

APPENDIX 5.15A

Preliminary Stormwater Management Design



**CALCULATION SUMMARY &
CONTROL SHEET**

CALCULATION SET NO. 383206-CE-01

PRELIM. X	FINAL	VOID	REVISION C
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CLIENT: Diamond Generating Corporation (DGC) Sheet 1 of 19
Discipline Civil

PROJECT TITLE: Kelso CT Project Project No 383206

SUBJECT: Drainage calculations for Peak Runoff and Detention Pond sizing.

COMPLETED BY: John Purdy, P.E. *[Signature]* DATE: 5/19/09
CHECKED BY: Matthew Cannizzaro, P.E. *[Signature]* DATE: 5/19/09
APPROVED BY: _____ DATE: _____

REVISION SUMMARY: General Revision TOTAL NUMBER OF SHEETS IN THIS ISSUE: 19
SHEETS REVISED ADDED, pgs 3&4 or DELETED:

PROBLEM STATEMENT: Calculate subbasin peak runoff flows and confirm the size of the site stormwater detention pond.

RESULTS & CONCLUSIONS: See Calculation Summary Sheet Page 2

DESIGN BASIS & ASSUMPTIONS: See Calculation Summary Sheet Page 2

UNVERIFIED ASSUMPTIONS/OPEN ITEMS: N/A

REFERENCES: NOAA Atlas 2, Volume XI; Alameda County Flood Control & Water Conservation District, C.3 Stormwater Technical Guidance, V1.0, 8/2006

ATTACHMENTS (Including number of pages): Drainage System Schematic (2p), Bentley CivilStorm Output Report (6p), Detention Pond Stage-Storage & Flow In / Out Graphs (2p), Water Quality Capture Volume (WQCV) Calculation (1p) California Precipitation Frequency Data Output (1p), Hydrologic Soil Group (4p), Alameda County Mean Annual Precipitation Map (1p)

COMPUTER PROGRAM DISCLOSURE INFORMATION:

Program Used	Rev No./Issue Date	CH2M Verified
<u>Bentley Civil Storm</u>	<u>V8 XM /</u>	<u>X</u> Yes <u> </u> No



PRELIM.	FINAL	VOID	REVISION
X			C

Site hydrology will be based on the following criteria:

Method: SCS Unit Hydrograph Method
 Rainfall Distribution: SCS Type I
 Hydrologic Soil Group: Group D (See Attachment from NRCS)
 Curve Number: 78 – Existing Condition – Meadow – cont. grass, HSG D
 Curve Number: 93 – Proposed Plant - Urban industrial, HSG D
 Water Quality Capture Volume (WQCV): Per Alameda County, C.3 Storm Water Technical Guidance, 8/2006
 Proposed Project Drainage Area: 8.12 Acres
 Tributary Off-Site Drainage Area: 67.50 Acres (Diverted around the Proposed Project Site)
 Minimum Time of Concentration (Tc): 5-minutes
 Minimum Pipe Size for Storm Drain Main Line: 18-inches

Design Storms:

2-year 24 hour - 1.64 inches (Prec. Freq. Data Output, NOAA Atlas 2, See Attachment)
 100-year 24 hour – 4.00 inches Prec. Freq. Data Output, NOAA Atlas 2, See Attachment)

Existing Condition Peak Runoff (CM-5):

2-year 24 hour – 0.21 Acre-ft, Q=0.58 cfs
 100-year 24 hour – 1.36 Acre-ft, Q=7.05 cfs

Computed runoff volume tributary to the On-Site Detention Pond (S-1 & S-2):

2-year 24 hour – 0.28 Acre-ft, Qout=0.58 cfs, peak elevation 108.63 ft
 100-year 24 hour – 0.79 Acre-ft, Qout=6.58 cfs, peak elevation 110.96 ft with 2.04 ft of freeboard
 Water Quality Capture Volume (WQCV): 4962 CuFt, outlet designed for 48-hour drawdown

System Description:

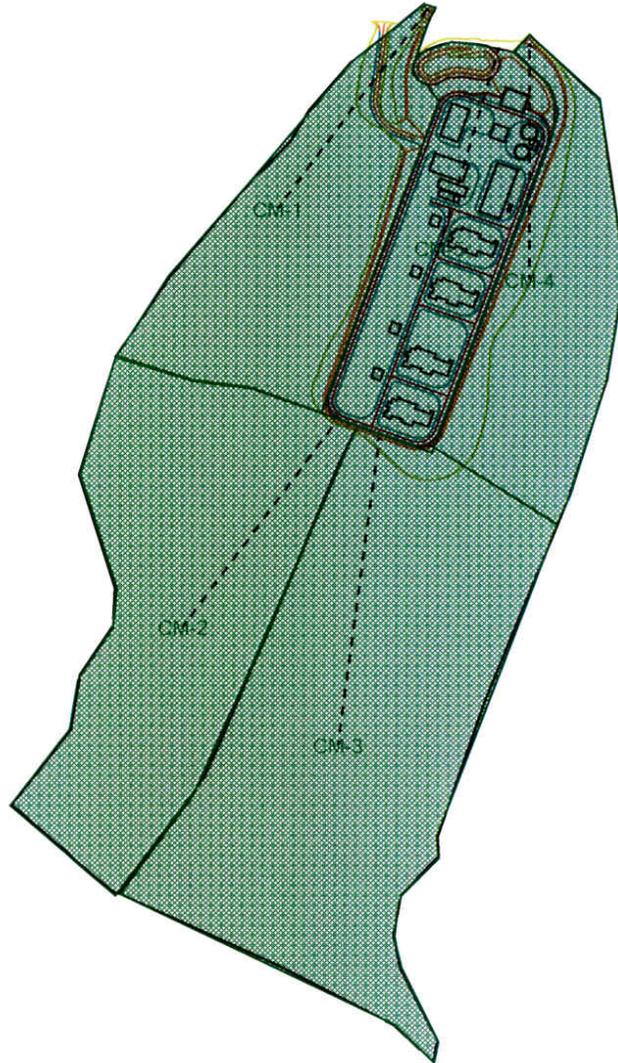
The Kelso Power Plant is a proposed facility in Alameda County, California.

The proposed facility will mitigate storm runoff with a series of inlets and storm drain pipes which will convey the runoff to a proposed on-site Extended Detention Basin (TC-22) located on the north end of the site. Areas of potential oil contamination will be sited inside containments which will prevent potential contaminants from being conveyed to the storm system. Storm water that is contained will be treated and disposed of per the regulatory requirements. The implementation of these containments will enable for the balance of site runoff to be conveyed directly to the Extended Detention Basin without prior treatment through an oil water separator.

Impervious areas will be limited to paved loop and equipment access roads and the equipment required to operate the plant. The remainder of the site will gravel surfaced. The proposed plant is 44% impervious.

EXISTING CONDITION

Scenario: Base



REV C

Ex-Kelso.csd

5/19/2009

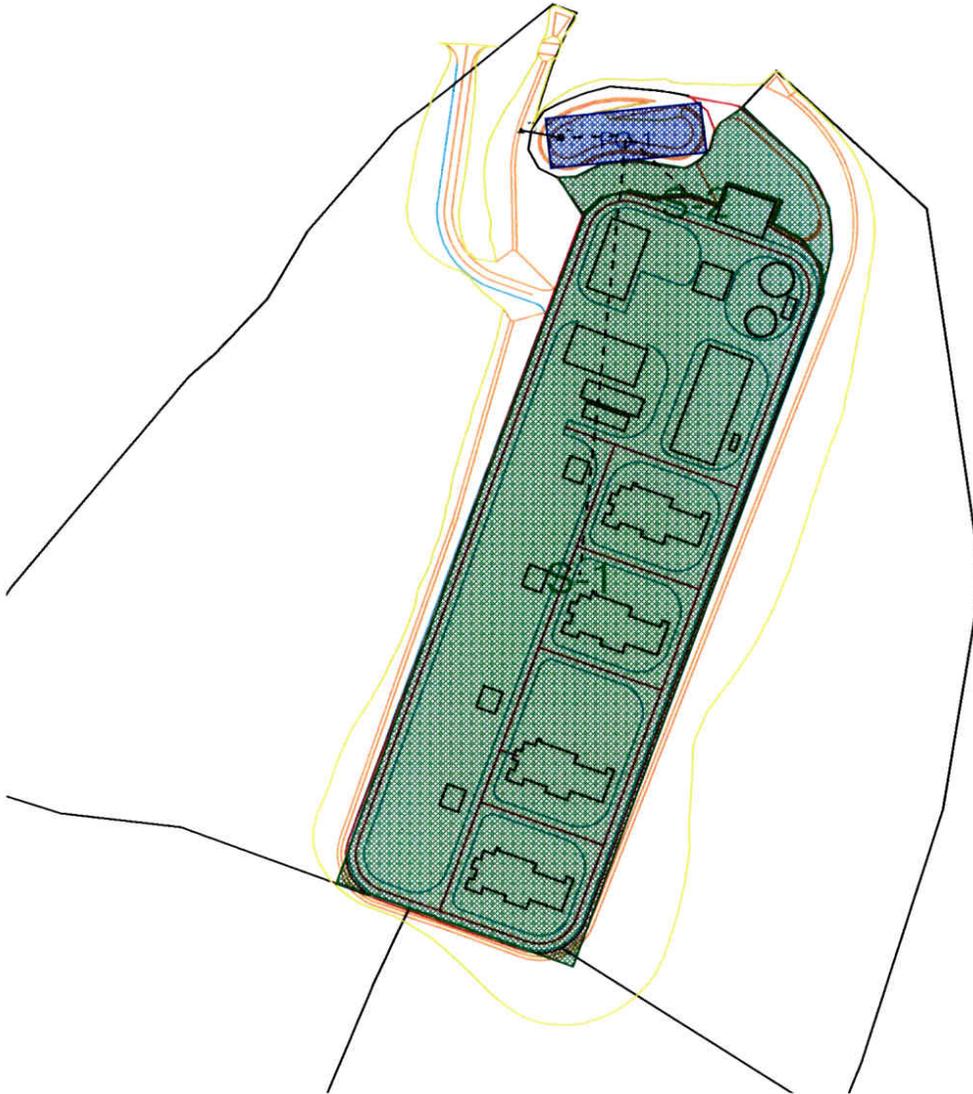
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27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Bentley CivilStorm V8i
[08.11.00.08]

Page 1 of 1

PROPOSED CONDITION

Scenario: Base



REV C

Kelso_B.csd

5/19/2009

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Watertown, CT 06795 USA +1-203-755-1666

Bentley CivilStorm V8i
[08.11.00.08]

Page 1 of 1

2-YR EXISTING

Calculation Detailed Summary

<General>			
Label	Base Calculation Options		
Calculation Options			
Calculation Time Step	1.50 min	Hydrologic Time Step	1.50 min
Output Increment	3.00 min	Total Simulation Time	2880.00 min
Options (Advanced)			
Y Iteration Tolerance	0.03 ft	Relaxation Weighting Coefficient	0.600
LPI Coefficient	1.000	Computation Distance	50.00 ft
NR Weighting Coefficient	0.700		

Catchment Calculation Summary

Label	Runoff Method	Loss Method	Total Rainfall Depth (in)	Area (acres)	Volume (Total Runoff) (ac-ft)	Flow (Peak) (ft ³ /s)	Time To Peak (min)
CM-5	Unit Hydrograph	SCS CN	1.640	8.650	0.21	0.58	618.00
CM-1	Unit Hydrograph	SCS CN	1.640	10.510	0.26	0.74	615.00
CM-2	Unit Hydrograph	SCS CN	1.640	16.440	0.41	1.12	615.00
CM-4	Unit Hydrograph	SCS CN	1.640	8.540	0.21	0.56	618.00
CM-3	Unit Hydrograph	SCS CN	1.640	23.360	0.58	1.42	621.00

General Calculation Summary

N/A

Label	Element Type	Branch	Time to Maximum Flow (min)	Flow (Maximum) (ft ³ /s)	Velocity (Maximum) (ft/s)	Hydraulic Grade (Maximum) (ft)
-------	--------------	--------	----------------------------	-------------------------------------	---------------------------	--------------------------------

100 YR EXISTING

Calculation Detailed Summary

<General>			
Label	Base Calculation Options		
Calculation Options			
Calculation Time Step	1.50 min	Hydrologic Time Step	1.50 min
Output Increment	3.00 min	Total Simulation Time	2880.00 min
Options (Advanced)			
Y Iteration Tolerance	0.03 ft	Relaxation Weighting Coefficient	0.600
LPI Coefficient	1.000	Computation Distance	50.00 ft
NR Weighting Coefficient	0.700		

Catchment Calculation Summary

Label	Runoff Method	Loss Method	Total Rainfall Depth (in)	Area (acres)	Volume (Total Runoff) (ac-ft)	Flow (Peak) (ft ³ /s)	Time To Peak (min)
CM-5	Unit Hydrograph	SCS CN	3.995	8.650	1.36	7.05	612.00
CM-1	Unit Hydrograph	SCS CN	3.995	10.510	1.65	9.01	609.00
CM-2	Unit Hydrograph	SCS CN	3.995	16.440	2.58	13.73	609.00
CM-4	Unit Hydrograph	SCS CN	3.995	8.540	1.34	6.77	612.00
CM-3	Unit Hydrograph	SCS CN	3.995	23.360	3.66	17.20	615.00

General Calculation Summary

N/A

Label	Element Type	Branch	Time to Maximum Flow (min)	Flow (Maximum) (ft ³ /s)	Velocity (Maximum) (ft/s)	Hydraulic Grade (Maximum) (ft)
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1

24R PROPOSED

7

Calculation Detailed Summary

<General>			
Label	Base Calculation Options		
Options			
Calculation Time Step	1.50 min	Hydrologic Time Step	1.50 min
Output Increment	3.00 min	Total Simulation Time	4800.00 min
Options (Advanced)			
Y Iteration Tolerance	0.03 ft	Relaxation Weighting Coefficient	0.600
LPI Coefficient	1.000	Computation Distance	50.00 ft
NR Weighting Coefficient	0.700		

Catchment Calculation Summary

Label	Runoff Method	Loss Method	Total Rainfall Depth (in)	Area (acres)	Volume (Total Runoff) (ac-ft)	Flow (Peak) (ft ³ /s)	Time To Peak (min)
S-1	Unit Hydrograph	SCS CN	1.640	7.530	0.62	5.09	600.00
S-2	Unit Hydrograph	SCS CN	1.640	0.590	0.05	0.45	594.00

General Calculation Summary

Label	Element Type	Branch	Time to Maximum Flow (min)	Flow (Maximum) (ft ³ /s)	Velocity (Maximum) (ft/s)	Hydraulic Grade (Maximum) (ft)
CO-1	Conduit	2	727.48	0.58	4.52	105.94
PO-1	Pond	1	---	---	---	108.63

Node Calculation Summary

Label	Element Type	Branch	Time to Maximum Inflow (min)	Flow (Total In Maximum) (ft ³ /s)	Time To Maximum Inlet Flow (min)	Flow (Surface Maximum) (ft ³ /s)	Time To Maximum Captured Flow (min)	Flow (Captured Maximum) (ft ³ /s)
OF-7	Outfall	2	(N/A)	(N/A)	---	---	---	---
PO-1	Pond	1	598.48	5.42	---	---	---	---

Time to Maximum Overflow (min)	Flow (Overflow Maximum) (ft ³ /s)
(N/A)	(N/A)
0.00	0.00

Gutter Calculation Summary

Label	Open Cross Section	Flow (Maximum) (ft ³ /s)	Time to Maximum Flow (min)	Velocity (Maximum) (ft/s)
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100 YR PROPOSED

Calculation Detailed Summary

<General>			
Label	Base Calculation Options		
Options			
Calculation Time Step	1.50 min	Hydrologic Time Step	1.50 min
Output Increment	3.00 min	Total Simulation Time	4800.00 min
Options (Advanced)			
Y Iteration Tolerance	0.03 ft	Relaxation Weighting Coefficient	0.600
LPI Coefficient	1.000	Computation Distance	50.00 ft
NR Weighting Coefficient	0.700		

Catchment Calculation Summary

Label	Runoff Method	Loss Method	Total Rainfall Depth (in)	Area (acres)	Volume (Total Runoff) (ac-ft)	Flow (Peak) (ft ³ /s)	Time To Peak (min)
S-1	Unit Hydrograph	SCS CN	4.000	7.530	2.02	16.51	600.00
S-2	Unit Hydrograph	SCS CN	4.000	0.590	0.16	1.49	594.00

General Calculation Summary

Label	Element Type	Branch	Time to Maximum Flow (min)	Flow (Maximum) (ft ³ /s)	Velocity (Maximum) (ft/s)	Hydraulic Grade (Maximum) (ft)
CO-1	Conduit	2	613.48	6.58	9.44	106.38
PO-1	Pond	1	---	---	---	110.96

Node Calculation Summary

Label	Element Type	Branch	Time to Maximum Inflow (min)	Flow (Total In Maximum) (ft ³ /s)	Time To Maximum Inlet Flow (min)	Flow (Surface Maximum) (ft ³ /s)	Time To Maximum Captured Flow (min)	Flow (Captured Maximum) (ft ³ /s)
OF-7	Outfall	2	(N/A)	(N/A)	---	---	---	---
PO-1	Pond	1	598.48	17.73	---	---	---	---

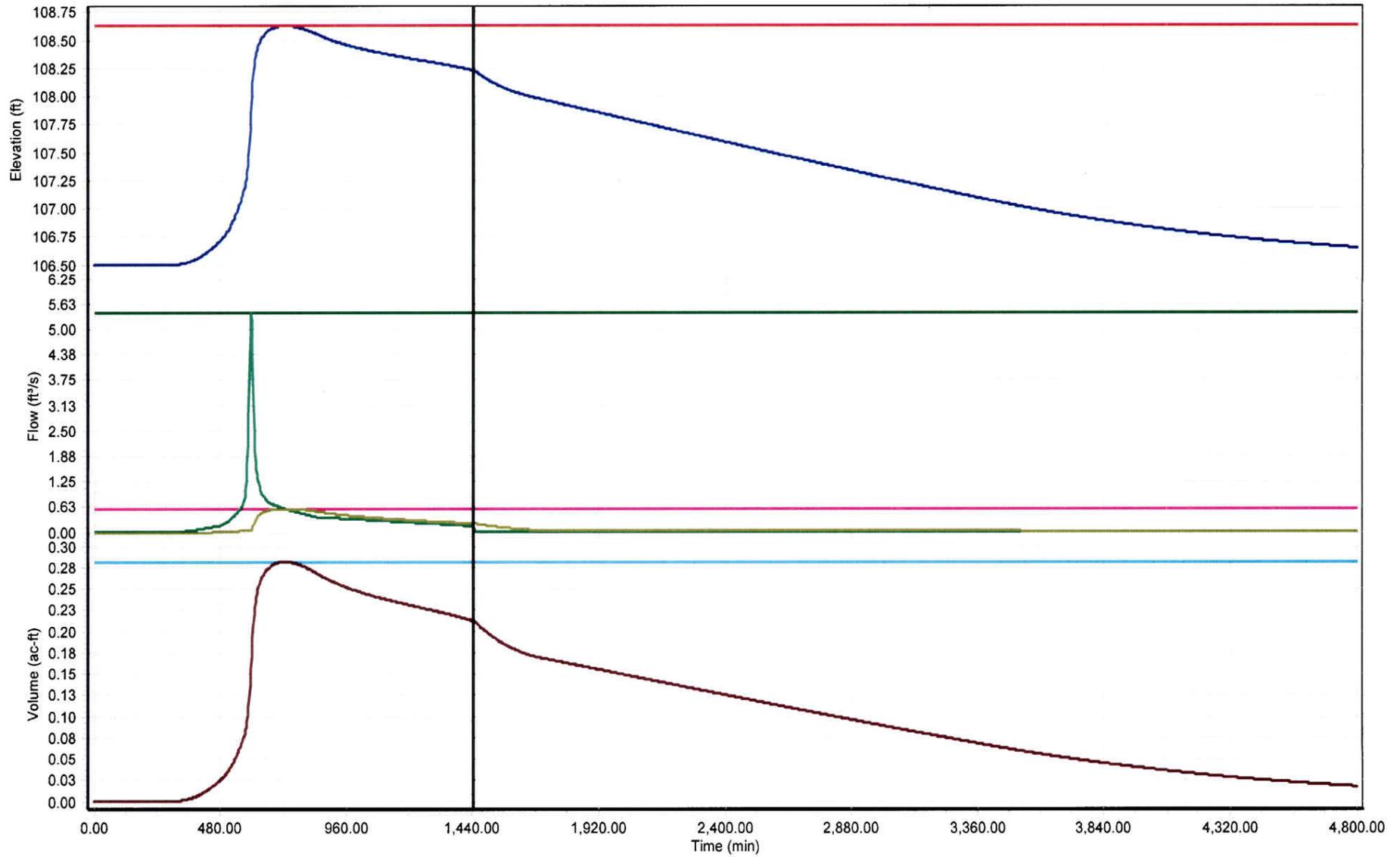
Time to Maximum Overflow (min)	Flow (Overflow Maximum) (ft ³ /s)
(N/A)	(N/A)
0.00	0.00

Gutter Calculation Summary

Label	Open Cross Section	Flow (Maximum) (ft ³ /s)	Time to Maximum Flow (min)	Velocity (Maximum) (ft/s)
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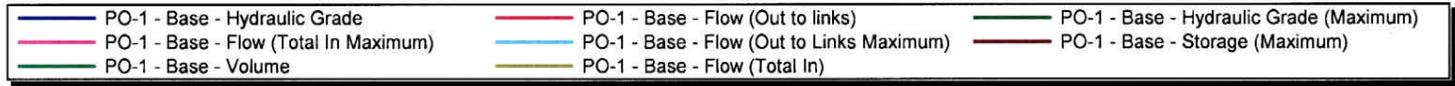
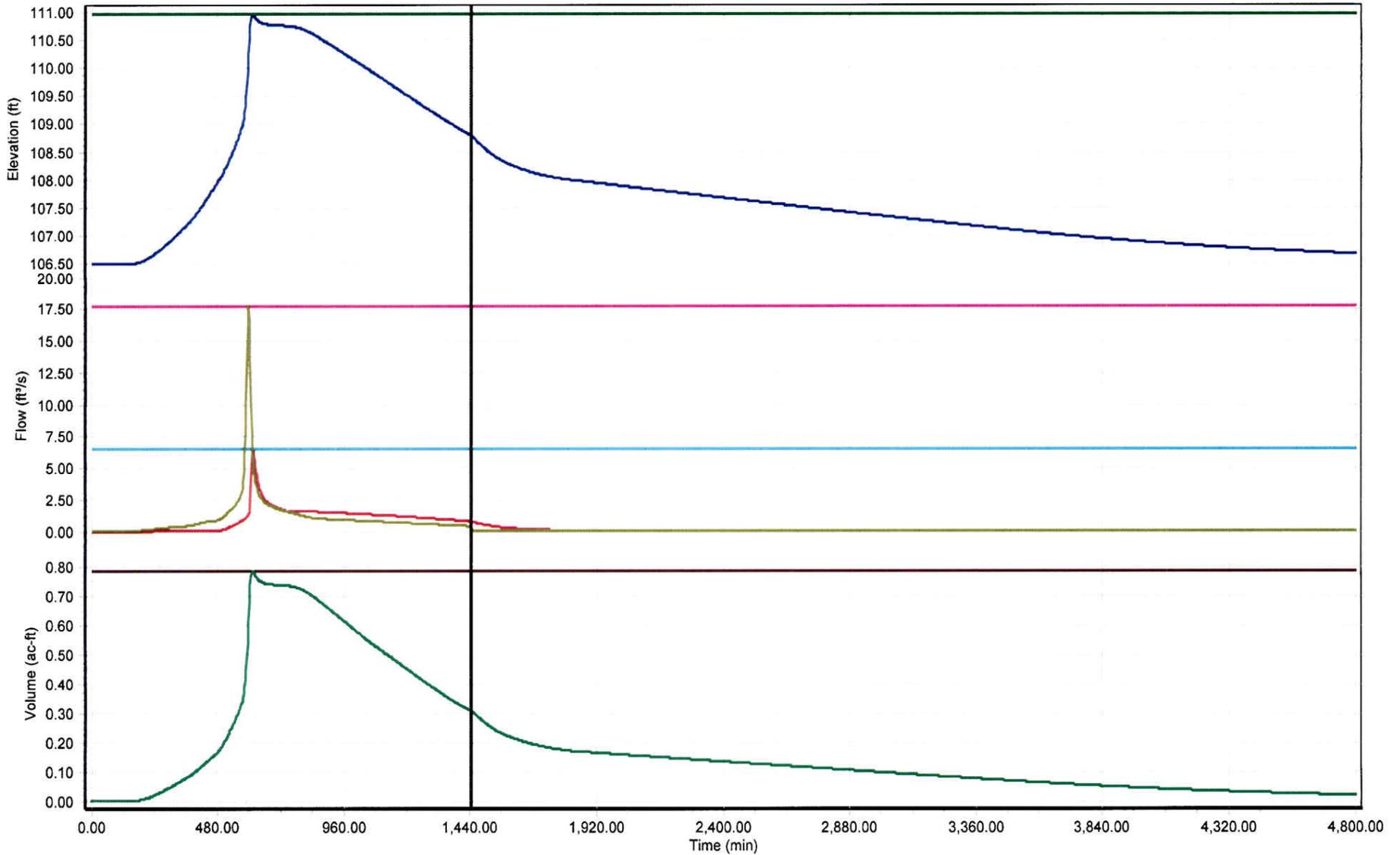
2 YR STORM

New Graph



- | | | |
|---|---|---------------------------------------|
| PO-1 - Base - Hydraulic Grade | PO-1 - Base - Hydraulic Grade (Maximum) | PO-1 - Base - Flow (Total In Maximum) |
| PO-1 - Base - Flow (Out to Links Maximum) | PO-1 - Base - Storage (Maximum) | PO-1 - Base - Volume |
| PO-1 - Base - Flow (Total In) | PO-1 - Base - Flow (Out to links) | |

New Graph



Kelso CT Project

Water Quality Capture Volume (WQCV)

Calculation Sheet

Reference: Alameda County Flood Control &
Water Conservation District
C.3 Stormwater Technical Guidance, V1.0, 8/2006

Perimeter Site

ft ²	Acres
323761	7.43

Total Infield

ft ²						
211412	117222	17461	17832	26399	16485	16013

Road ft ²	Road SqYd	Road Acres	Rational C	CA
112348.60	12483.18	2.58	0.70	1.81

Bldg & Equip

ft ²		
10535	4	2633.69
3120	4	780.00
1465		
4445		
194		
1512	2	756.00
2000		
1145		
5113		
5107		
840		
1590		
314		
1257		
125		
80		
20		
80		
3410		

Total Bldg ft ²	Total Bldg SqYd	Total Bldg Acres	Rational C	CA
42353	4705.91	0.97	0.80	0.78

Gravel Area ft ²	Gravel Area SqYd	Gravel Area Acres	Rational C	CA
169059	18784.31	3.88	0.10	0.39

Total Area	8.12 Acres
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Composite C	% Impervious
0.37	44%

Alameda County Flood Control &
Water Conservation District
C.3 Stormwater Technical Guidance V1.0

Appendix E

Mean Average

Rainfall Map

Inches

12

Alameda County Flood Control &
Water Conservation District
C.3 Stormwater Technical Guidance V1.0

Table 5-2

San Jose

Inches	Composite C		
14 inches		0.25	0.50
		0.14	0.28

Unit Basin Storage Volume (unadjusted)

inches	0.20
--------	------

Unit Basin Storage Volume (adjusted)

inches	0.17
--------	------

Capture Volume	
CuFt	4511.34
Required Capture Volume	
10 % Increase	
CuFt	4962

Precipitation Frequency Data Output

14

NOAA Atlas 2
California 37.7905°N 121.6012°W
Site-specific Estimates

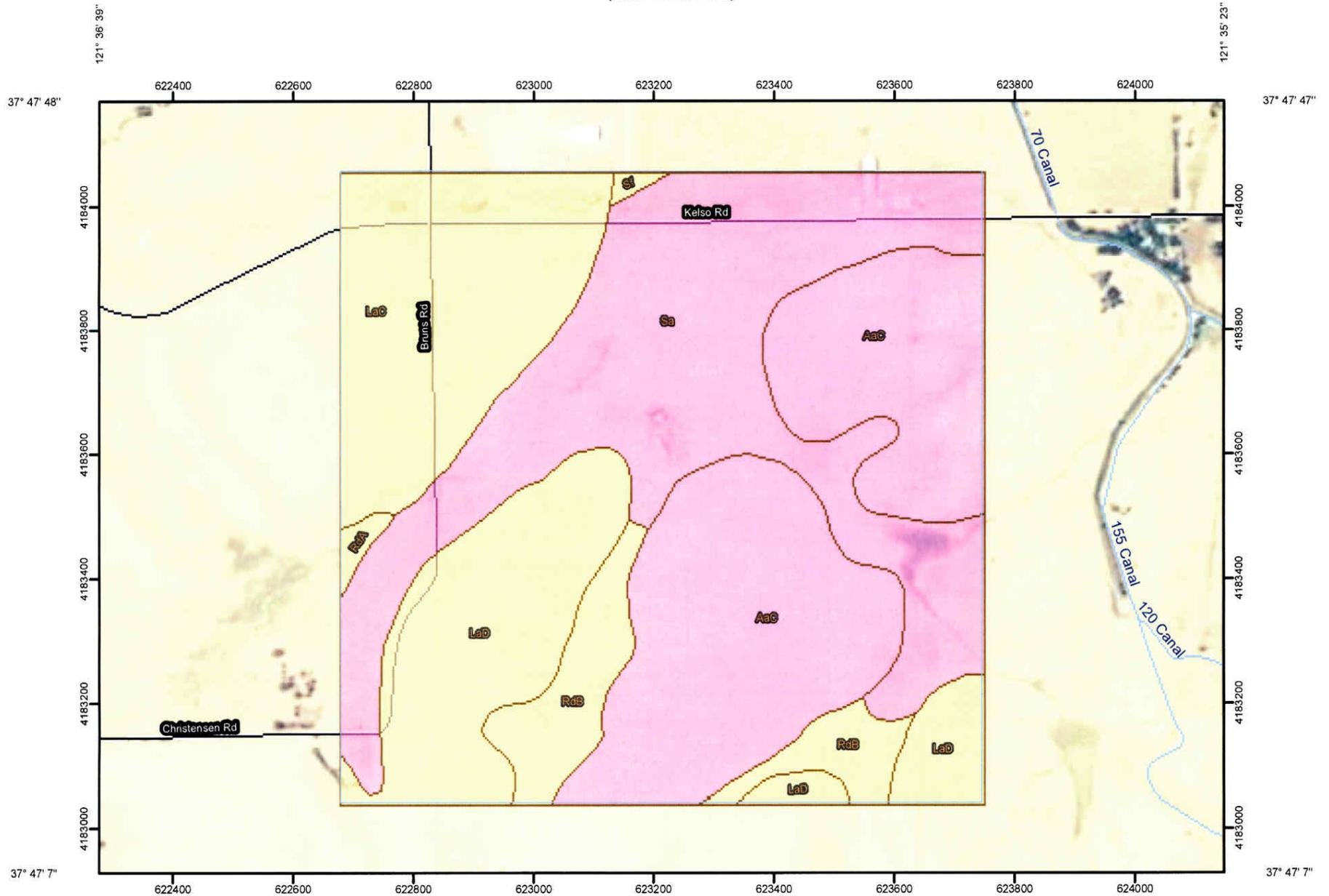
Map	Precipitation (inches)	Precipitation Intensity (in/hr)
2-year 6- hour	1.02	0.17
2-year 24-hour	1.64	0.07
100-year 6-hour	2.07	0.35
100-year 24-hour	4.00	0.17

Hydrometeorological Design Studies Center - NOAA/National Weather Service

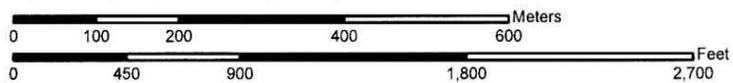
1325 East-West Highway - Silver Spring, MD 20910 - (301) 713-1669

Mon Feb 2 17:08:46 2009

Hydrologic Soil Group—Alameda Area, California
(Kelso Power Plant)



Map Scale: 1:8,880 if printed on A size (8.5" x 11") sheet.



15

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 A

 A/D

 B

 B/D

 C

 C/D

 D

Not rated or not available

Political Features

 Cities

Water Features

 Oceans

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:8,880 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Alameda Area, California
Survey Area Data: Version 5, Jul 22, 2008

Date(s) aerial images were photographed: 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

16

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Alameda Area, California				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaC	Altamont clay, 3 to 15 percent slopes	D	78.1	29.2%
LaC	Linne clay loam, 3 to 15 percent slopes	C	43.8	16.4%
LaD	Linne clay loam, 15 to 30 percent slopes	C	41.9	15.6%
RdA	Rincon clay loam, 0 to 3 percent slopes	C	1.2	0.5%
RdB	Rincon clay loam, 3 to 7 percent slopes	C	17.4	6.5%
Sa	San Ysidro loam	D	84.8	31.6%
Sf	Solano fine sandy loam	C	0.7	0.3%
Totals for Area of Interest			267.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

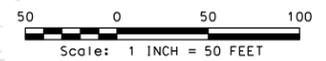
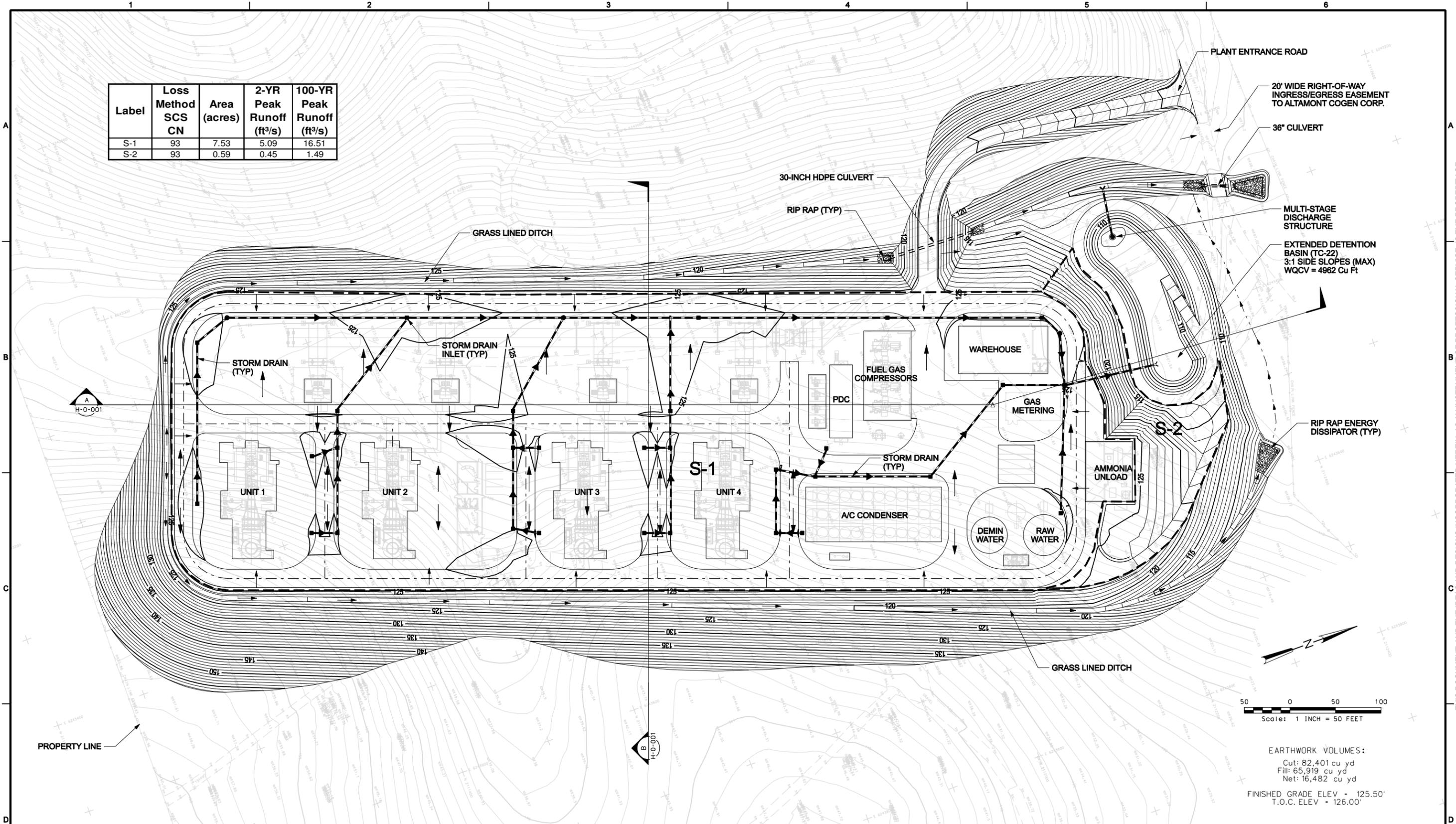
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Label	Loss Method SCS CN	Area (acres)	2-YR Peak Runoff (ft ³ /s)	100-YR Peak Runoff (ft ³ /s)
S-1	93	7.53	5.09	16.51
S-2	93	0.59	0.45	1.49



EARTHWORK VOLUMES:
 Cut: 82,401 cu yd
 Fill: 65,919 cu yd
 Net: 16,482 cu yd
 FINISHED GRADE ELEV = 125.50'
 T.O.C. ELEV = 126.00'

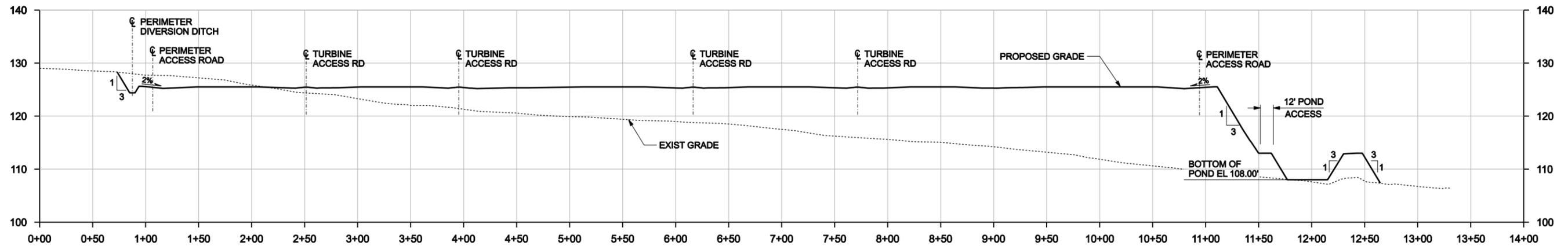
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								DISCIPLINE	REV	DATE	DM	SDE	PEM	
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B	2/26/09	ISSUED FOR REVIEW	TC	JP	CIVIL			PRELIMINARY						
C	5/4/09	ISSUED FOR REVIEW	TC	JP	STRUCTURAL			FOR REVIEW AND APPROVAL	D	5/4/09				
D	5/4/09	ISSUED FOR REVIEW	TC	JP	MECHANICAL			APPROVED FOR CONSTRUCTION	0					
					PROCESS			REVISED & APPROVED FOR CONSTRUCTION						
					PIPING									

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 A Subsidiary of Mitsubishi Corporation
 Mariposa Energy Project
 PROJECT NO. 383206
CH2MHILL
 CH2MHILL Engineers

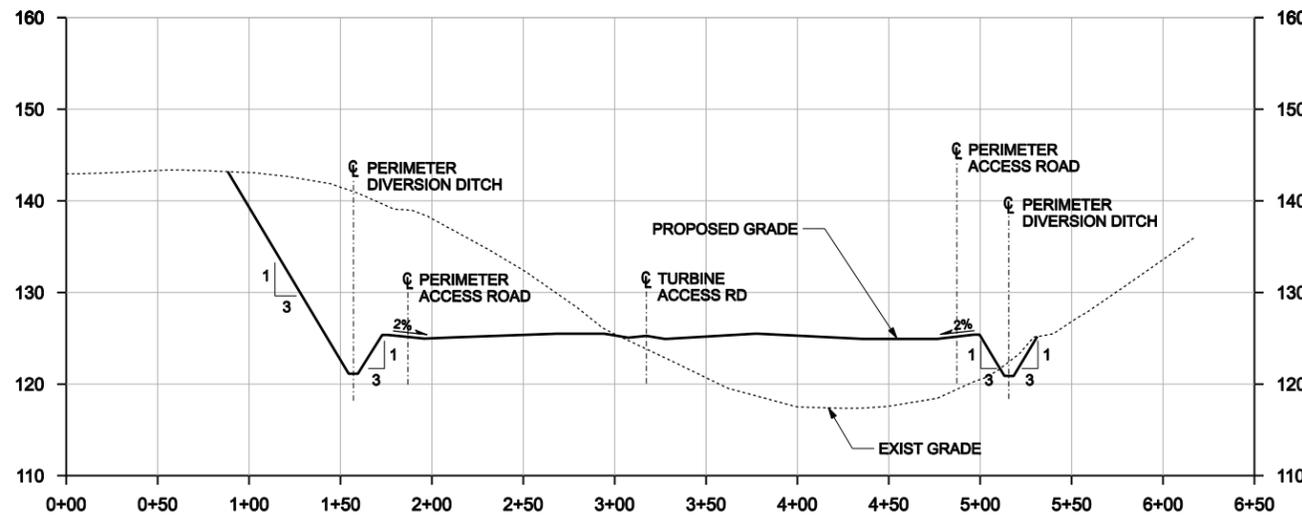
CIVIL
 PRELIMINARY
 GRADING AND DRAINAGE
 PLAN
 DWG. NO. C-000-W-0-002
 REV. D

BAR IS ONE INCH ON ORIGINAL DRAWING.

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SCALE: 1" = 50'
W-0-001



SECTION B
SCALE: 1" = 50'
W-0-001

NO.	DATE	REVISION	BY	CHK	REVISION APPROVAL		REV B	DATE 2/26/09	STATUS							
					DISCIPLINE	REVIEWED			DISCIPLINE	REVIEWED	ISSUED	REV	DATE	DM	SDE	PEM
A	2/13/09	ISSUED FOR REVIEW	TC	JP	DISCIPLINE	REVIEWED	ELECTRICAL		PRELIMINARY	P1	-					
B	2/26/09	ISSUED FOR REVIEW	TC	TC	CIVIL		STRUCTURAL		FOR REVIEW AND APPROVAL	B	2/26/09					
					MECHANICAL		ARCH.		APPROVED FOR CONSTRUCTION	O						
					PROCESS		GEN. ARRANG.		REVISED & APPROVED FOR CONSTRUCTION							
					PIPING											

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Kelso CT Project

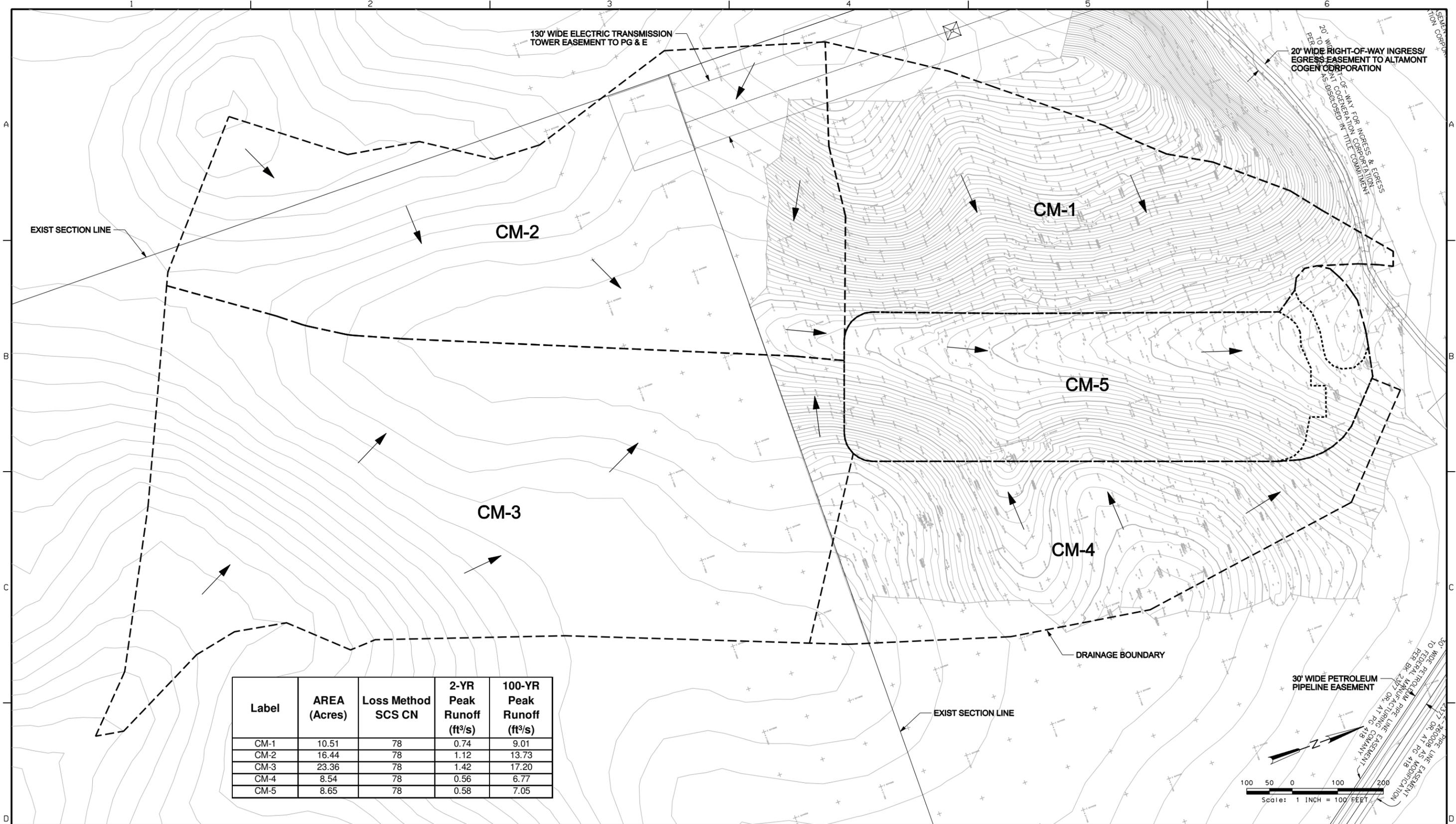
PROJECT NO. 383206

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CIVIL
PRELIMINARY
GRADING AND DRAINAGE
SECTIONS

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Label	AREA (Acres)	Loss Method SCS CN	2-YR Peak Runoff (ft ³ /s)	100-YR Peak Runoff (ft ³ /s)
CM-1	10.51	78	0.74	9.01
CM-2	16.44	78	1.12	13.73
CM-3	23.36	78	1.42	17.20
CM-4	8.54	78	0.56	6.77
CM-5	8.65	78	0.58	7.05

RESPONSIBLE ENGINEER
PE # _____

NO.	DATE	REVISION	BY	CHK	REVISION APPROVAL	REV B	DATE 2/26/09	STATUS					
A	2/13/09	ISSUED FOR REVIEW	TC	JP	DISCIPLINE REVIEWED	DISCIPLINE	REVIEWED	ISSUED	REV	DATE	DM	SDE	PEM
B	2/26/09	ISSUED FOR REVIEW	TC	JP	CIVIL	ELECTRICAL		PRELIMINARY	P1	-			
					STRUCTURAL	INST & CONT.		FOR REVIEW AND APPROVAL	B	2/26/09			
					MECHANICAL	ARCH.		APPROVED FOR CONSTRUCTION	O				
					PROCESS	GEN. ARRANG.		REVISED & APPROVED FOR CONSTRUCTION					
					PIPING								

SCALE AS SHOWN

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Kelso CT Project
PROJECT NO. 383206
CH2MHILL
CH2MHILL Engineers

CIVIL
PRE-CONSTRUCTION
DRAINAGE CONDITIONS

DWG. NO. C-000-W-0-001 REV. B

FILENAME: PLOT DATE: PLOT TIME:

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

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