PRELIMINARY HYDROLOGY AND HYDRAULIC STUDY FOR Bundy Canyon Resort Apartments

City of Wildomar
CALIFORNIA

PREPARED FOR:
HUFSDAR
INVESTMENTS, LLC
P.O. Box 6579
West Lake Village, CA
91359
(805) 241-5007

PREPARED BY:
Grant Becklund
30811Garbani Road
Winchester, CA 92596

(951) 288-0601

DATE PREPARED:
October 24, 2016

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Grant W. Becklund
RCE 23737
Registered Civil Engineer

10/24/2016

Table of Contents:

INTRODUCTION	***4***
PROJECT SITE AND DRAINAGE OVERVIEW	***4***
HYDROLOGY ANALYSIS	***5***
HYDRAULIC ANALYSIS	***7***
SANTA MARGARITA RIVER WATERSHED INCREASED RUNOFF MITIGATION	***7***
CONCLUSIONS	***8***
REFERENCES	***8***

INTRODUCTION

Bundy Canyon Resort Apartments is a proposed residential development of 140 apartments in the City of Wildomar. The purpose of this study is to determine the preliminary drainage improvements required to provide flood protection to the project area from the flows generated from the onsite and offsite areas.

The study will determine the preliminary drainage improvements required to convey the onsite flows to the existing storm drain in Windwood Lane.

The water quality system sizing and hydro modifications/hydrologic conditions of concern analyses have been included in the Water Quality Management Plan for the Santa Margarita Watershed area.

The scope of this report will include the following:

- Determine the peak 100-year and 10-year flow rates for the existing condition watershed using the Riverside County Flood Control and Water Conservation District (RCFC & WCD) Rational Method.

- Determine the 100-year and 10-year flow rates for the post-project condition onsite and offsite areas using the Riverside County Flood Control and WaterConservation District (RCFC & WCD) Rational Method.

- Develop preliminary storm drain alignments and sizes required to flood-proof and protect the project site from offsite and onsite flows.

- Preparation of a preliminary hydrology and hydraulic report providing the hydrological and analytical results and exhibits.

PROJECT SITE AND DRAINAGE OVERVIEW

The Bundy Canyon Apartment Project is a proposed residential development consisting of 140 apartment units, open-space areas, access roads and landscape buffers, and one retention basin.

The project is on approximately 28 acres located in the City of Wildomar and is located southerly of Bundy Canyon easterly of Interstate 15 at Tulip

Lane. The project is located within Section 25 of Township 6 South, Range 4 West.

The project site proposes a system to collect all onsite flows with subsurface storm drains which will convey the flows to an on-site basin. This system will treat the flows for water quality purposes, address hydro modifications and mitigate for increased runoff.

The project conveys approximately 1900 cfs from 1650 acres of easterly offsite drainage areas through the existing Bundy Canyon Wash to the existing Line òAò Bundy Canyon Channel maintained by Riverside County Flood Control Channel westerly of the project. The offsite flows will remain separate from the onsite flows and will pass through the site untouched.

The project is tributary to the Santa Margarita Watershed. The grading for the project is designed such that no areas are diverted from the existing tributary receiving waters and downstream tributaries. The entire project currently drains to Line ñAò of Bundy Canyon Channel and will continue to drain to this facility with only different flow paths directing flow to the channel. Exhibit C shows the drainage areas that have different flow paths and the proposed diversions of area within the project site. The existing storm drain in Windward Lane was master planned to serve this property and has the capacity to convey the design flows.

HYDROLOGY ANALYSIS

The RCFC & WCD Hydrology Manual was used to develop the hydrological parameters for the rational method. The existing soil classification for the area consists of ñCò Soils as shown on Exhibit ñFò - Plate C-1.51 of the RCFCD Hydrology Manual. Exhibit F is a hydrologic soils map that was obtained from the United States Department of Agriculture Natural Resources Conservation Service (NRCS). As recommended by the County of Riverside, an Antecedent Moisture Condition (AMC) I was utilized for the 2-year storm events, and an AMC II was utilized for the 10-year and 100-year storm events.

The following rainfall depths were obtained from the RCFC & WCD Hydrology Manualôs Standard Intensity ï Duration Chart for the Elsinore ï Wildomar Chart.The 10-year 60 minute rainfall intensity of 0.98 inches per hour and 100-year value of 1.50 inches per hour were used. The slope of intensity duration used was 0.48

Pre-Project Hydrology:

The on-site areas were analyzed for the existing land use condition. The existing land uses were determined using an aerial image. The following land use designation was utilized in the on-site hydrology analyses: Natural Covers ï Chaparral, Narrow leaf

The existing condition hydrology analysis was performed for the existing project watershed areas which is tributary to the Santa Margarita Watershed. The existing condition hydrology analyses was performed in order to determine the tributary areas at each of the downstream points to insure that the project did not divert more than one acre of area to any one point. The existing condition rational method calculations and the existing condition hydrology map for the 10 and 100 year storms have been included.

On-site Post-Project Hydrology:

The on-site areas were analyzed for the proposed land uses. The following land use designations were utilized in the on-site hydrology analyses: Apartments, Park and Natural.

The post condition rational method calculations and the post condition hydrology map for the 10 and 100 year storms have been included. The conclusion is that the project can be constructed without increasing the flow rates leaving the site.

The post-project condition onsite rational method hydrology analysis was performed for the proposed project watershed areas which are all tributary to the Santa Margarita Watershed. The onsite areas do not divert water to a different watershed.

The capacity of the proposed Basin at Woodwind was analyzed to determine if it has capacity for the difference between the ñPre-developedò condition and the ñDevelopedò condition for a 24-hour 10-year storm. The basin has sufficient capacity to store this difference and the outlet structure will be designed to limit the discharge to the design capacity of the existing storm drain. (See Chart A).

The Santa Margarita River Watershed requires the use of the Santa Margarita River Hydro Modification Program developed by Clear Creek Solutions to analyze the effect of the project on increased runoff to the Santa Margarita River Watershed. The hydro modification analysis is included in the Water Quality Management Plan for the Bundy Canyon Apartment Project.

Offsite Post-Project Hydrology:

An Offsite Pre and Post-Project hydrology analyses was not performed because it remains the same between the pre-project and post-project conditions.

HYDRAULIC ANALYSIS

The proposed project consists of a system of subsurface storm drain systems, bio retention basins, and a detention basin. The facilities will be utilized to flood protect the project site, treat onsite flows for water quality purposes, and mitigate flows for increased runoff/address hydro modifications. During the preliminary stages, the storm drain systems were not sized but the system alignment is shown and the Improvement plans for the existing system in Windwood Lane are included. During final engineering the CIVILCAD/CIVILDESIGN water surface profile gradient program will be used to generate the calculations for the system.

SANTA MARGARITA RIVER WATERSHED INCREASED RUNOFF MITIGATION:

The project site will utilize bio retention basins to treat for water quality purposes and the natural basin on the west side of the project site to address hydro modifications/hydrologic conditions of concern and increased runoff mitigation. The water quality calculations, hydro modification calculations, and hydrologic conditions of concern assessments have been included in the Preliminary Water Quality Management Plan for the for the Santa Margarita Watershed. The Santa Margarita River Watershed area meets increased runoff mitigation by addressing hydro modification using the Santa Margarita River Hydro modification Program developed by Clear Creek Solutions. The remaining existing natural basin area has sufficient storage capacity to store the entire volume from the development and will be utilized to maintain the existing flow conditions by a controlled release over time.

CONCLUSIONS

Drainage analyses were prepared for the project site in order to determine the pre-project and post-project conditions, hydrology and hydraulic results with the following conclusions:

The offsite flows being conveyed through the site by the existing Bundy Canyon Wash will not be impacted by the project as the access road will

be designed as a clear-span bridge over the wash and not affect the watercourse.

The proposed storm drain designs will provide flood protection to the project site for the 100-year storm events.

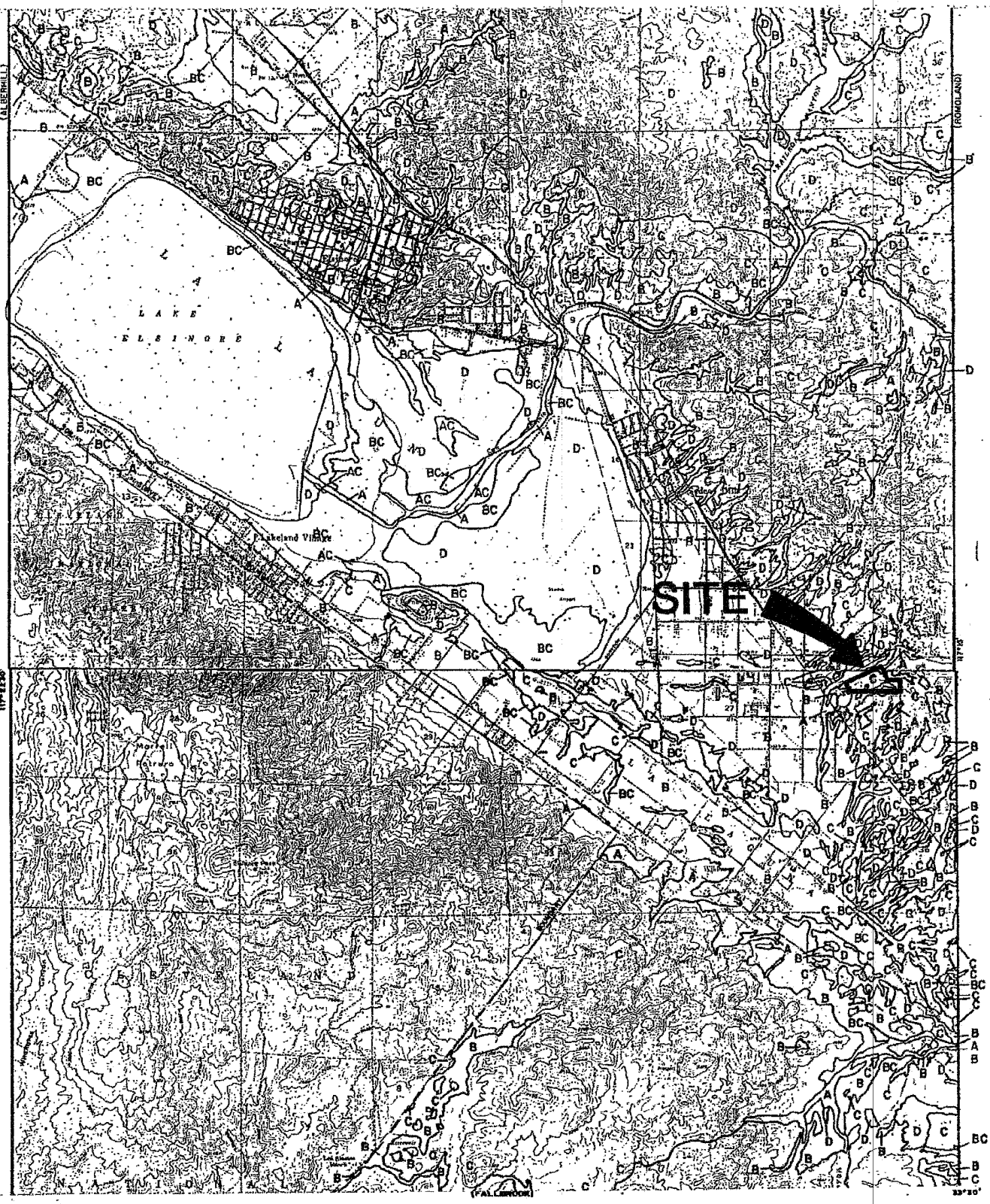
The project site will not adversely impact downstream properties by mitigating increased flows to less than pre-project levels.

REFERENCES

1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978.

2. Riverside County Storm water Quality Best Management Practice Design Handbook, July 2006

EXHIBITS



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC & WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR WILDOMAR

(2)

PLATE C-1.51

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

RAINFALL INTENSITY—INCHES PER HOUR

CATHEDRAL CITY			CHERRY VALLEY			CORONA			DESERT HOT SPRINGS			ELSINORE - WILDOMAR		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	4.14	6.76	5	3.65	5.49	5	3.10	4.78	5	4.39	6.76	5	3.23	4.94
6	3.73	6.08	6	3.30	4.97	6	2.84	4.38	6	3.95	6.08	6	2.96	4.53
7	3.41	5.56	7	3.03	4.56	7	2.64	4.07	7	3.62	5.56	7	2.75	4.21
8	3.15	5.15	8	2.82	4.24	8	2.47	3.81	8	3.35	5.15	8	2.58	3.95
9	2.95	4.81	9	2.64	3.97	9	2.34	3.60	9	3.13	4.81	9	2.44	3.73
10	2.77	4.52	10	2.49	3.75	10	2.22	3.43	10	2.94	4.52	10	2.32	3.54
11	2.62	4.28	11	2.36	3.56	11	2.12	3.27	11	2.78	4.28	11	2.21	3.39
12	2.49	4.07	12	2.25	3.39	12	2.04	3.14	12	2.65	4.07	12	2.12	3.25
13	2.38	3.88	13	2.16	3.25	13	1.96	3.02	13	2.53	3.88	13	2.04	3.13
14	2.28	3.72	14	2.07	3.12	14	1.89	2.92	14	2.42	3.72	14	1.97	3.02
15	2.19	3.58	15	1.99	3.00	15	1.83	2.82	15	2.32	3.58	15	1.91	2.92
16	2.11	3.44	16	1.92	2.90	16	1.77	2.73	16	2.24	3.44	16	1.85	2.83
17	2.04	3.32	17	1.86	2.80	17	1.72	2.66	17	2.16	3.32	17	1.80	2.75
18	1.97	3.22	18	1.80	2.71	18	1.68	2.58	18	2.09	3.22	18	1.75	2.67
19	1.91	3.12	19	1.75	2.64	19	1.63	2.52	19	2.03	3.12	19	1.70	2.60
20	1.85	3.03	20	1.70	2.56	20	1.59	2.46	20	1.97	3.03	20	1.66	2.54
22	1.75	2.86	22	1.61	2.43	22	1.52	2.35	22	1.86	2.86	22	1.59	2.43
24	1.67	2.72	24	1.54	2.32	24	1.46	2.25	24	1.77	2.72	24	1.52	2.33
26	1.59	2.60	26	1.47	2.22	26	1.40	2.17	26	1.69	2.60	26	1.46	2.24
28	1.52	2.49	28	1.41	2.13	28	1.36	2.09	28	1.62	2.49	28	1.41	2.16
30	1.46	2.39	30	1.36	2.05	30	1.31	2.02	30	1.55	2.39	30	1.37	2.09
32	1.41	2.30	32	1.31	1.98	32	1.27	1.96	32	1.50	2.30	32	1.33	2.03
34	1.36	2.22	34	1.27	1.91	34	1.23	1.90	34	1.45	2.22	34	1.29	1.97
36	1.32	2.15	36	1.23	1.85	36	1.20	1.85	36	1.40	2.15	36	1.25	1.92
38	1.28	2.09	38	1.20	1.80	38	1.17	1.81	38	1.36	2.09	38	1.22	1.87
40	1.24	2.02	40	1.16	1.75	40	1.14	1.76	40	1.32	2.02	40	1.19	1.82
45	1.16	1.89	45	1.09	1.64	45	1.08	1.66	45	1.23	1.89	45	1.13	1.72
50	1.09	1.78	50	1.03	1.55	50	1.03	1.58	50	1.16	1.78	50	1.07	1.64
55	1.03	1.68	55	.98	1.47	55	.98	1.51	55	1.09	1.68	55	1.02	1.56
60	.98	1.60	60	.93	1.40	60	.94	1.45	60	1.04	1.60	60	.98	1.50
65	.94	1.53	65	.89	1.34	65	.90	1.40	65	.99	1.53	65	.94	1.44
70	.90	1.46	70	.85	1.29	70	.87	1.35	70	.95	1.46	70	.91	1.39
75	.86	1.41	75	.82	1.24	75	.84	1.30	75	.91	1.41	75	.88	1.35
80	.83	1.35	80	.79	1.20	80	.82	1.26	80	.88	1.35	80	.85	1.31
85	.80	1.31	85	.77	1.16	85	.80	1.23	85	.85	1.31	85	.83	1.27
SLOPE = .580			SLOPE = .550			SLOPE = .480			SLOPE = .580			SLOPE = .480		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY-DURATION CURVES DATA

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 68

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.40	.55	.63	.69	.72	.74	.76	.78	.80	.81
5.	.04	.42	.57	.65	.70	.73	.75	.77	.78	.80	.82
10.	.09	.45	.59	.66	.71	.74	.76	.78	.79	.81	.82
15.	.13	.47	.61	.67	.72	.75	.77	.78	.80	.81	.83
20.	.18	.50	.62	.69	.73	.76	.78	.79	.80	.82	.83
25.	.22	.52	.64	.70	.74	.76	.78	.80	.81	.82	.84
30.	.27	.55	.66	.71	.75	.77	.79	.80	.81	.83	.84
35.	.31	.57	.67	.73	.76	.78	.80	.81	.82	.83	.84
40.	.36	.60	.69	.74	.77	.79	.81	.82	.83	.84	.85
45.	.40	.62	.71	.75	.78	.80	.81	.82	.83	.84	.85
50.	.45	.65	.73	.77	.79	.81	.82	.83	.84	.85	.86
55.	.49	.67	.74	.78	.80	.82	.83	.84	.85	.85	.86
60.	.54	.70	.76	.79	.81	.83	.84	.85	.85	.86	.87
65.	.58	.72	.78	.81	.82	.84	.85	.85	.86	.86	.87
70.	.63	.75	.80	.82	.84	.85	.85	.86	.86	.87	.87
75.	.67	.77	.81	.83	.85	.85	.86	.87	.87	.87	.88
80.	.72	.80	.83	.85	.86	.86	.87	.87	.88	.88	.88
85.	.76	.82	.85	.86	.87	.87	.88	.88	.88	.88	.89
90.	.81	.85	.87	.87	.88	.88	.88	.89	.89	.89	.89
95.	.86	.87	.88	.89	.89	.89	.89	.89	.89	.89	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 70

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.42	.57	.65	.70	.73	.76	.77	.79	.81	.82
5.	.04	.44	.59	.66	.71	.74	.76	.78	.79	.81	.83
10.	.09	.47	.61	.68	.72	.75	.77	.79	.80	.82	.83
15.	.13	.49	.62	.69	.73	.76	.78	.79	.80	.82	.83
20.	.18	.52	.64	.70	.74	.77	.78	.80	.81	.83	.84
25.	.22	.54	.65	.71	.75	.77	.79	.81	.82	.83	.84
30.	.27	.56	.67	.73	.76	.78	.80	.81	.82	.84	.85
35.	.31	.59	.69	.74	.77	.79	.81	.82	.83	.84	.85
40.	.36	.61	.70	.75	.78	.80	.81	.82	.83	.84	.85
45.	.40	.64	.72	.76	.79	.81	.82	.83	.84	.85	.86
50.	.45	.66	.74	.78	.80	.82	.83	.84	.84	.85	.86
55.	.49	.68	.75	.79	.81	.82	.84	.84	.85	.86	.86
60.	.54	.71	.77	.80	.82	.83	.84	.85	.86	.86	.87
65.	.58	.73	.79	.81	.83	.84	.85	.86	.86	.87	.87
70.	.63	.76	.80	.83	.84	.85	.86	.86	.87	.87	.88
75.	.67	.78	.82	.84	.85	.86	.86	.87	.87	.88	.88
80.	.72	.80	.83	.85	.86	.87	.87	.87	.88	.88	.88
85.	.76	.83	.85	.86	.87	.87	.88	.88	.88	.89	.89
90.	.81	.85	.87	.88	.88	.88	.89	.89	.89	.89	.89
95.	.86	.88	.88	.89	.89	.89	.89	.89	.89	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 72

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.44	.59	.67	.71	.75	.77	.78	.80	.82	.83
5.	.04	.46	.61	.68	.72	.75	.77	.79	.80	.82	.83
10.	.09	.49	.62	.69	.73	.76	.78	.80	.81	.82	.84
15.	.13	.51	.64	.70	.74	.77	.79	.80	.81	.83	.84
20.	.18	.53	.65	.72	.75	.78	.79	.81	.82	.83	.84
25.	.22	.56	.67	.73	.76	.78	.80	.81	.82	.84	.85
30.	.27	.58	.68	.74	.77	.79	.81	.82	.83	.84	.85
35.	.31	.60	.70	.75	.78	.80	.81	.82	.83	.85	.85
40.	.36	.63	.72	.76	.79	.81	.82	.83	.84	.85	.86
45.	.40	.65	.73	.77	.80	.81	.83	.84	.84	.85	.86
50.	.45	.67	.75	.78	.81	.82	.83	.84	.85	.86	.86
55.	.49	.69	.76	.80	.82	.83	.84	.85	.85	.86	.87
60.	.54	.72	.78	.81	.83	.84	.85	.85	.86	.87	.87
65.	.58	.74	.79	.82	.84	.85	.85	.86	.86	.87	.87
70.	.63	.76	.81	.83	.84	.85	.86	.87	.87	.87	.88
75.	.67	.79	.82	.84	.85	.86	.87	.87	.87	.88	.88
80.	.72	.81	.84	.85	.86	.87	.87	.88	.88	.88	.89
85.	.76	.83	.85	.87	.87	.88	.88	.88	.88	.89	.89
90.	.81	.85	.87	.88	.88	.88	.89	.89	.89	.89	.89
95.	.86	.88	.88	.89	.89	.89	.89	.89	.89	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 74

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.46	.61	.69	.73	.76	.78	.79	.81	.82	.83
5.	.04	.49	.63	.70	.74	.77	.78	.80	.81	.83	.84
10.	.09	.51	.64	.71	.75	.77	.79	.80	.82	.83	.84
15.	.13	.53	.66	.72	.75	.78	.80	.81	.82	.83	.84
20.	.18	.55	.67	.73	.76	.79	.80	.82	.82	.84	.85
25.	.22	.57	.68	.74	.77	.79	.81	.82	.83	.84	.85
30.	.27	.60	.70	.75	.78	.80	.81	.83	.83	.85	.85
35.	.31	.62	.71	.76	.79	.81	.82	.83	.84	.85	.86
40.	.36	.64	.73	.77	.80	.81	.83	.84	.84	.85	.86
45.	.40	.66	.74	.78	.81	.82	.83	.84	.85	.86	.86
50.	.45	.68	.76	.79	.81	.83	.84	.85	.85	.86	.87
55.	.49	.70	.77	.80	.82	.84	.85	.85	.86	.87	.87
60.	.54	.73	.79	.81	.83	.84	.85	.86	.86	.87	.87
65.	.58	.75	.80	.83	.84	.85	.86	.86	.87	.87	.88
70.	.63	.77	.81	.84	.85	.86	.86	.87	.87	.88	.88
75.	.67	.79	.83	.85	.86	.86	.87	.87	.88	.88	.88
80.	.72	.81	.84	.86	.87	.87	.88	.88	.88	.88	.89
85.	.76	.83	.86	.87	.87	.88	.88	.88	.89	.89	.89
90.	.81	.86	.87	.88	.88	.89	.89	.89	.89	.89	.89
95.	.86	.88	.89	.89	.89	.89	.89	.89	.90	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENT CURVE DATA

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 84

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.60	.72	.77	.80	.82	.83	.84	.85	.86	.86
5.	.04	.61	.73	.78	.80	.82	.83	.84	.85	.86	.87
10.	.09	.63	.74	.78	.81	.83	.84	.85	.85	.86	.87
15.	.13	.64	.75	.79	.81	.83	.84	.85	.85	.86	.87
20.	.18	.66	.75	.80	.82	.83	.84	.85	.86	.87	.87
25.	.22	.67	.76	.80	.82	.84	.85	.85	.86	.87	.87
30.	.27	.69	.77	.81	.83	.84	.85	.86	.86	.87	.87
35.	.31	.70	.78	.82	.83	.85	.85	.86	.87	.87	.88
40.	.36	.72	.79	.82	.84	.85	.86	.86	.87	.87	.88
45.	.40	.73	.80	.83	.84	.85	.86	.87	.87	.88	.88
50.	.45	.75	.81	.83	.85	.86	.86	.87	.87	.88	.88
55.	.49	.76	.82	.84	.85	.86	.87	.87	.88	.88	.88
60.	.54	.78	.83	.85	.86	.87	.87	.88	.88	.88	.89
65.	.58	.79	.84	.85	.86	.87	.88	.88	.88	.88	.89
70.	.63	.81	.85	.86	.87	.88	.88	.88	.88	.89	.89
75.	.67	.82	.85	.87	.87	.88	.88	.88	.89	.89	.89
80.	.72	.84	.86	.87	.88	.88	.89	.89	.89	.89	.89
85.	.76	.85	.87	.88	.88	.89	.89	.89	.89	.89	.89
90.	.81	.87	.88	.89	.89	.89	.89	.89	.89	.90	.90
95.	.86	.88	.89	.89	.89	.90	.90	.90	.90	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 86

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.63	.74	.79	.81	.83	.84	.85	.85	.86	.87
5.	.04	.64	.75	.79	.82	.83	.84	.85	.86	.86	.87
10.	.09	.65	.76	.80	.82	.84	.85	.85	.86	.87	.87
15.	.13	.67	.76	.80	.83	.84	.85	.86	.86	.87	.87
20.	.18	.68	.77	.81	.83	.84	.85	.86	.86	.87	.87
25.	.22	.70	.78	.81	.83	.85	.85	.86	.87	.87	.88
30.	.27	.71	.79	.82	.84	.85	.86	.86	.87	.87	.88
35.	.31	.72	.80	.83	.84	.85	.86	.87	.87	.88	.88
40.	.36	.74	.80	.83	.85	.86	.86	.87	.87	.88	.88
45.	.40	.75	.81	.84	.85	.86	.87	.87	.87	.88	.88
50.	.45	.76	.82	.84	.86	.86	.87	.87	.88	.88	.88
55.	.49	.78	.83	.85	.86	.87	.87	.88	.88	.88	.89
60.	.54	.79	.84	.85	.86	.87	.88	.88	.88	.89	.89
65.	.58	.80	.84	.86	.87	.87	.88	.88	.88	.89	.89
70.	.63	.82	.85	.87	.87	.88	.88	.88	.89	.89	.89
75.	.67	.83	.86	.87	.88	.88	.88	.89	.89	.89	.89
80.	.72	.85	.87	.88	.88	.89	.89	.89	.89	.89	.89
85.	.76	.86	.88	.88	.89	.89	.89	.89	.89	.89	.90
90.	.81	.87	.88	.89	.89	.89	.89	.89	.89	.90	.90
95.	.86	.89	.89	.89	.90	.90	.90	.90	.90	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

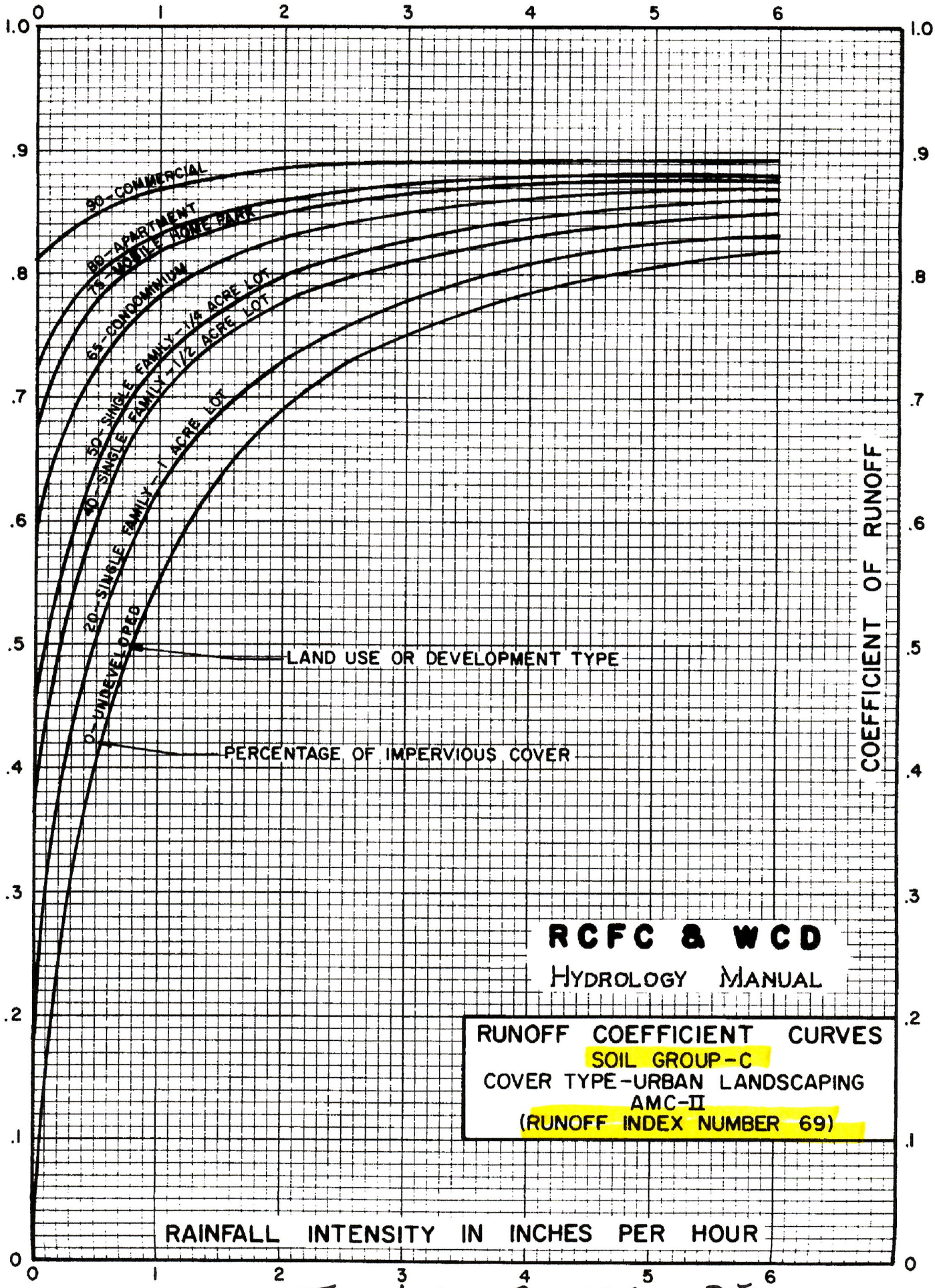
RUNOFF COEFFICIENTS FOR RI INDEX NO. = 88

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.66	.76	.80	.82	.84	.85	.86	.86	.87	.87
5.	.04	.67	.77	.81	.83	.84	.85	.86	.86	.87	.87
10.	.09	.68	.78	.81	.83	.85	.85	.86	.86	.87	.88
15.	.13	.70	.78	.82	.84	.85	.86	.86	.87	.87	.88
20.	.18	.71	.79	.82	.84	.85	.86	.86	.87	.87	.88
25.	.22	.72	.80	.83	.84	.85	.86	.87	.87	.88	.88
30.	.27	.73	.80	.83	.85	.86	.86	.87	.87	.88	.88
35.	.31	.74	.81	.84	.85	.86	.87	.87	.87	.88	.88
40.	.36	.76	.82	.84	.85	.86	.87	.87	.88	.88	.88
45.	.40	.77	.82	.85	.86	.87	.87	.88	.88	.88	.89
50.	.45	.78	.83	.85	.86	.87	.87	.88	.88	.88	.89
55.	.49	.79	.84	.86	.87	.87	.88	.88	.88	.89	.89
60.	.54	.80	.84	.86	.87	.88	.88	.88	.88	.89	.89
65.	.58	.82	.85	.87	.88	.88	.88	.88	.89	.89	.89
70.	.63	.83	.86	.87	.88	.88	.88	.89	.89	.89	.89
75.	.67	.84	.87	.88	.88	.88	.89	.89	.89	.89	.89
80.	.72	.85	.87	.88	.88	.89	.89	.89	.89	.89	.89
85.	.76	.86	.88	.88	.89	.89	.89	.89	.89	.90	.90
90.	.81	.88	.89	.89	.89	.89	.89	.90	.90	.90	.90
95.	.86	.89	.89	.90	.90	.90	.90	.90	.90	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENTS FOR RI INDEX NO. = 90

IMPERVIOUS PERCENT	INTENSITY - INCHES/HOUR										
	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0
0.	.00	.69	.78	.82	.84	.85	.86	.86	.87	.87	.88
5.	.04	.70	.79	.82	.84	.85	.86	.87	.87	.88	.88
10.	.09	.71	.80	.83	.84	.85	.86	.87	.87	.88	.88
15.	.13	.73	.80	.83	.85	.86	.86	.87	.87	.88	.88
20.	.18	.74	.81	.84	.85	.86	.87	.87	.87	.88	.88
25.	.22	.75	.81	.84	.85	.86	.87	.87	.88	.88	.88
30.	.27	.76	.82	.84	.86	.86	.87	.87	.88	.88	.88
35.	.31	.77	.82	.85	.86	.87	.87	.88	.88	.88	.89
40.	.36	.78	.83	.85	.86	.87	.87	.88	.88	.88	.89
45.	.40	.79	.84	.86	.87	.87	.88	.88	.88	.89	.89
50.	.45	.80	.84	.86	.87	.87	.88	.88	.88	.89	.89
55.	.49	.81	.85	.86	.87	.88	.88	.88	.89	.89	.89
60.	.54	.82	.85	.87	.88	.88	.88	.89	.89	.89	.89
65.	.58	.83	.86	.87	.88	.88	.89	.89	.89	.89	.89
70.	.63	.84	.87	.88	.88	.88	.89	.89	.89	.89	.89
75.	.67	.85	.87	.88	.88	.89	.89	.89	.89	.89	.89
80.	.72	.86	.88	.88	.89	.89	.89	.89	.89	.89	.90
85.	.76	.87	.88	.89	.89	.89	.89	.89	.90	.90	.90
90.	.81	.88	.89	.89	.89	.89	.90	.90	.90	.90	.90
95.	.86	.89	.89	.90	.90	.90	.90	.90	.90	.90	.90
100.	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90

RUNOFF COEFFICIENT
CURVE DATA



RCFC & WCD

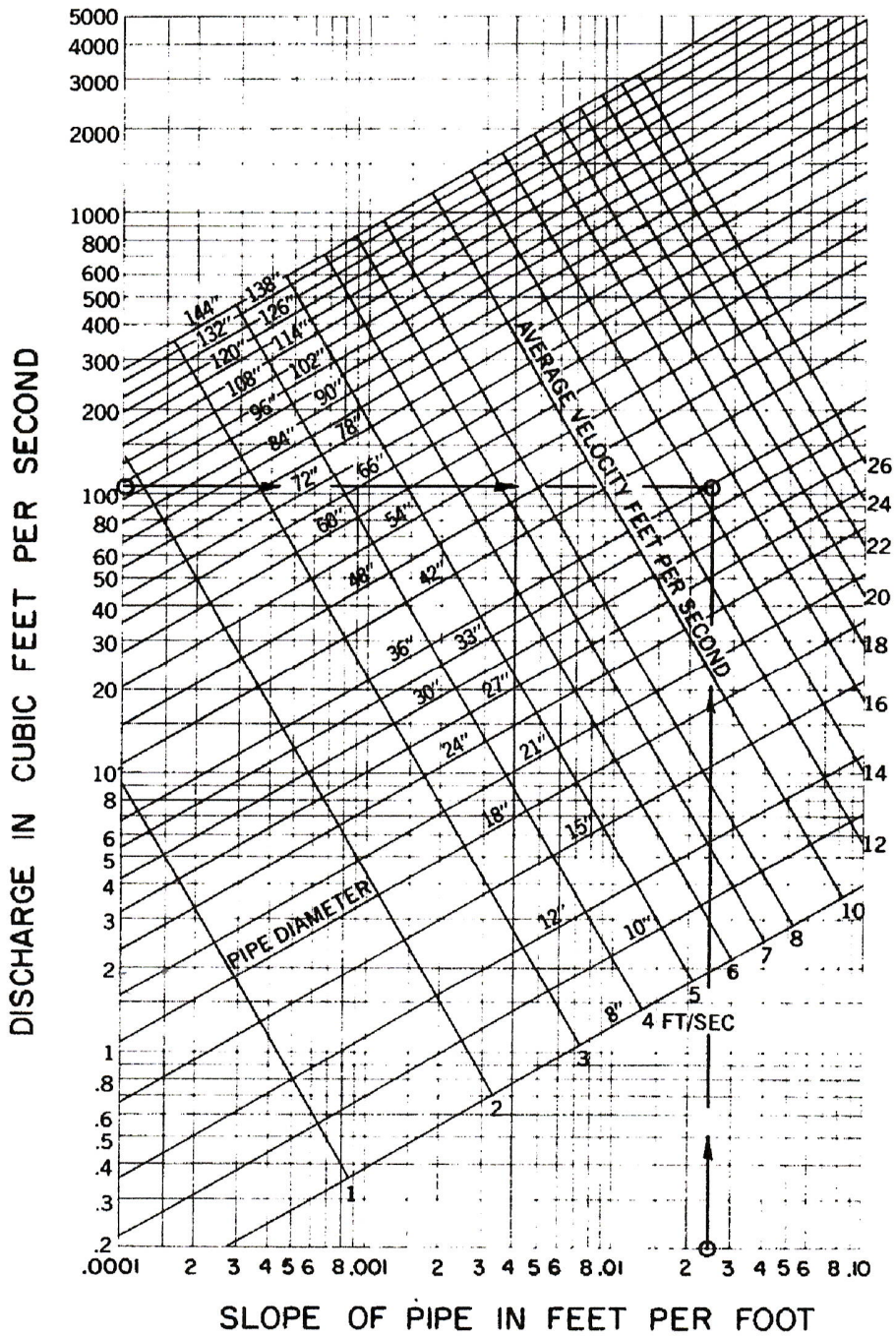
HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-C
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 69)

Typical - See Runoff Curve Data for project values

PLATE D-5.3

BASED ON MANNING'S EQUATION n=0.013



EXAMPLE:

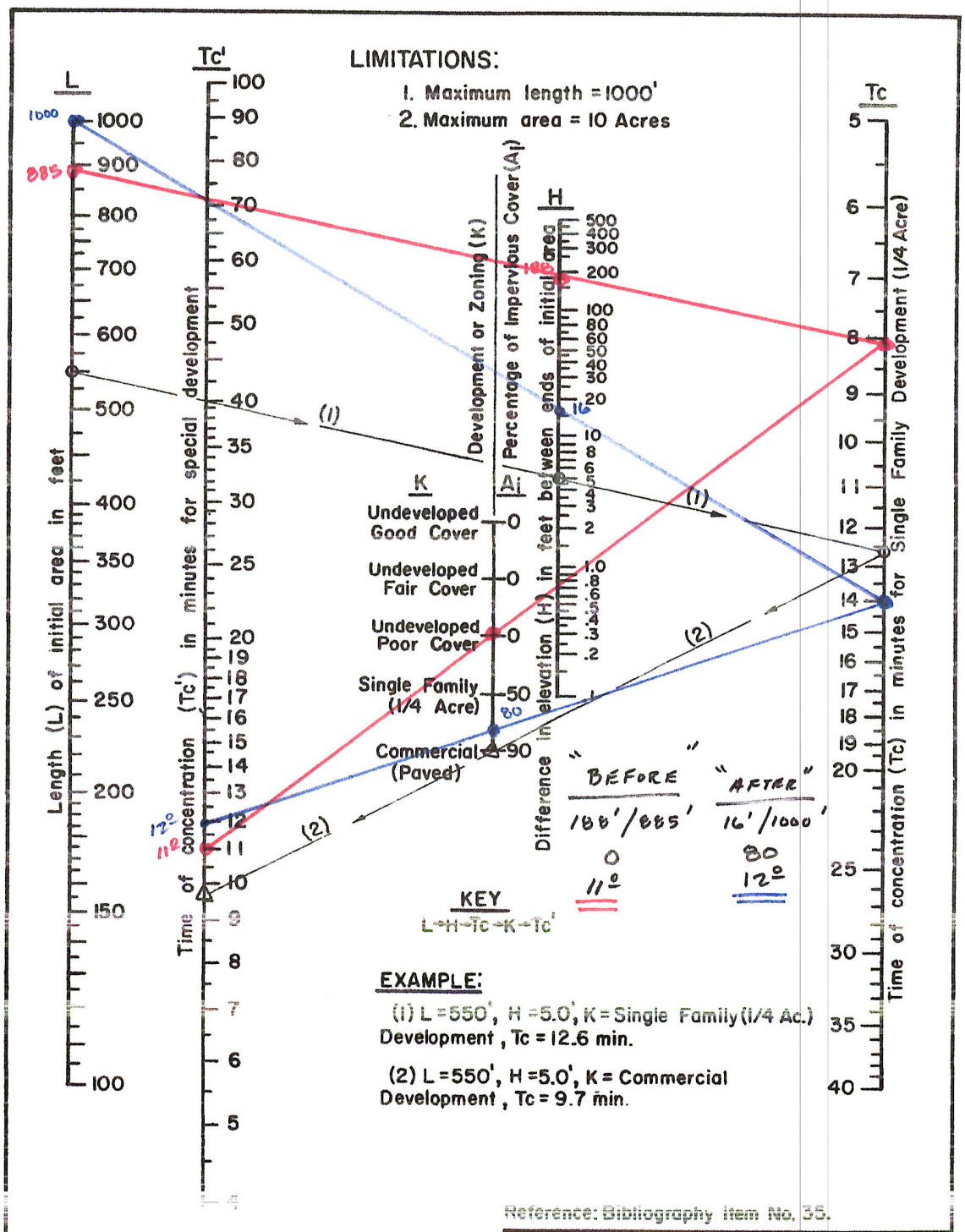
Given Q = 105 cfs and S = 2.5 % find required pipe size and velocity. From curves required Size = 36"ϕ and Velocity = 14.8 fps

Reference: Bibliography item No. 10.

RCFC & WCD

HYDROLOGY MANUAL

VELOCITY DISCHARGE CURVE
CIRCULAR CONCRETE PIPES
FLOWING FULL



Reference: Bibliography Item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. ___ of ___ Sheets

PROJECT: BUNDY CANYON APT - BEFORE

FREQUENCY: _____

Calculated by: GB DATE: 10/24/16

Checked by: GB DATE: 10/24/16

DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	ΣQ CFS	SLOPE	SECTION	V FPS	L FT.	T MIN.	ΣT	REMARKS
10-YEAR													
										T_c =	11.0		
B-1	C-NAT	5.35	2.21	.82	9.7							11.0	
						9.7	0.05	V-NAT	10	245	0.4		
B-2	C-NAT	9.00	2.15	.82	15.9							11.4	@ STORM DRAIN INLET
						25.6							
	SUB-TOTAL	14.35											IN WINDWOOD LANE
100-YEAR													
										T_c =	11.0		
B-1	C-NAT	5.35	3.39	.86	15.6							11.0	
						15.6	0.05	V NAT	12	245	0.3		
B-2	"	9.00	3.35	.86	25.9							11.3	@ STORM DRAIN INLET
						41.5							
	SUB-TOTAL	14.35											IN WINDWOOD LANE
B-3	C-NAT	1.22											
B-4		5.50											
B-5		6.42											
B-6		0.84											
B-7		4.87											
B-8		2.95											
	SUB-TOTAL	20.8											
	TOTAL	35.15											

PLATE D-2

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. ___ of ___ Sheets

PROJECT: BUNDY CANYON APT - AFTER

FREQUENCY: _____

Calculated by: GB 10/24/16 DATE

Checked by: GB 10/24/16 DATE

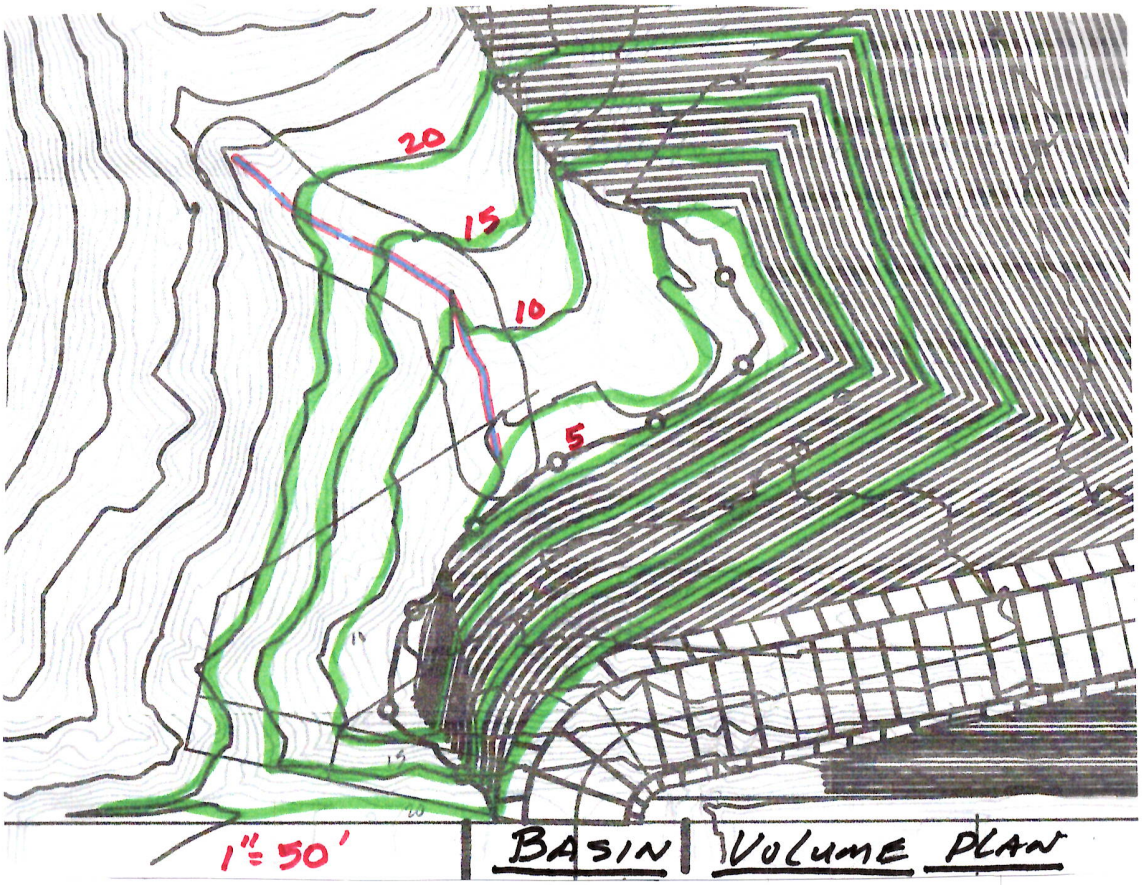
DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	ΣQ CFS	SLOPE	SECTION	V FPS	L FT.	T MIN.	ΣT	REMARKS
10-YEAR													
										T_C =	12.0		
A-2A	C-APTS	8.76	2.12	.86	16.0							12.0	
						16.0	0.10	PIPE	15	500	0.6		
A-2b	C-LANDS.	4.15	2.08	.82	7.1							12.6	@ STORM DRAIN IN
						23.1							WINDWOOD LANE
A-1	C-NAT	6.71	2.08	.70	9.8								
						32.9							10-YEAR DESIGN = 24.4 CFS
		19.6											
100-YEAR													
										T_C =	12.0		
A-2A	C-APTS	8.76	3.25	.86	24.5							12.0	
						24.5	0.10	PIPE	15	500	0.6		
A-2b	C-LANDS	4.15	3.20	.86	11.4							12.6	@ STORM DRAIN IN
						35.9							WOODWOOD LANE
A-1	C-NAT	6.71	3.20	.70	15.0								
						50.9							100-YEAR DESIGN = 40.3 CFS
		19.6											
A-3	C-NAT	0.65											BEFORE AREA = 14.35 AC
A-4A	"	5.21											+ 5.25 AC
A-4b	ROAD	0.74											
A-5A	C-NAT	2.65											
A-5b	"	2.45											
A-6	"	0.84											
A-7	"	2.22											
A-8	"	1.77											
	SUB-TOTAL	16.53											
													BEFORE AREA = 20.8 AC
	TOTAL	36.13											- 4.3 AC
													BEFORE AREA = 35.15
													LESS THAN 1 AC OK

NOTE:

STORM	BEFORE CFS	AFTER CFS
10-YEAR	24.42 CFS	32.9 CFS *
100-YEAR	40.3 CFS	50.9 CFS *

* INCREASE IN FLOWS WILL BE REDUCED TO DESIGN Q's WITH OUTLET STRUCTURE FROM BASIN AT FINAL DESIGN.

PLATE D-2



ELEV	AREA FT²	DEPTH-FT	AVERAGE AREA	VOLUME FT³	Σ VOLUME FT³
5	4000	0			0
			7,500	37,500	
10	11,000	5			37,500
			14,000	70,000	
15	17,000	10			107,500
			23,500	112,500	
20	28,000	15			220,000

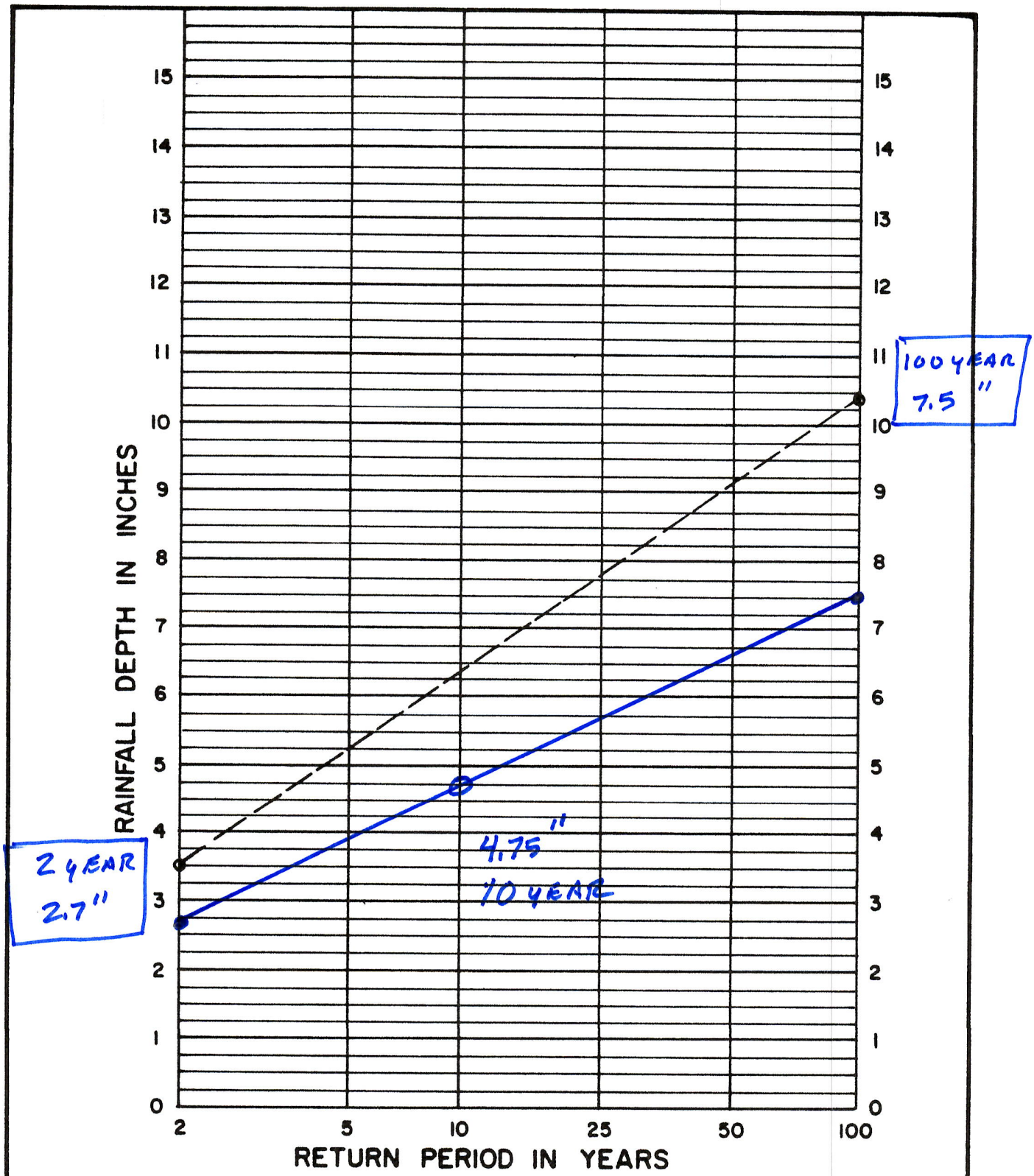
DETERMINE 24 HOUR-10 YEAR STORM VOLUME:
AREA = 12.91 AC RAINFALL = 4.75" 100% RUN-OFF

$12.91 \times 43{,}560 \times 4.75''/12 = 222{,}600 \text{ FT}^3$

BASIN HAS CAPACITY TO STORE ENTIRE 10 YEAR 24 HOUR STORM RUN-OFF WITH NO RELEASE.

∴ SYSTEM OUTLET WILL BE SIZED AT FINAL DESIGN TO MATCH DESIGN Q'S FOR STORM DRAIN IN WINDWOOD LANE FOR 10 AND 100 YEAR STORMS.

BUNDY CANYON APTS
BASIN CHART "A"
10/24/16



NOTE:

1. For intermediate return periods plot 2-year and 100-year values from maps for a specific duration, then connect points and read value for desired return period. For example given 2-year 24-hour = 3.50" and 100-year 24-hour = 10.40", 25-year 24-hour = 7.80"

Reference: NOAA Atlas 2, Volume XI-California, 1973.

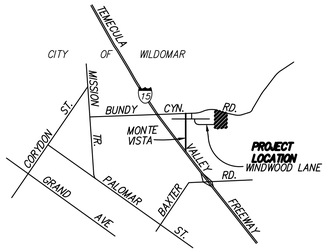
RCFC & WCD

HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

PLOT PLAN NO. 16-0006

CITY OF WILDOMAR



VICINITY MAP

N.T.S.

OWNER:

BOB TAGHDIRI ET. AL.
3112 BOSTONIAN DRIVE
LOS ALAMITOS, CALIFORNIA
(310) 596-9125

APPLICANT:

DICK DARLING – HUFSDAR INVESTORS, LLC.
P.O. BOX 6579
WEST LAKE VILLAGE, CA 91359
(805) 241-5007

ENGINEER AND EXHIBIT PREPARER:

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA. 92596
PHONE: (951) 288-0601

ASSESSOR'S PARCEL NUMBER:

367-250-008 – 28.28 ACRES TOTAL PROJECT AREA

UTILITIES PURVEYORS:

	AGENCY SERVING THE AREA	FACILITIES PRESENT	LOCATION
ELECTRIC:	SOUTHERN CALIFORNIA EDISON	YES	BUNDY CANYON & WINDWOOD
GAS:	SOUTHERN CALIFORNIA GAS CO.	YES	BUNDY CANYON & WINDWOOD
TELEPHONE:	VERIZON	YES	BUNDY CANYON & WINDWOOD
CABLE TV:	TIME WARNER	YES	BUNDY CANYON & WINDWOOD
WATER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD
SEWER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD

SCHOOL DIST:LAKE ELSINORE UNIFIED SCHOOL DISTRICT

LEGAL DESCRIPTION:

BEING A PORTION OF SECTION 25, TOWNSHIP 6 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN.

EARTHWORK:

THIS PROJECT WILL BE A "BALANCED EARTHWORK" DESIGN OF 320,000 CY ± WITH NO EXPORT OR IMPORT OF GRADING MATERIAL.

ZONING:

EXISTING LAND USE: VACANT WITH NO EXISTING STRUCTURES
PROPOSED LAND USE: RESIDENTIAL
EXISTING ZONING: R-R
PROPOSED ZONING: R-3
GENERAL PLAN DESIGNATION: MEDIUM DENSITY RESIDENTIAL 2 TO 5 D.U. / ACRE:

GENERAL NOTES:

DEVELOPMENT WILL CONSIST OF 140 RENTAL DWELLING UNITS – 50 TOWNHOMES AND 90 APARTMENTS. THESE UNITS WILL BE PROCESSED AS A PLOT PLAN.

DRAINAGE: DEVELOPMENT OF SITE WILL PERPETUATE EXISTING DRAINAGE PATTERNS. DEVELOPMENT WILL DRAIN TO WATER QUALITY BASINS AND BUNDY CANYON WASH WILL BE BRIDGED AND NOT BE DISTURBED.

GRADING: GRADING WILL CONFORM TO THAT SHOWN ON THIS PLOT PLAN.
STREETS: ALL STREETS WITHIN THIS TRACT WILL BE CONSTRUCTED PER THE CITY OF WILDOMAR STANDARDS.
LIGHTING: ALL LIGHTING WILL CONFORM TO CHAPTER 8.64 LIGHT POLLUTION CODE.
PREPARED: AUGUST 2016.

PROJECT IS NOT LOCATED IN SPECIFIC PLAN, NOT IN SPECIAL STUDIES ZONE OR SUBJECT TO LIQUEFACTION OR OTHER GEOLOGICAL HAZARDS. NO WELLS EXIST ON PROPERTY.

OPEN SPACE MAINTENANCE

OPEN SPACE LOTS WILL BE MAINTAINED BY PROPERTY MANAGEMENT.

AERIAL TOPOGRAPHY

THE TOPOGRAPHY IS BASED ON FLOWN TOPOGRAPHIC MAPPING 2003 AND FIELD VERIFIED IN 2015.

FLOOD PLAIN DESIGNATION

THIS SITE IS IN FLOOD ZONE "X" – FEMA PANEL 06065C 2044G
THIS PROJECT IS IN THE SANTA MARGARITA WATERSHED DRAINAGE AREA.
THIS LAND IS NOT SUBJECT TO OVERFLOW AND INUNDATION OR FLOOD HAZARD.

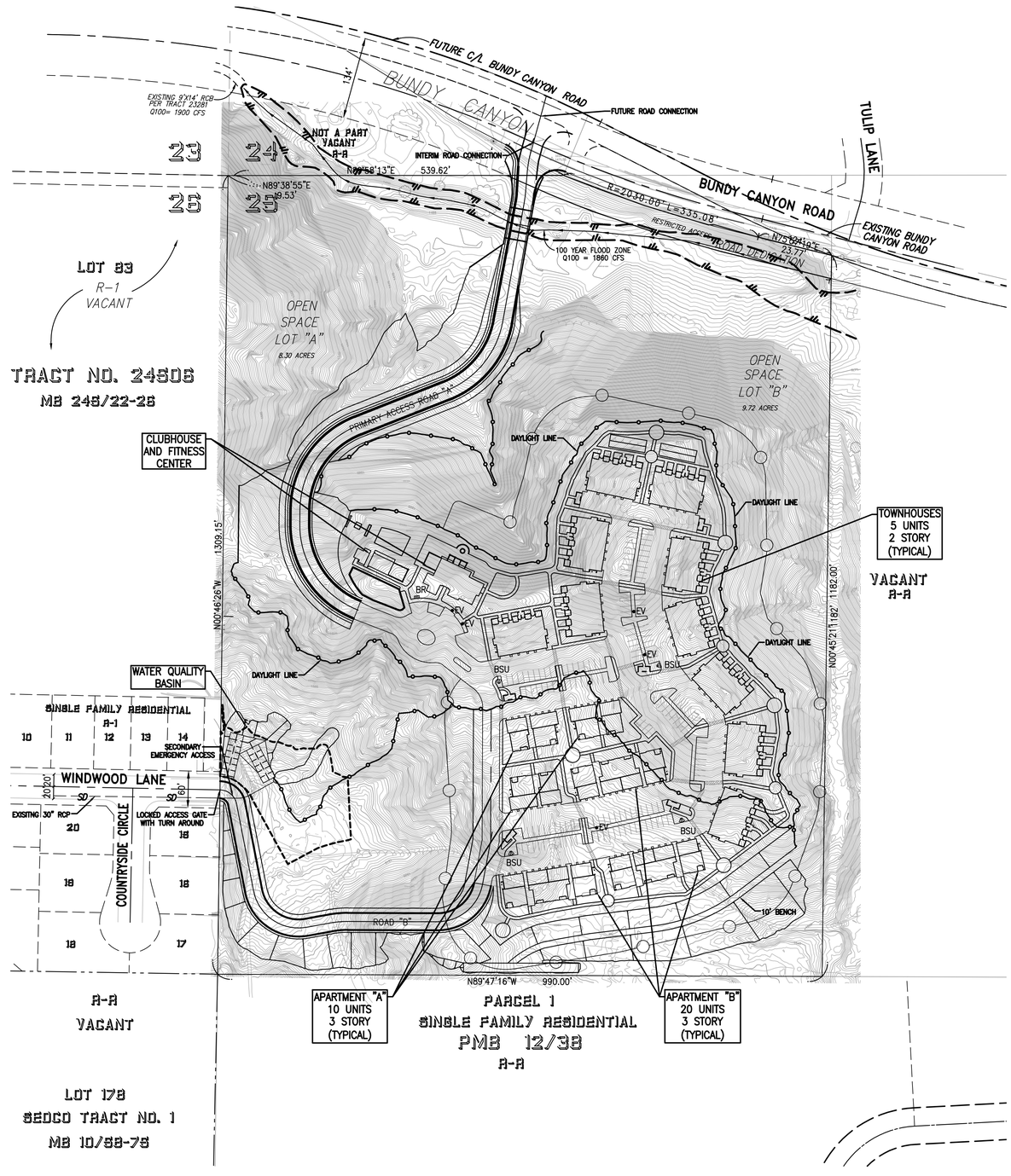
EXHIBIT "A"

LEGAL DESCRIPTION

The land referred to herein is situated in the State of California, County of Riverside, and described as follows:

All that portion of the Northwest Quarter of the Northwest quarter of section 25, Township 6 South, Range 4 West, San Bernardino Base and Meridian, and particularly described as follows:

Beginning at the Northwest corner of the Northwest quarter of the Northwest quarter of section 25; thence Southerly along the Westerly line of the Northwest quarter of the Northwest quarter, 1320 feet to the Southwest quarter thereof; thence East along the Southerly line thereof, 990 feet; thence Northerly and parallel to the Westerly line of section 25, to the centerline of Bundy Road; thence Northwesterly along the centerline of said road to its intersection with the Northerly line said section 25; thence Westerly along Northerly line of said section to the point of beginning; Excepting therefrom that portion thereof included in roads. APN: 367-250-008



PROJECT INFORMATION

OCCUPANCY	R3 (DWELLINGS)			
	U (GARAGES)			
TYPE OF CONSTRUCTION	VA			
INDIVIDUAL UNITS	57 ONE BEDROOM / 1 BATH (APARTMENTS)			
	33 TWO BEDROOM / 2 BATH (APARTMENTS)			
	35 TWO BEDROOM / 3 BATH (TOWNHOMES)			
	15 THREE BEDROOM / 3 BATH (TOWNHOMES)			
	140 TOTAL RENTABLE APARTMENTS			
BUILDING	LEVEL	UNITS	FOOTPRITN AREA (S.F.)	BUILDING AREA TOTAL (S.F.)
TEN TOWNHOMES	1 & 2	5	4,500	90,000
THREE APARTMENTS "A"	1, 2 & 3	10	3,530	31,770
THREE APARTMENTS "B"	1, 2 & 3	20	7,060	63,540
SUBTOTAL		140	76,770	185,310
TOTAL RESIDENTIAL				185,310
CLUBHOUSE AND FITNESS CENTER		2	5,140	5,140
TUCK UNDER GARAGES		127	INCLUDED	INCLUDED
GRAND TOTAL				190,450
BUILDING FOOTPRINT (ALL STRUCTURES TOWNHOMES, APARTMENTS AND CLUBHOUSE/FITNESS)				81,910

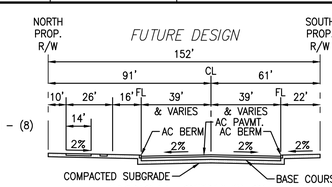
SITE TOTAL = 140 UNITS/28.3 ACRES = 5.0 D.U./ACRE

REQUIRED PARKING	1BR-1.25 SPACES/UNIT	2BR-2.25 SPACES/UNIT	3BR-2.75 SPACES/UNIT	TOTAL
PARKING SPACE REQUIRED	71.25	153	41.25	266
PARKING SPACES PROVIDED				288
ASSIGNED 140 UNITS @ 1:1BR, 2:2BR & 3:2.5BR	57	136	37.5	231
OPEN UNASSIGNED SPACES GUEST				22
ENCLOSED PARKING GARAGES				127
COVERED CARPORT PARKING STALLS				139

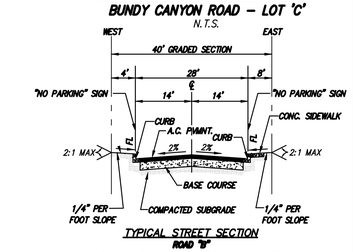
DEVELOPMENT STANDARD R-3 ZONE	REQUIRED	PROPOSED
BUILDING HEIGHT 50 FT. MAX.		37 FT. MAX.
FRONT SETBACK	14'	360'
SIDE SETBACK WEST	9'	236'
SIDE SETBACK EAST	9'	107'
REAR SETBACK	14'	108'
SEPARATION BETWEEN BUILDINGS	10'	15'
EV CHARGING STATIONS	8	8
BICYCLE RACK	4	5
BICYCLE STORAGE	12	12

LEGEND:

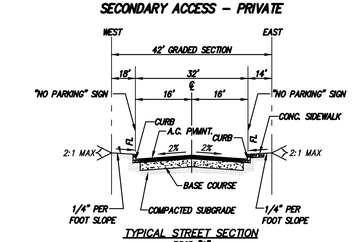
= 100 YEAR FLOOD PLAIN LIMITS
BSU = BIKE STORAGE UNITS – (4) 3 SPACES EACH
BR = BIKE RACK – (4)
EV = ELECTRIC VEHICLE CHARGING STATION – (8)
= 100' FIRE ZONE LIMITS



TYPICAL STREET SECTION
BUNDY CANYON ROAD – LOT 'C'
N.T.S.



TYPICAL STREET SECTION
ROAD "B"
SECONDARY ACCESS – PRIVATE



TYPICAL STREET SECTION
ROAD "A"
PRIMARY ACCESS – PRIVATE
N.T.S.

SCALE: 1"=100'
0 100 200 300

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after city acceptance or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for acceptance by the city.

MARK	BY	DATE	REVISIONS	APPR.	DATE
		8/17/16	REVISED SITE PLAN AND UNITS		
ENGINEER				CITY	

CITY OF WILDOMAR
ACCEPTED BY:
Date:
Daniel A. York, Director of Public Works
City Engineer, PE 43212
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL
REGISTERED PROFESSIONAL ENGINEER GRANT W. BECKLUND C 23737 Exp. 12/31/2017 CIVIL STATE OF CALIFORNIA

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA 92596
(951) 288-0601

PREPARED BY: GRANT W. BECKLUND
R.C.E. No. 23737 EXP. 12/31/2017

BENCHMARK:
Elevation = _____
Datum = _____
BENCHMARK # _____
THIS SURVEY WAS PERFORMED ON (date) BY (surveyor)
L.S. (number), EXP. (date)

SCALE:
H: As Noted V: As Noted

PLOT PLAN NO. 16-0006
CITY OF WILDOMAR
BUNDY CANYON RESORT APARTMENTS
DATE PREPARED AUGUST 2016

SHEET No. 1 OF 1 SHTS

COUNTY OF RIVERSIDE STREET IMPROVEMENT PLANS FOR TRACT NO. 24506

GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CLEARING OF THE PROPOSED WORK AREA, AND RELOCATION COSTS OF ALL EXISTING UTILITIES. PERMITTEE MUST INFORM COUNTY OF CONSTRUCTION SCHEDULE AT LEAST 48 HOURS PRIOR TO BEGINNING OF CONSTRUCTION. (PHONE:(714) 275-6885
2. THE DEVELOPER WILL INSTALL STREET SIGNS CONFORMING TO COUNTY STANDARD NO. 816.
3. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE RIVERSIDE COUNTY TRANSPORTATION DEPT IMPROVEMENT STANDARDS AND SPECIFICATIONS, DATED 1990, COUNTY ORDINANCE NO. 461 AND SUBSEQUENT AMENDMENTS.
4. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO NOTIFY THE ENGINEER TO INSTALL STREET CENTERLINE MONUMENTS AS REQUIRED BY RIVERSIDE COUNTY ORDINANCE NO. 461
5. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER OR CONTRACTOR TO APPLY TO THE RIVERSIDE COUNTY TRANSPORTATION DEPT., PERMIT SECTION, FOR AN ENCROACHMENT PERMIT FOR ALL WORK ON EXISTING COUNTY MAINTAINED ROADS, AND FOR UTILITY WORK WITHIN OFFERS OF DEDICATION FOR PUBLIC USE.
6. ALL UNDERGROUND FACILITIES, WITH LATERALS, SHALL BE IN PLACE PRIOR TO PAVING THE STREET SECTION INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING: SEWER, WATER, ELECTRIC, GAS, DRAINAGE.
7. ALL STREET SECTIONS ARE TENTATIVE. ADDITIONAL SOIL TESTS SHALL BE TAKEN AFTER ROUGH GRADING TO DETERMINE THE EXACT STREET SECTION REQUIREMENTS. USE STANDARD NO. 401 IF EXPANSIVE SOILS ARE ENCOUNTERED.
8. "ASPHALT EMULSION (FOG SEAL) SHALL BE APPLIED NOT LESS THAN FOURTEEN DAYS FOLLOWING PLACEMENT OF THE ASPHALT SURFACING AND SHALL BE APPLIED AT A RATE OF 0.05 GALLON PER SQUARE YARD. ASPHALTIC EMULSION SHALL CONFORM TO SECTIONS 37 39 AND 94 OF THE STATE STANDARD SPECIFICATIONS.
9. PRIME COAT REQUIRED PRIOR TO PAVING ALL GRADE IN EXCESS OF TEN PERCENT.
10. INSTALL STREET TREES IN ACCORDANCE WITH ORDINANCE NO. 460 & 499 1) CINNAMOMUM CAMPHORA 2) LAGERSTOEMIA INDICA 3) PLATNUS ACERIFOLIA
11. STREET LIGHTS SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROVED STREET LIGHTING PLAN.
12. "AS DETERMINED BY THE TRANSPORTATION DEPT., THE DEVELOPER IS RESPONSIBLE AS A MINIMUM FOR ROAD IMPROVEMENTS TO CENTERLINE AND MAY BE REQUIRED TO RECONSTRUCT EXISTING PAVEMENT, INCLUDING BASE, AND MATCHING OVERLAY REQUIRED TO MEET THE STRUCTURAL STANDARDS FOR THE CURRENT ASSIGNED TRAFFIC INDEX."
13. CURB DEPRESSIONS AND DRIVEWAY APPROACHES WILL BE INSTALLED AND CONSTRUCTED ACCORDING TO COUNTY STANDARD NO. 207 AS DIRECTED IN THE FIELD.
14. ONLY LANDSCAPING CONSISTING OF GRASS AND PARKWAY TREES MAY BE INSTALLED WITHIN PARKWAY ON LOCAL RESIDENTIAL STREETS WITHOUT SEPARATE LANDSCAPE PLANS. ALL OTHER TYPES OF LANDSCAPING IN THESE AREAS, AND ALL LANDSCAPING ON ALL OTHER STREETS SHALL REQUIRE SEPARATE LANDSCAPE PLANS. ALL LANDSCAPING ENCROACHMENTS SHALL CONFORM TO RIVERSIDE COUNTY STANDARDS RELATING TO THE ADMINISTRATION OF LANDSCAPE ENCROACHMENTS" DATED JUNE 1990.

15. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR OR DEVELOPER TO INSTALL AND MAINTAIN ALL CONSTRUCTION, REGULATORY GUIDE AND WARNING SIGNS WITHIN THE PROJECT LIMITS AND IT'S SURROUNDINGS AND PROVIDE SAFE PASSAGE FOR THE TRAVELING PUBLIC AND WORKERS UNTIL THE FINAL COMPLETION AND ACCEPTANCE OF THE PROJECT BY THE COUNTY

CONSTRUCTION NOTES AND QUANTITY ESTIMATES

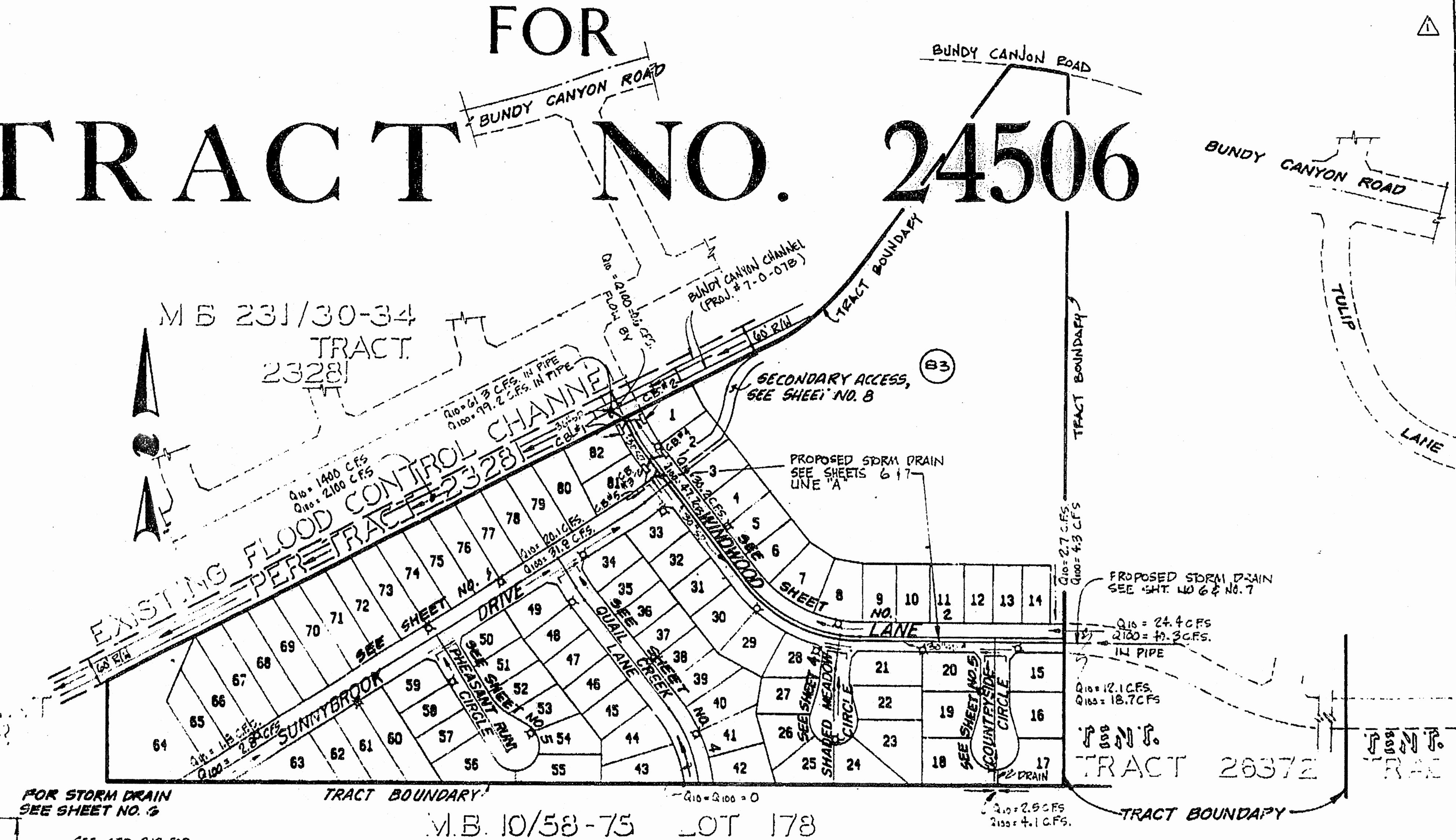
ITEM	DESCRIPTION		QUANTITY
1	CONST. 0.21' A.C. OVER 0.60' A.B. CLASS 2 (THROUGH STREETS)	A.C: 2011 TONS	A.B: 2955 C.Y.
2	CONST. 0.21' A.C. OVER 0.60' A.B. CLASS 2 (CUL-DE-SACS)	A.C: 469 TONS	A.B: 695 C.Y.
3	CONST. TYPE "A-6" CURB AND GUTTER PER RIV. CO. STD. NO. 200 (6" C.F.)		6,500 L.F.
4	CONST. 6' SIDEWALK PER RIV. CO. STD. NO 400 AND 401		26,000 S.F.
5	CONST. ACCESS RAMP PER RIV. CO. STD. NO. 403		10 EA
6	CONST. 10' X-GUTTER AND SPANDREL PER RIV. CO STD NO. 209 AND 209A		3,500 S.F.
7	INSTALL STREET NAME SIGNS PER RIV CO. STD. NO 816		5 EA.
8	ASPHALTIC EMULSION FOG SEAL		39 TONS
9	INSTALL BARRICADE PER RIV. CO. STD. NO. 810		155 LF
10	INSTALL STREET LIGHT PER RIV. CO. STD. NO. 1000		21 EA.
11	CONST. DRIVEWAY APPROACH PER RIV. CO. STD. NO. 207		12,300 S.F.
12	CONST. 6" CURB ONLY TYPE "D" PER RIV. CO. STD. NO. 204		400 L.F.
13	REMOVE EXISTING BARRICADE		1 EA.
* 14	CONST CATCH BASIN PER RIV. CO STD NO 301 W= (SEE PLAN FOR WIDTH) (SEE NOTE DOWN BELOW)		5 EA.
15	CONST UNDER SIDEWALK DRAIN PER RIV CO. STD. NO 308		1 EA.
16	INSTALL 5' HIGH CHAIN LINK DOUBLE DRIVE PER R.C.F.C.D STD M801 WIDTH OF DOUBLE GATES TO BE 24'		1 EA.
17	CONST. LOCAL DEPRESSION PER RIV. CO. STD NO 312		564 S.F.
18	INSTALL STREET TREES		92 EA.
19			
⚠ 20	CONST. 30" RCP 2000D OR 30" C.P.P		1056 L.F
21	CONST. M.H. NO. 1 PER RIV. CO. FLOOD CONTROL DIST STD M.H 251		5 EA.
22	CONST. J.S. NO. 1 PER RIV. CO. FLOOD CONTROL DIST STD J.S 226		1 EA.
23	CONST. C.M.P FLARED INLET PER CAL TRANS STD 224 (MODIFIED PER DETAIL "A" ON SHT 6)		1 EA.
24	CONST. 18" RCP CLASS IV 2000-D		123 LF
25	CONST MH NO. 4 PER RIV CO FLOOD CONTROL & WATER CONSERVATION DISTRICT		1 EA.
26	CONST. 36" RCP 1500-D		27 L.F.
27	PRIME COAT		0.3 TON
28	CONST CONCRETE COLLAR PER RIV. CO. FLOOD CONTROL & WATER CONSERV. DIST. PER STD NO. M803		1 EA
	ROADWAY EXCAVATION		3,160 C.Y.
	UTILITY TRENCH		3,600 L.F.
29	CONST 0.16' A.C. OVER 90% COMPACTIVE NATIVE SOIL		79 TONS
30	INSTALL 2"x4" REDWOOD HEADER		550 L.F.

QUANTITIES SHOWN HEREON ARE FOR PERMIT AND/OR BONDING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING. CONTRACTOR SHALL DETERMINE HIS OWN QUANTITIES AND BID A COMPLETE JOB.

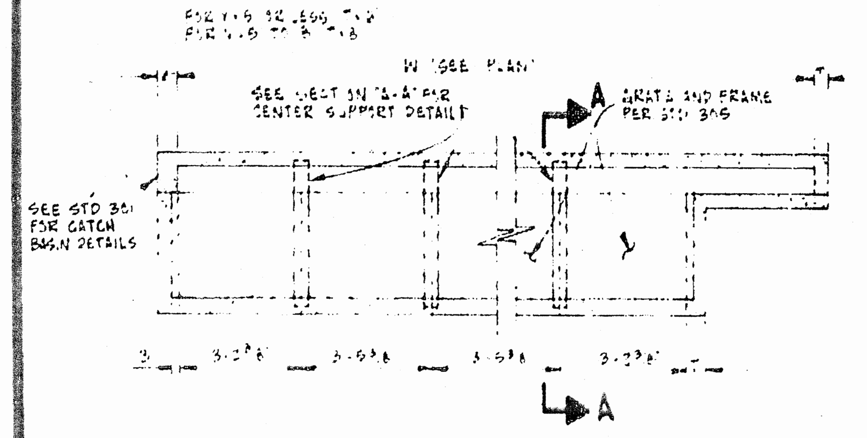
* GRATES TO BE BICYCLE PROOF PER CALTRANS STD DWG. NO D77B. USE GRATE TYPE 24-12X OR TYPE 24-13. ALSO SEE DETAIL "A" HEREON.

LEGEND

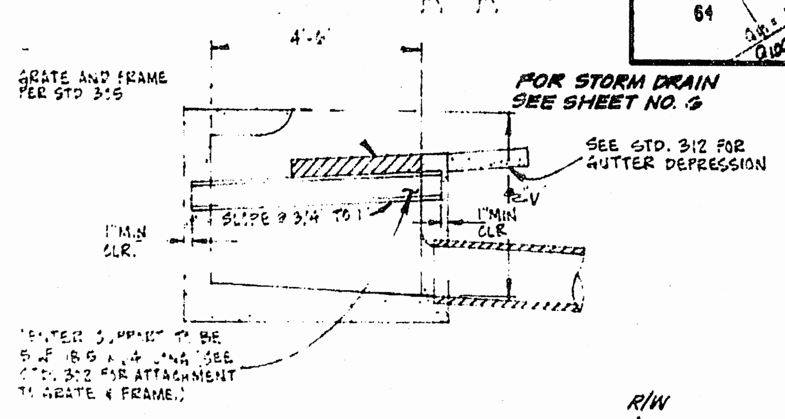
- T.C. TOP OF CURB
- F.L. FLOWLINE
- B.C. BEGIN CURVE
- E.C. END CURVE
- B.C.R. BEGIN CURB RETURN
- E.C.R. END CURB RETURN
- B.V.C. BEGIN VERTICAL CURVE
- E.V.C. END VERTICAL CURVE
- G.B. GRADE BREAK
- P.R.V.C. POINT OF REVERSE VERTICAL CURVE
- P.R.C. POINT OF REVERSE CURVATURE
- ○—☆ STREET LIGHT
- ▲ STREET NAME SIGN



INDEX MAP
1" = 200'

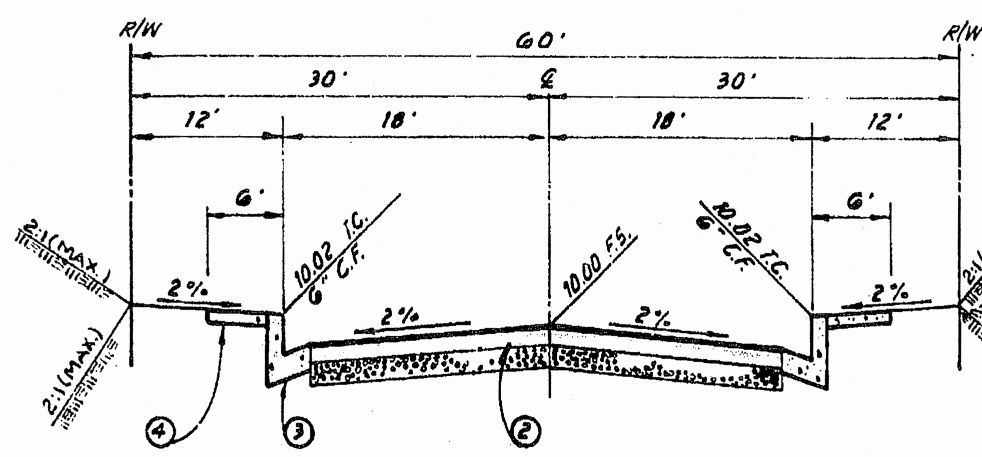


DETAIL "A" (NTS)
MULTIPLE GRATES FOR STD 301



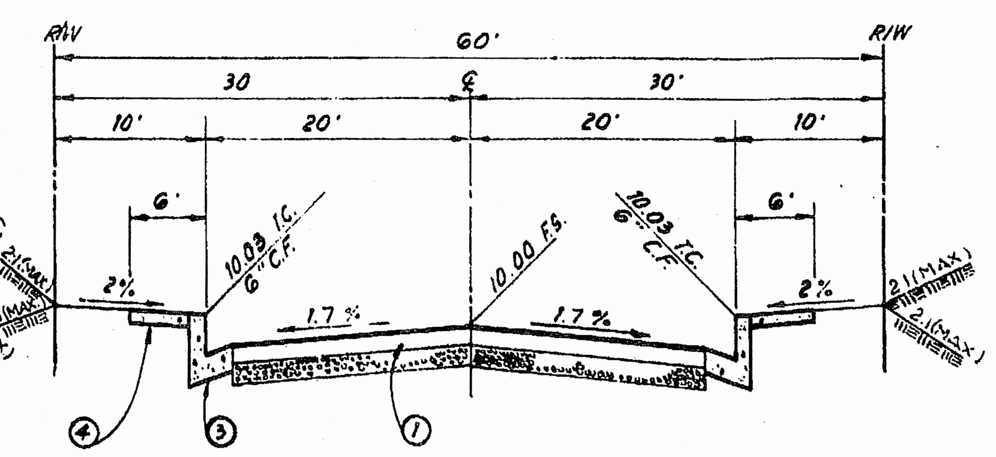
SECTION "A-A"
NTS

FOR STORM DRAIN SEE SHEET NO. 6



TYPICAL INTERIOR STREET SECTION
N.T.S.

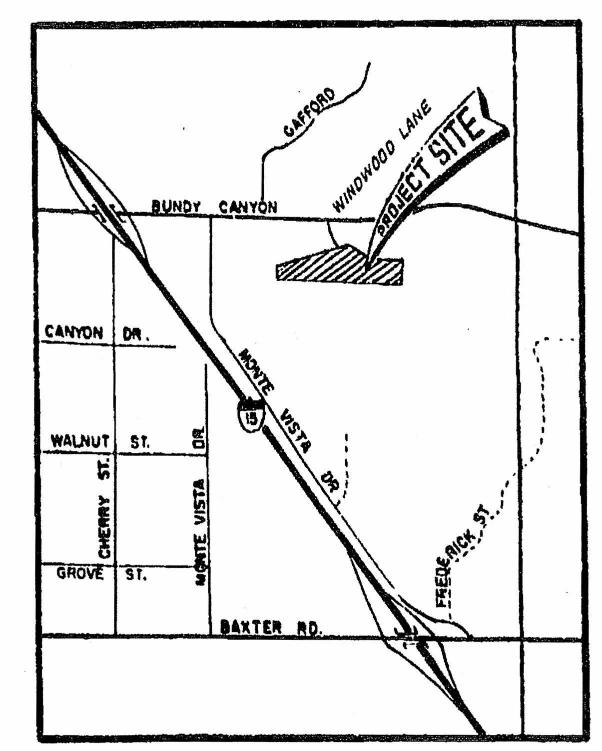
PHEASANTPUN CIRCLE / SHADED MEADOW CIRCLE / COUNTRYSIDE CIRCLE — PRELIMINARY R-VALUE = 34, T.I. = 5.0



TYPICAL INTERIOR STREET SECTION
N.T.S.

SUNNYBROOK DRIVE / WINDWOOD LANE / QUAIL CREEK LANE — PRELIMINARY R-VALUE = 34, T.I. = 5.5

0' 200' 400' 600' 800' SCALE IN FEET



S26, T6S, R4W

VICINITY MAP
N.T.S.

SCHEDULE "A"

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT, THOSE SHOWN ON THIS PLAN. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF, AND ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COARSE 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 CONSTRUCTION CONTRACTOR FURTHER AGREE TO, DEFEND, INDEMNIFY, AND HOLD DESIGN PROFESSIONAL AND OWNER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

Underground Service Alert
Call: TOLL FREE 1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG

VAN DAELE DEVELOPMENT CORP.
2900 ADAMS STREET, SUITE C 25
RIVERSIDE, CA. 92504 PH 354-2121

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after county approval or during construction the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the county.

DATE	BY	MARK	REVISIONS	APPR	DATE
6-24-93	E.A.S.	⚠	ADDED ALT 30" C.P.P DESIGNATION ON SHT. 6		

ENGINEER — COUNTY
DESIGNED BY V.M.S. DRAWN BY A.E.P. CHECKED BY J.J.L.

RECOMMENDED FOR APPROVAL — DATE 6/1/93
CHECKED BY — DATE 5-24-93

SEAL COUNTY

SEAL: REGISTERED PROFESSIONAL ENGINEER RICHARD A. SCIANNI 25917 EXPIRES 12/31/93 CIVIL STATE OF CALIFORNIA

APPROVED BY — DATE 6/4/93
FOR TRANSPORTATION DEPT., RIVERSIDE COUNTY, CALIFORNIA
R.C.E. NO 22815 EXP DATE 12/31/93

APPROVED BY Richard A. Scianni DATE 6-1-90
R.C.E. NO. 25917 EXP. DATE 12-31-93

CSL ENGINEERING INC.
2900 Adams Street, Suite A25
Riverside, California 92504
ph.: (714)785-5122

SCALE 1" = 40'
DATE MAY 1990

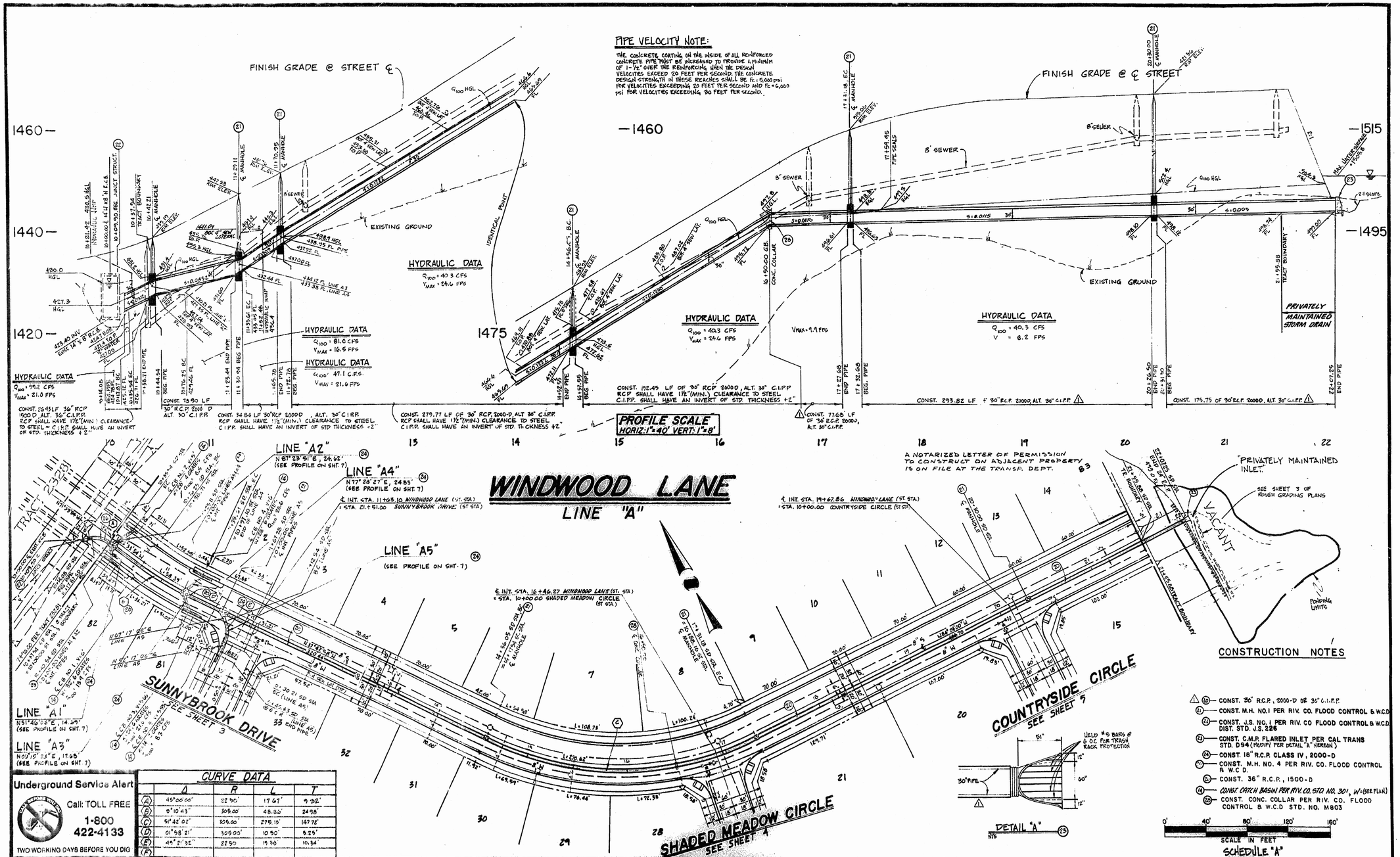
BENCHMARK FD 3" BRASS DISK (U.S.C. & G.S.) IN CONC UP 1 STAMPED "U312" 0.9 MILE E OF MISSION TRAIL AT S.E CORNER OF BUNDY CANYON ROAD & ORANGE STREET 1970 ELEV. = 1366.254

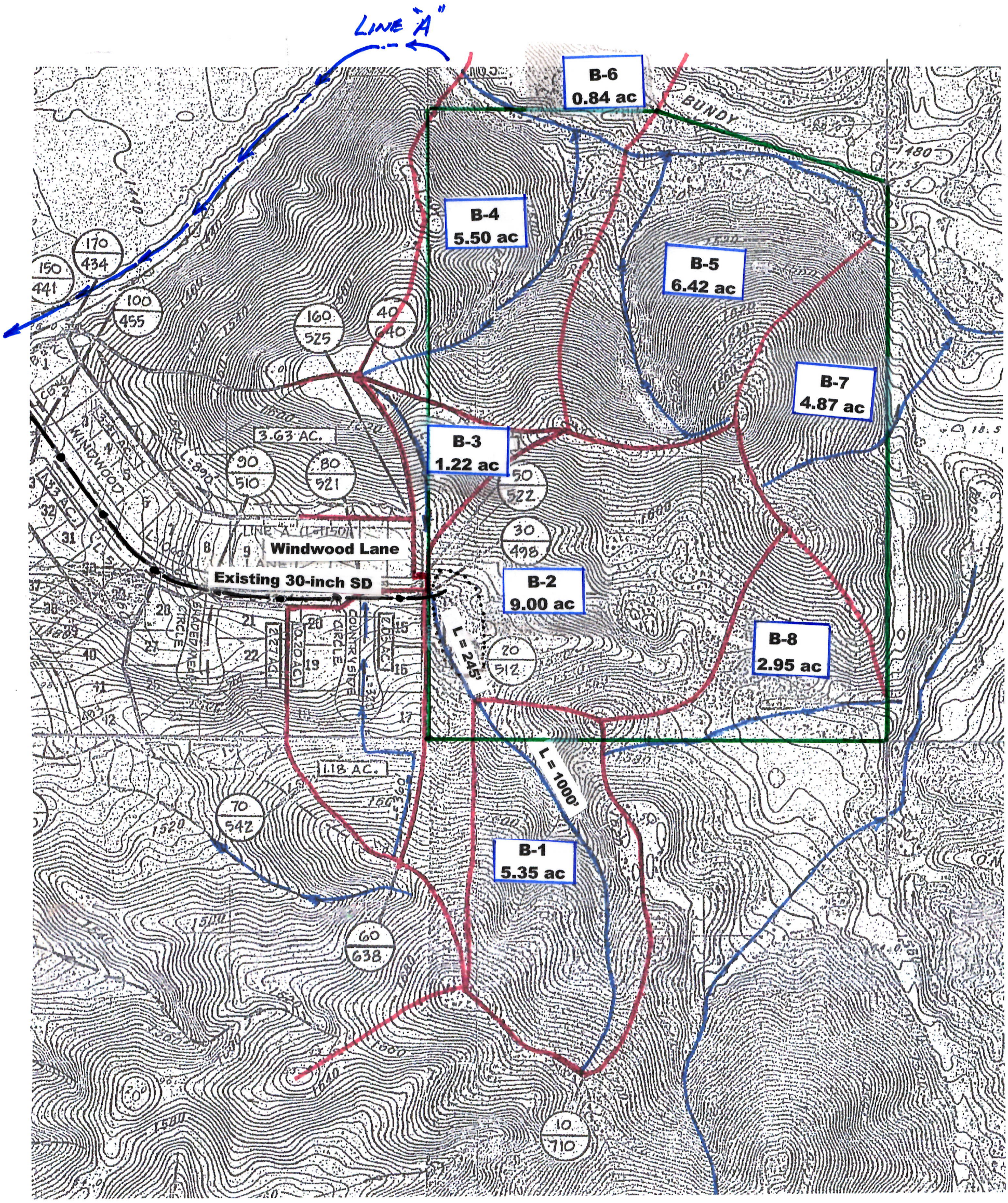
COUNTY OF RIVERSIDE STREET IMPROVENT PLANS FOR TRACT NO. 24506 TITLE SHEET

FOR — WO

SHEET NO 1 OF 8 SHTS.
FILE NO

895-EE JN 268


PIPE VELOCITY NOTE:
THE CONCRETE COATING 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 = 5,000 psi FOR VELOCITIES EXCEEDING 20 FEET PER SECOND AND f'c = 6,000 psi FOR VELOCITES EXCEEDING 30 FEET PER SECOND.
FINISH GRADE @ STREET ℄
EXISTING GROUND
HYDRAULIC DATA
Q100 = 40.3 CFS
VMAX = 24.6 FPS
HYDRAULIC DATA
Q100 = 81.0 CFS
VMAX = 16.6 FPS
HYDRAULIC DATA
Q100 = 47.1 C.F.S.
VMAX = 21.6 FPS
HYDRAULIC DATA
Q100 = 39.2 CFS
VMAX = 21.0 FPS
HYDRAULIC DATA
Q100 = 40.3 CFS
VMAX = 9.9 FPS
HYDRAULIC DATA
Q100 = 40.3 CFS
V = 8.2 FPS
PRIVATELY MAINTAINED STORM DRAIN
PROFILE SCALE
HORIZ: 1"=40' VERT: 1"=8'
WINDWOOD LANE
LINE "A"
LINE "A2"
LINE "A4"
LINE "A5"
LINE "A1"
LINE "A3"
SUNNYBROOK DRIVE
SEE SHEET 3
COUNTRYSIDE CIRCLE
SEE SHEET 5
SHADED MEADOW CIRCLE
SEE SHEET 4
TRACT 23251
VACANT
"PRIVATELY MAINTAINED INLET"
SEE SHEET 3 OF ROUGH GRADING PLANS
A NOTARIZED LETTER OF PERMISSION TO CONSTRUCT ON ADJACENT PROPERTY IS ON FILE AT THE TRANSP. DEPT.
DETAIL "A"
CONSTRUCTION NOTES
(20) CONST. 36" R.C.P., 2000-D OR 36" C.I.P.P.
(21) CONST. M.H. NO. 1 PER RIV. CO. FLOOD CONTROL & W.C.D.
(22) CONST. J.S. NO. 1 PER RIV. CO. FLOOD CONTROL & W.C.D. DIST. STD. J.S. 226
(23) CONST. C.M.P. FLARED INLET PER CAL TRANS STD. D94 (MODIFY PER DETAIL "A" HEREON)
(24) CONST. 18" R.C.P. CLASS IV, 2000-D
(25) CONST. M.H. NO. 4 PER RIV. CO. FLOOD CONTROL & W.C.D.
(26) CONST. 36" R.C.P., 1500-D
(14) CONST. CATCH BASIN PER RIV. CO. STD. NO. 301, W=(SEE PLAN)
(28) CONST. CONC. COLLAR PER RIV. CO. FLOOD CONTROL & W.C.D. STD. NO. M803
SCALE IN FEET
SCHEDULE "A"
Underground Service Alert
Call: TOLL FREE
1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG
CURVE DATA
VAN DAELE DEVELOPMENT CORP.
2900 ADAMS STREET, SUITE C25
RIVERSIDE, CA. 92504 PH. 354-2121
RECOMMENDED FOR APPROVAL
SEAL COUNTY
APPROVED BY
APPROVED BY
CSL ENGINEERING INC.
2900 ADAMS STREET, SUITE A25
RIVERSIDE, CA. 92504
PH. (714) 785-5122
COUNTY OF RIVERSIDE
STREET IMPROVEMENT PLANS
FOR
TRACT 24506
STORM DRAIN PLAN
SHEET NO. 6 OF 2 SHTS.
FILE NO.
BENCHMARK
SCALE 1"=40'
DATE JUNE 1990
DESIGNED BY V.M.S.
DRAWN BY
CHECKED BY J.J.L.
895-EE JN 268



BUNDY CANYON APARTMENTS

MAP A - Before Drainage Map

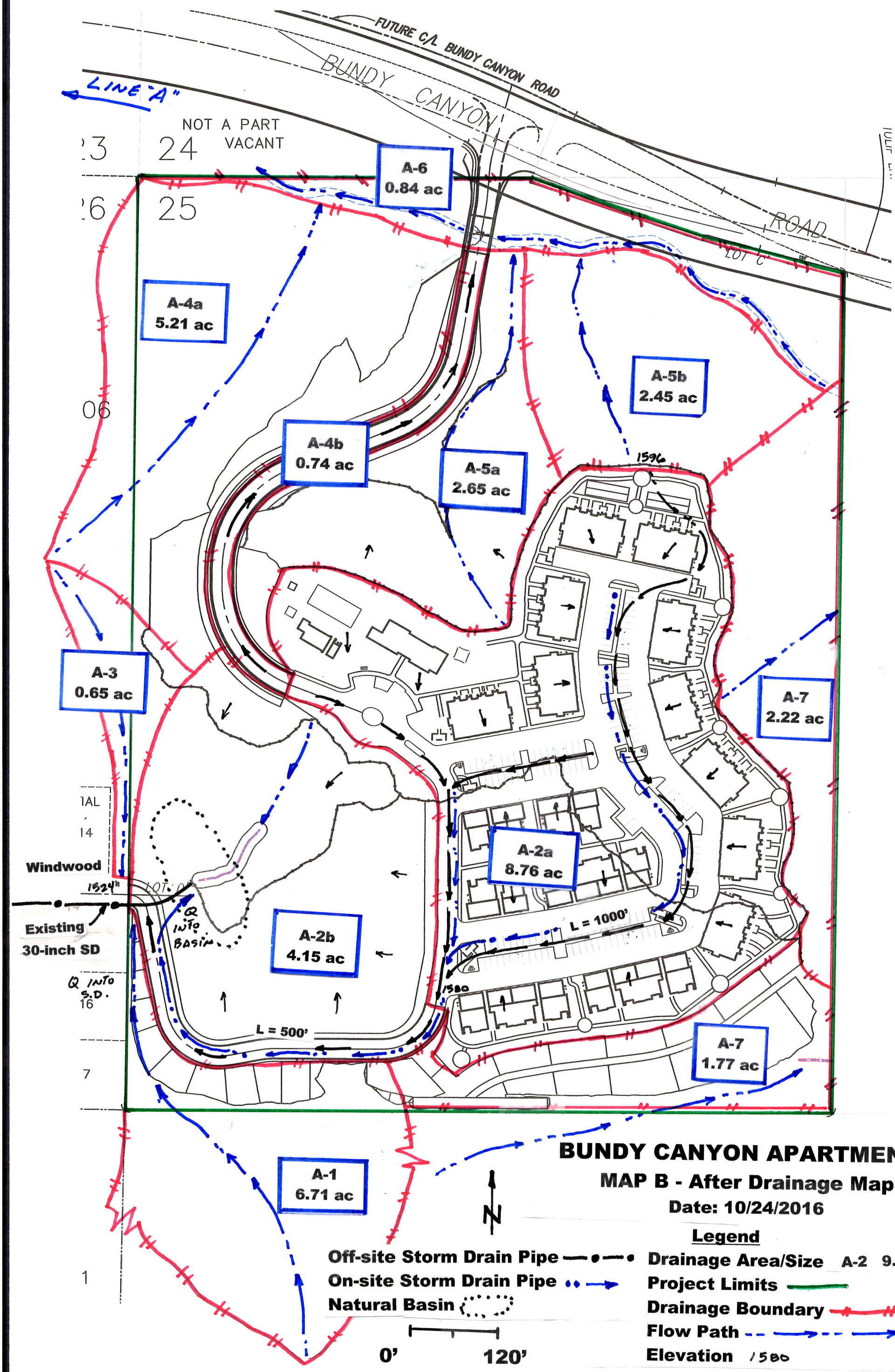
Date: 10/24/2016

Legend

Drainage Area/Size	B - 5.35 acres
Project Limits	
Drainage Boundary	
Flow Path	
Elevation	1580
Off-site Storm Drain Pipe	
On-site Storm Drain Pipe	
Natural Basin	

N

0' 200'

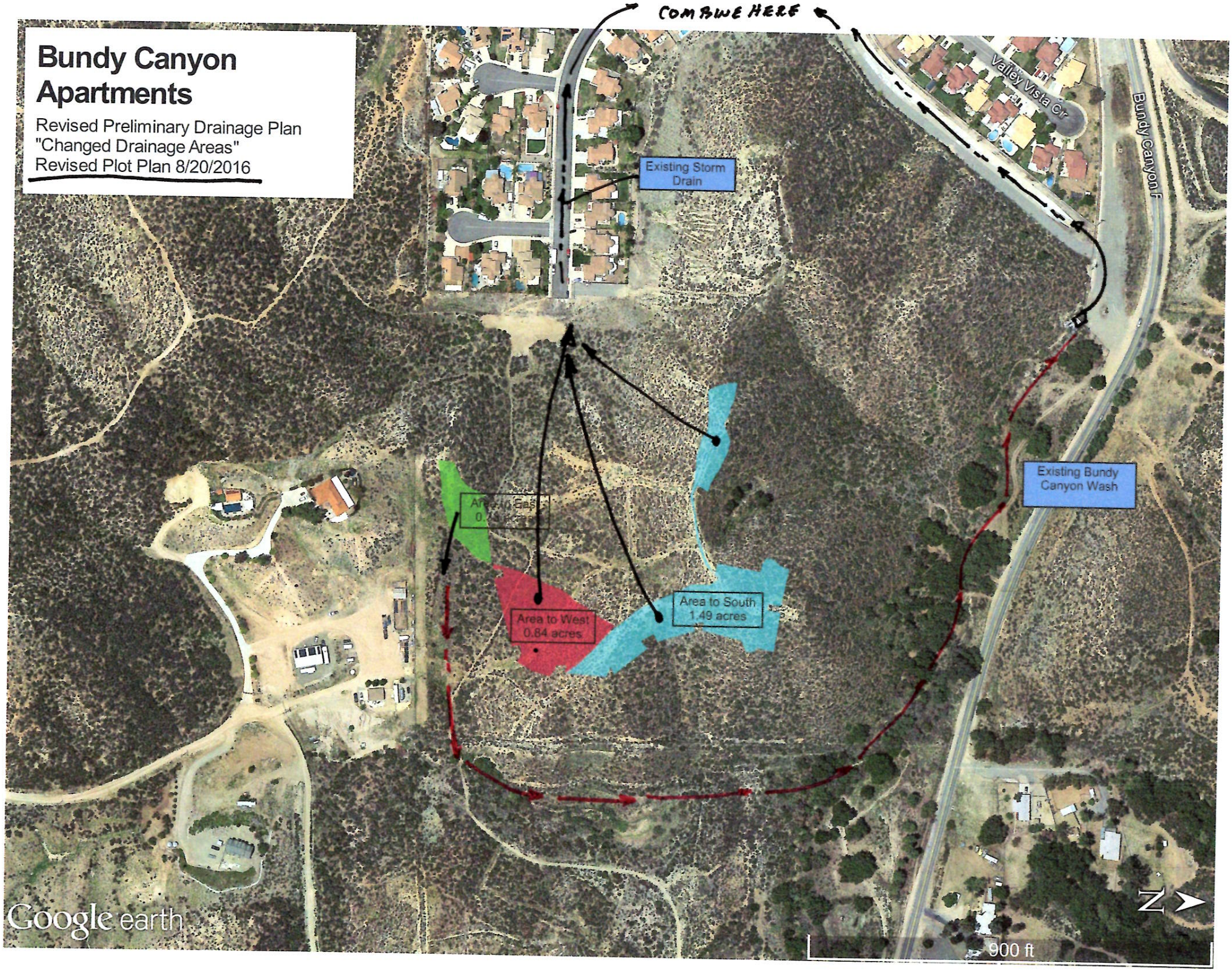


BUNDY CANYON APARTMENTS

MAP B - After Drainage Map

Date: 10/24/2016

Legend


COMBINE HERE
Bundy Canyon Apartments
Revised Preliminary Drainage Plan
"Changed Drainage Areas"
Revised Plot Plan 8/20/2016
Existing Storm Drain
Valley Vista Cir
Bundy Canyon R
Existing Bundy Canyon Wash
Area to West 0.84 acres
Area to South 1.49 acres
Google earth
900 ft
N

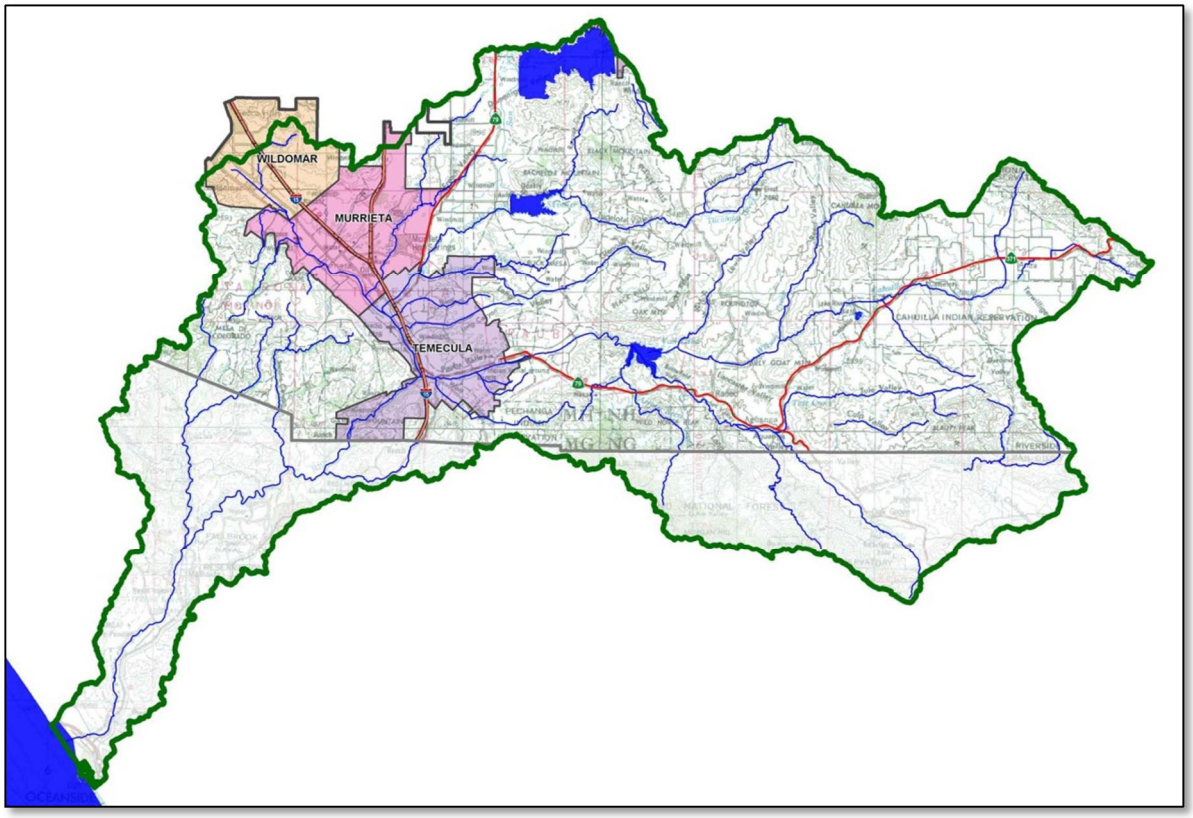
Project Specific Water Quality Management Plan

*A Template for preparing Project Specific WQMPs for Priority Development Projects located within the **Santa Margarita Region** of Riverside County*

Project Title: Bundy Canyon Resort Apartments

Development No: Plot Plan 16-0006

Design Review/Case No: Plot Plan 16-0006



☒ **Preliminary**
☐ **Final**

Original Date Prepared: 12/28/2015

Revision Date(s): 10/24/2016

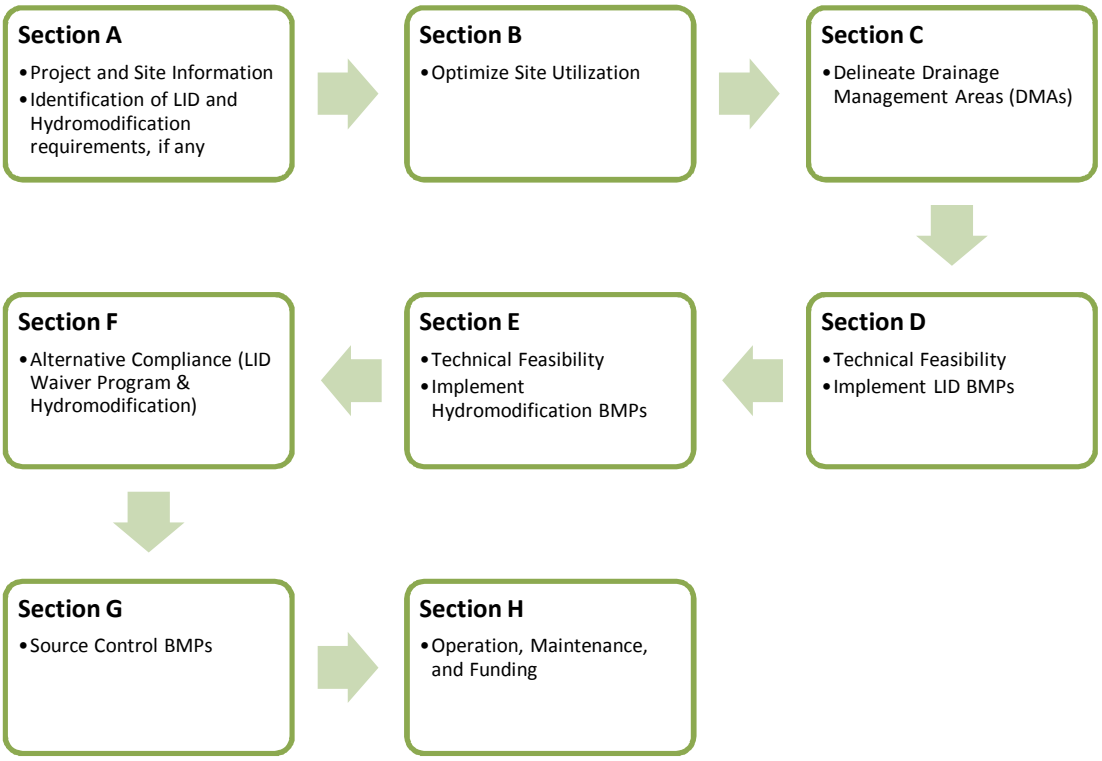
Prepared for Compliance with
Regional Board Order No. **R9-2010-0016**

Contact Information:

Prepared for: Hufsdar Investments,LLC PO Box 6579 West Lake Village, CA 91359 (805) 241-5007
Prepared by: Grant Becklund 30811 Garbani Road, Winchester, CA 92596 (951) 288-0601

A Brief Introduction

The Municipal Separate Storm water Sewer System (MS4) Permit[1] for the **Santa Margarita Region** (SMR) requires preparation of a Project-Specific Water Quality Management Plan (WQMP) for all Development Projects as defined in section F.1.d.(1) of the Permit. This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



[1] Order No. R9-2010-0016, NPDES No. CAS0108766, Waste Discharge Requirements for Discharges from the MS4 Draining the County of Riverside, the Incorporated Cities of Riverside County, and the Riverside County Flood Control and Water Conservation District within the San Diego Region, California Regional Water Quality Control Board, November 10, 2010.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Hufsdar Investments, LLC by Grant Becklund for the Bundy Canyon Resort Apartment project.

This WQMP is intended to comply with the requirements of City of Wildomar for Wildomar Water Quality Ordinance (Municipal Code Section 13.12.060) 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 Best Management Practices 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 of City of Wildomar Water Quality Ordinance (Municipal Code Section 13.12.060)

"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."

_____	10/24/2016
Owner's Signature	Date
_____	_____
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 Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2010-0016** and any subsequent amendments thereto."

_____	10/24/2016
Preparer's Signature	Date
Grant Becklund	Civil Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: RCE 23737

Table of Contents

Section A: Project and Site Information 6
A.1 Maps and Site Plans 6
A.2 Identify Receiving Waters 7
A.3 Drainage System Susceptibility to Hydromodification 7
A.4 Additional Permits/Approvals required for the Project: 8
Section B: Optimize Site Utilization (LID Principles) 10
Section C: Delineate Drainage Management Areas (DMAs) 11
Section D: Implement LID BMPs 13
D.1 Infiltration Applicability 13
D.2 Harvest and Use Assessment 15
D.3 Bioretention and Biotreatment Assessment 17
D.4 Other Limiting Geotechnical Conditions 18
D.5 Feasibility Assessment Summaries 18
D.6 LID BMP Sizing 19
Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs 20
E.1 Onsite Feasibility of Hydrologic Control BMPs 20
E.2 Meeting the HMP Performance Standard for Small Project Sites 21
E.3 Hydrologic Control BMP Selection 22
E.4 Hydrologic Control BMP Sizing 22
E.5 Implement Sediment Supply BMPs 23
Section F: Alternative Compliance 26
F.1 Identify Pollutants of Concern 28
F.2 Stormwater Credits 29
F.3 Sizing Criteria 29
F.4 Treatment Control BMP Selection 30
F.5 Hydrologic Performance Standard – Alternative Compliance Approach 30
F.6 Sediment Supply Performance Standard - Alternative Compliance 31
Section G: Source Control BMPs 32
Section H: Construction Plan Checklist 34
Section I: Operation, Maintenance and Funding 35
Acronyms, Abbreviations and Definitions 36

List of Tables

Table A.1 Identification of Receiving Waters 7
Table A.2 Identification of Susceptibility to Hydromodification 8
Table A.3 Other Applicable Permits 8
Table C.1 DMA Classifications 11
Table C.2 Type 'A', Self-Treating Areas 11
Table C.3 Type 'B', Self-Retaining Areas 11
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 12
Table C.5 Type 'D', Areas Draining to BMPs 12
Table D.1 Infiltration Feasibility 13
Table D.2 Geotechnical Concerns for Onsite Retention Table 18
Table D.3 LID Prioritization Summary Matrix 18
Table D.4 DCV Calculations for LID BMPs 19
Table D.5 LID BMP Sizing 20
Table E.1 LID & Hydromodification BMP Location 22
Table E.2 Hydrologic Control BMP Sizing 22
Table F.1 Potential Pollutants by Land Use Type 28
Table F.2 Stormwater Credits 29
Table F.3 Treatment Control BMP Sizing 29
Table F.4 Treatment Control BMP Selection 30
Table F.5 Offsite Hydrologic Control BMP Sizing 31
Table G.1 Structural and Operational Source Control BMP 32
Table H.1 Construction Plan Cross-reference 34

List of Appendices

Appendix 1: Maps and Site Plans 43
Appendix 2: Construction Plans 44
Appendix 3: Soils Information 45
Appendix 4: Historical Site Conditions 46
Appendix 5: LID Infeasibility 47
Appendix 6: BMP Design Details 48
Appendix 7: Hydromodification 49
Appendix 8: Source Control 50
Appendix 9: O&M 51
Appendix 10: Educational Materials 43

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Developing 28.28 of vacant/natural property into a 140 unit residential project on 10 +/- acres with the balance left open space.
Planning Area:	N/A
Community Name:	City of Wildomar
Development Name:	Plot Plan 16-0006
PROJECT LOCATION	
Latitude & Longitude (DMS): 33'37.492" N 117' 15.377" W	
Project Watershed and Sub-Watershed: Santa Margarita Watershed, Murrieta Creek Sub-Watershed	
APN(s): 367-250-008	
Map Book and Page No.: Book 367 page 25	
PROJECT CHARACTERISTICS	
Proposed or potential land use(s)	Residential
Proposed or Potential SIC Code(s)	N/A
Area of Impervious Project Footprint (SF)	0.0
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	282,270
Total Project Area (ac)	35.49
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
Is the project exempt from HMP Performance Standards?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0
Is the project located within any Multi-Species Habitat Conservation Plan (MSHCP Criteria Cell?	☒ Y ☐ N
If so, identify the Cell number: 5149	N/A
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 Natural Resources Conservation Service (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?	.710

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces

- Drainage Path
- Drainage infrastructure, inlets, overflows
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the Receiving Waters that the Project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated Beneficial Uses, and proximity, if any, to a RARE Beneficial Use. Include a map of the Receiving Waters in Appendix 1. *(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)*

Table A.1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
MURRIETA CREEK {SA 2.32}	CHLORPYRIFOS (PESTICIDES) IRON, COPPER (METALS) MANGANESE NITROGEN (NUTRIENTS) TOXICITY	MUN,AGR,IND,PROC, GWR, REC1,REC2,WARM, WILD	NOT A RARE WATER BODY {APPROX. 3.4 MILES FROM SITE}
SANTA MARGARITA RIVER – UPPER {HU2.22,2.21}	ENTEROCOCUS FECAL COLIFORM (BACTERIA) PHOSPHORUS, TOTAL NITROGEN (NUTRIENTS)	MUN, AGR, IND, PROC, REC1, REC2, WARM, COLD, WILD, RARE	A RARE WATER BODY {APPROX. 10.4 MILES FROM SITE}
SANTA MARGARITA RIVER – LOWER {HU2.11, 2.12, 2.13}	ENTEROCOCUS FECAL COLIFORM (BACTERIA) PHOSPHORUS, TOTAL NITROGEN (NUTRIENTS)	MUN, AGR, IND, PROC, REC1, REC2, WARM, COLD, WILD, RARE	A RARE WATER BODY {APPROX. 23.95 MILES FROM SITE}
SANTA MARGARITA LAGOON {HU-2.11}	EUTROPHIC {NUTRIENTS AND OXYGEN DEMANDING SUBSTANCES}	REC1, REC2, EST, WILD, RARE, MAR, MIGR, SPWN	A RARE WATER BODY {APPROX. 27.4 MILES FROM SITE}
PACIFIC OCEAN	NONE	IND, NAV, REC1, REC2, COMM, BIOL, WILD, RARE, MAR, AQUA, MIGR, SPWN, SHELL	A RARE WATER BODY {APPROX. 41.4 MILES FROM SITE}

A.3 Drainage System Susceptibility to Hydromodification

Using Table A.2 below, list in order of the point of discharge at the project site down to the Santa Margarita River, each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, the storm drain susceptibility using the SWCT2 (Stormwater & Water Conservation Tracking Tool - http://rivco.permitrack.com/) or Map 2 of the Hydromodification Susceptibility

Documentation Report and Mapping: Santa Margarita Region (Appendix D of the SMR HMP), and the condition for exempting the drainage system, if applicable. If the exemption includes receiving waters that were not evaluated in Appendix D, provide supporting documentation in Appendix 7 to demonstrate that they classify as Engineered, Fully Hardened and Maintained (EFHM) channels, consistent with the definition provided in Appendix D. Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A.2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Susceptibility of Drainage System	Hydromodification Exemption
Line A - 0.5 miles	Concrete Channel	Non-susceptible	None
Murrieta Creek – 3.4 miles	Natural	Natural Channel	None
Murrieta Creek – 10.4 miles	Large River	Non-susceptible	Large River
Santa Margarita River – 24 miles	Large River	Non-susceptible	Large River

A.4 Additional Permits/Approvals required for the Project:

Table A.3 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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act 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)*	☐ Y	☐ N

If yes is answered to any of the questions above, the Co-permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

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 LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

The 2010 SMR MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

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.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

The project will preserve the existing drainage patterns, and will not divert more than one acre of area to each of the downstream discharge points. All flows currently discharge to Bundy Canyon Channel Line A. The post-project condition mimics these patterns.

Did you identify and protect existing vegetation? If so, how? If not, why?
The project site consists of several open space areas that conserve existing vegetation.
Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

The project site does conserve the natural infiltration capacity within the existing basin and the open space areas.
Did you identify and minimize impervious area? If so, how? If not, why?

The project site will utilize the minimum amount of impervious area required. Additionally, the Project site includes landscaped areas and open space areas that will minimize the impervious surfaces.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Roof runoff will discharge into adjacent landscaping prior to discharging into the streets and Storm drains.

Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your Project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table B.1 DMA Classifications

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA One – Apt Site	Roof, Landscaping and Street	398,140	Type "D"
DMA Two – Natural Basin	Landscaping, Natural Cover and Street	164,220	Type "D"
DMA Three – South Off-Site Area Open Space	Landscaping and Natural Cover	292,290	Type "D"
DMA Four – Northerly Access Road and Open Space	Landscaping, Natural Cover and Street	691,730	Type "D"

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table B.2 Type 'A', Self-Treating Areas

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

Table B.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]

$$\text{[illegible]} = \text{[illegible]} + \frac{\text{[illegible]} \cdot [\text{illegible}]}{[\text{illegible}]}$$

Table B.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]

Note: (See Section 3.3 of WQMP Guidance Document) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

$$\text{[illegible]} \frac{\text{[illegible]}}{\text{[illegible]}} \text{[illegible]} : \text{[illegible]}$$

(Tributary Area: Self-Retaining Area)

Table B.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

Implement LID BMPs

B.1 Infiltration Applicability

An assessment of the feasibility of utilizing Infiltration BMPs is required for all projects, *except in the following case:*

- ☐ Harvest and Use BMPs will be implemented to address the Design Capture Volume (see the Harvest and Use Assessment below) for all Drainage Management Areas AND the project is exempt from HMP Performance Standards (*Proceed to Section D.2 and Section E*).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 3.4.1 of the WQMP Guidance Document and complete the remainder of Section D.1.

Is there an infiltration concern (see discussion in Chapter 2.3.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, both Infiltration BMPs and Hydrologic Control BMPs that include an infiltration functionalities may not be feasible for the site. It is recommended that you contact your Copermittee to verify whether or not infiltration within the Project is infeasible.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

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 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.3.4. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table B.6 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?		
If Yes, list affected DMAs:		x
…have any contaminated groundwater plume in the vicinity of the site?		x
If Yes, list affected DMAs:		
…geotechnical report identifies other site-specific factors that would preclude effective and safe infiltration?		x
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

The proposed plan does not depend on infiltration to function and therefore no soils testing was completed.

B.2 Harvest and Use Assessment

Please check what applies*:*

☐ 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 (verify with the Copermittee).

☐The Design Capture Volume (DCV) will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the DCV will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 7.7 ac

Type of Landscaping (Conservation Design or Active Turf): Conservation 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: 5.2 ac

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 2-4 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: EIATIA Factor

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: Insert Area (Acres)

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)
Insert Area (Acres)	Insert Area (Acres)

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

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: Number of daily Toilet Users

Project Type: Enter 'Residential', 'Commercial', 'Industrial' or 'Schools'

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 Project 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: Insert Area (Acres)

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 number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: TUTIA Factor

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: Required number of toilet users

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)
Insert Area (Acres)	Insert Area (Acres)

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

Project 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 2-5 in Chapter 2 to determine the minimum demand for non-potable uses of stormwater runoff per tributary impervious acre.

Enter the factor from Table 2-3: 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 gpd 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 Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
n/a	n/a

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment BMPs, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

B.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.3 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

XX LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the Project as noted below in Section D.4

☐ 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 Copermittee with jurisdiction over the Project site to discuss this option. Proceed to Section E to document your alternative compliance measures.

B.4 Other Limiting Geotechnical Conditions

Onsite retention may not be feasible due to specific geotechnical concerns identified in the Geotechnical Report. If any, describe below. If no, write N/A:

n/a

Table B.7 Geotechnical Concerns for Onsite Retention Table

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		
Other		

B.5 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.3 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table B.8 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 One	☐	☐	☒	☐	☐
DMA Two	☐	☐	☒	☐	☐
DMA Three	☐	☐	☒	☐	☐
DMA Four	☐	☐	☒	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

n/a

B.6 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be addressed by the selected BMPs. First, calculate the DCV for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee with jurisdiction over the Project site. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.4 below to document the DCV and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table B.9 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
DMA One	*398,140*	*Apartments*	*.66*	*0.46*	*183,144*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA Two	*164,420*	*Basin*	*.26*	*0.20*	*32,844*			
DMA Three	*292,290*	*Open Space*	*.15*	*0.14*	*40,920*			
DMA Four	*691,175*	*Open Space and Access Road*	*.15*	*.14*	*96,840*			
	1,546,025				353,748	0.71	20,930	22,000

[B], [C] is obtained as described in Section 2.5 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Each LID BMP must be designed to ensure that the Design Capture Volume (DCV) will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the 'V_{BMP}' worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee. Complete Table D.5 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard of the SMR HMP, as identified in Section E.

Table B.10 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
Parking Lot Swale	One	Bio-retention	10,617	11,000
Basin Swale	Two	Bio-retention	2,053	2,500
Basin Swale	Three	Bio-retention	2,436	2,500
Basin Swale	Four	Bio-retention	5,764	6,000

*Note, volume shown is equivalent to the volume within the basin ponded to only 0.5'. Per the LID Manual, the water quality volume within a Bioretention Basin cannot pond greater than 0.5'. This volume also includes the available volume within the soil layer and 1' of gravel layer, per the LID Manual.

The project will utilize
four bioretention basins that will be used for water quality purposes and to address hydromodifications. The bioretention basins have been labeled Basins 1 through 4, with corresponding DMA numbers. The areas listed on table C.1 (DMA Classification) corresponding to the rational method hydrology areas prepared as part of the Preliminary Hydrology and Hydraulics Report

The required water quality volume was determined by using the Santa Margarita Watershed BMP Design Volume Spreadsheets, included in Appendix 6. The effective impervious fraction was calculated based upon the tributary land use designations.

The bioretention basins have been designed so that the water quality volume will not pond higher than 6" above the soil media. The remaining volume will be utilized for addressing hydromodifications.

Section C: Implement Hydrologic Control BMPs and Sediment Supply BMPs

If a completed Table A.2 demonstrates that the project is exempt from HMP Performance Standards, specify N/A of proceed to Section F, if applicable, and Section G.

C.1 Onsite Feasibility of Hydrologic Control BMPs

An assessment of the feasibility of implementing onsite Hydrologic Control BMPs is required for all projects.

Select one of the following:

X Yes – The implementation of Hydrologic Control BMPs is feasible onsite. *(Proceed to Step E.3 and Step E.4)*

- *Or* -

- ☐ No – The project site is larger than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.5 and Step F for Alternative Compliance upon approval of the Technical Feasibility Assessment by the Copermittee)*
- ☐ No – The project site is smaller than one acre and the implementation of Hydrologic Control BMPs is not feasible onsite. *(Proceed to Step E.2)*

If the reasons for infeasibility are different from those listed in Section D.1, describe the technical or spatial reasons that preclude the implementation of onsite Hydrologic Control BMPs. If none, write N/A:

n/a

Approval of the condition for infeasibility, if any, is required by the Copermittee. Has the condition for infeasibility been approved by the Copermittee?

☐ Y ☐ N ☒ N/A

C.2 Meeting the HMP Performance Standard for Small Project Sites

Select one of the following:

- ☐ XX Yes – The project site is equal to or larger than one acre. *(Proceed to Step E.3, Step E.4, and Step E.5)*

- *Or* -

- ☐ No – The project site is less than one acre. *(Follow the remainder of Step E.2)*

Only a Simplified Technical Feasibility Study is required from the applicant. Complete the Simplified Technical Feasibility Study in Appendix 7, which must include, at a minimum, the soil conditions at the PDP, a demonstration of the lack of available space for onsite Hydrologic Control BMPs, an explanation of prohibitive costs to implement Hydrologic Control BMPs, and a written opinion from a Registered Geotechnical Engineer identifying the infeasibility due to geotechnical concerns.

Select one of the following:

- ☐ XX Yes – Onsite Hydrologic Control BMPs are feasible. *(Proceed to Step E., Step E.4, and Step E.5)*

- *Or* -

- ☐ No – Onsite Hydrologic Control BMPs are not feasible per the Simplified Technical Feasibility Study. *(Proceed to Section E.5 for Sediment Supply Performance Standard and Section F for Alternative Compliance)*

C.3 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. Similarly, compliance with the two identified requirements may be fully or partially achieved onsite.

For each DMA, identify in Table E.1 if the DCV is fully or partially captured onsite, if the Hydrologic Performance Standard is fully or partially met onsite (by using the SMRHM identified in Step E.4), and if structural BMPs for compliance with the LID requirement and the Hydrologic Performance Standard are combined.

Table E.1 LID & Hydromodification BMP Location

DMA	LID BMP	Hydrologic Control BMP	Combined BMP	BMP type and ID
1-4	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Onsite ☐ Partially Onsite ☐ Offsite ☐ None Required	☒ Yes ☐ No	Bioretention Basins

For each DMA provide a narrative describing if the DCV and the Hydrologic Performance Standard are to be fully managed onsite. If not, the narrative should detail how and where offsite structural BMPs will achieve management of the DCV and the Hydrologic Performance Standard. All the Basins will be constructed on-site and maintained and maintained by project management.

C.4 Hydrologic Control BMP Sizing

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP complies with the Hydrologic Performance Standard. Complete Table E.2 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E.2 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
Parking Swale	One	Bio retention Basin	☒	0.25	0.20	

Basin Swale	Two	Bio retention Basin	☒	0.06	0.06	
Basin Swale	Three	Bio retention Basin	☒	0.06	0.07	
Basin Swale	Four	Bio retention Basin	☒	0.14	0.13	

The project will address hydromodifications for the Santa Margarita River watershed by using the Clear Creek Solutions Santa Margarita River Hydromodification (SMRHM) program. The model utilized four bi oretention basins. The bottom surface areas represent the proposed basin bottom as currently d esigned. The bioretention basin will utilize a series of orifice holes and a riser to mitigate the flows to t he required levels to address hydromodification. The model assumed that
the roof runoff would flow to the adjacent landscaping, to the streets and into the bioretention basins. The open space area was not analyzed in the hydromodification analysis since this area remains undisturbed from its current condition. Per the hydromodification training, the basin areas are not to be included in the analyses, as the model includes precipitation on the proposed BMP facilities and accounts for this within the BMPs, therefore the areas tributary to the bioretention basins within the SMRHM program are slightly smaller than the total area watershed area for each basin. Based upon the model, the proposed bioretention basins adequately address hydromodifications.

C.5 Implement Sediment Supply BMPs

The applicant may refer to Section 2.3 of the SMR HMP for a comprehensive description of the methodology to meet the Sediment Supply Performance Standard. Complete the following steps to determine compliance with the Sediment Supply Performance Standard:

Step 1: Identify if the site is a Significant Source of Bed Sediment Supply to the receiving channel
ALL OFFSITE FLOWS ARE BYPASSED THROUGH OFFSITE STORM DRAIN SYSTEMS. THEREFORE THIS SECTION DOES NOT APPLY.

☐ Step 1.A – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity: ☐ High
☐ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ Step 1.B – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential: ☐ High
☐ Medium

☐ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ Step 1.C – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:

☐ High

☐ Medium

☐ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ Step 1.D – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E.3 Triad Assessment Summary

Step	**Rating**			**Total Score**
1.A	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.B	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.C	☐ High (3)	☐ Medium (2)	☐ Low (1)	
Significant Source Rating of Bed Sediment to the receiving channel(s)				

Step 2: Preservation of Identified Onsite Channels

Onsite streams identified as a Significant Source of Bed Sediment should be avoided in the site design.

Check one of the following:

☐ The site design does avoid all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may disregard subsequent steps of Section E.5 and directly advance directly to Section F.*)

- *Or* -

☐ The site design **does NOT avoid** all onsite channels identified as a Significant Source of Bed Sediment *(The applicant may proceed with the subsequent steps of Section E.5).*

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

The project site does not have onsite channels with significant sediment sources. All offsite flows will bypass via subsurface storm drain.

Step 3: By-Pass of Upstream Drainage(s) to Preserve the discharge of Bed Sediment Supply to the receiving channel(s)

Onsite channels identified as a Significant Source of Bed Sediment Supply should be by-passed the discharge of Bed Sediment Supply to the receiving channel(s).

Check one of the following:

x☐ The site design does avoid and/or bypass all onsite channels identified as a source of Bed Sediment Supply *(The applicant may directly advance to Section F.*)

- *Or* -

☐ The site design **does NOT avoid or by-pass** all onsite channels identified as a source of Bed Sediment Supply *(The applicant may proceed to an Alternative Approach, as defined in Section F).*

The project site does not have onsite channels with significant sediment sources. All offsite flows will bypass via subsurface storm drain.

Section D: Alternative Compliance

LID BMPs and Hydrologic Control BMPs are expected to be feasible on virtually all projects. Where LID BMPs and/or Hydrologic Control BMPs have been demonstrated to be infeasible as documented in Section D and/or Section E, respectively, other Treatment Control BMPs or alternative compliance approaches must be used (subject LID waiver and/or HMP alternative compliance approval by the Copermittee).

In addition, if supporting documentation demonstrates the infeasibility to implement Sediment Supply BMPs onsite (See Section E.5), the applicant may refer to Section F.5.

Check one of the following boxes:

XX LID Principles, LID BMPs, Hydrologic Control BMPs, and Sediment Supply 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.

- *Or* -

☐ LID Principles and LID BMPs have NOT been incorporated into the site design to fully address the LID requirements for all Drainage Management Areas AND HMP Performance Standards are not fully addressed in the following Drainage Management Areas.

- The following Drainage Management Areas are unable to be addressed using LID BMPs. A site specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Copermittee and included in Appendix 5. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated. The applicant should complete Section F.1, Section F.2, and Section F.3, as applicable.
- A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have completed the Simplified Technical Feasibility Study. The applicant should complete Section F.5 and/or Section F.6, as applicable.

n/a

- *Or* -

☐ LID Principles and LID BMPs have been incorporated into the site design to fully address the DCV for all Drainage Management Areas. However, HMP Performance Standards are not fully addressed in the following Drainage Management Areas. A site specific analysis demonstrating technical infeasibility of Hydrologic Control BMPs and Sediment Supply BMPs has been approved by the Copermittee and included in Appendix 7. Projects less than one acre have

completed the Simplified Technical Feasibility. The applicant should complete Section F.5 and/or Section F.6, as applicable.

n/a

D.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's Receiving Waters and their associated USEPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table F.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 D.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)	☐(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

D.2 Storm water Credits

Projects that cannot implement LID BMPs but nevertheless implement Smart Growth Principles are potentially eligible for Stormwater Credits. Utilize Table 3-7 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table D.2 Stormwater Credits

Qualifying Project Categories	Credit Percentage[2]
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*
[2]*Obtain corresponding data from Table 3-7 in the WQMP Guidance Document*

D.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your Project, utilize Table F.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.5 of the WQMP Guidance Document for further information.

Table D.3 Treatment Control BMP Sizing

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA x Runoff Factor		*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum DCV or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	[F] = $\frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.5 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 Stormwater 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

D.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

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table D.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]

[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 Reference Table E.1 above to populate this column.*
[3] *As documented in a Copermittee Approved Study and provided in Appendix 6.*

D.5 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. Attach to Appendix 7 the Technical Feasibility Study (Projects equal or greater than one acre) or Simplified Technical Feasibility Study (Projects less than one acre) along with a written approval from the Copermittee. The applicant may refer to Section 2.2.iv of the SMR HMP for extensive guidelines on the alternative compliance approach.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

n/a

☐ In-Stream Restoration Project

n/a

<u>For Offsite Hydrologic Control BMP Option</u>

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of

each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F.4 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F.5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee.

D.6 Sediment Supply Performance Standard - Alternative Compliance

The alternative compliance option to the Sediment Supply Performance Standard is only available if the governing Copermittee has approved the investigation of alternative Bed Sediment Supply options. Attach to Appendix 7 the Technical Feasibility Study, along with the modeling analysis, the long-term monitoring program, and the potential corrective actions, that demonstrate the performance of the overall alternative compliance program. The applicant may refer to Section 2.3.ii of the SMR HMP for extensive guidelines on the alternative compliance approach.

Provide a narrative describing the alternative Bed Sediment Supply approach, including the long-term monitoring program and the findings of the numerical modeling.

n/a

Section E: 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 Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective structural BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources***: Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit***: Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative***: Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table E.1 Structural and Operational Source Control BMP

Potential Sources of Runoff Pollutants	Structural Source Control BMPs	Operational Source Control BMPs
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.	• Maintain and periodically repaint or replace inlet markings • Provide Stormwater pollution prevention information to new site owners, lessees, or operators. • See applicable optional 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." cabmphandbooks.com • Include the following in lease agreements: "Tenant shall not allow
Landscape/Outdoor Pesticide Use	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 poll ution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant to 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/. • Provide IPM information to new owners, lessees and operators.
Pools, spas, ponds, decorative fountains, and other water features	• 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/
Roofing, gutters and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
Sidewalks		• Sweep sidewalks regularly to prevent accumulation of litter and debris. Collect

		debris from pressure washing to prevent entry into storm drain system.
Vehicular Restrictions		Restrict vehicular onsite power washes Restrict vehicular onsite maintenance and repairs

Section F: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table F.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
1-7	Bioretention Basins	Site Plan

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section G: Operation, Maintenance and Funding

The Copermittee with jurisdiction over the Project site will periodically verify that BMPs on your Project are maintained and continue to operate as designed. To make this possible, the Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement maintenance of BMPs 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. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have 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. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Project Management

Will the proposed BMPs be maintained by a Homeowners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Acronyms, Abbreviations and Definitions

2010 SMR MS4 Permit	Order No. R9-2010-0016, an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the 2010 SMR MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The 2010 SMR MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.
County	The abbreviation refers to the County of Riverside in this document.
CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.

CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The 2010 SMR MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.
DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.

Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)
Hydromodification	The 2010 SMR MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.

JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the 2010 SMR MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The 2010 SMR MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biotreatment BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.
LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.

LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the 2010 SMR MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the 2010 MS4 permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Section F.1.d(2) of Order No. R9-2009-0002.

Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

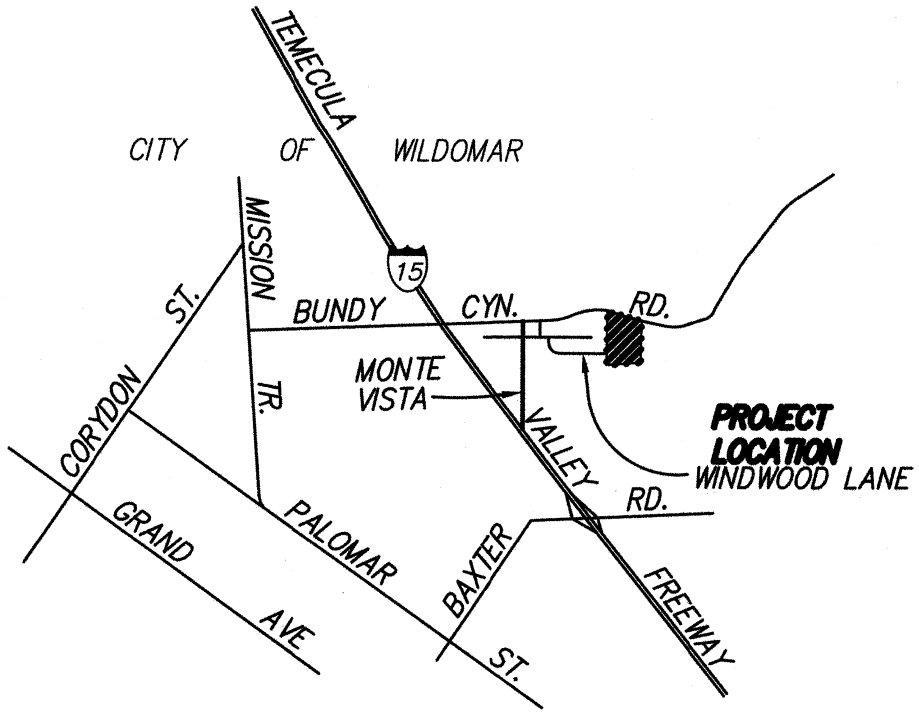
Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Stormwater Credit	Stormwater Credit can be claimed by an Applicant if certain development practices that provide broad-scale environmental benefits to communities are incorporated into the project design. Refer to Section 3.5.4 for additional information on Stormwater Credits.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The 2010 SMR MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

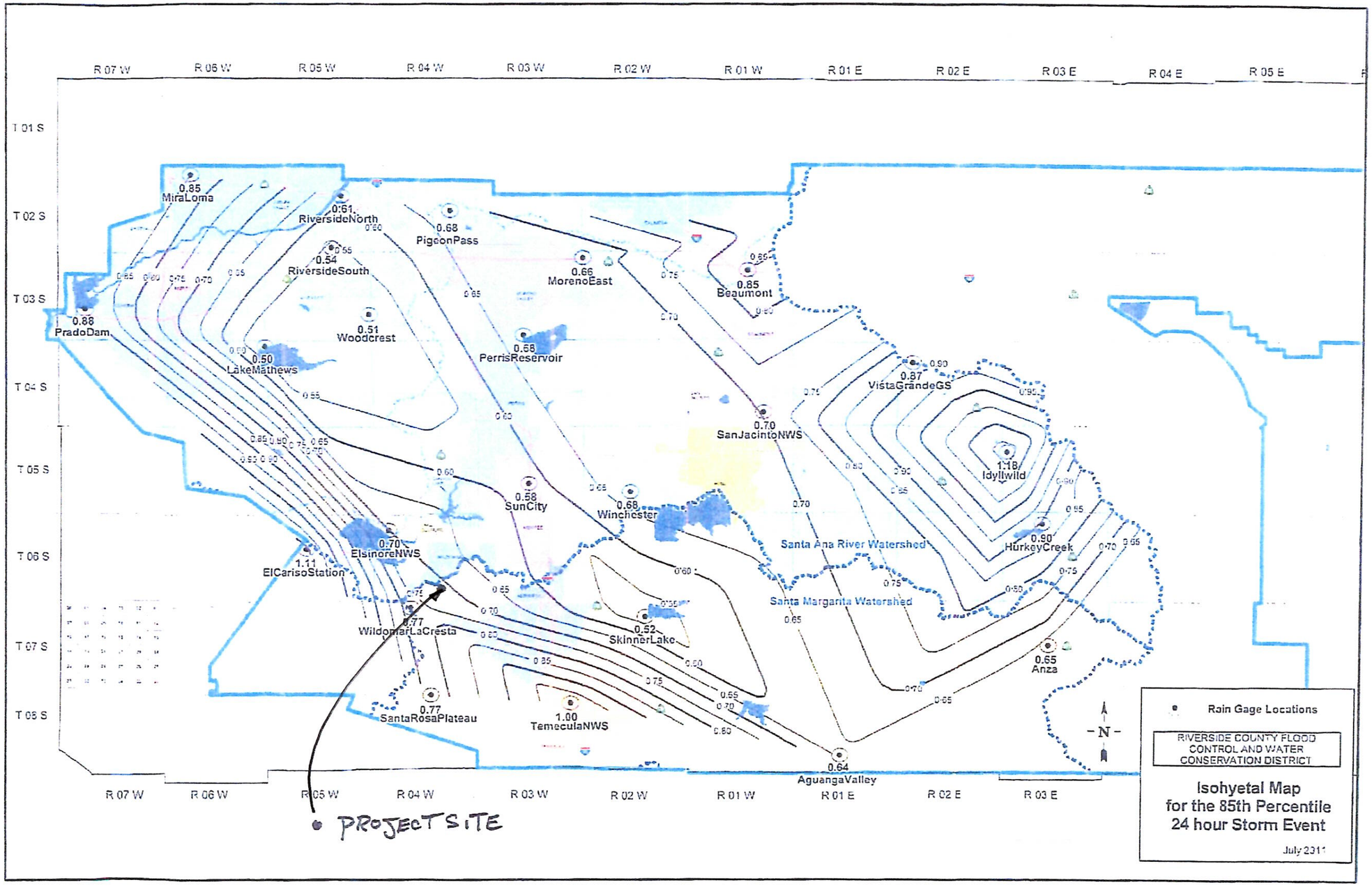
PLOT PLAN NO. 16-0006

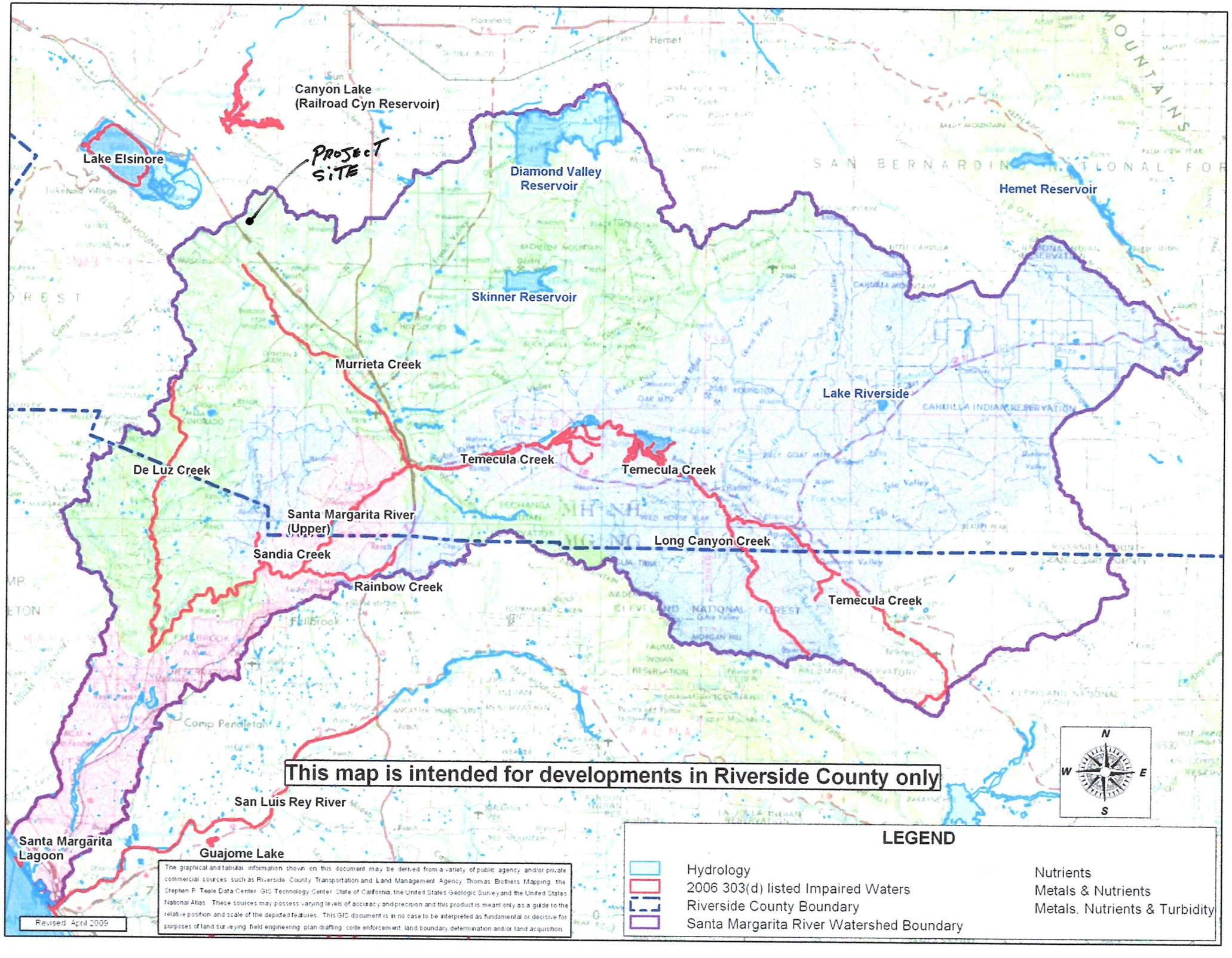
CITY OF WILDOMAR



VICINITY MAP

N.T.S.

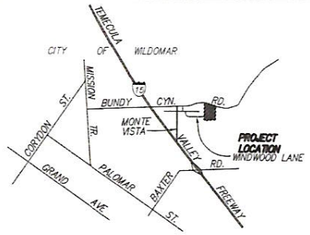

R 07 W
R 06 W
R 05 W
R 04 W
R 03 W
R 02 W
R 01 W
R 01 E
R 02 E
R 03 E
R 04 E
R 05 E
T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S
0.85 MiraLoma
0.61 RiversideNorth
0.68 PigeonPass
0.54 RiversideSouth
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.58 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.90 HurkeyCreek
1.11 ElCarisoStation
0.70 ElsinoreNWS
Santa Ana River Watershed
Santa Margarita Watershed
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley
N
PROJECT SITE
Rain Gage Locations
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
Isohyetal Map for the 85th Percentile 24 hour Storm Event
July 2011


Canyon Lake
(Railroad Cyn Reservoir)
Lake Elsinore
PROJECT SITE
Diamond Valley Reservoir
Hemet Reservoir
Skinner Reservoir
Murrieta Creek
Lake Riverside
Temecula Creek
Temecula Creek
De Luz Creek
Santa Margarita River (Upper)
Long Canyon Creek
Sandia Creek
Rainbow Creek
Temecula Creek
San Luis Rey River
Santa Margarita Lagoon
Guajome Lake
This map is intended for developments in Riverside County only
N
W
E
S
LEGEND
Hydrology
2006 303(d) listed Impaired Waters
Riverside County Boundary
Santa Margarita River Watershed Boundary
Nutrients
Metals & Nutrients
Metals, Nutrients & Turbidity
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.
Revised April 2009

WQMP -

PLOT PLAN NO. 16-0006

CITY OF WILDOMAR



VICINITY MAP

N.T.S.

OWNER:

BOB TAGHDIRI ET. AL.
3112 BOSTONIAN DRIVE
LOS ALAMITOS, CALIFORNIA
(310) 596-9125

APPLICANT:

DICK DARLING – HUFSDAR INVESTORS, LLC.
P.O. BOX 6579
WEST LAKE VILLAGE, CA 91359
(805) 241-5007

ENGINEER AND EXHIBIT PREPARER:

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA. 92596
PHONE: (951) 288-0601

ASSESSOR'S PARCEL NUMBER:

367-250-008 – 28.28 ACRES TOTAL PROJECT AREA

UTILITIES PURVEYORS:

	AGENCY SERVING THE AREA	FACILITIES PRESENT	LOCATION
ELECTRIC:	SOUTHERN CALIFORNIA EDISON	YES	BUNDY CANYON & WINDWOOD
GAS:	SOUTHERN CALIFORNIA GAS CO.	YES	BUNDY CANYON & WINDWOOD
TELEPHONE:	VERIZON	YES	BUNDY CANYON & WINDWOOD
CABLE TV:	TIME WARNER	YES	BUNDY CANYON & WINDWOOD
WATER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD
SEWER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD

SCHOOL DIST:LAKE ELSINORE UNIFIED SCHOOL DISTRICT

LEGAL DESCRIPTION:

BEING A PORTION OF SECTION 25, TOWNSHIP 6 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN.

EARTHWORK:

THIS PROJECT WILL BE A "BALANCED EARTHWORK" DESIGN OF 320,000 CY ± WITH NO EXPORT OR IMPORT OF GRADING MATERIAL.

ZONING:

EXISTING LAND USE: VACANT WITH NO EXISTING STRUCTURES
PROPOSED LAND USE: RESIDENTIAL
EXISTING ZONING: R-R
PROPOSED ZONING: R-3
GENERAL PLAN DESIGNATION: MEDIUM DENSITY RESIDENTIAL 2 TO 5 D.U. / ACRE:

GENERAL NOTES:

DEVELOPMENT WILL CONSIST OF 140 RENTAL DWELLING UNITS – 50 TOWNHOMES AND 90 APARTMENTS. THESE UNITS WILL BE PROCESSED AS A PLOT PLAN.
DRAINAGE: DEVELOPMENT OF SITE WILL PERPETUATE EXISTING DRAINAGE PATTERNS. DEVELOPMENT WILL DRAIN TO WATER QUALITY BASINS AND BUNDY CANYON WASH WILL BE BRIDGED AND NOT BE DISTURBED.
GRADING: GRADING WILL CONFORM TO THAT SHOWN ON THIS PLOT PLAN.
STREETS: ALL STREETS WITHIN THIS TRACT WILL BE CONSTRUCTED PER THE CITY OF WILDOMAR STANDARDS.
LIGHTING: ALL LIGHTING WILL CONFORM TO CHAPTER 8.64 LIGHT POLLUTION CODE.
PREPARED: AUGUST 2016.
PROJECT IS NOT LOCATED IN SPECIFIC PLAN, NOT IN SPECIAL STUDIES ZONE OR SUBJECT TO LIQUEFACTION OR OTHER GEOLOGICAL HAZARDS. NO WELLS EXIST ON PROPERTY.

OPEN SPACE MAINTENANCE

OPEN SPACE LOTS WILL BE MAINTAINED BY PROPERTY MANAGEMENT.

AERIAL TOPOGRAPHY

THE TOPOGRAPHY IS BASED ON FLOWN TOPOGRAPHIC MAPPING 2003 AND FIELD VERIFIED IN 2015.

FLOOD PLAIN DESIGNATION

THIS SITE IS IN FLOOD ZONE "X" – FEMA PANEL 06065C 2044G
THIS PROJECT IS IN THE SANTA MARGARITA WATERSHED DRAINAGE AREA.
THIS LAND IS NOT SUBJECT TO OVERFLOW AND INUNDATION OR FLOOD HAZARD.

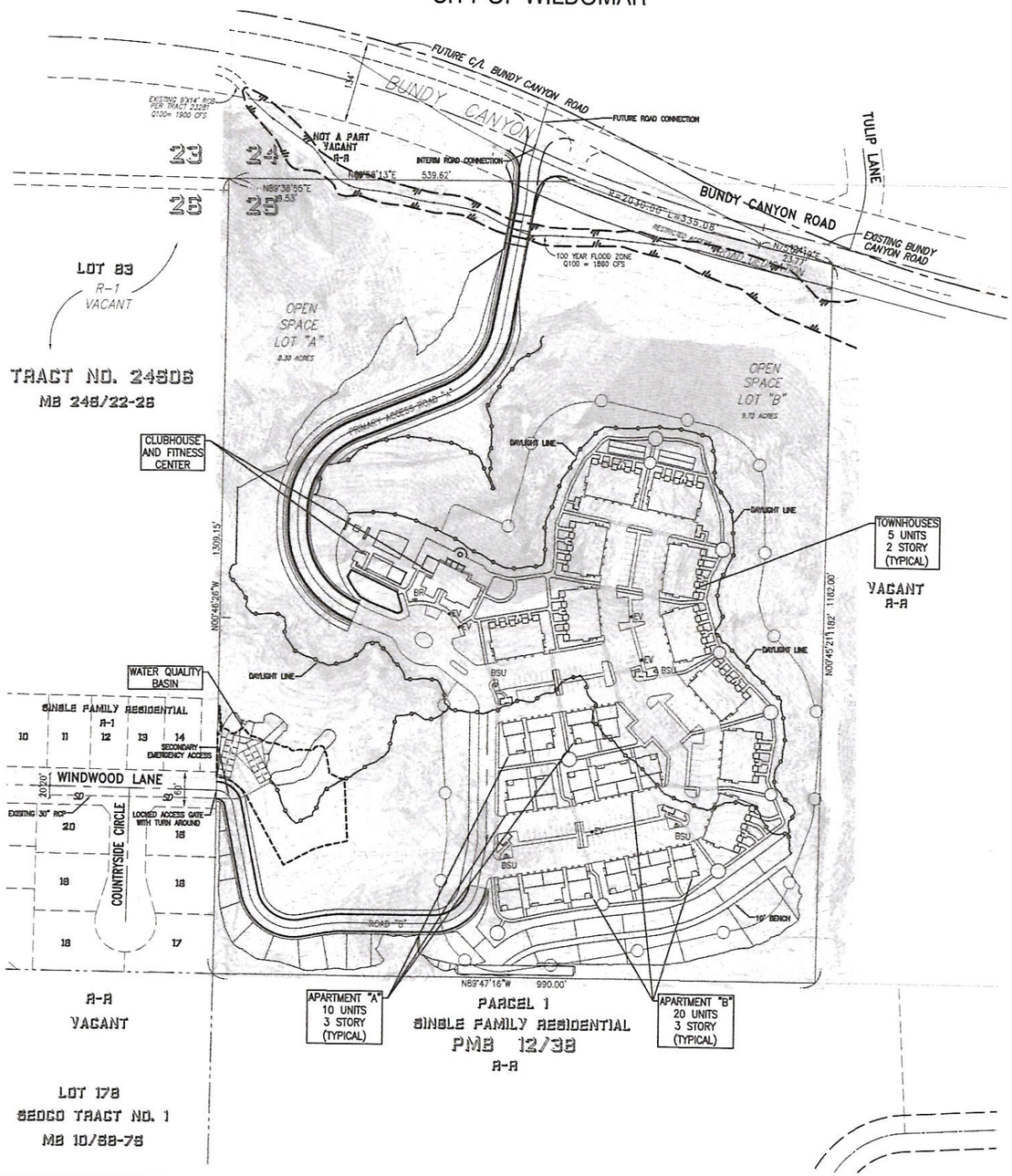
EXHIBIT "A"

LEGAL DESCRIPTION

The land referred to herein is situated in the State of California, County of Riverside, and described as follows:

All that portion of the Northwest Quarter of the Northwest quarter of section 25, Township 6 South, Range 4 West, San Bernardino Base and Meridian, and particularly described as follows:

Beginning at the Northwest corner of the Northwest quarter of the Northwest quarter of section 25; thence Southerly along the Westerly line of the Northwest quarter of the Northwest quarter, 1320 feet to the Southwest quarter thereof; thence East along the Southerly line thereof, 990 feet; thence Northerly and parallel to the Westerly line of section 25, to the centerline of Bundy Road; thence Northwesterly along the centerline of said road to its intersection with the Northerly line said section 25; thence Westerly along Northerly line of said section to the point of beginning; Excepting therefrom that portion thereof included in roads. APN: 367-250-008



PROJECT INFORMATION

OCCUPANCY	R3 (DWELLINGS)			
	U (GARAGES)			
TYPE OF CONSTRUCTION	VA			
INDIVIDUAL UNITS	57 ONE BEDROOM / 1 BATH (APARTMENTS)			
	33 TWO BEDROOM / 2 BATH (APARTMENTS)			
	35 TWO BEDROOM / 3 BATH (TOWNHOMES)			
	15 THREE BEDROOM / 3 BATH (TOWNHOMES)			
	140 TOTAL RENTABLE APARTMENTS			
BUILDING	LEVEL	UNITS	FOOTPRITN AREA (S.F.)	BUILDING AREA TOTAL (S.F.)
TEN TOWNHOMES	1 & 2	5	4,500	90,000
THREE APARTMENTS "A"	1, 2 & 3	10	3,530	31,770
THREE APARTMENTS "B"	1, 2 & 3	20	7,060	63,540
SUBTOTAL		140	76,770	185,310
TOTAL RESIDENTIAL				185,310
CLUBHOUSE AND FITNESS CENTER		2	5,140	5,140
TUCK UNDER GARAGES		127	INCLUDED	INCLUDED
GRAND TOTAL				190,450
BUILDING FOOTPRINT (ALL STRUCTURES TOWNHOMES, APARTMENTS AND CLUBHOUSE/FITNESS)				81,910

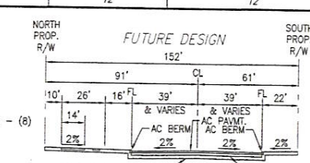
SITE TOTAL = 140 UNITS/28.3 ACRES = 5.0 D.U./ACRE

REQUIRED PARKING	1BR-1.25 SPACES/UNIT	2BR-2.25 SPACES/UNIT	3BR-2.75 SPACES/UNIT	TOTAL
PARKING SPACE REQUIRED	71.25	153	41.25	266
PARKING SPACES PROVIDED				288
ASSIGNED 140 UNITS @ 1:1BR, 2:2BR & 3:2.5BR	57	136	37.5	231
OPEN UNASSIGNED SPACES GUEST				22
ENCLOSED PARKING GARAGES				127
COVERED CARPORT PARKING STALLS				139

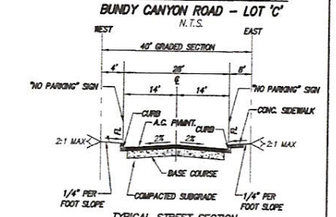
DEVELOPMENT STANDARD R-3 ZONE	REQUIRED	PROPOSED
BUILDING HEIGHT 50 FT. MAX.		37 FT. MAX.
FRONT SETBACK	14'	360'
SIDE SETBACK WEST	9'	236'
SIDE SETBACK EAST	9'	107'
REAR SETBACK	14'	108'
SEPARATION BETWEEN BUILDINGS	10'	15'
EV CHARGING STATIONS	8	8
BICYCLE RACK	4	5
BICYCLE STORAGE	12	12

LEGEND:

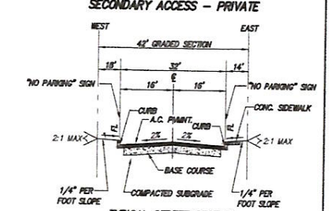
= 100 YEAR FLOOD PLAIN LIMITS
BSU = BIKE STORAGE UNITS – (4) 3 SPACES EACH
BR = BIKE RACK – (4)
EV = ELECTRIC VEHICLE CHARGING STATION – (8)
= 100' FIRE ZONE LIMITS



TYPICAL STREET SECTION
BUNDY CANYON ROAD – LOT 'C'
N.T.S.



TYPICAL STREET SECTION
ROAD "B"
SECONDARY ACCESS – PRIVATE



TYPICAL STREET SECTION
ROAD "A"
PRIMARY ACCESS – PRIVATE
N.T.S.

SCALE: 1"=100'
0 100 200 300

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after city acceptance or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for acceptance by the city.

MARK	BY	DATE	REVISIONS	APPR.	DATE
		8/17/16	REVISED SITE PLAN AND UNITS		
	ENGINEER			CITY	

CITY OF WILDOMAR
ACCEPTED BY:
Date:
Daniel A. York, Director of Public Works
City Engineer, PE 43212
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

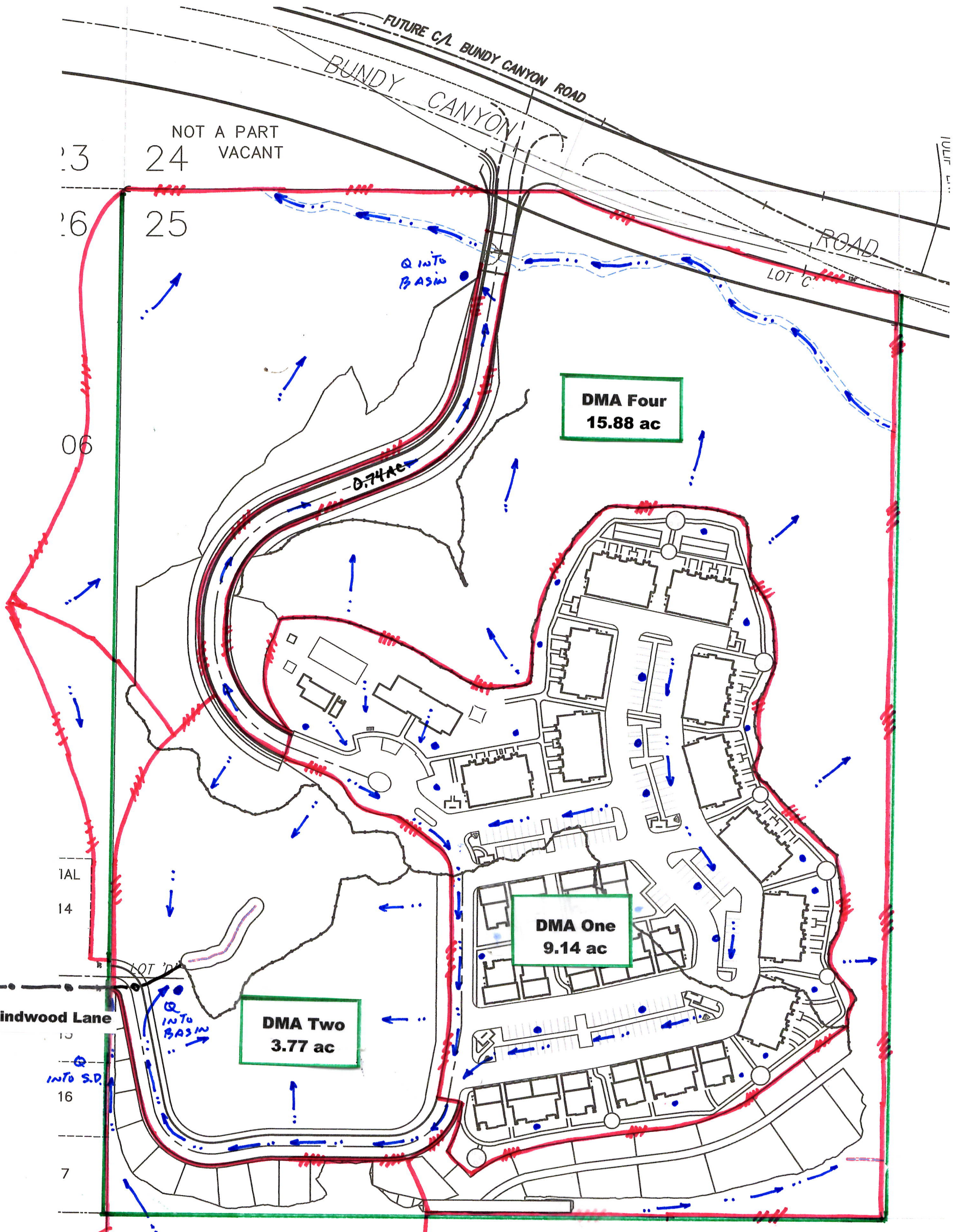
SEAL
REGISTERED PROFESSIONAL ENGINEER GRANT W. BECKLUND C 23737 Exp. 12/31/2017 CIVIL STATE OF CALIFORNIA

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA 92596
(951) 288-0601
PREPARED BY: GRANT W. BECKLUND
R.C.E. No. 23737 EXP. 12/31/2017

BENCHMARK:
Elevation =
Datum =
BENCHMARK #
THIS SURVEY WAS PERFORMED ON (date) BY (surveyor)
L.S. (number), EXP. (date)
SCALE:
H: As Noted V: As Noted

PLOT PLAN NO. 16-0006
CITY OF WILDOMAR
BUNDY CANYON RESORT APARTMENTS
DATE PREPARED AUGUST 2016

SHEET No. 1 OF 1 SHTS



BUNDY CANYON APARTMENTS

MAP C - WQMP Map

Date: 10/24/2016

Legend

Drainage Management Area/Size **DMA One - 9.14 acres**

Project Limits

Bio-Retention Swale

DMA Boundary

Flow Path

Off-site Storm Drain Pipe

On-site Storm Drain Pipe

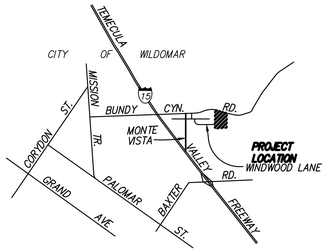
Natural Basin

N

0' 120'

PLOT PLAN NO. 16-0006

CITY OF WILDOMAR



VICINITY MAP

N.T.S.

OWNER:

BOB TAGHDIRI ET. AL.
3112 BOSTONIAN DRIVE
LOS ALAMITOS, CALIFORNIA
(310) 596-9125

APPLICANT:

DICK DARLING – HUFSDAR INVESTORS, LLC.
P.O. BOX 6579
WEST LAKE VILLAGE, CA 91359
(805) 241-5007

ENGINEER AND EXHIBIT PREPARER:

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA. 92596
PHONE: (951) 288-0601

ASSESSOR'S PARCEL NUMBER:

367-250-008 – 28.28 ACRES TOTAL PROJECT AREA

UTILITIES PURVEYORS:

	AGENCY SERVING THE AREA	FACILITIES PRESENT	LOCATION
ELECTRIC:	SOUTHERN CALIFORNIA EDISON	YES	BUNDY CANYON & WINDWOOD
GAS:	SOUTHERN CALIFORNIA GAS CO.	YES	BUNDY CANYON & WINDWOOD
TELEPHONE:	VERIZON	YES	BUNDY CANYON & WINDWOOD
CABLE TV:	TIME WARNER	YES	BUNDY CANYON & WINDWOOD
WATER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD
SEWER:	ELSINORE VALLEY MUNICIPAL WATER DISTRICT	YES	BUNDY CANYON & WINDWOOD

SCHOOL DIST:LAKE ELSINORE UNIFIED SCHOOL DISTRICT

LEGAL DESCRIPTION:

BEING A PORTION OF SECTION 25, TOWNSHIP 6 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN.

EARTHWORK:

THIS PROJECT WILL BE A "BALANCED EARTHWORK" DESIGN OF 320,000 CY ± WITH NO EXPORT OR IMPORT OF GRADING MATERIAL.

ZONING:

EXISTING LAND USE: VACANT WITH NO EXISTING STRUCTURES
PROPOSED LAND USE: RESIDENTIAL
EXISTING ZONING: R-R
PROPOSED ZONING: R-3
GENERAL PLAN DESIGNATION: MEDIUM DENSITY RESIDENTIAL 2 TO 5 D.U. / ACRE:

GENERAL NOTES:

DEVELOPMENT WILL CONSIST OF 140 RENTAL DWELLING UNITS – 50 TOWNHOMES AND 90 APARTMENTS. THESE UNITS WILL BE PROCESSED AS A PLOT PLAN.

DRAINAGE: DEVELOPMENT OF SITE WILL PERPETUATE EXISTING DRAINAGE PATTERNS. DEVELOPMENT WILL DRAIN TO WATER QUALITY BASINS AND BUNDY CANYON WASH WILL BE BRIDGED AND NOT BE DISTURBED.

GRADING: GRADING WILL CONFORM TO THAT SHOWN ON THIS PLOT PLAN.
STREETS: ALL STREETS WITHIN THIS TRACT WILL BE CONSTRUCTED PER THE CITY OF WILDOMAR STANDARDS.
LIGHTING: ALL LIGHTING WILL CONFORM TO CHAPTER 8.64 LIGHT POLLUTION CODE.
PREPARED: AUGUST 2016.

PROJECT IS NOT LOCATED IN SPECIFIC PLAN, NOT IN SPECIAL STUDIES ZONE OR SUBJECT TO LIQUEFACTION OR OTHER GEOLOGICAL HAZARDS. NO WELLS EXIST ON PROPERTY.

OPEN SPACE MAINTENANCE

OPEN SPACE LOTS WILL BE MAINTAINED BY PROPERTY MANAGEMENT.

AERIAL TOPOGRAPHY

THE TOPOGRAPHY IS BASED ON FLOWN TOPOGRAPHIC MAPPING 2003 AND FIELD VERIFIED IN 2015.

FLOOD PLAIN DESIGNATION

THIS SITE IS IN FLOOD ZONE "X" – FEMA PANEL 06065C 2044G
THIS PROJECT IS IN THE SANTA MARGARITA WATERSHED DRAINAGE AREA.
THIS LAND IS NOT SUBJECT TO OVERFLOW AND INUNDATION OR FLOOD HAZARD.

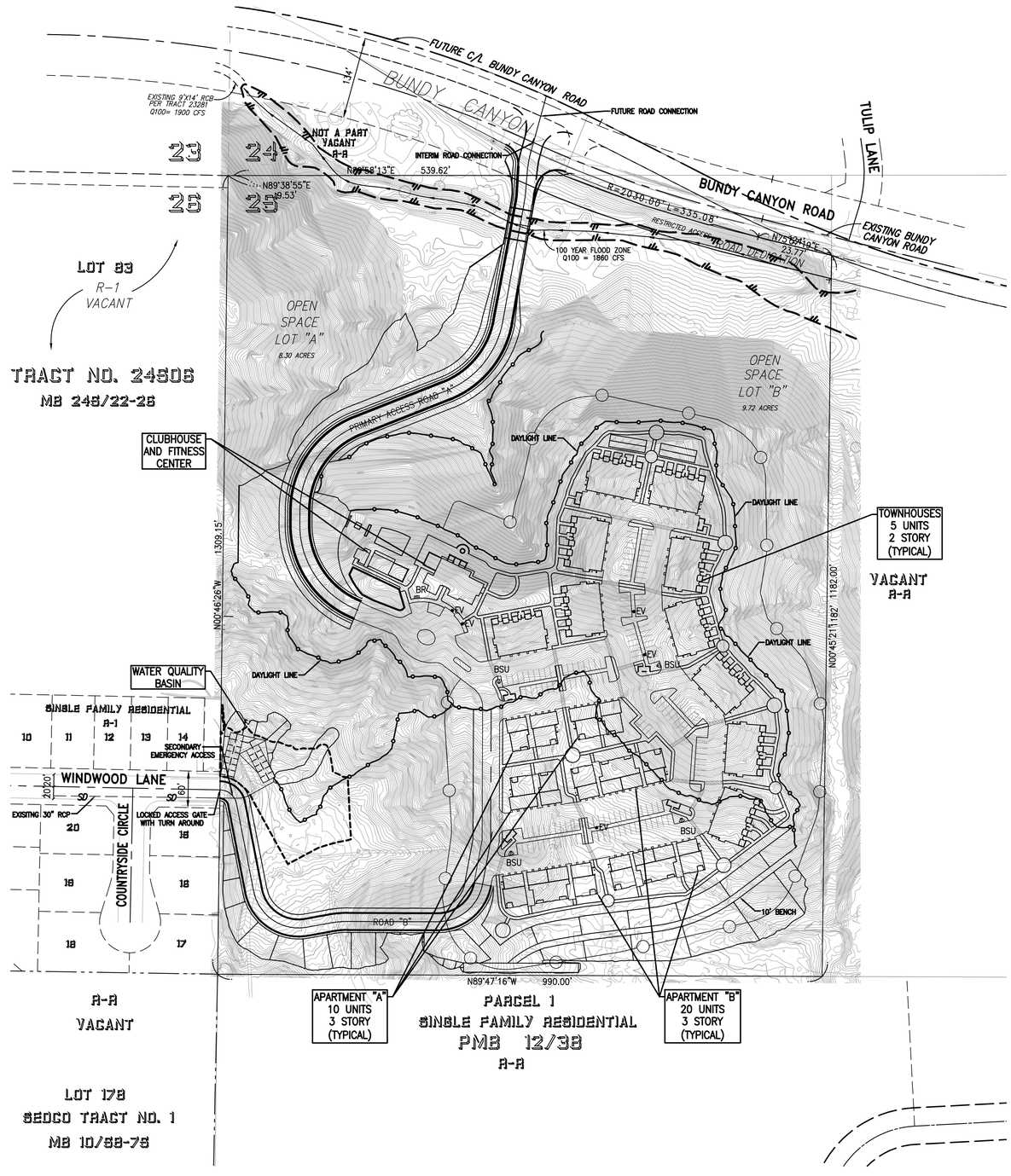
EXHIBIT "A"

LEGAL DESCRIPTION

The land referred to herein is situated in the State of California, County of Riverside, and described as follows:

All that portion of the Northwest Quarter of the Northwest quarter of section 25, Township 6 South, Range 4 West, San Bernardino Base and Meridian, and particularly described as follows:

Beginning at the Northwest corner of the Northwest quarter of the Northwest quarter of section 25; thence Southerly along the Westerly line of the Northwest quarter of the Northwest quarter, 1320 feet to the Southwest quarter thereof; thence East along the Southerly line thereof, 990 feet; thence Northerly and parallel to the Westerly line of section 25, to the centerline of Bundy Road; thence Northwesterly along the centerline of said road to its intersection with the Northerly line said section 25; thence Westerly along Northerly line of said section to the point of beginning; Excepting therefrom that portion thereof included in roads. APN: 367-250-008



PROJECT INFORMATION

OCCUPANCY	R3 (DWELLINGS)			
	U (GARAGES)			
TYPE OF CONSTRUCTION	VA			
INDIVIDUAL UNITS	57 ONE BEDROOM / 1 BATH (APARTMENTS)			
	33 TWO BEDROOM / 2 BATH (APARTMENTS)			
	35 TWO BEDROOM / 3 BATH (TOWNHOMES)			
	15 THREE BEDROOM / 3 BATH (TOWNHOMES)			
	140 TOTAL RENTABLE APARTMENTS			
BUILDING	LEVEL	UNITS	FOOTPRITN AREA (S.F.)	BUILDING AREA TOTAL (S.F.)
TEN TOWNHOMES	1 & 2	5	4,500	90,000
THREE APARTMENTS "A"	1, 2 & 3	10	3,530	31,770
THREE APARTMENTS "B"	1, 2 & 3	20	7,060	63,540
SUBTOTAL		140	76,770	185,310
TOTAL RESIDENTIAL				185,310
CLUBHOUSE AND FITNESS CENTER		2	5,140	5,140
TUCK UNDER GARAGES		127	INCLUDED	INCLUDED
GRAND TOTAL				190,450
BUILDING FOOTPRINT (ALL STRUCTURES TOWNHOMES, APARTMENTS AND CLUBHOUSE/FITNESS)				81,910

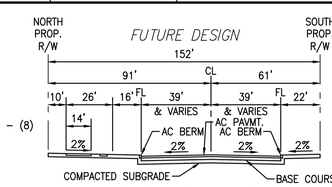
SITE TOTAL = 140 UNITS/28.3 ACRES = 5.0 D.U./ACRE

REQUIRED PARKING	1BR-1.25 SPACES/UNIT	2BR-2.25 SPACES/UNIT	3BR-2.75 SPACES/UNIT	TOTAL
PARKING SPACE REQUIRED	71.25	153	41.25	266
PARKING SPACES PROVIDED				288
ASSIGNED 140 UNITS @ 1:1BR, 2:2BR & 3:2.5BR	57	136	37.5	231
OPEN UNASSIGNED SPACES GUEST				22
ENCLOSED PARKING GARAGES				127
COVERED CARPORT PARKING STALLS				139

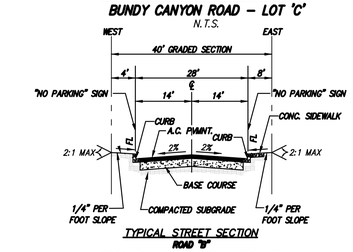
DEVELOPMENT STANDARD R-3 ZONE	REQUIRED	PROPOSED
BUILDING HEIGHT 50 FT. MAX.		37 FT. MAX.
FRONT SETBACK	14'	360'
SIDE SETBACK WEST	9'	236'
SIDE SETBACK EAST	9'	107'
REAR SETBACK	14'	108'
SEPARATION BETWEEN BUILDINGS	10'	15'
EV CHARGING STATIONS	8	8
BICYCLE RACK	4	5
BICYCLE STORAGE	12	12

LEGEND:

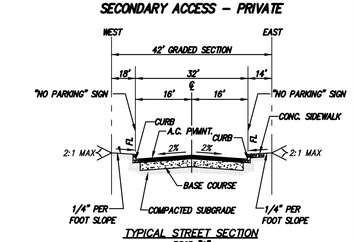
= 100 YEAR FLOOD PLAIN LIMITS
BSU = BIKE STORAGE UNITS – (4) 3 SPACES EACH
BR = BIKE RACK – (4)
EV = ELECTRIC VEHICLE CHARGING STATION – (8)
= 100' FIRE ZONE LIMITS



TYPICAL STREET SECTION
BUNDY CANYON ROAD – LOT 'C'
N.T.S.



TYPICAL STREET SECTION
ROAD "B"
SECONDARY ACCESS – PRIVATE



TYPICAL STREET SECTION
ROAD "A"
PRIMARY ACCESS – PRIVATE
N.T.S.

SCALE: 1"=100'
0 100 200 300

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after city acceptance or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for acceptance by the city.

MARK	BY	DATE	REVISIONS	APPR.	DATE
		8/17/16	REVISED SITE PLAN AND UNITS		
ENGINEER				CITY	

CITY OF WILDOMAR
ACCEPTED BY:
Date:
Daniel A. York, Director of Public Works
City Engineer, PE 43212
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL
REGISTERED PROFESSIONAL ENGINEER GRANT W. BECKLUND C 23737 Exp. 12/31/2017 CIVIL STATE OF CALIFORNIA

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA 92596
(951) 288-0601

PREPARED BY: GRANT W. BECKLUND
R.C.E. No. 23737 EXP. 12/31/2017

BENCHMARK:
Elevation = _____
Datum = _____
BENCHMARK # _____
THIS SURVEY WAS PERFORMED ON (date) BY (surveyor)
L.S. (number), EXP. (date)

SCALE:
H: As Noted V: As Noted

PLOT PLAN NO. 16-0006
CITY OF WILDOMAR
BUNDY CANYON RESORT APARTMENTS
DATE PREPARED AUGUST 2016

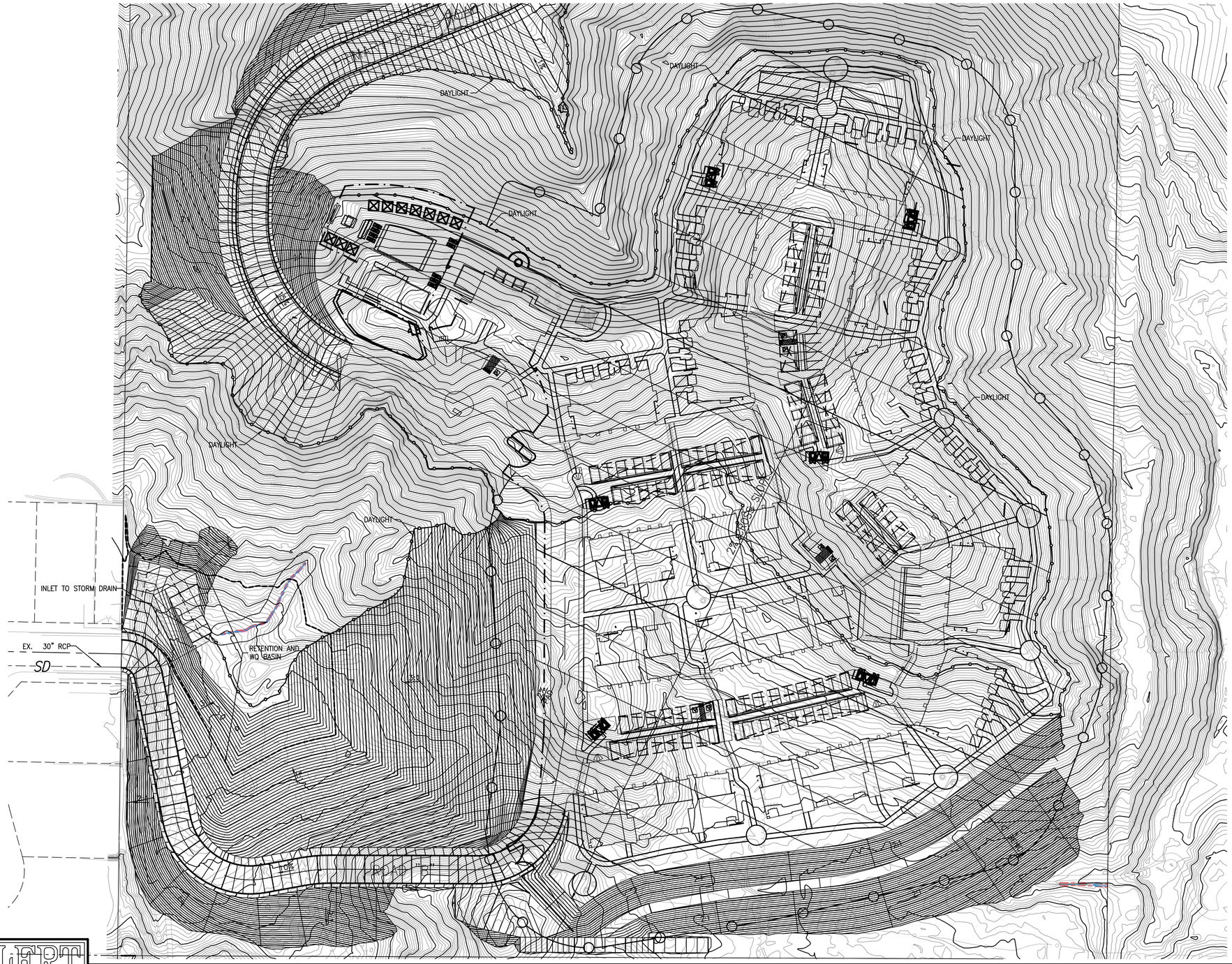
SHEET No. 1 OF 1 SHTS

Appendix 2: Construction Plans

Grading and Drainage Plans

PRELIMINARY GRADING PLAN NO 16-0006

CITY OF WILDOMAR



OWNER:

BOB TAGHDIRI ET. AL.
3112 BOSTONIAN DRIVE
LOS ALAMITOS, CALIFORNIA
(310) 596-9125

APPLICANT:

DICK DARLING – HUFSDAR INVESTORS, LLC.
P.O. BOX 6579
WEST LAKE VILLAGE, CA 91359
(805) 241-5007

ENGINEER AND EXHIBIT PREPARER:

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA. 92596
PHONE: (951) 288-0601

ASSESSOR'S PARCEL NUMBER:

367-250-008 – 28.28 ACRES TOTAL PROJECT AREA

LEGAL DESCRIPTION:

BEING A PORTION OF SECTION 25, TOWNSHIP 6 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN.

GENERAL NOTES:

DEVELOPMENT WILL CONSIST OF 140 RENTAL DWELLING UNITS – 50 TOWNHOMES AND 90 APARTMENTS. THESE UNITS WILL BE PROCESSED AS A PLOT PLAN.

DRAINAGE: DEVELOPMENT OF SITE WILL PERPETUATE EXISTING DRAINAGE PATTERNS. DEVELOPMENT WILL DRAIN TO WATER QUALITY BASINS AND BUNDY CANYON WASH WILL BE BRIDGED AND NOT BE DISTURBED.
GRADING: GRADING WILL CONFORM TO THAT SHOWN ON THIS PLOT PLAN.
STREETS: ALL STREETS WITHIN THIS TRACT WILL BE CONSTRUCTED PER THE CITY OF WILDOMAR STANDARDS.
LIGHTING: ALL LIGHTING WILL CONFORM TO CHAPTER 8.64 LIGHT POLLUTION CODE.
PREPARED: DECEMBER 2015.

PROJECT IS NOT LOCATED IN SPECIFIC PLAN, NOT IN SPECIAL STUDIES ZONE OR SUBJECT TO LIQUEFACTION OR OTHER GEOLOGICAL HAZARDS.
NO WELLS EXIST ON PROPERTY.

OPEN SPACE MAINTENANCE

OPEN SPACE LOTS WILL BE MAINTAINED BY PROPERTY MANAGEMENT.

AERIAL TOPOGRAPHY

THE TOPOGRAPHY IS BASED ON FLOWN TOPOGRAPHIC MAPPING 2003 AND FIELD VERIFIED IN 2015.

FLOOD PLAIN DESIGNATION

THIS SITE IS IN FLOOD ZONE "X" – FEMA PANEL 06065C 2044G
THIS PROJECT IS IN THE SANTA MARGARITA WATERSHED DRAINAGE AREA.
THIS LAND IS NOT SUBJECT TO OVERFLOW AND INUNDATION OR FLOOD HAZARD.

LEGEND

- STORM DRAIN LINE
- INLET
- PROPOSED ASPHALT PAVING
- PROPOSED SLOPES
- 100 FT. FIRE MAINTENANCE ZONE
- LIMITS OF RETENTION BASIN

QUANTITY ESTIMATE

TOTAL CUT: 320,000 C.Y. FILL: 320,000 C.Y.

THIS PROJECT WILL BE A "BALANCED EARTHWORK" DESIGN WITH NO EXPORT OR IMPORT OF GRADING MATERIAL.

ENTIRE PAD IS SLOPED AT 2% TO THE SOUTHWEST AND WILL DRAIN TO A RETENTION BASIN.

SCALE: 1"=50'
0 50 100 150

DIGALERT
DIAL BEFORE YOU DIG
TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after city acceptance or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for acceptance by the city.

MARK	BY	DATE	REVISIONS	APPR.	DATE
		8/8/16	REVISED SITE PLAN AND UNITS		
ENGINEER				CITY	

CITY OF WILDOMAR
ACCEPTED BY:
Date:
Daniel A. York, Director of Public Works
City Engineer, PE 43212
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL
REGISTERED PROFESSIONAL ENGINEER GRANT W. BECKLUND C 23737 Exp. 12/31/2017 CIVIL STATE OF CALIFORNIA

GRANT BECKLUND CIVIL ENGINEERING
30811 GARBANI ROAD
WINCHESTER, CA 92596
(951) 288-0601

PREPARED BY: GRANT W. BECKLUND
R.C.E. No. 23737 EXP. 12/31/2017

BENCHMARK:
Elevation = _____
Datum = _____
BENCHMARK # _____
THIS SURVEY WAS PERFORMED ON (date) BY (surveyor) L.S. (number), EXP. (date)

SCALE:
H: As Noted V: As Noted

PLOT PLAN NO. 16-0006
CITY OF WILDOMAR
BUNDY CANYON RESORT APARTMENTS
PRELIMIMARY GRADING PLAN

SHEET No. 1
OF 1 SHTS

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

UPDATE GEOTECHNICAL IN ESTIGATION

MULTI FAMILY DE ELOPMENT
BUNDY CANYON ROAD
NEAR TULIP LANE
APN
WILDOMAR CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

DARLING DE ELOPMENT GROUP
WESTLA E ILLAGE CALIFORNIA

FEBRUARY
PRO ECT NO T

GEOCON
WEST, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. T2145-22-02
February 25, 2016

Darling Development Group
PO Box 6579
Westlake Village, California 91359

Attention: Mr. Dick Darling

Subject: UPDATE GEOTECHNICAL INVESTIGATION
MULTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD AT TULIP LANE
APN 367-250-008
WILDOMAR, CALIFORNIA

Dear Mr. Darling:

In accordance with the request of Mr. Grant Becklund and your authorization of Proposal IE-1520 dated October 15, 2015, Geocon West, Inc. (Geocon) herein submits the results of our update geotechnical investigation and infiltration testing for the proposed multi-family development located at Bundy Canyon Road near Tulip Lane, in the city of Wildomar, California. The accompanying report presents our findings, conclusions and recommendations pertaining to the geotechnical aspects of the proposed development. Based on the results of this study, it is our opinion the site is considered suitable for the proposed development provided the recommendations of this report are followed.

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON WEST, INC.

PROFESSIONAL GEOLOGIST
PAUL D. THERIAULT
No. 2374
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Paul D. Theriault
CEG 2374

REGISTERED PROFESSIONAL ENGINEER
CHET E. ROBINSON
No. 2890
GEOTECHNICAL
STATE OF CALIFORNIA

Chet E. Robinson
GE 2890

PDT:CER:LAB:hd

(email) Addressee

TABLE OF CONTENTS

1. PURPOSE AND SCOPE 1

2. SITE AND PROJECT DESCRIPTION 1

3. GEOLOGIC SETTING 2

4. GEOLOGIC MATERIALS 3
   - 4.1 General 3
   - 4.2 Previously Placed Artificial Fill - (Qpf) 3
   - 4.3 Topsoil - (No Map Symbol) 3
   - 4.4 Alluvium - (Qal) 3
   - 4.5 Granitic Bedrock (Granodiorite) - (Kpvg) 4

5. GEOLOGIC STRUCTURE 4

6. GROUNDWATER 4

7. GEOLOGIC HAZARDS 4
   - 7.1 Faulting 4
   - 7.2 Seismic Design Criteria 5
   - 7.3 Liquefaction 6
   - 7.4 Expansive Soil 6
   - 7.5 Collapsible Soils 6
   - 7.6 Landslides 7
   - 7.7 Rock Fall Hazards 7
   - 7.8 Slope Stability 7
   - 7.9 Tsunamis and Seiches 7

8.0 SITE INFILTRATION 8

9. CONCLUSIONS AND RECOMMENDATIONS 9
   - 9.1 General 9
   - 9.2 Soil Characteristics 10
   - 9.3 Grading 12
   - 9.4 Graded Slopes 14
   - 9.5 Earthwork Grading Factors 15
   - 9.6 Settlement of Proposed Fill 16
   - 9.7 Foundation and Concrete Slabs-On-Grade Recommendations 16
   - 9.8 Exterior Concrete Flatwork 22
   - 9.9 Conventional Retaining Walls 23
   - 9.10 Lateral Loading 24
   - 9.11 Swimming Pool/Spa 24
   - 9.12 Preliminary Pavement Recommendations 25
   - 9.13 Site Drainage and Moisture Protection 28
   - 9.14 Plan Review 29

TABLE OF CONTENTS (Continued)

LIMITATIONS AND UNIFORMITY OF CONDITIONS

LIST OF REFERENCES

MAPS AND ILLUSTRATIONS
- Figure 1, Vicinity Map
- Figure 2, Geotechnical Map
- Figures 3 through 8, Slope Stability Analysis
- Figure 9, Wall/Column Footing Detail
- Figure 10, Wall Drainage Detail

APPENDIX A
- EXPLORATORY EXCAVATIONS
- Figures A-1 through A-10, Logs of Geotechnical Borings
- Figures A-11 and A-12, Percolation Test Data

APPENDIX B
- LABORATORY TESTING
- Figure B1, Summary of Laboratory Test Results
- Figure B2, Direct Shear Test Results
- Figure B3, Grain size Distribution Test Results

APPENDIC C
- PREVIOUS INVESTIGATION
- Figures C-1 through C-11, Logs of Air Track Borings, Geocon, 2003
- Figures C-12 through C-15, Logs of Test Pits, Geocon, 2003
- Figure C-16 and C-17, Previous Laboratory Test Results, Geocon, 2003

APPENDIX D
- RECOMMENDED GRADING SPECIFICATIONS

UPDATE GEOTECHNICAL IN ESTIGATION

PURPOSE AND SCOPE

This report presents the results of our update geotechnical investigation and infiltration testing for the proposed multi-family development located south of Bundy Canyon Road, near Tulip Lane, in the city of Wildomar, California as depicted on the *Vicinity Map*, Figure 1. The purpose of the investigation is to evaluate subsurface soil and geologic conditions at the site and, based on the conditions encountered; provide recommendations pertaining to the geotechnical aspects of developing the property to accommodate the proposed multi-family residential housing development. We utilized the referenced *Preliminary Grading Plan*, prepared by Grant Becklund Civil Engineering as the base map for our *Geotechnical Map*, Figure 2.

The scope of our investigation included review of aerial photographs and available geotechnical reports in the vicinity of the site, geologic mapping, subsurface exploration, infiltration testing, laboratory testing, engineering analyses, and the preparation of this report. A summary of the information reviewed for this study is presented in the *List of References.*

Our field investigation for the site included the excavation of eight test pits and two infiltration tests. *Appendix A* presents a discussion of the field investigation, logs of the excavations, and infiltration test data. The approximate locations of the exploratory excavations are presented on the *Geotechnical Map* (Figure 2). We performed laboratory tests on soil samples obtained from the exploratory excavations to evaluate pertinent physical and chemical properties for engineering analysis. The results of the laboratory testing are presented in *Appendix B.* Logs of air track borings, test pits, and laboratory testing from previous investigations are provided in *Appendix C*. The approximate locations of previous exploratory excavations are shown on Figure 2.

We referred to the *Plot Plan* and *Preliminary Grading Plan* prepared by Grant Becklund Engineering for site development plan and preliminary grading information. References to elevations presented in this report are based on the referenced topographic information. Geocon does not practice in the field of land surveying and is not responsible for the accuracy of such topographic information.

SITE AND PRO ECT DESCRIPTION

Site development is proposed to consist of 140 dwelling units in six buildings that will be two to three stories in height. Additional construction will include a single story recreation building pool area, basketball court, picnic area, and associated infrastructure improvements. The site is approximately 28.3 acres and is located south of Bundy Canyon Road, near Tulip Lane, and east of the eastern terminus of Windwood Lane, in the city of Wildomar.

Topography within the site is comprised of granitic bedrock peaks along an arcuate ridgeline in the center of the site with a northwest trending ridgeline in the southeast corner of the site and a lesser peak near the southwest corner of the site. Alluvium-filled valleys are present along the southeastern and southwestern portion of the site. An oak lined ephemeral stream drains to west along the northern border of the site. Vegetation on the remainder of the property consists predominately of moderate to thick brush. A few trails and remnant dirt roads from a previous investigation were observed during our exploration. Drainage in the northern half of the site is to the north into the west flowing ephemeral stream. Drainage on the southern half is predominately to the west to an existing drainage culvert associated with an adjacent neighborhood. A small amount of drainage in the southeastern portion of the site is to the east towards a low lying area on the adjacent property. Site elevations range from a low of approximately 1,450 feet above mean sea level (MSL) in the in the stream bed in the northwest portion of the site to a high of approximately 1,685 feet MSL in the east central portion of the site.

The site will be graded to create level building pads to accommodate the development. Maximum cuts of approximately 95 feet are planned near proposed Building 2. Maximum fills of approximately 75 feet are planned in the southwest corner of the site. Preliminary evaluation has determined that the site will be balanced, with approximately 430,000 cubic yards each of cut and fill

We anticipate the residential buildings will be of typical wood or light metal frame construction and will be founded on conventional shallow foundations with concrete slabs-on-grade or post-tensioned foundation systems. Infiltration basins/structures are preliminarily proposed in the southwest corner of the site. Primary access to the site will be gained off of Bundy Canyon Road, with a secondary access off of the existing Windwood Lane.

GEOLOGIC SETTING

The site is located within the Perris Block of the Peninsular Ranges Geomorphic Province. The Perris Block is characterized by granitic highlands which display multiple elevated erosional surfaces surrounded by alluviated valleys. The Peninsular Ranges are bound by the Transverse Ranges (San Gabrielle and San Bernardino Mountains) to the north, the Colorado Desert Geomorphic Province to the east. The Province extends westward into the Pacific Ocean and southward to the tip of Baja California. Overall the Province is characterized by Cretaceous-age granitic rock and a lesser amount of Mesozoic-age metamorphic rock overlain buy terrestrial and marine sediments. Faulting within the province is typically northwest trending and includes the San Andreas, San Jacinto, Elsinore, and Newport-Inglewood faults. Locally, the site is just east of the southern portion of Elsinore Valley, east of the Glenn Ivy segment of the Elsinore fault zone. Cretaceous-age granitic rocks associated with the Paloma Valley Ring Complex compose the majority of the site, with lesser amounts alluvium on the fringes.

GEOLOGIC MATERIALS

General

Site geologic materials encountered consist of previously placed artificial fill, alluvium, and granitic bedrock. Previously placed artificial fill was encountered along the western edge of the site, associated with the neighboring housing tract. Alluvium is present within the ephemeral stream along the north of the site, and in the southwest and southeast portions of the site. Cretaceous-age granitic bedrock (granodiorite) makes up the remainder of the site and underlies the site at depth. The lateral extent of the materials encountered is shown on the *Geotechnical Map* (Figure 2). The descriptions of the soil and geologic conditions are shown on the excavation logs located in *Appendix A* and described herein in order of increasing age.

Pre iously Placed Artificial Fill (pf)

Although not encountered in the explorations, previously placed artificial fill was observed along the western portion of the site, in association with the grading of the neighboring housing tract. The fill appears to be locally derived silty sand which was appeared to be dry to slightly moist and medium dense to dense. Geocon has not been provided documentation pertaining to the quality of the fill. Therefore, this fill should be evaluated during grading operations and, if necessary replaced with documented fill in conformance with the recommendations herein.

Topsoil (No Map Sym ol)

Topsoil was encountered in test pits GT-1 through Gt-3, and GT-8 to depths of one to three feet overlying alluvium and granitic bedrock. Topsoil consisted of silty, fine to coarse sand that was loose, slightly moist, brown, and contained some gravel. Due to loose consistency of the topsoil, complete removal and replacement with compacted fill is recommended.

Allu ium (al)

Alluvium was encountered within test pits GT-2 through GT-8 during this investigation within the southwest and southeast drainages. We encountered alluvium deeper than 15 feet, beyond the reach of our excavation equipment. The alluvium was encountered to depths of 10 ½ feet within the southeastern drainage. The alluvium along the stream to the north was not evaluated during this investigation. However a previous investigation indicated depths of five to 15 feet on the parcel immediately to the east. Similar depths can be anticipated on this site. Alluvium, as encountered, consisted of silty sand with varying amounts of gravel which was loose to medium dense. Although some of the alluvium is medium dense, we anticipate the consistency, density, and moisture content to be variable and are therefore, recommending complete removal of the alluvial soils and replacement with compacted fill.

Granitic Bedroc (Granodiorite) (p)

Cretaceous-age granitic bedrock consisting predominately of granodiorite with lesser amounts of monzogranite dominates the site and underlies the alluvium. As observed and based on our previous investigation at the site, the granitic bedrock is generally moderately weathered, dense, and rippable to marginally rippable. The upper approximately five feet of the granitic rock is highly weathered and excavates as silty fine to coarse sand. Some zones of non-rippable rock were observed in the air track borings and should be expected to be encountered during grading (see *Appendix C*). Even though the granitic rock is moderately fractured, oversize material (greater than 12 inches) should be expected to be generated during grading. Oversize material that is generated during grading should be placed in fills deeper than 10 feet below finish grade, and at least one foot below deepest utilities if placed within a utility corridor. The granitic rock is suitable to support fill or proposed structures.

GEOLOGIC STRUCTURE

The geologic structure consists of generally moderately weathered and jointed granitic bedrock overlain by surficial soils.

GROUNDWATER

Groundwater was not encountered during our investigation and is not anticipated to be encountered during grading. However, dependent upon the grading schedule and regional weather conditions, perched water may be encountered within the alluvium near the bedrock contact, and in fractures within the granitic bedrock after a rain event. If water is encountered during construction, it is our opinion that the use of sump pumps, diversion and/or damming techniques could be used to manage nuisance water encountered.

GEOLOGIC HA ARDS

Faultin

The site, like the rest of southern California, is located within a seismically active region near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems are estimated to produce up to approximately 55 millimeters of slip per year between the plates (Harden, 1998).

The site is not located within a State of California "Alquist-Priolo Earthquake Fault Zone" for fault rupture hazard (CGS 2015), nor is the site located within a Riverside County Fault Zone (Riverside GIS, 2016). There are several major late Quaternary active/potentially active faults that are within a 100-kilometer radius of the site (Blake, 2000). The nearest known active fault to the site is the Glen Ivy section of Elsinore fault zone located approximately 2,300 feet west of the project site. The Elsinore

fault zone is a right-lateral fault, with multiple *en echelon* faults which create tensional basins like that of Lake Elsinore. The Elsinore fault zone is capable of producing an earthquake with an estimated maximum moment magnitude of M_W 7.5, and has an associated slip-rate of 1.0 mm/year (CDMG, 1996).

Seismic Desi n Criteria

We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.2.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class D. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.2.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE
CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	2.265g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.907g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.0	Table 1613.3.3(1)
Site Coefficient, F_V	1.5	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	2.265g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	1.361g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.510g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.907g	Section 1613.3.4 (Eqn 16-40)

Table 7.2.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE
CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.894	Figure 22-7
Site Coefficient, F_{PGA}	1.0	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.894g	Section 11.8.3 (Eqn 11.8-1)

Conformance to the criteria in Tables 7.2.1 and 7.2.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

Li uefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless/silt or clay with low plasticity, static groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not. Based on the dense to very dense nature of the granitic bedrock, the dense nature of proposed fill placed at the site, and the lack of groundwater at the site, liquefaction and seismically induced settlement of soil is not a design consideration.

E pansi e Soil

The geologic units generally consisted of silty sands to gravelly sands which are expected to have a low expansion potential. Previous laboratory testing results (*Appendix C*) indicate a sample of the fine-grained soil units exhibit an expansion index of 25 which would classify as “low” in accordance with ASTM International (ASTM) D4829. If medium to highly expansive soils are encountered during grading, they should be kept at least four feet below proposed structural, flatwork, or paving improvements.

Collapsi le Soils

Alluvial soils may exhibit some degree of collapse potential when loaded to the anticipated post-grading pressures. Remedial grading (removal of alluvium) should be performed to mitigate the effects of the collapsible soils.

Landslides

The property is in an area of moderate relief with intervening alluviated valleys. No landslides were mapped on the references reviewed nor were landslides observed during our field investigation. Due to the nature of the material (granitic bedrock) that makes up the slopes, and the proposed grading, the likelihood of landsliding at the site is not a design consideration. We did not observe other evidence of slope stability issues on or directed toward the site during our aerial photograph review or our field investigation.

Roc Fall Ha ards

The hills on and adjacent to the site consist of granitic bedrock. A few boulders were observed during our field work. However, the proposed grading will mitigate any potential for rockfall affecting the site. The natural slopes below the project area are relatively free of boulders, covered with brush, and topsoil which will mitigate rock hall hazard. Therefore, rock fall issues are not a design consideration for this project.

Slope Sta ility

We anticipate proposed grading at the project site will include fill slopes with maximum heights of approximately 75 feet , with maximum inclinations of 2:1 (h:v), and horizontal benches or roadways at about mid-height within the slopes. Minor cut slopes into the granitic bedrock with maximum heights of approximately 15 feet and maximum inclinations of 2:1 (h:v) are anticipated in cut areas of the site. In general, it is our opinion that cut slopes in the granitic bedrock and fill slopes constructed with on-site soils as described above will possess Factors of Safety of 1.5 or greater under static conditions and 1.1 or greater under seismic conditions. Slope stability analyses are presented on Figures 3 through 8. Additional slope stability analyses should be performed as needed during further development of the grading plans. Cut slopes should be geologically mapped during grading. Fill keys should be constructed in accordance with the standard grading specifications in *Appendix D*. Grading of cut and fill slopes should be designed in accordance with the requirements of the local building codes of the City of Wildomar and the 2013 California Building Code (CBC).

Tsunamis and Seic es

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first order driving force for locally generated tsunamis offshore southern California is expected to be tectonic deformation from large earthquakes (Legg, *et al.*, 2002). The site is located 24 miles from the nearest coastline; therefore, the negligible risk associated with tsunamis is not a design consideration.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. Canyon Lake is approximately 3½ miles north of the site and Lake Elsinore is approximately 4½ miles northwest of the site. Both lakes are at lower elevations (100 and 300 feet lower) than the project site. Therefore, seiches are not a design consideration for the site.

SITE INFILTRATION

Percolation testing was performed in accordance with Table 1 Infiltration Basin Option 2 of Appendix A of Riverside County – Low Impact Development BMP Design Handbook (Handbook). The percolation tests were run in accordance with Section 2.3 Deep Percolation Test Method. This method requires two percolation tests and one deep (extending 10 feet below percolation test elevation) excavation per basin.

The test pit and percolation test locations are depicted on the *Geotechnical Map,* Figure 2. Test pit logs and percolation test data are presented in *Appendix A.* Descriptions of the testing procedures, and test results are provided below.

A storm water infiltration structure is planned for the southwest corner of the site at approximately 1 foot below existing grade. Geocon hand excavated two percolation test holes (P-1 and P-2) to depths of 1 foot below grade. Soils encountered within the excavations consisted of predominately medium dense silty sand. No groundwater was observed within the excavations. A 12-inch diameter hole was hand excavated and lined with a perforated 5-gallon bucket. Approximately two inches of gravel was placed at the bottom of the hole. The test locations were pre-saturated with five gallons of water. The percolation testing began approximately 24 hours after the holes were pre-saturated. Percolation data sheets are presented in *Appendix A* of this report. Calculations to convert the percolation test rate to infiltration test rate in accordance with Section 2.3 of the Handbook are presented in Table 8.0. Please note that the Handbook requires a factor of safety of 3 be applied to the values below based on the test method used.

TABLE
INFILTRATION TEST RATES

	P-1	P-2
Soil Type	Normal	Normal
Change in head over time:ΔH	0.5 in	0.7 in
Time Interval (minutes): Δt	30 min	30 min
Radius of test hole: r	6 in	6 in
Average head over time interval: Havg	10.2 in	10.1 in
Tested Infiltration Rate: It	0.2 in/hr	0.3 in/hr

CONCLUSIONS AND RECOMMENDATIONS

General

9.1.1 It is our opinion that soil or geologic conditions were not encountered during the investigation that would preclude the proposed development of the project provided the recommendations presented herein are followed and implemented during construction.

9.1.2 Potential geologic hazards at the site include seismic shaking, highly erodible soils, and compressible near surface soils.

9.1.3 Based on our review of aerial photographs and readily available geotechnical reports, we do not believe that faulting is present on the site.

9.1.4 Previously placed fill associated with the neighboring development along the southwest boundary should be evaluated during to grading for its suitability to support new documented fill.

9.1.5 The topsoil, alluvium, and highly weathered granitic bedrock are considered unsuitable for the support of compacted fill or settlement-sensitive improvements based on the potential compressibility of the units. Remedial grading of the surficial soil will be required as discussed herein. Over excavation of cut fill transition building pads will be required, or alternatively in cut fill transition building pads, deepened foundations may be used to support the structures entirely in the granitic bedrock. New documented fill is considered suitable to support additional fill and the proposed structures and improvements.

9.1.6 We did not encounter groundwater during our investigation. Seepage and perched groundwater conditions may be encountered during the grading operations, particularly during the rainy seasons.

9.1.7 Subdrains will be required in areas where fill is placed over bedrock such as keyways or in canyons. *Appendix D* provides general subdrain recommendations. If fill has to be placed below a canyon subdrain in order to achieve proper flow, that fill should be compacted to 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. The approximate locations of anticipated subdrains are shown on Figure 2. The actual location of subdrains should be determined by Geocon during grading.

9.1.8 In general, slopes should possess calculated factors of safety of at least 1.5 in static conditions and 1.1 in seismic conditions with slopes inclined as steep as 2:1 (h:v), maximum heights of 75 feet, and horizontal benches or roadways as shown on the referenced *Preliminary Grading Plan*. Slopes should be reevaluated once final grading plans have been prepared for the site.

9.1.9 If cut slopes expose adverse geologic conditions, stabilization fills will likely be required.

9.1.10 Proper drainage should be maintained in order to preserve the engineering properties of the fill in the sheet-graded pads and slope areas and reduce the potential for erosion of the granular soils. Recommendations for site drainage are provided herein.

9.1.11 The majority of the granitic rock should be considered rippable based on previous air track borings (see *Appendix C*). However, non-rippable zones and corestones (hard intact boulders) should be expected to be encountered. We understand that quarry operations north of the site by Buck Kemmis encountered excavatable bedrock with isolated core stones and blasting was not required at the quarry. Blasting or other excavation techniques may be required in these areas.

9.1.12 Oversize material generated should be able to be used as fill provided the recommendations provided in *Section 9.3* and *Appendix D* are followed.

9.1.13 Fill placed in deep fill areas (greater than 50 feet in thickness), should be compacted to 95 percent relative compaction and settlement monitors should be installed and monitored to measure settlement of the newly placed fill. Construction of settlement sensitive structures should be delayed until settlements are within tolerable levels.

Soil C aracteristics

9.2.1 The site soils soil encountered in the field investigation are considered to be “expansive” (Expansion Index [EI] greater than 20) as defined by 2013 California Building Code (CBC) Section 1803.5.3. The laboratory test results would classify the soil as having a “low” expansion index in accordance with ASTM D4829. Table 9.2.1 presents soil classifications based on the EI.

TABLE
SOIL CLASSIFICATION BASED ON E PANSION INDE

Expansion Index (EI)	Expansion Classification	2013 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

9.2.2 Based on the material classifications and laboratory testing, fine grained site soils generally possess a very low to low expansion potential (EI between 0 and 50). Medium to highly expansive soils, if encountered, should not be placed within four feet of the proposed foundations, flatwork or paving improvements. Additional testing for expansion potential should be performed once final grades are achieved.

9.2.3 Laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests indicate that the on-site materials at the location tested possess a sulfate content of 0.001% equating to an exposure class of S0 (Negligible) to concrete structures as defined by 2013 CBC Section 1904.3 and ACI 318. Table 9.2.3 presents a summary of concrete requirements set forth by 2013 CBC Section 1904.3 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE
RE UIREMENTS FOR CONCRETE
E POSED TO SULFATE CONTAINING SOLUTIONS

Sulfate Exposure	Exposure Class	Water-Soluble Sulfate Percent by Weight	Cement Type	Maximum Water to Cement Ratio by Weight	Minimum Compressive Strength (psi)
Not Applicable	S0	0.00-0.10	--	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V+ Pozzolan or Slag	0.45	4,500

9.2.4 Laboratory testing indicates the site soils have a pH of 6.4, and possess 86 parts per million (ppm) chloride, and have a minimum resistivity of 3,800 ohm-cm. Based on the lab test results, the site soils would not be classified as "corrosive" to metal improvements, in accordance with the Caltrans Corrosion Guidelines (Caltrans, 2012).

9.2.5 Geocon does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer should be performed if improvements that could be susceptible to corrosion are planned.

Gradin

9.3.1 Grading should be performed in accordance with the *Recommended Grading Specifications* contained in *Appendix D* and the Grading Ordinances of the City of Wildomar.

9.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the city inspector, owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

9.3.3 Site preparation should begin with the removal of previous structures and infrastructure, deleterious material, debris, buried trash, and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

9.3.4 Topsoil, alluvium, and highly weathered granitic bedrock within a 1:1 (h:v) projection the limits of grading should be removed to expose competent granitic bedrock. The area of previously placed fill along the western side of the site will be observed and evaluated during grading. The actual depth of removal should be evaluated by the engineering geologist during grading operations. We expect that removals will need to extend laterally beyond the outside edge of building or toes of slopes at a 1:1 (h:v) projection. The bottom of the excavations should be scarified to a depth of at least 1 foot, moisture conditioned as necessary to near to slightly above optimum moisture content, and properly compacted.

9.3.5 Bedrock exposed at finish grade (Buildings 1, 2, and 3) and in cut fill transitions (Building 4 and Rec Building), and areas within proposed structural areas should be over excavated to remove the differential support conditions. Over excavations should extend a minimum of three feet below pad grade or H/3 (where H is deepest fill in building envelope area), whichever is greater. Over excavations should be sloped so a bath-tub like geometry does not result from the over excavation. In cut fill transition areas where overexcavation is not

practical due to non-rippable rock being encountered beneath the building pad elevation, the buildings may be supported on deepened foundations extending through the fill and into the underlying bedrock.

9.3.6 Consideration should be given to overexcavation of granitic bedrock and replacement with compacted fill in areas of utility corridors, flatwork, parking lots, driveways, and any other improvements that would extend into granitic bedrock in order to facilitate excavation for construction of these improvements.

9.3.7 We should observe the removal bottoms to verify suitable material is encountered. Deeper excavations may be required if dry, loose, or soft materials are present at the base of the removals.

9.3.8 The fill placed within 4 feet of proposed foundations should possess a “low” expansion potential (EI of 50 or less).

9.3.9 If perched groundwater or saturated materials are encountered during remedial grading, extensive drying and mixing with dryer soil will be required. The excavated materials should then be moisture conditioned as necessary to near to slightly above optimum moisture content prior to placement as compacted fill.

9.3.10 The site soils and excavated granitic bedrock are suitable for re-use as engineered fill provide they are free of organics, and deleterious material. Material greater than 6 inches should not be placed within 10 feet of finish grade.

9.3.11 The site should be brought to finish grade elevations with fill compacted in layers. Layers of fill should be no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Fills deeper than 50 feet should be compacted to 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill.

9.3.12 Import fill (if necessary) should consist of granular materials with a “low” expansion potential (EI of 50 or less), generally free of deleterious material and rock fragments larger than 6 inches, noncorrosive, and should be compacted as recommended herein. Geocon should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

9.3.13 Oversize material (rock bigger than 12-inches) should be expected to be generated during grading operations with the granitic bedrock. Oversize rock can be used as fill as long as it is placed in accordance with City of Wildomar requirements, Riverside County Grading Ordinance and the recommendations in *Appendix D* of this report. The fill portion of the site should be able to accommodate oversize material as long as it is kept at least ten feet below finish grade, one foot below deepest utility in all utility corridors, and at least 15 feet horizontally from the face of slope.

9.3.14 Rock blanket fills are allowable provided they are placed in accordance with rock placement details provided in *Appendix D*.

9.3.15 Rocks of up to four feet in diameter may by placed individually or in windrows. The placement of individual rocks or windrows should allow compaction equipment can traverse on either side. Granular soil should be used to fill the void spaces around and beneath the rocks, and should be flooded.

9.3.16 Rock windrows should be placed parallel to each other, have a minimum horizontal spacing of 12 feet center-to-center, have a five foot horizontal offset from the underlying course, and a two foot vertical offset from the windrow below and above.

9.3.17 If possible, a subdrain should be placed at the base of a rock fill and outletted to a permanent drainage structure.

Graded Slopes

9.4.1 Fill slopes should be overbuilt at least 2 feet and cut back to grade. The slopes should be track-walked at the completion of each slope such that the fill is compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content to the face of the finished slope.

9.4.2 Finished slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, the slopes should be drained and properly maintained to reduce erosion. Water should not be allowed to flow down slopes, construction of earth berms, lined v-ditches or similar are recommended.

9.4.3 Although the proposed slopes are anticipated to have adequate factors of safety, natural factors may result in slope creep and/or lateral fill extension over time. Slope creep is due to alternate wetting and drying of fill soils resulting in downslope movement. Slope creep

occurs throughout the life of the slope and may affect improvements within about 15 feet of the top of slope, depending on the slope height. Slope creep can results in differential settlement of the structures supported by the slope. Lateral fill extension (LFE) occurs when expansive soils within the slope experience deep wetting due to rainfall or irrigation. LFE is mitigated as much as practical during grading by placing expansive soils at slightly greater than optimum moisture content.

9.4.4 Landscaping activities should avoid over steepening of slopes or grade changes along slopes. Backfill of irrigation lines should be compacted to 90 percent of the maximum dry density as evaluated by ASTM D1557. Vegetation should be light weight with variable root depth.

9.4.5 Excessive watering should be avoided; only enough irrigation to support vegetation suitable to the prevailing climate should be applied. Irrigation of natural, ungraded slopes should not be performed. Drainage or irrigation from adjacent improvements should not be directed to the tops of slopes. Drainage should be directed toward streets and approved drainage devices. Areas of seepage may develop after periods of heavy rainfall or irrigation.

9.4.6 Homeowners and maintenance associations should be made aware of the potential for slope creep, LFE, and erosion and be provided with these recommendations on how to reduce the likelihood of its occurrence.

Eart or Gradin Factors

9.5.1 Estimates of shrinkage factors are based on empirical judgments comparing the material in its existing or natural state as encountered in the exploratory excavations to a compacted state. Variations in natural soil density and in compacted fill density render shrinkage value estimates very approximate. As an example, the contractor can compact the fill to a dry density of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has an approximately 10 percent range of control over the fill volume. Table 9.5.1 below proves estimated shrink/bulk factors.

TABLE
ESTIMATED SHRIN BUL FACTORS

Soil Unit	Shrink/Bulk Factors
Topsoil	5-15 percent shrink
Alluvium	7-12 percent shrink
Granitic Bedrock	5-15 percent bulk

Please note that this estimate is for preliminary quantity estimates only. Due to the variations in the actual shrinkage/bulking factors, a balance area should be provided to accommodate variations.

Settlement of Proposed Fill

9.6.1 The post-grading settlement (hydrocompression) could reach up to 1 inch. We expect the settlement will occur over many years depending on the influx of rain and irrigation water into the fill. The settlement will likely be linear from the time the fill is placed to the end of the settlement period depending on the permeability of the fill soil. We do not expect the settlement will impact proposed utilities with gradients of 1 percent or greater. In addition, foundation recommendations are provided herein based on the maximum and differential fill thickness to account for potential fill settlement. Surface settlement monuments should be placed on fills deeper than 50 feet. The settlement monuments should be surveyed periodically to evaluate settlement of the newly placed fill. Construction of settlement sensitive structures should be delayed until expected settlements are within tolerable levels.

Foundation and Concrete Sla s On Grade Recommendations

9.7.1 The foundation recommendations presented herein are for the various proposed buildings. We understand that the buildings will be supported on either conventional shallow foundations with concrete slabs-on-grade or post-tensioned foundation systems.

9.7.2 In cut fill transition areas, the foundations may be founded in compacted fill where the bedrock is overexcavated in accordance with the grading recommendations, or the foundations may be extended such that the building is founded entirely on undisturbed bedrock in order to avoid overexcavation of non-rippable areas.

9.7.3 We separated the foundation recommendations into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria for the anticipated conditions are presented in Table 9.7.3. Final foundation categories will be evaluated once site grading has been completed.

TABLE
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T<20$	$D<10$	$EI\leq50$
II	$20\leq T<50$	$10\leq D<20$	$50<EI\leq90$
III	$T\geq50$	$D\geq20$	$90<EI\leq130$

9.7.4 Post-tensioned concrete slab and foundation systems may be used for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer

experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), as required by the 2013 California Building Code (CBC Section 1808.6). Although this procedure was developed for expansive soil conditions, we understand it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 9.7.4 for the particular Foundation Category designated. The parameters presented in Table 9.7.4 are based on the guidelines presented in the PTI, Third Edition design manual. The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer.

TABLE
POST TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Third Edition Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

9.7.5 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

9.7.6 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. Placement of 3 inches and 4 inches of sand is common practice in Southern California for 5-inch and 4-inch thick slabs, respectively. The foundation engineer should provide appropriate concrete mix design criteria and curing measures that may be utilized to assure proper curing of the slab to reduce the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation engineer present concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

9.7.7 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. A wall/column footing dimension detail is provided on Figure 9. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

9.7.8 If the structural engineer proposes a post-tensioned foundation design method other than the 2013 CBC:

- The deflection criteria presented in Table 9.7.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

9.7.9 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

9.7.10 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

9.7.11 Foundations in compacted fill may be designed for an allowable soil bearing pressure of 3,500 pounds per square foot (psf) (dead plus live load). This value may be increased by 250 psf for each additional foot in depth and 200 psf for each additional foot of width to a maximum value of 4,500 psf. Foundations extending to the underlying granitic bedrock may be designed for an allowable soil bearing pressure of 5,000 psf. The allowable bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. We estimate the total settlements under the imposed allowable loads to be about 1 inch with differential settlements on the order of ½ inch over a horizontal distance of 40 feet.

9.7.12 As an alternate to post-tensioned foundation systems, conventional shallow foundation with a concrete slab-on-grade may be used for support of the proposed structures. Conventional shallow foundations in compacted fill may be designed for an allowable soil bearing pressure of 3,500 pounds per square foot (psf) (dead plus live load). This value may be increased by 250 psf for each additional foot in depth and 200 psf for each additional foot of width to a maximum value of 4,500 psf. Foundations extending to the underlying granitic bedrock may be designed for an allowable soil bearing pressure of 5,000 psf. The allowable bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. We estimate the total settlements under the imposed allowable loads to be about 1 inch with differential settlements on the order of ½ inch over a horizontal distance of 40 feet. Table 9.7.12 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE
CON ENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 – 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions at slab mid-point
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions at slab mid-point

9.7.13 The embedment depths presented in Table 9.7.12 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. Figure 9 presents a wall/column footing dimension detail depicting lowest adjacent pad grade.

9.7.14 Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

9.7.15 Foundations in cut fill transition where the bedrock is non-rippable should be extended to the underlying granitic bedrock in the fill areas to avoid differential support conditions of the building. Foundations should be embedded at least 6 inches into the granitic bedrock, and at least 12 inches beneath lowest adjacent pad grade. Where the granitic bedrock in the fill areas is deeper than practical for deepening of the foundations, such as the southern portion of Building 4, Geocon should be contacted for additional recommendations if the bedrock is non-rippable. Alternative foundations may include using cast-in-drilled-hole piles that bear on the granitic bedrock in combination with a structural floor.

9.7.16 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.35 may be used with the dead load forces in newly compacted fill.

9.7.17 Passive earth pressure for the sides of foundations and slabs poured against newly placed engineered fill may be computed as an equivalent fluid having a density of 350 pounds per cubic foot with a maximum earth pressure of 3,500 pounds per square foot. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

9.7.18 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in such concrete placement.

9.7.19 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal to vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, building foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but not to exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope.
- Geocon should be contacted to review the pool plans and the specific site conditions to provide additional recommendations, if necessary.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support.
- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon should be consulted for specific recommendations.

9.7.20 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present) and differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.7.21 Geocon should be consulted to provide additional design parameters as required by the structural engineer.

E terior Concrete Flat or

9.8.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein assuming the subgrade materials possess an Expansion Index of 50 or less. Subgrade soils should be compacted to 90 percent relative compaction. Slab panels should be a minimum of 4 inches thick and when in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh or No. 3 reinforcing bars spaced 18 inches center-to-center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

9.8.2 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade or differential settlement. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork.

9.8.3 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

9.8.4 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

Con entional Retainin Walls

9.9.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal to vertical), an active soil pressure of 60 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an EI of 50 or less. For those walls where backfill materials do not conform to the criteria herein, Geocon should be consulted for additional recommendations.

9.9.2 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, an additional fluid density of 25 pcf should be added to the active soil pressure.

9.9.3 The structural engineer should determine the seismic design category for the project. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressure added to the active pressure. The seismic load exerted on the wall should be a triangular distribution with a pressure of 24H (where H is the height of the wall, in feet, resulting in pounds per square foot [psf]) exerted at the bottom of the wall and zero at the top of the wall. We used a peak site acceleration of 0.894g calculated from the 2013 California Building Code and applying a pseudo-static coefficient of 0.33.

9.9.4 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

9.9.5 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The soil immediately adjacent to the backfilled retaining wall should be composed of free draining material completely wrapped in Mirafi 140 (or equivalent) filter fabric for a lateral distance of 1 foot for the bottom two-thirds of the height of the retaining wall. The upper one-third should be backfilled with less permeable compacted fill to reduce water infiltration. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted backfill

(EI of 50 or less) with no hydrostatic forces or imposed surcharge load. Figure 10 presents a typical retaining wall drainage detail. If conditions different than those described are expected or if specific drainage details are desired, Geocon should be contacted for additional recommendations.

9.9.6 In general, wall foundations having a minimum depth and width of 1.5 feet may be designed for an allowable soil bearing pressure of 3,500 psf. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon should be consulted where such a condition is expected.

9.9.7 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 12 feet. In the event that walls higher than 12 feet or other types of walls are planned, Geocon should be consulted for additional recommendations.

Lateral Loadin

9.10.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat against formational materials. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

9.10.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design.

S immin Pool Spa

9.11.1 If swimming pools or spas are planned, the proposed swimming pool shell bottom should be designed as a free-standing structure and may derive support in newly placed engineered fill or the granitic bedrock. It is recommended that uniformity be maintained beneath the proposed swimming pools where possible, so overexcavation of the bedrock and replacement with compacted fill may be necessary. Geocon should be contacted for additional recommendations where swimming pools are planned over a cut-fill transition.

9.11.2 Swimming pool foundations and walls may be designed in accordance with the *Foundation* and *Retaining Wall* sections of this report (See Sections 9.7 and 9.9). A hydrostatic relief valve should be considered as part of the swimming pool design unless a gravity drain system can be placed beneath the pool shell.

9.11.3 If a spa is proposed it should be constructed independent of the swimming pool and must not be cantilevered from the swimming pool shell.

9.11.4 If the proposed pool is in proximity to the proposed structure, consideration should be given to construction sequence. If the proposed pool is constructed after building foundation construction, the excavation required for pool construction could remove a component of lateral support from the foundations and would therefore require shoring. Once information regarding the pool location and depth becomes available, this information should be provided to Geocon for review and possible revision of these recommendations.

Preliminary Pa ement Recommendations

9.12.1 The final pavement sections for roadways should be based on the R-Value of the subgrade soils encountered at final subgrade elevation. Streets should be designed in accordance with the City of Wildomar specifications (Riverside County standards) when final Traffic Indices and R-Value test results of subgrade soil are completed. Based on the soil types encountered during our investigation an R-Value of 24 for the subgrade soil and an assumed 78 for aggregate base materials have been used for the purposes of this preliminary analysis. Preliminary flexible pavement sections are presented in Table 9.12.1 for road classifications in accordance with the County of Riverside *Roadway Design Requirements* (Standard No. 114).

TABLE
PRELIMINARY FLE IBLE PA EMENT SECTIONS

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Crushed Aggregate Base (inches)
Light-Duty Vehicles and Parking Areas	5.5	24	3.5	7.0
Collector	7.0	24	4.5	10.0
Heavy Truck Vehicles	8.0	24	5.5	12.0

9.12.2 The upper 12 inches of the subgrade soil should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content beneath pavement sections.

9.12.3 The crushed aggregated base and asphalt concrete materials should conform to Section 200-2.2 and Section 203-6, respectively, of the *Standard Specifications for Public Works Construction* (Greenbook) and the latest edition of the *County of Riverside Standard*

Specifications. Base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of 95 percent of the laboratory Hveem density in accordance with ASTM D 1561.

9.12.4 A rigid Portland cement concrete (PCC) pavement section should be placed in driveway aprons and cross gutters and where desired to support heavy vehicle loads. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R, *Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 9.12.4.

TABLE
RIGID PA EMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	100 pci
Modulus of rupture for concrete, M_R	550 psi
Traffic Category, TC	C and D
Average daily truck traffic, ADTT	100 and 700

9.12.5 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 9.12.5.

TABLE
RIGID PA EMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Roadways (TC=C)	6.5
Bus Stops and Truck Parking Areas (TC=D)	8.0

9.12.6 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,500 psi (pounds per square inch). Base material will not be required beneath concrete improvements.

9.12.7 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the

recommended slab thickness 4 feet behind the face of the slab (e.g., a 7-inch-thick slab would have a 9-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

9.12.8 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 15 feet for the 7-inch-thick or greater slabs (e.g., a 9-inch-thick slab would have a 15-foot spacing pattern). The depth of the crack-control joints and need for sealing of the joints should be determined by the referenced ACI report.

9.12.9 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker as discussed in the referenced ACI guide.

9.12.10 Where brick or concrete pavers are used, the following preliminary pavement sections may be used. Final pavement sections should be based on the R-value of the soils placed at the roadway subgrade elevation and the type of paver chosen for the pavement surface. Traffic indices have been assumed for walkways, light duty pavements and parking lots, and Collector roads. If the anticipated traffic is different than what we assumed, Geocon should be contacted to provide revised recommendations.

9.12.11 Pavement thicknesses were determined following procedures outlined in the Caltrans California Highway Design Manual. The pavers provide a wearing surface with a similar structural value as asphalt concrete, and additional support for the pavers is provided with the underlying aggregate base. The recommended thickness of aggregate base beneath the pavers is provided in Table 9.12.11.

TABLE
PRELIMINARY PA ER RECOMMENDATIONS

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Recommended thickness of Crushed Aggregate Base (inches)
Walkways	4.0	24	6.0
Light-Duty Vehicles and Parking Areas	5.5	24	8.0
Collector	7.0	24	13.0

9.12.12 Pavers should be installed in accordance with the manufacturer's recommendations, including the use of bedding sand and a geotextile fabric above the aggregate base. The crushed aggregate base should conform to Section 200-2.2 of the Standard Specifications for Public Works Construction (Greenbook). Base materials should be compacted to 95 percent of the laboratory maximum dry density at near to slightly above optimum moisture content as evaluated by ASTM D1557.

9.12.13 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement surfaces will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

Site Draina e and Moisture Protection

9.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2013 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

9.13.2 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

9.13.3 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

9.13.4 We understand the property may incorporate storm water management devices that promote water infiltration. 9.13.5 If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. Based on our experience with similar clayey soil conditions, infiltration areas are considered infeasible due to the poor percolation and lateral migration characteristics. We have not performed a hydrogeology study at the site. Down-gradient and adjacent structures may be subjected to seeps, movement of foundations and slabs, or other impacts as a result of water infiltration.

Plan Re ie

9.14.1 Geocon should review the grading and structural foundation plans for the project prior to final submittal. Additional analyses may be required after review of the project plans.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous materials was not part of the scope of services provided by Geocon.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

LIST OF REFERENCES

1. American Concrete Institute, 2011, *Building Code Requirements for Structural Concrete*, Report by ACI Committee 318.

2. American Concrete Institute, 2008, *Guide for Design and Construction of Concrete Parking Lots*, Report by ACI Committee 330.

3. Boore, D. M. and G. M Atkinson, *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S*, Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February 2008.

4. Byerly, John R. Incorporated, 2002, *Preliminary Geotechnical Investigation, Tract No. 29426, Bundy Canyon Road, Wildomar Area of Riverside County, California*, dated March 14.

5. Byerly, John R. Incorporated, 2001, *Slope Stability Analysis, Tentative Tract No. 29426, Bundy Canyon road, Wildomar Area of Riverside County, California*, dated April 13.

6. California Building Standards Commission, 2013, *California Building Code (CBC)*, California Code of Regulations Title 24, Part 2.

7. California Geological Survey (CGS), *Earthquake Shaking Potential for California*, from USGS/CGS Seismic Hazards Model, CSSC No. 03-02, 2003.

8. California Geological Survey (CGS), *Probabilistic Seismic Hazards Mapping-Ground Motion Page*, 2003, CGS Website: www.conserv.ca.gov/cgs/rghm/pshamap.

9. California Geological Survey, *Seismic Shaking Hazards in California*, Based on the USGS/*CGS Probabilistic* Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years;

   http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

10. California Department of Transportation (Caltrans), Division of Engineering Services, Materials Engineering and Testing Services, *Corrosion Guidelines, Version 2.0*, dated November, 2012.

11. California Department of Water Resources, Water Data Library www.water.ca.gov/waterdatalibrary/

12. Campbell, K. W. and Y. Bozorgnia, *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Preprint of version submitted for publication in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February 2008.

13. Chiou, Brian S. J. and Robert R. Youngs, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring 2008.

14. City of Wildomar, Road Standards and Specifications, accessed at: www.cityofwildomar.org/public-works.asp

REFERENCES (CONTINUED)

15. County of Riverside Transportation Department, Road Standards, Ordinance 461, accessed at: rctlma.org/trans/Land-Development/Road-Standards

16. Grant Becklund Civil Engineering, *Plot Plan No. 16-00XX, City of Wildomar, Bundy Canyon Resort Apartments*, Sheet 1 of 1, dated December 2015.

17. Grand Becklund Civil Engineering, *Preliminary Grading Plan, City of Wildomar, Bundy Canyon Resort Apartments*, Sheet 1 of 1, undated.

18. Jennings, Charles W. and Bryant, William A., 2010, *Fault Activity Map of California*, California Division of Mines and Geology Map No. 6.

19. Kennedy, Michael P., 1977, *Recency and Character of Faulting Along the Elsinore Fault Zone in Southern Riverside County, California*, CDMG Special Report 131.

20. Legg, M. R., J. C. Borrero, and C. E. Synolakis, *Evaluation of Tsunami Risk to Southern California Coastal Cities*, 2002 NEHRP Professional Fellowship Report, dated January.

21. Mains, Steven, *Cooperative Well Measuring Program Covering the Upper Santa Ana River Watershed, San Jacinto Watershed, and Santa Margarita Watershed*, Spring 2012.

22. Morton, D.M., and Weber, F. H., 2003, *Preliminary Geologic Map of the Elsinore 7.5' Quadrangle, Riverside County, California, USGS Open File Report 03-281*.

23. Public Works Standards, Inc., 2015, *Standard Specifications for Public Works Construction "Greenbook,"* Published by BNi Building News.

24. Rasmussen, Gary S. & Associates, 2001, *Rippability Investigation, Tentative Tract No. 29426, Lots 1-80Southeast of Bundy Canyon Road and Proposed Tulip Lane, Riverside County California*, dated August 13.

25. Rasmussen, Gary S. & Associates, 2002, *Subsurface Engineering Geology, Investigation, Tentative Tract Map 29426, Lots 1-80, Southeast of Bundy Canyon Road and Proposed Tulip Lane, Bundy Canyon Area, Riverside County, California, Tentative Tract Map No. 30846*, dated March 1.

26. Rasmussen, Gary S. & Associates, 1990, *Engineering Geology Investigation of Tentative Tract No. 25545, Lots 1-74, South of Bundy Canyon Road and Tulip Lane, Lake Elsinore Area, Riverside County, California*, dated March 21.

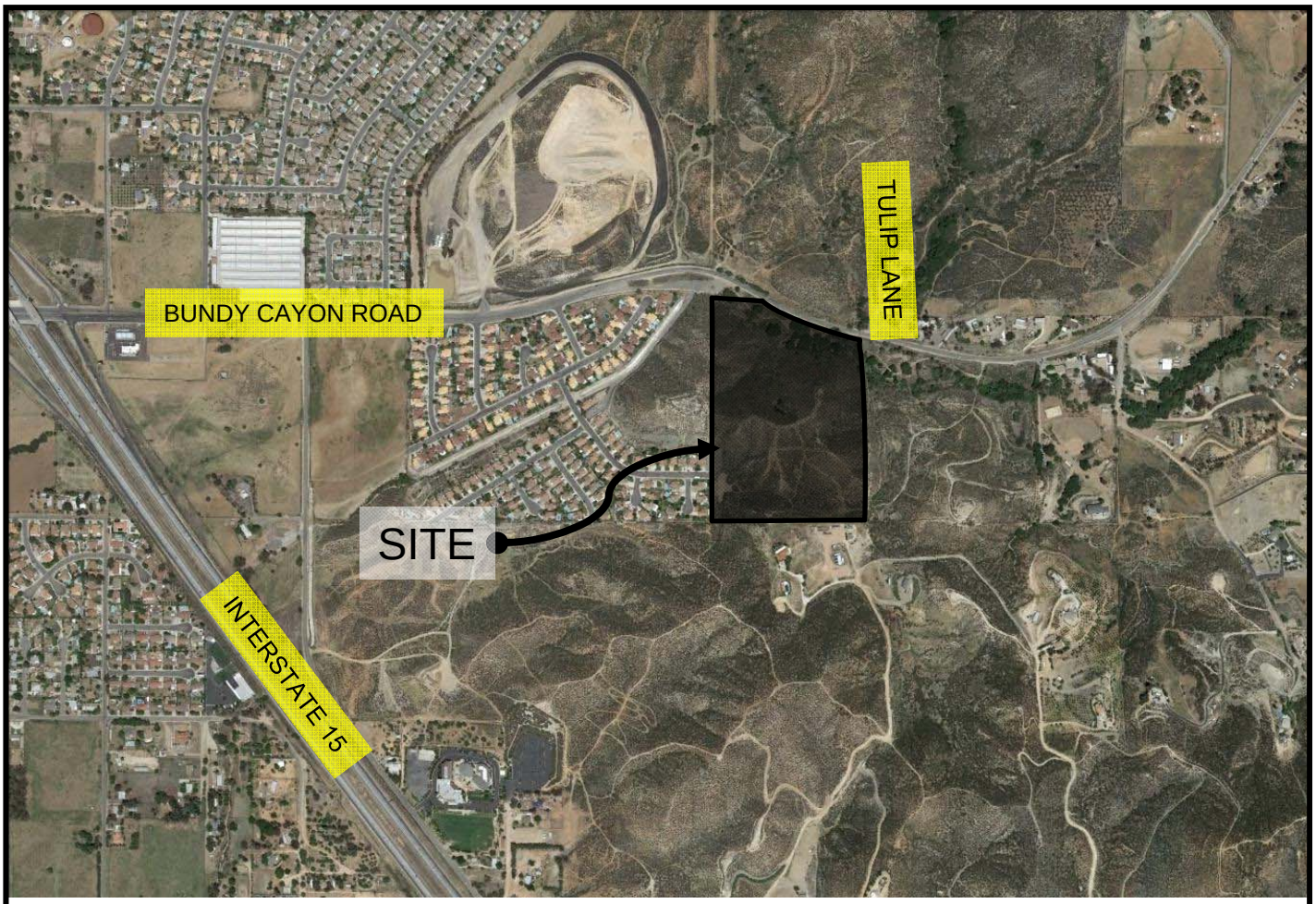
27. Risk Engineering, *EZ-FRISK*, (Version 7.62) 2012.

28. Riverside County Flood Control and Water Conservation District, *Low Impact Development BMP Design Handbook* dated September 2011.

29. Riverside County, 2016, Map My County v4, http://mmc.rivcoit.org/MMC_Public/Viewer.html?Viewer=MMC_Public

30. U.S. Geological Survey (USGS), *Deaggregation of Seismic Hazard for PGA and 2 Periods of Spectral Acceleration*, 2002, USGS Website: www.earthquake.usgs.gov/research/hazmaps.

31. USGS computer program, Seismic Hazard Curves and Uniform Hazard Response Spectra, http://earthquake.usgs.gov/research/hazmaps/design/.



N

NO SCALE

SOURCE: Google Earth, 2016.

VICINITY MAP

GEOCON
WEST, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE SUITE 101 MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

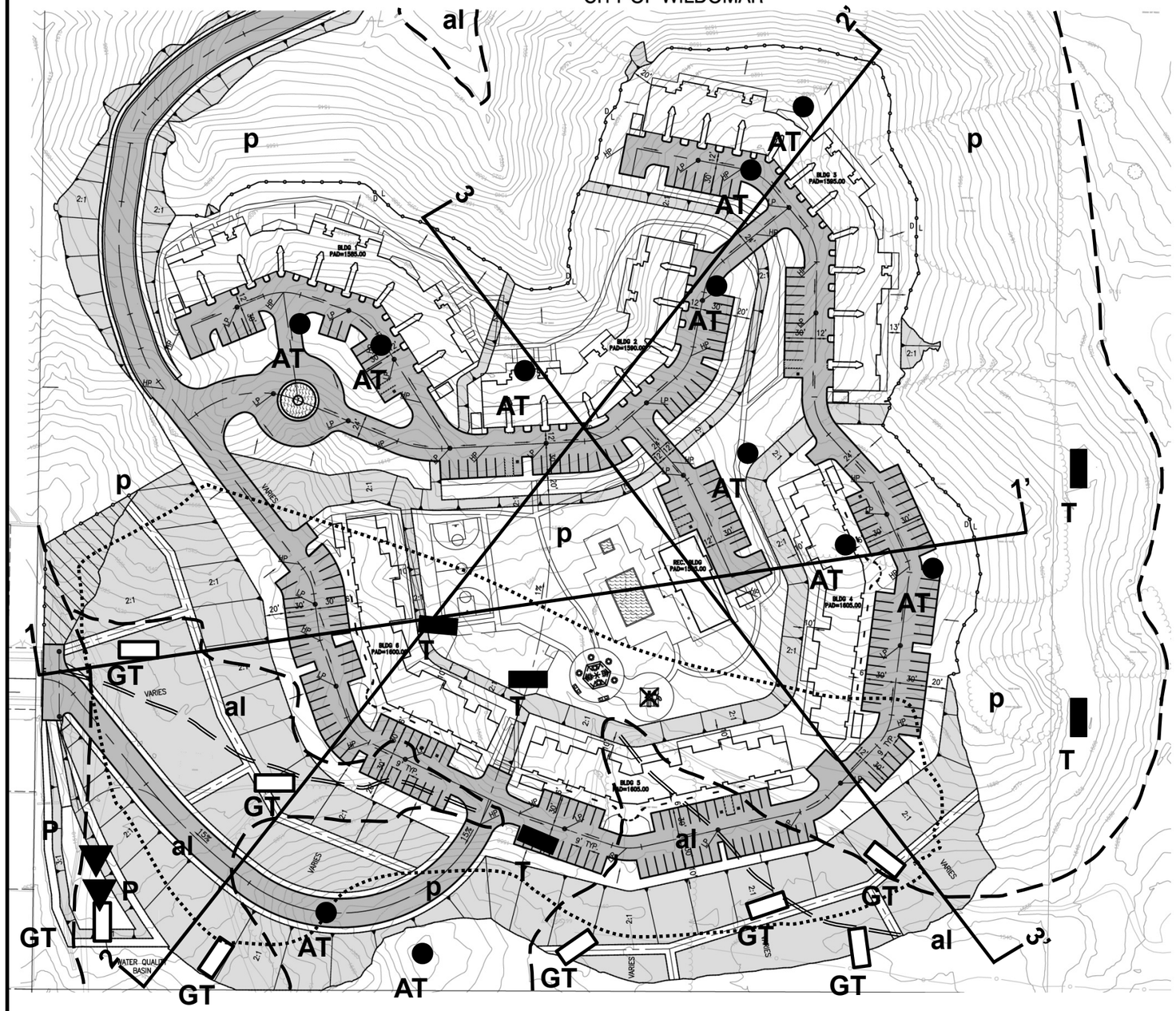
UPDATE GEOTECHNICAL INVESTIGATION
MUTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA

PDT		

FEBRUARY, 2016	PROJECT NO. T2145-22-02	FIG. 1

PRELIMINARY GRADING PLAN

CITY OF WILDOMAR



GEOCON LEGEND

al	ALLU IUM
p	GRANITIC BEDROC (GRANODIORITE)
	GEOLOGIC CONTACT
GT	TEST PIT (GEOCON THIS REPORT)
P	PERCOLATION TEST(GEOCON THIS REPORT)
	LOCATION OF CROSS SECTION USED IN SLOPE STABILITY CALCULATIONS (GEOCON THIS REPORT)
	APPRO IMATE ROC DISPOSAL AREA
	PROPOSED CANYON SUBDRAIN
T	TEST PIT (GEOCON)
AT	TEST PIT (GEOCON)

SCALE: 1"=50'

0 50 100 150

SOURCE: Grant Becklund Civil Engineering

GEOCON WEST, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE SUITE 101 MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT/ PDT

GEOTECHNICAL MAP

UPDATE GEOTECHNICAL INVESTIGATION
MULTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR YULIP LANE
WILDOMAR, CALIFORNIA

FEBRUARY, 2016	PROJECT NO. T2145-22-02	FIG. 2

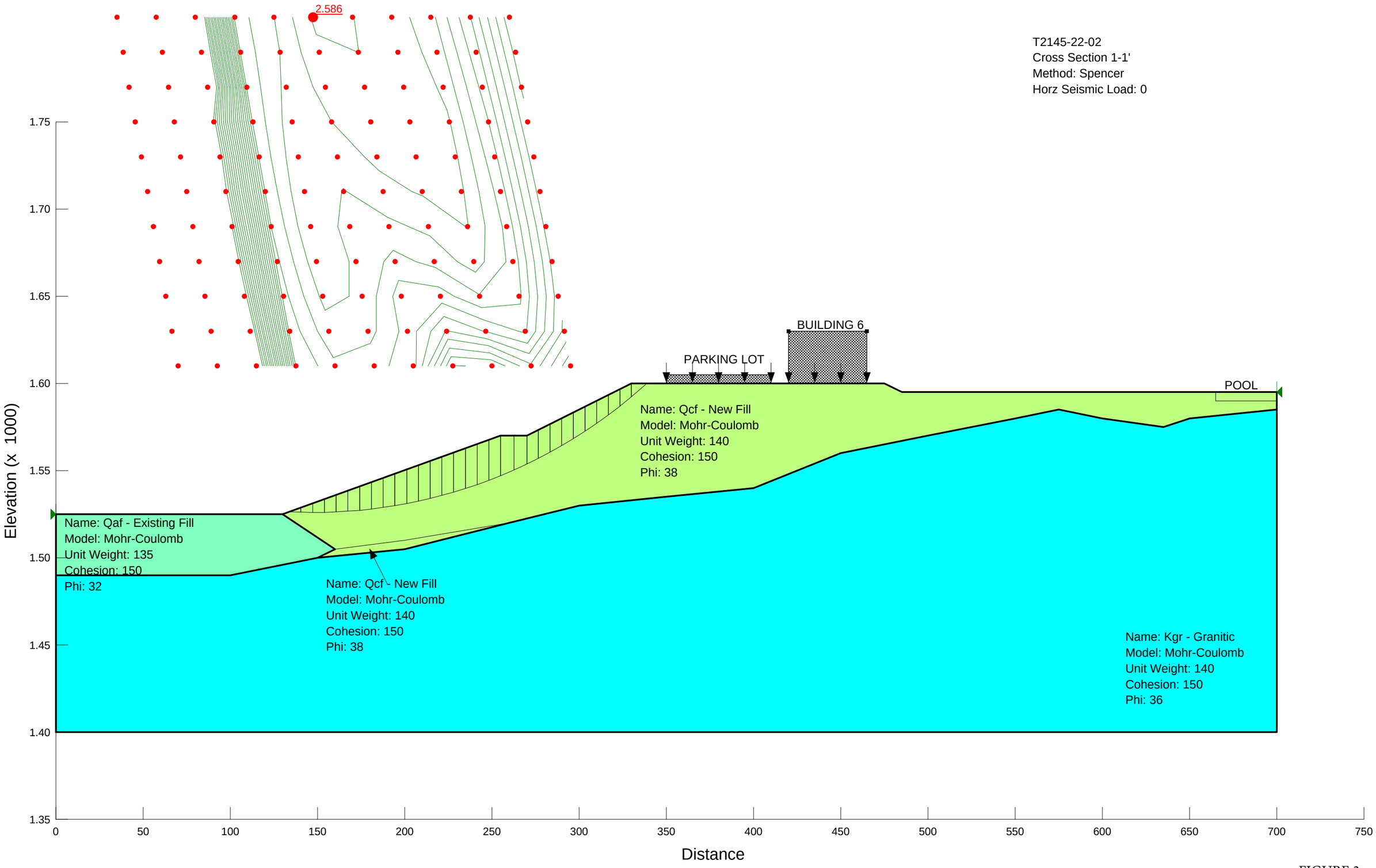

2.586
T2145-22-02
Cross Section 1-1'
Method: Spencer
Horz Seismic Load: 0
BUILDING 6
PARKING LOT
POOL
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Qaf - Existing Fill
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 150
Phi: 32
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Kgr - Granitic
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 36
Elevation (x 1000)
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Distance

FIGURE 3

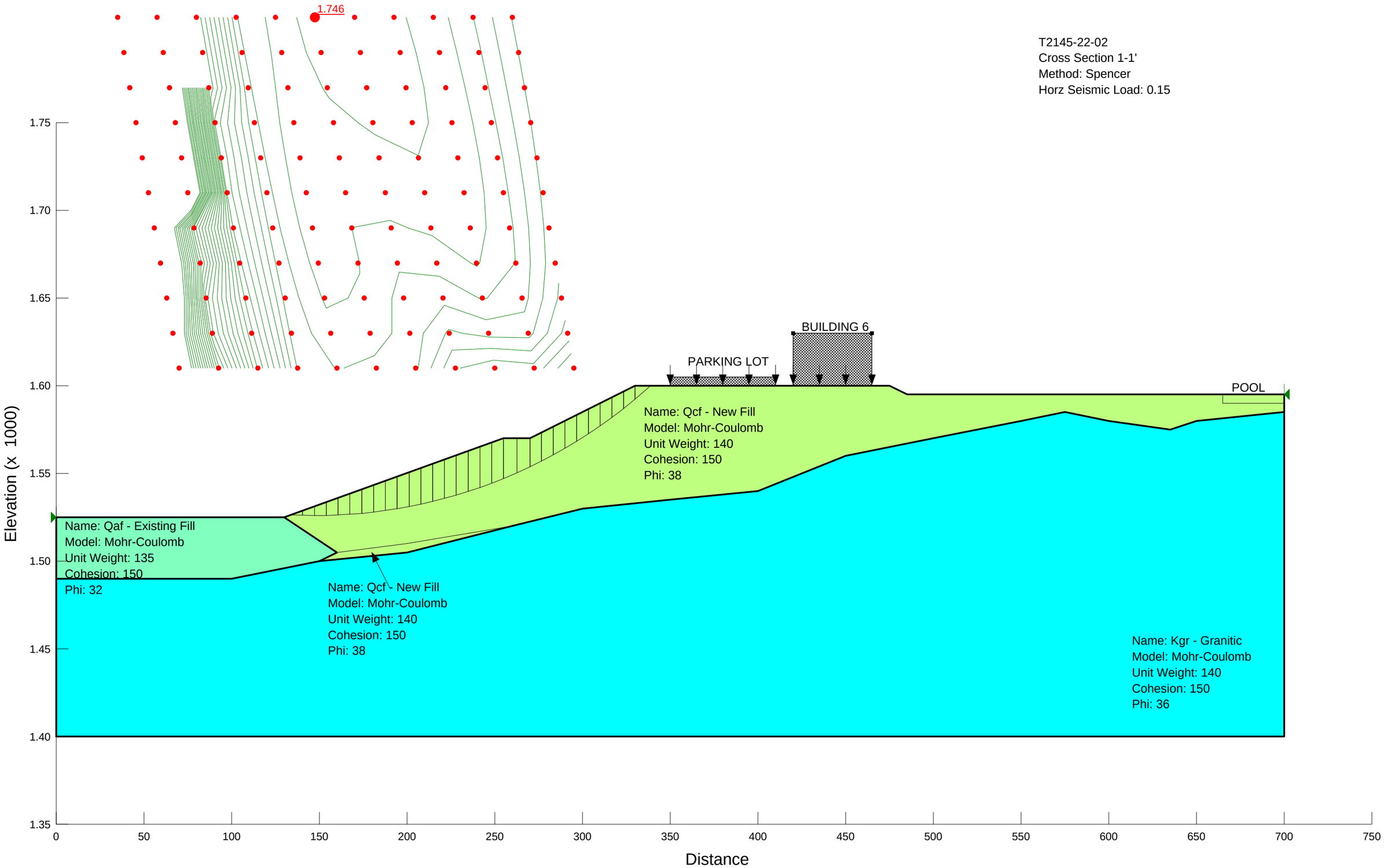

1.746
T2145-22-02
Cross Section 1-1'
Method: Spencer
Horz Seismic Load: 0.15
BUILDING 6
PARKING LOT
POOL
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Qaf - Existing Fill
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 150
Phi: 32
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Kgr - Granitic
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 36
Elevation (x 1000)
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Distance

FIGURE 4

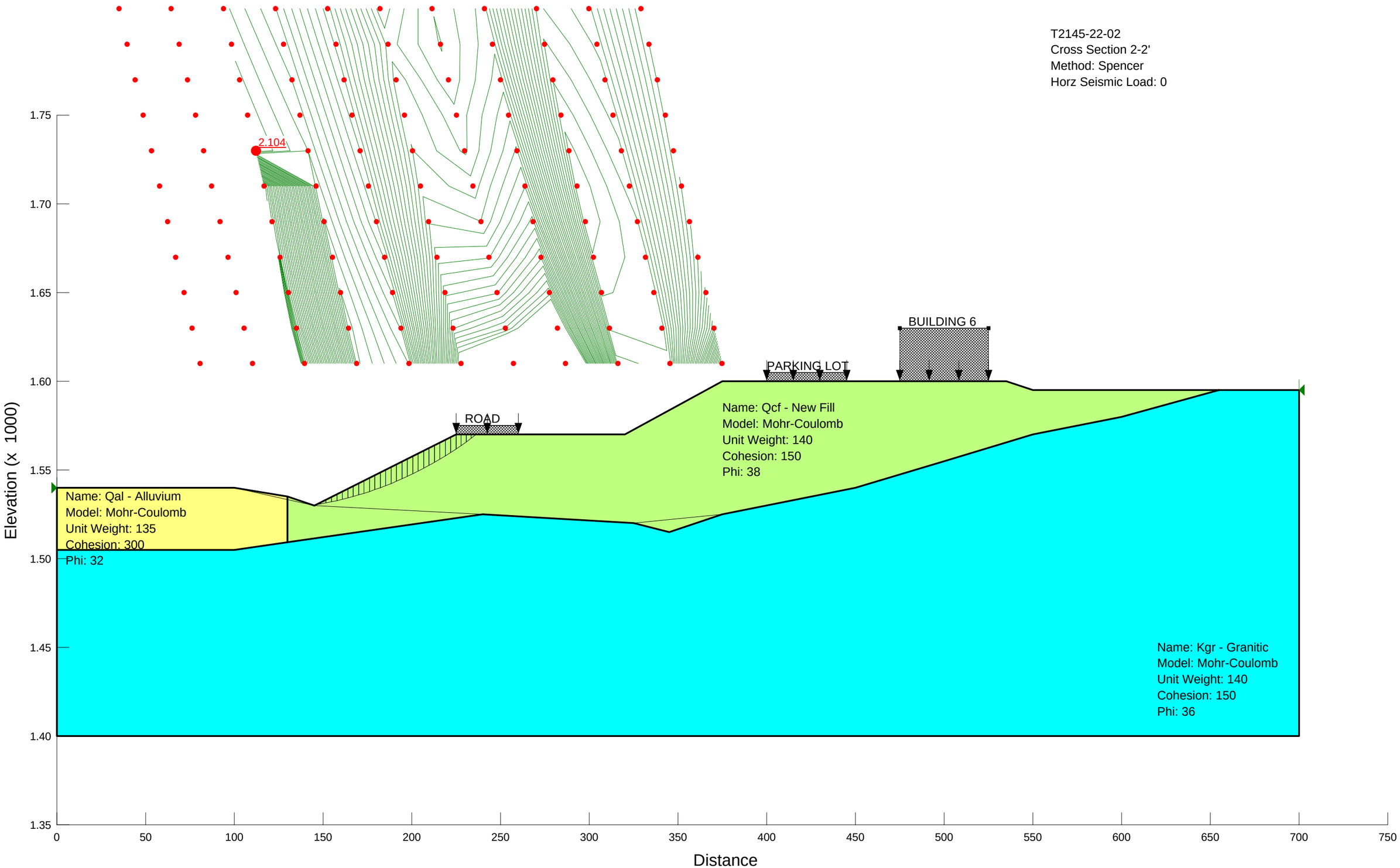

T2145-22-02
Cross Section 2-2'
Method: Spencer
Horz Seismic Load: 0
2.104
BUILDING 6
PARKING LOT
ROAD
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Qal - Alluvium
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 300
Phi: 32
Name: Kgr - Granitic
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 36
Elevation (x 1000)
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Distance

FIGURE 5

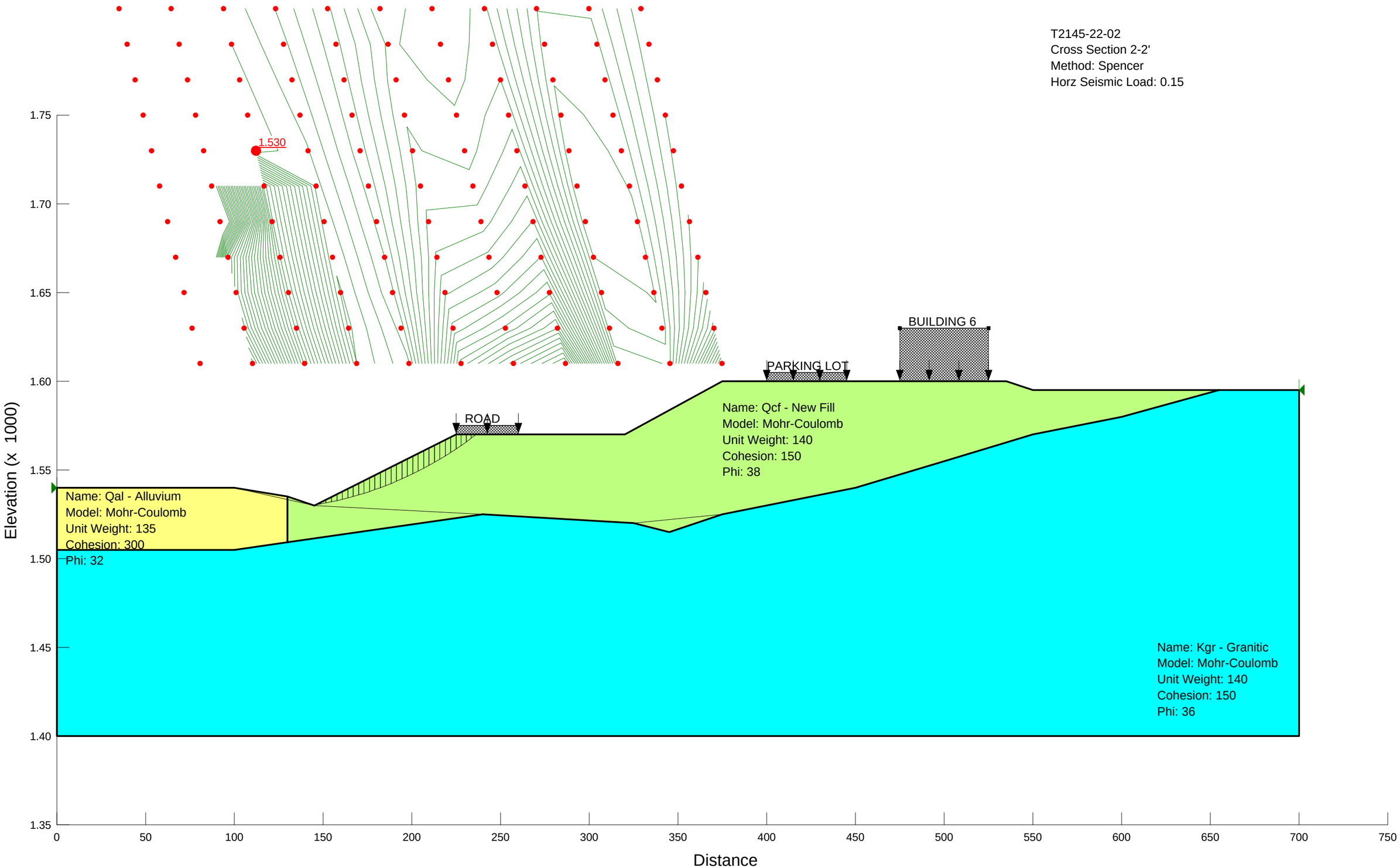

T2145-22-02
Cross Section 2-2'
Method: Spencer
Horz Seismic Load: 0.15
1.530
BUILDING 6
PARKING LOT
ROAD
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Qal - Alluvium
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 300
Phi: 32
Name: Kgr - Granitic
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 36
Elevation (x 1000)
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Distance

FIGURE 6

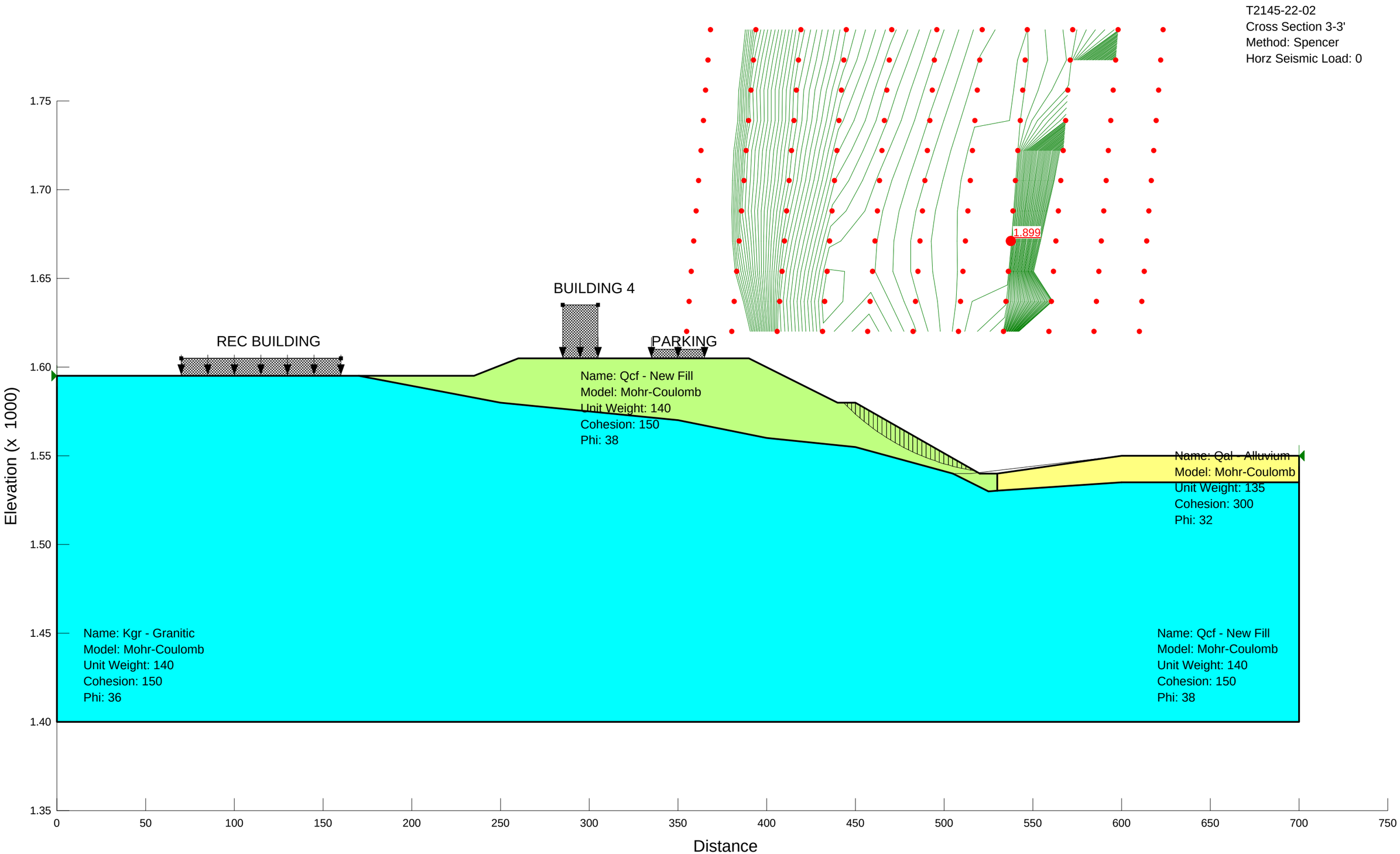

T2145-22-02
Cross Section 3-3'
Method: Spencer
Horz Seismic Load: 0
1.899
BUILDING 4
REC BUILDING
PARKING
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Name: Qal - Alluvium
Model: Mohr-Coulomb
Unit Weight: 135
Cohesion: 300
Phi: 32
Name: Kgr - Granitic
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 36
Name: Qcf - New Fill
Model: Mohr-Coulomb
Unit Weight: 140
Cohesion: 150
Phi: 38
Elevation (x 1000)
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Distance

FIGURE 7

T2145-22-02
Cross Section 3-3'
Method: Spencer
Horz Seismic Load: 0.15

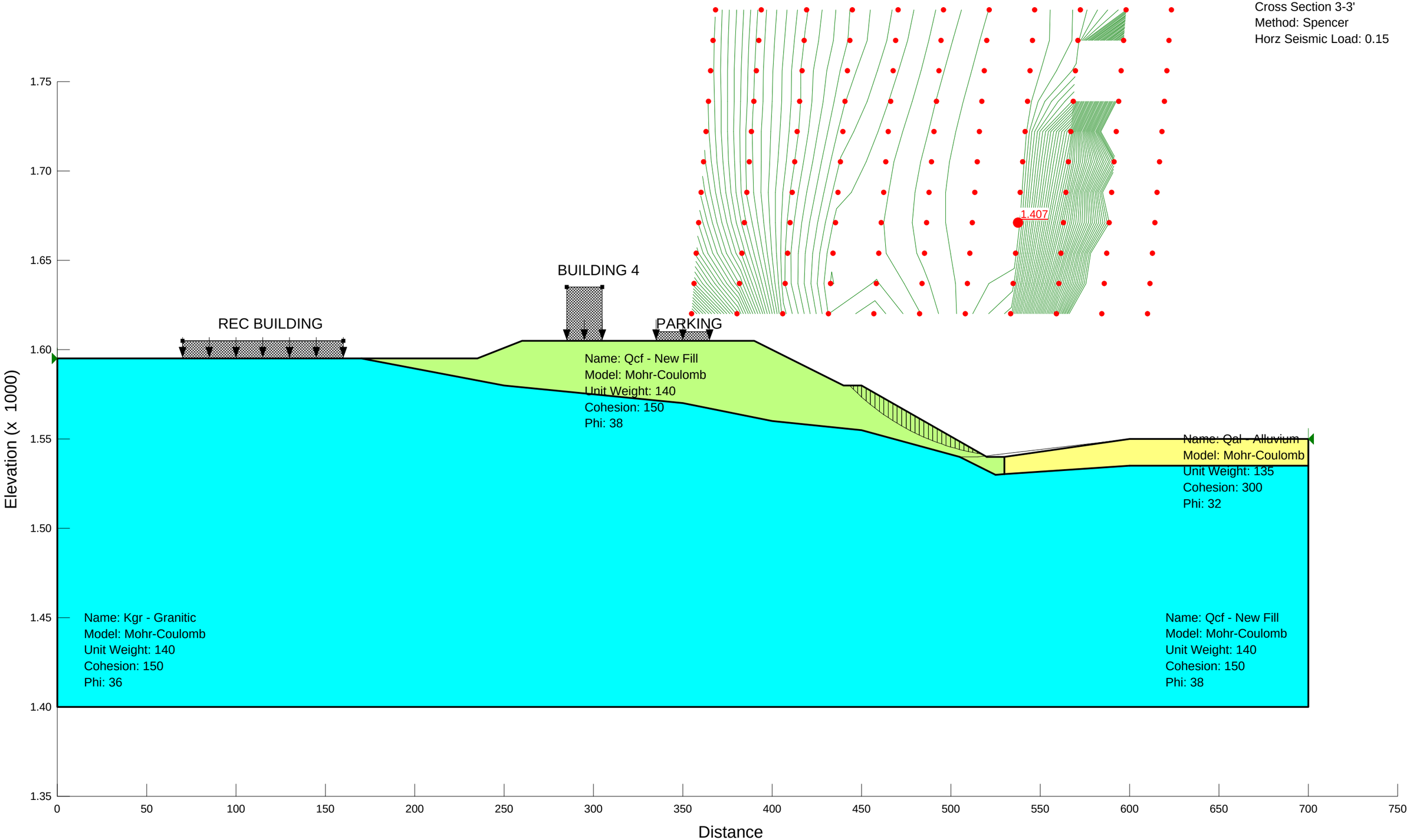
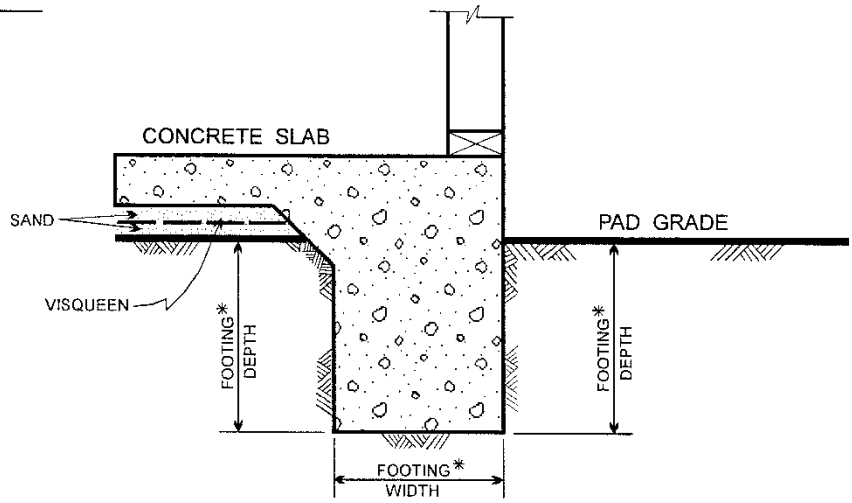
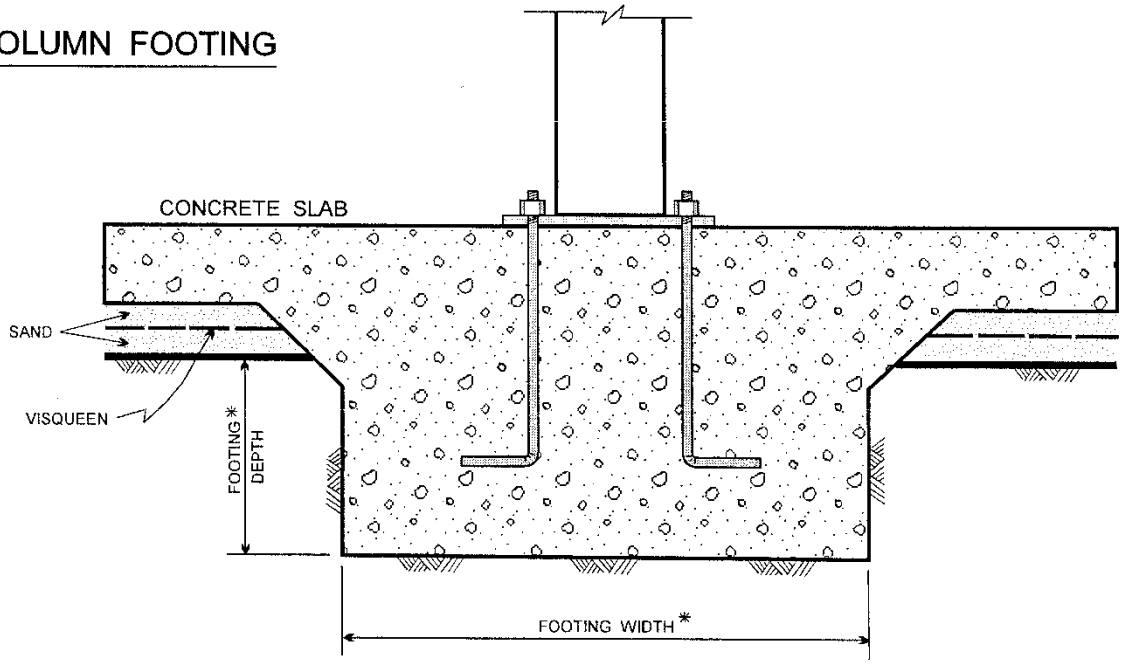


FIGURE 8

WALL FOOTING



COLUMN FOOTING



*……SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

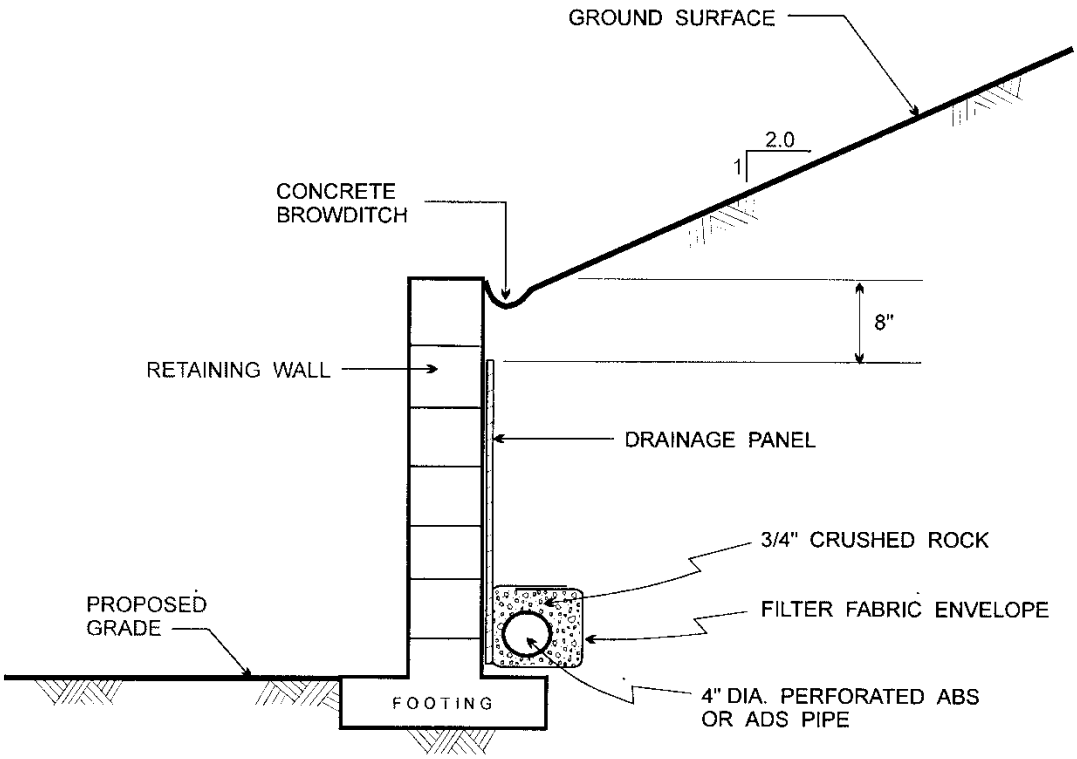
GEOCON
WEST, INC.
ENVIRONMENTAL GEOTECHNICAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562
PHONE (951) 304-2300 FAX (951) 304-2392

CER		

WALL / COLUMN FOOTING DETAIL

UPDAT EGEOTECHNICAL REPORT
MULTI-FAMILTY DEVELOPMENT
BYNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA

FEBRUARY, 2016	PROJECT NO. T2145-22-02	FIG. 9



NOTES:

1.....WALL DRAINAGE PANELS SHOULD CONSISTS OF MIRADRAIN 6000 OR EQUIVALENT

2.....FILTER FABRIC SHOULD CONSIST OF MIRAFI 140N OR APPROVED EQUIVALENT

3.....VOLUME OF CRUSHED ROCK SHOULD BE AT LEAST 1 CUBIC FOOT PER FOOT OF PIPE

4.....CONCRETE BROWDITCH RECOMMENDED FOR SLOPE HEIGHTS GREATER THAN 6 FEET

NO SCALE

GEOCON
W E S T, I N C.
ENVIRONMENTAL GEOTECHNICAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562
PHONE (951) 304-2300 FAX (951) 304-2392

PDT		

WALL DRAINAGE DETAL

UPDATE GEOTECHNICAL INVESTIGATION
MULTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA

FEBRUARY, 2016	PROJECT NO. T2145-22-02	FIG. 10

PERCOLATION TEST REPORT							
Project Name		Bundy Canyon			**Project No**		T2145-22-02
Test Hole No		P-1			**Date E ca ated**		2/4/2016
Len t of Test Pipe			15.6	inches	**Soil Classification**		SM
Hei t of Pipe a o e Ground			3.5	inches	**Presoa Date**		2/4/2016
Dept of Test Hole			12.1	inches	**Perc Test Date**		2/5/2016
C ec for Sandy Soil Criteria Tested y				AMO	**Percolation Tested y**		PDT
Water le el measured from ottom of ole							
Sandy Soil Criteria Test							
Trial No	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
		Inter al	**Elapsed**	**Le el**	**Le el**	**Le el**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(inc es)**	**(min inc)**
1	9:00 AM 9:25 AM	25	25	9.7	9.0	0.7	35.7
2	9:25 AM 9:50 AM	25	50	10.9	9.7	1.2	20.8
			Soil Criteria Normal				
			Percolation Test				
Readin	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
No		**Inter al**	**Elapsed**	**Head**	**Head**	**Le el**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(inc es)**	**(min inc)**
1	9:50 AM 10:20 AM	30	30	11.0	10.3	0.7	42.9
2	10:20 AM 10:50 AM	30	60	10.3	9.5	0.8	37.5
3	10:50 AM 11:20 AM	30	90	11.4	10.6	0.8	37.5
4	11:20 AM 11:50 AM	30	120	11.8	11.6	0.2	150.0
5	11:50 AM 12:20 PM	30	150	11.6	10.6	1.0	30.0
6	12:20 PM 12:50 PM	30	180	12.0	11.3	0.7	42.9
7	12:50 PM 1:20 PM	30	210	11.3	10.5	0.8	37.5
8	1:20 PM 1:50 PM	30	240	10.5	10.2	0.3	100.0
9	1:50 PM 2:20 PM	30	270	11.3	10.5	0.8	37.5
10	2:20 PM 2:50 PM	30	300	10.5	10.1	0.4	75.0
11	2:50 PM 3:20 PM	30	330	10.1	9.5	0.6	50.0
12	3:20 PM 3:50 PM	30	360	10.4	9.9	0.5	60.0
Infiltration Rate (in r)			0.2				
Radius of test ole (in)			6				**Fi ure A**
A era e Head (in)			10.2				

PERCOLATION TEST REPORT							
Project Name		Bundy Cayon			**Project No**		T2145-22-02
Test Hole No		P-2			**Date E ca ated**		2/4/2016
Len t of Test Pipe			16.5	inches	**Soil Classification**		SM
Hei t of Pipe a o e Ground			4	inches	**Presoa Date**		2/4/2016
Dept of Test Hole			12.5	inches	**Perc Test Date**		2/5/2016
C ec for Sandy Soil Criteria Tested y				PDT	**Percolation Tested y**		PDT
Water le el measured from ottom of ole							
Sandy Soil Criteria Test							
Trial No	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
		Inter al	**Elapsed**	**Le el**	**Le el**	**Le el**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(inc es)**	**(min inc)**
1	9:02 AM 9:27 AM	25	25	9.1	8.5	0.6	41.7
2	9:27 AM 9:52 AM	25	50	10.0	9.3	0.7	35.7
			Soil Criteria Normal				
			Percolation Test				
Readin	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
No		**Inter al**	**Elapsed**	**Le el**	**Le el**	**Le el**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(inc es)**	**(min inc)**
1	9:22 AM 10:22 AM	30	30	10.2	9.5	0.7	42.9
2	10:22 AM 10:52 AM	30	60	10.5	9.6	0.9	33.3
3	10:52 AM 11:22 AM	30	90	10.7	9.3	1.4	21.4
4	11:22 AM 11:52 AM	30	120	10.5	9.8	0.7	42.9
5	11:52 AM 12:22 PM	30	150	10.5	9.7	0.8	37.5
6	12:22 PM 12:52 PM	30	180	10.6	9.6	1.0	30.0
7	12:52 PM 1:22 PM	30	210	10.3	9.8	0.5	60.0
8	1:22 PM 1:52 PM	30	240	9.8	9.1	0.7	42.9
9	1:52 PM 2:22 PM	30	270	10.4	9.8	0.6	50.0
10	2:22 PM 2:52 PM	30	300	10.4	9.6	0.8	37.5
11	2:52 PM 3:22 PM	30	330	10.6	9.9	0.7	42.9
12	3:22 PM 3:52 PM	30	360	10.4	9.7	0.7	42.9
Infiltration Rate (in r)			0.3				
Radius of test ole (in)			6				**Fi ure A**
A era e Head (in)			10.1				

APPENDIX A

APPENDI A

E PLORATORY E CA ATIONS

We performed the field investigation on January 15, and February 4 and 5, 2016. Our subsurface exploration consisted of excavating 8 geotechnical test pits along the southern portion of the site, and hand excavating two percolation pits within the proposed basin in the southwest corner of the site. Excavation and presaturation of the percolation test holes was performed on February 4, 2016, and percolation testing was performed on February 5, 2016 in accordance with *Riverside County Flood Control and Water Conservation District Low Impact Development Handbook Appendix A (Handbook)*. The test pits were excavated with a backhoe to depths of up to 15 feet. Bulk samples of disturbed soils were transported to our laboratory for testing.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the borings are presented on Figures A-1 through A-8. Percolation test data is presented on Figures A-9 and A-10. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. Previous site exploration logs are in *Appendix C*. The approximate locations of the test pits and percolations pits, as well as previous site explorations are shown the *Geotechnical Map*, Figure 2.

PROJECT NO. T2145-22-02

TEST PIT GT-1

ELEV. (MSL.) **1552** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Silty SAND, loose, slightly moist, brown; fine to coarse sand; some gravel; sparse shubs at surface			
2					**GRANITIC BEDROCK (Kpvg)** Completely weathered, reddish brown and yellowish brown, weak, GRANODIORITE; excavates as a sand with trace gravel			
4	GT-1@4.5				-Becomes highly weathered; moderately weak			
6					-Becomes moderately weathered; slow advance			
8					-Becomes lightly weathered			

TOTAL DEPTH 8 FEET
Groundwater not encountered
No caving
Backfilled with cuttings 1/15/2016

Figure A-1,
Log of Test Pit GT-1, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-2

ELEV. (MSL.) **1549** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Silty SAND, loose, slightly moist, strong brown; fine to coarse sand; trace gravel; sparse shubs at surface			
2	GT-2@1'							
4				SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, yellowish brown; fine to coarse sand; trace clay; moderate porosity (up to 1/8 inch diam.)			
6								
8								
10					**GRANITIC BEDROCK (Kpvg)** Completely weathered, yellowish brown, weak, GRANODIORITE; excavates as a gravelly sand; some clay alteration -Becomes moderately weathered			
12								

TOTAL DEPTH 12 FEET
Groundwater not encountered
No caving
Backfilled with cuttings 1/15/2016

Figure A-2,
Log of Test Pit GT-2, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-3

ELEV. (MSL.) **1565** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Silty SAND, loose, slightly moist, dark brown; fine sand; some medium and coarse sand; some gravel; sparse shubs at surface			
2								
4				SM	**ALLUVIUM (Qal)** Silty SAND, medium dense, slightly moist, yellowish brown; fine to coarse sand; moderate porosity (up to 1/2 inch diam.); root hairs			
6								
8					**GRANITIC BEDROCK (Kpvg)** Completely weathered, yellowish brown, weak, GRANODIORITE; excavates as a gravelly sand; -Becomes moderately weathered			
10					TOTAL DEPTH 10 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-3,
Log of Test Pit GT-3, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-4

ELEV. (MSL.) **1510** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**ALLUVIUM (Qal)** Silty SAND, loose, moist, brown; fine to coarse sand; roots; sparse shubs at surface			
2								
4					-Becomes light brown; some gravel; moderate porosity (up to 1/8 inch diam.)			
6								
8	GT-4@8				-Becomes brownish yellow; fine to medium sand; non porous			8.8
10								
12					**GRANITIC BEDROCK (Kpvg)** Completely weathered, olive/light gray, weak, GRANODIORITE; excavates as a gravelly sand with silt -Excavates as a sandy gravel with cobbles			
14					TOTAL DEPTH 14 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-4,
Log of Test Pit GT-4, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-5

ELEV. (MSL.) **1518** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, brown; fine to coarse sand; some gravel; roots; sparse shubs at surface			
2								
4					-Becomes medium dense			
6								
8					**GRANITIC BEDROCK (Kpvg)** Completely weathered, yellowish brown, weak, GRANODIORITE; excavates as a sandy gravel			
10					-Becomes highly weathered			
12								
14					-Becomes moderately weathered; slow advance			
					TOTAL DEPTH 15 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-5,
Log of Test Pit GT-5, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED)

... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-6

ELEV. (MSL.) **1528** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Silty SAND, loose, moist, dark brown; fine to coarse sand; sparse shubs at surface			
2					-Becomes slightly moist, brownish yellow; some gravel			
4								
6								
8					-Slight increase in gravel content			
10								
12								
14								
					TOTAL DEPTH 15 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-6,
Log of Test Pit GT-6, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-7

ELEV. (MSL.) **1513** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, brown; fine to coarse sand; some gravel; sparse shubs at surface			
2								
4					**GRANITIC BEDROCK (Kpvg)** Completely weathered, black and white, weak, GRANODIORITE; excavates as a silty fine to medium sand; slightly finer-grained than in other excavations -Becomes moderately weathered			
6								
8					TOTAL DEPTH 8 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-7,
Log of Test Pit GT-7, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

TEST PIT GT-8

ELEV. (MSL.) **1550** DATE COMPLETED **01/15/2016**

EQUIPMENT **BACK HOE** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Silty SAND, loose, moist, dark brown; fine to coarse sand; sparse shubs at surface			
2				SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, reddish brown; fine to coarse sand; root hairs; moderate porosity (up to 1/8 inch diam.) -Becomes medium dense			
4								
6								
8					**GRANITIC BEDROCK (Kpvg)** Completely weathered, olive to pale yellow, weak, GRANODIORITE; excavates as a silty sand with clay -Becomes highly weathered; brownish yellow; excavates as a gravelly sand -Becomes moderatly weathered; finer grained			
10								
12					TOTAL DEPTH 12 FEET Groundwater not encountered No caving Backfilled with cuttings 1/15/2016			

Figure A-8,
Log of Test Pit GT-8, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◪ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TEST PIT P-1** ELEV. (MSL.) **1515** DATE COMPLETED EQUIPMENT **BACK HOE** BY: **P. THERIAULT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, brown; fine to coarse sand; little gravel; sparse shubs at surface			
	P-1@1							

TOTAL DEPTH 1.5 FEET
Groundwater not encountered
No caving
Backfilled with cuttings 2/05/2016

Figure A-9,
Log of Test Pit P-1, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2145-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TEST PIT P-2** ELEV. (MSL.) **1512** DATE COMPLETED EQUIPMENT **BACK HOE** BY: **P. THERIAULT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	P-2@1			SM	**ALLUVIUM (Qal)** Silty SAND, loose, slightly moist, brown; fine to coarse sand; little gravel; sparse shubs at surface			

TOTAL DEPTH 1 FOOT
Groundwater not encountered
No caving
Backfilled with cuttings 2/05/2016

Figure A-10,
Log of Test Pit P-2, Page 1 of 1

T2145-22-02 APPENDIX A TEST PIT LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

APPENDIX B

APPENDI B

LABORATORY TESTING

We performed laboratory tests in accordance with current, generally accepted test methods of ASTM International (ASTM) or other suggested procedures. We analyzed selected soil samples maximum dry density and optimum moisture content, direct shear strength, corrosion, grain size analysis, and R-Value. The results of the laboratory tests are presented on Figures B1 through B3. Additional laboratory data from previous investigations are presented in *Appendix C*.

SUMMARY OF LABORATORY MA IMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% of dry wt.)
GT-4 @ 8-9’	Silty SAND, brown	135.4	9.3

SUMMARY OF CORROSI ITY TEST RESULTS

Sample No.	Chloride Content (ppm)	Sulfate Content (%)	pH	Resistivity (ohm-centimeter)
GT-2 @ 1-2’	86	0.001	6.4	3,800

Chloride content determined by California Test 422.
Water-soluble sulfate determined by California Test 417.
Resistivity and pH determined by Caltrans Test 643.

SUMMARY OF LABORATORY R ALUE TEST RESULTS ASTM D

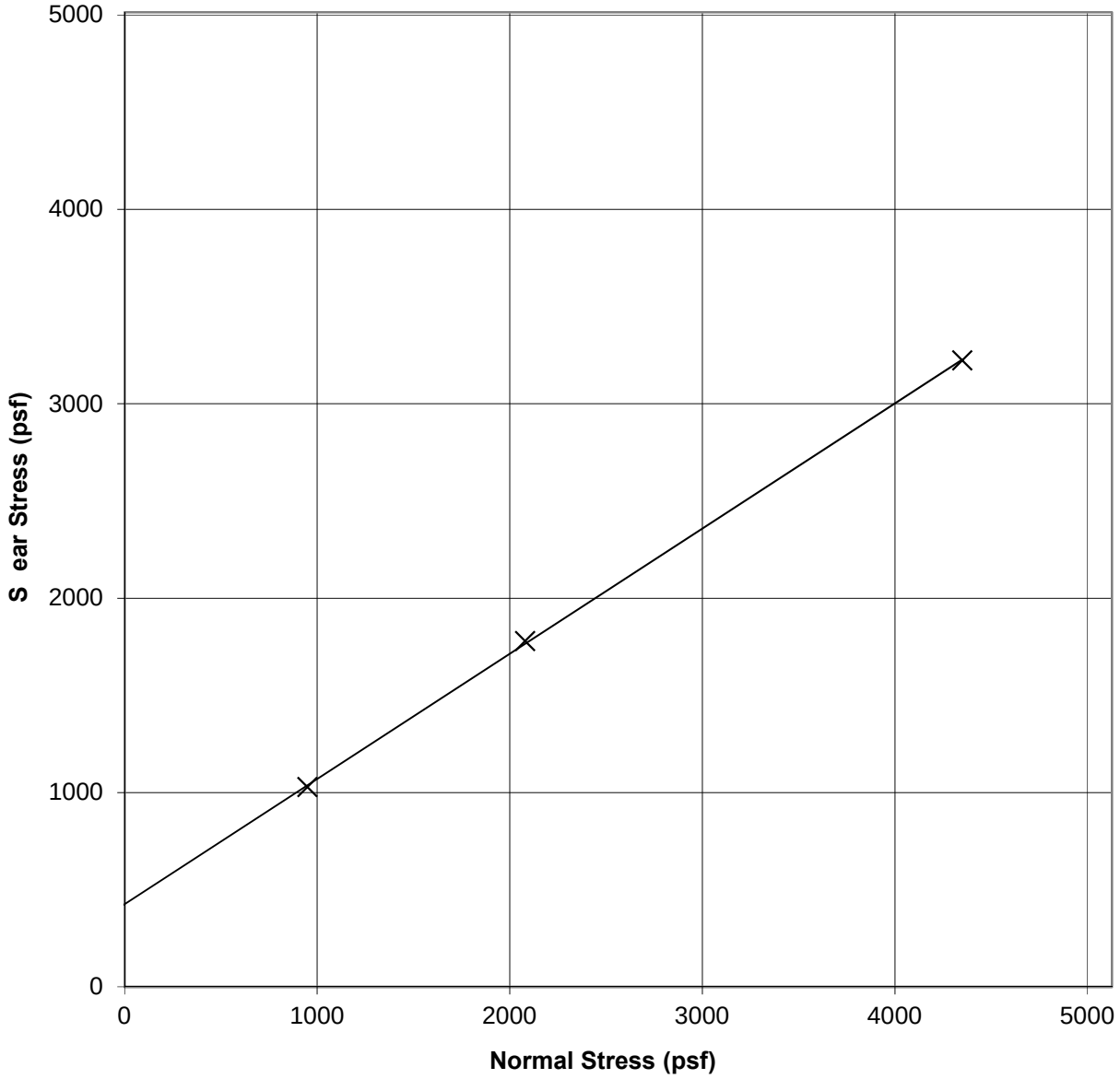
Sample No.	R-Value
GT-2 @ 1-2’	24

GEOCON WEST, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE SUITE 101 MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

LABORATORY TEST RESULTS

UPDATE GEOTECHNICAL INVESTIGATION
MULTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA



SAMPLE ID	SOIL TYPE	INITIAL DRY DENSITY (pcf)	INITIAL MOISTURE ( )	FINAL MOISTURE ( )	C (psf)	ϕ (de)
*GT-4 @ 8'	SM	122.2	8.8	13.8	430	33

*Sample remolded to approximately 90% of the test maximum dry density at optimum moisture content.

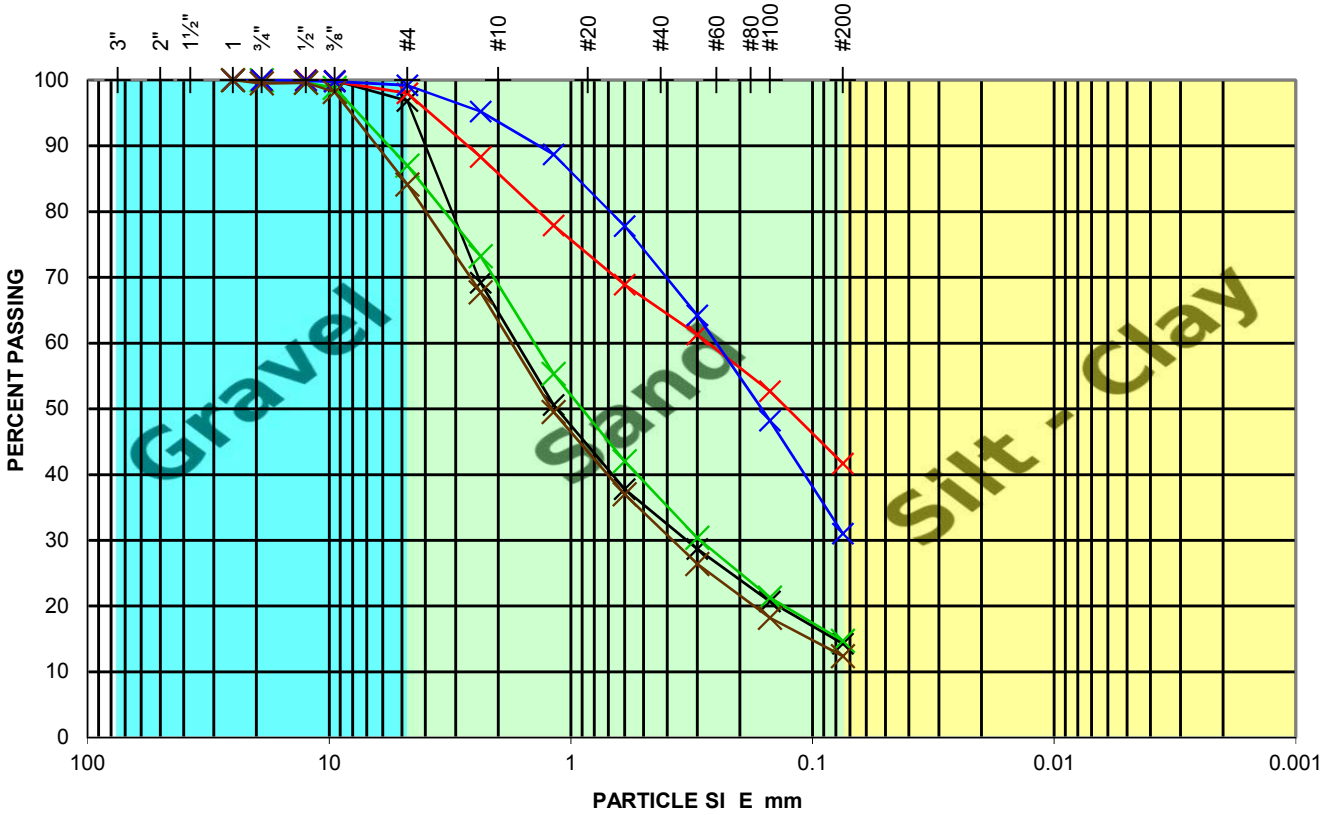
GEOCON
WEST, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE SUITE 101 MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

DIRECT SHEAR TEST RESULTS

UIPDATE GEOTECHNICAL INVESTIGATION
MULTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA

FEBRUARY, 2016 | PROJECT NO. T2145-22-02 | FIG B-2



SAMPLE ID	SAMPLE DESCRIPTION
GT-1 @ 4.5'	SM - Silty SAND, trace Gravel
GT-2 @ 1'	SM - Silty SAND, trace Gravel
GT-4 @ 8'	SM - Silty SAND, trace Gravel
P-1 @ 1'	SM - Silty SAND, little Gravel
P-2 @ 1'	SM - Silty SAND, little Gravel

GEOCON
WEST, INC.
GEOTECHNICAL CONSULTANTS
41571 CORNING PLACE SUITE 101 MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

GRAIN SIZE DISTRIBUTION

UPDATE GEOTECHNICAL INVESTIGATION
MUTI-FAMILY DEVELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR, CALIFORNIA

FEBRUARY, 2016	PROJECT NO. T2145-22-01	FIG. B-3

APPENDIX C

APPENDI C

PRE IOUS E PLORATION LOGS
AND LABORATORY TEST DATA

FOR

MULI FAMILY DE ELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR CALIFORNIA

PRO ECT NO T

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on July 1 and 2, 2003, and consisted of a site reconnaissance, the advancement of three exploratory excavations and 11 air-track borings. The exploratory excavations were made with a D8 dozer. The air-track borings were excavated to depths ranging from 40 to 80 feet below existing grade using an Ingersoll-Rand ECM-370 air-track drill rig equipped with a 4-inch bit. An additional 3 air-track borings and two exploratory excavations were excavated on the easterly adjacent tract (Tract No. 29426). During advancement of the air-track borings, the rate of penetration was timed. The rates of penetration as a function of depth (for all 14 borings) are plotted on Figures A-1 through A-14. Based on information provided by Edick & Watt, Inc., the drill penetration rates can be related to the rock rippability approximately as noted below:

Drill Rates	Rippability Characteristics
0-20 sec/ft	Rippable
20-30 sec/ft	Marginally Rippable
+30 sec/ft	Non-Rippable

Previous investigations by Byerly (2001 and 2002) on the easterly adjacent property included borings and trench excavation logs which are provided in Appendix C. The soil conditions encountered in the Geocon excavations were visually examined, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The approximate locations of the exploratory excavations are shown on the Geologic Map, Figure 2.

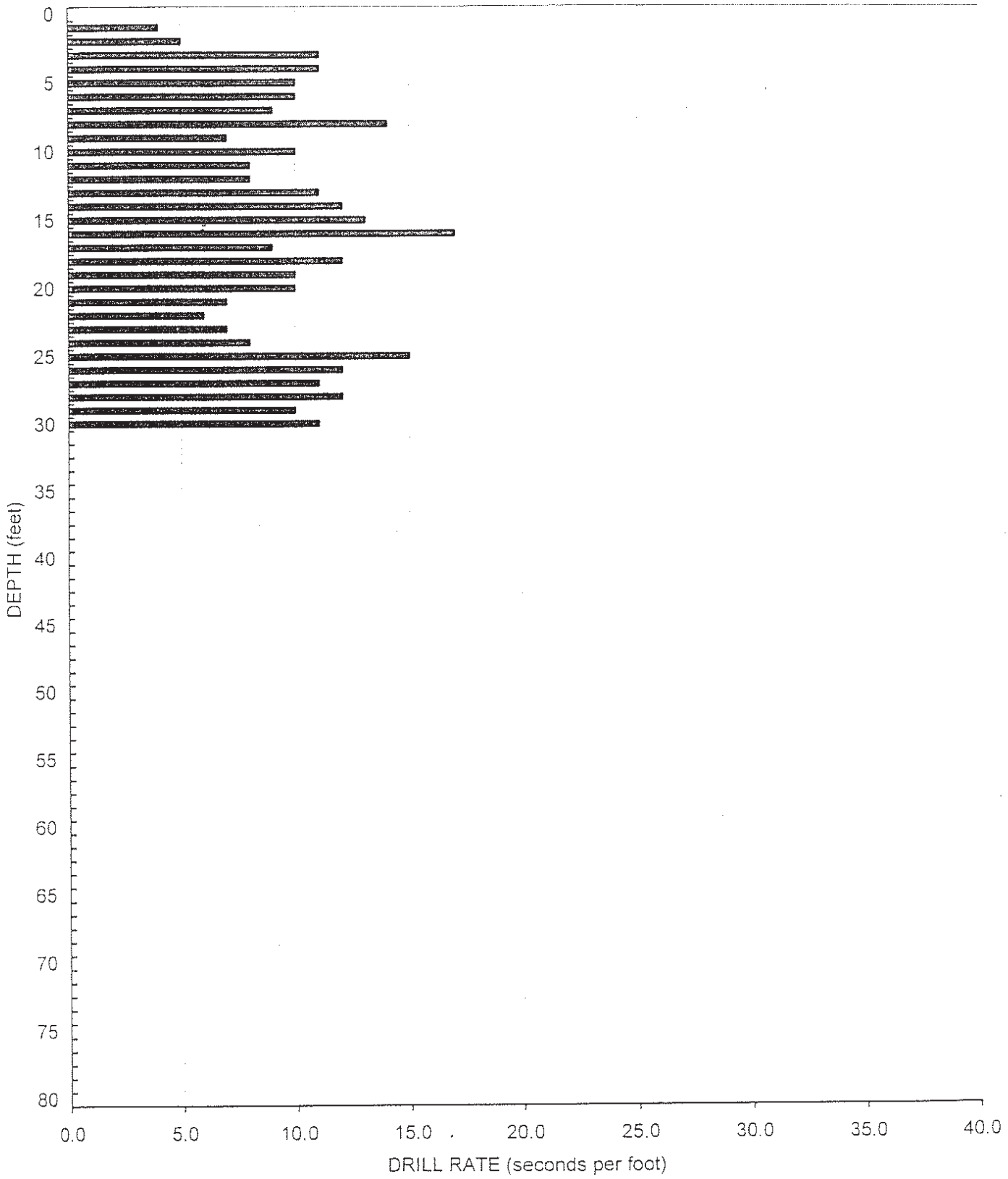
TRACT NO. 26372

AIR TRACK BORING AT-4

Elevation - 1570Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT04.xls

FIGURE A-4

FIGURE C-1

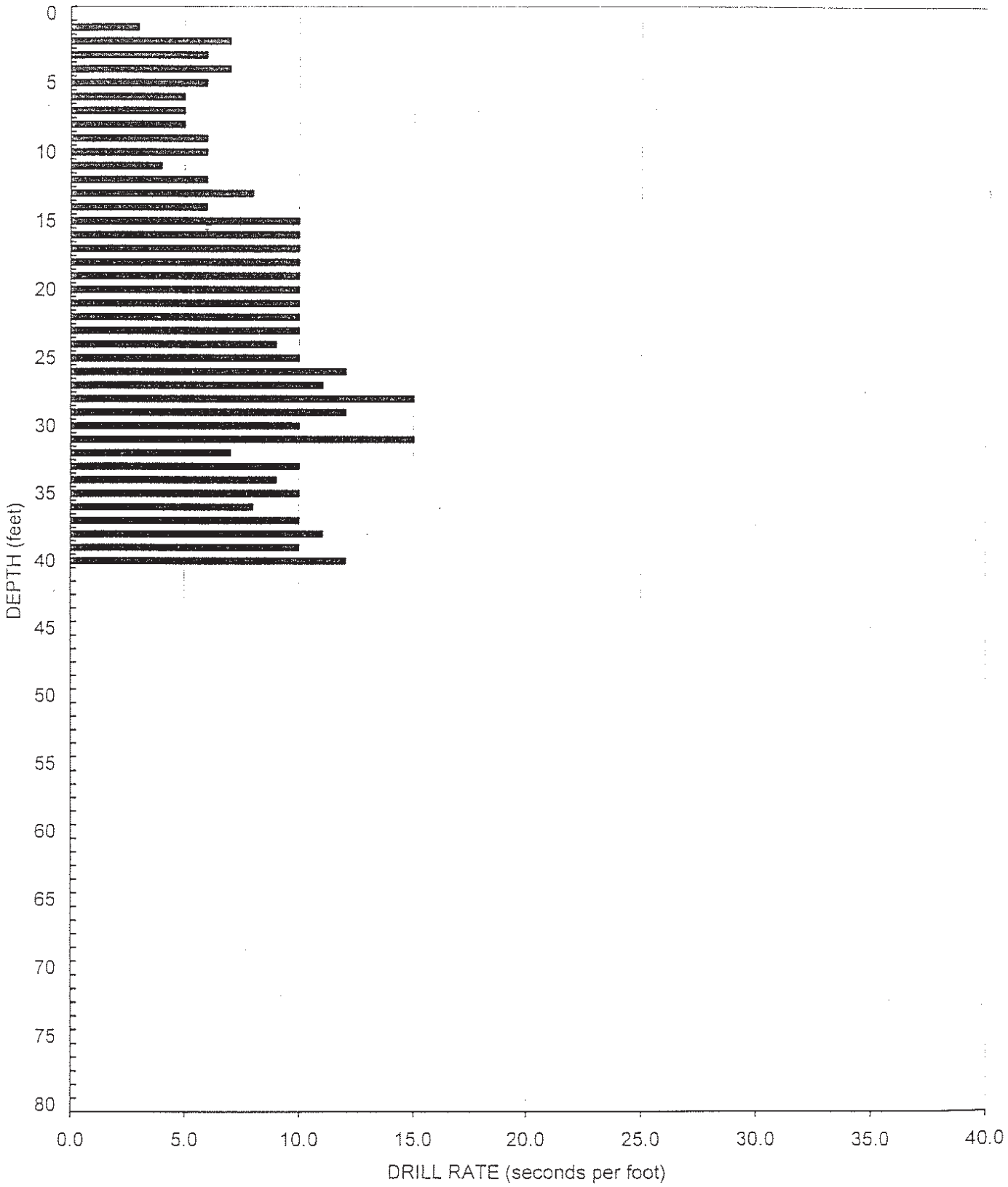
TRACT NO. 26372

AIR TRACK BORING AT-5

Elevation - 1590 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT05.xls

FIGURE A-5

FIGURE C-2

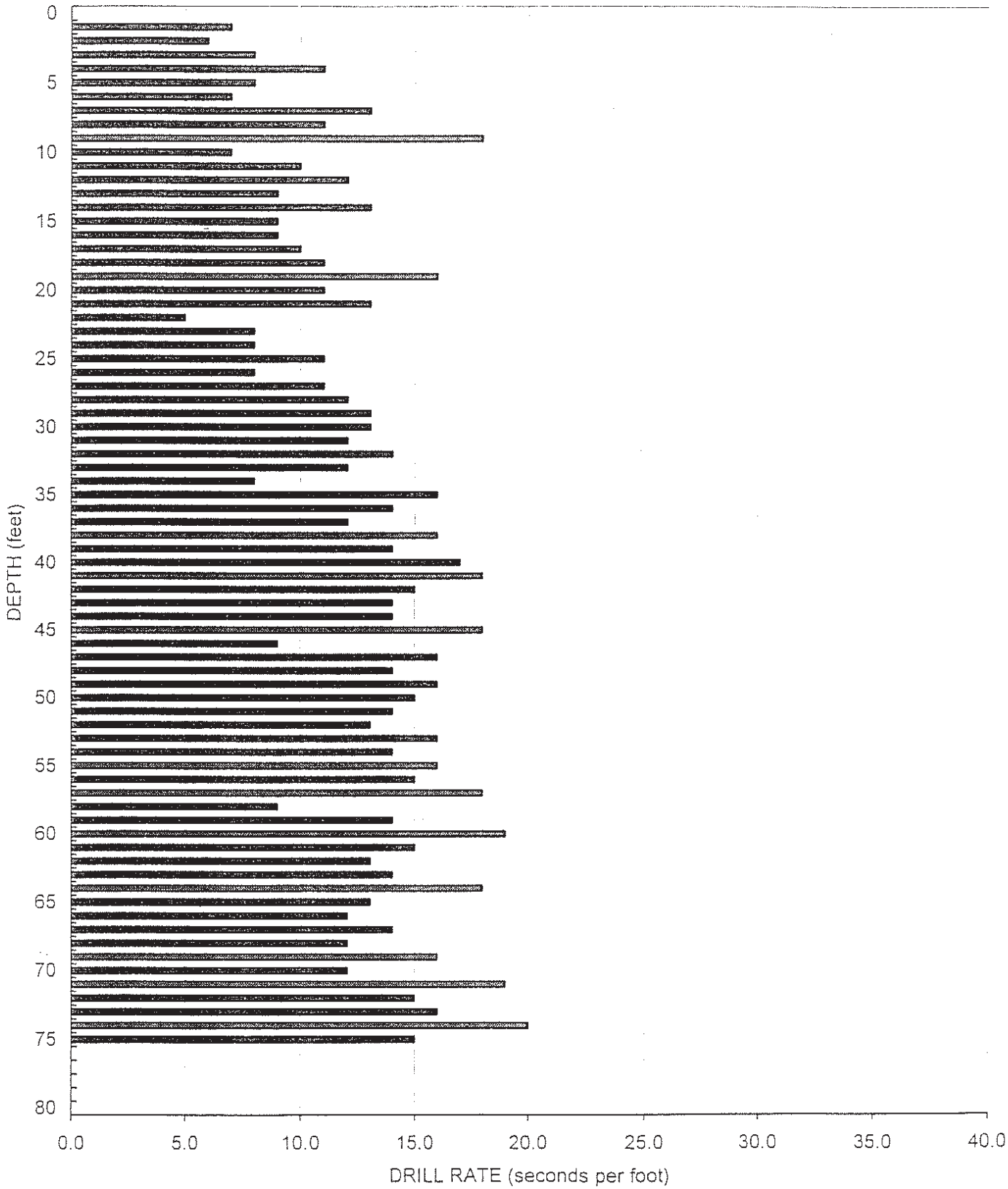
TRACT NO. 26372

AIR TRACK BORING AT-6

Elevation - 1660 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT06.xls

FIGURE A-6

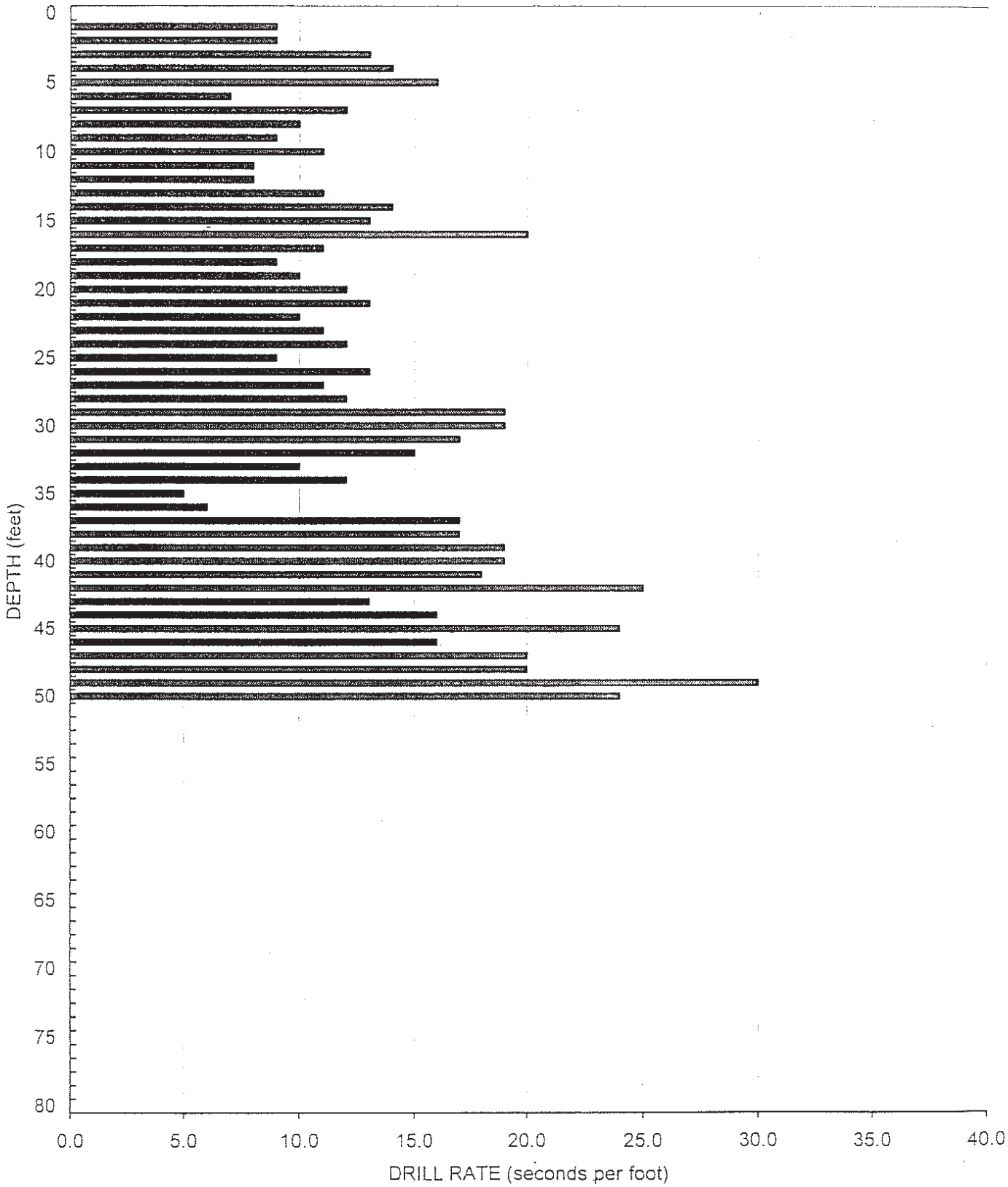
TRACT NO. 26372

AIR TRACK BORING AT-7

Elevation - 1654 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT07.xls

FIGURE A-7

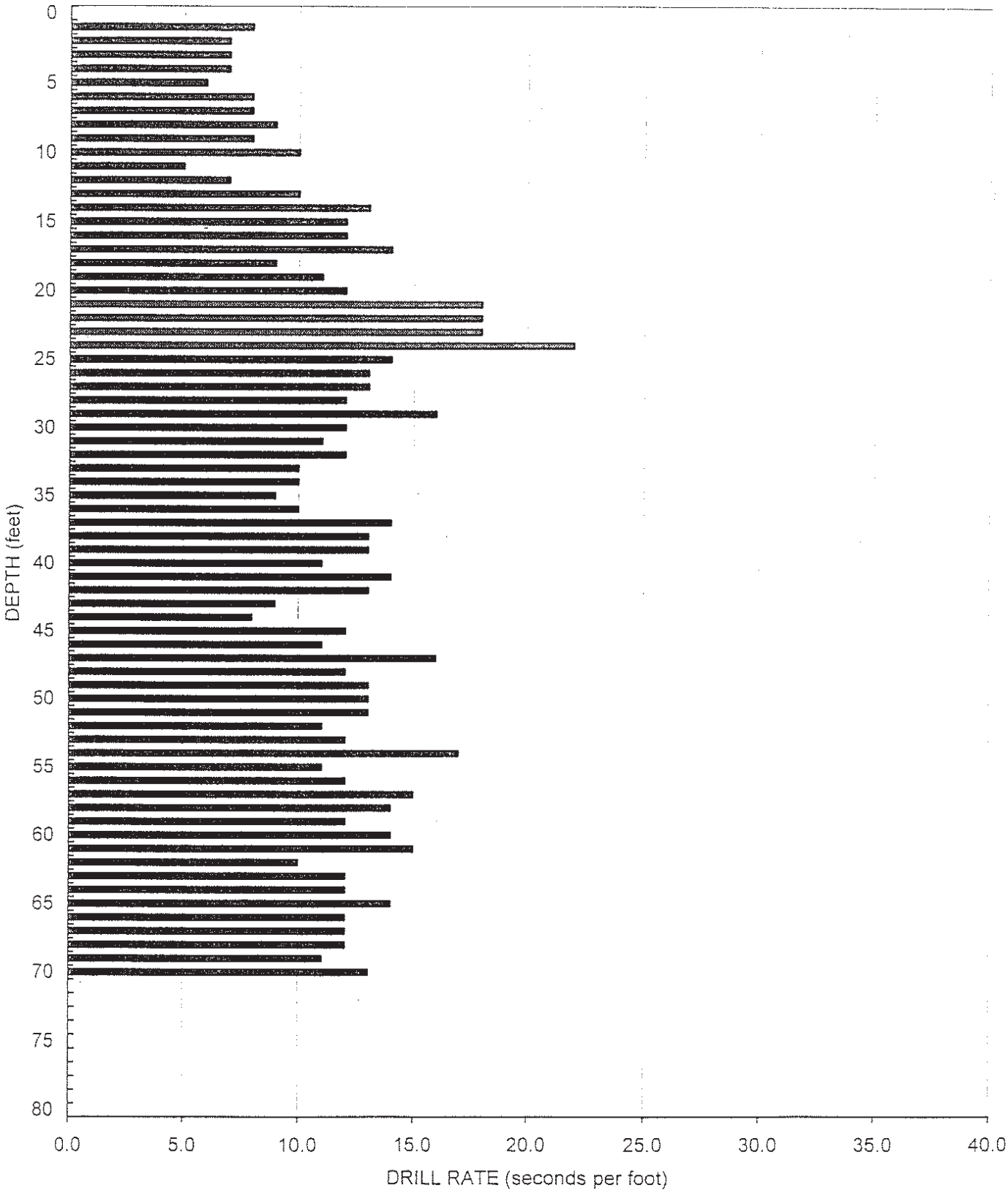
TRACT NO. 26372

AIR TRACK BORING AT-8

Elevation - 1656 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT08.xls

FIGURE A-8

FIGURE C-5

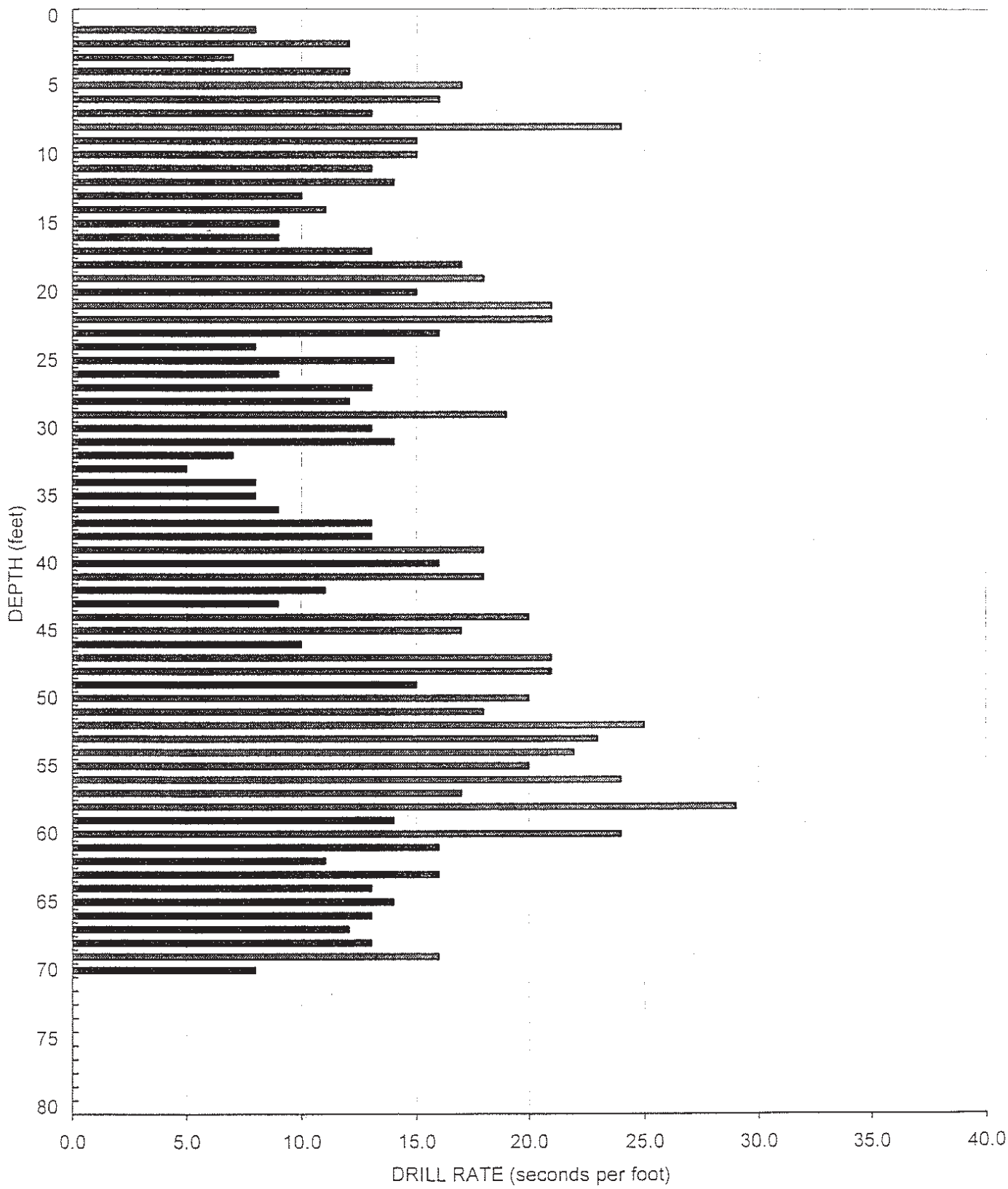
TRACT NO. 26372

AIR TRACK BORING AT-9

Elevation - 1686 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT09.xls

FIGURE A-9

FIGURE C-6

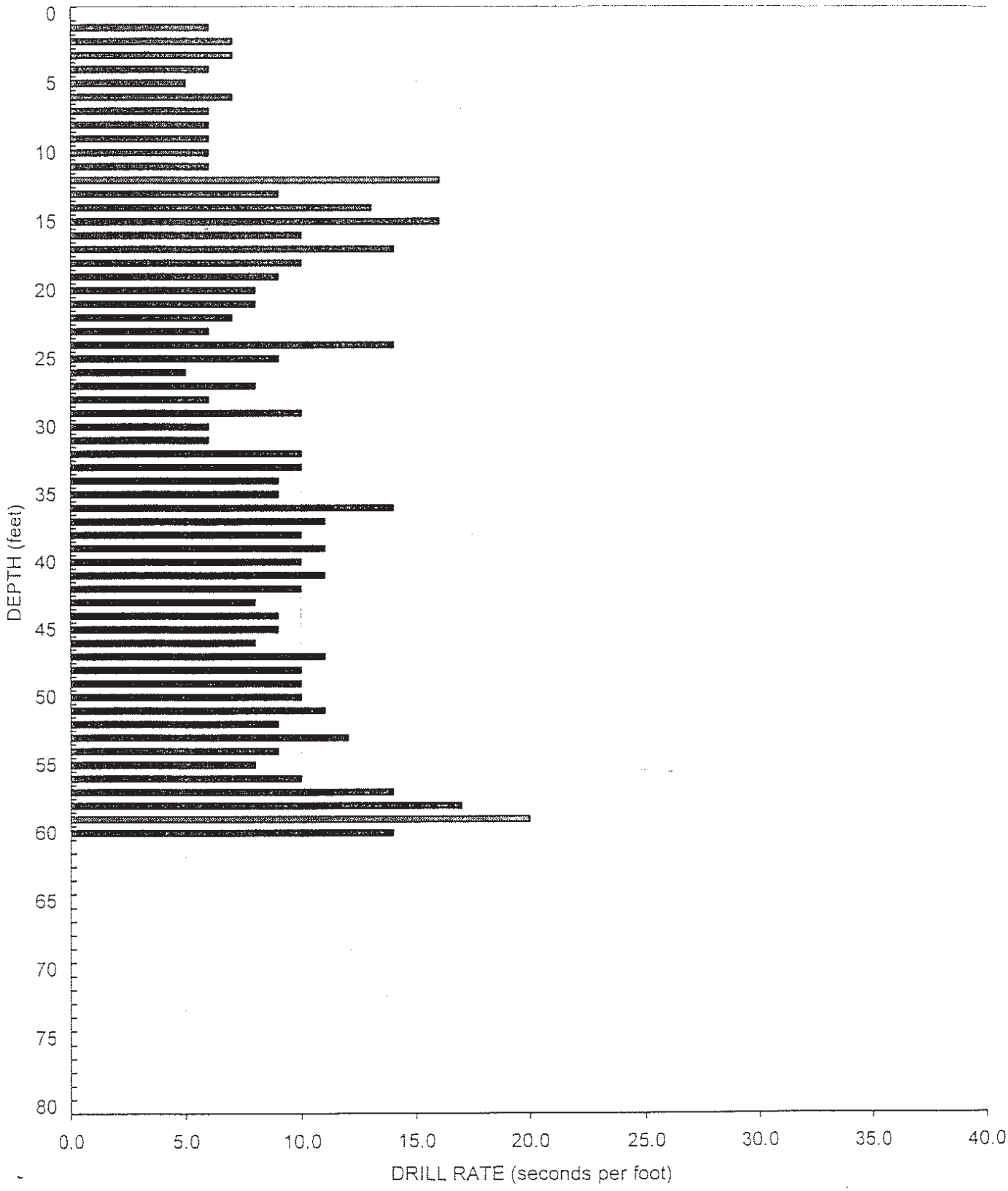
TRACT NO. 26372

AIR TRACK BORING AT-10

Elevation - 1660 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT10.xls

FIGURE A-10

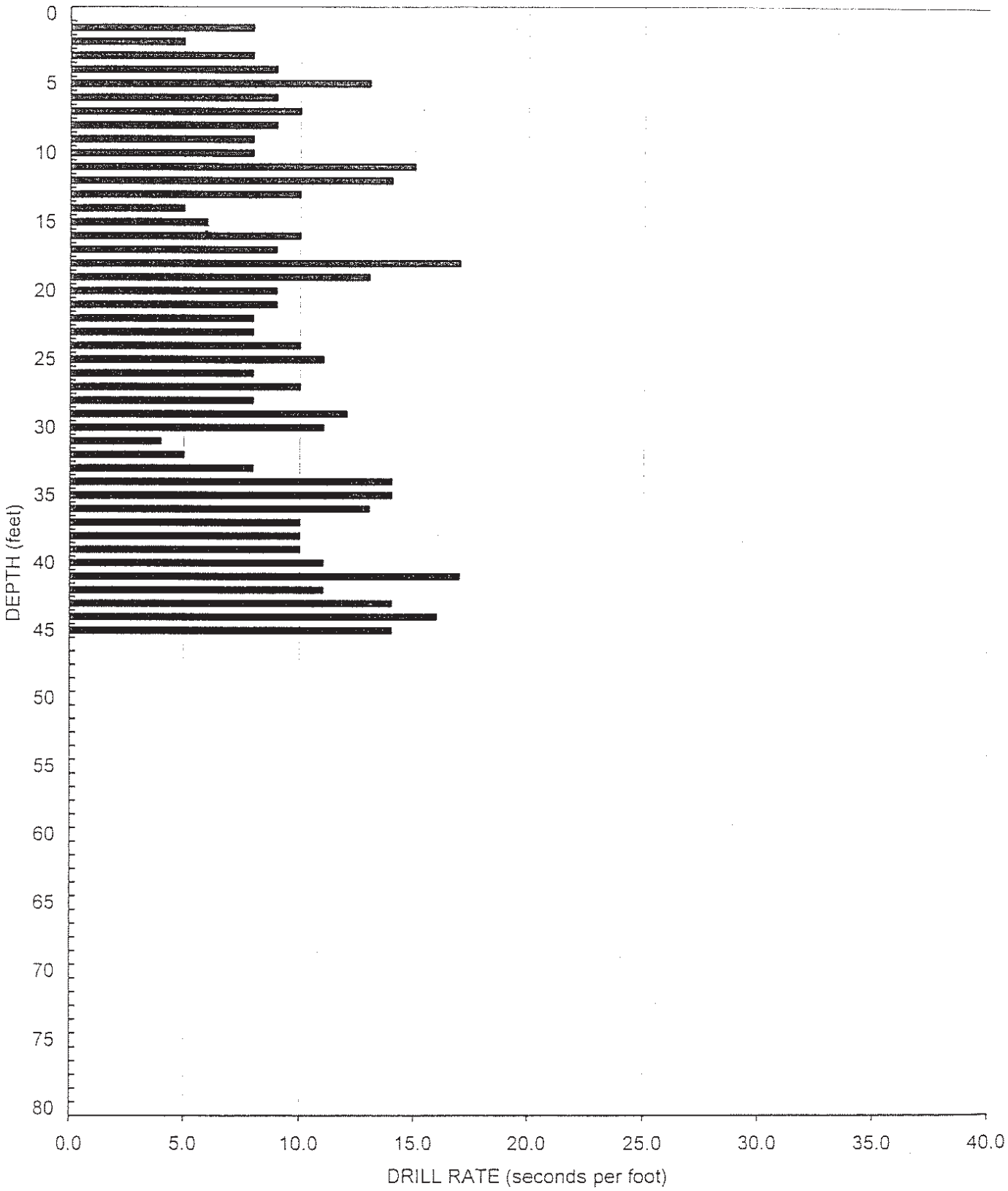
TRACT NO. 26372

AIR TRACK BORING AT-11

Elevation - 1640 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT11.xls

FIGURE A-11

FIGURE C-8

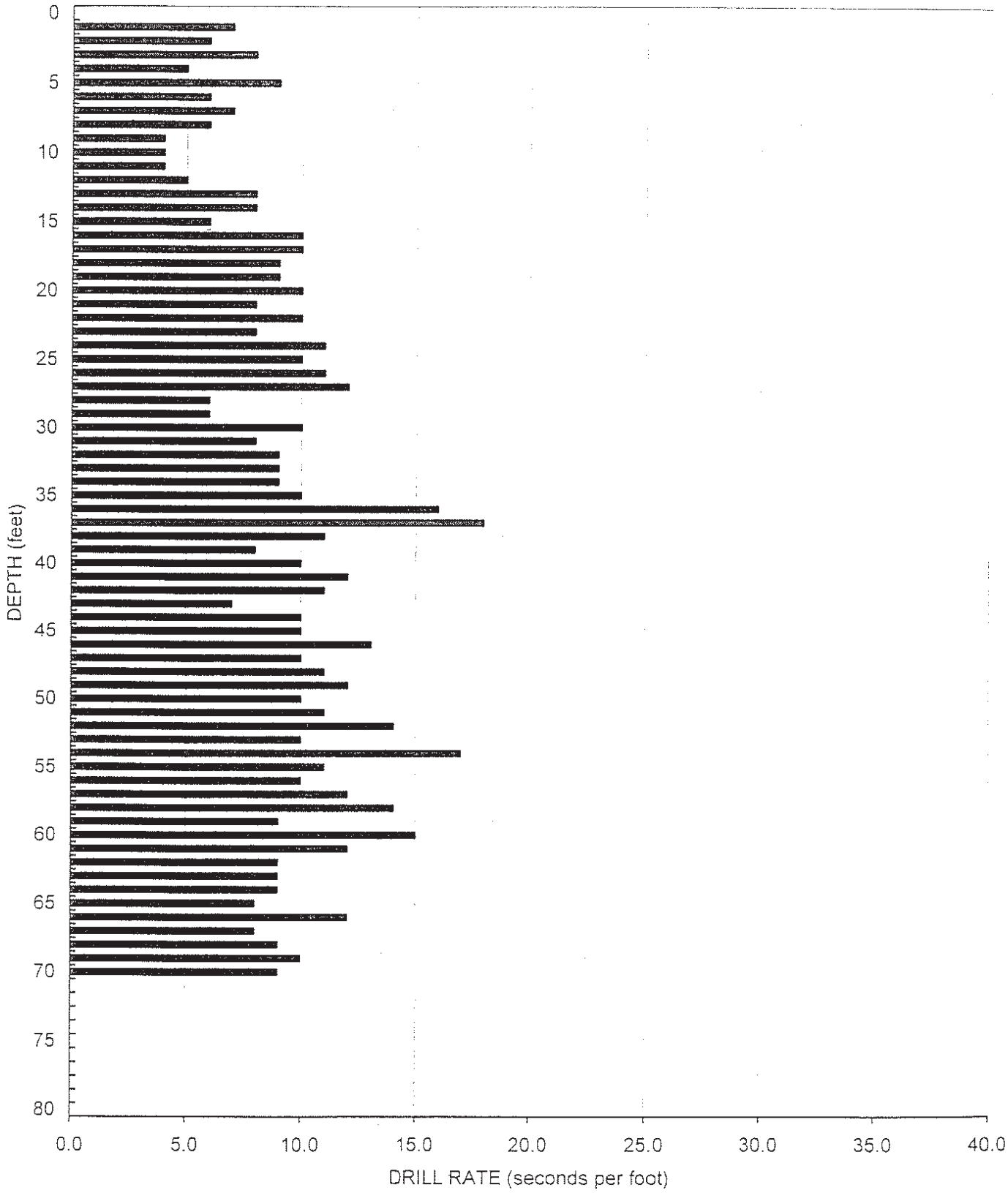
TRACT NO. 26372

AIR TRACK BORING AT-12

Elevation - 1654 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT12.xls

FIGURE A-12

FIGURE C-9

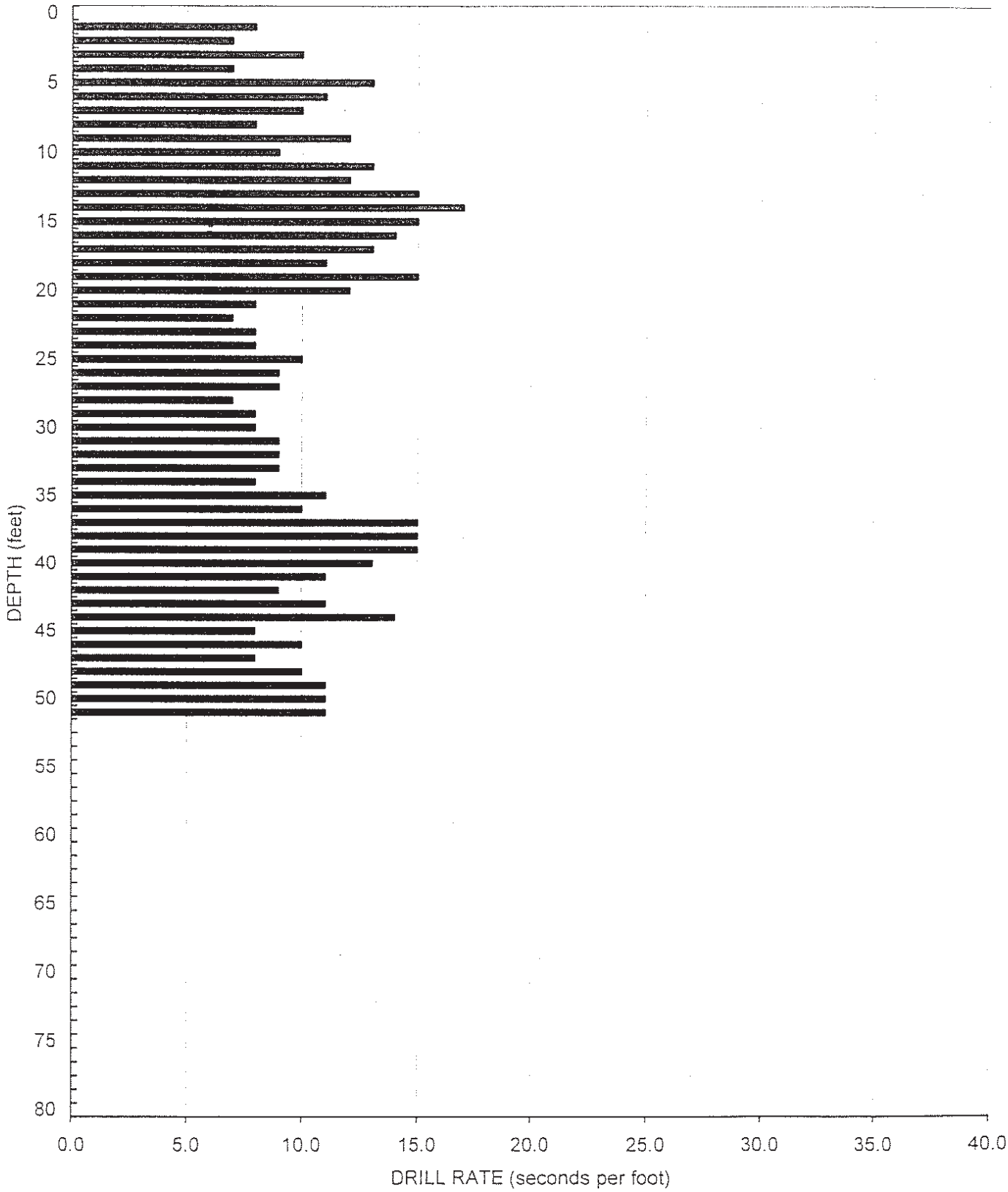
TRACT NO. 26372

AIR TRACK BORING AT-13

Elevation - 1640 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT13.xls

FIGURE A-13

FIGURE C-10

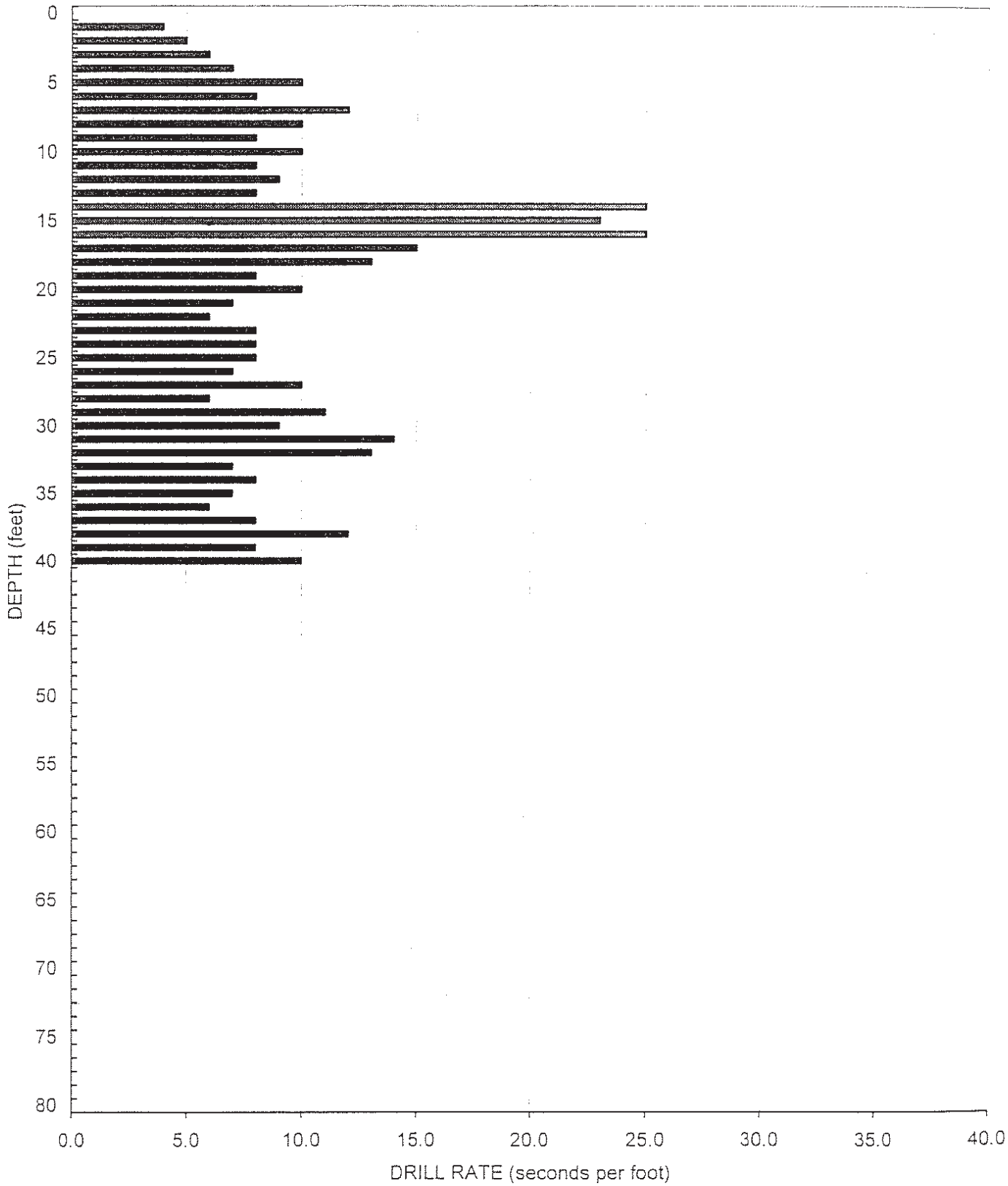
TRACT NO. 26372

AIR TRACK BORING AT-14

Elevation - 1620 Feet (MSL)

Date 07-02-2003 - Equipment: IR 370

GEOCON INCORPORATED



AT14.xls

FIGURE A-14

FIGURE C-11

PROJECT NO. 20145-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1 ELEV. (MSL.) 1540 DATE COMPLETED 07/01/03 EQUIPMENT D8R DOZER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T1-1			SM	**TOPSOIL** Loose, medium to reddish brown, dry, Silty, fine to coarse SAND, trace gravel			
2				SM	**GRANITIC ROCK** Dense, highly weathered, medium brown to gray, fine to coarse-grained intrission igneous ROCK, moderately to highly fractured -Excavates as a Silty, fine to coarse SAND -Becomes highly to moderately weathered			
4								
6					TRENCH TERMINATED AT 6 FEET			

20145-12-01.GPJ

Figure A-15,
Log of Trench T 1, Page 1 of 1

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20145-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 3 ELEV. (MSL.) 1566 DATE COMPLETED 07/01/03 EQUIPMENT D8R DOZER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Loose, medium to reddish brown, dry, Silty, fine to coarse SAND, trace gravel			
2				SM	**GRANITIC ROCK** Dense, highly to moderately weathered, gray, fine to coarse-grained intrussive igneous ROCK, moderately fractured -Excavates as a Silty, fine to coarse SAND			
4					-Becomes moderately to slightly weathered			
					TRENCH TERMINATED AT 5.5 FEET			

Figure A-17,
Log of Trench T 3, Page 1 of 1

20145-12-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20145-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 4 ELEV. (MSL.) 1582 DATE COMPLETED 07/01/03 EQUIPMENT D8R DOZER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	T4-1			SM	**TOPSOIL** Loose, reddish brown, dry, Silty, Clayey, fine to coarse SAND, trace fine gravel			
2 4				-SM	**GRANITIC ROCK** Dense, highly weathered, gray, fine to coarse-grained intrussive igneous ROCK, moderately fractured -Excavates as a Silty, fine to medium SAND			
					TRENCH TERMINATED AT 5 FEET			

Figure A-18,
Log of Trench T 4, Page 1 of 1

20145-12-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20145-12-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5 ELEV. (MSL.) _____ DATE COMPLETED 07/01/03 EQUIPMENT D8R DOZER	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**TOPSOIL** Loose, reddish brown, dry, Silty, fine to coarse SAND, trace clay, fine gravel			
2				SM				
	T5-1				**GRANITIC ROCK** Dense, highly weathered, gray, fine to coarse-grained intrussive igneous ROCK, moderately fractured			
4								
6					TRENCH TERMINATED AT 6 FEET			

Figure A-19,
Log of Trench T 5, Page 1 of 1

20145-12-01.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

LABORATORY TESTING

Laboratory tests were previously performed by Byerly (2001, 2002) on the easterly parcel (Tract No. 29426) in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Laboratory testing was also performed by Geocon for this investigation. Disturbed bulk representative samples collected during the Geocon investigation were also tested to determine maximum dry density and optimum moisture content, expansion characteristics and strength parameters. A water-soluble sulfate test was also conducted. Results of the laboratory tests are presented in tabular form herewith.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-00

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
TP-1*	Brown, silty fine to coarse SAND	132.6	7.2
TP-11*	Brown, silty fine to coarse SAND	130.4	9.3
B-2*	Light Brown silty fine to coarse SAND	133.4	9.7
T5-1	Brown to Grey silty fine to coarse SAND	130.2	9.5

*Data obtained from report by John R. Byerly Inc., dated March 14, 2002.

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-95

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T5-1	8.3	22.1	116.6	25

TABLE B-III
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Sample Depth (ft)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
TP-2(1)	4.0	150	36
TP-3*(1)	3.5-12.5	175	42
TP-5*(1)	6.0-12.0	150	38
T5-1*	3.0-4.0	260	41

* Sample remolded to 90 percent relative compaction at near or slightly above optimum moisture content.

(1) Data obtained from report by John R. Byerly Inc., dated April 13, 2001.

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)	Sulfate Exposure
T5-1	0.015	Negligible

APPENDIX D

APPENDI D

RECOMMENDED GRADING SPECIFICATIONS

FOR

MULI FAMILY DE ELOPMENT
BUNDY CANYON ROAD NEAR TULIP LANE
WILDOMAR CALIFORNIA

PRO ECT NO T

RECOMMENDED GRADING SPECIFICATIONS

GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

CLEARING AND PREPARING AREAS TO BE FILLED

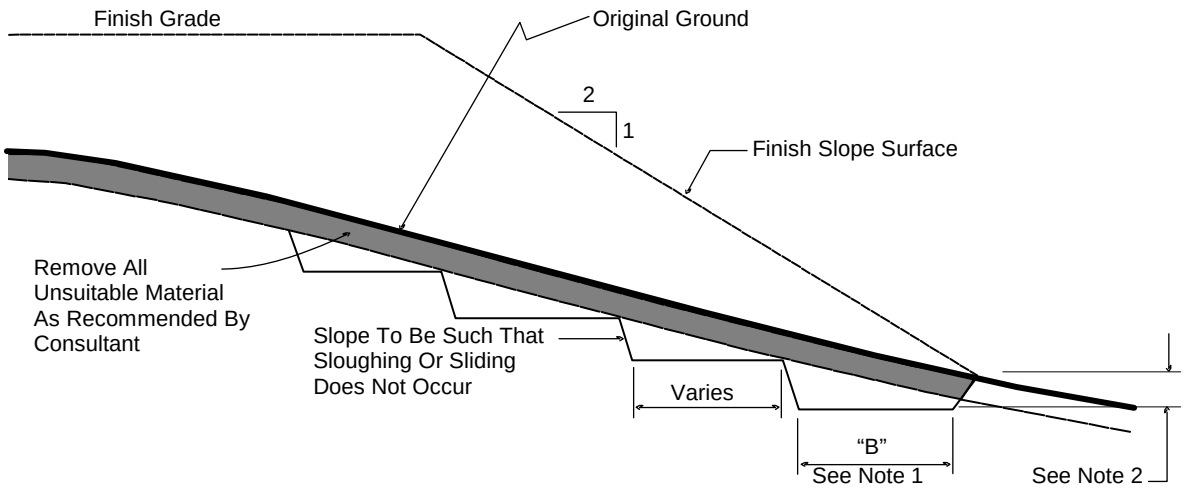
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES:

(1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

COMPACTION E UIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

PLACING SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

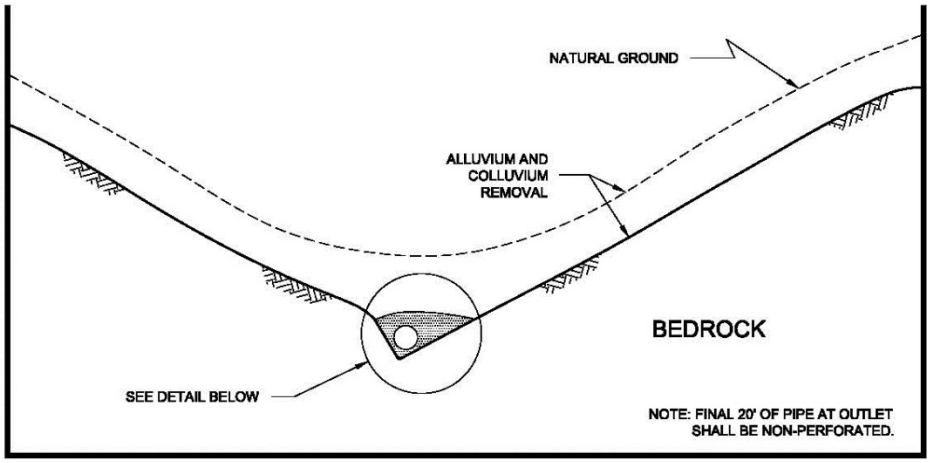
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

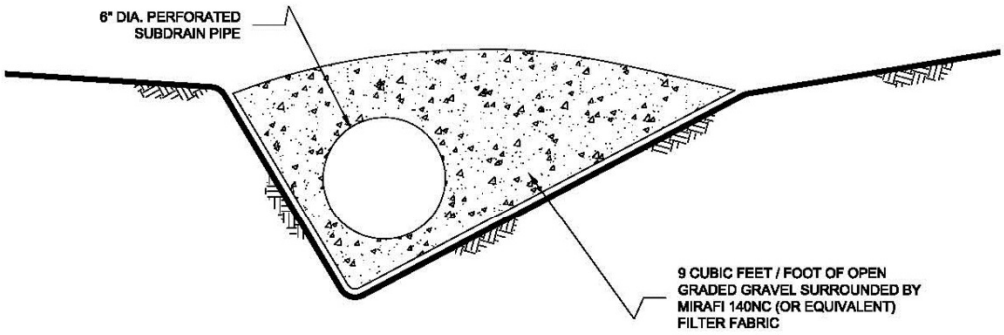
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

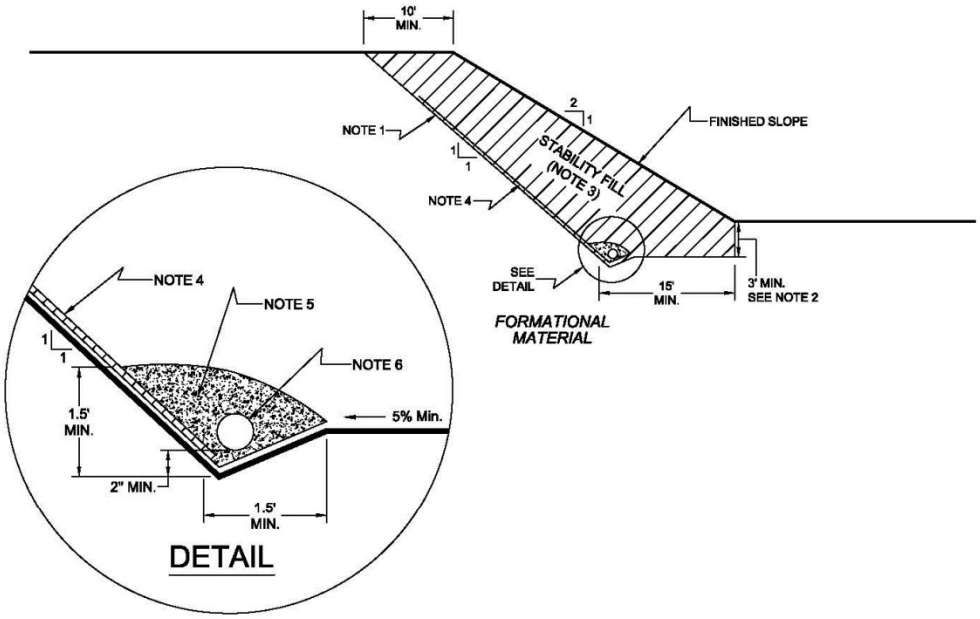
1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

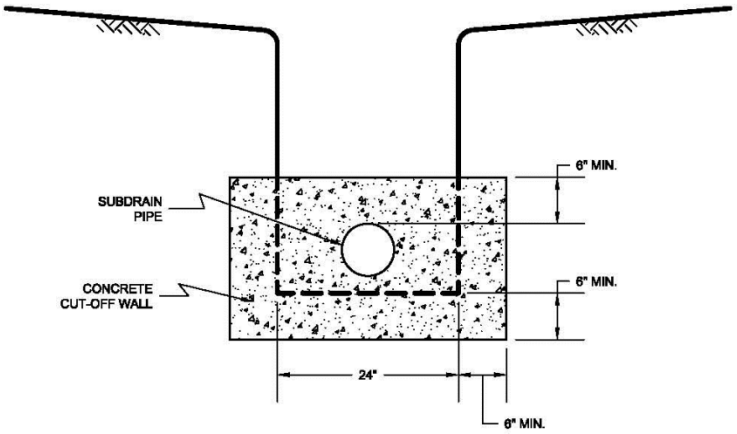
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

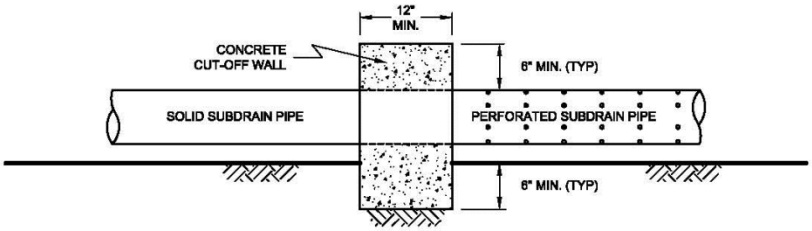
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

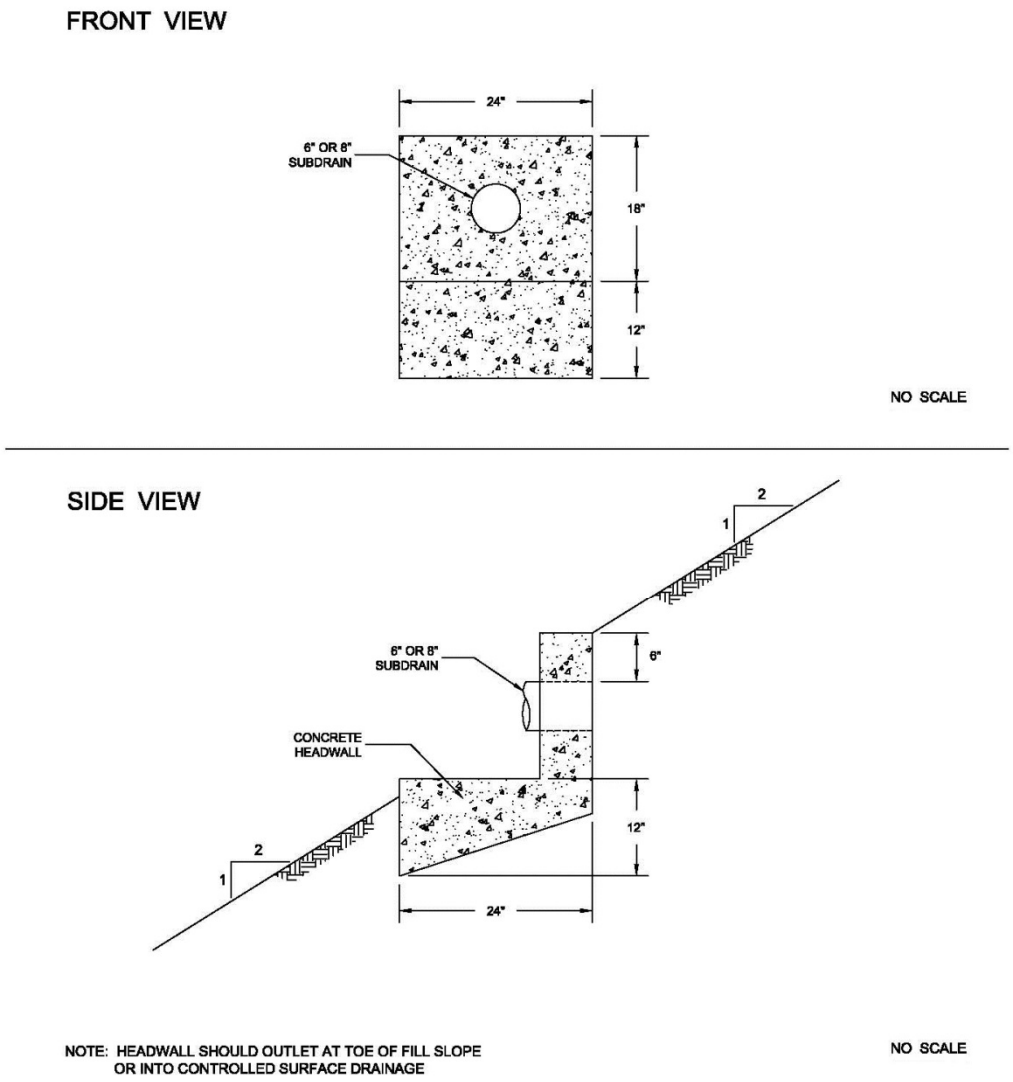
SIDE VIEW



NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL



7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

OBSER ATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

Soil and Soil Roc Fills

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

PROTECTION OF WOR

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

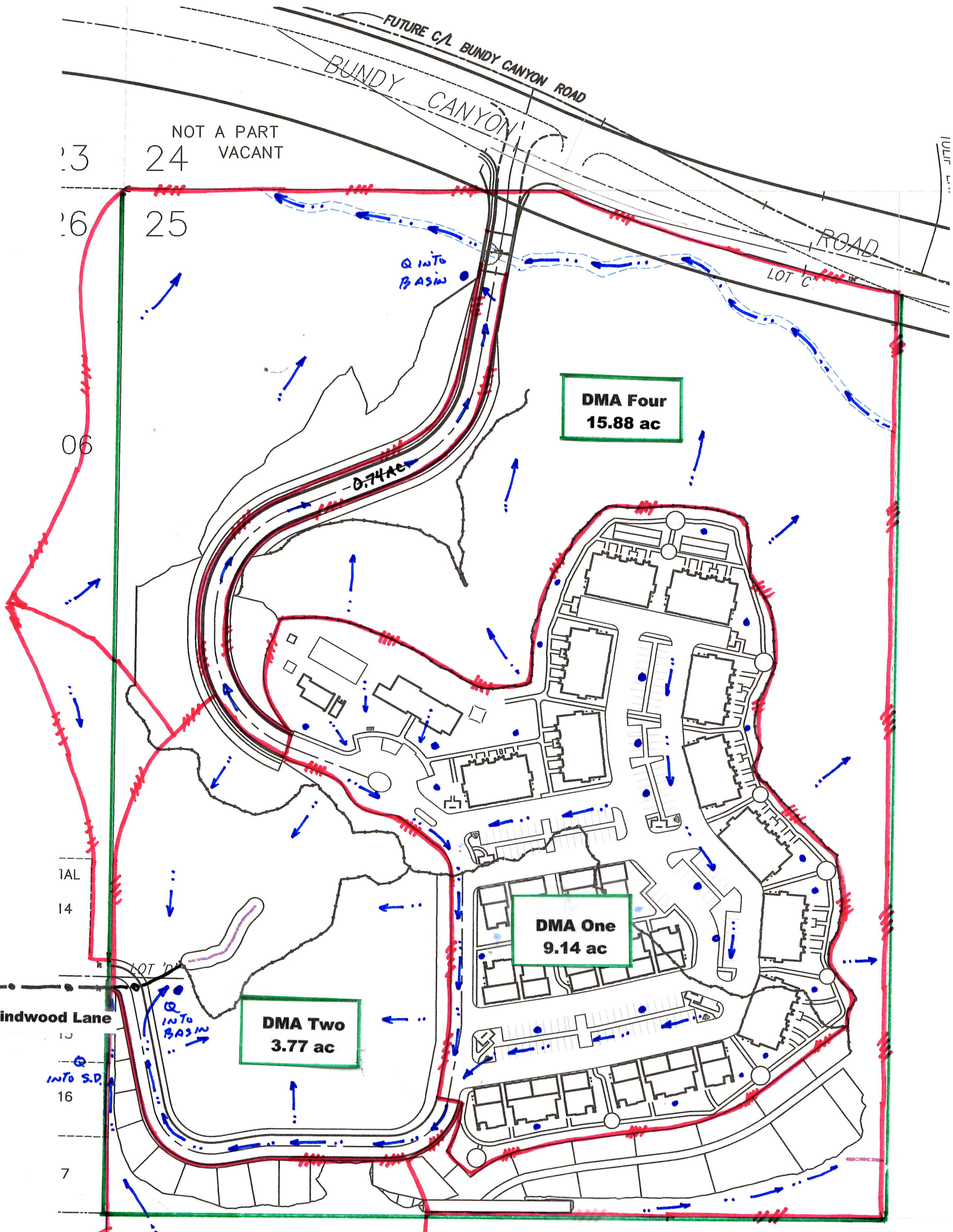
Project will require Burrowing Owl Surveys.

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation



BUNDY CANYON APARTMENTS

MAP C - WQMP Map

Date: 10/24/2016

Legend

Drainage Management Area/Size **DMA One - 9.14 acres**

Project Limits

Bio-Retention Swale

DMA Boundary

Flow Path

Off-site Storm Drain Pipe

On-site Storm Drain Pipe

Natural Basin

N

0' 120'

SMRHM

PROJECT REPORT

General Model Information

Project Name:	BC DMA One 10-25-2016b
Site Name:	Bundy Canyon Apartments
Site Address:	Bundy Canyon at Tulip
City:	Windomar, CA
Report Date:	10/25/2016
Gage:	Wildomar / North Murrieta
Data Start:	1949/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	0.710
Version Date:	2016/08/31

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year
Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year
Low Flow Threshold for POC3:	10 Percent of the 2 Year
High Flow Threshold for POC3:	10 Year

DRAFT

Landuse Basin Data

Predeveloped Land Use

DMA 1 - Apartment Site Before

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Very(>20%)	12.91
Pervious Total	12.91
Impervious Land Use	acre
Impervious Total	0
Basin Total	12.91

Element Flows To:

Surface	Interflow	Groundwater

DRAFT

DMA 2 - Southerly Off-site Before

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Very(>20%)	6.71
Pervious Total	6.71
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.71

Element Flows To:

Surface	Interflow	Groundwater

DRAFT

DMA 3 - Northerly Off-site Before

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Shrub,Very(>20%)	19.04
Pervious Total	19.04
Impervious Land Use	acre
Impervious Total	0
Basin Total	19.04

Element Flows To:

Surface	Interflow	Groundwater

DRAFT

Mitigated Land Use

DMA One - Roof Areas

Bypass:	No
Impervious Land Use	acre
Roof Area LAT	2.5
Element Flows To:	
Outlet 1	Outlet 2

DMA One - Driveway Areas

DRAFT

DMA One - Driveway Areas

Bypass:	No
Impervious Land Use	acre
Driveways,Flat(0-5%) LAT	3.2

Element Flows To:

Outlet 1	Outlet 2

DMA One - Landscape Areas

DRAFT

DMA One - Landscape Areas

Bypass: No

GroundWater: No

Pervious Land Use	acre
C D,Grass,Flat(0-5%)	3.44

Element Flows To:

Surface	Interflow	Groundwater
Surface cape Swales	Surface cape Swales	

DRAFT

DMA Two - Natural Basin Area

Bypass: No

GroundWater: No

Pervious Land Use	acre
C D,Shrub,St(10-20%)	3.77

Element Flows To:

Surface		Interflow		Groundwater
Surface	Area Swale	Surface	Area Swale	

DRAFT

DMA Three - Off-site Areas

Bypass: No

GroundWater: No

Pervious Land Use	acre
C D,Shrub,Very(>20%)	6.71

Element Flows To:

Surface	Interflow	Groundwater

DRAFT

DMA Four - Northerly Areas

Bypass: No

GroundWater: No

Pervious Land Use	acre
C D,Shrub,Very(>20%)	15.1

Element Flows To:

Surface	Interflow	Groundwater
Surface s Road Basin	Surface s Road Basin	

DRAFT

DMA Four - Northerly Access Road Area

Bypass:	No
Impervious Land Use	acre
Roads,Mod(5-10%) LAT	0.78

Element Flows To:

Outlet 1	Outlet 2

DMA Four - Northerly Areas

DRAFT

Routing Elements
Predeveloped Routing

DRAFT

Mitigated Routing

DMA One - Parking and Landscape Swales

Bottom Length:	600.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	3
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	3
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.33
Orifice Diameter (in.):	0.1
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	8.107
Total Outflow (ac-ft.):	78.939
Percent Through Underdrain:	10.27
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Orifice 1 Diameter:	0.1 in. Elevation:0.5 ft.
Element Flows To:	
Outlet 1	Outlet 2
Surface Area Swale	

DRAFT

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1377	0.0000	0.0000	0.0000
0.0824	0.1377	0.0052	0.0000	0.0000
0.1648	0.1377	0.0104	0.0000	0.0000
0.2473	0.1377	0.0156	0.0000	0.0000
0.3297	0.1377	0.0208	0.0000	0.0000
0.4121	0.1377	0.0260	0.0000	0.0000
0.4945	0.1377	0.0311	0.0000	0.0000
0.5769	0.1377	0.0363	0.0000	0.0000
0.6593	0.1377	0.0415	0.0000	0.0000
0.7418	0.1377	0.0467	0.0000	0.0000
0.8242	0.1377	0.0519	0.0000	0.0000
0.9066	0.1377	0.0571	0.0000	0.0000
0.9890	0.1377	0.0623	0.0000	0.0000
1.0714	0.1377	0.0675	0.0000	0.0000
1.1538	0.1377	0.0727	0.0000	0.0000
1.2363	0.1377	0.0779	0.0000	0.0000
1.3187	0.1377	0.0831	0.0000	0.0000
1.4011	0.1377	0.0883	0.0000	0.0000
1.4835	0.1377	0.0934	0.0000	0.0000
1.5659	0.1377	0.0986	0.0000	0.0000
1.6484	0.1377	0.1038	0.0000	0.0000
1.7308	0.1377	0.1090	0.0000	0.0000
1.8132	0.1377	0.1142	0.0000	0.0000
1.8956	0.1377	0.1194	0.0000	0.0000
1.9780	0.1377	0.1246	0.0000	0.0000
2.0604	0.1377	0.1298	0.0000	0.0000
2.1429	0.1377	0.1350	0.0000	0.0000
2.2253	0.1377	0.1402	0.0000	0.0000

2.3077	0.1377	0.1454	0.0000	0.0000
2.3901	0.1377	0.1506	0.0000	0.0000
2.4725	0.1377	0.1557	0.0000	0.0000
2.5549	0.1377	0.1609	0.0000	0.0000
2.6374	0.1377	0.1661	0.0000	0.0000
2.7198	0.1377	0.1713	0.0000	0.0000
2.8022	0.1377	0.1765	0.0000	0.0000
2.8846	0.1377	0.1817	0.0000	0.0000
2.9670	0.1377	0.1869	0.0000	0.0000
3.0495	0.1377	0.1916	0.0000	0.0000
3.1319	0.1377	0.1963	0.0000	0.0000
3.2143	0.1377	0.2010	0.0000	0.0000
3.2967	0.1377	0.2057	0.0000	0.0000
3.3791	0.1377	0.2104	0.0000	0.0000
3.4615	0.1377	0.2152	0.0000	0.0000
3.5440	0.1377	0.2199	0.0000	0.0000
3.6264	0.1377	0.2246	0.0000	0.0000
3.7088	0.1377	0.2293	0.0000	0.0000
3.7912	0.1377	0.2340	0.0000	0.0000
3.8736	0.1377	0.2387	0.0000	0.0000
3.9560	0.1377	0.2434	0.0000	0.0000
4.0385	0.1377	0.2481	0.0000	0.0000
4.1209	0.1377	0.2528	0.0000	0.0000
4.2033	0.1377	0.2576	0.0000	0.0000
4.2857	0.1377	0.2623	0.0000	0.0000
4.3681	0.1377	0.2670	0.0000	0.0000
4.4505	0.1377	0.2717	0.0000	0.0000
4.5330	0.1377	0.2764	0.0000	0.0000
4.6154	0.1377	0.2811	0.0000	0.0000
4.6978	0.1377	0.2858	0.0000	0.0000
4.7802	0.1377	0.2905	0.0000	0.0000
4.8626	0.1377	0.2952	0.0000	0.0000
4.9451	0.1377	0.3000	0.0000	0.0000
5.0275	0.1377	0.3047	0.0000	0.0000
5.1099	0.1377	0.3094	0.0000	0.0000
5.1923	0.1377	0.3141	0.0000	0.0000
5.2747	0.1377	0.3188	0.0000	0.0000
5.3571	0.1377	0.3235	0.0000	0.0000
5.4396	0.1377	0.3282	0.0000	0.0000
5.5220	0.1377	0.3329	0.0000	0.0000
5.6044	0.1377	0.3376	0.0000	0.0000
5.6868	0.1377	0.3424	0.0000	0.0000
5.7692	0.1377	0.3471	0.0000	0.0000
5.8516	0.1377	0.3518	0.0000	0.0000
5.9341	0.1377	0.3565	0.0000	0.0000
6.0000	0.1377	0.3603	0.0000	0.0000

DRAFT

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
6.0000	0.1377	0.3603	0.0000	1.7125	0.0000
6.0824	0.1446	0.3719	0.0000	1.7125	0.0000
6.1648	0.1514	0.3841	0.0000	1.7582	0.0000
6.2473	0.1582	0.3968	0.0001	1.8040	0.0000
6.3297	0.1650	0.4102	0.0001	1.8498	0.0000
6.4121	0.1718	0.4240	0.0001	1.8956	0.0000
6.4945	0.1786	0.4385	0.0001	1.9414	0.0000
6.5769	0.1854	0.4535	0.0001	1.9872	0.0000
6.6593	0.1922	0.4690	0.0001	2.0330	0.0000

6.7418	0.1990	0.4852	0.0002	2.0788	0.0000
6.8242	0.2059	0.5019	0.0002	2.1245	0.0000
6.9066	0.2127	0.5191	0.0002	2.1703	0.0000
6.9890	0.2195	0.5369	0.0002	2.2161	0.0000
7.0714	0.2263	0.5553	0.0002	2.2619	0.0000
7.1538	0.2331	0.5742	0.0002	2.3077	0.0000
7.2363	0.2399	0.5937	0.0002	2.3535	0.0000
7.3187	0.2467	0.6138	0.0002	2.3993	0.0000
7.4011	0.2535	0.6344	0.0002	2.4451	0.0000
7.4835	0.2603	0.6555	0.0002	2.4908	0.0000
7.5000	0.2617	0.6598	0.0002	2.5000	0.0000

DRAFT

Surface cape Swales

Element Flows To:

Outlet 1	Outlet 2
Surface Area Swale	DMA One - Parking and Landscape Swales

DRAFT

DMA One - Natural Basin Area Swale

Bottom Length:	50.00 ft.
Bottom Width:	50.00 ft.
Material thickness of first layer:	3
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	3
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	24.299
Total Volume Through Riser (ac-ft.):	57.533
Total Volume Through Facility (ac-ft.):	85.469
Percent Infiltrated:	28.43
Total Precip Applied to Facility:	2.011
Total Evap From Facility:	6.318
Underdrain used	
Underdrain Diameter (feet):	0.33
Orifice Diameter (in.):	0.15
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	3.637
Total Outflow (ac-ft.):	85.469
Percent Through Underdrain:	4.26
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	0.2 in. Elevation:2 ft.
Element Flows To:	
Outlet 1	Outlet 2

DRAFT

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0574	0.0000	0.0000	0.0000
0.1319	0.0574	0.0035	0.0000	0.0000
0.2637	0.0574	0.0069	0.0003	0.0003
0.3956	0.0574	0.0104	0.0016	0.0016
0.5275	0.0574	0.0138	0.0028	0.0028
0.6593	0.0574	0.0173	0.0043	0.0043
0.7912	0.0574	0.0208	0.0058	0.0058
0.9231	0.0574	0.0242	0.0058	0.0058
1.0549	0.0574	0.0277	0.0058	0.0058
1.1868	0.0574	0.0311	0.0058	0.0058
1.3187	0.0574	0.0346	0.0058	0.0058
1.4505	0.0574	0.0381	0.0058	0.0058
1.5824	0.0574	0.0415	0.0058	0.0058
1.7143	0.0574	0.0450	0.0058	0.0058
1.8462	0.0574	0.0485	0.0058	0.0058
1.9780	0.0574	0.0519	0.0058	0.0058
2.1099	0.0574	0.0554	0.0058	0.0058
2.2418	0.0574	0.0588	0.0058	0.0058
2.3736	0.0574	0.0623	0.0058	0.0058
2.5055	0.0574	0.0658	0.0058	0.0058
2.6374	0.0574	0.0692	0.0058	0.0058

2.7692	0.0574	0.0727	0.0058	0.0058
2.9011	0.0574	0.0761	0.0058	0.0058
3.0330	0.0574	0.0793	0.0058	0.0058
3.1648	0.0574	0.0824	0.0058	0.0058
3.2967	0.0574	0.0856	0.0058	0.0058
3.4286	0.0574	0.0887	0.0058	0.0058
3.5604	0.0574	0.0918	0.0058	0.0058
3.6923	0.0574	0.0950	0.0058	0.0058
3.8242	0.0574	0.0981	0.0058	0.0058
3.9560	0.0574	0.1013	0.0058	0.0058
4.0879	0.0574	0.1044	0.0058	0.0058
4.2198	0.0574	0.1075	0.0058	0.0058
4.3516	0.0574	0.1107	0.0058	0.0058
4.4835	0.0574	0.1138	0.0058	0.0058
4.6154	0.0574	0.1170	0.0058	0.0058
4.7473	0.0574	0.1201	0.0058	0.0058
4.8791	0.0574	0.1233	0.0058	0.0058
5.0110	0.0574	0.1264	0.0058	0.0058
5.1429	0.0574	0.1295	0.0058	0.0058
5.2747	0.0574	0.1327	0.0058	0.0058
5.4066	0.0574	0.1358	0.0058	0.0058
5.5385	0.0574	0.1390	0.0058	0.0058
5.6703	0.0574	0.1421	0.0058	0.0058
5.8022	0.0574	0.1452	0.0058	0.0058
5.9341	0.0574	0.1484	0.0058	0.0058
6.0000	0.0574	0.1499	0.0058	0.0058

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
6.0000	0.0574	0.1499	0.0000	0.7250	0.0000
6.1319	0.0574	0.1575	0.0000	0.7250	0.0000
6.2637	0.0574	0.1651	0.0000	0.7555	0.0000
6.3956	0.0574	0.1727	0.0001	0.7860	0.0000
6.5275	0.0574	0.1802	0.0001	0.8165	0.0000
6.6593	0.0574	0.1878	0.0002	0.8471	0.0000
6.7912	0.0574	0.1954	0.0004	0.8776	0.0000
6.9231	0.0574	0.2029	0.0004	0.9081	0.0000
7.0549	0.0574	0.2105	0.0004	0.9386	0.0000
7.1868	0.0574	0.2181	0.0005	0.9692	0.0000
7.3187	0.0574	0.2256	0.0005	0.9997	0.0000
7.4505	0.0574	0.2332	0.0005	1.0302	0.0000
7.5824	0.0574	0.2408	0.0005	1.0607	0.0000
7.7143	0.0574	0.2483	0.0005	1.0913	0.0000
7.8462	0.0574	0.2559	0.0006	1.1218	0.0000
7.9780	0.0574	0.2635	0.0006	1.1523	0.0000
8.1099	0.0574	0.2710	0.0006	1.1828	0.0000
8.2418	0.0574	0.2786	0.0006	1.2134	0.0000
8.3736	0.0574	0.2862	0.0007	1.2439	0.0000
8.5055	0.0574	0.2937	0.0007	1.2744	0.0000
8.6374	0.0574	0.3013	0.0007	1.3049	0.0000
8.7692	0.0574	0.3089	0.0007	1.3355	0.0000
8.9011	0.0574	0.3164	0.0007	1.3660	0.0000
9.0330	0.0574	0.3240	0.0007	1.3965	0.0000
9.1648	0.0574	0.3316	0.0008	1.4270	0.0000
9.2967	0.0574	0.3392	0.0008	1.4576	0.0000
9.4286	0.0574	0.3467	0.0008	1.4881	0.0000
9.5604	0.0574	0.3543	0.0008	1.5186	0.0000
9.6923	0.0574	0.3619	0.0008	1.5491	0.0000

DRAFT

9.8242	0.0574	0.3694	0.0008	1.5797	0.0000
9.9560	0.0574	0.3770	0.0009	1.6102	0.0000
10.088	0.0574	0.3846	0.0009	1.6407	0.0000
10.220	0.0574	0.3921	0.0009	1.6712	0.0000
10.352	0.0574	0.3997	0.0009	1.7018	0.0000
10.484	0.0574	0.4073	0.0009	1.7323	0.0000
10.615	0.0574	0.4148	0.0009	1.7628	0.0000
10.747	0.0574	0.4224	0.0009	1.7933	0.0000
10.879	0.0574	0.4300	0.0009	1.8239	0.0000
11.011	0.0574	0.4375	0.0010	1.8544	0.0000
11.143	0.0574	0.4451	0.0010	1.8849	0.0000
11.275	0.0574	0.4527	0.0010	1.9154	0.0000
11.407	0.0574	0.4602	0.0010	1.9460	0.0000
11.538	0.0574	0.4678	0.0010	1.9765	0.0000
11.670	0.0574	0.4754	0.0010	2.0070	0.0000
11.802	0.0574	0.4829	0.0010	2.0375	0.0000
11.934	0.0574	0.4905	0.0011	2.0681	0.0000
12.000	0.0574	0.4943	0.0011	2.0833	0.0000

DRAFT

Surface Area Swale

Element Flows To:

Outlet 1	Outlet 2
	DMA One - Natural Basin Area Swale

DRAFT

DMA Four - Northerly Access Road Basin

Bottom Length:	100.00 ft.
Bottom Width:	20.00 ft.
Material thickness of first layer:	3
Material type for first layer:	SMMWW 12 in/hr
Material thickness of second layer:	3
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.33
Orifice Diameter (in.):	0.1
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	5.816
Total Outflow (ac-ft.):	60.008
Percent Through Underdrain:	9.69
Discharge Structure	
Riser Height:	5 ft.
Riser Diameter:	36 in.
Element Flows To:	
Outlet 1	Outlet 2

DRAFT

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0459	0.0000	0.0000	0.0000
0.1319	0.0459	0.0028	0.0000	0.0000
0.2637	0.0459	0.0055	0.0000	0.0000
0.3956	0.0459	0.0083	0.0000	0.0000
0.5275	0.0459	0.0111	0.0000	0.0000
0.6593	0.0459	0.0138	0.0000	0.0000
0.7912	0.0459	0.0166	0.0000	0.0000
0.9231	0.0459	0.0194	0.0000	0.0000
1.0549	0.0459	0.0221	0.0000	0.0000
1.1868	0.0459	0.0249	0.0000	0.0000
1.3187	0.0459	0.0277	0.0000	0.0000
1.4505	0.0459	0.0305	0.0000	0.0000
1.5824	0.0459	0.0332	0.0000	0.0000
1.7143	0.0459	0.0360	0.0000	0.0000
1.8462	0.0459	0.0388	0.0000	0.0000
1.9780	0.0459	0.0415	0.0000	0.0000
2.1099	0.0459	0.0443	0.0000	0.0000
2.2418	0.0459	0.0471	0.0000	0.0000
2.3736	0.0459	0.0498	0.0000	0.0000
2.5055	0.0459	0.0526	0.0000	0.0000
2.6374	0.0459	0.0554	0.0000	0.0000
2.7692	0.0459	0.0581	0.0000	0.0000
2.9011	0.0459	0.0609	0.0000	0.0000
3.0330	0.0459	0.0634	0.0000	0.0000
3.1648	0.0459	0.0659	0.0000	0.0000
3.2967	0.0459	0.0685	0.0000	0.0000
3.4286	0.0459	0.0710	0.0000	0.0000
3.5604	0.0459	0.0735	0.0000	0.0000
3.6923	0.0459	0.0760	0.0000	0.0000
3.8242	0.0459	0.0785	0.0000	0.0000
3.9560	0.0459	0.0810	0.0000	0.0000

4.0879	0.0459	0.0835	0.0000	0.0000
4.2198	0.0459	0.0860	0.0000	0.0000
4.3516	0.0459	0.0886	0.0000	0.0000
4.4835	0.0459	0.0911	0.0000	0.0000
4.6154	0.0459	0.0936	0.0000	0.0000
4.7473	0.0459	0.0961	0.0000	0.0000
4.8791	0.0459	0.0986	0.0000	0.0000
5.0110	0.0459	0.1011	0.0000	0.0000
5.1429	0.0459	0.1036	0.0000	0.0000
5.2747	0.0459	0.1061	0.0000	0.0000
5.4066	0.0459	0.1087	0.0000	0.0000
5.5385	0.0459	0.1112	0.0000	0.0000
5.6703	0.0459	0.1137	0.0000	0.0000
5.8022	0.0459	0.1162	0.0000	0.0000
5.9341	0.0459	0.1187	0.0000	0.0000
6.0000	0.0459	0.1200	0.0000	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
6.0000	0.0459	0.1200	0.0000	0.5800	0.0000
6.1319	0.0477	0.1261	0.0000	0.5800	0.0000
6.2637	0.0495	0.1325	0.0001	0.6044	0.0000
6.3956	0.0514	0.1392	0.0001	0.6288	0.0000
6.5275	0.0532	0.1461	0.0001	0.6532	0.0000
6.6593	0.0550	0.1532	0.0001	0.6777	0.0000
6.7912	0.0568	0.1606	0.0002	0.7021	0.0000
6.9231	0.0586	0.1682	0.0002	0.7265	0.0000
7.0549	0.0604	0.1761	0.0002	0.7509	0.0000
7.1868	0.0623	0.1842	0.0002	0.7753	0.0000
7.3187	0.0641	0.1925	0.0002	0.7998	0.0000
7.4505	0.0659	0.2011	0.0002	0.8242	0.0000
7.5824	0.0677	0.2099	0.0002	0.8486	0.0000
7.7143	0.0695	0.2189	0.0002	0.8730	0.0000
7.8462	0.0713	0.2282	0.0003	0.8974	0.0000
7.9780	0.0732	0.2377	0.0003	0.9219	0.0000
8.1099	0.0750	0.2475	0.0003	0.9463	0.0000
8.2418	0.0768	0.2575	0.0003	0.9707	0.0000
8.3736	0.0786	0.2677	0.0003	0.9951	0.0000
8.5055	0.0804	0.2782	0.0003	1.0195	0.0000
8.6374	0.0822	0.2890	0.0003	1.0440	0.0000
8.7692	0.0841	0.2999	0.0003	1.0684	0.0000
8.9011	0.0859	0.3111	0.0003	1.0928	0.0000
9.0330	0.0877	0.3226	0.0003	1.1172	0.0000
9.1648	0.0895	0.3343	0.0003	1.1416	0.0000
9.2967	0.0913	0.3462	0.0003	1.1661	0.0000
9.4286	0.0931	0.3583	0.0004	1.1905	0.0000
9.5604	0.0950	0.3707	0.0004	1.2149	0.0000
9.6923	0.0968	0.3834	0.0004	1.2393	0.0000
9.8242	0.0986	0.3963	0.0004	1.2637	0.0000
9.9560	0.1004	0.4094	0.0004	1.2882	0.0000
10.088	0.1022	0.4228	0.0004	1.3126	0.0000
10.220	0.1040	0.4364	0.0004	1.3370	0.0000
10.352	0.1059	0.4502	0.0004	1.3614	0.0000
10.484	0.1077	0.4643	0.0004	1.3858	0.0000
10.615	0.1095	0.4786	0.0004	1.4103	0.0000
10.747	0.1113	0.4932	0.0004	1.4347	0.0000
10.879	0.1131	0.5080	0.0004	1.4591	0.0000
11.011	0.1149	0.5230	0.0004	1.4835	0.0000

DRAFT

11.143	0.1168	0.5383	0.0004	1.5079	0.0000
11.275	0.1186	0.5538	0.0004	1.5324	0.0000
11.407	0.1204	0.5695	0.0004	1.5568	0.0000
11.538	0.1222	0.5855	0.0004	1.5812	0.0000
11.670	0.1240	0.6018	0.0005	1.6056	0.0000
11.802	0.1258	0.6182	0.0005	1.6300	0.0000
11.934	0.1277	0.6350	0.0005	1.6545	0.0000
12.000	0.1286	0.6434	0.0005	1.6667	0.0000

DRAFT

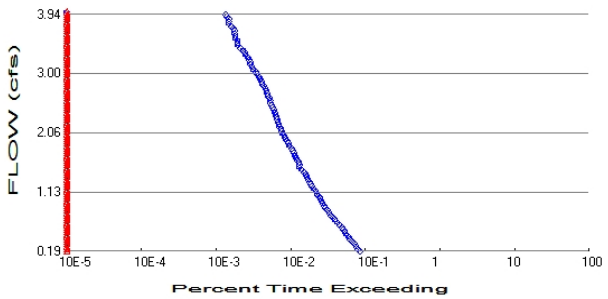
Surface s Road Basin

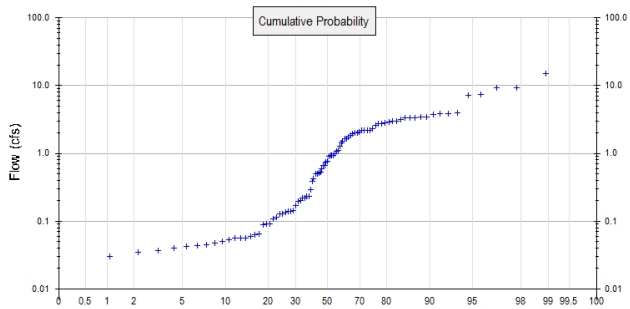
Element Flows To:

Outlet 1	Outlet 2
	DMA Four - Northerly Access Road Basin

DRAFT

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 12.91
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 7.21
Total Impervious Area: 5.7

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.913879
5 year	3.362357
10 year	3.938521
25 year	9.173529

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0

DRAFT

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1914	1845	0	0	Pass
0.2292	1733	0	0	Pass
0.2671	1621	0	0	Pass
0.3049	1532	0	0	Pass
0.3428	1437	0	0	Pass
0.3806	1360	0	0	Pass
0.4185	1289	0	0	Pass
0.4563	1222	0	0	Pass
0.4942	1160	0	0	Pass
0.5320	1108	0	0	Pass
0.5699	1051	0	0	Pass
0.6077	973	0	0	Pass
0.6456	912	0	0	Pass
0.6834	846	0	0	Pass
0.7213	797	0	0	Pass
0.7591	750	0	0	Pass
0.7970	713	0	0	Pass
0.8348	671	0	0	Pass
0.8727	626	0	0	Pass
0.9105	603	0	0	Pass
0.9484	581	0	0	Pass
0.9862	560	0	0	Pass
1.0241	541	0	0	Pass
1.0619	515	0	0	Pass
1.0998	486	0	0	Pass
1.1376	468	0	0	Pass
1.1755	446	0	0	Pass
1.2133	417	0	0	Pass
1.2512	403	0	0	Pass
1.2890	388	0	0	Pass
1.3269	371	0	0	Pass
1.3647	356	0	0	Pass
1.4026	345	0	0	Pass
1.4404	327	0	0	Pass
1.4783	303	0	0	Pass
1.5161	288	0	0	Pass
1.5540	283	0	0	Pass
1.5918	280	0	0	Pass
1.6297	266	0	0	Pass
1.6675	257	0	0	Pass
1.7054	247	0	0	Pass
1.7432	240	0	0	Pass
1.7811	229	0	0	Pass
1.8189	222	0	0	Pass
1.8568	209	0	0	Pass
1.8946	201	0	0	Pass
1.9325	194	0	0	Pass
1.9703	184	0	0	Pass
2.0082	179	0	0	Pass
2.0460	170	0	0	Pass
2.0839	164	0	0	Pass
2.1217	162	0	0	Pass
2.1596	154	0	0	Pass

DRAFT

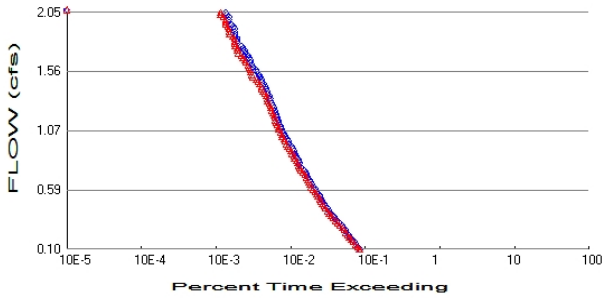
2.1974	150	0	0	Pass
2.2353	146	0	0	Pass
2.2731	142	0	0	Pass
2.3110	140	0	0	Pass
2.3488	135	0	0	Pass
2.3867	132	0	0	Pass
2.4245	129	0	0	Pass
2.4624	125	0	0	Pass
2.5002	120	0	0	Pass
2.5381	117	0	0	Pass
2.5759	115	0	0	Pass
2.6138	111	0	0	Pass
2.6516	106	0	0	Pass
2.6895	105	0	0	Pass
2.7273	103	0	0	Pass
2.7652	99	0	0	Pass
2.8030	95	0	0	Pass
2.8409	90	0	0	Pass
2.8787	89	0	0	Pass
2.9166	85	0	0	Pass
2.9544	83	0	0	Pass
2.9923	76	0	0	Pass
3.0301	74	0	0	Pass
3.0680	68	0	0	Pass
3.1058	66	0	0	Pass
3.1437	62	0	0	Pass
3.1815	62	0	0	Pass
3.2194	60	0	0	Pass
3.2572	58	0	0	Pass
3.2951	54	0	0	Pass
3.3329	53	0	0	Pass
3.3708	50	0	0	Pass
3.4086	46	0	0	Pass
3.4465	43	0	0	Pass
3.4843	42	0	0	Pass
3.5222	42	0	0	Pass
3.5600	39	0	0	Pass
3.5979	39	0	0	Pass
3.6357	38	0	0	Pass
3.6736	38	0	0	Pass
3.7114	37	0	0	Pass
3.7493	35	0	0	Pass
3.7871	32	0	0	Pass
3.8250	32	0	0	Pass
3.8628	32	0	0	Pass
3.9007	30	0	0	Pass
3.9385	29	0	0	Pass

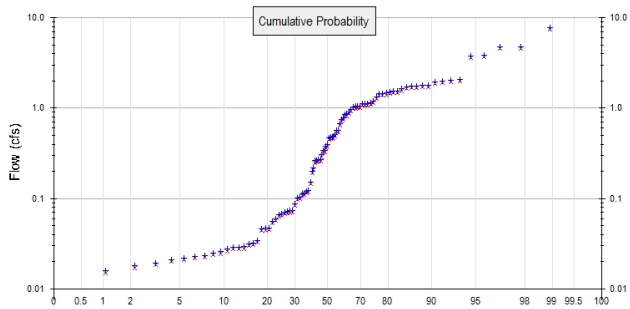
DRAFT

Water Quality

DRAFT

POC 2





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 6.71
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 6.71
Total Impervious Area: 0

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.994743
5 year	1.747592
10 year	2.047055
25 year	4.767961

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.950351
5 year	1.669459
10 year	1.959255
25 year	4.554738

DRAFT

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0995	1845	1817	98	Pass
0.1191	1733	1707	98	Pass
0.1388	1626	1592	97	Pass
0.1585	1532	1491	97	Pass
0.1782	1437	1404	97	Pass
0.1978	1360	1326	97	Pass
0.2175	1290	1253	97	Pass
0.2372	1222	1190	97	Pass
0.2569	1161	1131	97	Pass
0.2765	1108	1067	96	Pass
0.2962	1050	984	93	Pass
0.3159	975	928	95	Pass
0.3355	914	861	94	Pass
0.3552	846	802	94	Pass
0.3749	798	760	95	Pass
0.3946	752	715	95	Pass
0.4142	713	671	94	Pass
0.4339	671	626	93	Pass
0.4536	626	603	96	Pass
0.4733	603	578	95	Pass
0.4929	581	558	96	Pass
0.5126	560	531	94	Pass
0.5323	542	506	93	Pass
0.5519	515	481	93	Pass
0.5716	486	459	94	Pass
0.5913	468	427	91	Pass
0.6110	446	410	91	Pass
0.6306	417	397	95	Pass
0.6503	403	376	93	Pass
0.6700	390	365	93	Pass
0.6897	371	353	95	Pass
0.7093	356	337	94	Pass
0.7290	345	315	91	Pass
0.7487	327	293	89	Pass
0.7683	303	283	93	Pass
0.7880	288	279	96	Pass
0.8077	283	267	94	Pass
0.8274	279	257	92	Pass
0.8470	266	245	92	Pass
0.8667	257	240	93	Pass
0.8864	247	228	92	Pass
0.9060	240	221	92	Pass
0.9257	229	207	90	Pass
0.9454	222	199	89	Pass
0.9651	209	191	91	Pass
0.9847	201	181	90	Pass
1.0044	194	177	91	Pass
1.0241	184	164	89	Pass
1.0438	179	164	91	Pass
1.0634	170	160	94	Pass
1.0831	164	150	91	Pass
1.1028	162	148	91	Pass
1.1224	154	142	92	Pass

DRAFT

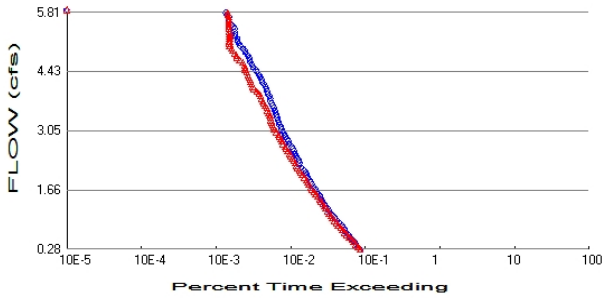
1.1421	150	141	94	Pass
1.1618	147	136	92	Pass
1.1815	142	132	92	Pass
1.2011	140	129	92	Pass
1.2208	135	125	92	Pass
1.2405	132	120	90	Pass
1.2602	129	117	90	Pass
1.2798	125	115	92	Pass
1.2995	120	111	92	Pass
1.3192	117	106	90	Pass
1.3388	115	105	91	Pass
1.3585	111	103	92	Pass
1.3782	106	97	91	Pass
1.3979	105	92	87	Pass
1.4175	103	90	87	Pass
1.4372	99	88	88	Pass
1.4569	95	84	88	Pass
1.4766	90	79	87	Pass
1.4962	89	75	84	Pass
1.5159	85	68	80	Pass
1.5356	83	66	79	Pass
1.5552	76	63	82	Pass
1.5749	74	62	83	Pass
1.5946	68	60	88	Pass
1.6143	66	58	87	Pass
1.6339	62	54	87	Pass
1.6536	62	53	85	Pass
1.6733	60	50	83	Pass
1.6929	58	47	81	Pass
1.7126	54	43	79	Pass
1.7323	53	42	79	Pass
1.7520	50	42	84	Pass
1.7716	47	39	82	Pass
1.7913	43	39	90	Pass
1.8110	42	38	90	Pass
1.8307	42	38	90	Pass
1.8503	39	36	92	Pass
1.8700	39	33	84	Pass
1.8897	38	32	84	Pass
1.9093	38	32	84	Pass
1.9290	37	31	83	Pass
1.9487	35	29	82	Pass
1.9684	32	29	90	Pass
1.9880	32	29	90	Pass
2.0077	32	27	84	Pass
2.0274	30	25	83	Pass
2.0471	29	25	86	Pass

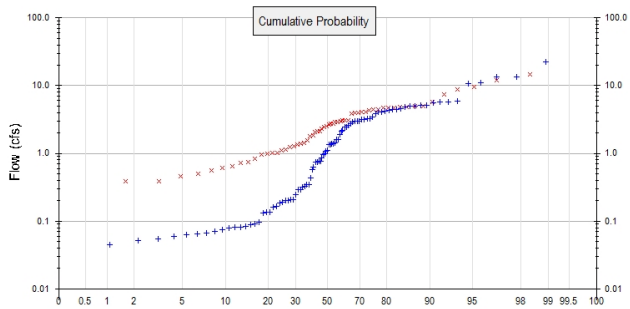
DRAFT

Water Quality

DRAFT

POC 3





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 19.04
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 15.1
Total Impervious Area: 0.78

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	2.822638
5 year	4.958891
10 year	5.808632
25 year	13.529358

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	2.485626
5 year	4.659326
10 year	5.204561
25 year	9.751164

DRAFT

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2823	1845	1851	100	Pass
0.3381	1733	1749	100	Pass
0.3939	1624	1635	100	Pass
0.4497	1531	1521	99	Pass
0.5056	1437	1429	99	Pass
0.5614	1360	1321	97	Pass
0.6172	1288	1234	95	Pass
0.6730	1220	1159	95	Pass
0.7288	1160	1080	93	Pass
0.7847	1108	1012	91	Pass
0.8405	1050	937	89	Pass
0.8963	971	891	91	Pass
0.9521	912	845	92	Pass
1.0079	846	792	93	Pass
1.0638	797	753	94	Pass
1.1196	750	714	95	Pass
1.1754	713	683	95	Pass
1.2312	670	644	96	Pass
1.2871	626	613	97	Pass
1.3429	603	585	97	Pass
1.3987	581	553	95	Pass
1.4545	560	525	93	Pass
1.5103	541	500	92	Pass
1.5662	515	469	91	Pass
1.6220	486	442	90	Pass
1.6778	468	415	88	Pass
1.7336	446	401	89	Pass
1.7895	417	380	91	Pass
1.8453	403	366	90	Pass
1.9011	388	351	90	Pass
1.9569	371	329	88	Pass
2.0127	356	307	86	Pass
2.0686	345	294	85	Pass
2.1244	327	283	86	Pass
2.1802	303	270	89	Pass
2.2360	288	262	90	Pass
2.2919	283	249	87	Pass
2.3477	279	238	85	Pass
2.4035	266	227	85	Pass
2.4593	257	218	84	Pass
2.5151	247	209	84	Pass
2.5710	240	199	82	Pass
2.6268	229	187	81	Pass
2.6826	222	182	81	Pass
2.7384	209	169	80	Pass
2.7942	201	165	82	Pass
2.8501	194	161	82	Pass
2.9059	184	153	83	Pass
2.9617	179	148	82	Pass
3.0175	170	140	82	Pass
3.0734	164	130	79	Pass
3.1292	162	128	79	Pass
3.1850	154	124	80	Pass

DRAFT

3.2408	150	121	80	Pass
3.2966	146	118	80	Pass
3.3525	142	116	81	Pass
3.4083	140	114	81	Pass
3.4641	135	110	81	Pass
3.5199	132	105	79	Pass
3.5758	129	104	80	Pass
3.6316	125	98	78	Pass
3.6874	120	94	78	Pass
3.7432	117	92	78	Pass
3.7990	115	89	77	Pass
3.8549	111	86	77	Pass
3.9107	106	82	77	Pass
3.9665	105	76	72	Pass
4.0223	103	70	67	Pass
4.0782	99	68	68	Pass
4.1340	95	65	68	Pass
4.1898	90	63	70	Pass
4.2456	89	62	69	Pass
4.3014	85	60	70	Pass
4.3573	83	58	69	Pass
4.4131	76	56	73	Pass
4.4689	74	53	71	Pass
4.5247	68	53	77	Pass
4.5806	66	52	78	Pass
4.6364	62	49	79	Pass
4.6922	61	45	73	Pass
4.7480	60	41	68	Pass
4.8038	58	41	70	Pass
4.8597	54	38	70	Pass
4.9155	53	36	67	Pass
4.9713	50	35	70	Pass
5.0271	46	33	71	Pass
5.0829	44	33	75	Pass
5.1388	42	33	78	Pass
5.1946	42	33	78	Pass
5.2504	39	33	84	Pass
5.3062	39	33	84	Pass
5.3621	38	33	86	Pass
5.4179	38	32	84	Pass
5.4737	37	32	86	Pass
5.5295	35	32	91	Pass
5.5853	32	32	100	Pass
5.6412	32	32	100	Pass
5.6970	32	32	100	Pass
5.7528	30	31	103	Pass
5.8086	29	31	106	Pass

DRAFT

Water Quality

DRAFT

Rational Method

Company Name	Grant Becklund
Designed by	Grant Becklund
Company Project Number/Name	Bundy Canyon Luxury Apartments
Drainage Area Number/Name	DMA Two - Natural Basin Area
Date	10/24/2016
County/City Case No.	Plot Plan 16-0006

6 South	Township
4 West	Range
25	Section
.71	85th Percentile

acre	Cover Type
	Roofs
0.68	Concrete or Asphalt
	Grouted or Gapless Paving Blocks
	Compacted Soil (e.g. unpaved parking)
	Decomposed Granite
	Permeable Paving Blocks w/ Sand Filled Gap
	Class 2 Base
	Gravel or Class 2 Permeable Base
	Pervious Concrete / Porous Asphalt
	Open and Porous Pavers
	Turf block
1.5	Ornamental Landscaping
	Natural (A Soil)
	Natural (B Soil)
1.59	Natural (C Soil)
	Natural (D Soil)
	Mixed Surface Types Fraction = 0.00

DRAFT

Calculated Values

C	= 0.30
Vu	= 0.21 (in * ac)/ac
Vbmp	= 2$914 ft3
Qbmp	= 0.2 ft3/s

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

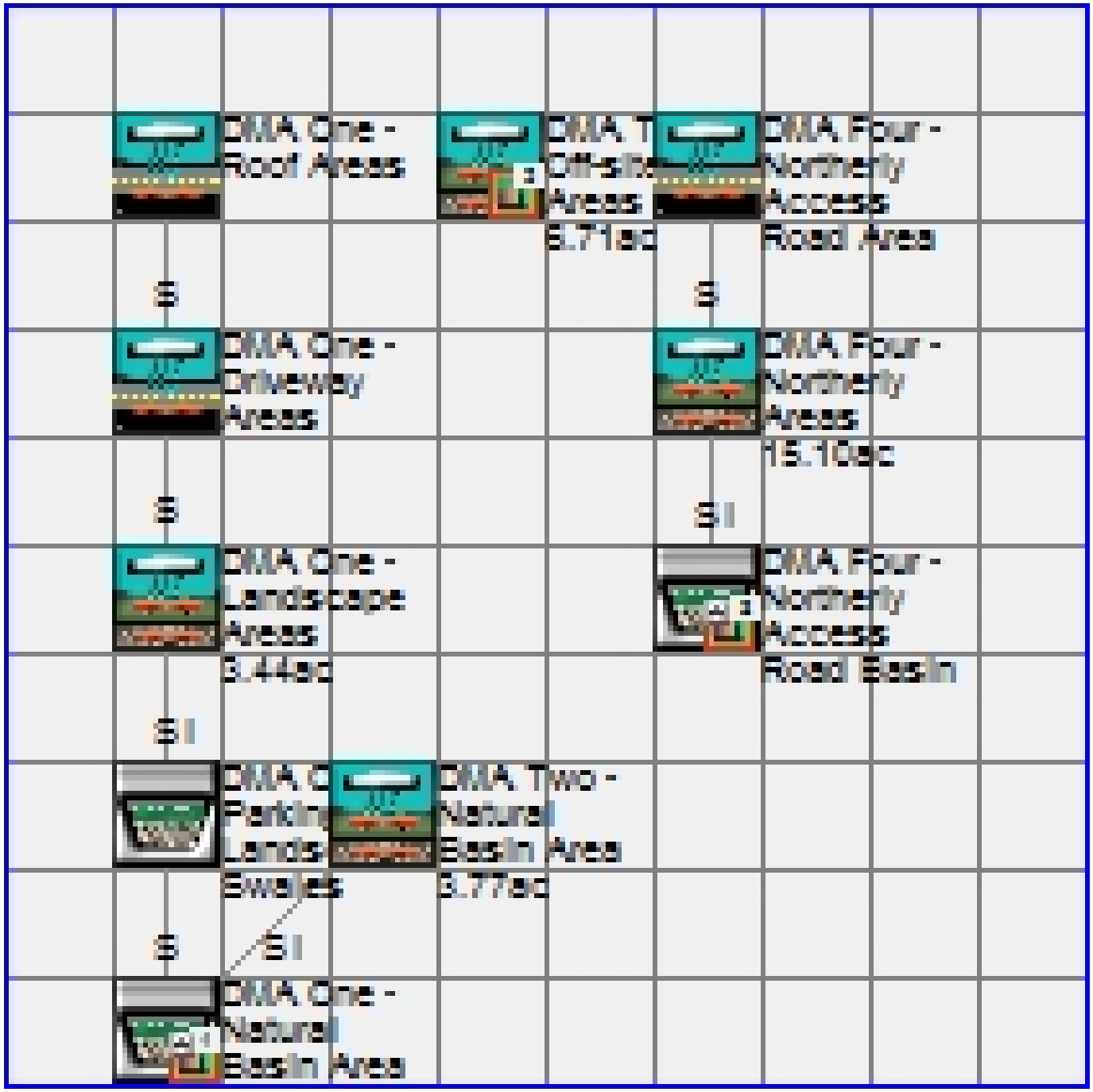
No IMPLND changes have been made.

DRAFT

Appendix

Predeveloped Schematic

Mitigated Schematic



DRAFT

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   BC DMA One 10-25-2016b.wdm
MESSU      25   MitBC DMA One 10-25-2016b.MES
           27   MitBC DMA One 10-25-2016b.L61
           28   MitBC DMA One 10-25-2016b.L62
           31   POCBC DMA One 10-25-2016b2.dat
           32   POCBC DMA One 10-25-2016b3.dat
           30   POCBC DMA One 10-25-2016b1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND      24
      PERLND      55
      PERLND      56
      IMPLND      26
      IMPLND      25
      PERLND      58
      PERLND      54
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      GENER        6
      RCHRES       5
      RCHRES       6
      COPY       502
      COPY         3
      COPY       503
      COPY         1
      COPY       501
      DISPLY       2
      DISPLY       3
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    2        DMA Three - Off-site Area   MAX                    1    2   31    9
    3        Surface s Road Basin        MAX                    1    2   32    9
    1        DMA One - Natural Basin A   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  502         1    1
    3         1    1
  503         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
```

DRAFT

```
  OPCODE
    #    # OPCD ***
    2        24
    4        24
    6        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
    6             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                           in  out            ***
   55     C/D,Shrub,St(10-20%)    1    1    1    1   27    0
   56     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
   58     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
   54     C/D,Grass,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   55         0    0    1    0    0    0    0    0    0    0    0    0
   56         0    0    1    0    0    0    0    0    0    0    0    0
   58         0    0    1    0    0    0    0    0    0    0    0    0
   54         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   55         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   56         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   58         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   54         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   55         0    0    0    1    0    0    0    0    1    0    0
   56         0    0    0    1    0    0    0    0    1    0    0
   58         0    0    0    1    0    0    0    0    1    0    0
   54         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   55              0       4.2      0.03       300      0.15         2      0.95
   56              0         4     0.025       200      0.25         2      0.95
   58              0         4     0.025       200      0.25         2      0.95
   54              0       4.8     0.045       400      0.05         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   55             40        35         3         2      0.15      0.15         0
   56             40        35         3         2      0.15      0.15         0
   58             40        35         3         2      0.15      0.15         0
   54             40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
```

DRAFT

```
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   55              0       0.5       0.3       0.8       0.4         0
   56              0       0.4       0.3       0.4      0.35         0
   58              0       0.4       0.3       0.4      0.35         0
   54              0       0.8      0.25         2       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   55       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   56       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   58       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   54       0.4  0.4  0.4 0.45  0.5 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   55      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   56      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   58      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   54      0.12 0.12 0.12 0.11  0.1  0.1  0.1  0.1  0.1  0.1 0.11 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   55              0         0      0.01         0       0.5       0.3      0.01
   56              0         0      0.01         0       0.5       0.3      0.01
   58              0         0      0.01         0       0.5       0.3      0.01
   54              0         0      0.01         0       0.5       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                      User  t-series Engl Metr ***
                                       in  out           ***
   24     Roof Area LAT           1    1    1   27    0
   26     Roads,Mod(5-10%) LAT    1    1    1   27    0
   25     Driveways,Flat(0-5%) LAT1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    ***
   24         0    0    1    0    0    0
   26         0    0    1    0    0    0
   25         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL     *********
   24         0    0    4    0    0    0    1    9
   26         0    0    4    0    0    0    1    9
   25         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
   24         0    0    0    0    0
   26         0    0    0    0    0
   25         0    0    0    0    0
  END IWAT-PARM1
```

DRAFT

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -   # ***  LSUR     SLSUR      NSUR     RETSC
   24            100      0.05       0.1       0.1
   26            100       0.1       0.1      0.09
   25            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN
   24              0         0
   26              0         0
   25              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -   # ***  RETS      SURS
   24              0         0
   26              0         0
   25              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK    ***
<Name>   #                  <-factor->     <Name>   #   Tbl#    ***
DMA One - Roof Areas***
IMPLND  24                     0.7812      IMPLND  25     53
DMA One - Landscape Areas***
PERLND  54                       3.44      RCHRES   3      2
PERLND  54                       3.44      RCHRES   3      3
DMA One - Driveway Areas***
IMPLND  25                     0.9302      PERLND  54     50
DMA Two - Natural Basin Area***
PERLND  55                       3.77      RCHRES   5      2
PERLND  55                       3.77      RCHRES   5      3
DMA Four - Northerly Access Road Area***
IMPLND  26                     0.0517      PERLND  58     50
DMA Four - Northerly Areas***
PERLND  58                       15.1      RCHRES   1      2
PERLND  58                       15.1      RCHRES   1      3
DMA Three - Off-site Areas***
PERLND  56                       6.71      COPY   502     12
PERLND  56                       6.71      COPY   502     13

******Routing******
RCHRES   4                          1      RCHRES   5      6
RCHRES   3                          1      RCHRES   5      7
RCHRES   3                          1      RCHRES   4      8
RCHRES   5                          1      RCHRES   6      8
RCHRES   5                                 COPY     1     18
PERLND  58                       15.1      COPY     3     12
PERLND  58                       15.1      COPY     3     13
RCHRES   1                          1      RCHRES   2      8
RCHRES   6                          1      COPY   501     17
RCHRES   2                          1      COPY   503     16
RCHRES   1                          1      COPY   503     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #         <Name> # #<-factor->strg <Name>   #   #         <Name> # #  ***
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1
```

DRAFT

```
GENER    4 OUTPUT TIMSER      .0011111     RCHRES   3     EXTNL  OUTDGT 1
GENER    6 OUTPUT TIMSER      .0011111     RCHRES   5     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                             ***
    1     Surface s Road B-038    3    1    1    1   28    0    1
    2     DMA Four - North-037    1    1    1    1   28    0    1
    3     Surface cape Swa-024    3    1    1    1   28    0    1
    4     DMA One - Parkin-023    1    1    1    1   28    0    1
    5     Surface  Area Sw-026    3    1    1    1   28    0    1
    6     DMA One - Natura-025    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *   *  *  *  *  *      *  *  *  *  *        ***
    1       0  1  0  0   4  5  6  0  0      0  1  0  0  0       2  1  2  2  2
    2       0  1  0  0   4  0  0  0  0      0  0  0  0  0       2  2  2  2  2
    3       0  1  0  0   4  5  6  0  0      0  1  0  0  0       2  1  2  2  2
    4       0  1  0  0   4  0  0  0  0      0  0  0  0  0       2  2  2  2  2
    5       0  1  0  0   4  5  6  0  0      0  1  0  0  0       2  1  2  2  2
    6       0  1  0  0   4  5  0  0  0      0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.01       0.0       0.0       0.5       0.0
    2             2      0.02       0.0       0.0       0.5       0.0
    3             3      0.01       0.0       0.0       0.5       0.0
    4             4      0.11       0.0       0.0       0.5       0.0
    5             5      0.01       0.0       0.0       0.5       0.0
    6             6      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
```

DRAFT

```
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 K       1        3
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol6   RCHRES   6 VOL              4
  UVQUAN v2m6   GLOBAL     WORKSP  5        3
  UVQUAN vpo6   GLOBAL     WORKSP  6        3
  UVQUAN v2d6   GENER    6 K       1        3
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    1 K       1         1.0 QUAN
*** User-Defined Target Variable Names
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m6    1 WORKSP  5         1.0 QUAN
  UVNAME  vpo6    1 WORKSP  6         1.0 QUAN
  UVNAME  v2d6    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  4912.
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
```

DRAFT

```
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                                vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                                v2d2            =  vpo2
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <---><-><-><-><-><-------> <> <-><->
  GENER   4                                v2m4            =  14752.
*** Compute remaining available pore space
  GENER   4                                vpo4            =  v2m4
  GENER   4                                vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                                vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                                v2d4            =  vpo4
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <---><-><-><-><-><-------> <> <-><->
  GENER   6                                v2m6            =  6140.
*** Compute remaining available pore space
  GENER   6                                vpo6            =  v2m6
  GENER   6                                vpo6           -=  vol6
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo6 < 0.0) THEN
  GENER   6                                vpo6            =  0.0
END IF
*** Infiltration volume
  GENER   6                                v2d6            =  vpo6
END SPEC-ACTIONS
FTABLES
  FTABLE      4
   74    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.137741  0.000000  0.000000
  0.082418  0.137741  0.005191  0.000000
  0.164835  0.137741  0.010383  0.000040
  0.247253  0.137741  0.015574  0.000069
  0.329670  0.137741  0.020766  0.000089
  0.412088  0.137741  0.025957  0.000105
  0.494505  0.137741  0.031148  0.000119
  0.576923  0.137741  0.036340  0.000132
  0.659341  0.137741  0.041531  0.000143
  0.741758  0.137741  0.046723  0.000153
  0.824176  0.137741  0.051914  0.000163
  0.906593  0.137741  0.057105  0.000172
  0.989011  0.137741  0.062297  0.000181
  1.071429  0.137741  0.067488  0.000189
  1.153846  0.137741  0.072680  0.000197
  1.236264  0.137741  0.077871  0.000205
  1.318681  0.137741  0.083062  0.000212
  1.401099  0.137741  0.088254  0.000219
  1.483516  0.137741  0.093445  0.000226
  1.565934  0.137741  0.098637  0.000233
  1.648352  0.137741  0.103828  0.000239
  1.730769  0.137741  0.109019  0.000246
  1.813187  0.137741  0.114211  0.000252
  1.895604  0.137741  0.119402  0.000258
  1.978022  0.137741  0.124594  0.000264
  2.060440  0.137741  0.129785  0.000269
  2.142857  0.137741  0.134976  0.000275
  2.225275  0.137741  0.140168  0.000281
  2.307692  0.137741  0.145359  0.000286
  2.390110  0.137741  0.150551  0.000291
  2.472527  0.137741  0.155742  0.000296
  2.554945  0.137741  0.160933  0.000302
  2.637363  0.137741  0.166125  0.000307
  2.719780  0.137741  0.171316  0.000311
```

DRAFT

```
  2.802198  0.137741  0.176508  0.000316
  2.884615  0.137741  0.181699  0.000321
  2.967033  0.137741  0.186890  0.000326
  3.049451  0.137741  0.191602  0.000330
  3.131868  0.137741  0.196313  0.000335
  3.214286  0.137741  0.201024  0.000340
  3.296703  0.137741  0.205735  0.000344
  3.379121  0.137741  0.210446  0.000348
  3.461538  0.137741  0.215158  0.000353
  3.543956  0.137741  0.219869  0.000357
  3.626374  0.137741  0.224580  0.000361
  3.708791  0.137741  0.229291  0.000366
  3.791209  0.137741  0.234002  0.000370
  3.873626  0.137741  0.238714  0.000374
  3.956044  0.137741  0.243425  0.000378
  4.038462  0.137741  0.248136  0.000382
  4.120879  0.137741  0.252847  0.000386
  4.203297  0.137741  0.257558  0.000390
  4.285714  0.137741  0.262270  0.000394
  4.368132  0.137741  0.266981  0.000398
  4.450549  0.137741  0.271692  0.000401
  4.532967  0.137741  0.276403  0.000405
  4.615385  0.137741  0.281114  0.000409
  4.697802  0.137741  0.285826  0.000413
  4.780220  0.137741  0.290537  0.000416
  4.862637  0.137741  0.295248  0.000420
  4.945055  0.137741  0.299959  0.000424
  5.027473  0.137741  0.304670  0.000427
  5.109890  0.137741  0.309382  0.000431
  5.192308  0.137741  0.314093  0.000434
  5.274725  0.137741  0.318804  0.000438
  5.357143  0.137741  0.323515  0.000441
  5.439560  0.137741  0.328226  0.000445
  5.521978  0.137741  0.332938  0.000448
  5.604396  0.137741  0.337649  0.000452
  5.686813  0.137741  0.342360  0.000455
  5.769231  0.137741  0.347071  0.000458
  5.851648  0.137741  0.351782  0.000462
  5.934066  0.137741  0.356494  0.000466
  6.000000  0.137741  0.756551  0.000473
  END FTABLE  4
  FTABLE      3
   20    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.137741  0.000000  0.000000  0.000000  0.000000
  0.082418  0.144552  0.011633  0.000000  1.712456  0.000000
  0.164835  0.151364  0.023827  0.000000  1.758243  0.000000
  0.247253  0.158175  0.036583  0.000000  1.804031  0.000000
  0.329670  0.164987  0.049900  0.000000  1.849818  0.000000
  0.412088  0.171798  0.063779  0.000000  1.895606  0.000000
  0.494505  0.178609  0.078218  0.000000  1.941393  0.000000
  0.576923  0.185421  0.093220  0.225747  1.987181  0.000000
  0.659341  0.192232  0.108782  0.659803  2.032969  0.000000
  0.741758  0.199043  0.124906  1.167185  2.078756  0.000000
  0.824176  0.205855  0.141592  1.637964  2.124544  0.000000
  0.906593  0.212666  0.158838  1.981950  2.170331  0.000000
  0.989011  0.219477  0.176647  2.182823  2.216119  0.000000
  1.071429  0.226289  0.195016  2.381102  2.261907  0.000000
  1.153846  0.233100  0.213947  2.547034  2.307694  0.000000
  1.236264  0.239912  0.233439  2.702798  2.353482  0.000000
  1.318681  0.246723  0.253493  2.850063  2.399269  0.000000
  1.401099  0.253534  0.274108  2.990083  2.445057  0.000000
  1.483516  0.260346  0.295284  3.123833  2.490844  0.000000
  1.500000  0.261708  0.299587  3.252087  2.500002  0.000000
  END FTABLE  3
  FTABLE      6
   47    5
```

DRAFT

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.057392	0.000000	0.000000	0.000000		
0.131868	0.057392	0.003461	0.000000	0.000000		
0.263736	0.057392	0.006922	0.000010	0.000337		
0.395604	0.057392	0.010383	0.000066	0.001650		
0.527473	0.057392	0.013844	0.000135	0.002797		
0.659341	0.057392	0.017305	0.000240	0.004324		
0.791209	0.057392	0.020766	0.000359	0.005787		
0.923077	0.057392	0.024227	0.000392	0.005787		
1.054945	0.057392	0.027687	0.000422	0.005787		
1.186813	0.057392	0.031148	0.000451	0.005787		
1.318681	0.057392	0.034609	0.000478	0.005787		
1.450549	0.057392	0.038070	0.000503	0.005787		
1.582418	0.057392	0.041531	0.000527	0.005787		
1.714286	0.057392	0.044992	0.000550	0.005787		
1.846154	0.057392	0.048453	0.000572	0.005787		
1.978022	0.057392	0.051914	0.000593	0.005787		
2.109890	0.057392	0.055375	0.000614	0.005787		
2.241758	0.057392	0.058836	0.000634	0.005787		
2.373626	0.057392	0.062297	0.000653	0.005787		
2.505495	0.057392	0.065758	0.000672	0.005787		
2.637363	0.057392	0.069219	0.000690	0.005787		
2.769231	0.057392	0.072680	0.000707	0.005787		
2.901099	0.057392	0.076141	0.000725	0.005787		
3.032967	0.057392	0.079281	0.000742	0.005787		
3.164835	0.057392	0.082422	0.000758	0.005787		
3.296703	0.057392	0.085563	0.000774	0.005787		
3.428571	0.057392	0.088704	0.000790	0.005787		
3.560440	0.057392	0.091845	0.000805	0.005787		
3.692308	0.057392	0.094985	0.000821	0.005787		
3.824176	0.057392	0.098126	0.000836	0.005787		
3.956044	0.057392	0.101267	0.000850	0.005787		
4.087912	0.057392	0.104408	0.000865	0.005787		
4.219780	0.057392	0.107549	0.000879	0.005787		
4.351648	0.057392	0.110689	0.000893	0.005787		
4.483516	0.057392	0.113830	0.000907	0.005787		
4.615385	0.057392	0.116971	0.000920	0.005787		
4.747253	0.057392	0.120112	0.000933	0.005787		
4.879121	0.057392	0.123253	0.000947	0.005787		
5.010989	0.057392	0.126393	0.000960	0.005787		
5.142857	0.057392	0.129534	0.000972	0.005787		
5.274725	0.057392	0.132675	0.000985	0.005787		
5.406593	0.057392	0.135816	0.000998	0.005787		
5.538462	0.057392	0.138956	0.001010	0.005787		
5.670330	0.057392	0.142097	0.001022	0.005787		
5.802198	0.057392	0.145238	0.001035	0.005787		
5.934066	0.057392	0.148379	0.001058	0.005787		
6.000000	0.057392	0.314894	0.001063	0.005787		

END FTABLE 6
FTABLE 5
47 6

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	outflow 3 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.057392	0.000000	0.000000	0.000000	0.000000		
0.131868	0.057392	0.007568	0.000000	0.724970	0.000000		
0.263736	0.057392	0.015136	0.000000	0.755495	0.000000		
0.395604	0.057392	0.022705	0.000000	0.786020	0.000000		
0.527473	0.057392	0.030273	0.000000	0.816545	0.000000		
0.659341	0.057392	0.037841	0.000000	0.847070	0.000000		
0.791209	0.057392	0.045409	0.000000	0.877595	0.000000		
0.923077	0.057392	0.052977	0.000000	0.908120	0.000000		
1.054945	0.057392	0.060546	0.000000	0.938645	0.000000		
1.186813	0.057392	0.068114	0.000000	0.969170	0.000000		
1.318681	0.057392	0.075682	0.000000	0.999696	0.000000		
1.450549	0.057392	0.083250	0.000000	1.030221	0.000000		
1.582418	0.057392	0.090818	0.000000	1.060746	0.000000		
1.714286	0.057392	0.098386	0.000000	1.091271	0.000000		

DRAFT

```
1.846154  0.057392  0.105955  0.000000  1.121796  0.000000
1.978022  0.057392  0.113523  0.000000  1.152321  0.000000
2.109890  0.057392  0.121091  0.000360  1.182846  0.000000
2.241758  0.057392  0.128659  0.000534  1.213371  0.000000
2.373626  0.057392  0.136227  0.000663  1.243896  0.000000
2.505495  0.057392  0.143796  0.000772  1.274421  0.000000
2.637363  0.057392  0.151364  0.000867  1.304946  0.000000
2.769231  0.057392  0.158932  0.000952  1.335471  0.000000
2.901099  0.057392  0.166500  0.001030  1.365996  0.000000
3.032967  0.057392  0.174068  0.001103  1.396521  0.000000
3.164835  0.057392  0.181637  0.001172  1.427046  0.000000
3.296703  0.057392  0.189205  0.001236  1.457571  0.000000
3.428571  0.057392  0.196773  0.001297  1.488096  0.000000
3.560440  0.057392  0.204341  0.001356  1.518621  0.000000
3.692308  0.057392  0.211909  0.001412  1.549147  0.000000
3.824176  0.057392  0.219477  0.001466  1.579672  0.000000
3.956044  0.057392  0.227046  0.001518  1.610197  0.000000
4.087912  0.057392  0.234614  0.001568  1.640722  0.000000
4.219780  0.057392  0.242182  0.001617  1.671247  0.000000
4.351648  0.057392  0.249750  0.001665  1.701772  0.000000
4.483516  0.057392  0.257318  0.001711  1.732297  0.000000
4.615385  0.057392  0.264887  0.001755  1.762822  0.000000
4.747253  0.057392  0.272455  0.001799  1.793347  0.000000
4.879121  0.057392  0.280023  0.001842  1.823872  0.000000
5.010989  0.057392  0.287591  0.038583  1.854397  0.000000
5.142857  0.057392  0.295159  1.718745  1.884922  0.000000
5.274725  0.057392  0.302728  4.563734  1.915447  0.000000
5.406593  0.057392  0.310296  8.138755  1.945972  0.000000
5.538462  0.057392  0.317864  12.17889  1.976497  0.000000
5.670330  0.057392  0.325432  16.42651  2.007022  0.000000
5.802198  0.057392  0.333000  20.61690  2.037547  0.000000
5.934066  0.057392  0.340569  24.49410  2.068072  0.000000
6.000000  0.057392  0.344353  27.84085  2.083335  0.000000
END FTABLE  5
FTABLE      2
 47    4
   Depth       Area     Volume  Outflow1 Velocity  Travel Time***
    (ft)    (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.045914  0.000000  0.000000
0.131868  0.045914  0.002769  0.000000
0.263736  0.045914  0.005537  0.000074
0.395604  0.045914  0.008306  0.000102
0.527473  0.045914  0.011075  0.000124
0.659341  0.045914  0.013844  0.000143
0.791209  0.045914  0.016612  0.000159
0.923077  0.045914  0.019381  0.000174
1.054945  0.045914  0.022150  0.000188
1.186813  0.045914  0.024919  0.000200
1.318681  0.045914  0.027687  0.000212
1.450549  0.045914  0.030456  0.000224
1.582418  0.045914  0.033225  0.000234
1.714286  0.045914  0.035994  0.000244
1.846154  0.045914  0.038762  0.000254
1.978022  0.045914  0.041531  0.000264
2.109890  0.045914  0.044300  0.000273
2.241758  0.045914  0.047069  0.000282
2.373626  0.045914  0.049837  0.000290
2.505495  0.045914  0.052606  0.000298
2.637363  0.045914  0.055375  0.000307
2.769231  0.045914  0.058144  0.000314
2.901099  0.045914  0.060912  0.000322
3.032967  0.045914  0.063425  0.000330
3.164835  0.045914  0.065938  0.000337
3.296703  0.045914  0.068450  0.000344
3.428571  0.045914  0.070963  0.000351
3.560440  0.045914  0.073476  0.000358
3.692308  0.045914  0.075988  0.000365
3.824176  0.045914  0.078501  0.000371
3.956044  0.045914  0.081014  0.000378
4.087912  0.045914  0.083526  0.000384
```

DRAFT

```
  4.219780  0.045914  0.086039  0.000391
  4.351648  0.045914  0.088551  0.000397
  4.483516  0.045914  0.091064  0.000403
  4.615385  0.045914  0.093577  0.000409
  4.747253  0.045914  0.096089  0.000415
  4.879121  0.045914  0.098602  0.000421
  5.010989  0.045914  0.101115  0.000427
  5.142857  0.045914  0.103627  0.000432
  5.274725  0.045914  0.106140  0.000438
  5.406593  0.045914  0.108653  0.000443
  5.538462  0.045914  0.111165  0.000449
  5.670330  0.045914  0.113678  0.000454
  5.802198  0.045914  0.116190  0.000460
  5.934066  0.045914  0.118703  0.000470
  6.000000  0.045914  0.251915  0.000473
  END FTABLE  2
  FTABLE      1
   47    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.045914  0.000000  0.000000  0.000000  0.000000
  0.131868  0.047730  0.006174  0.000000  0.579976  0.000000
  0.263736  0.049547  0.012588  0.000000  0.604396  0.000000
  0.395604  0.051363  0.019242  0.000000  0.628816  0.000000
  0.527473  0.053180  0.026135  0.000000  0.653236  0.000000
  0.659341  0.054996  0.033267  0.000000  0.677656  0.000000
  0.791209  0.056813  0.040639  0.000000  0.702076  0.000000
  0.923077  0.058629  0.048251  0.000000  0.726496  0.000000
  1.054945  0.060446  0.056102  0.000000  0.750916  0.000000
  1.186813  0.062262  0.064192  0.000000  0.775336  0.000000
  1.318681  0.064079  0.072523  0.000000  0.799756  0.000000
  1.450549  0.065896  0.081092  0.000000  0.824176  0.000000
  1.582418  0.067712  0.089902  0.000000  0.848597  0.000000
  1.714286  0.069529  0.098950  0.000000  0.873017  0.000000
  1.846154  0.071345  0.108239  0.000000  0.897437  0.000000
  1.978022  0.073162  0.117767  0.000000  0.921857  0.000000
  2.109890  0.074979  0.127534  0.000000  0.946277  0.000000
  2.241758  0.076795  0.137541  0.000000  0.970697  0.000000
  2.373626  0.078612  0.147788  0.000000  0.995117  0.000000
  2.505495  0.080429  0.158274  0.000000  1.019537  0.000000
  2.637363  0.082245  0.169000  0.000000  1.043957  0.000000
  2.769231  0.084062  0.179965  0.000000  1.068377  0.000000
  2.901099  0.085879  0.191170  0.000000  1.092797  0.000000
  3.032967  0.087695  0.202615  0.000000  1.117217  0.000000
  3.164835  0.089512  0.214299  0.000000  1.141637  0.000000
  3.296703  0.091329  0.226222  0.000000  1.166057  0.000000
  3.428571  0.093146  0.238385  0.000000  1.190477  0.000000
  3.560440  0.094962  0.250788  0.000000  1.214897  0.000000
  3.692308  0.096779  0.263430  0.000000  1.239317  0.000000
  3.824176  0.098596  0.276312  0.000000  1.263737  0.000000
  3.956044  0.100413  0.289434  0.000000  1.288157  0.000000
  4.087912  0.102229  0.302795  0.000000  1.312577  0.000000
  4.219780  0.104046  0.316395  0.000000  1.336997  0.000000
  4.351648  0.105863  0.330235  0.000000  1.361417  0.000000
  4.483516  0.107680  0.344315  0.000000  1.385837  0.000000
  4.615385  0.109497  0.358635  0.000000  1.410258  0.000000
  4.747253  0.111313  0.373193  0.000000  1.434678  0.000000
  4.879121  0.113130  0.387992  0.000000  1.459098  0.000000
  5.010989  0.114947  0.403030  0.036700  1.483518  0.000000
  5.142857  0.116764  0.418308  1.716821  1.507938  0.000000
  5.274725  0.118581  0.433825  4.561769  1.532358  0.000000
  5.406593  0.120398  0.449582  8.136751  1.556778  0.000000
  5.538462  0.122215  0.465578  12.17685  1.581198  0.000000
  5.670330  0.124031  0.481814  16.42443  1.605618  0.000000
  5.802198  0.125848  0.498290  20.61478  1.630038  0.000000
  5.934066  0.127665  0.515005  24.49195  1.654458  0.000000
  6.000000  0.128574  0.523452  27.83866  1.666668  0.000000
  END FTABLE  1
```

DRAFT

```
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.71           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.71           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    0.71           RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    0.71           RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    0.71           RCHRES   5     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   6 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL      REPL
RCHRES   6 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL      REPL
RCHRES   5 HYDR   STAGE  1 1        1      WDM   1016 STAG     ENGL      REPL
RCHRES   5 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL      REPL
RCHRES   2 HYDR   RO     1 1        1      WDM   1018 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1019 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1020 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1021 FLOW     ENGL      REPL
COPY     3 OUTPUT MEAN   1 1     48.4      WDM    703 FLOW     ENGL      REPL
COPY   503 OUTPUT MEAN   1 1     48.4      WDM    803 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                  RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                  RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
```

DRAFT

```
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       18
RCHRES     OFLOW  OVOL   2                 COPY           INPUT  MEAN
  END MASS-LINK   18

  MASS-LINK       50
IMPLND     IWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   50

  MASS-LINK       53
IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   53


END MASS-LINK

END RUN
```

DRAFT

DRAFT

Mitigated HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
47 2.2434E+04 2.2802E+04 2.2896E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1980/ 2/14  7:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
3.9596E+01 1.1122E+04 -1.402E+04    1.2550  1.2550E+00      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1998/ 2/23 21:30

RCHRES:     3

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
20 1.2863E+04 1.3050E+04 1.3419E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1998/ 2/23 21:30

RCHRES:     3

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
5.9328E+01 2.2681E+04 -6.746E+04    2.9516  2.9516E+00      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1998/ 2/23 21:45

RCHRES:     3
```

DRAFT

```
The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
20 1.2863E+04 1.3050E+04 1.4608E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1998/ 2/23 21:45

RCHRES:     3

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
5.9328E+01 2.2681E+04 -2.117E+05    9.1179  9.1178E+00      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1998/ 2/23 22: 0

RCHRES:     3

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
20 1.2863E+04 1.3050E+04 1.3620E+04
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1998/ 2/23 22: 0

RCHRES:     3

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
5.9328E+01 2.2681E+04 -9.186E+04    4.0081  4.0081E+00      3
```

DRAFT

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2016; All Rights Reserved.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

DRAFT

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the HMP Performance Standards

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Grant Becklund	Date	10/24/2016
Designed by	Grant Becklund	County/City Case No	Plot Plan 16-0006
Company Project Number/Name	Bundy Canyon Luxury Apartments		
Drainage Area Number/Name	DMA One - Apartment Site		

Enter the Area Tributary to this Feature A_T = 9.14 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6 South

Range: 4 West

Section: 25

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.71

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.66

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.46

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.32 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 10,617 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Grant Becklund	Date	10/24/2016
Designed by	Grant Becklund	County/City Case No	Plot Plan 16-0006
Company Project Number/Name	Bundy Canyon Luxury Apartments		
Drainage Area Number/Name	DMA Two - Natural Basin		

Enter the Area Tributary to this Feature A_T = 3.77 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6 South

Range: 4 West

Section: 25

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.71

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.26

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.20

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.15 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 2,053 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Grant Becklund	Date	10/24/2016
Designed by	Grant Becklund	County/City Case No	Plot Plan 16-0006
Company Project Number/Name	Bundy Canyon Luxury Apartments		
Drainage Area Number/Name	DMA Three - Off-Site from South		

Enter the Area Tributary to this Feature A_T = 6.71 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6 South

Range: 4 West

Section: 25

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.71

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.15

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.14

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.10 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 2,436 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Grant Becklund	Date	10/24/2016
Designed by	Grant Becklund	County/City Case No	Plot Plan 16-0006
Company Project Number/Name	Bundy Canyon Luxury Apartments		
Drainage Area Number/Name	DMA Four - North Portion and Access Road		

Enter the Area Tributary to this Feature A_T = 15.88 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6 South

Range: 4 West

Section: 25

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.71

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.15

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.14

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.10 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 5,764 ft^3

Notes:

Bioretention Facility - Design Procedure	BMP ID: One	Legend:	Required Entries / Calculated Cells
Company Name:	Grant Becklund	Date:	Oct-16
Designed by:	Grant Becklund	County/City Case No.:	PP 16-0006

Design Volume

Enter the area tributary to this feature	A_T=	9.14	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	10,617	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 =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	5,899	ft^2
Proposed Surface Area	A=	11,000	ft^2
Minimum Required Length of Bioretention Facility, L	L =	589.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.001	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

Bioretention Facility - Design Procedure	BMP ID Two	Legend:	Required Entries / Calculated Cells
Company Name:	Grant Becklund	Date:	Oct-16
Designed by:	Grant Becklund	County/City Case No.:	PP 16-0006

Design Volume

Enter the area tributary to this feature	A_T=	3.77	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,053	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 =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	50.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,141	ft^2
Proposed Surface Area	A=	2,500	ft^2
Minimum Required Length of Bioretention Facility, L	L =	22.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.001	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

Bioretention Facility - Design Procedure	BMP ID Three	Legend:	Required Entries / Calculated Cells
Company Name:	Grant Becklund	Date:	Oct-16
Designed by:	Grant Becklund	County/City Case No.:	PP 16-0006

Design Volume

Enter the area tributary to this feature	A_T=	6.71	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,436	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 =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	15.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,354	ft^2
Proposed Surface Area	A=	2,500	ft^2
Minimum Required Length of Bioretention Facility, L	L =	90.3	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.001	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

Bioretention Facility - Design Procedure	BMP ID: Four	Legend:	Required Entries / Calculated Cells
Company Name:	Grant Becklund	Date:	Oct-16
Designed by:	Grant Becklund	County/City Case No.:	PP 16-0006

Design Volume

Enter the area tributary to this feature	A_T=	15.88	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	5,764	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 =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	30.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	3,203	ft^2
Proposed Surface Area	A=	6,000	ft^2
Minimum Required Length of Bioretention Facility, L	L =	106.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.001	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information