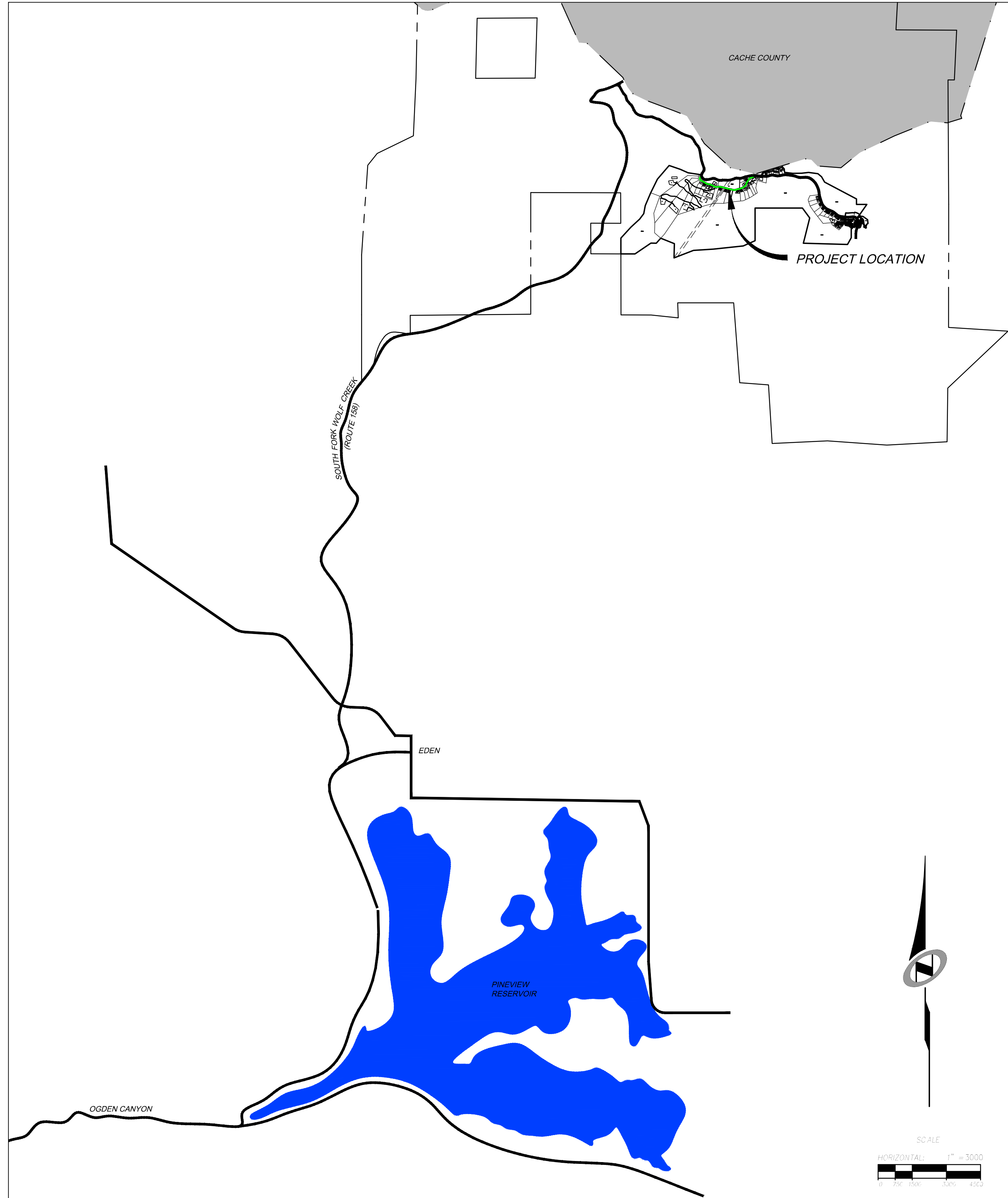


# SUMMIT AT POWDER MOUNTAIN PHASE 1A - HORIZON RUN ROADWAY AND UTILITY CONSTRUCTION DRAWINGS

**Located in Sec 01 T7N R1E  
Weber County, Utah**



**SHEET INDEX:**

SHEET NUMBER	SHEET DESCRIPTION
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1.04	OVERALL GRADING
1.05	TYPICAL ROADWAY SECTION
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2.01	PLAN & PROFILE - HORIZON RUN
2.02	PLAN & PROFILE - HORIZON RUN
3.00	EARTHWORK & SECTIONS - HORIZON RUN
3.01	EARTHWORK & SECTIONS - HORIZON RUN
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4.00	EROSION CONTROL PLAN - HORIZON RUN
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E3	LIFT STATION NUMBER 2 POWER ONE-LINE DIAGRAM
GE-1	ELECTRICAL DETAILS
GE-2	ELECTRICAL DETAILS

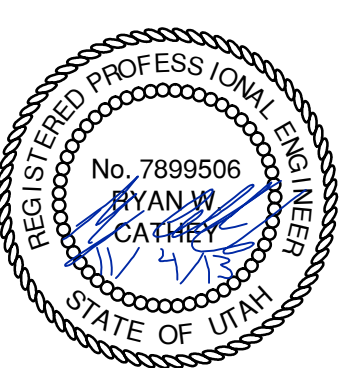
**PHASE 1A CONSTRUCTION**

**CIVIL TITLE SHEET**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

**NV5**  
BEYOND ENGINEERING  
627 SOUTH STATE STREET, SUITE 200  
MURRAY, UT 84107  
801.743.0300 TEL. 801.743.0300 FAX  
WWW.NV5.COM



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11/19/2013 10:55:18 AM



SHEET NUMBER	<b>1.00</b>
SCALE	VERTICAL: 1" = 8' HORIZONTAL: 1" = 3000'
JOB NUMBER	<b>SLB079306</b>

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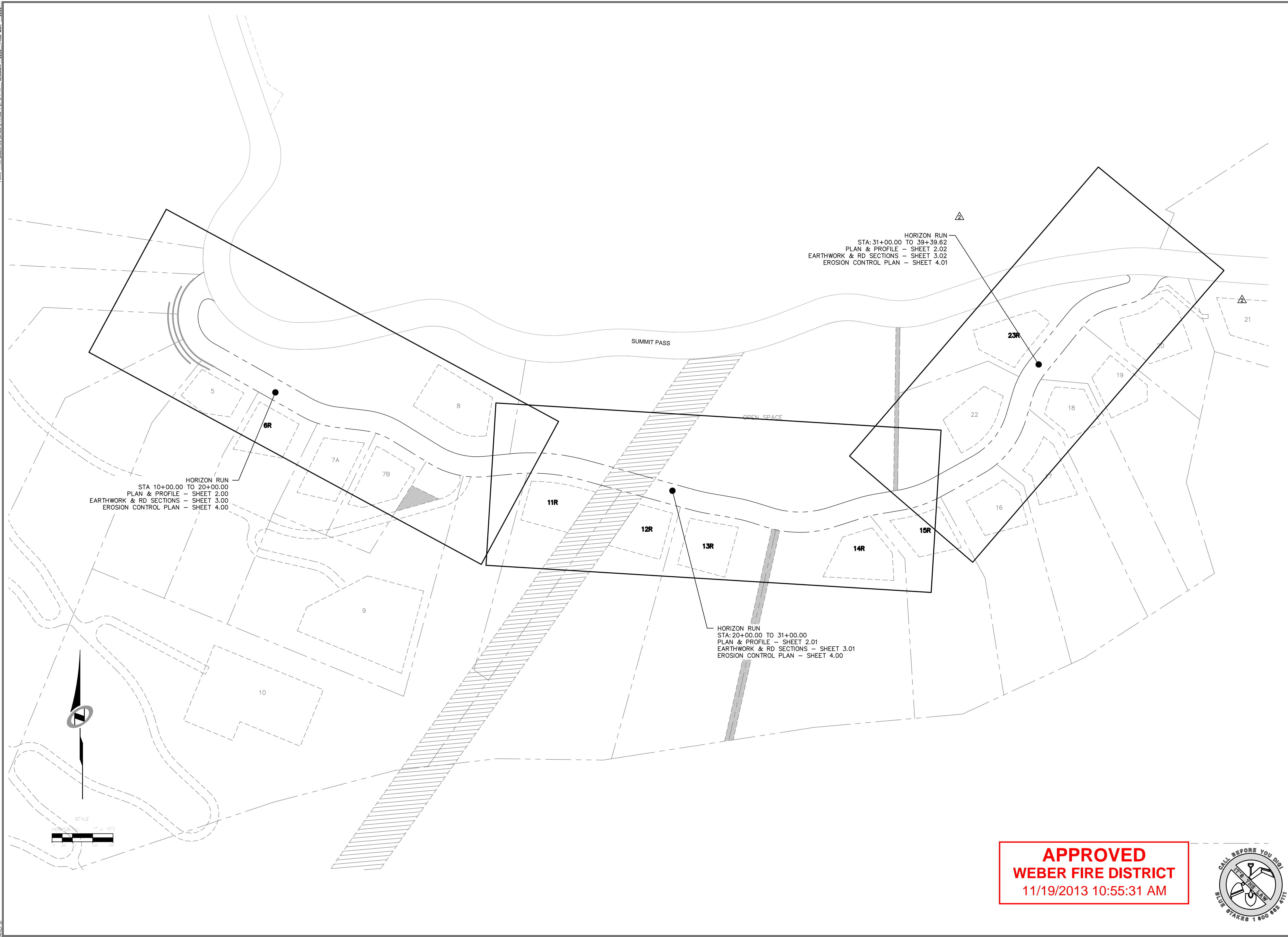
NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDENDUM 1
2	RWC	9/24/2013	UTILITY, GRADING, AND ROCKET REV

CAUTION

The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. Any such changes or uses must be approved by the preparer of these plans.



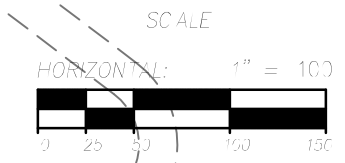
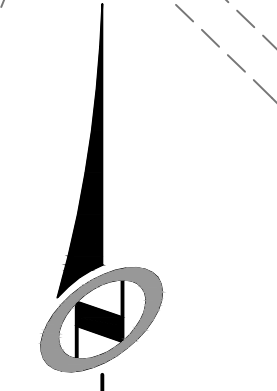
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HORIZON RUN  
 STA 10+00.00 TO 20+00.00  
 PLAN & PROFILE - SHEET 2.00  
 EARTHWORK & RD SECTIONS - SHEET 3.00  
 EROSION CONTROL PLAN - SHEET 4.00

HORIZON RUN  
 STA: 31+00.00 TO 39+39.62  
 PLAN & PROFILE - SHEET 2.02  
 EARTHWORK & RD SECTIONS - SHEET 3.02  
 EROSION CONTROL PLAN - SHEET 4.01

HORIZON RUN  
 STA: 20+00.00 TO 31+00.00  
 PLAN & PROFILE - SHEET 2.01  
 EARTHWORK & RD SECTIONS - SHEET 3.01  
 EROSION CONTROL PLAN - SHEET 4.00



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NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDITIONAL UTILITY, GRADING, AND SOCKET REV
2	RWC	9/24/2013	

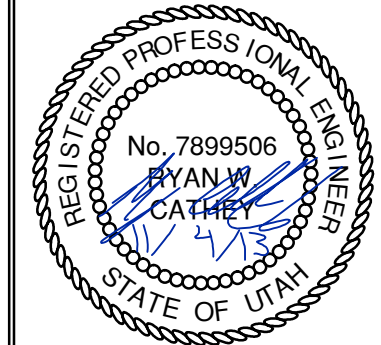
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. Any such changes or uses must be approved by the preparer of these plans.

**PHASE 1A CONSTRUCTION**  
**SHEET KEYMAP**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

**NV5**  
 BEYOND ENGINEERING  
 5217 SOUTH STATE STREET, SUITE 200  
 801743.0000 TEL. 801743.0000 FAX  
 MURRAY, UT 84107  
 WWW.NV5.COM



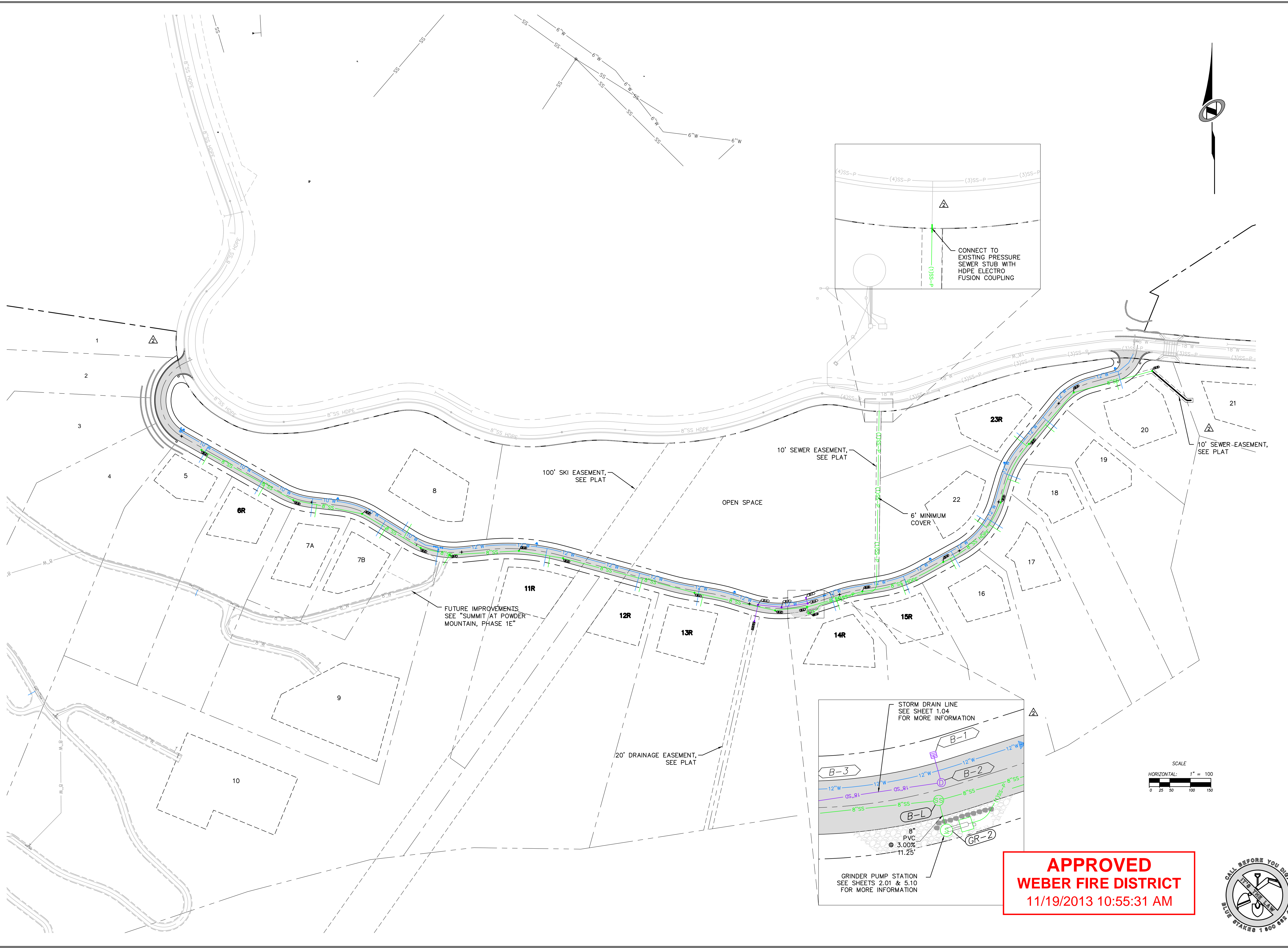
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SCALE  
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JOB NUMBER  
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PREFACE  
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NO.	BY	DATE	REVISIONS
1	PMC	8/27/2013	ADDendum 1
2	PMC	9/24/2013	UTILITY, GRADING, AND SOCKET REV

**PHASE 1A CONSTRUCTION**  
**OVERALL UTILITY PLAN**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

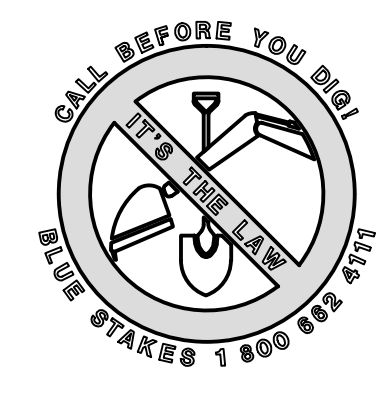
**NV5**  
 BEYOND ENGINEERING

5217 SOUTH STATE STREET, SUITE 200  
 801743.000 TEL. 801743.000 FAX  
 MURRAY, UT 84107  
 WWW.NV5.COM

REGISTERED PROFESSIONAL ENGINEER  
 No. 7899506  
 RYAN W. CATHEY  
 STATE OF UTAH

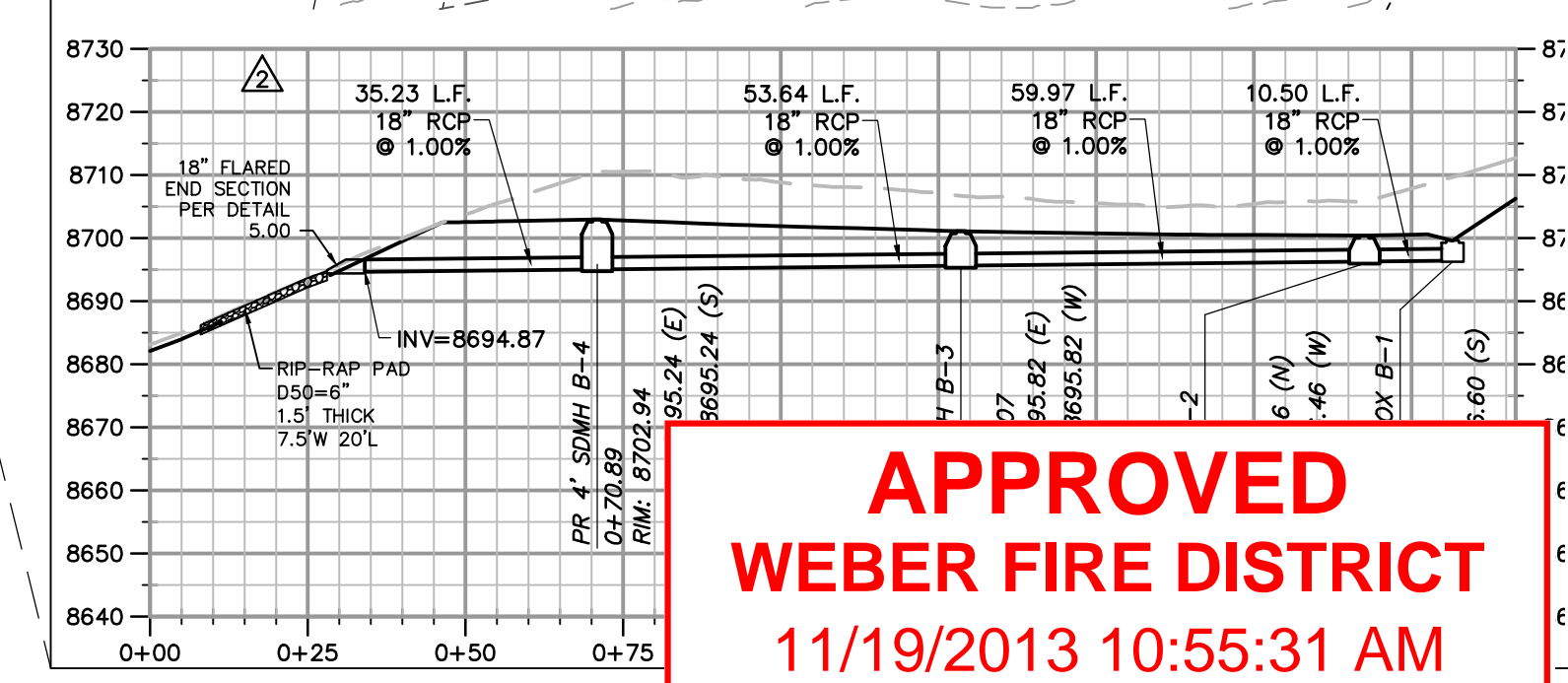
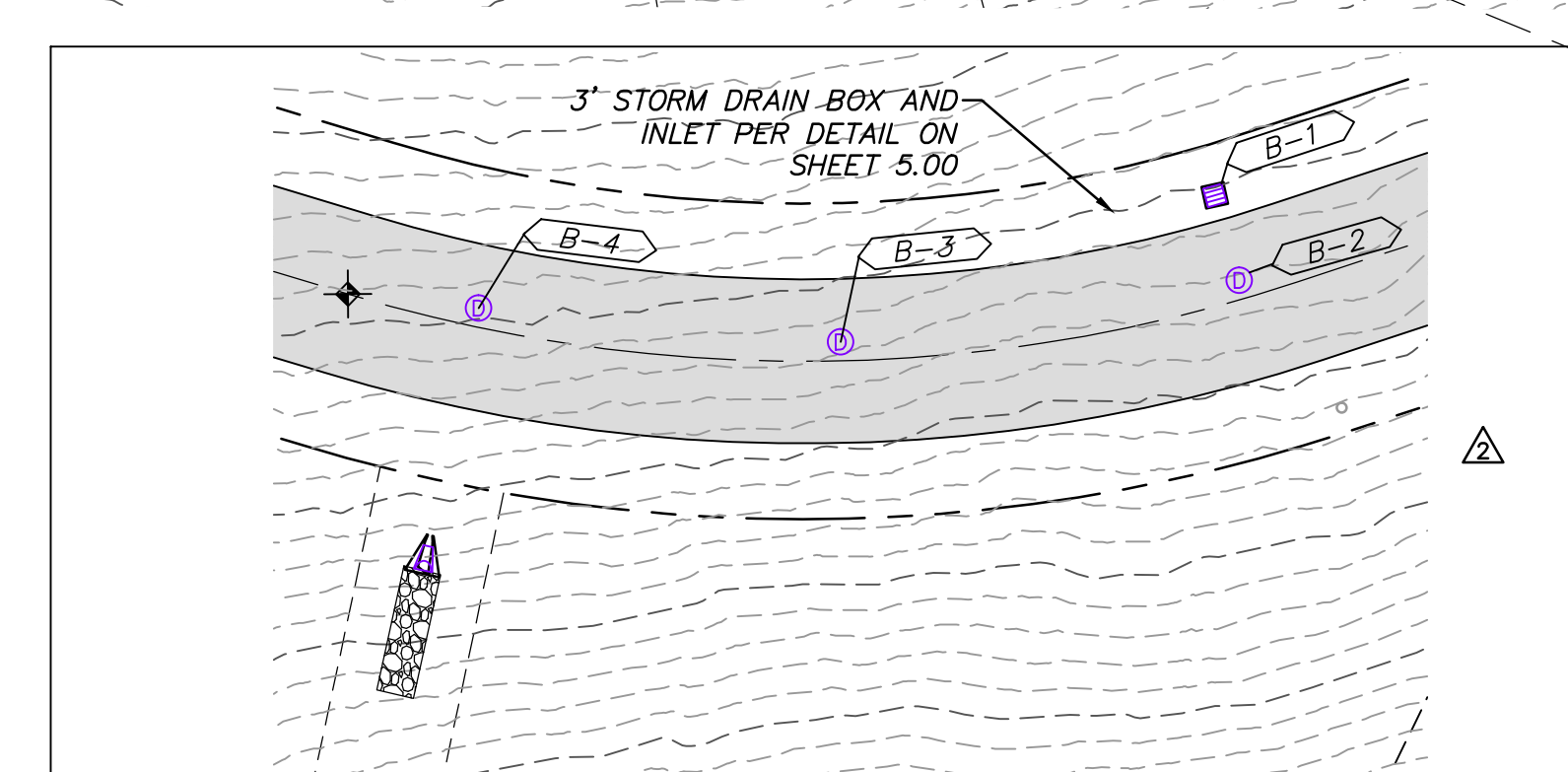
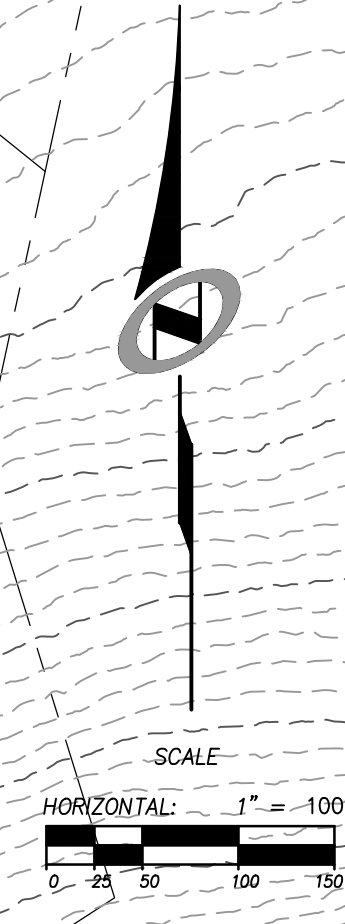
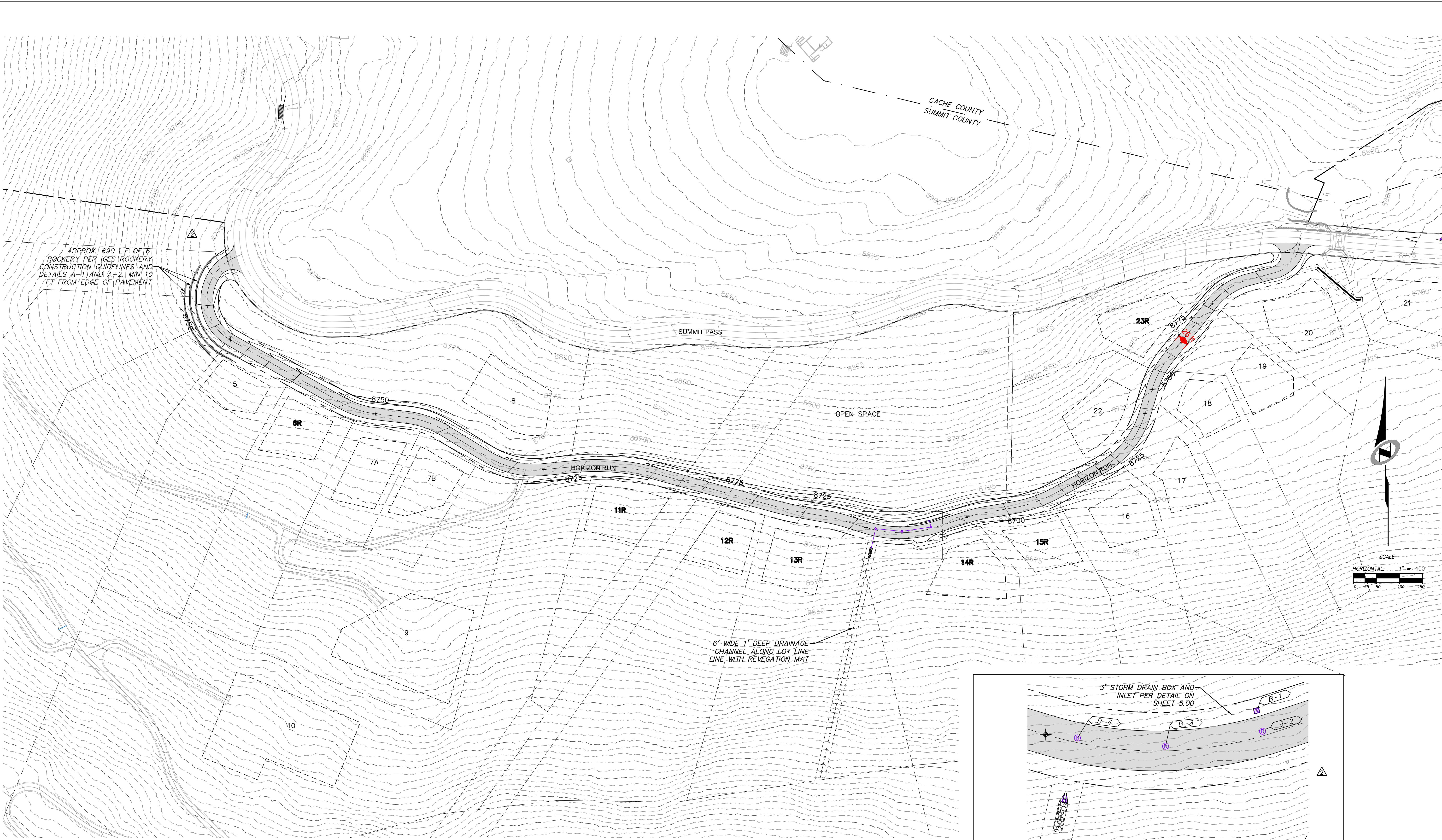
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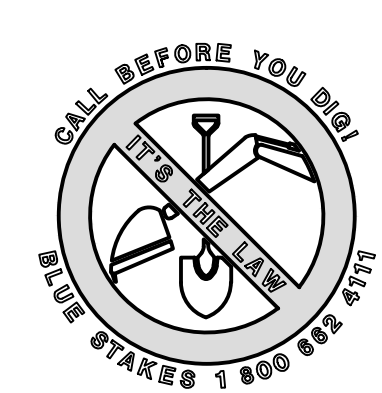


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PREFACE:  
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NO.	BY	DATE	REVISIONS
1	PMC	8/27/2013	ADDENDUM 1
2	PMC	8/27/2013	UTILITY, GRADING, AND ROCKERY REV.

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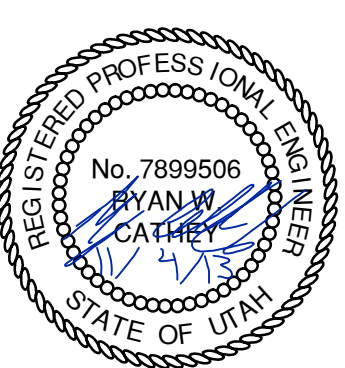
CAUTION

**PHASE 1A CONSTRUCTION**  
**HORIZON RUN**  
**OVERALL GRADING AND DRAINAGE PLAN**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

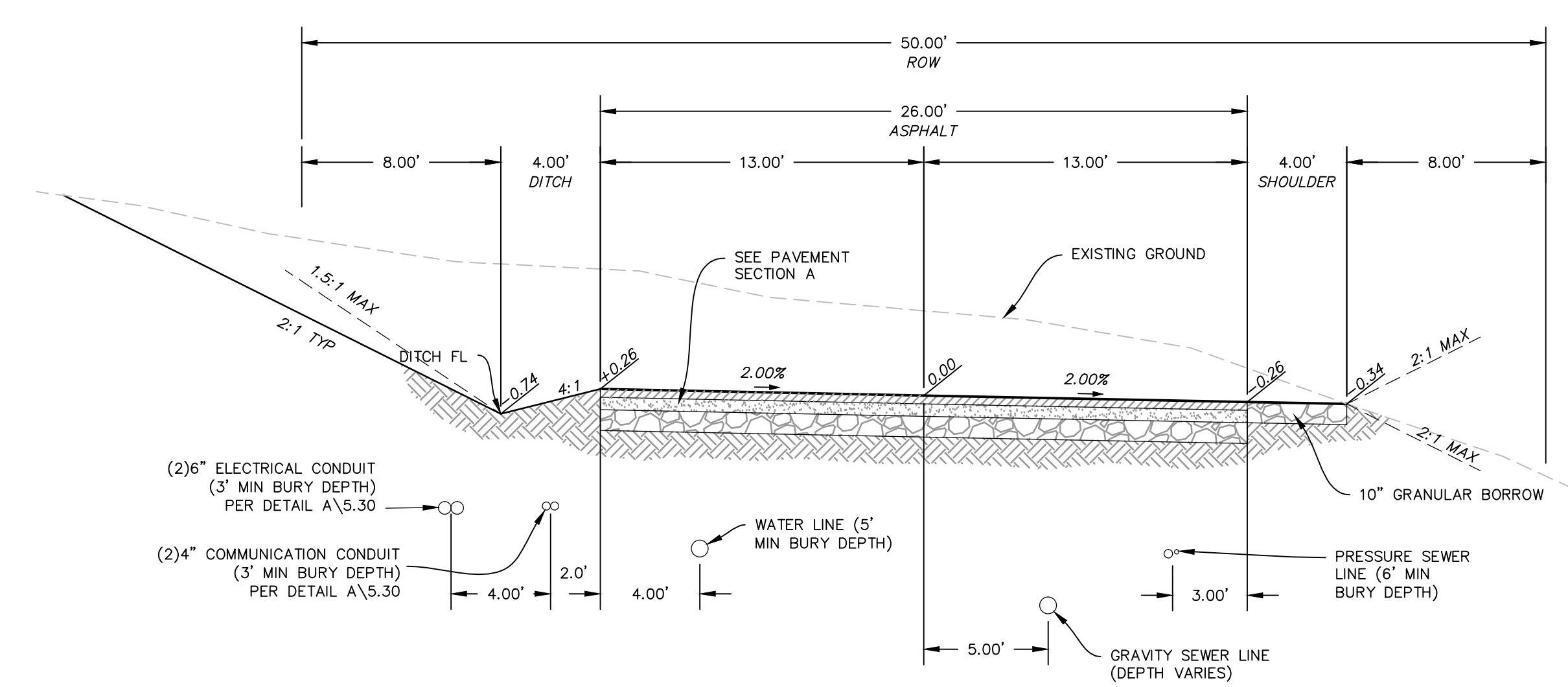
**NV5**  
 BEYOND ENGINEERING  
 5217 SOUTH STATE STREET, SUITE 200  
 801743.0000 TEL. 801743.0000 FAX  
 MURRAY, UT 84107  
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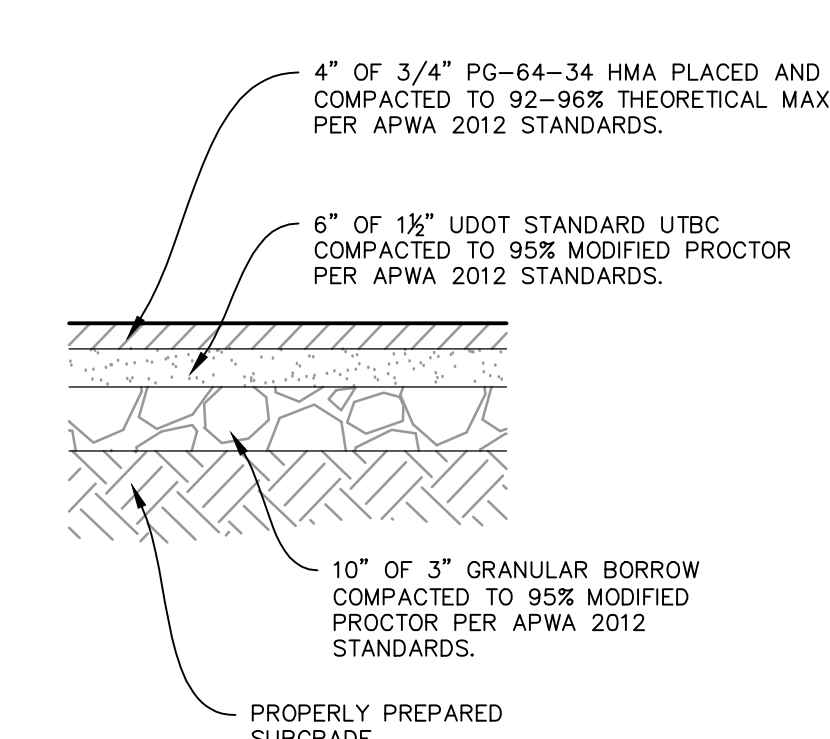
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JOB NUMBER  
**SLB079306**

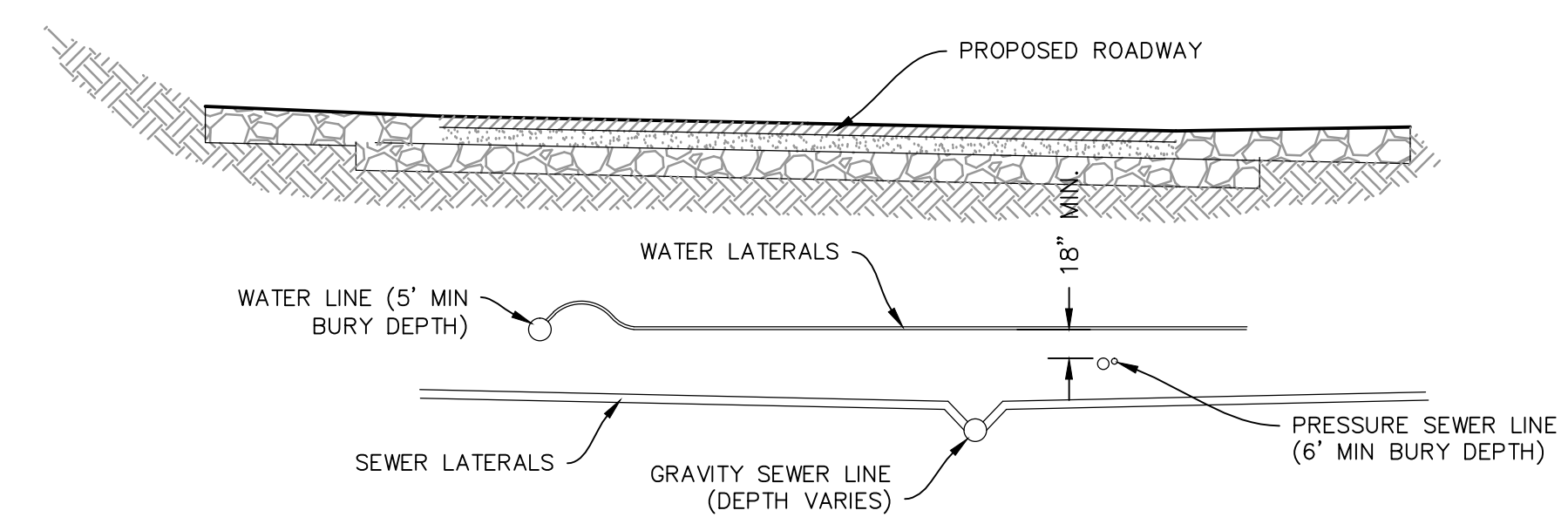


**TYPICAL ROADWAY SECTION A-A**  
 (50' RIGHT OF WAY SECTION)  
 STA: 10+00.00 TO 18+14.86



**PAVEMENT SECTION A**

FOR CUT AND FILL SLOPES GREATER THAN 2:1 REFER TO GEOTECHNICAL REPORT AND SUPPLEMENTAL LETTERS FOR SPECIAL STABILIZATION REQUIREMENTS.



**WATER AND SEWER SEPARATION DETAIL**

NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDENDUM 1
2	RWC	9/24/2013	UTILITY, GRADING, AND ROCKERY REV

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CAUTION

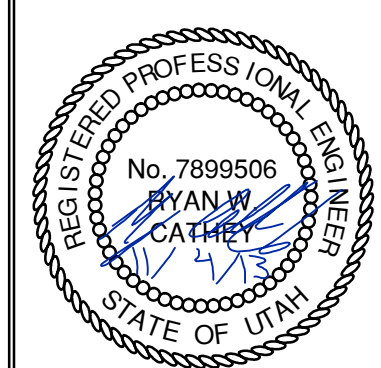
**PHASE 1A CONSTRUCTION**

**ROADWAY TYPICAL SECTIONS**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

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 5217 SOUTH STATE STREET, SUITE 200  
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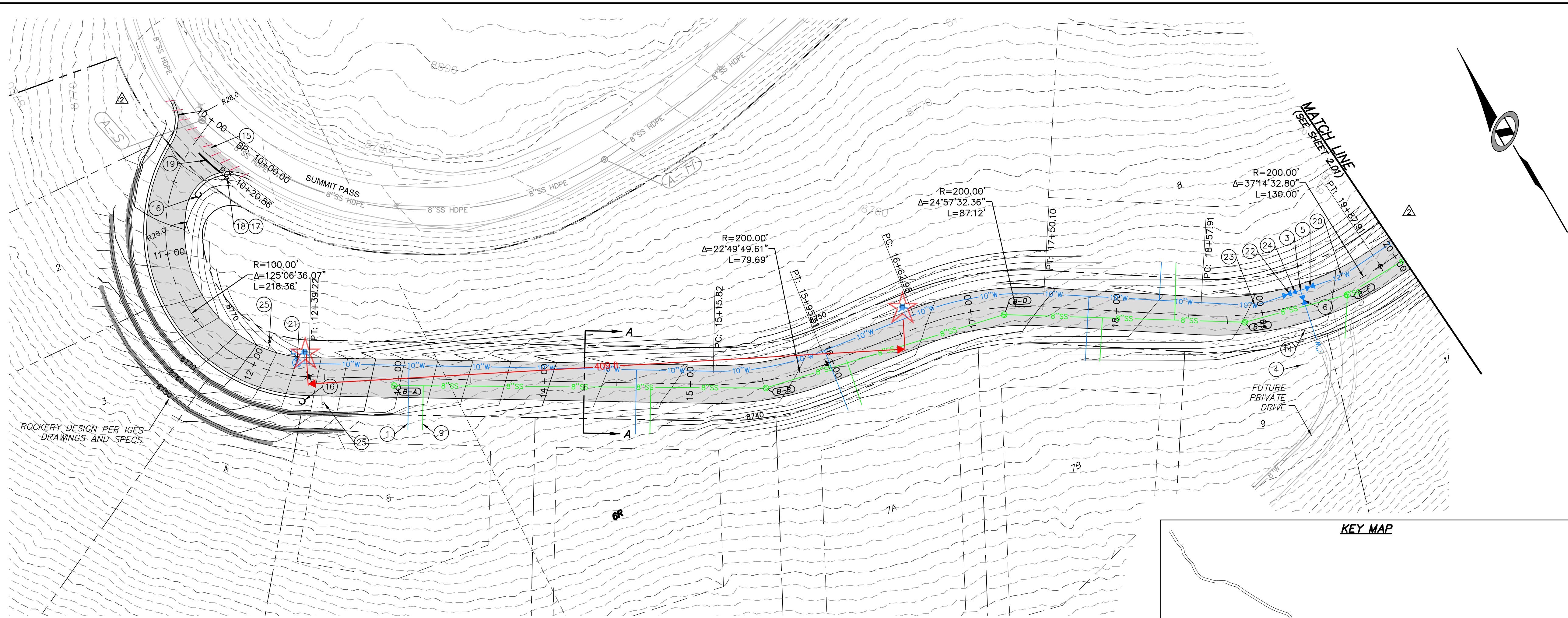
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**WEBER FIRE DISTRICT**  
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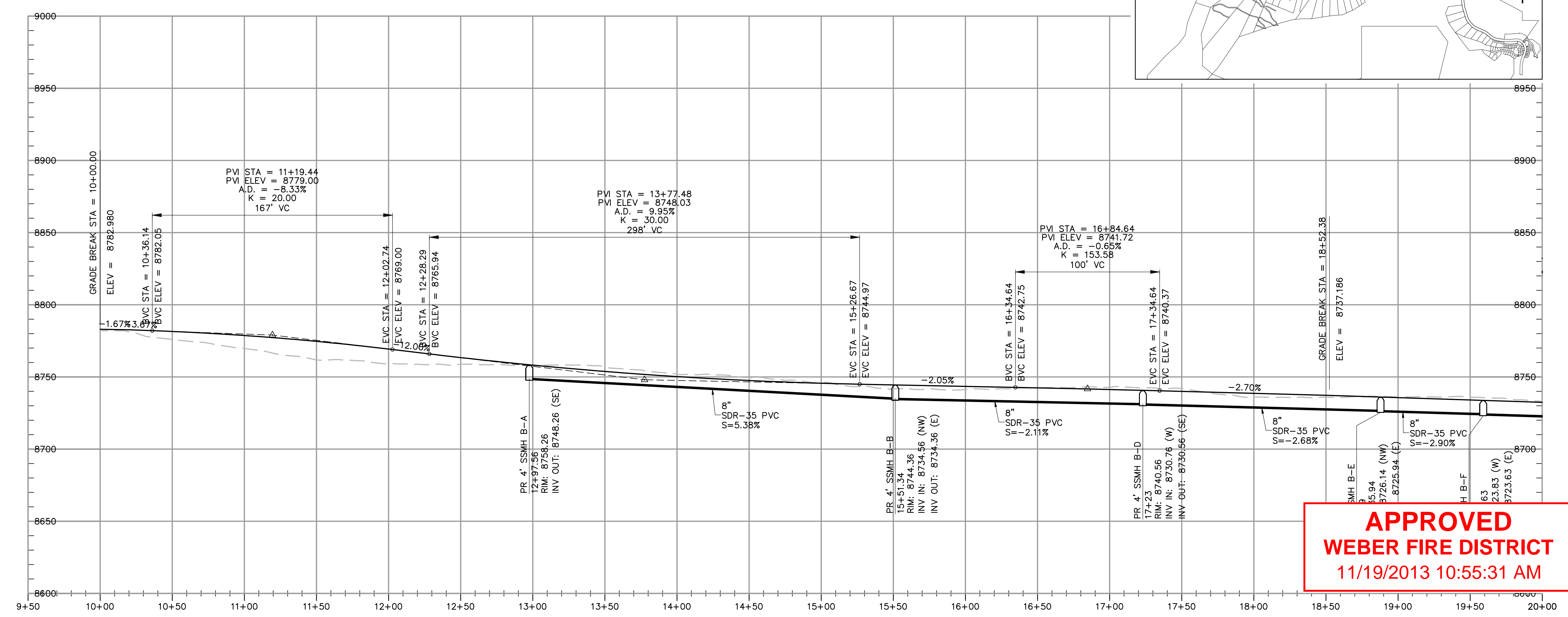
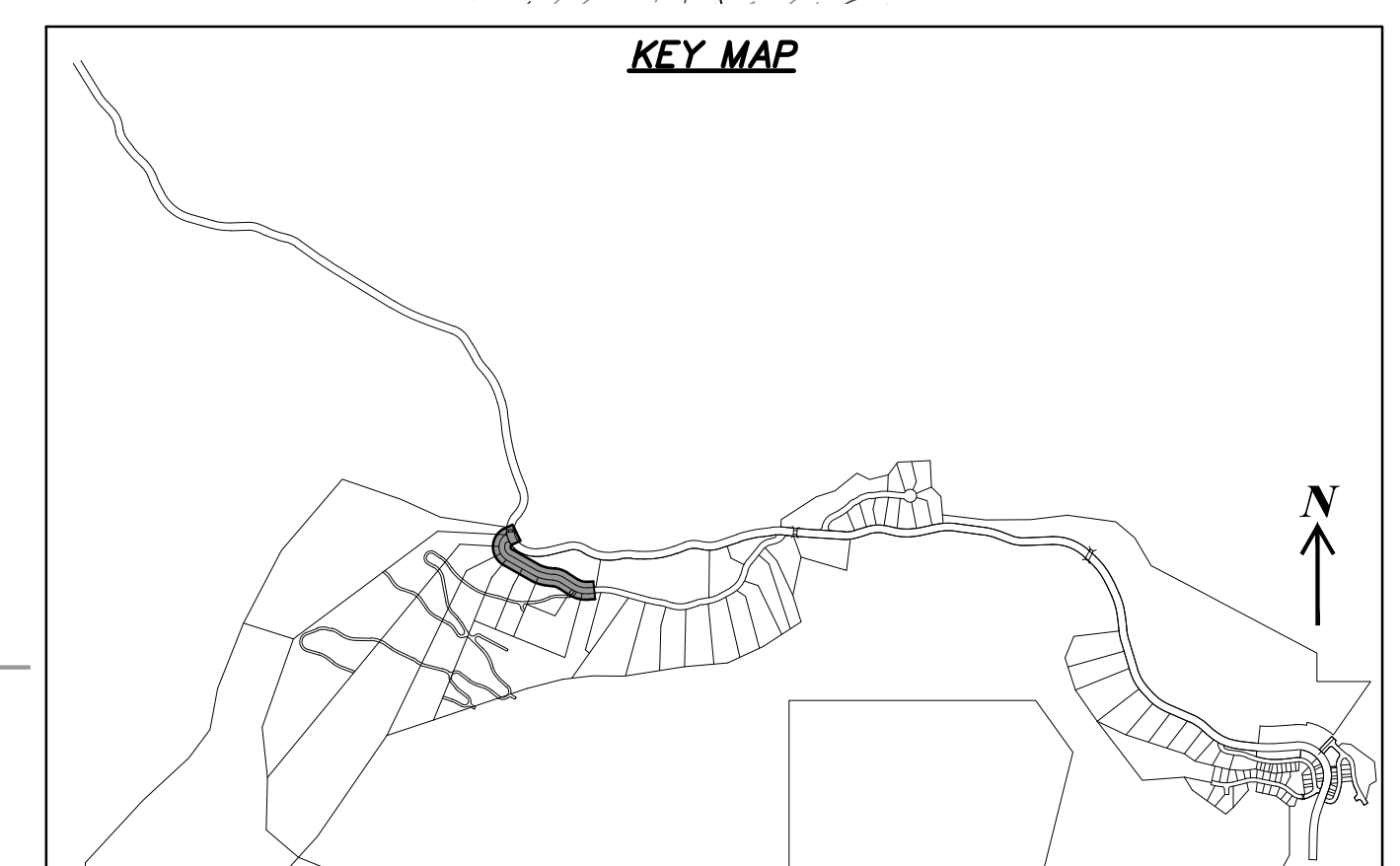
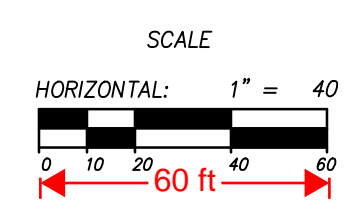
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JOB NUMBER  
**SLB079306**



**HORIZON RUN**  
 STA: 10+00.00 TO 20+00.00



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**WEBER FIRE DISTRICT**  
 11/19/2013 10:55:31 AM



NO.	BY	DATE	REVISIONS
1	PMC	8/27/2013	ADDENDUM 1
2	PMC	8/27/2013	UTILITY, GRADING, AND ROCKERY REV

PHASE 1A CONSTRUCTION  
 PLAN AND PROFILE  
 HORIZON RUN

PREPARED FOR: SUMMIT, LLC  
 DATE SUBMITTED: 11/4/2013

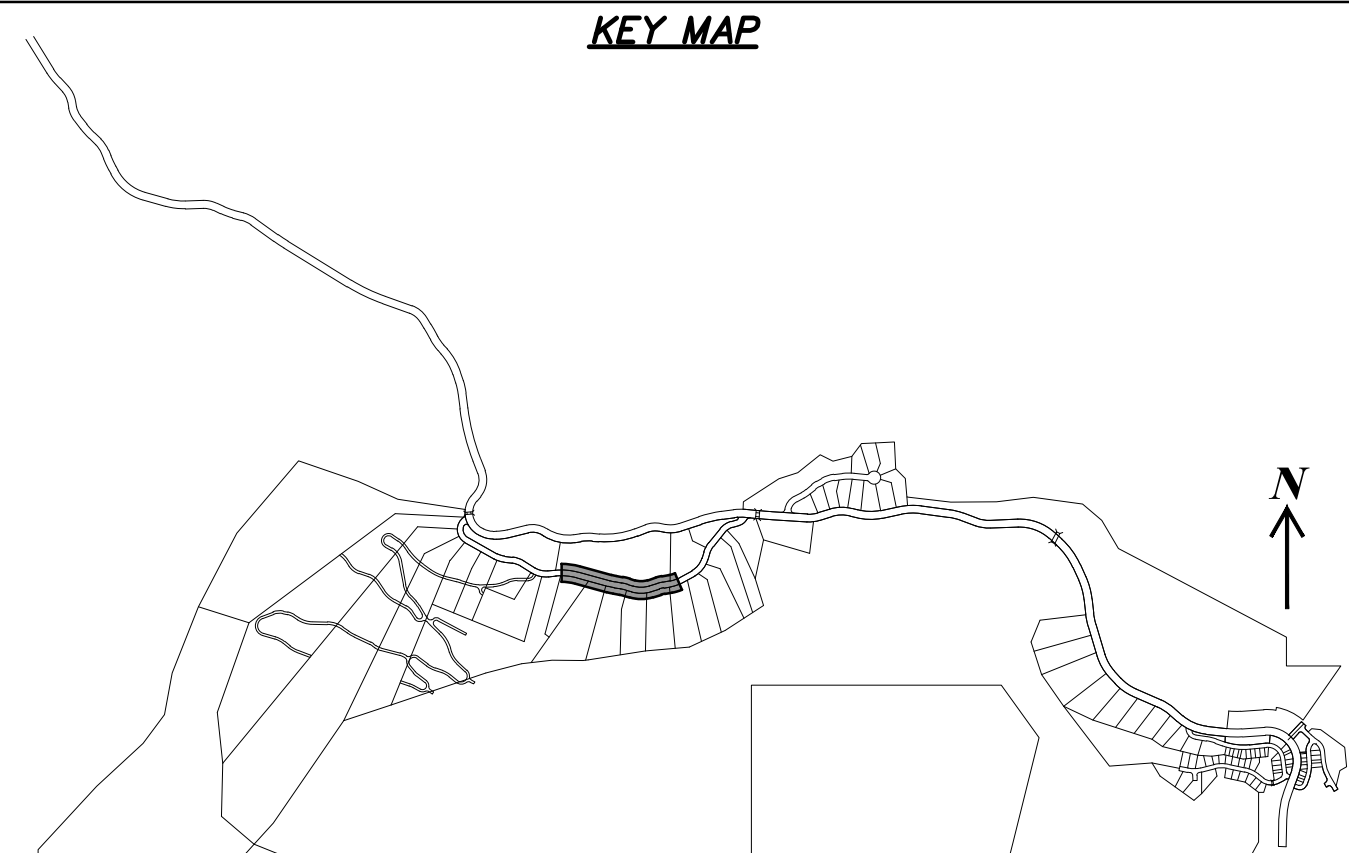
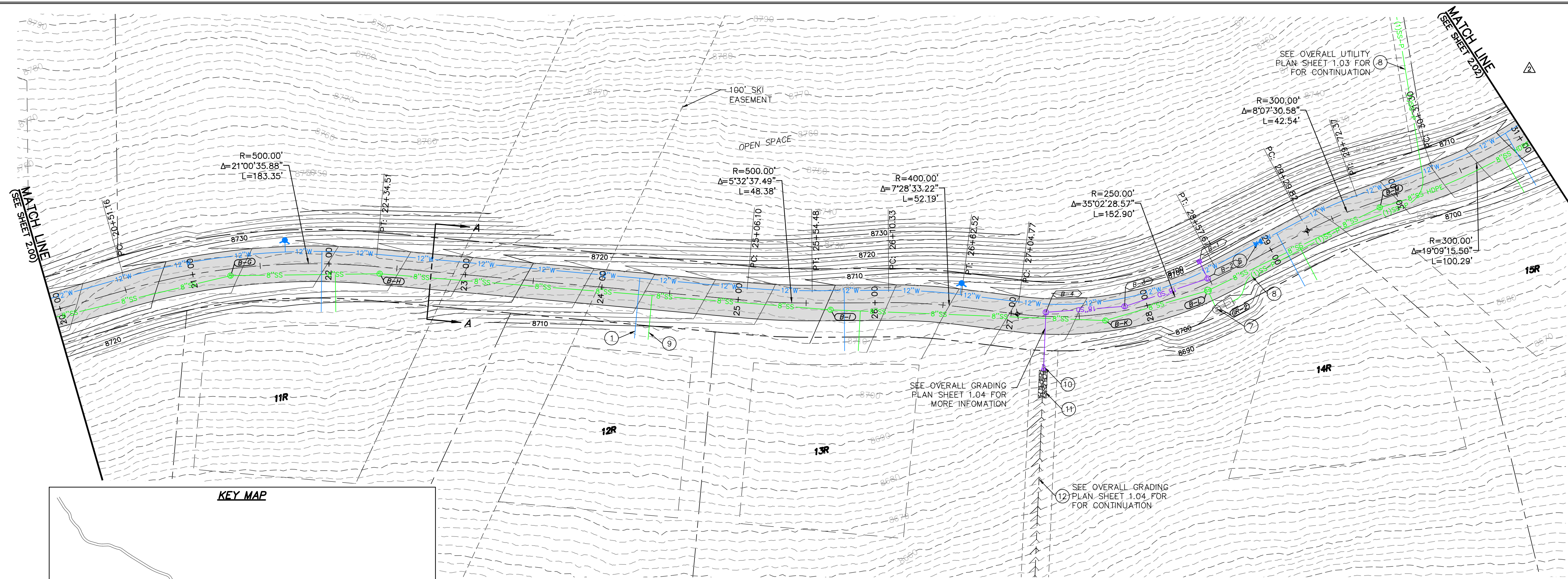
CAUTION  
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**NV5**  
 BEYOND ENGINEERING  
 6217 SOUTH STATE STREET, SUITE 200  
 801743.0300 TEL. 801743.0300 FAX  
 MURRAY, UT 84107  
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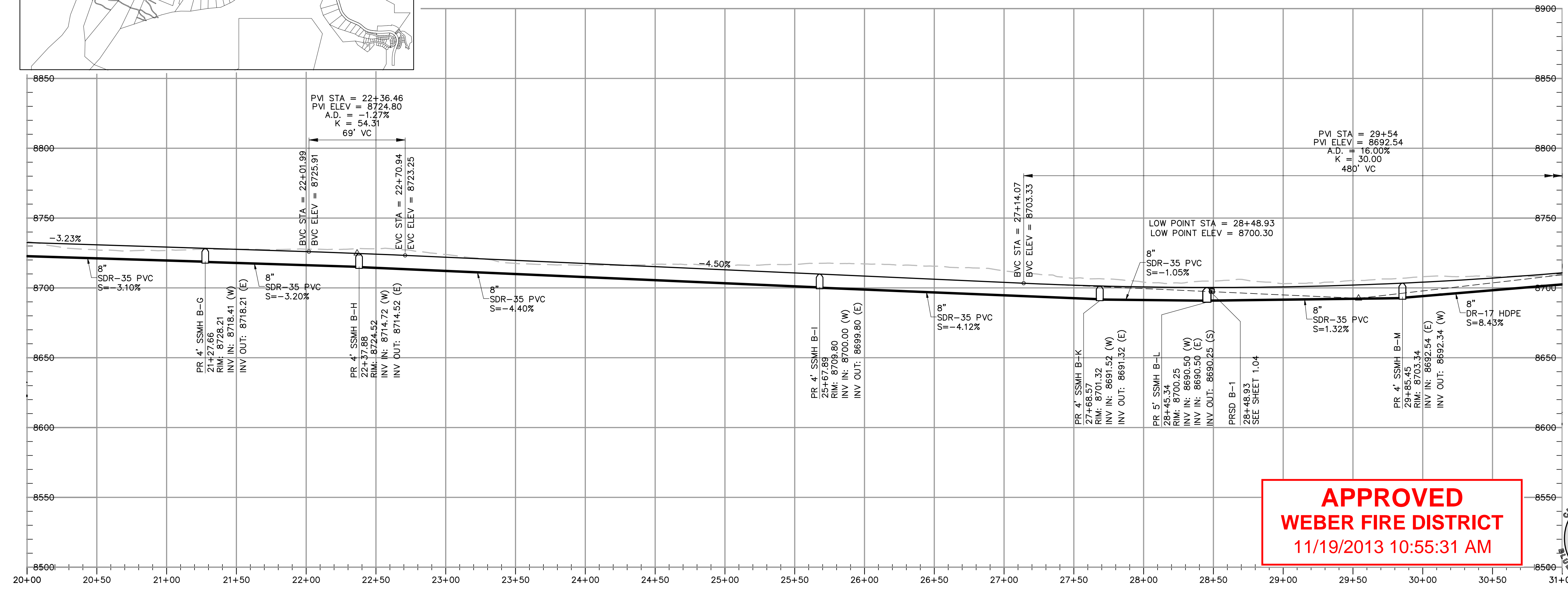
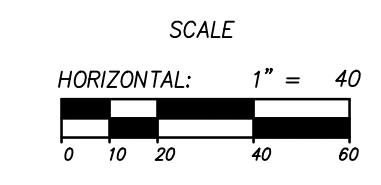
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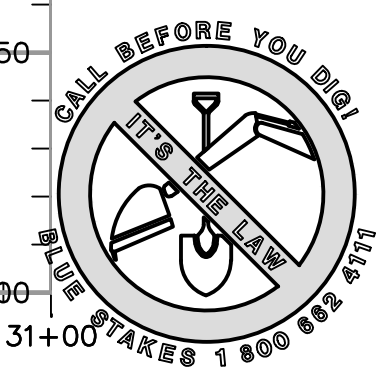
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**HORIZON RUN**  
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NO.	BY	DATE	REVISIONS
1	PMC	8/27/2013	ADDendum 1
2	PMC	9/24/2013	UTILITY, GRADING, AND SLOPEY REV

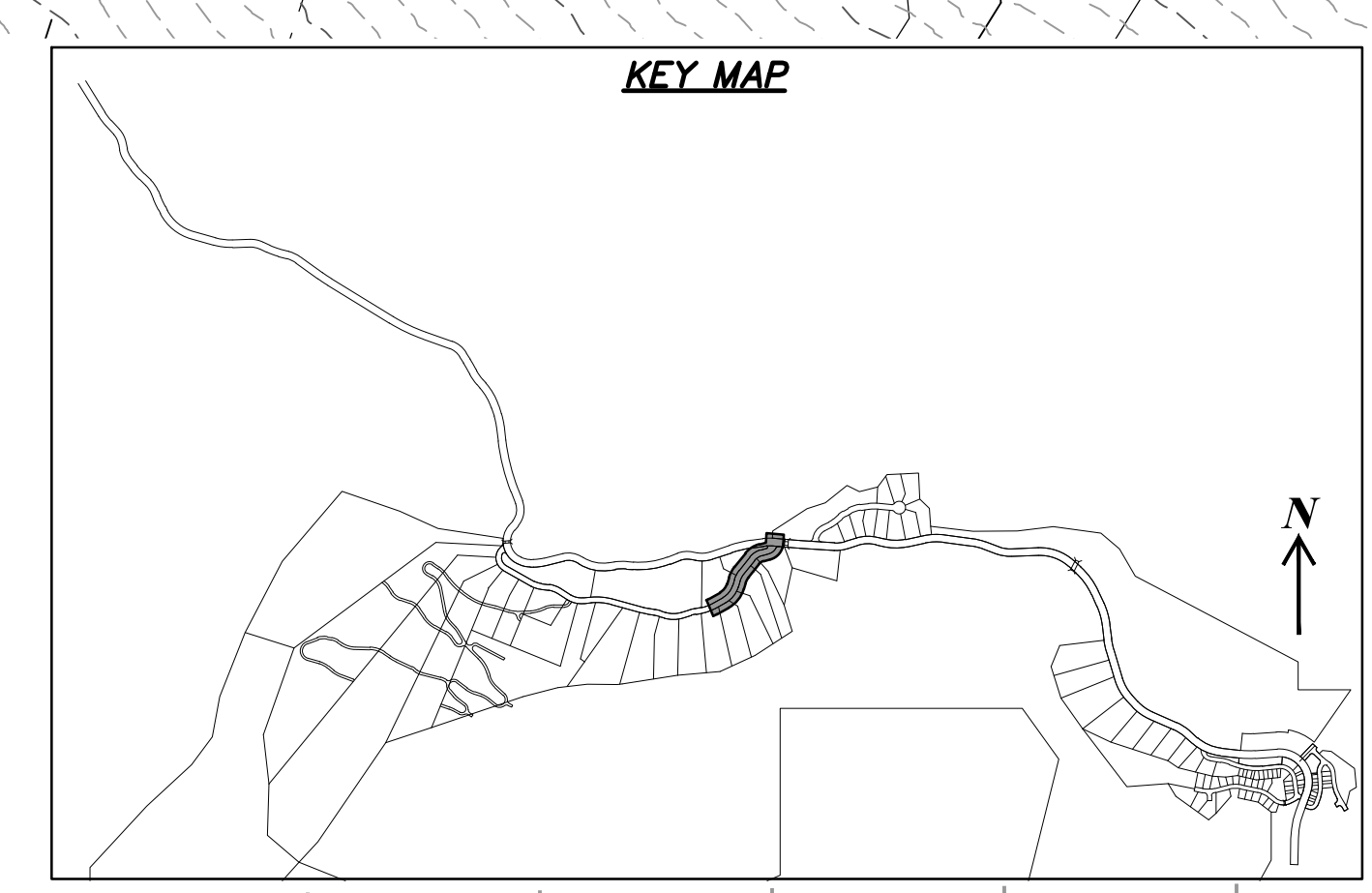
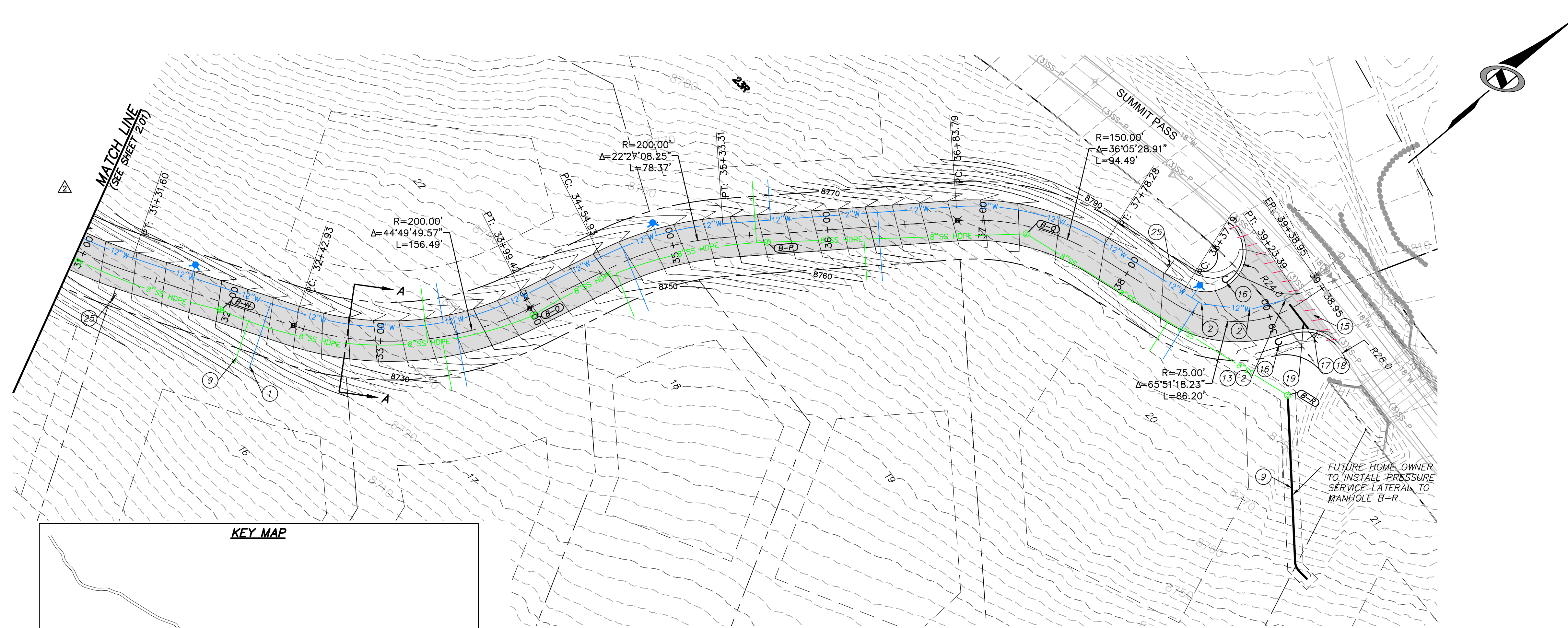
DATE SUBMITTED: 11/4/2013  
 PREPARED FOR: SUMMIT, LLC

**PHASE 1A CONSTRUCTION**  
**PLAN AND PROFILE**  
**HORIZON RUN**

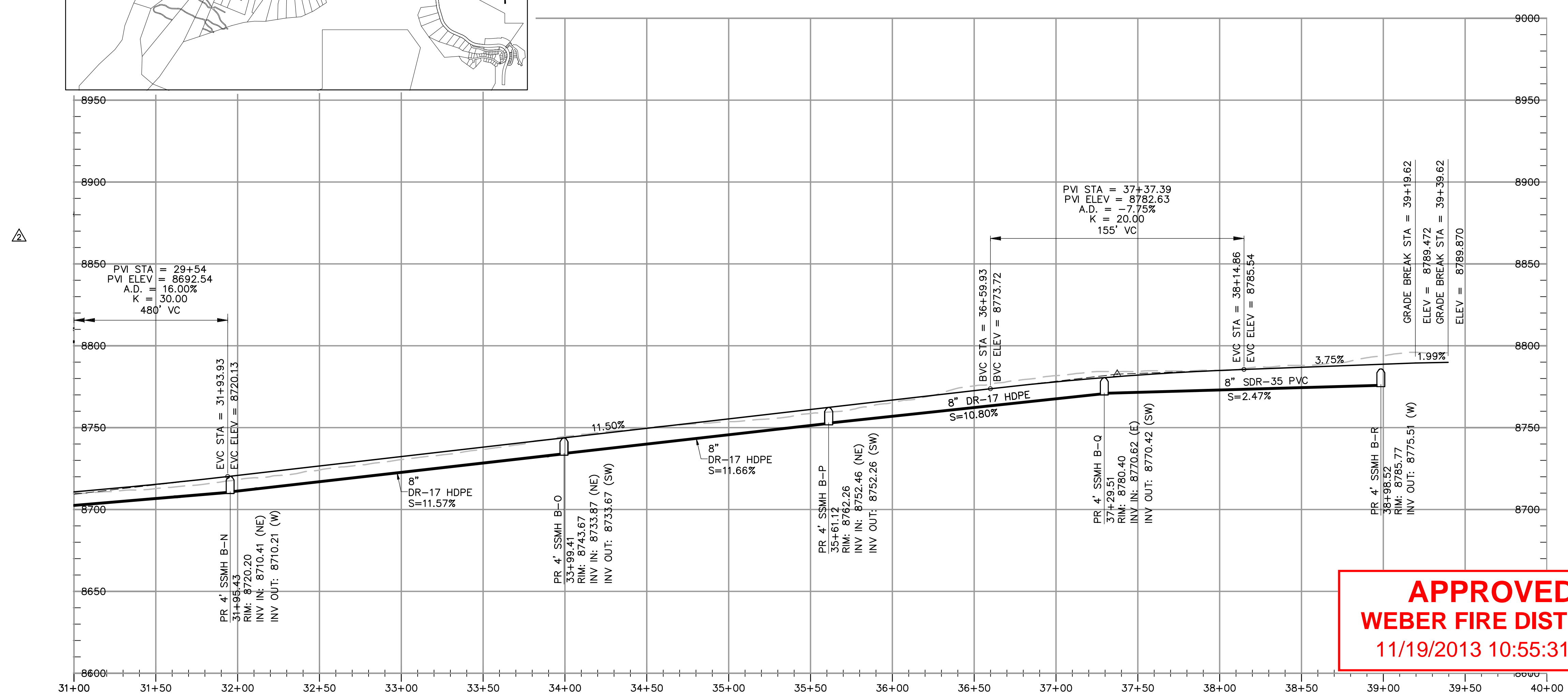
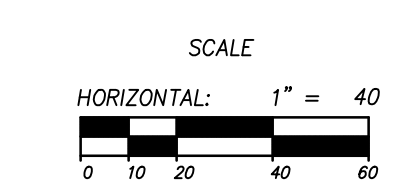
**NV5**  
 BEYOND ENGINEERING  
 5217 SOUTH STATE STREET, SUITE 200  
 801743.0000 TEL. 801743.0000 FAX  
 MURRAY, UT 84107  
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SHEET NUMBER	2.01
SCALE	VERTICAL: 1" = 40' HORIZONTAL: 1" = 40'
JOB NUMBER	SLB079306





**HORIZON RUN**  
 STA: 31+00.00 TO 39+39.62



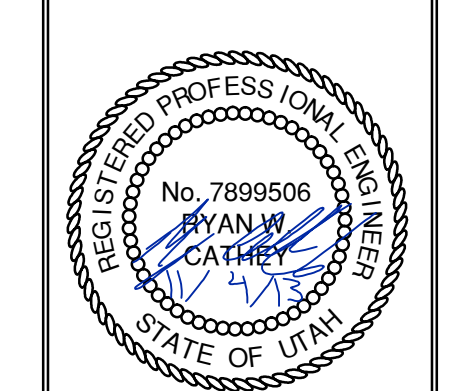
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NO.	BY	DATE	REVISIONS
1	PMC	8/27/2013	ADDendum 1
2	PMC	8/27/2013	UTILITY, GRADING, AND ROCKERY REV

**PHASE 1A CONSTRUCTION**  
**PLAN AND PROFILE**  
**HORIZON RUN**

**NV5**  
 BEYOND ENGINEERING  
 6217 SOUTH STATE STREET, SUITE 200  
 801743.0000 TEL. 801743.0000 FAX  
 MURRAY, UT 84107  
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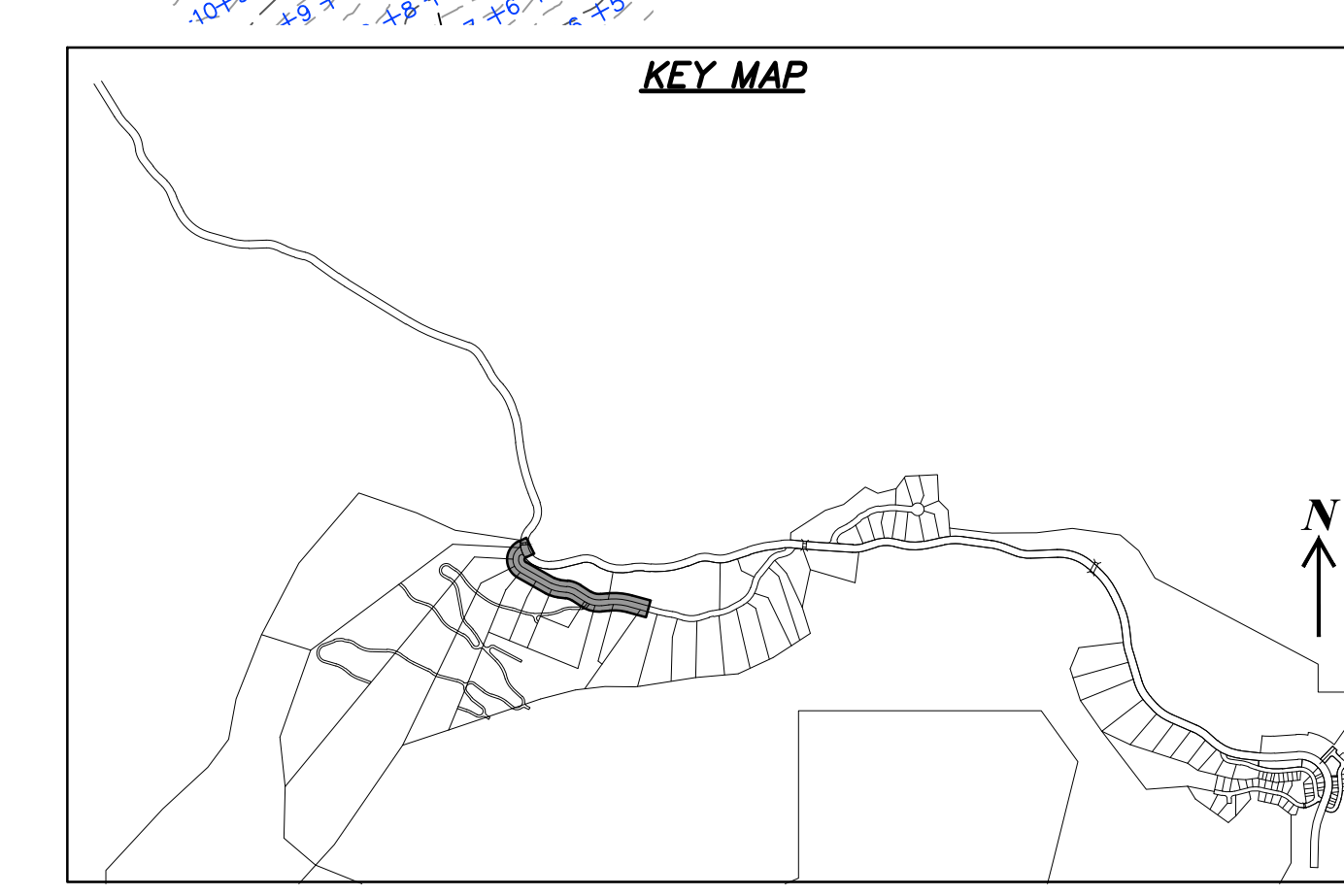
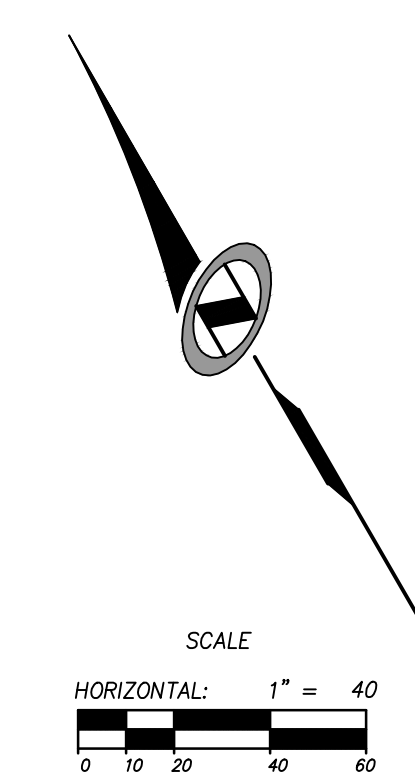
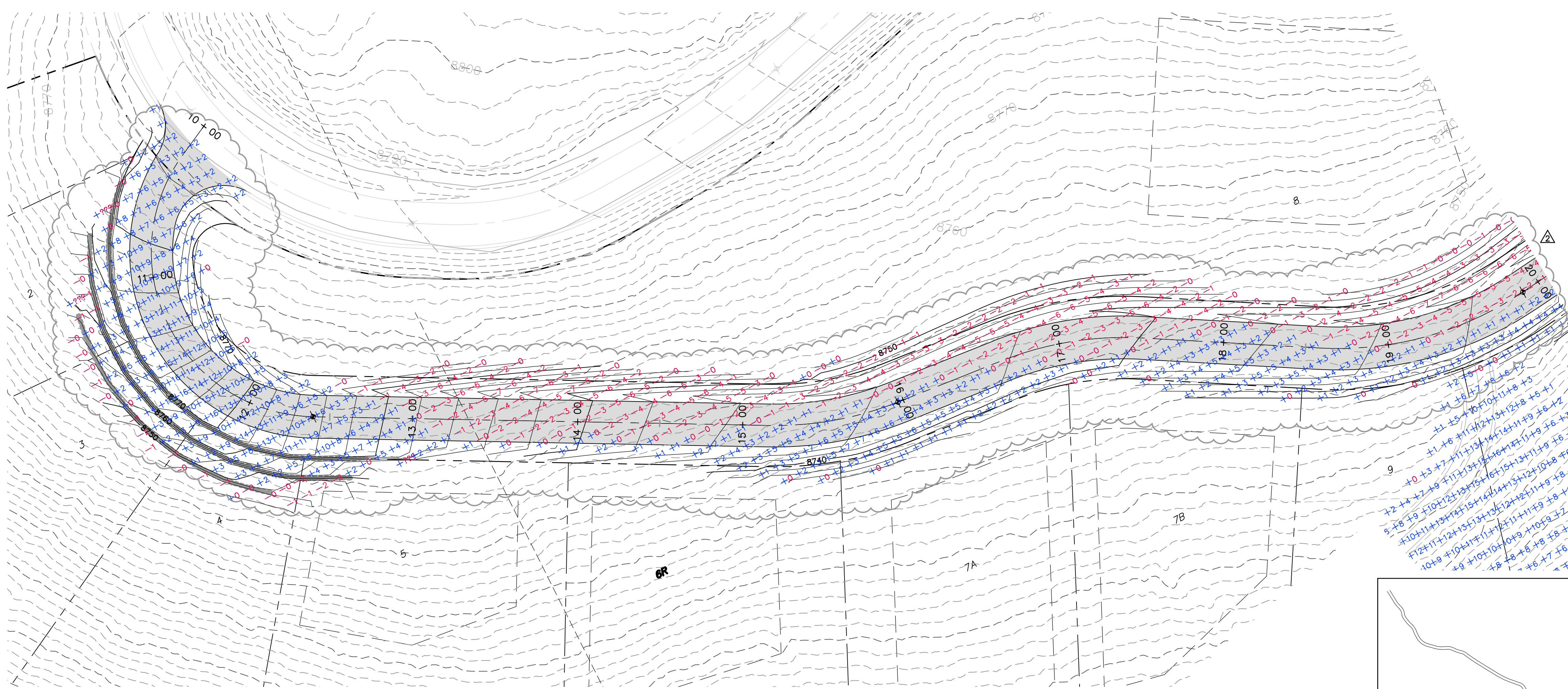
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 JOB NUMBER  
**SLB079306**

DATE SUBMITTED: 11/4/2013

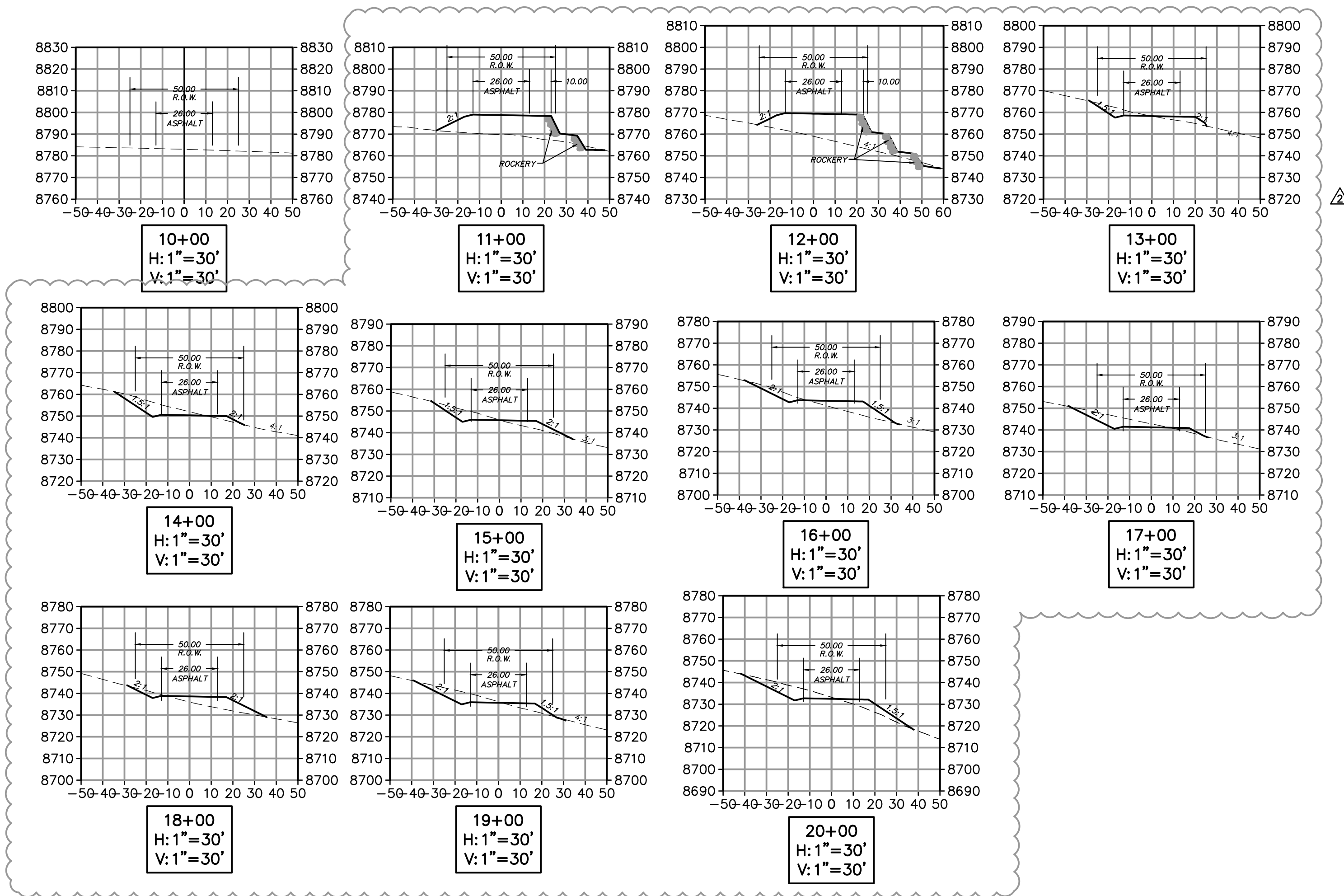
PREPARED FOR: SUMMIT, LLC

CAUTION  
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**HORIZON RUN**  
 STA: 10+00.00 TO 20+00.00



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**WEBER FIRE DISTRICT**  
 11/19/2013 10:55:31 AM



NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDENDUM 1
2	RWC	9/24/2013	UTILITY, GRADING, AND ROCKERY REV.

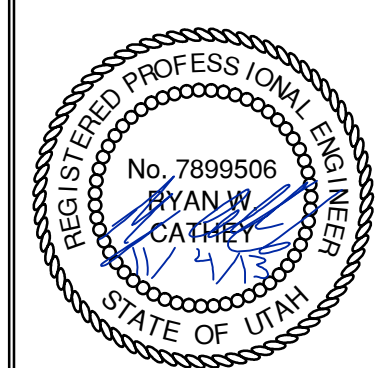
The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. The engineer's responsibility is limited to the design and construction of the project as shown on these plans and must be approved by the preparer of these plans.

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

**PHASE 1A CONSTRUCTION**  
**EARTHWORK AND SECTIONS**  
**HORIZON RUN**

**NV5**  
 BEYOND ENGINEERING  
 527 SOUTH STATE STREET, SUITE 200  
 801743.000 TEL. 801743.000 FAX  
 MURRAY, UT 84107  
 WWW.NV5.COM

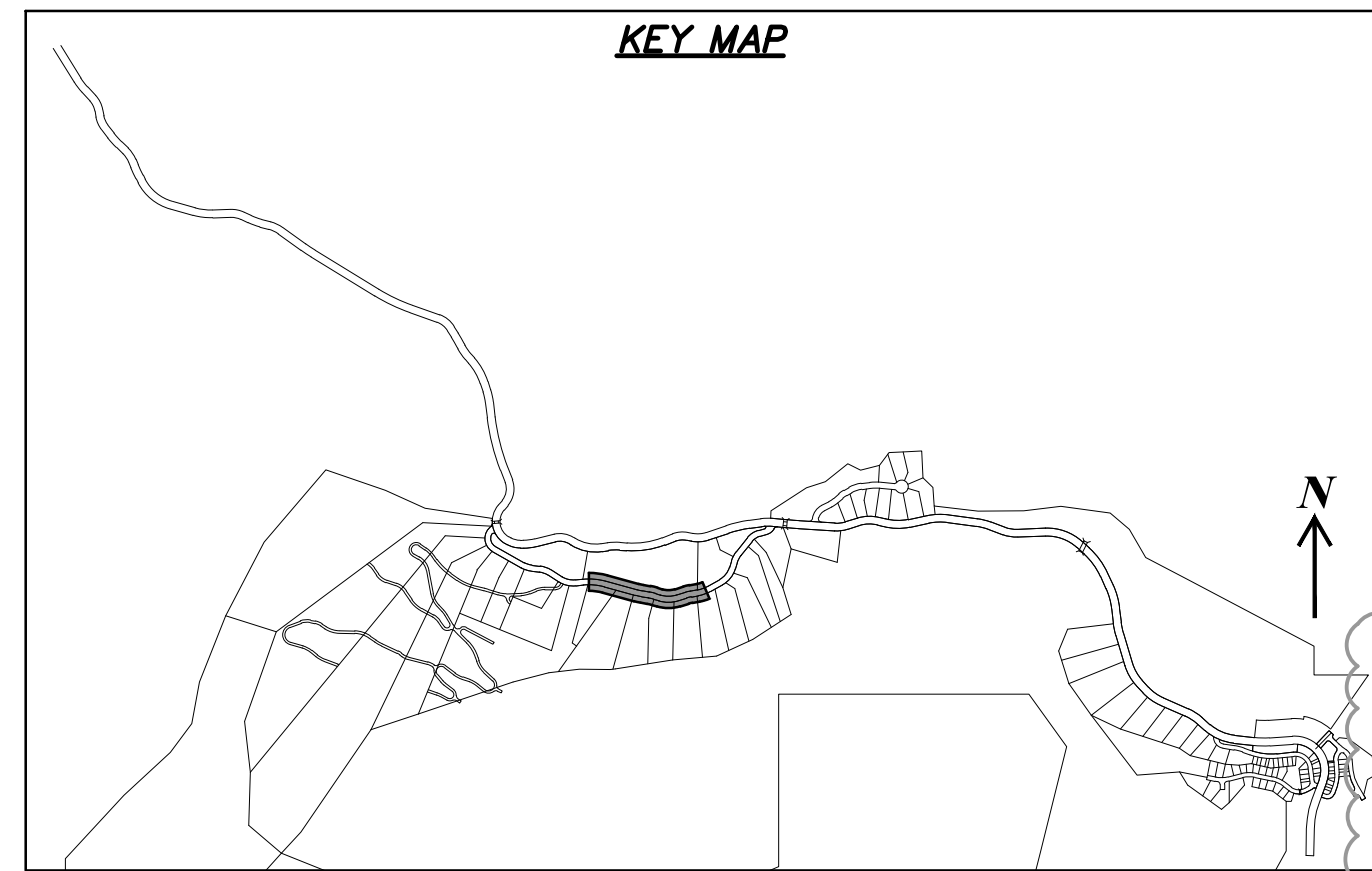
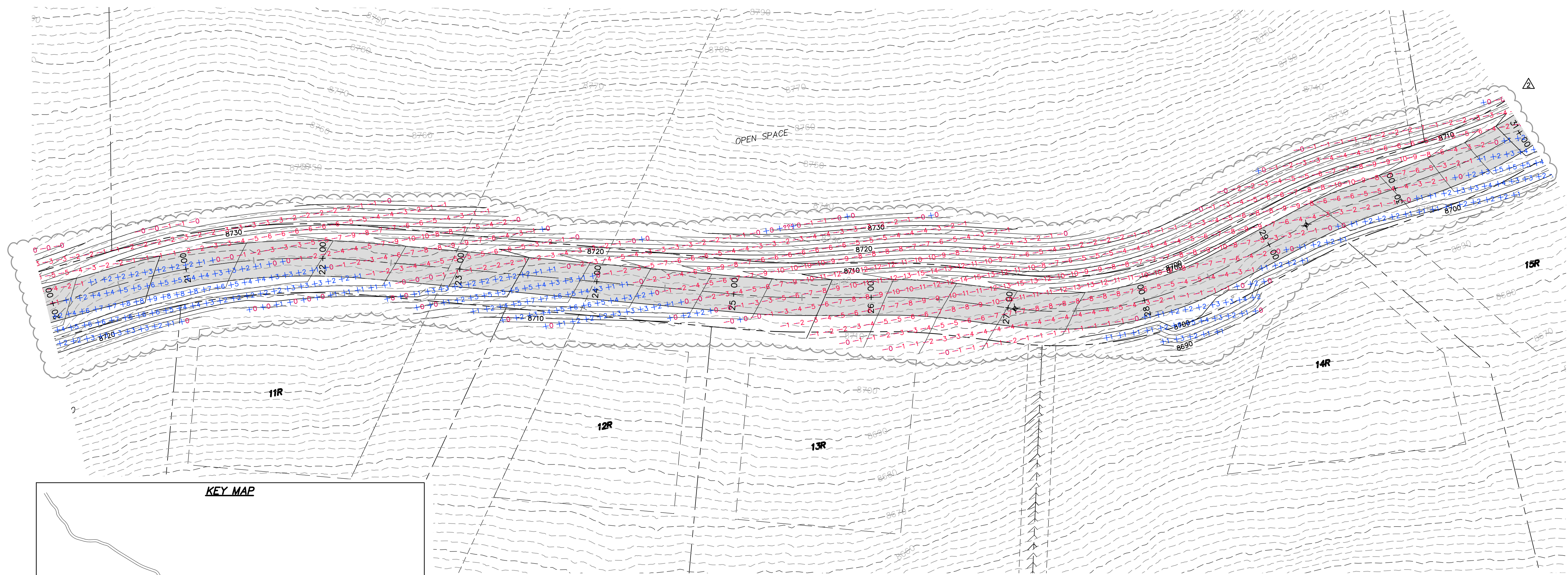


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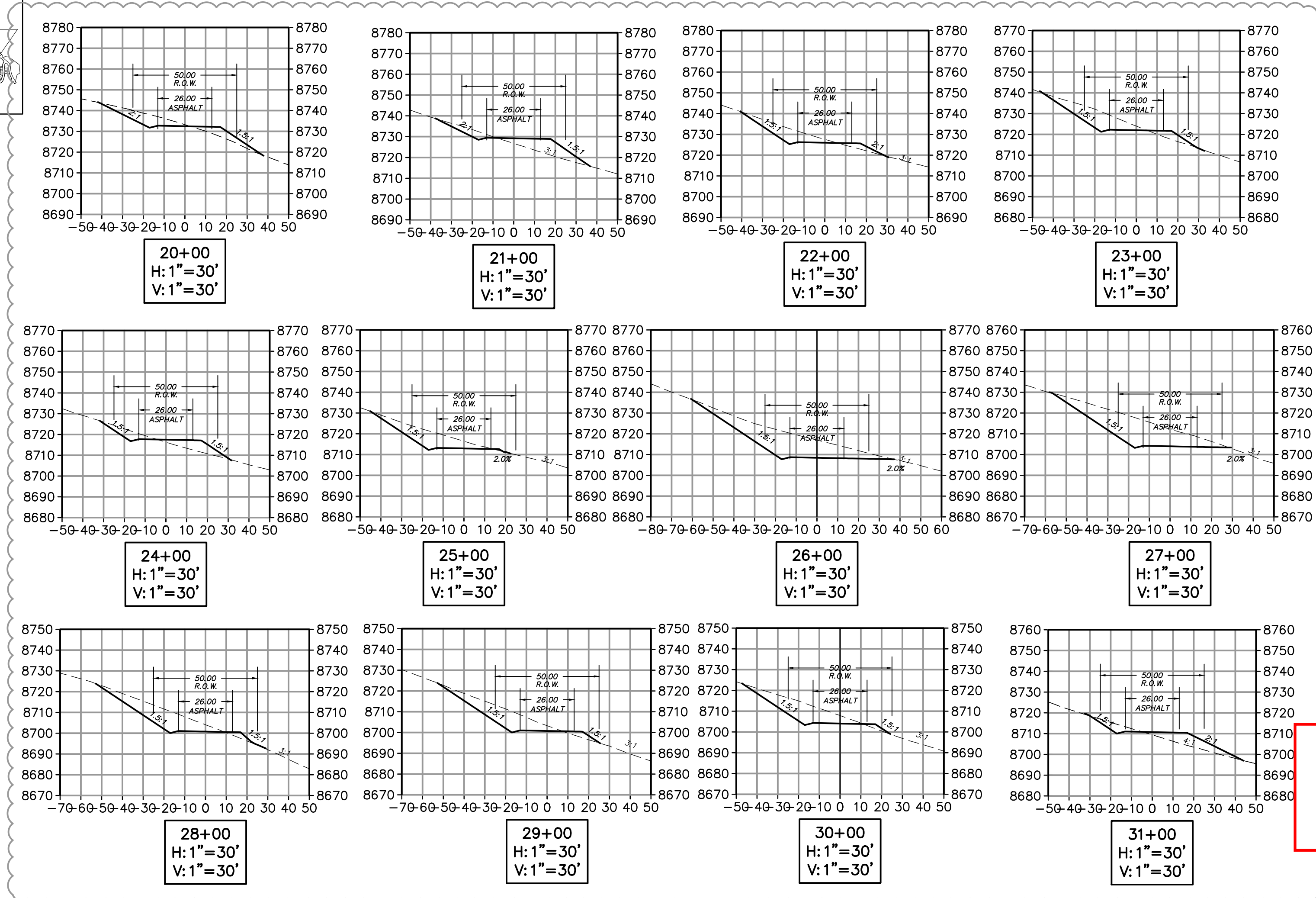
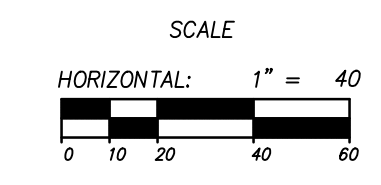
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**SLB079306**

PREFACE  
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**HORIZON RUN**

STA: 20+00.00 TO 31+00.00



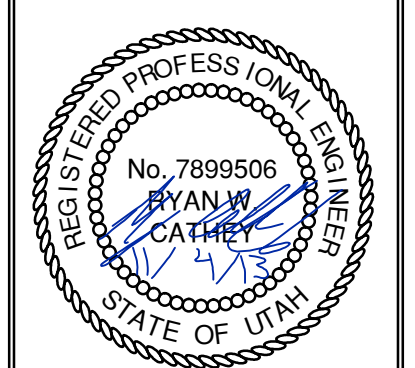
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NO.	BY	DATE	REVISIONS
1	RMC	8/27/2013	ADDITION 1
2	RMC	8/27/2013	UTILITY, GRADING, AND ROCKERY REV

**PHASE 1A CONSTRUCTION**  
**EARTHWORK AND SECTIONS**  
**HORIZON RUN**

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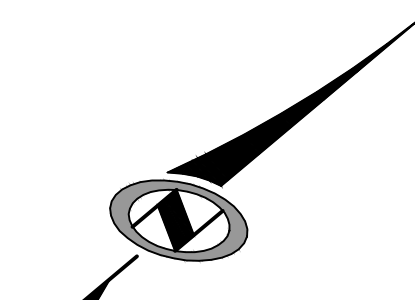
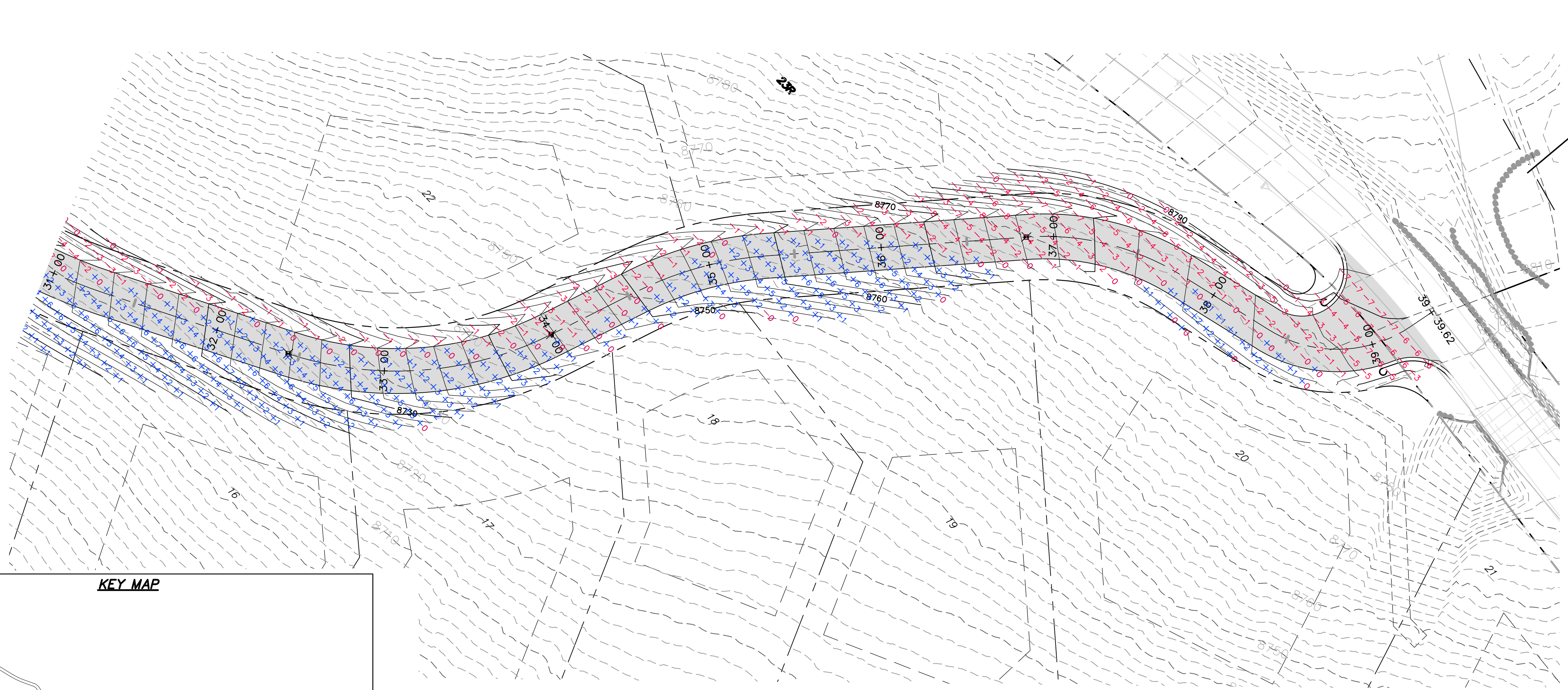
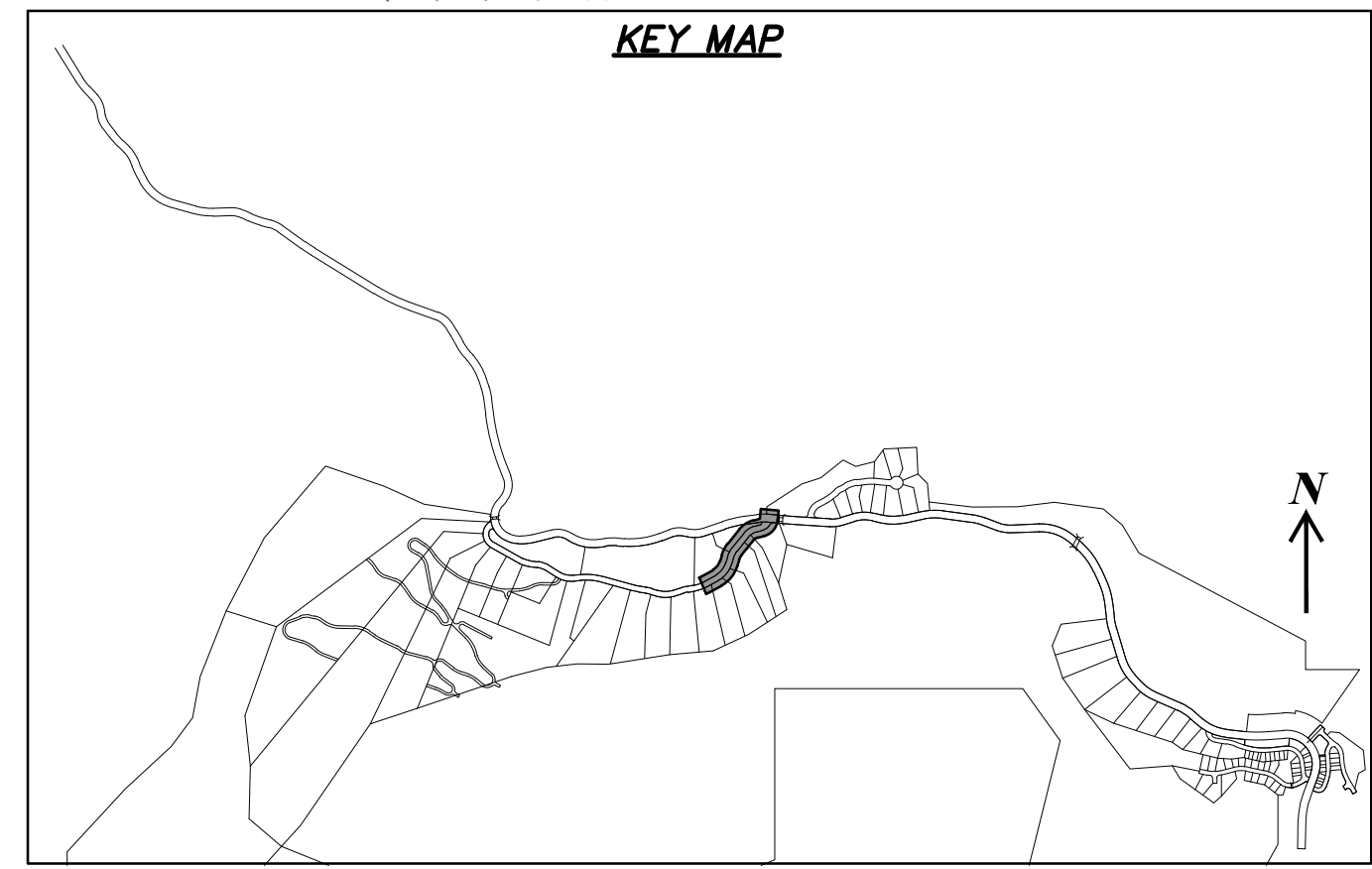


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**3.01**  
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 HORIZONTAL: 1" = 40'  
 JOB NUMBER  
**SLB079306**

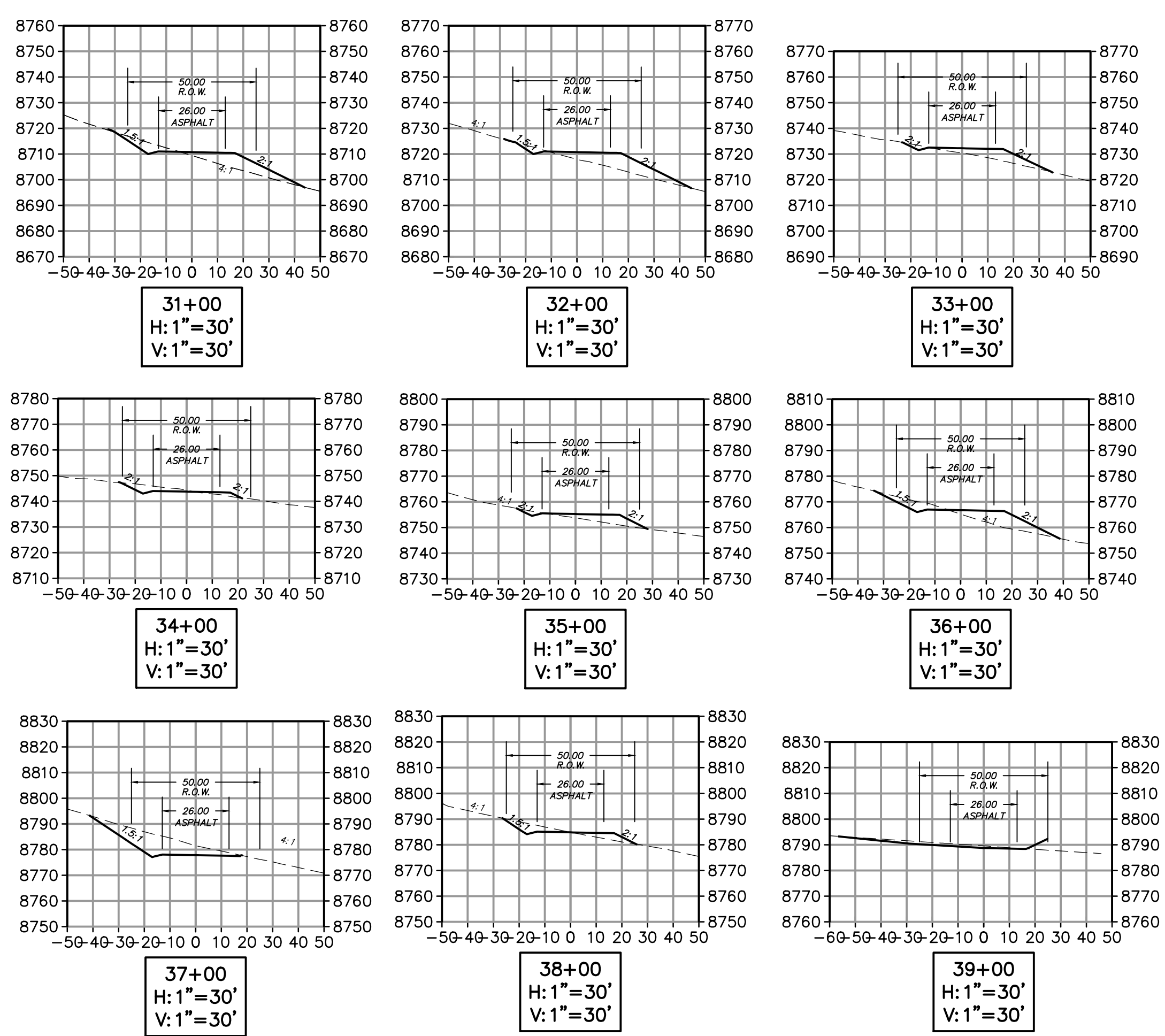
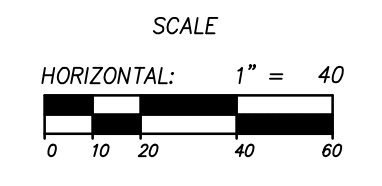
DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

CAUTION  
 The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. Any such changes or uses must be approved by the preparer of these plans.



**HORIZON RUN**  
 STA: 31+00.00 TO 39+39.62



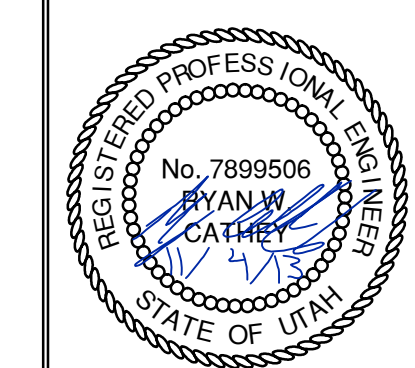
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**WEBER FIRE DISTRICT**  
 11/19/2013 10:55:31 AM



NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDITION 1
2	RWC	8/27/2013	UTILITY, GRADING, AND ROCKETRY REV

**PHASE 1A CONSTRUCTION**  
**EARTHWORK AND SECTIONS**  
**HORIZON RUN**

**NV5**  
 BEYOND ENGINEERING  
 5217 SOUTH STATE STREET, SUITE 200  
 MURRAY, UT 84107  
 801.743.0300 TEL. 801.743.0300 FAX  
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SHEET NUMBER	<b>3.02</b>
SCALE	VERTICAL: 1" = 40' HORIZONTAL: 1" = 40'
JOB NUMBER	<b>SLB079306</b>

DATE SUBMITTED: 11/4/2013

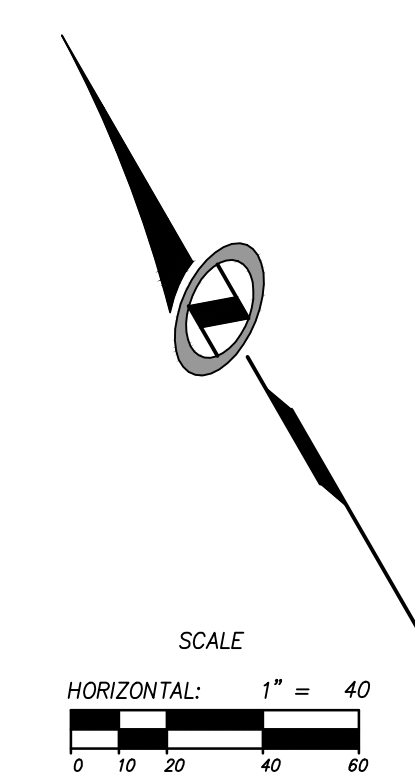
PREPARED FOR: SUMMIT, LLC

CAUTION  
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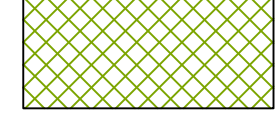
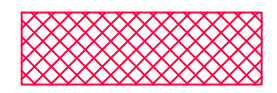
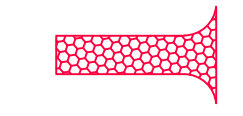





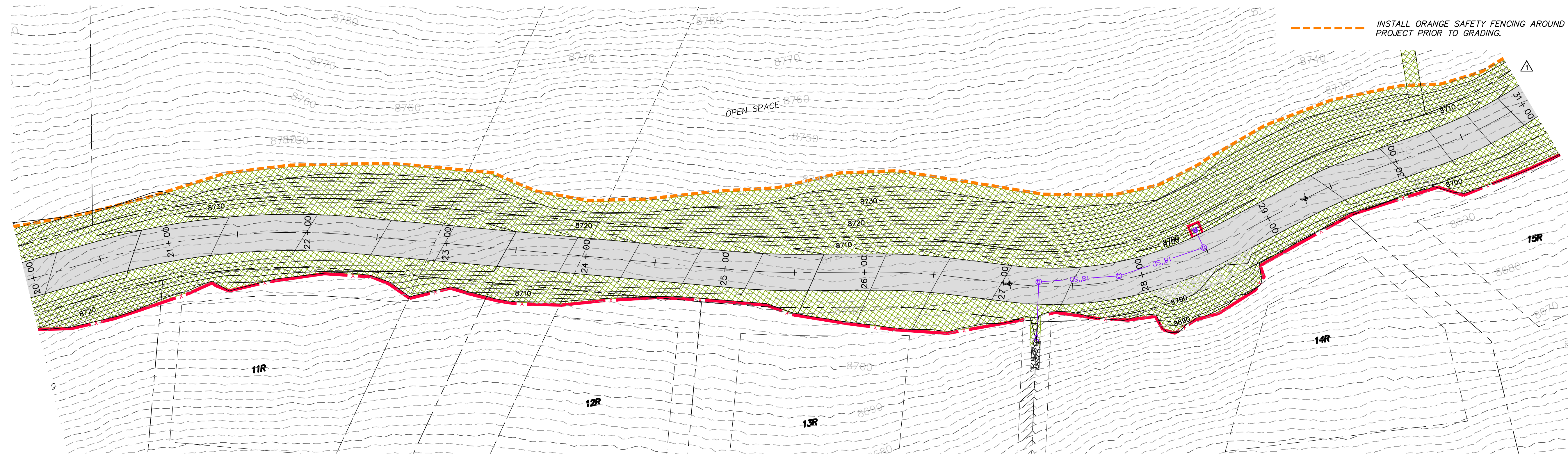
**HORIZON RUN**

STA: 10+00.00 TO 20+00.00



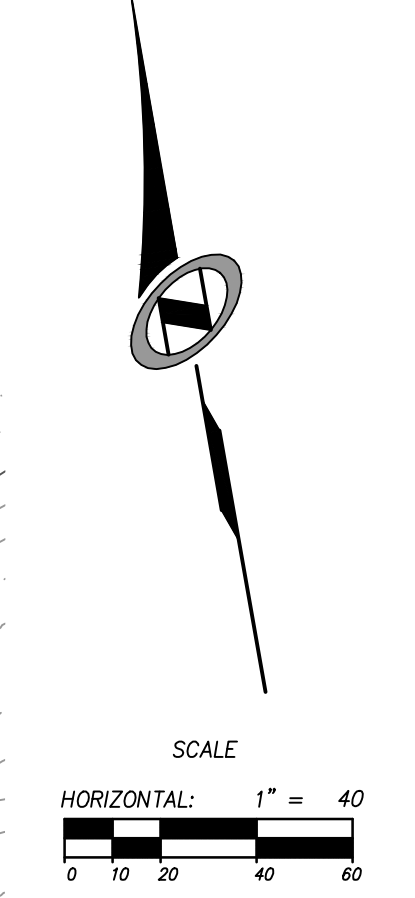
**LEGEND**

-  HATCHING INDICATES AREAS TO RECEIVE 4" TOPSOIL AND TO BE SEED FOR NATURAL REVEGETATION. AREAS RECEIVING SEEDING FOR NATURAL REVEGETATION MUST BE COVERED WITH AN EROSION CONTROL BLANKET AFTER THE FINAL GRADING AND SEEDING ARE FINISHED. INSTALL NORTH AMERICAN GREEN SC-150 BLANKET OR APPROVED EQUAL. FOLLOW MANUFACTURER'S SPECIFICATIONS. INSTALL NORTH AMERICAN GREEN P300 EROSION CONTROL BLANKET ON ALL SLOPES GREATER THAN 1.5:1.
-  INSTALL 15' X 50' VEHICLE WASH DOWN AREA WITH 1"-2.5" COARSE AGGREGATE PLACED A MINIMUM 8" THICK. SUPPLY WATER FOR VEHICLE WASH DOWN.
-  STABILIZED CONSTRUCTION ENTRANCE FOR SITE INGRESS/EGRESS. IF ALTERNATE ACCESS POINTS ARE APPROVED BY OWNER, ADDITIONAL STABILIZED CONSTRUCTION ENTRANCES WILL BE REQUIRED.
-  INSTALL INLET PROTECTION IN FORM OF CONCRETE BLOCKS / FILTER CLOTH / GRAVEL OR SILT SACK AT EXISTING AND PROPOSED CATCH BASINS AS SHOWN ON PLAN.
-  INSTALL SILT FENCE ALONG DOWN GRADIENT LIMITS OF DISTURBANCE AS SHOWN ON PLAN.
-  INSTALL ORANGE SAFETY FENCING AROUND OUTER LIMITS OF PROJECT PRIOR TO GRADING.



**HORIZON RUN**

STA: 20+00.00 TO 31+00.00



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NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDendum 1
2	RWC	9/24/2013	UTILITY, GRADING, AND SOBBY REV

**PHASE 1A CONSTRUCTION**  
**EROSION CONTROL PLAN**  
**HORIZON RUN**

**NV5**  
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 5217 SOUTH STATE STREET, SUITE 200  
 801743.0300 TEL. 801743.0300 FAX  
 MURRAY, UT 84107  
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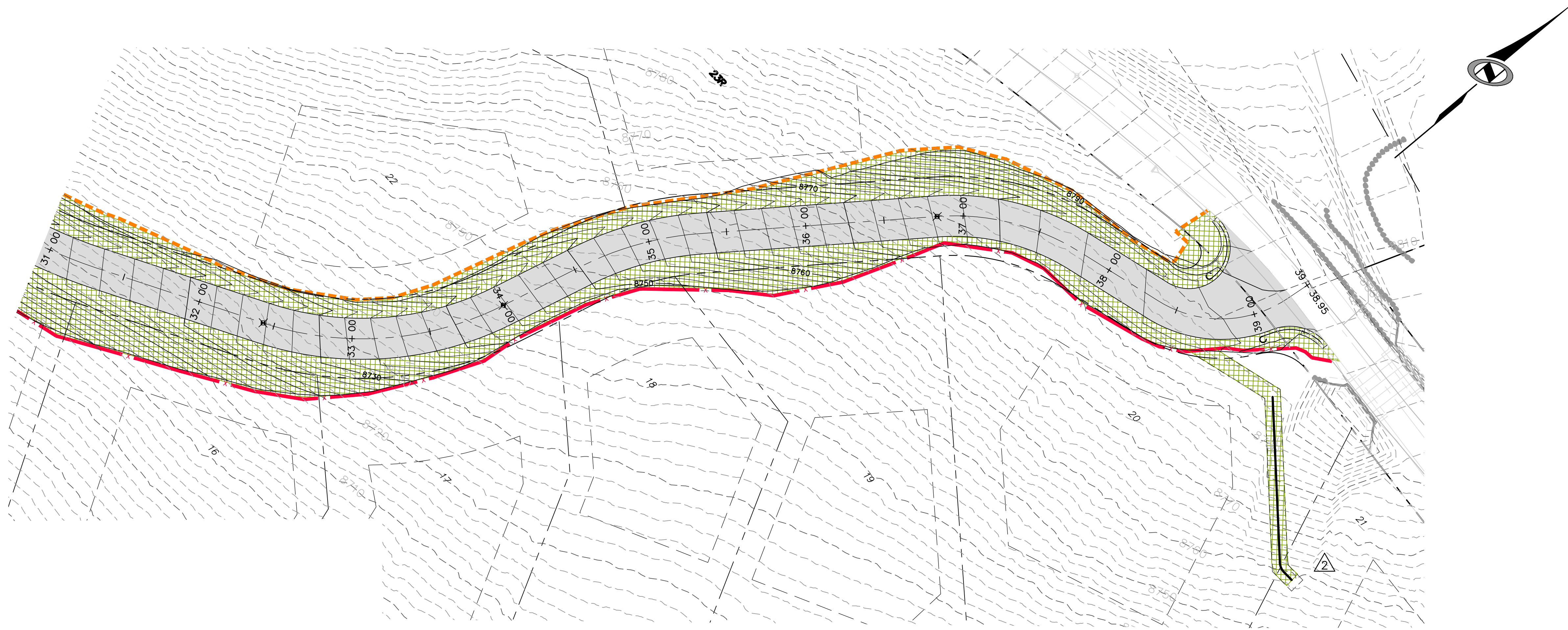
SHEET NUMBER	<b>4.00</b>
SCALE	VERTICAL: 1" = 40' HORIZONTAL: 1" = 40'
JOB NUMBER	<b>SLB079306</b>

DATE SUBMITTED: 11/4/2013

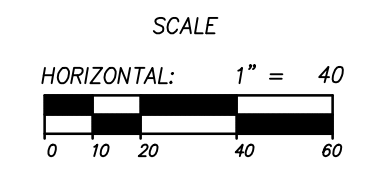
PREPARED FOR: SUMMIT, LLC

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CAUTION



**HORIZON RUN**  
 STA: 31+00.00 TO 39+39.62



NO.	BY	DATE	REVISIONS:
1	RWC	8/27/2013	ADD/NOV 1
2	RWC	8/27/2013	UTILITY, GRADING, AND ROCKERY REV

The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. Any such changes or uses must be approved by the preparer of these plans.

CAUTION

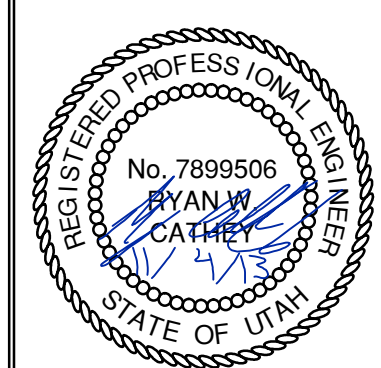
**PHASE 1A CONSTRUCTION**  
**EROSION CONTROL PLAN**  
**HORIZON RUN**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC



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SHEET NUMBER  
**4.01**

SCALE  
 VERTICAL: 1" = 40'  
 HORIZONTAL: 1" = 40'

JOB NUMBER  
**SLB079306**

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**WEBER FIRE DISTRICT**  
 11/19/2013 10:55:31 AM



**3' X 3' LID**  
WT. 990 #

**3' X 3' RISER**

**3' X 3' BASE**

HEIGHT	WEIGHTS	
	BASE	RISER
6"		550 #
1'		1,099 #
2'		2,198 #
3'	3,171 #	3,297 #
4'	4,796 #	4,207 #
5'	5,896 #	5,259 #
6'	6,994 #	7,894 #

NOTES:  
 1. Vault design complies with ASTM C-857 and C-858 with less than 2" of earth cover and an AASHTO HS-20 loading.  
 2. Lifting insert type and location may change without notice.

**Oldcastle Precast**  
 801 West 12th Street, Ogden, Utah 84404  
 Phone: 801-399-1171 Fax: 801-392-7849

**3' x 3' Basin**  
 FILE NAME: 2100IC3X3CB000  
 ISSUE DATE: 1/08  
 www.oldcastleprecast.com

**3' x 3' Catch Basin Bases, Risers and lid**  
 Copyright © 2008

**3'x3' CATCH BASIN LID ELEVATION VIEW**

**3'x3' CATCH BASIN LID PLAN VIEW 31" OPENING**

**3'x3' CATCH BASIN LID PLAN VIEW 2'x3' OPENING CENTER/OFFSET**

**3'x3' CATCH BASIN RISER ELEVATION VIEW**

**3'x3' CATCH BASIN BASE ELEVATION VIEW**

**3'x3' CATCH BASIN BASE / RISER PLAN VIEW**

**JOINT DETAIL**

KNOCKOUT	
BASE HEIGHT	DIA.
3'	30"
4'	36"
5'	36"
6'	36"

KNOCKOUTS ARE 4" DEEP

**Oldcastle Precast**  
 801 West 12th Street, Ogden, Utah 84404  
 Phone: 801-399-1171 Fax: 801-392-7849

**3' x 3' Basin**  
 FILE NAME: 2100IC3X3CB000  
 ISSUE DATE: 1/08  
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**3' x 3' Catch Basin Bases, risers and lid**  
 Copyright © 2008

**PLAN VIEW**

**SECTION A-A**

**END VIEW**

Diam.	Slope	X - Y					
		A	B	C	E	F	G
12"	2.4 : 1	4"	24"	48"	72"	24"	2"
15"	2.4 : 1	6"	27"	46"	73"	30"	2 1/2"
18"	2.3 : 1	9"	27"	46"	73"	36"	2 1/2"
24"	2.5 : 1	9"	43"	30"	73"	48"	3"
30"	2.5 : 1	12"	54"	19"	73"	60"	3 1/2"
36"	2.5 : 1	15"	63"	34"	97"	72"	4"
42"	2.5 : 1	21"	63"	35"	98"	78"	4 1/2"
48"	2.5 : 1	24"	72"	26"	98"	84"	5"

**Oldcastle Precast**  
 801 West 12th Street, Ogden, Utah 84404  
 Phone: 801-399-1171 Fax: 801-392-7849

**Flared End**  
 FILE NAME: 2100PERNDFLARE  
 ISSUE DATE: 5/2008  
 www.oldcastleprecast.com

**Flared End Section for Round Pipe**  
 Copyright © 2008

**I-3742 Drop Inlet**

**BICYCLE SAFETY LUGS**

**CAST IRON to conform to ASTM A-48, CLASS 35B H-20 Wheel Loading**

**I-3742**  
 Est. weight 582 lbs.

**D&L SUPPLY**  
 D&L Foundry  
 P.O. Box 1919  
 Moses Lake, WA 98837  
 Phone: (509) 765-7952  
 Fax: (509) 765-8124

Designation: I-3742 Date of Drawing: JUL 1994 Prepared by: D&L Supply Scale: 1" = 17 1/2" Sheet Number: 1 Total Sheets: 1

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**WEBER FIRE DISTRICT**  
 11/19/2013 10:55:32 AM



**PHASE 1A CONSTRUCTION**  
**STORM DRAIN DETAILS**

NO. BY DATE REVISIONS:  
 1 RMC 8/27/03 ADDITION 1  
 2 RMC 9/25/03 UTILITY, GRADING, AND SOCKET REV

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

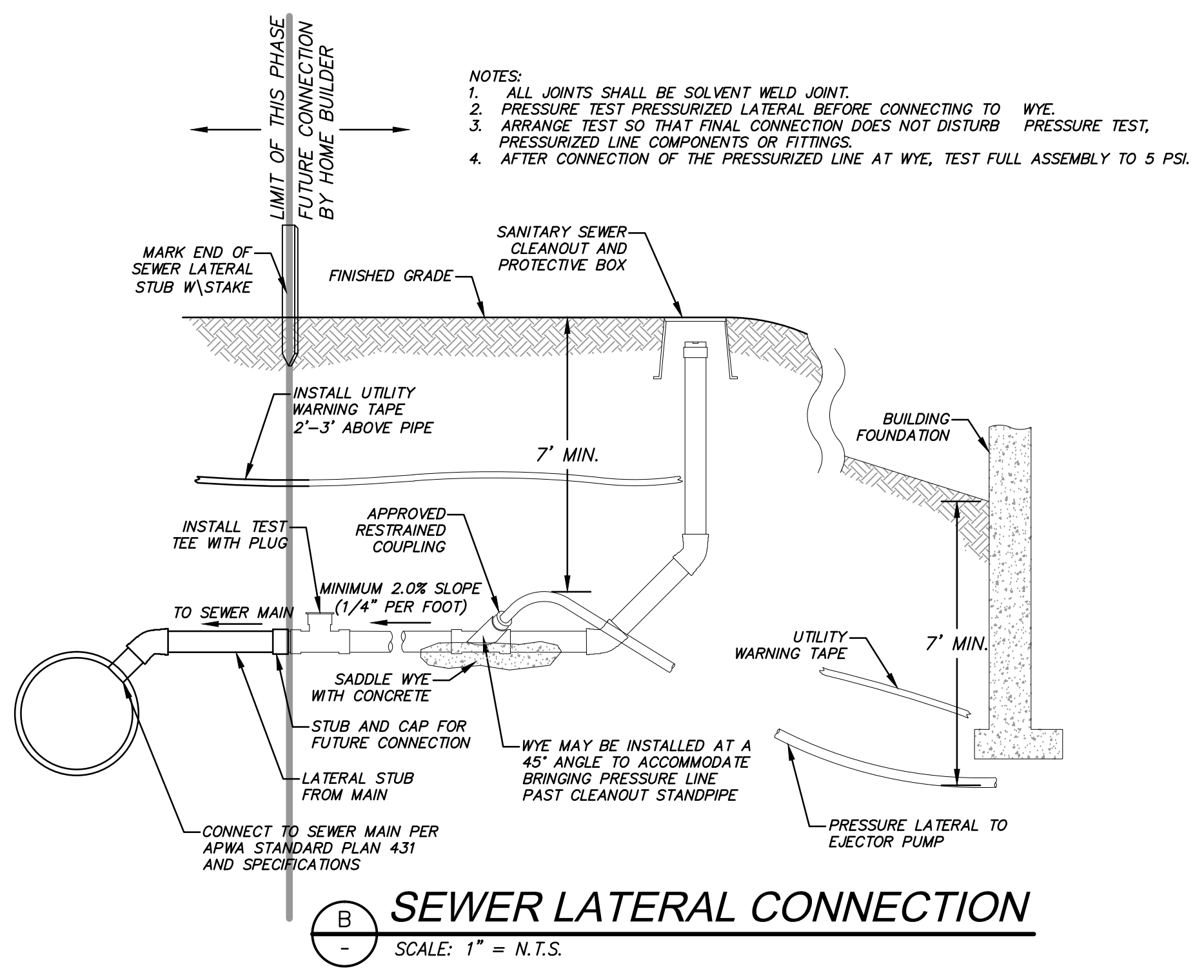
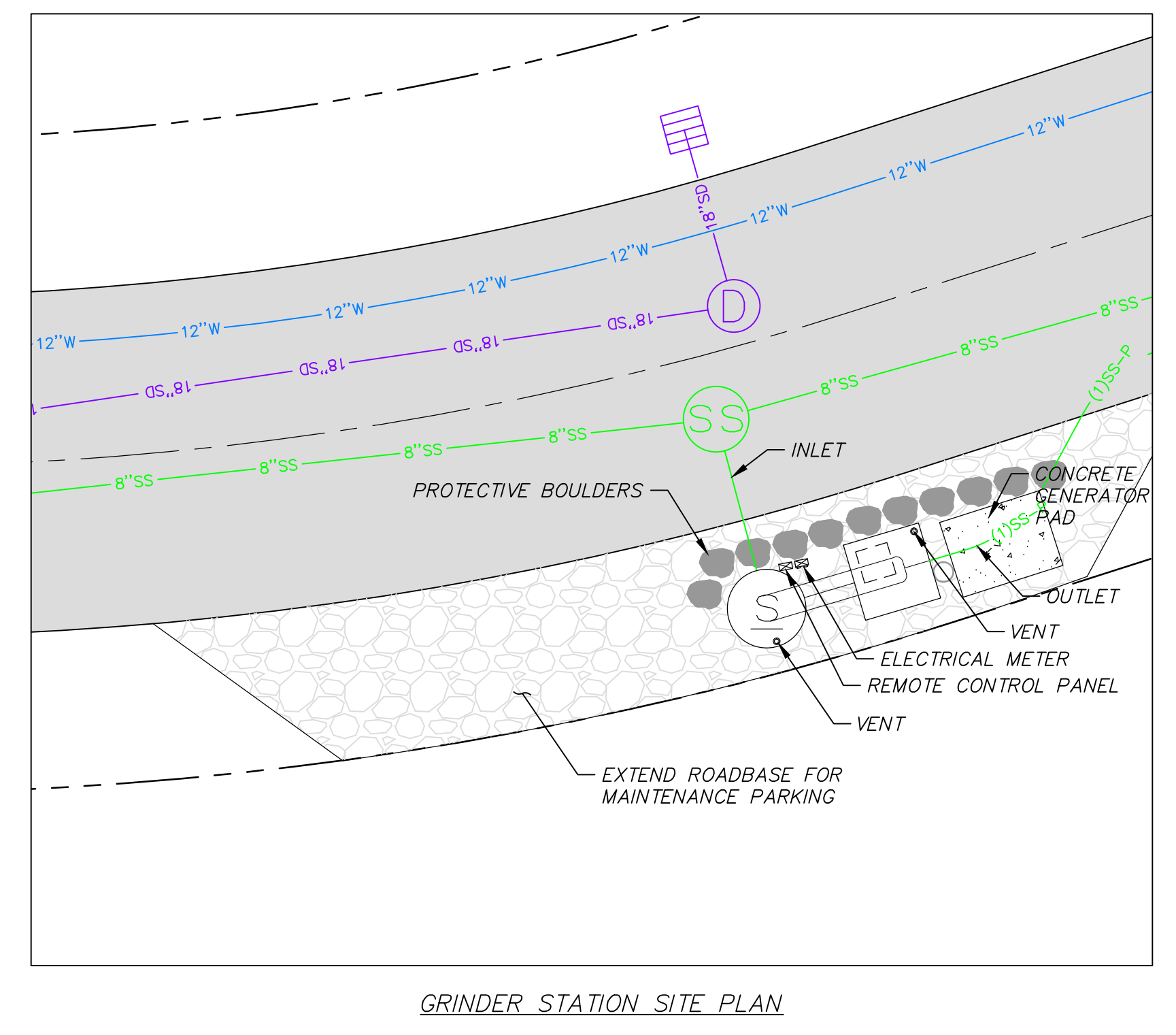
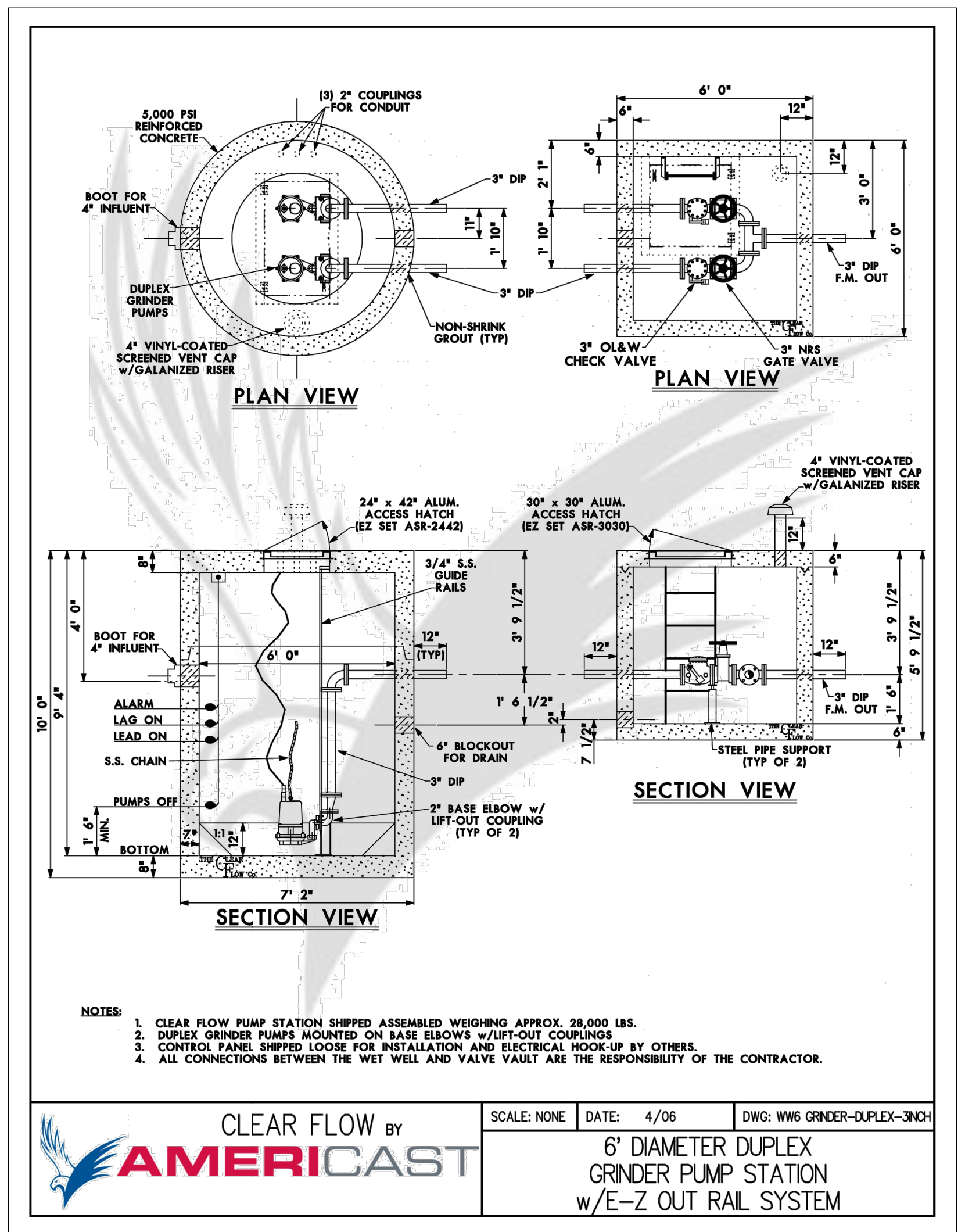
**NV5**  
 BEYOND ENGINEERING  
 527 SOUTH STATE STREET, SUITE 200  
 801743.000 TEL. 801743.000 FAX  
 MURRAY, UT 84107  
 WWW.NV5.COM

REGISTERED PROFESSIONAL ENGINEER  
 No. 7899506  
 RYAN W. CATHEY  
 STATE OF UTAH

SHEET NUMBER  
**5.00**

SCALE  
 VERTICAL: 1" = N/A  
 HORIZONTAL: 1" = N/A

JOB NUMBER  
**SLB079306**



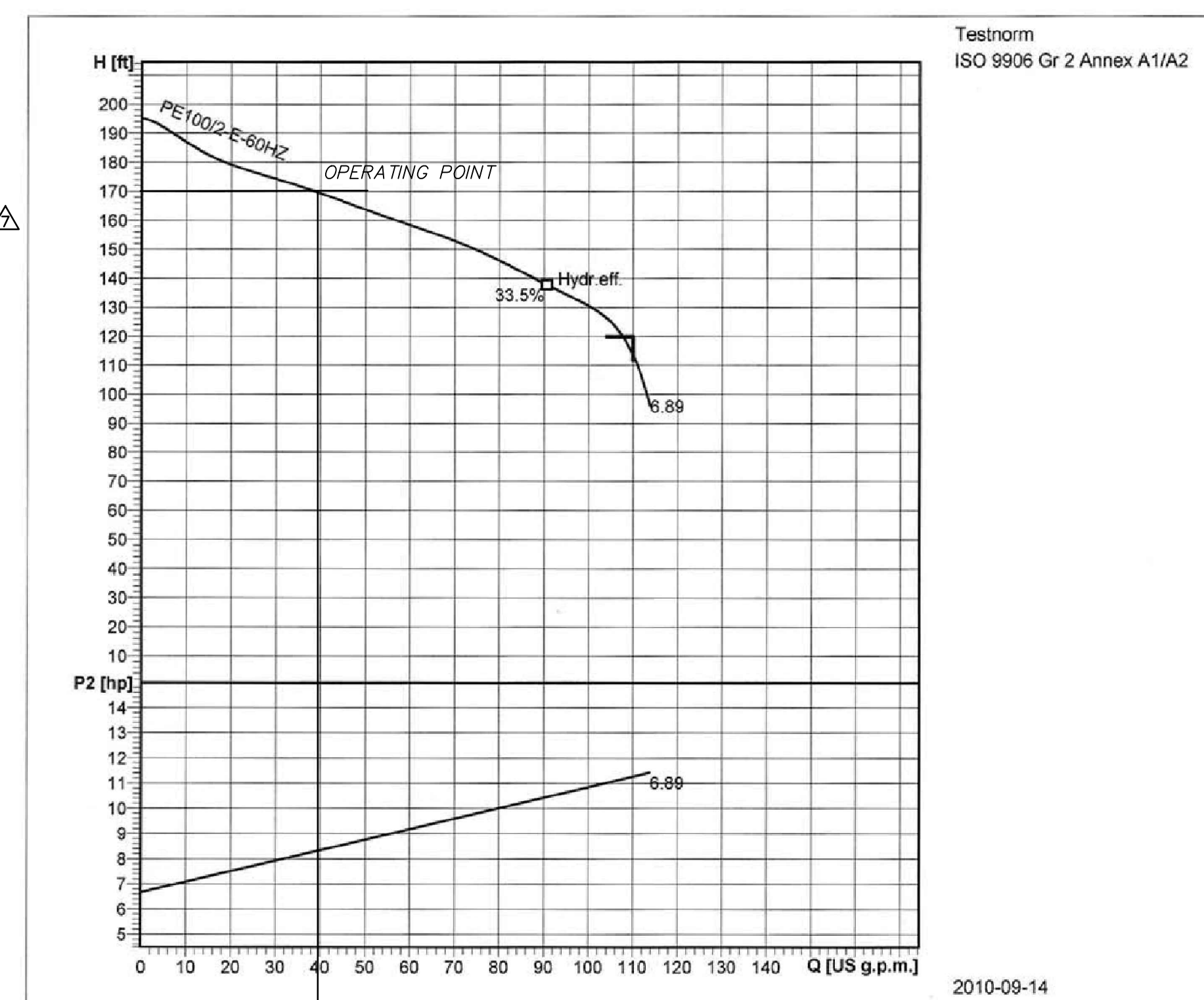
**LEGEND**

PUMP NAME	INVERT IN	INVERT IN SIZE	SUMP ELEV	BASIN DIA.	PUMP HEAD	PUMP HP	DISCHARGE DIA	DISCHARGE VELOCITY	MIN STORAGE VOLUME (gal)	STATION DETAIL	PUMP	PEAK FLOW (GPM)	AUTO DIALER	MAIN POWER TRANSFER SWITCH	POWER
GR-2	8689.80	8"	8682.71	72"	170	3	3"	2.16	1500	AMERICAST 6' DIA. DUPLEX	ABS PUMP MODEL M100/2D	38	CELLULAR	MANUAL	1 PHASE/240 VOLT

**SEWER GRINDER PUMP DETAILS**  
 SCALE: 1" = N.T.S.

**Grinder Station Calculations**

Head Difference	8683.71-8848.06=164.35 ft.
Pipe Length	750 ft.
Friction Loss	6.28 ft.
Flow Calc.	(23 units )(3.2 People/household)(100 gallons/day/capita) =5.11 g/m average
Peaking Factor (Ten States Method)	$Q_{peak}/Q_{ave} = 18+VP/4+VP=4.5$ $Q_{peak} = 23.0$ g/m
Pump Curve	See Pump Curve = 40 g/m

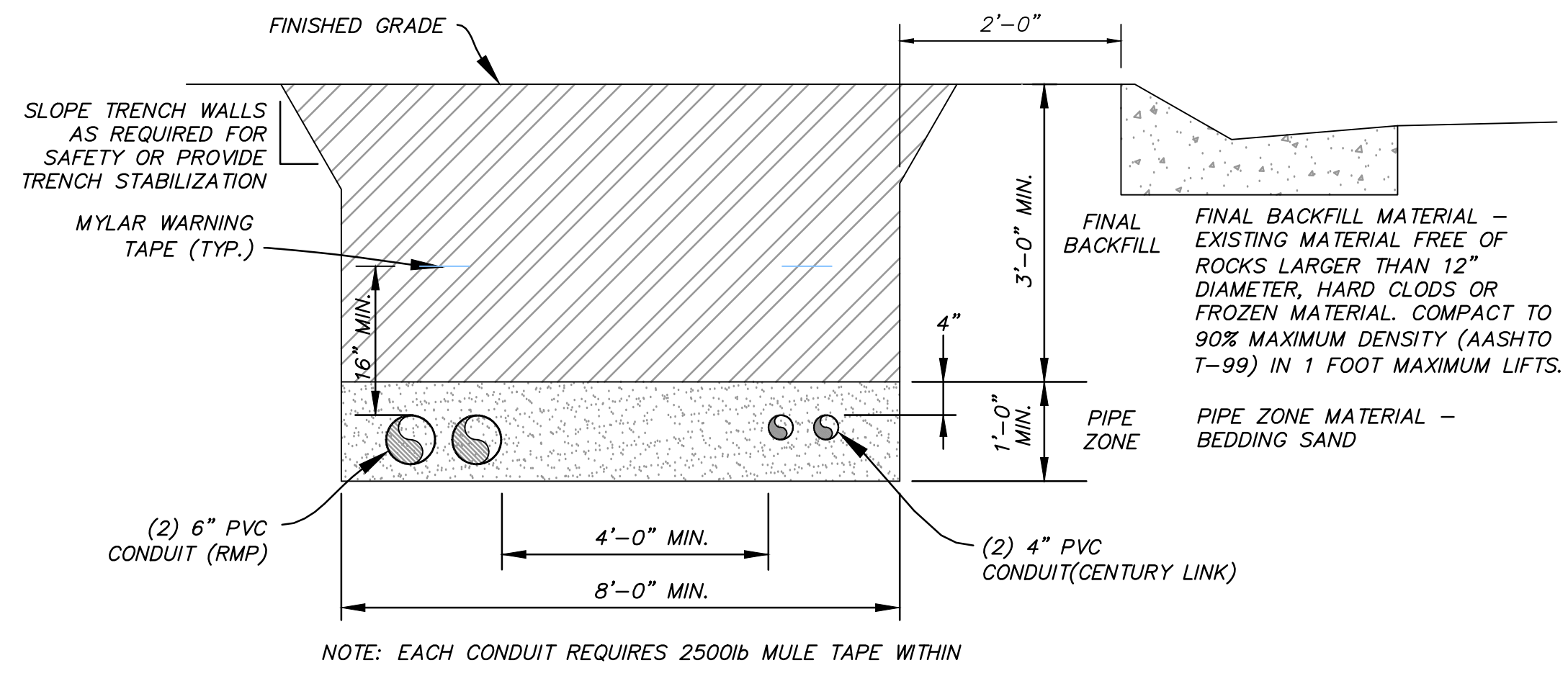
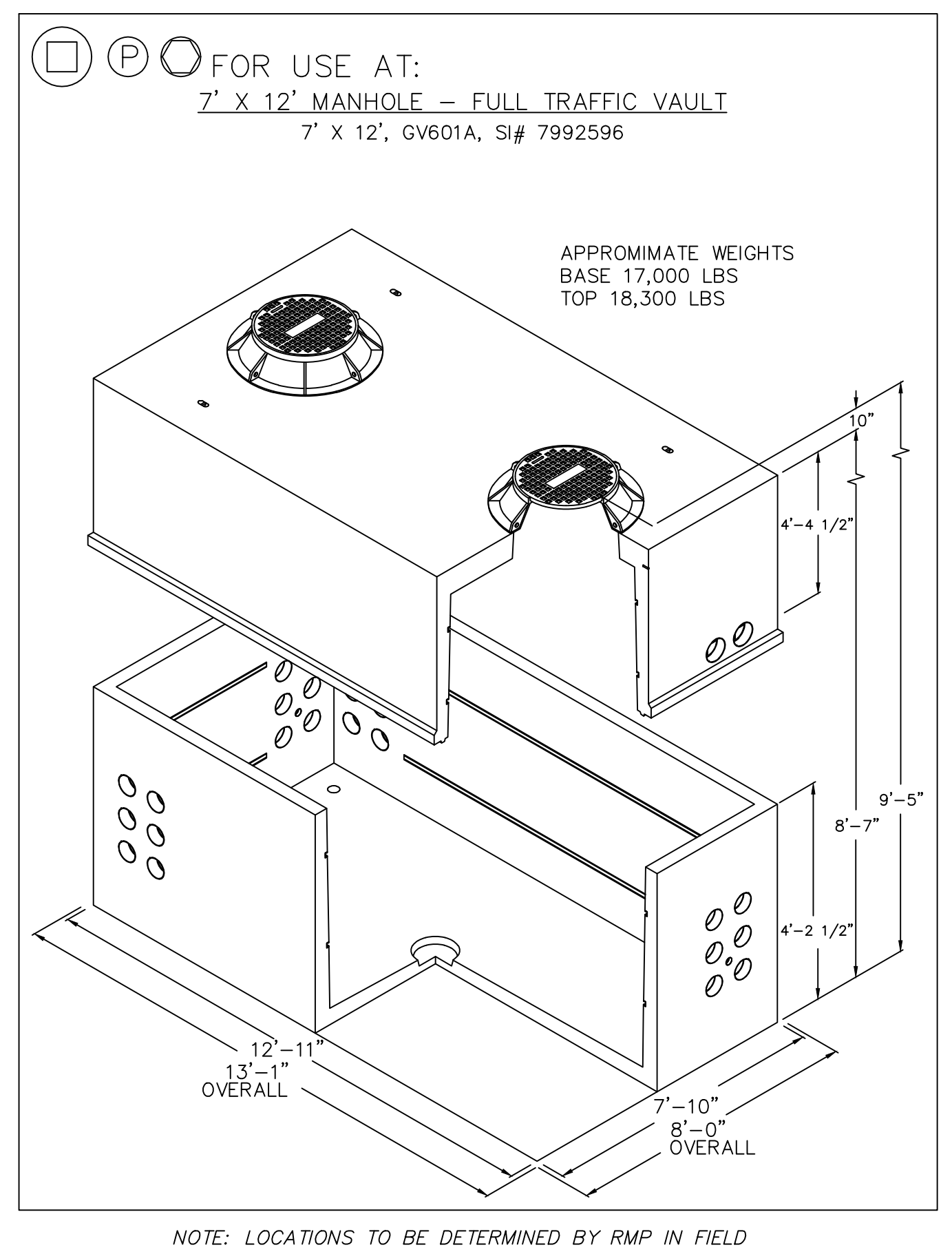
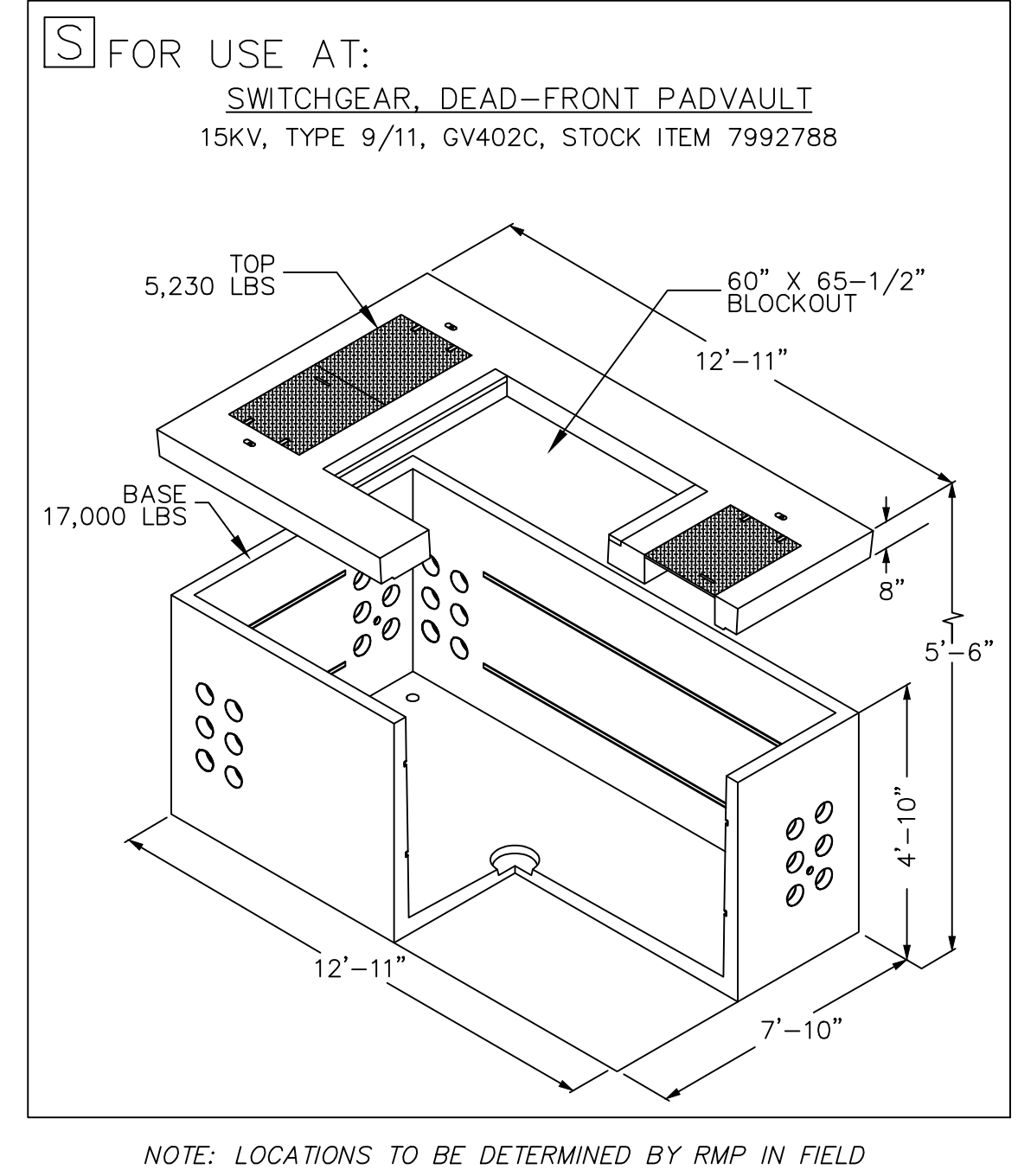
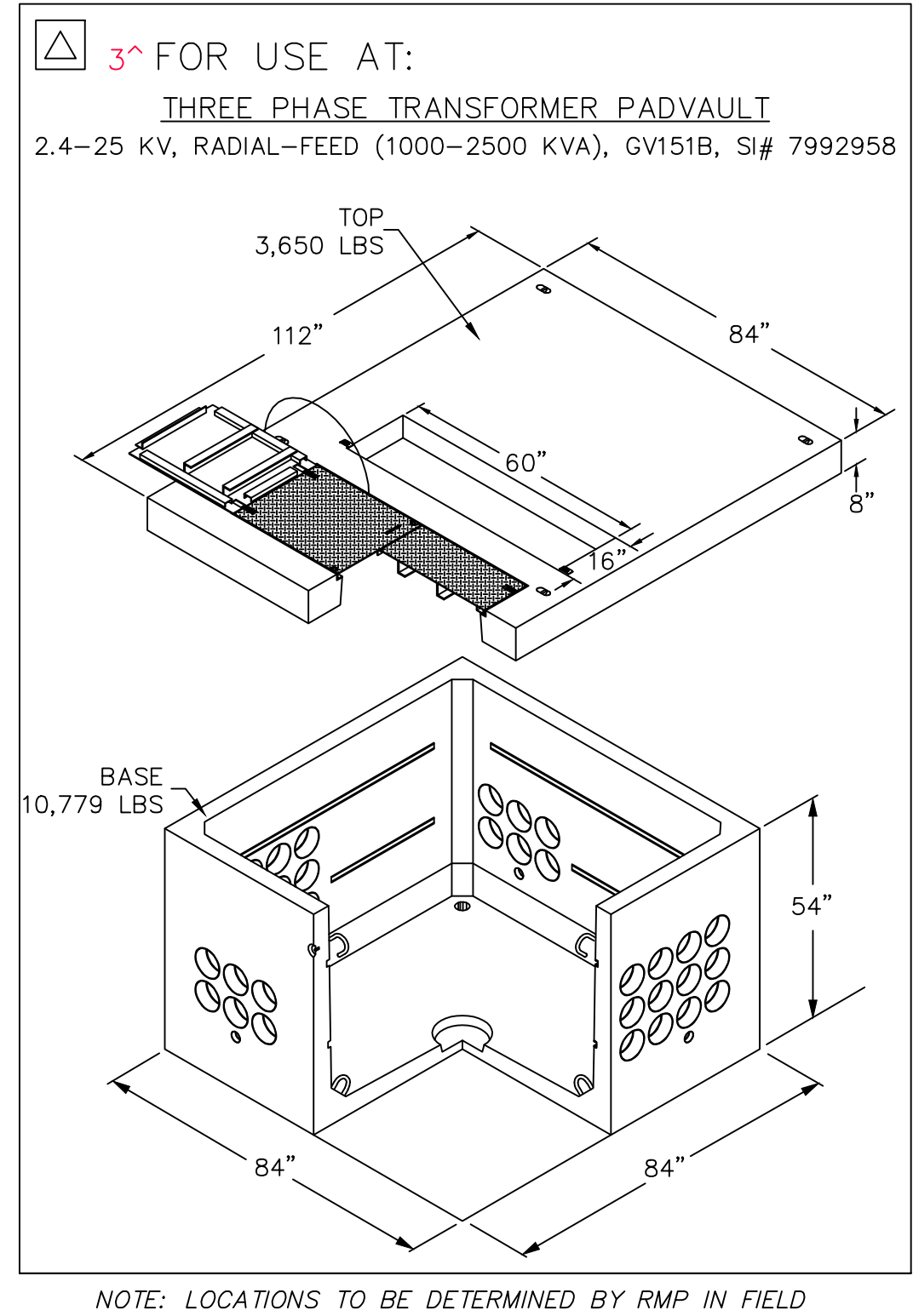


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PHASE 1A CONSTRUCTION  
 SEWER DETAILS  
 DATE SUBMITTED: 11/4/2013  
 PREPARED FOR: SUMMIT, LLC  
 SHEET NUMBER: 5.10  
 SCALE: VERTICAL: 1" = N/A, HORIZONTAL: 1" = N/A  
 JOB NUMBER: SLB079306





**POWER CONDUIT TRENCH**  
 VAR NTS

NO.	BY	DATE	REVISIONS
1	RMC	8/27/2013	ADD COLUMN 1
2	RMC	9/24/2013	UTILITY, GRADING, AND SOCKET REV

**PHASE 1A CONSTRUCTION**  
**ELECTRICAL DETAILS**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

**NV5**  
 BEYOND ENGINEERING  
 5217 SOUTH STATE STREET, SUITE 200  
 801743.000 TEL. 801743.000 FAX  
 MURRAY, UT 84107  
 WWW.NV5.COM

REGISTERED PROFESSIONAL ENGINEER  
 No. 7899506  
 RYAN W. CATHEY  
 STATE OF UTAH

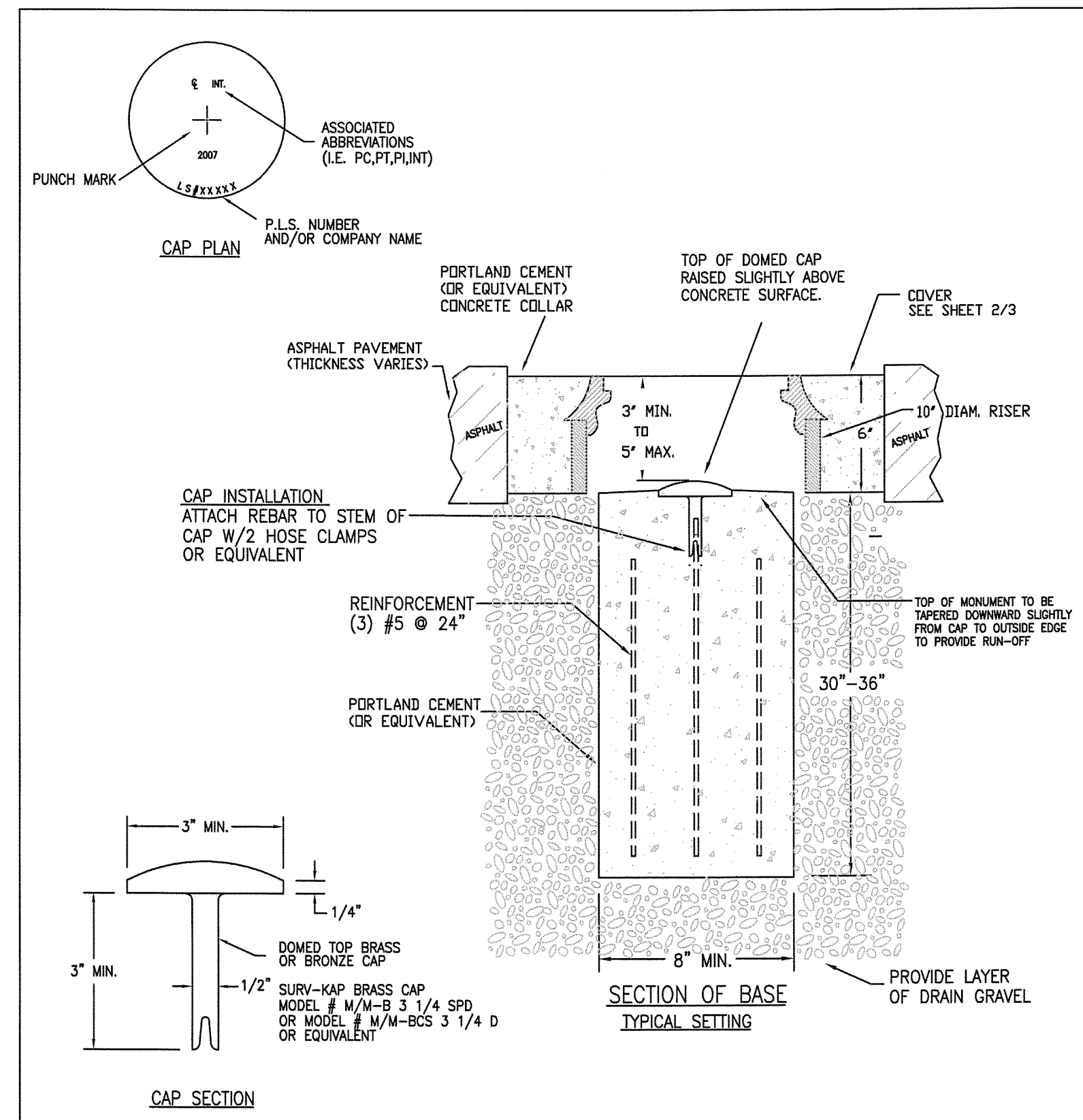
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**5.20**

SCALE  
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JOB NUMBER  
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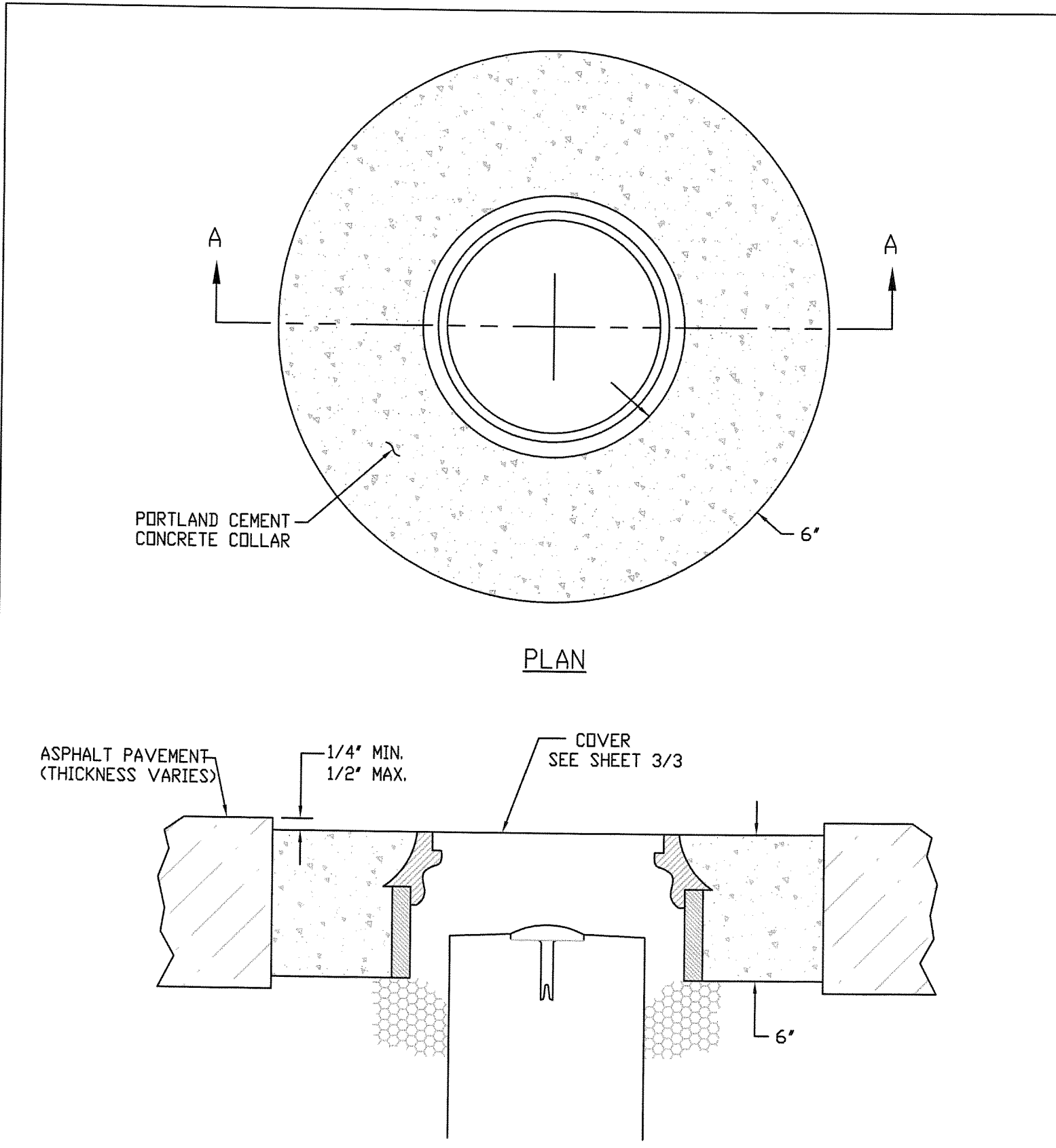
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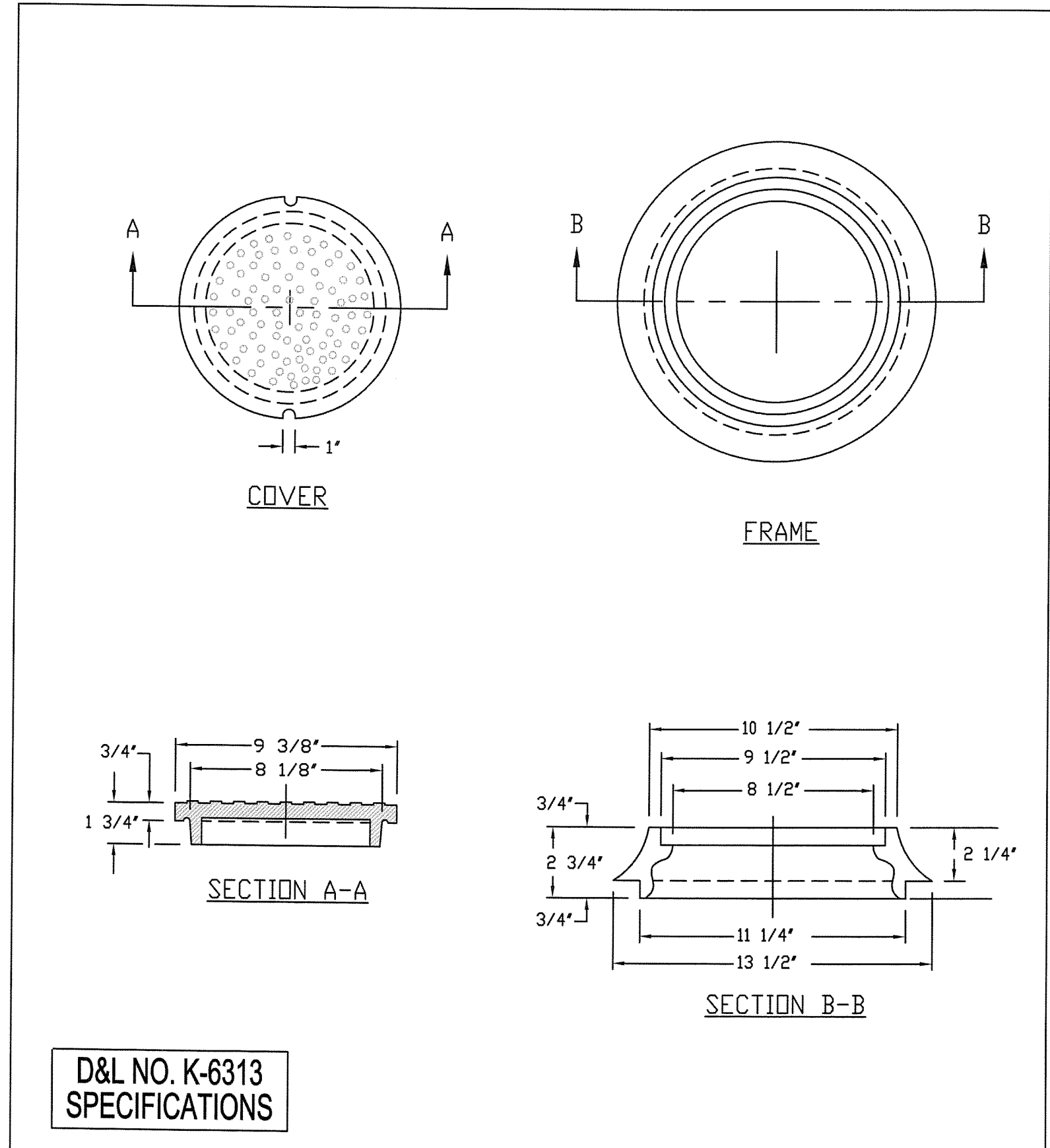


CAP CAN BE PURCHASED FROM SURVEYOR'S OFFICE

<b>WEBER COUNTY SURVEY OFFICE</b>	<b>RING &amp; LID SURVEY MONUMENT</b>	STANDARD PLANS Monument Standard
3/28/10 399-8020		SHEET 1 OF 3



<b>WEBER COUNTY SURVEY OFFICE</b>	<b>Cover Collar For Survey Monuments</b>	STANDARD PLANS Monument Specifications
3/28/10 399-8020		SHEET 2 OF 3



<b>WEBER COUNTY SURVEY OFFICE</b>	<b>RING &amp; LID SURVEY MONUMENT</b>	STANDARD PLANS Monument Specifications
3/28/10 399-8020		SHEET 3 OF 3

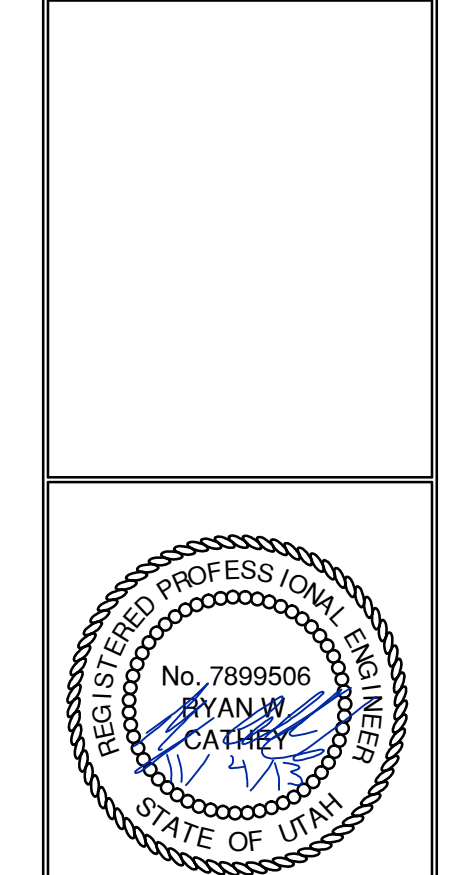
NO.	BY	DATE	REVISIONS
1	RWC	8/27/2013	ADDENDUM 1
2	RWC	8/27/2013	UTILITY, GRADING, AND SOCIETY REV.

**PHASE 1A CONSTRUCTION**  
**MISCELLANEOUS DETAILS**

DATE SUBMITTED: 11/4/2013

PREPARED FOR: SUMMIT, LLC

**NV5**  
 BEYOND ENGINEERING  
 627 SOUTH STATE STREET, SUITE 200  
 801743.000 TEL. 801743.000 FAX  
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SHEET NUMBER	<b>5.30</b>
SCALE	VERTICAL: 1" = N/A HORIZONTAL: 1" = N/A
JOB NUMBER	<b>SLB079306</b>

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 11/19/2013 10:55:32 AM



ELECTRICAL SYMBOLS LEGEND

	SELECTOR SWITCH 2 POSITION		THERMAL OVERLOAD RELAY
	NORMALLY OPEN TIME DELAY CLOSING AFTER COIL ENERGIZED		DETAIL DESIGNATION
	NORMALLY CLOSED TIME DELAY OPENING AFTER COIL ENERGIZED		DETAIL CALL OUT
	INDICATOR LIGHT		SHEET REFERENCE
	REMOTE DEVICE CONNECTION		GROUND ROD
	CLOSED RELAY CONTACT		GROUND ROD IN GROUND WELL
	OPEN RELAY CONTACT		GROUND RISER FROM THE GROUND PLATE (REBAR)
	TERMINAL TO EXTERNAL REMOTE DEVICE		BOLTED AND WELDED GROUND CONNECTIONS, RESPECTIVELY
	WIRE TERMINAL OR CONNECTION POINT		GROUND CABLE: • EMBEDDED IN CONCRETE • BURIED IN EARTH • EXPOSED
	SINGLE PHASE MOTOR		CONDUIT EXPOSED
	MOTOR OVERLOAD RELAY		CONDUIT RUN UNDERGROUND OR IN CONCRETE
	LIMIT SWITCH		BARE COPPER WIRE IN SLAB OR UNDERGROUND GRID, SIZE AS NOTED
	CONTROL RELAY		TRANSFORMER W/ DELTA-Y AND GROUND
	TRANSFORMER		UTILITY METER
	SELECTOR SWITCH 3 POSITION MAINTAINED CONTACT		UTILITY CT
	LEVEL SWITCH CLOSING ON FALLING LEVEL		MOTOR, HORSEPOWER AS NOTED
	LEVEL SWITCH CLOSING ON RISING LEVEL		CIRCUIT BREAKER
	CONTROL SWITCH PUSHBUTTON, MOMENTARY CONTACT		ELECTRICAL PANEL
	GROUND CONNECTION		FUSE
	FRACTIONAL HP MOTOR		MOTOR STARTER NEMA SIZE AS NOTED
	CONTROL STATION		DISCONNECT SWITCH SIZE AS NOTED
	JUNCTION BOX		GFCI DUPLEX RECEPTACLE
	DUPLEX RECEPTACLE		INCANDESCENT FIXTURE
	LIGHT FIXTURE TYPE AS INDICATED		POLE MOUNTED HID FIXTURE
	FUSED DISCONNECT		ELECTRICAL CONNECTION
	SINGLE LIGHT SWITCH		
	DISCONNECT UNFUSED SIZE NOTED		
	CONTACTOR/STARTER (NO. OF POLES SHOWN)		
	CIRCUIT BREAKER (NO. OF POLES SHOWN)		
	SOLENOID		
	FLOW SWITCH CLOSING ON LOW FLOW		
	PRESSURE SWITCH CLOSING ON RISING PRESSURE		

EQUIPMENT GROUNDING CONDUCTORS

FUSE OR CB SIZE	CB SIZE (COPPER)
15	14
20	12
30	10
40	10
60	10
100	8
200	6
300	4
400	3
500	2
600	1
800	1/0
1000	2/0
1200	3/0
1600	4/0
2000	250
2500	350

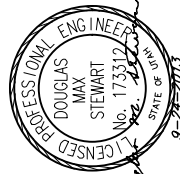
GROUNDING ELECTRODE CONDUCTOR SERVICE ENTRANCE OR SEPARATELY DERIVED SYSTEM

COPPER CONDUCTOR	WIRE SIZE
#2 OR SMALLER	#8
1 OR 1/0	#6
2/0 OR 3/0	#4
>3/0 THRU 350 KCMIL	#2
>350 KCMIL THRU 600 KCMIL	1/0

GENERAL NOTES:

1. VERIFY ALL EQUIPMENT DIMENSIONS AND LOCATIONS BEFORE BEGINNING ROUGH-IN. CONSULT ALL APPLICABLE CONTRACT DRAWINGS AND SHOP DRAWINGS TO ENSURE NEC CODE CLEARANCE REQUIRED AROUND ALL ELECTRICAL EQUIPMENT.
2. CONTRACTOR SHALL VERIFY ALL ELECTRICAL LOADS (VOLTAGE, PHASE, CONNECTION REQUIREMENTS, ETC.) OF EQUIPMENT FURNISHED BEFORE BEGINNING ROUGH-IN.
3. SEE APPLICABLE SHOP DRAWINGS FOR ROUGH-IN LOCATION OF ALL EQUIPMENT, WIRING DEVICES, ETC.
4. THE ELECTRICAL CONTRACTOR SHALL NOTIFY AND COOPERATE WITH THE MECHANICAL CONTRACTOR SUCH THAT NO PIPING, OR EQUIPMENT FOREIGN TO THE OPERATION OF THE ELECTRICAL EQUIPMENT SHALL BE PERMITTED TO BE INSTALLED IN, ENTER OR PASS THROUGH ELECTRICAL ROOMS OR SPACES; OR ABOVE OR BELOW ELECTRICAL EQUIPMENT IN THE OTHER AREAS.
5. ALL PENETRATIONS OF FLOORS, WALLS AND CEILINGS SHALL BE SEALED WITH APPROVED MATERIAL.
6. FOR PACKAGE EQUIPMENT PROVIDED ON THE PROJECT, SOME CONDUITS AND WIRES ARE SHOWN ON THE DRAWINGS, BUT IT IS EXPECTED THAT SOME ADDITIONAL CONDUITS AND WIRES MAY BE REQUIRED BY EQUIPMENT MANUFACTURERS TO COMPLETE INSTALLATION. IT IS INCUMBENT UPON THE GENERAL CONTRACTOR TO COORDINATE THIS REQUIREMENT WITH HIS SUBCONTRACTORS TO MAKE SURE THAT EQUIPMENT SUPPLIER PROVIDED ALL NECESSARY ELECTRICAL INFORMATION TO ELECTRICAL SUBCONTRACTOR FOR INCLUSION WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS.
7. IF OTHER THAN FIRST NAMED EQUIPMENT IS USED, IT SHALL BE CAREFULLY CHECKED FOR ELECTRICAL REQUIREMENTS AND CONTROL REQUIREMENTS OF ALTERNATE EQUIPMENT. SHOULD CHANGES OR ADDITIONS OCCUR IN ELECTRICAL WORK, OR THE WORK OF OTHER CONTRACTORS BE REVISED BY THE ALTERNATE EQUIPMENT, THE COST OF ALL CHANGES SHALL BE BORNE BY THE CONTRACTOR.
8. IT IS THE ELECTRICAL SUBCONTRACTOR'S RESPONSIBILITY TO DELIVER THE COMPLETE SET OF PLANS IN ORDER TO INSURE THAT ALL ITEMS RELATED TO ELECTRICAL POWER AND CONTROL SYSTEMS ARE COMPLETELY ACCOUNTED FOR.
9. ALL EQUIPMENT DIMENSIONS SHOWN ON PLANS AND ELEVATIONS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL USE THE SHOP DRAWINGS FOR PROPER LAYOUT, FOUNDATION AND PAD, ETC. FOR FINAL INSTALLATION WITHOUT ANY ADDITIONAL COST TO THE OWNER.
10. THE DRAWINGS DIAGRAMMATICALLY INDICATE THE DESIRED LOCATION AND ARRANGEMENT OF OUTLETS, CONDUIT RUNS, EQUIPMENT AND OTHERS ITEMS. DETERMINE EXACT LOCATIONS IN THE FIELD BASED ON PHYSICAL SIZE AND ARRANGEMENT OF EQUIPMENT, FINISHED ELEVATIONS, AND OTHERS OBSTRUCTIONS. LOCATIONS SHOWN ON THE DRAWINGS, HOWEVER, SHALL BE ADHERED TO AS CLOSELY AS POSSIBLE.

Bowen Collins & Associates, Inc. CONSULTING ENGINEERS



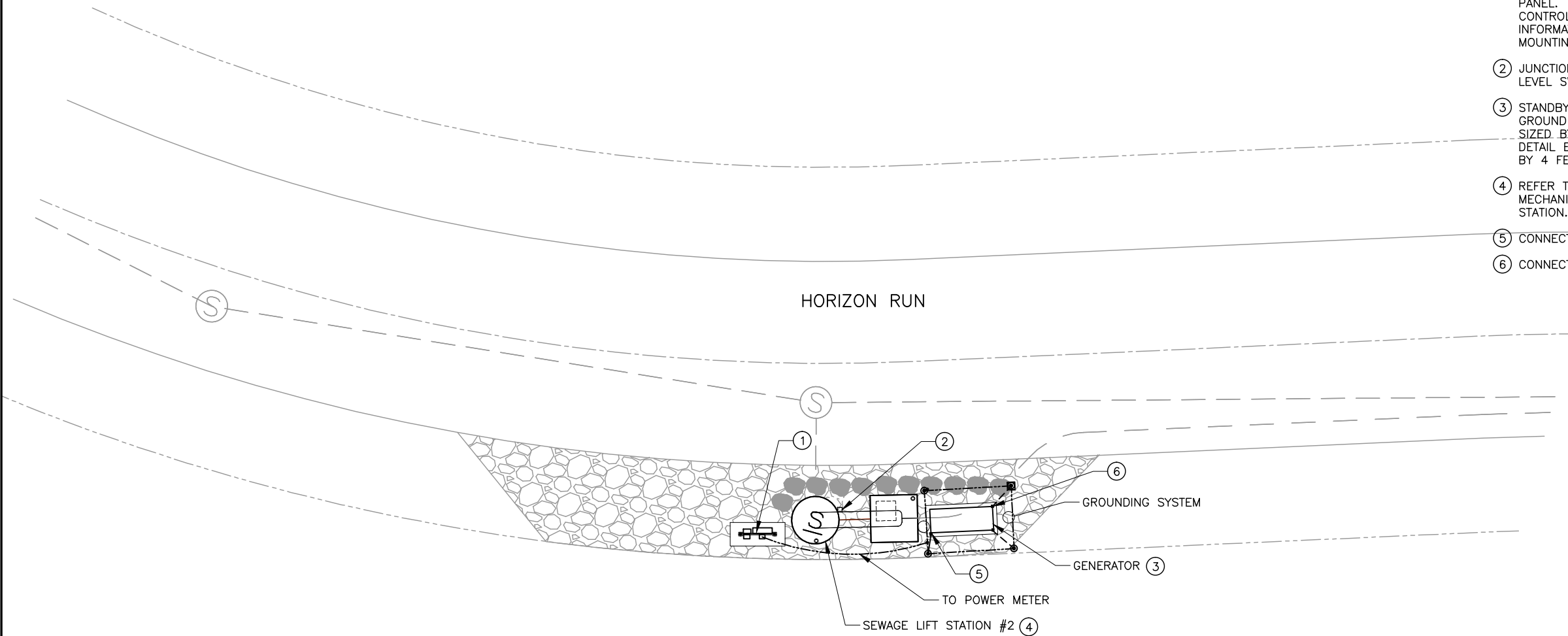
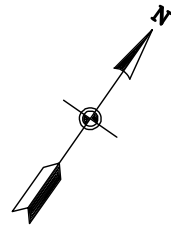
NO.	DATE	REV. BY	DESCRIPTION

VERIFY SCALE  
BAR IS ONE INCH ON ORIGINAL DRAWING

DESIGN	D. STEWART
REVIEW	D. LAMPH
CHECKED	D. STEWART
APPROVED	J. BECKMAN

ELECTRICAL  
SUMMIT AT POWDER MOUNTAIN  
POWDER MOUNTAIN, UT  
PHASE 1A  
PROJECT NUMBER 334-13-01  
DATE: September 2013

DRAWING NO.  
E-1  
SHEET 1 OF 5



**ELECTRICAL SITE PLAN SEWAGE LIFT STATION #2**  
 SCALE: 1/8" = 1'-0"

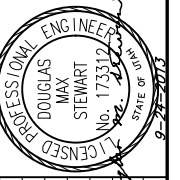
**GENERAL NOTES:**

1. THE GROUNDING SYSTEM SHALL HAVE A GROUND RING OF 2/0 AWG BARE COPPER BURIED NOT LESS THAN 30" BELOW THE EARTH'S SURFACE. CONNECT REBAR TO THE GROUND RING VIA 2/0 AWG BARE COPPER GROUND CABLE (GROUND RISERS). EQUIPMENT AND MISCELLANEOUS METALWORK SHALL BE CONNECTED TO THE GROUND RING WITH 2/0 AWG BARE COPPER GROUND CABLE. 2/0 AWG CONDUCTOR FROM GROUND RING SHALL CONNECT TO GENERATOR, METER BASE, AND AUTOMATIC TRANSFER SWITCH. THE GROUND RING SHALL BE A MINIMUM OF 2 FEET FROM GENERATOR FOUNDATION WHERE POSSIBLE. REFER TO DETAILS E-5001, E-5002, E-5003.
2. DRAWING SHOWS TYPICAL LOCATIONS OF GROUNDING SYSTEM COMPONENTS.
3. DRAWING SHOWS APPROXIMATE LOCATIONS AND MINIMUM NUMBER OF RISERS AND GROUNDING CONNECTIONS TO BE INSTALLED.
4. REFER TO POWER ONE-LINE DIAGRAM FOR GENERATOR SIZE AND CONDUIT AND CONDUCTOR SIZES.
5. REFER TO POWER ONE-LINE DIAGRAM FOR PUMP SIZES AND QUANTITY. FOR CONDUIT AND CONDUCTOR SIZES REFER TO POWER ONE-LINE DIAGRAM AND CONTROL BLOCK DIAGRAM.

**KEY NOTES:**

- ① SEWAGE LIFT STATION CONTROL PANEL, AUTOMATIC TRANSFER SWITCH, POWER METER, AND POWER PANEL. REFER TO POWER ONE-LINE DIAGRAM AND CONTROL BLOCK DIAGRAM FOR SIZES AND MORE INFORMATION. REFER TO DETAIL E-5073 FOR MOUNTING INFORMATION.
- ② JUNCTION BOX TO CONNECT PUMP CABLES AND LEVEL SWITCHES REFER TO DETAIL E-5201
- ③ STANDBY GENERATOR WITH CONCRETE PAD AND GROUND SYSTEM. THE GENERATOR PAD SHALL BE SIZED BY CONTRACTOR FOR GENERATOR REFER TO DETAIL E-5081, APPROXIMATE SIZE IS 9 FEET LONG BY 4 FEET WIDE.
- ④ REFER TO CIVIL DRAWINGS FOR LOCATION AND MECHANICAL DRAWINGS FOR SECTION VIEW OF LIFT STATION.
- ⑤ CONNECT TO REBAR.
- ⑥ CONNECT TO GENERATOR.

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NO.	DATE	REV. BY	DESCRIPTION

**VERIFY SCALE**  
 BAR IS ONE INCH ON ORIGINAL DRAWING

SUMMIT AT POWDER MOUNTAIN  
**PHASE 1A**  
 POWDER MOUNTAIN, UT

DESIGN: D. STEWART  
 DRAWN: D. LAMPH

REVIEW: D. STEWART  
 APPROVED: J. BECKMAN

**ELECTRICAL**  
**ELECTRICAL SITE PLAN**  
**SEWAGE LIFT STATION**  
**NUMBER 2**

DATE: September 2013  
 PROJECT NUMBER: 334-13-01

DRAWING NO.  
**E-2**

SHEET **2** OF **5**

NO.	DATE	REV. BY	DESCRIPTION
1	10/2013	PMS	ADDENDUM NO. 1

**VERIFY SCALE**  
BAR IS ONE INCH ON ORIGINAL DRAWING

REVIEW  
CHECKED D. STEWART  
APPROVED D. STEWART

DESIGN  
DESIGN T. BIRD  
DRAWN D. LAMPH

ELECTRICAL  
**SEWER LIFT STATION #2**  
**POWER**  
**ONE-LINE DIAGRAM**  
PROJECT NUMBER 334-13-01  
DATE: September 2013

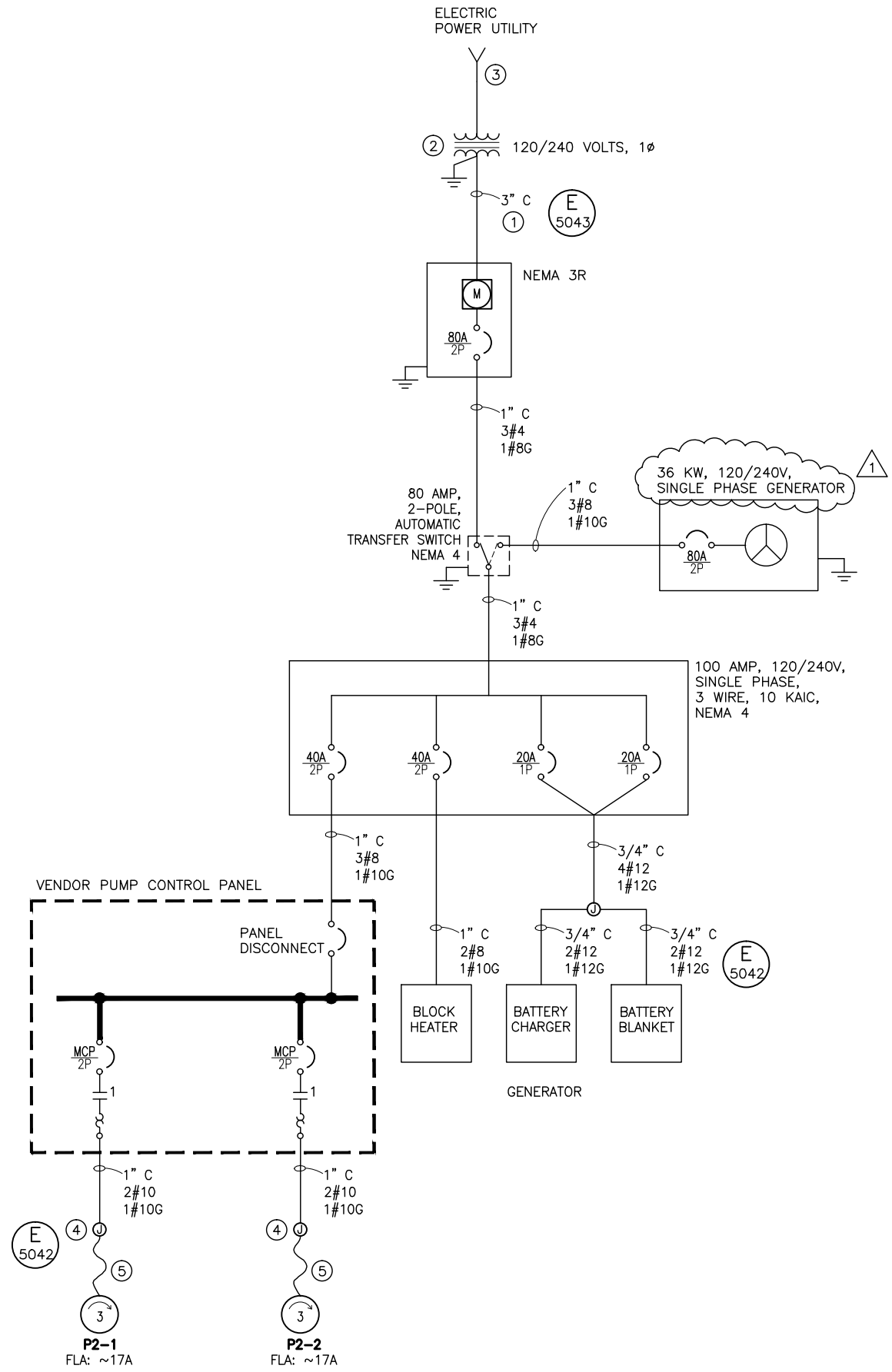
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**E-3**  
SHEET 3 OF 5

**GENERAL NOTES:**

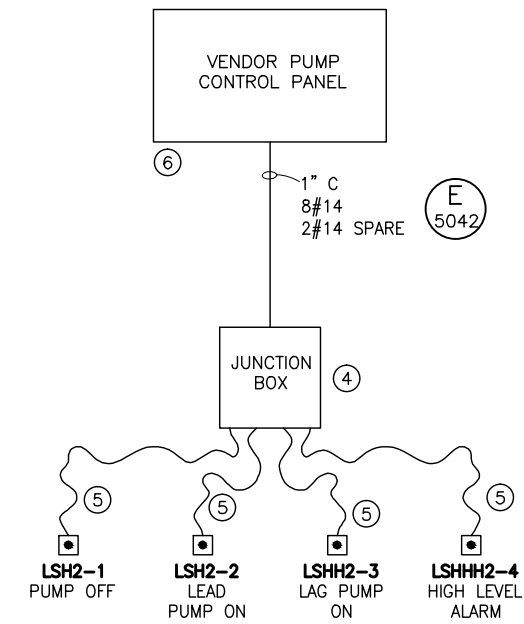
- REFER TO SITE PLAN FOR EQUIPMENT LOCATION.

**KEY NOTES:**

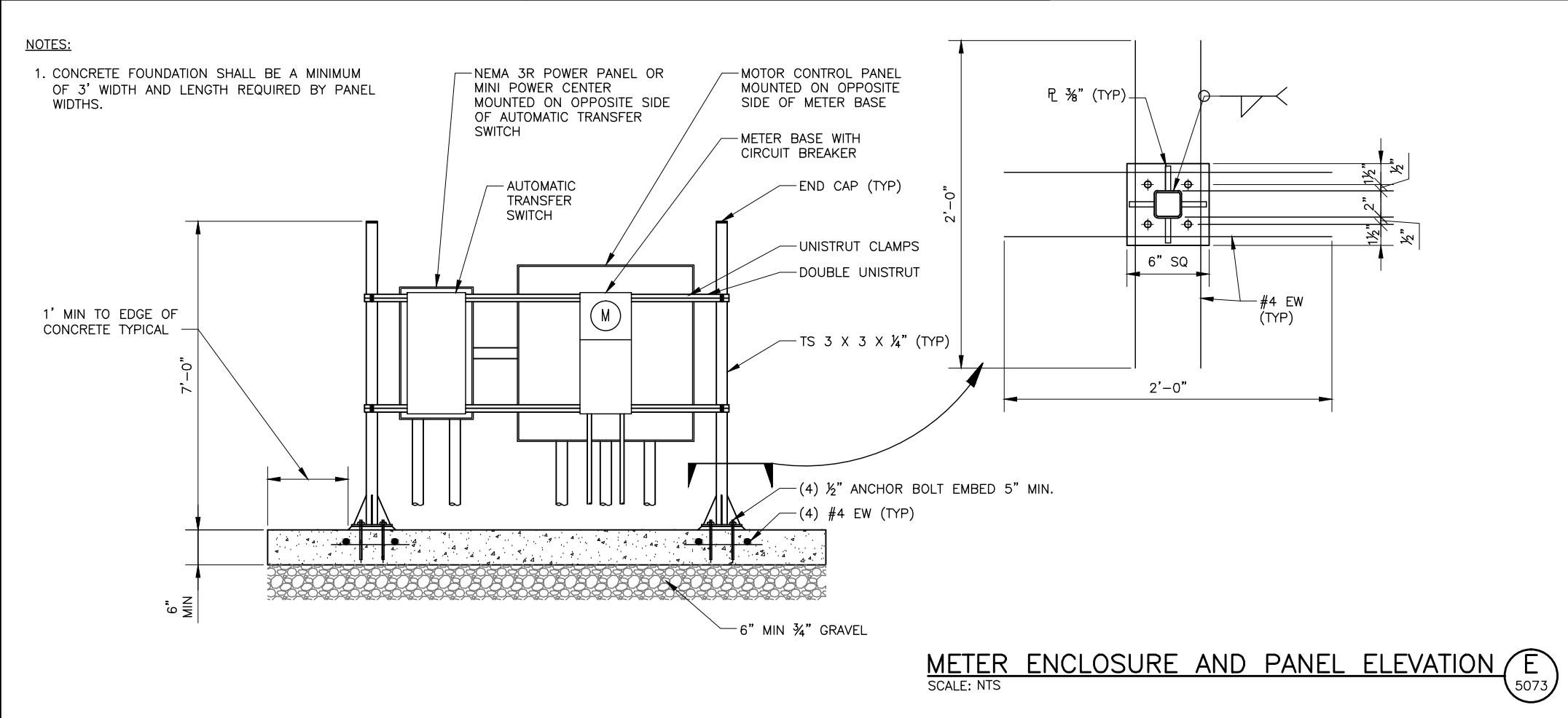
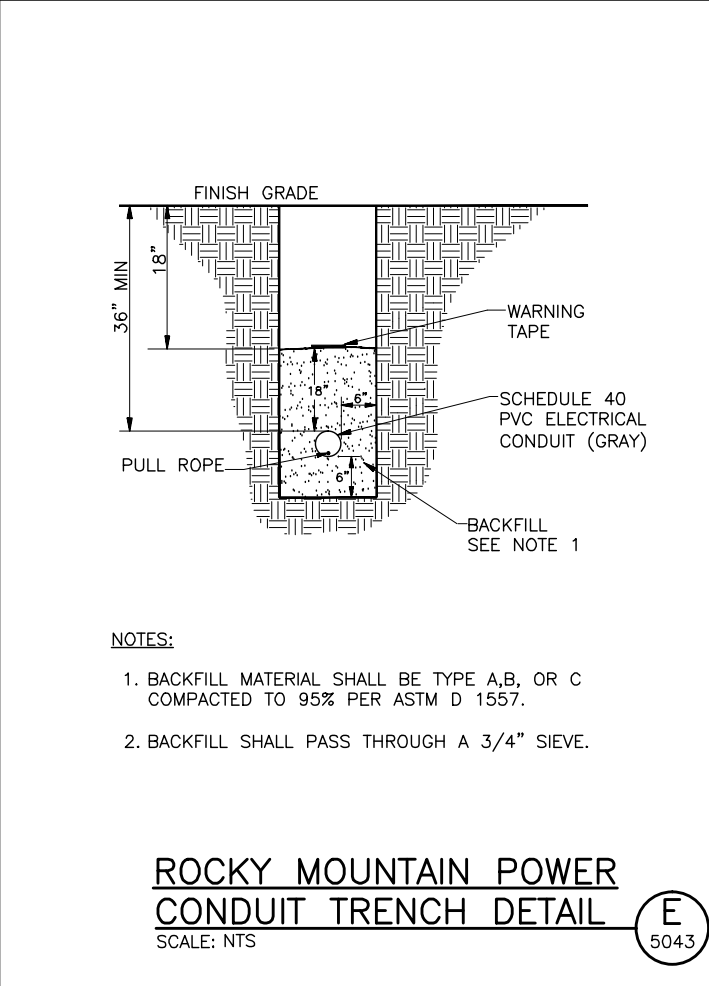
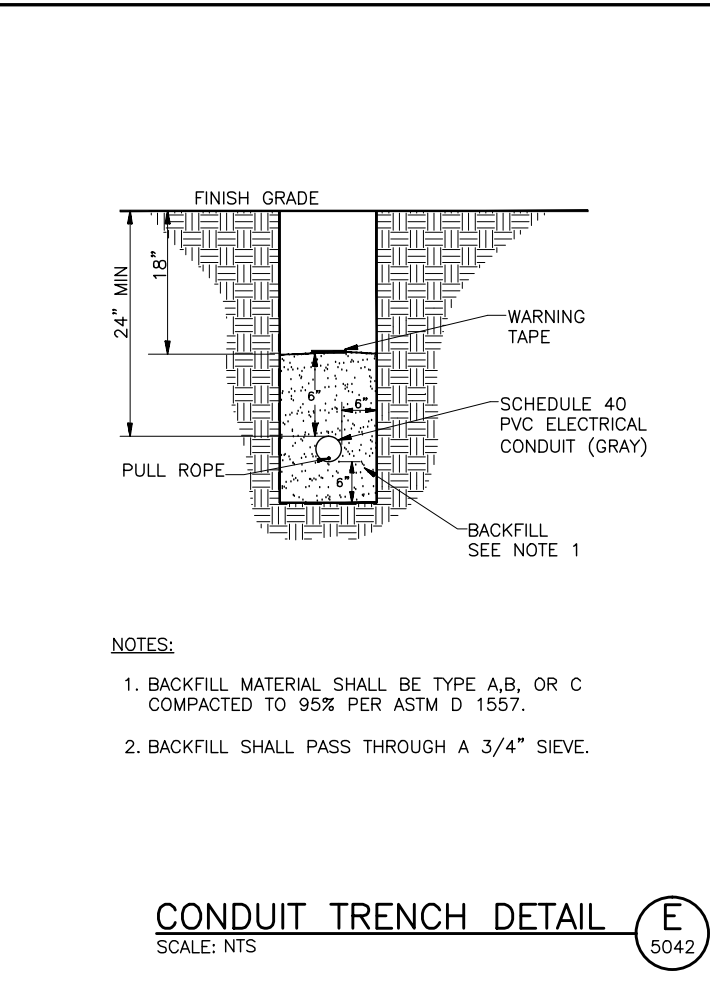
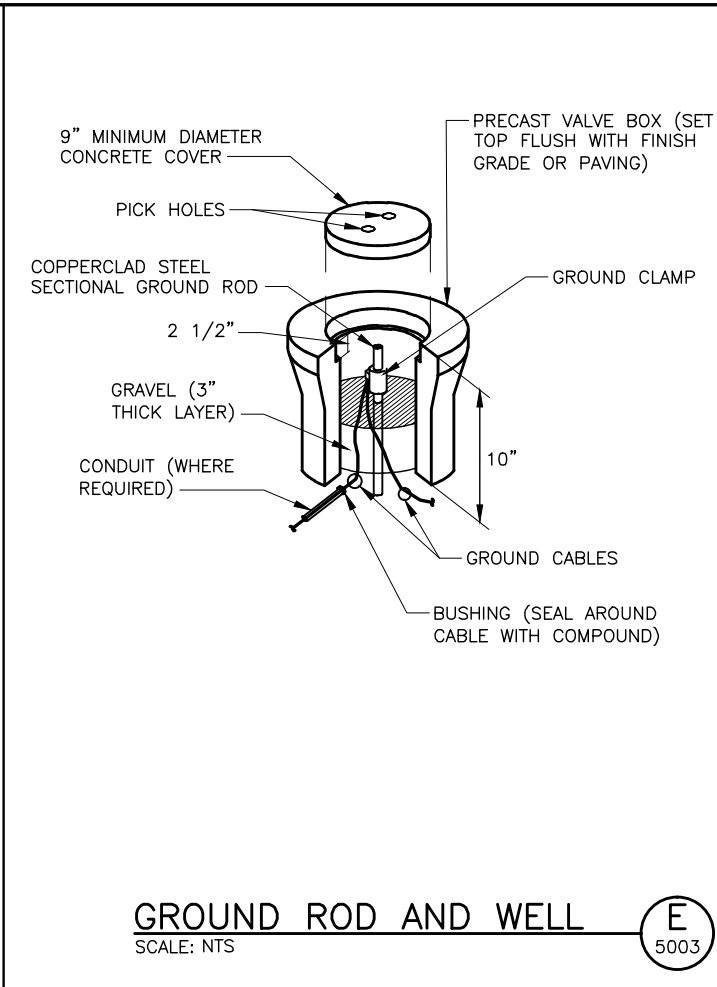
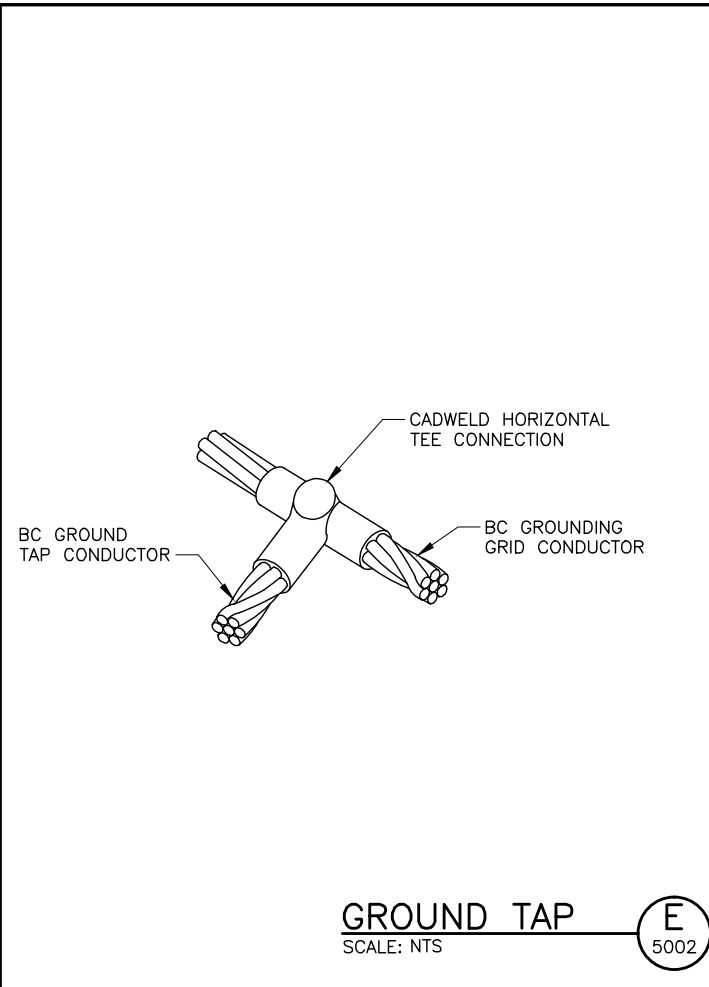
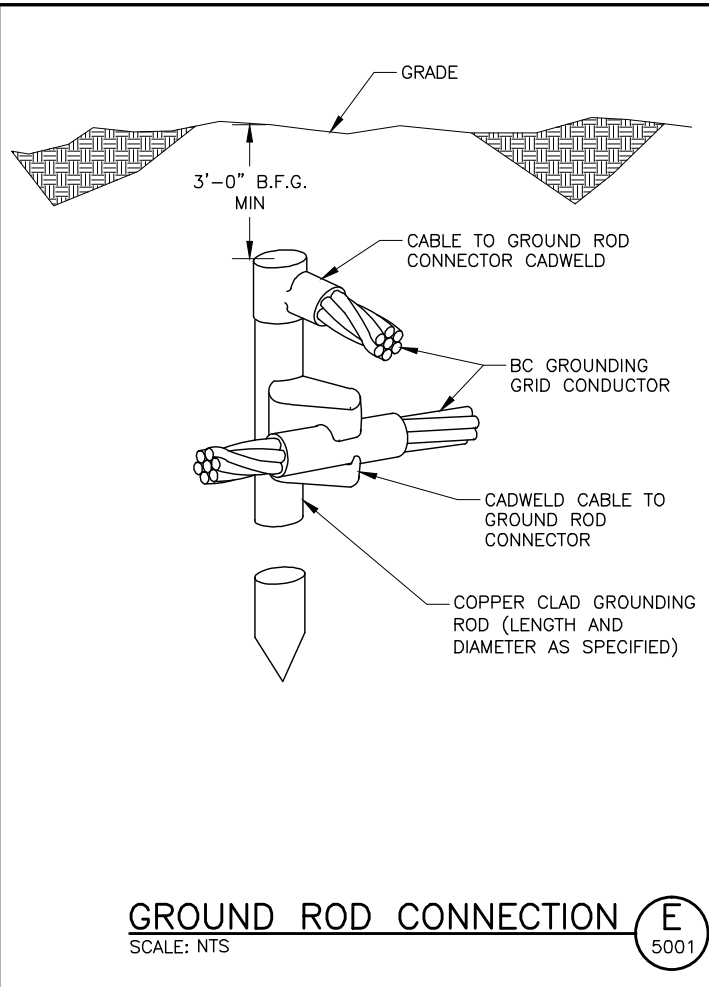
- CONTRACTOR SHALL PROVIDE AND INSTALL CONDUIT IN ACCORDANCE WITH ROCKY MOUNTAIN POWER REQUIREMENTS. CONDUCTORS SHALL BE INSTALLED BY ROCKY MOUNTAIN POWER.
- PROVIDED AND INSTALLED BY ROCKY MOUNTAIN POWER.
- PROVIDED AND INSTALLED BY DEVELOPER.
- HAZARDOUS LOCATION JUNCTION BOX AND CONDUIT SEAL REFER TO DETAIL E-5201.
- MANUFACTURER'S CABLE.
- PROVIDE AND INSTALL AN INTRINSICALLY SAFE BARRIER FOR EACH LEVEL SWITCH. THE LEVEL SWITCHES SHALL BE MADE FOR LOW ENERGY CIRCUITS TO BE USED IN A HAZARDOUS LOCATION, ANCHOR SCIENTIFIC TYPE GSI - GOLD OR EQUAL.



**POWER ONE-LINE DIAGRAM #2**



**CONTROL BLOCK DIAGRAM #2**



**Bowen Collins & Associates, Inc.**  
CONSULTING ENGINEERS

**PROFESSIONAL ENGINEER**  
DOUGLAS MARK STEWART  
No. 173512  
STATE OF VT. LICENSED

NO.	DATE	REV. BY	DESCRIPTION

**VERIFY SCALE**  
BAR IS ONE INCH ON ORIGINAL DRAWING

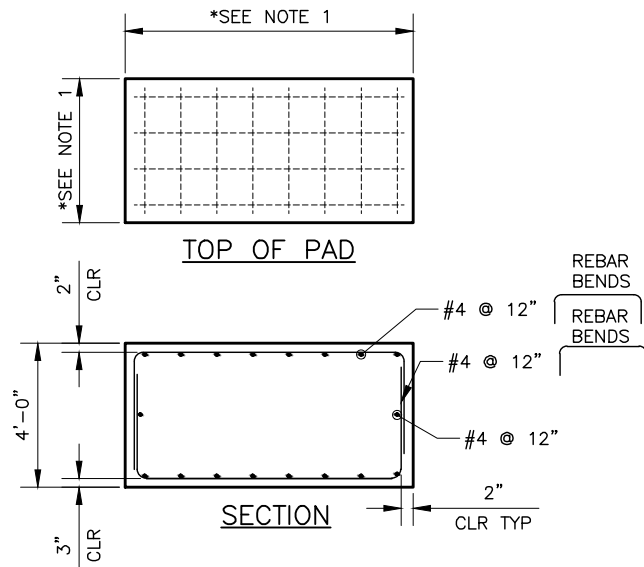
DESIGN: D. STEWART  
DRAWN: D. LAMPH  
CHECKED: D. STEWART  
APPROVED: J. BECKMAN

**ELECTRICAL**  
**PHASE 1A**  
SUMMIT AT POWDER MOUNTAIN  
POWDER MOUNTAIN, UT

**ELECTRICAL DETAILS - 1**

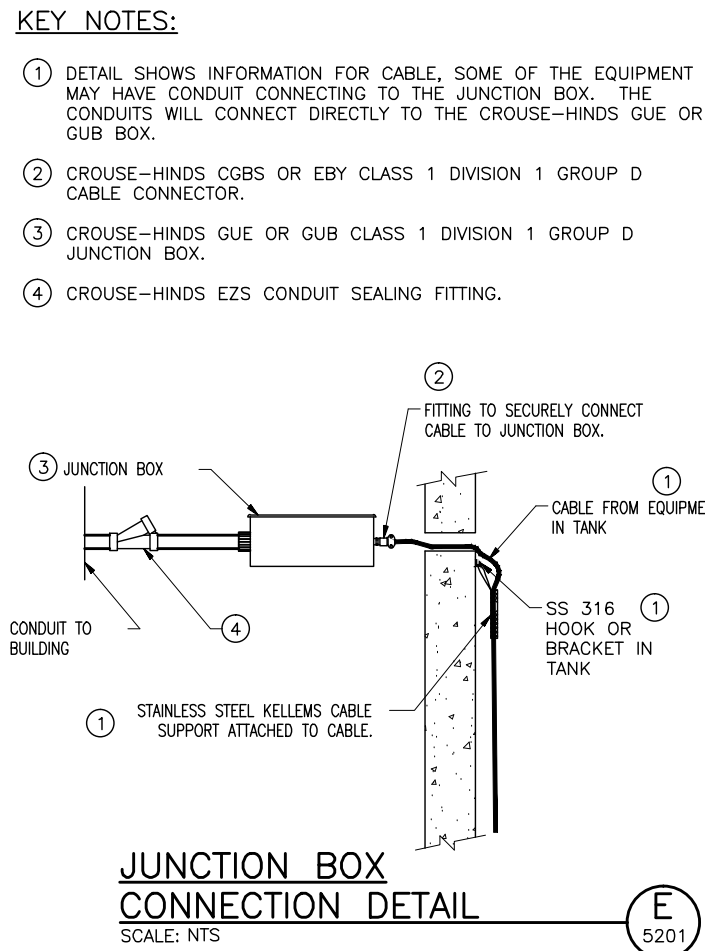
DATE: September 2013  
PROJECT NUMBER: 334-13-01

DRAWING NO. **GE-1**  
SHEET **4** OF **5**

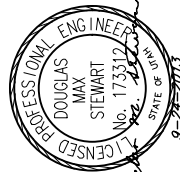


NOTES:  
 1. THE LENGTH AND WIDTH OF THE GENERATOR PAD WILL BE SIZED AS NEEDED TO ACCOMMODATE THE GENERATOR WITH AN ADDITIONAL EIGHT INCHES OF SPACE ON ALL SIDES. ANCHOR GENERATOR TO CONCRETE PAD WITH FOUR 5/8" EPOXY ANCHORS, MINIMUM 4" EMBEDDED INTO CONCRETE.

**CONCRETE GENERATOR PAD** (E)  
 SCALE: NTS 5081



**Bowen Collins & Associates, Inc.**  
 CONSULTING ENGINEERS



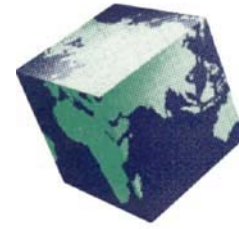
NO.	DATE	REV. BY	DESCRIPTION

**VERIFY SCALE**  
 BAR IS ONE INCH ON ORIGINAL DRAWING

DESIGN	D. STEWART
DRAWN	D. LAMPH
REVIEW	
CHECKED	D. STEWART
APPROVED	J. BECKMAN

**ELECTRICAL**  
**ELECTRICAL DETAILS - 2**  
 DATE: September 2013  
 PROJECT NUMBER: 334-13-01

DRAWING NO.  
**GE-2**  
 SHEET 5 OF 5



**IGES®**

**DESIGN PACKAGE  
ROCKERY DESIGN - HORIZON RUN  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH**

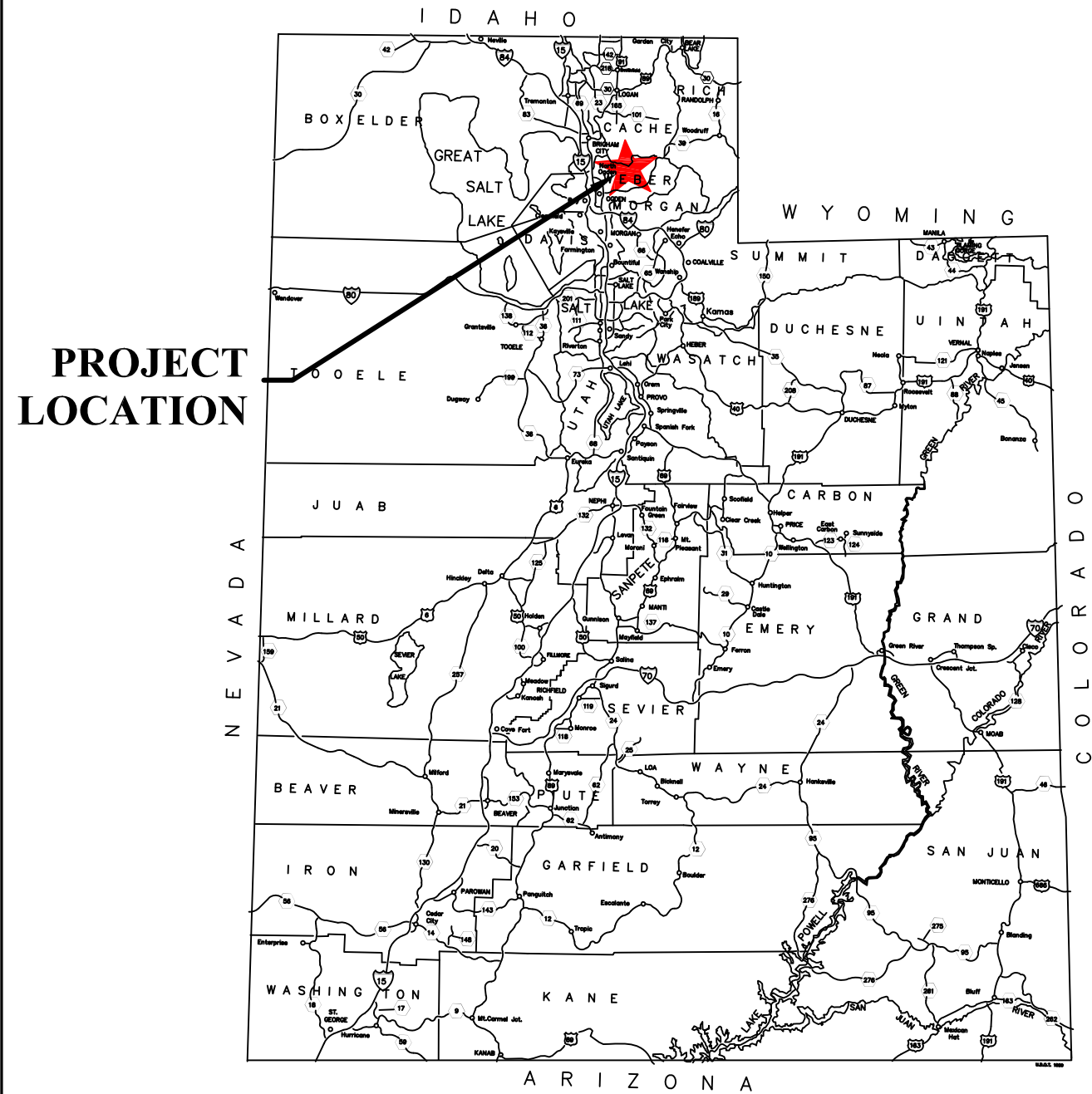
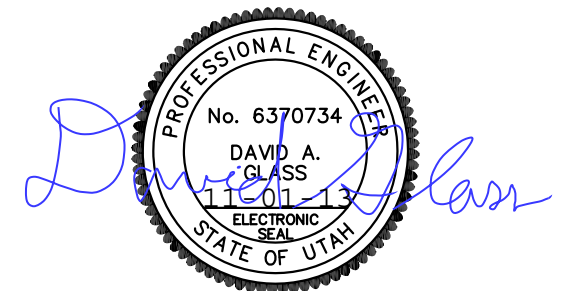
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  - SHEET 1.2 - PLAN VIEW
  - SHEET 1.3 - DESIGN CRITERIA
  - SHEET 1.4a - SECTION VIEW
  - SHEET 1.4b - SECTION VIEW
  - SHEET 1.5 - ARC ROCKERY CONSTRUCTION DETAILS
  
2. DESIGN CALCULATION PACKAGE
  - 2.1 - FHWA ROCKERY DESIGN CALCULATIONS
  - 2.2 - SLIDE CALCULATION OUTPUT

PREPARED BY:  
JUSTIN W. WHITMER, P.E.I.

*Justin Whitmer*

REVIEWED BY:  
DAVID A. GLASS, P.E.



**PROJECT  
LOCATION**

PROJECT LOCATION MAP

PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK

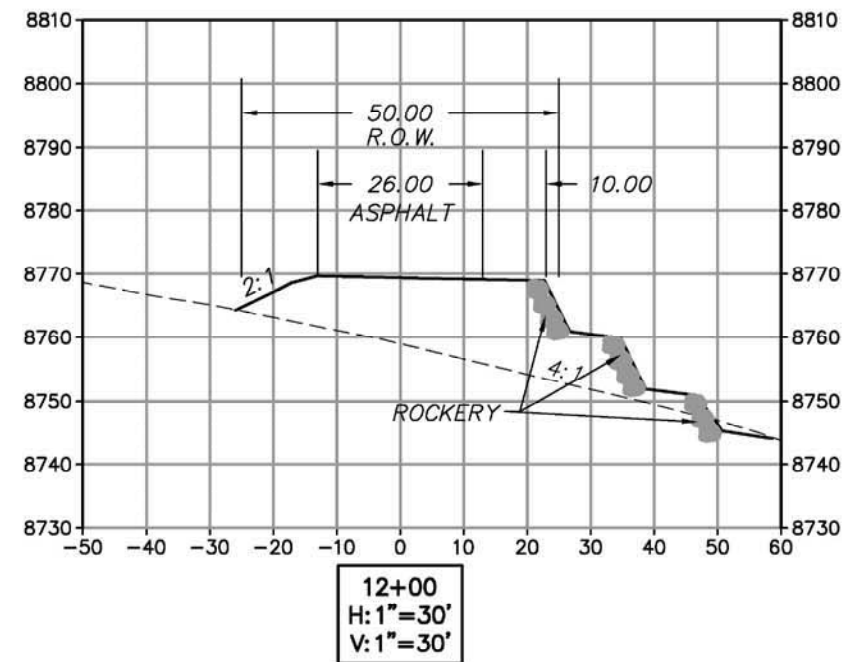
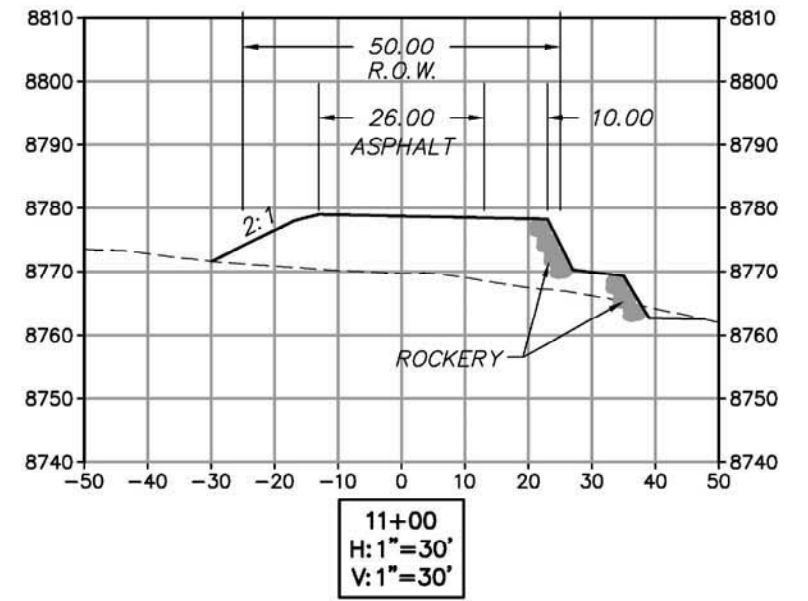
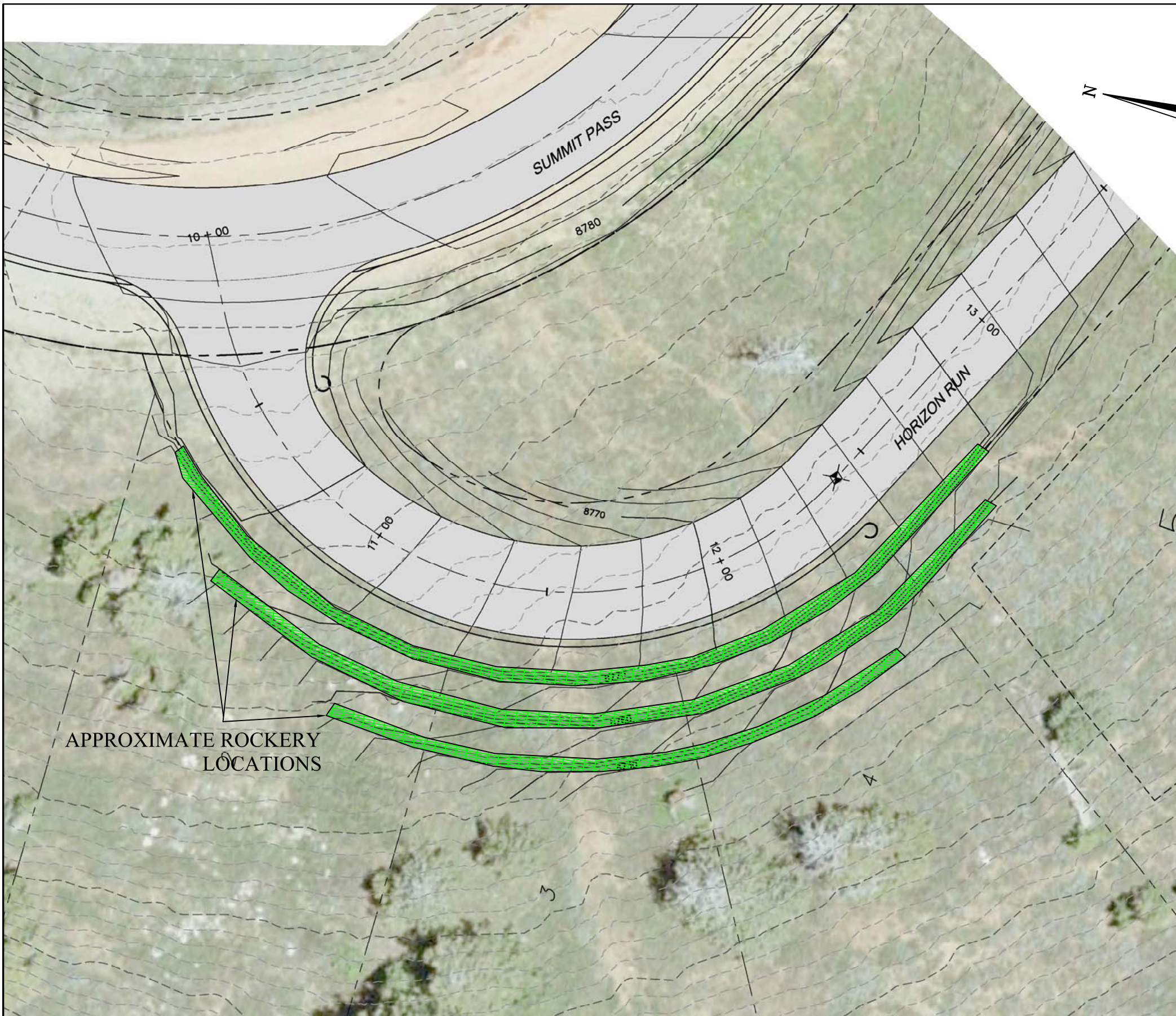


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ROCKERY DESIGN - HORIZON RUN  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH  
COVER SHEET

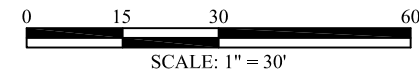
DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: KAH OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	NTS
IGES PROJECT NO. 01855-001	SHEET NO. 1.1
	REV. N/A





BASE MAP: UNDATED SITE PLAN PROVIDED BY NV5

**POWDER MOUNTAIN HORIZON RUN SITE LAYOUT**



PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



**IGES**

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ROCKERY DESIGN - HORIZON RUN  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH  
PLAN VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	1"=30'
IGES PROJECT NO. 01855-001	SHEET NO. 1.2
	REV. N/A

ROCKERY STABILITY ANALYSES	
ANALYSIS	DESIGN REFERENCES/SOFTWARE
EXTERNAL STABILITY	FHWA 2006 CFL/TD-06-006 DESIGN METHODOLOGY
INTERNAL STABILITY	FHWA 2006 CFL/TD-06-006 DESIGN METHODOLOGY
GLOBAL STABILITY	SLIDE: ROCSCIENCE INC., 1998-2010, VERSION 5.044, BUILD DATE FEBRUARY 2, 2010.

SOIL CONDITIONS			
SOIL AREA	FRICTION ANGLE	COHESION	UNIT WEIGHT
NATIVE CLAYEY GRAVEL SOILS	36°	100 PSF*	125 PCF
ENGINEERED FILL	34°	50 PSF*	125 PCF

\* COHESION USED ONLY IN GLOBAL STABILITY ANALYSIS

ROCKERY GEOMETRY AND LOADING CONDITIONS				
TIER	LENGTH (FT)	MAXIMUM HEIGHT (FT)	BACKSLOPE CONDITIONS	SURCHARGE LOADING
UPPER	~225	8	FLAT	250 PSF (TRAFFIC)
MIDDLE	~185	8	8:1	150 PSF (SNOW)
LOWER	~140	6	8:1	150 PSF (SNOW)

2012 IBC HORIZONTAL GROUND ACCELERATION		
SITE CLASS	PGA	SEISMIC COEFFICIENT
C: VERY DENSE SOIL	0.35g	0.15g

SOURCES:

1. INTERNATIONAL CODE COUNCIL, 2012, INTERNATIONAL BUILDING CODE.

REFERENCE: IGES, INC., 2013, ROCKERY CONSTRUCTION GUIDELINES, POWDER MOUNTAIN RESORT, WEBER COUNTY, UTAH, PROJECT NO. 01628-005, DATED MAY 8, 2013

PLOT DATE: OCT 30, 2013

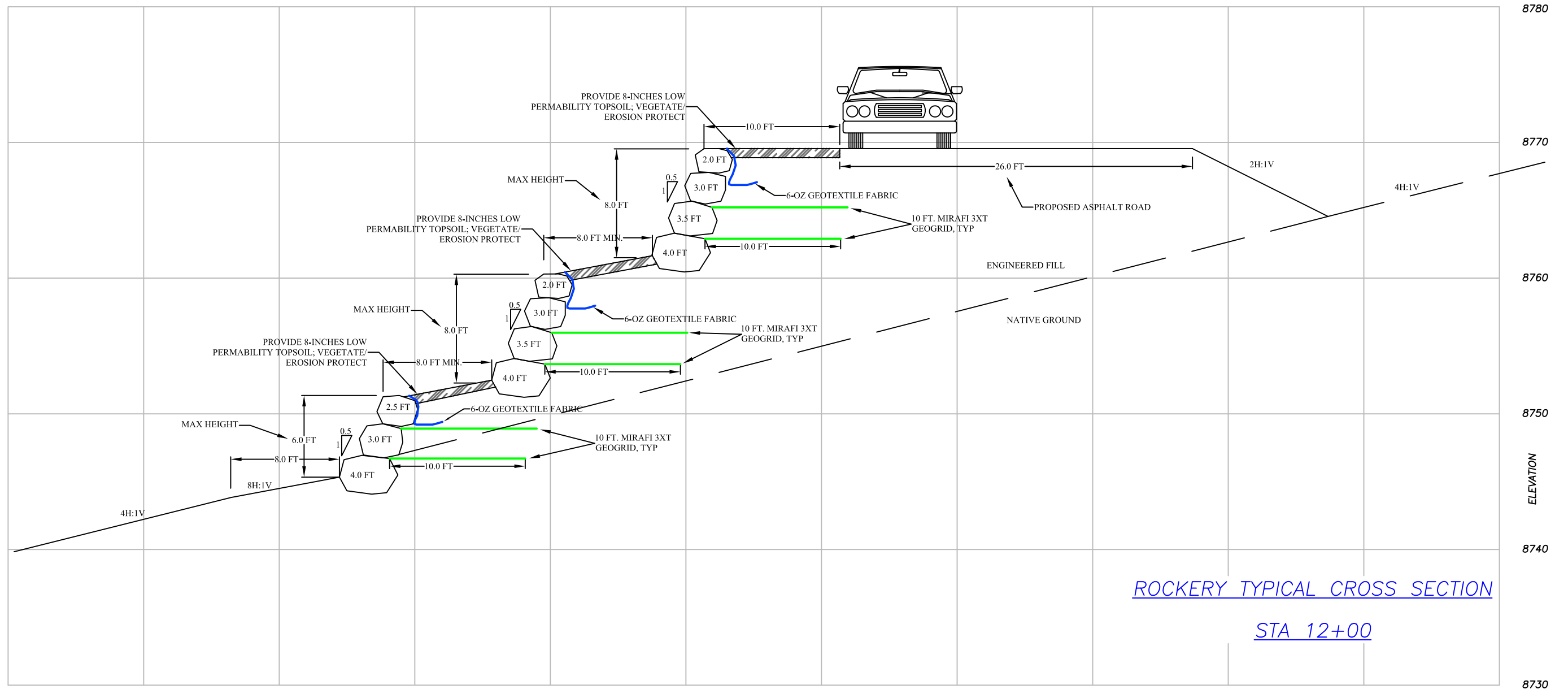
MARK	REVISIONS	DATE	BY	CHK



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ROCKERY DESIGN - HORIZON RUN  
 POWDER MOUNTAIN RESORT  
 WEBER COUNTY, UTAH  
 DESIGN CRITERIA

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	NA
IGES PROJECT NO. 01855-001	SHEET NO. 1.3
	REV. N/A



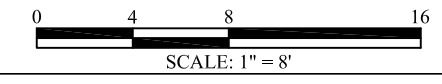
ROCKERY TYPICAL CROSS SECTION  
STA 12+00

SECTION BASED ON UNDATED CROSS-SECTION DRAWN BY NV-5

EXPOSED ROCKERY HEIGHT - ASSUMES 1-FOOT MINIMUM EMBEDMENT DEPTH FOR ALL ROCKERY SECTIONS AND TIERS

CONSTRUCTION CRITERIA

1. MAINTAIN MINIMUM OF 10 FEET FROM FACE OF TOP BOULDER TO ASPHALT PAVEMENT
2. MAXIMUM BATTER OF 0.5H:1V
3. BOULDER SIZES SHOWN IS MINIMUM DIMENSION INTO THE SLOPE



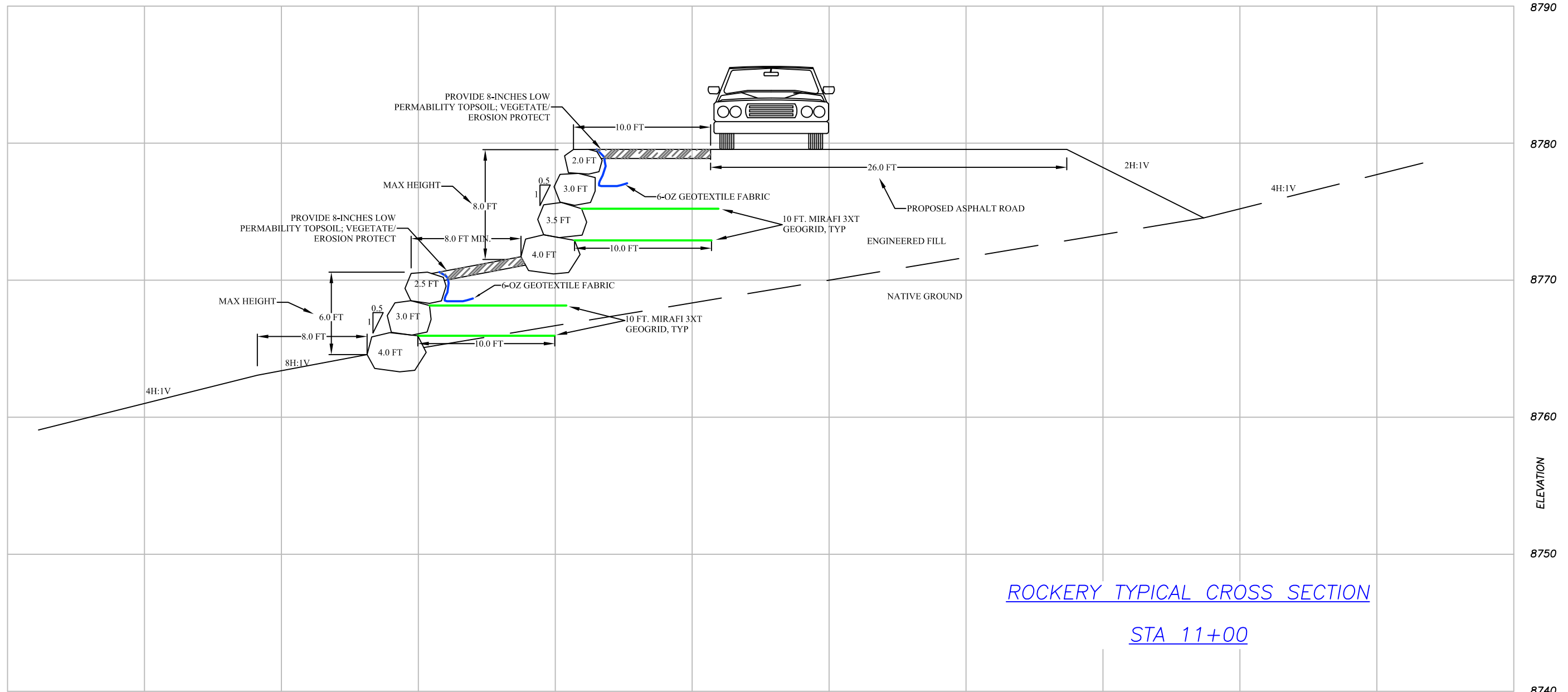
PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK

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ROCKERY DESIGN - HORIZON RUN  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH  
SECTION VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	1"=8'
IGES PROJECT NO. 01855-001	SHEET NO. 1.4a
	REV. N/A



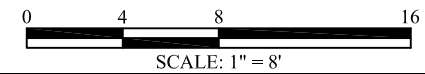
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STA 11+00

SECTION BASED ON UNDATED CROSS-SECTION DRAWN BY NV-5

\* EXPOSED ROCKERY HEIGHT - ASSUMES 1-FOOT MINIMUM EMBEDMENT DEPTH FOR ALL ROCKERY SECTIONS AND TIERS

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PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



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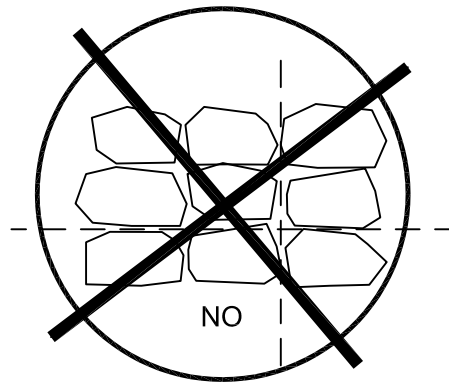
ROCKERY DESIGN - HORIZON RUN  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH  
SECTION VIEW

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE: 1=1
DRAWN BY: JWW OCT 30, 2013	DWG SCALE: 1"=8'
CHECKED BY: DAG OCT 30, 2013	
APPROVED BY: DAG OCT 30, 2013	
IGES PROJECT NO. 01855-001	SHEET NO. 1.4b
	REV. N/A

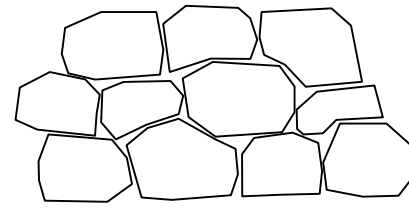
**Rock Stacking Construction Guidelines:**

Rocks should be stacked in general accordance with the Associated Rockery Contractors (ARC) Rockery Construction Guidelines, summarized as follows:

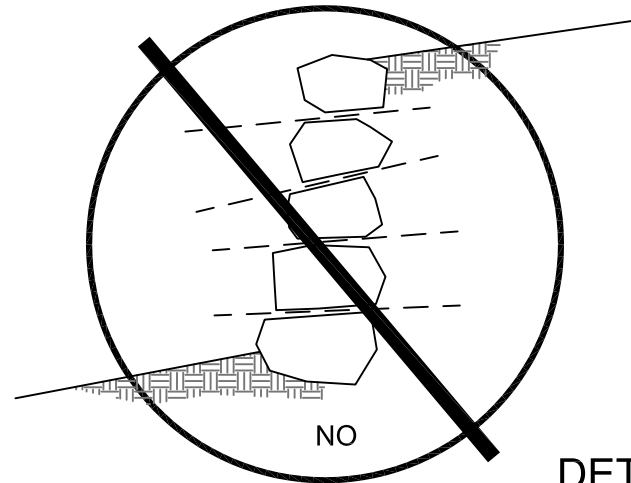
- Rocks should be placed so that there are no continuous joint planes in either the vertical or lateral direction (see detail A)
- Wherever possible, each rock should bear on at least two rocks below it.
- The upper plane of each rock between courses (the top surface of rock), should slope back towards the slope face and away from the face of the rock wall (see detail B)



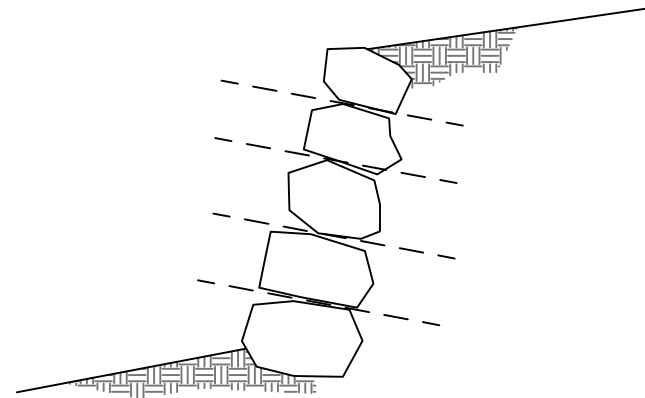
DETAIL A



YES



DETAIL B



YES

1. INTRODUCTION

- 1.1. DESIGN AND CONSTRUCTION INFORMATION IS BASED ON INFORMATION OBTAINED FROM SITE TOPOGRAPHY, SOIL DESCRIPTIONS, SITE OBSERVATIONS, SITE GEOMETRY, PROJECT PLANS, AND THE ENGINEERING ANALYSIS PERFORMED AS PART OF THE SCOPE OF WORK FOR THIS PROJECT BY IGES, INC.
- 1.2. CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES PRIOR TO ROCKERY CONSTRUCTION.
- 1.3. THE DESIGN INCLUDES MEASURES TO REDUCE THE POTENTIAL FOR SATURATION OF THE SLOPES ABOVE THE ROCKERIES.
  - 1.3.1. VEGETATION OR EROSION CONTROL MEASURES SHALL BE ESTABLISHED ABOVE AND BELOW THE ROCKERIES IMMEDIATELY FOLLOWING CONSTRUCTION.
- 1.4. CONDITIONS SUCH AS LEAKY OR BROKEN IRRIGATION LINES AND/OR RUNOFF FROM PRECIPITATION CAN LEAD TO UNDERMINING OR SATURATION OF THE SOIL BEHIND THE ROCKERY, WHICH CAN LEAD TO SLOPE MOVEMENT.
  - 1.4.1. THE OWNER SHALL BE AWARE OF THE RISKS IF THESE OR OTHER CONDITIONS OCCUR THAT COULD SATURATE OR ERODE THE SOIL BEHIND THE ROCKERIES.

2. MATERIALS

- 2.1. RETAINED SOILS ARE TO CONSIST OF NATIVE CUT SOILS OR GRANULAR IMPORT APPROVED BY IGES, INC. IF NATIVE FILL IS USED, THE FILL SHOULD CONSIST OF 4-INCH MINUS GRANULAR SOILS COMPACTED TO A MINIMUM OF 90 PERCENT ASTM D-1557 FOR LANDSCAPE AREAS AND 95 PERCENT UNDERNEATH OR IMMEDIATELY ADJACENT TO STRUCTURES. ANY BACKFILL MATERIAL THAT IS IMPORTED SHOULD BE APPROVED BY IGES INC. PRIOR TO IMPORTING.
- 2.2. ROCKERY BOULDERS TO BE USED AS FACING SHALL BE DURABLE ANGULAR PARTICLES WITH A MINIMUM NOMINAL DIAMETER OF 1½ -FEET. ROCK SIZES SHALL BE IN ACCORDANCE WITH DESIGN DRAWINGS.

3. ROCKERY INSTALLATION

- 3.1. ROCKS SHOULD BE STACKED IN GENERAL ACCORDANCE WITH THE ASSOCIATED ROCKERY CONTRACTORS (ARC) ROCKERY CONSTRUCTION GUIDELINES (SEE ADJACENT DETAILS).
- 3.2. ROCK FACING SHOULD BE STACKED AT A MAXIMUM STEEPNESS OF ½ HORIZONTAL TO 1 VERTICAL.
- 3.3. BOTTOM ROW OF ROCKS SHOULD BE BURIED (KEYED IN) A MINIMUM DEPTH OF 1 FOOT.

4. CONSTRUCTION OBSERVATION

- 4.1. TO FULFILL ANY APPLICABLE CITY, COUNTY AND/OR STATE AGENCY REQUIREMENTS, AND TO PROTECT THE CONTRACTOR AND DESIGN ENGINEER, IGES MUST PERFORM PERIODIC CONSTRUCTION OBSERVATIONS.
  - 4.1.1. INSPECTIONS SHALL PROCEED AS FOLLOWS:
    - 4.1.1.1. OBSERVE THE ROCKERY BASE EXCAVATION TO ASSESS THE SUITABILITY OF THE FOUNDATION SOILS.
    - 4.1.1.2. INSPECT THE FIRST COURSE OF ROCKS FOR SIZE AND EMBEDMENT INSTALLATION.
    - 4.1.1.3. INSPECT THE SECOND OR THIRD COURSE OF ROCKS FOR SIZE, POSITION AND PLACEMENT.
    - 4.1.1.4. INSPECT THE FINISHED ROCKERIES FOR CONFORMANCE TO DESIGN REQUIREMENTS SUCH AS MAXIMUM HEIGHTS, BATTER, FRONT AND BACK SLOPE GEOMETRIES, ROCK SIZING, POSITIONING AND PLACEMENT.

PLOT DATE: OCT 30, 2013

MARK	REVISIONS	DATE	BY	CHK



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 (801) 748-4044 FAX: (801) 748-4045

ROCKERY DESIGN - HORIZON RUN  
 POWDER MOUNTAIN RESORT  
 WEBER COUNTY, UTAH  
**ARC DETAILS AND SPECIFICATIONS**

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. <b>1.5</b>
	REV. N/A

# ROCKERY EXTERNAL AND INTERNAL STABILITY CALCULATIONS FROM FHWA 2006 CFL/TD-06-006

<i>MINIMUM ALLOWABLE FACTORS OF SAFETY</i>		
<i>FAILURE MECHANISM</i>	<i>UNDER STATIC CONDITIONS</i>	<i>UNDER SEISMIC CONDITIONS</i>
<i>EXTERNAL SLIDING</i>	<i>1.5</i>	<i>1.13</i>
<i>EXTERNAL OVERTURNING</i>	<i>1.5</i>	<i>1.13</i>
<i>BEARING CAPACITY</i>	<i>2.0</i>	<i>1.50</i>
<i>INDIVIDUAL ROCK OVERTURNING</i>	<i>1.5</i>	<i>1.13</i>



**ROCKERY DESIGN**  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. 2.1
	REV. N/A

# Interactive Rockery Minimum Rock Size Stability Calculations

Project: Powder Mountain Resort  
 Rockery Analysis and Design  
 Location: Weber County, UT  
 IGES, Inc. Project No:  
 Engineer: JWW  
 Date: October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	2.16	1.46		
Sliding:	1.5	1.1	1.78	1.30		
Bearing Capacity:	2.0	1.5	2.56	1.83		
Internal Sliding:	1.5	1.1	1.87	1.34		
Internal Overturning:	1.5	1.1	2.76	1.86		

**Rockery Section Description:** 8-ft Rockery Section      Top Tier

**1. Enter Geometric Parameters:**

<b>Backslope</b> (for flat backslope V=0): 10 H. : 1 V. $\beta = 5.71$ degrees surcharge, $q_B = 250$ psf	<b>Toeslope</b> (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	<b>Rockery Batter</b> (for vertical stacking H = 0): 1 H. : 2 V. $\Psi_{front} = -26.57$ degrees Number of Rocks (8 max): 4 Appr. Rockery Length, L = 80 ft
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**2. Enter Soil, Foundation, Rock and Seismic Properties**

Will geotextile fabric be used along the back soil?  YES  NO

<b>Retained Soil Properties:</b> $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.195$ $K_{ah} = 0.190$	<b>Foundation Properties:</b> $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	Foundation Soil Type: Sand Silt or Clay Gravel Bedrock Structural Fill	<b>Rock Properties:</b> $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
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<b>Seismic Properties:</b> 2 % Exceedance Prob. 50 years Exposure Time      2 PE 50 PGA: 0.150 g 2475 -yr Recurrence Interval	$k_v = 0.000$ g $K_{AE} = 0.247$ $k_h = 0.075$ g $F_{AE} = 1,348.0$ lb/ft $\theta = 4.29$ degrees $\Delta F_{AE} = 282.5$ lb/ft
--	---

**3. Enter Rock Diameters in Table Below**

Actual Back of Rock Batter,  $\psi = 17.2$  degrees from vertical (CW)

**4. Calculate Hinge Height** do not use

Avg. rock diameter: 3.1 ft      Hinge Ht.,  $H_h = 10.1$  ft

**5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)**

Wall Weight,  $W_1 = 4,208$  lb/ft

Acting At: x = 2.48      y = 4.16

Resisting Moment,  $M_{res} = 11,623.0$  lb       $M_{res-E} = 11,981.0$  lb-dyn

Driving Moment,  $M_{drv} = 5,369.9$  lb       $M_{drv-E} = 8,226.8$  lb-dyn

$FS_{ovt} = M_{res}/M_{drv} = 2.16$  static      1.46 seismic

**6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)**

Resisting Force,  $P_{res} = 2,665.6$  lb/ft       $P_{res-E} = 2,703.0$  lb/ft-dyn

Driving Force,  $P_{ah1} = 1,495.0$  lb/ft       $P_{ah1-E} = 2,086.1$  lb/ft-dyn

$FS_{slid} = P_{res}/P_{ah1} = 1.78$  static      1.30 seismic

**7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)**

Eccentricity, e = 0.593 ft      OK       $e_E = 1.17$  ft

Bearing Stress,  $\sigma_{vb} = 2,098$  psf       $\sigma_{vb-E} = 2,936$  psf-dyn

Max. Allow.,  $q_{ULT} = 5,368$  psf       $q_{ULT-E} = 5,368$  psf-dyn

$FS_{bearing} = q_{ULT}/\sigma_{vb} = 2.56$  static      1.83 seismic

**8. Calculate the Factors of Safety for Internal Bulldging (Min. FS = 1.5)**

Values tabulated below

Approximate Maximum Exposed Rockery Height: **8.4** ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	$F_{AEi}$ (lb/ft)	$\Delta F_{AEi}$ (lb/ft)	$P_{ahi}$		$P_{resi}$		F.S. Internal Sliding		$M_{drv}$		$M_{res}$		F.S. Internal Overturning	
						Static (lb/ft)	Seismic (lb/ft)	Static (lb/ft)	Seismic (lb/ft)	1.5 Min.	1.13 Min.	Static (lb)	Seismic (lb)	Static (lb)	Seismic (lb)	1.5 Min.	1.1 Min.
						(ft)	(ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	Static (lb)	Seismic (lb)
1	4.0	9.4	4,208	1,348	282	1,495	2,086	2,666	2,703	See Base Sliding	5,370	8,227	11,623	11,981	See Ext. OT		
2	3.5	6.6	2,702	662	139	829	1,167	1,550	1,568	1.87	1.34	2,159	3,294	5,968	6,113	2.76	1.86
3	3.0	4.1	1,538	259	54	400	568	870	878	2.18	1.55	683	1,034	2,666	2,711	3.90	2.62
4	2.0	2.0	600	62	13	145	203	336	338	2.32	1.67	129	189	713	720	5.52	3.80

Calculations Based on Rockery Design and Construction Guidelines, FHWA Publication No. FHWA-CFL/TD-06-006



# Interactive Rockery Minimum Rock Size Stability Calculations

**Project:** Powder Mountain Resort  
**Rockery Analysis and Design**  
**Location:** Weber County, UT  
**IGES, Inc. Project No:**  
**Engineer:** JWW  
**Date:** October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	2.53	1.60		
Sliding:	1.5	1.1	2.00	1.40		
Bearing Capacity:	2.0	1.5	3.16	2.13		
Internal Sliding:	1.5	1.1	2.17	1.49		
Internal Overturning:	1.5	1.1	3.37	2.09		

**Rockery Section Description:** 8-ft Rockery Section Middle Tier

**1. Enter Geometric Parameters:**

<b>Backslope</b> (for flat backslope V=0): 8 H. : 1 V. $\beta = 7.13$ degrees surcharge, $q_B = 150$ psf	<b>Toeslope</b> (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	<b>Rockery Batter</b> (for vertical stacking H = 0): 1 H. : 2 V. $\Psi_{front} = -26.57$ degrees Number of Rocks (8 max): 4 Appr. Rockery Length, L = 80 ft
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**2. Enter Soil, Foundation, Rock and Seismic Properties**

Will geotextile fabric be used along the back soil?  YES  NO

<b>Retained Soil Properties:</b> $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.198$ $K_{ah} = 0.194$	<b>Foundation Properties:</b> $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	Foundation Soil Type: Sand Silt or Clay Gravel Bedrock Structural Fill	<b>Rock Properties:</b> $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
--	---	---	--

<b>Seismic Properties:</b> 2 % Exceedance Prob. 50 years Exposure Time <b>2 PE 50 PGA: 0.150 g</b> 2475 -yr Recurrence Interval	$k_v = 0.000$ g $K_{AE} = 0.252$ $k_h = 0.075$ g $F_{AE} = 1,377.6$ lb/ft $\theta = 4.29$ degrees $\Delta F_{AE} = 293.2$ lb/ft
--	---

**3. Enter Rock Diameters in Table Below**

Actual Back of Rock Batter,  $\psi = 17.2$  degrees from vertical (CW)

**4. Calculate Hinge Height** do not use

Avg. rock diameter: 3.1 ft    Hinge Ht.,  $H_h = 10.1$  ft

**5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)**

Wall Weight,  $W_1 = 4,208$  lb/ft

Acting At: x = 2.48    y = 4.16

Resisting Moment,  $M_{res} = 11,643.7$  lb     $M_{res-E} = 12,015.3$  lb-dyn

Driving Moment,  $M_{drv} = 4,597.5$  lb     $M_{drv-E} = 7,513.1$  lb-dyn

$FS_{ovt} = M_{res}/M_{drv} = 2.53$  static    1.60 seismic

**6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)**

Resisting Force,  $P_{res} = 2,668.1$  lb/ft     $P_{res-E} = 2,706.9$  lb/ft-dyn

Driving Force,  $P_{ah1} = 1,336.0$  lb/ft     $P_{ah1-E} = 1,937.5$  lb/ft-dyn

$FS_{slid} = P_{res}/P_{ah1} = 2.00$  static    1.40 seismic

**7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)**

Eccentricity, e = 0.415 ft    OK     $e_E = 1.00$  ft

Bearing Stress,  $\sigma_{vb} = 1,805$  psf     $\sigma_{vb-E} = 2,673$  psf-dyn

Max. Allow.,  $q_{ULT} = 5,699$  psf     $q_{ULT-E} = 5,699$  psf-dyn

$FS_{bearing} = q_{ULT}/\sigma_{vb} = 3.16$  static    2.13 seismic

**8. Calculate the Factors of Safety for Internal Bulldging (Min. FS = 1.5)**

Values tabulated below

Approximate Maximum Exposed Rockery Height: **8.4** ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	$F_{AEi}$ (lb/ft)	$\Delta F_{AEi}$ (lb/ft)	$P_{ahi}$		$P_{resi}$		F.S. Internal Sliding		$M_{drv}$		$M_{res}$		F.S. Internal Overturning	
						Static (lb/ft)	Seismic (lb/ft)	Static (lb/ft)	Seismic (lb/ft)	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
						(ft)	(ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	Lb	Lb	Lb	Lb	1.5 Min.	1.1 Min.
1	4.0	9.4	4,208	1,378	293	1,336	1,937	2,668	2,707	See Base Sliding	4,598	7,513	11,644	12,015	See Ext. OT		
2	3.5	6.6	2,702	676	144	714	1,057	1,551	1,570	2.17	1.49	1,772	2,927	5,977	6,127	3.37	2.09
3	3.0	4.1	1,538	265	56	325	496	871	878	2.68	1.77	528	884	2,669	2,716	5.05	3.07
4	2.0	2.0	600	63	13	108	166	336	338	3.11	2.03	92	153	714	721	7.77	4.73

Calculations Based on *Rockery Design and Construction Guidelines*, FHWA Publication No. FHWA-CFL/TD-06-006





# Interactive Rockery Minimum Rock Size Stability Calculations

Project: Powder Mountain Resort  
 Rockery Analysis and Design  
 Location: Weber County, UT  
 IGES, Inc. Project No:  
 Engineer: JWW  
 Date: October 28, 2013

	Minimum Factors of Safety:		Allowable		Actual	
	Static	Seismic	Static	Seismic	Static	Seismic
Overturning:	1.5	1.1	3.71	2.24		
Sliding:	1.5	1.1	2.54	1.70		
Bearing Capacity:	2.0	1.5	4.83	3.40		
Internal Sliding:	1.5	1.1	2.72	1.79		
Internal Overturning:	1.5	1.1	4.96	2.94		

**Rockery Section Description:** 6-ft Rockery Section Lower Tier

**1. Enter Geometric Parameters:**

<b>Backslope</b> (for flat backslope V=0): 8 H. : 1 V. $\beta = 7.13$ degrees surcharge, $q_B = 150$ psf	<b>Toeslope</b> (for flat toeslope V=0): 4 H. : 0 V. $\beta_T = 0.00$ degrees surcharge, $q_T = 0$ psf	<b>Rockery Batter</b> (for vertical stacking H = 0): 1 H. : 2 V. $\psi_{front} = -26.57$ degrees Number of Rocks (8 max): 3 Appr. Rockery Length, L = 80 ft
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**2. Enter Soil, Foundation, Rock and Seismic Properties**

Will geotextile fabric be used along the back soil?  YES  NO

<b>Retained Soil Properties:</b> $\gamma_{retained} = 125$ pcf $\phi_{retained} = 30$ degrees $C_{retained} = 0$ psf $\delta_{retained} = 30.00$ degrees $K_a = 0.200$ $K_{ah} = 0.195$	<b>Foundation Properties:</b> $\gamma_{foundation} = 125$ pcf $\phi_{foundation} = 30.0$ degrees $C_{foundation} = 0$ psf $I_{foundation} = 0.6$ Depth to Groundwater, z = 50.0 ft	<b>Rock Properties:</b> $\gamma_{Rock\ Boulder} = 150$ pcf $\phi_{Boulder\ Interface} = 0.55$ degrees Rockery Embedment, D = 1.0 ft Rock Stacking Red. Factor* = 0.70 *Height to Width Ratio
--	---	--

<b>Seismic Properties:</b> 2 % Exceedance Prob. 50 years Exposure Time 2475 -yr Recurrence Interval	2 PE 50 PGA: 0.150 g $k_v = 0.000$ g $k_h = 0.075$ g $\theta = 4.29$ degrees	$K_{AE} = 0.254$ $F_{AE} = 868.2$ lb/ft $\Delta F_{AE} = 184.1$ lb/ft
--	---	---

**3. Enter Rock Diameters in Table Below**

Actual Back of Rock Batter,  $\psi = 17.0$  degrees from vertical (CW)

**4. Calculate Hinge Height** do not use

Avg. rock diameter: 3.2 ft Hinge Ht.,  $H_h = 10.3$  ft

**5. Calculate the Factor of Safety against Overturning (Min. FS = 1.5)**

Wall Weight,  $W_1 = 3,608$  lb/ft  
 Acting At: x = 2.33 y = 3.42

Resisting Moment, $M_{res} = 9,145.6$ lb	$M_{res-E} = 9,367.1$ lb-dyn
Driving Moment, $M_{drv} = 2,465.4$ lb	$M_{drv-E} = 4,186.1$ lb-dyn
$FS_{ovt} = M_{res}/M_{drv} = 3.71$ static	2.24 seismic

**6. Calculate the Factor of Safety against Base Sliding (Min. FS = 1.5)**

Resisting Force, $P_{res} = 2,256.7$ lb/ft	$P_{res-E} = 2,281.5$ lb/ft-dyn
Driving Force, $P_{ah1} = 888.5$ lb/ft	$P_{ah1-E} = 1,338.5$ lb/ft-dyn
$FS_{slid} = P_{res}/P_{ah1} = 2.54$ static	1.70 seismic

**7. Calculate the Factor of Safety for Bearing Capacity (Min. FS = 2.0)**

Eccentricity, e = 0.224 ft OK	$e_E = 0.64$ ft OK
Bearing Stress, $\sigma_{vb} = 1,256$ psf	$\sigma_{vb-E} = 1,784$ psf-dyn
Max. Allow., $q_{ULT} = 6,060$ psf	$q_{ULT-E} = 6,060$ psf-dyn
$FS_{bearing} = q_{ULT}/\sigma_{vb} = 4.83$ static	3.40 seismic

**8. Calculate the Factors of Safety for Internal Bulding (Min. FS = 1.5)**

Values tabulated below

Approximate Maximum Exposed Rockery Height: 6.4 ft

Row, i	Min. Rock Dia. (ft)	$H_{1,i}$ (ft)	Accm. Weigh t (lb/ft)	$F_{AEi}$ (lb/ft)	$\Delta F_{AEi}$ (lb/ft)	$P_{ahi}$		$P_{resi}$		F.S. Internal Sliding		$M_{drv}$		$M_{res}$		F.S. Internal Overturning	
						Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
						(lb/ft)	(lb/ft)	(lb/ft)	(lb/ft)	1.5 Min.	1.13 Min.	Lb	Lb	Lb	Lb	1.5 Min.	1.1 Min.
1	4.0	7.4	3,608	868	184	889	1,339	2,257	2,281	See Base Sliding	2,465	4,186	9,146	9,367	See Ext. OT		
2	3.0	4.6	1,898	336	71	396	607	1,076	1,086	2.72	1.79	712	1,221	3,532	3,593	4.96	2.94
3	2.5	2.5	938	99	21	151	242	525	528	3.48	2.18	157	276	1,395	1,409	8.88	5.11

Calculations Based on Rockery Design and Construction Guidelines, FHWA Publication No. FHWA-CFL/TD-06-006

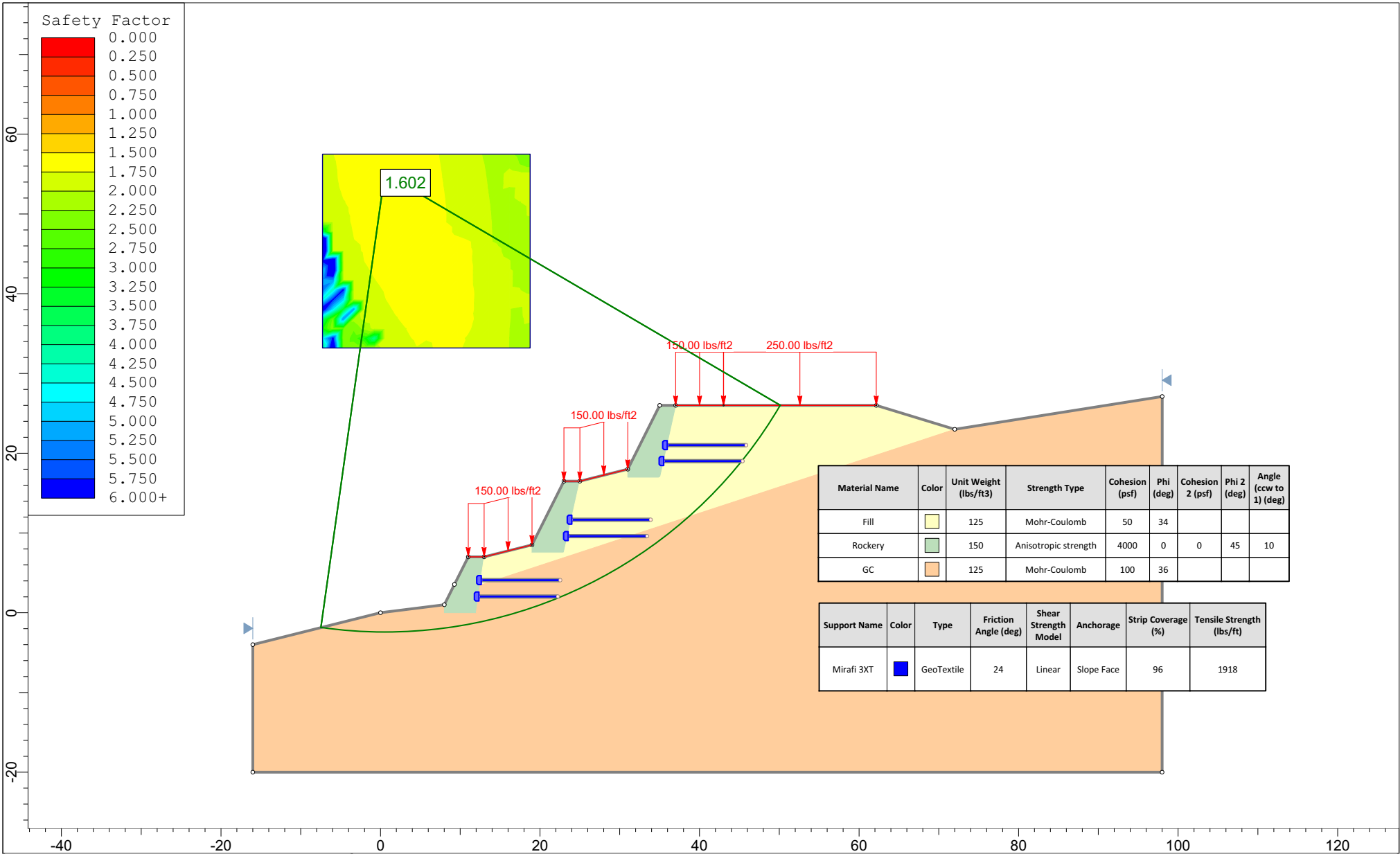
# ROCKERY RETAINING WALL GLOBAL STABILITY CALCULATIONS FROM SLIDE

<i>MINIMUM ALLOWABLE FACTORS OF SAFETY</i>	
<i>UNDER STATIC CONDITIONS</i>	<i>UNDER SEISMIC CONDITIONS</i>
1.5	1.1



**ROCKERY DESIGN**  
POWDER MOUNTAIN RESORT  
WEBER COUNTY, UTAH

DESIGNED BY: JWW OCT 30, 2013	PLOT SCALE
DRAWN BY: JWW OCT 30, 2013	1=1
CHECKED BY: DAG OCT 30, 2013	DWG SCALE
APPROVED BY: DAG OCT 30, 2013	N/A
IGES PROJECT NO. 01855-001	SHEET NO. 2.2
	REV. N/A



Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Angle (ccw to 1) (deg)
Fill		125	Mohr-Coulomb	50	34			
Rockery		150	Anisotropic strength	4000	0	0	45	10
GC		125	Mohr-Coulomb	100	36			

Support Name	Color	Type	Friction Angle (deg)	Shear Strength Model	Anchorage	Strip Coverage (%)	Tensile Strength (lbs/ft)
Mirafi 3XT		GeoTextile	24	Linear	Slope Face	96	1918

**Project** Powder Mountain - Max Section - Static

**Analysis Description** Spencer's

**Drawn By** Justin W      **Scale** 1:200      **Company** IGES, Inc

**Date** 10/28/13      **File Name** 25H Static.slim

Slide Analysis Information  
Powder Mountain - Max Section - Static

Project Summary

- File Name: 25H Static
- Slide Modeler Version: 6.025
- Project Title: Powder Mountain - Max Section - Static
- Analysis: Spencer's
- Author: Justin W
- Company: IGES, Inc
- Date Created: 10/28/13

General Settings

- Units of Measurement: Imperial Units
- Time Units: seconds
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: Not Defined

Loading

- 4 Distributed Loads present




Distributed Load 1  
Distribution: Constant  
Magnitude [psf]: 250  
Orientation: Normal to boundary

Distributed Load 2  
Distribution: Constant  
Magnitude [psf]: 150  
Orientation: Normal to boundary

Distributed Load 3  
Distribution: Constant  
Magnitude [psf]: 150  
Orientation: Vertical

Distributed Load 4  
Distribution: Constant  
Magnitude [psf]: 150  
Orientation: Vertical

Material Properties

Property	Fill	Rockery	GC
Color			
Strength Type	Mohr-Coulomb	Anisotropic strength	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	150	125
Cohesion [psf]	50		100
Friction Angle [deg]	34		36
Cohesion 1 [psf]		4000	
Cohesion 2 [psf]		0	
Friction Angle 1 [deg]		0	
Friction Angle 2 [deg]		45	
Angle from 1 [deg]		10	
Water Surface	None	None	None
Ru Value	0	0	0

Support Properties

Mirafi 3XT  
Support Type: GeoTextile  
Force Application: Passive  
Force Orientation: Bisector of Parallel and Tangent  
Anchorage: Slope Face  
Shear Strength Model: Linear  
Strip Coverage: 96 percent

Tensile Strength: 1918 lb/ft  
 Pullout Strength Adhesion: 0 psf  
 Pullout Strength Friction Angle: 24 degrees

Global Minimums

Method: spencer  
 FS: 1.601890  
 Center: 0.539, 55.069  
 Radius: 57.498  
 Left Slip Surface Endpoint: -7.472, -1.868  
 Right Slip Surface Endpoint: 50.148, 26.000  
 Resisting Moment=2.8359e+006 lb-ft  
 Driving Moment=1.77035e+006 lb-ft  
 Resisting Horizontal Force=42723.4 lb  
 Driving Horizontal Force=26670.6 lb  
 Total Slice Area=464.539 ft2

Valid / Invalid Surfaces

Method: spencer  
 Number of Valid Surfaces: 3889  
 Number of Invalid Surfaces: 962

Error Codes:

Error Code -106 reported for 11 surfaces  
 Error Code -108 reported for 298 surfaces  
 Error Code -111 reported for 653 surfaces

Error Codes

The following errors were encountered during the computation:  
 -106 = Average slice width is less than 0.0001 \* (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.  
 -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).  
 -111 = safety factor equation did not converge

Slice Data

• Global Minimum Query (spencer) - Safety Factor: 1.60189

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.3088	123.317	GC	100	36	123.03	197.081	133.621	0	133.621
2	2.3088	356.367	GC	100	36	182.947	293.061	265.725	0	265.725
3	2.3088	562.38	GC	100	36	230.058	368.528	369.598	0	369.598
4	2.3088	717.262	GC	100	36	259.973	416.448	435.555	0	435.555
5	2.3088	788.684	GC	100	36	267.103	427.869	451.272	0	451.272
6	2.3088	830.927	GC	100	36	266.759	427.319	450.518	0	450.518
7	2.3088	930.955	GC	100	36	278.967	446.874	477.432	0	477.432
8	2.3088	2102.29	GC	100	36	515.966	826.521	999.97	0	999.97

9	2.3088	2639.9	GC	100	36	675.46	1082.01	1351.62	0	1351.62
10	2.3088	2329.2	GC	100	36	591.046	946.791	1165.51	0	1165.51
11	2.3088	2314.56	GC	100	36	565.903	906.515	1110.07	0	1110.07
12	2.3088	2504.86	GC	100	36	544.406	872.078	1062.67	0	1062.67
13	2.3088	3732.37	GC	100	36	705.935	1130.83	1418.81	0	1418.81
14	2.3088	4348.5	GC	100	36	825.594	1322.51	1682.64	0	1682.64
15	2.3088	3816.06	GC	100	36	720.998	1154.96	1452.03	0	1452.03
16	2.3088	3632.54	GC	100	36	664.072	1063.77	1326.52	0	1326.52
17	2.3088	3511.3	GC	100	36	601.489	963.52	1188.53	0	1188.53
18	2.3088	4401.77	GC	100	36	665.751	1066.46	1330.22	0	1330.22
19	2.3088	5119.93	GC	100	36	729.913	1169.24	1471.69	0	1471.69
20	2.3088	4323.05	GC	100	36	627.237	1004.77	1245.3	0	1245.3
21	2.28877	3680.27	Fill	50	34	476.91	763.957	1058.49	0	1058.49
22	2.28877	3029.94	Fill	50	34	385.942	618.236	842.446	0	842.446
23	2.28877	2299.3	Fill	50	34	310.38	497.194	662.992	0	662.992
24	2.28877	1470.11	Fill	50	34	213.52	342.036	432.962	0	432.962
25	2.28877	514.079	Fill	50	34	114.386	183.234	197.528	0	197.528

Interslice Data

• Global Minimum Query (spencer) - Safety Factor: 1.60189

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-7.47209	-1.86802	0	0	0
2	-5.16329	-2.14541	320.583	159.375	26.4339
3	-2.85449	-2.32866	790.87	393.174	26.4339
4	-0.545689	-2.41868	1354.3	673.279	26.4339
5	1.76311	-2.4159	1952.18	970.512	26.4339
6	4.07191	-2.32031	2524.57	1255.07	26.4339
7	6.38071	-2.13144	3054.22	1518.38	26.4339
8	8.68952	-1.84837	3561.94	1770.79	26.4339
9	10.9983	-1.46969	4372.29	2173.65	26.4339
10	13.3071	-0.993442	5285.15	2627.47	26.4339
11	15.6159	-0.41713	5975.49	2970.67	26.4339
12	17.9247	0.262407	6525.26	3243.98	26.4339
13	20.2335	1.04906	6943.86	3452.08	26.4339
14	22.5423	1.9476	7295.79	3627.04	26.4339
15	24.8511	2.96381	7488.43	3722.81	26.4339
16	27.1599	4.10471	7493.31	3725.24	26.4339
17	29.4687	5.37892	7333.38	3645.73	26.4339
18	31.7775	6.79697	7034.09	3496.94	26.4339
19	34.0863	8.37197	6473.18	3218.09	26.4339
20	36.3951	10.1204	5582.06	2775.08	26.4339
21	38.7039	12.0635	4607.82	2290.74	26.4339

22	40.9927	14.209	3426.25	1703.33	26.4339
23	43.2815	16.6097	2285.52	1136.23	26.4339
24	45.5702	19.3167	1277.45	635.074	26.4339
25	47.859	22.4063	427.58	212.568	26.4339
26	50.1478	26	0	0	0

List Of Coordinates

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Line Load

X	Y
62.156	26
43	26

Line Load

X	Y
43.0223	26
37	26

Line Load

X	Y
31	18
25	16.5
23	16.5

Line Load

X	Y
19	8.5
13	7
11	7

External Boundary

X	Y
-16	-20
98	-20
98.005	27.116
72	23
62.156	26
37	26
35	26
31	18
25	16.5
23	16.5

19	8.5
13	7
11	7
9.27164	3.54328
8	1
0	0
-16	-4

Material Boundary

X	Y
8	1
8	0
12	0
12.4935	3.45431
13	7

Material Boundary

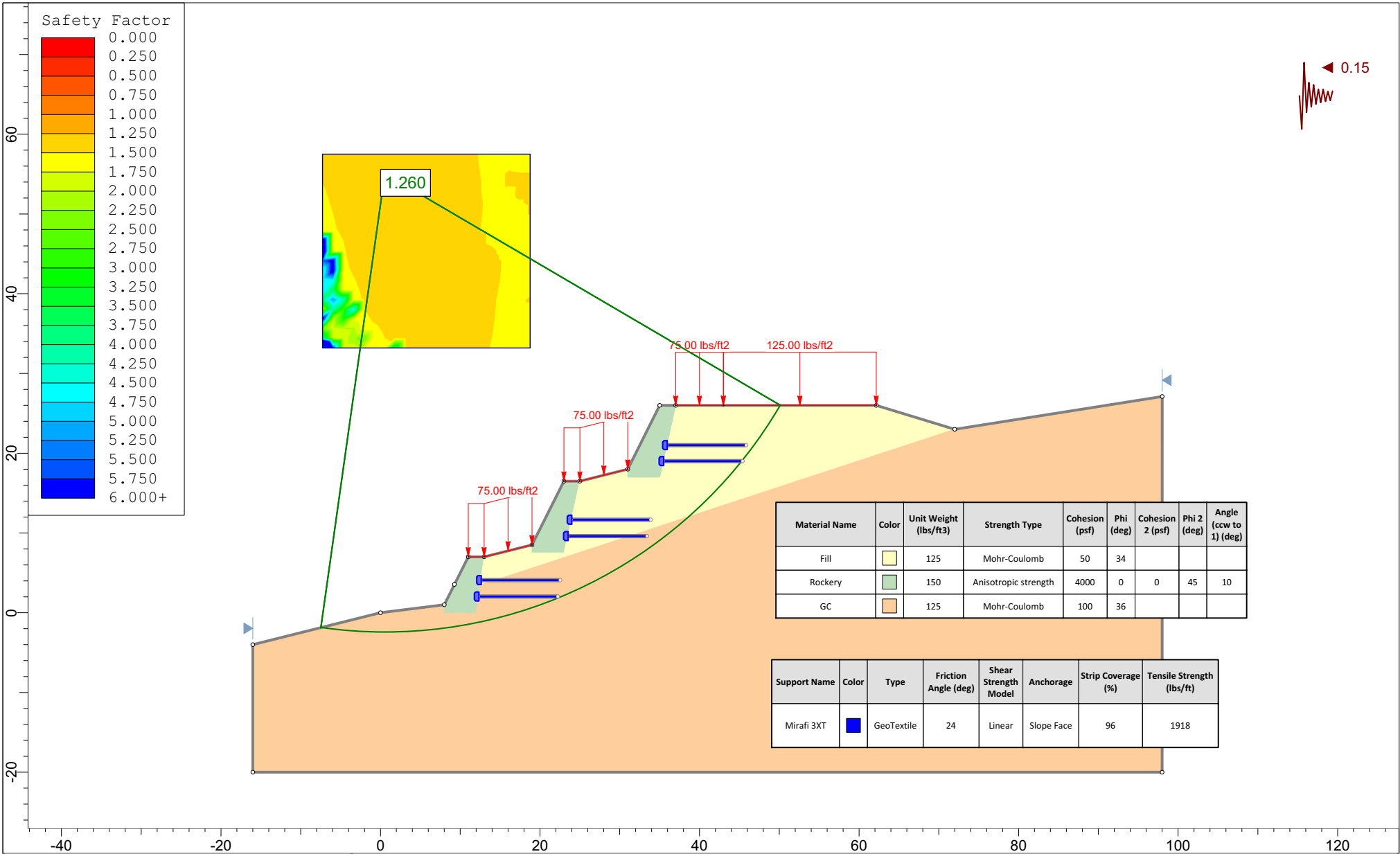
X	Y
19	8.5
19	7.5
23	7.5
25	16.5

Material Boundary

X	Y
31	18
31	17
35	17
37	26

Material Boundary

X	Y
12.4935	3.45431
72	23



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Angle (ccw to 1) (deg)
Fill		125	Mohr-Coulomb	50	34			
Rockery		150	Anisotropic strength	4000	0	0	45	10
GC		125	Mohr-Coulomb	100	36			

Support Name	Color	Type	Friction Angle (deg)	Shear Strength Model	Anchorage	Strip Coverage (%)	Tensile Strength (lbs/ft)
Mirafi 3XT		GeoTextile	24	Linear	Slope Face	96	1918

**Project**  
Powder Mountain - Max Section - Pseudo Static

**Analysis Description**  
Spencer's

**Drawn By** Justin W      **Scale** 1:200      **Company** IGES, Inc

**Date** 10/28/13      **File Name** 25H P-Static.slim

Slide Analysis Information  
Powder Mountain - Max Section - Pseudo Static

Project Summary

- File Name: 25H P-Static
- Slide Modeler Version: 6.025
- Project Title: Powder Mountain - Max Section - Pseudo Static
- Analysis: Spencer's
- Author: Justin W
- Company: IGES, Inc
- Date Created: 10/28/13

General Settings

- Units of Measurement: Imperial Units
- Time Units: seconds
- Permeability Units: feet/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check  $m\alpha < 0.2$ : Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 62.4 lbs/ft<sup>3</sup>
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Grid Search
- Radius Increment: 10
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined

- Minimum Depth: Not Defined

Loading

- Seismic Load Coefficient (Horizontal): 0.15
- 4 Distributed Loads present

Distributed Load 1

Distribution: Constant  
Magnitude [psf]: 125  
Orientation: Normal to boundary

Distributed Load 2

Distribution: Constant  
Magnitude [psf]: 75  
Orientation: Normal to boundary




Distributed Load 3

Distribution: Constant  
Magnitude [psf]: 75  
Orientation: Vertical

Distributed Load 4

Distribution: Constant  
Magnitude [psf]: 75  
Orientation: Vertical

Material Properties

Property	Fill	Rockery	GC
Color			
Strength Type	Mohr-Coulomb	Anisotropic strength	Mohr-Coulomb
Unit Weight [lbs/ft <sup>3</sup> ]	125	150	125
Cohesion [psf]	50		100
Friction Angle [deg]	34		36
Cohesion 1 [psf]		4000	
Cohesion 2 [psf]		0	
Friction Angle 1 [deg]		0	
Friction Angle 2 [deg]		45	
Angle from 1 [deg]		10	
Water Surface	None	None	None
Ru Value	0	0	0

Support Properties

Mirafi 3XT

Support Type: GeoTextile  
Force Application: Passive  
Force Orientation: Bisector of Parallel and Tangent  
Anchorage: Slope Face



Shear Strength Model: Linear  
 Strip Coverage: 96 percent  
 Tensile Strength: 1918 lb/ft  
 Pullout Strength Adhesion: 0 psf  
 Pullout Strength Friction Angle: 24 degrees

Global Minimums

Method: spencer  
 FS: 1.259510  
 Center: 0.539, 55.069  
 Radius: 57.498  
 Left Slip Surface Endpoint: -7.472, -1.868  
 Right Slip Surface Endpoint: 50.148, 26.000  
 Resisting Moment=2.61663e+006 lb-ft  
 Driving Moment=2.0775e+006 lb-ft  
 Resisting Horizontal Force=39926.5 lb  
 Driving Horizontal Force=31700 lb  
 Total Slice Area=464.539 ft2

Valid / Invalid Surfaces

Method: spencer  
 Number of Valid Surfaces: 3585  
 Number of Invalid Surfaces: 1266

Error Codes:

Error Code -106 reported for 11 surfaces  
 Error Code -108 reported for 383 surfaces  
 Error Code -111 reported for 872 surfaces

Error Codes

The following errors were encountered during the computation:  
 -106 = Average slice width is less than 0.0001 \* (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.  
 -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).  
 -111 = safety factor equation did not converge

Slice Data

• Global Minimum Query (spencer) - Safety Factor: 1.25951

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	2.3088	123.317	GC	100	36	205.17	258.414	218.038	0	218.038
2	2.3088	356.367	GC	100	36	288.819	363.771	363.049	0	363.049
3	2.3088	562.38	GC	100	36	348.511	438.953	466.529	0	466.529
4	2.3088	717.262	GC	100	36	380.856	479.692	522.6	0	522.6
5	2.3088	788.684	GC	100	36	380.752	479.561	522.421	0	522.421
6	2.3088	830.927	GC	100	36	371.338	467.704	506.101	0	506.101
7	2.3088	930.955	GC	100	36	379.517	478.005	520.281	0	520.281

8	2.3088	2102.29	GC	100	36	677.934	853.865	1037.61	0	1037.61
9	2.3088	2639.9	GC	100	36	827.916	1042.77	1297.61	0	1297.61
10	2.3088	2329.2	GC	100	36	709.62	893.774	1092.54	0	1092.54
11	2.3088	2314.56	GC	100	36	669.456	843.187	1022.91	0	1022.91
12	2.3088	2504.86	GC	100	36	653.804	823.473	995.774	0	995.774
13	2.3088	3732.37	GC	100	36	853.33	1074.78	1341.67	0	1341.67
14	2.3088	4348.5	GC	100	36	959.143	1208.05	1525.1	0	1525.1
15	2.3088	3816.06	GC	100	36	820.483	1033.41	1284.72	0	1284.72
16	2.3088	3632.54	GC	100	36	746.648	940.411	1156.73	0	1156.73
17	2.3088	3511.3	GC	100	36	677.05	852.751	1036.07	0	1036.07
18	2.3088	4401.77	GC	100	36	758.411	955.226	1177.12	0	1177.12
19	2.3088	5119.93	GC	100	36	820.595	1033.55	1284.92	0	1284.92
20	2.3088	4323.05	GC	100	36	682.838	860.041	1046.11	0	1046.11
21	2.28877	3680.27	Fill	50	34	501.185	631.247	861.734	0	861.734
22	2.28877	3029.94	Fill	50	34	396.818	499.796	666.849	0	666.849
23	2.28877	2299.3	Fill	50	34	305.62	384.931	496.557	0	496.557
24	2.28877	1470.11	Fill	50	34	201.495	253.785	302.125	0	302.125
25	2.28877	514.079	Fill	50	34	102.123	128.625	116.567	0	116.567

Interslice Data

• Global Minimum Query (spencer) - Safety Factor: 1.25951

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	-7.47209	-1.86802	0	0	0
2	-5.16329	-2.14541	515.949	330.547	32.646
3	-2.85449	-2.32866	1196.23	766.373	32.6459
4	-0.545689	-2.41868	1958.96	1255.03	32.6461
5	1.76311	-2.4159	2729.74	1748.83	32.646
6	4.07191	-2.32031	3441.08	2204.56	32.646
7	6.38071	-2.13144	4078.69	2613.05	32.646
8	8.68952	-1.84837	4668.49	2990.91	32.646
9	10.9983	-1.46969	5526.32	3540.49	32.646
10	13.3071	-0.993442	6424.94	4116.19	32.646
11	15.6159	-0.41713	7085.22	4539.2	32.646
12	17.9247	0.262407	7589.44	4862.24	32.646
13	20.2335	1.04906	7940.74	5087.3	32.646
14	22.5423	1.9476	8146.63	5219.21	32.646
15	24.8511	2.96381	8160.27	5227.95	32.646
16	27.1599	4.10471	8017.52	5136.49	32.646
17	29.4687	5.37892	7723.57	4948.17	32.646
18	31.7775	6.79697	7291.73	4671.51	32.646
19	34.0863	8.37197	6529.51	4183.19	32.646
20	36.3951	10.1204	5410.57	3466.33	32.646

21	38.7039	12.0635	4306.9	2759.25	32.646
22	40.9927	14.209	3053.7	1956.38	32.646
23	43.2815	16.6097	1907.08	1221.79	32.6461
24	45.5702	19.3167	986.881	632.253	32.646
25	47.859	22.4063	294.377	188.595	32.646
26	50.1478	26	0	0	0

23	16.5
19	8.5
13	7
11	7
9.27164	3.54328
8	1
0	0
-16	-4

List Of Coordinates

---

Line Load

X	Y
62.156	26
43	26

Line Load

X	Y
42.9819	26
37	26

Line Load

X	Y
31	18
25	16.5
23	16.5

Line Load

X	Y
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13	7
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External Boundary

X	Y
-16	-20
98	-20
98.005	27.116
72	23
62.156	26
37	26
35	26
31	18
25	16.5

Material Boundary

X	Y
8	1
8	0
12	0
12.4935	3.45431
13	7

Material Boundary

X	Y
19	8.5
19	7.5
23	7.5
25	16.5

Material Boundary

X	Y
31	18
31	17
35	17
37	26

Material Boundary

X	Y
12.4935	3.45431
72	23