PRELIMINARY HYDROLOGY AND HYDRAULICS REPORT FOR AUSTIN VINEYARDS

CITY OF TEMECULA
CALIFORNIA

PREPARED FOR:

AUSTIN VINEYARDS, LLC
3060 UPHAM STREET
WHEAT RIDGE, CO 08033
PH. 303.475.1555

PREPARED BY:

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552
FAX 951.304.3568

JUNE 10, 2022
REVISED

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.

06/10/2022

Joseph L. Castaneda RCE 59835 Registered Civil Engineer	Date	Seal

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I. INTRODUCTION

The purpose of this study is to evaluate the drainage patterns and potential runoff for the Austin Vineyards project. The project is located within the City of Temecula, in the County of Riverside. The project site is bounded by Glen Oaks Road to the southwest and is located to the southeast of Rancho California Road, as shown on Figure 1 Vicinity Map. The project site is an existing vineyard with a graded pad. The project is proposing to build a winery with a tasting room, production room, patio deck and parking area with Class II base impervious area. The project site consists of two existing desilting basin areas, as shown on the Existing Storm Drain Condition Map, Figure 2. The project proposed to convert the basins to water quality basins.

The scope of the study includes the following:

1. Assess the grading to determine the drainage areas and patterns for the project area.
2. Perform the post-project hydrology analysis for the 10-year and 100-year storm events.
3. Provide water quality basins.
4. Size the basin outlets for the 100-year flow rate.
5. Preparation of the hydrology and hydraulics report, which consists of hydrological and analytical results and exhibits.

II. HYDROLOGY

The RCFC&WCD Hydrology Manual (Reference 1) was used to develop the hydrological parameters for the hydrology analyses. The rational method was used for the analyses and the computations were performed using the computer program developed by Civil Cadd/Civil Design.

Rainfall depths were obtained from the RCFC&WCD Hydrology Manual, and included as Exhibit D and Exhibit E, as follows:

Storm Event & Duration	Rainfall (inches)
2-Year, 1-Hour	0.50
100-Year, 1-Hour	1.2
Slope of Intensity	0.55

The existing soil classification for the project site consists of hydraulic Soil Group “C” as shown in Exhibit C. Exhibit C provides the soils data obtained from the Natural Resource Conservation Service Websoil Survey. An Antecedent Moisture Condition of II was used for the 10-year and 100-year rational method calculations.

A land cover map was developed for the WQMP and has been included as Excerpt A (labeled as Figure 4 for the WQMP). The land cover breaks down the project area into the

following land covers: AC, Concrete, Class II Pervious Aggregate Base, Ornamental Landscaping, and Vineyard. Per the land cover analysis, Area A has an impervious ratio of 0.18 and Area B has an impervious ratio of 0.34. Due to constraints in the available land cover options for initial areas in the program used for the hydrology analysis, land covers were used with a similar impervious ratio. Single Family (1 Acre Lot) was used for Area A which has an impervious ratio of 0.2. Single Family (1/2 Acre Lot) was used for Area B which has an impervious ratio of 0.4.

The project site consists of two drainage areas. Area A has an area of 2.59 acres and Area B has an area of 2.16 acres. The project site was assessed for the 10-year and 100-year storm events. The results of the rational method analysis are as follows:

Area	100-Year Storm Event		10-Year Storm Event	
	Q_{100} (ft^3/s)	Tc (min)	Q_{10} (ft^3/s)	Tc (min)
A	6.66	9.74	4.12	9.74
B	7.16	6.74	4.53	6.74

The results of the rational method analysis were used to size the outlet structures for the water quality basins.

The rational method hydrology calculations have been included in Appendix A. The post-project rational method hydrology map has been included as Exhibit A.

III. HYDRAULICS

A drainage facilities map has been provided for the project site, see Exhibit B. Runoff from Area A discharges to Water Quality Basin A and discharges through a proposed 36" riser and a proposed 24" CMP (replacing an existing 18" CMP). Runoff from Area B discharges to Water Quality Basin B and discharges through a proposed 36" riser and a proposed 24" CMP.

The outlet structures for the basins were sized using the 100-year flow rates per the rational method analysis. The calculations have been included in Appendix B. The outlet structures were designed to ensure sufficient freeboard within the basins, see summary table below:

Basin	Outlet Structure	100-Year Ponding Depth (ft)	Outlet Structure Elevation	100-Year WSE	Top of Basin	Freeboard (ft)
A	Riser #A	0.6	1505.5	1506.1	1508.0	1.9
B	Riser #B	0.7	1502.0	1502.7	1505.0	2.3

The outlet pipes were assessed using the FlowMaster program to calculate the full flow condition capacity. Line A1 and Line A2 are both 24" CMP systems which have a capacity

of 12.3 ft^3/s. This capacity exceeds the 100-year flow rates for Area A and Area B. The calculations have been included Appendix C.

V. CONCLUSIONS

The hydrology analysis evaluated the proposed winery to assess the drainage patterns and storm drain systems. It has been concluded that:

1. The runoff emanating from the project site will discharge into Water Quality Basin A and Water Quality Basin B.
2. Water Quality Basin A and Water Quality Basin B are designed to treat the water quality volume emanating from the project site.
3. The 100-year flows are contained within Basin A and Basin B.
4. The proposed outlet risers are sized sufficiently for the 100-year flow rates.
5. The proposed outlet storm drain systems are sized to adequately contain the 100-year flow rates.

VI. REFERENCES

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

FIGURES

FIGURE 1: VICINITY MAP

35620 GLEN OAKS ROAD, TEMECULA, CA 92591

N

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

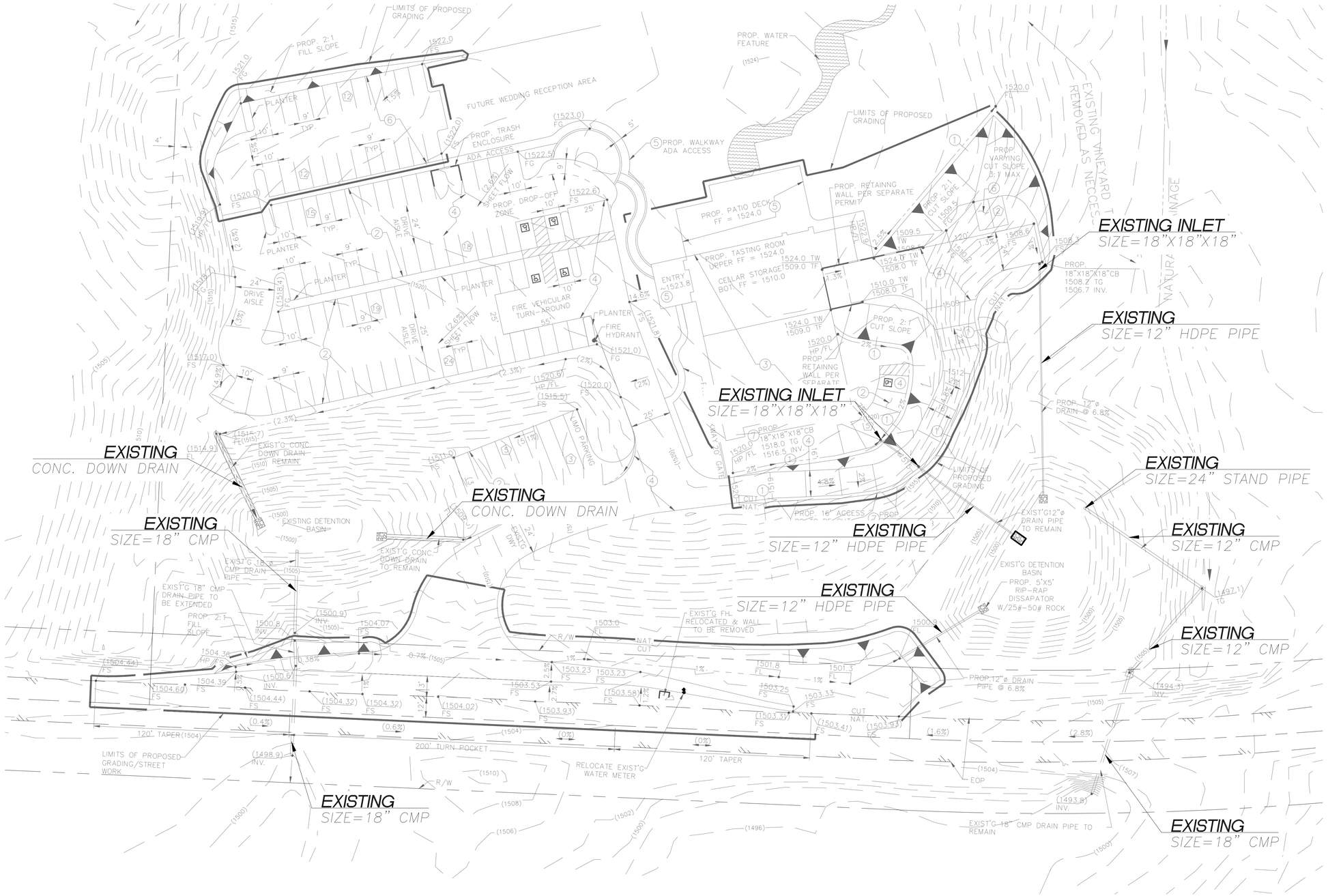
FIGURE 1

FIGURE 2: EXISTING STORM DRAIN CONDITION

PLOT PLAN MAP 210132

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

EXISTING STORM DRAIN CONDITION MAP



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41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 2

PP NO. 210132

EXISTING STORM DRAIN CONDITION MAP

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APPENDICES

APPENDIX A: POST-PROJECT RATIONAL METHOD HYDROLOGY CALCULATIONS

APPENDIX A.1: POST-PROJECT RATIONAL METHOD ANALYSIS, AREAS "A"

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2001 Version 6.4
Rational Hydrology Study Date: 06/08/22 File:ARA100.out

158.22.18
PLOT PLAN MAP 18006
100-YEAR RATIONAL TABLING METHOD FOR DMA A
FN: ARA100.RRV

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

TRI-8 Builders - S/N 615

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 429.000(Ft.)
Top (of initial area) elevation = 1523.000(Ft.)
Bottom (of initial area) elevation = 1500.000(Ft.)
Difference in elevation = 23.000(Ft.)
Slope = 0.05361 s(percent)= 5.36
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.736 min.
Rainfall intensity = 3.263(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 6.661(CFS)
Total initial stream area = 2.590(Ac.)
Pervious area fraction = 0.800
End of computations, total study area = 2.59 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.800
Area averaged RI index number = 69.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2001 Version 6.4
Rational Hydrology Study Date: 06/08/22 File:ARA10.out

158.22.18
PLOT PLAN MAP 18006
10-YEAR RATIONAL TABLING METHOD FOR DMA A
FN: ARA10.RRV

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

TRI-8 Builders - S/N 615

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.788(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 429.000(Ft.)
Top (of initial area) elevation = 1523.000(Ft.)
Bottom (of initial area) elevation = 1500.000(Ft.)
Difference in elevation = 23.000(Ft.)
Slope = 0.05361 s(percent)= 5.36
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.736 min.
Rainfall intensity = 2.142(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.743
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Initial subarea runoff = 4.121(CFS)
Total initial stream area = 2.590(Ac.)
Pervious area fraction = 0.800
End of computations, total study area = 2.59 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.800
Area averaged RI index number = 69.0

APPENDIX A.2: POST-PROJECT RATIONAL METHOD ANALYSIS, AREAS "B"

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2001 Version 6.4
Rational Hydrology Study Date: 06/08/22 File:ARB100.out

158.22.18
PLOT PLAN MAP 18006
100-YEAR RATIONAL TABLING METHOD FOR DMA B
FN: ARB100.RRV

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

TRI-8 Builders - S/N 615

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 103.000 to Point/Station 104.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 303.000(Ft.)
Top (of initial area) elevation = 1523.500(Ft.)
Bottom (of initial area) elevation = 1497.300(Ft.)
Difference in elevation = 26.200(Ft.)
Slope = 0.08647 s(percent)= 8.65
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.737 min.
Rainfall intensity = 3.995(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 7.159(CFS)
Total initial stream area = 2.160(Ac.)
Pervious area fraction = 0.600
End of computations, total study area = 2.16 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.600
Area averaged RI index number = 69.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2001 Version 6.4
Rational Hydrology Study Date: 06/08/22 File:ARB10.out

158.22.18
PLOT PLAN MAP 18006
10-YEAR RATIONAL TABLING METHOD FOR DMA B
FN: ARB10.RRV

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

TRI-8 Builders - S/N 615

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.788(In/Hr)
Slope of intensity duration curve = 0.5500

++
Process from Point/Station 103.000 to Point/Station 104.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 303.000(Ft.)
Top (of initial area) elevation = 1523.500(Ft.)
Bottom (of initial area) elevation = 1497.300(Ft.)
Difference in elevation = 26.200(Ft.)
Slope = 0.08647 s(percent)= 8.65
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 6.737 min.
Rainfall intensity = 2.623(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 4.531(CFS)
Total initial stream area = 2.160(Ac.)
Pervious area fraction = 0.600
End of computations, total study area = 2.16 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.600
Area averaged RI index number = 69.0

APPENDIX B: OUTLET RISER CALCULATIONS

APPENDIX B.1: CALCULATIONS FOR OUTLET RISER #A

RISER #A

36" RISER

Orifice Equation:	Q = CA√2gh	Weir Equation:	Q = CLH$^{3/2}$
Q =	6.66 cfs	Q =	6.66 cfs
C =	0.66	C =	2.8
A=	7.07 ft^2	L=	9.42 ft^2
A * 50% Clogging	3.535 ft^2	A * 50% Clogging	4.71 ft^2
g=	32.2 ft/s^2	Riser Invert	0 ft
Riser Invert	0 ft		
Resulting h =	0.51 ft	Resulting H =	0.63 ft
Resulting 100-year WSE at Inlet =	0.51 ft	Resulting 100-year WSE at Inlet =	0.63 ft
RISER HYDRAULIC CONTROL		WEIR CONTROLS INLET CONDITION	

APPENDIX B.2: CALCULATION FOR OUTLET RISER #B

RISER #B

36" RISER

Orifice Equation:	Q = CA√2gh	Weir Equation:	Q = CLH$^{3/2}$
Q =	7.16 cfs	Q =	7.16 cfs
C =	0.66	C =	2.8
A=	7.07 ft^2	L=	9.42 ft^2
A * 50% Clogging	3.535 ft^2	A * 50% Clogging	4.71 ft^2
g=	32.2 ft/s^2	Riser Invert	0 ft
Riser Invert	0 ft		
Resulting h =	0.58 ft	Resulting H =	0.67 ft
Resulting 100-year WSE at Inlet =	0.58 ft	Resulting 100-year WSE at Inlet =	0.67 ft
RISER HYDRAULIC CONTROL		WEIR CONTROLS INLET CONDITION	

APPENDIX C: FLOW CAPACITY ANALYSIS FOR 24" CMP

Worksheet for 24" CMP FULL FLOW CAPACITY

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.024	
Channel Slope	0.01000	ft/ft
Normal Depth	2.00	ft
Diameter	2.00	ft
Discharge	12.25	ft³/s

Results

Discharge	12.25	ft³/s
Normal Depth	2.00	ft
Flow Area	3.14	ft²
Wetted Perimeter	6.28	ft
Hydraulic Radius	0.50	ft
Top Width	0.00	ft
Critical Depth	1.26	ft
Percent Full	100.0	%
Critical Slope	0.01922	ft/ft
Velocity	3.90	ft/s
Velocity Head	0.24	ft
Specific Energy	2.24	ft
Froude Number	0.00	
Maximum Discharge	13.18	ft³/s
Discharge Full	12.25	ft³/s
Slope Full	0.01000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for 24" CMP FULL FLOW CAPACITY

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	1.26	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.01922	ft/ft

Messages

Notes

158.22.18 Austin Vineyards
Preliminary Drainage Report
Outlet storm drain analysis

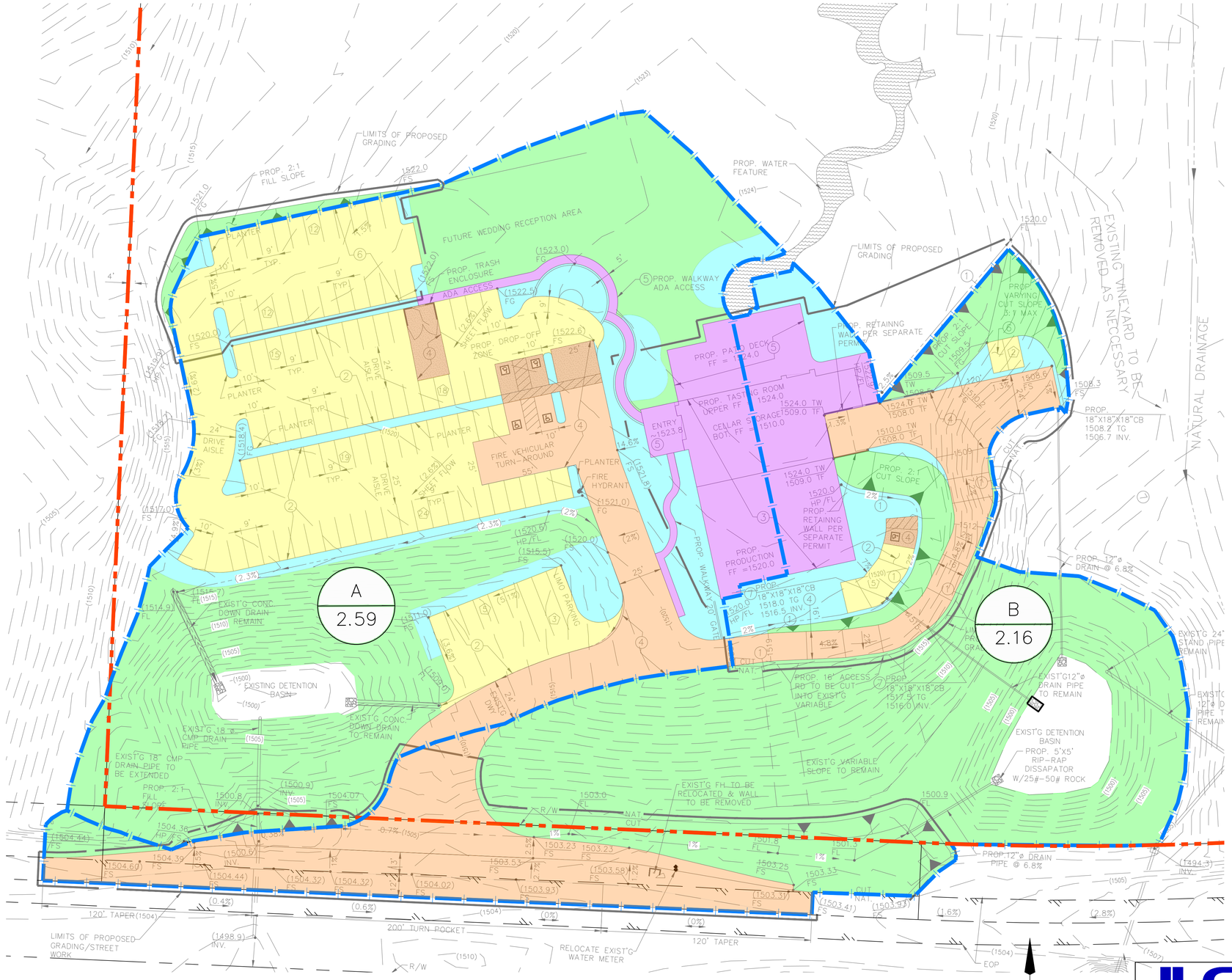
EXCERPTS

EXCERPT A: WQMP FIGURE 4 LAND COVER MAP

PLOT PLAN MAP 210132

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LAND COVER MAP



LEGEND:

XXX / X.X — DMA / ACRES

- DMA BOUNDARY
- TRACT BOUNDARIES
- AC
- CONCRETE
- CLASS II PERVIOUS AGG. BASE
- ORNAMENTAL LANDSCAPE
- VINEYARD

DMA SUMMARY TABLE			
DMA	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)	TOTAL AREA (SF)
A	19805.0	93226.2	113031.2
B	30702.6	63541.1	94243.7

DMA A SUMMARY TABLE			
LANDCOVER	TOTAL AREA (SF)	PERCENT IMPERVIOUS	IMPERVIOUS AREA (SF)
AC	11922.9	100.00%	11922.9
CONCRETE	7916.2	100.00%	7916.2
CLASS II AGG. BASE	35122.5	0.00%	0.0
ORNAMENTAL LANDSCAPE	16139.8	0.00%	0.0
VINEYARD	41929.8	0.00%	0.0
TOTAL IMPERVIOUS AREA			17.92%
TOTAL EFFECTIVE IMPERVIOUS AREA			34.09%

DMA B SUMMARY TABLE			
LANDCOVER	TOTAL AREA (SF)	PERCENT IMPERVIOUS	IMPERVIOUS AREA (SF)
AC	23870.4	100.00%	23870.4
CONCRETE	6962.0	100.00%	6962.0
CLASS II AGG. BASE	1167.2	0.00%	0.0
ORNAMENTAL LANDSCAPE	9848.8	0.00%	0.0
VINEYARD	52395.3	0.00%	0.0
TOTAL IMPERVIOUS AREA			34.09%
TOTAL EFFECTIVE IMPERVIOUS AREA			50.56%

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 4

PP NO. 210132

LAND COVER MAP

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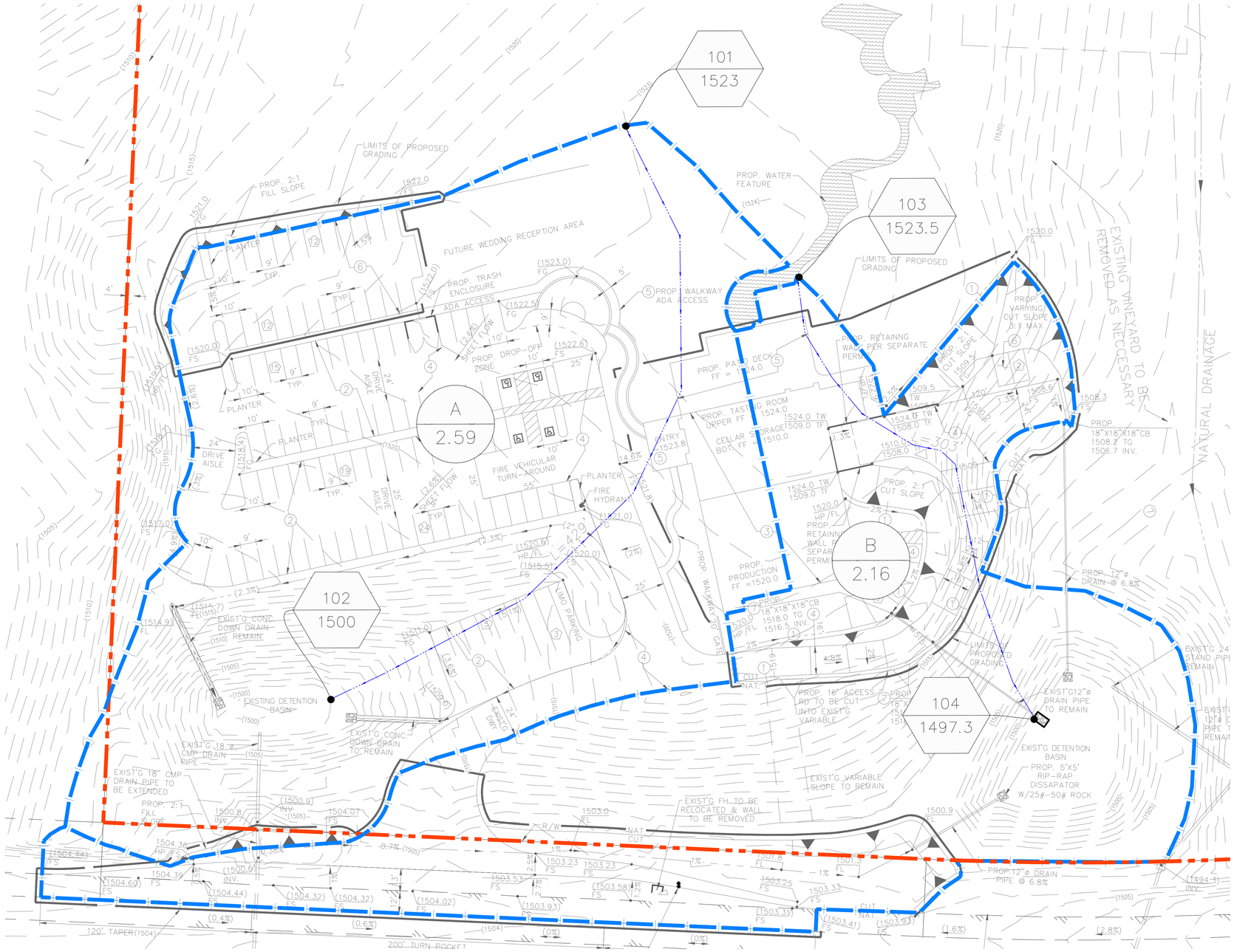
EXHIBITS

EXHIBIT A: POST-PROJECT HYDROLOGY MAP

PLOT PLAN MAP 210132

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

POST PROJECT HYDROLOGY MAP



HYDROLOGY SUMMARY TABLE					
NODE	Q_{100} (CFS)	T_C (MIN)	Q_{10} (CFS)	T_C (MIN)	AREA (ac)
101–102	6.66	9.74	4.12	9.74	2.59
103–104	7.16	6.74	4.53	6.74	2.16

NOTE:
ALL AREAS ARE SOIL TYPE C PER NRCS SOILS MAP

LEGEND:

- XXX.X / XXXX — NODE/CONCENTRATION POINT
- XXXX.X — APPROXIMATE INVERT ELEVATION
- XXX / X.X — DMA / ACRES
- FLOW PATH
- DMA BOUNDARY
- TRACT BOUNDARIES

GRAPHIC SCALE
30' 0 15' 30' 60'
1" = 30'

EXHIBIT "A"

PP NO. 210132

HYDROLOGY MAP

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41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

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EXHIBIT B: DRAINAGE FACILITIES MAP

PLOT PLAN MAP 210132

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

DRAINAGE FACILITIES MAP

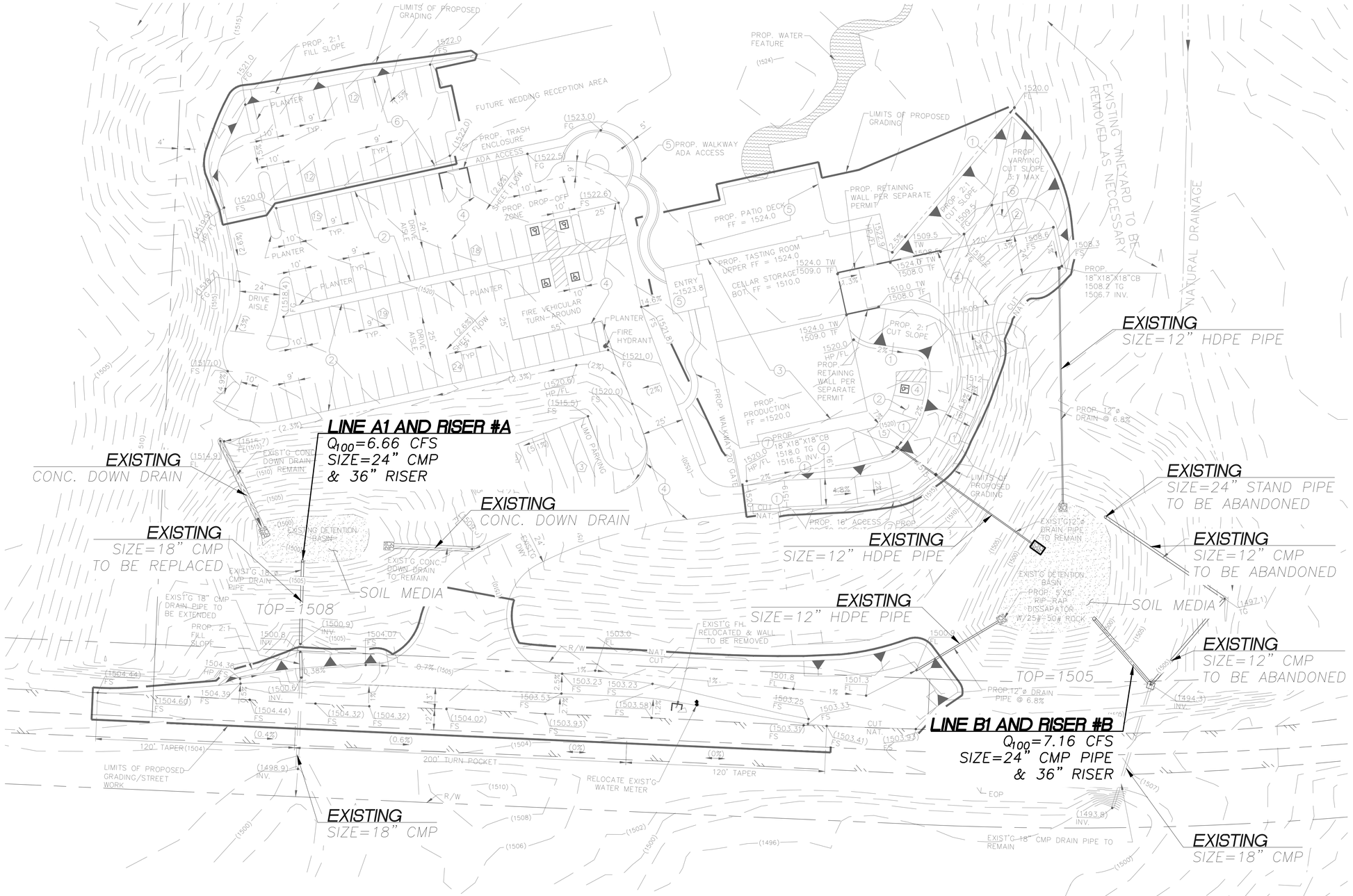

EXHIBIT "B"

PP NO. 210132

DRAINAGE FACILITIES MAP

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41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

Drawing Name: O:\158.22.18\Engineering\Hydrology_Plan\Exhibits\158.22.18-ExhB-Drainage-Facilities-Map.dwg
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EXHIBIT C: SOILS MAP

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D

SOILS MAP

N

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41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT C

Drawing Name: O:\158.22.18\Engineering\Hydrology_Plan\Exhibits\158.22.18-ExhC-Soils-Map.dwg
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EXHIBIT D: RAINFALL MAPS

2 YEAR, 1 HOUR

AUSTIN WINERY
RAINFALL = 0.50

JLC Engineering & Consulting, Inc.

41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR
PRECIPITATION

APPROVED CHIEF ENGINEER R.E. NO. 8885
DATE
DRAWN BY R.L.S.
PLATE D-4.3
SHEET NO
DR. NO
REVISED

100 YEAR, 1 HOUR

AUSTIN WINERY
RAINFALL = 1.20

JLC Engineering & Consulting, Inc.

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MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

Notes:
Isohyetals based on NOAA Atlas 2, volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 1-HOUR PRECIPITATION

PLATE D-4.4

EXHIBIT E: SLOPE INTENSITY MAP

SLOPE INTENSITY CURVE

AUSTIN WINERY
RAINFALL = 0.55

JLC Engineering & Consulting, Inc.

41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

Notes:
1. Slope of Intensity - Duration Curve based on District analysis of automatic recording rain gage records.

RCFC & WCD

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

SLOPE OF INTENSITY DURATION CURVE

APPROVED CHIEF ENGINEER R.E. NO. 8888 DATE	DRAWN BY E.A.S.	SHEET NO
	PLATE D-4.6	DR NO