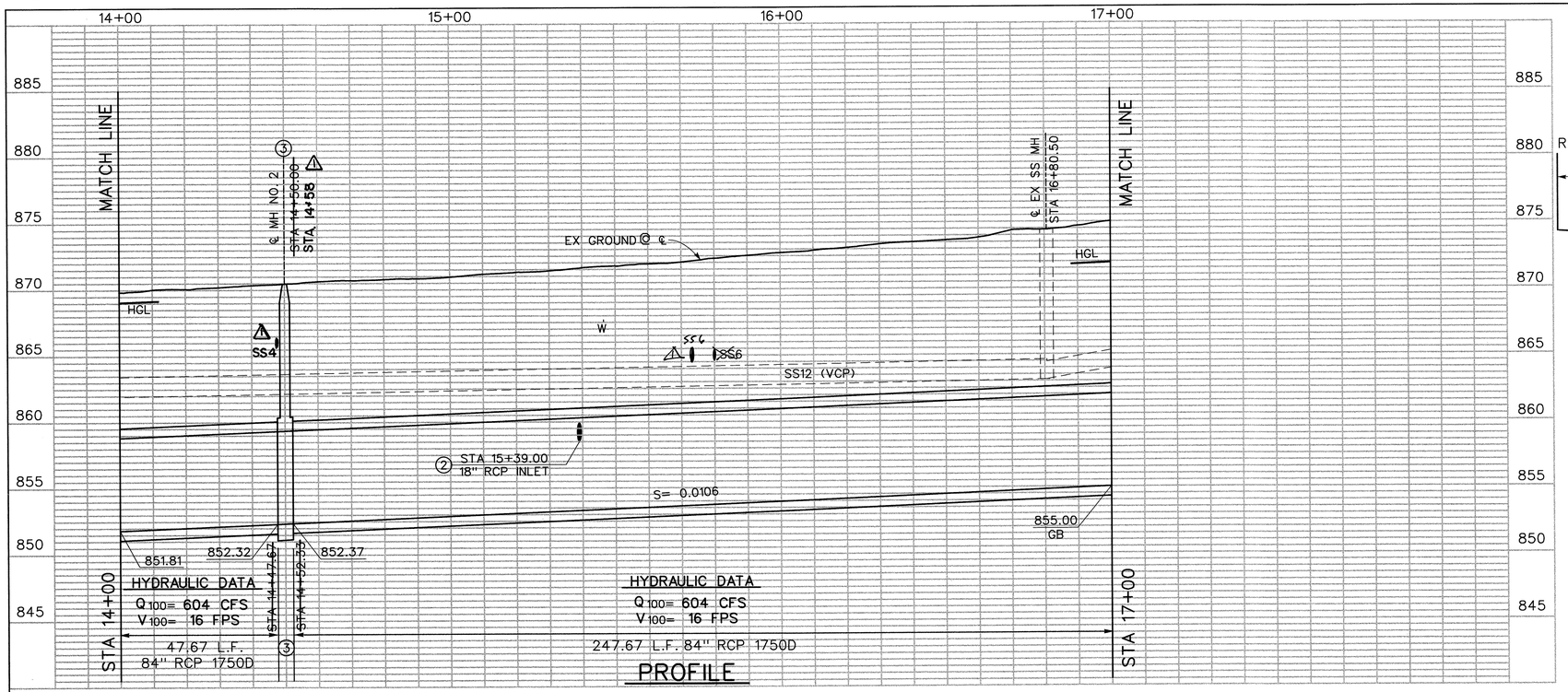
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M Wong
DATE: 4/27/09 R.E. No. 46355

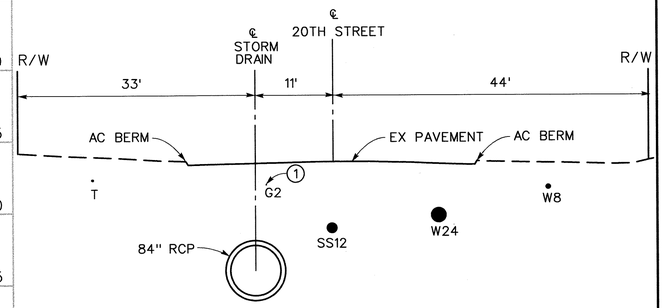
APPROVED BY: Robert Cullen
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN LINE B STORM DRAIN STAGE 1
STA 10+30 TO STA 14+00

PROJECT NO. 1-0-0156
DRAWING NO. 1-637
SHEET NO. 19 OF 78

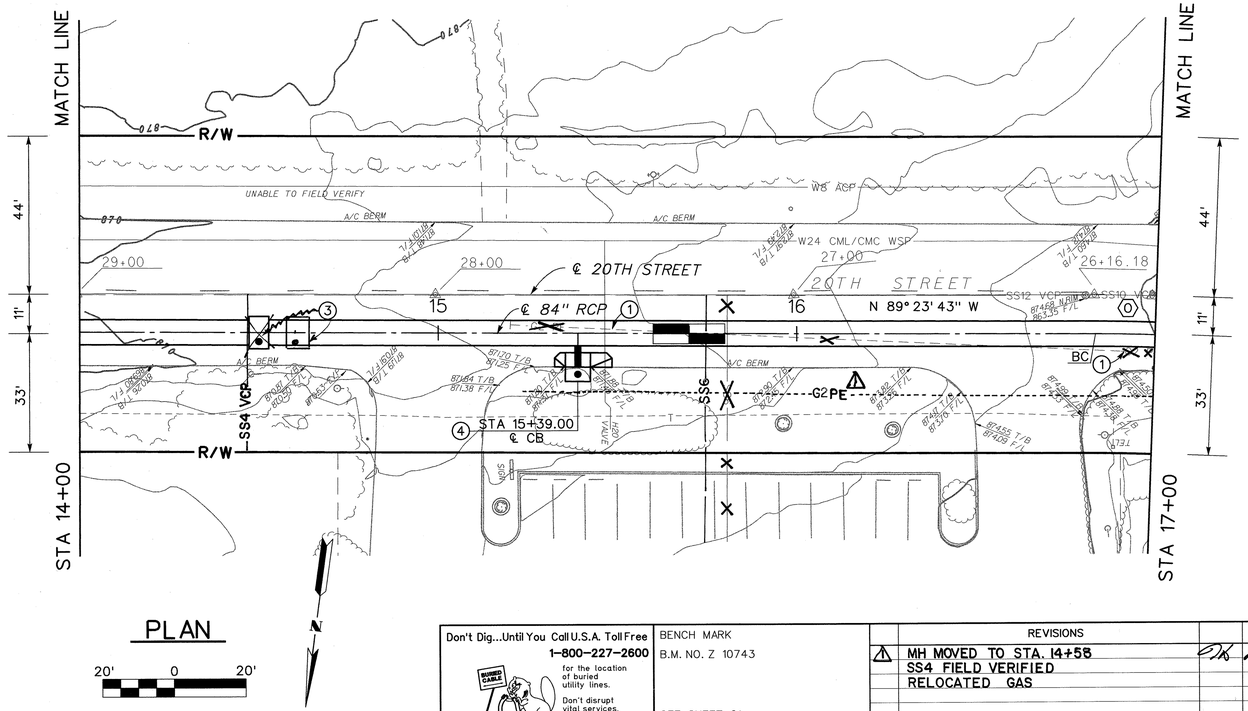


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 15+70

10' 0 10'



PLAN

20' 0 20'

℄ CURVE DATA

Δ = 19° 33' 25"
R = 488.00'
L = 166.57'
T = 84.10'
BC = STA 16+83.43
EC = STA 18+50.00
PI = N 2316395.638
E 6215868.571

NOTES

1. 2" GAS LINE TO BE RELOCATED BY OTHERS
2. CONSTRUCT JS NO. 4 PER STD JS229, A= 90°, D= 18", ELEV S=858.60.
3. CONSTRUCT MH NO.2 PER STD MH252, $D_1 = D_2 =$ 84".
4. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300 H= 7', W=7', 9.5 LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 48.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/24/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10743

SEE SHEET 21

REF.	REVISIONS	APPR.	DATE
⚠	MH MOVED TO STA. 14+58 SS4 FIELD VERIFIED RELOCATED GAS	CJS	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

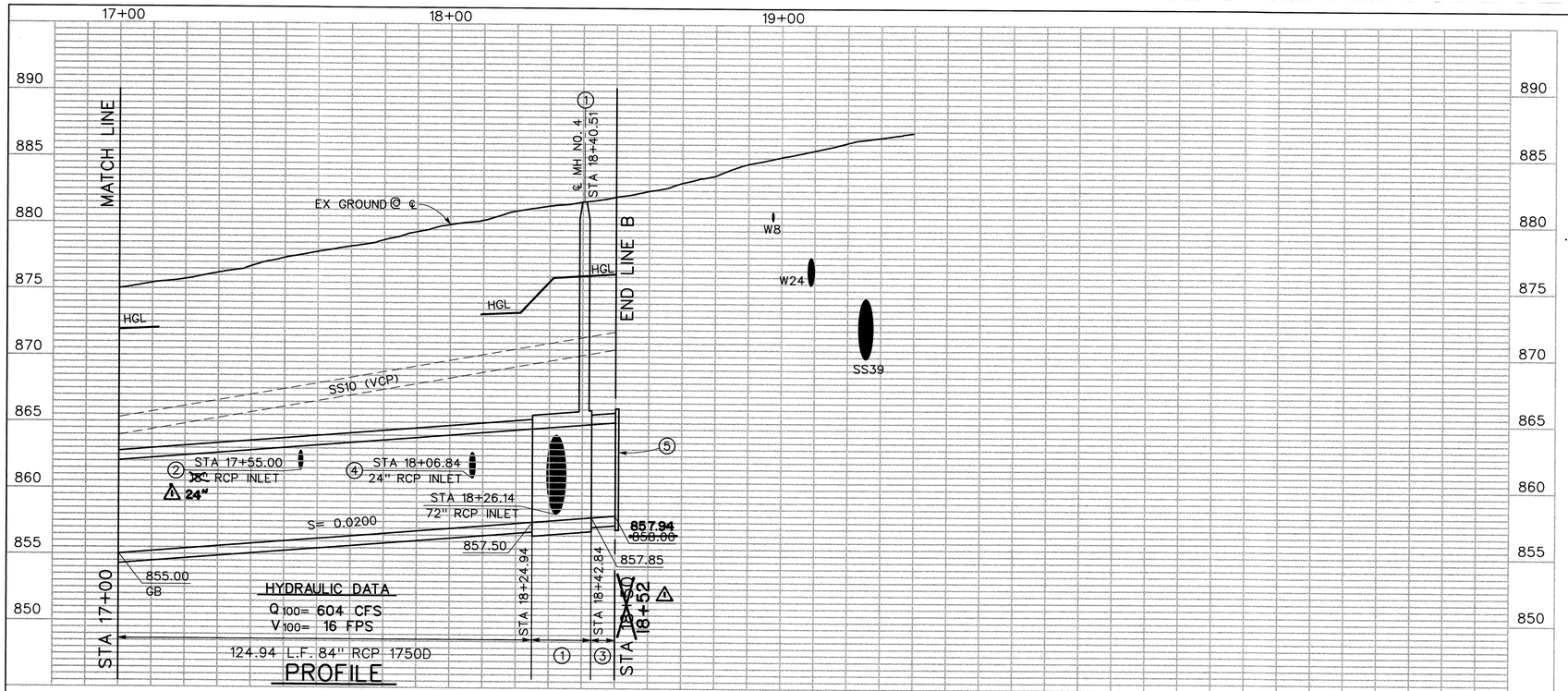
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

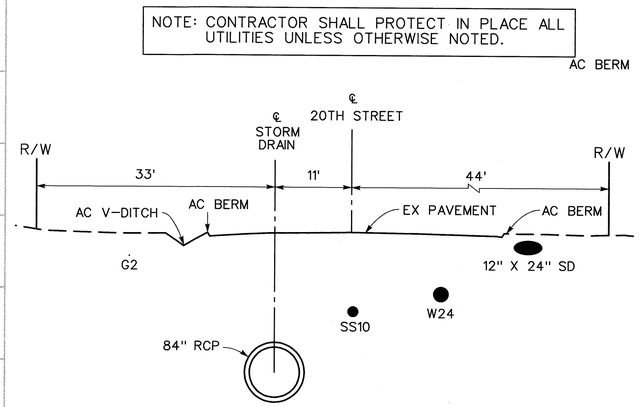
APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN LINE B STORM DRAIN
STAGE 1
STA 14+00 TO STA 17+00

PROJECT NO. 1-0-0156
DRAWING NO. 1-637
SHEET NO. 20 OF 78

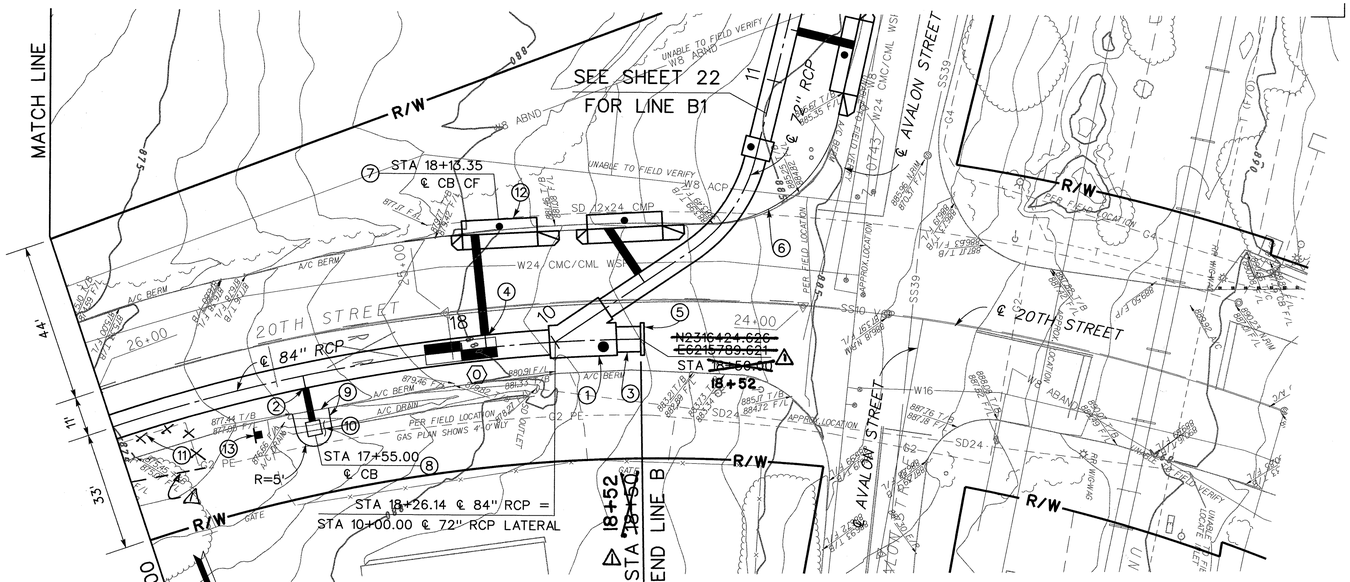


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 18+00

10' 0 10'



PLAN

20' 0 20'

℄ CURVE DATA

Δ = 19° 33' 25"
R = 488.00'
L = 166.57'
T = 84.10'
BC = STA 16+83.43
EC = STA 18+50.00
PI = N 2316395.638
E 6215868.571

NOTES

① CONSTRUCT MH NO. 4 PER STD MH254, A= 30°, B= 72', C= 16.87, $D_1 = D_2$ = 84", ELEV R= 853.83, ELEV S= 858.11.

② CONSTRUCT JS NO. 4 PER STD JS229, A= 90°, D= 18", ELEV S= 861.36.

③ INSTALL 84" RCP 1750D JOINT.

④ CONSTRUCT JS NO. 4 PER STD JS229, A= 90°, D= 24", ELEV S= 860.78.

⑤ SEAL RCP WITH CONCRETE BULKHEAD PER STD M816.

⑥ CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.

⑦ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 6', W= 21', 33 LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 49.

⚠ ⑧ CONSTRUCT CONCRETE DROP INLET PER STD CB110, OPENING EAST, WEST AND SOUTH SIDES, V= 7', 13LF – ~~18~~ 24" RCP CLASS IV. SEE PROFILE ON SHEET 48.

⑨ CUT AND REMOVE 10' OF EXISTING BERM. CONSTRUCT 8" AC DIKE PER COUNTY STD 212. UPSTREAM T/B ELEV= 878.02, DOWNSTREAM T/B ELEV= 877.67.

⑩ CONSTRUCT TOP OF AC DIKE TO BOTTOM OF EXISTING AC TRAP. GRADE TO DRAIN AS DIRECTED BY ENGINEER.

⑪ 2" GAS LINE TO BE RELOCATED BY OTHERS.

⑫ REMOVE AND DISPOSE OF INTERFERING PORTIONS OF 12" X 24" CMP.

⑬ INSTALL OBJECT MARKER PER CALTRANS STD A73–A TYPE L–1.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12–31–10 — CIV IL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3–31–10 — CIV IL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/24/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10743
FD 1 1/4" IP WITH RIV. CO. SUR. TAG DOWN 0.20'
N 2316386.47
E 6215708.62
ELEV = 885.33

REF.	DESCRIPTION	APPR.	DATE
⚠	CHANGE STATION OF BULKHEAD INLET SIZE CHANGE	DK	8/24/11
⚠	SHOW TRUE LOCATION OF 2" GAS	DK	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

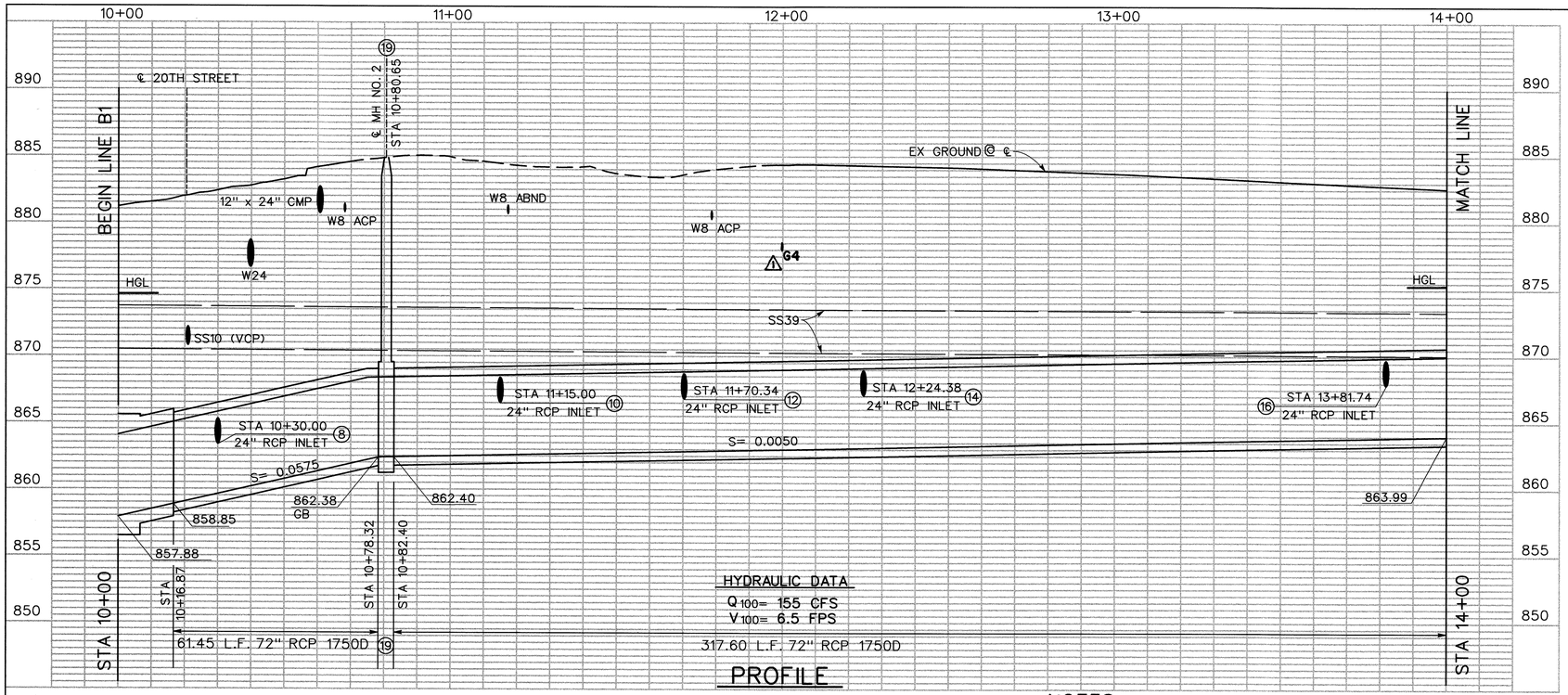
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN LINE B STORM DRAIN
STAGE 1
STA 17+00 TO STA 18+50

PROJECT NO. 1-0-0156
DRAWING NO. 1-637
SHEET NO. 21 OF 78

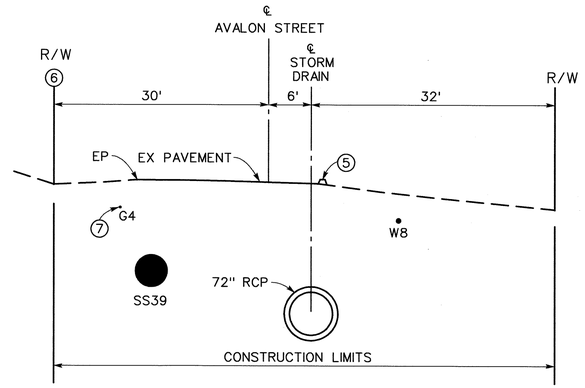


HYDRAULIC DATA

Q_{100}= 155 CFS
V_{100}= 6.5 FPS

PROFILE

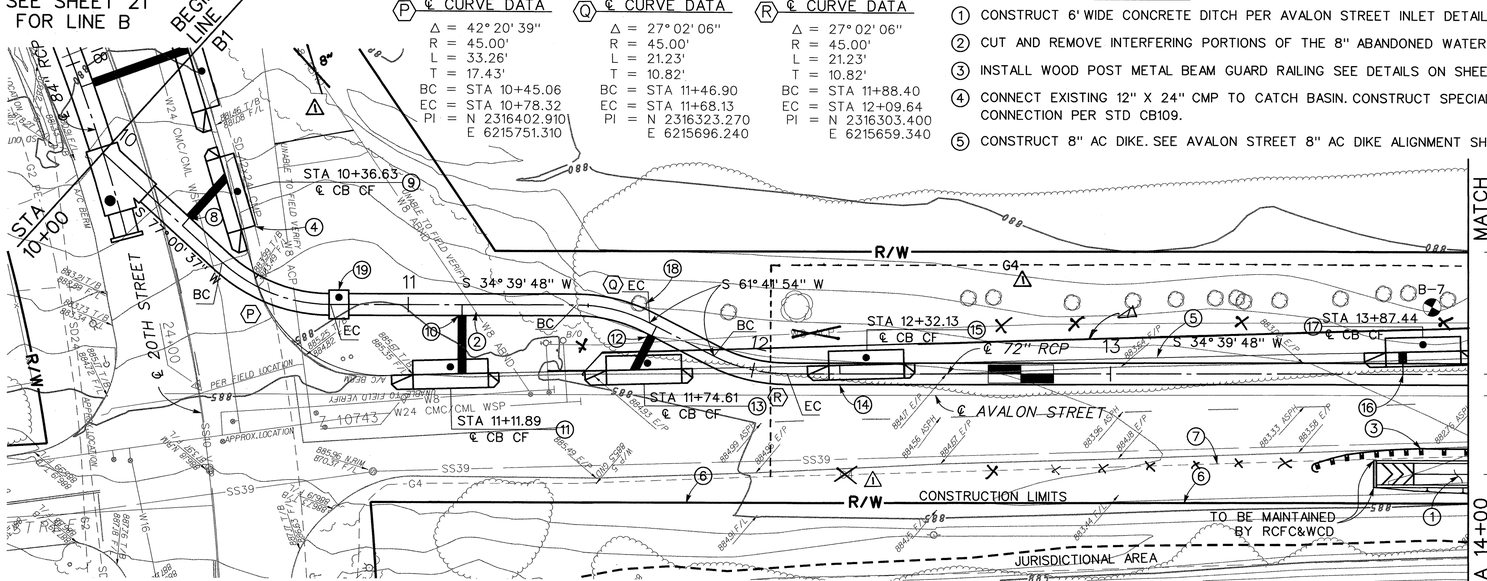
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 12+75

10' 0 10'

SEE SHEET 21 FOR LINE B



PLAN

20' 0 20'

℗ ℄ CURVE DATA
Δ = 42° 20' 39"
R = 45.00'
L = 33.26'
T = 17.43'
BC = STA 10+45.06
EC = STA 10+78.32
PI = N 2316402.910
E 6215751.310

Ⓠ ℄ CURVE DATA
Δ = 27° 02' 06"
R = 45.00'
L = 21.23'
T = 10.82'
BC = STA 11+46.90
EC = STA 11+68.13
PI = N 2316323.270
E 6215696.240

Ⓡ ℄ CURVE DATA
Δ = 27° 02' 06"
R = 45.00'
L = 21.23'
T = 10.82'
BC = STA 11+88.40
EC = STA 12+09.64
PI = N 2316303.400
E 6215659.340

NOTES

1. CONSTRUCT 6' WIDE CONCRETE DITCH PER AVALON STREET INLET DETAILS ON SHEET 37.
2. CUT AND REMOVE INTERFERING PORTIONS OF THE 8" ABANDONED WATER LINE.
3. INSTALL WOOD POST METAL BEAM GUARD RAILING SEE DETAILS ON SHEET 37.
4. CONNECT EXISTING 12" X 24" CMP TO CATCH BASIN. CONSTRUCT SPECIAL CONNECTION PER STD CB109.
5. CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.
6. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
7. 4" GAS LINE TO BE RELOCATED BY OTHERS.
8. CONSTRUCT JS NO. 4 PER STD JS229, A= 90°, D= 24", ELEV S= 866.92.
9. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300, H= 5', W= 21', 20LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 49.
10. CONSTRUCT JS NO. 4 CASE 2 PER STD JS229 , A= 90°, D= 24", ELEV S= 866.91.
11. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300, H= 5.5', W= 21', 18.5LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 50.
12. CONSTRUCT JS NO. 4 CASE 2 PER STD JS229 , A= 90°, D= 24", ELEV S= 867.42.
13. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300, H= 5', W= 21', 16.5LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 50.
14. CONSTRUCT JS NO. 4 CASE 2 PER STD JS229 , A= 90°, D= 24", ELEV S= 868.58.
15. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300, H= 5', W= 21', 11.5LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 51.
16. CONSTRUCT JS NO. 4 CASE 2 PER STD JS229 , A= 90°, D= 24", ELEV S= 868.81.
17. CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300, H= 4', W= 21', 12LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 51.
18. REMOVE TREE.
19. CONSTRUCT MH NO. 2 PER STD MH252, $D_1 = D_2$ = 72".

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/22/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10743

SEE SHEET 21

REF.	REVISIONS DESCRIPTION	APPR.	DATE
1	RELOCATION OF 4" GAS LINE PLOT TRUE LOCATION OF 8" WATERLINE	DS	4/7/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

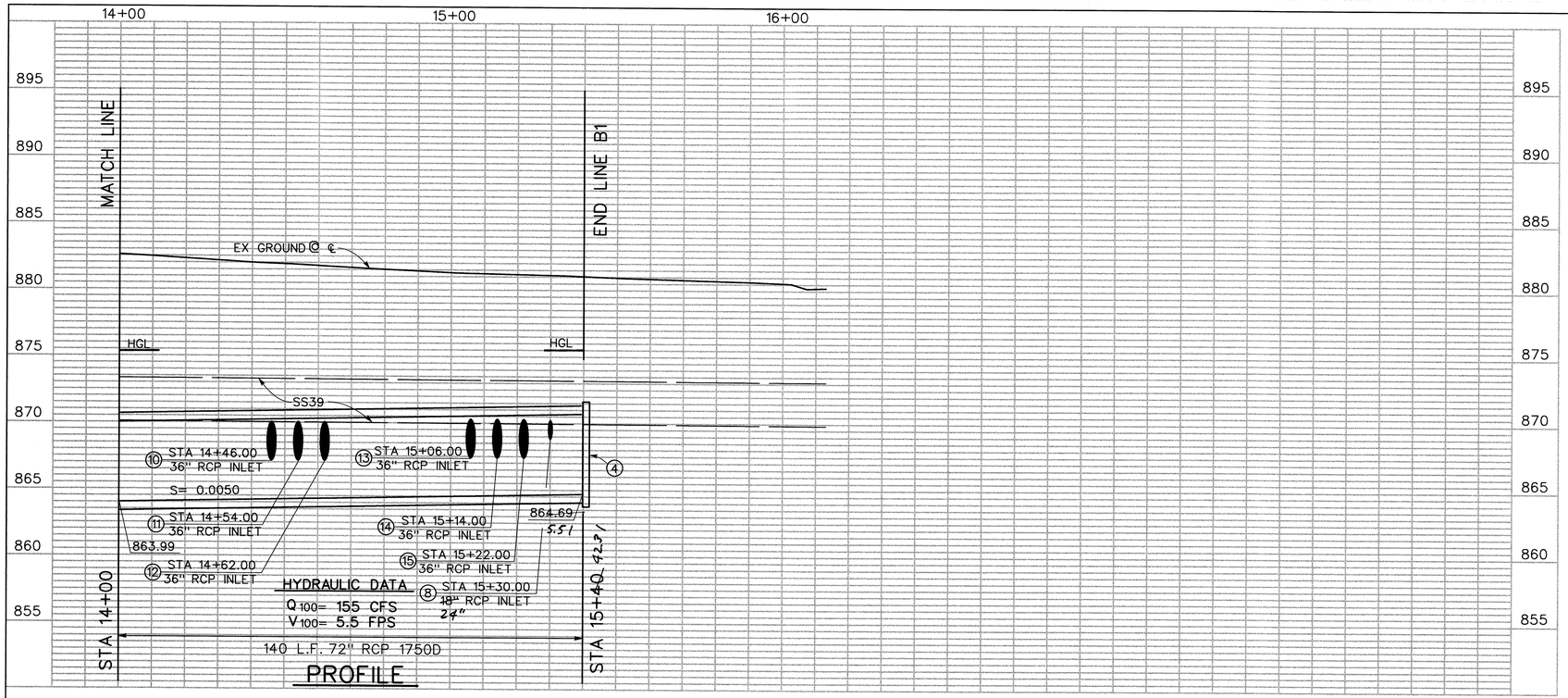
DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

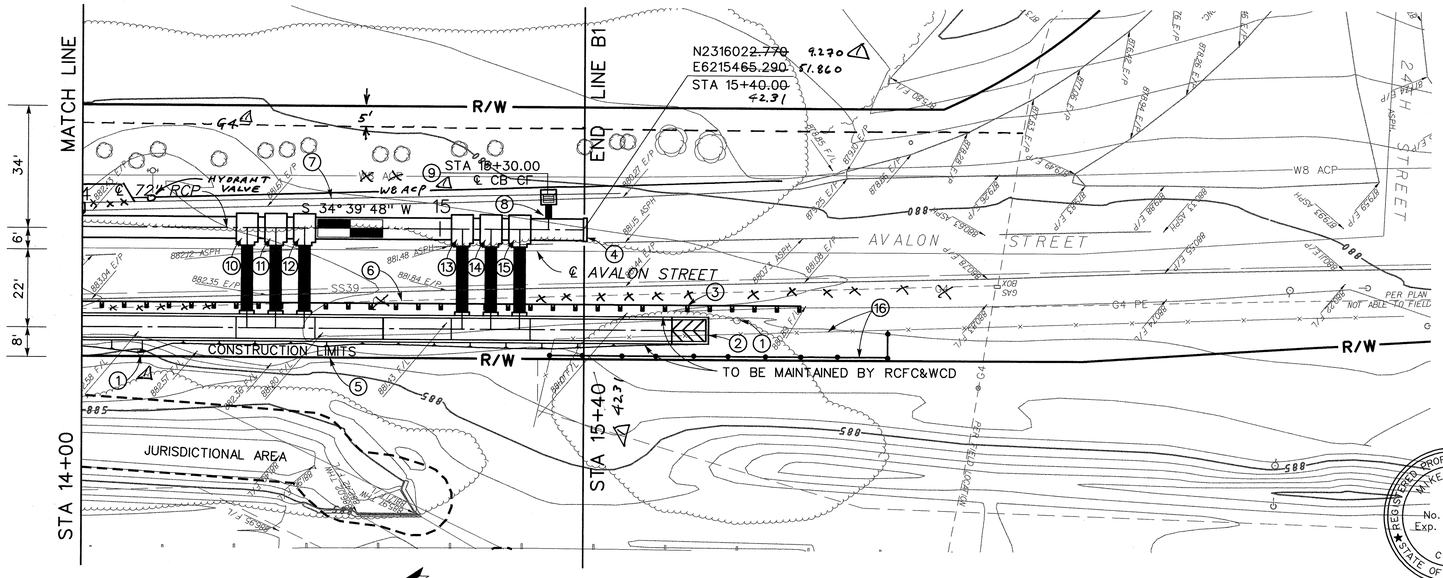
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN LINE B1 STORM DRAIN
STAGE 1
STA 10+00 TO STA 14+00

PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 22 OF 78

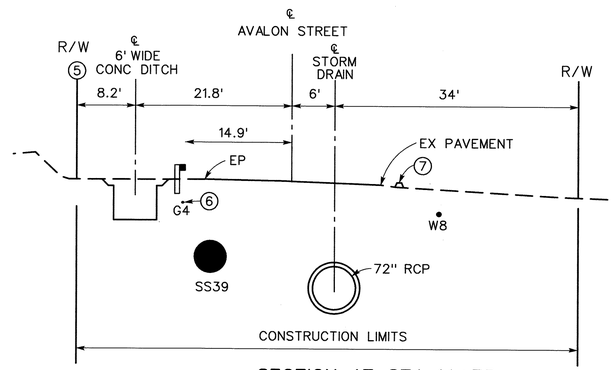




PLAN

20' 0 20'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 14+75

10' 0 10'

NOTES

① ELECTRIC POLE TO BE ~~RELOCATED BY OTHERS.~~ PROTECTED IN PLACE.

② CONSTRUCT 6' WIDE CONCRETE DITCH PER AVALON STREET INLET DETAILS ON SHEET 37.

③ INSTALL WOOD POST METAL BEAM GUARD RAILING SEE DETAILS ON SHEET 37.

④ SEAL RCP WITH CONCRETE BULKHEAD PER STD M816.

⑤ ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.

⑥ 4" GAS LINE TO BE RELOCATED BY OTHERS.

⑦ CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.

⑧ CONSTRUCT JS NO. 4 CASE 2 PER STD JS229, A= 90°, D= 24", ELEV S= 869.36.

⑨ CONSTRUCT COMBINATION INLET CATCH BASIN NO. 2 PER COUNTY STD NO. 302, W= 2' 11 3/8", H=3.5', 10.5LF – 18" RCP CLASS IV. SEE PROFILE ON SHEET 55.

⑩ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1', G= 3', L= 4.1', ELEV R= 868.71, ELEV S= 867.69. SEE PROFILE ON SHEET 52.

⑪ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1', G= 3', L= 4.1', ELEV R= 868.74, ELEV S= 867.72. SEE PROFILE ON SHEET 52.

⑫ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1', G= 3', L= 4.1', ELEV R= 868.77, ELEV S= 867.75. SEE PROFILE ON SHEET 53.

⑬ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1.1', G= 3', L= 4.1', ELEV R= 868.95, ELEV S= 867.94. SEE PROFILE ON SHEET 53.

⑭ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1.1', G= 3', L= 4.1', ELEV R= 868.97, ELEV S= 867.97. SEE PROFILE ON SHEET 54.

⑮ CONSTRUCT JS NO. 2 PER STD JS227, A= 90°, B= 36", C= 4.9', D= 72" E= 2', F= 1.1', G= 3', L= 4.1', ELEV R= 869.00, ELEV S= 868.00. SEE PROFILE ON SHEET 54.

⑯ REMOVE AND REPLACE EXISTING FENCE WITH CHAINLINK AT PROPERTY LINE AND AS SHOWN.

AS BUILT
APPROVED BY:
DATE 8/24/2011

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12–31–10 C IV IL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3–31–10 C IV IL STATE OF CALIFORNIA

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10743

SEE SHEET 21

REF.	REVISIONS	APPR.	DATE
1	PLOTTED TRUE LOCATION OF 4" GAS LINE & 8" ASBESTOS COATED PIPE; PROTECTED ELECTRIC POLE IN PLACE	DK	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

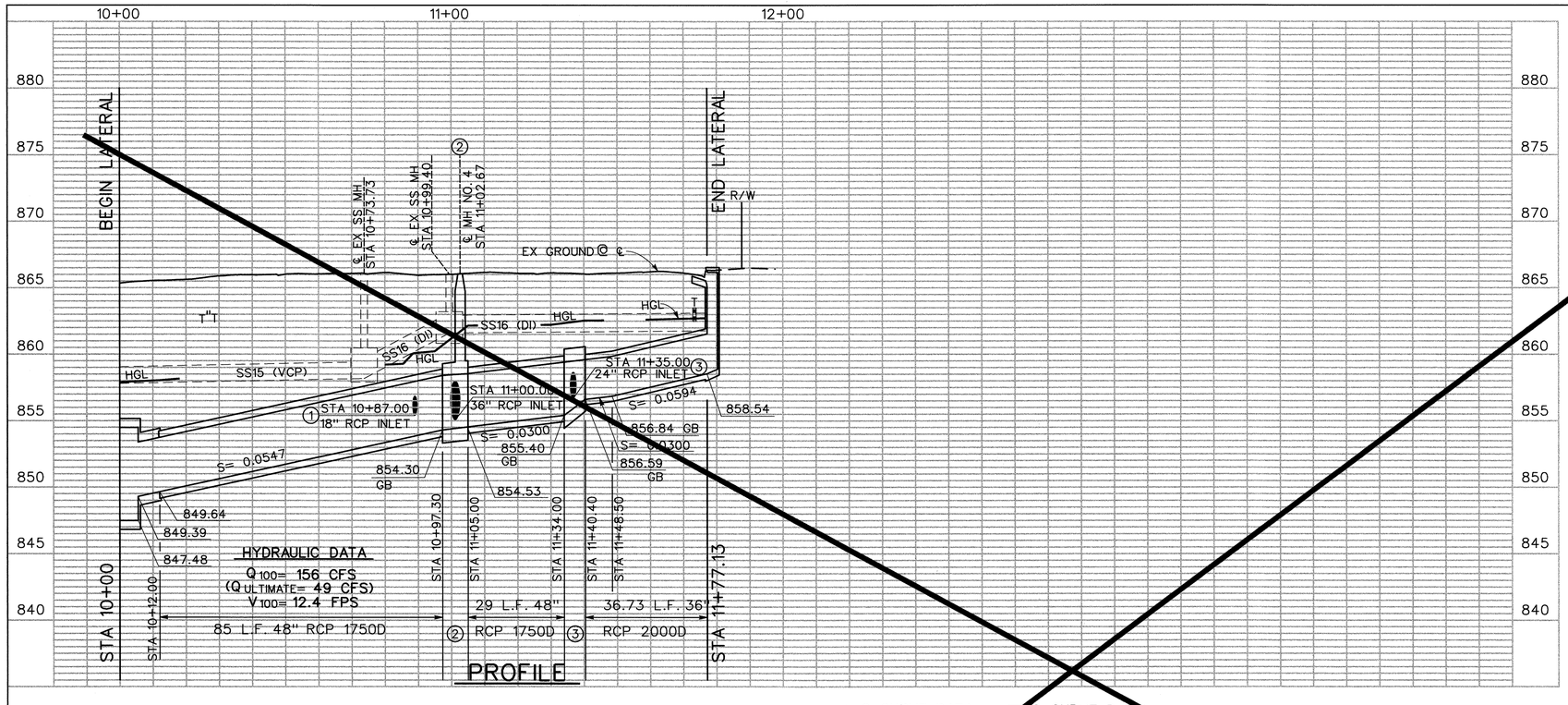
DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

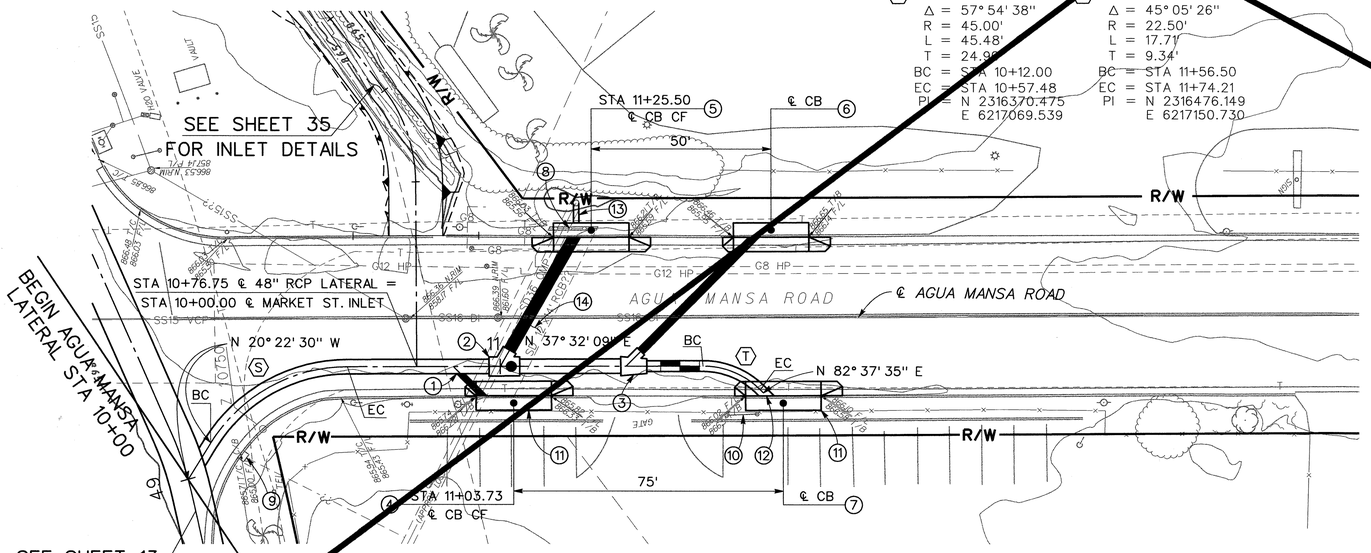
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN LINE B1 STORM DRAIN
STAGE 1
STA 14+00 TO STA 15+40

PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 23 OF 78

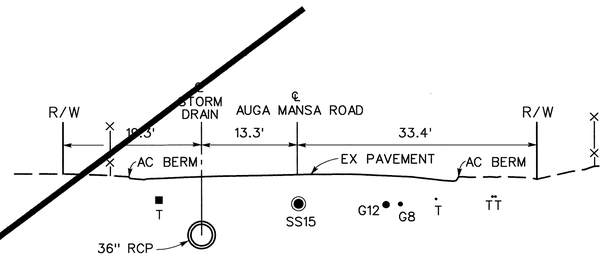




℄ CURVE DATA (S)
Δ = 57° 54' 38"
R = 45.00'
L = 45.48'
T = 24.98'
BC = STA 10+12.00
EC = STA 10+57.48
PI = N 2316370.475
E 6217069.539

℄ CURVE DATA (T)
Δ = 45° 05' 26"
R = 22.50'
L = 17.71'
T = 9.34'
BC = STA 11+56.50
EC = STA 11+74.21
PI = N 2316476.149
E 6217150.730

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 11+50

10' 0 10'

NOTES

① CONSTRUCT JS NO. 4 PER STD JS229, A= 45°, D= 18", ELEV S= 855.80.

② CONSTRUCT MH NO. 4 PER STD MH254, A= 60°, B= 36", C= 5.26', $D_1 = D_2 = 48"$, ELEV R= 855.20, ELEV S= 854.99.

③ CONSTRUCT TS NO. 3 PER STD TS303, A= 45°, B= 24", C= 5.86, $D_1 = 36"$ $D_2 = 48"$, ELEV R= 856.72, ELEV S= 856.61.

④ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8', W= 21' 10LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 46.

⑤ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8.5', W= 21' 37LF – 36" RCP 2000D. SEE PROFILE ON SHEET 46.

⑥ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 5.5', W= 21' 45LF – 24" RCP CLASS IV. SEE PROFILE ON SHEET 46.

⑦ CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8', W= 21' SEE PROFILE ABOVE.

⑧ REMOVE EXISTING GUARD RAIL.

⑨ PROTECT CATCH BASIN IN PLACE.

⑩ REMOVE AND RELOCATE SIGN.

⑪ REMOVE AND RELOCATE EXISTING FENCE AND GATE, AS DIRECTED BY ENGINEER.

⑫ CONSTRUCT SPECIAL CONNECTION PER STD CB109.

⑬ REMOVE INTERFERING PORTION OF CMP AND CONNECT EXISTING INLET TO PROPOSED CATCH BASIN WITH 18" RCP CLASS IV AS DIRECTED BY ENGINEER.

⑭ REMOVE INTERFERING PORTIONS OF CMP AND 12' X 14' RCB.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10750

SEE SHEET 13

REF.	REVISIONS	APPR.	DATE
⚠	SEE SHEET 24A.	GK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

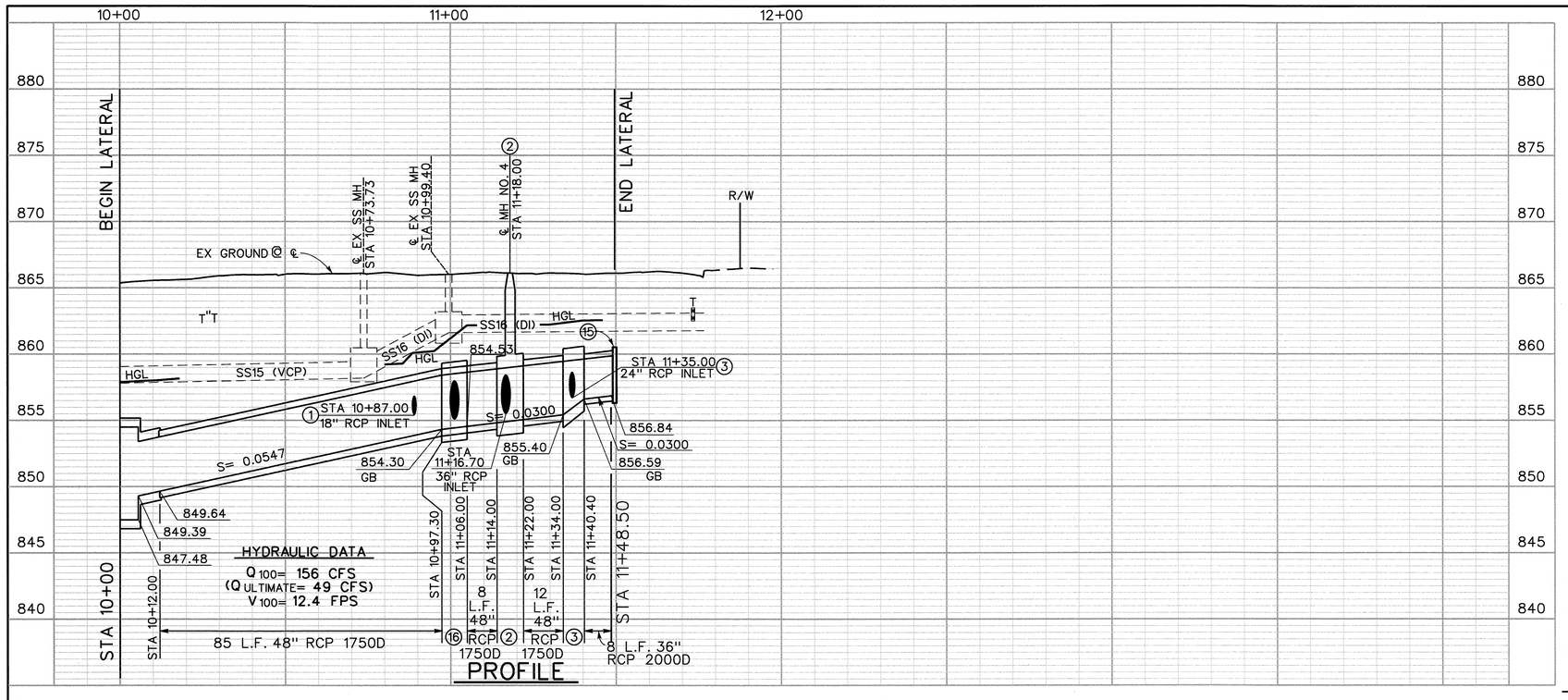
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

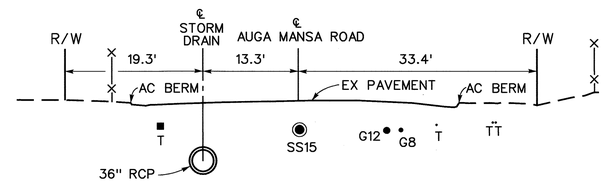
APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
(AGUA MANSA LATERAL)
STA 10+00 TO STA 11+77.13

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 24 OF 78

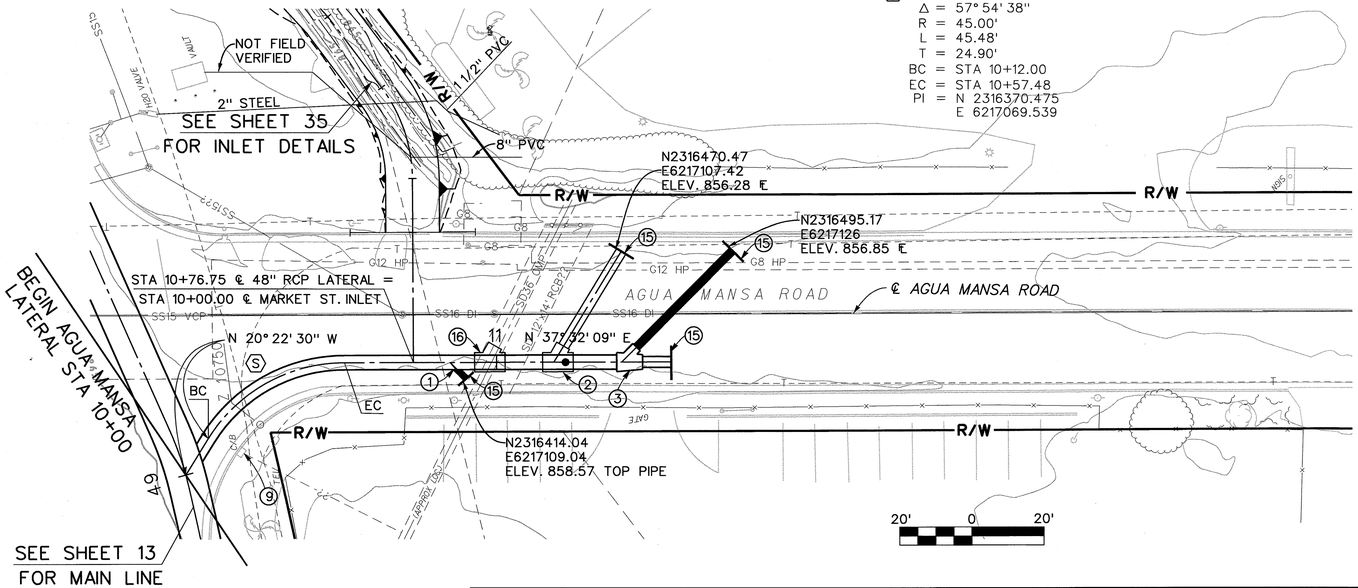


NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 11+50

10' 0 10'



PLAN

20' 0 20'

NOTES

1. CONSTRUCT JS NO. 4 PER STD JS229, A= 45°, D= 18", ELEV S= 855.80.
2. CONSTRUCT MH NO. 4 PER STD MH254, A= 60°, B= 36", C= 5.26', $D_1 = D_2 = 48"$,
3. CONSTRUCT TS NO. 3 PER STD TS303, A= 45°, B= 24", C= 5.86, $D_1 = 36"$ $D_2 = 48"$, ELEV R= 856.72, ELEV S= 856.61.
4. ~~CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8', W= 21' 10LF 24" RCP CLASS IV. SEE PROFILE ON SHEET 46.~~
5. ~~CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8.5', W= 21' 37LF 36" RCP 2000D. SEE PROFILE ON SHEET 46.~~
6. ~~CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 5.5', W= 21' 45LF 24" RCP CLASS IV. SEE PROFILE ON SHEET 46.~~
7. ~~CONSTRUCT CURB INLET CATCH BASIN PER COUNTY STD NO. 300. H= 8', W= 21' SEE PROFILE ABOVE.~~
8. REMOVE EXISTING GUARD RAIL.
9. PROTECT CATCH BASIN IN PLACE.
10. ~~REMOVE AND RELOCATE SIGN.~~
11. ~~REMOVE AND RELOCATE EXISTING FENCE AND GATE, AS DIRECTED BY ENGINEER.~~
12. ~~CONSTRUCT SPECIAL CONNECTION PER STD CB109.~~
13. ~~REMOVE INTERFERING PORTION OF CMP AND CONNECT EXISTING INLET TO PROPOSED CATCH BASIN WITH 18" RCP CLASS IV AS DIRECTED BY ENGINEER.~~
14. REMOVE INTERFERING PORTIONS OF CMP AND 12' X 14' RCB AND PLUG.
15. CONSTRUCT CONCRETE BULKHEAD PER RCFC STD DWG NO. M816.
16. CONSTRUCT T.S. NO. 3 AND TIE INTO EXISTING 36" CMP B=36" $D_1 = D_2 = 48"$

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2014

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10750

SEE SHEET 13

REF.	REVISIONS	APPR.	DATE
1	THIS SHEET SUPERCEDES SHEET 24	OK	8/26/14

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

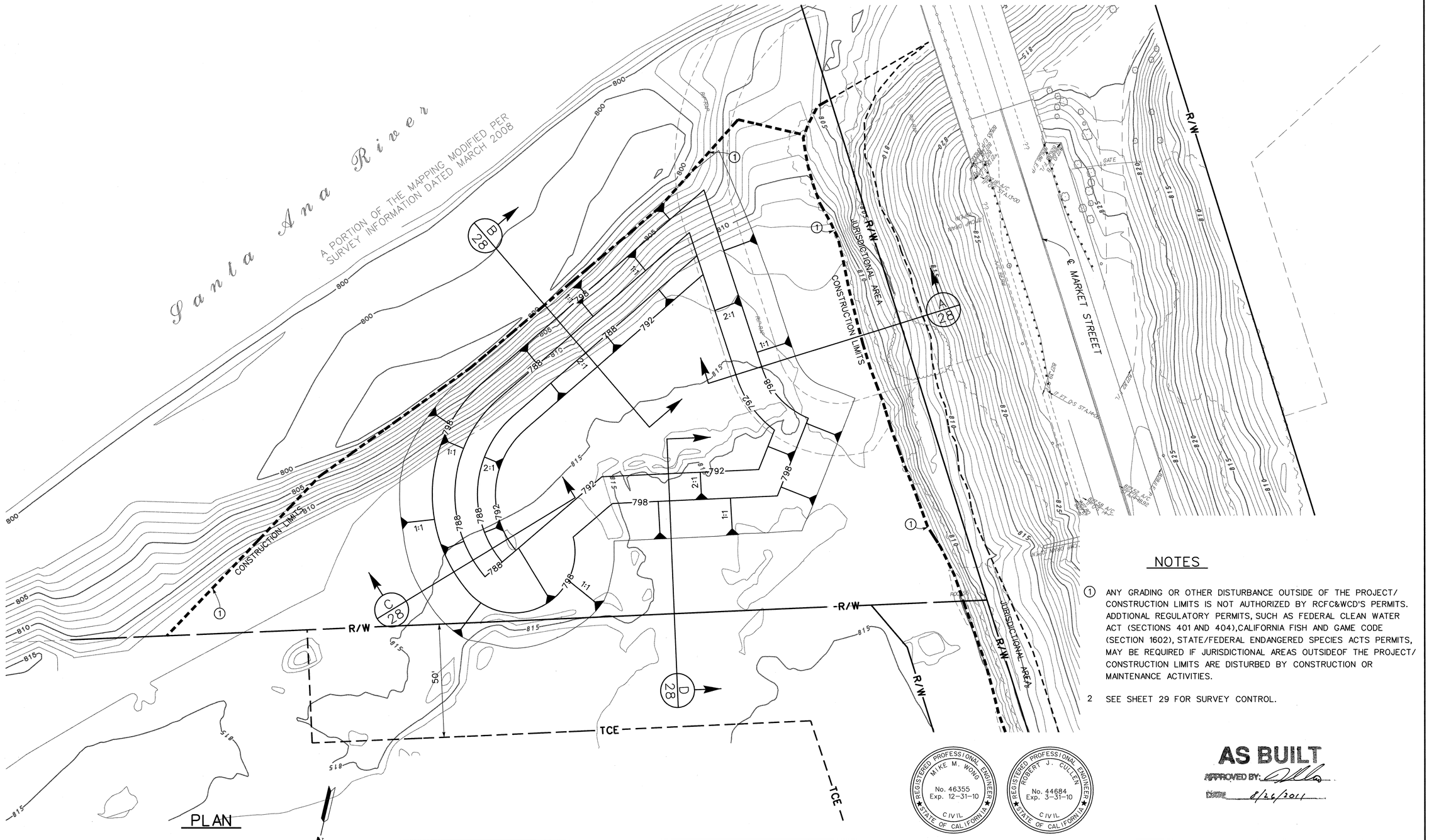
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: DATE: R.E. No. 46355

APPROVED BY: DATE: R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
(AGUA MANSA LATERAL)
STA 10+00 TO STA 11+77.13

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 24A OF 78



NOTES

1. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/ CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDTIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404),CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDEOF THE PROJECT/ CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
2. SEE SHEET 29 FOR SURVEY CONTROL.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CUILLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

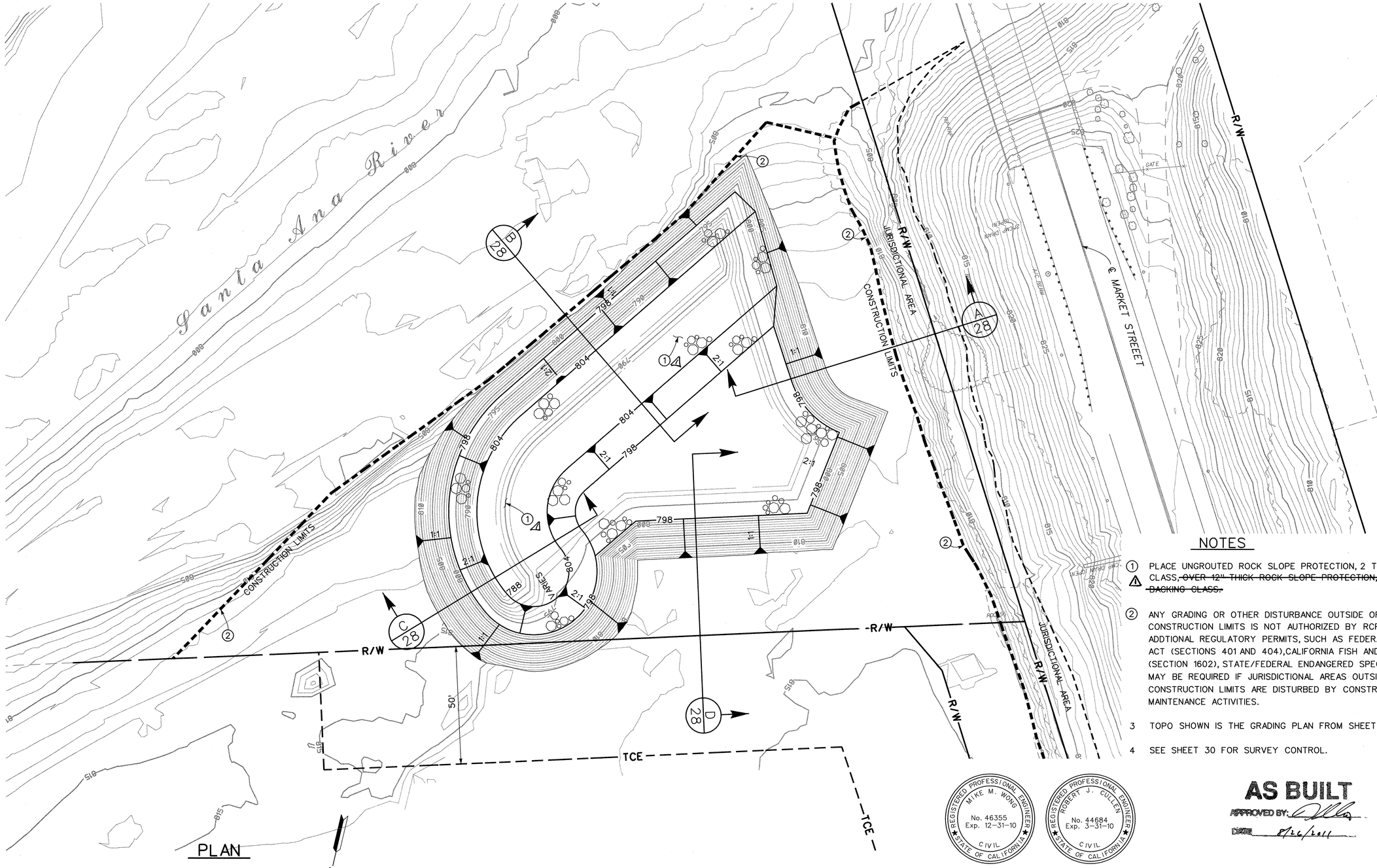
DESIGNED BY: K.W.G. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
OUTLET DETAILS – EXCAVATION

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 25 OF 78



PLAN

20' 0 20'

N

NOTES

1. ① PLACE UNGROUTED ROCK SLOPE PROTECTION, 2 TON CLASS, ~~OVER 12" THICK ROCK SLOPE PROTECTION, NO. 1 BACKING CLASS.~~
2. ② ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/ CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDTIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404),CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDEOF THE PROJECT/ CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
3. TOPO SHOWN IS THE GRADING PLAN FROM SHEET 25.
4. SEE SHEET 30 FOR SURVEY CONTROL.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
⚠	CHANGE NOTE	DB	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

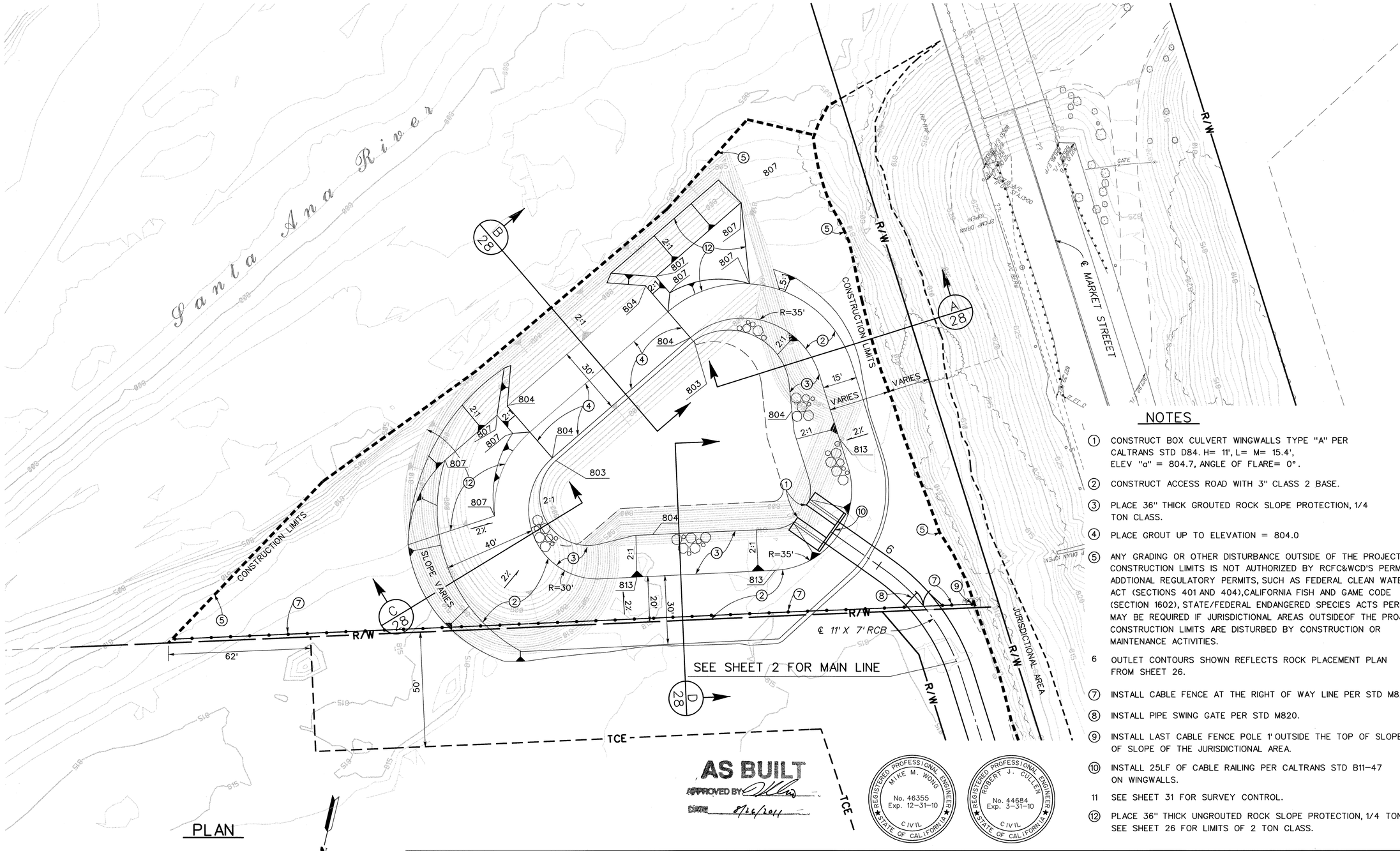
DESIGNED BY: K.W.G. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
OUTLET DETAILS – ROCK PLACEMENT

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 26 OF 78



NOTES

1. CONSTRUCT BOX CULVERT WINGWALLS TYPE "A" PER CALTRANS STD D84. H= 11', L= M= 15.4', ELEV "a" = 804.7, ANGLE OF FLARE= 0°.
2. CONSTRUCT ACCESS ROAD WITH 3" CLASS 2 BASE.
3. PLACE 36" THICK GROUTED ROCK SLOPE PROTECTION, 1/4 TON CLASS.
4. PLACE GROUT UP TO ELEVATION = 804.0
5. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/ CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDTIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404),CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDEOF THE PROJECT/ CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
6. OUTLET CONTOURS SHOWN REFLECTS ROCK PLACEMENT PLAN FROM SHEET 26.
7. INSTALL CABLE FENCE AT THE RIGHT OF WAY LINE PER STD M826.
8. INSTALL PIPE SWING GATE PER STD M820.
9. INSTALL LAST CABLE FENCE POLE 1' OUTSIDE THE TOP OF SLOPE OF SLOPE OF THE JURISDICTIONAL AREA.
10. INSTALL 25LF OF CABLE RAILING PER CALTRANS STD B11-47 ON WINGWALLS.
11. SEE SHEET 31 FOR SURVEY CONTROL.
12. PLACE 36" THICK UNGROUTED ROCK SLOPE PROTECTION, 1/4 TON CLASS. SEE SHEET 26 FOR LIMITS OF 2 TON CLASS.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIV IL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIV IL — STATE OF CALIFORNIA

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.

TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

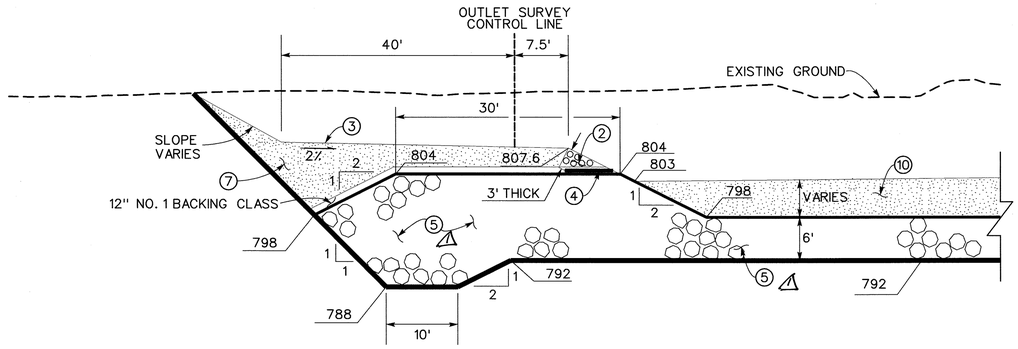
DESIGNED BY: K.W.G. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/27/09 R.E. No. 46355

APPROVED BY: Robert Cullen
DATE: 27 APR 09 R.E. No. 44684

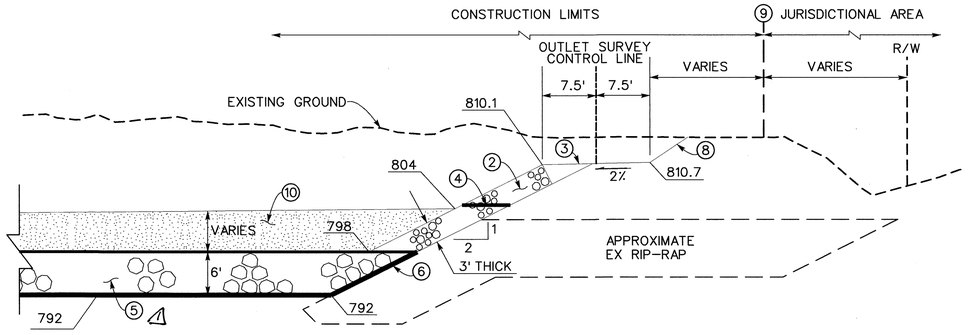
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
OUTLET DETAILS – FINISHED SURFACE

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 27 OF 78



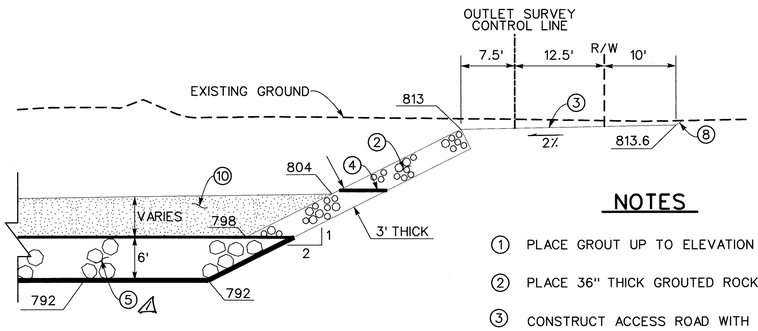
SECTION C 25-27

10' 0 10'



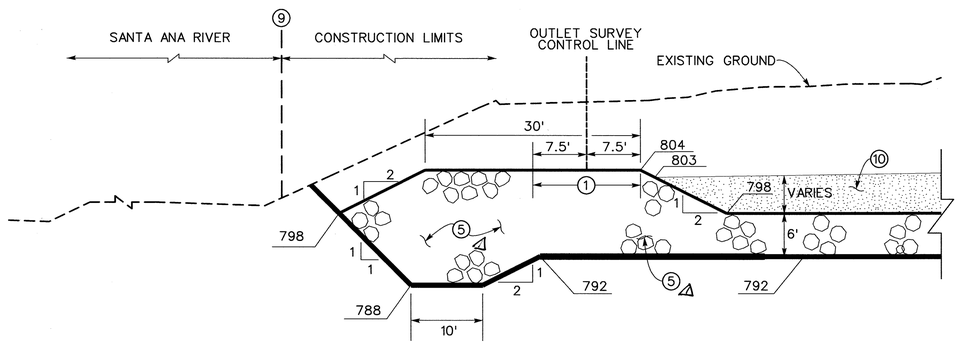
SECTION A 25-27

10' 0 10'



SECTION D 25-27

10' 0 10'



SECTION B 25-27

10' 0 10'

LINE TYPE LEGEND

- EXCAVATION (SHEET 25)
- ROCK PLACEMENT (SHEET 26)
- FINISHED SURFACE (SHEET 27)

AS BUILT
APPROVED BY:
DATE 8/26/2011

NOTES

1. PLACE GROUT UP TO ELEVATION 804. POUR FLUSH TO SURFACE.
2. PLACE 36" THICK GROUTED ROCK SLOPE PROTECTION, 1/4 TON CLASS.
3. CONSTRUCT ACCESS ROAD WITH 3" CLASS 2 BASE. (SEE SHEET 27)
4. INSTALL WEEPHOLES @ 10' ON CENTER PER STD CH326.
5. ⚠ PLACE ROCK SLOPE PROTECTION, 2 TON CLASS, ~~OVER 12" THICK FILTER BLANKET, NO. 1 BACKING CLASS OVER ROCK PROTECTION FABRIC. (SEE SHEET 26)~~
6. MAKE CONNECTION TO EXISTING RIP-RAP.
7. BACKFILL WITH NATIVE MATERIAL OVER 12" THICK FILTER BLANKET, NO. 1 BACKING CLASS.
8. CUT/FILL SLOPE AT 2:1 TO EXISTING GROUND.
9. ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.
10. BACKFILL WITH NON-COMPACTED NATIVE MATERIAL.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

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TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
⚠	NOTE CHANGED		8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

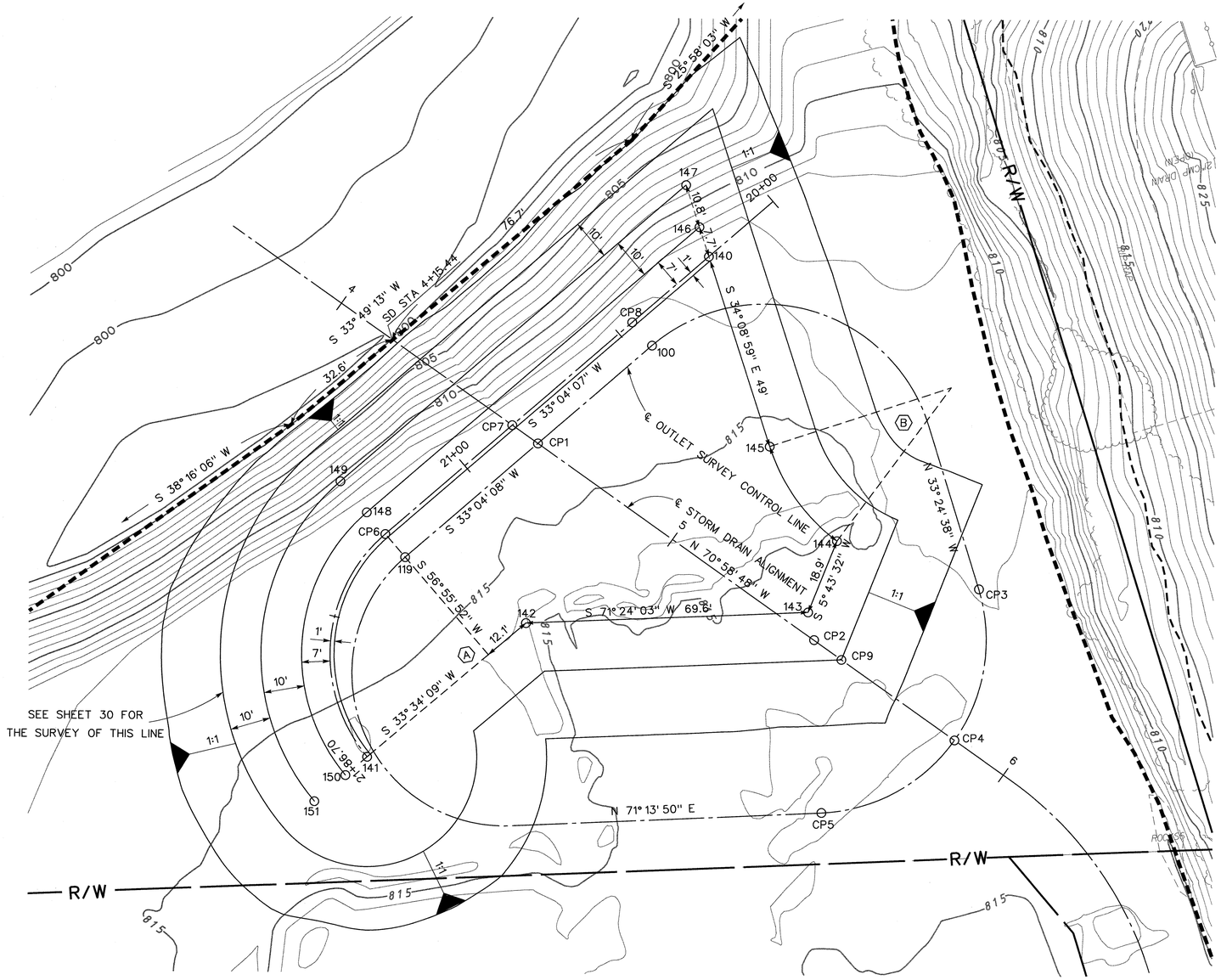
DESIGNED BY: K.W.G. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert J. Cullen
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
OUTLET CROSS SECTIONS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 28 OF 78



CURVE DATA		Ⓐ	Ⓑ
R		39.00'	47.00'
Δ		89° 29' 58"	35° 19' 56"
L		60.92'	28.98'
T		38.66'	14.97'
B.C. PT.#		CP6	144
E.C. PT.#		141	145
P.I.	NORTHING	2312550.72	2312483.57
	EASTING	6219049.40	6218936.49

POINT NUMBER	DESCRIPTION	ELEV.
CONTROL POINT 1	CONTROL LINE STA 10+00 = SD STA 4+59.34	804.00
CONTROL POINT 2	SD STA 5+42.75 (NOT USED FOR THIS SURVEY)	803.68
CONTROL POINT 3	CONTROL LINE STA 11+63.06	813.15
CONTROL POINT 4	CONTROL LINE STA 12+01.96 = SD STA 5+85.24	813.15
CONTROL POINT 5	CONTROL LINE STA 12+40.68	813.15
CONTROL POINT 6	STA 21+25.78 = OFFSET CONTROL LINE STA 14+10.11	804.00
CONTROL POINT 7	STA 20+84.59 = SD STA 14+51.61	804.00
CONTROL POINT 8	STA 20+45.68 = OFFSET CONTROL LINE STA 10+36.97	804.00
CONTROL POINT 9	SD STA 5+51.06	798.00
140	STA 20+20.80	792.00
141	STA 21+86.70	792.00
142	SEE BEARING AND DISTANCE ON THIS SHEET	792.00
143	SEE BEARING AND DISTANCE ON THIS SHEET	792.00
144	SEE BEARING AND DISTANCE ON THIS SHEET	792.00
145	SEE BEARING AND DISTANCE ON THIS SHEET	792.00
146	SEE BEARING AND DISTANCE ON THIS SHEET	
147	SEE BEARING AND DISTANCE ON THIS SHEET	
148	7' OFFSET FROM POINT CP6	
149	10' OFFSET FROM POINT 148	
150	7' OFFSET FROM POINT 141	
151	10' OFFSET FROM POINT 150	

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
STATE OF CALIFORNIA
CIVIL

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
STATE OF CALIFORNIA
CIVIL

AS BUILT
APPROVED BY:
DATE 6/14/2011

PLAN
N.T.S

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1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

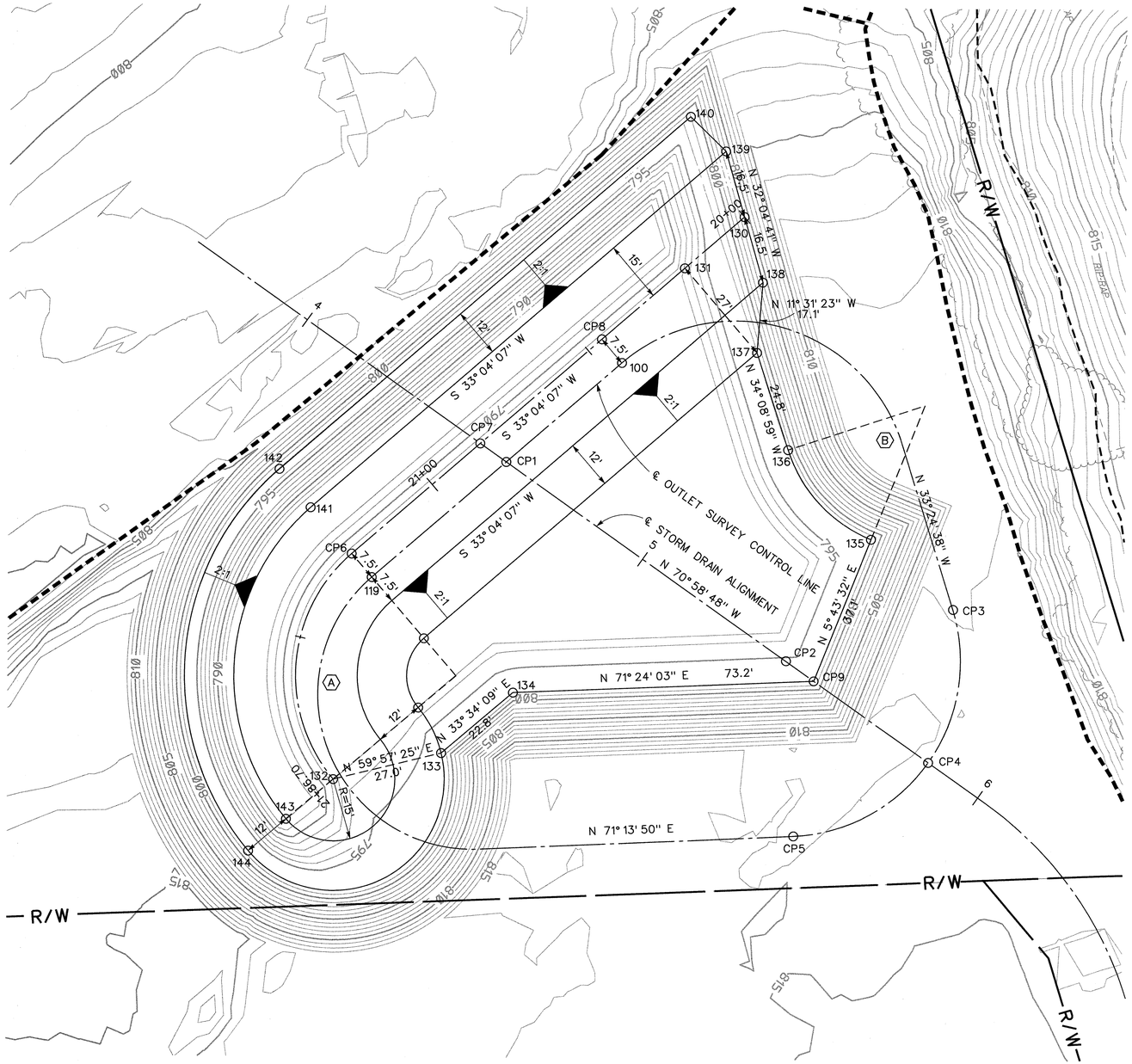
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
SURVEY CONTROL – EXCAVATION

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 29 OF 78



PLAN

N.T.S.

CURVE DATA		Ⓐ	Ⓑ
R		39.00'	35.00'
∠		89° 29' 58"	50° 07' 30"
L		60.92'	30.62'
T		38.66'	16.37'
B.C. PT.#		CP6	135
E.C. PT.#		132	136
P.I.	NORTHING	2312551.00	2312478.00
	EASTING	6219050.78	6218925.78

POINT NUMBER	DESCRIPTION	ELEV.
CONTROL POINT 1	CONTROL LINE STA 10+00 = SD STA 4+59.34	804.00
CONTROL POINT 2	SD STA 5+42.75 (NOT USED FOR THIS SURVEY)	803.68
CONTROL POINT 3	CONTROL LINE STA 11+63.13	813.15
CONTROL POINT 4	CONTROL LINE STA 12+01.96 = SD STA 5+85.24	813.15
CONTROL POINT 5	CONTROL LINE STA 12+40.68	813.15
CONTROL POINT 6	STA 21+25.78 = OFFSET CONTROL LINE STA 14+10.11	804.00
CONTROL POINT 7	STA 20+84.59 = SD STA 14+51.61	804.00
CONTROL POINT 8	STA 20+45.68 = OFFSET CONTROL LINE STA 10+36.97	804.00
CONTROL POINT 9	SD STA 5+51.06	798.00
130	STA 20+00	804.00
131	STA 20+19.12	804.00
132	STA 21+86.70	804.00
133	SEE BEARING AND DISTANCE ON THIS SHEET	798.00
134	SEE BEARING AND DISTANCE ON THIS SHEET	798.00
135	SEE BEARING AND DISTANCE ON THIS SHEET	798.00
136	SEE BEARING AND DISTANCE ON THIS SHEET	798.00
137	SEE BEARING AND DISTANCE ON THIS SHEET	798.00
138	SEE BEARING AND DISTANCE ON THIS SHEET	
139	SEE BEARING AND DISTANCE ON THIS SHEET	
140	12' OFFSET FROM POINT 139	
141	15' OFFSET FROM POINT CP6	
142	12' OFFSET FROM POINT 141	
143	15' OFFSET FROM POINT 132	
144	12' OFFSET FROM POINT 143	

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12-31-10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3-31-10 — CIVIL — STATE OF CALIFORNIA

AS BUILT

APPROVED BY:

DATE 8/24/2011

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TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

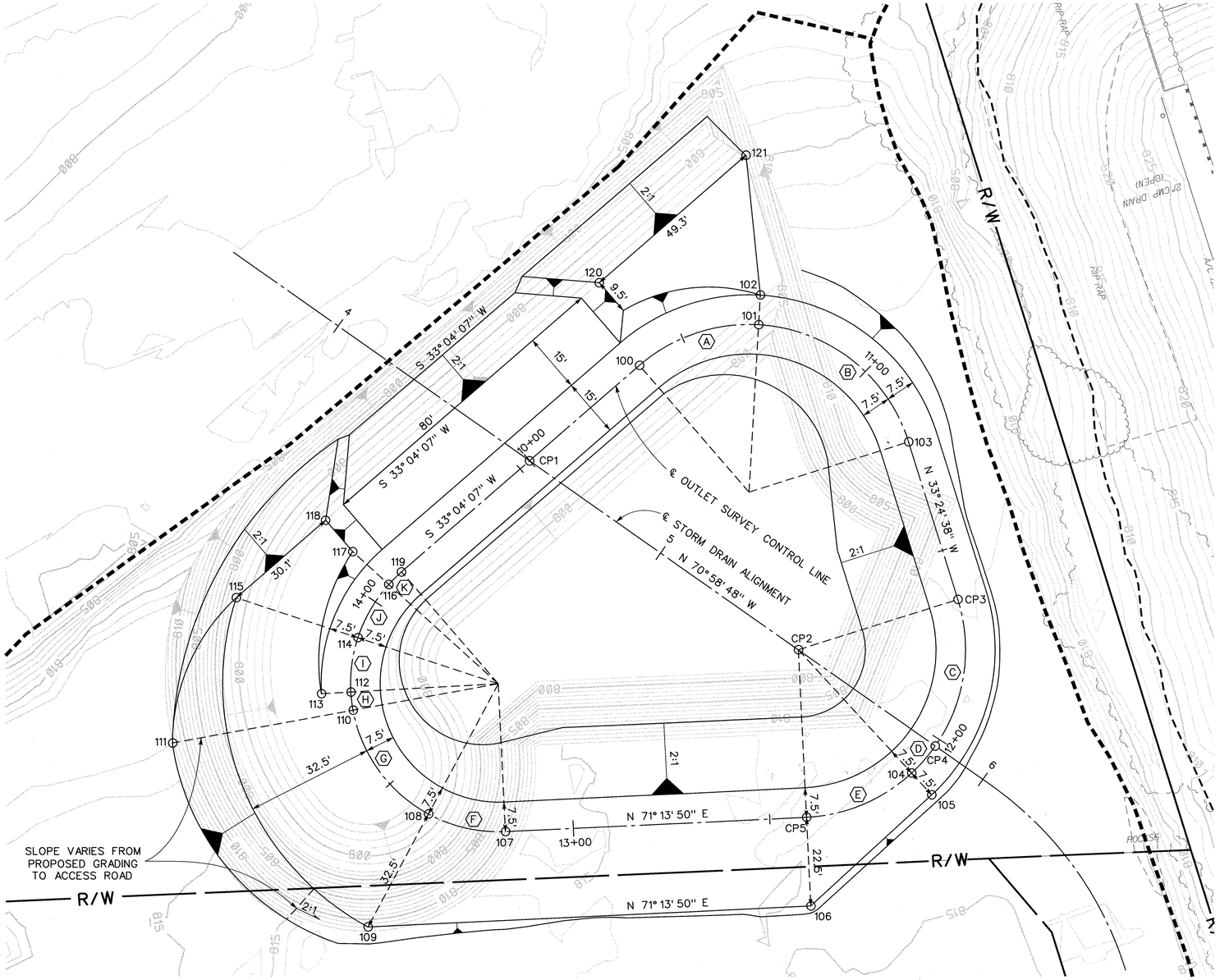
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
SURVEY CONTROL – ROCK PLACEMENT

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 30 OF 78



CURVE DATA		Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ
R		42.50'	42.50'	42.50'	42.50'	42.50'
∆		44° 14' 13"	69° 17' 02"	52° 25' 43"	12° 21' 14"	39° 51' 31"
L		32.82'	51.39'	38.90'	9.15'	29.57'
T		17.27'	29.37'	20.94'	4.59'	15.41'
B.C. PT.#		100	101	CP 3	CP 4	104
E.C. PT.#		101	103	CP 4	104	CP 5
P.I.	NORTHING	2312441.16	2312430.91	2312507.85	2312531.98	2312542.84
	EASTING	6218970.31	6218924.81	6218874.05	6218882.38	6218897.79

CURVE DATA		Ⓕ	Ⓖ	Ⓗ	Ⓘ	Ⓙ	Ⓚ
R		37.50'	37.50'	37.50'	37.50'	37.50'	37.50'
∆		31° 00' 10"	51° 23' 16"	07° 04' 55"	21° 21' 47"	24° 05' 17"	06° 54' 52"
L		20.29'	33.28'	4.64'	13.98'	15.77'	4.52'
T		10.40'	18.04'	2.32'	7.07'	8.00'	2.27'
B.C. PT.#		107	108	110	112	114	116
E.C. PT.#		108	110	112	114	116	119
P.I.	NORTHING	2312582.01	2312575.99	2312557.74	2312548.88	2312533.81	2312524.60
	EASTING	6218989.76	6219017.55	6219026.60	6219029.71	6219029.16	6219024.64

POINT NUMBER	DESCRIPTION	ELEV.
CONTROL POINT 1	CONTROL LINE STA 10+00 = SD STA 4+57.34	804.00
CONTROL POINT 2	SD STA 5+40.74	803.68
CONTROL POINT 3	CONTROL LINE STA 11+63.06	813.15
CONTROL POINT 4	CONTROL LINE STA 12+01.96 = SD STA 5+83.24	813.15
CONTROL POINT 5	CONTROL LINE STA 12+40.68	813.15
100	CONTROL LINE STA 10+36.97	804.00
101	CONTROL LINE STA 10+69.79	806.85
102	CONTROL LINE STA 10+69.79	807.00
103	CONTROL LINE STA 11+21.18	811.08
104	CONTROL LINE STA 12+11.11	813.15
105	CONTROL LINE STA 12+11.11	813.30
106	CONTROL LINE STA 12+40.68	813.60
107	CONTROL LINE STA 13+17.28	811.57
108	CONTROL LINE STA 13+37.57	809.95
109	CONTROL LINE STA 13+37.57	810.60
110	CONTROL LINE STA 13+71.20	807.26
111	CONTROL LINE STA 13+71.20	813.00
112	CONTROL LINE STA 13+75.84	806.89
113	CONTROL LINE STA 13+75.84	807.04
114	CONTROL LINE STA 13+89.82	805.77
115	CONTROL LINE STA 13+89.82	807.00
116	CONTROL LINE STA 14+05.59	804.51
117	CONTROL LINE STA 14+05.59	807.00
118	SEE BEARING AND DISTANCE ON THIS SHEET	807.00
119	CONTROL LINE STA 14+10.11	804.00
120	SEE BEARING AND DISTANCE ON THIS SHEET	807.00
121	SEE BEARING AND DISTANCE ON THIS SHEET	807.00

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/24/2011

PLAN
N.T.S.

N

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

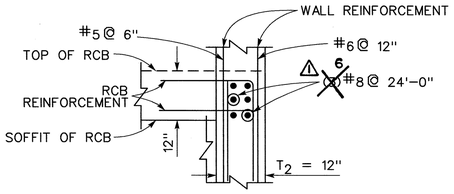
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 21-April-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
SURVEY CONTROL – FINISHED SURFACE

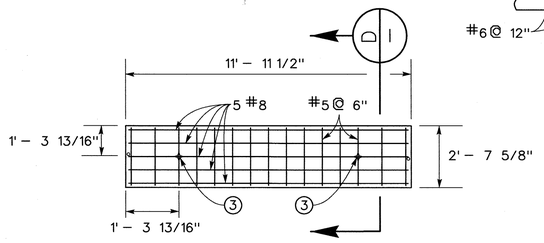
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 31 OF 78



SOFFIT–WALL BEAM DETAIL

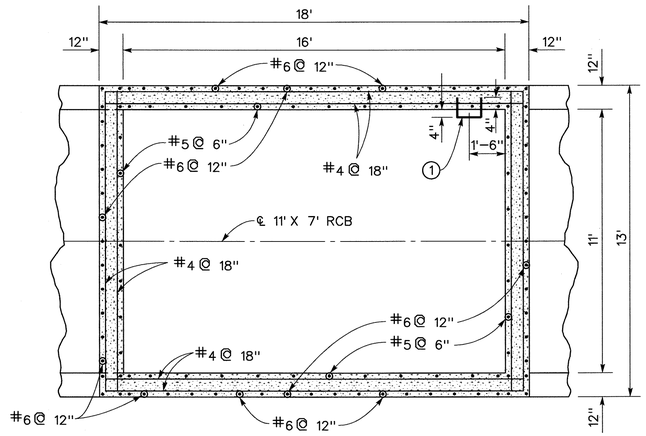
DETAIL E

N.T.S.



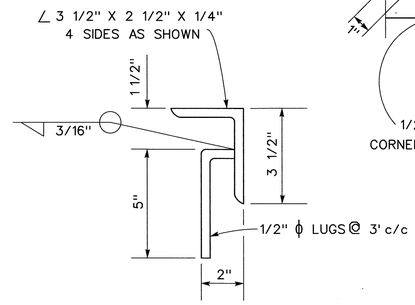
COVER PANEL DETAIL

N.T.S.



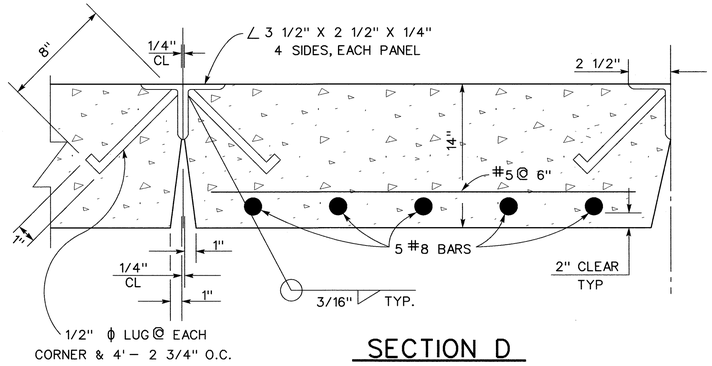
SECTION B

N.T.S.



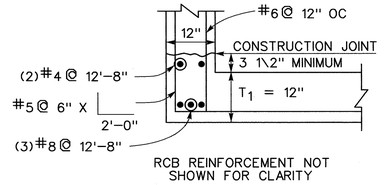
ANGLE & ANCHOR DETAIL

N.T.S.



SECTION D

N.T.S.

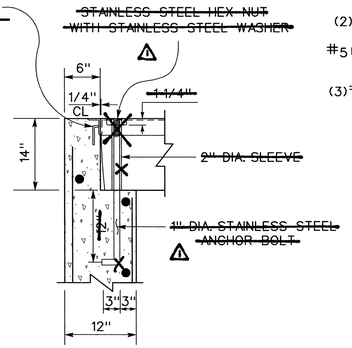


RCB REINFORCEMENT NOT SHOWN FOR CLARITY

EDGE BEAM DETAIL

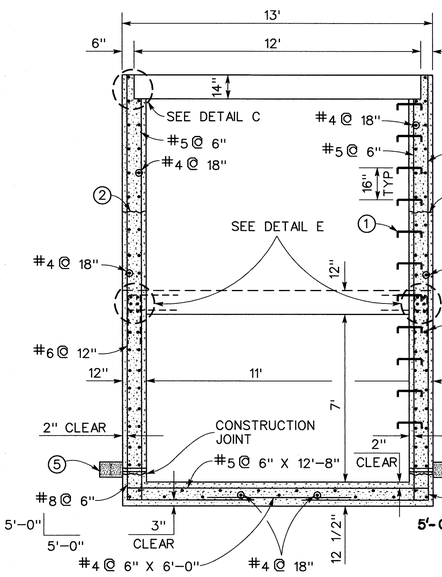
DETAIL F

N.T.S.



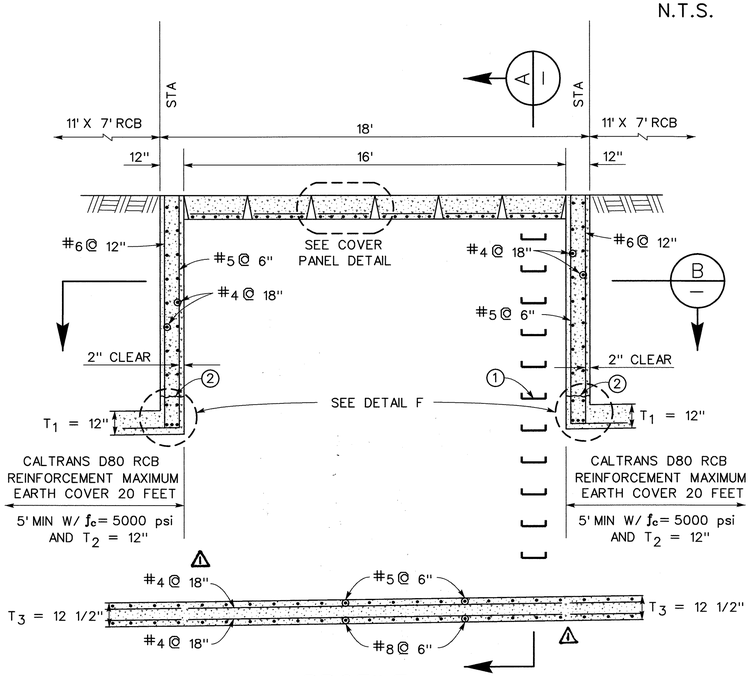
DETAIL C

1' 0 1'



SECTION A

N.T.S.



PROFILE

N.T.S.

DESIGN DATA

LIVELOAD = HS20–44

SOIL DENSITY = 130 # /FT^3

MAXIMUM WALL HEIGHT = 17.5'

ALLOWABLE STRESSES:

f_c = 5000 psi

f'_c = 2250 psi

f_s = 60,000 psi

f_y = 24,000 psi

AS BUILT

APPROVED BY:

DATE 8/26/2011

NOTES

1. STANDARD DROP STEP PER STD MH259.
2. REQUIRED CONSTRUCTION JOINT.
3. INSTALL 2–UPPER–LIFT II LIFTING DEVICES BY THE BURKE COMPANY OR APPROVED EQUAL.
4. FOR MANHOLE ELEVATIONS, STATIONS AND WALL HEIGHTS SEE PLAN AND PROFILE.
5. CONSTRUCT WEEPHOLES PER STD CH326.

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TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	CHANGE BAR SIZE	DK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: L. F. & K. A.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN

STAGE 1

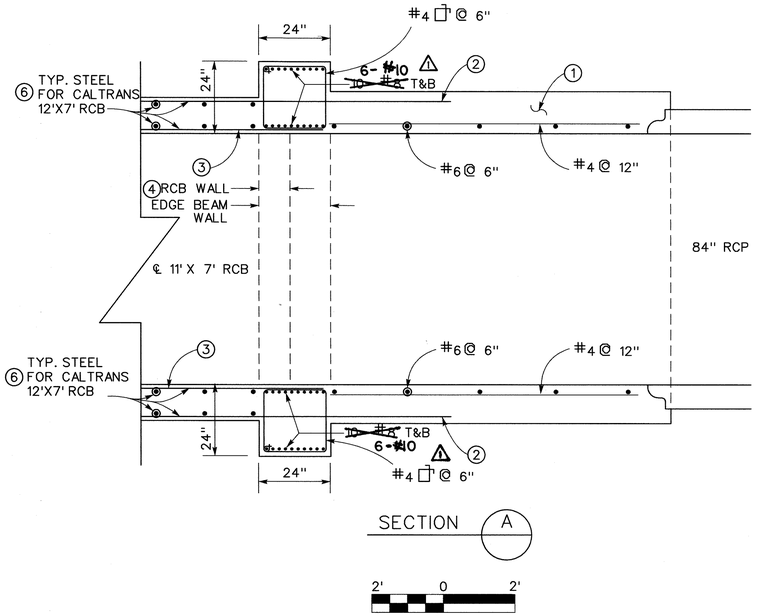
STRUCTURAL DETAILS

ACCESS MANHOLE

PROJECT NO. 1–0–0148

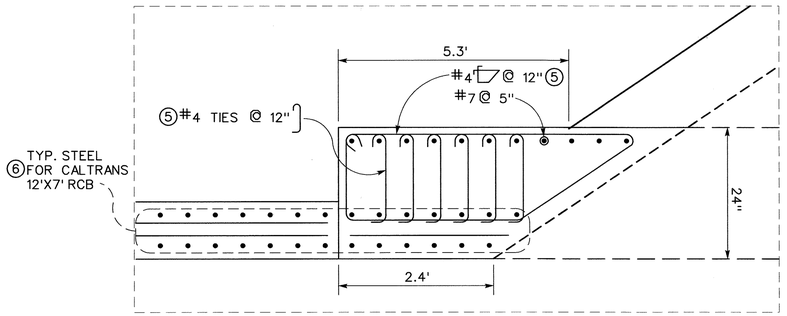
DRAWING NO. 1–637

SHEET NO. 32 OF 78

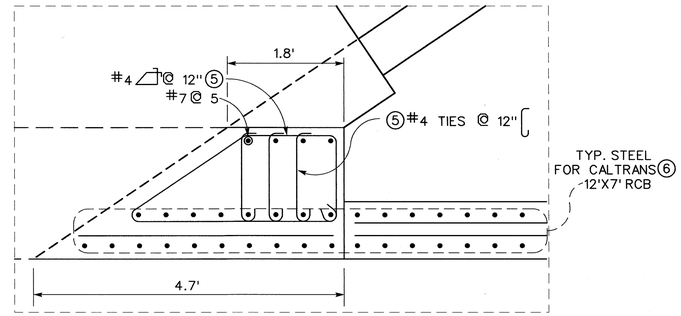


SECTION A

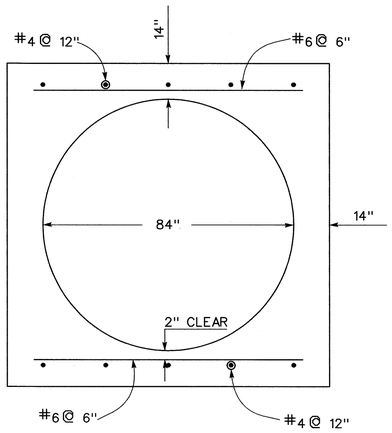
2' 0 2'



DETAIL C NTS

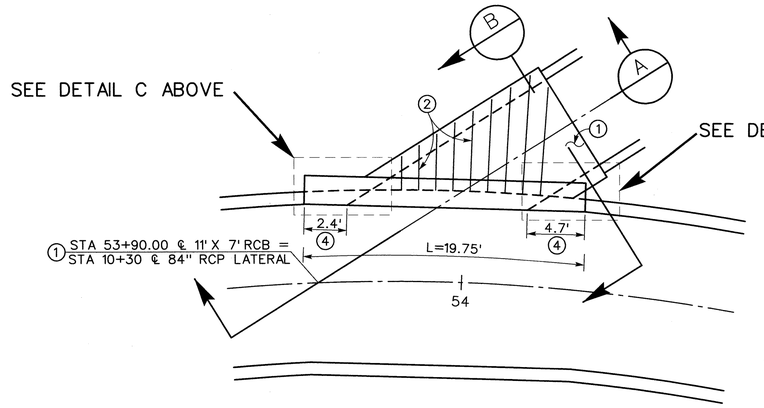


DETAIL D NTS



SECTION B

2' 0 2'



PLAN

5' 0 5'

NOTES

1. CONSTRUCT MODIFIED JS NO. 1, A= 30°, B= 84", C=21.87', ELEV R= 849.03, ELEV S= 848.97. SEE STRUCTURAL DETAILS ON THIS SHEET.
2. EXTEND RCB b & c BARS STRAIGHT INTO TOP AND BOTTOM OF JUNCTION STRUCTURE AND CUT TO PROVIDE CLEAR COVER.
3. EXTEND RCB a BAR.
4. THE WALL OF THE RCB SHALL BE INCREASED TO 24" TO MATCH THE THICKNESS OF THE EDGE BEAM.
5. #4 TIES SHALL BE PLACED IN THE WALL FROM THE BOX SOFFIT TO INVERT.
6. STEEL PATTERN SHALL CONFROM TO CALTRANS STD. D80. USE 20' COVER.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

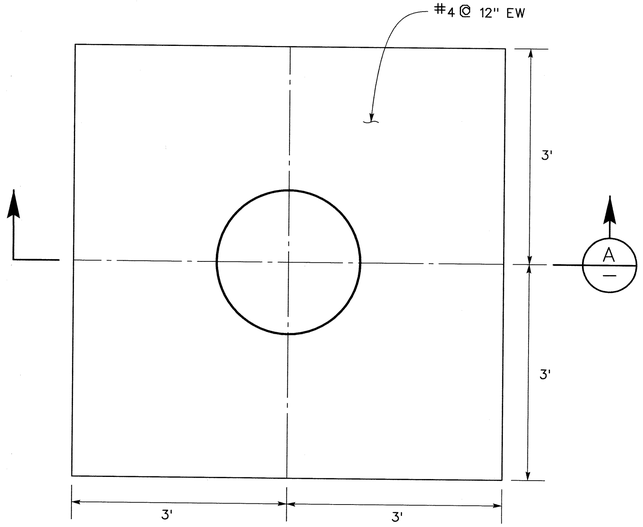
REF.	REVISIONS	APPR.	DATE
1	CHANGE BAR SIZE AND SPACING	OK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: K. GHODS & M.W.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355
APPROVED BY: DATE 22-APR-09 R.E. No. 44684

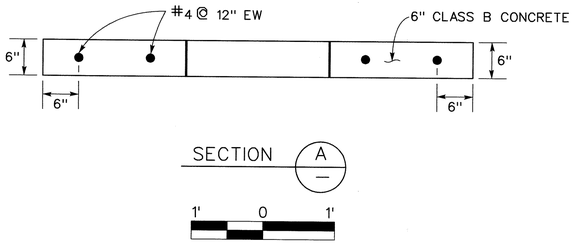
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STRUCTURAL DETAILS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 33 OF 78

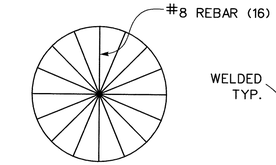


PLAN VIEW

1' 0 1'

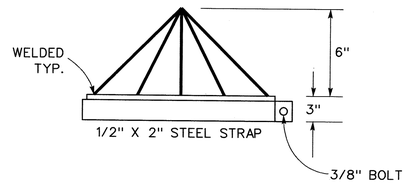


CONCRETE PAD DETAIL



TOP VIEW

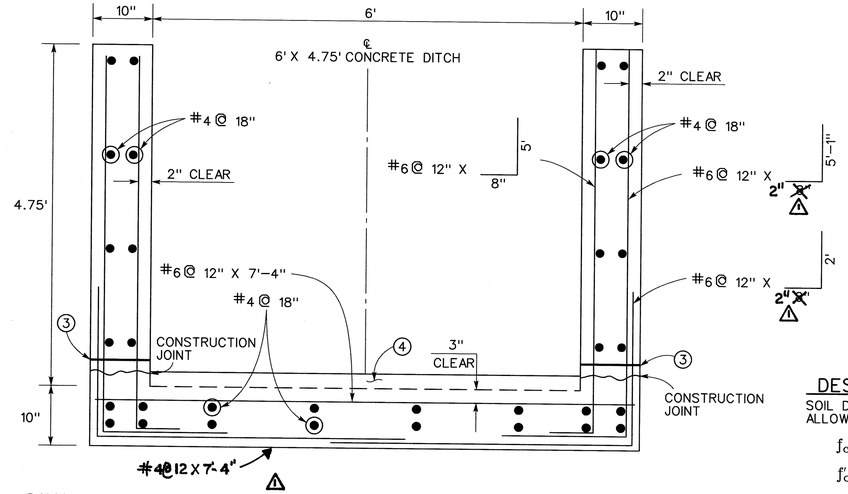
N.T.S.



GRATE ASSEMBLY DETAIL

N.T.S.

SEE PLAN AND PROFILE SHEET 18



6'W X 4.75'H CONCRETE DITCH STRUCTURAL SECTION

CONCRETE DITCH STA 13+73.54 TO STA 15+74.22

1' 0 1'

DESIGN DATA

SOIL DENSITY: 120 PCF
ALLOWABLE STRESSES:

f_c = 4000 psi

f'_c = 1800 psi

f_s = 24,000 psi

f_y = 60,000 psi

NOTES

1. ALL CONCRETE FOR THE STRUCTURE IS CLASS "A" CONCRETE, RECTANGULAR CHANNEL.
2. SEE PLAN AND PROFILE OF CHANNEL ON SHEET 37.
3. INSTALL 2 1/2" Ø WEEPHOLE WITH FILTER MATERIAL @ 10' OC PER STD CH327.
4. DITCH INVERT THICKNESS SHALL BE INCREASED STARTING AT STA 14+65.25 TO A MAX HEIGHT OF 4.5" AT STA 14+84.25 AND BACK TO MEET INVERT AT STA 15+03.25.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	ADDITIONAL BAR	JK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. M. & K. R. G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

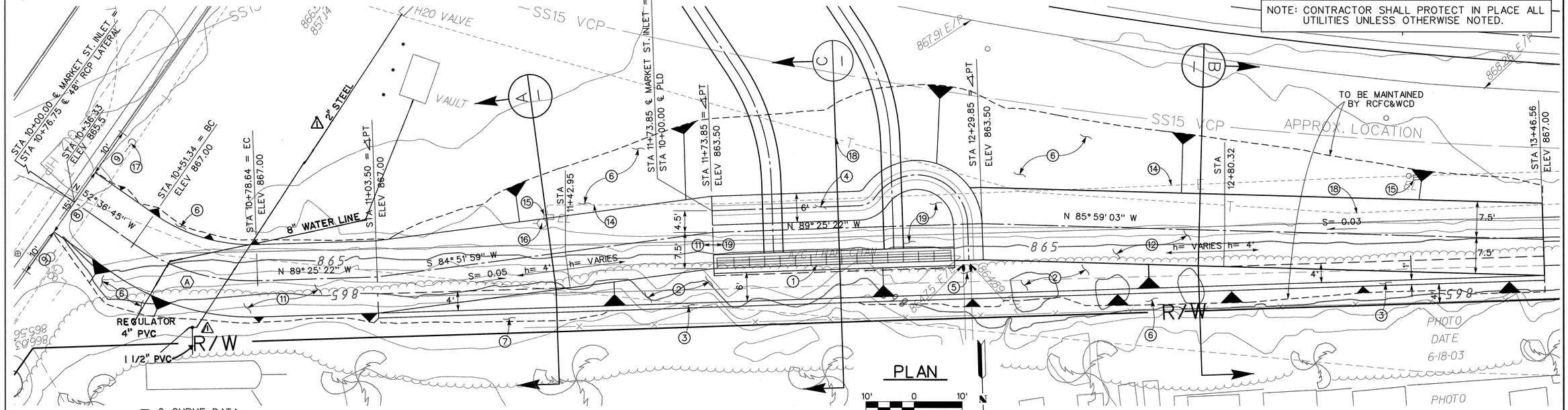
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STRUCTURAL DETAILS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 34 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

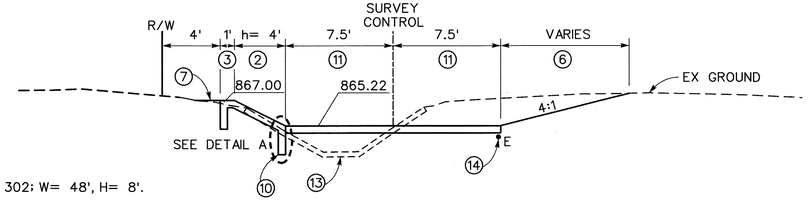


PLAN

10' 0 10'

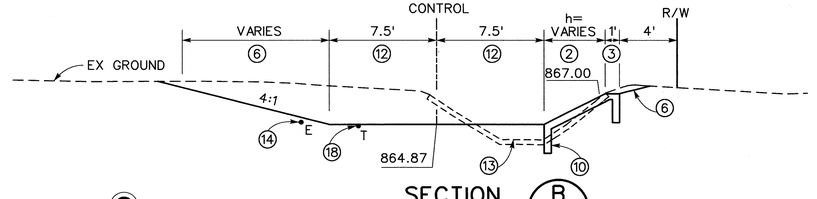
Ⓐ ℄ CURVE DATA

Δ = 36° 48' 37"
R = 42.50'
L = 27.30'
T = 14.14'
BC = STA 10+51.34
EC = STA 10+78.64
PI = N 2316445.260
E 6217044.425



SECTION A
STA 11+40.00

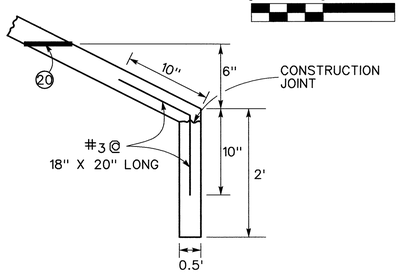
5' 0 5'



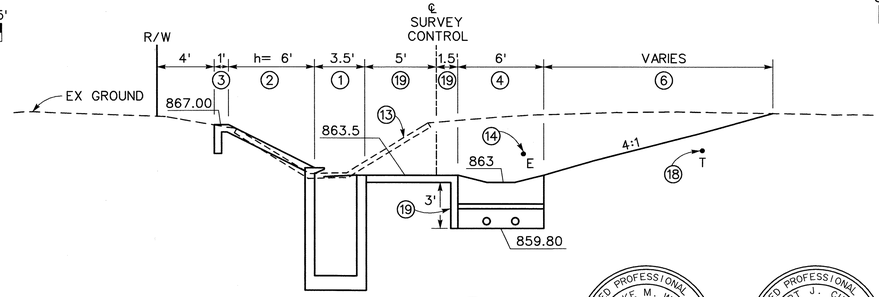
SS15 (VCP)

SECTION B
STA 12+75.00

5' 0 5'



DETAIL A
NTS



SECTION C
STA 12+00.00

5' 0 5'

NOTES

1. CONSTRUCT COMBINATION INLET CATCH BASIN NO. 2 PER COUNTY STD NO. 302; W= 48', H= 8'.
2. CONSTRUCT 0.5' THICK 2:1 CONCRETE SLOPE PER STD CH326 "DETAIL B".
3. CONSTRUCT CUT OFF WALL PER STD CH326 "DETAIL B".
4. CONSTRUCT POROUS LANDSCAPE DETENTION (PLD) WATER QUALITY FEATURE. SEE DETAILS ON SHEET 36.
5. CONNECT TWO EXISTING 18" CMP'S TO CONCRETE SLOPE.
6. GRADE DIRT SLOPE 4:1 TO MEET EXISTING GROUND.
7. FILL TO ELEVATION 867.00.
8. CONSTRUCT TYPE C CURB PER COUNTY STD NO. 202.
9. CONSTRUCT CURB TRANSITION PER COUNTY STD NO. 211.
10. CONSTRUCT CUT OFF WALL PER "DETAIL A" AND STD CH326 "DETAIL B".
11. CONSTRUCT 15' WIDE ACCESS ROAD WITH 6" CLASS 2 AB.
12. GRADE 15' ACCESS ROAD WITH NATIVE MATERIAL.
13. REMOVE EXISTING AC TRAP CHANNEL.
14. ELECTRIC LINE TO BE RELOCATED BY OTHERS.
15. ELECTRIC BOX TO BE RELOCATED BY OTHERS.
16. ELECTRIC POLE TO BE RELOCATED BY OTHERS.
17. ELECTRIC GUY ANCHOR AND POLE TO BE RELOCATED BY OTHERS.
18. TELEPHONE LINE TO BE RELOCATED BY OTHERS.
19. CONSTRUCT 0.5' THICK CONCRETE MAINTENANCE ACCESS WITH REINFORCING STEEL PER STD CH326 "DETAIL B".
20. INSTALL 2 1/2" Ø WEEPHOLE WITH FILTER MATERIAL ℄ 10' ON CENTER PER STD CH326, FROM STA 11+40.00 TO STA 12+80.00.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	ADD UTILITIES	DK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

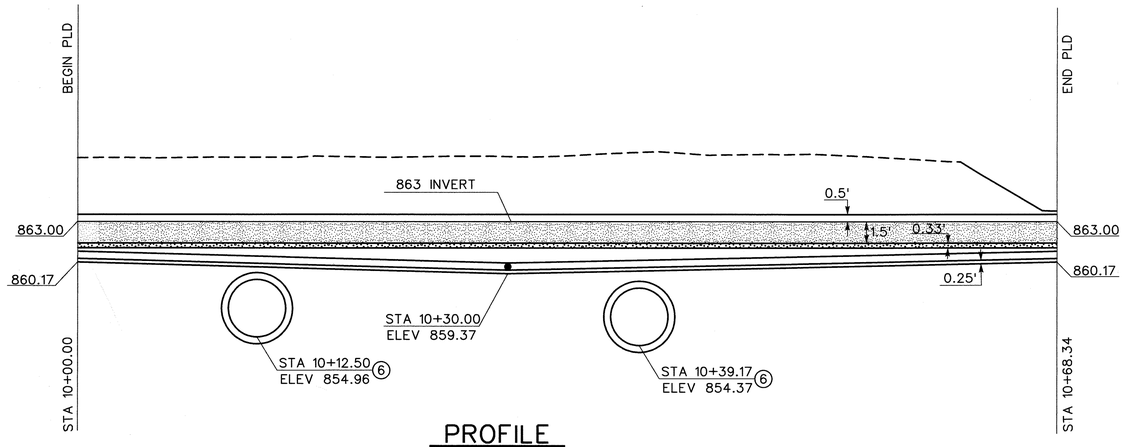
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert Cullen
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
MARKET STREET INLET DETAILS

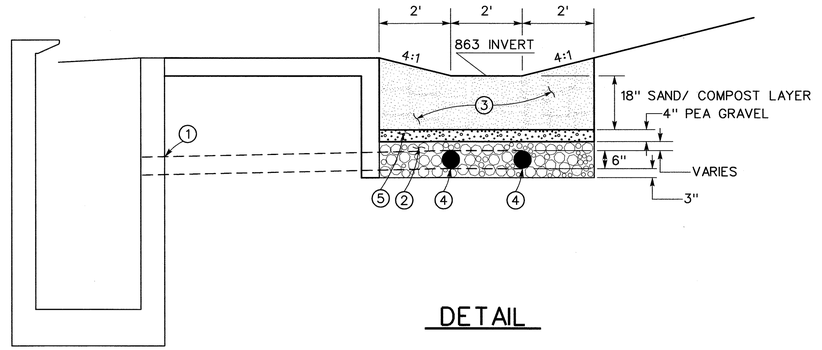
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 35 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



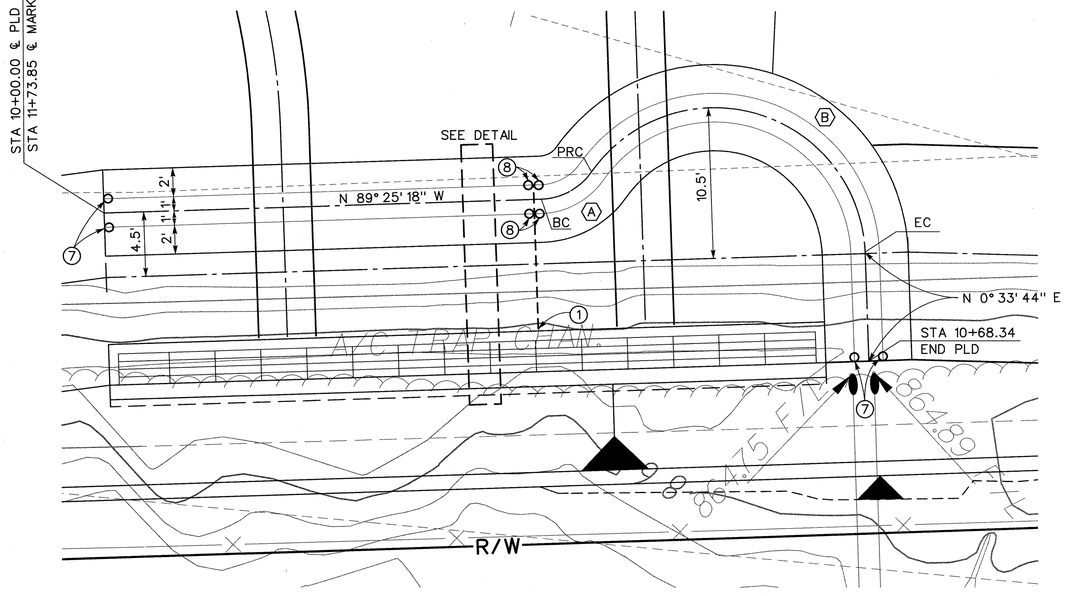
PROFILE

5' 0 5'



DETAIL

2' 0 2'



PLAN

5' 0 5'

N

Ⓐ ℄ CURVE DATA
Δ = 52° 33' 19"
R = 4.50'
L = 4.13'
T = 2.22
BC = STA 10+30.51
PRC = STA 10+34.64
PI = N 2316435.167
E 6216902.549

Ⓑ ℄ CURVE DATA
Δ = 142° 32' 11"
R = 10.50
L = 26.12'
T = 30.96'
PRC = STA 10+34.64
EC = STA 10+60.67
PI = N 2316408.820
E 6216882.372

NOTES

1. CONNECT SUBDRAIN WITH NON PERFORATED PVC INTO COMBINATION CATCH BASIN NO. 2.
2. CALTRANS CLASS 1 TYPE B PERMEABLE MATERIAL PER 86-1.025.
3. 2/3 CALTRANS FINE AGGREGATE PER 90-3.03. 1/3 PEAT OR CLASS 'A' COMPOST. SAND COMPOST MIX SHALL BE DRUM MIXED PRIOR PLACEMENT.
4. 6" DIAMETER PERFORATED PVC SUBDRAIN CONNECTED TO NON PERFORATED PVC OUTLET DRAIN USING CROSS AND TEE FITTINGS.
5. 4" OF 1/4" PEA GRAVEL.
6. 48" RCP CONNECTOR PIPE. SEE CONNECTOR PIPE PROFILES ON SHEET 45.
7. FOUR CLEANOUTS USING ELBOW FITTINGS.
8. FOUR CLEANOUTS USING WYE FITTINGS.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	DESCRIPTION	APPR.	DATE
	REVISIONS		

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

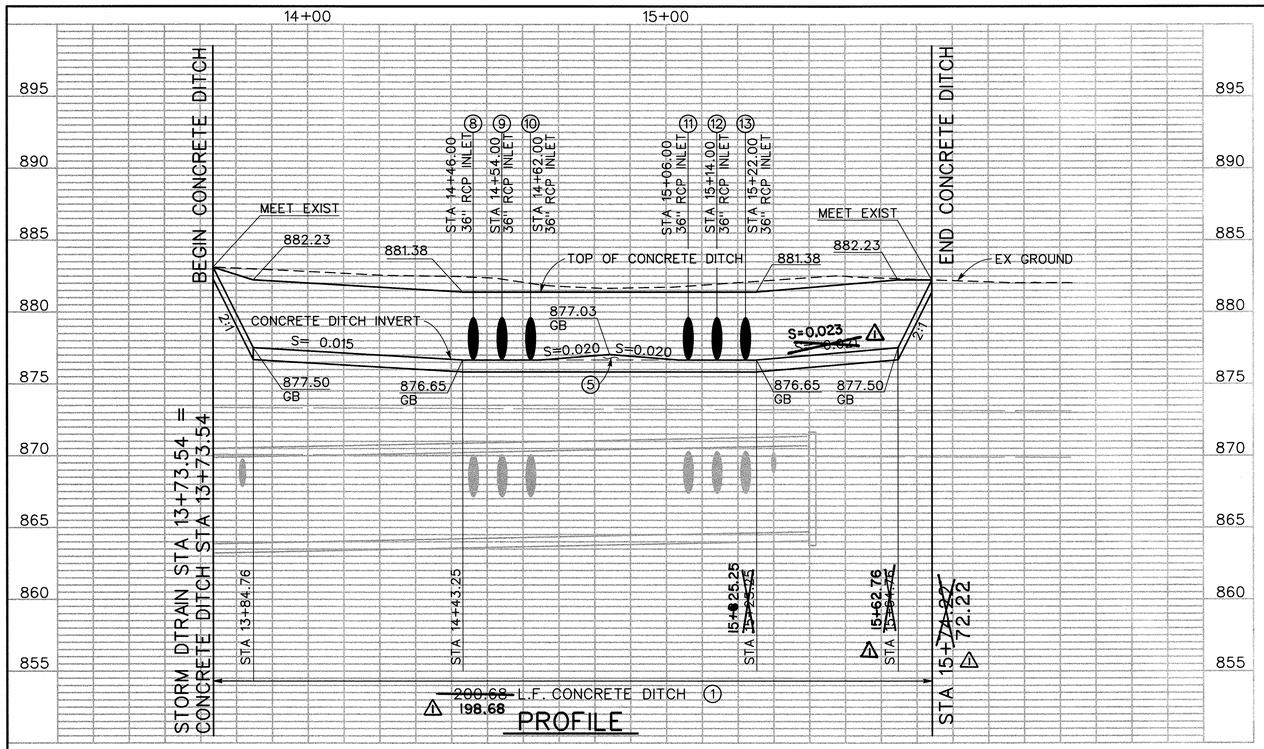
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

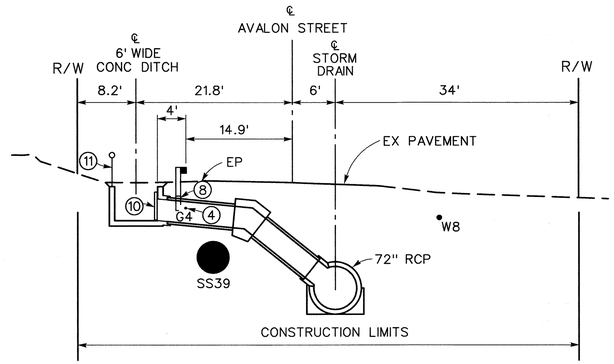
APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
MARKET STREET INLET DETAILS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 36 OF 78



NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



SECTION AT STA 14+62

10' 0 10'

NOTES

(1) CONSTRUCT CONCRETE DITCH PER DETAILS ON THIS SHEET. SEE STRUCTURAL DETAILS ON SHEET 34.

(2) INSTALL WOOD POST METAL BEAM GUARD RAIL, TYPE 11B LAYOUT, L = 244' PER CALTRANS A77 STDS LISTED ON SHEET 1.

(3) ANY GRADING OR OTHER DISTURBANCE OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS IS NOT AUTHORIZED BY RCFC&WCD'S PERMITS. ADDITIONAL REGULATORY PERMITS, SUCH AS FEDERAL CLEAN WATER ACT (SECTIONS 401 AND 404), CALIFORNIA FISH AND GAME CODE (SECTION 1602), STATE/FEDERAL ENDANGERED SPECIES ACTS PERMITS, MAY BE REQUIRED IF JURISDICTIONAL AREAS OUTSIDE OF THE PROJECT/CONSTRUCTION LIMITS ARE DISTURBED BY CONSTRUCTION OR MAINTENANCE ACTIVITIES.

(4) 4" GAS LINE TO BE RELOCATED BY OTHERS.

(5) DITCH INVERT THICKNESS SHALL BE INCREASED STARTING AT STA 14+65.25 TO A MAX HEIGHT OF 4.5" AT STA 14+84.25 AND BACK TO MEET INVERT AT STA 15+03.25.

⚠ (6) ELECTRIC POLE TO BE ~~RELOCATED BY OTHERS.~~ **PROTECTED IN PLACE**

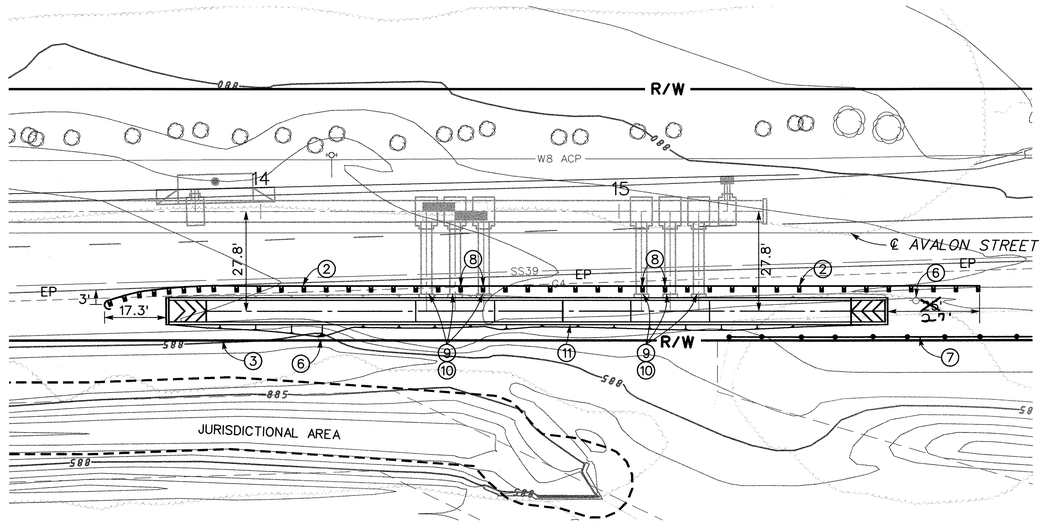
(7) REMOVE AND REPLACE EXISTING FENCE WITH CHAINLINK AT PROPERTY LINE AND AS SHOWN.

(8) REDUCE THE DEPTH OF WOOD POSTS ON GUARD RAILS WHEN POSTS INTERFERE WITH CONNECTOR PIPES. SEE TYPICAL SECTION ON THIS SHEET.

(9) CONSTRUCT JS NO. 1 PER STD JS226, A= 90°, B= 36", C= 4.75' ELEV R= 876.65, ELEV S= 876.58. SEE PROFILE ON SHEET 52.

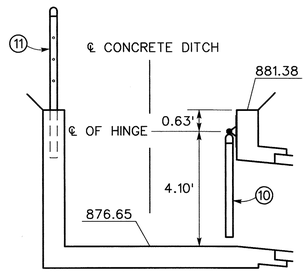
(10) INSTALL SLOPE PROTECTION BARRIER, 4' X 4' RECTANGULAR SHAPE FOR A PIPE INLET PER APWA STD 360-0. PROTECTION BARRIER TO HANG VERTICALLY WITH SIDE FRAME MEMBER L= 3.5'. OMIT BASE PLATE. SEE DETAIL ON THIS SHEET.

(11) INSTALL 200 LF OF CABLE RAILING PER CALTRANS STD B11-47 ON NORTHWEST WALL OF THE CONCRETE DITCH.



PLAN

20' 0 20'



DETAIL
N.T.S.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY: [signature]
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.


TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
B.M. NO. Z 10743

SEE SHEET 21

REF.	REVISIONS	APPR.	DATE
⚠	SLOPE AND STATION CHANGE NOTE CHANGE	DK	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

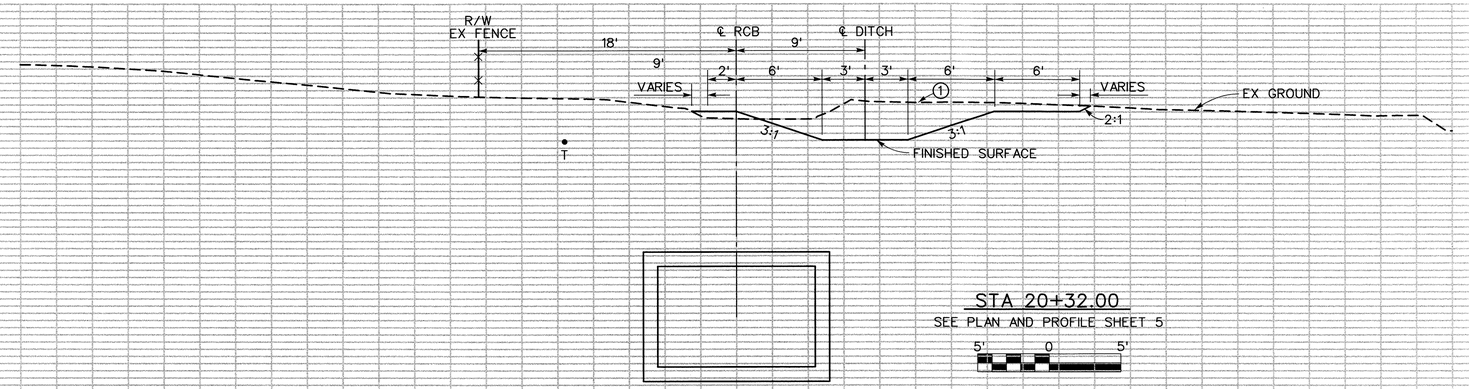
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: [signature] DATE: 4/22/09 R.E. No. 46355

APPROVED BY: [signature] DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN LINE B1 STORM DRAIN STAGE 1
AVALON STREET INLET DETAILS

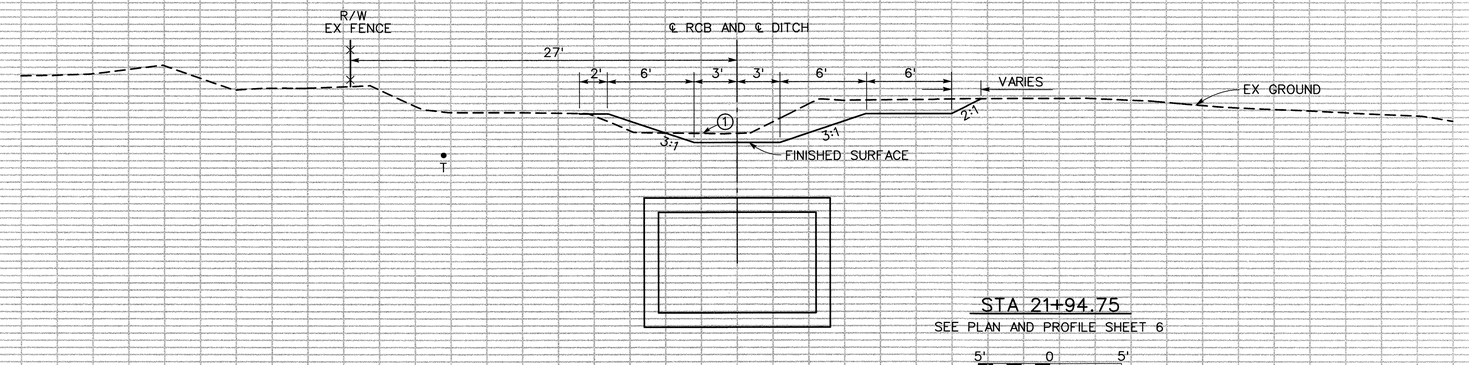
PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 37 OF 78



STA 20+32.00

SEE PLAN AND PROFILE SHEET 5

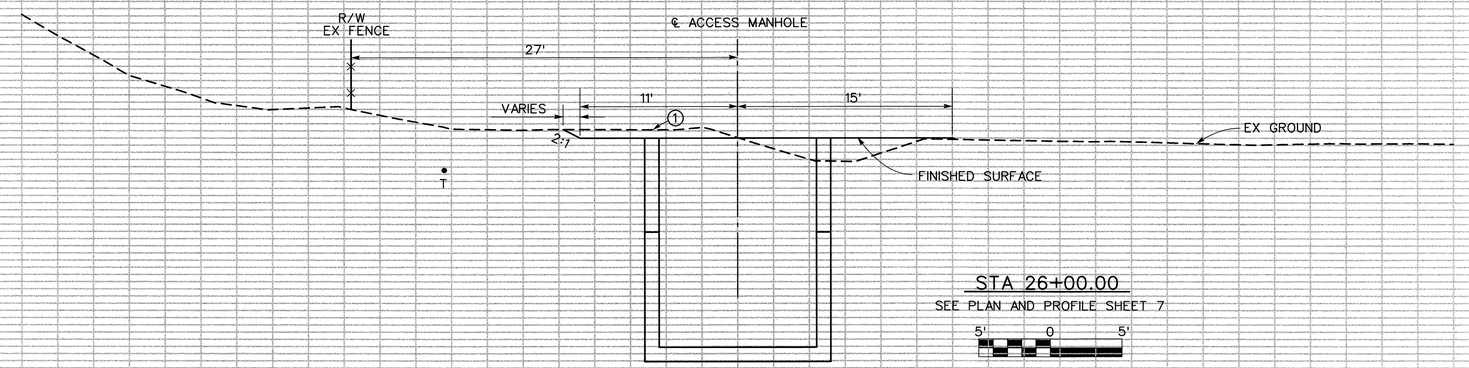
5' 0 5'



STA 21+94.75

SEE PLAN AND PROFILE SHEET 6

5' 0 5'



STA 26+00.00

SEE PLAN AND PROFILE SHEET 7

5' 0 5'

NOTES

① EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT

APPROVED BY: _____

DATE 8/24/2011

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

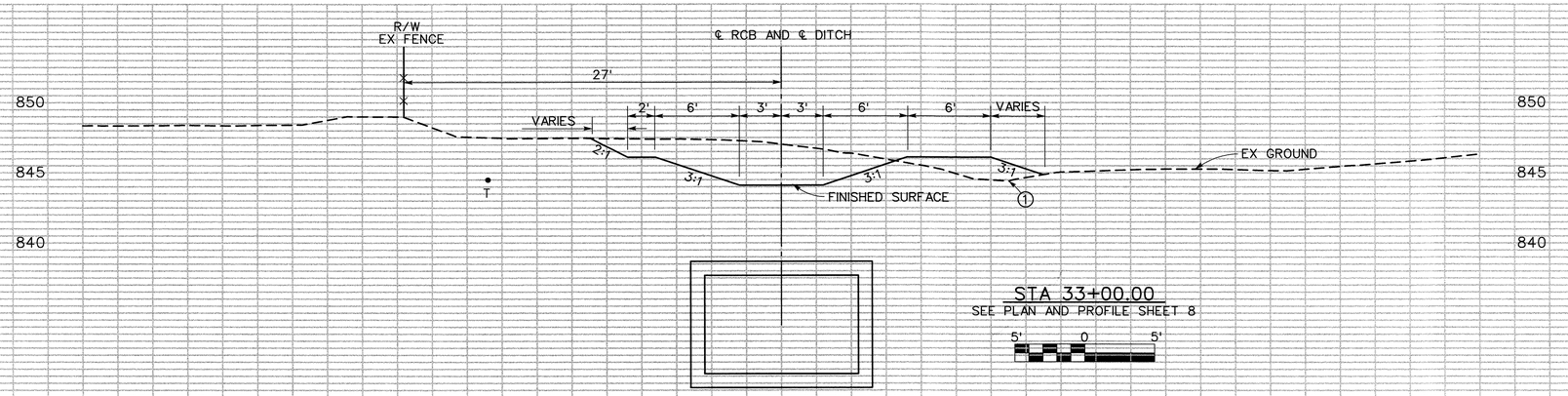
DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE 22-MAY-09 R.E. No. 44684

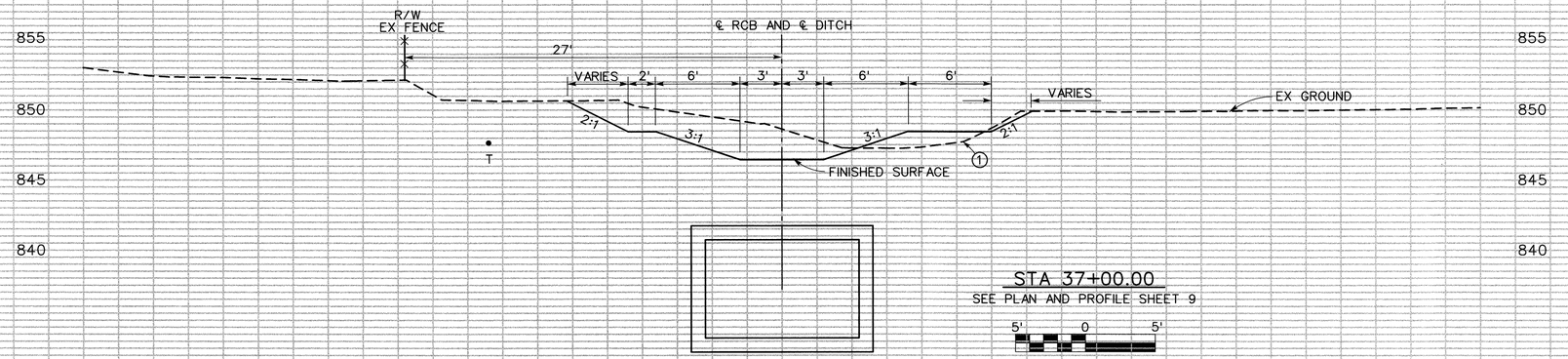
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
MARKET STREET
DITCH CROSS SECTIONS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 38 OF 78



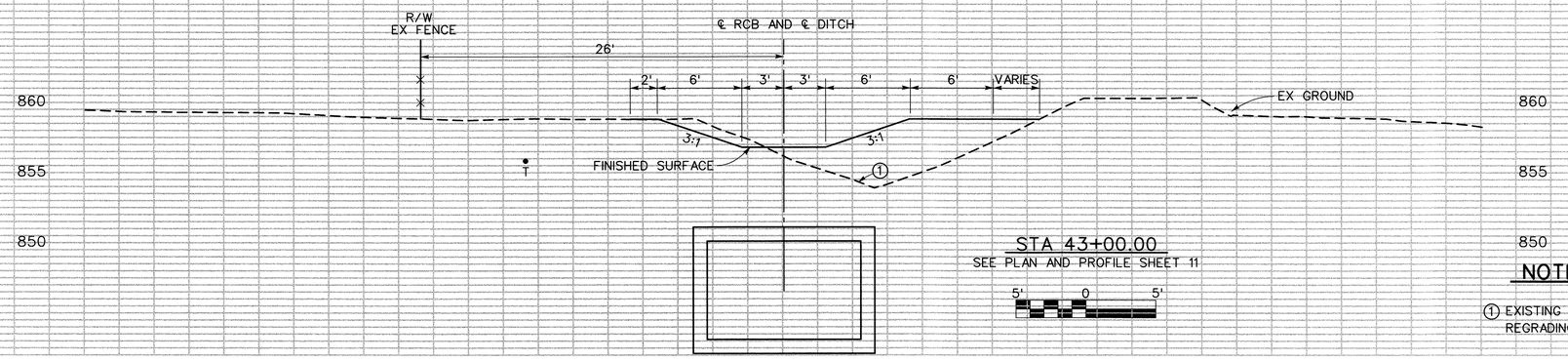
STA 33+00.00
SEE PLAN AND PROFILE SHEET 8

5' 0 5'



STA 37+00.00
SEE PLAN AND PROFILE SHEET 9

5' 0 5'



STA 43+00.00
SEE PLAN AND PROFILE SHEET 11

5' 0 5'

NOTES

1. EXISTING GROUND APPROXIMATE, MINOR REGRADING HAS OCCURRED SINCE MAPPING DATE.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE: 8/26/2011

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

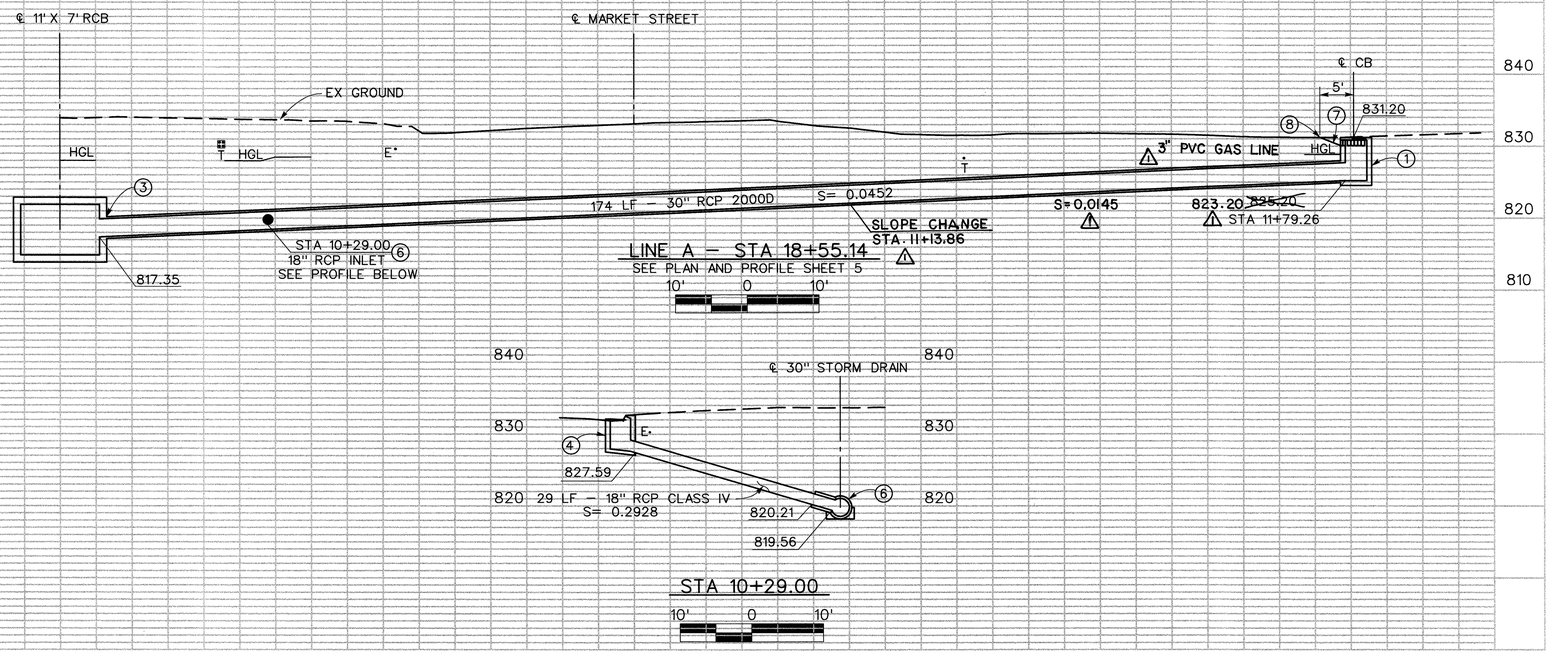
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

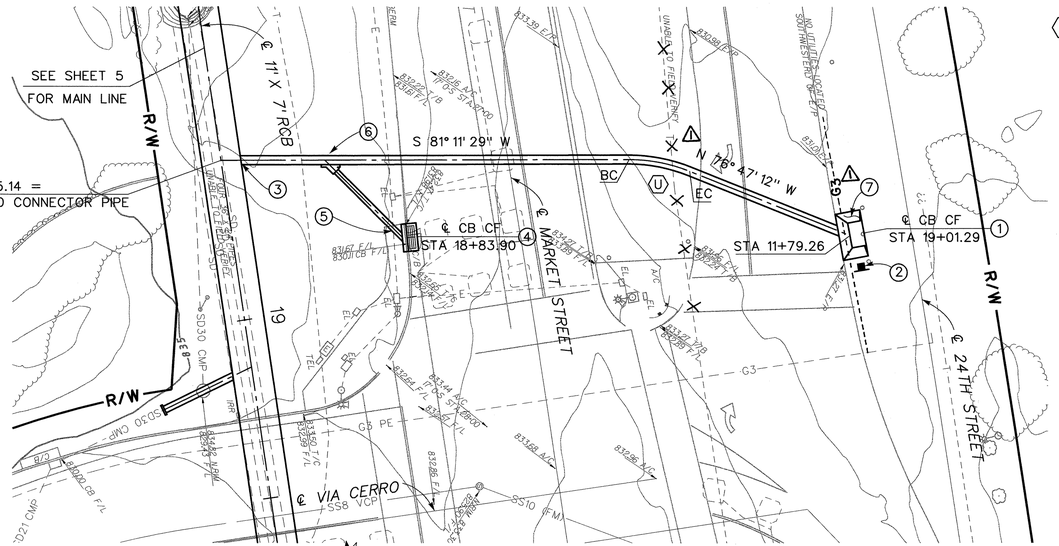
APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
MARKET STREET DITCH CROSS SECTIONS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 39 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.





℄ CURVE DATA (U)

Δ = 22° 01' 19"
R = 45.00'
L = 17.30'
T = 8.76'
BC = STA 11+13.86
EC = STA 11+31.16
PI = N 2313610.563
E 6218169.381

NOTES

1. CONSTRUCT INLET PER STD CB110, OPENINGS ON NORTH, EAST AND SOUTH SIDES. V= X', D=30", A=6' ON STREET SIDE, 163 LF – 30" RCP 2000D. (8')
2. INSTALL OBJECT MARKER PER CALTRANS STD A73–A TYPE L–1.
3. CONSTRUCT JS NO. 3 PER STD JS228. A= 81.8°, D= 30", ELEV S= 817.35.
4. REMOVE EXISTING CATCH BASIN AND CONSTRUCT COMBINATION INLET CATCH BASIN NO. 2 PER COUNTY STD 302 H= 5', W= 6.4', 29LF – 18" RCP CLASS IV. SEE PROFILE ABOVE.
5. CONSTRUCT SIDE CONNECTION PER STD CB109.
6. CONSTRUCT JS NO. 2 PER STD JS227. A= 45°, B= 18", C= 4.39', D= 30", E= 3.20', F= 0.74', G= 1.11', L= 3.18', ELEV R= 820.21, ELEV S= 819.56.
7. GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.
8. MATCH TO EXISTING EDGE OF PAVEMENT.

PLAN

20' 0 20'

N

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12–31–10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3–31–10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/11

Don't Dig...Until You Call U.S.A. Toll Free 1–800–227–2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	SLOPE CHANGED TO AVOID G3 V CHANGED FROM 6' TO 8'	MK	8/24/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

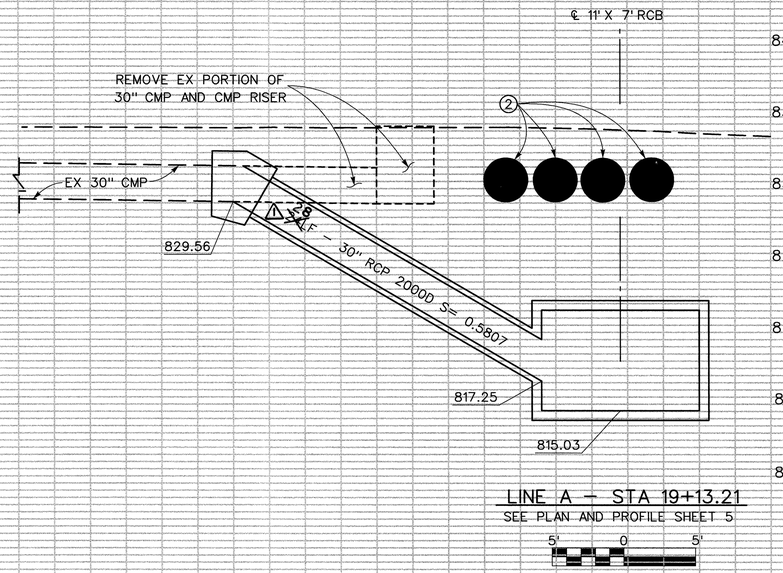
DESIGNED BY: L.F. & A.M.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

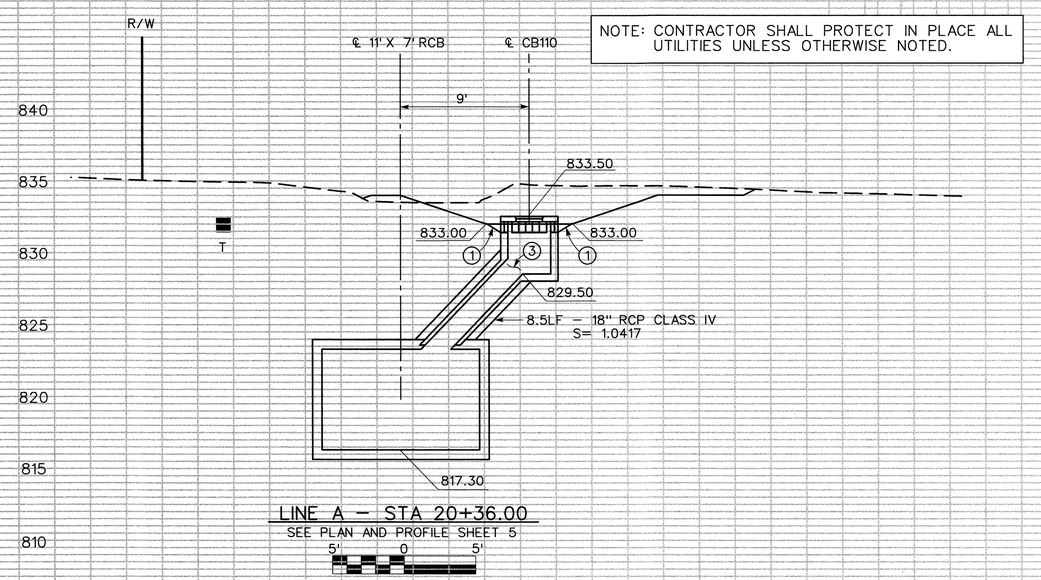
BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

PROJECT NO. 1–0–0148
DRAWING NO. 1–637
SHEET NO. 40 OF 78



LINE A – STA 19+13.21
SEE PLAN AND PROFILE SHEET 5

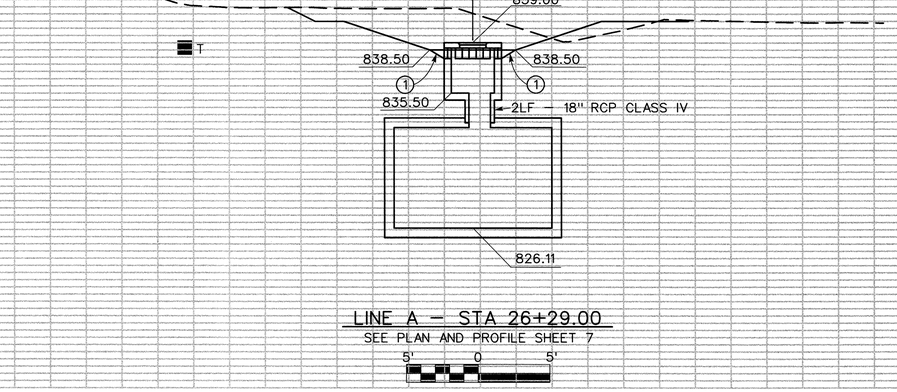
5' 0 5'



NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.

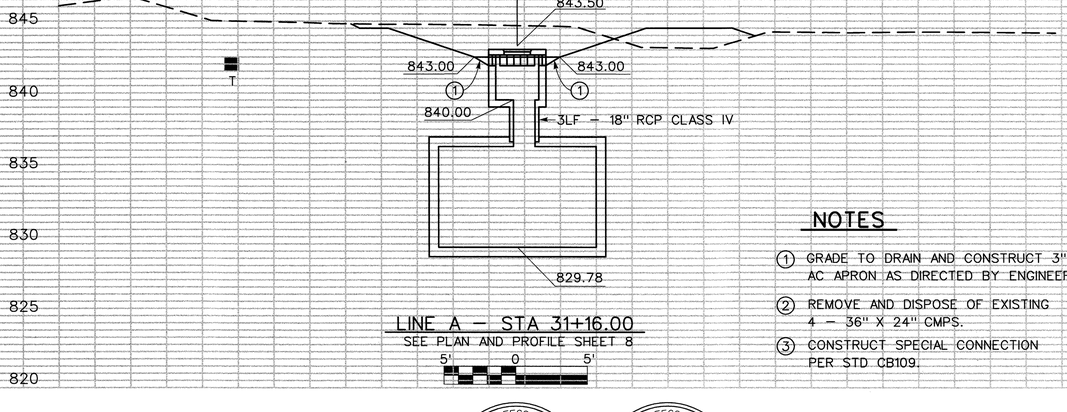
LINE A – STA 20+36.00
SEE PLAN AND PROFILE SHEET 5

5' 0 5'



LINE A – STA 26+29.00
SEE PLAN AND PROFILE SHEET 7

5' 0 5'



LINE A – STA 31+16.00
SEE PLAN AND PROFILE SHEET 8

5' 0 5'

NOTES

1. GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.
2. REMOVE AND DISPOSE OF EXISTING 4 – 36" X 24" CMPS.
3. CONSTRUCT SPECIAL CONNECTION PER STD CB109.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
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for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	⚠ CATCH BASIN LENGTH CHANGED	JS	8/26/11

DESIGNED BY: A. McNEILLL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

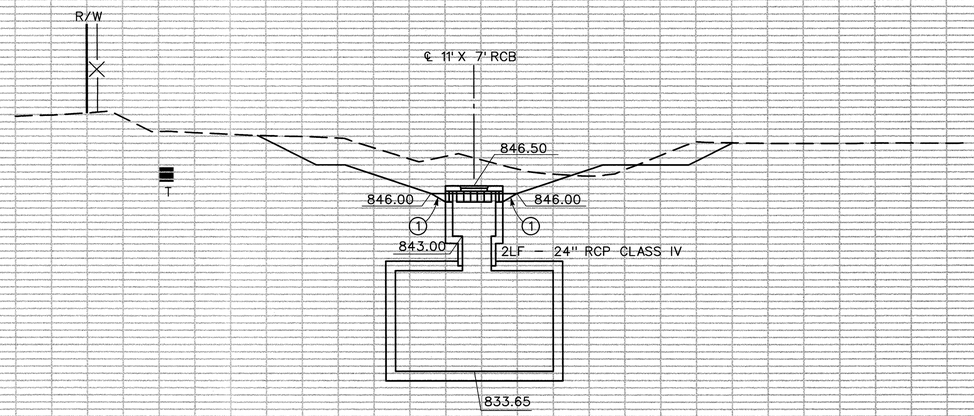
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert Cullen
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

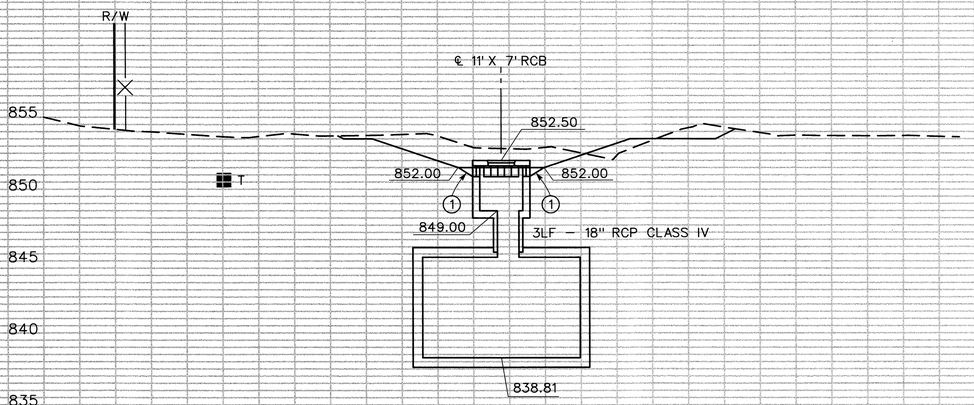
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 41 OF 78



LINE A – STA 36+28.75

SEE PLAN AND PROFILE SHEET 9

5' 0 5'

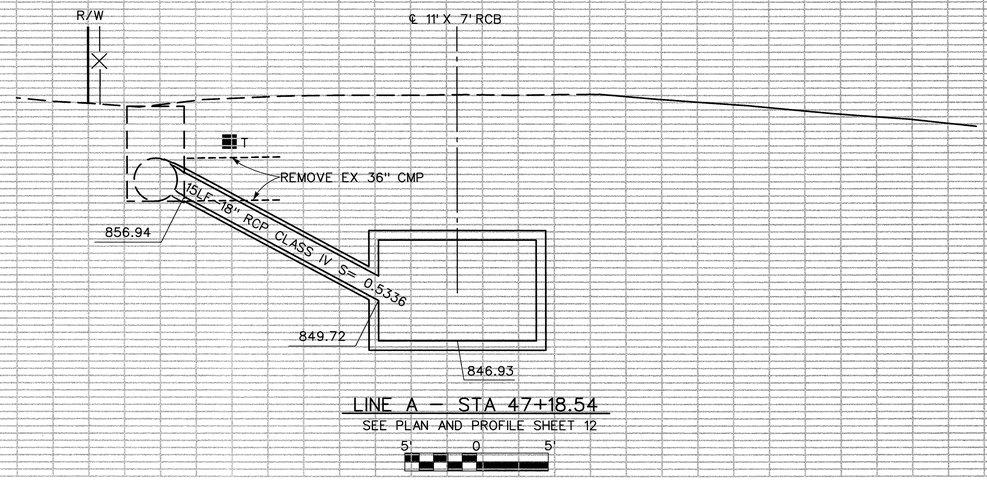


LINE A – STA 40+16.00

SEE PLAN AND PROFILE SHEET 10

5' 0 5'

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE A – STA 47+18.54

SEE PLAN AND PROFILE SHEET 12

5' 0 5'

NOTES

(1) GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT

APPROVED BY:

DATE 4/6/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

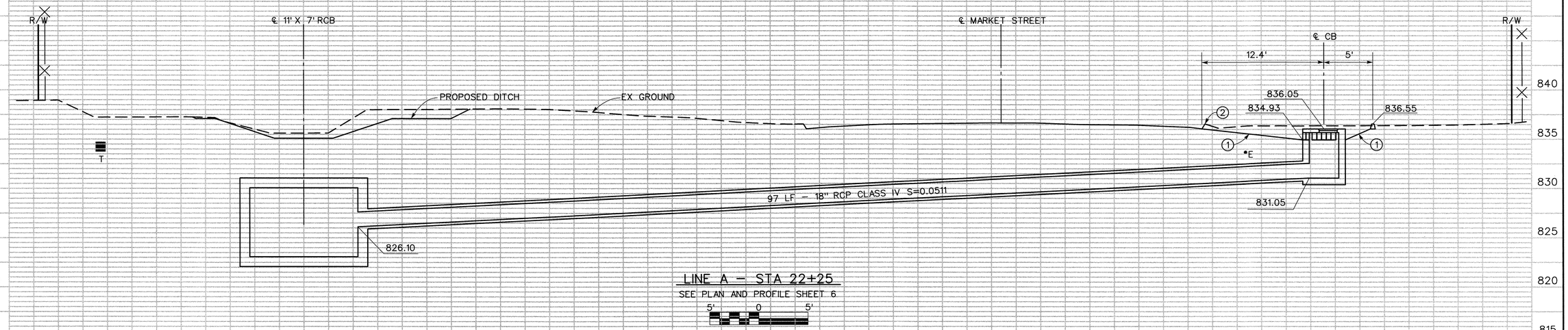
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/27/09 R.E. No. 46355

APPROVED BY:
DATE 4/29/09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 42 OF 78

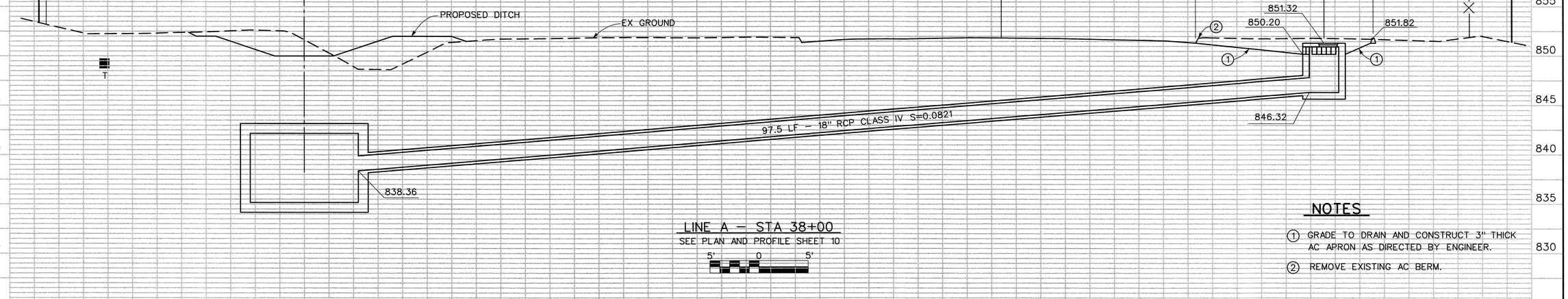
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE A – STA 22+25

SEE PLAN AND PROFILE SHEET 6

5' 0 5'



LINE A – STA 38+00

SEE PLAN AND PROFILE SHEET 10

5' 0 5'

NOTES

1. GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.
2. REMOVE EXISTING AC BERM.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
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for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

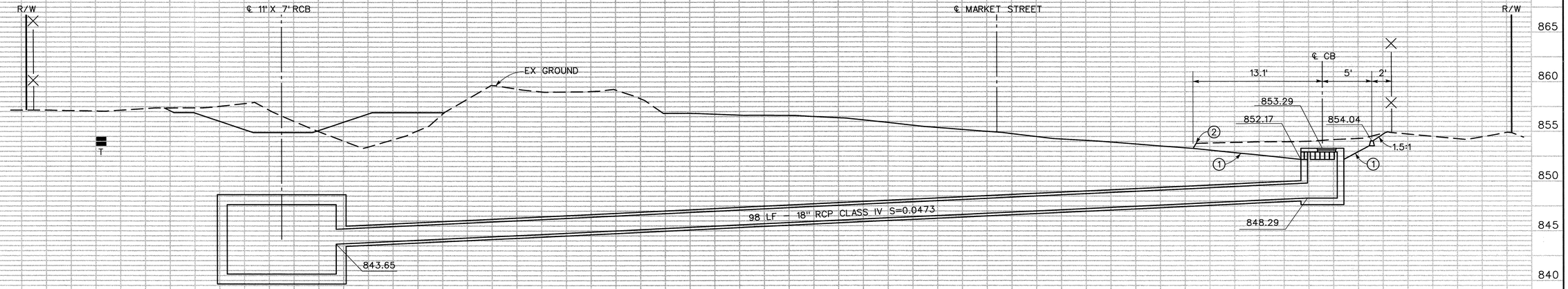
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

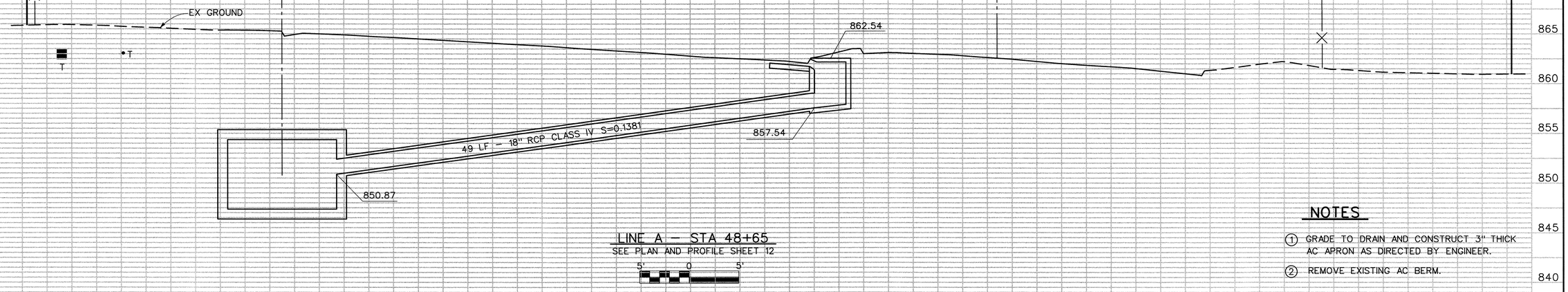
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 43 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE A – STA 41+25
SEE PLAN AND PROFILE SHEET 11

5' 0 5'



LINE A – STA 48+65
SEE PLAN AND PROFILE SHEET 12

5' 0 5'

NOTES

1. GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.
2. REMOVE EXISTING AC BERM.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE

Don't Dig...Until You Call U.S.A. Toll Free
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for the location of buried utility lines.
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TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

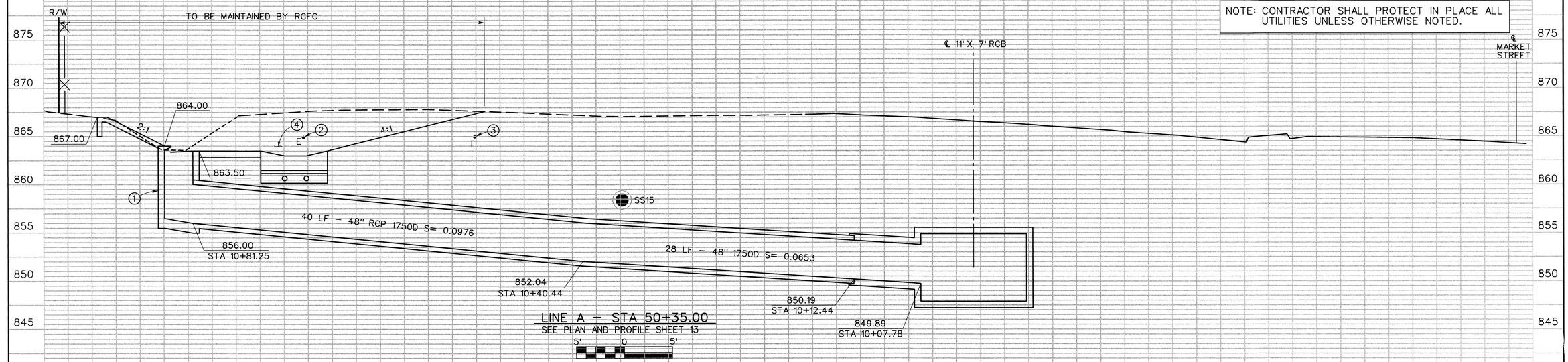
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

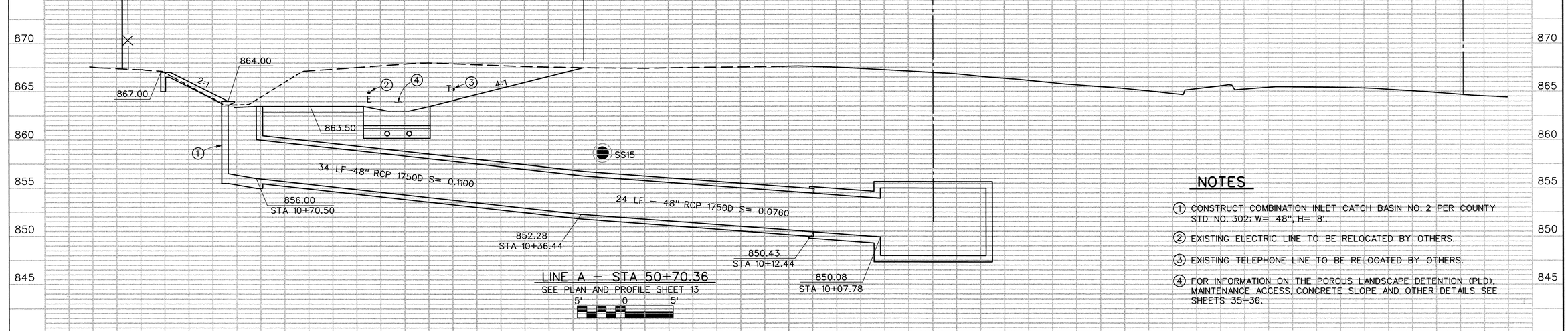
APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 44 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.





NOTES

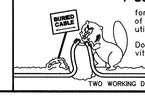
1. CONSTRUCT COMBINATION INLET CATCH BASIN NO. 2 PER COUNTY STD NO. 302; W= 48", H= 8'.
2. EXISTING ELECTRIC LINE TO BE RELOCATED BY OTHERS.
3. EXISTING TELEPHONE LINE TO BE RELOCATED BY OTHERS.
4. FOR INFORMATION ON THE POROUS LANDSCAPE DETENTION (PLD), MAINTENANCE ACCESS, CONCRETE SLOPE AND OTHER DETAILS SEE SHEETS 35-36.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/26/2011

Don't Dig...Until You Call U.S.A. Toll Free **1-800-227-2600** for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

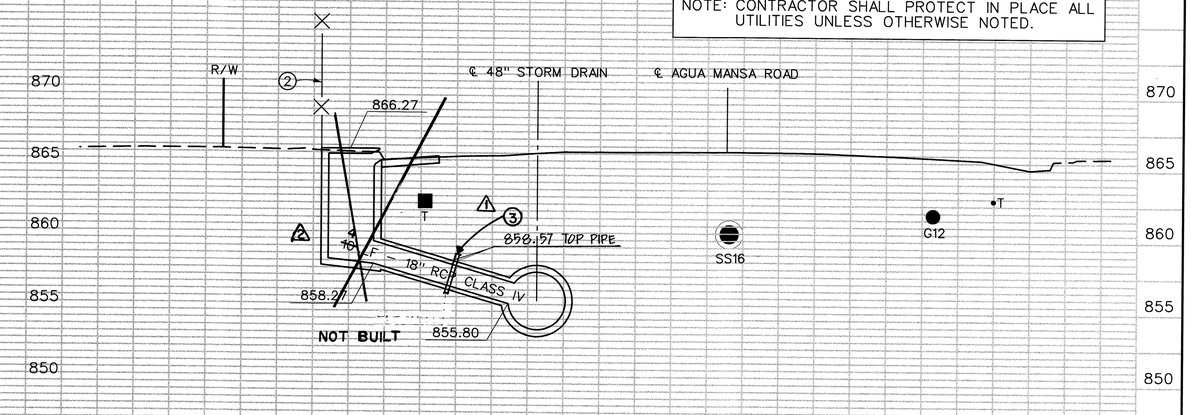
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE A

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 45 OF 78

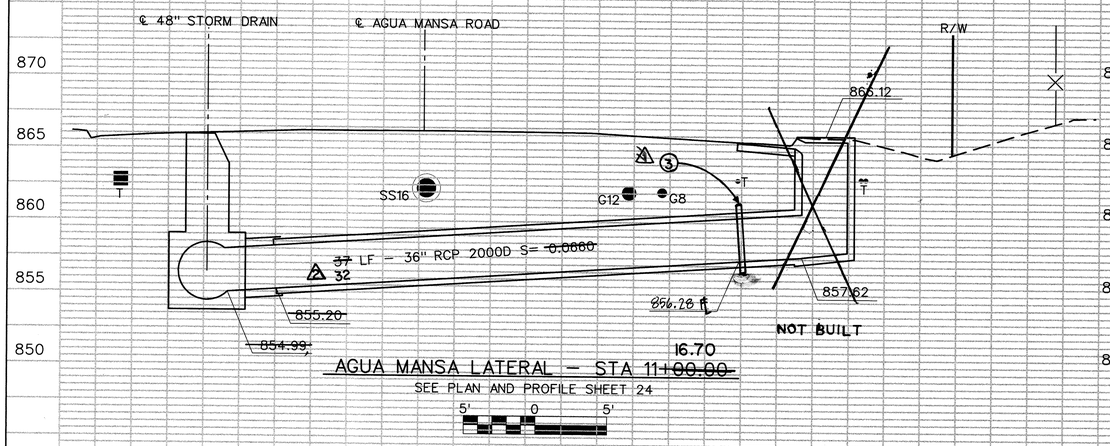
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



AGUA MANSA LATERAL – STA 10+87.00

SEE PLAN AND PLAN AND PROFILE SHEET 24

5' 0 5'

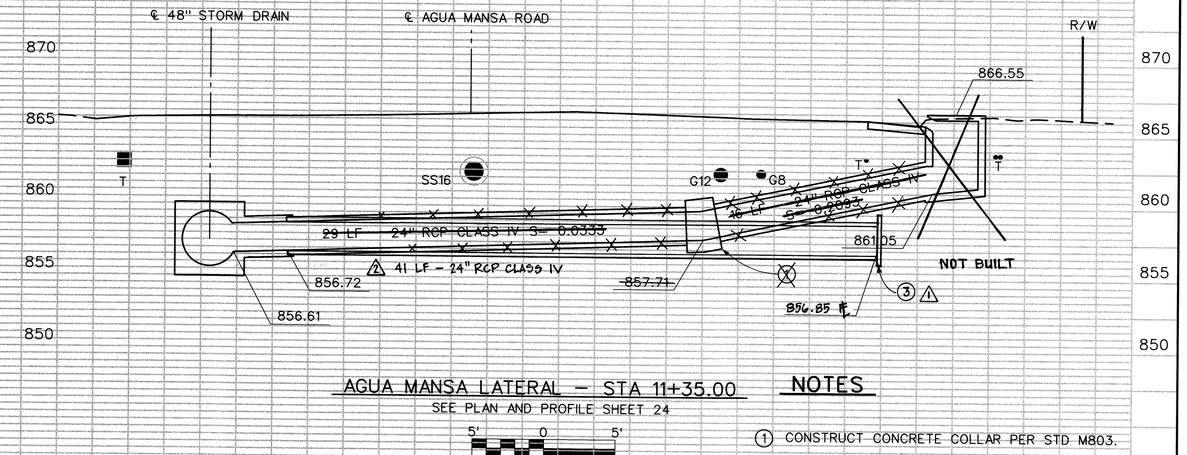


16.70

AGUA MANSA LATERAL – STA ~~11+00.00~~

SEE PLAN AND PROFILE SHEET 24

5' 0 5'



AGUA MANSA LATERAL – STA 11+35.00

SEE PLAN AND PLAN AND PROFILE SHEET 24

5' 0 5'

NOTES

1. CONSTRUCT CONCRETE COLLAR PER STD M803.
2. REMOVE AND RELOCATE EXISTING FENCE, AS DIRECTED BY ENGINEER.
3. **CONSTRUCT CONCRETE BULKHEAD.**

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT

APPROVED BY:

DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
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for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	DESCRIPTION	APPR.	DATE
1	ADD CONCRETE BULKHEAD	DKS	8/26/11
2	CHANGE CONNECTOR LENGTH	DKS	8/24/11

REVISIONS

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

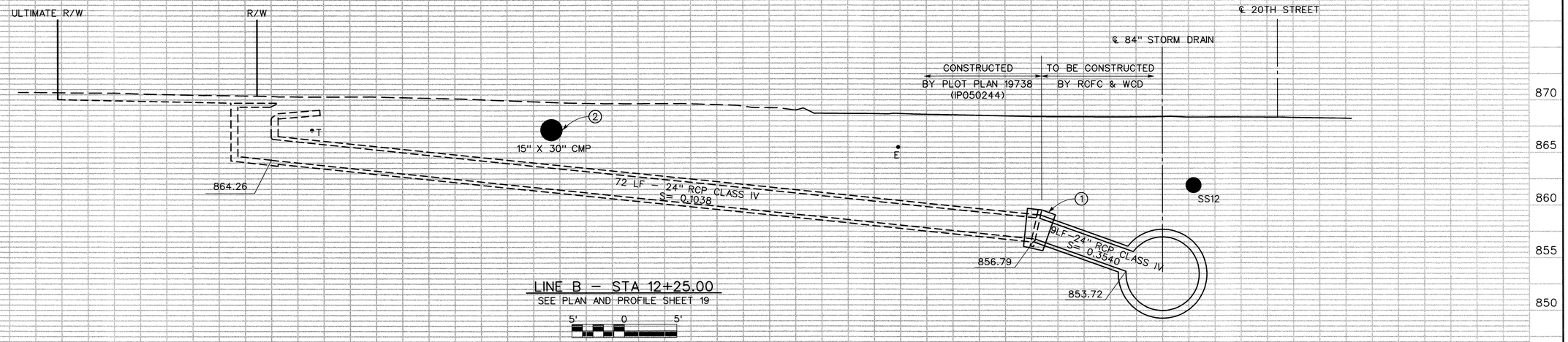
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE 4/22/09 R.E. No. 46355

APPROVED BY:
DATE 28-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES
AGUA MANSA LATERAL

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 46 OF 78

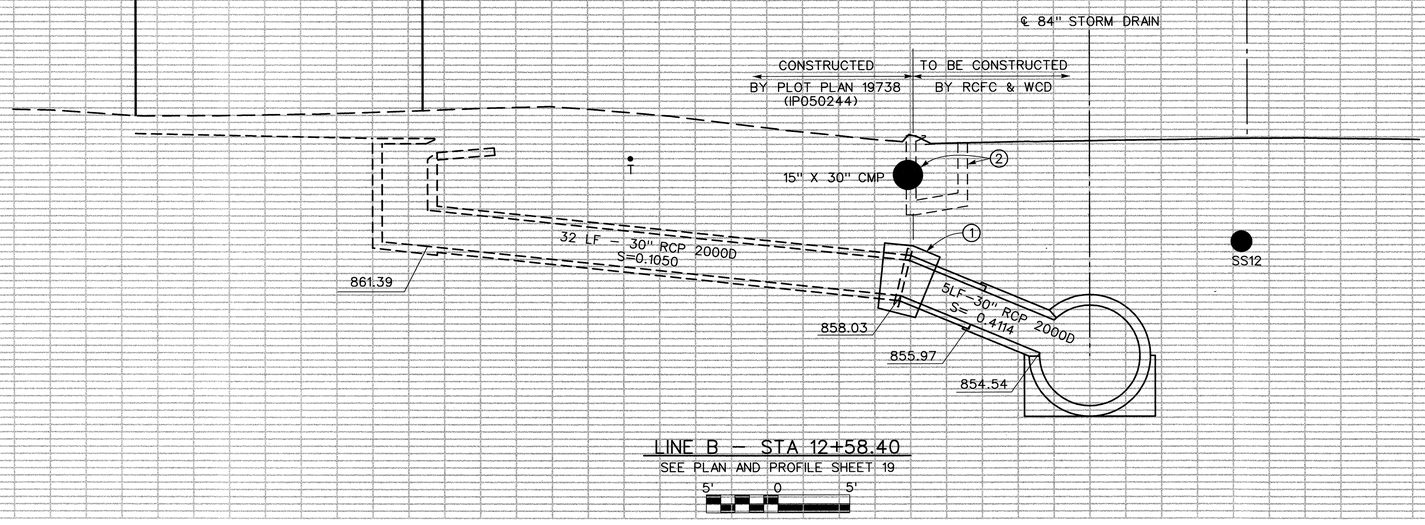
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B – STA 12+25.00

SEE PLAN AND PROFILE SHEET 19

5' 0 5'



LINE B – STA 12+58.40

SEE PLAN AND PROFILE SHEET 19

5' 0 5'

NOTES

① CONSTRUCT CONCRETE COLLAR PER STD M803.

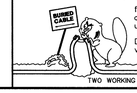
② EXISTING CATCH BASIN AND 15" X 30" CMP RELOCATED BY OTHERS.

REGISTERED PROFESSIONAL ENGINEER — MIKE M. WONG — No. 46355 Exp. 12–31–10 — CIVIL — STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — ROBERT J. CULLEN — No. 44684 Exp. 3–31–10 — CIVIL — STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE: 8/26/2014

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

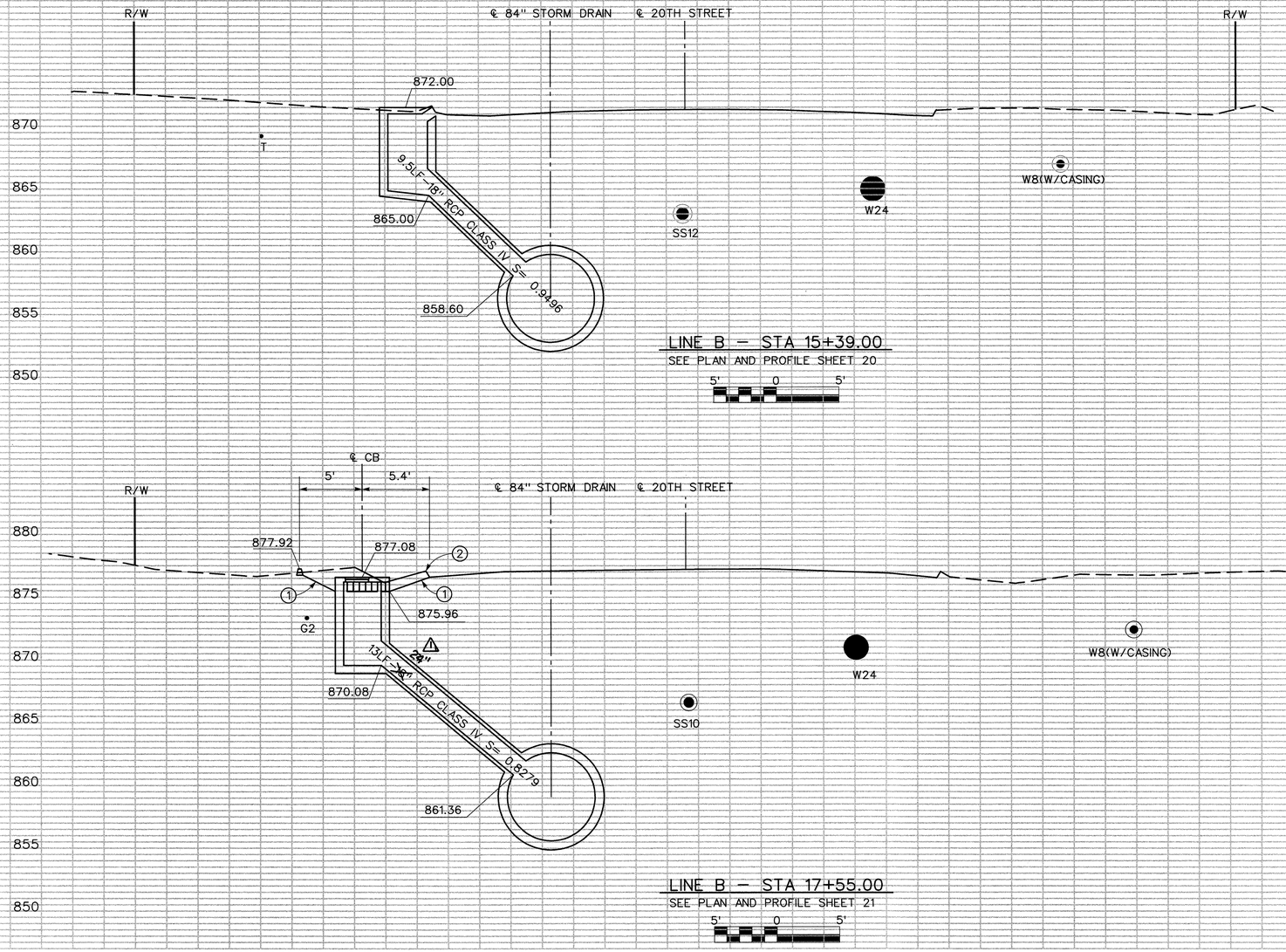
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert J. Cullen
DATE: 28-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B

PROJECT NO. 1-0-0156
DRAWING NO. 1-637
SHEET NO. 47 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



NOTES

1. GRADE TO DRAIN AND CONSTRUCT 3" THICK AC APRON AS DIRECTED BY ENGINEER.
2. REMOVE EXISTING AC BERM.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	DESCRIPTION	APPR.	DATE
1	CATCH BASIN RCP SIZE CHANGED	JS	4/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: A. McNEILL
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

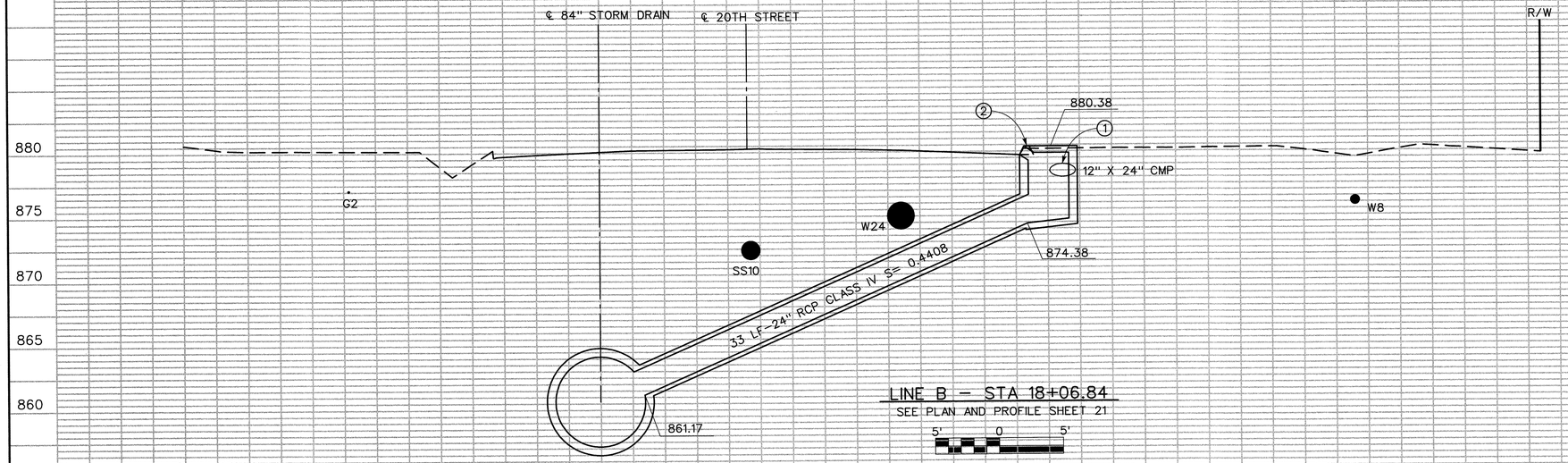
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert J. Cullen
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B

PROJECT NO. 1-0-0156
DRAWING NO. 1-637
SHEET NO. 48 OF 78

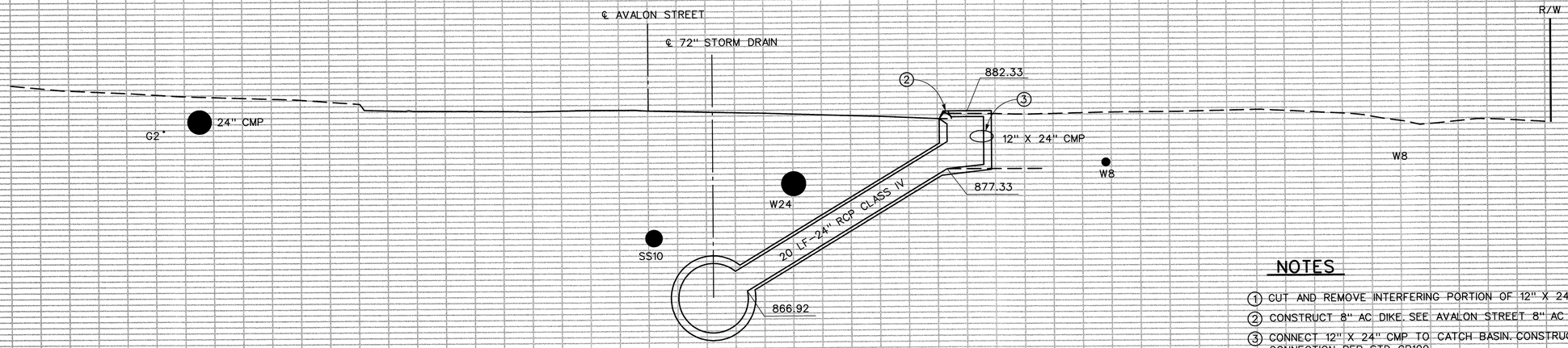
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B – STA 18+06.84

SEE PLAN AND PROFILE SHEET 21

5' 0 5'



LINE B1 – STA 10+30.00

SEE PLAN AND PROFILE SHEET 22

5' 0 5'

NOTES

1. CUT AND REMOVE INTERFERING PORTION OF 12" X 24" CMP.
2. CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.
3. CONNECT 12" X 24" CMP TO CATCH BASIN. CONSTRUCT SPECIAL CONNECTION PER STD CB109.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT

APPROVED BY:

DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS / DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

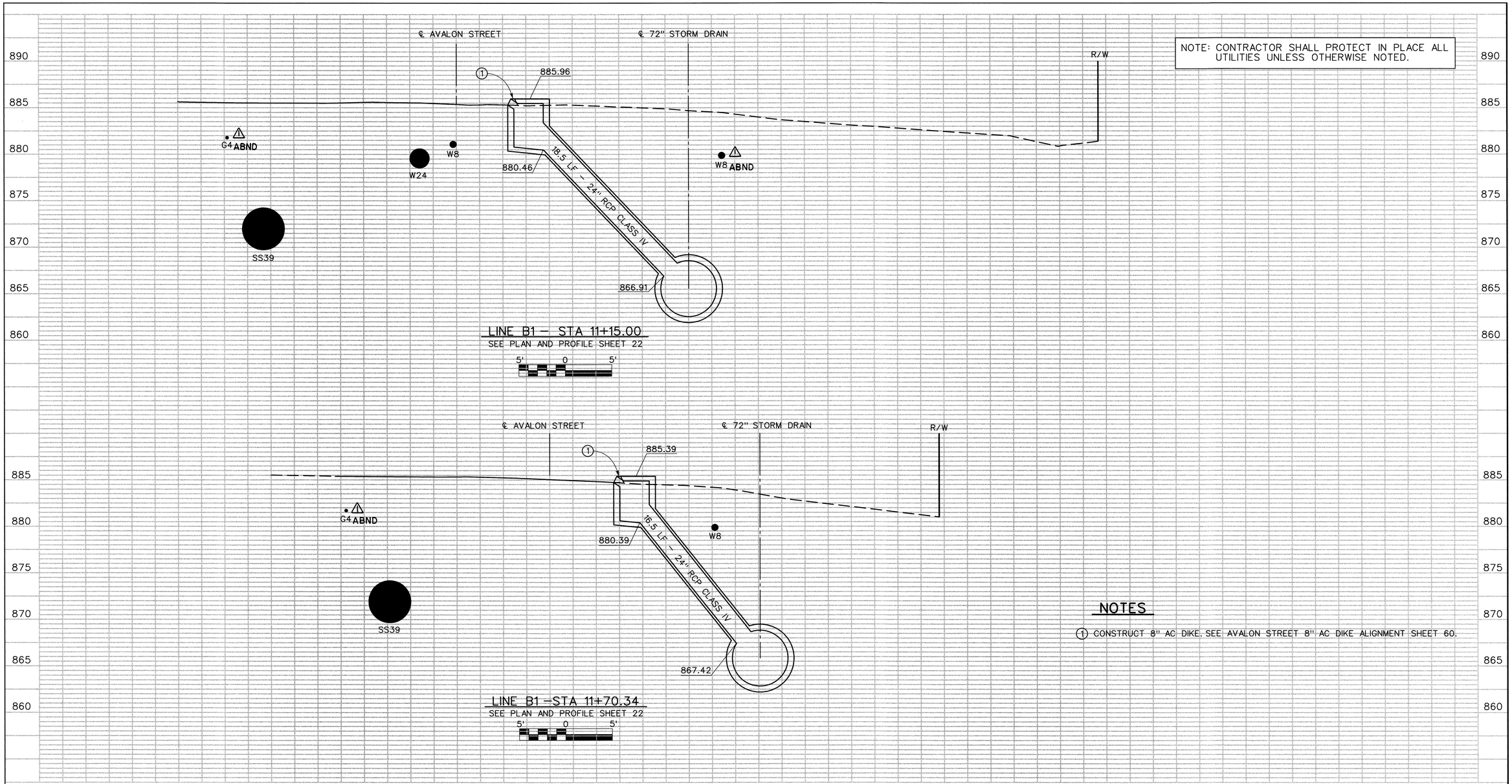
DESIGNED BY: EQ, AM & KRG
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22 APR 09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B AND B1

PROJECT NO. 1-0-0156 1-0-0157
DRAWING NO. 1-637
SHEET NO. 49 OF 78



NOTES

(1) CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12–31–10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3–31–10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY: [signature]
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1–800–227–2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	ABND UTILITIES	DKB	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

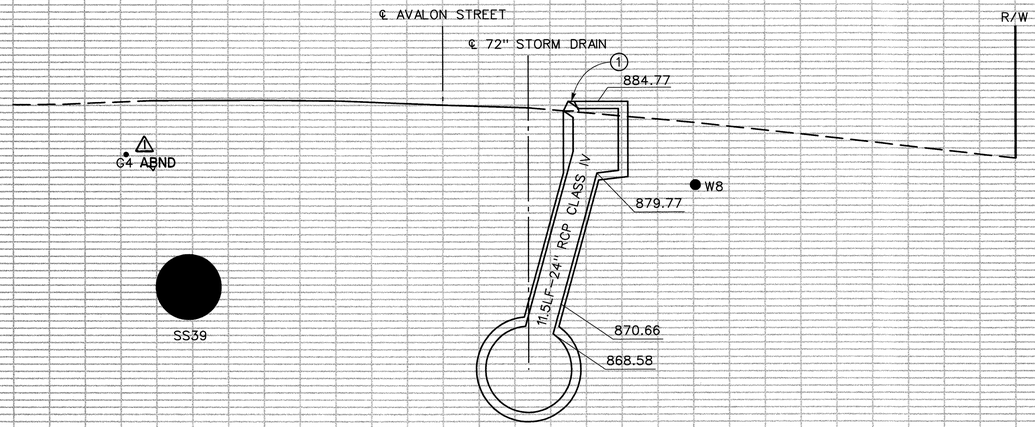
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: [signature]
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B1

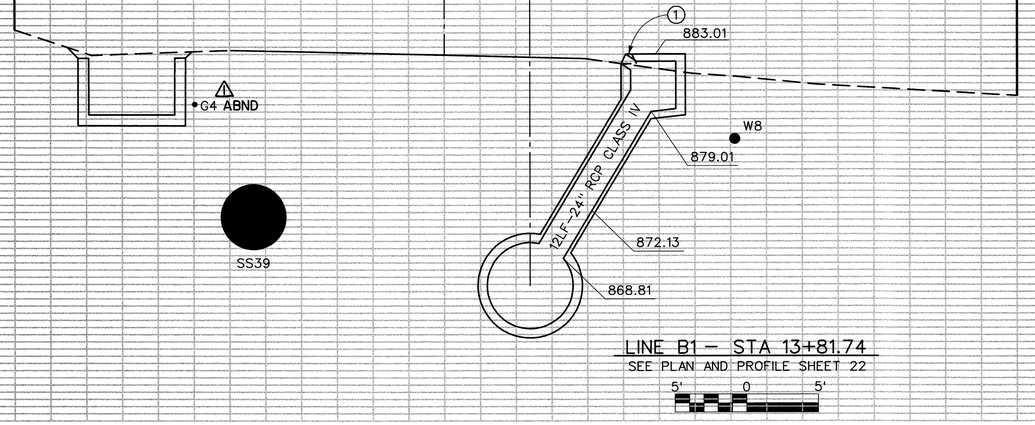
PROJECT NO. 1–0–0157
DRAWING NO. 1–637
SHEET NO. 50 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B1 – STA 12+24.38
SEE PLAN AND PROFILE SHEET 22

5' 0 5'



LINE B1 – STA 13+81.74
SEE PLAN AND PROFILE SHEET 22

5' 0 5'

NOTES

1. CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free **1-800-227-2600** for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	G4 ABND	DKS	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

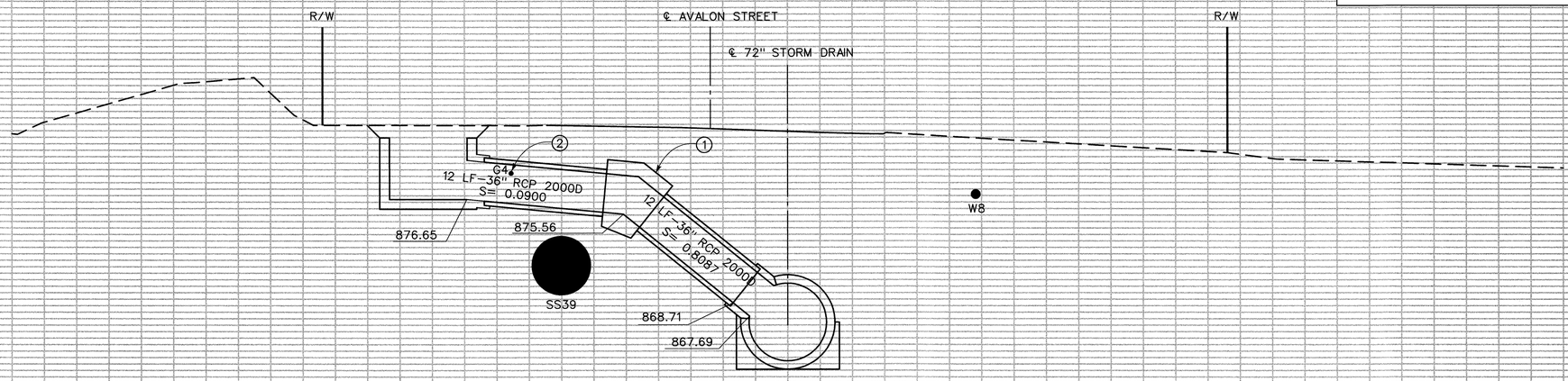
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 26-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B1

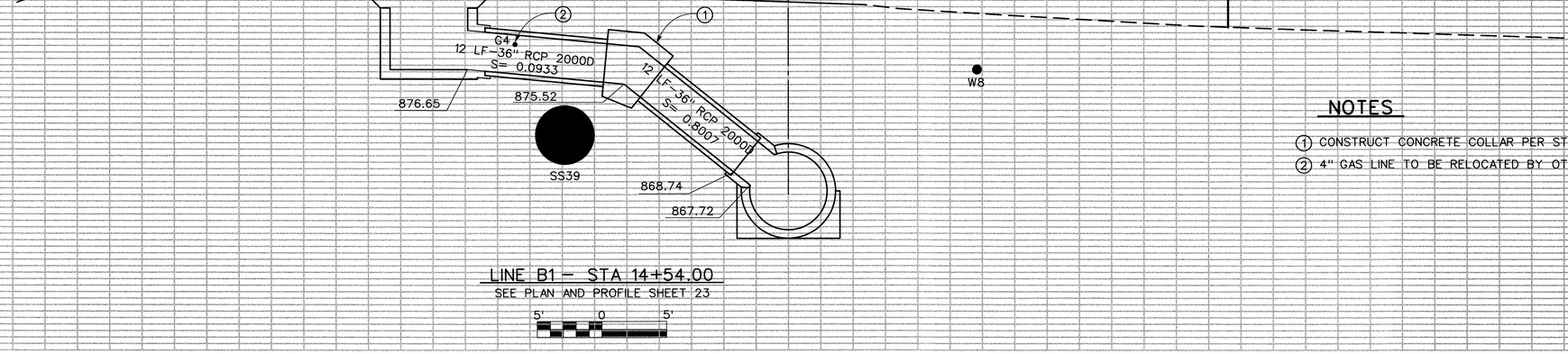
PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 51 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B1 – STA 14+46.00
SEE PLAN AND PROFILE SHEET 23

5' 0 5'



LINE B1 – STA 14+54.00
SEE PLAN AND PROFILE SHEET 23

5' 0 5'

NOTES

1. CONSTRUCT CONCRETE COLLAR PER STD M803.
2. 4" GAS LINE TO BE RELOCATED BY OTHERS.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/24/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

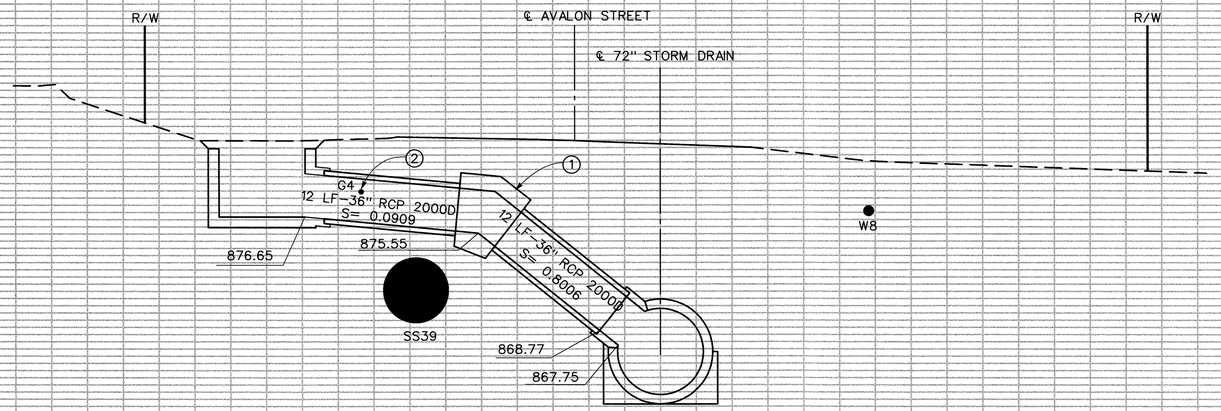
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22 APR 09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B1

PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 52 OF 78

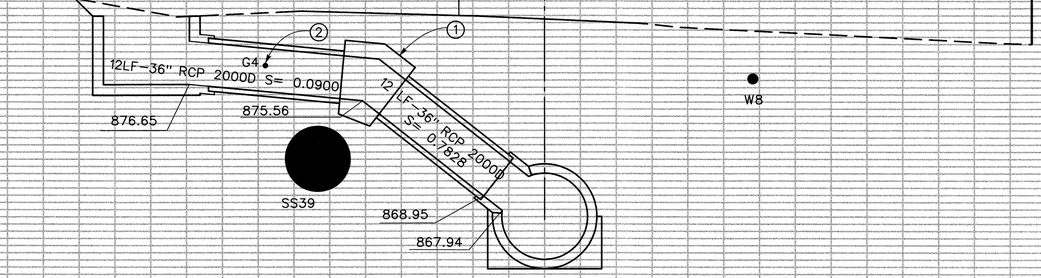
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B1 – STA 14+62.00

SEE PLAN AND PROFILE SHEET 23

5' 0 5'



LINE B1 – STA 15+06.00

SEE PLAN AND PROFILE SHEET 23

5' 0 5'

NOTES

1. CONSTRUCT CONCRETE COLLAR PER STD M803.
2. 4" GAS LINE TO BE RELOCATED BY OTHERS.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

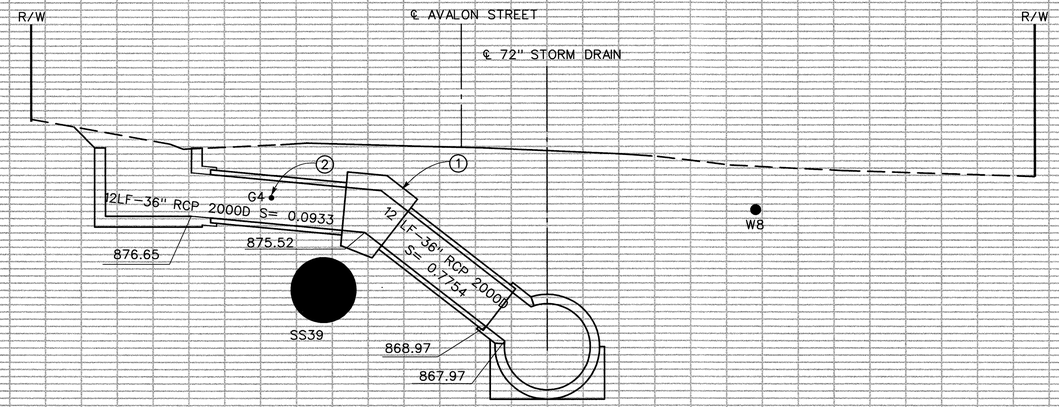
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B1

PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 53 OF 78

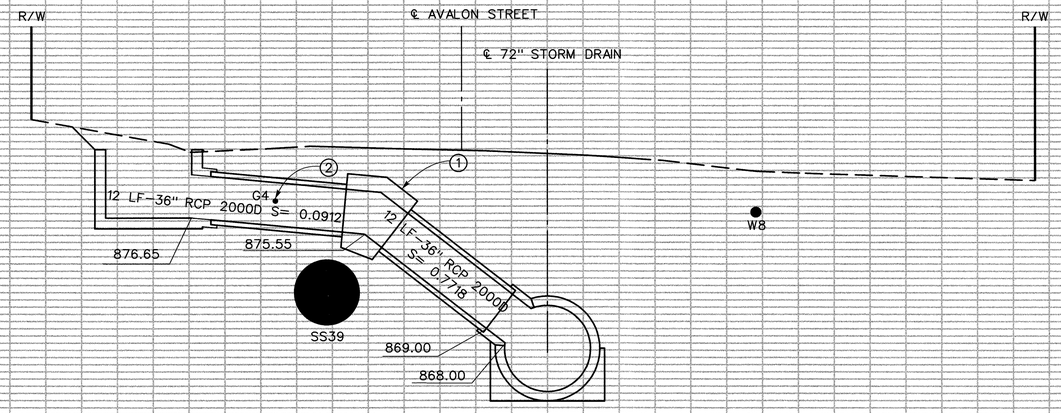
NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B1 – STA 15+14.00

SEE PLAN AND PROFILE SHEET 23

5' 0 5'



LINE B1 – STA 15+22.00

SEE PLAN AND PROFILE SHEET 23

5' 0 5'

NOTES

1. CONSTRUCT CONCRETE COLLAR PER STD M803.
2. 4" GAS LINE TO BE RELOCATED BY OTHERS.

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CUTLER
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

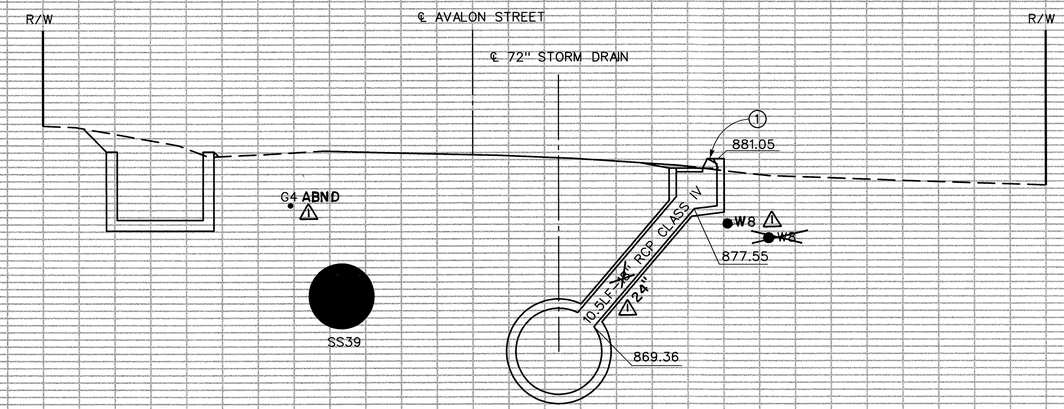
RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY: Robert J. Cutler
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
CONNECTOR PIPES LINE B1

PROJECT NO. 1-0-0157
DRAWING NO. 1-637
SHEET NO. 54 OF 78

NOTE: CONTRACTOR SHALL PROTECT IN PLACE ALL UTILITIES UNLESS OTHERWISE NOTED.



LINE B1 – STA 15+30.00

SEE PLAN AND PROFILE SHEET 23

5' 0 5'

NOTES

(1) CONSTRUCT 8" AC DIKE. SEE AVALON STREET 8" AC DIKE ALIGNMENT SHEET 60.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT

APPROVED BY:

DATE 8/26/2011

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.



TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	CHANGE W8 LOATION G4 ABND CATCH BASIN LENGTH CHANGED	JB	8/26/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: E.Q. & K.R.G.

DRAWN BY: MARK UPTON

DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355

APPROVED BY: DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN

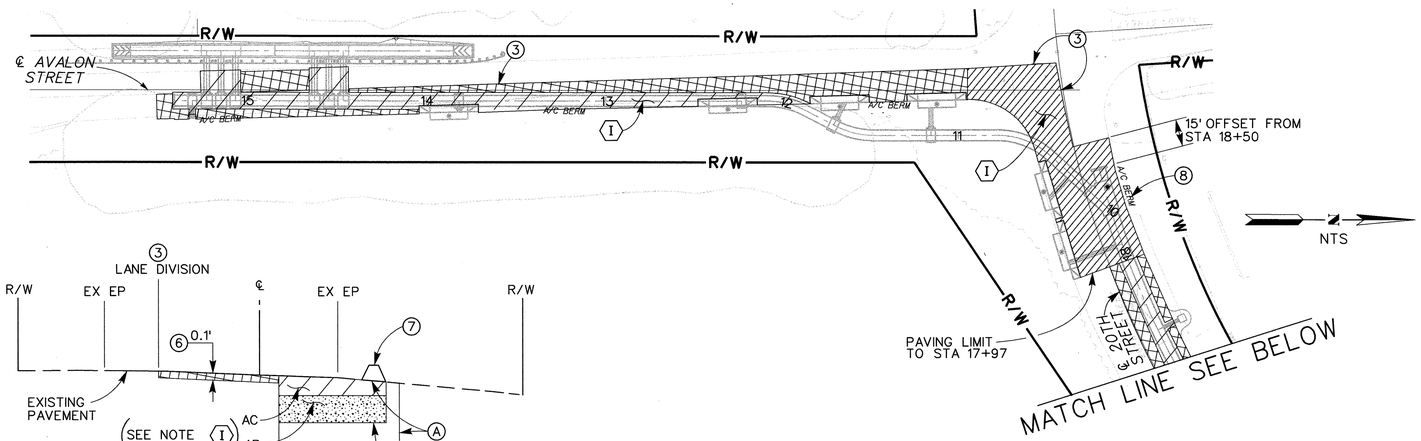
STAGE 1

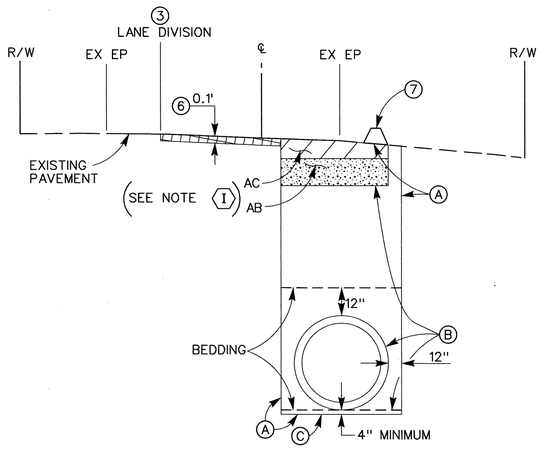
CONNECTOR PIPES LINE B1

PROJECT NO. 1-0-0157

DRAWING NO. 1-637

SHEET NO. 55 OF 78

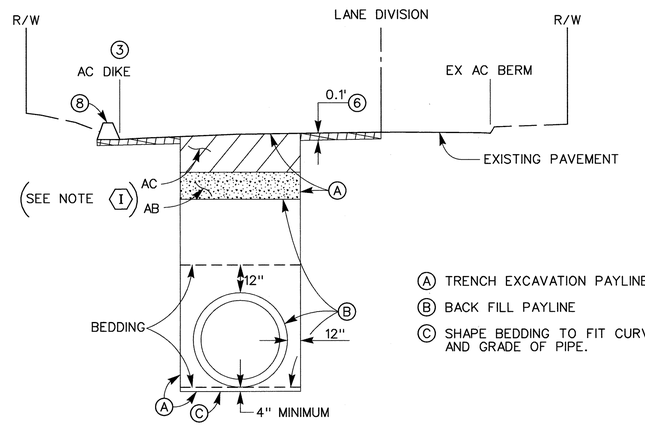




AVALON ST TYP SECTION AND PAY LINES

NTS

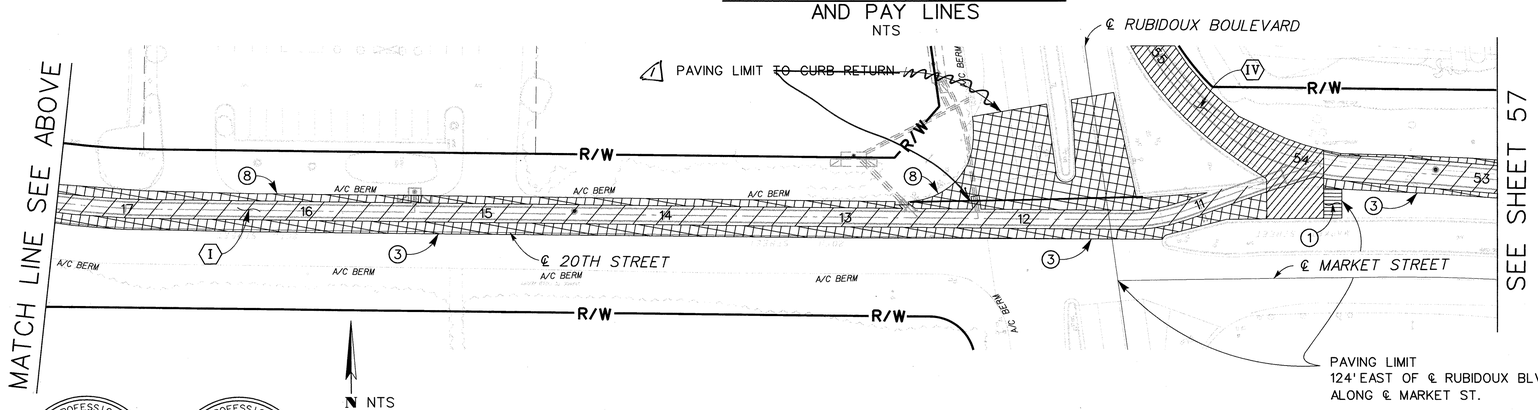
- (A) TRENCH EXCAVATION PAYLINE
- (B) BACK FILL PAYLINE
- (C) SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.



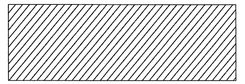
- (A) TRENCH EXCAVATION PAYLINE
- (B) BACK FILL PAYLINE
- (C) SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

20th ST TYP SECTION AND PAY LINES

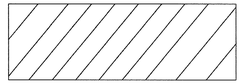
NTS



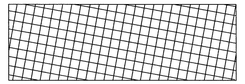
LEGEND



REMOVE AND REPLACE EXISTING AC AND AB PER NOTES (I) AND (IV)

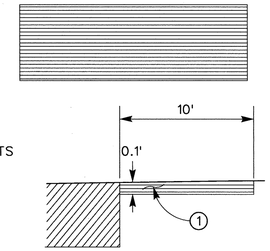


AC AND AB REPLACEMENT WITHIN TRENCH LIMITS



ASPHALT CONCRETE EXCAVATION – GRIND EXISTING AC OUTSIDE TRENCH WIDTH AND REPLACE WITH 0.1' ASPHALT CONCRETE

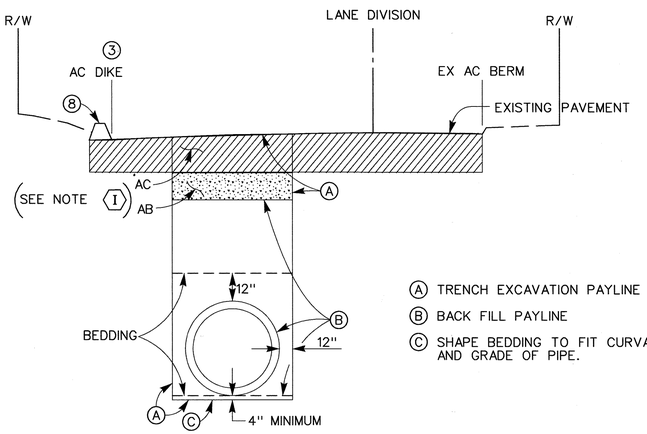
10' HEADER CUT



NTS

(I) 20TH AND AVALON STREETS SECTION WILL BE 0.29'AC OVER 0.50'AB (NO AB OUTSIDE TRENCH)

(IV) RUBIDOUX BLVD. SECTION WILL BE 0.58'AC OVER 1.18'AB (NO AB OUTSIDE TRENCH)



- (A) TRENCH EXCAVATION PAYLINE
- (B) BACK FILL PAYLINE
- (C) SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

FULL AC REPLACEMENT AND PAY LINES

NTS

AS BUILT
APPROVED BY:
DATE 4/22/2011

NOTES

1. 10' HEADER CUT (SEE DETAIL THIS SHEET).
2. PROTECT IN PLACE ALL MANHOLES / VALVES. ADJUST TO GRADE AS REQUIRED.
3. PAVING SHALL EXTEND FROM LANE LINE DIVISION TO EXISTING EDGE OF PAVEMENT, LIP OF GUTTER OR BACK OF PROPOSED AC DIKE.
4. REPLACE ALL DISTURBED STRIPING, YELLOW CENTER LINE, WHITE EDGE LINES AND REFLECTIVE PAVEMENT.
5. ALL SIGNING, STRIPING, AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH SECTION 84 OF THE CALTRANS STANDARD SPECIFICATIONS (LATEST EDITION) AND WITH ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL LAWS.
6. GRIND EXISTING AC OUTSIDE TRENCH OPENING AND PLACE 0.1' OVERLAY TO MEET EXISTING GROUND.
7. CONSTRUCT 8" AC DIKE (SEE ALIGNMENT DETAILS ON SHEET 60).
8. REMOVE EXISTING AC BERM AND CONSTRUCT 8" AC DIKE.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY: Tatiana Ramos
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/11/09

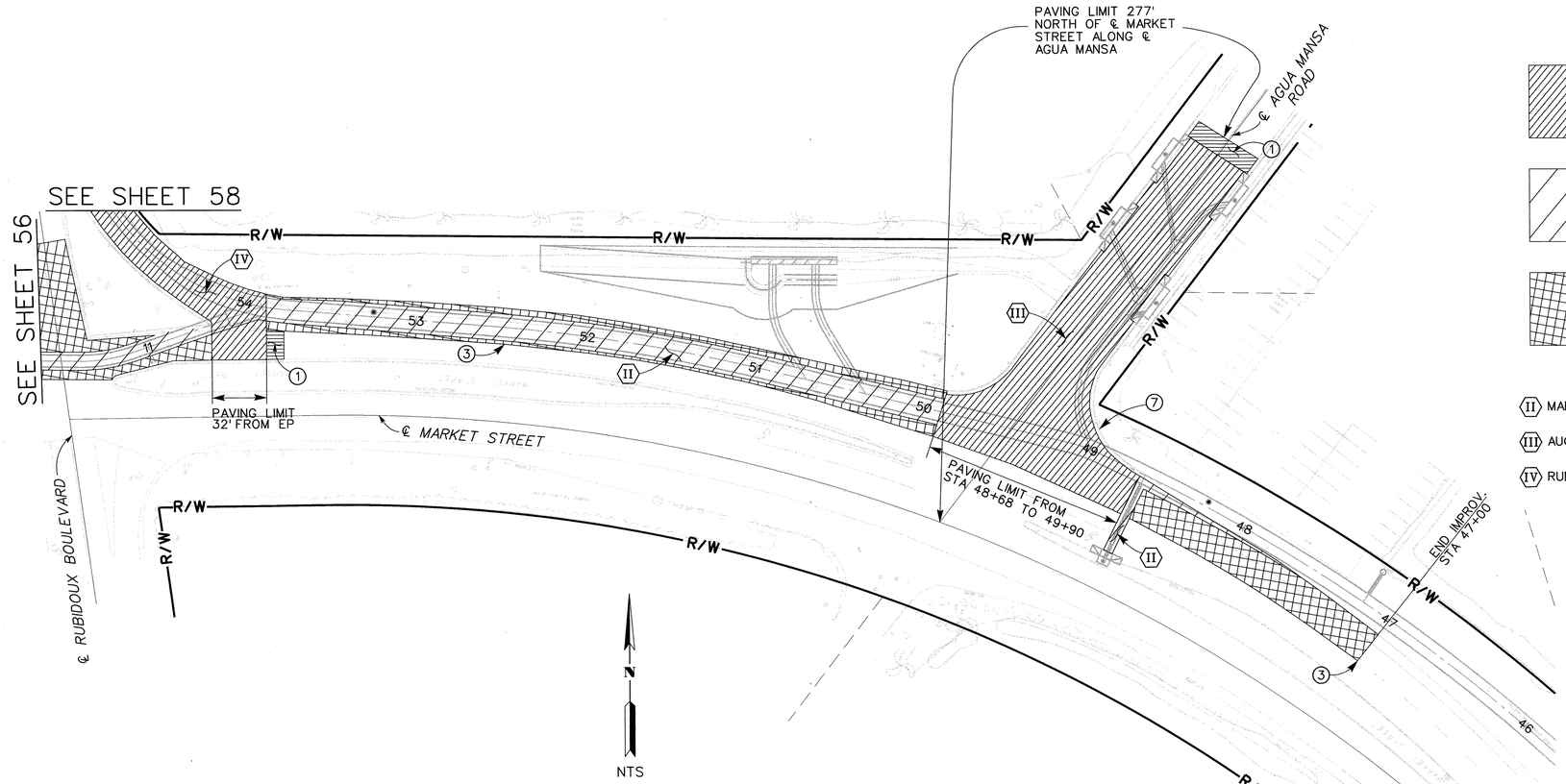
Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services. TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE
1	REVISED PAVING LIMIT @ 20th ST./ RUBIDOUX BOULEVARD INTERSECTION	CK	4/29/11

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355
APPROVED BY: DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STREET IMPROVEMENT PLANS

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 56 OF 78



LEGEND

REMOVE AND REPLACE EXISTING AC AND AB PER NOTES (II) THRU (IV)

AC AND AB REPLACEMENT WITHIN TRENCH LIMITS.

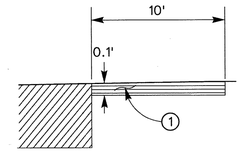
ASPHALT CONCRETE EXCAVATION – GRIND EXISTING AC OUTSIDE TRENCH WIDTH AND REPLACE WITH 0.1' ASPHALT CONCRETE.

(II) MARKET STREET SECTION WILL BE 0.53'AC OVER 1.03'AB (NO AB OUTSIDE TRENCH).

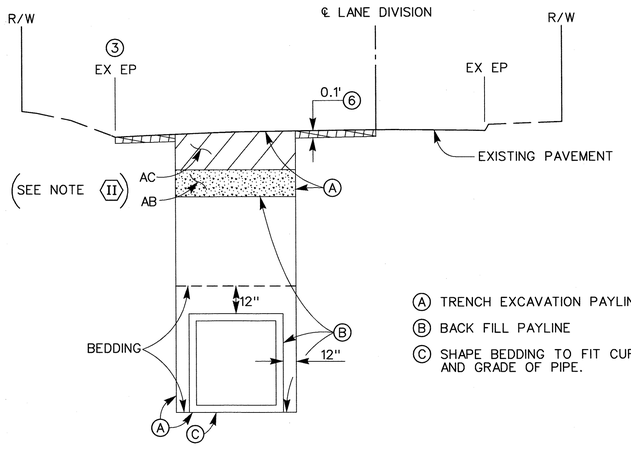
(III) AUGA MANSA ROAD SECTION WILL BE 0.43'AC OVER 0.87'AB (NO AB OUTSIDE TRENCH).

(IV) RUBIDOUX BLVD. SECTION WILL BE 0.58'AC OVER 1.18'AB (NO AB OUTSIDE TRENCH).

10' HEADER CUT



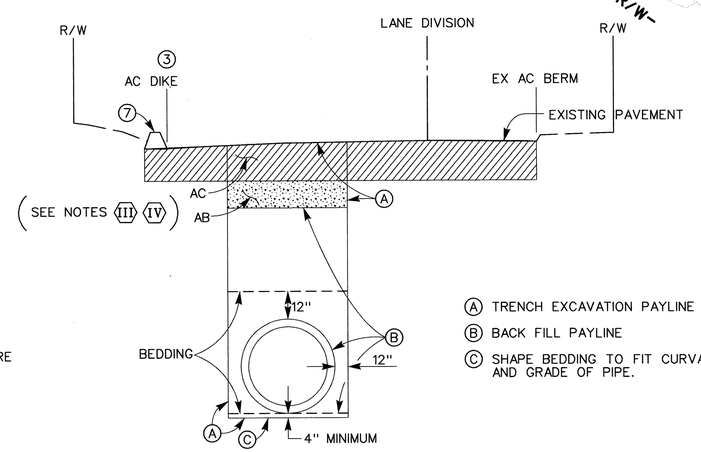
NTS



(A) TRENCH EXCAVATION PAYLINE
(B) BACK FILL PAYLINE
(C) SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

MARKET ST TYP SECTION AND PAY LINES

NTS



(A) TRENCH EXCAVATION PAYLINE
(B) BACK FILL PAYLINE
(C) SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

FULL AC REPLACEMENT AND PAY LINES

NTS

NOTES

(1) 10' HEADER CUT (SEE DETAIL THIS SHEET).

2 PROTECT IN PLACE ALL MANHOLES / VALVES. ADJUST TO GRADE AS REQUIRED.

(3) PAVING SHALL EXTEND FROM LANE LINE DIVISION TO EXISTING EDGE OF PAVEMENT, LIP OF GUTTER OR BACK OF PROPOSED AC DIKE.

4 REPLACE ALL DISTURBED STRIPING, YELLOW CENTER LINE, WHITE EDGE LINES AND REFLECTIVE PAVEMENT.

5 ALL SIGNING, STRIPING, AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH SECTION 84 OF THE CALTRANS STANDARD SPECIFICATIONS (LATEST EDITION) AND WITH ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL LAWS.

(6) GRIND EXISTING AC OUTSIDE TRENCH OPENING AND PLACE 0.1' OVERLAY TO MEET EXISTING GROUND.

(7) RECONSTRUCT 40 LF OF CURB AND GUTTER PER COUNTY STD 200.

REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 4/22/2011

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/11/09

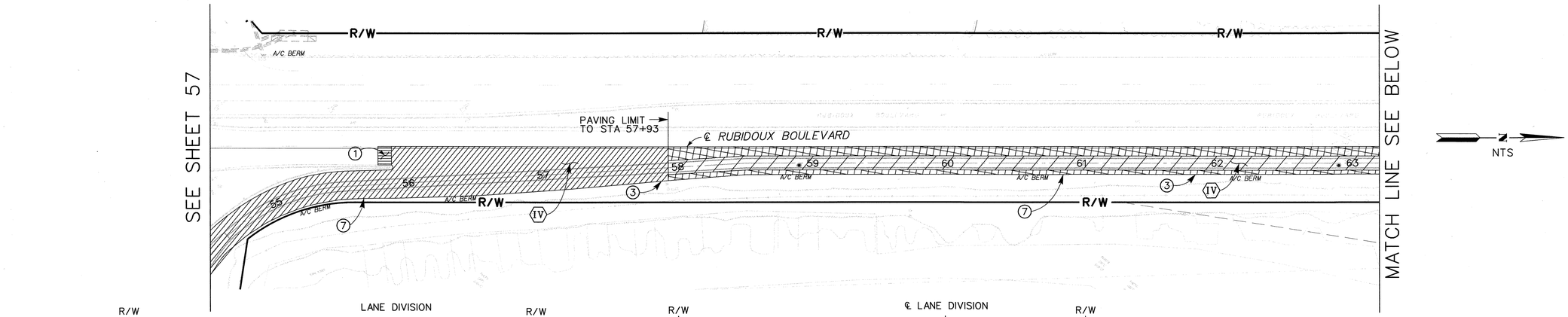
Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

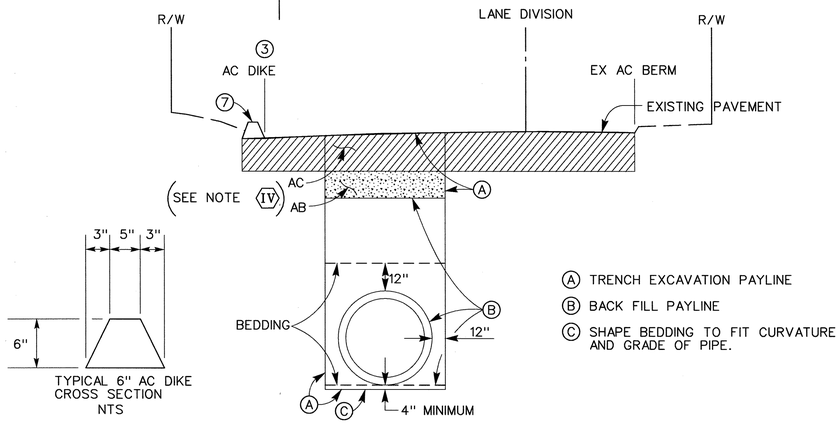
REVISIONS			
REF.	DESCRIPTION	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009
RECOMMENDED FOR APPROVAL BY: Mike M. Wong DATE: 4/22/09 R.E. No. 46355
APPROVED BY: DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STREET IMPROVEMENT PLANS

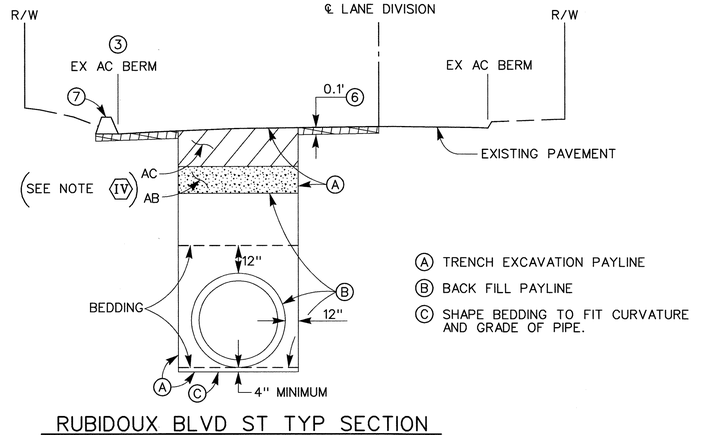
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 57 OF 78





A TRENCH EXCAVATION PAYLINE
B BACK FILL PAYLINE
C SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

FULL AC REPLACEMENT AND PAY LINES
NTS



A TRENCH EXCAVATION PAYLINE
B BACK FILL PAYLINE
C SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

RUBIDOUX BLVD ST TYP SECTION AND PAY LINES
NTS

NOTES

1. 10' HEADER CUT (SEE DETAIL THIS SHEET).
2. PROTECT IN PLACE ALL MANHOLES / VALVES. ADJUST TO GRADE AS REQUIRED.
3. PAVING SHALL EXTEND FROM LANE LINE DIVISION TO EXISTING EDGE OF PAVEMENT, LIP OF GUTTER OR BACK OF PROPOSED AC DIKE.
4. REPLACE ALL DISTURBED STRIPING, YELLOW CENTER LINE, WHITE EDGE LINES AND REFLECTIVE PAVEMENT.
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6. GRIND EXISTING AC OUTSIDE TRENCH OPENING AND PLACE 0.1' OVERLAY TO MEET EXISTING GROUND.
7. REMOVE EXISTING AC BERM AND CONSTRUCT 6" AC DIKE PER DETAIL THIS SHEET.

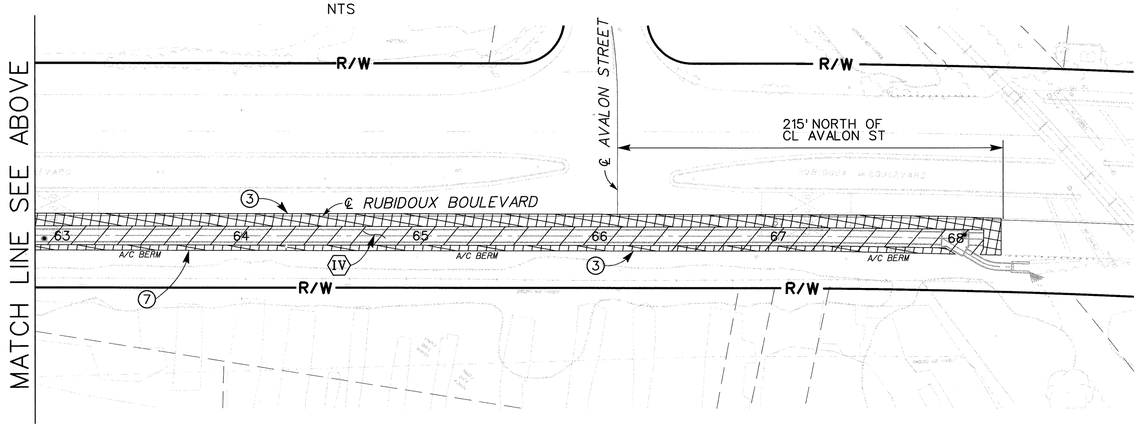
LEGEND

REMOVE AND REPLACE EXISTING AC AND AB PER NOTE IV

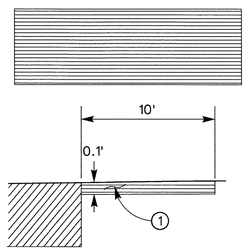
AC AND AB REPLACEMENT WITHIN TRENCH LIMITS

ASPHALT CONCRETE EXCAVATION – GRIND EXISTING AC OUTSIDE TRENCH WIDTH AND REPLACE WITH 0.1' ASPHALT CONCRETE

IV RUBIDOUX BOULEVARD SECTION WILL BE 0.58'AC OVER 1.18'AB (NO AB OUTSIDE TRENCH).



10' HEADER CUT



REGISTERED PROFESSIONAL ENGINEER MIKE M. WONG No. 46355 Exp. 12-31-10 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ROBERT J. CULLEN No. 44684 Exp. 3-31-10 CIVIL STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE: 4/16/2014

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY: Patricia Romo
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/11/09

Don't Dig...Until You Call U.S.A. Toll Free 1-800-227-2600 for the location of buried utility lines. Don't disrupt vital services.
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

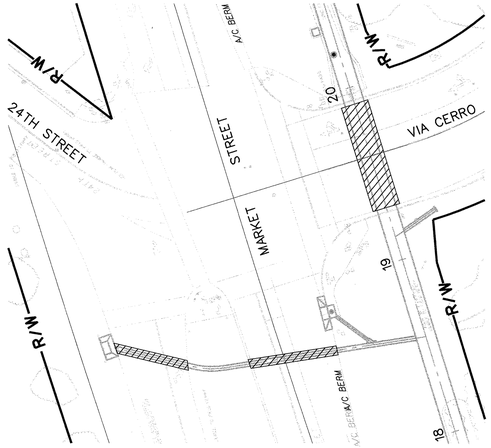
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

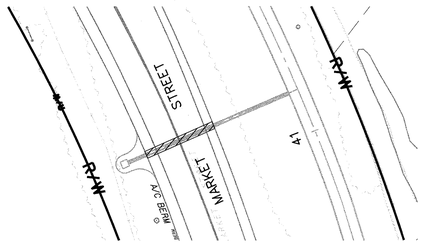
APPROVED BY: Robert J. Cullen
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STREET IMPROVEMENT PLANS

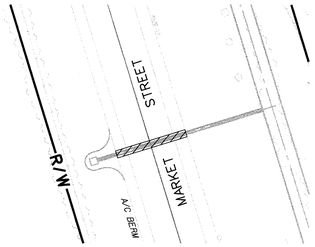
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 58 OF 78



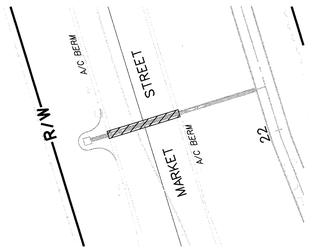
STA 18+55.14 AND
ADJACENT INTERSECTION
NTS



STA 41+25.00
NTS



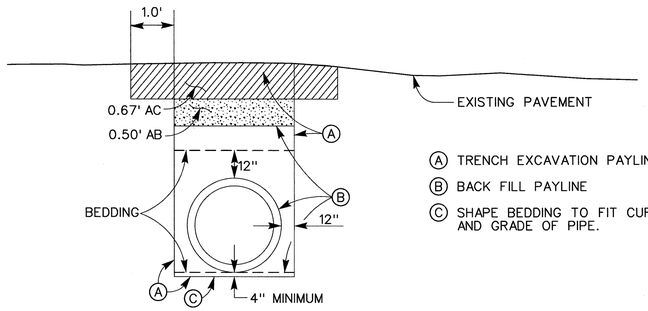
STA 38+00.00
NTS



STA 22+25.25
NTS

LEGEND

REMOVE AND REPLACE EXISTING AC AND AB PER CONNECTOR PIPE TYP SECTION ON THIS SHEET.



Ⓐ TRENCH EXCAVATION PAYLINE

Ⓑ BACK FILL PAYLINE

Ⓒ SHAPE BEDDING TO FIT CURVATURE AND GRADE OF PIPE.

CONNECTOR PIPE TYP SECTION
AND PAY LINES
NTS

NOTES

1 ALL SIGNING, STRIPING, AND PAVEMENT MARKINGS SHALL BE IN COMPLIANCE WITH SECTION 84 OF THE CALTRANS STANDARD SPECIFICATIONS (LATEST EDITION) AND WITH ALL OTHER APPLICABLE FEDERAL, STATE, AND LOCAL LAWS.

2 PROTECT IN PLACE ALL MANHOLES / VALVES. ADJUST TO GRADE AS REQUIRED.

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REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 11/26/2011

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/11/09

Don't Dig...Until You Call U.S.A. Toll Free
1-800-227-2600
for the location of buried utility lines.
Don't disrupt vital services.
BURIED CABLE
TWO WORKING DAYS BEFORE YOU DIG

REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

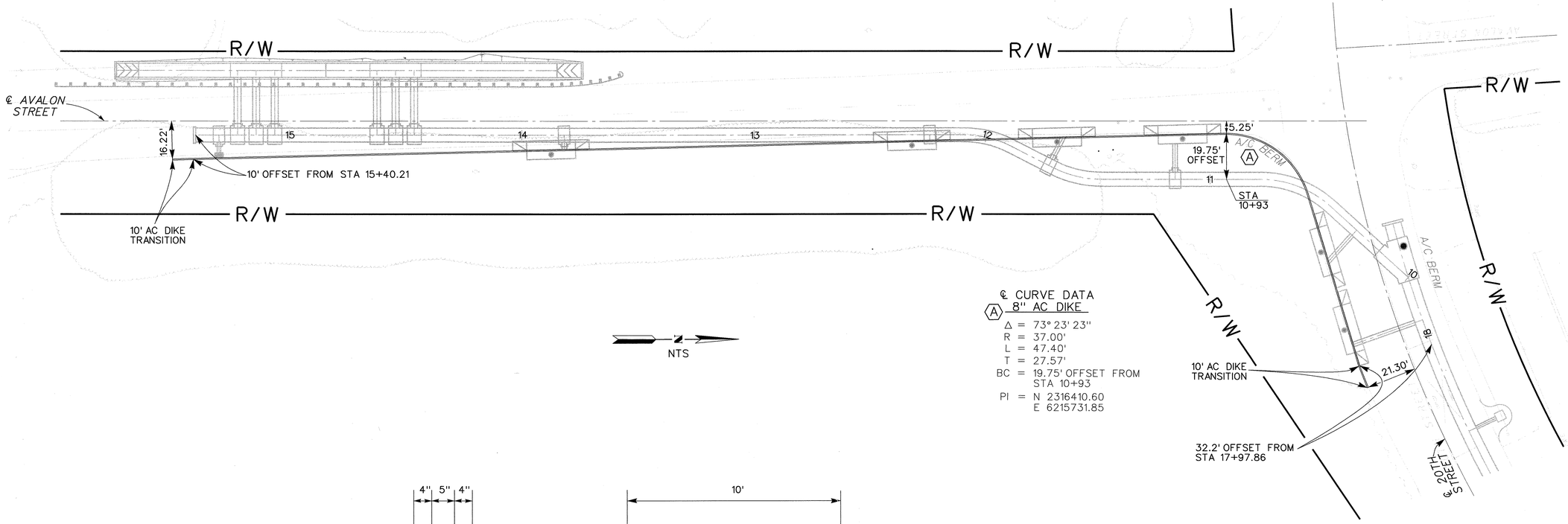
DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY: Mike M. Wong
DATE: 4/22/09 R.E. No. 46355

APPROVED BY:
DATE: 22-Apr-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
STREET IMPROVEMENT PLANS

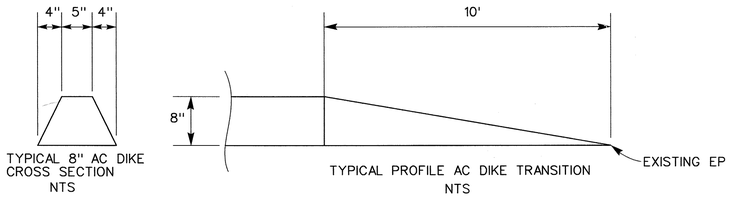
PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 59 OF 78



NTS

℄ CURVE DATA
Ⓐ 8" AC DIKE

Δ = 73° 23' 23"
R = 37.00'
L = 47.40'
T = 27.57'
BC = 19.75' OFFSET FROM STA 10+93
PI = N 2316410.60
E 6215731.85



TYPICAL 8" AC DIKE CROSS SECTION
NTS

TYPICAL PROFILE AC DIKE TRANSITION
NTS

REGISTERED PROFESSIONAL ENGINEER
MIKE M. WONG
No. 46355
Exp. 12-31-10
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. CULLEN
No. 44684
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

AS BUILT
APPROVED BY:
DATE 8/26/2011

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:
DEPUTY DIRECTOR OF TRANSPORTATION
DATE: 5/11/09

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REF.	REVISIONS	APPR.	DATE

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

DESIGNED BY: K. GHODS
DRAWN BY: MARK UPTON
DATE DRAWN: APRIL 2009

RECOMMENDED FOR APPROVAL BY:
DATE: 4/22/09 R.E. No. 46355

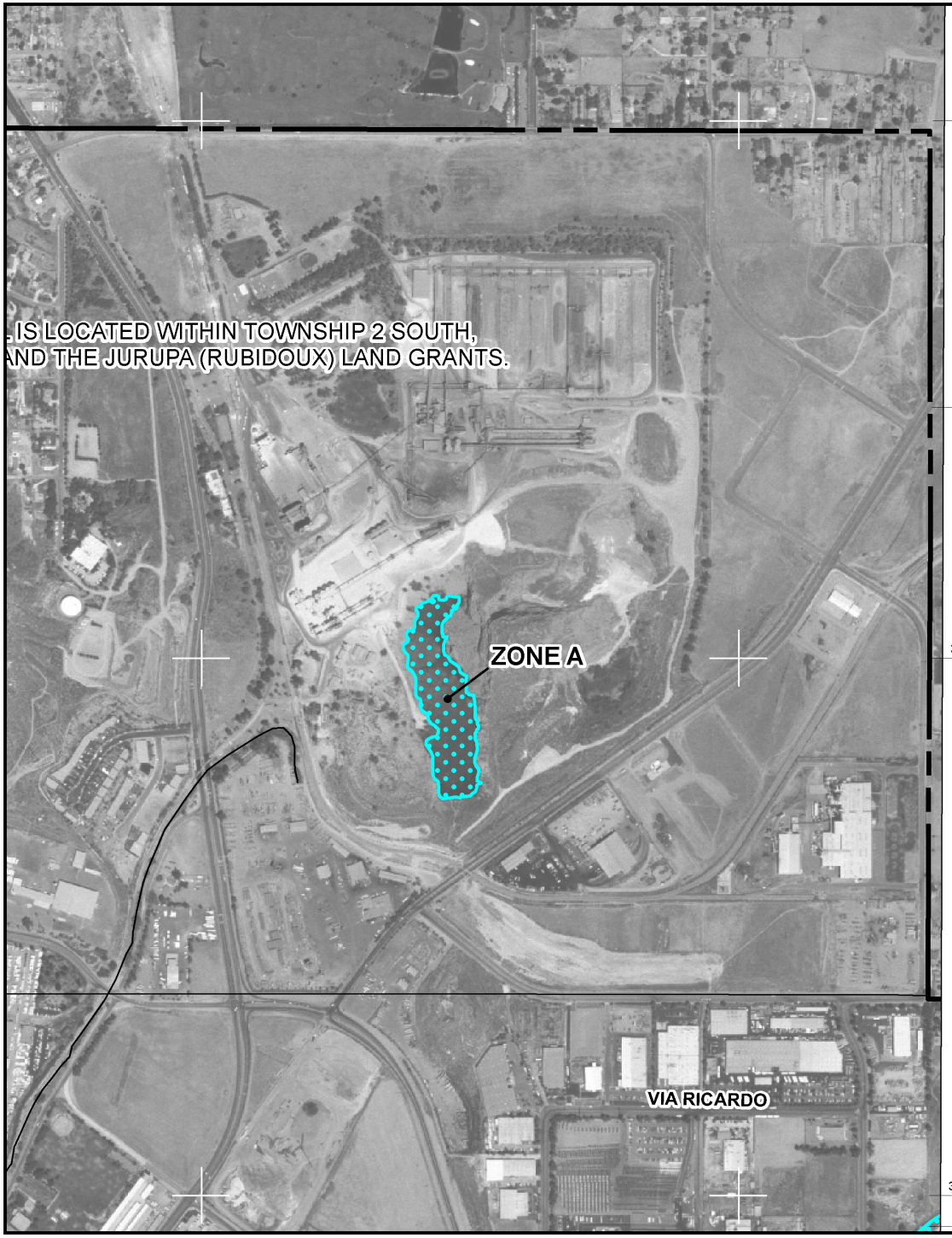
APPROVED BY:
DATE: 22-APR-09 R.E. No. 44684

BELLTOWN MARKET STREET STORM DRAIN
STAGE 1
AVALON STREET 8" AC DIKE ALIGNMENT

PROJECT NO. 1-0-0148
DRAWING NO. 1-637
SHEET NO. 60 OF 78

APPENDIX B

FEMA Flood Insurance Rate Map



MAP SCALE 1" = 1000'

500 0 1000 2000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0045G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 45 OF 3805
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RIVERSIDE COUNTY	060245	0045	G
RIVERSIDE, CITY OF	060260	0045	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C0045G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX C

Excerpt of Preliminary Calculations

Existing Rational Area Backup

AREA ID	AREA		SOILS (%)				LANDUSE
	SF	AC	A	B	C	D	
S1	271395.1	6.2	1	0	0	0	NATURAL - POOR
S2	295362.9	6.8	1	0	0	0	NATURAL - POOR
S3	348404.5	8.0	1	0	0	0	NATURAL - POOR
S4	509139.8	11.7	1	0	0	0	NATURAL - POOR
S5	260225.5	6.0	1	0	0	0	NATURAL - POOR
S6	241860.6	5.6	1	0	0	0	NATURAL - POOR
S7	682298	15.7	1	0	0	0	NATURAL - POOR
S8	1403523	32.2	1	0	0	0	NATURAL - POOR
	TOTAL	**92.1**					
10-A	424952	9.8	1	0	0	0	COMMERCIAL
10-B	285899.2	6.6	1	0	0	0	COMMERCIAL
10-C	787278.6	18.1	1	0	0	0	COMMERCIAL
10-D	871269	20.0	0.8	0	0	0.2	COMMERCIAL
10-E	1069818	24.6	0.95	0	0	0.05	COMMERCIAL
10-F	224170.5	5.1	0.08	0	0	0.92	NATURAL - POOR
11-A	457859.1	10.5	1	0	0	0	COMMERCIAL
11-B	456345.6	10.5	1	0	0	0	COMMERCIAL
11-C	953836.5	21.9	1	0	0	0	COMMERCIAL
11-D	1122537	25.8	1	0	0	0	COMMERCIAL
12-A	841591.4	19.3	1	0	0	0	COMMERCIAL
	TOTAL	**172.1**					
BA-1	333780	7.7	1	0	0	0	COMMERCIAL
BA-2	454317.1	10.4	0.96	0.04	0	0	COMMERCIAL
BA-3	181125.4	4.2	0.5	0.5	0	0	COMMERCIAL
	TOTAL	**22.3**					

Proposed Rational Area Backup

AREA ID	AREA		SOILS				LANDUSE
	SF	AC	A	B	C	D	
1-A	76695.72	1.76	1.00	0.00	0.00	0.00	COMMERCIAL
1-B	47889.71	1.10	1.00	0.00	0.00	0.00	COMMERCIAL
1-C	33236.35	0.76	1.00	0.00	0.00	0.00	COMMERCIAL
1-D	145853.9	3.35	1.00	0.00	0.00	0.00	COMMERCIAL
1-E	131018.7	3.01	1.00	0.00	0.00	0.00	COMMERCIAL
1-F	40468.34	0.93	1.00	0.00	0.00	0.00	COMMERCIAL
1-G	15891.53	0.36	1.00	0.00	0.00	0.00	COMMERCIAL
1-H	25550.71	0.59	1.00	0.00	0.00	0.00	COMMERCIAL
1-I	49730.46	1.14	1.00	0.00	0.00	0.00	COMMERCIAL
		13.00					
2-A	70103.25	1.61	1.00	0.00	0.00	0.00	COMMERCIAL
2-B	40885.21	0.94	1.00	0.00	0.00	0.00	COMMERCIAL
2-C	18126.51	0.42	1.00	0.00	0.00	0.00	COMMERCIAL
2-D	17582.93	0.40	1.00	0.00	0.00	0.00	COMMERCIAL
2-E	19075.17	0.44	1.00	0.00	0.00	0.00	COMMERCIAL
2-F	31462.32	0.72	1.00	0.00	0.00	0.00	COMMERCIAL
2-G	171151.4	3.93	1.00	0.00	0.00	0.00	COMMERCIAL
2-H	177120.2	4.07	1.00	0.00	0.00	0.00	COMMERCIAL
2-I	20793.76	0.48	1.00	0.00	0.00	0.00	COMMERCIAL
2-J	138750.1	3.19	1.00	0.00	0.00	0.00	COMMERCIAL
2-K	105942.7	2.43	1.00	0.00	0.00	0.00	COMMERCIAL
		18.62					
3-A	32184.35	0.74	1.00	0.00	0.00	0.00	COMMERCIAL
3-B	70988.94	1.63	1.00	0.00	0.00	0.00	COMMERCIAL
3-C	59249.6	1.36	1.00	0.00	0.00	0.00	COMMERCIAL
3-D	21673.8	0.50	1.00	0.00	0.00	0.00	COMMERCIAL
		4.23					
4-A	30778.29	0.71	1.00	0.00	0.00	0.00	COMMERCIAL
4-B	435571.9	10.00	1.00	0.00	0.00	0.00	COMMERCIAL
4-C	457720.6	10.51	1.00	0.00	0.00	0.00	COMMERCIAL
4-D	58945.78	1.35	1.00	0.00	0.00	0.00	COMMERCIAL
4-E	50239.24	1.15	1.00	0.00	0.00	0.00	COMMERCIAL
4-F	90013.7	2.07	1.00	0.00	0.00	0.00	COMMERCIAL
4-G	113087.2	2.60	1.00	0.00	0.00	0.00	COMMERCIAL
4-H	389584.4	8.94	1.00	0.00	0.00	0.00	COMMERCIAL
4-I	510675.3	11.72	1.00	0.00	0.00	0.00	COMMERCIAL
4-J	391716.4	8.99	1.00	0.00	0.00	0.00	COMMERCIAL
4-K	400370.7	9.19	1.00	0.00	0.00	0.00	COMMERCIAL
4-L	53881.29	1.24	1.00	0.00	0.00	0.00	COMMERCIAL

4-M	53408.98	1.23	1.00	0.00	0.00	0.00	COMMERCIAL
4-N	69379.53	1.59	1.00	0.00	0.00	0.00	COMMERCIAL
4-O	30188.44	0.69	1.00	0.00	0.00	0.00	COMMERCIAL
4-P	37133.93	0.85	1.00	0.00	0.00	0.00	COMMERCIAL
4-Q	371762.3	8.53	1.00	0.00	0.00	0.00	COMMERCIAL
4-R	411908.7	9.46	1.00	0.00	0.00	0.00	COMMERCIAL
4-S	199269.1	4.57	0.89	0.00	0.00	0.11	COMMERCIAL
		95.40					
5-A	354145.8	8.13	0.98	0.02	0.00	0.00	COMMERCIAL
5-B	281975.4	6.47	1.00	0.00	0.00	0.00	COMMERCIAL
5-C	155463	3.57	0.97	0.00	0.00	0.02	COMMERCIAL
5-D	110940	2.55	0.70	0.00	0.00	0.30	COMMERCIAL
5-E	38832.36	0.89	1.00	0.00	0.00	0.00	COMMERCIAL
5-F	229598.8	5.27	1.00	0.00	0.00	0.00	COMMERCIAL
5-G	250404.6	5.75	1.00	0.00	0.00	0.00	COMMERCIAL
5-H	242338.8	5.56	1.00	0.00	0.00	0.00	COMMERCIAL
5-I	226812.7	5.21	1.00	0.00	0.00	0.00	COMMERCIAL
5-J	49737.48	1.14	1.00	0.00	0.00	0.00	COMMERCIAL
5-K	617091.9	14.17	0.10	0.00	0.07	0.83	COMMERCIAL
		58.71					
BA-1	138852.6	3.19	1.00	0.00	0.00	0.00	COMMERCIAL
BA-2	55046.39	1.26	1.00	0.00	0.00	0.00	COMMERCIAL
BA-3	249646.9	5.73	0.70	0.30	0.00	0.00	COMMERCIAL
BA-4	196865.6	4.52	0.74	0.26	0.00	0.00	COMMERCIAL
		14.70					
6-A	27839.21	0.64	1.00	0.00	0.00	0.00	COMMERCIAL
6-B	40195.58	0.92	1.00	0.00	0.00	0.00	COMMERCIAL
6-C	195605.8	4.49	1.00	0.00	0.00	0.00	COMMERCIAL
6-D	344243.4	7.90	0.59	0.00	0.00	0.41	COMMERCIAL
6-E	455862.8	10.47	0.88	0.00	0.00	0.12	COMMERCIAL
6-F	295777.9	6.79	0.79	0.00	0.00	0.21	COMMERCIAL
6-G	224170.5	5.15	0.08	0.00	0.00	0.92	NATURAL - POOR
		36.36					

Proposed Rational Routing

AREA 1

		Area	Length	Elevation
1000				912.89
	1-A	1.76	403.94	
999				910.87
	1-B	1.10	290.24	
998				909.42
	1-C	0.76	195.76	
997				908.44
	1-D	3.35	274.96	
996				907.07
	1-E	3.01	275.11	
995				905.69
	1-F	0.93	287.48	
994				904.25
	1-G	0.36	86.42	
	1-H	0.59		
993				903.82
	1-I	1.14	241.56	
992				902.57
			849.87	
1997.1				898.84

Line A Stage 2 (West of Rubidoux)

20000				900.58
			347.83	
1997.1				898.84

AREA 2

		Area	Length	Elevation
2000				911.78
	2-A	1.61	184.40	
1999				909.94
	2-B	0.94	386.63	
1998				906.07
	2-C	0.42	384.17	
1997				902.23
	2-D	0.40	338.05	
1997.1				898.84
			52.42	
1996				898.38
	2-E	0.44	423.75	
1995				896.26
	2-F	0.72	699.33	
1994				892.76
	2-I	0.48	461.98	
1993				890.45
	2-K	2.43	585.60	
	6-F	6.79		
	6-G	5.15		
1992				880.32
			662.82	
1990				868.85

AREA 6

		Area	Length	Elevation
6000				925.30
	6-A	0.64	448.43	
5999				919.13
	6-B	0.92	670.07	
5998				913.24
	6-C	4.49	707.42	
5997				906.57
	6-D	7.90	1052.00	
5996				895.06
	6-E	10.47	821.35	
1990				886.00

AREA 3

		Area	Length	Elevation
3000				929.69
	3-A	0.74	183.26	
2999				928.77
	3-B	1.63	541.10	
2998				926.07
	3-C	1.36	412.73	
2997				924.00
	3-D	0.50	126.61	
2996				921.47
			50.83	
1996				898.38

		Area	Length	Elevation
				893.10
1993.3				
	2-G	3.93	207.50	
1993.2				892.06
	2-H	4.07	187.50	
	2-J	3.19		
1993.1				891.13
			135.00	
1993				890.45

AREA 4

		Area	Length	Elevation
4000				930.00
	4-A	0.71	78.00	
3999				929.61
	4-B	10.00	244.40	
3999.1				928.39
			400.13	
3998				926.39
	4-C	10.51	799.94	
3997				922.39
	4-D	1.35	483.35	
	4-E	1.15		
3996				919.97
	4-F	2.07	517.92	
3995				917.38
			110.13	
3994				916.83
	4-L	1.24	569.81	
3993				908.27
	4-M	1.23	456.60	
3992				901.42
			107.27	
3991				900.88
			56.55	
3990				900.60
			415.08	
3989				898.52
	4-S	4.57	246.63	
3988				897.54
			954.99	
1994				892.77

		Area	Length	Elevation
3994.5				924.40
	4-G	2.60	179.24	
3994.4				923.50
	4-H	8.94	398.76	
3994.3				921.51
	4-J	8.99	174.82	
3994.2				920.64
	4-K	9.19		
	4-I	11.72	703.28	
3994.1				917.12
			57.95	
3994				916.83
3992.6				919.50
	4-N	1.59	344.04	
3992.5				915.41
	4-O	0.69	282.35	
3992.4				912.06
	4-P	0.85	318.93	
3992.3				908.26
	4-Q	8.53	593.67	
3992.2				905.30
	4-R	9.46	704.59	
3992.1				901.77
			70.91	
3992				901.42

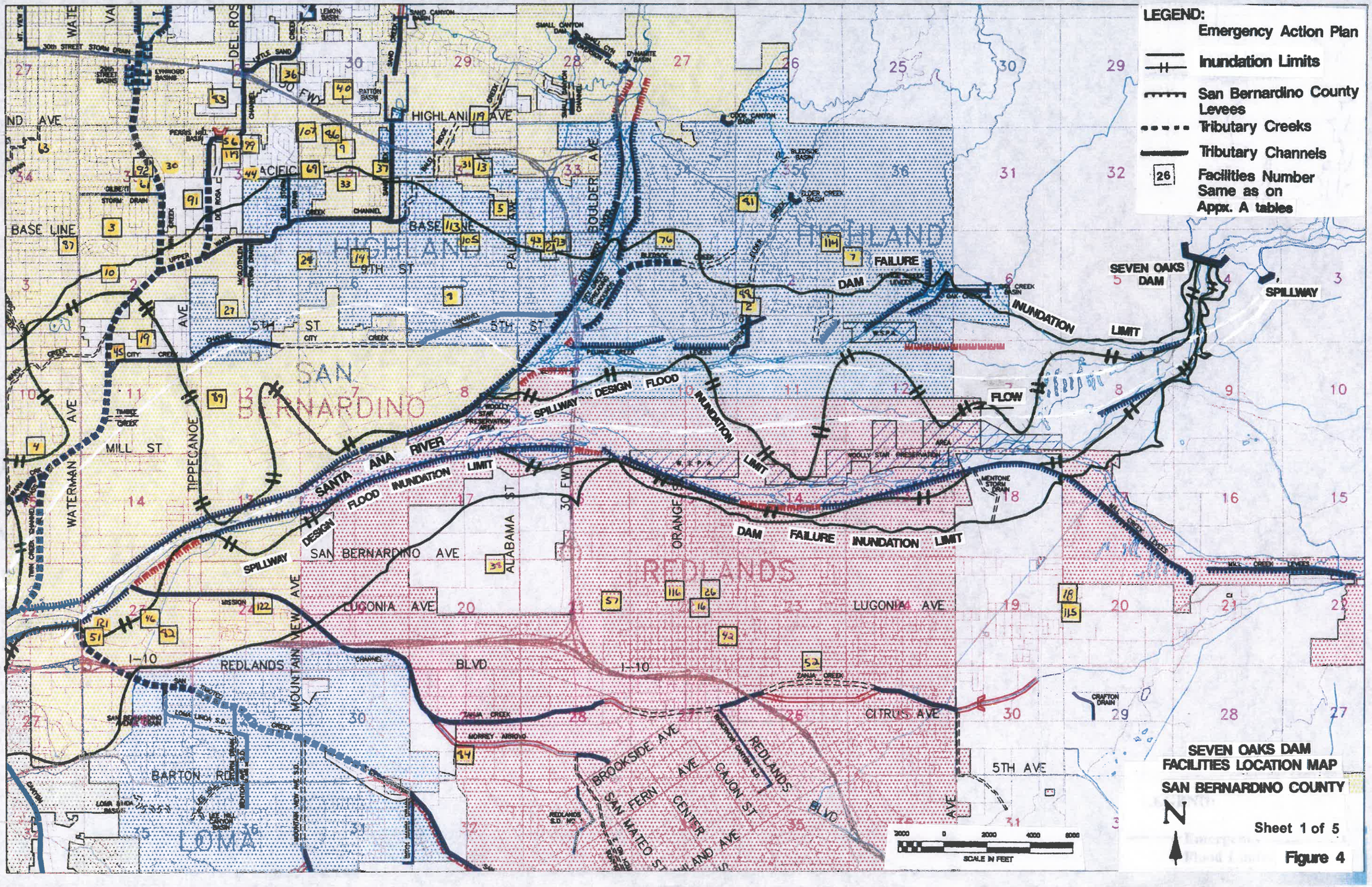
AREA 5

		Area	Length	Elevation
4995.6				937.00
5000				932.00
	5-A	8.13	460.03	
4995.5				935.29
4999				926.95
	5-B	6.47	462.98	
4995.4				929.74
4998				921.87
	5-C	3.57	273.56	
4995.3				921.53
4998.1				905.67
			392.638	
4995.2				913.61
4997				903.70
	5-D	2.55	410.88	
4995.1				907.76
4996				901.65
	5-K	14.17	24.75	
4995				901.52
			126.901	
3991				900.88

		Area	Length	Elevation
	5-E	0.89	100.00	
	5-F	5.27	325.02	
	5-G	5.75	480.60	
	5-H	5.56	463.38	
	5-I	5.21	343.00	
	5-J	1.14	365.01	
4995				901.52

APPENDIX D

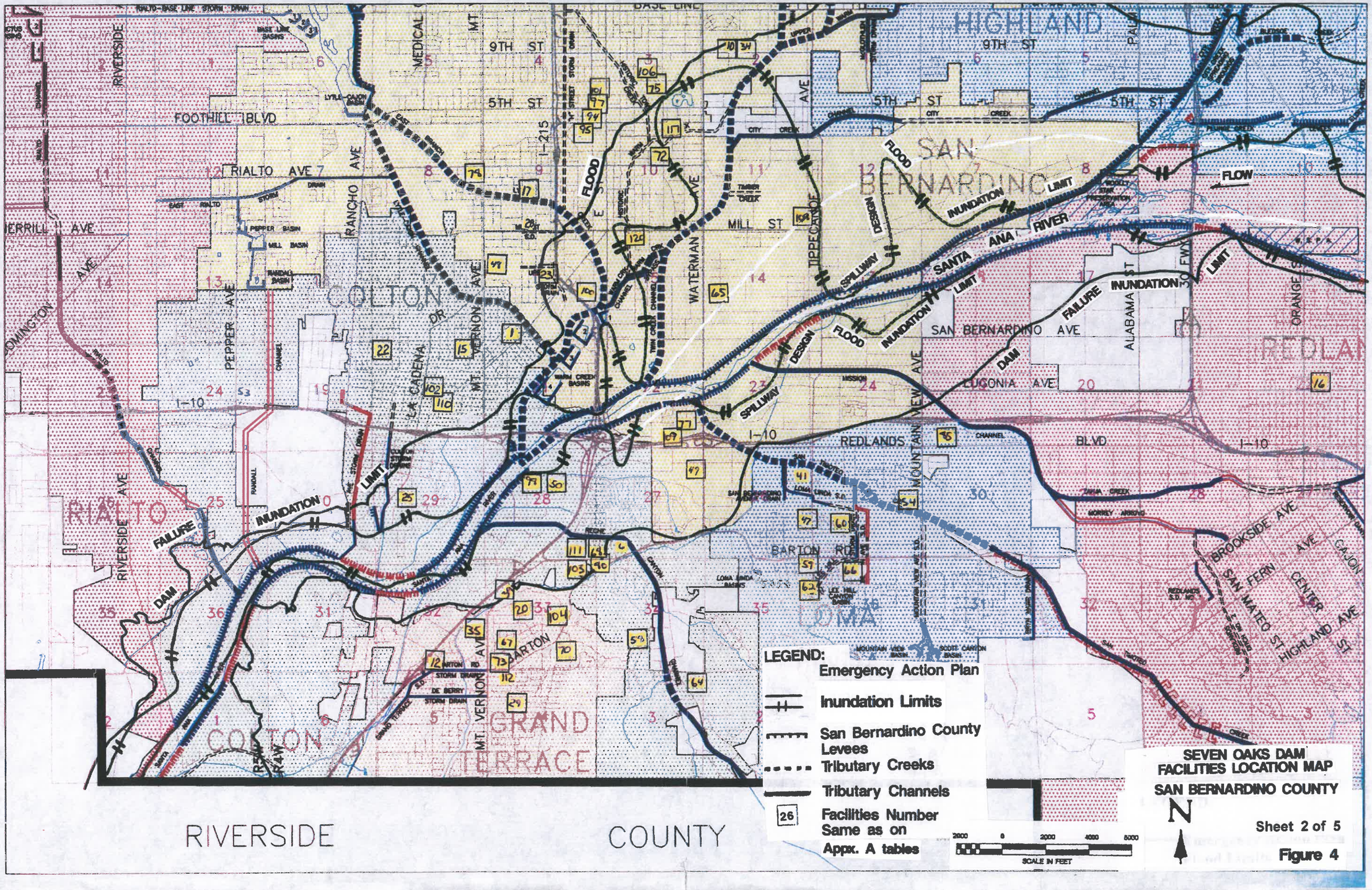
ACOE & RCFC & WCD Inundation Maps



SEVEN OAKS DAM
FACILITIES LOCATION MAP
SAN BERNARDINO COUNTY

Sheet 1 of 5

Figure 4

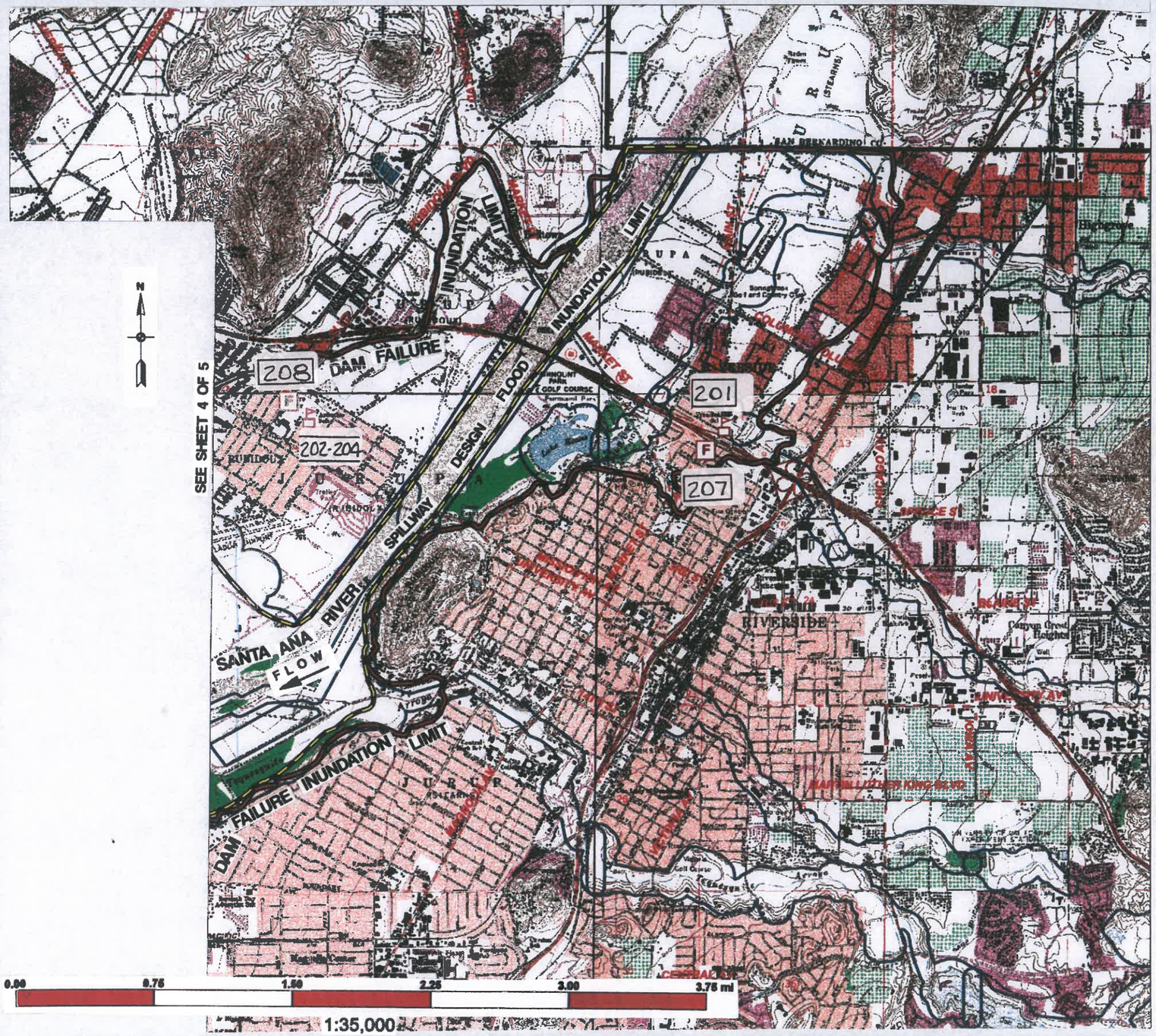


SEVEN OAKS DAM
FACILITIES LOCATION MAP
SAN BERNARDINO COUNTY

Sheet 2 of 5

Figure 4

VALUE ENGINEERING PAYS



Legend

- Spillway Design Flood Inundation Limits
- Dam Failure Inundation Limits
- Riverside County Boundary
- FEMA Floodplain
- CHP Stations
- Hospitals
- Schools
- Police Stations
- Sheriffs Substations
- Fire Stations
- Facilities Number (Same as on Appendix A Tables)

SOURCE OF INFORMATION:
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT GEOGRAPHIC INFORMATION SYSTEM. THE GRAPHICS AND TABULAR INFORMATION SHOWN ON THIS DOCUMENT ARE DERIVED FROM A VARIETY OF PUBLIC AGENCY AND/OR PRIVATE COMMERCIAL SOURCES. THESE SOURCES MAY POSSESS VARYING LEVELS OF ACCURACY AND PRECISION AND THIS PRODUCT IS MEANT ONLY AS A GUIDE TO THE RELATIVE POSITION AND SCALE OF THE DEPICTED FEATURES. THE GIS DOCUMENT IS IN NO CASE TO BE INTERPRETED AS FUNDAMENTAL OR DECISIVE FOR PURPOSES OF LAND SURVEYING, FIELD ENGINEERING, PLAN DRAFTING OR LAND AQUISITION AND DETERMINATION.

SEVEN OAKS DAM
EMERGENCY ACTION PLAN

FACILITIES LOCATION MAP
RIVERSIDE COUNTY
(APRIL 2001)

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SAFETY PAYS

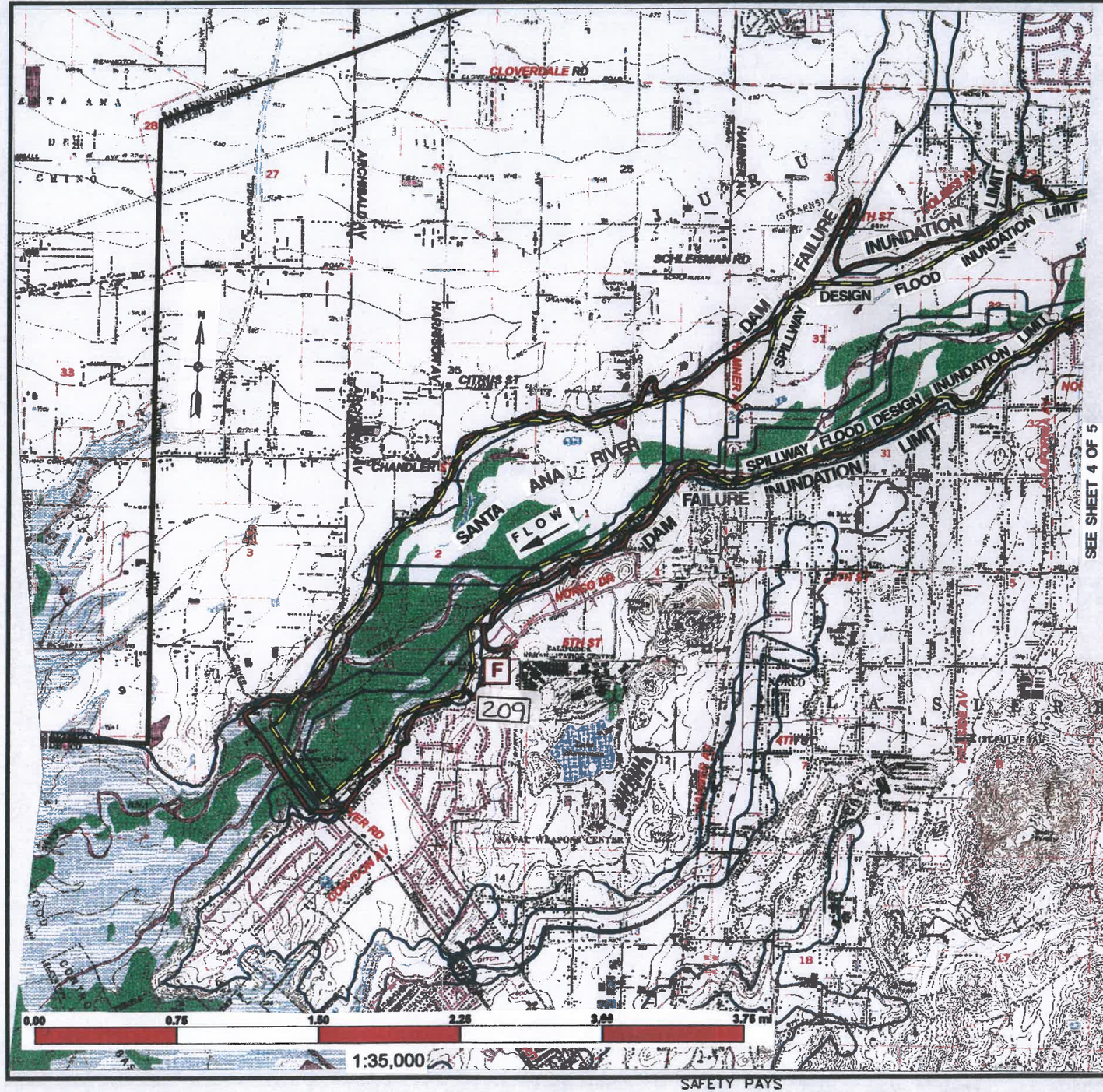
SOURCE OF INFORMATION:
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT GEOGRAPHIC INFORMATION SYSTEM. THE GRAPHICS AND TABULAR INFORMATION SHOWN ON THIS DOCUMENT ARE DERIVED FROM A VARIETY OF PUBLIC AGENCY AND/OR PRIVATE COMMERCIAL SOURCES. THESE SOURCES MAY POSSESS VARYING LEVELS OF ACCURACY AND PRECISION AND THIS PRODUCT IS MEANT ONLY AS A GUIDE TO THE RELATIVE POSITION AND SCALE OF THE DEPICTED FEATURES. THE GIS DOCUMENT IS IN NO CASE TO BE INTERPRETED AS FUNDAMENTAL OR DECISIVE FOR PURPOSES OF LAND SURVEYING, FIELD ENGINEERING, PLAN DRAFTING OR LAND AQUISITION AND DETERMINATION.

SEVEN OAKS DAM
EMERGENCY ACTION PLAN

FACILITIES LOCATION MAP
RIVERSIDE COUNTY
(APRIL 2001)

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

VALUE ENGINEERING PAYS



Legend

- CHP Stations
- Hospitals
- Schools
- Police Stations
- Sheriffs Substations
- Fire Stations
- Facilities Number (Same as on Appendix A Tables)
- Spillway Design Flood Inundation Limits
- Dam Failure Inundation Limits
- Riverside County Boundary
- FEMA Floodplain

SOURCE OF INFORMATION:
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT GEOGRAPHIC INFORMATION SYSTEM. THE GRAPHICS AND TABULAR INFORMATION SHOWN ON THIS DOCUMENT ARE DERIVED FROM A VARIETY OF PUBLIC AGENCY AND/OR PRIVATE COMMERCIAL SOURCES. THESE SOURCES MAY POSSESS VARYING LEVELS OF ACCURACY AND PRECISION AND THIS PRODUCT IS MEANT ONLY AS A GUIDE TO THE RELATIVE POSITION AND SCALE OF THE DEPICTED FEATURES. THE GIS DOCUMENT IS IN NO CASE TO BE INTERPRETED AS FUNDAMENTAL OR DECISIVE FOR PURPOSES OF LAND SURVEYING, FIELD ENGINEERING, PLAN DRAFTING OR LAND AQUISITION AND DETERMINATION.

SEVEN OAKS DAM
EMERGENCY ACTION PLAN

FACILITIES LOCATION MAP
RIVERSIDE COUNTY
(APRIL 2001)

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SAFETY PAYS

APPENDIX E

Preliminary Belltown MDP Line A Stage 2 H Hydraulic Calculations

Channel Report

LINE-A STORM DRAIN (NODE 11)

Circular

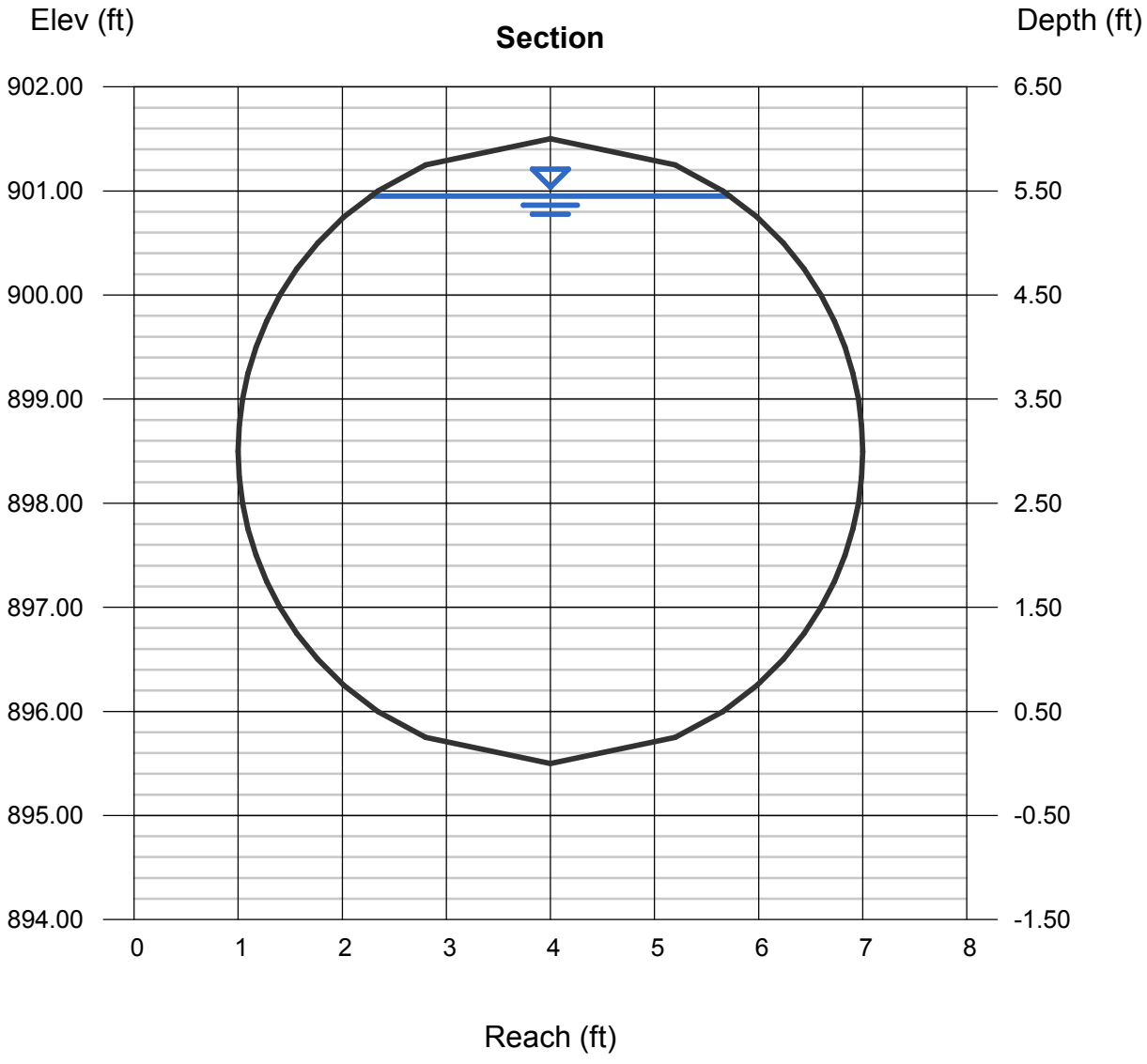
Diameter (ft)	= 6.00
Invert Elev (ft)	= 895.50
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 453.00

Highlighted

Depth (ft)	= 5.45
Q (cfs)	= 453.00
Area (sqft)	= 27.00
Velocity (ft/s)	= 16.78
Wetted Perim (ft)	= 15.18
Crit Depth, Yc (ft)	= 5.54
Top Width (ft)	= 3.44
EGL (ft)	= 9.83



Channel Report

LINE-A STORM DRAIN (NODE 12)

Circular

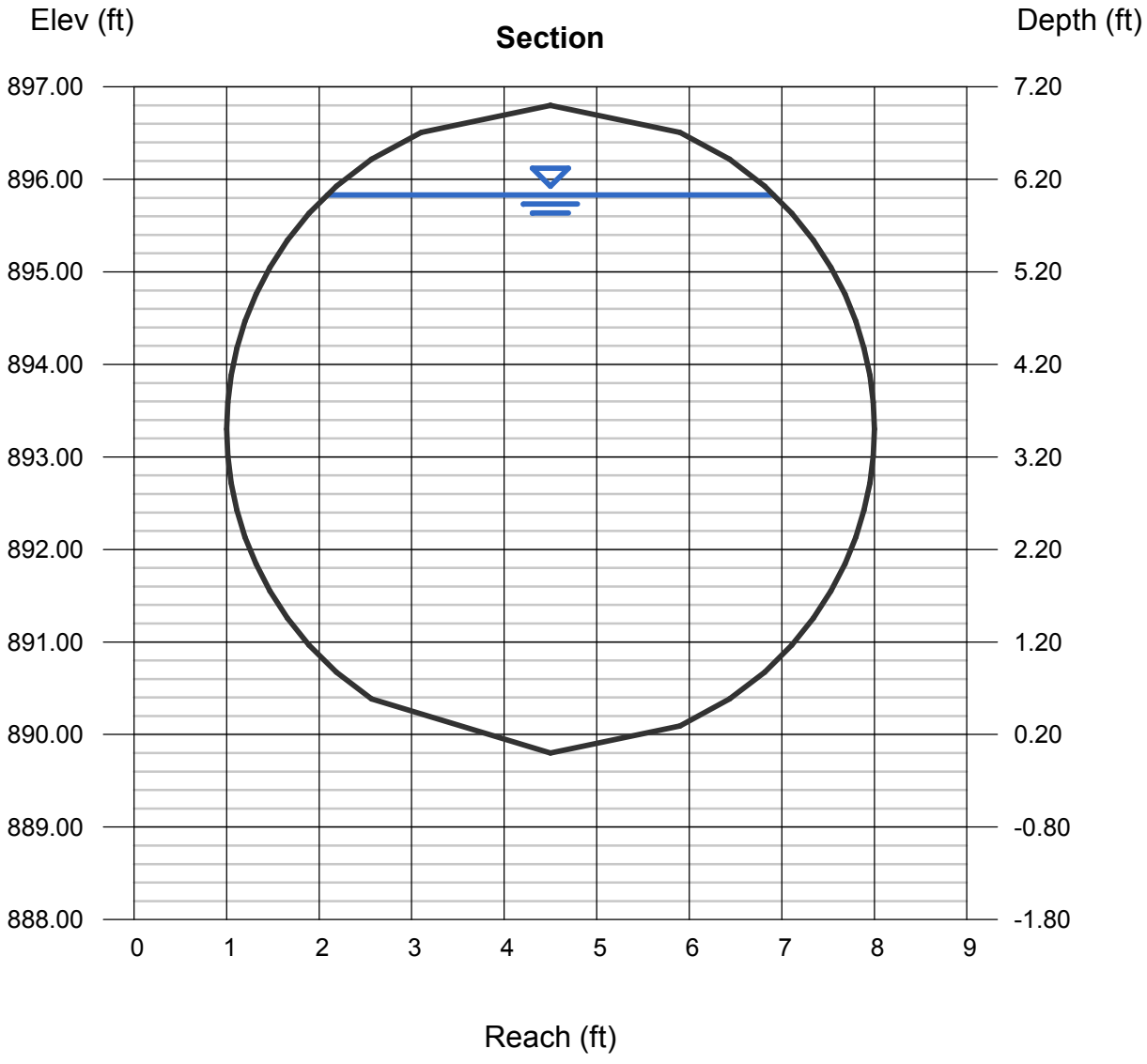
Diameter (ft)	= 7.00
Invert Elev (ft)	= 889.80
Slope (%)	= 1.30
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 758.00

Highlighted

Depth (ft)	= 6.03
Q (cfs)	= 758.00
Area (sqft)	= 35.27
Velocity (ft/s)	= 21.49
Wetted Perim (ft)	= 16.66
Crit Depth, Yc (ft)	= 6.66
Top Width (ft)	= 4.83
EGL (ft)	= 13.21



Channel Report

LINE-A STORM DRAIN (NODE 13)

Circular

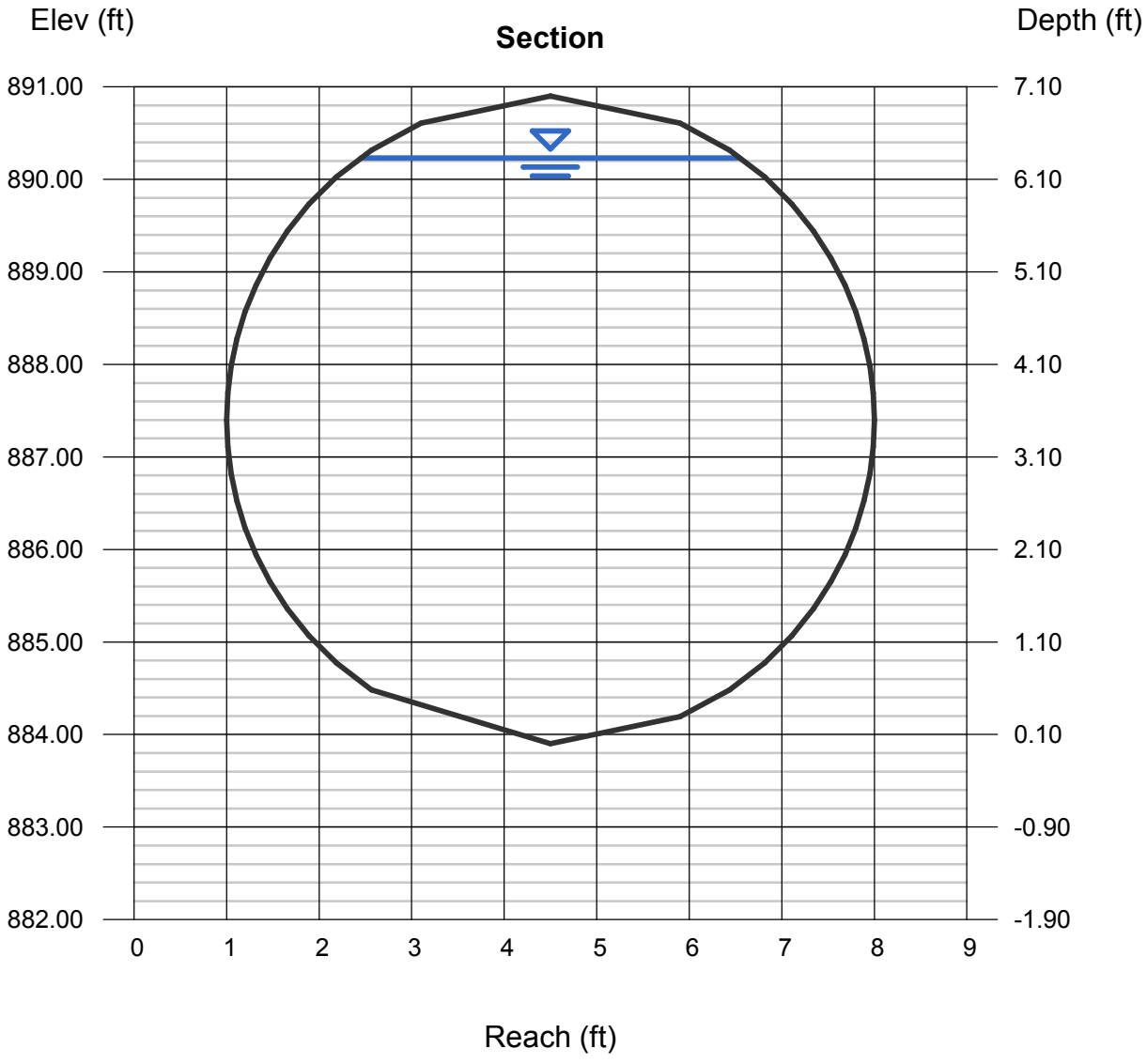
Diameter (ft)	= 7.00
Invert Elev (ft)	= 883.90
Slope (%)	= 1.30
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 778.00

Highlighted

Depth (ft)	= 6.33
Q (cfs)	= 778.00
Area (sqft)	= 36.63
Velocity (ft/s)	= 21.24
Wetted Perim (ft)	= 17.61
Crit Depth, Yc (ft)	= 6.69
Top Width (ft)	= 4.10
EGL (ft)	= 13.34



Channel Report

LINE-A STORM DRAIN (NODE 13)

Circular

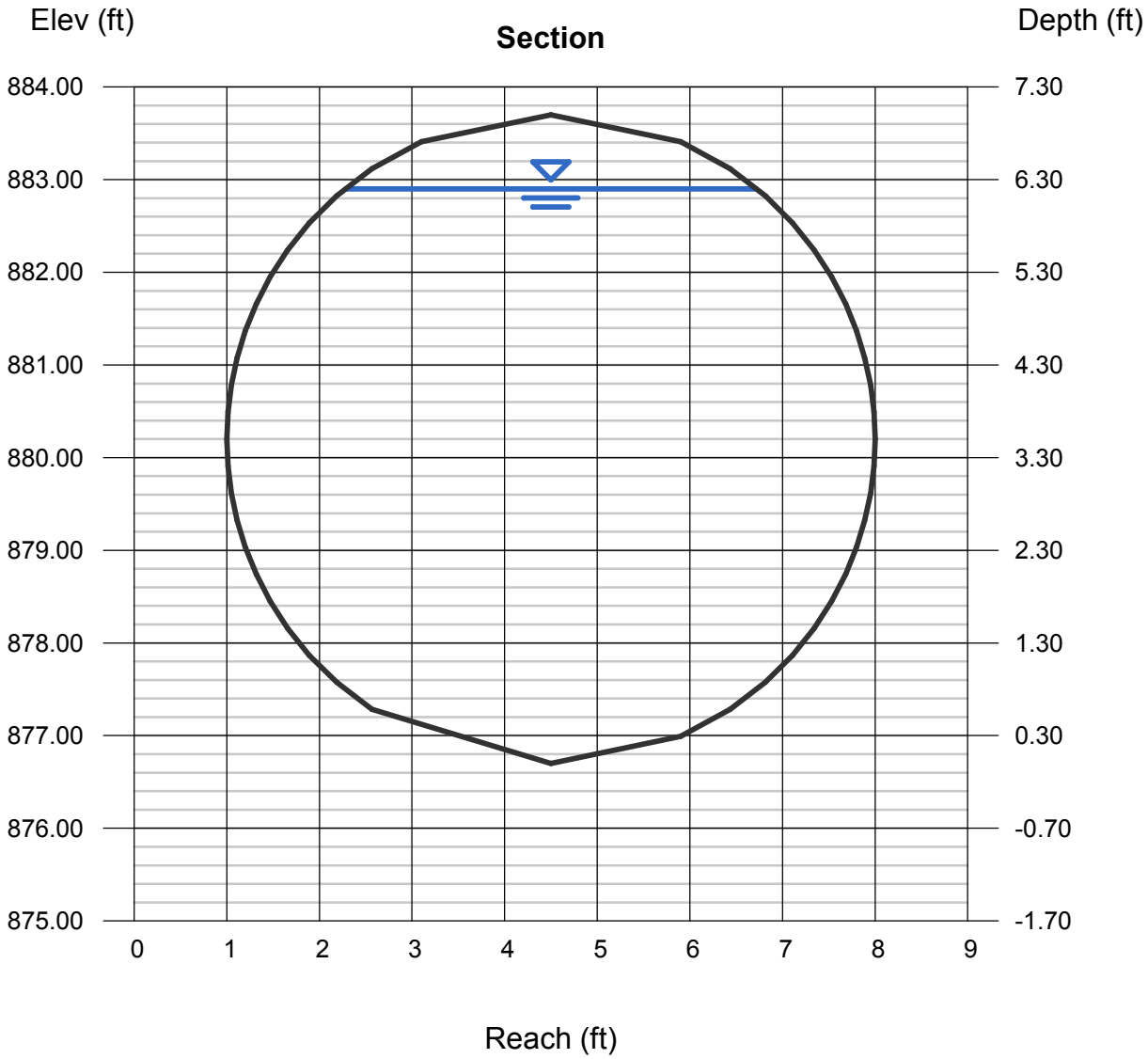
Diameter (ft)	= 7.00
Invert Elev (ft)	= 876.70
Slope (%)	= 1.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 800.00

Highlighted

Depth (ft)	= 6.20
Q (cfs)	= 800.00
Area (sqft)	= 36.08
Velocity (ft/s)	= 22.17
Wetted Perim (ft)	= 17.19
Crit Depth, Yc (ft)	= 6.72
Top Width (ft)	= 4.44
EGL (ft)	= 13.84



PRELIMINARY WATER QUALITY MANAGEMENT PLAN

for

AGUA MANSA COMMERCE PARK
JURUPA VALLEY, RIVERSIDE COUNTY, CALIFORNIA

PRELIMINARY

Prepared For:
VIRIDIAN PARTNERS,
1805 SHEA CENTER DR. SUITE 250
HIGHLANDS RANCH, CO 80129

Prepared By:
Langan Engineering & Environmental Services
32 Executive Park, Suite 130
Irvine, California 92614

April 2018
700045404

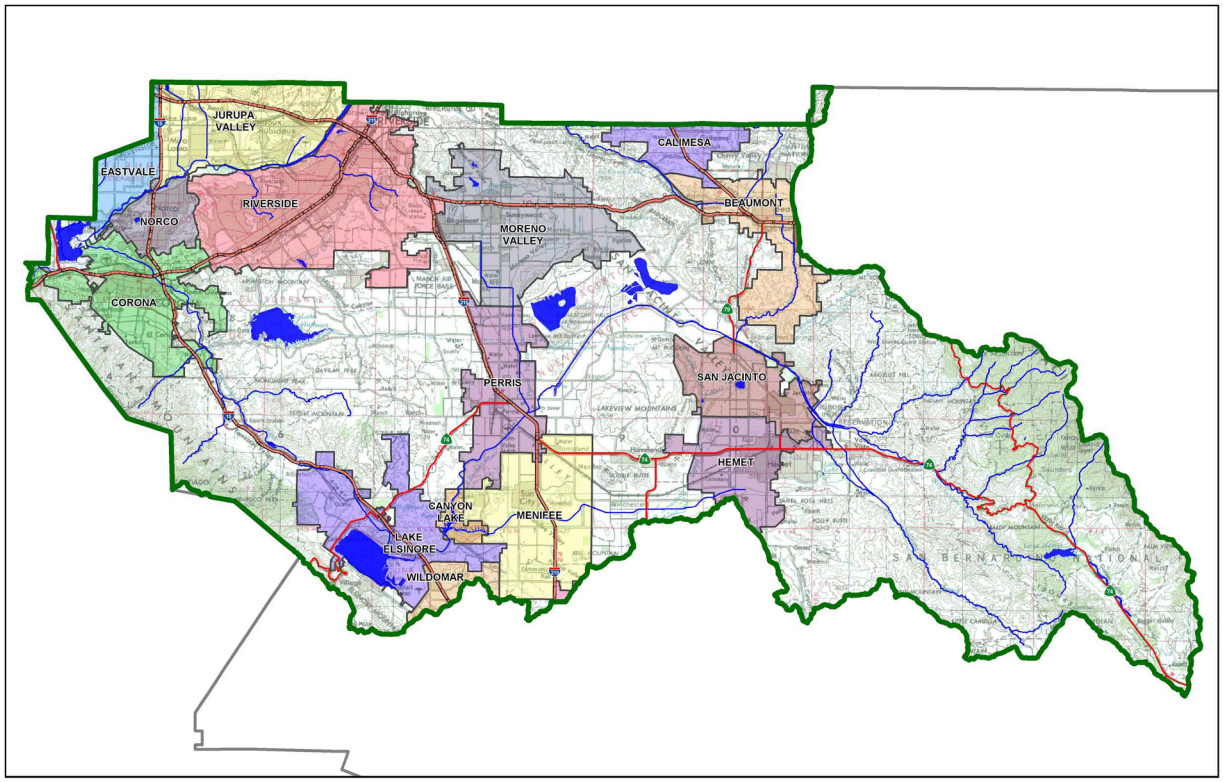
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Agua Mansa Commercial Park

Public Works No

Design Review/Case No: N/A



☒ **Preliminary**
☐ **Final**

Original Date Prepared: April 2017

Revision Date(s):

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

Contact Information:

Prepared for: Viridian Partners
1805 Shea Center Dr., Suite 250
Highlands Ranch, CO 80129
(720) 317-2025

Prepared by:
Mark Nguyen
Langan
32 Executive Park
Suite 130,Ca 92614
(949) 255-8640

OWNER'S CERTIFICATION

This Preliminary Water Quality Management Plan (PWQMP) has been prepared for Viridian Partners by Langan for the Agua Mansa Commercial Park project.

This PWQMP is intended to comply with the requirements of Riverside County for Management & Discharge Controls Ordinance No. 754.2 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under the City of Riverside Water Quality Ordinance (Municipal Code Section 14.12.315).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Erik Zitek	Director of Investment
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Mark Nguyen	Project Manager
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:



PRELIMINARY

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PRELIMINARY

Section A: Project and Site Information

Project Description:

The proposed project is located within the existing Cement Plant facility in the City of Jurupa Valley, Riverside County, California. The site is approximately 205 acres and is bounded by Rubidoux Blvd. on the west, El Rivino Road on the north, Hall Avenue and an industrial development on the east, and portion of the exist Cement Plan facility to the South (to be developed for future). The site is transected by railroads tracks owned and operated by Union Pacific Railroad (UPRR).

Watershed:

The project site is located within the Santa Ana River Watershed (HUC 18070203). The Santa Ana River watershed is located in southern California, south and east of the city of Los Angeles. The watershed includes much of Orange County, the northwestern corner of Riverside County, the southwestern corner of San Bernardino County, and a small portion of Los Angeles County. The watershed is bounded on the south by the Santa Margarita watershed, on the east by the Salton Sea and Southern Mojave watersheds, and on the north/west by the Mojave and San Gabriel watersheds. The watershed is approximately 2,800 square miles in area. The Santa Ana River watershed is located in the Peninsular Ranges and Transverse Ranges Geomorphic Provinces of Southern California. The highest elevations (upper reaches) of the watershed occur in the San Bernardino Mountains (San Gorgonio Peak – 11,485 feet), eastern San Gabriel Mountains (Transverse Ranges Province; Mt. Baldy – 10,080 feet), and San Jacinto Mountains (Peninsular Ranges Province, Mt. San Jacinto – 10,804 feet). Downstream, the Santa Ana Mountains and the Chino Hills form a topographic high before the river flows into the Coastal Plain and into the Pacific Ocean. Primary slope direction is northeast to southwest, with secondary slopes controlled by local topography. This is in an arid region, and therefore has little natural perennial surface water. Surface waters start in the upper erosion zone of the watershed, primarily in the San Bernardino and San Gabriel Mountains. This upper zone has the highest gradient and soils/geology that do not allow large quantities of percolation of surface water into the ground. Flows consist mainly of snowmelt and storm runoff from the lightly developed San Bernardino National Forest; this water is generally high quality at this point. In this zone, the Santa Ana River is generally confined in its lateral movement, contained by the slope in the mountainous regions. In the upper valley, flows from the Seven Oaks dam to the city of San Bernardino consist mainly of storm flows, flows from the San Timoteo Creek, and groundwater that is rising due to local geological conditions. From the City of San Bernardino to the City of Riverside, the river flows perennially, and it includes treated discharges from wastewater treatment plants. Near Corona, the river cuts through the Santa Ana Mountains and the Puente-Chino Hills. The river then flows into the Orange County Coastal Plain; the channel lessens and the gradient decreases. In a natural environment, a river in this area would have a much wider channel, increased meandering, and increased sediment build-up. However, much of the Santa Ana River channel in this area has been contained in concrete-lined channels, which modifies the flow regime and sediment deposition environment. The only major tributary of the Santa Ana River in Orange County is Santiago Creek, which joins the river in the City of Santa Ana. There is only one natural freshwater lake of any size – Lake

PRELIMINARY

Elsinore. A variety of water storage reservoirs (Lake Perris, Lake Mathews, and Big Bear Lake) and Flood Control areas (Prado Dam area and Seven Oaks Dam area) have been created to hold surface water.

PROJECT INFORMATION	
Type of Project:	Commercial
Ward Area:	N/A
Community Name:	City of Jurupa Valley
Development Name:	Agua Mansa Commercial Park
PROJECT LOCATION	
Latitude & Longitude (DMS): $34°1'33\ N, 117°22'46.48\ W$	
Project Watershed and Sub-Watershed: Santa Ana Watershed	
APN(s): 175-170-035, 175-170-036, 175-170-040, 175-170-041, 175-170-043, 175-180-001, 175-200-001, 175-200-002, 175-200-003, 175-200-004, 175-200-005, 175-200-007, 175-200-008, 175-200-009.	
Map Book and Page No.: N/A	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Commercial
Proposed or Potential SIC Code(s)	N/A
Area of Impervious Project Footprint (SF)	8,139,222 SF
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	8,139,222 SF
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	4,389,211 SF
Is the project located within any MSHCP Criteria Cell?	☒ Y ☐ N
If so, identify the Cell number:	21,22 & 55
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	A,B,C & D
What is the Water Quality Design Storm Depth for the project?	0.65

A.1 Maps and Site Plans

Appendix 1 includes a map of the local vicinity and existing site. In addition, WQMP Site Plan, located in Appendix 1, includes the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

PRELIMINARY

A.2 Receiving Waters

In order of upstream to downstream, the receiving waters that the project site is tributary to are as follows. A map of the receiving waters is included in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	Hydrologic Unit	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Santa Ana River Reach 4	801.27, 801.44	Pathogens	MUN, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	RATE WATER BODY 1.09 MILES
Santa Ana River Reach 3	801.21, 801.25	Copper,Lead, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN,	RARE WATER BODY 3.98 Miles
Santa Ana River Reach 2	801.11, 801.12	Indicator Bacteria	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	RARE WATER BODY 17.80 Miles
Santa Ana River Reach 1	801.11	Fecal Coliform	MUN, REC1, REC2, WARM, WILD	NOT A RARE WATERBODY

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☒ Y	☐ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*		
City of Jurupa Valley Conditional Use Permit	☐ Y	☒ N
City of Jurupa Valley Design Review	☐ Y	☒ N
City of Jurupa Valley Building Permit	☐ Y	☒ N
City of Jurupa Valley Grading Permit	☐ Y	☒ N
City of Jurupa Valley Construction Permit	☐ Y	☒ N

PRELIMINARY

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). .

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Does the project identify and preserve existing drainage patterns? If so, how? If not, why?

The existing project site drains to the southwest corner of the site. The existing drainage pattern will be preserved by the project.

Does the project identify and protect existing vegetation? If so, how? If not, why?

The project is an industrial/commercial development facility which does not preserve the existing vegetation.

Does the project identify and preserve natural infiltration capacity? If so, how? If not, why?

We identify and preserved the natural infiltration by proposing Biotreatment and Bioretention BMP (Infiltration tests have been conducted per the geotechnical report. However, should future infiltration proved to be insufficient, different BMPs will be proposed for the final Water Quality Management Plan.

Does the project identify and minimize impervious area? If so, how? If not, why?

Yes, however most of the site is currently impervious. Thus, runoff from these locations will be captured by the proposed Extended Detention Basins (EBD) and Bioswale.

Does the project identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, Biotreatment BMPs such as EDB and Bioswale are implemented to capture and treat runoffs.

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Section C: Delineate Drainage Management Areas (DMAs)

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)	Area (Sq. Ft.)	DMA Type
DMA-A	MIXED	1,206,612	D
DMA-B	MIXED	1,071,576	D
DMA-C	MIXED	378,972	D
DMA-D	MIXED	3,833,280	D
DMA-E	MIXED	448,668	D
DMA-F	MIXED	657,756	D
DMA-G	MIXED	936,540	D
DMA-H	MIXED	113,256	D
DMA-I	MIXED	95,832	D
DMA-J	MIXED	47,916	D

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

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Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA-A	Bioretention Basin
DMA-B	Extended Detention Basin
DMA-C	Extended Detention Basin
DMA-D	Extended Detention Basin
DMA-E	Bioretention Basin
DMA-F	Extended Detention Basin
DMA-G	Extended Detention Basin
DMA-H	Proprietary Modular Wetland System
DMA-I	Proprietary Modular Wetland System
DMA-J	Proprietary Modular Wetland System

PRELIMINARY

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (ref: Chapter 2.4.4 of the WQMP Guidance Document)? ☐ Y ☒ N

Geotechnical Report

A Geotechnical Report is required by the City of Riverside to confirm present and past site characteristics that may affect the use of Infiltration BMPs, see Appendix 3.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

Note:

Percolation tests were conducted on 2 areas and vary significantly as displayed on the Boring and Trench Location Plan in Appendix 3. Upon preparation of the final WQMP, further percolation tests on specific BMP locations will be conducted to obtain accurate infiltration rates

PRELIMINARY

D.2 Harvest and Use Assessment

The following conditions apply*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verified with the City of Riverside).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. (Harvest and Use BMPs are still encouraged, but are not required as the Design Capture Volume will be infiltrated or evapotranspired).

☐ None of the above.

Harvest and Use BMPs need not be assessed for the site.

Irrigation Use Feasibility

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: N/A

Type of Landscaping (Conservation Design or Active Turf): Conservative Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

The project EIATIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: N/A

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
N/A	N/A

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Toilet Use Feasibility

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: N/A

Project Type: Commercial/Industrial

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

The project TUTIA factor: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: N/A

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
N/A	N/A

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

PRELIMINARY

The project factor: N/A

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Average Daily non-potable demand (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
N/A	N/A

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

For the project, the following applies:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the City of Riverside to discuss this option. If you checked this box, then proceed to Section E to document your alternative compliance measures.

☐ None of the above.

PRELIMINARY

D.4 Feasibility Assessment Summaries

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA-A	☐	☐	☒	☐	☐
DMA-B	☐	☐	☐	☒	☐
DMA-C	☐	☐	☐	☒	☐
DMA-D	☐	☐	☐	☒	☐
DMA-E	☐	☐	☒	☐	☐
DMA-F	☐	☐	☐	☒	☐
DMA-G	☐	☐	☐	☒	☐
DMA-H	☐	☐	☒	☐	☐
DMA-I	☐	☐	☒	☐	☐
DMA-J	☐	☐	☒	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, with technical infeasibility criteria included in Appendix 5, and Alternative Compliance measures for those DMAs documented in Section E.

PRELIMINARY

D.5 LID BMP Sizing

See Appendix 6 for calculations.

Table D.3.1 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BIORETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-A	*1,206,612*	*Mixed*	*0.92*	*0.76*	*917,028*	*Design rainfall intensity (in/hr)*	*Design flow rate, Q_{BMP} (cubic feet/s)*	*Proposed Dimension on Plan*
	1,206,612				917,028	0.65	4.2	Pending final WQMP

Table D.3.2 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*EXTENDED DETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-B	*1,071,576*	*Mixed*	*0.89*	*0.72*	*767,126*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	1,071,576				767,126	0.65	41,553	Pending Final WQMP

PRELIMINARY

[**Table D.3.3** DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*EXTENDED DETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-C	*378,972*	*Mixed*	*0.84*	*0.65*	*245,700*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	378,972				245,700	0.65	13,309	Pending Final WQMP

Table D.3.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*EXTENDED DETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-D	*3,833,280*	*Mixed*	*0.89*	*0.72*	*2,743,490*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	3,833,280				2,743,490	0.65	148,605	Pending

PRELIMINARY

Table D.3.5 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BIORETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-E	*448,668*	*Mixed*				*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	448,668				Σ= [D]	0.65	$[F] = \frac{[D]x[E]}{12}$	[G]

Table D.3.6 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*EXTENDED DETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-F	*657,756*	*Mixed*	*0.75*	*0.54*	*357,634*	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	657,756				357,634	.65	19,372	[G]

PRELIMINARY

Table D.3.7 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*EXTENDED DETENTION BASIN*		
	[A]		[B]	[C]	[A] x [C]			
DMA-G	*936,540*	*Mixed*	*0.92*	*0.76*	*711,773*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	936,540				Σ= [D]	0.65	38,554	[G]

B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A of the WQMP Guidance Document
[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

PRELIMINARY

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to confirmation of LID waiver approval by the Regional Board). For the project, the following applies:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

PRELIMINARY

E.1 Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P[(2)]
☒ Commercial/Industrial Development	P[(3)]	P	P[(1)]	P[(1)]	P[(5)]	P[(1)]	P	P
☐ Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P[(6)]	P	P[(1)]	P[(1)]	P[(4)]	P[(1)]	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

PRELIMINARY

E.2 Stormwater Credits

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	N/A
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*
[2]*Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

E.3 Sizing Criteria

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		***PROPRIETARY BIOCLEAN MODULAR WETLAND SYSTEM***		
	[A]		[B]	[C]	[A] x [C]				
DMA-H	113,256	Mixed	1	0.89	101,024	*Design rainfall Intensity (in/hr)*	*Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	113,256				101,024	0.20	0.5	[F] X (1-[H])	[I]

PRELIMINARY

Table E.4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		***PROPRIETARY BIOCLEAN MODULAR WETLAND SYSTEM***		
	[A]		[B]	[C]	[A] x [C]				
DMA-I	95,832	Mixed	0.85	0.66	63,371	*Design rainfall intensity (in/hr)*	*Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	95,832				63,371	0.20	0.3	[F] X (1-[H])	[I]

Table E.5 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		***PRORIETARY BIOCLEAN MODULAR WETLAND SYSTEM***		
	[A]		[B]	[C]	[A] x [C]				
DMA-J	47,916	Mixed	1	0.89	42,741	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	47,916				42,741	0.20	0.2	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

PRELIMINARY

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

See Appendix 6 for efficiency

Table E.6 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
BioClean Modular Wetland System (MWS)	Metals, Bacterial Indicators, Nutrients	Medium

BIO-CLEAN Modular Wetland System

The Modular Wetland System (MWS) by BioClean is a proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. Stormwater runoff enters MWS via curb inlet opening and flows through a pre-treatment chamber that includes separation and prefilter cartridges. The pretreatment chamber contains a settling chamber for separating out larger solids and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, absorbed and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the stormdrain system.

[1] *Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.*
[2] *Cross Referenced from Table E.1 above.*
[3] *As documented in a Co-Permittee Approved Study and provided in Appendix 6.*

PRELIMINARY

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

The project does not create a Hydrologic Condition of Concern, meeting the criteria for HCOC Exemption as shown below:

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The City of Riverside has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the City of Riverside

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

Results included in Table F.1 below and hydrologic analysis included in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	INSERT VALUE	INSERT VALUE	INSERT VALUE
Flow (CFS)	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

PRELIMINARY

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (Prado Dam, Santa Ana River) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

F.2 HCOC Mitigation

As an alternative to the HCOC Exemption Criteria above, HCOC criteria is considered mitigated if the project meets one of the following conditions, as indicated:

☐ a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

☐ b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

☒ c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

☐ d. None of the above.

See Hydrographs analysis in Appendix 7.

Table F.2 Hydrologic Conditions of Concern Summary

Belltown Market Trib.	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Peak Flow rate (cfs)	43.7	56.7	29.8%
Volume (Cubic Feet)	1,196,781	1,559,448	30.2%

Agua Mansa Brown Trib.	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Peak Flow rate (cfs)	0.68	3.72	447.1%
Volume (Cubic Feet)	17,424	100,188	190.0%

PRELIMINARY

For Item C:

During the preliminary stages of the project, it is evident that the pre-condition hydrology is not maintained. The volume which is needed to be mitigated was determined by taking the difference between pre and post-conditions at each tributary area. This displayed an excess runoff of 361,548 cubic feet and 82,764 cubic feet from the Belltown Market and Agua Mansa Brown tributary.

As depicted on the WQMP Site plan in Appendix 1, a Bioretention basin, DMA-E and Extended Detention Basins (EDB) DMA-B, C, D, F & G have been placed throughout the Belltown Market Tributary, capable of capturing and storing approximately 616,080 cubic feet. Furthermore, Stormwater Bioretention basin, DMA-A, have been placed capable of handling a total of 86,320 cubic feet of runoff from the Agua Mansa Brown Tributary. Thus, all additional runoff created by post site conditions are mitigated by the proposed BMPs.

The pre and post development unit hydrographs have been included in Appendix 7.

PRELIMINARY

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

The following table identifies the potential sources of runoff pollutants for this project and specifies how they are addressed through permanent controls and operational BMP

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff Pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
• A. On-site storm drain inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify. • Include Catch Basin Filter Inserts in all inlets/catch basins onsite as a pretreatment measure.	• Maintain and periodically repaint or replace inlet markings. • Provide stormwater pollution prevention information to new site owners, lessees, or operators. • See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

PRELIMINARY

• D2. Landscape/ Outdoor Pesticide Use	• Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. • Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	• Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater • Consider using pest-resistant plants, especially adjacent to hardscape. • To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.
Potential Sources of Runoff Pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
• G. Refuse areas	• Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. • If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run- on and show locations of berms to prevent runoff from the area.	• State how site refuse will be handled and provide supporting detail to what is shown on plans. • State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.

PRELIM

• M. Loading Docks	• Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.	• Move loaded and unloaded items indoors as soon as possible.
• P. Plazas, sidewalks, and parking lots.	• N/A	• Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain

PRELIMINARY

Section H: Construction Plan Checklist

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Plan Sheet Number(s)	Latitude / Longitude
A	Bioretention Basin	WQMP Exh	Shown in Final WQMP
B	Extended Detention Basin	"	"
C	Extended Detention Basin	"	"
D	Extended Detention Basin	"	"
E	Bioretention Basin	"	"
F	Extended Detention Basin	"	"
G	Extended Detention Basin	"	"
H	Treatment Control BMP (MWS)	"	"
I	Treatment Control BMP (MWS)	"	"
J	Treatment Control BMP (MWS)	"	"

PRELIMINARY

Section I: Operation, Maintenance and Funding

As required by the City of Riverside, the following Operation, Maintenance and Funding details are provided as summarized:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred.
3. An outline of general maintenance requirements for the Stormwater BMPs selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance.

See Appendix 9 for a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on site, and an agreement assigning responsibility for maintenance and providing for inspections and certification.

Maintenance Mechanism: Property Owners Association

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

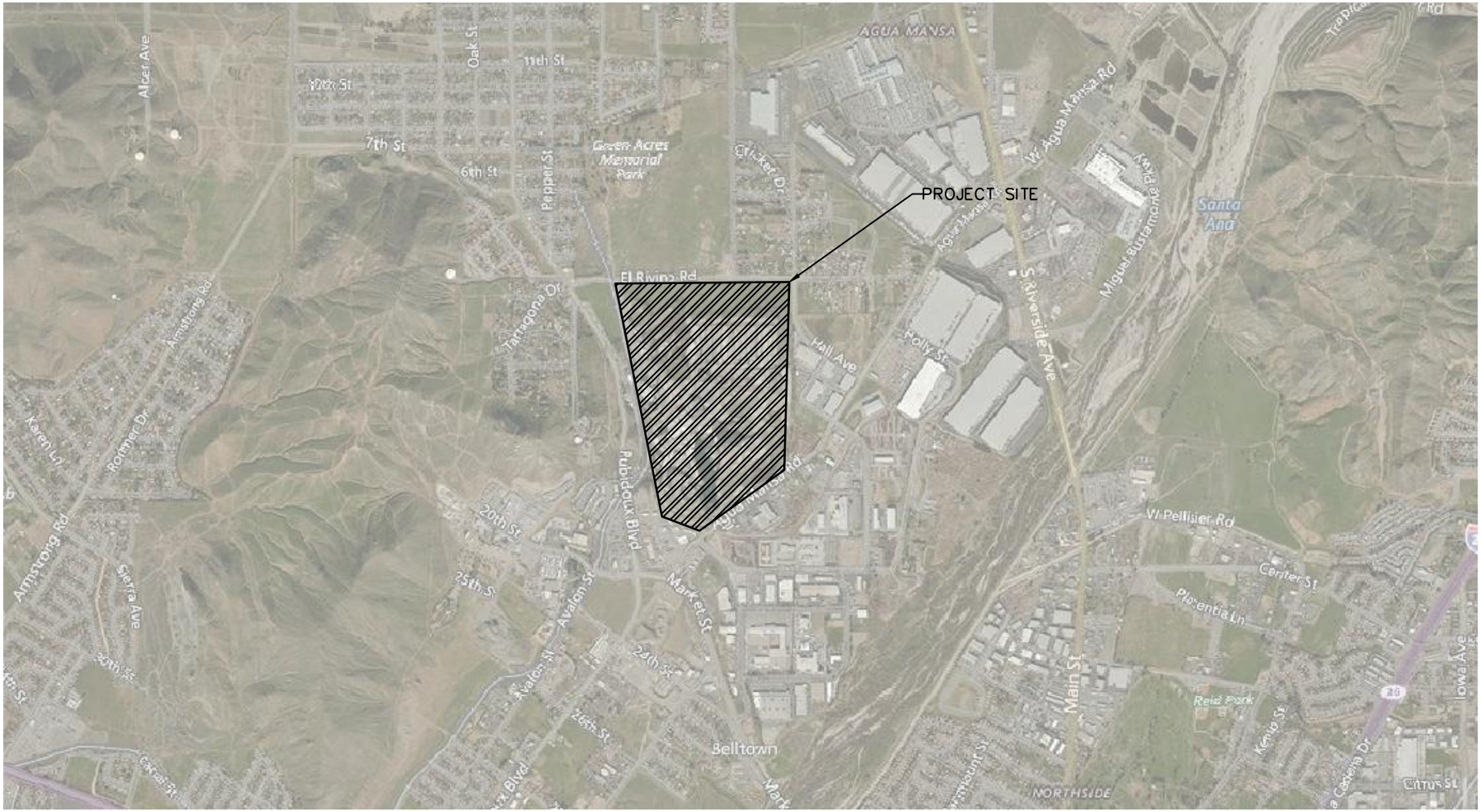
Final maintenance mechanism shall be finalized in the "Final WQMP.

PRELIMINARY

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

PRELIMINARY



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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project

AGUA MANSA COMMERCE PARK

JURUPA VALLEY CALIFORNIA

Drawing Title

VICINITY MAP

Project No. 700045404	Drawing No.
Date 11/04/16	
Scale N.T.S.	
Drawn By WH / Checked By	
Submission Date	Sheet of

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Filename: \\langan.com\data\IRV\data4\700045404\Engineering Data\Site\Stormwater\WQMP\DWG\VICINITY MAP.dwg Date: 11/4/2016 Time: 10:05 User: wharijanto Style Table: Langan.stb Layout: ANSIA-BL

NPDES MUNICIPAL PERMIT
SANTA ANA RIVER WATERSHED
EXHIBIT SA-1
(EASTVALE, JURUPA VALLEY, RIVERSIDE, CORONA, NORCO AREAS)

- CITY MS4 FACILITIES
- COUNTY MS4 FACILITIES
- RCFC&WCD MS4 FACILITIES
- OTHER FACILITIES
- MAJOR OUTFALL SITES
- SAR CORE MONITORING STATIONS
- SANTA ANA RIVER WATERSHED BOUNDARY
- LANDFILL SITES
- SEWAGE TREATMENT PLANTS
- BLUE LINE STREAMS
- RIVERSIDE COUNTY BOUNDARY
- INCORPORATED AREAS
- FREEWAYS/HIGHWAYS
- PRIMARY STREETS

N

0 0.5 1 1.5 2 MILES

UPDATED NOVEMBER 2015

EASTVALE

JURUPA VALLEY

NORCO

CORONA

RIVERSIDE

MORENO VALLEY

SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

EASTVALE MASTER DRAINAGE PLAN - LINE A

EASTVALE MASTER DRAINAGE PLAN - LINE E

SAN ANTONIO MASTER DRAINAGE PLAN - LINE J

BLY CHANNEL - MISSION RD

JAMESTOWN STORM DRAIN

RUBIDOUX CHANNEL

HIGHGROVE - CENTER STREET STORM DRAIN

SPRING STREET CHANNEL

UNIVERSITY WASH - SPRUCE STREET STORM DRAIN

BOX SPRINGS STORM DRAIN

MAGNOLIA CENTER STORM DRAIN

PHOENIX AVENUE STORM DRAIN

MAGNOLIA CENTER STORM DRAIN - CENTRAL AVENUE LATERAL

MAGNOLIA CENTER STORM DRAIN - PIERCE STREET LATERAL

MONROE MOFP - VAN BUREN LATERAL

NORTH NORCO CHANNEL - LINE N-1

NORTH NORCO CHANNEL - LINE A

CORONA DRAIN LINE 46

CORONA DRAIN LINE 47

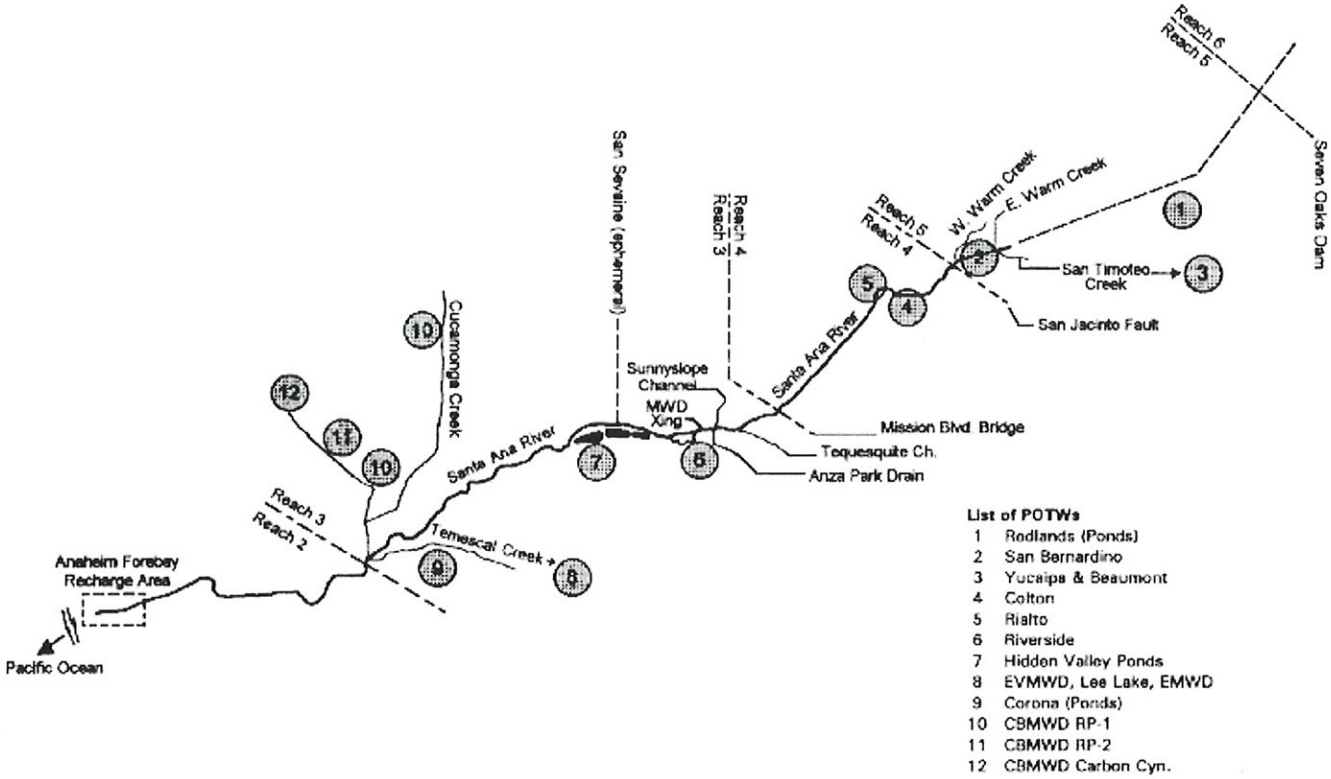
CORONA DRAIN LINE 48

RINCON CHANNEL

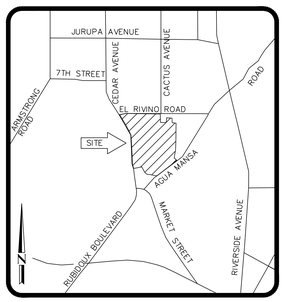
The graphical and tabular information shown on this document may be derived from a variety of public agency and/or private commercial sources such as Riverside County Transportation and Land Management Agency, Thomas Brothers Mapping, the Stephen P. Teale Data Center, GIS Technology Center, State of California, the United States Geologic Survey and the United States National Atlas. These sources may possess varying levels of accuracy and precision and this product is meant only as a guide to the relative position and scale of the depicted features. This GIS document is in no case to be interpreted as fundamental or decisive for purposes of land surveying, field engineering, plan drafting, code enforcement, land boundary determination and/or land acquisition.

SAR 2015 ArcPgt - MS4 Maps - Map1.mxd

FIGURE 1-2
SANTA ANA RIVER AND TRIBUTARIES



FROM SANTA ANA BASIN PLAN



VICINITY MAP
NOT TO SCALE

LEGEND

- SITE BOUNDARY/LIMITS OF WORK
- DRAINAGE/TRIBUTARY AREA BOUNDARY
- B / 22.4 — DRAINAGE MANAGEMENT AREA ID / DRAINAGE MANAGEMENT AREA (DMA) IDENTIFIER / SURFACE AREA (ACRE)
- EXTENDED DETENTION BASIN
- BIORETENTION BASIN
- MODULAR WETLAND SYSTEM
- LANDSCAPE AREA
- PROPOSED STORM DRAIN
- FLOW ARROW

WQMP PROVISION NOTES:

LEGEND	BMP TYPE	NO.	NOTE DESCRIPTION	UNIT	QUANTITY
	BIOTREATMENT	1	BIORETENTION BASIN	SF	55,386
	BIOTREATMENT	2	MODULAR WETLAND SYSTEM	EA	3
	BIOTREATMENT	3	EXTENDED DETENTION BASIN	SF	155,394

GENERAL NOTES:

1. THIS PLAN IS FOR STORM WATER QUALITY MANAGEMENT PLAN CONTROL PURPOSES ONLY, REFER TO THE CONSTRUCTION DOCUMENTS FOR DESIGN SPECIFICATIONS.
2. THIS PLAN IS TO BE USED IN CONJUNCTION WITH THE STORM WATER QUALITY MANAGEMENT REPORT.
3. HYDROLOGIC SOIL TYPE: PENDING SOILS REPORT

DMA TABLE:

DMA	SURFACE AREA (SF)	SURFACE AREA (AC)	IMPERVIOUS FRACTION	BMP TYPE	DESIGN CAPTURE VOLUME (CF) REQUIRED	DESIGN CAPTURE FLOW (CFS) REQUIRED
A	1,206,612	27.7	0.92	BIORETENTION BASIN	49,672.3	–
B	1,071,576	24.6	0.89	EXTENDED DETENTION BASIN	41,552.6	–
C	378,972	8.7	0.84	EXTENDED DETENTION BASIN	13,308.7	–
D	3,833,280	88.0	0.89	EXTENDED DETENTION BASIN	148,605.7	–
E	448,668	10.3	0.95	BIORETENTION BASIN	15,711.3	–
F	657,756	15.1	0.75	EXTENDED DETENTION BASIN	19,371.9	–
G	936,540	21.5	0.92	EXTENDED DETENTION BASIN	38,554.3	–
H	113,256	2.6	1.00	TREATMENT CONTROL (PROPRIETARY MODULAR WETLAND)	–	0.5
I	95,832	2.2	0.85	TREATMENT CONTROL (PROPRIETARY MODULAR WETLAND)	–	0.3
J	47,916	1.1	1.00	TREATMENT CONTROL (PROPRIETARY MODULAR WETLAND)	–	0.2
TOTAL	8,646,660	198.5			–	–

EL RIVINO ROAD
HALL AVENUE
RUBIDOUX BOULEVARD
BUILDING 1
BUILDING 2
BUILDING 3
BUILDING 4
BUILDING 5
BUILDING 6
F 15.1
I 2.2
B 24.6
G 21.5
A 27.7
D 88.0
C 8.7
J 1.1
H 2.6
E 10.3
DOWNSPOUT (TYP.)
SCALE 1"=100'
100 50 0 100 200
SCALE: 1"=100'

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Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project: AGUA MANSA COMMENCE PARK
JURUPA VALLEY CALIFORNIA

Drawing Title: PRELIMINARY WQMP EXHIBIT

Project No.	700045404
Date	APRIL 2018
Scale	1" = 100'
Drawn By	
Checked By	
Submission Date	APRIL 2018
Drawing No.	
Sheet	1 of 1

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Appendix 2: Construction Plans

Grading and Drainage Plans

PRELIMINARY

LEGEND

CKD AREAS

SD SD PROPOSED STORM DRAIN

NOTE:

1. A DUST CONTROL PLAN MUST BE DEVELOPED AND IMPLEMENTED TO MINIMIZE EMISSIONS OF PARTICULATE MATTER DURING SITE DEMOLITION WORK. MUCH OF THE SOIL IN UNPAVED AREAS OF THE SITE IS COVERED OR INTERSPERSED WITH CEMENT KILN DUST (CKD) AND/OR OTHER FINE-GRAINED SOLIDS THAT CAN DEGRADE AIR QUALITY WHEN DISTURBED. AIR QUALITY WILL BE CONTINUOUSLY MONITORED AT TWO STATIONS ON THE PROPERTY DURING DEMOLITION OPERATIONS TO DEMONSTRATE COMPLIANCE WITH THE FACILITY'S AIR QUALITY MANAGEMENT DISTRICT (AQMD) PERMIT.
2. HYDROSEEDING SHOULD BE USED FOR LONG TERM EROSION CONTROL MEASURES.

EARTHWORK:

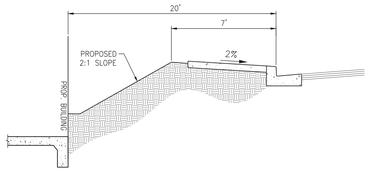
SITE ACREAGE: 189 Ac.

RAW CUT	1,693,698 C.Y.	RAW FILL	1,541,452 C.Y.
SHRINKAGE (10% ASSUMED)	−169,369 C.Y.		
SUBSIDENCE (0.1' ASSUMED)	−30,492 C.Y.		
5' O/X BLDG. PAD	651,890 C.Y.	5' O/X BLDG. PAD	651,890 C.Y.
		SHRINKAGE ON O/X (10% ASSUMED)	65,190 C.Y.
NET AVAILABE CUT	2,145,726 C.Y.	TOTAL FILL REQUIRED	2,258,532 C.Y.
EXPORT CUT (RAW)		IMPORT FILL (RAW)	112,806 C.Y.

NOTE:

ROUGH QUANTITIES SHOWN ARE PROVIDED FOR ROUGH ESTIMATE. CONTRACTORS SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES PRIOR TO BIDDING AND CONSTRUCTION.

ASSUMPTIONS:
1. 10" SECTION FOR ALL BLDG. FINISHED FLOOR
2. 12" SECTION FOR ALL DRIVE AISLES AND PARKING
3. SUBSIDENCE 0.1' AND SHRINKAGE 10%
4. UTILITY SPOILS, FOOTING TRENCH.....CAN BE USED FOR THE **112,806 FILL.
5. 5' OUTSIDE THE BUILDING LINE (ENVELOPE) FOR PAD AREA
6. WELLS AVAILABLE ON-SITE AND LAKE WATER COULD BE USED FOR DEWATERING (WELLS CAPACITY NEEDS TO BE CONFIRMED).
7. PLACE 40 MIL LINER FOR PROPOSED BASIN WITH 6" COVER.
8. GEOTECH COMPACTION CRITERIA:
   A. FILL MATERIAL (IMPORTED OR REUSED) SHOULD BE FREE OF ORGANIC AND OTHER DELETERIOUS MATERIALS AND SHOULD HAVE A MAXIMUM PARTICLE SIZE NO GREATER THAN 6". COBBLES ENCOUNTERED DURING GRADING MAY BE REUSED AS BACKFILL IF THEY ARE PROCESSED TO FORM A WELL-GRADED GRANULAR MIXTURE COMPRISED OF MATERIAL NO LARGER THAN 6" IN ITS LARGEST DIAMETER.
   B. ALL STRUCTURAL BACKFILL AND FILL BENEATH BUILDING SLABS, PAVEMENTS AND SIDEWALKS SHOULD BE PLACED IN UNIFORM LIFTS (MAXIMUM 8-INCHES THICK PRIOR TO COMPACTION) AND COMPACTED TO A MINIMUM OF 90 PERCENT OF THE MAXIMUM DRY DENSITY AT A MOISTURE CONTENT WITHIN 3 PERCENT OF OPTIMUM MOISTURE CONTENT, AS DETERMINED BY ASTM D1557 (MODIFIED PROCTOR COMPACTION).
9. EARTHWORKS FOR PAD 5 SITE ARE NOT INCLUDED IN THE ABOVE CALCS.



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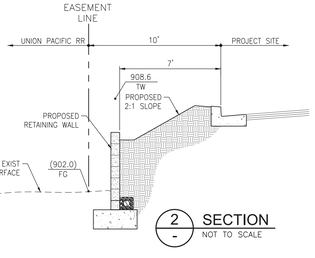

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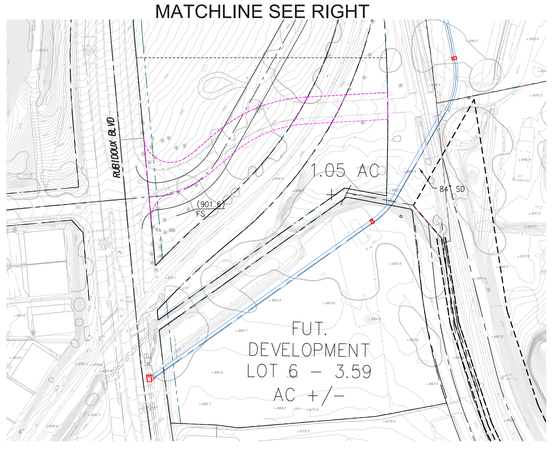

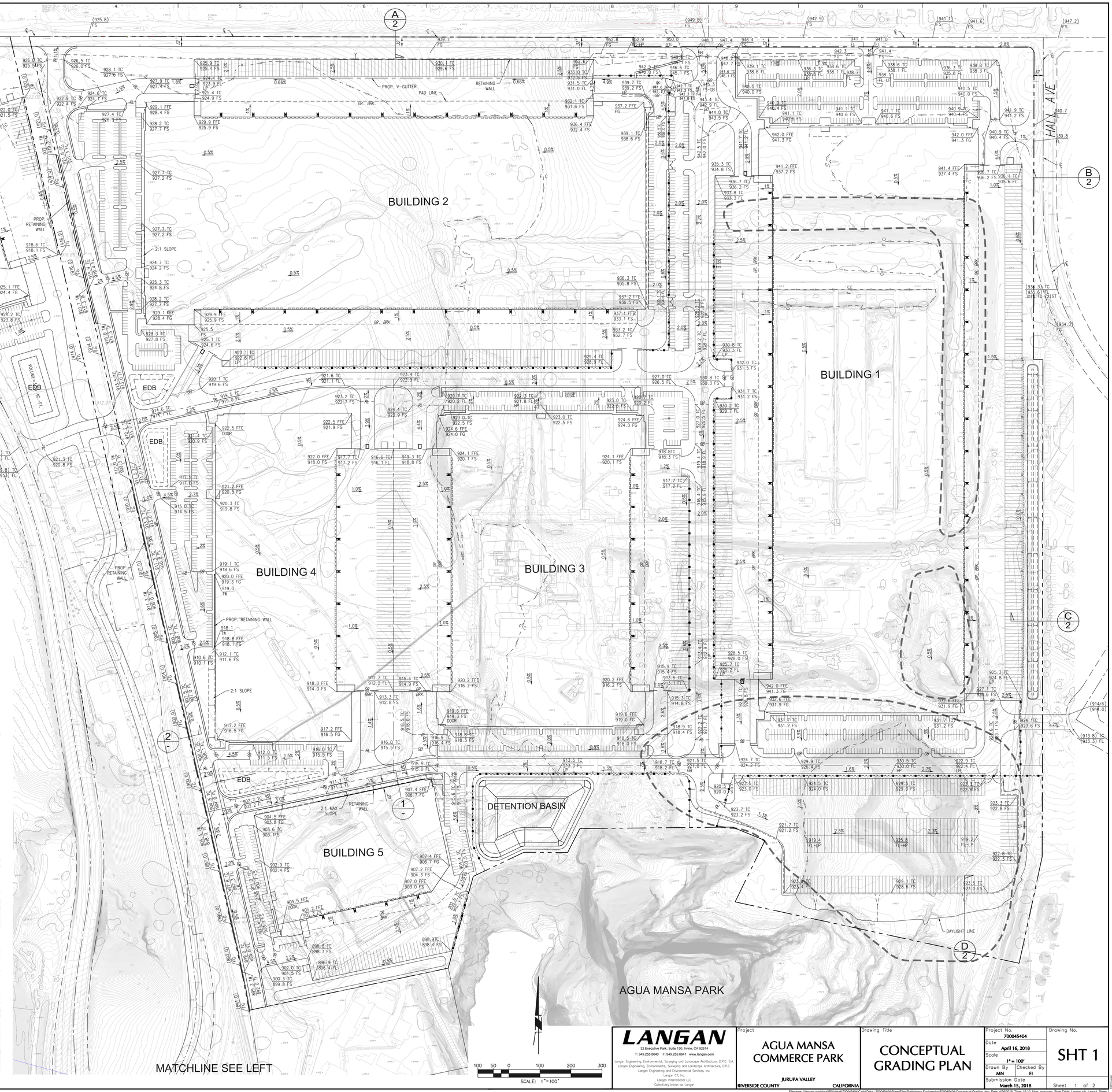

SCALE: 1"=100'

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Langan International LLC
Collectively known as Langan

Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Drawing Title: CONCEPTUAL GRADING PLAN

Project No.	700045404
Date	April 16, 2018
Scale	1" = 100'
Drawn By	MN
Checked By	FI
Submission Date	March 15, 2018
Drawing No.	SHT 1
Sheet	1 of 2

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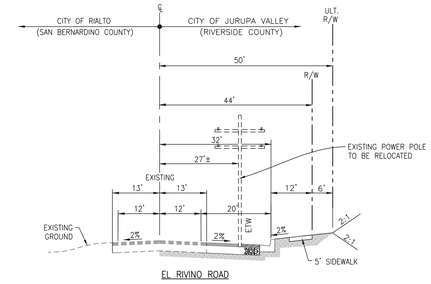

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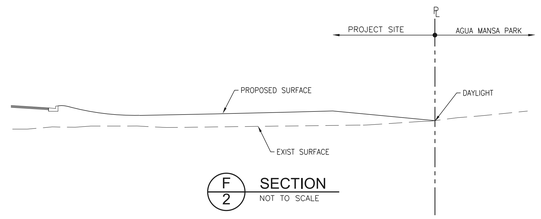

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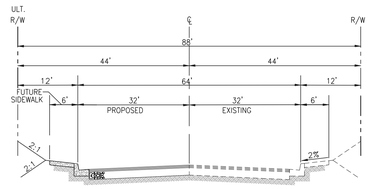

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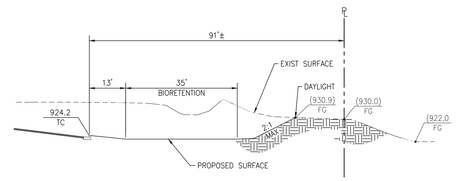

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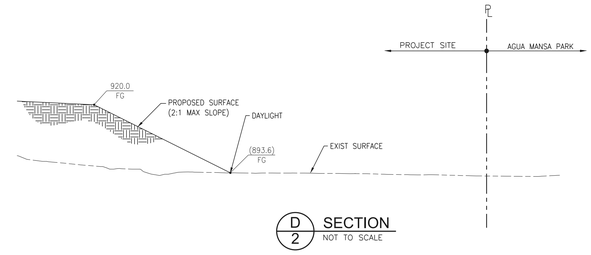

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Langan CT, Inc.
Langan International LLC
Collectively known as Langan

Project
AGUA MANSA COMMERCE PARK
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Drawing Title
CONCEPTUAL GRADING PLAN

Project No.	700045404
Date	April 7, 2017
Scale	1" = 100'
Drawn By	MN
Checked By	FI
Submission Date	April 7, 2017

Drawing No.
SHT 2
Sheet 2 of 2

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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

PRELIMINARY

LANGAN

Memorandum

32 Executive Park, Suite 130 Irvine, CA 92614 T: 949.255.8640 F: 949.255.8641

To: Fred Irianto

From: Jose Baron

Info: Percolation Test Results

Date: 19 October 2016

Re: Percolation Test Results
Agua Mansa Commerce Park
Jurupa Valley, California
Langan Project No.: 700045403

Percolation tests were performed in borings LB-4 and LB-9 at depths of 40 feet and 30 feet, respectively. The percolation tests were performed in general accordance with the methods presented in the "Design Handbook for Low Impact Development, Best Management Practices" by Riverside County Flood Control and Water Conservation District, dated September 2011.

Based on the results of the percolation test, the calculated infiltration rate for each test is listed below.

Boring ID	Test Depth (feet)	Soil Type	Infiltration Rate (inches/hour)
LB-4	40	SW	14.4
LB-9	30	SW	0.8

Percolation test results are attached.

PRELIMNARY GEOTECHNICAL INVESTIGATION REPORT

for

AGUA MANSA COMMERCE PARK
1500 Rubidoux Boulevard
Jurupa Valley, California

Prepared For:
Crestmore Redevelopment, LLC
1745 Shea Center Drive, Suite 190
Highlands Ranch, CO 80129

Prepared By:
Langan Engineering & Environmental Services
32 Executive Park, Suite 130
Irvine, California 92614

28 April 2017
700045403

LANGAN

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

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GE# 3042

LANGAN

28 April 2017
700045403

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Appendix A – EQSearch and USGS Reported Earthquakes
Appendix B – Boring Logs
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Appendix D – Test Pit Logs
Appendix E – Geophysical Investigation Report
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1. INTRODUCTION

As requested by Crestmore Redevelopment, LLC, Langan Engineering and Environmental Services, Inc. (Langan) has completed a preliminary geotechnical investigation for the proposed Agua Mansa Commerce Park (the Project). The services were performed in accordance with the Langan proposal for geotechnical engineering services, dated 27 May 2016 executed by Crestmore Redevelopment, LLC on 8 September 2016 and Contract Change Order for Additional Services, dated 21 March 2017.

Our services included:

1. Review of published geotechnical and geologic data about the site and region, including California Geologic Survey publications, historic mining data, and historic aerial photographs;
2. A limited geotechnical field investigation that included borings and test pits and geophysical surveys
3. A second geotechnical field investigation to investigate for presence of eolian sand in the northern portion of the site
4. Geotechnical laboratory testing
5. Preliminary evaluation of the data, and
6. Preparation of this preliminary report.

The purposes of this report are to: summarize our understanding of the current development plans, summarize our understanding of the geological and geotechnical aspects of the project, including existing conditions; summarize the results of the subsurface investigation and findings; and provide our geotechnical recommendations in support of the project entitlement efforts.

2. PROJECT DESCRIPTION

2.1 Site Description

The Project is proposed to be located within the existing Riverside Cement Plant facility which includes associated quarries and the former Crestmore Mine (the "Site") located at 1500 Rubidoux Boulevard, Jurupa Valley, Riverside County, California. The Site is approximately 205 acres and is bounded by Rubidoux Boulevard on the west, Rivino Road on the north, Hall Avenue and an industrial development on the east, and Agua Mansa Road and an industrial development on the south. The Site is transected by railroad tracks owned and operated by Union Pacific Railroad (UPRR).The Project encompasses an area of approximately 205 acres is located in the mid to northern portion of the Site. The location of the Site and proposed Project are shown in Figure 1.

Having been in operation since 1906 until the mid-1980s, the existing Riverside Cement Plant contains the cement plant, the former quarries (Wet Weather Quarry, Lonestar Quarry, Commercial Quarry and Chino Quarry), the former Crestmore Mine and various support buildings. The former quarries and mine were used for the mining of limestone minerals for cement production. Shallow below grade chambers associated with former cement plant and deeper below grade chambers associated with former mining operations are present below portions of the Site. The northern part of the Site is overlain by fill and is vegetated with shrubs, grass and trees. The remainder of the Site contains fill stockpiles including material stockpiles, berms and filled former quarry areas. Ground surface elevations vary from

approximately 835 feet above mean sea level (amsl)[1] to approximately 985 feet amsl.

The Wet Weather Quarry is located in the south-east end of the Project and elevations within the quarry vary between 835 to 945 feet amsl. The slopes within the Wet Weather Quarry have a maximum height of approximately 110 feet and have an approximate inclination of 3:4 (horizontal to vertical) or flatter.

The Lonestar Quarry was located west and adjacent to the Wet Weather Quarry however the Lonestar Quarry was filled in prior to 1976 as interpreted from stereographic photographs. Information on the filled in depth was not found.

The Commercial Quarry is located in the south-east end of the Site and was mined in the 1960s and early 1970s. The Commercial Quarry was filled in the mid-1970s however the fill material was subsequently mined in the late 1970s and the majority was removed and recovered by the late 1980s for mill or kiln feed supplement. Information on the filled in depth was not found. Elevations within the Commercial Quarry vary between 810 to 900 feet amsl.

Chino Quarry is located south of the Site and is flooded to an elevation of approximately 815 feet amsl. The ground surface elevation at the southern end of the Project, adjacent to the Chino Quarry, is approximately 915 feet amsl. The 100 foot high slope between the southern end of the Project and Chino Quarry has an approximate slope of 1:1 (horizontal to vertical) or flatter. Underground mining below the Chino Quarry started in 1930 and was designated as Crestmore Mine. From 1930 to 1954, the Block Caving method was used in underground mining and from 1955 to 1986, the Room and Pillar Underground Mining Methods were used. Underground mining ceased in 1986 and Crestmore Mine was allowed to flood. When mining was ceased, the entrance to the mine was at an approximate elevation of 650 feet amsl and the bottom of the mine was at an approximate elevation of 60 feet below mean sea level. The approximate mapped extent of the underground mining is shown on Figure 2.

Based on the various Riverside Cement Company maps that were reviewed the shallowest mine level is at an elevation of 572 feet amsl. Based on the maps titled "Crestmore Mine Plan" and "35 Level" by Riverside Cement Company dated 25 November 1968 and 17 January 1972, respectively, the lateral extent of mining extended north past Well 88-1 and near the northern end of the Material Storage Yard.

An adit (a passage from the surface in a mine) with a beltway was used to transport materials from the mine to the rock crushing plant. The adit is located in the southern portion of the Project. Based on the map "Crestmore Mine Plan" by Riverside Cement Company dated 25 November 1968, the adit is oriented south 22 degrees west (S22°W) for an approximate length of 570 feet, then orients S62°E for an approximate length of 1,068 feet and then orients N72°E for an approximate length of 625 feet to connect to the mine. It was reported that the below grade chamber had collapsed, but the depth or length of the collapse along the below grade chamber could not be confirmed.

Two on-site wells, identified as 60-1 and 88-1, that previously provided water in support of plant operations, remain on Site. Well 88-1 is non-operational and Well 60-1 is operational, continuing to feed the on-site water lines. Documentation regarding the construction of the groundwater wells was not available for review. The locations of the groundwater wells are shown in Figure 2.

[1] Elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD 1929) as referenced from DRC Engineering, Inc. "Encumbrance Map, Vacant Commercial Property, Jurupa Valley, California" dated 2 March 2016

2.2 Riverside Cement Plant Operational History

Cement manufacturing operations began in 1914 and continued through 2015. Limestone mined from the quarries and Crestmore Mine was mixed with imported materials, and burned in rotary kilns to manufacture cement clinker. The cement clinker was then crushed to create cement, which was then packaged and shipped off-site. Cement Kiln Dust (CKD) was the primary by-product generated during the cement manufacturing process, and was comprised of material accumulated within the kilns that could not be reused in the process stream. Prior to the 1970s, CKD was hauled from the kilns using end-dump trucks and deposited at several locations throughout the Site. In the 1970s, a process was implemented for incorporating CKD into the final product thus eliminating its generation as a by-product, and some of the previously deposited CKD was recovered.

2.3 Proposed Development

Our understanding of the proposed project is based on documentation and exhibits provided by Crestmore Redevelopment, LLC, including a Draft Preliminary Site Plan dated 7 September 2016. Per the Draft Proposed Site Plan, the proposed Project consists of a commercial/ industrial development that includes up to 4 single story industrial buildings with a mezzanine level and a combined footprint of approximately 3.6 million square feet. Site development will require installation of new utilities, and mass grading that could include cuts of up to 35 feet and fills of up to 100 feet. The limits of the proposed Project are shown on Figure 2.

3. GEOLOGY

3.1 Document Review

Information that was reviewed included maps and websites from the United States Geological Survey's (USGS), California Geological Survey (CGS), Geologic Map by Thomas W. Dibblee, Jr. (Dibblee) County of Riverside, Department of Water Resources, Federal Emergency Management Agency (FEMA) and Division of Oil, Gas & Geothermal Resources (DOGGR).

Stereographic aerial photographs taken between 1949 and 1999 that showed the Riverside Cement Plant and a Site Assessment Report prepared by Ryan-Murphy dated 7 July 1995 were reviewed. The results of the review are summarized in Section 3.2 to 3.7.

3.2 Regional Geologic Setting

The Project is located within the fault-bounded, northwest-southeast trending Perris Block within the Peninsular Ranges geomorphic province of California. The Perris Block is bounded in the east by the San Jacinto Fault Zone, the north by Cucamonga Fault Zone, and the west by Elsinore Fault Zone. According to the USGS maps (USGS 2006), the Perris Block is underlain by lithologically diverse prebatholithic metasedimentary rocks intruded by plutons of the Cretaceous age Peninsular Ranges batholith. Erosional depositional surfaces are developed on the Perris Block and thin to relatively thick sections of Quaternary age non-marine sediments discontinuously cover the basement rock.

3.3 Local Geologic Setting

The Project is located in the eastern end of the Jurupa Mountains on the south side of the San Bernardino Valley. The Santa Ana River drains the San Bernardino Valley towards the southwest and is approximately one-half mile east of the Project.

Based on our review of published geologic reports, maps and referenced geologic information, the Project is underlain by a variety of geologic units. USGS and CGS reports that the northeast

portion of the Project is underlain by Holocene to late Pleistocene age, eolian deposits (Qye) consisting of unconsolidated, gray to tan, massive, fine grained sand forming stabilized dunes; the northern portion of the Project is underlain by Holocene to late Pleistocene age, young alluvial fan deposits (Qyfl) consisting of unconsolidated, gray, cobbley and bouldery alluvium of Lytle Creek fan; the western, southern and eastern portion of the Project is underlain by two geologic units consisting of artificial fill and intermixed tonalite marble and schist. The artificial fill (Qaf) reportedly consists of uncompacted and undocumented fill from mining operations, cement kiln dust (CKD) and unconsolidated talus deposits. The intermixed tonalite, marble, and schist (KtPzms) are Cretaceous and Paleozoic age and consist of intermixed biotite-hornblende tonalite and coarse grained marble containing lesser amounts of biotite-quartz schist. The surficial geologic units shown within the former Riverside Cement Plant and Crestmore Mine property on Figure 3 are based on USGS and CGS maps and our interpretation of field conditions based on our field exploration.

Based on the information reviewed, quarrying and subsurface mining activities were initiated in 1906 to mine the limestone within the southern portion of the Site. Prior to quarrying, the limestone was present as two generally irregular, roughly parallel, lenticular limestone bodies dipping primarily east-northeast. The upper (shallower) and lower (deeper) limestone bodies are referred to as Sky Blue and Chino Limestones, respectively and were mineralogically similar. The limestone is coarsely crystalline, associated with metamorphosed sediments, enveloped and cut by intrusive igneous rocks and contact metamorphic minerals, including large masses of intrusive microcrystalline quartz monzonite porphyry and quartz monzonite pegmatites. Country rock within the boundary of the Site consists of Perris quartz-biotite diorite that becomes granodiorite. Quartz monzonite pegmatites occur commonly as dikes in the porphyry and country rock and extended generally less than 2 or 3 feet into the limestone. The most widespread contact rock is composed generally of grossularite garnet with and without diopside.

The shallower, Sky Blue limestone was an arcuate shaped body, enveloped and intruded by quartz diorite and intruded by quartz monzonite porphyry. The body was up to several hundred feet thick and dipped primarily east or northeast. Where the body was thinnest, the limestone was converted to contact rock. Two (2) facies were present within the limestone; a white limestone with localized yellow predazzite beds and a sky blue colored limestone present closer to the intrusive quartz monzonite porphyry and associated pegmatites.

The deeper, Chino limestone was generally composed of alternating bands of yellowish predazzite and white crystalline limestone with widely disseminated graphite flakes. The unit dipped up to 45 degrees east, was at least 2,000 feet long, and had irregular upper and lower surfaces. Banding ranged from few inches to a few feet thick.

3.4 Local Faulting

Langan reviewed the following publications and report as part of our geologic review regarding local faulting within the Site:

- Daly, John W., (1931), The Geology and Mineralogy of the Limestone Deposits at Crestmore, Riverside County, California, dated 1931 (Daly, 1931).
- Woodford, A. O., Crippen, R. A., and Garner, K. B., (1941), Section Across Commercial Quarry, Crestmore, California, American Mineralogist, Volume 26, pages 351-381 (Woodford et al, 1941).

- ERM-West, Inc., (1991), Technical Evaluation 9/30/90 EPA FIT Report, Riverside Cement Company, Crestmore Plant, dated November 1991 (ERM-West Report).

Plate 1 included in the Daly, 1931 report shows a northeast-southwest trending fault segment between the Commercial Quarry in the northeast and southwestern portion of the Chino Quarry to the southwest. The corresponding report text does not elaborate on this fault and alleges Daly (i) identified only a few small faults of which have no particular significance regarding the major geologic structure of the Site and (ii) did not find any large faults in the area mapped west of the quarries.

The Woodford, et al, 1941 report refers to "a prominent fault (?) running N50°E 70°SE" that extends into bedrock at Station 15 of Woodford, et al's Figure 3-Section Across the Commercial Quarry, 1940'. Additional information of this fault was not provided in this report.

Figures 2-1, 2-2, 2-5, and 3-2 included in the ERM-West Report shows a generally northwest-southeast trending fault in southwestern portion of the Chino Quarry. The corresponding report text does not elaborate on the nature or source of this fault.

Approximate locations of the faults reported by Daly and ERM-West are shown in Langan's Figure 3. The quality of Woodford, et al's Figure 3 does not allow for an accurate determination of the reported fault, thus the location of the fault reported by Woodford, et al is not shown in Langan's Figure 3.

USGS, CGS and Dibblee maps were also reviewed. No other local faults were mapped on the Site. Based on our review of the referenced publications it is our opinion active faulting (Holocene or younger) is not present within the Site.

3.5 Geologic Hazards

Our geologic hazard review was performed in general accordance with CGS "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California", and the 2016 edition of California Building Code (2016 CBC). The following subsections present the results of our review of geologic hazards as they pertain to the Project.

- Regional Faulting – Recognized and mapped faults that are located within a 100-kilometer (km) radius of the Project based on the CGS "2010 Fault Activity Map of California" (Fault Activity Map) and "An Explanatory Text to Accompany the Fault Activity Map of California" (Explanatory Text) are shown on Figures 4a and 4b, respectively. Based on our review, the closest known fault to the Project is the Rialto-Colton Fault, located approximately 4 miles (6.4 km) northeast. The closest active fault is the San Jacinto Fault located approximately 5 miles northeast of the Project. An Inferred Fault near Fontana is located approximately 6 miles northwest of the Project. The Project's relative location to active faults is shown in Figure 4a and 4b.

  Due to the Project's proximity to several nearby active faults, moderate to strong ground shaking could occur from an earthquake on any of the nearby fault(s).

- Regional Seismicity – A search of the CGS earthquake catalog (updated through December 2016) using the *EQSearch* computer program, found that 82 earthquakes with magnitudes greater than 5.0 have occurred within a 100-km radius of the Project since 1800. In addition, a search of the USGS ANSS Comprehensive Earthquake Catalog (ComCat), updated through August 15, 2016, using a web-based Earthquake Archive Search and URL Builder tool, found that 48 earthquakes with magnitudes greater than 5.0 have occurred within a 100-km radius of the Project since 1900. A

summary of the *EQSearch* and USGS ANSS ComCat reported earthquake events are provided in Appendix A.

- Surface Rupture – Alquist-Priolo Earthquake Fault Zones (APEFZ) are regulatory zones established by the CGS around active faults with the potential to cause surface rupture. The zones vary in width, however the average is approximately ¼ mile wide. The CGS has not published an APEFZ map containing the Project.

  Per the Safety Element included in County of Riverside General Plan, Riverside County has zoned fault systems within Riverside County and require special studies be performed within the zones prior to development; per the Safety Element, the Project is not located in a County Fault Zone.

  The City of Jurupa Valley California Draft 2017 General Plan states that there are no known active faults within the City of Jurupa Valley.

- Liquefaction - Based on the County of Riverside General Plan, the Project is located in an area with shallow groundwater and susceptible sediments with low to moderate liquefaction susceptibility. The City of Jurupa Valley California Draft 2017 General Plan shows the east portion of the Project is located in an area with low liquefaction susceptibility and the western portion in an area with medium liquefaction susceptibility.

  However, information from the Department of Water Resources, Water Data Library shows State Well Number 03S03W03A001S less than 100 feet north of the Project. Groundwater data was collected from 2012 to 2016 and the groundwater elevation was reported at approximately 825 feet amsl (depth of 137 feet). Therefore, the potential for soil liquefaction at the Project is anticipated to be low under the design earthquake. The design earthquake is defined in ASCE 7-10 as the earthquake effects that are two-thirds of the corresponding Maximum Considered Earthquake effects. The Project's relative location on the County of Riverside General Plan generalized liquefaction map is shown in Figure 5.

- Lateral Spreading – Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction of a free face, such as a slope, by earthquake and gravitational forces. The potential for liquefaction under the design earthquake is anticipated to be low and therefore the potential for lateral spreading is considered low.

- Seismic-Induced Ground Deformations – Seismic-induced ground deformations include ground surface settlement and differential settlement resulting from liquefaction of saturated cohesionless soils and cyclic densification, or differential compaction, of unsaturated sands and gravels caused by earthquakes. The potential for liquefaction under the design earthquake is anticipated to be low however according to the geologic conditions within the Project, seismic-induced ground deformations induced by cyclic densification (dry seismic settlement) of artificial fill, young alluvial fan deposits and eolian deposits could occur. Additional information is in Section 6.2.

- Earthquake-Induced Landslide Areas – Based on the County of Riverside General Plan and City of Jurupa Valley California Draft 2017 General Plan, the Project is not located within an 'Earthquake-Induced Landslide' area. Documented evidence of historic landslides was not observed at the Project, based on our site visits and our review of aerial photographs. The Project's location on the earthquake-induced landslide map is

shown in Figure 6.

- Groundwater – The Department of Water Resources, Water Data Library shows State Well Number 03S03W03A001S less than 100 feet north of the Project. Groundwater data was collected from 2012 to 2016 and the groundwater elevation was reported at approximately 825 feet amsl (depth of 137 feet).
- Flood Mapping –According to Federal Emergency Management Agency FEMA's 'Flood Insurance Rate Map (FIRM) Number 06065C0045G', dated 28 August 2008, the Project is located in Other Areas Zone X, which is defined as an area determined to be outside the 0.2 percent annual chance floodplain.
- Tsunami and Seiche – A tsunami is a long high sea wave caused by an earthquake, submarine landslide, or other disturbance. A seiche is oscillation of surface water in an enclosed or semi-enclosed basin such as a lake, bay, or harbor. The Project is not located within a potential tsunami or seiche inundation area; however, Chino Quarry is a lake and adjacent to the Project. The lake is approximately 200 feet in depth and the Project is approximately 100 feet higher than the water elevation. The potential for a seiche to overtop the Project is considered to be low.
- Subsidence
    - Land subsidence may be induced from withdrawal of oil, gas, or water from wells. Based on a search of the Division of Oil, Gas & Geothermal Resources (DOGGR) Well Finder online tool, the Project is not within a state-designated oil field. In addition, no active oil, gas, or geothermal wells are identified within the Project. According to our review of the available information from DOGGR, the likelihood of land subsidence caused by oil, gas, or water withdrawal from oil wells is not expected and need not be considered in design.
    - The risk of subsidence from below grade adits below the proposed development will be presented in a separate report, if authorized.
- Collapsible Soils – Collapsible soils, or soils susceptible to hydroconsolidation, are geologically young, unconsolidated, low-density, loose, dry soils commonly present in arid to semi-arid regions, such as Southern California. These soils generally occur within wind deposited sands or silts, alluvial fans, colluvial soils, stream banks, or residual mudflow soils. Collapsible soils have a porous structure. Once water is introduced, the porous structure collapses and the granular particles are rearranged. A rise in groundwater or increase in surface-water infiltration, combined with the weight of a structure or fill, can cause rapid settlement, resulting in cracking of foundations and walls. Based on the reported geologic conditions and subsurface information reviewed for the Project, soils potentially susceptible to significant hydroconsolidation are anticipated, additional information and recommendations are included in Section 6.2.
- Expansive Soils – Expansive soils occur when the moisture content in the soil causes swelling or shrinking as a result of cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading. Swelling and shrinking soils can result in differential movement of structures including floor slabs and foundations, and site work including hardscape, utilities, and sidewalks. Portions of the Site are underlain by alluvial soils which could have expansive clays, although expansive clays have not been identified on the Site yet. Additional discussion regarding expansive soil potential at the Site and recommendations are included in Section 6.3.

3.6 Aerial Photograph Review

Stereographic aerial photographs, from Continental Aerial Photo, taken between 1949 and 1999 showing the Project, Site and surrounding vicinity were reviewed for available information regarding historic conditions and any discernable topographic and/or geomorphic/geologic features. A summary of our interpretation of development within the Site based on the photographs is summarized below.

Aerial Photograph Year	Site Development Description
1949	The Site is developed with a circular tank believed to be a 6 million gallon fuel storage tank, industrial buildings, a rectangular depression believed to be the spray pond and parking lots in the north-western portion. The north-eastern and north-western corners of the Site are observed to be occupied by residential properties. The southern portion of the Site contains unpaved roads surrounding two quarries with steep slopes (Chino Quarry and the Wet Weather Quarry). The Chino Quarry is bounded by hillsides to the south-west and north-east and has irregular slopes with possible sloughing in the north and south ends. The Wet Weather Quarry is filled with water. A stockpile is observed east of the industrial buildings and is surrounded by unpaved roads and disturbed land.
1959	The Site extends past the margin of the photograph, thus the southern portion of the Site is not visible in the photograph. The Site has been developed with additional parking lots and industrial structures in the north-west and west portions. Mining in the quarries appears to have continued. The residential buildings in the north-western corner are no longer observed.
1967	The Site layout and types of equipment have been changed in the middle portion of the Site. A material storage yard, grey kilns, grey cement plant, white kilns and white cement plant are observed. The stockpile observed east of the industrial buildings in 1949 is no longer observed. A haul road is observed within Chino Quarry creating a loop in the excavation. The Wet Weather Quarry is observed to have less water and vegetation is present on the eastern slope. Some of the residential buildings in the north-eastern corner are no long observed. Mining in the quarries appears to have continued. No other significant changes are observed compared to 1959.
1968	A dark area is observed in the rectangular spray pond, mining in the quarries appears to have continued, and no other significant changes to the Site are observed from 1967.
1970	The north slope of the Chino Quarry appears to have been filled in with a gentler slope and mining in the quarries appears to have continued. No other significant changes to the Site are observed compared to 1968.
1976	A third quarry, believed to be the Commercial Quarry, is observed in the southern portion of the Site. The Commercial Quarry has haul roads creating a loop and entering into the quarry. The north-western end of the Wet Weather Quarry appears to have been filled with material and developed with a parking

Aerial Photograph Year	Site Development Description
	area and structures. The Wet Weather Quarry appears to have less water. Mining in the quarries appears to have continued. No other significant changes are observed compared to 1970.
1977	No liquid is observed in the Commercial Quarry. Mining in the western end of Chino Quarry appears to have created a steep slope. No other significant changes are observed compared to 1976.
1980	No significant changes to the Site are observed in the 1980 aerial photographs compared to 1979.
1986	The 6 million gallon fuel storage tank is no longer observed in the north-western portion of the Site, only a circular pad remains. Chino Quarry is filled with water and a stockpile is observed within the Project north of the Wet Weather Quarry. A stockpile is observed in the south end of the Commercial Quarry. A residential building is no longer observed in the north-eastern part of the Site. Grading is observed west of the Wet Weather Quarry. No other significant changes are observed compared to 1979.
1990	The stockpile south of the Commercial Quarry is no longer observed and the area appears to have been graded. The circular pad for the 6 million gallon storage tank is no longer observed and the area is vegetated. No other significant changes are observed compared to 1986.
1993	The stockpile north of the Wet Weather Quarry is observed to have vegetation. No other significant changes are observed compared to 1990. No significant changes are observed in the 1995 aerial photographs compared to 1993. In the 1999 aerial photograph, water is not observed in the Commercial Quarry. No other significant changes are observed in the 1999 aerial photograph compared to 1993.

3.7 Previous Investigation

Based on a Site Assessment Report prepared by Ryan-Murphy, nine soil borings were advanced using a Mobile B-53 drill rig and 8-inch hollow stem augers to a maximum depth of 45 feet to investigate the area of the former White Kiln Pipeline Leak. Two borings were advanced horizontally using a hand auger under the boiler building to a depth of 6 to 7 feet. Fill was encountered to a depth of 5 feet. Fill was generally underlain by alluvium consisting of clays and silty sands and was encountered to a depth that ranged from 20 to 40 feet. Decomposed granite was encountered below the fill and/or alluvium at a depth of 5 feet or greater below alluvium or fill. Standard Penetration Test (SPT) blow counts in clay varied from 5 to 48, SPT blow counts in silty sands varied from 17 to refusal and SPT blow counts in decomposed granite varied from 50 to refusal.

4. SUBSURFACE INVESTIGATION

Langan's preliminary geotechnical field investigation was performed in two phases. The first consisted of drilling thirteen (13) geotechnical borings, excavating 57 test pits, performing two (2) percolation tests, measurement of groundwater at existing wells, and a geophysical

investigation to investigate the subsurface conditions throughout the Site and obtain information about depth of filled in quarries and below grade chambers. The second phase of the investigation consisted of performing six (6) test pits in the northern portion of the Site to investigate the vertical and lateral extent of eolian sands.

Before performing the subsurface investigation, borings and test pits were located and marked by a field engineer from our office. Underground Service Alert of Southern California (DigAlert) was contacted to locate and mark known public underground utilities present within the public rights-of-way. In addition, a private utility-locating subcontractor performed subsurface utility check at the boring and test pit locations to confirm the locations were clear of subsurface utilities or obstructions. Additional details of our subsurface investigation are discussed below. See Figure 2 for approximate locations of borings, trenches and percolation tests.

- Borings – Thirteen (13) borings, identified as LB-1 through LB-12 and ALB-10, were drilled between 19 and 26 September 2016 by Martini Drilling under full-time observation of a Langan field engineer. The borings were hand-augered to 5 feet below existing grade and subsequently drilled to depths ranging between approximately 31.5 and 61.5 feet below existing grade.

  A truck-mounted drill rig and hollow-stem augers were used to advance the boreholes using conventional soil drilling techniques. Standard Penetration Tests (SPT)[2] and split spoon sampling were performed at select locations. California ring samples were collected at select locations using a 3.0-inch-outer-diameter split-barrel California sampler lined with 2.42-inch-inner-diameter brass rings in accordance with ASTM D3550. Soil samples were visually examined and classified in the field in accordance with the Unified Soil Classification System (USCS); classifications were confirmed by re-examination in our office. Boring logs are attached in Appendix B. Excess cuttings were placed at the Site near each boring and borings were backfilled with cement grout. Borings that were drilled on top of pavement were patched with quick-dry concrete and dyed black.

- Percolation Testing – Percolation tests were performed in borings LB-4 and LB-9 at depths of 40 feet and 30 feet, respectively. The percolation tests were performed in general accordance with the methods presented in the "Design Handbook for Low Impact Development, Best Management Practices" by Riverside County Flood Control, Water Conservation District, dated September 2011. Percolation test results are attached in Appendix C.

- Tests Pits – Fifty-seven test pits, identified as LT-2, LT-4, LT-5 through LT-6, LT-8 through LT-24, LT-26 through LT-36, LT-39 through LT-47, LT-CBermA, LT-MW1A, LT-MW1B, LT-MW1C, LT-SBermA, LT-SBermB, LT-EBermC, LT-EBermD, LT-NBermA, LT-NBermB, and LT-Sewer were excavated and logged as part of a Phase II Environmental Investigation at the Site. Test pits were excavated to depths that ranged from approximately 5 to 16 feet. The test pits were excavated by Dennis A. Lorton & Associates, Inc., using a Caterpillar 321C Excavator between 19 and 30 September

[2] The Standard Penetration Test is a measure of the soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch outer diameter split-barrel sampler 12-inches or 3.0-inch-outer-diameter split-barrel California sampler lined with 2.42-inch-inner-diameter brass rings, after an initial penetration of 6 inches, using a 140-pound automatic hammer free falling of a height of 30-inches (ASTM D1586).

2016 under the full-time observation of a Langan field engineer. An additional six (6) test pits, identified as TP-1 through TP-6, were excavated to delineate eolian sand, if any in the northern portion of the Project. Test pits were excavated by Dennis A. Lorton & Associates, Inc., using a Caterpillar 321C Excavator on 10 April 2017 under the full-time observation of a Langan field geologist. Following completion of logging, the test pits were backfilled in lifts with excavated soil using the excavator. The tests areas will need to be re-excavated and backfilled as controlled fill as part of remedial grading. Refer to Figure 2 for approximate test pit locations. Test pit logs are attached in Appendix D.

- Groundwater Measurements – The depth to groundwater was measured at two wells on 4 October 2016, an off-site well identified as MW-3 and a "Monitoring Well" in the northern portion of the Project. A summary of the groundwater measurements is provided in Section 5.1.
- Geophysical Investigation – A geophysical investigation was performed by Spectrum Geophysics, Inc., to investigate the alignment and depth of the former conveyor below grade chamber and potential for below grade chamber(s) south of the proposed footprint of Building 1.

  A p-wave seismic refraction study was performed in the area of the Wet Weather Quarry and Lonestar Quarry to identify the depth to bedrock. The geophysical investigation was performed on 3 to 6 October 2016. The geophysical investigation results are summarized in Section 5.3 and attached in Appendix E.

4.1 Laboratory Testing

A laboratory test program performed on select soil samples included the following tests:

- Expansion Index – ASTM D4829
- Consolidation – ASTM D2435
- Direct Shear – ASTM D3080
- Sieve Analyses – ASTM D422
- Percent Passing #200 Sieve Analyses – ASTM D1140
- Moisture Content and Density – ASTM D2937
- Electrical Resistivity – CTM 643
- Chloride Content – CTM 422
- Sulfate Content – CTM 417
- Soil pH – CTM 643
- Modified Proctor Compaction – ASTM D1557

Laboratory test results are included in Appendix F.

5. SUBSURFACE INVESTIGATION RESULTS

Borings and test pits generally indicated that subsurface conditions consisted of artificial fill, alluvial deposits, and weathered granitic rock. Generalized subsurface cross-sections are presented in Figure 7. Our interpretation of the subsurface conditions based on borings, test pits and laboratory test results is summarized below. Boring logs are attached in Appendix B.

- artificial fill (Qaf): Artificial fill was observed throughout the Project extending from the ground surface to a depth of approximately 13 feet. Fill material consists of dry to moist, brown, silty fine to coarse sand with varying proportions of gravel and clay. In addition, fill stockpiles are present throughout the Site.
- eolian deposits (Qye): As stated in Section 3.3, USGS and CGS maps showed eolian deposits in the northeastern portion of the Project. Eolian sand was not observed in the north and northeastern portion of the Project.

As stated in Section 3.3, USGS and CGS maps showed eolian deposits in the northeastern portion of the Project. Eolian sands are dune sand deposits which typically have a grain sizes in the fine to very fine sand range, with minimal fines. Sieve analyses of the sands encountered in the referenced area reported fines contents (% passing a #200 sieve) ranging from approximately 21 to 38 percent, which is outside the range that would be anticipated in an eolian sand. Therefore, eolian sand was not observed in the north and northeastern portion of the Site.

- alluvial deposits: Alluvial deposits generally underlie artificial fill and are white-tan to brown, moist, medium dense to very dense, fine to coarse sand and silty fine sand. Brown to orange-brown, firm to hard, sandy silt, silt and clay were also observed. Alluvial deposits were observed at depths that ranged from approximately 2.5 to 61.5 feet. SPT N-values typically ranged from 12 to 48 blows/foot.
- weathered granitic rock: Weathered granitic rock generally underlies the artificial fill and was white-gray to white-pink with some brown, dense to very dense, fine to coarse sand with some fine to coarse gravel. Weathered granitic rock was observed at depths that ranged from approximately 3 to 61.5 feet.

5.1 Groundwater Measurements

On October 4, 2016, field personnel measured the depth to groundwater at two on-site wells, identified as Monitoring Well and off-site well number MW-3. The locations of the wells are shown in Figure 2. The groundwater elevation at the Monitoring Well was approximately 818 feet amsl (approximate depth of 134 feet) and at well MW-3 the elevation was approximately 806 feet amsl (approximate depth of 84 feet). The elevations were recorded using a water level meter, the wells were not bailed prior to collecting measurements. Groundwater elevations may vary with time and season.

5.2 Percolation Testing

Based on the results of the percolation test, the calculated infiltration rate for each test is listed below.

Boring ID	Test Depth (feet)	Soil Type	Infiltration Rate (inches/hour)
LB-4	35-40	SM-SW	14.4
LB-9	25-30	CL-SW	0.8

Percolation test results are attached in Appendix C.

5.3 Geophysical Evaluation/Results

Based on the geophysical evaluation, high resistivity was detected along transect Lines 1RS, 2RS and 3RS. High values of resistivity can be an indication of a void space, such as below grade chambers, because essentially there is no path for the electrical current to travel across the void space. Therefore, electrical resistivity within a void space is very high (infinite) unless the void space is completely filled with water.

High values of electrical resistivity can also be an indication of an increase in grain size (e.g. coarse-grained materials such as gravel or cobbles have higher resistivity values than finer grained materials such as fine sands and silts). The station and depth at which high values of

resistivity were detected are listed below for each transect line along with an interpretation for each.

Transect Line	Station	Depth (Feet)	Interpretation
1RS	263 to 330	30 to 160	Based on the map titled "Air Flow Diagram Crestmore Mine" by Riverside Cement Company dated 10 January 1968, that shallowest mines were at an elevation of 440 feet amsl. The surface elevation along transect Line 1RS varies from 930 to 950. Therefore, the high value of resistivity is not believed to be associated with a below grade chamber. The high value of resistivity is possibly associated with debris such as concrete or a granitic intrusion.
	582 to 687	30	Based on the map titled "Air Flow Diagram Crestmore Mine" by Riverside Cement Company dated 10 January 1968, that shallowest mines were at an elevation of 440 feet amsl. The surface elevation along transect Line 1RS varies from 930 to 950. Therefore, the high value of resistivity is not believed to be associated with a below grade chamber. The high value of resistivity is possibly associated with debris such as concrete or a granitic intrusion.
2RS	40 to 70	10	As shown in Figure 2, an adit is located north of transect Line 2RS and the below grade chamber extends in a south west direction. The high value of resistivity is believed to have indicated the position of the below grade chamber.
	160 to 200	15 to 80	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.
	200 to 300	40	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.
3RS	65 to 167	5	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.
	234 to 334	66	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.
	372 to 390	30	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.
	401 to 460	20	Based on field observations, the high value of resistivity is believed to have indicated the position of manholes and associated pipes.

The results of the seismic refraction investigation are summarized in the table below.

Transect Line	Layer	Approximate Depth (Feet)	P-Wave Velocity (feet/second)
1RF	1	0 to 45	1,400
	2	20 to 100	2,400
	3	Greater than 90	4,150
2RF	1	0 to 130	1,100 to 1,700
	2	Greater than 50	4,200
		Greater than 130	11,000

The geophysical investigation report is attached in Appendix E.

6. GEOTECHNICAL EVALUATION

Below is our evaluation of the following geotechnical issues:

- Seismic evaluation,
- Collapsible soils,
- Expansive soils and,
- Historic below grade chambers.

6.1 Seismic Evaluation

We understand the project's seismic structural design will be in accordance with the 2016 CBC and ASCE 7-10. The following seismic parameters are based on the 2016 CBC and ASCE 7-10. Based on the available subsurface information, and in accordance with the seismic provisions of these codes, the following parameters are recommended for preliminary seismic design:

- Mapped Spectral Accelerations S_s and S_1 of 1.500g and 0.608g, respectively.
- Site Class D
- Site Coefficients F_A and F_V of 1.0 and 1.5, respectively.
- Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters at short periods, S_{MS}, and at one-second period, S_{M1}, of 1.500g and 0.912g, respectively.
- Design Earthquake (DE) spectral response acceleration parameters at short period, S_{DS}, and at one-second period, S_{D1}, of 1.000g and 0.608g, respectively.
- MCE_R Geometric Mean Peak Ground Acceleration PGA_M of 0.561g.

Using the deaggregation of the probabilistic seismic hazard spectrum from the USGS 2008 Hazard Maps, the mean and modal earthquakes for the 2 percent probability of exceedance in 50 year event are 7.10M and 7.80M, respectively.

Based on the subsurface investigation results, the depth to groundwater was measured to be greater than 50 feet below the proposed building foundation elevations and therefore the potential for liquefaction is considered low.

An analysis was performed for dry seismic settlement at Boring LB-6 due to the thickness of loose sands. The analysis was based on the measured ground water depth of 137 feet. SPT N-values based on automatic hammers were corrected for theoretical hammer efficiency, fines contents and overburden pressure for this evaluation. A peak horizontal ground acceleration

(PGA) and maximum magnitude of 0.561g and 7.1, respectively were used in our analysis. Based on this evaluation, settlement of 0.35 inch is anticipated under seismic loading.

6.2 Collapsible Soil Evaluation

Potentially collapsible soils were encountered during drilling and samples were collected using a driven split-barrel California sampler. Collected samples may have higher values of collapse potential due to being disturbed with a driven sampler. Select samples were sent to a laboratory for measurement of collapse potential in accordance with ASTM D5333.

Based on the laboratory results, the collapse potential varies between 0.2 to 1.5 percent within the upper 20 feet and less than 0.5 percent for samples collected at greater depths. Samples that had a collapse potential greater than 1 percent were located in LB-4 and LB-8, approximately in the center of the proposed Project at depths of approximately 5 to 6½ feet and 15 to 16½ feet, respectively. Remedial grading should be performed as described in Section 9.0 to reduce the potential for settlement from collapsible soils. Remedial grading is anticipated to minimize settlement to approximately 0.8 inches in LB-8, assuming remedial grading of the upper 5 feet of alluvial deposits.

6.3 Expansive Soil Evaluation

Based on the field investigation, cohesive soil was not encountered within the upper 15 feet of borings. Cohesive soil was encountered in boring LB-5 at a depth of 15 to 16.5 feet and based on laboratory results, the material has a medium expansive potential. Boring LB-5 is within the proposed footprint of Building 1 however the proposed building pad elevation is approximately 14 feet higher than the potentially expansive soil and therefore has a low potential to affect building foundations. Although not encountered in the preliminary investigation, expansive soils are often found at sites underlain by alluvial soils; also, grading operations could result potentially expansive soils beneath the building pads. Further testing and evaluation should be performed during final design and following rough grading.

Boring	Depth (Feet)	Expansion Index	Sample Elevation (Feet)	Proposed Pad Elevation of Building 1 (Feet)
LB-5	15 to 16.5	79	928	942

6.4 Historic Below Grade Chambers

As stated in Section 2.1, the lateral extent of mining is shown to extend beneath the proposed footprint of Building 1. The mines were excavated in limestone rock with the shallowest at an elevation of 440 feet amsl and the deepest at an elevation of 60 feet below sea level. Further evaluation of the below grade chambers with respect to the proposed developed is planned for a separate study.

7. PRELIMINARY FOUNDATION RECOMMENDATIONS

From a geotechnical point of view, the Project is considered feasible provided the development is designed and constructed in accordance with the recommendations presented herein.

In general, any existing artificial fill, and the upper 5 feet of alluvial soils are considered unsuitable in their present state for support of the proposed structures and other improvements. Based on the preliminary boring and test pit observations and the conceptual grading plan, artificial fill could extend up to 15 feet below existing grade in portions of the Site.

These soils should be overexcavated and the proposed structures could be supported on shallow foundations bearing on compacted engineered fill. Overexcavated soil may be reused in the compacted engineered fill. As an alternative to overexcavation, alternative ground improvement methods, such as Rapid Impact Compaction, geopiers, or other methods could be evaluated.

7.1 Shallow Foundations

Provided grading is performed as recommended herein, a bearing value of 2,500 pounds per square foot (psf) may be used for continuous and isolated footings founded at a minimum depth of 24 inches below the lowest adjacent grade and having a minimum width of 12 inches and 24 inches, respectively. The bearing value may be increased by 250 psf and 500 psf for each additional foot in width and depth, respectively, up to a maximum value of 4,000 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

Footing settlement of less than 1 inch and differential settlements of less than ½-inch over 50 feet is anticipated with foundations bearing on controlled compacted fill soil as described above. Based on Section 6.2, an estimated 1.3 percent collapse strain was calculated if 5 feet of alluvial deposits, within LB-8, became saturated with an estimated potential hydrocollapse of less than 1 inch. Seismic induced settlements are anticipated to be less than 1 inch.

Footing excavations should be performed using a backhoe bucket fitted with a smooth steel plate welded across the bucket teeth to minimize disturbance during excavation and to provide a smooth bearing surface.

The footing subgrades should be firm and unyielding inspected and approved by a qualified geotechnical engineer prior to steel placement or concrete placement.

Foundations should be constructed as soon as possible following subgrade approval. The contractor shall be responsible for maintaining the subgrade in its as approved condition (i.e. free of water, debris, etc.) until the footing is constructed.

Foundations bearing on appropriately prepared engineered fills can be designed to resist lateral sliding using a coefficient of friction equal, to 0.39. If the sliding resistance calculated using the above coefficient of friction is deemed insufficient, shear keys can be provided in the bearing material to provide supplemental sliding resistance. Should additional lateral resistance be required, we should be notified so we can perform additional analyses and develop supplemental recommendations to resist the intended loads.

7.2 Corrosion

Samples for corrosion testing were collected from the upper 5 feet of soil borings. Corrosion test results are listed and summarized below:

Sample ID	Resistivity (ohm-cm)		pH		Soluble Sulfate (ppm)	Chloride Content (ppm)	
LB-1/B-1	11,000	Mildly	7.9	Basic	165	54	Low
LB-2/B-1	6,000	Moderately	6.9	Acidic	103	148	Low
LB-6/B-1	1,500	Corrosive	7.9	Basic	239	116	Low
LB-8/B-1	4,000	Moderately	7.3	Basic	91	104	Low
ALB-10/B-1	2,000	Corrosive	9.8	Basic	128	1,534	High

Based on the laboratory results, soluble sulfate concentration in soil is considered negligible and therefore concrete anticipated to be exposed to soil should be designed for negligible corrosive conditions according to the guidelines presented in the 2015 edition of American Concrete Institute Reinforced Concrete Design Manual (ACI 2015).

The upper 5 feet of soil has a high to low resistivity therefore ferrous metals anticipated to be exposed to soil should be designed for mildly to corrosive conditions. In general, results show that pH and chloride concentrations in the upper 5 feet are generally not corrosive except at ALB-10 where the pH is equal to 9.8 and chloride concentration exceeds 500 ppm and is therefore corrosive to steel (CalTrans 2015). A corrosion engineer should be consulted to review the test results, provide concrete corrosion protection recommendations or alternative piping material and confirm the suitability of on-site soils as compacted artificial fill for metallic subsurface utilities.

The upper 5 feet of soil near ALB-10 should not be used as fill within the upper 5 feet of the proposed building footprint to avoid corrosive soils affecting foundations and other structures.

8. ADDITIONAL STUDIES

Additional studies are recommended to confirm the following:

- Subsidence from below grade chambers and
- A final geotechnical study to confirm geotechnical recommendations.

9. CONSTRUCTION RECOMMENDATIONS

Prior to the commencement of mass excavation and grading, a meeting should be held at the Project with the owner, city inspector, excavation/grading contractor, civil engineer, and geotechnical consultant to discuss the work schedule and geotechnical aspects of the grading.

All vegetation and deleterious materials should be disposed of off-site prior to initiation of grading operations.

Soil overexcavation should extend laterally a distance equal to the depth of removal but no less than 5 feet beyond the limits of the structures. In addition, within building limits, existing soil should be removed and replaced as engineered fill (overexcavated) to a depth of at least 5 feet below bottom of the building foundations, to the bottom of artificial fill, or 5 feet below existing grade whichever is the greater depth. Beyond building limits, existing soil should be removed and replaced as engineered fill (overexcavated) to a depth of at least 2 feet below proposed grade. The actual depths of removal should be evaluated in the field by a representative of the geotechnical consultant based on actual conditions exposed during grading.

All surficial units consisting of artificial fill, upper 5 feet of alluvial soils, soil with roots and loose surficial soil are considered unsuitable for support of the proposed fills and improvements following removal of vegetation and deleterious materials. These materials should be over-excavated to expose competent soil. Environmentally unsuitable soils encountered during the excavation process should be properly disposed of off-site in accordance with all state and local regulations. Over-excavated soils, free of deleterious and environmentally unsuitable materials, may be reused as compacted fill. These surficial soil materials are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Most of these materials are below optimum moisture content and will require the addition of water to achieve proper compaction. On-site materials to be overexcavated are not anticipated to bulk and are anticipated to shrink approximately 10 percent.

All excavations should conform to the requirements of CAL/OSHA. Over-excavated materials, free of deleterious materials and approved by the geotechnical consultant, may be reused as compacted fill.

All over-excavation bottoms should be observed by the geotechnical consultant prior to fill placement. Prior to placement of fill material, the over-excavation bottom should be scarified to a depth of at least six inches, moisture conditioned to within 1 to 2 percent of optimum moisture content, and proof-rolled.

The geotechnical consultant should be provided with appropriate survey staking during grading to verify that depths and locations of recommended over-excavations have been achieved. Observations and detailed geologic mapping of over-excavations should be performed by the engineering geologist or geotechnical engineer to verify the anticipated conditions.

Any foundation remnants or construction debris associated with former structures or developments encountered within excavations should be fully removed, and any void spaces that may be created should be backfilled with approved compacted structural fill. Private sewage systems, if encountered during grading should be properly removed or abandoned in place in accordance with local codes. If sewages pits are abandoned in-place, they should be pumped clean, backfilled with gravel or clean sand and capped with a minimum of two feet of 2-sack slurry. The top of the slurry cap should be at 5 feet below proposed grade.

On-site excavated materials to be used as compacted fill should be placed in uniform lifts restricted to about 6 inches in thickness, moisture conditioned to near optimum moisture content, and then mechanically compacted. Compacted fill to be 50 feet thick or less should be compacted to at least 90 percent of maximum dry density as determined by ASTM Test Method D1557 (Modified Proctor compaction). Per the County of Riverside, Transportation and Land Management Agency compacted fill placed at depths greater than 50 feet thick should be compacted to at least 95 percent of maximum dry density as determined by ASTM Test Method D1557 (Modified Proctor compaction) and require a settlement monitoring program. Fill placement should be subject to controlled engineering inspection by the engineer. No fill material should be placed on areas where free water is standing or on surfaces which have not been approved by the engineer.

Fill slopes should be designed at a slope ratio of 2:1 (H:V) or flatter and be overbuilt and subsequently cut back to a compacted core. Fill slopes should be constructed with keyways, backcuts, and backdrains. Keyways should be a minimum of 15 feet wide for slopes up to 30 feet high and a minimum of ½ the slope height for slopes higher than 30 feet. Keyways should be tilted a minimum 2 percent towards the back of the keyway and embedded a minimum of 3 feet into competent material at the toe. Backcut benches should be excavated to expose competent material where fill is placed on slopes steeper than approximately 5:1 (horizontal:vertical).

If removals are limited by existing improvements or property lines, special grading techniques, such as slot cuttings or other acceptable design criteria may be required. Under such conditions, specific recommendations should be provided by the geotechnical consultant during review of final grading plan.

10. OWNER AND CONTRACTOR OBLIGATIONS

The Contractor is responsible for construction quality control, which includes satisfactorily constructing the foundation system and any associated temporary works to achieve the design

intent while not adversely impacting or causing loss of support to neighboring property, structures, utilities, roadways, etc. Construction activities that can alter the existing ground conditions such as excavation, fill placement, foundation construction, ground improvement, pile driving/drilling, dewatering, etc. can also induce stresses, vibrations, and movements in nearby structures and utilities, and disturb occupants. Contractors are solely responsible to ensure that their activities will not adversely affect the structures and utilities, and will not disturb occupants. Contractors must also take all necessary measures to protect the existing structures, utilities, etc. during construction.

11. LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the Site inferred from a limited number of borings, trenches, as well as architectural, and historical information provided by others. Actual subsurface conditions may vary. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so that we can determine whether such changes affect our recommendations. Information on subsurface strata shown on the logs and groundwater levels measured represent conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation, as they may affect our recommendations.

This report has been prepared to assist the Owner, architect, and structural engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be utilized or depended on by engineers or contractors who are involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties which are beyond the limits of that which is the specific subject of this report.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

12. REFERENCES

12.1 Publications

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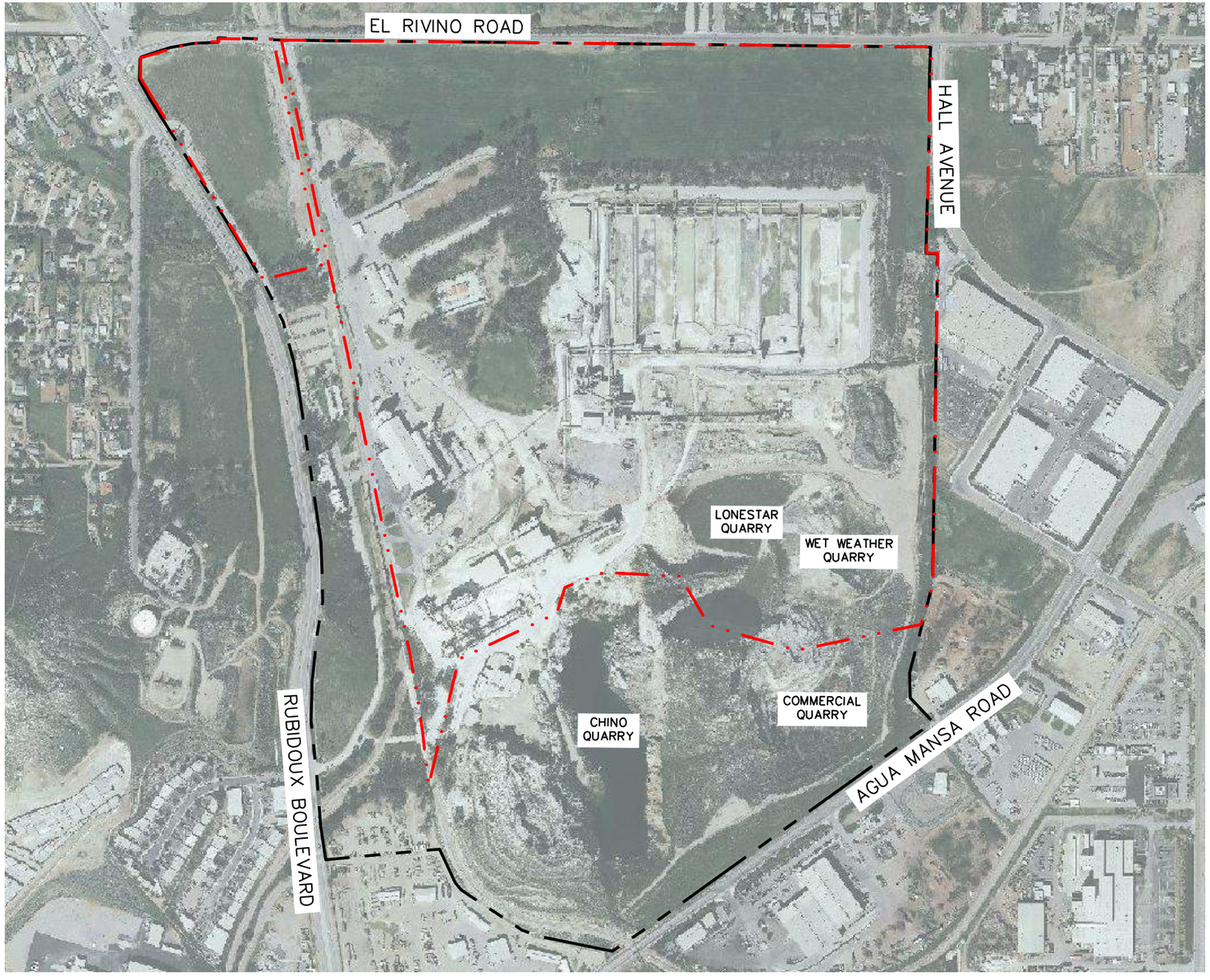
FIGURES



NOTES:

1. BACKGROUND IMAGE REFERENCED FROM AERIAL DATADOORS DESKTOP ON 28 APRIL 2016.
2. APPROXIMATE SITE AND PROJECT LIMITS REFERENCED FROM PLAN TITLED "CRESTMORE REDEVELOPMENT, JURUPA VALLEY, CA – PRELIMINARY SITE PLAN – SCHEME A.01," PREPARED BY RGA OFFICE OF ARCHITECTURAL DESIGN, DATED 11 MAY 2016.

LEGEND:

APPROXIMATE LIMITS OF PROPOSED PROJECT

APPROXIMATE LIMITS OF SITE

600 0 300 600

SCALE IN FEET

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Figure Title
SITE LOCATION MAP

Project No. 700045403
Date 28 APRIL 2017
Scale 1" = 600'
Drawn By djh

Figure No. 1

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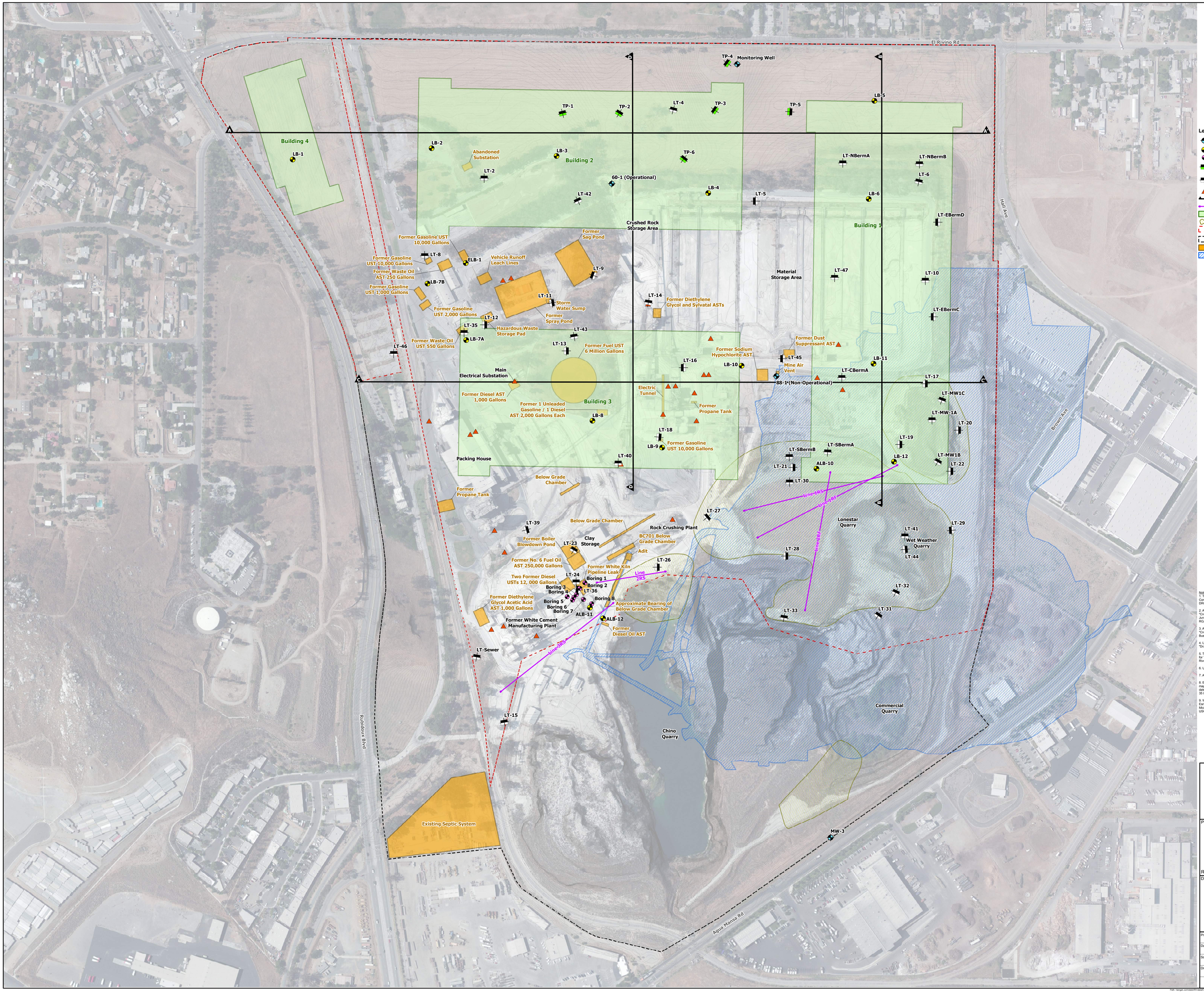
Filename: \\langan.com\data\IRV\data4\700045401\Cadd Data - 700045401\2D-DesignFiles\Geotech\ARCHIVE\2016-10-26 ALL FILES\Site Location Ma□.dwg Date: 4/26/2017 Time: 13:22 User: jbaron Style Table: Langan.stb Layout: Site Location Ma□



Legend

- Monitoring Well (MW-3)
- Approximate Boring Locations (LB-1 and ALB-10)
- Approximate Previous Boring Locations by Ryan Murphy
- Approximate Trench Location (2017)
- Approximate Trench Locations (2016)
- Approximate Transformer Locations
- Cross Section
- Approximate Geophysical Line Locations
- Proposed Building Footprint
- Approximate Limits of Possible CKD Landfill Areas
- Approximate Limits of Proposed Project
- Approximate Limits of Former Riverside Cement Manufacturing Plant
- Approximate Location of Environmental Locations
- Approximate Extent of Crestmore Mines

Notes:

1. Topographic contours referenced from plan titled "Encumbrance Map, Vacant Commercial Property, Jurupa Valley, California, Topographic Information by DRC Engineering, Inc., Dated 2 March 2016.

2. Approximate project, site limits, and building limits referenced from plan titled "Crestmore Redevelopment, Jurupa Valley, CA - Preliminary Site Plan - Scheme A.01," Prepared by RGA Office of Architectural Design, Dated 11 May 2016.

3. Approximate limits of areas are referenced from "Crestmore Plant, Hazardous Material Business Plan (HMBP)" by Riverside TXI Cement, Dated 2009.

4. Limits of Cement Kiln Dust (CKD) Disposal Areas area referenced from "Draft Technical Memorandum No.1" by Sector, Dated 25 January 2001.

5. Transformer locations referenced from "Figure 2 - Site Map, for TXI Riverside Cement Crestmore Plant, 1500 Rubidoux Boulevard, Riverside, California 92509" by Stantec, Dated 26 July 2013.

6. Underground Storage Tank (UST)

7. Above Ground Storage Tank (AST)

8. Extent of below grade chambers referenced from maps Riverside Cement Company, Crestmore Mine Plan, dated 25 November 1968 and Riverside Cement Company, 35 Level, dated 17 January 1972.

9. World aerial imagery basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online. Source of aerial imagery is Microsoft from 2011. Credits: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community.

0 140 280

SCALE IN FEET

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AGUA MANSA COMMERCE PARK

JURUPA VALLEY

RIVERSIDE COUNTY CALIFORNIA

Drawing Title

BORING AND TRENCH LOCATION PLAN

Project No. 700045407	Figure No. 2
Date 28 APRIL 2017	
Scale 1"= 140'	
Drawn By BJS	

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600 0 300 600

SCALE IN FEET

LEGEND:

- APPROXIMATE LIMITS OF SITE
- APPROXIMATE LIMITS OF PROPOSED PROJECT
- APPROXIMATE GEOLOGIC CONTACT
- APPROXIMATE LOCATION OF REPORTED FAULT (DOTTED WHERE BURIED) (ERM-WEST, 1991)
- APPROXIMATE LOCATION OF REPORTED FAULT (DALY, 1931)
- D — D' CROSS SECTION

GEOLOGIC UNITS:

Qaf	ARTIFICIAL FILL
Qyfl	YOUNG ALLUVIAL-FAN DEPOSITS OF LYTLE CREEK
Qof1	OLD ALLUVIAL-FAN DEPOSITS, UNIT 1
Kt	TONALITE
Psm	MARBLE
KtPzs	INTERMIXED HETEROGENOUS TONALITE AND SCHIST
KtPzms	INTERMIXED TONALITE, MARBLE AND SCHIST

NOTES:

1. BACKGROUND IMAGE OBTAINED FROM "ENCUMBRANCE MAP, VACANT COMMERCIAL PROPERTY, JURUPA VALLEY, CALIFORNIA, TOPOGRAPHIC INFORMATION", PROVIDED BY DRC ENGINEERING, INC., DATED 2 MARCH 2016.
2. GEOLOGIC UNITS REFERENCED FROM "UNITED STATES GEOLOGIC SURVEY (1999), PRELIMINARY GEOLOGIC MAP OF THE FONTANA 7.5' QUADRANGLE, SAN BERNARDINO AND RIVERSIDE COUNTIES, CALIFORNIA, VERSION 1.0, OPEN-FIELD REPORT 03-418" AND INTERPRETED FROM LANGAN'S OBSERVATIONS OF GEOTECHNICAL BORINGS AND TEST PITS PERFORMED IN SEPTEMBER 2016 AND APRIL 2017.
3. FAULT LOCATION REFERENCED FROM REPORT "ERM-WEST, INC., TECHNICAL EVALUATION 9/30/90 EPA FIT REPORT, RIVERSIDE CEMENT COMPANY, CRESTMORE PLANT", by ERM-WEST, INC., DATED NOVEMBER 1991.
4. FAULT LOCATION REFERENCED FROM REPORT "THE GEOLOGY AND MINERALOGY OF THE LIMESTONE DEPOSITS AT CRESTMORE, RIVERSIDE COUNTY, CALIFORNIA," THESIS BY JOHN W. DALY DATED 1931.

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Figure Title: GEOLOGIC MAP

Project No. 700045407
Date 28 APRIL 2017
Scale 1" = 600'
Drawn By SS

Figure No. 3

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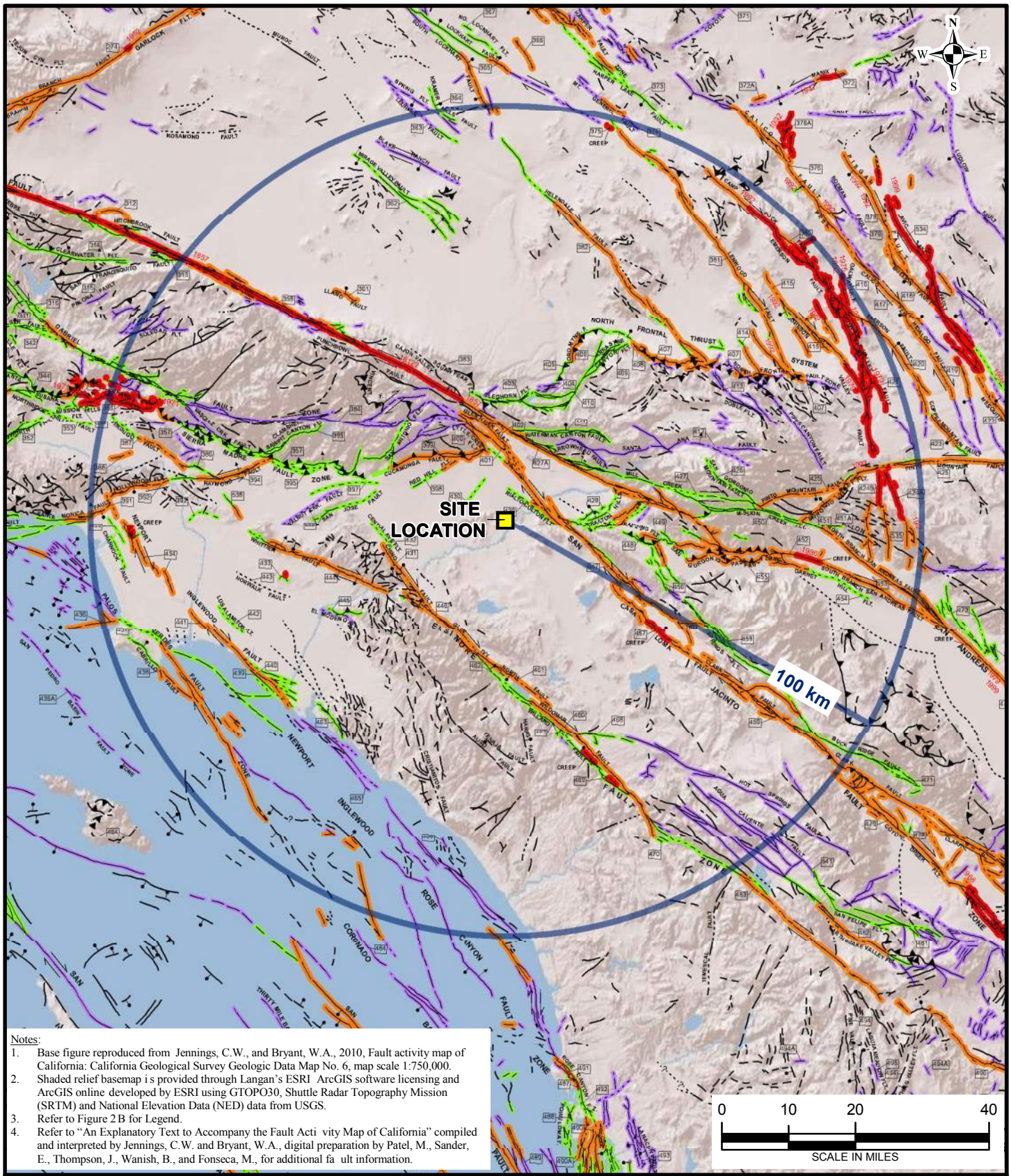

Notes:

1. Base figure reproduced from Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
2. Shaded relief basemap i s provided through Langan's ESRI ArcGIS software licensing and ArcGIS online developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM) and National Elevation Data (NED) data from USGS.
3. Refer to Figure 2 B for Legend.
4. Refer to "An Explanatory Text to Accompany the Fault Acti vity Map of California" compiled and interpreted by Jennings, C.W. and Bryant, W.A., digital preparation by Patel, M., Sander, E., Thompson, J., Wanish, B., and Fonseca, M., for additional fa ult information.

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Figure Title
CGS FAULT ACTIVITY MAP OF CALIFORNIA LEGEND

Project No.	700045403
Date	28 APRIL 2017
Scale	1 inch = 20 miles
Drawn By	BJS

Figure
4A

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LEGEND:

Site Location

Fault Age

The age classifications are based on geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault of fault seciton

- Historic
- Holocene
- Late Quaternary
- Quaternary
- 100 km

Pre Quaternary Faults

- fault, certain
- fault, approx. located
- fault, concealed
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, approx. located, queried
- fault, certain, barball
- fault, concealed, barball
- fault, approx. located, barball

Quaternary Faults

- fault, certain
- fault, approx. located
- fault, approx. located, queried
- fault, inferred, queried
- fault, concealed
- fault, concealed, queried
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, concealed
- dextral fault, certain
- dextral fault, approx. located
- dextral fault, concealed
- sinistral fault, certain
- sinistral fault, approx. located
- sinistral fault, concealed
- thrust fault, certain (2)
- thrust fault, approx. located (2)
- thrust fault, concealed (2)
- fault, solid, barball
- fault, dashed, barball
- fault, dotted, barball
- dextral fault, solid, barball
- fault, dotted, queried, ballbar
- fault, dotted, queried, ballbar (2)
- fault, solid, dip
- fault, dashed, dip
- fault, dotted, dip
- reverse fault, solid
- reverse fault, dashed
- reverse fault, dotted

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Figure Title: CGS FAULT ACTIVITY MAP OF CALIFORNIA LEGEND

Project No.: 700045403
Date: 28 APRIL 2017
Scale: NOT TO SCALE
Drawn By: BJS

Figure: 4B

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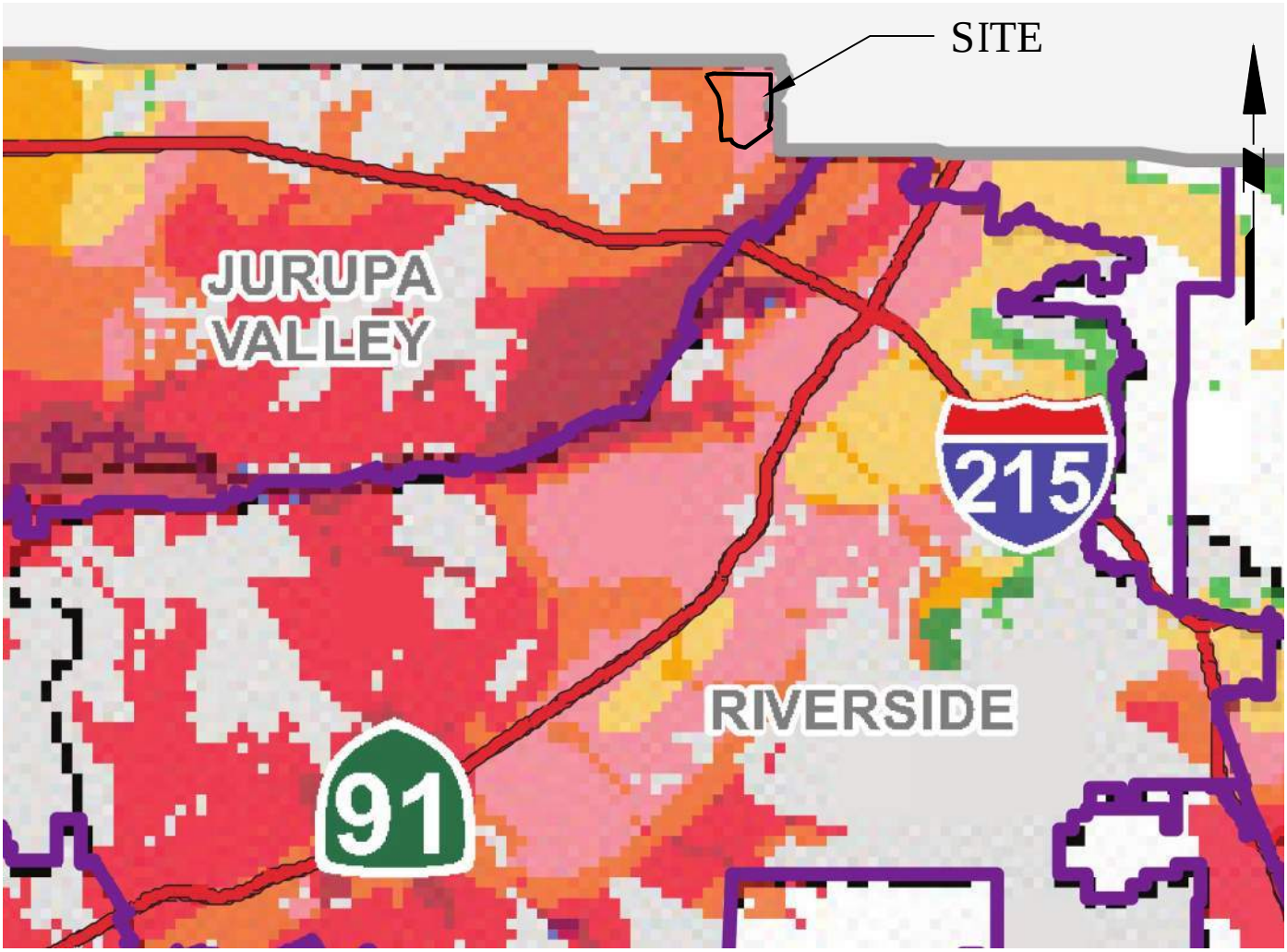

NOTES:

1. BACKGROUND REFERENCED FROM "COUNTY OF RIVERSIDE GENERAL PLAN, SAFETY ELEMENT, GENERALIZED LIQUEFACTION – FIGURE S-3", DATED ON 8 DECEMBER 2015.

LEGEND:

Liquefaction Susceptibility

Shallow Groundwater Susceptible Sediments	Deep Groundwater Susceptible Sediments	No Groundwater Data Susceptible Sediments
Very High	Moderate	Moderate
High	Low	Low
Moderate	Very Low	Very Low
Low		
Very Low		

- Highways
- Area Plan Boundary
- City Boundary
- Waterbodies

California Geological Survey Seismic Hazard Zones

- Murrieta Quad

(See detail in Elsinore, Southwest, Sun City / Menifee Valley Area Plans)

2 0 1 2

SCALE IN MILES

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Figure Title
GENERALIZED LIQUEFACTION MAP

Project No.	Figure No.
700045403	5
Date: 28 APRIL 2017	
Scale: 1" = 2 MILES	
Drawn By: DJJ	

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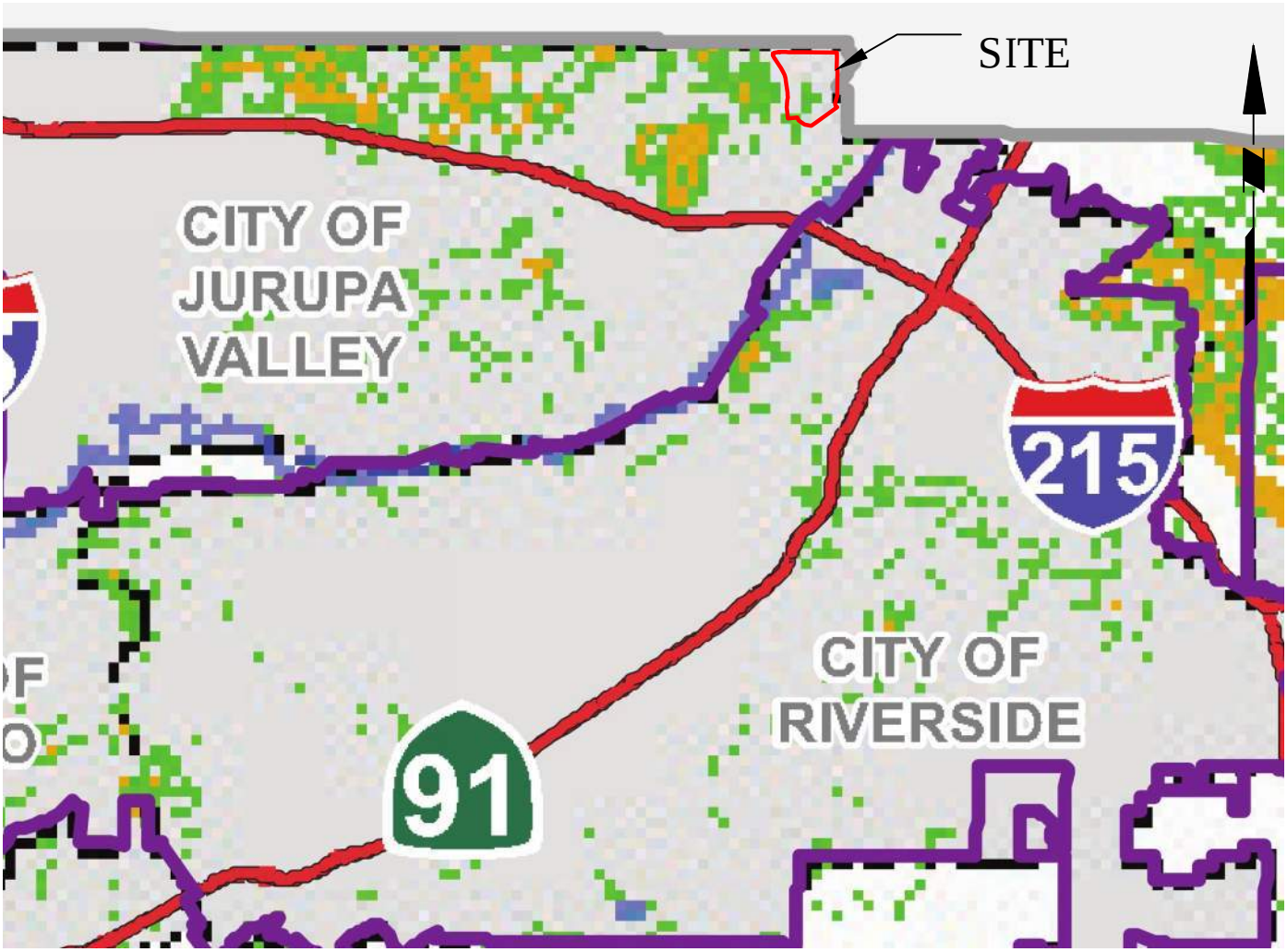

NOTES:

1. BACKGROUND REFERENCED FROM "COUNTY OF RIVERSIDE GENERAL PLAN, SAFETY ELEMENT, FIGURE S-4 – EARTHQUAKE-INDUCED SLOPE INSTABILITY MAP", DATED ON 8 DECEMBER 2015.

LEGEND:

Slope Instability

- Existing Landslides
- High susceptibility to seismically induced landslides and rockfalls.
- Low to locally moderate susceptibility to seismically induced landslides and rockfalls.
- Highways
- Area Plan Boundary
- City Boundary
- Waterbodies

California Geological Survey
Seismic Hazard Zones
- Murrieta Quad
  (See detail in Elsinore, Southwest, Sun City / Menifee Valley Area Plans)

2 0 1 2
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Figure Title
EARTHQUAKE INDUCED LANDSLIDE MAP

Project No.	Figure No.
700045403	6
Date: 28 APRIL 2017	
Scale: 1" = 2 MILES	
Drawn By: DJJ	

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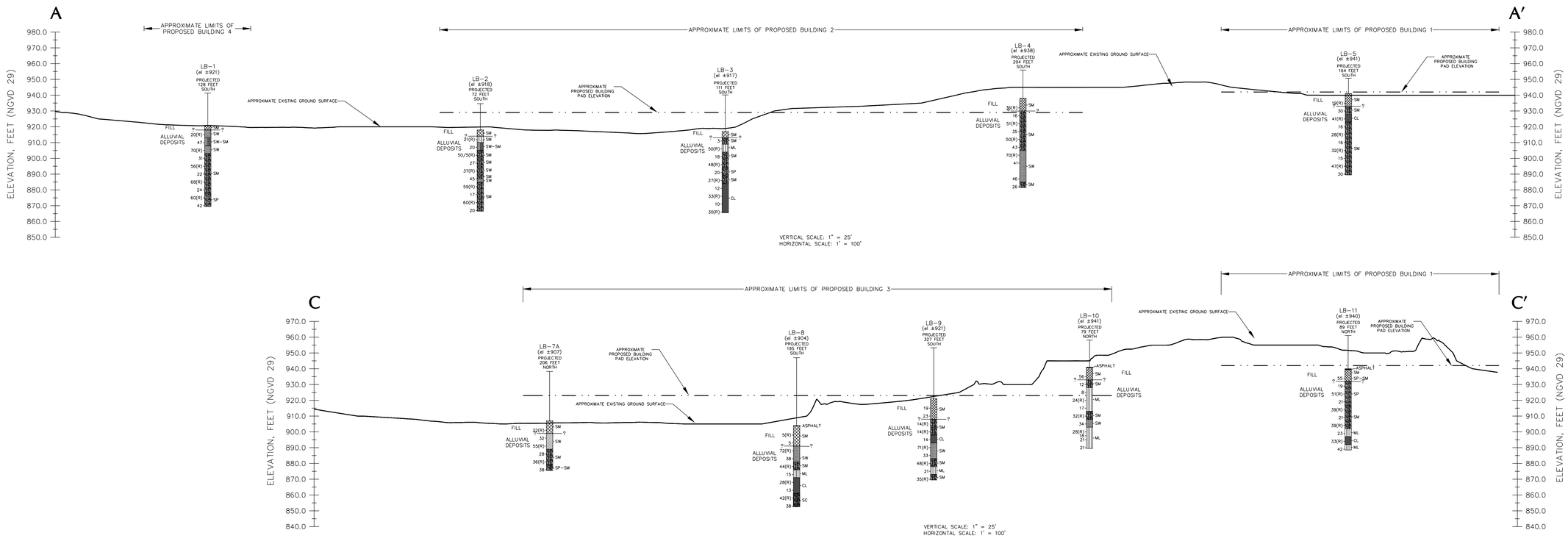

LEGEND:

LB-1 (el±940)	LB-1	BORING IDENTIFICATION
	(el±940)	INFERRED GROUND SURFACE ELEVATION (FEET) AT TIME OF BORING
N	N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 2-INCH-O.D. SPLIT SPOON SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.
N(R)	N(R)	NUMBER OF BLOWS A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 3-INCH-O.D. CALIFORNIA MODIFIED SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.

KEY TO SYMBOLS:

- FILL
- WELL-GRADED SAND (SW)
- WELL-GRADED SAND WITH SILT (SW-SM)
- SILTY SAND (SM)
- POORLY-GRADED SAND (SP)
- POORLY-GRADED SAND WITH SILT (SP-SM)
- LOW PLASTICITY CLAY (CL)
- SILT (ML)
- ASPHALT

NOTES:

1. THE FIGURE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORINGS. VARIATIONS IN CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED SEE BORING LOGS.
2. LANGAN BORINGS LB-1 THROUGH LB-12 AND ALB-10 WERE PERFORMED BETWEEN 19 AND 26 SEPTEMBER 2016 UNDER FULL-TIME ENGINEERING OBSERVATION BY A LANGAN FIELD ENGINEER.
3. TOP OF BORING ELEVATIONS ARE APPROXIMATE AND BASED ON "ENCUMBRANCE MAP, VACANT COMMERCIAL PROPERTY, JURUPA VALLEY, CALIFORNIA, TOPOGRAPHIC INFORMATION", PROVIDED BY DRC ENGINEERING, INC, DATED 2 MARCH 2016.

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Project	AGUA MANSA COMMERCE PARK JURUPA VALLEY RIVERSIDE COUNTY CALIFORNIA
Figure Title	SUBSURFACE CROSS-SECTIONS
Project No.	700045403
Date	28 APRIL 2017
Scale	AS SHOWN
Drawn By	SS
Figure No.	7

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TABLES

TABLE 1

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (FT)	SAMPLE TYPE	FIELD BLOW COUNT (BLOW/FT)	INDEX TESTS							STRENGTH						EXPANSION /COLLAPSE (%)[2]	REMARKS
					WATER CONTENT (%)	GRAIN SIZE			USCS SYMBOL[1]	MINUS NO. 200 SIEVE (%)	DRY UNIT WEIGHT (PCF)	LOADING SCHEDULE (KSF)	PERCENT REMOLDED (%)	DIRECT SHEAR (PEAK STRENGTH)		DIRECT SHEAR (ULTIMATE STRENGTH)			
						GRAVEL %	SAND %	FINES %						PEAK FRICTION ANGLE (φ)	PEAK COHESION (c)	ULTIMATE FRICTION ANGLE (φ)	ULTIMATE COHESION (c)		
LB-1	S-2	10	SPT	47						10									
LB-1	S-3	15	CR	70	1.5						121.6	1, 2, 4	Not Remolded	46	0	46	0		
LB-1	S-5	25	CR	56	6.5						126.8								
LB-1	S-7	35	CR	68	6.8						126.5								
LB-2	S-1	5	CR	21	3.8														
LB-2	S-2	10	SPT	20						8									
LB-2	S-3	15	CR	50/5"	1.3						118.5								
LB-2	S-4	20	SPT	27						16									
LB-2	S-5	25	CR	37	1.8						115.5								
LB-2	S-6	30	SPT	45		17	56	27	SM										
LB-3	S-1	5	SPT	3						18									
LB-3	S-2	10	CR	50	8.3						88.0								
LB-3	S-3	15	SPT	18						49									
LB-3	S-4	20	CR	48	17.1					66	110.3								
LB-3	S-8	30	CR	33	26.4						98.4								
LB-4	S-1	5	CR	36	2.5	0	65	35	SM		109.3							-1.2	
LB-4	S-2	10	SPT	16		0	65	35	SM										
LB-4	S-3	15	CR	51	2.9						105.3	1, 2, 4	Not Remolded	34	100	32	0	-0.2	
LB-4	S-5	25	CR	50	3.6						108.9								
LB-4	S-7	35	CR	70	0.6						99.9								
LB-5	S-1	5	CR	19	3.3						111.4							-0.9	
LB-5	S-3	15	CR	41	28.3					93	94.4	1, 2, 4	Not Remolded	28	300	27	0	7.9	
LB-5	S-5	25	CR	28	3.6						102.0							-0.2	
LB-5	S-7	35	CR	32	7.5						112.0								
LB-6	S-1	5	SPT	6						48									
LB-6	S-2	10	CR	21	2.3						117.1								
LB-6	S-4	20	CR	30	3.0						111.9	1, 2, 4	Not Remolded	33	0	33	0		
LB-6	S-5	25	CR	29						29								-0.3	
LB-6	S-7	35	CR	49	15.4						105.0								
LB-6	S-8	40	CR	36						70									
LB-7A	S-1	5	CR	22	4.3						117.5								
LB-7A	S-3	15	CR	55	1.1						120.0								
LB-7A	S-5	25	CR	36	4.7						110.8								
LB-7A	S-6	30	SPT	38		0	92	8	SP-SM										
LB-8	S-1	5	CR	5	16.4						100.8								
LB-8	S-3	15	CR	72	2.0						112.6	1, 2, 4	Not Remolded	36	400	36	0	-1.3	
LB-8	S-5	25	CR	44	1.9						111.1								
LB-8	S-6	30	SPT	15		0	19	81	ML										
LB-9	S-3	5	CR	14	2.8						103.5								
LB-9	S-4	15	CR	14	3.6						105.4	1, 2, 4	Not Remolded	32	100	32	0		
LB-9	S-9	45	SPT	21		9	11	80	ML										
LB-10	S-4	20	CR	24	8.9						110.5								
LB-10	S-8	40	CR	28	18.3					87	108.3								
LB-11	S-1	5	SPT	55		0	90	10	SP-SM										
LB-11	S-5	25	CR	39	2.4						101.5								
LB-11	S-7	35	CR	39	5.4						99.4								
LB-12	S-5	25	CR	40	2.8						104.4	1, 2, 4	Not Remolded	36	200	33	0		
ALB-10	S-3	15	CR	14	6.3					16	94.7								
ALB-10	S-7	35	CR	34	4.6						100.8								
TP-1	Sample B	1	Bulk			1	61	38	SM										
TP-3	Sample A	3	Bulk			0	79	21	SM										
TP-6	Sample A	5	Bulk			0	50	50	CL										

Notes:
1. USCS symbol is based on results from sieve analysis, atterberg limits or visual classificaiton.
2. Samples with expansion potential have positive values (+) and collapse potential have negative values (-).
3. Laboratory results are attached in Appendix F.

APPENDIX A
EQSearch and USGS Reported Earthquakes

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*************************
*                       *
*    E Q S E A R C H    *
*                       *
*     Version 3.00      *
*                       *
*************************
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 700045403

DATE: 01-09-2017

JOB NAME: Agua Mansa Commerce Park

EARTHQUAKE-CATALOG-FILE NAME: C:\Program Files (x86)\EQSEARCH\December 2016 Update\ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE: 5.00
   MAXIMUM MAGNITUDE: 9.00

SITE COORDINATES:
   SITE LATITUDE: 34.0302
   SITE LONGITUDE: 117.3850

SEARCH DATES:
           START DATE: 1800
           END DATE: 2016

SEARCH RADIUS:
           62.1 mi
           99.9 km

ATTENUATION RELATION: 14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 0 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: 0   Campbell SHR: 0
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 3.0

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.157	VIII	6.8(11.0)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.432	X	6.9(11.1)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.277	IX	8.0(12.9)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.102	VII	11.8(18.9)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.123	VII	13.9(22.4)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.051	VI	18.8(30.2)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.041	V	19.5(31.4)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.113	VII	19.7(31.8)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.076	VII	20.1(32.3)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.033	V	20.1(32.4)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.037	V	22.2(35.7)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.065	VI	22.3(35.9)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.028	V	22.8(36.7)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.063	VI	22.8(36.7)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.028	V	22.8(36.7)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.040	V	24.0(38.6)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.068	VI	27.2(43.7)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.103	VII	27.9(44.9)
DMG	34.1800	116.9200	01/16/1930	02433.9	0.0	5.20	0.024	V	28.5(45.9)
DMG	34.1800	116.9200	01/16/1930	034 3.6	0.0	5.10	0.022	IV	28.5(45.9)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.030	V	28.9(46.6)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.083	VII	29.3(47.2)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.020	IV	29.3(47.2)
GSP	34.2900	116.9460	02/10/2001	210505.8	9.0	5.10	0.020	IV	30.8(49.6)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.018	IV	31.1(50.1)
GSP	33.9325	117.9158	03/29/2014	040942.2	5.1	5.10	0.020	IV	31.1(50.1)
GSP	34.1630	116.8550	06/28/1992	144321.0	6.0	5.30	0.023	IV	31.7(50.9)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.027	V	31.7(51.0)
GSP	34.1950	116.8620	08/17/1992	204152.1	11.0	5.30	0.022	IV	32.0(51.5)
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.018	IV	33.8(54.4)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.063	VI	34.1(54.8)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.016	IV	34.4(55.4)
GSP	34.2390	116.8370	07/09/1992	014357.6	0.0	5.30	0.020	IV	34.5(55.5)
GSP	34.3400	116.9000	11/27/1992	160057.5	1.0	5.30	0.020	IV	35.0(56.3)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.015	IV	35.3(56.7)
GSG	34.3100	116.8480	02/22/2003	121910.6	1.0	5.20	0.017	IV	36.2(58.3)
GSP	34.3690	116.8970	12/04/1992	020857.5	3.0	5.30	0.019	IV	36.4(58.5)
DMG	33.9760	116.7210	06/12/1944	104534.7	10.0	5.10	0.015	IV	38.2(61.5)
DMG	33.9940	116.7120	06/12/1944	111636.0	10.0	5.30	0.017	IV	38.6(62.1)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.019	IV	38.7(62.3)
DMG	34.1000	116.7000	02/07/1889	520 0.0	0.0	5.30	0.017	IV	39.5(63.5)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.027	V	39.8(64.0)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.016	IV	40.9(65.8)

MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.035	V	41.2(66.3)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.032	V	43.9(70.7)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.012	III	44.4(71.5)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.012	III	44.4(71.5)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.014	IV	44.4(71.5)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.011	III	44.4(71.5)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.011	III	44.4(71.5)
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.60	0.018	IV	44.6(71.8)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.016	IV	45.0(72.5)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.012	III	45.3(72.8)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.012	III	45.3(72.8)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.011	III	46.1(74.2)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.015	IV	46.1(74.2)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.012	III	46.5(74.9)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.009	III	49.5(79.7)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.009	III	49.5(79.7)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.009	III	49.5(79.7)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.009	III	50.2(80.7)
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.009	III	50.6(81.5)
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.014	IV	50.6(81.5)
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.011	III	50.6(81.5)
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.010	III	50.6(81.5)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.009	III	52.0(83.7)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.011	III	52.4(84.3)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.012	III	52.4(84.4)
GSP	34.3410	116.5290	06/28/1992	124053.5	6.0	5.20	0.010	III	53.4(85.9)
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.009	III	55.1(88.6)
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.064	VI	55.5(89.3)
GSP	34.1080	116.4040	06/29/1992	141338.8	9.0	5.40	0.011	III	56.4(90.7)
GSP	34.3320	116.4620	07/01/1992	074029.9	9.0	5.40	0.011	III	56.7(91.2)
DMG	34.5190	118.1980	08/23/1952	10 9 7.1	13.1	5.00	0.008	II	57.4(92.3)
PAS	34.3270	116.4450	03/15/1979	21 716.5	2.5	5.20	0.009	III	57.5(92.5)
DMG	33.9330	116.3830	12/04/1948	234317.0	0.0	6.50	0.026	V	57.8(92.9)
GSP	33.5290	116.5720	06/12/2005	154146.5	14.0	5.20	0.009	III	58.1(93.5)
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.007	II	58.5(94.2)
GSP	34.0640	116.3610	09/15/1992	084711.3	9.0	5.20	0.009	III	58.6(94.3)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.008	III	60.2(96.9)
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.007	II	60.2(96.9)
PAS	34.5160	116.4950	06/01/1975	13849.2	4.5	5.20	0.008	III	60.9(97.9)
GSP	34.0290	116.3210	08/21/1993	014638.4	9.0	5.00	0.007	II	60.9(98.0)
GSP	33.9610	116.3180	04/23/1992	045023.0	12.0	6.10	0.017	IV	61.3(98.6)
GSP	33.5080	116.5140	10/31/2001	075616.6	15.0	5.10	0.008	II	61.6(99.2)
PAS	33.5010	116.5130	02/25/1980	104738.5	13.6	5.50	0.010	III	62.0(99.7)

****

-END OF SEARCH- 86 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2016

LENGTH OF SEARCH TIME: 217 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 6.8 MILES (11.0 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.432 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.342
b-value= 0.399
beta-value= 0.920

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	86	0.39631
4.5	86	0.39631
5.0	86	0.39631
5.5	25	0.11521
6.0	16	0.07373
6.5	7	0.03226
7.0	3	0.01382
7.5	1	0.00461

TABLE A.1 - USGS ANSS COMPREHENSIVE CATALOG SEARCH RESULTS

Date	Latitude	Longitude	Approximate Magnitude (Magnitude Type)		Approximate Distance from Site (km)
3/29/2014	33.933	-117.916	5.1	(Mw)	50
7/29/2008	33.949	-117.766	5.4	(Mw)	36
6/12/2005	33.533	-116.567	5.2	(Mw)	95
10/31/2001	33.508	-116.514	5.0	(Mw)	100
10/16/1999	34.240	-117.040	5.6	(Mb)	40
8/21/1993	34.029	-116.321	5.0	(Ml)	99
12/4/1992	34.369	-116.898	5.3	(Ml)	59
11/27/1992	34.340	-116.900	5.3	(Ml)	57
9/15/1992	34.064	-116.361	5.3	(Ml)	95
8/17/1992	34.195	-116.863	5.2	(Ml)	52
7/1/1992	34.330	-116.464	5.3	(Ml)	92
6/29/1992	34.105	-116.390	5.1	(Mc)	93
6/29/1992	34.105	-116.403	5.7	(Ml)	92
6/28/1992	34.255	-116.912	5.3	(Ml)	51
6/28/1992	34.203	-116.827	6.3	(Mw)	55
6/28/1992	34.162	-116.852	5.5	(Ml)	52
6/28/1992	34.341	-116.511	5.4	(Ml)	88
6/28/1992	34.115	-116.426	5.5	(Ml)	90
6/28/1992	34.103	-116.425	5.0	(Mh)	90
6/28/1992	34.061	-116.473	5.0	(Mh)	85
6/28/1992	34.120	-116.323	5.7	(Ml)	99
6/28/1992	34.131	-116.408	5.8	(Ml)	91
6/28/1992	34.200	-116.437	7.3	(Mw)	90
4/23/1992	33.960	-116.317	6.1	(Mw)	100
6/28/1991	34.270	-117.993	5.8	(Mw)	61
2/28/1990	34.144	-117.697	5.5	(Ml)	31
12/16/1988	33.979	-116.681	5.0	(Ml)	66
12/3/1988	34.151	-118.130	5.0	(Ml)	70
10/4/1987	34.074	-118.098	5.3	(Ml)	66
10/1/1987	34.061	-118.079	5.9	(Mw)	64
7/8/1986	33.999	-116.608	6.0	(Mw)	73
3/15/1979	34.326	-116.416	5.2	(Ml)	96
6/1/1979	34.512	-116.488	5.3	(Ml)	99
9/12/1970	34.255	-117.534	5.2	(Ml)	28
9/23/1963	33.704	-116.938	5.3	(Ml)	56
12/4/1948	33.983	-116.331	6.0	(Mw)	98
7/25/1947	34.030	-116.406	5.2	(Ml)	91
7/24/1947	33.994	-116.481	5.3	(Ml)	85
6/12/1944	34.002	-116.699	5.2	(Ml)	64
6/12/1944	33.989	-116.731	5.1	(Ml)	62
8/29/1943	34.268	-116.968	5.3	(Ml)	47
11/14/1941	33.791	-118.264	5.1	(Ml)	86
5/18/1940	34.037	-116.307	5.2	(Ml)	100
5/31/1938	33.699	-117.511	5.2	(Ml)	39
3/11/1933	33.624	-118.001	5.3	(Mh)	73
3/11/1933	33.767	-117.985	5.0	(Mh)	63
3/11/1933	33.631	-118.000	6.4	(Mw)	72
4/21/1918	33.647	-117.433	6.7	(Mw)	43

Notes:

1. Earthquake Catalog Search results obtained from USGS ANSS Comprehensive Catalog on 11 October 2016.

APPENDIX B
Boring Logs

LANGAN

Log of Boring **ALB-10** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 939 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/23/16 — Date Finished: 9/23/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 61.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 13 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+939.0	**FILL** Tan, silty fine to coarse SAND, some gravel, (SM), dry	0	B-1	HA			
		Dense, white-tan, fine to coarse SAND, trace silt, fine to coarse gravel, (SW), dry	5	S-1	SPT	14	33 18 15	
	+931.0	**ALLUVIAL DEPOSITS**	8					Concrete debris encountered at 7.5 feet
		Loose, brown, silty fine to coarse SAND, trace fine gravel, (SM), moist	10	S-2	SPT	17	1 2 2	
		Medium dense, brown, trace pink, silty fine to medium SAND, trace rock fragments, (SM), moist	15	S-3	CR	18	4 9 5	
	+921.0		18					
			20					

\LANGAN.COM\DATA\IRVDATA4\700045403\ENGINEERING DATA\GEOTECHNICAL\GINTLOGS\700045403-GINT LOGS.GPJ ... 1/6/2017 4:01:32 PM ... Report: Log - LANGAN

LANGAN

Log of Boring **ALB-10** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 939 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, tan-brown, fine SAND, (SP), moist	20	S-4	SPT	18	3 6 8	
			21					
			22					
			23					
			24					
		Medium dense, tan-brown, fine SAND, (SP), moist	25	S-5	CR	18	4 10 18	
			26					
			27					
			28					
			29					
		Medium dense, tan-brown, fine SAND, (SP), moist	30	S-6	SPT	18	4 7 11	
			31					
			32					
	+906.0		33					
			34					
		Medium dense, tan-brown,silty fine to medium SAND, (SM), moist	35	S-7	CR	18	8 14 20	
			36					
			37					
	+901.0		38					
			39					
		Very stiff, brown, CLAY, some silt, trace fine sand, (CL), moist	40	S-8	SPT	18	4 7 13	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **ALB-10** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 939 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very stiff, brown, CLAY, some silt, trace fine sand, (CL), moist	45	S-9	CR	18	4 13 22	Pocket Penetrometer (PP) = 2.75 tsf
	+891.0		46					
		Very stiff, brown, SILT, trace fine sand, (ML), moist	47					
			48					
			49					
			50	S-10	SPT	18	4 6 19	
			51					
			52					
			53					
			54					
			55	S-11	SPT	18	5 12 12	
		Very stiff, brown, SILT, trace fine sand, (ML), moist	56					
			57					
			58					
			59					
		Very stiff, brown, SILT, trace fine sand, (ML), moist	60	S-12	SPT	18	8 14 17	
	+877.5		61					
		End of boring at 61.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **ALB-11** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 897 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/26/16 — Date Finished: 9/26/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 6-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 14 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Jeff Frazer
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+897.0		0					
	+896.6	5 inch - Asphalt						
		FILL	1					
		Brown, fine to coarse SAND, some silt, (SM), moist	2	B-1	HA			
	+894.0		3					
		WEATHERED GRANITIC ROCK	4					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), dry	5	S-1	CR	-	22 50/6"	
			6					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), dry	7					
			8	S-2	SPT	16	17 44 50/4"	
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), dry	9					
			10	S-3	CR	-	35 50/3"	
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	11					
			12					
			13	S-4	SPT	11	45 50/5"	
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	14					
			15	S-5	CR	-	50/4"	
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	16					
			17					
			18	S-6	SPT	5	50/5"	
			19					
			20					

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Log of Boring **ALB-11** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 897 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	20	S-7	CR	-	50/5"	
			21					
			22					
			23					
			24					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	25	S-8	SPT	6	50/6"	
			26					
			27					
			28					
			29					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	30	S-9	CR	-	50/3"	
			31					
			32					
			33					
			34					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	35	S-10	SPT	5	50/5"	
			36					
			37					
			38					
			39					
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	40	S-11	CR	-	50/5"	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **ALB-11** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 897 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very dense, white-gray, some brown, fine to coarse SAND, some fine gravel, (SW), moist	45	S-12	SPT	3	50/3"	
			46					
			47					
			48					
			49					
			50	S-13	SPT	-	50/3"	No sample recovery.
	+845.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **ALB-12** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 897 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/26/16 — Date Finished: 9/26/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 6-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 14 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Jeff Frazer
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+897.0	8 inch - Asphalt	0					
	+896.3	**FILL** Brown, silty fine to coarse SAND, some fine to coarse gravel, (SM), moist	1	B-1	HA			
	+893.0	**WEATHERED GRANITIC ROCK** Medium dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	5	S-1	CR	-	7 18 20	
		Loose, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	8	S-2	CR	-	4 2 1	
		Medium dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	10	S-3	CR	-	7 12 16	
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	13	S-4	CR	-	12 32 50/5"	
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	15	S-5	CR	-	45 50/2"	
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	18	S-6	CR	-	50/5"	

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Log of Boring **ALB-12** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 897 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	20	S-7	CR	-	50/5"	
			21					
			22					
			23					
			24					
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	25	S-8	SPT	3	50/6"	
			26					
			27					
			28					
			29					
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	30	S-9	CR	-	50/2"	
			31					
			32					
			33					
			34					
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	35	S-10	SPT	4	50/6"	
			36					
			37					
			38					
			39					
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	40	S-11	CR	-	50/4"	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **ALB-12** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 897 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	45	S-12	SPT	4	50/4"	
			46					
			47					
			48					
			49					
		Very dense, white-pink, some brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	50	S-13	CR	-	50/3"	
	+845.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **ELB-1** Sheet 1 of 2

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 911 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/23/16 — Date Finished: 9/23/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 31.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 6 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ - — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+911.0	**FILL**	0					
		Loose, tan-brown, silty fine SAND, (SM), moist	5	S-1	SPT	15	2, 3, 4	
	+903.0	**ALLUVIAL DEPOSITS**	8					
		Dense, white-tan, fine to coarse SAND, some gravel, trace cobble, (SW), dry	10	S-2	SPT	16	7, 20, 17	
		Dense, white-tan, fine to coarse, SAND, some gravel, trace cobble, (SW), dry	15	S-3	SPT	17	21, 30, 21	
	+893.0		18					
			20					

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Log of Boring **ELB-1** Sheet 2 of 2

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 911 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, tan-brown, silty fine SAND, (SM), moist	20	S-4	SPT	17	5 7 12	
	+888.0		21					
			22					
			23					
		Dense, tan-brown, fine to coarse SAND, trace gravel, (SW), dry	24					
			25	S-5	SPT	16	8 7 23	
	+883.0		26					
			27					
			28					
		Dense, tan-brown, silty fine to medium SAND, (SM), moist	29					
			30	S-6	SPT	16	11 19 26	
	+879.5		31					
		End of borning at 31.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	32					
			33					
			34					
			35					
			36					
			37					
			38					
			39					
			40					
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-1** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 921 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/19/16 — Date Finished: 9/19/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+921.0	**FILL** Tan, fine to coarse SAND, some silt, trace gravel, (SM), dry	0	B-1	HA			
	+918.0	**ALLUVIAL DEPOSITS** Dense, tan, fine to coarse SAND, trace silt, trace gravel, (SW), dry	5	S-1	CR	-	3 6 14	No sample recovery.
	+913.0	Dense, tan, fine to coarse SAND, trace silt, trace gravel, (SW-SM), dry	10	S-2	SPT	15	16 21 26	
	+908.0	Dense, tan, fine to coarse SAND, trace silt, some gravel, (SW), dry	15	S-3	CR	18	41 32 38	Gravel layer at approximately 17 feet.
	+903.0		20					

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Log of Boring **LB-1** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 921 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, orange- brown, silty fine to coarse SAND, some clay, trace gravel, (SM), moist	20–21	S-4	SPT	18	11, 16, 15	
			21–25					
		Dense, orange-brown, silty fine to medium SAND, some clay, trace gravel, (SM), moist	25–26	S-5	CR	18	16, 24, 32	
			26–30					
		Medium dense, orange-brown, silty fine to coarse SAND, trace gravel, (SM), moist	30–31	S-6	SPT	18	10, 11, 11	
			31–35					
		Dense, orange-brown, silty fine to coarse SAND, trace gravel, (SM), moist	35–36	S-7	CR	18	11, 23, 45	
			36–40					
		Medium dense, orange-brown, silty fine to coarse SAND, some clay, (SM), moist	40–41	S-8	SPT	18	9, 10, 14	
			41–43					
	+878.0		43–45					

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Log of Boring **LB-1** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 921 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, light brown, fine to medium SAND, trace silt, (SP), moist	45	S-9	CR	18	11 24 36	
			46					
			47					
			48					
			49					
		Dense, light brown, fine to medium SAND, trace silt, (SP), moist	50	S-10	SPT	18	10 21 21	
	869.5		51					
		End of Borning at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-2** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 918 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/19/16 — Date Finished: 9/19/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 10 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+918.0	**FILL** Brown, silty fine SAND, trace gravel, (SM), moist	0	B-1	HA			
	+914.0	**ALLUVIAL DEPOSITS** Medium dense, tan, silty fine to coarse SAND, trace gravel, (SM), dry	4	S-1	CR	18	9 10 11	
	+910.0	Medium dense, tan, fine to coarse SAND, trace silt, trace gravel, (SW-SM), dry	8	S-2	SPT	15	7 11 9	
	+905.0	Very dense, tan, silty fine to coarse SAND, trace gravel, trace cobble, (SM), dry	13	S-3	CR	18	32 50/5"	Gravel layer encountered at depth of appoximately 13 feet.
			20					

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Log of Boring **LB-2** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 918 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, light brown, fine to coarse SAND, some silt, trace gravel, (SM), dry	20	S-4	SPT	12	6 12 15	
			21					
			22					
			23					
			24					
		Medium dense, light brown, silty fine to coarse SAND, trace gravel, (SM), dry	25	S-5	CR	18	10 14 23	
			26					
			27					
			28					
			29					
		Medium dense, brown, fine to medium SAND, some silt, some gravel, (SM), moist	30	S-6	SPT	16	3 8 37	
	+887.0		31					Transition of soil type from SM to SW in split spoon sample.
		Medium dense, brown, fine to coarse SAND, trace silt, trace gravel, (SW), moist	32					
	+885.0		33					
			34					
		Dense, brown, silty fine SAND, trace clay, (SM), moist	35	S-7	CR	18	11 23 36	
			36					
			37					
			38					
			39					
		Medium dense, brown, silty fine to medium SAND, trace clay, (SM), moist	40	S-8	SPT	18	4 7 10	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-2** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 918 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, brown, silty fine to medium SAND, trace clay, (SM), moist	45	S-9	CR	18	5 20 40	
			46					
			47					
			48					
			49					
		Medium dense, brown, silty fine to medium SAND, trace clay, (SM), moist	50	S-10	SPT	18	4 8 12	
	866.5		51					
		End of Borning at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-3** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 917 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/20/16 — Date Finished: 9/20/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+917.0	**FILL** Brown, silty fine to medium SAND, trace gravel, (SM), moist	0	B-1	HA			
	+913.0	**ALLUVIAL DEPOSITS** Loose, brown, fine SAND, some silt, (SM), moist	5	S-1	SPT	15	1 1 2	
	+909.0	Dense, brown, fine sandy SILT, trace gravel, (ML), moist	10	S-2	CR	18	17 20 30	
	+904.0	Medium dense, orange-brown, silty fine to medium SAND, trace clay, (SM), moist	15	S-3	SPT	18	4 7 11	
			20					

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Log of Boring **LB-3** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 917 (NGVD 29)

Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	Dense, brown, silty fine SAND, (SM), moist	20	S-4	CR	18	7 20 28	
894.0		21					
		22					
		23					
	Medium dense, brown, fine to medium SAND, (SP), wet	24					
		25	S-5	SPT	16	10 9 11	
889.0		26					
		27					
	Medium dense, brown, silty fine SAND, (SM), moist	28					
		29					
		30	S-6	CR	18	6 10 17	
884.0		31					
		32					
		33					
	Stiff, brown, CLAY, trace silt, (CL), moist	34					
		35	S-7	SPT	16	3 5 7	
		36					
		37					
		38					
		39					
	Very stiff, brown, CLAY, trace silt, (CL), moist	40					
		41	S-8	CR	18	8 14 19	
		42					Pocket Penetrometer (PP) = 3.0 tsf
		43					
		44					
		45					

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Log of Boring **LB-3** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 917 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Stiff, brown, CLAY, trace silt, (CL), moist	45	S-9	SPT	18	2 4 6	
			46					
			47					
			48					
			49					
		Very Stiff, brown, CLAY, trace silt, (CL), moist	50	S-10	CR	18	5 12 18	
	+865.5		51					PP = 2.5 tsf
		End of boring at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-4** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 938 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/19/16 — Date Finished: 9/21/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 56.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+938.0	**FILL** Light brown, fine to coarse SAND, some silt, trace gravel, (SM), dry	0	B-1	HA			
		Medium dense, light brown, silty fine SAND, trace fine gravel, (SM), dry	5	S-1	CR	18	10 15 21	
	+930.0	**ALLUVIAL DEPOSITS** Medium dense, light brown, silty fine to medium SAND, (SM), dry	8	S-2	SPT	15	5 7 9	
		Dense, tan, silty fine SAND, (SM), dry	15	S-3	CR	18	10 22 29	
			20					

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Log of Boring **LB-4** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 938 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, tan, silty fine SAND, (SM), dry	20					
			21	S-4	SPT	16	7 13 22	
			22					
			23					
			24					
		Dense, tan, silty fine SAND, (SM), dry	25					
			26	S-5	CR	18	11 20 30	
			27					
			28					
			29					
		Dense, tan, silty fine SAND, (SM), dry	30					
			31	S-6	SPT	12	11 19 24	
			32					
			33					
			34					
		Dense, tan, silty fine to coarse SAND, trace gravel, (SM), dry	35					
			36	S-7	CR	18	16 30 40	Gravel layer at 36 feet.
			37					
	+900.0		38					
			39					
		Dense, tan, fine to coarse SAND, trace gravel, (SW), dry	40					
			41	S-8	SPT	18	4 17 24	
			42					Stop drilling on 9/19/2016 at 41.5 feet for percolation test. Continue drilling on 9/21/2016.
			43					Gravel layer at 43.5 feet.
			44					
			45					

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Log of Boring **LB-4** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 938 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, tan, fine to coarse SAND, (SW), dry	45 46 47 48 49 50 51	S-9	SPT	12	9 20 26	
	+885.0		52 53					
		Medium dense, light brown, silty fine SAND, (SM), moist	54 55 56	S-10	SPT	10	11 14 12	
	+881.5	End of Boring at 56.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	57 58 59 60 61 62 63 64 65 66 67 68 69 70					

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Log of Boring **LB-5** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 941 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/20/16 — Date Finished: 9/20/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+941.0	**FILL** Light brown, silty fine to medium SAND, (SM), dry	0	B-1	HA			
		Loose, light brown, silty fine to medium SAND, (SM), dry	5	S-1	CR	18	4 7 12	
	+933.0	**ALLUVIAL DEPOSITS** Medium dense, light brown, silty fine SAND, (SM), dry	10	S-2	SPT	12	8 13 17	
	+928.0	Very stiff, light brown, CLAY, trace silt, (CL), moist	15	S-3	CR	18	9 15 26	Pocket Penetrometer (PP) = 3.75 tsf
			20					

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Log of Boring **LB-5** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 941 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, light brown, silty fine SAND, (SM), moist	20	S-4	SPT	18	5 8 8	
			21					
			22					
			23					
			24					
		Medium dense, light brown, silty fine SAND, (SM), moist	25	S-5	CR	18	9 10 18	
			26					
			27					
			28					
			29					
		Medium dense, brown, silty fine to medium SAND, (SM), moist	30	S-6	SPT	17	5 8 8	
			31					
			32					
			33					
			34					
		Medium dense, brown, silty fine SAND, (SM), moist	35	S-7	CR	18	8 12 20	
			36					
			37					
			38					
			39					
		Medium dense, brown, silty fine SAND, (SM), moist	40	S-8	SPT	18	7 6 9	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-5** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 941 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, brown, silty fine SAND, trace clay, (SM), moist	45	S-9	CR	18	9 19 28	
			46					
			47					
			48					
			49					
		Medium dense, brown, silty fine SAND, (SM), moist	50	S-10	SPT	15	6 13 17	
	889.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-6** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 939 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/20/16 — Date Finished: 9/20/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+939.0		0					
	+938.5	2.5 inch - Asphalt 4.0 inch - Aggregate Base						
		FILL Brown, silty fine to medium SAND, trace gravel, (SM), dry	1	B-1	HA			
			2					
			3					
			4					
		Loose, brown, silty fine to medium SAND, (SM), dry	5	S-1	SPT	15	2 3 3	
			6					
	+931.0		7					
		ALLUVIAL DEPOSITS	8					
			9					
		Medium dense, brown, silty fine SAND, (SM), dry	10	S-2	CR	18	6 8 13	
			11					
			12					
			13					
			14					
		Loose, light brown, silty fine SAND, (SM), dry	15	S-3	SPT	16	3 4 5	
			16					
			17					
			18					
			19					
			20					

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Log of Boring **LB-6** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 939 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, light brown, silty fine SAND, (SM), dry	20	S-4	CR	18	7 12 18	
			21					
			22					
			23					
			24					
		Medium dense, light brown, silty fine SAND, (SM), dry	25	S-5	CR	18	6 11 18	
			26					
			27					
			28					
			29					
		Medium dense, light brown, silty fine SAND, (SM), dry	30	S-6	CR	18	8 12 18	
			31					
			32					
	+905.8		33					
		Hard, brown, silty CLAY, (CL), moist	34					
			35	S-7	CR	18	13 22 27	
			36					
			37					
	+900.8		38					
		Very stiff, light brown, SILT, some fine sand, (ML), moist	39					
			40	S-8	CR	18	7 12 24	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-6** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 939 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very stiff, light brown, fine sandy SILT, (ML), moist	45	S-9	SPT	18	8 17 20	
	+890.8		46					
			47					
			48					
			49					
		Dense, tan, fine to medium SAND, (SP), moist	50	S-10	CR	18	9 32 31	
	+887.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-7A** Sheet 1 of 2

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 907 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/22/16 — Date Finished: 9/22/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 31.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 6 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First ▽ - — Completion ▼ - — 24 HR. ▼ -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+907.0	**FILL** Brown, silty fine to medium SAND, trace clay, (SM), moist	0					
			1					
			2					
			3					
			4					
		Medium dense, brown, silty fine SAND, trace clay, (SM), moist	5	S-1	CR	18	4 8 14	
			6					
			7					
	+899.0	**ALLUVIAL DEPOSITS**	8					
			9					
		Dense, light brown, fine to coarse SAND, some gravel, (SW), dry	10	S-2	SPT	13	4 11 21	
			11					
			12					
			13					
			14					
		Dense, tan, fine to coarse SAND, some gravel, (SW), dry	15	S-3	CR	18	14 25 30	
			16					
			17					
	+889.0		18					
			19					
			20					

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Log of Boring **LB-7A** Sheet 2 of 2

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 907 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, tan, silty fine to coarse SAND, trace gravel, (SM), moist	20	S-4	SPT	15	12 15 13	
			21					
			22					
			23					
			24					
		Medium dense, orange-brown, silty fine SAND, (SM), moist	25	S-5	CR	18	14 15 21	
			26					
			27					
	+879.0		28					
			29					
		Dense, tan, fine to coarse SAND, trace silt, (SP-SM), moist	30	S-6	SPT	15	8 19 19	
	+875.5		31					
		End of boring at 31.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	32					
			33					
			34					
			35					
			36					
			37					
			38					
			39					
			40					
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-7B** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 911 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/22/16 — Date Finished: 9/22/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 61.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 13 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+911.0		0					
	+910.7	3 inch - Asphalt						
		FILL	1					
		Brown, silty fine to medium SAND, (SM), moist	2	B-1	HA			
			3					
			4					
		Loose, light brown, fine to coarse SAND, (SW), moist	5					
			6	S-1	CR	-	7 9 7	
			7					
	+903.0		8					
		ALLUVIAL DEPOSITS	9					
		Medium dense, light brown, fine to coarse SAND, trace gravel, (SW), moist	10					
			11	S-2	SPT	16	10 15 16	
			12					
			13					
			14					
		Very dense, light brown, fine to coarse SAND, trace gravel, trace cobble, (SW), moist	15					
			16	S-3	CR	-	20 41 50/4"	
			17					
			18					
			19					
			20					

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Log of Boring **LB-7B** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 911 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, light brown, fine to coarse, SAND, trace gravel, trace cobbles, (SW), moist	20	S-4	SPT	17	14 20 23	
	+888.0		23					
		Dense, brown, silty fine to coarse SAND, trace gravel, trace cobble, (SM), moist	25	S-5	CR	-	10 17 27	
	+883.0		28					
		Dense, brown, fine to coarse, clayey SAND, some silt, trace gravel, (SC), moist	30	S-6	SPT	15	9 14 21	
		Medium dense, brown, clayey fine to coarse SAND, some silt, (SC), moist	35	S-7	CR	-	5 10 21	
	+873.0		38					
		Stiff, orange -brown, CLAY, some fine to coarse sand, some silt, (CL), moist	40	S-8	SPT	18	4 7 9	
	+868.0		43					
			45					

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Log of Boring **LB-7B** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 911 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very dense, orange-brown, silty fine to medium SAND, trace clay, (SM), moist	45	S-9	CR	-	22 39 36	
			46					
			47					
			48					
			49					
		Very dense, orange-brown, silty fine to coarse SAND, trace fine gravel, (SM), moist	50	S-10	SPT	5	50/5"	
			51					
			52					
	+858.0		53					
		Very dense, tan-brown, fine to coarse SAND, some gravel, (SW), moist	54					
			55	S-11	SPT	5	50/5"	
			56					
			57					
			58					
			59					
		Very dense, tan-brown, fine to coarse SAND, some fine gravel, (SW), moist	60	S-12	SPT	11	34 50/5"	
	+849.5		61					
		End of boring at 61.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-8** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 904 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/22/16 — Date Finished: 9/22/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 61.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+904.0		0					
	+903.8	3 inch - Asphalt						
		FILL	1					
		Brown, silty fine to medium SAND, trace clay, (SM), moist	2					
			3	B-1	HA			
			4					
		Loose, brown, silty fine SAND, trace clay, (SM), moist	5					
			6	S-1	CR	18	2 2 3	
			7					
			8					
			9					
		Loose, brown, silty fine to medium SAND, trace clay, (SM), moist	10					
			11	S-2	SPT	18	1 2 3	
			12					
	+891.0		13					
		ALLUVIAL DEPOSITS	14					
		Very dense, tan-brown, fine to coarse SAND, trace gravel, trace cobbles, (SW), dry	15					
			16	S-3	CR	18	16 30 42	
			17					
			18					
			19					
			20					

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Log of Boring **LB-8** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 904 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, tan- brown, fine to coarse SAND, trace gravel, (SW), dry	20	S-4	SPT	12	18 18 20	
	+881.0		23					
		Dense, tan-brown, silty fine to coarse SAND, trace gravel, (SM), dry	25	S-5	CR	18	10 21 23	
	+876.0		28					
		Stiff, brown, SILT, some fine sand, (ML), moist	30	S-6	SPT	18	4 5 10	
	+871.0		33					
		Very stiff, brown, CLAY, trace silt, (CL), moist	35	S-7	CR	18	8 13 15	Pocket Penetrometer (PP) = 3.75 tsf
		Stiff, brown, CLAY, trace silt, (CL), moist	40	S-8	SPT	18	3 5 8	
	+861.0		43					
			45					

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Log of Boring **LB-8** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 904 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Dense, brown, clayey fine to coarse SAND, trace silt, (SC), moist	45	S-9	CR	18	6 16 26	
			46					
			47					
			48					
			49					
		Dense, brown, clayey fine to coarse, SAND, some silt, (SC), moist	50	S-10	SPT	18	8 17 21	
	852.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-9** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 921 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/20/16 — Date Finished: 9/23/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 50.1 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+921.0	**FILL** Brown, silty fine SAND, trace clay, (SM), moist	0	B-1	HA			
		Medium dense, brown, silty fine SAND, trace clay, trace gravel, (SM), moist	5	S-1	SPT	15	10 13 6	
		Medium dense, brown, silty fine SAND, (SM), moist	10	S-2	SPT	17	9 12 11	
	+908.0	**ALLUVIAL DEPOSITS** Medium dense, brown, silty fine SAND, (SM), moist	13	S-3	CR	-	3 5 9	
			20					

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Log of Boring **LB-9** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 921 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, brown, silty fine SAND, (SM), moist	20					
			21	S-4	CR	-	9 6 8	
			22					
	898.0		23					
			24					
		Stiff, brown, CLAY, some silt, (CL), moist	25					
			26	S-5	SPT	18	2 5 9	
	893.0		27					Layer of gravel encountered at 26.5 feet.
			28					
			29					
		Dense, tan-brown, fine to coarse SAND, (SW), moist	30					
			31	S-6	CR	-	14 27 44	Stop drilling at 30 feet on 9/20/2016 for percolation test.
			32					Continue drilling on 9/23/2016.
			33					
			34					
		Dense, tan-brown, fine to coarse SAND, (SW), moist	35					
			36	S-7	SPT	12	6 16 17	
	883.0		37					
			38					
			39					
		Dense, tan-brown, silty fine SAND, (SM), moist	40					
			41	S-8	CR	-	12 18 30	
			42					
	878.0		43					
			44					
			45					

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Log of Boring **LB-9** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 921 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Stiff, tan-brown, SILT, trace fine to coarse sand, trace gravel, some clay (ML), moist	45	S-9	SPT	18	4 8 13	
	+873.0		46					
			47					
			48					
			49					
		Medium dense, tan-brown, silty fine SAND, trace clay, (SM), moist	50	S-10	CR	-	9 14 21	
	+869.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-10** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 941 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/21/16 — Date Finished: 9/21/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 12 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+941.0		0					
	+940.7	3 inch - Asphalt						
		FILL	1					
		Grey-brown, silty fine to medium SAND, some fine to coarse gravel, trace clay (SM), dry	2	B-1	HA			
			3					
			4					
		Very dense, brown, fine SAND, some silt, (SM), moist	5					
			6	S-1	SPT	15	23 36 20	
			7					
	+933.0		8					
		ALLUVIAL DEPOSITS	9					
		Medium dense, brown, fine silty SAND, (SM), moist	10					
			11	S-2	SPT	18	5 7 5	
			12					
	+928.0		13					
			14					
		Firm, brown, fine sandy SILT, (ML), moist	15					
			16	S-3	SPT	18	3 4 4	
			17					
			18					
			19					
			20					

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Log of Boring **LB-10** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 941 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very stiff, brown, fine sandy SILT, trace clay, (ML), moist	20	S-4	CR	18	8 11 13	
			21					
			22					
			23					
			24					
		Very stiff, brown, fine sandy SILT, trace clay, (ML), moist	25	S-5	SPT	16	4 8 9	
			26					
			27					
	+913.0		28					
		Medium dense, brown, silty fine SAND, trace clay, (SM), moist	29					
			30	S-6	CR	18	11 16 16	
			31					
			32					
	+908.0		33					
		Dense, light brown, fine to coarse SAND, some fine to coarse gravel, (SW), moist	34					
			35	S-7	SPT	18	8 15 19	
			36					
			37					
	+903.0		38					
		Very stiff, brown, fine sandy SILT, some clay, (ML), moist	39					
			40	S-8	CR	18	5 9 19	
			41					
			42					Pocket Penetrometer (PP) = 3.25 tsf
		Very stiff, brown, fine sandy SILT, (ML), moist	43	S-9	SPT	18	5 7 11	
			44					
			45					

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Log of Boring **LB-10** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 941 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very stiff, brown, fine sandy SILT, (ML), moist	45	S-10	SPT	18	7 11 10	
			46					
			47					
			48					
			49					
		Very stiff, fine sandy SILT, trace clay, (ML), moist	50	S-11	SPT	17	10 12 9	
	+889.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concrete. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-11** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 940 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/21/16 — Date Finished: 9/21/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+940.0	8 inch - Asphalt	0					
	+939.3	**FILL** Dark brown, silty fine to coarse SAND, trace clay, trace gravel, (SM), moist	1	B-1	HA			
			2					
			3					
			4					
		Very dense, brown, fine SAND, trace silt, (SP-SM), moist	5	S-1	SPT	12	36 30 25	
			6					
			7					
	+932.0	**ALLUVIAL DEPOSITS**	8					
			9					
		Medium dense, brown, fine SAND, (SP), moist	10	S-2	SPT	17	4 8 11	
			11					
			12					
			13					
			14					
		Dense, brown, fine SAND, (SP), moist	15	S-3	CR	18	8 22 29	
			16					
			17					
			18					
			19					
			20					

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Log of Boring **LB-11** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 940 (NGVD 29)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, brown, fine SAND, (SP), moist	20					
			21	S-4	SPT	18	9 8 13	
			22					
	+917.0		23					
			24					
		Medium dense, brown, silty fine to medium SAND, (SM), moist	25					
			26	S-5	CR	18	5 16 23	
			27					
			28					
			29					
		Medium dense, brown, silty fine SAND, (SM), moist	30					
			31	S-6	SPT	18	10 7 14	
			32					
			33					
			34					
		Medium dense, light brown, silty fine to medium SAND, (SM), moist	35					
			36	S-7	CR	18	8 16 23	
			37					
	+902.0		38					
			39					
		Very stiff, brown, SILT, some clay, (ML), moist	40					
			41	S-8	SPT	18	6 8 15	
			42					
	+897.0		43					
			44					
			45					

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Log of Boring **LB-11** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 940 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Very stiff, brown, CLAY, some silt, (CL), moist	45	S-9	CR	18	5 10 23	Pocket Penetrometer (PP) = 3.25 tsf
	+892.0		46					
			47					
			48					
			49					
		Hard, brown, SILT, some clay, (ML), moist	50	S-10	SPT	14	10 22 20	
	+888.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout and surface patched with quick-dry concerte . Ground water was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
			64					
			65					
			66					
			67					
			68					
			69					
			70					

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Log of Boring **LB-12** Sheet 1 of 3

Project: Agua Mansa Commerce Park	Project No.: 700045403
Location: Jurupa Valley, California	Elevation and Datum: Approx. 950 (NGVD 29)
Drilling Company: Martini Drilling	Date Started: 9/21/16 — Date Finished: 9/21/16
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 51.5 ft — Rock Depth: -
Size and Type of Bit: 8-inch dia. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed - — Core -
Casing Diameter (in): - — Casing Depth (ft): -	Water Level (ft.): First - — Completion - — 24 HR. -
Casing Hammer: - — Weight (lbs): - — Drop (in): -	Drilling Foreman: Gene Golar
Sampler: 2-inch O.D. Split Spoon/ 3 in O.D. Cal Mod	Field Engineer: Sing Song
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+950.0	**FILL** Brown, silty fine SAND, trace gravel, (SM), moist	0	B-1	HA			
		Very dense, brown, trace pink, silty fine SAND, (SM), moist	5	S-1	SPT	16	8 19 40	
	+942.0	**ALLUVIAL DEPOSITS** Loose, brown, silty fine SAND, (SM), moist	10	S-2	SPT	17	2 2 4	
	+937.0	Stiff, brown, SILT, trace fine sand, (ML), moist	15	S-3	SPT	16	2 3 6	
	+932.0		20					

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Log of Boring **LB-12** Sheet 2 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 950 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, brown, silty fine SAND, (SM), moist	20	S-4	SPT	17	4 6 9	
			21					
			22					
			23					
			24					
		Medium dense, light brown, silty fine to medium SAND, (SM), moist	25	S-5	CR	18	8 15 25	
			26					
			27					
	+922.0		28					
			29					
		Medium dense, light brown, fine SAND, (SP), moist	30	S-6	SPT	18	5 11 13	
			31					
			32					
			33					
			34					
		Medium dense, light brown, fine SAND, (SP), moist	35	S-7	CR	18	6 14 23	
			36					
			37					
			38					
			39					
		Medium dense, light brown, fine SAND, (SP), moist	40	S-8	SPT	16	7 13 17	
			41					
			42					
			43					
			44					
			45					

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Log of Boring **LB-12** Sheet 3 of 3

Project	Project No.
Agua Mansa Commerce Park	700045403
Location	**Elevation and Datum**
Jurupa Valley, California	Approx. 950 (NGVD 29)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
		Medium dense, light brown, fine SAND, (SP), moist	45	S-9	CR	18	6 12 26	
			46					
			47					
			48					
			49					
		Medium dense, light brown, fine SAND, (SP), moist	50	S-10	SPT	18	8 13 14	
	898.5		51					
		End of boring at 51.5 feet. Boring backfilled with cement grout. Groundwater was not encountered.	52					
			53					
			54					
			55					
			56					
			57					
			58					
			59					
			60					
			61					
			62					
			63					
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			65					
			66					
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			68					
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APPENDIX C
Percolation Test Results

PERCOLATION TEST DATA SHEET

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Project:	Agua Mansa Commerce Park				Project No.:	700045403	Date of Test:	9/20/2016	
Test Hole No.:	LB-4				Tested By:	JAB			
Depth of Test Hole (ft):	40				USCS Soil Classification:		Dense, tan, fine to coarse SAND, trace gravel, (SW), dry		
Casing Depth (ft):	40' PVC Pipe; Perforated in Bottom 5'				Test Hole Diameter (in):		8		
Trial No.	Date	Time of Measurement	Initial Depth to Water (Feet)	Time of Measurement	Final Depth to Water (Feet)	Time Interval (min)	Change in Water Level (Feet)	Percolation Rate (in/min)	Infiltration Rate (in/hr)
Sandy soil criteria 1	9/20/2016	1:18 PM	34.80	1:33 PM	41.50	25	6.70	3.22	
Sandy soil criteria 2	9/20/2016	1:39 PM	36.20	2:04 PM	41.50	25	5.30	2.54	
1	9/20/2016	2:03 PM	31.60	2:13 PM	38.50	10	6.90	8.28	
2	9/20/2016	2:18 PM	37.50	2:28 PM	40.60	10	3.10	3.72	
3	9/20/2016	2:31 PM	36.00	2:41 PM	40.30	10	4.30	5.16	
4	9/20/2016	2:45 PM	36.80	2:55 PM	40.50	10	3.70	4.44	
5	9/20/2016	3:00 PM	35.90	3:10 PM	40.70	10	4.80	5.76	
6	9/20/2016	3:13 PM	35.00	3:23 PM	40.00	10	5.00	6.00	14.4

Comments:

1. Percolation test was performed in accordance with the Riverside County Flood Control and Water Conservation District ' "Design Handbook for Low Impact Development Best Management Practices" dated September 2011.
2. Per the procedures for deep percolation tests in sandy soils, measurements were taken in 10-minute intervals for an hour after sandy soil criteria was met.
3. Weather: Partly cloudy, 85° F
4. Measurements were collected from the Top of Pipe = 41.5 Feet

PERCOLATION TEST DATA SHEET

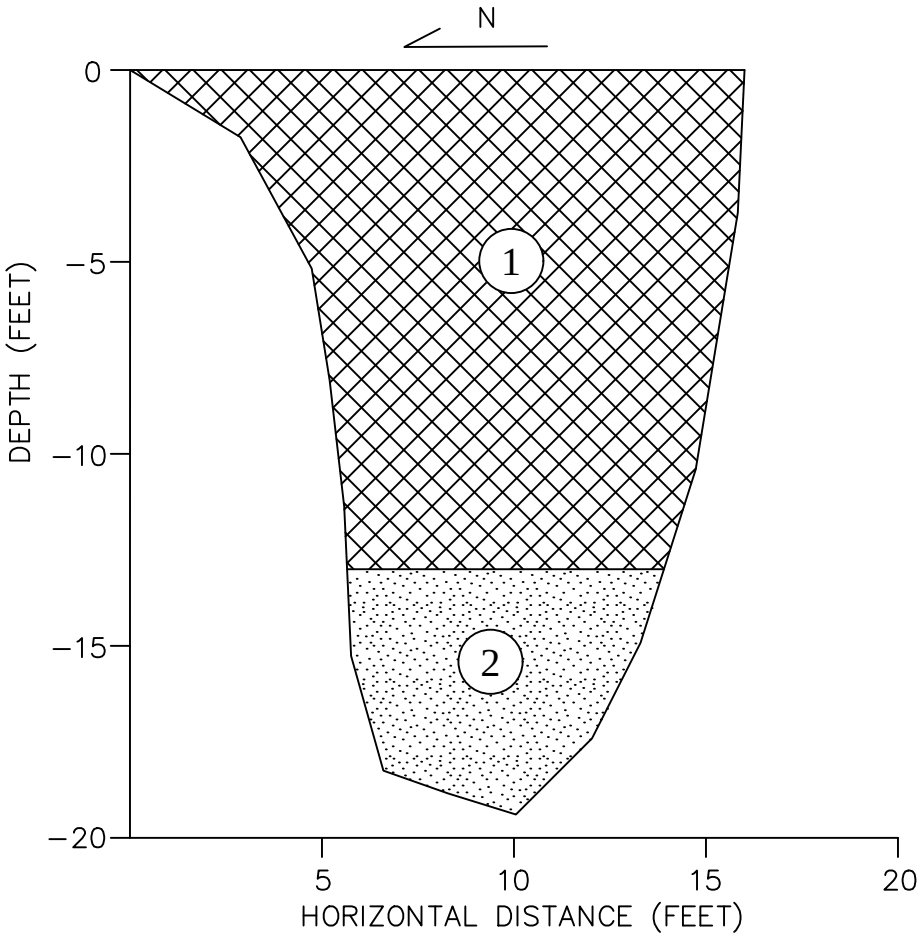
LANGAN

Project:	Agua Mansa Commerce Park				Project No.:	700045403	Date of Test:	9/22/2016	
Test Hole No.:	LB-9				Tested By:	JAB			
Depth of Test Hole (ft):	30				USCS Soil Classification:		Dense, tan-brown, fine to coarse SAND, (SW), moist		
Casing Depth (ft):	40' PVC Pipe; Perforated in Bottom 5'				Test Hole Diameter (in):		8		
Trial No.	Date	Time of Measurement	Initial Depth to Water (Feet)	Time of Measurement	Final Depth to Water (Feet)	Time Interval (min)	Change in Water Level (Feet)	Percolation Rate (in/min)	Infiltration Rate (in/hr)
Sandy soil criteria 1	9/22/2016	8:59 AM	23.15	9:24 AM	24.30	25	1.15	0.55	
Sandy soil criteria 2	9/22/2016	9:29 AM	22.80	9:54 AM	23.90	25	1.10	0.53	
1	9/22/2016	9:54 PM	23.90	10:04 AM	24.20	10	0.30	0.36	
2	9/22/2016	10:08 AM	23.50	10:18 AM	23.80	10	0.30	0.36	
3	9/22/2016	10:22 AM	22.50	10:32 AM	23.10	10	0.60	0.72	
4	9/22/2016	10:32 AM	23.10	10:42 AM	23.50	10	0.40	0.48	
5	9/22/2016	10:42 AM	23.50	10:52 AM	23.90	10	0.40	0.48	
6	9/22/2016	10:52 AM	23.90	11:02 AM	24.25	10	0.35	0.42	0.8

Comments:

1. Percolation test was performed in accordance with the Riverside County Flood Control and Water Conservation District ' "Design Handbook for Low Impact Development Best Management Practices" dated September 2011
2. Per the procedures for deep percolation tests in sandy soils, measurements were taken in 10-minute intervals for an hour after sandy soil criteria was met.
3. Weather: Partly cloudy, 85°C
4. Measurements were collected from the Top of Pipe = 28.9 Feet

APPENDIX D
Test Pit Logs



TEST PIT DESCRIPTION:

(1) Tan, fine to medium SAND, trace gravel, (SP). [FILL]

(2) Tan/light grey, fine to coarse SAND, trace gravel, trace cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 22 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project	AGUA MANSA COMMERCE PARK JURUPA VALLEY RIVERSIDE COUNTY CALIFORNIA
Figure Title	TEST PIT LOG LT-2
Project No.	700045403
Date	28 APRIL 2017
Scale	1" = 5'
Logged By / Drawn By	DL / DJJ
Figure No.	D-1

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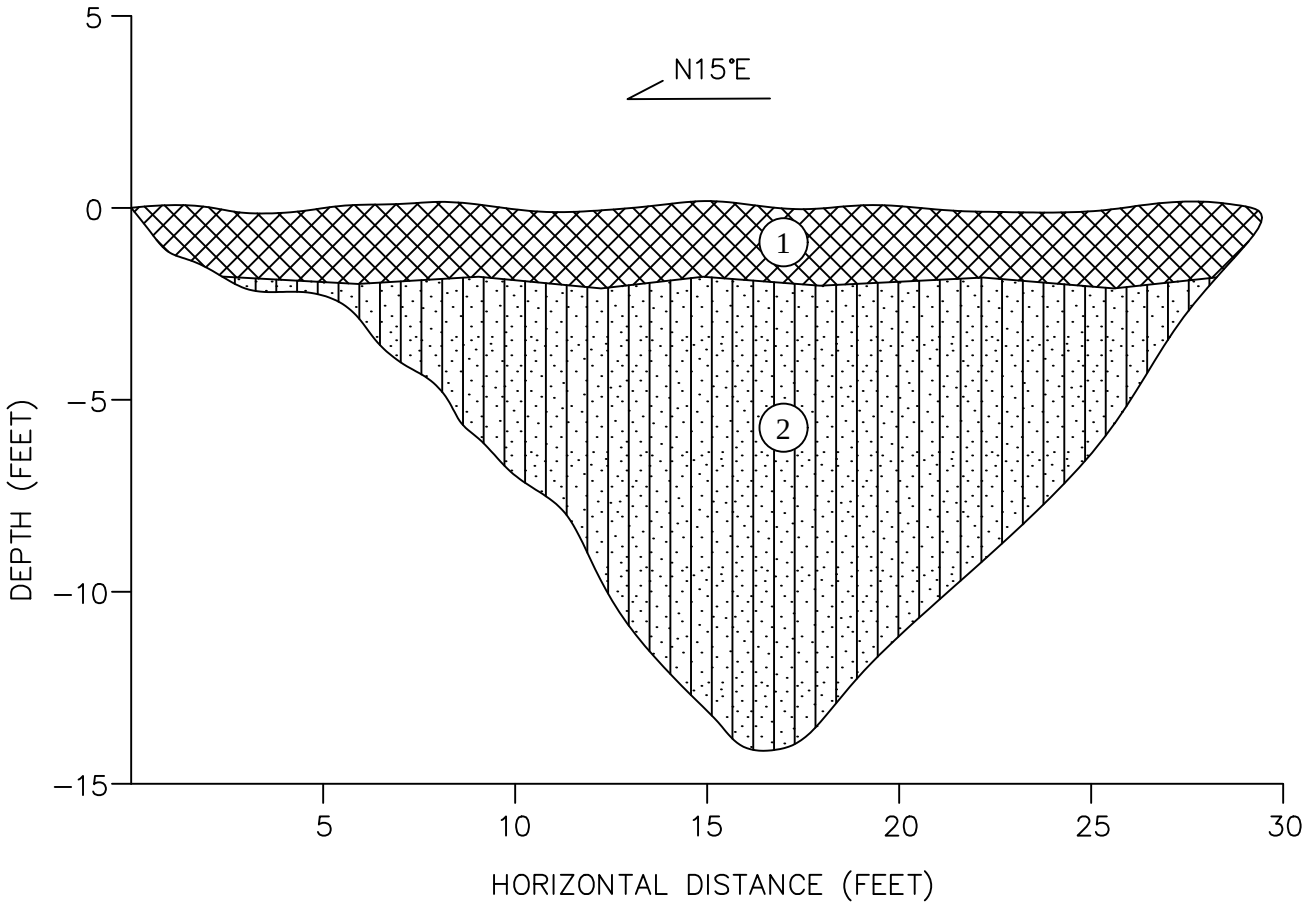

TEST PIT DESCRIPTION:

(1) Tan, silty fine SAND, (SM), dry, [FILL]

(2) Tan, silty fine SAND, (SM), dry, pinholes in sidewall observed at approximately 5 feet. [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 21 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-4

Project No.	Figure No.
700045403	D-2
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB	Drawn By: DJJ

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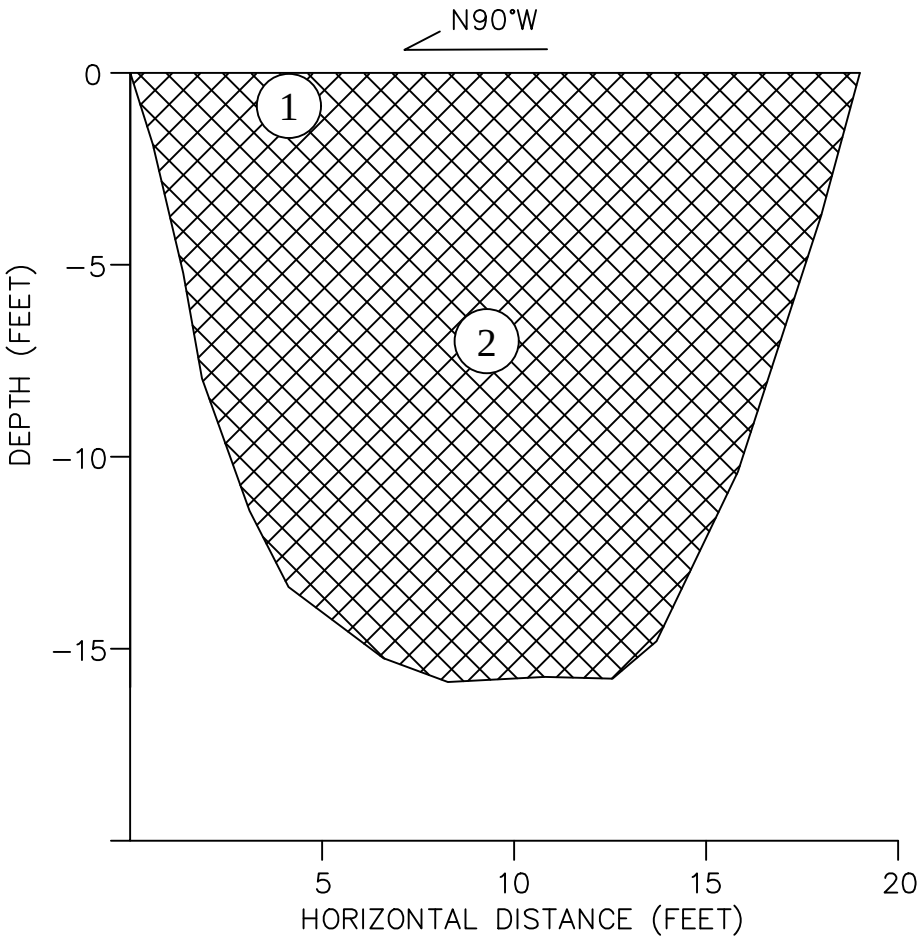

TEST PIT DESCRIPTION:

(1) Light grey, SAND, (SP), partially cemented materials. [FILL]

(2) Light brown, fine to medium SAND, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-5

Project No.	Figure No.
700045403	D-3
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL / Drawn By: DJJ	

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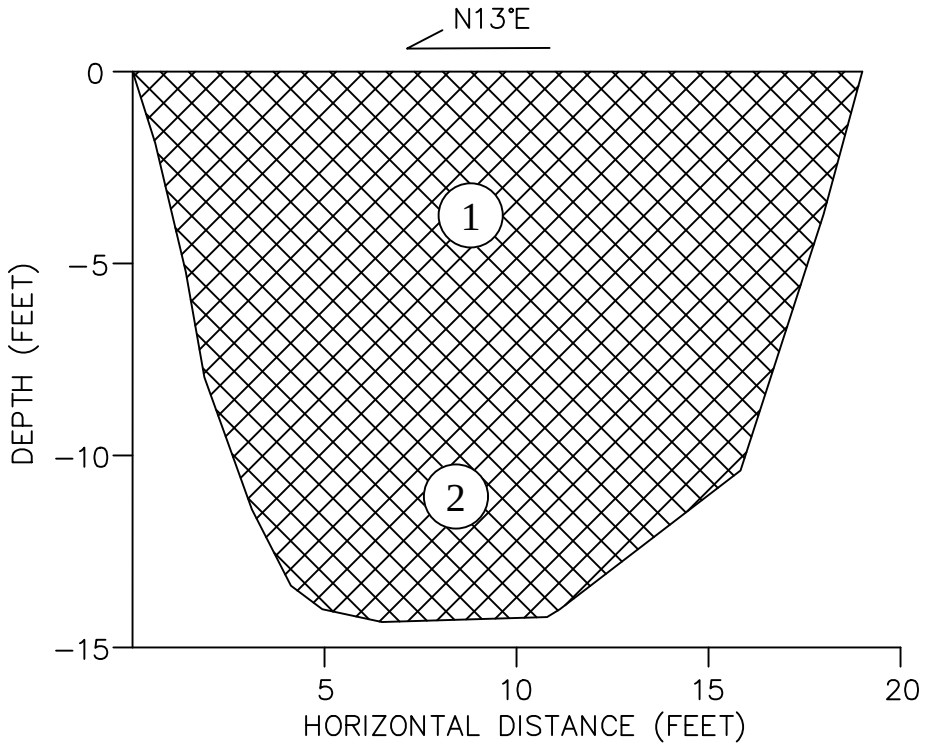

TEST PIT DESCRIPTION:

(1) Light brown, fine to medium silty SAND, (SM). [FILL]

(2) Tan/light grey, fine to medium SAND, trace gravel, trace cobbles (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-6

Project No.	Figure No.
700045403	D-4
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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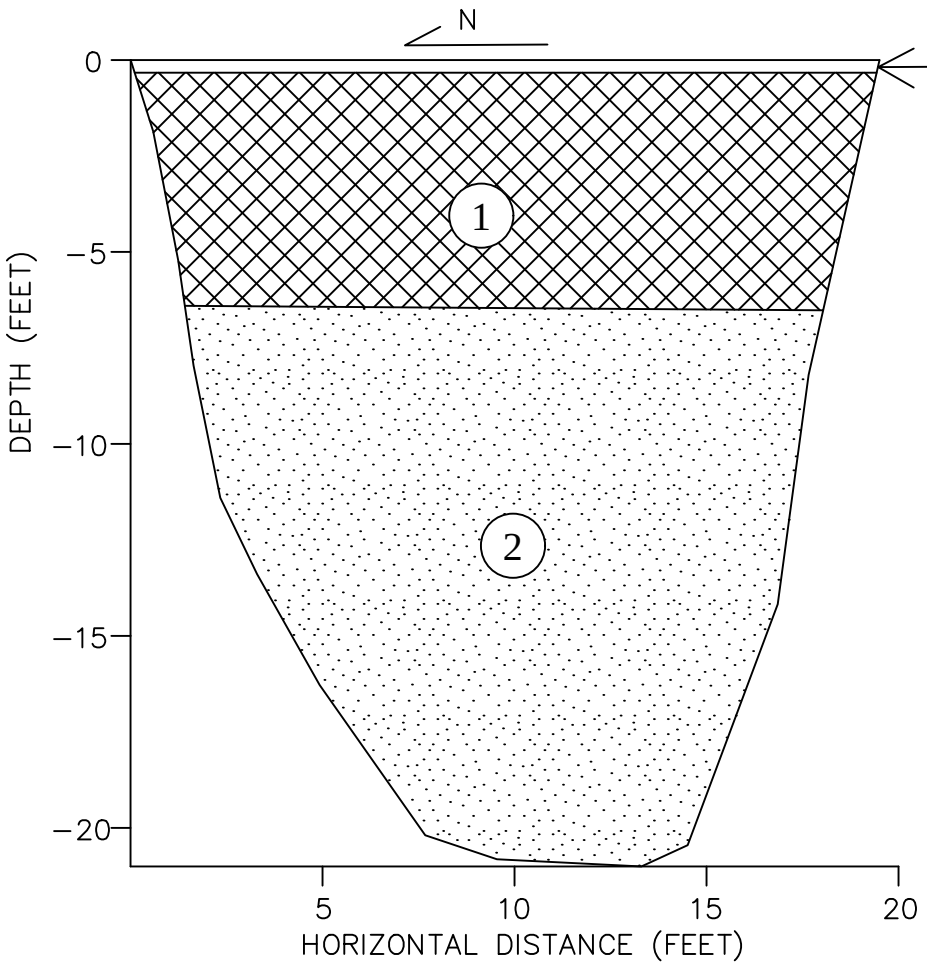

TEST PIT DESCRIPTION:

(1) Tan/light brown, fine to medium silty SAND, (SM). [FILL]

(2) Tan/light brown, fine to coarse SAND, trace gravel and cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 22 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-8

Project No.	Figure No.
700045403	D-5
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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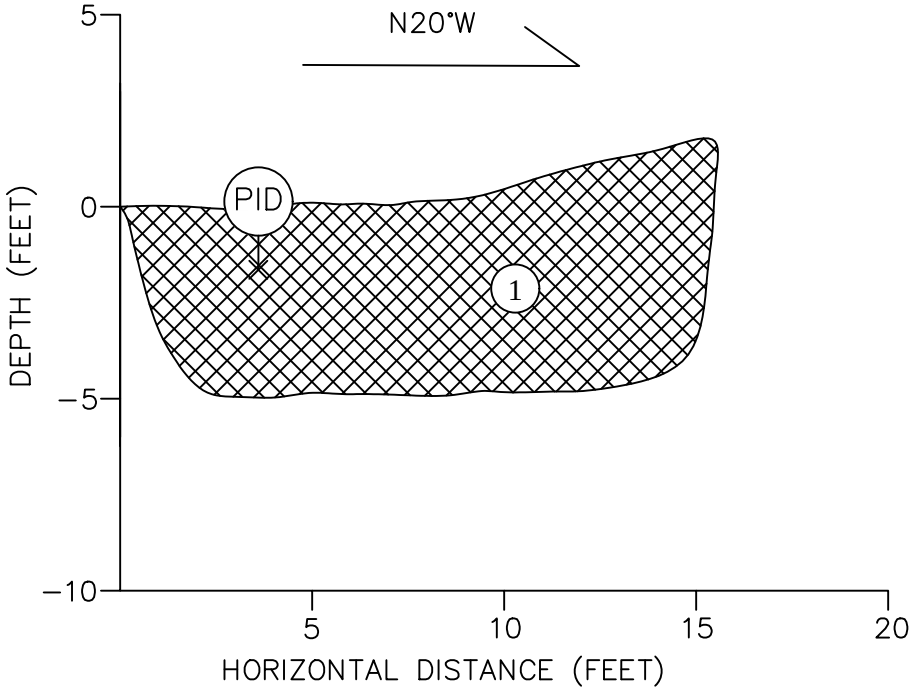

TEST PIT DESCRIPTION:

(1) Brown–black, silty fine to coarse SAND, some fine to coarse gravel, (SM), dry, slight odor, vegetation within trench side walls, PID=10 parts per million, plastic debris. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 21 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-9

Project No.	Figure No.
700045403	D-6
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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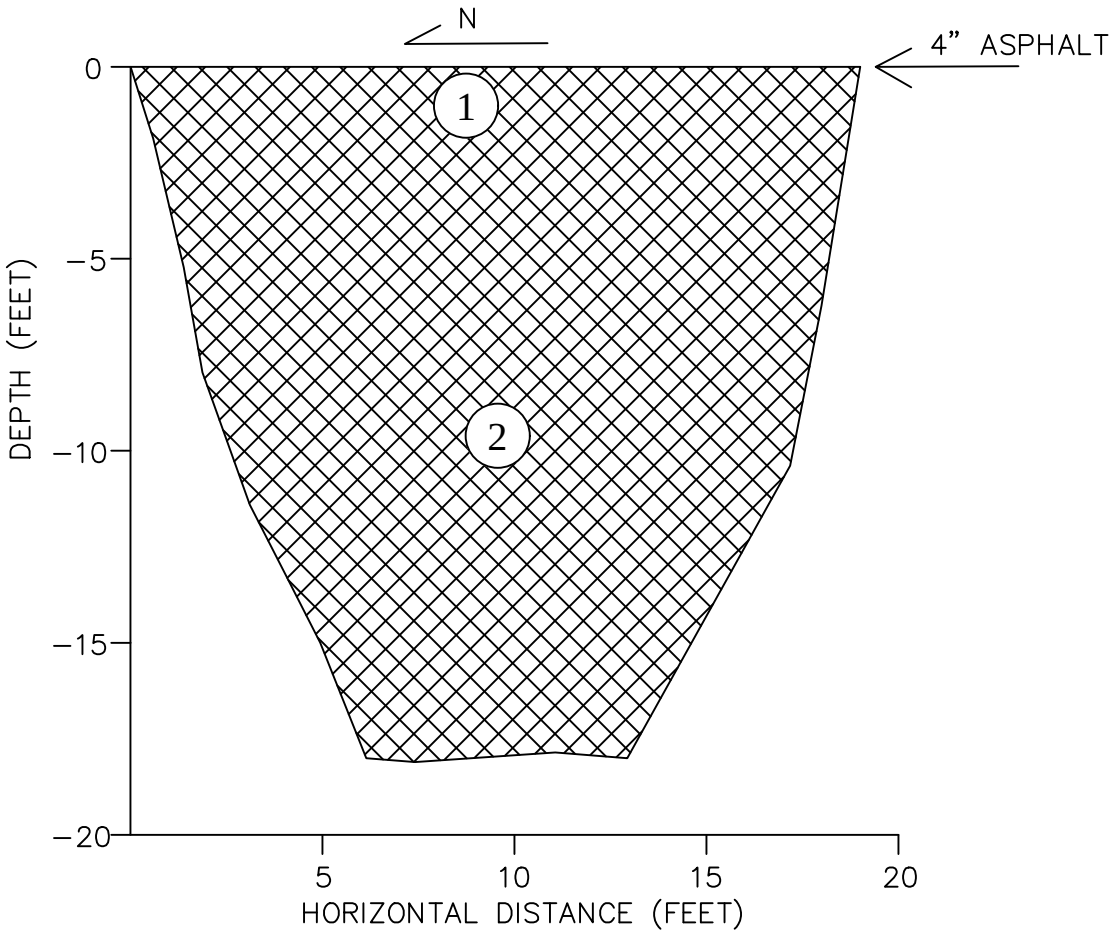

TEST PIT DESCRIPTION:

(1) Light brown, fine to coarse SAND, (SP). [FILL]

(2) Light brown, fine to medium SAND, trace silt and clay, (SP−SM). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-10

Project No.	Figure No.
700045403	D-7
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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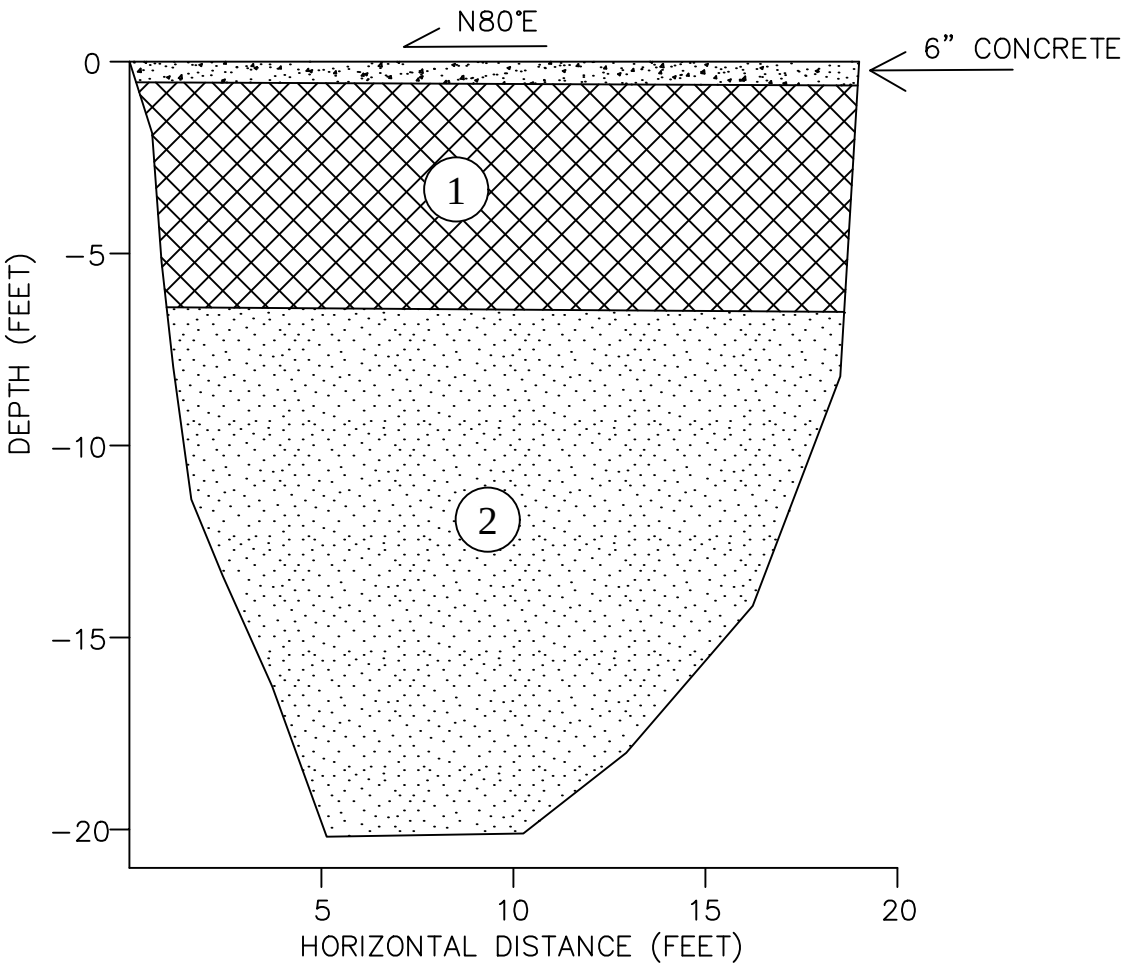

TEST PIT DESCRIPTION:

(1) Tan, fine to coarse silty SAND, trace gravel, (SM). [FILL]

(2) Tan−grey, medium to coarse SAND, trace gravel, trace cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 22 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-11

Project No.	Figure No.
700045403	D-8
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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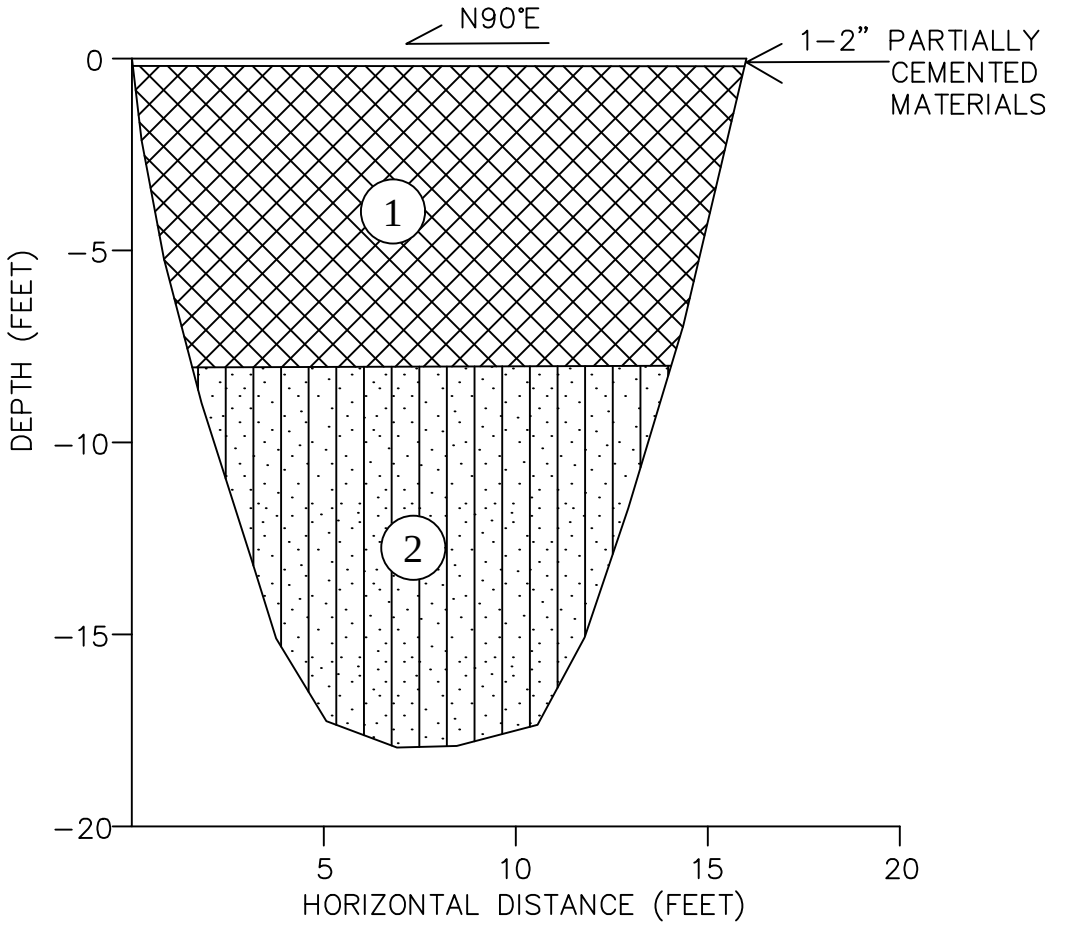

TEST PIT DESCRIPTION:

(1) Tan/light brown, fine to medium silty SAND, trace gravel, (SM). [FILL]

(2) Light brown, fine to coarse silty SAND, trace gravel and cobbles, (SM). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 22 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Figure Title: TEST PIT LOG LT-12

Project No.	Figure No.
700045403	D-9
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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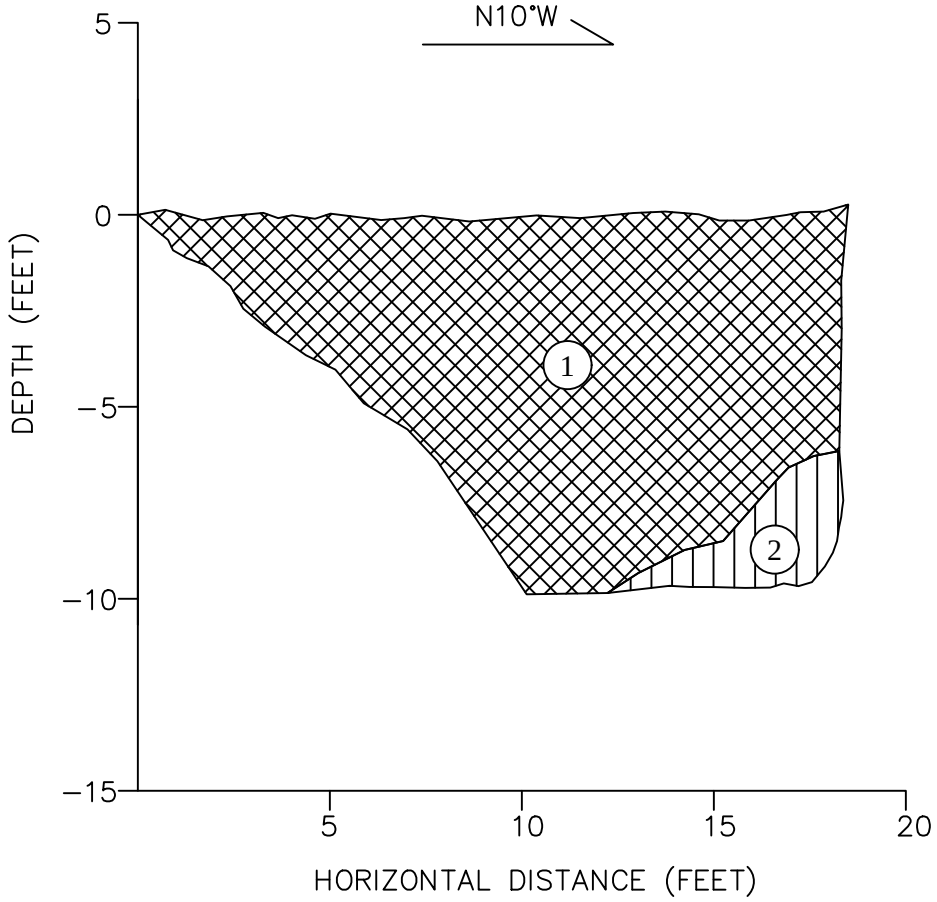

TEST PIT DESCRIPTION:

1. Brown–tan, silty fine to coarse SAND, some fine to coarse gravel, some cobbles, (SM), dry, vegetation debris. [FILL]
2. Brown–tan, sandy SILT, fine sand, trace cobbles, (ML), moist. [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 21 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project: AGUA MANSA COMMERCE PARK
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Figure Title: TEST PIT LOG LT-13

Project No.	Figure No.
700045403	D-10
Date: 28 APRIL 2017	
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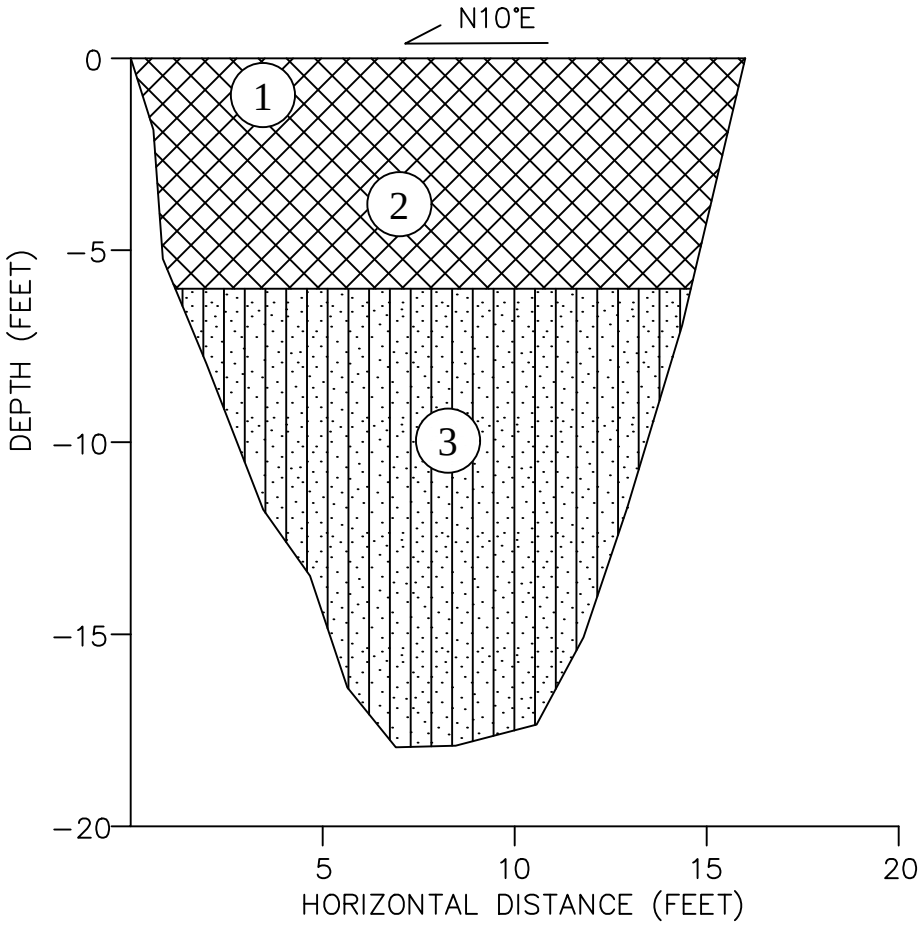

TEST PIT DESCRIPTION:

1. Light grey, partially cemented material. [FILL]
2. Tan, fine to coarse SAND, trace gravel, (SP). [FILL]
3. Light brown, fine to medium silty SAND, (SM). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project	AGUA MANSA COMMERCE PARK JURUPA VALLEY RIVERSIDE COUNTY CALIFORNIA
Figure Title	TEST PIT LOG LT-14
Project No.	700045403
Date	28 APRIL 2017
Scale	1" = 5'
Logged By / Drawn By	DL / DJJ
Figure No.	D-11

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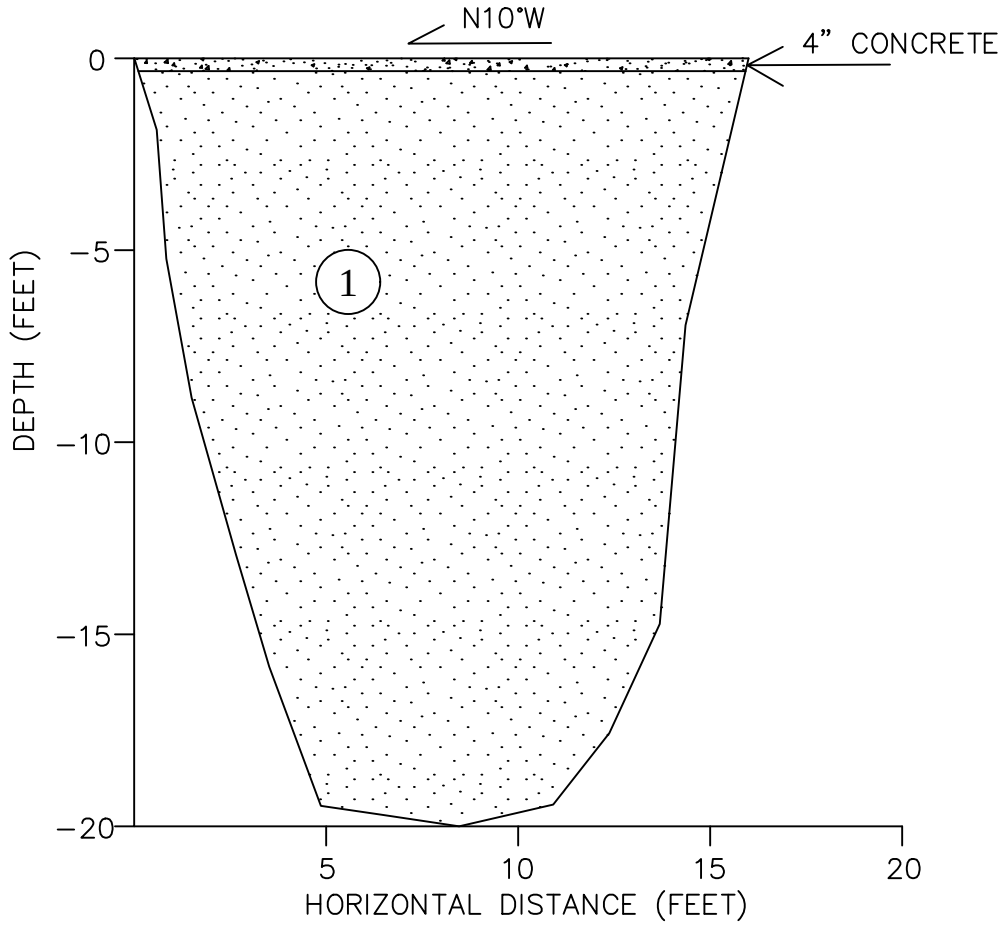

TEST PIT DESCRIPTION:

(1) Tan/brown, fine to coarse SAND, trace gravel and cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-15

Project No.	Figure No.
700045403	D-12
Date: 28 APRIL 2017	
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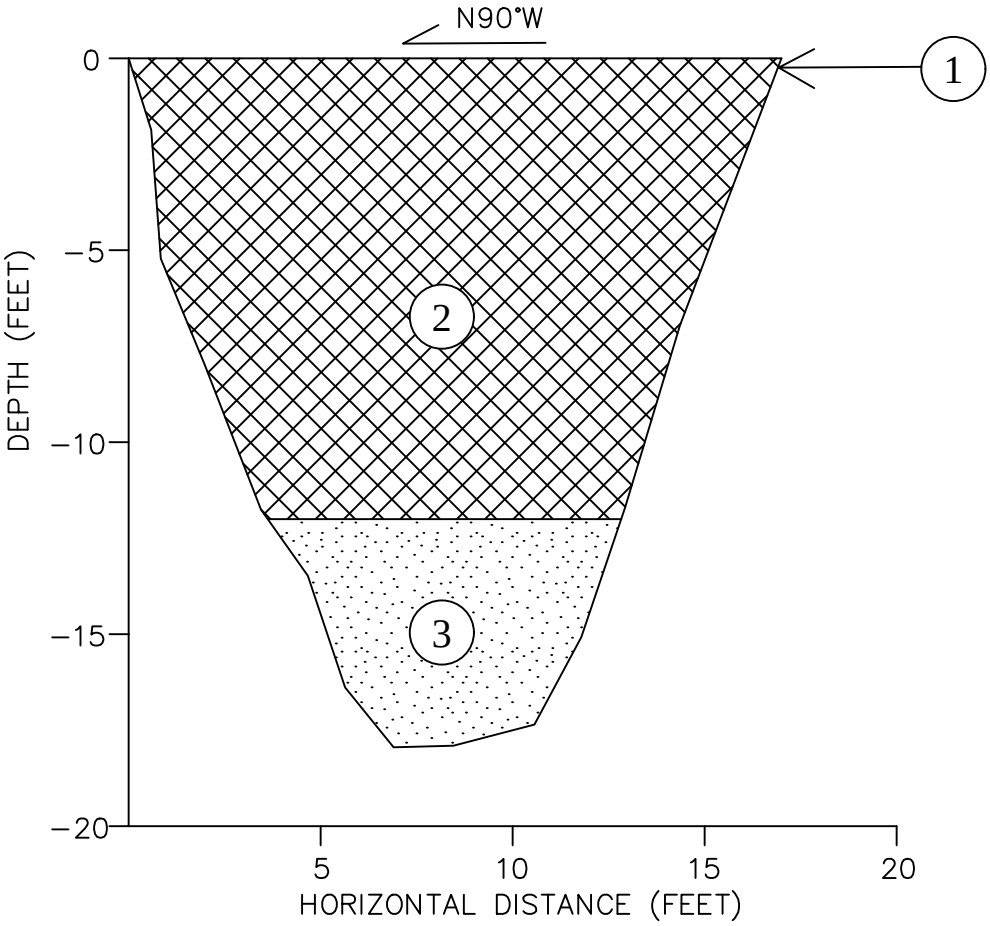

TEST PIT DESCRIPTION:

1. Light grey, partially cemented material. [FILL]
2. Tan, fine to coarse SAND, (SP). [FILL]
3. Light brown, fine to medium SAND, trace cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-16

Project No.	Figure No.
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Date: 28 APRIL 2017	
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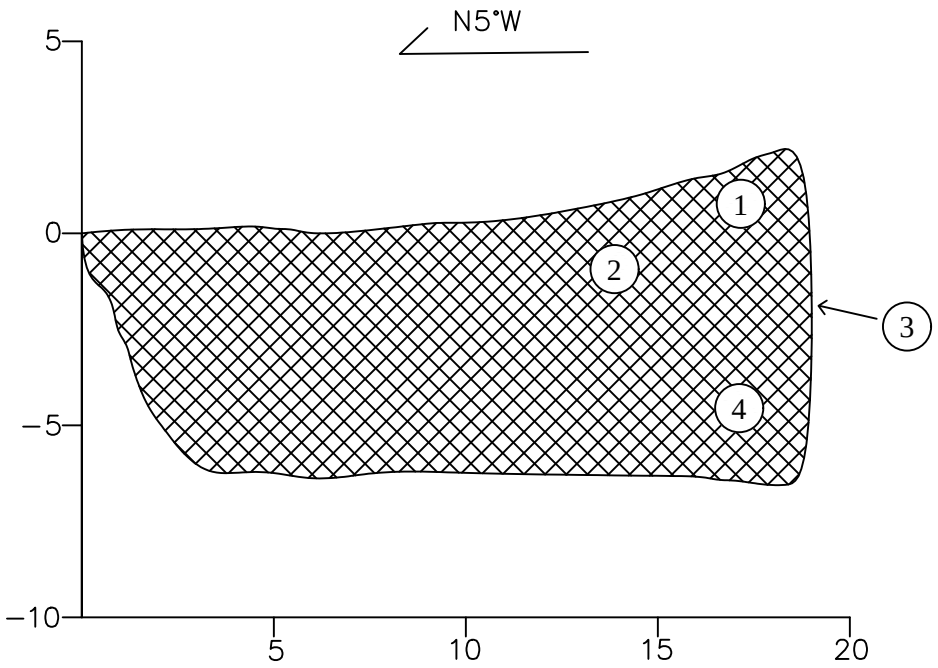

TEST PIT DESCRIPTION:

1. Tan, fine to coarse SAND, some fine to coarse gravel, (SW), dry. [FILL]
2. 3" Asphalt. [FILL]
3. Gray, fine to coarse SAND, some fine gravel, (SW), dry. [FILL]
4. Brown, SILT, trace fine sand, (ML), moist. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-17

Project No.	Figure No.
700045403	D-14
Date: 28 APRIL 2017	
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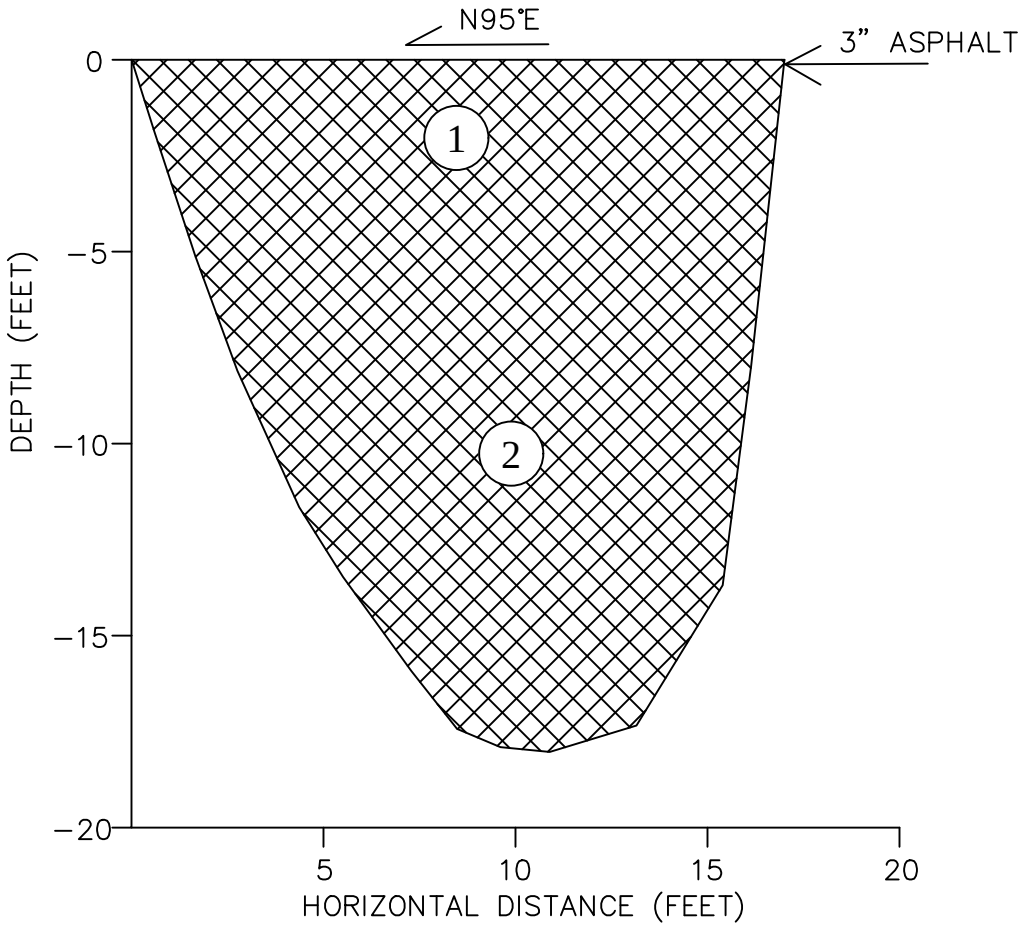

TEST PIT DESCRIPTION:

(1) Tan, fine to coarse SAND, (SP). [FILL]

(2) Light brown, fine to medium SAND, trace cobbles, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project	AGUA MANSA COMMERCE PARK JURUPA VALLEY RIVERSIDE COUNTY CALIFORNIA
Figure Title	TEST PIT LOG LT-18
Project No.	700045403
Date	28 APRIL 2017
Scale	1" = 5'
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Figure No.	D-15

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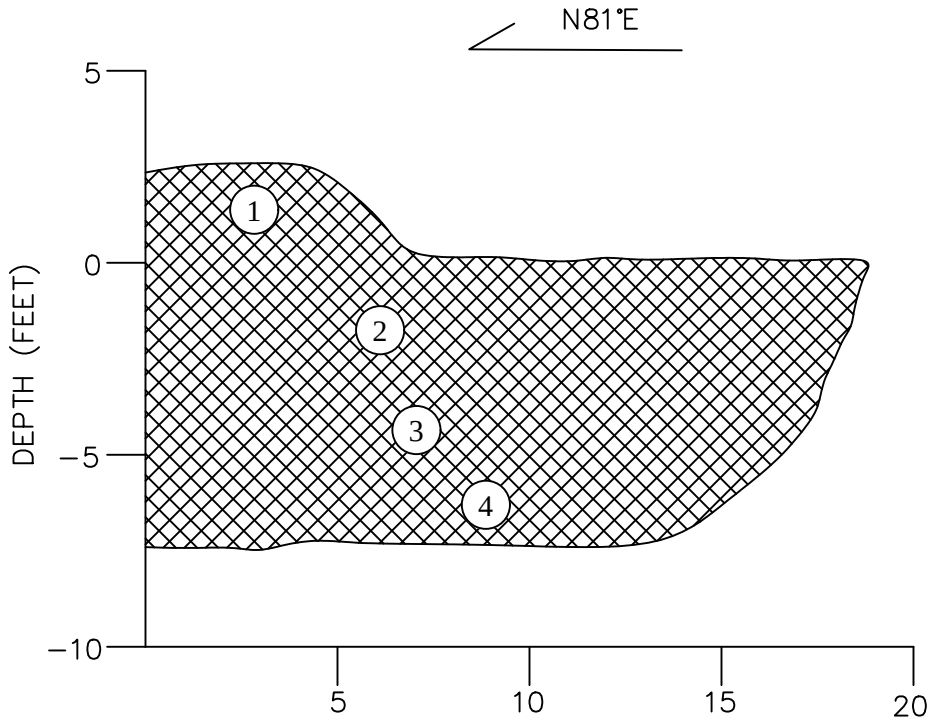

TEST PIT DESCRIPTION:

1. Tan, silty, fine to medium SAND, some fine to coarse gravel, (SM), dry. [FILL]
2. Tan fine to coarse SAND, some fine to medium gravel, cemented, (SW), dry. [FILL]
3. Tan, fine to medium SAND, (SP), dry. [FILL]
4. Reddish–brown, silty fine to medium SAND, (SM), moist. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-19

Project No.	Figure No.
700045403	D-16
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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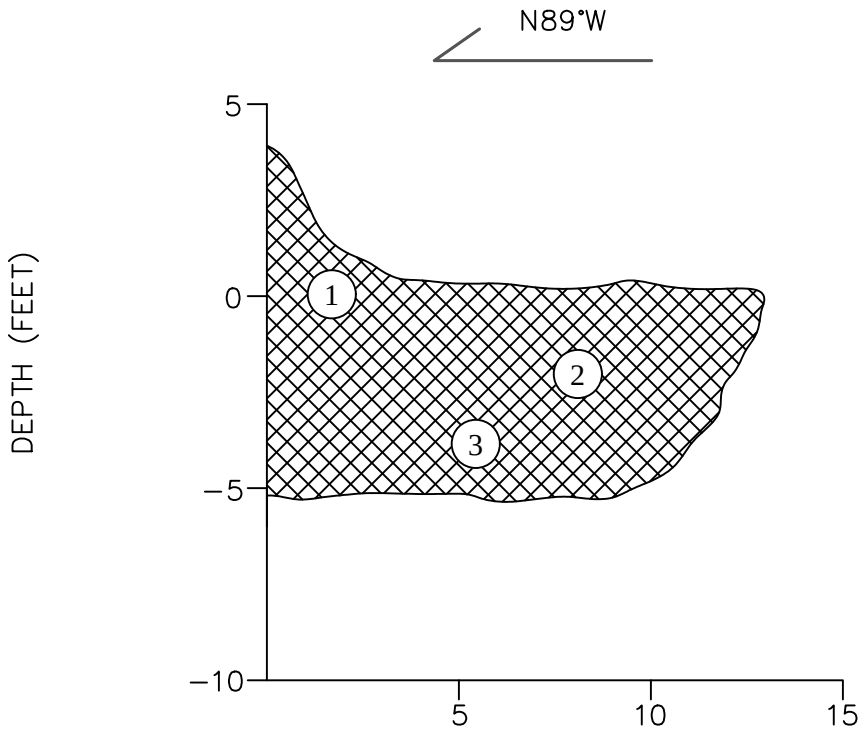

TEST PIT DESCRIPTION:

1. Tan/grey, fine to coarse SAND, some gravel, (SW), dry, cemented material. [FILL]
2. Dark brown, silty fine to coarse SAND, some gravel, (SM), moist, cemented material. [FILL]
3. Reddish–brown, silty fine to medium SAND, (SM), moist. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-20

Project No.	Figure No.
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Date: 28 APRIL 2017	
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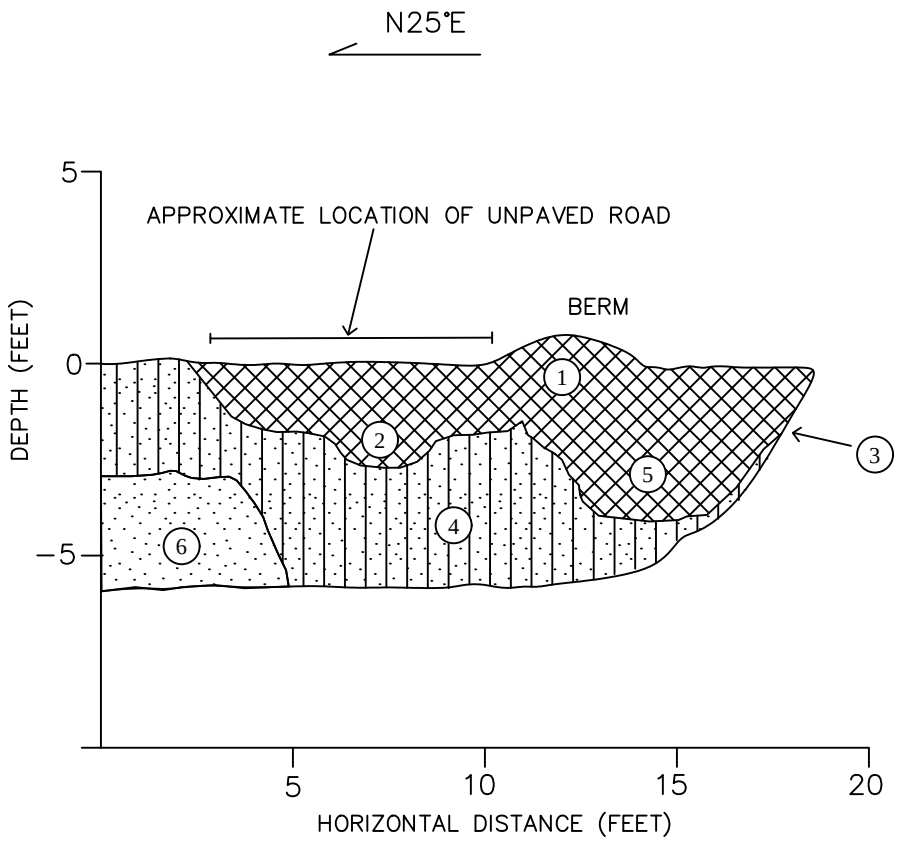

TEST PIT DESCRIPTION:

1. Dark brown, silty fine to coarse SAND, some fine gravel, (SM), dry. [FILL]
2. Gray, fine to coarse GRAVEL, (GP), dry, cemented material. [FILL]
3. Pink, suspected CKD.
4. Brown, silty fine to coarse SAND, some fine to coarse gravel, (SM), moist. [Alluvial Deposits]
5. Brown with white mottling, fine GRAVEL, (GP), cemented material. [FILL]
6. Light gray, fine to medium SAND, (SP), dry.

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-21

Project No.	Figure No.
700045403	D-18
Date: 28 APRIL 2017	
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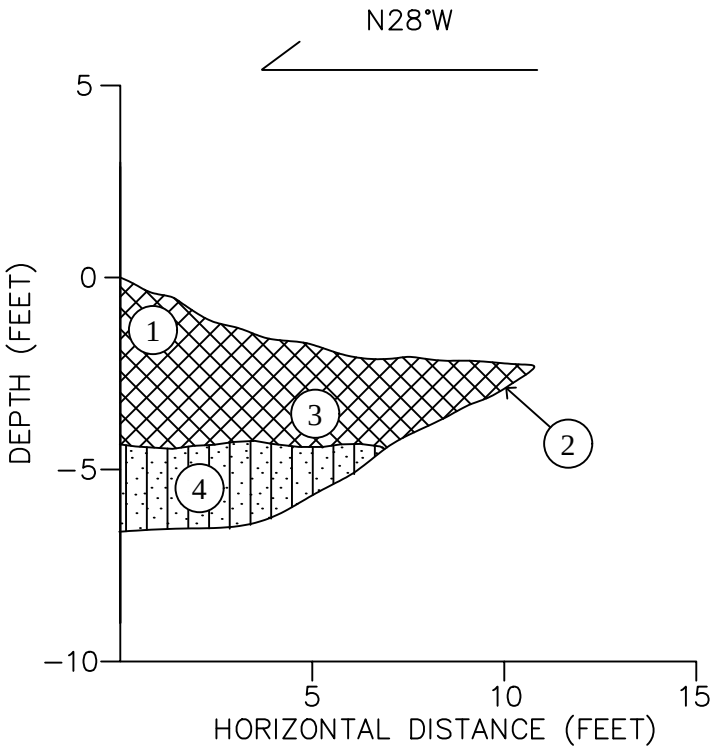

TEST PIT DESCRIPTION:

1. Tan, fine to coarse SAND, some fine to coarse gravel, (SW), dry. [FILL]
2. 3" thick asphalt and 4' aggregate base. [FILL]
3. Dark brown, silty fine to coarse SAND, some fine to coarse gravel, (SM), moist. [FILL]
4. Reddish–brown, SILT, some fine sand, (SM), moist. [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-22

Project No.	Figure No.
700045403	D-19
Date: 28 APRIL 2017	
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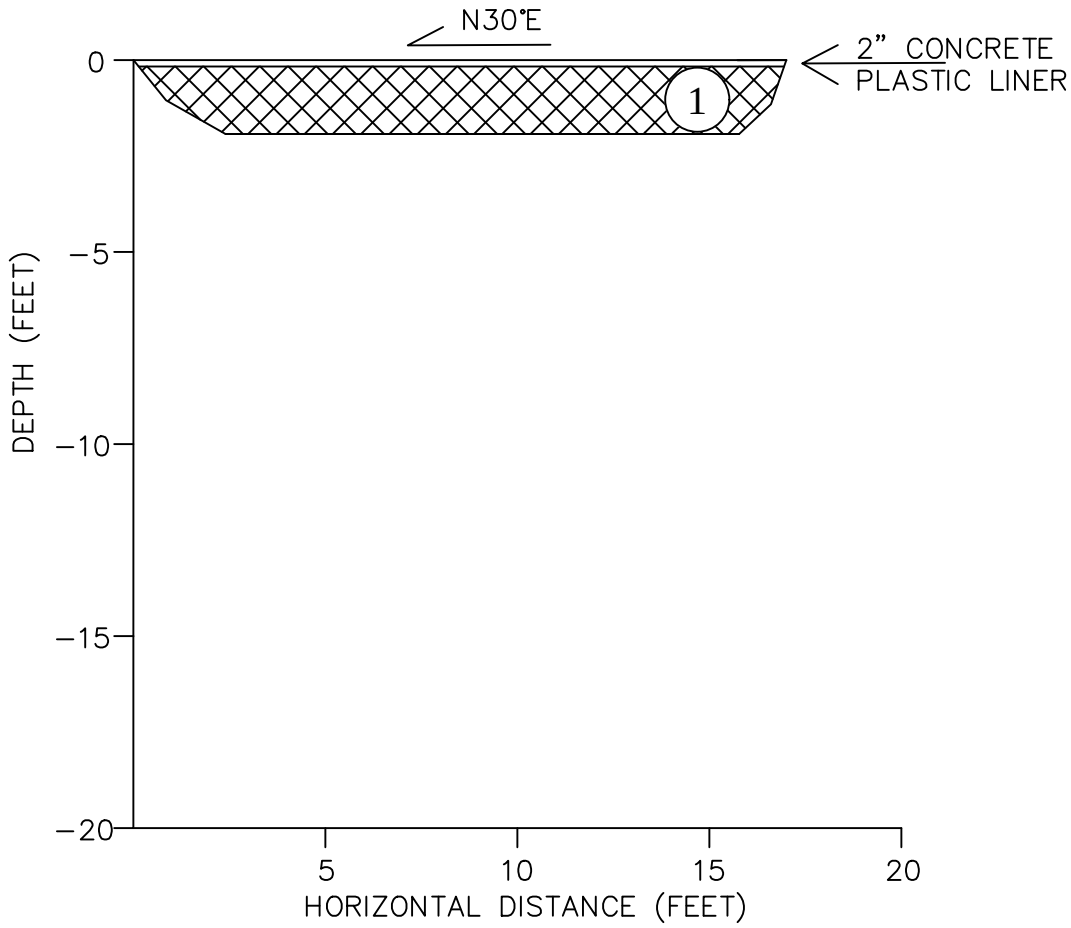

TEST PIT DESCRIPTION:

(1) Tan, fine to coarse SAND, (SP). [FILL]

Encountered concrete at 2 feet

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 20 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-23

Project No.	Figure No.
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Date: 28 APRIL 2017	
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Logged By: DL / Drawn By: DJJ	

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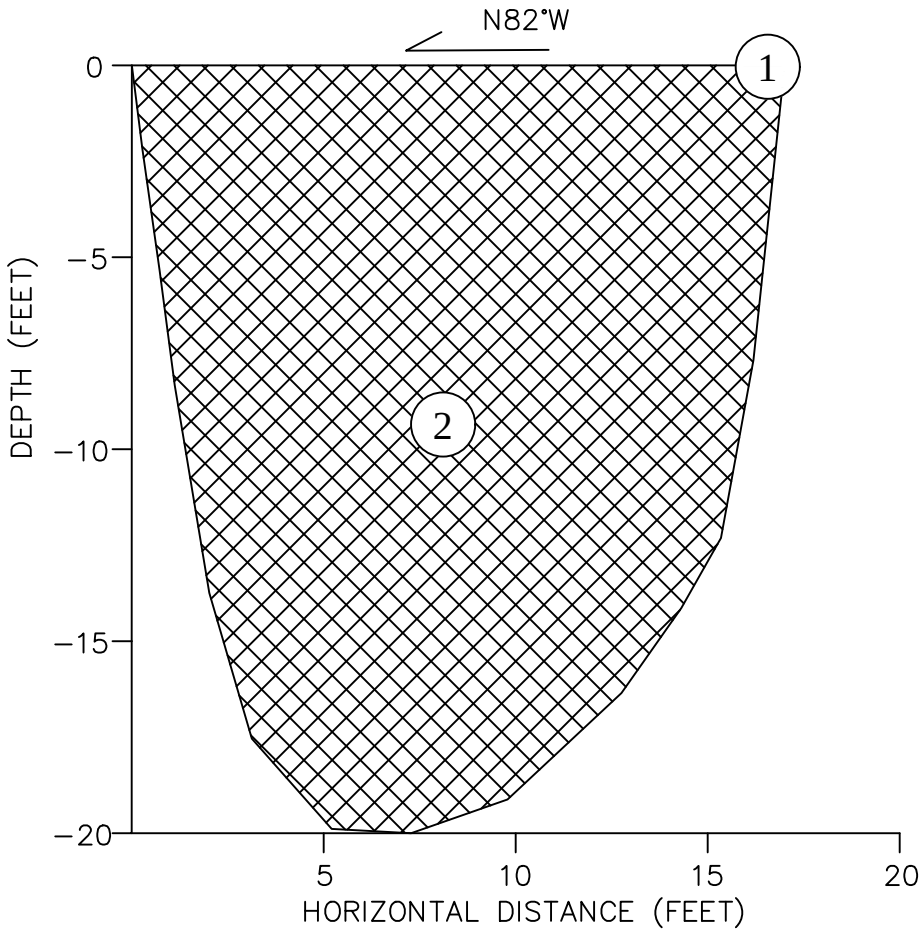

TEST PIT DESCRIPTION:

1. Cemented materials.

2. Brown, fine to coarse SAND, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 23 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-24

Project No.	Figure No.
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Date: 28 APRIL 2017	
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Logged By: DL / Drawn By: DJJ	

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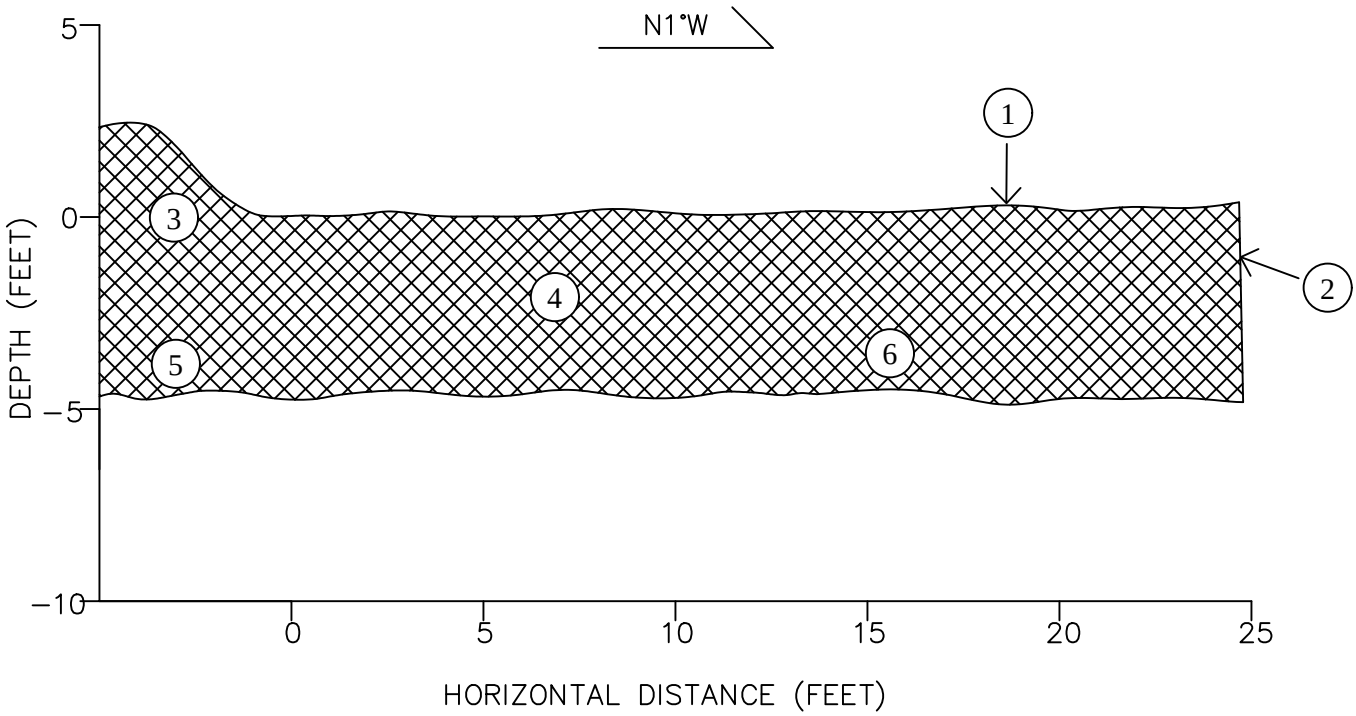

TEST PIT DESCRIPTION:

1. Brown, silty fine to coarse SAND, some fine to coarse gravel, (SM), moist. [FILL]
2. Pink, cemented and hardened material, trace fine sand, suspected CKD, dry. [FILL]
3. White, fine to coarse SAND, some silt, some fine to coarse gravel, (SM), dry. [FILL]
4. Red, clayey fine to coarse SAND, some fine to coarse gravel, (SC), moist. [FILL]
5. White, SILT, trace fine sand, cemented, (ML), dry. [FILL]
6. Brown, silty fine to coarse SAND, some fine to coarse gravel, some cobbles, (SM), moist. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 20 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING

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Figure Title: TEST PIT LOG LT-26

Project No.	Figure No.
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Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB	Drawn By: DJJ

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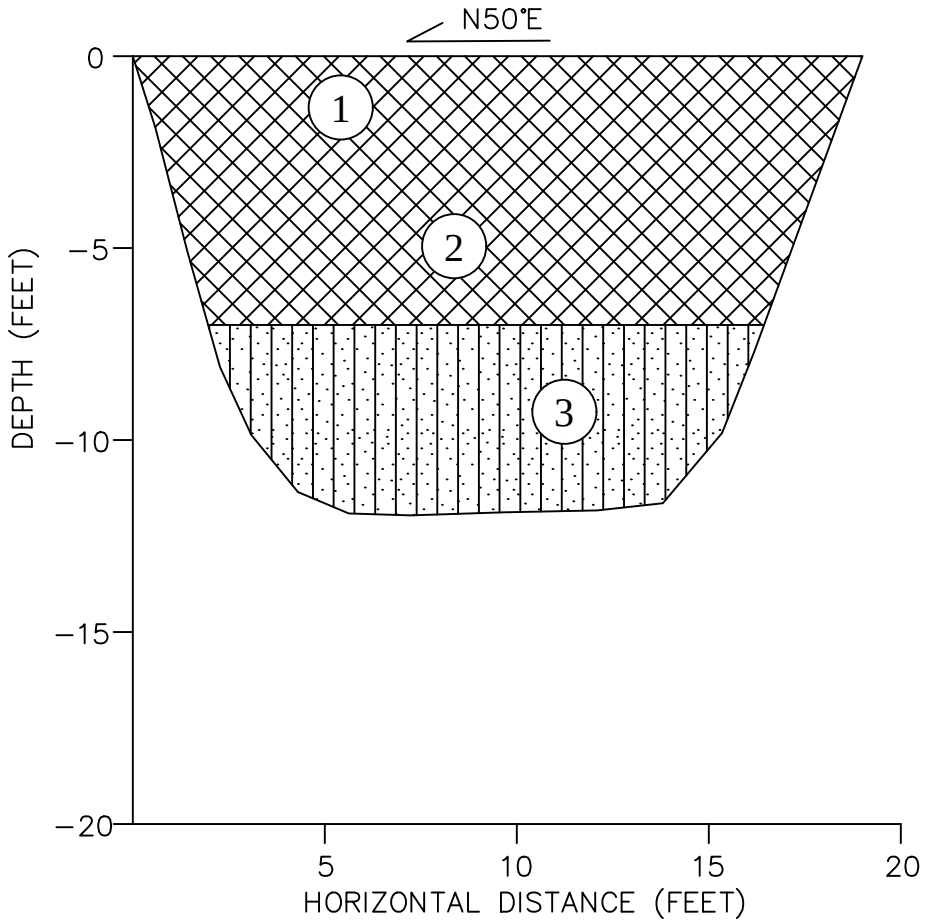

TEST PIT DESCRIPTION:

1. Tan, fine to medium SAND, (SP), partially cemented materials. [FILL]

2. Light brown, fine to medium SAND, trace clay, (SC), partially cemented materials. [FILL]

3. Brown, fine to coarse silty SAND, trace gravel, (SM). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 20 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-27

Project No.	Figure No.
700045403	D-23
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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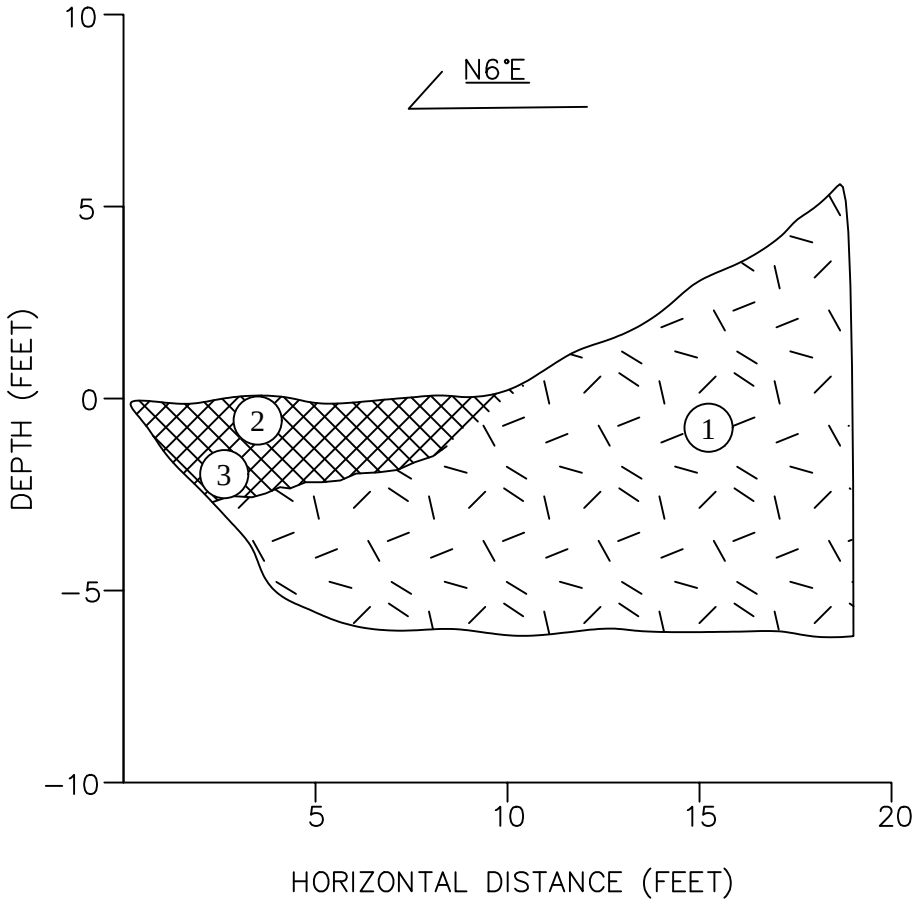

TEST PIT DESCRIPTION:

1. Brownish−white, decomposed granitic rock. [WEATHERED ROCK]
2. 12" thick cement and concrete. [FILL]
3. Tan, fine SAND, (SP), dry (mixed with harden cement pink material suspected CKD). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 19 SEPTMENBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-28

Project No.	Figure No.
700045403	D-24
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB	Drawn By: DJJ

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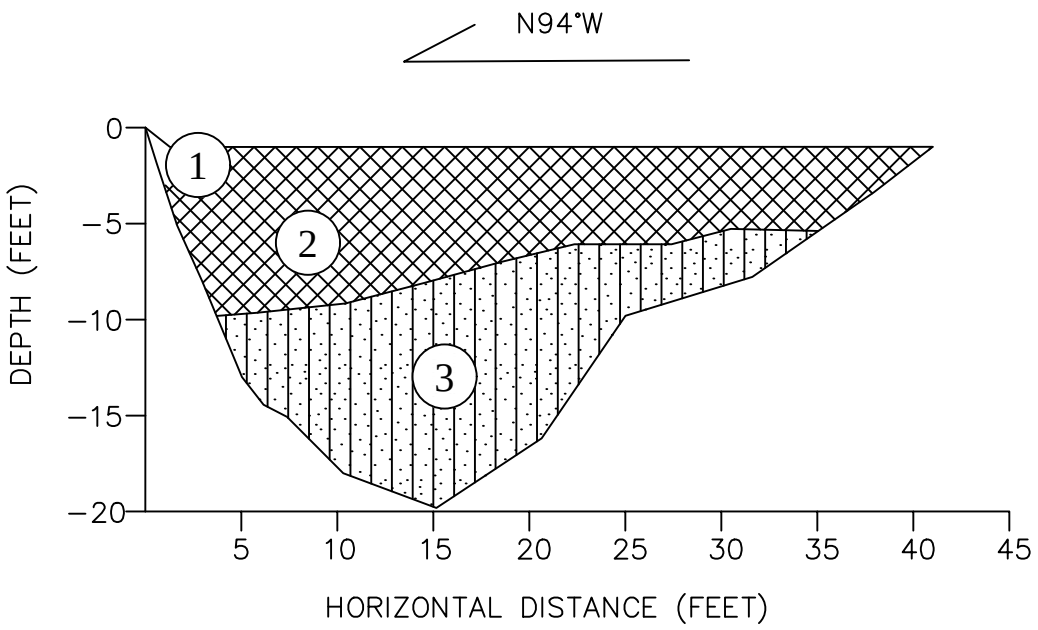

TEST PIT DESCRIPTION:

1. Light brown, fine to coarse SAND, trace gravel, (SP). [FILL]
2. Tan, fine to medium SAND, (SP), and cement kiln dust (CKD). [FILL]
3. Light brown, fine to coarse SAND, trace gravel, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 23 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-29

Project No.	Figure No.
700045403	D-25
Date: 28 APRIL 2017	
Scale: 1" = 10'	
Logged By: DL / Drawn By: DJJ	

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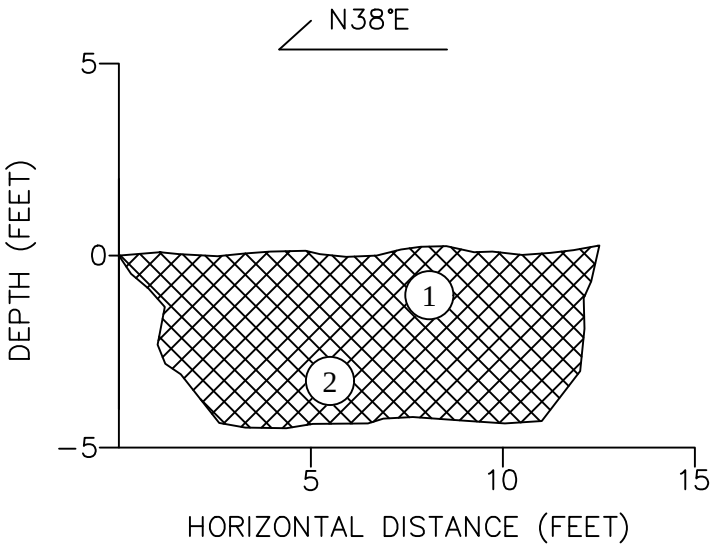

TEST PIT DESCRIPTION:

1. Pink, silty fine to coarse SAND, some fine to coarse gravel, cemented, (SM), dry. [FILL]
2. Grey–brown cement, metal, wood and fabric. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 21 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-30

Project No.	Figure No.
700045403	D-26
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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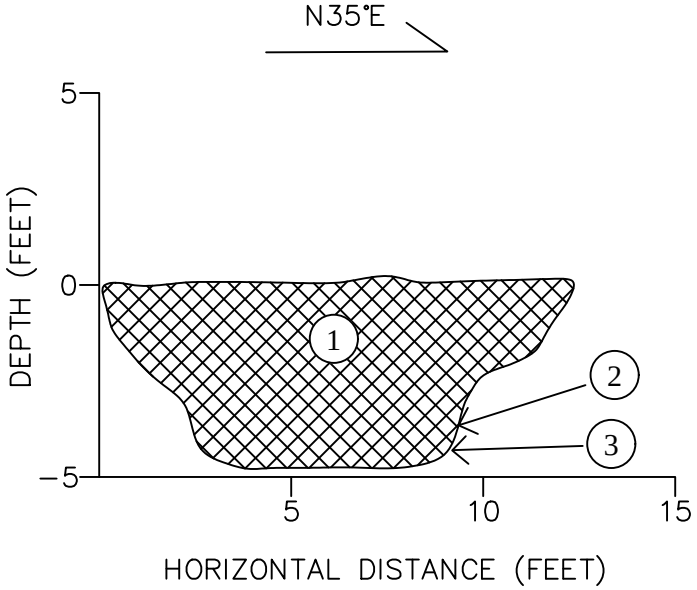

TEST PIT DESCRIPTION:

1. Pink–tan, silty fine to coarse SAND, some fine to coarse gravel, (SM), dry, plastic debris. [FILL]
2. Pink, cement, brittle, crushed turns to very fine powder, suspected CKD, dry. [FILL]
3. Black–brown, silty fine to coarse SAND, (SM), dry. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 21 SEPTEMEBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-31

Project No.	Figure No.
700045403	D-27
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB / Drawn By: DJJ	

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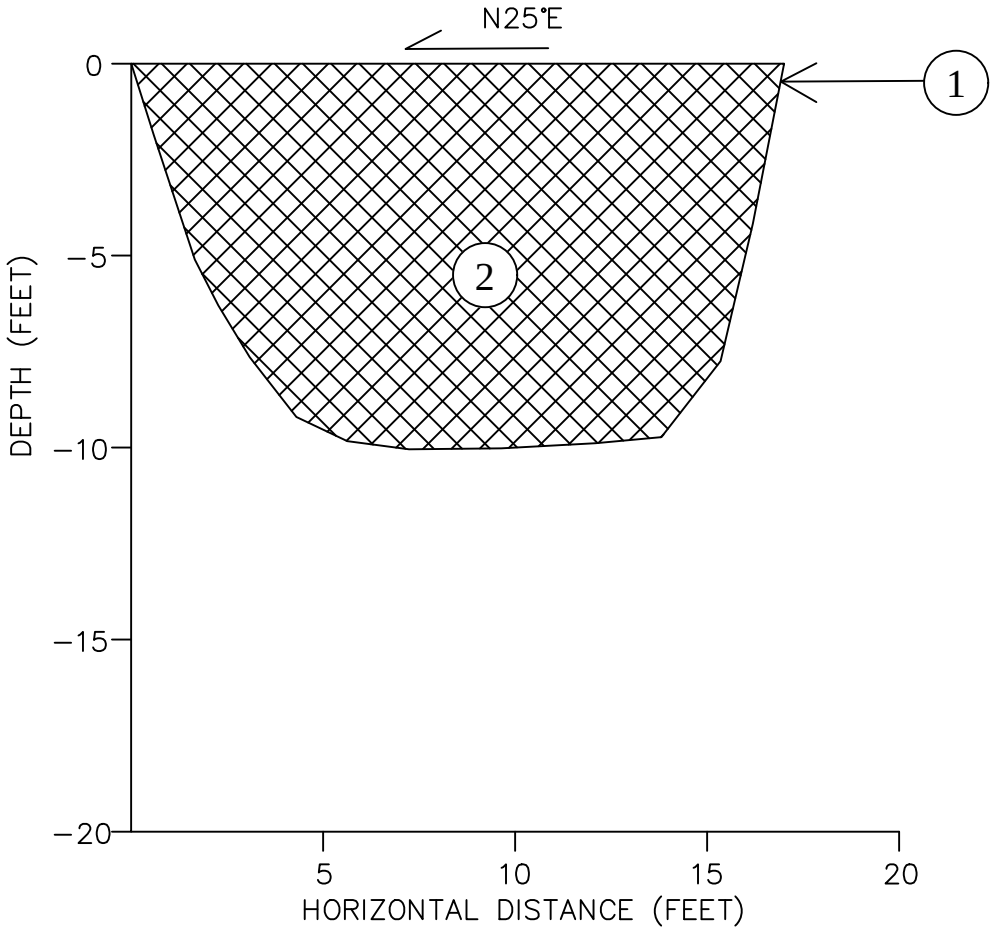

TEST PIT DESCRIPTION:

(1) Light brown, fine to medium SAND, trace gravel, (SP). [FILL]

(2) Grey, fine to coarse SAND, trace gravel, (SP), partially cemented materials. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 20 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-32

Project No.	Figure No.
700045403	D-28
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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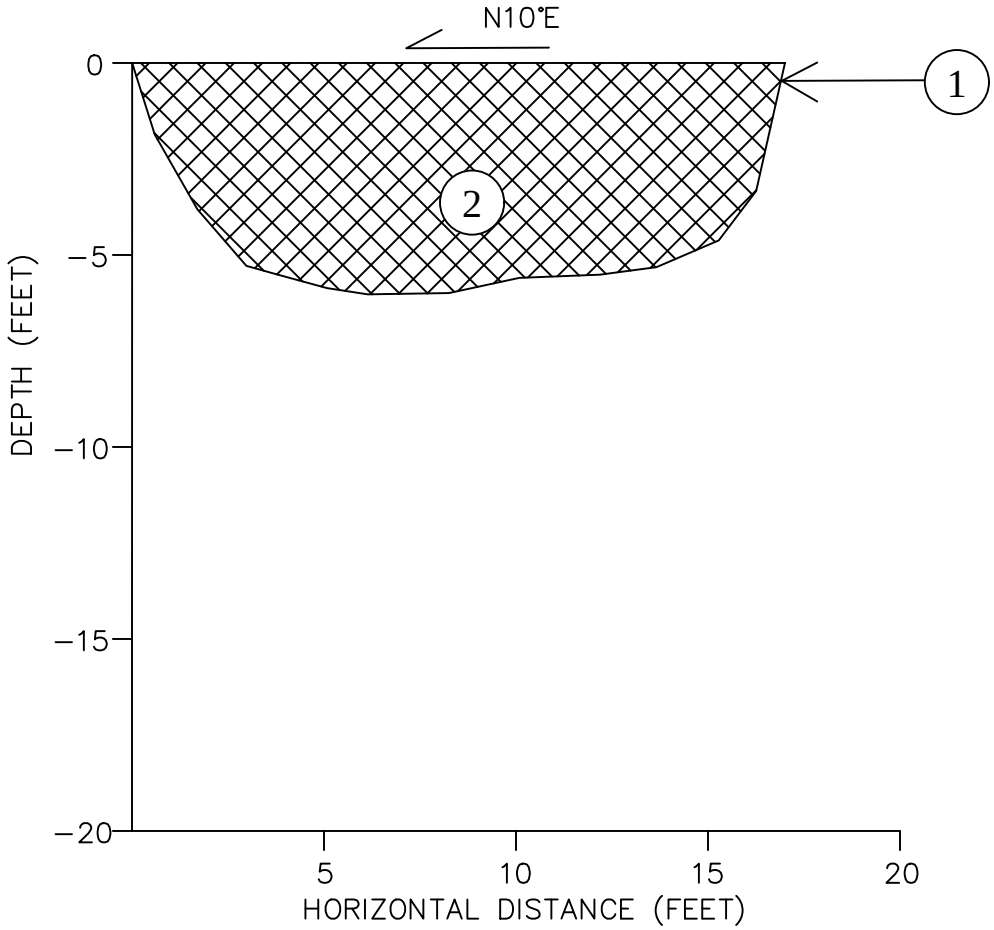

TEST PIT DESCRIPTION:

(1) Tan, fine to medium SAND, (SP). [FILL]

(2) Tan, fine to medium SAND, trace gravel, (SP), partially cemented materials. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 20 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-33

Project No.	Figure No.
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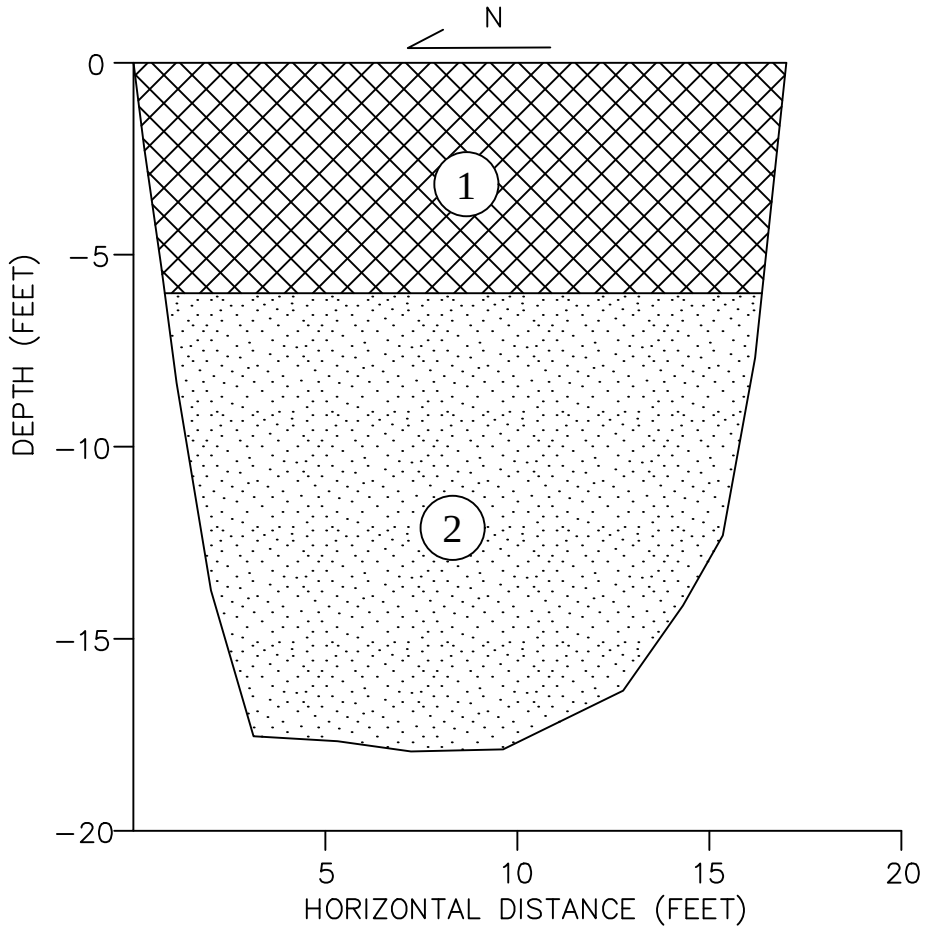

TEST PIT DESCRIPTION:

1. Tan, fine to medium SAND, tracel gravel, (SP). [FILL]

2. Gravelly SAND, trace cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 22 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-35

Project No.	Figure No.
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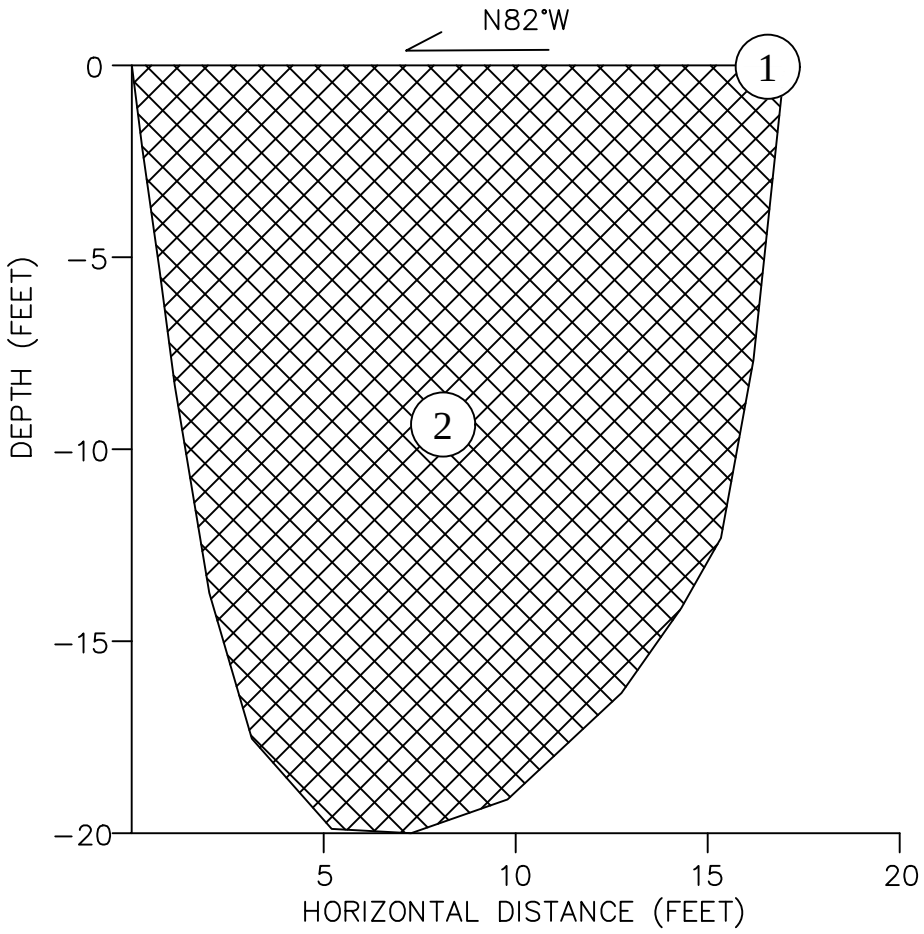

TEST PIT DESCRIPTION:

1. Cemented materials.

2. Brown, fine to coarse SAND, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 23 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-36

Project No.	Figure No.
700045403	D-31
Date: 28 APRIL 2017	
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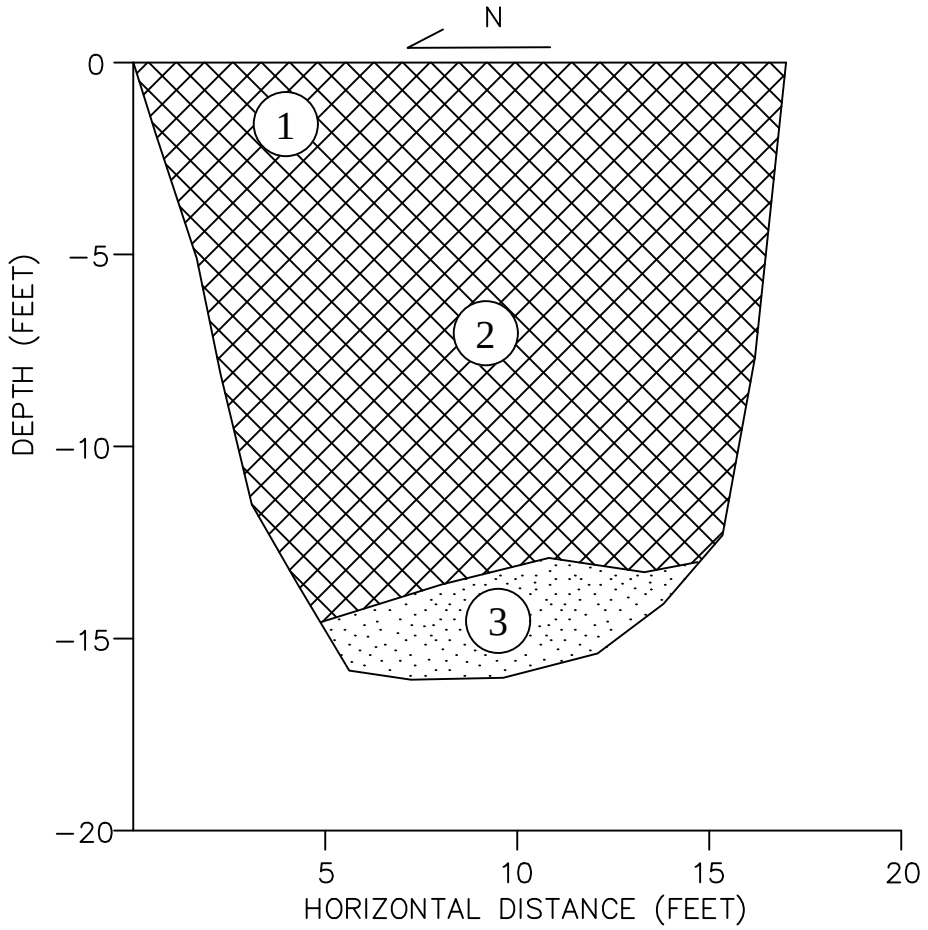

TEST PIT DESCRIPTION:

(1) Tan/light grey, fine to coarse SAND, trace gravel, (SP). [FILL]

(2) Light brown, fine to coarse SAND, (SP). [FILL]

(3) Light brown, fine to coarse SAND, trace gravel, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-39

Project No.	Figure No.
700045403	D-32
Date: 28 APRIL 2017	
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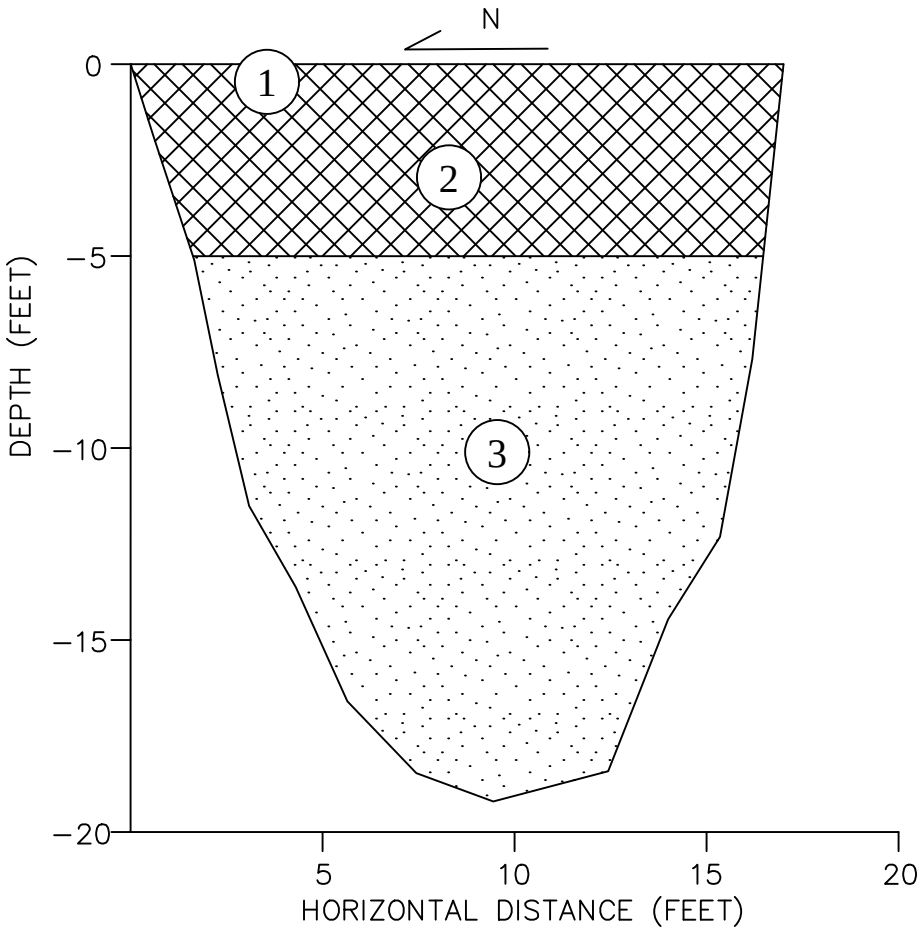

TEST PIT DESCRIPTION:

(1) Light grey, partially cemented material.

(2) Tan/grey, fine to coarse SAND, trace gravel and cemented materials, (SP). [FILL]

(3) Tan/grey, medium to coarse SAND, trace gravel and cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 26 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-40

Project No.	Figure No.
700045403	D-33
Date: 28 APRIL 2017	
Scale: 1" = 5'	
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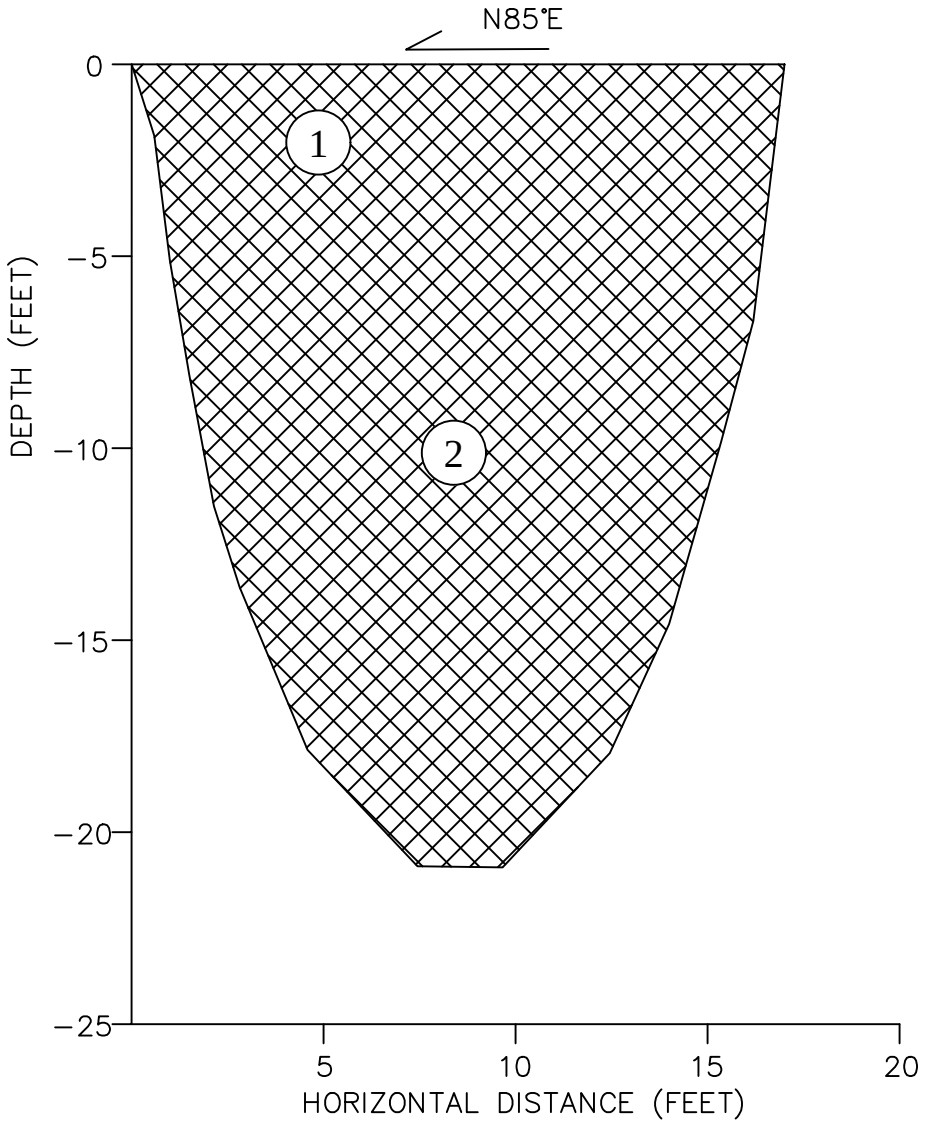

TEST PIT DESCRIPTION:

(1) Light grey, partially cemented materials and cement kiln dust (CKD) layers. [FILL]

(2) Tan/brown, fine to coarse SAND, trace gravel and cobbles, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-41

Project No.	Figure No.
700045403	D-34
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL / Drawn By: DJJ	

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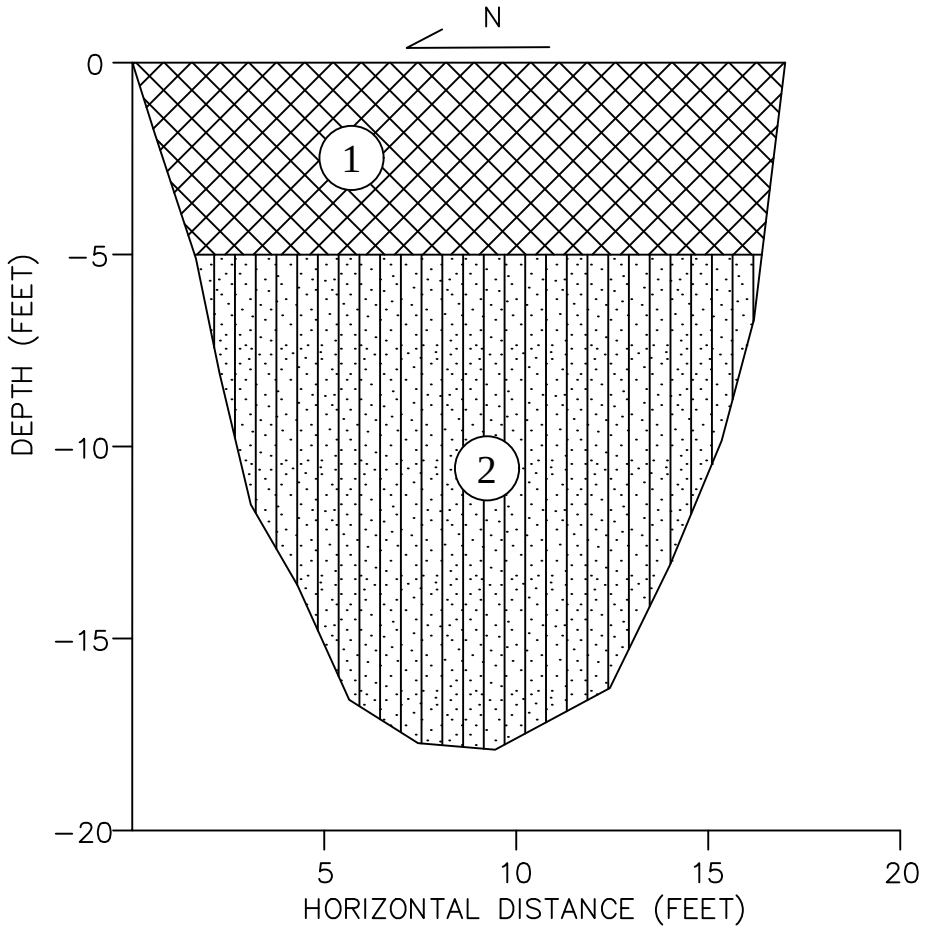

TEST PIT DESCRIPTION:

1. Tan, fine to coarse silty SAND, (SM). [FILL]

2. Tan, fine to coarse silty SAND, trace gravel, (SM). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 26 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-42

Project No.	Figure No.
700045403	D-35
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: DL / Drawn By: DJJ	

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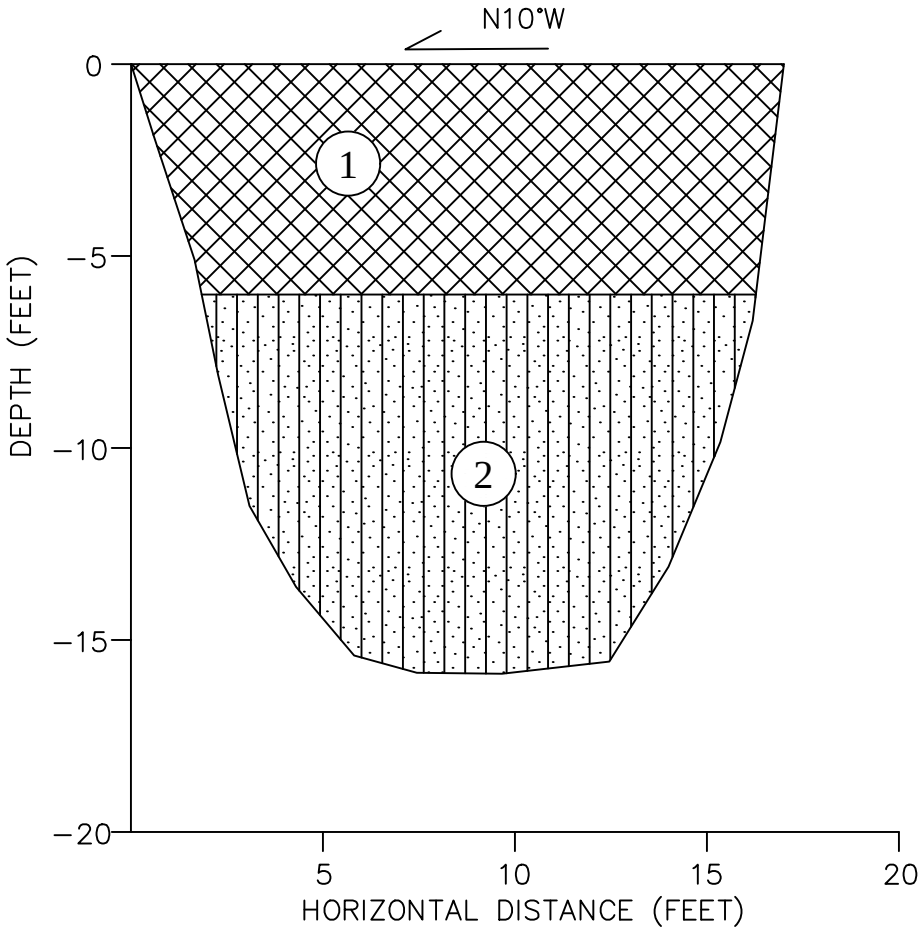

TEST PIT DESCRIPTION:

(1) Tan, fine to medium silty SAND, (SM). [FILL]

(2) Tan, fine to coarse silty SAND, (SM), trace gravel and cobbles. [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 26 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-43

Project No.	Figure No.
700045403	D-36
Date: JANUARY 2017	
Scale: 1" = 5'	
Logged By: DL / Drawn By: DJJ	

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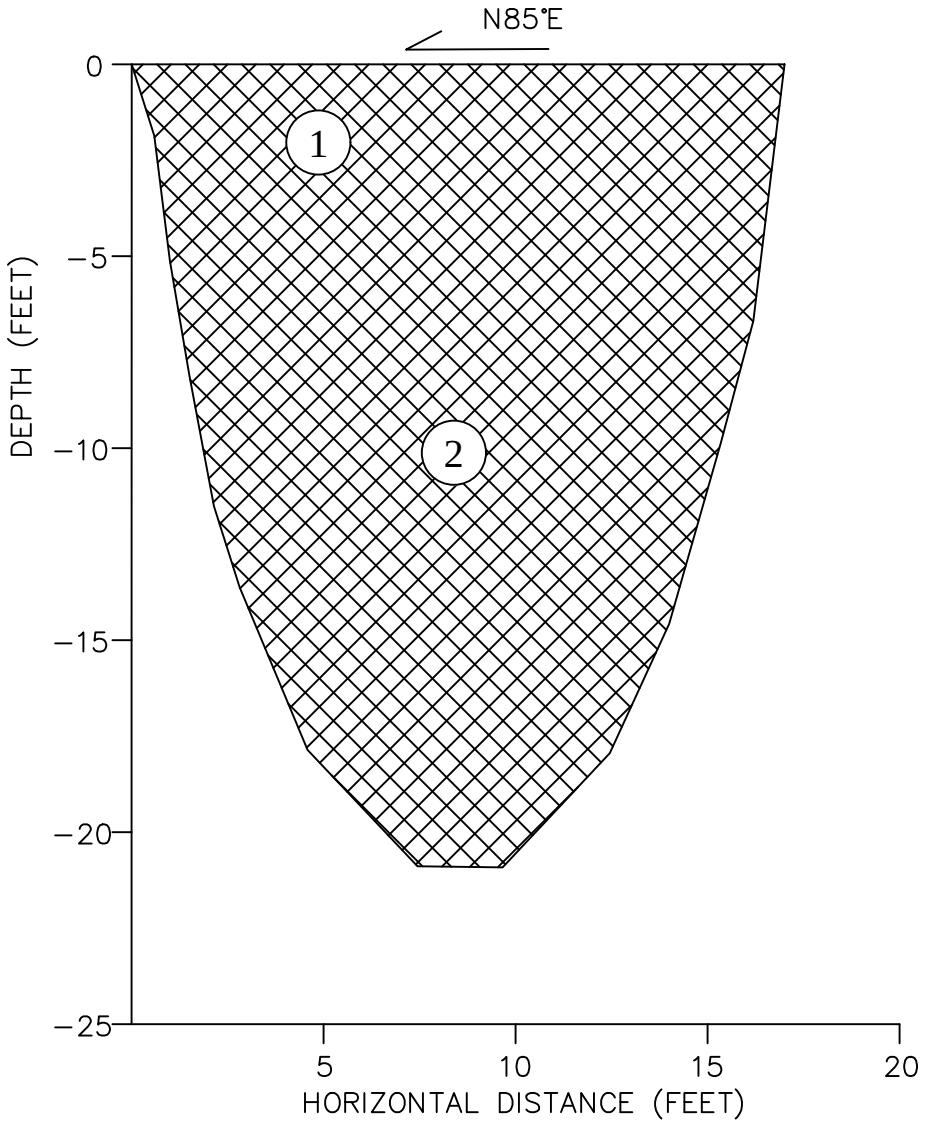

TEST PIT DESCRIPTION:

(1) Light grey, partially cemented materials and cement kiln dust (CKD) layers. [FILL]

(2) Tan/brown, fine to coarse SAND, trace gravel and cobbles, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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RIVERSIDE COUNTY CALIFORNIA

Figure Title: TEST PIT LOG LT-44

Project No.	Figure No.
700045403	D-37
Date: JANUARY 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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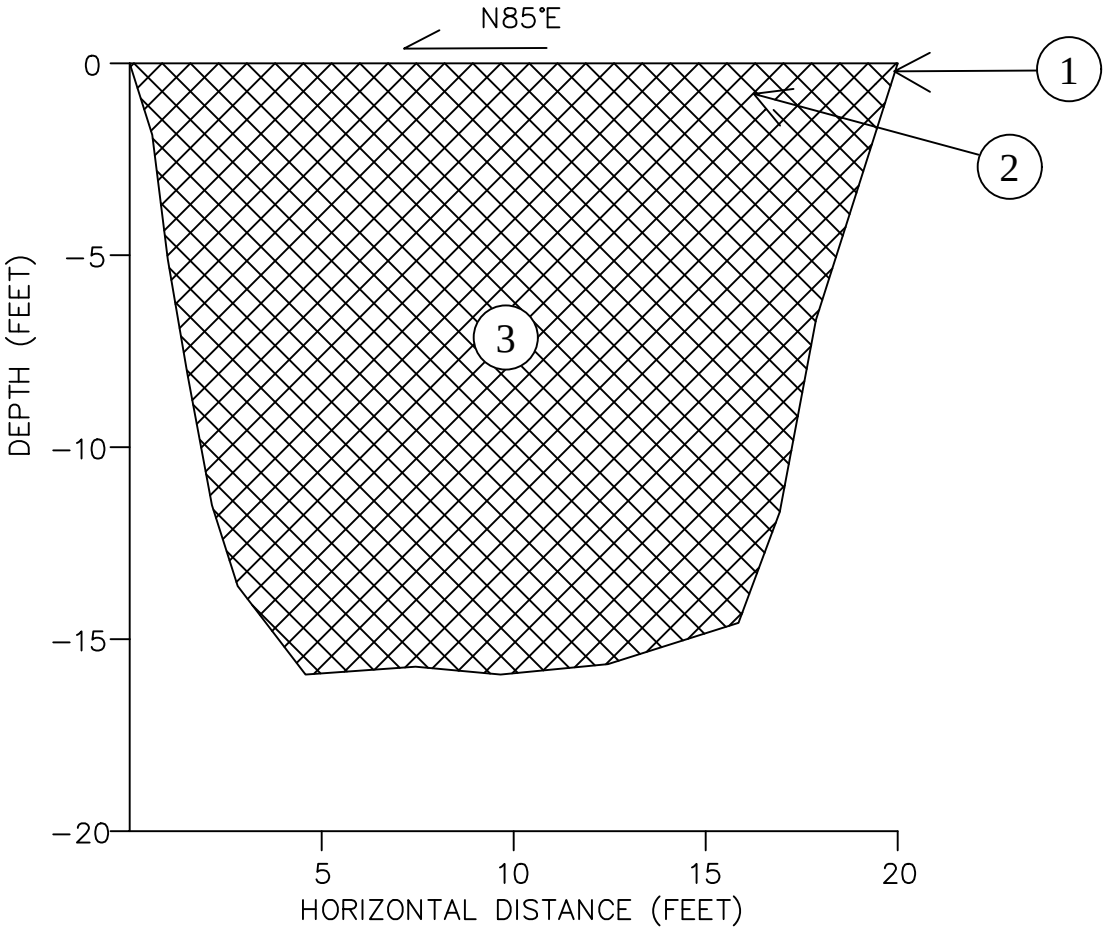

TEST PIT DESCRIPTION:

1. Cemented materials / asphalt
2. Brown, fine to medium SAND, (SP). [FILL]
3. Light brown, fine to medium SAND, trace clay and silt, (SM). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project: AGUA MANSA COMMERCE PARK
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RIVERSIDE COUNTY CALIFORNIA

Figure Title: TEST PIT LOG LT-45

Project No.	Figure No.
700045403	D-38
Date: JANUARY 2017	
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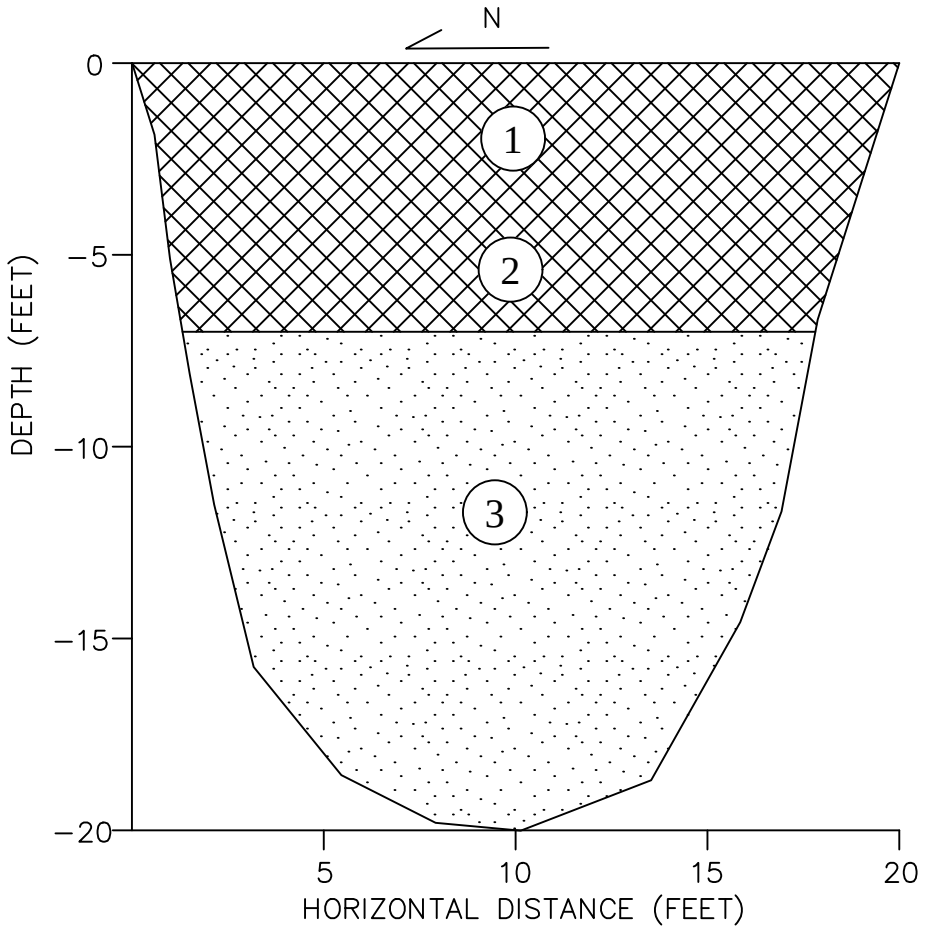

TEST PIT DESCRIPTION:

(1) Tan/light brown, fine to medium SAND, (SP). [FILL]

(2) Tan/light brown, fine to coarse SAND, trace gravel and cobbles, (SP). [FILL]

(3) Tan/light brown, fine to medium SAND, trace gravel and cobbles, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project: AGUA MANSA COMMERCE PARK
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Figure Title: TEST PIT LOG LT-46

Project No.	Figure No.
700045403	D-39
Date: JANUARY 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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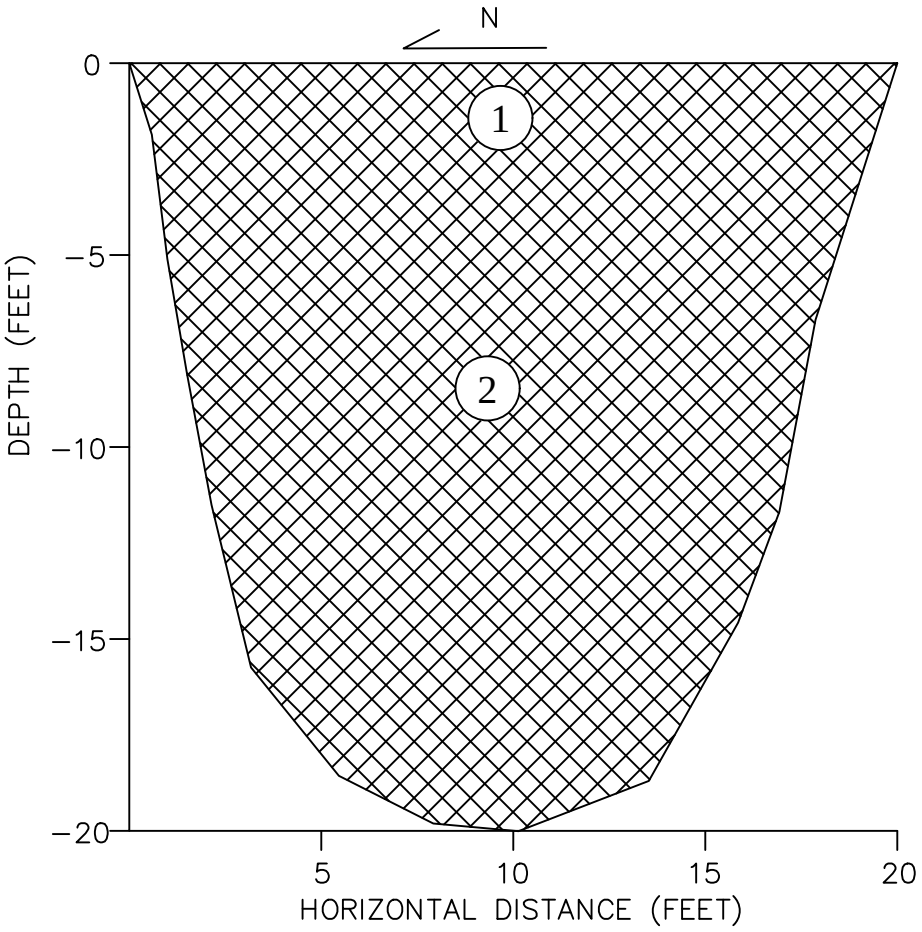

TEST PIT DESCRIPTION:

1. White/light grey, heavily cemented materials. [FILL]

2. Tan/brown, fine to medium SAND, trace silt and clay, (SM). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 29 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-47

Project No.	Figure No.
700045403	D-40
Date: JANUARY 2017	
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Logged By: DL	Drawn By: DJJ

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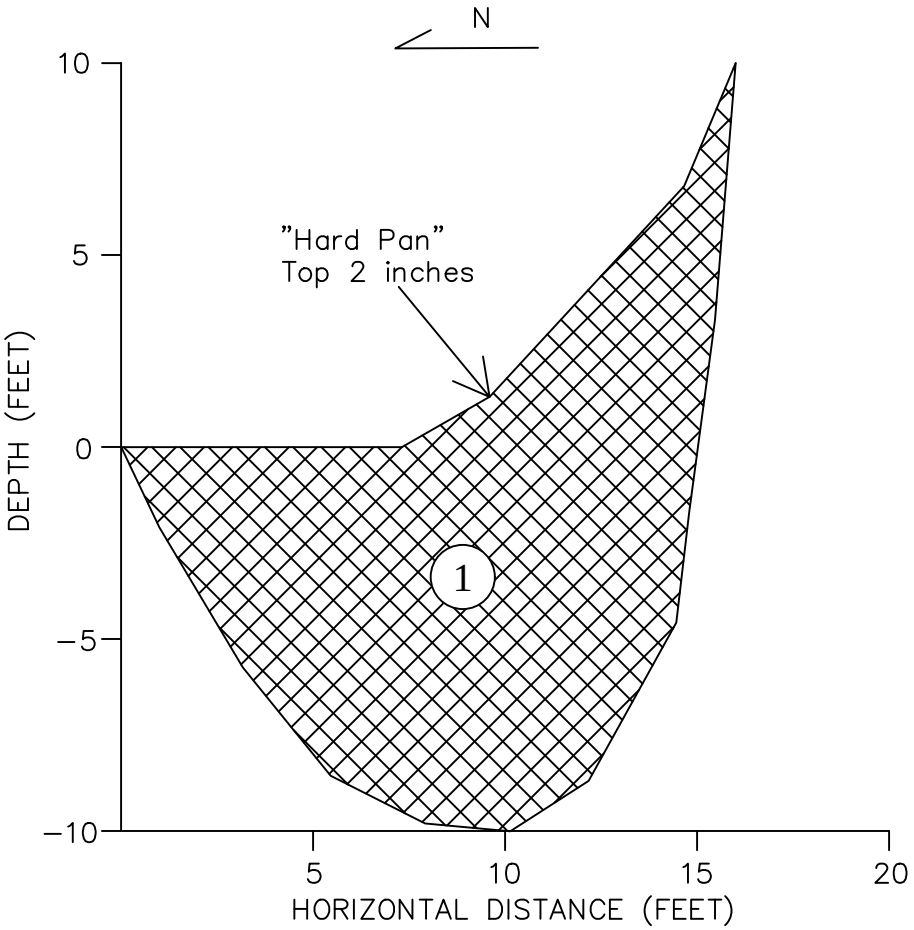

TEST PIT DESCRIPTION:

(1) Tan, fine to coarse SAND, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 29 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-CBermA

Project No.	Figure No.
700045403	D-41
Date: JANUARY 2017	
Scale: 1" = 5'	
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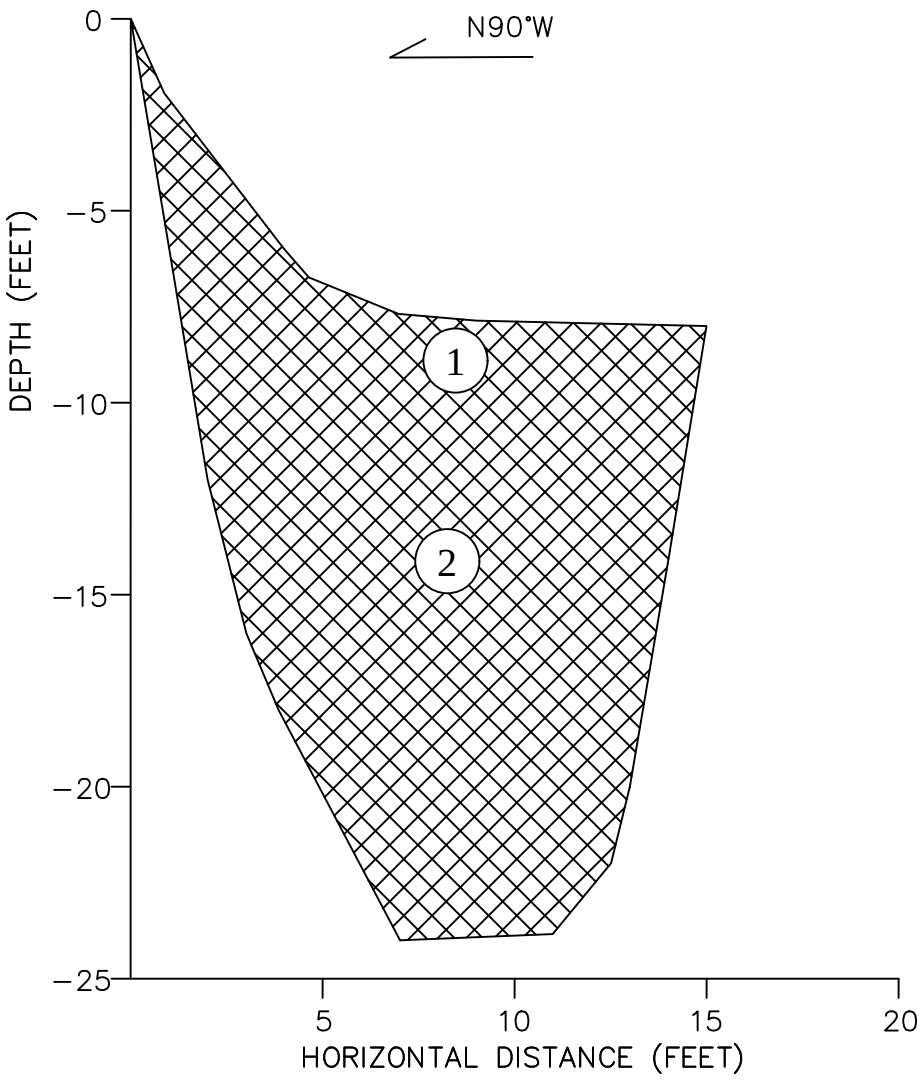

TEST PIT DESCRIPTION:

(1) Light tan, fine silty SAND, (SM). [FILL]

(2) Light tan, fine silty SAND, (SM), contains cement kiln dust pockets. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 27 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-MW1A

Project No.	Figure No.
700045403	D-42
Date: JANUARY 2017	
Scale: 1" = 5'	
Logged By: DL	Drawn By: DJJ

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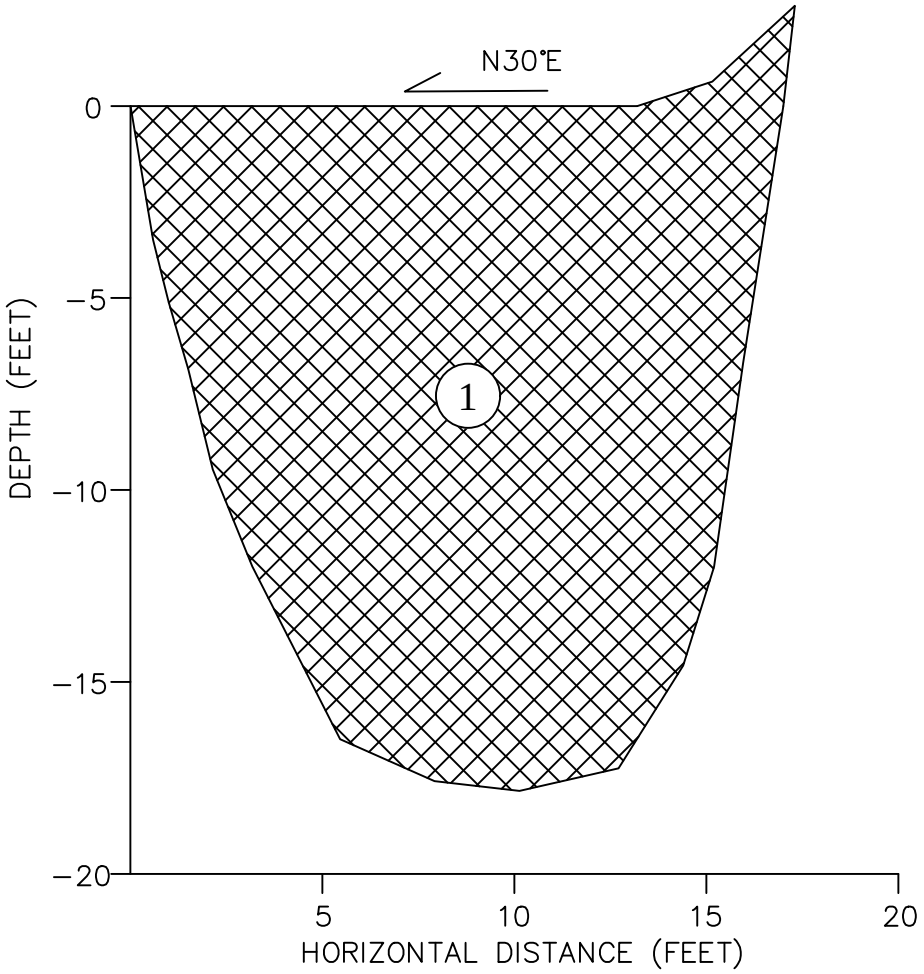

TEST PIT DESCRIPTION:

(1) Light tan, fine silty SAND, (SM), contains cement kiln dust (CKD) pockets. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-MW1B

Project No.	Figure No.
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Date: JANUARY 2017	
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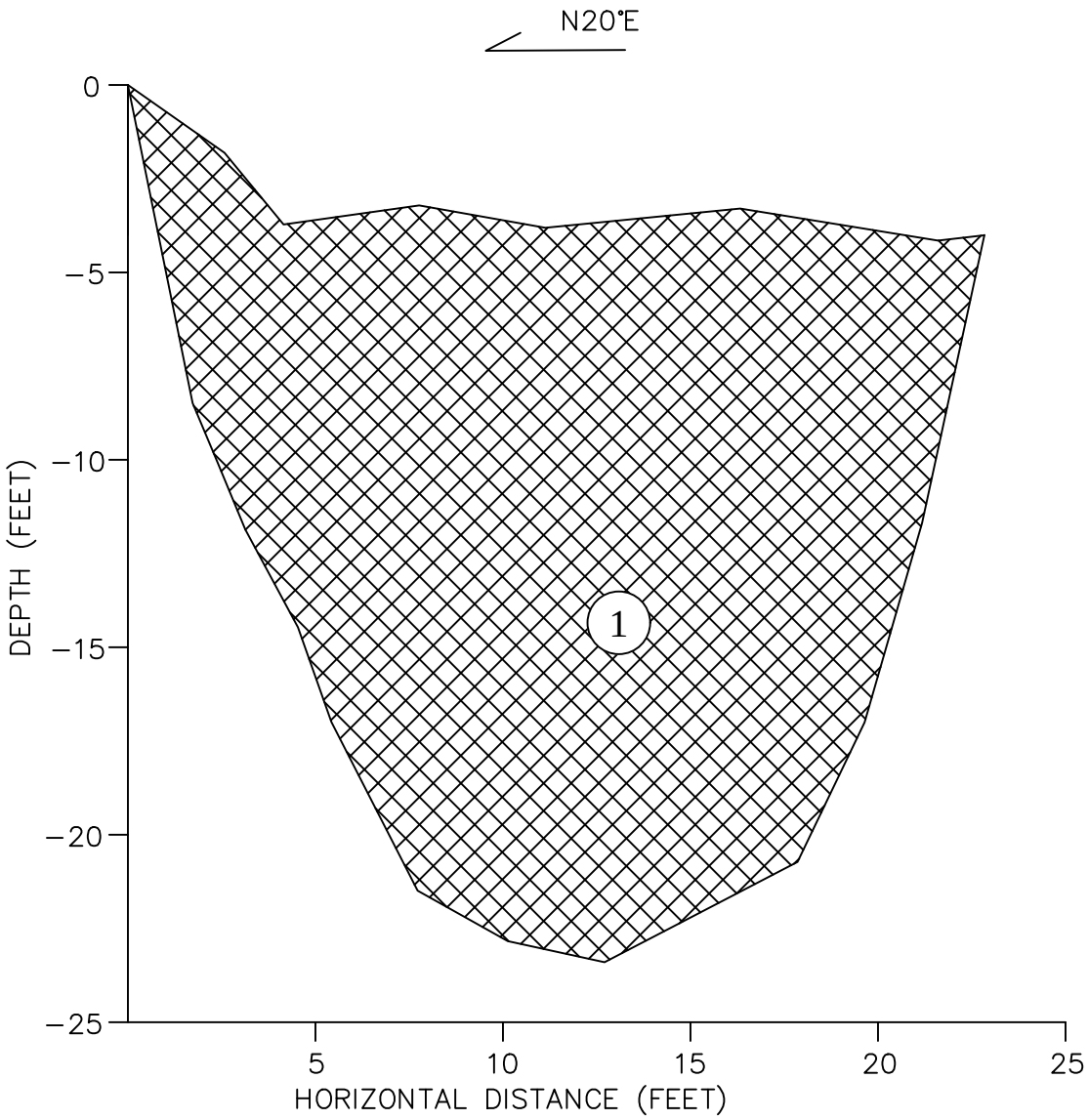

TEST PIT DESCRIPTION:

(1) Tan, fine to medium silty SAND, (SM), some cement kiln dust pockets. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-MW1C

Project No.	Figure No.
700045403	D-44
Date: JANUARY 2017	
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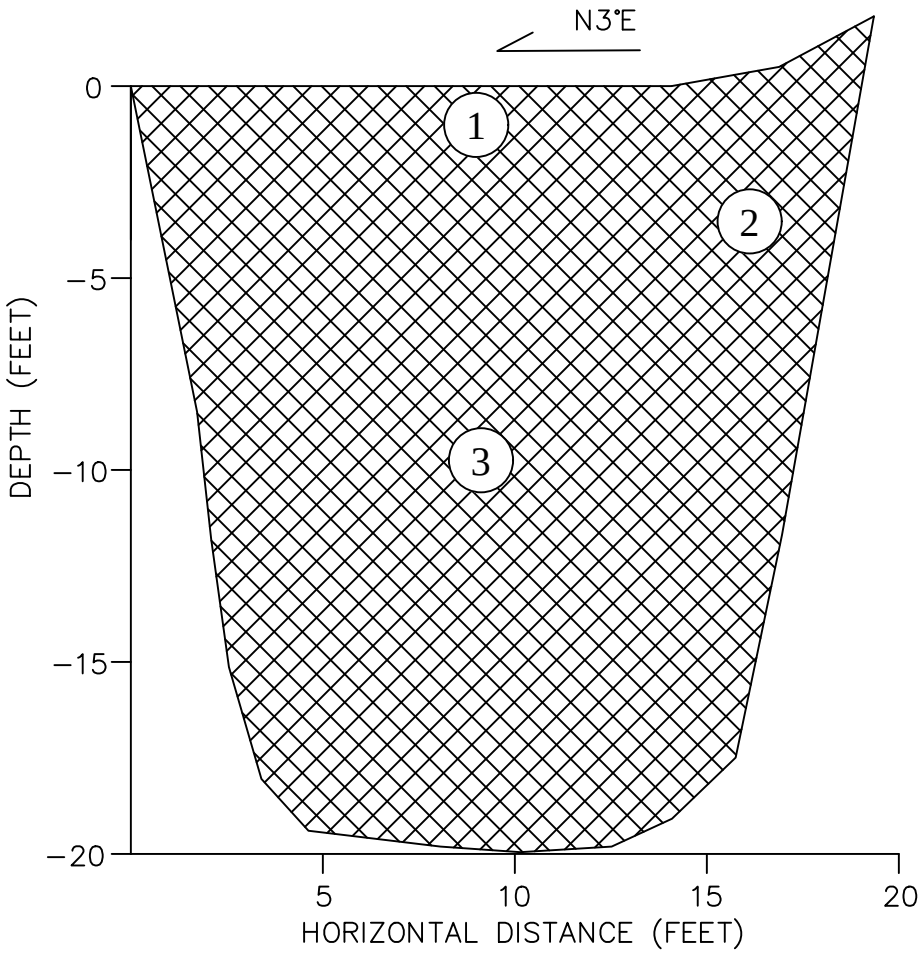

TEST PIT DESCRIPTION:

(1) White/light grey, partially cemented material. [FILL]

(2) Dark grey, fine to medium SAND, trace gravel and coal, (SP). [FILL]

(3) Tan, fine to medium SAND, trace gravel, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AN LOGGING.

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Figure Title: TEST PIT LOG LT-SBermA

Project No.	Figure No.
700045403	D-45
Date: JANUARY 2017	
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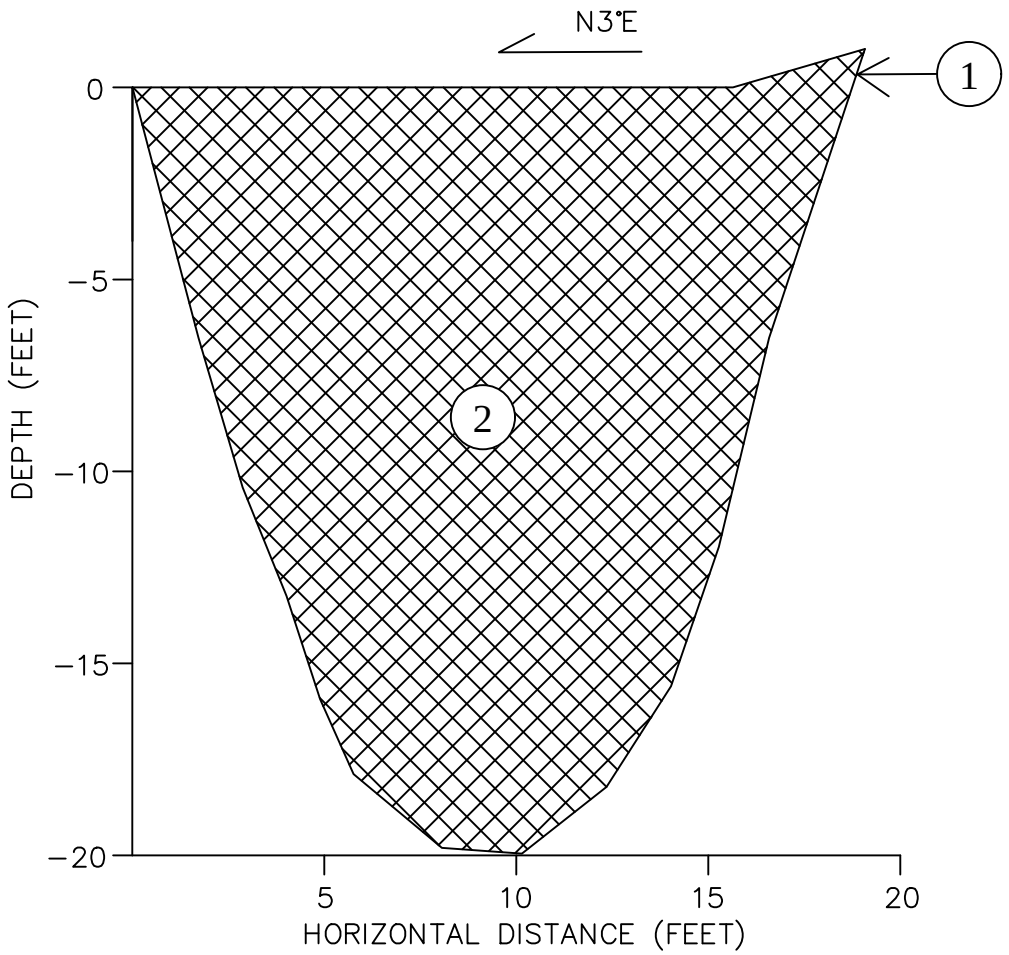

TEST PIT DESCRIPTION:

(1) White/light grey, partially cemented material. [FILL]

(2) Tan/light brown, fine to coarse SAND, trace gravel, (SP). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AN LOGGING.

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Figure Title: TEST PIT LOG LT-SBermB

Project No.	Figure No.
700045403	D-46
Date: JANUARY 2017	
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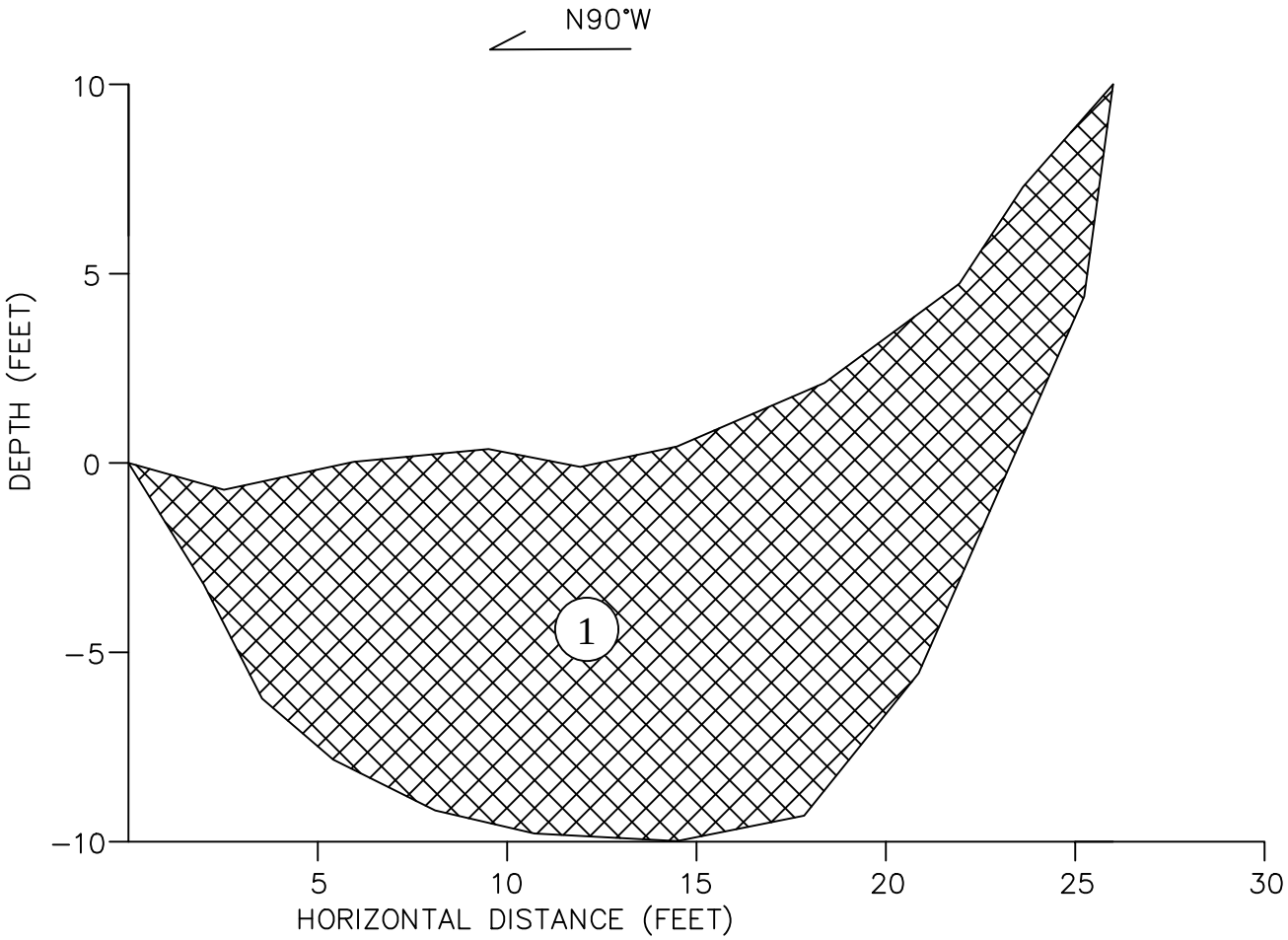

TEST PIT DESCRIPTION:

(1) Tan, fine silty SAND, (SM), trace cement kiln dust (CKD). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-EBermC

Project No.	Figure No.
700045403	D-47
Date: JANUARY 2017	
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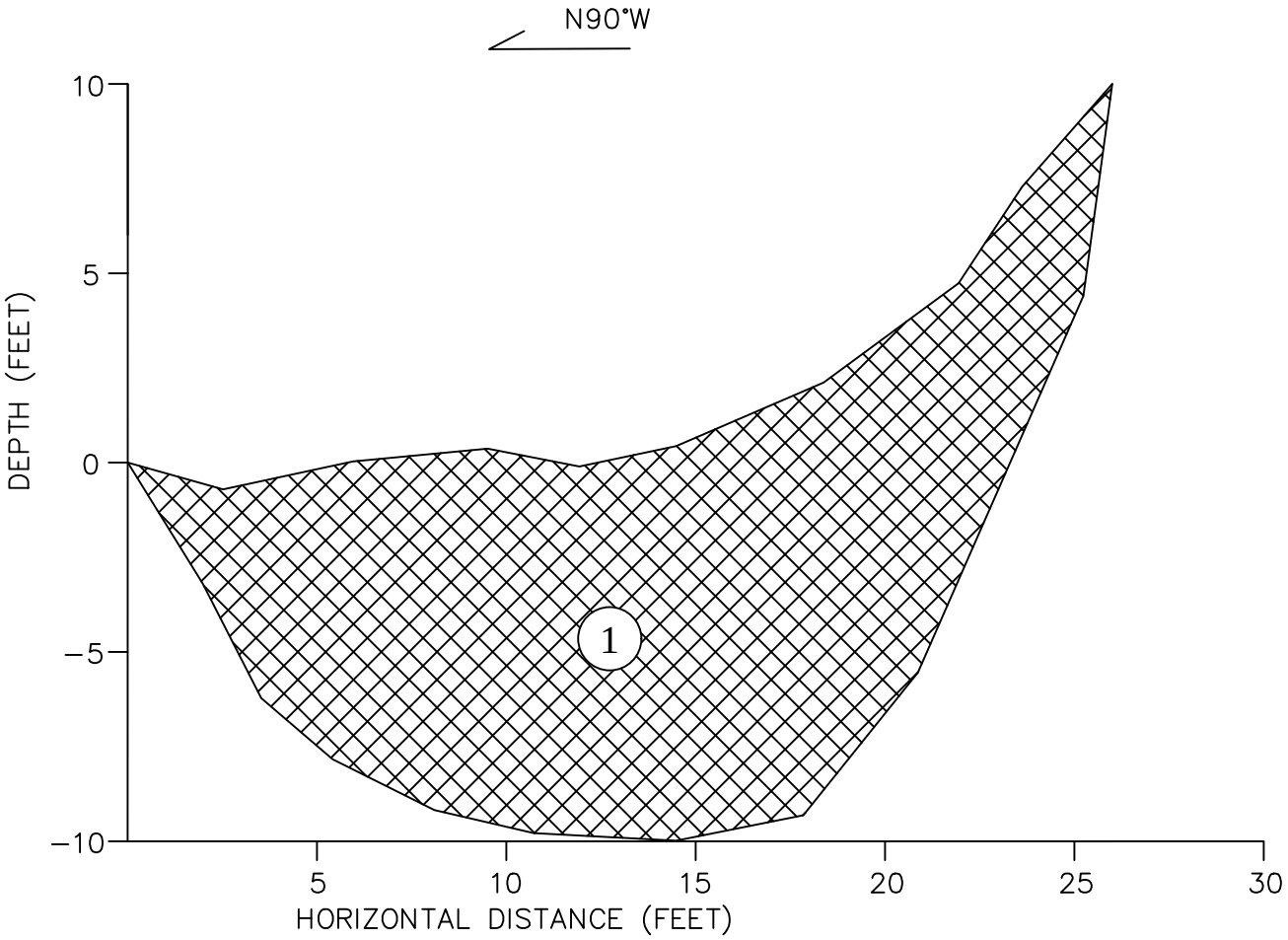

TEST PIT DESCRIPTION:

(1) Tan, fine to medium silty SAND, (SM), trace cement kiln dust (CKD) pockets. [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-EBermD

Project No.	Figure No.
700045403	D-48
Date: JANUARY 2017	
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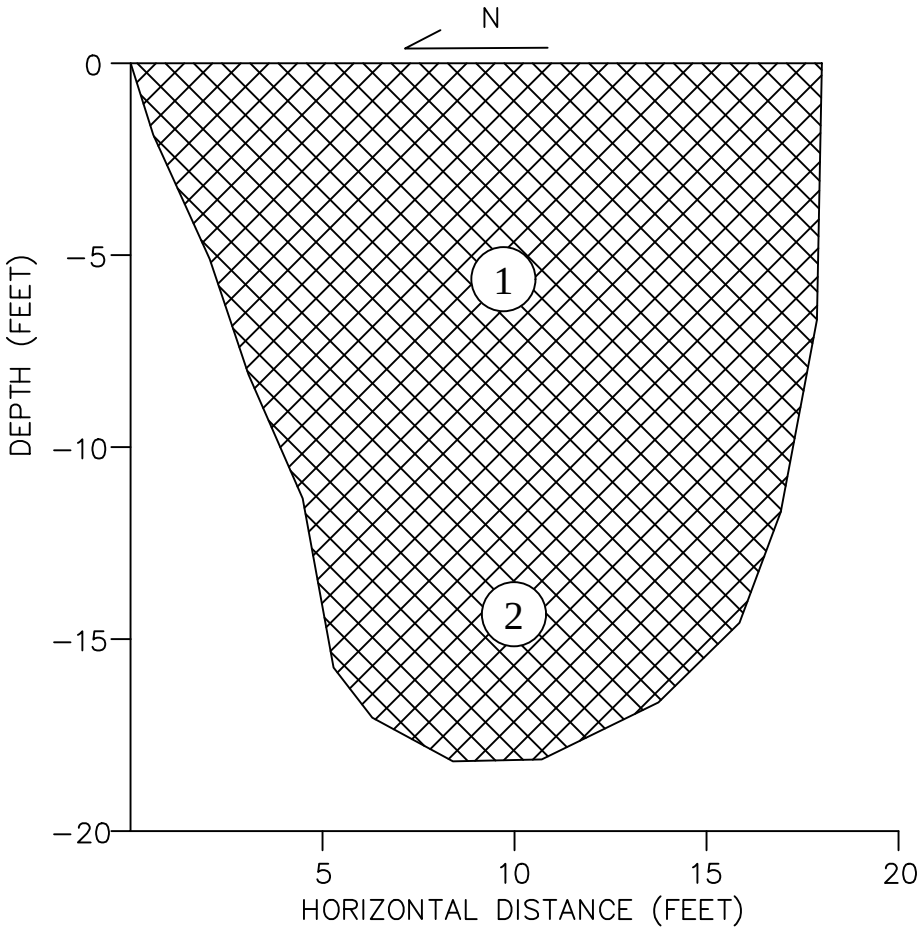

TEST PIT DESCRIPTION:

(1) Tan, fine silty SAND, (SM). [FILL]

(2) Tan, fine silty SAND, (SM), trace cement kiln dust (CKD). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-NBermA

Project No.	Figure No.
700045403	D-49
Date: JANUARY 2017	
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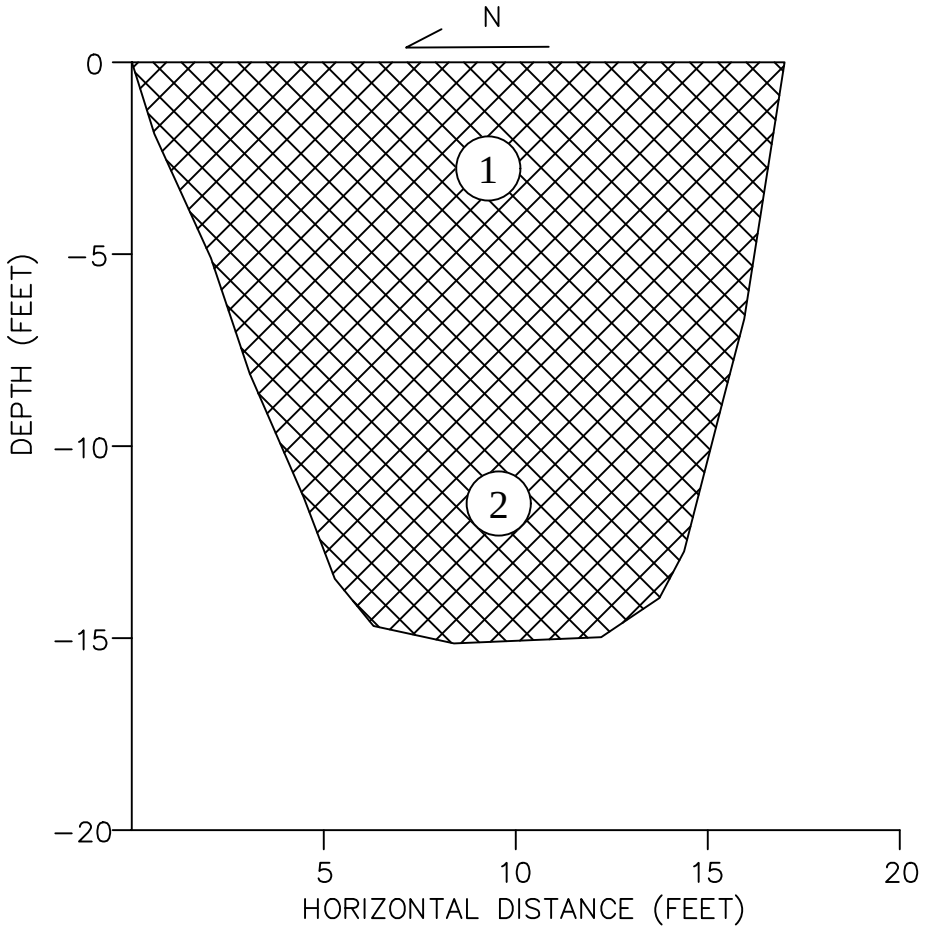

TEST PIT DESCRIPTION:

(1) Light grey, fine to medium silty SAND, trace gravel, (SM). [FILL]

(2) Tan, fine to medium silty SAND, (SM), trace cement kiln dust (CKD). [FILL]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 28 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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RIVERSIDE COUNTY CALIFORNIA

Figure Title: TEST PIT LOG LT-NBermB

Project No.	Figure No.
700045403	D-50
Date: JANUARY 2017	
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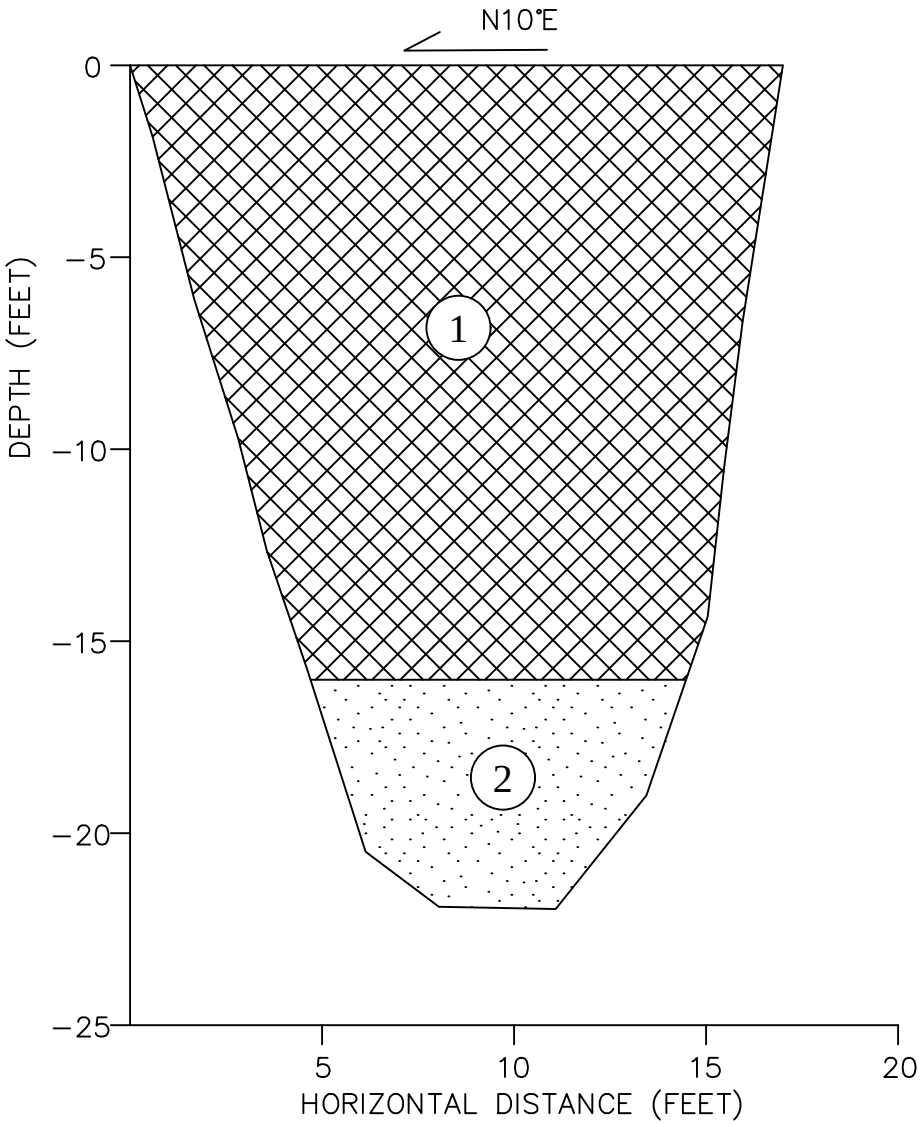

TEST PIT DESCRIPTION:

(1) Light brown, fine to coarse SAND, trace gravel, (SP). [FILL]

(2) Light brown, medium to coarse SAND, trace gravel, (SP). [Alluvial Deposits]

NOTES:

1. REFER TO FIGURE 2 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 29 SEPTEMBER 2016 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG LT-Sewer

Project No.	Figure No.
700045403	D-51
Date: JANUARY 2017	
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Logged By: DL	Drawn By: DJJ

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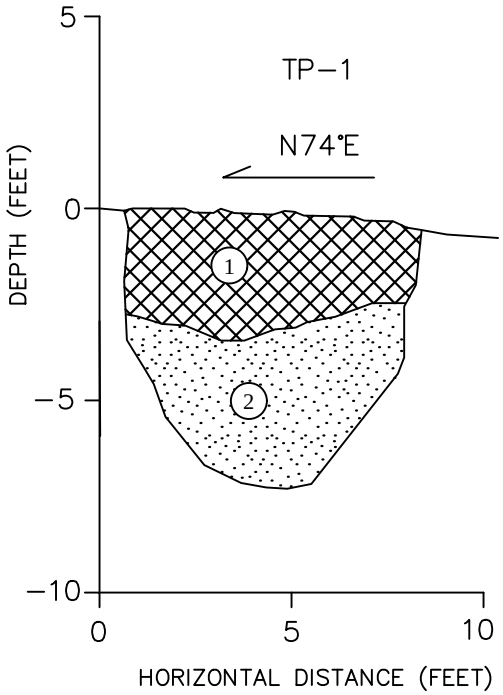
Filename: \\langan.com\data\IRV\data4\700045403\Cadd Data - 700045403\2D-DesignFiles\700045403 Test Pit Logs and Cross Sections.dwg Date: 4/26/2017 Time: 14:55 User: jbaron Style Table: Langan.stb Layout: LT-Sewer



TEST PIT DESCRIPTION:

(1) 7.5YR 5/4, silty fine to medium SAND, (SM), dry to slightly moist [FILL]

(2) 7.5YR 4/4, fine SAND, (SP), moist [Alluvial Deposit]

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Project: AGUA MANSA COMMERCE PARK
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Figure Title: TEST PIT LOG TP-1

Project No.	Figure No.
700045407	D-52
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB / Drawn By: DJJ	

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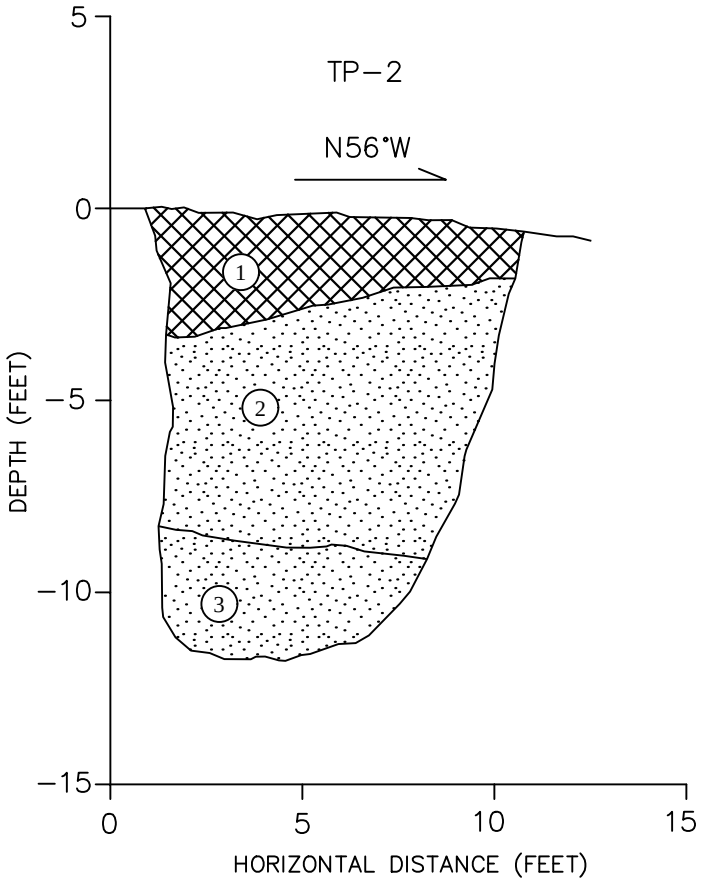

TEST PIT DESCRIPTION:

(1) 7.5YR 5/4, silty fine to medium SAND, (SM), dry to slightly moist, scattered roots and rootlets [FILL]

(2) 7.5YR 4/4, fine SAND, (SP), moist [Alluvial Deposit]

(3) 7.5YR 4/4, medium SAND, trace coarse sand, (SP), moist

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG TP-2

Project No.	Figure No.
700045407	D-53
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB	Drawn By: DJJ

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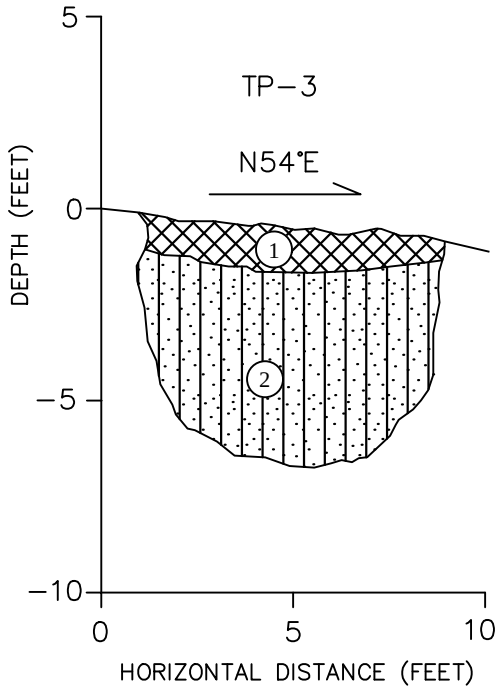

TEST PIT DESCRIPTION:

(1) 7.5YR 5/4, silty fine to medium SAND, (SM), dry to slightly moist [FILL]

(2) 7.5YR 4/4, fine to medium SAND, some silt, (SM), moist [Alluvial Deposit]

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG TP-3

Project No.	Figure No.
700045407	D-54
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB / Drawn By: DJJ	

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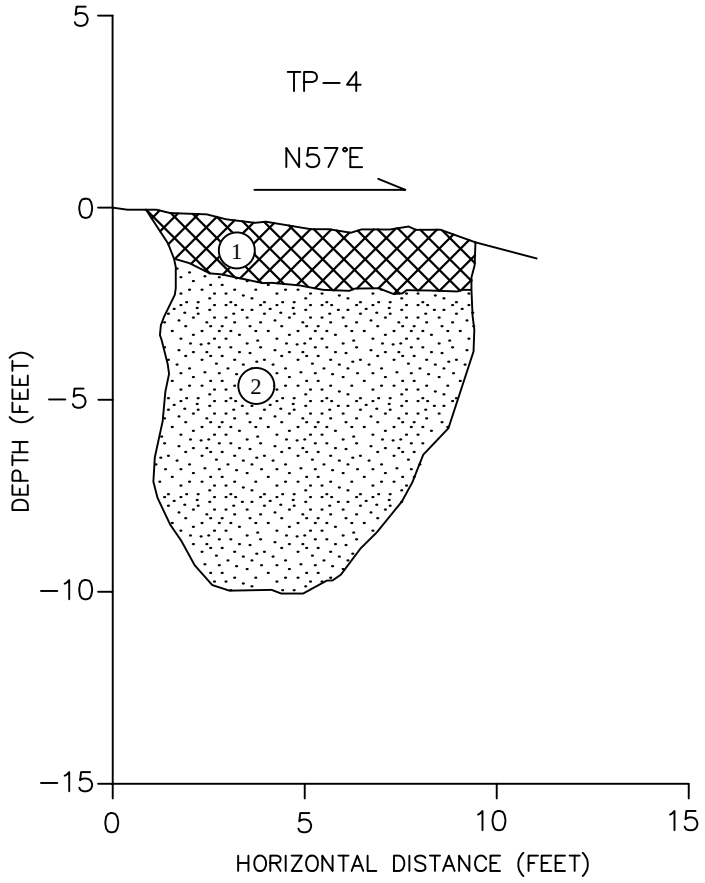
Filename: \\langan.com\data\IRV\data4\700045407\Cadd Data - 700045407\2D-DesignFiles\Test Pits.dwg Date: 4/28/2017 Time: 19:03 User: jbaron Style Table: Langan.stb Layout: TP-3



TEST PIT DESCRIPTION:

(1) 7.5YR 5/4, silty fine to medium SAND, (SM), dry to slightly moist [FILL]

(2) 7.5YR 4/4, fine SAND, (SP), moist [Alluvial Deposit]

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG TP-4

Project No.	Figure No.
700045407	D-55
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB	Drawn By: DJJ

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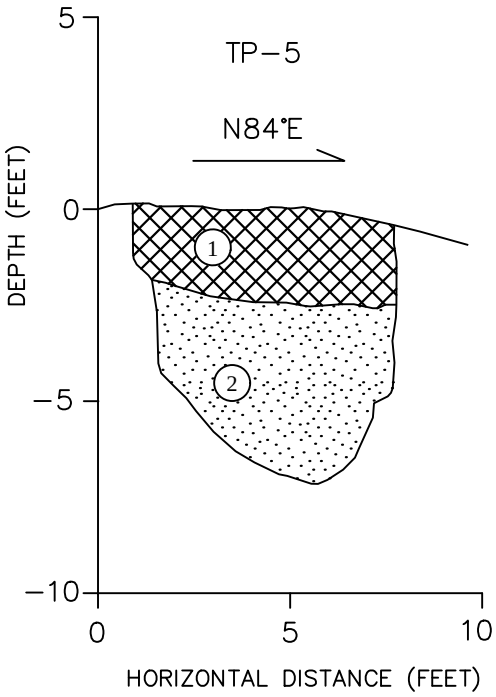
Filename: \\langan.com\data\IRV\data4\700045407\Cadd Data - 700045407\2D-DesignFiles\Test Pits.dwg Date: 4/28/2017 Time: 19:03 User: jbaron Style Table: Langan.stb Layout: TP-4



TEST PIT DESCRIPTION:

(1) 7.5YR 5/4, silty medium SAND, (SM), dry to slightly moist [FILL]

(2) 7.5YR 5/6, medium SAND, trace coarse sand (SP), moist [Alluvial Deposit]

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG TP-5

Project No.	Figure No.
700045407	D-56
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB / Drawn By: DJJ	

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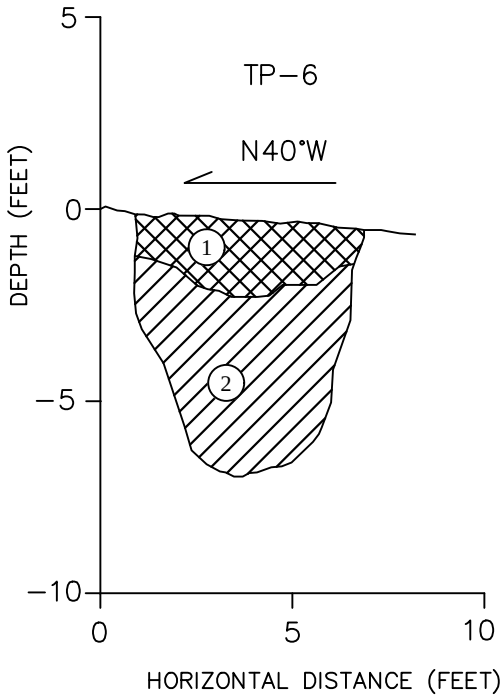
Filename: \\langan.com\data\IRV\data4\700045407\Cadd Data - 700045407\2D-DesignFiles\Test Pits.dwg Date: 4/28/2017 Time: 19:03 User: jbaron Style Table: Langan.stb Layout: TP-5



TEST PIT DESCRIPTION:

(1) 10YR 6/3, SILT, (ML), dry [FILL]

(2) 10YR 4/3, CLAY and fine SAND, (CL), slightly moist [Alluvial Deposit]

NOTES:

1. REFER TO FIGURE 1 FOR APPROXIMATE LOCATION OF TEST PITS.
2. TEST PIT WAS EXCAVATED ON 10 APRIL 2017 AND BACKFILLED AFTER OBSERVATION AND LOGGING.

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Figure Title: TEST PIT LOG TP-6

Project No.	Figure No.
700045407	D-57
Date: 28 APRIL 2017	
Scale: 1" = 5'	
Logged By: JAB / Drawn By: DJJ	

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APPENDIX E
Geophysical Investigation Report

Report of Geophysical Investigation

Former Crestmore Mine
Project #1609161J

Langan
Irvine, California

3505 Cadillac Ave O-209A
Costa Mesa, CA 92626
(714) 435-1073

SPECTRUM GEOPHYSICS, 3505 CADILLAC AVE O-209A, COSTA MESA, CA 92626

EXECUTIVE SUMMARY

Spectrum Geophysics was hired to conduct a geophysical investigation during September and October of 2016 at the Former Crestmore Mine in Jurupa Valley, California. The purpose of this investigation was twofold: The first task (Task #1) was to investigate for the presence of tunnels and shafts/adits associated with the former mine operation to a depth of 300 feet (where possible) to assess safety and proposed development concerns at the Site. The second task (Task#2) was to identify the depth to bedrock in the Wet Weather Quarry Area.

To accomplish Task # 1 Spectrum collected electrical resistivity and induced polarization data along three transects: Line 1RS was 220 ground meters (722 ground feet) and ran southwest to northeast in the Wet Weather Quarry Area; this line was established to explore for the presence of tunnels that could extend north of the Wet Weather Quarry area. Line 2RS was 108 ground meters (354 ground feet) and ran WSW-ENE across the known tunnel shaft in the southern portion of the Site; this line was established in an attempt to image and delineate the tunnel connected to the known tunnel shaft. Line 3RS was 220 ground meters (722 ground feet) and ran northeast-southwest, beginning just northwest of the north edge of the Former Crestmore Mine and extending to the southwest along the road south of the former White Cement Manufacturing Plant, where it was terminated at the fence just east of the railroad tracks; this line was established to explore for the presence of tunnels running south of the White Cement Manufacturing Plant and west of the Former Crestmore Mine. The locations of these transects are indicated in Figure 1.

To accomplish Task # 2 Spectrum collected p-wave seismic refraction data along two transects in the Wet Weather Quarry area: Line 1RF was 775 ground feet and ran southwest to northeast in the Wet Weather Quarry area. Line 2RF was 775 ground feet and ran SSW-NNE in the Wet Weather Quarry area. The locations of these transects are indicated in Figure 1.

Results of Surveys in the Wet Weather Quarry Area

Both the resistivity/IP and the seismic refraction data were useful in the Wet Weather Quarry Area. Based on a very high electrical resistivity response juxtaposed next to a low resistivity background material (assumed to be limestone) the electrical resistivity/IP data indicate the presence of a tunnel and possibly a shaft on Line 1RS in the Wet Weather Quarry Area. The p-wave seismic refraction data were able to detect the bottom of the quarry on Line 1 RF. The sections below contain a brief summary of the findings.

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Line 1RS

Electrical resistivity (upper image) and IP (lower image) profiles for Line 1RS are presented in Figure 2. The data indicate a high resistivity (7,000 Ohm-meters -dark red) feature with a response consistent with that of a vertical shaft between Stations 263 and 330 beginning at a depth of about 30 feet below ground surface (bgs) and extending to at least 160 feet bgs. It should be mentioned that there is a possibility that this high resistivity feature is associated with a vertical concrete column or a granitic intrusion instead of a vertical shaft ; this could be confirmed by drilling. In addition to this, the data indicate the presence of a horizontal tunnel, as evidenced by an extremely high resistivity feature-dark red- between Stations 582 and 687 beginning at a depth of 30 feet bgs on Line 1 (Figure 2).

Line 1RF

The seismic refraction profile for Line 1RF is presented in Figure 3. The data indicate a three-layer case, where Layer 1 is interpreted as the loose, weathered fill material at the Site and Layer 2 is slightly more consolidated and may contain cement kiln dust per conversations with Langan personnel. Layer 3 is interpreted as bedrock below the quarry, and has a velocity of 4,150 feet/s; the top of Layer 3 is encountered at about 140 feet bgs in the vicinity of Stations 350 to 550.

Line 2RF

The data collected along Line 2RF are still being processed at the time of this summary.

Results of Surveys in the Southern Portion of the Site

The resistivity/IP data were useful in the southern portion of the Site adjacent to the Former Crestmore Mine. Based on a very high electrical resistivity response juxtaposed next to a low resistivity background material the electrical resistivity/IP data confirm the presence of the known tunnel shaft and have identified several other tunnel or shaft-like features. The sections below contain a brief summary of the findings.

Line 2RS

Electrical resistivity (upper image) and IP (lower image) profiles for Line 2RS are presented in Figure 4. The data indicate a steeply northeast dipping high resistivity (3,000 to 4,000 Ohm-meters -dark red) feature between Stations 160 and 200 on Line 2RS that begins about 15 feet below ground surface. This feature exhibits a response consistent with that of a

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vertical shaft, and extends to at least 80 feet bgs; it is therefore interpreted to be associated with the known vertical shaft located just north of the center of Line 2RS. In addition to this, the data indicate the presence of a horizontal tunnel that connects to the shaft at about 40 feet bgs between Stations 200 and 300; this tunnel then appears to continue to the east (Figure 4). Another possible vertical shaft is indicated between Stations 40 and 70 as evidenced by the elevated resistivity (100 to 200 Ohm-meters) response over background.

Line 3RS

Electrical resistivity (upper image) and IP (lower image) profiles for Line 3RS are presented in Figure 5. The data indicate several extremely high resistivity (over 10,000 Ohm-meters – dark brown) anomalies; these are all believed to be associated with shafts or tunnels, and they extend to depths of 50 to 100 feet bgs. The locations of these anomalies are identified in Figure 5 and are as follows:

- Between Stations 65 and 157 beginning about 5 feet bgs and dipping to the northeast
- Between Stations 234 and 334 beginning about 66 feet bgs at Station 234 and dipping to the northeast
- Between Stations 372 and 390 at about 30 feet bgs (may be a tunnel running perpendicular to Line 3)
- Between Stations 401 and 460 beginning about 20 feet bgs

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LIST OF FIGURES

FIGURE	TITLE
1	Geophysical Investigation Map
2	Resistivity and Induced Polarization Profiles – Line 1RS
3	Seismic Refraction Profile – Line 1RF
4	Resistivity and Induced Polarization Profiles – Line 2RS
5	Resistivity and Induced Polarization Profiles – Line 3RS

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The Fisher M-Scope was used to investigate for the presence of near-surface buried metallic material and utilities at the Property. The M-Scope has a transmitter and a receiver at the ends of a short boom. The transmitter emits a radio-frequency source signal that induces a secondary magnetic field in metallic material in its immediate vicinity. The receiver measures the signal strength of this secondary magnetic field and emits an audible response, the volume and pitch of which increase in the presence of metallic material. The sensitivity of the M-Scope allows the precise identification of the lateral boundaries of a metallic object.

1.1 **Utility Locators**

A Radiodetection RD-400 Utility Locator and a Dynatel 500A Cable Locator were used at the Property to check for the presence of utilities associated with the existing oil wells, and to follow up on identified EM-31 anomalies. Utility locators are specifically designed to accurately locate and delineate metallic underground pipes and utilities. These locators are designed to detect the magnetic field resulting from an electric current flow on a line.

During the use of a locator, a transmitter emits a radio-frequency source signal that induces a secondary electromagnetic field in nearby utilities. A receiver unit measures the signal strength of this secondary magnetic field and emits an audible response to allow the precise location and tracing of the pipe, cable, or other conductor in which the signal is induced. If the utility is accessible, the source signal can be directly connected to it, which makes the secondary field much larger and more readily measurable. The line tracer is effective for the location of long, linear metallic objects.

2.0 **ELECTRICAL METHODS**

Electrical resistivity and IP methods have historically been used in mineral exploration to identify buried ore bodies and disseminated sulfide deposits; however, more recently they have been used in environmental and groundwater studies.

2.1 **Resistivity**

The electrical resistivity of a material is a measure of the ease with which an electrical current can flow through that material. In the electrical resistivity method a DC circuit is established in the ground via cables and electrodes, and the ground acts as the resistor to complete the circuit. The resistivity method calculates the electrical resistance of the ground by sending a known amount of current through a known section of ground via electrodes and measuring the potential difference between two other electrodes some distance from the current electrodes.

A useful property of electrical resistivity for *dry* sedimentary soils and rocks is that an increase in grain size generally causes an increase in resistivity (e.g. coarse-grained materials such as gravel or cobbles have higher resistivity values than finer grained materials such as fine sands and silts).

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Because the electrical resistivity of a material correlates well with grain size, this method can be used not only to identify lateral and vertical boundaries between different materials but also to identify the lithology of the material (e.g. sand vs. silt vs. clay). In sedimentary rocks, the bulk resistivity is approximately equal to the resistivity of the pore fluid divided by the fractional porosity, where electrical current flow through these materials is primarily electrolytic. As a result, permeable materials (such as coarse sands or sandstones) are typically less resistive (or more conductive) when *fully saturated* than when dry – making the electrical resistivity method useful for many groundwater applications. In addition, because ionic conduction is enhanced by the presence of dissolved salts in the pore fluid, soils and rocks saturated with saline or high-TDS groundwater will have significantly lower levels of resistivity than soils and rocks bearing fresh water.

In the case of attempting to transmit electrical current through a void space, such as a mine shaft or tunnel, essentially there is no path for the current to take across that void space. Therefore, the electrical resistivity of that void space is *very high (essentially infinite)* unless the void space is completely filled with water.

It is important to note that clay will also give rise to low resistivity measurements. While clay is not permeable, the presence of clay minerals in soil or rock will decrease the resistivity for two reasons: 1) because clay minerals can combine with water and 2) because clay minerals tend to ionize and contribute to the supply of free ions in a material, thereby providing another path for current to travel along. Because clays, in addition to high chloride/high TDS water, will give rise to low resistivity measurements, the polarization property of clays was used to discriminate clays from brackish or saline groundwater during this project. Clays generally polarize in the presence of an injected current because of the property of *membrane polarization.*

2.2 **Induced Polarization**

The induced polarization method measures the ability of a material to polarize, or hold charge. IP is also known as "complex resistivity," or resistivity as a function of time (time domain IP) or frequency (spectral IP). In the time domain IP method used by the SuperSting, a known amount of current is injected into a section of ground via electrodes, the current is then turned off, and the voltage between two other electrodes some distance away is measured at specific time intervals (or gates) after current turn off during a specified integration time (in this case 2 seconds). For each measurement location, the measured residual voltage at each time gate is then normalized by the primary voltage, and the result is called chargeability, with units of mV/V or milliseconds (ms) and can be plotted on a decay curve. Electrical resistivity and IP data are typically displayed in 2D sections or profiles, where they supply lateral and vertical electrical resistivity/chargeability information about materials directly below a given transect (much like a road cut).

The chargeability of a material is based on its ability to polarize, or hold charge. IP is a surface phenomenon which takes place at the interface between an electrolyte and a mineral grain. The chargeability of a material depends on the salinity of the electrolyte, grain size distribution, ion exchange properties of the interface, thickness of the electrical double layer, current pulse duration and excitation frequency. Clays and disseminated mineral deposits tend to have higher

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chargeability than sands or granites because they tend to have more free ions available. In time domain IP, certain layered earth situations where there is a sharp drop in resistivity with depth (such as in the case of resistive alluvium over materials bearing high salinity fluids) can cause the discharge current to flow in the opposite direction, resulting in negative chargeability values (Nabighian and Elliot 1976).

Res/IP Data Processing

The data file saved for each transect was entered into the software program EarthImager® (Advanced Geosciences, Inc., 2010). This program reads the data file, which contains information such as electrode spacing, length of transect, number of repeat measurements per electrode, and type of resistivity/IP array. Once the data are read into EarthImager® each raw data set is reviewed for indication of erroneous or noisy data using interactive displays of several different measurement parameters, depending on the type of data. The resistivity data were reviewed for measured voltage, apparent resistivity, injected current, repeatability and geometric factor. The IP data were reviewed for measured voltage, apparent chargeability, voltage decay curve, and correlation coefficient. During this process care was taken to review cultural features such as utilities and vaults, so that noisy or suspect data points could be removed from the final measured resistivity and chargeability pseudosections. This final edited data file was then saved and used for the inversion procedure.

To carry out the inversion the final edited data file containing both the measured apparent resistivity pseudosection and the measured apparent chargeability pseudosection is read into EarthImager®, topography information is read into the program and the data are then sorted into finite element blocks, where each block is assigned an initial resistivity/chargeability value. A forward modeling algorithm that uses a non-linear least squares optimization technique is used to first calculate synthetic apparent resistivity/apparent chargeability values that would be measured with the given array type for the starting model. The data are then jointly inverted using a non-linear inversion routine for resistivity and a linear inversion routine for the IP chargeability data, where the *synthetic calculated* apparent resistivity/apparent chargeability values are then compared with the *actual measured* apparent resistivity/apparent chargeability values, and the difference between the two used to improve the model to produce a resistivity/chargeability model that has a lower root-mean-square (RMS) error fit to the measured sections. The program advances through a series of iterations to improve the model until an acceptable error level is reached (usually 10% or less) or the inversion converges.

For each transect, the final product of the processing is two color-contoured model sections – one of resistivity and one of chargeability. The final fitting error between the *synthetic calculated* apparent resistivity/apparent chargeability pseudosection and the *actual measured* apparent resistivity/apparent chargeability pseudosection is represented as the RMS (root mean square) in percent.

It should be noted that the resolution of the resistivity/IP method decreases with increasing depth. Therefore, the finite element mesh becomes coarser with depth, providing lower resolution and a more generalized model. This tends to produce broadening and flattening along the lower

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boundary. The highest resolution and most accurate depth conversion data are provided in the upper 30% of the model section, where the overall resolution is approximately one-half the unit electrode separation. In generation of the final model sections for Lines 1 and 2 and 3, one standard color scheme was used for resistivity and one standard color scheme was used for chargeability. This was done to facilitate interpretation and provide a means to compare the results from line to line.

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N
W E
S
NORTH

Scale in feet
0 100 200

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"Revealing The Subsurface"

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Costa Mesa, California 92626
(714) 435-1073 www.spectrum-geophysics.com

Geophysical Investigation Map

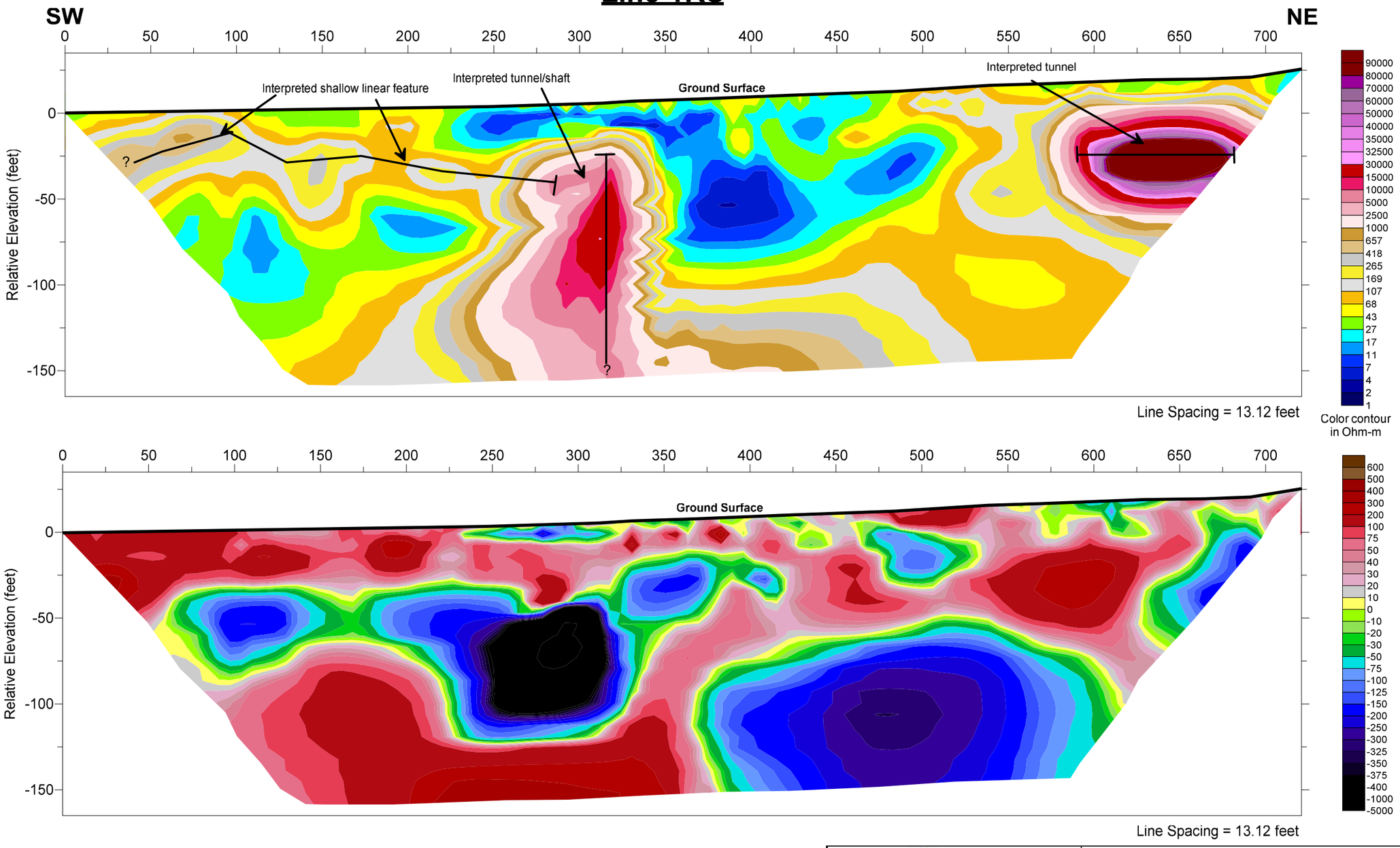
PROJECT: Geophysical Investigation
Former Crestmore Mine
Jurupa Valley, California

PREPARED FOR: Langan
Irvine, CA

SCALE: 1 inch = approx 200 feet
FIGURE BY: BAU
REVIEWED BY: LCD

FIGURE NUMBER: 1A
PROJECT NUMBER: 1609161J
DATE: 11/15/16

Line 1RS



Scale in feet

0 30 60

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Resistivity and Induced Polarization Profiles - Line 1RS

PROJECT: Geophysical Investigation, Former Crestmore Mine, Jurupa Valley, California

PREPARED FOR: Langan, Irvine, CA

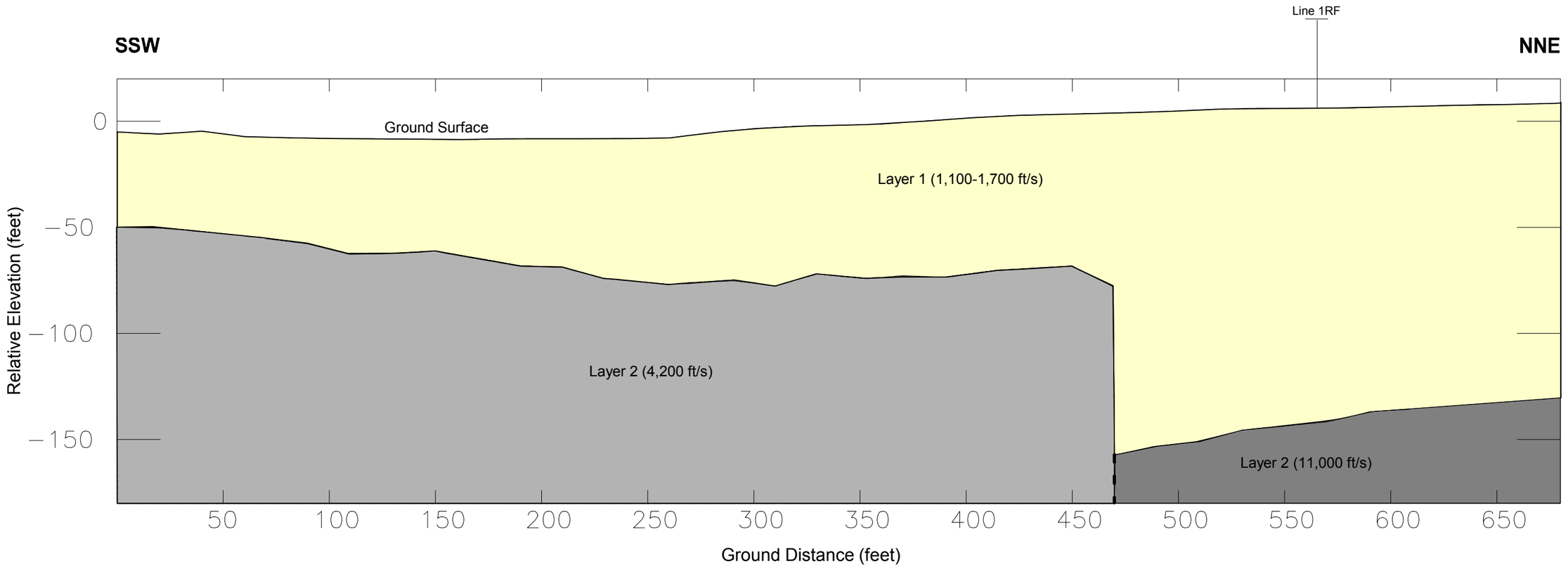
SCALE	FIGURE BY	REVIEWED BY
1 inch = 60 feet	BAU	LCD

FIGURE NUMBER: 2

PROJECT NUMBER: 1609161J

DATE: 12/09/16

Line 2RF



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(714) 435-1073 www.spectrum-geophysics.com

Seismic Refraction Profile - Line 2RF

PROJECT: Geophysical Investigation
Former Crestmore Mine
Jurupa Valley, California

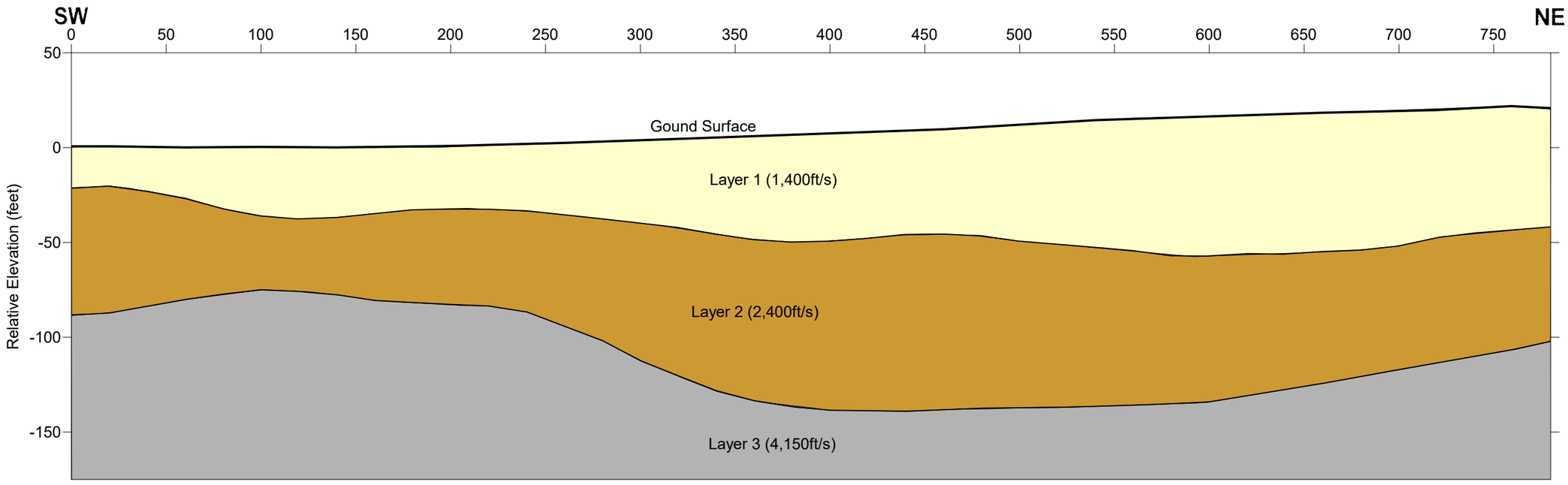
PREPARED FOR: Langan
Irvine, CA

SCALE	FIGURE BY	REVIEWED BY	DATE
1 inch = 50 feet	BAU	LCD	12/29/16

FIGURE NUMBER: 3A

PROJECT NUMBER: 1609161J

Line 1RF



Geophone spacing = 20 feet

DRAFT

Scale in feet

0 30 60

SPECTRUM GEOPHYSICS "Revealing The Subsurface"
3505 Cadillac Ave O-209A
Costa Mesa, California 92626
(714) 435-1073 www.spectrum-geophysics.com

Seismic Refraction Profile - Line 1RF

PROJECT: Geophysical Investigation
Former Crestmore Mine
Jurupa Valley, California

PREPARED FOR: Langan
Irvine, CA

SCALE: 1 inch = 60 feet

DRAWN BY: BAU

REVIEWED BY: LCD

FIGURE NUMBER: 3

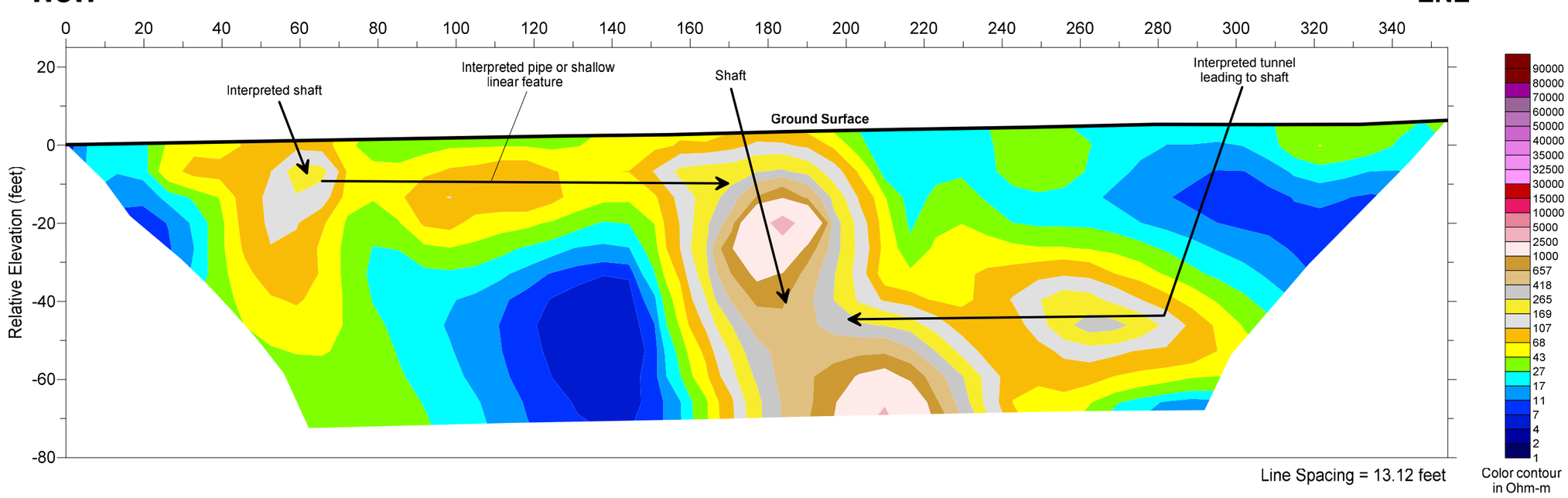
PROJECT NUMBER: 1609161J

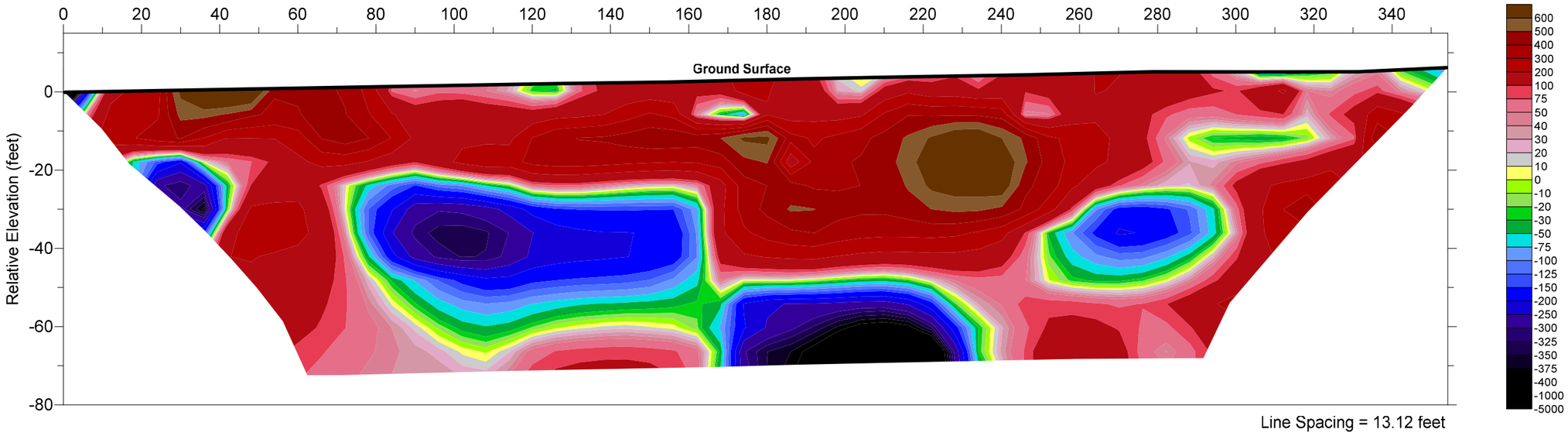
DATE: 11/15/16

Line 2RS

WSW

ENE





Scale in feet

0 15 30

SPECTRUM GEOPHYSICS "Revealing The Subsurface"

3505 Cadillac Ave O-209A
Costa Mesa, California 92626

(714) 435-1073 www.spectrum-geophysics.com

Resistivity and Induced Polarization Profiles - Line 2RS

FIGURE NUMBER 4

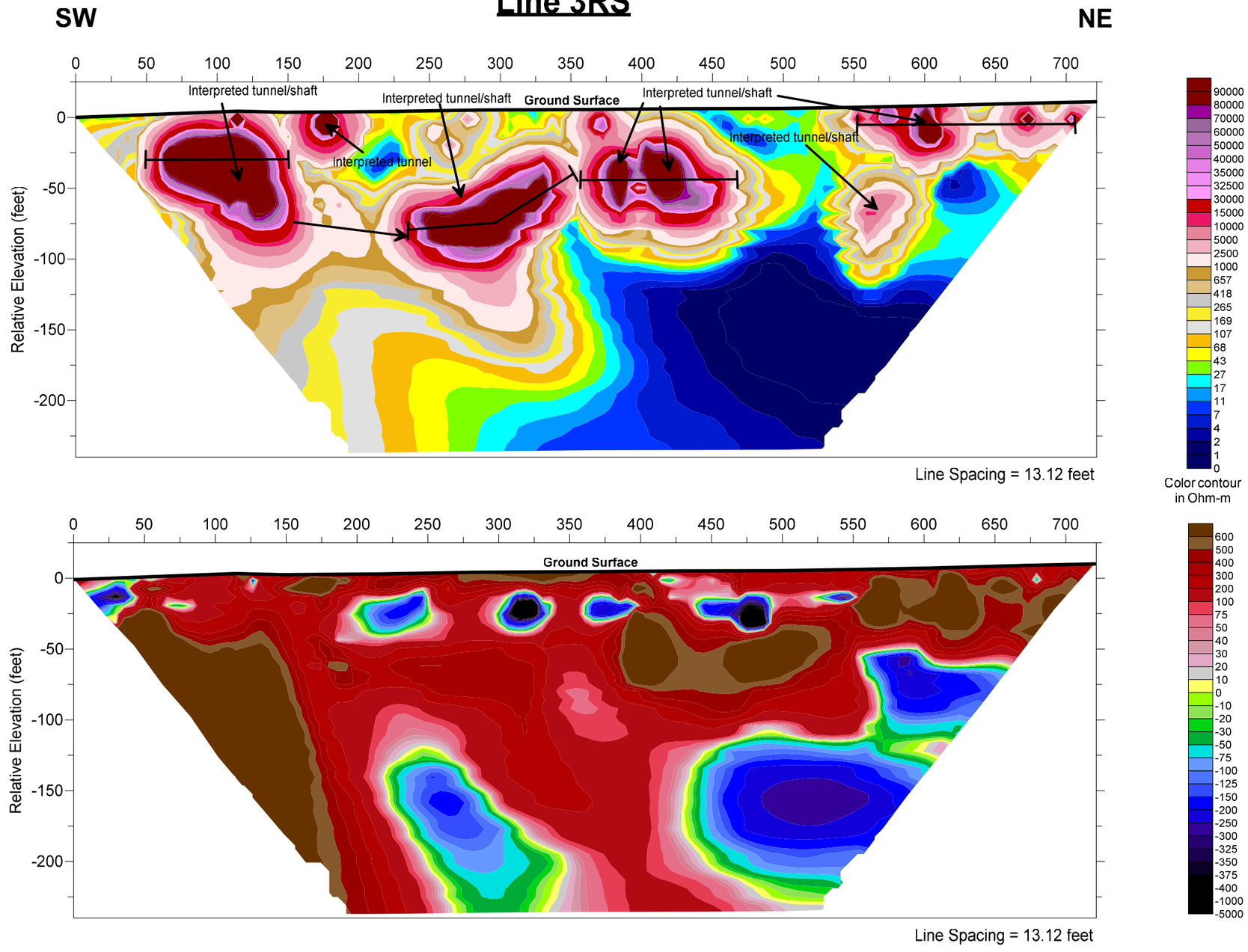
PROJECT
Geophysical Investigation
Former Crestmore Mine
Jurupa Valley, California

PREPARED FOR
Langan
Irvine, CA

PROJECT NUMBER 1609161J

SCALE	FIGURE BY	REVIEWED BY	DATE
1 inch = 30 feet	BAU	LCD	12/09/16

Line 3RS



Scale in feet

0 40 80

SPECTRUM GEOPHYSICS "Revealing The Subsurface"

3505 Cadillac Ave O-209A
Costa Mesa, California 92626

(714) 435-1073 www.spectrum-geophysics.com

Resistivity and Induced Polarization Profiles - Line 3RS

PROJECT: Geophysical Investigation
Former Crestmore Mine
Jurupa Valley, California

PREPARED FOR: Langan
Irvine, CA

SCALE	FIGURE BY	REVIEWED BY
1 inch = 80 feet	BAU	LCD

FIGURE NUMBER: 5

PROJECT NUMBER: 1609161J

DATE: 12/09/16

APPENDIX F
Laboratory Results

DENSITY TESTS

PROJECT Langan # 700045403 **JOB NO.** 2012-0057 **BY** LD **DATE** 10/05/16

Sample No.	LB-1/S-3	LB-1/S-5	LB-1/S-7	LB-2/S-1	LB-2/S-3	LB-2/S-5	LB-3/S-2	LB-3/S-4
Depth (ft)	15 - 16.5	25 - 26.5	35 - 36.5	5 - 6.5	15 - 16.5	25 - 26.5	10 - 11.5	20 - 21.5
Soil Type	Brown, F.C. Sand w. Gravel	Brown, F.M. Silty Sand	Brown, F.C. Silty Sand	Brown, F.C. Silty Sand w. Gravel	Brown, F.C. Silty Sand w. Gravel	Brown, F.C. Silty Sand w. Gravel	Brown, F. Sandy Silt	Brown, F. Silty Sand
Wet+Tare	578.3	1239.4	1240.0	Disturbed	943.5	928.7	636.4	997.8
No. Ring	3	6	6		5	5	4	5
% Water	1.5	6.5	6.8	3.8	1.3	1.8	8.3	17.1
Dry Density(pcf)	121.6	126.8	126.5		118.5	115.5	88.0	110.3
Pocket Pen.								
Sample No.	LB-3/S-8	LB-4/S-1	LB-4/S-3	LB-4/S-5	LB-4/S-7			
Depth (ft)	30 - 31.5	5 - 6.5	15 - 16.5	25 - 26.5	35 - 36.5			
Soil Type	Brown, Clay	Brown, F. Silty Sand	Brown, F. Silty Sand	Brown, F. Silty Sand	Brown, F.C. Silty Sand			
Wet+Tare	580.0	714.2	871.2	1077.1	988.4			
No. Ring	3	4	5	6	6			
% Water	26.4	2.5	2.9	3.6	0.6			
Dry Density(pcf)	98.4	109.3	105.3	108.9	99.9			
Pocket Pen.								

Geo-Logic ASSOCIATES

DENSITY TESTS

PROJECT Langan # 700045403 **JOB NO.** 2012-0057 **BY** LD **DATE** 10/05/16

Sample No.	LB-5/S-1	LB-5/S-3	LB-5/S-5	LB-5/S-7	LB-6/S-2	LB-6/S-4	LB-6/S-7	
Depth (ft)	5 - 6.5	15 - 16.5	25 - 26.5	35 - 36.5	10 - 11.5	20 - 21.5	35 - 36.5	
Soil Type	Brown, F.M. Silty Sand	Brown, Clay	Brown, F. Silty Sand	Brown, Silty F. Sand	Brown, F. Silty Sand	Brown, F. Silty Sand	Brown, Silty Clay	
Wet+Tare	910.9	1137.4	855.2	1132.3	939.8	547.6	758.5	
No. Ring	5	6	5	6	5	3	4	
% Water	3.3	28.3	3.6	7.5	2.3	3.0	15.4	
Dry Density(pcf)	111.4	94.4	102.0	112.0	117.1	111.9	105.0	
Pocket Pen.								
Sample No.	LB-7A/S-1	LB-7A/S-3	LB-7A/S-5	LB-8/S-1	LB-8/S-3	LB-8/S-5		
Depth (ft)	5 - 6.5	15 - 16.5	25 - 26.5	5 - 6.5	15 - 16.5	25 - 26.5		
Soil Type	Brown, F. Silty Sand	Brown, F.M. Sand w. Gravel	Brown, F. Silty Sand	Brown, Silty F. Sand	Brown, F.C. Sand w. Gravel	Brown, F.C. Silty Sand w. Gravel		
Wet+Tare	764.8	948.8	733.6	1110.0	910.6	720.4		
No. Ring	4	5	4	6	5	4		
% Water	4.3	1.1	4.7	16.4	2.0	1.9		
Dry Density(pcf)	117.5	120.0	110.8	100.8	112.6	111.1		
Pocket Pen.								

Geo-Logic ASSOCIATES

DENSITY TESTS

PROJECT Langan # 700045403 **JOB NO.** 2012-0057 **BY** LD **DATE** 10/05/16

Sample No.	LB-9/S-3	LB-9/S-4	LB-10/S-4	LB-10/S-8	LB-11/S-5	LB-11/S-7	LB-12/S-5	
Depth (ft)	**15 - 16.5**	**20 - 21.5**	**20 - 21.5**	**40 - 41.5**	**25 - 26.5**	**35 - 36.5**	**25 - 26.5**	
Soil Type	Brown, F. Silty Sand	Brown, F. Silty Sand	Brown, F. Sandy Silt	Brown, F. Sandy Silt	Brown, F.M. Silty Sand	Brown, F.M. Silty Sand	Brown, F.M. Silty Sand	
Wet+Tare	1031.2	876.4	1131.9	593.7	1014.1	1019.8	1038.3	
No. Ring	6	5	6	3	6	6	6	
% Water	**2.8**	**3.6**	**8.9**	**18.3**	**2.4**	**5.4**	**2.8**	
Dry Density(pcf)	**103.5**	**105.4**	**110.5**	**108.3**	**101.5**	**99.4**	**104.4**	
Pocket Pen.								
Sample No.	**ALB-10/S-3**	**ALB-10/S-5**	**ALB-10/S-7**					
Depth (ft)	**15 - 16.5**	**25 - 26.5**	**35 - 36.5**					
Soil Type	Brown,F.M. Silty Sand w. rock frmgts	No Sample Recovered	Brown, F.M. Silty Sand					
Wet+Tare	990.0		1024.7					
No. Ring	6		6					
% Water	**6.3**		**4.6**					
Dry Density(pcf)	**94.7**		**100.8**					
Pocket Pen.								

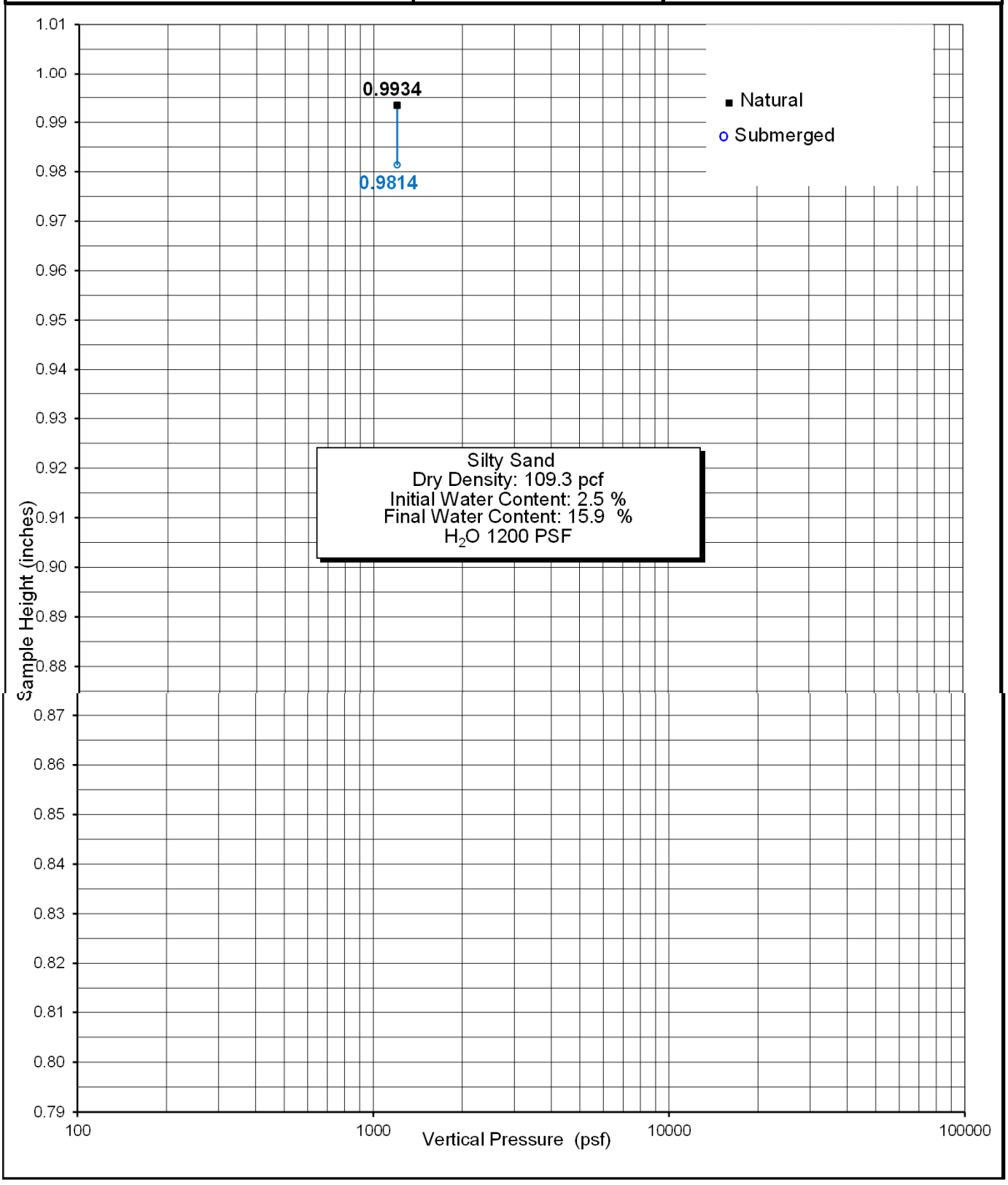
Geo-Logic ASSOCIATES

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-4 / S-1	Depth:	5' - 6.5'	Date	10-01-16



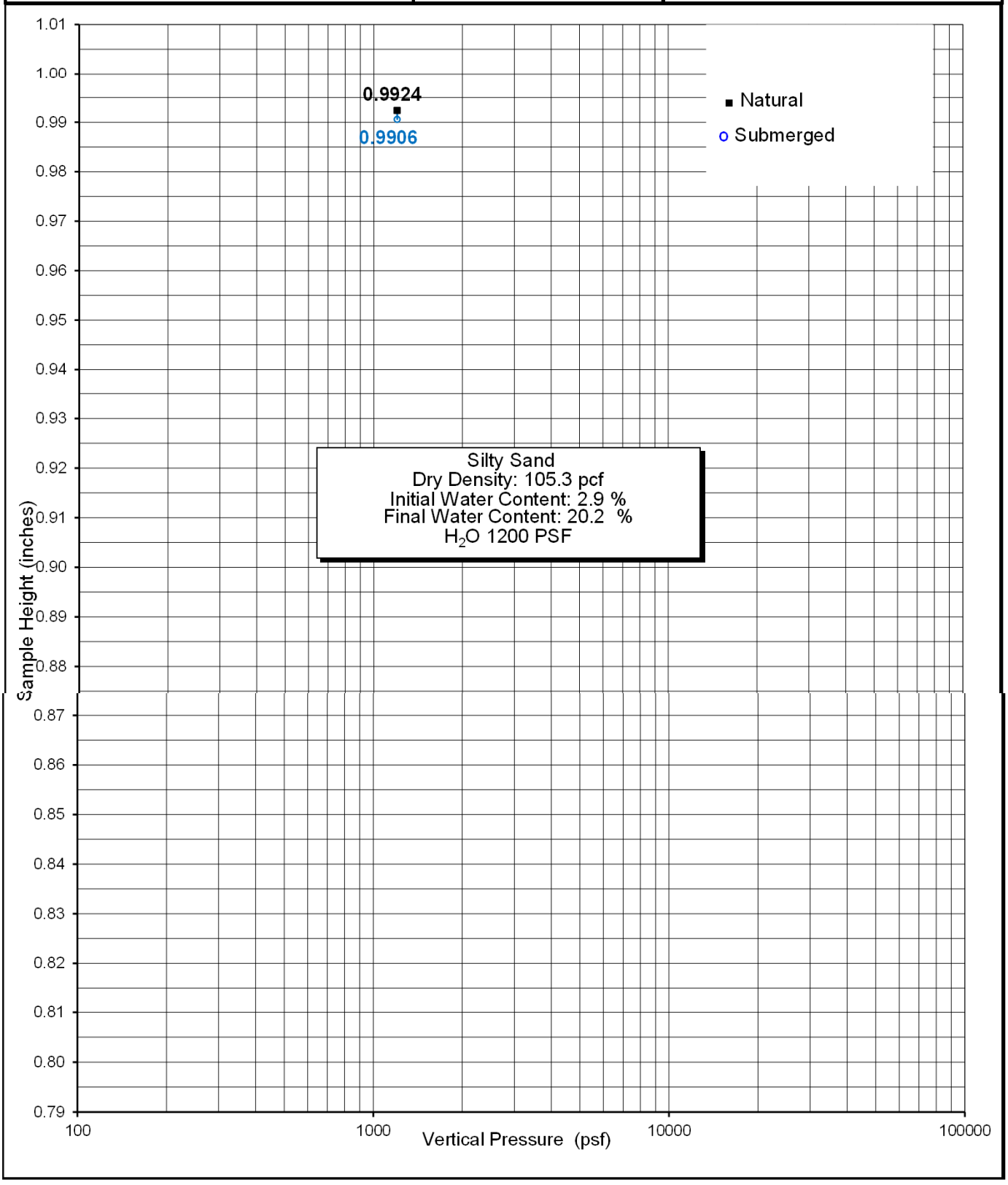
Geo-Logic Associates

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-4 / S-3	Depth:	15' - 16.5'	Date	10-01-16



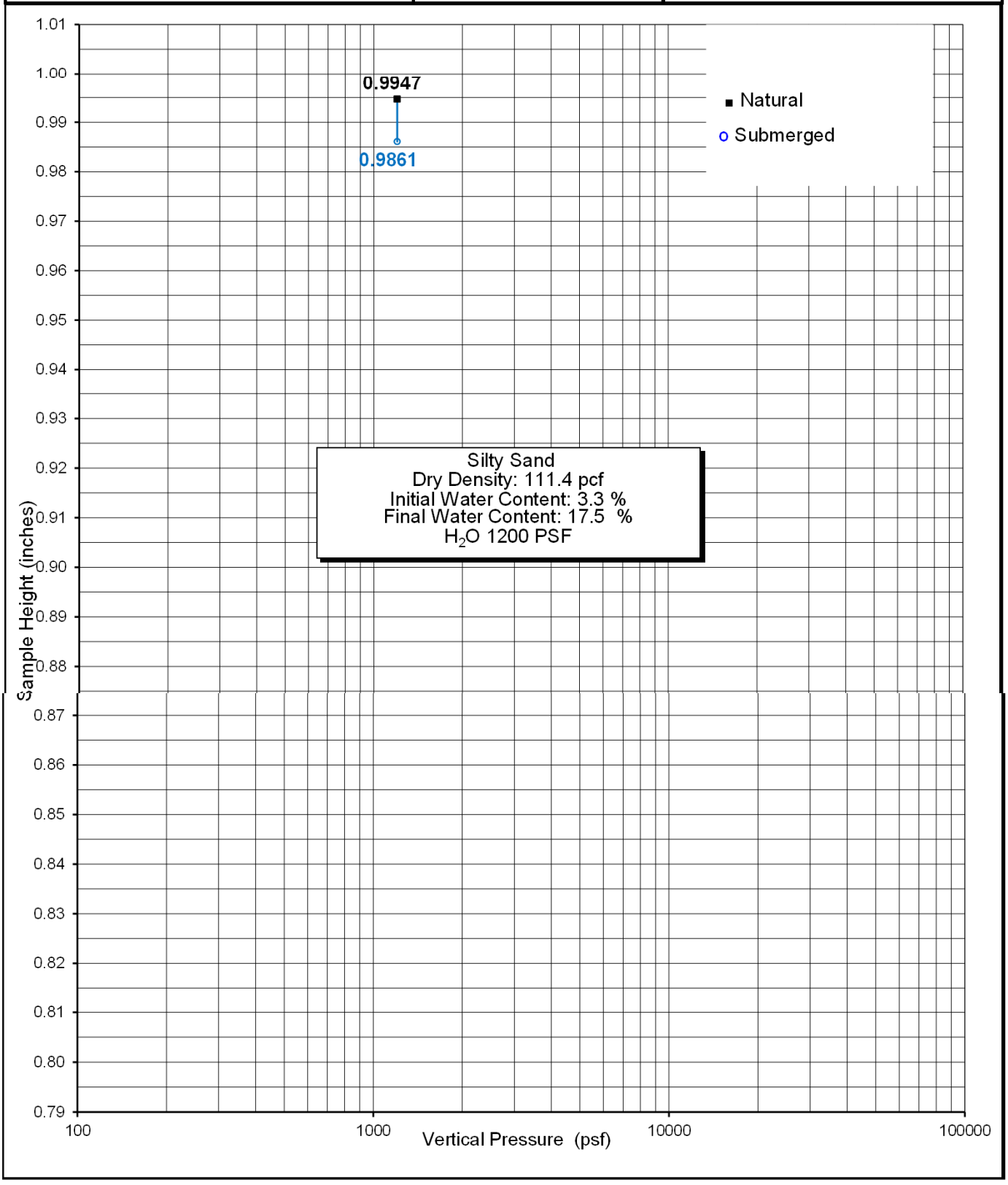
Geo-Logic Associates

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-5 / S-1	Depth:	5' - 6.5'	Date	10-01-16



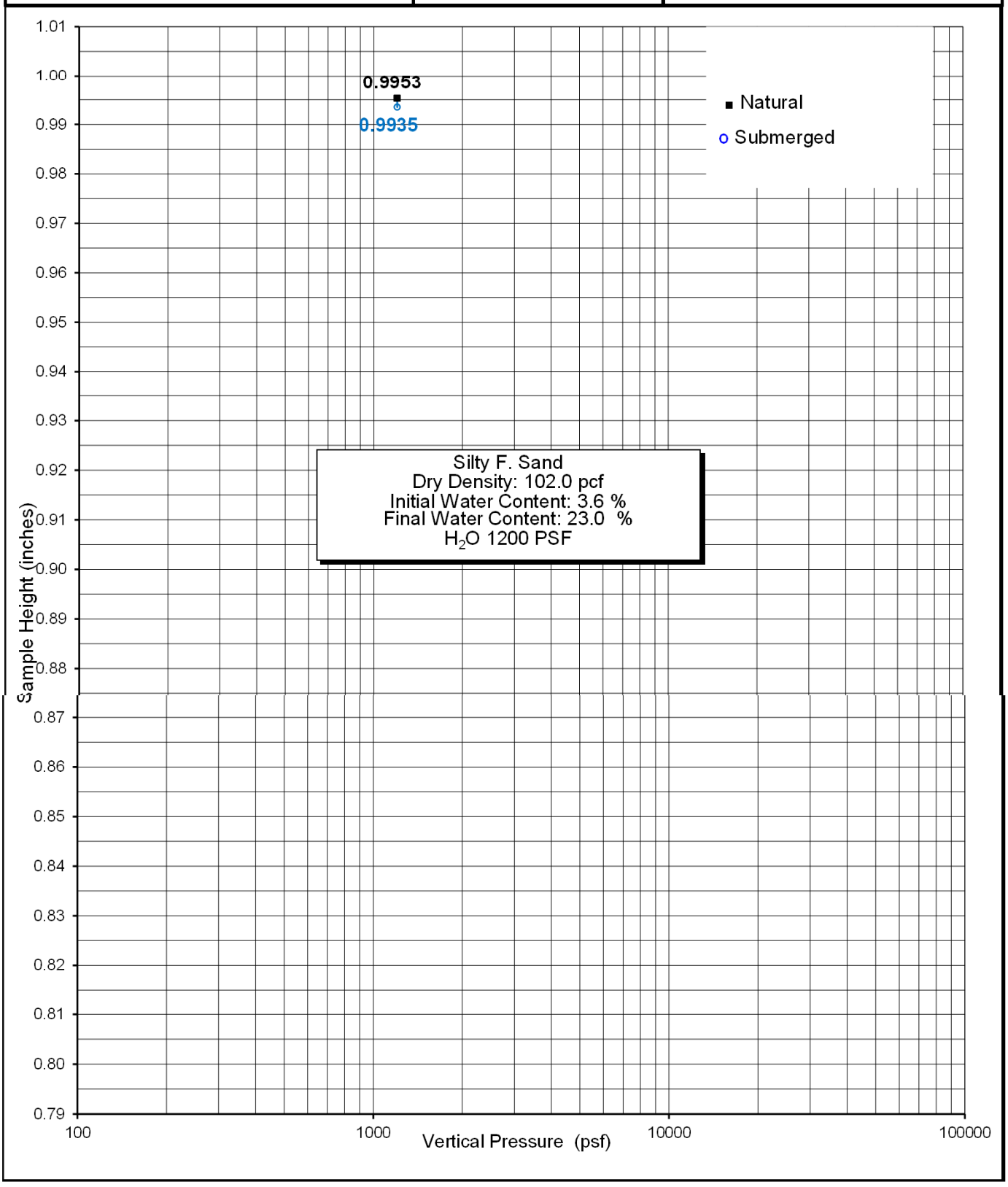
Geo-Logic Associates

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-5 / S-5	Depth:	25' - 26.5'	Date	10-01-16



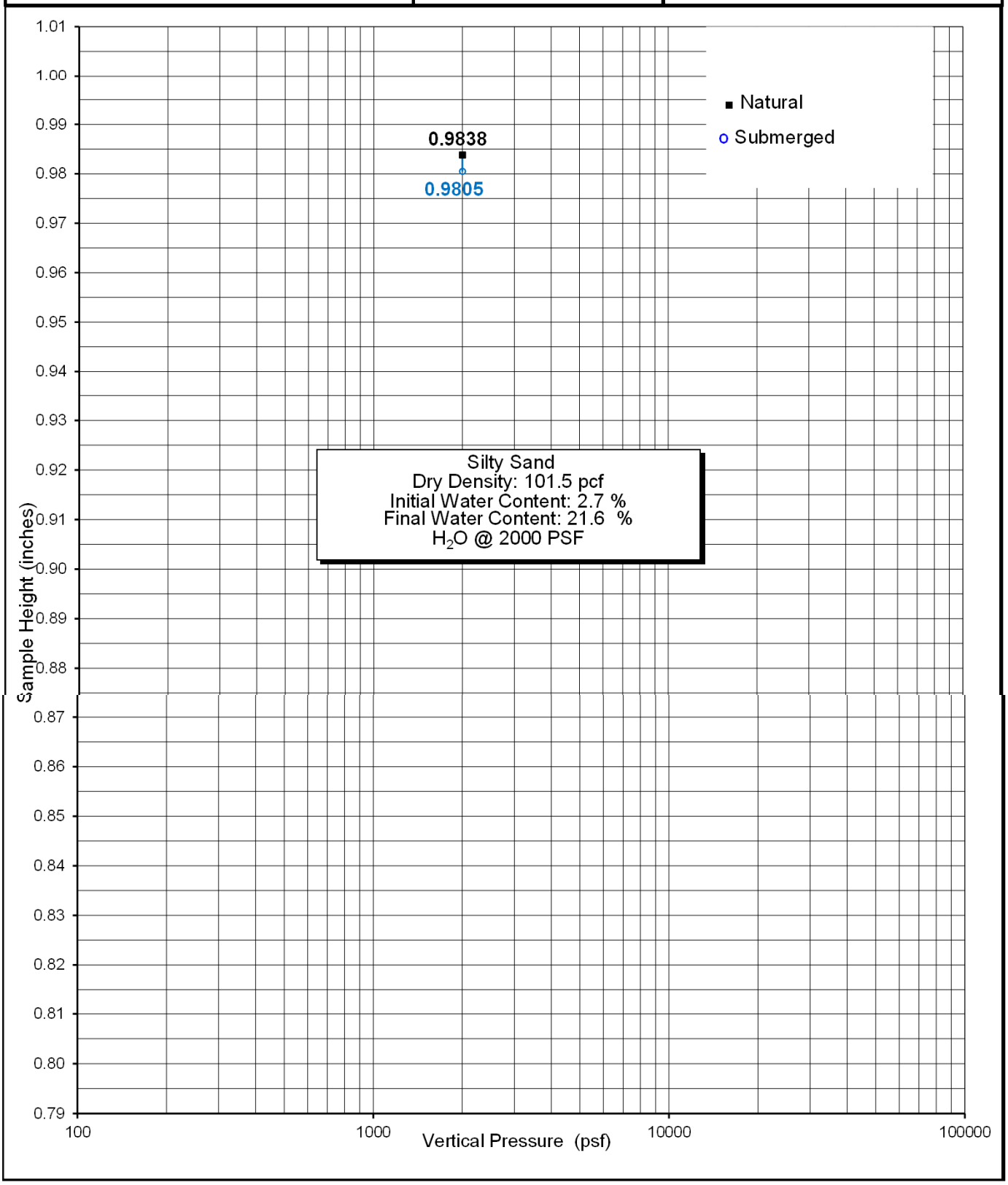
Geo-Logic Associates

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-6 / S-5	Depth:	25' - 26.5'	Date	10-01-16



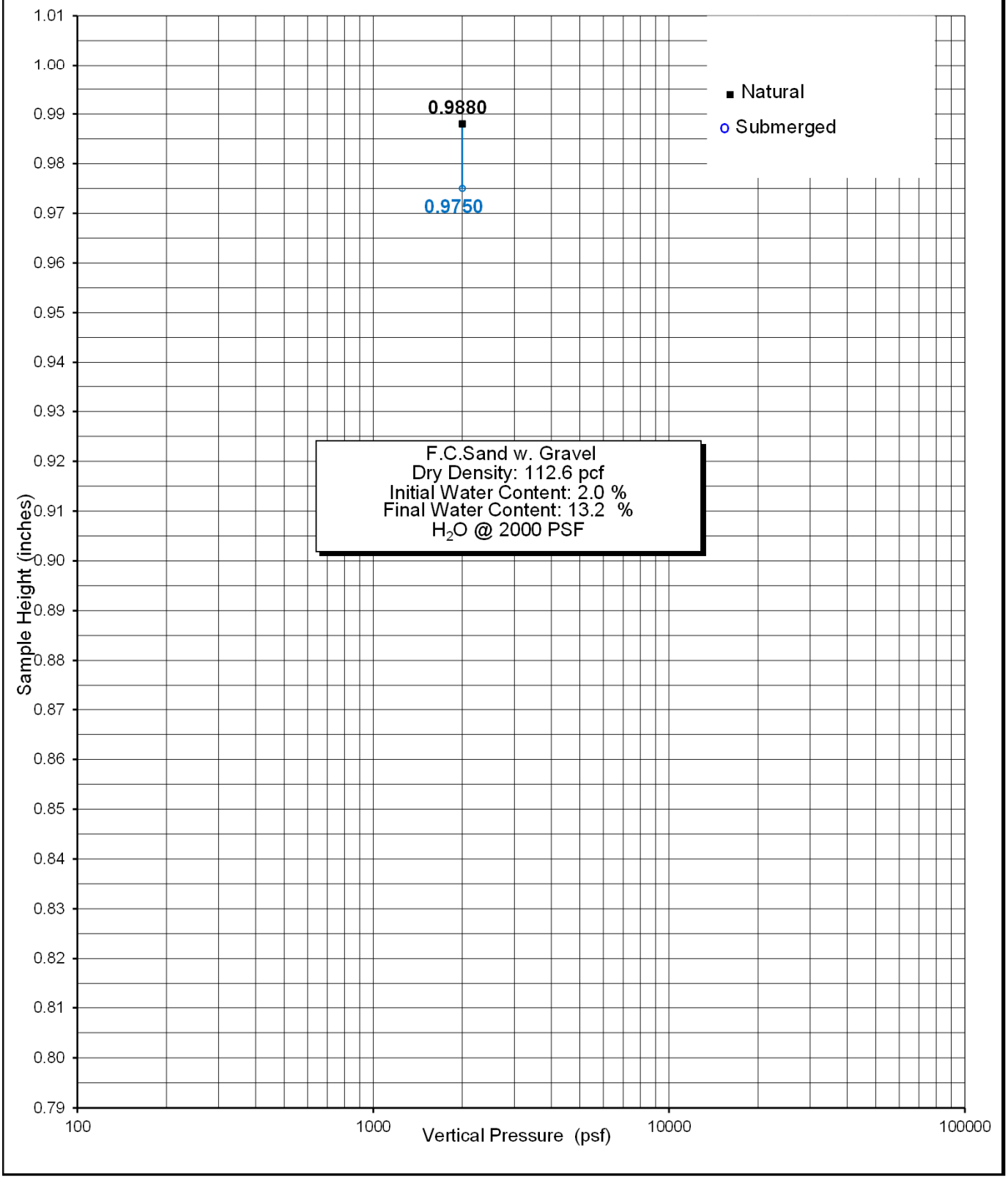
Geo-Logic ASSOCIATES

Langan Engineering #700045403

CONSOLIDATION TEST - ASTM D2435

Job No. 2012-0057

Boring / Sample No.	LB-8 / S-3	Depth:	15' - 16.5'	Date	10-01-16



Geo-Logic ASSOCIATES

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan #700045403 JOB NO. 2012-0057

Sample	LB-5 / S-3		By	LD	Sample			By	
Sta. No.					Sta. No.				
Soil Type	Brown, Clay				Soil Type				
Date	Time	Dial Reading	Wet+Tare	556.2	Date		Dial Reading	Wet+Tare	
10/1/2016	13:35	0.1732	Tare	219.5				Tare	
		H2O	Net Weight	336.7				Net Weight	
10/2/2016	10:00	0.0945	% Water	17.0				% Water	
			Dry Dens.	87.2				Dry Dens.	
			% Max					% Max	
			Wet+Tare	620				Wet+Tare	
			Tare	219.5				Tare	
			Net Weight	400.5				Net Weight	
INDEX	79	7.9%	% Water	39.2	**INDEX**			% Water	

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date		Dial Reading	Wet+Tare		Date		Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
INDEX			% Water		**INDEX**			% Water	

Geo-Logic ASSOCIATES

WASH #200 SIEVE - ASTM D 1140-92

Job Name	Langan # 700045403	Date	10-8-16
Job No.	2012-0057	By	LD

Sample	LB-1 / S-2	**Sample**	LB-2 / S-2	**Sample**	LB-2 / S-4
Soil Type		Soil Type		Soil Type	
% water	0	% water	0	% water	0
Wet weight	261.6	Wet weight	286.9	Wet weight	266.6
Dry weight	261.6	Dry weight	286.9	Dry weight	266.6
+ 200 sieve	235.1	+ 200 sieve	263.2	+ 200 sieve	224.9
% Retained	89.9	% Retained	91.7	% Retained	84.4
%Pass. #200	**10**	**%Pass. #200**	**8**	**%Pass. #200**	**16**

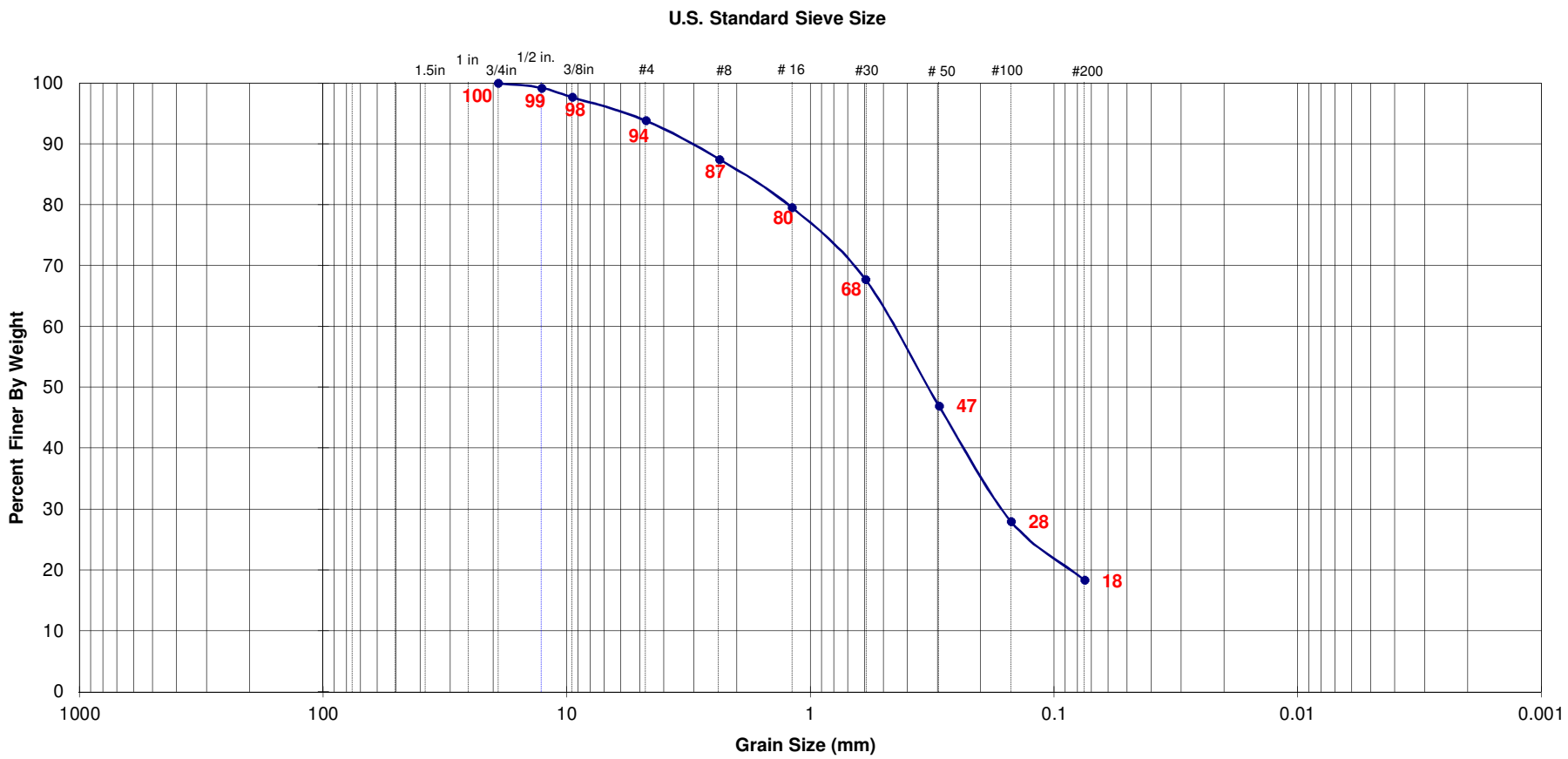
Sample	LB-3 / S-1	**Sample**	LB-3 / S-3	**Sample**	LB-3 / S-9
Soil Type		Soil Type		Soil Type	
% water	11.1	% water	14.3	% water	0
Wet weight	224.9	Wet weight	232.5	Wet weight	195.9
Dry weight	202.5	Dry weight	203.5	Dry weight	195.9
+ 200 sieve	166	+ 200 sieve	104	+ 200 sieve	67.2
% Retained	82.0	% Retained	51.1	% Retained	34.3
%Pass. #200	**18**	**%Pass. #200**	**49**	**%Pass. #200**	**66**

Sample	LB-5 / S-3	**Sample**	LB-6 / S-1	**Sample**	LB-6 / S-5
Soil Type		Soil Type		Soil Type	
% water	17.9	% water	5.2	% water	2.7
Wet weight	154.9	Wet weight	240.4	Wet weight	221.6
Dry weight	131.4	Dry weight	228.5	Dry weight	215.8
+ 200 sieve	9	+ 200 sieve	118.9	+ 200 sieve	154
% Retained	6.9	% Retained	52.0	% Retained	71.4
%Pass. #200	**93**	**%Pass. #200**	**48**	**%Pass. #200**	**29**

Sample	LB-6 / S-8	**Sample**	LB-10 / S-8	**Sample**	ALB-10 / S-3
Soil Type		Soil Type		Soil Type	
% water	4.2	% water	18.3	% water	6.3
Wet weight	235.2	Wet weight	180	Wet weight	225.4
Dry weight	225.7	Dry weight	152.2	Dry weight	212.0
+ 200 sieve	66.8	+ 200 sieve	19.2	+ 200 sieve	177.3
% Retained	29.6	% Retained	12.6	% Retained	83.6
%Pass. #200	**70**	**%Pass. #200**	**87**	**%Pass. #200**	**16**

Geo-Logic ASSOCIATES

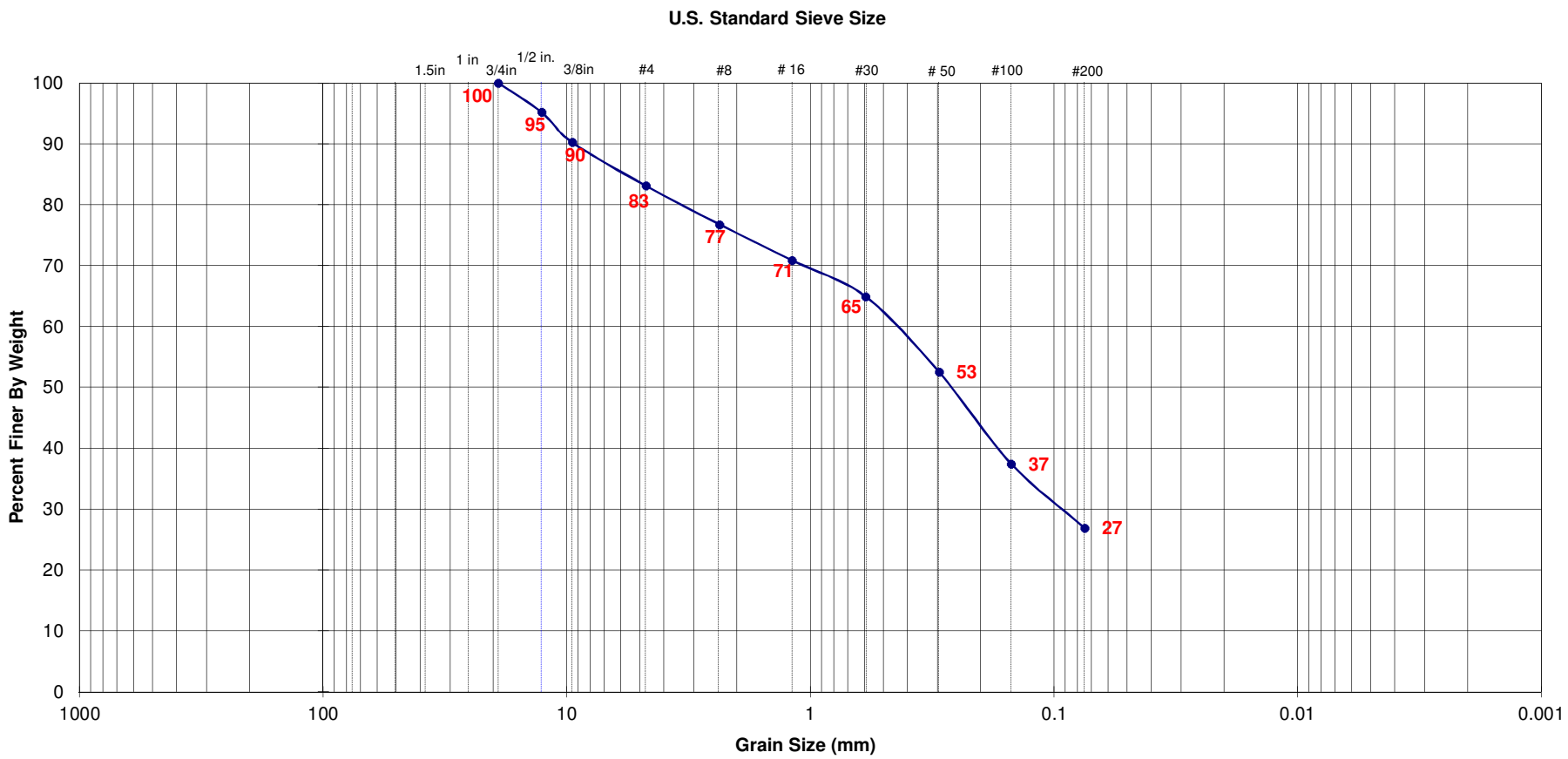
Date: 10/12/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-1 / B-1									**SM**	

Geo-Logic Associates

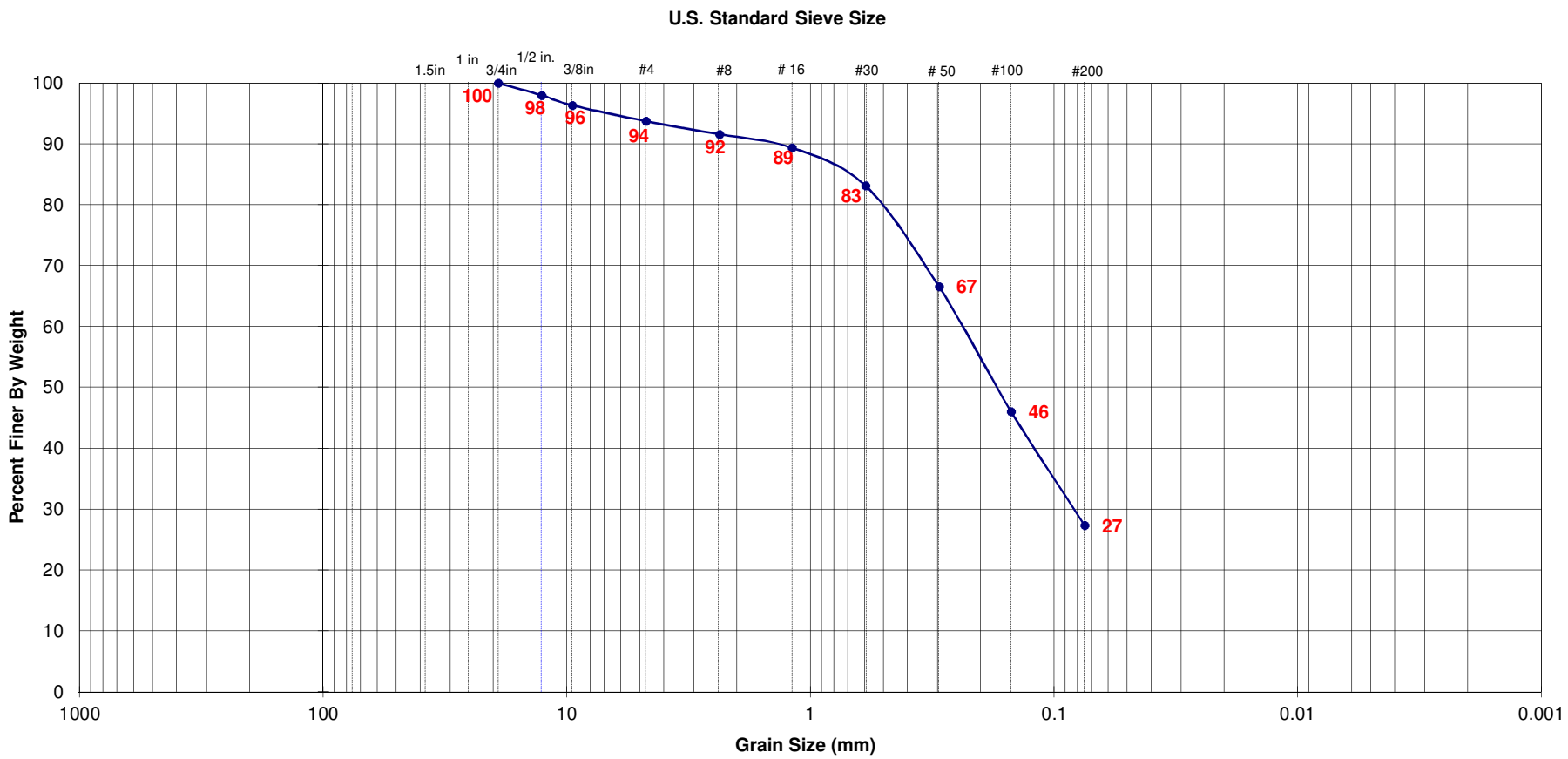
Date: 10/4/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-2 / S-6									**SM**	

Geo-Logic Associates

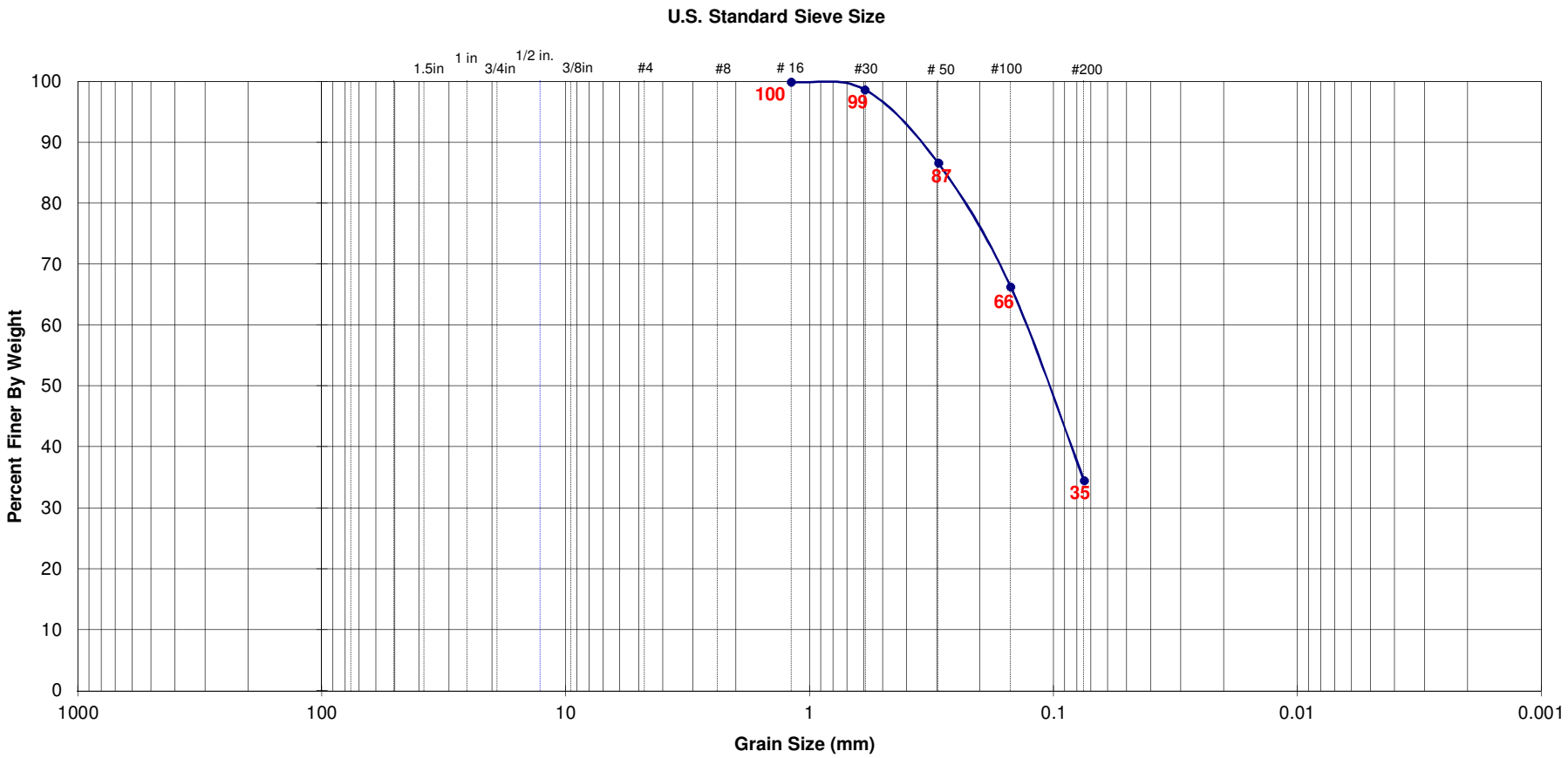
Date: 10/8/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-4 / B-1									**SM**	

Geo-Logic Associates

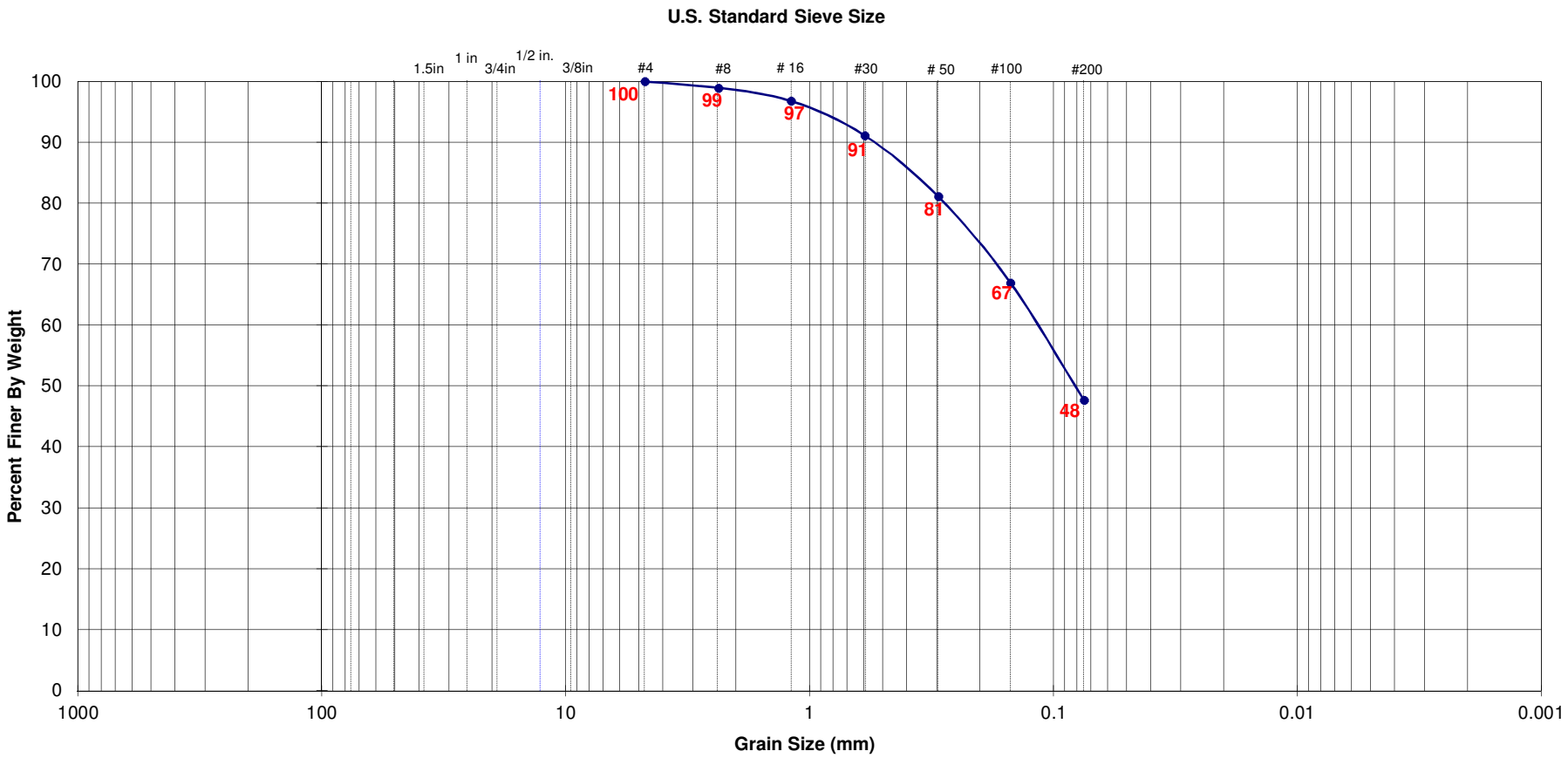
Date: 10/8/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-4 / S-2									**SM**	

Geo-Logic Associates

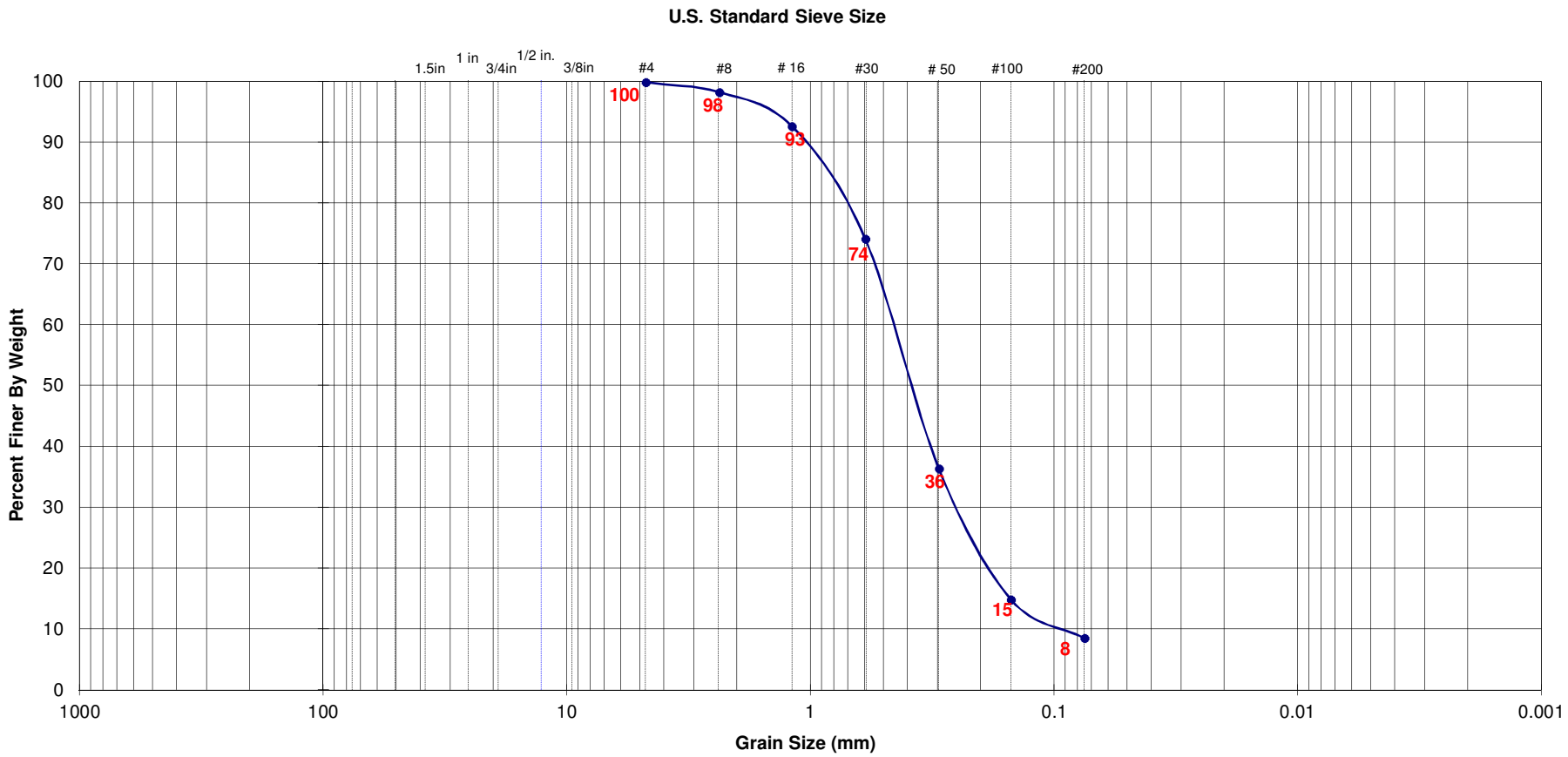
Date: 10/12/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-5 / B-1									**SM**	

Geo-Logic Associates

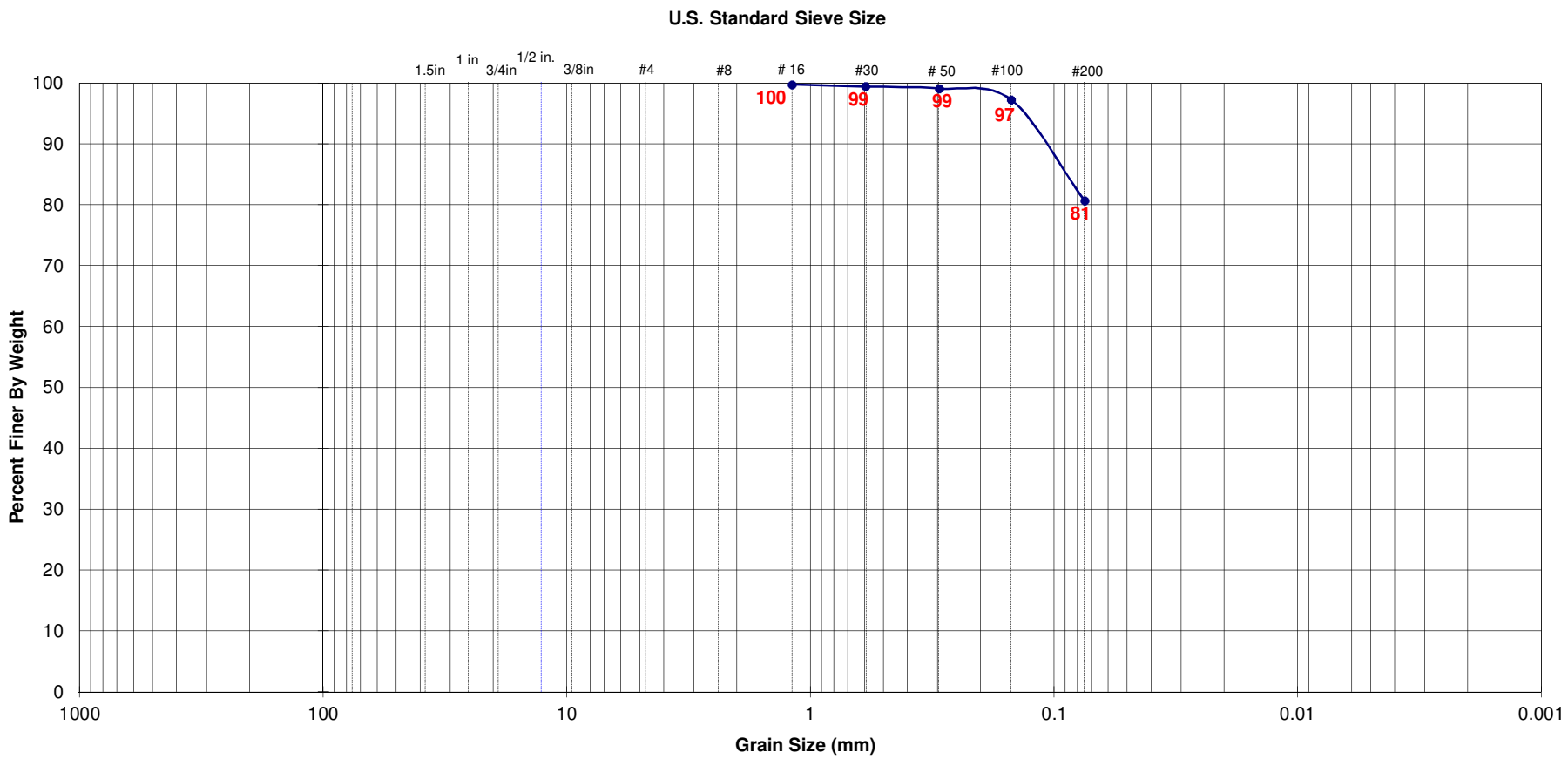
Date: 10/10/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-7A / S-6									**SP-SM**	

Geo-Logic Associates

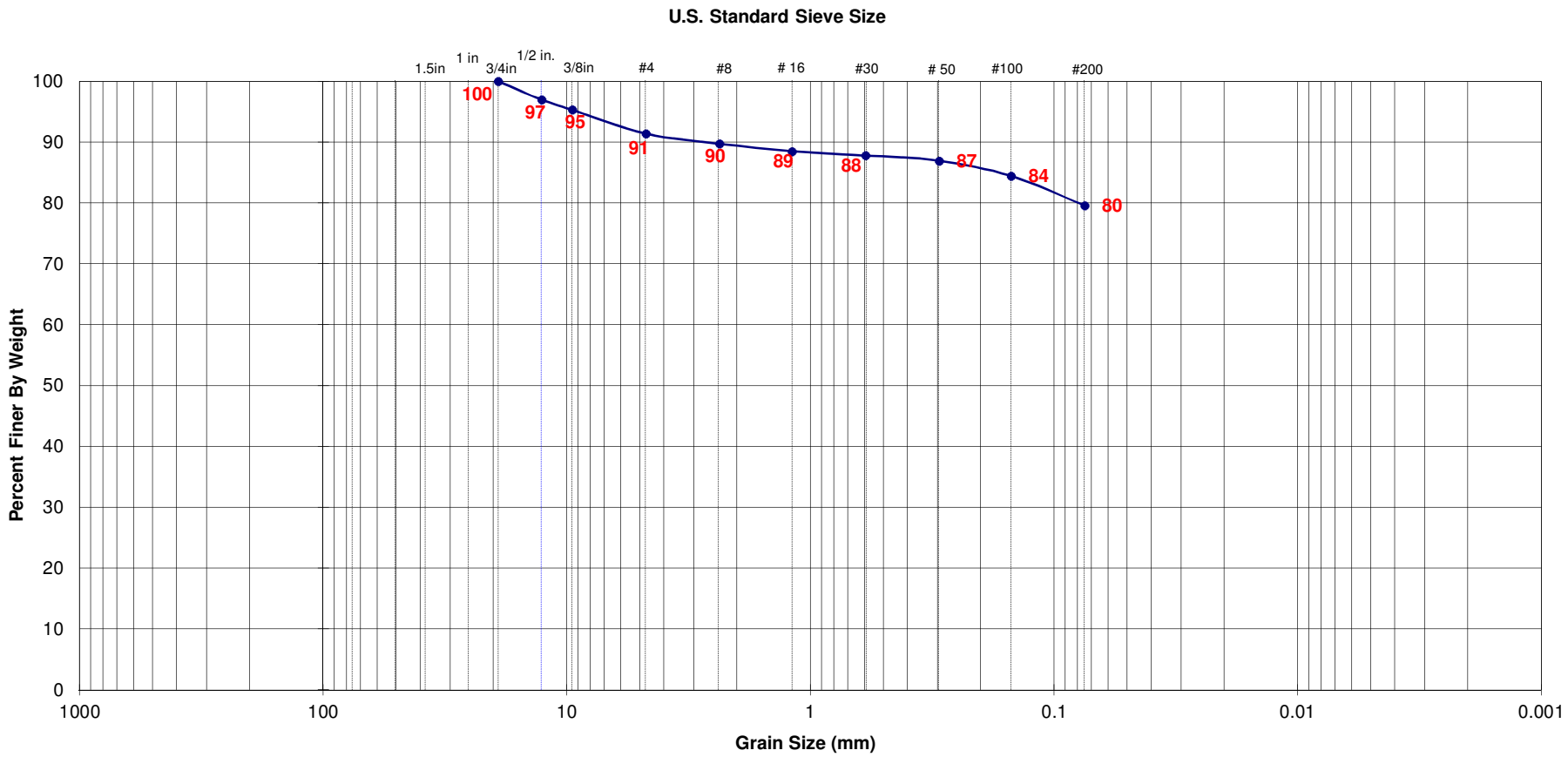
Date: 10/10/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-8 / S-6									**ML**	

Geo-Logic Associates

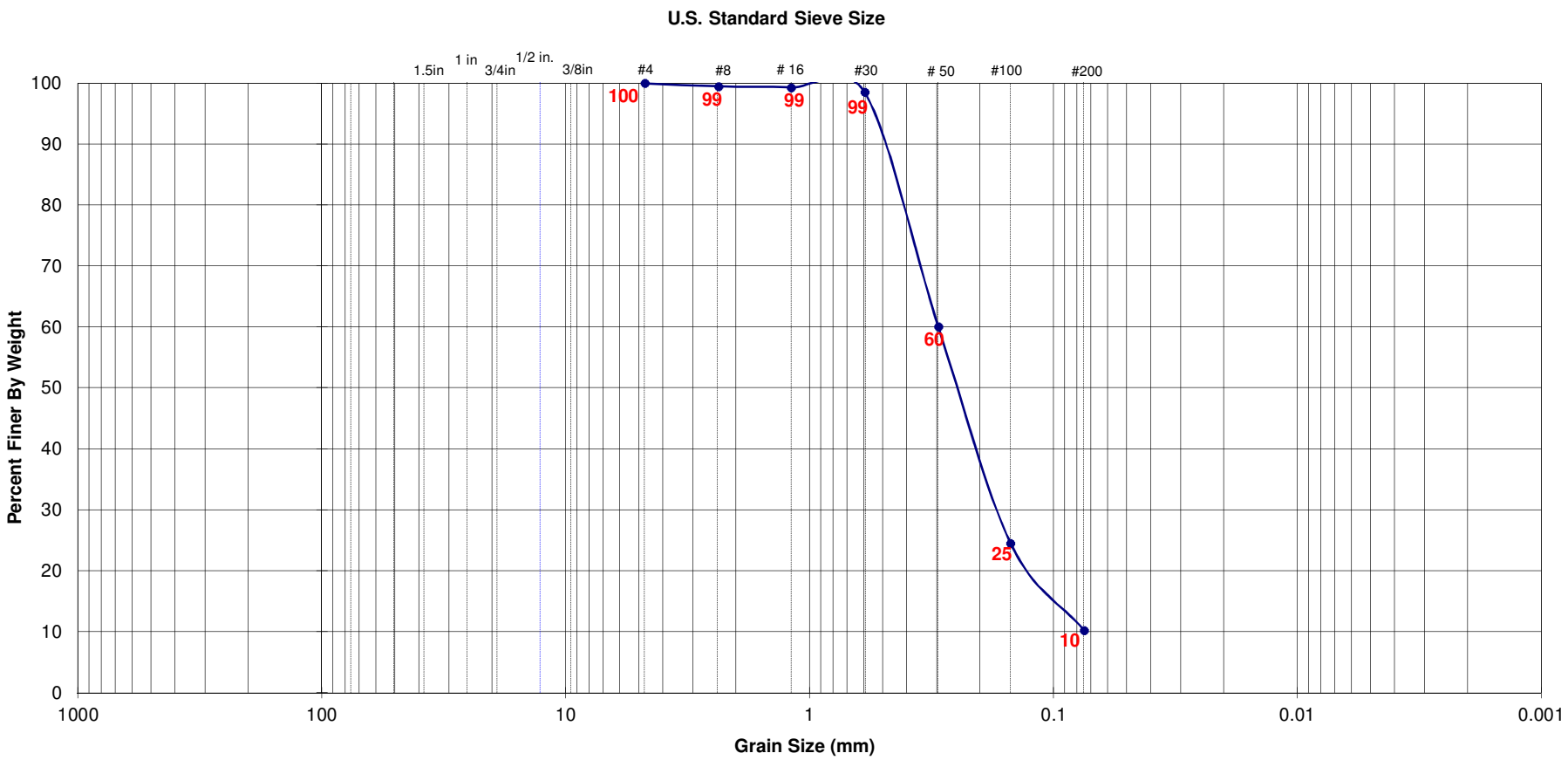
Date: 10/10/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-9 / S-9									**ML**	

Geo-Logic Associates

Date: 10/10/16



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
LB-11 / S-1									**SP-SM**	

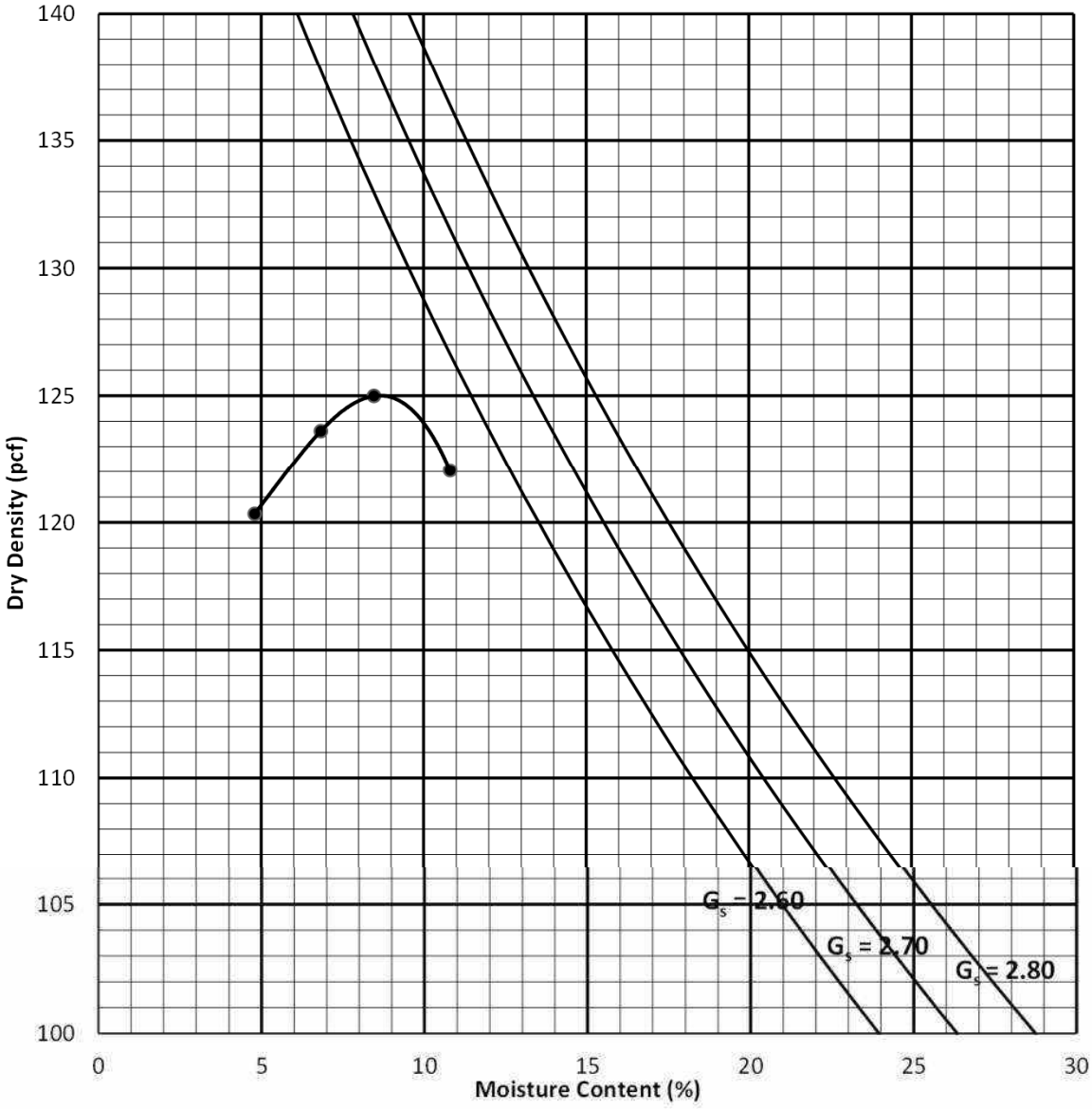
Geo-Logic Associates

COMPACTION TEST REPORT

Project: Langan # 700045403 **GLA No.** 2012-0057
Sample: LB-1 / B-1 **Date:** 10/10/2016
Description: Brown, F.C. SAND w. silty w. F. Gravel **By:** LD

ASTM D1557	Method B	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		2045	2050	1997	1907
Wet Density (pcf)		135.3	135.6	132.1	126.1
Moisture Content (%)		10.8	8.5	6.8	4.8
Dry Density (pcf)		122.1	125.0	123.6	120.3

Max. Dry Density : 125.0 pcf
Opt. Water Content: 8.5 %



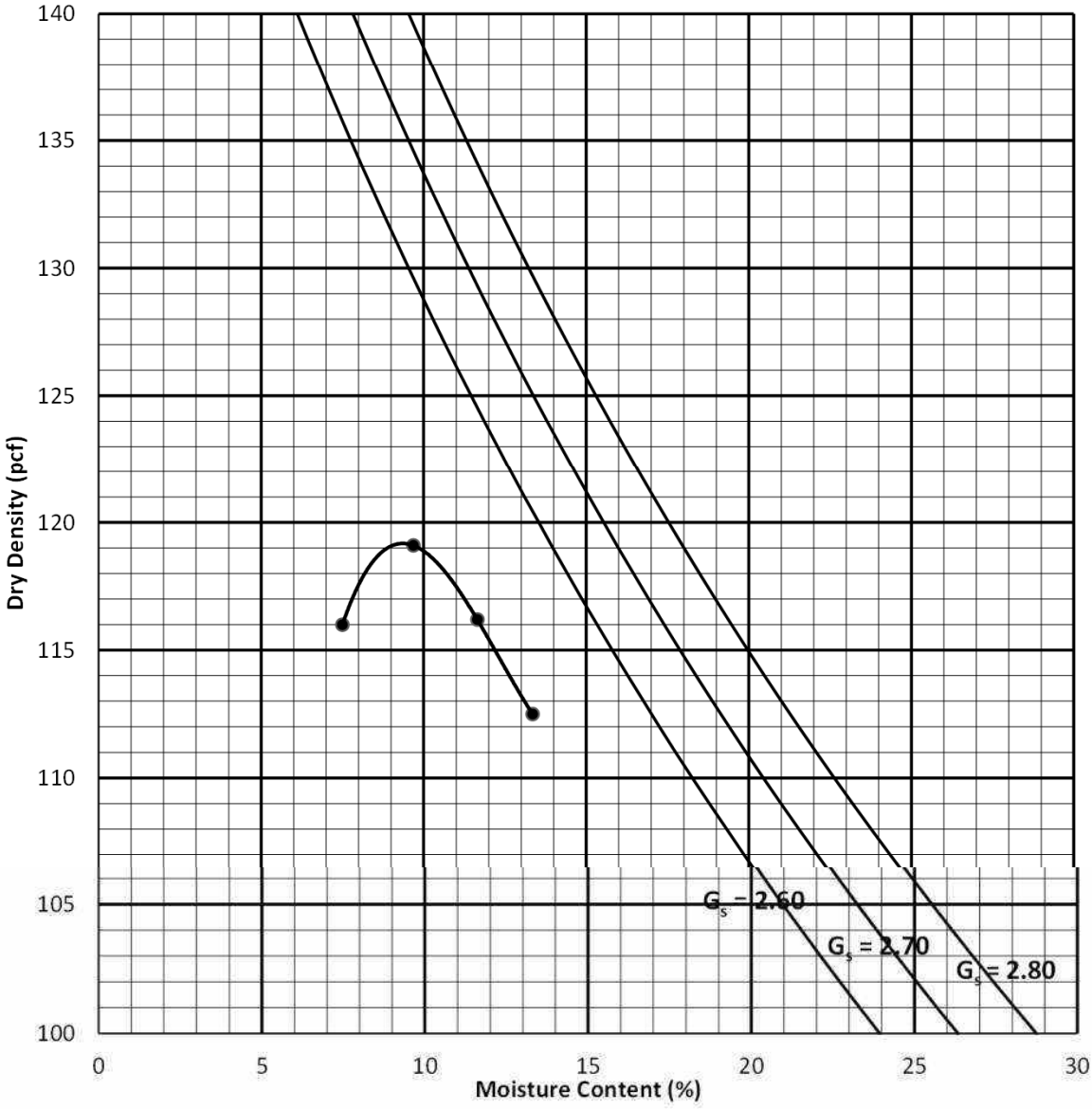
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700045403 **GLA No.** 2012-0057
Sample: LB-3 / B-1 **Date:** 10/10/16
Description: Brown, F.M. Silty Sand w. Gravel **By:** LD

ASTM D1557	Method C	Volume (cf): 0.075		# Blows: 56	# Layers: 5
Specimen		A	B	C	D
Wet Weight (lbs)		9.73	9.56	9.80	9.35
Wet Density (pcf)		129.7	127.5	130.6	124.7
Moisture Content (%)		11.6	13.4	9.7	7.5
Dry Density (pcf)		116.2	112.5	119.1	116.0

Max. Dry Density : 119.0 pcf
Opt. Water Content: 9.5 %



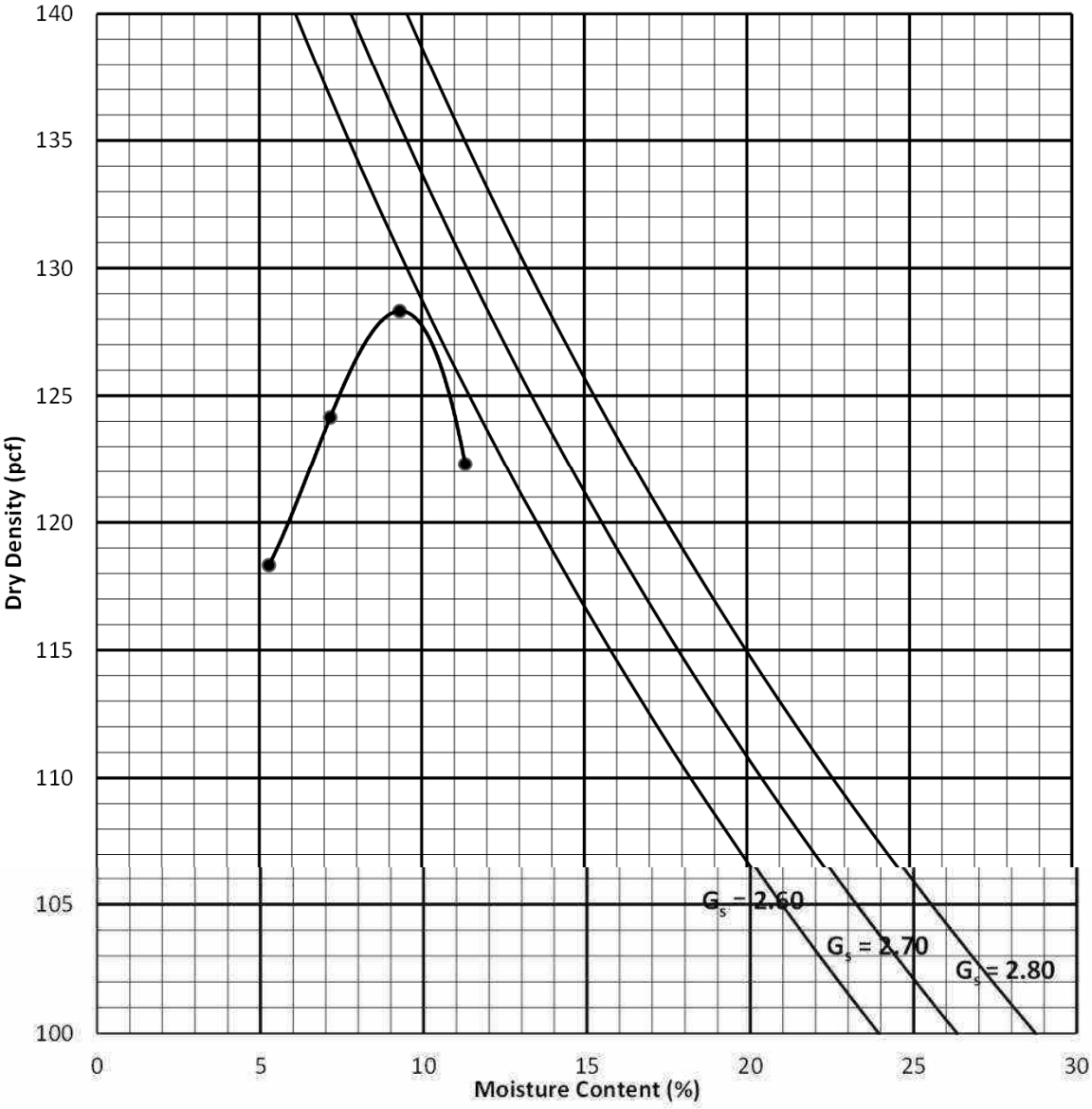
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700045403 **GLA No.** 2012-0057
Sample: LB-5 / B-1 **Date:** 10/12/2016
Description: Brown, F.M. Silty Sand **By:** LD

ASTM D1557	Method A	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		2059	2121	2012	1884
Wet Density (pcf)		136.2	140.3	133.1	124.6
Moisture Content (%)		11.3	9.3	7.2	5.3
Dry Density (pcf)		122.3	128.3	124.2	118.3

Max. Dry Density : 128.5 pcf
Opt. Water Content: 9.5 %



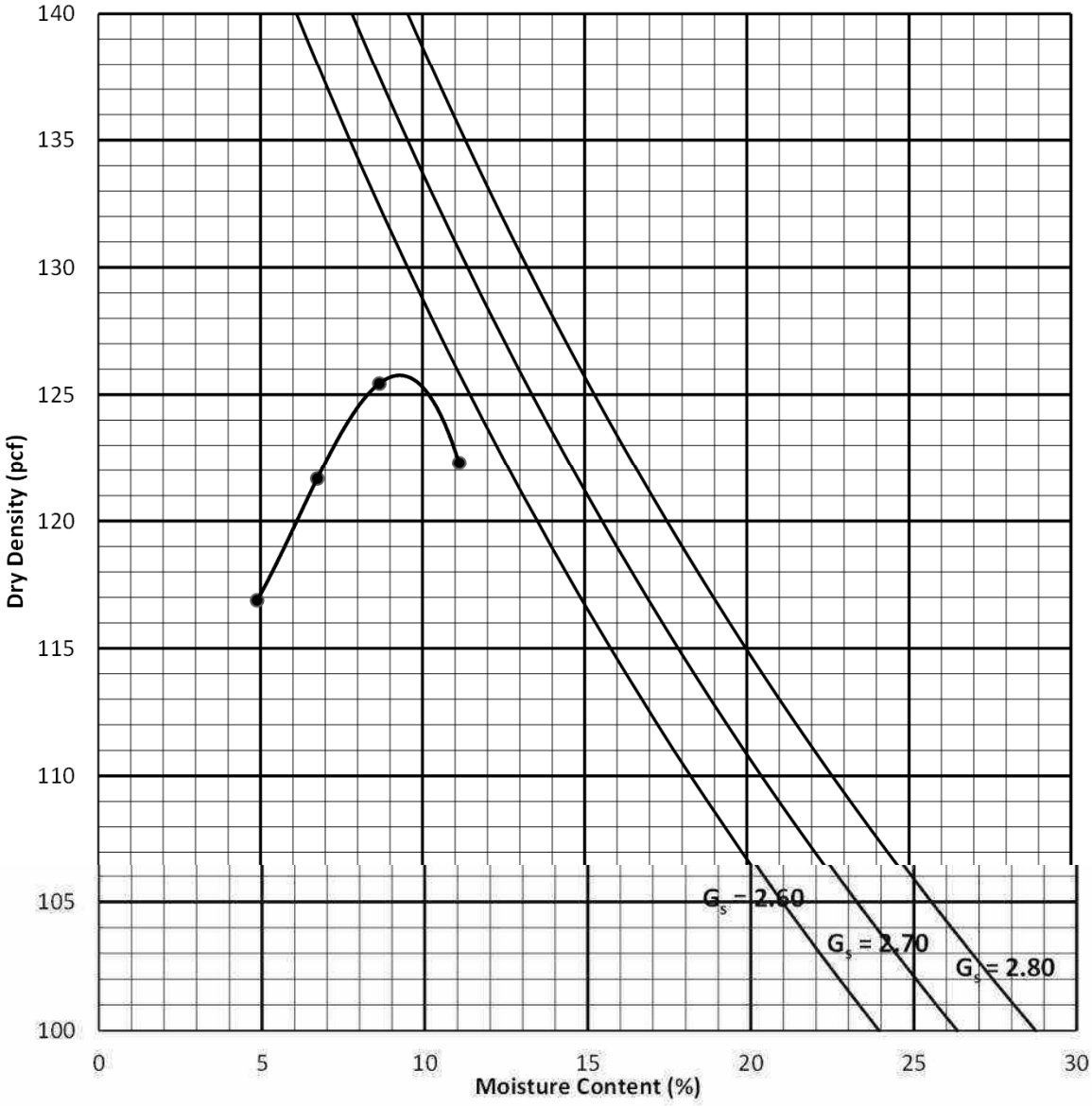
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700045403 **GLA No.** 2012-0057
Sample: LB-6 / B-1 **Date:** 10/12/2016
Description: Brown, F.M. Silty Sand w. F. Gravel **By:** LD

ASTM D1557	Method B	Volume (cf): 0.03333		# Blows: 25	# Layers: 5
Specimen		A	B	C	D
Wet Weight (grs)		2055	2061	1964	1854
Wet Density (pcf)		135.9	136.3	129.9	122.6
Moisture Content (%)		11.1	8.7	6.7	4.9
Dry Density (pcf)		122.3	125.4	121.7	116.9

Max. Dry Density : 125.5 pcf
Opt. Water Content: 9.5 %



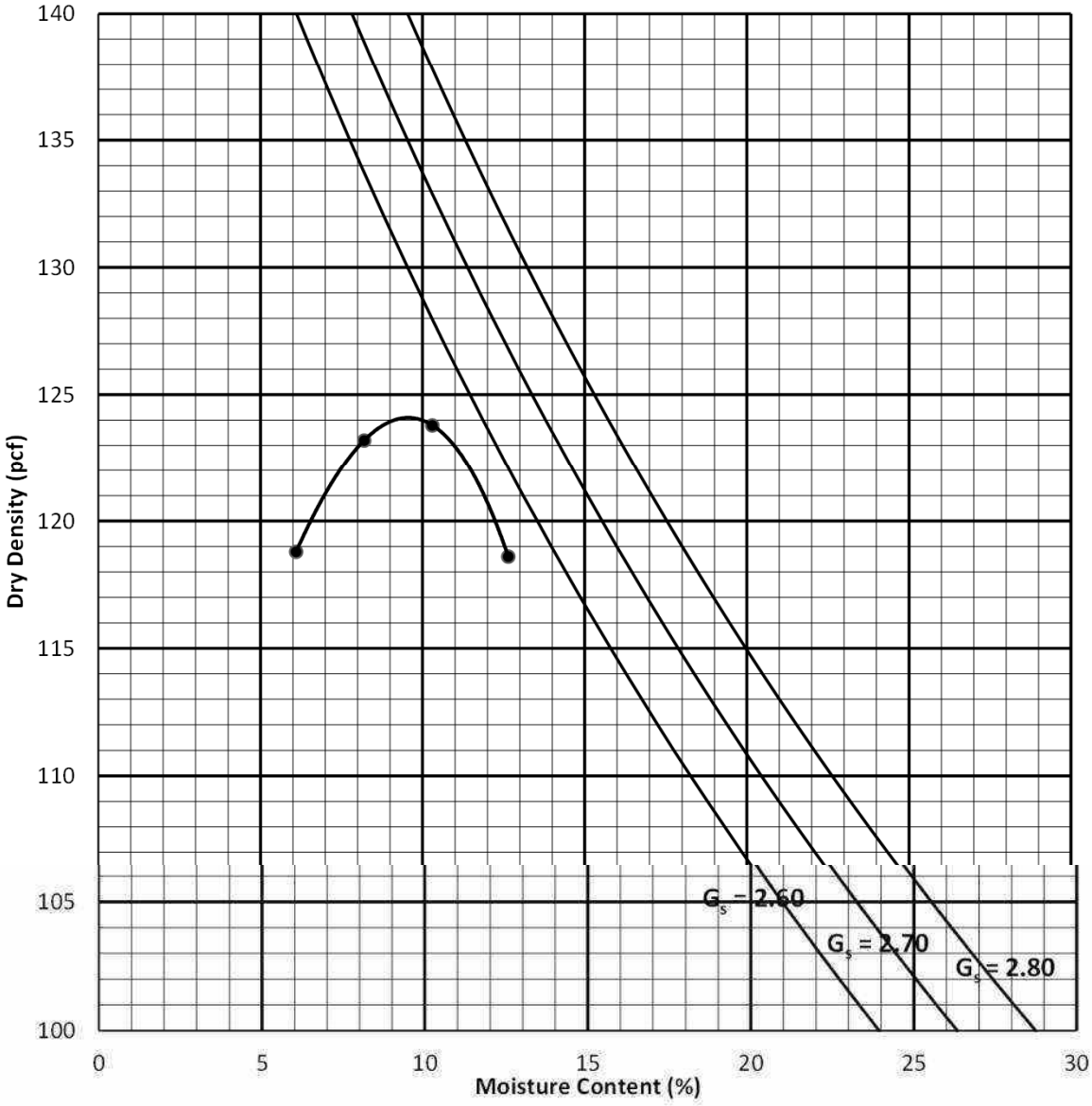
Geo-Logic ASSOCIATES

COMPACTION TEST REPORT

Project: Langan # 700045403 **GLA No.** 2012-0057
Sample: LB-10 / B-1 **Date:** 10/12/16
Description: Brown, F.M. Silty Sand w. Gravel & trace Clay **By:** LD

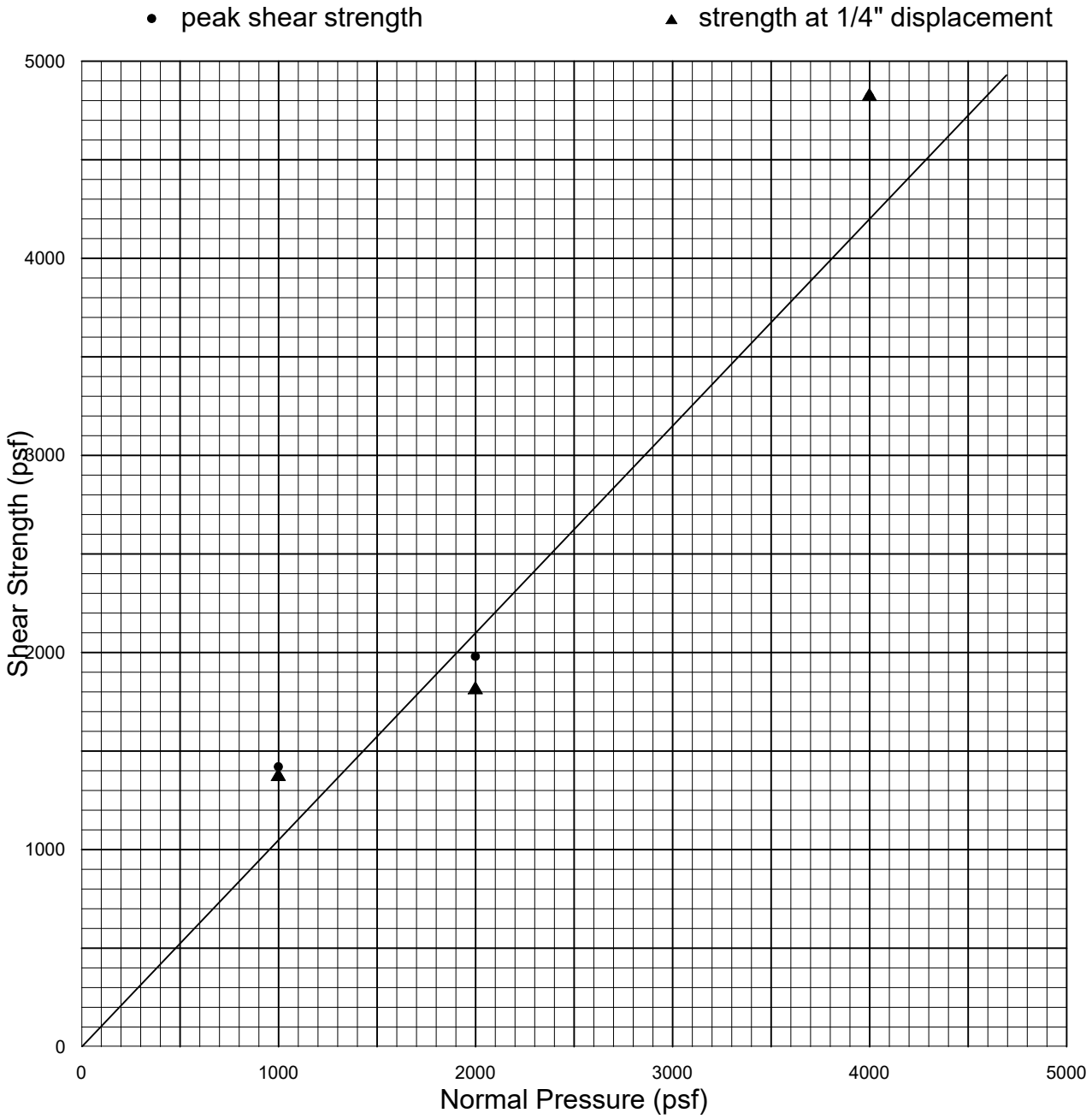
ASTM D1557	Method C	Volume (cf): 0.075		# Blows: 56	# Layers: 5
Specimen		A	B	C	D
Wet Weight (lbs)		10.02	10.24	10.00	9.45
Wet Density (pcf)		133.6	136.6	133.3	126.0
Moisture Content (%)		12.6	10.3	8.2	6.1
Dry Density (pcf)		118.6	123.8	123.2	118.8

Max. Dry Density : 124.0 pcf
Opt. Water Content: 9.5 %



Geo-Logic ASSOCIATES

DIRECT SHEAR TEST - ASTM D-3080



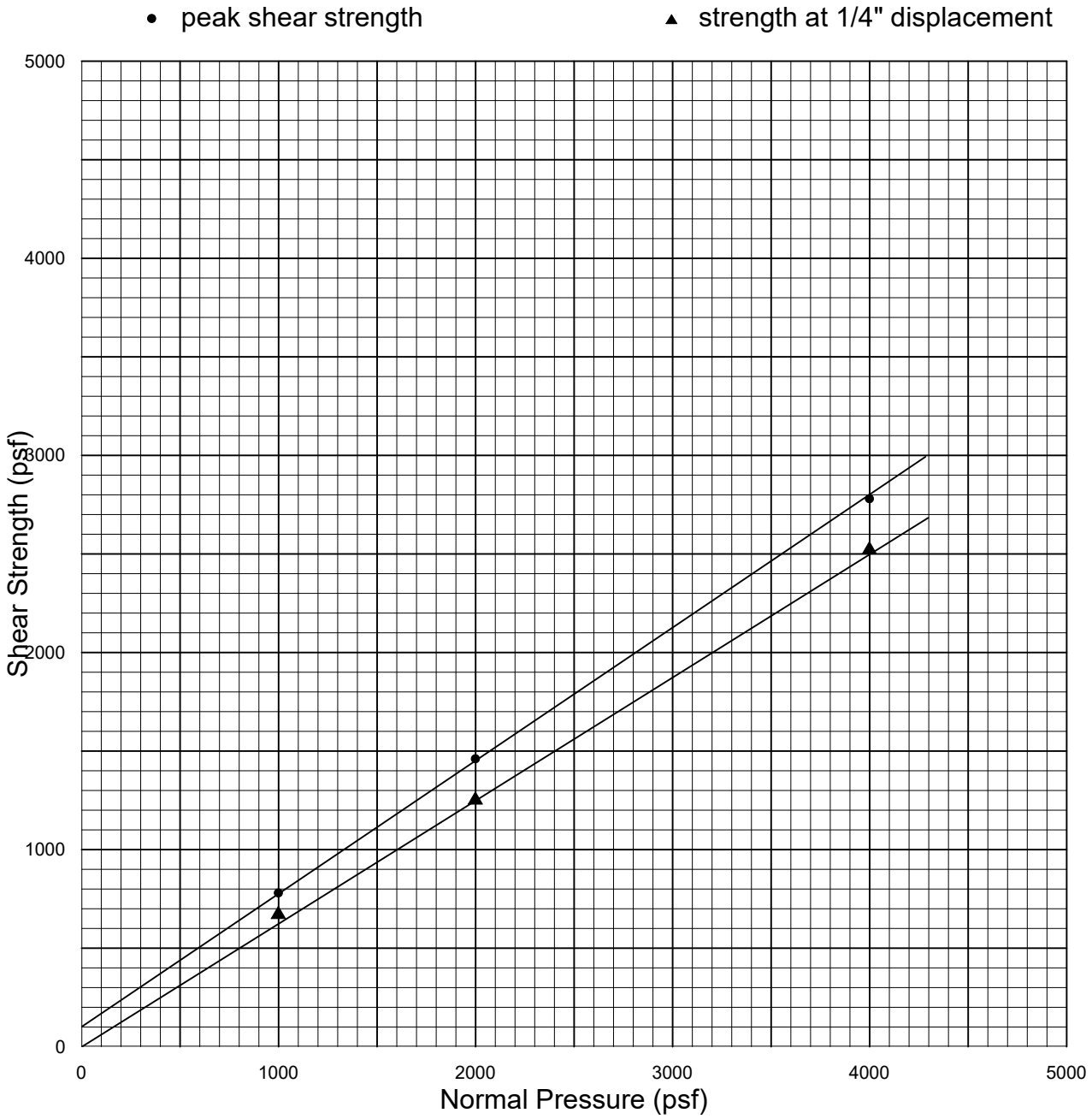
Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-1/S-3	Undisturbed & Saturated	F.C. Sand w. Gravel	121.6	1.5	12.2

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	1420 @ 0.1610"	1370
2000	1980 @ 0.1670"	1810
4000	4820 @ 0.2460"	4820
	C = 0 psf	C = 0 psf
	ϕ = 46 deg.	ϕ = 46 deg.

Date: 10-8-16

DIRECT SHEAR TEST - ASTM D-3080

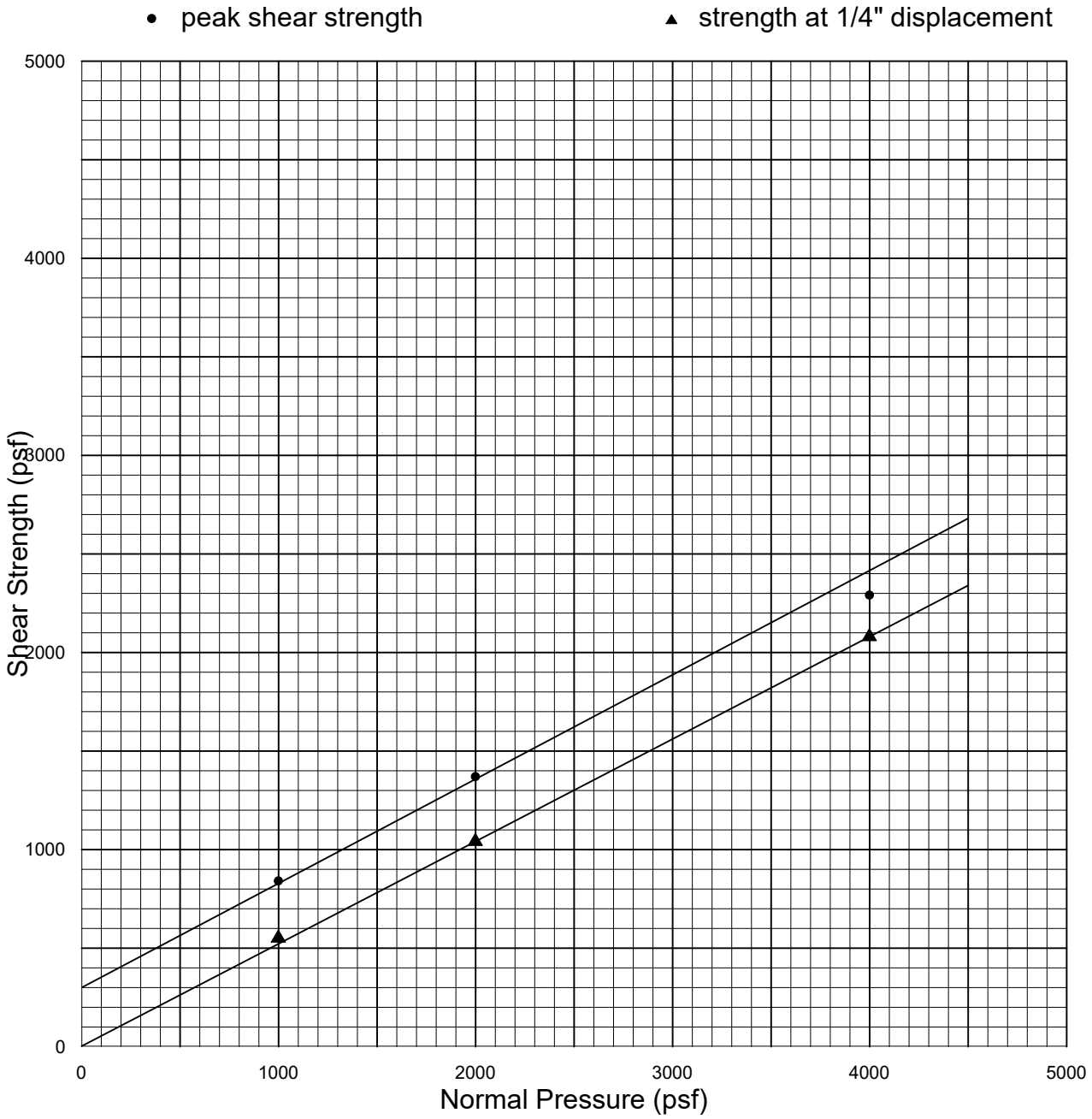


Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-4/S-3	Undisturbed & Saturated	F. Silty Sand	105.3	2.9	24.3

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	780 @ 0.0700"	670
2000	1460 @ 0.0705"	1250
4000	2780 @ 0.1010"	2520
	C = 100 psf	C = 0 psf
	ϕ = 34 deg.	ϕ = 32 deg.

DIRECT SHEAR TEST - ASTM D-3080



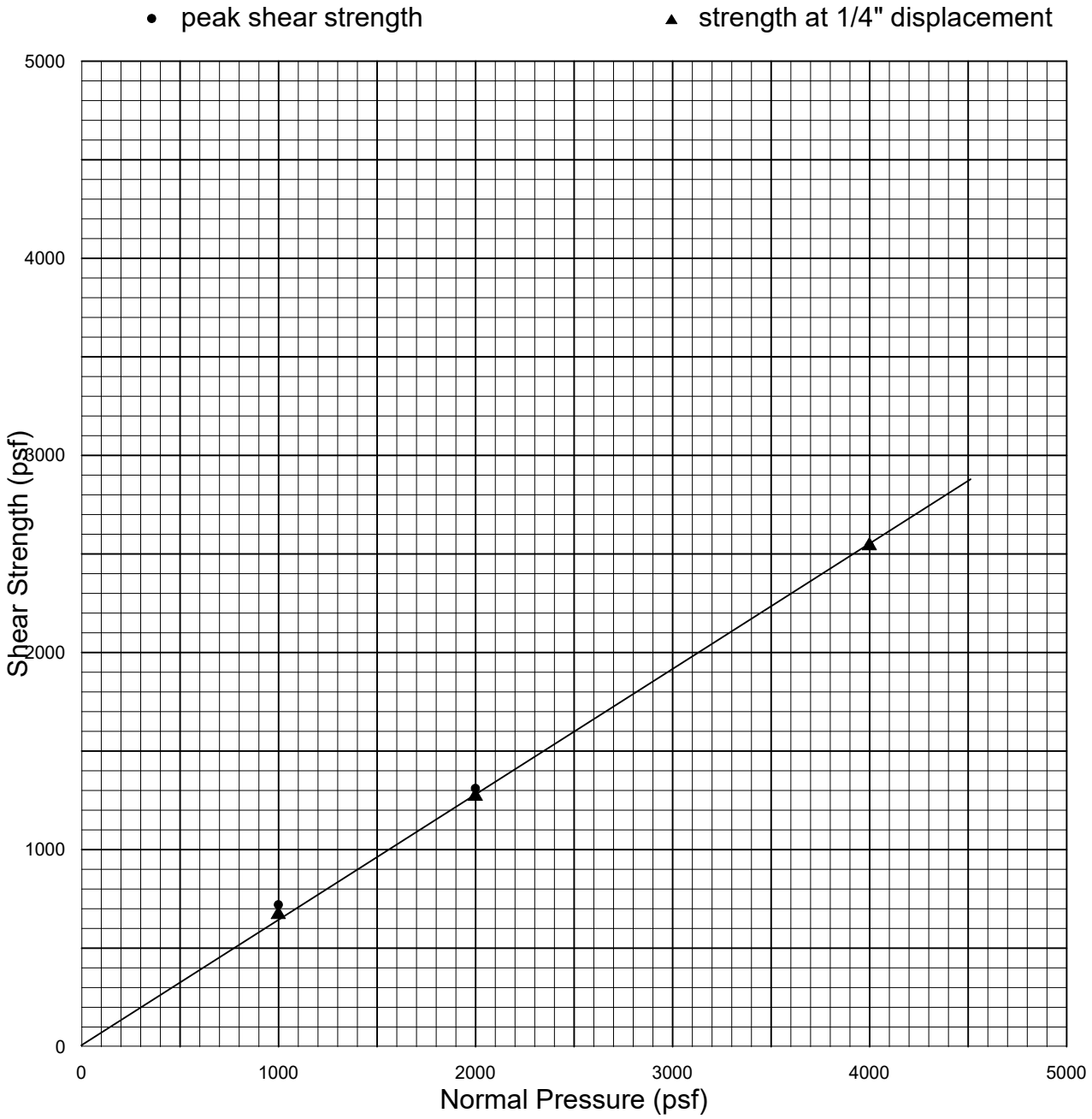
Strain Rate: 0.0042 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-5/S-3	Undisturbed & Saturated	Clay	94.4	28.3	35.4

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	840 @ 0.0600"	550
2000	1370 @ 0.0750"	1040
4000	2290 @ 0.1300"	2080
	C = 300 psf	C = 0 psf
	ϕ = 28 deg.	ϕ = 27 deg.

Date: 10-8-16

DIRECT SHEAR TEST - ASTM D-3080



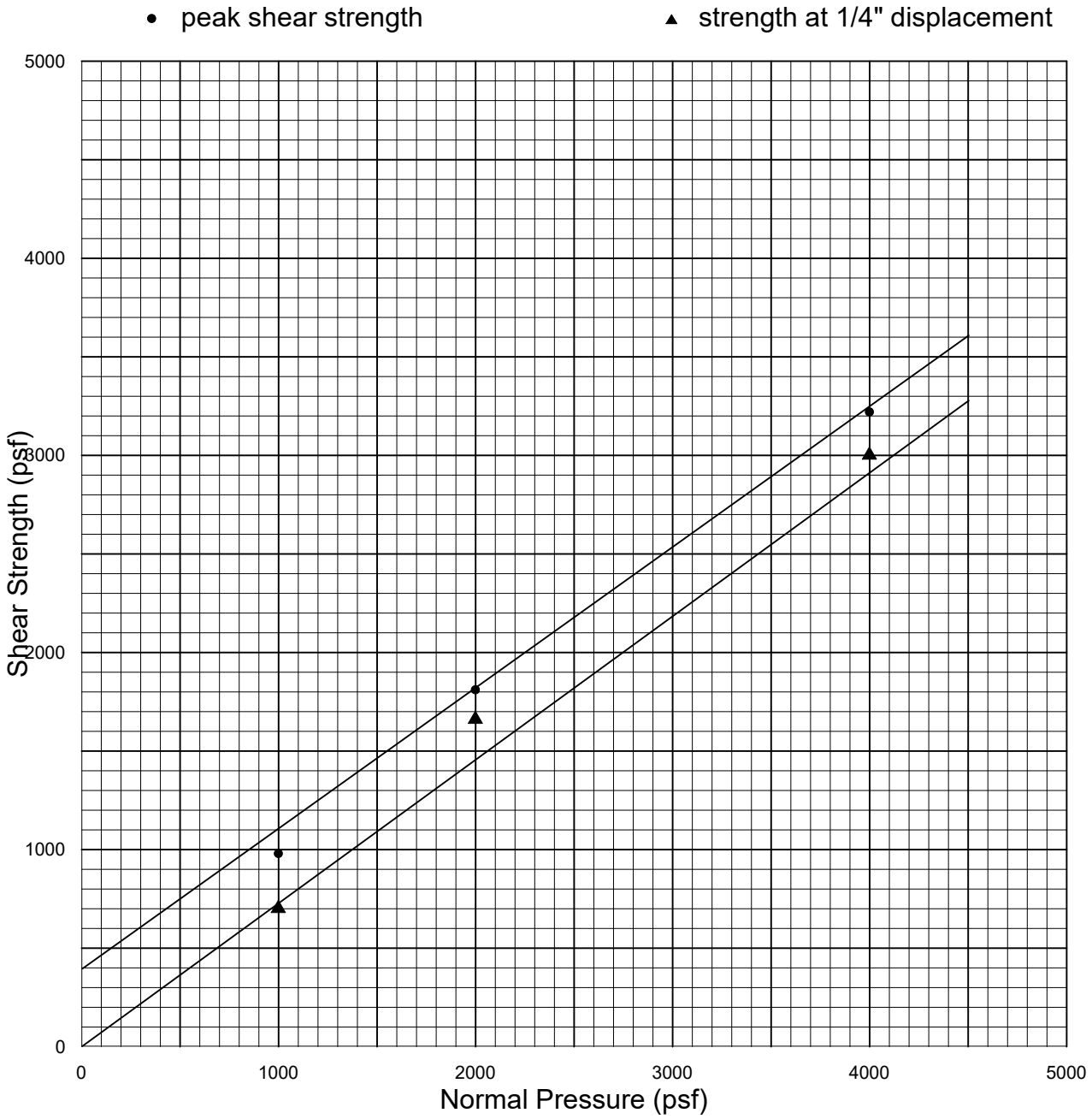
Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-6/S-4	Undisturbed & Saturated	F. Silty Sand	111.9	3.0	28.2

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	720 @ 0.0905"	670
2000	1310 @ 0.1305"	1270
4000	2540 @ 0.2460"	2540
	C = 0 psf	C = 0 psf
	ϕ = 33 deg.	ϕ = 33 deg.

Date: 10-8-16

DIRECT SHEAR TEST - ASTM D-3080

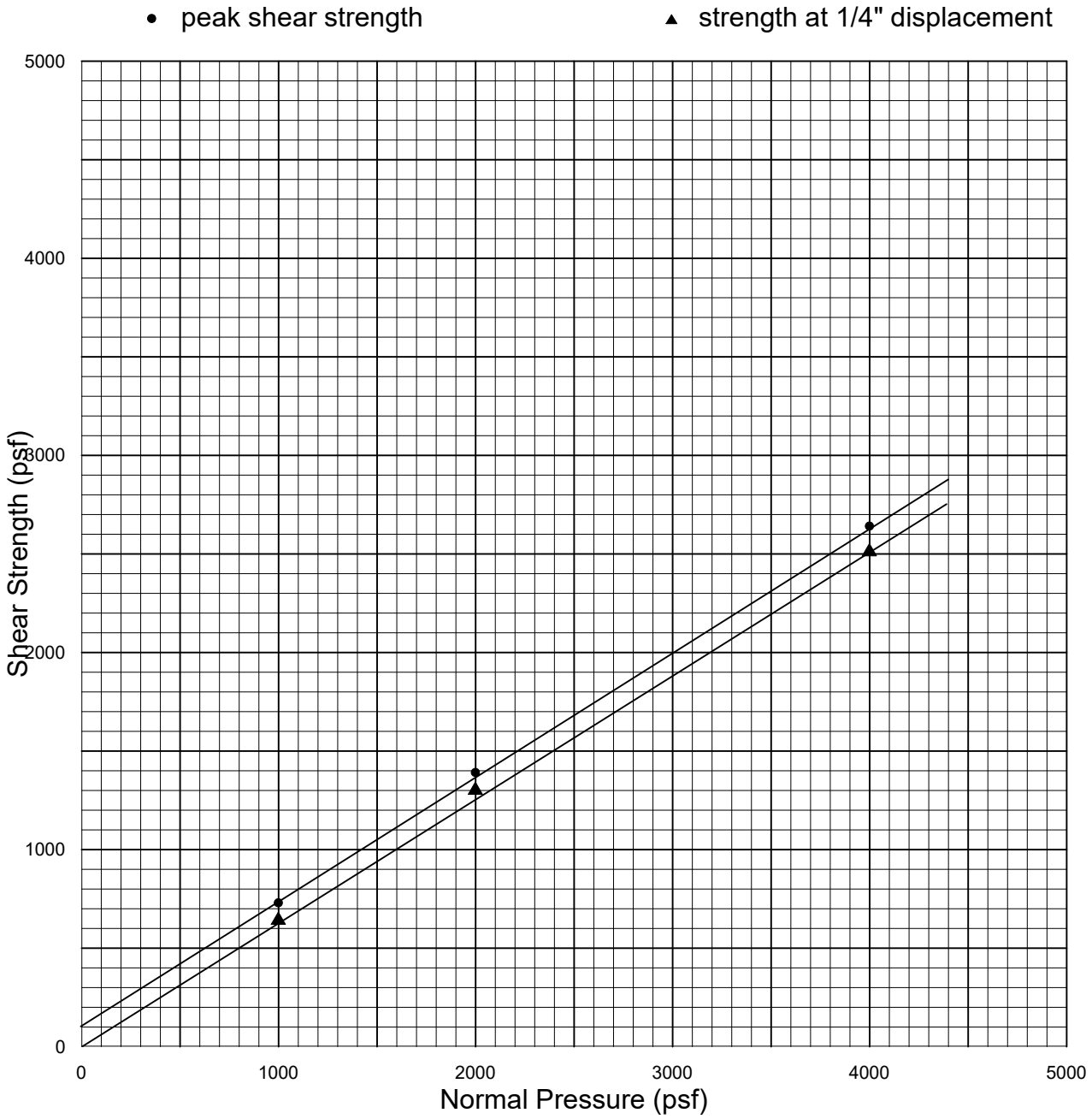


Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-8/S-3	Undisturbed & Saturated	F.C. Sand w. Gravel	112.6	2.0	14.3

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	980 @ 0.1065"	700
2000	1810 @ 0.1865"	1660
4000	3220 @ 0.1615"	3000
	C = 400 psf	C = 0 psf
	ϕ = 36 deg.	ϕ = 36 deg.

DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-9/S-4	Undisturbed & Saturated	F. Silty Sand	105.4	3.6	19.5

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	730 @ 0.0755"	640
2000	1390 @ 0.0960"	1300
4000	2640 @ 0.1155"	2510
	C = 100 psf	C = 0 psf
	ϕ = 32 deg.	ϕ = 32 deg.

Date: 10-8-16

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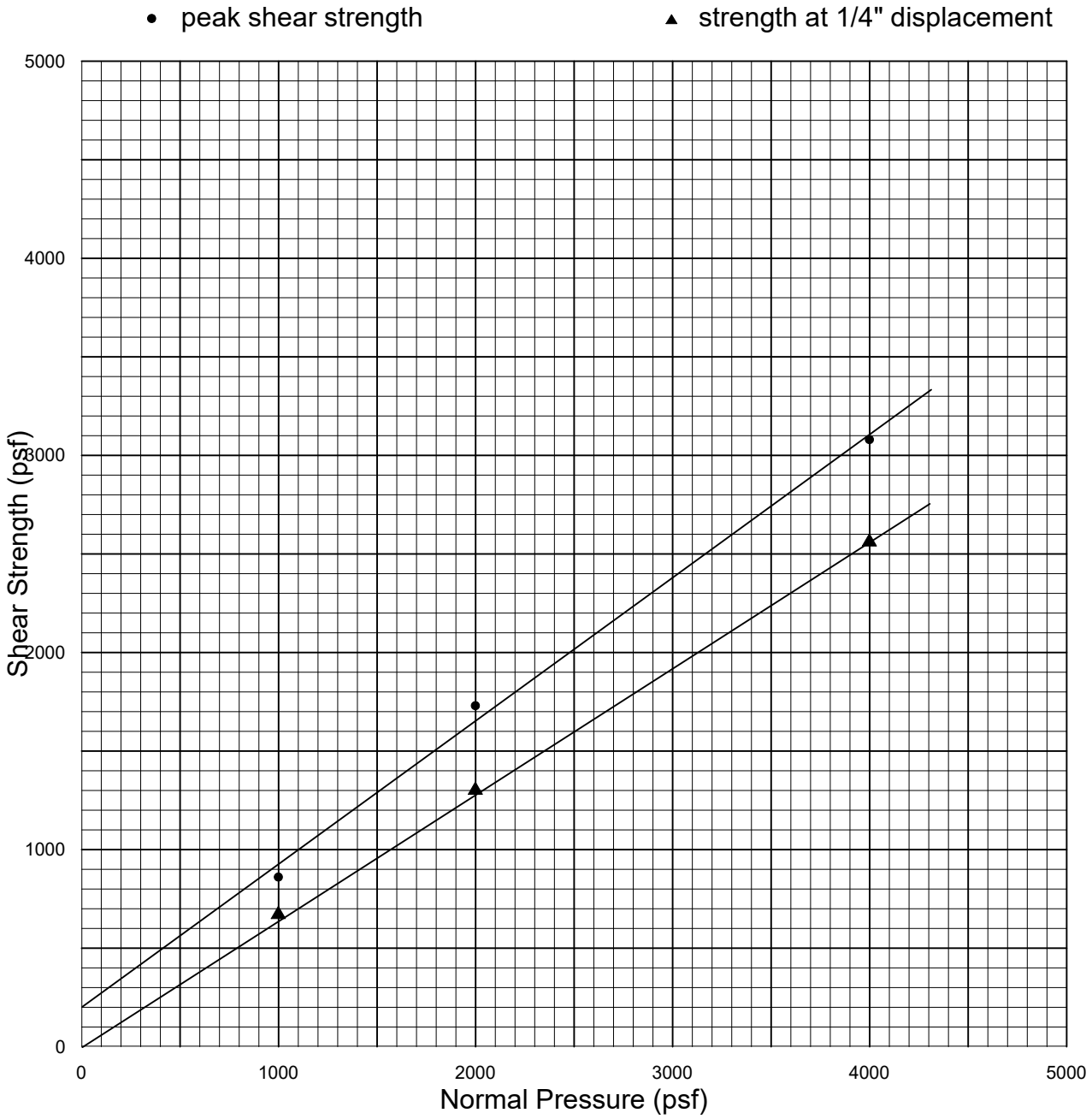
DIRECT SHEAR TEST - ASTM D-3080



Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
LB-12/S-5	Undisturbed & Saturated	F.M. Silty Sand	104.4	2.8	21.2

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	860 @ 0.0410"	670
2000	1730 @ 0.0660"	1300
4000	3080 @ 0.1160"	2560
	C = 200 psf	C = 0 psf
	ϕ = 36 deg.	ϕ = 33 deg.

Date: 10-8-16

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SAMPLE NO.:	LB-1 / B-1	LB-2 / B-1	LB-6 / B-1	LB-8 / B-1	ALB-10 / B-1
DESCRIPTION	F.C. Sand	Silty Sand	Silty Sand	Silty Sand	Silty Sand
DIRECT SHEAR TEST (type)					
Initial Moisture Content %					
Dry Density (pcf)					
Normal Stress (psf)					
Peak Shear Stress (psf)					
Ultimate Shear Stress (psf)					
Cohesion (psf)					
Internal Friction Angle (degrees)					
EXPANSION TEST UBC STD 18-2					
Initial Dry Density (pcf)					
Initial Moisture Content %					
Final Moisture Content %					
Pressure (psf)					
Expansion Index / Swell %					
CORROSIVITY TEST					
Resistivity (CTM643) (ohm-cm)	11000	6000	1500	4000	2000
pH (CTM643)	7.9	6.9	7.9	7.3	9.8
CHEMICAL TESTS					
Soluble Sulfate (CTM 417) (ppm)	165	103	239	91	128
Chloride Content (CTM 422) (ppm)	54	148	116	104	1534
Wash #200 Sieve (ASTM-1140) %					
Sand Equivalent (ASTM D2419)					

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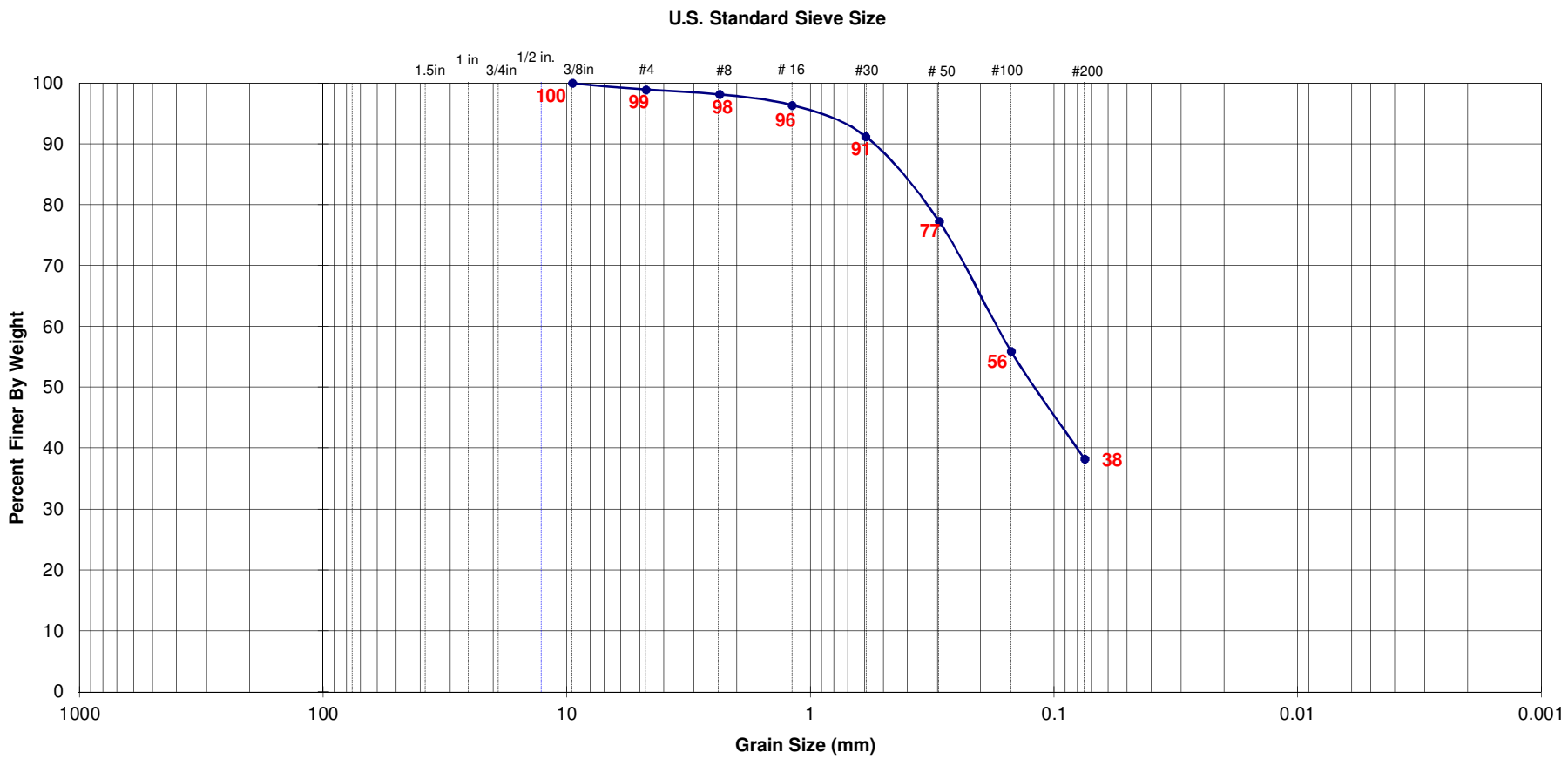
Date: 4/16/17



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
TP-1 / Sample B									**SM**	

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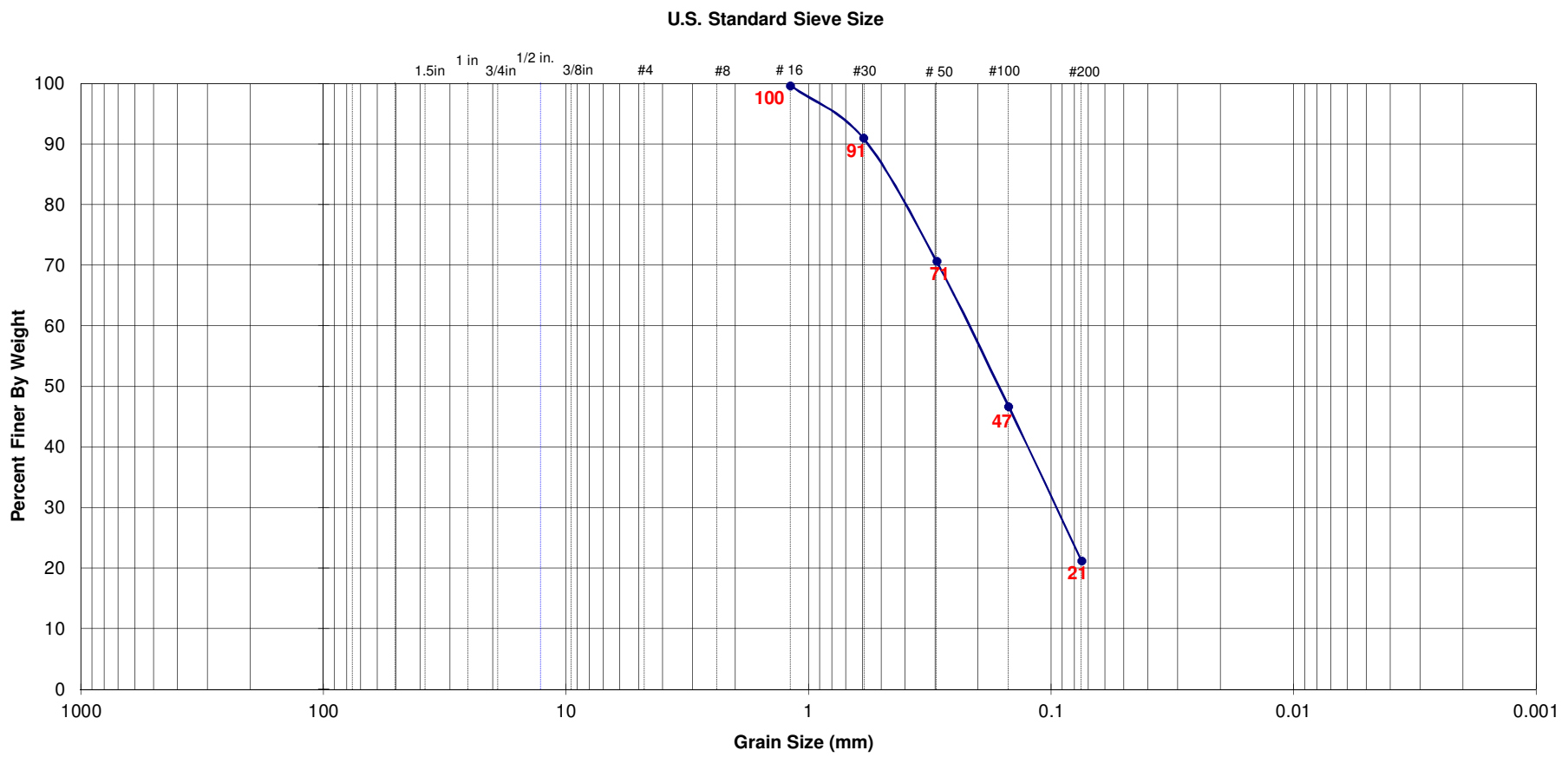
Date: 4/16/17



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
TP-3 / Sample A									**SM**	

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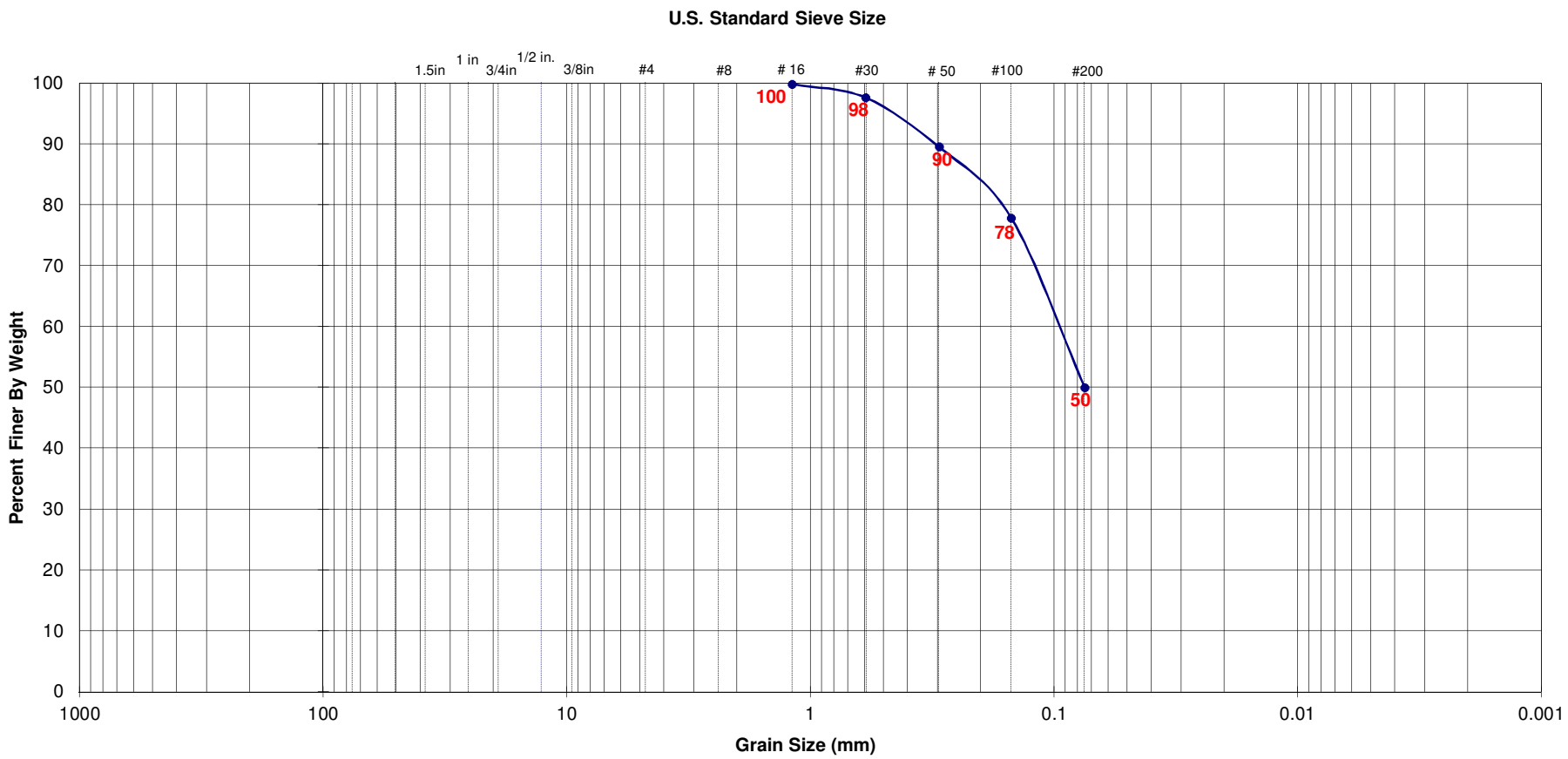
Date: 4/16/17



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	% Passing No. 200 Sieve	Sand Equivalent (ASTM D2419)	LL	PL	PI	Unified Soil Class.	Description
TP-6 / Sample A									**CL**	

Geo-Logic Associates

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

PRELIMINARY

PHASE I ENVIRONMENTAL SITE ASSESSMENT
for
RIVERSIDE CEMENT PLANT
JURUPA VALLEY, CALIFORNIA

Prepared For:

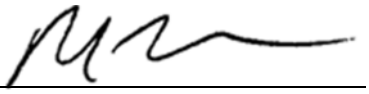
Crestmore Redevelopment

Prepared By:

Langan Engineering and Environmental Services, Inc.



Jose A. Baron jr
Senior Staff Engineer



Rory Johnston, PE, GE
Principal/ Vice President

10 June 2016
Langan Project No. 700045401

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FIGURES

Figure 1 Site Location Map

Figure 2 Environmental Conditions Map

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Table 1 List of Former Underground Storage Tanks

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Appendix J City Directory Abstract

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EXECUTIVE SUMMARY

Langan Engineering and Environmental Services, Inc., (Langan) was retained by Crestmore Redevelopment, to prepare this Phase I Environmental Site Assessment (ESA) for the Subject Property, located at 1500 Rubidoux Boulevard, Jurupa Valley, California (the "Subject Property"). The Subject Property consists of 12 adjoining parcels with a proposed development area of approximately 190 acres, and comprises a portion of the former Crestmore Cement/ Riverside Cement Manufacturing Plant. Figure 1 depicts the approximate location of the Subject Property and former Crestmore Cement/ Riverside Cement Manufacturing Plant.

The Subject Property is bound to the west by railroad track and Rubidoux Boulevard, to the north by El Rivino Road, to the south by three inactive quarries and Agua Mansa Road, and to the east by industrial development and Hall Avenue. As shown on Figure 1, the eastern end of the site contains undeveloped land and unpaved roads, while the northern end of contains undeveloped land and a paved entrance road with a guard shack. The western end encompasses an entrance road, along with storage silos, a warehouse (Pack House), part of the former white cement manufacturing plant ,and a one to two-story administration buildings (Truck Garage, Transportation Office, Storehouse, and Garage).

The former white cement manufacturing area, one-story warehouses for clay and clinker storage, a 210,000-gallon AST, storage silos, a crushing plant, stockpiles, undeveloped land, and a tunnel with a beltway connected to the former underground mine are the primary features of the southern portion of the property. The center of the Subject Property contains the former grey cement manufacturing plant, main electrical substation, two water wells (60-1 and 88-1), crushed rock storage area, storage silos, asphalt paved parking, a hazardous waste storage area, a former spray pond that was converted to a storage area, electrical control rooms, and a former material storage area.

This Phase I ESA was conducted using the guidelines of the American Society for Testing and Materials (ASTM) Practice E1527-13 (Standard Practice for ESA: Phase I ESA Process), and the United States Environmental Protection Agency's (USEPA) 2006 All Appropriate Inquiry (AAI) Rule (40 CFR Part 312). The objective of this Phase I ESA was to attempt to identify the presence or likely presence, use, or release on the Subject Property of hazardous substances or petroleum products as defined in ASTM E1527-13 as a Recognized Environmental Condition (REC).

Based on the results of Phase I efforts, the following RECs were identified:

- REC 1: Cement Kiln Dust (CKD) – Based on a review of field investigation, technical evaluation, technical memorandum, and Phase I Environmental Site Assessment reports provided by Crestmore Redevelopment, CKD was landfilled and capped with soil in the southern end of the Subject Property. Approximately 250,000 tons of CKD were disposed on-site with approximately 48 cubic yards of refractory brick containing 10 percent of hexavalent chromium. Historical sampling of CKD identified detected chromium with a maximum concentration of 4.6 mg/kg and lead with a maximum concentration of 106 mg/kg. Riverside Cement Company submitted a closure plan to the Regional Water Quality Control Board (RWQCB) on August 13, 1991; however, no confirmation of final closure has been located. The limits of the CKD disposal areas are shown in Figure 2.
- REC 2: Crestmore Mine – The underground mine was flooded and no closure documentation was located. The lateral limits of the underground mine are unknown but are suspected to extend to Production Well 88-1. The owner's site contact Pat Crites (Mr. Crites), noted that the bottom of Production Well 88-1 was installed within an underground mining room. The location of Crestmore Mine is shown on Figure 2.

The following historical RECs (HRECs) were identified:

- HREC 1: Underground Storage Tanks (USTs) – Based on documents reviewed as part of the public records review for the Department of Toxic Substances Control (DTSC) and the Riverside County Environmental Health Department (RCEHD), nine USTs were removed from the site between 1987 and 1999. The former USTs are listed in Table 1 and shown in Figure 2.
- HREC 2: Above Ground Storage Tanks (ASTs) – Based on a review of documents provided by Crestmore Redevelopment, the Subject Property had 12 ASTs. Three ASTs were observed on-site and the results of the site reconnaissance suggested that the remaining on-site ASTs were cleaned. The locations of the ASTs are shown in Figure 2.
- HREC 3: Former Boiler Blowdown Pond – Based on the closure report for the boiler blowdown pond, the boiler blowdown pond was approximately 50 feet in length, 30 feet in width, and 4 feet in depth. The boiler blowdown pond was lined with plastic and covered with clayey soil. The boiler blowdown pond received blowdown water from 1985 to 1990. In May 1995, ERM EnviroClean West, Inc. prepared a closure report that documented remedial activities and confirmation sampling. In June 15, 1995, RWQCB notified Riverside Cement Company that closure of the former boiler blowdown pond was complete for the current use of the property. However, the change in use of the

property may require subsequent review by the RWQCB and potential supplemental closure activities. The location of the former boiler blowdown pond is shown in Figure 2.

- HREC 4: Former Spray Pond – Based on the conversation with the owner's site contact William Brown (Mr. Brown), the former spray pond was used to spray warmed liquids into the air for evaporative cooling before reuse in the cement manufacturing process. No details regarding the liquid composition or the as-built construction details of the pond were provided. The location of the former spray pond is shown in Figure 2.
- HREC 5: Former Sag Pond – Based on the map titled "Wells and Major Water Lines, Crestmore Plant and Vicinity" by Riverside Cement Company dated January 1985, the sag pond was identified; however, no information was provided regarding the usage and as-built construction of the pond. Based on a review of historical aerial photographs from 1948 to 1974, a depression could be noted with liquid at times where historical maps have identified the sag pond was located. The location of the former sag pond is shown in Figure 2.
- HREC 6: White Kiln Pipeline Leak – Based on a review of public documents, in August 1993, a pipeline leak was discovered in an underground pipeline connecting the 250,000 Gallon No.6 fuel oil AST to supply pumps for the white kilns. Impacted soil was excavated and temporarily stockpiled on-site before incorporating the material with other ingredients in the production of Portland cement. The excavation dimensions were approximately 59 feet in length, 23 feet in width, and 9 to 13 feet in depth. Laboratory results for samples collected in boring B-7 (near the diesel pumping station) detected diesel concentrations ranging from 9,800 to 12,000 mg/kg to a depth of 45 feet. A monitoring well was installed and for possible free product (total petroleum hydrocarbons) in the area of the white kiln pipeline leak. The well was monitored over a three-month period and no free product was detected during any of the monitoring episodes. Additional information is needed to confirm or refute the potential for groundwater impacts in this area. The location of the white kiln pipeline leak is shown in Figure 2.
- HREC 7: Vehicle Cleaning Area – Based on a review of documents provided by Crestmore Redevelopment, vehicles were cleaned with high pressure water and detergent. Mr. Crites noted that runoff from vehicles was collected in a concrete lined vault and directed towards leach lines east of the Truck Garage. The location of the leach lines are shown in Figure 2.
- HREC 8: Hazardous Waste Storage Area – Based on a review of documents provided by Crestmore Redevelopment, the hazardous waste storage area consist of a fenced area

with a concrete pad where waste oil, waste grease, waste solvents, and empty drums were stored. The location of the hazardous waste storage area is shown in Figure 2.

- HREC 9: Transformers – Transformers were observed throughout the Subject Property. The transformers appeared to be in good conditions and were not labeled as containing polychlorinated biphenyls (PCBs). Mr. Brown noted that all transformers have been emptied and tested to be free of PCBs. The approximate locations of the transformers are shown in Figure 2

No Controlled Recognized Environmental Concerns (CRECs) were identified during this Phase I ESA. The following non-ASTM environmental concerns were identified during this Phase I ESA:

- It is unknown if monitoring wells reported in historical reports were closed or abandoned properly. It is also unknown if Production Well 88-1 has been properly closed or abandoned.
- Mr. Crites pointed out a tunnel with a beltway that was used to bring ore from the underground mine. Mr. Crites noted that the tunnel had collapsed and no other information was provided. The tunnel is reportedly located south of the clay storage area and west of the rock crushing plant. The location to the entrance of the tunnel is shown in Figure 2.
- A storm water sump was observed in the southeast corner of former spray pond storage area. The sump contained liquid and debris consisting of wood, clothing, plastic bags, and metals. The storm water sump was inside a concrete depression that measured approximately 10 feet wide, 20 feet in length, and 10 feet in depth with a roof made of wooden planks. An inlet/outlet was located in the southeast corner of the storm water sump. The location of the storm water sump is shown in Figure 2.
- A sanitary leach field is located south-west of the Subject Property. Mr. Crites noted that sewer lines within the Subject Property did not drain into the public sewer system. Instead, sewer lines drained into septic system and then into leach field. Mr. Crites noted that a subcontractor was hired to maintain the septic system once a year. The location of the sanitary leach field is shown on Figure 2.

The following de minimis conditions were identified:

- Over 130 empty 55-gallon drums were observed throughout the Subject Property. Areas in which the empty 55-gallon drums were observed included the former white and grey cement manufacturing plant, clay storage area, and former spray pond storage area.

- Approximately 220, 55-gallon drums containing steel and porcelain balls that were used in the cement manufacturing process were observed within the Subject Property. Mr. Brown noted that the drums were sold and awaiting collection by their new owner.
- Stockpiles of soil, crushed rock, and concrete were observed in the Subject Property. Soil stockpiles were observed throughout the Subject Property and were at times covered with gunite. Stockpiles of crushed rock were observed in the crushed rock storage area. Stockpiles of concrete were observed within and adjacent to the demolished grey kilns.
- Stained soil was observed in the white cement manufacturing plant. The stained soil was observed northwest of one of the control rooms.
- Seepage was observed near the former grey cement manufacturing plant; liquid was seeping underneath a concrete slab. Mr. Brown noted that water lines had been rupturing throughout out the Subject Property because of wear and tear.

1.0 INTRODUCTION

Langan Engineering and Environmental Services, Inc., (Langan) was retained by Crestmore Redevelopment (the "User"), to prepare this Phase I Environmental Site Assessment (ESA) for the Subject Property located at 1500 Rubidoux Boulevard, Jurupa Valley, California (the "Subject Property"). The Subject Property consists of 12 adjoining parcels with a proposed development area of approximately 190 acres that are part of the former Crestmore Cement/ Riverside Cement Manufacturing Plant.

The Subject Property is bounded by railroad tracks and Rubidoux Boulevard to the west, El Rivino Road to the north, three inactive quarries and Agua Mansa Road to the south, and industrial development and Hall Avenue to the East. Figure 1 depicts the approximate limits of the Subject Property.

The eastern end of the Subject Property contains undeveloped land and unpaved roads, while the northern end of the Subject Property contains undeveloped land and a paved entrance road with a guard shack. The western end of the Subject Property contains an entrance road, along with storage silos, warehouse (Pack House), part of the former white cement manufacturing plant, and one to two-story administration buildings (Truck Garage, Transportation Office, Storehouse and Garage). Part of the former white cement manufacturing area, one-story warehouses (clay storage and clinker storage), storage silos, rock crushing plant, stockpiles, undeveloped land, and a beltway to a collapsed underground mine mark the primary features of the southern portion of the property. The center of the Subject Property contains the former grey cement manufacturing plant, main electrical substation, two water wells (60-1 and 88-1), crushed rock storage area, storage silos, vehicle parking spaces, hazardous waste storage area, former spray pond storage area, electrical control rooms, and former material storage area.

The purpose of this Phase I ESA is to attempt to identify Recognized Environmental Conditions (RECs) in connection with the Subject Property, as defined in The Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, Designation E1527-13, which states: "The presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not considered RECs. De minimis conditions are further defined as conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

1.1 Scope of the Phase I ESA

This Phase I ESA was conducted using a standard of good commercial/customary practice and the local standard of care with a scope of services that is generally consistent with American Society for Testing and Materials (ASTM) E1527-13. Significant scope-of-work additions, deletions, or deviations to ASTM E1527-13 are noted in Section 8.0 of this report. In general, the scope of this assessment consisted of obtaining information from the User; reviewing reasonably ascertainable information and environmental data relating to the Subject Property; reviewing maps and records maintained by federal, state, and local regulatory agencies; interviewing persons knowledgeable about the Subject Property; and conducting a site inspection. The specific scope of this assessment included the following:

1. A site reconnaissance to attempt to characterize conditions and assess the Subject Property's location with respect to adjoining and surrounding property uses and natural surface features. The reconnaissance included the surrounding roads and observations of surrounding properties from public rights-of-way to identify obvious potential environmental conditions on neighboring properties. The site reconnaissance focused on the spatial extent of the Subject Property and then progressed to adjacent and surrounding properties. Photographs taken as part of the site reconnaissance are provided in Appendix A.

2. Questionnaires were provided to the User and site owner to obtain information related to the Subject Property. Copies of the completed questionnaires are provided in Appendix B.

3. A review of available previous environmental reports completed for the Subject Property provided and obtained by the User. Copies of the reports are included as Appendix C.

4. A review of environmental databases maintained by the USEPA, state, and local agencies within the approximate minimum search distance. Environmental Data Resources, Inc. (EDR) prepared the environmental database report, which is included in Appendix D.

5. An evaluation of sites that may result in a vapor encroachment at the Subject Property. EDR's Vapor Encroachment Screen report is included in Appendix E.

6. Freedom of Information Act (FOIA) requests were sent to federal, state, and local agencies. Any FOIA responses received that alter the conclusions made in this report will be documented in an addendum to this report. Copies of the FOIA requests are included in Appendix F.

7. Physical characteristics of the Subject Property were determined through referenced sources for topographic, geologic, soils, and hydrologic data.

8. A review and interpretation of aerial photographs, Sanborn Fire Insurance Maps (Sanborn Maps), historical topographic maps, and city directories to identify previous activities on and in the vicinity of the Subject Property. Copies are included in Appendices G, H, I, and J, respectively.

1.2 Assumptions, Limitations, and Exceptions

This Phase I ESA report was prepared for the User for the Subject Property located at the address specified in Section 1.0 of this report. This report is intended to be used in its entirety. Excerpts taken from this report are not necessarily representative of the assessment findings. Langan cannot assume responsibility for use of this report for any property other than the Subject Property addressed herein, or by any other third party without a written authorization from Langan.

Langan's scope of services, described in Section 1.1, was limited to that agreed with the User and no other services beyond those explicitly stated are implied. The services performed and agreed upon for this effort is generally consistent with ASTM Standard E1527-13. Intrusive sampling (e.g., soil borings and groundwater sampling) was not performed as part of this Phase I ESA.

This Phase I ESA is not intended to be a definitive investigation of possible environmental impacts at the Subject Property. The purpose of this investigation was limited to determining if there is reason to suspect the possibility of RECs at the Subject Property. It should be understood that even the most comprehensive Phase I ESA may fail to detect environmental liabilities at a particular Subject Property. Therefore, Langan cannot "insure" or "certify" that the Subject Property is free of environmental impacts. No expressed or implied representation or warranty is included or intended in this report, except that our services were performed, within the limits prescribed by our client, with the customary standard of care exercised by professionals performing similar services under similar circumstances within the same jurisdiction.

The conclusions and opinions provided in this report are based solely on the specific activities as required for the performance of ASTM E1527-13 and are intended exclusively for the purpose stated herein, at the specified Subject Property as it existed at the time of our site visit.

2.0 SUBJECT PROPERTY DESCRIPTION

2.1 Location and Description

The Subject Property comprises 12 parcels in Jurupa Valley, California. The Subject Property is located at 1500 Rubidoux Boulevard and identified by 12 Assessor's Parcel Numbers (APNs). The APN numbers are listed below:

APN
175-200-001-6
175-200-002-7
175-200-007-2
175-200-003-8
175-200-004-9
175-200-005-0

APN
175-170-004-7
175-170-001-4
175-170-002-5
175-170-003-6
175-180-001-5
175-200-006-1

The northern end contains undeveloped land with dense vegetation consisting of grass, shrubs and trees, and a paved entrance road with a guard shack. The western portion contains an entrance road, storage silos, warehouse (Pack House), part of the former white cement manufacturing plant and one to two-story administration buildings (Truck Garage, Transportation Office, Storehouse and Garage).

The Pack House contained different mechanical equipment that was powered by electricity; none of the equipment was observed to be active. Storage silos for white and grey cement were adjacent to the Pack House along with a former stockhouse and warehouse. The former white cement manufacturing plant has two white cement kilns, an open warehouse for clinker storage, boiler house, two control houses, two bag houses and storage silos. The Truck Garage is a two-story building that is currently used as the main administration building and to store drums, materials, and equipment. The Truck Garage and Garage were used to maintain company vehicles and had pits that were used to access the underside of vehicles. The Storehouse is a one-story warehouse that was used to store materials and equipment.

The southern portion of the Subject Property contains part of the former white cement manufacturing area, one-story warehouses for clay and clinker storage, a 210,000-gallon AST, storage silos, rock crushing plant, stockpiles, undeveloped land, and a beltway to the underground mine that had collapsed. The clay storage building is a one-story warehouse used to store clay and has storage silos adjacent to the building. The former 210,000-gallon AST

used to store fuel oil for the white kilns is inside a secondary containment made of concrete reportedly underlain with plastic and clay. The rock crushing plant received raw materials for crushing is connected to the underground mine with a beltway and mine shaft. The mine shaft had collapsed. Stockpiles of soil (reportedly spoils from the underground mine) and white clinker are located along the southern portion of the Subject Property. The undeveloped land is believed to be the former disposal area for CKD and is capped with an unknown amount of soil.

The center of the Subject Property contains the former grey cement manufacturing plant, storage silos, vehicle parking spaces, hazardous waste storage area, main electrical substation, two water wells (60-1 and 88-1), crushed rock storage area, former spray pond storage area, and former material storage area. The former grey cement manufacturing plant had storage silos, a motor control house, mill motor house, two former ASTs and two grey kilns that were demolished. Vehicle parking spaces were paved with asphalt and adjacent to open metal sheds. The hazardous waste storage area is fenced and has a concrete pad. The former spray pond storage area is fenced, has a concrete pad, currently used to store drums, equipment, storage containers, and temporary plastic tanks. The southeast corner of the former spray pond storage area has a storm water sump made of concrete and a wooden roof. The main electrical substation is a one-story building made of mortar and houses electrical equipment. Production Well 60-1 provides potable water for the Subject Property and Production Well 88-1 is non-operational. The former material storage area has two motor control rooms and one former AST.

The east end of the Subject Property contains undeveloped land, unpaved roads and soil stockpiles that Mr. Crites noted were spoils from underground mining.

The Subject Property is bounded by railroad tracks and Rubidoux Boulevard to the west, El Rivino Road to the north, three inactive quarries and Agua Mansa Road to the south, and industrial development and Hall Avenue to the East. .

Based on visual observations of the surrounding area made during the site reconnaissance, the Subject Property is located in a suburban area primarily characterized by commercial, industrial properties, undeveloped parcels, and residential properties. Surrounding Property usages are summarized in the following table:

Direction	**Adjoining Properties**		**Surrounding Properties**
	Address	**Description**	
North	Not Available	El Rivino Road followed by a Golf Course, residential property and a	Single-family residences. Single-story

		commercial/industrial property in the northwest corner.	commercial/industrial building.
West	1850 Agua Mansa Road	Rubidoux Boulevard followed by residential property in the northwest corner and undeveloped land with a descending slope in the west. Commercial/ industrial property (Yeager EL Construction) in the southwest corner followed by Rubidoux Boulevard and Market Street.	Single-family residences, undeveloped land and single-story commercial/industrial buildings.
South	1850 Agua Mansa Road 1780 Agua Mansa Road	Agua Mansa Road followed by commercial/ industrial property (Household Hazardous Waste Facility and Tri-County Rubbish Garbage Collection Service).	Single-story commercial/industrial buildings.
East	1725 Agua Mansa Road 705 Columbia Avenue 1135 Hall Avenue	Commercial/ industrial property (Earthworks Soil Amendments) and undeveloped land in the southeast corner. Commercial/ industrial property (Aramark Uniform Services) followed by Brown Avenue and Hall Avenue. Brown Avenue followed by a commercial/ industrial complex (American Trademark Inc. and Cibaria International Inc.). Hall Avenue followed by undeveloped land.	Single-story commercial/industrial buildings and undeveloped land.

2.2 Description of Subject Property Improvements

Improvements at the Subject Property are summarized in the following table:

SUBJECT PROPERTY IMPROVEMENTS	
Size of the Subject Property	190 acres
Buildings/Spaces/Structures	1500 Rubidoux Boulevard: One-story commercial/ industrial buildings related to a cement manufacturing plant. Several parcels of undeveloped land. Storage areas and open quarries.
Surface Water	Surface water is located on the southwest end of the Subject Property and is generally referred to as Crestmore Lake.
Potable Water Source	Well 60-1
Sanitary and Sewer Utilities	On-site Septic System
Storm Drain Utilities	Santa Ana Regional Water Quality Control Board
Electrical Utilities	Southern California Edison
Construction Completion Date	1974
General Construction Type	Concrete tilt-up with flat roof for buildings, concrete for silos and some equipment, steel for beltways and warehouses
Cooling and Ventilation System Type	Central air conditioning in Truck Garage
Heating System Type	Central heating in Truck Garage
Emergency Power	None observed

3.0 USER PROVIDED INFORMATION

3.1 User/Owner Questionnaires

Per ASTM E1527-13, a User Questionnaire was provided to the User to inquire about specialized information related to the Subject Property. William Lynott of Crestmore Redevelopment, completed the User Questionnaire. Based on the completed questionnaire, Mr. Lynott indicated that the reason for the Phase I ESA is for due diligence for acquisition. Mr. Lynott is unaware of any environmental cleanup liens and/or activity and land use limitations for the Subject Property. Mr. Lynott indicated that he is aware of the commonly known and ascertainable information about the property, such as the fact that the property used to be a concrete manufacturing plant and mined for minerals, and that the market price for the Subject Property is affected by on-site disposal of CKD. Mr. Lynott is also aware of environmental cleanups consisting of tank removal and chemical disposal., as well as the likely presence of contamination and the past litigation relevant to hazardous substances and proceedings relevant to hazardous substances. Mr. Lynott noted that copies of environmental site assessment reports, reports regarding hydrogeological conditions, risk assessments, and environmental clean-up reports will be provided to Langan. The completed User Questionnaire is included in Appendix B.

3.2 Previous Environmental Reports

The following is a summary of the previous environmental reports pertaining to the Subject Property that were reviewed by Langan:

Document	Summary
September 30, 1990 – Environmental Protection Agency, Hazardous Site Evaluation Division - Field investigation Team Zone 2 - Ecology and Environment, Inc.	The Environmental Protection Agency requested Ecology and Environment Inc. to conduct a Screening Site Inspection under CERCLA and Superfund Amendments and Reauthorization Act of 1980 (SARA). The apparent problem that was investigated consisted of basic brick containing hexavalent chromium and CKD were possibly disposed of at near the historical groundwater elevation. The report noted the following: The Riverside Cement Company (RCC) is listed as a generator in the Resource Conservation and Recovery Act (RCRA) due to generation of basic brick, asbestos insulation from plant refurbishing and PCB containing transformers. The report states that approximately 250,000 tons of CKD had been disposed of on-site from 1964 to 1987. From 1955 to 1979, approximately 48 cubic yards of brick containing 10 percent chrome was disposed of on-site in the CKD disposal areas. Two soil samples were collected from a suspected CKD disposal area. The soil samples were analyzed for metals. Chromium was detected with a maximum concentration of 4.6 milligrams per kilograms (mg/kg) and lead was detected with a maximum concentration of 106 mg/kg. A soil sample was also analyzed for California Waste Extraction Test and no metal concentrations exceeded the soluble threshold limit concentration. Groundwater samples were collected from the Yeager Construction Company well (YCC) south of the Subject Property, and up gradient at the El Rivino Country Club (ERCC) well. Groundwater samples were collected to determine if the CKD disposal areas had leached toxic metals into the groundwater. The conclusion was that disposal of the CKD material was ongoing and groundwater samples indicated that an observed release into groundwater has occurred.
May 10, 1991 – Draft Limited Phase I Site Assessment, Riverside Cement Company, Crestmore Facility, 1500 Rubidoux Blvd, Riverside County, CA – Geomatrix Consultants, Inc.	The limited Phase I Site Assessment was conducted to address questions that were raised during review of the limited Phase I Site Assessment by Levine Fricke in 1991. The report noted the following: Cement was not produced at the Subject Property between 1929 and 1942. The white and grey kilns were installed in 1964. Chrome brick fragments were mixed with CKD and deposited on-site from the 1950's to 1979. A 210,000-gallon AST was used to store No. 6 fuel. The 210,000-gallon AST was constructed on a concrete floor with a base of 12 to 18 inches of sand and gravel. The AST is in a

Document	Summary
	bermed containment area lined with plastic and a 3-inch asphaltic layer with hardened cementitious material. A 10,000-gallon AST that was used to store diesel fuel was taken out of service and left in place in 1986. Boiler Blowdown Water Retention Area, adjacent to the 210,000-gallon AST, was separated by an 18-inch berm from the AST. The area is referred to as a pond, has a plastic liner throughout the bermed area and was used to collect steam blowdown from 1985 to 1990. Soil samples were collected to a depth of 2 feet using a hand auger and analyzed for Total Petroleum Hydrocarbons (TPH) and Toxic Characteristics Leaching (TCLP) Metals. TPH was detected with a concentration of 62 mg/kg and only silver and barium were detected at concentrations of 0.004 mg/kg and 0.04 mg/kg, respectively. Two 12,000-gallon diesel fuel USTs are located near the white kilns. One 10,000-gallon gasoline UST is located across a driveway from the vehicle maintenance area. Three USTs were closed and removed in 1988: a 550-gallon waste oil tank located near the crane parking area, a 12,000-gallon diesel fuel UST adjacent to the vehicle maintenance area and a 6-million fuel UST. CKD disposal area is covered with hardened kiln dust and soil. Bricks containing 10 percent chrome were used in the hottest part of the gray kiln. The bricks were removed using a jackhammer and disposed in the CKD disposal area.
November 1991 - Technical Evaluation 9/30/90 EPA Fit Report Riverside Cement Company, Crestmore Plant – ERM-West, Inc.	The Technical Evaluation was performed in response to the 1990 report by Ecology and Environment. The Technical Evaluation sought to demonstrate that disposal operations at the Subject Property had no significant impact on ground water. The report noted the following: CKD thickness in the Wet Weather Quarry ranges from 2 to greater than 60 feet and was last used for disposal in 1990. The disposal area was capped and a closure plan submitted to RWQCB. The Commercial Quarry was a secondary disposal area during the 1960's and the majority of CKD was removed and recovered in the late 1980s for mill or kiln feed supplement. The north side of the Crestmore Mine was not designated as a disposal area for CKD. Trucks transporting CKD may have spilled or temporarily stored CKD, which resulted in some CKD on the slopes of the Crestmore Mine. EMR-West installed and sampled two monitoring wells in alluvium: MW-1 located north of the Wet Weather Quarry and MW-3 located southeast of the Commercial Quarry. Samples from wells 60-1, 88-1, the ERCC, and YCC were collected for comparison. Groundwater test results indicated that chromium concentrations do not exceed 13 micrograms per liter (µg/L). The report noted that well 60-1 and the ERCC well were

Document	Summary
	installed in alluvium while the well 88-1 was installed in the lower Chino Limestone.
June 22, 1994 - Site Inspection Prioritization - Bechtel Environmental, Inc.	This report reviewed the September 1990 and November 1991 reports by Ecology and Environment and ERM-West, respectively. The report noted the following: Between 1964 and 1990, approximately 250,000 tons of CKD were disposed on-site. The report states that an apparent release of metals to groundwater is established based on the data presented in the September 1990 report, where concentrations of aluminum (155 µg/L), chromium (19.4 µg/L), and manganese (34.4 µg/L) were detected in the YCC well (down gradient) and compared to groundwater samples collected from the ERCC well (up gradient), where concentrations of aluminum (26.9 µg/L), chromium (3.8 µg/L), and manganese(< 1µg/L) were detected. The report mentioned the analytical results from wells YCC and ERCC by ERM-West, Inc. in November 1991 as further proof that a release of chromium and manganese had occurred to groundwater.
October 7, 1994 – SUBJECT: Technical review of EPA Site Inspection Prioritization Report - ERM-West, Inc.	The report re-evaluates the September 1990 and November 1991 reports and disputes the conclusion developed by Bechtel Environmental in the June 1994 report.
September 18, 1995 – Environmental Risk Assessment Survey of Riverside Cement Company , Crestmore Plant, Riverside, California – AIG Consultants	The Environmental Risk Assessment Survey was performed to determine the general environmental conditions at the Subject Property in support of Riverside Cement Company environmental liability insurance coverage. The report noted the following: A 210,000-gallon AST containing fuel oil is located within a secondary containment berm constructed of polyethylene liner under sand and compacted clay layers, and a gunite surface. A 6,000–gallon AST containing acetic acid is constructed of polyethylene with a polyethylene containment vessel. A 2,000-gallon AST containing diethylene glycol is constructed of steel within an open-topped steel containment vessel. A 250-gallon AST has a secondary containment polyethylene vessel. Three USTs are present on-site: Two 12,000-gallon diesel tanks and one 10,000-gallon gasoline tank. The USTs are constructed of single-wall steel. The USTs are not catholically protected or equipped with overfill prevention. Integrity test conducted in 1994 found all three USTs to be "tight". A 6-million gallon fuel oil UST and five other fuel USTs were removed in 1987. The 6-million gallon UST had leaked resulting in 120,000 tons of soil removal. The other five USTs showed no evidence of extensive leakage and generated approximately 500 tons of soil removal. With the approval from the Riverside County Department of Health Services in 1991, removed soil was mixed with cement product to produce a solid material that could be used on-site as base material.

Document	Summary
	Pipes were insulated with asbestos. Between the years 1964 and 1987, approximately 250,000 tons of CKD were disposed on-site, primarily in a ravine between the mine entrance and the Wet Weather quarry, as well as in the Commercial Quarry. Between 1955 and 1979, approximately 48 cubic yards of refractory brick containing approximately 10% hexavalent chromium was disposed on-site with the CKD. The brine pond was the discharge location for blow-down and condensate. The brine pond was located adjacent to the 210,000-gallon AST. Sanitary wastewater is treated in an on-site wastewater treatment plant and discharged to on-site leach field in compliance with Waste Discharge Requirements (WDR). The former diesel pumping station near the white cement kiln has soil with diesel concentrations up to 12,000 ppm. A plume of free product is present to a depth of 45 feet below ground surface (bgs) where the alluvium/bedrock interface is located. The contaminated soil could not be excavated because it is underneath a building and process equipment. Groundwater was determined to at 600 feet bgs. In 1993, a fuel oil leak from underground piping between the AST and the kilns was discovered. Boring and sampling were conducted to define the lateral extents of impacted soil. Approximately 583 tons of soil was later removed. Sampling in 1995 found soil impacted by TPH remained up to a concentration of 37,000 mg/kg with detectable amounts of fuel related constituents (Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)). RCC submitted a plan to Riverside County Health Services Agency to excavate the remaining impacted soil.
January 25, 2001 – Draft Technical Memorandum No. 1, Records Review for the CKD Areas at the RCC Crestmore Plant - SECOR	The Technical Memorandum summarizes the findings for records reviewed regarding the CKD disposal areas for Riverside Cement Company. The memorandum noted the following: In 1960 - The Regional Water Quality Control Board (RWQCB) adopted Waste Discharge Requirements (WDRs) Order No. 60-17 for the Subject Property, limiting discharge shall not cause groundwater to contain hexavalent chromium in excess of 0.05 mg/L. June 24 1966 - the RWQCB revised the WDRs to address the discharge of CKD due to a citizen complaint. July 20, 1966 – RWQCB sent a letter to interested parties that discharge of CKD into the quarry areas containing groundwater had ceased. January 30, 1968 - RCC informs RWQCB that CKD is recycled through the plant and no longer discharged into the quarry areas.

Document	Summary
	August 1, 1973 – Hexavalent chromium was detected within wastewater discharge into on-site percolation pond with a concentration of 0.55 mg/L. Cooling water was inadvertently discharged to the wastewater system. 1976 - WDRs (Order No. 76-78) revised by RWQCB and addressed the discharge of: 1) groundwater pumped from the limestone quarry area to nearby surface water bodies, 2) boiler blowdown water to a lined facility, and 3) septic wastes to on-site leaching systems. 1978 – WDRs (Order No. 78-25) were amended by RWQCB. The WDRs include a time schedule requiring RCC to develop a treatment system for the septic wastes. WDRs (Order No. 78-27) were revised to prohibit the discharge of untreated industrial and domestic wastes to subsurface leaching system and approve of a proposed design for treatment of domestic wastes. 1986 - Underground mining operations at the Site were permanently shut down due groundwater flooding conditions. August 13, 1991- RCC submitted a Closure Plan to the RWQCB for the CKD area and the boiler blowdown Pond. This closure plan was not available in the RWQCB file records. March 8, 1993 – County of Riverside submitted a letter to RCC indicating CKD disposal areas are exempt from California Integrated Waste Management Board Requirements. June 15, 1995 – RWQCB provided a letter to RCC approving of the final closure for the former Boiler Blowdown Pond. 1998 - WDRs (Order No. 98-77) for the Site were rescinded by RWQCB.
February 8, 2016 – RE: Project Summary of a Haz Mat Clean-up including tank cleaning, tank removal and lab packing of hazardous waste materials and out-dated chemicals for removal and disposal – Filter Recycling Services, Inc. and Environmental Logistics, Inc.	The letter report summarizes clean-up activities at the Subject Property performed between November 16, 2015 and December 23, 2015 by Filter Recycling Services, Inc. and Environmental Logistics, Inc. Several small to medium sized tanks and one large tank were cleaned up. The tanks are listed below: (1) 300 gallon Diethylene Glycol (DEG) tank at the White Plant (removed & waste disposed). (1) 1,000 gallon Diethylene Glycol (DEG) tank at the White Plant (removed & waste disposed). (1) 10,000 gallon Tall Oil tank at the Gray Finishing Mill (cleaned & waste removed) (1) 12,000 gallon Grinding Aid tank at the Gray Finishing Mill (cleaned & waste removed) (1) 5,000 gallon metal Dust Treatment tank at the Old Clinker

Document	Summary
	Storage Area (cleaned, removed & waste disposed) (1) 4,000 gallon poly Dust Treatment tanks at the Old Clinker Storage Area (cleaned, removed & waste disposed) (1) 2,000 gallon poly Water tank at the Old Clinker Storage Area (water removed & disposed) (1) 5,000 gallon poly Sodium Hypochlorite tank and poly Containment (500 gals of sodium hypochlorite removed & disposed, tank and containment, cleaned, removed & disposed) (1) 210,000 gallon metal #5 Fuel Oil tank (204 cubic yards of waste #5 Fuel Oil was removed from site and properly disposed of, tank was cleaned of all residual oil and left on site) Removal and disposal of a 33-piece lab pack consisting of various RCRA hazardous materials and out dated chemicals. Removal and disposal of a 6-piece lab pack of non-RCRA hazardous materials and out dated chemicals. Several other waste materials were removed including universal wastes such as aerosol cans, electronic scrap and light bulbs. Two 40 cubic bins of tires were removed.

Copies of the above referenced reports are included in Appendix C.

4.0 RECORDS REVIEW

4.1 Environmental Records

A copy of regulatory database information was provided by EDR and is included in Appendix D. The EDR report is a listing of sites identified on select federal and state standard source environmental databases within the approximate search radius specified by ASTM Standard Practice for E1527-13. Langan reviewed each environmental database to determine if certain sites identified in the report are suspected to represent a potential impact to the Subject Property. Langan also reviewed "Orphan Sites" listed within the report. Orphan site are those sites that could not be mapped due to inadequate address information. Orphan sites that were identified by Langan within the ASTM search radii, either during the Subject Property reconnaissance or by cross-referencing to mapped listings, are addressed in the discussion below. All distances to adjacent properties are measured from the perimeter of the Subject Property.

The following table lists the number of sites by database within the prescribed search radius appearing in the EDR Report.

Database Record Summary			
Database Reviewed (Date of government version)	**Minimum Search Area**	**Subject Property listed**	**Number of Sites Within Minimum Search Area**
USEPA DATABASES			
National Priorities List (NPL) (10/30/2015)	1 Mile Radius	No	0
Delisted NPL (10/30/2015)	1 Mile Radius	No	0
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) (10/25/2013)	1/2 Mile Radius	Yes	1
CERCLIS No Further Remediation Action Planned (NFRAP) (01/11/2016)	1/2 Mile Radius	No	0
Resource Conservation and Recovery Act (RCRA) Corrective Reports (CORRACTS) (06/09/2015)	1 Mile Radius	No	0
Federal RCRA non-CORRACTS Treatment, Storage, and Disposal Facilities (TSDF) List (06/09/2014)	1/2 Mile Radius	No	0
Federal RCRA generators List (LQG, SQG) (06/09/2015)	1/4 Mile Radius	No	9

Database Record Summary			
Database Reviewed (Date of government version)	**Minimum Search Area**	**Subject Property listed**	**Number of Sites Within Minimum Search Area**
Environmental Response Notification System (ERNS) (06/22/2015)	< 1/8 Mile Radius	No	0
Engineering Controls (EC) Site Lists (09/10/2015)	1/2 Mile Radius	No	0
Institutional Controls (IC) Site Lists (09/10/2015)	1/2 Mile Radius	No	0
CALIFORNIA DATABASES			
State- and tribal-equivalent NPL (RESPONSE) (11/07/2015)	1 Mile Radius	No	1
State- and tribal- equivalent CERCLIS (ENVIROSTOR) (11/07/2015)	1 Mile Radius	Yes	3
Solid Waste or Landfill Facilities (SWF/LF) (11/16/2015)	1/2 Mile Radius	No	4
State and tribal leaking storage tank lists (LUST, SLIC, INDIAN LUST)	1/2 Mile Radius	Yes	5
State and tribal registered storage tank lists (UST, AST, INDIAN UST, FEMA UST)	1/4 Mile Radius	Yes	6
State and tribal voluntary cleanup sites (VCP, INDIAN VCP)	1/2 Mile Radius	No	0
OTHER ASCERTAINABLE RECORDS			
Local Lists of Registered Storage Tanks (CA FID UST, HIST UST, SWEEPS UST)	1/4 Mile Radius	Yes	10
Local Lists of Landfill/Solid Waste Disposal Sites (WMUDS/SWAT, SWRCY)	1/2 Mile Radius	Yes	3
Local Lists of Hazardous Waste/ Contaminated Sites (HIST Cal-Sites)	1 Mile Radius	No	1
Records of Emergency Release Reports (LDS)	< 1/8 Mile Radius	Yes	1
TSCA	1/2 Mile Radius	Yes	1
US AIRS	< 1/8 Mile Radius	Yes	1
US MINES	1/4 Mile Radius	No	1
Facility Information System Database (FINDS)	< 1/8 Mile	Yes	2

Database Record Summary			
Database Reviewed (Date of government version)	**Minimum Search Area**	**Subject Property listed**	**Number of Sites Within Minimum Search Area**
	Radius		
EMI	< 1/8 Mile Radius	Yes	2
HAZNET	0.001 Mile Radius	Yes	3
HIST CORTESE	1/2 Mile Radius	Yes	2
CA HWP	1 Mile Radius	No	1
MINES	< 1/8 Mile Radius	No	1
NPDES	< 1/8 Mile Radius	Yes	1
San Bern. Co. Permit	1/4 Mile Radius	No	2
PROC	1/2 Mile Radius	No	1
WDS	< 1/8 Mile Radius	Yes	1
ECHO	< 1/8 Mile Radius	Yes	2
EDR US Historical Auto Station Site (NA)	1/4 Mile Radius (N/A)	No	5
RGA LUST	< 1/8 Mile Radius	Yes	2

NA - Not Applicable; databases with a "Not Applicable" Minimum Search Radius are databases reviewed as part of the Phase I ESA but not required as per ASTM E1527-13.

A description of the reviewed databases is provided in the EDR Report (Appendix D). A summary of Subject Property database listings and other sites identified within the prescribed search area is presented below.

4.1.1 Federal Agency Database Findings

The Subject Property and sites within their respective minimum search distances as specified by ASTM E1527-13 were not listed in the following Federal Agency databases: NPL, Delisted NPL, CERCLIS NFRAP, RCRA CORRACTS, RCRA non-CORRACTS TSDF, ERNS, EC, or IC. However, the Subject Property was identified on Federal Agency databases and is discussed below. Based on distance, topographically cross-gradient or down-gradient position relative to the Subject Property, and non-violation status, none of the adjacent and surrounding sites listed

in Federal Agency databases are likely to have current or former releases of hazardous substances with the potential to migrate to the Subject Property.

Riverside Cement Co Crestmore PLT, 1500 Rubidoux Boulevard

The Subject Property is listed under the SEMS database. According to the SEMS database listing, the Subject Property is not listed in the National Priority List (NPL) and is listed as state-lead cleanup. Sites listed in the NPL are evaluated by the Superfund Program. These listings are not considered a REC for the Subject Property.

Advance Collision, 12073 Cedar Ave

Advance Collision is located northwest of the Subject Project, less than 1/8 of a mile. Advance Collision is listed under the RCRA-SQC database and according to the database, Advanced Collision is a Small Quantity Generator (SQC) that generates more than 100 kilograms (kg) and less than 1,000 kg of hazardous waste during any calendar month, and accumulates less than 6,000 kg of hazardous waste at any time. Advanced Collision received a notice of violation on October 6, 1992 concerning generators-general and the facility achieved compliance on October 6, 1997. Advanced Collision is reported to have the following waste categories and disposal methods: oxygenated solvents (acetone, butanol, ethyl acetate, etc.) that are disposed with a transfer station, paint sludge that is disposed with treatment/incineration and an unspecified solvent mixture that is disposed using a recycler. This listing is not considered a REC for the Subject Property.

4.1.2 State Agency Database Findings

The Subject Property and sites within the respective minimum search distances as specified by ASTM E1527-13 were not listed in the INDIAN LUST, FEMA UST, INDIAN UST, VCP, INDIAN VCP and BROWNFIELDS State Agency databases. No sites that were identified within the designated search radii, which are likely to have current or former releases of hazardous substances, have the potential to migrate to the Subject Property. The Subject Property was identified on State Agency databases and is discussed below.

Riverside Cement Com, 1500 Rubidoux Boulevard

The Subject Property is listed under the ENVIROSTOR, LUST and AST databases. According to the ENVIROSTOR database, the Subject Property status is referred to the RWQCB with the lead agency as the USEPA. Potential Chemicals of Concern (COCs) are listed as PCBs and hexavalent chromium, confirmed COCs are not specified. The LUST database list the Subject Property status as completed - case closed as of November 5, 1991. The lead agency is listed

as Riverside County Local Oversight Program (LOP) with potential COCs listed as heating oil/ fuel oil. These listings are not considered a REC for the Subject Property.

Riverside Cement Cre, 1500 Rubidoux Boulevard

According the AST database, the certified unified program agencies is listed as Riverside, the owner is listed as Riverside Cement Company and the total gallons is listed as 5,000. These listings are not considered a REC for the Subject Property.

4.1.3 Other Ascertainable Records

The Subject Property was listed in the WMUDS/SWAT, SWEEPS UST, HIST UST, CA FID UST, CHMIRS, LDS, TSCA, US AIRS, FINDS, EMI, HAZNET, HIST CORTESE, NPDES, WDS, ECHO and RGA LUST databases. Sites within the respective minimum search distances were listed in the following databases: WMUDS/SWAT, SWRCY, HIST Cal-Sites, SWEEPS UST, HIST UST, CA FID UST, US MINES, HIST CORTESE, HWP, MINES, San Bern. Co. Permit, PROC and EDR Hist Auto. Based on distance, topographically cross-gradient or down-gradient position relative to the Subject Property, and non-violation status, none of the adjacent and surrounding sites listed in these databases are likely to have current or former releases of hazardous substances with the potential to migrate to the Subject Property.

4.1.4 Vapor Encroachment Screen

A vapor encroachment screen was conducted for the Subject Property to assess for the presence of vapor encroachment conditions (VECs), defined in ASTM E2600-10 as "the presence or likely presence of [chemical of concern (COC)] vapors in the sub-surface of the target property (TP) caused by the release of vapors from contaminated soil or groundwater either on or near the TP." No VECs or likely VECs were identified surrounding the Subject Property. A copy of the vapor encroachment screen is included in Appendix E.

4.1.5 Local Regulatory Agency Findings

Freedom of Information Act (FOIA) Requests

FOIA requests were submitted to the state and local agencies listed below:

- South Coast Air Quality Management District (AQMD). AQMD indicated that records are available for review and consist of site inspection reports. The site inspection reports detail Title V inspections and equipment list at the Subject Property from

October 1990 to March 2016. The inspections noted emissions (dust) generated are in compliance by the Subject Property.

- California Environmental Protection Agency Department of Toxic Substances Control (DTSC) Cypress, CA. The DTSC indicated that records are available for review. According to the records reviewed:

  July 27, 1973, RWQCB notified Riverside Cement Company that the sample results for waste discharge had a concentration of hexavalent chromium of 0.55 mg/L. A re-sample was requested to determine if any significant chromate was detected.

  August 1, 1973, Riverside Cement Company notified RWQCB that re-sampling of plant wastewater determined that the concentration of hexavalent chromium was equal to 0.5 parts per million (ppm). The letter states that a pump failure caused treated cooling water be dumped into storm water effluent during the sampling period. A standby pump will be installed in case the circulating pump fails, and water treatment for cooling water will be changed to reduce or eliminate the use of chromate.

  November 5, 1991, the County of Riverside Department of Health issued a letter to Riverside Cement Company confirming the completion of site investigation and remedial action for the USTs at the Subject Property. The letter does not specify for which UST the letter is confirming the completion of site investigation and remedial action.

  June 6, 1994 – Riverside Cement Company requested from RWQCB concurrence of closure for the CKD disposal area.

  A Closure Report for the Boiler Blowdown Pond was prepared by ERM EnviroClean-West, Inc. in May 1995 on behalf of the Riverside Cement Company. The report documents remedial activities performed at the boiler blowdown pond that included excavating soils impacted by petroleum hydrocarbons and an average conductivity of 5,350 micromhos per centimeter (umhos/cm). The boiler blowdown pond is located within the secondary containment basin for the 210,000-gallon AST (No. 6 fuel oil). Excavated soils were stockpiled on-site and confirmation samples were collected from the bottom and sides of the excavation. Confirmation samples were analyzed for total petroleum hydrocarbons, total chromium, hexavalent chromium, and conductivity. As the excavation progressed, confirmation samples were only analyzed for conductivity because it was a major concern expressed by RWQCB. The average conductivity of the final confirmation samples was equal to 667.5 umhos/cm. Clay was used as backfill material for the excavation, as liner material for the berms and flooring of the secondary

containment basin. A 45-mil-thick liner was installed following placement and compaction of the clay backfill.

June 15, 1995, RWQCB notified Riverside Cement Company that the closure report for the former boiler blowdown disposal pond is approved and closure of the former pond is complete.

December 11, 1995, Ryan Murphy Incorporated (RMI) provided the County of Riverside Health Services Agency a letter summarizing the remedial excavation for hydrocarbon impacted soil related to the former white kiln fuel oil pipeline. Impacted soil was excavated and temporarily stockpiled on-site until re-used as part of the cement manufacturing process. The excavation dimensions were approximately 59 feet in length, 23 feet in width, and 9 to 13 feet in depth. Confirmation samples were collected from the bottom, ends, and sidewalls of the excavation. Samples were analyzed for total petroleum hydrocarbons by EPA Method 418.1. Total petroleum hydrocarbon concentrations ranged from non-detect to 12,000 mg/kg. The letter concluded that site conditions satisfy HMMD/RWQCB criteria for file closure and requested no further action with regards to remedial activities.

December 4, 1996, ERM-West, Inc. provided Riverside Cement Company with an annual groundwater monitoring report summarizing the depth to groundwater in wells MW-1 and MW-3 and the laboratory results for groundwater samples. Groundwater depths were measured to be 107 to 110 feet below the top of casing for MW-1 and 74 to 76 feet below the top of casing for MW-3. Groundwater samples were analyzed for metals, total dissolved solids, turbidity, alkalinity, chloride, color, fluoride, nitrate (NO_3), odor, pH, specific conductance, sulfate, and MBAS (surfactants). Groundwater sample results were compared to USEPA and State of California drinking water maximum contaminant levels.

A Site Screening Assessment was prepared by DTSC in December 8, 2006 and concluded the Subject Property was CERCLA eligible. State agencies were overseeing lead remediation and RWQCB was overseeing closure of the boiler blow down disposal pond and CKD disposal area.

- California Department of Conservation Division of Oil, Gas, and Geothermal Resource (DOGGR). The DOGGR indicated that records are available for review and consist of annual reports and surface mining inspection reports. The surface mining reports indicate that mining activities have not yet started under the approved permit in 1993, and no mining activities were permitted and in operation in 1996 and 1997. The DOGGR indicate that no records regarding the underground mine were available for the Subject Property.

- Riverside County Department of Environmental Health (RCDEH). RCDEH indicated that records are available for review. According to the records reviewed:

  An Investigation of Soil Conditions Below and Adjacent to the Fuel Storage Tank at the Riverside Cement Crestmore Plant, Riverside, California, March 24 – April 1, 1987 was prepared by ERM-West in June 26, 1987. Two slant borings and four vertical borings were drilled beneath the 6-million gallon fuel UST to determine the vertical and lateral extent of potential soil contamination. Vertical borings were drilled to a maximum depth of 27.5 feet. Soil samples were analyzed for TPH. Laboratory results detected TPH concentrations ranging from non-detect to 129,000 mg/kg. The highest concentration of TPH was detected in Boring 1 at a depth of 20 to 20.5 feet.

  November 4, 1987, RCDEH notified Riverside Cement Company that the last confirmation sampling results for the 6-million-gallon fuel UST showed no significant contamination and required no further site mitigation. RCDEH concluded that no further action was needed at this location.

  A Final Report, Removal of Storage Tanks, Riverside Cement Company Facility, Riverside, California was prepared by Cal Tank Testing in March 1988 and summarized the removals of one 550-gallon waste oil UST and one 10,000-gallon diesel UST. The top and bottom of the 550-gallon UST were measured at 4 feet and 8 feet bgs, respectively. The top and bottom of the 10,000-gallon UST were measured at 3 feet and 11 feet bgs, respectively. Confirmation samples were collected by LOK Environmental, Inc., from the sides of the excavation for the 550-gallon UST, and from the bottom and sides of the excavation for the 10,000-gallon UST. Confirmation samples were analyzed for total petroleum hydrocarbons and two samples below the 550-gallon UST were analyzed for lead. Laboratory results showed the total petroleum hydrocarbons ranged from 57 to 1,000 mg/kg in the excavation for the 550-gallon UST and 34 to 15,000 mg/kg in the excavation for the 10,000-gallon UST. Visual staining was not observed in the excavation or excavated soils, and therefore excavations were backfilled with excavated soil and imported soil. The report mentions that backfill for the 550 gallon UST was compacted to 90 percent of relative compaction.

  A Final Report, Removal of Storage Tanks, Riverside Cement Company Facility, Riverside, California was prepared by Cal Tank Testing in May 1988 and summarized the removal of a 10,000-gallon diesel UST and associated utilities performed in May 17, 1988. The top and bottom of the UST were 5 feet and 13 feet bgs, respectively. LOK Environmental, Inc. collected confirmation samples at the bottom and sides of the excavation. Confirmation samples were analyzed for total petroleum hydrocarbons.

Laboratory results showed concentrations ranging from 440 to 17,000 mg/kg. The excavation was advanced to a depth of 36 feet bgs to remove soils impacted by total petroleum hydrocarbons. Approximately 150 cubic yards of soil was removed and re-used by Riverside Cement Company as raw materials. Approximately 250 cubic yards of imported soil was used to backfill the excavation and compacted to 90 percent of relative compaction.

February 10, 1989, RCDEH notified Riverside Cement Company that soil stockpiles contaminated with bunker 6 heating fuel, from the 6-million-gallon UST, can be used as raw material for cold mix asphalt. No further permits for transporting the soil stockpiles are needed.

January 16, 1992, RCDEH notified Riverside Cement Company that the department did not issue operating permits for the 6-million-gallon UST at the Subject Property. The only permit issued was for the removal of the UST.

A Site Assessment Report was prepared by Ryan-Murphy Incorporated in July 7, 1995 and summarized the field investigation for the white kiln pipeline leak. The report states that in August 1993, a pipeline leak was discovered in an underground pipeline connecting the 250,000-gallon No.6 fuel oil AST to supply pumps for the white kilns. Nine soil borings were advanced using a Mobile B-53 drill rig and 8-inch hollow stem augers to a maximum depth of 45 feet near the pipeline leak and diesel pumping station. Two borings were advanced horizontally using a hand auger under the boiler building to a depth of 6 to 7 feet. Soil samples were collected at 5-foot intervals and analyzed for Total Recoverable Petroleum Hydrocarbons (TRPH) using EPA Method 418.1. Three soil samples with the highest concentration of TRPH were also analyzed for Total Extractable Hydrocarbons and BTEX. For soil left in place, one soil sample was collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP). Laboratory results for samples collected under the boiler building detected TRPH concentrations ranging from non-detect to 19 mg/kg. Laboratory results for samples collected at borings B-1 and B-2 (near the pipeline leak) detected TRPH concentrations ranging from non-detect to 30,000 mg/kg. The highest concentration of TRPH was detected in boring B-1 at a depth of 10 feet and a TCLP analysis of 14 mg/L. Laboratory results for samples collected in boring B-7 (near the diesel pumping station) detected diesel concentrations ranging from 9,800 to 12,000 mg/kg to a depth of 45 feet.

March 21, 1996, Ryan Murphy Incorporated (RMI) provided the County of Riverside Health Services Agency a letter summarizing the monitoring well installation for possible free product (total petroleum hydrocarbons) in the area of the white kiln

pipeline leak. A four-inch diameter PVC well was installed with 0.02 slotted pipe and number three filter pack. The screened interval was from approximately 5 to 13 feet below grade. The well was monitored for free product over a three-month period and no free product was detected during any of the monitoring episodes.

May 6, 1996, RCDEH notified Riverside Cement Company that the department received the report prepared by Ryan-Murphy, Inc. dated March 21, 1996 and summarized the well installation and monitoring procedures for groundwater under the white kilns pipeline leak. The well was checked for the presence of free product on 4 occasions over a three-month period. RCDEH stated no further action was required.

July 31, 1997, Decon Environmental Services provided a packet of certificates for the tank removals performed at the Subject Property. The tanks removed consisted of two 12,000-gallon diesel tanks, a 10,000-gallon gasoline tank, and a 250-gallon kerosene tank. UST Closure Inspection Report, UST Permit for Closure, and UST Closure/ Abandonment Application from RCDEH are included as attachments in the letter.

September 3, 1997, RCDEH notified Riverside Cement Company that the department received the closure report by Decon Environmental Services regarding the removals of two 12,000-gallon diesel tanks, a 10,000-gallon gasoline tank, and a 250-gallon kerosene tank. RCDEH determined that no significant contamination existed and no further action was required.

July 1, 1999, RCDEH notified Riverside Cement – Maintenance that the department received soil sample results collected below a fuel UST on May 25, 1999. RCDEH determined that no significant contamination existed under the UST and further mitigation was not required. No further action was required.

A UST Closure Report was prepared by Altec Testing and Engineering, Inc. in June 1999 and states that in May 25, 1999, one 1,000-gallon Diesel UST and one 2,000-gallon gasoline UST were removed along with associated piping from the Subject Property. After the removal of the UST, confirmation samples were collected from the excavation and stockpiled soil. Soil samples were analyzed for organic lead, TPH-gasoline, TPH diesel, BTEX and Methyl Tertiary Butyl Ether (MTBE). All laboratory results were non-detect. The excavations were backfilled with excavated and imported soil using a backhoe with a wheel attachment and capped with asphalt. UST Closure Inspection Report, UST Permit for Closure, and UST Closure/ Abandonment Application from RCDEH are included as attachments in the report.

- Riverside County Planning Department. The Riverside County Planning Department indicated that records were available for the Subject Property. Records consisted of several versions of Environmental Impact Reports and Mining and Reclamation Plans. The Environmental Impact Reports accompanied a renewal application for Surface Mining Permit 180. The board of supervisors approved the application for renewal to Surface Mining Permit 180 in September 1, 1992. Riverside Cement Company proposed to begin surface mining in 1992. The Mining and Reclamation Plan summarizes Geology, Hydrogeology, Minerals and Mining Operations proposed for the Subject Property. The Mining and Reclamation Plan summarized the three phases for reclamation of the surface mines at the Subject Property. Reclamation consisted of landscaping and sloping the sides of the surface mines at a ratio of 1.5 to 1 (horizontal to vertical).

- Regional Water Quality Control Board. The Santa Ana Regional Water Quality Control Board indicated that records were available for the Subject Property. Records consisted of annual storm-water discharge reports from 2007 to 2013. The annual storm-water discharge reports summarizes the laboratory results for storm-water samples that are discharged from the Subject Property. Riverside Cement Company received a failure-to-comply notice in August 2008 for not submitting an annual report by July 1. Riverside Cement Company submitted the annual storm-water discharge report on September 2008.

- Riverside County Fire Department. The Riverside County Fire Department indicated that it does not hold any records for the Subject Property.

Copies of the FOIA requests are included in Appendix F.

California Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR) Well Finder

On August 13, 2015, Langan searched for the Subject Property on the DOGGR online Well Finder database (http://maps.conservation.ca.gov/doggr/index.html#close). The Subject Property is not located within a mapped oil or gas field. There are no oil wells located on the Subject Property. The closest oil well is located approximately 1.2 miles northwest of the Subject Property and is listed as plugged.

State Water Resources Control Board (SWRCB) GeoTracker Site

On August 13, 2015, Langan searched for the Subject Property on the SWRCB GeoTracker online database (http://geotracker.waterboards.ca.gov). The Subject Property is listed on

GeoTracker. The Subject Property and nearby listed sites were evaluated as part of the environmental records review summarized in Section 4.1.

DTSC EnviroStor Site

On March 18, 2016, Langan searched for the Subject Property on the DTSC EnviroStor online database (http://www.envirostor.dtsc.ca.gov). The Subject Property is listed on EnviroStor. The Subject Property and nearby listed sites were evaluated as part of the environmental records review summarized in Section 4.1.

4.2 Physical Setting Sources

4.2.1 Topography

According to the USGS Fontana, CA Quadrangle 7.5-minute Series Topographic Map, the elevation of the Subject Property varies from approximately 700 to 940 feet above mean sea level (amsl). The Subject Property and surrounding area slope gently to the east and south.

4.2.2 Geology

The Subject Property is in the Peninsular Ranges Province of Southern California, dominated by granitic rocks of Mesozoic age that intruded pre-existing sedimentary strata. Tertiary strata was deposited west of the eroded granitic rocks, and as the area was uplifted, some of these strata formed upland coastal plains. The Subject Property is located east of the coastal plains in an area dominated by granitic rocks that are mainly quartz diorite. The Subject Property was developed for mining activities because of two steeply dipping limestone formations approximately 200 to 300 feet thick in the south end of the Subject Property. The limestone formations are roughly parallel with an upper and lower formation, the upper formation known as Sky Blue Hill and the lower formation known as Chino Limestone. Thin, poorly developed soils and minor sedimentary strata locally cover the bedrock on the Subject Property (Geomatrix, 1991).

The Subject Property is located in the eastern end of the Jurupa Mountains on the south side of the San Bernardino Valley. The Santa Ana River drains the San Bernardino Valley towards the southwest and is approximately one-half mile east of the Subject Property. The ground surface elevations vary between approximately 800 feet amsl to approximately 1120 feet amsl. Groundwater is at a depth of approximately 130 feet (Geomatrix, 1991).

4.2.3 Hydrology

Dewatering feasibility studies for the underground mine were conducted by W.P. Rowe in 1928 and 1950. It was inferred that the quartz diorite layers above and below the Chino Limestone acted as confining layers and only a small portion of the Chino Limestone came into surface contact with alluvial deposits of the Santa Ana River. Groundwater inflow from alluvial deposits to the Chino Limestone is limited due to clay layers in the lower portion of the alluvium and natural clay seals within the cracks and fissures in the Chino Limestone. It was concluded that groundwater in the Chino Limestone originated from percolation of rainwater at the mine and influx from a deep source in the east below the Santa Ana River. The influx of water from the deep source was minor during dewatering of the underground mine between 1928 and 1950. Groundwater levels in the alluvium wells dropped approximately 10 feet during the initial stages of dewatering the Chino Limestone. Subsequent dewatering of the Chino Limestone had no further impact on alluvial groundwater levels (ERM-West, 1991).

The limestone in the Wet Weather and Commercial Quarries is in contact with the alluvium over a wide area east of the outcrop. Water levels in wells screened in the two upper limestone layers were identical in elevation and it was inferred that the shallow limestone was in direct surface contact with the alluvium. According to W.P. Rowe, the limestone in the Commercial Quarry was dense and massive, similar in structure to the Chino Limestone, but the limestone in the Wet Weather Quarry was honeycombed and fissured. Groundwater inflow from the alluvium into the Wet Weather Quarry is limited due to clay seals in the fractures and fissures. It was concluded that the direction of groundwater flow is towards the south and southeast to the Santa Ana River (ERM-West, 1991).

5.0 HISTORICAL USE INFORMATION

Langan reviewed available historic resources (including aerial photographs, topographic maps, and city directories) dated 1896 to 2012. Findings of the reviews are presented below.

5.1 Aerial Photographs

Langan reviewed aerial photographs of the Subject Property and surrounding areas for the years 1938, 1948, 1953, 1966, 1968, 1974, 1985, 1990, 1995, 2005, 2009, 2010, and 2012. The Subject Property was occupied by the cement manufacturing plant in 1938 and surface mining/excavation is apparent in the south side of the Property. The center of the Subject Property is occupied by buildings, an open area, and two rectangular depressions. The 1948 aerial photograph depicts a depression with liquid, which is believed to be the Wet Weather Quarry in the southeast end of the Subject Property. A circular tank appears in the center of the

Subject Property and is adjacent to one of the rectangular depressions mentioned above. A third rectangular depression appears in the center of the Subject Property. Residential buildings are depicted in the northeast end of the Subject Property. The 1953 aerial photograph depicts that surface mining/excavation has continued in the south end of the Subject Property. Materials appear to be stockpiled within an open area in the center of the Subject Property. Residential development and buildings are shown in the northeast end of the Subject Property.

The 1966 aerial photograph shows that surface mining/excavation has continued in the south end of the Subject Property. The cement material storage bays and the gray and white kilns have been constructed. Except for two, most of the residential buildings are not shown in the northeast end of the Subject Property. A road leading to the underground mine is shown in the south end of the Subject Property. The 1968 aerial photograph depicts that surface mining/excavation has continued in the south end of the Subject Property. The Subject Property appears relatively unchanged when compared to the 1966 aerial photograph. The 1974 aerial photograph depicts that surface mining/excavation has continued in the south end of the Subject Property. One of the rectangular depressions in the center of the Subject Property is not shown. The 1985 aerial photograph depicts that surface mining/excavation has continued in the south end of the Subject Property. Another depression believed to be the Commercial Quarry is shown in the southeast end of the Subject Property and appears to hold liquid. The Wet Weather Quarry is adjacent but with little liquid. Of the three rectangular depressions shown in the center of the Subject Property in previous aerial photographs, only the depression adjacent to the circular tank is shown. The 1990 aerial photograph depicts that surface mining/excavation has continued in the south end of the Subject Property. The Commercial and Wet Weather Quarry, the circular tank, and the adjacent rectangular depressions are not shown in the aerial photograph. Meanwhile, Crestmore Mine appears to hold liquid. The Subject Property appears relatively unchanged in the 1995, 2005, 2009, 2010, and 2012 aerial photographs.

Surrounding properties consist of agricultural land from 1938 to 1966. A golf course is visible north of the Subject Property in 1966 until 2009. Industrial development is depicted south of the Subject Property beginning in 1966, which continues in the southwest of the Subject Property beginning in 1974, and in the southeast and east of the Subject Property beginning in 2005. Surrounding properties are characterized by residential use to the west and northeast. Langan's review of aerial photographs did not indicate RECs at the Subject Property or surrounding areas. Copies of the historical aerial photographs are included in Appendix G.

5.2 Sanborn Fire Insurance Maps

Langan requested historical Sanborn fire insurance maps from EDR. EDR indicated that fire insurance maps covering the target property were not found. A copy of the EDR Certified Sanborn Map Report in included as Appendix H.

5.3 Historical USGS Topographic Quadrangles

Langan reviewed historical USGS Topographic Quadrangles obtained from EDR for information regarding past uses of the Subject Property and surrounding areas for the years 1896, 1898, 1901, 1943, 1953-1954, 1954, 1967, 1973, 1980, and 2012. The 1896 and 1898 topographic maps depict the Subject Property and immediate vicinity as undeveloped land, the Subject Property is seen with two elevated areas of approximately 1100 feet and 1150 feet amsl. Three streets surround the Subject Property and appear to be El Rivino Road on the north, Agua Mansa Road on the south, and Rubidoux Boulevard on the west. The Subject Property remained undeveloped in the 1901 topographic map with the exception of new street additions in the south. The 1943 to 2012 topographic maps depict the Subject Property as being a "cement plant." In the 1953-1954 topographic map and later years, the term "Quarry" or "Quarries" is depicted in the southern half of the Subject Property and two railroads in the south and southeast of the Subject Property are described as "Pacific Electric" and "Union Pacific," respectively. The 1954, 1967, 1973, and 1980 topographic maps depict increasing residential and industrial developments in the surrounding vicinity. The 2012 topographic map depicts the Subject Property in its current configuration. Copies of the topographic maps are provided in Appendix I.

5.4 City Directories

The City Directory Abstract, obtained from EDR, is a review of available business directories, including city, cross-reference, and telephone directories, at approximately five-year intervals for the years spanning 1921 through 2013. The following listings were provided for the Subject Property:

- 1970: American Cement Corp, Land Paul B, Riverside Cement Co, Riverside Cement Transportation Department
- 1990: CDK Contracting, Crestmore Federal Credit Union
- 1996: California Caddle Feeders
- 2001: Budcr 11 DS, Crestmorediv, MKTG Dept TXIRiversdcement, Purchasing, Transloading CCF, TX IRIV 0 SD Cement
- 2002: ORO Grande Federal Credit Union

- 2003: CCF, Crestmore DIV, ORO Grande Federal CRDT Union
- 2013: Riverside Cement Co

Commercial, industrial, and light manufacturing businesses were listed at adjoining and surrounding properties. A copy of the City Directory Abstract is provided in Appendix J.

6.0 SITE RECONNAISSANCE

6.1 Methodology and Limiting Conditions

The site reconnaissance focused on the spatial extent of the Subject Property and then progressed to the adjacent and surrounding properties. The assessment of the adjacent and surrounding properties was limited to identifying, if possible, any indications of past or current use that may involve the use, storage, disposal, or generation of hazardous substances or petroleum products; noting the general type of current use; the general topography of the surrounding area; and providing a general description of adjoining or adjacent structures.

6.1.1 Date and Time of Site Visits

The site reconnaissance was performed at 10:00 AM on April 1, 2016 and at 9:00 AM on April 25, 2016. The Langan team included Diane Fiorelli, Jose Baron, Fred Irianto, and Nicholas De Rose. On April 1, the owner's site contact was William Brown (Mr. Brown) and on April 25, the owner's site contact was Pat Crites (Mr. Crites). The weather at the time of the inspections was partly cloudy and approximately 75° F.

6.1.2 General Subject Property Setting and Reconnaissance Observations

The Subject Property occupies an area of approximately 190 acres and contains an existing cement manufacturing plant. The cement manufacturing plant is in the process of decommissioning on-site equipment and buildings. Areas observed during the site reconnaissance included the following:

The north end contains undeveloped land with dense vegetation consisting of grass, shrubs and trees, and a paved entrance road with a guard shack. A one-story building constructed of wood and mortar was observed in the north end, which was an abandoned substation according to Mr. Brown. The inside of the abandoned substation was filled with wooden, plastic, and metal debris such as paint cans, wiring, nails, plywood, and pipes. Mr. Crites noted that to the west of the abandoned substation was a residential home that was demolished following a fire. An air/dust monitoring station was observed in the northeast corner of the Subject Property. The northeast end was observed to have a dense tree line surrounding the former material storage yard and slopes that, according to Mr. Crites, were created from the underground mine spoils. The slopes were generally covered with gunite.

The western side contains an entrance road, along with storage silos, warehouse (Pack House), part of the former white cement manufacturing plant, and one to two-story administration buildings (Truck Garage, Transportation Office, Storehouse, and Garage). The Pack House

contained different mechanical equipment that was powered by electricity; however, none of the equipment was observed to be active. Storage silos for white and grey cement were adjacent to the Pack House along with a former stockhouse and warehouse. The former white cement manufacturing plant has two white cement kilns, an open warehouse for clinker storage, boiler house, two control houses, two bag houses, and storage silos. Manholes for storm drain lines were observed traversing the former white cement manufacturing plant. Above-ground beltways and pipes were observed traversing the white cement manufacturing plant. Mr. Brown pointed out that material from the crushing plant was transferred via beltways to the white cement manufacturing plant for processing and the finished cement product was transferred to the Pack House via pipes. Transformers and air compressors were observed in the former white cement manufacturing plant near the control houses and storage silos. The Truck Garage is a two-story building that is currently being used as the main administration building and to store drums, materials, and equipment. The Truck Garage and Garage were used to maintain company vehicles and had pits that were used to access the underside of vehicles. The Storehouse is a one-story warehouse for materials and equipment storage. The location of the former propane AST was observed to consist of a concrete pad. The location of where storm water is collected and discharged off-site was seen in the southwest corner of the Subject Property, along with the location of where storm-water samples were collected during rain events, as pointed out by Mr. Crites. Lastly, the sanitary leach lines were located outside of the southwest corner of the Subject Property.

The south end contains part of the former white cement manufacturing area, one-story warehouses for clay and clinker storage, a 210,000-gallon AST, storage silos, rock crushing plant, stockpiles, undeveloped land, and a beltway to the underground mine that had collapsed. The clay storage building is a one-story warehouse used to store clay and has storage silos adjacent to the building. Clay stockpiles, bags of cement, and empty 55-gallon drums were seen inside the clay storage building. The former 210,000-gallon AST was used to store fuel oil for the white kilns and is now inside a secondary containment made of concrete underlain with plastic and clay. The rock crushing plant receives raw materials for crushing and is connected to the underground mine with a tunnel and a beltway. Mr. Crites noted that the tunnel had collapsed and no other information was provided or located about the tunnel. Stockpiles of soil and white clinker are along the southern portion of the Subject Property. Soil stockpiles, which according to Mr. Crites were spoils from the underground mine, could be seen along the eastern edge of the paved access road. White clinker was seen scattered throughout the southern paved roads and former white cement manufacturing areas. The undeveloped land is believed to be the former disposal area for CKD and is capped with an unknown amount of soil. Transformers were observed near the crushing plant and clay storage building.

The center of the Subject Property contains the former grey cement manufacturing plant, vehicle parking spaces, hazardous waste storage area, main electrical substation, two water wells (60-1 and 88-1), crushed rock storage area, former spray pond storage area, and former material storage area. The former grey cement manufacturing plant has storage silos, a motor control house, mill motor house, two former ASTs, and two former grey kilns that had been demolished. Soil and concrete stockpiles were observed underneath and adjacent to the former grey kilns. The owner' site contact noted that the soil stockpiles were spoils from the underground mine. Concrete stockpiles appeared to be related to the demolished grey kilns. Transformers and air compressors were observed within the former grey cement manufacturing plant.

Beltways and pipes transverse the former grey manufacturing plant, where beltways were used to transfer raw material from the former material storage yard for processing. Product from the former grey cement manufacturing plant was transferred via pipes to the Pack House. Vehicle parking spaces were paved with asphalt and adjacent to open metal sheds. The hazardous waste storage area is fenced and has a concrete pad. The former spray pond storage area is fenced, has a concrete pad, has been used to store drums, equipment, storage containers and temporary plastic tanks.

The southeast corner of the former spray pond storage area has a storm-water sump made of concrete and a wooden roof. The storm-water sump had liquid at the time of reconnaissance along with metal and wooden debris. The main electrical substation is a one-story building made of mortar and houses electrical equipment. Production Well 60-1 provides potable water for the Subject Property and Production Well 88-1 is non-operational. Mr. Crites was unaware if Production Well 88-1 had been closed or abandoned properly and noted that the bottom of Production Well 88-1 was installed within an underground mining room. Stockpiles of crushed rock were observed in the crushed rock storage area. The former material storage area has two switch houses and one former AST. Beltways and mechanical equipment were seen in the former material storage area. A stockpile of sand was stored in the former material storage area. Mr. Crites noted that the sand stockpile was for raw material in the cement manufacturing process.

The north, west, east, and south end of the former material storage area had slopes generally covered with gunite. The slopes north, east, and south of the former material storage area were from soil stockpiles.

The east end of the Subject Property contains undeveloped land, unpaved roads, and soil stockpiles, which were spoils from the underground mine. A general location of the Subject Property features are shown in Figure 2.

Pits, Ponds, Lagoons

Crestmore Lake was observed south of the Subject Property. The Wet Weather Quarry and Commercial Quarry were observed southeast of the Subject Property. No other Pits, Ponds or Lagoons were seen at the Subject Property.

Pools of Liquid

A pool of liquid was observed in the former grey cement manufacturing plant. The pool of liquid had green material floating at the surface and was in a depression west of the former grey kilns.

A pool of liquid was observed in the secondary containment for the 210,000-gallon AST near the former white cement manufacturing plant. The pool of liquid was believed to be from recent rains.

A pool of liquid was observed in the former white cement manufacturing plant. The pool of liquid was believed to be from recent rains.

Storm Drains, Wells, and Cisterns

Storm drains and wells were located at the Subject Property. Manholes to storm drains were seen throughout the property. Mr. Brown informed us that storm-water drains towards the southwest end of the Subject Property. Two wells were observed, with Well 88-1 near the former grey cement manufacturing plant and Well 60-1 north of the grey cement manufacturing plant. Mr. Crites noted that Production Well 88-1 was non-operational; however, he was unaware whether the well had been closed or abandoned. Meanwhile, Mr. Brown noted that Production Well 60-1 is still in operation and has been providing water for the Subject Property. Monitoring well MW-1 was not located during the site visit. Wells in the Subject Property are shown in Figure 2.

PCB Transformers and Suspect Equipment

Transformers were observed throughout the Subject Property. The transformers appeared to be in good condition and were not labeled as containing PCBs. Mr. Brown noted that all transformers have been emptied and tested to be free of PCBs. Locations of the transformer throughout the Site Property are shown in Figure 2.

Storage Containers and Drums

Approximately 100 55-gallon drums containing 2½ and 1½-inch diameter white porcelain balls were located south of the spray pond storage area. Mr. Brown noted that the white clinker balls were waiting to be sold to another cement manufacturer.

Approximately 120 55-gallon drums containing 2½ and 1½-inch diameter steel balls were located in the former grey cement manufacturing area. Mr. Brown noted that the steel balls have been sold and are waiting to be picked up by the new owner.

Approximately 130 empty 55-gallons drums were observed in the former grey cement manufacturing area. Mr. Brown noted that the drums were empty and awaiting disposal.

An empty 55-gallon drum was on its side in the former white cement manufacturing plant.

Approximately 10 55-gallon drums were observed inside the Truck Garage. Mr. Brown noted that the drums had waste from the hazardous waste clean-up performed by Filter Recycling Services, Inc. and Environmental Logistics, Inc. in January and February of 2016. Mr. Brown noted that the drums were also awaiting disposal.

Four empty 55-gallon drums were seen in the clay storage area. The 55-gallon drums were labeled as Panaca Natrual Pozzolan / ASTM Class N.

Two 55-gallon drums were observed west of the former grey kilns. The 55-gallon drums were empty and unlabeled.

Two empty 55-gallon drums were located in the former spray pond storage area.

Waste Generation, Storage, and Disposal

East of the maintenance warehouse shop was a concrete lined hazardous waste storage area and the Spray Pond Storage Area. The hazardous waste storage area was empty except for standing water believed to be from recent rain. The spray pond storage area had pipes, storage containers, empty 55-gallon drums, machinery, and other miscellaneous equipment.

Air Emissions or Wastewater Discharges

No air emissions or wastewater discharges were observed at the Subject Property.

Sewage Ejector Pits and Sumps

A storm-water sump was located in the southeast corner of the spray pond storage area, which contained liquid and debris consisting of wood, clothing, plastic bags, and metals. The storm-

water sump was inside a concrete depression that measured approximately 10 feet wide, 20 feet in length, and 10 feet in depth with a roof made of wooden planks. An inlet/outlet was located on the southeast corner of the storm-water sump.

USTs or ASTs

Evidence of USTs were not observed at the Subject Property. Two ASTs were observed near the Gray Finish Mill Feeder. The size of the ASTs was unknown and posted signs stated that Diethylene Glycol (DEG) and Sylvatal D30LR (Tal Oil) were stored in each tank. Both of the ASTs were out of commission and had writing on the outside of the tank stating, "emptied cleaned on 12/2015."

Monitoring Wells or Remedial Activities

Monitoring wells reported in historical reports near the white kiln pipeline leak, CKD disposal area, and USTs were not located. Historical reports do not state whether the monitoring wells had been closed or abandoned.. Remedial activities were not observed at the Subject Property.

Stained or Discolored Soils

Stained or discolored soil was observed in the former white cement manufacturing plant, in the northwest side of the control room.

Leachate or Seeps

Leachate was not observed at the Subject Property. A seep was observed near the former grey cement manufacturing plant, where liquid was seen seeping underneath a concrete slab. Mr. Brown noted that water lines had been rupturing throughout the Subject Property because of age.

Adjoining and Surrounding Property Uses

The Subject Property is bounded on the west by Rubidoux Boulevard, followed by residential properties in the northwest corner and an ascending slope in the west. Commercial property (Skanska) is adjacent to the Subject Property in the southwest corner. The Subject Property is bounded on the north by El Rivino Road followed by an auto-body repair shop (Prestige Paint and Collision) in the northwest corner, a catch basin and former golf course in the north, and residential property in the northeast corner. The Subject Property is bounded on the east by Hall Avenue, followed undeveloped property in the northeast corner. Commercial property (Aramark Uniform Services) and undeveloped property are adjacent to the Subject Property in

the east. Commercial property (Earthworks Soil Amendment) is adjacent to the Subject Property in the southeast corner. The Subject Property is bounded on the south by Agua Mansa Road, followed by commercial property (County of Riverside Household Hazardous Waste Facility) in the southeast corner and commercial property (Burrtec Waste Industries) in the south.

6.2 Interviews

6.2.1 Subject Property Owner

For the Phase I ESA, Langan was introduced to and interviewed the Subject Property owner's site contact, John A. Gillan, as defined in ASTM 1527-13 represented as knowledgeable of land usage and operations at the Subject Property. Mr. Gillan acknowledged that he was aware of administrative proceedings, notice of violation, and past litigation relevant to hazardous substances from the Subject Property, one of which was with AQMD related to dust emissions. However, Mr. Gillan was unaware of the registration for underground and above-ground storage tanks, reports regarding hydrogeological conditions, geotechnical studies, and recorded activity and use limitations. The Owner/User Questionnaire is included as Appendix B.

6.2.2 Subject Property Occupants

The Subject Property is currently occupied by Martin Marietta. No previous Subject Property occupants were available for interview as part of this Phase I ESA.

6.2.3 Owners/Tenants of Adjacent Properties

Owners/tenants of adjacent properties were not available for interview as part of this Phase I ESA.

7.0 DEVIATIONS AND DATA GAPS

7.1 Deviations

Langan has performed a Phase I ESA of the Subject Property utilizing a standard of good commercial and customary practice that is generally consistent with the ASTM E1527-13. Significant deviations were not made to the above referenced standards.

7.2 Data Gaps

In order to address data gaps, additional sources of information may be consulted. According to ASTM E 1527-13, Section 8.3.2.3, "historical research is complete when either: (1) the objectives in 8.3.1 through 8.3.2.2 are achieved; or (2) data failure is encountered. Data failure occurs when all standard historical sources that are reasonably ascertainable and likely to be useful have been reviewed and yet the objectives have not been met. If data failure is encountered, the report shall document the failure and, if any of the standard historical sources were excluded, give the reasons for the exclusion."

This Phase I ESA was completed without data gaps, with the following exceptions: (1) records or approval letters detailing the closure of the CKD landfill were not located; and (2) records detailing the closure of monitoring wells reported in reviewed reports were not located. During the site reconnaissance on April 25, 2016, Mr. Crites showed us the file room within the office building located west of the Subject Property, which contained utility and structural plans for the Subject Property. However, due to limited time, the plans are expected to be reviewed in subsequent phases of work.

Sufficient information has been provided from other data sources to render conclusions regarding the presence of RECs at the Subject Property. Thus, these data gaps are not expected to affect the overall findings and opinions of the Phase I ESA. If additional information provided in the FOIA responses alters the conclusions of this Phase I ESA, we will issue an addendum to this report.

8.0 FINDINGS AND OPINIONS

This Phase I ESA was conducted in general accordance with the ASTM Practice E1527-13 (Standard Practice for ESA: Phase I ESA Process), which also satisfies the USEPA AAI Rule needed to qualify for the bona fide prospective purchaser liability protections available under the CERCLA. The objective of this Phase I ESA was to identify the presence or likely presence, use, or release on the Subject Property of hazardous substances or petroleum products as defined in ASTM E1527-13 as a REC. Based on the results of the Phase 1 efforts, the following RECs were identified:

- REC 1: Cement Kiln Dust (CKD) – Based on a review of field investigation, technical evaluation, technical memorandum, and Phase I Environmental Site Assessment reports provided by the User, CKD was landfilled and capped with soil in the southern end of the Subject Property. Approximately 250,000 tons of CKD were disposed on-site with approximately 48 cubic yards of refractory brick containing 10 percent of hexavalent chromium. Historical sampling of CKD identified detected chromium with a maximum concentration of 4.6 mg/kg and lead with a maximum concentration of 106 mg/kg. Riverside Cement Company submitted a closure plan to the Regional Water Quality Control Board (RWQCB) on August 13, 1991; however, no confirmation of final closure has been located. The limits of the CKD disposal areas are shown in Figure 2.
- REC 2: Crestmore Mine – The underground mine was flooded and no closure documentation was located. The lateral limits of the underground mine are unknown but are suspected to extend to Production Well 88-1. Mr. Crites noted that the bottom of Production Well 88-1 was installed within an underground mining room. The location of Crestmore Mine is shown on Figure 2.

The following historical RECs (HRECs) were identified:

- HREC 1: Underground Storage Tanks (USTs) – Based on documents reviewed as part of the public records review for the Department of Toxic Substances Control (DTSC) and the Riverside County Environmental Health Department (RCEHD), nine USTs were removed from the site between 1987 and 1999. The former USTs are listed in Table 1 and shown in Figure 2.
- HREC 2: Above Ground Storage Tanks (ASTs) – Based on a review of documents provided by the User, the Subject Property had 12 ASTs. Three ASTs were observed

on-site and the results of the site reconnaissance suggested that the remaining on-site ASTs were cleaned. The locations of the ASTs are shown in Figure 2.

- HREC 3: Former Boiler Blowdown Pond – Based on the closure report for the boiler blowdown pond, the boiler blowdown pond was approximately 50 feet in length, 30 feet in width, and 4 feet in depth. The boiler blowdown pond was lined with plastic and covered with clayey soil. The boiler blowdown pond received blowdown water from 1985 to 1990. In May 1995, ERM EnviroClean West, Inc. prepared a closure report that documented remedial activities and confirmation sampling. In June 15, 1995, RWQCB notified Riverside Cement Company that closure of the former boiler blowdown pond was complete for the current use of the property. However, the change in use of the property may require subsequent review by the RWQCB and potential supplemental closure activities. The location of the former boiler blowdown pond is shown in Figure 2.
- HREC 4: Former Spray Pond – Based on the conversation with Mr. Brown, the former spray pond was used to spray warmed liquids into the air for evaporative cooling before reuse in the cement manufacturing process. No details regarding the liquid composition or the as-built construction details of the pond were provided. The location of the former spray pond is shown in Figure 2.
- HREC 5: Former Sag Pond – Based on the map titled "Wells and Major Water Lines, Crestmore Plant and Vicinity" by Riverside Cement Company dated January 1985, the sag pond was identified; however, no information was provided regarding the usage and as-built construction of the pond. Based on a review of historical aerial photographs from 1948 to 1974, a depression could be noted with liquid at times where historical maps have identified the sag pond was located. The location of the former sag pond is shown in Figure 2.
- HREC 6: White Kiln Pipeline Leak – Based on a review of public documents, in August 1993, a pipeline leak was discovered in an underground pipeline connecting the 250,000 Gallon No.6 fuel oil AST to supply pumps for the white kilns. Impacted soil was excavated and temporarily stockpiled on-site before incorporating the material with other ingredients in the production of Portland cement. The excavation dimensions were approximately 59 feet in length, 23 feet in width, and 9 to 13 feet in depth. Laboratory results for samples collected in boring B-7 (near the diesel pumping station) detected diesel concentrations ranging from 9,800 to 12,000 mg/kg to a depth of 45 feet. A monitoring well was installed and for possible free product (total petroleum hydrocarbons) in the area of the white kiln pipeline leak. The well was monitored over a three-month period and no free product was detected during any of the monitoring

episodes. Additional information is needed to confirm or refute the potential for groundwater impacts in this area. The location of the white kiln pipeline leak is shown in Figure 2.

- HREC 7: Vehicle Cleaning Area – Based on a review of documents provided by the User, vehicles were cleaned with high pressure water and detergent. Mr. Crites noted that runoff from vehicles was collected in a concrete lined vault and directed towards leach lines east of the Truck Garage. The location of the leach lines are shown in Figure 2.
- HREC 8: Hazardous Waste Storage Area – Based on a review of documents provided by the User, the hazardous waste storage area consist of a fenced area with a concrete pad where waste oil, waste grease, waste solvents, and empty drums were stored. The location of the hazardous waste storage area is shown in Figure 2.
- HREC 9: Transformers – Transformers were observed throughout the Subject Property. The transformers appeared to be in good conditions and were not labeled as containing polychlorinated biphenyls (PCBs). Mr. Brown noted that all transformers have been emptied and tested to be free of PCBs. The approximate locations of the transformers are shown in Figure 2

No Controlled Recognized Environmental Concerns (CRECs) were identified during this Phase I ESA. The following non-ASTM environmental concerns were identified during this Phase I ESA:

- It is unknown if monitoring wells reported in historical reports were closed or abandoned properly. It is also unknown if Production Well 88-1 has been properly closed or abandoned.
- Mr. Crites pointed out a tunnel with a beltway that was used to bring ore from the underground mine. Mr. Crites noted that the tunnel had collapsed and no other information was provided. The tunnel is reportedly located south of the clay storage area and west of the rock crushing plant. The location to the entrance of the tunnel is shown in Figure 2.
- A storm water sump was observed in the southeast corner of former spray pond storage area. The sump contained liquid and debris consisting of wood, clothing, plastic bags, and metals. The storm water sump was inside a concrete depression that measured approximately 10 feet wide, 20 feet in length, and 10 feet in depth with a roof made of wooden planks. An inlet/outlet was located in the southeast corner of the storm water sump. The location of the storm water sump is shown in Figure 2.
- A sanitary leach field is located south-west of the Subject Property. Mr. Crites noted that sewer lines within the Subject Property did not drain into the public sewer system.

Instead, sewer lines drained into septic system and then into leach field. Mr. Crites noted that a subcontractor was hired to maintain the septic system once a year. The location of the sanitary leach field is shown on Figure 2.

The following de minimis conditions were identified:

- Over 130 empty 55-gallon drums were observed throughout the Subject Property. Areas in which the empty 55-gallon drums were observed included the former white and grey cement manufacturing plant, clay storage area, and former spray pond storage area.
- Approximately 220 55-gallon drums containing steel and porcelain balls that were used in the cement manufacturing process were observed within the Subject Property. Mr. Brown noted that the drums were sold and awaiting collection by their new owner.
- Stockpiles of soil, crushed rock, and concrete were observed in the Subject Property. Soil stockpiles were observed throughout the Subject Property and were at times covered with gunite. Stockpiles of crushed rock were observed in the crushed rock storage area. Stockpiles of concrete were observed within and adjacent to the demolished grey kilns.
- Stained soil was observed in the white cement manufacturing plant. The stained soil was observed northwest of one of the control rooms.
- Seepage was observed near the former grey cement manufacturing plant; liquid was seeping underneath a concrete slab. Mr. Brown noted that water lines had been rupturing throughout out the Subject Property because of wear and tear.

9.0 CONCLUSIONS

Langan has performed a Phase I ESA in accordance with the ASTM Practice E1527-13 (Standard Practice for ESA: Phase I ESA Process) for the Subject Property located at 1500 Rubidoux Boulevard, Jurupa Valley, California. Any exceptions to, deletions from, or deviations from this practice are described in Section 8.0 of this report. This assessment has revealed evidence of the following RECs in connection with the Subject Property.

The following RECs were identified:

- REC 1: Cement Kiln Dust (CKD) – Based on a review of field investigation, technical evaluation, technical memorandum, and Phase I Environmental Site Assessment reports provided by the User, CKD was landfilled and capped with soil in the southern end of the Subject Property. Approximately 250,000 tons of CKD were disposed on-site with approximately 48 cubic yards of refractory brick containing 10 percent of hexavalent chromium. Historical sampling of CKD identified detected chromium with a maximum concentration of 4.6 mg/kg and lead with a maximum concentration of 106 mg/kg. Riverside Cement Company submitted a closure plan to the Regional Water Quality Control Board (RWQCB) on August 13, 1991; however, no confirmation of final closure has been located. The limits of the CKD disposal areas are shown in Figure 2.
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- HREC 2: Above Ground Storage Tanks (ASTs) – Based on a review of documents provided by the User, the Subject Property had 12 ASTs. Three ASTs were observed on-site and the results of the site reconnaissance suggested that the remaining on-site ASTs were cleaned. The locations of the ASTs are shown in Figure 2.

- HREC 3: Former Boiler Blowdown Pond – Based on the closure report for the boiler blowdown pond, the boiler blowdown pond was approximately 50 feet in length, 30 feet in width, and 4 feet in depth. The boiler blowdown pond was lined with plastic and covered with clayey soil. The boiler blowdown pond received blowdown water from 1985 to 1990. In May 1995, ERM EnviroClean West, Inc. prepared a closure report that documented remedial activities and confirmation sampling. In June 15, 1995, RWQCB notified Riverside Cement Company that closure of the former boiler blowdown pond was complete for the current use of the property. However, the change in use of the property may require subsequent review by the RWQCB and potential supplemental closure activities. The location of the former boiler blowdown pond is shown in Figure 2.
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groundwater impacts in this area. The location of the white kiln pipeline leak is shown in Figure 2.

- HREC 7: Vehicle Cleaning Area – Based on a review of documents provided by the User, vehicles were cleaned with high pressure water and detergent. Mr. Crites noted that runoff from vehicles was collected in a concrete lined vault and directed towards leach lines east of the Truck Garage. The location of the leach lines are shown in Figure 2.
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- A sanitary leach field is located south-west of the Subject Property. Mr. Crites noted that sewer lines within the Subject Property did not drain into the public sewer system. Instead, sewer lines drained into septic system and then into leach field. Mr. Crites

noted that a subcontractor was hired to maintain the septic system once a year. The location of the sanitary leach field is shown on Figure 2.

The following de minimis conditions were identified:

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- Approximately 220 55-gallon drums containing steel and porcelain balls that were used in the cement manufacturing process were observed within the Subject Property. Mr. Brown noted that the drums were sold and awaiting collection by their new owner.
- Stockpiles of soil, crushed rock, and concrete were observed in the Subject Property. Soil stockpiles were observed throughout the Subject Property and were at times covered with gunite. Stockpiles of crushed rock were observed in the crushed rock storage area. Stockpiles of concrete were observed within and adjacent to the demolished grey kilns.
- Stained soil was observed in the white cement manufacturing plant. The stained soil was observed northwest of one of the control rooms.
- Seepage was observed near the former grey cement manufacturing plant; liquid was seeping underneath a concrete slab. Mr. Brown noted that water lines had been rupturing throughout out the Subject Property because of wear and tear.

10.0 REFERENCES

The following references were reviewed as part of this Phase I ESA:

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16. ERM-West, Inc., (1991) Technical Evaluation 9/30/90 EPA Fit Report Riverside Cement Company, Crestmore Plant, November 1991
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20. Geomatrix Consultants, Inc. (Geomatrix) (1991), Limited Phase I Site Assessment, Riverside Cement Company, Crestmore Facility, 1500 Rubidoux Blvd., Riverside County, California
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23. State Water Resources Control Board (SWRCB) GeoTracker website (2016), available at http://geotracker.waterboards.ca.gov, accessed 21 March 2016.
24. United States Geological Society (USGS) (2016), Fontana 7.5-Minute Quadrangle, San Bernardino, California
25. Paul Martin, (2013) "Mining History, Geology and Rare Minerals at the TXI Crestmore Sky Blue and Chino Hills Mines Presented at the WIM Chapter Meeting at Crestmore" dated 26 September 2013

11.0 STATEMENT OF QUALIFICATIONS

Langan declares that, to the best of its professional knowledge and belief, the personnel who performed this Phase I ESA meet the definition of Environmental Professional as defined in Subsection 312 10 of 40 CFR 312 and that they have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the Subject Property. They have developed and performed the Phase I ESA in conformance with the standards and practices set forth in ASTM Practice E1527, which also satisfies the USEPA AAI Rule. Resumes outlining the qualifications of the Environmental Professionals who performed this Phase I ESA are provided in Appendix K.

Site Inspection and Report Written By:

Jose A. Baron jr
Senior Staff Engineer

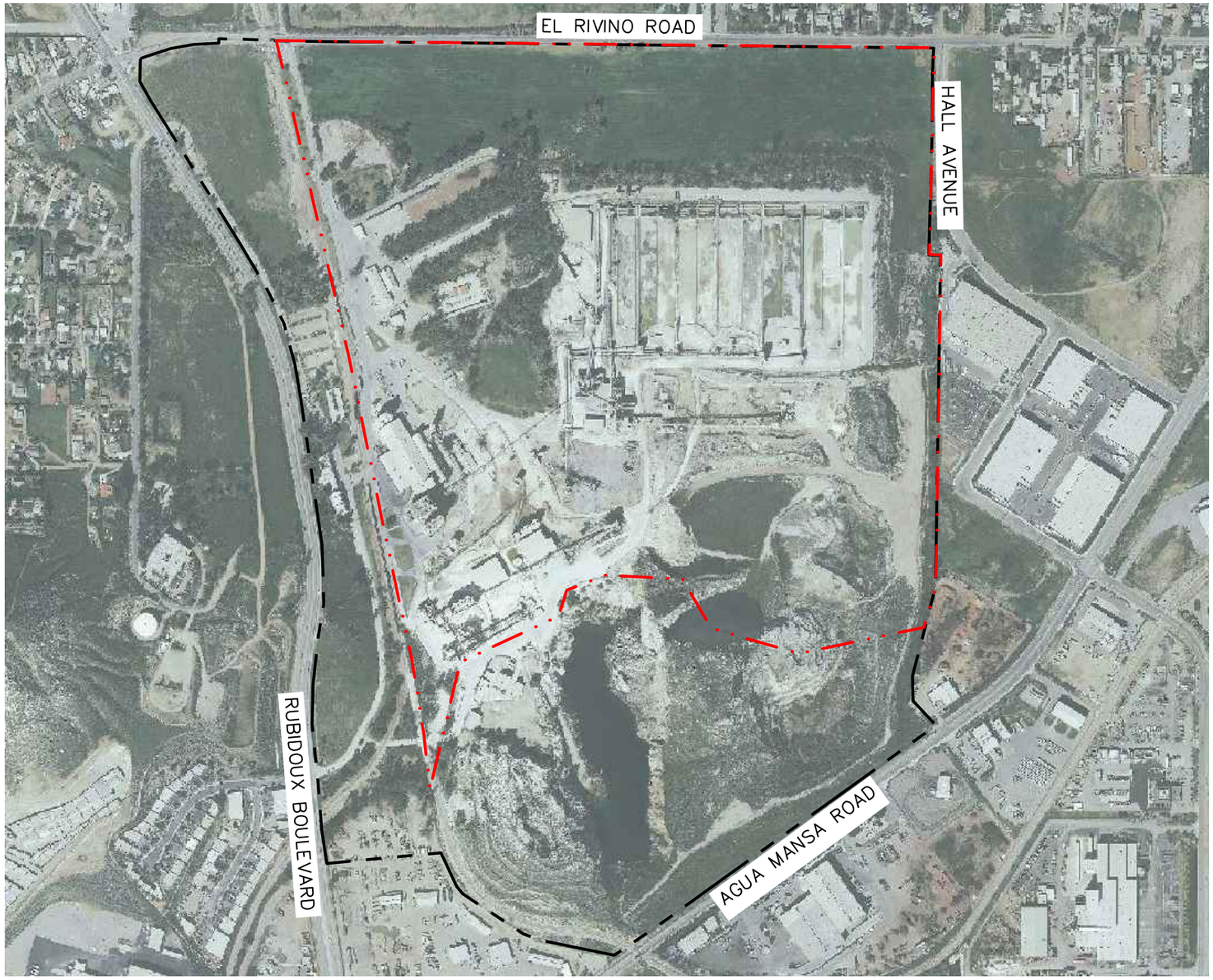
Report Reviewed By:

Diane M. Fiorelli
Senior Associate/ Vice President

Report Reviewed By:

Rory Johnston
Principal/ Vice President

FIGURES



NOTES:

1. BACKGROUND IMAGE REFERENCED FROM AERIAL DATADOORS DESKTOP ON 28 APRIL 2016.
2. APPROXIMATE SITE LIMITS REFERENCED FROM PLAN TITLED "CRESTMORE REDEVELOPMENT, JURUPA VALLEY, CA – PRELIMINARY SITE PLAN – SCHEME A.01," PREPARED BY RGA OFFICE OF ARCHITECTURAL DESIGN, DATED 11 MAY 2016.

LEGEND:

APPROXIMATE LIMITS OF SUBJECT PROPERTY

APPROXIMATE LIMITS OF FORMER RIVERSIDE CEMENT MANUFACTURING PLANT

600 0 300 600

SCALE IN FEET

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VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA
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DUBAI ISTANBUL PANAMA
Langan Engineering & Environmental Services, Inc.

Project
RIVERSIDE CEMENT PLANT
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Figure Title
SITE LOCATION MAP

Project No. 700045401
Date 10 JUNE 2016
Scale 1" = 600'
Drawn By AT

Figure No. 1

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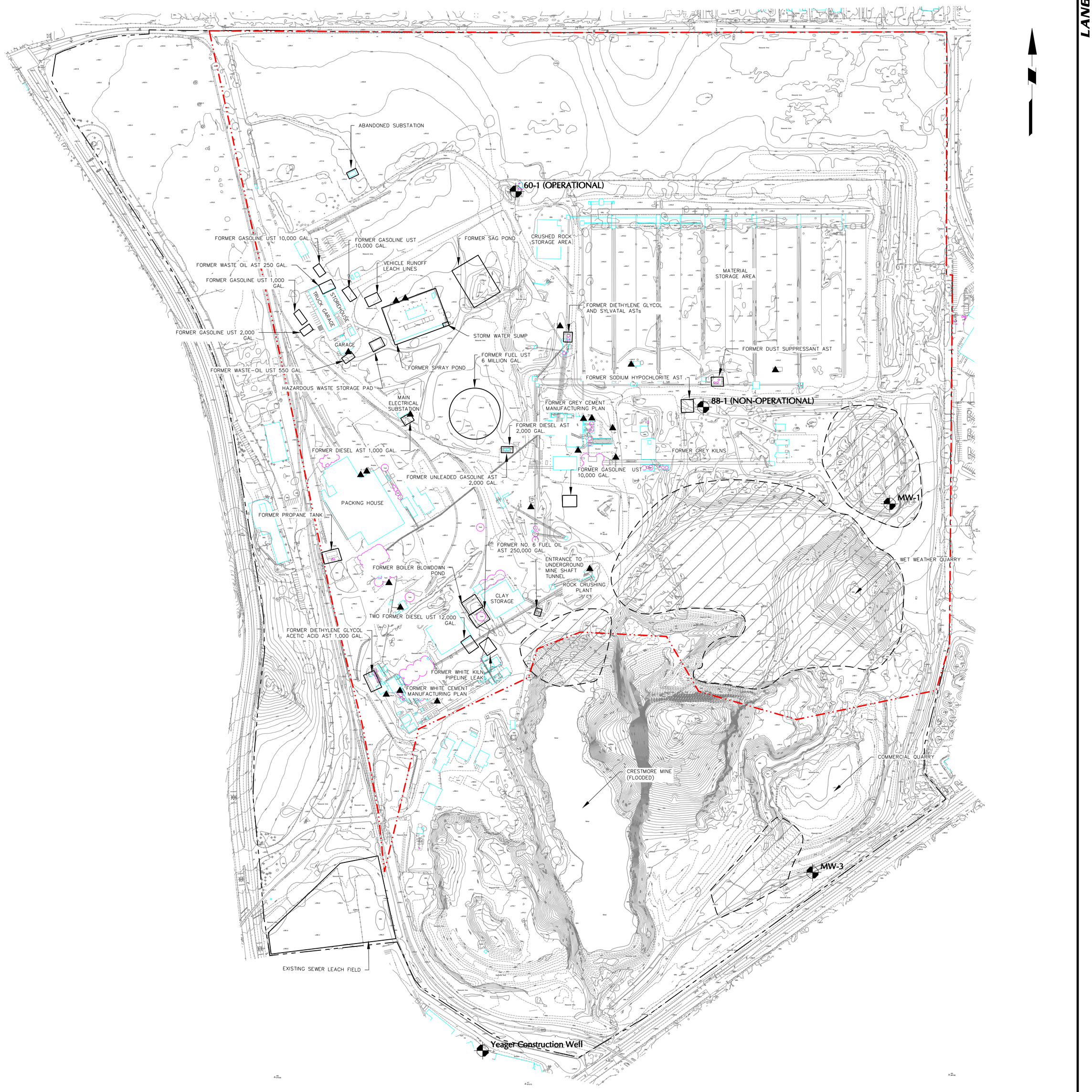
Filename: \\langan.com\data\IRV\data4\700045401\Cadd Data - 700045401\2D-DesignFiles\Site Location Ma□dwg Date: 6/9/2016 Time: 17:51 User: jbaron Style Table: Langan.stb Layout: Site Location Ma□



NOTES:

1. BACKGROUND REFERENCED FROM PLAN TITLED "ENCUMBRANCE MAP, VACANT COMMERCIAL PROPERTY, JURUPA VALLEY, CALIFORNIA, TOPOGRAPHIC INFORMATION" BY DRC ENGINEERING, INC., DATED 2 MARCH 2016.
2. APPROXIMATE SITE LIMITS REFERENCED FROM PLAN TITLED "CRESTMORE REDEVELOPMENT, JURUPA VALLEY, CA – PRELIMINARY SITE PLAN – SCHEME A.01," PREPARED BY RGA OFFICE OF ARCHITECTURAL DESIGN, DATED 11 MAY 2016.
3. APPROXIMATE LIMITS OF AREAS ARE REFERENCED FROM "CRESTMORE PLANT, HAZARDOUS MATERIALS BUSINESS PLAN (HMBP)" BY RIVERSIDE TXI CEMENT, DATED 2009.
4. LIMITS OF CEMENT KILN DUST (CKD) DISPOSAL AREAS ARE REFERENCED FROM "DRAFT TECHNICAL MEMORANDUM NO.1" BY SECTOR, DATED 25 JANUARY 2001.
5. TRANSFORMER LOCATIONS REFERENCED FROM "FIGURE 2 – SITE MAP, FOR TXI RIVERSIDE CEMENT CRESTMORE PLANT, 1500 RUBIDOUX BOULEVARD, RIVERSIDE, CALIFORNIA 92509" BY STANTEC, DATED 26 JULY 2013.
6. UNDERGROUND STORAGE TANK (UST)
7. ABOVE GROUND STORAGE TANK (AST)

LEGEND:

- APPROXIMATE LOCATION OF ENVIRONMENTAL CONDITIONS
- APPROXIMATE LIMITS OF SUBJECT PROPERTY
- APPROXIMATE LIMITS OF FORMER RIVERSIDE CEMENT MANUFACTURING PLANT
- APPROXIMATE LIMITS POSSIBLE CKD LANDFILL AREAS
- 88-1 GROUNDWATER WELL
- TRANSFORMER

150 0 75 150
SCALE IN FEET

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Langan Engineering & Environmental Services, Inc.

Project
RIVERSIDE CEMENT PLANT
JURUPA VALLEY
RIVERSIDE COUNTY CALIFORNIA

Figure Title
ENVIRONMENTAL CONDITIONS MAP

Project No. 700045401
Date 10 JUNE 2016
Scale 1" = 150'
Drawn By JAB

Figure No. 2

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Filename: \\langan.com\data\IRV\data4\700045401\Cadd Data - 700045401\2D-DesignFiles\Environ Conditions Ma□and Ex□lora.dwg Date: 6/9/2016 Time: 17:54 User: jbaron Style Table: Langan.stb Layout: Environmental Conditions Ma□ 2□

TABLES

List of Former Underground Storage Tanks

Size of Tank	Chemical Storage	RCEHD UST Permit for Closure	Closure Report Date	RCEHD Approval Closure Letter Date
1,000 gallon	Gasoline	5/19/1999	6/1/1999	7/1/1999
2,000 gallon	Diesel	5/19/1999	6/1/1999	7/1/1999
12,000 gallon	Diesel	6/17/1997	6/26/1997	9/3/1997
12,000 gallon	Diesel	6/17/1997	6/26/1997	9/3/1997
10,000 gallon	Gasoline	6/17/1997	6/26/1997	9/3/1997
6 million gallon	Fuel Oil	--	--	11/4/1987
10,000 gallon	Gasoline	--	5/1/1988	--
10,000 gallon	Diesel	2/18/1988	3/1/1988	--
550 gallon	Waste Oil	2/18/1988	3/1/1988	--

Note:
1. -- No documentation was located.
2. Riverside County Environmental Health Department (RCEHD)

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

PRELIMINARY

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

PRELIMINARY

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

0.85 MiraLoma
0.61 Riverside North
0.54 Riverside South
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.90 HurkeyCreek
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | CANYON LAKE | LAKE ELSINORE | WILDOMAR | MENIFEE | HEMET | MURRIETA | TEMECULA

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN — Date: 4/26/2018

Designed by: — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: BIORETENTION BASIN/DMA A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A	*1206611.9*	*Mixed Surface Types*	*0.92*	*0.76*	*917027.8*			

Bioretention Facility - Design Procedure	BMP ID: DMA-A	Legend:	Required Entries / Calculated Cells

Company Name: LANGAN | Date: 4/26/2018

Designed by: | County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 27.7 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 49,672 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 35.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.33 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 37,348 ft^2

Proposed Surface Area — A= 37,671 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.5 %

6" Check Dam Spacing — 0 feet

Describe Vegetation: Other

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN
Date: 4/26/2018
Designed by:
Case No:
Company Project Number/Name:

BMP Identification

BMP NAME / ID: EXTENDED DETENTION BASIN/ DMA B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B	*1071576*	*Mixed Surface Types*	*0.89*	*0.72*	*767125.6*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN
Date: 4/26/2018
Designed by:
Case No:
Company Project Number/Name:

BMP Identification

BMP NAME / ID: EXTENDED DETENTION BASIN/ DMA C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C	*378972*	*Mixed Surface Types*	*0.84*	*0.65*	*245699.7*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN
Date: 4/26/2018
Designed by:
Case No:
Company Project Number/Name:

BMP Identification

BMP NAME / ID: EXTENDED DETENTION BASIN/DMA D

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D	*3832302.9*	*Mixed Surface Types*	*0.89*	*0.72*	*2743489.7*			

Extended Detention Basin Design Procedure	BMP Subarea No. DMA-D	Legend:	Required Entries / Calculated Cells

Company Name: LANGAN — Date: 4/26/2018

Designed by: — County/City Case No.:

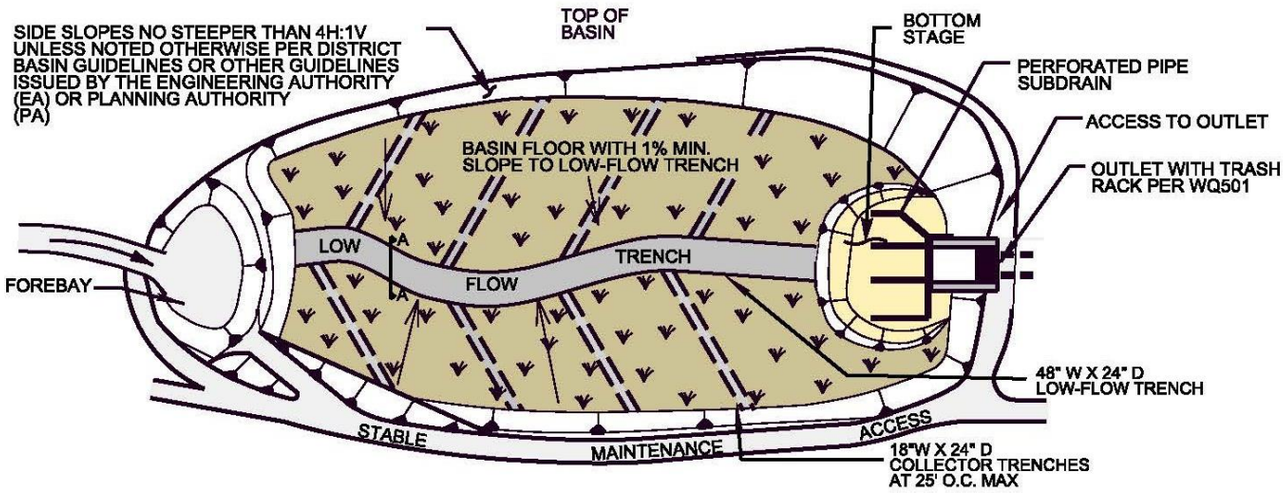
Design Volume

Tributary Area (BMP Subarea)	A_T =	88	acres
Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook	V_{BMP}=	148,606	ft^3

Basin Footprint

Overall Geometry

Length at Basin Bottom Surface	Length =	217	ft
Width at Basin Bottom Surface	Width =	93	ft
	Meets 1.5 : 1 requirement?	✓	
Side Slopes per "Basin Guidelines", Sect. 1.2	z =	4	:1
Proposed Basin Depth (with no freeboard)	D_B =	14.00	ft
Depth of freeboard (if used)	D_{FB} =	1.00	ft
Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33'))	D_{REQ} =	17.7	ft
Depth from design water surface elevation to lowest orifice	D_O =	14.0	ft



Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN — Date: 4/26/2018

Designed by: — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: BIORETENTION BASIN/ DMA E

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
E	*474597.1*	*Mixed Surface Types*	*0.81*	*0.61*	*290054*			

Bioretention Facility - Design Procedure	BMP ID: DMA-E	Legend:	Required Entries / Calculated Cells

Company Name: LANGAN | Date: 4/26/2018

Designed by: | County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 10.3 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 15,711 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 35.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.33 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 11,814 ft^2

Proposed Surface Area — A= 17,714 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.5 %

6" Check Dam Spacing — 0 feet

Describe Vegetation: Other

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN
Date: 4/26/2018
Designed by:
Case No:
Company Project Number/Name:

BMP Identification

BMP NAME / ID: EXTENDED DETENTION BASIN/ DMA F

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
F	*657756*	*Mixed Surface Types*	*0.75*	*0.54*	*357634.3*			

Extended Detention Basin Design Procedure	BMP Subarea No. DMA-F	Legend:	Required Entries / Calculated Cells

Company Name: LANGAN — Date: 4/26/2018

Designed by: — County/City Case No.:

Design Volume

Tributary Area (BMP Subarea) — A_T = 15.1 acres

Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook — V_{BMP} = 19,372 ft^3

Basin Footprint

Overall Geometry

Length at Basin Bottom Surface — Length = 184 ft

Width at Basin Bottom Surface — Width = 61 ft

Meets 1.5 : 1 requirement? ✓

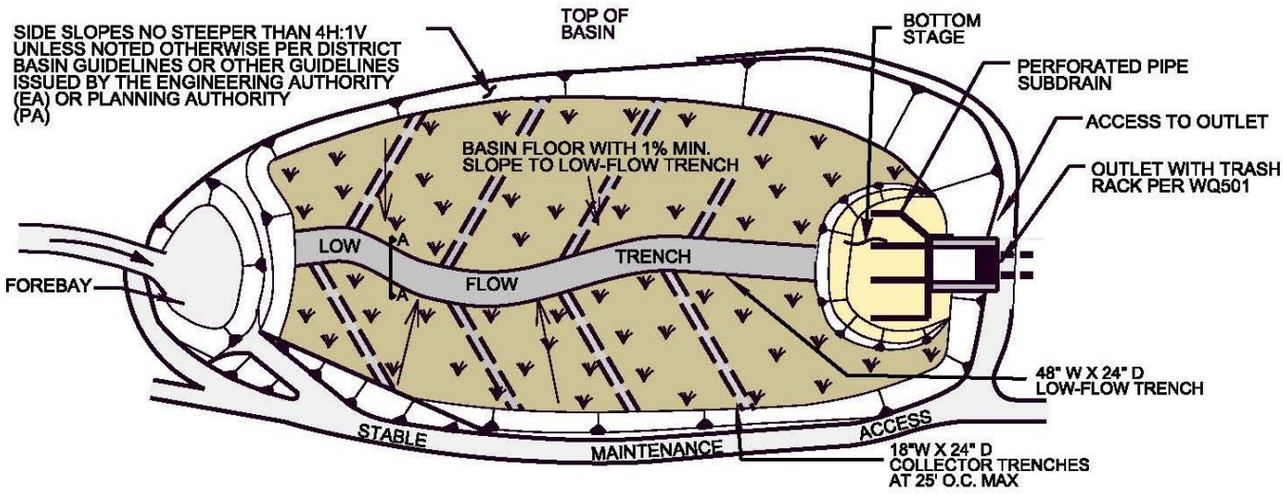
Side Slopes per "Basin Guidelines", Sect. 1.2 — z = 4 :1

Proposed Basin Depth (with no freeboard) — D_B = 7.00 ft

Depth of freeboard (if used) — D_{FB} = 1.00 ft

Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33')) — D_{REQ} = 10.7 ft

Depth from design water surface elevation to lowest orifice — D_O = 7.0 ft



Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN
Date: 4/26/2018
Designed by:
Case No:
Company Project Number/Name:

BMP Identification

BMP NAME / ID: EXTENDED DETENTION BASIN/ DMA G

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.65 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
G	*936540*	*Mixed Surface Types*	*0.92*	*0.76*	*711772.6*			

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN — Date: 4/26/2018

Designed by: — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: Modular Wetland/DMA H

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
H	*113256*	*Concrete or Asphalt*	*1*	*0.89*	*101024.4*			

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN — Date: 4/26/2018

Designed by: — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: MODULAR WETLAND/DMA I

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs								
1	*95832*	*Mixed Surface Types*	*0.85*	*0.66*	*63370.8*			

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: LANGAN — Date: 4/26/2018

Designed by: — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: Modular Wetland/DMA J

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

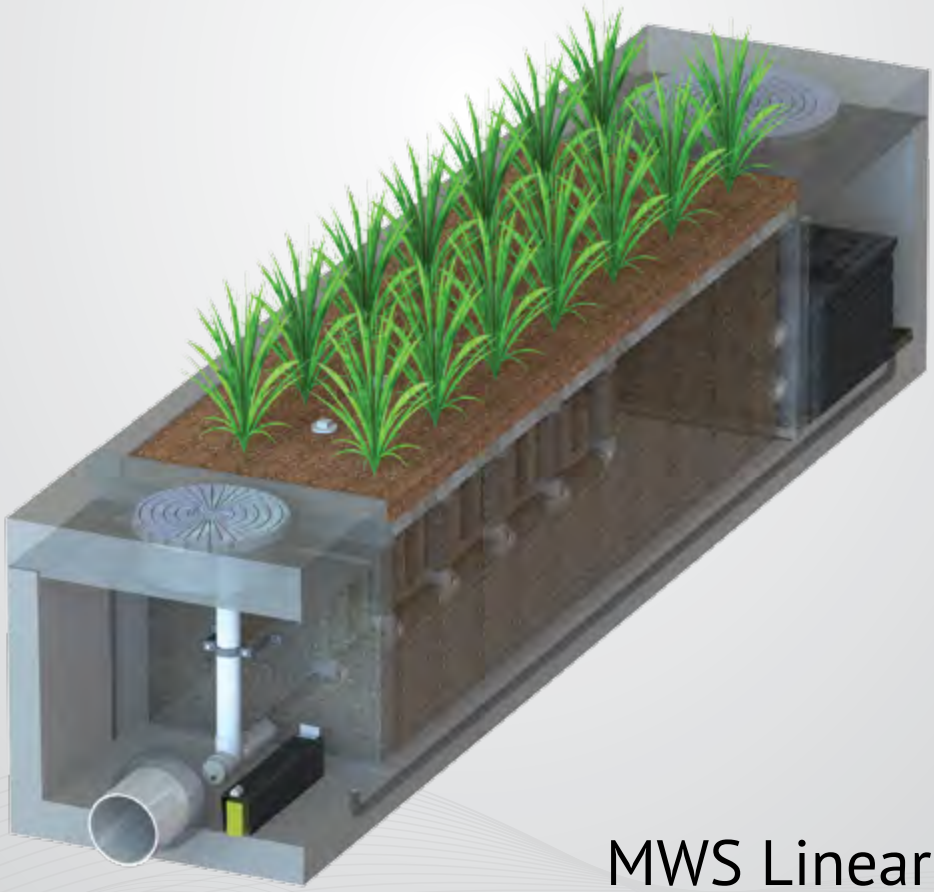
Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
J	*47916*	*Concrete or Asphalt*	*1*	*0.89*	*42741.1*			

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear



Contents

1 Introduction

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The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.



Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.





MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.



Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.



Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.



Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.



Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.



Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.



Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

- Agriculture
- Reuse
- Low Impact Development
- Waste Water





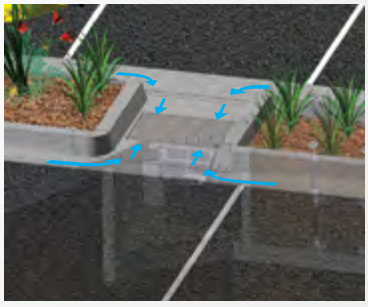
Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.



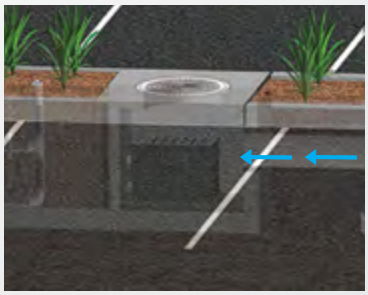
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.



Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

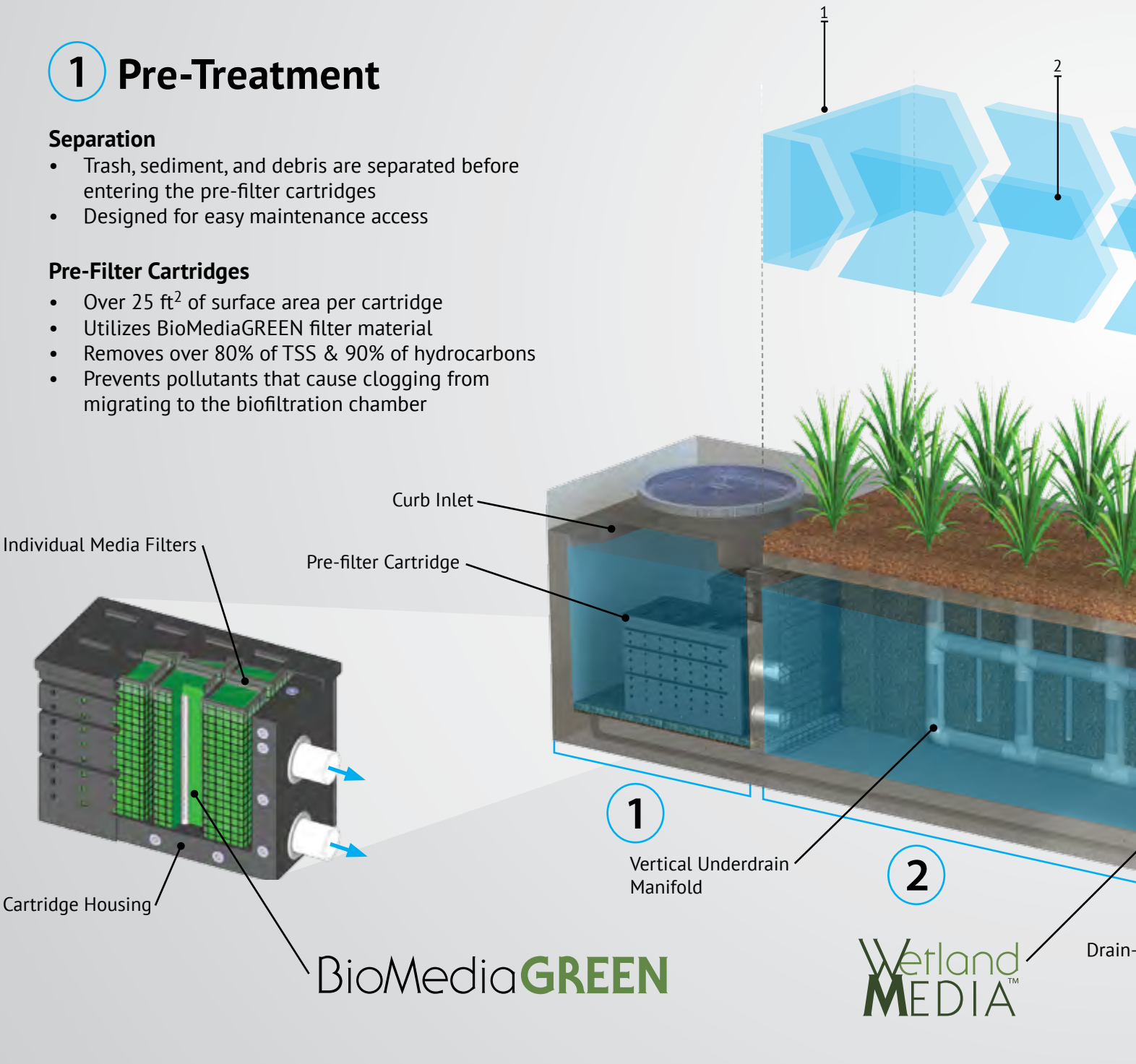
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



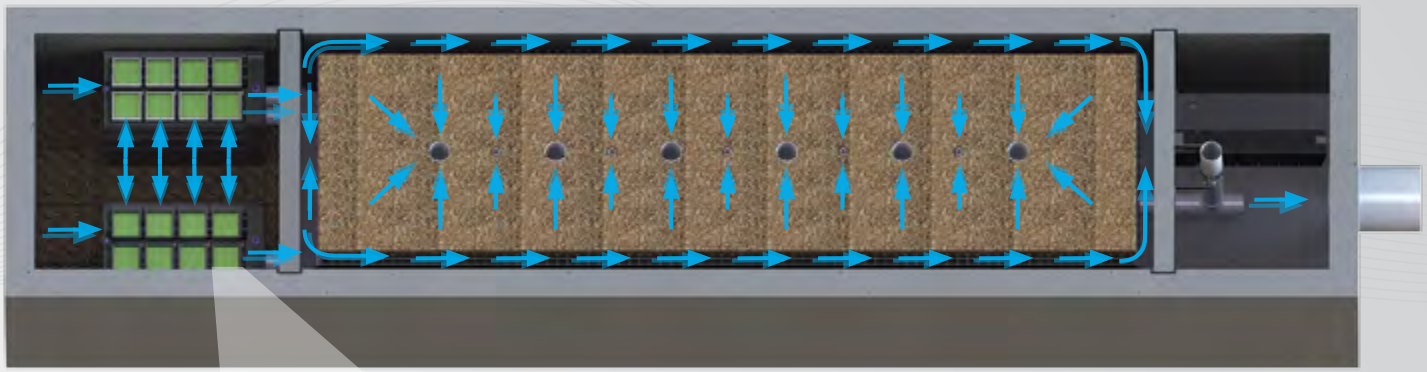


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.



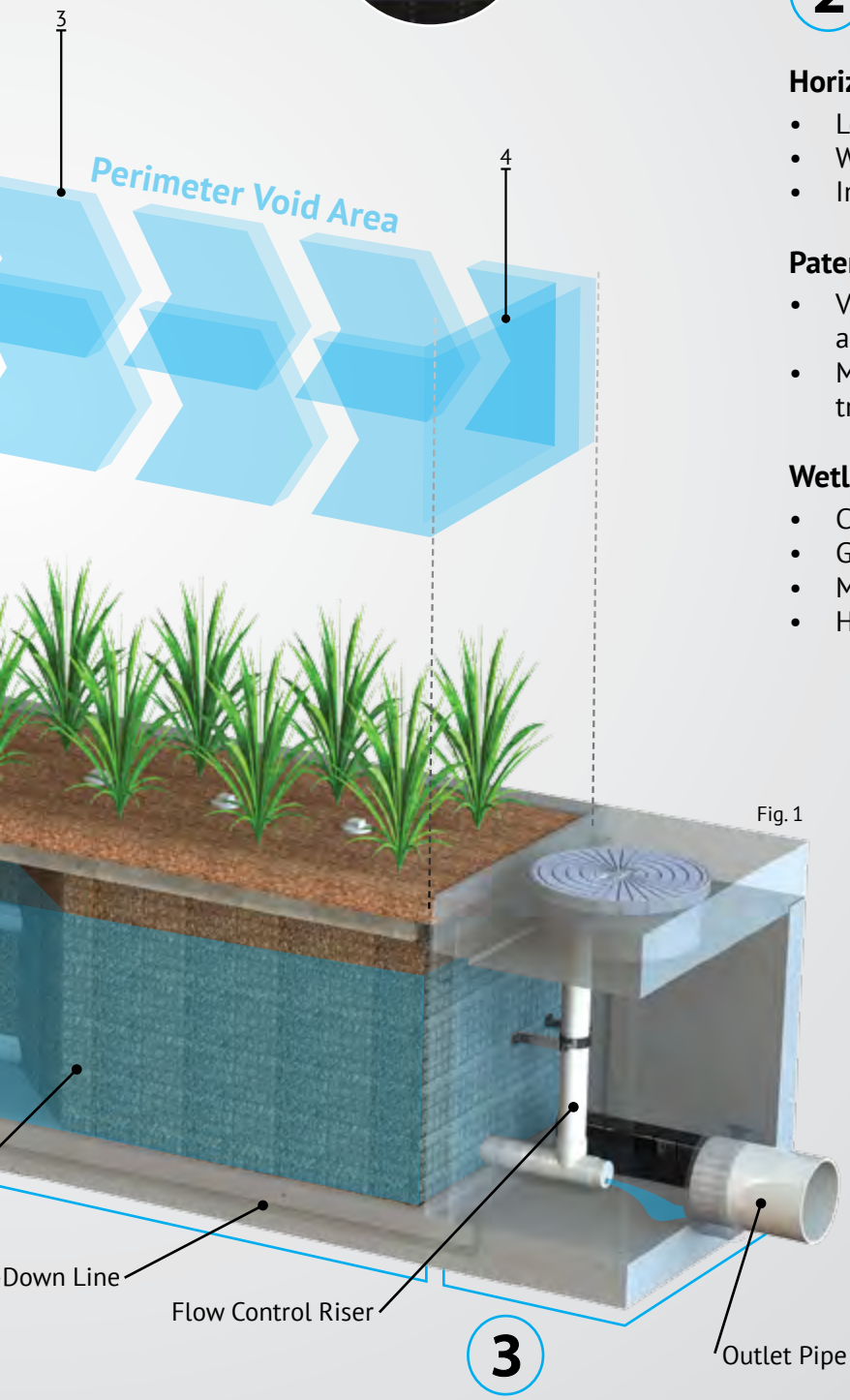


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

Drain-Down Filter

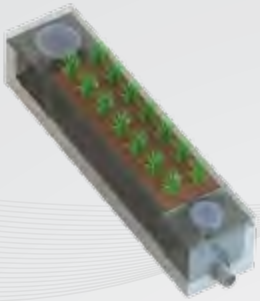
- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations



Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

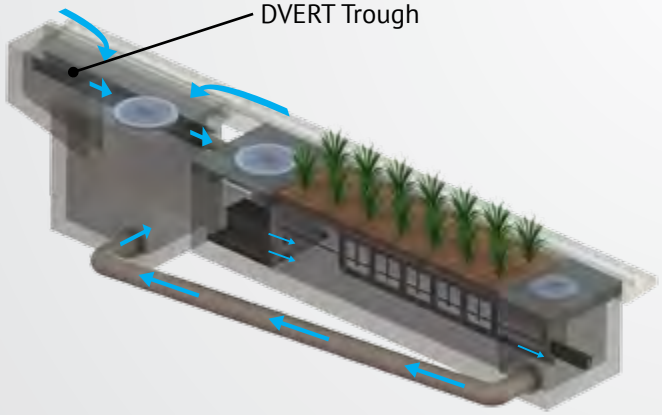
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.





Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.



Washington State DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%



DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.



MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.



Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

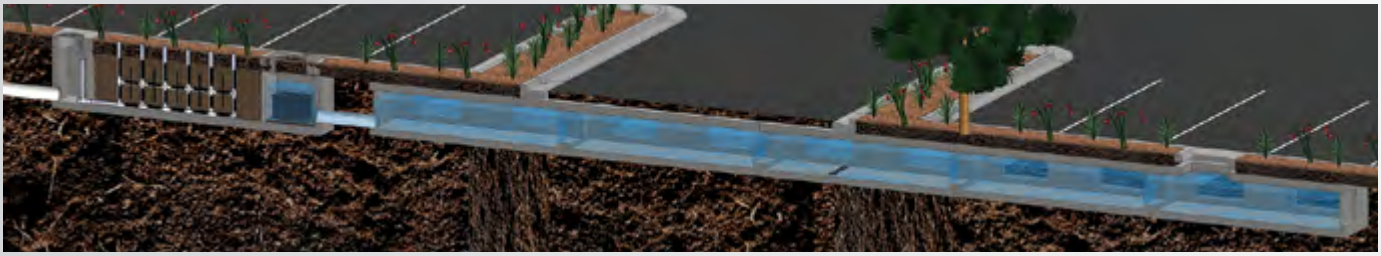


Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.



Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.



Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.



Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

PRELIMINARY

PRE-DEVELOPMENT 2 YEAR, 24-HOUR STORM DURATION

AGUA MANSA BROWN TRIBUTARY

U n i t H y d r o g r a p h A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 10/27/16 File: CMexBA242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6353

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Crestmore - Existing Hydrology - SUH
@ Brown Avenue SD inlet
2016-10-27
AMC II - 2 Year

Drainage Area = 22.30(Ac.) = 0.035 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 22.30(Ac.) = 0.035 Sq. Mi.
Length along longest watercourse = 1927.30(Ft.)
Length along longest watercourse measured to centroid = 1104.15(Ft.)
Length along longest watercourse = 0.365 Mi.
Length along longest watercourse measured to centroid = 0.209 Mi.
Difference in elevation = 20.00(Ft.)
Slope along watercourse = 54.7916 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.127 Hr.
Lag time = 7.60 Min.
25% of lag time = 1.90 Min.
40% of lag time = 3.04 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
22.30	2.25	50.18

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
22.30	5.50	122.65

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.250(In)
Area Averaged 100-Year Rainfall = 5.500(In)

Point rain (area averaged) = 2.250(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.250(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
19.156	46.00	0.000
3.144	66.00	0.000

Total Area Entered = 22.30(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
46.0	46.0	0.611	0.000	0.611	0.859	0.525
66.0	66.0	0.405	0.000	0.405	0.141	0.057
					Sum (F) =	0.582

Area averaged mean soil loss (F) (In/Hr) = 0.582
Minimum soil loss rate ((In/Hr)) = 0.291
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	65.828	6.469	1.454
2	0.167	131.656	37.404	8.406
3	0.250	197.484	31.099	6.989
4	0.333	263.313	11.505	2.586
5	0.417	329.141	6.501	1.461
6	0.500	394.969	3.643	0.819
7	0.583	460.797	1.610	0.362
8	0.667	526.625	0.686	0.154
9	0.750	592.453	0.469	0.105
10	0.833	658.281	0.414	0.093
11	0.917	724.110	0.201	0.045
			Sum = 100.000	Sum= 22.474

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	0.07	0.018	(1.032)		0.016	0.002
2	0.17	0.07	0.018	(1.028)		0.016	0.002
3	0.25	0.07	0.018	(1.024)		0.016	0.002
4	0.33	0.10	0.027	(1.020)		0.024	0.003
5	0.42	0.10	0.027	(1.016)		0.024	0.003
6	0.50	0.10	0.027	(1.012)		0.024	0.003
7	0.58	0.10	0.027	(1.008)		0.024	0.003
8	0.67	0.10	0.027	(1.004)		0.024	0.003
9	0.75	0.10	0.027	(1.000)		0.024	0.003
10	0.83	0.13	0.036	(0.996)		0.032	0.004
11	0.92	0.13	0.036	(0.992)		0.032	0.004
12	1.00	0.13	0.036	(0.989)		0.032	0.004

13	1.08	0.10	0.027	(0.985)	0.024	0.003
14	1.17	0.10	0.027	(0.981)	0.024	0.003
15	1.25	0.10	0.027	(0.977)	0.024	0.003
16	1.33	0.10	0.027	(0.973)	0.024	0.003
17	1.42	0.10	0.027	(0.969)	0.024	0.003
18	1.50	0.10	0.027	(0.965)	0.024	0.003
19	1.58	0.10	0.027	(0.961)	0.024	0.003
20	1.67	0.10	0.027	(0.957)	0.024	0.003
21	1.75	0.10	0.027	(0.954)	0.024	0.003
22	1.83	0.13	0.036	(0.950)	0.032	0.004
23	1.92	0.13	0.036	(0.946)	0.032	0.004
24	2.00	0.13	0.036	(0.942)	0.032	0.004
25	2.08	0.13	0.036	(0.938)	0.032	0.004
26	2.17	0.13	0.036	(0.935)	0.032	0.004
27	2.25	0.13	0.036	(0.931)	0.032	0.004
28	2.33	0.13	0.036	(0.927)	0.032	0.004
29	2.42	0.13	0.036	(0.923)	0.032	0.004
30	2.50	0.13	0.036	(0.919)	0.032	0.004
31	2.58	0.17	0.045	(0.916)	0.040	0.004
32	2.67	0.17	0.045	(0.912)	0.040	0.004
33	2.75	0.17	0.045	(0.908)	0.040	0.004
34	2.83	0.17	0.045	(0.904)	0.040	0.004
35	2.92	0.17	0.045	(0.901)	0.040	0.004
36	3.00	0.17	0.045	(0.897)	0.040	0.004
37	3.08	0.17	0.045	(0.893)	0.040	0.004
38	3.17	0.17	0.045	(0.890)	0.040	0.004
39	3.25	0.17	0.045	(0.886)	0.040	0.004
40	3.33	0.17	0.045	(0.882)	0.040	0.004
41	3.42	0.17	0.045	(0.878)	0.040	0.004
42	3.50	0.17	0.045	(0.875)	0.040	0.004
43	3.58	0.17	0.045	(0.871)	0.040	0.004
44	3.67	0.17	0.045	(0.867)	0.040	0.004
45	3.75	0.17	0.045	(0.864)	0.040	0.004
46	3.83	0.20	0.054	(0.860)	0.049	0.005
47	3.92	0.20	0.054	(0.857)	0.049	0.005
48	4.00	0.20	0.054	(0.853)	0.049	0.005
49	4.08	0.20	0.054	(0.849)	0.049	0.005
50	4.17	0.20	0.054	(0.846)	0.049	0.005
51	4.25	0.20	0.054	(0.842)	0.049	0.005
52	4.33	0.23	0.063	(0.839)	0.057	0.006
53	4.42	0.23	0.063	(0.835)	0.057	0.006
54	4.50	0.23	0.063	(0.831)	0.057	0.006
55	4.58	0.23	0.063	(0.828)	0.057	0.006
56	4.67	0.23	0.063	(0.824)	0.057	0.006
57	4.75	0.23	0.063	(0.821)	0.057	0.006
58	4.83	0.27	0.072	(0.817)	0.065	0.007
59	4.92	0.27	0.072	(0.814)	0.065	0.007
60	5.00	0.27	0.072	(0.810)	0.065	0.007
61	5.08	0.20	0.054	(0.807)	0.049	0.005
62	5.17	0.20	0.054	(0.803)	0.049	0.005
63	5.25	0.20	0.054	(0.800)	0.049	0.005
64	5.33	0.23	0.063	(0.796)	0.057	0.006
65	5.42	0.23	0.063	(0.793)	0.057	0.006
66	5.50	0.23	0.063	(0.789)	0.057	0.006
67	5.58	0.27	0.072	(0.786)	0.065	0.007
68	5.67	0.27	0.072	(0.782)	0.065	0.007
69	5.75	0.27	0.072	(0.779)	0.065	0.007
70	5.83	0.27	0.072	(0.775)	0.065	0.007
71	5.92	0.27	0.072	(0.772)	0.065	0.007
72	6.00	0.27	0.072	(0.768)	0.065	0.007
73	6.08	0.30	0.081	(0.765)	0.073	0.008
74	6.17	0.30	0.081	(0.762)	0.073	0.008
75	6.25	0.30	0.081	(0.758)	0.073	0.008

76	6.33	0.30	0.081	(0.755)	0.073	0.008
77	6.42	0.30	0.081	(0.751)	0.073	0.008
78	6.50	0.30	0.081	(0.748)	0.073	0.008
79	6.58	0.33	0.090	(0.745)	0.081	0.009
80	6.67	0.33	0.090	(0.741)	0.081	0.009
81	6.75	0.33	0.090	(0.738)	0.081	0.009
82	6.83	0.33	0.090	(0.735)	0.081	0.009
83	6.92	0.33	0.090	(0.731)	0.081	0.009
84	7.00	0.33	0.090	(0.728)	0.081	0.009
85	7.08	0.33	0.090	(0.725)	0.081	0.009
86	7.17	0.33	0.090	(0.721)	0.081	0.009
87	7.25	0.33	0.090	(0.718)	0.081	0.009
88	7.33	0.37	0.099	(0.715)	0.089	0.010
89	7.42	0.37	0.099	(0.712)	0.089	0.010
90	7.50	0.37	0.099	(0.708)	0.089	0.010
91	7.58	0.40	0.108	(0.705)	0.097	0.011
92	7.67	0.40	0.108	(0.702)	0.097	0.011
93	7.75	0.40	0.108	(0.699)	0.097	0.011
94	7.83	0.43	0.117	(0.695)	0.105	0.012
95	7.92	0.43	0.117	(0.692)	0.105	0.012
96	8.00	0.43	0.117	(0.689)	0.105	0.012
97	8.08	0.50	0.135	(0.686)	0.121	0.013
98	8.17	0.50	0.135	(0.683)	0.121	0.013
99	8.25	0.50	0.135	(0.679)	0.121	0.013
100	8.33	0.50	0.135	(0.676)	0.121	0.013
101	8.42	0.50	0.135	(0.673)	0.121	0.013
102	8.50	0.50	0.135	(0.670)	0.121	0.013
103	8.58	0.53	0.144	(0.667)	0.130	0.014
104	8.67	0.53	0.144	(0.664)	0.130	0.014
105	8.75	0.53	0.144	(0.660)	0.130	0.014
106	8.83	0.57	0.153	(0.657)	0.138	0.015
107	8.92	0.57	0.153	(0.654)	0.138	0.015
108	9.00	0.57	0.153	(0.651)	0.138	0.015
109	9.08	0.63	0.171	(0.648)	0.154	0.017
110	9.17	0.63	0.171	(0.645)	0.154	0.017
111	9.25	0.63	0.171	(0.642)	0.154	0.017
112	9.33	0.67	0.180	(0.639)	0.162	0.018
113	9.42	0.67	0.180	(0.636)	0.162	0.018
114	9.50	0.67	0.180	(0.633)	0.162	0.018
115	9.58	0.70	0.189	(0.630)	0.170	0.019
116	9.67	0.70	0.189	(0.627)	0.170	0.019
117	9.75	0.70	0.189	(0.624)	0.170	0.019
118	9.83	0.73	0.198	(0.621)	0.178	0.020
119	9.92	0.73	0.198	(0.618)	0.178	0.020
120	10.00	0.73	0.198	(0.615)	0.178	0.020
121	10.08	0.50	0.135	(0.612)	0.121	0.013
122	10.17	0.50	0.135	(0.609)	0.121	0.013
123	10.25	0.50	0.135	(0.606)	0.121	0.013
124	10.33	0.50	0.135	(0.603)	0.121	0.013
125	10.42	0.50	0.135	(0.600)	0.121	0.013
126	10.50	0.50	0.135	(0.597)	0.121	0.013
127	10.58	0.67	0.180	(0.594)	0.162	0.018
128	10.67	0.67	0.180	(0.591)	0.162	0.018
129	10.75	0.67	0.180	(0.588)	0.162	0.018
130	10.83	0.67	0.180	(0.585)	0.162	0.018
131	10.92	0.67	0.180	(0.583)	0.162	0.018
132	11.00	0.67	0.180	(0.580)	0.162	0.018
133	11.08	0.63	0.171	(0.577)	0.154	0.017
134	11.17	0.63	0.171	(0.574)	0.154	0.017
135	11.25	0.63	0.171	(0.571)	0.154	0.017
136	11.33	0.63	0.171	(0.568)	0.154	0.017
137	11.42	0.63	0.171	(0.566)	0.154	0.017
138	11.50	0.63	0.171	(0.563)	0.154	0.017

139	11.58	0.57	0.153	(0.560)	0.138	0.015
140	11.67	0.57	0.153	(0.557)	0.138	0.015
141	11.75	0.57	0.153	(0.554)	0.138	0.015
142	11.83	0.60	0.162	(0.552)	0.146	0.016
143	11.92	0.60	0.162	(0.549)	0.146	0.016
144	12.00	0.60	0.162	(0.546)	0.146	0.016
145	12.08	0.83	0.225	(0.543)	0.202	0.022
146	12.17	0.83	0.225	(0.541)	0.202	0.022
147	12.25	0.83	0.225	(0.538)	0.202	0.022
148	12.33	0.87	0.234	(0.535)	0.211	0.023
149	12.42	0.87	0.234	(0.533)	0.211	0.023
150	12.50	0.87	0.234	(0.530)	0.211	0.023
151	12.58	0.93	0.252	(0.527)	0.227	0.025
152	12.67	0.93	0.252	(0.525)	0.227	0.025
153	12.75	0.93	0.252	(0.522)	0.227	0.025
154	12.83	0.97	0.261	(0.519)	0.235	0.026
155	12.92	0.97	0.261	(0.517)	0.235	0.026
156	13.00	0.97	0.261	(0.514)	0.235	0.026
157	13.08	1.13	0.306	(0.511)	0.275	0.031
158	13.17	1.13	0.306	(0.509)	0.275	0.031
159	13.25	1.13	0.306	(0.506)	0.275	0.031
160	13.33	1.13	0.306	(0.504)	0.275	0.031
161	13.42	1.13	0.306	(0.501)	0.275	0.031
162	13.50	1.13	0.306	(0.499)	0.275	0.031
163	13.58	0.77	0.207	(0.496)	0.186	0.021
164	13.67	0.77	0.207	(0.494)	0.186	0.021
165	13.75	0.77	0.207	(0.491)	0.186	0.021
166	13.83	0.77	0.207	(0.489)	0.186	0.021
167	13.92	0.77	0.207	(0.486)	0.186	0.021
168	14.00	0.77	0.207	(0.484)	0.186	0.021
169	14.08	0.90	0.243	(0.481)	0.219	0.024
170	14.17	0.90	0.243	(0.479)	0.219	0.024
171	14.25	0.90	0.243	(0.476)	0.219	0.024
172	14.33	0.87	0.234	(0.474)	0.211	0.023
173	14.42	0.87	0.234	(0.471)	0.211	0.023
174	14.50	0.87	0.234	(0.469)	0.211	0.023
175	14.58	0.87	0.234	(0.467)	0.211	0.023
176	14.67	0.87	0.234	(0.464)	0.211	0.023
177	14.75	0.87	0.234	(0.462)	0.211	0.023
178	14.83	0.83	0.225	(0.459)	0.202	0.022
179	14.92	0.83	0.225	(0.457)	0.202	0.022
180	15.00	0.83	0.225	(0.455)	0.202	0.022
181	15.08	0.80	0.216	(0.452)	0.194	0.022
182	15.17	0.80	0.216	(0.450)	0.194	0.022
183	15.25	0.80	0.216	(0.448)	0.194	0.022
184	15.33	0.77	0.207	(0.445)	0.186	0.021
185	15.42	0.77	0.207	(0.443)	0.186	0.021
186	15.50	0.77	0.207	(0.441)	0.186	0.021
187	15.58	0.63	0.171	(0.439)	0.154	0.017
188	15.67	0.63	0.171	(0.436)	0.154	0.017
189	15.75	0.63	0.171	(0.434)	0.154	0.017
190	15.83	0.63	0.171	(0.432)	0.154	0.017
191	15.92	0.63	0.171	(0.430)	0.154	0.017
192	16.00	0.63	0.171	(0.428)	0.154	0.017
193	16.08	0.13	0.036	(0.425)	0.032	0.004
194	16.17	0.13	0.036	(0.423)	0.032	0.004
195	16.25	0.13	0.036	(0.421)	0.032	0.004
196	16.33	0.13	0.036	(0.419)	0.032	0.004
197	16.42	0.13	0.036	(0.417)	0.032	0.004
198	16.50	0.13	0.036	(0.415)	0.032	0.004
199	16.58	0.10	0.027	(0.412)	0.024	0.003
200	16.67	0.10	0.027	(0.410)	0.024	0.003
201	16.75	0.10	0.027	(0.408)	0.024	0.003

202	16.83	0.10	0.027	(0.406)	0.024	0.003
203	16.92	0.10	0.027	(0.404)	0.024	0.003
204	17.00	0.10	0.027	(0.402)	0.024	0.003
205	17.08	0.17	0.045	(0.400)	0.040	0.004
206	17.17	0.17	0.045	(0.398)	0.040	0.004
207	17.25	0.17	0.045	(0.396)	0.040	0.004
208	17.33	0.17	0.045	(0.394)	0.040	0.004
209	17.42	0.17	0.045	(0.392)	0.040	0.004
210	17.50	0.17	0.045	(0.390)	0.040	0.004
211	17.58	0.17	0.045	(0.388)	0.040	0.004
212	17.67	0.17	0.045	(0.386)	0.040	0.004
213	17.75	0.17	0.045	(0.384)	0.040	0.004
214	17.83	0.13	0.036	(0.382)	0.032	0.004
215	17.92	0.13	0.036	(0.381)	0.032	0.004
216	18.00	0.13	0.036	(0.379)	0.032	0.004
217	18.08	0.13	0.036	(0.377)	0.032	0.004
218	18.17	0.13	0.036	(0.375)	0.032	0.004
219	18.25	0.13	0.036	(0.373)	0.032	0.004
220	18.33	0.13	0.036	(0.371)	0.032	0.004
221	18.42	0.13	0.036	(0.369)	0.032	0.004
222	18.50	0.13	0.036	(0.368)	0.032	0.004
223	18.58	0.10	0.027	(0.366)	0.024	0.003
224	18.67	0.10	0.027	(0.364)	0.024	0.003
225	18.75	0.10	0.027	(0.362)	0.024	0.003
226	18.83	0.07	0.018	(0.361)	0.016	0.002
227	18.92	0.07	0.018	(0.359)	0.016	0.002
228	19.00	0.07	0.018	(0.357)	0.016	0.002
229	19.08	0.10	0.027	(0.356)	0.024	0.003
230	19.17	0.10	0.027	(0.354)	0.024	0.003
231	19.25	0.10	0.027	(0.352)	0.024	0.003
232	19.33	0.13	0.036	(0.351)	0.032	0.004
233	19.42	0.13	0.036	(0.349)	0.032	0.004
234	19.50	0.13	0.036	(0.347)	0.032	0.004
235	19.58	0.10	0.027	(0.346)	0.024	0.003
236	19.67	0.10	0.027	(0.344)	0.024	0.003
237	19.75	0.10	0.027	(0.343)	0.024	0.003
238	19.83	0.07	0.018	(0.341)	0.016	0.002
239	19.92	0.07	0.018	(0.340)	0.016	0.002
240	20.00	0.07	0.018	(0.338)	0.016	0.002
241	20.08	0.10	0.027	(0.337)	0.024	0.003
242	20.17	0.10	0.027	(0.335)	0.024	0.003
243	20.25	0.10	0.027	(0.334)	0.024	0.003
244	20.33	0.10	0.027	(0.332)	0.024	0.003
245	20.42	0.10	0.027	(0.331)	0.024	0.003
246	20.50	0.10	0.027	(0.329)	0.024	0.003
247	20.58	0.10	0.027	(0.328)	0.024	0.003
248	20.67	0.10	0.027	(0.327)	0.024	0.003
249	20.75	0.10	0.027	(0.325)	0.024	0.003
250	20.83	0.07	0.018	(0.324)	0.016	0.002
251	20.92	0.07	0.018	(0.323)	0.016	0.002
252	21.00	0.07	0.018	(0.321)	0.016	0.002
253	21.08	0.10	0.027	(0.320)	0.024	0.003
254	21.17	0.10	0.027	(0.319)	0.024	0.003
255	21.25	0.10	0.027	(0.318)	0.024	0.003
256	21.33	0.07	0.018	(0.316)	0.016	0.002
257	21.42	0.07	0.018	(0.315)	0.016	0.002
258	21.50	0.07	0.018	(0.314)	0.016	0.002
259	21.58	0.10	0.027	(0.313)	0.024	0.003
260	21.67	0.10	0.027	(0.312)	0.024	0.003
261	21.75	0.10	0.027	(0.311)	0.024	0.003
262	21.83	0.07	0.018	(0.309)	0.016	0.002
263	21.92	0.07	0.018	(0.308)	0.016	0.002
264	22.00	0.07	0.018	(0.307)	0.016	0.002

265	22.08	0.10	0.027	(0.306)	0.024	0.003
266	22.17	0.10	0.027	(0.305)	0.024	0.003
267	22.25	0.10	0.027	(0.304)	0.024	0.003
268	22.33	0.07	0.018	(0.303)	0.016	0.002
269	22.42	0.07	0.018	(0.303)	0.016	0.002
270	22.50	0.07	0.018	(0.302)	0.016	0.002
271	22.58	0.07	0.018	(0.301)	0.016	0.002
272	22.67	0.07	0.018	(0.300)	0.016	0.002
273	22.75	0.07	0.018	(0.299)	0.016	0.002
274	22.83	0.07	0.018	(0.298)	0.016	0.002
275	22.92	0.07	0.018	(0.298)	0.016	0.002
276	23.00	0.07	0.018	(0.297)	0.016	0.002
277	23.08	0.07	0.018	(0.296)	0.016	0.002
278	23.17	0.07	0.018	(0.295)	0.016	0.002
279	23.25	0.07	0.018	(0.295)	0.016	0.002
280	23.33	0.07	0.018	(0.294)	0.016	0.002
281	23.42	0.07	0.018	(0.294)	0.016	0.002
282	23.50	0.07	0.018	(0.293)	0.016	0.002
283	23.58	0.07	0.018	(0.293)	0.016	0.002
284	23.67	0.07	0.018	(0.292)	0.016	0.002
285	23.75	0.07	0.018	(0.292)	0.016	0.002
286	23.83	0.07	0.018	(0.292)	0.016	0.002
287	23.92	0.07	0.018	(0.291)	0.016	0.002
288	24.00	0.07	0.018	(0.291)	0.016	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.7

Flood volume = Effective rainfall 0.22(In)
times area 22.3(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 2.02(In)
Total soil loss = 3.763(Ac.Ft)
Total rainfall = 2.25(In)
Flood volume = 18212.7 Cubic Feet
Total soil loss = 163914.6 Cubic Feet

Peak flow rate of this hydrograph = 0.684(CFS)

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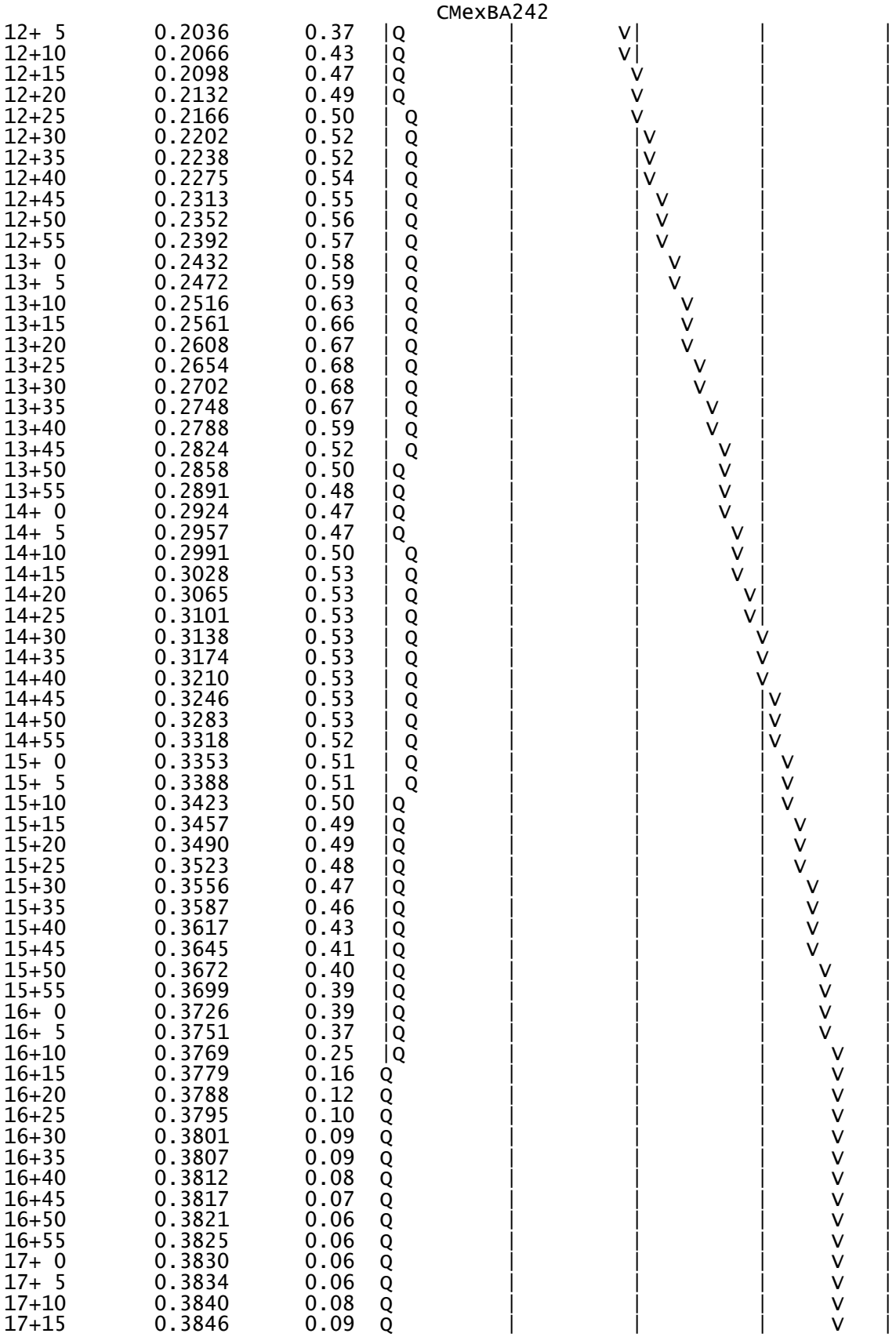
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q				
0+10	0.0001	0.02	Q				
0+15	0.0003	0.03	Q				
0+20	0.0006	0.04	Q				
0+25	0.0009	0.05	Q				
0+30	0.0013	0.05	Q				
0+35	0.0017	0.06	Q				
0+40	0.0021	0.06	Q				
0+45	0.0025	0.06	Q				
0+50	0.0029	0.06	Q				
0+55	0.0034	0.07	Q				
1+ 0	0.0039	0.08	Q				
1+ 5	0.0045	0.08	Q				
1+10	0.0049	0.07	Q				
1+15	0.0054	0.07	Q				
1+20	0.0058	0.06	Q				
1+25	0.0063	0.06	Q				
1+30	0.0067	0.06	Q				

1+35	0.0071	0.06	Q	|	|	|	|
1+40	0.0075	0.06	Q	|	|	|	|
1+45	0.0079	0.06	Q	|	|	|	|
1+50	0.0084	0.06	Q	|	|	|	|
1+55	0.0088	0.07	Q	|	|	|	|
2+ 0	0.0094	0.08	Q	|	|	|	|
2+ 5	0.0099	0.08	Q	|	|	|	|
2+10	0.0104	0.08	Q	|	|	|	|
2+15	0.0110	0.08	QV	|	|	|	|
2+20	0.0116	0.08	QV	|	|	|	|
2+25	0.0121	0.08	QV	|	|	|	|
2+30	0.0127	0.08	QV	|	|	|	|
2+35	0.0132	0.08	QV	|	|	|	|
2+40	0.0139	0.09	QV	|	|	|	|
2+45	0.0145	0.10	QV	|	|	|	|
2+50	0.0152	0.10	QV	|	|	|	|
2+55	0.0159	0.10	QV	|	|	|	|
3+ 0	0.0166	0.10	QV	|	|	|	|
3+ 5	0.0173	0.10	QV	|	|	|	|
3+10	0.0180	0.10	QV	|	|	|	|
3+15	0.0187	0.10	QV	|	|	|	|
3+20	0.0194	0.10	QV	|	|	|	|
3+25	0.0201	0.10	QV	|	|	|	|
3+30	0.0208	0.10	QV	|	|	|	|
3+35	0.0214	0.10	Q V	|	|	|	|
3+40	0.0221	0.10	Q V	|	|	|	|
3+45	0.0228	0.10	Q V	|	|	|	|
3+50	0.0235	0.10	Q V	|	|	|	|
3+55	0.0243	0.11	Q V	|	|	|	|
4+ 0	0.0251	0.12	Q V	|	|	|	|
4+ 5	0.0259	0.12	Q V	|	|	|	|
4+10	0.0267	0.12	Q V	|	|	|	|
4+15	0.0276	0.12	Q V	|	|	|	|
4+20	0.0284	0.12	Q V	|	|	|	|
4+25	0.0293	0.13	Q V	|	|	|	|
4+30	0.0303	0.14	Q V	|	|	|	|
4+35	0.0312	0.14	Q V	|	|	|	|
4+40	0.0322	0.14	Q V	|	|	|	|
4+45	0.0332	0.14	Q V	|	|	|	|
4+50	0.0341	0.14	Q V	|	|	|	|
4+55	0.0352	0.15	Q V	|	|	|	|
5+ 0	0.0362	0.16	Q V	|	|	|	|
5+ 5	0.0373	0.16	Q V	|	|	|	|
5+10	0.0383	0.14	Q V	|	|	|	|
5+15	0.0392	0.13	Q V	|	|	|	|
5+20	0.0401	0.13	Q V	|	|	|	|
5+25	0.0410	0.13	Q V	|	|	|	|
5+30	0.0420	0.14	Q V	|	|	|	|
5+35	0.0429	0.14	Q V	|	|	|	|
5+40	0.0440	0.15	Q V	|	|	|	|
5+45	0.0450	0.16	Q V	|	|	|	|
5+50	0.0461	0.16	Q V	|	|	|	|
5+55	0.0472	0.16	Q V	|	|	|	|
6+ 0	0.0483	0.16	Q V	|	|	|	|
6+ 5	0.0495	0.16	Q V	|	|	|	|
6+10	0.0506	0.17	Q V	|	|	|	|
6+15	0.0519	0.18	Q V	|	|	|	|
6+20	0.0531	0.18	Q V	|	|	|	|
6+25	0.0543	0.18	Q V	|	|	|	|
6+30	0.0556	0.18	Q V	|	|	|	|
6+35	0.0568	0.18	Q V	|	|	|	|
6+40	0.0582	0.19	Q V	|	|	|	|
6+45	0.0595	0.20	Q V	|	|	|	|

```
 6+50       0.0609      0.20  Q    V     |           |           |           |
 6+55       0.0623      0.20  Q    V     |           |           |           |
 7+ 0       0.0637      0.20  Q     V    |           |           |           |
 7+ 5       0.0651      0.20  Q     V    |           |           |           |
 7+10       0.0664      0.20  Q     V    |           |           |           |
 7+15       0.0678      0.20  Q     V    |           |           |           |
 7+20       0.0692      0.20  Q     V    |           |           |           |
 7+25       0.0707      0.21  Q     V    |           |           |           |
 7+30       0.0722      0.22  Q     V    |           |           |           |
 7+35       0.0737      0.22  Q      V   |           |           |           |
 7+40       0.0753      0.23  Q      V   |           |           |           |
 7+45       0.0769      0.24  Q      V   |           |           |           |
 7+50       0.0786      0.24  Q      V   |           |           |           |
 7+55       0.0803      0.25  |Q     V   |           |           |           |
 8+ 0       0.0821      0.26  |Q     V   |           |           |           |
 8+ 5       0.0839      0.26  |Q      V  |           |           |           |
 8+10       0.0858      0.28  |Q      V  |           |           |           |
 8+15       0.0878      0.29  |Q      V  |           |           |           |
 8+20       0.0899      0.30  |Q      V  |           |           |           |
 8+25       0.0920      0.30  |Q      V  |           |           |           |
 8+30       0.0940      0.30  |Q      V  |           |           |           |
 8+35       0.0961      0.30  |Q       V|           |           |           |
 8+40       0.0983      0.31  |Q       V|           |           |           |
 8+45       0.1005      0.32  |Q       V|           |           |           |
 8+50       0.1027      0.32  |Q       V|           |           |           |
 8+55       0.1050      0.33  |Q        V           |           |           |
 9+ 0       0.1073      0.34  |Q        V           |           |           |
 9+ 5       0.1097      0.34  |Q        V           |           |           |
 9+10       0.1121      0.36  |Q        V           |           |           |
 9+15       0.1147      0.37  |Q        V           |           |           |
 9+20       0.1173      0.38  |Q        |V          |           |           |
 9+25       0.1200      0.39  |Q        |V          |           |           |
 9+30       0.1228      0.40  |Q        |V          |           |           |
 9+35       0.1255      0.40  |Q        | V         |           |           |
 9+40       0.1284      0.41  |Q        | V         |           |           |
 9+45       0.1313      0.42  |Q        | V         |           |           |
 9+50       0.1342      0.42  |Q        | V         |           |           |
 9+55       0.1372      0.43  |Q        |  V        |           |           |
10+ 0       0.1402      0.44  |Q        |  V        |           |           |
10+ 5       0.1432      0.43  |Q        |  V        |           |           |
10+10       0.1458      0.38  |Q        |  V        |           |           |
10+15       0.1481      0.34  |Q        |   V       |           |           |
10+20       0.1503      0.32  |Q        |   V       |           |           |
10+25       0.1525      0.31  |Q        |   V       |           |           |
10+30       0.1546      0.31  |Q        |   V       |           |           |
10+35       0.1568      0.31  |Q        |   V       |           |           |
10+40       0.1592      0.35  |Q        |    V      |           |           |
10+45       0.1618      0.38  |Q        |    V      |           |           |
10+50       0.1645      0.39  |Q        |    V      |           |           |
10+55       0.1672      0.40  |Q        |    V      |           |           |
11+ 0       0.1700      0.40  |Q        |     V     |           |           |
11+ 5       0.1728      0.40  |Q        |     V     |           |           |
11+10       0.1755      0.39  |Q        |     V     |           |           |
11+15       0.1782      0.39  |Q        |      V    |           |           |
11+20       0.1808      0.39  |Q        |      V    |           |           |
11+25       0.1835      0.39  |Q        |      V    |           |           |
11+30       0.1861      0.39  |Q        |      V    |           |           |
11+35       0.1888      0.38  |Q        |       V   |           |           |
11+40       0.1913      0.37  |Q        |       V   |           |           |
11+45       0.1937      0.35  |Q        |       V   |           |           |
11+50       0.1961      0.35  |Q        |       V   |           |           |
11+55       0.1986      0.36  |Q        |       V   |           |           |
12+ 0       0.2011      0.36  |Q        |        V  |           |           |
```


12+ 5 0.2036 0.37
12+10 0.2066 0.43
12+15 0.2098 0.47
12+20 0.2132 0.49
12+25 0.2166 0.50
12+30 0.2202 0.52
12+35 0.2238 0.52
12+40 0.2275 0.54
12+45 0.2313 0.55
12+50 0.2352 0.56
12+55 0.2392 0.57
13+ 0 0.2432 0.58
13+ 5 0.2472 0.59
13+10 0.2516 0.63
13+15 0.2561 0.66
13+20 0.2608 0.67
13+25 0.2654 0.68
13+30 0.2702 0.68
13+35 0.2748 0.67
13+40 0.2788 0.59
13+45 0.2824 0.52
13+50 0.2858 0.50
13+55 0.2891 0.48
14+ 0 0.2924 0.47
14+ 5 0.2957 0.47
14+10 0.2991 0.50
14+15 0.3028 0.53
14+20 0.3065 0.53
14+25 0.3101 0.53
14+30 0.3138 0.53
14+35 0.3174 0.53
14+40 0.3210 0.53
14+45 0.3246 0.53
14+50 0.3283 0.53
14+55 0.3318 0.52
15+ 0 0.3353 0.51
15+ 5 0.3388 0.51
15+10 0.3423 0.50
15+15 0.3457 0.49
15+20 0.3490 0.49
15+25 0.3523 0.48
15+30 0.3556 0.47
15+35 0.3587 0.46
15+40 0.3617 0.43
15+45 0.3645 0.41
15+50 0.3672 0.40
15+55 0.3699 0.39
16+ 0 0.3726 0.39
16+ 5 0.3751 0.37
16+10 0.3769 0.25
16+15 0.3779 0.16
16+20 0.3788 0.12
16+25 0.3795 0.10
16+30 0.3801 0.09
16+35 0.3807 0.09
16+40 0.3812 0.08
16+45 0.3817 0.07
16+50 0.3821 0.06
16+55 0.3825 0.06
17+ 0 0.3830 0.06
17+ 5 0.3834 0.06
17+10 0.3840 0.08
17+15 0.3846 0.09

17+20	0.3852	0.10	Q	|	|	|	V |
17+25	0.3859	0.10	Q	|	|	|	V |
17+30	0.3866	0.10	Q	|	|	|	V |
17+35	0.3873	0.10	Q	|	|	|	V |
17+40	0.3880	0.10	Q	|	|	|	V |
17+45	0.3887	0.10	Q	|	|	|	V |
17+50	0.3894	0.10	Q	|	|	|	V |
17+55	0.3900	0.09	Q	|	|	|	V |
18+ 0	0.3906	0.09	Q	|	|	|	V |
18+ 5	0.3912	0.08	Q	|	|	|	V |
18+10	0.3917	0.08	Q	|	|	|	V |
18+15	0.3923	0.08	Q	|	|	|	V |
18+20	0.3929	0.08	Q	|	|	|	V |
18+25	0.3934	0.08	Q	|	|	|	V |
18+30	0.3940	0.08	Q	|	|	|	V |
18+35	0.3945	0.08	Q	|	|	|	V |
18+40	0.3950	0.07	Q	|	|	|	V |
18+45	0.3955	0.07	Q	|	|	|	V |
18+50	0.3959	0.06	Q	|	|	|	V |
18+55	0.3963	0.05	Q	|	|	|	V |
19+ 0	0.3966	0.05	Q	|	|	|	V |
19+ 5	0.3969	0.04	Q	|	|	|	V |
19+10	0.3973	0.05	Q	|	|	|	V |
19+15	0.3976	0.06	Q	|	|	|	V |
19+20	0.3981	0.06	Q	|	|	|	V |
19+25	0.3985	0.07	Q	|	|	|	V |
19+30	0.3990	0.08	Q	|	|	|	V |
19+35	0.3996	0.08	Q	|	|	|	V |
19+40	0.4001	0.07	Q	|	|	|	V |
19+45	0.4005	0.06	Q	|	|	|	V |
19+50	0.4009	0.06	Q	|	|	|	V |
19+55	0.4013	0.05	Q	|	|	|	V |
20+ 0	0.4016	0.05	Q	|	|	|	V |
20+ 5	0.4019	0.04	Q	|	|	|	V |
20+10	0.4023	0.05	Q	|	|	|	V |
20+15	0.4027	0.06	Q	|	|	|	V |
20+20	0.4031	0.06	Q	|	|	|	V |
20+25	0.4035	0.06	Q	|	|	|	V |
20+30	0.4039	0.06	Q	|	|	|	V |
20+35	0.4043	0.06	Q	|	|	|	V |
20+40	0.4047	0.06	Q	|	|	|	V |
20+45	0.4051	0.06	Q	|	|	|	V |
20+50	0.4055	0.06	Q	|	|	|	V |
20+55	0.4059	0.05	Q	|	|	|	V |
21+ 0	0.4062	0.05	Q	|	|	|	V |
21+ 5	0.4065	0.04	Q	|	|	|	V |
21+10	0.4069	0.05	Q	|	|	|	V |
21+15	0.4073	0.06	Q	|	|	|	V |
21+20	0.4077	0.06	Q	|	|	|	V |
21+25	0.4080	0.05	Q	|	|	|	V|
21+30	0.4083	0.04	Q	|	|	|	V|
21+35	0.4086	0.04	Q	|	|	|	V|
21+40	0.4090	0.05	Q	|	|	|	V|
21+45	0.4094	0.06	Q	|	|	|	V|
21+50	0.4097	0.06	Q	|	|	|	V|
21+55	0.4101	0.05	Q	|	|	|	V|
22+ 0	0.4104	0.04	Q	|	|	|	V|
22+ 5	0.4107	0.04	Q	|	|	|	V|
22+10	0.4111	0.05	Q	|	|	|	V|
22+15	0.4114	0.06	Q	|	|	|	V|
22+20	0.4118	0.06	Q	|	|	|	V|
22+25	0.4122	0.05	Q	|	|	|	V|
22+30	0.4125	0.04	Q	|	|	|	V|

22+35	0.4128	0.04	Q	|	|	|	V|
22+40	0.4131	0.04	Q	|	|	|	V|
22+45	0.4134	0.04	Q	|	|	|	V|
22+50	0.4136	0.04	Q	|	|	|	V|
22+55	0.4139	0.04	Q	|	|	|	V|
23+ 0	0.4142	0.04	Q	|	|	|	V|
23+ 5	0.4145	0.04	Q	|	|	|	V|
23+10	0.4148	0.04	Q	|	|	|	V|
23+15	0.4150	0.04	Q	|	|	|	V|
23+20	0.4153	0.04	Q	|	|	|	V|
23+25	0.4156	0.04	Q	|	|	|	V|
23+30	0.4159	0.04	Q	|	|	|	V|
23+35	0.4161	0.04	Q	|	|	|	V|
23+40	0.4164	0.04	Q	|	|	|	V|
23+45	0.4167	0.04	Q	|	|	|	V|
23+50	0.4170	0.04	Q	|	|	|	V|
23+55	0.4173	0.04	Q	|	|	|	V|
24+ 0	0.4175	0.04	Q	|	|	|	V|
24+ 5	0.4178	0.04	Q	|	|	|	V|
24+10	0.4180	0.02	Q	|	|	|	V|
24+15	0.4180	0.01	Q	|	|	|	V|
24+20	0.4181	0.01	Q	|	|	|	V|
24+25	0.4181	0.00	Q	|	|	|	V|
24+30	0.4181	0.00	Q	|	|	|	V|
24+35	0.4181	0.00	Q	|	|	|	V|
24+40	0.4181	0.00	Q	|	|	|	V|
24+45	0.4181	0.00	Q	|	|	|	V|
24+50	0.4181	0.00	Q	|	|	|	V

PRE-DEVELOPMENT 2 YEAR, 24-HOUR STORM DURATION

BELLTOWN MARKET TRIBUTARY

CMexSUH242

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/25/16 File: CMexSUH242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6353

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Crestmore - Existing Hydrology - SUH
AMC II - 2 year
2016-10-25

Drainage Area = 264.18(Ac.) = 0.413 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 264.18(Ac.) = 0.413 Sq. Mi.
Length along longest watercourse = 7340.34(Ft.)
Length along longest watercourse measured to centroid = 3750.89(Ft.)
Length along longest watercourse = 1.390 Mi.
Length along longest watercourse measured to centroid = 0.710 Mi.
Difference in elevation = 108.00(Ft.)
Slope along watercourse = 77.6857 Ft./Mi.
Average Manning's 'N' = 0.024
Lag time = 0.247 Hr.
Lag time = 14.84 Min.
25% of lag time = 3.71 Min.
40% of lag time = 5.94 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
264.18	2.25	594.40

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
264.18	5.50	1452.99

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.250(In)
Area Averaged 100-Year Rainfall = 5.500(In)

Point rain (area averaged) = 2.250(In)
Areal adjustment factor = 99.95 %
Adjusted average point rain = 2.249(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
161.700	32.00	0.900
92.520	46.00	0.000
5.230	75.00	0.900
4.730	88.00	0.000

Total Area Entered = 264.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
32.0	32.0	0.742	0.900	0.141	0.612	0.086
46.0	46.0	0.611	0.000	0.611	0.350	0.214
75.0	75.0	0.303	0.900	0.058	0.020	0.001
88.0	88.0	0.153	0.000	0.153	0.018	0.003
					Sum (F) =	0.304

Area averaged mean soil loss (F) (In/Hr) = 0.304
Minimum soil loss rate ((In/Hr)) = 0.152
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.445

U n i t H y d r o g r a p h
FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	33.684	2.495	6.643
2	0.167	67.368	8.446	22.487
3	0.250	101.052	19.998	53.243
4	0.333	134.736	29.159	77.635
5	0.417	168.420	11.964	31.853
6	0.500	202.105	7.590	20.207
7	0.583	235.789	5.435	14.469
8	0.667	269.473	4.094	10.899
9	0.750	303.157	3.115	8.293
10	0.833	336.841	2.351	6.260
11	0.917	370.525	1.680	4.473
12	1.000	404.209	1.212	3.226
13	1.083	437.893	0.614	1.635
14	1.167	471.577	0.390	1.039
15	1.250	505.261	0.340	0.904
16	1.333	538.946	0.250	0.666
17	1.417	572.630	0.217	0.579
18	1.500	606.314	0.263	0.701
19	1.583	639.998	0.179	0.477
20	1.667	673.682	0.118	0.314
21	1.750	707.366	0.089	0.238
			Sum = 100.000	Sum= 266.244

Storm Event 5 Effective Rainfall = 0.225(In)

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.002	(0.539)	0.001	0.001
2	0.17	0.07	0.002	(0.537)	0.001	0.001
3	0.25	0.07	0.002	(0.535)	0.001	0.001
4	0.33	0.10	0.003	(0.533)	0.001	0.001
5	0.42	0.10	0.003	(0.531)	0.001	0.001
6	0.50	0.10	0.003	(0.529)	0.001	0.001
7	0.58	0.10	0.003	(0.527)	0.001	0.001
8	0.67	0.10	0.003	(0.525)	0.001	0.001
9	0.75	0.10	0.003	(0.523)	0.001	0.001
10	0.83	0.13	0.004	(0.521)	0.002	0.002
11	0.92	0.13	0.004	(0.519)	0.002	0.002
12	1.00	0.13	0.004	(0.517)	0.002	0.002
13	1.08	0.10	0.003	(0.515)	0.001	0.001
14	1.17	0.10	0.003	(0.512)	0.001	0.001
15	1.25	0.10	0.003	(0.510)	0.001	0.001
16	1.33	0.10	0.003	(0.508)	0.001	0.001
17	1.42	0.10	0.003	(0.506)	0.001	0.001
18	1.50	0.10	0.003	(0.504)	0.001	0.001
19	1.58	0.10	0.003	(0.502)	0.001	0.001
20	1.67	0.10	0.003	(0.500)	0.001	0.001
21	1.75	0.10	0.003	(0.498)	0.001	0.001
22	1.83	0.13	0.004	(0.496)	0.002	0.002
23	1.92	0.13	0.004	(0.494)	0.002	0.002
24	2.00	0.13	0.004	(0.492)	0.002	0.002
25	2.08	0.13	0.004	(0.490)	0.002	0.002
26	2.17	0.13	0.004	(0.488)	0.002	0.002
27	2.25	0.13	0.004	(0.486)	0.002	0.002
28	2.33	0.13	0.004	(0.484)	0.002	0.002
29	2.42	0.13	0.004	(0.482)	0.002	0.002
30	2.50	0.13	0.004	(0.480)	0.002	0.002
31	2.58	0.17	0.004	(0.478)	0.002	0.002
32	2.67	0.17	0.004	(0.477)	0.002	0.002
33	2.75	0.17	0.004	(0.475)	0.002	0.002
34	2.83	0.17	0.004	(0.473)	0.002	0.002
35	2.92	0.17	0.004	(0.471)	0.002	0.002
36	3.00	0.17	0.004	(0.469)	0.002	0.002
37	3.08	0.17	0.004	(0.467)	0.002	0.002
38	3.17	0.17	0.004	(0.465)	0.002	0.002
39	3.25	0.17	0.004	(0.463)	0.002	0.002
40	3.33	0.17	0.004	(0.461)	0.002	0.002
41	3.42	0.17	0.004	(0.459)	0.002	0.002
42	3.50	0.17	0.004	(0.457)	0.002	0.002
43	3.58	0.17	0.004	(0.455)	0.002	0.002
44	3.67	0.17	0.004	(0.453)	0.002	0.002
45	3.75	0.17	0.004	(0.451)	0.002	0.002
46	3.83	0.20	0.005	(0.450)	0.002	0.003
47	3.92	0.20	0.005	(0.448)	0.002	0.003
48	4.00	0.20	0.005	(0.446)	0.002	0.003
49	4.08	0.20	0.005	(0.444)	0.002	0.003
50	4.17	0.20	0.005	(0.442)	0.002	0.003
51	4.25	0.20	0.005	(0.440)	0.002	0.003
52	4.33	0.23	0.006	(0.438)	0.003	0.003
53	4.42	0.23	0.006	(0.436)	0.003	0.003
54	4.50	0.23	0.006	(0.434)	0.003	0.003
55	4.58	0.23	0.006	(0.433)	0.003	0.003
56	4.67	0.23	0.006	(0.431)	0.003	0.003
57	4.75	0.23	0.006	(0.429)	0.003	0.003

58	4.83	0.27	0.007	(0.427)	0.003	0.004
59	4.92	0.27	0.007	(0.425)	0.003	0.004
60	5.00	0.27	0.007	(0.423)	0.003	0.004
61	5.08	0.20	0.005	(0.421)	0.002	0.003
62	5.17	0.20	0.005	(0.420)	0.002	0.003
63	5.25	0.20	0.005	(0.418)	0.002	0.003
64	5.33	0.23	0.006	(0.416)	0.003	0.003
65	5.42	0.23	0.006	(0.414)	0.003	0.003
66	5.50	0.23	0.006	(0.412)	0.003	0.003
67	5.58	0.27	0.007	(0.411)	0.003	0.004
68	5.67	0.27	0.007	(0.409)	0.003	0.004
69	5.75	0.27	0.007	(0.407)	0.003	0.004
70	5.83	0.27	0.007	(0.405)	0.003	0.004
71	5.92	0.27	0.007	(0.403)	0.003	0.004
72	6.00	0.27	0.007	(0.402)	0.003	0.004
73	6.08	0.30	0.008	(0.400)	0.004	0.004
74	6.17	0.30	0.008	(0.398)	0.004	0.004
75	6.25	0.30	0.008	(0.396)	0.004	0.004
76	6.33	0.30	0.008	(0.394)	0.004	0.004
77	6.42	0.30	0.008	(0.393)	0.004	0.004
78	6.50	0.30	0.008	(0.391)	0.004	0.004
79	6.58	0.33	0.009	(0.389)	0.004	0.005
80	6.67	0.33	0.009	(0.387)	0.004	0.005
81	6.75	0.33	0.009	(0.386)	0.004	0.005
82	6.83	0.33	0.009	(0.384)	0.004	0.005
83	6.92	0.33	0.009	(0.382)	0.004	0.005
84	7.00	0.33	0.009	(0.380)	0.004	0.005
85	7.08	0.33	0.009	(0.379)	0.004	0.005
86	7.17	0.33	0.009	(0.377)	0.004	0.005
87	7.25	0.33	0.009	(0.375)	0.004	0.005
88	7.33	0.37	0.010	(0.374)	0.004	0.005
89	7.42	0.37	0.010	(0.372)	0.004	0.005
90	7.50	0.37	0.010	(0.370)	0.004	0.005
91	7.58	0.40	0.011	(0.368)	0.005	0.006
92	7.67	0.40	0.011	(0.367)	0.005	0.006
93	7.75	0.40	0.011	(0.365)	0.005	0.006
94	7.83	0.43	0.012	(0.363)	0.005	0.006
95	7.92	0.43	0.012	(0.362)	0.005	0.006
96	8.00	0.43	0.012	(0.360)	0.005	0.006
97	8.08	0.50	0.013	(0.358)	0.006	0.007
98	8.17	0.50	0.013	(0.357)	0.006	0.007
99	8.25	0.50	0.013	(0.355)	0.006	0.007
100	8.33	0.50	0.013	(0.353)	0.006	0.007
101	8.42	0.50	0.013	(0.352)	0.006	0.007
102	8.50	0.50	0.013	(0.350)	0.006	0.007
103	8.58	0.53	0.014	(0.348)	0.006	0.008
104	8.67	0.53	0.014	(0.347)	0.006	0.008
105	8.75	0.53	0.014	(0.345)	0.006	0.008
106	8.83	0.57	0.015	(0.344)	0.007	0.008
107	8.92	0.57	0.015	(0.342)	0.007	0.008
108	9.00	0.57	0.015	(0.340)	0.007	0.008
109	9.08	0.63	0.017	(0.339)	0.008	0.009
110	9.17	0.63	0.017	(0.337)	0.008	0.009
111	9.25	0.63	0.017	(0.335)	0.008	0.009
112	9.33	0.67	0.018	(0.334)	0.008	0.010
113	9.42	0.67	0.018	(0.332)	0.008	0.010
114	9.50	0.67	0.018	(0.331)	0.008	0.010
115	9.58	0.70	0.019	(0.329)	0.008	0.010
116	9.67	0.70	0.019	(0.328)	0.008	0.010
117	9.75	0.70	0.019	(0.326)	0.008	0.010
118	9.83	0.73	0.020	(0.324)	0.009	0.011
119	9.92	0.73	0.020	(0.323)	0.009	0.011
120	10.00	0.73	0.020	(0.321)	0.009	0.011

121	10.08	0.50	0.013	(0.320)	0.006	0.007
122	10.17	0.50	0.013	(0.318)	0.006	0.007
123	10.25	0.50	0.013	(0.317)	0.006	0.007
124	10.33	0.50	0.013	(0.315)	0.006	0.007
125	10.42	0.50	0.013	(0.314)	0.006	0.007
126	10.50	0.50	0.013	(0.312)	0.006	0.007
127	10.58	0.67	0.018	(0.310)	0.008	0.010
128	10.67	0.67	0.018	(0.309)	0.008	0.010
129	10.75	0.67	0.018	(0.307)	0.008	0.010
130	10.83	0.67	0.018	(0.306)	0.008	0.010
131	10.92	0.67	0.018	(0.304)	0.008	0.010
132	11.00	0.67	0.018	(0.303)	0.008	0.010
133	11.08	0.63	0.017	(0.301)	0.008	0.009
134	11.17	0.63	0.017	(0.300)	0.008	0.009
135	11.25	0.63	0.017	(0.298)	0.008	0.009
136	11.33	0.63	0.017	(0.297)	0.008	0.009
137	11.42	0.63	0.017	(0.296)	0.008	0.009
138	11.50	0.63	0.017	(0.294)	0.008	0.009
139	11.58	0.57	0.015	(0.293)	0.007	0.008
140	11.67	0.57	0.015	(0.291)	0.007	0.008
141	11.75	0.57	0.015	(0.290)	0.007	0.008
142	11.83	0.60	0.016	(0.288)	0.007	0.009
143	11.92	0.60	0.016	(0.287)	0.007	0.009
144	12.00	0.60	0.016	(0.285)	0.007	0.009
145	12.08	0.83	0.022	(0.284)	0.010	0.012
146	12.17	0.83	0.022	(0.283)	0.010	0.012
147	12.25	0.83	0.022	(0.281)	0.010	0.012
148	12.33	0.87	0.023	(0.280)	0.010	0.013
149	12.42	0.87	0.023	(0.278)	0.010	0.013
150	12.50	0.87	0.023	(0.277)	0.010	0.013
151	12.58	0.93	0.025	(0.276)	0.011	0.014
152	12.67	0.93	0.025	(0.274)	0.011	0.014
153	12.75	0.93	0.025	(0.273)	0.011	0.014
154	12.83	0.97	0.026	(0.271)	0.012	0.014
155	12.92	0.97	0.026	(0.270)	0.012	0.014
156	13.00	0.97	0.026	(0.269)	0.012	0.014
157	13.08	1.13	0.031	(0.267)	0.014	0.017
158	13.17	1.13	0.031	(0.266)	0.014	0.017
159	13.25	1.13	0.031	(0.265)	0.014	0.017
160	13.33	1.13	0.031	(0.263)	0.014	0.017
161	13.42	1.13	0.031	(0.262)	0.014	0.017
162	13.50	1.13	0.031	(0.261)	0.014	0.017
163	13.58	0.77	0.021	(0.259)	0.009	0.011
164	13.67	0.77	0.021	(0.258)	0.009	0.011
165	13.75	0.77	0.021	(0.257)	0.009	0.011
166	13.83	0.77	0.021	(0.255)	0.009	0.011
167	13.92	0.77	0.021	(0.254)	0.009	0.011
168	14.00	0.77	0.021	(0.253)	0.009	0.011
169	14.08	0.90	0.024	(0.251)	0.011	0.013
170	14.17	0.90	0.024	(0.250)	0.011	0.013
171	14.25	0.90	0.024	(0.249)	0.011	0.013
172	14.33	0.87	0.023	(0.248)	0.010	0.013
173	14.42	0.87	0.023	(0.246)	0.010	0.013
174	14.50	0.87	0.023	(0.245)	0.010	0.013
175	14.58	0.87	0.023	(0.244)	0.010	0.013
176	14.67	0.87	0.023	(0.243)	0.010	0.013
177	14.75	0.87	0.023	(0.241)	0.010	0.013
178	14.83	0.83	0.022	(0.240)	0.010	0.012
179	14.92	0.83	0.022	(0.239)	0.010	0.012
180	15.00	0.83	0.022	(0.238)	0.010	0.012
181	15.08	0.80	0.022	(0.236)	0.010	0.012
182	15.17	0.80	0.022	(0.235)	0.010	0.012
183	15.25	0.80	0.022	(0.234)	0.010	0.012

184	15.33	0.77	0.021	(0.233)	0.009	0.011
185	15.42	0.77	0.021	(0.232)	0.009	0.011
186	15.50	0.77	0.021	(0.230)	0.009	0.011
187	15.58	0.63	0.017	(0.229)	0.008	0.009
188	15.67	0.63	0.017	(0.228)	0.008	0.009
189	15.75	0.63	0.017	(0.227)	0.008	0.009
190	15.83	0.63	0.017	(0.226)	0.008	0.009
191	15.92	0.63	0.017	(0.225)	0.008	0.009
192	16.00	0.63	0.017	(0.223)	0.008	0.009
193	16.08	0.13	0.004	(0.222)	0.002	0.002
194	16.17	0.13	0.004	(0.221)	0.002	0.002
195	16.25	0.13	0.004	(0.220)	0.002	0.002
196	16.33	0.13	0.004	(0.219)	0.002	0.002
197	16.42	0.13	0.004	(0.218)	0.002	0.002
198	16.50	0.13	0.004	(0.217)	0.002	0.002
199	16.58	0.10	0.003	(0.216)	0.001	0.001
200	16.67	0.10	0.003	(0.214)	0.001	0.001
201	16.75	0.10	0.003	(0.213)	0.001	0.001
202	16.83	0.10	0.003	(0.212)	0.001	0.001
203	16.92	0.10	0.003	(0.211)	0.001	0.001
204	17.00	0.10	0.003	(0.210)	0.001	0.001
205	17.08	0.17	0.004	(0.209)	0.002	0.002
206	17.17	0.17	0.004	(0.208)	0.002	0.002
207	17.25	0.17	0.004	(0.207)	0.002	0.002
208	17.33	0.17	0.004	(0.206)	0.002	0.002
209	17.42	0.17	0.004	(0.205)	0.002	0.002
210	17.50	0.17	0.004	(0.204)	0.002	0.002
211	17.58	0.17	0.004	(0.203)	0.002	0.002
212	17.67	0.17	0.004	(0.202)	0.002	0.002
213	17.75	0.17	0.004	(0.201)	0.002	0.002
214	17.83	0.13	0.004	(0.200)	0.002	0.002
215	17.92	0.13	0.004	(0.199)	0.002	0.002
216	18.00	0.13	0.004	(0.198)	0.002	0.002
217	18.08	0.13	0.004	(0.197)	0.002	0.002
218	18.17	0.13	0.004	(0.196)	0.002	0.002
219	18.25	0.13	0.004	(0.195)	0.002	0.002
220	18.33	0.13	0.004	(0.194)	0.002	0.002
221	18.42	0.13	0.004	(0.193)	0.002	0.002
222	18.50	0.13	0.004	(0.192)	0.002	0.002
223	18.58	0.10	0.003	(0.191)	0.001	0.001
224	18.67	0.10	0.003	(0.190)	0.001	0.001
225	18.75	0.10	0.003	(0.189)	0.001	0.001
226	18.83	0.07	0.002	(0.188)	0.001	0.001
227	18.92	0.07	0.002	(0.188)	0.001	0.001
228	19.00	0.07	0.002	(0.187)	0.001	0.001
229	19.08	0.10	0.003	(0.186)	0.001	0.001
230	19.17	0.10	0.003	(0.185)	0.001	0.001
231	19.25	0.10	0.003	(0.184)	0.001	0.001
232	19.33	0.13	0.004	(0.183)	0.002	0.002
233	19.42	0.13	0.004	(0.182)	0.002	0.002
234	19.50	0.13	0.004	(0.182)	0.002	0.002
235	19.58	0.10	0.003	(0.181)	0.001	0.001
236	19.67	0.10	0.003	(0.180)	0.001	0.001
237	19.75	0.10	0.003	(0.179)	0.001	0.001
238	19.83	0.07	0.002	(0.178)	0.001	0.001
239	19.92	0.07	0.002	(0.177)	0.001	0.001
240	20.00	0.07	0.002	(0.177)	0.001	0.001
241	20.08	0.10	0.003	(0.176)	0.001	0.001
242	20.17	0.10	0.003	(0.175)	0.001	0.001
243	20.25	0.10	0.003	(0.174)	0.001	0.001
244	20.33	0.10	0.003	(0.174)	0.001	0.001
245	20.42	0.10	0.003	(0.173)	0.001	0.001
246	20.50	0.10	0.003	(0.172)	0.001	0.001

247	20.58	0.10	0.003	(0.171)	0.001	0.001
248	20.67	0.10	0.003	(0.171)	0.001	0.001
249	20.75	0.10	0.003	(0.170)	0.001	0.001
250	20.83	0.07	0.002	(0.169)	0.001	0.001
251	20.92	0.07	0.002	(0.169)	0.001	0.001
252	21.00	0.07	0.002	(0.168)	0.001	0.001
253	21.08	0.10	0.003	(0.167)	0.001	0.001
254	21.17	0.10	0.003	(0.167)	0.001	0.001
255	21.25	0.10	0.003	(0.166)	0.001	0.001
256	21.33	0.07	0.002	(0.165)	0.001	0.001
257	21.42	0.07	0.002	(0.165)	0.001	0.001
258	21.50	0.07	0.002	(0.164)	0.001	0.001
259	21.58	0.10	0.003	(0.163)	0.001	0.001
260	21.67	0.10	0.003	(0.163)	0.001	0.001
261	21.75	0.10	0.003	(0.162)	0.001	0.001
262	21.83	0.07	0.002	(0.162)	0.001	0.001
263	21.92	0.07	0.002	(0.161)	0.001	0.001
264	22.00	0.07	0.002	(0.161)	0.001	0.001
265	22.08	0.10	0.003	(0.160)	0.001	0.001
266	22.17	0.10	0.003	(0.160)	0.001	0.001
267	22.25	0.10	0.003	(0.159)	0.001	0.001
268	22.33	0.07	0.002	(0.159)	0.001	0.001
269	22.42	0.07	0.002	(0.158)	0.001	0.001
270	22.50	0.07	0.002	(0.158)	0.001	0.001
271	22.58	0.07	0.002	(0.157)	0.001	0.001
272	22.67	0.07	0.002	(0.157)	0.001	0.001
273	22.75	0.07	0.002	(0.156)	0.001	0.001
274	22.83	0.07	0.002	(0.156)	0.001	0.001
275	22.92	0.07	0.002	(0.155)	0.001	0.001
276	23.00	0.07	0.002	(0.155)	0.001	0.001
277	23.08	0.07	0.002	(0.155)	0.001	0.001
278	23.17	0.07	0.002	(0.154)	0.001	0.001
279	23.25	0.07	0.002	(0.154)	0.001	0.001
280	23.33	0.07	0.002	(0.154)	0.001	0.001
281	23.42	0.07	0.002	(0.153)	0.001	0.001
282	23.50	0.07	0.002	(0.153)	0.001	0.001
283	23.58	0.07	0.002	(0.153)	0.001	0.001
284	23.67	0.07	0.002	(0.153)	0.001	0.001
285	23.75	0.07	0.002	(0.153)	0.001	0.001
286	23.83	0.07	0.002	(0.152)	0.001	0.001
287	23.92	0.07	0.002	(0.152)	0.001	0.001
288	24.00	0.07	0.002	(0.152)	0.001	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 1.5

Flood volume = Effective rainfall 0.12(In)
times area 264.2(Ac.)/[(In)/(Ft.)] = 2.7(Ac.Ft)
Total soil loss = 0.10(In)
Total soil loss = 2.203(Ac.Ft)
Total rainfall = 0.22(In)
Flood volume = 119678.2 Cubic Feet
Total soil loss = 95979.5 Cubic Feet

Storm Event 4 Effective Rainfall = 0.337(In)

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.003	(0.539)	0.001	0.001
2	0.17	0.07	0.003	(0.537)	0.001	0.001
3	0.25	0.07	0.003	(0.535)	0.001	0.001

4	0.33	0.10	0.004	(0.533)	0.002	0.002
5	0.42	0.10	0.004	(0.531)	0.002	0.002
6	0.50	0.10	0.004	(0.529)	0.002	0.002
7	0.58	0.10	0.004	(0.527)	0.002	0.002
8	0.67	0.10	0.004	(0.525)	0.002	0.002
9	0.75	0.10	0.004	(0.523)	0.002	0.002
10	0.83	0.13	0.005	(0.521)	0.002	0.003
11	0.92	0.13	0.005	(0.519)	0.002	0.003
12	1.00	0.13	0.005	(0.517)	0.002	0.003
13	1.08	0.10	0.004	(0.515)	0.002	0.002
14	1.17	0.10	0.004	(0.512)	0.002	0.002
15	1.25	0.10	0.004	(0.510)	0.002	0.002
16	1.33	0.10	0.004	(0.508)	0.002	0.002
17	1.42	0.10	0.004	(0.506)	0.002	0.002
18	1.50	0.10	0.004	(0.504)	0.002	0.002
19	1.58	0.10	0.004	(0.502)	0.002	0.002
20	1.67	0.10	0.004	(0.500)	0.002	0.002
21	1.75	0.10	0.004	(0.498)	0.002	0.002
22	1.83	0.13	0.005	(0.496)	0.002	0.003
23	1.92	0.13	0.005	(0.494)	0.002	0.003
24	2.00	0.13	0.005	(0.492)	0.002	0.003
25	2.08	0.13	0.005	(0.490)	0.002	0.003
26	2.17	0.13	0.005	(0.488)	0.002	0.003
27	2.25	0.13	0.005	(0.486)	0.002	0.003
28	2.33	0.13	0.005	(0.484)	0.002	0.003
29	2.42	0.13	0.005	(0.482)	0.002	0.003
30	2.50	0.13	0.005	(0.480)	0.002	0.003
31	2.58	0.17	0.007	(0.478)	0.003	0.004
32	2.67	0.17	0.007	(0.477)	0.003	0.004
33	2.75	0.17	0.007	(0.475)	0.003	0.004
34	2.83	0.17	0.007	(0.473)	0.003	0.004
35	2.92	0.17	0.007	(0.471)	0.003	0.004
36	3.00	0.17	0.007	(0.469)	0.003	0.004
37	3.08	0.17	0.007	(0.467)	0.003	0.004
38	3.17	0.17	0.007	(0.465)	0.003	0.004
39	3.25	0.17	0.007	(0.463)	0.003	0.004
40	3.33	0.17	0.007	(0.461)	0.003	0.004
41	3.42	0.17	0.007	(0.459)	0.003	0.004
42	3.50	0.17	0.007	(0.457)	0.003	0.004
43	3.58	0.17	0.007	(0.455)	0.003	0.004
44	3.67	0.17	0.007	(0.453)	0.003	0.004
45	3.75	0.17	0.007	(0.451)	0.003	0.004
46	3.83	0.20	0.008	(0.450)	0.004	0.004
47	3.92	0.20	0.008	(0.448)	0.004	0.004
48	4.00	0.20	0.008	(0.446)	0.004	0.004
49	4.08	0.20	0.008	(0.444)	0.004	0.004
50	4.17	0.20	0.008	(0.442)	0.004	0.004
51	4.25	0.20	0.008	(0.440)	0.004	0.004
52	4.33	0.23	0.009	(0.438)	0.004	0.005
53	4.42	0.23	0.009	(0.436)	0.004	0.005
54	4.50	0.23	0.009	(0.434)	0.004	0.005
55	4.58	0.23	0.009	(0.433)	0.004	0.005
56	4.67	0.23	0.009	(0.431)	0.004	0.005
57	4.75	0.23	0.009	(0.429)	0.004	0.005
58	4.83	0.27	0.011	(0.427)	0.005	0.006
59	4.92	0.27	0.011	(0.425)	0.005	0.006
60	5.00	0.27	0.011	(0.423)	0.005	0.006
61	5.08	0.20	0.008	(0.421)	0.004	0.004
62	5.17	0.20	0.008	(0.420)	0.004	0.004
63	5.25	0.20	0.008	(0.418)	0.004	0.004
64	5.33	0.23	0.009	(0.416)	0.004	0.005
65	5.42	0.23	0.009	(0.414)	0.004	0.005
66	5.50	0.23	0.009	(0.412)	0.004	0.005

67	5.58	0.27	0.011	(0.411)	0.005	0.006
68	5.67	0.27	0.011	(0.409)	0.005	0.006
69	5.75	0.27	0.011	(0.407)	0.005	0.006
70	5.83	0.27	0.011	(0.405)	0.005	0.006
71	5.92	0.27	0.011	(0.403)	0.005	0.006
72	6.00	0.27	0.011	(0.402)	0.005	0.006
73	6.08	0.30	0.012	(0.400)	0.005	0.007
74	6.17	0.30	0.012	(0.398)	0.005	0.007
75	6.25	0.30	0.012	(0.396)	0.005	0.007
76	6.33	0.30	0.012	(0.394)	0.005	0.007
77	6.42	0.30	0.012	(0.393)	0.005	0.007
78	6.50	0.30	0.012	(0.391)	0.005	0.007
79	6.58	0.33	0.013	(0.389)	0.006	0.007
80	6.67	0.33	0.013	(0.387)	0.006	0.007
81	6.75	0.33	0.013	(0.386)	0.006	0.007
82	6.83	0.33	0.013	(0.384)	0.006	0.007
83	6.92	0.33	0.013	(0.382)	0.006	0.007
84	7.00	0.33	0.013	(0.380)	0.006	0.007
85	7.08	0.33	0.013	(0.379)	0.006	0.007
86	7.17	0.33	0.013	(0.377)	0.006	0.007
87	7.25	0.33	0.013	(0.375)	0.006	0.007
88	7.33	0.37	0.015	(0.374)	0.007	0.008
89	7.42	0.37	0.015	(0.372)	0.007	0.008
90	7.50	0.37	0.015	(0.370)	0.007	0.008
91	7.58	0.40	0.016	(0.368)	0.007	0.009
92	7.67	0.40	0.016	(0.367)	0.007	0.009
93	7.75	0.40	0.016	(0.365)	0.007	0.009
94	7.83	0.43	0.018	(0.363)	0.008	0.010
95	7.92	0.43	0.018	(0.362)	0.008	0.010
96	8.00	0.43	0.018	(0.360)	0.008	0.010
97	8.08	0.50	0.020	(0.358)	0.009	0.011
98	8.17	0.50	0.020	(0.357)	0.009	0.011
99	8.25	0.50	0.020	(0.355)	0.009	0.011
100	8.33	0.50	0.020	(0.353)	0.009	0.011
101	8.42	0.50	0.020	(0.352)	0.009	0.011
102	8.50	0.50	0.020	(0.350)	0.009	0.011
103	8.58	0.53	0.022	(0.348)	0.010	0.012
104	8.67	0.53	0.022	(0.347)	0.010	0.012
105	8.75	0.53	0.022	(0.345)	0.010	0.012
106	8.83	0.57	0.023	(0.344)	0.010	0.013
107	8.92	0.57	0.023	(0.342)	0.010	0.013
108	9.00	0.57	0.023	(0.340)	0.010	0.013
109	9.08	0.63	0.026	(0.339)	0.011	0.014
110	9.17	0.63	0.026	(0.337)	0.011	0.014
111	9.25	0.63	0.026	(0.335)	0.011	0.014
112	9.33	0.67	0.027	(0.334)	0.012	0.015
113	9.42	0.67	0.027	(0.332)	0.012	0.015
114	9.50	0.67	0.027	(0.331)	0.012	0.015
115	9.58	0.70	0.028	(0.329)	0.013	0.016
116	9.67	0.70	0.028	(0.328)	0.013	0.016
117	9.75	0.70	0.028	(0.326)	0.013	0.016
118	9.83	0.73	0.030	(0.324)	0.013	0.016
119	9.92	0.73	0.030	(0.323)	0.013	0.016
120	10.00	0.73	0.030	(0.321)	0.013	0.016
121	10.08	0.50	0.020	(0.320)	0.009	0.011
122	10.17	0.50	0.020	(0.318)	0.009	0.011
123	10.25	0.50	0.020	(0.317)	0.009	0.011
124	10.33	0.50	0.020	(0.315)	0.009	0.011
125	10.42	0.50	0.020	(0.314)	0.009	0.011
126	10.50	0.50	0.020	(0.312)	0.009	0.011
127	10.58	0.67	0.027	(0.310)	0.012	0.015
128	10.67	0.67	0.027	(0.309)	0.012	0.015
129	10.75	0.67	0.027	(0.307)	0.012	0.015

130	10.83	0.67	0.027	(0.306)	0.012	0.015
131	10.92	0.67	0.027	(0.304)	0.012	0.015
132	11.00	0.67	0.027	(0.303)	0.012	0.015
133	11.08	0.63	0.026	(0.301)	0.011	0.014
134	11.17	0.63	0.026	(0.300)	0.011	0.014
135	11.25	0.63	0.026	(0.298)	0.011	0.014
136	11.33	0.63	0.026	(0.297)	0.011	0.014
137	11.42	0.63	0.026	(0.296)	0.011	0.014
138	11.50	0.63	0.026	(0.294)	0.011	0.014
139	11.58	0.57	0.023	(0.293)	0.010	0.013
140	11.67	0.57	0.023	(0.291)	0.010	0.013
141	11.75	0.57	0.023	(0.290)	0.010	0.013
142	11.83	0.60	0.024	(0.288)	0.011	0.013
143	11.92	0.60	0.024	(0.287)	0.011	0.013
144	12.00	0.60	0.024	(0.285)	0.011	0.013
145	12.08	0.83	0.034	(0.284)	0.015	0.019
146	12.17	0.83	0.034	(0.283)	0.015	0.019
147	12.25	0.83	0.034	(0.281)	0.015	0.019
148	12.33	0.87	0.035	(0.280)	0.016	0.019
149	12.42	0.87	0.035	(0.278)	0.016	0.019
150	12.50	0.87	0.035	(0.277)	0.016	0.019
151	12.58	0.93	0.038	(0.276)	0.017	0.021
152	12.67	0.93	0.038	(0.274)	0.017	0.021
153	12.75	0.93	0.038	(0.273)	0.017	0.021
154	12.83	0.97	0.039	(0.271)	0.017	0.022
155	12.92	0.97	0.039	(0.270)	0.017	0.022
156	13.00	0.97	0.039	(0.269)	0.017	0.022
157	13.08	1.13	0.046	(0.267)	0.020	0.025
158	13.17	1.13	0.046	(0.266)	0.020	0.025
159	13.25	1.13	0.046	(0.265)	0.020	0.025
160	13.33	1.13	0.046	(0.263)	0.020	0.025
161	13.42	1.13	0.046	(0.262)	0.020	0.025
162	13.50	1.13	0.046	(0.261)	0.020	0.025
163	13.58	0.77	0.031	(0.259)	0.014	0.017
164	13.67	0.77	0.031	(0.258)	0.014	0.017
165	13.75	0.77	0.031	(0.257)	0.014	0.017
166	13.83	0.77	0.031	(0.255)	0.014	0.017
167	13.92	0.77	0.031	(0.254)	0.014	0.017
168	14.00	0.77	0.031	(0.253)	0.014	0.017
169	14.08	0.90	0.036	(0.251)	0.016	0.020
170	14.17	0.90	0.036	(0.250)	0.016	0.020
171	14.25	0.90	0.036	(0.249)	0.016	0.020
172	14.33	0.87	0.035	(0.248)	0.016	0.019
173	14.42	0.87	0.035	(0.246)	0.016	0.019
174	14.50	0.87	0.035	(0.245)	0.016	0.019
175	14.58	0.87	0.035	(0.244)	0.016	0.019
176	14.67	0.87	0.035	(0.243)	0.016	0.019
177	14.75	0.87	0.035	(0.241)	0.016	0.019
178	14.83	0.83	0.034	(0.240)	0.015	0.019
179	14.92	0.83	0.034	(0.239)	0.015	0.019
180	15.00	0.83	0.034	(0.238)	0.015	0.019
181	15.08	0.80	0.032	(0.236)	0.014	0.018
182	15.17	0.80	0.032	(0.235)	0.014	0.018
183	15.25	0.80	0.032	(0.234)	0.014	0.018
184	15.33	0.77	0.031	(0.233)	0.014	0.017
185	15.42	0.77	0.031	(0.232)	0.014	0.017
186	15.50	0.77	0.031	(0.230)	0.014	0.017
187	15.58	0.63	0.026	(0.229)	0.011	0.014
188	15.67	0.63	0.026	(0.228)	0.011	0.014
189	15.75	0.63	0.026	(0.227)	0.011	0.014
190	15.83	0.63	0.026	(0.226)	0.011	0.014
191	15.92	0.63	0.026	(0.225)	0.011	0.014
192	16.00	0.63	0.026	(0.223)	0.011	0.014

193	16.08	0.13	0.005	(0.222)	0.002	0.003
194	16.17	0.13	0.005	(0.221)	0.002	0.003
195	16.25	0.13	0.005	(0.220)	0.002	0.003
196	16.33	0.13	0.005	(0.219)	0.002	0.003
197	16.42	0.13	0.005	(0.218)	0.002	0.003
198	16.50	0.13	0.005	(0.217)	0.002	0.003
199	16.58	0.10	0.004	(0.216)	0.002	0.002
200	16.67	0.10	0.004	(0.214)	0.002	0.002
201	16.75	0.10	0.004	(0.213)	0.002	0.002
202	16.83	0.10	0.004	(0.212)	0.002	0.002
203	16.92	0.10	0.004	(0.211)	0.002	0.002
204	17.00	0.10	0.004	(0.210)	0.002	0.002
205	17.08	0.17	0.007	(0.209)	0.003	0.004
206	17.17	0.17	0.007	(0.208)	0.003	0.004
207	17.25	0.17	0.007	(0.207)	0.003	0.004
208	17.33	0.17	0.007	(0.206)	0.003	0.004
209	17.42	0.17	0.007	(0.205)	0.003	0.004
210	17.50	0.17	0.007	(0.204)	0.003	0.004
211	17.58	0.17	0.007	(0.203)	0.003	0.004
212	17.67	0.17	0.007	(0.202)	0.003	0.004
213	17.75	0.17	0.007	(0.201)	0.003	0.004
214	17.83	0.13	0.005	(0.200)	0.002	0.003
215	17.92	0.13	0.005	(0.199)	0.002	0.003
216	18.00	0.13	0.005	(0.198)	0.002	0.003
217	18.08	0.13	0.005	(0.197)	0.002	0.003
218	18.17	0.13	0.005	(0.196)	0.002	0.003
219	18.25	0.13	0.005	(0.195)	0.002	0.003
220	18.33	0.13	0.005	(0.194)	0.002	0.003
221	18.42	0.13	0.005	(0.193)	0.002	0.003
222	18.50	0.13	0.005	(0.192)	0.002	0.003
223	18.58	0.10	0.004	(0.191)	0.002	0.002
224	18.67	0.10	0.004	(0.190)	0.002	0.002
225	18.75	0.10	0.004	(0.189)	0.002	0.002
226	18.83	0.07	0.003	(0.188)	0.001	0.001
227	18.92	0.07	0.003	(0.188)	0.001	0.001
228	19.00	0.07	0.003	(0.187)	0.001	0.001
229	19.08	0.10	0.004	(0.186)	0.002	0.002
230	19.17	0.10	0.004	(0.185)	0.002	0.002
231	19.25	0.10	0.004	(0.184)	0.002	0.002
232	19.33	0.13	0.005	(0.183)	0.002	0.003
233	19.42	0.13	0.005	(0.182)	0.002	0.003
234	19.50	0.13	0.005	(0.182)	0.002	0.003
235	19.58	0.10	0.004	(0.181)	0.002	0.002
236	19.67	0.10	0.004	(0.180)	0.002	0.002
237	19.75	0.10	0.004	(0.179)	0.002	0.002
238	19.83	0.07	0.003	(0.178)	0.001	0.001
239	19.92	0.07	0.003	(0.177)	0.001	0.001
240	20.00	0.07	0.003	(0.177)	0.001	0.001
241	20.08	0.10	0.004	(0.176)	0.002	0.002
242	20.17	0.10	0.004	(0.175)	0.002	0.002
243	20.25	0.10	0.004	(0.174)	0.002	0.002
244	20.33	0.10	0.004	(0.174)	0.002	0.002
245	20.42	0.10	0.004	(0.173)	0.002	0.002
246	20.50	0.10	0.004	(0.172)	0.002	0.002
247	20.58	0.10	0.004	(0.171)	0.002	0.002
248	20.67	0.10	0.004	(0.171)	0.002	0.002
249	20.75	0.10	0.004	(0.170)	0.002	0.002
250	20.83	0.07	0.003	(0.169)	0.001	0.001
251	20.92	0.07	0.003	(0.169)	0.001	0.001
252	21.00	0.07	0.003	(0.168)	0.001	0.001
253	21.08	0.10	0.004	(0.167)	0.002	0.002
254	21.17	0.10	0.004	(0.167)	0.002	0.002
255	21.25	0.10	0.004	(0.166)	0.002	0.002

256	21.33	0.07	0.003	(0.165)	0.001	0.001
257	21.42	0.07	0.003	(0.165)	0.001	0.001
258	21.50	0.07	0.003	(0.164)	0.001	0.001
259	21.58	0.10	0.004	(0.163)	0.002	0.002
260	21.67	0.10	0.004	(0.163)	0.002	0.002
261	21.75	0.10	0.004	(0.162)	0.002	0.002
262	21.83	0.07	0.003	(0.162)	0.001	0.001
263	21.92	0.07	0.003	(0.161)	0.001	0.001
264	22.00	0.07	0.003	(0.161)	0.001	0.001
265	22.08	0.10	0.004	(0.160)	0.002	0.002
266	22.17	0.10	0.004	(0.160)	0.002	0.002
267	22.25	0.10	0.004	(0.159)	0.002	0.002
268	22.33	0.07	0.003	(0.159)	0.001	0.001
269	22.42	0.07	0.003	(0.158)	0.001	0.001
270	22.50	0.07	0.003	(0.158)	0.001	0.001
271	22.58	0.07	0.003	(0.157)	0.001	0.001
272	22.67	0.07	0.003	(0.157)	0.001	0.001
273	22.75	0.07	0.003	(0.156)	0.001	0.001
274	22.83	0.07	0.003	(0.156)	0.001	0.001
275	22.92	0.07	0.003	(0.155)	0.001	0.001
276	23.00	0.07	0.003	(0.155)	0.001	0.001
277	23.08	0.07	0.003	(0.155)	0.001	0.001
278	23.17	0.07	0.003	(0.154)	0.001	0.001
279	23.25	0.07	0.003	(0.154)	0.001	0.001
280	23.33	0.07	0.003	(0.154)	0.001	0.001
281	23.42	0.07	0.003	(0.153)	0.001	0.001
282	23.50	0.07	0.003	(0.153)	0.001	0.001
283	23.58	0.07	0.003	(0.153)	0.001	0.001
284	23.67	0.07	0.003	(0.153)	0.001	0.001
285	23.75	0.07	0.003	(0.153)	0.001	0.001
286	23.83	0.07	0.003	(0.152)	0.001	0.001
287	23.92	0.07	0.003	(0.152)	0.001	0.001
288	24.00	0.07	0.003	(0.152)	0.001	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.2

Flood volume = Effective rainfall 0.19(In)
times area 264.2(Ac.)/[(In)/(Ft.)] = 4.1(Ac.Ft)
Total soil loss = 0.15(In)
Total soil loss = 3.305(Ac.Ft)
Total rainfall = 0.34(In)
Flood volume = 179517.2 Cubic Feet
Total soil loss = 143969.3 Cubic Feet

Storm Event 3 Effective Rainfall = 0.427(In)

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.003	(0.539)	0.002	0.002
2	0.17	0.07	0.003	(0.537)	0.002	0.002
3	0.25	0.07	0.003	(0.535)	0.002	0.002
4	0.33	0.10	0.005	(0.533)	0.002	0.003
5	0.42	0.10	0.005	(0.531)	0.002	0.003
6	0.50	0.10	0.005	(0.529)	0.002	0.003
7	0.58	0.10	0.005	(0.527)	0.002	0.003
8	0.67	0.10	0.005	(0.525)	0.002	0.003
9	0.75	0.10	0.005	(0.523)	0.002	0.003
10	0.83	0.13	0.007	(0.521)	0.003	0.004
11	0.92	0.13	0.007	(0.519)	0.003	0.004
12	1.00	0.13	0.007	(0.517)	0.003	0.004

13	1.08	0.10	0.005	(0.515)	0.002	0.003
14	1.17	0.10	0.005	(0.512)	0.002	0.003
15	1.25	0.10	0.005	(0.510)	0.002	0.003
16	1.33	0.10	0.005	(0.508)	0.002	0.003
17	1.42	0.10	0.005	(0.506)	0.002	0.003
18	1.50	0.10	0.005	(0.504)	0.002	0.003
19	1.58	0.10	0.005	(0.502)	0.002	0.003
20	1.67	0.10	0.005	(0.500)	0.002	0.003
21	1.75	0.10	0.005	(0.498)	0.002	0.003
22	1.83	0.13	0.007	(0.496)	0.003	0.004
23	1.92	0.13	0.007	(0.494)	0.003	0.004
24	2.00	0.13	0.007	(0.492)	0.003	0.004
25	2.08	0.13	0.007	(0.490)	0.003	0.004
26	2.17	0.13	0.007	(0.488)	0.003	0.004
27	2.25	0.13	0.007	(0.486)	0.003	0.004
28	2.33	0.13	0.007	(0.484)	0.003	0.004
29	2.42	0.13	0.007	(0.482)	0.003	0.004
30	2.50	0.13	0.007	(0.480)	0.003	0.004
31	2.58	0.17	0.009	(0.478)	0.004	0.005
32	2.67	0.17	0.009	(0.477)	0.004	0.005
33	2.75	0.17	0.009	(0.475)	0.004	0.005
34	2.83	0.17	0.009	(0.473)	0.004	0.005
35	2.92	0.17	0.009	(0.471)	0.004	0.005
36	3.00	0.17	0.009	(0.469)	0.004	0.005
37	3.08	0.17	0.009	(0.467)	0.004	0.005
38	3.17	0.17	0.009	(0.465)	0.004	0.005
39	3.25	0.17	0.009	(0.463)	0.004	0.005
40	3.33	0.17	0.009	(0.461)	0.004	0.005
41	3.42	0.17	0.009	(0.459)	0.004	0.005
42	3.50	0.17	0.009	(0.457)	0.004	0.005
43	3.58	0.17	0.009	(0.455)	0.004	0.005
44	3.67	0.17	0.009	(0.453)	0.004	0.005
45	3.75	0.17	0.009	(0.451)	0.004	0.005
46	3.83	0.20	0.010	(0.450)	0.005	0.006
47	3.92	0.20	0.010	(0.448)	0.005	0.006
48	4.00	0.20	0.010	(0.446)	0.005	0.006
49	4.08	0.20	0.010	(0.444)	0.005	0.006
50	4.17	0.20	0.010	(0.442)	0.005	0.006
51	4.25	0.20	0.010	(0.440)	0.005	0.006
52	4.33	0.23	0.012	(0.438)	0.005	0.007
53	4.42	0.23	0.012	(0.436)	0.005	0.007
54	4.50	0.23	0.012	(0.434)	0.005	0.007
55	4.58	0.23	0.012	(0.433)	0.005	0.007
56	4.67	0.23	0.012	(0.431)	0.005	0.007
57	4.75	0.23	0.012	(0.429)	0.005	0.007
58	4.83	0.27	0.014	(0.427)	0.006	0.008
59	4.92	0.27	0.014	(0.425)	0.006	0.008
60	5.00	0.27	0.014	(0.423)	0.006	0.008
61	5.08	0.20	0.010	(0.421)	0.005	0.006
62	5.17	0.20	0.010	(0.420)	0.005	0.006
63	5.25	0.20	0.010	(0.418)	0.005	0.006
64	5.33	0.23	0.012	(0.416)	0.005	0.007
65	5.42	0.23	0.012	(0.414)	0.005	0.007
66	5.50	0.23	0.012	(0.412)	0.005	0.007
67	5.58	0.27	0.014	(0.411)	0.006	0.008
68	5.67	0.27	0.014	(0.409)	0.006	0.008
69	5.75	0.27	0.014	(0.407)	0.006	0.008
70	5.83	0.27	0.014	(0.405)	0.006	0.008
71	5.92	0.27	0.014	(0.403)	0.006	0.008
72	6.00	0.27	0.014	(0.402)	0.006	0.008
73	6.08	0.30	0.015	(0.400)	0.007	0.009
74	6.17	0.30	0.015	(0.398)	0.007	0.009
75	6.25	0.30	0.015	(0.396)	0.007	0.009

76	6.33	0.30	0.015	(0.394)	0.007	0.009
77	6.42	0.30	0.015	(0.393)	0.007	0.009
78	6.50	0.30	0.015	(0.391)	0.007	0.009
79	6.58	0.33	0.017	(0.389)	0.008	0.009
80	6.67	0.33	0.017	(0.387)	0.008	0.009
81	6.75	0.33	0.017	(0.386)	0.008	0.009
82	6.83	0.33	0.017	(0.384)	0.008	0.009
83	6.92	0.33	0.017	(0.382)	0.008	0.009
84	7.00	0.33	0.017	(0.380)	0.008	0.009
85	7.08	0.33	0.017	(0.379)	0.008	0.009
86	7.17	0.33	0.017	(0.377)	0.008	0.009
87	7.25	0.33	0.017	(0.375)	0.008	0.009
88	7.33	0.37	0.019	(0.374)	0.008	0.010
89	7.42	0.37	0.019	(0.372)	0.008	0.010
90	7.50	0.37	0.019	(0.370)	0.008	0.010
91	7.58	0.40	0.021	(0.368)	0.009	0.011
92	7.67	0.40	0.021	(0.367)	0.009	0.011
93	7.75	0.40	0.021	(0.365)	0.009	0.011
94	7.83	0.43	0.022	(0.363)	0.010	0.012
95	7.92	0.43	0.022	(0.362)	0.010	0.012
96	8.00	0.43	0.022	(0.360)	0.010	0.012
97	8.08	0.50	0.026	(0.358)	0.011	0.014
98	8.17	0.50	0.026	(0.357)	0.011	0.014
99	8.25	0.50	0.026	(0.355)	0.011	0.014
100	8.33	0.50	0.026	(0.353)	0.011	0.014
101	8.42	0.50	0.026	(0.352)	0.011	0.014
102	8.50	0.50	0.026	(0.350)	0.011	0.014
103	8.58	0.53	0.027	(0.348)	0.012	0.015
104	8.67	0.53	0.027	(0.347)	0.012	0.015
105	8.75	0.53	0.027	(0.345)	0.012	0.015
106	8.83	0.57	0.029	(0.344)	0.013	0.016
107	8.92	0.57	0.029	(0.342)	0.013	0.016
108	9.00	0.57	0.029	(0.340)	0.013	0.016
109	9.08	0.63	0.032	(0.339)	0.014	0.018
110	9.17	0.63	0.032	(0.337)	0.014	0.018
111	9.25	0.63	0.032	(0.335)	0.014	0.018
112	9.33	0.67	0.034	(0.334)	0.015	0.019
113	9.42	0.67	0.034	(0.332)	0.015	0.019
114	9.50	0.67	0.034	(0.331)	0.015	0.019
115	9.58	0.70	0.036	(0.329)	0.016	0.020
116	9.67	0.70	0.036	(0.328)	0.016	0.020
117	9.75	0.70	0.036	(0.326)	0.016	0.020
118	9.83	0.73	0.038	(0.324)	0.017	0.021
119	9.92	0.73	0.038	(0.323)	0.017	0.021
120	10.00	0.73	0.038	(0.321)	0.017	0.021
121	10.08	0.50	0.026	(0.320)	0.011	0.014
122	10.17	0.50	0.026	(0.318)	0.011	0.014
123	10.25	0.50	0.026	(0.317)	0.011	0.014
124	10.33	0.50	0.026	(0.315)	0.011	0.014
125	10.42	0.50	0.026	(0.314)	0.011	0.014
126	10.50	0.50	0.026	(0.312)	0.011	0.014
127	10.58	0.67	0.034	(0.310)	0.015	0.019
128	10.67	0.67	0.034	(0.309)	0.015	0.019
129	10.75	0.67	0.034	(0.307)	0.015	0.019
130	10.83	0.67	0.034	(0.306)	0.015	0.019
131	10.92	0.67	0.034	(0.304)	0.015	0.019
132	11.00	0.67	0.034	(0.303)	0.015	0.019
133	11.08	0.63	0.032	(0.301)	0.014	0.018
134	11.17	0.63	0.032	(0.300)	0.014	0.018
135	11.25	0.63	0.032	(0.298)	0.014	0.018
136	11.33	0.63	0.032	(0.297)	0.014	0.018
137	11.42	0.63	0.032	(0.296)	0.014	0.018
138	11.50	0.63	0.032	(0.294)	0.014	0.018

139	11.58	0.57	0.029	(0.293)	0.013	0.016
140	11.67	0.57	0.029	(0.291)	0.013	0.016
141	11.75	0.57	0.029	(0.290)	0.013	0.016
142	11.83	0.60	0.031	(0.288)	0.014	0.017
143	11.92	0.60	0.031	(0.287)	0.014	0.017
144	12.00	0.60	0.031	(0.285)	0.014	0.017
145	12.08	0.83	0.043	(0.284)	0.019	0.024
146	12.17	0.83	0.043	(0.283)	0.019	0.024
147	12.25	0.83	0.043	(0.281)	0.019	0.024
148	12.33	0.87	0.044	(0.280)	0.020	0.025
149	12.42	0.87	0.044	(0.278)	0.020	0.025
150	12.50	0.87	0.044	(0.277)	0.020	0.025
151	12.58	0.93	0.048	(0.276)	0.021	0.027
152	12.67	0.93	0.048	(0.274)	0.021	0.027
153	12.75	0.93	0.048	(0.273)	0.021	0.027
154	12.83	0.97	0.050	(0.271)	0.022	0.028
155	12.92	0.97	0.050	(0.270)	0.022	0.028
156	13.00	0.97	0.050	(0.269)	0.022	0.028
157	13.08	1.13	0.058	(0.267)	0.026	0.032
158	13.17	1.13	0.058	(0.266)	0.026	0.032
159	13.25	1.13	0.058	(0.265)	0.026	0.032
160	13.33	1.13	0.058	(0.263)	0.026	0.032
161	13.42	1.13	0.058	(0.262)	0.026	0.032
162	13.50	1.13	0.058	(0.261)	0.026	0.032
163	13.58	0.77	0.039	(0.259)	0.017	0.022
164	13.67	0.77	0.039	(0.258)	0.017	0.022
165	13.75	0.77	0.039	(0.257)	0.017	0.022
166	13.83	0.77	0.039	(0.255)	0.017	0.022
167	13.92	0.77	0.039	(0.254)	0.017	0.022
168	14.00	0.77	0.039	(0.253)	0.017	0.022
169	14.08	0.90	0.046	(0.251)	0.021	0.026
170	14.17	0.90	0.046	(0.250)	0.021	0.026
171	14.25	0.90	0.046	(0.249)	0.021	0.026
172	14.33	0.87	0.044	(0.248)	0.020	0.025
173	14.42	0.87	0.044	(0.246)	0.020	0.025
174	14.50	0.87	0.044	(0.245)	0.020	0.025
175	14.58	0.87	0.044	(0.244)	0.020	0.025
176	14.67	0.87	0.044	(0.243)	0.020	0.025
177	14.75	0.87	0.044	(0.241)	0.020	0.025
178	14.83	0.83	0.043	(0.240)	0.019	0.024
179	14.92	0.83	0.043	(0.239)	0.019	0.024
180	15.00	0.83	0.043	(0.238)	0.019	0.024
181	15.08	0.80	0.041	(0.236)	0.018	0.023
182	15.17	0.80	0.041	(0.235)	0.018	0.023
183	15.25	0.80	0.041	(0.234)	0.018	0.023
184	15.33	0.77	0.039	(0.233)	0.017	0.022
185	15.42	0.77	0.039	(0.232)	0.017	0.022
186	15.50	0.77	0.039	(0.230)	0.017	0.022
187	15.58	0.63	0.032	(0.229)	0.014	0.018
188	15.67	0.63	0.032	(0.228)	0.014	0.018
189	15.75	0.63	0.032	(0.227)	0.014	0.018
190	15.83	0.63	0.032	(0.226)	0.014	0.018
191	15.92	0.63	0.032	(0.225)	0.014	0.018
192	16.00	0.63	0.032	(0.223)	0.014	0.018
193	16.08	0.13	0.007	(0.222)	0.003	0.004
194	16.17	0.13	0.007	(0.221)	0.003	0.004
195	16.25	0.13	0.007	(0.220)	0.003	0.004
196	16.33	0.13	0.007	(0.219)	0.003	0.004
197	16.42	0.13	0.007	(0.218)	0.003	0.004
198	16.50	0.13	0.007	(0.217)	0.003	0.004
199	16.58	0.10	0.005	(0.216)	0.002	0.003
200	16.67	0.10	0.005	(0.214)	0.002	0.003
201	16.75	0.10	0.005	(0.213)	0.002	0.003

202	16.83	0.10	0.005	(0.212)	0.002	0.003
203	16.92	0.10	0.005	(0.211)	0.002	0.003
204	17.00	0.10	0.005	(0.210)	0.002	0.003
205	17.08	0.17	0.009	(0.209)	0.004	0.005
206	17.17	0.17	0.009	(0.208)	0.004	0.005
207	17.25	0.17	0.009	(0.207)	0.004	0.005
208	17.33	0.17	0.009	(0.206)	0.004	0.005
209	17.42	0.17	0.009	(0.205)	0.004	0.005
210	17.50	0.17	0.009	(0.204)	0.004	0.005
211	17.58	0.17	0.009	(0.203)	0.004	0.005
212	17.67	0.17	0.009	(0.202)	0.004	0.005
213	17.75	0.17	0.009	(0.201)	0.004	0.005
214	17.83	0.13	0.007	(0.200)	0.003	0.004
215	17.92	0.13	0.007	(0.199)	0.003	0.004
216	18.00	0.13	0.007	(0.198)	0.003	0.004
217	18.08	0.13	0.007	(0.197)	0.003	0.004
218	18.17	0.13	0.007	(0.196)	0.003	0.004
219	18.25	0.13	0.007	(0.195)	0.003	0.004
220	18.33	0.13	0.007	(0.194)	0.003	0.004
221	18.42	0.13	0.007	(0.193)	0.003	0.004
222	18.50	0.13	0.007	(0.192)	0.003	0.004
223	18.58	0.10	0.005	(0.191)	0.002	0.003
224	18.67	0.10	0.005	(0.190)	0.002	0.003
225	18.75	0.10	0.005	(0.189)	0.002	0.003
226	18.83	0.07	0.003	(0.188)	0.002	0.002
227	18.92	0.07	0.003	(0.188)	0.002	0.002
228	19.00	0.07	0.003	(0.187)	0.002	0.002
229	19.08	0.10	0.005	(0.186)	0.002	0.003
230	19.17	0.10	0.005	(0.185)	0.002	0.003
231	19.25	0.10	0.005	(0.184)	0.002	0.003
232	19.33	0.13	0.007	(0.183)	0.003	0.004
233	19.42	0.13	0.007	(0.182)	0.003	0.004
234	19.50	0.13	0.007	(0.182)	0.003	0.004
235	19.58	0.10	0.005	(0.181)	0.002	0.003
236	19.67	0.10	0.005	(0.180)	0.002	0.003
237	19.75	0.10	0.005	(0.179)	0.002	0.003
238	19.83	0.07	0.003	(0.178)	0.002	0.002
239	19.92	0.07	0.003	(0.177)	0.002	0.002
240	20.00	0.07	0.003	(0.177)	0.002	0.002
241	20.08	0.10	0.005	(0.176)	0.002	0.003
242	20.17	0.10	0.005	(0.175)	0.002	0.003
243	20.25	0.10	0.005	(0.174)	0.002	0.003
244	20.33	0.10	0.005	(0.174)	0.002	0.003
245	20.42	0.10	0.005	(0.173)	0.002	0.003
246	20.50	0.10	0.005	(0.172)	0.002	0.003
247	20.58	0.10	0.005	(0.171)	0.002	0.003
248	20.67	0.10	0.005	(0.171)	0.002	0.003
249	20.75	0.10	0.005	(0.170)	0.002	0.003
250	20.83	0.07	0.003	(0.169)	0.002	0.002
251	20.92	0.07	0.003	(0.169)	0.002	0.002
252	21.00	0.07	0.003	(0.168)	0.002	0.002
253	21.08	0.10	0.005	(0.167)	0.002	0.003
254	21.17	0.10	0.005	(0.167)	0.002	0.003
255	21.25	0.10	0.005	(0.166)	0.002	0.003
256	21.33	0.07	0.003	(0.165)	0.002	0.002
257	21.42	0.07	0.003	(0.165)	0.002	0.002
258	21.50	0.07	0.003	(0.164)	0.002	0.002
259	21.58	0.10	0.005	(0.163)	0.002	0.003
260	21.67	0.10	0.005	(0.163)	0.002	0.003
261	21.75	0.10	0.005	(0.162)	0.002	0.003
262	21.83	0.07	0.003	(0.162)	0.002	0.002
263	21.92	0.07	0.003	(0.161)	0.002	0.002
264	22.00	0.07	0.003	(0.161)	0.002	0.002

265	22.08	0.10	0.005	(0.160)	0.002	0.003
266	22.17	0.10	0.005	(0.160)	0.002	0.003
267	22.25	0.10	0.005	(0.159)	0.002	0.003
268	22.33	0.07	0.003	(0.159)	0.002	0.002
269	22.42	0.07	0.003	(0.158)	0.002	0.002
270	22.50	0.07	0.003	(0.158)	0.002	0.002
271	22.58	0.07	0.003	(0.157)	0.002	0.002
272	22.67	0.07	0.003	(0.157)	0.002	0.002
273	22.75	0.07	0.003	(0.156)	0.002	0.002
274	22.83	0.07	0.003	(0.156)	0.002	0.002
275	22.92	0.07	0.003	(0.155)	0.002	0.002
276	23.00	0.07	0.003	(0.155)	0.002	0.002
277	23.08	0.07	0.003	(0.155)	0.002	0.002
278	23.17	0.07	0.003	(0.154)	0.002	0.002
279	23.25	0.07	0.003	(0.154)	0.002	0.002
280	23.33	0.07	0.003	(0.154)	0.002	0.002
281	23.42	0.07	0.003	(0.153)	0.002	0.002
282	23.50	0.07	0.003	(0.153)	0.002	0.002
283	23.58	0.07	0.003	(0.153)	0.002	0.002
284	23.67	0.07	0.003	(0.153)	0.002	0.002
285	23.75	0.07	0.003	(0.153)	0.002	0.002
286	23.83	0.07	0.003	(0.152)	0.002	0.002
287	23.92	0.07	0.003	(0.152)	0.002	0.002
288	24.00	0.07	0.003	(0.152)	0.002	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.8

Flood volume = Effective rainfall 0.24(In)
times area 264.2(Ac.)/[(In)/(Ft.)] = 5.2(Ac.Ft)
Total soil loss = 0.19(In)
Total soil loss = 4.186(Ac.Ft)
Total rainfall = 0.43(In)
Flood volume = 227388.5 Cubic Feet
Total soil loss = 182361.1 Cubic Feet

Storm Event 2 Effective Rainfall = 0.810(In)

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.006	(0.539)	0.003	0.004
2	0.17	0.07	0.006	(0.537)	0.003	0.004
3	0.25	0.07	0.006	(0.535)	0.003	0.004
4	0.33	0.10	0.010	(0.533)	0.004	0.005
5	0.42	0.10	0.010	(0.531)	0.004	0.005
6	0.50	0.10	0.010	(0.529)	0.004	0.005
7	0.58	0.10	0.010	(0.527)	0.004	0.005
8	0.67	0.10	0.010	(0.525)	0.004	0.005
9	0.75	0.10	0.010	(0.523)	0.004	0.005
10	0.83	0.13	0.013	(0.521)	0.006	0.007
11	0.92	0.13	0.013	(0.519)	0.006	0.007
12	1.00	0.13	0.013	(0.517)	0.006	0.007
13	1.08	0.10	0.010	(0.515)	0.004	0.005
14	1.17	0.10	0.010	(0.512)	0.004	0.005
15	1.25	0.10	0.010	(0.510)	0.004	0.005
16	1.33	0.10	0.010	(0.508)	0.004	0.005
17	1.42	0.10	0.010	(0.506)	0.004	0.005
18	1.50	0.10	0.010	(0.504)	0.004	0.005
19	1.58	0.10	0.010	(0.502)	0.004	0.005
20	1.67	0.10	0.010	(0.500)	0.004	0.005
21	1.75	0.10	0.010	(0.498)	0.004	0.005

22	1.83	0.13	0.013	(0.496)	0.006	0.007
23	1.92	0.13	0.013	(0.494)	0.006	0.007
24	2.00	0.13	0.013	(0.492)	0.006	0.007
25	2.08	0.13	0.013	(0.490)	0.006	0.007
26	2.17	0.13	0.013	(0.488)	0.006	0.007
27	2.25	0.13	0.013	(0.486)	0.006	0.007
28	2.33	0.13	0.013	(0.484)	0.006	0.007
29	2.42	0.13	0.013	(0.482)	0.006	0.007
30	2.50	0.13	0.013	(0.480)	0.006	0.007
31	2.58	0.17	0.016	(0.478)	0.007	0.009
32	2.67	0.17	0.016	(0.477)	0.007	0.009
33	2.75	0.17	0.016	(0.475)	0.007	0.009
34	2.83	0.17	0.016	(0.473)	0.007	0.009
35	2.92	0.17	0.016	(0.471)	0.007	0.009
36	3.00	0.17	0.016	(0.469)	0.007	0.009
37	3.08	0.17	0.016	(0.467)	0.007	0.009
38	3.17	0.17	0.016	(0.465)	0.007	0.009
39	3.25	0.17	0.016	(0.463)	0.007	0.009
40	3.33	0.17	0.016	(0.461)	0.007	0.009
41	3.42	0.17	0.016	(0.459)	0.007	0.009
42	3.50	0.17	0.016	(0.457)	0.007	0.009
43	3.58	0.17	0.016	(0.455)	0.007	0.009
44	3.67	0.17	0.016	(0.453)	0.007	0.009
45	3.75	0.17	0.016	(0.451)	0.007	0.009
46	3.83	0.20	0.019	(0.450)	0.009	0.011
47	3.92	0.20	0.019	(0.448)	0.009	0.011
48	4.00	0.20	0.019	(0.446)	0.009	0.011
49	4.08	0.20	0.019	(0.444)	0.009	0.011
50	4.17	0.20	0.019	(0.442)	0.009	0.011
51	4.25	0.20	0.019	(0.440)	0.009	0.011
52	4.33	0.23	0.023	(0.438)	0.010	0.013
53	4.42	0.23	0.023	(0.436)	0.010	0.013
54	4.50	0.23	0.023	(0.434)	0.010	0.013
55	4.58	0.23	0.023	(0.433)	0.010	0.013
56	4.67	0.23	0.023	(0.431)	0.010	0.013
57	4.75	0.23	0.023	(0.429)	0.010	0.013
58	4.83	0.27	0.026	(0.427)	0.012	0.014
59	4.92	0.27	0.026	(0.425)	0.012	0.014
60	5.00	0.27	0.026	(0.423)	0.012	0.014
61	5.08	0.20	0.019	(0.421)	0.009	0.011
62	5.17	0.20	0.019	(0.420)	0.009	0.011
63	5.25	0.20	0.019	(0.418)	0.009	0.011
64	5.33	0.23	0.023	(0.416)	0.010	0.013
65	5.42	0.23	0.023	(0.414)	0.010	0.013
66	5.50	0.23	0.023	(0.412)	0.010	0.013
67	5.58	0.27	0.026	(0.411)	0.012	0.014
68	5.67	0.27	0.026	(0.409)	0.012	0.014
69	5.75	0.27	0.026	(0.407)	0.012	0.014
70	5.83	0.27	0.026	(0.405)	0.012	0.014
71	5.92	0.27	0.026	(0.403)	0.012	0.014
72	6.00	0.27	0.026	(0.402)	0.012	0.014
73	6.08	0.30	0.029	(0.400)	0.013	0.016
74	6.17	0.30	0.029	(0.398)	0.013	0.016
75	6.25	0.30	0.029	(0.396)	0.013	0.016
76	6.33	0.30	0.029	(0.394)	0.013	0.016
77	6.42	0.30	0.029	(0.393)	0.013	0.016
78	6.50	0.30	0.029	(0.391)	0.013	0.016
79	6.58	0.33	0.032	(0.389)	0.014	0.018
80	6.67	0.33	0.032	(0.387)	0.014	0.018
81	6.75	0.33	0.032	(0.386)	0.014	0.018
82	6.83	0.33	0.032	(0.384)	0.014	0.018
83	6.92	0.33	0.032	(0.382)	0.014	0.018
84	7.00	0.33	0.032	(0.380)	0.014	0.018

85	7.08	0.33	0.032	(0.379)	0.014	0.018
86	7.17	0.33	0.032	(0.377)	0.014	0.018
87	7.25	0.33	0.032	(0.375)	0.014	0.018
88	7.33	0.37	0.036	(0.374)	0.016	0.020
89	7.42	0.37	0.036	(0.372)	0.016	0.020
90	7.50	0.37	0.036	(0.370)	0.016	0.020
91	7.58	0.40	0.039	(0.368)	0.017	0.022
92	7.67	0.40	0.039	(0.367)	0.017	0.022
93	7.75	0.40	0.039	(0.365)	0.017	0.022
94	7.83	0.43	0.042	(0.363)	0.019	0.023
95	7.92	0.43	0.042	(0.362)	0.019	0.023
96	8.00	0.43	0.042	(0.360)	0.019	0.023
97	8.08	0.50	0.049	(0.358)	0.022	0.027
98	8.17	0.50	0.049	(0.357)	0.022	0.027
99	8.25	0.50	0.049	(0.355)	0.022	0.027
100	8.33	0.50	0.049	(0.353)	0.022	0.027
101	8.42	0.50	0.049	(0.352)	0.022	0.027
102	8.50	0.50	0.049	(0.350)	0.022	0.027
103	8.58	0.53	0.052	(0.348)	0.023	0.029
104	8.67	0.53	0.052	(0.347)	0.023	0.029
105	8.75	0.53	0.052	(0.345)	0.023	0.029
106	8.83	0.57	0.055	(0.344)	0.025	0.031
107	8.92	0.57	0.055	(0.342)	0.025	0.031
108	9.00	0.57	0.055	(0.340)	0.025	0.031
109	9.08	0.63	0.062	(0.339)	0.027	0.034
110	9.17	0.63	0.062	(0.337)	0.027	0.034
111	9.25	0.63	0.062	(0.335)	0.027	0.034
112	9.33	0.67	0.065	(0.334)	0.029	0.036
113	9.42	0.67	0.065	(0.332)	0.029	0.036
114	9.50	0.67	0.065	(0.331)	0.029	0.036
115	9.58	0.70	0.068	(0.329)	0.030	0.038
116	9.67	0.70	0.068	(0.328)	0.030	0.038
117	9.75	0.70	0.068	(0.326)	0.030	0.038
118	9.83	0.73	0.071	(0.324)	0.032	0.040
119	9.92	0.73	0.071	(0.323)	0.032	0.040
120	10.00	0.73	0.071	(0.321)	0.032	0.040
121	10.08	0.50	0.049	(0.320)	0.022	0.027
122	10.17	0.50	0.049	(0.318)	0.022	0.027
123	10.25	0.50	0.049	(0.317)	0.022	0.027
124	10.33	0.50	0.049	(0.315)	0.022	0.027
125	10.42	0.50	0.049	(0.314)	0.022	0.027
126	10.50	0.50	0.049	(0.312)	0.022	0.027
127	10.58	0.67	0.065	(0.310)	0.029	0.036
128	10.67	0.67	0.065	(0.309)	0.029	0.036
129	10.75	0.67	0.065	(0.307)	0.029	0.036
130	10.83	0.67	0.065	(0.306)	0.029	0.036
131	10.92	0.67	0.065	(0.304)	0.029	0.036
132	11.00	0.67	0.065	(0.303)	0.029	0.036
133	11.08	0.63	0.062	(0.301)	0.027	0.034
134	11.17	0.63	0.062	(0.300)	0.027	0.034
135	11.25	0.63	0.062	(0.298)	0.027	0.034
136	11.33	0.63	0.062	(0.297)	0.027	0.034
137	11.42	0.63	0.062	(0.296)	0.027	0.034
138	11.50	0.63	0.062	(0.294)	0.027	0.034
139	11.58	0.57	0.055	(0.293)	0.025	0.031
140	11.67	0.57	0.055	(0.291)	0.025	0.031
141	11.75	0.57	0.055	(0.290)	0.025	0.031
142	11.83	0.60	0.058	(0.288)	0.026	0.032
143	11.92	0.60	0.058	(0.287)	0.026	0.032
144	12.00	0.60	0.058	(0.285)	0.026	0.032
145	12.08	0.83	0.081	(0.284)	0.036	0.045
146	12.17	0.83	0.081	(0.283)	0.036	0.045
147	12.25	0.83	0.081	(0.281)	0.036	0.045

148	12.33	0.87	0.084	(0.280)	0.037	0.047
149	12.42	0.87	0.084	(0.278)	0.037	0.047
150	12.50	0.87	0.084	(0.277)	0.037	0.047
151	12.58	0.93	0.091	(0.276)	0.040	0.050
152	12.67	0.93	0.091	(0.274)	0.040	0.050
153	12.75	0.93	0.091	(0.273)	0.040	0.050
154	12.83	0.97	0.094	(0.271)	0.042	0.052
155	12.92	0.97	0.094	(0.270)	0.042	0.052
156	13.00	0.97	0.094	(0.269)	0.042	0.052
157	13.08	1.13	0.110	(0.267)	0.049	0.061
158	13.17	1.13	0.110	(0.266)	0.049	0.061
159	13.25	1.13	0.110	(0.265)	0.049	0.061
160	13.33	1.13	0.110	(0.263)	0.049	0.061
161	13.42	1.13	0.110	(0.262)	0.049	0.061
162	13.50	1.13	0.110	(0.261)	0.049	0.061
163	13.58	0.77	0.074	(0.259)	0.033	0.041
164	13.67	0.77	0.074	(0.258)	0.033	0.041
165	13.75	0.77	0.074	(0.257)	0.033	0.041
166	13.83	0.77	0.074	(0.255)	0.033	0.041
167	13.92	0.77	0.074	(0.254)	0.033	0.041
168	14.00	0.77	0.074	(0.253)	0.033	0.041
169	14.08	0.90	0.087	(0.251)	0.039	0.049
170	14.17	0.90	0.087	(0.250)	0.039	0.049
171	14.25	0.90	0.087	(0.249)	0.039	0.049
172	14.33	0.87	0.084	(0.248)	0.037	0.047
173	14.42	0.87	0.084	(0.246)	0.037	0.047
174	14.50	0.87	0.084	(0.245)	0.037	0.047
175	14.58	0.87	0.084	(0.244)	0.037	0.047
176	14.67	0.87	0.084	(0.243)	0.037	0.047
177	14.75	0.87	0.084	(0.241)	0.037	0.047
178	14.83	0.83	0.081	(0.240)	0.036	0.045
179	14.92	0.83	0.081	(0.239)	0.036	0.045
180	15.00	0.83	0.081	(0.238)	0.036	0.045
181	15.08	0.80	0.078	(0.236)	0.035	0.043
182	15.17	0.80	0.078	(0.235)	0.035	0.043
183	15.25	0.80	0.078	(0.234)	0.035	0.043
184	15.33	0.77	0.074	(0.233)	0.033	0.041
185	15.42	0.77	0.074	(0.232)	0.033	0.041
186	15.50	0.77	0.074	(0.230)	0.033	0.041
187	15.58	0.63	0.062	(0.229)	0.027	0.034
188	15.67	0.63	0.062	(0.228)	0.027	0.034
189	15.75	0.63	0.062	(0.227)	0.027	0.034
190	15.83	0.63	0.062	(0.226)	0.027	0.034
191	15.92	0.63	0.062	(0.225)	0.027	0.034
192	16.00	0.63	0.062	(0.223)	0.027	0.034
193	16.08	0.13	0.013	(0.222)	0.006	0.007
194	16.17	0.13	0.013	(0.221)	0.006	0.007
195	16.25	0.13	0.013	(0.220)	0.006	0.007
196	16.33	0.13	0.013	(0.219)	0.006	0.007
197	16.42	0.13	0.013	(0.218)	0.006	0.007
198	16.50	0.13	0.013	(0.217)	0.006	0.007
199	16.58	0.10	0.010	(0.216)	0.004	0.005
200	16.67	0.10	0.010	(0.214)	0.004	0.005
201	16.75	0.10	0.010	(0.213)	0.004	0.005
202	16.83	0.10	0.010	(0.212)	0.004	0.005
203	16.92	0.10	0.010	(0.211)	0.004	0.005
204	17.00	0.10	0.010	(0.210)	0.004	0.005
205	17.08	0.17	0.016	(0.209)	0.007	0.009
206	17.17	0.17	0.016	(0.208)	0.007	0.009
207	17.25	0.17	0.016	(0.207)	0.007	0.009
208	17.33	0.17	0.016	(0.206)	0.007	0.009
209	17.42	0.17	0.016	(0.205)	0.007	0.009
210	17.50	0.17	0.016	(0.204)	0.007	0.009

211	17.58	0.17	0.016	(0.203)	0.007	0.009
212	17.67	0.17	0.016	(0.202)	0.007	0.009
213	17.75	0.17	0.016	(0.201)	0.007	0.009
214	17.83	0.13	0.013	(0.200)	0.006	0.007
215	17.92	0.13	0.013	(0.199)	0.006	0.007
216	18.00	0.13	0.013	(0.198)	0.006	0.007
217	18.08	0.13	0.013	(0.197)	0.006	0.007
218	18.17	0.13	0.013	(0.196)	0.006	0.007
219	18.25	0.13	0.013	(0.195)	0.006	0.007
220	18.33	0.13	0.013	(0.194)	0.006	0.007
221	18.42	0.13	0.013	(0.193)	0.006	0.007
222	18.50	0.13	0.013	(0.192)	0.006	0.007
223	18.58	0.10	0.010	(0.191)	0.004	0.005
224	18.67	0.10	0.010	(0.190)	0.004	0.005
225	18.75	0.10	0.010	(0.189)	0.004	0.005
226	18.83	0.07	0.006	(0.188)	0.003	0.004
227	18.92	0.07	0.006	(0.188)	0.003	0.004
228	19.00	0.07	0.006	(0.187)	0.003	0.004
229	19.08	0.10	0.010	(0.186)	0.004	0.005
230	19.17	0.10	0.010	(0.185)	0.004	0.005
231	19.25	0.10	0.010	(0.184)	0.004	0.005
232	19.33	0.13	0.013	(0.183)	0.006	0.007
233	19.42	0.13	0.013	(0.182)	0.006	0.007
234	19.50	0.13	0.013	(0.182)	0.006	0.007
235	19.58	0.10	0.010	(0.181)	0.004	0.005
236	19.67	0.10	0.010	(0.180)	0.004	0.005
237	19.75	0.10	0.010	(0.179)	0.004	0.005
238	19.83	0.07	0.006	(0.178)	0.003	0.004
239	19.92	0.07	0.006	(0.177)	0.003	0.004
240	20.00	0.07	0.006	(0.177)	0.003	0.004
241	20.08	0.10	0.010	(0.176)	0.004	0.005
242	20.17	0.10	0.010	(0.175)	0.004	0.005
243	20.25	0.10	0.010	(0.174)	0.004	0.005
244	20.33	0.10	0.010	(0.174)	0.004	0.005
245	20.42	0.10	0.010	(0.173)	0.004	0.005
246	20.50	0.10	0.010	(0.172)	0.004	0.005
247	20.58	0.10	0.010	(0.171)	0.004	0.005
248	20.67	0.10	0.010	(0.171)	0.004	0.005
249	20.75	0.10	0.010	(0.170)	0.004	0.005
250	20.83	0.07	0.006	(0.169)	0.003	0.004
251	20.92	0.07	0.006	(0.169)	0.003	0.004
252	21.00	0.07	0.006	(0.168)	0.003	0.004
253	21.08	0.10	0.010	(0.167)	0.004	0.005
254	21.17	0.10	0.010	(0.167)	0.004	0.005
255	21.25	0.10	0.010	(0.166)	0.004	0.005
256	21.33	0.07	0.006	(0.165)	0.003	0.004
257	21.42	0.07	0.006	(0.165)	0.003	0.004
258	21.50	0.07	0.006	(0.164)	0.003	0.004
259	21.58	0.10	0.010	(0.163)	0.004	0.005
260	21.67	0.10	0.010	(0.163)	0.004	0.005
261	21.75	0.10	0.010	(0.162)	0.004	0.005
262	21.83	0.07	0.006	(0.162)	0.003	0.004
263	21.92	0.07	0.006	(0.161)	0.003	0.004
264	22.00	0.07	0.006	(0.161)	0.003	0.004
265	22.08	0.10	0.010	(0.160)	0.004	0.005
266	22.17	0.10	0.010	(0.160)	0.004	0.005
267	22.25	0.10	0.010	(0.159)	0.004	0.005
268	22.33	0.07	0.006	(0.159)	0.003	0.004
269	22.42	0.07	0.006	(0.158)	0.003	0.004
270	22.50	0.07	0.006	(0.158)	0.003	0.004
271	22.58	0.07	0.006	(0.157)	0.003	0.004
272	22.67	0.07	0.006	(0.157)	0.003	0.004
273	22.75	0.07	0.006	(0.156)	0.003	0.004

274	22.83	0.07	0.006	(0.156)	0.003	0.004
275	22.92	0.07	0.006	(0.155)	0.003	0.004
276	23.00	0.07	0.006	(0.155)	0.003	0.004
277	23.08	0.07	0.006	(0.155)	0.003	0.004
278	23.17	0.07	0.006	(0.154)	0.003	0.004
279	23.25	0.07	0.006	(0.154)	0.003	0.004
280	23.33	0.07	0.006	(0.154)	0.003	0.004
281	23.42	0.07	0.006	(0.153)	0.003	0.004
282	23.50	0.07	0.006	(0.153)	0.003	0.004
283	23.58	0.07	0.006	(0.153)	0.003	0.004
284	23.67	0.07	0.006	(0.153)	0.003	0.004
285	23.75	0.07	0.006	(0.153)	0.003	0.004
286	23.83	0.07	0.006	(0.152)	0.003	0.004
287	23.92	0.07	0.006	(0.152)	0.003	0.004
288	24.00	0.07	0.006	(0.152)	0.003	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.4

Flood volume = Effective rainfall 0.45(In)
times area 264.2(Ac.)/[(In)/(Ft.)] = 9.9(Ac.Ft)
Total soil loss = 0.36(In)
Total soil loss = 7.932(Ac.Ft)
Total rainfall = 0.81(In)
Flood volume = 430841.4 Cubic Feet
Total soil loss = 345526.3 Cubic Feet

Storm Event 1 Effective Rainfall = 2.249(In)

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.539)	0.008	0.010
2	0.17	0.07	0.018	(0.537)	0.008	0.010
3	0.25	0.07	0.018	(0.535)	0.008	0.010
4	0.33	0.10	0.027	(0.533)	0.012	0.015
5	0.42	0.10	0.027	(0.531)	0.012	0.015
6	0.50	0.10	0.027	(0.529)	0.012	0.015
7	0.58	0.10	0.027	(0.527)	0.012	0.015
8	0.67	0.10	0.027	(0.525)	0.012	0.015
9	0.75	0.10	0.027	(0.523)	0.012	0.015
10	0.83	0.13	0.036	(0.521)	0.016	0.020
11	0.92	0.13	0.036	(0.519)	0.016	0.020
12	1.00	0.13	0.036	(0.517)	0.016	0.020
13	1.08	0.10	0.027	(0.515)	0.012	0.015
14	1.17	0.10	0.027	(0.512)	0.012	0.015
15	1.25	0.10	0.027	(0.510)	0.012	0.015
16	1.33	0.10	0.027	(0.508)	0.012	0.015
17	1.42	0.10	0.027	(0.506)	0.012	0.015
18	1.50	0.10	0.027	(0.504)	0.012	0.015
19	1.58	0.10	0.027	(0.502)	0.012	0.015
20	1.67	0.10	0.027	(0.500)	0.012	0.015
21	1.75	0.10	0.027	(0.498)	0.012	0.015
22	1.83	0.13	0.036	(0.496)	0.016	0.020
23	1.92	0.13	0.036	(0.494)	0.016	0.020
24	2.00	0.13	0.036	(0.492)	0.016	0.020
25	2.08	0.13	0.036	(0.490)	0.016	0.020
26	2.17	0.13	0.036	(0.488)	0.016	0.020
27	2.25	0.13	0.036	(0.486)	0.016	0.020
28	2.33	0.13	0.036	(0.484)	0.016	0.020
29	2.42	0.13	0.036	(0.482)	0.016	0.020
30	2.50	0.13	0.036	(0.480)	0.016	0.020

31	2.58	0.17	0.045	(0.478)	0.020	0.025
32	2.67	0.17	0.045	(0.477)	0.020	0.025
33	2.75	0.17	0.045	(0.475)	0.020	0.025
34	2.83	0.17	0.045	(0.473)	0.020	0.025
35	2.92	0.17	0.045	(0.471)	0.020	0.025
36	3.00	0.17	0.045	(0.469)	0.020	0.025
37	3.08	0.17	0.045	(0.467)	0.020	0.025
38	3.17	0.17	0.045	(0.465)	0.020	0.025
39	3.25	0.17	0.045	(0.463)	0.020	0.025
40	3.33	0.17	0.045	(0.461)	0.020	0.025
41	3.42	0.17	0.045	(0.459)	0.020	0.025
42	3.50	0.17	0.045	(0.457)	0.020	0.025
43	3.58	0.17	0.045	(0.455)	0.020	0.025
44	3.67	0.17	0.045	(0.453)	0.020	0.025
45	3.75	0.17	0.045	(0.451)	0.020	0.025
46	3.83	0.20	0.054	(0.450)	0.024	0.030
47	3.92	0.20	0.054	(0.448)	0.024	0.030
48	4.00	0.20	0.054	(0.446)	0.024	0.030
49	4.08	0.20	0.054	(0.444)	0.024	0.030
50	4.17	0.20	0.054	(0.442)	0.024	0.030
51	4.25	0.20	0.054	(0.440)	0.024	0.030
52	4.33	0.23	0.063	(0.438)	0.028	0.035
53	4.42	0.23	0.063	(0.436)	0.028	0.035
54	4.50	0.23	0.063	(0.434)	0.028	0.035
55	4.58	0.23	0.063	(0.433)	0.028	0.035
56	4.67	0.23	0.063	(0.431)	0.028	0.035
57	4.75	0.23	0.063	(0.429)	0.028	0.035
58	4.83	0.27	0.072	(0.427)	0.032	0.040
59	4.92	0.27	0.072	(0.425)	0.032	0.040
60	5.00	0.27	0.072	(0.423)	0.032	0.040
61	5.08	0.20	0.054	(0.421)	0.024	0.030
62	5.17	0.20	0.054	(0.420)	0.024	0.030
63	5.25	0.20	0.054	(0.418)	0.024	0.030
64	5.33	0.23	0.063	(0.416)	0.028	0.035
65	5.42	0.23	0.063	(0.414)	0.028	0.035
66	5.50	0.23	0.063	(0.412)	0.028	0.035
67	5.58	0.27	0.072	(0.411)	0.032	0.040
68	5.67	0.27	0.072	(0.409)	0.032	0.040
69	5.75	0.27	0.072	(0.407)	0.032	0.040
70	5.83	0.27	0.072	(0.405)	0.032	0.040
71	5.92	0.27	0.072	(0.403)	0.032	0.040
72	6.00	0.27	0.072	(0.402)	0.032	0.040
73	6.08	0.30	0.081	(0.400)	0.036	0.045
74	6.17	0.30	0.081	(0.398)	0.036	0.045
75	6.25	0.30	0.081	(0.396)	0.036	0.045
76	6.33	0.30	0.081	(0.394)	0.036	0.045
77	6.42	0.30	0.081	(0.393)	0.036	0.045
78	6.50	0.30	0.081	(0.391)	0.036	0.045
79	6.58	0.33	0.090	(0.389)	0.040	0.050
80	6.67	0.33	0.090	(0.387)	0.040	0.050
81	6.75	0.33	0.090	(0.386)	0.040	0.050
82	6.83	0.33	0.090	(0.384)	0.040	0.050
83	6.92	0.33	0.090	(0.382)	0.040	0.050
84	7.00	0.33	0.090	(0.380)	0.040	0.050
85	7.08	0.33	0.090	(0.379)	0.040	0.050
86	7.17	0.33	0.090	(0.377)	0.040	0.050
87	7.25	0.33	0.090	(0.375)	0.040	0.050
88	7.33	0.37	0.099	(0.374)	0.044	0.055
89	7.42	0.37	0.099	(0.372)	0.044	0.055
90	7.50	0.37	0.099	(0.370)	0.044	0.055
91	7.58	0.40	0.108	(0.368)	0.048	0.060
92	7.67	0.40	0.108	(0.367)	0.048	0.060
93	7.75	0.40	0.108	(0.365)	0.048	0.060

94	7.83	0.43	0.117	(0.363)	0.052	0.065
95	7.92	0.43	0.117	(0.362)	0.052	0.065
96	8.00	0.43	0.117	(0.360)	0.052	0.065
97	8.08	0.50	0.135	(0.358)	0.060	0.075
98	8.17	0.50	0.135	(0.357)	0.060	0.075
99	8.25	0.50	0.135	(0.355)	0.060	0.075
100	8.33	0.50	0.135	(0.353)	0.060	0.075
101	8.42	0.50	0.135	(0.352)	0.060	0.075
102	8.50	0.50	0.135	(0.350)	0.060	0.075
103	8.58	0.53	0.144	(0.348)	0.064	0.080
104	8.67	0.53	0.144	(0.347)	0.064	0.080
105	8.75	0.53	0.144	(0.345)	0.064	0.080
106	8.83	0.57	0.153	(0.344)	0.068	0.085
107	8.92	0.57	0.153	(0.342)	0.068	0.085
108	9.00	0.57	0.153	(0.340)	0.068	0.085
109	9.08	0.63	0.171	(0.339)	0.076	0.095
110	9.17	0.63	0.171	(0.337)	0.076	0.095
111	9.25	0.63	0.171	(0.335)	0.076	0.095
112	9.33	0.67	0.180	(0.334)	0.080	0.100
113	9.42	0.67	0.180	(0.332)	0.080	0.100
114	9.50	0.67	0.180	(0.331)	0.080	0.100
115	9.58	0.70	0.189	(0.329)	0.084	0.105
116	9.67	0.70	0.189	(0.328)	0.084	0.105
117	9.75	0.70	0.189	(0.326)	0.084	0.105
118	9.83	0.73	0.198	(0.324)	0.088	0.110
119	9.92	0.73	0.198	(0.323)	0.088	0.110
120	10.00	0.73	0.198	(0.321)	0.088	0.110
121	10.08	0.50	0.135	(0.320)	0.060	0.075
122	10.17	0.50	0.135	(0.318)	0.060	0.075
123	10.25	0.50	0.135	(0.317)	0.060	0.075
124	10.33	0.50	0.135	(0.315)	0.060	0.075
125	10.42	0.50	0.135	(0.314)	0.060	0.075
126	10.50	0.50	0.135	(0.312)	0.060	0.075
127	10.58	0.67	0.180	(0.310)	0.080	0.100
128	10.67	0.67	0.180	(0.309)	0.080	0.100
129	10.75	0.67	0.180	(0.307)	0.080	0.100
130	10.83	0.67	0.180	(0.306)	0.080	0.100
131	10.92	0.67	0.180	(0.304)	0.080	0.100
132	11.00	0.67	0.180	(0.303)	0.080	0.100
133	11.08	0.63	0.171	(0.301)	0.076	0.095
134	11.17	0.63	0.171	(0.300)	0.076	0.095
135	11.25	0.63	0.171	(0.298)	0.076	0.095
136	11.33	0.63	0.171	(0.297)	0.076	0.095
137	11.42	0.63	0.171	(0.296)	0.076	0.095
138	11.50	0.63	0.171	(0.294)	0.076	0.095
139	11.58	0.57	0.153	(0.293)	0.068	0.085
140	11.67	0.57	0.153	(0.291)	0.068	0.085
141	11.75	0.57	0.153	(0.290)	0.068	0.085
142	11.83	0.60	0.162	(0.288)	0.072	0.090
143	11.92	0.60	0.162	(0.287)	0.072	0.090
144	12.00	0.60	0.162	(0.285)	0.072	0.090
145	12.08	0.83	0.225	(0.284)	0.100	0.125
146	12.17	0.83	0.225	(0.283)	0.100	0.125
147	12.25	0.83	0.225	(0.281)	0.100	0.125
148	12.33	0.87	0.234	(0.280)	0.104	0.130
149	12.42	0.87	0.234	(0.278)	0.104	0.130
150	12.50	0.87	0.234	(0.277)	0.104	0.130
151	12.58	0.93	0.252	(0.276)	0.112	0.140
152	12.67	0.93	0.252	(0.274)	0.112	0.140
153	12.75	0.93	0.252	(0.273)	0.112	0.140
154	12.83	0.97	0.261	(0.271)	0.116	0.145
155	12.92	0.97	0.261	(0.270)	0.116	0.145
156	13.00	0.97	0.261	(0.269)	0.116	0.145

157	13.08	1.13	0.306	(0.267)	0.136	0.170
158	13.17	1.13	0.306	(0.266)	0.136	0.170
159	13.25	1.13	0.306	(0.265)	0.136	0.170
160	13.33	1.13	0.306	(0.263)	0.136	0.170
161	13.42	1.13	0.306	(0.262)	0.136	0.170
162	13.50	1.13	0.306	(0.261)	0.136	0.170
163	13.58	0.77	0.207	(0.259)	0.092	0.115
164	13.67	0.77	0.207	(0.258)	0.092	0.115
165	13.75	0.77	0.207	(0.257)	0.092	0.115
166	13.83	0.77	0.207	(0.255)	0.092	0.115
167	13.92	0.77	0.207	(0.254)	0.092	0.115
168	14.00	0.77	0.207	(0.253)	0.092	0.115
169	14.08	0.90	0.243	(0.251)	0.108	0.135
170	14.17	0.90	0.243	(0.250)	0.108	0.135
171	14.25	0.90	0.243	(0.249)	0.108	0.135
172	14.33	0.87	0.234	(0.248)	0.104	0.130
173	14.42	0.87	0.234	(0.246)	0.104	0.130
174	14.50	0.87	0.234	(0.245)	0.104	0.130
175	14.58	0.87	0.234	(0.244)	0.104	0.130
176	14.67	0.87	0.234	(0.243)	0.104	0.130
177	14.75	0.87	0.234	(0.241)	0.104	0.130
178	14.83	0.83	0.225	(0.240)	0.100	0.125
179	14.92	0.83	0.225	(0.239)	0.100	0.125
180	15.00	0.83	0.225	(0.238)	0.100	0.125
181	15.08	0.80	0.216	(0.236)	0.096	0.120
182	15.17	0.80	0.216	(0.235)	0.096	0.120
183	15.25	0.80	0.216	(0.234)	0.096	0.120
184	15.33	0.77	0.207	(0.233)	0.092	0.115
185	15.42	0.77	0.207	(0.232)	0.092	0.115
186	15.50	0.77	0.207	(0.230)	0.092	0.115
187	15.58	0.63	0.171	(0.229)	0.076	0.095
188	15.67	0.63	0.171	(0.228)	0.076	0.095
189	15.75	0.63	0.171	(0.227)	0.076	0.095
190	15.83	0.63	0.171	(0.226)	0.076	0.095
191	15.92	0.63	0.171	(0.225)	0.076	0.095
192	16.00	0.63	0.171	(0.223)	0.076	0.095
193	16.08	0.13	0.036	(0.222)	0.016	0.020
194	16.17	0.13	0.036	(0.221)	0.016	0.020
195	16.25	0.13	0.036	(0.220)	0.016	0.020
196	16.33	0.13	0.036	(0.219)	0.016	0.020
197	16.42	0.13	0.036	(0.218)	0.016	0.020
198	16.50	0.13	0.036	(0.217)	0.016	0.020
199	16.58	0.10	0.027	(0.216)	0.012	0.015
200	16.67	0.10	0.027	(0.214)	0.012	0.015
201	16.75	0.10	0.027	(0.213)	0.012	0.015
202	16.83	0.10	0.027	(0.212)	0.012	0.015
203	16.92	0.10	0.027	(0.211)	0.012	0.015
204	17.00	0.10	0.027	(0.210)	0.012	0.015
205	17.08	0.17	0.045	(0.209)	0.020	0.025
206	17.17	0.17	0.045	(0.208)	0.020	0.025
207	17.25	0.17	0.045	(0.207)	0.020	0.025
208	17.33	0.17	0.045	(0.206)	0.020	0.025
209	17.42	0.17	0.045	(0.205)	0.020	0.025
210	17.50	0.17	0.045	(0.204)	0.020	0.025
211	17.58	0.17	0.045	(0.203)	0.020	0.025
212	17.67	0.17	0.045	(0.202)	0.020	0.025
213	17.75	0.17	0.045	(0.201)	0.020	0.025
214	17.83	0.13	0.036	(0.200)	0.016	0.020
215	17.92	0.13	0.036	(0.199)	0.016	0.020
216	18.00	0.13	0.036	(0.198)	0.016	0.020
217	18.08	0.13	0.036	(0.197)	0.016	0.020
218	18.17	0.13	0.036	(0.196)	0.016	0.020
219	18.25	0.13	0.036	(0.195)	0.016	0.020

220	18.33	0.13	0.036	(0.194)	0.016	0.020
221	18.42	0.13	0.036	(0.193)	0.016	0.020
222	18.50	0.13	0.036	(0.192)	0.016	0.020
223	18.58	0.10	0.027	(0.191)	0.012	0.015
224	18.67	0.10	0.027	(0.190)	0.012	0.015
225	18.75	0.10	0.027	(0.189)	0.012	0.015
226	18.83	0.07	0.018	(0.188)	0.008	0.010
227	18.92	0.07	0.018	(0.188)	0.008	0.010
228	19.00	0.07	0.018	(0.187)	0.008	0.010
229	19.08	0.10	0.027	(0.186)	0.012	0.015
230	19.17	0.10	0.027	(0.185)	0.012	0.015
231	19.25	0.10	0.027	(0.184)	0.012	0.015
232	19.33	0.13	0.036	(0.183)	0.016	0.020
233	19.42	0.13	0.036	(0.182)	0.016	0.020
234	19.50	0.13	0.036	(0.182)	0.016	0.020
235	19.58	0.10	0.027	(0.181)	0.012	0.015
236	19.67	0.10	0.027	(0.180)	0.012	0.015
237	19.75	0.10	0.027	(0.179)	0.012	0.015
238	19.83	0.07	0.018	(0.178)	0.008	0.010
239	19.92	0.07	0.018	(0.177)	0.008	0.010
240	20.00	0.07	0.018	(0.177)	0.008	0.010
241	20.08	0.10	0.027	(0.176)	0.012	0.015
242	20.17	0.10	0.027	(0.175)	0.012	0.015
243	20.25	0.10	0.027	(0.174)	0.012	0.015
244	20.33	0.10	0.027	(0.174)	0.012	0.015
245	20.42	0.10	0.027	(0.173)	0.012	0.015
246	20.50	0.10	0.027	(0.172)	0.012	0.015
247	20.58	0.10	0.027	(0.171)	0.012	0.015
248	20.67	0.10	0.027	(0.171)	0.012	0.015
249	20.75	0.10	0.027	(0.170)	0.012	0.015
250	20.83	0.07	0.018	(0.169)	0.008	0.010
251	20.92	0.07	0.018	(0.169)	0.008	0.010
252	21.00	0.07	0.018	(0.168)	0.008	0.010
253	21.08	0.10	0.027	(0.167)	0.012	0.015
254	21.17	0.10	0.027	(0.167)	0.012	0.015
255	21.25	0.10	0.027	(0.166)	0.012	0.015
256	21.33	0.07	0.018	(0.165)	0.008	0.010
257	21.42	0.07	0.018	(0.165)	0.008	0.010
258	21.50	0.07	0.018	(0.164)	0.008	0.010
259	21.58	0.10	0.027	(0.163)	0.012	0.015
260	21.67	0.10	0.027	(0.163)	0.012	0.015
261	21.75	0.10	0.027	(0.162)	0.012	0.015
262	21.83	0.07	0.018	(0.162)	0.008	0.010
263	21.92	0.07	0.018	(0.161)	0.008	0.010
264	22.00	0.07	0.018	(0.161)	0.008	0.010
265	22.08	0.10	0.027	(0.160)	0.012	0.015
266	22.17	0.10	0.027	(0.160)	0.012	0.015
267	22.25	0.10	0.027	(0.159)	0.012	0.015
268	22.33	0.07	0.018	(0.159)	0.008	0.010
269	22.42	0.07	0.018	(0.158)	0.008	0.010
270	22.50	0.07	0.018	(0.158)	0.008	0.010
271	22.58	0.07	0.018	(0.157)	0.008	0.010
272	22.67	0.07	0.018	(0.157)	0.008	0.010
273	22.75	0.07	0.018	(0.156)	0.008	0.010
274	22.83	0.07	0.018	(0.156)	0.008	0.010
275	22.92	0.07	0.018	(0.155)	0.008	0.010
276	23.00	0.07	0.018	(0.155)	0.008	0.010
277	23.08	0.07	0.018	(0.155)	0.008	0.010
278	23.17	0.07	0.018	(0.154)	0.008	0.010
279	23.25	0.07	0.018	(0.154)	0.008	0.010
280	23.33	0.07	0.018	(0.154)	0.008	0.010
281	23.42	0.07	0.018	(0.153)	0.008	0.010
282	23.50	0.07	0.018	(0.153)	0.008	0.010

283	23.58	0.07	0.018	(0.153)	0.008	0.010
284	23.67	0.07	0.018	(0.153)	0.008	0.010
285	23.75	0.07	0.018	(0.153)	0.008	0.010
286	23.83	0.07	0.018	(0.152)	0.008	0.010
287	23.92	0.07	0.018	(0.152)	0.008	0.010
288	24.00	0.07	0.018	(0.152)	0.008	0.010

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.0

Flood volume = Effective rainfall 1.25(In)
times area 264.2(Ac.)/[(In)/(Ft.)] = 27.5(Ac.Ft)
Total soil loss = 1.00(In)
Total soil loss = 22.034(Ac.Ft)
Total rainfall = 2.25(In)
Flood volume = 1196781.5 Cubic Feet
Total soil loss = 959795.3 Cubic Feet

Peak flow rate of this hydrograph = 43.704(CFS)

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TOTAL OF: 5 24 - H O U R S T O R M E V E N T S
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0000	0.01	Q	|	|	|	|
0+10	0.0002	0.03	Q	|	|	|	|
0+15	0.0008	0.08	Q	|	|	|	|
0+20	0.0019	0.16	Q	|	|	|	|
0+25	0.0034	0.21	Q	|	|	|	|
0+30	0.0051	0.25	Q	|	|	|	|
0+35	0.0072	0.31	Q	|	|	|	|
0+40	0.0095	0.33	Q	|	|	|	|
0+45	0.0119	0.35	Q	|	|	|	|
0+50	0.0145	0.37	Q	|	|	|	|
0+55	0.0171	0.39	Q	|	|	|	|
1+ 0	0.0201	0.42	Q	|	|	|	|
1+ 5	0.0232	0.46	Q	|	|	|	|
1+10	0.0265	0.47	Q	|	|	|	|
1+15	0.0296	0.46	Q	|	|	|	|
1+20	0.0326	0.43	Q	|	|	|	|
1+25	0.0355	0.42	Q	|	|	|	|
1+30	0.0383	0.41	Q	|	|	|	|
1+35	0.0411	0.41	Q	|	|	|	|
1+40	0.0439	0.41	Q	|	|	|	|
1+45	0.0467	0.41	Q	|	|	|	|
1+50	0.0495	0.41	Q	|	|	|	|
1+55	0.0524	0.42	Q	|	|	|	|
2+ 0	0.0554	0.44	Q	|	|	|	|
2+ 5	0.0587	0.48	Q	|	|	|	|
2+10	0.0622	0.50	Q	|	|	|	|
2+15	0.0656	0.51	Q	|	|	|	|
2+20	0.0692	0.51	Q	|	|	|	|
2+25	0.0727	0.52	Q	|	|	|	|
2+30	0.0763	0.52	Q	|	|	|	|
2+35	0.0800	0.53	Q	|	|	|	|
2+40	0.0837	0.54	Q	|	|	|	|
2+45	0.0876	0.57	Q	|	|	|	|
2+50	0.0918	0.61	Q	|	|	|	|
2+55	0.0961	0.63	Q	|	|	|	|
3+ 0	0.1005	0.64	Q	|	|	|	|

3+ 5	0.1050	0.64	Q				
3+10	0.1094	0.65	Q				
3+15	0.1139	0.65	Q				
3+20	0.1185	0.66	Q				
3+25	0.1230	0.66	Q				
3+30	0.1276	0.66	Q				
3+35	0.1321	0.66	Q				
3+40	0.1367	0.66	Q				
3+45	0.1413	0.66	Q				
3+50	0.1459	0.67	Q				
3+55	0.1505	0.68	Q				
4+ 0	0.1554	0.71	Q				
4+ 5	0.1605	0.74	Q				
4+10	0.1658	0.76	Q				
4+15	0.1711	0.77	Q				
4+20	0.1764	0.78	Q				
4+25	0.1819	0.80	Q				
4+30	0.1877	0.83	Q				
4+35	0.1936	0.87	Q				
4+40	0.1998	0.89	Q				
4+45	0.2060	0.90	Q				
4+50	0.2123	0.91	Q				
4+55	0.2187	0.93	Q				
5+ 0	0.2253	0.96	Q				
5+ 5	0.2321	1.00	Q				
5+10	0.2390	0.99	Q				
5+15	0.2455	0.95	Q				
5+20	0.2516	0.88	Q				
5+25	0.2576	0.87	Q				
5+30	0.2637	0.88	Q				
5+35	0.2699	0.91	Q				
5+40	0.2764	0.93	Q				
5+45	0.2830	0.96	Q				
5+50	0.2899	1.00	Q				
5+55	0.2969	1.02	Q				
6+ 0	0.3040	1.03	Q				
6+ 5	0.3112	1.04	Q				
6+10	0.3185	1.06	Q				
6+15	0.3260	1.09	Q				
6+20	0.3339	1.14	Q				
6+25	0.3418	1.15	Q				
6+30	0.3499	1.17	Q				
6+35	0.3580	1.18	Q				
6+40	0.3662	1.19	Q				
6+45	0.3746	1.23	Q				
6+50	0.3834	1.27	VQ				
6+55	0.3922	1.29	VQ				
7+ 0	0.4012	1.30	VQ				
7+ 5	0.4102	1.31	VQ				
7+10	0.4192	1.31	VQ				
7+15	0.4283	1.32	VQ				
7+20	0.4374	1.32	VQ				
7+25	0.4466	1.34	VQ				
7+30	0.4561	1.37	VQ				
7+35	0.4658	1.41	VQ				
7+40	0.4757	1.44	VQ				
7+45	0.4858	1.48	VQ				
7+50	0.4963	1.52	VQ				
7+55	0.5071	1.56	VQ				
8+ 0	0.5181	1.60	VQ				
8+ 5	0.5295	1.66	VQ				
8+10	0.5412	1.70	VQ				
8+15	0.5534	1.77	VQ				

8+20	0.5662	1.86	VQ	|	|	|	|
8+25	0.5793	1.90	VQ	|	|	|	|
8+30	0.5925	1.93	VQ	|	|	|	|
8+35	0.6059	1.95	VQ	|	|	|	|
8+40	0.6195	1.97	VQ	|	|	|	|
8+45	0.6334	2.01	VQ	|	|	|	|
8+50	0.6476	2.06	VQ	|	|	|	|
8+55	0.6620	2.09	VQ	|	|	|	|
9+ 0	0.6767	2.13	VQ	|	|	|	|
9+ 5	0.6917	2.19	VQ	|	|	|	|
9+10	0.7071	2.23	VQ	|	|	|	|
9+15	0.7230	2.30	VQ	|	|	|	|
9+20	0.7394	2.39	VQ	|	|	|	|
9+25	0.7563	2.45	VQ	|	|	|	|
9+30	0.7735	2.50	VQ	|	|	|	|
9+35	0.7911	2.56	V Q	|	|	|	|
9+40	0.8090	2.60	V Q	|	|	|	|
9+45	0.8273	2.65	V Q	|	|	|	|
9+50	0.8459	2.71	V Q	|	|	|	|
9+55	0.8648	2.74	V Q	|	|	|	|
10+ 0	0.8840	2.79	V Q	|	|	|	|
10+ 5	0.9034	2.82	V Q	|	|	|	|
10+10	0.9224	2.76	V Q	|	|	|	|
10+15	0.9403	2.59	V Q	|	|	|	|
10+20	0.9564	2.33	VQ	|	|	|	|
10+25	0.9717	2.23	VQ	|	|	|	|
10+30	0.9867	2.17	VQ	|	|	|	|
10+35	1.0014	2.14	VQ	|	|	|	|
10+40	1.0163	2.16	VQ	|	|	|	|
10+45	1.0319	2.27	VQ	|	|	|	|
10+50	1.0487	2.44	VQ	|	|	|	|
10+55	1.0659	2.51	V Q	|	|	|	|
11+ 0	1.0835	2.55	V Q	|	|	|	|
11+ 5	1.1012	2.57	V Q	|	|	|	|
11+10	1.1190	2.59	V Q	|	|	|	|
11+15	1.1367	2.58	V Q	|	|	|	|
11+20	1.1543	2.55	V Q	|	|	|	|
11+25	1.1718	2.55	V Q	|	|	|	|
11+30	1.1893	2.54	V Q	|	|	|	|
11+35	1.2068	2.53	V Q	|	|	|	|
11+40	1.2240	2.50	V Q	|	|	|	|
11+45	1.2409	2.45	|Q	|	|	|	|
11+50	1.2572	2.37	|Q	|	|	|	|
11+55	1.2734	2.35	|Q	|	|	|	|
12+ 0	1.2896	2.36	|Q	|	|	|	|
12+ 5	1.3062	2.40	|Q	|	|	|	|
12+10	1.3233	2.49	|Q	|	|	|	|
12+15	1.3417	2.68	|VQ	|	|	|	|
12+20	1.3621	2.95	|VQ	|	|	|	|
12+25	1.3832	3.08	|VQ	|	|	|	|
12+30	1.4051	3.17	|VQ	|	|	|	|
12+35	1.4276	3.27	|VQ	|	|	|	|
12+40	1.4507	3.35	|VQ	|	|	|	|
12+45	1.4744	3.44	|VQ	|	|	|	|
12+50	1.4988	3.55	|VQ	|	|	|	|
12+55	1.5237	3.61	|VQ	|	|	|	|
13+ 0	1.5490	3.68	|VQ	|	|	|	|
13+ 5	1.5749	3.76	|V Q	|	|	|	|
13+10	1.6014	3.84	|V Q	|	|	|	|
13+15	1.6289	4.00	|V Q	|	|	|	|
13+20	1.6579	4.21	|V Q	|	|	|	|
13+25	1.6876	4.30	|V Q	|	|	|	|
13+30	1.7176	4.36	|V Q	|	|	|	|

13+35	1.7477	4.37	V Q			
13+40	1.7772	4.28	V Q			
13+45	1.8048	4.01	V Q			
13+50	1.8296	3.60	VQ			
13+55	1.8533	3.44	VQ			
14+ 0	1.8763	3.34	VQ			
14+ 5	1.8988	3.28	VQ			
14+10	1.9213	3.26	VQ			
14+15	1.9442	3.33	VQ			
14+20	1.9680	3.45	VQ			
14+25	1.9919	3.48	VQ			
14+30	2.0158	3.47	VQ			
14+35	2.0397	3.46	VQ			
14+40	2.0635	3.46	VQ			
14+45	2.0873	3.46	VQ			
14+50	2.1111	3.46	VQ			
14+55	2.1348	3.45	VQ			
15+ 0	2.1584	3.42	VQ			
15+ 5	2.1816	3.37	VQ			
15+10	2.2047	3.35	VQ			
15+15	2.2275	3.31	VQ			
15+20	2.2499	3.26	VQ			
15+25	2.2721	3.23	VQ			
15+30	2.2941	3.19	VQ			
15+35	2.3156	3.13	VQ			
15+40	2.3367	3.06	VQ			
15+45	2.3569	2.93	VQ			
15+50	2.3759	2.77	VQ			
15+55	2.3945	2.70	VQ			
16+ 0	2.4127	2.65	VQ			
16+ 5	2.4304	2.57	VQ			
16+10	2.4468	2.37	Q			
16+15	2.4602	1.96	Q			
16+20	2.4696	1.36	Q			
16+25	2.4773	1.11	Q V			
16+30	2.4838	0.95	Q V			
16+35	2.4896	0.84	Q V			
16+40	2.4947	0.74	Q V			
16+45	2.4992	0.65	Q V			
16+50	2.5031	0.56	Q V			
16+55	2.5066	0.51	Q V			
17+ 0	2.5099	0.48	Q V			
17+ 5	2.5131	0.46	Q V			
17+10	2.5163	0.47	Q V			
17+15	2.5199	0.51	Q V			
17+20	2.5239	0.58	Q V			
17+25	2.5281	0.61	Q V			
17+30	2.5324	0.62	Q V			
17+35	2.5367	0.63	Q V			
17+40	2.5411	0.64	Q V			
17+45	2.5456	0.65	Q V			
17+50	2.5500	0.65	Q V			
17+55	2.5544	0.64	Q V			
18+ 0	2.5587	0.62	Q V			
18+ 5	2.5627	0.58	Q V			
18+10	2.5666	0.57	Q V			
18+15	2.5704	0.56	Q V			
18+20	2.5742	0.55	Q V			
18+25	2.5780	0.54	Q V			
18+30	2.5817	0.54	Q V			
18+35	2.5854	0.54	Q V			
18+40	2.5890	0.52	Q V			
18+45	2.5924	0.49	Q V			

18+50	2.5955	0.45	Q V	|	|	|	|
18+55	2.5984	0.42	Q V	|	|	|	|
19+ 0	2.6010	0.39	Q V	|	|	|	|
19+ 5	2.6034	0.34	Q V	|	|	|	|
19+10	2.6057	0.33	Q V	|	|	|	|
19+15	2.6081	0.34	Q V	|	|	|	|
19+20	2.6107	0.38	Q V	|	|	|	|
19+25	2.6134	0.40	Q V	|	|	|	|
19+30	2.6163	0.43	Q V	|	|	|	|
19+35	2.6195	0.47	Q V	|	|	|	|
19+40	2.6228	0.47	Q V	|	|	|	|
19+45	2.6260	0.46	Q V	|	|	|	|
19+50	2.6289	0.43	Q V	|	|	|	|
19+55	2.6317	0.41	Q V	|	|	|	|
20+ 0	2.6342	0.37	Q V	|	|	|	|
20+ 5	2.6365	0.33	Q V	|	|	|	|
20+10	2.6388	0.33	Q V	|	|	|	|
20+15	2.6411	0.34	Q V	|	|	|	|
20+20	2.6437	0.37	Q V	|	|	|	|
20+25	2.6463	0.38	Q V	|	|	|	|
20+30	2.6489	0.38	Q V	|	|	|	|
20+35	2.6516	0.39	Q V	|	|	|	|
20+40	2.6543	0.39	Q V	|	|	|	|
20+45	2.6570	0.39	Q V	|	|	|	|
20+50	2.6597	0.39	Q V	|	|	|	|
20+55	2.6623	0.38	Q V	|	|	|	|
21+ 0	2.6648	0.36	Q V	|	|	|	|
21+ 5	2.6670	0.32	Q V	|	|	|	|
21+10	2.6692	0.32	Q V	|	|	|	|
21+15	2.6715	0.33	Q V	|	|	|	|
21+20	2.6739	0.36	Q V	|	|	|	|
21+25	2.6764	0.36	Q V	|	|	|	|
21+30	2.6788	0.34	Q V	|	|	|	|
21+35	2.6809	0.31	Q V	|	|	|	|
21+40	2.6830	0.31	Q V	|	|	|	|
21+45	2.6853	0.33	Q V	|	|	|	|
21+50	2.6877	0.36	Q V	|	|	|	|
21+55	2.6902	0.36	Q V	|	|	|	|
22+ 0	2.6926	0.34	Q V	|	|	|	|
22+ 5	2.6947	0.31	Q V	|	|	|	|
22+10	2.6968	0.31	Q V	|	|	|	|
22+15	2.6990	0.33	Q V	|	|	|	|
22+20	2.7015	0.36	Q V	|	|	|	|
22+25	2.7040	0.36	Q V	|	|	|	|
22+30	2.7063	0.34	Q V	|	|	|	|
22+35	2.7084	0.30	Q V	|	|	|	|
22+40	2.7104	0.29	Q V	|	|	|	|
22+45	2.7124	0.29	Q V	|	|	|	|
22+50	2.7143	0.28	Q V	|	|	|	|
22+55	2.7162	0.28	Q V	|	|	|	|
23+ 0	2.7181	0.27	Q V	|	|	|	|
23+ 5	2.7200	0.27	Q V	|	|	|	|
23+10	2.7218	0.27	Q V	|	|	|	|
23+15	2.7237	0.27	Q V	|	|	|	|
23+20	2.7255	0.27	Q V	|	|	|	|
23+25	2.7273	0.27	Q V	|	|	|	|
23+30	2.7292	0.27	Q V	|	|	|	|
23+35	2.7310	0.27	Q V	|	|	|	|
23+40	2.7329	0.27	Q V	|	|	|	|
23+45	2.7347	0.27	Q V	|	|	|	|
23+50	2.7365	0.27	Q V	|	|	|	|
23+55	2.7384	0.27	Q V	|	|	|	|
24+ 0	2.7402	0.27	Q V	|	|	|	|

24+ 5	2.7403	0.01	Q V	|	|	|	|
24+10	2.7406	0.04	Q V	|	|	|	|
24+15	2.7414	0.12	Q V	|	|	|	|
24+20	2.7431	0.24	Q V	|	|	|	|
24+25	2.7452	0.31	Q V	|	|	|	|
24+30	2.7478	0.38	Q V	|	|	|	|
24+35	2.7510	0.46	Q V	|	|	|	|
24+40	2.7544	0.50	Q V	|	|	|	|
24+45	2.7581	0.53	Q V	|	|	|	|
24+50	2.7619	0.55	Q V	|	|	|	|
24+55	2.7659	0.58	Q V	|	|	|	|
25+ 0	2.7703	0.63	Q V	|	|	|	|
25+ 5	2.7751	0.70	Q V	|	|	|	|
25+10	2.7799	0.71	Q V	|	|	|	|
25+15	2.7847	0.69	Q V	|	|	|	|
25+20	2.7891	0.64	Q V	|	|	|	|
25+25	2.7934	0.63	Q V	|	|	|	|
25+30	2.7977	0.62	Q V	|	|	|	|
25+35	2.8019	0.61	Q V	|	|	|	|
25+40	2.8061	0.61	Q V	|	|	|	|
25+45	2.8103	0.61	Q V	|	|	|	|
25+50	2.8145	0.61	Q V	|	|	|	|
25+55	2.8188	0.62	Q V	|	|	|	|
26+ 0	2.8234	0.66	Q V	|	|	|	|
26+ 5	2.8283	0.72	Q V	|	|	|	|
26+10	2.8334	0.74	Q V	|	|	|	|
26+15	2.8387	0.76	Q V	|	|	|	|
26+20	2.8440	0.77	Q V	|	|	|	|
26+25	2.8493	0.78	Q V	|	|	|	|
26+30	2.8547	0.78	Q V	|	|	|	|
26+35	2.8602	0.79	Q V	|	|	|	|
26+40	2.8658	0.81	Q V	|	|	|	|
26+45	2.8716	0.85	Q V	|	|	|	|
26+50	2.8779	0.91	Q V	|	|	|	|
26+55	2.8844	0.94	Q V	|	|	|	|
27+ 0	2.8910	0.95	Q V	|	|	|	|
27+ 5	2.8976	0.97	Q V	|	|	|	|
27+10	2.9043	0.97	Q V	|	|	|	|
27+15	2.9111	0.98	Q V	|	|	|	|
27+20	2.9179	0.99	Q V	|	|	|	|
27+25	2.9247	0.99	Q V	|	|	|	|
27+30	2.9315	0.99	Q V	|	|	|	|
27+35	2.9384	0.99	Q V	|	|	|	|
27+40	2.9452	0.99	Q V	|	|	|	|
27+45	2.9521	1.00	Q V	|	|	|	|
27+50	2.9590	1.00	Q V	|	|	|	|
27+55	2.9660	1.02	Q V	|	|	|	|
28+ 0	2.9733	1.06	Q V	|	|	|	|
28+ 5	2.9810	1.12	Q V	|	|	|	|
28+10	2.9888	1.14	Q V	|	|	|	|
28+15	2.9968	1.16	Q V	|	|	|	|
28+20	3.0049	1.17	Q V	|	|	|	|
28+25	3.0131	1.20	Q V	|	|	|	|
28+30	3.0217	1.24	Q V	|	|	|	|
28+35	3.0307	1.31	|QV	|	|	|	|
28+40	3.0398	1.33	|QV	|	|	|	|
28+45	3.0491	1.35	|QV	|	|	|	|
28+50	3.0586	1.37	|QV	|	|	|	|
28+55	3.0682	1.39	|QV	|	|	|	|
29+ 0	3.0781	1.44	|QV	|	|	|	|
29+ 5	3.0884	1.49	|QV	|	|	|	|
29+10	3.0986	1.49	|QV	|	|	|	|
29+15	3.1084	1.43	|QV	|	|	|	|

29+20	3.1176	1.33	QV			
29+25	3.1266	1.31	QV			
29+30	3.1357	1.32	QV			
29+35	3.1451	1.37	QV			
29+40	3.1547	1.40	QV			
29+45	3.1647	1.44	QV			
29+50	3.1750	1.50	QV			
29+55	3.1855	1.53	QV			
30+ 0	3.1962	1.55	QV			
30+ 5	3.2070	1.57	QV			
30+10	3.2180	1.59	QV			
30+15	3.2293	1.64	QV			
30+20	3.2410	1.70	QV			
30+25	3.2529	1.73	QV			
30+30	3.2650	1.75	QV			
30+35	3.2771	1.77	QV			
30+40	3.2895	1.79	QV			
30+45	3.3021	1.84	QV			
30+50	3.3152	1.90	QV			
30+55	3.3285	1.93	QV			
31+ 0	3.3419	1.95	QV			
31+ 5	3.3554	1.96	QV			
31+10	3.3690	1.97	QV			
31+15	3.3826	1.98	QV			
31+20	3.3963	1.99	QV			
31+25	3.4101	2.01	QV			
31+30	3.4243	2.05	QV			
31+35	3.4388	2.12	QV			
31+40	3.4537	2.16	QV			
31+45	3.4689	2.21	QV			
31+50	3.4847	2.29	QV			
31+55	3.5008	2.34	QV			
32+ 0	3.5173	2.40	QV			
32+ 5	3.5344	2.48	QV			
32+10	3.5520	2.55	Q			
32+15	3.5703	2.66	Q			
32+20	3.5895	2.79	Q			
32+25	3.6091	2.85	Q			
32+30	3.6290	2.89	Q			
32+35	3.6491	2.92	Q			
32+40	3.6695	2.96	Q			
32+45	3.6902	3.02	Q			
32+50	3.7115	3.09	QV			
32+55	3.7331	3.14	QV			
33+ 0	3.7552	3.20	QV			
33+ 5	3.7778	3.28	QV			
33+10	3.8008	3.35	QV			
33+15	3.8246	3.45	QV			
33+20	3.8494	3.59	QV			
33+25	3.8746	3.67	QV			
33+30	3.9004	3.75	QV			
33+35	3.9269	3.84	Q			
33+40	3.9538	3.90	Q			
33+45	3.9811	3.97	Q			
33+50	4.0091	4.06	Q			
33+55	4.0374	4.11	Q			
34+ 0	4.0662	4.18	Q			
34+ 5	4.0953	4.22	Q			
34+10	4.1238	4.14	Q			
34+15	4.1506	3.89	Q			
34+20	4.1747	3.50	QV			
34+25	4.1978	3.35	QV			
34+30	4.2202	3.25	QV			

34+35	4.2423	3.21	QV				
34+40	4.2646	3.24	QV				
34+45	4.2880	3.40	QV				
34+50	4.3132	3.66	QV				
34+55	4.3391	3.76	Q				
35+ 0	4.3654	3.82	Q				
35+ 5	4.3920	3.86	Q				
35+10	4.4187	3.88	Q				
35+15	4.4453	3.87	Q				
35+20	4.4717	3.83	Q				
35+25	4.4980	3.82	Q				
35+30	4.5242	3.81	Q				
35+35	4.5503	3.79	Q				
35+40	4.5762	3.75	Q				
35+45	4.6015	3.67	QV				
35+50	4.6260	3.56	QV				
35+55	4.6502	3.52	QV				
36+ 0	4.6746	3.53	QV				
36+ 5	4.6994	3.61	QV				
36+10	4.7251	3.73	QV				
36+15	4.7528	4.01	Q				
36+20	4.7833	4.43	Q				
36+25	4.8150	4.61	Q				
36+30	4.8478	4.76	Q				
36+35	4.8816	4.91	Q				
36+40	4.9162	5.02	VQ				
36+45	4.9517	5.16	Q				
36+50	4.9884	5.33	Q				
36+55	5.0258	5.42	Q				
37+ 0	5.0637	5.52	Q				
37+ 5	5.1025	5.63	Q				
37+10	5.1422	5.77	Q				
37+15	5.1836	6.00	Q				
37+20	5.2271	6.32	VQ				
37+25	5.2715	6.45	VQ				
37+30	5.3166	6.55	VQ				
37+35	5.3618	6.56	VQ				
37+40	5.4060	6.42	VQ				
37+45	5.4474	6.02	Q				
37+50	5.4846	5.40	Q				
37+55	5.5201	5.16	Q				
38+ 0	5.5546	5.01	Q				
38+ 5	5.5884	4.91	QV				
38+10	5.6222	4.90	QV				
38+15	5.6565	4.99	QV				
38+20	5.6921	5.17	Q				
38+25	5.7281	5.21	Q				
38+30	5.7640	5.21	Q				
38+35	5.7997	5.19	Q				
38+40	5.8354	5.19	Q				
38+45	5.8711	5.19	Q				
38+50	5.9069	5.19	Q				
38+55	5.9425	5.17	Q				
39+ 0	5.9778	5.13	Q				
39+ 5	6.0126	5.06	Q				
39+10	6.0472	5.02	Q				
39+15	6.0814	4.96	QV				
39+20	6.1150	4.89	QV				
39+25	6.1484	4.84	QV				
39+30	6.1813	4.78	Q V				
39+35	6.2136	4.69	Q V				
39+40	6.2452	4.59	Q V				
39+45	6.2755	4.40	Q V				

39+50	6.3041	4.15	| Q V	|	|	|
39+55	6.3319	4.04	| Q V	|	|	|
40+ 0	6.3593	3.97	| Q V	|	|	|
40+ 5	6.3858	3.85	| Q V	|	|	|
40+10	6.4104	3.56	| Q V	|	|	|
40+15	6.4306	2.93	| Q V	|	|	|
40+20	6.4446	2.04	|Q V	|	|	|
40+25	6.4561	1.67	|Q V	|	|	|
40+30	6.4659	1.43	|Q V	|	|	|
40+35	6.4746	1.26	|Q V	|	|	|
40+40	6.4822	1.11	Q V	|	|	|
40+45	6.4890	0.98	Q V	|	|	|
40+50	6.4948	0.85	Q V	|	|	|
40+55	6.5001	0.77	Q V	|	|	|
41+ 0	6.5050	0.72	Q V	|	|	|
41+ 5	6.5098	0.70	Q V	|	|	|
41+10	6.5147	0.71	Q V	|	|	|
41+15	6.5200	0.77	Q V	|	|	|
41+20	6.5260	0.87	Q V	|	|	|
41+25	6.5323	0.91	Q V	|	|	|
41+30	6.5387	0.93	Q V	|	|	|
41+35	6.5453	0.95	Q V	|	|	|
41+40	6.5519	0.96	Q V	|	|	|
41+45	6.5585	0.97	Q V	|	|	|
41+50	6.5652	0.97	Q V	|	|	|
41+55	6.5719	0.96	Q V	|	|	|
42+ 0	6.5782	0.93	Q V	|	|	|
42+ 5	6.5842	0.87	Q V	|	|	|
42+10	6.5901	0.85	Q V	|	|	|
42+15	6.5958	0.83	Q V	|	|	|
42+20	6.6015	0.82	Q V	|	|	|
42+25	6.6071	0.82	Q V	|	|	|
42+30	6.6127	0.81	Q V	|	|	|
42+35	6.6182	0.80	Q V	|	|	|
42+40	6.6236	0.78	Q V	|	|	|
42+45	6.6287	0.74	Q V	|	|	|
42+50	6.6334	0.68	Q V	|	|	|
42+55	6.6378	0.64	Q V	|	|	|
43+ 0	6.6418	0.58	Q V	|	|	|
43+ 5	6.6453	0.51	Q V	|	|	|
43+10	6.6487	0.50	Q V	|	|	|
43+15	6.6523	0.52	Q V	|	|	|
43+20	6.6562	0.56	Q V	|	|	|
43+25	6.6603	0.59	Q V	|	|	|
43+30	6.6647	0.64	Q V	|	|	|
43+35	6.6695	0.70	Q V	|	|	|
43+40	6.6744	0.71	Q V	|	|	|
43+45	6.6791	0.69	Q V	|	|	|
43+50	6.6835	0.64	Q V	|	|	|
43+55	6.6877	0.61	Q V	|	|	|
44+ 0	6.6916	0.56	Q V	|	|	|
44+ 5	6.6950	0.50	Q V	|	|	|
44+10	6.6984	0.49	Q V	|	|	|
44+15	6.7019	0.51	Q V	|	|	|
44+20	6.7057	0.55	Q V	|	|	|
44+25	6.7096	0.57	Q V	|	|	|
44+30	6.7136	0.58	Q V	|	|	|
44+35	6.7176	0.58	Q V	|	|	|
44+40	6.7216	0.59	Q V	|	|	|
44+45	6.7257	0.59	Q V	|	|	|
44+50	6.7297	0.59	Q V	|	|	|
44+55	6.7337	0.57	Q V	|	|	|
45+ 0	6.7373	0.53	Q V	|	|	|

45+ 5	6.7407	0.48	Q	V				
45+10	6.7439	0.48	Q	V				
45+15	6.7474	0.50	Q	V				
45+20	6.7511	0.54	Q	V				
45+25	6.7548	0.54	Q	V				
45+30	6.7584	0.51	Q	V				
45+35	6.7616	0.46	Q	V				
45+40	6.7647	0.46	Q	V				
45+45	6.7681	0.49	Q	V				
45+50	6.7718	0.54	Q	V				
45+55	6.7755	0.54	Q	V				
46+ 0	6.7790	0.51	Q	V				
46+ 5	6.7822	0.46	Q	V				
46+10	6.7854	0.46	Q	V				
46+15	6.7887	0.49	Q	V				
46+20	6.7924	0.54	Q	V				
46+25	6.7961	0.54	Q	V				
46+30	6.7996	0.51	Q	V				
46+35	6.8028	0.46	Q	V				
46+40	6.8058	0.44	Q	V				
46+45	6.8087	0.43	Q	V				
46+50	6.8116	0.42	Q	V				
46+55	6.8145	0.41	Q	V				
47+ 0	6.8173	0.41	Q	V				
47+ 5	6.8201	0.41	Q	V				
47+10	6.8229	0.40	Q	V				
47+15	6.8257	0.40	Q	V				
47+20	6.8284	0.40	Q	V				
47+25	6.8312	0.40	Q	V				
47+30	6.8340	0.40	Q	V				
47+35	6.8367	0.40	Q	V				
47+40	6.8395	0.40	Q	V				
47+45	6.8422	0.40	Q	V				
47+50	6.8450	0.40	Q	V				
47+55	6.8477	0.40	Q	V				
48+ 0	6.8505	0.40	Q	V				
48+ 5	6.8506	0.01	Q	V				
48+10	6.8509	0.06	Q	V				
48+15	6.8520	0.16	Q	V				
48+20	6.8542	0.31	Q	V				
48+25	6.8569	0.39	Q	V				
48+30	6.8602	0.48	Q	V				
48+35	6.8642	0.58	Q	V				
48+40	6.8685	0.63	Q	V				
48+45	6.8731	0.67	Q	V				
48+50	6.8779	0.70	Q	V				
48+55	6.8830	0.74	Q	V				
49+ 0	6.8886	0.80	Q	V				
49+ 5	6.8946	0.88	Q	V				
49+10	6.9008	0.90	Q	V				
49+15	6.9068	0.87	Q	V				
49+20	6.9124	0.81	Q	V				
49+25	6.9179	0.79	Q	V				
49+30	6.9233	0.79	Q	V				
49+35	6.9286	0.78	Q	V				
49+40	6.9340	0.77	Q	V				
49+45	6.9393	0.77	Q	V				
49+50	6.9446	0.77	Q	V				
49+55	6.9500	0.79	Q	V				
50+ 0	6.9558	0.84	Q	V				
50+ 5	6.9621	0.91	Q	V				
50+10	6.9686	0.94	Q	V				
50+15	6.9752	0.96	Q	V				

50+20	6.9819	0.97	Q	V			
50+25	6.9887	0.98	Q	V			
50+30	6.9955	0.99	Q	V			
50+35	7.0024	1.00	Q	V			
50+40	7.0095	1.03	Q	V			
50+45	7.0170	1.08	Q	V			
50+50	7.0250	1.16	Q	V			
50+55	7.0332	1.19	Q	V			
51+ 0	7.0415	1.21	Q	V			
51+ 5	7.0499	1.22	Q	V			
51+10	7.0584	1.23	Q	V			
51+15	7.0670	1.24	Q	V			
51+20	7.0756	1.25	Q	V			
51+25	7.0842	1.25	|Q	V			
51+30	7.0929	1.26	|Q	V			
51+35	7.1015	1.26	|Q	V			
51+40	7.1102	1.26	|Q	V			
51+45	7.1189	1.26	|Q	V			
51+50	7.1276	1.27	|Q	V			
51+55	7.1365	1.29	|Q	V			
52+ 0	7.1457	1.34	|Q	V			
52+ 5	7.1555	1.41	|Q	V			
52+10	7.1654	1.45	|Q	V			
52+15	7.1755	1.46	|Q	V			
52+20	7.1857	1.48	|Q	V			
52+25	7.1962	1.52	|Q	V			
52+30	7.2070	1.57	|Q	V			
52+35	7.2184	1.65	|Q	V			
52+40	7.2300	1.69	|Q	V			
52+45	7.2418	1.71	|Q	V			
52+50	7.2538	1.73	|Q	V			
52+55	7.2659	1.77	|Q	V			
53+ 0	7.2785	1.82	|Q	V			
53+ 5	7.2915	1.89	|Q	V			
53+10	7.3045	1.88	|Q	V			
53+15	7.3169	1.81	|Q	V			
53+20	7.3285	1.68	|Q	V			
53+25	7.3399	1.65	|Q	V			
53+30	7.3514	1.67	|Q	V			
53+35	7.3634	1.73	|Q	V			
53+40	7.3756	1.77	|Q	V			
53+45	7.3881	1.83	|Q	V			
53+50	7.4013	1.90	|Q	V			
53+55	7.4146	1.94	|Q	V			
54+ 0	7.4281	1.96	|Q	V			
54+ 5	7.4418	1.98	|Q	V			
54+10	7.4557	2.02	|Q	V			
54+15	7.4700	2.08	|Q	V			
54+20	7.4848	2.16	|Q	V			
54+25	7.4999	2.19	|Q	V			
54+30	7.5152	2.22	|Q	V			
54+35	7.5306	2.24	|Q	V			
54+40	7.5462	2.27	|Q	V			
54+45	7.5623	2.33	|Q	V			
54+50	7.5789	2.41	|Q	V			
54+55	7.5957	2.44	|Q	V			
55+ 0	7.6127	2.47	|Q	V			
55+ 5	7.6298	2.48	|Q	V			
55+10	7.6470	2.50	|Q	V			
55+15	7.6642	2.50	| Q	V			
55+20	7.6816	2.52	| Q	V			
55+25	7.6991	2.54	| Q	V			
55+30	7.7170	2.60	| Q	V			

55+35	7.7354	2.68	Q V			
55+40	7.7542	2.73	Q V			
55+45	7.7736	2.80	Q V			
55+50	7.7935	2.90	Q V			
55+55	7.8139	2.96	Q V			
56+ 0	7.8348	3.04	Q V			
56+ 5	7.8565	3.14	Q V			
56+10	7.8787	3.23	Q V			
56+15	7.9019	3.36	Q V			
56+20	7.9262	3.53	Q V			
56+25	7.9511	3.61	Q V			
56+30	7.9763	3.66	Q V			
56+35	8.0018	3.70	Q V			
56+40	8.0276	3.75	Q V			
56+45	8.0539	3.82	Q V			
56+50	8.0808	3.91	Q V			
56+55	8.1082	3.98	Q V			
57+ 0	8.1361	4.05	Q V			
57+ 5	8.1648	4.16	Q V			
57+10	8.1940	4.24	Q V			
57+15	8.2241	4.37	Q V			
57+20	8.2554	4.55	Q V			
57+25	8.2874	4.65	Q V			
57+30	8.3201	4.75	Q V			
57+35	8.3536	4.86	Q V			
57+40	8.3877	4.94	Q V			
57+45	8.4223	5.03	Q V			
57+50	8.4577	5.14	Q V			
57+55	8.4936	5.21	Q V			
58+ 0	8.5301	5.30	Q V			
58+ 5	8.5669	5.35	Q V			
58+10	8.6031	5.25	Q V			
58+15	8.6370	4.93	Q V			
58+20	8.6676	4.43	Q V			
58+25	8.6968	4.24	Q V			
58+30	8.7251	4.12	Q V			
58+35	8.7531	4.06	Q V			
58+40	8.7814	4.10	Q V			
58+45	8.8110	4.31	Q V			
58+50	8.8430	4.64	Q V			
58+55	8.8758	4.76	Q V			
59+ 0	8.9091	4.84	Q V			
59+ 5	8.9427	4.89	Q V			
59+10	8.9766	4.91	Q V			
59+15	9.0103	4.90	Q V			
59+20	9.0437	4.85	Q V			
59+25	9.0770	4.84	Q V			
59+30	9.1102	4.83	Q V			
59+35	9.1433	4.81	Q V			
59+40	9.1761	4.76	Q V			
59+45	9.2081	4.65	Q V			
59+50	9.2391	4.51	Q V			
59+55	9.2699	4.46	Q V			
60+ 0	9.3007	4.48	Q V			
60+ 5	9.3322	4.57	Q V			
60+10	9.3647	4.73	Q V			
60+15	9.3998	5.09	Q V			
60+20	9.4384	5.61	Q V			
60+25	9.4786	5.84	Q V			
60+30	9.5201	6.03	Q V			
60+35	9.5629	6.21	Q V			
60+40	9.6067	6.36	Q V			
60+45	9.6518	6.54	Q V			

60+50	9.6982	6.75	Q V			
60+55	9.7455	6.87	Q V			
61+ 0	9.7936	6.99	Q V			
61+ 5	9.8428	7.13	Q V			
61+10	9.8931	7.30	Q V			
61+15	9.9454	7.60	Q V			
61+20	10.0005	8.00	Q V			
61+25	10.0568	8.18	Q V			
61+30	10.1139	8.29	Q V			
61+35	10.1711	8.30	Q V			
61+40	10.2271	8.13	Q V			
61+45	10.2796	7.62	Q V			
61+50	10.3267	6.84	Q V			
61+55	10.3717	6.53	Q V			
62+ 0	10.4154	6.34	Q V			
62+ 5	10.4583	6.22	Q V			
62+10	10.5010	6.20	Q V			
62+15	10.5445	6.32	Q V			
62+20	10.5896	6.55	Q V			
62+25	10.6351	6.61	Q V			
62+30	10.6806	6.60	Q V			
62+35	10.7258	6.57	Q V			
62+40	10.7711	6.57	Q V			
62+45	10.8163	6.57	Q V			
62+50	10.8616	6.57	Q V			
62+55	10.9067	6.55	Q V			
63+ 0	10.9514	6.50	Q V			
63+ 5	10.9956	6.41	Q V			
63+10	11.0394	6.36	Q V			
63+15	11.0826	6.28	Q V			
63+20	11.1253	6.19	Q V			
63+25	11.1675	6.13	Q V			
63+30	11.2092	6.06	Q V			
63+35	11.2501	5.94	Q V			
63+40	11.2901	5.81	Q V			
63+45	11.3285	5.58	Q V			
63+50	11.3647	5.26	Q V			
63+55	11.4000	5.12	Q V			
64+ 0	11.4347	5.03	Q V			
64+ 5	11.4683	4.88	Q V			
64+10	11.4993	4.51	Q V			
64+15	11.5249	3.72	Q V			
64+20	11.5427	2.58	Q V			
64+25	11.5573	2.11	Q V			
64+30	11.5698	1.81	Q V			
64+35	11.5807	1.59	Q V			
64+40	11.5904	1.41	Q V			
64+45	11.5989	1.24	Q V			
64+50	11.6063	1.07	Q V			
64+55	11.6130	0.97	Q V			
65+ 0	11.6193	0.91	Q V			
65+ 5	11.6253	0.88	Q V			
65+10	11.6315	0.90	Q V			
65+15	11.6382	0.98	Q V			
65+20	11.6459	1.11	Q V			
65+25	11.6538	1.16	Q V			
65+30	11.6620	1.18	Q V			
65+35	11.6702	1.20	Q V			
65+40	11.6786	1.22	Q V			
65+45	11.6870	1.23	Q V			
65+50	11.6955	1.23	Q V			
65+55	11.7039	1.22	Q V			
66+ 0	11.7120	1.17	Q V			

66+ 5	11.7196	1.10	Q	V			
66+10	11.7270	1.07	Q	V			
66+15	11.7343	1.06	Q	V			
66+20	11.7415	1.04	Q	V			
66+25	11.7486	1.03	Q	V			
66+30	11.7557	1.03	Q	V			
66+35	11.7627	1.02	Q	V			
66+40	11.7695	0.99	Q	V			
66+45	11.7760	0.94	Q	V			
66+50	11.7819	0.86	Q	V			
66+55	11.7874	0.80	Q	V			
67+ 0	11.7925	0.73	Q	V			
67+ 5	11.7970	0.65	Q	V			
67+10	11.8013	0.63	Q	V			
67+15	11.8058	0.66	Q	V			
67+20	11.8108	0.72	Q	V			
67+25	11.8159	0.75	Q	V			
67+30	11.8215	0.81	Q	V			
67+35	11.8276	0.88	Q	V			
67+40	11.8338	0.90	Q	V			
67+45	11.8398	0.87	Q	V			
67+50	11.8453	0.81	Q	V			
67+55	11.8506	0.77	Q	V			
68+ 0	11.8555	0.71	Q	V			
68+ 5	11.8599	0.63	Q	V			
68+10	11.8642	0.62	Q	V			
68+15	11.8686	0.65	Q	V			
68+20	11.8735	0.70	Q	V			
68+25	11.8784	0.72	Q	V			
68+30	11.8834	0.73	Q	V			
68+35	11.8885	0.74	Q	V			
68+40	11.8936	0.74	Q	V			
68+45	11.8987	0.75	Q	V			
68+50	11.9039	0.74	Q	V			
68+55	11.9089	0.73	Q	V			
69+ 0	11.9135	0.68	Q	V			
69+ 5	11.9177	0.61	Q	V			
69+10	11.9219	0.60	Q	V			
69+15	11.9262	0.63	Q	V			
69+20	11.9310	0.69	Q	V			
69+25	11.9357	0.69	Q	V			
69+30	11.9402	0.65	Q	V			
69+35	11.9442	0.59	Q	V			
69+40	11.9482	0.59	Q	V			
69+45	11.9525	0.62	Q	V			
69+50	11.9572	0.68	Q	V			
69+55	11.9619	0.68	Q	V			
70+ 0	11.9663	0.64	Q	V			
70+ 5	11.9704	0.59	Q	V			
70+10	11.9744	0.58	Q	V			
70+15	11.9786	0.62	Q	V			
70+20	11.9833	0.68	Q	V			
70+25	11.9880	0.68	Q	V			
70+30	11.9924	0.64	Q	V			
70+35	11.9964	0.58	Q	V			
70+40	12.0002	0.56	Q	V			
70+45	12.0040	0.54	Q	V			
70+50	12.0076	0.53	Q	V			
70+55	12.0113	0.53	Q	V			
71+ 0	12.0148	0.52	Q	V			
71+ 5	12.0184	0.52	Q	V			
71+10	12.0219	0.51	Q	V			
71+15	12.0254	0.51	Q	V			

71+20	12.0289	0.51	Q	V|	|	|	|
71+25	12.0324	0.51	Q	V|	|	|	|
71+30	12.0359	0.51	Q	V|	|	|	|
71+35	12.0394	0.51	Q	V|	|	|	|
71+40	12.0429	0.51	Q	V|	|	|	|
71+45	12.0464	0.51	Q	V|	|	|	|
71+50	12.0499	0.51	Q	V|	|	|	|
71+55	12.0534	0.51	Q	V|	|	|	|
72+ 0	12.0568	0.51	Q	V|	|	|	|
72+ 5	12.0570	0.02	Q	V|	|	|	|
72+10	12.0577	0.10	Q	V|	|	|	|
72+15	12.0598	0.30	Q	V|	|	|	|
72+20	12.0638	0.59	Q	V|	|	|	|
72+25	12.0689	0.74	Q	V|	|	|	|
72+30	12.0752	0.91	Q	V|	|	|	|
72+35	12.0828	1.10	Q	V|	|	|	|
72+40	12.0910	1.20	Q	V|	|	|	|
72+45	12.0998	1.26	|Q	V|	|	|	|
72+50	12.1089	1.33	|Q	V|	|	|	|
72+55	12.1185	1.40	|Q	V|	|	|	|
73+ 0	12.1290	1.52	|Q	V|	|	|	|
73+ 5	12.1405	1.67	|Q	V|	|	|	|
73+10	12.1522	1.70	|Q	V|	|	|	|
73+15	12.1636	1.65	|Q	V|	|	|	|
73+20	12.1741	1.54	|Q	V|	|	|	|
73+25	12.1845	1.50	|Q	V|	|	|	|
73+30	12.1948	1.49	|Q	V|	|	|	|
73+35	12.2049	1.48	|Q	V|	|	|	|
73+40	12.2150	1.47	|Q	V|	|	|	|
73+45	12.2251	1.46	|Q	V|	|	|	|
73+50	12.2352	1.46	|Q	V|	|	|	|
73+55	12.2455	1.50	|Q	V|	|	|	|
74+ 0	12.2564	1.59	|Q	V|	|	|	|
74+ 5	12.2683	1.73	|Q	V|	|	|	|
74+10	12.2806	1.78	|Q	V|	|	|	|
74+15	12.2932	1.82	|Q	V|	|	|	|
74+20	12.3059	1.85	|Q	V|	|	|	|
74+25	12.3187	1.87	|Q	V|	|	|	|
74+30	12.3317	1.88	|Q	V|	|	|	|
74+35	12.3448	1.90	|Q	V|	|	|	|
74+40	12.3582	1.95	|Q	V	|	|	|
74+45	12.3723	2.05	|Q	V	|	|	|
74+50	12.3874	2.19	|Q	V	|	|	|
74+55	12.4030	2.25	|Q	V	|	|	|
75+ 0	12.4187	2.29	|Q	V	|	|	|
75+ 5	12.4347	2.32	|Q	V	|	|	|
75+10	12.4508	2.34	|Q	V	|	|	|
75+15	12.4670	2.35	|Q	V	|	|	|
75+20	12.4833	2.37	|Q	V	|	|	|
75+25	12.4997	2.38	|Q	V	|	|	|
75+30	12.5161	2.38	|Q	V	|	|	|
75+35	12.5325	2.38	|Q	V	|	|	|
75+40	12.5490	2.39	|Q	V	|	|	|
75+45	12.5654	2.39	|Q	V	|	|	|
75+50	12.5819	2.40	|Q	V	|	|	|
75+55	12.5988	2.44	|Q	V	|	|	|
76+ 0	12.6163	2.54	| Q	V	|	|	|
76+ 5	12.6347	2.68	| Q	V	|	|	|
76+10	12.6536	2.74	| Q	V	|	|	|
76+15	12.6727	2.77	| Q	V	|	|	|
76+20	12.6921	2.81	| Q	V	|	|	|
76+25	12.7118	2.87	| Q	V	|	|	|
76+30	12.7324	2.98	| Q	V	|	|	|

76+35	12.7540	3.13	Q V			
76+40	12.7760	3.20	Q V			
76+45	12.7983	3.24	Q V			
76+50	12.8209	3.28	Q V			
76+55	12.8440	3.34	Q V			
77+ 0	12.8678	3.46	Q V			
77+ 5	12.8925	3.59	Q V			
77+10	12.9171	3.57	Q V			
77+15	12.9406	3.42	Q V			
77+20	12.9626	3.19	Q V			
77+25	12.9842	3.13	Q V			
77+30	13.0060	3.17	Q V			
77+35	13.0286	3.28	Q V			
77+40	13.0517	3.35	Q V			
77+45	13.0756	3.46	Q V			
77+50	13.1004	3.61	Q V			
77+55	13.1257	3.67	Q V			
78+ 0	13.1513	3.71	Q V			
78+ 5	13.1772	3.76	Q V			
78+10	13.2035	3.82	Q V			
78+15	13.2306	3.94	Q V			
78+20	13.2588	4.09	Q V			
78+25	13.2874	4.16	Q V			
78+30	13.3163	4.20	Q V			
78+35	13.3455	4.24	Q V			
78+40	13.3751	4.30	Q V			
78+45	13.4055	4.41	Q V			
78+50	13.4369	4.57	Q V			
78+55	13.4688	4.63	Q V			
79+ 0	13.5011	4.68	Q V			
79+ 5	13.5335	4.71	Q V			
79+10	13.5660	4.73	Q V			
79+15	13.5987	4.74	Q |V			
79+20	13.6315	4.77	Q |V			
79+25	13.6647	4.82	Q |V			
79+30	13.6986	4.92	Q |V			
79+35	13.7336	5.08	Q |V			
79+40	13.7692	5.18	Q |V			
79+45	13.8058	5.31	Q |V			
79+50	13.8436	5.49	Q |V			
79+55	13.8823	5.61	Q |V			
80+ 0	13.9219	5.76	Q |V			
80+ 5	13.9629	5.96	Q |V			
80+10	14.0051	6.12	Q |V			
80+15	14.0490	6.37	Q |V			
80+20	14.0951	6.69	Q |V			
80+25	14.1422	6.84	Q |V			
80+30	14.1899	6.93	Q |V			
80+35	14.2382	7.01	Q |V			
80+40	14.2871	7.10	Q |V			
80+45	14.3370	7.24	Q |V			
80+50	14.3880	7.42	Q |V			
80+55	14.4399	7.53	Q |V			
81+ 0	14.4928	7.68	Q |V			
81+ 5	14.5470	7.88	Q |V			
81+10	14.6024	8.04	Q |V			
81+15	14.6595	8.29	Q |V			
81+20	14.7189	8.62	Q |V			
81+25	14.7795	8.80	Q |V			
81+30	14.8414	9.00	Q | V			
81+35	14.9049	9.22	Q | V			
81+40	14.9694	9.36	Q | V			
81+45	15.0351	9.53	Q | V			

81+50	15.1021	9.74	|	Q | V	|	|	|
81+55	15.1701	9.87	|	Q | V	|	|	|
82+ 0	15.2393	10.04	|	Q | V	|	|	|
82+ 5	15.3091	10.14	|	Q | V	|	|	|
82+10	15.3776	9.94	|	Q | V	|	|	|
82+15	15.4419	9.34	|	Q | V	|	|	|
82+20	15.4997	8.40	|	Q | V	|	|	|
82+25	15.5551	8.03	|	Q | V	|	|	|
82+30	15.6088	7.80	|	Q | V	|	|	|
82+35	15.6618	7.70	|	Q | V	|	|	|
82+40	15.7154	7.78	|	Q | V	|	|	|
82+45	15.7716	8.16	|	Q | V	|	|	|
82+50	15.8321	8.78	|	Q | V	|	|	|
82+55	15.8942	9.02	|	Q | V	|	|	|
83+ 0	15.9573	9.16	|	Q | V	|	|	|
83+ 5	16.0211	9.26	|	Q | V	|	|	|
83+10	16.0852	9.31	|	Q | V	|	|	|
83+15	16.1491	9.28	|	Q | V	|	|	|
83+20	16.2124	9.19	|	Q | V	|	|	|
83+25	16.2755	9.16	|	Q | V	|	|	|
83+30	16.3385	9.15	|	Q | V	|	|	|
83+35	16.4012	9.11	|	Q | V	|	|	|
83+40	16.4632	9.01	|	Q | V	|	|	|
83+45	16.5239	8.81	|	Q | V	|	|	|
83+50	16.5827	8.54	|	Q | V	|	|	|
83+55	16.6410	8.46	|	Q | V	|	|	|
84+ 0	16.6994	8.48	|	Q | V	|	|	|
84+ 5	16.7590	8.66	|	Q | V	|	|	|
84+10	16.8207	8.96	|	Q | V	|	|	|
84+15	16.8871	9.64	|	Q | V	|	|	|
84+20	16.9603	10.63	|	Q | V	|	|	|
84+25	17.0365	11.07	|	Q | V	|	|	|
84+30	17.1152	11.42	|	Q| V	|	|	|
84+35	17.1962	11.77	|	Q| V	|	|	|
84+40	17.2792	12.05	|	Q| V	|	|	|
84+45	17.3645	12.39	|	Q| V	|	|	|
84+50	17.4526	12.78	|	Q V	|	|	|
84+55	17.5422	13.01	|	Q V	|	|	|
85+ 0	17.6334	13.24	|	Q V	|	|	|
85+ 5	17.7265	13.52	|	Q V	|	|	|
85+10	17.8218	13.84	|	|Q V	|	|	|
85+15	17.9210	14.40	|	|Q V	|	|	|
85+20	18.0254	15.16	|	| Q V	|	|	|
85+25	18.1321	15.49	|	| Q V	|	|	|
85+30	18.2402	15.71	|	| Q V	|	|	|
85+35	18.3486	15.73	|	| Q V	|	|	|
85+40	18.4547	15.40	|	| Q V	|	|	|
85+45	18.5541	14.44	|	|Q V	|	|	|
85+50	18.6434	12.97	|	Q V	|	|	|
85+55	18.7287	12.38	|	Q| V	|	|	|
86+ 0	18.8114	12.01	|	Q| V	|	|	|
86+ 5	18.8926	11.79	|	Q| V	|	|	|
86+10	18.9736	11.75	|	Q| V	|	|	|
86+15	19.0561	11.98	|	Q| V	|	|	|
86+20	19.1415	12.41	|	Q| V	|	|	|
86+25	19.2277	12.52	|	Q V	|	|	|
86+30	19.3139	12.51	|	Q V	|	|	|
86+35	19.3996	12.44	|	Q| V	|	|	|
86+40	19.4853	12.45	|	Q| V	|	|	|
86+45	19.5711	12.46	|	Q| V	|	|	|
86+50	19.6568	12.45	|	Q| V	|	|	|
86+55	19.7423	12.41	|	Q| V	|	|	|
87+ 0	19.8271	12.31	|	Q| V	|	|	|

87+ 5	19.9107	12.15	| Q|	V	|	|	|
87+10	19.9937	12.04	| Q|	V	|	|	|
87+15	20.0757	11.91	| Q|	V	|	|	|
87+20	20.1565	11.73	| Q|	V	|	|	|
87+25	20.2365	11.62	| Q|	V	|	|	|
87+30	20.3155	11.47	| Q|	V	|	|	|
87+35	20.3930	11.25	| Q|	V	|	|	|
87+40	20.4688	11.01	| Q |	V	|	|	|
87+45	20.5415	10.57	| Q |	V	|	|	|
87+50	20.6102	9.97	| Q |	V	|	|	|
87+55	20.6770	9.71	| Q |	V	|	|	|
88+ 0	20.7427	9.54	| Q |	V	|	|	|
88+ 5	20.8064	9.24	| Q |	V	|	|	|
88+10	20.8652	8.54	| Q |	V	|	|	|
88+15	20.9137	7.04	| Q |	V	|	|	|
88+20	20.9474	4.90	| Q |	V	|	|	|
88+25	20.9750	4.00	| Q |	V	|	|	|
88+30	20.9986	3.43	| Q |	V	|	|	|
88+35	21.0194	3.01	| Q |	V	|	|	|
88+40	21.0378	2.67	| Q |	V	|	|	|
88+45	21.0539	2.34	|Q |	V	|	|	|
88+50	21.0679	2.03	|Q |	V	|	|	|
88+55	21.0806	1.85	|Q |	V	|	|	|
89+ 0	21.0924	1.72	|Q |	V	|	|	|
89+ 5	21.1039	1.67	|Q |	V	|	|	|
89+10	21.1156	1.70	|Q |	V	|	|	|
89+15	21.1284	1.85	|Q |	V	|	|	|
89+20	21.1428	2.10	|Q |	V	|	|	|
89+25	21.1579	2.19	|Q |	V	|	|	|
89+30	21.1733	2.24	|Q |	V	|	|	|
89+35	21.1890	2.27	|Q |	V	|	|	|
89+40	21.2049	2.30	|Q |	V	|	|	|
89+45	21.2209	2.33	|Q |	V	|	|	|
89+50	21.2369	2.33	|Q |	V	|	|	|
89+55	21.2528	2.31	|Q |	V	|	|	|
90+ 0	21.2682	2.22	|Q |	V	|	|	|
90+ 5	21.2825	2.09	|Q |	V	|	|	|
90+10	21.2966	2.04	|Q |	V	|	|	|
90+15	21.3103	2.00	|Q |	V	|	|	|
90+20	21.3240	1.98	|Q |	V	|	|	|
90+25	21.3375	1.96	|Q |	V	|	|	|
90+30	21.3509	1.95	|Q |	V	|	|	|
90+35	21.3642	1.93	|Q |	V	|	|	|
90+40	21.3771	1.88	|Q |	V	|	|	|
90+45	21.3893	1.78	|Q |	V	|	|	|
90+50	21.4005	1.62	|Q |	V	|	|	|
90+55	21.4110	1.52	|Q |	V	|	|	|
91+ 0	21.4206	1.39	|Q |	V	|	|	|
91+ 5	21.4291	1.24	Q |	V	|	|	|
91+10	21.4374	1.20	Q |	V	|	|	|
91+15	21.4459	1.24	Q |	V	|	|	|
91+20	21.4553	1.36	|Q |	V	|	|	|
91+25	21.4651	1.42	|Q |	V	|	|	|
91+30	21.4756	1.54	|Q |	V	|	|	|
91+35	21.4872	1.67	|Q |	V	|	|	|
91+40	21.4989	1.70	|Q |	V	|	|	|
91+45	21.5103	1.65	|Q |	V	|	|	|
91+50	21.5208	1.53	|Q |	V	|	|	|
91+55	21.5308	1.46	|Q |	V	|	|	|
92+ 0	21.5401	1.34	|Q |	V	|	|	|
92+ 5	21.5484	1.20	Q |	V	|	|	|
92+10	21.5565	1.17	Q |	V	|	|	|
92+15	21.5649	1.22	Q |	V	|	|	|

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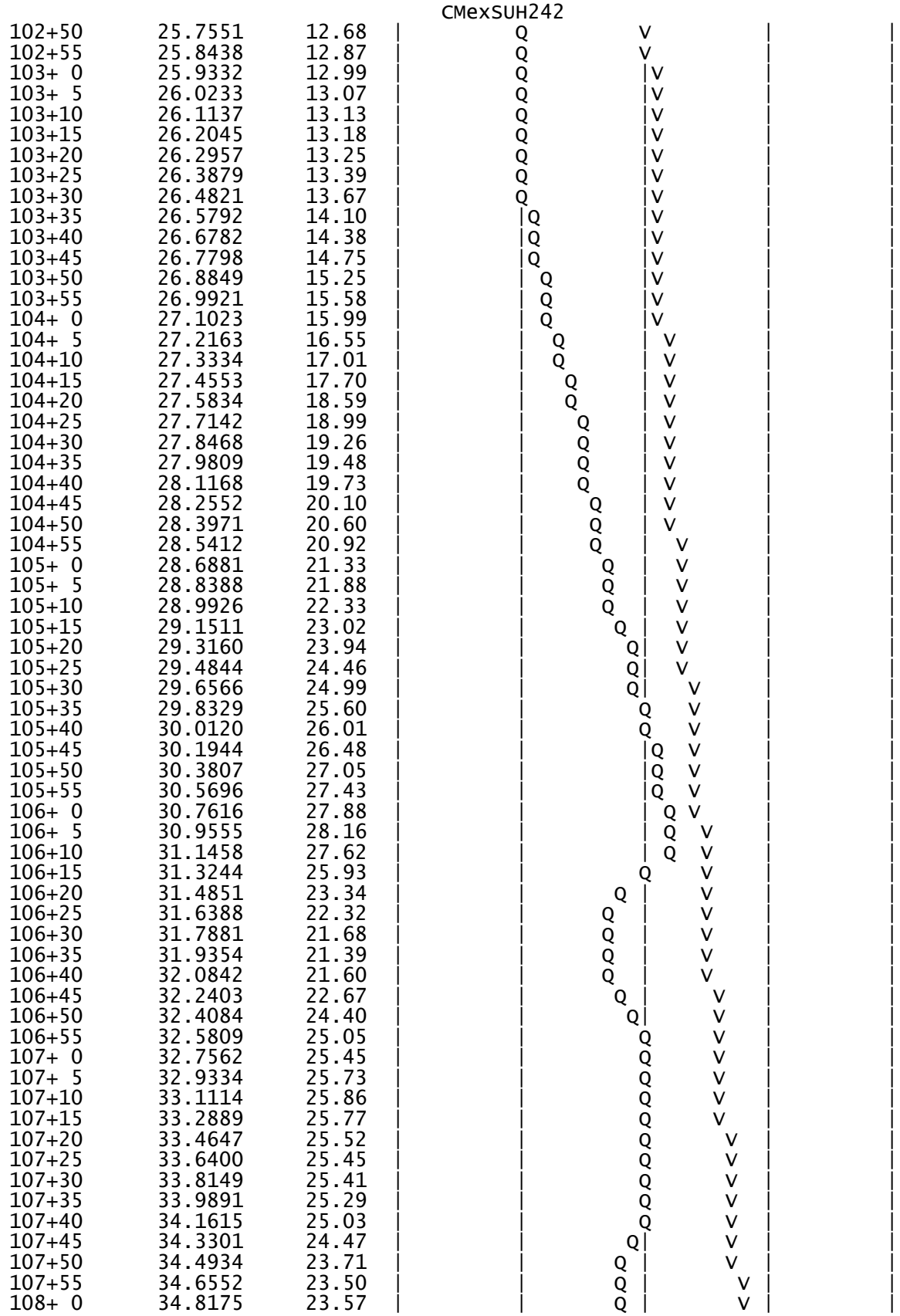
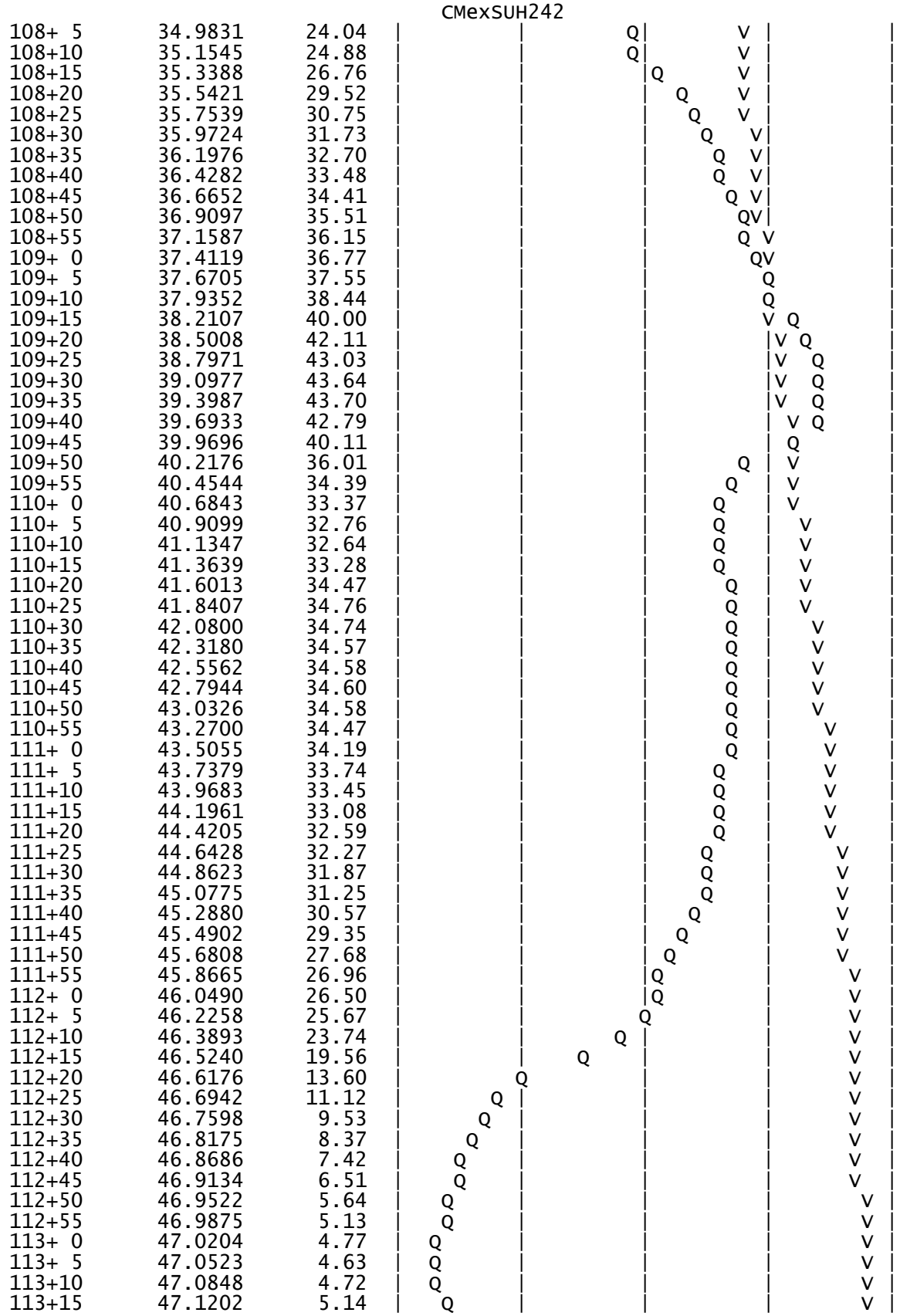
92+20      21.5741      1.33  |Q          |        V  |          |          |
92+25      21.5834      1.36  |Q          |        V  |          |          |
92+30      21.5930      1.38  |Q          |        V  |          |          |
92+35      21.6026      1.39  |Q          |        V  |          |          |
92+40      21.6122      1.41  |Q          |        V  |          |          |
92+45      21.6220      1.41  |Q          |        V  |          |          |
92+50      21.6317      1.41  |Q          |        V  |          |          |
92+55      21.6412      1.38  |Q          |        V  |          |          |
93+ 0      21.6500      1.28  |Q          |        V  |          |          |
93+ 5      21.6580      1.16  Q           |        V  |          |          |
93+10      21.6658      1.14  Q           |        V  |          |          |
93+15      21.6741      1.20  Q           |        V  |          |          |
93+20      21.6830      1.30  |Q          |        V  |          |          |
93+25      21.6920      1.30  |Q          |        V  |          |          |
93+30      21.7004      1.23  Q           |        V  |          |          |
93+35      21.7081      1.11  Q           |        V  |          |          |
93+40      21.7157      1.11  Q           |        V  |          |          |
93+45      21.7239      1.18  Q           |        V  |          |          |
93+50      21.7327      1.29  |Q          |        V  |          |          |
93+55      21.7416      1.29  |Q          |        V  |          |          |
94+ 0      21.7500      1.22  Q           |        V  |          |          |
94+ 5      21.7577      1.11  Q           |        V  |          |          |
94+10      21.7653      1.11  Q           |        V  |          |          |
94+15      21.7734      1.17  Q           |        V  |          |          |
94+20      21.7822      1.28  |Q          |        V  |          |          |
94+25      21.7911      1.29  |Q          |        V  |          |          |
94+30      21.7995      1.22  Q           |        V  |          |          |
94+35      21.8070      1.10  Q           |        V  |          |          |
94+40      21.8143      1.05  Q           |        V  |          |          |
94+45      21.8214      1.03  Q           |        V  |          |          |
94+50      21.8283      1.01  Q           |        V  |          |          |
94+55      21.8352      1.00  Q           |        V  |          |          |
95+ 0      21.8420      0.99  Q           |        V  |          |          |
95+ 5      21.8487      0.98  Q           |        V  |          |          |
95+10      21.8554      0.97  Q           |        V  |          |          |
95+15      21.8620      0.97  Q           |        V  |          |          |
95+20      21.8687      0.96  Q           |        V  |          |          |
95+25      21.8753      0.96  Q           |        V  |          |          |
95+30      21.8819      0.96  Q           |        V  |          |          |
95+35      21.8885      0.96  Q           |        V  |          |          |
95+40      21.8951      0.96  Q           |        V  |          |          |
95+45      21.9017      0.96  Q           |        V  |          |          |
95+50      21.9083      0.96  Q           |        V  |          |          |
95+55      21.9149      0.96  Q           |        V  |          |          |
96+ 0      21.9215      0.96  Q           |        V  |          |          |
96+ 5      21.9220      0.07  Q           |        V  |          |          |
96+10      21.9240      0.29  Q           |        V  |          |          |
96+15      21.9297      0.82  Q           |        V  |          |          |
96+20      21.9409      1.63  |Q          |        V  |          |          |
96+25      21.9551      2.06  |Q          |        V  |          |          |
96+30      21.9725      2.53  | Q         |        V  |          |          |
96+35      21.9936      3.06  | Q         |        V  |          |          |
96+40      22.0165      3.33  | Q         |        V  |          |          |
96+45      22.0407      3.51  | Q         |        V  |          |          |
96+50      22.0661      3.68  | Q         |        V  |          |          |
96+55      22.0929      3.89  |  Q        |        V  |          |          |
97+ 0      22.1221      4.23  |  Q        |        V  |          |          |
97+ 5      22.1540      4.63  |  Q        |        V  |          |          |
97+10      22.1864      4.71  |  Q        |        V  |          |          |
97+15      22.2180      4.57  |  Q        |        V  |          |          |
97+20      22.2474      4.27  |  Q        |         V |          |          |
97+25      22.2762      4.18  |  Q        |         V |          |          |
97+30      22.3046      4.13  |  Q        |         V |          |          |
```

97+35	22.3329	4.10	Q	V		
97+40	22.3609	4.07	Q	V		
97+45	22.3888	4.05	Q	V		
97+50	22.4168	4.07	Q	V		
97+55	22.4455	4.16	Q	V		
98+ 0	22.4759	4.42	Q	V		
98+ 5	22.5090	4.80	Q	V		
98+10	22.5432	4.96	Q	V		
98+15	22.5780	5.06	Q	V		
98+20	22.6133	5.13	Q	V		
98+25	22.6490	5.18	Q	V		
98+30	22.6850	5.22	Q	V		
98+35	22.7214	5.28	Q	V		
98+40	22.7587	5.42	Q	V		
98+45	22.7979	5.70	Q	V		
98+50	22.8399	6.09	Q	V		
98+55	22.8830	6.26	Q	V		
99+ 0	22.9268	6.36	Q	V		
99+ 5	22.9712	6.44	Q	V		
99+10	23.0159	6.50	Q	V		
99+15	23.0609	6.54	Q	V		
99+20	23.1062	6.57	Q	V		
99+25	23.1517	6.60	Q	V		
99+30	23.1972	6.62	Q	V		
99+35	23.2429	6.62	Q	V		
99+40	23.2885	6.63	Q	V		
99+45	23.3342	6.63	Q	V		
99+50	23.3801	6.67	Q	V		
99+55	23.4269	6.79	Q	V		
100+ 0	23.4755	7.06	Q	V		
100+ 5	23.5267	7.45	Q	V		
100+10	23.5791	7.61	Q	V		
100+15	23.6322	7.71	Q	V		
100+20	23.6860	7.81	Q	V		
100+25	23.7410	7.98	Q	V		
100+30	23.7981	8.29	Q	V		
100+35	23.8580	8.71	Q	V		
100+40	23.9192	8.89	Q	V		
100+45	23.9812	9.00	Q	V		
100+50	24.0440	9.12	Q	V		
100+55	24.1080	9.29	Q	V		
101+ 0	24.1742	9.60	Q	V		
101+ 5	24.2427	9.96	Q	V		
101+10	24.3111	9.92	Q	V		
101+15	24.3765	9.51	Q	V		
101+20	24.4375	8.85	Q	V		
101+25	24.4974	8.70	Q	V		
101+30	24.5581	8.81	Q	V		
101+35	24.6209	9.12	Q	V		
101+40	24.6851	9.31	Q	V		
101+45	24.7513	9.62	Q	V		
101+50	24.8203	10.02	Q	V		
101+55	24.8906	10.20	Q	V		
102+ 0	24.9616	10.32	Q	V		
102+ 5	25.0335	10.44	Q	V		
102+10	25.1067	10.62	Q	V		
102+15	25.1820	10.94	Q	V		
102+20	25.2603	11.36	Q	V		
102+25	25.3398	11.54	Q	V		
102+30	25.4201	11.66	Q	V		
102+35	25.5011	11.77	Q	V		
102+40	25.5834	11.94	Q	V		
102+45	25.6678	12.26	Q	V		



102+50	25.7551	12.68	Q V
102+55	25.8438	12.87	Q V
103+ 0	25.9332	12.99	Q |V
103+ 5	26.0233	13.07	Q |V
103+10	26.1137	13.13	Q |V
103+15	26.2045	13.18	Q |V
103+20	26.2957	13.25	Q |V
103+25	26.3879	13.39	Q |V
103+30	26.4821	13.67	Q |V
103+35	26.5792	14.10	|Q |V
103+40	26.6782	14.38	|Q |V
103+45	26.7798	14.75	|Q |V
103+50	26.8849	15.25	| Q |V
103+55	26.9921	15.58	| Q |V
104+ 0	27.1023	15.99	| Q |V
104+ 5	27.2163	16.55	| Q | V
104+10	27.3334	17.01	| Q | V
104+15	27.4553	17.70	| Q | V
104+20	27.5834	18.59	| Q | V
104+25	27.7142	18.99	| Q | V
104+30	27.8468	19.26	| Q | V
104+35	27.9809	19.48	| Q | V
104+40	28.1168	19.73	| Q | V
104+45	28.2552	20.10	| Q | V
104+50	28.3971	20.60	| Q | V
104+55	28.5412	20.92	| Q | V
105+ 0	28.6881	21.33	| Q | V
105+ 5	28.8388	21.88	| Q | V
105+10	28.9926	22.33	| Q | V
105+15	29.1511	23.02	| Q | V
105+20	29.3160	23.94	| Q| V
105+25	29.4844	24.46	| Q| V
105+30	29.6566	24.99	| Q| V
105+35	29.8329	25.60	| Q V
105+40	30.0120	26.01	| Q V
105+45	30.1944	26.48	| |Q V
105+50	30.3807	27.05	| |Q V
105+55	30.5696	27.43	| |Q V
106+ 0	30.7616	27.88	| | Q V
106+ 5	30.9555	28.16	| | Q V
106+10	31.1458	27.62	| | Q V
106+15	31.3244	25.93	| | Q V
106+20	31.4851	23.34	| | Q | V
106+25	31.6388	22.32	| | Q | V
106+30	31.7881	21.68	| | Q | V
106+35	31.9354	21.39	| | Q | V
106+40	32.0842	21.60	| | Q | V
106+45	32.2403	22.67	| | Q | V
106+50	32.4084	24.40	| | Q| V
106+55	32.5809	25.05	| | Q V
107+ 0	32.7562	25.45	| | Q V
107+ 5	32.9334	25.73	| | Q V
107+10	33.1114	25.86	| | Q V
107+15	33.2889	25.77	| | Q V
107+20	33.4647	25.52	| | Q V
107+25	33.6400	25.45	| | Q V
107+30	33.8149	25.41	| | Q V
107+35	33.9891	25.29	| | Q V
107+40	34.1615	25.03	| | Q V
107+45	34.3301	24.47	| | Q| V
107+50	34.4934	23.71	| | Q | V
107+55	34.6552	23.50	| | Q | V
108+ 0	34.8175	23.57	| | Q | V



108+ 5	34.9831	24.04	
108+10	35.1545	24.88	
108+15	35.3388	26.76	
108+20	35.5421	29.52	
108+25	35.7539	30.75	
108+30	35.9724	31.73	
108+35	36.1976	32.70	
108+40	36.4282	33.48	
108+45	36.6652	34.41	
108+50	36.9097	35.51	
108+55	37.1587	36.15	
109+ 0	37.4119	36.77	
109+ 5	37.6705	37.55	
109+10	37.9352	38.44	
109+15	38.2107	40.00	
109+20	38.5008	42.11	
109+25	38.7971	43.03	
109+30	39.0977	43.64	
109+35	39.3987	43.70	
109+40	39.6933	42.79	
109+45	39.9696	40.11	
109+50	40.2176	36.01	
109+55	40.4544	34.39	
110+ 0	40.6843	33.37	
110+ 5	40.9099	32.76	
110+10	41.1347	32.64	
110+15	41.3639	33.28	
110+20	41.6013	34.47	
110+25	41.8407	34.76	
110+30	42.0800	34.74	
110+35	42.3180	34.57	
110+40	42.5562	34.58	
110+45	42.7944	34.60	
110+50	43.0326	34.58	
110+55	43.2700	34.47	
111+ 0	43.5055	34.19	
111+ 5	43.7379	33.74	
111+10	43.9683	33.45	
111+15	44.1961	33.08	
111+20	44.4205	32.59	
111+25	44.6428	32.27	
111+30	44.8623	31.87	
111+35	45.0775	31.25	
111+40	45.2880	30.57	
111+45	45.4902	29.35	
111+50	45.6808	27.68	
111+55	45.8665	26.96	
112+ 0	46.0490	26.50	
112+ 5	46.2258	25.67	
112+10	46.3893	23.74	
112+15	46.5240	19.56	
112+20	46.6176	13.60	
112+25	46.6942	11.12	
112+30	46.7598	9.53	
112+35	46.8175	8.37	
112+40	46.8686	7.42	
112+45	46.9134	6.51	
112+50	46.9522	5.64	
112+55	46.9875	5.13	
113+ 0	47.0204	4.77	
113+ 5	47.0523	4.63	
113+10	47.0848	4.72	
113+15	47.1202	5.14	

113+20	47.1604	5.83	Q				V
113+25	47.2023	6.08	Q				V
113+30	47.2451	6.22	Q				V
113+35	47.2886	6.32	Q				V
113+40	47.3327	6.40	Q				V
113+45	47.3771	6.46	Q				V
113+50	47.4218	6.48	Q				V
113+55	47.4660	6.41	Q				V
114+ 0	47.5085	6.18	Q				V
114+ 5	47.5485	5.80	Q				V
114+10	47.5874	5.65	Q				V
114+15	47.6257	5.56	Q				V
114+20	47.6636	5.49	Q				V
114+25	47.7011	5.45	Q				V
114+30	47.7383	5.41	Q				V
114+35	47.7752	5.35	Q				V
114+40	47.8111	5.22	Q				V
114+45	47.8452	4.94	Q				V
114+50	47.8762	4.51	Q				V
114+55	47.9054	4.23	Q				V
115+ 0	47.9320	3.86	Q				V
115+ 5	47.9556	3.43	Q				V
115+10	47.9786	3.33	Q				V
115+15	48.0023	3.45	Q				V
115+20	48.0282	3.76	Q				V
115+25	48.0555	3.96	Q				V
115+30	48.0849	4.27	Q				V
115+35	48.1169	4.65	Q				V
115+40	48.1495	4.73	Q				V
115+45	48.1810	4.58	Q				V
115+50	48.2103	4.25	Q				V
115+55	48.2382	4.05	Q				V
116+ 0	48.2639	3.73	Q				V
116+ 5	48.2869	3.34	Q				V
116+10	48.3094	3.26	Q				V
116+15	48.3328	3.40	Q				V
116+20	48.3583	3.69	Q				V
116+25	48.3843	3.78	Q				V
116+30	48.4107	3.83	Q				V
116+35	48.4374	3.87	Q				V
116+40	48.4643	3.90	Q				V
116+45	48.4914	3.93	Q				V
116+50	48.5183	3.92	Q				V
116+55	48.5447	3.82	Q				V
117+ 0	48.5692	3.57	Q				V
117+ 5	48.5913	3.21	Q				V
117+10	48.6131	3.17	Q				V
117+15	48.6361	3.33	Q				V
117+20	48.6610	3.62	Q				V
117+25	48.6858	3.61	Q				V
117+30	48.7093	3.40	Q				V
117+35	48.7306	3.09	Q				V
117+40	48.7518	3.08	Q				V
117+45	48.7743	3.27	Q				V
117+50	48.7990	3.58	Q				V
117+55	48.8237	3.59	Q				V
118+ 0	48.8470	3.39	Q				V
118+ 5	48.8683	3.08	Q				V
118+10	48.8894	3.07	Q				V
118+15	48.9119	3.26	Q				V
118+20	48.9365	3.57	Q				V
118+25	48.9611	3.58	Q				V
118+30	48.9844	3.39	Q				V

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 118+35      49.0054      3.05  | Q        |          |          |         V|
 118+40      49.0256      2.92  | Q        |          |          |         V|
 118+45      49.0452      2.85  | Q        |          |          |         V|
 118+50      49.0645      2.80  | Q        |          |          |         V|
 118+55      49.0836      2.77  | Q        |          |          |         V|
 119+ 0      49.1024      2.74  | Q        |          |          |         V|
 119+ 5      49.1211      2.71  | Q        |          |          |         V|
 119+10      49.1397      2.70  | Q        |          |          |         V|
 119+15      49.1582      2.68  | Q        |          |          |         V|
 119+20      49.1766      2.68  | Q        |          |          |         V|
 119+25      49.1950      2.67  | Q        |          |          |         V|
 119+30      49.2134      2.67  | Q        |          |          |         V|
 119+35      49.2317      2.67  | Q        |          |          |         V|
 119+40      49.2501      2.67  | Q        |          |          |         V|
 119+45      49.2685      2.66  | Q        |          |          |         V|
 119+50      49.2868      2.66  | Q        |          |          |         V|
 119+55      49.3051      2.66  | Q        |          |          |         V|
 120+ 0      49.3234      2.66  | Q        |          |          |         V|
 120+ 5      49.3413      2.59  | Q        |          |          |         V|
 120+10      49.3576      2.37  |Q         |          |          |         V|
 120+15      49.3703      1.84  |Q         |          |          |         V|
 120+20      49.3776      1.06  Q          |          |          |         V|
 120+25      49.3827      0.74  Q          |          |          |         V|
 120+30      49.3864      0.54  Q          |          |          |         V|
 120+35      49.3891      0.40  Q          |          |          |         V|
 120+40      49.3911      0.29  Q          |          |          |         V|
 120+45      49.3925      0.20  Q          |          |          |         V|
 120+50      49.3935      0.14  Q          |          |          |         V|
 120+55      49.3942      0.10  Q          |          |          |         V|
 121+ 0      49.3946      0.07  Q          |          |          |         V|
 121+ 5      49.3950      0.05  Q          |          |          |         V|
 121+10      49.3952      0.04  Q          |          |          |         V|
 121+15      49.3954      0.03  Q          |          |          |         V|
 121+20      49.3956      0.02  Q          |          |          |         V|
 121+25      49.3957      0.02  Q          |          |          |         V|
 121+30      49.3958      0.01  Q          |          |          |         V|
 121+35      49.3958      0.01  Q          |          |          |         V|
 121+40      49.3959      0.00  Q          |          |          |          V
-------------------------------------------------------------------------
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POST-DEVELOPMENT 2 YEAR, 24-HOUR STORM DURATION

AGUA MANSA BROWN TRIBUTARY

U n i t H y d r o g r a p h A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 10/27/16 File: CMpropBA242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6353

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Crestmore - Proposed Hydrology - SUH
@ Brown Avenue Inlet
2016-10-27
AMC II - 2 Year

Drainage Area = 14.70(Ac.) = 0.023 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 14.70(Ac.) = 0.023 Sq. Mi.
Length along longest watercourse = 1742.02(Ft.)
Length along longest watercourse measured to centroid = 685.26(Ft.)
Length along longest watercourse = 0.330 Mi.
Length along longest watercourse measured to centroid = 0.130 Mi.
Difference in elevation = 8.71(Ft.)
Slope along watercourse = 26.3997 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.058 Hr.
Lag time = 3.50 Min.
25% of lag time = 0.88 Min.
40% of lag time = 1.40 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
14.70	2.25	33.07

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
14.70	5.50	80.85

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.250(In)
Area Averaged 100-Year Rainfall = 5.500(In)

Point rain (area averaged) = 2.250(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.250(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.806	32.00	0.900
2.894	56.00	0.900

Total Area Entered = 14.70(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
32.0	32.0	0.742	0.900	0.141	0.803	0.113
56.0	56.0	0.511	0.900	0.097	0.197	0.019
					Sum (F) =	0.132

Area averaged mean soil loss (F) (In/Hr) = 0.132
Minimum soil loss rate ((In/Hr)) = 0.066
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	142.757	28.502	4.223
2	0.167	285.514	54.855	8.127
3	0.250	428.272	12.739	1.887
4	0.333	571.029	2.830	0.419
5	0.417	713.786	1.074	0.159
			Sum = 100.000	Sum= 14.815

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.235)	0.003	0.015
2	0.17	0.07	0.018	(0.234)	0.003	0.015
3	0.25	0.07	0.018	(0.233)	0.003	0.015
4	0.33	0.10	0.027	(0.232)	0.005	0.022
5	0.42	0.10	0.027	(0.231)	0.005	0.022
6	0.50	0.10	0.027	(0.230)	0.005	0.022
7	0.58	0.10	0.027	(0.229)	0.005	0.022
8	0.67	0.10	0.027	(0.228)	0.005	0.022
9	0.75	0.10	0.027	(0.227)	0.005	0.022
10	0.83	0.13	0.036	(0.226)	0.006	0.030
11	0.92	0.13	0.036	(0.226)	0.006	0.030
12	1.00	0.13	0.036	(0.225)	0.006	0.030
13	1.08	0.10	0.027	(0.224)	0.005	0.022
14	1.17	0.10	0.027	(0.223)	0.005	0.022
15	1.25	0.10	0.027	(0.222)	0.005	0.022
16	1.33	0.10	0.027	(0.221)	0.005	0.022
17	1.42	0.10	0.027	(0.220)	0.005	0.022
18	1.50	0.10	0.027	(0.219)	0.005	0.022

19	1.58	0.10	0.027	(0.219)	0.005	0.022
20	1.67	0.10	0.027	(0.218)	0.005	0.022
21	1.75	0.10	0.027	(0.217)	0.005	0.022
22	1.83	0.13	0.036	(0.216)	0.006	0.030
23	1.92	0.13	0.036	(0.215)	0.006	0.030
24	2.00	0.13	0.036	(0.214)	0.006	0.030
25	2.08	0.13	0.036	(0.213)	0.006	0.030
26	2.17	0.13	0.036	(0.212)	0.006	0.030
27	2.25	0.13	0.036	(0.212)	0.006	0.030
28	2.33	0.13	0.036	(0.211)	0.006	0.030
29	2.42	0.13	0.036	(0.210)	0.006	0.030
30	2.50	0.13	0.036	(0.209)	0.006	0.030
31	2.58	0.17	0.045	(0.208)	0.008	0.037
32	2.67	0.17	0.045	(0.207)	0.008	0.037
33	2.75	0.17	0.045	(0.206)	0.008	0.037
34	2.83	0.17	0.045	(0.206)	0.008	0.037
35	2.92	0.17	0.045	(0.205)	0.008	0.037
36	3.00	0.17	0.045	(0.204)	0.008	0.037
37	3.08	0.17	0.045	(0.203)	0.008	0.037
38	3.17	0.17	0.045	(0.202)	0.008	0.037
39	3.25	0.17	0.045	(0.201)	0.008	0.037
40	3.33	0.17	0.045	(0.201)	0.008	0.037
41	3.42	0.17	0.045	(0.200)	0.008	0.037
42	3.50	0.17	0.045	(0.199)	0.008	0.037
43	3.58	0.17	0.045	(0.198)	0.008	0.037
44	3.67	0.17	0.045	(0.197)	0.008	0.037
45	3.75	0.17	0.045	(0.196)	0.008	0.037
46	3.83	0.20	0.054	(0.196)	0.010	0.044
47	3.92	0.20	0.054	(0.195)	0.010	0.044
48	4.00	0.20	0.054	(0.194)	0.010	0.044
49	4.08	0.20	0.054	(0.193)	0.010	0.044
50	4.17	0.20	0.054	(0.192)	0.010	0.044
51	4.25	0.20	0.054	(0.191)	0.010	0.044
52	4.33	0.23	0.063	(0.191)	0.011	0.052
53	4.42	0.23	0.063	(0.190)	0.011	0.052
54	4.50	0.23	0.063	(0.189)	0.011	0.052
55	4.58	0.23	0.063	(0.188)	0.011	0.052
56	4.67	0.23	0.063	(0.187)	0.011	0.052
57	4.75	0.23	0.063	(0.187)	0.011	0.052
58	4.83	0.27	0.072	(0.186)	0.013	0.059
59	4.92	0.27	0.072	(0.185)	0.013	0.059
60	5.00	0.27	0.072	(0.184)	0.013	0.059
61	5.08	0.20	0.054	(0.183)	0.010	0.044
62	5.17	0.20	0.054	(0.183)	0.010	0.044
63	5.25	0.20	0.054	(0.182)	0.010	0.044
64	5.33	0.23	0.063	(0.181)	0.011	0.052
65	5.42	0.23	0.063	(0.180)	0.011	0.052
66	5.50	0.23	0.063	(0.179)	0.011	0.052
67	5.58	0.27	0.072	(0.179)	0.013	0.059
68	5.67	0.27	0.072	(0.178)	0.013	0.059
69	5.75	0.27	0.072	(0.177)	0.013	0.059
70	5.83	0.27	0.072	(0.176)	0.013	0.059
71	5.92	0.27	0.072	(0.175)	0.013	0.059
72	6.00	0.27	0.072	(0.175)	0.013	0.059
73	6.08	0.30	0.081	(0.174)	0.015	0.066
74	6.17	0.30	0.081	(0.173)	0.015	0.066
75	6.25	0.30	0.081	(0.172)	0.015	0.066
76	6.33	0.30	0.081	(0.172)	0.015	0.066
77	6.42	0.30	0.081	(0.171)	0.015	0.066
78	6.50	0.30	0.081	(0.170)	0.015	0.066
79	6.58	0.33	0.090	(0.169)	0.016	0.074
80	6.67	0.33	0.090	(0.169)	0.016	0.074
81	6.75	0.33	0.090	(0.168)	0.016	0.074

82	6.83	0.33	0.090	(0.167)	0.016	0.074
83	6.92	0.33	0.090	(0.166)	0.016	0.074
84	7.00	0.33	0.090	(0.165)	0.016	0.074
85	7.08	0.33	0.090	(0.165)	0.016	0.074
86	7.17	0.33	0.090	(0.164)	0.016	0.074
87	7.25	0.33	0.090	(0.163)	0.016	0.074
88	7.33	0.37	0.099	(0.163)	0.018	0.081
89	7.42	0.37	0.099	(0.162)	0.018	0.081
90	7.50	0.37	0.099	(0.161)	0.018	0.081
91	7.58	0.40	0.108	(0.160)	0.019	0.089
92	7.67	0.40	0.108	(0.160)	0.019	0.089
93	7.75	0.40	0.108	(0.159)	0.019	0.089
94	7.83	0.43	0.117	(0.158)	0.021	0.096
95	7.92	0.43	0.117	(0.157)	0.021	0.096
96	8.00	0.43	0.117	(0.157)	0.021	0.096
97	8.08	0.50	0.135	(0.156)	0.024	0.111
98	8.17	0.50	0.135	(0.155)	0.024	0.111
99	8.25	0.50	0.135	(0.154)	0.024	0.111
100	8.33	0.50	0.135	(0.154)	0.024	0.111
101	8.42	0.50	0.135	(0.153)	0.024	0.111
102	8.50	0.50	0.135	(0.152)	0.024	0.111
103	8.58	0.53	0.144	(0.152)	0.026	0.118
104	8.67	0.53	0.144	(0.151)	0.026	0.118
105	8.75	0.53	0.144	(0.150)	0.026	0.118
106	8.83	0.57	0.153	(0.149)	0.028	0.125
107	8.92	0.57	0.153	(0.149)	0.028	0.125
108	9.00	0.57	0.153	(0.148)	0.028	0.125
109	9.08	0.63	0.171	(0.147)	0.031	0.140
110	9.17	0.63	0.171	(0.147)	0.031	0.140
111	9.25	0.63	0.171	(0.146)	0.031	0.140
112	9.33	0.67	0.180	(0.145)	0.032	0.148
113	9.42	0.67	0.180	(0.145)	0.032	0.148
114	9.50	0.67	0.180	(0.144)	0.032	0.148
115	9.58	0.70	0.189	(0.143)	0.034	0.155
116	9.67	0.70	0.189	(0.142)	0.034	0.155
117	9.75	0.70	0.189	(0.142)	0.034	0.155
118	9.83	0.73	0.198	(0.141)	0.036	0.162
119	9.92	0.73	0.198	(0.140)	0.036	0.162
120	10.00	0.73	0.198	(0.140)	0.036	0.162
121	10.08	0.50	0.135	(0.139)	0.024	0.111
122	10.17	0.50	0.135	(0.138)	0.024	0.111
123	10.25	0.50	0.135	(0.138)	0.024	0.111
124	10.33	0.50	0.135	(0.137)	0.024	0.111
125	10.42	0.50	0.135	(0.136)	0.024	0.111
126	10.50	0.50	0.135	(0.136)	0.024	0.111
127	10.58	0.67	0.180	(0.135)	0.032	0.148
128	10.67	0.67	0.180	(0.134)	0.032	0.148
129	10.75	0.67	0.180	(0.134)	0.032	0.148
130	10.83	0.67	0.180	(0.133)	0.032	0.148
131	10.92	0.67	0.180	(0.132)	0.032	0.148
132	11.00	0.67	0.180	(0.132)	0.032	0.148
133	11.08	0.63	0.171	(0.131)	0.031	0.140
134	11.17	0.63	0.171	(0.130)	0.031	0.140
135	11.25	0.63	0.171	(0.130)	0.031	0.140
136	11.33	0.63	0.171	(0.129)	0.031	0.140
137	11.42	0.63	0.171	(0.129)	0.031	0.140
138	11.50	0.63	0.171	(0.128)	0.031	0.140
139	11.58	0.57	0.153	(0.127)	0.028	0.125
140	11.67	0.57	0.153	(0.127)	0.028	0.125
141	11.75	0.57	0.153	(0.126)	0.028	0.125
142	11.83	0.60	0.162	(0.125)	0.029	0.133
143	11.92	0.60	0.162	(0.125)	0.029	0.133
144	12.00	0.60	0.162	(0.124)	0.029	0.133

145	12.08	0.83	0.225	(0.124)	0.040	0.184
146	12.17	0.83	0.225	(0.123)	0.040	0.184
147	12.25	0.83	0.225	(0.122)	0.040	0.184
148	12.33	0.87	0.234	(0.122)	0.042	0.192
149	12.42	0.87	0.234	(0.121)	0.042	0.192
150	12.50	0.87	0.234	(0.120)	0.042	0.192
151	12.58	0.93	0.252	(0.120)	0.045	0.207
152	12.67	0.93	0.252	(0.119)	0.045	0.207
153	12.75	0.93	0.252	(0.119)	0.045	0.207
154	12.83	0.97	0.261	(0.118)	0.047	0.214
155	12.92	0.97	0.261	(0.117)	0.047	0.214
156	13.00	0.97	0.261	(0.117)	0.047	0.214
157	13.08	1.13	0.306	(0.116)	0.055	0.251
158	13.17	1.13	0.306	(0.116)	0.055	0.251
159	13.25	1.13	0.306	(0.115)	0.055	0.251
160	13.33	1.13	0.306	(0.115)	0.055	0.251
161	13.42	1.13	0.306	(0.114)	0.055	0.251
162	13.50	1.13	0.306	(0.113)	0.055	0.251
163	13.58	0.77	0.207	(0.113)	0.037	0.170
164	13.67	0.77	0.207	(0.112)	0.037	0.170
165	13.75	0.77	0.207	(0.112)	0.037	0.170
166	13.83	0.77	0.207	(0.111)	0.037	0.170
167	13.92	0.77	0.207	(0.110)	0.037	0.170
168	14.00	0.77	0.207	(0.110)	0.037	0.170
169	14.08	0.90	0.243	(0.109)	0.044	0.199
170	14.17	0.90	0.243	(0.109)	0.044	0.199
171	14.25	0.90	0.243	(0.108)	0.044	0.199
172	14.33	0.87	0.234	(0.108)	0.042	0.192
173	14.42	0.87	0.234	(0.107)	0.042	0.192
174	14.50	0.87	0.234	(0.107)	0.042	0.192
175	14.58	0.87	0.234	(0.106)	0.042	0.192
176	14.67	0.87	0.234	(0.106)	0.042	0.192
177	14.75	0.87	0.234	(0.105)	0.042	0.192
178	14.83	0.83	0.225	(0.104)	0.040	0.184
179	14.92	0.83	0.225	(0.104)	0.040	0.184
180	15.00	0.83	0.225	(0.103)	0.040	0.184
181	15.08	0.80	0.216	(0.103)	0.039	0.177
182	15.17	0.80	0.216	(0.102)	0.039	0.177
183	15.25	0.80	0.216	(0.102)	0.039	0.177
184	15.33	0.77	0.207	(0.101)	0.037	0.170
185	15.42	0.77	0.207	(0.101)	0.037	0.170
186	15.50	0.77	0.207	(0.100)	0.037	0.170
187	15.58	0.63	0.171	(0.100)	0.031	0.140
188	15.67	0.63	0.171	(0.099)	0.031	0.140
189	15.75	0.63	0.171	(0.099)	0.031	0.140
190	15.83	0.63	0.171	(0.098)	0.031	0.140
191	15.92	0.63	0.171	(0.098)	0.031	0.140
192	16.00	0.63	0.171	(0.097)	0.031	0.140
193	16.08	0.13	0.036	(0.097)	0.006	0.030
194	16.17	0.13	0.036	(0.096)	0.006	0.030
195	16.25	0.13	0.036	(0.096)	0.006	0.030
196	16.33	0.13	0.036	(0.095)	0.006	0.030
197	16.42	0.13	0.036	(0.095)	0.006	0.030
198	16.50	0.13	0.036	(0.094)	0.006	0.030
199	16.58	0.10	0.027	(0.094)	0.005	0.022
200	16.67	0.10	0.027	(0.093)	0.005	0.022
201	16.75	0.10	0.027	(0.093)	0.005	0.022
202	16.83	0.10	0.027	(0.092)	0.005	0.022
203	16.92	0.10	0.027	(0.092)	0.005	0.022
204	17.00	0.10	0.027	(0.091)	0.005	0.022
205	17.08	0.17	0.045	(0.091)	0.008	0.037
206	17.17	0.17	0.045	(0.090)	0.008	0.037
207	17.25	0.17	0.045	(0.090)	0.008	0.037

208	17.33	0.17	0.045	(0.090)	0.008	0.037
209	17.42	0.17	0.045	(0.089)	0.008	0.037
210	17.50	0.17	0.045	(0.089)	0.008	0.037
211	17.58	0.17	0.045	(0.088)	0.008	0.037
212	17.67	0.17	0.045	(0.088)	0.008	0.037
213	17.75	0.17	0.045	(0.087)	0.008	0.037
214	17.83	0.13	0.036	(0.087)	0.006	0.030
215	17.92	0.13	0.036	(0.087)	0.006	0.030
216	18.00	0.13	0.036	(0.086)	0.006	0.030
217	18.08	0.13	0.036	(0.086)	0.006	0.030
218	18.17	0.13	0.036	(0.085)	0.006	0.030
219	18.25	0.13	0.036	(0.085)	0.006	0.030
220	18.33	0.13	0.036	(0.084)	0.006	0.030
221	18.42	0.13	0.036	(0.084)	0.006	0.030
222	18.50	0.13	0.036	(0.084)	0.006	0.030
223	18.58	0.10	0.027	(0.083)	0.005	0.022
224	18.67	0.10	0.027	(0.083)	0.005	0.022
225	18.75	0.10	0.027	(0.082)	0.005	0.022
226	18.83	0.07	0.018	(0.082)	0.003	0.015
227	18.92	0.07	0.018	(0.082)	0.003	0.015
228	19.00	0.07	0.018	(0.081)	0.003	0.015
229	19.08	0.10	0.027	(0.081)	0.005	0.022
230	19.17	0.10	0.027	(0.080)	0.005	0.022
231	19.25	0.10	0.027	(0.080)	0.005	0.022
232	19.33	0.13	0.036	(0.080)	0.006	0.030
233	19.42	0.13	0.036	(0.079)	0.006	0.030
234	19.50	0.13	0.036	(0.079)	0.006	0.030
235	19.58	0.10	0.027	(0.079)	0.005	0.022
236	19.67	0.10	0.027	(0.078)	0.005	0.022
237	19.75	0.10	0.027	(0.078)	0.005	0.022
238	19.83	0.07	0.018	(0.078)	0.003	0.015
239	19.92	0.07	0.018	(0.077)	0.003	0.015
240	20.00	0.07	0.018	(0.077)	0.003	0.015
241	20.08	0.10	0.027	(0.077)	0.005	0.022
242	20.17	0.10	0.027	(0.076)	0.005	0.022
243	20.25	0.10	0.027	(0.076)	0.005	0.022
244	20.33	0.10	0.027	(0.076)	0.005	0.022
245	20.42	0.10	0.027	(0.075)	0.005	0.022
246	20.50	0.10	0.027	(0.075)	0.005	0.022
247	20.58	0.10	0.027	(0.075)	0.005	0.022
248	20.67	0.10	0.027	(0.074)	0.005	0.022
249	20.75	0.10	0.027	(0.074)	0.005	0.022
250	20.83	0.07	0.018	(0.074)	0.003	0.015
251	20.92	0.07	0.018	(0.073)	0.003	0.015
252	21.00	0.07	0.018	(0.073)	0.003	0.015
253	21.08	0.10	0.027	(0.073)	0.005	0.022
254	21.17	0.10	0.027	(0.072)	0.005	0.022
255	21.25	0.10	0.027	(0.072)	0.005	0.022
256	21.33	0.07	0.018	(0.072)	0.003	0.015
257	21.42	0.07	0.018	(0.072)	0.003	0.015
258	21.50	0.07	0.018	(0.071)	0.003	0.015
259	21.58	0.10	0.027	(0.071)	0.005	0.022
260	21.67	0.10	0.027	(0.071)	0.005	0.022
261	21.75	0.10	0.027	(0.071)	0.005	0.022
262	21.83	0.07	0.018	(0.070)	0.003	0.015
263	21.92	0.07	0.018	(0.070)	0.003	0.015
264	22.00	0.07	0.018	(0.070)	0.003	0.015
265	22.08	0.10	0.027	(0.070)	0.005	0.022
266	22.17	0.10	0.027	(0.069)	0.005	0.022
267	22.25	0.10	0.027	(0.069)	0.005	0.022
268	22.33	0.07	0.018	(0.069)	0.003	0.015
269	22.42	0.07	0.018	(0.069)	0.003	0.015
270	22.50	0.07	0.018	(0.069)	0.003	0.015

271	22.58	0.07	0.018	(0.068)	0.003	0.015
272	22.67	0.07	0.018	(0.068)	0.003	0.015
273	22.75	0.07	0.018	(0.068)	0.003	0.015
274	22.83	0.07	0.018	(0.068)	0.003	0.015
275	22.92	0.07	0.018	(0.068)	0.003	0.015
276	23.00	0.07	0.018	(0.067)	0.003	0.015
277	23.08	0.07	0.018	(0.067)	0.003	0.015
278	23.17	0.07	0.018	(0.067)	0.003	0.015
279	23.25	0.07	0.018	(0.067)	0.003	0.015
280	23.33	0.07	0.018	(0.067)	0.003	0.015
281	23.42	0.07	0.018	(0.067)	0.003	0.015
282	23.50	0.07	0.018	(0.067)	0.003	0.015
283	23.58	0.07	0.018	(0.067)	0.003	0.015
284	23.67	0.07	0.018	(0.066)	0.003	0.015
285	23.75	0.07	0.018	(0.066)	0.003	0.015
286	23.83	0.07	0.018	(0.066)	0.003	0.015
287	23.92	0.07	0.018	(0.066)	0.003	0.015
288	24.00	0.07	0.018	(0.066)	0.003	0.015

(Loss Rate Not Used)

Sum = 100.0 Sum = 22.1

Flood volume = Effective rainfall 1.84(In)
times area 14.7(Ac.)/[(In)/(Ft.)] = 2.3(Ac.Ft)
Total soil loss = 0.40(In)
Total soil loss = 0.496(Ac.Ft)
Total rainfall = 2.25(In)
Flood volume = 98448.2 Cubic Feet
Total soil loss = 21610.6 Cubic Feet

Peak flow rate of this hydrograph = 3.719(CFS)

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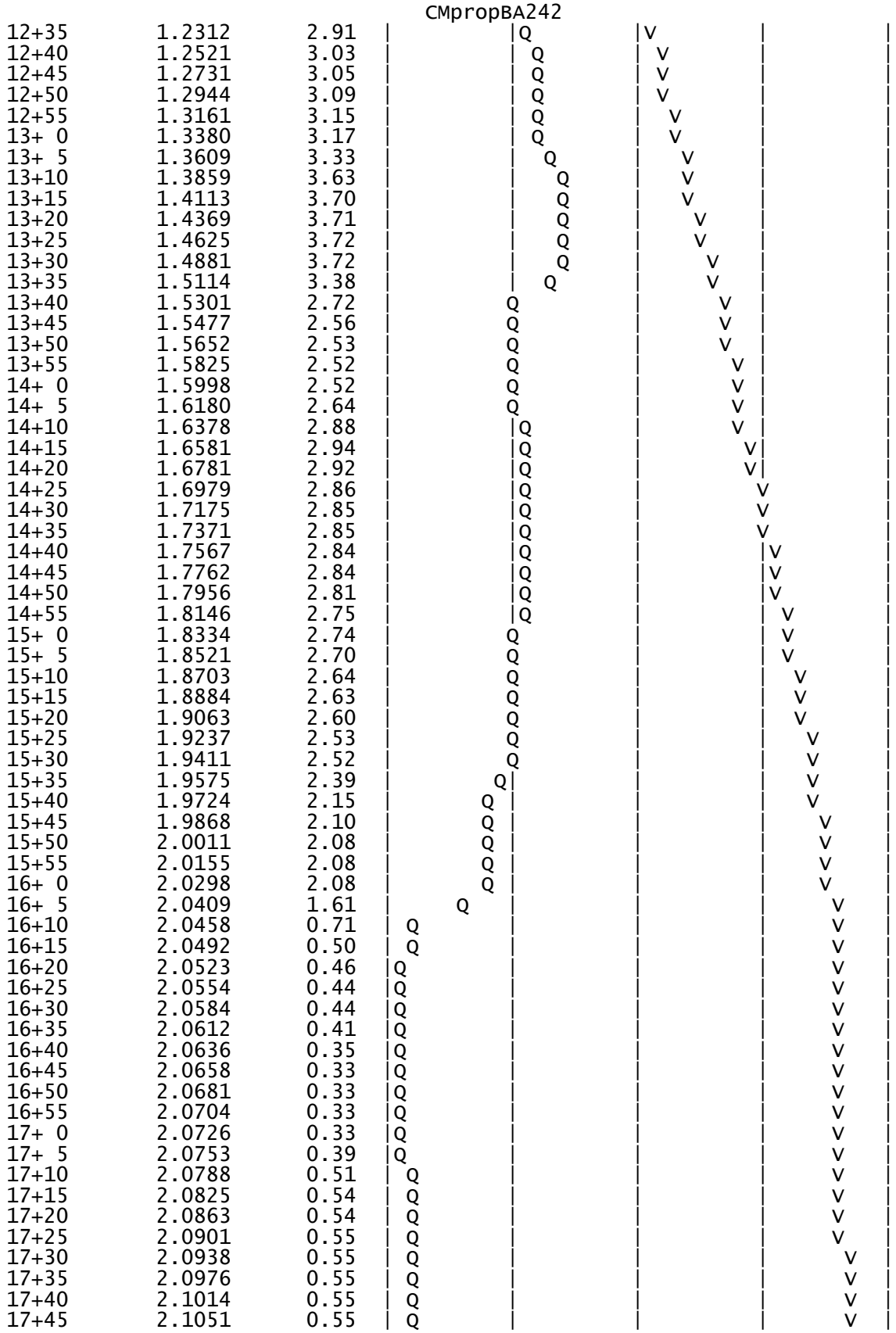
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0004	0.06	Q				
0+10	0.0017	0.18	Q				
0+15	0.0031	0.21	Q				
0+20	0.0048	0.25	Q				
0+25	0.0070	0.31	VQ				
0+30	0.0092	0.32	VQ				
0+35	0.0115	0.33	VQ				
0+40	0.0137	0.33	VQ				
0+45	0.0160	0.33	VQ				
0+50	0.0185	0.36	VQ				
0+55	0.0213	0.42	VQ				
1+ 0	0.0243	0.43	VQ				
1+ 5	0.0271	0.41	VQ				
1+10	0.0295	0.35	VQ				
1+15	0.0318	0.33	VQ				
1+20	0.0341	0.33	VQ				
1+25	0.0363	0.33	VQ				
1+30	0.0386	0.33	VQ				
1+35	0.0408	0.33	VQ				
1+40	0.0431	0.33	VQ				
1+45	0.0454	0.33	VQ				
1+50	0.0478	0.36	VQ				
1+55	0.0507	0.42	VQ				
2+ 0	0.0537	0.43	VQ				

2+ 5	0.0567	0.44	|Q	|	|	|	|
2+10	0.0597	0.44	|Q	|	|	|	|
2+15	0.0627	0.44	|Q	|	|	|	|
2+20	0.0657	0.44	|Q	|	|	|	|
2+25	0.0688	0.44	|Q	|	|	|	|
2+30	0.0718	0.44	|Q	|	|	|	|
2+35	0.0750	0.47	|Q	|	|	|	|
2+40	0.0786	0.53	|VQ	|	|	|	|
2+45	0.0824	0.54	|VQ	|	|	|	|
2+50	0.0861	0.55	|VQ	|	|	|	|
2+55	0.0899	0.55	|VQ	|	|	|	|
3+ 0	0.0937	0.55	|VQ	|	|	|	|
3+ 5	0.0974	0.55	|VQ	|	|	|	|
3+10	0.1012	0.55	|VQ	|	|	|	|
3+15	0.1050	0.55	|VQ	|	|	|	|
3+20	0.1087	0.55	|VQ	|	|	|	|
3+25	0.1125	0.55	|VQ	|	|	|	|
3+30	0.1163	0.55	| Q	|	|	|	|
3+35	0.1200	0.55	| Q	|	|	|	|
3+40	0.1238	0.55	| Q	|	|	|	|
3+45	0.1276	0.55	| Q	|	|	|	|
3+50	0.1316	0.58	| Q	|	|	|	|
3+55	0.1360	0.64	| Q	|	|	|	|
4+ 0	0.1404	0.65	| Q	|	|	|	|
4+ 5	0.1450	0.66	| Q	|	|	|	|
4+10	0.1495	0.66	| Q	|	|	|	|
4+15	0.1540	0.66	| Q	|	|	|	|
4+20	0.1587	0.69	| Q	|	|	|	|
4+25	0.1639	0.75	| Q	|	|	|	|
4+30	0.1691	0.76	| VQ	|	|	|	|
4+35	0.1744	0.76	| Q	|	|	|	|
4+40	0.1797	0.77	| Q	|	|	|	|
4+45	0.1849	0.77	| Q	|	|	|	|
4+50	0.1904	0.80	| Q	|	|	|	|
4+55	0.1963	0.86	| Q	|	|	|	|
5+ 0	0.2023	0.87	| Q	|	|	|	|
5+ 5	0.2079	0.81	| Q	|	|	|	|
5+10	0.2127	0.69	| QV	|	|	|	|
5+15	0.2173	0.66	| QV	|	|	|	|
5+20	0.2220	0.69	| QV	|	|	|	|
5+25	0.2272	0.75	| Q V	|	|	|	|
5+30	0.2324	0.76	| QV	|	|	|	|
5+35	0.2379	0.80	| QV	|	|	|	|
5+40	0.2438	0.86	| QV	|	|	|	|
5+45	0.2498	0.87	| QV	|	|	|	|
5+50	0.2558	0.87	| QV	|	|	|	|
5+55	0.2618	0.88	| QV	|	|	|	|
6+ 0	0.2679	0.88	| QV	|	|	|	|
6+ 5	0.2741	0.91	| QV	|	|	|	|
6+10	0.2808	0.97	| QV	|	|	|	|
6+15	0.2875	0.98	| Q V	|	|	|	|
6+20	0.2943	0.98	| Q V	|	|	|	|
6+25	0.3011	0.98	| Q V	|	|	|	|
6+30	0.3078	0.98	| Q V	|	|	|	|
6+35	0.3148	1.02	| QV	|	|	|	|
6+40	0.3222	1.08	| QV	|	|	|	|
6+45	0.3297	1.09	| QV	|	|	|	|
6+50	0.3373	1.09	| QV	|	|	|	|
6+55	0.3448	1.09	| Q V	|	|	|	|
7+ 0	0.3523	1.09	| Q V	|	|	|	|
7+ 5	0.3599	1.09	| Q V	|	|	|	|
7+10	0.3674	1.09	| Q V	|	|	|	|
7+15	0.3749	1.09	| Q V	|	|	|	|

7+20	0.3827	1.13	Q V			
7+25	0.3908	1.19	Q V			
7+30	0.3991	1.20	Q V			
7+35	0.4076	1.23	Q V			
7+40	0.4165	1.29	Q V			
7+45	0.4255	1.31	Q V			
7+50	0.4348	1.34	Q V			
7+55	0.4444	1.40	Q V			
8+ 0	0.4542	1.42	Q V			
8+ 5	0.4644	1.48	Q V			
8+10	0.4755	1.60	Q V			
8+15	0.4867	1.63	Q V			
8+20	0.4980	1.64	Q V			
8+25	0.5093	1.64	Q V			
8+30	0.5206	1.64	Q V			
8+35	0.5321	1.67	Q V			
8+40	0.5440	1.73	Q V			
8+45	0.5561	1.75	Q V			
8+50	0.5683	1.78	Q V			
8+55	0.5810	1.84	Q V			
9+ 0	0.5938	1.86	Q V			
9+ 5	0.6070	1.92	Q V			
9+10	0.6211	2.04	Q V			
9+15	0.6353	2.07	Q V			
9+20	0.6498	2.11	Q V			
9+25	0.6648	2.17	Q V			
9+30	0.6798	2.18	Q V			
9+35	0.6951	2.22	Q V			
9+40	0.7108	2.28	Q V			
9+45	0.7266	2.29	Q V			
9+50	0.7426	2.33	Q V			
9+55	0.7591	2.39	Q V			
10+ 0	0.7756	2.40	Q V			
10+ 5	0.7907	2.19	Q V			
10+10	0.8028	1.77	Q V			
10+15	0.8143	1.67	Q V			
10+20	0.8257	1.65	Q V			
10+25	0.8370	1.64	Q V			
10+30	0.8483	1.64	Q V			
10+35	0.8607	1.80	Q V			
10+40	0.8751	2.10	Q V			
10+45	0.8900	2.17	Q V			
10+50	0.9051	2.18	Q V			
10+55	0.9201	2.19	Q V			
11+ 0	0.9352	2.19	Q V			
11+ 5	0.9500	2.16	Q V			
11+10	0.9645	2.10	Q V			
11+15	0.9788	2.08	Q V			
11+20	0.9932	2.08	Q V			
11+25	1.0075	2.08	Q V			
11+30	1.0218	2.08	Q V			
11+35	1.0357	2.02	Q V			
11+40	1.0487	1.90	Q V			
11+45	1.0616	1.87	Q V			
11+50	1.0746	1.89	Q V			
11+55	1.0881	1.95	Q V			
12+ 0	1.1016	1.96	Q V			
12+ 5	1.1166	2.19	Q V			
12+10	1.1346	2.61	Q V			
12+15	1.1532	2.70	Q V			
12+20	1.1722	2.76	Q V			
12+25	1.1917	2.83	Q V			
12+30	1.2112	2.84	Q V			



12+35	1.2312	2.91	
12+40	1.2521	3.03	
12+45	1.2731	3.05	
12+50	1.2944	3.09	
12+55	1.3161	3.15	
13+ 0	1.3380	3.17	
13+ 5	1.3609	3.33	
13+10	1.3859	3.63	
13+15	1.4113	3.70	
13+20	1.4369	3.71	
13+25	1.4625	3.72	
13+30	1.4881	3.72	
13+35	1.5114	3.38	
13+40	1.5301	2.72	
13+45	1.5477	2.56	
13+50	1.5652	2.53	
13+55	1.5825	2.52	
14+ 0	1.5998	2.52	
14+ 5	1.6180	2.64	
14+10	1.6378	2.88	
14+15	1.6581	2.94	
14+20	1.6781	2.92	
14+25	1.6979	2.86	
14+30	1.7175	2.85	
14+35	1.7371	2.85	
14+40	1.7567	2.84	
14+45	1.7762	2.84	
14+50	1.7956	2.81	
14+55	1.8146	2.75	
15+ 0	1.8334	2.74	
15+ 5	1.8521	2.70	
15+10	1.8703	2.64	
15+15	1.8884	2.63	
15+20	1.9063	2.60	
15+25	1.9237	2.53	
15+30	1.9411	2.52	
15+35	1.9575	2.39	
15+40	1.9724	2.15	
15+45	1.9868	2.10	
15+50	2.0011	2.08	
15+55	2.0155	2.08	
16+ 0	2.0298	2.08	
16+ 5	2.0409	1.61	
16+10	2.0458	0.71	
16+15	2.0492	0.50	
16+20	2.0523	0.46	
16+25	2.0554	0.44	
16+30	2.0584	0.44	
16+35	2.0612	0.41	
16+40	2.0636	0.35	
16+45	2.0658	0.33	
16+50	2.0681	0.33	
16+55	2.0704	0.33	
17+ 0	2.0726	0.33	
17+ 5	2.0753	0.39	
17+10	2.0788	0.51	
17+15	2.0825	0.54	
17+20	2.0863	0.54	
17+25	2.0901	0.55	
17+30	2.0938	0.55	
17+35	2.0976	0.55	
17+40	2.1014	0.55	
17+45	2.1051	0.55	

17+50	2.1087	0.52	| Q	|	|	|	V |
17+55	2.1118	0.46	|Q	|	|	|	V |
18+ 0	2.1149	0.44	|Q	|	|	|	V |
18+ 5	2.1179	0.44	|Q	|	|	|	V |
18+10	2.1209	0.44	|Q	|	|	|	V |
18+15	2.1239	0.44	|Q	|	|	|	V |
18+20	2.1269	0.44	|Q	|	|	|	V |
18+25	2.1299	0.44	|Q	|	|	|	V |
18+30	2.1330	0.44	|Q	|	|	|	V |
18+35	2.1357	0.41	|Q	|	|	|	V |
18+40	2.1381	0.35	|Q	|	|	|	V |
18+45	2.1404	0.33	|Q	|	|	|	V |
18+50	2.1425	0.30	|Q	|	|	|	V |
18+55	2.1441	0.24	Q	|	|	|	V |
19+ 0	2.1456	0.22	Q	|	|	|	V |
19+ 5	2.1474	0.25	|Q	|	|	|	V |
19+10	2.1495	0.31	|Q	|	|	|	V |
19+15	2.1517	0.32	|Q	|	|	|	V |
19+20	2.1542	0.36	|Q	|	|	|	V |
19+25	2.1571	0.42	|Q	|	|	|	V |
19+30	2.1601	0.43	|Q	|	|	|	V |
19+35	2.1629	0.41	|Q	|	|	|	V |
19+40	2.1653	0.35	|Q	|	|	|	V |
19+45	2.1675	0.33	|Q	|	|	|	V |
19+50	2.1696	0.30	|Q	|	|	|	V |
19+55	2.1712	0.24	Q	|	|	|	V |
20+ 0	2.1728	0.22	Q	|	|	|	V |
20+ 5	2.1745	0.25	|Q	|	|	|	V |
20+10	2.1766	0.31	|Q	|	|	|	V |
20+15	2.1789	0.32	|Q	|	|	|	V |
20+20	2.1811	0.33	|Q	|	|	|	V |
20+25	2.1834	0.33	|Q	|	|	|	V |
20+30	2.1856	0.33	|Q	|	|	|	V |
20+35	2.1879	0.33	|Q	|	|	|	V |
20+40	2.1902	0.33	|Q	|	|	|	V |
20+45	2.1924	0.33	|Q	|	|	|	V |
20+50	2.1945	0.30	|Q	|	|	|	V |
20+55	2.1961	0.24	Q	|	|	|	V |
21+ 0	2.1976	0.22	Q	|	|	|	V |
21+ 5	2.1994	0.25	|Q	|	|	|	V |
21+10	2.2015	0.31	|Q	|	|	|	V |
21+15	2.2037	0.32	|Q	|	|	|	V|
21+20	2.2058	0.30	|Q	|	|	|	V|
21+25	2.2074	0.24	Q	|	|	|	V|
21+30	2.2089	0.22	Q	|	|	|	V|
21+35	2.2107	0.25	|Q	|	|	|	V|
21+40	2.2128	0.31	|Q	|	|	|	V|
21+45	2.2150	0.32	|Q	|	|	|	V|
21+50	2.2171	0.30	|Q	|	|	|	V|
21+55	2.2187	0.24	Q	|	|	|	V|
22+ 0	2.2202	0.22	Q	|	|	|	V|
22+ 5	2.2220	0.25	|Q	|	|	|	V|
22+10	2.2241	0.31	|Q	|	|	|	V|
22+15	2.2263	0.32	|Q	|	|	|	V|
22+20	2.2284	0.30	|Q	|	|	|	V|
22+25	2.2300	0.24	Q	|	|	|	V|
22+30	2.2315	0.22	Q	|	|	|	V|
22+35	2.2330	0.22	Q	|	|	|	V|
22+40	2.2345	0.22	Q	|	|	|	V|
22+45	2.2361	0.22	Q	|	|	|	V|
22+50	2.2376	0.22	Q	|	|	|	V|
22+55	2.2391	0.22	Q	|	|	|	V|
23+ 0	2.2406	0.22	Q	|	|	|	V|

23+ 5	2.2421	0.22	Q	|	|	|	V|
23+10	2.2436	0.22	Q	|	|	|	V|
23+15	2.2451	0.22	Q	|	|	|	V|
23+20	2.2466	0.22	Q	|	|	|	V|
23+25	2.2481	0.22	Q	|	|	|	V|
23+30	2.2496	0.22	Q	|	|	|	V|
23+35	2.2511	0.22	Q	|	|	|	V|
23+40	2.2526	0.22	Q	|	|	|	V|
23+45	2.2541	0.22	Q	|	|	|	V|
23+50	2.2556	0.22	Q	|	|	|	V|
23+55	2.2572	0.22	Q	|	|	|	V|
24+ 0	2.2587	0.22	Q	|	|	|	V|
24+ 5	2.2597	0.16	Q	|	|	|	V|
24+10	2.2600	0.04	Q	|	|	|	V|
24+15	2.2600	0.01	Q	|	|	|	V|
24+20	2.2601	0.00	Q	|	|	|	V

POST-DEVELOPMENT 2 YEAR, 24-HOUR STORM DURATION

BELLTOWN MARKET TRIBUTARY

CMpropSUH242

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/27/16 File: CMpropSUH242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6353

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Crestmore - Proposed Hydrology - SUH
AMC II
2016-10-27
2 Year

Drainage Area = 318.42(Ac.) = 0.498 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 318.42(Ac.) = 0.498 Sq. Mi.
Length along longest watercourse = 9699.02(Ft.)
Length along longest watercourse measured to centroid = 5034.20(Ft.)
Length along longest watercourse = 1.837 Mi.
Length along longest watercourse measured to centroid = 0.953 Mi.
Difference in elevation = 108.00(Ft.)
Slope along watercourse = 58.7936 Ft./Mi.
Average Manning's 'N' = 0.019
Lag time = 0.265 Hr.
Lag time = 15.89 Min.
25% of lag time = 3.97 Min.
40% of lag time = 6.36 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
318.42	2.25	716.45

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
318.42	5.50	1751.31

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.250(In)
Area Averaged 100-Year Rainfall = 5.500(In)

Point rain (area averaged) = 2.250(In)
Areal adjustment factor = 99.94 %
Adjusted average point rain = 2.249(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
200.980	32.00	0.900
92.110	46.00	0.000
0.410	62.00	0.000
0.200	56.00	0.900
0.970	69.00	0.900
19.010	75.00	0.900
4.740	88.00	0.000

Total Area Entered = 318.42(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
32.0	32.0	0.742	0.900	0.141	0.631	0.089
46.0	46.0	0.611	0.000	0.611	0.289	0.177
62.0	62.0	0.448	0.000	0.448	0.001	0.001
56.0	56.0	0.511	0.900	0.097	0.001	0.000
69.0	69.0	0.373	0.900	0.071	0.003	0.000
75.0	75.0	0.303	0.900	0.058	0.060	0.003
88.0	88.0	0.153	0.000	0.153	0.015	0.002
					Sum (F) =	0.272

Area averaged mean soil loss (F) (In/Hr) = 0.272
Minimum soil loss rate ((In/Hr)) = 0.136
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.400

U n i t H y d r o g r a p h
FOOTHILL S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	31.467	2.286	7.335
2	0.167	62.934	7.466	23.959
3	0.250	94.402	15.802	50.711
4	0.333	125.869	30.191	96.885
5	0.417	157.336	13.494	43.302
6	0.500	188.803	7.948	25.507
7	0.583	220.270	5.787	18.570
8	0.667	251.737	4.337	13.918
9	0.750	283.205	3.349	10.748
10	0.833	314.672	2.600	8.344
11	0.917	346.139	1.972	6.328
12	1.000	377.606	1.439	4.619
13	1.083	409.073	1.021	3.276
14	1.167	440.540	0.505	1.621
15	1.250	472.008	0.362	1.162
16	1.333	503.475	0.317	1.016
17	1.417	534.942	0.239	0.766
18	1.500	566.409	0.197	0.633
19	1.583	597.876	0.245	0.785
20	1.667	629.344	0.197	0.632
21	1.750	660.811	0.122	0.393
22	1.833	692.278	0.076	0.245

CMpropSUH242

23	1.917	723.745	0.047	0.151
		Sum = 100.000	Sum=	320.908

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.483)	0.007	0.011
2	0.17	0.07	0.018	(0.481)	0.007	0.011
3	0.25	0.07	0.018	(0.479)	0.007	0.011
4	0.33	0.10	0.027	(0.477)	0.011	0.016
5	0.42	0.10	0.027	(0.475)	0.011	0.016
6	0.50	0.10	0.027	(0.474)	0.011	0.016
7	0.58	0.10	0.027	(0.472)	0.011	0.016
8	0.67	0.10	0.027	(0.470)	0.011	0.016
9	0.75	0.10	0.027	(0.468)	0.011	0.016
10	0.83	0.13	0.036	(0.466)	0.014	0.022
11	0.92	0.13	0.036	(0.464)	0.014	0.022
12	1.00	0.13	0.036	(0.462)	0.014	0.022
13	1.08	0.10	0.027	(0.461)	0.011	0.016
14	1.17	0.10	0.027	(0.459)	0.011	0.016
15	1.25	0.10	0.027	(0.457)	0.011	0.016
16	1.33	0.10	0.027	(0.455)	0.011	0.016
17	1.42	0.10	0.027	(0.453)	0.011	0.016
18	1.50	0.10	0.027	(0.452)	0.011	0.016
19	1.58	0.10	0.027	(0.450)	0.011	0.016
20	1.67	0.10	0.027	(0.448)	0.011	0.016
21	1.75	0.10	0.027	(0.446)	0.011	0.016
22	1.83	0.13	0.036	(0.444)	0.014	0.022
23	1.92	0.13	0.036	(0.443)	0.014	0.022
24	2.00	0.13	0.036	(0.441)	0.014	0.022
25	2.08	0.13	0.036	(0.439)	0.014	0.022
26	2.17	0.13	0.036	(0.437)	0.014	0.022
27	2.25	0.13	0.036	(0.435)	0.014	0.022
28	2.33	0.13	0.036	(0.434)	0.014	0.022
29	2.42	0.13	0.036	(0.432)	0.014	0.022
30	2.50	0.13	0.036	(0.430)	0.014	0.022
31	2.58	0.17	0.045	(0.428)	0.018	0.027
32	2.67	0.17	0.045	(0.427)	0.018	0.027
33	2.75	0.17	0.045	(0.425)	0.018	0.027
34	2.83	0.17	0.045	(0.423)	0.018	0.027
35	2.92	0.17	0.045	(0.421)	0.018	0.027
36	3.00	0.17	0.045	(0.420)	0.018	0.027
37	3.08	0.17	0.045	(0.418)	0.018	0.027
38	3.17	0.17	0.045	(0.416)	0.018	0.027
39	3.25	0.17	0.045	(0.414)	0.018	0.027
40	3.33	0.17	0.045	(0.413)	0.018	0.027
41	3.42	0.17	0.045	(0.411)	0.018	0.027
42	3.50	0.17	0.045	(0.409)	0.018	0.027
43	3.58	0.17	0.045	(0.408)	0.018	0.027
44	3.67	0.17	0.045	(0.406)	0.018	0.027
45	3.75	0.17	0.045	(0.404)	0.018	0.027
46	3.83	0.20	0.054	(0.402)	0.022	0.032
47	3.92	0.20	0.054	(0.401)	0.022	0.032
48	4.00	0.20	0.054	(0.399)	0.022	0.032
49	4.08	0.20	0.054	(0.397)	0.022	0.032
50	4.17	0.20	0.054	(0.396)	0.022	0.032
51	4.25	0.20	0.054	(0.394)	0.022	0.032
52	4.33	0.23	0.063	(0.392)	0.025	0.038
53	4.42	0.23	0.063	(0.391)	0.025	0.038

54	4.50	0.23	0.063	(0.389)	0.025	0.038
55	4.58	0.23	0.063	(0.387)	0.025	0.038
56	4.67	0.23	0.063	(0.386)	0.025	0.038
57	4.75	0.23	0.063	(0.384)	0.025	0.038
58	4.83	0.27	0.072	(0.382)	0.029	0.043
59	4.92	0.27	0.072	(0.381)	0.029	0.043
60	5.00	0.27	0.072	(0.379)	0.029	0.043
61	5.08	0.20	0.054	(0.377)	0.022	0.032
62	5.17	0.20	0.054	(0.376)	0.022	0.032
63	5.25	0.20	0.054	(0.374)	0.022	0.032
64	5.33	0.23	0.063	(0.372)	0.025	0.038
65	5.42	0.23	0.063	(0.371)	0.025	0.038
66	5.50	0.23	0.063	(0.369)	0.025	0.038
67	5.58	0.27	0.072	(0.368)	0.029	0.043
68	5.67	0.27	0.072	(0.366)	0.029	0.043
69	5.75	0.27	0.072	(0.364)	0.029	0.043
70	5.83	0.27	0.072	(0.363)	0.029	0.043
71	5.92	0.27	0.072	(0.361)	0.029	0.043
72	6.00	0.27	0.072	(0.360)	0.029	0.043
73	6.08	0.30	0.081	(0.358)	0.032	0.049
74	6.17	0.30	0.081	(0.356)	0.032	0.049
75	6.25	0.30	0.081	(0.355)	0.032	0.049
76	6.33	0.30	0.081	(0.353)	0.032	0.049
77	6.42	0.30	0.081	(0.352)	0.032	0.049
78	6.50	0.30	0.081	(0.350)	0.032	0.049
79	6.58	0.33	0.090	(0.348)	0.036	0.054
80	6.67	0.33	0.090	(0.347)	0.036	0.054
81	6.75	0.33	0.090	(0.345)	0.036	0.054
82	6.83	0.33	0.090	(0.344)	0.036	0.054
83	6.92	0.33	0.090	(0.342)	0.036	0.054
84	7.00	0.33	0.090	(0.341)	0.036	0.054
85	7.08	0.33	0.090	(0.339)	0.036	0.054
86	7.17	0.33	0.090	(0.338)	0.036	0.054
87	7.25	0.33	0.090	(0.336)	0.036	0.054
88	7.33	0.37	0.099	(0.334)	0.040	0.059
89	7.42	0.37	0.099	(0.333)	0.040	0.059
90	7.50	0.37	0.099	(0.331)	0.040	0.059
91	7.58	0.40	0.108	(0.330)	0.043	0.065
92	7.67	0.40	0.108	(0.328)	0.043	0.065
93	7.75	0.40	0.108	(0.327)	0.043	0.065
94	7.83	0.43	0.117	(0.325)	0.047	0.070
95	7.92	0.43	0.117	(0.324)	0.047	0.070
96	8.00	0.43	0.117	(0.322)	0.047	0.070
97	8.08	0.50	0.135	(0.321)	0.054	0.081
98	8.17	0.50	0.135	(0.319)	0.054	0.081
99	8.25	0.50	0.135	(0.318)	0.054	0.081
100	8.33	0.50	0.135	(0.316)	0.054	0.081
101	8.42	0.50	0.135	(0.315)	0.054	0.081
102	8.50	0.50	0.135	(0.313)	0.054	0.081
103	8.58	0.53	0.144	(0.312)	0.058	0.086
104	8.67	0.53	0.144	(0.310)	0.058	0.086
105	8.75	0.53	0.144	(0.309)	0.058	0.086
106	8.83	0.57	0.153	(0.308)	0.061	0.092
107	8.92	0.57	0.153	(0.306)	0.061	0.092
108	9.00	0.57	0.153	(0.305)	0.061	0.092
109	9.08	0.63	0.171	(0.303)	0.068	0.103
110	9.17	0.63	0.171	(0.302)	0.068	0.103
111	9.25	0.63	0.171	(0.300)	0.068	0.103
112	9.33	0.67	0.180	(0.299)	0.072	0.108
113	9.42	0.67	0.180	(0.297)	0.072	0.108
114	9.50	0.67	0.180	(0.296)	0.072	0.108
115	9.58	0.70	0.189	(0.295)	0.076	0.113
116	9.67	0.70	0.189	(0.293)	0.076	0.113

117	9.75	0.70	0.189	(0.292)	0.076	0.113
118	9.83	0.73	0.198	(0.290)	0.079	0.119
119	9.92	0.73	0.198	(0.289)	0.079	0.119
120	10.00	0.73	0.198	(0.288)	0.079	0.119
121	10.08	0.50	0.135	(0.286)	0.054	0.081
122	10.17	0.50	0.135	(0.285)	0.054	0.081
123	10.25	0.50	0.135	(0.283)	0.054	0.081
124	10.33	0.50	0.135	(0.282)	0.054	0.081
125	10.42	0.50	0.135	(0.281)	0.054	0.081
126	10.50	0.50	0.135	(0.279)	0.054	0.081
127	10.58	0.67	0.180	(0.278)	0.072	0.108
128	10.67	0.67	0.180	(0.277)	0.072	0.108
129	10.75	0.67	0.180	(0.275)	0.072	0.108
130	10.83	0.67	0.180	(0.274)	0.072	0.108
131	10.92	0.67	0.180	(0.273)	0.072	0.108
132	11.00	0.67	0.180	(0.271)	0.072	0.108
133	11.08	0.63	0.171	(0.270)	0.068	0.103
134	11.17	0.63	0.171	(0.269)	0.068	0.103
135	11.25	0.63	0.171	(0.267)	0.068	0.103
136	11.33	0.63	0.171	(0.266)	0.068	0.103
137	11.42	0.63	0.171	(0.265)	0.068	0.103
138	11.50	0.63	0.171	(0.263)	0.068	0.103
139	11.58	0.57	0.153	(0.262)	0.061	0.092
140	11.67	0.57	0.153	(0.261)	0.061	0.092
141	11.75	0.57	0.153	(0.259)	0.061	0.092
142	11.83	0.60	0.162	(0.258)	0.065	0.097
143	11.92	0.60	0.162	(0.257)	0.065	0.097
144	12.00	0.60	0.162	(0.256)	0.065	0.097
145	12.08	0.83	0.225	(0.254)	0.090	0.135
146	12.17	0.83	0.225	(0.253)	0.090	0.135
147	12.25	0.83	0.225	(0.252)	0.090	0.135
148	12.33	0.87	0.234	(0.250)	0.094	0.140
149	12.42	0.87	0.234	(0.249)	0.094	0.140
150	12.50	0.87	0.234	(0.248)	0.094	0.140
151	12.58	0.93	0.252	(0.247)	0.101	0.151
152	12.67	0.93	0.252	(0.245)	0.101	0.151
153	12.75	0.93	0.252	(0.244)	0.101	0.151
154	12.83	0.97	0.261	(0.243)	0.104	0.157
155	12.92	0.97	0.261	(0.242)	0.104	0.157
156	13.00	0.97	0.261	(0.241)	0.104	0.157
157	13.08	1.13	0.306	(0.239)	0.122	0.183
158	13.17	1.13	0.306	(0.238)	0.122	0.183
159	13.25	1.13	0.306	(0.237)	0.122	0.183
160	13.33	1.13	0.306	(0.236)	0.122	0.183
161	13.42	1.13	0.306	(0.234)	0.122	0.183
162	13.50	1.13	0.306	(0.233)	0.122	0.183
163	13.58	0.77	0.207	(0.232)	0.083	0.124
164	13.67	0.77	0.207	(0.231)	0.083	0.124
165	13.75	0.77	0.207	(0.230)	0.083	0.124
166	13.83	0.77	0.207	(0.229)	0.083	0.124
167	13.92	0.77	0.207	(0.227)	0.083	0.124
168	14.00	0.77	0.207	(0.226)	0.083	0.124
169	14.08	0.90	0.243	(0.225)	0.097	0.146
170	14.17	0.90	0.243	(0.224)	0.097	0.146
171	14.25	0.90	0.243	(0.223)	0.097	0.146
172	14.33	0.87	0.234	(0.222)	0.094	0.140
173	14.42	0.87	0.234	(0.221)	0.094	0.140
174	14.50	0.87	0.234	(0.219)	0.094	0.140
175	14.58	0.87	0.234	(0.218)	0.094	0.140
176	14.67	0.87	0.234	(0.217)	0.094	0.140
177	14.75	0.87	0.234	(0.216)	0.094	0.140
178	14.83	0.83	0.225	(0.215)	0.090	0.135
179	14.92	0.83	0.225	(0.214)	0.090	0.135

180	15.00	0.83	0.225	(0.213)	0.090	0.135
181	15.08	0.80	0.216	(0.212)	0.086	0.130
182	15.17	0.80	0.216	(0.211)	0.086	0.130
183	15.25	0.80	0.216	(0.209)	0.086	0.130
184	15.33	0.77	0.207	(0.208)	0.083	0.124
185	15.42	0.77	0.207	(0.207)	0.083	0.124
186	15.50	0.77	0.207	(0.206)	0.083	0.124
187	15.58	0.63	0.171	(0.205)	0.068	0.103
188	15.67	0.63	0.171	(0.204)	0.068	0.103
189	15.75	0.63	0.171	(0.203)	0.068	0.103
190	15.83	0.63	0.171	(0.202)	0.068	0.103
191	15.92	0.63	0.171	(0.201)	0.068	0.103
192	16.00	0.63	0.171	(0.200)	0.068	0.103
193	16.08	0.13	0.036	(0.199)	0.014	0.022
194	16.17	0.13	0.036	(0.198)	0.014	0.022
195	16.25	0.13	0.036	(0.197)	0.014	0.022
196	16.33	0.13	0.036	(0.196)	0.014	0.022
197	16.42	0.13	0.036	(0.195)	0.014	0.022
198	16.50	0.13	0.036	(0.194)	0.014	0.022
199	16.58	0.10	0.027	(0.193)	0.011	0.016
200	16.67	0.10	0.027	(0.192)	0.011	0.016
201	16.75	0.10	0.027	(0.191)	0.011	0.016
202	16.83	0.10	0.027	(0.190)	0.011	0.016
203	16.92	0.10	0.027	(0.189)	0.011	0.016
204	17.00	0.10	0.027	(0.188)	0.011	0.016
205	17.08	0.17	0.045	(0.187)	0.018	0.027
206	17.17	0.17	0.045	(0.186)	0.018	0.027
207	17.25	0.17	0.045	(0.185)	0.018	0.027
208	17.33	0.17	0.045	(0.184)	0.018	0.027
209	17.42	0.17	0.045	(0.183)	0.018	0.027
210	17.50	0.17	0.045	(0.183)	0.018	0.027
211	17.58	0.17	0.045	(0.182)	0.018	0.027
212	17.67	0.17	0.045	(0.181)	0.018	0.027
213	17.75	0.17	0.045	(0.180)	0.018	0.027
214	17.83	0.13	0.036	(0.179)	0.014	0.022
215	17.92	0.13	0.036	(0.178)	0.014	0.022
216	18.00	0.13	0.036	(0.177)	0.014	0.022
217	18.08	0.13	0.036	(0.176)	0.014	0.022
218	18.17	0.13	0.036	(0.175)	0.014	0.022
219	18.25	0.13	0.036	(0.175)	0.014	0.022
220	18.33	0.13	0.036	(0.174)	0.014	0.022
221	18.42	0.13	0.036	(0.173)	0.014	0.022
222	18.50	0.13	0.036	(0.172)	0.014	0.022
223	18.58	0.10	0.027	(0.171)	0.011	0.016
224	18.67	0.10	0.027	(0.170)	0.011	0.016
225	18.75	0.10	0.027	(0.170)	0.011	0.016
226	18.83	0.07	0.018	(0.169)	0.007	0.011
227	18.92	0.07	0.018	(0.168)	0.007	0.011
228	19.00	0.07	0.018	(0.167)	0.007	0.011
229	19.08	0.10	0.027	(0.166)	0.011	0.016
230	19.17	0.10	0.027	(0.166)	0.011	0.016
231	19.25	0.10	0.027	(0.165)	0.011	0.016
232	19.33	0.13	0.036	(0.164)	0.014	0.022
233	19.42	0.13	0.036	(0.163)	0.014	0.022
234	19.50	0.13	0.036	(0.163)	0.014	0.022
235	19.58	0.10	0.027	(0.162)	0.011	0.016
236	19.67	0.10	0.027	(0.161)	0.011	0.016
237	19.75	0.10	0.027	(0.160)	0.011	0.016
238	19.83	0.07	0.018	(0.160)	0.007	0.011
239	19.92	0.07	0.018	(0.159)	0.007	0.011
240	20.00	0.07	0.018	(0.158)	0.007	0.011
241	20.08	0.10	0.027	(0.157)	0.011	0.016
242	20.17	0.10	0.027	(0.157)	0.011	0.016

243	20.25	0.10	0.027	(0.156)	0.011	0.016
244	20.33	0.10	0.027	(0.155)	0.011	0.016
245	20.42	0.10	0.027	(0.155)	0.011	0.016
246	20.50	0.10	0.027	(0.154)	0.011	0.016
247	20.58	0.10	0.027	(0.153)	0.011	0.016
248	20.67	0.10	0.027	(0.153)	0.011	0.016
249	20.75	0.10	0.027	(0.152)	0.011	0.016
250	20.83	0.07	0.018	(0.152)	0.007	0.011
251	20.92	0.07	0.018	(0.151)	0.007	0.011
252	21.00	0.07	0.018	(0.150)	0.007	0.011
253	21.08	0.10	0.027	(0.150)	0.011	0.016
254	21.17	0.10	0.027	(0.149)	0.011	0.016
255	21.25	0.10	0.027	(0.149)	0.011	0.016
256	21.33	0.07	0.018	(0.148)	0.007	0.011
257	21.42	0.07	0.018	(0.147)	0.007	0.011
258	21.50	0.07	0.018	(0.147)	0.007	0.011
259	21.58	0.10	0.027	(0.146)	0.011	0.016
260	21.67	0.10	0.027	(0.146)	0.011	0.016
261	21.75	0.10	0.027	(0.145)	0.011	0.016
262	21.83	0.07	0.018	(0.145)	0.007	0.011
263	21.92	0.07	0.018	(0.144)	0.007	0.011
264	22.00	0.07	0.018	(0.144)	0.007	0.011
265	22.08	0.10	0.027	(0.143)	0.011	0.016
266	22.17	0.10	0.027	(0.143)	0.011	0.016
267	22.25	0.10	0.027	(0.142)	0.011	0.016
268	22.33	0.07	0.018	(0.142)	0.007	0.011
269	22.42	0.07	0.018	(0.142)	0.007	0.011
270	22.50	0.07	0.018	(0.141)	0.007	0.011
271	22.58	0.07	0.018	(0.141)	0.007	0.011
272	22.67	0.07	0.018	(0.140)	0.007	0.011
273	22.75	0.07	0.018	(0.140)	0.007	0.011
274	22.83	0.07	0.018	(0.140)	0.007	0.011
275	22.92	0.07	0.018	(0.139)	0.007	0.011
276	23.00	0.07	0.018	(0.139)	0.007	0.011
277	23.08	0.07	0.018	(0.139)	0.007	0.011
278	23.17	0.07	0.018	(0.138)	0.007	0.011
279	23.25	0.07	0.018	(0.138)	0.007	0.011
280	23.33	0.07	0.018	(0.138)	0.007	0.011
281	23.42	0.07	0.018	(0.137)	0.007	0.011
282	23.50	0.07	0.018	(0.137)	0.007	0.011
283	23.58	0.07	0.018	(0.137)	0.007	0.011
284	23.67	0.07	0.018	(0.137)	0.007	0.011
285	23.75	0.07	0.018	(0.137)	0.007	0.011
286	23.83	0.07	0.018	(0.136)	0.007	0.011
287	23.92	0.07	0.018	(0.136)	0.007	0.011
288	24.00	0.07	0.018	(0.136)	0.007	0.011
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	16.2

Flood volume = Effective rainfall 1.35(In)
times area 318.4(Ac.)/[(In)/(Ft.)] = 35.8(Ac.Ft)
Total soil loss = 0.90(In)
Total soil loss = 23.867(Ac.Ft)
Total rainfall = 2.25(In)
Flood volume = 1559446.8 Cubic Feet
Total soil loss = 1039631.2 Cubic Feet

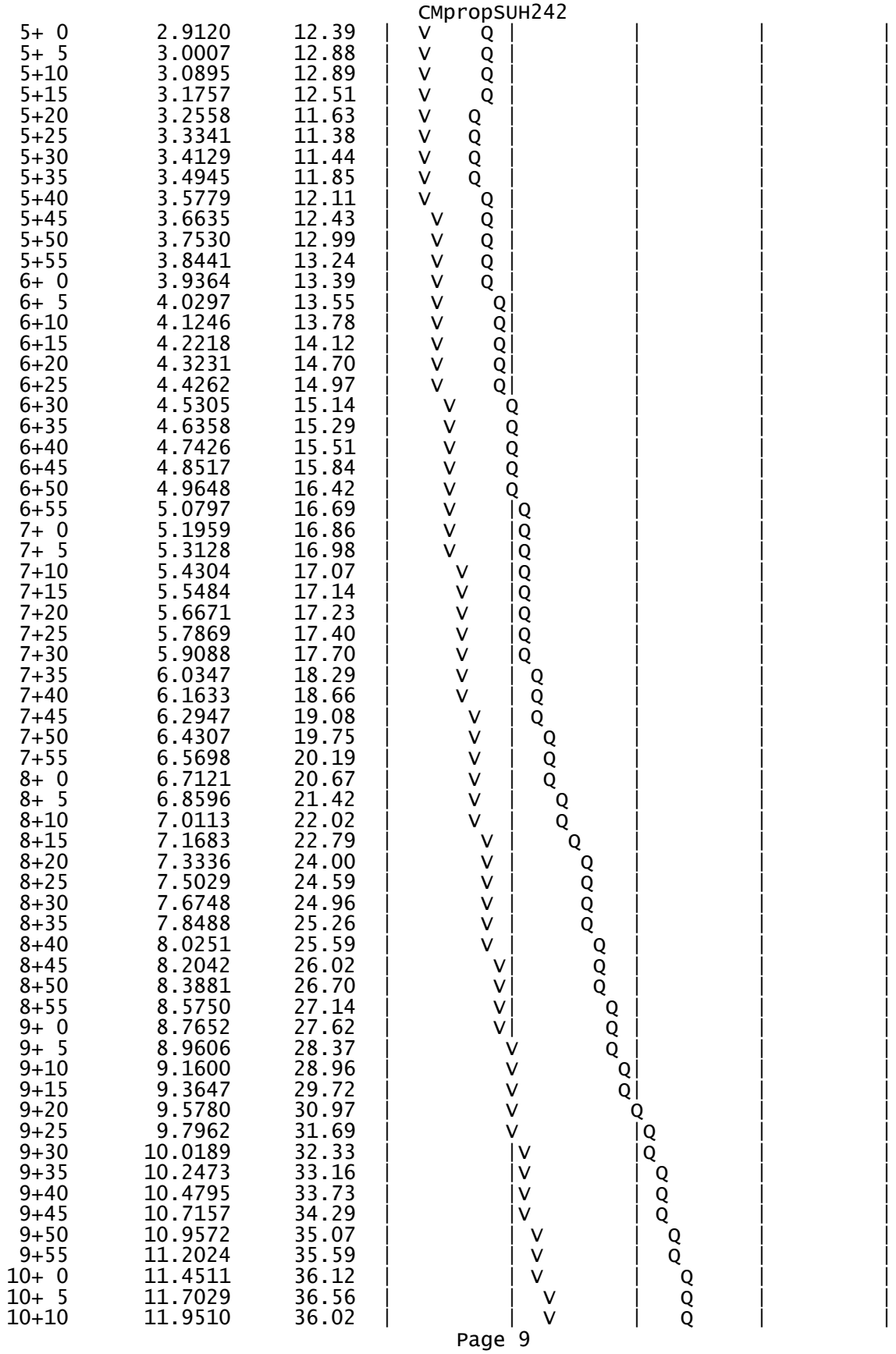
Peak flow rate of this hydrograph = 56.731(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	15.0	30.0	45.0	60.0
0+ 5	0.0005	0.08	Q				
0+10	0.0029	0.34	Q				
0+15	0.0090	0.89	Q				
0+20	0.0225	1.97	VQ				
0+25	0.0402	2.57	VQ				
0+30	0.0617	3.12	V Q				
0+35	0.0882	3.84	V Q				
0+40	0.1173	4.23	V Q				
0+45	0.1481	4.48	V Q				
0+50	0.1805	4.71	V Q				
0+55	0.2149	4.98	V Q				
1+ 0	0.2518	5.36	V Q				
1+ 5	0.2926	5.93	V Q				
1+10	0.3345	6.08	V Q				
1+15	0.3757	5.99	V Q				
1+20	0.4142	5.59	V Q				
1+25	0.4518	5.45	V Q				
1+30	0.4889	5.38	V Q				
1+35	0.5256	5.34	V Q				
1+40	0.5622	5.31	V Q				
1+45	0.5986	5.29	V Q				
1+50	0.6352	5.31	V Q				
1+55	0.6725	5.41	V Q				
2+ 0	0.7115	5.67	V Q				
2+ 5	0.7541	6.18	V Q				
2+10	0.7983	6.41	V Q				
2+15	0.8434	6.55	V Q				
2+20	0.8892	6.65	V Q				
2+25	0.9355	6.72	V Q				
2+30	0.9821	6.78	V Q				
2+35	1.0294	6.86	V Q				
2+40	1.0777	7.02	V Q				
2+45	1.1281	7.32	V Q				
2+50	1.1823	7.86	V Q				
2+55	1.2380	8.10	V Q				
3+ 0	1.2948	8.24	V Q				
3+ 5	1.3523	8.35	V Q				
3+10	1.4104	8.43	V Q				
3+15	1.4688	8.49	V Q				
3+20	1.5276	8.54	V Q				
3+25	1.5867	8.58	V Q				
3+30	1.6460	8.60	V Q				
3+35	1.7053	8.62	V Q				
3+40	1.7648	8.63	V Q				
3+45	1.8243	8.64	V Q				
3+50	1.8841	8.68	V Q				
3+55	1.9448	8.82	V Q				
4+ 0	2.0075	9.09	V Q				
4+ 5	2.0737	9.62	V Q				
4+10	2.1416	9.86	V Q				
4+15	2.2105	10.00	V Q				
4+20	2.2803	10.14	V Q				
4+25	2.3516	10.35	V Q				
4+30	2.4251	10.68	V Q				
4+35	2.5026	11.25	V Q				
4+40	2.5818	11.51	V Q				
4+45	2.6623	11.68	V Q				
4+50	2.7438	11.83	V Q				
4+55	2.8267	12.05	V Q				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5+25 3.3341 11.38
5+30 3.4129 11.44
5+35 3.4945 11.85
5+40 3.5779 12.11
5+45 3.6635 12.43
5+50 3.7530 12.99
5+55 3.8441 13.24
6+ 0 3.9364 13.39
6+ 5 4.0297 13.55
6+10 4.1246 13.78
6+15 4.2218 14.12
6+20 4.3231 14.70
6+25 4.4262 14.97
6+30 4.5305 15.14
6+35 4.6358 15.29
6+40 4.7426 15.51
6+45 4.8517 15.84
6+50 4.9648 16.42
6+55 5.0797 16.69
7+ 0 5.1959 16.86
7+ 5 5.3128 16.98
7+10 5.4304 17.07
7+15 5.5484 17.14
7+20 5.6671 17.23
7+25 5.7869 17.40
7+30 5.9088 17.70
7+35 6.0347 18.29
7+40 6.1633 18.66
7+45 6.2947 19.08
7+50 6.4307 19.75
7+55 6.5698 20.19
8+ 0 6.7121 20.67
8+ 5 6.8596 21.42
8+10 7.0113 22.02
8+15 7.1683 22.79
8+20 7.3336 24.00
8+25 7.5029 24.59
8+30 7.6748 24.96
8+35 7.8488 25.26
8+40 8.0251 25.59
8+45 8.2042 26.02
8+50 8.3881 26.70
8+55 8.5750 27.14
9+ 0 8.7652 27.62
9+ 5 8.9606 28.37
9+10 9.1600 28.96
9+15 9.3647 29.72
9+20 9.5780 30.97
9+25 9.7962 31.69
9+30 10.0189 32.33
9+35 10.2473 33.16
9+40 10.4795 33.73
9+45 10.7157 34.29
9+50 10.9572 35.07
9+55 11.2024 35.59
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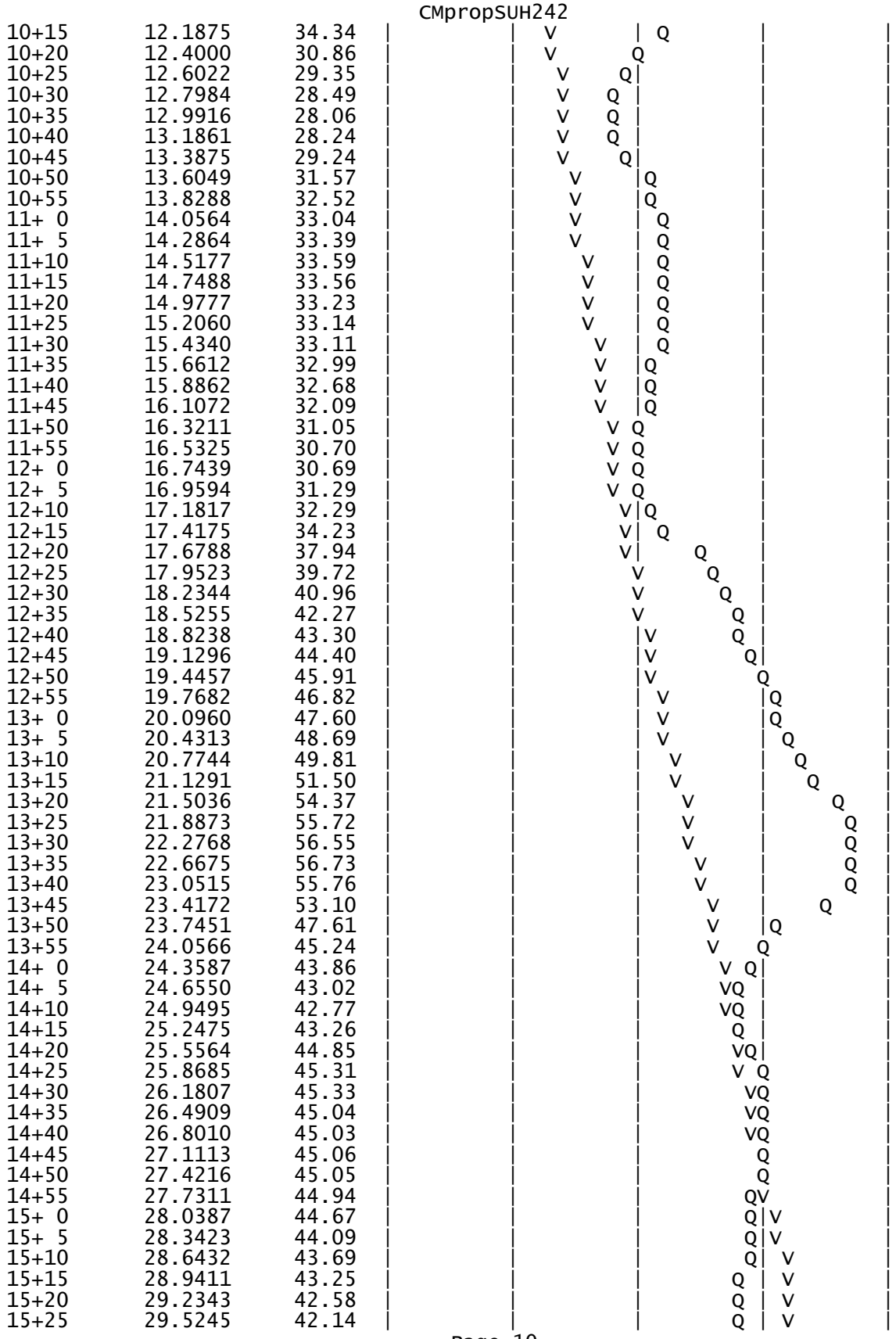
10+ 5 11.7029 36.56
10+10 11.9510 36.02



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10+25	12.6022	29.35	
10+30	12.7984	28.49	
10+35	12.9916	28.06	
10+40	13.1861	28.24	
10+45	13.3875	29.24	
10+50	13.6049	31.57	
10+55	13.8288	32.52	
11+ 0	14.0564	33.04	
11+ 5	14.2864	33.39	
11+10	14.5177	33.59	
11+15	14.7488	33.56	
11+20	14.9777	33.23	
11+25	15.2060	33.14	
11+30	15.4340	33.11	
11+35	15.6612	32.99	
11+40	15.8862	32.68	
11+45	16.1072	32.09	
11+50	16.3211	31.05	
11+55	16.5325	30.70	
12+ 0	16.7439	30.69	
12+ 5	16.9594	31.29	
12+10	17.1817	32.29	
12+15	17.4175	34.23	
12+20	17.6788	37.94	
12+25	17.9523	39.72	
12+30	18.2344	40.96	
12+35	18.5255	42.27	
12+40	18.8238	43.30	
12+45	19.1296	44.40	
12+50	19.4457	45.91	
12+55	19.7682	46.82	
13+ 0	20.0960	47.60	
13+ 5	20.4313	48.69	
13+10	20.7744	49.81	
13+15	21.1291	51.50	
13+20	21.5036	54.37	
13+25	21.8873	55.72	
13+30	22.2768	56.55	
13+35	22.6675	56.73	
13+40	23.0515	55.76	
13+45	23.4172	53.10	
13+50	23.7451	47.61	
13+55	24.0566	45.24	
14+ 0	24.3587	43.86	
14+ 5	24.6550	43.02	
14+10	24.9495	42.77	
14+15	25.2475	43.26	
14+20	25.5564	44.85	
14+25	25.8685	45.31	
14+30	26.1807	45.33	
14+35	26.4909	45.04	
14+40	26.8010	45.03	
14+45	27.1113	45.06	
14+50	27.4216	45.05	
14+55	27.7311	44.94	
15+ 0	28.0387	44.67	
15+ 5	28.3423	44.09	
15+10	28.6432	43.69	
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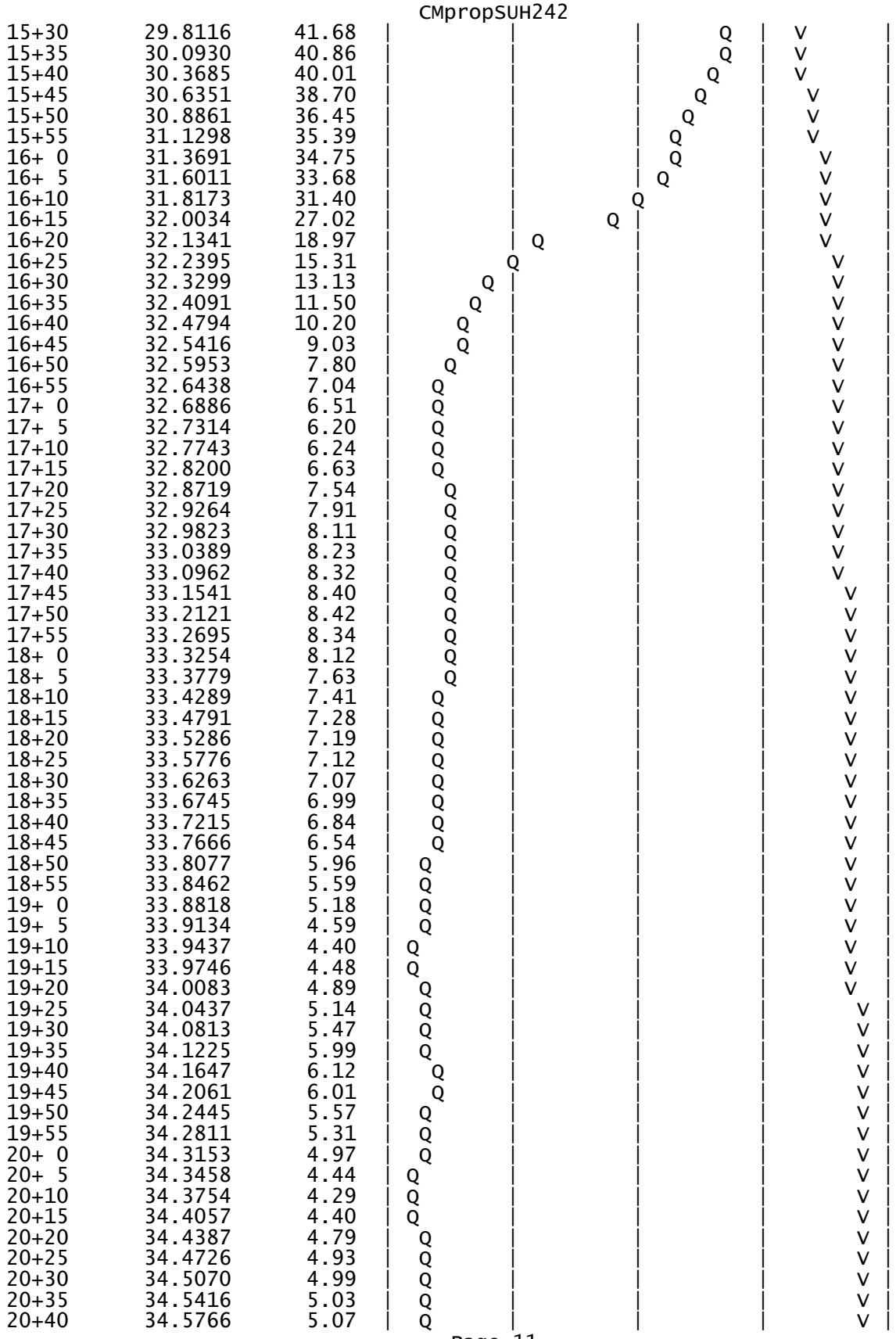
15+25	29.5245	42.14	



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15+40	30.3685	40.01	
15+45	30.6351	38.70	
15+50	30.8861	36.45	
15+55	31.1298	35.39	
16+ 0	31.3691	34.75	
16+ 5	31.6011	33.68	
16+10	31.8173	31.40	
16+15	32.0034	27.02	
16+20	32.1341	18.97	
16+25	32.2395	15.31	
16+30	32.3299	13.13	
16+35	32.4091	11.50	
16+40	32.4794	10.20	
16+45	32.5416	9.03	
16+50	32.5953	7.80	
16+55	32.6438	7.04	
17+ 0	32.6886	6.51	
17+ 5	32.7314	6.20	
17+10	32.7743	6.24	
17+15	32.8200	6.63	
17+20	32.8719	7.54	
17+25	32.9264	7.91	
17+30	32.9823	8.11	
17+35	33.0389	8.23	
17+40	33.0962	8.32	
17+45	33.1541	8.40	
17+50	33.2121	8.42	
17+55	33.2695	8.34	
18+ 0	33.3254	8.12	
18+ 5	33.3779	7.63	
18+10	33.4289	7.41	
18+15	33.4791	7.28	
18+20	33.5286	7.19	
18+25	33.5776	7.12	
18+30	33.6263	7.07	
18+35	33.6745	6.99	
18+40	33.7215	6.84	
18+45	33.7666	6.54	
18+50	33.8077	5.96	
18+55	33.8462	5.59	
19+ 0	33.8818	5.18	
19+ 5	33.9134	4.59	
19+10	33.9437	4.40	
19+15	33.9746	4.48	
19+20	34.0083	4.89	
19+25	34.0437	5.14	
19+30	34.0813	5.47	
19+35	34.1225	5.99	
19+40	34.1647	6.12	
19+45	34.2061	6.01	
19+50	34.2445	5.57	
19+55	34.2811	5.31	
20+ 0	34.3153	4.97	
20+ 5	34.3458	4.44	
20+10	34.3754	4.29	
20+15	34.4057	4.40	
20+20	34.4387	4.79	
20+25	34.4726	4.93	
20+30	34.5070	4.99	
20+35	34.5416	5.03	
20+40	34.5766	5.07	

20+45	34.6117	5.10	Q				V
20+50	34.6468	5.09	Q				V
20+55	34.6811	4.99	Q				V
21+ 0	34.7137	4.73	Q				V
21+ 5	34.7431	4.26	Q				V
21+10	34.7717	4.16	Q				V
21+15	34.8012	4.29	Q				V
21+20	34.8334	4.68	Q				V
21+25	34.8659	4.70	Q				V
21+30	34.8969	4.51	Q				V
21+35	34.9251	4.09	Q				V
21+40	34.9528	4.03	Q				V
21+45	34.9817	4.20	Q				V
21+50	35.0134	4.61	Q				V
21+55	35.0456	4.66	Q				V
22+ 0	35.0765	4.49	Q				V
22+ 5	35.1045	4.07	Q				V
22+10	35.1322	4.01	Q				V
22+15	35.1610	4.19	Q				V
22+20	35.1927	4.60	Q				V
22+25	35.2247	4.65	Q				V
22+30	35.2556	4.48	Q				V
22+35	35.2833	4.03	Q				V
22+40	35.3098	3.84	Q				V
22+45	35.3355	3.74	Q				V
22+50	35.3608	3.67	Q				V
22+55	35.3858	3.62	Q				V
23+ 0	35.4105	3.58	Q				V
23+ 5	35.4349	3.55	Q				V
23+10	35.4592	3.53	Q				V
23+15	35.4834	3.51	Q				V
23+20	35.5075	3.49	Q				V
23+25	35.5315	3.49	Q				V
23+30	35.5554	3.48	Q				V
23+35	35.5794	3.48	Q				V
23+40	35.6033	3.48	Q				V
23+45	35.6273	3.48	Q				V
23+50	35.6512	3.47	Q				V
23+55	35.6751	3.47	Q				V
24+ 0	35.6990	3.47	Q				V
24+ 5	35.7223	3.39	Q				V
24+10	35.7438	3.13	Q				V
24+15	35.7616	2.58	Q				V
24+20	35.7722	1.53	Q				V
24+25	35.7795	1.07	Q				V
24+30	35.7849	0.79	Q				V
24+35	35.7890	0.59	Q				V
24+40	35.7920	0.44	Q				V
24+45	35.7943	0.32	Q				V
24+50	35.7959	0.23	Q				V
24+55	35.7970	0.17	Q				V
25+ 0	35.7978	0.12	Q				V
25+ 5	35.7983	0.08	Q				V
25+10	35.7988	0.06	Q				V
25+15	35.7991	0.05	Q				V
25+20	35.7994	0.04	Q				V
25+25	35.7996	0.03	Q				V
25+30	35.7998	0.02	Q				V
25+35	35.7999	0.02	Q				V
25+40	35.7999	0.01	Q				V
25+45	35.8000	0.00	Q				V
25+50	35.8000	0.00	Q				V

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

PRELIMINARY

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☒ **A. On-site storm drain inlets**	☒ Locations of inlets.	☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify. ☒ Include Catch Basin Filter Inserts in all inlets/catch basins onsite as a pretreatment measure.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☐ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B. Interior floor drains and elevator shaft sump pumps**		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C. Interior parking garages**		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.
☒ **D2.** Landscape/ Outdoor Pesticide Use	☒ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☐ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	☐ State that final landscape plans will accomplish all of the following. ☐ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☐ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. ☒ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☐ Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in "What you should know for.....Landscape and Gardening" at http://rcflood.org/stormwater/Error! Hyperlink reference not valid. ☐ Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUT ANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features.	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	❑ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ **F.** Food service	❑ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ❑ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	❑ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	❑ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
❑ **G.** Refuse areas	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☒ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ❑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☒ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	❑ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **H.** Industrial processes.	❑ Show process area.	❑ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	❑ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

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❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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❑ **J.** Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

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❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

STORMWATER POLLUT ANT SOURCES/SOURCE CONTROL CHECKLIST

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☒ **M.** Loading Docks	☒ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☒ Move loaded and unloaded items indoors as soon as possible. ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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❑ **N.** Fire Sprinkler Test Water		❑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	❑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ❑ Boiler drain lines ❑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ❑ Roofing, gutters, and trim. ❑ Other sources		❑ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ❑ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ❑ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ❑ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ❑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUT ANT SOURCES/SOURCE CONTROL CHECKLIST

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☒ P. Plazas, sidewalks, and parking lots.			☒ Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

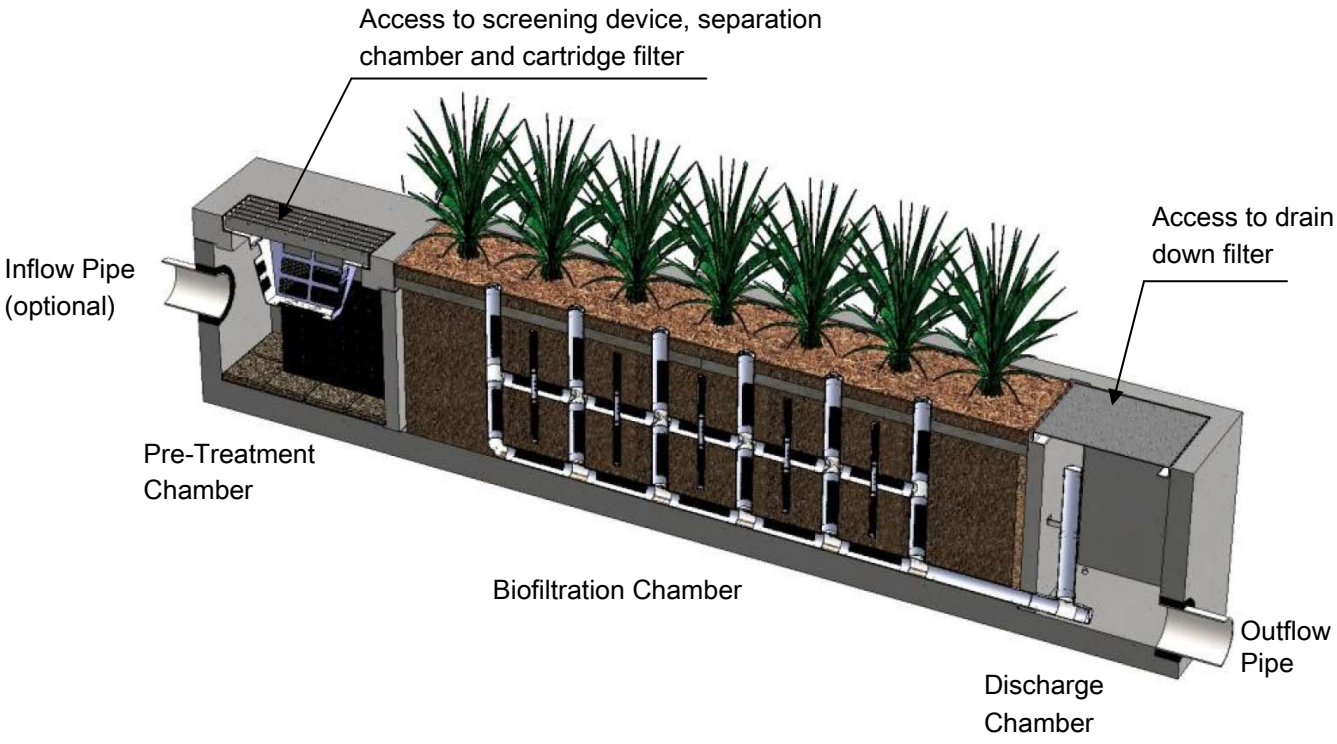
PRELIMINARY

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.







Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.







Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.









Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information