Tables

Table 1.- List of major tanks found in the mill area

Tank Name	**Size (gallons)**
Slurry Storage Tanks	12690 ea
Lead Conditioning Tank	1064
PB Lead cleaner 1st flotation cell	449
PB Lead cleaner 2nd flotation cell	290
Lead cleaner column	214
Lead concentrate filter feed tank	933
Zinc conditioning tanks	1064 ea
Zinc Rougher Flotation Cell	1320
PB Rougher Flotation Cell	1320
zinc rougher scavenger flotation cells	1320 ea
Zinc cleaner flotation cells	1320 ea
Zinc cleaner column	214
Zinc concentrate filter feed tank	1728
Process water tank	1800
Tailings filter feed tank	1800

Table 2. – Volume of reagent tanks compared to the volume of secondary containment.

Tank Location	Containment Volume (gal)	Volume (gal) Total	
		Mixing Tank	Storage Tank
Lime Area	12,281	1320	9200
Flocculent Area	6,758	300	
Xanthate Enclosed Containment Room	1,031	120	120
MIBC Frother	793		300
Aerophine 3418A	1084	300	
Common Area	6072		
Sodium Metabisulfite		120	120
Zinc Sulfate		120	120
Copper Sulfate		120	120
Aero 242		300	

Table 3. – Reagent dosing rates in the flotation circuit.

	Reagent Dosage (lbs/st)							
Reagent	**Pb Ro**	**Zn Ro**	**Pb Cl-1**	**Pb Cl-2**	**Zn Cl-1**	**Zn Cl-2**	**Dose/ton**	**Packaging**
Zinc Sulfate	0.5		0.03				0.5300	Dry 50lbs bags
Sodium Metabisulfite	0.5		0.03				0.5300	Dry 50lbs bags
Areophine 3418	0.015		0.005				0.0200	Liquid 240 gal tote
Areofloat 242	0.01						0.0100	Liquid 240 gal tote
Oreprep F-549	0.15	0.03	0.04	0.01	0.01		0.2400	Liquid 240 gal tote
Hydrated Lime		5			0.35	0.014	5.3640	Dry 1800lbs supersack
Copper Sulfate		0.22					0.2200	Dry 50lb bags
Sodium Isopropyl Xanthate		0.03		0.002	0.01	0.001	0.0430	Dry 50lb bags
Flocculant AF-309		0.06		0.002		0.001	0.0630	Dry 50lb bags

Table 4. – Sizes of day tanks and mixing/storage tanks in gallons.

Reagent	**Day Tank (gal)**	**Mixing /storage tanks (gal)**	**Comment**
Zinc Sulfate	70	240	120gal mixing tank feeding 120gal solution tank
Sodium Metabisulfite	70	280	140gal mixing tank feeding 140gal solution tank
Aerophine 3418A	70	300	only storage tank in reagent area
Aero 242	70	300	only storage tank in reagent area
OrePrep 549 (MIBC)	70	300	only storage tank in reagent area
Lime	9200	1320	both in reagent area
Copper Sulfate	70	240	120gal mixing tank feeding 120gal solution tank
Sodium Isopropyl Xanthate	70	240	120gal mixing tank feeding 120gal solution tank
Floc AF-309		310	70gal mixing tank feeding 240gal solution tank

Table 5. -2017 Multi-element analyses of concentrate and tailings.

Element	Unit	Pb Cl Conc.	Zn Cl Conc.	Ro Tails
(FA) Ag	oz/st	286	16	1.5
Al	wt%	0.10	0.08	4.13
Ba	wt%	< 0.02	< 0.02	0.597
Bi	wt%	<0.001	<0.001	<0.001
Ca	wt%	0.08	0.07	2.03
Cu	wt%	3.11	0.26	0.037
Fe	wt%	2.52	3.52	4.19
K	wt%	0.07	0.16	1.89
Mg	wt%	0.03	0.02	0.62
Mn	wt%	0.39	0.15	1.22
Mo	wt%	< 0.002	< 0.002	< 0.002
Na	wt%	0.07	0.08	0.48
Ni	wt%	<0.003	<0.003	0.004
P	wt%	0.025	0.024	0.075
Pb	wt%	70.3	2.28	0.42
S	wt%	16.0	34.3	1.81
S=	wt%			1.49
Si	wt%	5.49	5.76	19.9
Sn	wt%	< 0.005	< 0.005	< 0.005
Ti	wt%	<0.0065	<0.0065	0.25
W	wt%	0.024	0.354	0.007
Zn	wt%	4.18	57.5	0.116
Zr	wt%	<0.003	<0.003	<0.003
As	ppm	2055	5150	1610
Cd	ppm	299	2870	<3.0
Co	ppm	28	46	27
Cr	ppm	<3.0	<3.0	97
Li	ppm	237	337	307
Re	ppm	56	93	70.5
Sb	ppm	15550	369	72
Sr	ppm	15	<10.0	318
Te	ppm	<10	<10	<10
Tl	ppm	<10	<10	<10
V	ppm	<25.0	<25.0	87
Cl	ppm	<50	<50	
F	ppm	<20	<20	
Hg	ppm	4	31	
Se	ppm	5	19	

Source: FLSmidth, 2017

Table 6. – 2017 ABA of tailings.

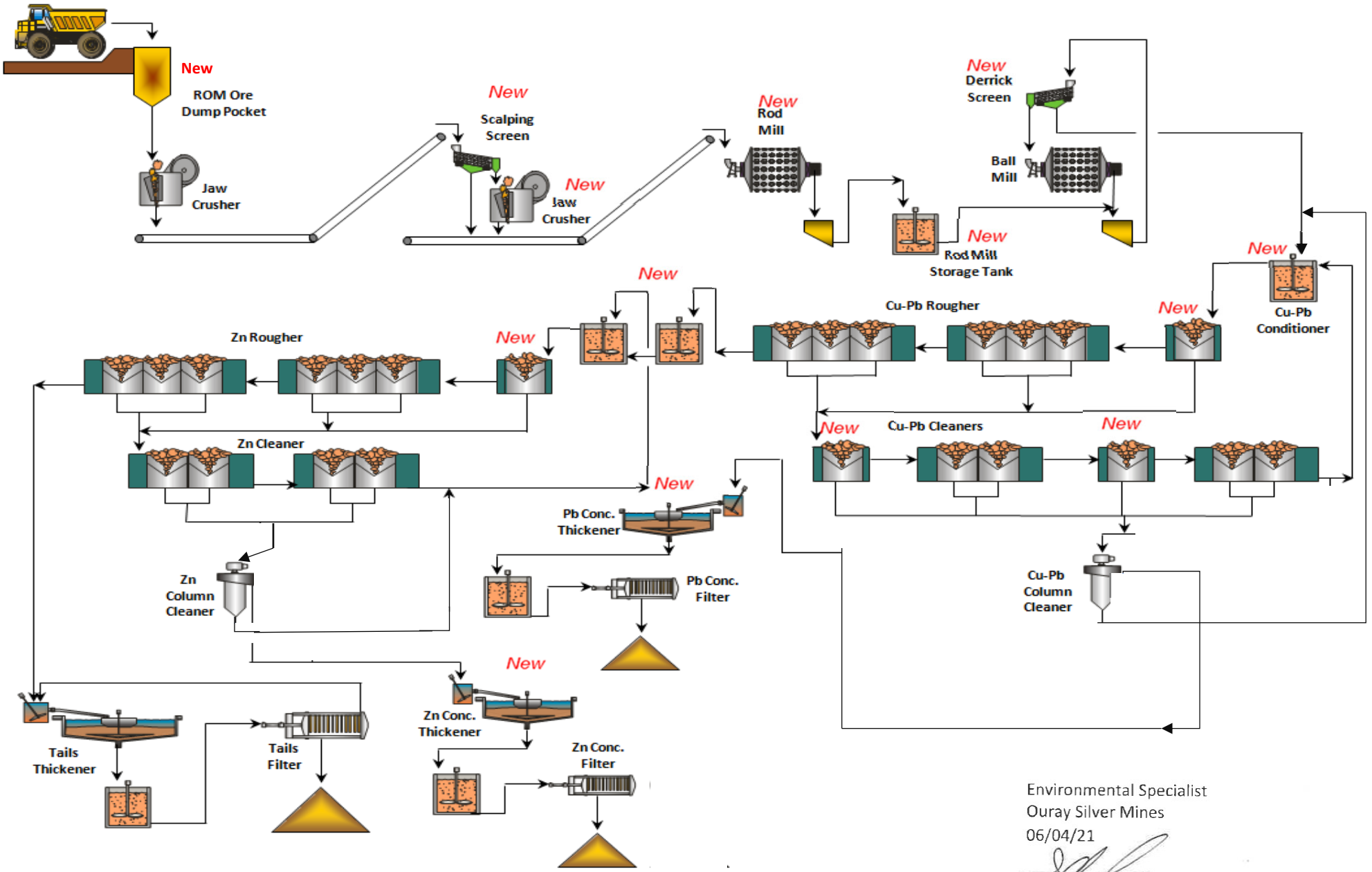
Modified Acid/Base Accounting (Mod ABA) Static ARD Potential Test Results, Ouray Mining - Master Composite Locked Cycle Float T#15: Rougher Tailings												
Paste pH	Sulfur, wt.% (as S)					AGP [1]	ANP	NNP	Ratio	Sulfur, wt.% (as S) - HCl Wash		
	Total	SO4	Pyritic $S^{=}$	Non-Ext S	Non Sulfate S					SO4	Pyritic $S^{=}$	Non Sulfate S
8.2	1.74	0.52	1.22	<0.01	1.22	38.1	89.4	51.3	2.35	0.65	1.09	1.09

Source: FLSmidth, 2017

(1) AGP based on Pyritic $S^{=}$ content (%$S^{=}$ x 31.25). AGP, ANP and NNP in units of tons $CaCO_3$ equivalents per 1,000 st of solids.

Figures

Figure 1. – Simplified mill process flow diagram



Environmental Specialist
Ouray Silver Mines
06/04/21

Appendix 1
For Construction Drawings

sn	DESCRIPTION
Area Drawings	
100-GA	General Arrangement Site Plan
100-SS	Structural Steel Typical Details
200-FF	Crushing Area Foundation
200-GA	Crushing Area General Arrangement
200-MC	Crushing Area Platework
200-MP	Crushing Area Piping
200-SS	Crushing Area Structural Steel
300-FF	Mill and Flotation Foundation
300-GA	Mill and Flotation General Arrangement
300-MC	Mill and Flotation Platework
300-MP	Mill and Flotation Piping
300-SS	Mill and Flotation Structural Steel
400-GA	Concentrate Area General Arrangement
500-FF	Transformer Roof Foundation
500-GA	Tailing Filtration General Arrangement
500-MP	Tailing Filtration Piping
500-SS	Transformer Roof Structural Steel
700-FF	Reagent & Compressor Foundation
700-GA	Reagent & Compressor General Arrangement
700-MC	Reagent & Compressor Platework
700-MP	Reagent & Compressor Piping
700-SS	Reagent & Compressor Structural Steel
800-MP	Tailings Thickener Piping
MF	Process Flow Diagram
PI	Process Control Diagram
Crushing	
200-FEM-01	Pan Feeder
200-CVB-01	ROM Ore Conveyor
200-HTM-03	~~Magnet Hoist (Manual)~~
200-CVB-02	Primary Crusher Discharge Conveyor
200-SCT-01	Secondary Crusher Screen
200-CVB-03	Secondary Crusher Discharge Conveyor
200-WTM-01	Crushed Ore Weightometer
200-PPS-02	Crushing Area Sump Pump
200-PPS-04	Feeder Area Sump Pump
300-PPS-03	Crushing Area Sump Pump
Milling	

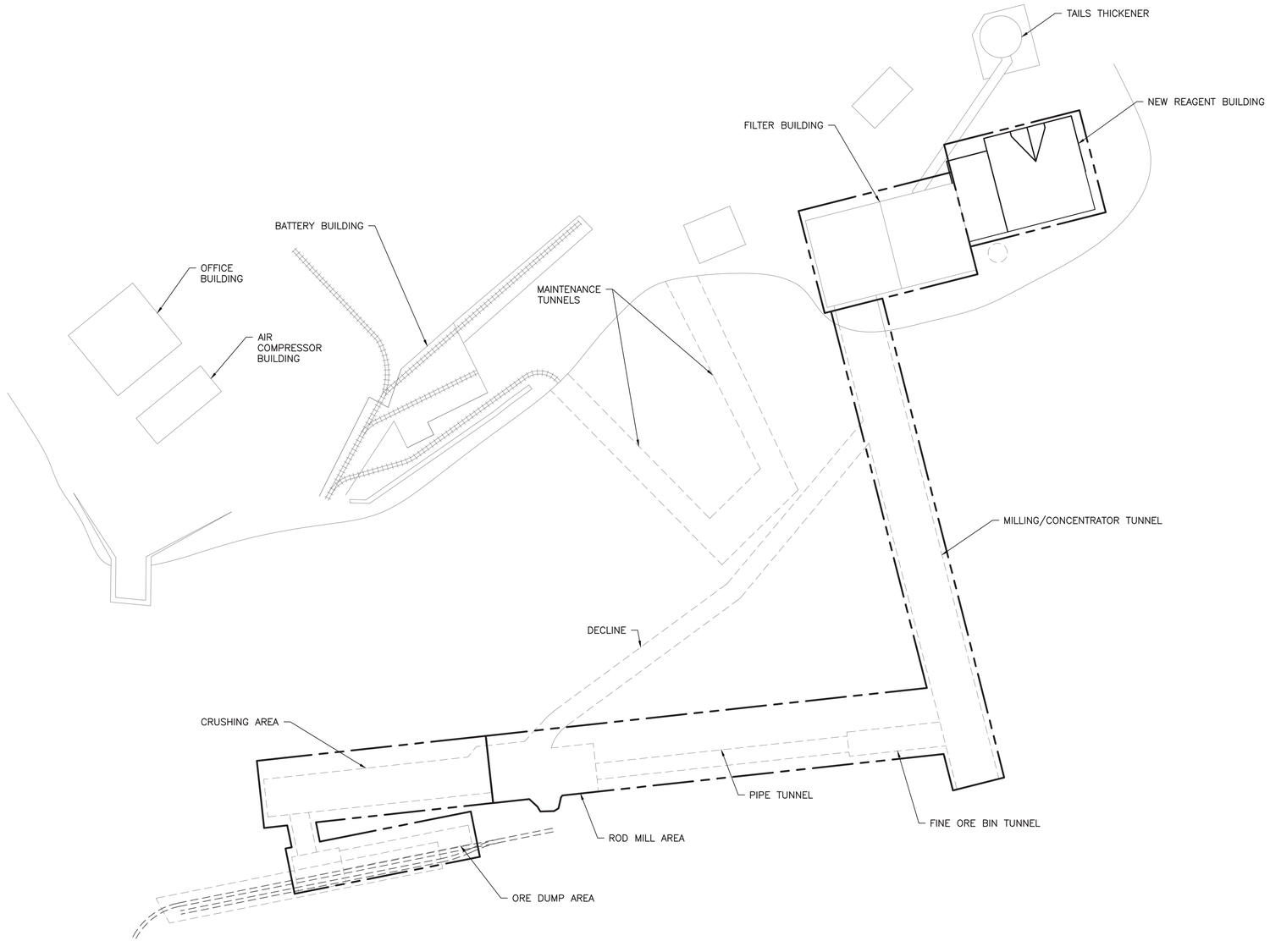
300-ZM-31	Rod Mill Gear Spray System
300-ZM-32	Rod Charger
	~~Rod Mill Hydraulic Jack~~
300-PPC-31A	Rod Mill Discharge Pump #1
300-PPC-31B	Rod Mill Discharge Pump #2
300-AGA-30	~~Rod Mill Discharge Storage Tank Agitator~~
300-PPC-33A-B	~~Rod Mill Discharge Transfer Pump #1~~
Screen	Derrick Stack Sizer
Ball mill	~~spiral feed trunnion liner~~
Rod Mill	Trommel
Rod Mill	Liners
Rod Mill	Rod mill Motor
Classification	
300-FEC-01	Ball Mill Feed Screw Conveyor
Copper/Lead Floatation	
300-AGA-01	Cu/Pb Conditioning Tank Agitator
300-PPC-02A	Cu/Pb Rougher Flotation Feed Pump
300-PPC-02B	Cu/Pb Rougher Flotation Feed Pump
300-FCC-30	Cu/Pb Rougher Flotation Tank Cell
300-PPB-04	Cu/Pb Rougher Flotation Concentrate By-Pass Pump
300-PPB-01	Cu/Pb Rougher Flotation Tails Pump
300-FCC-32A	Cu/Pb Cleaner Flotation Tank Cell #1
300-FCC-32B	Cu/Pb Cleaner Flotation Tank Cell #2
300-PPB-13	Cu/Pb Cleaner Flotation Tank Cell #1 Tails Pump
300-PPB-14	Cu/Pb Cleaner Flotation Tank Cell #2 Tails Pump
300-BLT-04	Flotation Blower
300-PPB-15	Cu/Pb Cleaner Flotation Bank #1 Tails Pump
Zinc Floatation	
300-AGA-02	Zn Conditioning Tank #1 Agitator
300-AGA-03	Zn Conditioning Tank #2 Agitator
300-PPC-37A	Zn Rougher Flotation Feed Pump
300-PPC-37B	Zn Rougher Flotation Feed Pump
300-FCC-31	Zn Rougher Flotation Tank Cell
300-PPB-05	Zn Rougher Flotation Concentrate Pump
300-PPB-02	Zn Rougher Scavenger Flotation Feed Pump
Lead Concentrate Thickening,	
400-THR-01	Cu/Pb Concentrate Thickener
400-PPC-08A	Cu/Pb Concentrate Thickener U/F Pump #1
400-PPC-08B	Cu/Pb Concentrate Thickener U/F Pump #2

400-AGA-02	Pb Concentrate Filter Feed Tank Agitator
400-PPS-03	Concentrate Area Sump Pump
Zinc Concentrate Thickening	
400-THR-02	Zn Concentrate Thickener
400-PPC-21A	Zn Concentrate Thickener U/F Pump #1
400-PPC-21B	Zn Concentrate Thickener U/F Pump #2
400-AGA-01	Zn Concentrate Filter Feed Tank Agitator
400-PPB-24	Cu/Pb/Zn Concentrates Thickener O/F Pump
Tailings Thickening and Filtration	
500-PPC-01A	Tailings Filter Feed Pump #1
500-PPC-01B	Tailings Filter Feed Pump #2
Reagents	
700-PPM-22	Diaphragm)
700-PPM-01	Xanthate Distribution Pump
700-PPM-02	Xanthate Distribution Pump
700-PPM-23	Diaphragm)
700-PPM-03	Copper Sulphate Distribution Pump
700-PPM-24	Diaphragm)
700-PPM-04	Zinc Sulphate Distribution Pump
700-PPM-05	Zinc Sulphate Distribution Pump
700-PPM-15	MIBC Transfer Drum Pump
700-PPM-25	MIBC Transfer Pump (Pneumatic Diaphragm)
700-PPM-09	Zn MIBC Distribution Pump
700-PPM-10	Pb MIBC Distribution Pump
700-PPM-08	Pb MIBC Distribution Pump
700-PPM-07	Zn MIBC Distribution Pump
700-PPM-26	Aero 242 Transfer Drum Pump
700-PPM-26	Aero 242 Transfer Pump (Pneumatic Diaphragm)
700-PPM-06	Pb Aero 242 Distribution Pump
700-PPM-19	3418A Transfer Drum Pump
700-PPM-27	3418A Transfer Pump (Pneumatic Diaphragm)
700-PPM-11	3418A Distribution Pump
700-PPM-12	3418A Distribution Pump
700-PPM-13	3418A Distribution Pump
700-PPM-28	Diaphragm)
700-PPM-14	SMBS Distribution Pump
700-PPM-18	SMBS Distribution Pump
700-AGI-22	Hydrated Lime Mixing Tank
700-AGA-22	Hydrated Lime Mixing Tank Agitator

700-PPM-33	Lime Transfer Pump
700-PPM-34A	Lime Recirculation Pump
700-PPM-34B	Lime Recirculation Pump
700-PPS-05	Reagent Building Sump Pump
700-PPM-20	Flocculant Transfer Pump
700-AGA-23	Flocculant Mixing Tank Agitator
700-PPM-16A	Conc. Thickener Flocculant Distribution Pump
700-PPM-16B	Conc. Thickener Flocculant Distribution Pump
700-PPM-16C	Conc. Thickener Flocculant Distribution Pump
700-PPM-17A	Tails Thickener Flocculant Distribution Pump
700-PPM-17B	Tails Thickener Flocculant Distribution Pump
700-PPS-04	Flocculant Area Sump Pump
700-SLP-06	Aero 242 Mixing System
700-SLP-08	3418A Mixing System
700-SLP-04	SMBS Mixing System
700-SLP-01A	Xanthate Mixing System
700-SLP-01B	Xanthate Solution Tank
700-SLP-02A	Copper Sulphate Mixing System
700-SLP-02B	Copper Sulphate Solution Tank
700-SLP-03A	Zinc Sulphate Mixing System
700-SLP-03B	Zinc Sulphate Solution Tank
Fresh Water	
800-PPM-08	Gland Water Pump
800-PPM-09	Gland Water Pump
800-PPC-04	Crusher gallery pump
800-PPC-02A&B	Old reagent room pumps
800-FLF-01	Gland Water Inline Strainer
800-FLF-02	Gland Water Inline Strainer
800-FLF-03	Gland Water Inline Strainer
Compressed Air	
800-CPR-04	Mill Compressor 1
800-CPR-05	Mill Compressor 2
800-PVA-03	Mill Air Receiver
800-ADA-02	Mill Instrument Air Dyer & Non Lube Module
Mill Pumping package	
PUMP package	ALL pumps for mill upgrade. + spare parts packages
Agitator Package	Agitators for all tanks
Electrical and Instrumentation & Misc	
Flotation	Various Upgrades & Shipping by WestPro

Sampling	Head Ore and Conc Auto Samplers
Milling	VFD's and MCC cabinet/soft starts
Milling	Density gauges
Reagents	1000KVA Dry Type Transformer
Flotation	dart package
Transformer	5000 KVA Transformer
800 MCC 01	480V 1200 amp MCC
800 Main Switch	4160 Switch Extension
Mill	Distribution Panel Board
Control Room	module and alarming module, remove Factory Talk,
Mill	Instrumentation Upgrades
Site	Nema Drives/ VFD's

100 Area Drawings



1 PLAN: OVERALL SITE
1"=40' APPROXIMATE

COLORADO LICENSED
DAVID SCOTT MICKELSEN
PE.0052024
PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	DSM	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
	DATE RELEASED						

CLIENT	4/14/17	4/28/17
BID		4/28/17
CONSTRUCTION		4/28/17

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/15/17
Drawn	DAK
Checked	PGJ
Designed	DAK/DTJ
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
SITE PLAN

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No.
DWG. No. 100-GA-001
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\784A8AA-BEE7-4FF8-939B-877E917B0935\5EFA2210-7792-40A0-B6DC-8E9F43E4BD56\0646100100_100-GA-001.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 9:37 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

GENERAL STRUCTURAL NOTES:

1. ALL WORK SHALL COMPLY WITH THE 2006 INTERNATIONAL BUILDING CODE.
2. ALL WORK SHALL COMPLY WITH ASCE 7-05 – MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.
3. ALL WORK SHALL COMPLY WITH MINE SAFETY AND HEALTH ADMINISTRATION REGULATIONS. THESE REGULATIONS ARE FOUND IN TITLE 30 OF THE CODE OF FEDERAL REGULATIONS.
4. THE DESIGN DRAWINGS REPRESENT THE FINISHED DESIGN. THE DESIGN DRAWINGS DO NOT REPRESENT OR CONVEY THE MEANS AND METHODS OF CONSTRUCTION. THE CONTRACTOR SHALL DESIGN AND PROVIDE ANY SUPPORTS NECESSARY TO BRACE, SUPPORT, STABILIZE AND MAINTAIN ALIGNMENT WHILE ERECTING STRUCTURES. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, PROCEDURES, PROCUREMENTS, SEQUENCES, AND CONSTRUCTION SAFETY ON THE JOB SITE.
5. WORK SHALL COMPLY WITH THE 2009 INTERNATIONAL ENERGY CODE.
6. LOADS:
   - 6.1. DEAD LOADS – UNLESS OTHERWISE NOTED, DEAD LOADS HAVE BEEN CALCULATED AS THE WEIGHTS OF MATERIALS AND PERMANENT EQUIPMENT (20 PSF MINIMUM USED FOR DESIGN OF UNDERGROUND PROCESS RELATED STRUCTURES).
   - 6.2. FLOOR LIVE LOADS – 100 PSF TYPICAL INSIDE PROCESSING PLANT. THIS LOAD MAY BE REDUCED TO 80 PSF FOR COLUMNS SUPPORTING MULTIPLE LEVELS OF FLOORS. REFER TO DRAWING 950-SS-001 FOR LIVE LOAD AT DRY ROOM ADDITION.
   - 6.3. ROOF LIVE LOADS – 20 PSF
   - 6.4. SNOW LOADS – FLAT ROOF SNOW LOAD OF 135 PSF TYPICAL. FOR NEW BUILDINGS CONSTRUCTED ADJACENT TO THE MOUNTAINSIDE, A FLAT ROOF SNOW LOAD OF AT LEAST 185 PSF IS USED PER OWNER.
   - 6.5. WIND LOADS FOR DRY ROOM ADDITION AND SWITCHYARD BUILDING – ASCE 7-05 WITH 130 MPH WIND, EXP C, Kzt = 1, Kd = 0.85, AND IMPORTANCE FACTOR OF 1.0 (NOTE – HIGHER DESIGN WIND LOAD DUE TO PROXIMITY TO CONTROLLED AVALANCHE CORRIDOR). NOTE: SWITCHYARD BUILDING UPLIFT WAS DESIGNED TO THE WORST CASE OF: (0.6 DEAD LOAD + 0.5 SNOW LOAD + WIND UPLIFT LOAD BASED ON 130 MPH) AND (0.6 DEAD LOAD + WIND UPLIFT LOAD BASED ON 90 MPH). SINCE THE 130 MPH WIND REQUIREMENT IS BASED ON AN AVALANCHE SUCTION FORCE AND NOT AN ACTUAL WIND LOAD, IT SEEMED OVERLY CONSERVATIVE TO ASSUME THERE WOULD NOT BE SNOW ON ROOF.
   - 6.6. WIND LOADS FOR ADDITIONS TO THE EXISTING FILTER BUILDING (REAGENT BUILDING, GENSET BUILDING, CRICKET) ARE DESIGNED TO ASCE 7-05 WITH 90 MPH WIND, EXP C, Kzt = 1, Kd = 0.85, AND AN IMPORTANCE FACTOR OF 1.15
   - 6.7. WIND LOADS IN THE PROCESSING PLANT INSIDE THE MOUNTAIN SHALL BE TAKEN AS ZERO. HOWEVER, THESE STRUCTURES WILL STILL BE DESIGNED FOR SEISMIC LOAD AND STABILITY REQUIREMENTS OF CODE.
   - 6.8. SEISMIC LOADS – Ss = 0.435g, S1 = 0.097g, SITE CLASS D (ASSUMED), Fa = 1.452, Fv = 2.4, Sms = 0.631g, Sm1 = 0.234g, Sds = 0.421g, Sd1 = 0.156g, SEISMIC PERFORMANCE CATEGORY C, OCCUPANCY CATEGORY II, I = 1.0
7. GEOTECHNICAL DESIGN INFORMATION:
   - 7.1. A SPECIFIC GEOTECHNICAL INVESTIGATION WAS NOT COMPLETED FOR THIS PROJECT, AND WERE NOT DIRECTLY AVAILABLE FOR THE STRUCTURAL DESIGN. DESIGN CAPACITIES OF SOIL ARE BASED ON PREVIOUS DESIGNS WHICH WERE ASSUMED TO BE BASED ON PREVIOUS GEOTECHNICAL INVESTIGATIONS.
   - 7.2. FOUNDATIONS INSIDE THE PROCESSING PLANT WITHIN THE MOUNTAIN TUNNELS SHALL BE DESIGNED FOR AN ALLOWABLE BEARING PRESSURE OF 3500 PSF BASED ON CH2M HILL DRAWING 100-S-002 REV 1
   - 7.3. ADDITIONS TO THE EXISTING FILTER BUILDING (REAGENT BUILDING, GENSET BUILDING). SOIL IS ANTICIPATED TO BE VERY SHALLOW OVER ROCK FOR THESE FOUNDATIONS. NEW FOUNDATIONS ARE ASSUMED TO BEAR DIRECTLY ON THIS ROCK AND BE DESIGNED FOR 8500 PSF CAPACITY TO MATCH THE EXISTING STAR MINE OPERATIONS DRAWING S-2 DATED 6-13-13.
   - 7.4. THE DRY ROOM ADDITION WILL USE AN ALLOWABLE BEARING PRESSURE OF 3000 PSF BASED ON BUCKTHORN GEOTECH DRAWING S1.1 OF THE EXISTING DRY ROOM FACILITY.
   - 7.5. BATTERY BUILDING FOUNDATIONS ARE DESIGNED BASED ON A NET BEARING CAPACITY OF 2000 PSF. THIS IS BASED ON CH2M HILL DRAWING 100-S-002 REV 1 FOR STRUCTURES OUTSIDE THE TUNNEL.
   - 7.6. FROST DEPTH – 6 FEET MINIMUM FOR FOOTINGS SITTING ON FILL PER OWNER
8. COMPLIANCE WITH LOCAL, STATE AND FEDERAL ENVIRONMENTAL REGULATIONS IS THE RESPONSIBILITY OF THE OWNER AND IS NOT CONTAINED IN THESE DRAWINGS.
9. THE CONTRACTOR SHALL LOCATE ALL EXISTING STRUCTURES AND UTILITIES, SUCH AS ELECTRICAL CABLES, WATER AND PROCESS LINES, ETC. THE CONTRACTOR SHALL EXERCISE CAUTION TO NOT DAMAGE SUCH ITEMS DURING CONSTRUCTION. NOTIFY ENGINEER IF ANY EXISTING BURIED UTILITIES INTERFERE WITH NEW DESIGN.
10. PRIOR TO FABRICATION AND CONSTRUCTION, THE CONTRACTOR SHALL VERIFY ALL EXISTING ELEVATIONS AND DIMENSIONS ASSOCIATED WITH THE WORK. ADDITIONALLY, CONTRACTOR SHALL VERIFY ALL REQUIRED DIMENSIONS, CERTIFIED VENDOR DRAWING DIMENSIONS, MEMBER SIZES AND ELEVATIONS PRIOR TO INITIATING FABRICATION OR CONSTRUCTION. CONFLICTS BETWEEN THE DESIGN DRAWINGS AND ACTUAL CONDITIONS SHALL BE COMMUNICATED TO THE ENGINEER OF RECORD PRIOR TO CONTINUATION OF WORK IN THAT AREA OF THE PROJECT.
11. SPECIAL INSPECTION AND OBSERVATION SHALL BE PROVIDED IN COMPLIANCE WITH CHAPTER 17 OF THE 2006 INTERNATIONAL BUILDING CODE (AND ANY LOCAL AND STATE INSPECTION / OBSERVATION REQUIREMENTS). THIS WORK IS OWNER FURNISHED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING CONSTRUCTION WORK SCHEDULE WITH SPECIAL INSPECTOR(S) IN ORDER TO GUARANTEE NECESSARY CONSTRUCTION ITEMS ARE INSPECTED AT PROPER TIMES.
12. THE STRUCTURAL AND FOUNDATION DRAWINGS ARE PART OF THE CONSTRUCTION DOCUMENTS FOR THIS PROJECT, AND ARE TO BE USED IN CONJUNCTION WITH THE COMPLETE SET OF DRAWINGS AND SPECIFICATIONS WHICH MAKE UP THE CONSTRUCTION DOCUMENTS FOR THIS PROJECT.
13. CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON FRAMED FLOORS OR ROOF. LOAD PRESSURE SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT.
14. WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND / OR ADDENDUM.
15. TYPICAL DETAILS FOUND ON DRAWINGS 100-SS-101 AND 100-SS-102 MAY OR MAY NOT BE REFERENCED ON DRAWINGS, BUT SHALL APPLY UNLESS NOTED OTHERWISE.
16. NOTIFY ENGINEER OF RECORD OF ANY DISCREPANCIES BETWEEN PLANS, ELEVATIONS, DETAILS, SPECIFICATIONS AND STRUCTURAL NOTES.
17. SITE IS ACCESSED BY A SMALL COUNTY ROAD WITH AT LEAST ONE SWITCH-BACK, AND OTHER LOCATIONS WITH LIMITED TRAVEL HEIGHT. CONTRACTOR, ALONG WITH STRUCTURAL DETAILERS AND FABRICATORS SHOULD DETERMINE WHAT SIZE ITEMS CAN BE SHIPPED, AND WHAT ITEMS WILL REQUIRE FIELD SPLICES. SUBMIT PROPOSED FIELD SPLICES TO ENGINEER FOR APPROVAL.
18. ROCK ANCHORS SHALL BE AS CALLED OUT ON THE DRAWINGS. ROCK SURFACES TO BE SPECIAL INSPECTED AND DOCUMENTED BY OWNER GEOTECHNICAL ENGINEER PRIOR TO ANCHOR INSTALL TO VERIFY SUITABILITY FOR ANCHORAGE.

CONCRETE NOTES:

1. ALL WORK SHALL COMPLY WITH ACI 318-05 – BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
2. ALL CONCRETE SHALL BE DESIGNED, MIXED AND PLACED IN ACCORDANCE WITH ACI 301 – SPECIFICATIONS FOR STRUCTURAL CONCRETE
3. COLD AND HOT WEATHER CONCRETING REQUIREMENTS SHALL BE ADHERED TO WHEN TEMPERATURES ARE BELOW 40 DEG F OR ABOVE 90 DEG F. REFER TO ACI 301, ACI 305R, AND ACI 306R.
4. CEMENT: PER ASTM C150, TYPE II
5. AGGREGATES: NORMAL WEIGHT PER ASTM C33
6. READY MIXED CONCRETE SHALL COMPLY WITH ASTM C94 – STANDARD SPECIFICATION FOR READY-MIXED CONCRETE.
7. ALL CONCRETE SHALL BE AIR-ENTRAINED WITH AN AIR CONTENT OF 6% (+/- 1.5%) OF THE VOLUME OF CONCRETE AS MEASURED AT THE POINT OF DISCHARGE FROM THE MIXER. AIR ENTRAINED MIXTURES SHALL CONFORM TO ACI 301.
8. CONCRETE SHALL BE DESIGNED WITH A 28 DAY STRENGTH OF 4500 PSI AND A MAXIMUM AGGREGATE SIZE OF 1 INCH. MAXIMUM WATER TO CEMENT RATIO SHALL BE 0.45.
9. CURING OF CONCRETE SHALL BE STARTED AFTER PLACING AND FINISHING AS SOON AS THE SURFACE CONDITIONS ARE SUITABLE. CURING METHODS AND PROCEDURES SHALL CONFORM TO ACI 308 – STANDARD PRACTICE FOR CURING CONCRETE.
10. TEST SPECIMENS SHALL BE MADE AND CURED IN ACCORDANCE WITH ASTM C31 OR ASTM C192. COMPRESSIVE STRENGTH TESTING SHALL BE DONE IN CONFORMANCE WITH ASTM C39. CONCRETE SAMPLES SHALL BE MADE AND TESTED BY AN OWNER APPROVED CONCRETE TESTING CONTRACTOR UTILIZING QUALIFIED TECHNICIANS.
11. STRENGTH TESTS OF CYLINDERS AGED 7 DAYS AND 28 DAYS SHALL BE RECORDED THROUGHOUT THE DURATION OF THE WORK FOR EACH DAY CONCRETE IS PLACED.
12. CYLINDERS SHALL BE TAKEN AT THE FOLLOWING INTERVALS:
    - 12.1. FOR EACH DAY OR 150 CUBIC YARDS OF CONCRETE PLACED, FOUR CYLINDERS SHALL BE MOLDED AND CURED UNDER FIELD CONDITIONS FOR TESTING ONE AT 7 DAYS, TWO AT 28 DAYS, AND ONE SPARE TO BE SAVED FOR FUTURE TESTING IF REQUIRED.
    - 12.2. FOR EACH DAY OR 150 CUBIC YARDS OF CONCRETE PLACED, FOUR ADDITIONAL CYLINDERS SHALL BE MOLDED AND CURED UNDER LAB CONDITIONS FOR TESTING ONE AT 7 DAYS, TWO AT 28 DAYS, AND ONE SPARE TO BE SAVED FOR FUTURE TESTING IF REQUIRED.
13. THE CONCRETE TESTING CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY BY TELEPHONE AND SUBMIT WRITTEN RECOMMENDATIONS FOR CORRECTIVE ACTION WITHIN 24 HOURS WHEN A TEST INDICATES ANY OF THE FOLLOWING:
    - 13.1. THE 28 DAY STRENGTH TEST OF ANY CYLINDER IS LESS THAN 85% OF SPECIFIED.
    - 13.2. THE AVERAGE OF THE TWO 28 DAY TESTS ARE LESS THAN SPECIFIED.
    - 13.3. THE STRENGTH OF 28 DAY CYLINDERS TESTED TO VERIFY CURING AND PROTECTION METHODS IS LESS THAN 85% OF THE COMPANION LABORATORY CURED CYLINDERS.
    - 13.4. THE STRENGTH OF A 7 DAY CYLINDER IS LESS THAN 60% OF THE DESIGN 28 DAY STRENGTH
14. ALL DAMAGED CONCRETE SHALL BE REPLACED AT THE CONTRACTORS EXPENSE.
15. CONTRACTOR SHALL SUPPLY ALL CONCRETE, REINFORCING BARS, BAR SUPPORTS, FORMS, ANCHOR RODS, GROUT, ADHESIVE, SEALANTS, FILLER, BACKING RODS, AND ANYTHING ELSE REQUIRED FOR CONSTRUCTION THAT IS COMPLIANT WITH THIS DESIGN PACKAGE. CONCRETE MIX DESIGNS SHALL BE DESIGNED BY THE CONCRETE SUPPLIER UTILIZED BY THE CONTRACTOR. CONCRETE MIX DESIGNS SHALL BE REVIEWED BY THE ENGINEER OF RECORD PRIOR TO USE ON THE PROJECT.
16. REINFORCING BARS: ASTM A615 GRADE 60, UNLESS NOTED OTHERWISE.
17. UNLESS OTHERWISE APPROVED BY OWNER'S FIELD REPRESENTATIVE, BAR SUPPORTS SHALL BE PRE-CAST CONCRETE BLOCKS WHEN CONCRETE IS CAST ON GRADE, OR CRSI CLASS 3 BRIGHT BASIC WHERE CONCRETE WILL NOT BE EXPOSED TO VIEW.
18. TEMPORARY COVERS SHALL BE PLACED ON VERTICAL BARS WHERE THERE IS A DANGER OF IMPALEMENT. REINFORCING STEEL SHALL REMAIN FREE OF OIL AND OTHER CONTAMINANTS.
19. JOINT SEALANT COMPOUND. USE SONOLASTIC PAVING JOINT SEALANT FOR HORIZONTAL EXPANSION AND ISOLATION JOINTS, OR ENGINEER APPROVED EQUAL. USE SONOLASTIC SL-1 FOR SAWCUT CONTROL JOINTS, OR ENGINEER APPROVED EQUAL. USE SIKAFLEX-1a FOR VERTICAL JOINTS, OR ENGINEER APPROVED EQUAL.
20. JOINT PREPARATION AND APPLICATION OF THE SEALANT SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
21. BACKING ROD SHALL BE ROUND, PRE-FORMED, OF RESILIENT MATERIAL, AND MADE OF CLOSED CELL MATERIAL CONFORMING TO ASTM C1330, TYPE C. BACKING ROD SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS.
22. MINIMUM CLEAR COVER FOR REINFORCING BARS SHALL BE AS FOLLOWS:
    - 22.1. 3" COVER FOR CONCRETE EXPOSED AGAINST EARTH OR VOID FORMS
    - 22.2. 2" COVER FOR CONCRETE EXPOSED TO EARTH OR WEATHER (EARTH OR WEATHER IS DEFINED IN ACI 318 R7.7)
    - 22.3. 1 1/2" COVER FOR CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND.
23. REINFORCING SPLICES SHALL BE CLASS B LAP SPLICES IN ACCORDANCE WITH CHAPTER 12 OF ACI 318.
24. WELDING OR THE USE OF METAL COUPLERS ON REINFORCING IS PROHIBITED EXCEPT WITH PRIOR APPROVAL FROM THE ENGINEER.
25. ALL EXPOSED EDGES OF CONCRETE SHALL BE FORMED TO A 3/4" CHAMFER.
26. ANCHOR RODS: ASTM F1554 GRADE 36, UNLESS NOTED OTHERWISE. PROVIDE ASTM A36 PLATE WASHERS PER AISC STEEL MANUAL TABLE 14-2, AND ASTM A563 HEAVY HEX NUTS.
27. ALL ANCHOR ROD GROUPS SHALL BE SUPPORTED AND SET USING A TEMPLATE WITH THE EMBEDDED ENDS SECURELY TIED TO PREVENT DISPLACEMENT DURING THE PLACEMENT OF CONCRETE. FIELD WELDING TO THE ANCHOR RODS IS NOT PERMITTED.
28. BEFORE PLACING CONCRETE, ALL DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR TO DETERMINE THAT ALL ANCHOR RODS, EMBEDDED STEEL, PIPING, CONDUITS, DRAINS, BOXES, ETC. ARE PROPERLY INSTALLED.
29. GROUT USED FOR LEVELING BUILDING COLUMNS, SOLE PLATES, ETC. SHALL BE A NON-SHRINK, NON-METAILLIC CEMENTITIOUS GROUT, THAT CONFORMS TO ASTM C1107.
30. GROUT USED FOR EQUIPMENT AND VESSELS SHALL BE W.R. MEADOWS, 588 PRECISION GROUT, OR APPROVED EQUAL.
31. CONTRACTOR SHALL PLACE GROUT ACCORDING TO MANUFACTURERS RECOMMENDATIONS, INCLUDING SURFACE PREPARATION, FORMING, MIXING, PLACEMENT AND CURING.
32. UNLESS NOTED OTHERWISE, TYPICAL POST INSTALLED ANCHORS / REINFORCING BAR ON THIS PROJECT SHALL UTILIZE HILTI HIT-HY 200 ADHESIVE. POST-INSTALLED ANCHORS SHALL BE HILTI HAS-E MATERIAL UNLESS NOTED OTHERWISE. WITH ENGINEERS APPROVAL, ASTM A572, GRADE 50 ALL-THREAD MAY BE USED IN LIEU OF HAS-E ANCHORS.
33. PORTIONS OF REINFORCING BARS EMBEDDED INTO EXISTING CONCRETE WITH ADHESIVE MUST BE STRAIGHT AND FREE OF ALL MILL SCALE, RUST AND OTHER COATINGS THAT MAY IMPAIR THEIR BOND WITH THE ADHESIVE.
34. THREADED RODS USED WITH ADHESIVE MUST BE CLEAN AND CONTINUOUSLY THREADED.
35. CONTRACTOR MAY POUR SLABS-ON-GRADE CONTINUOUS AND SAW CUT CONTROL JOINTS WITHIN 4 TO 12 HOURS AFTER POURING.
36. SLABS AND FOOTINGS SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE UNLESS NOTED OTHERWISE.
37. PROVIDE SLEEVES FOR MECHANICAL OR ELECTRICAL SERVICES IN CONCRETE PRIOR TO PLACING CONCRETE. VERIFY ALL OPENINGS WITH MECHANICAL AND ELECTRICAL DRAWINGS. DO NOT CUT ANY REINFORCING THAT MAY CONFLICT.
38. WATERSTOPS SHALL BE AS SPECIFIED ON THE DRAWINGS.
39. WATER-PROOFING MEMBRANE SHALL BE BITUTHENE 3000 BY GCP APPLIED TECHNOLOGIES, OR EQUAL.
40. SUBMIT REBAR SHOP DRAWINGS FOR ENGINEER REVIEW.

STRUCTURAL STEEL NOTES:

1. ALL WORK SHALL COMPLY WITH AISC 360-05 – SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
2. STRUCTURAL BOLTING SHALL COMPLY WITH RCSC SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS DATED JUNE 30, 2004.
3. IN GENERAL, WORK SHALL COMPLY WITH AISC 303-05 – CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES.
   - 3.1. MUCH OF THE WORK RELATED TO THIS PROJECT INVOLVES MODIFICATION OF EXISTING STRUCTURES. A PORTION OF THE DEMOLITION MAY OR MAY NOT BE COMPLETED BY THE OWNER PRIOR TO THE BEGINNING OF THIS PROJECT. THE GENERAL CONTRACTOR SHALL BECOME FAMILIAR WITH WHAT DEMOLITION AND STRUCTURAL MODIFICATIONS OF EXISTING STRUCTURES THAT THE OWNER WILL COMPLETE / HAS COMPLETED VERSUS WHAT IS REMAINING WHICH THE CONTRACTOR WILL NEED TO COMPLETE.
   - 3.2. GENERAL CONTRACTOR IS RESPONSIBLE FOR UNDERSTANDING THE BREAKDOWN OF WORK RESPONSIBILITIES DESCRIBED IN AISC 303. IT IS THE GENERAL CONTRACTOR'S RESPONSIBILITY TO ENSURE THE COMPLETE STRUCTURAL DESIGN PACKAGE IS FABRICATED AND CONSTRUCTED. IF DELINEATIONS OF WORK RESPONSIBILITIES LISTED IN AISC 303 IS NOT HOW THE GENERAL CONTRACTOR WOULD LIKE TO DISTRIBUTE THE WORK, THEN IT IS THE GENERAL CONTRACTORS RESPONSIBILITY TO CLEARLY DESCRIBE TO RELEVANT PARTIES WHAT WORK THOSE PARTIES ARE RESPONSIBLE FOR COMPLETING. THIS IS PARTICULARLY RELEVANT IN TERMS OF DEMOLITION WORK AND STRUCTURAL MODIFICATION WORK.
4. WIDE FLANGE BEAMS AND WT SHAPES: ASTM A992
5. PLATES, CHANNELS, S-SHAPES AND ANGLE SHAPES: ASTM A36
6. SQUARE AND RECTANGULAR HSS – ASTM A500, GRADE B, Fy = 46 KSI.
7. ROUND HSS AND STRUCTURAL PIPE – ASTM A500, GRADE B, Fy = 42 KSI. (IF PIPES ARE CALLED OUT ON DRAWINGS, USE THE SAME SHAPE AS AN HSS SECTION)
8. ALL BEAMS SHALL BE ERECTED WITH NATURAL CAMBER UPWARD.
9. UNLESS NOTED OTHERWISE, BOLTED CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS UTILIZING 3/4" DIAMETER ASTM F3125 GRADE A325 OR F1852 BOLTS WITH ONE HEAVY HEX ASTM A563 GRADE C NUT AND ASTM F436 TYPE 3 WASHER UNDER THE TURNED ELEMENT.
10. DOUBLE CLIP ANGLE CONNECTIONS SHALL BE MADE WITH 5/16" OR THICKER ANGLES.
11. GUSSET PLATES SHALL BE MADE WITH 3/8" OR THICKER PLATES.
12. STANDARD BOLT HOLES SHALL BE UTILIZED UNLESS OTHERWISE NOTED. STANDARD BOLT HOLES SHALL BE 1/16" LARGER DIAMETER THAN THE BOLT DIAMETER.
13. UNLESS NOTED OTHERWISE, TYPICAL BEAM END CONNECTIONS SHALL BE DOUBLE CLIP ANGLE BOLTED/WELDED CONNECTIONS PER AISC STEEL CONSTRUCTION MANUAL TABLE 10-2 CASE 1. OUTSTANDING LEGS TO BE BOLTED WITH n=2 FOR C8, W8, C10, AND W10 MEMBERS, n=3 FOR C12, W12, AND W14 MEMBERS, n=4 FOR C15 AND W16 MEMBERS, n=5 FOR W18 MEMBERS, n=6 FOR W21 MEMBERS, n=7 FOR W24 MEMBERS. TYPICAL WELD SIZE SHALL BE 1/4" UNLESS NOTED OTHERWISE.
14. NEW BEAM MEMBERS CONNECTED TO EXISTING STRUCTURAL STEEL COLUMNS, EXISTING BEAMS, OR EXISTING GIRDERS SHALL BE PER TYPICAL DETAIL 3 ON DRAWING 100-SS-101.
15. TYPICAL VERTICAL SINGLE AND DOUBLE ANGLE BRACE CONNECTIONS ARE PER TYPICAL DETAILS 1 THROUGH 6 ON DRAWING 100-SS-102.
16. TYPICAL HORIZONTAL BRACE SINGLE ANGLE CONNECTIONS ARE PER TYPICAL DETAIL 7 ON DRAWING 100-SS-102.
17. ALL DOUBLE ANGLE MEMBERS SHALL BE CONNECTED WITH STITCH PLATES AS REQUIRED FOR THE COMBINED SECTION TO ACT AS ONE UNIT. AT A MAXIMUM, ANGLES SHALL BE CONNECTED WITH WELDED OR BOLTED STITCH PLATES AT 6'-0" O.C. STITCH PLATES SHALL ALSO BE SPACED CLOSER THAN 3/4 THE LENGTH OF THE MEMBER TIMES THE RATIO OF THE LEAST RADIUS OF GYRATION FOR A SINGLE ANGLE DIVIDED BY THE LEAST RADIUS OF GYRATION OF THE COMBINED ANGLE SECTION. AT LEAST ONE STITCH PLATE PER MEMBER SHALL BE USED.
18. ALL WELDING SHALL BE DONE IN ACCORDANCE WITH AWS D1.1 – STRUCTURAL WELDING CODE – STEEL.
19. ALL WELDERS SHALL BE CERTIFIED PER AWS D1.1 REQUIREMENTS.
20. ALL WELDING SHALL BE ELECTRIC ARC TYPE. WELD ELECTRODES SHALL BE E70XX.
21. STRUCTURAL STEEL SHALL HAVE SSPC-SP6 NACE#3 PREPARATION WITH SHERWIN WILLIAMS MACROPOXY 646-100 OR MACROPOXY 646-FAST CURE SHOP EPOXY COATING SYSTEM, INSTALLED IN ACCORDANCE WITH SHERWIN WILLIAMS CORP. PAINT SPECIFICATION STANDARDS. CONTRACTOR TO TOUCH UP ANY DAMAGED COATINGS IN THE FIELD.
22. UNLESS NOTED OTHERWISE, BAR GRATING SHALL BE RECTANGULAR WELDED CARBON STEEL BAR GRATING (TYPE W-19) CONFORMING TO ASTM A569 WITH 1 1/4"x3/16" BEARING BARS AND CROSS BARS AT 4" O.C. GRATING FOR EXTERIOR STAIR AND PLATFORM APPLICATIONS SHALL HAVE SERRATED BEARING BARS (SIZE AS NOTED ON DRAWINGS). BAND ALL EDGES. PROVIDE MEBAC NOSINGS AT STAIR TREADS AND AT THE HEAD OF ALL STAIRWAYS.
23. ALL NEW INTERIOR BAR GRATING (INCLUDING PROCESSING FACILITY INSIDE THE MOUNTAIN) SHALL BE SHOP PAINTED. ALL EXTERIOR BAR GRATING SHALL BE HOT DIP GALVANIZED PER ASTM A123, UNLESS NOTED OTHERWISE.
24. FIELD CUT OPENINGS IN GRATING FOR MECHANICAL AND ELECTRICAL PENETRATIONS AS REQUIRED. PROVIDE 1/4" THICK x 4" TALL STEEL BANDING AROUND ALL OPENINGS.
25. TAKE APPROPRIATE SAFETY PRECAUTIONS WHEN CUTTING OR WELDING EXISTING GALVANIZED STEEL. STRIP GALVANIZING AND TOUCH UP STRIPPED GALVANIZING WITH SHERWIN WILLIAMS ZINC-CLAD II PLUS. NOTE – EXISTING BAR GRATING IS GALVANIZED.
26. ALL SHOP FABRICATED STEEL SHALL BE DETAILED BY A STRUCTURAL DETAILER SPECIALIZING IN STRUCTURAL STEEL DETAILING. SHOP DRAWINGS SHALL BE SUBMITTED FOR ENGINEER OF RECORD REVIEW.
27. ALL LADDERS SHALL BE FURNISHED WITH A SELF CLOSING SAFETY GATE, GALVANIZED WITH A SAFETY YELLOW FINISH COAT AS MANUFACTURED BY PS DOORS, FABRENCO, OR APPROVED EQUAL.
28. METAL ROOFING AND SIDING SHALL BE RECLA METALS ASTM A606 RCM50 (22 GA) OR RCM75 (24 GA). NOTE – SEE INDIVIDUAL STRUCTURES FOR CALLOUTS AS TO WHETHER RCM50 OR RCM75 IS REQUIRED FOR THAT STRUCTURE.
29. METAL ROOFING AND SIDING SHALL BE INSTALLED IN A MINIMUM 3-SPAN CONDITION UNLESS NOTED OTHERWISE.
30. METAL ROOFING TO BE ATTACHED TO STEEL STRUCTURE AT ALL SUPPORT BEAMS OR PURLINS AND AT 8 INCH O.C. MAX SPACING ALONG STEEL MEMBER. TYPICAL ATTACHMENTS SHALL BE MADE USING #12 SELF-TAPPING HEX HEAD SCREWS WITH 5/8"ø METAL BACKED NEOPRENE WASHERS. SIDELAPS SHALL BE ATTACHED TOGETHER USING #10 SCREWS WITH METAL BACKED NEOPRENE WASHERS AT 12" O.C. END LAPS SHALL OCCUR AT SUPPORT STEEL.
31. LAP ROOFING AND SIDING PANELS PER RECLA REQUIREMENTS. APPLY ELASTOMERIC SEALANT OR BUTYL TAPE CONTINUOUS AT ALL LAPS AND AT ALL FLASHING TO SIDING OR ROOFING.
32. FLASHING SHALL BE MADE OF SIMILAR ASTM A606 MATERIAL WITH 22 GA. MIN. THICKNESS.
33. FLASHING AND SEALANTS SHALL BE PROVIDED TO PREVENT WATER INFILTRATION INTO THE BUILDING INTERIOR.
34. BUTYL SEALING TAPE SHALL BE PRESSURE-SENSITIVE, 100 PERCENT SOLIDS, POLYISOBUTYLENE COMPOUND SEALING TAPE WITH RELASE-PAPER BACKING. PROVIDE PERMANENTLY ELASTIC, NONSAG, NONTOXIC TAPE.
35. BUTYL SEALANT SHALL BE ASTM C1311 SINGLE-COMPONENT, SOLVENT-RELEASE BUTYL RUBBER SEALANT, POLYISOBUTYLENE PLASTICIZED, HEAVY BODIED FOR HOOKED-TYPE EXPANSION JOINTS WITH LIMITED.
36. ELASTOMERIC SEALANT SHALL BE ASTM C920 ELASTOMERIC POLYURETHANE POLYMER SEALANT OF TYPE, GRADE, AND CLASSIFICATIONS REQUIRED TO SEAL JOINTS IN SHEET METAL FLASHING AND TRIM AND REMAIN WATERTIGHT.

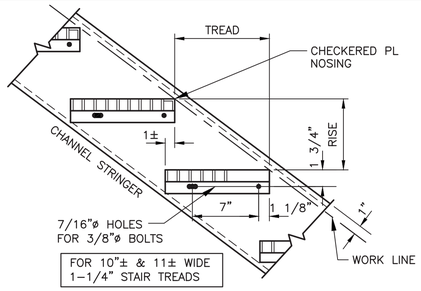
ABBREVIATIONS (WITH OR WITHOUT PERIODS) :

ADJ.	ADJACENT	IN./"	INCHES
ALT.	ALTERNATE	INT.	INTERIOR
APPROX.	APPROXIMATE	ISO.	ISOLATION
AVG.	AVERAGE	JT.	JOINT
BLDG.	BUILDING	K./KIP	1000 LBS.
BLK'G.	BLOCKING	LBS. or #	POUNDS
BM.	BEAM	L.L.	LIVE LOAD
BOT./BOTM.	BOTTOM	L.F.	LINEAL FOOT
B.O. (or B/)	BOTTOM OF	L.P.	LOW POINT
BRG.	BEARING	MANF.	MANUFACTURER
C.J.	CONST./CONTROL JOINT	MAX.	MAXIMUM
C.L. OR ℄	CENTER LINE	MECH.	MECHANICAL
CLR.	CLEAR	MIN.	MINIMUM
CMU	CONC. MASONRY UNIT	MISC.	MISCELLANEOUS
COL.	COLUMN	M.O.	MASONRY OPENING
CONC.	CONCRETE	MSRY.	MASONRY
CONST.	CONSTRUCTION	MTL.	METAL
CONT.	CONTINUOUS	(N)	NEW
CONTR.	CONTRACTOR	NO./#	NUMBER
(D)	DEPTH	N.S.	NEAR SIDE
DBL.	DOUBLE	N.T.S.	NOT TO SCALE
DEG./°	DEGREE	O.C.	ON CENTER
DIA./ø	DIAMETER	O.D.	OUTSIDE DIAMETER
DIM.	DIMENSION	O.F.	OUTSIDE FACE
D.L.	DEAD LOAD	O.H.	OPPOSITE HAND
DN.	DOWN	OPNG.	OPENING
DTL.	DETAIL	OPP.	OPPOSITE
DWG.	DRAWING	O.S.	OPPOSITE SIDE
EA.	EACH	PL. or ℄	PLATE
E.E.	EACH END	PSI.	LBS. PER SQUARE IN.
E.F.	EACH FACE	PSF.	LBS. PER SQUARE FT.
E.J.	EXPANSION JOINT	R. or RAD.	RADIUS
ELEC.	ELECTRICAL	R.D.	ROOF DRAIN
EL.	ELEVATION	REF. or REF.	REFER TO
EQ.	EQUAL	REINF.	REINFORCING
EQUIP.	EQUIPMENT	REQ'D	REQUIRED
E.S.	EACH SIDE	REV.	REVISED
E.W.	EACH WAY	R.O.	ROUGH OPENING
EXIST./(E)	EXISTING	R.T.U.	ROOF TOP UNIT
EXP.	EXPANSION	SCHD.	SCHEDULE
EXT.	EXTERIOR	SECT.	SECTION
F.D.	FLOOR DRAIN	SHT.	SHEET
FDN.	FOUNDATION	SIM.	SIMILAR
F.F.	FINISH FLOOR /FAR FACE	SF.	SQUARE FOOT
F.L.	FRAME LINE	SPECS.	SPECIFICATIONS
FL.	FLOOR	SPS.	SPACES
F.M.	FIELD MEASUREMENT	SQ.	SQUARE
F.S.	FAR SIDE	STD.	STANDARD
FTG.	FOOTING	STL.	STEEL
FT./'	FEET/FOOT	STRUCT.	STRUCTURAL
F.V.	FIELD VERIFY	T&B	TOP & BOTTOM
GA.	GAGE/GAUGE	TEMP.	TEMPORARY
GALV.	GALVANIZED	T.O. (or T/)	TOP OF
G.C.	GENERAL CONTR.	TYP.	TYPICAL
G.L.	GIRT LINE	U.N.O.	UNLESS NOTED OTHERWISE
GYP.	GYPSUM	VERT.	VERTICAL
H.A.S.	HEADED ANCHOR STUD	V.I.F.	VERIFY IN FIELD
HDR.	HEADER	(W)	WIDTH
HORZ./HORIZ.	HORIZONTAL	W/	WITH
H.P.	HIGH POINT	W/O	WITH OUT
HT./(H)	HEIGHT	WT.	WEIGHT
I.F.	INSIDE FACE	W.W.F.	WELDED WIRE FABRIC

STRUCTURAL STEEL AND STRUCTURAL FOUNDATION DRAWING LIST FOR THIS PROJECT:

GENERAL
- 100-SS-100
- 100-SS-101
- 100-SS-102

ORE DUM



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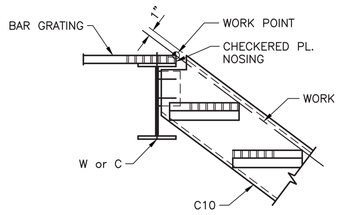

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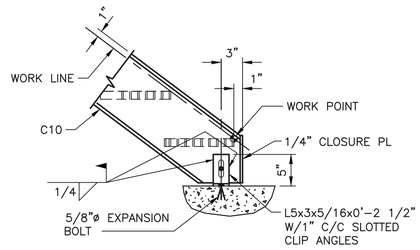

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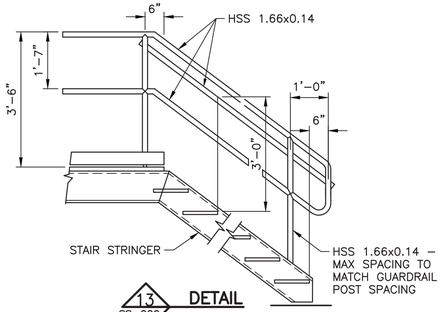

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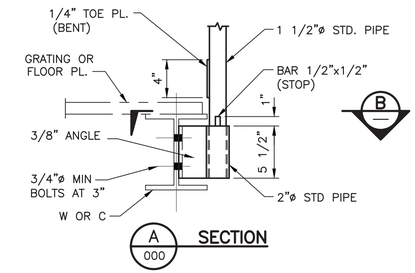

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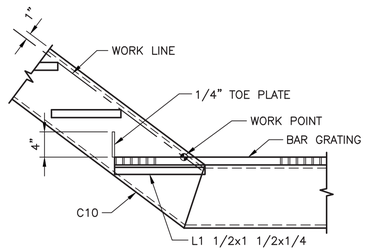

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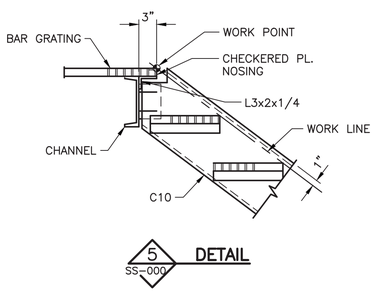

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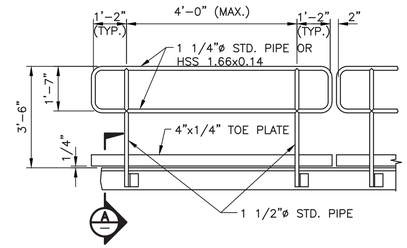

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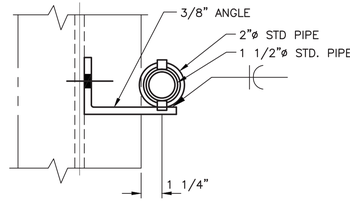
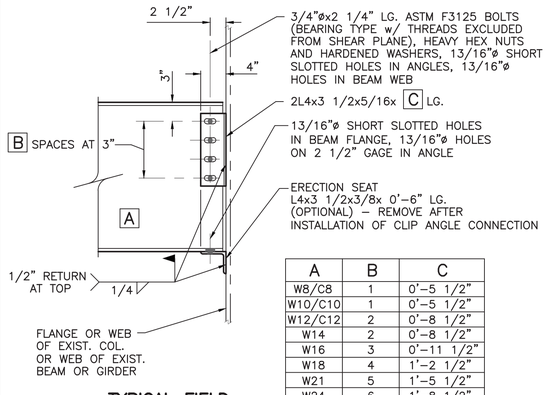
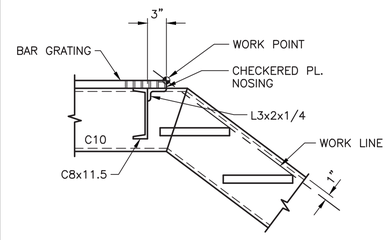




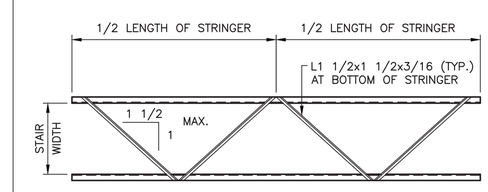
A	B	C
W8/C8	1	0'–5 1/2"
W10/C10	1	0'–5 1/2"
W12/C12	2	0'–8 1/2"
W14	2	0'–8 1/2"
W16	3	0'–11 1/2"
W18	4	1'–2 1/2"
W21	5	1'–5 1/2"
W24	6	1'–8 1/2"

NOTE: NUMBER OF REQ'D BOLTS IN PRIMARY CONN. WILL BE (B+1)

3 00–000 TYPICAL FIELD CONNECTION
SCALE: NOT APPLICABLE

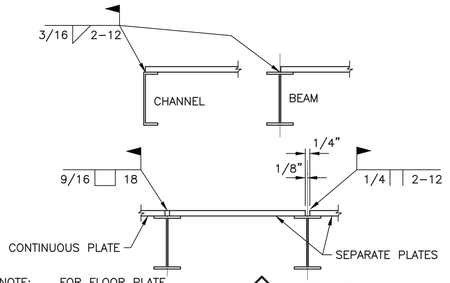


6 SS–000 DETAIL



STAIR BRACING
STAIR 9'–0" LONG OR LONGER

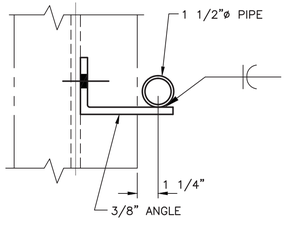
11 SS–000 DETAIL

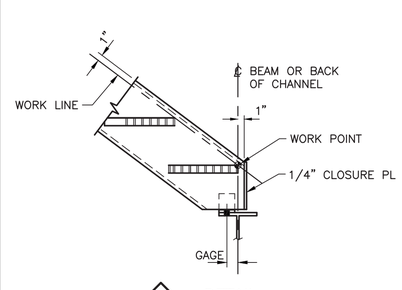


NOTE: FOR FLOOR PLATE SITTING ON TOP OF BAR GRATING, TACK WELD PLATE TO BAR GRATING AT 6" O.C. AROUND PERIMETER OF EACH PIECE OF FLOOR PLATE

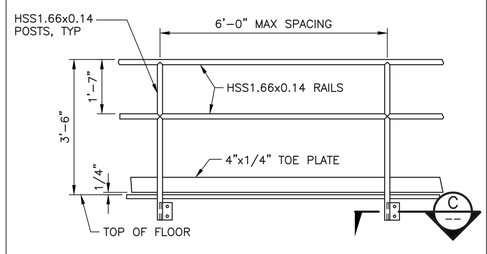
15 SS–000 DETAIL

FLOOR PL. WELD DETAIL





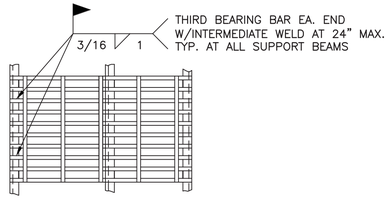
7 SS–000 DETAIL



STANDARD GUARDRAIL

NOTE: HSS1.66x0.14 IS EQIVALENT TO 1 1/4"ø STD PIPE, BUT MEETS ASTM A500 GR. B

12 SS–000 DETAIL



GRATING WELD DETAIL

16 SS–000 DETAIL

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JGT	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

A	B	C	0	1	2	3
			4/28/17			
			4/28/17			
			4/28/17			

CLIENT
BID
CONSTRUCTION
DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Scale	AS SHOWN
Date	2/23/17
Drawn	BARR
Checked	JGT
Designed	TOP
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
TYPICAL DETAILS

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 100–SS–101
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\B426C5EB–9CEA–405E–8862–A66BBF0DEA47\$E9FF440–EDF9–4491–946D–BC9C6865AFA1\0646100100_100–SS–101.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 2:52 PM
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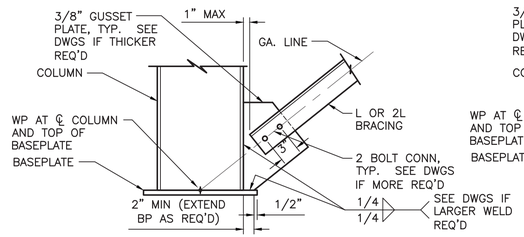
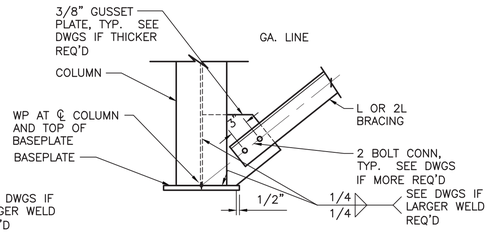
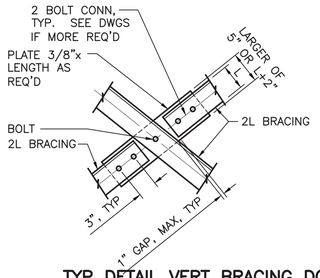


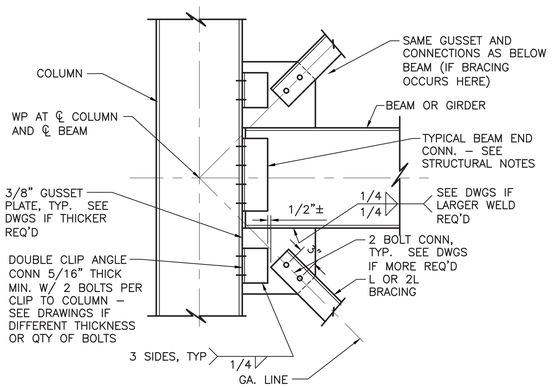
1 – TYP DETAIL VERT BRACING AT COLUMN FLANGE & BASEPLATE
NTS



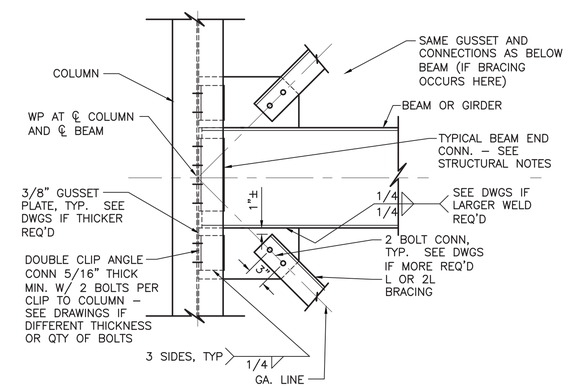
2 – TYP DETAIL VERT BRACING AT COLUMN WEB & BASEPLATE
NTS



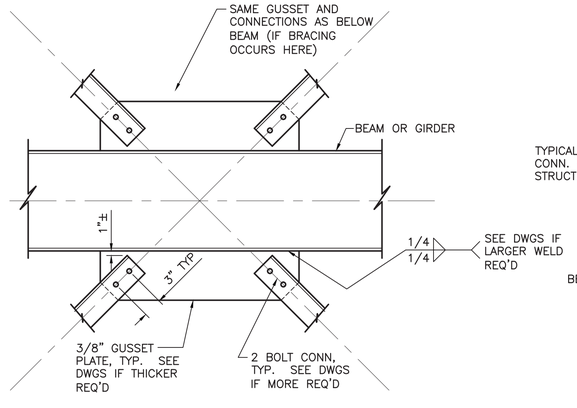
3 – TYP DETAIL VERT BRACING DOUBLE ANGLE CROSS BRACING INTERSECTION
NTS



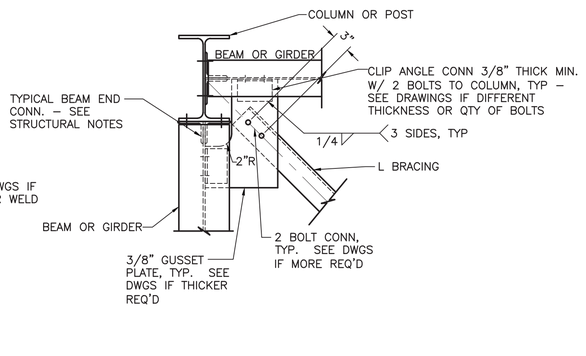
4 – TYP DETAIL VERT BRACING ANGLE BRACING TO COLUMN FLANGE
NTS



5 – TYP DETAIL VERT BRACING ANGLE BRACING TO COLUMN WEB
NTS



6 – TYP DETAIL VERT BRACING ANGLE BRACING TO BEAM
NTS



7 – TYP DETAIL HORIZ BRACING ANGLE CONN TO COLUMN
NTS

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	TOP	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT			4/28/17			
BID			4/28/17			
CONSTRUCTION			4/28/17			

A	B	C	0	1	2	3

DATE RELEASED

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
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Scale	AS SHOWN
Date	2/23/17
Drawn	BARR
Checked	JGT
Designed	TOP
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
TYPICAL DETAILS

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 100–SS–102
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\B426C5EB-9CEA-405E-8862-A66BBF0E6A47\{CD13ED00-1BE7-46D3-92E5-9590B6B062CA}\0646100100_100-SS-102.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 2:50 PM
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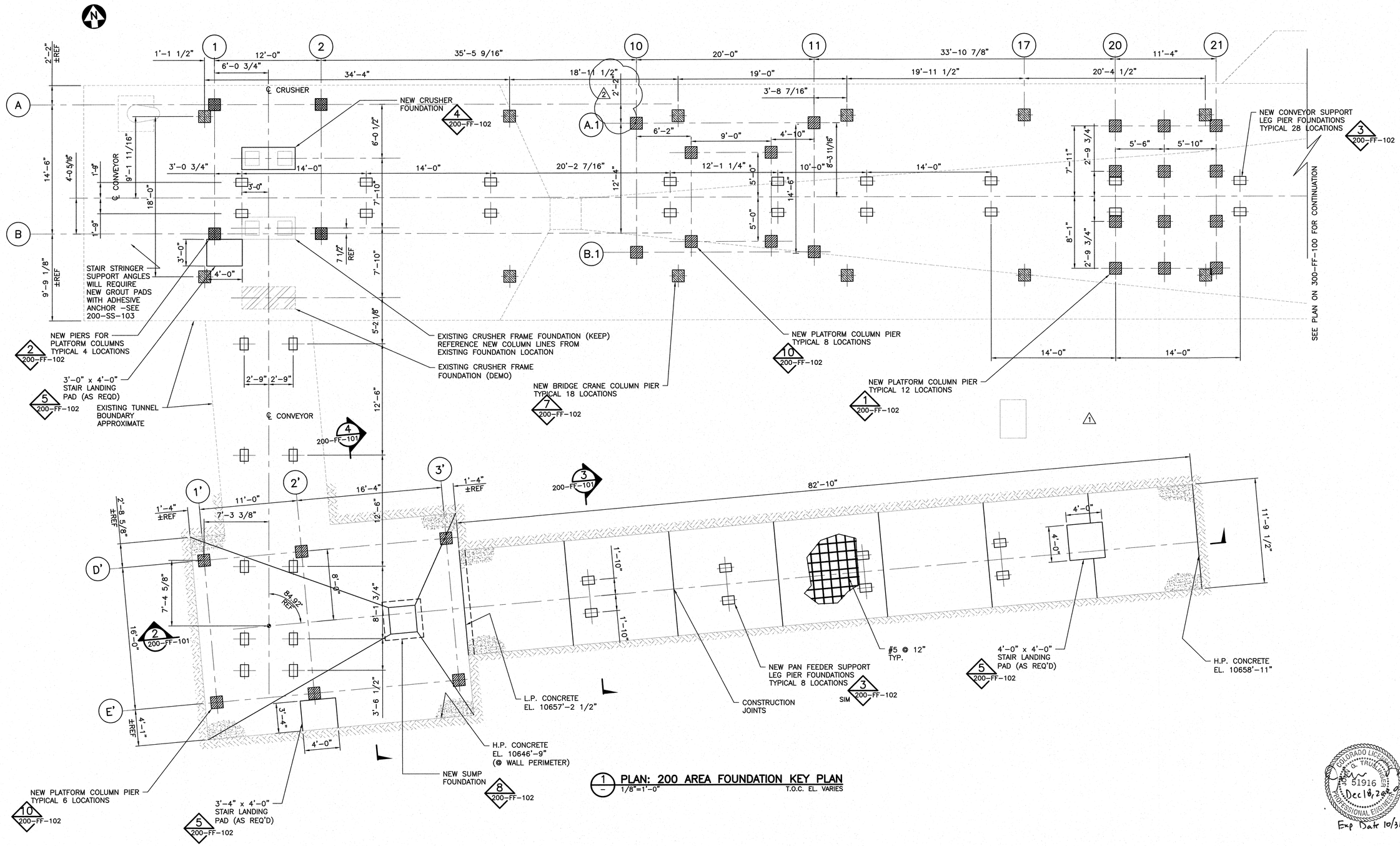
200 Area Drawings



1 PLAN: 200 AREA FOUNDATION KEY PLAN

1/8"=1'-0" T.O.C. EL. VARIES

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. NO BENCHMARKS ARE PROVIDED ON THIS DRAWING. CARE SHOULD BE TAKEN WHEN LAYING OUT LOCATIONS OF FOOTINGS. THIS IS PARTICULARLY TRUE FOR THE BRIDGE CRANE COLUMNS WHICH WERE LOCATED USING THE OURAY LIDAR SURVEY TO AVOID HITTING EXISTING WALLS.

COLORADO LICENSED JOHN G. TRULLINGER No. 51916 PROFESSIONAL ENGINEER Dec 18, 2020

Exp Dat 10/31/21

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	12/18/20	MODIFY DIMENSION FROM 2'-4" TO 2'-2"
1	SWO	JGT	JGT	11/25/20	ISSUED FOR CONSTRUCTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

		A	B	C	0	1	2	3
CLIENT					4/28/17	11/25/20	12/18/20	
BID					4/28/17			
CONSTRUCTION					4/28/17	11/25/20	12/18/20	
RELEASED TO/FOR	DATE RELEASED							

BARR
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/14/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

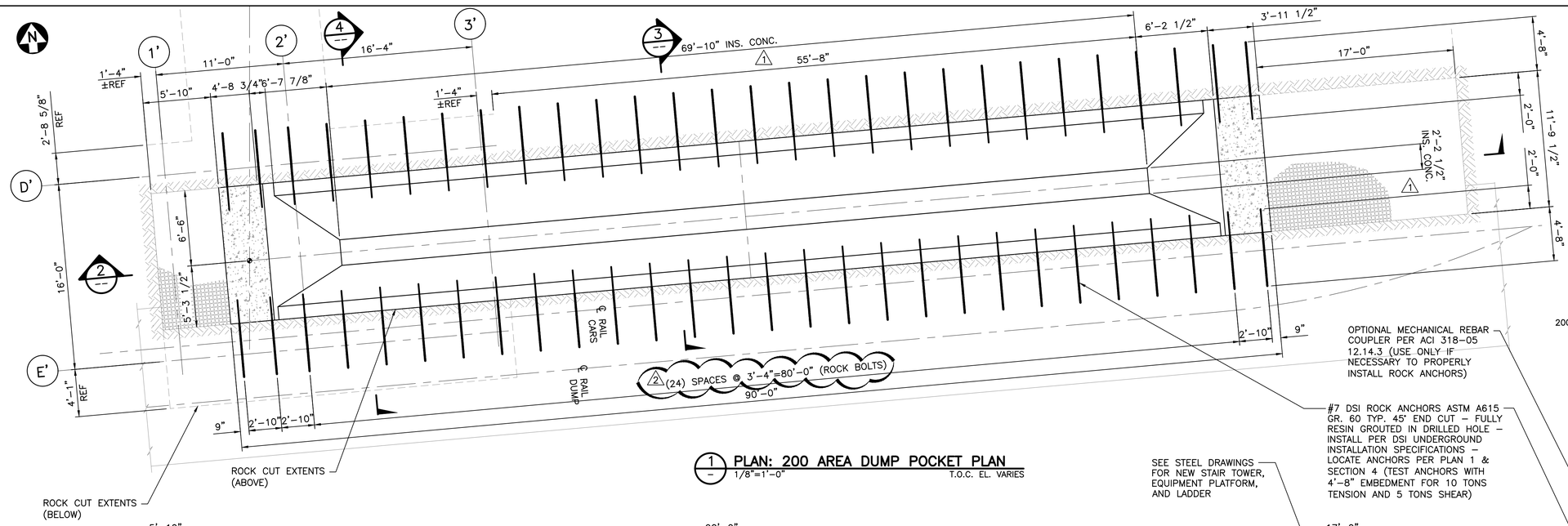
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

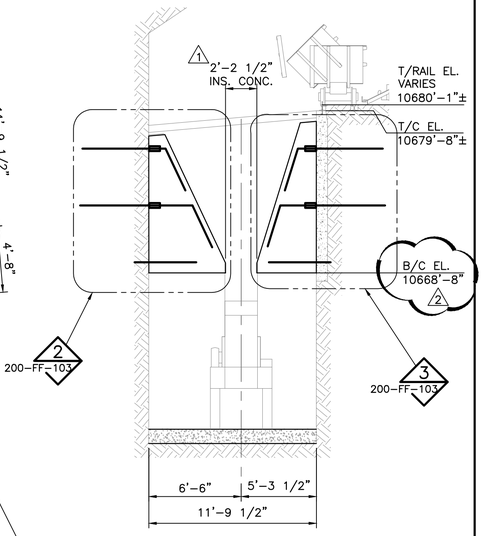
200 AREA FOUNDATION KEY PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-FF-100
REV. No. 2

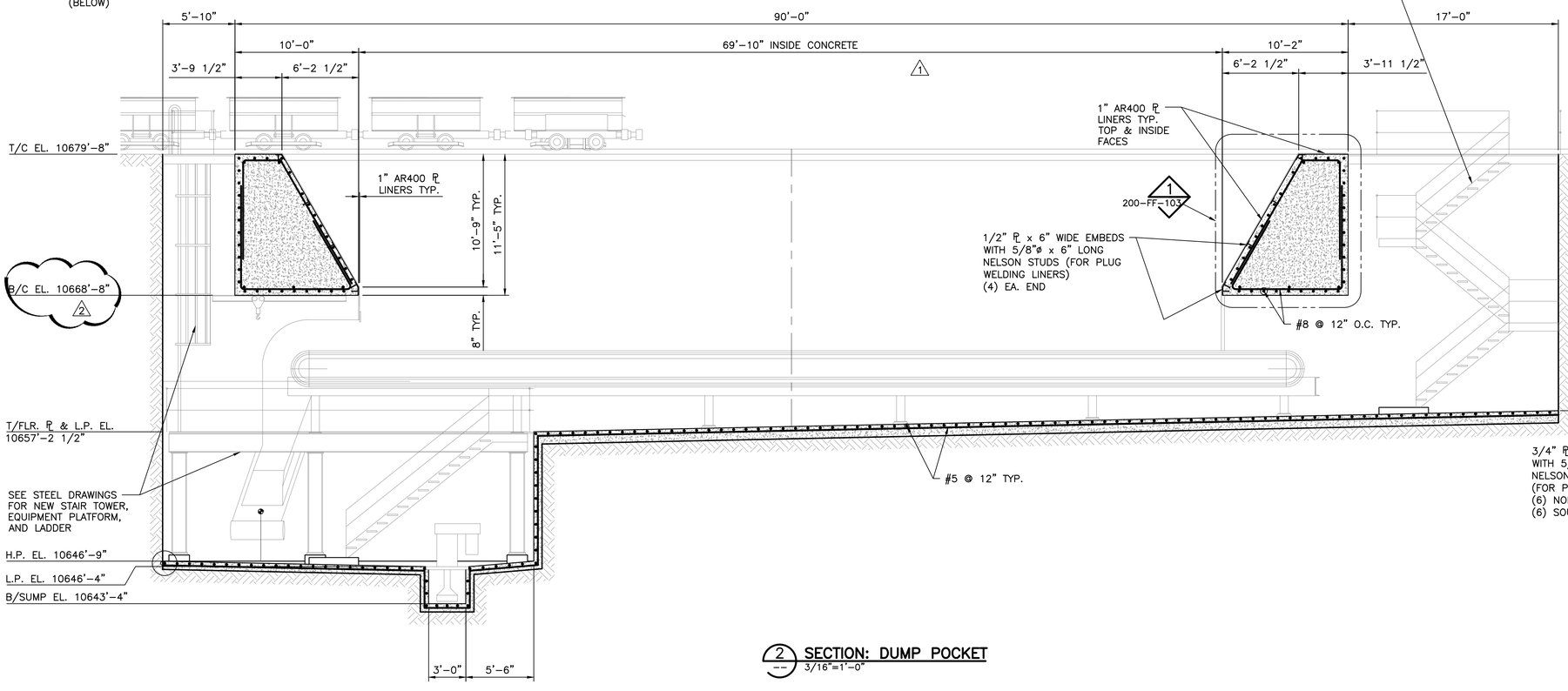
CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001104_200-FF-100.DWG PLOT SCALE: 1:1 PLOT DATE: 12/18/2020 12:08 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



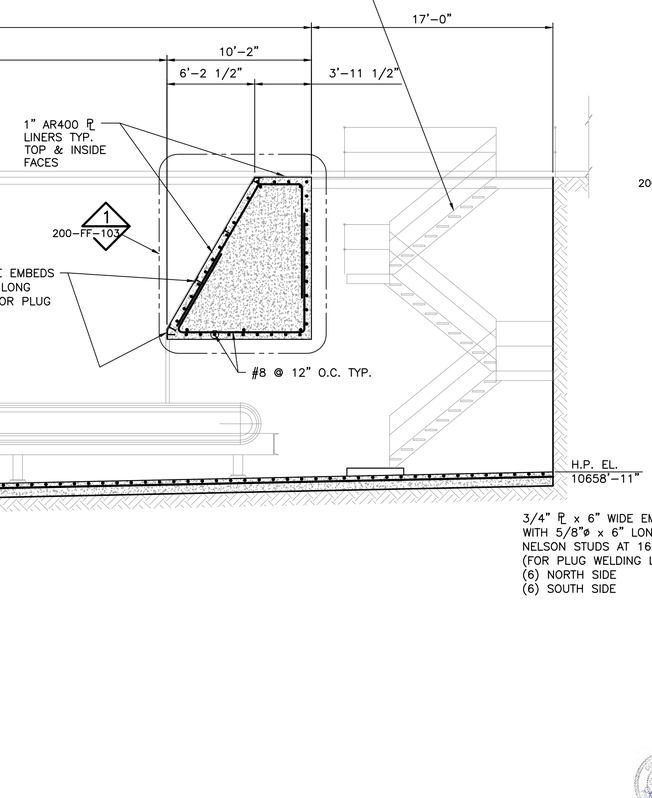
1 PLAN: 200 AREA DUMP POCKET PLAN
1/8"=1'-0" T.O.C. EL. VARIES

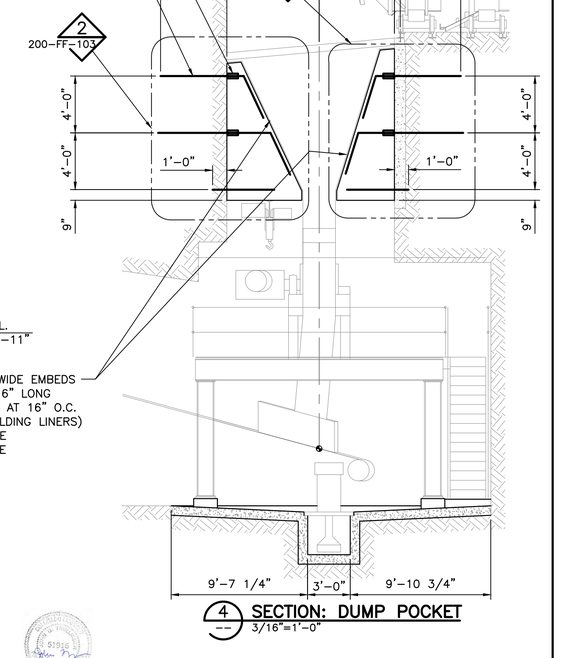


3 SECTION: DUMP POCKET
3/16"=1'-0"



2 SECTION: DUMP POCKET
3/16"=1'-0"





4 SECTION: DUMP POCKET
3/16"=1'-0"

ISSUED FOR CONSTRUCTION

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	3/12/21	MODIFY BOC EL TO MATCH RFI RESPONSE, MODIFY ROCK ANCHOR SPACING
1	JGT	JGT	JGT	1/20/21	MODIFY DUMP POCKET DIMENSIONS TO MATCH GA DRAWINGS
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION

DATE RELEASED

A	B	C	0	1	2	3
			4/28/17	1/20/21	3/12/21	
			4/28/17	1/20/21	3/12/21	
			4/28/17	1/20/21	3/12/21	

BARR
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/7/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

200 AREA FOUNDATION
DUMP POCKET

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-FF-101
REV. No. 2

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100104_200-FF-101.DWG PLOT SCALE: 1:1 PLOT DATE: 3/12/2021 3:34 PM
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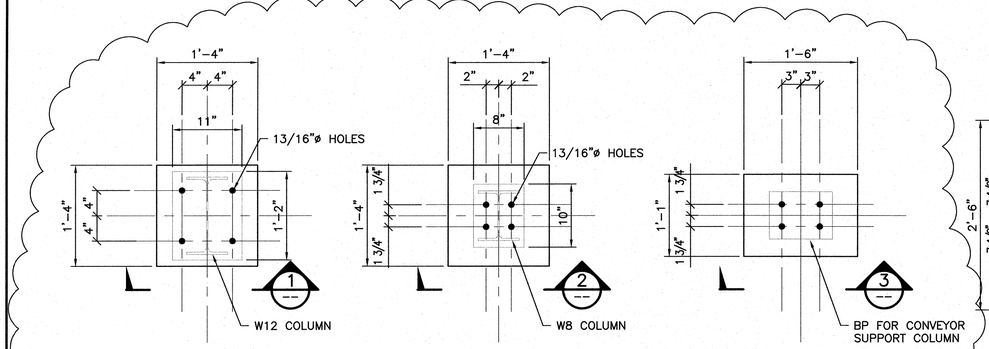
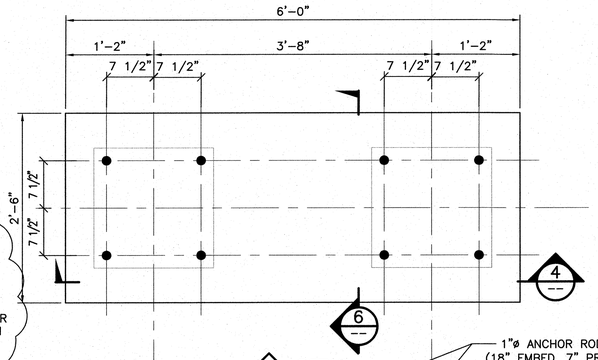


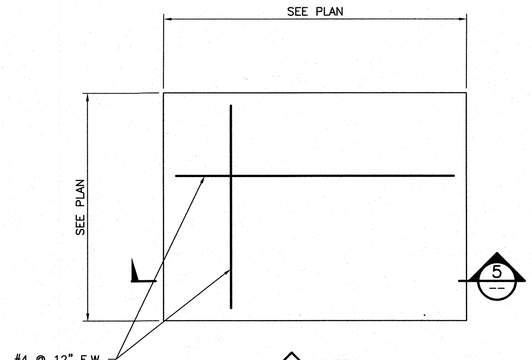
1 DETAIL: 200-FF-100 1"=1'-0"

2 DETAIL: 200-FF-100 1"=1'-0"

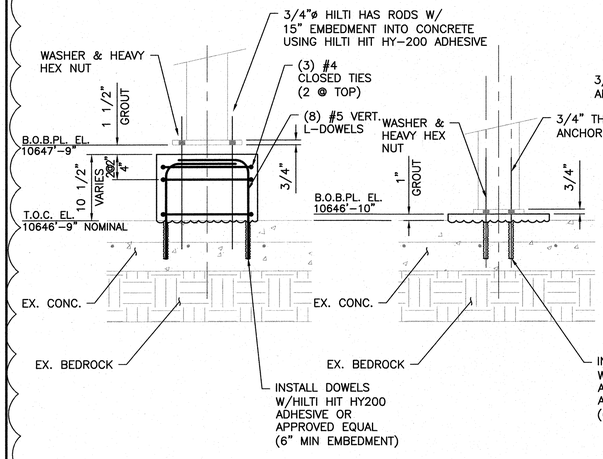
3 DETAIL: 200-FF-100 1"=1'-0"



4 DETAIL: 200-FF-100 1"=1'-0"



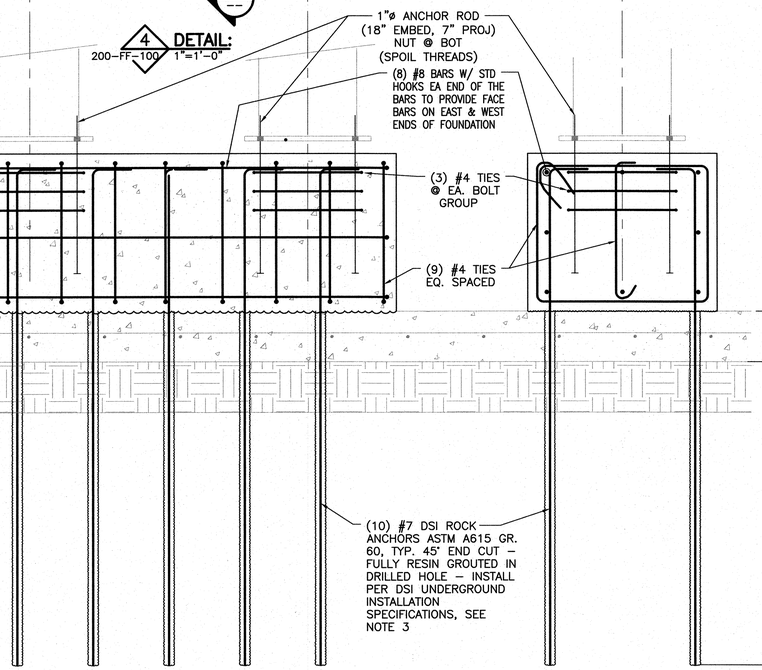
5 DETAIL: 200-FF-100 1"=1'-0"



1 SECTION: NEW COLUMN 1"=1'-0" 12 REQ'D

2 SECTION: 1"=1'-0" 4 REQ'D

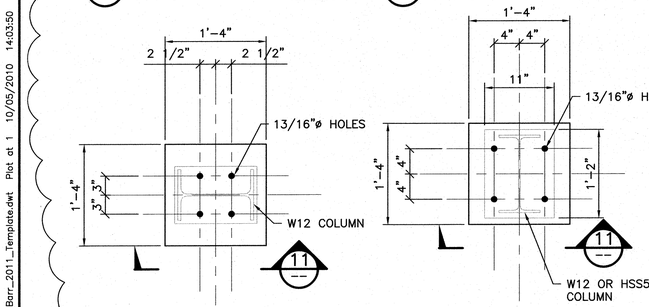
3 SECTION: CONVEYOR 1"=1'-0" 30 REQ'D 8 LOCATIONS SIM (PAN FEEDER)



4 SECTION: CRUSHER PIER 1"=1'-0" 1 REQ'D

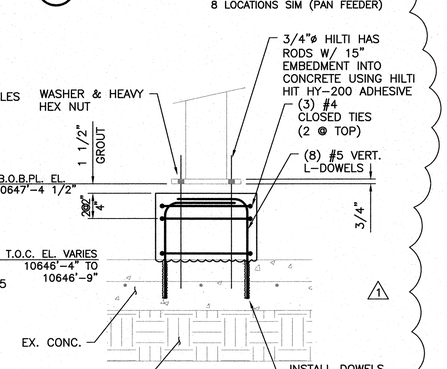
6 SECTION: CRUSHER PIER 1"=1'-0"

5 SECTION: STAIR PAD 1"=1'-0"

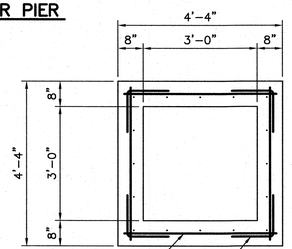


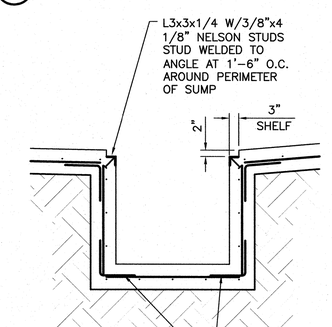
7 DETAIL: 200-FF-100 1"=1'-0"

10 DETAIL: 200-FF-100 1"=1'-0"



11 SECTION: NEW COLUMN 1"=1'-0" 6 REQ'D 1' TO 3' 8 REQ'D 10 TO 11 18 REQ'D BRIDGE CRANE





8 DETAIL: SUMP 200-FF-100 1/2"=1'-0"

NOTES:
1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. ROUGHEN AND CLEAN ALL EXISTING CONCRETE SURFACES PRIOR TO PLACING NEW CONCRETE OR GROUT
3. ALL CONCRETE SLABS AND ROCK BENEATH CRUSHER AREA FOUNDATIONS AND ROCK ANCHORS TO BE INSPECTED/APPROVED BY GEOTECHNICAL ENGINEER REPRESENTATIVE FOR FULLY CONCRETE CAPACITY/INTEGRITY AND ROCK #7 ANCHOR CAPACITY/INTEGRITY FOR 10 TONS TENSION AND 5 TONS SHEAR

COLORADO LICENSED JOHN G. TRULLINGER 51916 PROFESSIONAL ENGINEER
Exp Date 10/31/21

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SWO	JGT	JGT	11/25/20	ISSUED FOR CONSTRUCTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 11/25/20; BID — 4/28/17 —; CONSTRUCTION — 4/28/17 11/25/20

DATE RELEASED: A — B — C — 0 — 1 — 2 — 3

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2601 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	3/14/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

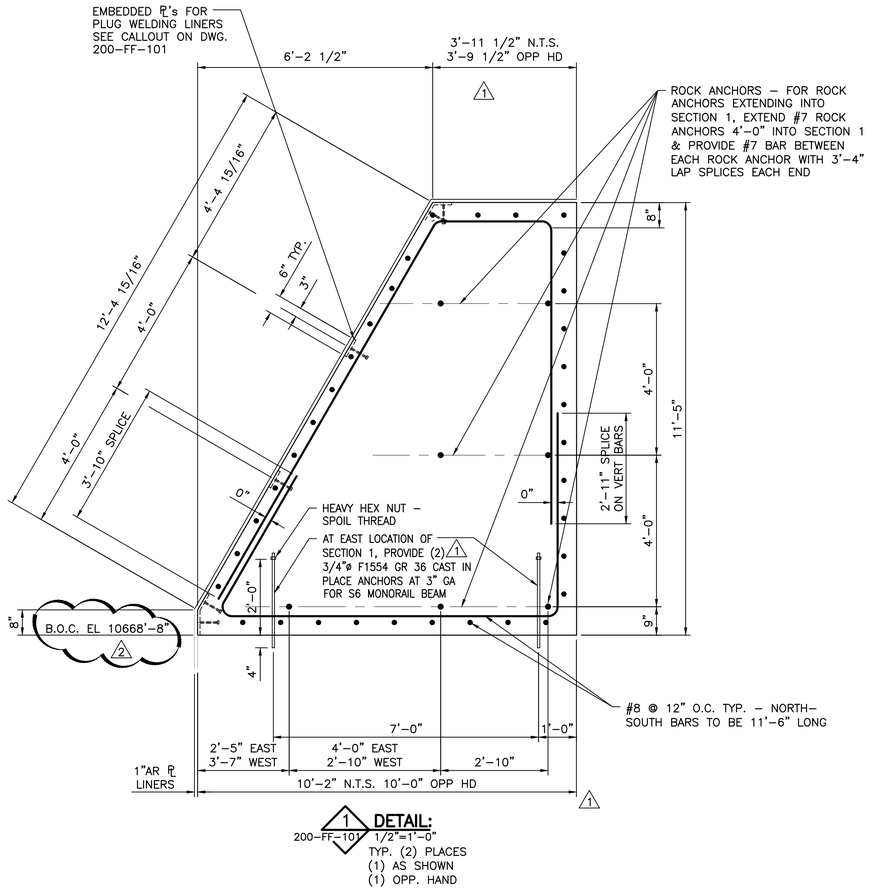
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

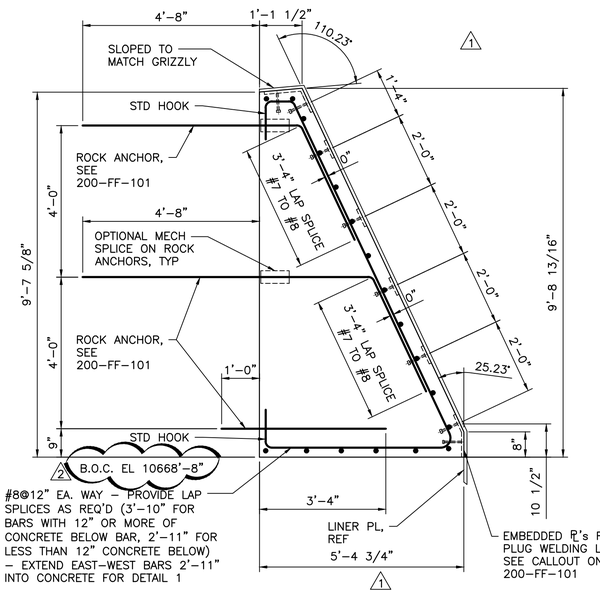
200 AREA FOUNDATION SECTIONS AND DETAILS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-FF-102
REV. No. 1

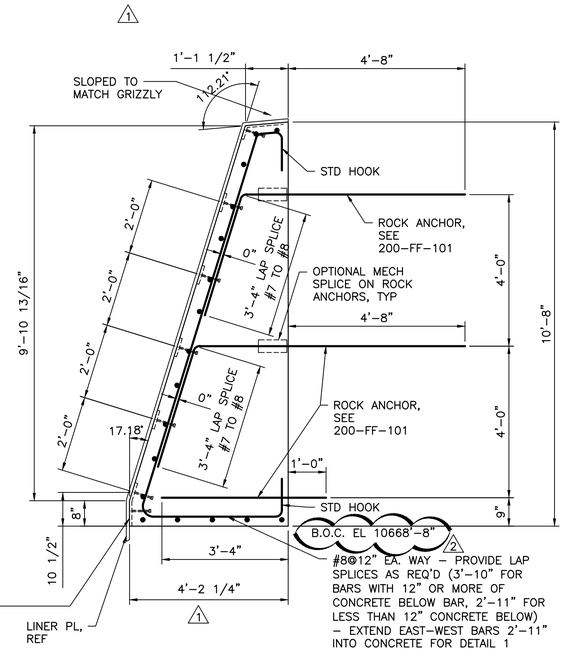
CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001104_200-FF-102.DWG PLOT SCALE: 1:1 PLOT DATE: 11/25/2020 10:34 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



1 **DETAIL:** 200–FF–101 1/2"=1'–0"
TYP. (2) PLACES
(1) AS SHOWN
(1) OPP. HAND



2 **DETAIL:** 200–FF–101 1/2"=1'–0"



3 **DETAIL:** 200–FF–101 1/2"=1'–0"

NOTES:
1. SEE STANDARD NOTES AND DETAILS ON 100–SS–100 THRU 100–SS–102
2. DIMENSIONS OF CONCRETE DETAILS 1, 2, AND 3 MAY BE MODIFIED UP TO 1/2" IF NECESSARY TO WORK WITH REBAR, EMBEDDED PLATE, AND WEAR PLATE FABRICATIONS.
2 3. OPTIONAL MECHANICAL SPLICE / COUPLER TO BE A TYPE 2 MECHANICAL SPLICE.
4. WORK DETAILS 1, 2, AND 3 ON THIS SHEET WITH SURVEYED ROCK GEOMETRY SHOWN ON DRAWING 200–FF–104.
5. LAP SPLICES SHOWN IN DETAILS 2 & 3 MAY BE NON–CONTACT LAP SPLICES WHERE BAR SPACINGS AND ANCHOR SPACINGS DO NOT CORRESPOND.

1 ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	3/12/21	UPDATE CONC. ELEVATIONS PER RFI RESPONSE, MODIFY NOTE 2, ADD NOTES 3–5
1	JGT	JGT	JGT	1/20/21	REVISED DUMP POCKET DIMENSIONS TO MATCH GA DRAWINGS
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT	—	—	—	4/28/17	1/20/21	3/12/21	—
BID	—	—	—	4/28/17	1/20/21	3/12/21	—
CONSTRUCTION	—	—	—	4/28/17	1/20/21	3/12/21	—
DATE RELEASED	—	—	—	—	—	—	—

BARR
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Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1–800–632–2277 Fax: (952) 832–2601 www.barr.com

Scale	AS SHOWN
Date	4/7/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE
200 AREA FOUNDATION DUMP POCKET DETAILS

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 200–FF–103
REV. No. 2

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001O4_200–FF–103.DWG PLOT SCALE: 1:1 PLOT DATE: 3/12/2021 3:34 PM
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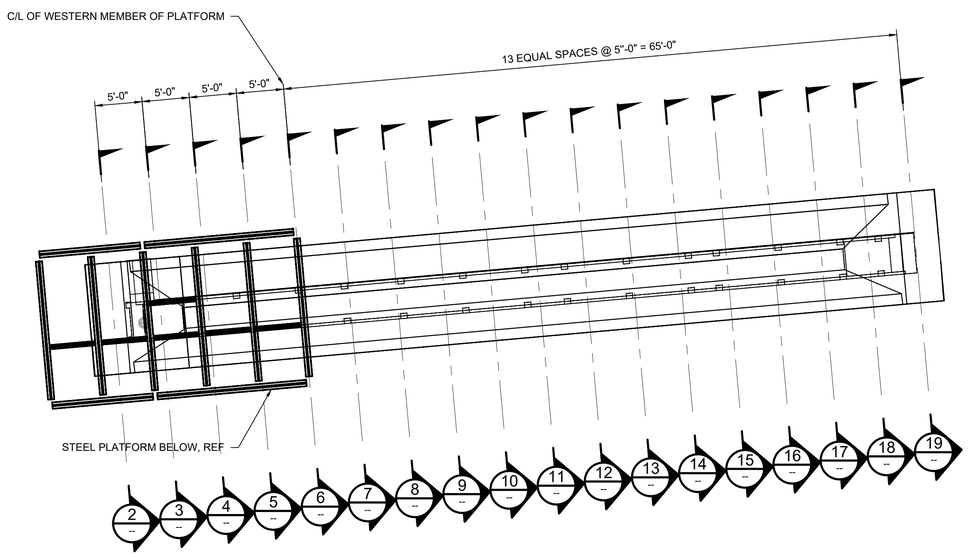
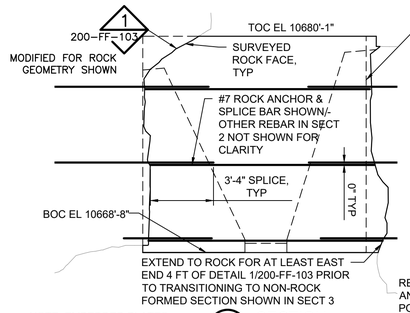
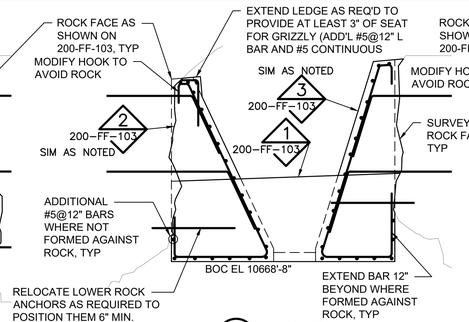


1 -- DUMP POCKET PLAN: SECTION CUTS THROUGH LIDAR SCAN:
1/8"=1'-0"



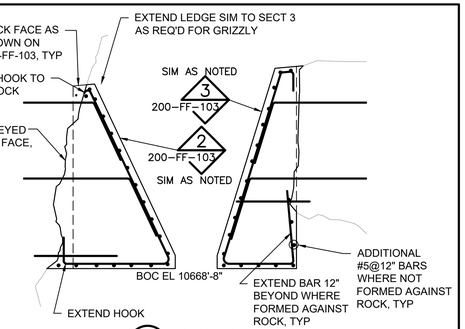
NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY

2 -- SECTION: 1/4"=1'-0"



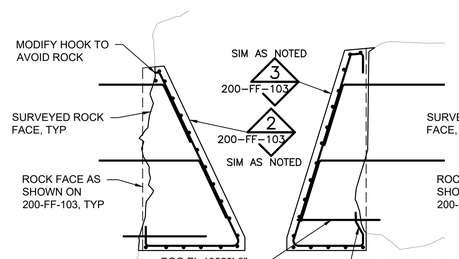
3 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



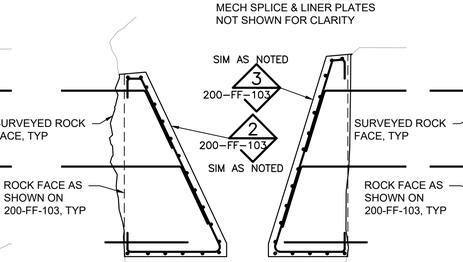
4 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



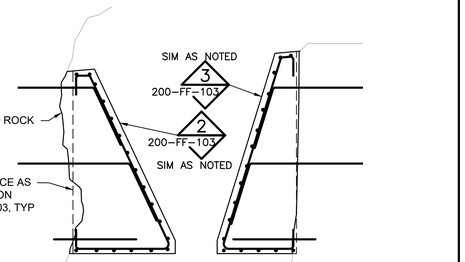
5 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



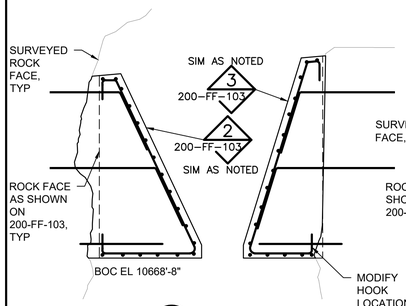
6 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



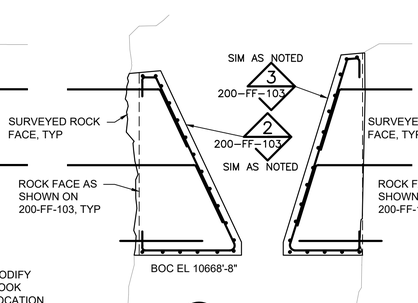
7 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



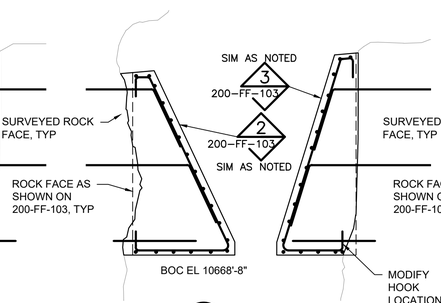
8 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



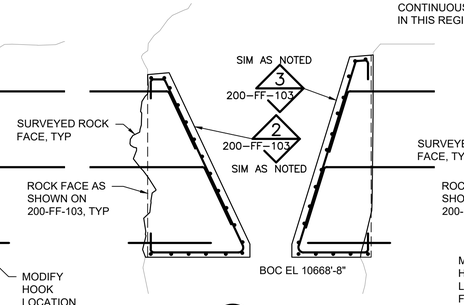
9 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



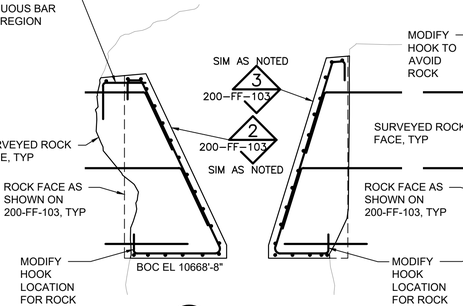
10 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



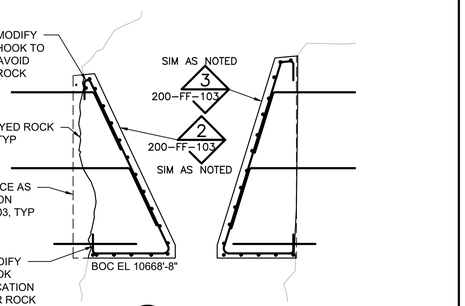
11 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



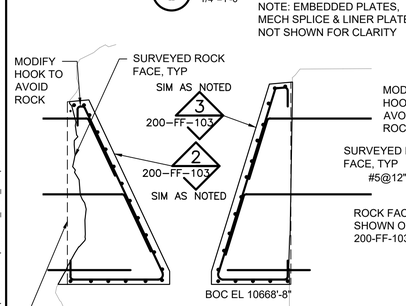
12 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



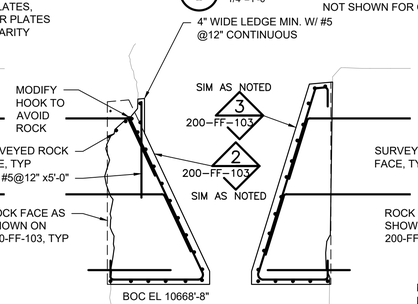
13 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



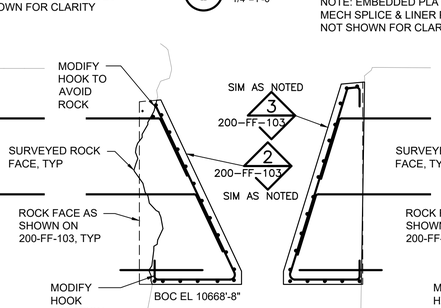
14 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



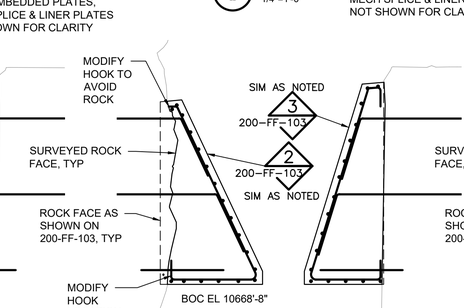
15 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



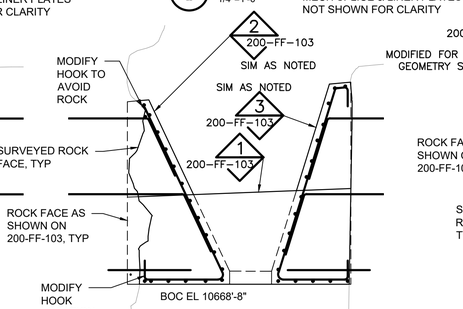
16 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



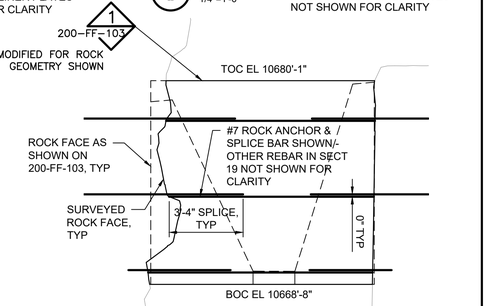
17 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



18 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY



19 -- SECTION: 1/4"=1'-0"

NOTE: EMBEDDED PLATES, MECH SPLICE & LINER PLATES NOT SHOWN FOR CLARITY

NO.	BY	CHK	APP	DATE	REVISION DESCRIPTION
0	JGT	JGT	JGT	3/12/21	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
	DATE RELEASED						
CLIENT				3/12/21			
BID				3/12/21			
CONSTRUCTION				3/12/21			

BARR
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/2/21
Drawn	DAK/JGT
Checked	
Designed	JGT
Approved	

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

200 AREA FOUNDATION
DUMP POCKET MODIFICATIONS BASED ON SURVEY

BARR PROJECT No.	
06/46-1001.04	
CLIENT PROJECT No.	
DWG. No.	REV. No.
200-FF-104	0

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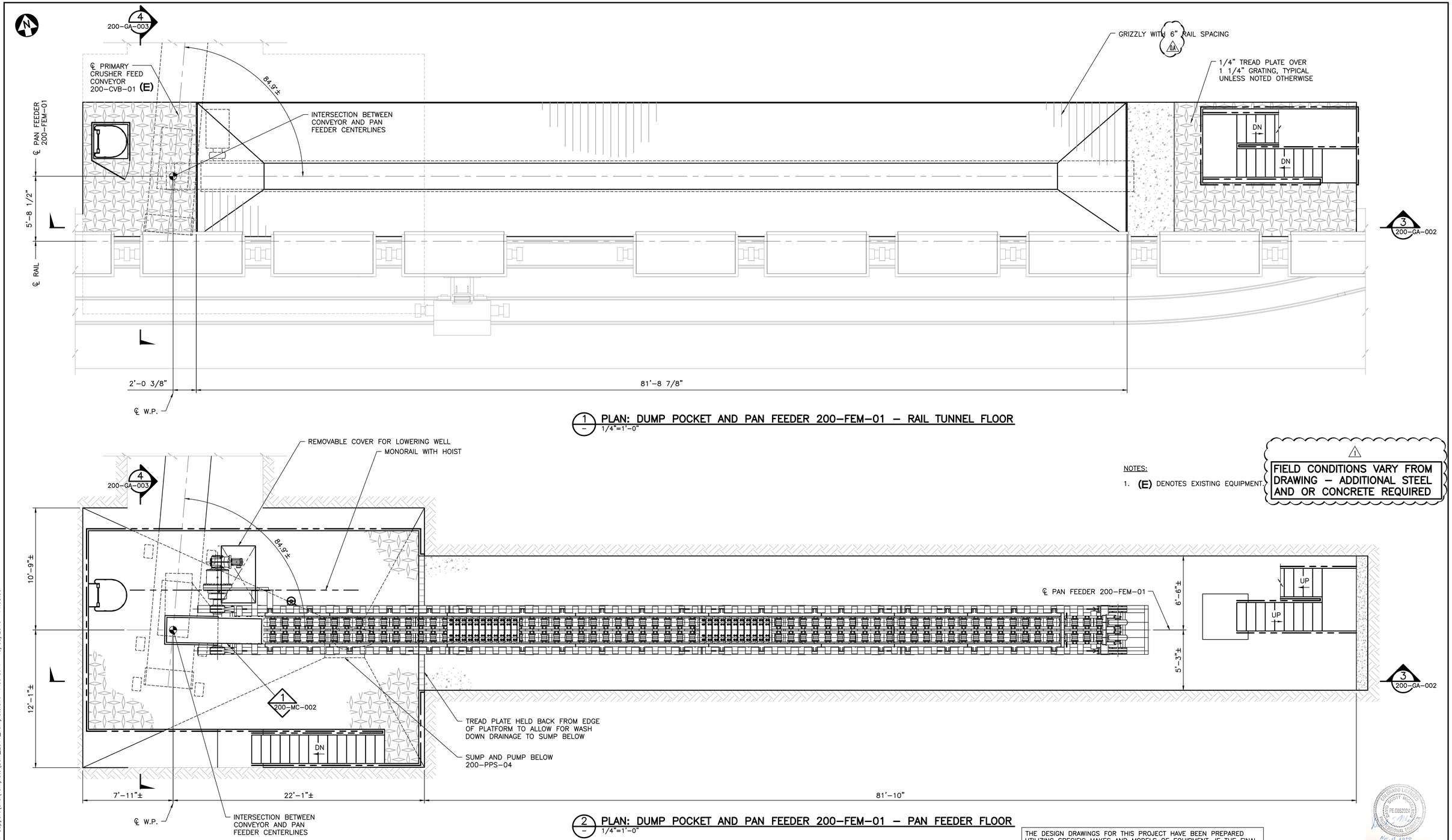

1 – PLAN: DUMP POCKET AND PAN FEEDER 200-FEM-01 – RAIL TUNNEL FLOOR
1/4"=1'-0"

2 – PLAN: DUMP POCKET AND PAN FEEDER 200-FEM-01 – PAN FEEDER FLOOR
1/4"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

⚠1 FIELD CONDITIONS VARY FROM DRAWING – ADDITIONAL STEEL AND OR CONCRETE REQUIRED

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	9/10/20	11/13/20	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/13/20	—
DATE RELEASED	—	—	—	—	—	—	—

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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/15/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
DUMP POCKET AND PAN FEEDER PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-GA-001
REV. No. 1

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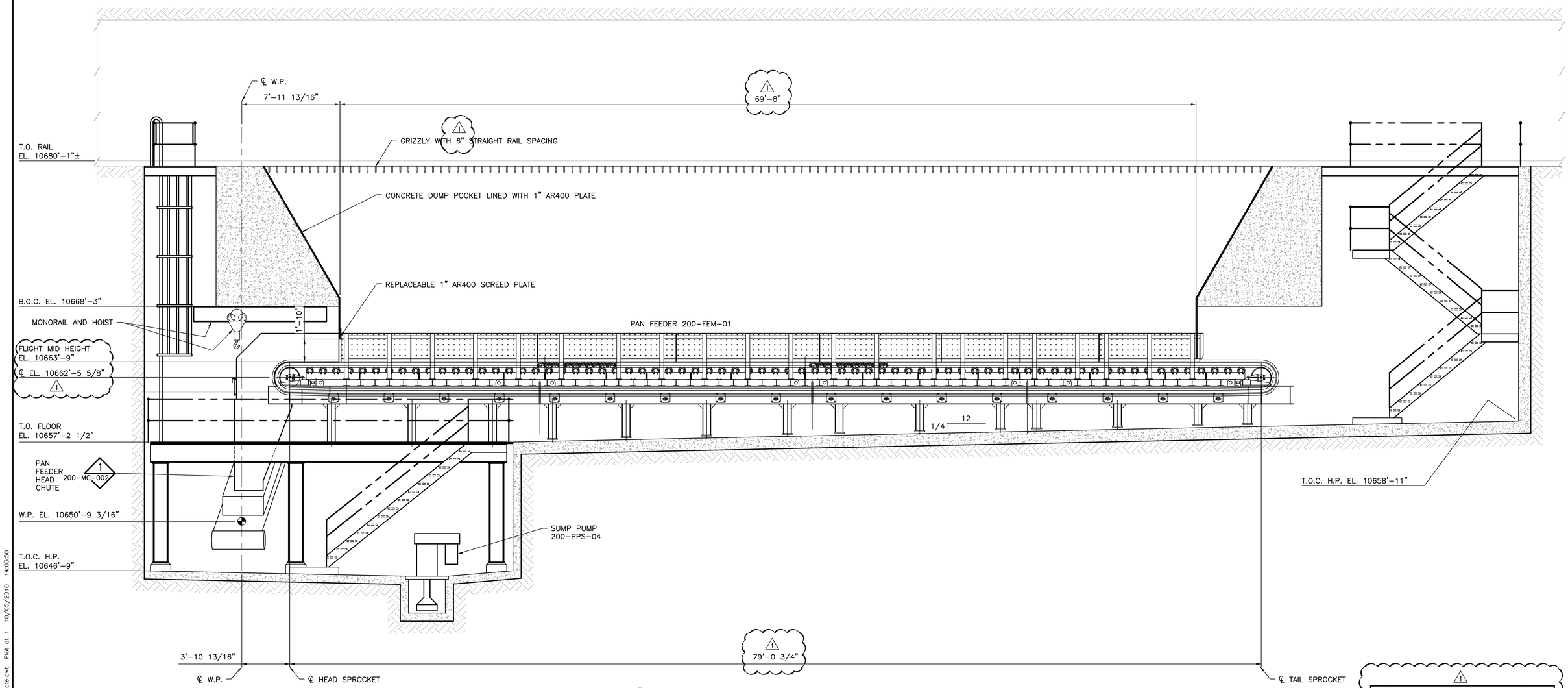

3 / 200-GA-001 **SECTION: DUMP POCKET AND PAN FEEDER 200-FEM-01**
1/4"=1'-0"

1 **FIELD CONDITIONS VARY FROM DRAWING – ADDITIONAL STEEL AND OR CONCRETE REQUIRED**

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

PE.0052004 — Nov. 13, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	9/10/20	11/13/20	—		
BID	—	—	—	4/28/17	—	—	—		
CONSTRUCTION	—	—	—	4/28/17	—	11/13/20	—		
RELEASED TO/FOR	—	—	—	—	—	—	—		
DATE RELEASED	A	B	C	0	0.A	1	2		

BARR
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/15/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
DUMP POCKET AND PAN FEEDER SECTION

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-GA-002
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\F1A388E8-61AB-4F80-BE0B-D64E6ADEDB54\5A31E3DC-C1AB-4E0D-AF9-A9098E1015FC\0646100104_200-GA-002.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 9:58 AM
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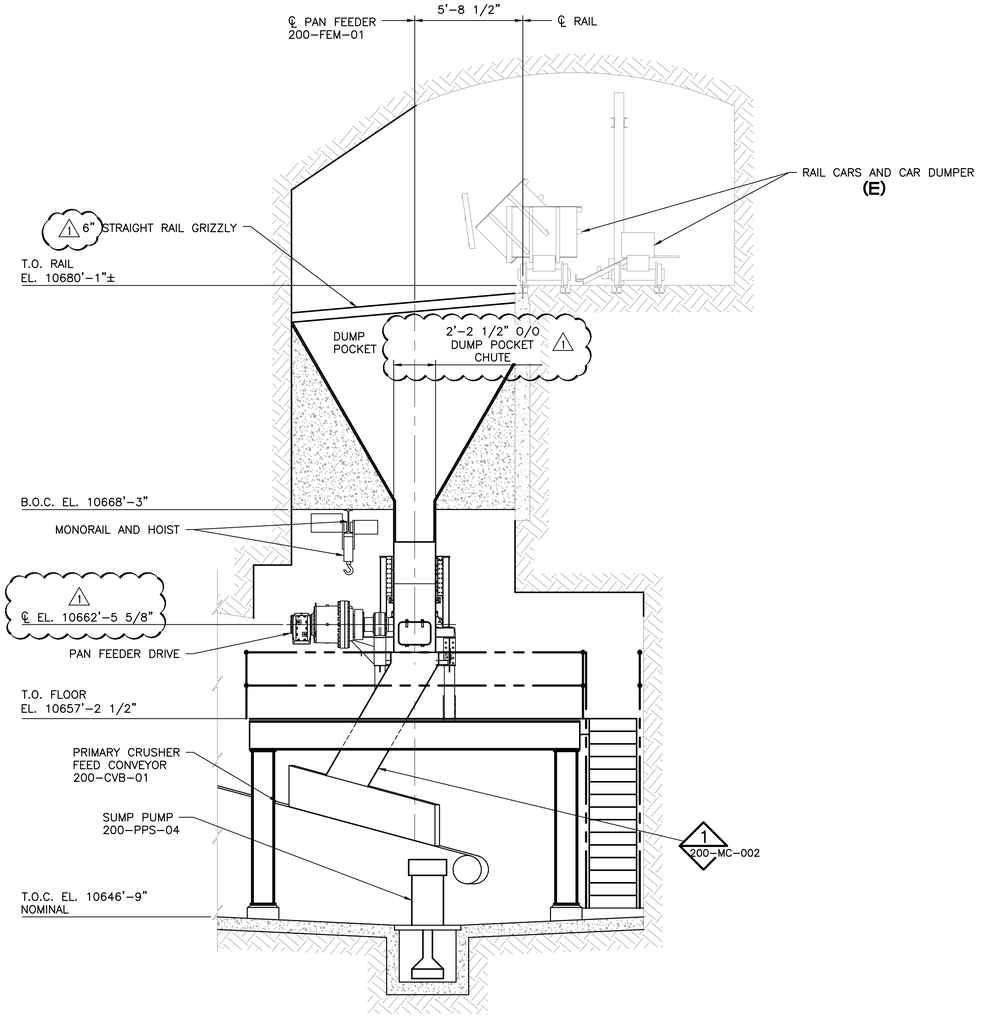

4 SECTION: DUMP POCKET AND PAN FEEDER 200–FEM–01
200–GA–001 1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

1 FIELD CONDITIONS VARY FROM DRAWING – ADDITIONAL STEEL AND OR CONCRETE REQUIRED

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

PE.0052004 — NOV. 13, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
DATE RELEASED				4/28/17	9/10/20	11/13/20	

CLIENT	—	—	—	4/28/17	—	11/13/20	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/13/20	—

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Scale	AS SHOWN
Date	2/15/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
DUMP POCKET AND PAN FEEDER SECTION

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 200–GA–003
REV. No. 1

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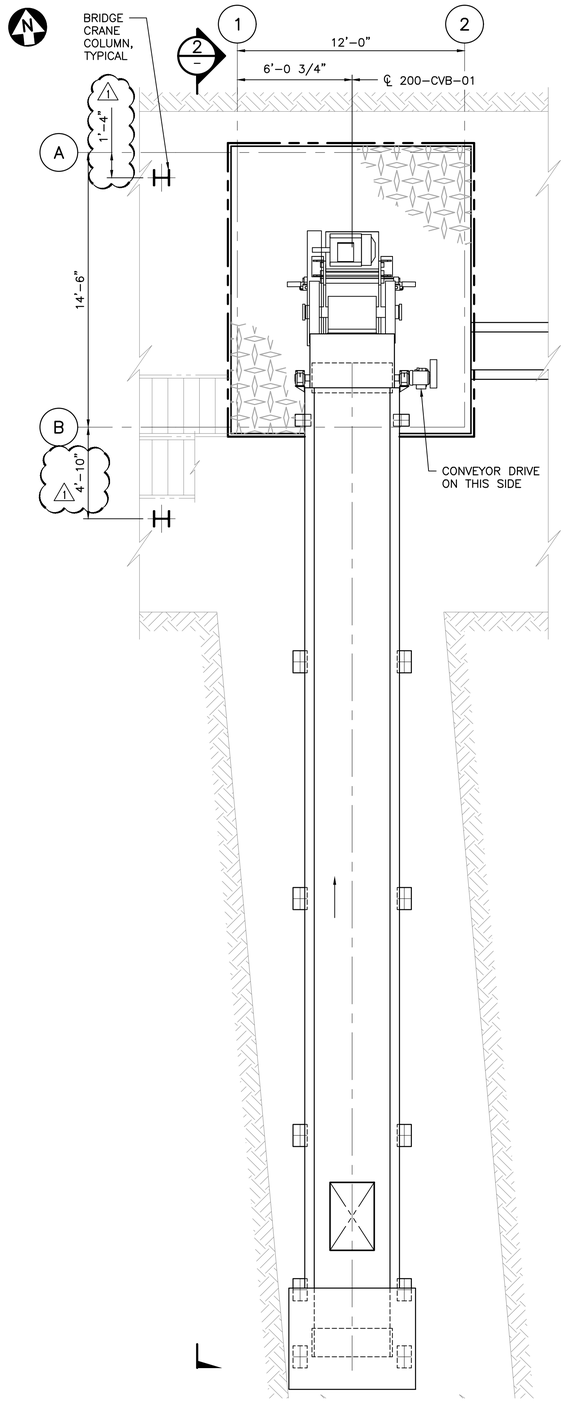
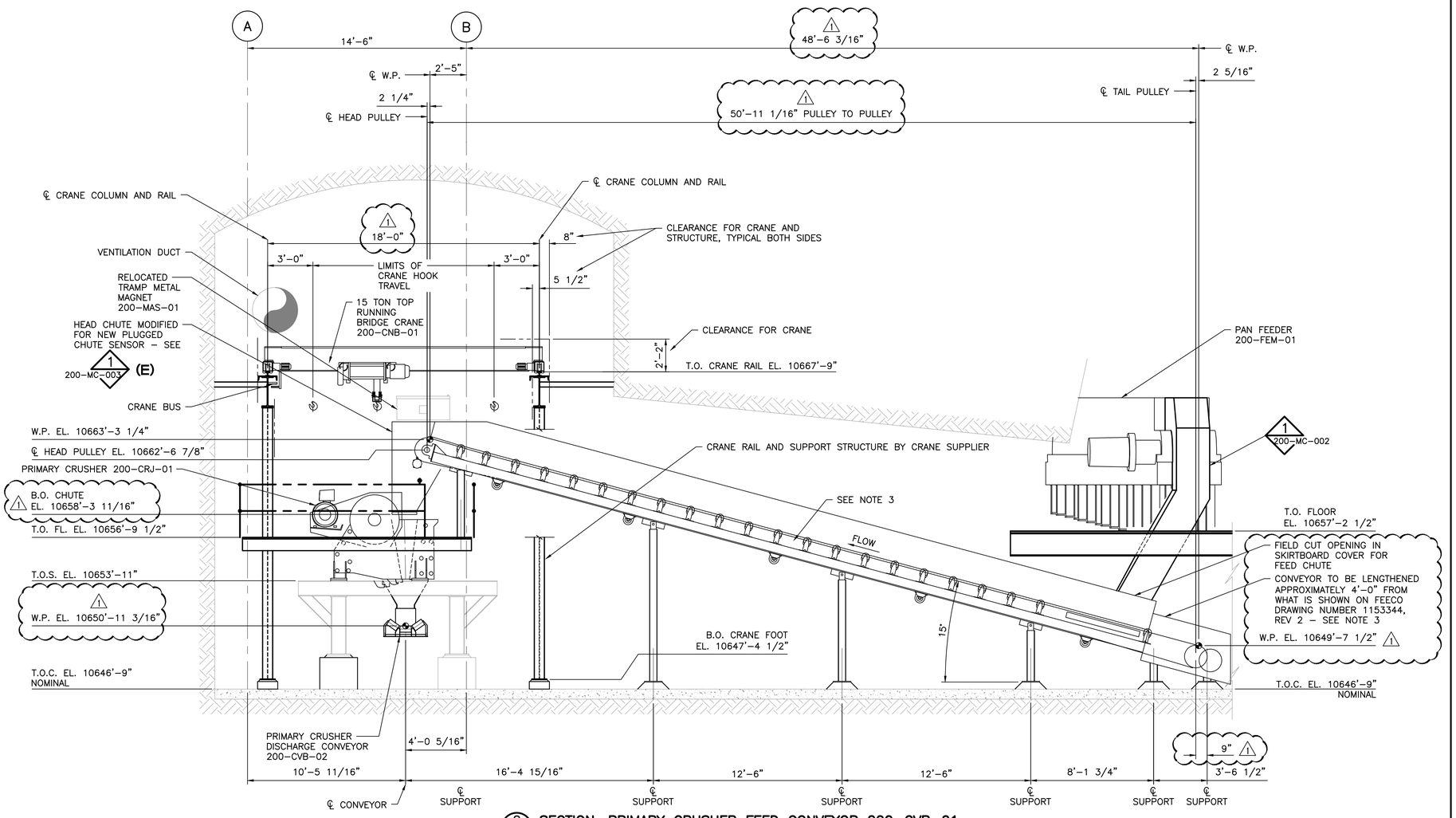


1 PLAN: PRIMARY CRUSHER FEED CONVEYOR 200–CVB–01
1/4"=1'–0"



2 SECTION: PRIMARY CRUSHER FEED CONVEYOR 200–CVB–01
1/4"=1'–0"

NOTES:

1. PRIMARY CRUSHER FEED CONVEYOR 200–CVB–01 TO BE RE–USED AND RE–LOCATED AS SHOWN. REPAIR OR REPLACE IN–KIND CONVEYOR FRAME AND ANY OTHER DAMAGED OR MISSING COMPONENTS. **(E)**
2. SEE FEECO DRAWING 1153344, REVISION 2 FOR CONVEYOR DETAILS.
3. CONVEYOR BELT ON CONVEYOR TO BE REPLACED. NEW BELTING TO BE 330 PIW (MIN.) BELT WITH 3/8" (MIN.) TOP COVER, 3/32" (MIN.) BOTTOM COVER. BELT TO BE FIRE RESISTANT AND MSHA APPROVED FOR UNDERGROUND APPLICATION.
4. **(E)** DENOTES EXISTING EQUIPMENT.
5. REFER TO STRUCTURAL DRAWING 200–SS–106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED PROFESSIONAL ENGINEER PE 0052024 DAVID K. ... INTERNATIONAL Nov. 13, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — — — 4/28/17 9/10/20 11/13/20 — ; BID — — — 4/28/17 — — — ; CONSTRUCTION — — — 4/28/17 — 11/13/20 —

DATE RELEASED: A B C 0 0.A 1 2

BARR
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www.barr.com

Scale	AS SHOWN
Date	2/9/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT PLAN AND SECTION AT PRIMARY CRUSHER FEED CONVEYOR

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 200–GA–004
REV. No. 1

CADD USER: Hbpwuser FILE: \\HB–PW\HB_PW_IN\F1A388E8–61AB–4F80–BE0B–D645E6A0EDB54\60ACBBF4–193A–4885–807D–837A3FAEF3C1\0646100104_200–GA–004.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 9:58 AM
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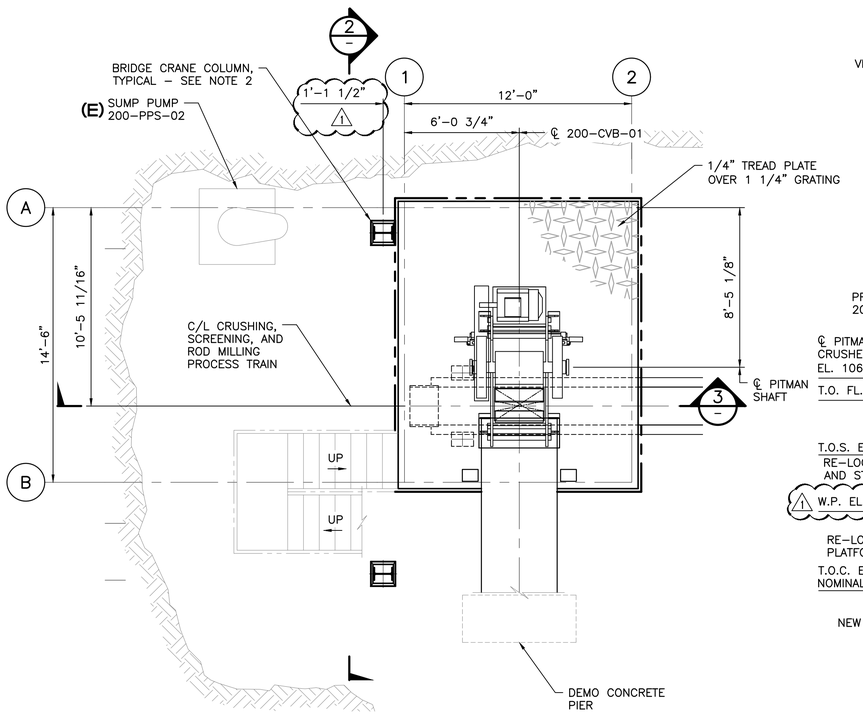
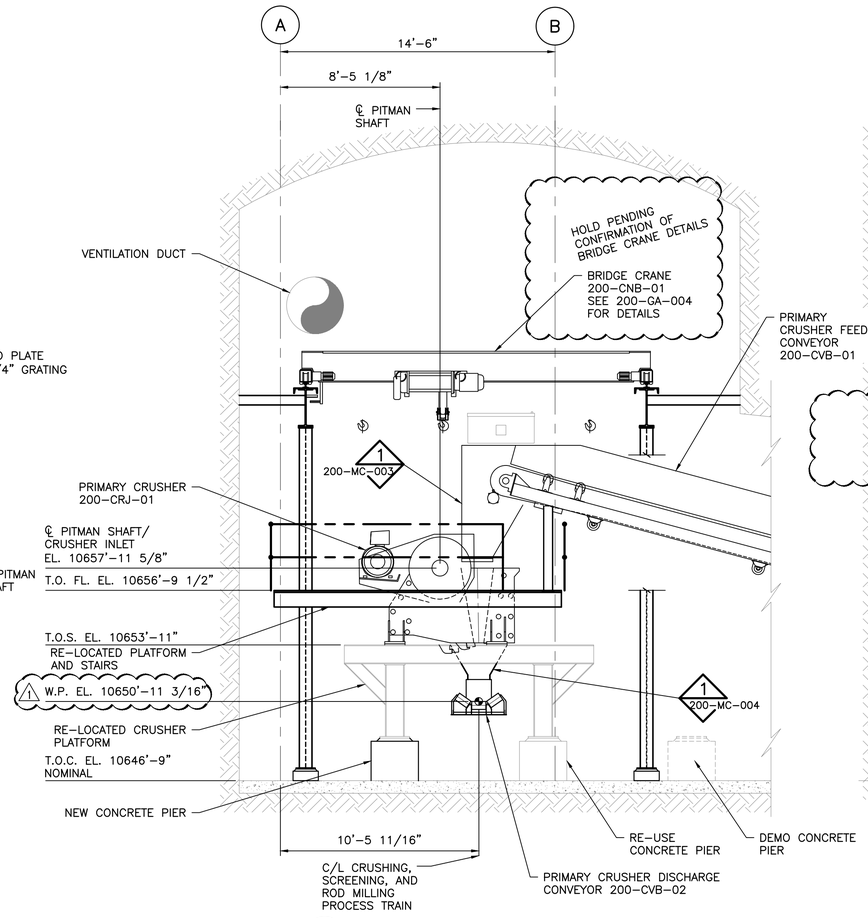
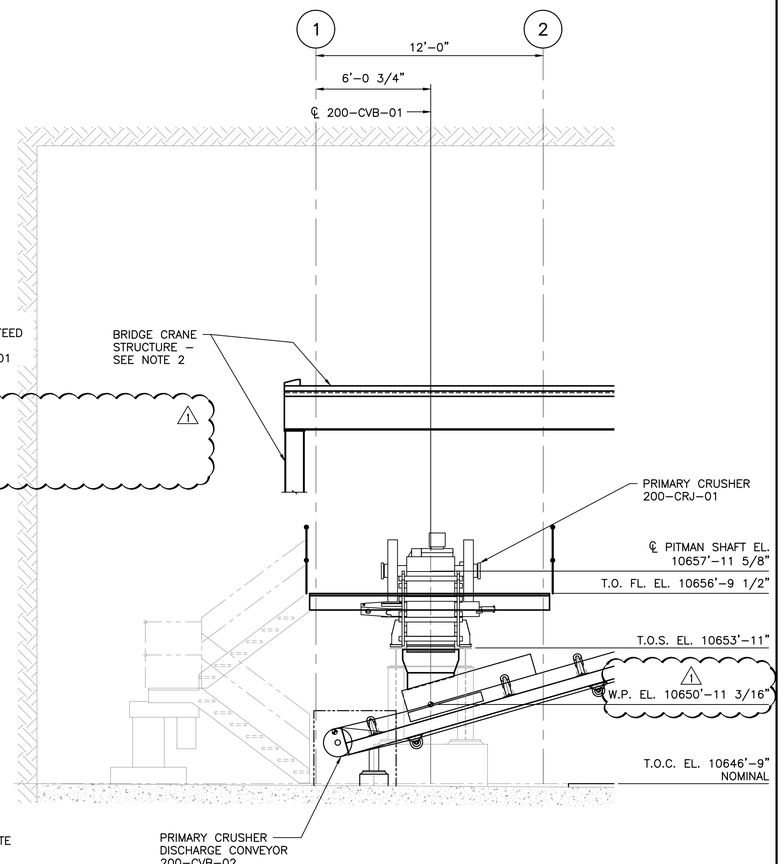


1 PLAN: PRIMARY CRUSHER 200–CRJ–01
1/4"=1'–0"



2 SECTION: PRIMARY CRUSHER 200–CRJ–01
1/4"=1'–0"



3 SECTION: PRIMARY CRUSHER 200–CRJ–01
1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.
2. REFER TO STRUCTURAL DRAWING 200–SS–106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	9/10/20	11/13/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/13/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
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www.barr.com

Scale	AS SHOWN
Date	2/9/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT PLAN AND SECTIONS AT PRIMARY CRUSHER

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 200–GA–005
REV. No. 1

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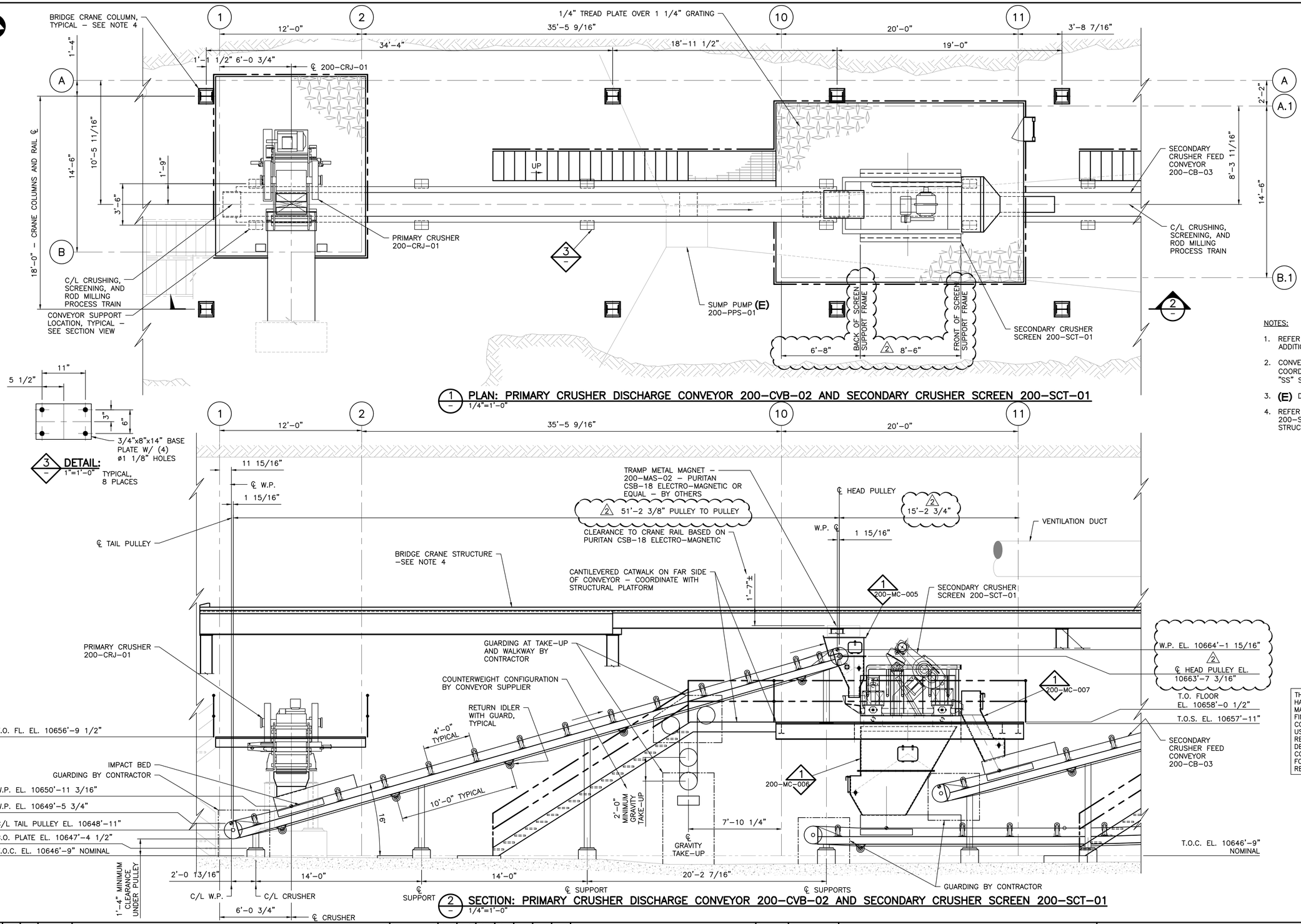

1 / – PLAN: PRIMARY CRUSHER DISCHARGE CONVEYOR 200-CVB-02 AND SECONDARY CRUSHER SCREEN 200-SCT-01
1/4"=1'-0"

3 / – DETAIL:
1"=1'-0" TYPICAL, 8 PLACES

2 / – SECTION: PRIMARY CRUSHER DISCHARGE CONVEYOR 200-CVB-02 AND SECONDARY CRUSHER SCREEN 200-SCT-01
1/4"=1'-0"

NOTES:

1. REFER TO CONVEYOR SPECIFICATION FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONVEYOR SKIRTBOARDS REQUIRE COORDINATION WITH "MC" SERIES CHUTE AND "SS" SERIES STRCUTURAL DRAWINGS.
3. **(E)** DENOTES EXISTING EQUIPMENT.
4. REFER TO STRUCTURAL DRAWINGS 200-SS-106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

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1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	AMB3	DSM	12/01/2020	UPDATED PER LATEST SCREEN INFORMATION, REMOVED SCREEN HOLDS
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	0	0.A	1	2	3	4	5
CLIENT	4/28/17	9/10/20	11/13/20	12/01/20			
BID	4/28/17						
CONSTRUCTION	4/28/17		11/13/20	12/01/20			

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT PLAN AND SECTION AT PRIMARY CRUSHER DISCHARGE CONVEYOR

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-GA-006
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\3814D91D-3DEA-4529-918D-30F0B761011\E310D136-9804-4E5F-A835-63C752CAEB02\06461001004_200-GA-006.DWG PLOT SCALE: 1:1 PLOT DATE: 11/30/2020 2:02 PM
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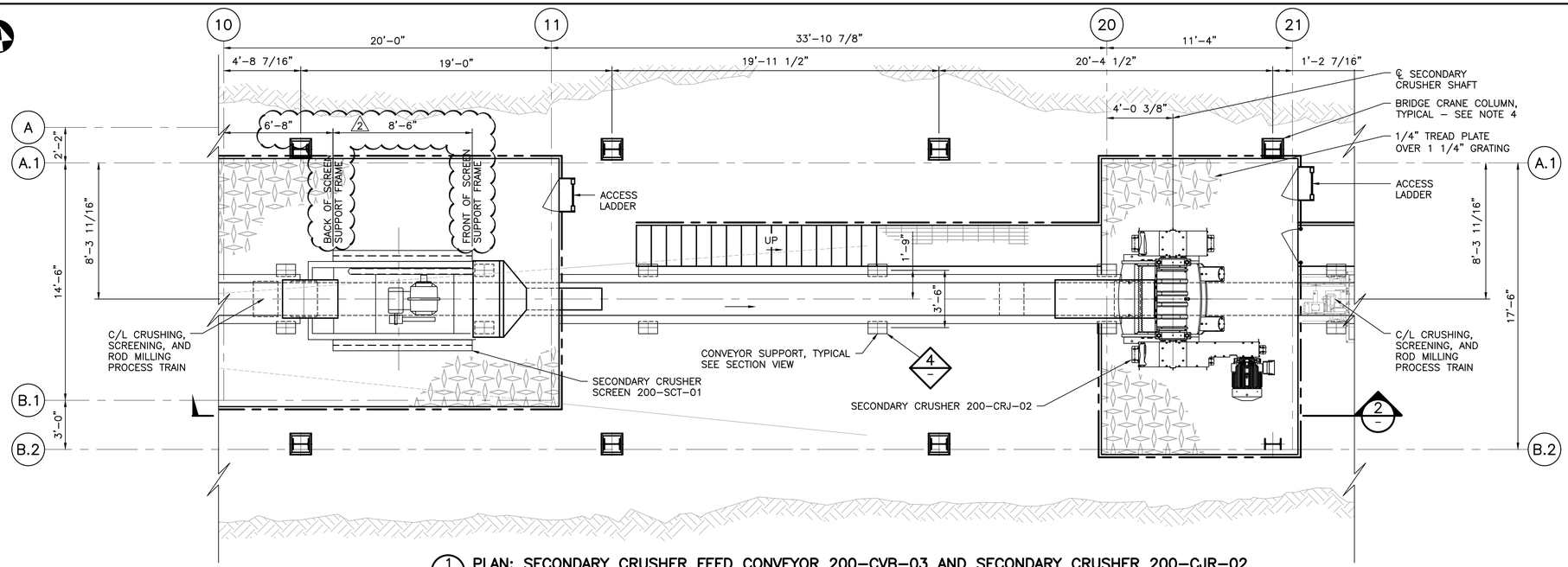
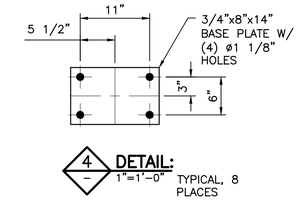
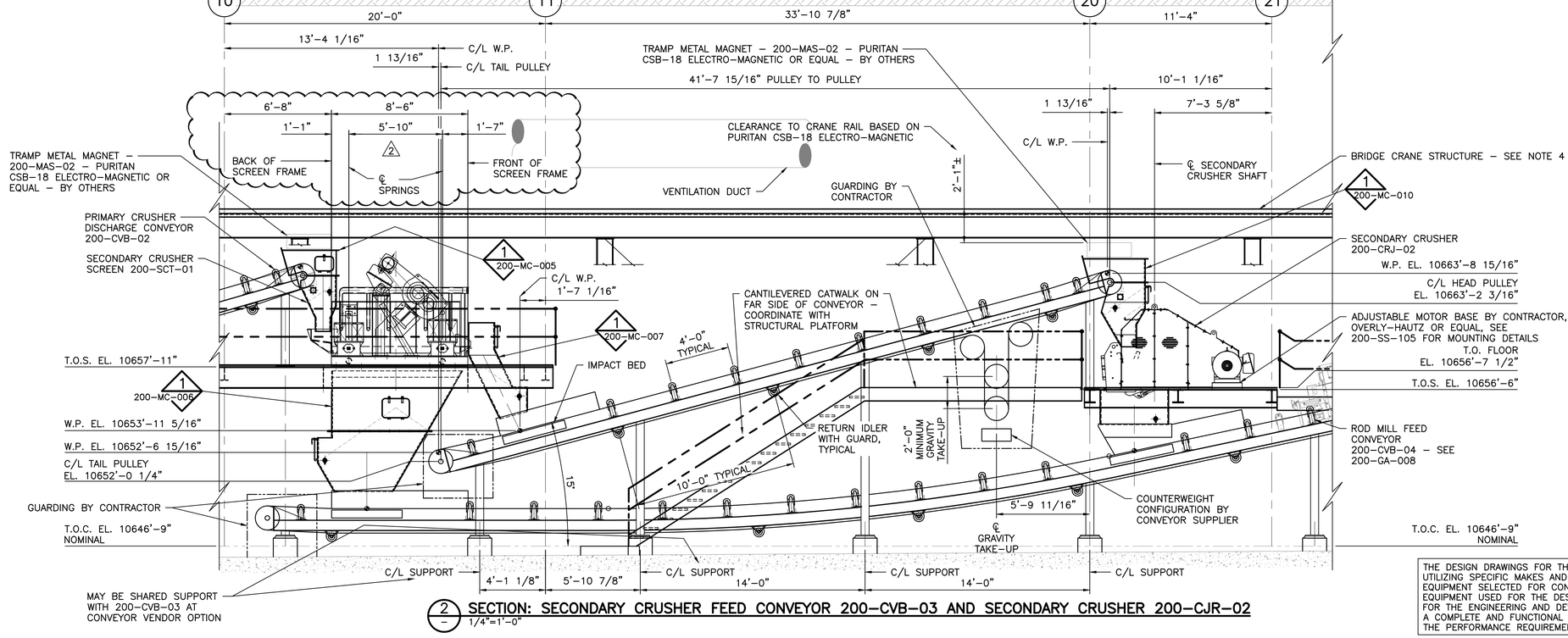


1 PLAN: SECONDARY CRUSHER FEED CONVEYOR 200-CVB-03 AND SECONDARY CRUSHER 200-CJR-02
1/4"=1'-0"



4 DETAIL:
1"=1'-0" TYPICAL, 8 PLACES



2 SECTION: SECONDARY CRUSHER FEED CONVEYOR 200-CVB-03 AND SECONDARY CRUSHER 200-CJR-02
1/4"=1'-0"

NOTES:

1. REFER TO CONVEYOR SPECIFICATION FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONVEYOR SKIRTBOARDS REQUIRE COORDINATION WITH "MC" SERIES CHUTE AND "SS" SERIES STRCUTURAL DRAWINGS.
3. (E) DENOTES EXISTING EQUIPMENT.
4. REFER TO STRUCTURAL DRAWING 200-SS-106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

COLORADO LICENSED SCOTT MARTIN PE.0052204 PROFESSIONAL ENGINEER
Dec. 1, 2020

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠ COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	AMB3	DSM	12/01/2020	UPDATED PER LATEST SCREEN INFOROMATION, REMOVED SCREEN HOLDS
1	DAK	AMB3	DSM	11/13/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	0	0.A	1	2	3	4	5
DATE RELEASED							

	4/28/17	9/10/20	11/13/20	12/01/20			
CLIENT							
BID	4/28/17	—	—	—	—	—	—
CONSTRUCTION	4/28/17	—	11/13/20	12/01/20	—	—	—

BARR
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Scale	AS SHOWN
Date	2/10/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT PLAN AND SECTION AT SECONDARY CRUSHER FEED CONVEYOR

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-GA-007
REV. No. 2

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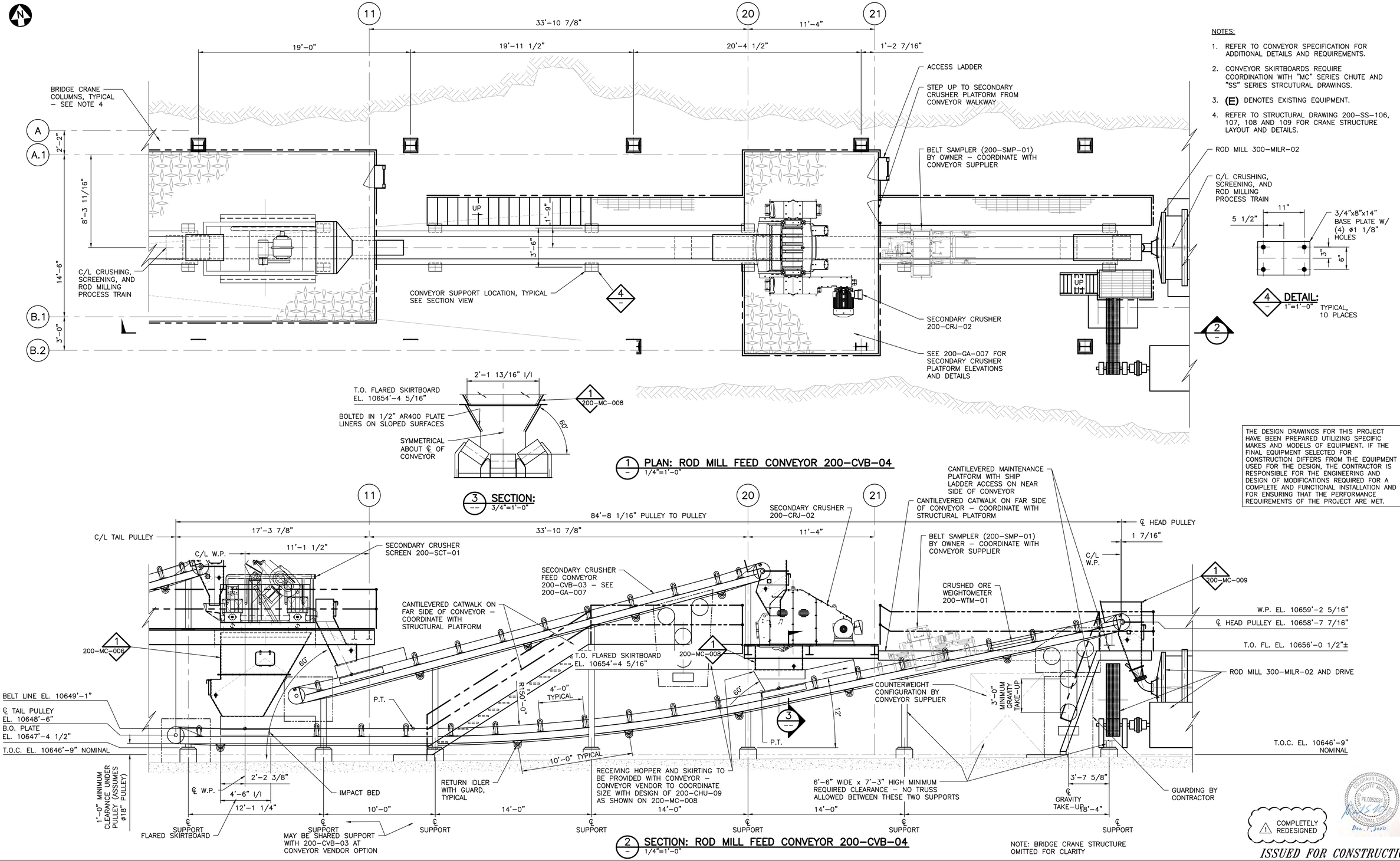

NOTES:

1. REFER TO CONVEYOR SPECIFICATION FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. CONVEYOR SKIRTBOARDS REQUIRE COORDINATION WITH "MC" SERIES CHUTE AND "SS" SERIES STRCUTURAL DRAWINGS.
3. **(E)** DENOTES EXISTING EQUIPMENT.
4. REFER TO STRUCTURAL DRAWING 200-SS-106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

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⚠ COMPLETELY REDESIGNED

PE 0052024 — Dec. 1, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	12/01/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 9/10/20 12/01/20; BID 4/28/17; CONSTRUCTION 4/28/17 12/01/20

DATE RELEASED: A 4/28/17; B 9/10/20; C 12/01/20; 0 4/28/17; 0.A 9/10/20; 1 12/01/20; 2

BARR
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT – PLAN AND SECTION AT ROD MILL FEED CONVEYOR

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-GA-008
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\05278902-110C-40DF-8CD5-29057EB02C9D\E317C77F-9201-41AE-B267-92FFD8529200\0646100104_200-GA-008.DWG PLOT SCALE: 1:1 PLOT DATE: 12/1/2020 11:29 AM
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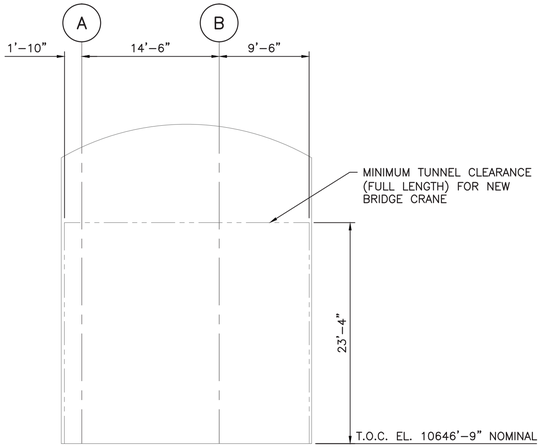
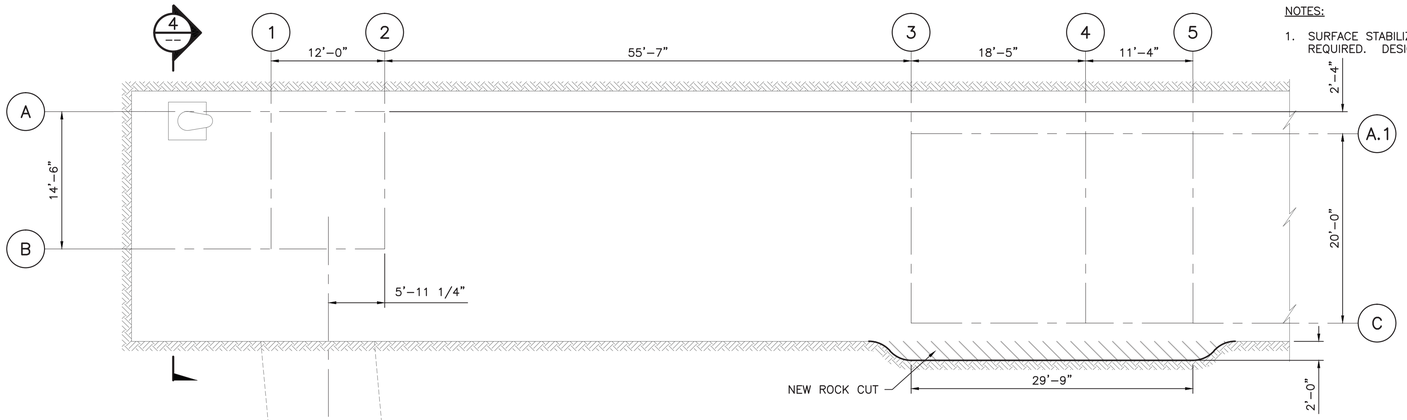
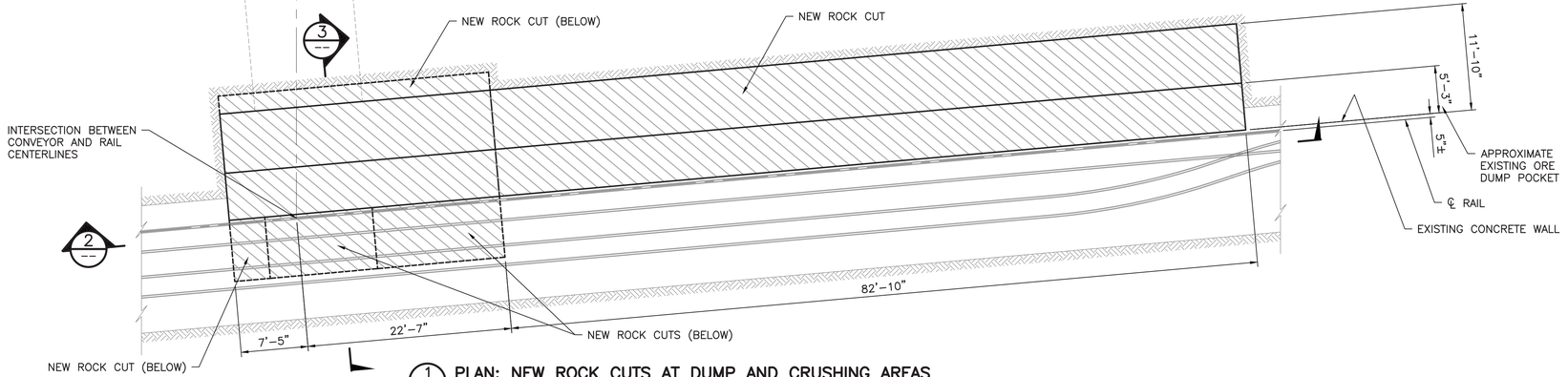


4 SECTION: MINIMUM TUNNEL CLEARANCE
1/8"=1'–0"

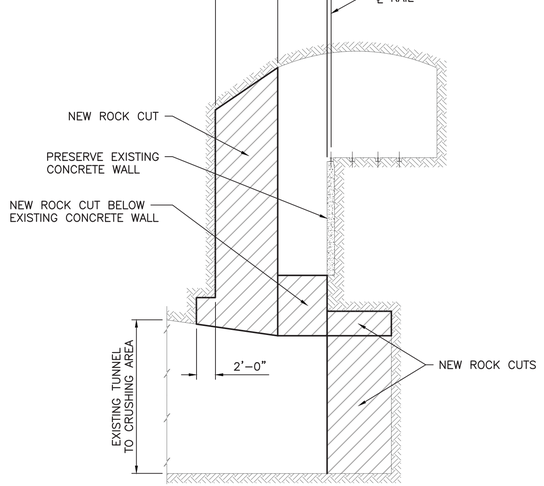
NOTES:

1. SURFACE STABILIZATION OF NEW ROCK CUTS IS REQUIRED. DESIGN AND APPLICATION BY OTHERS.

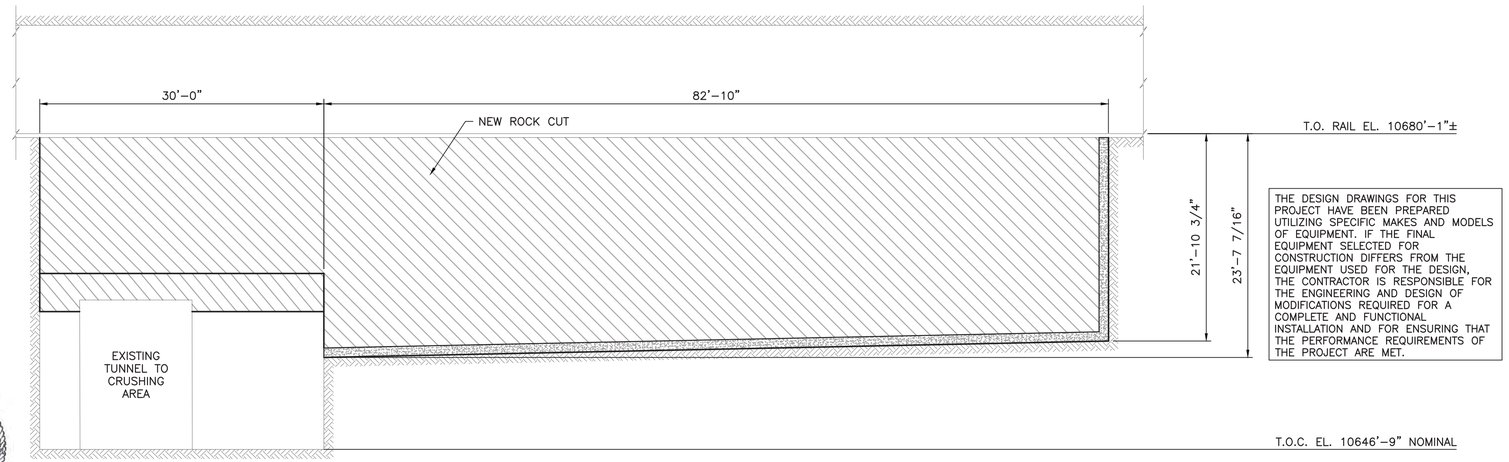




1 PLAN: NEW ROCK CUTS AT DUMP AND CRUSHING AREAS
1/8"=1'–0"



3 SECTION: NEW ROCK CUTS AT DUMP AND CRUSHING AREAS
1/8"=1'–0"



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2 SECTION: NEW ROCK CUTS AT DUMP AND CRUSHING AREAS
1/8"=1'–0"

COLORADO LICENSED SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A | B | C | 0 | 1 | 2 | 3

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Corporate Headquarters: Minneapolis, Minnesota Ph: 1–800–632–2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1–800–632–2277 Fax: (952) 832–2601 www.barr.com

Scale	AS SHOWN
Date	3/8/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT – PLAN
NEW ROCK CUTS AT DUMP AND CRUSHING AREA

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 200–GA–009
REV. No. 0

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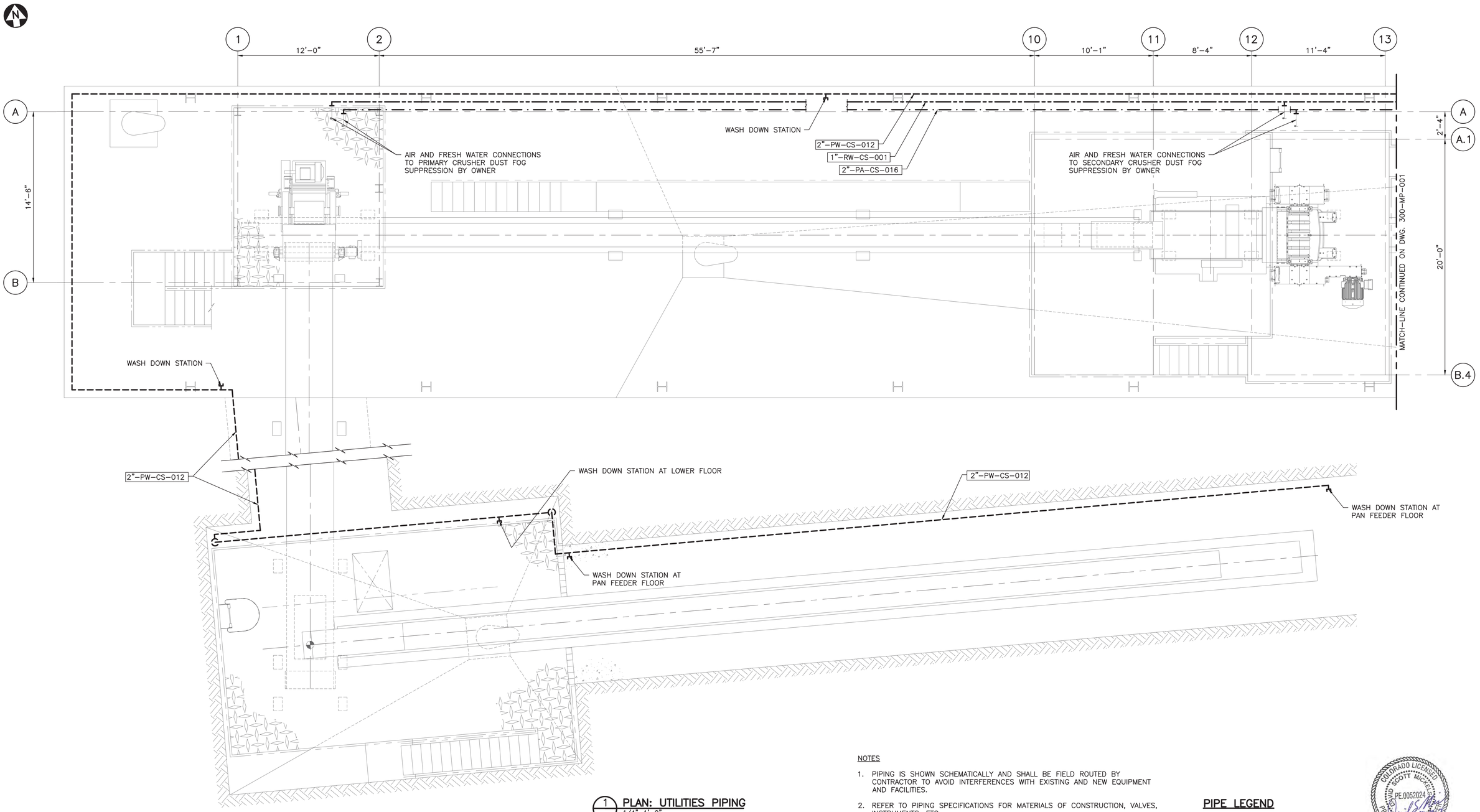

1 – PLAN: UTILITIES PIPING
1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

PIPE LEGEND

- SLURRY
- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

COLORADO LICENSED SCOTT MICKEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DAK
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITIES
DUMP POCKET AND CRUSHER AREAS

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 200–MP–001
REV. No. 0

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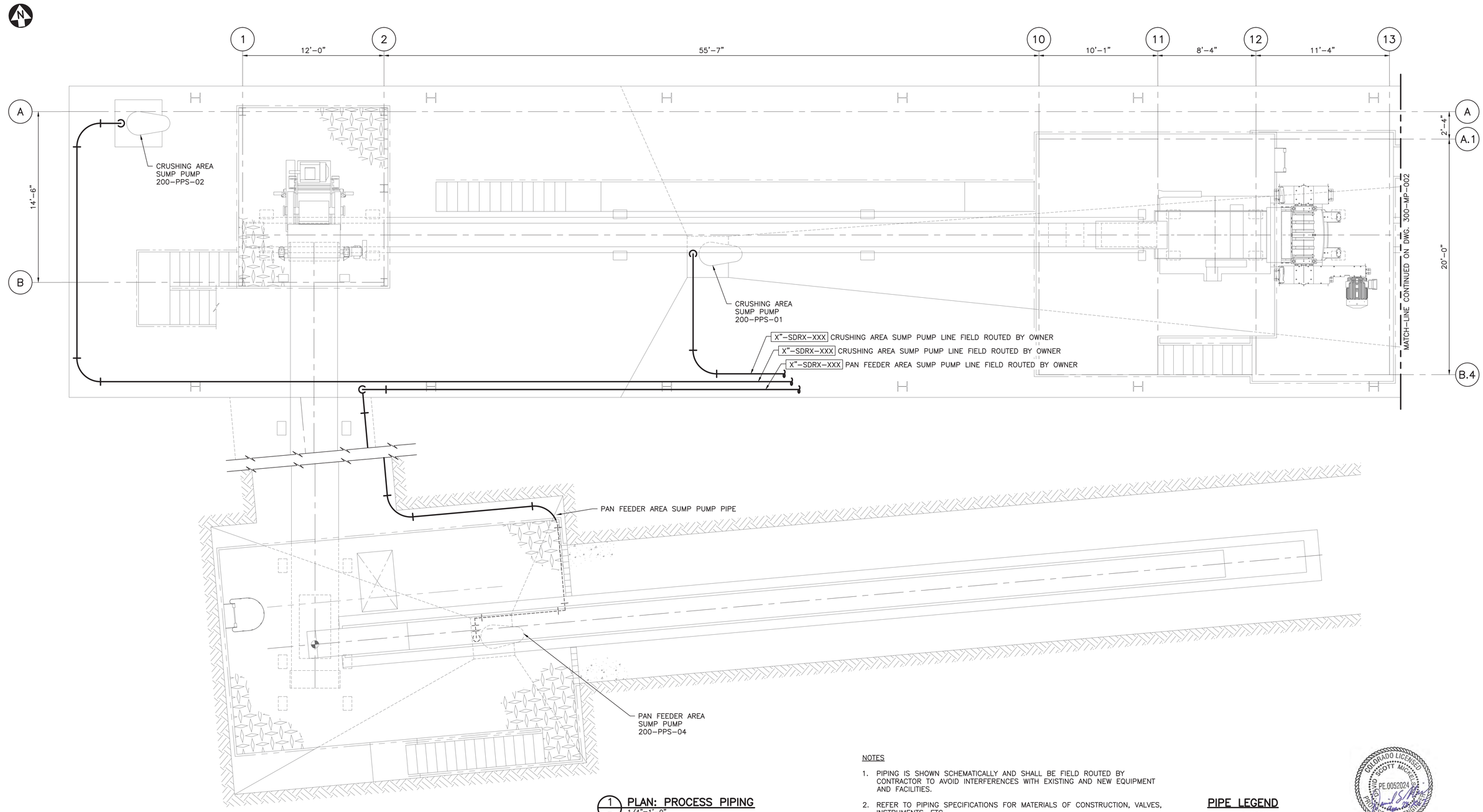

1 / – PLAN: PROCESS PIPING
1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

NOTES

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3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

PIPE LEGEND

- SLURRY
- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

COLORADO LICENSED SCOTT MICHAEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

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Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DAK
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DUMP POCKET AND CRUSHER AREAS

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 200–MP–002
REV. No. 0

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Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	Flanges
X"	SL	SDRX	XXX	200-PPS-xx PAN FEEDER AREA SUMP PUMP	BY OWNER	BY OWNER	-	-	-	-	-	-
X"	SL	SDRX	XXX	200-PPS-xx CRUSHER AREA SUMP PUMP	BY OWNER	BY OWNER	-	-	-	-	-	-
X"	SL	SDRX	XXX	200-PPS-01 CRUSHER AREA SUMP PUMP	BY OWNER	BY OWNER	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

SEE 300–MP–004 FOR UTILITY PIPING

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\055E6539-83DB-439B-A472-110F2711F7E6\8C2257B63-A352-40AB-9566-6913190ABCFE\06461001001_200-MP-003.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:17 PM
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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
DATE RELEASED							

CLIENT			4/28/17
BID			4/28/17
CONSTRUCTION			4/28/17

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www.barr.com

Scale	AS SHOWN
Date	4/13/17
Drawn	DAK
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

COLORADO LICENSED
SCOTT MICKELSON
PE.0052024
DAVID S. MICKELSON
PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

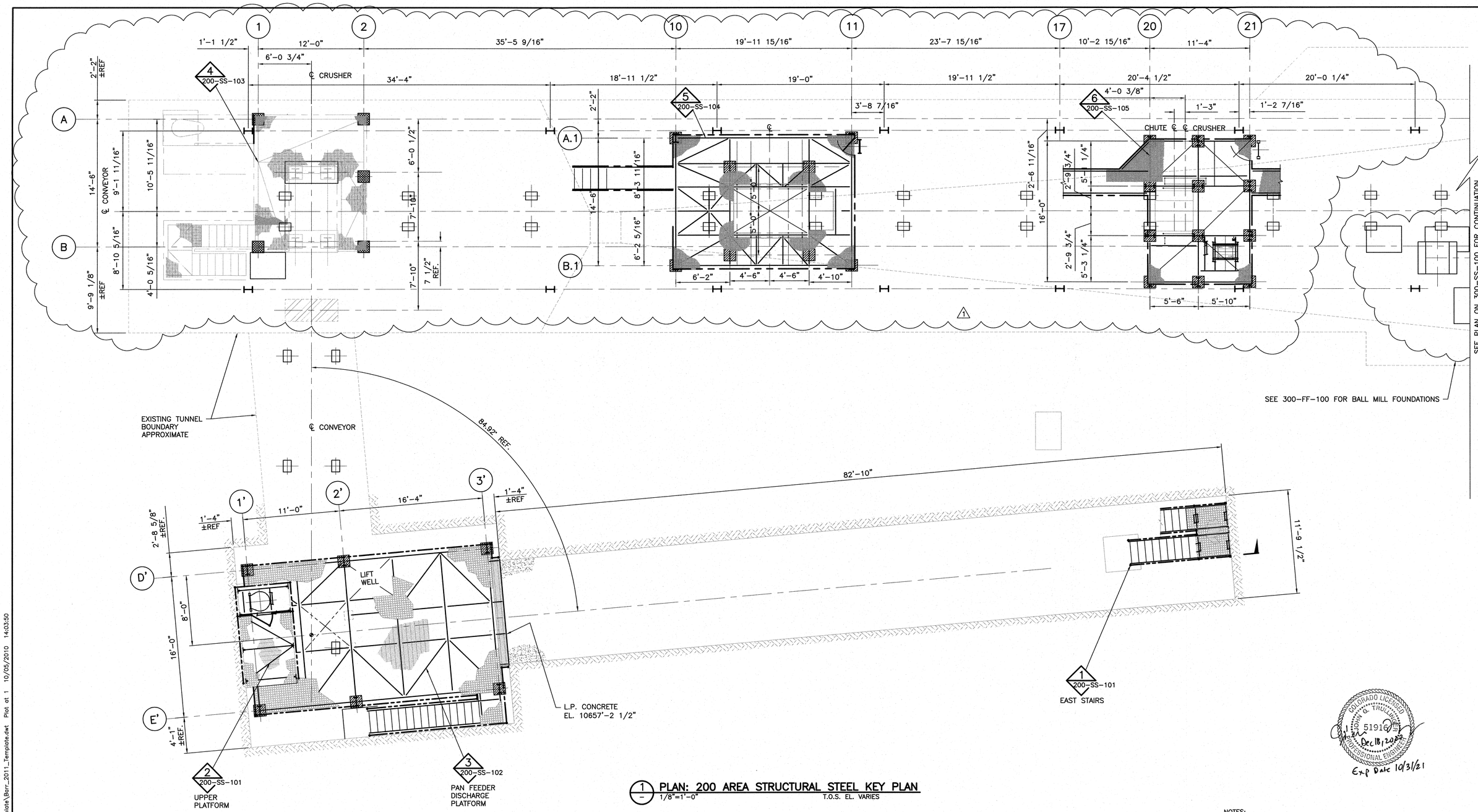
ISSUED FOR CONSTRUCTION

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No.	06/46–1001.00
CLIENT PROJECT No.	–
DWG. No.	200–MP–003
REV. No.	0



1 – PLAN: 200 AREA STRUCTURAL STEEL KEY PLAN
1/8"=1'-0" T.O.S. EL. VARIES

NOTES:

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102

COLORADO LICENSED JOHN G. TRULLINGER 51916 PROFESSIONAL ENGINEER Dec 18, 2020
Exp Date 10/31/21

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SWO	JGT	JGT	12/18/20	UPDATE TO MATCH 200-SS-104 THRU 200-SS-109, 200-FF AND 200-GA DWGS
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION

A	B	C	0	1	2	3
			4/28/17	12/18/20		
			4/28/17			
			4/28/17	12/18/20		

DATE RELEASED

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Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

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BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/14/17
Drawn	BMC
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

200 AREA STRUCTURAL STEEL KEY PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-100
REV. No. 1

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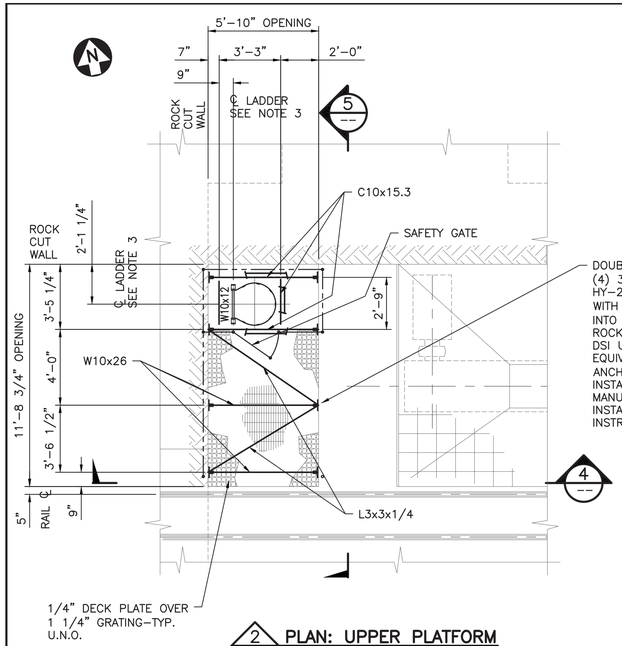
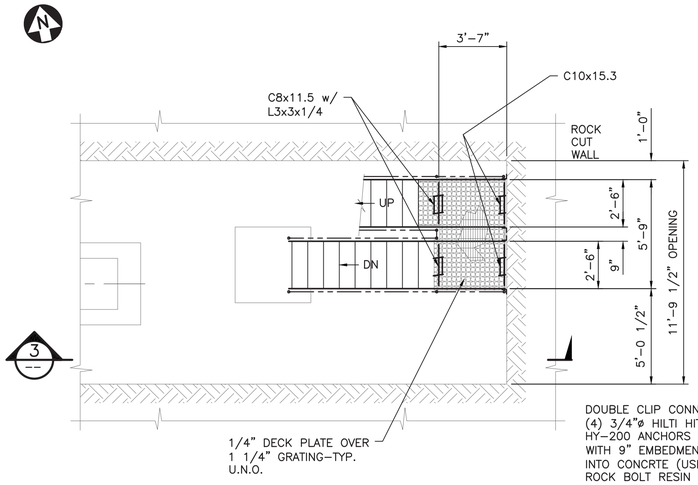
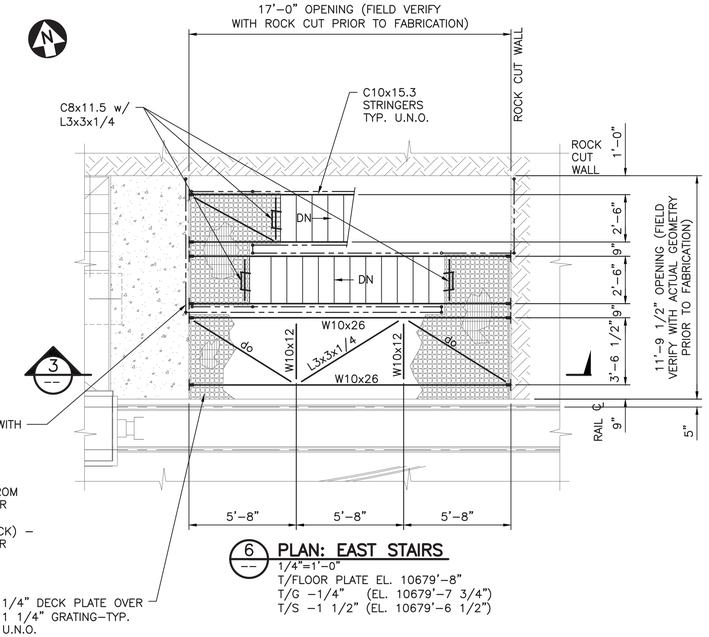


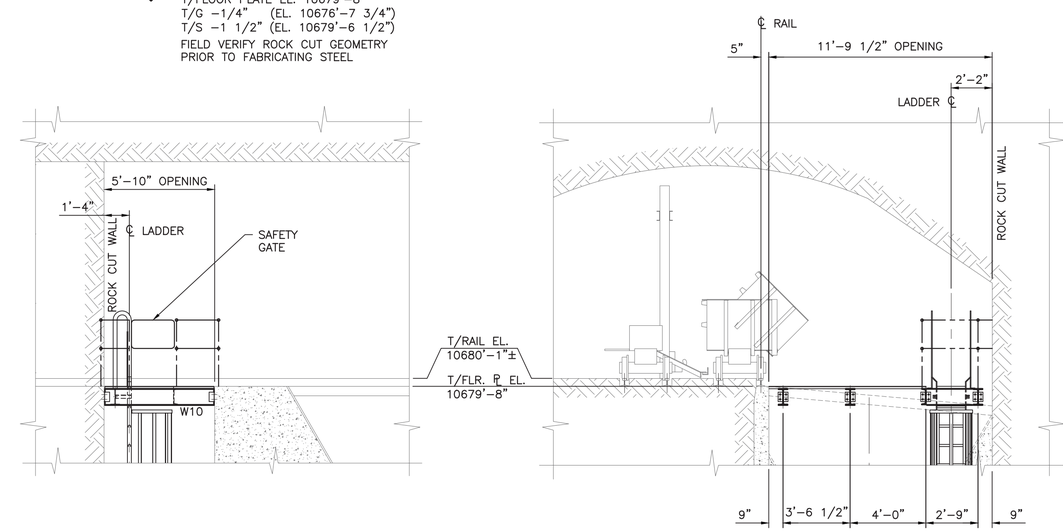
2 PLAN: UPPER PLATFORM
200-SS-100
1/4"=1'-0"
T/FLOOR PLATE EL. 10679'-8"
T/G -1/4" (EL. 10676'-7 3/4")
T/S -1 1/2" (EL. 10679'-6 1/2")
FIELD VERIFY ROCK CUT GEOMETRY PRIOR TO FABRICATING STEEL



1 DETAIL: EAST STAIR LANDING
200-SS-100
1/4"=1'-0"
T/FLOOR PLATE EL. 10665'-8 1/4"
T/G -1/4" (EL. 10665'-8")
T/S -1 1/2" (EL. 10665'-6 3/4")

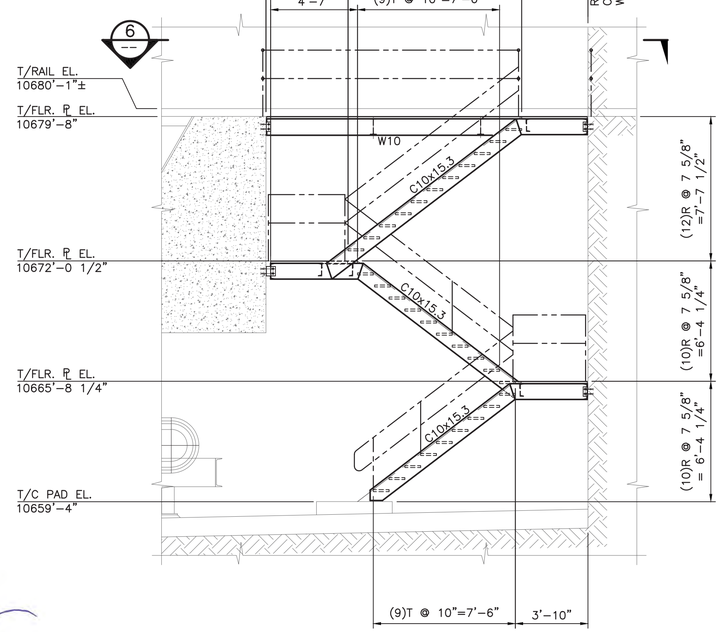


6 PLAN: EAST STAIRS
1/4"=1'-0"
T/FLOOR PLATE EL. 10679'-8"
T/G -1/4" (EL. 10679'-7 3/4")
T/S -1 1/2" (EL. 10679'-6 1/2")



4 ELEVATION: UPPER PLATFORM LOOKING NORTH
1/4"=1'-0"

5 ELEVATION: UPPER PLATFORM LOOKING WEST
1/4"=1'-0"



3 ELEVATION: EAST STAIR LOOKING NORTH
1/4"=1'-0"

NOTES:
1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. GEOTECHNICAL SPECIAL INSPECTOR TO INSPECT ROCK CUTS FOR SUITABILITY OF SUPPORTING STRUCTURES SHOWN ON THIS DRAWING.
3. OSHA COMPLIANT LADDER IS TO BE SUPPLIED BY CONTRACTOR WITH OSHA COMPLIANT CAGE. TOP RUNG IS TO BE AT EL 10679'-8". RUNGS BELOW THAT ARE TO BE AT 12" O.C. SIDE RAILS SHALL BE MADE OF 1/2"x2 1/2" BARS BRACED TO WALLS AT 8'-0" O.C. RUNGS TO BE MADE OF 1"ø SOLID ROD OR PREFORMED LADDER TREADS CAPABLE OF WITHSTANDING 250 POUNDS. LADDER TO BE 18" CLEAR BETWEEN RAILS EXCEPT ABOVE UPPER FLOOR WHERE RAILS FLARE OUT TO 24" CLEAR BETWEEN RAILS. LADDER TO BE SUPPLIED WITH A SELF CLOSING SAFETY GATE AT UPPER FLOOR. BOTTOM OF LADDER RAILS TO CONNECT TO W10 AT TOS EL 10657'-1" WITH CLIP ANGLE AND (1) BOLT PER RAIL.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17
DATE RELEASED: A B C 0 1 2 3

BARR
Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
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www.barr.com
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Scale	AS SHOWN
Date	4/5/17
Drawn	BMC
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
DUMP POCKET PLATFORM AND STAIRS

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 200-SS-101
REV. No. 0

CADD USER: Adqtuser FILE: \\PWHIB\HIBBING PW IN\{F061A54A-77EC-48E6-8FEB-706822C8946E}\88E95AD9-50C7-4FCA-97F4-3709260460D5\0646100100_200-SS-101.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 2:00 PM
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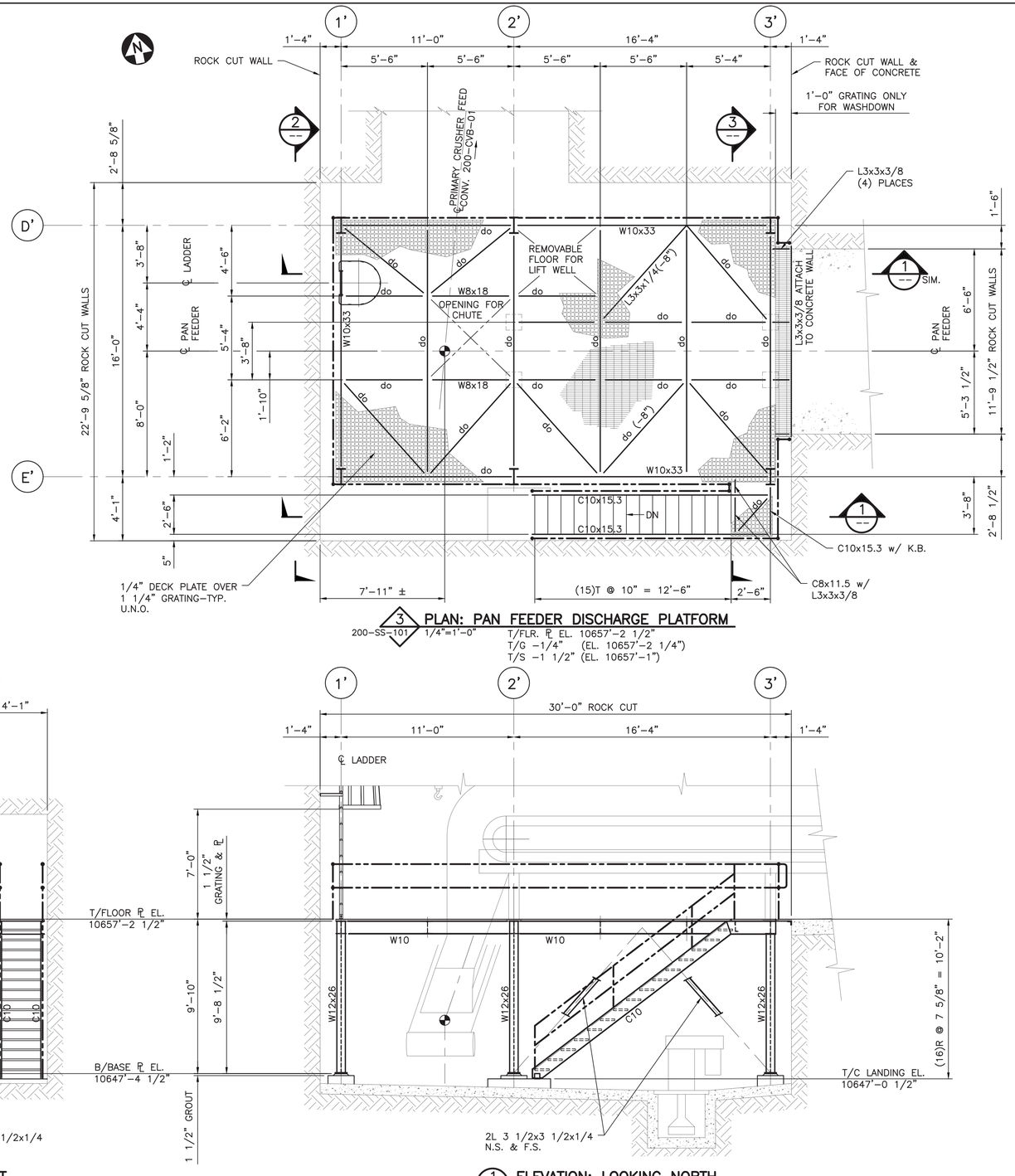
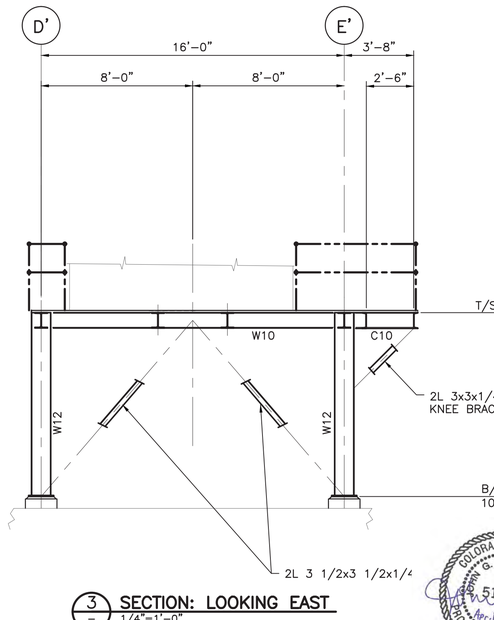
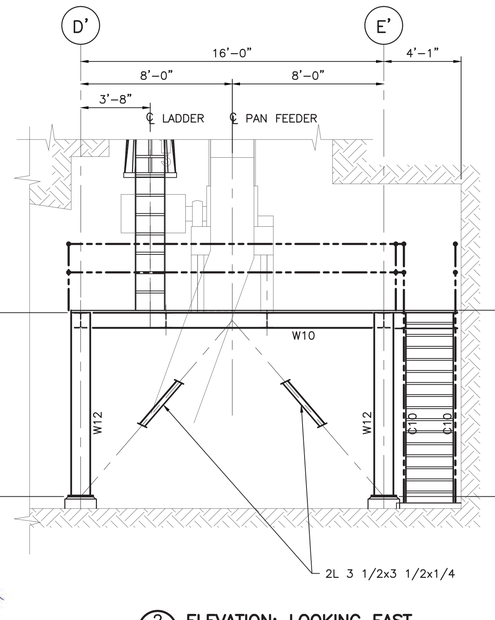


3 / 200–SS–101 **PLAN: PAN FEEDER DISCHARGE PLATFORM** 1/4"=1'–0"

T/FLR. ℄ EL. 10657'–2 1/2"
T/G –1/4" (EL. 10657'–2 1/4")
T/S –1 1/2" (EL. 10657'–1")



3 / – **SECTION: LOOKING EAST** 1/4"=1'–0"



2 / – **ELEVATION: LOOKING EAST** 1/4"=1'–0"

1 / – **ELEVATION: LOOKING NORTH** 1/4"=1'–0"

1. SEE STANDARD NOTES AND DETAILS ON 100–SS–100 THRU 100–SS–102

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID; CONSTRUCTION — 4/28/17

DATE RELEASED: A B C 0 1 2 3

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Corporate Headquarters: Minneapolis, Minnesota
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Project Office:
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SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	4/5/17
Drawn	BMC
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
PAN FEEDER DISCHARGE PLATFORM

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 200–SS–102
REV. No. 0

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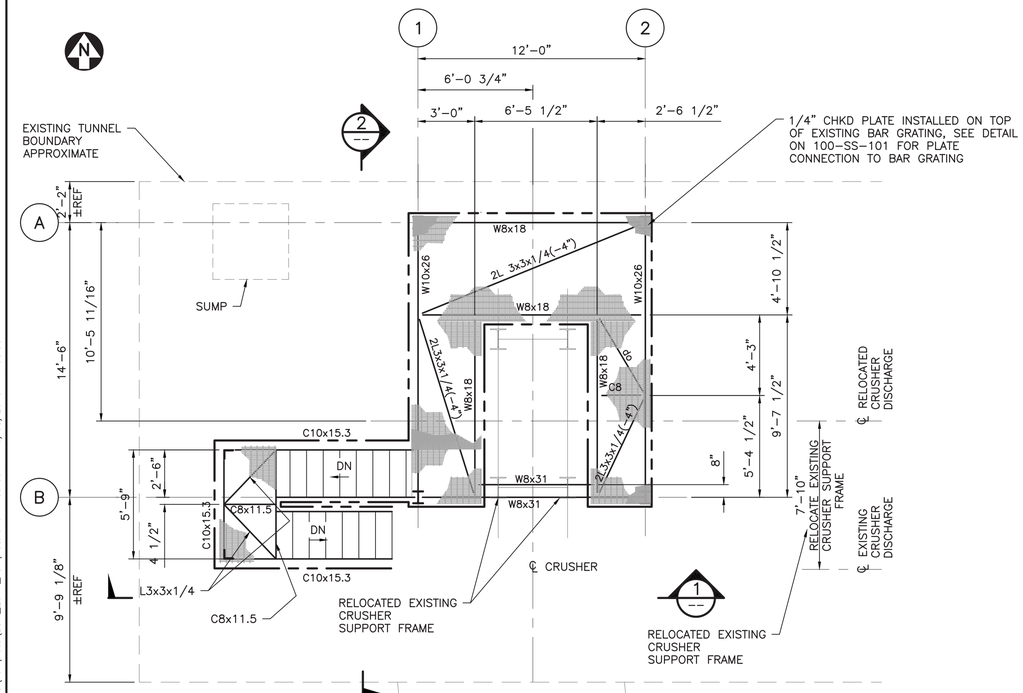
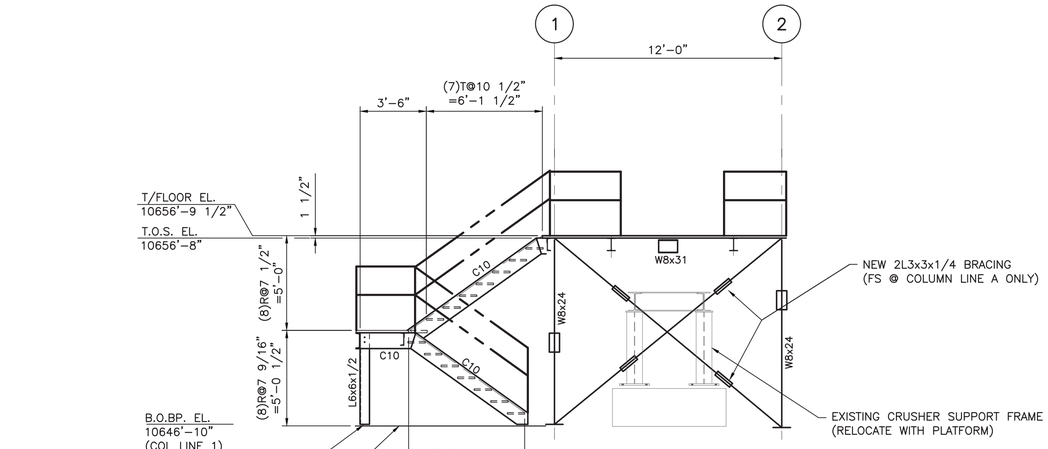
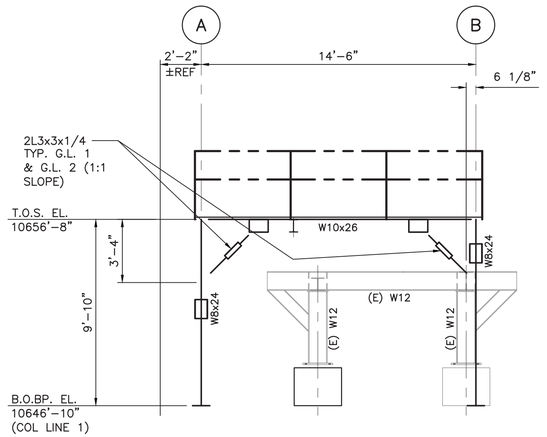


4 / 200-SS-100 **PLAN: NEW PRIMARY CRUSHER PLATFORM**
1/4"=1'-0" TOS EL. 10656'-8"

CONTRACTOR TO INSTALL NEW CONCRETE PIER AND RELOCATE EXISTING CRUSHER SUPPORT FRAME



1 / -- **SECTION: NEW PRIMARY CRUSHER PLATFORM**
1/4"=1'-0" LOOKING NORTH



2 / -- **SECTION: NEW PRIMARY CRUSHER PLATFORM**
1/4"=1'-0" LOOKING EAST

CONTRACTOR TO INSTALL NEW CONCRETE PIER AND RELOCATE EXISTING CRUSHER SUPPORT FRAME

NOTES:

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. TYPICAL DOUBLE CLIP ANGLE BEAM END CONNECTIONS PER 100-SS-100 MAY NOT WORK FOR CONNECTIONS FRAMING INTO W8 COLUMN WEBS. IF DOUBLE CLIP ANGLE CONNECTIONS DO NOT FIT, IT IS ACCEPTABLE TO USE SINGLE PLATE "SHEAR TAB" END CONNECTIONS PER AISC FIG 10-11 WITH n=2 FOR W8 & W10 BEAMS WITH 1/4" FILLET WELD SIZE AND 3/8" THICK PLATE.
3. NEW PLATFORM SHOWN IN PLAN 4 WAS ORIGINALLY INTENDED TO BE AN EXISTING PLATFORM RELOCATED WITH A SMALL AMOUNT OF MODIFICATION. PLATFORM WAS DAMAGED DURING DEMO OF OTHER ITEMS IN PLANT AND HAS TO BE RE-BUILT AS SHOWN. THE DESIGN IS ESSENTIALLY THE SAME AS PREVIOUS CH2M HILL DESIGN. END CONNECTIONS FOR CORNER VERTICAL BRACING SHOWN IN SECTION 2 CAN BE DESIGNED TO MATCH TYPICAL CH2M HILL CONNECTION DESIGNS AS FOUND OTHER LOCATIONS IN EXISTING STEEL IN PROCESSING PLANT.

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17			
BID				4/28/17			
CONSTRUCTION				4/28/17			

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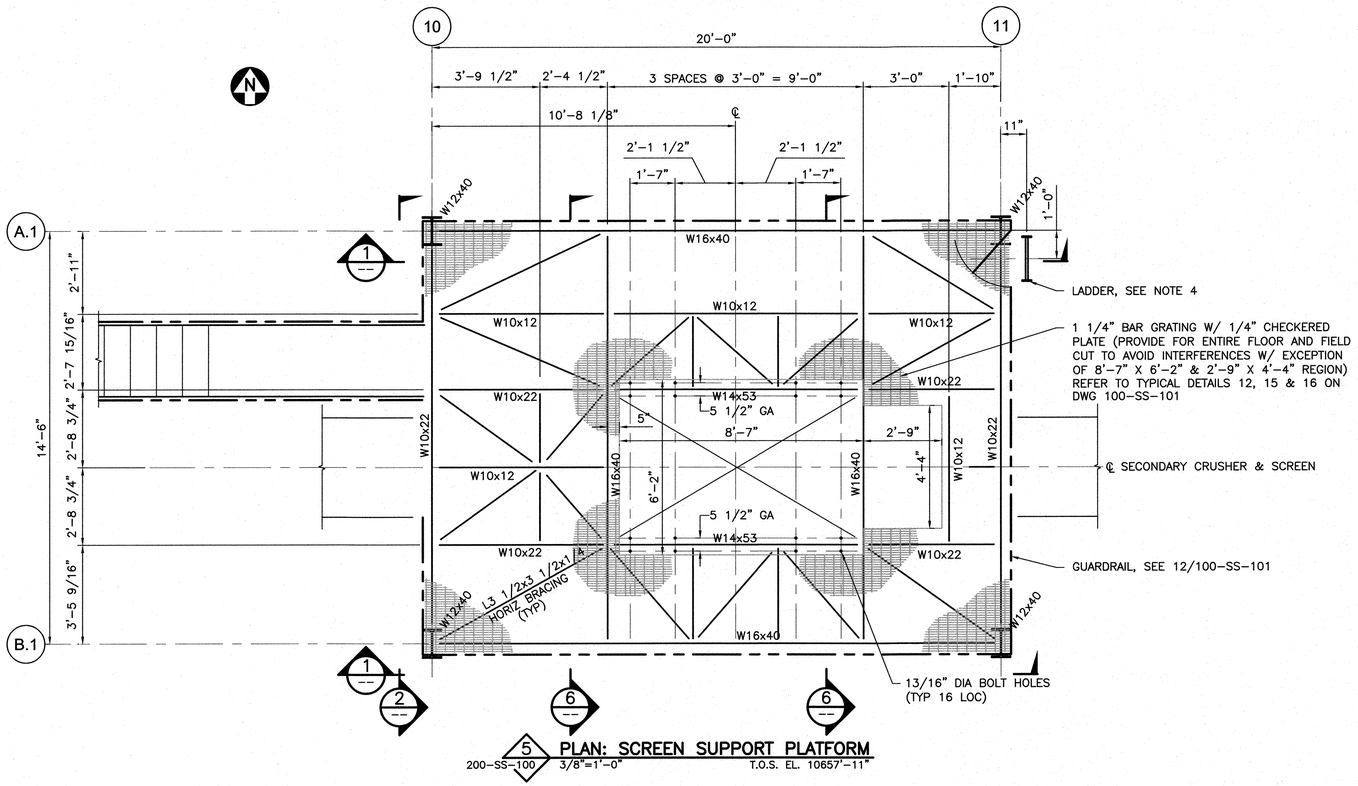
Scale	AS SHOWN
Date	2/21/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JDT

OURAY SILVER MINES, INC.
OURAY, COLORADO

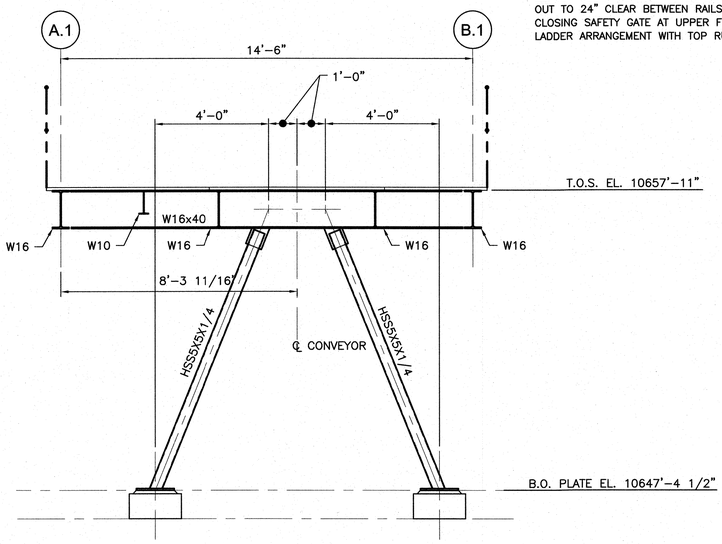
PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
PRIMARY CRUSHER PLATFORM

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 200-SS-103
REV. No. 0



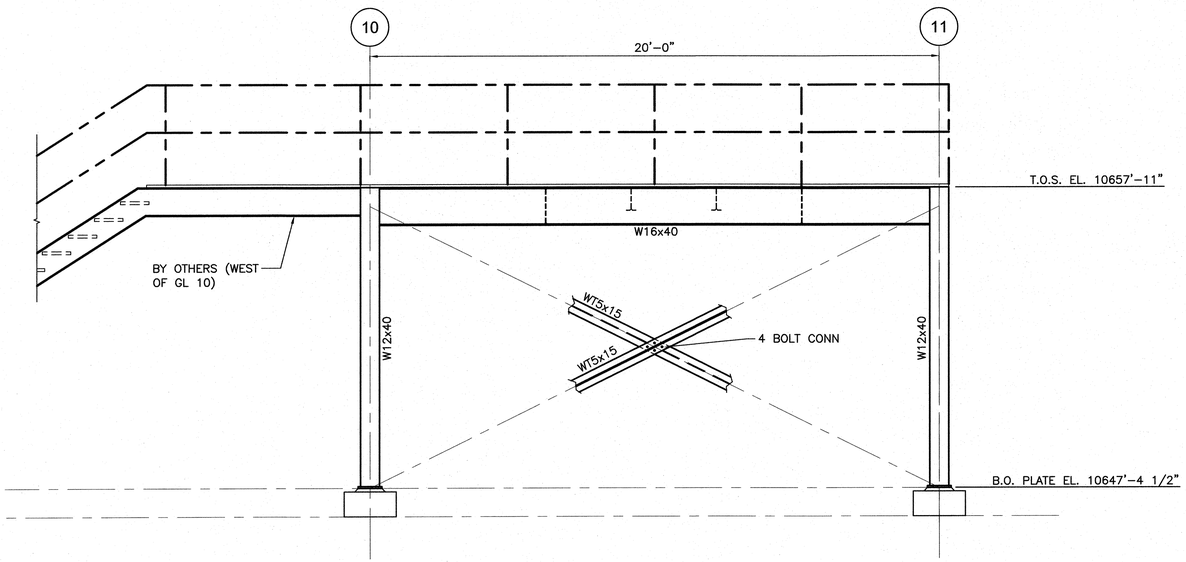
5 PLAN: SCREEN SUPPORT PLATFORM
200-SS-100 3/8"=1'-0" T.O.S. EL. 10657'-11"



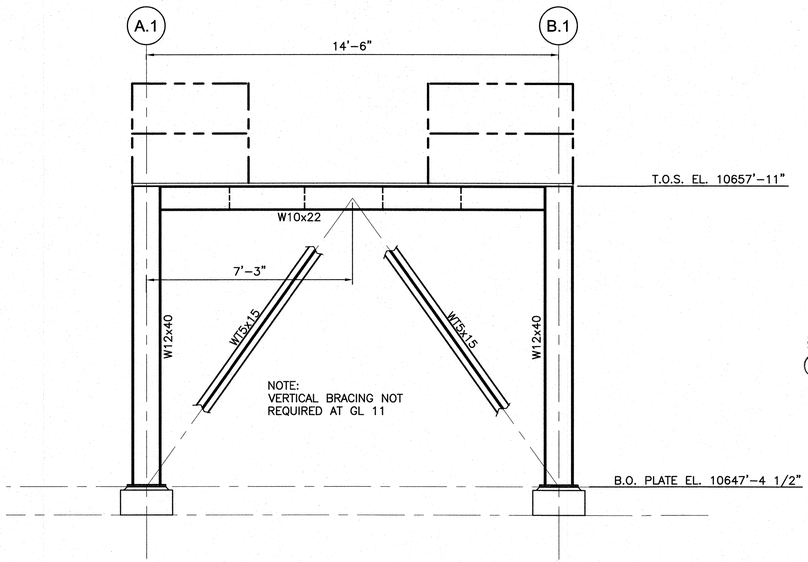
6 SECTION: SCREEN SUPPORT PLATFORM
3/8"=1'-0"

NOTES:

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. COORDINATE CONNECTION AND HANDRAIL WITH CONVEYOR SUPPLIER.
3. STEEL LAYOUT IS BASED ON TABOR MACHINE DRAWING 8A-GA-48-17507-B REV 4, 4 FT X 8 FT SINGLE DECK SCREEN.
4. OSHA COMPLIANT LADDER IS TO BE SUPPLIED BY CONTRACTOR. TOP RUNG IS TO BE AT EL 10658'-0 1/2". RUNGS BELOW THAT ARE TO BE AT 12" O.C. SIDE RAILS SHALL BE MADE OF 1/2"x2 1/2" BARS. RUNGS TO BE MADE OF 250 POUND CAPACITY, NON-SLIP PERFORATED, OR EQ. LADDER TO BE 18" CLEAR BETWEEN RAILS EXCEPT ABOVE UPPER FLOOR WHERE RAILS FLARE OUT TO 24" CLEAR BETWEEN RAILS LADDER TO BE SUPPLIED WITH A SELF CLOSING SAFETY GATE AT UPPER FLOOR. SEE 5/200-SS-105 SIMILAR FOR LADDER ARRANGEMENT WITH TOP RUNG AT T.O. RUNG EL 10658'-0 1/2".



1 SECTION: SCREEN SUPPORT PLATFORM
3/8"=1'-0" ALONG GRIDS A.1 & B.1



2 SECTION: SCREEN SUPPORT PLATFORM
3/8"=1'-0" ALONG GRID 10

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ELP Date 10/31/21

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1	SWO	JGT	JGT	11/19/20	ISSUED FOR CONSTRUCTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

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DATE RELEASED: A 04/28/17 11/19/20 | B 04/28/17 11/19/20 | C 04/28/17 11/19/20 | 0 | 1 | 2 | 3

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Scale	AS SHOWN
Date	2/21/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
SCREEN SUPPORT PLATFORM

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-104
REV. No. 1

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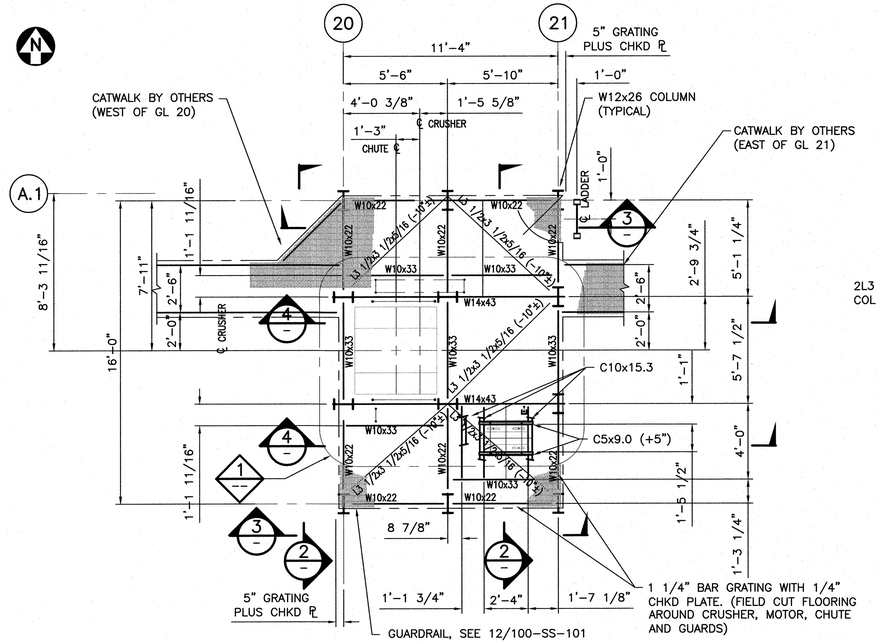
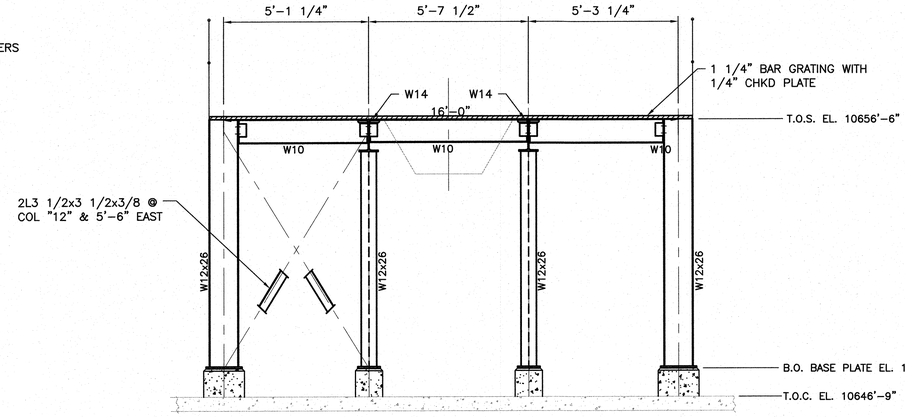
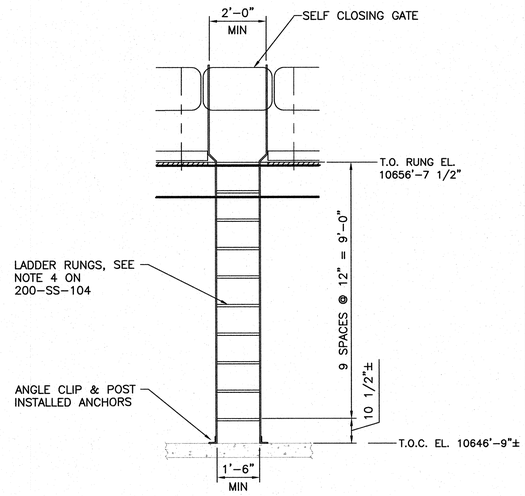


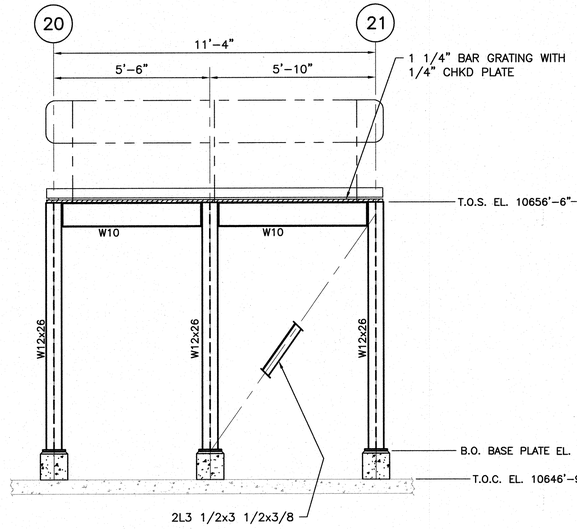
6 PLAN: SECONDARY CRUSHER PLATFORM
200-SS-100 1/4"=1'-0" T.O.S. EL. 10656'-6"



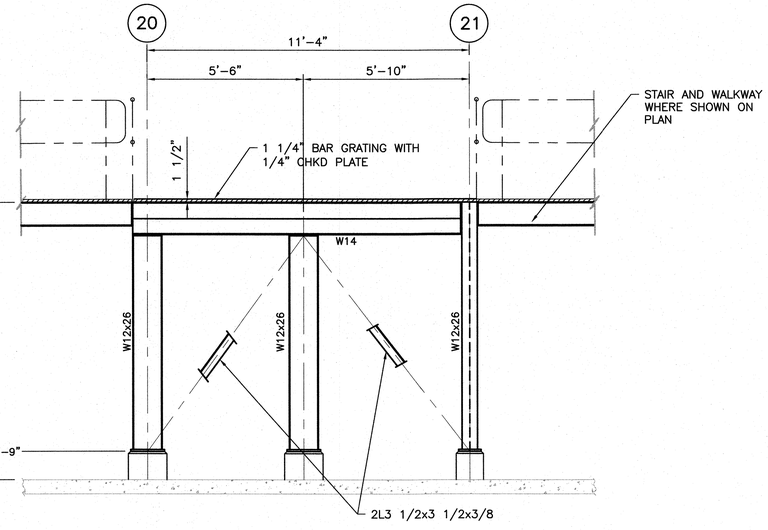
2 SECTION: LOOKING EAST
3/8"=1'-0"
TYP (3) PLACES



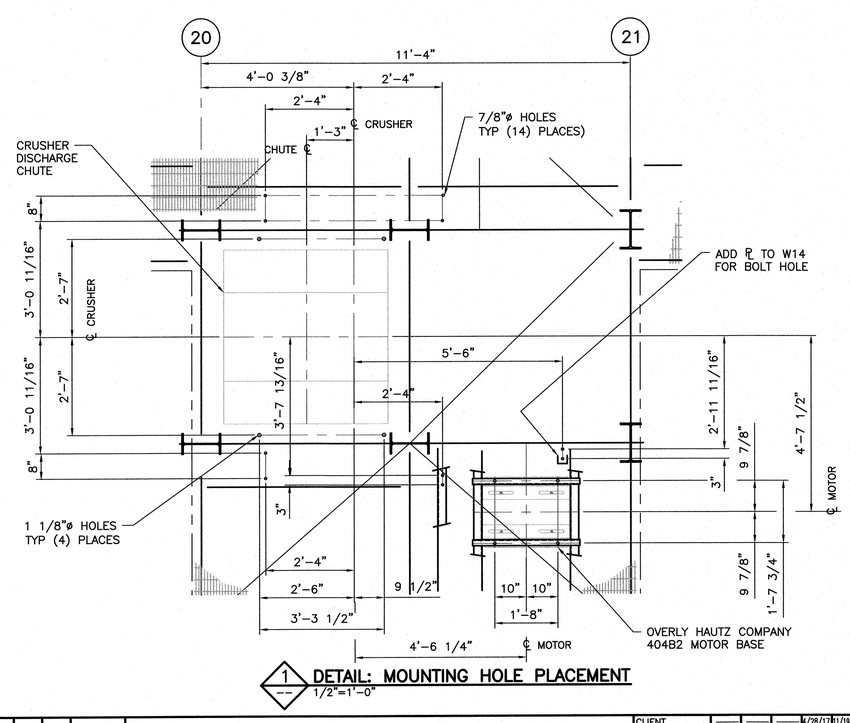
5 ELEVATION: TYPICAL LADDER
3/8"=1'-0"



3 SECTION: LOOKING NORTH
3/8"=1'-0"
TYP. (2) PLACES



4 SECTION: LOOKING NORTH
3/8"=1'-0"
TYP. (2) PLACES



1 DETAIL: MOUNTING HOLE PLACEMENT
1/2"=1'-0"

NOTES:
1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. STRUCTURAL DESIGN IS BASED ON MCLANAHAN DRAWING D1153-61 (2 SHEETS). THESE WERE NOT VENDOR CERTIFIED DRAWINGS.

COLORADO LICENSED JOHN G. TRULLINGER 51916 PROFESSIONAL ENGINEER
Exp Date 10/31/21

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SWO	JGT	JGT	11/19/20	ISSUED FOR CONSTRUCTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 11/19/20; BID 4/28/17 11/19/20; CONSTRUCTION 4/28/17 11/19/20

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Scale	AS SHOWN
Date	4/12/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

SECONDARY CRUSHER STRUCTURAL FRAMING PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-105
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001\04_200-SS-105.DWG PLOT SCALE: 1:1 PLOT DATE: 11/19/2020 4:59 PM
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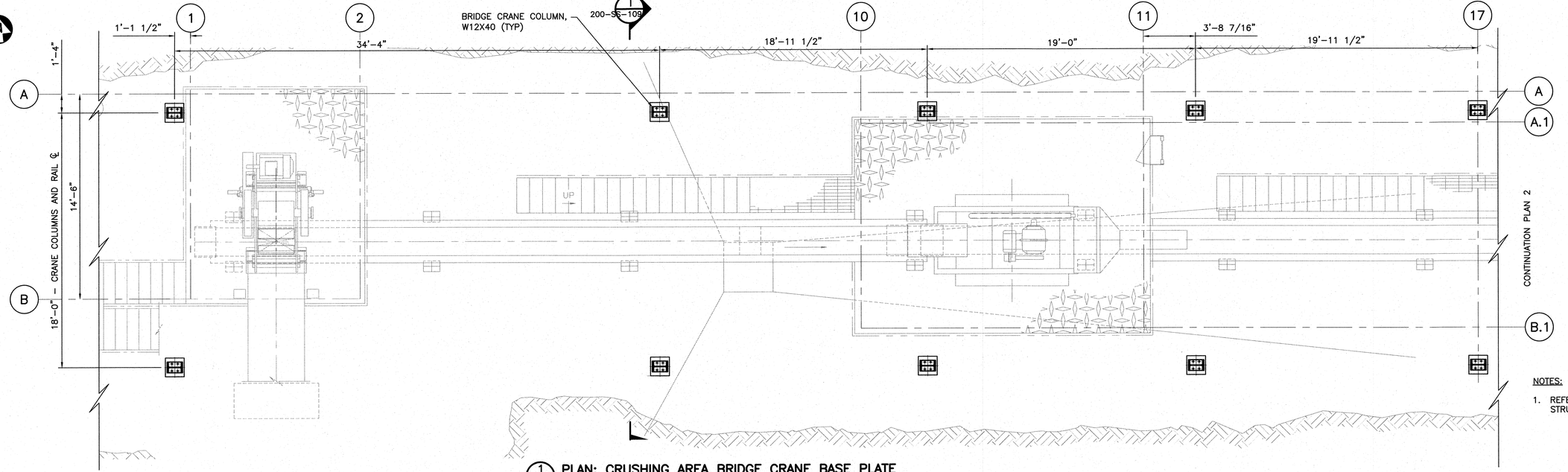
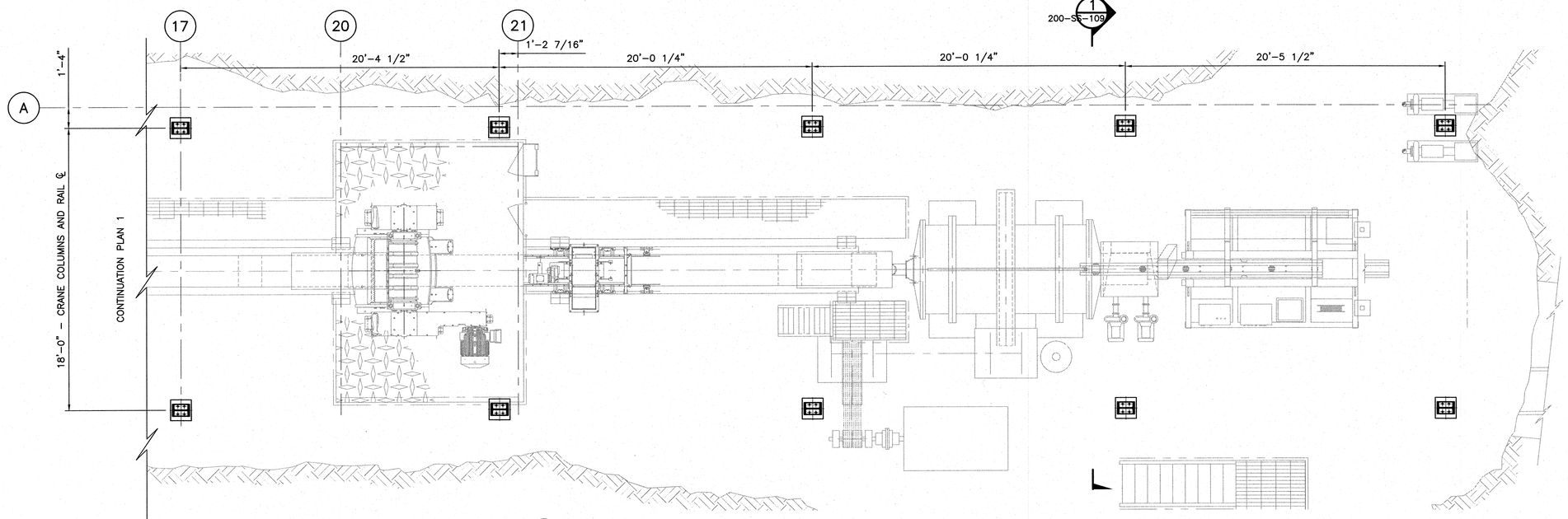


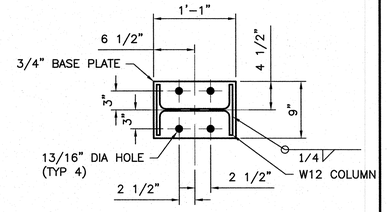
NOTES:

1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.

1 — PLAN: CRUSHING AREA BRIDGE CRANE BASE PLATE
1/4"=1'-0"



2 — PLAN: CRUSHING AREA BRIDGE CRANE BASE PLATE
1/4"=1'-0"



3 — DETAIL:
1"=1'-0"

COLORADO LICENSED
JOHN G. TRULLINGER
51916
PROFESSIONAL ENGINEER
Nov 13, 20
Exp Date
10/31/21

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
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CONSTRUCTION				11/13/20			

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Scale	AS SHOWN
Date	NOV 2020
Drawn	SWO
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Designed	JGT
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CRUSHING AREA BRIDGE CRANE BASE PLATE PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-106
REV. No. 0

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100104_200-SS-106.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 3:39 PM
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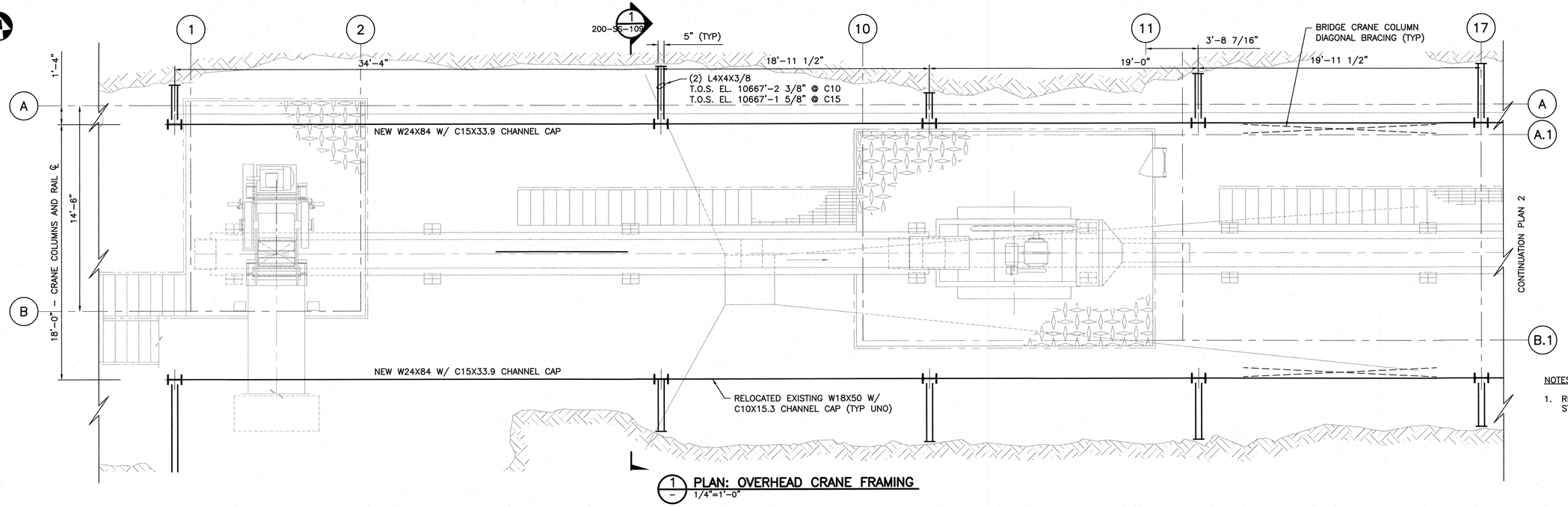
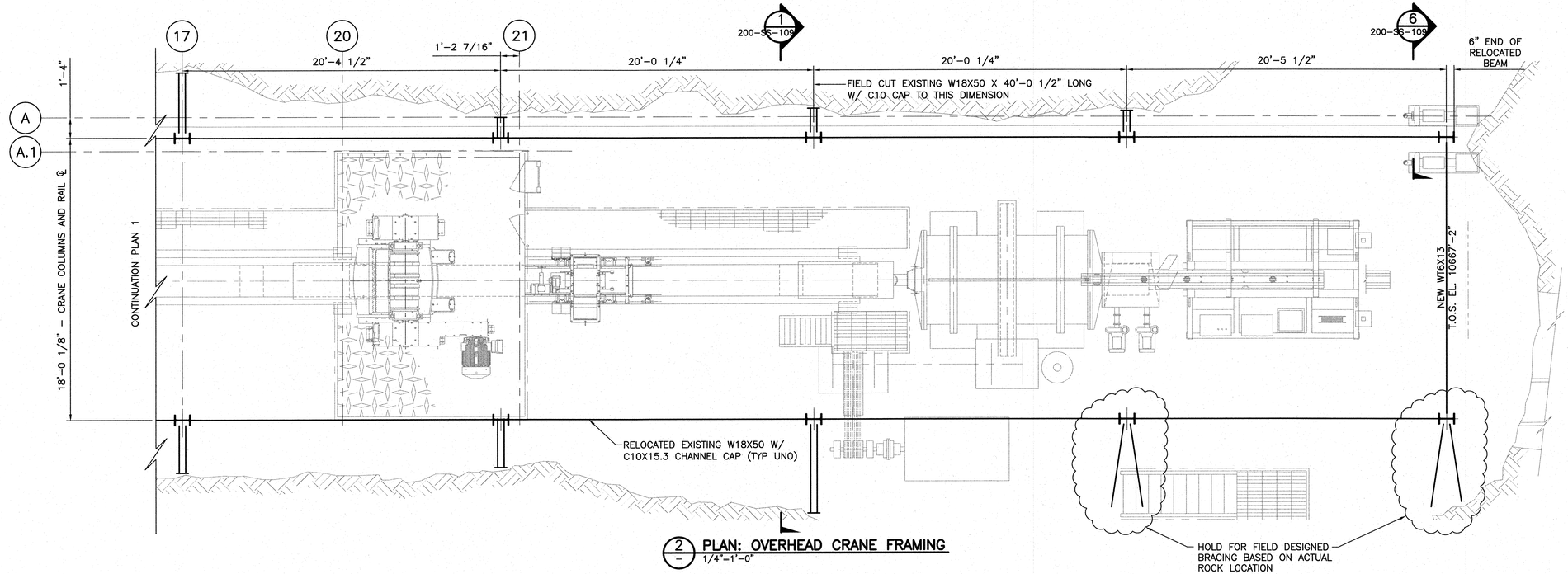


1 — PLAN: OVERHEAD CRANE FRAMING
1/4"=1'-0"

NOTES:

1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.



2 — PLAN: OVERHEAD CRANE FRAMING
1/4"=1'-0"

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JOHN C. TRULLINGER
51916
PROFESSIONAL ENGINEER
NOV 13, 2020
Exp Date 10/31/21

0 NEW DRAWING

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	SWO	JGT	DSM	11/13/20	ISSUED FOR CONSTRUCTION

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CLIENT				11/13/20			
BID							
CONSTRUCTION				11/13/20			
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Date	NOV 2020
Drawn	SWO
Checked	JGT
Designed	JGT
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CRUSHING AREA BRIDGE CRANE
RUNWAY FRAMING PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-107
REV. No. 0

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001004_200-SS-107.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 3:39 PM
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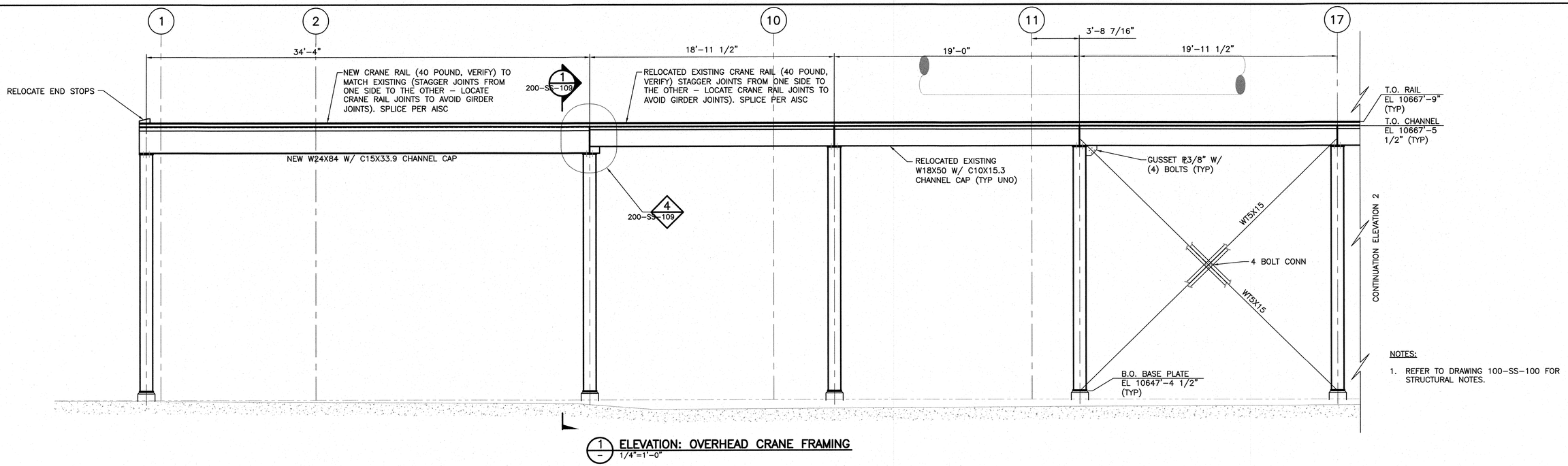
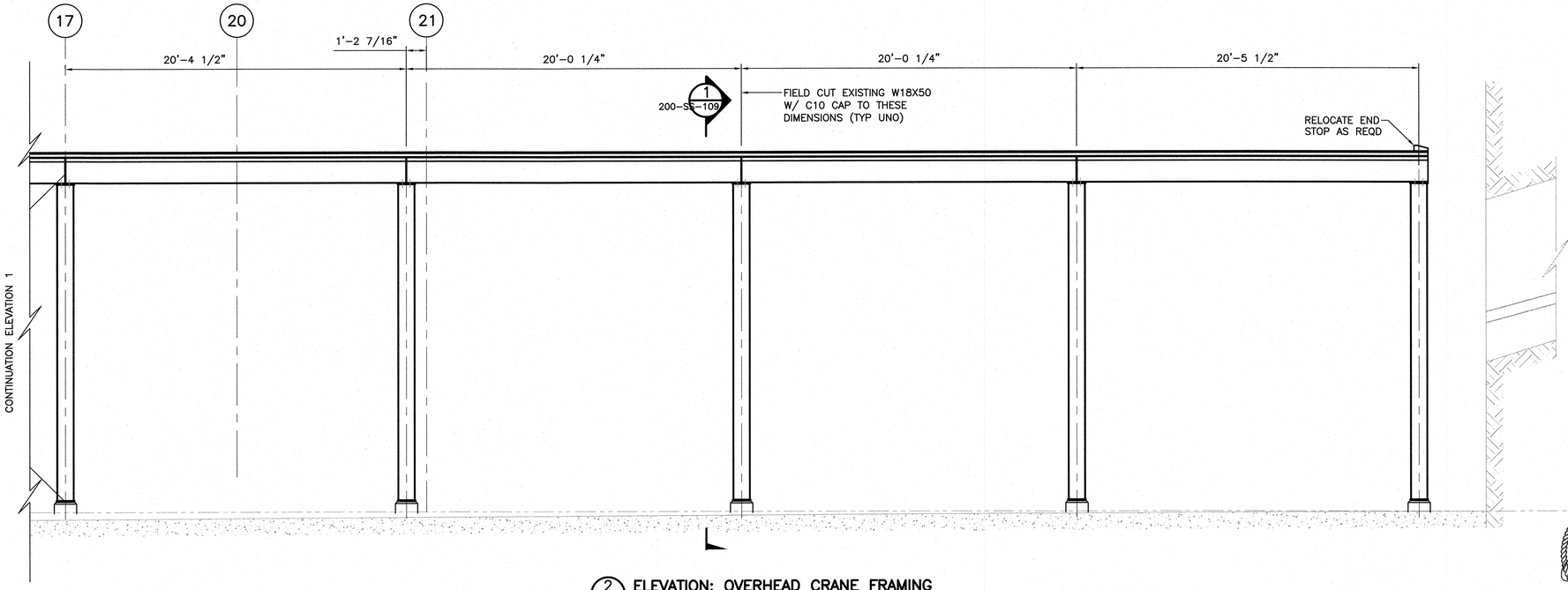


NOTES:

1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.

1 – ELEVATION: OVERHEAD CRANE FRAMING
1/4"=1'-0"



2 – ELEVATION: OVERHEAD CRANE FRAMING
1/4"=1'-0"

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PROFESSIONAL ENGINEER
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0	SWO	JGT	DSM	11/13/20	ISSUED FOR CONSTRUCTION

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Date	NOV 2020
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OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CRUSHING AREA BRIDGE CRANE ELEVATION

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-108
REV. No. 0

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001104_200-SS-108.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 3:40 PM
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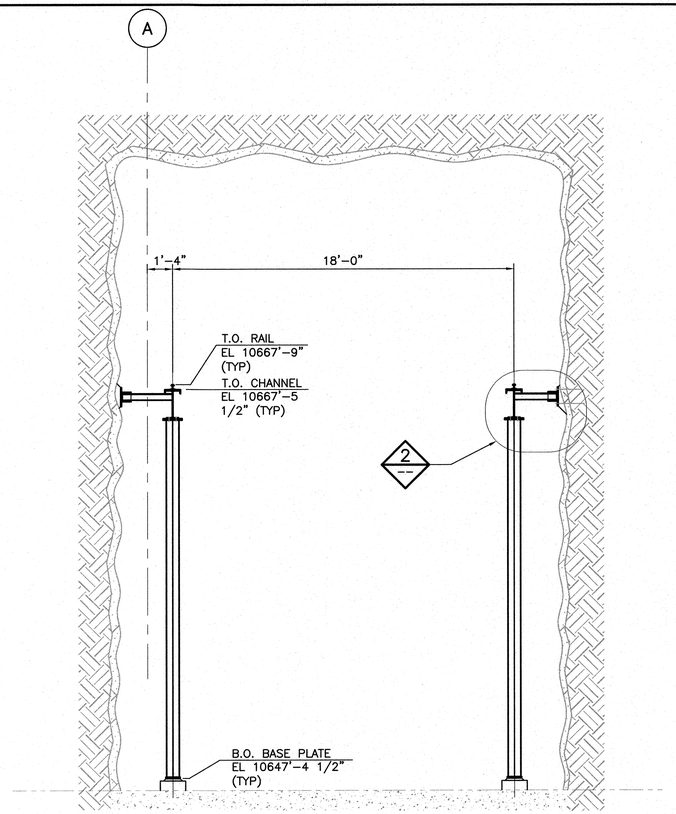
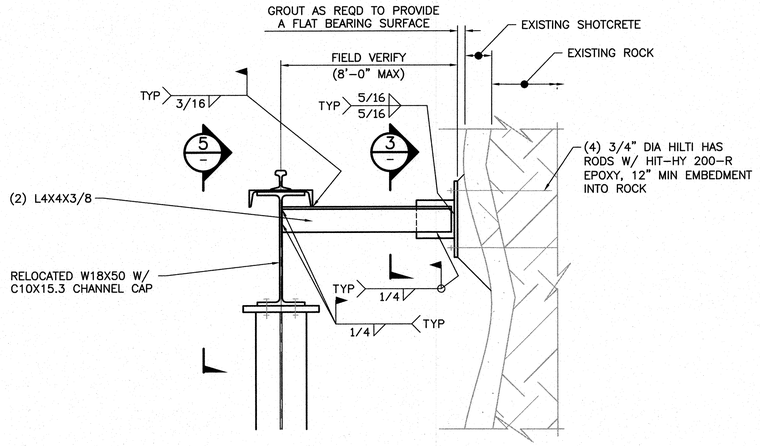
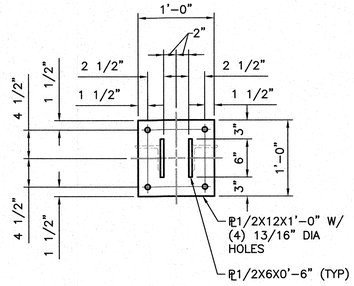


1 SECTION: OVERHEAD CRANE FRAMING
1/4"=1'-0"
200-SS-106
200-SS-107
200-SS-108



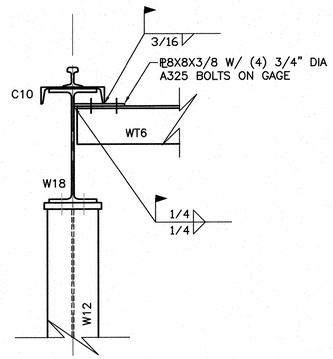
2 DETAIL: OVERHEAD CRANE FRAMING
1/4"=1'-0"



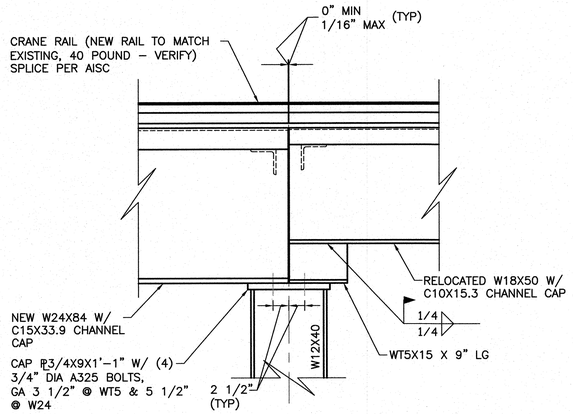
3 SECTION: OVERHEAD CRANE FRAMING
1/4"=1'-0"

NOTES:

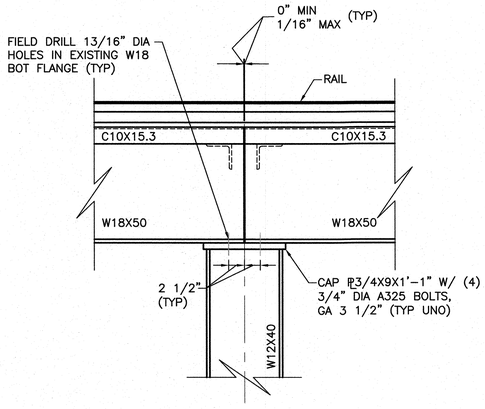
1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.



6 SECTION: OVERHEAD CRANE FRAMING
200-SS-107 1/4"=1'-0"



4 DETAIL: OVERHEAD CRANE FRAMING
200-SS-108 1/4"=1'-0"



5 SECTION: OVERHEAD CRANE FRAMING
1/4"=1'-0"

COLORADO LICENSED
JOHN G. TRULLINGER
51916
PROFESSIONAL ENGINEER
Nov 13, 2020
Exp Date 10/31/21

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	SWO	JGT	DSM	11/13/20	ISSUED FOR CONSTRUCTION

1 NEW DRAWING

ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 11/13/20; BID; CONSTRUCTION 11/13/20

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Scale	AS SHOWN
Date	NOV 2020
Drawn	SWO
Checked	JGT
Designed	JGT
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL SECTIONS AND DETAILS AT OVERHEAD CRANE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-SS-109
REV. No. 0

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100104_200-SS-109.DWG PLOT SCALE: 1:1 PLOT DATE: 11/13/2020 3:40 PM
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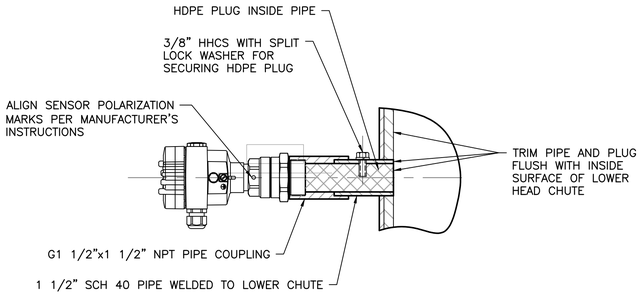
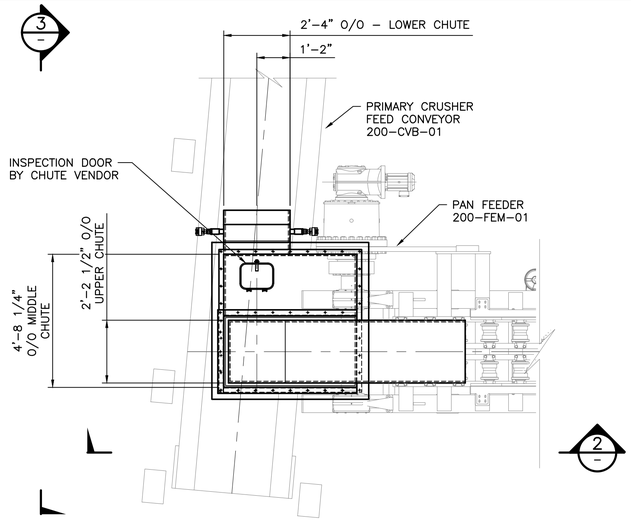


4 — **DETAIL: SENSOR MOUNTING** 3"=1'-0" — TYPICAL, 2 PLACES

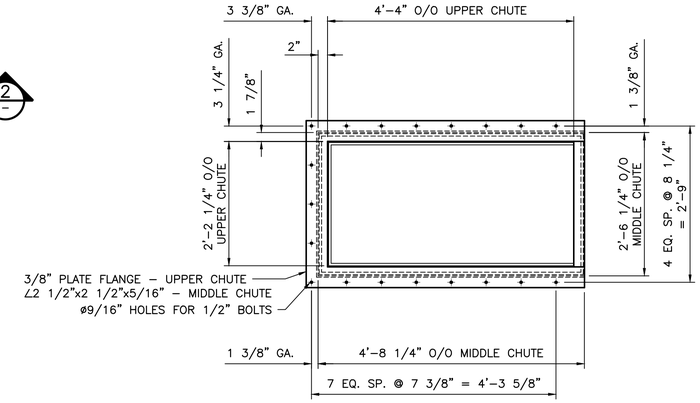


N — **PLAN:**

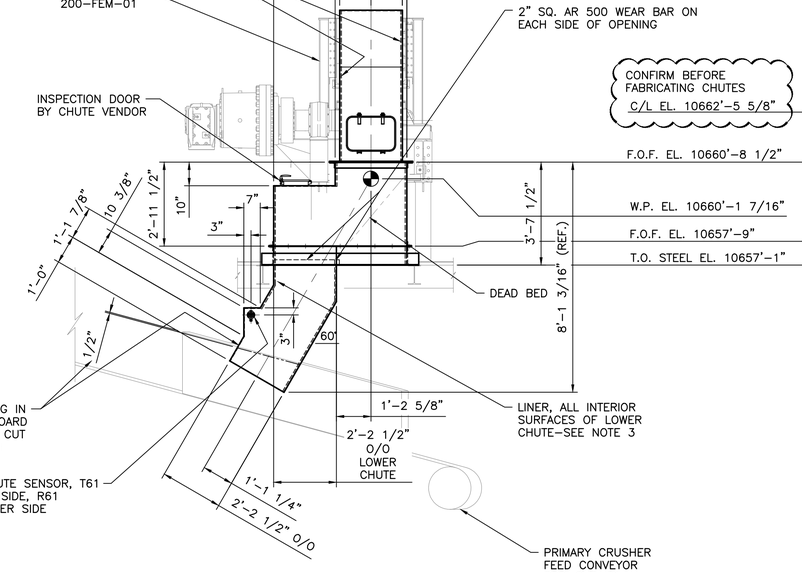
1 (200-GA-002) — **DETAIL: PAN FEEDER HEAD CHUTE 200-CHU-02** 3/8"=1'-0"

NOTES:

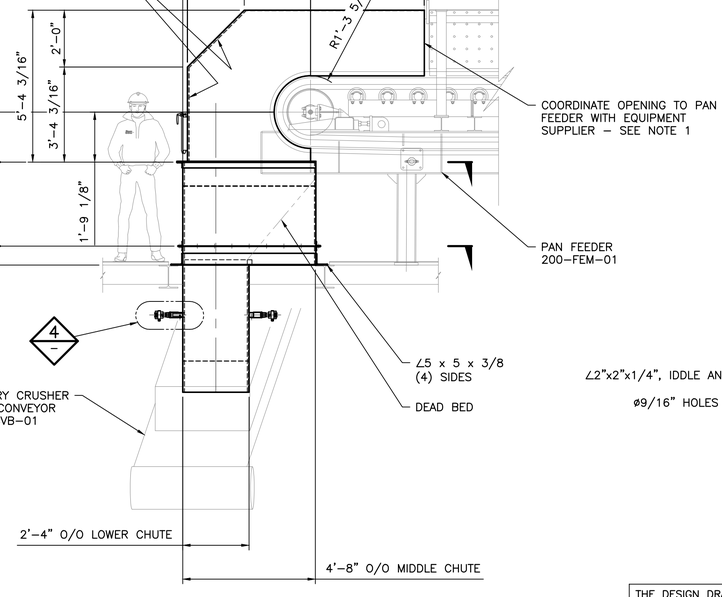
1. WORK THIS DRAWING WITH 200-GA-001 THRU -004 AND FEECO DRAWING US25500091, REV. 0.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. ALL INTERIOR SURFACES OF CHUTE (EXCEPT AS SHOWN) SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL ADDITIONAL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



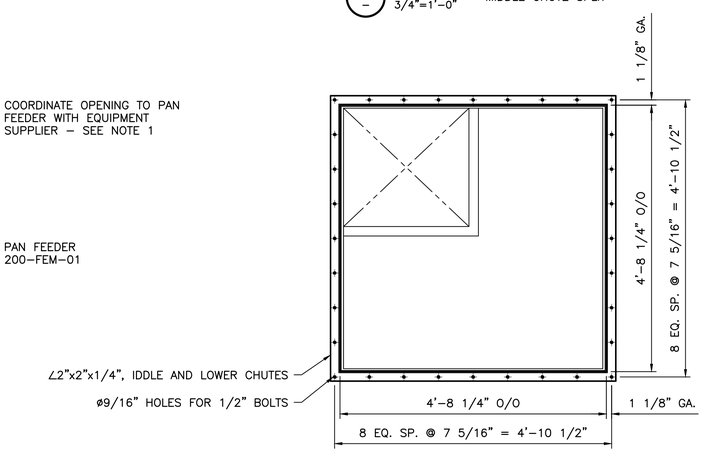
6 — **SECTION:** 3/4"=1'-0" — FLANGE AT UPPER AND MIDDLE CHUTE SPLIT



3 — **SECTION: PAN FEEDER HEAD CHUTE 200-CHU-02** 3/8"=1'-0" — LOOKING EAST



2 — **SECTION: PAN FEEDER HEAD CHUTE 200-CHU-02** 3/8"=1'-0" — LOOKING NORTH



5 — **SECTION:** 3/4"=1'-0" — FLANGE AT MIDDLE AND LOWER CHUTE SPLIT

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	AMB3	DSM	3/31/21	TITLE EDIT
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/2017	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 11/18/20 3/31/21; BID 4/28/17; CONSTRUCTION 4/28/17 11/18/20 3/31/21

DATE RELEASED: A 4/28/17; B 11/18/20; C 3/31/21; 0; 1; 2; 3

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	4/7/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK (1) PAN FEEDER HEAD CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-002
REV. No. 2

CADD USER: Hbpwuser FILE: \\HB-PW\HB_PW_IN\3174E848-5071-4020-A785-DC0E8BEC2679\16BBE734-F39C-4B9E-B9CF-047A769DE1C8\{B6461001 04_200-MC-002.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 3:46 PM
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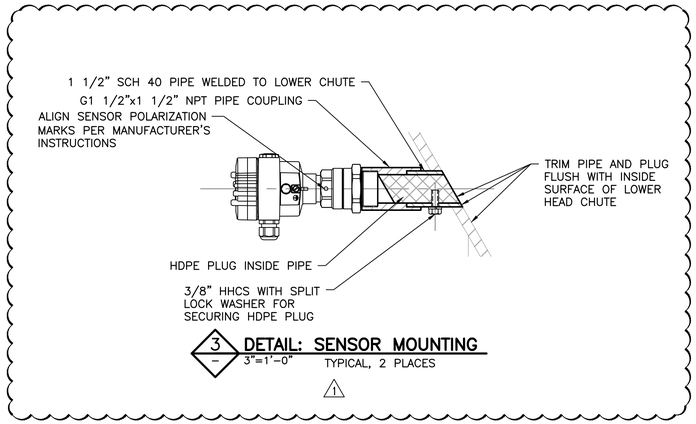
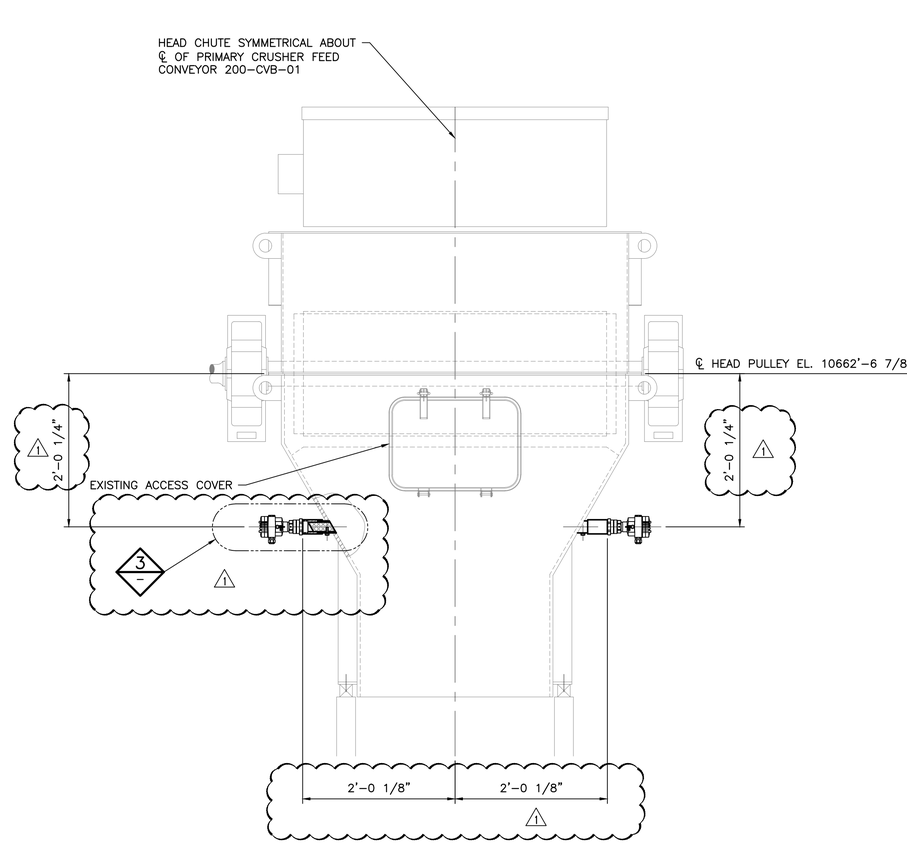


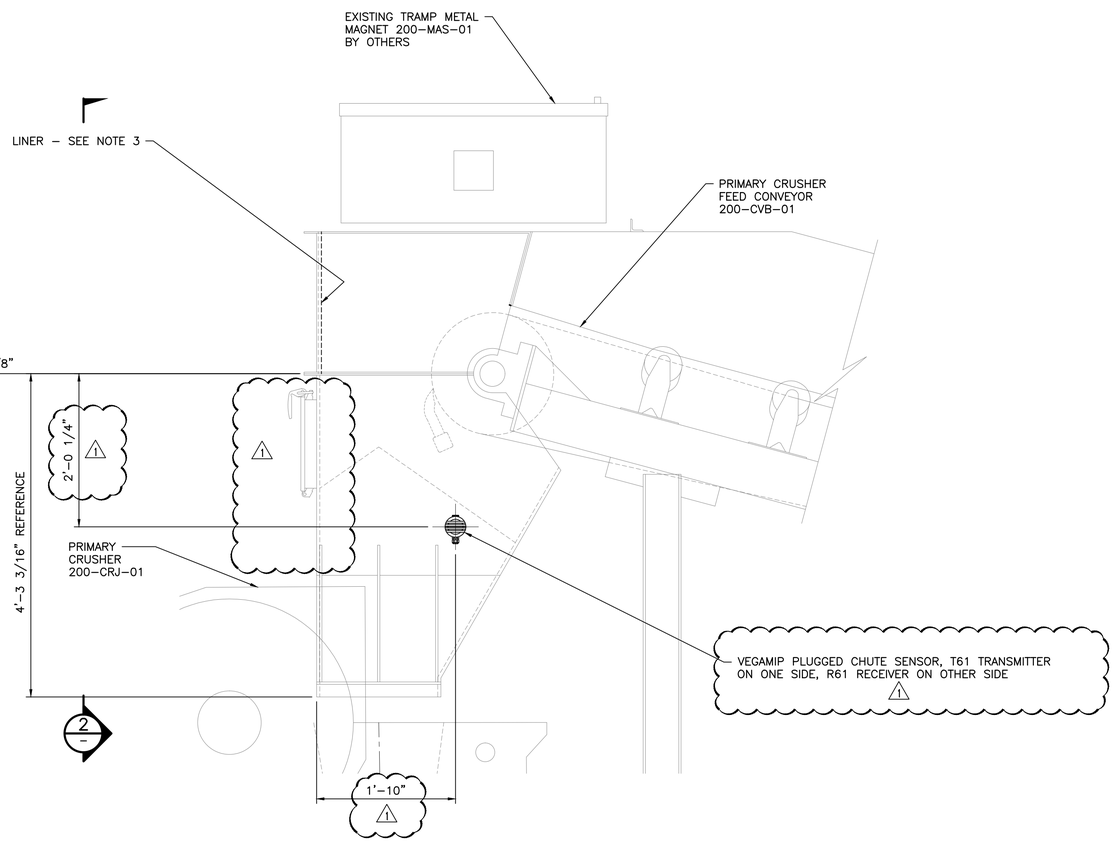
3 – DETAIL: SENSOR MOUNTING
3"=1'–0" TYPICAL, 2 PLACES
⚠1

NOTES:

1. REFER TO FEECO DRAWING 1153344, REVISION 2 FOR DIMENSIONS OF EXISTING HEAD CHUTE.
2. CHUTE MODIFICATION CONSTRUCTION SHALL BE AR400 1/2" THICK PLATE. OTHER SIZES AS NOTED.
3. ADD REMOVABLE, BOLT IN LINER TO END PLATE OF HEAD CHUTE ABOVE HEAD PULLEY ℄ AS SHOWN. LINER SHALL BE 1/2" THICK NITRONIC 30.
4. ⚠1 REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



2 – SECTION: PRIMARY CRUSHER FEED CONVEYOR HEAD CHUTE 200–CHU–03
1"=1'–0"



1 – DETAIL: PRIMARY CRUSHER FEED CONVEYOR HEAD CHUTE 200–CHU–03
200–GA–004 1"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	10/9/2020	11/18/20	—	
BID	—	—	—	4/28/17	—	—	—	
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	—	
RELEASED TO/FOR	—	—	—	—	—	—	—	
DATE RELEASED	A	B	C	0	0.A	1	2	

BARR
Corporate Headquarters: Minneapolis, Minnesota
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BARR ENGINEERING CO.
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Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
PRIMARY CRUSHER FEED CONVEYOR HEAD CHUTE

BARR PROJECT No.	06/46–1001.04
CLIENT PROJECT No.	
DWG. No.	200–MC–003
REV. No.	1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\21A979D4-4F19-4603-A0CF-C2A93AE13E4D\D417CA64-005F-4676-BF5C-1025BFB48374\0646100104_200-MC-003.DWG PLOT SCALE: 1:1 PLOT DATE: 11/17/2020 11:36 AM
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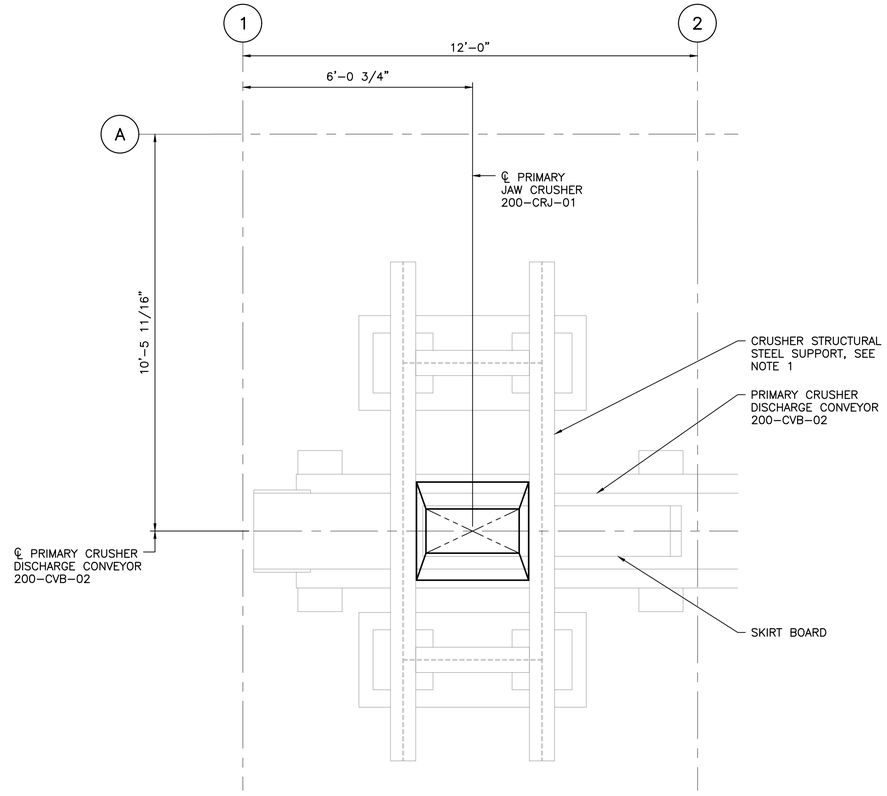
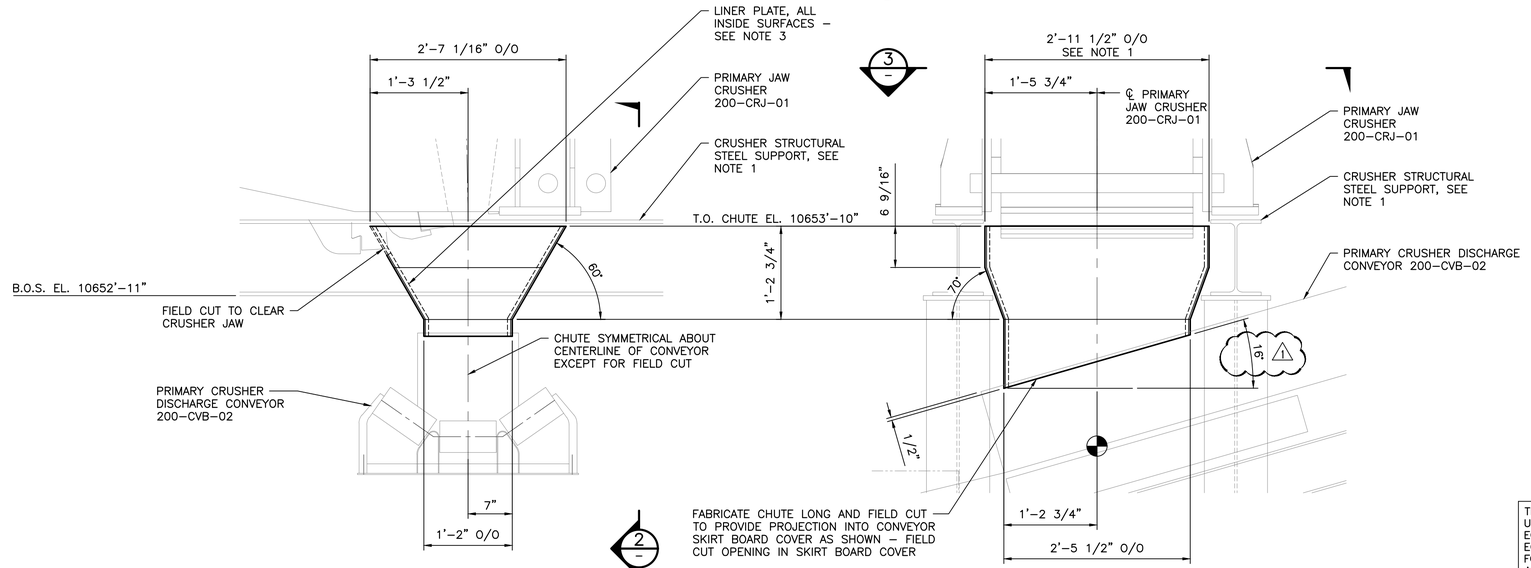


3 / – SECTION: PRIMARY CRUSHER DISCHARGE CHUTE 200-CHU-05
1/2"=1'-0"



1 / 200-GA-005 DETAIL: PRIMARY CRUSHER DISCHARGE CHUTE 200-CHU-05
1"=1'-0"

2 / – SECTION: PRIMARY CRUSHER DISCHARGE CHUTE 200-CHU-05
1"=1'-0"

NOTES:

1. WORK THIS DRAWING WITH 200-GA-006. REFER TO CH2MHILL DRAWING 200-S-027 FOR CHUTE CLEARANCE.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR OF CHUTE SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED — SCOTT M. SHEPPARD — PE 0052003 — PROFESSIONAL ENGINEER — Nov. 19, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/9/2020	11/18/20	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	—
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/27/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
PRIMARY CRUSHER DISCHARGE CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-004
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\21A97904-4F19-4603-A0CF-C2A93AE13E4D\E437734-1381-4498-8BC3-5004577AA57F\0646100104_200-MC-004.DWG PLOT SCALE: 1:1 PLOT DATE: 11/17/2020 11:36 AM
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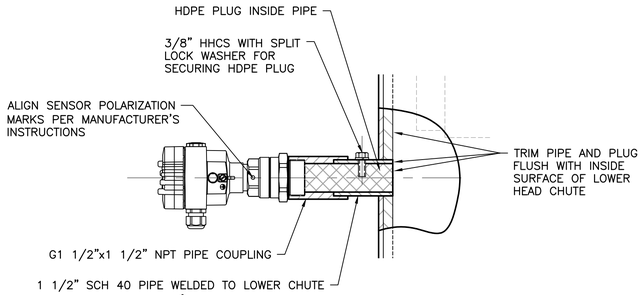
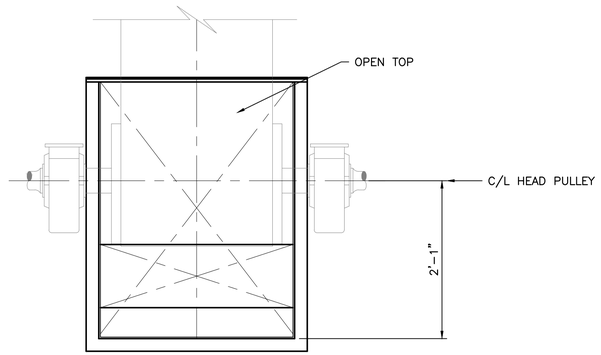


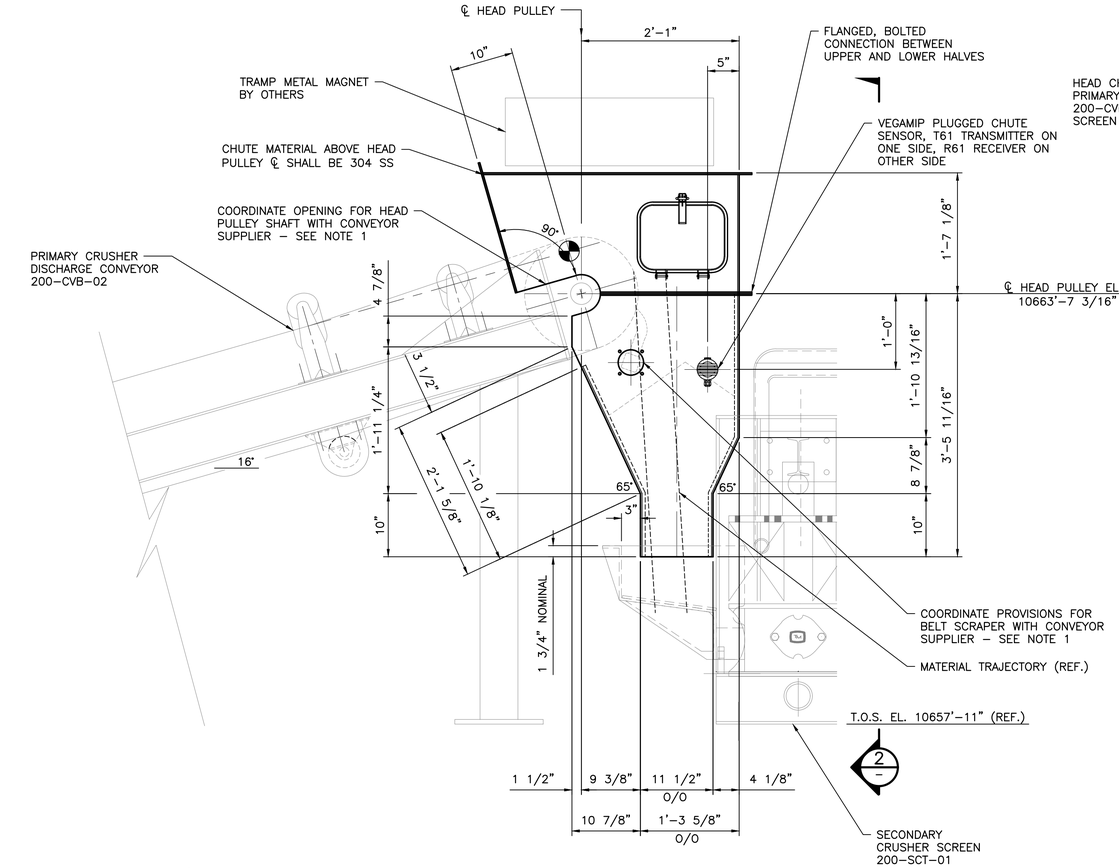
4 — **DETAIL: SENSOR MOUNTING**
3"=1'-0" TYPICAL, 2 PLACES



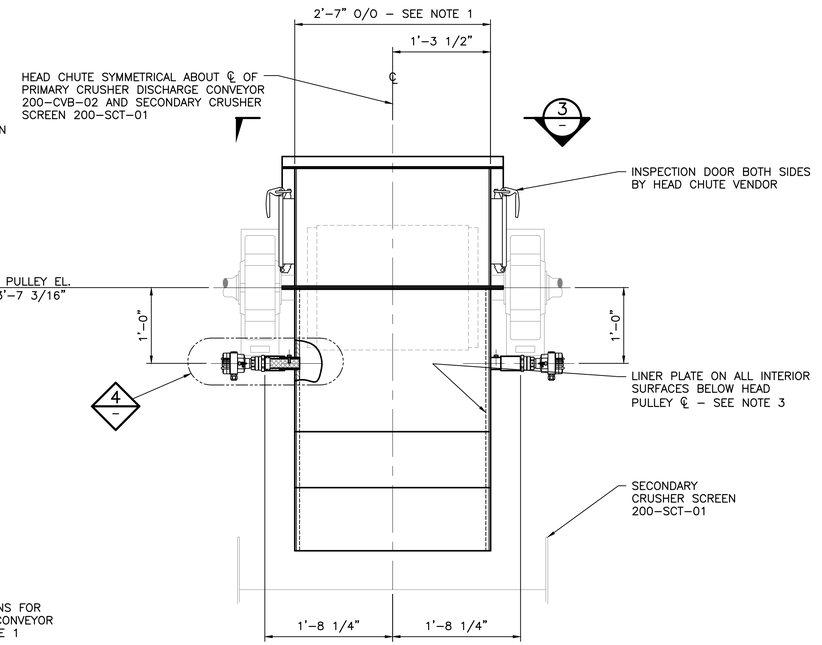
3 — **SECTION: PRIMARY CRUSHER DISCHARGE CONVEYOR HEAD CHUTE 200-CHU-06**
1"=1'-0"

NOTES:

1. WORK THIS DRAWING WITH 200-GA-006.
2. CHUTE CONSTRUCTION ABOVE HEAD PULLEY ℄ SHALL BE 304 SS 1/4" (MINIMUM) THICK PLATE, BELOW HEAD PULLEY ℄ SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR SURFACES OF CHUTE SHOWN SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS ABOVE HEAD PULLEY ℄ SHALL BE NITRONIC 30, BELOW HEAD PULLEY ℄ SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



1 — **DETAIL: PRIMARY CRUSHER DISCHARGE CONVEYOR HEAD CHUTE 200-CHU-06**
200-GA-006, 200-GA-007 1"=1'-0" LOOKING NORTH



2 — **SECTION: PRIMARY CRUSHER DISCHARGE CONVEYOR HEAD CHUTE 200-CHU-06**
1"=1'-0" LOOKING WEST

2 REMOVED "HOLDS" AND COMPLETELY REDESIGNED THE CHUTE BASED ON UPDATED SCREEN INFORMATION

1 COMPLETE REDESIGN

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	AMB3	DSM	12/01/2020	UPDATED PER LATEST SCREEN INFORMATION AND REMOVED "HOLDS"
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/9/2020	11/18/20	12/01/20
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	12/01/20
DATE RELEASED	—	—	—	—	—	—	—

BARR
Corporate Headquarters: Minneapolis, Minnesota
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www.barr.com

Scale	AS SHOWN
Date	2/28/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
PRIMARY CRUSHER DISCHARGE CONVEYOR HEAD CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-005
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\{9B140911D-3DEA-4529-918D-3DF0B7610111}\BC992796E-BF69-46C6-AF64-9A12E9FF62AA\{64610104_200-MC-005.DWG PLOT SCALE: 1:1 PLOT DATE: 11/30/2020 2:03 PM
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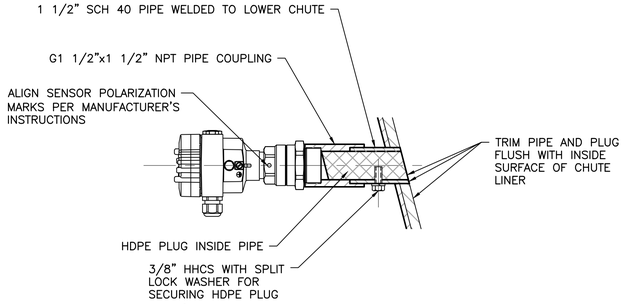
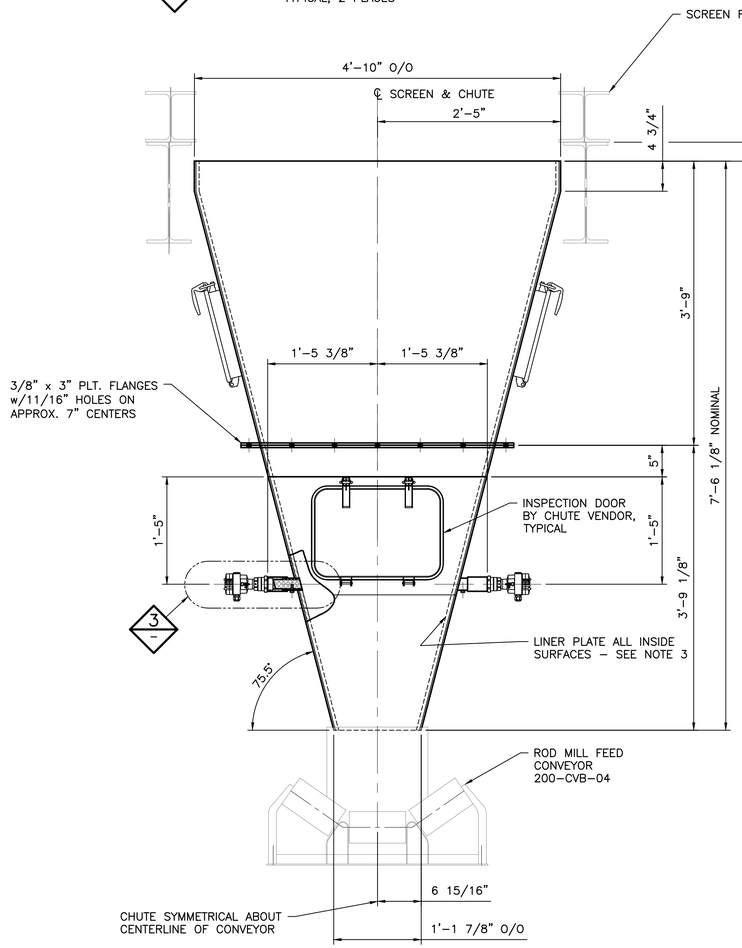


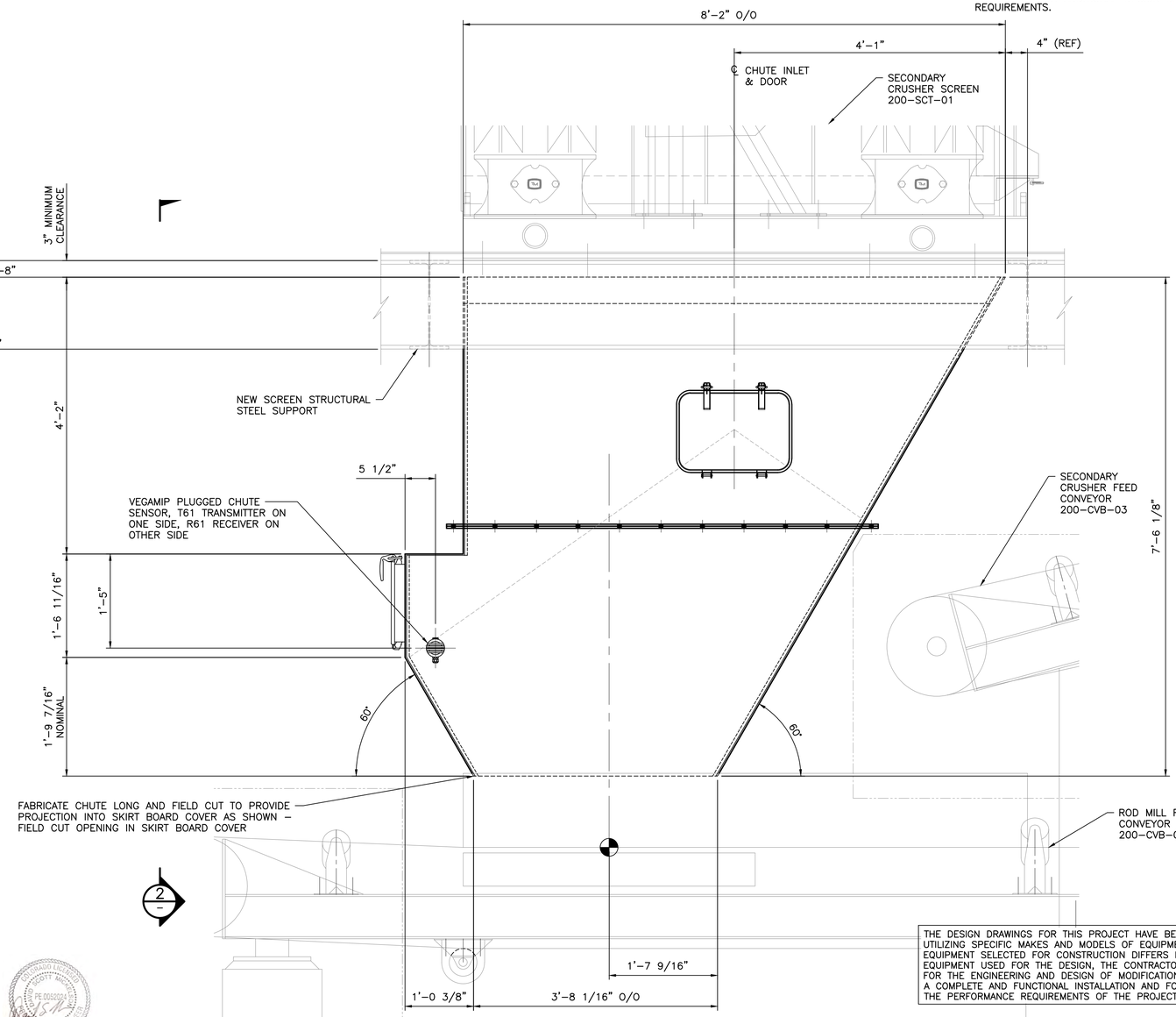
3 – **DETAIL: SENSOR MOUNTING**
3"=1'-0" TYPICAL, 2 PLACES

NOTES:

1. WORK THIS DRAWING WITH 200-GA-008.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR OF CHUTE SHALL HAVE REMOVABLE, BOLT IN LINERS. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



2 – **SECTION: SECONDARY CRUSHER SCREEN UNDERSIZE DISCHARGE CHUTE 200-CHU-08**
1"=1'-0"



1 – **DETAIL: SECONDARY CRUSHER SCREEN UNDERSIZE DISCHARGE CHUTE 200-CHU-08**
200-GA-006, 200-GA-007, 200-GA-008 1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/9/2020	—	11/18/20
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	—	11/18/20
DATE RELEASED							

BARR
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Minneapolis, Minnesota
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BARR ENGINEERING CO.
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SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SCREEN UNDERSIZE DISCHARGE CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-006
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\DA6BB927-4D87-4AAA-B66D-B4D5FC54BCA6\V2DE493A-28D5-4A96-8E39-616322700510\0646100104_200-MC-006.DWG PLOT SCALE: 1:1 PLOT DATE: 11/17/2020 3:21 PM
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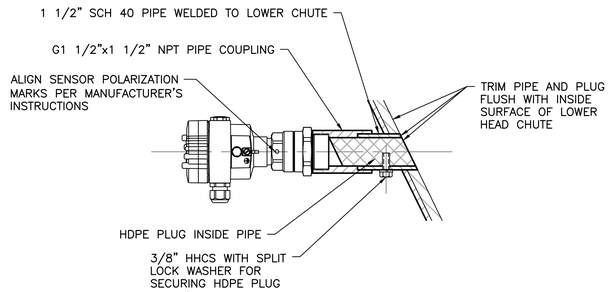
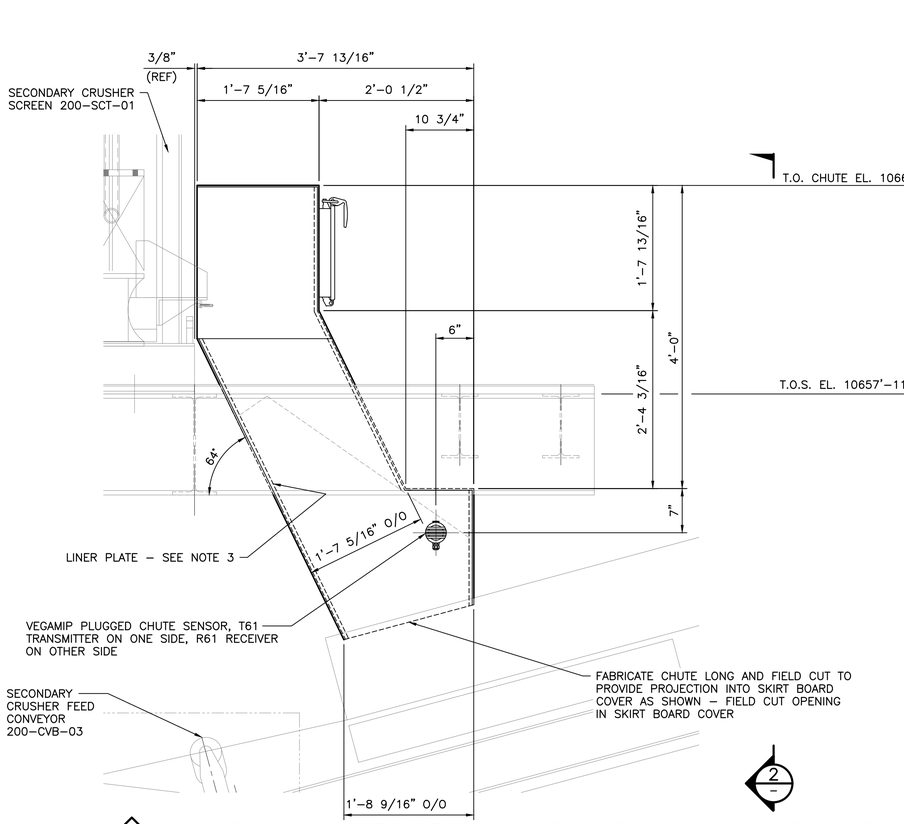
NOTES:

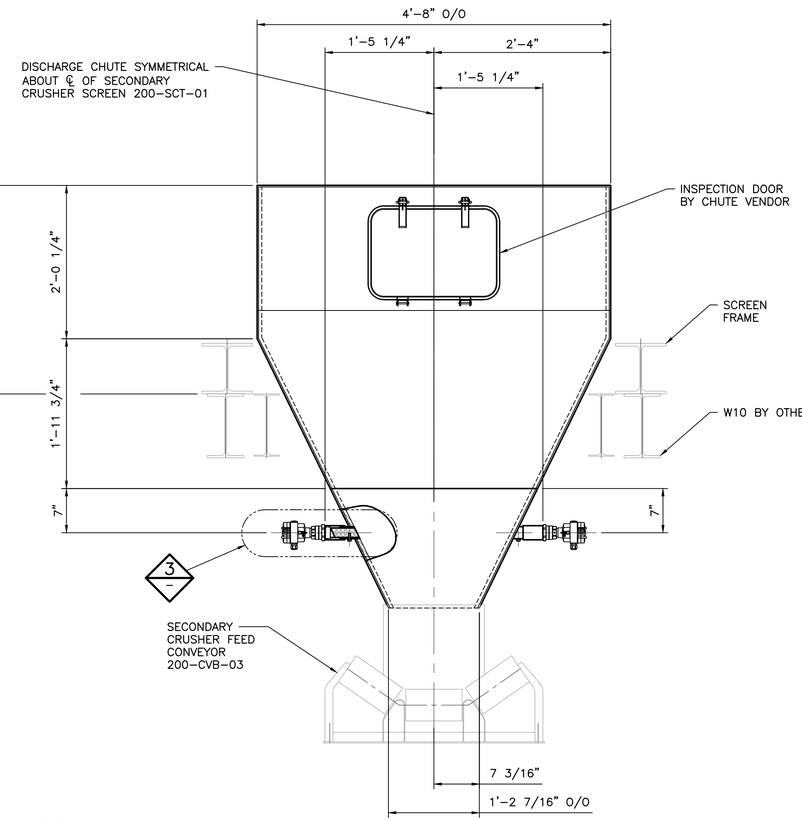
1. WORK THIS DRAWING WITH 200-GA-007.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR SURFACES OF CHUTE SHOWN SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



3 – DETAIL: SENSOR MOUNTING
3"=1'-0" TYPICAL, 2 PLACES



1 – DETAIL: SECONDARY CRUSHER SCREEN OVERSIZE DISCHARGE CHUTE 200-CHU-07
200-GA-006, 200-GA-007 1"=1'-0" LOOKING NORTH



2 – SECTION: SECONDARY CRUSHER SCREEN OVERSIZE DISCHARGE CHUTE 200-CHU-07
1"=1'-0" LOOKING WEST

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/9/2020 11/18/20; BID 4/28/17; CONSTRUCTION 4/28/17 11/18/20

DATE RELEASED: A B C 0 0.A 1 2

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

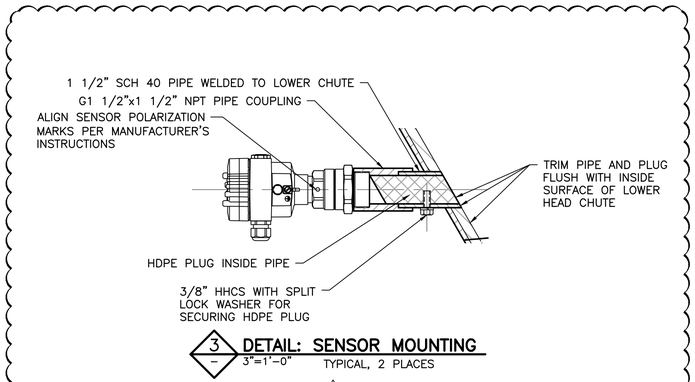
PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SCREEN OVERSIZE DISCHARGE CHUTE

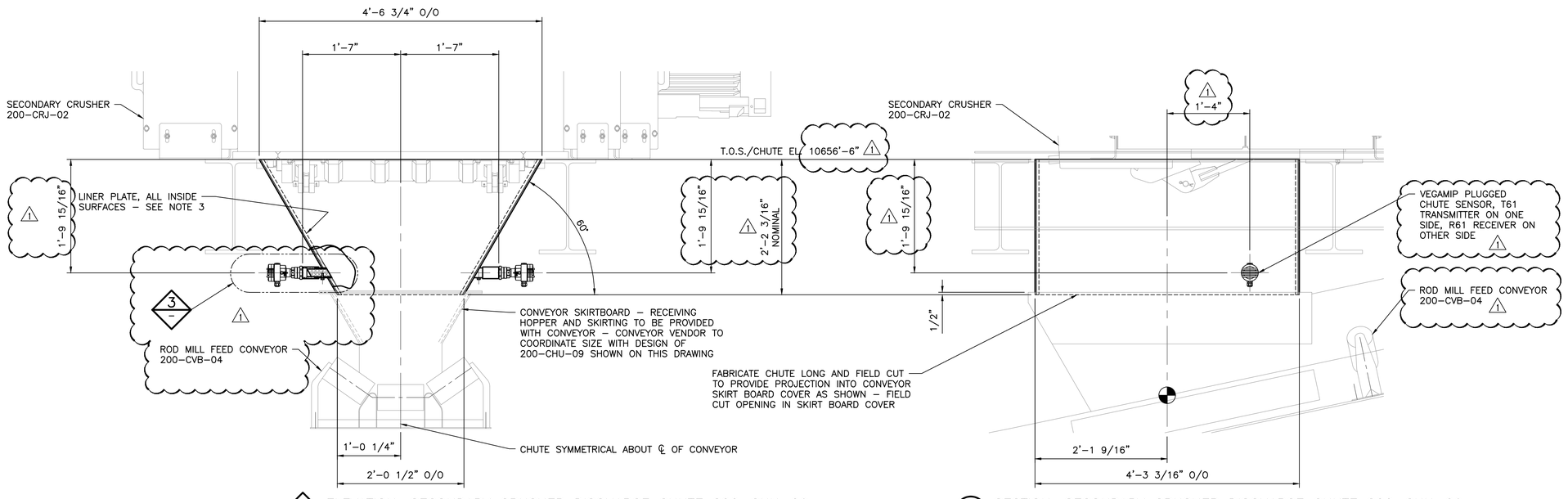
BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-007
REV. No. 1

NOTES:

1. WORK THIS DRAWING WITH 200-GA-008.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR SURFACES OF CHUTE SHOWN SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. ⚠1 REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



3 – DETAIL: SENSOR MOUNTING
3"=1'-0" TYPICAL, 2 PLACES ⚠1



1 – ELEVATION: SECONDARY CRUSHER DISCHARGE CHUTE 200-CHU-09
200-GA-007 1"=1'-0"

2 – SECTION: SECONDARY CRUSHER DISCHARGE CHUTE 200-CHU-09
1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT — — — 4/28/17 10/9/2020 11/18/20
BID — — — 4/28/17 — —
CONSTRUCTION — — — 4/28/17 — 11/18/20

RELEASED TO/FOR: A B C 0 0.A 1 2
DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SECONDARY CRUSHER DISCHARGE CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-008
REV. No. 1

COLORADO LICENSED PROFESSIONAL ENGINEER PE 0050021 DAVID M. SCHWARTZ PROFESSIONAL ENGINEER Nov. 19, 2020

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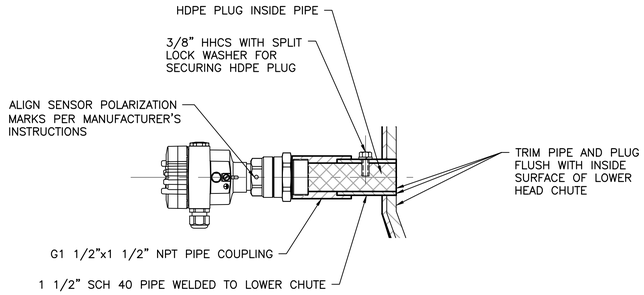
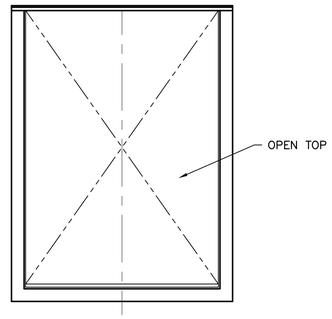


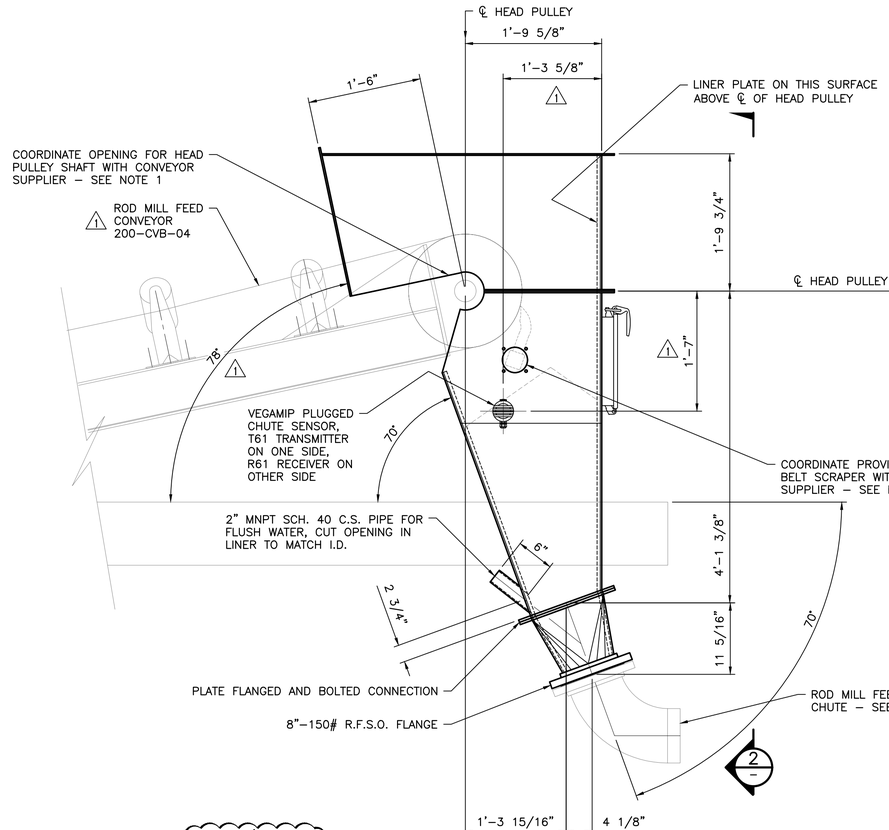
4 – DETAIL: SENSOR MOUNTING
3"=1'-0" TYPICAL, 2 PLACES
⚠1



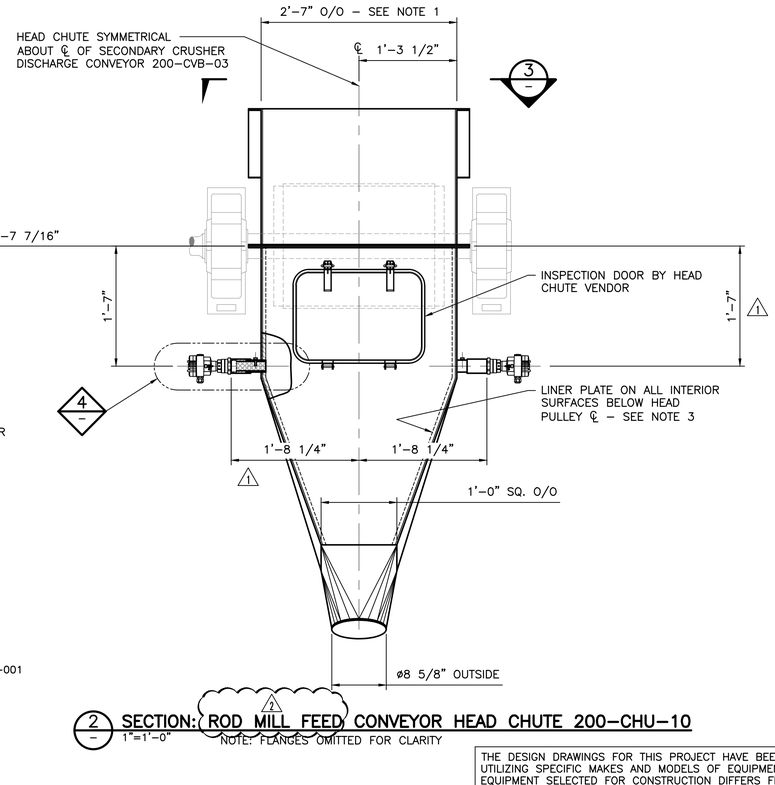
3 – SECTION: ROD MILL FEED CONVEYOR HEAD CHUTE 200–CHU–10
1"=1'-0" ⚠2

NOTES:

1. WORK THIS DRAWING WITH 200–GA–008.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR SURFACES OF CHUTE SHOWN SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. ⚠1 REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



1 – ELEVATION: ROD MILL FEED CONVEYOR HEAD CHUTE 200–CHU–10
200–GA–008 1"=1'-0" ⚠2



2 – SECTION: ROD MILL FEED CONVEYOR HEAD CHUTE 200–CHU–10
1"=1'-0" ⚠2 NOTE: FLANGES OMITTED FOR CLARITY

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 DAVID S. MARTIN 3/31/21

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	AMB3	DSM	3/31/21	TEXT EDITS
1	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	10/9/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/9/2020	11/18/20	3/31/21
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	3/31/21
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—
DATE RELEASED							

BARR
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
ROD MILL FEED CONVEYOR HEAD CHUTE

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 200–MC–009
REV. No. 2

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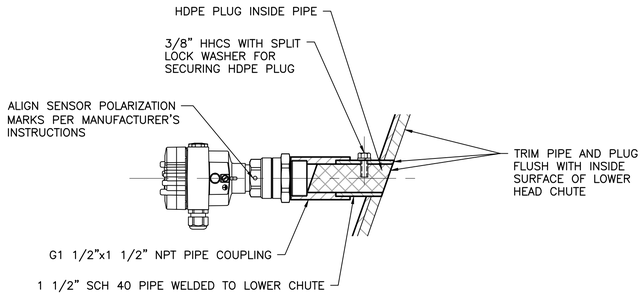
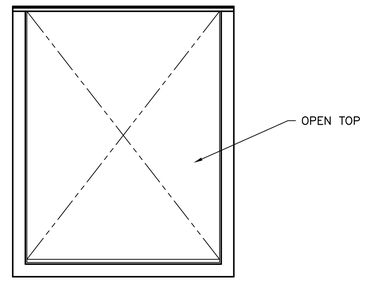


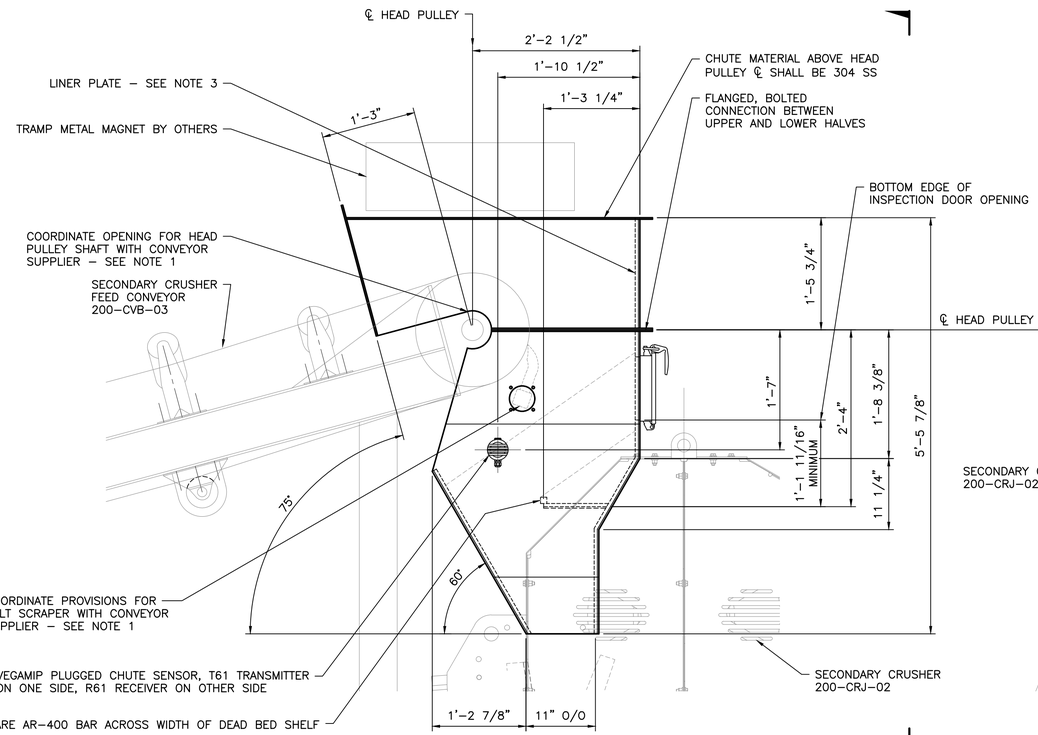
4 — DETAIL: SENSOR MOUNTING
3"=1'-0" TYPICAL, 2 PLACES



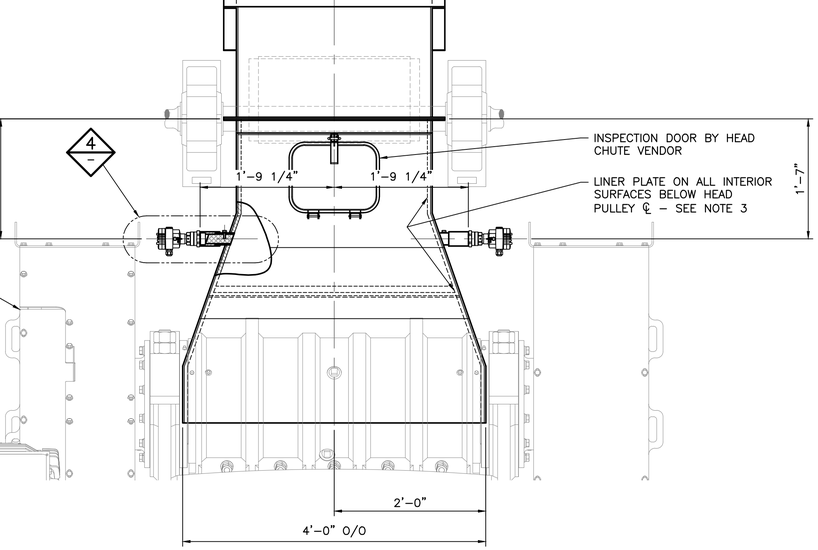
3 — SECTION: SECONDARY CRUSHER FEED CONVEYOR HEAD CHUTE 200-CHU-11
1"=1'-0"

NOTES:

1. WORK THIS DRAWING WITH 200-GA-007.
2. CHUTE CONSTRUCTION ABOVE HEAD PULLEY ℄ SHALL BE 304 SS 1/4" (MINIMUM) THICK PLATE, BELOW HEAD PULLEY ℄ SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. INTERIOR SURFACES OF CHUTE SHOWN SHALL HAVE REMOVABLE, BOLT IN LINERS IN THE AREAS SHOWN. LINERS ABOVE HEAD PULLEY ℄ SHALL BE NITRONIC 30, BELOW HEAD PULLEY ℄ SHALL BE 1/2" THICK AR400 PLATE.
4. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.
5. REFER TO SPECIFICATION 40 32 13 MECHANICAL PLATEWORK FOR ADDITIONAL DESIGN DETAILS AND REQUIREMENTS.



1 (200-GA-007) — DETAIL: SECONDARY CRUSHER FEED CONVEYOR HEAD CHUTE 200-CHU-11
1"=1'-0"



2 — SECTION: SECONDARY CRUSHER FEED CONVEYOR HEAD CHUTE 200-CHU-11
1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	AMB3	DSM	11/18/2020	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 10/9/2020; BID —; CONSTRUCTION 11/18/20

DATE RELEASED: A — B — C — 0 11/18/20 — 0.A — 1 — 2

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	9/9/2020
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SECONDARY CRUSHER FEED CONVEYOR HEAD CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 200-MC-010
REV. No. 0

CADD USER: Hbpwuser FILE: \\HB-PW\HB_PW_IN\A96C4A01-5F27-40DF-A25E-DE0EC01AB08\38E831E6-F0A4-4540-8F0B-B2D40057358D\0646100104_200-MC-010.DWG PLOT SCALE: 1:1 PLOT DATE: 11/18/2020 2:11 PM
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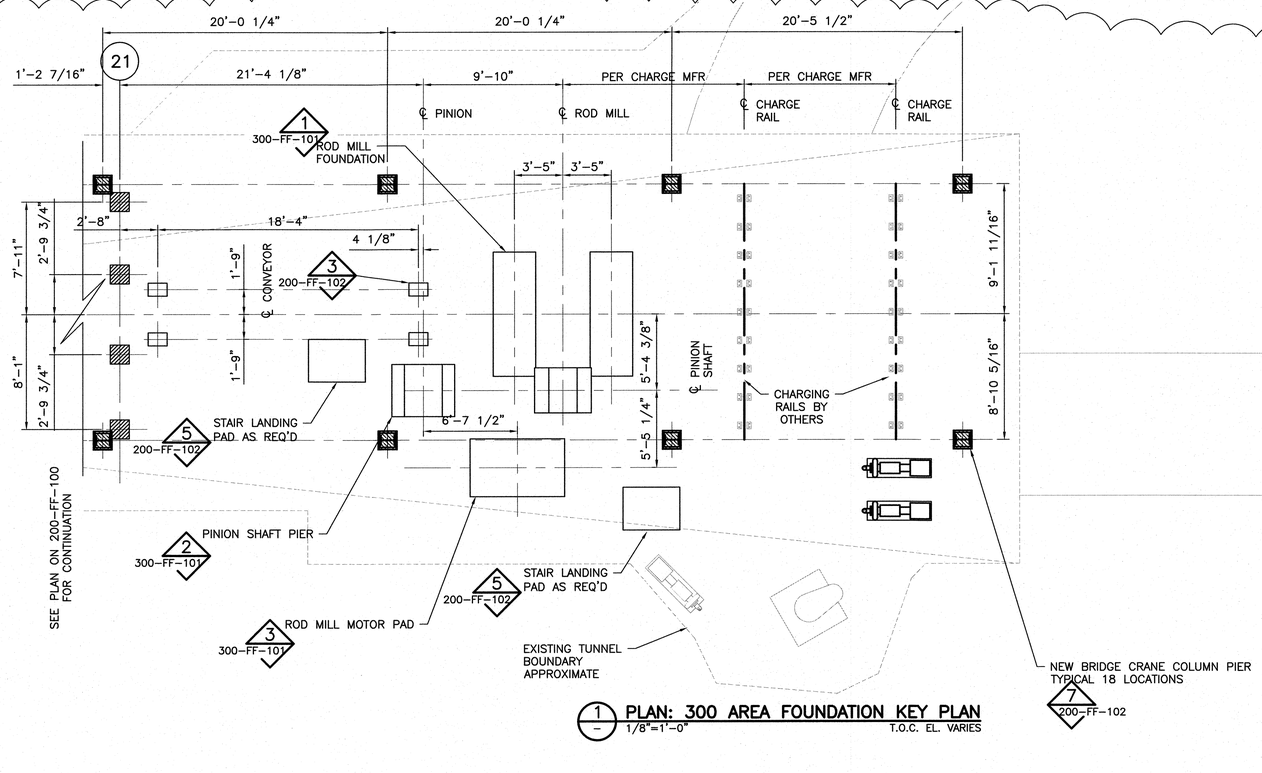
300 Area Drawings



1 PLAN: 300 AREA FOUNDATION KEY PLAN
1/8"=1'-0" T.O.C. EL. VARIES

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. ROUGHEN AND CLEAN ALL EXISTING CONCRETE SURFACES PRIOR TO PLACING NEW CONCRETE OR GROUT
3. ALL CONCRETE SLABS AND ROCK BENEATH CRUSHER AREA FOUNDATIONS AND ROCK ANCHORS TO BE INSPECTED/APPROVED BY GEOTECHNICAL ENGINEER REPRESENTATIVE FOR FULLY CONCRETE CAPACITY/INTEGRITY AND ROCK #7 ANCHOR CAPACITY/INTEGRITY FOR 10 TON PULL OUT AND 5 TON SHEAR

COLORADO LICENSED JOHN G. TRULLINGER 51916 PROFESSIONAL ENGINEER
Exp Date 10/31/21

1

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SWO	JGT	JGT	11/25/20	ISSUED FOR CONSTRUCTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

	A	B	C	0	1	2	3
CLIENT				4/28/17	11/25/20		
BID				4/28/17			
CONSTRUCTION				4/28/17	11/25/20		
RELEASED TO/FOR	DATE RELEASED						

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/14/17
Drawn	JWM
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

300 ROD MILL AREA FOUNDATION KEY PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-FF-100
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001\04_300-FF-100.DWG PLOT SCALE: 1:1 PLOT DATE: 11/25/2020 9:39 AM
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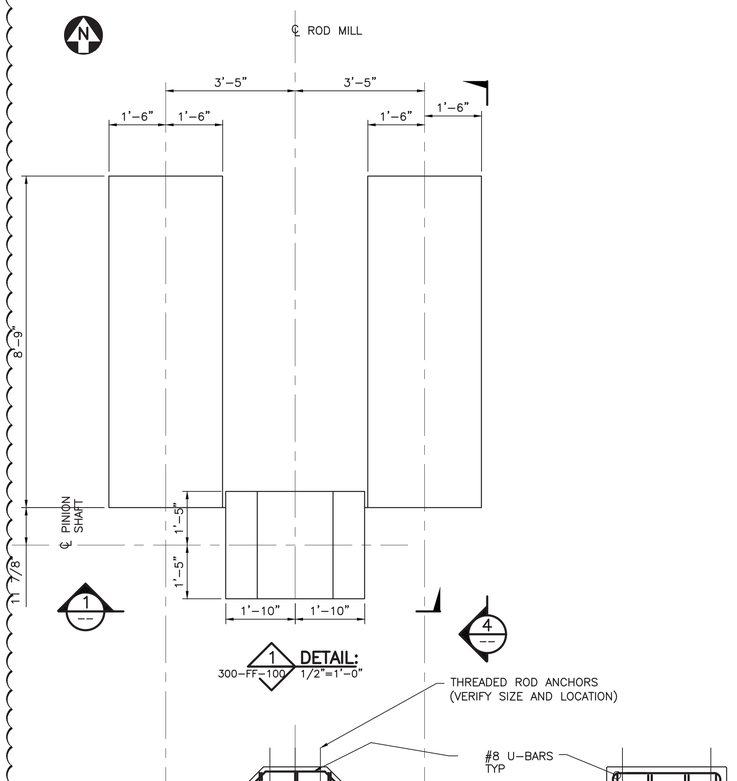
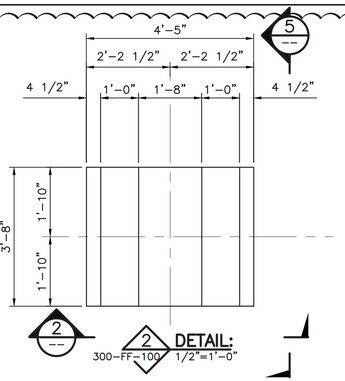
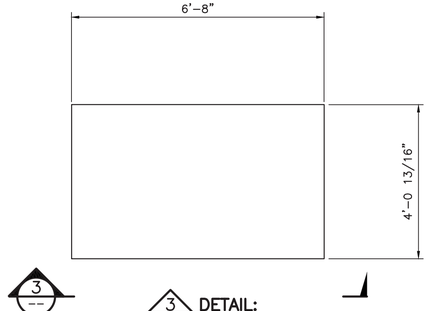


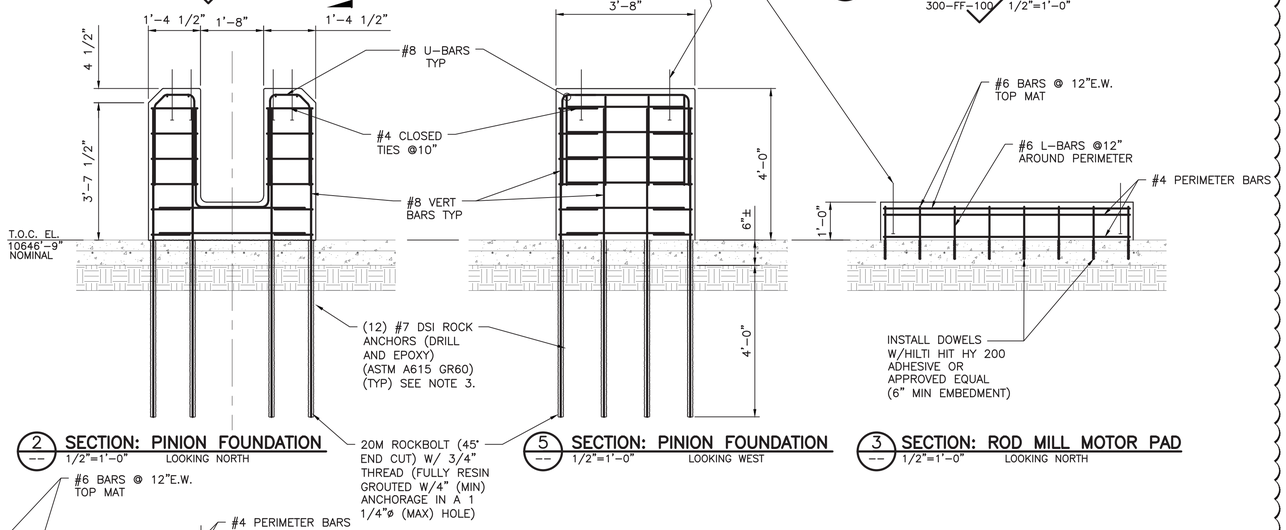
1 DETAIL: 300-FF-100 1/2"=1'-0"



2 DETAIL: 300-FF-100 1/2"=1'-0"



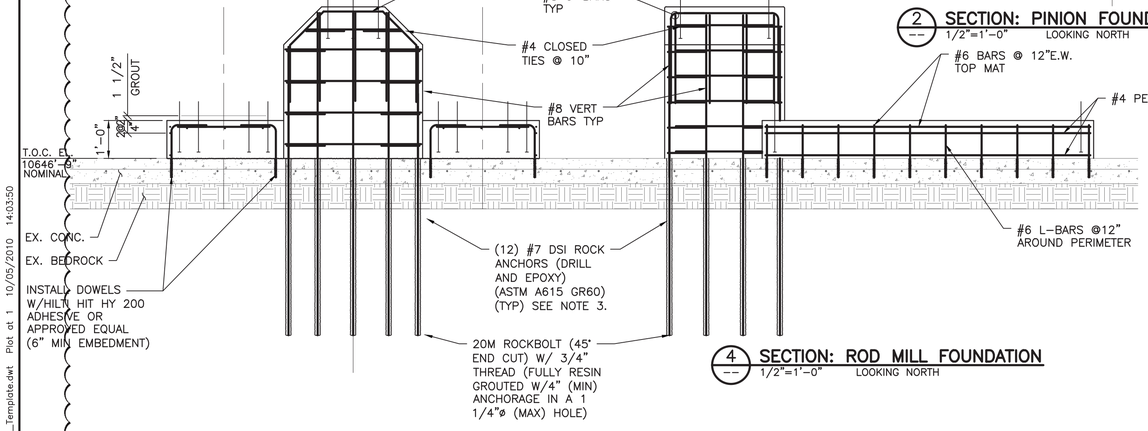
3 DETAIL: 300-FF-100 1/2"=1'-0"



2 SECTION: PINION FOUNDATION 1/2"=1'-0" LOOKING NORTH

5 SECTION: PINION FOUNDATION 1/2"=1'-0" LOOKING WEST

3 SECTION: ROD MILL MOTOR PAD 1/2"=1'-0" LOOKING NORTH



4 SECTION: ROD MILL FOUNDATION 1/2"=1'-0" LOOKING NORTH

1 SECTION: ROD MILL FOUNDATION 1/2"=1'-0" LOOKING NORTH

NOTES:

1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102

ISSUED FOR BID ONLY – CONTRACTOR IS TO BASE THEIR BID OFF THE DESIGN AS SHOWN. CONTRACTOR TO ALSO INCLUDE DESIGN COSTS AS LISTED:
–CONTRACTOR IS RESPONSIBLE FOR BOTH THE DESIGN AND CONSTRUCTION OF ROD MILL AND ASSOCIATED EQUIPMENT FOUNDATIONS
–CONTRACTOR AND / OR THE CONTRACTOR'S ENGINEER WILL NEED TO VERIFY AND MEASURE EQUIPMENT SIZE, ANCHORAGE, AND LOAD REQUIREMENTS (AS OF APRIL 2017, EQUIPMENT IS IN STORAGE IN TUCSON, AZ, BUT IS TO BE REFURBISHED AND SENT TO OURAY, COLORADO)
–CONTRACTOR'S ENGINEER WILL NEED TO DESIGN REINFORCING AND ANCHORAGE FOR THESE FOUNDATIONS
–THE DESIGN OF THESE FOUNDATIONS WILL NEED TO TAKE INTO ACCOUNT MACHINE DYNAMICS TO AVOID RESONANCE AND DYNAMIC DISPLACEMENTS, VELOCITIES, OR ACCELERATIONS THAT ARE EXCESSIVE AND/OR DAMAGING TO THE EQUIPMENT OR THE SUPPORT STRUCTURES AND FOUNDATIONS
–ENGINEERING DESIGN OF THESE FOUNDATIONS SHALL BE SEALED BY AN ENGINEER IN THE STATE OF COLORADO, WITH A RECORD COPY SUBMITTED TO THE OWNER AND THE ENGINEER OF RECORD

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION

A	B	C	0	1	2	3
			4/28/17			
			4/28/17			
			4/28/17			

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/14/17
Drawn	JWM
Checked	
Designed	JWM
Approved	

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

200 AREA FOUNDATION SECTIONS AND DETAILS

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-FF-101
REV. No. 0

CADD USER: Adepluser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\D996E231-A5DA-4646-B203-0ADDC6F1132F\128252S7-4999-4984-BBB1-F7EB8C0B5E05\0646100100_300-FF-101.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 3:30 PM
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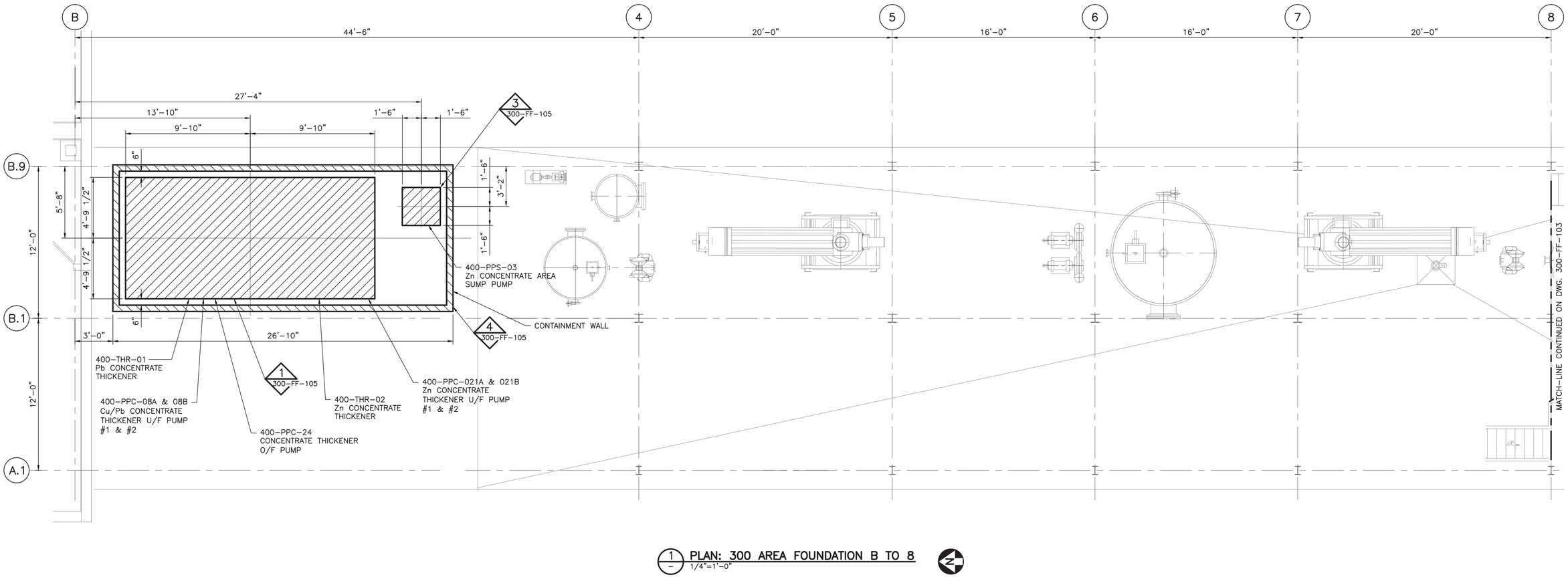
NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102



1 / – PLAN: 300 AREA FOUNDATION B TO 8
1/4"=1'-0"

COLORADO LICENSED
JOHN C. TRUCLIFFE
51916
PROFESSIONAL ENGINEER
Apr. 28, 2017

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
DATE RELEASED				4/28/17			

CLIENT	4/28/17
BID	4/28/17
CONSTRUCTION	4/28/17

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/10/17
Drawn	APP
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

300 AREA FOUNDATION PLAN

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-FF-102
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HBB PW IN\0996E231-A5DA-46A6-B203-0A0DC6F11327\C5840C30-B530-41E9-8F2B-E0218E1D3C09\06461001\00_300-FF-102.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 3:32 PM
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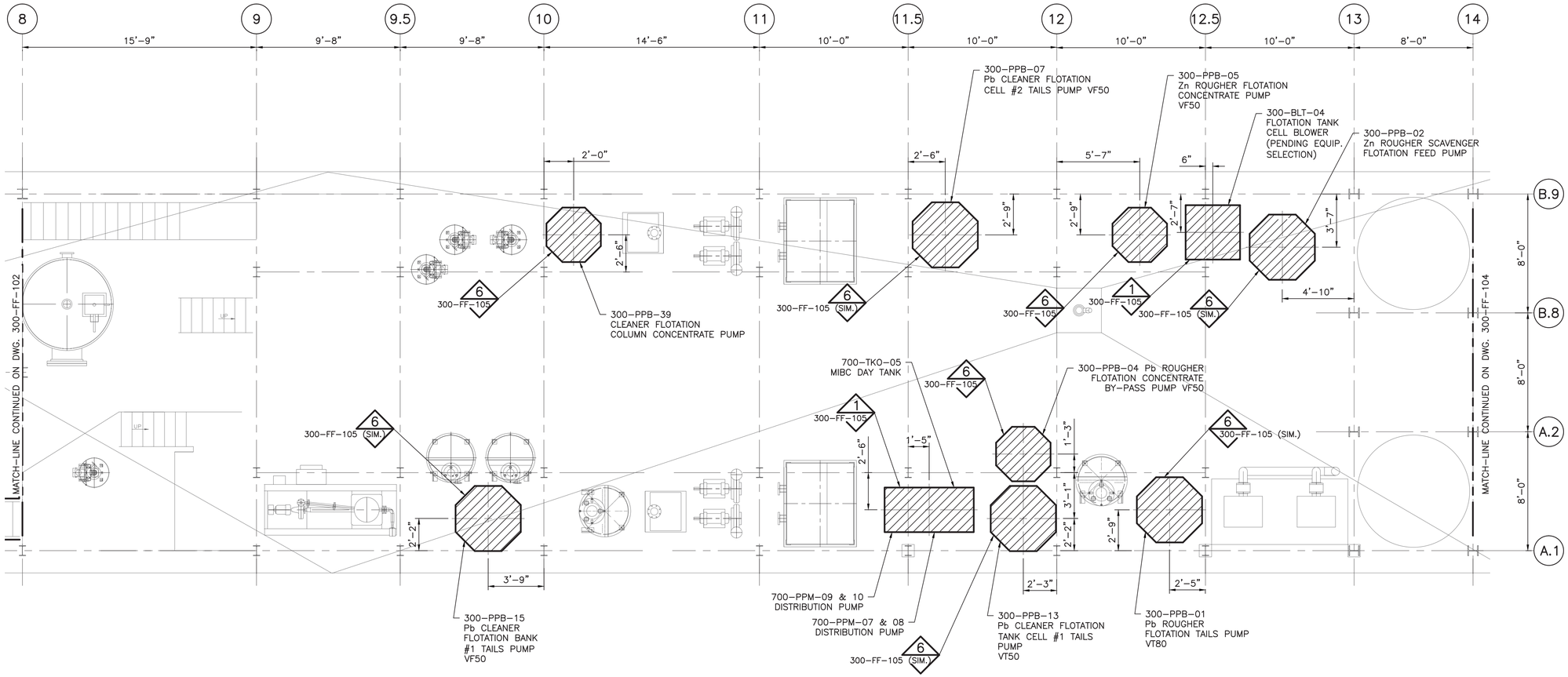
NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102



1 — PLAN: 300 AREA FOUNDATIONS COLUMN LINE 8 TO 14
1/4"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17
DATE RELEASED: A B C 0 1 2 3

BARR
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Scale	AS SHOWN
Date	4/10/17
Drawn	APP
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

300 AREA FOUNDATION PLAN

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-FF-103
REV. No. 0

CADD USER: Adaptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\D9956231-45DA-4646-B203-0AD0C6F11327\76EDB5C2-0E55-454B-87CB-D95499AE9C6\0646100100_300-FF-103.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 3:34 PM
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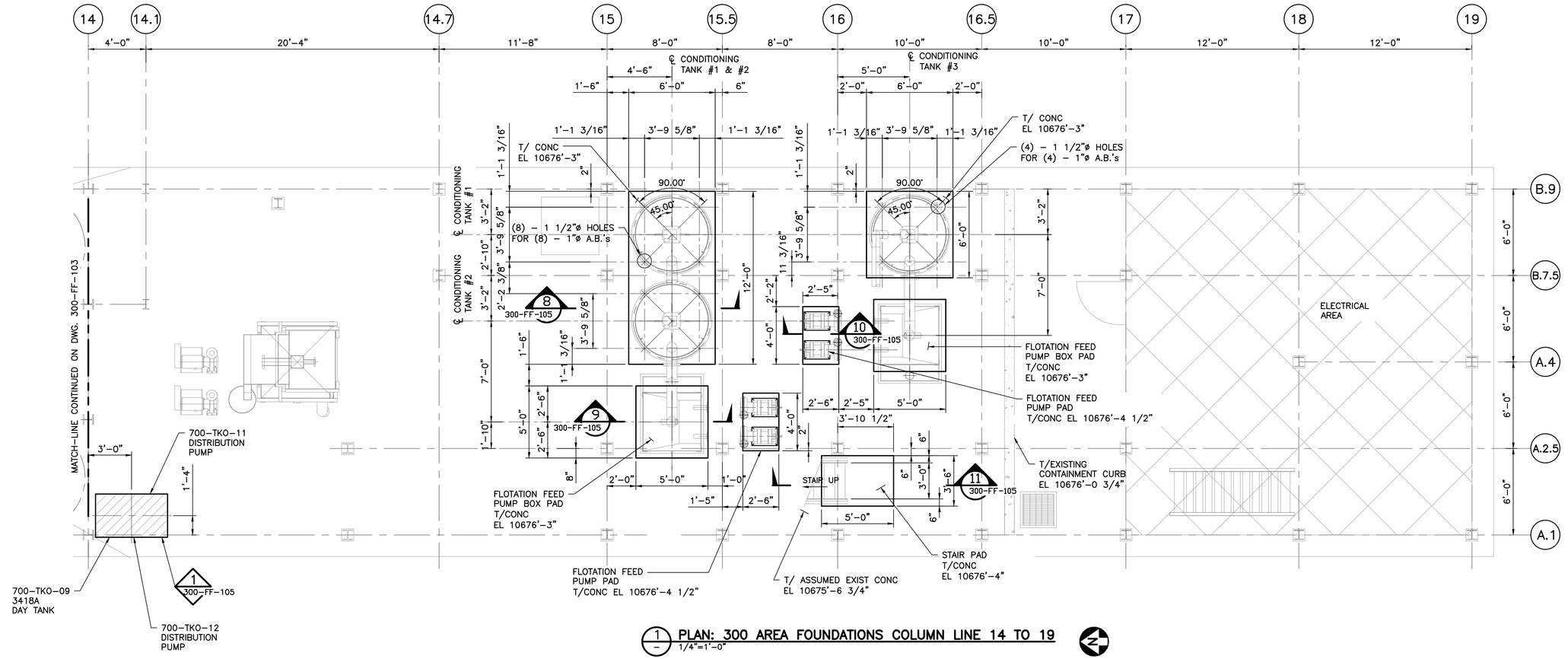
NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102



1 PLAN: 300 AREA FOUNDATIONS COLUMN LINE 14 TO 19
1/4"=1'-0"

DRAWING COMPLETELY REVISED 1

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/14/2020	COMPLETELY REVISED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — BID — CONSTRUCTION

A	B	C	0	1	2	3
DATE RELEASED			4/28/17	12/14/20		
			4/28.17	12/14/20		
			4/28/17	12/14/20		

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	11/19/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

300 AREA FOUNDATION PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-FF-104
REV. No. 1

CADD USER: Dulpwuser FILE: \\DUL-FW\DUL_PW_IN\2ACE602D-4C42-432C-B809-0357B970B23F\{0610C28-8440-4DD2-AF6B-79AF3112EBC1\}0646100104_300-FF-104.DWG PLOT SCALE: 1:1 PLOT DATE: 12/14/2020 7:59 AM
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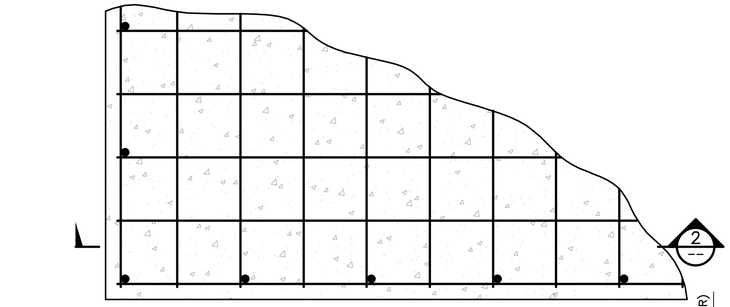
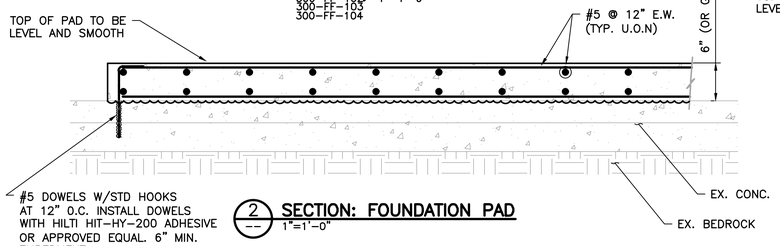
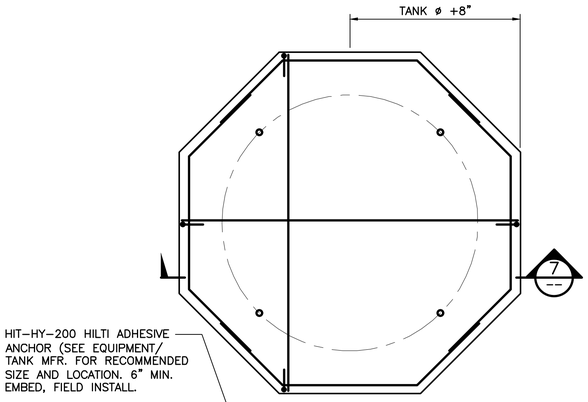


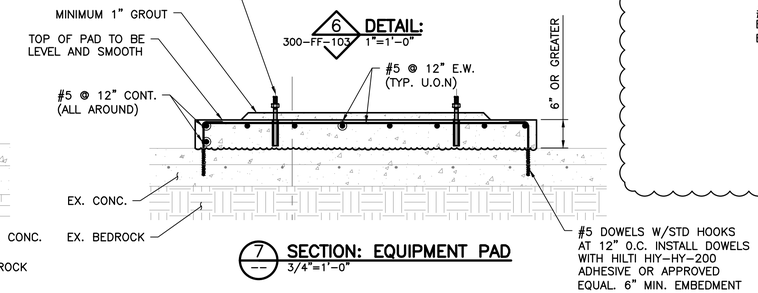
1 DETAIL:
300-FF-102, 300-FF-103, 300-FF-104
1"=1'-0"



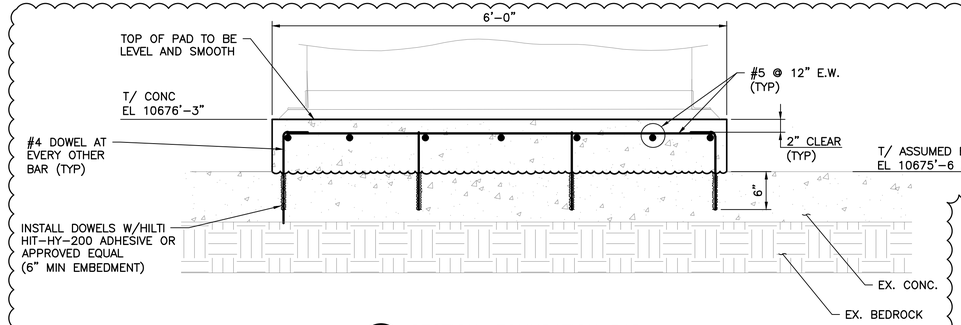
2 SECTION: FOUNDATION PAD
1"=1'-0"



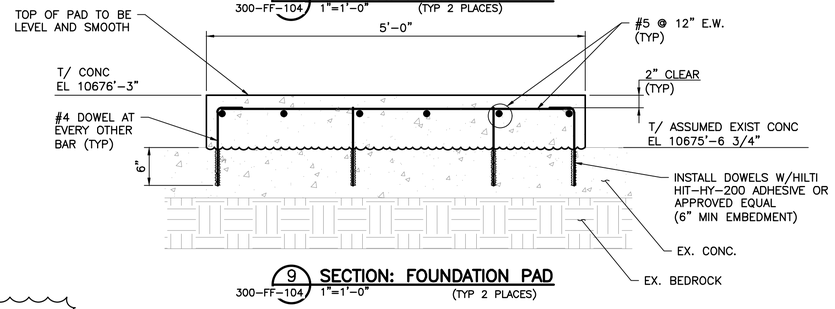
6 DETAIL:
300-FF-103
1"=1'-0"



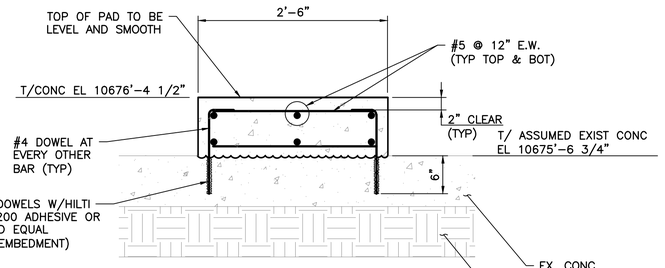
7 SECTION: EQUIPMENT PAD
3/4"=1'-0"



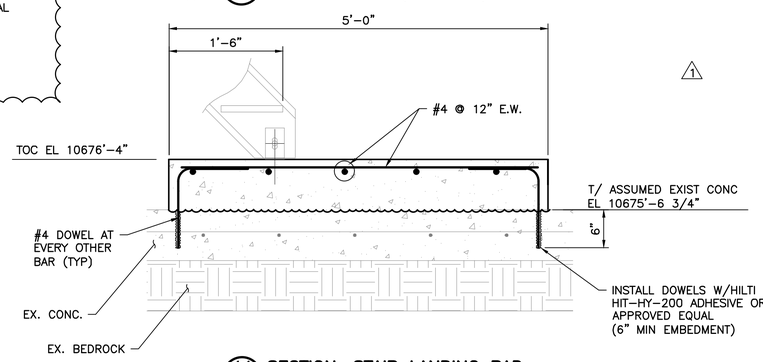
8 SECTION: FOUNDATION PAD
300-FF-104 1"=1'-0" (TYP 2 PLACES)



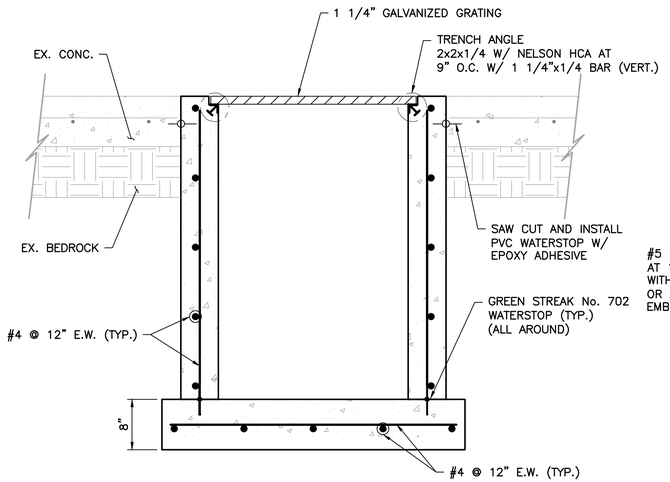
9 SECTION: FOUNDATION PAD
300-FF-104 1"=1'-0" (TYP 2 PLACES)



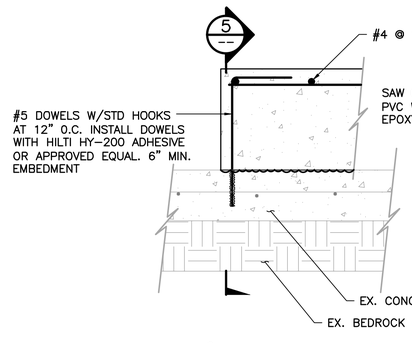
10 SECTION: FOUNDATION PAD
300-FF-104 1"=1'-0" (TYP 2 PLACES)



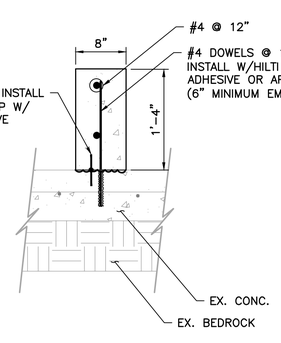
11 SECTION: STAIR LANDING PAD
300-FF-104 1"=1'-0"



3 DETAIL: SUMP
300-FF-102 1"=1'-0"



4 DETAIL:
300-FF-102 1"=1'-0"



5 SECTION: CONTAINMENT WALL
1"=1'-0"

NOTES:
1. SEE STANDARD NOTES AND DETAILS ON 100-SS-100 THRU 100-SS-102
2. ROUGHEN AND CLEAN ALL EXISTING CONCRETE SURFACES PRIOR TO PLACING NEW CONCRETE OR GROUT
3. ALL CONCRETE SLABS AND ROCK BENEATH CRUSHER AREA FOUNDATIONS AND ROCK ANCHORS TO BE INSPECTED/APPROVED BY GEOTECHNICAL ENGINEER REPRESENTATIVE FOR FULLY CONCRETE CAPACITY/INTEGRITY AND ROCK #7 ANCHOR CAPACITY/INTEGRITY FOR 10 TON PULL OUT AND 5 TON SHEAR

COLORADO LICENSED JOHN G. TERRELL 51916 PROFESSIONAL ENGINEER
Exp Date 10/31/21

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/14/2020	ADD SECTIONS 8, 10, 11 AND REVISED 9
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 12/14/20; BID 4/28/17 12/14/20; CONSTRUCTION 4/28/17 12/14/20
DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	11/19/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

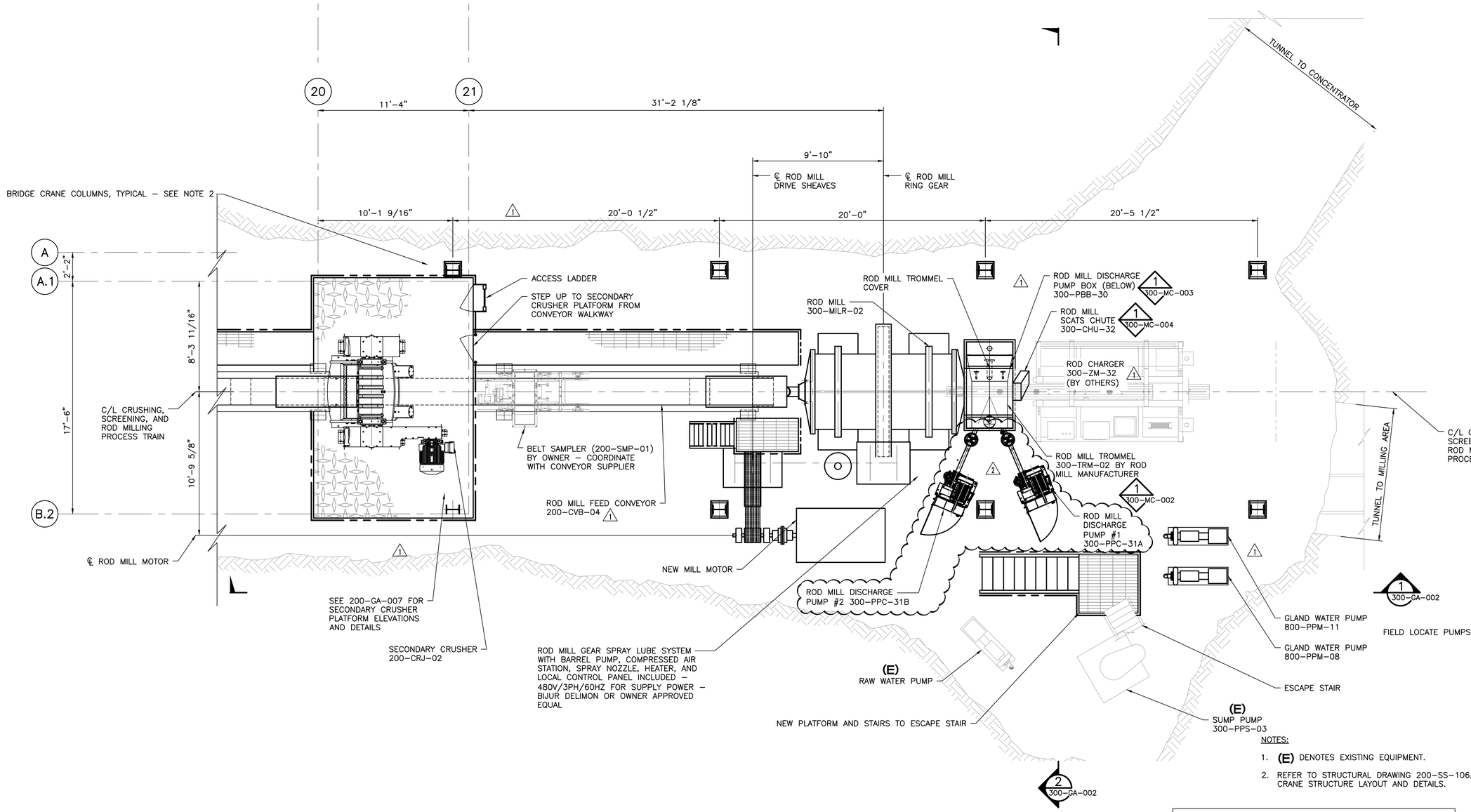
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

300 AREA FOUNDATION SECTIONS AND DETAILS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-FF-105
REV. No. 1

CADD USER: Dulpwuser FILE: \\DUL-FW\DUL_PW_IN\24CE602D-4C42-432C-B809-0357B970B23F\A18ACE3C-F573-4068-8408-157E02E45AC7\0646100104_300-FF-105.DWG BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50 PLOT SCALE: 1:1 PLOT DATE: 12/14/2020 7:59 AM



1 / – PLAN: ROD MILL 300-MILR-02
1/4"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.
2. REFER TO STRUCTURAL DRAWING 200-SS-106, 107, 108 AND 109 FOR CRANE STRUCTURE LAYOUT AND DETAILS.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	DTJ	AMB3	DSM	3/31/21	UPDATED ROD MILL DISCHARGE PUMP ARRANGEMENT
1	DAK	AMB3	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	9/10/20	12/2/20	3/31/21
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	12/2/20	3/31/21
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—
DATE RELEASED							

BARR
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Scale	AS SHOWN
Date	2/10/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
PLAN AT ROD MILL

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-GA-001
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\{850B21F-9B49-4565-8947-5FFC7FC29903}\3C8E3824-0997-4739-8498-E2EBBB364283}\0646100104_300-GA-001.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 4:30 PM
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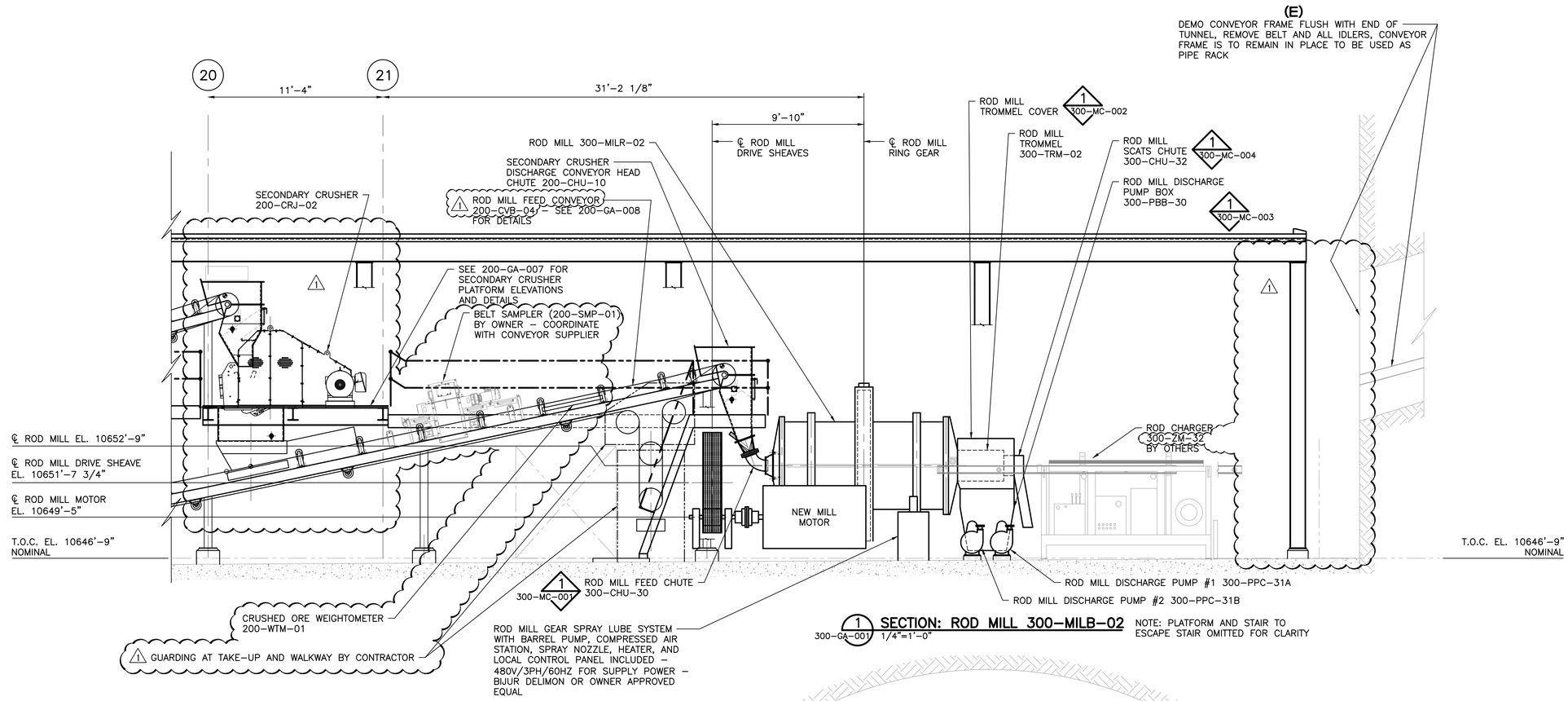


NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO REGISTERED PROFESSIONAL ENGINEER PE.0052024 CHRISTOPHER J. MORGAN

Dec. 1, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0.A	DAK	AMB3	DSM	9/10/2020	ISSUED FOR APPROVAL
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	9/10/20	12/2/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		12/2/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

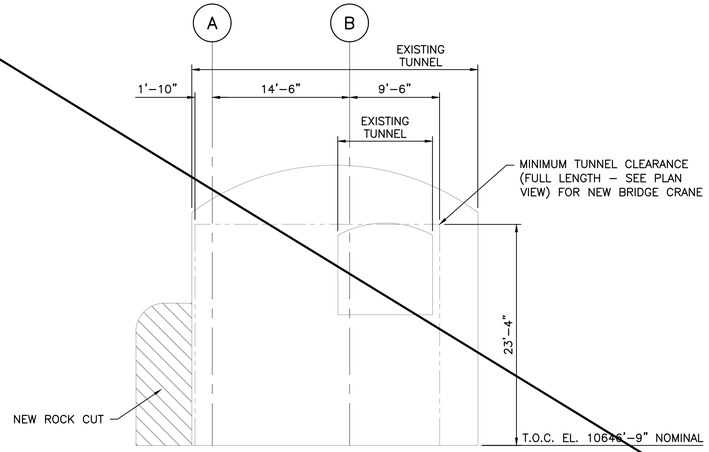
GENERAL ARRANGEMENT SECTIONS AT ROD MILL

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-GA-002
REV. No. 1

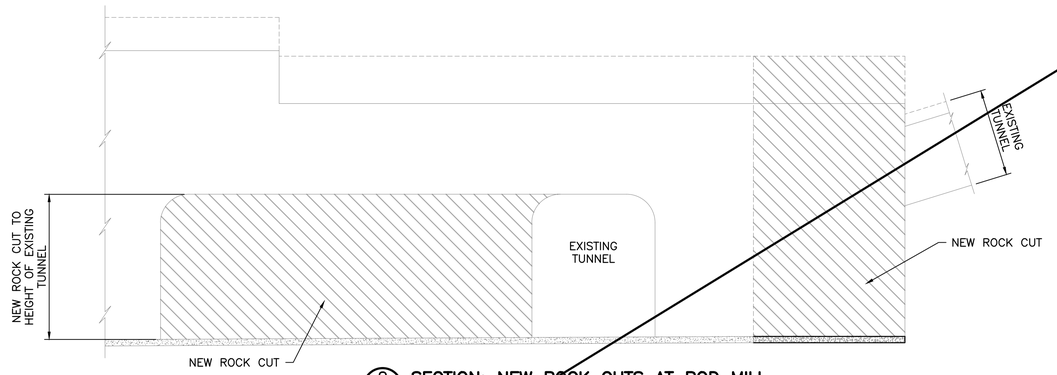
CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\5788C28D-49AA-4FE2-B3D4-CD3DC30E6A8F\8.3\F96F79-FB81-4239-AEB2-F50B03E7AEF\0646100104_300-GA-002.DWG PLOT SCALE: 1:1 PLOT DATE: 11/30/2020 2:25 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

NOTES:

1. SURFACE STABILIZATION OF NEW ROCK CUTS IS REQUIRED. DESIGN AND APPLICATION BY OTHERS.



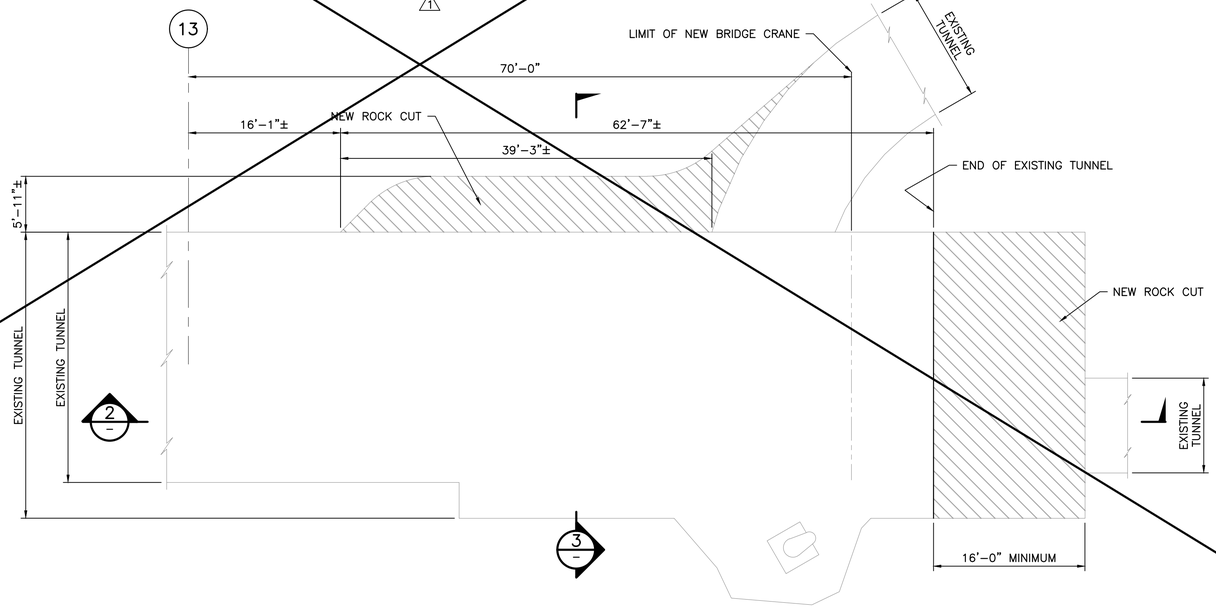
3 — SECTION: NEW ROCK CUTS AT ROD MILL
1/8"=1'–0"



2 — SECTION: NEW ROCK CUTS AT ROD MILL
1/8"=1'–0"

OBSOLETE

△1



1 — PLAN: NEW ROCK CUTS AT ROD MILL
1/8"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

NOT FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	DSM	DSM	3/31/21	OBSOLETE
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17			

DATE RELEASED

BARR
Corporate Headquarters:
Minneapolis, Minnesota
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Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	3/8/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
NEW ROCK CUTS AT ROD MILL AREA

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–GA–003
REV. No. 1

CADD USER: Hbpreuser FILE: \\HIB-PW\HIB_PW_IN\C850B21F-9B49-4565-8947-5FFC7FC29903\E67EBA5A-B9B7-4474-B8F0-BB2D503092731064610104_300-GA-003.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 4:30 PM
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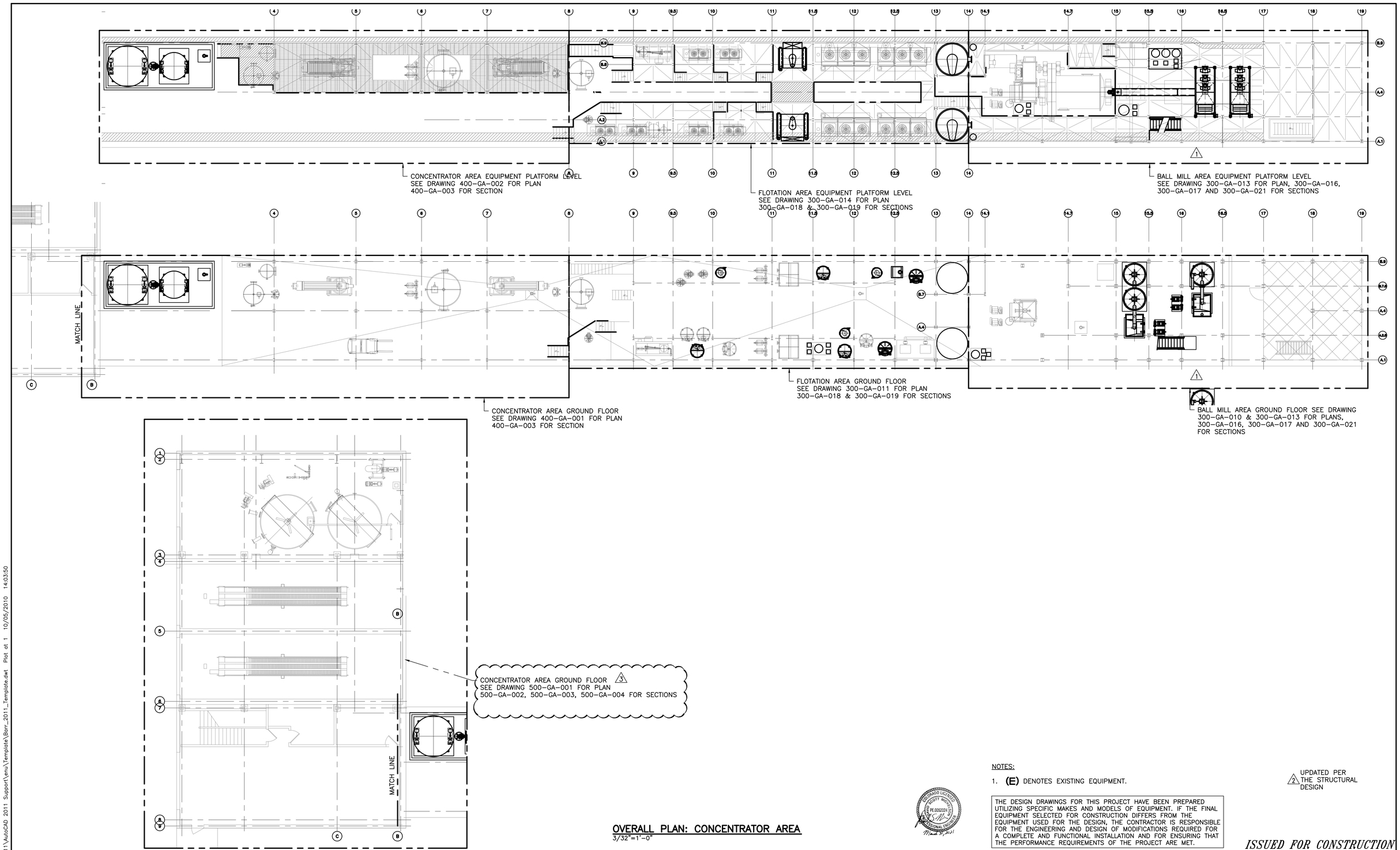

OVERALL PLAN: CONCENTRATOR AREA

3/32"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

2 UPDATED PER THE STRUCTURAL DESIGN

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
3	AMB	JAK	DSM	3/31/21	UPDATED REFERENCE CALLOUT TO 500 AREA DRAWINGS
2	BMC	JAK	DSM	12/8/20	REVISED-UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

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CLIENT			4/28/17	10/09/20	11/18/20	12/08/20	3/31/21
BID			4/28/17				
CONSTRUCTION			4/28/17		11/18/20	12/08/20	3/31/21

DATE RELEASED

BARR

Corporate Headquarters:
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Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLOADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
OVERALL CONCENTRATOR PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-GA-009
REV. No. 3

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_INV\C850B21F-9B49-4565-8947-5FFC7FC29903\{0169B58A-2E5C-4E3A-A5EC-9DD2FB45444A}\06461001\04_300-GA-009.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 4:30 PM
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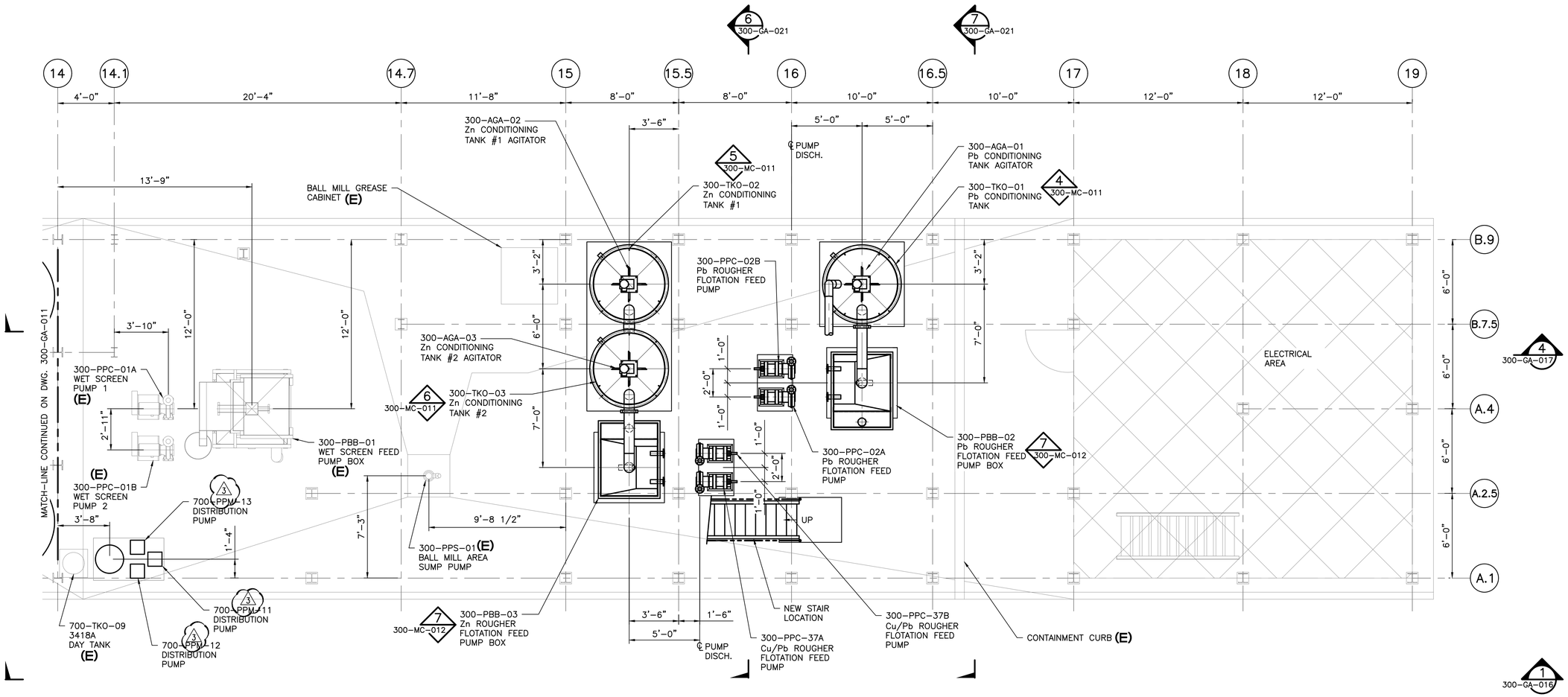

1 / – PLAN: CONCENTRATOR GRADE FLOOR COLUMN LINE 14 TO 19

1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

2 UPDATED PER THE STRUCTURAL DESIGN

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
3	AMB	JAK	DSM	3/31/21	UPDATED PUMP LABELS
2	BMC	JAK	DSM	12/8/20	REVISED–UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	0	0.A	1	2	3
CLIENT	—	—	4/28/17	10/09/20	11/18/20	12/08/20	3/31/21
BID	—	—	4/28/17	—	—	—	—
CONSTRUCTION	—	—	4/28/17	—	11/18/20	12/08/20	3/31/21
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—
DATE RELEASED	—	—	—	—	—	—	—

BARR
Corporate Headquarters:
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Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. GRADE FLOOR PLAN COL. 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–GA–010
REV. No. 3

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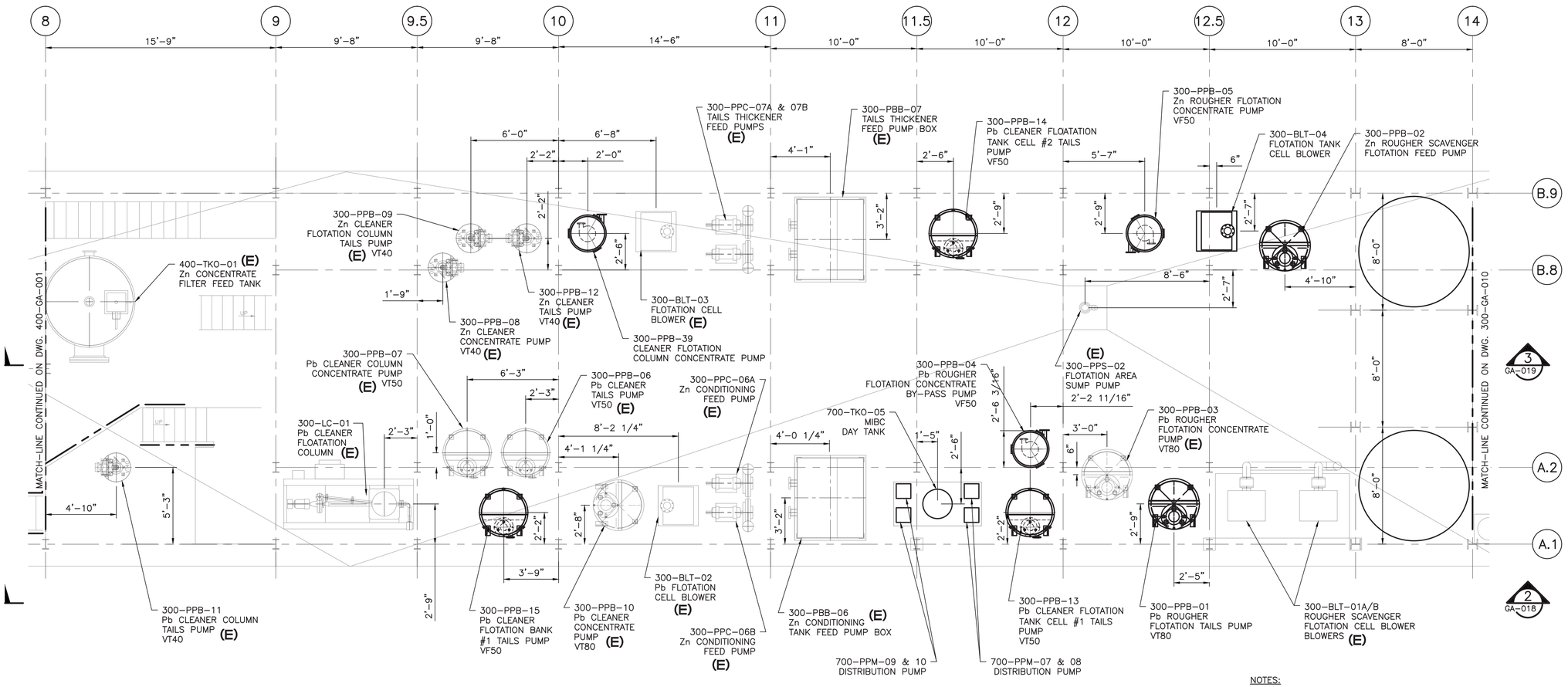

2 PLAN: CONCENTRATOR GRADE FLOOR COLUMN LINE 8 TO 14
1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED DAVID SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT				4/28/17			
BID				4/28/17			
CONSTRUCTION				4/28/17			
DATE RELEASED							

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Corporate Headquarters: Minneapolis, Minnesota
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Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. GRADE FLOOR PLAN COL. 8 TO 14

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–GA–011
REV. No. 0

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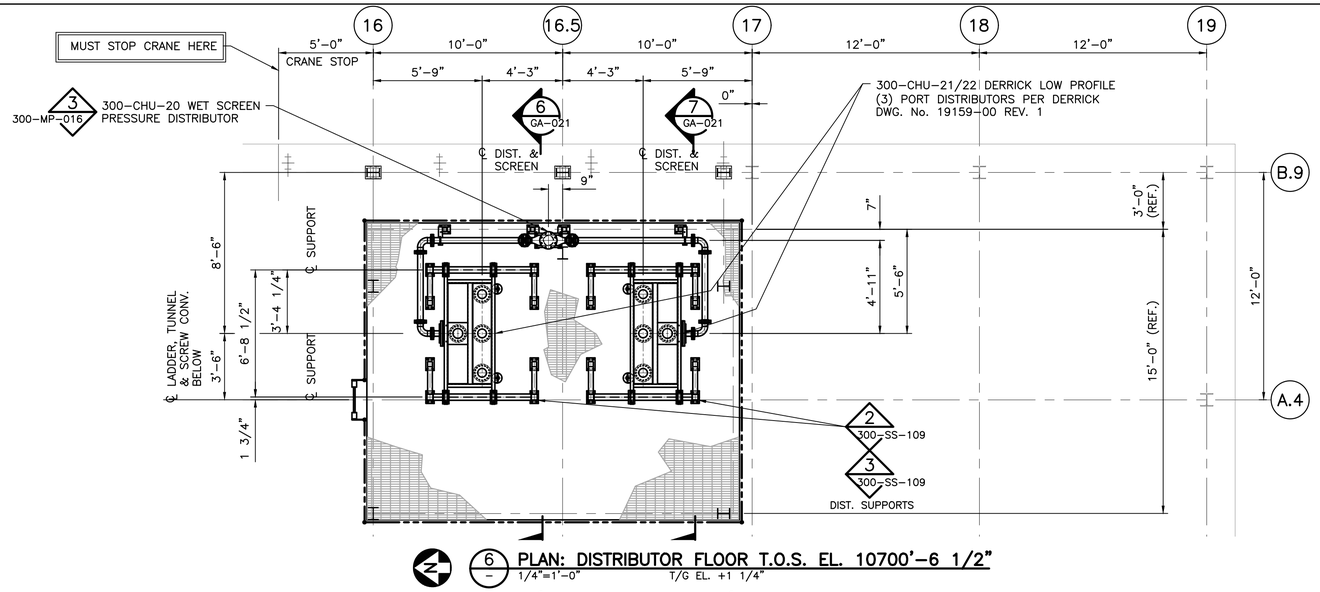
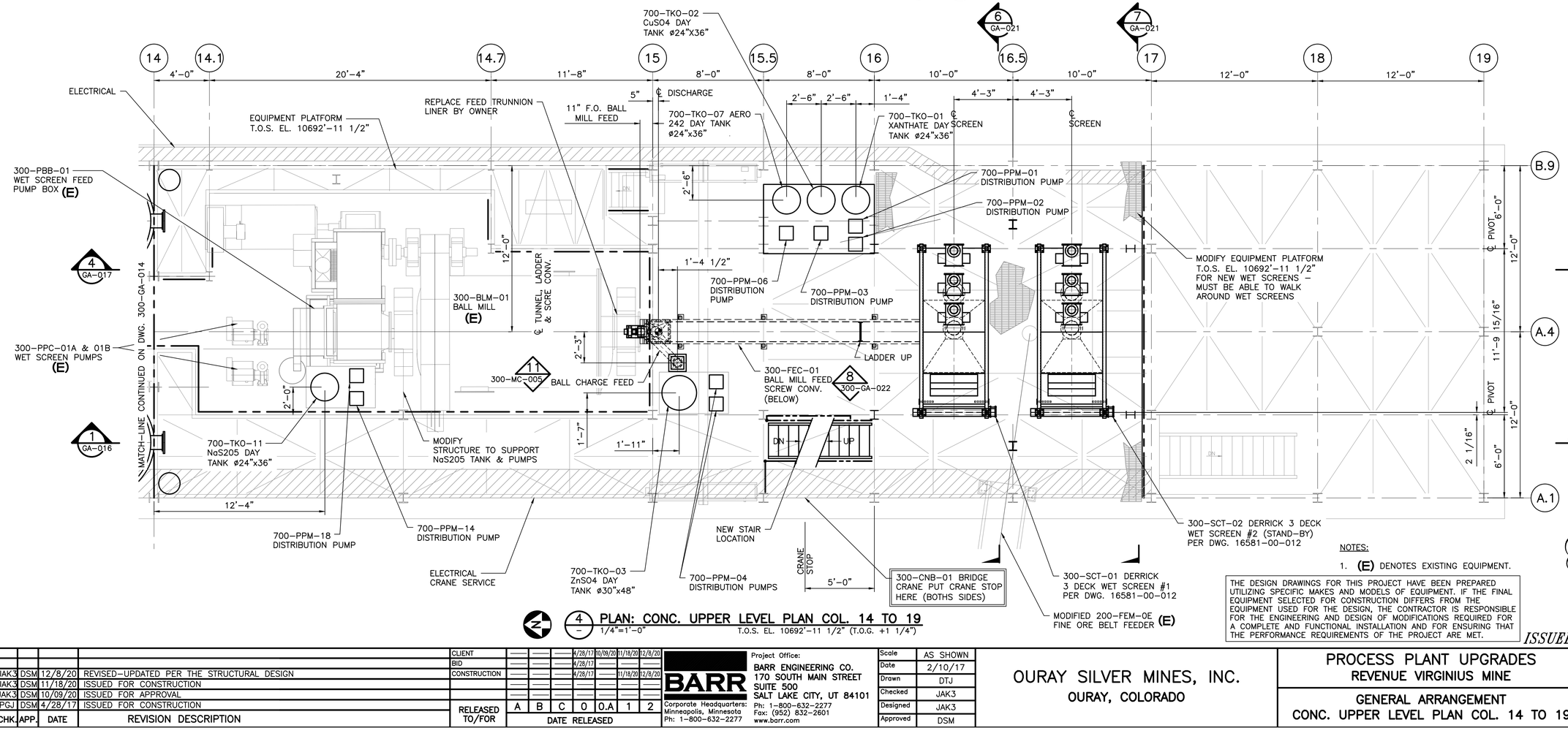


6 — PLAN: DISTRIBUTOR FLOOR T.O.S. EL. 10700'-6 1/2"
1/4"=1'-0" T/G EL. +1 1/4"



4 — PLAN: CONC. UPPER LEVEL PLAN COL. 14 TO 19
1/4"=1'-0" T.O.S. EL. 10692'-11 1/2" (T.O.G. +1 1/4")

NOTES:
1. (E) DENOTES EXISTING EQUIPMENT.

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2 UPDATED PER THE STRUCTURAL DESIGN

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	JAK3	DSM	12/8/20	REVISED-UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK3	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT				4/28/17	10/09/20	11/18/20	12/8/20
BID				4/28/17			
CONSTRUCTION				4/28/17		11/18/20	12/8/20
DATE RELEASED							

BARR
Project Office:
BARR ENGINEERING CO.
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www.barr.com
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. UPPER LEVEL PLAN COL. 14 TO 19

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-GA-013
REV. No. 2

CADD USER: Hibpwuser FILE: \\HIB-PW\HIB_PW_IN\21330B4D-CFFE-40C3-B9CD-02A4A741EE4B\01688D6E-864B-4068-9A70-217CDC2383AB\0646100104_300-GA-013.DWG PLOT SCALE: 1:1 PLOT DATE: 12/8/2020 11:48 AM
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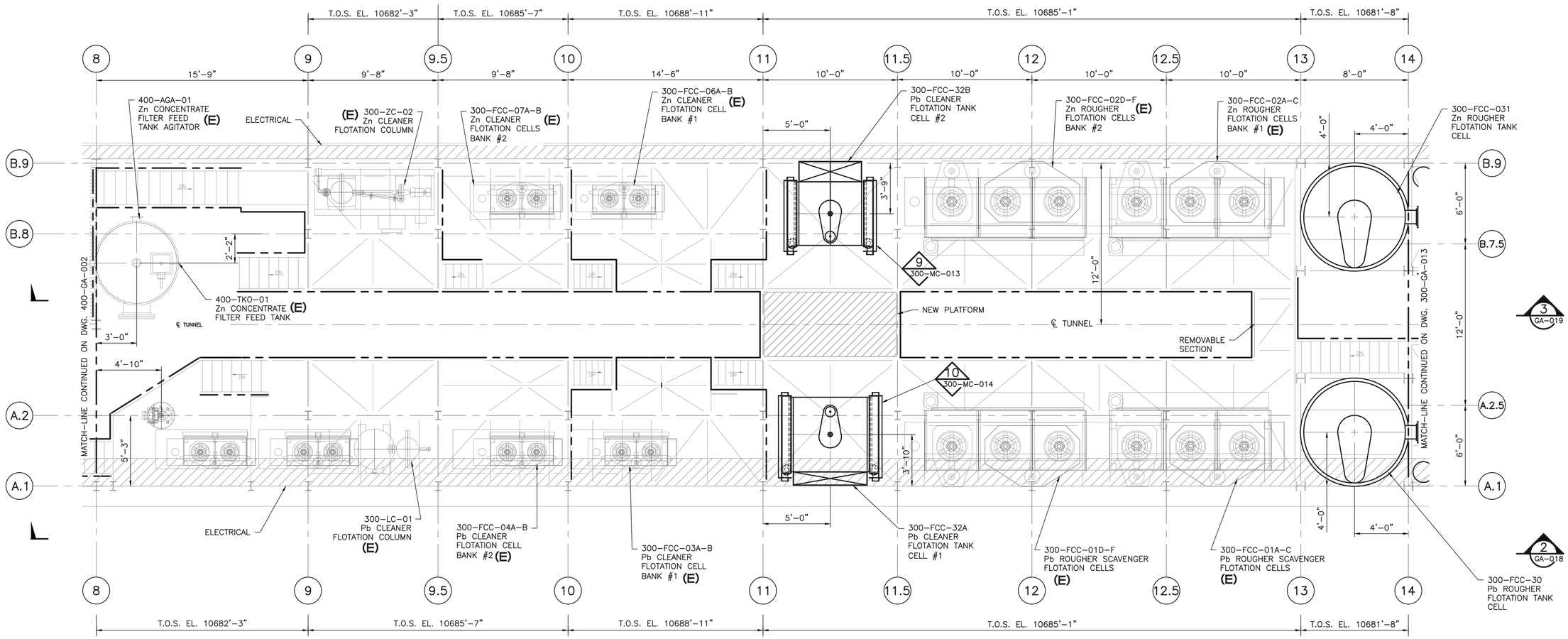

5 PLAN: CONCENTRATOR UPPER LEVEL COLUMN 8 TO 14
1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT			4/28/17				
BID			4/28/17				
CONSTRUCTION			4/28/17				
A	B	C	0	1	2	3	
DATE RELEASED							

BARR
Corporate Headquarters:
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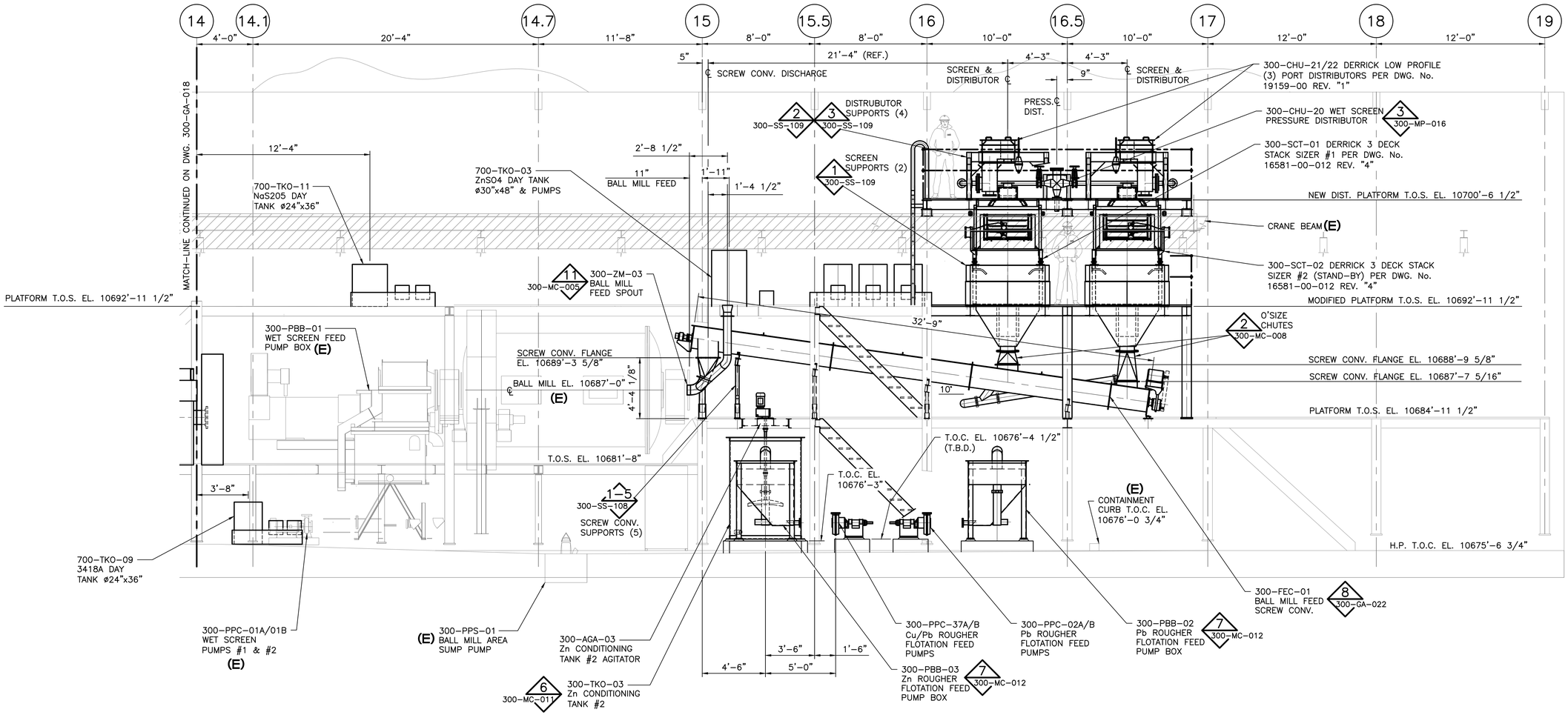
Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. UPPER LEVEL PLAN COL. 8 TO 14

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–GA–014
REV. No. 0



1 SECTION: CONCENTRATOR WEST SIDE OF TUNNEL COLUMN LINE 14 TO 19
300-GA-010 300-GA-013
1/4"=1'-0"

NOTES:

1. (E) DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

2 UPDATED PER THE STRUCTURAL DESIGN

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	JAK3	DSM	12/8/20	REVISED-UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK3	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/09/20	11/18/20	12/8/20
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	12/8/20
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—

DATE RELEASED

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www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. SECTION WEST COL. 14 TO 19

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-GA-016
REV. No. 2

CADD USER: Hibpwuser FILE: \\HIB-PW\HIB_PW_IN\21330840-CFFE-40C3-B9CD-02A4A741EE49\d3D42225-F8B2-4DD8-B33B-846280CF4601\06461001040_300-GA-016.DWG PLOT SCALE: 1:1 PLOT DATE: 12/8/2020 11:49 AM
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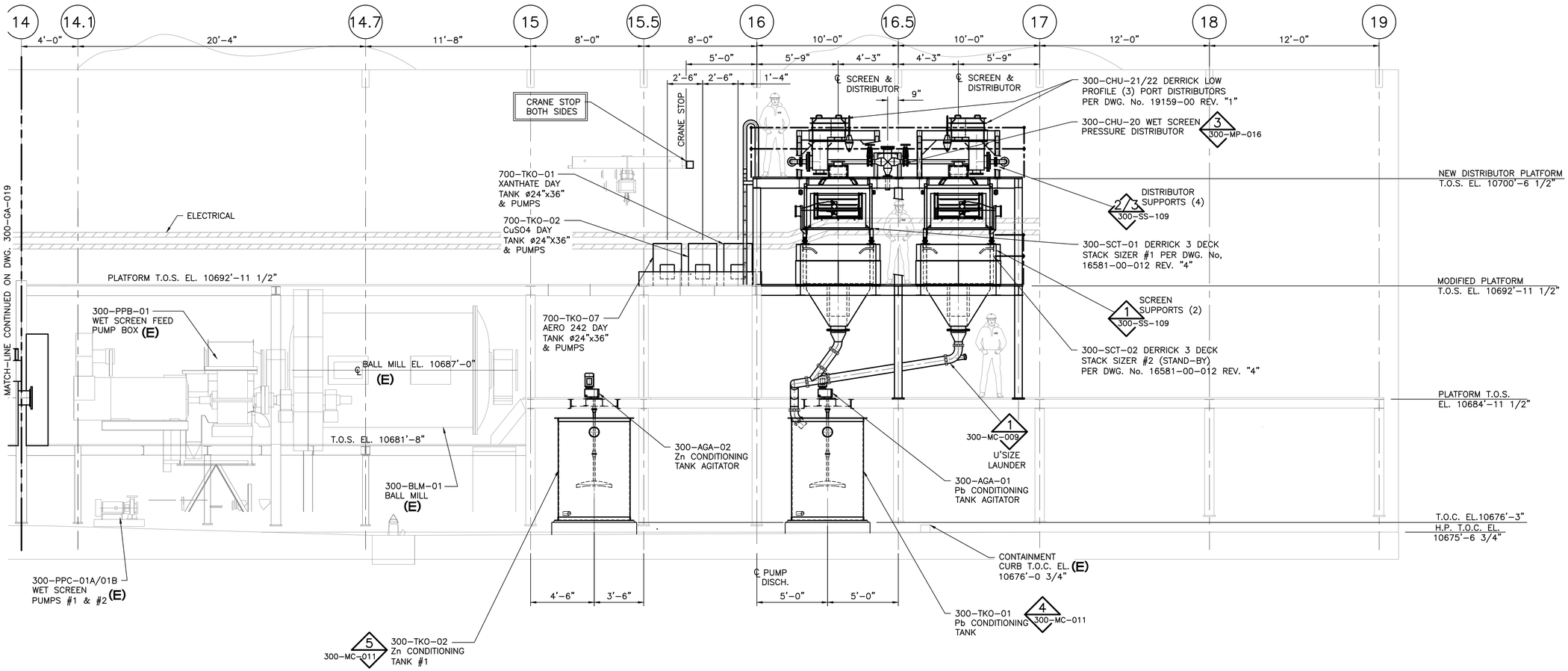

4 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE 14 TO 19

300–GA–010 / 300–GA–013 1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

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2 UPDATED PER THE STRUCTURAL DESIGN

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	JAK3	DSM	12/8/20	REBISED–UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK3	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 10/09/20 11/18/20 12/8/20; BID — 4/28/17; CONSTRUCTION — 4/28/17 11/18/20 12/8/20

DATE RELEASED: A B C 0 0.A 1 2

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1–800–632–2277

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Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. SECTION EAST COL. 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–GA–017
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_JN\213308\0–CFFE–4DC3–B9CD–02A4A741EE48\6BA5B3C6–DB99–470E–B213–F6BED8B882D1\5\0646100104_300–GA–017.DWG PLOT SCALE: 1:1 PLOT DATE: 12/8/2020 11:49 AM
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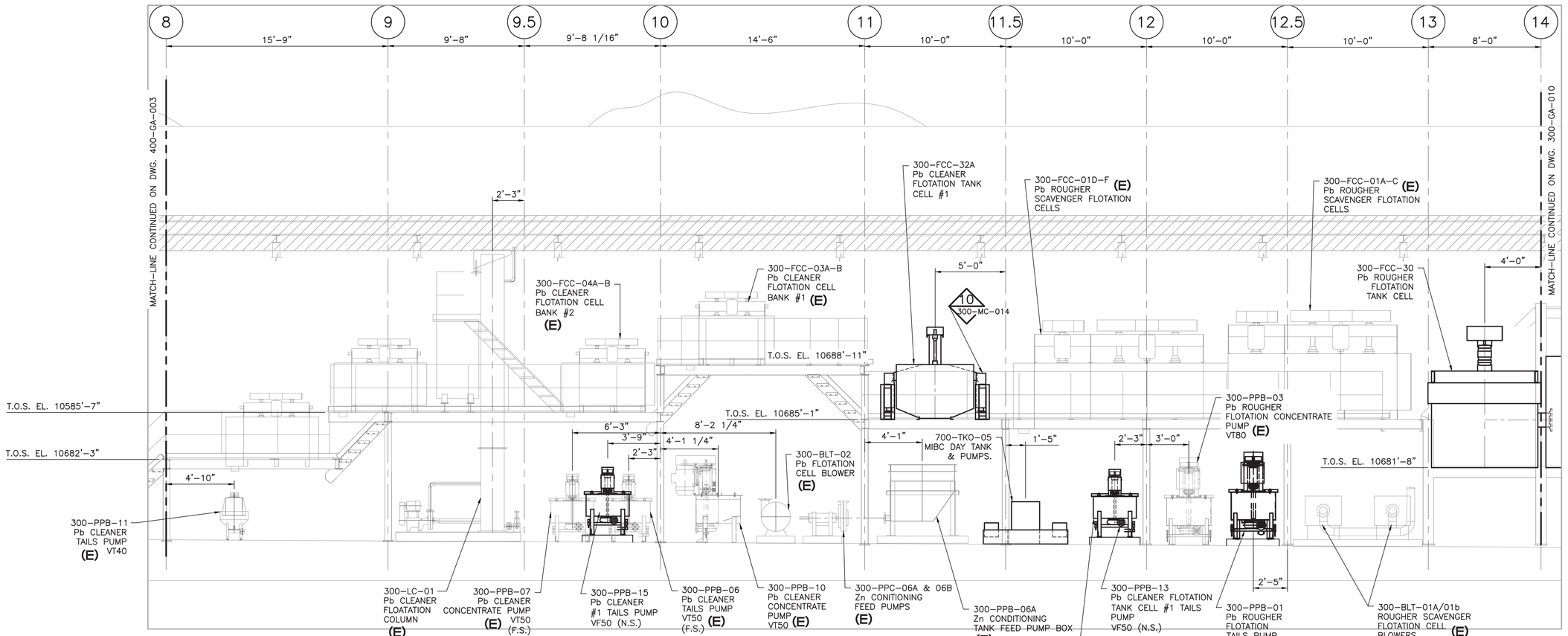

2 SECTION: CONCENTRATOR WEST SIDE OF TUNNEL COLUMN LINE 8 TO 14

300–GA–011
300–GA–014
1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
DAVID SCOTT MICHEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT				4/28/17			
BID				4/28/17			
CONSTRUCTION				4/28/17			
DATE RELEASED							

BARR
Corporate Headquarters:
Minneapolis, Minnesota
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www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

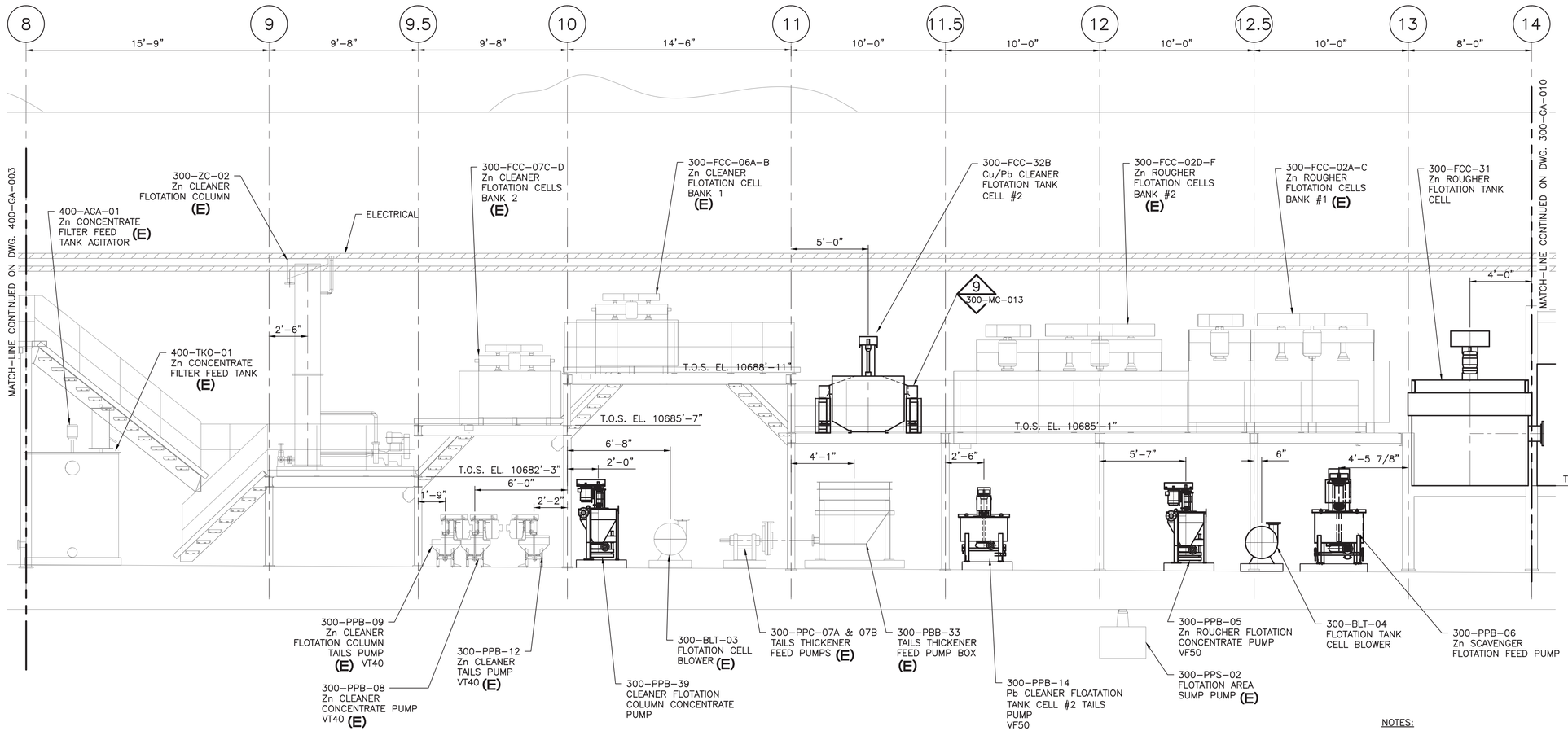
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. SECTION WEST COL. 8 TO 14

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–GA–018
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\EEB44425F-B8BD-471B-9EC3-1083551797C3\2022C2BC-F48F-436A-A99D-0C1B89D6CEFD\06461001 00_300-GA-018.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 10:17 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



3 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE 8 TO 14

300–GA–011
300–GA–014

1/4"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
DAVID SCOTT MICKELSON
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

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Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. SECTION EAST COL. 8 TO 14

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–GA–019
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\EEB44251–88BD–471B–9EC3–10835517797C3\D0935599–9BA5–4026–B9F2–D764C7DF3651\0646100100_300–GA–019.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 9:52 AM
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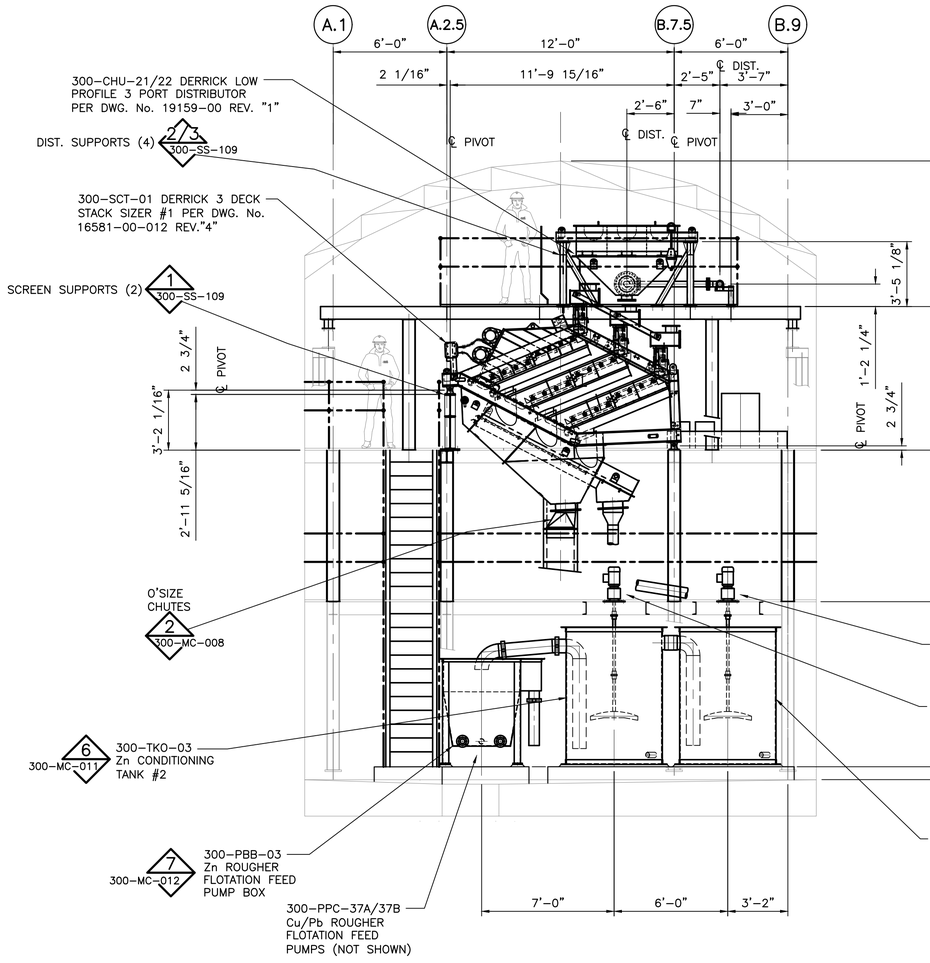
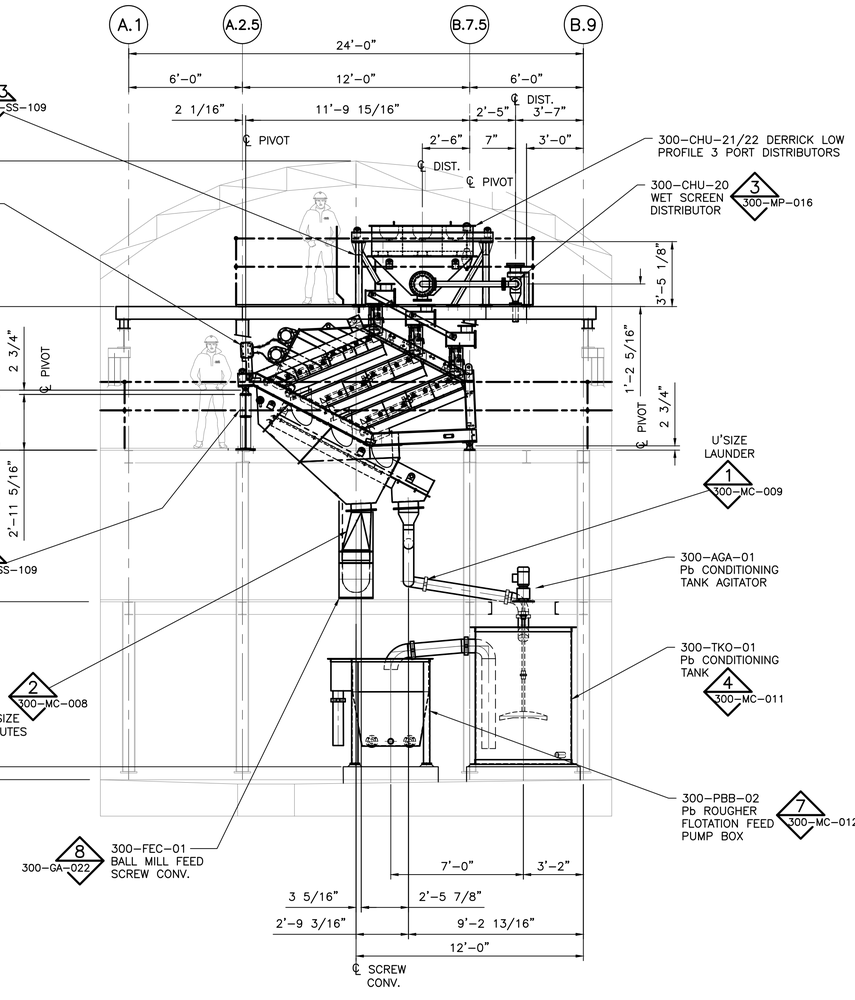


6 SECTION: CONCENTRATOR COLUMN LINE A.1 TO B.9
GA–010 GA–013 1/4"=1'–0" LOOKING NORTH



7 SECTION: CONCENTRATOR COLUMN LINE A.1 TO B.9
GA–010 GA–013 1/4"=1'–0" LOOKING NORTH

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

Dec. 7 2020

2 UPDATED PER THE STRUCTURAL DESIGN

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	BMC	JAK3	DSM	12/8/20	REVISED–UPDATED PER THE STRUCTURAL DESIGN
1	BMC	JAK3	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/09/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/09/20	11/18/20	12/8/20
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/18/20	12/8/20

DATE RELEASED

BARR
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www.barr.com

Scale	AS SHOWN
Date	4/17/18
Drawn	DTJ/BMC
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

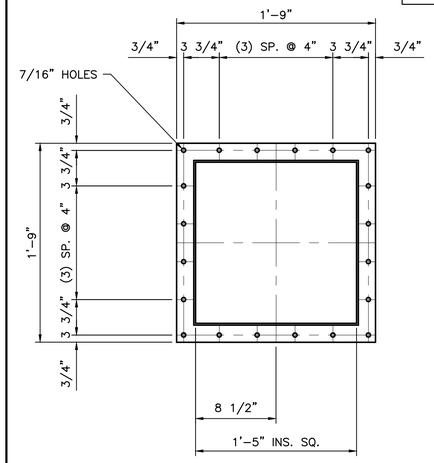
GENERAL ARRANGEMENT
CONC. SECTIONS COLUMNS A.1 TO B.9

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–GA–021
REV. No. 2

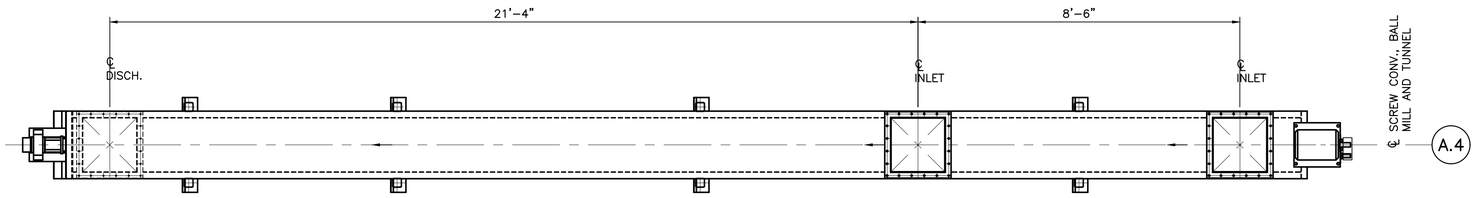
CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_IN\21330840–CFFE–4DC3–B9CD–02A4A741EE4B\531F5252–E0E6–478D–8E2F–44EBF502DD9B\06461001O4_300–GA–021.DWG PLOT SCALE: 1:1 PLOT DATE: 12/8/2020 11:50 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

BALL MILL FEED SCREW CONVEYORS– PERFORMANCE DATA

CONVEYOR NO.	MATERIAL CONVEYED	SOLIDS SG	SLURRY DENSITY	PERCENT SOLIDS	MATERIAL SIZE	ANGLE OF REPOSE	SURCHARGE ANGLE	CAPACITY	MATERIAL TEMPERATURE	SCREW DIAMETER	INLET FLANGE	DISCHARGE FLANGE
300–FEC–01	GALENA ORE	2.70 MT/M³	1.79 MT/M³	70.00	35 MESH TO 38mm	34 DEGREES	25 DEGREES	19.4–MTPH	50 °F	16 INCH (SEE NOTE 1)	16 INCH CEMA STD. SQUARE (SEE DETAIL "10")	16 INCH CEMA STD. SQUARE (SEE DETAIL "10")



10 DETAIL: INLET AND DISCHARGE FLANGE
1 1/2"=1'–0"
TYP. (3) PLACES

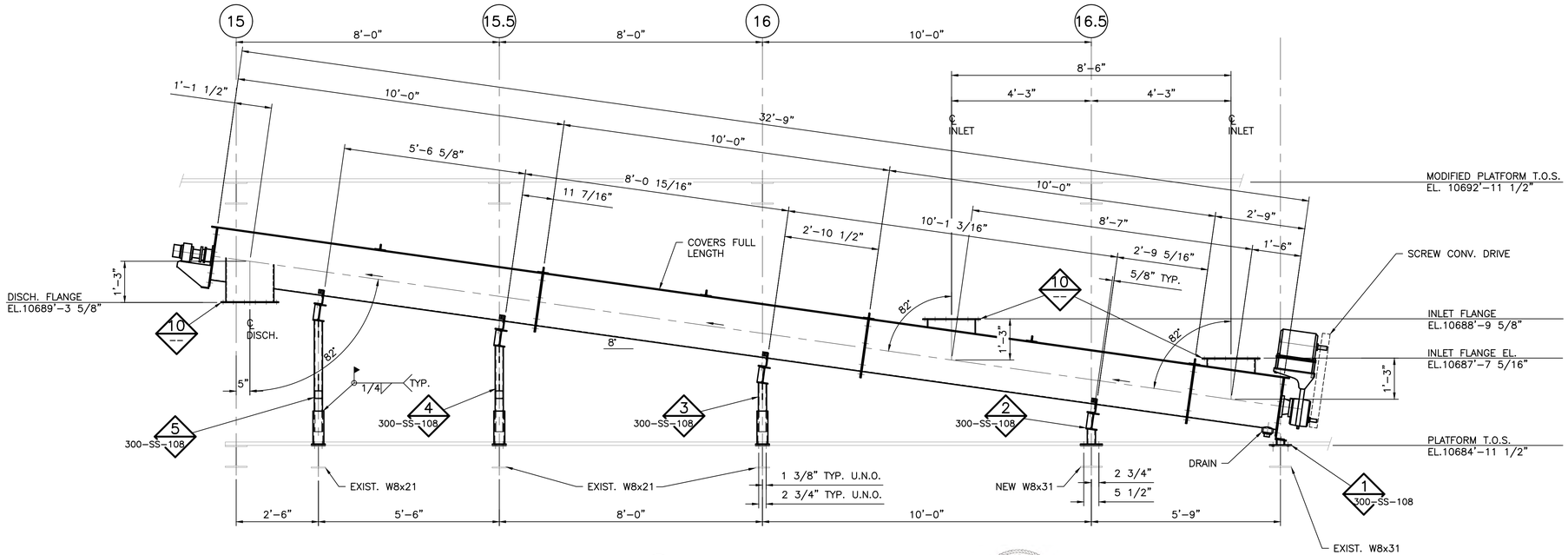


9

PLAN:

N

8 DETAIL: SCREW CONVEYOR 300–FEC–01
300–GA–013
300–GA–016
1/2"=1'–0"



9 ELEVATION: LOOKING EAST

NOTES:
1. ESTIMATED SCREW DIAMETER SHOWN. MANUFACTURER TO VERIFY SIZE AND NOTIFY OWNER IF MANUFACTURER'S SUGGESTED SIZE DIFFERS FROM WHAT IS SHOWN.
2. REFER TO SPECIFICATION SECTION 41 12 15 FOR ADDITIONAL DESIGN REQUIREMENTS AND DETAILS.
3. VENDOR TO PROVIDE SUPPORT FEET AT TROUGH FLANGES AS SHOWN ON DRAWING.
4. TOP COVER PLATE TO BE COORDINATED WITH DRAWING 300–MC–008

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠ COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/18/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/20/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17, 10/20/20, 11/18/20; BID — 4/28/17; CONSTRUCTION — 4/28/17, 11/18/20

DATE RELEASED: A | B | C | 0 | 0.A | 1 | 2

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Scale	AS SHOWN
Date	3/30/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

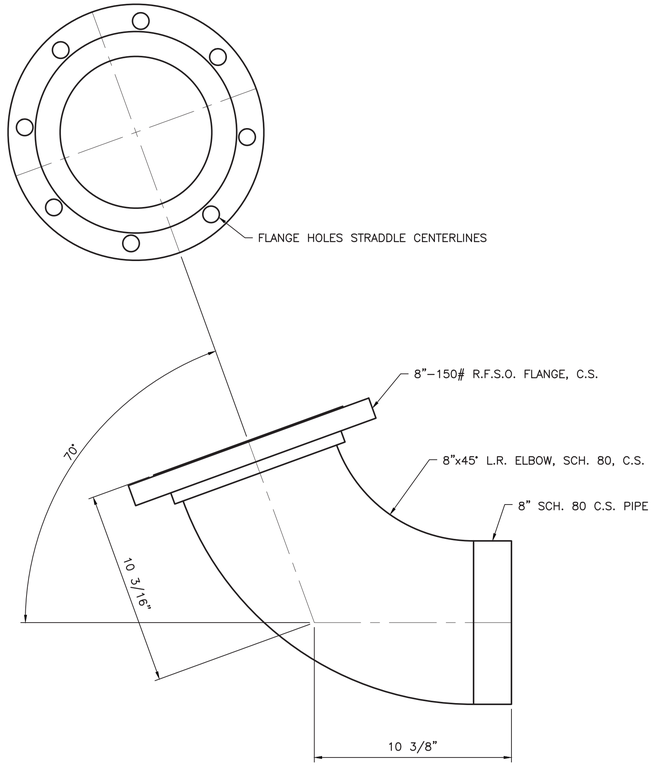
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
SCREW CONVEYOR CONTROL DRAWING

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–GA–022
REV. No. 1

CADD USER: Hbpwuser FILE: \\HB-PW\HB_PW_IN\30282407-8BB6-4FDE-AC9B-6B6CB54CF1B9\96F1D713-2318-4EF2-ABDC-29CE6B18B566\06461001O4_300-GA-022.DWG BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



1 / 300–GA–002 **DETAIL: ROD MILL FEED CHUTE 300–CHU–30**
3"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
SCOTT MICKEY
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

A	B	C	0	1	2	3
			4/28/17			
			4/28/17			
			4/28/17			

DATE RELEASED

CLIENT
BID
CONSTRUCTION

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Minneapolis, Minnesota
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Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	2/22/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
ROD MILL FEED CHUTE

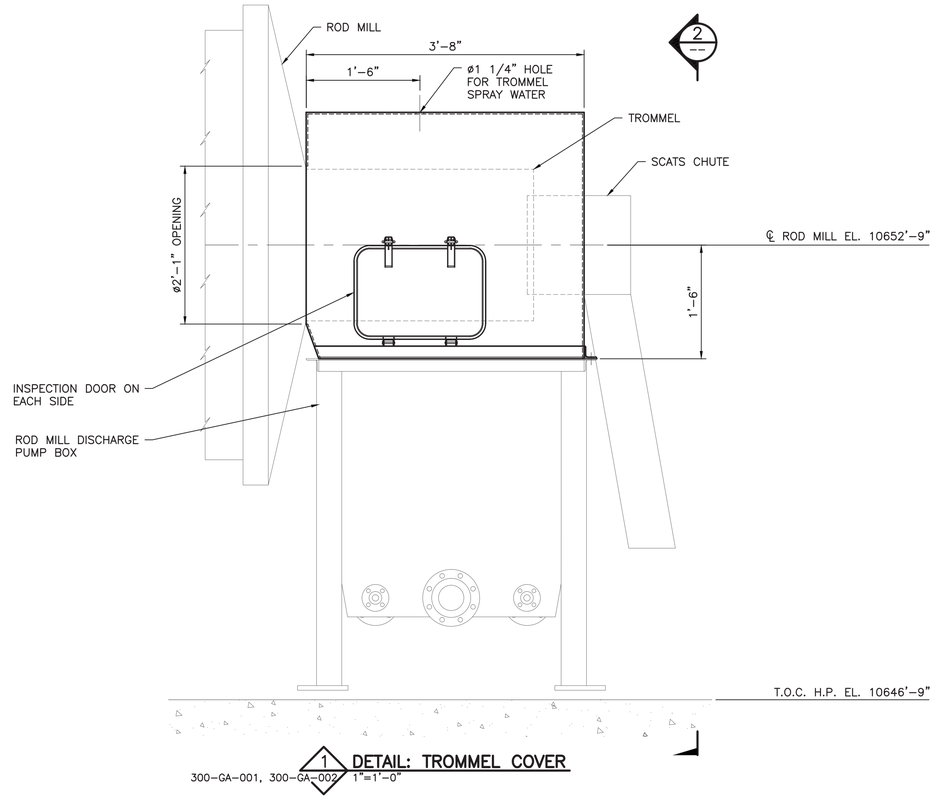
BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–MC–001
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\C023903F–9178–450C–9B8E–03323963644A1\EDE681EB–9012–4BF1–8393–B955DB651656\06461001OO_300–MC–001.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 3:44 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

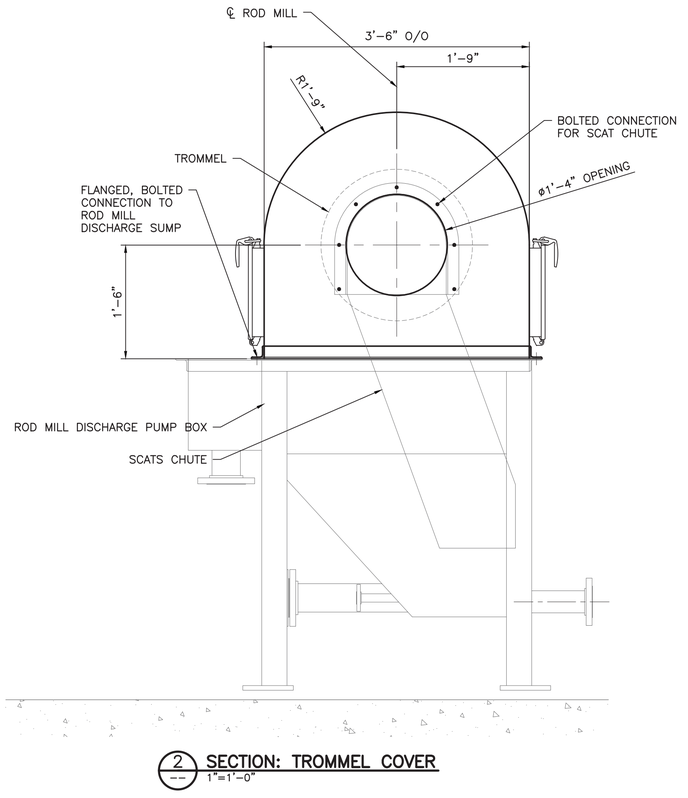
FOR BIDDING PURPOSES ONLY
DESIGN TO BE REVIEWED UPON RECEIPT OF ROD MILL AND TROMMEL INFORMATION

NOTES:

1. WORK THIS DRAWING WITH 300-MC-003 AND 300-MC-004.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.



1 DETAIL: TROMMEL COVER
300-GA-001, 300-GA-002 1"=1'-0"



2 SECTION: TROMMEL COVER
1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — BID — CONSTRUCTION 4/28/17
DATE RELEASED: A B C 0 1 2 3

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Corporate Headquarters: Minneapolis, Minnesota
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/28/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

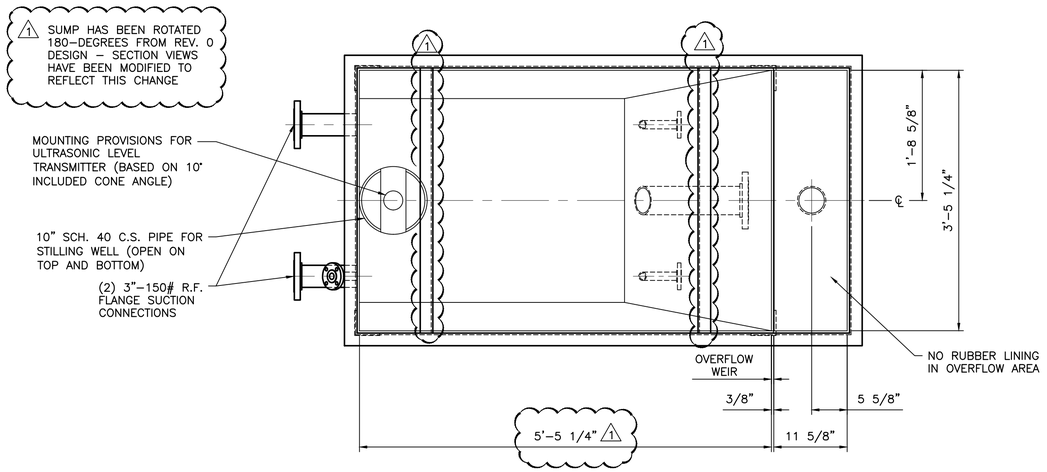
PLATEWORK
ROD MILL TROMMEL COVER

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-MC-002
REV. No. 0

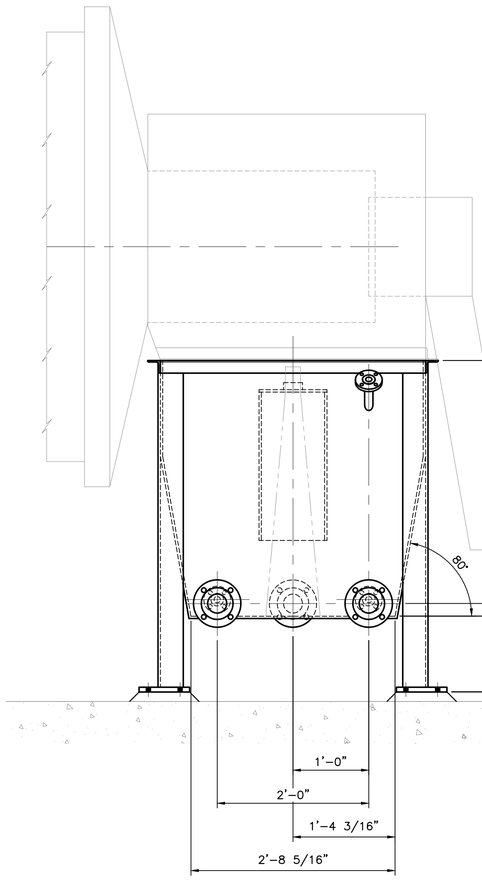
CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\C023903F-9178-450C-98BE-03329636A41\C64EEB6D-CA18-4446-814D-84AF184A6F19\06461001002_300-MC-002.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 4:05 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

NOTES:

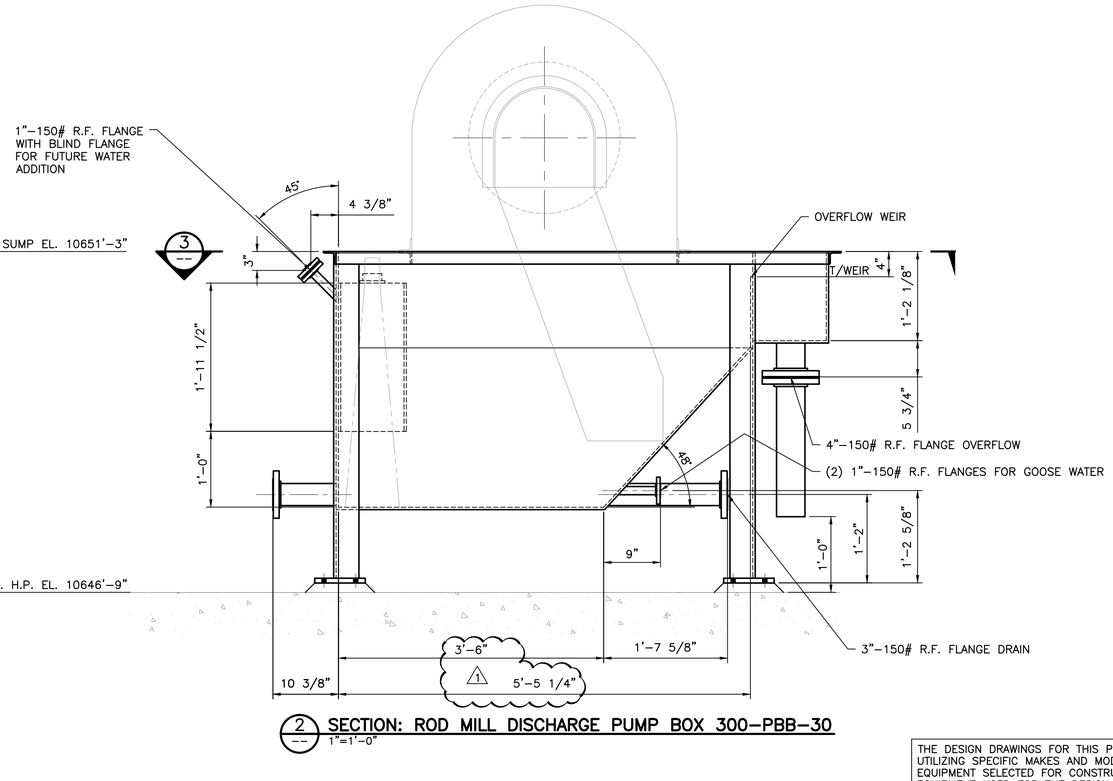
1. WORK THIS DRAWING WITH 300-MC-002 AND 300-MC-004.
2. PUMP BOX CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. PUMP BOX INTERIOR SHALL BE RUBBER LINED WITH 1/4" NATURAL GUM RUBBER (UNLESS NOTED).
4. DIMENSIONS ARE TO INSIDE OF STEEL UNLESS OTHERWISE NOTED.



3 SECTION: ROD MILL DISCHARGE PUMP BOX 300-PBB-30
1"=1'-0"



1 DETAIL: ROD MILL DISCHARGE PUMP BOX 300-PBB-30
300-GA-001, 300-GA-002 1"=1'-0"



2 SECTION: ROD MILL DISCHARGE PUMP BOX 300-PBB-30
1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	AMB3	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 12/2/20; BID 4/28/17; CONSTRUCTION 4/28/17 12/2/20

DATE RELEASED: A B C 0 1 2 3

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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/28/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
ROD MILL DISCHARGE PUMP BOX

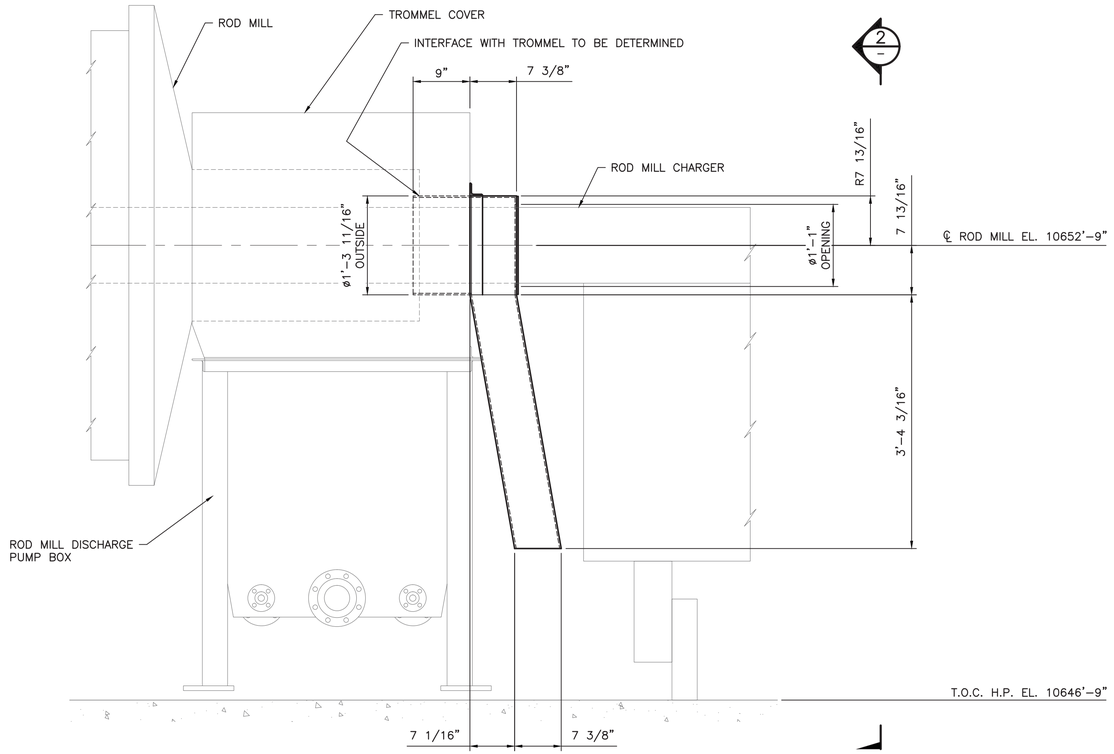
BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-MC-003
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\{BC6D7612-65AA-435B-BDD7-46A250319FD5}\{2B62810-6B57-409B-9D43-895E58FD130D}\{64610D104_300-MC-003.DWG PLOT SCALE: 1:1 PLOT DATE: 11/30/2020 11:11 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

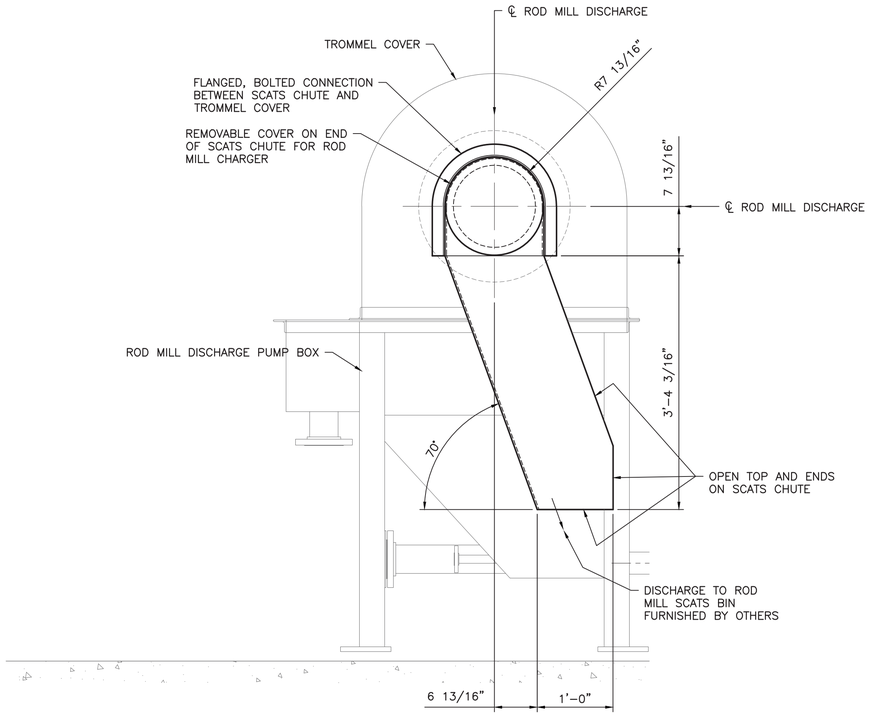
FOR BIDDING PURPOSES ONLY
DESIGN TO BE REVIEWED UPON RECEIPT OF ROD MILL AND ROD MILL CHARGER INFORMATION

NOTES:

1. WORK THIS DRAWING WITH 300-MC-002 AND 300-MC-003.
2. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" (MINIMUM) THICK PLATE. OTHER SIZES AS NOTED.
3. SCAT CHUTE SHALL BE SELF SUPPORTING OFF END OF TROMMEL COVER.



1 DETAIL: ROD MILL SCATS CHUTE 300-CHU-32
300-GA-001, 300-GA-002 1"=1'-0"



2 SECTION: ROD MILL SCATS CHUTE 300-CHU-32
1"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED · SCOTT MICHEL · PE.0052024 · PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17			
BID				4/28/17			
CONSTRUCTION				12/8/17			
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/28/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
ROD MILL SCATS CHUTE

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-MC-004
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\C023903F-9178-450C-9B8E-03323963A4A1\1CB6BDAF-035F-4857-936D-054B97C9402F\06461001001_300-MC-004.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 3:59 PM
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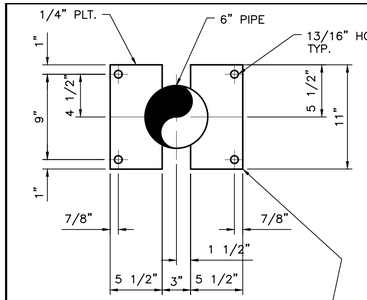
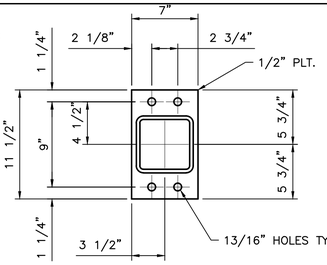
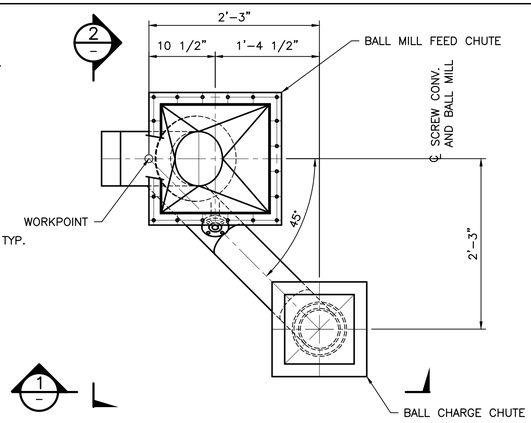


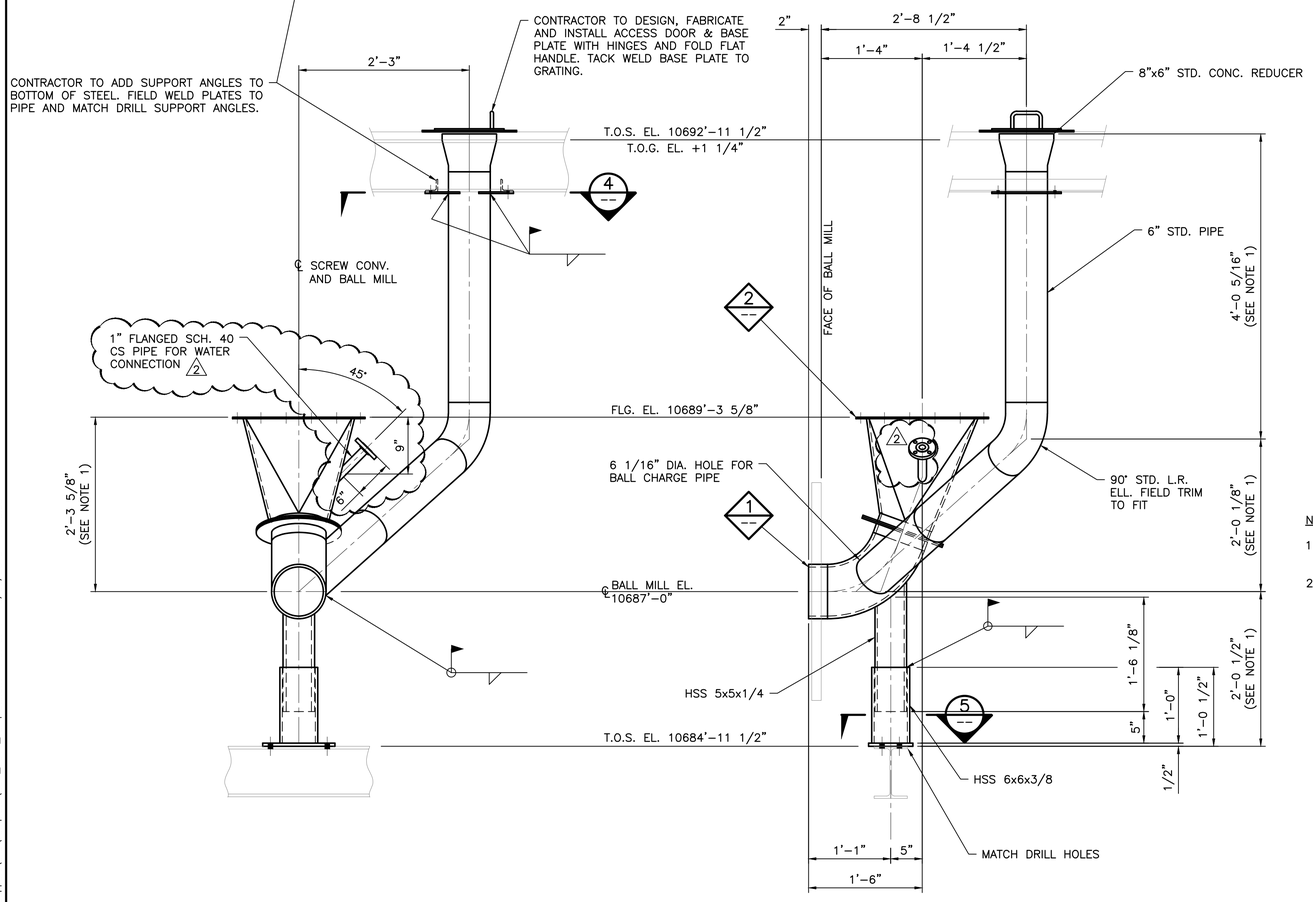
4 SECTION:
1 1/2"=1'-0"



5 SECTION:
1 1/2"=1'-0"

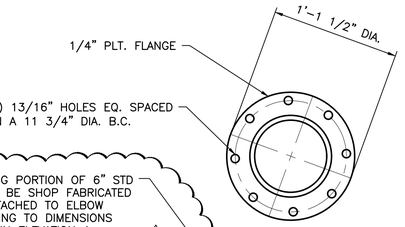


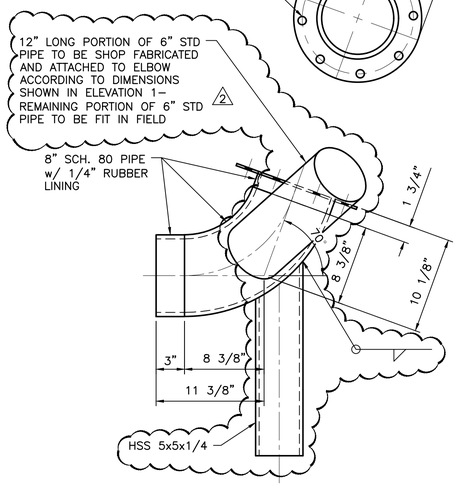
1 DETAIL: BALL MILL FEED CHUTE w/BALL CHARGE CHUTE
1"=1'-0"
(1) REQ'D.
300-GA-013
300-GA-016



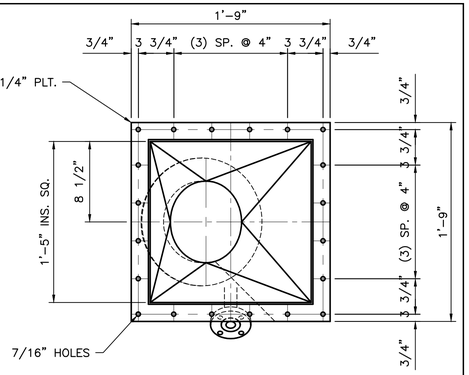
2 ELEVATION: LOOKING SOUTH
1"=1'-0"

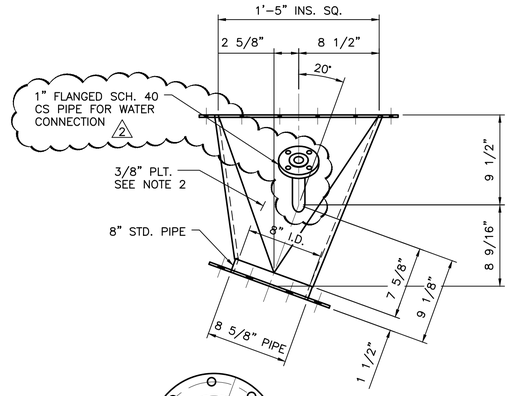
1 ELEVATION: LOOKING EAST
1"=1'-0"

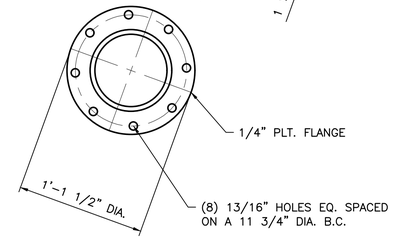




1 DETAIL:
1 1/2"=1'-0"
(1) REQ'D.







2 DETAIL:
1 1/2"=1'-0"
(1) REQ'D.

NOTES:

1. FIELD VERIFY DIMENSIONS FROM BALL MILL INLET TO TOP OF STEEL BEFORE FABRICATION.
2. INTERIOR OF CHUTE SHALL BE LINED WITH 1/4" THK. NATURAL GUM RUBBER.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK	APP.	DATE	REVISION DESCRIPTION
2	AMB	DSM	DSM	3/31/21	ADDED WATER CONNECTION AND ADDITIONAL DETAILS
1	BMC	JAK3	DSM	11/19/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/27/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION

A	B	C	0	0.A	1	2
—	—	—	4/28/17	10/27/20	11/19/20	3/31/21
—	—	—	4/28/17	—	—	—
—	—	—	—	11/19/20	3/31/21	—

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
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170 SOUTH MAIN STREET
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SALT LAKE CITY, UT 84101
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www.barr.com

Scale	AS SHOWN
Date	3/18-17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
BALL MILL FEED CHUTE

BARR PROJECT No. 06/46-1004.04
CLIENT PROJECT No. -
DWG. No. 300-MC-005
REV. No. 2

CADD USER: Hbpeuser FILE: \\HIB-PW\HIB_PW_IV\3174EB48-5071-4020-A785-0C0EBBEC2679\J3498270-9042-47C0-9539-0D38F18CBA91\0646100104_300-MC-005.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 3:46 PM
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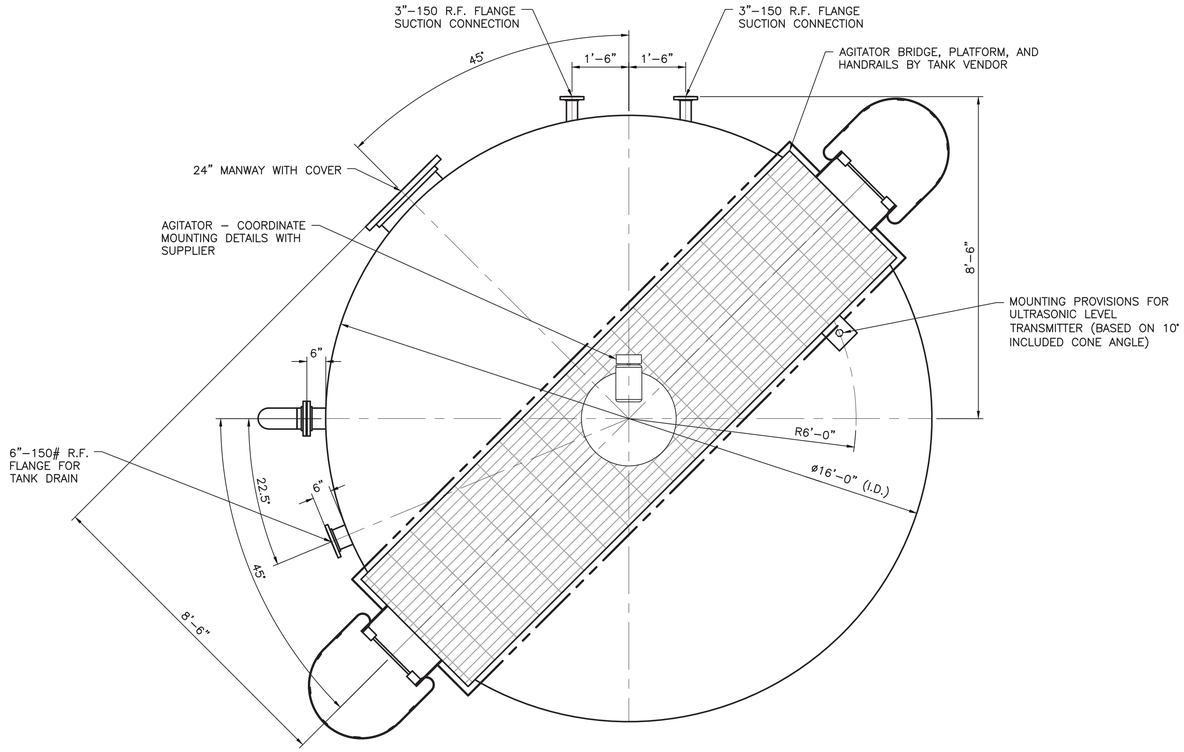
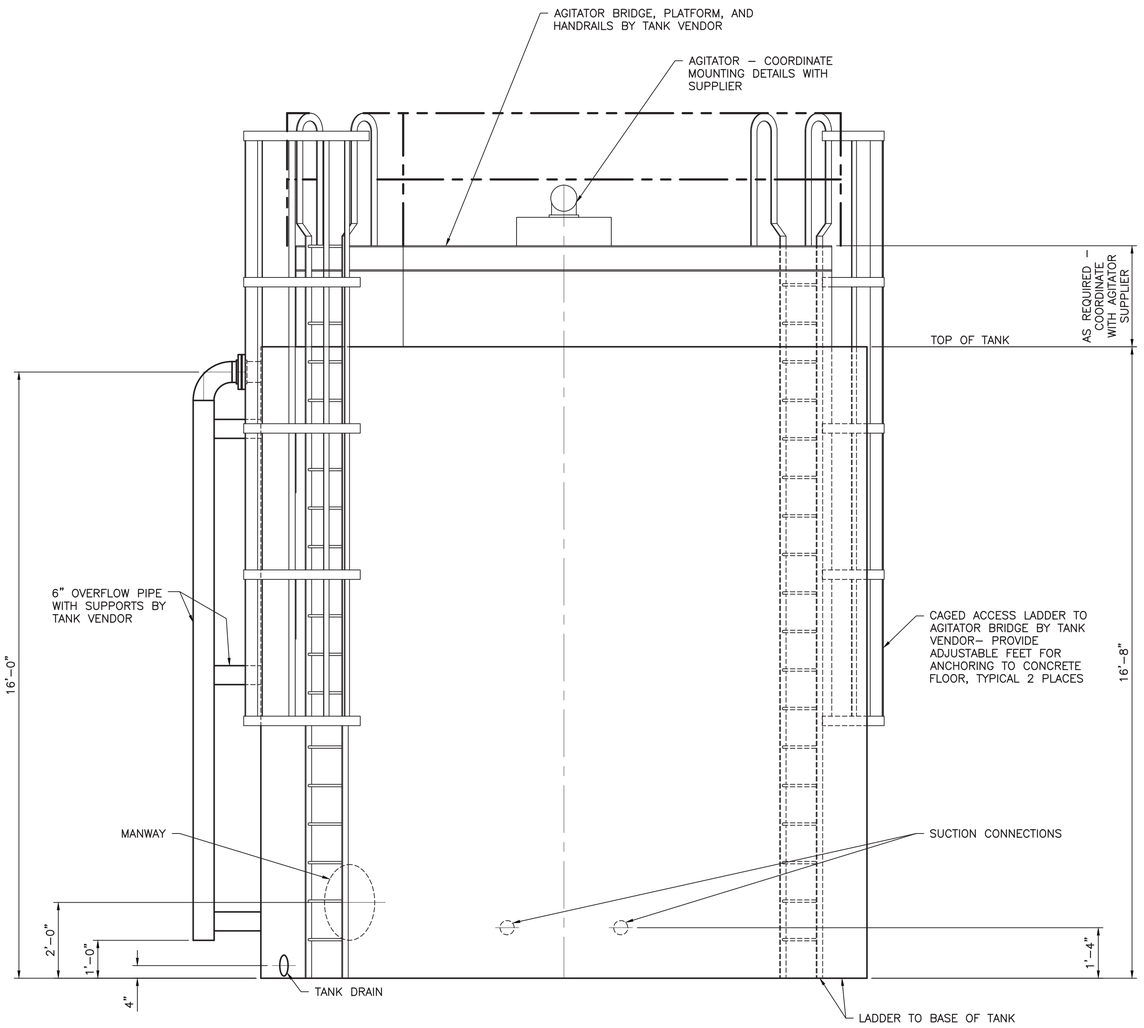


2

1 PLAN: ROD MILL DISCHARGE STORAGE TANK 300–TKO–30

300–GA–001, 300–GA–002 1/2"=1'–0"



2 SECTION: ROD MILL DISCHARGE STORAGE TANK 300–TKO–30

1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE TANK CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK INTERIOR, EXCLUDING INTERIOR OF NOZZLES AND MANWAY, SHALL BE RUBBER LINES WITH NATURAL GUM RUBBER 1/4" THICK, LINING SHALL BE INSTALLED, INSPECTED AND TESTED IN ACCORDANCE WITH LINING MANUFACTURER'S WRITTEN RECOMMENDATIONS.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL.
5. TANK VENDOR SHALL SUPPLY BLIND FLANGE, GASKETS, STUD BOLTS AND MANWAY DAVIT FOR MANWAY.
6. TANK TO BE FABRICATED AND LINED IN PLACE – SEE 300–GA–001.

THIS TANK IS IN THE PROCESS OF BEING REDESIGNED ENTIRELY.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	—	—	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	—	—
RELEASED TO/FOR	A	B	C	0	1	2	3
	DATE RELEASED						

BARR
Corporate Headquarters: Minneapolis, Minnesota
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www.barr.com

Scale	AS SHOWN
Date	3/10/17
Drawn	DAK
Checked	PGJ
Designed	AMB
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

ROD MILL DISCHARGE
STORAGE TANK DETAILS

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 300–MC–006
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\C023903F-9178-45DC-9B8E-033239636AA1\AAAC6A8-31F0-40B4-94CF-E94D447A6F96\06461100100_300-MC-006.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 3:53 PM
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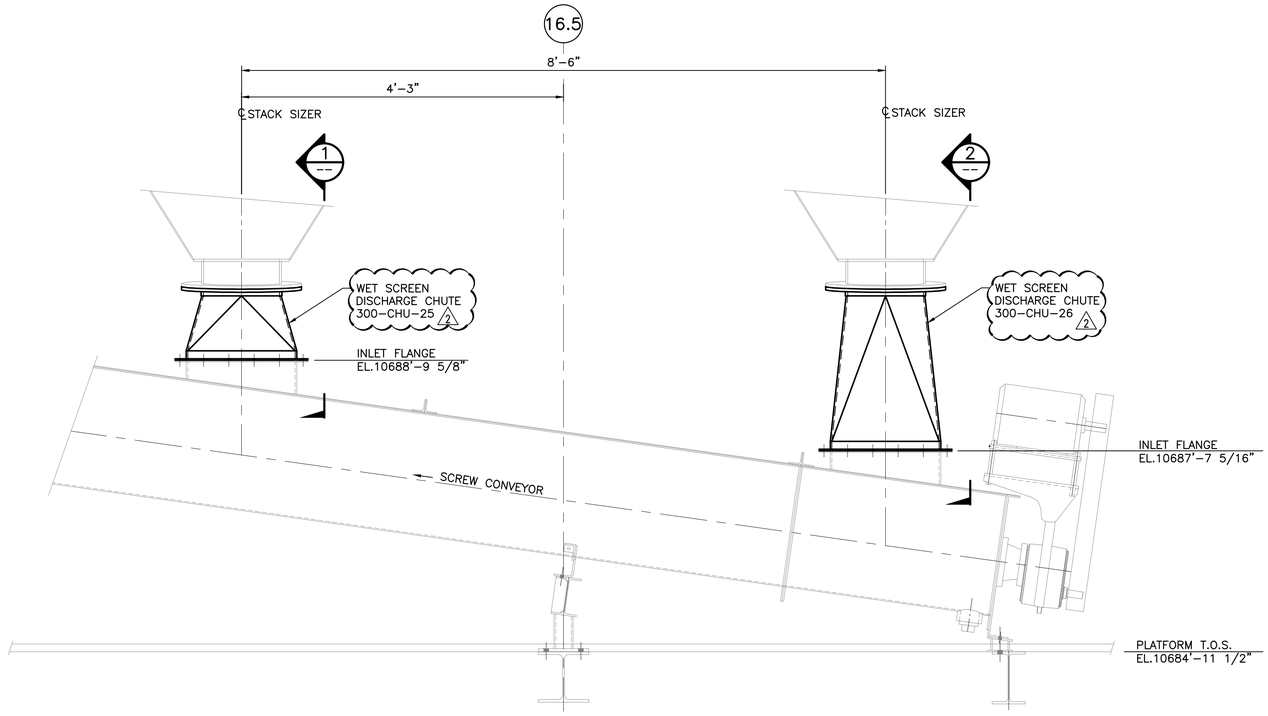
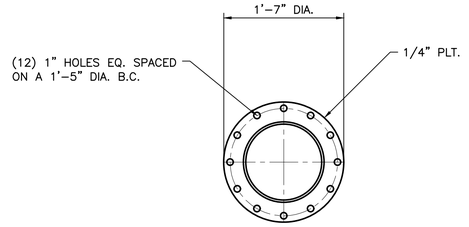
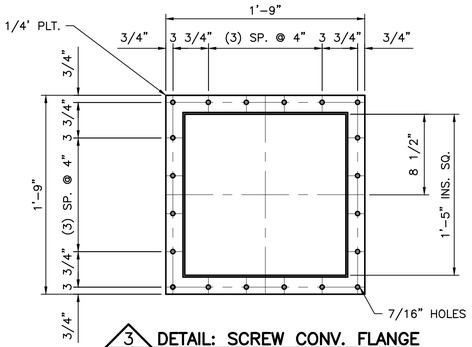


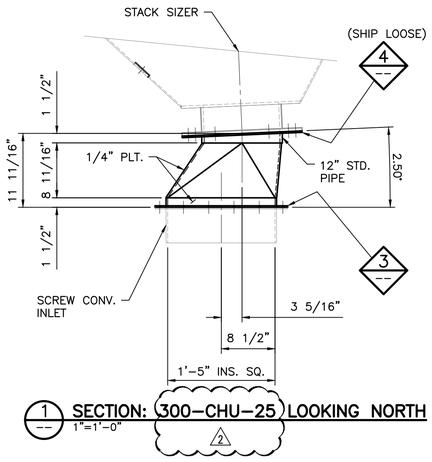
ELEVATION: LOOKING EAST

4 DETAIL: STACK SIZER FLANGE
1" =1'-0"
(2) REQ'D. (SHIP LOOSE)

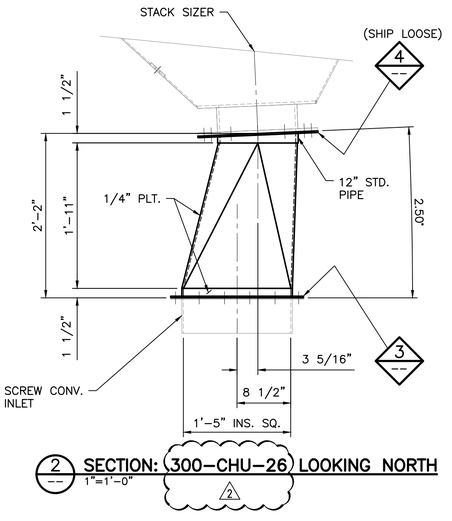




3 DETAIL: SCREW CONV. FLANGE
1 1/2" =1'-0"
(2) REQ'D.



1 SECTION: 300-CHU-25 LOOKING NORTH
1"=1'-0"
⚠2



2 SECTION: 300-CHU-26 LOOKING NORTH
1"=1'-0"
⚠2

2 DETAIL: STACK SIZER DISCHARGE CHUTES
300-GA-13
300-GA-16
300-GA-21
1"=1'-0"
(1) OF EACH REQ'D.

NOTES:

1. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" THICK PLATE. OTHER SIZES AS NOTED.
2. INTERIOR OF CHUTE SHALL 1/4" NATURAL GUM RUBBER LINER.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠1 COMPLETELY REDESIGNED

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052074 CERTIFICATE NOT VALID UNLESS DIGITALLY SIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	DSM	DSM	3/31/21	ADDED CHUTE LABELS
1	BMC	JAK3	DSM	11/19/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/27/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	10/27/20	11/19/20	3/31/21
BID				4/28/17			
CONSTRUCTION				4/28/17		11/19/20	3/31/21

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office:
BARR ENGINEERING CO.
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www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGNINUS MINE

PLATEWORK
WET SCREEN DISCHARGE CHUTE

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MC-008
REV. No. 2

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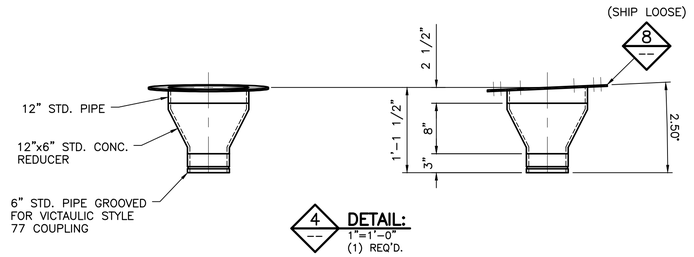
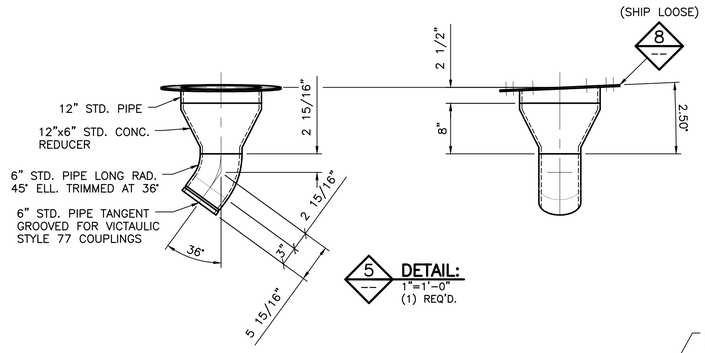
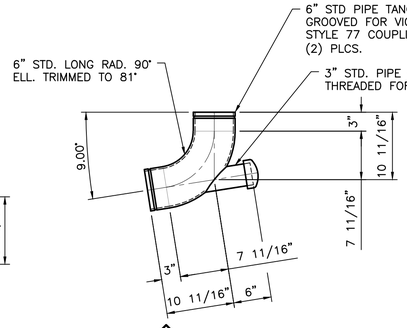


4 DETAIL:
1"=1'-0"
(1) REQ'D.

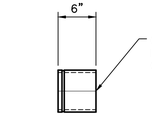


5 DETAIL:
1"=1'-0"
(1) REQ'D.

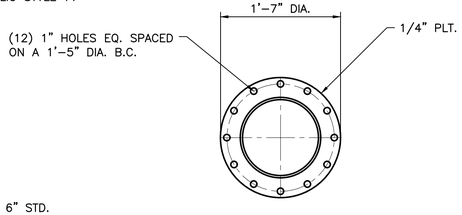
7 DETAIL:
1"=1'-0"
(1) REQ'D.



6 DETAIL:
1"=1'-0"
(1) REQ'D.



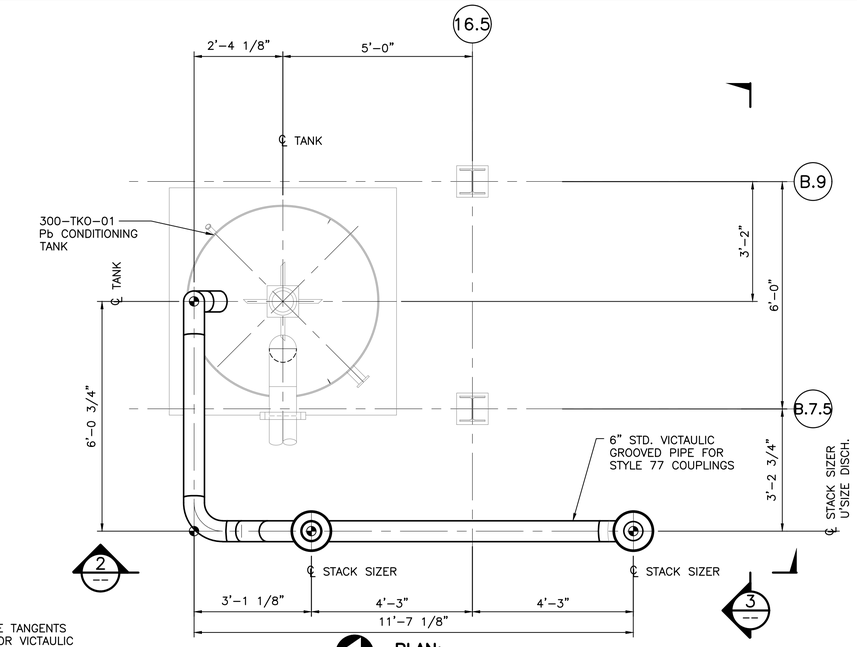
9 DETAIL:
1"=1'-0"
(1) REQ'D.



8 DETAIL: STACK SIZER FLANGE
1"=1'-0"
(2) PLACES

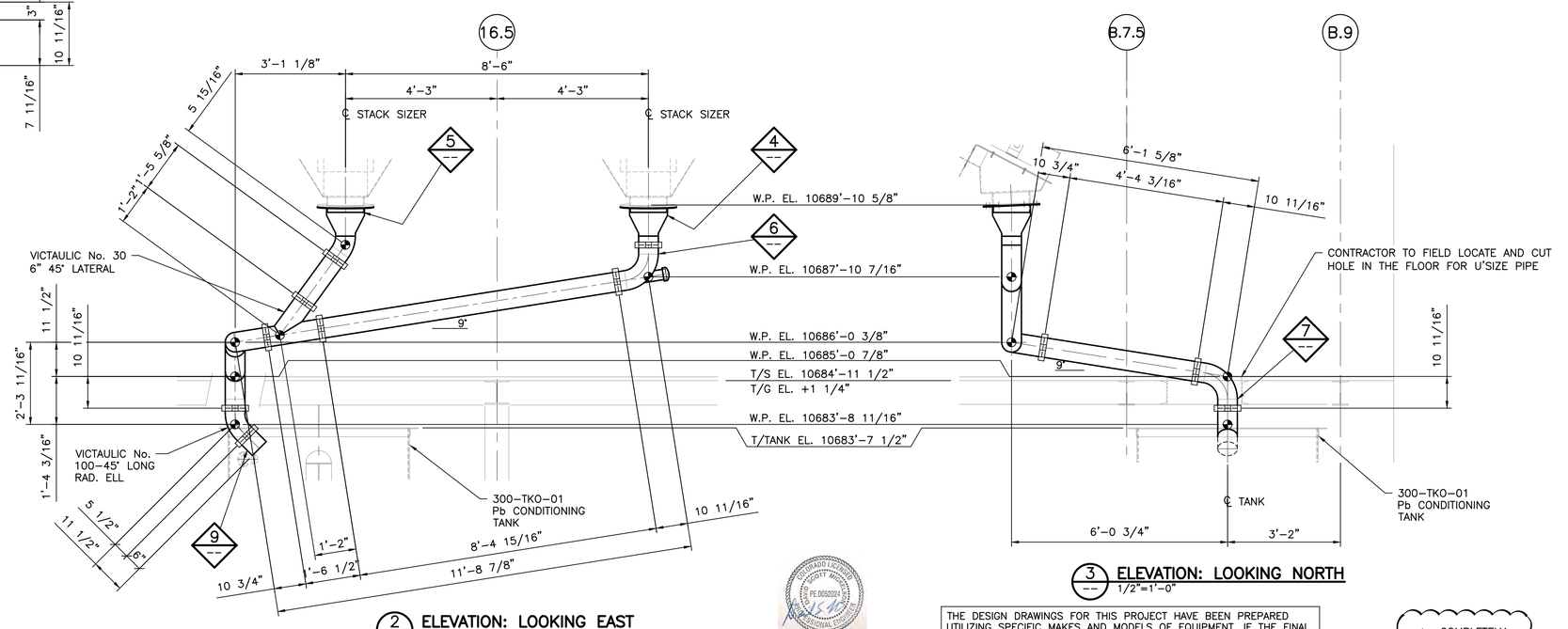
NOTES:

1. LAUNDER CONSTRUCTION SHALL BE 6" STD. VICTAULIC GROOVED PIPE. OTHER SIZES AS NOTED.
2. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL PIPE SUPPORTS AS REQUIRED.
3. ALL PIPING AND FITTINGS SHALL BE VICTAULIC GROOVED LONG RADIUS STEEL ELBOWS STANDARD WALL WITH 1/4" RUBBER LINING (U.N.O.).



2 PLAN:

1 DETAIL: WET SCREEN UNDERSIZE LAUNDER
300-GA-017
300-GA-021
1/2"=1'-0"
(1) REQ'D.



2 ELEVATION: LOOKING EAST
1/2"=1'-0"

3 ELEVATION: LOOKING NORTH
1/2"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/19/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	12/27/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	10/27/20	11/19/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/19/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

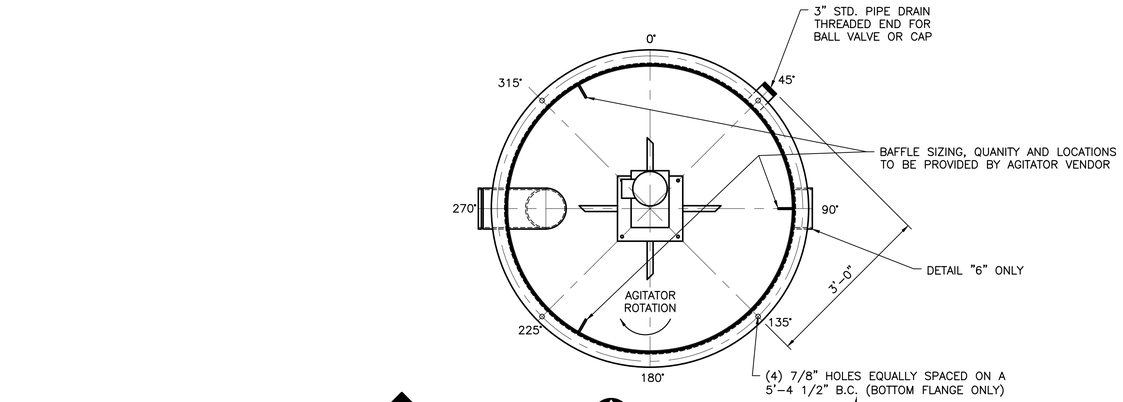
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGNINUS MINE

PLATEWORK
WET SCREEN UNDERSIZE LAUNDER

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MC-009
REV. No. 1

CADD USER: Hbpreuser FILE: \\HB-PW\HB_PW_MV\FAD3FC3F-79B0-4BEA-A3FE-586C6FC443AA\B8B8B6F6-BDFD-40B4-818B-3220FE636A9A\06461001O4_300-MC-009.DWG PLOT BY: BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50 PLOT DATE: 11/18/2020 11:30 AM PLOT SCALE: 1:1

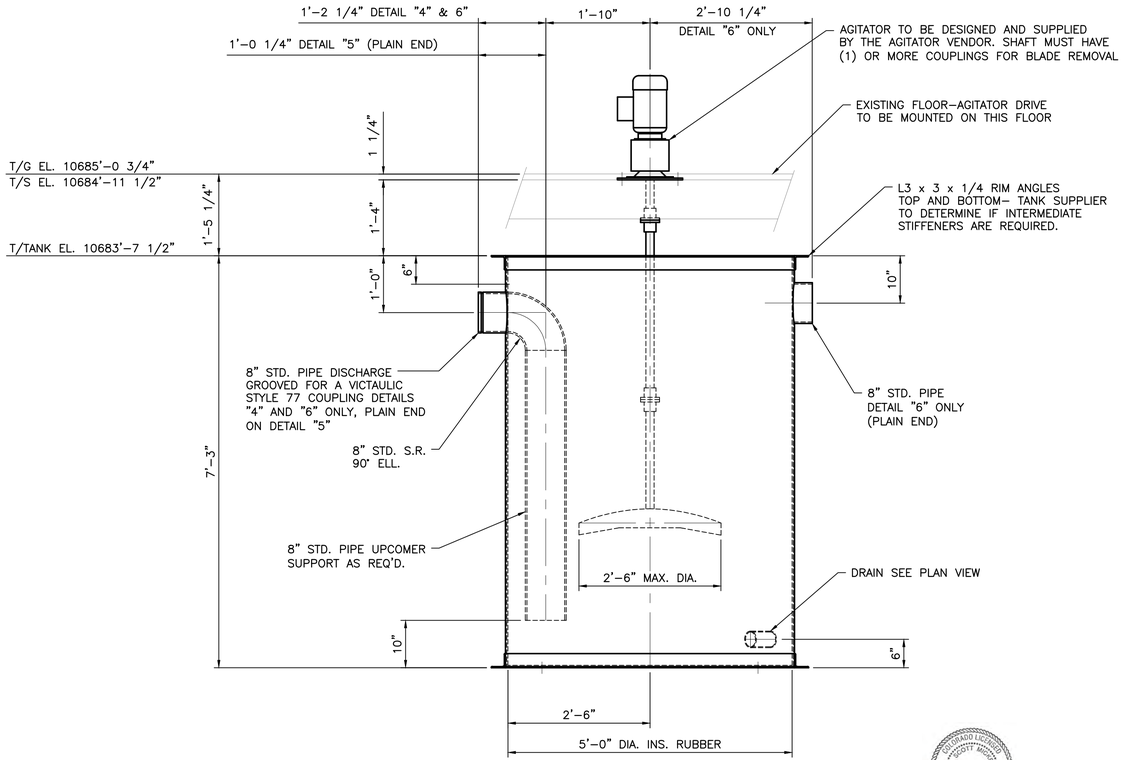


1 — PLAN:

4 5 6 — 300-GA-010, 300-GA-016, 300-GA-017, 300-GA-021

DETAIL: CONDITIONING TANK

3/4"=1'-0"
(3) SIMILAR REQ'D.
DETAIL "4": Pb CONDITIONING TANK (TAG: 300-TKO-01)
DETAIL "5": Zn CONDITIONING TANK #1 (TAG: 300-TKO-02)
DETAIL "6": Zn CONDITIONING TANK #2 (TAG: 300-TKO-03)



1 — ELEVATION: CONDITIONING TANK—LOOKING NORTH
3/4"=1'-0"
INTERNAL BAFFLES NOT SHOWN FOR CLARITY

NOTES:

1. GROUNDING LUGS BY TANK SUPPLIER (2) REQUIRED 180° APART.
2. TANK INTERIOR, EXCLUDING INTERIOR OF NOZZLES SHALL BE RUBBER LINED WITH 1/4" THK. NATURAL GUM RUBBER. LINING SHALL BE INSTALLED, INSPECTED AND TESTED IN ACCORDANCE WITH LINING MANUFACTURER'S WRITTEN RECOMMENDATIONS.
3. AGITATOR TO BE SUPPORTED FROM EXISTING STRUCTURAL STEEL FLOOR.
4. CONTRACTOR TO DETERMINE WHICH TANKS MUST BE FABRICATED AND LINED IN PLACE DUE TO ACCESS LIMITATIONS.

TANK DIAMETERS BASED ON 1/4" SKIN PLATE:
TANK SUPPLIER TO DETERMINE IF 1/4" THK. SKIN PLATE IS ADEQUATE.
INSIDE RUBBER LINING DIAMETER = 5'-0"
INSIDE SKIN PLATE DIAMETER = 5'-0 1/2"
OUTSIDE SKIN PLATE DIAMETER = 5'-1"
OUTSIDE FLANGE DIAMETER = 5'-7"
BOLT CIRCLE DIAMETER = 5'-4 1/2"

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 — Nov. 19, 2020

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/19/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/27/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT	—	—	—	4/28/17	10/27/20	11/19/20	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	11/19/20	—
DATE RELEASED							

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Scale	AS SHOWN
Date	1/25/17
Drawn	DTJ/SSW
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
CONDITIONING TANKS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. —
DWG. No. 300-MC-011
REV. No. 1

CADD USER: Hbpwauser FILE: \\HB-PW\HB_PW_IN\FA03FC3F-7B60-48EA-A3FE-586C6FC443AA\$B440C99-5FDD-4000-B61F-BB71BCBD42E9\0646100104_300-MC-011.DWG PLOT SCALE: 1:1 PLOT DATE: 11/18/2020 11:30 AM
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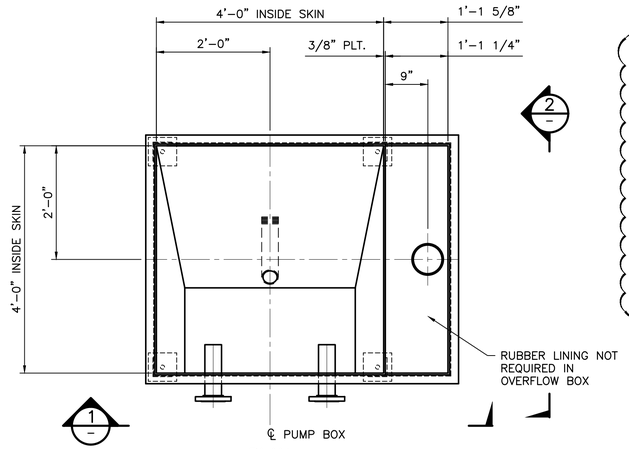

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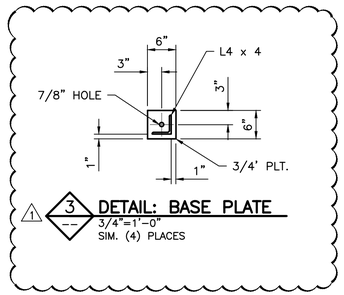
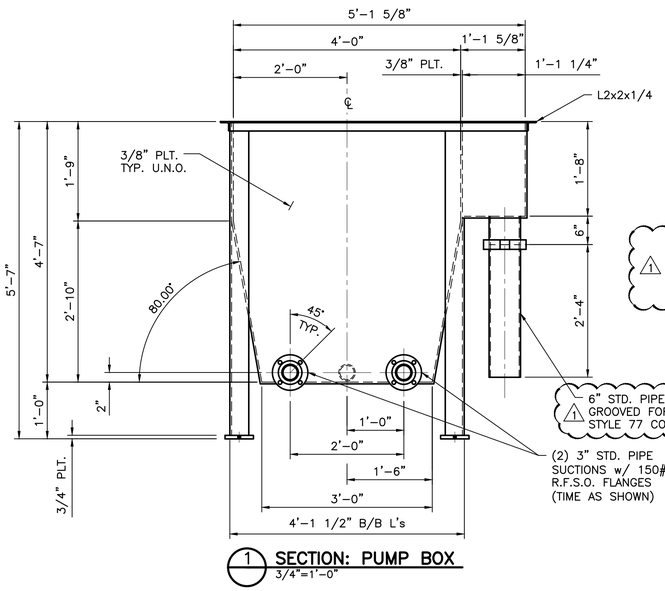
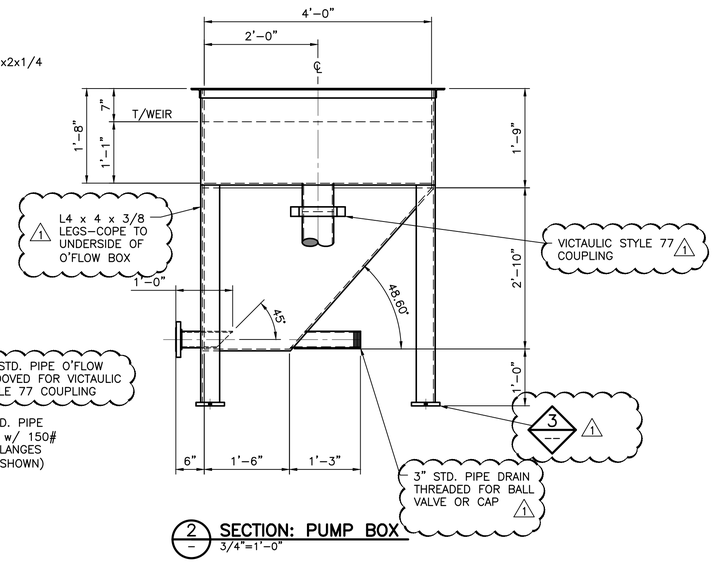


3 DETAIL: BASE PLATE
3/4"=1'-0"
SIM. (4) PLACES

7 DETAIL: PUMP BOX
3/4"=1'-0"
300-GA-010
300-GA-016
300-GA-017
300-GA-009
(2) REQ'D.– (1) Pb ROUGHER FLOTATION FEED PIMP BOX (TAG: 300-PBB-02)
– (1) Zn ROUGHER FLOTATION FEED PUMP BOX (TAG: 300-PBB-03)



1 SECTION: PUMP BOX
3/4"=1'-0"



2 SECTION: PUMP BOX
3/4"=1'-0"

NOTE:

1. DIMENSIONS ARE TO INSIDE OF STEEL UNLESS OTHERWISE NOTED.
2. PUMP BOX INTERIOR SHALL BE RUBBER LINED WITH 1/4" THK. NATURAL GUM RUBBER (UNLESS NOTED).

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/19/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	10/27/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17	10/27/20	11/19/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/19/20	
RELEASED TO/FOR	A	B	C	0	0.A	1	2
DATE RELEASED							

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Scale	AS SHOWN
Date	1/26/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
PUMP BOXES – 300-PBB-02 & 03

BARR PROJECT No.	06/46-1001.04
CLIENT PROJECT No.	–
DWG. No.	300-MC-012
REV. No.	1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\{A03FC3F-7B60-48EA-A3FE-586C6FC443AA\CAE80865-C2AB-42B4-96CD-0CD5E2E9BC99\0646100104_300-MC-012.DWG PLOT SCALE: 1:1 PLOT DATE: 11/18/2020 11:30 AM
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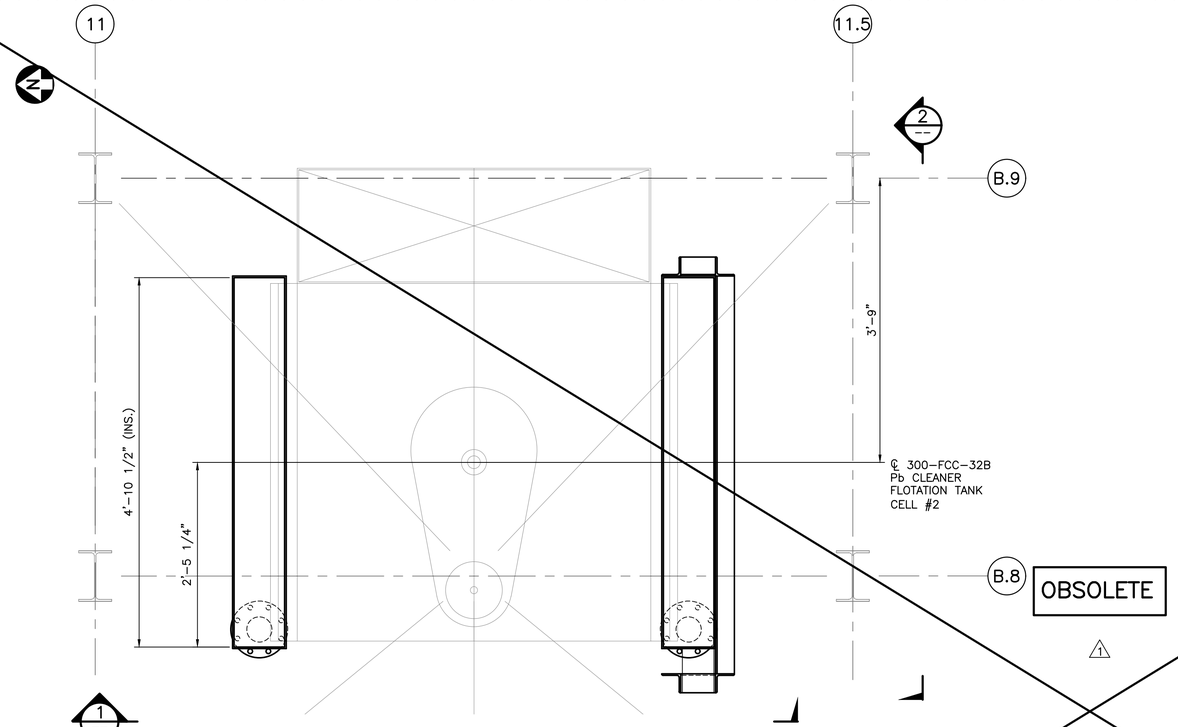
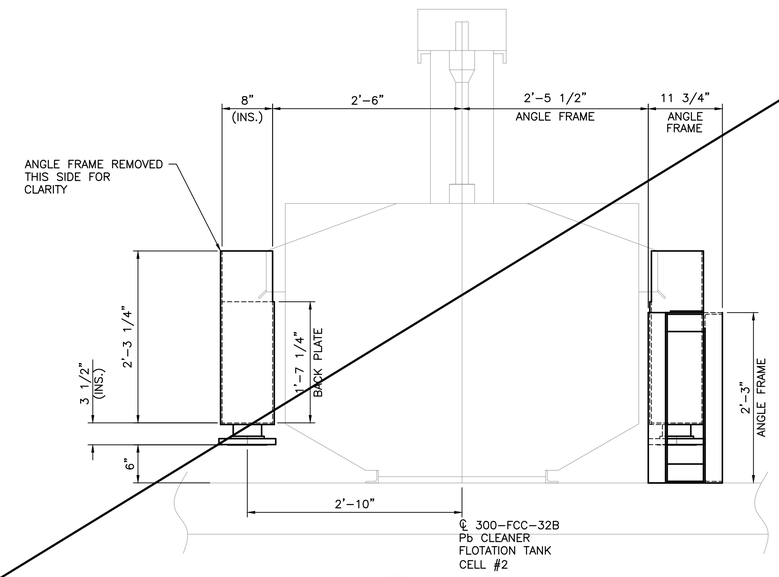
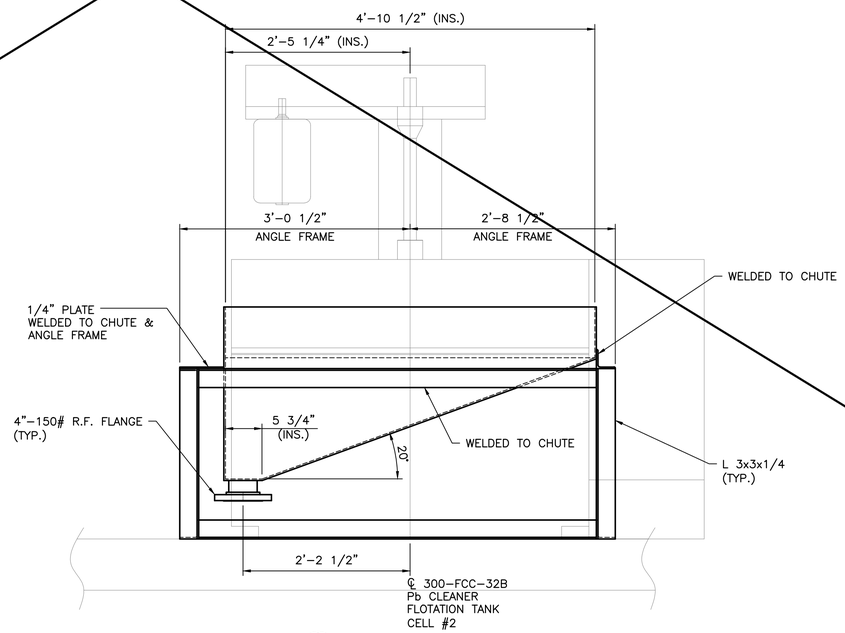


9 DETAIL: Pb CLEANER FLOTATION COLLECTION BOXES
300-GA-014
300-GA-019
1"=1'-0"



1 SECTION:
1"=1'-0" (LOOKING EAST)



2 SECTION:
1"=1'-0" (LOOKING NORTH)

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

NOTES:

1. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" THICK PLATE. OTHER SIZES AS NOTED.
2. INTERIOR OF CHUTE SHALL BE RUBBER LINED WITH 1/4" NATURAL GUM RUBBER.
3. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.

NOT FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DTJ	DSM	DSM	3/31/21	OBSOLETE
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION

A	B	C	0	1	2	3
			4/28/17	3/31/21		
			4/28/17			
			4/28/17			

DATE RELEASED

BARR
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Scale	AS SHOWN
Date	4/6/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGNINUS MINE

PLATEWORK
Pb CLEANER FLOTATION COLLECTION BOXES

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MC-013
REV. No. 1

CADD USER: Hbpreuser FILE: \\HIB-PW\HIB_PW_N\2873\3503-0600-4E8A-A35A-9FDF16478B3D\07BD468E-EBB2-4435-A0B8-42C351CCF2A0\0646100104_300-MC-013.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 4:37 PM
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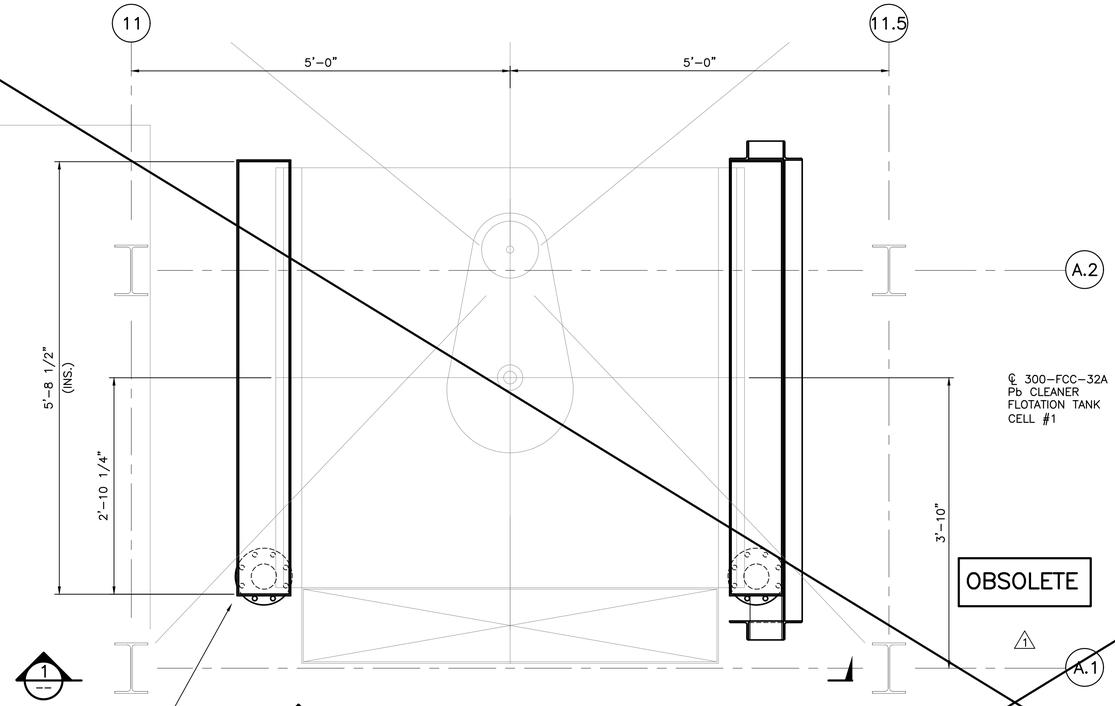
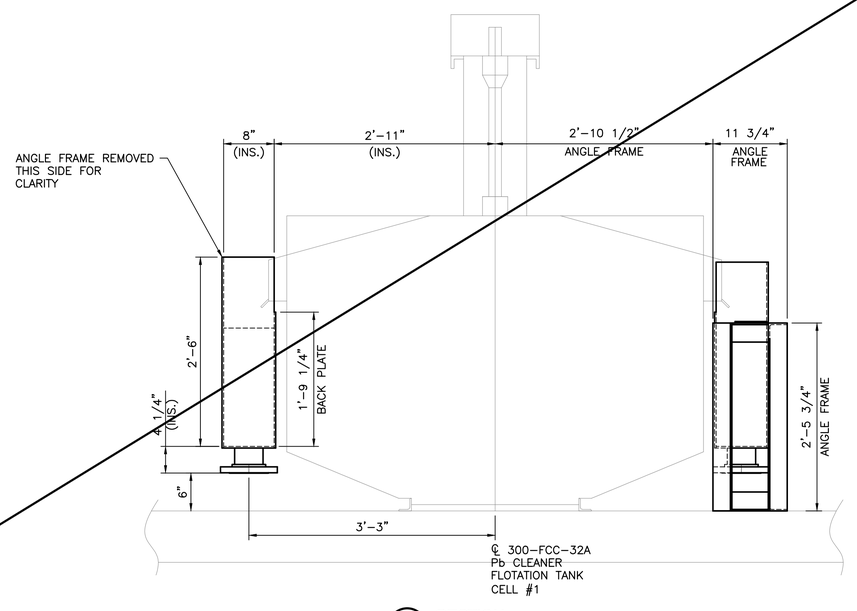
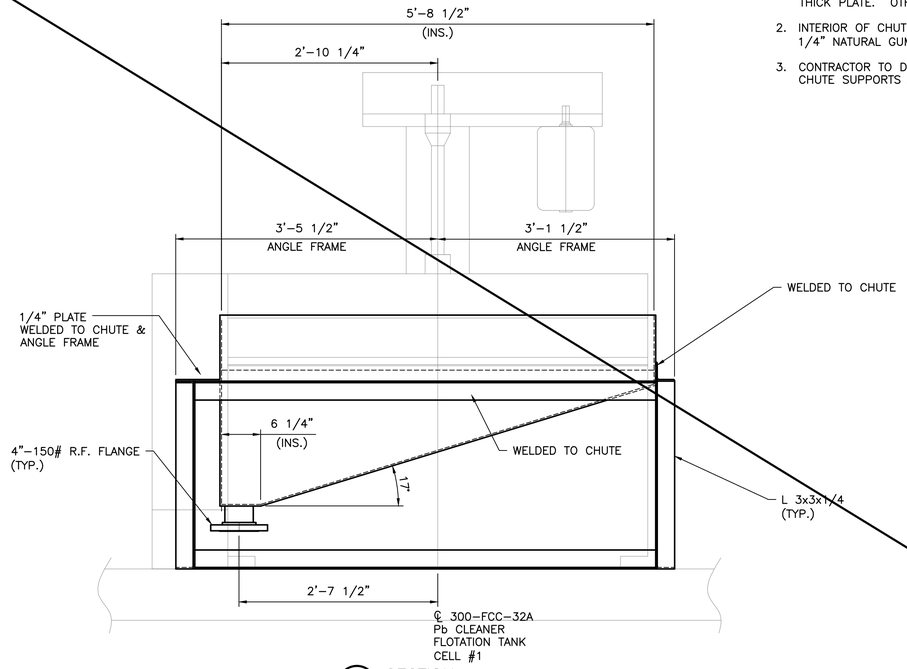


10 **DETAIL: Pb CLEANER FLOTATION COLLECTION BOXES**
300-GA-014
300-GA-018
1"=1'-0"



1 **SECTION:** 1"=1'-0" (LOOKING EAST)



2 **SECTION:** 1"=1'-0" (LOOKING NORTH)

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

NOTES:

1. CHUTE CONSTRUCTION SHALL BE ASTM A36 1/4" THICK PLATE. OTHER SIZES AS NOTED.
2. INTERIOR OF CHUTE SHALL BE RUBBER LINED WITH 1/4" NATURAL GUM RUBBER.
3. CONTRACTOR TO DESIGN, FABRICATE, AND INSTALL CHUTE SUPPORTS AS REQUIRED.

NOT FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DTJ	DSM	DSM	3/31/21	OBSOLETE
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — BID — CONSTRUCTION

A	B	C	0	1	2	3
			4/28/17	3/31/21		
			4/28/17			
			4/28/17			

DATE RELEASED

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www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGNINUS MINE

PLATEWORK
Pb CLEANER FLOTATION COLLECTION BOXES

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MC-014
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB-PW\HIB_PW_IN\287A3503-0600-4E8A-A35A-9FDF16478B3D\0DEBF329-01F4-41CC-BB85-7655F43458A4\0646100104_300-MC-014.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 4:37 PM
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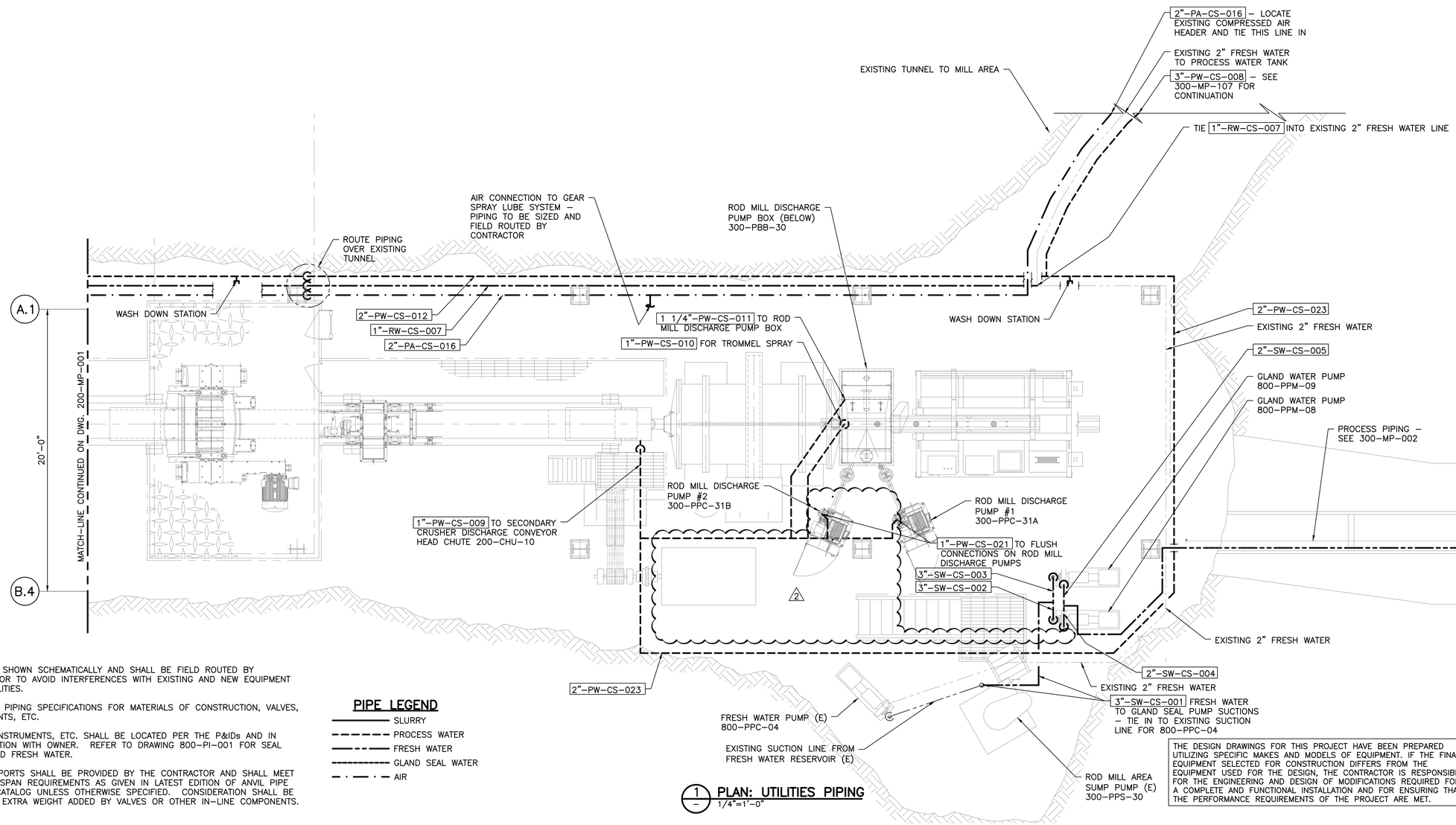

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER. REFER TO DRAWING 800–PI–001 FOR SEAL WATER AND FRESH WATER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

PIPE LEGEND

- SLURRY
- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

1 PLAN: UTILITIES PIPING
1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	DSM	DSM	3/31/21	REMOVE GLAND SEAL WATER ON ROD MILL DISCHARGE PUMPS
1	DAK	AMB3	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	12/2/2020	3/31/21	—	—
BID	—	—	—	4/28/17	—	—	—	—
CONSTRUCTION	—	—	—	4/28/17	12/2/2020	3/31/21	—	—
RELEASED TO/FOR	—	—	—	—	—	—	—	—
DATE RELEASED	A	B	C	0	1	2	3	

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www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	PGJ

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITIES
ROD MILL AREA

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–MP–001
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_IN\3A7595E9–91FC–4C9B–B607–E21693F13A93\87415EBC–813F–4820–A0AF–1FF17C4BB09C\V64610010 4_300–MP–001.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:36 PM
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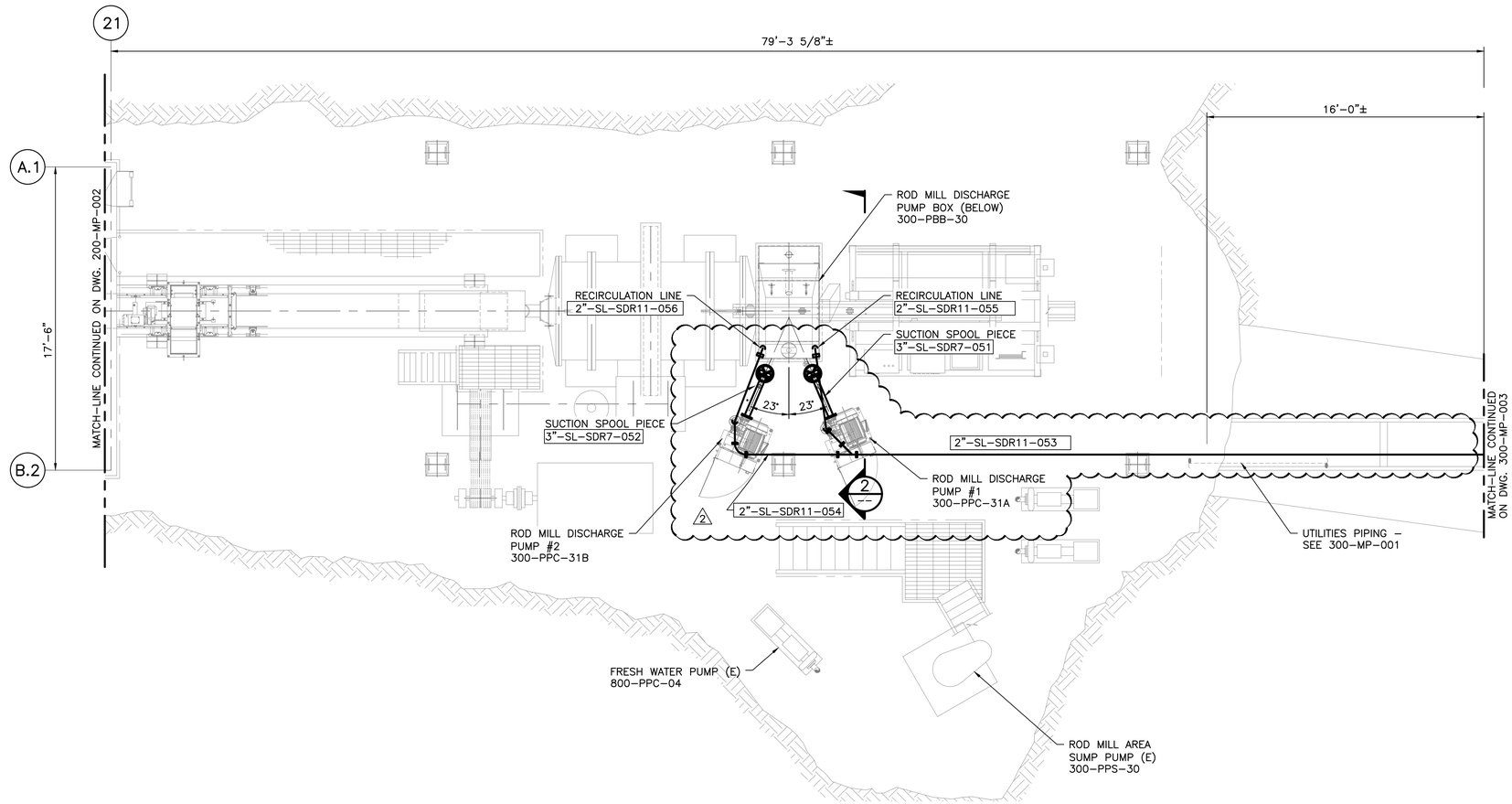
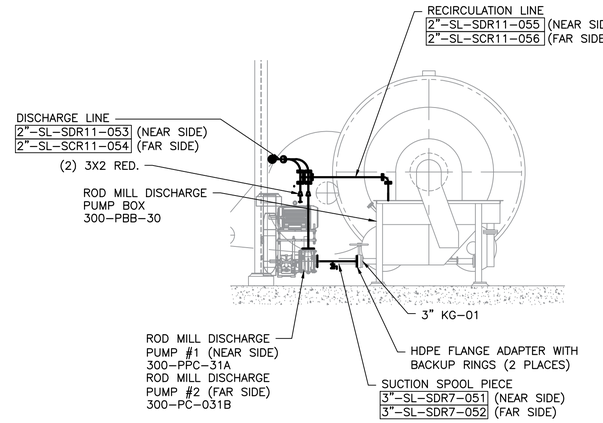


1 PLAN: PROCESS PIPING
1/4"=1'-0"



2 SECTION: PROCESS PIPING
1/4"=1'-0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN-LINE COMPONENTS.

PIPE LEGEND

- SLURRY
- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	DTJ	AMB3	DSM	3/31/21	REVISED PUMP LOCATIONS – ISSUED FOR CONSTRUCTION
1	DAK	AMB3	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — — — 4/28/17 12/2/20 3/31/21; BID — — — 4/28/17 — — —; CONSTRUCTION — — — 4/28/17 12/2/20 3/31/21

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/6/17
Drawn	DAK
Checked	AMB3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
ROD MILL AREA

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-MP-002
REV. No. 2

CADD USER: Hbpwuser FILE: \\hlb-PW\hlb_PW_IN\5A7595E9-91FC-4C9B-B607-E21693F13A93\853970E0-6911-4400-8887-0E1D1C7D893F\06461001.04_300-MP-002.DWG
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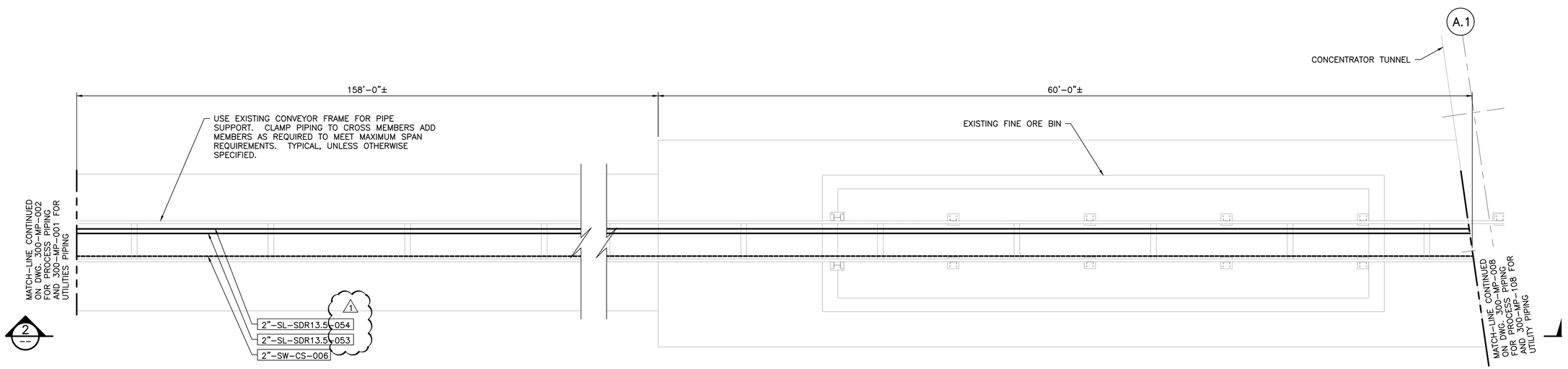
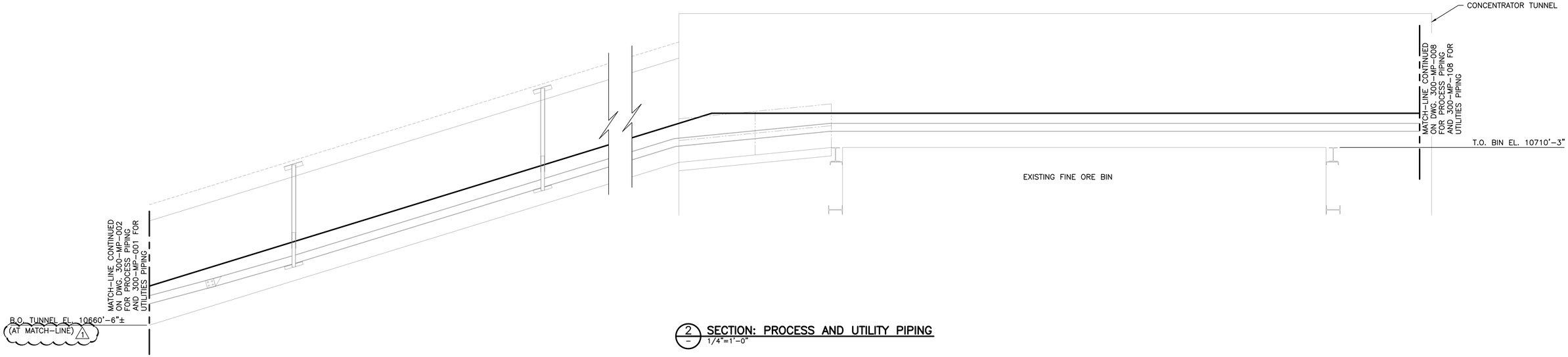


1 PLAN: PROCESS AND UTILITY PIPING
1/4"=1'-0"



2 SECTION: PROCESS AND UTILITY PIPING
1/4"=1'-0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PIPE LEGEND

- SLURRY
- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB	AMB	DSM	12/2/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17	12/2/20			
BID				4/28/17				
CONSTRUCTION				4/28/17	12/2/20			
RELEASED TO/FOR	A	B	C	0	1	2	3	
	DATE RELEASED							

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Scale	AS SHOWN
Date	4/6/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS AND UTILITIES
ROD MILL AREA

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-MP-003
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\BC607612-65AA-435B-BDD7-46A250319FD5\1B18BFC3-AAEE-4E9F-841B-F8BA5C5D8C85\06461001\04_300-MP-003.DWG PLOT BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	Flanges
1"	RW	CS	001	EXISTING 2" FRESH WATER LINE	DUST FOG SUPRESSION	190	4				3	
2"	PW	CS	012	3"-PW-CS-008	ROD MILL DISCHARGE STORAGE TANK	400	13	-	-	-	7	
1"	PW	CS	009	3"-PW-CS-008	ROD MILL FEED CHUTE	20	4	-	-	-	1	
1"	PW	CS	010	3"-PW-CS-008	ROD MILL DISCHARGE	25	4	-	-	-	1	
1-1/4"	PW	CS	011	3"-PW-CS-008	ROD MILL DISCHARGE PUMP BOX 300-PBB-30	30	6	-	-	-	1	
3"	PW	CS	008	EXISTING HEADER	ROD MILL AREA	300	3	-	-	-	1	
1"	PW	CS	013	2"-PW-CS-012	ROD MILL DISCHARGE TRANSFER PUMP 300-PPC-33A/B	40	6	-	-	-	1	
1"	PW	CS	021	3"-PW-CS-008	ROD MILL DISCHARGE PUMP 300-PPC-31A/B	50	6	-	-	-	1	
2"	PW	CS	023	3" PW-CS-008	ROD MILL AREA HEADER	160	6	-	-	-	3	
2"	PA	CS	016	EXISTING PLANT AIR HEADER IN CONCENTRATOR AREA	BALL MILL AREA	500	8	-	-	-	4	-
3"	SW	CS	001	FRESH WATER LINE FROM RESERVOIR	3"-SW-CS-001	120	5	-	-	-	1	
3"	SW	CS	002	3"-SW-CS-001	GLAND WATER PUMP #1 800-PPM-08	5	2	-	-	-		1
3"	SW	CS	003	3"-SW-CS-001	GLAND WATER PUMP #2 800-PPM-09	5	2	-	-	-		1
2"	SW	CS	004	800-PPM-08	2"-SW-CS-006	150	5	-	-	-	1	1
2"	SW	CS	005	800-PPM-09	2"-SW-CS-006	5	2	-	-	-		1
2"	SW	CS	006	3"-SW-CS-004/005	BALL MILL AREA	270	6	-	-	-	1	
2"	SW	CS	007	2"-SW-CS-006	3/4"-SW-CS-008/009	135	5	-	-	-	1	
3/4"	SW	CS	008	2"-SW-CS-007	ROD MILL DISCHARGE PUMP #1 300-PPC-31A	30	3	-	-	-	1	
3/4"	SW	CS	009	2"-SW-CS-007	ROD MILL DISCHARGE PUMP #1 300-PPC-31B	30	4	-	-	-		
3/4"	SW	CS	010	2"-SW-CS-006	2"-SW-CS-011/012	40	6	-	-	-	1	
3"	SL	SDR7	051	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	300-PPC-31A ROD MILL DISCHARGE PUMP #1	1	-	-	-	-	-	2
3"	SL	SDR7	052	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	300-PPC-31B ROD MILL DISCHARGE PUMP #2	1	-	-	-	-	-	2
2"	SL	SDR13.5	053	300-PPC-31A ROD MILL DISCHARGE PUMP #1	300-TKO-30 ROD MILL DISCHARGE STORAGE TANK	54	3	-	-	-	-	1
2"	SL	SDR13.5	054	300-PPC-31B ROD MILL DISCHARGE PUMP #2	300-TKO-30 ROD MILL DISCHARGE STORAGE TANK	51	3	-	-	-	-	1
3"	SL	SDR7	055	300-TKO-30 ROD MILL DISCHARGE STORAGE TANK	300-PPC-33A ROD MILL DISCHARGE TRANSFER PUMP #1	1	-	-	-	-	-	2
3"	SL	SDR7	056	300-TKO-30 ROD MILL DISCHARGE STORAGE TANK	300-PPC-33B ROD MILL DISCHARGE TRANSFER PUMP #2	1	-	-	-	-	-	2
2"	SL	SDR13.5	057	300-PPC-33A ROD MILL DISCHARGE TRANSFER PUMP #1	300-PBB-01 WET SCREEN FEED PUMP BOX	260	3	2	-	-	-	1
2"	SL	SDR13.5	058	300-PPC-33B ROD MILL DISCHARGE TRANSFER PUMP #2	300-PBB-01 WET SCREEN FEED PUMP BOX	260	3	2	-	-	-	1
2"	SL	HOSE	068	300-PPC-33A ROD MILL DISCHARGE TRANSFER PUMP #1	HDPE SLURRY PIPING IN TUNNEL (2"-SL-SDR13.5-057)	20	-	-	-	-	-	-
2"	SL	HOSE	069	300-PPC-33B ROD MILL DISCHARGE TRANSFER PUMP #2	HDPE SLURRY PIPING IN TUNNEL (2"-SL-SDR13.5-058)	20	-	-	-	-	-	-

⚠ THIS DRAWING AND CHART ARE OBSOLETE AND NOT REQUIRED FOR THIS 2020 REDESIGN

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠ OBSOLETE NOT REQUIRED FOR REDESIGN

ISSUED FOR CONSTRUCTION
OBOSOLETE NOT REQUIRED

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

	CLIENT	BID	CONSTRUCTION
	4/28/17 11/20/20	4/28/17	4/28/17 11/20/20

RELEASED TO/FOR: A B C 0 1 2 3 — DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Scale	AS SHOWN
Date	4/13/17
Drawn	DAK
Checked	JAK3
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No.	06/46-1001.00
CLIENT PROJECT No.	–
DWG. No.	300-MP-004
REV. No.	1

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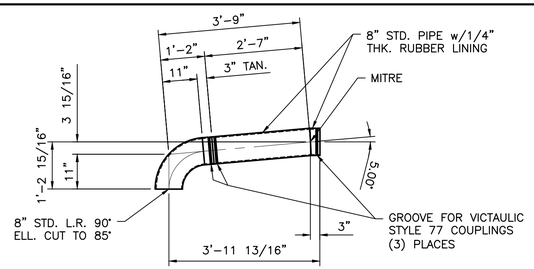
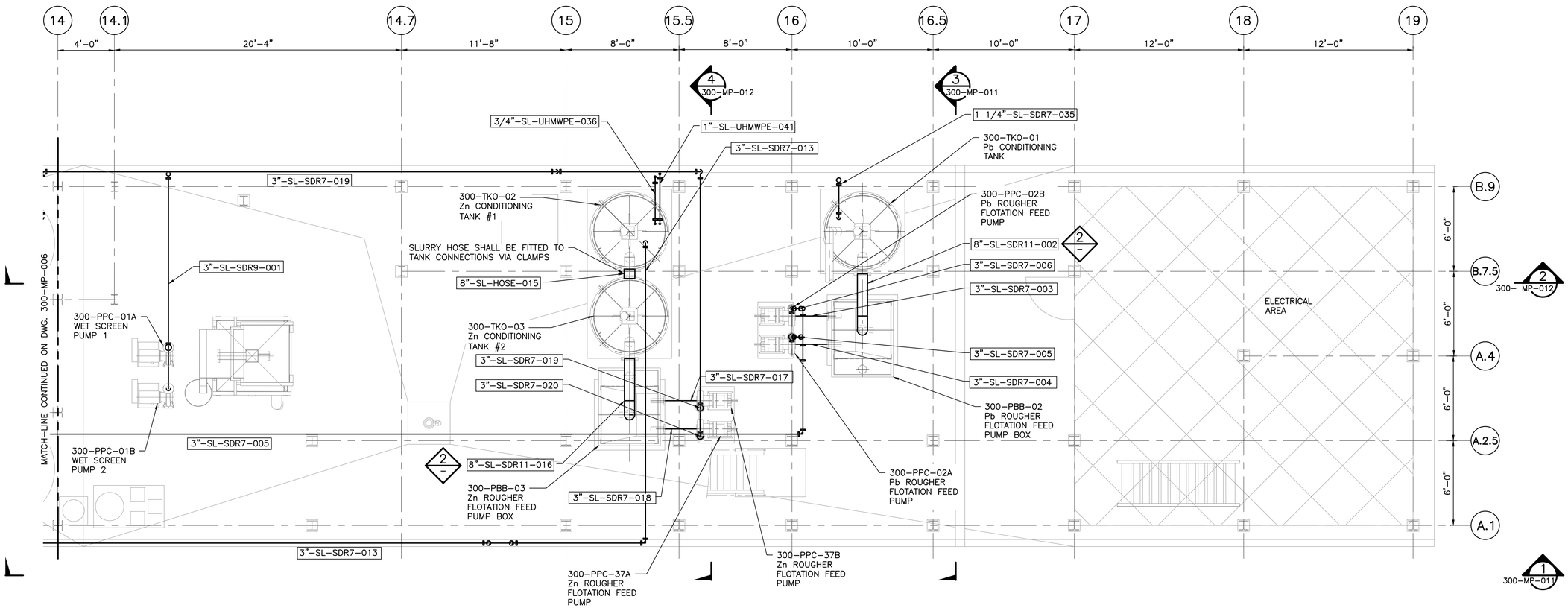


2 DETAIL: 8"-SL-SDR11-002 & 8"-SL-SDR11-016
300-MP-011 300-MP-012 1/2"=1'-0" LOOKING NORTH
(1) EA. REQ'D.: TAG AS SHOWN



1 PIPING: CONCENTRATOR GRADE FLOOR COLUMN LINE 14 TO 19
1/4"=1'-0"

NOTES

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1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

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CLIENT				4/28/17	11/06/20	11/20/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/20/27
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGNINUS MINE

PIPING - PROCESS
PLAN AT CONC. GRADE FLOOR PLAN COL. 14 TO 19

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. -
DWG. No. 300-MP-005
REV. No. 1

CADD USER: Hbpwuser FILE: \\HB-PW\HB_PW_IN\E5681B31-3653-4777-8D55-79A32BD89670\40DD7985-A0F4-41B9-8F90-FBBCA3532C9C\{86461001 04_300-MP-005.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:07 AM
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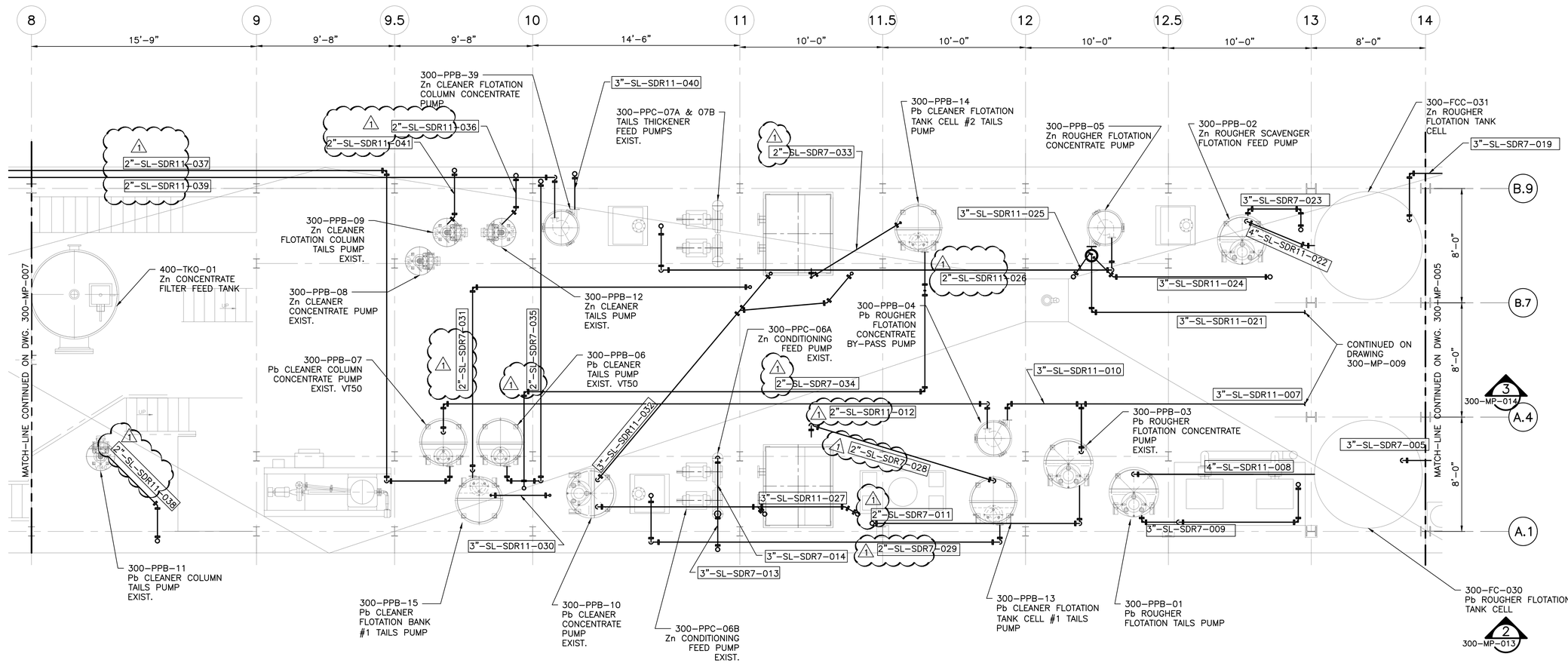

2 PIPING: CONCENTRATOR GRADE FLOOR COLUMN LINE 8 TO 14
2 / – 1/4"=1'–0"

NOTES

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COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 DAVID S. MILLER PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1–800–632–2277
Project Office: BARR ENGINEERING CO. 3128 14TH AVENUE EAST HIBBING, MN 55746 Ph: 1–800–225–1966 Fax: (218) 262–3460 www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT CONC. GRADE FLOOR PLAN COL. 8 TO 14

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–006
REV. No. 1

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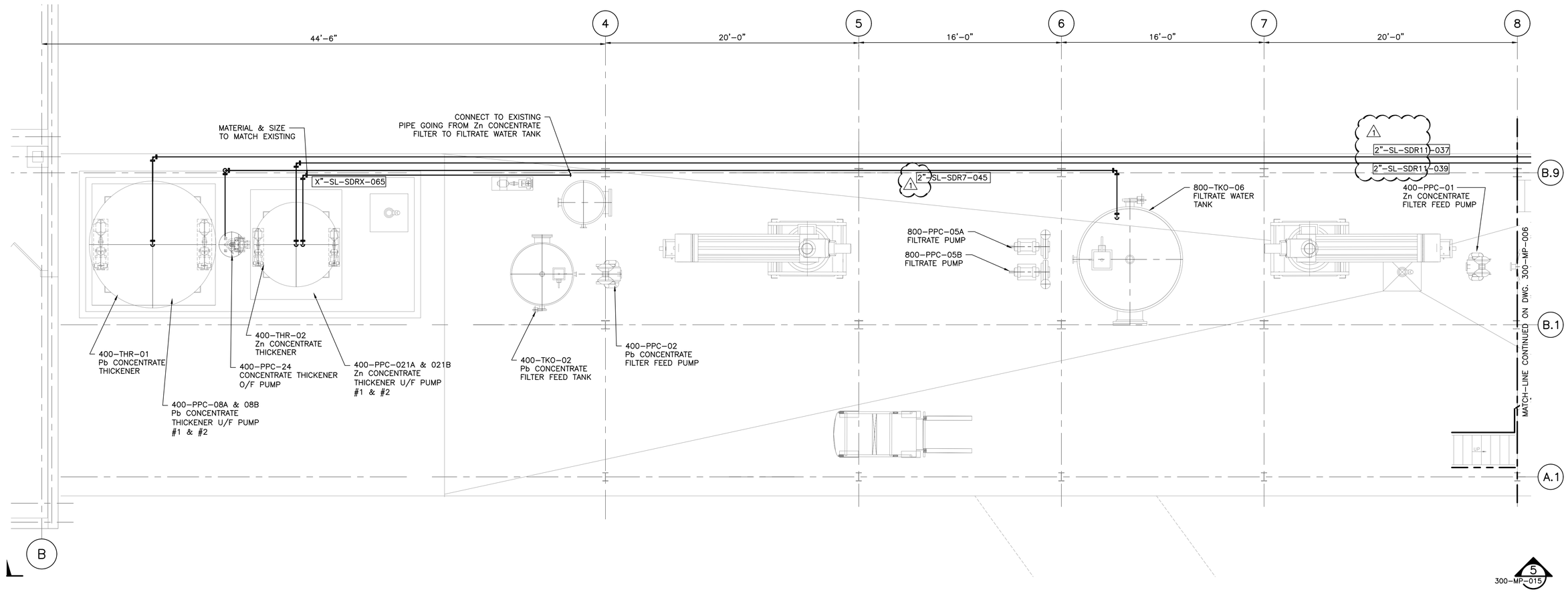

3 PIPING: CONCENTRATOR GRADE FLOOR COLUMN B TO 8
1/4"=1'-0"

NOTES

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ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		
RELEASED TO/FOR	DATE RELEASED						

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Fax: (218) 262-3460
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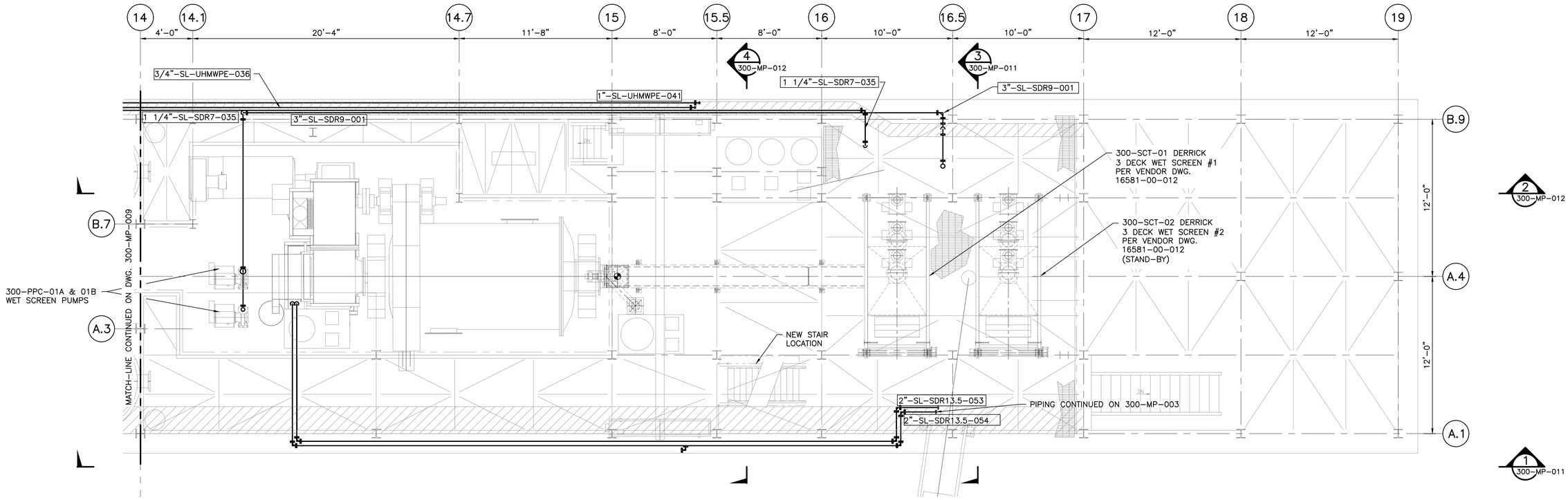
Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT CONC. GRADE FLOOR PLAN COL. B TO 8

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-007
REV. No. 1



4 PIPING: CONC. UPPER LEVEL PLAN COL. 14 TO 19

1/4"=1'-0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PE 0052024 — NOV 20, 2020

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠ COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28 11/06/20 11/20/20; BID — 4/24; CONSTRUCTION — 4/28 11/20/20

DATE RELEASED: A B C 0 0.A 1 2

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT CONC. UPPER LEVEL PLAN COL. 14 TO 19

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-008
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB-PW\HIB_PW_JN\E5681B31-3653-47F7-8055-79A32B0B9670\71142CC-F62E-4EA5-A45B-CCB734E12B1\06461001\04_300-MP-008.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:07 AM
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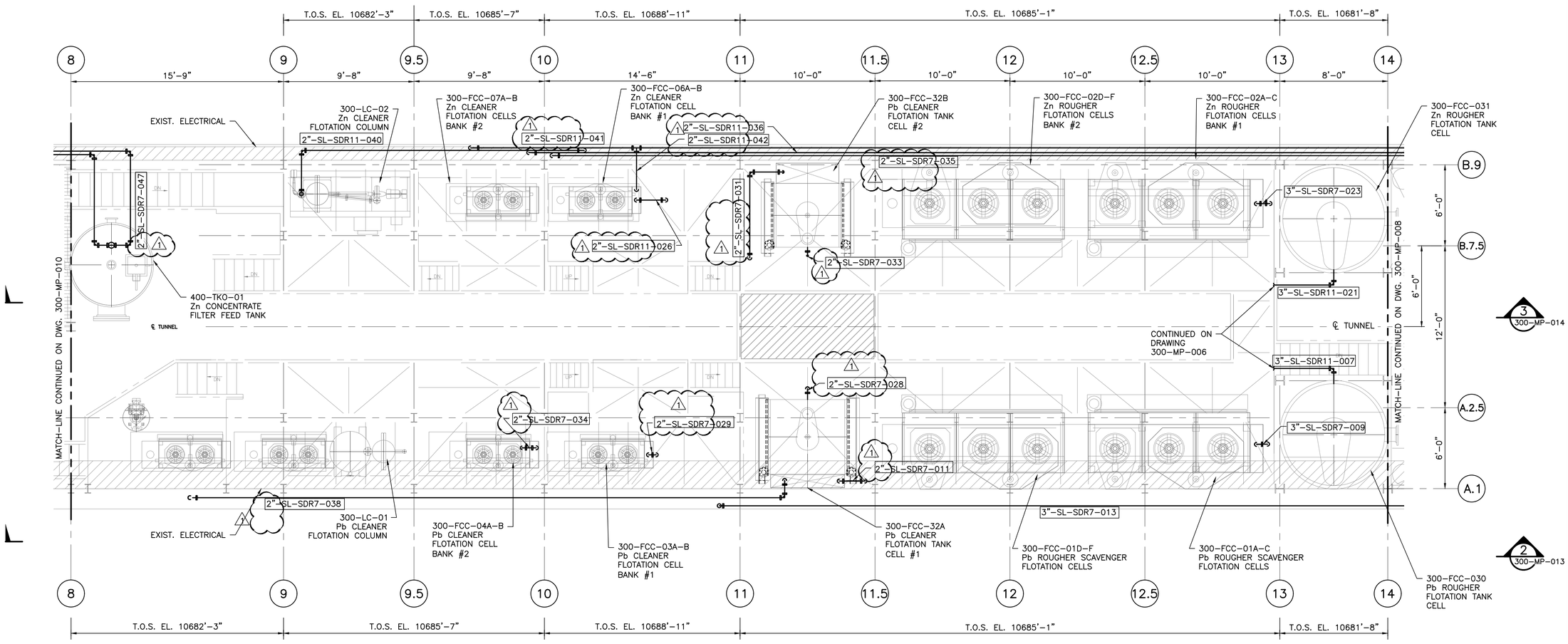

(5) PIPING: CONCENTRATOR UPPER LEVEL COLUMN 8 TO 14
1/4"=1'-0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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COLORADO LICENSED SCOTT BROWN PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1-800-225-1966
Fax: (218) 262-3460
www.barr.com

Scale	AS SHOWN
Date	3/21/17
Drawn	DTJ
Checked	PDJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT CONC. UPPER LEVEL PLAN COL. 8 TO 14

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-009
REV. No. 1

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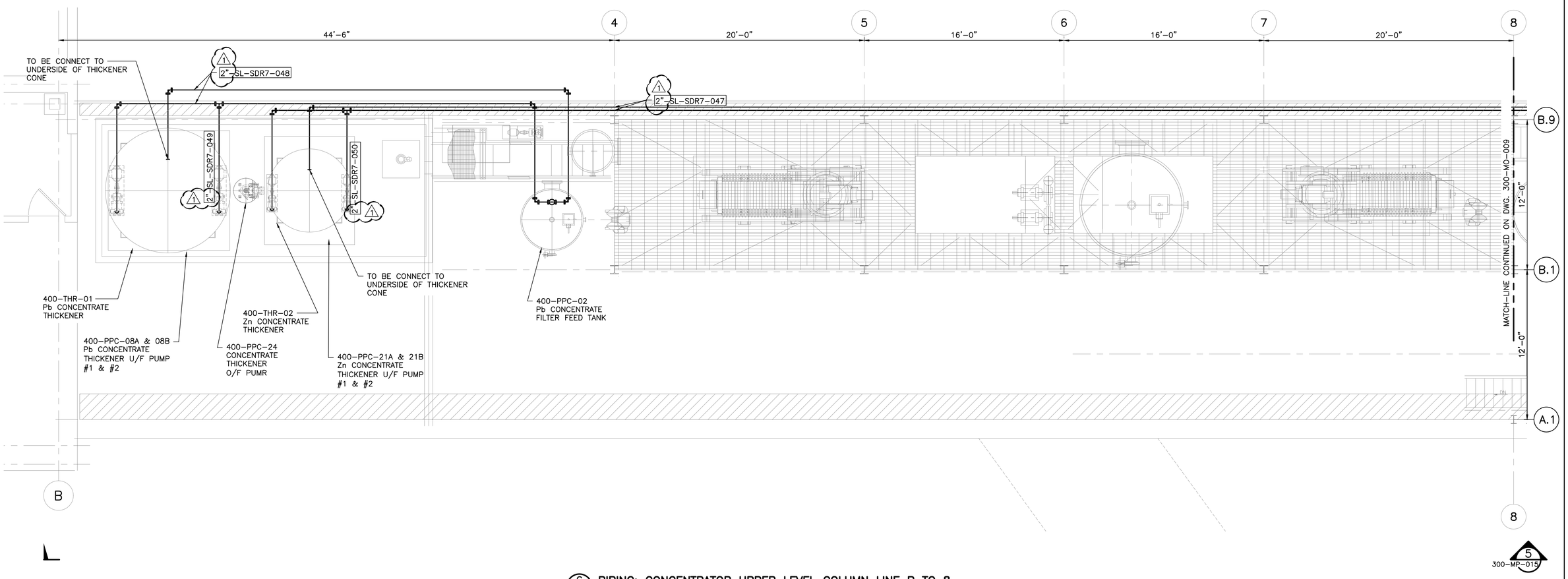

6 PIPING: CONCENTRATOR UPPER LEVEL COLUMN LINE B TO 8
1/4"=1'-0"

NOTES

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		

DATE RELEASED

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www.barr.com

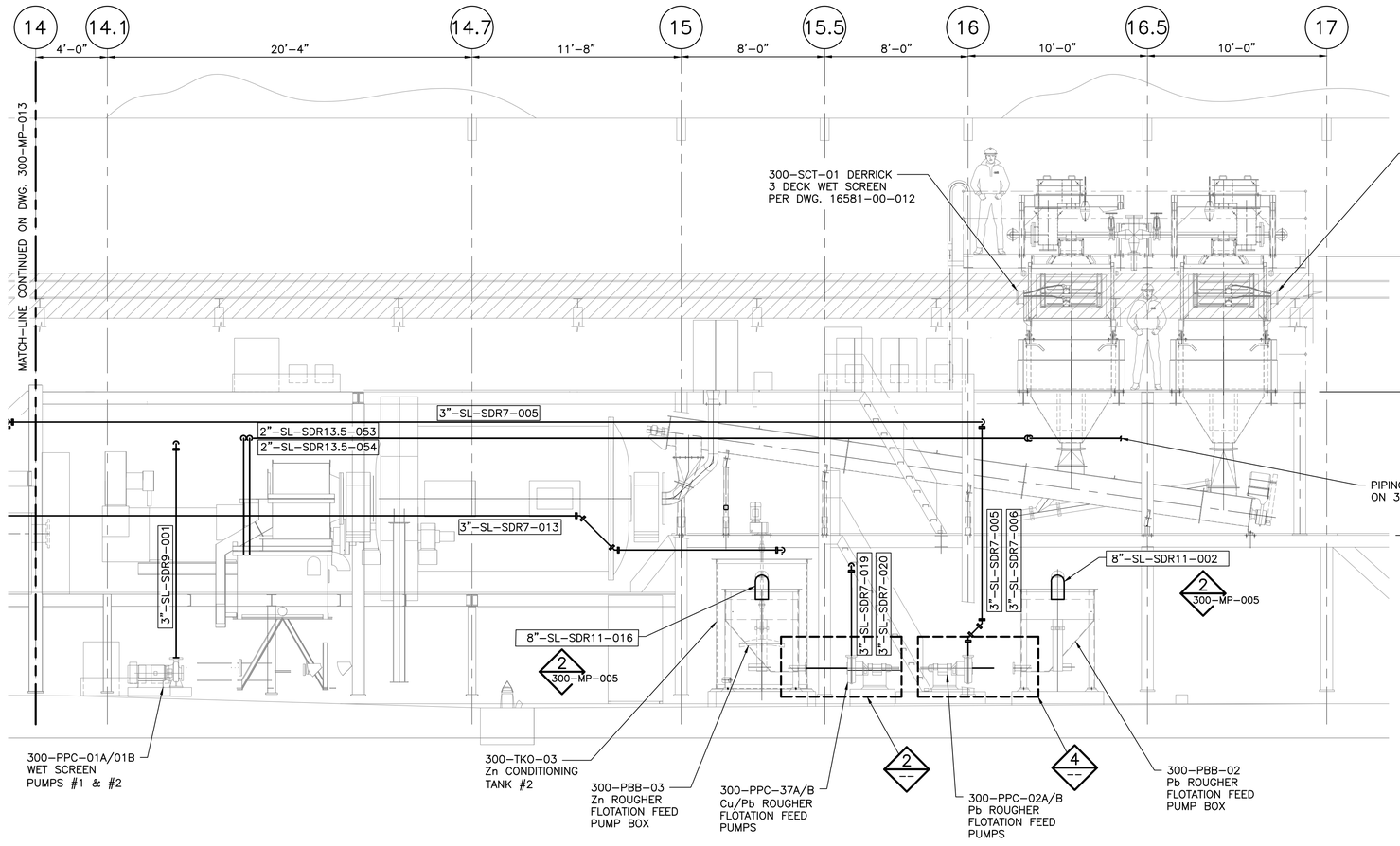
Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

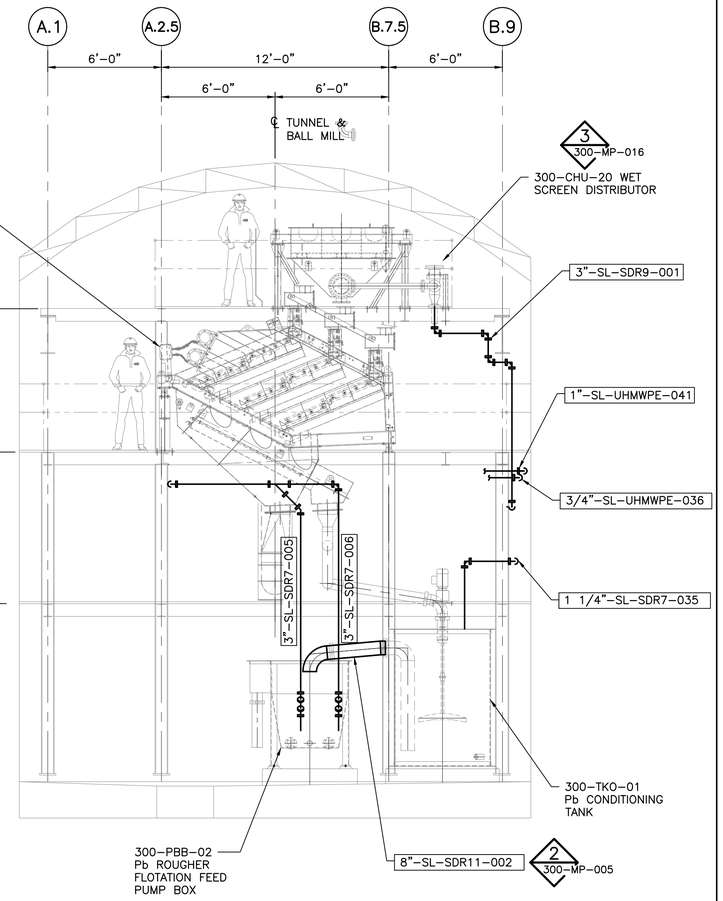
OURAY SILVER MINES, INC
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT CONC. UPPER LEVEL PLAN COL. B TO 8

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-010
REV. No. 1



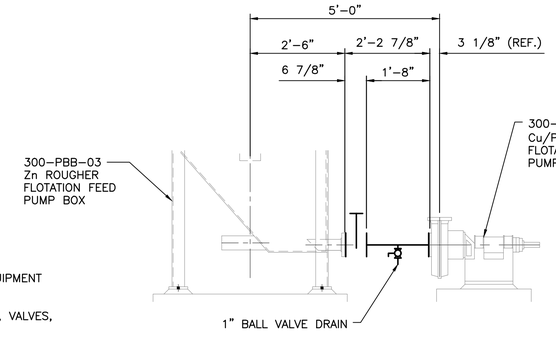


1 SECTION: CONCENTRATOR WEST SIDE OF TUNNEL COLUMN LINE 14 TO 17

300–MP–005
300–MP–008
1/4"=1'–0"
LOOKING EAST

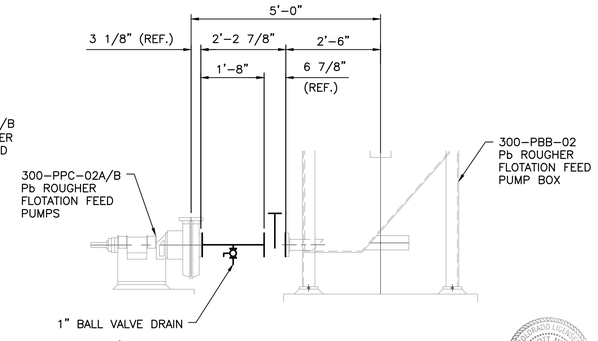
3 SECTION: CONCENTRATOR LOOKING NORTH

300–MP–005
300–MP–008
1/4"=1'–0"



2 DETAIL: 3"–SL–SDR7–017 & 018

1/2"=1'–0"
(1) EA. REQ'D. TAG AS SHOWN



4 DETAIL: 3"–SL–SDR7–003 & 004

1/2"=1'–0"
(1) EA. REQ'D. TAG AS SHOWN

NOTES

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1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 11/06/20 11/20/20; BID — 4/28/17; CONSTRUCTION — 4/28/17 11/20/20

DATE RELEASED: A — B — C — 0 — 0.A — 1 — 2

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
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SUITE 500
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Ph: 1–800–632–2277
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www.barr.com

Scale	AS SHOWN
Date	3/21/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
CONC. SECTION WEST COL. 14 TO 17 & SECT. NORTH

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–011
REV. No. 1

CADD USER: Hbpwuser FILE: \\HB–PW\HB_PW_JN\E56811831–3653–47F7–8055–79A32B0B9670\70DC8264–9589–490A–9553–42D177B0AB5\06461001104_300–MP–011.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:08 AM
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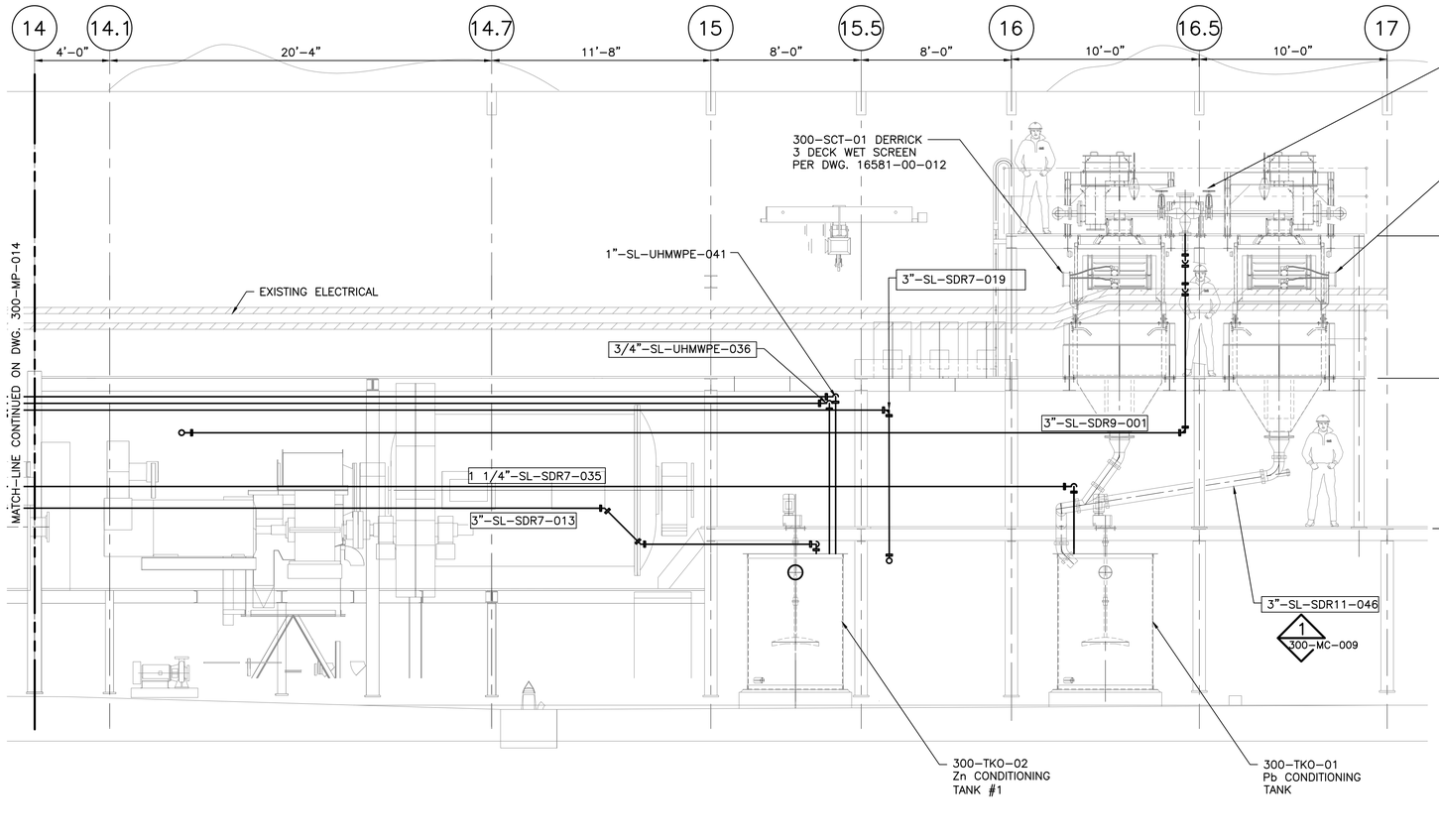
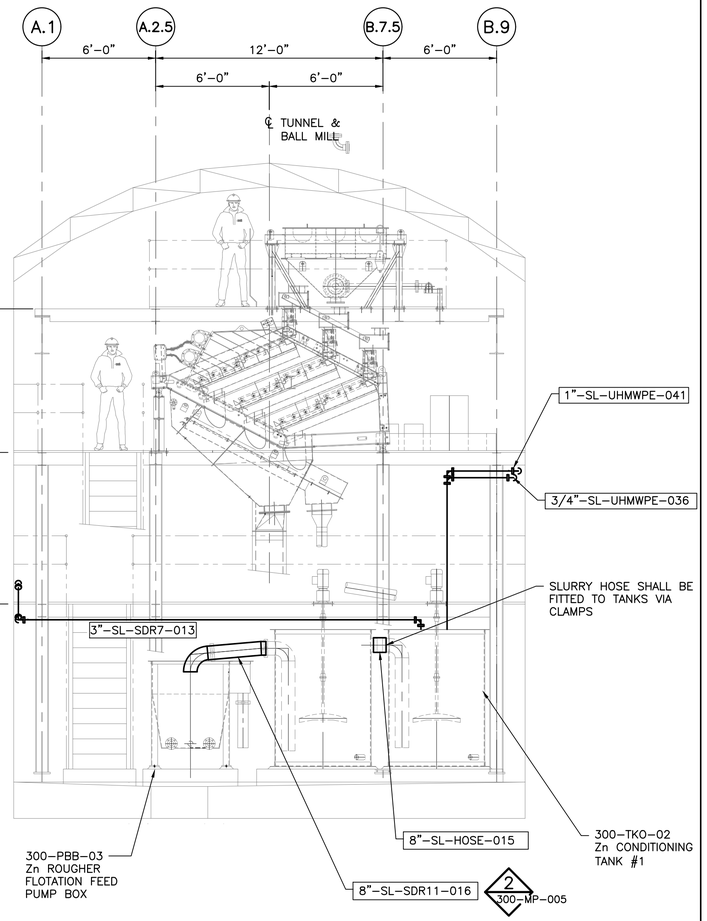


2 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE 14 TO 17
300–MP–005 300–MP–008 1/4"=1'–0"



4 SECTION: LOOKING NORTH
300–MP–005 300–MP–008 1/4"=1'–0"

NOTES

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COLORADO LICENSED PE 0025004 PROFESSIONAL ENGINEER NOV. 20, 2020

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1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17	11/06/20	11/20/20	RELEASED TO/FOR	A	B	C	0	0.A	1	2
BID				4/28/17			DATE RELEASED							
CONSTRUCTION				4/28/17		11/20/20								

BARR
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Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
CONC. SECTION EAST COL. 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–012
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_IN\E5681B31–3653–47F7–8D55–79A32B089670\578282FE–75EC–4803–A9CF–E7A5601C7ADB\06461001004_300–MP–012.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:08 AM
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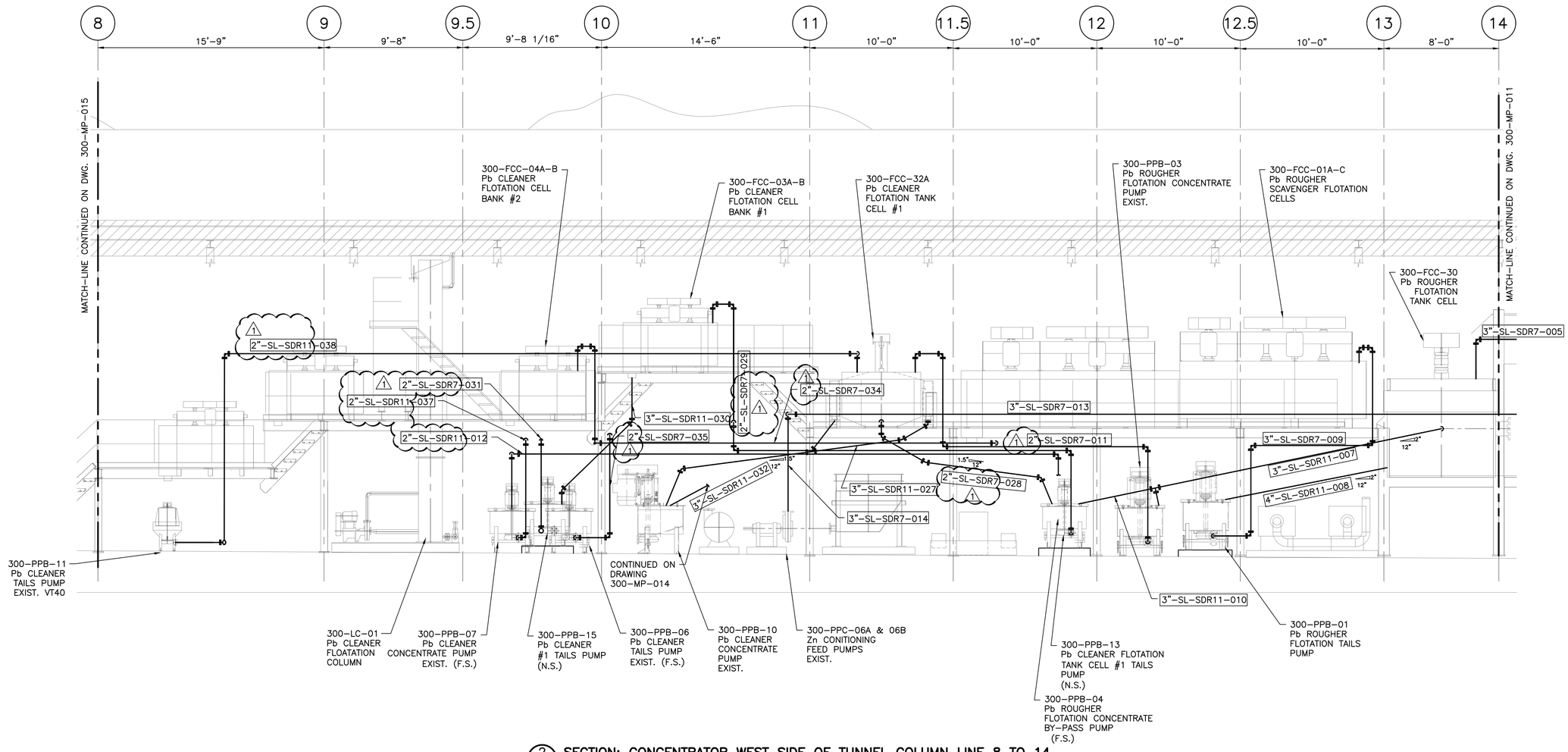

2 SECTION: CONCENTRATOR WEST SIDE OF TUNNEL COLUMN LINE 8 TO 14

300–MP–006
300–MP–009
1/4"=1'–0"

NOTES

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COLORADO LICENSED — SCOTT M. JAKS — PE.0052024 — PROFESSIONAL ENGINEER — March 31, 2021

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 3/31/21; BID 4/28/17; CONSTRUCTION 4/28/17 3/31/21

DATE RELEASED: A B C 0 1 2 3

BARR

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Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
CONC. SECTION WEST COL. 8 TO 14

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–013
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB–PW\HIB_PW_IN\5A7595E9–91FC–4C9B–B607–E21693F13493\D0643C89–B4FF–4867–8E57–14570BEB13E3\06461001O4_300–MP–013.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:37 PM
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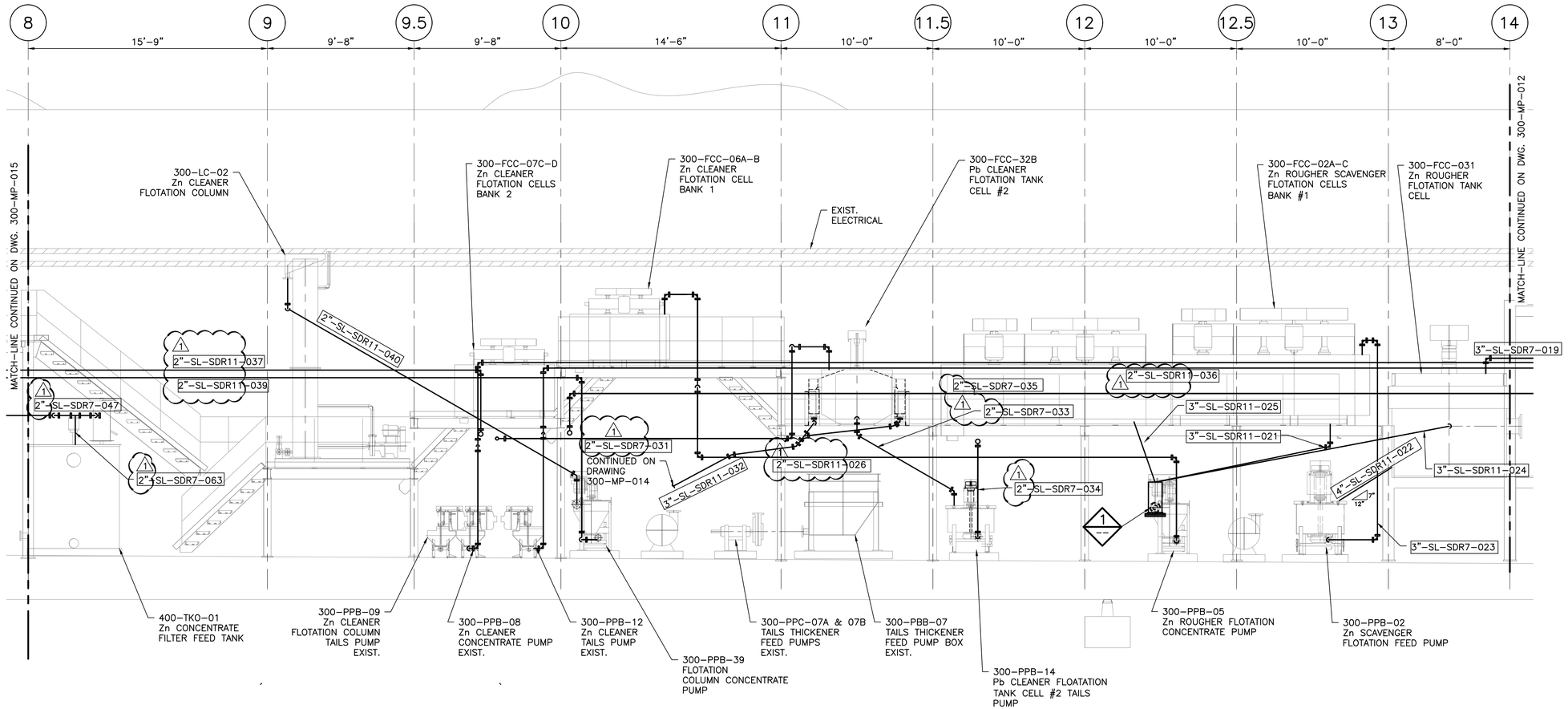
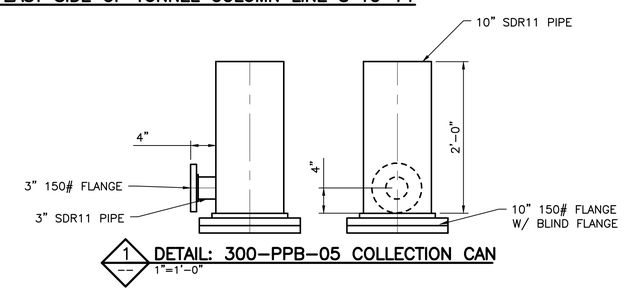


3 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE 8 TO 14

300-MP-006
300-MP-009
1/4"=1'-0"



1 DETAIL: 300-PPB-05 COLLECTION CAN

1"=1'-0"

NOTES

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0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 3/31/21; BID 4/28/17; CONSTRUCTION 4/28/17 3/31/21
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OURAY SILVER MINES, INC.
OURAY COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
CONC. SECTION EAST COL. 8 TO 14

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-014
REV. No. 1

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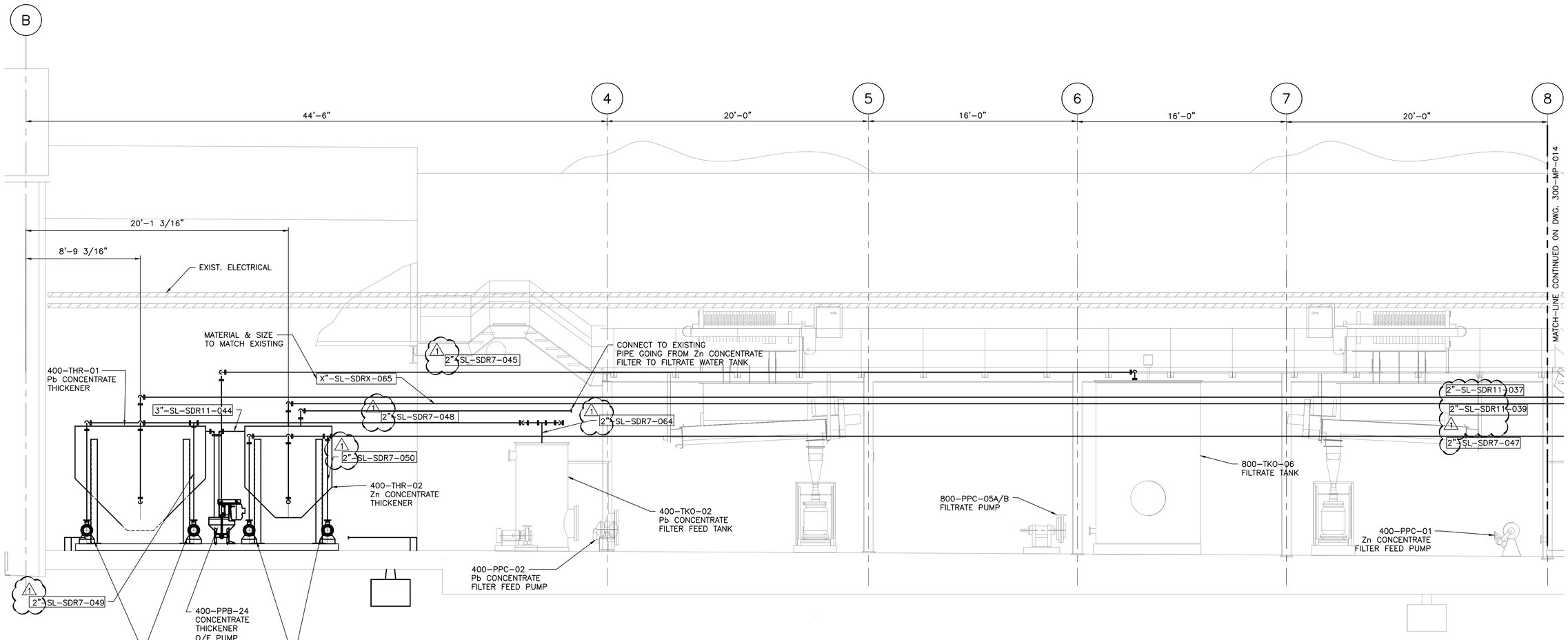

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

5 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE B TO 8
300–MP–007, 300–MP–010
1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED PE.0052024 SCOTT BUCHI PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	PGJ	DSM	3/31/21	UPDATED SLURRY PIPE SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT 4/28/17 3/31/21
BID 4/28/17
CONSTRUCTION 4/28/17 3/31/21

RELEASED TO/FOR: A B C 0 1 2 3
DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1–800–632–2277
Project Office:
BARR ENGINEERING CO.
3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1–800–225–1966
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www.barr.com

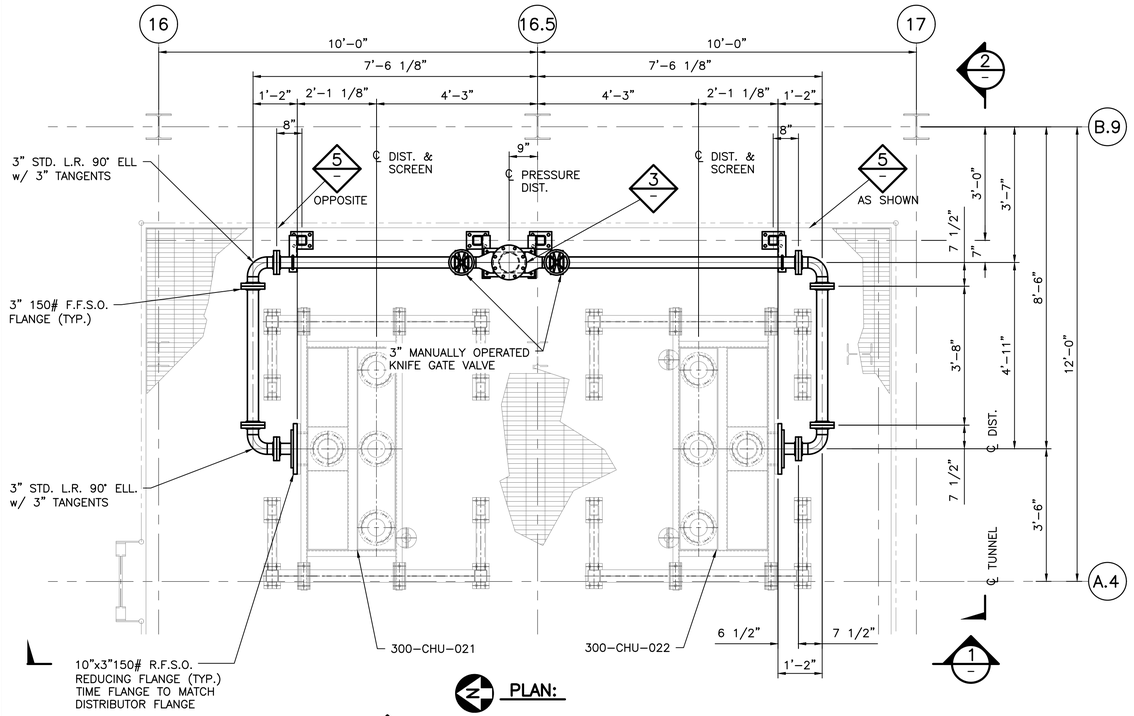
Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OUYAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINUIS MINE

PIPING – PROCESS
CONC, SECTION EAST COL. B TO 8

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–015
REV. No. 1

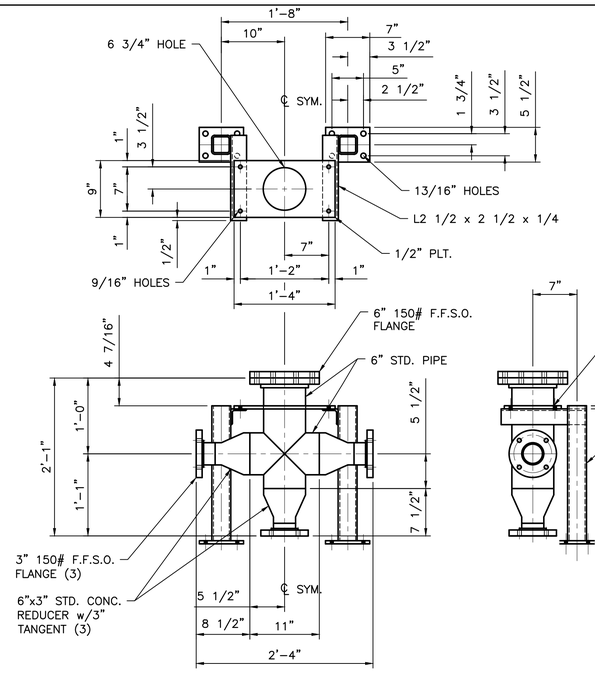


PLAN:

3 DETAIL: 2-WAY PRESSURE DISTRIBUTOR PIPING

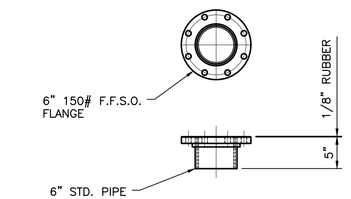
300-GA-013
300-GA-017
300-GA-021

1/2"=1'-0"
(1) REQ'D.



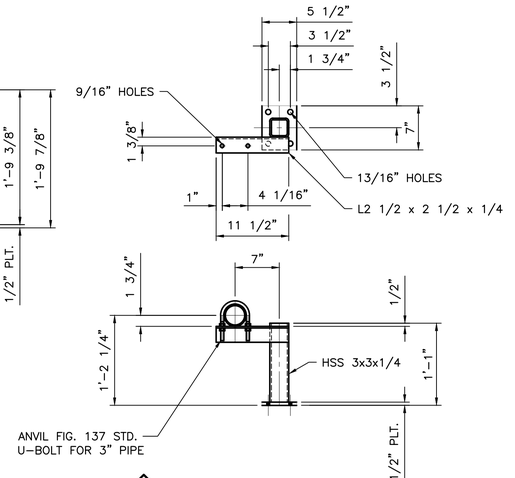
3 DETAIL: 2 WAY PRESSURE DISTRIBUTOR

1"=1'-0"
(1) REQ'D.



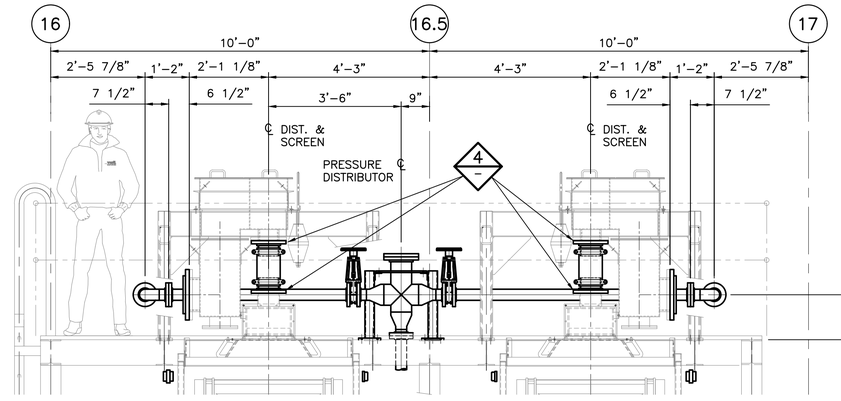
4 DETAIL: HOSE ADAPTER

1"=1'-0"
(12) REQ'D. w/ 1/4" THK RUBBER LINING



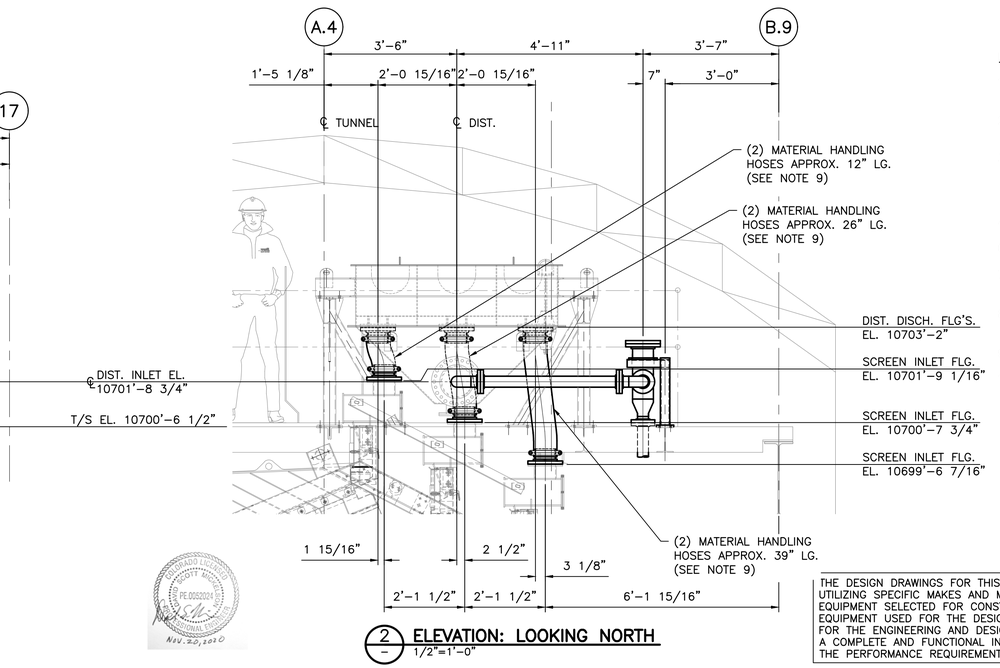
5 DETAIL: PIPE SUPPORT

1"=1'-0"
(2) REQ'D. – (1) AS SHOWN
(1) OPPOSITE



1 ELEVATION: LOOKING EAST

1/2"=1'-0"



2 ELEVATION: LOOKING NORTH

1/2"=1'-0"

NOTES

1. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
2. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
3. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN-LINE COMPONENTS.
4. INTERIOR SHALL BE RUBBER LINED WITH 1/4" NATURAL GUM RUBBER.
6. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION.
7. ALL SLURRY PIPING SHALL BE STANDARD WT. PIPE WITH 1/4" THK. RUBBER LINING U.N.O.
8. ALL FLANGES ON SLURRY PIPING SHALL HAVE 1/8" THK. RUBBER LINING ON THE FLANGE FACE.
9. MATERIAL HANDLING HOSE SHALL BE 6 5/8" I.D. PLAIN END SLURRY HOSE.
10. HOSE CLAMPS SHALL BE DIXON DOUBLE BOLT CLAMPS TO FIT THE O.D. OF THE SLURRY HOSE.

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 JAMES K. MARTIN NEVADA
NEV. 20, 2020

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — — — 4/28/17 11/06/20 11/20/20; BID — — — 4/28/17 — —; CONSTRUCTION — — — 4/28/17 — 11/20/20

DATE RELEASED: A — B — C — 0 4/28/17 — 0.A 11/06/20 — 1 11/20/20 — 2

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	3/18-17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DETAIL – PRESSURE DISTRIBUTOR

BARR PROJECT No. 06/46-100.04
CLIENT PROJECT No. –
DWG. No. 300-MP-016
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\E6681B31-3653-47F7-8055-79A32B089670\42208050-078B-4742-9337-532C61917107\0646100104_300-MP-016.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:09 AM
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	Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
	Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
1	3"	SL	SDR9	001	300-PPC-01A/B WET SCREEN PUMPS	300-CHU-20 WE SCREEN DISTRIBUTOR	96	7	-	-	-	1	-
1	8"	SL	SDR11	002	300-TKO-01 Pb CONDITIONING TANK	300-PBB-02 Pb ROUGHER FLOTATION FEED PUMP BOX	DET.ON 300-MP-005	-	-	-	-	-	-
	3"	SL	SDR7	003	300-PBB-02 Pb ROUGHER FLOTATION FEED PUMP BOX	300-PPC-02A Pb ROUGHER FLOTATION FEED PUMP	3	-	-	-	-	-	-
	3"	SL	SDR7	004	300-PBB-02 Pb ROUGHER FLOTATION FEED PUMP BOX	300-PPC-02B Pb ROUGHER FLOTATION FEED PUMP	3	-	-	-	-	-	-
1	3"	SL	SDR7	005	300-PPC-02B Pb ROUGHER FLOTATION FEED PUMP	300-FCC-030 Pb ROUGHER FLOTATION TANK CELL	76	2	-	3	-		1
1	3"	SL	SDR7	006	300-PPC-02A Pb ROUGHER FLOTATION FEED PUMP	300-FCC-030 Pb ROUGHER FLOTATION TANK CELL	16	1	-	2	-	-	-
	3"	SL	SDR11	007	300-FCC-030 Pb ROUGHER FLOTATION TANK CELL	300-PPB-03 Pb ROUGHER FLOTATION CONENTRATE PUMP/300-PPB-04 Pb ROUGHER FLOTATION CONCENTRATE BY-PASS PUMP	25	2	-	-	-	1	-
	4"	SL	SDR11	008	300-FCC-030 Pb ROUGHER FLOTATION TANK CELL	300-PPB-01 Pb ROUGHER FLOTATION TAILS PUMP	14	1	-	-	-	-	-
	3"	SL	SDR7	009	300-PPB-01 Pb ROUGHER FLOTATION TAILS PUMP	300-FCC-01A-C Pb ROUGHER SCAVENGER FLOTATION CELLS	27	7	-	-	-	-	-
	3"	SL	SDR11	010	3"-SL-SDR11-007	300-PPB-03 Pb ROUGHER FLOTATION CONENTRATE PUMP	8	1	-	-	-	-	-
	1-1/4"	SL	SDR7	011	300-PPB-03 Pb ROUGHER FLOTATION CONENTRATE PUMP	300-FCC-31A Pb CLEANER FLOTATION TANK CELL #1	39	6	-	-	-	-	-
	3/4"	SL	UHMWPE	012	300-PPB-04 Pb ROUGHER FLOTATION CONCENTRATE BY-PASS PUMP	300-PPB-07 Pb CLEANER COLUMN CONCENTRATE PUMP	44	4	-	-	-	-	-
1	3"	SL	SDR7	013	300-PPC-06B Zn CONDITIONING FEED PUMP	300-TKO-02 Zn CONDITIONING TANK #1	129	5	-	2	-	1	-
	3"	SL	SDR7	014	300-PPC-06A Zn CONDITIONING FEED PUMP	300-TKO-02 Zn CONDITIONING TANK #1	16	4	-	-	-	-	-
1	8"	SL	HOSE	015	300-TKO-02 Zn CONDITIONING TANK #1	300-TKO-03 Zn CONDITIONING TANK #2	1	-	-	-	-	-	-
1	8"	SL	SDR11	016	300-TKO-03 Zn CONDITIONING TANK #2	300-PBB-03 Zn ROUGHER FLOTATION FEED PUMP BOX	DET.ON 300-MP-005	-	-	-	-	-	-
1	3"	SL	SDR7	017	300-PBB-03 Zn ROUGHER FLOTATION FEED PUMP BOX	300-PPC-37A Pb ROUGHER FLOTATION FEED PUMP	3	-	-	-	-	-	-
1	3"	SL	SDR7	018	300-PBB-03 Zn ROUGHER FLOTATION FEED PUMP BOX	300-PPC-37B Pb ROUGHER FLOTATION FEED PUMP	3	-	-	-	-	-	-
1	3"	SL	SDR7	019	300-PPC-37A Pb ROUGHER FLOTATION FEED PUMP	300-FCC-031 Zn ROUGHER FLOTATION TANK CELL	79	6	-	-	-	1	-
1	3"	SL	SDR7	020	300-PPC-37B Pb ROUGHER FLOTATION FEED PUMP	300-FCC-031 Zn ROUGHER FLOTATION TANK CELL	5	4	-	-	-	-	-
	3"	SL	SDR11	021	300-FCC-031 Zn ROUGHER FLOTATION TANK CELL	300-PPB-05 Zn ROUGHER FLOTATION CONCENTRATE PUMP	20	2	-	-	1	-	2
	4"	SL	SDR11	022	300-FCC-031 Zn ROUGHER FLOTATION TANK CELL	300-PPB-02 Zn ROUGHER SCAVENGER FLOTATION FEED PUMP	5	-	-	-	-	-	-
	3"	SL	SDR7	023	300-PPB-02 Zn ROUGHER SCAVENGER FLOTATION FEED PUMP	300-FCC-02A-C Zn ROUGHER FLOTATION CELLS BANK #1	26	5	-	-	-	-	-
	3"	SL	SDR11	024	300-FCC-02A-C Zn ROUGHER FLOTATION CELLS BANK #1	300-PPB-05 Zn ROUGHER FLOTATION CONCENTRATE PUMP	16	1	-	1	-	-	-
	3"	SL	SDR11	025	300-FCC-02D-F Zn ROUGHER FLOTATION CELLS BANK #2	300-PPB-05 Zn ROUGHER FLOTATION CONCENTRATE PUMP	4	1	-	-	-	-	-

	Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
	Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
	1-1/4"	SL	SDR7	026	300-PPB-05 Zn ROUGHER FLOTATION CONCENTRATE PUMP	300-FCC-06A-B Zn CLEANER FLOTATION CELL Bank #1	55	7	-	-	-	-	-
	3"	SL	SDR11	027	300-FCC-31A Pb CLEANER FLOTATION TANK CELL #1	300-PPB-10 Pb CLEANER CONCENTRATE PUMP	26	-	3	-	2	-	1
	1-1/2"	SL	SDR9	028	300-FCC-31A Pb CLEANER FLOTATION TANK CELL #1	300-PPB-13 Pb CLEANER FLOTATION TANK CELL #1 TAILS PUMP	16	1	2	-	-	-	-
	1-1/2"	SL	SDR9	029	300-PPB-13 Pb CLEANER FLOTATION TANK CELL #1 TAILS PUMP	300-FCC-03A-B Pb CLEANER FLOTATION CELL BANK #1	41	7	-	-	-	-	-
	3"	SL	SDR11	030	300-FCC-03A-B Pb CLEANER FLOTATION CELL BANK #1	300-PPB-15 Pb CLEANER FLOTATION BANK #1 TAILS PUMP	11	-	-	2	-	-	-
	1-1/4"	SL	SDR9	031	300-PPB-15 Pb CLEANER FLOTATION BANK #1 TAILS PUMP	300-FCC-31B Pb CLEANER FLOTATION TANK CELL #2	61	7	-	-	-	-	-
	3"	SL	SDR11	032	300-FCC-31B Pb CLEANER FLOTATION TANK CELL #2	300-PPB-10 Pb CLEANER CONCENTRATE PUMP	30	-	2	2	2	-	1
	1-1/2"	SL	SDR7	033	300-FCC-31B Pb CLEANER FLOTATION TANK CELL #2	300-PPB-14 Pb CLEANER FLOTATION TANK CELL #2 TAILS PUMP	15	1	2	-	-	-	-
	1-1/4"	SL	SDR7	034	300-PPB-14 Pb CLEANER FLOTATION TANK CELL #2 TAILS PUMP	300-FCC-04A-B Pb CLEANER FLOTATION CELL BANK #2	57	7	-	-	-	-	-
	1-1/4"	SL	SDR7	035	300-PPB-06 Pb CLEANER TAILS PUMP	300-TKO-01 Pb CONDITIONING TANK	157	8	-	-	-	-	-
1	3/4"	SL	UHMWPE	036	300-PPB-12 Zn CLEANER TAILS PUMP	300-TKO-02 Zn CONDITIONING TANK #1	122	7	-	1	-	-	-
	1-1/4"	SL	SDR7	037	300-PPB-07 Pb CLEANER COLUMN CONCENTRATE PUMP	400-THR-01 Pb CONCENTRATE THICKENER	175	6	-	-	-	-	-
	1-1/2"	SL	SDR7	038	300-PPB-11 Pb CLEANER COLUMN TAILS PUMP	300-FCC-31A Pb CLEANER FLOTATION TANK CELL #1	78	4	-	1	-	-	-
	3/4"	SL	UHMWPE	039	300-PPB-39 FLOTATION COLUMN CONCENTRATE PUMP	400-THR-02 Zn CONCENTRATE THICKENER	151	4	-	-	-	-	-
	3"	SL	SDR11	040	300-ZC-02 Zn CLEANER FLOTATION COLUMN	300-PPB-39 FLOTATION COLUMN CONCENTRATE PUMP	32	3	-	-	1	-	-
1	1"	SL	UHMWPE	041	300-PPB-09 Zn CLEANER FLOTATION COLUMN TAILS PUMP	300-TKO-02 Zn CONDITIONING TANK #1	142	5	-	1	-	1	-
	1"	SL	UHMWPE	042	1"-SL-UHMWPE-041	300-FCC-06A-B Zn CLEANER FLOTATION CELL Bank #1	4	1	-	-	-	-	-
	3"	SL	SDR11	043	400-THR-01 Pb CONCENTRATE THICKENER	400-PPB-24 CONCENTRATE THICKENER O/F PUMP	10	1	-	-	-	-	-
	3"	SL	SDR11	044	400-THR-02 Zn CONCENTRATE THICKENER	400-PPB-24 CONCENTRATE THICKENER O/F PUMP	10	1	-	-	-	-	-
	1-1/4"	SL	SDR7	045	400-PPC-24 CONCENTRATE THICKENER O/F PUMP	800-TKO-06 FILTRATE WATER TANK	90	4	-	-	-	-	-
	6"	SL	SDR11	046	300-SCT-01/02 WET SCREEN	300-TKO-01 Pb CONDITIONING TANK	DETAILED ON DRAWING 300-MC-09	-	-	-	-	-	-
	1-1/4"	SL	SDR7	047	400-THR-02 Zn CONCENTRATE THICKENER	400-TKO-01 Zn CONCENTRATE FILTER FEED TANK	245	10	-	-	-	1	-
	1-1/4"	SL	SDR7	048	400-THR-01 Pb CONCENTRATE THICKENER	400-PPC-02 Pb CONCENTRATE FILTER FEED TANK	120	10	-	-	-	1	-
	1-1/4"	SL	SDR7	049	400-PPC-08A Pb CONCENTRATE THICKENER U/F PUMP	400-PPC-08B Pb CONCENTRATE THICKENER U/F PUMP	17	2	-	-	-	-	-
	1-1/4"	SL	SDR7	050	400-PPC-21A Zn CONCENTRATE THICKENER U/F PUMP	400-PPC-21B Zn CONCENTRATE THICKENER U/F PUMP	15	2	-	-	-	-	-

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	11/06/20	11/20/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/7/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No.	06/46-1001.04
CLIENT PROJECT No.	–
DWG. No.	300-MP-017
REV. No.	1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\{E5681B31-3653-47F7-8D55-79A32BDB9670}\BD5BFB6-A3AA-4E8E-B04C-16320F36B403\06461001\04_300-MP-017.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:09 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
3"	SL	SDR7	051	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	300-PPC-31A ROD MILL DISCHARGE PUMP #1	1	-	-	-	-	-	-
3"	SL	SDR7	052	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	300-PPC-31B ROD MILL DISCHARGE PUMP #2	1	-	-	-	-	-	-
2"	SL	SDR13.5	053	300-PPC-31A ROD MILL DISCHARGE PUMP #1	300-PBB-01 WET SCREEN FEED PUMP BOX	54	3	-	-	-	-	-
2"	SL	SDR13.5	054	300-PPC-31B ROD MILL DISCHARGE PUMP #2	300-PBB-01 WET SCREEN FEED PUMP BOX	51	3	-	-	-	-	-
2"	SL	SDR13.5	055	2"-SL-SDR13.5-053	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	1	-	-	-	-	-	-
2"	SL	SDR13.5	056	2"-SL-SDR13.5-054	300-PBB-30 ROD MILL DISCHARGE PUMP BOX	1	-	-	-	-	-	-
2"	SL	SDR13.5	057	300-PPC-33A ROD MILL DISCHARGE TRANSFER PUMP #1	300-PBB-01 WET SCREEN FEED PUMP BOX	260	3	2	-	-	-	-
2"	SL	SDR13.5	058	300-PPC-33B ROD MILL DISCHARGE TRANSFER PUMP #2	300-PBB-01 WET SCREEN FEED PUMP BOX	260	3	2	-	-	-	-
1-1/4"	SL	SDR7	059	400-THR-02 Zn CONCENTRATE THICKENER	400-PPC-21A Zn CONCENTRATE THICKENER U/F	5	2	-	-	-	-	-
1-1/4"	SL	SDR7	060	400-THR-02 Zn CONCENTRATE THICKENER	400-PPC-21B Zn CONCENTRATE THICKENER U/F	5	2	-	-	-	-	-
1-1/4"	SL	SDR7	061	400-THR-01 Pb CONCENTRATE THICKENER	400-PPC-08A Zn CONCENTRATE THICKENER U/F	5	2	-	-	-	-	-
1-1/4"	SL	SDR7	062	400-THR-01 Pb CONCENTRATE THICKENER	400-PPC-08B Zn CONCENTRATE THICKENER U/F	5	2	-	-	-	-	-
1-1/2"	SL	SDR7	063	LINE 1-1/4"-SL-SDR-047	400-TKO-01 Zn CONCENTRATE FILTER FEED TANK	4	-	-	-	-	-	-
1-1/2"	SL	SDR7	064	LINE 1-1/4"-SL-SDR-048	400-TKO-02 Pb CONCENTRATE FILTER FEED TANK	4	-	-	-	-	-	-
X"	SL	SDRX	065	EXISTING PIPING FEEDING FILTRATE TANK FROM Zn CONCENTRATE FILTER	400-THR-02 Zn CONCENTRATE THICKENER	29	2	-	-	-	1	-
4"	SL	SDR11	066	500-FLF-01A & B TAILINGS FILTER	500-PPB-01 TAILINGS FILTER FILTRATE PUMP	16	1	-	-	-	1	-
2"	SL	SDR11	067	800-PPC-05 FILTRATE PUMP	500-THR-01 TAILINGS THICKENER	311	10	2	-	-	-	-
2"	SL	HOSE	068	300-PPC-33A ROD MILL DISCHARGE TRANSFER PUMP #1	HDPE SLURRY PIPING IN TUNNEL (2"-SL-SDR13.5-057)	20	-	-	-	-	-	-
2"	SL	HOSE	069	300-PPC-33B ROD MILL DISCHARGE TRANSFER PUMP #2	HDPE SLURRY PIPING IN TUNNEL (2"-SL-SDR13.5-058)	20	-	-	-	-	-	-
2"	SL	SDR9	070	500-PPB-01 TAILINGS FILTER FILTRATE PUMP	800-TK-03 PROCESS WATER TANK	32	3	-	-	-	-	-

HOLD ⚠1

⚠1 NO LONGER USED

⚠1 NO LONGER USED

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	0.A	1	2
CLIENT				4/28/17	11/06/20	11/20/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/7/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-018
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\E56681B31-3653-4777-8D55-79A32BD89670\C86CBC8D-E3B3-48F9-BA20-D815C85CF7C3\06461001O4_300-MP-018.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:09 AM
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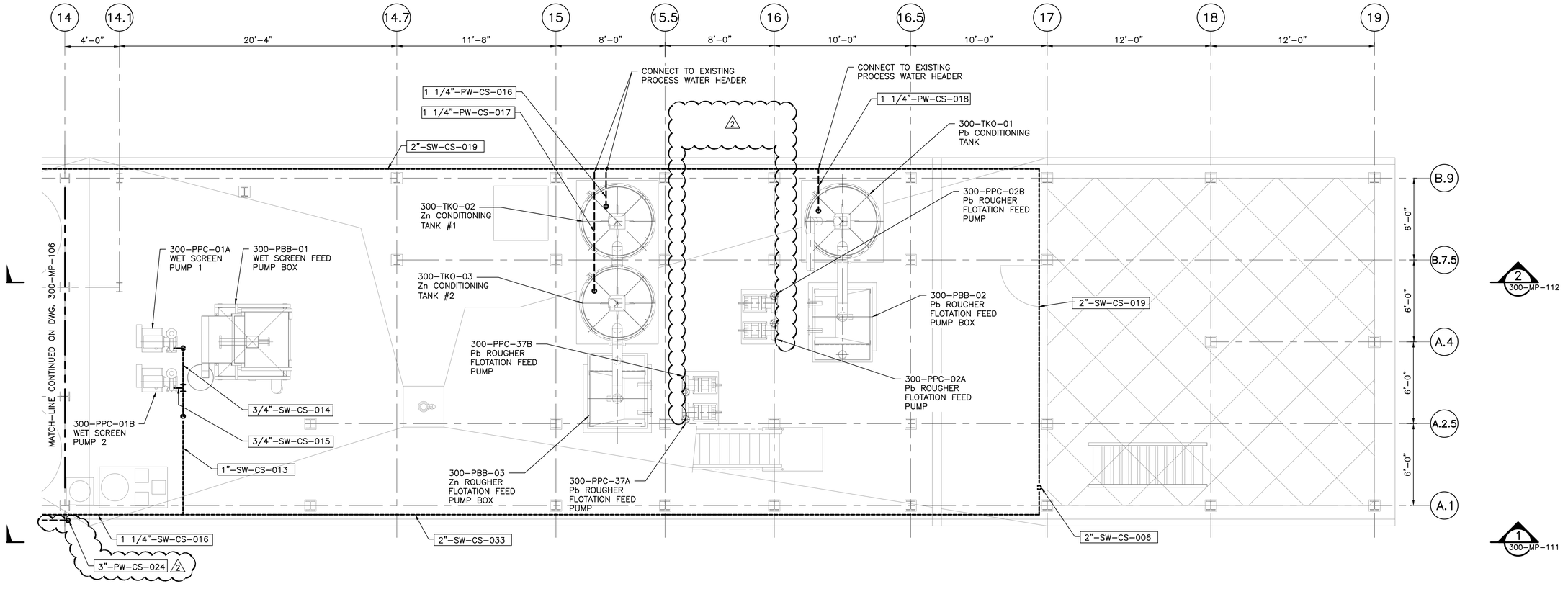

1 PIPING – UTILITY PLAN: 300 TPD BALL MILL AREA CONC. GRADE FLOOR COLUMN LINE 14 TO 19
1/4"=1'–0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

⚠ COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK	APP.	DATE	REVISION DESCRIPTION
2	AMB	DSM	DSM	3/31/21	ADDED PW LINE FOR SLURRY STORAGE TANKS; REMOVE GLAND WATER LINE
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 — 11/06/20 — 11/20/20 — 3/31/21; BID — 4/28/17; CONSTRUCTION — 4/28/17 — 11/20/20 — 3/31/21

DATE RELEASED: A — B — C — 0 — 0.A — 1 — 2

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	PGJ
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN BALL MILL AREA CONC. GRADE FLOOR COLUMN 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–105
REV. No. 2

CADD USER: Hbpreuser FILE: \\HIB–PW\HIB_PW_W\54759569–91FC–409B–B607–E2163F13493\{A84AB5B3–3802–4164–85E1–588831C12923}\0646100104_300–MP–105.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:38 PM
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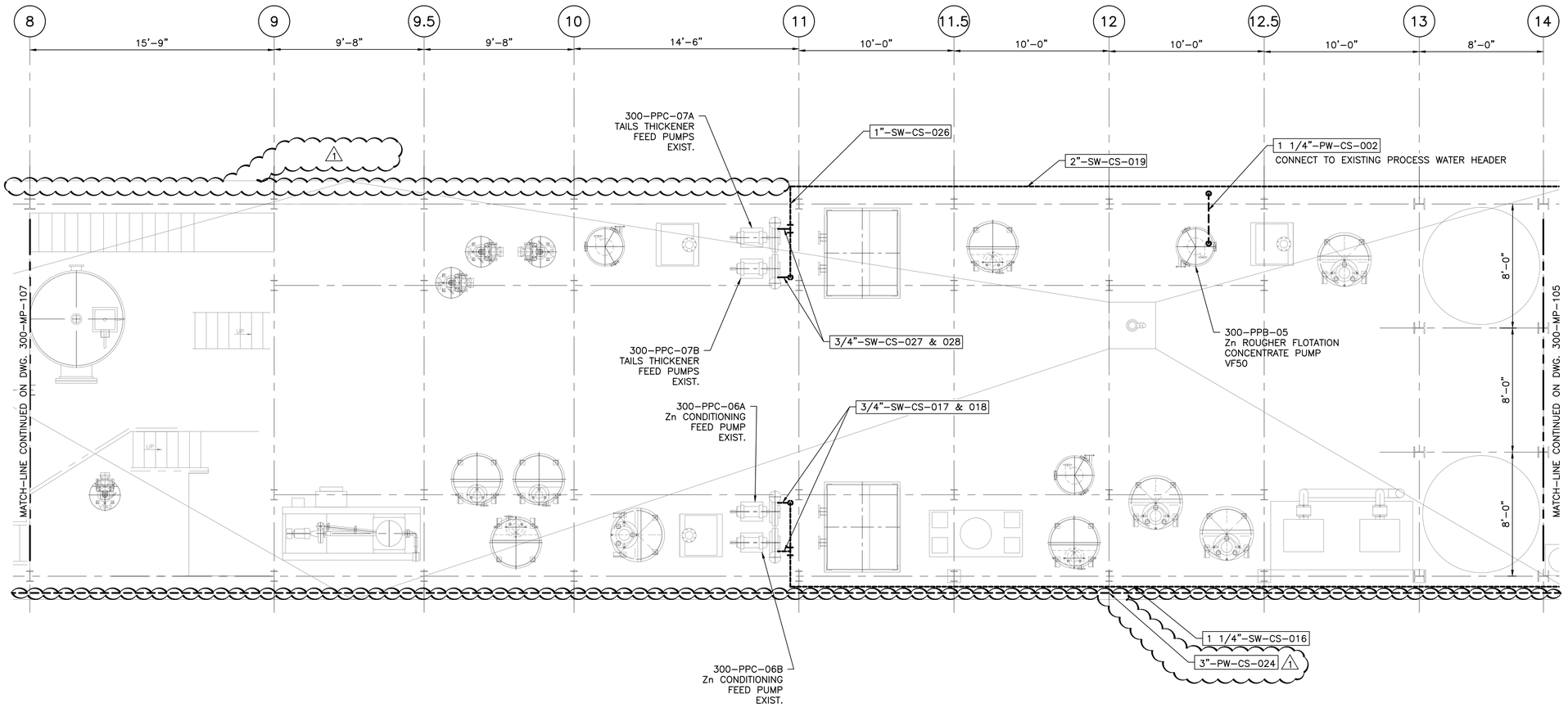

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

2 PIPING – UTILITY PLAN: 300 TPD FLOTATION AREA CONC. GROUND FLOOR COLUMN LINE 8 TO 14

1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB	3 DSM	DSM	3/31/21	EXTENDED PW LINE FOR SLURRY STORAGE TANKS; REMOVE GLAND WATER LINE
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		
DATE RELEASED							

BARR
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www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	PGJ
Approved	DSM

OURAY SILVER MINES, INC
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN FLOTATION AREA CONC. GRADE FLOOR COLUMN 8 TO 14

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–106
REV. No. 1

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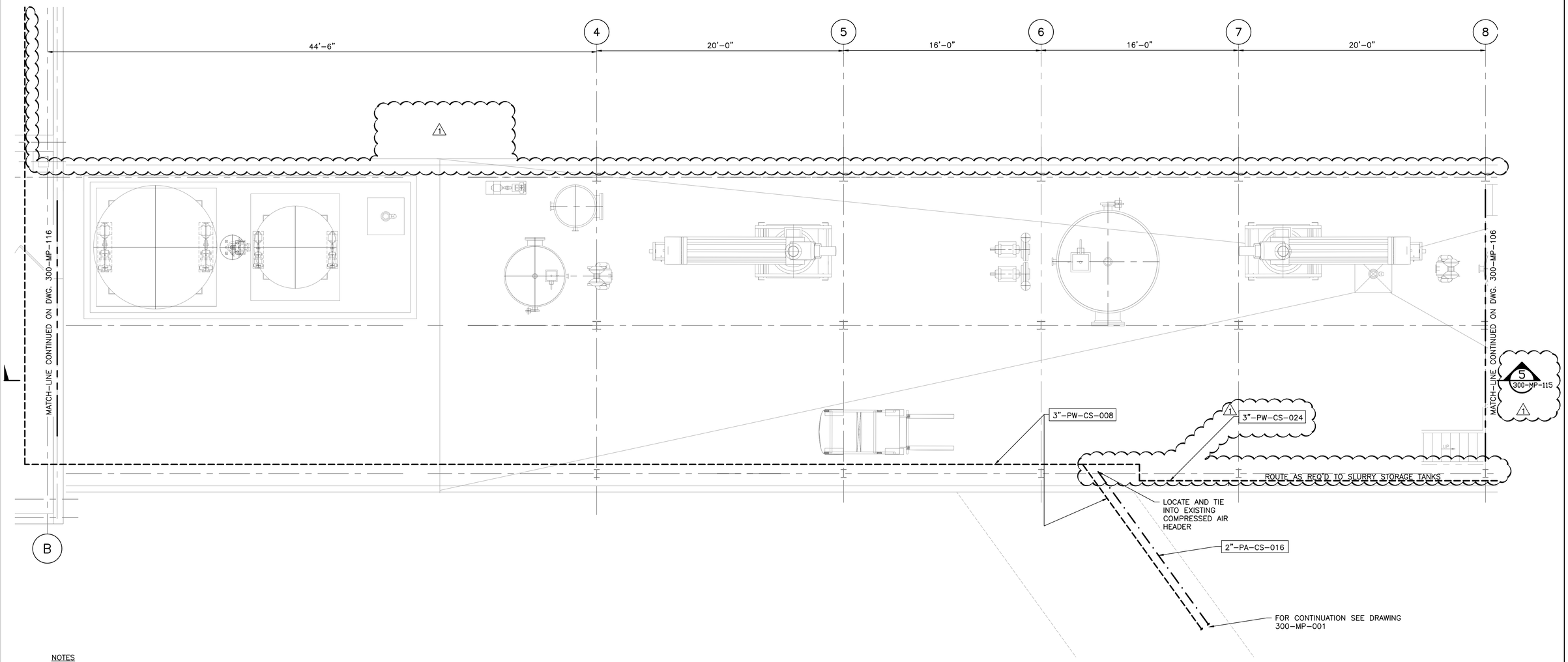

NOTES

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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

COLORADO LICENSED SCOTT MACKAY PE.0052024 PROFESSIONAL ENGINEER March 31, 2021

3 – PIPING – UTILITY PLAN: 300 TPD CONCENTRATOR AREA CONC. FLOOR COLUMN B TO 8
1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	EXTENDED PW LINE FOR SLURRY STORAGE TANKS; REMOVE GLAND WATER LINE
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
DATE RELEASED				4/28/17	3/31/21		
BID				4/28/17	—		
CONSTRUCTION				4/28/17	3/31/21		

BARR
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Fax: (218) 262–3460
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	PGJ
Approved	DSM

ORUAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN CONCENTRATOR AREA CONC. GRADE FLOOR COLUMN B TO 8

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–107
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB–PW\HIB_PW_IN\5A75595E9–91FC–4C9B–B607–E21693F13A93\9EC607B0–70B4–44FE–B34B–597A1D4A56FF\0646100104_300–MP–107.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:39 PM
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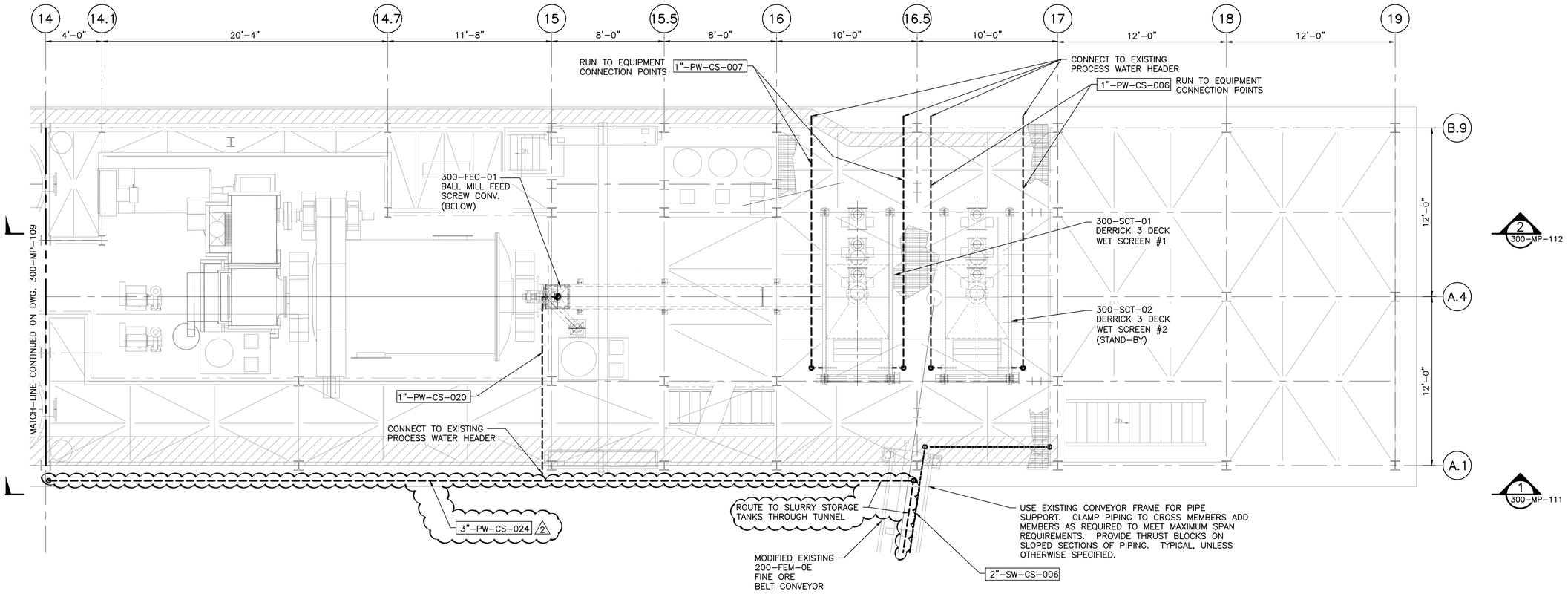

4 / – PIPING – UTILITY PLAN: 300 TPD BALL MILL AREA UPPER LEVELS COLUMN 14 TO 19

1/4"=1'–0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	DSM	DSM	3/31/21	ADDED PW LINE FOR SLURRY STORAGE TANKS
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT				4/28/17	11/06/20	11/20/20	3/31/21
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	3/31/21
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN BALL MILL UPPER LEVELS COLUMN 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–108
REV. No. 2

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_JN\5A7595E9–91FC–4C9B–B607–E21693F13A83\B3E093C6–E0FE–4E90–B08A–CAF405ABAF75\0646100104_300–MP–108.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:39 PM
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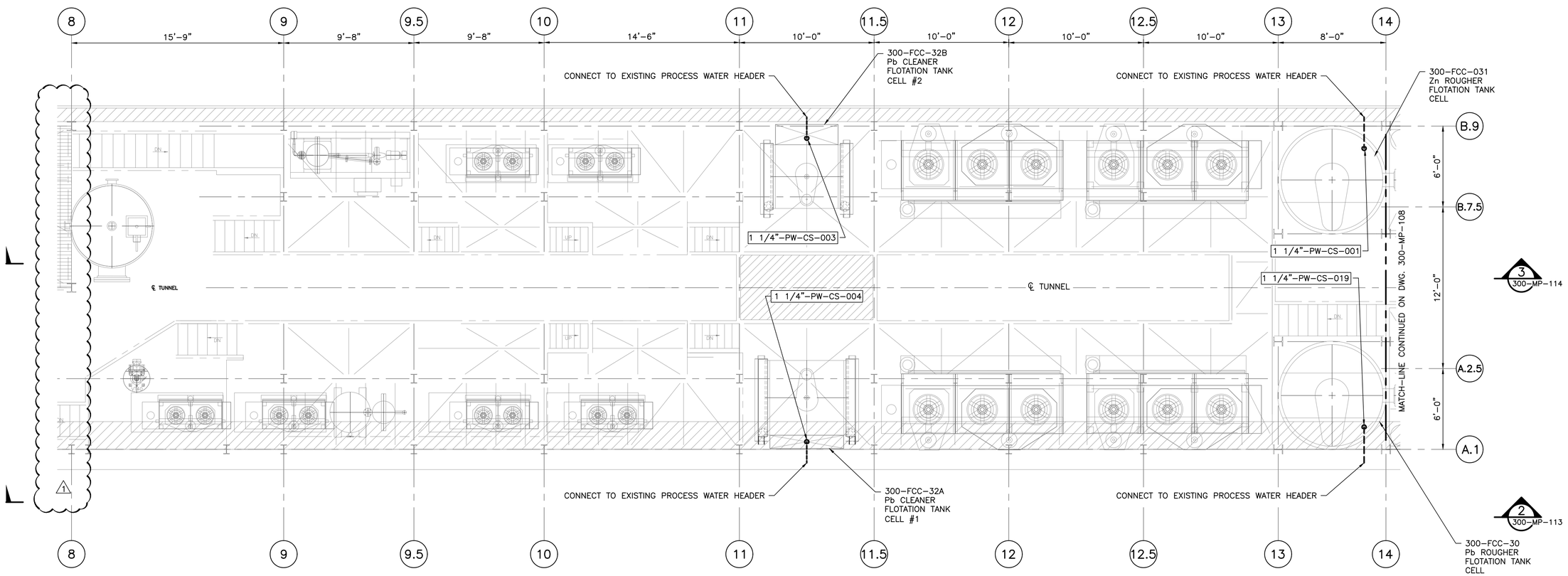

5 PIPING – UTILITY PLAN: 300 TPD FLOTATION AREA UPPER LEVELS COLUMN 8 TO 14
1/4"=1'–0"

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 AMANDA B. JAK INTERNATIONAL ENGINEER
March 31, 2021

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	REMOVED MATCHLINE TO OBSOLETE DRAWING
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 3/31/21; BID 4/28/17; CONSTRUCTION 4/28/17 3/31/21

DATE RELEASED: A 4/28/17; B 3/31/21; C —; 0 —; 1 —; 2 —; 3 —

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1–800–632–2277
Project Office: BARR ENGINEERING CO. 3128 14TH AVENUE EAST HIBBING, MN 55746
Ph: 1–800–225–1966
Fax: (218) 262–3460
www.barr.com

Scale	AS SHOWN
Date	3/21/17
Drawn	DTJ
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINS, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN FLOTATION AREA UPPER LEVELS COLUMN 8 TO 14

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–109
REV. No. 1

CADD USER: Hbpruser FILE: \\HIB-PW\HIB_PW_IN\5A7595E9-91FC-4C9B-B607-E21693F13493\6978197E-C99B-4030-A9C4-A4C0A98F7404\0646100104_300-MP-109.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:40 PM
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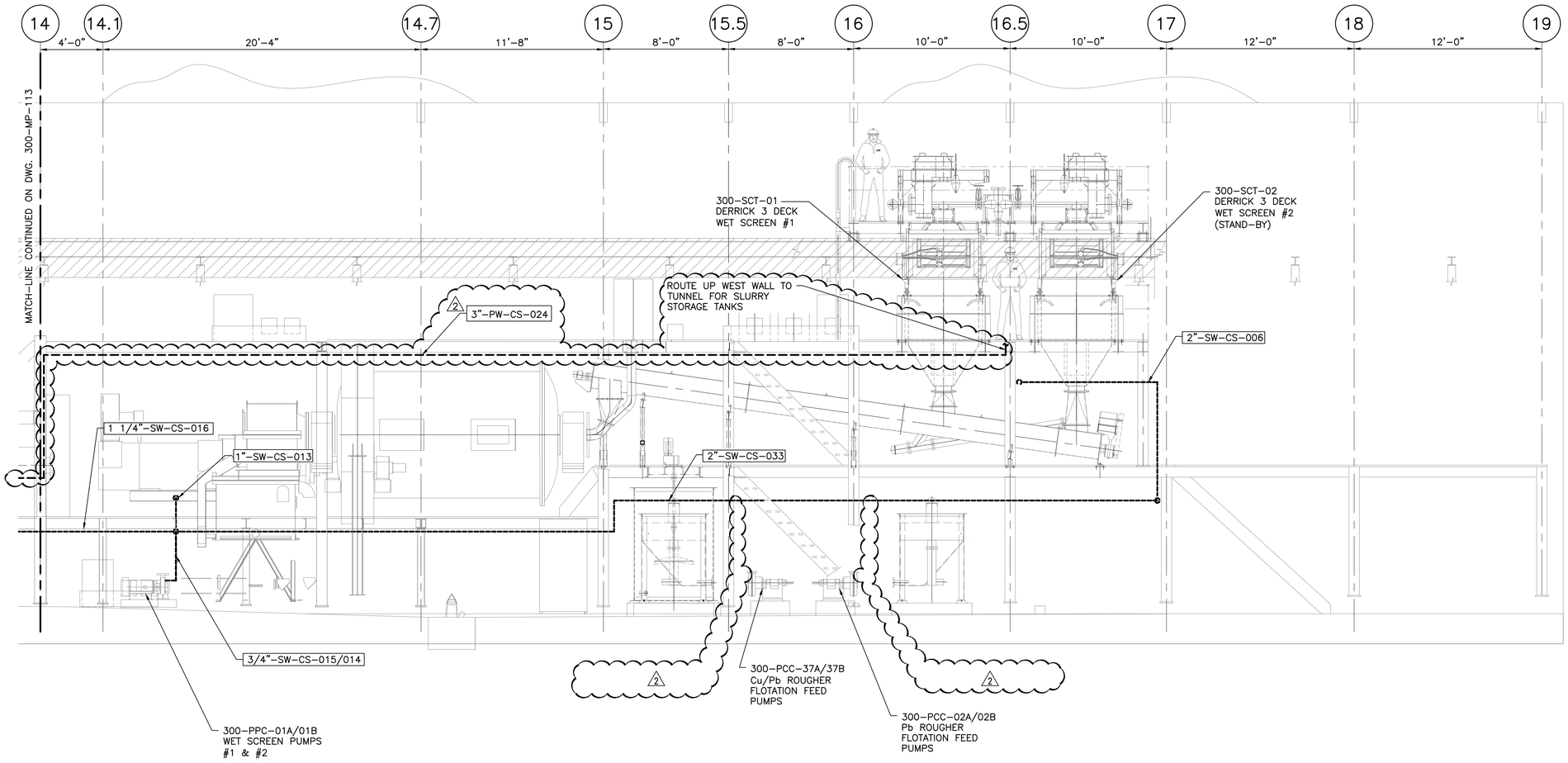

1 PIPING – UTILITY SECTION: BALL MILL AREA WEST COLUMN LINE 14 TO 19

300–MP–105
300–MP–108

1/4"=1'–0"

LOOKING EAST

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	DSM	DSM	3/31/21	REMOVED GLAND WATER LINES; ADDED PW LINE TO SLURRY STORAGE TANKS
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTG	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	0.A	1	2
CLIENT				4/28/17	11/06/20	11/20/20	3/31/21
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	3/31/21
DATE RELEASED							

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY. COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING SECTION BALL MILL AREA WEST COLUMN 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–111
REV. No. 2

CADD USER: Hbpwuser FILE: \\HIB–PW\HIB_PW_JN\5479959–91FC–409B–B607–E21693F13A83\4C7908E8–1CC4–479C–BE30–9573538AFB9C\0646100104_300–MP–111.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:40 PM
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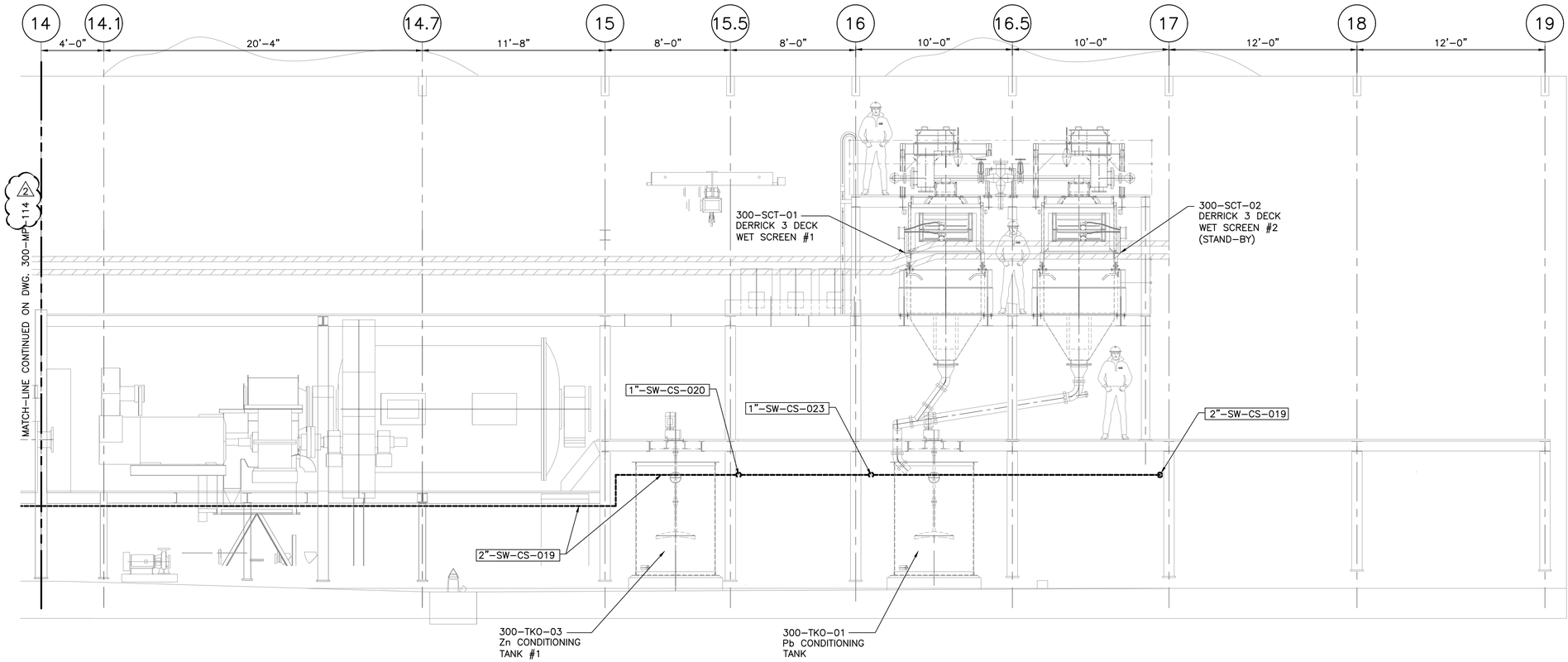

2 PIPING – UTILITY SECTION: BALL MILL AREA EAST COLUMN LINE 14 TO 19

300–MP–105
300–MP–108

1/4"=1'–0"

LOOKING EAST

NOTES

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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

REGISTERED PROFESSIONAL ENGINEER
PE.0052204
STATE OF COLORADO

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

△1 COMPLETELY REDESIGNED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	AMB3	DSM	DSM	3/31/21	DRAWING REFERENCE EDIT
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	11/06/20	11/20/20	3/31/21	
BID	—	—	—	4/8/17	—	—	—	
CONSTRUCTION	—	—	—	4/28/17	—	11/20/20	3/31/21	
	—	—	—	—	—	—	—	
RELEASED TO/FOR	A	B	C	0	0.A	1	2	
	DATE RELEASED							

BARR
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www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	JAK3
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING SECTION BALL MILL AREA EAST COLUMN 14 TO 19

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–112
REV. No. 2

CADD USER: Hbpwuser FILE: \\HB-PW\HB_PW_IN\5A7595E9-91FC-403B-B607-E21693F13A93\2C96A6EC-3AAB-4519-945C-E5AF4E5E6250\0646100104_300-MP-112.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:40 PM
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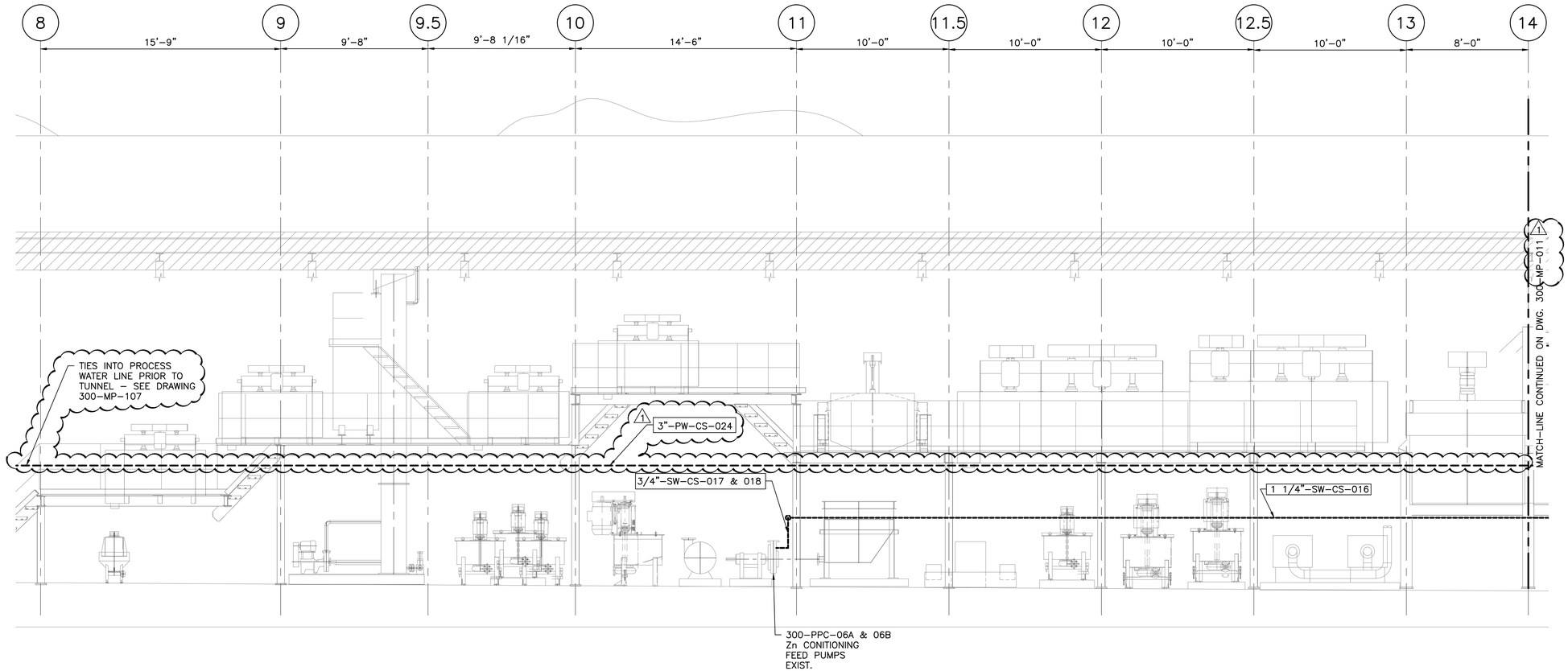

2 SECTION PIPING UTILITY SECTION: FLOTATION AREA WEST COLUMN LINE 8 TO 14

300-MP-106
300-MP-109
1/4"=1'-0"

NOTES

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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	ADDED PROCESS WATER LINE TO SLURRY STORAGE TANKS
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT — — — 4/28/17 3/31/21 — —
BID — — — 4/28/17 — — —
CONSTRUCTION — — — 4/28/17 3/31/21 — —

RELEASED TO/FOR | A | B | C | 0 | 1 | 2 | 3 | DATE RELEASED

BARR
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Project Office:
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Ph: 1-800-225-1966
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www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING - UTILITY
PIPING SECTION FLOTATION AREA WEST COLUMN 8 TO 14

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. -
DWG. No. 300-MP-113
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB-PW\HIB_PW_IN\5A75955E9-91FC-429B-B607-E2169F13A93\218913FC-C1ED-4CC5-9810-3E2306188330\0646100104_300-MP-113.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:41 PM
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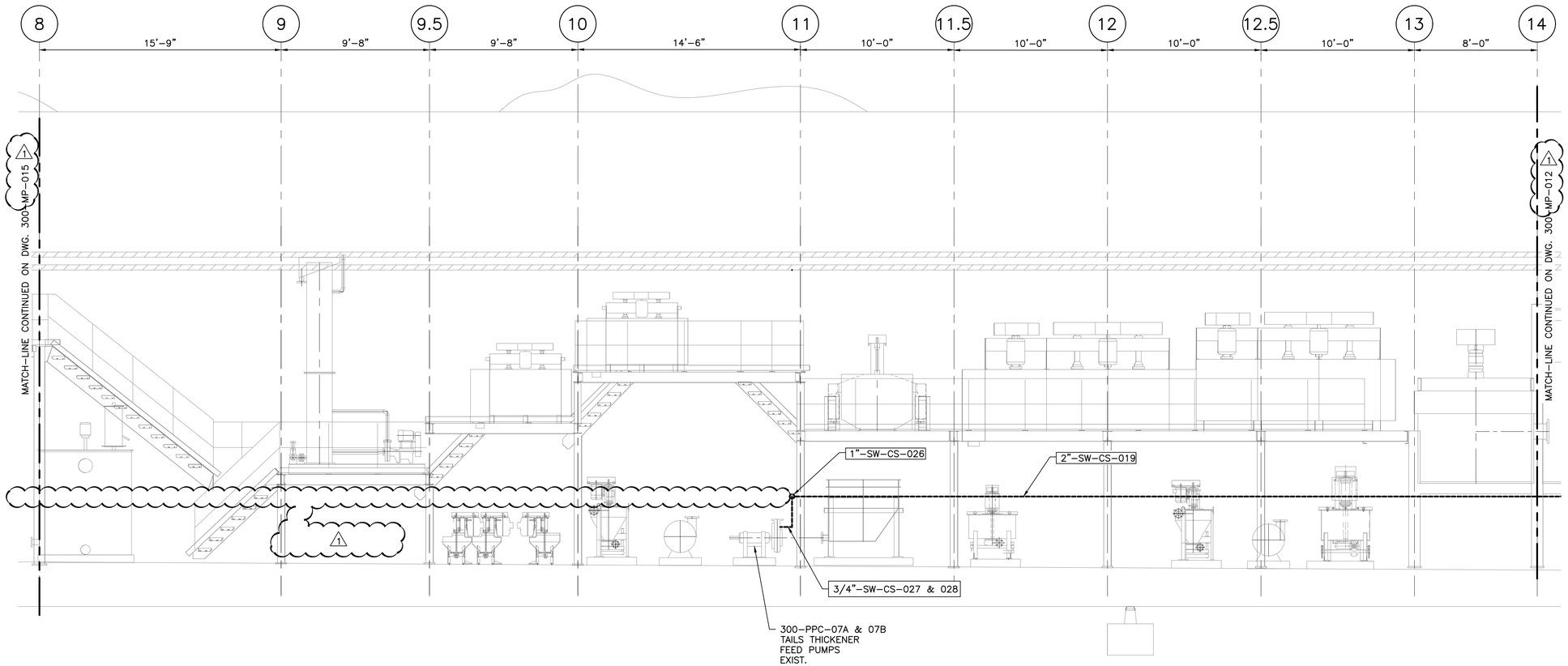

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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

3 PIPING – UTILITY SECTION: FLOTATION AREA EAST COLUMN LINE 8 TO 14

300–MP–106 / 300–MP–109 — 1/4"=1'–0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED — SCOTT BUCHER — PE.0052024 — PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	REMOVE GLAND WATER LINE
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 3/31/21; BID — 4/28/17 —; CONSTRUCTION — 4/28/17 3/31/21

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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BARR ENGINEERING CO.
3128 14TH AVENUE EAST
HIBBING, MN 55746
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Fax: (218) 262–3460
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	AMB3/JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING SECTION FLOTATION AREA EAST COLUMN 8 TO 14

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No. –
DWG. No. 300–MP–114
REV. No. 1

CADD USER: Hibpwuser FILE: \\HIB–FPW\HIB_PW_IN\5A7595E9–91FC–409B–B607–E21693F13A83\0FCC3A53–63E2–4F75–A7AC–978FE6E8D9E4\0646100104_300–MP–114.DWG PLOT SCALE: 1:1 PLOT DATE: 3/31/2021 5:41 PM
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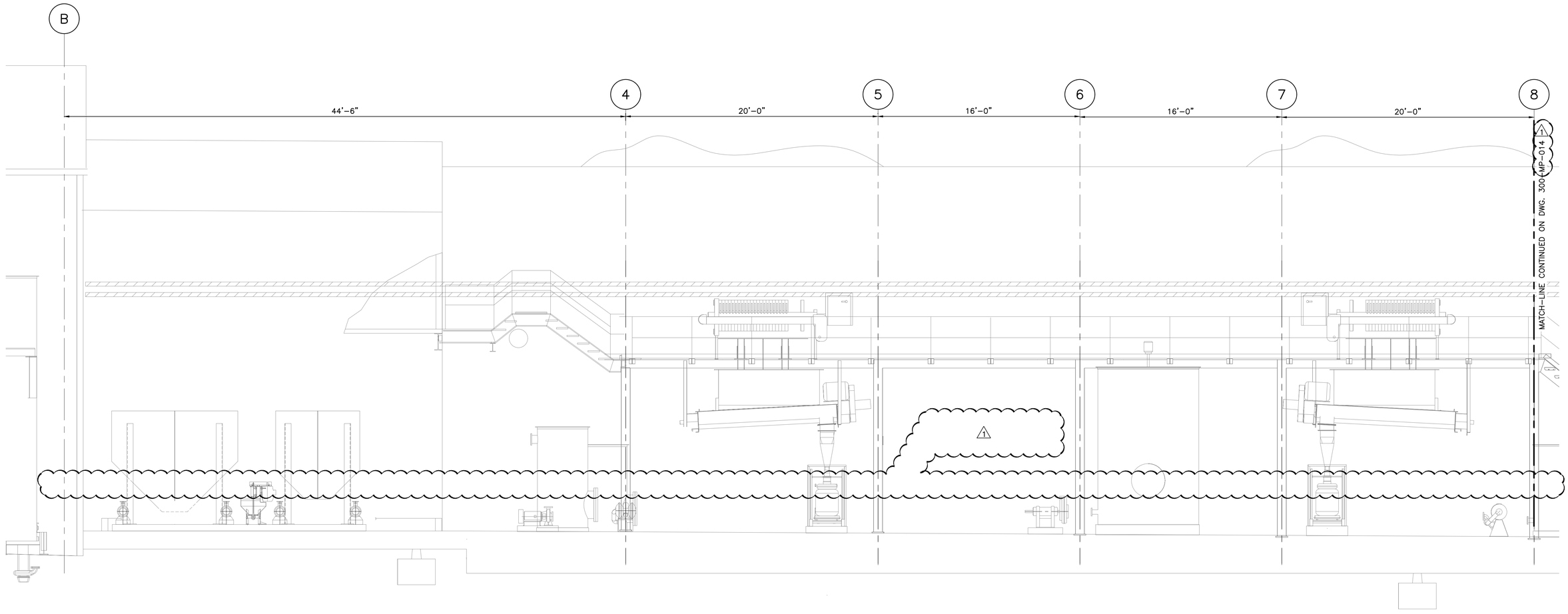

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PIPE LEGEND

- PROCESS WATER
- FRESH WATER
- GLAND SEAL WATER
- AIR

5 / 300-MP-107 / 1 — **PIPING – UTILITY SECTION: CONCENTRATOR AREA COLUMN B TO 8**
1/4"=1'-0"

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COLORADO LICENSED PROFESSIONAL ENGINEER PE.0052024 — 3/31/2021

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB	DSM	DSM	3/31/21	REMOVE GLAND WATER LINE
0	DTG	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17 3/31/21; BID — 4/28/17; CONSTRUCTION — 4/28/17 3/31/21

DATE RELEASED: A — B — C — 0 — 1 — 2 — 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

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3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1-800-225-1966
Fax: (218) 262-3460
www.barr.com

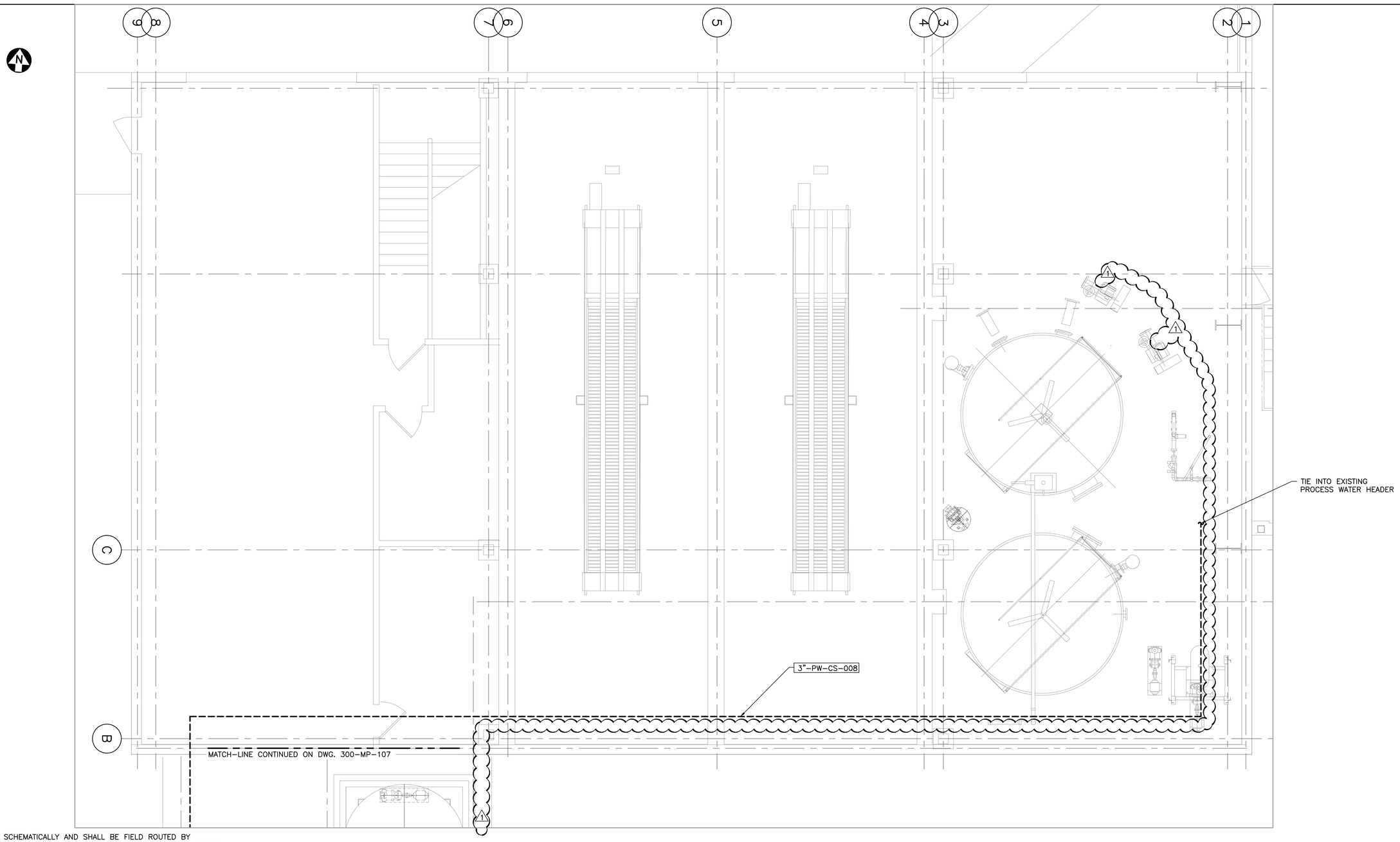
Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	PGJ
Approved	DSM

OURAY SILVER MINES INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING SECTION CONCENTRATOR AREA COLUMN B TO 8

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-115
REV. No. 1



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PIPE LEGEND

- PROCESS WATER
- FRESHGLANDWATERSEAL WATER
- AIR

6 PIPING – UTILITY PLAN: FILTER AREA

1/4"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	REMOVED GLAND WATER LINES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 3/31/21; BID 4/28/17; CONSTRUCTION 4/28/17 3/31/21

DATE RELEASED: A B C 0 1 2 3

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Fax: (218) 262-3460
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3/PGJ
Approved	DSM

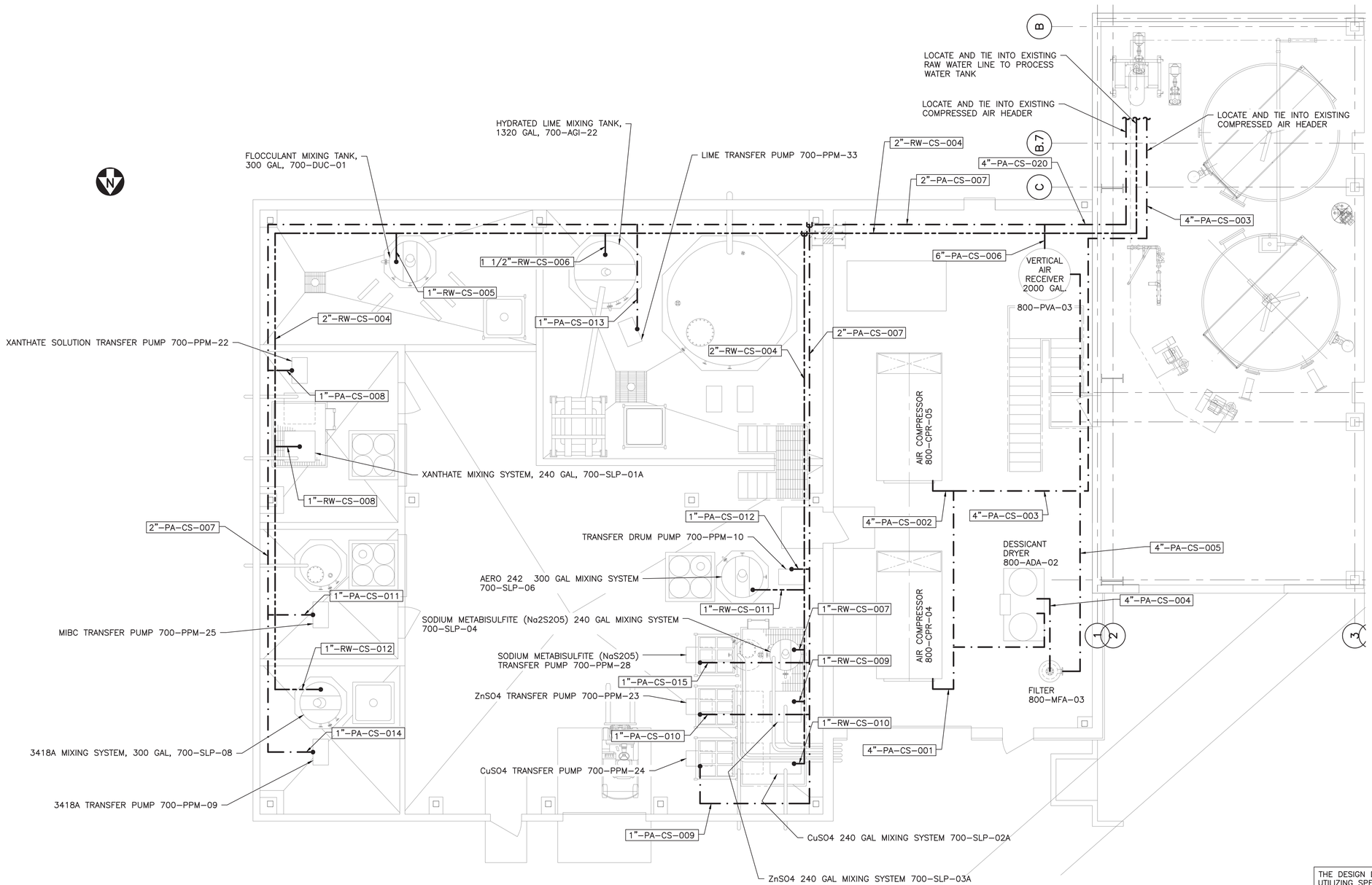
OURAY SILVER MINES INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
PIPING PLAN FILTER AREA

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-116
REV. No. 1

CADD USER: Hbpreuser FILE: \\HIB-PW\HIB_PW_NA\5A7595E9-91FC-409B-B607-E2169F13A93\D2015192-894D-4CFC-B0BE-E436F5EFBA41\0646100104_300-MP-116.DWG BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



1 PIPING – UTILITY PLAN: AIR COMPRESSOR AND REAGENT BUILDING
3/16"=1'-0"

NOTES

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PIPE LEGEND

- PROCESS WATER
- RAW WATER
- GLAND SEAL WATER
- AIR

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COLORADO LICENSED SCOTT MICHAEL SMITH PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTG	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID — 4/28/17; CONSTRUCTION — 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1-800-225-1966
Fax: (218) 262-3460
www.barr.com

Scale	AS SHOWN
Date	3/20/17
Drawn	DTJ
Checked	PGJ
Designed	PGJ
Approved	DSM

OURAY SILVER MINES, INC.
OURAY. COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
AIR COMPRESSOR AND REAGENT BUILDING

BARR PROJECT No. 06/461001.00
CLIENT PROJECT No. –
DWG. No. 300-MP-117
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\A8E6D89-5087-4028-9EAE-DB9BE743A12\F3683F76-4EF2-4E83-8CBA-7E935531921C\0646100100_300-MP-117.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:45 PM
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PROCESS WATER PIPING

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
1-1/4"	PW	CS	001	EXISTING HEADER	Zn ROUGHER FLOTATION TANK CELL 300-FCC-31	16	3	-	-	-	1	
1-1/4"	PW	CS	002	EXISTING HEADER	Zn ROUGHER FLOTATION CONENCTRATE PUMP 300-PPB-05	16	3	-	-	-		
1-1/4"	PW	CS	003	EXISTING HEADER	Pb CLEANER FLOTATION TANK CELL 300-FCC-32B	16	3	-	-	-	1	
1-1/4"	PW	CS	004	EXISTING HEADER	Pb CLEANER FLOTATION TANK CELL 300-FCC-32A	16	3	-	-	-	1	
1-1/4"	PW	CS	005	EXISTING HEADER	WET SCREENS	32	5	-	-	-	1	
1"	PW	CS	006	1-1/4"-PW-CS-005	WET SCREEN 300-SCT-02	8	2	-	-	-	1	
1"	PW	CS	007	1-1/4"-PW-CS-005	WET SCREEN 300-SCT-01	8	2	-	-	-		
3"	PW	CS	008	EXISTING HEADER	ROD MILL AREA	300	3	-	-	-	1	
1"	PW	CS	009	3"-PW-CS-008	ROD MILL FEED CHUTE	20	4	-	-	-	1	
1"	PW	CS	010	3"-PW-CS-008	ROD MILL DISCHARGE	25	4	-	-	-	1	
1-1/4"	PW	CS	011	3"-PW-CS-008	ROD MILL DISCHARGE PUMP BOX 300-PBB-30	30	6	-	-	-	1	
2"	PW	CS	012	3"-PW-CS-008	ROD MILL DISCHARGE STORAGE TANK	400	13	-	-	-	7	
1"	PW	CS	013	2"-PW-CS-012	ROD MILL DISCHARGE TRANSFER PUMP 300-PPC-33A/B	40	6	-	-	-	1	
1"	PW	CS	014	EXISTING HEADER	Pb CONCENTRATE THICKENER 400-THR-01	12	2	-	-	-	1	
1"	PW	CS	015	EXISTING HEADER	Zn CONCENTRATE THICKENER 400-THR-02	12	2	-	-	-		
1-1/4"	PW	CS	016	EXISTING HEADER	Zn CONDITIONING TANK 300-TKO-02	4	2	-	-	-	1	
1-1/4"	PW	CS	017	EXISTING HEADER	Zn CONDITIONING TANK 300-TKO-03	10	2	-	-	-	1	
1-1/4"	PW	CS	018	EXISTING HEADER	Pb CONDITIONING TANK 300-TKO-01	4	2	-	-	-	1	
1-1/4"	PW	CS	019	EXISTING HEADER	Pb ROUGHER FLOTATION TANK 300-FCC-30	16	3	-	-	-	1	
1"	PW	CS	020	EXISTING HEADER	BALL MILL FEED CHUTE	24	6	-	-	-	1	
1"	PW	CS	021	3"-PW-CS-008	ROD MILL DISCHARGE PUMP 300-PPC-31A/B	50	6	-	-	-	1	
1"	PW	CS	022	2"-PW-CS-012	ROD MILL DISCHARGE TRANSFER PUMP 300-PPC-33A/B	12	2	-	-	-		
2"	PW	CS	023	3" PW-CS-008	ROD MILL AREA HEADER	160	6	-	-	-	3	

SEAL WATER PIPING

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
3"	SW	CS	001	FRESH WATER LINE FROM RESERVOIR	3"-SW-CS-001	120	5	-	-	-	1	
3"	SW	CS	002	3"-SW-CS-001	GLAND WATER PUMP #1 800-PPM-08	5	2	-	-	-		
3"	SW	CS	003	3"-SW-CS-001	GLAND WATER PUMP #2 800-PPM-09	5	2	-	-	-		
2"	SW	CS	004	800-PPM-08	2"-SW-CS-006	150	5	-	-	-	1	
2"	SW	CS	005	800-PPM-09	2"-SW-CS-006	5	2	-	-	-		
2"	SW	CS	006	3"-SW-CS-004/005	BALL MILL AREA	270	6	-	-	-	1	
2"	SW	CS	007	2"-SW-CS-006	3/4"-SW-CS-008/009	135	5	-	-	-	1	
3/4"	SW	CS	008	2"-SW-CS-007	ROD MILL DISCHARGE PUMP #1 300-PPC-31A	30	3	-	-	-	1	
3/4"	SW	CS	009	2"-SW-CS-007	ROD MILL DISCHARGE PUMP #1 300-PPC-31B	30	4	-	-	-		
3/4"	SW	CS	010	2"-SW-CS-006	2"-SW-CS-011/012	40	6	-	-	-	1	
3/4"	SW	CS	011	3/4"-SW-CS-010	ROD MILL TRANSFER PUMP #1 300-PPC-33A	8	4	-	-	-		
3/4"	SW	CS	012	3/4"-SW-CS-010	ROD MILL TRANSFER PUMP #1 300-PPC-33B	8	4	-	-	-		
1"	SW	CS	013	2"-SW-CS-006	3/4"-SW-CS-014/015	14	5	-	-	-	2	
3/4"	SW	CS	014	1"-SW-CS-013	WET SCREEN PUMP #1 300-PPC-01A	12	2	-	-	-		
3/4"	SW	CS	015	1"-SW-CS-013	WET SCREEN PUMP #1 300-PPC-01B	12	2	-	-	-		
1-1/4"	SW	CS	016	2"-SW-CS-013	3/4"-SW-CS-017/018	62	4	-	-	-	1	
3/4"	SW	CS	017	1-1/4"-SW-CS-016	Zn CONDITIONING FEED PUMP 300-PPC-06A	8	4	-	-	-	1	
3/4"	SW	CS	018	1-1/4"-SW-CS-016	Zn CONDITIONING FEED PUMP 300-PPC-06B	12	1	-	-	-		
2"	SW	CS	019	2"-SW-CS-006	HEADER	150	1	-	-	-		
1"	SW	CS	020	2"-SW-CS-019	3/4"-SW-CS-021/022	18	3	-	-	-	2	
3/4"	SW	CS	021	2"-SW-CS-019	Zn ROUGHER FLOTATION FEED PUMP 300-PPC-37A	9	3	-	-	-	1	
3/4"	SW	CS	022	2"-SW-CS-019	Zn ROUGHER FLOTATION FEED PUMP 300-PPC-37B	6	2	-	-	-	1	
1"	SW	CS	023	2"-SW-CS-019	3/4"-SW-CS-024/025	12	3	-	-	-	2	
3/4"	SW	CS	024	1"-SW-CS-023	Pb ROUGHER FLOTATION FEED PUMP 300-PPC-02A	8	2	-	-	-	1	
3/4"	SW	CS	025	1"-SW-CS-023	Pb ROUGHER FLOTATION FEED PUMP 300-PPC-02B	6	2	-	-	-	1	
1"	SW	CS	026	2"-SW-CS-019	3/4"-SW-CS-027/028	12	3	-	-	-	2	
3/4"	SW	CS	027	1"-SW-CS-026	TAILS THICKENER FEED PUMP 300-PPC-07A	12	3	-	-	-	2	
3/4"	SW	CS	028	1"-SW-CS-026	TAILS THICKENER FEED PUMP 300-PPC-07B	12	3	-	-	-	2	
1-1/4"	SW	CS	029	2"-SW-CS-019	1"-SW-CS-030	260	4	-	-	-	1	
1"	SW	CS	030	1-1/4"-SW-CS-029	3/4"-SW-CS-031/032	14	2	-	-	-	1	
3/4"	SW	CS	031	1"-SW-CS-030	TAILINGS FILTER FEED PUMP #1 500-PPC-01A	8	1	-	-	-	1	
3/4"	SW	CS	032	1"-SW-CS-030	TAILINGS FILTER FEED PUMP #1 500-PPC-01B	8	1	-	-	-	1	
2"	SW	CS	033	2"-SW-CS-006	1" SW-CS-013 AND 1-1/4"-SW-CS-015	70	1	-	-	-	1	

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	BMC	JAK3	DSM	11/20/20	ISSUED FOR CONSTRUCTION
0.A	BMC	JAK3	DSM	11/06/20	ISSUED FOR APPROVAL
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: A B C 0 0.A 1 2

CLIENT				4/28/17	11/06/20	11/20/20	
BID				4/28/17			
CONSTRUCTION				4/28/17		11/20/20	

DATE RELEASED

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Scale	AS SHOWN
Date	4/7/17
Drawn	DTJ
Checked	JAK3
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. –
DWG. No. 300-MP-118
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\E56B1B31-3653-47F7-8D55-79A32BD89670\D942E1E9-C479-42B4-9ABA-9FD9C6E55A27\0646100104_300-MP-118.DWG PLOT SCALE: 1:1 PLOT DATE: 11/20/2020 7:11 AM
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COMPRESSED AIR PIPING

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
4"	PA	CS	001	800-CPR-04 MILL AIR COMPRESSOR	800-ADA-02 MILL INSTRUMENT AIR DRYER	12	6	-	-	-	-	-
4"	PA	CS	002	800-CPR-05 MILL AIR COMPRESSOR	800-ADA-02 MILL INSTRUMENT AIR DRYER	12	6	-	-	-	-	-
4"	PA	CS	003	EXISTING PLANT AIR HEADER	800-ADA-02 MILL INSTRUMENT AIR DRYER	80	12	-	-	-	-	-
4"	PA	CS	004	800-ADA-02 MILL INSTRUMENT AIR DRYER	800-MFA-03 MILL AIR FILTER	10	4	-	-	-	-	-
4"	PA	CS	005	800-MFA-03 MILL AIR FILTER	800-PVA-03 MILL AIR RECIEVER	40	4	-	-	-	-	-
6"	PA	CS	006	800-PVA-03 MILL AIR RECIEVER	EXISTING PLANT AIR HEADER	4		-	-	-	1	-
2"	PA	CS	007	800-PVA-03 MILL AIR RECIEVER	REAGENT BUILING HEADER	180	6	-	-	-	9	-
1"	PA	CS	008	REAGENT BUILING HEADER	700-PPM-22 XANTHATE SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	009	REAGENT BUILING HEADER	700-PPM-23 CuSO4 SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	010	REAGENT BUILING HEADER	700-PPM-24 ZnSO4 SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	011	REAGENT BUILING HEADER	700-PPM-25 MIBC TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	012	REAGENT BUILING HEADER	700-PPM-26 AERO 242 SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	013	REAGENT BUILING HEADER	700-PPM-33 HYDRATED LIME TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	014	REAGENT BUILING HEADER	700-PPM-09 3418A SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
1"	PA	CS	015	REAGENT BUILING HEADER	700-PPM-28 Na2S2O5 SOLUTION TRANSFER PUMP	16	3	-	-	-	-	-
2"	PA	CS	016	EXISTING PLANT AIR HEADER IN CONCENTRATOR AREA	BALL MILL AREA	500	8	-	-	-	4	-
1"	PA	CS	017	EXISTING PLANT AIR HEADER	ROD MILL LUBE SPRAY SYSTEM	16	3	-	-	-	-	-
1"	PA	CS	018	EXISTING PLANT AIR HEADER	DUST FOG SUPRESSION SYSTEM	16	3	-	-	-	-	-
1"	PA	CS	019	EXISTING PLANT AIR HEADER	DUST FOG SUPRESSION SYSTEM	16	3	-	-	-	-	-
4"	PA	CS	020	800-PVA-03 MILL AIR RECIEVER	EXISTING PLANT AIR HEADER	80	12	-	-	-	-	-

RAW WATER PIPING

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
2"	RW	CS	004	EXISTING 2" FRESH WATER LINE	HEADER	191	3				8	
1"	RW	CS	005	HEADER	700-DUC-01 FLOCCULANT MIXING TANK	11	1					
1-1/4"	RW	CS	006	HEADER	700-AGI-22 LIME MIXING TANK	10	1					
1"	RW	CS	007	HEADER	700-SLP-04 NA2S205 MIXING SYSTEM	9	1					
1"	RW	CS	008	HEADER	700-SLP-01A XANTHATE MIXING SYSTEM	11	1					
1"	RW	CS	009	HEADER	700-SLP-03A ZNSO4 MIXING SYSTEM	9	1					
1"	RW	CS	010	HEADER	700-SLP-02A CUSO4 MIXING SYSTEM	9	1					
1"	RW	CS	011	HEADER	700-SLP-06 AERO 242 MIXING SYSTEM	13	1					
1"	RW	CS	012	HEADER	700-SLP-08 3418A MIXING SYSTEM	13	1					

COLORADO LICENSED
SCOTT MICEK
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	—	—	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	—	—
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—
RELEASED TO/FOR	A	B	C	0	1	2	3
	DATE RELEASED						

BARR
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Scale	AS SHOWN
Date	4/7/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – UTILITY
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No.	06/46–1001.00
CLIENT PROJECT No.	–
DWG. No.	300–MP–119
REV. No.	0

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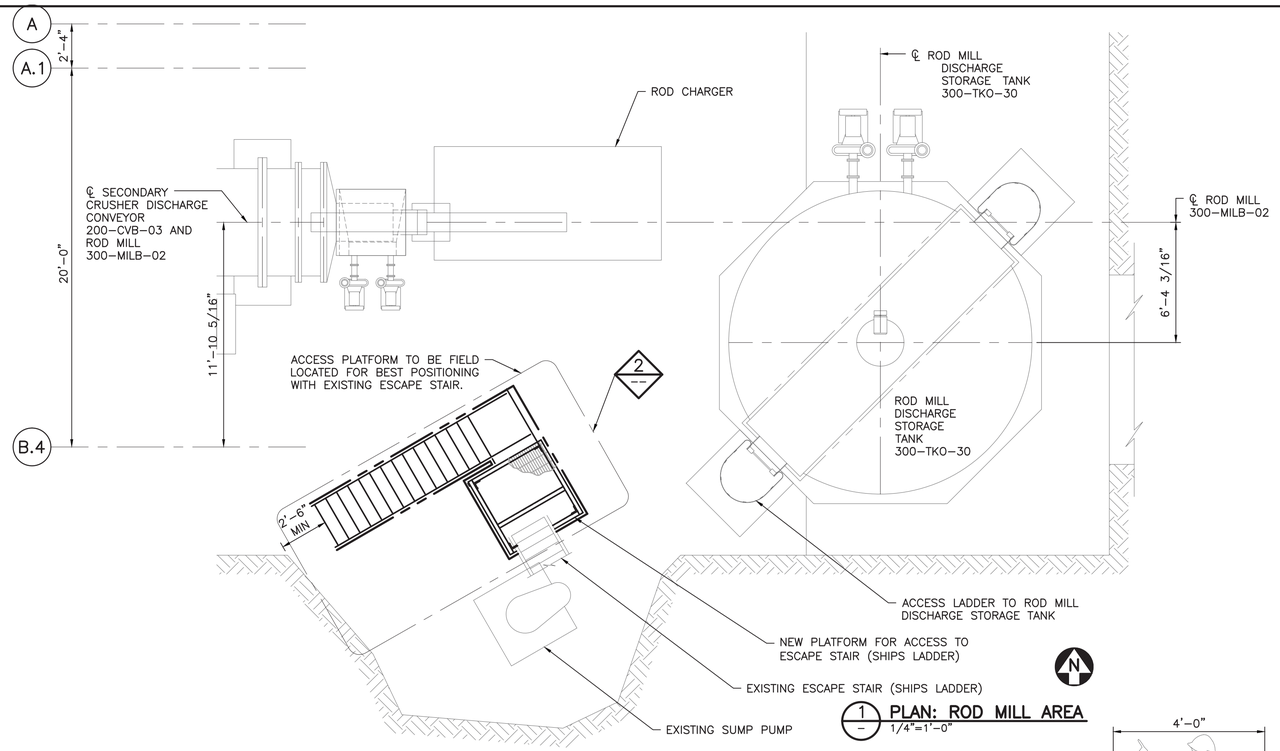
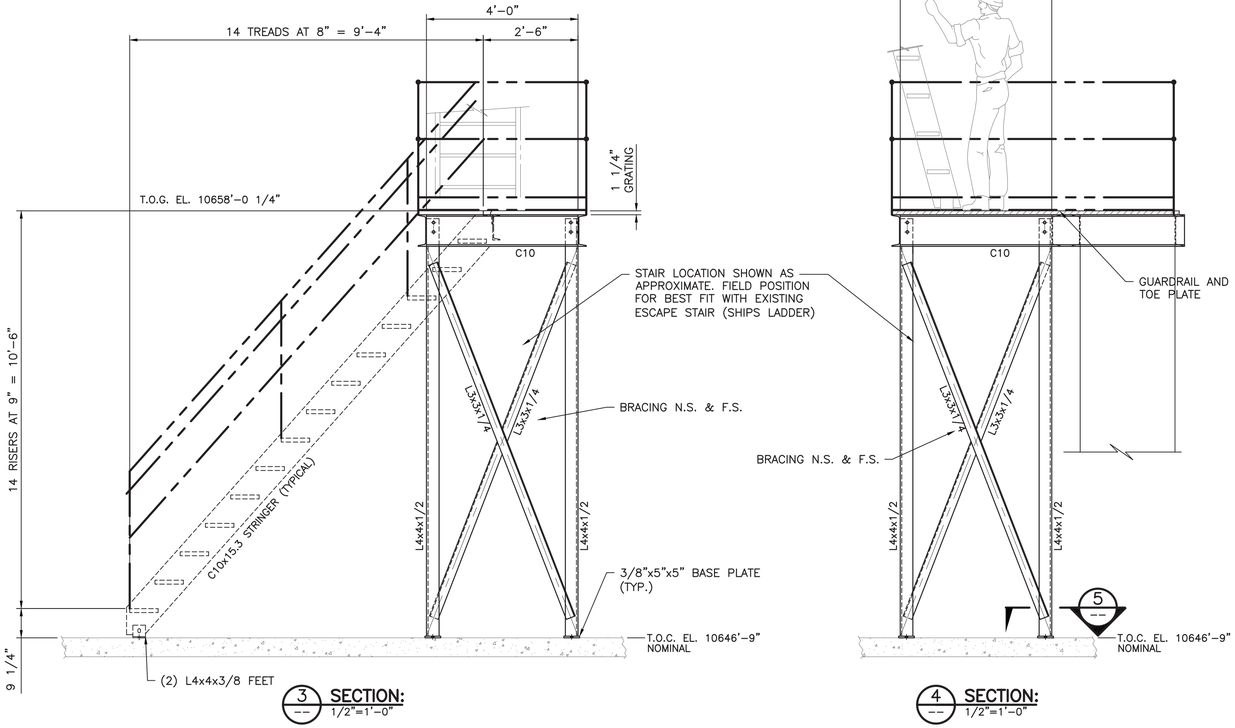
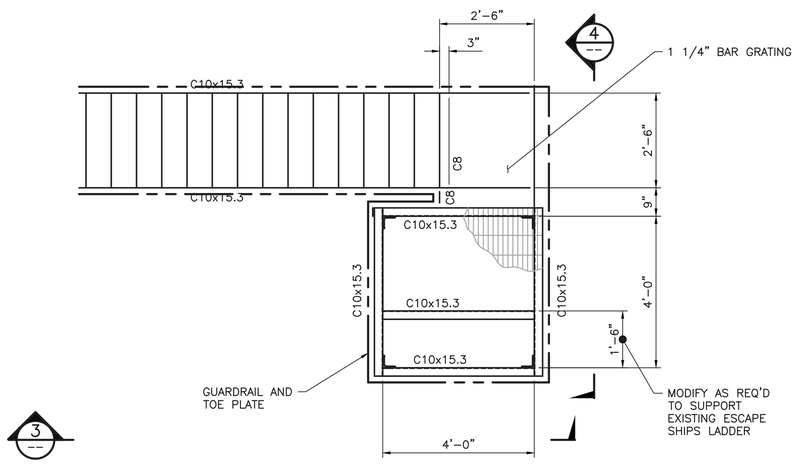


1 PLAN: ROD MILL AREA
1/4"=1'-0"



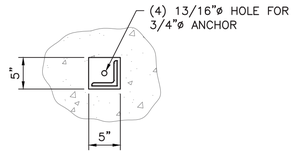
3 SECTION:
1/2"=1'-0"

4 SECTION:
1/2"=1'-0"



3

2 DETAIL: ESCAPE STAIR ACCESS PLATFORM
1/2"=1'-0"



5 SECTION:
1/2"=1'-0"

NOTES:
1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.
2. REFER TO DRAWINGS 100-SS-101 AND 100-SS-102 FOR TYPICAL DETAILS. IN PARTICULAR, TYPICAL DETAILS 1 (SIM), 6, 8, 11, 12, 13, AND 16 ON DRAWING 100-SS-101 APPLY TO THIS DRAWING.

COLORADO LICENSED JOHN G. TRULLINGER 51916 PROFESSIONAL ENGINEER Apr 28, 2017

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JWM	JGT	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A | B | C | 0 | 1 | 2 | 3

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Scale	AS SHOWN
Date	2/10/17
Drawn	APP
Checked	JGT
Designed	JWM
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
ESCAPE STAIR ACCESS PLATFORM

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 300-SS-101
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\F0615A4A-77EC-48E6-8FEB-70682C9846EE\200C1D36-E483-445D-A4BF-0CE4E4B5E50D\06461001.00_300-SS-101.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 2:07 PM
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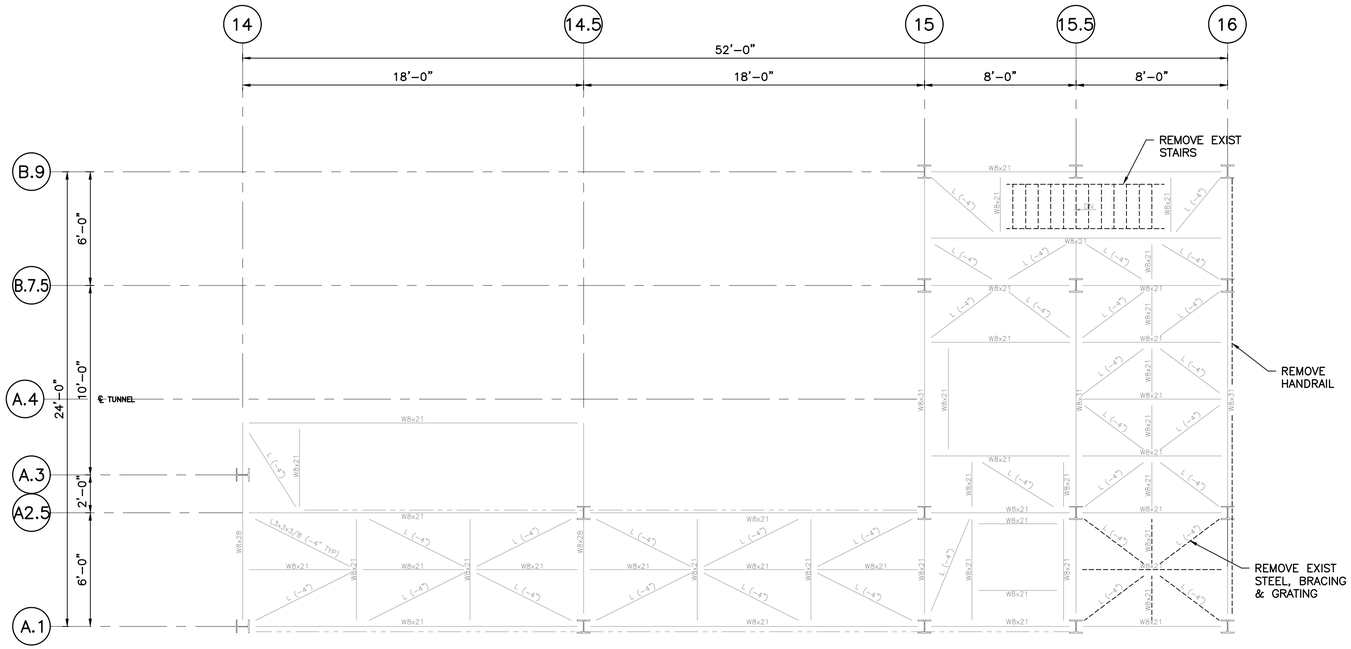
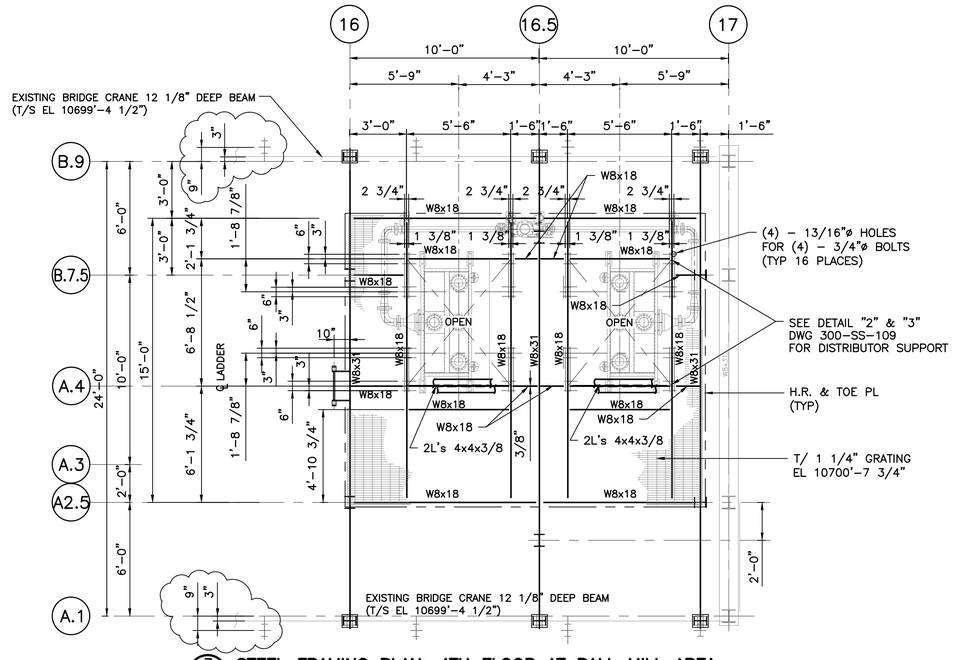
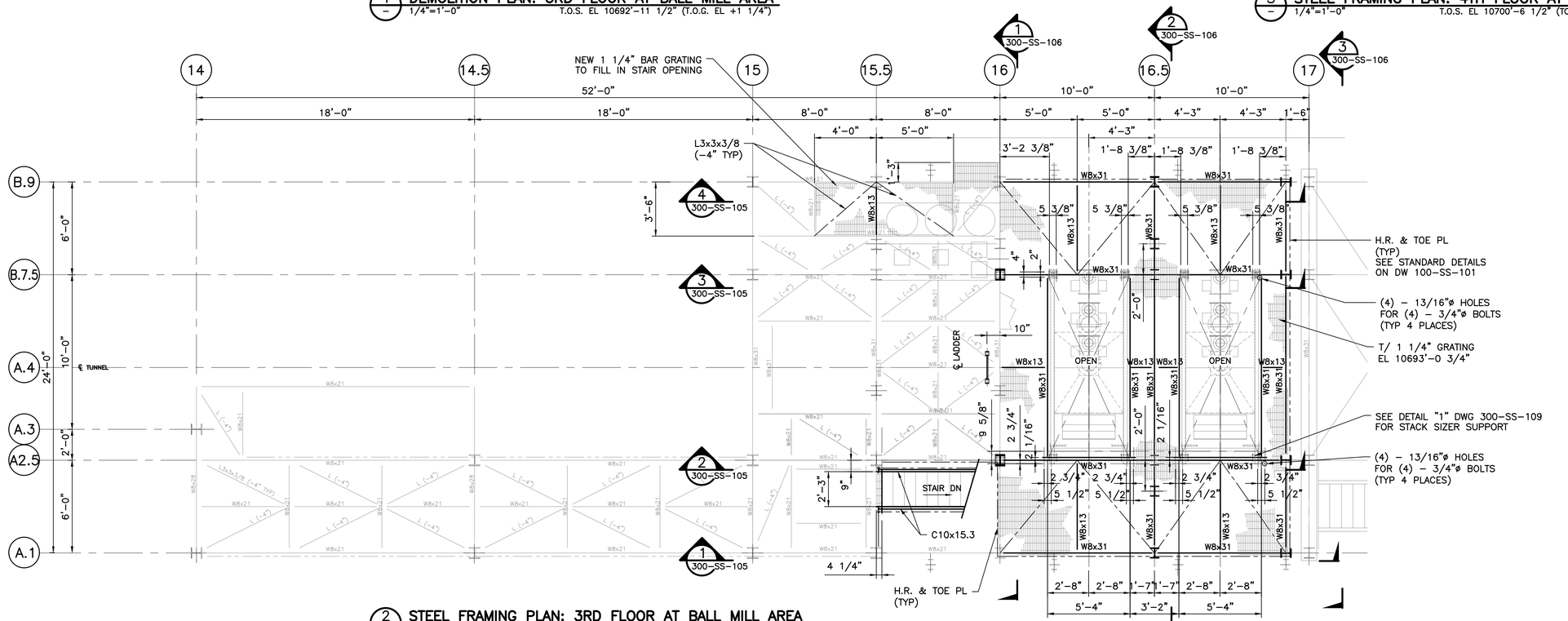


1 / – DEMOLITION PLAN: 3RD FLOOR AT BALL MILL AREA
1/4"=1'-0" T.O.S. EL 10692'-11 1/2" (T.O.G. EL +1 1/4")



3 / – STEEL FRAMING PLAN: 4TH FLOOR AT BALL MILL AREA
1/4"=1'-0" T.O.S. EL 10700'-6 1/2" (TOG + 1 1/4")



2 / – STEEL FRAMING PLAN: 3RD FLOOR AT BALL MILL AREA
1/4"=1'-0" T.O.S. EL 10692'-11 1/2" (TOG + 1 1/4")

COLORADO LICENSED
G. TRAUTNER
51915
PROFESSIONAL ENGINEER
Exp Date 10/31/21

⚠ DWG COMPLETELY REVISED

NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/07/20	COMPLETELY REVISED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17	12/7/20			
BID				4/28/17	12/7/20			
CONSTRUCTION				4/28/17	12/7/20			

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Scale	AS SHOWN
Date	10/5/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
3RD AND 4TH FL PLAN NEAR BALL MILL

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-SS-103
REV. No. 1

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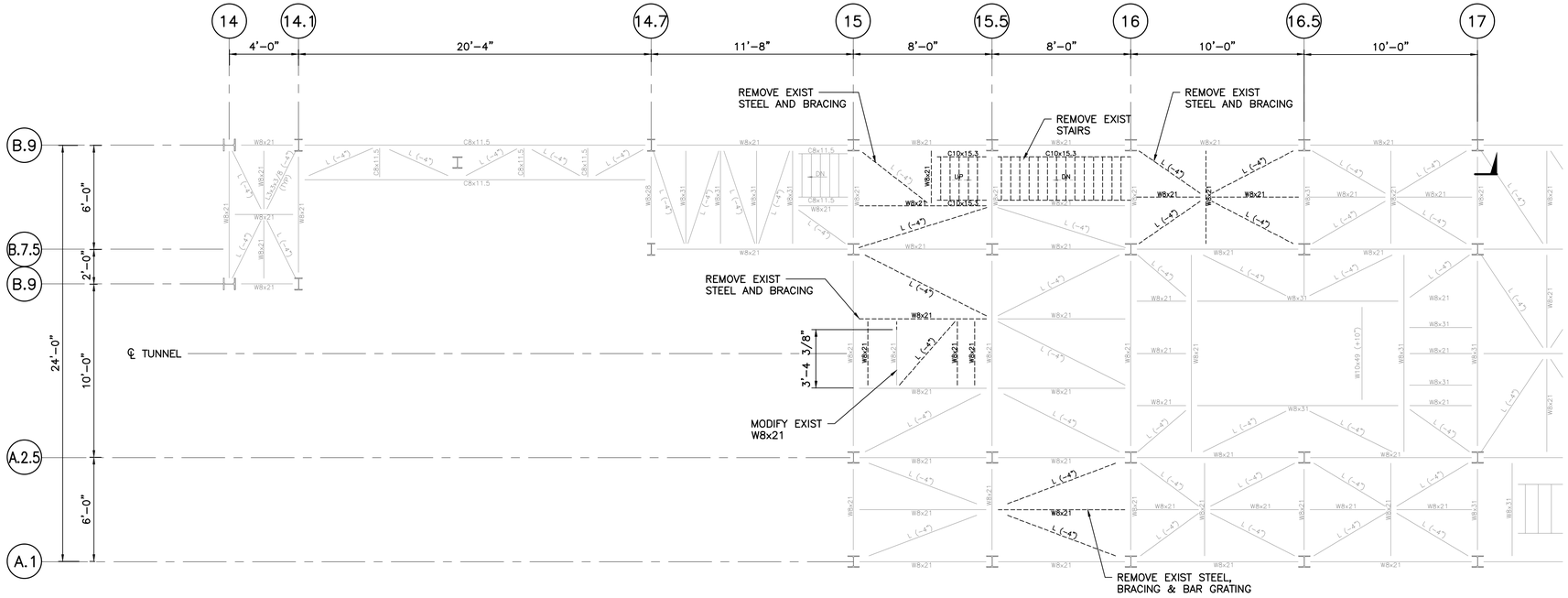
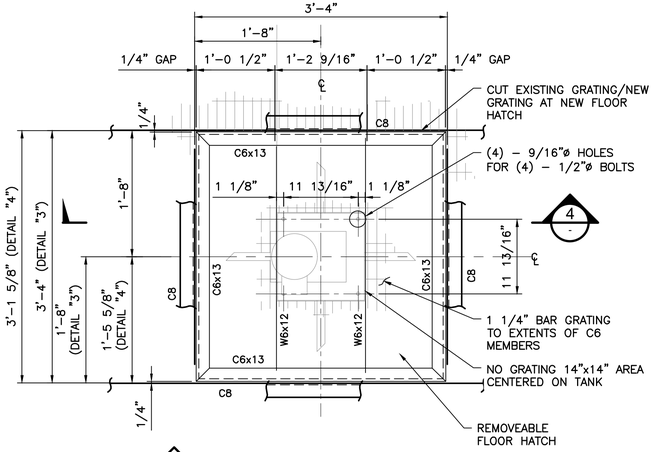
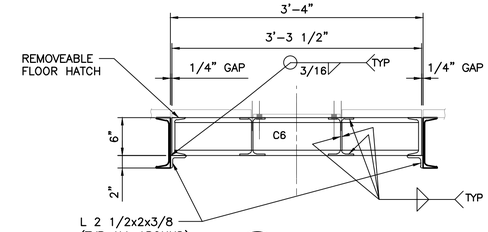


1 — DEMOLITION PLAN: 2ND FLOOR AT BALL MILL AREA
1/4"=1'–0"
T.O.S. EL 10684'–11 1/2" (TOG + 1 1/4")



3 — REMOVEABLE FLOOR HATCH DETAIL:
1"=1'–0"

4 — REMOVEABLE FLOOR HATCH DETAIL:



5 — SECTION:
1"=1'–0"

2 — STEEL FRAMING PLAN: 2ND FLOOR AT BALL MILL AREA
1/4"=1'–0"
T.O.S. EL 10684'–11 1/2" (TOG + 1 1/4")

COLORADO LICENSED
JOHN G. TERRELL
No. 51916
DEC 7, 2020
PROFESSIONAL ENGINEER
Exp Date 10/31/21

1 DWG COMPLETELY REVISED

NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100–SS–100 THROUGH 100–SS–102

ISSUED FOR CONSTRUCTION

NO.	BY	CHK	APP	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/07/20	COMPLETELY REVISED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION — 4/28/17, 12/7/20

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

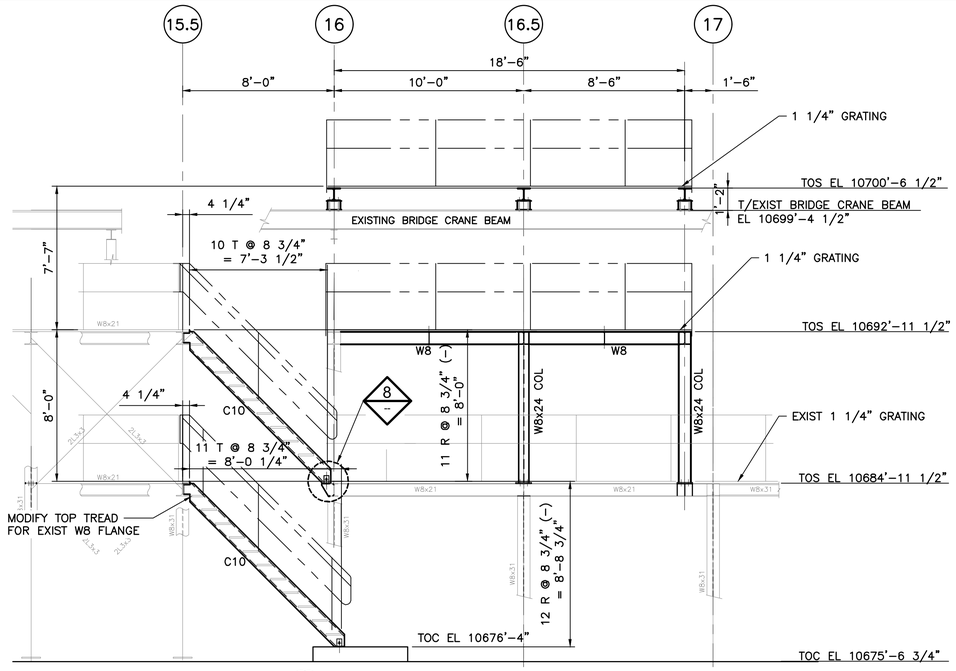
Scale	AS SHOWN
Date	10/5/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
2ND FLOOR FRAMING PLAN NEAR BALL MILL

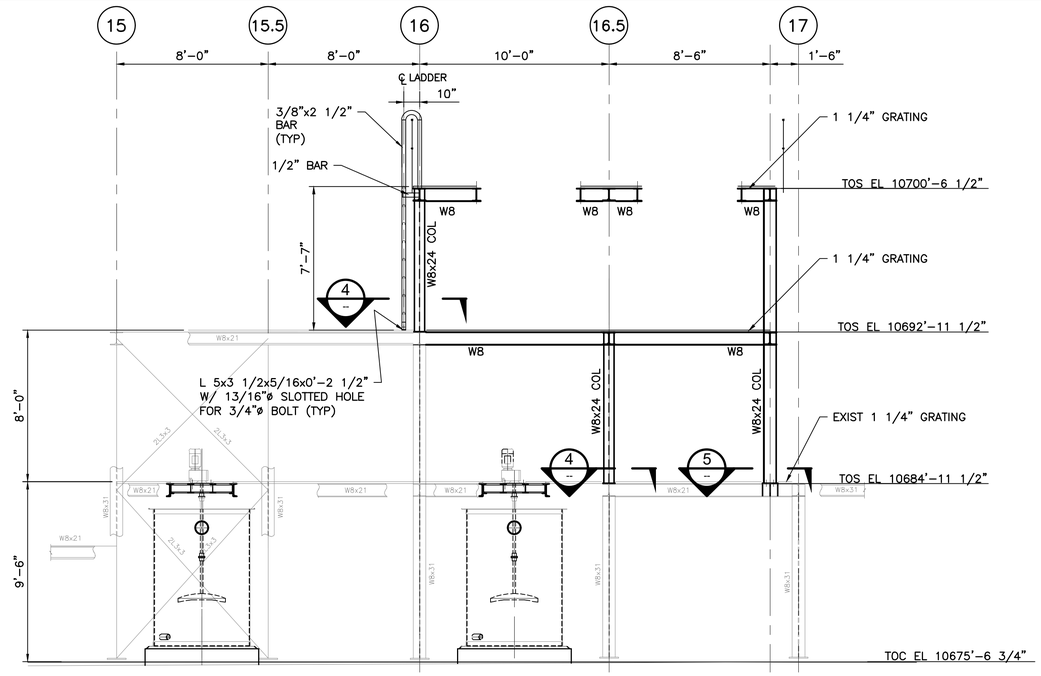
BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 300–SS–104
REV. No. 1



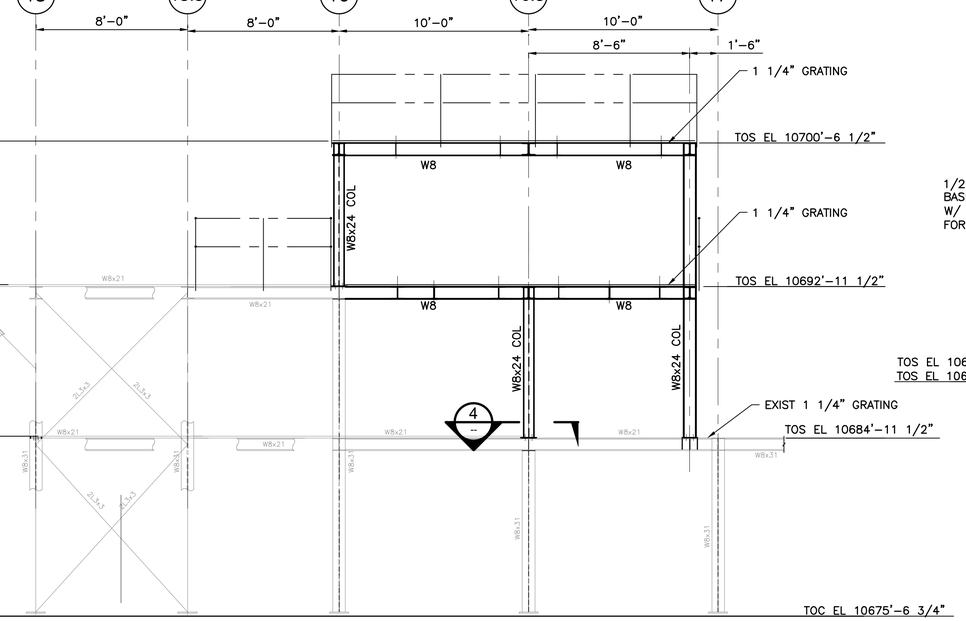
NOTE:
STAIRS ON SECTION "1" ONLY. SEE DWG 100-SS-101 FOR STAIR DETAILS

1 **ELEVATION: GRID LINE A.1** (AS SHOWN)
300-SS-103 & 104 — 1/4"=1'-0"

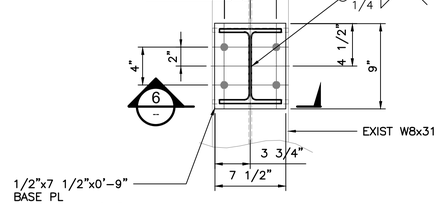
4 **ELEVATION: GRID LINE B.9** (SIM)
300-SS-103 & 104



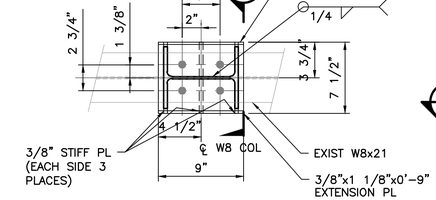
3 **ELEVATION: GRID LINE B.7.5**
300-SS-103 & 104 — 1/4"=1'-0"



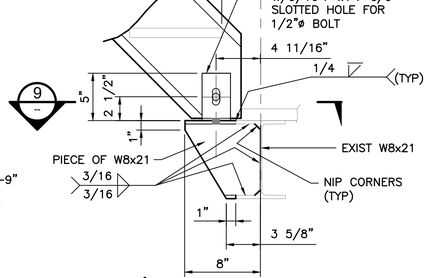
2 **ELEVATION: GRID LINE A.2.5**
300-SS-103 & 104 — 1/4"=1'-0"



4 **SECTION:** 1 1/2"=1'-0"

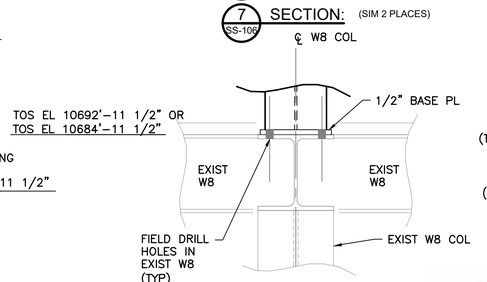


5 **SECTION:** 1 1/2"=1'-0"

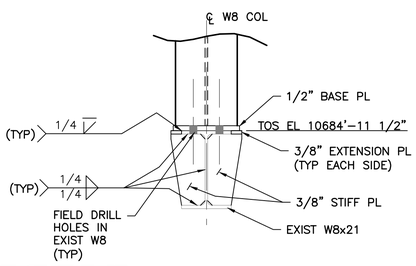


8 **DETAIL:** 1 1/2"=1'-0"

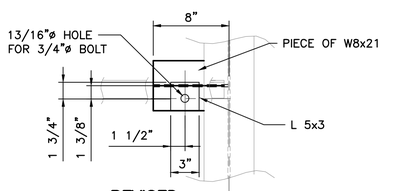
7 **SECTION:** SS-106 (SIM 2 PLACES)



6 **SECTION:** 1 1/2"=1'-0" (TYP 6 PLACES)



7 **SECTION:** 1 1/2"=1'-0" (TYP 4 PLACES)



REVISED
9 **SECTION:** 1 1/2"=1'-0" (TYP 2 PLACES)
(1 AS SHOWN - 1 OPP HAND)

COLORADO LICENSED
G. TROUTMAN
51916
PROFESSIONAL ENGINEER
Exp Date 10/31/21

1 DWG COMPLETELY REVISED

NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/07/20	COMPLETELY REVISED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT, BID, CONSTRUCTION — DATE RELEASED: A 4/28/17 12/7/20; B 4/28/17 12/7/20; C 4/28/17 12/7/20; 0; 1; 2; 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	10/5/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

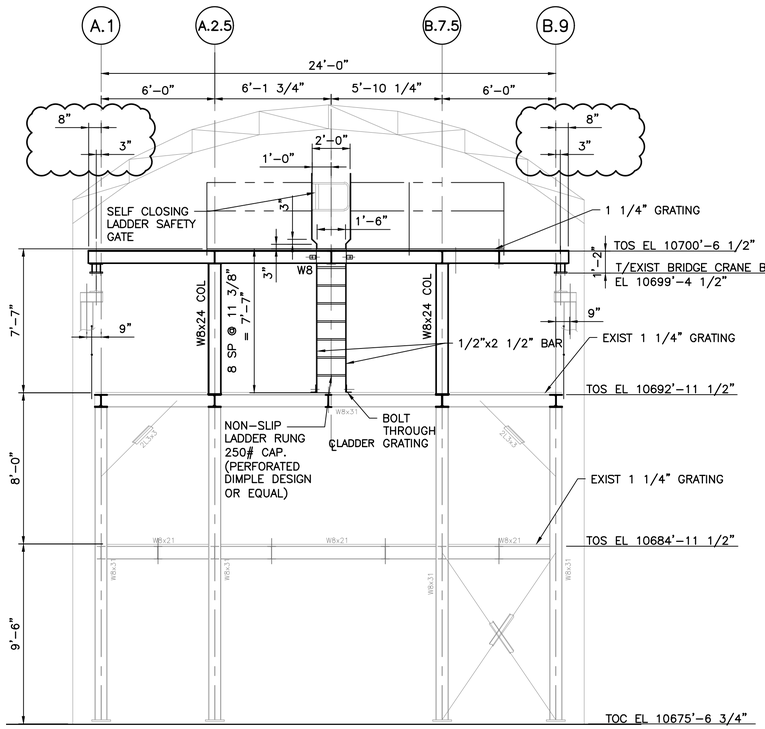
PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
FRAMING ELEVATIONS

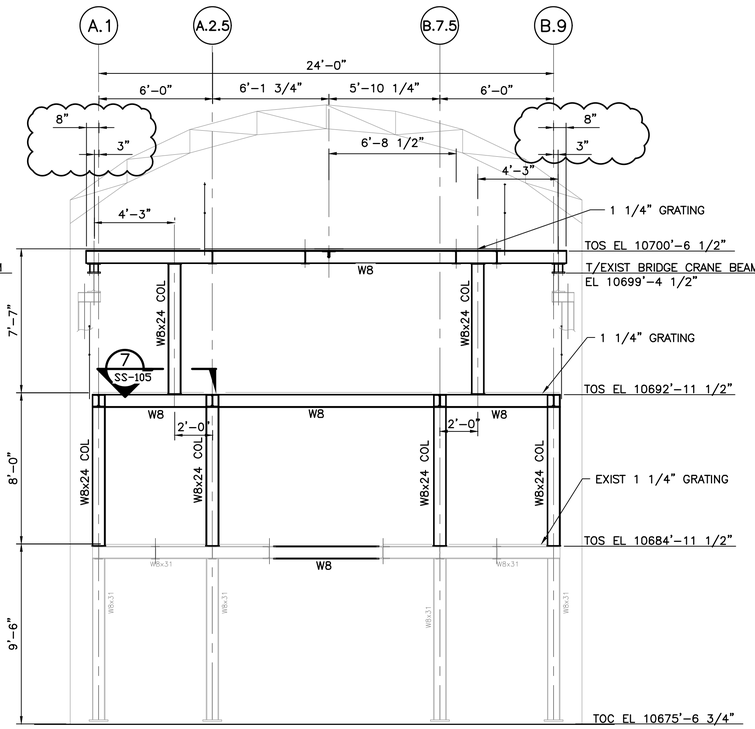
BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-SS-105
REV. No. 1

CADD USER: Dulpwuser FILE: \\DUL-PW\DUL_PW_IN\0240F497-08B8-46A4-B000-9932B10C2E2A\CCC42114-C899-4F52-8F42-5B458EE9DEE3\06461001O4_300-SS-105.DWG PLOT SCALE: 1:1 PLOT DATE: 12/8/2020 10:37 AM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:30

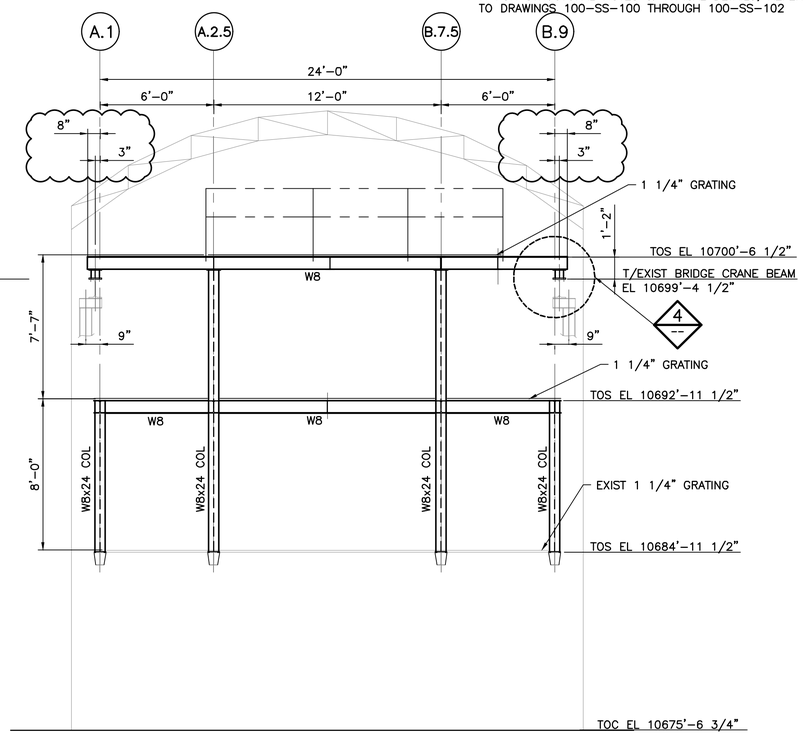
NOTES:
1. FOR STRUCTURAL NOTES & TYPICAL DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102



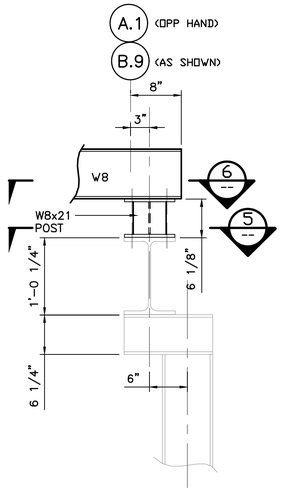
1 ELEVATION: GRID LINE 16
300-SS-103 & 104 1/4"=1'-0"



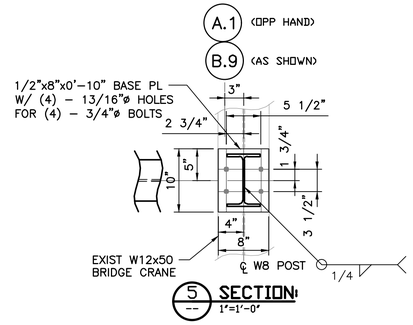
2 ELEVATION: GRID LINE 16.5
300-SS-103 & 104 1/4"=1'-0"



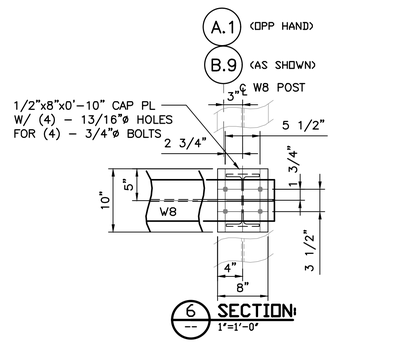
3 ELEVATION: GRID LINE 17
300-SS-103 & 104 1/4"=1'-0"



4 DETAIL
1"=1'-0"



5 SECTION
1"=1'-0"



6 SECTION
1"=1'-0"

1 DWG COMPLETELY REVISED

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	KLW	JGT	JGT	12/07/20	COMPLETELY REVISED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	12/7/20		
BID				4/28/17	12/7/20		
CONSTRUCTION				4/28/17	12/7/20		

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	10/5/2020
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	JGT

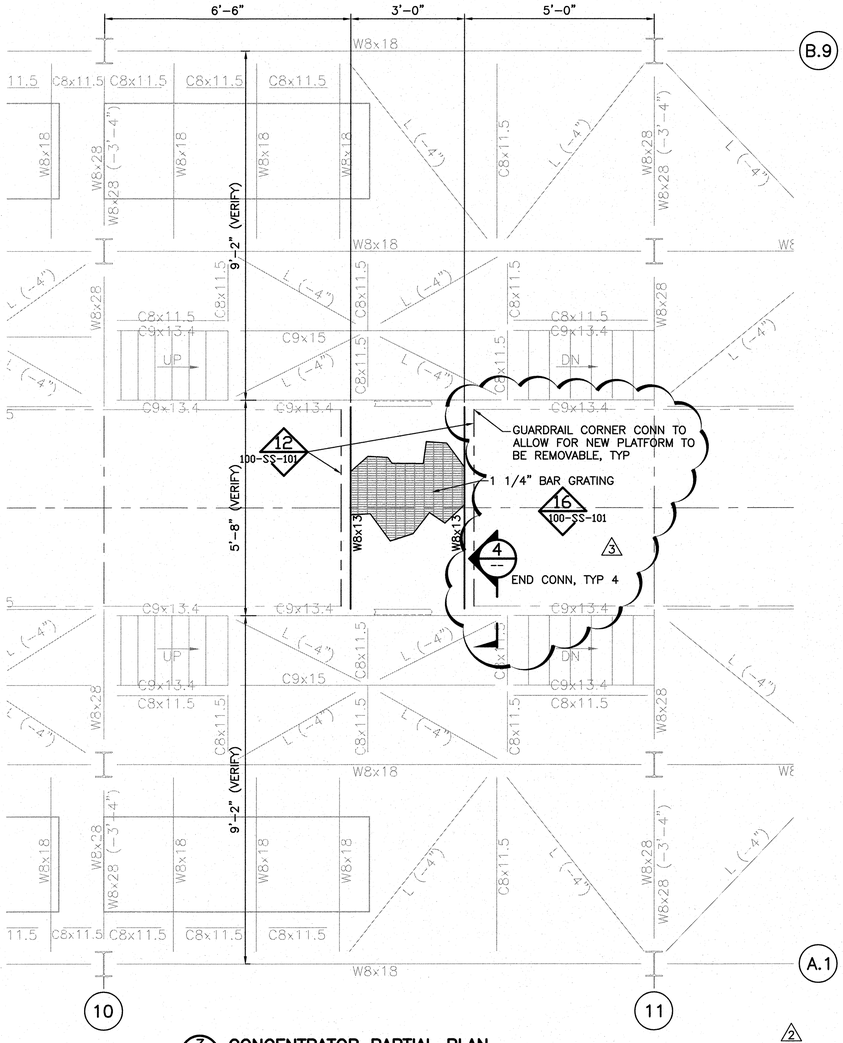
OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

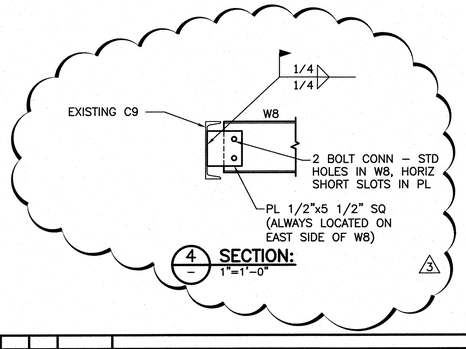
STRUCTURAL STEEL
FRAMING ELEVATIONS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-SS-106
REV. No. 1

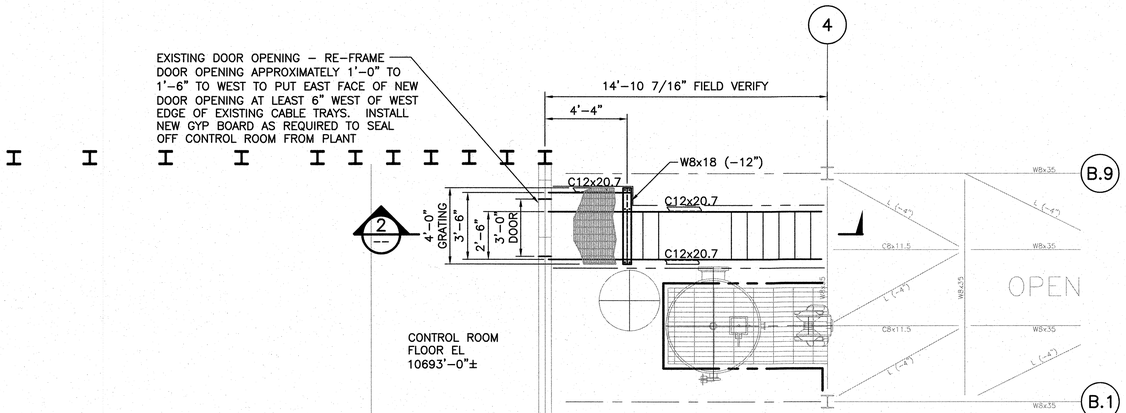
CADD USER: Dulpnuser FILE: \\DUL-FPW\DUL_PW_IN\024DF497-0BB8-46A4-B0D0-9952B10C2E2A\1FB81DF3-A7BE-45CE-B788-EB50586B6D6A\064610010A_300-SS-106.DWG BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50



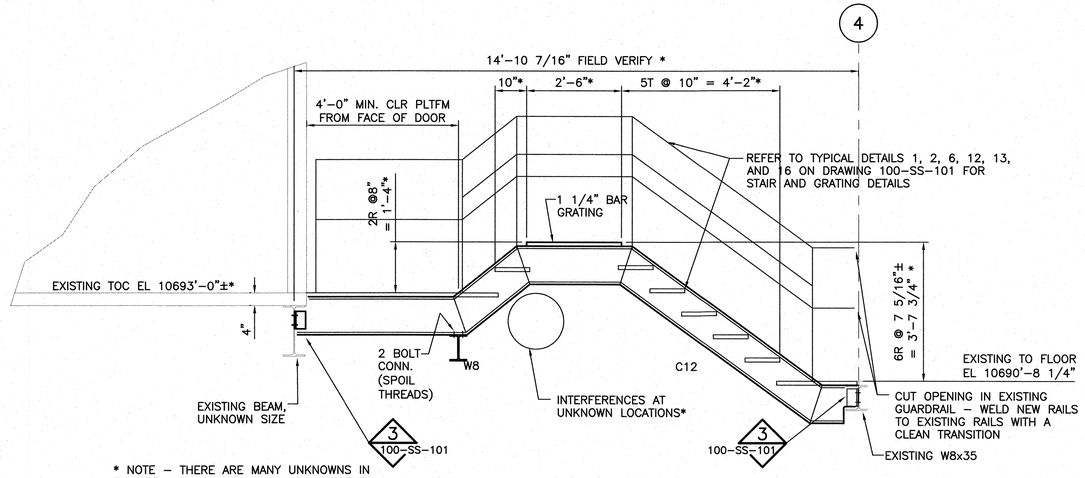
3 — CONCENTRATOR PARTIAL PLAN
1/2"=1'-0" T.O.S. EL 10688'-11"



4 — SECTION:
1"=1'-0"



1 — FLOOR PLAN AT CONTROL ROOM
1/4"=1'-0" T.O.S. EL 10690'-7" & 116'-0"



* NOTE – THERE ARE MANY UNKNOWNS IN THIS SECTION WHICH BARR WAS UNABLE TO MEASURE. THESE INCLUDE INTERFERENCE LOCATIONS, DISTANCE BETWEEN BEAMS, AND ELEVATION OF THE TWO FLOORS THAT WE ARE CONNECTING TO. THIS STEEL WILL LIKELY NEED TO EITHER BE FIELD MODIFIED OR FIELD FABRICATED IN ORDER TO GET A DESIGN TO FIT BASED ON THESE UNKNOWNS

2 — SECTION:
1"=1'-0"

COLORADO LICENSED JOHN B. TRULLINGER 51916 PROFESSIONAL ENGINEER Exp Date 10/31/21

NOTES:
1. FOR STRUCTURAL NOTES AND STANDARD DETAILS, REFER TO DRAWINGS 100-SS-100 THROUGH 100-SS-102

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
3	JGT	JGT	JGT	2/26/21	MODIFY PARTIAL PLAN 3 AND ADD SECTION 4 FOR PLATFORM REMOVABILITY
2	JGT	JGT	JGT	2/24/21	ADD PARTIAL PLAN 3
1	KLW	JGT	JGT	12/7/20	ISSUED FOR CONSTRUCTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 12/7/20 2/24/21 2/26/21; BID 4/28/17 12/7/20 2/24/21; CONSTRUCTION 4/28/17 12/7/20 2/24/21 2/26/21
DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	3/28/17
Drawn	APP
Checked	JGT
Designed	TOP
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
2ND FLOOR FRAMING PLAN NEAR BALL MILL

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 300-SS-107
REV. No. 3

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100104_300-SS-107.DWG PLOT SCALE: 1:1 PLOT DATE: 2/26/2021 4:22 PM
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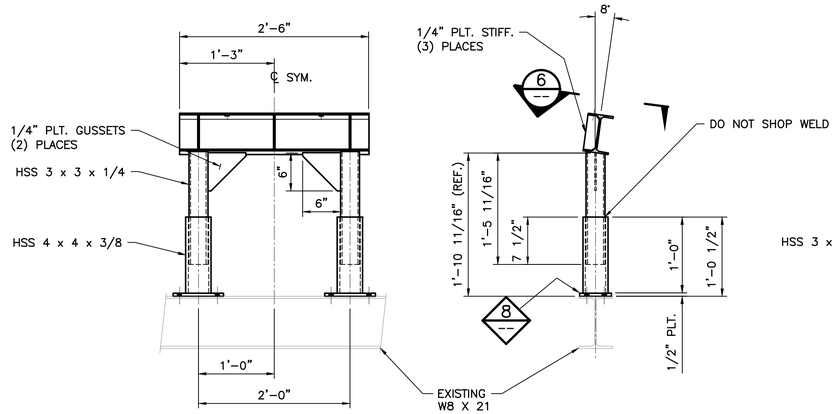
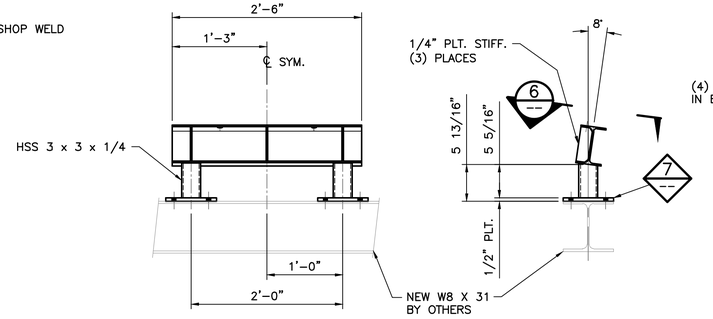
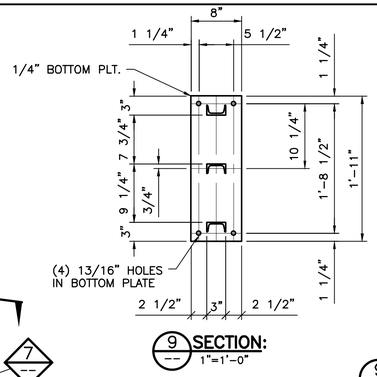


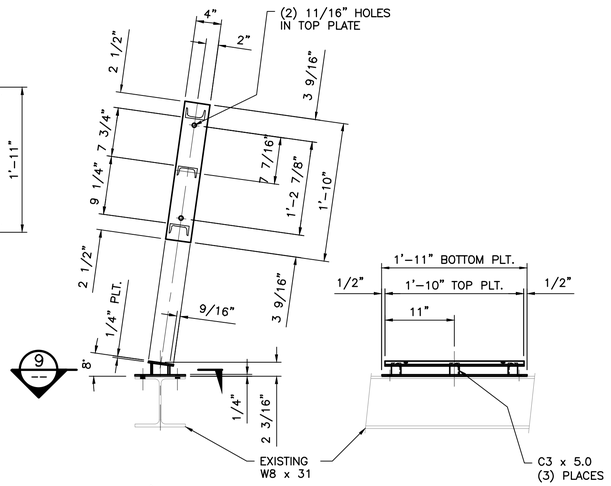
3 DETAIL: SCREW CONVEYOR SUPPORT 3
300-GA-022 1"=1'-0"
(1) REQ'D.



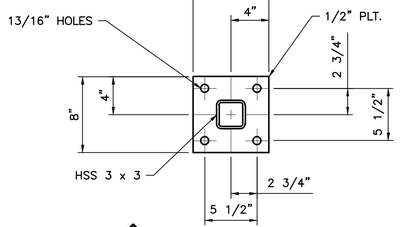
2 DETAIL: SCREW CONVEYOR SUPPORT 2
300-GA-022 1"=1'-0"
(1) REQ'D.



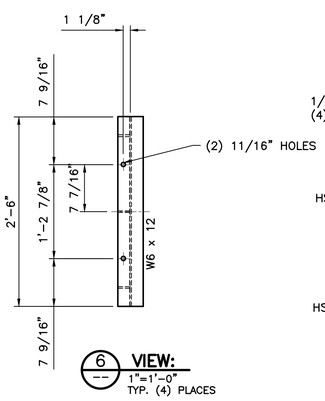
9 SECTION:
1"=1'-0"



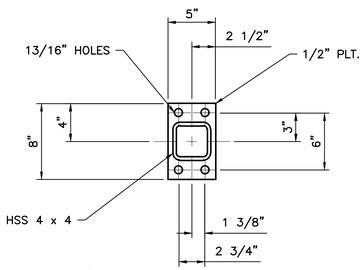
1 DETAIL: SCREW CONVEYOR SUPPORT 1
300-GA-022 1"=1'-0"
(1) REQ'D.



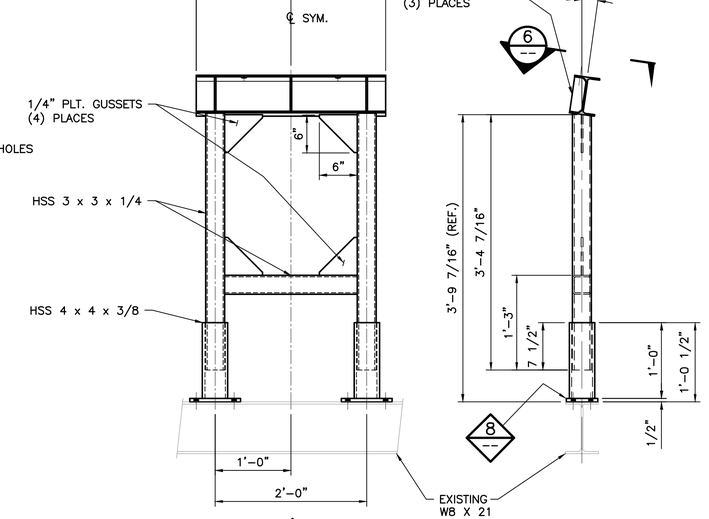
7 DETAIL: BASE PLATE
1 1/2"=1'-0"
TYP. (2) PLACES ON SUPPORT 2



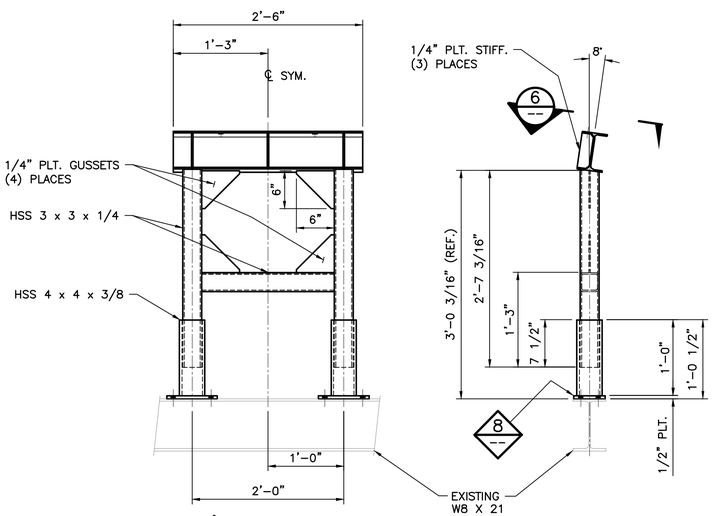
6 VIEW:
1"=1'-0"
TYP. (4) PLACES



8 DETAIL: BASE PLATE
1 1/2"=1'-0"
TYP. (6) PLACES
(2) ON SUPPORT 3
(2) ON SUPPORT 4
(2) ON SUPPORT 5



5 DETAIL: SCREW CONVEYOR SUPPORT 5
300-GA-022 1"=1'-0"
(1) REQ'D.



4 DETAIL: SCREW CONVEYOR SUPPORT 4
300-GA-022 1"=1'-0"
(1) REQ'D.

COLORADO LICENSED
JOHN G. TRUELSEN
51916
PROFESSIONAL ENGINEER
Exp Date 10/31/21

NEW DRAWING

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	BMC	JGT	JGT	12/7/20	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 12/7/20; BID 12/7/20; CONSTRUCTION —
DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 3128 14TH AVENUE EAST HIBBING, MN 55746
Ph: 1-800-225-1966 Fax: (218) 262-3460 www.barr.com

Scale	AS SHOWN
Date	11/5/20
Drawn	BMC
Checked	JGT
Designed	JGT
Approved	.

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
SCREW CONVEYOR SUPPORTS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. —
DWG. No. 300-SS-108
REV. No. 0

CADD USER: Dulpwuser FILE: \\DUL-PW\DUL_PW_IN\0F44EF64-C095-49DA-90BE-5947C0185586\Y66331B7-69A3-4183-A749-89EA0C5DD33B\0646100104_300-SS-108.DWG PLOT SCALE: 1:1 PLOT DATE: 12/7/2020 5:18 PM
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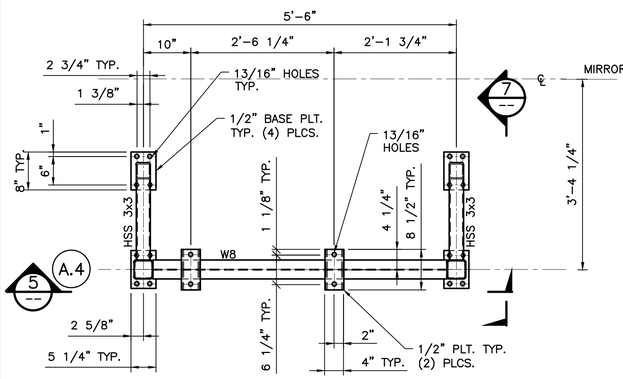
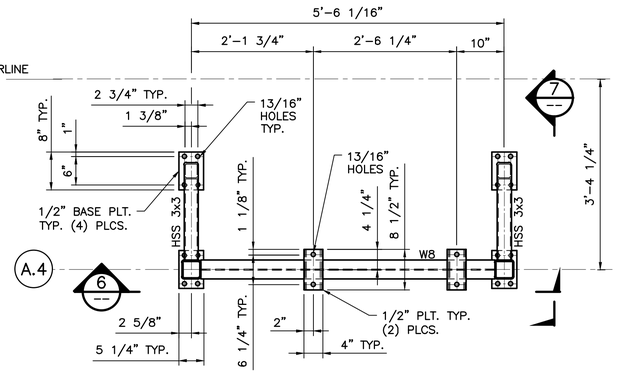


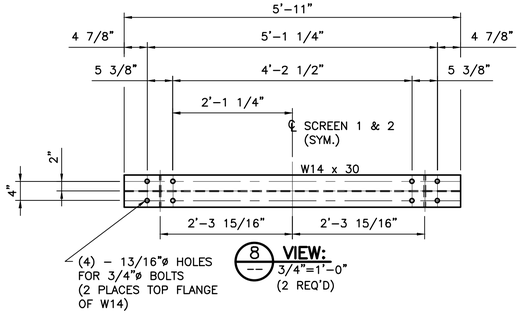
PLAN:

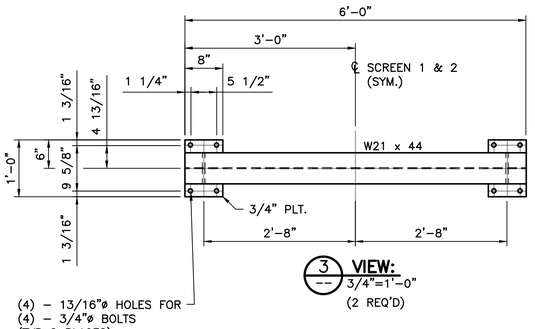
2 DETAIL: DISTRIBUTOR SUPPORT (LH)
300-GA-013, 300-GA-016, 300-GA-021
3/4"=1'-0"
(2) REQ'D.

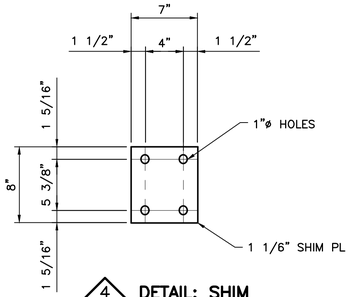


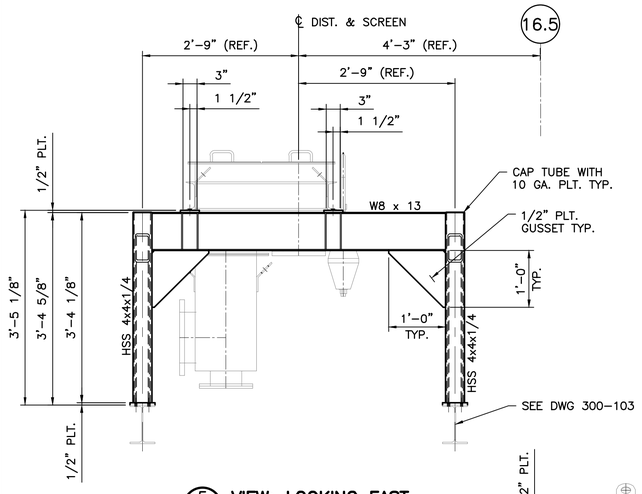
PLAN:

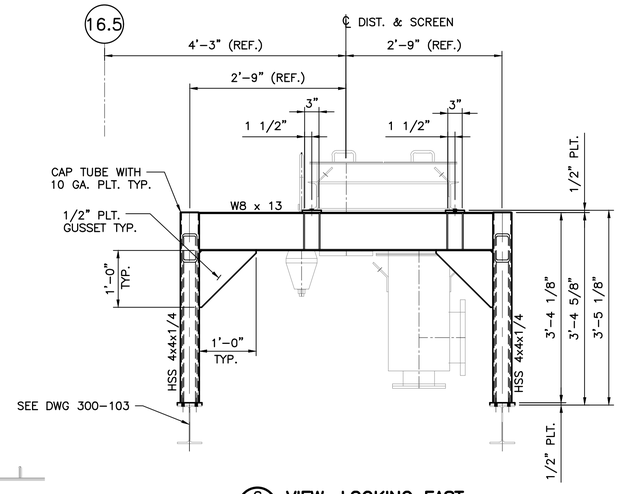
3 DETAIL: DISTRIBUTOR SUPPORT (RH)
300-GA-013, 300-GA-016, 300-GA-021
3/4"=1'-0"
(2) REQ'D.

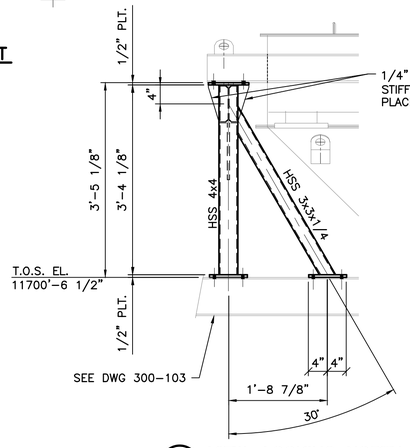


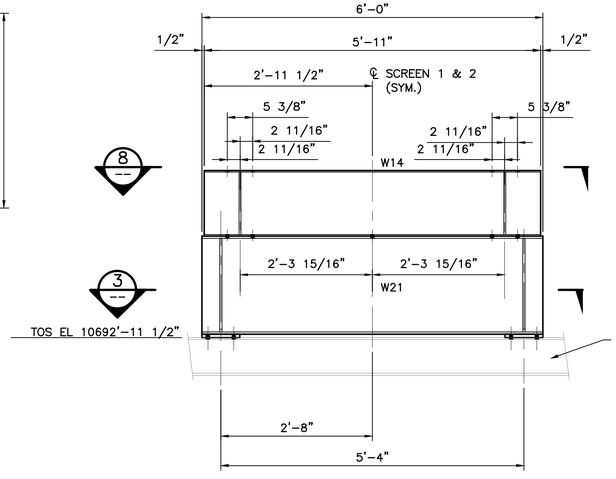


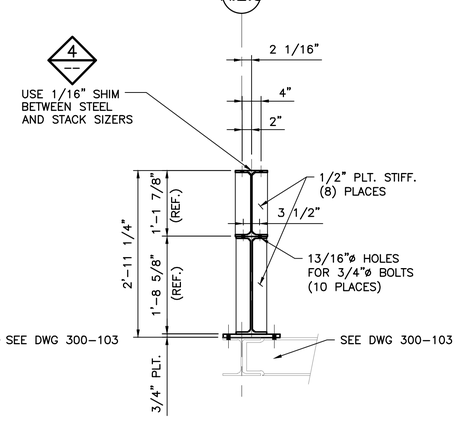












1 DETAIL: STACK SIZER SUPPORT
300-GA-013, 300-GA-016, 300-GA-021
3/4"=1'-0"
(2) REQ'D.

NEW DRAWING

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	KLW	JGT	JGT	12/7/20	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 12/7/20; BID 12/7/20; CONSTRUCTION 12/7/20
DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Ph: 1-800-225-1966 Fax: (218) 262-3460 www.barr.com

Scale	AS SHOWN
Date	11/5/20
Drawn	KLW
Checked	JGT
Designed	JGT
Approved	.

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
STACK SIZER AND DISTRIBUTOR SUPPORTS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No. -
DWG. No. 300-SS-109
REV. No. 0

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400 Area Drawings

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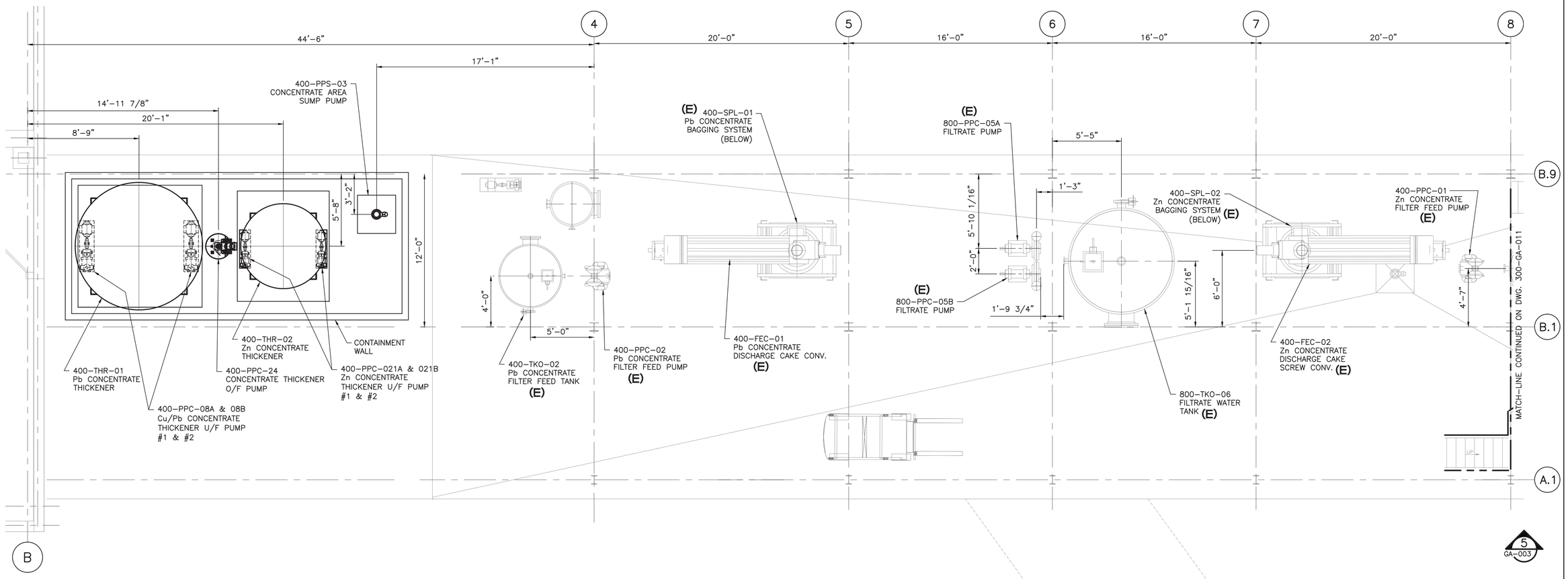

3 — PLAN: CONCENTRATOR GRADE FLOOR COLUMN B TO 8
1/4"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
A	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID — 4/28/17; CONSTRUCTION — 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
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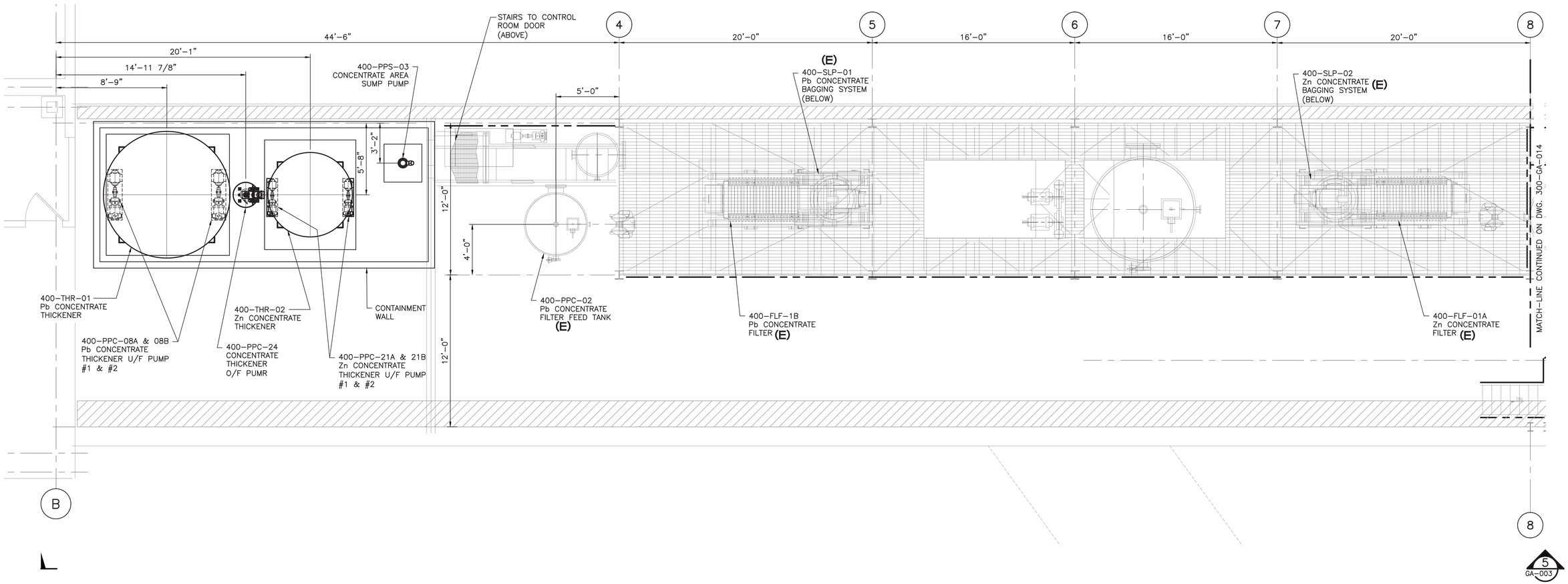
Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. GRADE FLOOR PLAN COL. B TO 8

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 400-GA-001
REV. No. 0



6 PLAN: CONCENTRATOR UPPER LEVEL COLUMN LINE B TO 8
1/4"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED DAVID SCOTT MICKELSEN PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID — 4/28/17; CONSTRUCTION — 4/28/17

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BARR
Corporate Headquarters: Minneapolis, Minnesota
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. UPPER LEVEL PLAN COL. B TO 8

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 400-GA-002
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW IN\{EB4425F-B8BD-471B-9EC3-10835517973C}\B2632C9-E7F5-451D-9F47-7BE52ACE3CC5}\0646100100_400-GA-002.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 10:05 AM
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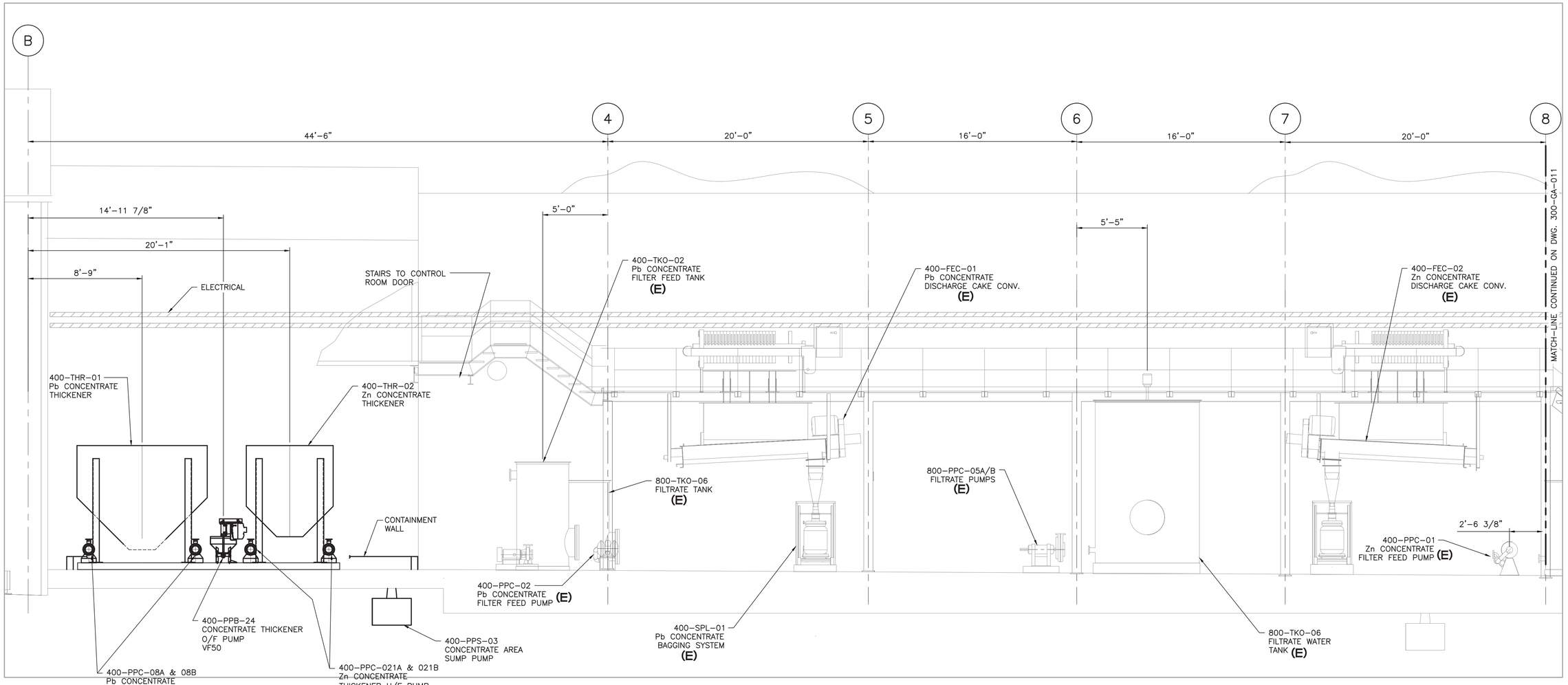

5 SECTION: CONCENTRATOR EAST SIDE OF TUNNEL COLUMN LINE B TO 8

GA-001, GA-002 — 1/4"=1'-0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT				4/28/17				
BID				4/28/17				
CONSTRUCTION				4/28/17				
	A	B	C	0	1	2	3	
DATE RELEASED								

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277

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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
CONC. SECTION EAST COL. B TO 8

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 400-GA-003
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\EEB4425F-B88D-471B-9EC3-10835517797C3\150503E-FCBC-4111-842C-E9FFA164BFCA\06461001001_400-GA-003.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 10:02 AM
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500 Area Drawings

CADD USER: Adeptuser FILE: \\PW\HB\HIBBING PW\HIBB PW IN\9060A4CC-C4CC-4D28-B811-05C27E0A9533\1698335F-67E8-4489-939E-7B7307FE817E\0646100100_500-FF-100.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 4:56 PM
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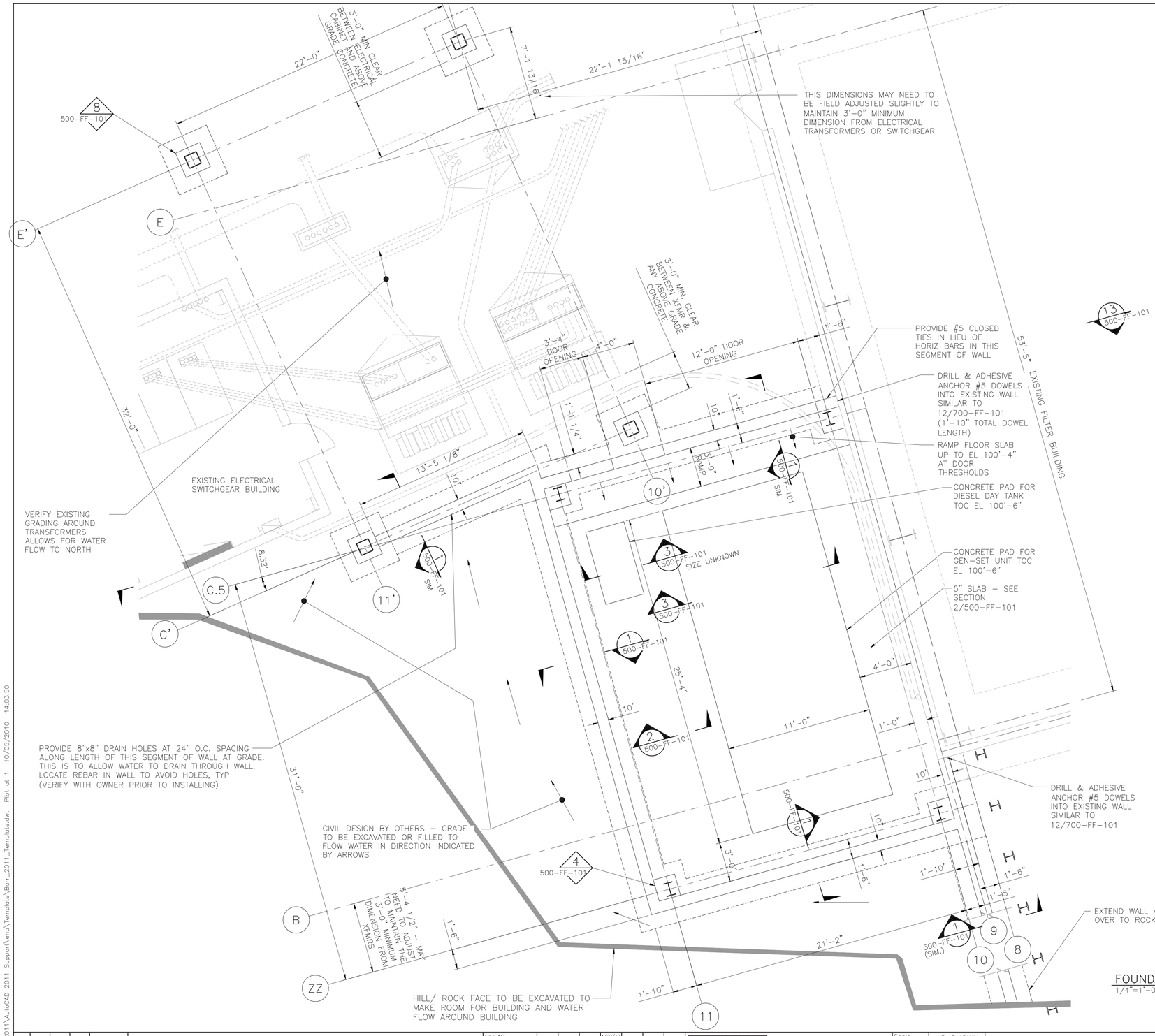

NOTES:

1. REFER TO DRAWING 100-SS-100 FOR STRUCTURAL NOTES.
2. THE RELATIVE LOCATIONS OF THE EXISTING FILTER BUILDING, THE EXISTING OUTDOOR TRANSFORMERS AND SWITCHGEAR, AND EXISTING ELECTRICAL SWITCHGEAR BUILDING ARE APPROXIMATE. SITE SURVEY SHOWS THE ELECTRICAL BUILDING AND FILTER BUILDING RELATIONSHIP RELATIVE TO EACH OTHER. OUTDOOR TRANSFORMERS AND SWITCHGEAR WERE APPROXIMATELY LOCATED BASED ON SCALING OF STAR MINE DRAWING 800-E-120 REV F. DIMENSIONS SHOWN MAY NEED TO BE MODIFIED SLIGHTLY AS INDICATED IN THE DRAWING TO MAINTAIN ADEQUATE DISTANCE FROM TRANSFORMERS. FIELD LOCATE ALL EXISTING INTERFACES AND FIELD LOCATE FOUNDATIONS PRIOR TO STARTING CONSTRUCTION TO ENSURE ALL MINIMUM CLEARANCE DIMENSIONS ARE SATISFIED.
3. LOCATE ALL UNDERGROUND BURIED UTILITIES PRIOR TO EXCAVATING. THESE INCLUDE POWER DISTRIBUTION AS WELL AS GROUNDING GRIDS.
4. THE CIVIL ENGINEERING DESIGN OF MOUNTAIN EXCAVATING, SITE GRADING, AND BACKFILL IS BY OTHERS. OWNER WILL DO THE ROUGH EXCAVATING. CONTRACTOR MAY BE RESPONSIBLE FOR SOME FINISH EXCAVATING AND BACKFILL REQUIRED TO ALLOW SITE TO DRAIN. FINISH GRADE SHALL BE CONSTRUCTED TO DRAIN WATER TO THE NORTH AWAY FROM THE FACE OF THE MOUNTAIN, AND NOT TRAP WATER BEHIND THE GEN SET BUILDING (OR THE COMPRESSOR/REAGENT ADDITIONS, OR THE EXISTING FILTER BUILDING OR ELECTRICAL SWITCHGEAR BUILDING).
5. IT IS INTENDED THAT ELEVATION 100'-0" = ELEVATION 10677'-0". THIS MAY NEED TO BE MODIFIED SLIGHTLY TO ALLOW FOR SITE GRADING TO MEET NOTE #4.
6. THE PVC INTAKE AND EXHAUST PIPING THAT IS MOUNTED ON THE WEST SIDE OF THE EXISTING FILTER BUILDING WILL NEED TO BE RELOCATED TO A DIFFERENT LOCATION ON THE FILTER BUILDING WALL SO AS TO NOT BE WITHIN THE GEN SET ADDITION.
7. THE ELECTRICAL SERVICE NORTH OF THESE PVC PIPES WILL ALSO NEED TO BE RELOCATED.
8. THE COMMON WALL BETWEEN THE FILTER BUILDING AND THE GEN SET ADDITION WILL REQUIRE 2-HOURS OF FIRE PROTECTION OVER THE FULL HEIGHT OF THE WALL PER NFPA 110. ADD A FIRE WALL PER 2006 IBC TABLE 720.1(2) TO COMPLY WITH THIS REQUIREMENT. THE EXISTING CONCRETE WALL CAN POTENTIALLY BE UTILIZED FOR THE BOTTOM 12 FEET OF THIS REQUIREMENT AS LONG AS THE ENTIRE WALL SYSTEM WILL HAVE AT LEAST 2 HOURS OF FIRE PROTECTION WHEN INSTALLED. THIS FIRE PROTECTION SHALL NOT ENCROACH CLOSER THAN 3 FEET TO THE GENERATOR.
9. THIS DESIGN ASSUMES TOP OF EXISTING ROCK ELEVATION IS APPROXIMATELY EL 98'-0" TO MATCH WHERE ROCK WAS SHOWN ON EXISTING FILTER BUILDING DRAWINGS.

NOTES:
1. REFER TO DRAWING 100-SS-100 AND 500-FF-100 FOR STRUCTURAL NOTES.

COLORADO LICENSED
JOHN G. TRULLINGER
51916
PROFESSIONAL ENGINEER
Apr. 28, 2017

FOUNDATION PLAN: GEN SET & TRANSFORMER AREA
1/4"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

A	B	C	0	1	2	3
DATE RELEASED							

CLIENT		4/28/17
BID		4/28/17
CONSTRUCTION		4/28/17

BARR
Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

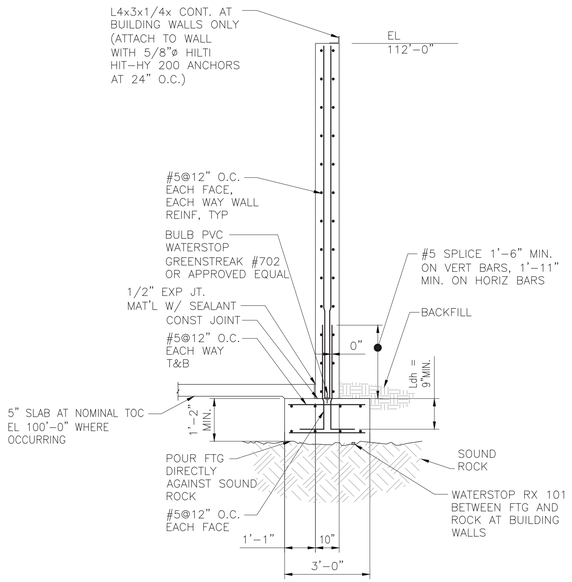
Scale	AS SHOWN
Date	2/28/17
Drawn	SSW
Checked	TOP
Designed	TOP/SSW
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

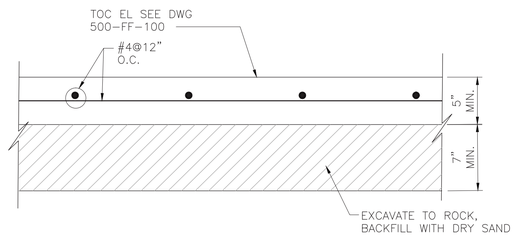
PROCESS PLANT UPGRADES
REVENUE VIRGINUUS MINE

FOUNDATION PLAN
GEN SET ADDITION / TRANSFORMER CANOPY

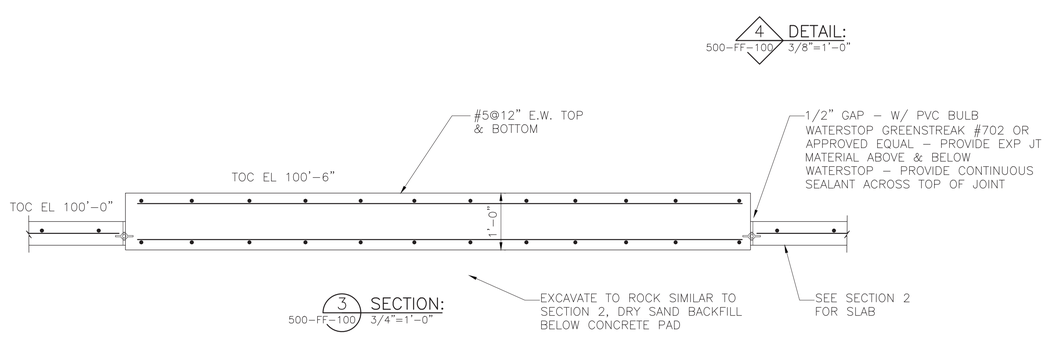
BARR PROJECT No. 06/461001.00
CLIENT PROJECT No. –
DWG. No. 500-FF-100
REV. No. 0



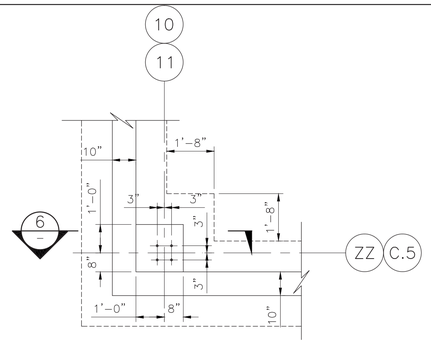
1 SECTION: 500-FF-100 3/8"=1'-0"



2 SECTION: 500-FF-100 1 1/2"=1'-0"

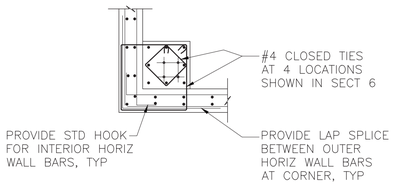


3 SECTION: 500-FF-100 3/4"=1'-0"

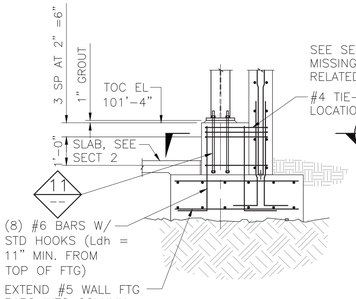


4 DETAIL: 500-FF-100 3/8"=1'-0"

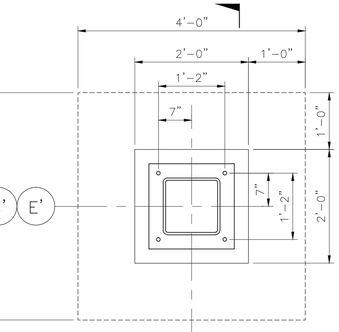
NOTES:
1. REFER TO DRAWING 100-SS-100 AND 500-FF-100 FOR STRUCTURAL NOTES.



7 SECTION: 3/8"=1'-0"



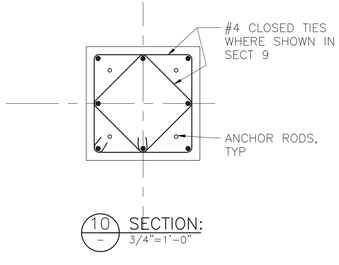
6 SECTION: 3/8"=1'-0"



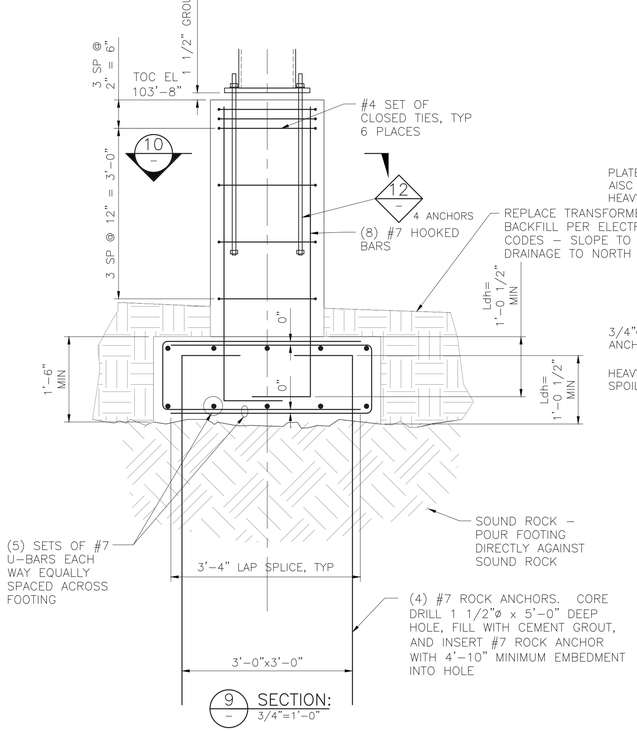
AT C'/10', LOCATE REINFORCING AT THE COLUMN FOOTING / WALL FOOTING INTERFACE, SO BOTH FOOTINGS ARE REINFORCED PER SECTIONS 1 & 9

10'
11'
9

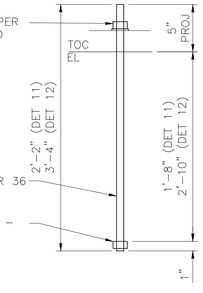
8 DETAIL: 500-FF-100 3/4"=1'-0"



10 SECTION: 3/4"=1'-0"

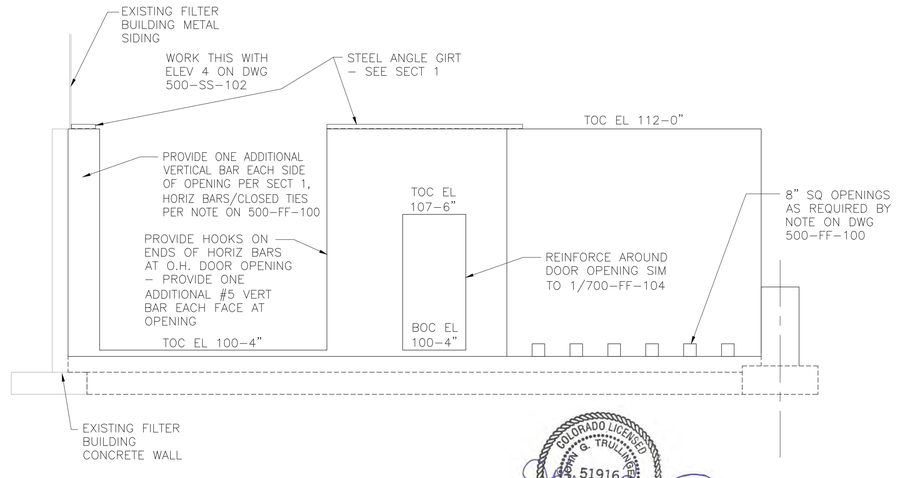


9 SECTION: 3/4"=1'-0"



11 DETAIL: 1 1/2"=1'-0"

12 DETAIL: 1 1/2"=1'-0"



13 SECTION: 1/4"=1'-0"

COLORADO LICENSED CLIFFORD G. TRUITNER 51916 PROFESSIONAL ENGINEER April 28, 2017

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: A B C 0 1 2 3 — DATE RELEASED

CLIENT	4/28/17
BID	4/28/17
CONSTRUCTION	4/28/17

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/28/17
Drawn	SSW
Checked	TOP
Designed	TOP/SSW
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINUUS MINE

FOUNDATION DETAILS
GEN SET ADDITION / TRANSFORMER CANOPY

BARR PROJECT No.	06/461001.00
CLIENT PROJECT No.	–
DWG. No.	500-FF-101
REV. No.	0

CADD USER: Adeptuser FILE: \\PWHB\HBBNG PW\HBB PW IN\9060A4CC-C4CC-4D28-B811-05C27E0A9533\8161D1D1-BBB4-4EAC-AFBE-719E05012C36\0646100100_500-FF-101.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 5:04 PM
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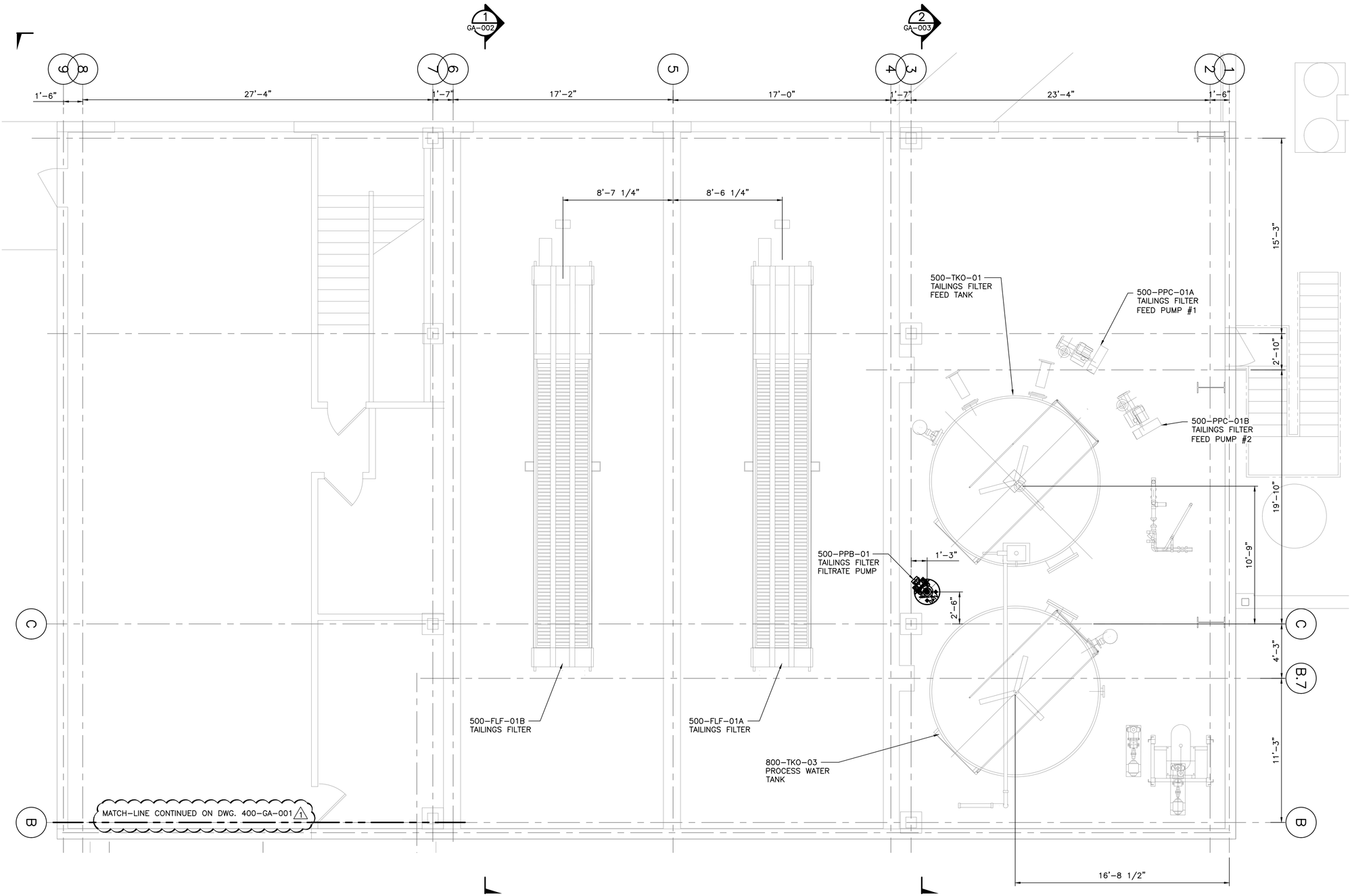

PLAN: TAILINGS FILTRATION & DISPOSAL AREA

1/4"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	AMB3	DSM	DSM	3/31/21	UPDATED REFERENCE CALLOUT TO 400-GA-001
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	3/31/21		
BID				4/28/17			
CONSTRUCTION				4/28/17	3/31/21		

DATE RELEASED

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
PLAN AT TAILINGS FILTRATION & DISPOSAL AREA

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 500-GA-001
REV. No. 1

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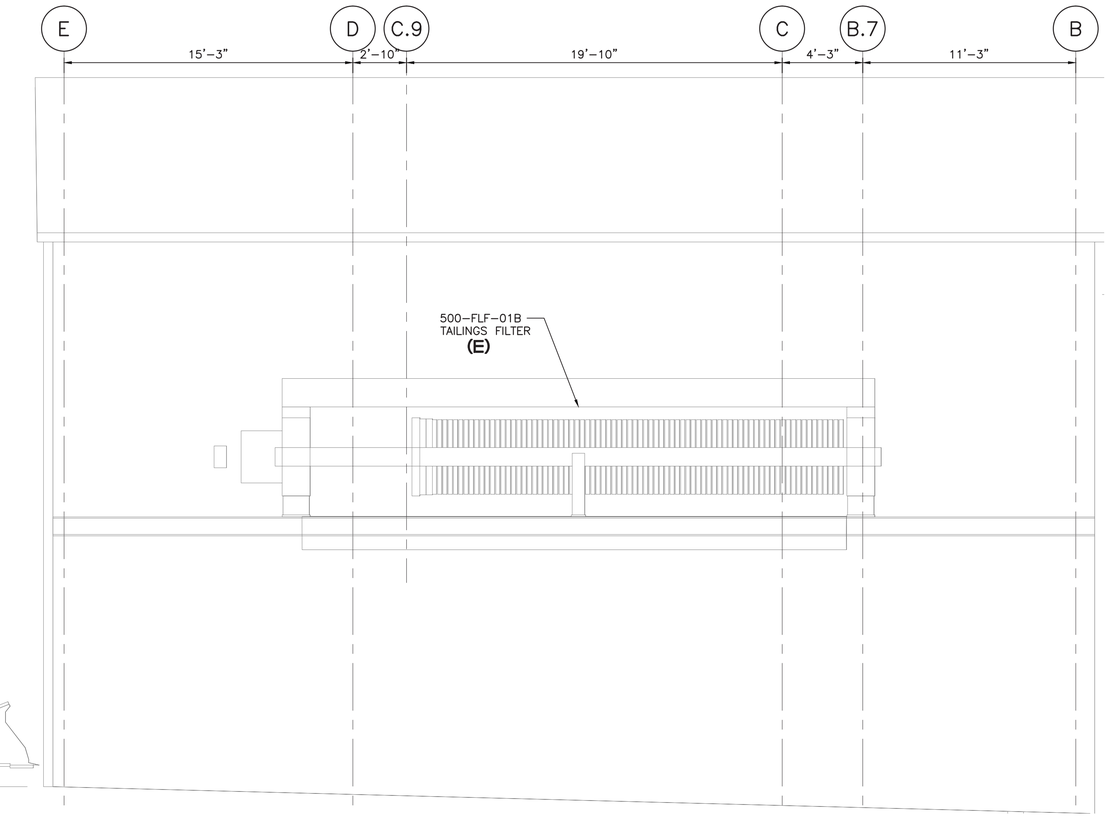

500–GA–001 (1) SECTION: TAILINGS FILTRATION & DISPOSAL AREA
1/4"=1'–0" LOOKING EAST

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED DAVID SCOTT MARKEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: A B C 0 1 2 3

DATE RELEASED

CLIENT	4/28/17
BID	4/28/17
CONSTRUCTION	4/28/17

BARR
Corporate Headquarters:
Minneapolis, Minnesota
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Fax: (952) 832–2601
www.barr.com

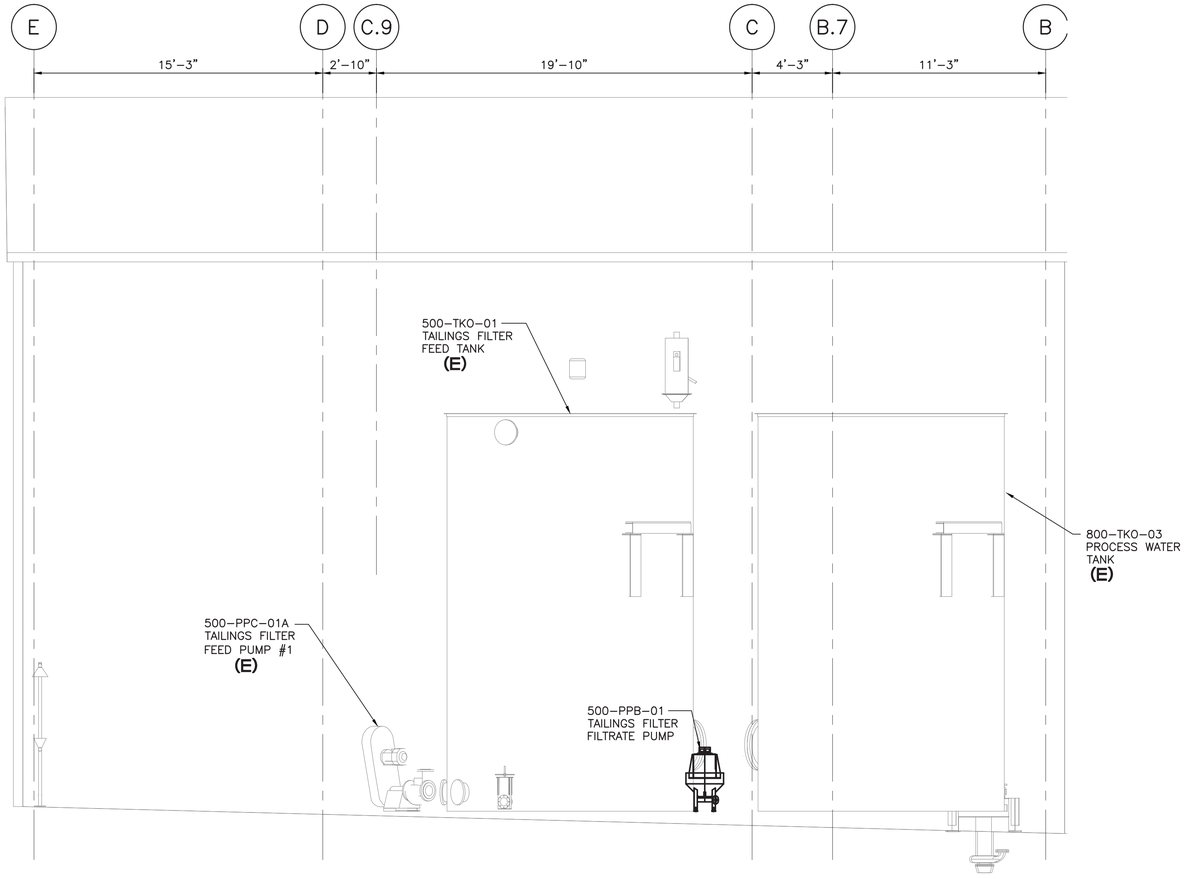
Scale	AS SHOWN
Date	4/17/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
TAILINGS FILTRATION SECTION AT COL. 6

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 500–GA–002
REV. No. 0



2 SECTION: TAILINGS FILTRATION & DISPOSAL AREA
500-GA-001 1/4"=1'-0" LOOKING EAST

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
SCOTT MICHEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

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DATE RELEASED: A B C 0 1 2 3

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Corporate Headquarters:
Minneapolis, Minnesota
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

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Date	4/17/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
TAILINGS FILTRATION SECTION AT COL. 3

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-GA-003
REV. No. 0

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW IN\EEB4425F-B8BD-471B-9EC3-1083551797C3\97E33A3D-EF95-44B9-9A47-40351E77445E\0646100100_500-GA-003.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 10:22 AM
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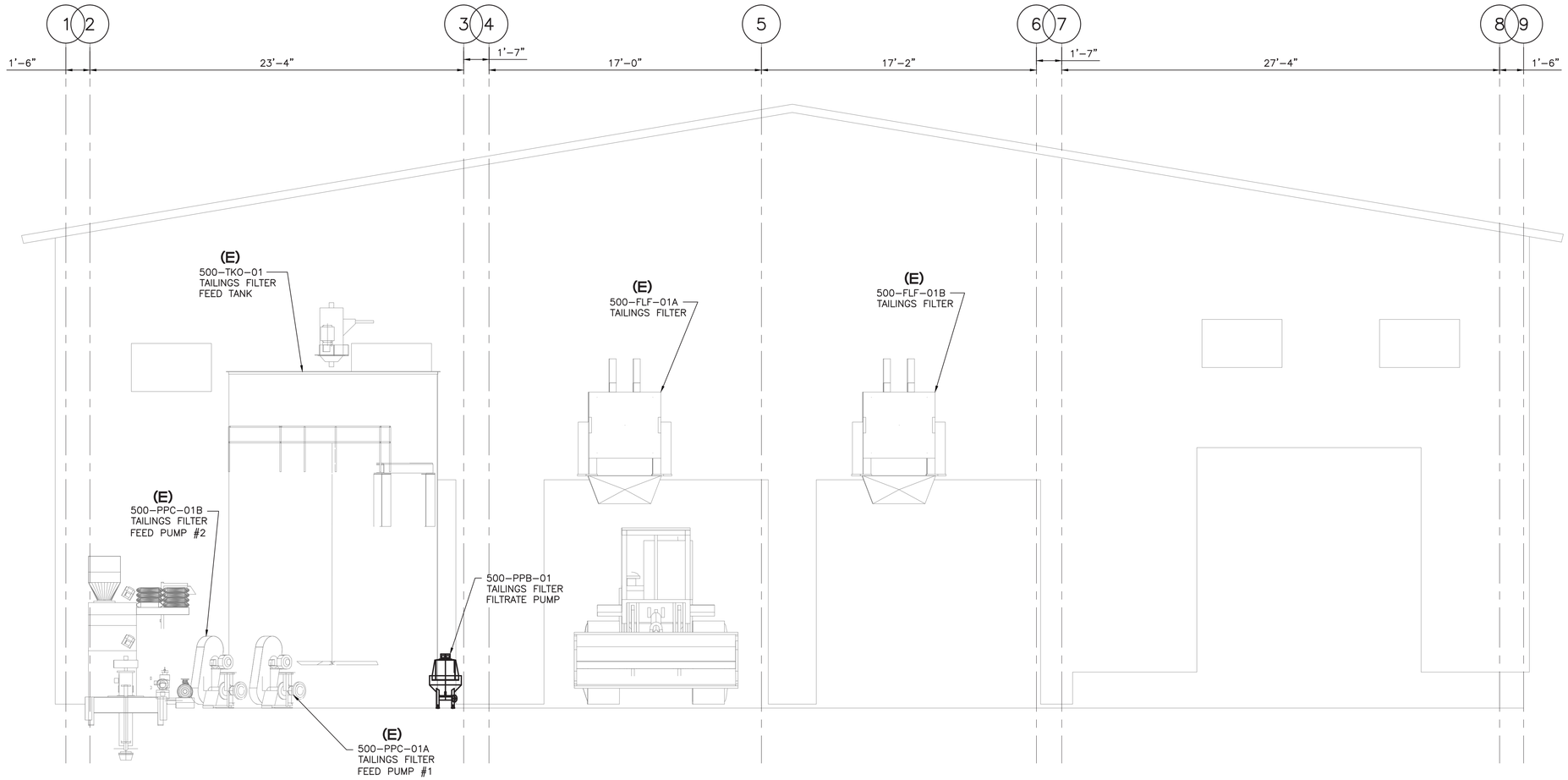

3 SECTION: TAILINGS FILTRATION & DISPOSAL AREA
500–GA–001 1/4"=1'–0" LOOKING SOUTH

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

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Fax: (952) 832–2601
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Scale	AS SHOWN
Date	4/17/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
TAILINGS FILTRATION SECTION

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 500–GA–004
REV. No. 0

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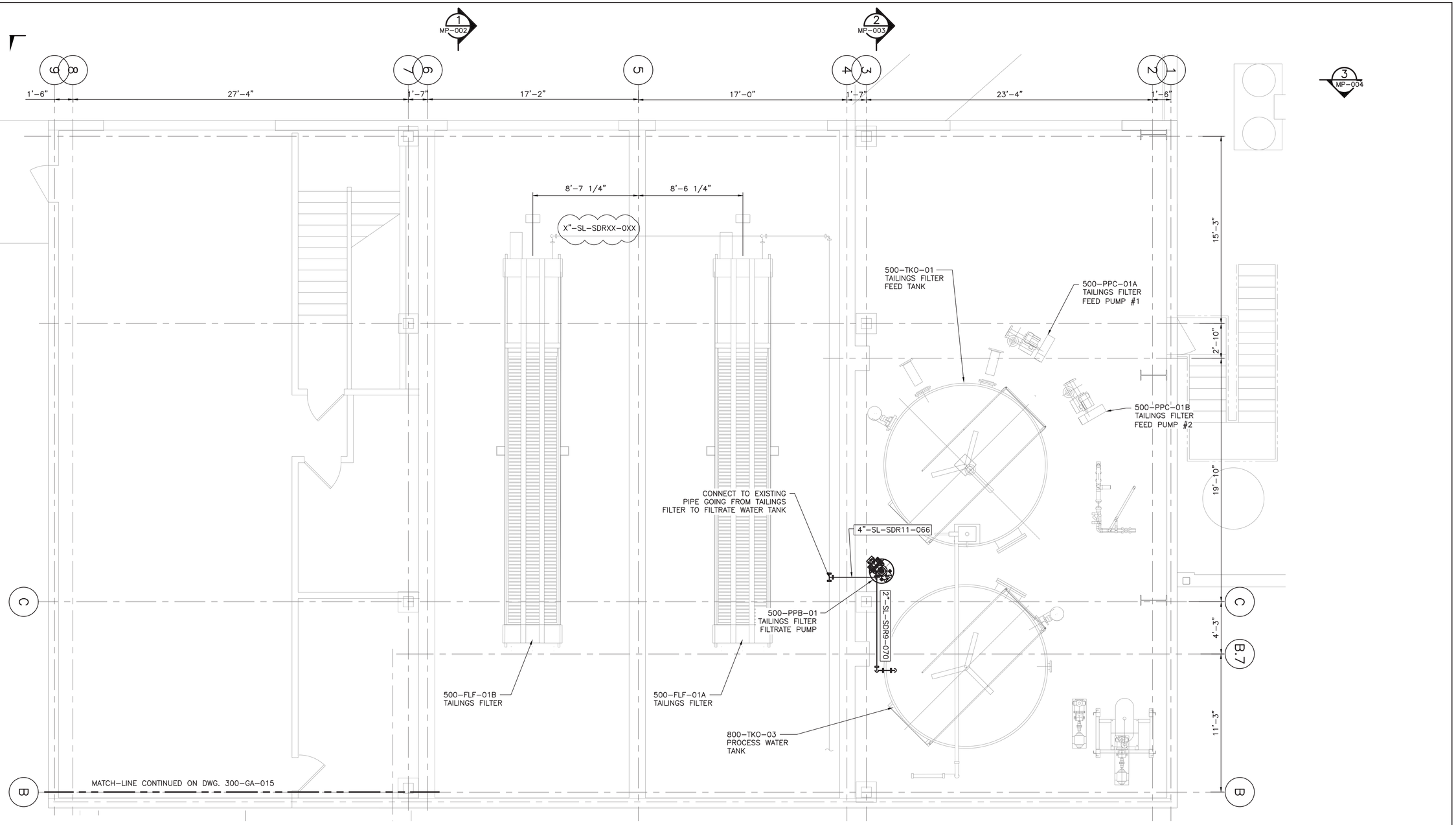

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN-LINE COMPONENTS.

PIPING: TAILINGS FILTRATION & DISPOSAL AREA

1/4"=1'-0"

COLORADO LICENSED
DAVID SCOTT MICKELSEN
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID — 4/28/17; CONSTRUCTION — 4/28/17

DATE RELEASED: A | B | C | 0 | 1 | 2 | 3

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Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/10/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
PLAN AT TAILINGS FILTRATION & DISPOSAL AREA

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-MP-001
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A4BE6089-5087-4028-9EAE-D898EF743A12\E03C1405-3EC8-44F7-8871-BFC9647CB0C9\0646100100_500-MP-001.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:48 PM
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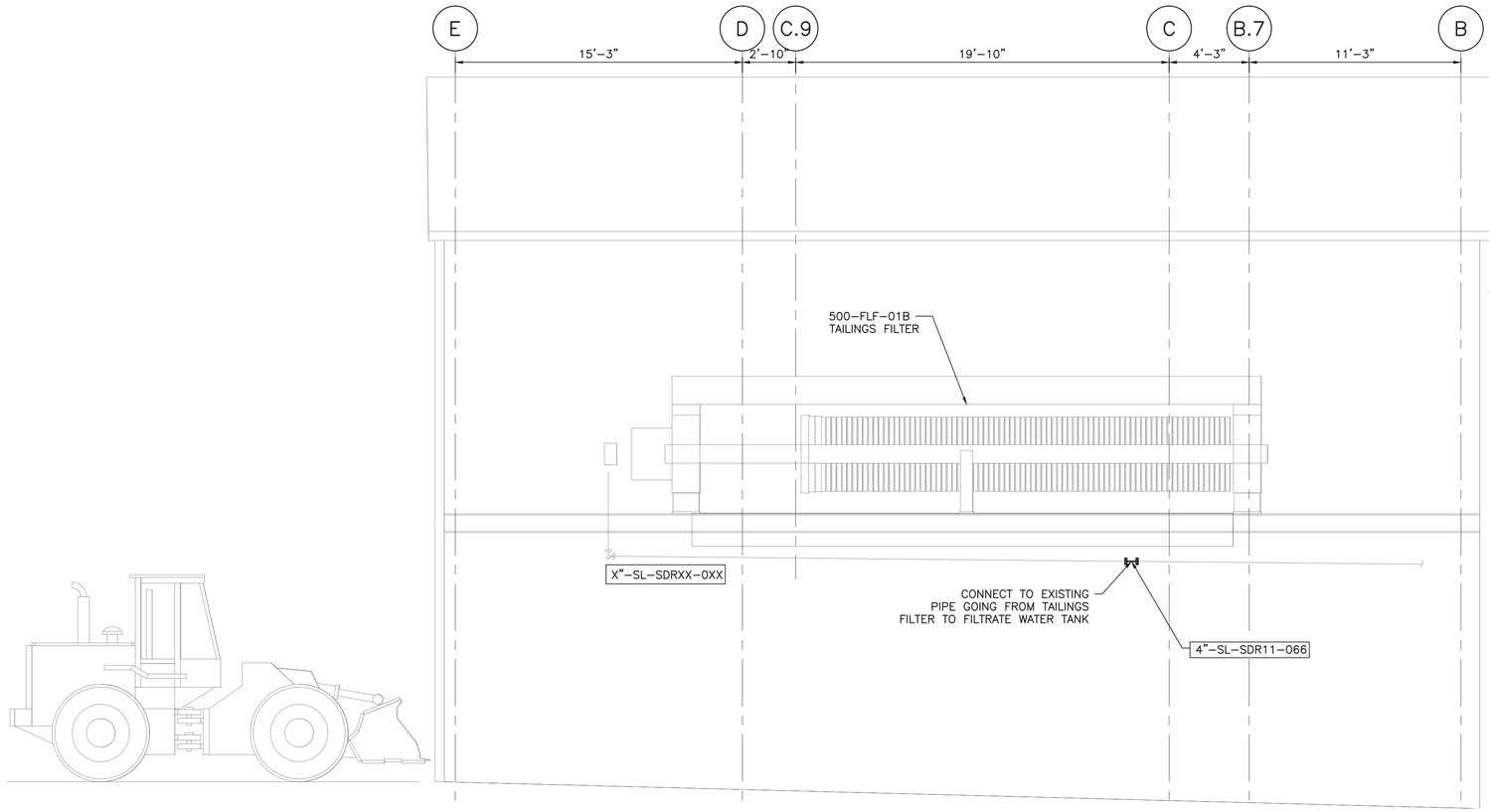

500-GA-001 (1) SECTION: TAILINGS FILTRATION & DISPOSAL AREA
1/4"=1'-0" LOOKING EAST

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
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COLORADO LICENSED
SCOTT MICHELE
PE.0052024
CIVIL
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17				
BID				4/28/17				
CONSTRUCTION				4/28/17				
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DATE RELEASED								

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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/17/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
TAILINGS FILTRATION SECTION AT COL. 6

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-MP-002
REV. No. 0

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A4BE6089-5087-4028-9EAE-D89BEF743A12\63E0E178-5C34-4B03-9AC6-BCB712D9A7C\0646100100_500-MP-002.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:50 PM
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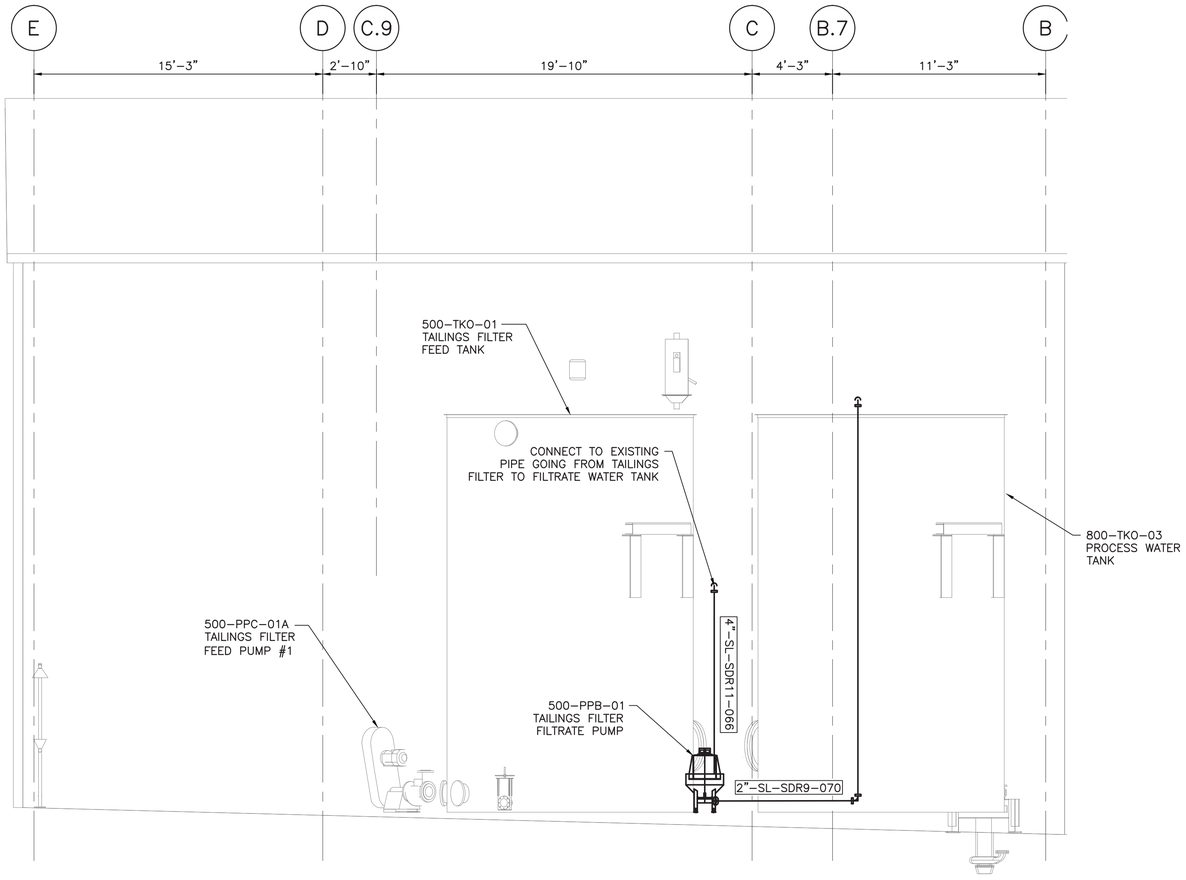

500-GA-001 (2) SECTION: TAILINGS FILTRATION & DISPOSAL AREA
1/4"=1'-0" LOOKING EAST

NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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COLORADO LICENSED
DAVID SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

A	B	C	0	1	2	3	DATE RELEASED
			4/28/17				CLIENT
			4/28/17				BID
			4/28/17				CONSTRUCTION

BARR
Corporate Headquarters:
Minneapolis, Minnesota
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Project Office:
BARR ENGINEERING CO.
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SALT LAKE CITY, UT 84101
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/17/17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
TAILINGS FILTRATION SECTION AT COL. 3

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-MP-003
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A4B6D089-5087-4028-9EAE-D898EF743A12\37793393-47E3-412F-A884-4C58385FE402\0646100100_500-MP-003.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:52 PM
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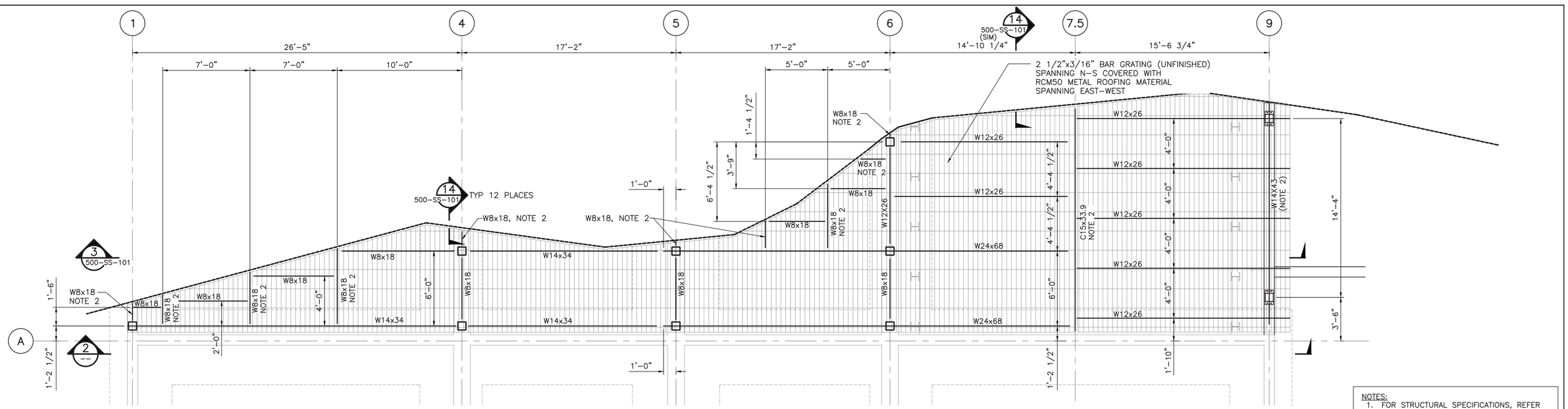
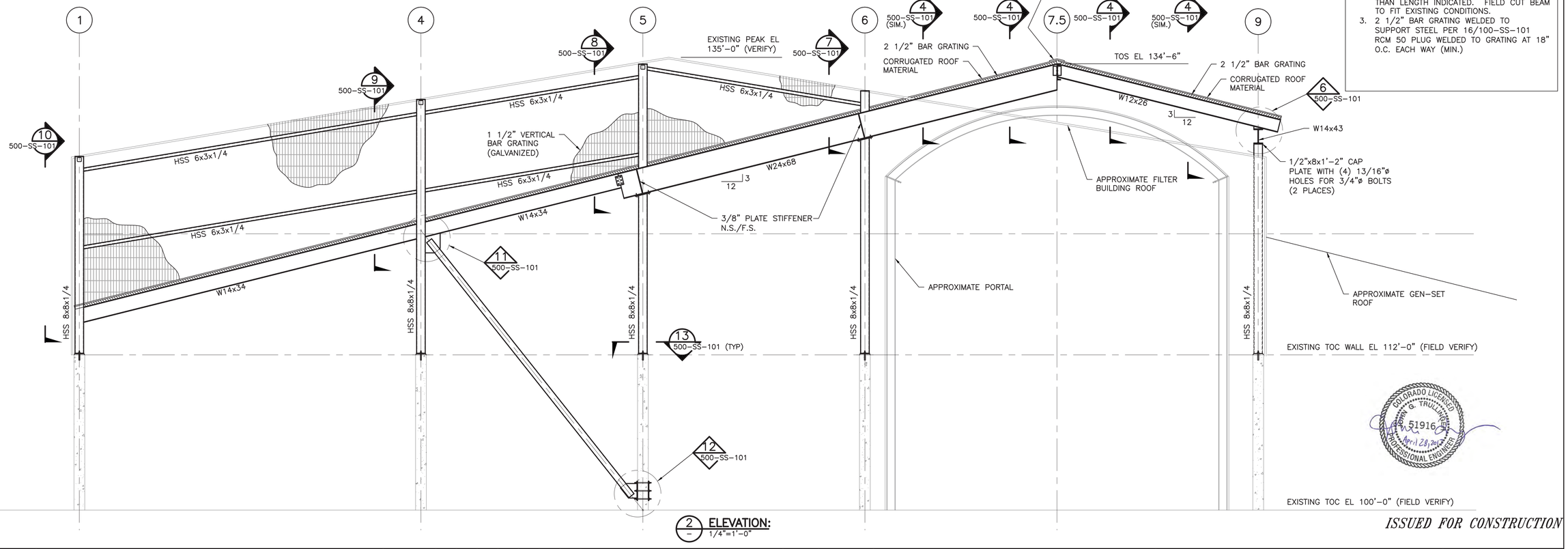


N 1 PLAN: CRICKET ROOF PLAN
1/4"=1'-0"



2 ELEVATION:
1/4"=1'-0"

NOTES:
1. FOR STRUCTURAL SPECIFICATIONS, REFER TO STRUCTURAL NOTES DRAWING 100-SS-100.
2. FOR BEAMS INDICATED AS "NOTE 2", PROVIDE BEAM LENGTH 4 FEET LONGER THAN LENGTH INDICATED. FIELD CUT BEAM TO FIT EXISTING CONDITIONS.
3. 2 1/2" BAR GRATING WELDED TO SUPPORT STEEL PER 16/100-SS-101 RCM 50 PLUG WELDED TO GRATING AT 18" O.C. EACH WAY (MIN.)

COLORADO LICENSED
JOHN G. TRULLINGER
No. 51916
PROFESSIONAL ENGINEER
Apr. 28, 2017

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT	BID	CONSTRUCTION
4/28/17	4/28/17	4/28/17

A	B	C	0	1	2	3
DATE RELEASED						

BARR
Corporate Headquarters:
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www.barr.com

Scale	AS SHOWN
Date	2/2/17
Drawn	APP
Checked	TOP
Designed	JDT
Approved	JDT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CRICKET ROOF
FRAMING PLAN

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-SS-100
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\9060A4CC-C40C-4D28-B811-05C27E0A9533\BBA1DBBF-2CF3-4C69-828F-09D4340692F0\0646100100_500-SS-100.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 4:59 PM
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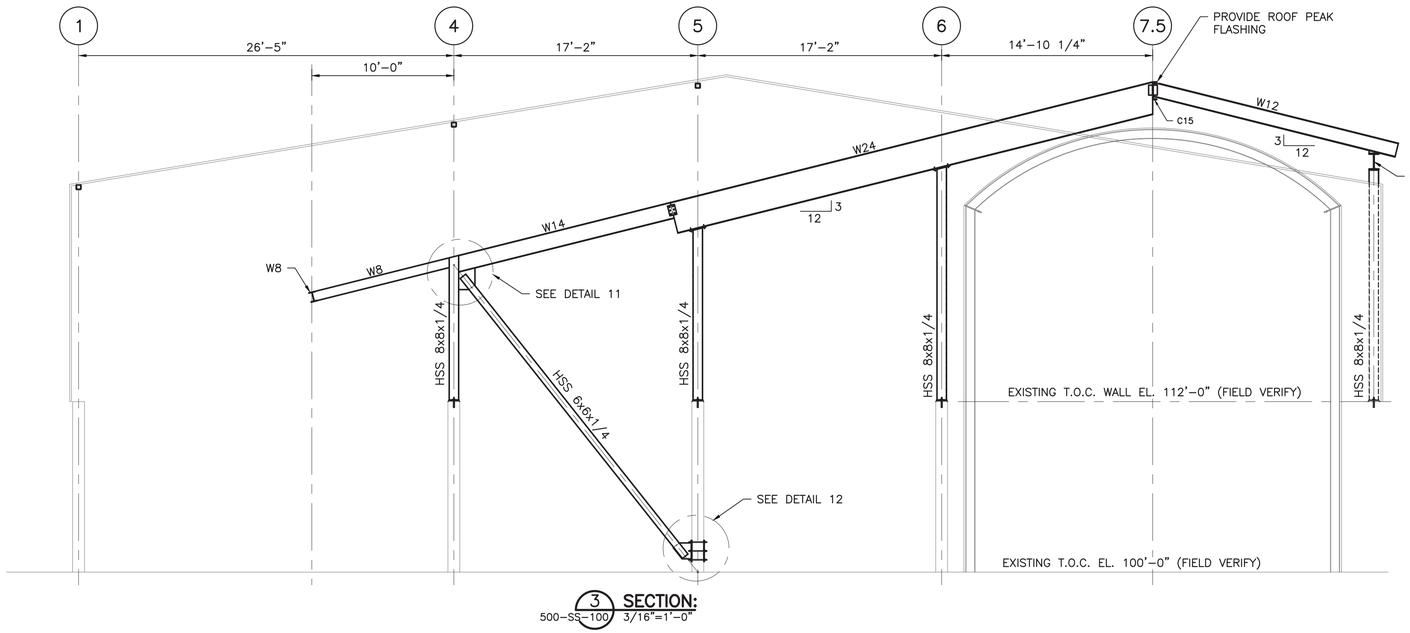
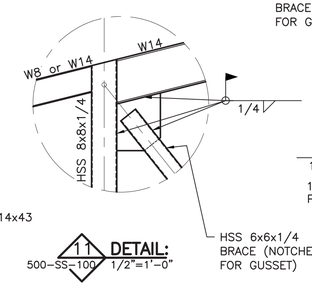
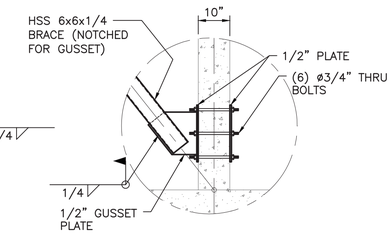


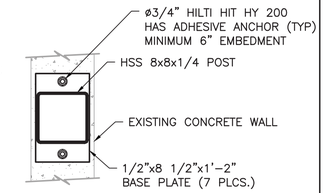
3 SECTION: 500-SS-100 3/16"=1'-0"



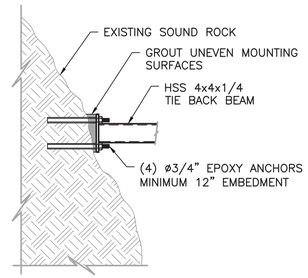
11 DETAIL: 500-SS-100 1/2"=1'-0"



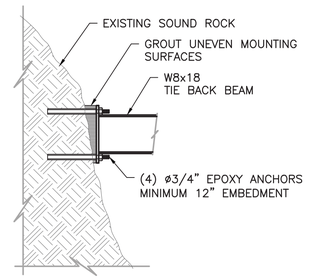
12 DETAIL: 500-SS-100 1/2"=1'-0"



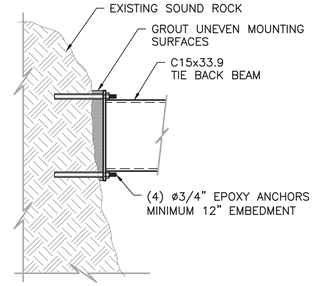
13 SECTION: 500-SS-100 3/4"=1'-0"



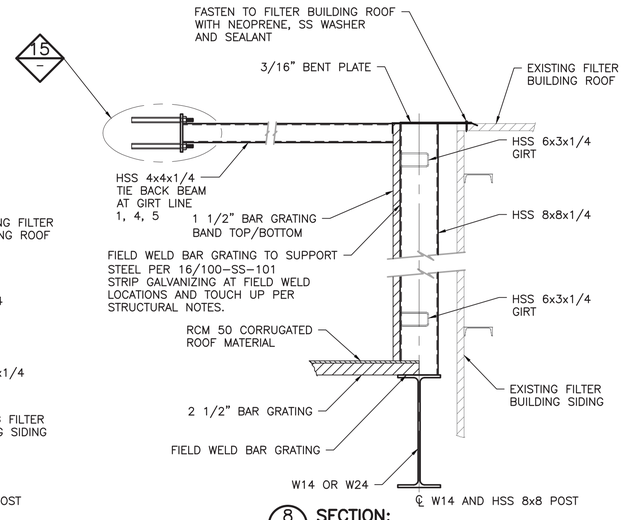
15 DETAIL: – 3/4"=1'-0"



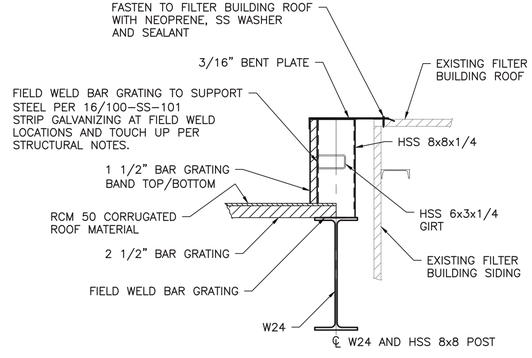
14 SECTION: 500-SS-100 3/4"=1'-0"



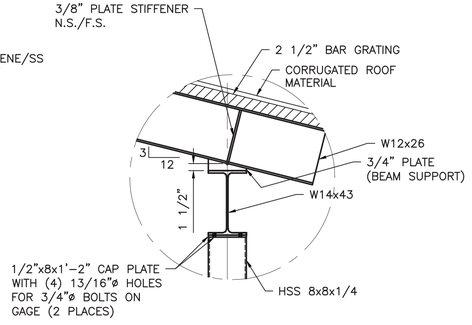
14 SECTION: SIMILAR 500-SS-100 3/4"=1'-0"



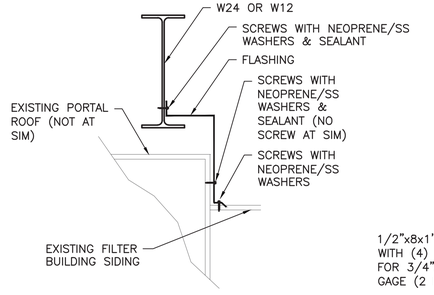
8 SECTION: 500-SS-100 3/4"=1'-0"
9 SECTION: 500-SS-100 3/4"=1'-0"
10 SECTION: 500-SS-100 3/4"=1'-0"



7 SECTION: 500-SS-100 3/4"=1'-0"



6 DETAIL: 500-SS-100 1/2"=1'-0"



4 SECTION: 500-SS-100 3/4"=1'-0"

NOTES:
1. FOR STRUCTURAL SPECIFICATIONS, REFER TO STRUCTURAL NOTES DRAWING 100-SS-100.
2. FOR BEAMS INDICATED AS "NOTE 2", PROVIDE BEAM LENGTH 4 FEET LONGER THAN LENGTH INDICATED. FIELD CUT BEAM TO FIT EXISTING CONDITIONS.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	APP	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
DATE RELEASED							

CLIENT	4/28/17
BID	4/28/17
CONSTRUCTION	4/28/17

BARR
Corporate Headquarters: Minneapolis, Minnesota
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www.barr.com

Scale	AS SHOWN
Date	2/2/17
Drawn	APP
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CRICKET ROOF
SECTIONS AND DETAILS

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 500-SS-101
REV. No. 0

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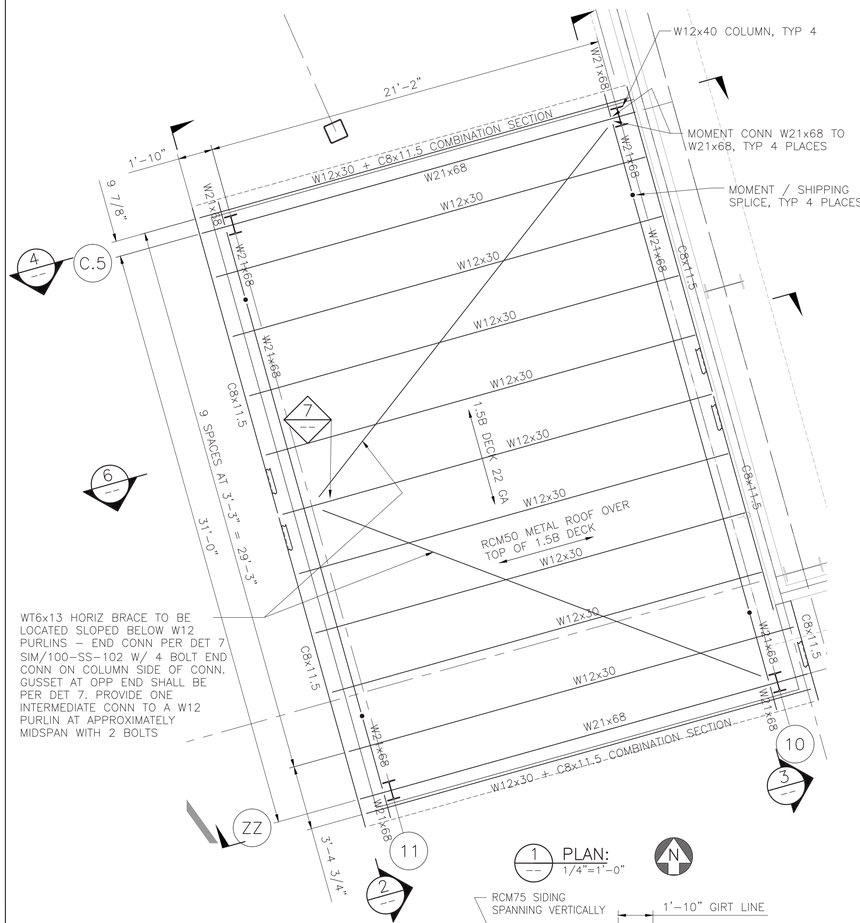
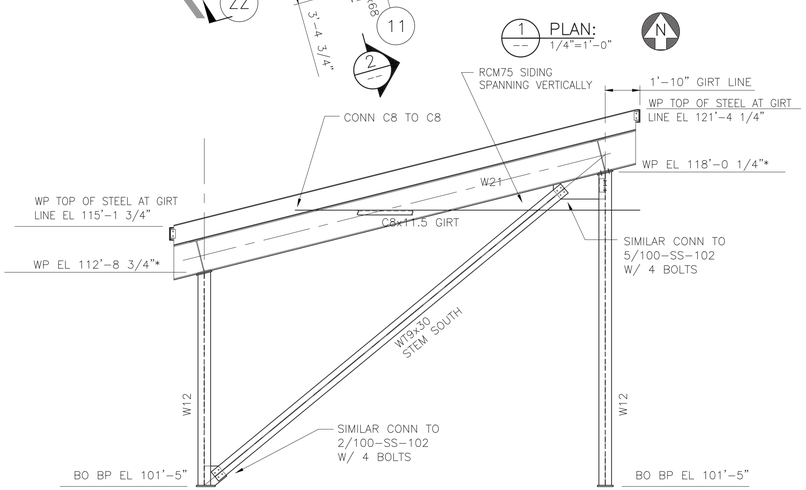


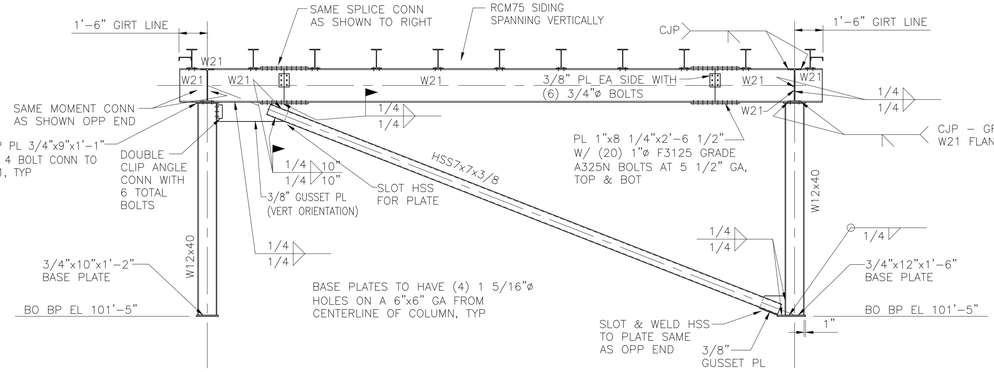
WT6x13 HORIZ BRACE TO BE LOCATED SLOPED BELOW W12 PURLINS – END CONN PER DET 7 SIM/100–SS–102 W/ 4 BOLT END CONN ON COLUMN SIDE OF CONN. GUSSET AT OPP END SHALL BE PER DET 7. PROVIDE ONE INTERMEDIATE CONN TO A W12 PURLIN AT APPROXIMATELY MIDSPAN WITH 2 BOLTS

1 PLAN: 1/4"=1'-0"

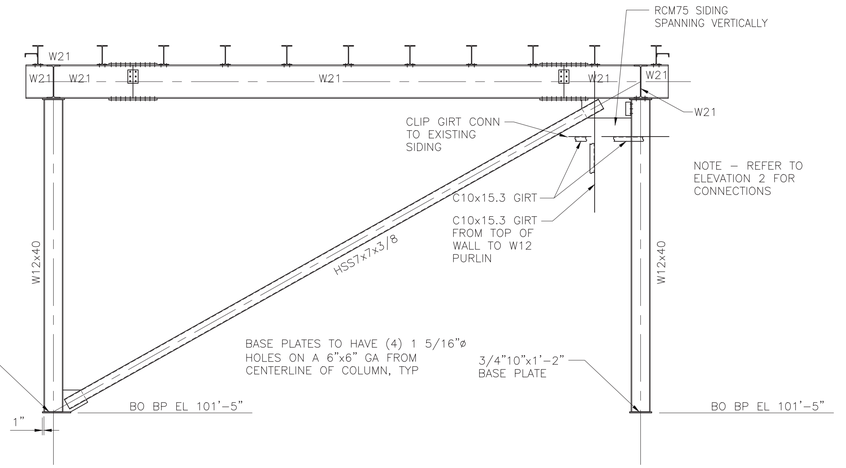


5 ELEVATION: 1/4"=1'-0"

* WP EL IS ℄ COLUMN & BOTTOM OF W21

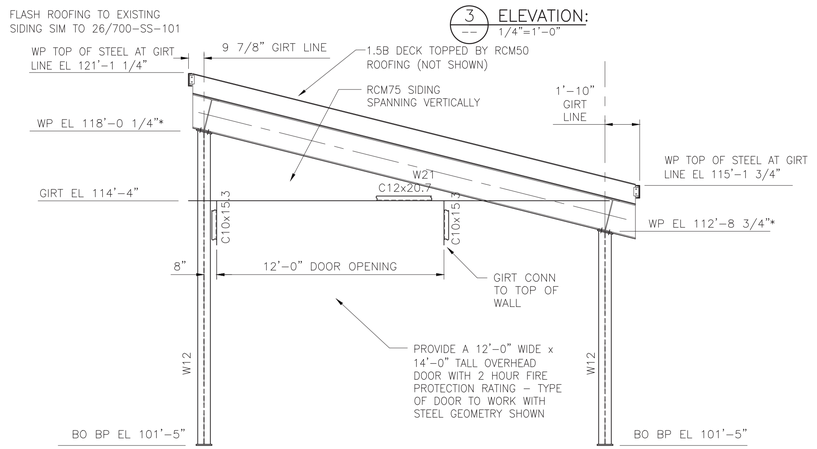


2 ELEVATION: 1/4"=1'-0"



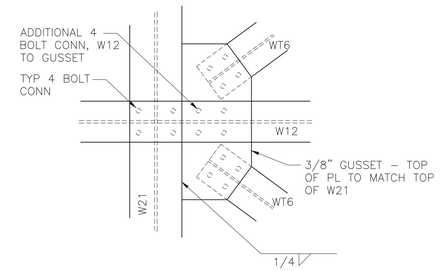
NOTE – REFER TO ELEVATION 2 FOR CONNECTIONS

3 ELEVATION: 1/4"=1'-0"

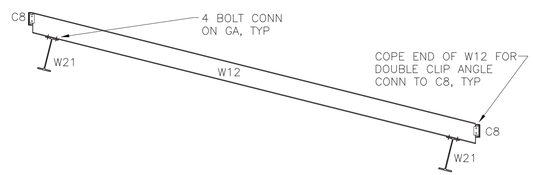


4 ELEVATION: 1/4"=1'-0"

* WP EL IS ℄ COLUMN & BOTTOM OF W21



7 DETAIL: 1"=1'-0"



6 SECTION: 1/4"=1'-0"

ISSUED FOR CONSTRUCTION

NOTES:
1. REFER TO DRAWING 100–SS–100 AND 500–FF–100 FOR STRUCTURAL NOTES.

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
A	SSW	TOP	JDT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT	A	B	C	0	1	2	3
BID	4/28/17						
CONSTRUCTION	4/28/17						

DATE RELEASED

BARR
Project Office:
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Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Scale	AS SHOWN
Date	2/28/17
Drawn	SSW
Checked	TOP
Designed	TOP/SSW
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINUUS MINE

STEEL FRAMING PLAN & ELEVATIONS
GEN SET ADDITION

BARR PROJECT No. 06/461001.00
CLIENT PROJECT No. –
DWG. No. 500–SS–102
REV. No. 0

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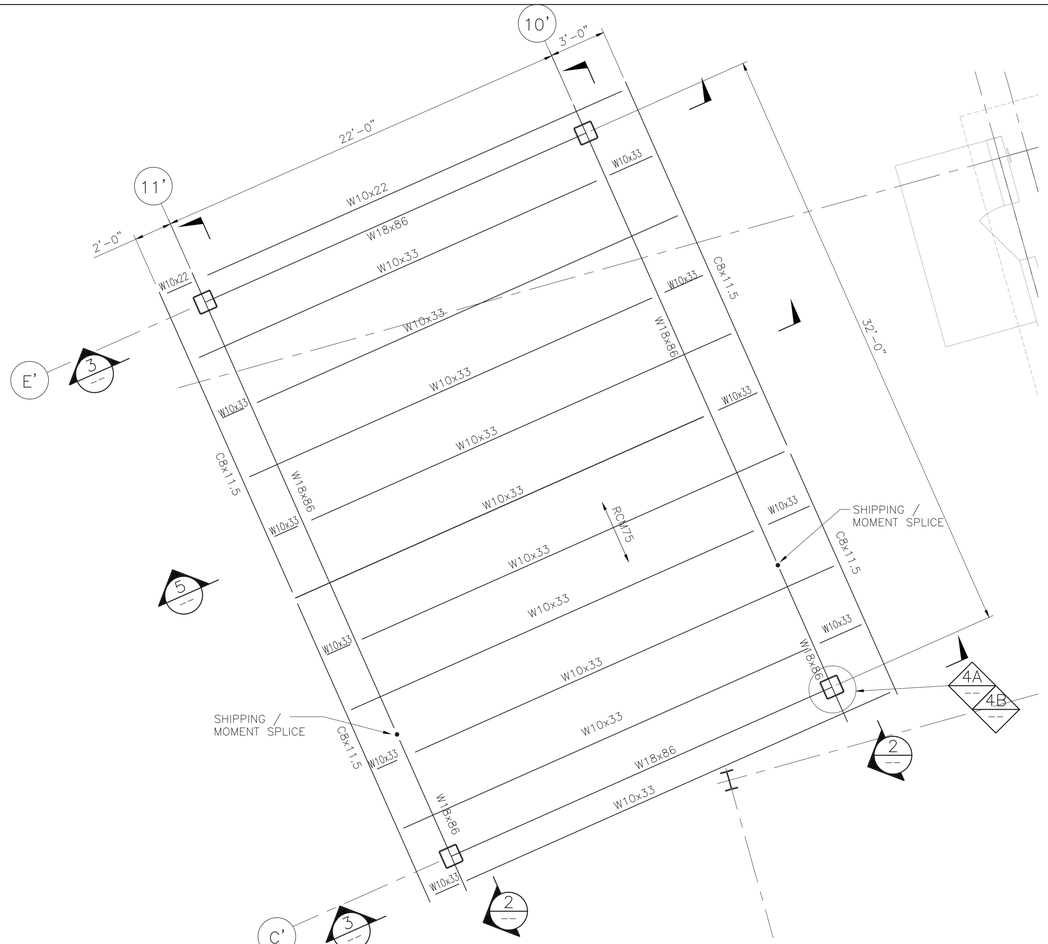
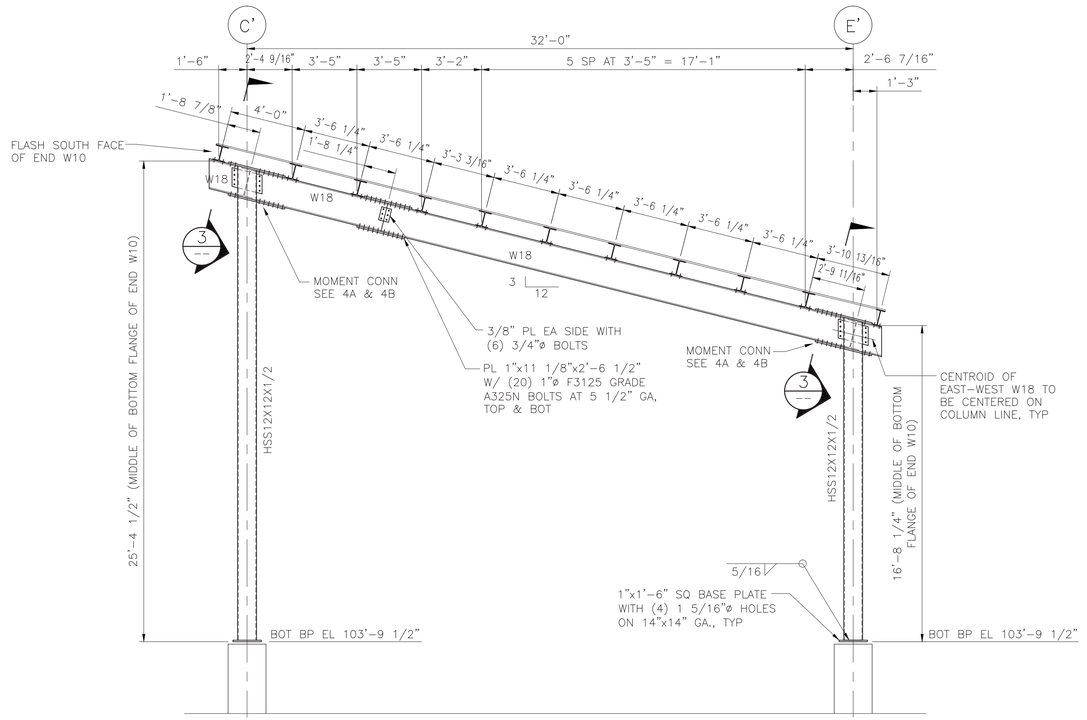
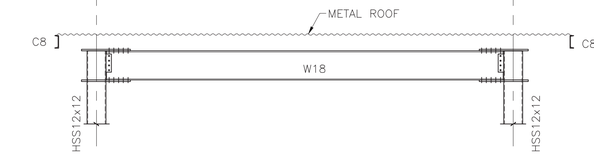


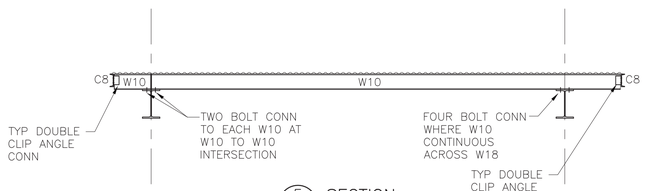
1 TRANSFORMER CANOPY ROOF FRAMING PLAN:
1/4"=1'-0"



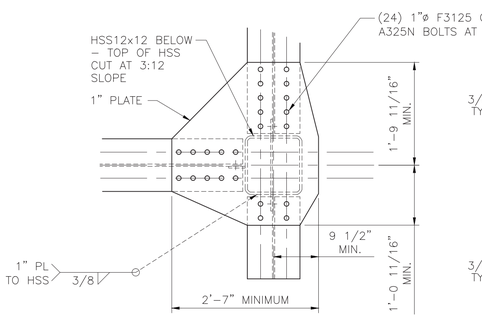
2 SECTION:
1/4"=1'-0"



3 SECTION:
1/4"=1'-0"

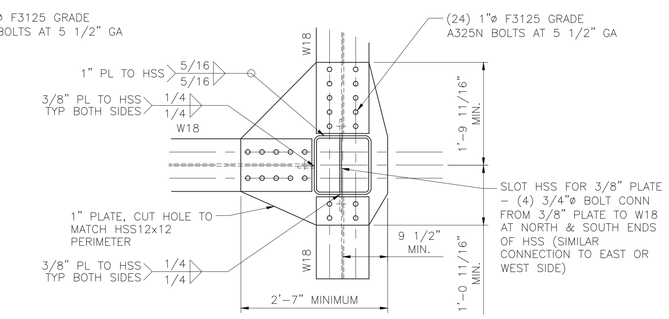


5 SECTION:
1/4"=1'-0"



WORK DETAILS 4A AND 4B TOGETHER

DIMENSIONS SHOWN ARE MINIMUMS – PROVIDE LONGER DIMENSIONS TO ALLOW BOLT INSTALLATION SPACE AS REQUIRED



CLEAR SPACE BETWEEN TOP & BOTTOM PLATES TO BE 18 3/8" DEPTH OF W18. A SMALL AMOUNT OF ADDITIONAL SPACE CAN BE PROVIDED BETWEEN PLATES AS ALLOWED BY AISC PROVIDED SHIMS ARE PROVIDED TO FILL THE GAP OVER THE ENTIRE WIDTH AND LENGTH OF W18 WHERE IT INTERSECTS THE PLATE

4A TOP MOMENT PLATE DETAIL:
3/4"=1'-0" LOOKING DOWN

4B BOTTOM MOMENT PLATE DETAIL:
3/4"=1'-0" LOOKING DOWN

NOTES:
1. REFER TO DRAWING 100-SS-100 AND 500-FF-100 FOR STRUCTURAL NOTES.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	SSW	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

A	B	C	0	1	2	3
DATE RELEASED						

BARR
Corporate Headquarters: Minneapolis, Minnesota
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Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/28/17
Drawn	SSW
Checked	TOP
Designed	TOP/SSW
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINUUS MINE

STEEL FRAMING PLAN & ELEVATIONS
TRANSFORMER CANOPY

BARR PROJECT No. 06/461001.00
CLIENT PROJECT No. –
DWG. No. 500-SS-103
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIB PW IN\906044C-C4CC-4128-B811-05C27E0495\3\{6860BEB5-6E05-426B-B0FD-042146BED6D2}\{0646100100_500-SS-103.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 5:00 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

700 Area Drawings

NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)
2. REFER TO 100-SS-103 FOR COLUMN BASE PLATE AND ANCHOR SCHEDULE PATTERN.

FOUNDATION PLAN:
1/4"=1'-0"
EL 100'-0" = EL 10677'-0"± WHICH SHOULD EQUAL FILTER BLDG TOC FLOOR ELEVATION WEST OF GL 2

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION	RELEASED TO/FOR
1	SWO	JGT	JGT	10/23/20	IFC – MOVE 15' NORTH, REVISE COMPRESSOR AREA, ADJUST BEDROCK BEARING	
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION	

	A	B	C	0	1	2	3
CLIENT				4/28/17	10/23/20		
BID				4/28/17	10/23/20		
CONSTRUCTION				4/28/17	10/23/20		

DATE RELEASED

BARR
Corporate Headquarters:
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BARR ENGINEERING CO.
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CONCRETE AND FOUNDATION
REAGENT & COMPRESSOR AREA FLOOR PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-FF-100
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100100_700-FF-100A.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:32 PM
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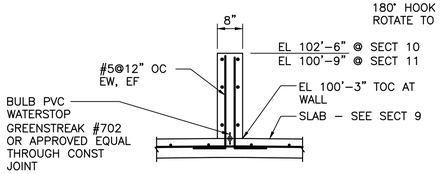
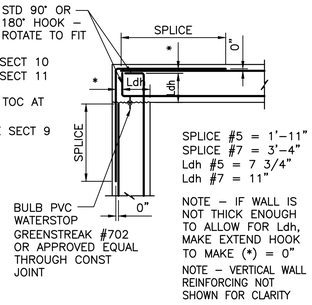
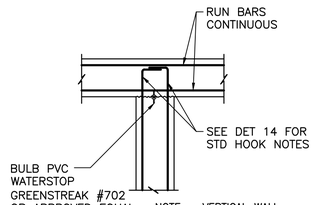


10 SECTION: 700–FF–100 1/2"=1'–0"

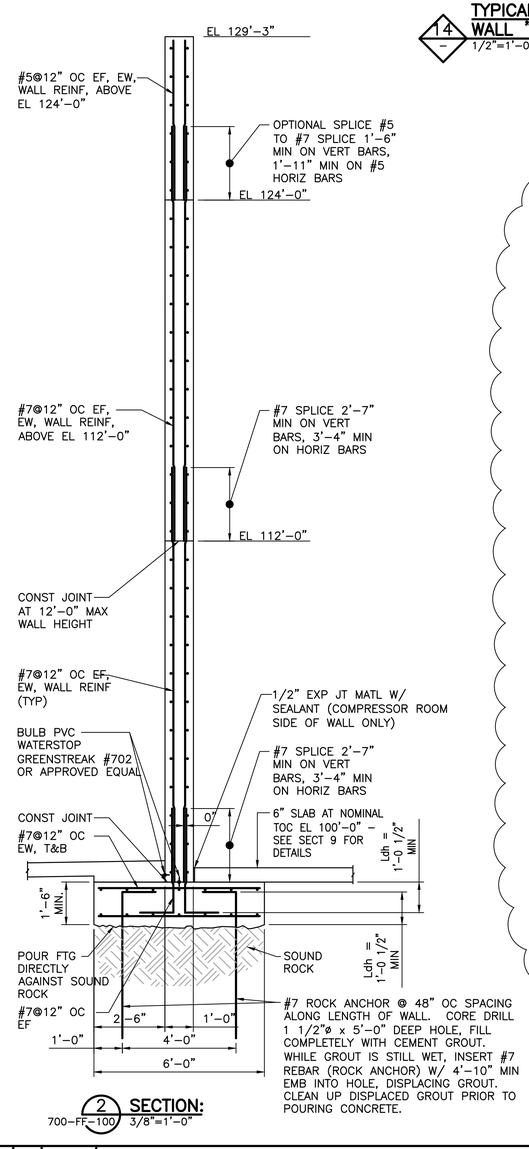


11 SECTION: 700–FF–100 1/2"=1'–0"

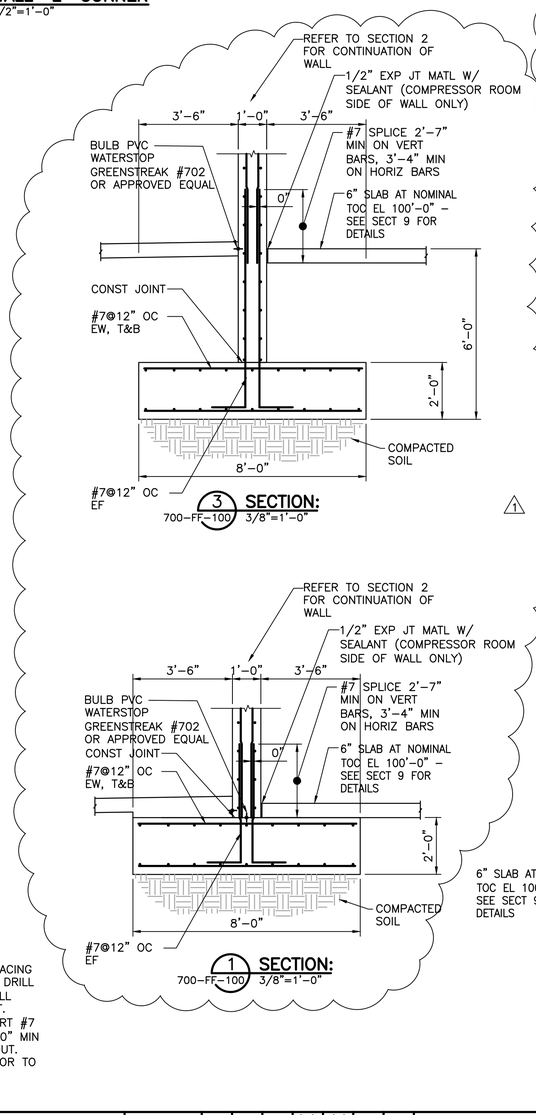


15 TYPICAL DETAIL: WALL "T" CORNER 1/2"=1'–0"

14 TYPICAL DETAIL: WALL "L" CORNER 1/2"=1'–0"

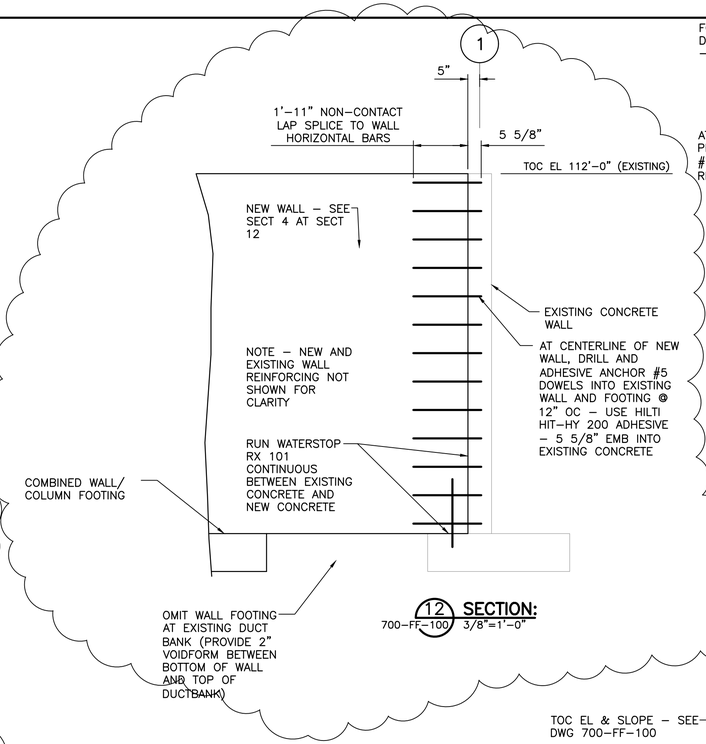


2 SECTION: 700–FF–100 3/8"=1'–0"

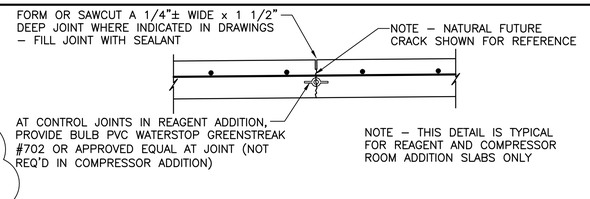


3 SECTION: 700–FF–100 3/8"=1'–0"

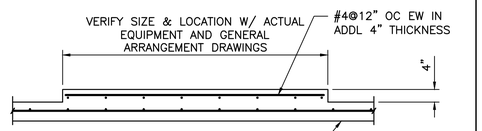
1 SECTION: 700–FF–100 3/8"=1'–0"



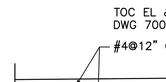
12 SECTION: 700–FF–100 3/8"=1'–0"

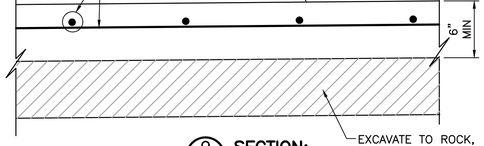


17 TYPICAL DETAIL: SLAB CONTROL JOINT (CJ OR C.J.) 1/2"=1'–0"

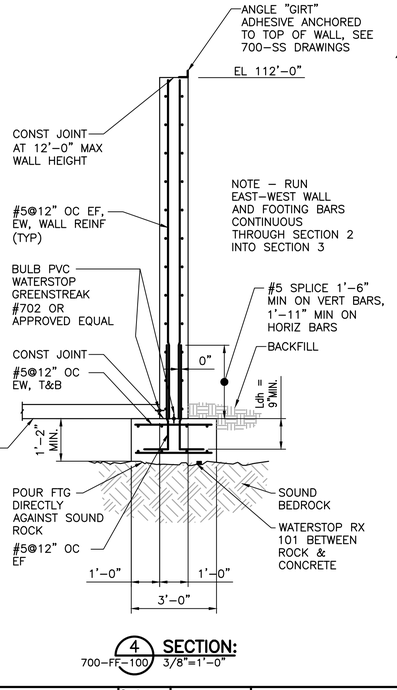


18 SECTION – COMPRESSOR PADS: 700–FF–100 1/2"=1'–0"

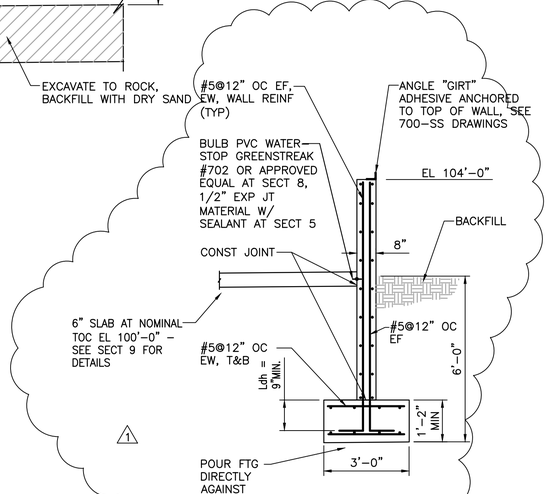




9 SECTION: 700–FF–100 1 1/2"=1'–0" 700–FF–102



4 SECTION: 700–FF–100 3/8"=1'–0"



5 SECTION: 700–FF–100 3/8"=1'–0"

8 SECTION: 700–FF–100 3/8"=1'–0"

NOTES:
1. REFER TO 100–SS–100 AND 700–FF–102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SWO	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION–ADD SECT 1&3, MODIFY SECT 5,8,12, DELETE SECT 19
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/23/20; BID 4/28/17 10/23/20; CONSTRUCTION 4/28/17 10/23/20

DATE RELEASED: A B C 0 1 2 3

BARR
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Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CONCRETE AND FOUNDATION
REAGENT BUILDING CONCRETE WALL SECTIONS

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 700–FF–101
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001\00_700–FF–101A.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:28 PM
BAR M:\AutoCAD 2011\AutoCAD 2011 Support\enu\Template\Barr_2011_Template.dwt Plot at 1 10/05/2010 14:03:50

REAGENT AND COMPRESSOR BUILDING NOTES & SPECIFICATIONS:

1. ACCORDING TO PRELIMINARY NIXON MOORE ASSOCIATES DRAWINGS, THE EXISTING FILTER BUILDING WAS DESIGNED AS OCCUPANCY F2/B, TYPE V / NON-SPRINKLED. THE REAGENT AND COMPRESSOR ADDITIONS WILL BE TYPE I/II / NON-SPRINKLED.

A. THE COMPRESSOR PORTION OF THE ADDITION IS BEING CLASSIFIED AS F-2 AND WILL BE LOCATED DIRECTLY BETWEEN THE REAGENT ADDITION AND THE EXISTING FILTER BUILDING. THE REAGENT BUILDING WILL BE CLASSIFIED AS HAZARDOUS AS DESCRIBED IN 1B. THE EAST SIDE OF THE EXISTING FILTER BUILDING IS GENERALLY OCCUPANCY F-2 TO MATCH PART OF THE FILTER BUILDING. HOWEVER, THE SECOND FLOOR OF THE FILTER BUILDING IN THE SOUTHEAST CORNER CONTAINS AN OUT-OF-USE OFFICE OR CONFERENCE ROOM AREA. THIS ROOM IS VERY MOLD INFESTED AND CANNOT CURRENTLY BE USED AS AN OFFICE OR CONFERENCE ROOM. THE EAST EXTERIOR WALL OF THIS ROOM IS COVERED WITH MOLDED GYP BOARD. IF THIS AREA WERE IN USE, IT WOULD LIKELY BE CLASSIFIED AS B PER THE ORIGINAL NIXON MOORE CLASSIFICATION. SINCE IT IS NOT BEING USED FOR IT'S ORIGINAL PURPOSE, THIS ROOM IS BEING DECLARED AS THE SAME F-2 OCCUPANCY AS THE SURROUNDING FILTER BUILDING SPACE AS WELL AS THE NEW COMPRESSOR ROOM SPACE. IF THE OWNER WISHES TO EVENTUALLY REPAIR THIS ROOM AND BRING IT BACK TO B CLASSIFICATION, THEY WILL NEED TO MEET THE IBC SEPARATION REQUIREMENTS WHICH PER 2006 IBC WOULD INVOLVE ENSURING THAT THE FLOOR AND THE EAST, WEST, AND SOUTH WALLS ALL HAVE A 2-HOUR FIRE SEPARATION.

B. CLASSIFICATION OF THE REAGENT PORTION INCLUDES STORAGE OF NINE REAGENT CHEMICALS:

FLOCCULANT	NON-HAZARDOUS
AEROPHINE 3418A (DIALKYL DITHIOPHOSPATE)	HAZARDOUS (H-4)
AERO 242 PROMOTER (DIARYL DITHIOPHOSPHATE)	HAZARDOUS (H-4)
MIBC (METHYL ISOBUTYL CARBINOL)	HAZARDOUS (H-3 DUE TO FLAMMABILITY)
COPPER SULFATE	HAZARDOUS (H-4)
ZINC SULFATE	HAZARDOUS (H-4)
LIME PH MODIFIER	HAZARDOUS (H-4)
MBS SODIUM METABISULPHITE	HAZARDOUS (H-4)
SIPX SODIUM ISOPROPYL XANTHATE	HAZARDOUS (H-3 - CLASS 2 WATER REACTIVE)

THE XANTHATE IS REACTIVE WITH WATER AND THIS REACTION CREATES POTENTIALLY LETHAL OR EXPLOSIVE FUMES. PER 2006 IBC TABLE 508.3.3, THE SEPARATION OF A H-3 FROM AN H-4 OCCUPANCY DOES NOT REQUIRE A SEPARATION AS LONG AS IT IS SPRINKLED. SINCE XANTHATE IS WATER REACTIVE, SPRINKLING IS NOT AN OPTION. IBC 903.3.1.1.1 PROVIDES AN EXCEPTION TO REQUIRING THIS SPRINKLING REQUIREMENT. INSTEAD OF THIS SPRINKLER REQUIREMENT, THIS PROJECT HAS DECIDED TO PUT THE H-3 CLASSIFIED MIBC, AND XANTHATE CHEMICALS IN THEIR OWN SEPARATE INDEPENDENT ENCLOSED ROOMS/BUILDINGS WITHIN THE REAGENT BUILDING. CONTRACTOR TO PROVIDE DESIGN AND CONSTRUCTION FOR THESE ROOMS AS DESCRIBED IN DETAIL 9/700-SS-104. THESE ROOMS WILL PROVIDE A ONE HOUR SEPARATION BETWEEN THESE CHEMICALS AND THE REST OF THE H-4 CLASSIFIED CHEMICALS IN THE REAGENT BUILDING. A THREE HOUR MINIMUM UNSPRINKLERED SEPARATION WALL WILL BE PROVIDED BETWEEN THE REAGENT ADDITION AND THE COMPRESSOR ADDITION TO SEPARATE H-4 OCCUPANCIES FROM F-2 OCCUPANCIES.

2. HVAC AND VENTILATION DESIGNS PROVIDED BY OTHERS. AT MINIMUM, THE TWO ENCLOSED ROOMS REQUIRE VENTILATION. THE ADDITIONS MAY REQUIRE UNIT HEATERS. CONTRACTOR TO COORDINATE WITH OWNER TO DETERMINE WHAT IS IN THE CONTRACTOR'S SCOPE.

3. PROVIDE INSULATION AS FOLLOWS:

EXTERIOR WALLS	R = 20 MIN.
ROOF	R = 49 MIN.

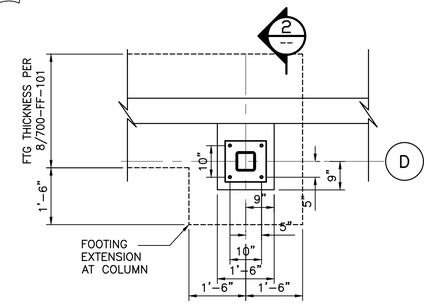
COMPRESSOR ADDITION IS NOT HAZARDOUS. POLYURETHANE OR FOAM INSULATION (EITHER BOARDS OR SPRAY FOAM MAY USED).

REAGENT ADDITION IS HAZARDOUS. NON-FLAMMABLE INSULATION SHOULD BE UTILIZED. USE FIBERGLASS BATT INSULATION BELOW ROOF. ADD LAGGING AS NECESSARY TO HOLD IN PLACE. USE MINERAL WOOL INSULATION BOARD ATTACHED TO INSIDE OF WALLS.

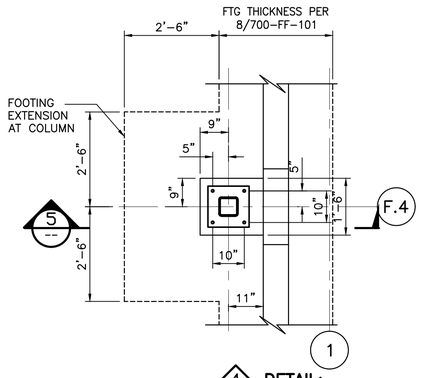
4. SITE GRADING DESIGN IS BY OTHERS. GRADING OF SITE SHALL BE PROVIDED TO FLOW WATER FROM WEST TO EAST ALONG SOUTH SIDE OF REAGENT AND COMPRESSOR ROOM ADDITIONS, AND THEN FROM SOUTH TO NORTH ALONG THE EAST SIDE OF THE REAGENT BUILDING. SITE WILL REQUIRE GRADING OF MOUNTAINSIDE TO ALLOW SPACE FOR BUILDING AND FOUNDATION. OWNER WILL PROVIDE ROUGH EXCAVATION OF MOUNTAINSIDE. CONTRACTOR MAY BE RESPONSIBLE FOR SOME FINISH EXCAVATION (COORDINATE WITH OWNER REGARDING EXCAVATION SCOPE). FOUNDATION DRAWINGS ASSUME TOP OF ROCK ELEVATION IS AT APPROXIMATE ELEVATION 98'-0" THROUGHOUT TO MATCH EXISTING FILTER BUILDING FOUNDATION DRAWINGS. NEW FOOTINGS ARE DESIGNED TO BEAR ON ROCK, AND SITE EXCAVATION SHALL BE EXTENDED TO ROCK SURFACE.

5. PROVIDE THE FOLLOWING DOORS AND ALL RELATED HARDWARE (REFER TO 700-GA-001 FOR DOOR SWINGS). ALL EXTERIOR DOORS TO BE COATED FOR EXTERIOR EXPOSURE.

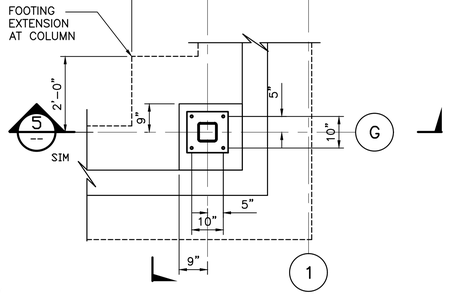
- (2) ONE HOUR RATED OVERHEAD ROLL UP DOORS - ROUGH OPENING 6'-0" WIDE x 8'-0" TALL IN MIBC AND XANTHATE ROOM WALLS. THESE DOORS TO BE AUTOMATICALLY CLOSING DURING A FIRE.
- (2) ONE HOUR RATED MAN-DOORS - ROUGH OPENING 3'-4" WIDE x 7'-2" TALL IN MIBC AND XANTHATE ROOM WALLS FOR 3'-0"x7'-0" DOORS. THESE DOORS TO ALL BE SELF-CLOSING AND OPEN AWAY FROM THE ROOMS. DOORS TO HAVE PANIC BARS AND RELATED HARDWARE ON THE INTERIOR OF THE ROOMS.
- (1) THREE HOUR RATED MAN-DOOR - ROUGH OPENING 3'-4" WIDE x 7'-2" TALL IN 12" CONCRETE WALL BETWEEN REAGENT AND COMPRESSOR ADDITIONS (DOOR SIZE 3'-0" x 7'-0"). THIS DOOR TO BE SELF-CLOSING AND OPEN AWAY FROM THE REAGENT ADDITION AND INTO THE COMPRESSOR ADDITION. DOOR TO HAVE PANIC BAR AND RELATED HARDWARE ON THE REAGENT SIDE OF THE DOOR.
- (3) EXTERIOR INSULATED MAN-DOORS - ROUGH OPENING 3'-4" WIDE x 7'-2" TALL. TWO DOORS ARE FOR EXITING THE REAGENT AND COMPRESSOR ADDITIONS ON THE NORTH SIDE OF THE BUILDING, AND ONE DOOR IS FOR EXITING THE COMPRESSOR ADDITION ON THE SOUTH SIDE NEAR EXISTING SEPTIC TANK (DOOR SIZE 3'-0"x7'-0", TYPICAL).
- (1) EXTERIOR INSULATED OVERHEAD ROLL UP OR TRACKED DOOR - ROUGH OPENING 8'-0"x10'-0" TALL AT NORTH WALL ENTERING REAGENT ADDITION. CONTRACTOR TO SUPPLY A DOOR THAT WORKS WITH THE GEOMETRY. REFER TO SECTION 9 ON DRAWING 700-SS-103 FOR GEOMETRY. DOOR TO HAVE AN ELECTRIC OPENER.
- (1) EXTERIOR INSULATED OVERHEAD ROLL UP OR TRACKED DOOR - ROUGH OPENING 12'-0"x10'-0" TALL AT NORTH WALL ENTERING COMPRESSOR ADDITION. DOOR TO HAVE AN ELECTRIC OPENER.



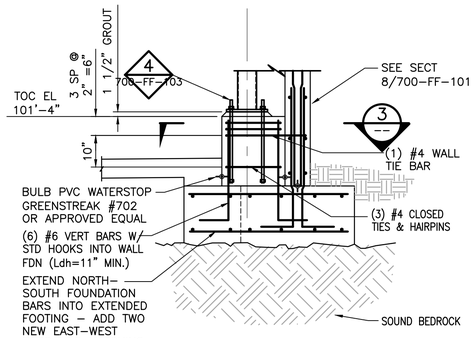
1 700-FF-100 DETAIL: 1/2"=1'-0"



4 700-FF-100 DETAIL: 1/2"=1'-0"



7 700-FF-100 DETAIL: 1/2"=1'-0"



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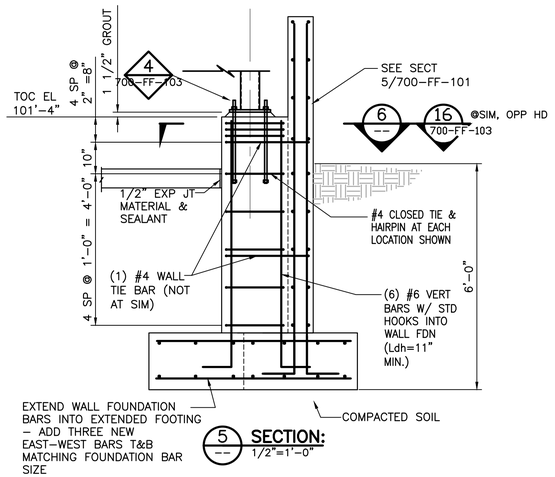
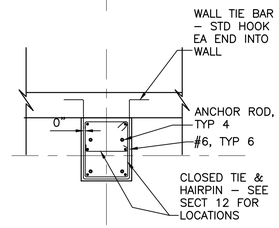


5 SECTION: 1/2"=1'-0"

NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)



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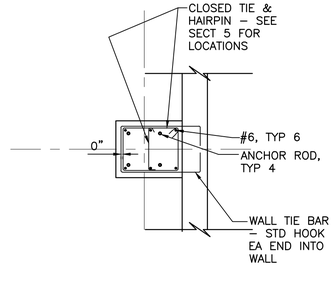

6 SECTION: 1/2"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION	RELEASED TO/FOR
					CLIENT	
					BID	
					CONSTRUCTION	
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0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION	

DATE RELEASED

A	B	C	0	1	2	3
			4/28/17	10/23/20		
			4/28/17	10/23/20		
			4/28/17	10/23/20		

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Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

REAGENT & COMPRESSOR ADDITION
STRUCTURAL NOTES & CMU

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-FF-102
REV. No. 1

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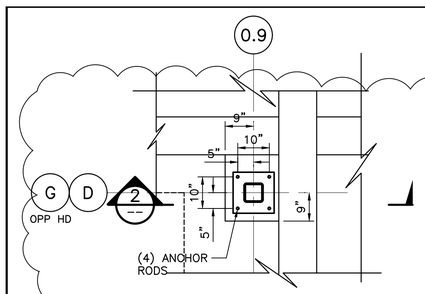
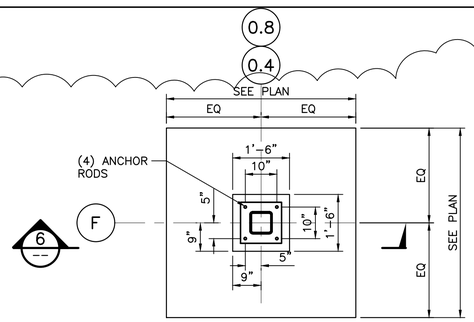
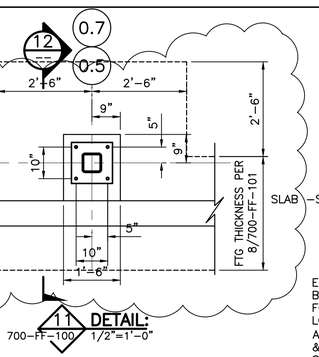
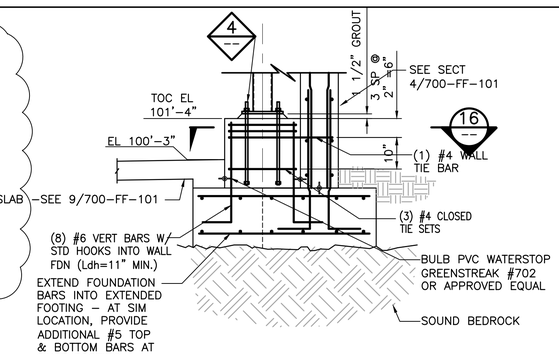
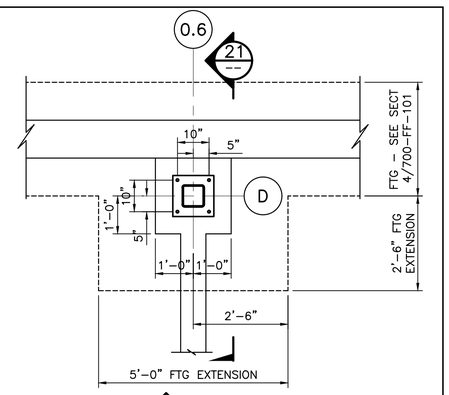




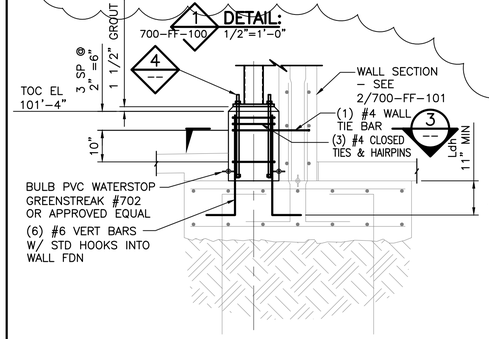
NOTE: PLAN FOOTING DIMENSIONS PROVIDE ONE DIMENSION IF THE FOOTING IS BEARING ON SOUND BEDROCK AND A SECOND DIMENSION IF THE FOOTING IS BEARING ON COMPACTED SOIL



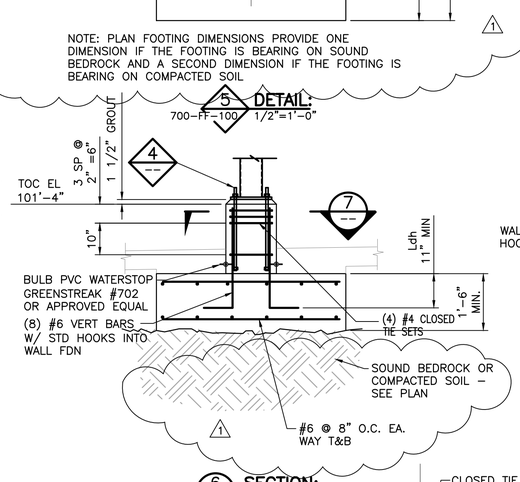




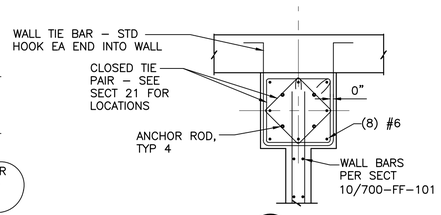
20 DETAIL: 700-FF-100 3/8"=1'-0"



2 SECTION: 1/2"=1'-0"



6 SECTION: 1/2"=1'-0"



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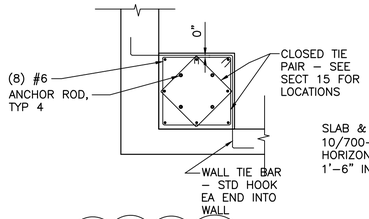
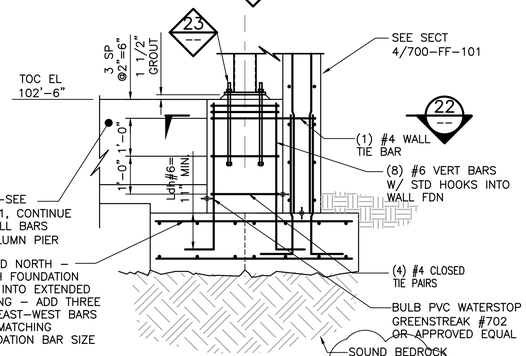
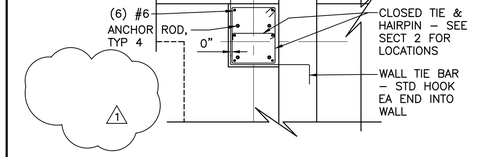
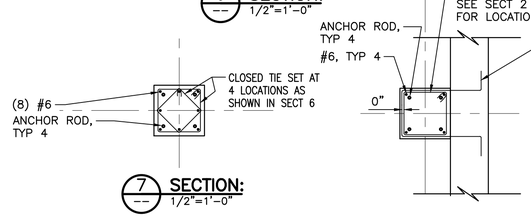


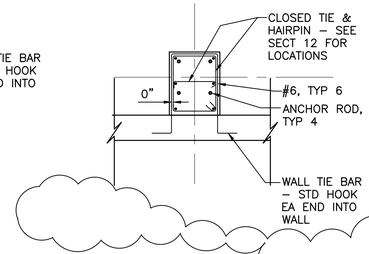


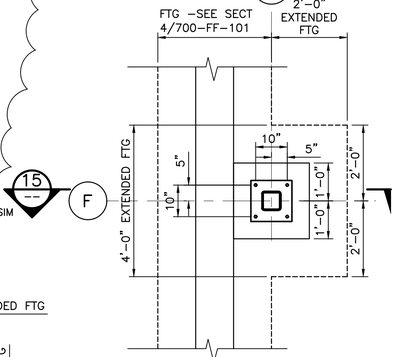
16 SECTION: 1/2"=1'-0"

21 SECTION: 1/2"=1'-0"



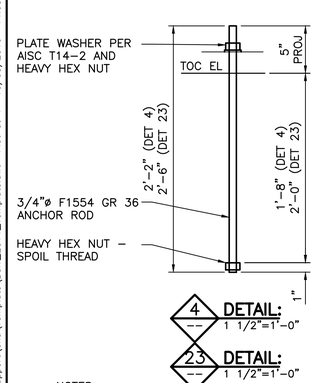






3 SECTION: 1/2"=1'-0"

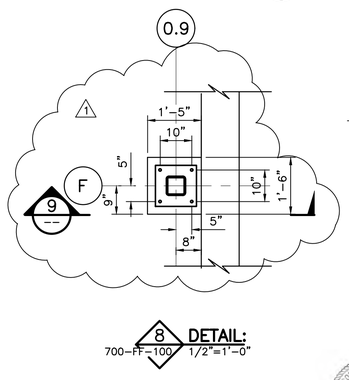
7 SECTION: 1/2"=1'-0"



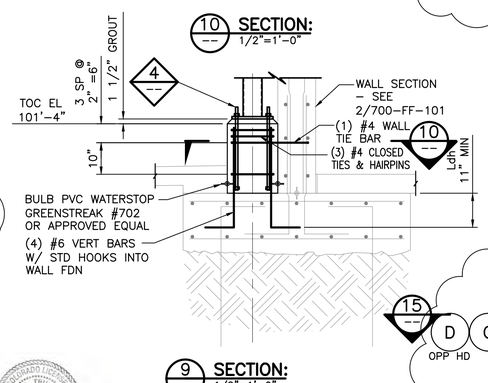
4 DETAIL: 1 1/2"=1'-0"

23 DETAIL: 1 1/2"=1'-0"

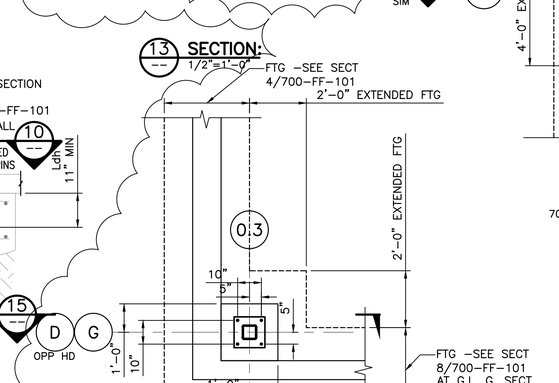
NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)



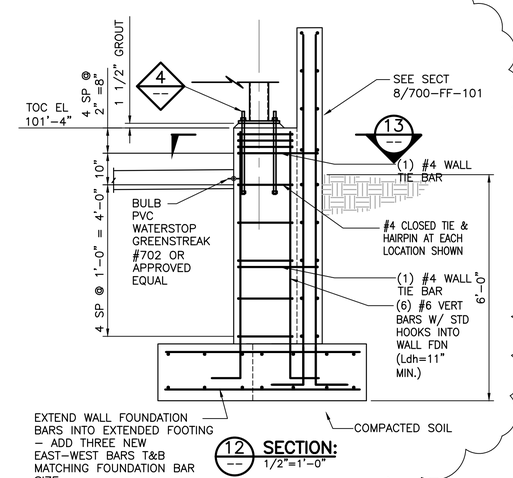
8 DETAIL: 700-FF-100 1/2"=1'-0"



9 SECTION: 1/2"=1'-0"



17 DETAIL: 700-FF-100 3/8"=1'-0"



12 SECTION: 1/2"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION –REVISE DETAILS 1,5,8,11,14,17 & SECTIONS 3,6,12,13
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/23/20; BID 4/28/17 10/23/20; CONSTRUCTION 4/28/17 10/23/20

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101
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Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CONCRETE AND FOUNDATION
REAGENT BUILDING CONCRETE DETAILS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-FF-103
REV. No. 1

CADD USER: John Trullinger FILE: M:\DEPTWORK\JGT\06461001.00_700-FF-103A.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:19 PM
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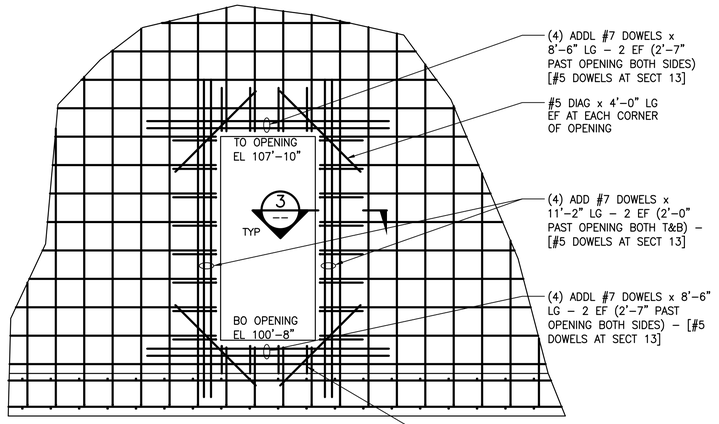
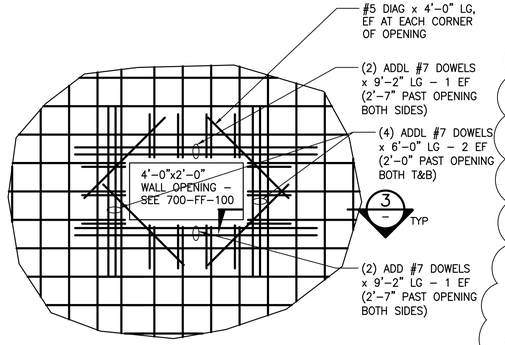
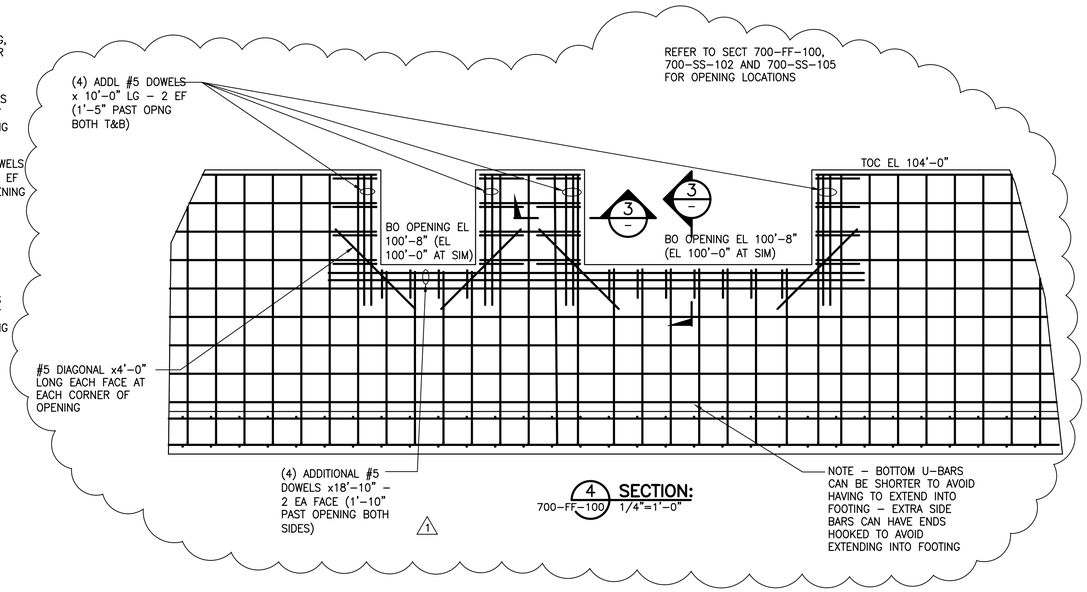


1 SECTION: 700-FF-100 1/4"=1'-0"

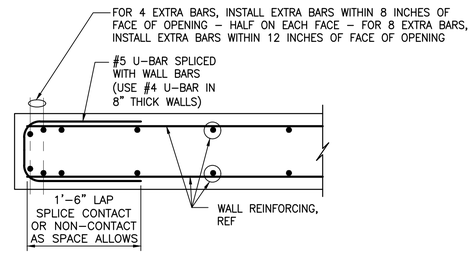
13 SECTION: 700-FF-100 1/4"=1'-0"



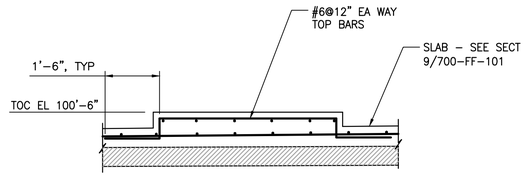
2 SECTION: 700-FF-100 1/4"=1'-0"



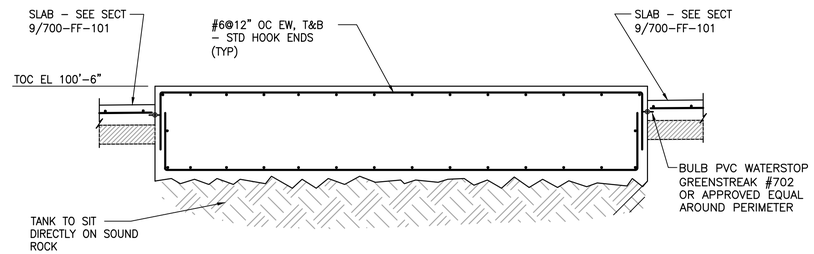
4 SECTION: 700-FF-100 1/4"=1'-0"



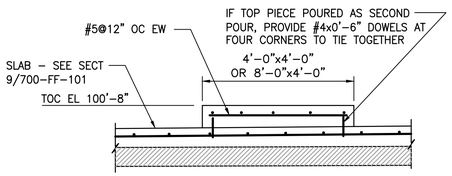
3 SECTION: 1"=1'-0"



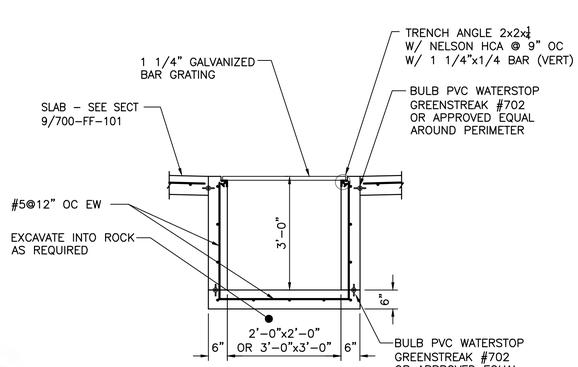
TYPICAL REAGENT TANK FOUNDATION
6 OCTAGON 7 FT OR LESS ACROSS
700-FF-100 1/2"=1'-0"



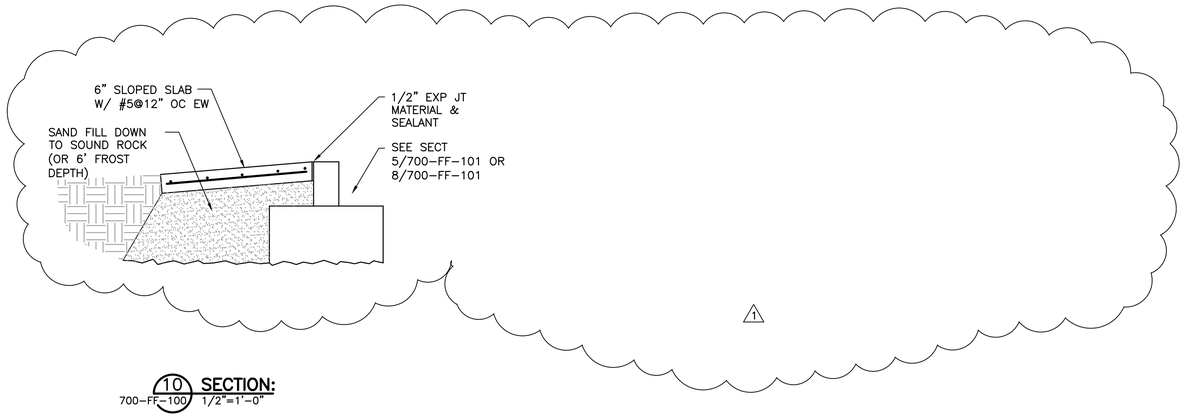
TYPICAL REAGENT TANK FOUNDATION
7 OCTAGON LARGER THAN 7 FT ACROSS
700-FF-100 1/2"=1'-0"



8 TYPICAL INTERIOR DOOR PAD
700-FF-100 1/2"=1'-0"



9 SECTION: 700-FF-100 1/4"=1'-0"



10 SECTION: 700-FF-100 1/2"=1'-0"

NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION - MODIFY SECT 4 & 10, DELETE SECT 11 & 12
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	10/23/20		
BID				4/28/17	10/23/20		
CONSTRUCTION				4/28/17	10/23/20		

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

CONCRETE AND FOUNDATION REAGENT & COMPRESSOR AREA DETAILS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-FF-104
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001.00_700-FF-104A.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:18 PM
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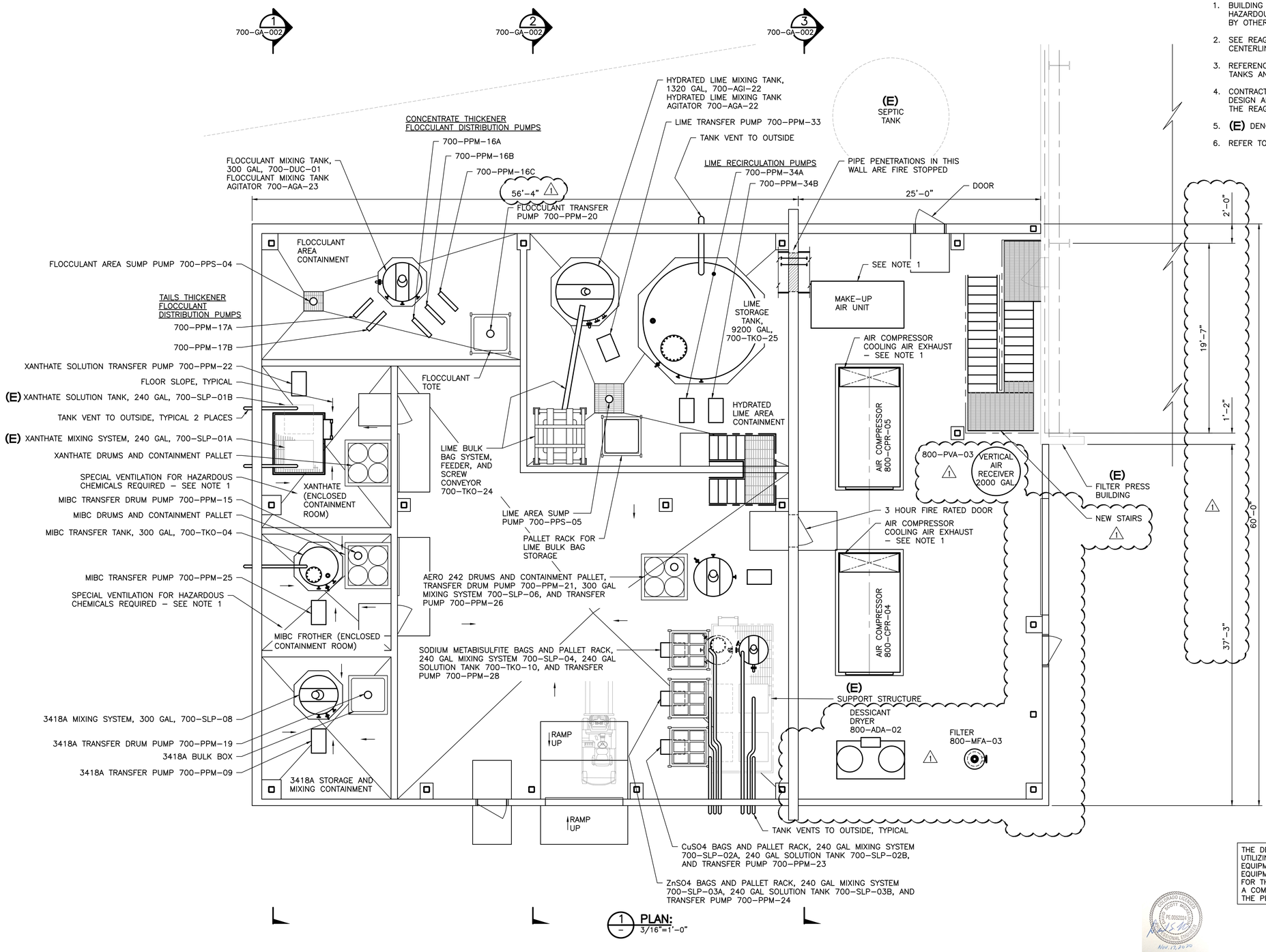
NOTES:

1. BUILDING HVAC AND UTILITIES INCLUDING SPECIAL VENTILATION FOR HAZARDOUS CHEMICALS, MAKE-UP AIR UNIT, AND AIR COMPRESSOR COOLING BY OTHERS AND WILL REQUIRE ADDITIONAL DESIGN.
2. SEE REAGENT BUILDING STRUCTURAL DRAWINGS FOR LOCATING TANK CENTERLINES.
3. REFERENCE 300 SERIES GAs FOR LOCATIONS OF ADDITIONAL REAGENT DAY TANKS AND METERING PUMPS.
4. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH OWNER ON THE DESIGN AND INSTALLATION OF SAFETY SHOWERS AND EYE WASH STATIONS IN THE REAGENT BUILDING.
5. (E) DENOTES EXISTING EQUIPMENT.
6. REFER TO 700-MC SERIES DRAWINGS FOR TANK DETAILS.



1 PLAN: 3/16"=1'-0"

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

PE 0052291 Nov. 17, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	DSM	DSM	11/17/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

	A	B	C	0	1	2	3
CLIENT				4/28/17	11/17/2020		
BID				4/28/17	11/17/2020		
CONSTRUCTION				4/28/17	11/17/2020		

DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	2/14/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
AIR COMPRESSOR AND REAGENT BUILDING PLAN

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No.
DWG. No. 700-GA-001
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-PW\HIB_PW_IN\B4655C5F8-FD25-4616-ABDB-A5A87C77F5D2\E6E75740-2AFA-4F28-9A9D-CABFE3BAE200\0646100104_700-GA-001.DWG PLOT SCALE: 1:1 PLOT DATE: 11/16/2020 4:12 PM
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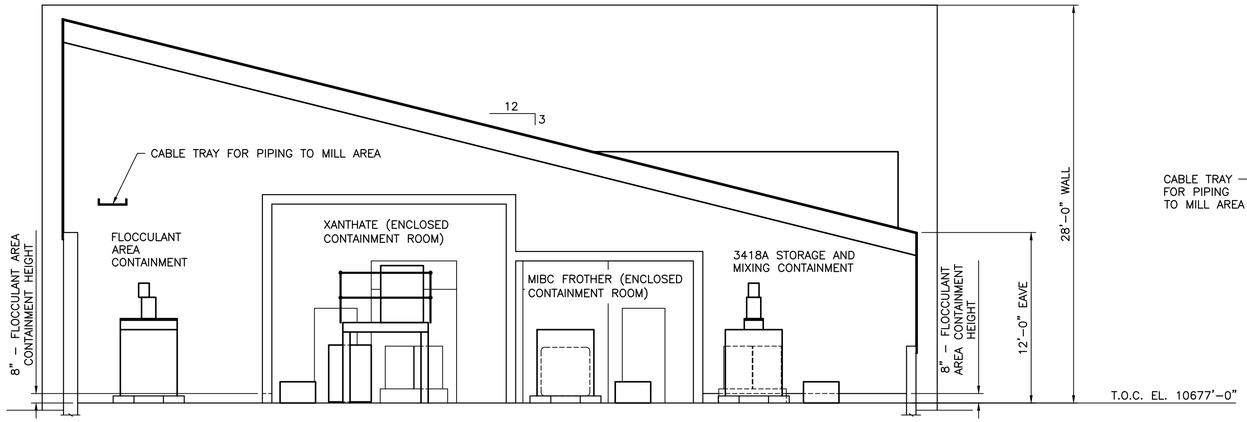
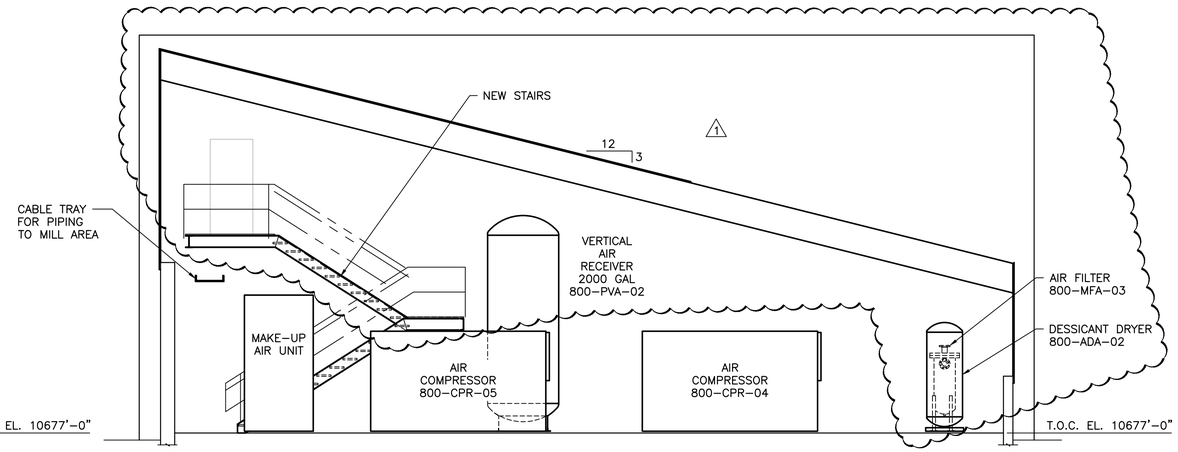
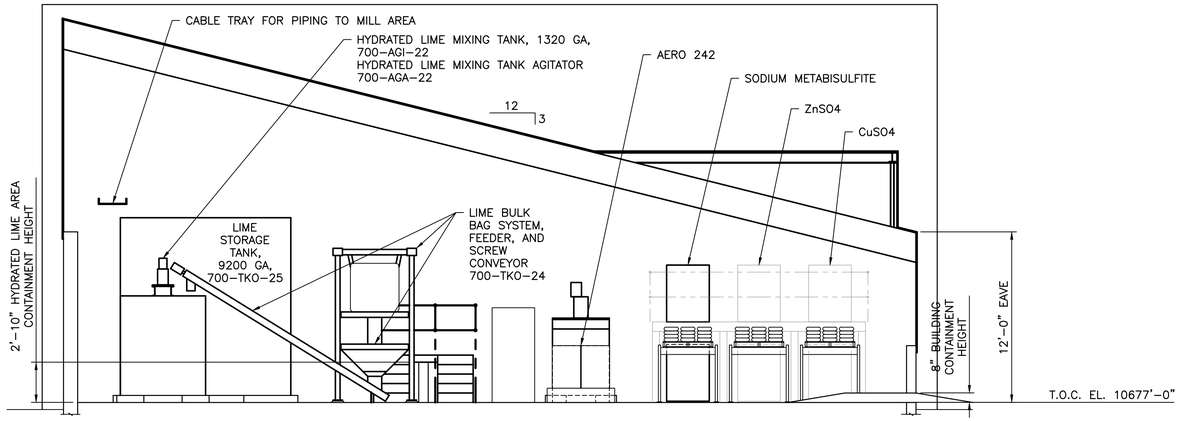


1 SECTION: 700–GA–001 3/16"=1'–0"



3 SECTION: 700–GA–001 3/16"=1'–0"



2 SECTION: 700–GA–001 3/16"=1'–0"

NOTES:

1. **(E)** DENOTES EXISTING EQUIPMENT.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED TIMOTHY MURPHY PE.0052054 PROFESSIONAL ENGINEER Nov. 17, 2020

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	DAK	DSM	DSM	11/17/2020	ISSUED FOR CONSTRUCTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT — 4/28/17 01/11/2020
BID — 4/28/17 01/11/2020
CONSTRUCTION — 4/28/17 01/11/2020

RELEASED TO/FOR: A B C 0 1 2 3
DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
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Scale	AS SHOWN
Date	3/23/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

GENERAL ARRANGEMENT
AIR COMPRESSOR AND REAGENT BUILDING SECTIONS

BARR PROJECT No. 06/46–1001
CLIENT PROJECT No.
DWG. No. 700–GA–002
REV. No. 1

CADD USER: Hbpwuser FILE: \\HIB-FPW\HIB_PW_IN\B4656C5F8-F025-4616-4BD8-A5A87C77F5D2\F6C46B51-BC74-4CA3-A019-20B3045285B9\0646100104_700-GA-002.DWG PLOT SCALE: 1:1 PLOT DATE: 11/16/2020 4:12 PM
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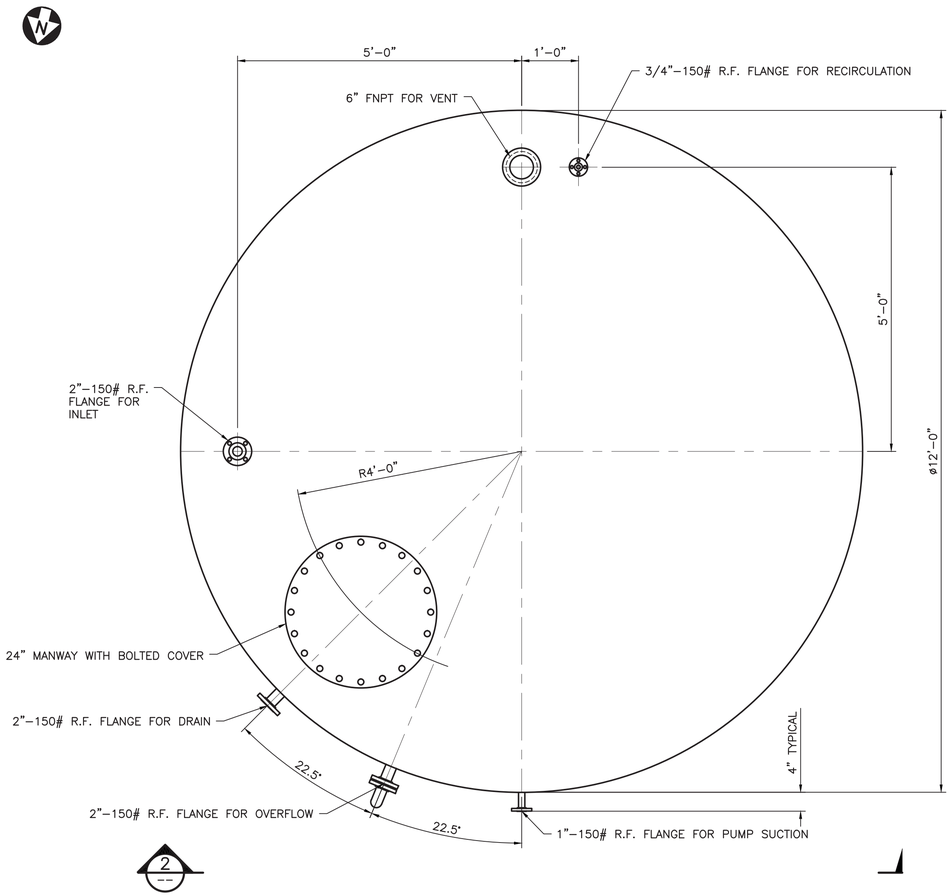
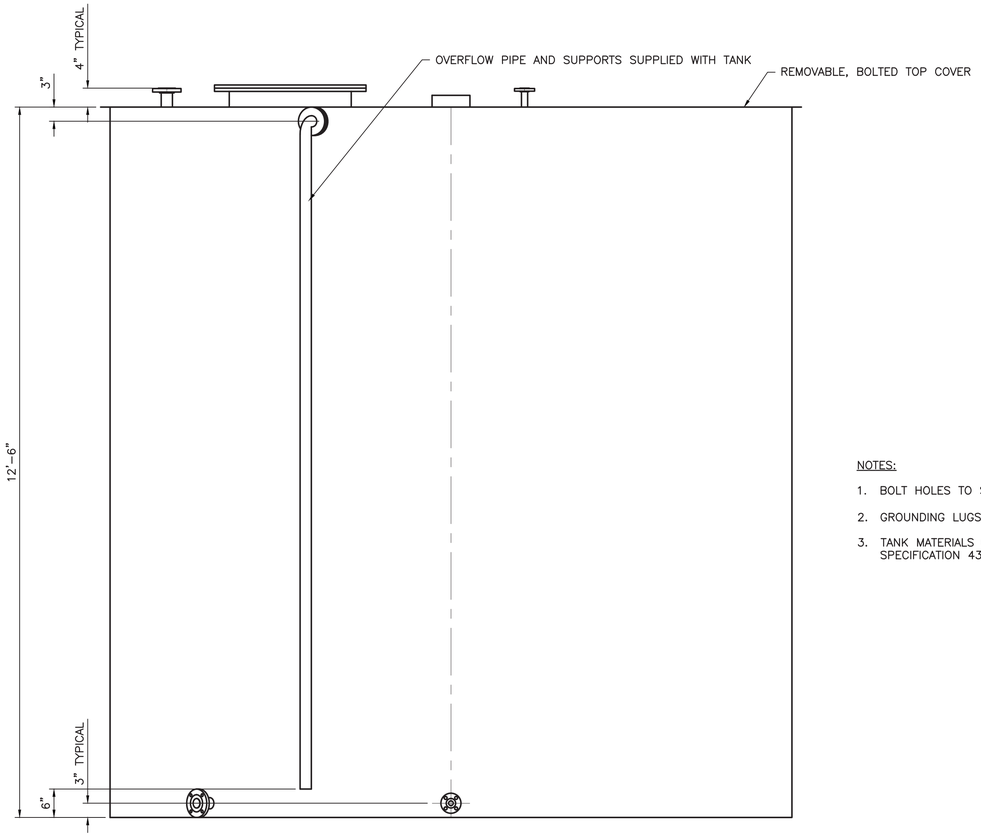


1 — PLAN: LIME STORAGE TANK 700-TK-025
3/4"=1'-0"



2 — ELEVATION: LIME STORAGE TANK 700-TK-025
3/4"=1'-0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.

COLORADO LICENSED — SCOTT MICHEL — PE.0052024 — PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
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Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
LIME STORAGE TANK 700-TKO-25

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No.
DWG. No. 700-MC-001
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\50E164EB-6630-4335-B2B2-22BFE6FE48CE\08209SC7-ACF1-4954-AC1F-23B9A1F06AB1\06461001OO_700-MC-001.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 11:53 AM
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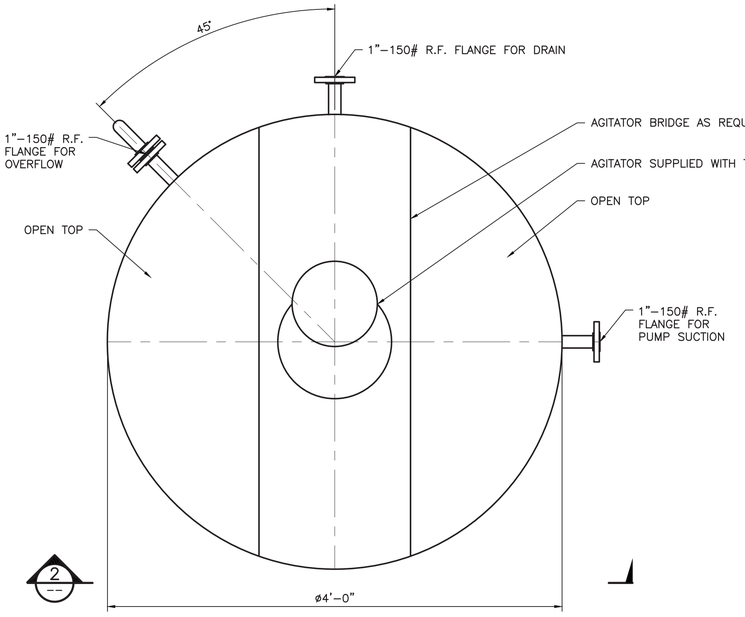
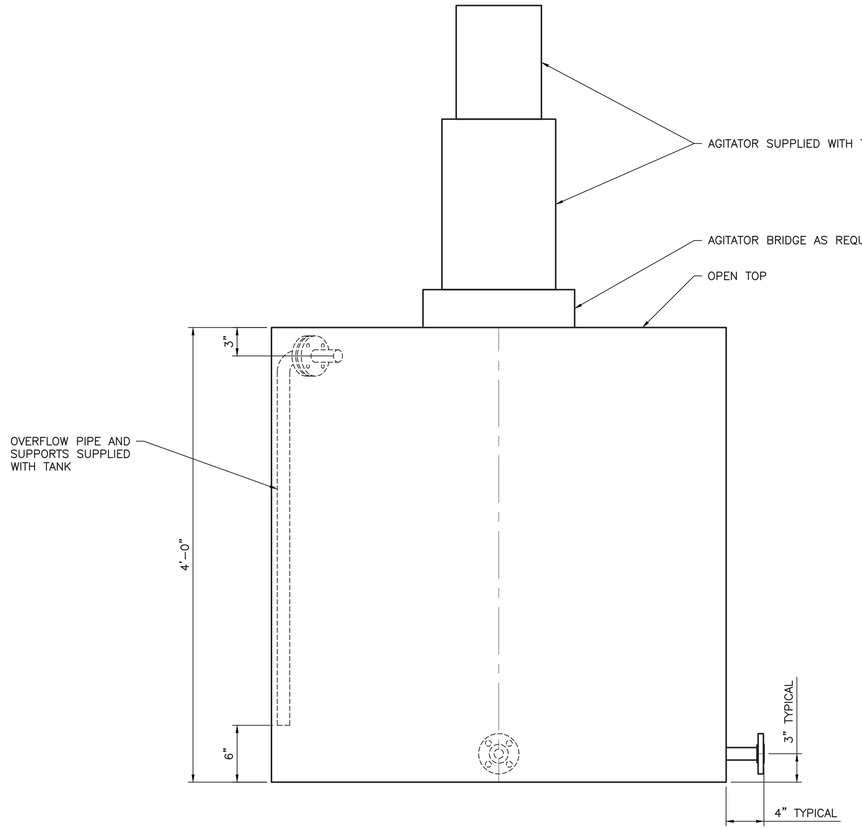


1 PLAN: AERO 242 MIXING SYSTEM 700–SLP–06
1 1/2"=1'–0"



2 ELEVATION: AERO 242 MIXING SYSTEM 700–SLP–06
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL MOUNTED ON TOP OF TANK.

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT				4/28/17					
BID				4/28/17					
CONSTRUCTION				4/28/17					
RELEASED TO/FOR	A	B	C	0	1	2	3		
DATE RELEASED									

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
170 SOUTH MAIN STREET
SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
AERO 242 MIXING SYSTEM 700–SLP–06

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–002
REV. No. 0

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\50E164EB-6630-4335-B2B2-22BFEBFE48CE\7BC3143B-72C2-4C46-930C-39ED502CCCA9\0646100100_700-MC-002.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 11:48 AM
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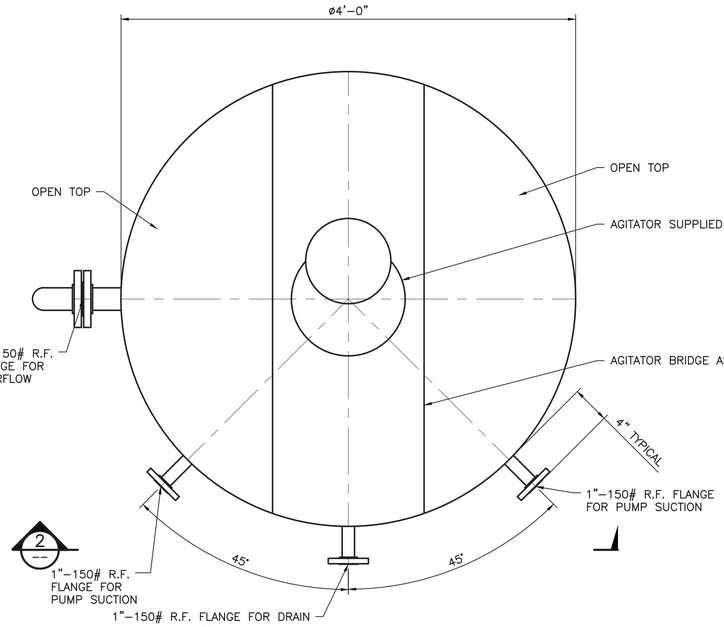
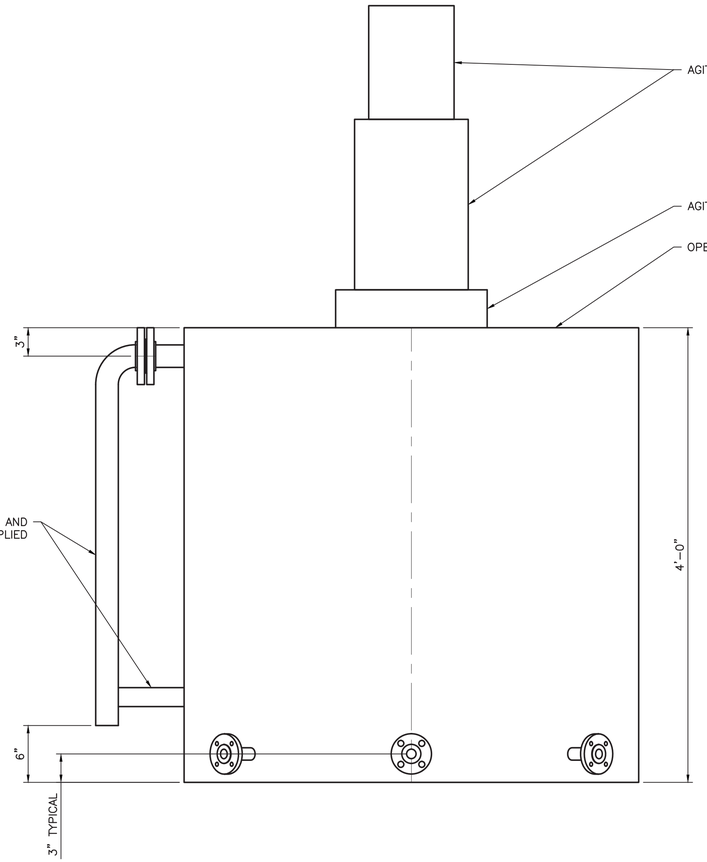


1 PLAN: FLOCCULANT MIXING TANK 700–DUC–01
1 1/2"=1'–0"



2 ELEVATION: FLOCCULANT MIXING TANK 700–DUC–01
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL MOUNTED ON TOP OF TANK.

COLORADO LICENSED SCOTT MICKEY PE.0052024 PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

CLIENT	—	—	—	4/28/17	—	—	—
BID	—	—	—	4/28/17	—	—	—
CONSTRUCTION	—	—	—	4/28/17	—	—	—
RELEASED TO/FOR	A	B	C	0	1	2	3
DATE RELEASED							

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1–800–632–2277

Project Office:
BARR ENGINEERING CO.
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SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1–800–632–2277
Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
FLOCCULANT MIXING TANK 700–DUC–01

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–003
REV. No. 0

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\50E1648B-6630-4335-B2B2-22BFE6FE48CE\090F4870-7E6E-4040-852D-2BF3B02BB6A0\06461001 00_700-MC-003.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 11:46 AM
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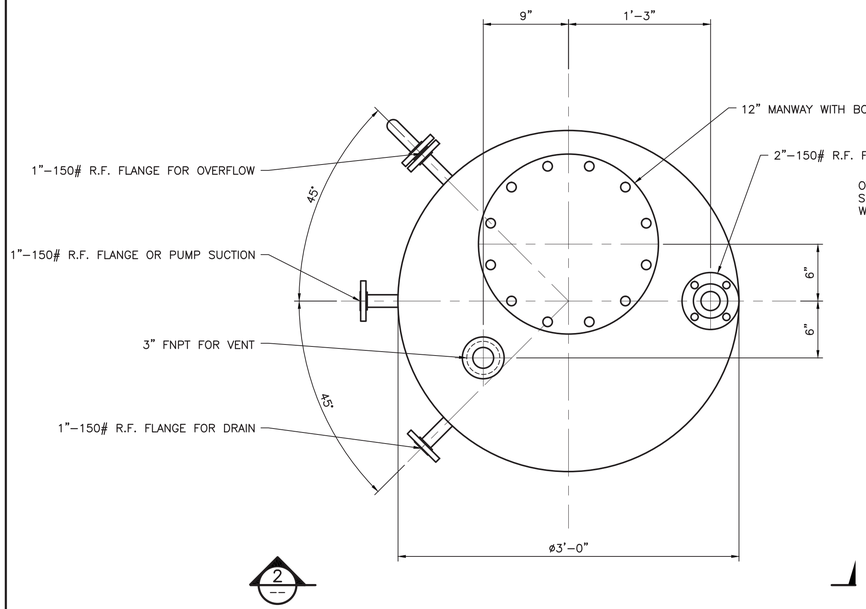
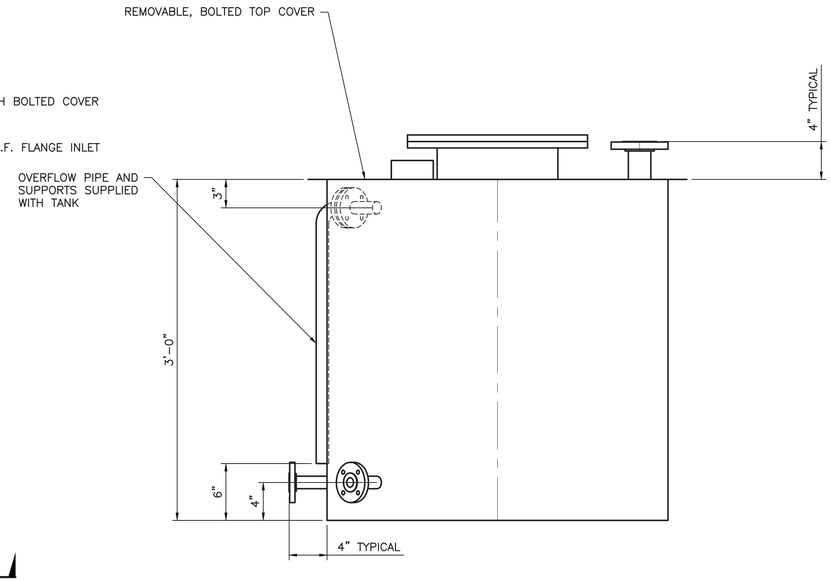


1 PLAN: SODIUM METABISULFITE SOLUTION TANK 700–TKO–10
1 1/2"=1'–0"



2 ELEVATION: SODIUM METABISULFITE SOLUTION TANK 700–TKO–10
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.

COLORADO LICENSED DAVID SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR

Corporate Headquarters: Minneapolis, Minnesota Ph: 1–800–632–2277

Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101 Ph: 1–800–632–2277 Fax: (952) 832–2601 www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
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Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SODIUM METABISULFITE SOLUTION TANK 700–TKO–10

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–004
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\AB315DD6-57AD-4AC4-B774-E90E7125F2A0\BDB2803C-3E9F-40F0-A790-55B2DDB28ECC\0646100100_700-MC-004.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 11:53 AM
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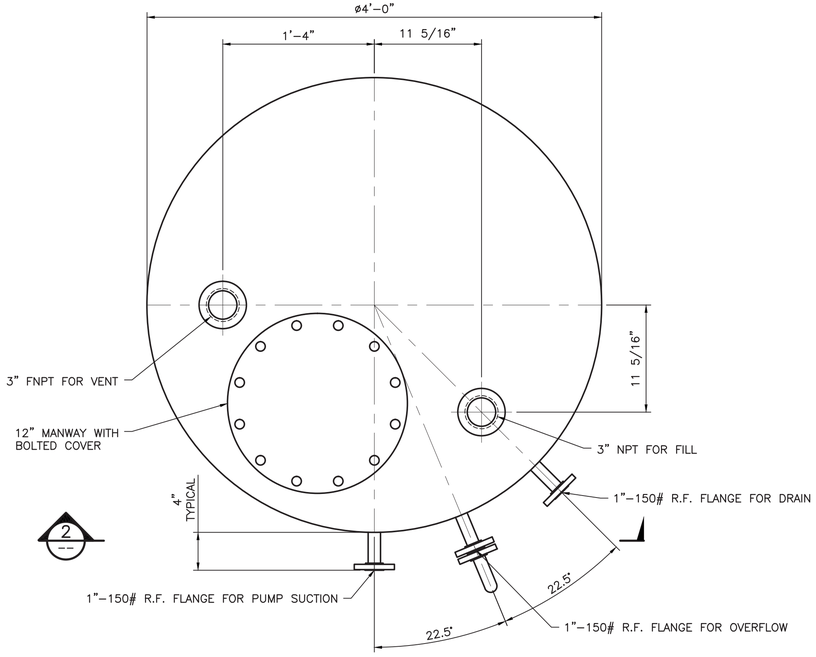
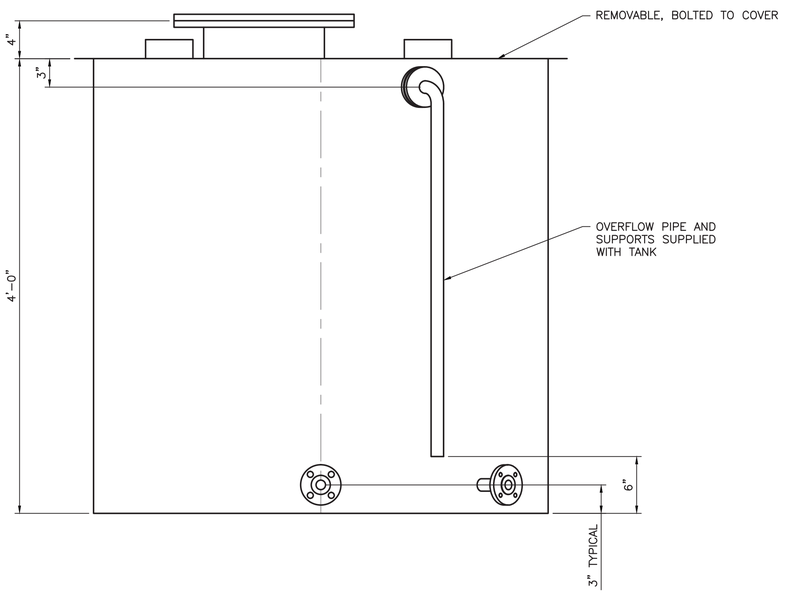


1 — PLAN: MIBC TRANSFER TANK 700–TKO–04
1 1/2"=1'–0"



2 — ELEVATION: MIBC TRANSFER TANK 700–TKO–04
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

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RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

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Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
MIBC TRANSFER TANK 700–TKO–04

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–005
REV. No. 0

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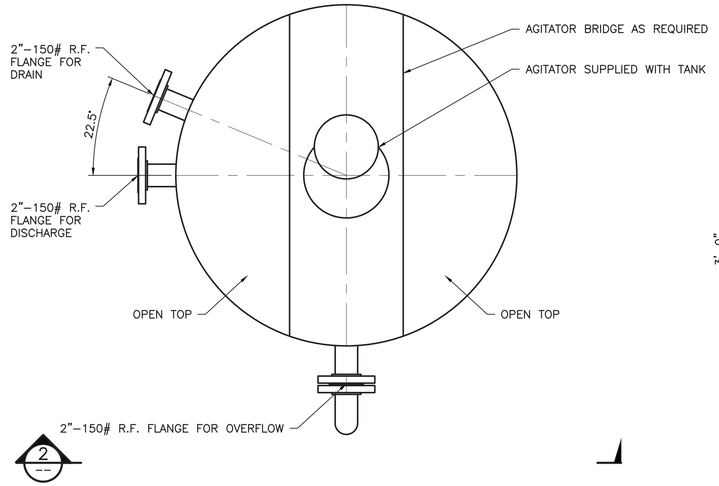
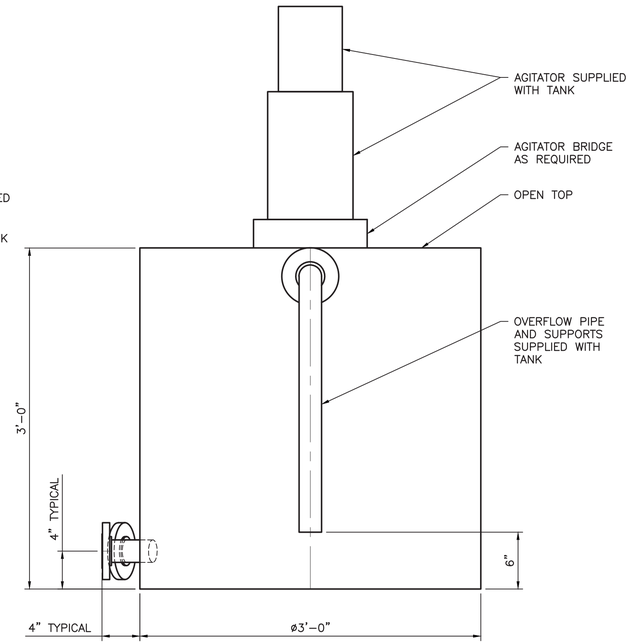


1 PLAN: SODIUM METABISULFITE MIXING SYSTEM 700–SLP–04
1 1/2"=1'–0"



2 ELEVATION: SODIUM METABISULFITE MIXING SYSTEM 700–SLP–04
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL MOUNTED TO TOP OF TANK.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

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RELEASED TO/FOR

CLIENT	BID	CONSTRUCTION
4/28/17	4/28/17	4/28/17

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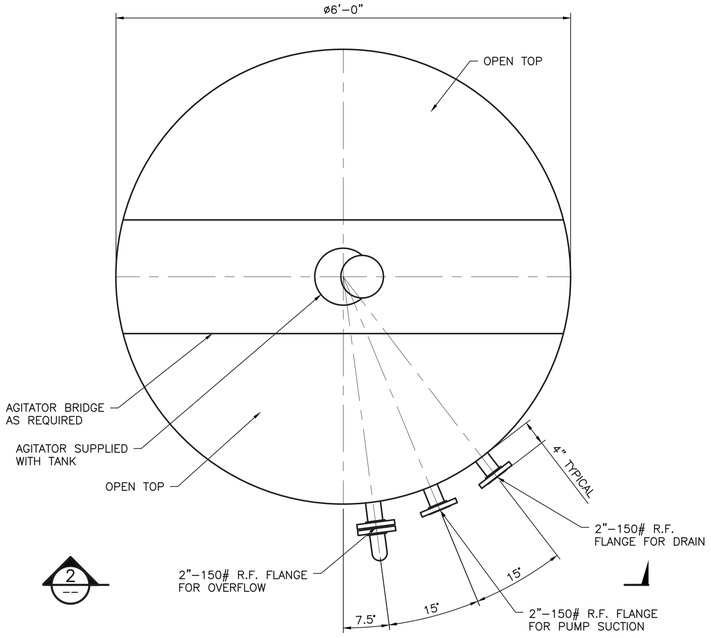
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

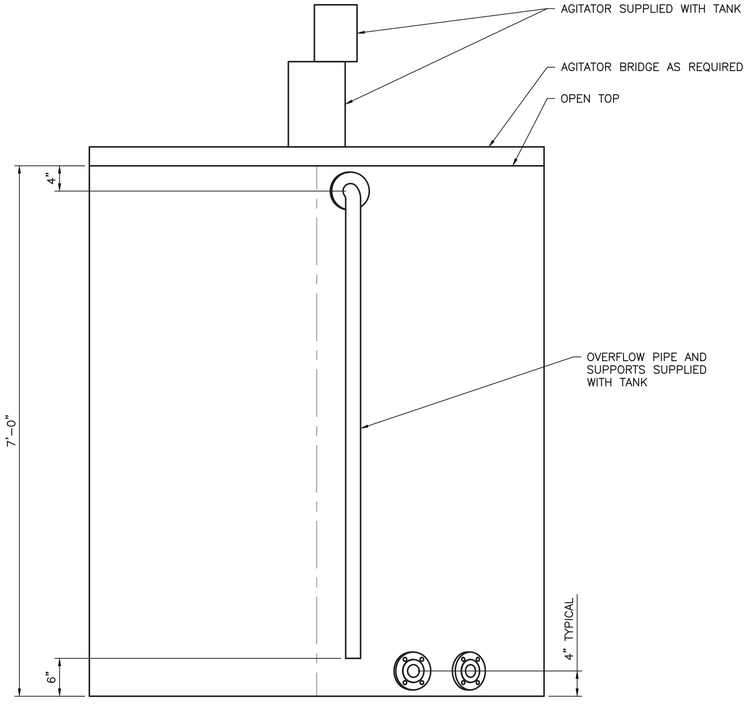
PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
SODIUM METABISULFITE SOLUTION MIXING SYSTEM 700–SLP–04

BARR PROJECT No.	
06/46–1001.00	
CLIENT PROJECT No.	
DWG. No.	REV. No.
700–MC–006	0



1 PLAN: HYDRATED LIME MIXING TANK 700–AGI–22
1"=1'–0"



2 ELEVATION: HYDRATED LIME MIXING TANK 700–AGI–22
1"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL MOUNTED ON TOP OF TANK.

COLORADO LICENSED SCOTT MICKELSON PE.0052024 PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

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0	DAK	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3		
DATE RELEASED									
CLIENT				4/28/17					
BID				4/28/17					
CONSTRUCTION				4/28/17					

BARR
Corporate Headquarters:
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Fax: (952) 832–2601
www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
HYDRATED LIME MIXING TANK 700–AGI–22

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–007
REV. No. 0

CADD USER: Adepluser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\AB315006-57AD-4AC4-B774-E90E7125F2A0\878F2D3E-397E-444C-8703-29F331E1B426\06461001OO_700-MC-007.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 11:56 AM
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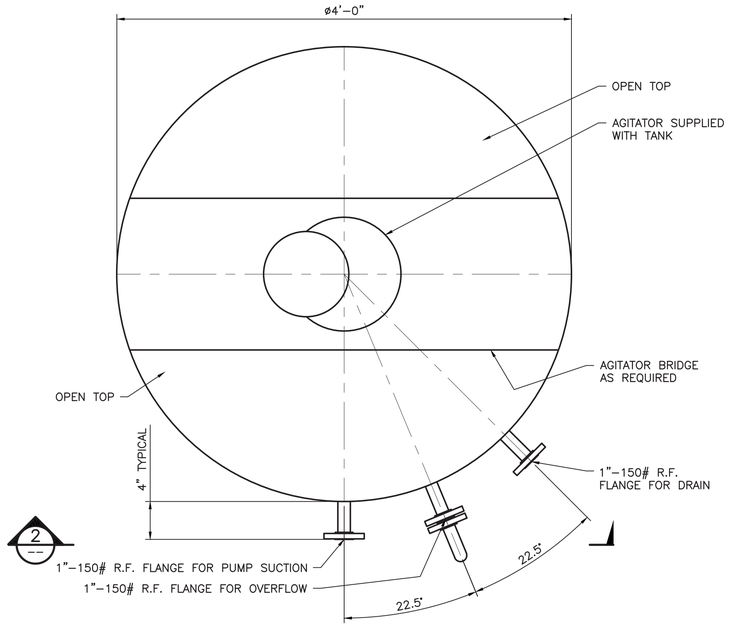
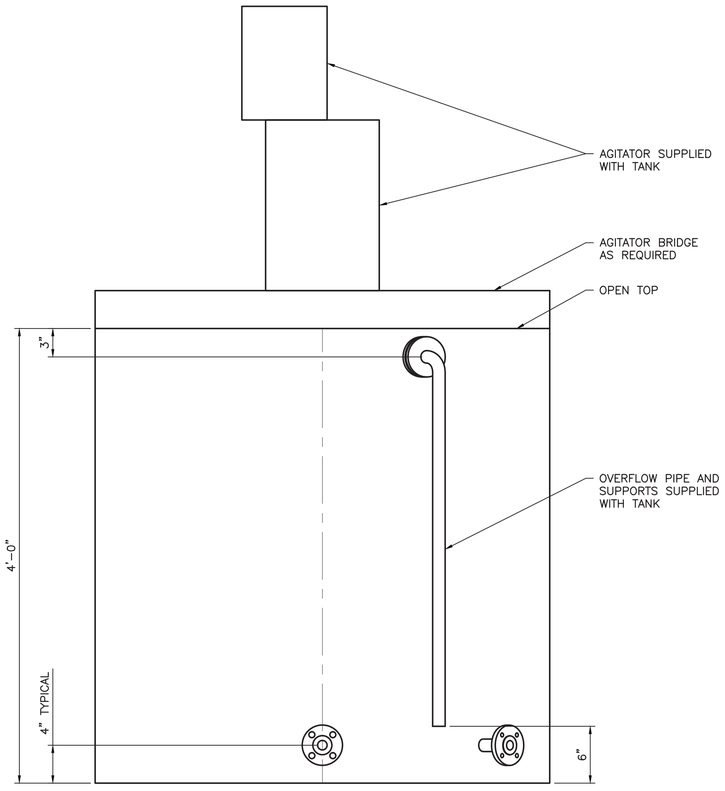


1 — PLAN: 3418A MIXING SYSTEM 700–SLP–08
1 1/2"=1'–0"



2 — ELEVATION: 3418A MIXING SYSTEM 700–SLP–08
1 1/2"=1'–0"

NOTES:

1. BOLT HOLES TO STRADDLE FLANGE CENTERLINES.
2. GROUNDING LUGS BY VENDOR (2) REQUIRED 180° APART.
3. TANK MATERIALS OF CONSTRUCTION SHALL CONFORM TO SPECIFICATION 43 20 00.
4. AGITATOR TO BE SUPPORTED FROM STRUCTURAL STEEL MOUNTED ON TOP OF TANK.

COLORADO LICENSED — DAVID SCOTT MICKELSEN — PE.0052024 — PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

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NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
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CLIENT				4/28/17					
BID				4/28/17					
CONSTRUCTION				4/28/17					
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	DATE RELEASED								

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www.barr.com

Scale	AS SHOWN
Date	4/12/17
Drawn	DAK
Checked	PGJ
Designed	DAK
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PLATEWORK
3418A MIXING SYSTEM 700–SLP–08

BARR PROJECT No. 06/46–1001.00
CLIENT PROJECT No.
DWG. No. 700–MC–008
REV. No. 0

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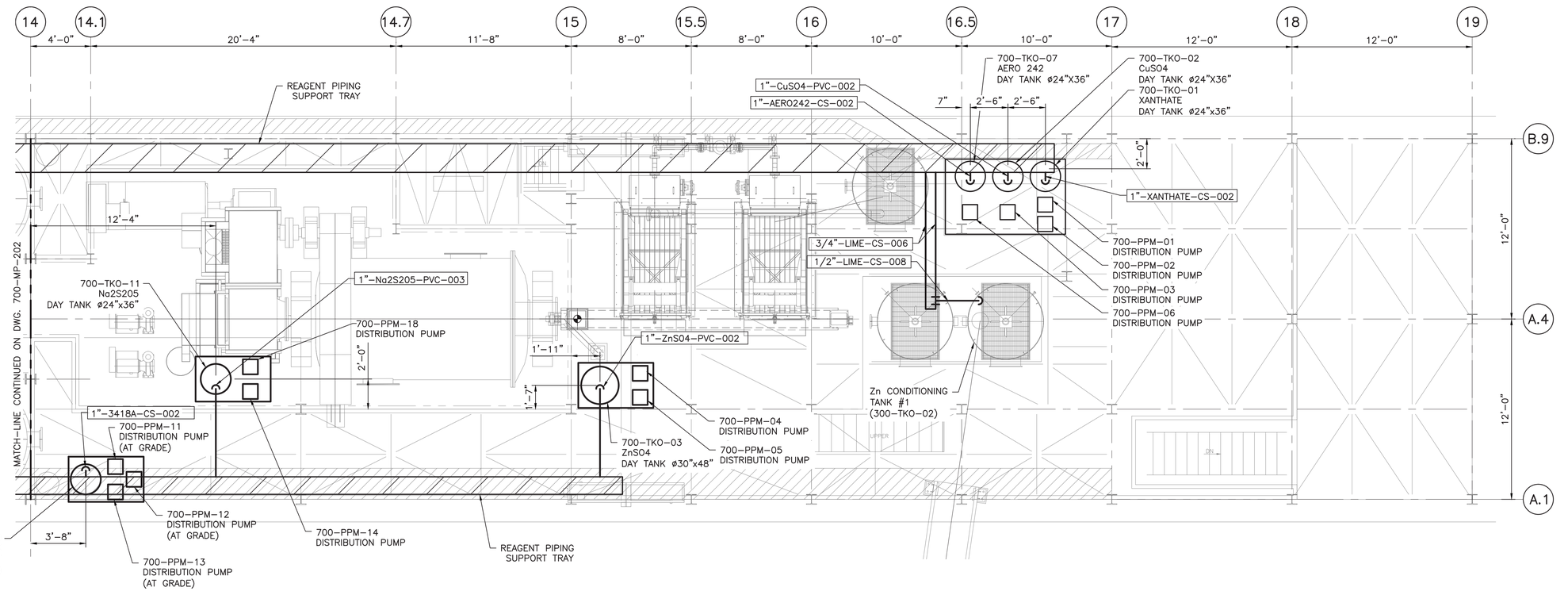

1 – REAGENT PIPING PLAN: UPPER LEVEL PLAN COL. 14 TO 19

1/4"=1'–0"

NOTES

1. IT IS RECOMMENDED THAT REAGENT PIPING IS ROUTED AND SUPPORTED IN CABLE TRAY IN AREAS WHERE IT MAKES SENSE TO DO SO. CONTRACTOR IS TO FIELD ROUTE CABLE TRAY.
2. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
3. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
4. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
5. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN–LINE COMPONENTS.

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED PROFESSIONAL ENGINEER · SCOTT MICHAEL · PE.0052024

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CONSTRUCTION				4/28/17			

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www.barr.com

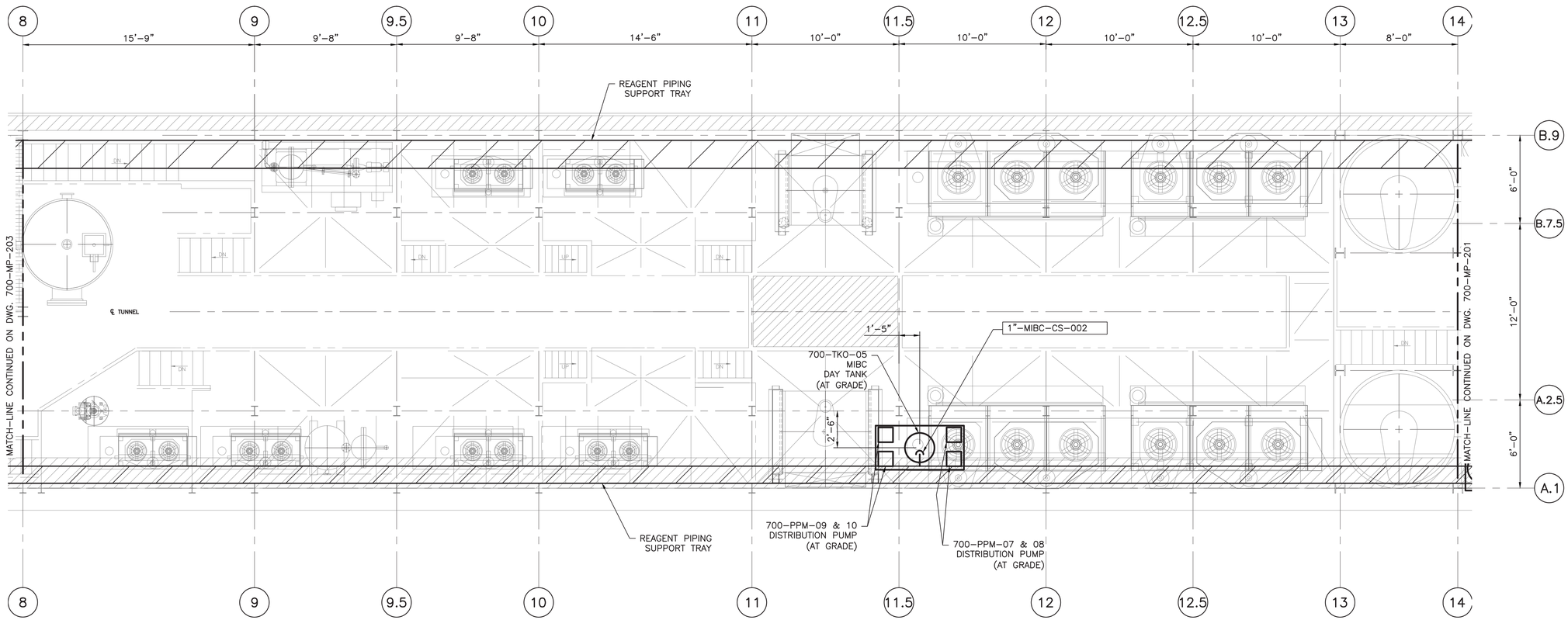
Scale	AS SHOWN
Date	3/30/17
Drawn	DTJ
Checked	PGJ
Designed	SMG
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
PIPING PLAN UPPER LEVEL COLUMN 14 TO 19

BARR PROJECT No. 06/46–1001
CLIENT PROJECT No. –
DWG. No. 700–MP–201
REV. No. 0



2 REAGENT PIPING PLAN: CONCENTRATOR UPPER LEVEL COLUMN 8 TO 14

1/4"=1'-0"

NOTES

1. IT IS RECOMMENDED THAT REAGENT PIPING IS ROUTED AND SUPPORTED IN CABLE TRAY IN AREAS WHERE IT MAKES SENSE TO DO SO. CONTRACTOR IS TO FIELD ROUTE CABLE TRAY.
2. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
3. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
4. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
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COLORADO LICENSED
SCOTT MICEK
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

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Approved	DSM

OURAY SILVER MINES, INC
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
PIPING PLAN UPPER LEVEL COLUMN 8 TO 14

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No. –
DWG. No. 700-MP-202
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A8E6089-5087-4028-9EAE-D89BEF743A12\0211FF56-B6FE-44D4-BE7E-651052D4260B\0646100100_700-MP-202.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:57 PM
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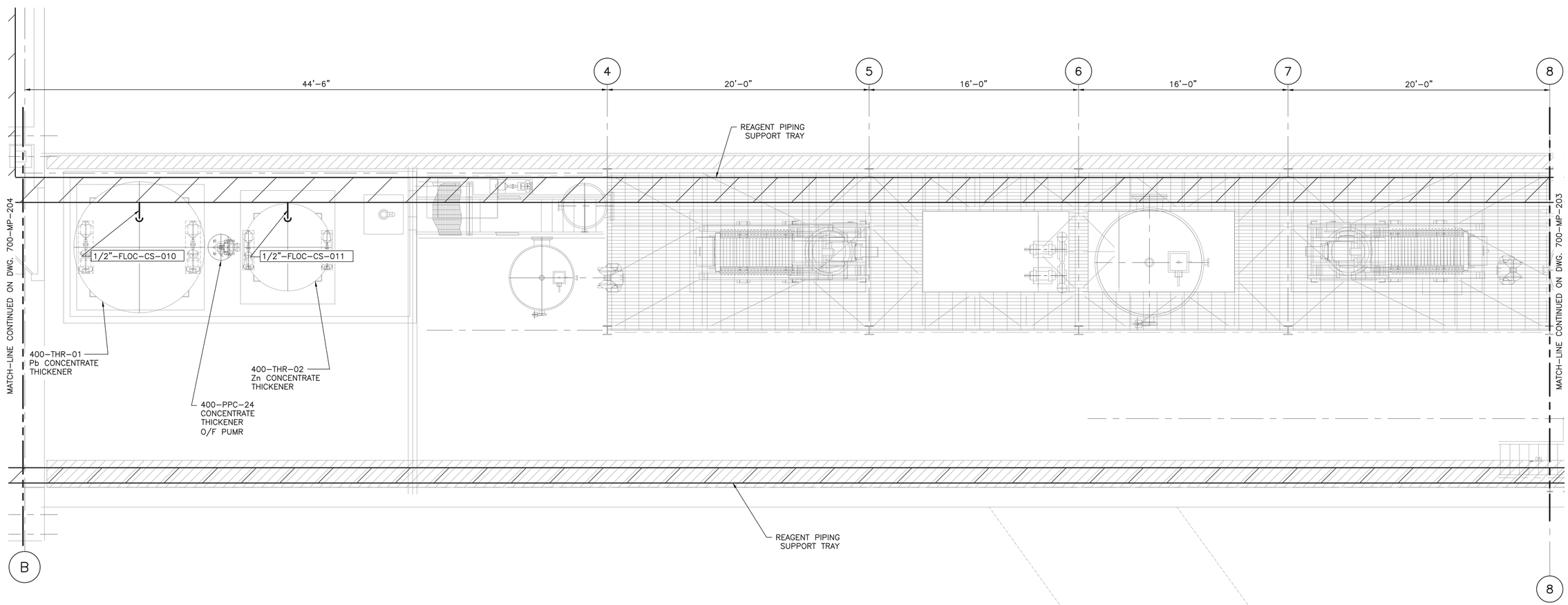

NOTES

1. IT IS RECOMMENDED THAT REAGENT PIPING IS ROUTED AND SUPPORTED IN CABLE TRAY IN AREAS WHERE IT MAKES SENSE TO DO SO. CONTRACTOR IS TO FIELD ROUTE CABLE TRAY.
2. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
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4. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
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3 – **REAGENT PIPING PLAN: CONCENTRATOR UPPER LEVEL COLUMN LINE B TO 8**
1/4"=1'-0"

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1-800-225-1966
Fax: (218) 262-3460
www.barr.com

Scale	AS SHOWN
Date	3/30/17
Drawn	DTJ
Checked	PGJ
Designed	SMG
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
PIPING PLAN UPPER LEVEL COLUMN 4 TO B

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No. –
DWG. No. 700-MP-203
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A4B6D89-5087-4028-9EAE-D898EF743A12\76F162BC-A330-4504-A4ED-40FBEFCD05F9\06461001001_700-MP-203.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 6:59 PM
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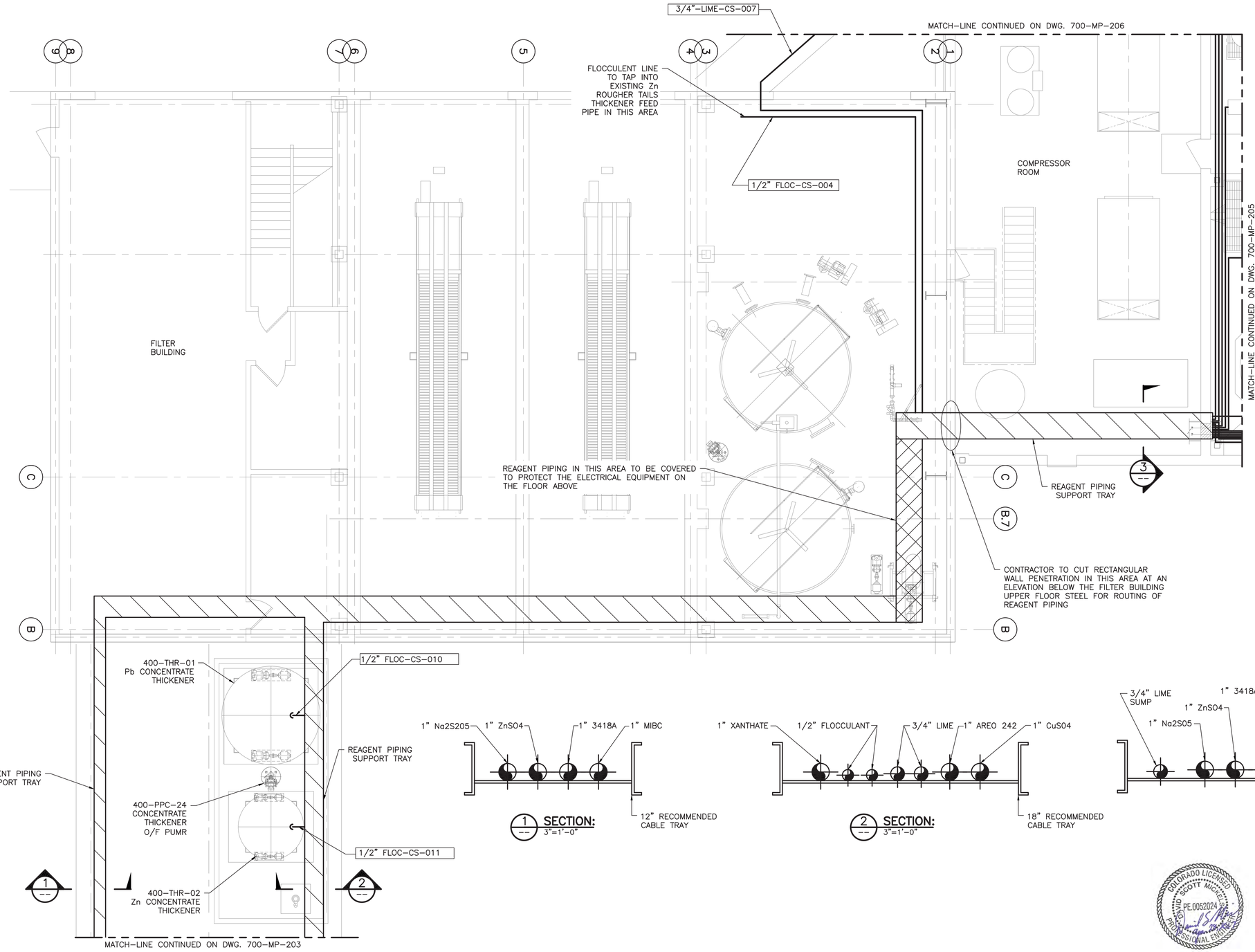

NOTES

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1 SECTION: 3"=1'-0"

2 SECTION: 3"=1'-0"

3 SECTION: 3"=1'-0"

4 REAGENT PIPING PLAN: FILTER BUILDING 3/16"=1'-0"

COLORADO LICENSED PE.0052024 SCOTT MICHAEL JONES PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
CLIENT				4/28/17			
BID				4/28/17			
CONSTRUCTION				4/28/17			
DATE RELEASED							

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
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Ph: 1-800-225-1966 Fax: (218) 262-3460 www.barr.com

Scale	AS SHOWN
Date	3/30/17
Drawn	DTJ
Checked	PGJ
Designed	SMG
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLOTADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT FILTER BUILDING

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No. –
DWG. No. 700-MP-204 REV. No. 0

CADD USER: Adepiuser FILE: \\PWEDINA\EDINA PW IN\AA8E6D89-5087-4028-9EAE-D89BEF743A12\9487C753-6006-4481-9E01-F50E398BEA4D\0646100100_700-MP-204.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 7:02 PM
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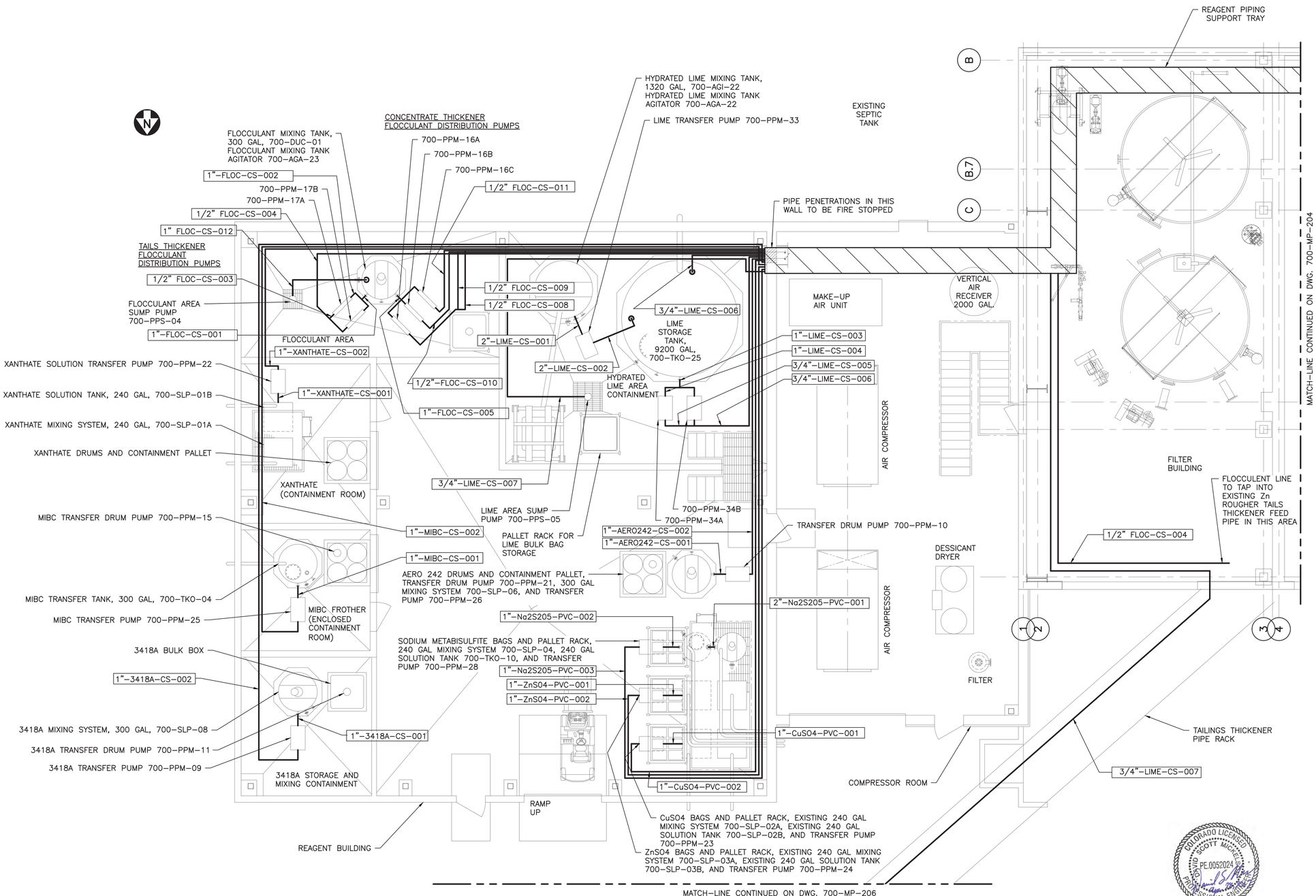

5 REAGENT PIPING PLAN: AIR COMPRESSOR & REAGENT BUILDING
3/16"=1'-0"

NOTES

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COLORADO LICENSED SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17; BID 4/28/17; CONSTRUCTION 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
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3128 14TH AVENUE EAST
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www.barr.com

Scale	AS SHOWN
Date	3/30/17
Drawn	DTJ
Checked	SMG
Designed	SMG
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
AIR COMPRESSOR AND REAGENT BUILDING

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No. –
DWG. No. 700-MP-205
REV. No. 0

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIBB PW IN\68F40FB8-FE53-4EEB-9A15-EF18E170C755\78453020-EF6B-427F-9917-4C9D49951FD1\0646100100_700-MP-205.DWG PLOT SCALE: 1:1 PLOT DATE: 4/28/2017 10:29 AM
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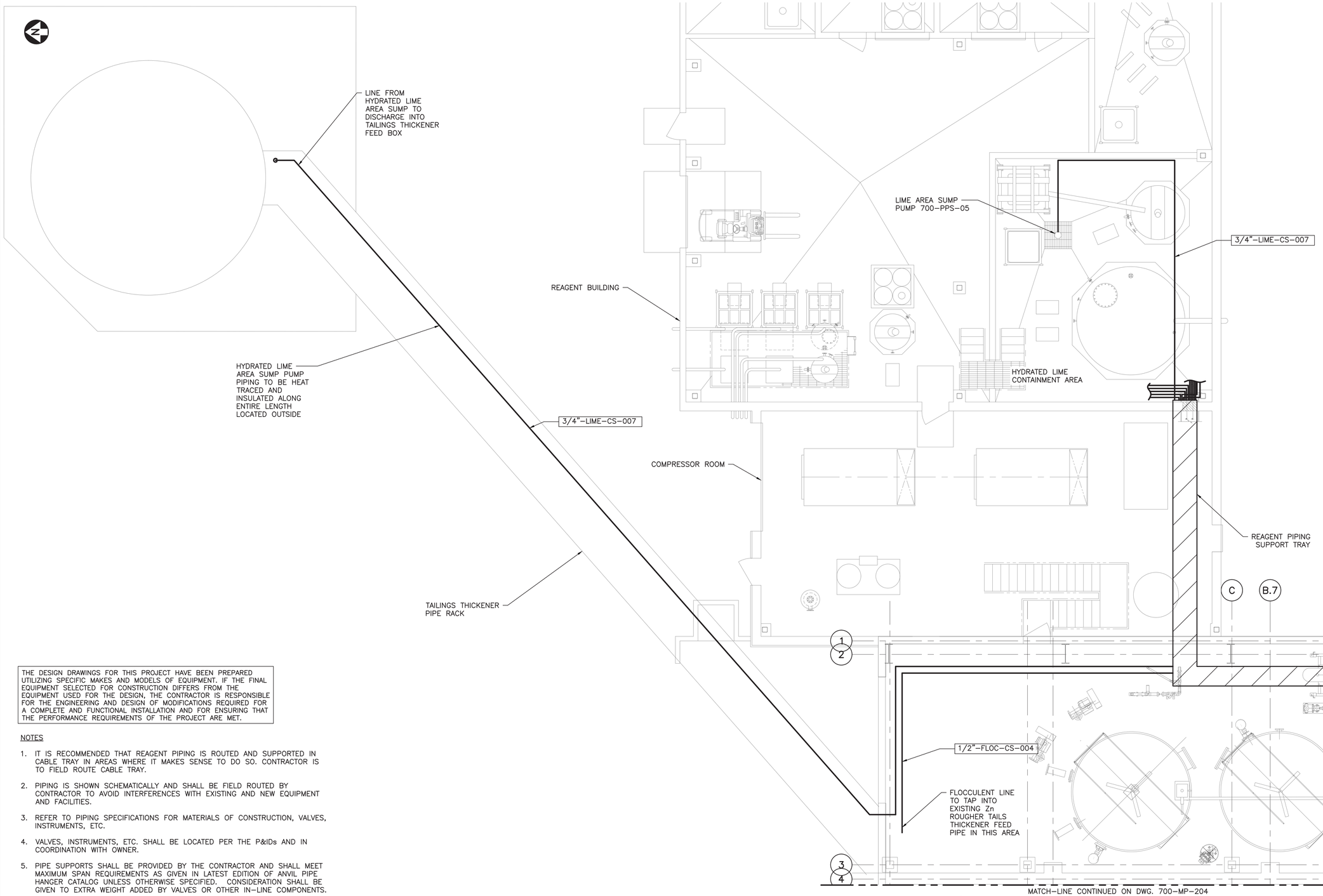

6 REAGENT PIPING PLAN: TAILINGS THICKENER
3/16"=1'-0"

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COLORADO LICENSED SCOTT MICHEL PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR

CLIENT	BID	CONSTRUCTION
4/28/17	4/28/17	4/28/17

A	B	C	0	1	2	3
DATE RELEASED						

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3128 14TH AVENUE EAST
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Ph: 1-800-225-1966
Fax: (218) 262-3460
www.barr.com

Scale	AS SHOWN
Date	3-30-17
Drawn	DTJ
Checked	PGJ
Designed	SMG
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING - REAGENT
TAILINGS THICKENER

BARR PROJECT No. 06/461001
CLIENT PROJECT No. -
DWG. No. 700-MP-206
REV. No. 0

CADD USER: Adepluser FILE: \\PWEDINA\EDINA PW IN\A8E6D89-5087-4028-9EAE-D898EF743A12\E721967E-EEA4-491C-B21D-7C7EA0088204\0646100100_700-MP-206.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 7:07 PM
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Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
XANTHATE												
1"	XANTHATE	CS	001	700-SLP-01B XANTHATE SOLUTION TANK	700-PPM-22 XANTHATE DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	XANTHATE	CS	002	700-PPM-22 XANTHATE DIAPHRAGM PUMP	700-TKO-01 XANTHATE DAY TANK	535	16	-	-	-	-	-
1/16"ID	XANTHATE	PT	003	700-TKO-01 XANTHATE DAY TANK	300-FCC-06A-B Zn CLEANER FLOTATION CELLS BANK #1	130	-	-	-	-	-	-
1/16"ID	XANTHATE	PT	004	700-TKO-01 XANTHATE DAY TANK	300-TKO-03 Zn CONDITIONING TANK #2	12	-	-	-	-	-	-
CuSO4												
1"	CuSO4	PVC	001	700-SLP-02B CuSO4 SOULUTION TANK	700-PPM-23 CuSO4 DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	CuSO4	PVC	002	700-PPM-23 CuSO4 DIAPHRAGM PUMP	700-TKO-02 CuSO4 DAY TANK	475	16	-	-	-	-	-
1/16"ID	CuSO4	PT	003	700-TKO-02 CuSO4 DAY TANK	300-TKO-03 Zn CONDITIONING TANK #2	12	-	-	-	-	-	-
ZnSO4												
1"	ZnSO4	PVC	001	700-SLP-03B ZnSO4 SOLUTION TANK	700-PPM-24 ZnSO4 DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	ZnSO4	PVC	002	700-PPM-24 ZnSO4 DIAPHRAGM PUMP	700-TKO-03 ZnSO4 DAY TANK	465	16	-	-	-	-	-
1/16"ID	ZnSO4	PT	003	700-TKO-03 ZnSO4 DAY TANK	300-FCC-32A Pb CLEANER FLOTATION TANK CELL #1	125	-	-	-	-	-	-
1/8"ID	ZnSO4	PT	004	700-TKO-03 ZnSO4 DAY TANK	300-ZM-03 BALL MILL FEED SPOUT	12	-	-	-	-	-	-
MIBC												
1"	MIBC	CS	001	700-TKO-04 MIBC TRANSFER TANK	700-PPM-25 MIBC DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	MIBC	CS	002	700-PPM-25 MIBC DIAPHRAGM PUMP	700-TKO-05 MIBC DAY TANK	440	16	-	-	-	-	-
1/16"ID	MIBC	PT	003	700-TKO-05 MIBC DAY TANK	300-FCC-32A Pb CLEANER FLOTATION TANK CELL #1	20	-	-	-	-	-	-
1/16"ID	MIBC	PT	004	700-TKO-05 MIBC DAY TANK	300-FCC-06A-B Zn CLEANER FLOTATION CELLS BANK #1	60	-	-	-	-	-	-
1/8"ID	MIBC	PT	005	700-TKO-05 MIBC DAY TANK	300-TKO-01 Pb CONDITIONING TANK	130	-	-	-	-	-	-
1/8"ID	MIBC	PT	006	700-TKO-05 MIBC DAY TANK	300-TKO-03 Zn CONDITIONING TANK #2	120	-	-	-	-	-	-
AERO 242												
1"	AERO242	CS	001	700-SLP-06 AERO 242 MIXING SYSTEM	700-PPM-26 AERO 242 DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	AERO242	CS	002	700-PPM-26 AERO 242 DIAPHRAGM PUMP	700-TKO-07 AERO 242 DAY TANK	455	16	-	-	-	-	-
1/16"ID	AERO242	PT	003	700-TKO-07 AERO 242 DAY TANK	300-TKO-01 Pb CONDITIONING TANK	10	-	-	-	-	-	-

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COLORADO LICENSED DAVID SCOTT MINKLER PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SMG	PGJ	DSM	5/26/17	UPDATED SEVERAL METERING TUBING SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 6/26/17; BID 4/28/17; CONSTRUCTION 4/28/17 6/26/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
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www.barr.com

Scale	AS SHOWN
Date	4/24/17
Drawn	DTJ
Checked	SMG
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No. –
DWG. No. 700-MP-207
REV. No. 1

CADD USER: Adeptuser FILE: \\PWHB\HIBBING PW\HIBB PW IN\943B9770-E30C-4374-B4F1-7AA105A0BE3\B8C5ACF7-A7B7-44FA-8404-2F51B2EDC9A3\06460100_700-MP-207.DWG PLOT SCALE: 1:1 PLOT DATE: 5/26/2017 1:35 PM
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Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
FLOCCULANT												
1"	FLOC	CS	001	700-DUC-01 FLOCCULANT MIXING TANK	700-PPM-17B TAILS THICKENER FLOCCULANT PUMP	4	2	-	-	-	1	-
1"	FLOC	CS	002	700-DUC-01 FLOCCULANT MIXING TANK	700-PPM-17A TAILS THICKENER FLOCCULANT PUMP	2	1	-	-	-	-	-
1/2"	FLOC	CS	003	700-PPM-17A TAILS THICKENER FLOCCULANT PUMP	500-THR-01 TAILINGS THICKENER	2	1	-	-	-	-	-
1/2"	FLOC	CS	004	700-PPM-17B TAILS THICKENER FLOCCULANT PUMP	500-THR-01 TAILINGS THICKENER	150	10	-	-	-	-	-
1"	FLOC	CS	005	700-DUC-01 FLOCCULANT MIXING TANK	700-PPM-16A CONCENTRATE THICKENER FLOCCULANT PUMP	6	2	-	-	-	2	-
1"	FLOC	CS	006	700-DUC-01 FLOCCULANT MIXING TANK	700-PPM-16B CONCENTRATE THICKENER FLOCCULANT PUMP	2	1	-	-	-	-	-
1"	FLOC	CS	007	700-DUC-01 FLOCCULANT MIXING TANK	700-PPM-16C CONCENTRATE THICKENER FLOCCULANT PUMP	2	1	-	-	-	-	-
1/2"	FLOC	CS	008	700-PPM-16A CONCENTRATE THICKENER FLOCCULANT PUMP	400-THR-01 Pb CONCENTRATE THICKENER	8	2	-	-	-	-	-
1/2"	FLOC	CS	009	700-PPM-16A CONCENTRATE THICKENER FLOCCULANT PUMP	400-THR-02 Zn CONCENTRATE THICKENER	8	2	-	-	-	-	-
1/2"	FLOC	CS	010	700-PPM-16B CONCENTRATE THICKENER FLOCCULANT PUMP	400-THR-01 Pb CONCENTRATE THICKENER	200	12	-	-	-	1	-
1/2"	FLOC	CS	011	700-PPM-16C CONCENTRATE THICKENER FLOCCULANT PUMP	400-THR-02 Zn CONCENTRATE THICKENER	210	12	-	-	-	1	-
1"	FLOC	PVC	012	700-PPS-04 FLOCCULANT AREA SUMP PUMP	700-DUC-01 FLOCCULANT MIXING TANK	16	3	-	-	-	-	-

Pipe Line Number				Associated Equipment		Process Piping Estimated Length and Fitting Table						
Size	Service	Material	Seq. #	Start	End	Length of Pipe (ft)	LR 90 deg Elbows	LR 60 deg Elbows	LR 45 deg Elbows	LR 22.5 deg Elbows	Tees	45 deg laterals
HYDRATED LIME												
2"	LIME	CS	001	700-AGI-22 HYDRATED LIME MIXING TANK	700-PPM-33 LIME DIAPHRAGM PUMP	4	2	-	-	-	-	-
2"	LIME	CS	002	700-PPM-33 LIME DIAPHRAGM PUMP	700-TKO-25 LIME STORAGE TANK	10	2	-	-	-	-	-
1"	LIME	CS	003	700-TKO-25 LIME STORAGE TANK	700-PPM-34B LIME RECIRCULATION	4	2	-	-	-	1	-
1"	LIME	CS	004	700-TKO-25 LIME STORAGE TANK	700-PPM-34A LIME RECIRCULATION PUMP	2	1	-	-	-	-	-
3/4"	LIME	CS	005	700-PPM-34A LIME RECIRCULATION PUMP	700-TKO-02 Zn CONDITIONING TANK #1	4	2	-	-	-	-	-
3/4"	LIME	CS	006	700-PPM-34B LIME RECIRCULATION PUMP	700-TKO-02 Zn CONDITIONING TANK #1	1000	32	-	-	-	1	-
3/4"	LIME	CS	007	700-PPS-REAGENT BUILDING SUMP PUMP	500-THR-01 TAILINGS THICKENER	350	14	-	-	-	-	-
1/2"	LIME	CS	008	3/4"-LIME-CS-006 LIME RECIRCULATION HEADER	700-TKO-02 Zn CONDITIONING TANK #1	6	3	-	-	-	-	-
3418A												
1"	3418A	CS	001	700-SLP-08 3418A MIXING SYSTEM	700-PPM-09 3418A DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	3418A	CS	002	700-PPM-09 3418A DIAPHRAGM PUMP	700-TKO-09 3418A DAY TANK	500	16	-	-	-	-	-
1/16"ID	3418A	PT	003	700-TKO-09 3418A DAY TANK	300-TKO-01 Pb CONDITIONING TANK	95	-	-	-	-	-	-
1/16"ID	3418A	PT	004	700-TKO-09 3418A DAY TANK	300-FCC-30 Pb ROUGHER FLOTATION TANK CELL	50	-	-	-	-	-	-
1 1/16"ID	3418A	PT	005	700-TKO-09 3418A DAY TANK	Pb ROUGHER SCAVENGER FLOTATION CELLS	50	-	-	-	-	-	-
SODIUM METABISULFITE												
2"	Na2S2O5	PVC	001	700-SLP-04 Na2S2O5 MIXING SYSTEM	700-TKO-10 Na2S2O5 SOLUTION TANK	3	1	-	-	-	-	-
1"	Na2S2O5	PVC	002	700-TKO-10 Na2S2O5 SOLUTION TANK	700-PPM-28 Na2S2O5 DIAPHRAGM PUMP	3	1	-	-	-	-	-
1"	Na2S2O5	PVC	003	700-PPM-28 Na2S2O5 DIAPHRAGM PUMP	700-TKO-11 Na2S2O5 DAY TANK	505	16	-	-	-	-	-
1/16"ID	Na2S2O5	PT	004	700-TKO-11 Na2S2O5 DAY TANK	300-FCC-32A Pb CLEANER FLOTATION TANK CELL #1	75	-	-	-	-	-	-
1 1/8"ID	Na2S2O5	PT	005	700-TKO-11 Na2S2O5 DAY TANK	300-ZM-03 BALL MILL FEED SPOUT	25	-	-	-	-	-	-

THE DESIGN DRAWINGS FOR THIS PROJECT HAVE BEEN PREPARED UTILIZING SPECIFIC MAKES AND MODELS OF EQUIPMENT. IF THE FINAL EQUIPMENT SELECTED FOR CONSTRUCTION DIFFERS FROM THE EQUIPMENT USED FOR THE DESIGN, THE CONTRACTOR IS RESPONSIBLE FOR THE ENGINEERING AND DESIGN OF MODIFICATIONS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND FOR ENSURING THAT THE PERFORMANCE REQUIREMENTS OF THE PROJECT ARE MET.

COLORADO LICENSED DAVID SCOTT MICKELSEN PE.0052024 PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	SMG	PGJ	DSM	5/26/17	UPDATED SEVERAL METERING TUBING SIZES
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 5/26/17; BID 4/28/17; CONSTRUCTION 4/28/17 5/26/17

DATE RELEASED: A 4/28/17; B 5/26/17; C; 0; 1; 2; 3

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Fax: (218) 262-3460
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Scale	AS SHOWN
Date	4/24/17
Drawn	DTJ
Checked	SMG
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – REAGENT
DETAIL – ESTIMATED PIPE LENGTHS AND FITTINGS

BARR PROJECT No. 06/46-1001.00
CLIENT PROJECT No. –
DWG. No. 700-MP-208
REV. No. 1

CADD USER: Adeptuser FILE: \\PWHIB\HIBBING PW\HIB PW IN\9438977C-E30C-4374-B4F1-7AA105A0BE3\911EF54E-F631-4362-8133-610E09D815ED\06461001 00_700-MP-208.DWG PLOT SCALE: 1:1 PLOT DATE: 5/26/2017 1:36 PM
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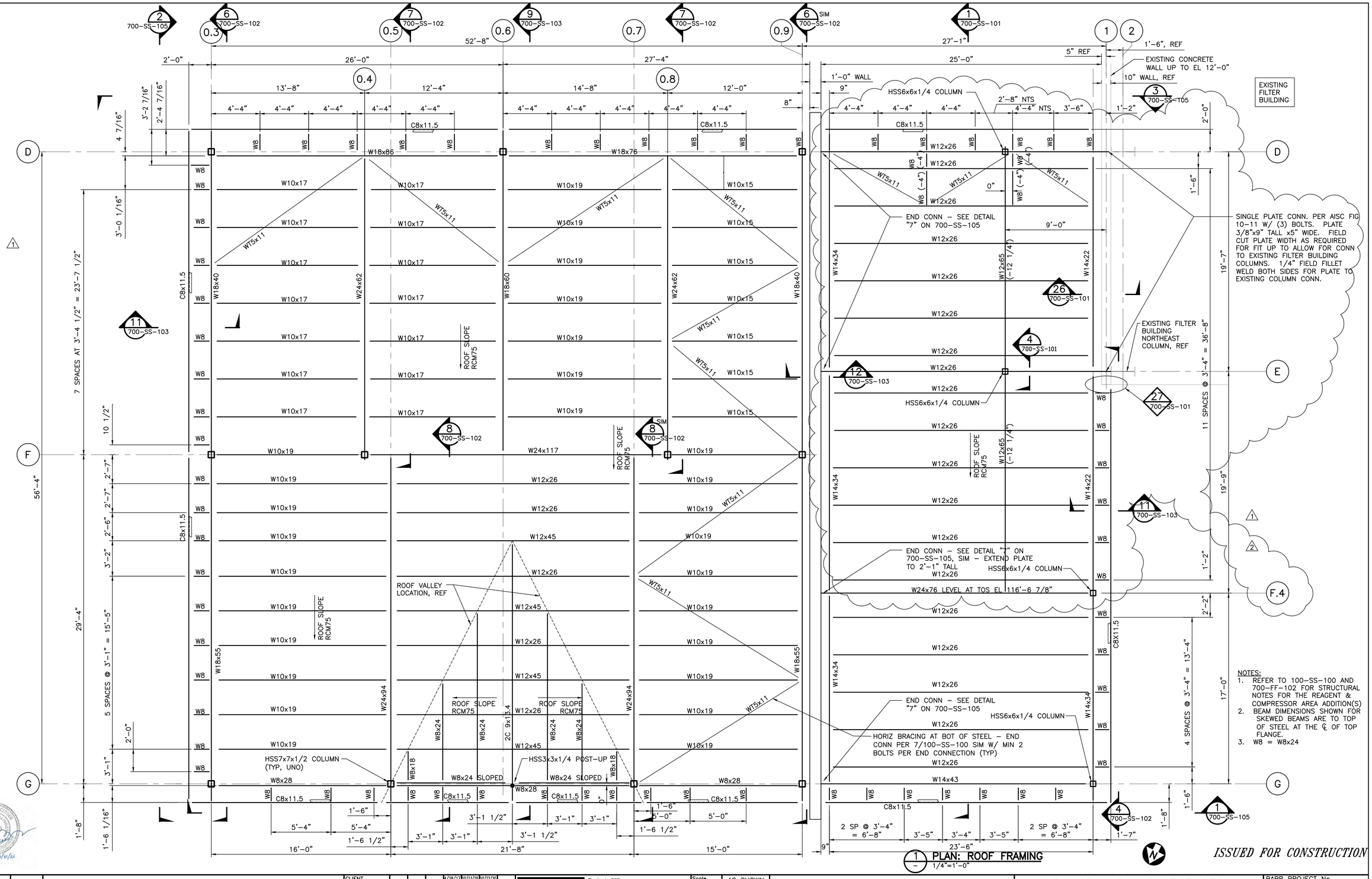

NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)
2. BEAM DIMENSIONS SHOWN FOR SKEWED BEAMS ARE TO TOP OF STEEL AT THE ℄ OF TOP FLANGE.
3. W8 = W8x24

1 PLAN: ROOF FRAMING
1/4"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION – MODIFY STRUCTURE TO AVOID DUCT BANK
1	SWO	JGT	JGT	10/13/20	ISSUED FOR CONSTRUCTION – MOVED 15' NORTH & REVISED COMPRESSOR AREA
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/13/20 10/23/20; BID 4/28/17 10/13/20 10/23/20; CONSTRUCTION 4/28/17 10/13/20 10/23/20

DATE RELEASED: A B C 0 1 2 3

BARR
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Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT BUILDING ROOF PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-SS-100
REV. No. 2

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001O4_700-SS-100.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:44 PM
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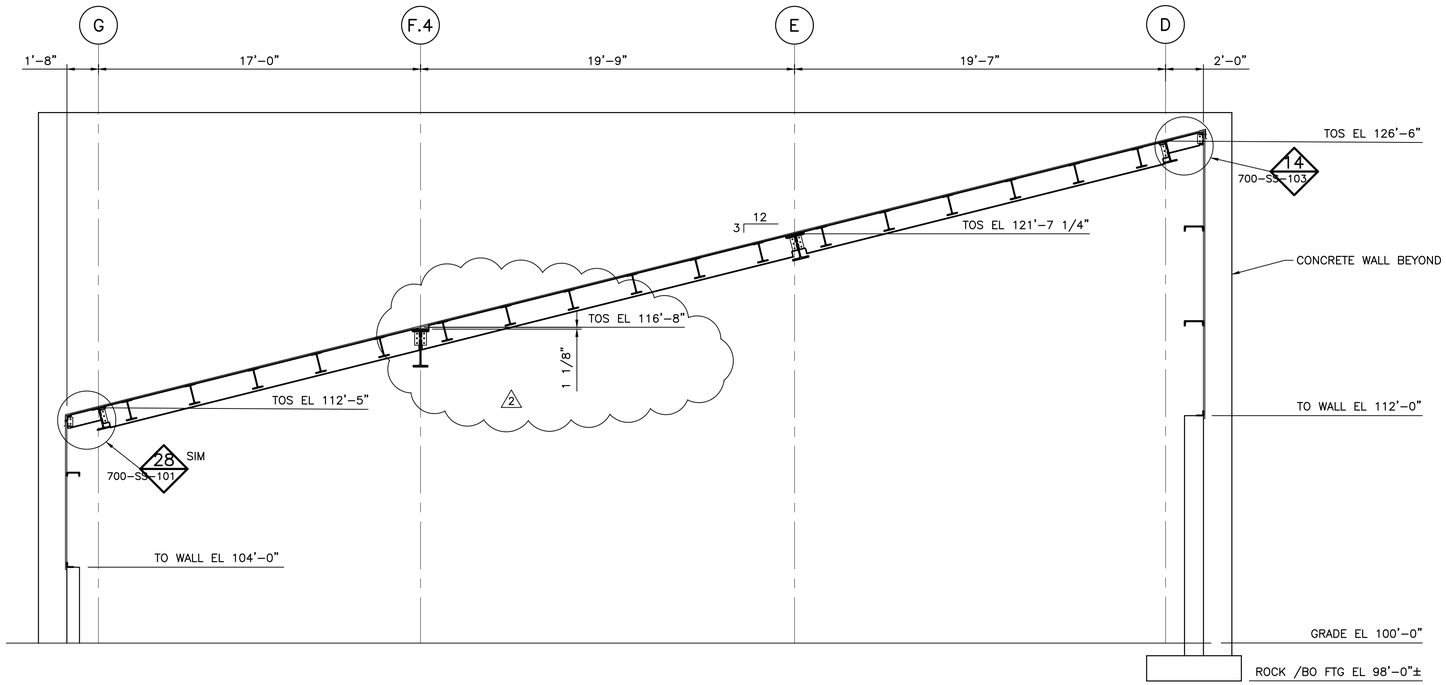
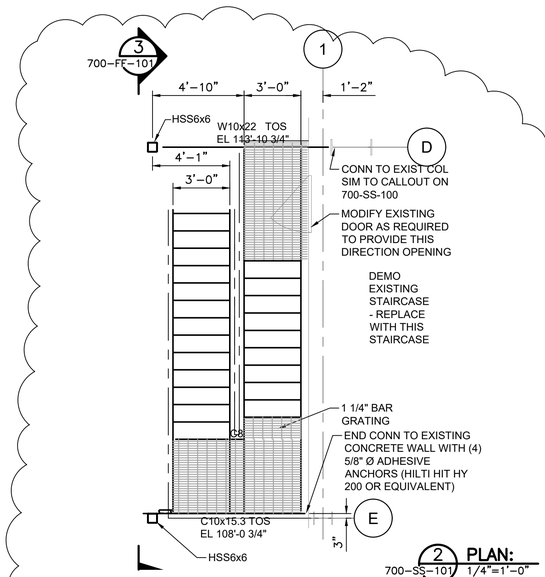
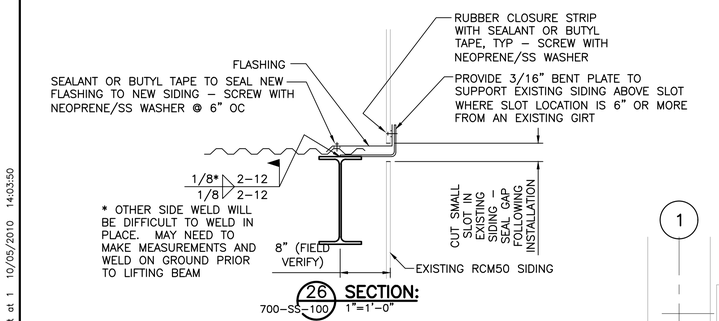


1 SECTION:
700–SS–100 1/4"=1'–0"

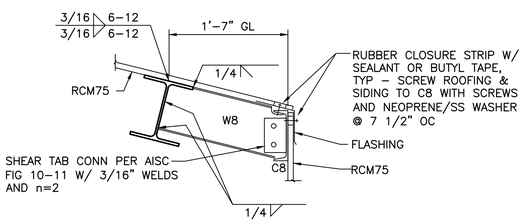
NOTES:
1. REFER TO 100–SS–100 AND 700–FF–102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)



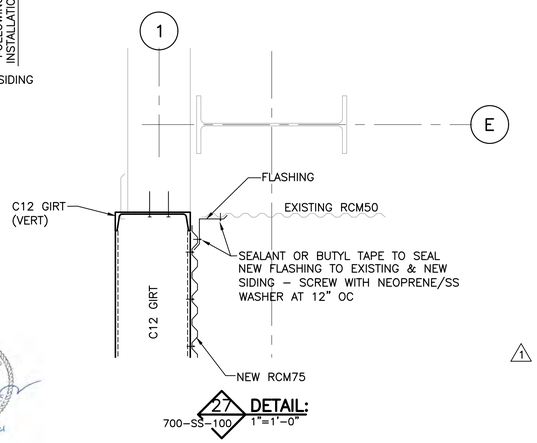
2 PLAN:
700–SS–101 1/4"=1'–0"



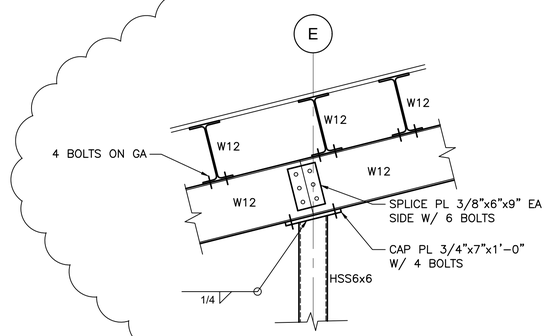
26 SECTION:
700–SS–100 1"=1'–0"



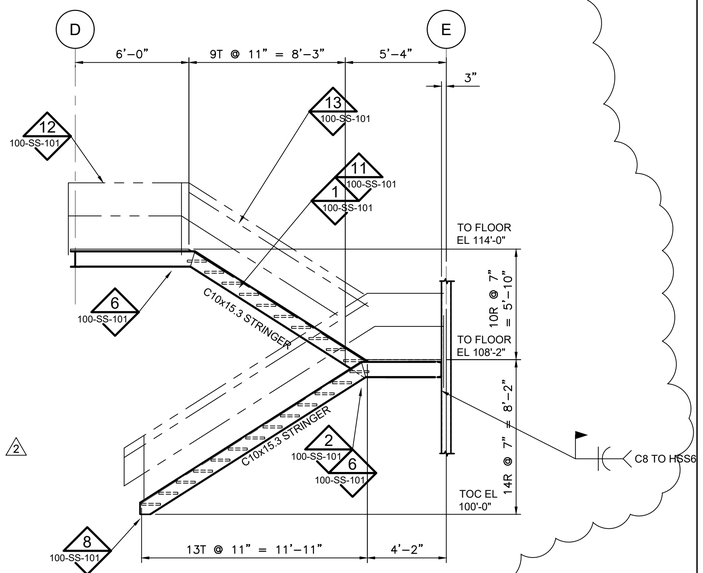
28 SECTION:
700–SS–100 1"=1'–0"



27 DETAIL:
700–SS–100 1"=1'–0"



4 SECTION:
700–SS–101 3/4"=1'–0"



3 SECTION:
– 1/4"=1'–0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION	RELEASED TO/FOR	A	B	C	0	1	2	3
						CLIENT				4/28/17	10/13/20	10/23/20	
						BID				4/28/17	10/13/20	10/23/20	
						CONSTRUCTION				4/28/17	10/13/20	10/23/20	
2	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION – MODIFY STAIR & SECT 1, ADD SECT 4								
1	SWO	JGT	JGT	10/13/20	ISSUED FOR CONSTRUCTION – MOVED 15' NORTH & REVISED COMPRESSOR AREA								
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION								
						DATE RELEASED							

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www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT BUILDING ROOF PLAN

BARR PROJECT No. 06/46–1001.04
CLIENT PROJECT No.
DWG. No. 700–SS–101
REV. No. 2

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001\04_700–SS–101.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:36 PM
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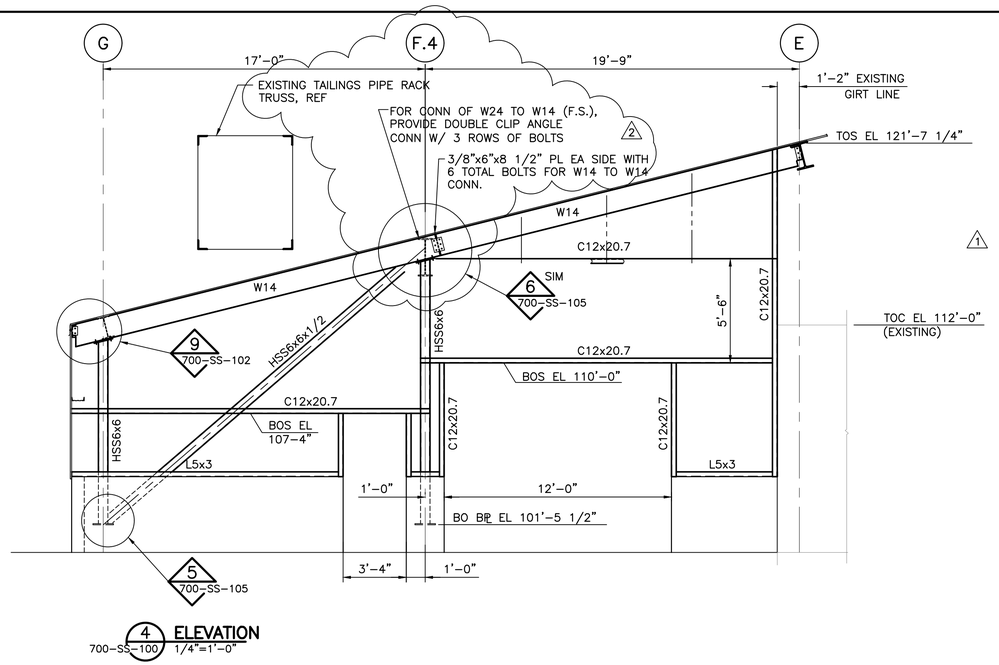

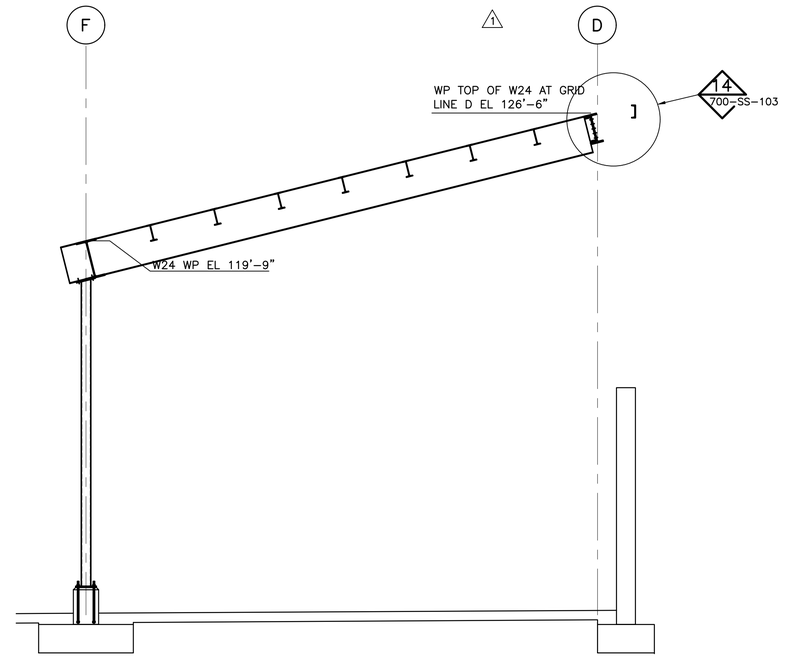

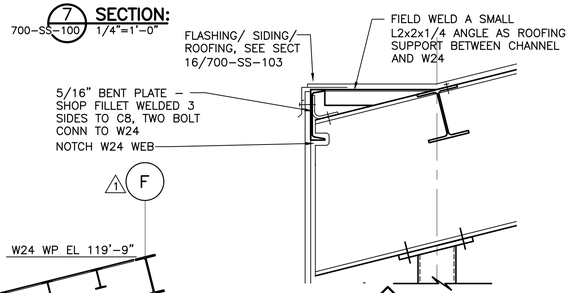

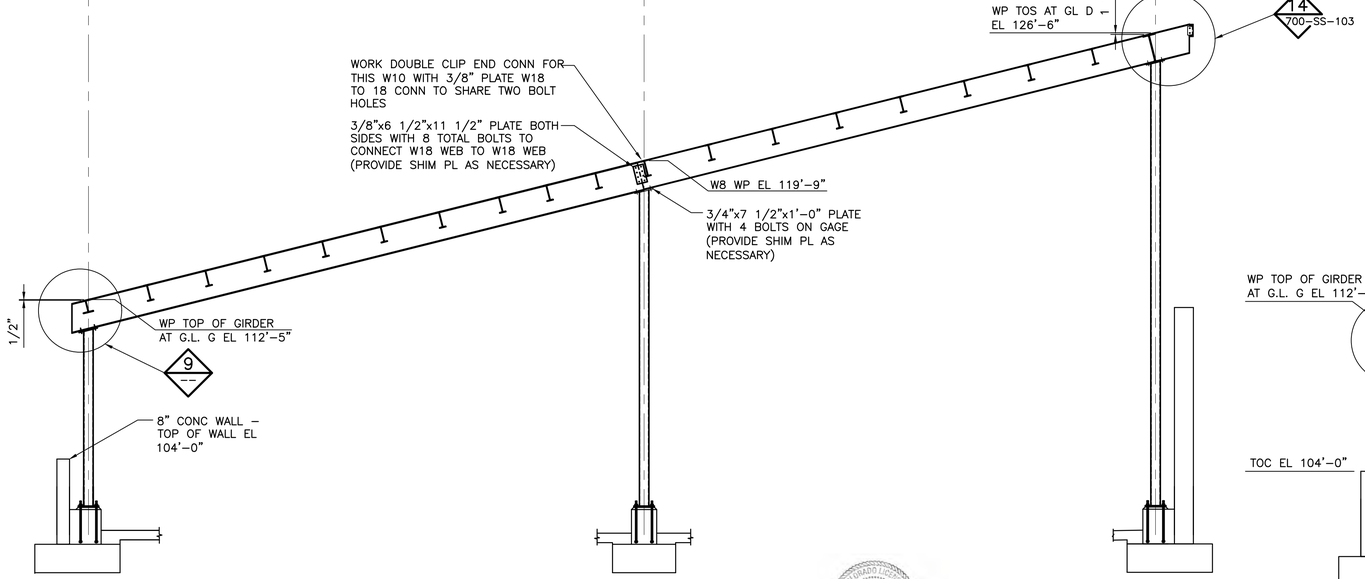

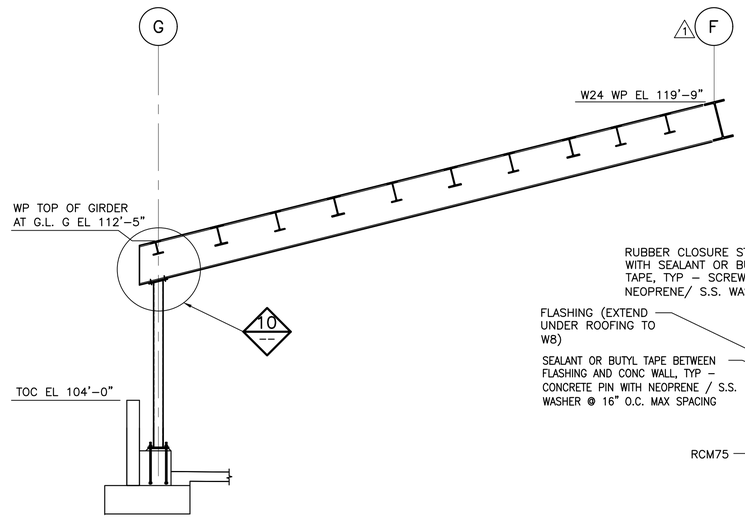

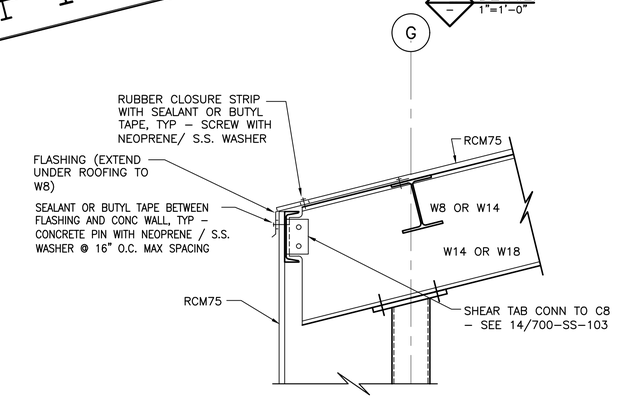

NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION - MODIFY ELEVATION 4
1	SWO	JGT	JGT	10/13/20	ISSUED FOR CONSTRUCTION - MOVED 15' NORTH & REVISED COMPRESSOR AREA
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR	A	B	C	0	1	2	3
DATE RELEASED							

CLIENT			4/28/17	10/13/20	10/23/20
BID			4/28/17	10/13/20	10/23/20
CONSTRUCTION			4/28/17	10/13/20	10/23/20

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www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT BUILDING ROOF PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-SS-102
REV. No. 2

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001.04_700-SS-102.DWG PLOT SCALE: 1:1 PLOT DATE: 10/23/2020 2:35 PM
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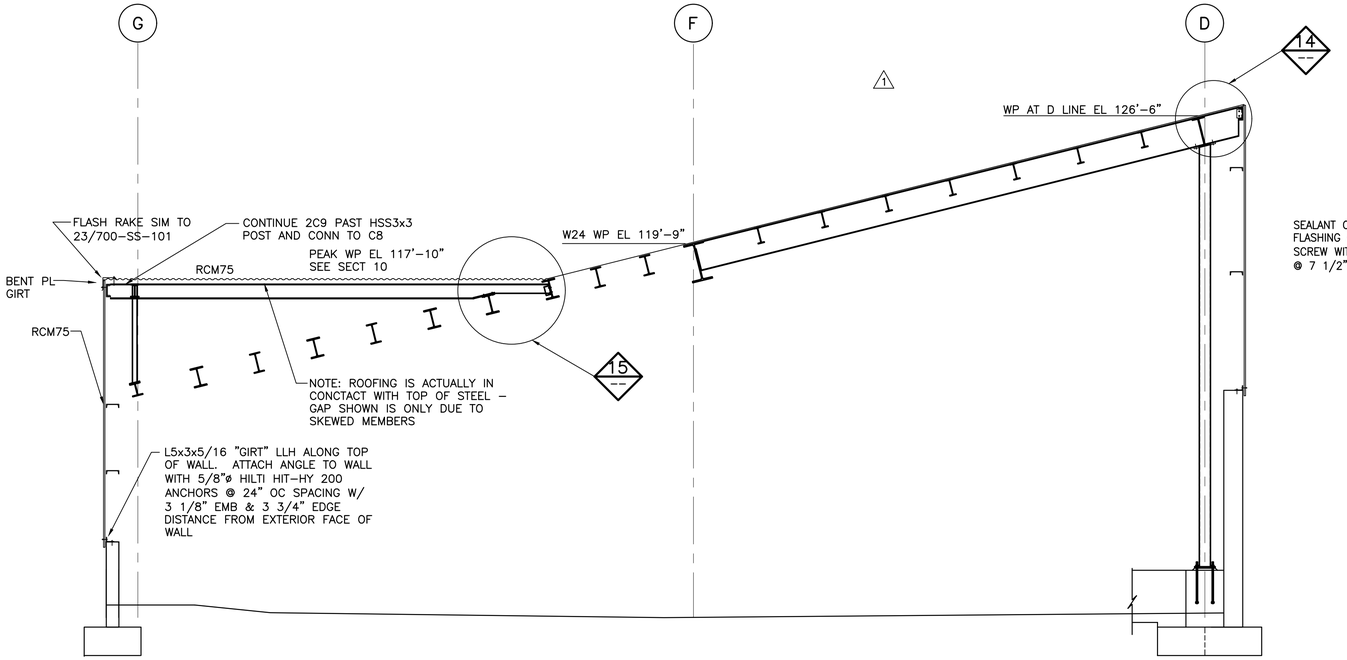
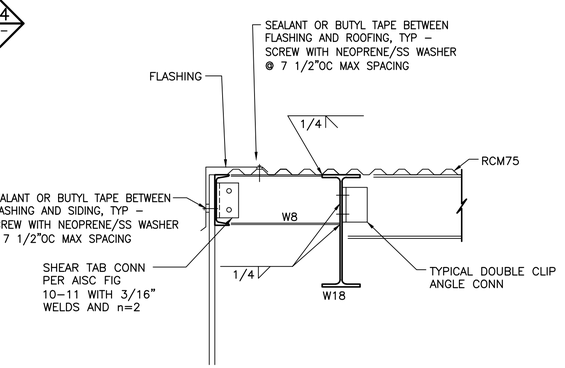
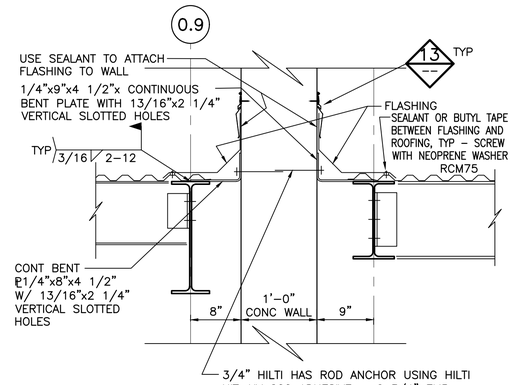


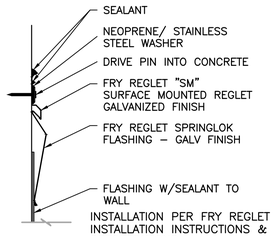
9 SECTION:
700-SS-100 1/4"=1'-0"



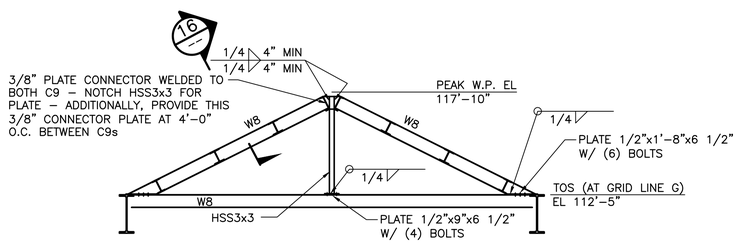
11 SECTION:
700-SS-100 1"=1'-0"



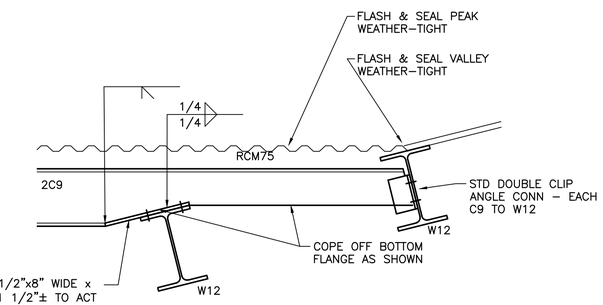
12 SECTION:
700-SS-100 1"=1'-0"



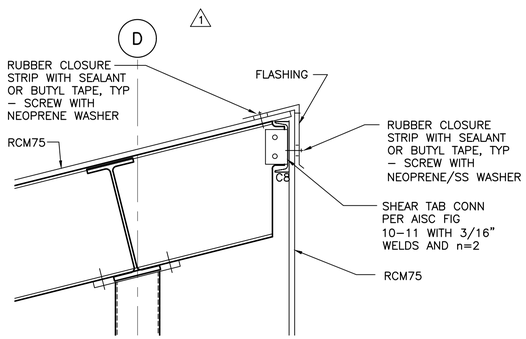
NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)



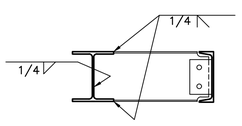
10 SECTION:
700-SS-105 1/4"=1'-0"



15 DETAIL:
3"=1'-0"



14 DETAIL:
700-SS-102 1"=1'-0"



SIDING/ ROOFING/ FLASHING SIMILAR TO SECTION 11

16 SECTION:
1"=1'-0"

13 DETAIL:
3"=1'-0"

COLUMN SCHEDULE	SIZE	BASE PLATE	BOT OF BP EL	NOTES:
REAGENT ADDITION				
0.3/D	HSS7x7x1/2	1"x1'-1"x1'-3"	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.3/F	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.3/G	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.4/F	HSS7x7x1/2	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.5/G	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.6/D	HSS7x7x1/2	1"x1'-1" SQ	102'-7 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.7/G	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.8/F	HSS7x7x1/2	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.9/D	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.9/F	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
0.9/G	HSS7x7x1/2	3/4"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
2 COMPRESSOR ADDITION				
BETWEEN 0.9&1/D 1	HSS6x6x1/4	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
BETWEEN 0.9&1/E	HSS6x6x1/4	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
BETWEEN 0.9&1/F.4	HSS6x6x1/4	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA
BETWEEN 0.9&1/G	HSS6x6x1/4	1"x1'-1" SQ	101'-5 1/2"	4 HOLES - 1 5/16" MAX HOLE DIA - 10" SQ GA

1. COLUMNS TO BE WELDED TO BASE PLATE WITH 1/4" FILLET WELD ALL AROUND, MINIMUM. HSS7x7 SHALL HAVE A 5/16" FILLET WELD.
2. UNLESS NOTED OTHERWISE, COLUMN SHALL HAVE CAP PLATE WITH SAME THICKNESS AS BASE PLATE, SAME WELD AS COLUMN TO BASE PLATE. CAP PLATE WIDTH TO BE THE MINIMUM OF: COLUMN WIDTH PLUS ONE INCH, OR BEAM WIDTH. CAP PLATE TO BEAM CONNECTION SHALL BE FOUR BOLTS AT BEAM STANDARD GAGE WITH BOLT SPACING AT THE SUM OF COLUMN SIZE PLUS THREE INCHES.

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
2	JGT	JGT	JGT	10/23/20	ISSUED FOR CONSTRUCTION - MODIFY COLUMN SCHEDULE
1	SWO	JGT	JGT	10/13/20	ISSUED FOR CONSTRUCTION - MOVED 15' NORTH & REVISED COPRESSOR AREA
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/13/20 10/23/20; BID 4/28/17 10/13/20 10/23/20; CONSTRUCTION 4/28/17 10/13/20 10/23/20

DATE RELEASED: A B C 0 1 2 3

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Scale	AS SHOWN
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Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT BUILDING ROOF PLAN

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-SS-103
REV. No. 2

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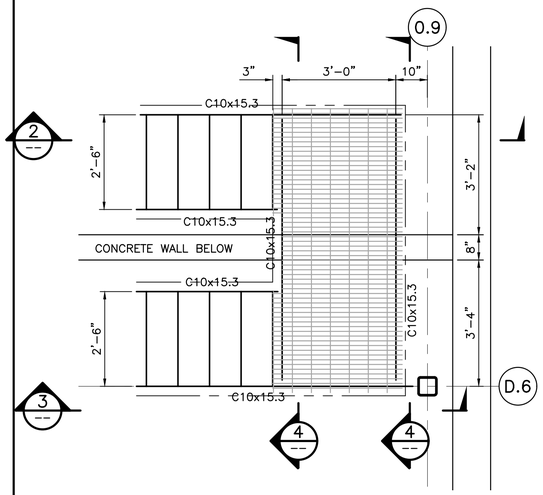
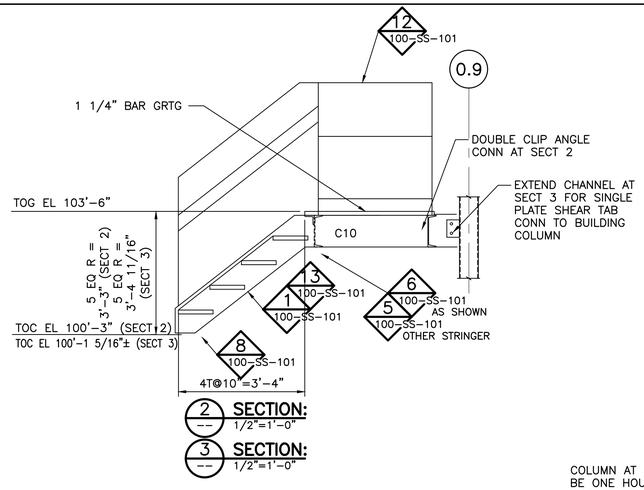
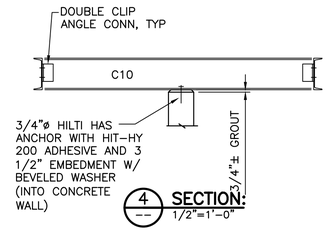


1 CROSSOVER STAIR PLAN:
1/2"=1'-0"



2 SECTION:
1/2"=1'-0"

3 SECTION:
1/2"=1'-0"



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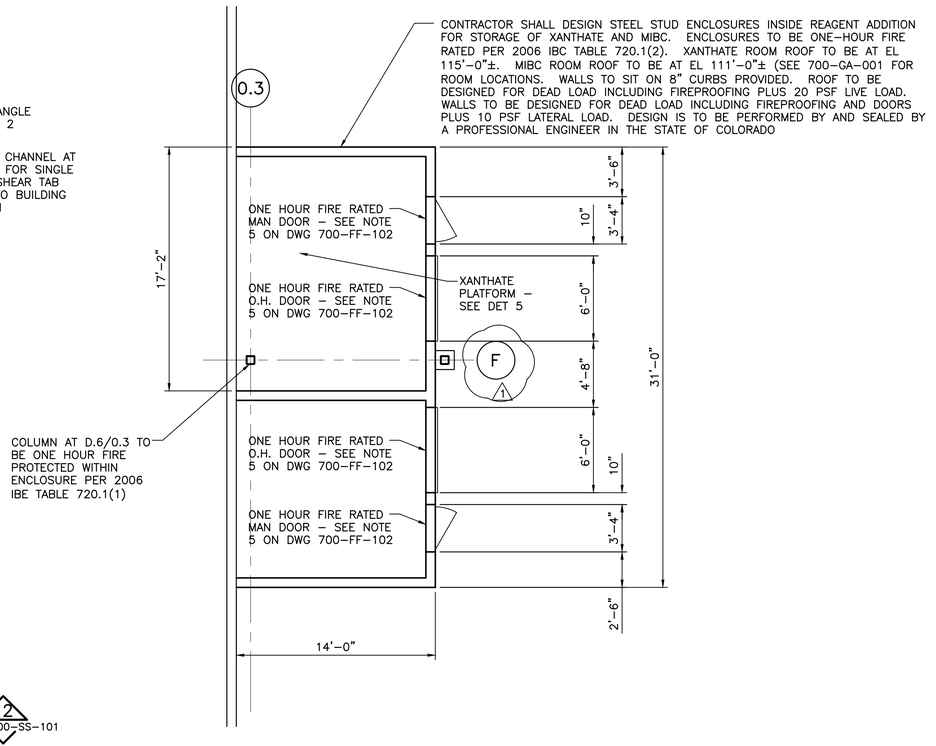
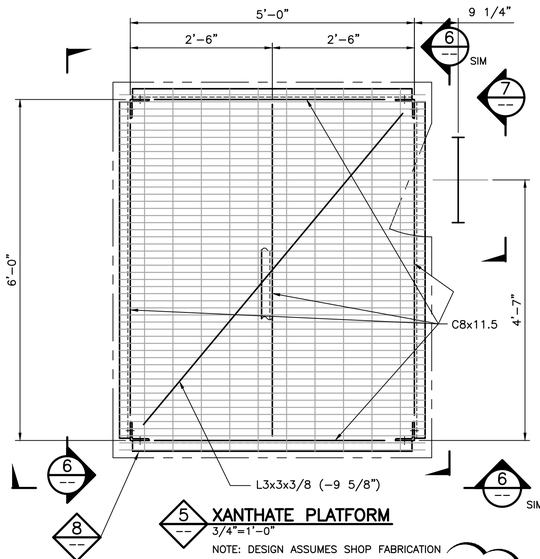
1/2"=1'-0"



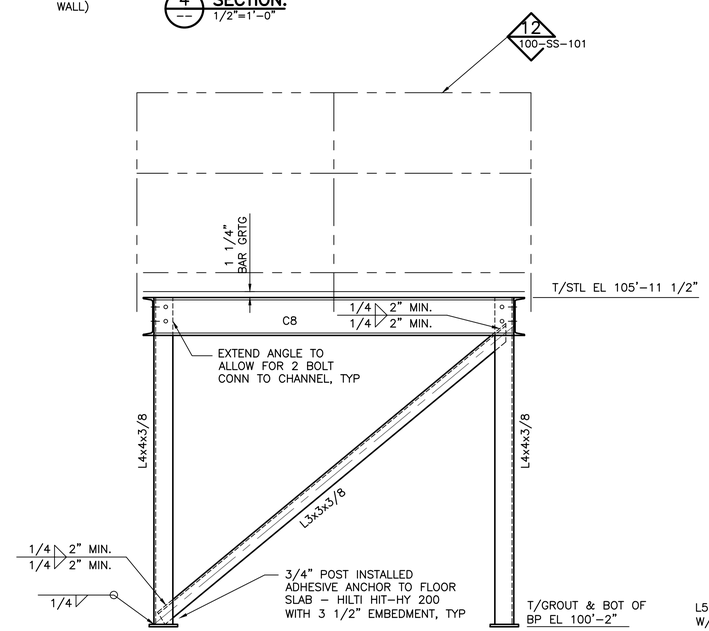
NOTES:
1. REFER TO 100-SS-100 AND 700-FF-102 FOR STRUCTURAL NOTES FOR THE REAGENT & COMPRESSOR AREA ADDITION(S)

9 PLAN - XANTHATE & MIBC ROOMS:
700-FF-100 3/16"=1'-0"

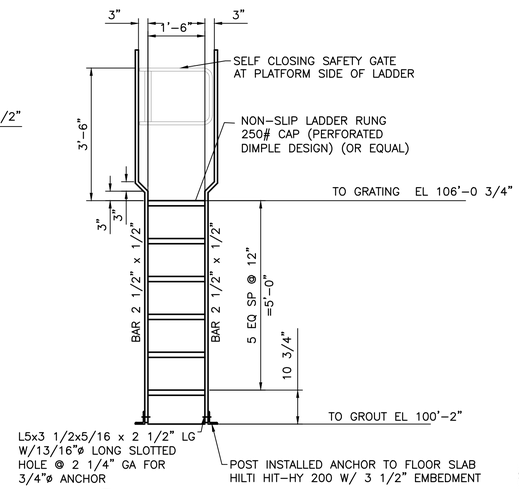


5 XANTHATE PLATFORM
3/4"=1'-0"

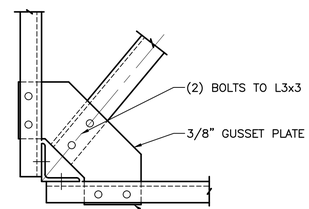
NOTE: DESIGN ASSUMES SHOP FABRICATION
NOTE: GEOMETRY OF XANTHATE TANK ON PLATFORM UNKNOWN. ADDITIONAL STEEL MEMBERS MAY BE REQUIRED.
PROVIDE BID BASED ON THIS GEOMETRY - CONFIRM WITH ENGINEER PRIOR TO CONSTRUCTION (HOLD)



6 ELEVATION
3/4"=1'-0"



7 ELEVATION: LADDER
1/2"=1'-0" 3 PLACES



8 DETAIL:
1 1/2"=1'-0"

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION	RELEASED TO/FOR	DATE RELEASED
						CLIENT	4/28/17 10/13/20
						BID	4/28/17 10/13/20
						CONSTRUCTION	4/28/17 10/13/20
1	JGT	TOP	JGT	10/13/20	ISSUED FOR CONSTRUCTION - MOVED 15' NORTH & REVISED COMPRESSOR AREA		
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION	A B C 0 1 2 3	

BARR
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Project Office:
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SUITE 500
SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT MISC STRUCTURES

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-SS-104
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\0646100100_700-SS-1044.DWG PLOT SCALE: 1:1 PLOT DATE: 10/14/2020 11:23 AM
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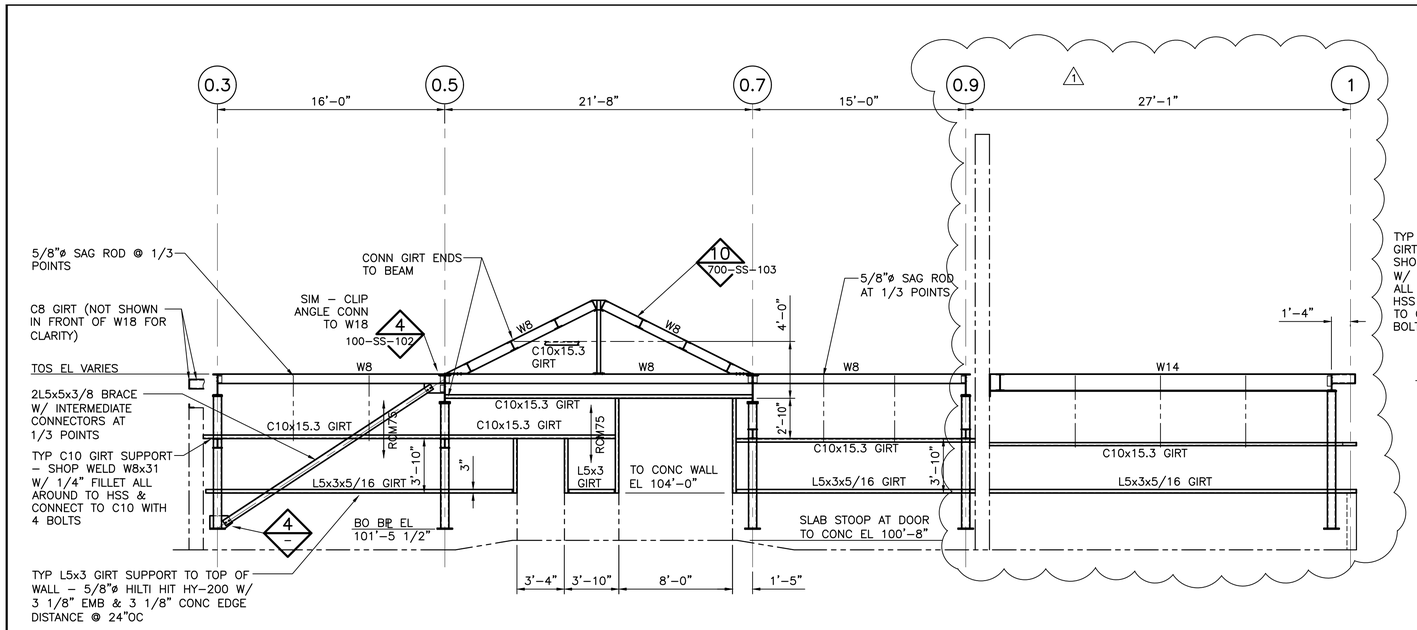
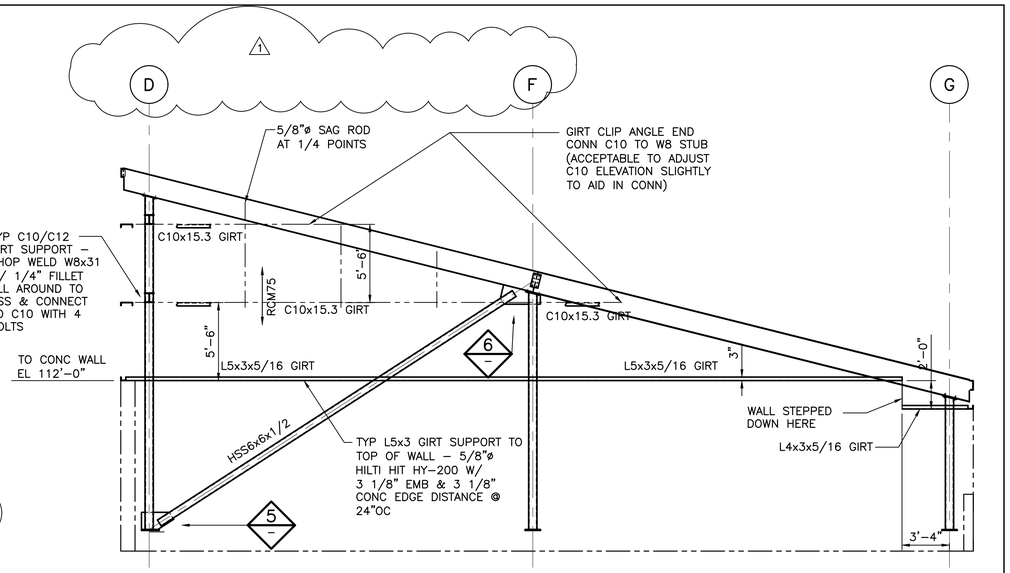


1 **ELEVATION:** 700-SS-100 3/16"=1'-0"



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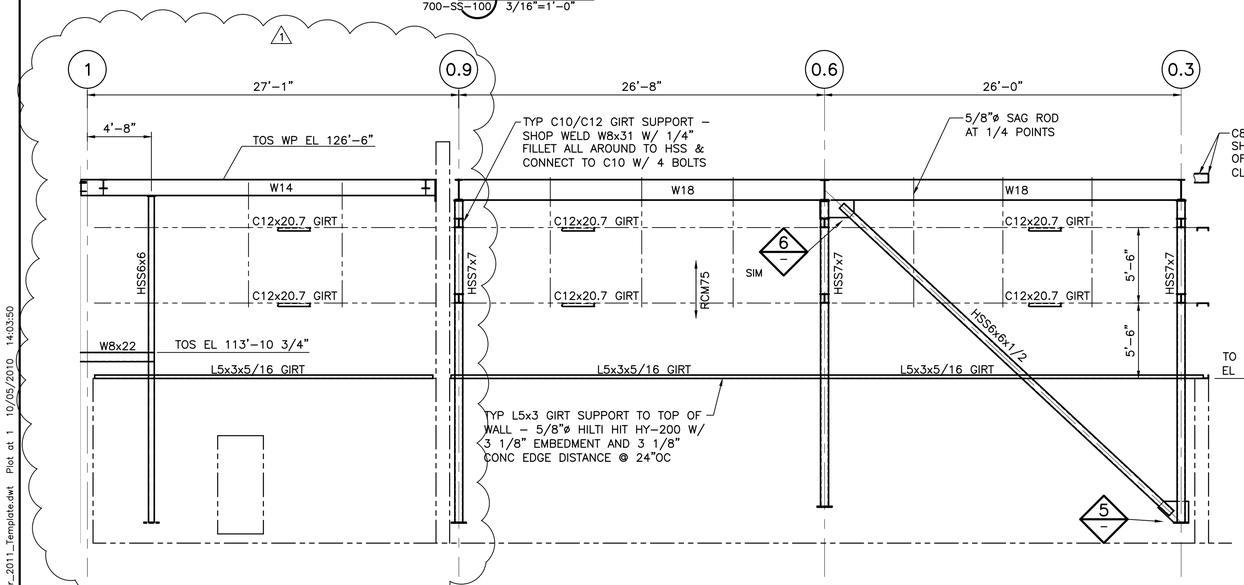
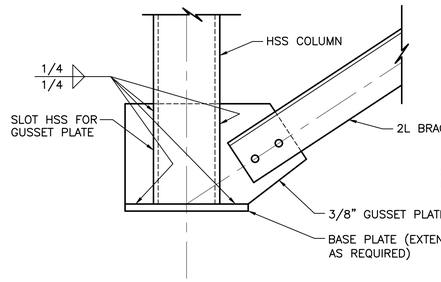
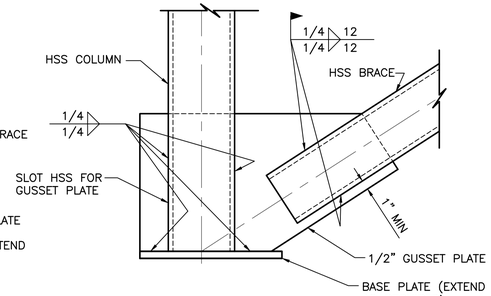


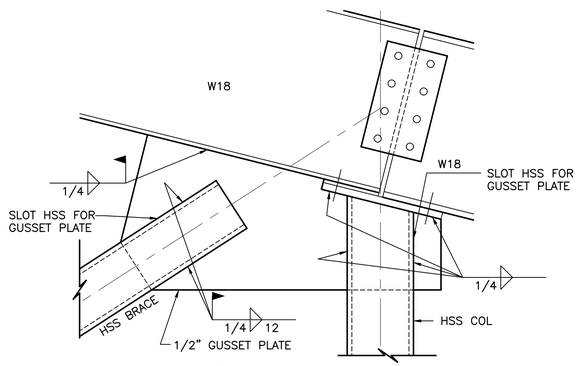
3 **ELEVATION:** 700-SS-100 3/16"=1'-0"



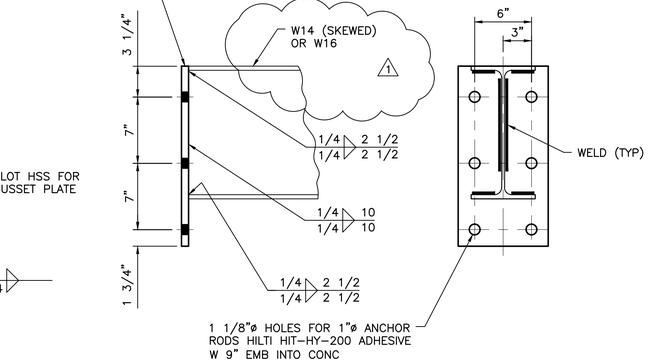
4 **DETAIL:** 1 1/2"=1'-0"



5 **DETAIL:** 1 1/2"=1'-0"



6 **DETAIL:** 1 1/2"=1'-0"



7 **DETAIL:** 700-SS-101 1 1/2"=1'-0"

ISSUED FOR CONSTRUCTION

COLORADO LICENSED JOHN C. TRULLINGER 51916 PROFESSIONAL ENGINEER
Oct 14, 2020
Exp Date Oct 31, 2021

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
1	JGT	TOP	JGT	10/13/20	ISSUED FOR CONSTRUCTION - MOVED 15' NORTH & REVISED COMPRESSOR AREA
0	JGT	TOP	JGT	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT 4/28/17 10/13/20; BID 4/28/17 10/13/20; CONSTRUCTION 4/28/17 10/13/20

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters: Minneapolis, Minnesota
Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 170 SOUTH MAIN STREET SUITE 500 SALT LAKE CITY, UT 84101
Ph: 1-800-632-2277
Fax: (952) 832-2601
www.barr.com

Scale	AS SHOWN
Date	3/16/17
Drawn	JGT
Checked	TOP
Designed	JGT
Approved	JGT

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

STRUCTURAL STEEL
REAGENT BUILDING ELEVATIONS

BARR PROJECT No. 06/46-1001.04
CLIENT PROJECT No.
DWG. No. 700-SS-105
REV. No. 1

CADD USER: John Trullinger FILE: M:\ADEPTWORK\JGT\06461001\00_700-SS-105A.DWG PLOT SCALE: 1:1 PLOT DATE: 10/14/2020 11:29 AM
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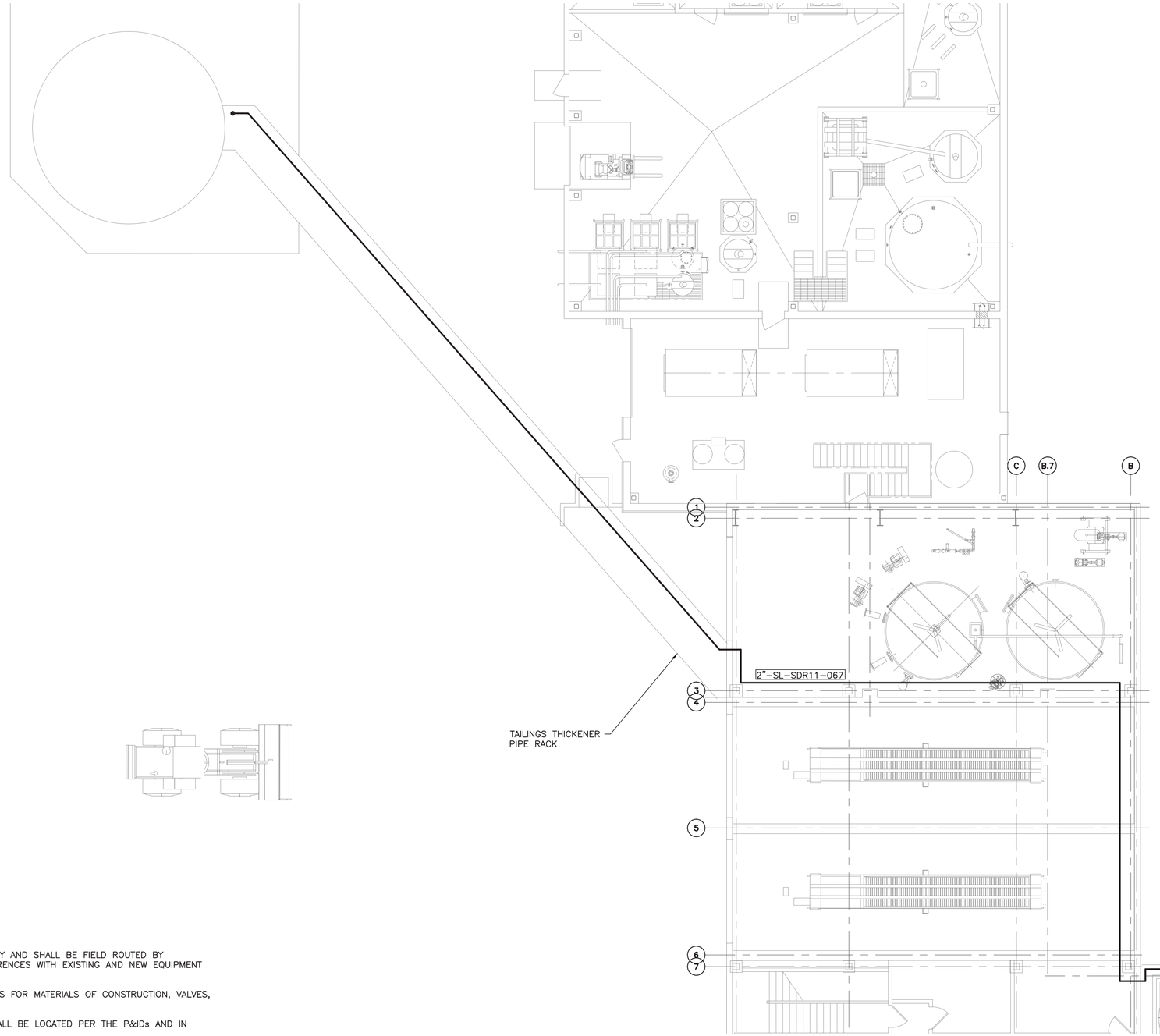
800 Area Drawings



NOTES

1. PIPING IS SHOWN SCHEMATICALLY AND SHALL BE FIELD ROUTED BY CONTRACTOR TO AVOID INTERFERENCES WITH EXISTING AND NEW EQUIPMENT AND FACILITIES.
2. REFER TO PIPING SPECIFICATIONS FOR MATERIALS OF CONSTRUCTION, VALVES, INSTRUMENTS, ETC.
3. VALVES, INSTRUMENTS, ETC. SHALL BE LOCATED PER THE P&IDs AND IN COORDINATION WITH OWNER.
4. PIPE SUPPORTS SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL MEET MAXIMUM SPAN REQUIREMENTS AS GIVEN IN LATEST EDITION OF ANVIL PIPE HANGER CATALOG UNLESS OTHERWISE SPECIFIED. CONSIDERATION SHALL BE GIVEN TO EXTRA WEIGHT ADDED BY VALVES OR OTHER IN-LINE COMPONENTS.

PIPING: TAILINGS THICKENER

3/16"=1'-0"

COLORADO LICENSED
SCOTT MICHAEL
PE.0052024
PROFESSIONAL ENGINEER

ISSUED FOR CONSTRUCTION

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION
0	DTJ	PGJ	DSM	4/28/17	ISSUED FOR CONSTRUCTION

RELEASED TO/FOR: CLIENT — 4/28/17; BID — 4/28/17; CONSTRUCTION — 4/28/17

DATE RELEASED: A B C 0 1 2 3

BARR
Corporate Headquarters:
Minneapolis, Minnesota
Ph: 1-800-632-2277

Project Office:
BARR ENGINEERING CO.
3128 14TH AVENUE EAST
HIBBING, MN 55746
Ph: 1-800-225-1966
Fax: (218) 262-3460
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Date	4-18-17
Drawn	DTJ
Checked	PGJ
Designed	JAK3
Approved	DSM

OURAY SILVER MINES, INC.
OURAY, COLORADO

PROCESS PLANT UPGRADES
REVENUE VIRGINIUS MINE

PIPING – PROCESS
TAILINGS THICKENER

BARR PROJECT No. 06/46-1001
CLIENT PROJECT No. –
DWG. No. 800-MP-001
REV. No. 0

CADD USER: Adeptuser FILE: \\PWEDINA\EDINA PW\EDINA PW IN\A8E6D89-5087-4028-9EAE-D89BEF743A12\F3A6D7E1-7866-410C-9073-A72A2ABA7A18\0646100100_800-MP-001.DWG PLOT SCALE: 1:1 PLOT DATE: 4/27/2017 7:13 PM
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Appendix 2
Reagent SDS

SDS Sheets for Mill Chemicals

The mine will purchase chemicals from distributors with lowest costs. The chemical makeup of the products are nearly identical, but slightly different ratios so that companies avoid patent infringement. The source that the chemicals are purchased from in the future may change as costs of products fluctuate.

Lime – The mine will be purchasing hydrated lime from L'Hoist.

Aerofloat 242 – The mine will be purchasing Danafloat 067 which is the same as Aerofloat 242 but distributed by Dana which is owned by Quadra Chemicals. SDS sheets for both Aerofloat and Danafloat are included.

Oreprep 549 – The mine will be purchasing Polyfroth W20 which is the same as Oreprep 549 but distributed by Dana which is owned by Quadra Chemicals. SDS sheets for both Polyfroth and Oreprep are included.

CuSO4 – The mine will be purchasing Cupric Sulfate (B) from Quadra.

ZnSO4 – The mine will be purchasing Zinc Sulphate Monohydrate from Zinc National which is a distributor for Cascade Columbia.

Sodium Isopropyl Xanthate – Two possible vendors: Prospec Chemicals is a distributor for Quadra Chemicals. Chemicals Cascade Columbia is a distributor for Charles Tennant. The SDS sheets for both Prospec and Charles Tennant are included.

Flocculant AF-309 – The mine will be purchasing SNF Hyperfloc AF309.

Aerophine 3418A – Distributed through Cytec Canada owned by Slovay

Sodium Metabisulfite – The mine will be purchasing Sodium Metabisulfite from Quadra.

Lime

SAFETY DATA SHEET

SECTION 1	IDENTIFICATION

Product

Name: Hydrated Lime

Other Names: Hydrate; High-Calcium Hydrated Lime

Recommended Uses: Water Treatment; pH adjustment; FGT; Construction

Company Identification:

US Operations:

Lhoist North America, Inc.
5600 Clearfork Main St, Ste. 300
Fort Worth, TX 76109
817-732-8164

Canadian Operations:

Lhoist North America of Canada, Inc.
20303-102B Ave.
Langley, BC V1M 3H1
604-888-4333

Emergency Phone Number:

Chemtrec 1-800-424-9300

SECTION 2	HAZARDS(S) IDENTIFICATION

Classification

Eye Damage – Category 1

Carcinogen – Category 1

Skin Irritation – Category 2

Specific Target Organ Toxicity Single Exposure – Category 3 (Respiratory System)

Specific Target Organ Toxicity Repeat Exposure – Category 1 (Respiratory System)

Labeling:

Pictograms:

Signal Word(s): Danger

Hazard Statements: Causes serious eye damage.

Causes skin irritation.

May cause respiratory irritation.

Causes damage to lungs through prolonged or repeated exposure when inhaled.

May cause cancer through inhalation.

Precautionary Statements:

Wear protective gloves and eye protection. Wash exposed skin thoroughly after handling. Do not breathe dust. Use only outdoors or in a well-ventilated area. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not eat, drink or smoke when using this product.

If on skin: wash exposed skin with plenty of water. If skin irritation occurs: Get medical attention. Take off contaminated clothing and wash it before reuse.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. Seek medical attention immediately. If inhaled: Remove person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

If exposed or concerned: Get medical advice

Dispose of contents or containers in accordance with applicable regulations.

Other Hazards: None.

SECTION 3	COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name: Calcium hydroxide

Common names and synonyms: Hydrate; High-Calcium Hydrated Lime

Chemical Identity	CAS #	Concentration, % Wt.
Calcium Hydroxide	1305-62-0	> 90%
Magnesium Oxide	1309-48-4	< 3%
Crystalline Silica	14808-60-7	< 2%

SECTION 4	FIRST AID MEASURES

Eye Contact: Contact can cause severe irritation or burning of eyes, including permanent damage. Immediately flush eyes with generous amounts of water for as long as needed. This may take several minutes. Pull back the eyelid to ensure that all lime dust has been washed out. Seek medical attention immediately. Do not rub eyes.

Inhalation: This product can cause severe irritation of the respiratory system. Move victim to fresh air. Seek medical attention if necessary. If breathing has stopped, give artificial respiration.

Skin Contact: Contact can cause severe irritation or burning of skin, especially in the presence of moisture. Wash exposed area with large amounts of water. Seek medical attention immediately.

Ingestion: This product can cause severe irritation or burning of gastrointestinal tract if swallowed. Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

Most important symptoms and effects, both acute and delayed: Irritation of skin, eyes, gastrointestinal tract or respiratory tract. Long-term exposure by inhalation may cause permanent damage. This product contains crystalline silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.

Note to Physician: Provide general supportive measures and treat symptomatically.

SECTION 5	FIREFIGHTING MEASURES

Extinguishing Media

Appropriate Extinguishing Media: Use dry chemical fire extinguisher

Inappropriate Extinguishing Media: Do not use halogenated compounds.

Firefighting

Fire Hazards: Hydrated Lime is not combustible or flammable. Hydrated Lime is not considered to be an explosive hazard, although reaction with incompatible materials may rupture containers.

Hazardous Combustion Products: None

Special Protective Equipment and Fire Fighting Instructions: Keep personnel away from and upwind of fire. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

SECTION 6	ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use proper protective equipment.

Environmental Precautions: For large spills, as much as possible, avoid the generation of dusts. Prevent release to sewers or waterways.

Methods and Materials for Containment and Cleaning Up:

Small Spills: Use dry methods to collect spilled materials. Avoid generating dust. Do not clean up with compressed air. Store collected materials in dry, sealed plastic or metal containers. Residue on surfaces may be washed with water or dilute vinegar.

Large Spills: Use dry methods to collect spilled materials. Evacuate area downwind of clean-up operations to minimize dust exposure. Store spilled materials in dry, sealed plastic or metal containers.

SECTION 7	HANDLING AND STORAGE

Precautions for Safe Handling: Keep in tightly closed containers. Protect containers from physical damage. Avoid direct skin contact with the material.

Conditions for Safe Storage, Including any Incompatibilities: Store in a cool, dry, and well-ventilated location. Do not store near incompatible materials (see Section 10 below). Keep away from moisture. Do not store or ship in aluminum containers.

SECTION 8	EXPOSURE CONTROLS/ PERSONAL PROTECTION

Control Parameters:

Component	CAS #	Exposure Limits
Calcium Hydroxide	1305-62-0	OSHA PEL: 15 mg/m3 (total) 5 mg/m3 (respirable) ACGIH TLV: 5 mg/m3
Magnesium Oxide	1309-48-4	OSHA PEL: 15 mg/m3 ACGIH TLV: 10 mg/m3
Crystalline Silica	14808-60-7	OSHA PEL: 0.050 mg/m3 as an 8 hr. TWA (respirable) ACGIH TLV: 0.025 mg/m3 (respirable)

Appropriate Engineering Controls: Provide ventilation adequate to maintain PELs.

Personal Protection

Respiratory Protection: Use NIOSH approved respirators if airborne concentration exceeds PEL.

Eye Protection: Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.

Skin Protection: If there is a risk of skin contact, wear appropriate clothing and gloves to prevent contact.

Other: Eye wash fountain and emergency showers are recommended.

SECTION 9	PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical State: Solid

Color: White

Odor: Odorless

Odor Threshold: N/ A

pH: 12.44 @ 25^{o} C when made into a saturated solution

Melting Point: N/ AF

Initial Boiling Point: N/ A

Freezing Point: N/ A

Flash Point: N/ A

Evaporation Rate: N/ A

Flammability (solid, gas): Non-flammable

Explosion Limits: N/ A

Vapor Pressure: N/ A

Vapor Density: N/ A

Relative Density: 0.4 – 0.7 g/ cm^3 (apparent)

Solubility(ies): Solubility is 1.6 g/L at 25^{o} C

Partition coefficient: Relatively insoluble

Auto-ignition Temperature: N/ A

Decomposition Temperature: 580^{o} C / 1076^{o} F

Viscosity: N/A

SECTION 10	STABILITY AND REACTIVITY

Reactivity:

Chemical Stability: Hydrated Lime is chemically stable.

Possibility of Hazardous Reactions: See reactivity above

Conditions to Avoid: Do not allow Hydrated Lime to come into contact with incompatible materials.

Incompatible Materials: Hydrated Lime should not be mixed or stored with the following materials, due to the potential for violent reaction and release of heat:

Acids (unless in a controlled process)
Reactive Fluoridated Compounds
Reactive Brominated Compounds
Reactive Powdered Metals
Organic Acid Anhydrides
Nitro-Organic Compounds
Reactive Phosphorous Compounds
Interhalogenated Compounds

Hazardous Decomposition Products: None

SECTION 11	TOXICOLOGICAL INFORMATION

Health Effects: see First Aid discussion in Section 4

Routes of Exposure: see First Aid discussion in Section 4

Symptoms Related to Exposure: see First Aid discussion in Section 4

Carcinogen Listing: Hydrated Lime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product contains crystalline silica, which has been classified by IARC as (Group I) carcinogenic to humans when inhaled.

SECTION 12	ECOLOGICAL INFORMATION

Ecotoxicity: Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems in high concentrations.

Persistence and Degradability: Reacts with atmospheric CO_2 over time to form calcium carbonate

Bioaccumulation Potential: This material shows no bioaccumulation effect or food chain concentration toxicity.

Mobility in Soil: Minimal mobility in soil. Reacts with clay portion of soil to form calcium silicates and calcium aluminates

Other Adverse Effects: This material is alkaline and if released into water or moist soil will cause an increase in pH

SECTION 13	DISPOSAL CONSIDERATIONS

Disposal Recommendations: Dispose of in accordance with all applicable federal, state, and local environmental regulations.

Regulatory Disposal Information: If this product as supplied, and unmixed, becomes a waste, it will not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act.

SECTION 14	TRANSPORT INFORMATION

UN Number: Not Regulated

UN Proper Shipping Name: Not Regulated

Transport Hazard Class(es): Not Regulated

Packing Group: Not Regulated

Marine Pollutant (y/n): This material is alkaline and if released into water or moist soil will cause an increase in pH.

Special Precautions: None

SECTION 15	REGULATORY INFORMATION

National Chemical Inventory Listings:

All chemical ingredients are listed on the USEPA TSCA Inventory List.

US Regulations:

RCRA Hazardous Waste Number: not listed (40 CFR 261.33)
RCRA Hazardous Waste Classification (40 CFR 261): not classified
CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311 (b) (4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ) not listed.
SARA 311/312 Codes: not listed.
SARA Toxic Chemical (40 CFR 372.65): not listed.
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed, Threshold Planning Quantity (TPQ): not listed

Specific State Regulations: ⚠WARNING: This product can expose you to chemicals, including crystalline silica, which is known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov
These naturally occurring impurities may also be regulated by other States.

Canadian DSL: Listed

Canadian NPRI: None of the components are listed

CEPA Toxic Substances: None of the components are listed

SECTION 16	OTHER INFORMATION

Prepared By: Lhoist North America Technical Services

Date Prepared: January 27, 2020

Revision: 2020-1

Abbreviations:

N/A	Not Available or Not Applicable
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
ACGIH	ACGIH American Conference of Governmental Industrial Hygienists
TWA	Time Weighted Average
PEL	Permissible Exposure Limit
TLV	Threshold Limit Value
REL	Recommended Exposure Limit

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Aerofloat 242

Quadra

SAFETY DATA SHEET

DANAFLOAT™ 067

Section 1. Identification

Product identifier as used on the label : DANAFLOAT™ 067

Product code : Q10795

Other means of identification : Not available.

Product type : Liquid.

Recommended use of the chemical and restrictions on use

Identified uses
Flotation agent

Supplier's details : Quadra Chemicals Inc.
21 Waterway Ave., Suite 200
The Woodlands, TX
United States (US) 77380
1-800-665-6553

Emergency telephone number (with hours of operation) : **Transportation Emergency - 24Hrs/Day - In US - Call 1-800-633-8253**

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (dermal) - Category 3
SKIN CORROSION - Category 1
SERIOUS EYE DAMAGE - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Toxic in contact with skin.
Harmful if swallowed.
Causes severe skin burns and eye damage.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF ON SKIN: Take off immediately all contaminated clothing and wash it before reuse. Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Section 2. Hazards identification

Immediately call a POISON CENTER or physician.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Keep container tightly closed. Do not breathe vapor or spray. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling.

Hazards not otherwise classified : Causes respiratory tract burns. Causes digestive tract burns.

Ingredients of unknown toxicity : Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 57.9%

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

Ingredient name	%	CAS number
ammonium O,O-bis(methylphenyl) dithiophosphate	49 - 51	58373-83-4
mix-cresol	0 - 7	1319-77-3
ammonia	0 - 1	1336-21-6

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Get medical attention immediately. Call a poison center or physician. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in

Section 4. First aid measures

recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Corrosive to the respiratory system.

Skin contact : Causes severe burns. Toxic in contact with skin.

Ingestion : May cause burns to mouth, throat and stomach. Harmful if swallowed. Corrosive to the digestive tract. Causes burns.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
sulfur oxides
phosphorus oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Do not store below the following temperature: 0°C (32°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
ammonium O,O-bis(methylphenyl) dithiophosphate Cresol	None. **OSHA PEL 1989 (United States, 3/1989).** **Absorbed through skin.** TWA: 5 ppm 8 hours. TWA: 22 mg/m³ 8 hours. **OSHA PEL (United States, 5/2018).** **Absorbed through skin.** TWA: 5 ppm 8 hours. TWA: 22 mg/m³ 8 hours. **ACGIH TLV (United States, 3/2018).** **Absorbed through skin.** TWA: 20 mg/m³ 8 hours. Form: Inhalable fraction and vapor

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Reddish brown.

Odor : Tar-like.

Odor threshold : Not available.

pH : 9 to 10.5

Melting point : -5 to -1°C (23 to 30.2°F)

Boiling point : 99°C (210.2°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : Not available.

Density : 1.11 to 1.15 g/cm³ [20°C (68°F)]

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : acids

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Cresol	LD50 Dermal LD50 Oral	Rabbit Rat	200 mg/kg 1454 mg/kg	- -

Irritation/Corrosion

Not available.

Sensitization

Section 11. Toxicological information

Not available.

Mutagenicity

Not available.

Carcinogenicity

No components known to Quadra, present at or above the cut-off value/concentration limit (≥0.1%), are listed as carcinogens by IARC, OSHA or NTP.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Corrosive to the respiratory system.

Skin contact : Causes severe burns. Toxic in contact with skin.

Ingestion : May cause burns to mouth, throat and stomach. Harmful if swallowed. Corrosive to the digestive tract. Causes burns.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Section 11. Toxicological information

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral Dermal	937 mg/kg 567.4 mg/kg

Section 12. Ecological information

Ecotoxicity

Product/ingredient name	Result	Species	Exposure
Cresol	Acute EC50 5 to 10 ppm Marine water	Algae - Macrocystis pyrifera - Young	4 days
	Acute EC50 7000 µg/l Fresh water	Crustaceans - Gammarus fasciatus	48 hours
	Acute LC50 10000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Cresol	2.33	17 to 20	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains

Section 13. Disposal considerations

and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Cresol	1319-77-3	Listed	U052

Section 14. Transport information

DOT Classification

UN number : UN2927

UN proper shipping name : Toxic liquid, corrosive, organic, n.o.s. (mix-cresol, ammonium O,O-bis(methylphenyl) dithiophosphate)

Transport hazard class(es) : 6.1 (8)

Packing group : II

Environmental hazards : No.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Additional information : **Reportable quantity** 1443 lbs / 655.12 kg [153.15 gal / 579.75 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

United States inventory (TSCA 8b) : All components are listed or exempted.

State regulations

Massachusetts : The following components are listed: CRESOL

New York : The following components are listed: Cresol(s)

New Jersey : The following components are listed: CRESOLS (mixed isomers); CRESYLIC ACID

Pennsylvania : The following components are listed: PHENOL, METHYL-

California Prop. 65

None of the components are listed.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	3
Flammability		0
Physical hazards		0

Section 16. Other information

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 4	Calculation method
ACUTE TOXICITY (dermal) - Category 3	Calculation method
SKIN CORROSION - Category 1	Calculation method
SERIOUS EYE DAMAGE - Category 1	Calculation method

History

Date of issue/Date of revision : 6/4/2020

Date of previous issue : No previous validation

Version : 1

Prepared by Regulatory Affairs

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name AEROFLOAT® 242 PROMOTER

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Mining chemicals

1.3 Details of the supplier of the safety data sheet

Company

CYTEC INDUSTRIES INC.
504 CARNEGIE CENTER
PRINCETON, NJ 08540 USA
Telephone: +1-973-357-3193

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

Disclaimer

The ® indicates a Registered Trademark in the United States and the ™ indicates a trademark in the United States. The mark may also be registered, subject of an application for registration, or a trademark in other countries.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture

HCS 2012 (29 CFR 1910.1200)

Acute toxicity, Category 4	H302: Harmful if swallowed.
Acute toxicity, Category 3	H311: Toxic in contact with skin.
Skin corrosion, Category 1B	H314: Causes severe skin burns and eye damage.
Serious eye damage, Category 1	H318: Causes serious eye damage.
Skin sensitization, Category 1	H317: May cause an allergic skin reaction.
Reproductive toxicity, Category 2	H361: Suspected of damaging fertility or the unborn child.
Specific target organ toxicity - repeated exposure, Category 2	H373: May cause damage to organs through prolonged or repeated exposure. (Thyroid)

2.2 Label elements

HCS 2012 (29 CFR 1910.1200)

Pictogram

Signal Word

- Danger

Hazard Statements

- H302	Harmful if swallowed.
- H311	Toxic in contact with skin.
- H314	Causes severe skin burns and eye damage.
- H317	May cause an allergic skin reaction.
- H361	Suspected of damaging fertility or the unborn child.
- H373	May cause damage to organs (Thyroid) through prolonged or repeated exposure.

Precautionary Statements

Prevention

- P201	Obtain special instructions before use.
- P202	Do not handle until all safety precautions have been read and understood.
- P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
- P264	Wash skin thoroughly after handling.
- P270	Do not eat, drink or smoke when using this product.
- P272	Contaminated work clothing must not be allowed out of the workplace.
- P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response

- P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
- P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
- P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
- P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
- P308 + P313	IF exposed or concerned: Get medical advice/ attention.
- P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
- P362	Take off contaminated clothing and wash before reuse.

Storage

- P405	Store locked up.

Disposal

- P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards which do not result in classification

- H402: Harmful to aquatic life.
- H412: Harmful to aquatic life with long lasting effects.

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

- Chemical nature Mixture of cresol and ammonium salt of aryldithiophosphoric acid in water

Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [%]
Dithiophosphate salt	*****	60 - 80
Phenol, methyl-	1319-77-3	<= 10
Thiourea, N,N'-diphenyl-	102-08-9	<= 10
Ammonium hydroxide ((NH4)(OH))	1336-21-6	<= 1

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation

- Quickly move the person away from the contaminated area. Make the affected person rest.
- Immediate medical attention is required.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of skin contact

- Wash off immediately with plenty of water for at least 15 minutes.
- Use appropriate protective equipment when treating a contaminated person.
- Immediate medical attention is required.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Keep eye wide open while rinsing.
- Show this sheet to the doctor.
- Always obtain medical advice, even if there are no symptoms.
- Be prepared to provide first aid or medical support if necessary.

In case of ingestion

- Do NOT induce vomiting.
- Immediate medical attention is required.
- Show this sheet to the doctor.
- Do not give anything to drink.
- Be prepared to provide first aid or medical support if necessary.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms

- Symptoms will depend on the target organs.
- Inhalation may provoke the following symptoms:
- Cough
- Breathing difficulties
- Irritation
- Redness

- Swelling of tissue
- Ingestion may provoke the following symptoms:
- Nausea
- Diarrhea
- Abdominal pain
- May cause respiratory tract irritation.
- allergic rhinitis
- Severe allergic skin reactions, bronchiospasm and anaphylactic shock
- Itching
- Dermatitis
- Causes skin burns.
- Lachrymation
- Conjunctivitis
- Causes eye burns.
- The gas deadens the sense of smell. Do not depend on odor to detect presence of gas.

Effects

- Serious effects on health can appear after exposure.
- Effects on health may appear after prolonged or repeated exposure.
- The effects will depend on target organs.
- Chronic exposure is suspected of causing effects on fertility or on the unborn child on basis of animal data. Effects on human have not been proven.
- Chronic exposure may cause allergic dermatitis.
- Exposure may cause allergic rhinitis, conjunctivitis, asthma or shock.
- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- In case of inhalation, irritation/corrosion of the respiratory tract.
- Risk of respiratory disorder
- May cause irreversible skin damage.
- Chronic exposure may cause dermatitis.
- May cause irreversible eye damage.
- Loss of the eye

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- Be aware to maintain life support if necessary.
- Take victim immediately to hospital.
- Immediate medical attention is required.
- Consult with an ophthalmologist immediately in all cases.
- Burns must be treated by a physician.
- Treat symptomatically.
- Contact a poison control center.
- Keep under medical supervision for at least 48 hours.
- Contact the occupational physician in case of exposure.

SECTION 5: Firefighting measures

Flash point	closed cup No flash up to boiling point
Autoignition temperature	No data available
Flammability / Explosive limit	No data available

5.1 Extinguishing media

Suitable extinguishing media

- Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- Under fire conditions:
- Will burn
- On combustion, toxic gases are released.

Hazardous combustion products:

- Sulfur dioxide or hydrogen sulfide may be formed under fire conditions.

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
- Wear a positive-pressure supplied-air respirator with full facepiece.
- For further information refer to section 8 "Exposure controls / personal protection."

Specific fire fighting methods

- Cool containers/tanks with water spray.
- Do not use a solid water stream as it may scatter and spread fire.

Further information

- Do not flush to sewer which may contain acid.
- This could result in generation of toxic and flammable hydrogen sulfide.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Where exposure level is not known, wear approved, positive pressure, self-contained respirator.
- Where exposure level is known, wear approved respirator suitable for level of exposure.
- Avoid contact with the skin and the eyes.
- In addition to the protective clothing/equipment in Section 8, wear a two piece PVC suit with hood or PVC overalls with hood.

6.2 Environmental precautions

- Stop the leak. Turn leaking containers leak-side up to prevent the escape of liquid.
- Contain the spilled material by diking.
- Do not let product enter drains.
- Do not allow uncontrolled discharge of product into the environment.

- Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies

6.3 Methods and materials for containment and cleaning up

- Stop leak if safe to do so.
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.

- Wash nonrecoverable remainder with large amounts of water.
- Soak up with inert absorbent material and dispose of as hazardous waste.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.
- Dispose of in accordance with local regulations.
- Never return spills in original containers for re-use.

6.4 Reference to other sections

- 7. HANDLING AND STORAGE
- 8. EXPOSURE CONTROLS/PERSONAL PROTECTION
- 13. DISPOSAL CONSIDERATIONS

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Large quantities of undiluted product should not be mixed with acids, since evolution of toxic and flammable hydrogen sulfide could result. In particular, precautions must be taken to avoid the accidental discharge of large volumes of the product in acid storage tanks or any tank or containment containing acidic materials. This precaution does not, of course, apply to addition of this reagent to flotation pulps in amounts customarily used in flotation, where the reagent amounts are small and instantly diluted to concentrations well below the solubility limits.

Hygiene measures

- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Recommended storage temperature: 32 - 95 °F (0 - 35 °C)

- To guarantee the quality and properties of the product keep according to Storage temperature and conditions.

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Components	Value type	Value	Basis
Phenol, methyl-	TWA	20 mg/m3	American Conference of Governmental Industrial Hygienists
	Form of exposure : Inhalable fraction and vapor Danger of cutaneous absorption		

Phenol, methyl-	TWA	5 ppm 22 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	Skin designation, The value in mg/m3 is approximate.		
Phenol, methyl-	PEL	5 ppm 22 mg/m3	
	Skin		
Ammonium hydroxide ((NH4)(OH))	TWA	50 ppm 35 mg/m3	Occupational Safety and Health Administration - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.		
Ammonium hydroxide ((NH4)(OH))	TWA	25 ppm	American Conference of Governmental Industrial Hygienists
	Expressed as :Ammonia		
Ammonium hydroxide ((NH4)(OH))	STEL	35 ppm	American Conference of Governmental Industrial Hygienists
	Expressed as :Ammonia		
Ammonium hydroxide ((NH4)(OH))	TWA	25 ppm 18 mg/m3	National Institute for Occupational Safety and Health
	Often used in an aqueous solution.Expressed as :Ammonia		
Ammonium hydroxide ((NH4)(OH))	ST	35 ppm 27 mg/m3	National Institute for Occupational Safety and Health
	Often used in an aqueous solution.Expressed as :Ammonia		

NIOSH IDLH (Immediately Dangerous to Life or Health Concentrations)

Components	CAS-No.	Concentration
Phenol, methyl-	1319-77-3	250 parts per million

8.2 Exposure controls

Control measures

Engineering measures

- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection

- Keep in a well-ventilated place.

Hand protection

- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).
- Impervious gloves

Suitable material

- Nitrile or fluorinated rubber gloves.

Eye protection
- Chemical resistant goggles must be worn.
- Tightly fitting safety goggles

Skin and body protection
- Impervious clothing
- Full protective suit
- Change working clothes after each work-shift.
- Contaminated work clothing should not be allowed out of the workplace.

Hygiene measures
- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Physical state: liquid Color: Yellow-brown
Odor	Ammonia sulfur
Odor Threshold	No data available
Molecular weight	Mixture
pH	> 10.0 (77 °F (25 °C))
Melting point/freezing point	Freezing point: -4.5 °F (-20.3 °C)
Initial boiling point and boiling range	212 °F (100 °C)
Flash point	closed cup No flash up to boiling point
Evaporation rate (Butylacetate = 1)	No data available
Flammability (solid, gas)	No data available
Flammability (liquids)	No data available
Flammability / Explosive limit	No data available
Autoignition temperature	No data available
Vapor pressure	No data available

Vapor density	No data available
Density	1.159 g/cm3 (77 °F (25 °C))
Relative density	No data available
Solubility	Water solubility: completely soluble
Partition coefficient: n-octanol/water	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidizing properties	No data available

9.2 Other information

Corrosion of Metals	Not classified due to data which are conclusive although insufficient for classification.
Reactions with water / air	Contact with acids liberates toxic gas.

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Stable

10.3 Possibility of hazardous reactions

- no data available

10.4 Conditions to avoid

- Keep away from oxidizing agents, strongly acid or alkaline materials and amines.
- Free radical initiators

10.5 Incompatible materials

- Strong acids and oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products
- Ammonia
- Carbon dioxide (CO2)

Thermal decomposition
- Carbon monoxide
- Sulfur oxides
- Phenol
- toluene
- Benzene
- Methane

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	This product is classified as acute toxicity category 4 According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Acute inhalation toxicity	Not classified as hazardous for acute inhalation toxicity according to GHS. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Acute dermal toxicity	
Dithiophosphate salt	Rabbit This product is classified as acute toxicity category 3
Phenol, methyl-	LD50 : 301 mg/kg - Rabbit This product is classified as acute toxicity category 3 Unpublished reports According to the available data on the constituents
Thiourea, N,N'-diphenyl-	LD50 : > 2,000 mg/kg - Rat , male and female Method: OECD Test Guideline 402 Not classified as hazardous for acute dermal toxicity according to GHS.
Acute toxicity (other routes of administration)	Not applicable
Skin corrosion/irritation	Corrosive to skin According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Serious eye damage/eye irritation	Risk of serious damage to eyes. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.

Respiratory or skin sensitization

Thiourea, N,N'-diphenyl-	Maximization Test - Guinea pig ≥ 30 % responding at ≤ 0,1 % intradermal induction dose Method: OECD Test Guideline 406 Unpublished reports

Mutagenicity

Genotoxicity in vitro	Product is not considered to be genotoxic According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Genotoxicity in vivo	Product is not considered to be genotoxic According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Carcinogenicity	The product is not considered to be carcinogenic. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.

This product does not contain any ingredient designated as probable or suspected human carcinogens by:

NTP
IARC
OSHA

Toxicity for reproduction and development

Toxicity to reproduction / fertility

Ammonium hydroxide ((NH4)(OH))	By analogy Reproduction / developmental toxicity screening test - Rat, male and female, Oral General Toxicity Parent NOAEL: 1,500 mg/kg bw/day OECD Test Guideline 422 Gavage, No toxicity to reproduction, Published data

Developmental Toxicity/Teratogenicity

Thiourea, N,N'-diphenyl-	Developmental Toxicity - Rat, male and female, Oral General Toxicity Maternal NOAEL: > 200 mg/kg bw/day Teratogenicity NOAEL F1:> 200mg/kg bw/day Developmental Toxicity NOAEL F1: 100 mg/kg bw/day Embryo-fetal toxicity. NOAEL F1: 50 mg/kg bw/day Method: OECD Test Guideline 414 Published data
Ammonium hydroxide ((NH4)(OH))	By analogy Reproduction / developmental toxicity screening test - Rat, male and female, Oral General Toxicity Maternal NOAEL: 1,500 mg/kg bw/day Method: OECD Test Guideline 422 Gavage, The product is not considered to be toxic for development., Unpublished reports By analogy

reproductive and developmental toxicity study - Rabbit, female, Oral Gavage, The product is not considered to be embryotoxic / fetotoxic., Published data

STOT

STOT-single exposure

The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.
According to the available data on the components.
According to the classification criteria for mixtures.
Unpublished reports and/or published data.

STOT-repeated exposure

The substance or mixture is classified as specific target organ toxicant, repeated exposure, category 2 according to GHS criteria.
According to the available data on the components.
According to the classification criteria for mixtures.
Unpublished reports and/or published data.

The product itself has not been tested.

Experience with human exposure

Experience with human exposure : Inhalation

In contact with acid

Symptoms: Released substances:
Hydrogen sulphide
Inhalation may provoke the following symptoms:
Irritating to the respiratory system and mucous membranes.
Coma
cardiorespiratory failure
Neurological disorders
Gastrointestinal disturbance

Experience with human exposure : Skin contact

No data is available on the product itself.

Experience with human exposure : Eye contact

No data is available on the product itself.

Experience with human exposure : Ingestion

No data is available on the product itself.

CMR effects

Teratogenicity

Thiourea, N,N'-diphenyl- — Suspected of damaging the unborn child.

Aspiration toxicity

No aspiration toxicity classification, According to the available data on the components, According to the classification criteria for mixtures.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish	LC50 - 96 h : ca.66 mg/l - Oncorhynchus mykiss (rainbow trout) static test Method: OECD Test Guideline 203 Published data
Acute toxicity to daphnia and other aquatic invertebrates	The product itself has not been tested.
Toxicity to aquatic plants	The product itself has not been tested.
Toxicity to microorganisms	The product itself has not been tested.
Chronic toxicity to fish	The product itself has not been tested.
Chronic toxicity to daphnia and other aquatic invertebrates	The product itself has not been tested.

Sediment compartment

Toxicity to benthic organisms	The product itself has not been tested.

Terrestrial Compartment

Toxicity to soil dwelling organisms	The product itself has not been tested.
Toxicity to terrestrial plants	The product itself has not been tested.
Toxicity to above ground organisms	The product itself has not been tested.

M-Factor

Ammonium hydroxide ((NH4)(OH))	Acute aquatic toxicity = 1 (according to the Globally Harmonized System (GHS))

12.2 Persistence and degradability

Abiotic degradation

Stability in water	Conclusion is not possible for a mixture as a whole.
Photodegradation	Conclusion is not possible for a mixture as a whole.
Other Physicochemical reactions	Conclusion is not possible for a mixture as a whole.

Physical- and photo-chemical elimination

Physico-chemical removability	Conclusion is not possible for a mixture as a whole.

Biodegradation

Biodegradability	< 70 % - 28 Days Information given is based on data obtained from similar products Expert judgment
Ratio BOD / COD	Conclusion is not possible for a mixture as a whole.

Ratio BOD / ThOD	Conclusion is not possible for a mixture as a whole.
Biochemical Oxygen Demand (BOD)	Conclusion is not possible for a mixture as a whole.
Dissolved organic carbon (DOC)	Conclusion is not possible for a mixture as a whole.
Chemical Oxygen Demand (COD)	Conclusion is not possible for a mixture as a whole.
Adsorbed organic bound halogens (AOX)	Conclusion is not possible for a mixture as a whole.

Degradability assessment

Phenol, methyl-	The product is considered to be rapidly degradable in the environment
Thiourea, N,N'-diphenyl-	The product is not considered to be rapidly degradable in the environment
Ammonium hydroxide ((NH4)(OH))	The product is considered to be rapidly degradable in the environment Expert judgment

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water	Conclusion is not possible for a mixture as a whole.
Bioconcentration factor (BCF)	As bioaccumulation is not relevant for mixtures, all the components of the mixture were assessed individually. Conclusion is not possible due to incomplete or heterogeneous data on the components Unpublished reports Published data

12.4 Mobility in soil

Adsorption potential (Koc)	Conclusion is not possible for a mixture as a whole.
Known distribution to environmental compartments	Conclusion is not possible due to incomplete or heterogeneous data on the components

12.5 Results of PBT and vPvB assessment	This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT). This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB). According to the available data on the components

12.6 Other adverse effects

Ecotoxicity assessment

Short-term (acute) aquatic hazard	Harmful to aquatic life. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Long-term (chronic) aquatic hazard	Harmful to aquatic life with long lasting effects. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- The Company encourages the recycle, recovery and reuse of materials, where permitted. If disposal is necessary, The Company recommends that organic materials, especially when classified as hazardous waste, be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed.

SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

DOT

14.1 UN number	UN 2922
14.2 Proper shipping name	CORROSIVE LIQUIDS, TOXIC, N.O.S. (Dithiophosphate salt, CRESOL (CRESYLIC ACID))
14.3 Transport hazard class	8
Subsidiary hazard class	6.1
Label(s)	8 (6.1)
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards	NO
Marine pollutant	

14.6 Special precautions for user

This product contains one or more ingredients identified as a hazardous substance in Appendix A of 49 CFR 172.101.

Reportable quantities	:	RQ substance: CRESOL (CRESYLIC ACID) RQ limit for substance: 100 lb

TDG

14.1 UN number	UN 2922
14.2 Proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (Dithiophosphate salt, CRESOL (CRESYLIC ACID))
14.3 Transport hazard class	8
Subsidiary hazard class	6.1
Label(s)	8 (6.1)
14.4 Packing group	
Packing group	II

ERG No	154
14.5 Environmental hazards **Marine pollutant**	NO

NOM

14.1 UN number	UN 2922
14.2 Proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (Dithiophosphate salt, CRESOL (CRESYLIC ACID))
14.3 Transport hazard class	8
Subsidiary hazard class	6.1
Label(s)	8 (6.1)
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards **Marine pollutant**	NO

IMDG

14.1 UN number	UN 2922
14.2 Proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (Dithiophosphate salt, Cresol (Cresylic Acid))
IMDG Code segregation group	Alkalis (SGG18)
14.3 Transport hazard class	8
Subsidiary hazard class	6.1
Label(s)	8 (6.1)
14.4 Packing group	
Packing group	II
14.5 Environmental hazards **Marine pollutant**	NO
14.6 Special precautions for user	
EmS	F-A , S-B

For personal protection see section 8.

14.7 Transport in bulk vessels according to IMO instruments

No data available

IATA

14.1 UN number	UN 2922
14.2 Proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (Dithiophosphate salt, Cresol (Cresylic Acid))
14.3 Transport hazard class	8
Subsidiary hazard class:	6.1
Label(s):	8 (6.1)
14.4 Packing group	
Packing group	II
Packing instruction (cargo aircraft)	855
Max net qty / pkg	30.00 L
Packing instruction (passenger aircraft)	851
Max net qty / pkg	1.00 L
14.5 Environmental hazards	NO

14.6 Special precautions for user
For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	- All substances listed as active on the TSCA inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	- When purchased from a Solvay legal entity based in the EEA ("European Economic Area"), this product is compliant with the registration provisions of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, and/or registered. When purchased from a legal entity outside of the EEA, please contact your local representative for additional information.
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
Taiwan Chemical Substance Inventory (TCSI)	- One or more components not listed on inventory
New Zealand. Inventory of Chemical Substances	- All components are listed on the NZIOC inventory. The HSNO status of the product has not been assessed.

15.2 Federal Regulations

US. EPA EPCRA SARA Title III

SARA HAZARD DESIGNATION SECTIONS 311/312 (40 CFR 370)

Acute toxicity (any route of exposure)	Yes
Skin corrosion or irritation	Yes
Serious eye damage or eye irritation	Yes
Respiratory or skin sensitization	Yes
Reproductive toxicity	Yes
Specific target organ toxicity (single or repeated exposure)	Yes

The categories not mentioned are not relevant for the product.

Section 313 Toxic Chemicals (40 CFR 372.65)
The following components are subject to reporting levels established by SARA Title III, Section 313:

Components	CAS-No.	Concentration
Phenol, methyl-	1319-77-3	<= 10%

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)
This material does not contain any components with a section 302 EHS TPQ.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)
This material does not contain any components with a SARA 302 RQ.

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)
This material does not contain any components with a section 304 EHS RQ.

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Components	CAS-No.	Reportable quantity
Ammonium hydroxide ((NH4)(OH))	1336-21-6	1000 lb
Phenol, methyl-	1319-77-3	100 lb

15.3 State Regulations

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

NFPA (National Fire Protection Association) - Classification

Health	3 serious
Flammability	1 slight
Instability or Reactivity	0 minimal

Further information

- Distribute new edition to clients
- Update
- See section 2

Date Prepared: 09/20/2019

Key or legend to abbreviations and acronyms used in the safety data sheet

- PEL	Permissible exposure limit
- ST	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
- STEL	Short-term exposure limit
- TWA	8-hour, time-weighted average
- ACGIH	American Conference of Governmental Industrial Hygienists
- OSHA	Occupational Safety and Health Administration
- NTP	National Toxicology Program
- IARC	International Agency for Research on Cancer
- NIOSH	National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Oreprep 549

Quadra

SAFETY DATA SHEET

POLYFROTH® W20

Section 1. Identification

Product identifier as used on the label : POLYFROTH® W20

Product code : Q10575

Other means of identification : Not available.

Product type : Liquid.

Recommended use of the chemical and restrictions on use

Identified uses
Industrial applications.

Supplier's details : Quadra Chemicals Inc.
21 Waterway Ave., Suite 200
The Woodlands, TX
United States (US) 77380
1-800-665-6553

Emergency telephone number (with hours of operation) : **Transportation Emergency - 24Hrs/Day - In US - Call 1-800-633-8253**

Section 2. Hazards identification

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this SDS contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

Classification of the substance or mixture : Not classified.

GHS label elements

Signal word : No signal word.

Hazard statements : No known significant effects or critical hazards.

Precautionary statements

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Not available.

Ingredient name	%	CAS number
[(methylethylene)bis(oxy)]dipropanol	98 - 100	24800-44-0

Section 3. Composition/information on ingredients

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if symptoms occur.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur.

Ingestion : Wash out mouth with water. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Section 5. Fire-fighting measures

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8).

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store between the following temperatures: 15 to 30°C (59 to 86°F). Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
[(methylethylene)bis(oxy)]dipropanol	None.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Clear.]

Color : Colorless.

Odor : Not available.

Odor threshold : Not available.

pH : 8.5 to 9.5 [Conc. (% w/w): 50%]

Melting point : -45°C (-49°F)

Boiling point : 269.5 to 270.5°C (517.1 to 518.9°F)

Flash point : Closed cup: 145°C (293°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : 0.013 kPa (0.0999 mm Hg) [room temperature]

Section 9. Physical and chemical properties

Vapor density : 6.6 [Air = 1]

Relative density : Not available.

Density :

Solubility : Easily soluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 232°C (449.6°F)

Decomposition temperature : Not available.

Viscosity : Kinematic (room temperature): 0.773 cm^2/s (77.3 cSt)
Kinematic (40°C (104°F)): 0.234 cm^2/s (23.4 cSt)

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : oxidizing materials
acids
alkalis

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
[(methylethylene)bis(oxy)] dipropanol	LD50 Oral	Rat	3 g/kg	-

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

No components known to Quadra, present at or above the cut-off value/concentration limit (≥0.1%), are listed as carcinogens by IARC, OSHA or NTP.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Section 11. Toxicological information

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Inhalation.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	3000.6 mg/kg

Section 12. Ecological information

Ecotoxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
[(methylethylene)bis(oxy)] dipropanol	-0.379	<5.7	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

DOT Classification

UN number : Not regulated.

UN proper shipping name : -

Transport hazard class(es) : -

Packing group : -

Environmental hazards : No.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Additional information : Not available.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

United States inventory (TSCA 8b) : All components are listed or exempted.

State regulations

Massachusetts : None of the components are listed.

New York : None of the components are listed.

New Jersey : None of the components are listed.

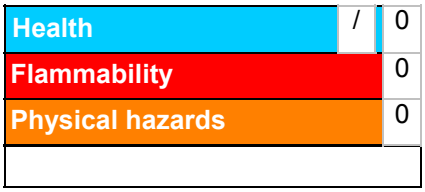
Pennsylvania : None of the components are listed.

California Prop. 65

None of the components are listed.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Not classified.	

History

Date of issue/Date of revision : 12/11/2019

Date of previous issue : No previous validation

Version : 1

Prepared by Regulatory Affairs

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name OREPREP® F-549 FROTHER

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Frother

1.3 Details of the supplier of the safety data sheet

Company

CYTEC CANADA INC.
9061 Garner Road, Niagara Falls,
Ontario, Canada L2H 0Y2
Tel:+1-905-356-9000

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): +1-800-424-9300 within the United States and Canada, or +1-703-527-3887 for international collect calls.

Disclaimer

The ® indicates a Registered Trademark in the United States and the ™ indicates a trademark in the United States. The mark may also be registered, subject of an application for registration, or a trademark in other countries.

SECTION 2: Hazards identification

Although WHMIS has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects

2.1 Classification of the substance or mixture

Hazardous Products Regulations (WHMIS 2015)

Skin irritation, Category 2	H315: Causes skin irritation.
Eye irritation, Category 2A	H319: Causes serious eye irritation.

2.2 Label elements

Hazardous Products Regulations (WHMIS 2015)

Pictogram

Signal Word

- Warning

Hazard Statements

- H315 Causes skin irritation.

- H319 Causes serious eye irritation.

Precautionary Statements

Prevention

- P264 Wash skin thoroughly after handling.
- P280 Wear protective gloves/ eye protection/ face protection.

Response

- P302 + P352 IF ON SKIN: Wash with plenty of water.
- P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P332 + P313 If skin irritation occurs: Get medical advice/ attention.
- P337 + P313 If eye irritation persists: Get medical advice/ attention.
- P362 + P364 Take off contaminated clothing and wash it before reuse.

2.3 Other hazards which do not result in classification

None identified

SECTION 3: Composition/information on ingredients

3.1 Substance

- Chemical nature Mixture of polyglycols

WHMIS Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [% wt/wt or V/V]
Mixed glycol ethers	*****	60 - 100

3.2 Mixture

Not applicable, this product is a substance.

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation

- Quickly move the person away from the contaminated area. Make the affected person rest.
- Obtain medical attention.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of skin contact

- Wash off immediately with plenty of water for at least 15 minutes.
- Use appropriate protective equipment when treating a contaminated person.
- In case of inflammation (redness, irritation, ...) obtain medical attention.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Keep eye wide open while rinsing.
- Show this sheet to the doctor.

- Always obtain medical advice, even if there are no symptoms.
- Be prepared to provide first aid or medical support if necessary.

In case of ingestion

- Do NOT induce vomiting.
- Obtain medical attention.
- Show this sheet to the doctor.
- Do not give anything to drink.
- Be prepared to provide first aid or medical support if necessary.

4.2 Most important symptoms and effects, both acute and delayed

Effects

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- In case of inhalation, irritation/corrosion of the respiratory tract.
- May cause irreversible skin damage.
- Chronic exposure may cause dermatitis.
- May cause irreversible eye damage.
- Loss of the eye

Symptoms

- Irritation
- Redness
- Swelling of tissue
- May cause respiratory tract irritation.
- Causes skin burns.
- Lachrymation
- Conjunctivitis
- Causes eye burns.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- Take victim immediately to hospital.
- Immediate medical attention is required.
- Consult with an ophthalmologist immediately in all cases.
- Burns must be treated by a physician.
- Contact a poison control center.
- Keep under medical supervision for at least 48 hours.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

- Water spray
- Foam
- Carbon dioxide (CO2)
- Multipurpose powders

Unsuitable extinguishing media

- High volume water jet

5.2 Special hazards arising from the substance or mixture

- Under fire conditions:

- Will burn
- On combustion, toxic gases are released.

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
- For further information refer to section 8 "Exposure controls / personal protection."

Specific fire fighting methods

- Cool containers/tanks with water spray.
- Do not use a solid water stream as it may scatter and spread fire.

Further information

- Standard procedure for chemical fires.
- Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
- Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Where exposure level is not known, wear approved, positive pressure, self-contained respirator.
- Where exposure level is known, wear approved respirator suitable for level of exposure.
- In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impermeable boots.

6.2 Environmental precautions

- Stop the leak. Turn leaking containers leak-side up to prevent the escape of liquid.
- Contain the spilled material by diking.
- Do not let product enter drains.
- Do not allow uncontrolled discharge of product into the environment.

6.3 Methods and materials for containment and cleaning up

- Stop leak if safe to do so.
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.
- Wash nonrecoverable remainder with large amounts of water.
- Soak up with inert absorbent material and dispose of as hazardous waste.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.
- Dispose of in accordance with local regulations.
- Never return spills in original containers for re-use.

6.4 Reference to other sections

- 7. HANDLING AND STORAGE
- 8. EXPOSURE CONTROLS/PERSONAL PROTECTION
- 13. DISPOSAL CONSIDERATIONS

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Hygiene measures

- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Recommended storage temperature: 41 - 95 °F (5 - 35 °C)

- Keep in a dry, cool and well-ventilated place.
- To guarantee the quality and properties of the product keep according to Storage temperature and conditions.

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

- Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Control measures

Engineering measures
- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection
- Keep in a well-ventilated place.

Hand protection
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).
- Impervious gloves

Eye protection
- Chemical resistant goggles must be worn.
- Tightly fitting safety goggles

Skin and body protection
- Impervious clothing
- Change working clothes after each work-shift.
- Contaminated work clothing should not be allowed out of the workplace.

Hygiene measures
- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.

- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Physical state	liquid
Color	Yellow-brown
Odor	mild, ether-like
Odor Threshold	No data available
Melting point/freezing point	Freezing point: ca. -31 °F (-35 °C)
Initial boiling point and boiling range	Boiling point/boiling range: > 399.9 °F (> 204.4 °C)
Flammability (solid, gas)	No data available
Flammability (liquids)	No data available
Flammability / Explosive limit	Lower flammability/explosion limit: Type: Lower flammability limit Not applicable Upper flammability/explosion limit: Type: Upper flammability limit Not applicable
Flash point	> 230 °F (110 °C) Pensky-Martens closed cup
Autoignition temperature	No data available
Decomposition temperature	No data available
pH	Not applicable
Viscosity	Viscosity, dynamic : ca. 28 mPa.s (77 °F (25 °C))
Solubility	Water solubility: completely soluble
Partition coefficient: n-octanol/water	No data available
Vapor pressure	< 0.02 mmHg (< 0.03 hPa) (77 °F (25 °C))
Density	0.99 - 1.05 g/cm3
Relative density	No data available
Relative vapor density	Very low
Particle characteristics	No data available

Evaporation rate (Butylacetate = 1)	< 0.01

9.2 Other information

Oxidizing properties	Not considered as oxidizing.
Peroxides	The substance or mixture is not classified as organic peroxide.
Corrosion of Metals	Not corrosive to metals.
Molecular weight	Mixture

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Stable

10.3 Possibility of hazardous reactions

- no data available

10.4 Conditions to avoid

- no data available

10.5 Incompatible materials

- Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products
- Carbon monoxide
- Carbon dioxide (CO2)

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	No data available
Acute inhalation toxicity	No data available
Acute dermal toxicity	No data available
Acute toxicity (other routes of administration)	No data available

Skin corrosion/irritation

Mixed glycol ethers	Skin irritation

Serious eye damage/eye irritation

Mixed glycol ethers	Eye irritation
Respiratory or skin sensitization	No data available

Mutagenicity

Genotoxicity in vitro	No data available
Genotoxicity in vivo	No data available
Carcinogenicity	No data available

Toxicity for reproduction and development

Toxicity to reproduction / fertility	No data available
Developmental Toxicity/Teratogenicity	No data available

STOT

STOT-single exposure	No data available
STOT-repeated exposure	No data available
Experience with human exposure	No data available
Aspiration toxicity	No data available

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish	No data available
Acute toxicity to daphnia and other aquatic invertebrates	No data available
Toxicity to aquatic plants	No data available
Toxicity to microorganisms	No data available
Chronic toxicity to fish	No data available
Chronic toxicity to daphnia and other aquatic invertebrates	No data available

12.2 Persistence and degradability

Abiotic degradation	No data available
Physical- and photo-chemical elimination	No data available
Biodegradation	No data available

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water	No data available
Bioconcentration factor (BCF)	No data available

12.4 Mobility in soil

Adsorption potential (Koc)	No data available
Known distribution to environmental compartments	No data available

12.5 Results of PBT and vPvB assessment No data available

12.6 Other adverse effects No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- The Company encourages the recycle, recovery and reuse of materials, where permitted. If disposal is necessary, The Company recommends that organic materials, especially when classified as hazardous waste, be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed.

SECTION 14: Transport information

TDG
not regulated

DOT
not regulated

NOM
not regulated

IMDG
not regulated

IATA
not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1Notification status

Inventory Information	Status
United States TSCA Inventory	- All substances listed as active on the TSCA inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
Taiwan Chemical Substance Inventory (TCSI)	- Listed on Inventory

New Zealand. Inventory of Chemical Substances	- All components are listed on the NZIoC inventory. Additional HSNO obligations may apply. Please refer to Section 15 of SDS for New Zealand.
EU. European Registration, Evaluation, Authorization and Restriction of Chemical (REACH)	- When purchased from a Solvay legal entity based in the EEA ("European Economic Area"), this product is compliant with the registration provisions of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, and/or registered. When purchased from a legal entity outside of the EEA, please contact your local representative for additional information.

15.2 National Regulations

Canada. CEPA 1999 Significant New Activity (SNAc) List:

- No substances are subject to a Significant New Activity Notification.

SECTION 16: Other information

Revision Date:

03/19/2021

NFPA (National Fire Protection Association) - Classification

Health	2 moderate
Flammability	1 slight
Instability or Reactivity	0 minimal

Further information

- Distribute new edition to clients

Key or legend to abbreviations and acronyms used in the safety data sheet

- ACGIH: American Conference of Governmental Industrial Hygienists
- OSHA: Occupational Safety and Health Administration
- NTP: National Toxicology Program
- IARC: International Agency for Research on Cancer
- NIOSH: National Institute for Occupational Safety and Health
- ADR: European Agreement on International Carriage of Dangerous Goods by Road.
- ADN: European Agreement on the International Carriage of Dangerous Goods by Inland Waterways.
- RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.
- IATA: International Air Transport Association.
- ICAO-TI: Technical Specification for Safe Transport of Dangerous Goods by Air.
- IMDG: International Maritime Dangerous Goods.
- TWA: Time weighted average
- ATE: Estimated value of acute toxicity
- EC: European Community number
- CAS: Chemical Abstracts Service.
- LD50: Substance that causes 50% (half) death in the test animals group (Median Fatal Dose).
- LC50: Substance concentration causing 50% (half) death in the test animals group.
- EC50: Effective Concentration of the substance causing the maximum of 50%.

- PBT: Persistent, Bioaccumulative and Toxic substance.
- vPvB: Very Persistent and Very Bioaccumulative.
- SEA: Classification, labeling, packaging regulation
- DNEL: Derived No Effect Level
- PNEC: Predicted No Effect Concentration
- STOT: Specific Target Organ Toxicity

Not all acronyms listed above are referenced in this SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

CuSO4

SAFETY DATA SHEET

CUPRIC SULPHATE (B)

Section 1. Identification

Product identifier : CUPRIC SULPHATE (B)

Product code : Q04613

Relevant identified uses of the substance or mixture

Identified uses
Industrial applications

Supplier's details : QUADRA CHEMICALS LTD.
3901 F.X Tessier
Vaudreuil-Dorion, QC
CANADA J7V 5V5
1-800-665-6553

Emergency telephone number (with hours of operation) : **TRANSPORTATION EMERGENCY - 24HRS/DAY - 7 DAYS/WEEK IN CANADA - CALL 1-888-922-3330**

Section 2. Hazard identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 4
EYE IRRITATION - Category 2A

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Harmful if swallowed.
Causes serious eye irritation.

Precautionary statements

Prevention : Wear eye or face protection. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Ingredient name	% (w/w)	CAS number
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	98 - 100	7758-99-8

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Section 4. First-aid measures

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
sulfur oxides
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Section 6. Accidental release measures

Small spill : Move containers from spill area. Avoid dust generation. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	-

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. If operating conditions cause high dust concentrations to be produced, use dust goggles.

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Physical state : Solid. [Crystals or powder.]

Color : Blue.

Odor : Odourless.

Odor threshold : Not available.

pH : Not available.

Melting point : Not available.

Boiling point : Not available.

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : 2.284

Density : 2.284 g/cm³ [20°C (68°F)]

Solubility : Soluble in the following materials: cold water and methanol.

Dispersibility properties : Not available.

Section 9. Physical and chemical properties

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : >110°C (>230°F)

Viscosity : Not available.

Volatility : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : metals

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	LD50 Oral	Rat	960 mg/kg	-

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Section 11. Toxicological information

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	960.2 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Sulfuric acid copper(2+) salt (1:1), hydrate (1:5)	Acute EC50 182 ppb Fresh water Acute LC50 0.032 ppm Fresh water	Daphnia - Daphnia magna Fish - Oncorhynchus mykiss	48 hours 96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	TDG Classification
UN number	3077
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Sulfuric acid copper(2+) salt (1:1), hydrate (1:5))
Transport hazard class(es)	9
Packing group	III
Additional information	Not available.

Section 14. Transport information

Section 15. Regulatory information

Canada inventory : All components are listed or exempted.

Section 16. Other information

History

Date of issue/Date of revision : 6 November 2019

Prepared by : Regulatory Affairs

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations
HPR = Hazardous Products Regulations

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 4 EYE IRRITATION - Category 2A	Calculation method Calculation method

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

ZnSO4

ZINC NACIONAL	SAFETY DATA SHEET			
	Date Previous Revision: 18.07.2016	Date of this revision: 23.04.2018	Revision Number: 7	*Página: 1 de 2*

1. CHEMICAL PRODUCT – COMPANY IDENTIFICATION.

GHS Product name:	Zinc Sulphate Monohydrate.
Common / Trade names.	Zinc Sulphate Monohydrate. Zinc Sulphate Maximum 360 / 361 / 362 / 363 / 365
Application.	Fertilizers, intermediates, laboratory chemicals, processing aid not otherwise listed, pharmaceutical substance, surface active agents, lubricants and lubricant additives, fillers, some grades of this substance are available for food/feedstuff additives.
Company Identification.	Zinc Nacional, S.A. Serafín Peña 938 Sur, Monterrey N.L. Mexico, C.P. 64000 Phone: +52 (81) 8345-4078 Fax +52 (81) 8344-3446.
Emergency telephone.	Business Hours: +52 (81) 8345-4078. 24 Hours: +52 (81) 8378-5730.

2. HAZARDS IDENTIFICATION.

- **Classification of the substance:** GHS Classification.

Acute aquatic toxicity (Category 1) H400; Chronic aquatic toxicity (Category 1) H410
Acute Tox. 4, H302; Eye Damage 1, H318

- **GHS label elements:**

Pictogram	Signal Word	Hazard Statements	Precautionary Statements
	Danger	H302 H318 H400 H410	P273 P301 + P312 P351

* For the full meaning of the phrases H and P: see section 16

3. COMPOSITION AND INFORMATION ON INGREDIENTS.

Component	CE N°	CAS N°	% (w/w)
Zinc Sulphate, $ZnSO_4$	231-793-3	7446-19-7	97.4

4. FIRST-AID MEASURES.

Description of first aid measures.

- **Ingestion:** Have victim rinse mouth thoroughly with water. "Do not induce vomiting". Immediately give large amounts of water. If vomiting occurs, rinse mouth and repeat administration of water. Obtain medical advice. Never give anything by mouth to an unconscious or convulsing person.
- **Inhalation:** If symptoms are experienced, remove source of contamination or move victim to fresh air. In case of breathing difficulties administer oxygen. If symptoms persist, obtain medical advice immediately.
- **Contact with eyes:** In case of eye contact, keep eyelid open and flush with plenty of water for 15 minutes. If irritation should persist subsequently consult an ophthalmologist. Protect the eye that is not injured.
- **Contact with skin:** After contact with skin, wash immediately with: Water. Subsequently wash again with: Water and soap. Take off immediately all contaminated clothing. If irritation persists, seek medical attention.

5. FIRE-FIGHTING MEASURE

- **Suitable extinguishing media:** Water sprays jet, water mist, foam and carbon dioxide (CO_2).
- **Unsuitable extinguishing media:** Full water jet.
- **Special hazards.** In case of fire may be liberated sulphur dioxide (SO_2) and Sulphur trioxide (SO_3).
- **Combustion decomposition products:** Sulphur dioxide (SO_2) and sulphur trioxide (SO_3) are generated.
- **Advice for firefighters:** Heating of container(s) will cause pressure rise with risk of bursting and subsequent explosion gives of toxic and irritant fumes when heated or burning. The vapor may be invisible and is heavier than air. It spreads along the ground and may enter sewers and basements. Keep container(s) cool with water. Extinguish with water fog (spray). Do not use water jet to extinguish. Use water spray to knock down fire fumes if possible. Avoid unnecessary run-off of extinguishing media which may cause pollution.
- **Personal protective equipment:** Wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES.

- **Personal precautions:** Use personal protective equipment (see section 8).
- **Environmental precautions:** Stop leaks if possible. Contain spillage by any means available. Cover drains. Do not allow to enter into soil/subsoil. Do not empty into drains or the aquatic environment.
- **Methods and material for containment and cleaning up:** Sweep spilled substance into containers. Carefully collect remainder, and then remove to safe place. Dispose according to regulations (see section 13).

7. HANDLING AND STORAGE.

- **Precautions for safe handling.**
  - Avoid spilling, skin and eye contact.
  - Use mechanical ventilation in case of handing which causes formation of dust.
  - Avoid inhalation of dust.
- **Conditions for safe storage, including any incompatibilities:**
  - Keep in the original container.
  - Keep in a fresh, dry and vented place.
  - Store away of strong acids or alkaline substances.
  - Store away of oxidizing or reducing materials.
  - Keep the container free of leaks.
  - Store away from hot surfaces and ask flame places.

8. EXPOSURE CONTROL / PERSONAL PROTECTION.

- **Exposure limits.**

Component	Mexico	USA	Europe
Zinc Sulphate	NOM-010-STPS (Mexico, 4/2014). LMPE-PPT: 10 mg/m³ 8 hours (powder). LMPE-CT: 10 mg/m³ 15 min (smoke). LMPE-PPT: 2 mg/m³ 8 hours (smoke).	OSHA PEL (2/2013). TWA: 5 mg/m³ 8 hours (Respirable fraction). TWA: 15 mg/m³ 8 hours (Total dust).	TWA 10 mg / m³ 8 hours (Total dust). TWA 4 mg / m³ 8 hours (Respirable fraction).

- **Exposure Controls:** Local and general ventilation, to ensure that concentration does not exceed the limits for occupational exposure. Consider enclosing the process. Ensuring control of process conditions. Replacement air supply to supply air continuously removed. Provide showers and eyewash stations.

- **Individual protection**

Eye Protection: Safety goggles are recommended.

Hand protection: Natural rubber gloves are recommended. Wash hands and face before eating, drinking or smoking.

Respiratory Equipment: P2 filter respirator for inert particles. Use NIOSH approved particulate respirator if dust generation occurs.

Other protection: Wear appropriate clothing to prevent reasonably probable skin contact. Chemical resistant safety shoes.

9. PHYSICAL AND CHEMICAL PROPERTIES.

- **Appearance:** Solid powder or granule.
- **Color:** White.
- **Odor:** Odorless.
- **Molecular weight (g/mol):** 179.47
- **Relative density (g/cm3):** 3.35 20°C
- **Melting point:** 100°C (212°F).
- **Boiling point:** 500°C (932 °F).
- **Ph:** 4.5 – 6.5.
- **Solubility in water:** 45 g. of Zinc Sulfate in 100 g. (100 ml) of water at 78°F
- **Flash Point:** Not applicable.

10. STABILITY AND REACTIVITY.

Reactivity: Stable.

Chemical stability: Stable under ordinary conditions and storage.

Possibility of hazardous reactions: Reacts with peroxides and other radical forming substances.

Conditions to avoid: High temperatures and moisture.

Incompatible materials: Oxidizers (strong), Acids.

Hazardous decomposition products: In case of fire, sulfur oxides (Sox) are produced.

11. TOXICOLOGICAL INFORMATION.

Information on toxicological effects.

- **Acute toxicity.** Oral: LD50 = 564 to 2949 mg/kg bw, (Rat). Dermal: LD50 > 2000 mg/kg bw, (Rat).
- **Skin corrosion/irritation.** Not irritant.
- **Carcinogenicity.** Not carcinogen.
- **Serious eye damage/irritation.** Strong irritant
- **Reproductive toxicity.** Not toxic for reproduction.
- **Respiratory or skin sensitization.** No sensitizing.
- **Germ cell mutagenicity.** Not mutagenic.
- **STOT-single exposure.** Not toxic.
- **STOT-repeated exposure.** Not toxic.
- **Aspiration hazard.** Not available.

12. ECOLOGICAL INFORMATION.

Toxicity.

- **Ecotoxicity.** Aquatic invertebrates. For pH <7: 1.13 mg Zn/l (based on 48 h. Ceriodaphnia dubia test) Algae. For pH >7-8.5: 3.73 mg Zn/l (based on 72 h. Selenastrum capricornutum test)
- **Bioaccumulation.** Not available.
- **Mobility in soil.** Not available.
- **Results of PBT and mPmB.** Not available.
- **Persistence / degradability.** Not available.
- **Other adverse effects.** Not available.

13. DISPOSAL INFORMATION.

Waste treatment methods.

SUBSTANCE DISPOSAL: Dispose of in accordance with all applicable local and national regulations. Use recovery/recycling where feasible.

CONTAINER DISPOSAL: Empty containers may contain hazardous residues. Do not cut, puncture or weld on or near to the container. Labels should not be removed from containers until they have been cleaned. Contaminated containers must not be treated as household waste. Containers should be cleaned by appropriate methods.

14. TRANSPORT INFORMATION.

- **Latin America**

This material is not regulated.

- **USA**

No DOT regulated in domestic (USA ground) transportation in package sizes less than 1000 lbs (454 kg). The DOT transportation information below is for shipments with package sizes equal to or exceeding this value. IMDG Regulated Marine Pollutant.

DOT

Basic shipping requirements:

UN number	UN 3077
Proper shipping name	Environmentally Hazardous Substance, Solid, N.O.S. (Zinc Sulphate Monohydrate RQ = 1000lbs.)
Hazard class	9
Packing group	III
Special precautions	Read safety instructions, SDS and emergency procedures before handling.
Additional information:	
Special provisions	8, 146, 335, A112, B54, IB8, IP3, N20; T1, TP33
Packaging exceptions	155
Packaging non bulk	213
Packaging bulk	240
Reportable quantity	1000

- **European Union:**

Type of transport	Classification	UN Number	Proper shipping name	Class	Group Packing	Label
Land Road Railroad	ADR RID	UN 3077	Environmentally Hazardous Substance, Solid, N.O.S. (Zinc Sulphate Monohydrate)	9	III	
Sea	IMO / IMDG					
Air	IATA / DGR					

15. REGULATORY INFORMATION.

- **Mexico.**

This material is not regulated.

- **USA**

SARA 302: RQ=None, TPQ=None.
SARA 311/312: Yes (Acute).
SARA 313: Zn and Pb Compounds.
RCRA 261: No
TSCA: No.

TSCA 8(d): No
TSCA 12 (b): No
Prop. 65: Yes (Pb, Cd).
CDTA: No

Florida: Yes
Pennsylvania: Yes
Minnesota: No
Massachusetts: Yes
New Jersey: Yes
California: Yes

- **Canada:**

Clasificación WHMIS: Not controlled
Lista de Sustancias Domesticas (DSL): No

- **Unión Europea:**

EINECS: No.
ELINCS: No.
REACH: Yes (01-2119474684-27-0023).

16. OTHER INFORMATION.

Hazard statements

H302: Harmful if swallowed.
H318: Causes serious eye damage.
H400: Very toxic to aquatic life
H410: Very toxic to aquatic life with long lasting effects.

Precautionary statements

P351: Rinse cautiously with water for several minutes.
P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P273: Avoid release to the environment.

- **Hazardous Materials Identification System, (HMIS)**

Health: 2 **Fire:** 0 **Reactivity:** 0 **Personal Protection:** E

Personal Protection: E (recommended only for bulk powder) = Gloves + Mask + Glasses

Definitions Classifications.

0 = Minimum 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

This information is based upon calculated data. The company holds no responsibility for damage suffered by the purchaser or other persons handling these goods if safety instructions are not observed. The company holds no responsibility for the wrong use of this material, even if safety instructions have been followed. The purchaser is solely responsible for the use of this material.

Sodium Isopropyl Xanthate

PROSPEC CHEMICALS
P.O. BOX 3478
176 STURGEON DRIVE
STURGEON COUNTY, ALBERTA, T8L 2T4
CANADA

PRODUCT: NAX 31

SECTION 01: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURERS	PROSPEC CHEMICALS P.O. BOX 3478 176 STURGEON DRIVE STURGEON COUNTY, ALBERTA T8L 2T4 (780) 992-1522
PRODUCT NAME	NAX 31
CHEMICAL NAME:	SODIUM ISOPROPYL XANTHATE.
CHEMICAL FAMILY:	SALTS OF CARBONIC ACID DITHIO ESTERS.
CHEMICAL FORMULA:	NOT APPLICABLE.
MOLECULAR WEIGHT:	NOT APPLICABLE.
MATERIAL USE:	ORE PROCESSING.

SECTION 02: HAZARDS IDENTIFICATION

HAZARD CLASSIFICATION	SELF-HEATING SUBSTANCES AND MIXTURES — CATEGORY 1 . ACUTE TOXICITY (ORAL) — CATEGORY 4. ACUTE TOXICITY (DERMAL) — CATEGORY 4. SKIN IRRITATION — CATEGORY 2. EYE IRRITATION — CATEGORY 2A.
SIGNAL WORD	DANGER.
HAZARD STATEMENT	
PREVENTION	P235+P410 KEEP COOL. PROTECT FROM SUNLIGHT. P264 WASH SKIN AREA THOROUGHLY AFTER HANDLING. P270 DO NO EAT, DRINK OR SMOKE WHEN USING THIS PRODUCT. P280 WEAR PROTECTIVE GLOVES/PROTECTIVE CLOTHING/EYE PROTECTION/FACE PROTECTION.
RESPONSE	P301+P310 IF SWALLOWED: IMMEDIATELY CALL A POISON CENTER OR DOCTOR/PHYSICIAN. P330 RINSE MOUTH. P302+P352 IF ON SKIN: WASH WITH PLENTY OF SOAP AND WATER. P332+P313 IF SKIN IRRITATION OCCURS: GET MEDICAL ADVICE/ATTENTION. P362+P364 TAKE OFF CONTAMINATED CLOTHING AND WASH BEFORE REUSE. P305+P351+P338 IF IN EYES: RINSE CAUTIOUSLY WITH WATER FOR SEVERAL MINUTES. REMOVE CONTACT LENSES, IF PRESENT AND EASY TO DO. CONTINUE RINSING.
STORAGE	P407 MAINTAIN AIR GAP BETWEEN STACKS/PALLETS. P420 STORE SEPARATELY.
DISPOSAL	P501 DISPOSE OF CONTENTS AND CONTAINER IN ACCORDANCE WITH LOCAL REGULATORY REQUIREMENTS. .
OTHER HAZARDS	NONE.

SECTION 03: COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS	CAS #	WT. %
SODIUM ISOPROPYL XANTHATE	140-93-2	65-80
ISOPROPANOL	67-63-0	1-5
SODIUM HYDROXIDE	1310-73-2	1-5

SECTION 04: FIRST AID MEASURES

SKIN:	SEEK MEDICAL ATTENTION IMMEDIATELY. REMOVE ALL CONTAMINATED CLOTHING. WASH SKIN AREAS FOR 60 MINUTES OR UNTIL CHEMICAL IS REMOVED WITH SOAP AND WATER. DO NOT USE SOLVENTS. LAUNDER CLOTHES BEFORE RE-USE.
EYE:	CHECK FOR AND REMOVE ANY CONTACT LENSES. FLUSH CONTINUOUSLY WITH WATER FOR 15 MINUTES. FORCIBLY HOLD EYELIDS APART TO ENSURE IRRIGATION OF ALL EYE TISSUE. IF IRRITATION PERSISTS GET MEDICAL ATTENTION.

PRODUCT: NAX 31

SECTION 04: FIRST AID MEASURES

INHALATION:.....	REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION, OR CARDIOPULMONARY RESUSCITATION (CPR) IF REQUIRED. IF BREATHING IS DIFFICULT, GIVE OXYGEN. KEEP WARM AND QUIET, AND OBTAIN MEDICAL ATTENTION.
INGESTION:.....	IF CONSCIOUS:. DO NOT INDUCE VOMITING. HAVE VICTIM RINSE MOUTH THOROUGHLY WITH WATER. GIVE A MINIMUM OF 500 mL WATER. IF INGESTION OF A LARGE AMOUNT DOES OCCUR SEEK MEDICAL ATTENTION. IF VOMITING OCCURS NATURALLY, HAVE VICTIM LEAN FORWARD TO REDUCE RISK OF ASPIRATION. IF UNCONSCIOUS:. IF INGESTION OF A LARGE AMOUNT DOES OCCUR SEEK MEDICAL ATTENTION.
NOTES TO PHYSICIAN:.....	THERE IS NO SPECIFIC ANTIDOTE. TREATMENT OF EXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION OF THE PATIENT.
GENERAL ADVICE:.....	CONSULT A PHYSICIAN AND/OR THE NEAREST POISON CONTROL CENTRE FOR ALL BUT MINOR INSTANCES OF INHALATION OR SKIN CONTACT. AVOID HIGH LEVELS OF DUST, USE DUST MASK OR RESPIRATOR WHEN NECESSARY. PRECAUTIONS SHOULD ALWAYS BE TAKEN TO AVOID SKIN/EYE CONTACT WITH ANY CHEMICAL SUBSTANCE.

SECTION 05: FIRE FIGHTING MEASURES

MEANS OF EXTINCTION:.....	CARBON DIOXIDE. DRY CHEMICAL. WATER.
HAZARDOUS COMBUSTION PRODUCTS.	CARBON DISULPHIDE. CARBONYL SULPHIDE. SODIUM SULPHIDE. ISOPROPYL ALCOHOL.
FLAMMABLE LIMITS IN AIR.....	VAPOURS FROM DECOMPOSITION (CARBON DISULPHIDE) ARE EXTREMELY FLAMMABLE.
IF YES, UNDER WHICH CONDITIONS?.....	SOLID XANTHATE WHEN EXPOSED TO HEAT AND/OR MOISTURE CAUSES DECOMPOSITION, AND VAPOURS ARE VERY FLAMMABLE AND SPONTANEOUS COMBUSTION CAN RESULT.
T.D.G. FLAMMABLE CLASS:.....	CLASS 4.2, SELF-HEATING SUBSTANCES.
SPECIAL PROCEDURES:.....	SELF-CONTAINED, POSITIVE PRESSURE BREATHING APPARATUS AND PROPER PROTECTIVE CLOTHING SHOULD BE WORN IN FIGHTING FIRES INVOLVING ANY CHEMICAL SUBSTANCE. HEAT WILL DECOMPOSE BOTH SOLID AND LIQUID XANTHATES YIELDING CARBON DISULPHIDE WHICH IS EXTREMELY FLAMMABLE AND TOXIC.

SECTION 06: ACCIDENTAL RELEASE MEASURES

CLEAN-UP PROCEDURES, LEAK/SPILL:...	IF IN THE LIQUID STATE:. STOP SPILL AT SOURCE. CONTAIN ANY SPILLED MATERIAL TO PREVENT DISCHARGE INTO THE ENVIRONMENT. ELIMINATE ALL SOURCES OF IGNITION. PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM THE AREA. ABSORB WITH INERT DRY MATERIAL. PUT INTO AN APPROVED METAL SALVAGE DRUM FOR DISPOSAL. IF IN THE SOLID STATE:. ELIMINATE ALL SOURCES OF IGNITION. RESTRICT ACCESS TO AREA UNTIL COMPLETION OF CLEAN-UP. ENSURE CLEAN-UP IS CONDUCTED BY TRAINED PERSONNEL ONLY. DO NOT TOUCH SPILLED MATERIAL. DO NOT USE WATER ON SPILLED MATERIAL AS HEAT WILL BE GENERATED. PUT SPILLED MATERIAL INTO APPROVED SALVAGE DRUMS FOR DISPOSAL. FLUSH CLEANED AREA WITH WATER, MAKING SURE NO WATER ENTERS XANTHATE CONTAINERS.

SECTION 07: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:	AVOID ALL SKIN CONTACT. AVOID CONTACT WITH EYES. AVOID BREATHING VAPOURS. EQUIPMENT SHOULD BE GROUNDED TO AVOID STATIC DISCHARGE. KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. USE NON-SPARKING TOOLS AND DO NOT SMOKE.
STORAGE NEEDS:.....	STORE SOLID XANTHATES UNDER COOL, DARK, DRY CONDITIONS. LIQUID PRODUCTS MUST BE KEPT COOL AND USED AS QUICKLY AS POSSIBLE.
SPECIAL SHIPPING INSTRUCTIONS.....	USE PRECAUTION WHEN HANDLING OR SHIPPING ANY CHEMICAL SUBSTANCE. PROTECT AGAINST PHYSICAL DAMAGE.

SECTION 08: EXPOSURE CONTROLS/PERSONAL PROTECTION

INGREDIENTS	ACGIH TLV TWA	ACGIH TLV STEL	OSHA PEL PEL	OSHA PEL STEL	NIOSH REL
SODIUM ISOPROPYL XANTHATE	NOT AVAILABLE				
ISOPROPANOL	400 ppm				

PRODUCT: NAX 31

SECTION 08: EXPOSURE CONTROLS/PERSONAL PROTECTION

INGREDIENTS	ACGIH TLV TWA	ACGIH TLV STEL	OSHA PEL PEL	OSHA PEL STEL	NIOSH REL

SODIUM HYDROXIDE 2 mg/m3 (CEILING) ACGIH

EXPOSURE LIMIT OF MATERIAL:..... TLV FOR DUST: 2 mg/m3. CARBON DISULPHIDE (DECOMPOSITION PRODUCT) ACGIH TLV: TWA: 1ppm 8 hour(s).

PROTECTIVE EQUIPMENT:

GLOVES/TYPE:..... WEAR IMPERVIOUS GLOVES (E.G. NEOPRENE, RUBBER).

RESPIRATOR/TYPE:..... IF RESPIRATORY PROTECTION IS REQUIRED, INSTITUTE A COMPLETE RESPIRATORY PROTECTION PROGRAM INCLUDING SELECTION, FIT TESTING, TRAINING, MAINTENANCE AND INSPECTION. REFER TO THE CAS STANDARD Z94.4-M1982 "SELECTION, CARE, AND USE OF RESPIRATORS" WHICH IS AVAILABLE FROM CANADIAN STANDARDS ASSOCIATION, REXDALE ONTARIO, M9W 1R3. IF VAPOURS ARE PRESENT, USE A NIOSH OR MSHA APPROVED RESPIRATOR FOR ACIDIC VAPOURS OR A SELF CONTAINED BREATHING APPARATUS. SEE M.S.D.S FOR MORE DETAIL ON THIS SECTION.

EYE/TYPE:..... FACE SHIELD. CHEMICAL SAFETY GOGGLES.

FOOTWEAR/TYPE:..... RUBBER SAFETY BOOTS.

CLOTHING/TYPE:..... WEAR ADEQUATE PROTECTIVE CLOTHES.

OTHER/TYPE:..... AN EYE WASH STATION AND SAFETY SHOWER SHOULD BE NEAR THE WORK AREA.

ENGINEERING CONTROLS:..... EXPLOSION PROOF MECHANICAL VENTILATION TO LIMIT VAPOUR CONCENTRATION BELOW T.L.V.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:..... SOLID.

ODOUR/APPEARANCE:..... YELLOW TO YELLOW-GREEN.

ODOUR THRESHOLD:..... NOT AVAILABLE.

pH:..... 10% H2O 13 +/- 1.

FREEZING POINT °C:..... NOT APPLICABLE.

BOILING POINT °C:..... NOT APPLICABLE. M.P. 150 - 250 (decomposes).

FLASH POINT, F, COC..... NOT APPLICABLE. -30 °C FOR CARBON DISULPHIDE VAPOURS.

EVAPORATION RATE:..... NOT APPLICABLE.

% VOLATILE:

BY VOLUME..... < 20.

BY WEIGHT

UPPER EXPLOSION LIMIT:..... 50% (RESIDUAL CARBON DISULPHIDE).

LOWER EXPLOSION LIMIT:..... 1.25% (RESIDUAL CARBON DISULPHIDE).

VAPOUR PRESSURE:..... NOT APPLICABLE.

REL. VAPOUR DENSITY..... NOT APPLICABLE.

SPECIFIC GRAVITY:..... NOT APPLICABLE.

SOLUBILITY IN WATER (20 °C):..... SOLUBLE.

COEFFICIENT WATER/OIL DIST.:..... NOT AVAILABLE.

AUTO IGNITION TEMPERATURE °C:..... 90 (CARBON DISULPHIDE VAPOURS).

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:

YES.

NO, WHICH CONDITIONS?..... SOLID XANTHATES ARE STABLE WHEN KEPT COOL AND DRY, EXPOSURE TO HEAT CAUSES DECOMPOSITION. ACIDS AND OXIDIZING AGENTS ACCELERATE AGING. IN SOLUTION, XANTHATES WILL DECOMPOSE SLOWLY EVEN AT ROOM TEMPERATURE.

COMPATIBILITY WITH OTHER SUBSTANCES:

YES.

NO, WHICH ONES?..... STRONG ACIDS. OXIDIZING AGENTS.

REACTS VIOLENTLY WITH..... VAPORS OR DUSTS MAY EXPLODE.

RATE OF BURNING:..... NOT AVAILABLE.

EXPLOSIVE POWER:..... NOT AVAILABLE.

EXPLOSION DATA:

SENSITIVITY TO STATIC DISCHARGE:..... CARBON DISULPHIDE VAPOURS WHICH MAY EVOLVE DUE TO DECOMPOSITION CAN BE READILY IGNITED BY STATIC DISCHARGE.

SENSITIVITY TO IMPACT:..... NOT AVAILABLE.

DECOMPOSITION:..... CARBON DISULPHIDE. TRITHIOCARBONATE. ISOPROPYL ALCOHOL.

PRODUCT: NAX 31

SECTION 11: TOXICOLOGICAL INFORMATION

INGREDIENTS	LC50	LD50
SODIUM ISOPROPYL XANTHATE	NOT AVAILABLE	ORAL RAT 250-2000mg/ Kg
ISOPROPANOL	FISH: >1400 MG/L, 96 HOURS	NOT AVAILABLE
SODIUM HYDROXIDE	NOT AVAILABLE	140 - 340 MG/KG RAT ORAL

ROUTE OF ENTRY:

IRRITANCY OF MATERIAL:..... IRRITANT. REFER TO ROUTE OF ENTRY, SECTION 3.

SKIN CONTACT:..... DUST OR VAPORS MAY BE IRRITATING. XANTHATE SOLUTIONS WILL CAUSE SEVERE SKIN IRRITATION.

SKIN ABSORPTION:..... NOT AVAILABLE.

EYE ..... DUST OR VAPORS MAY IRRITATE. XANTHATE SOLUTIONS WILL CAUSE SEVERE EYE IRRITATION.

INGESTION:..... CAN CAUSE GASTRO-INTESTINAL IRRITATION, NAUSEA, VOMITING AND DIARRHEA.

INHALATION ..... AIRBORNE DUST MAY CAUSE IRRITATION OF RESPIRATORY AIRWAYS. VAPOURS FROM DECOMPOSITION (CARBON DISULPHIDE) CAN CAUSE SEVERE DISTURBANCES OF MOOD AND BEHAVIOR, INCLUDING EXCITATION, ANGER AND VIOLENT DREAMS.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE TO THIS PRODUCT HAVE NOT BEEN ESTABLISHED. UNNECESSARY EXPOSURE TO THIS PRODUCT OR ANY OTHER CHEMICAL SHOULD BE AVOIDED.

EFFECTS OF ACUTE EXPOSURE:..... REFER TO ROUTE OF ENTRY.

EFFECTS OF CHRONIC EXPOSURE:..... REFER TO ROUTE OF ENTRY.

INHALATION CHRONIC:..... HIGH CONCENTRATIONS OF DECOMPOSITION PRODUCT (CARBON DISULPHIDE) CAN CAUSE DEATH.

REPRODUCTIVE EFFECTS:

REPRODUCTIVE TOXICITY:..... NOT AVAILABLE.

SENSITIZING CAPABILITY OF MATERIAL: NOT AVAILABLE.

SYNERGISTIC MATERIALS:..... NOT AVAILABLE.

MUTAGENICITY:..... NOT AVAILABLE.

TERATOGENICITY & EMBRYOTOXICITY:. NOT AVAILABLE.

CARCINOGENICITY OF MATERIAL:..... NOT AVAILABLE.

ACUTE ORAL TOXICITY..... NOT AVAILABLE. SEE SECTION 3, HAZARDOUS INGREDIENTS.

LC 50 OF MATERIAL, SPECIES & ROUTE: NOT AVAILABLE. SEE SECTION 3, HAZARDOUS INGREDIENTS.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL..... NOT AVAILABLE.

BIODEGRADABILITY..... NOT AVAILABLE.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL, METHOD AND EQUIPMENT: ..... ALL WASTE FROM THIS PRODUCT INCLUDING ALL EMPTY CONTAINERS MUST BE DISPOSED OF IN ACCORDANCE WITH MUNICIPAL, PROVINCIAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

T.D.G. CLASSIFICATION:..... CLASS 4.2 UN 3342 P.G. II.

T.D.G. SHIPPING NAME:..... XANTHATES.

T.D.G. SHIPPING INFORMATION:..... THE DANGEROUS GOODS ARE DESCRIBED IN ACCORDANCE WITH THE UN RECOMMENDATIONS.

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION:..... CLASS B DIV. 6. CLASS D DIV. 1 SUB. B. CLASS E.

CPR COMPLIANCE..... THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL OF THE INFORMATION REQUIRED BY THE CPR.

DSL/NDSL:..... ALL COMPONENTS ARE LISTED ON THE DSL.

SECTION 16: OTHER INFORMATION

MANUFACTURERS MSDS DATE:..... JUNE 21, 2004.

MSDS REVISION DATE:..... SEPTEMBER 28, 2015.

PRODUCT: NAX 31

SECTION 16: OTHER INFORMATION

NOTES:.....	We urge each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or to use and understand the data contained in this MSDS. To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material of the information in this MSDS and any other information regarding hazards or safety, (2) furnish this same information to each of its customers for the product; and (3) requests its customers to notify their employees, customers, and other users of the product of this information.
PREPARED BY	Regulatory Affairs
PREPARATION DATE.....	OCT 07/2015

CHARLES TENNANT & Company/Compagnie
CHARLES TENNANT & CO/CIE,
div of CHARLES TENNANT & CO (CANADA) LTD
34 CLAYSON RD., TORONTO, ONTARIO
M9M 2G8
(416)741-9264
CACD

PRODUCT: SODIUM ISOPROPYL XANTHATE

SECTION 01: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURERS	SUPPLIED BY: CHARLES TENNANT & COMPANY 34 CLAYSON ROAD WESTON, ONTARIO M9M 2G8 (416) 741 9264
PRODUCT NAME	SODIUM ISOPROPYL XANTHATE
CHEMICAL NAME:	SEE SECTION 3 "HAZARDOUS INGREDIENTS " . SODIUM ISOPROPYL XANTHATE.
CHEMICAL FAMILY:	SALTS OF CARBONIC ACID DITHIO ESTERS.
CHEMICAL FORMULA:	(CH3)2CHOCSSNa.
MOLECULAR WEIGHT:	NOT APPLICABLE.
MATERIAL USE:	ORE PROCESSING.
24 HOUR EMERGENCY PHONE NUMBER:	CANUTEC (613) 996-6666.

SECTION 02: HAZARDS IDENTIFICATION

HAZARD CLASSIFICATION	SELF-HEATING SUBSTANCES AND MIXTURES — CATEGORY 1 . ACUTE TOXICITY (ORAL) — CATEGORY 4. ACUTE TOXICITY (DERMAL) — CATEGORY 4. SKIN IRRITATION — CATEGORY 2. EYE IRRITATION — CATEGORY 2A.
SIGNAL WORD	DANGER.
HAZARD STATEMENT	H250 CATCHES FIRE SPONTANEOUSLY IF EXPOSED TO AIR. H302+H312 HARMFUL IF SWALLOWED OR IN CONTACT WITH SKIN. H315 CAUSES SKIN IRRITATION.
PRECAUTIONARY STATEMENT PREVENTION	P235+P410 KEEP COOL. PROTECT FROM SUNLIGHT. P264 WASH SKIN AREA THOROUGHLY AFTER HANDLING. P270 DO NOT EAT, DRINK OR SMOKE WHEN USING THIS PRODUCT. P280 WEAR PROTECTIVE GLOVES/PROTECTIVE CLOTHING/EYE PROTECTION/FACE PROTECTION.
RESPONSE	P301+P310 IF SWALLOWED: IMMEDIATELY CALL A POISON CENTER OR DOCTOR/PHYSICIAN. P330 RINSE MOUTH. P302+P352 IF ON SKIN: WASH WITH PLENTY OF SOAP AND WATER. P332+P313 IF SKIN IRRITATION OCCURS: GET MEDICAL ADVICE/ATTENTION. P363 WASH CONTAMINATED CLOTHING BEFORE REUSE. P362+P364 TAKE OFF CONTAMINATED CLOTHING AND WASH BEFORE REUSE. P305+P351+P338 IF IN EYES: RINSE CAUTIOUSLY WITH WATER FOR SEVERAL MINUTES. REMOVE CONTACT LENSES, IF PRESENT AND EASY TO DO. CONTINUE RINSING.
STORAGE	P407 MAINTAIN AIR GAP BETWEEN STACKS/PALLETS. P420 STORE SEPARATELY.
DISPOSAL	P501 DISPOSE OF CONTENTS AND CONTAINER IN ACCORDANCE WITH LOCAL REGULATORY REQUIREMENTS. .
OTHER HAZARDS	NONE.

SECTION 03: COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS	CAS #	WT. %
ISOPROPANOL	67-63-0	0.5-1.0
SODIUM ISOPROPYL XANTHATE	140-93-2	>84
SODIUM HYDROXIDE	1310-73-2	1.5
SODIUM SULFIDE	1313-8-2	1

SECTION 04: FIRST AID MEASURES

SKIN:	REMOVE ALL CONTAMINATED CLOTHING. WASH SKIN AREAS WITH SOAP AND WATER UNTIL CHEMICAL IS REMOVED. LAUNDER CLOTHES BEFORE RE-USE.

PRODUCT: SODIUM ISOPROPYL XANTHATE

SECTION 04: FIRST AID MEASURES

EYE:	FLUSH CONTINUOUSLY WITH WATER FOR 15 MINUTES. FORCIBLY HOLD EYELIDS APART TO ENSURE IRRIGATION OF ALL EYE TISSUE. IF IRRITATION PERSISTS GET MEDICAL ATTENTION.
INHALATION:	REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION, OR CARDIOPULMONARY RESUSCITATION (CPR) IF REQUIRED. IF BREATHING IS DIFFICULT, GIVE OXYGEN. KEEP WARM AND QUIET, AND OBTAIN MEDICAL ATTENTION.
INGESTION:	IF CONSCIOUS:. GIVE A MINIMUM OF 500 mL WATER. INDUCE VOMITING. HAVE VICTIM RINSE MOUTH THOROUGHLY WITH WATER. IF VOMITING OCCURS NATURALLY, HAVE VICTIM LEAN FORWARD TO REDUCE RISK OF ASPIRATION. DO NOT GIVE AN UNCONSCIOUS PERSON ANYTHING BY MOUTH. SEEK IMMEDIATE MEDICAL ATTENTION.
NOTES TO PHYSICIAN:	THERE IS NO SPECIFIC ANTIDOTE. TREATMENT OF EXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION OF THE PATIENT.
GENERAL ADVICE:	CONSULT A PHYSICIAN AND/OR THE NEAREST POISON CONTROL CENTRE FOR ALL BUT MINOR INSTANCES OF INHALATION OR SKIN CONTACT. AVOID HIGH LEVELS OF DUST, USE DUST MASK OR RESPIRATOR WHEN NECESSARY. PRECAUTIONS SHOULD ALWAYS BE TAKEN TO AVOID SKIN/EYE CONTACT WITH ANY CHEMICAL SUBSTANCE.

SECTION 05: FIRE FIGHTING MEASURES

MEANS OF EXTINCTION:	CARBON DIOXIDE. DRY CHEMICAL. WATER.
HAZARDOUS COMBUSTION PRODUCTS:	
FLAMMABLE LIMITS IN AIR	VAPOURS FROM DECOMPOSITION (CARBON DISULPHIDE) ARE EXTREMELY FLAMMABLE.
IF YES, UNDER WHICH CONDITIONS?.	SOLID XANTHATE WHEN EXPOSED TO HEAT AND/OR MOISTURE CAUSES DECOMPOSITION, AND VAPOURS ARE VERY FLAMMABLE AND SPONTANEOUS COMBUSTION CAN RESULT.
T.D.G. FLAMMABLE CLASS:	CLASS 4.2, SELF-HEATING SUBSTANCES.
SPECIAL PROCEDURES:	SELF-CONTAINED, POSITIVE PRESSURE BREATHING APPARATUS AND PROPER PROTECTIVE CLOTHING SHOULD BE WORN IN FIGHTING FIRES INVOLVING ANY CHEMICAL SUBSTANCE. HEAT WILL DECOMPOSE BOTH SOLID AND LIQUID XANTHATES YIELDING CARBON DISULPHIDE WHICH IS EXTREMELY FLAMMABLE AND TOXIC.

SECTION 06: ACCIDENTAL RELEASE MEASURES

CLEAN-UP PROCEDURES, LEAK/SPILL:	IF IN THE LIQUID STATE:. STOP SPILL AT SOURCE. CONTAIN ANY SPILLED MATERIAL TO PREVENT DISCHARGE INTO THE ENVIRONMENT. ELIMINATE ALL SOURCES OF IGNITION. PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM THE AREA. ABSORB WITH INERT DRY MATERIAL. PUT INTO AN APPROVED METAL SALVAGE DRUM FOR DISPOSAL. IF IN THE SOLID STATE:. ELIMINATE ALL SOURCES OF IGNITION. RESTRICT ACCESS TO AREA UNTIL COMPLETION OF CLEAN-UP. ENSURE CLEAN-UP IS CONDUCTED BY TRAINED PERSONNEL ONLY. DO NOT TOUCH SPILLED MATERIAL. DO NOT USE WATER ON SPILLED MATERIAL AS HEAT WILL BE GENERATED. PUT SPILLED MATERIAL INTO APPROVED SALVAGE DRUMS FOR DISPOSAL. FLUSH CLEANED AREA WITH WATER, MAKING SURE NO WATER ENTERS XANTHATE CONTAINERS.

SECTION 07: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:	AVOID ALL SKIN CONTACT. AVOID CONTACT WITH EYES. AVOID BREATHING VAPOURS. EQUIPMENT SHOULD BE GROUNDED TO AVOID STATIC DISCHARGE. KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. USE NON-SPARKING TOOLS AND DO NOT SMOKE.
STORAGE NEEDS:	STORE SOLID XANTHATES UNDER COOL, DARK, DRY CONDITIONS. LIQUID PRODUCTS MUST BE KEPT COOL AND USED AS QUICKLY AS POSSIBLE.
SPECIAL SHIPPING INSTRUCTIONS.....	USE PRECAUTION WHEN HANDLING OR SHIPPING ANY CHEMICAL SUBSTANCE. PROTECT AGAINST PHYSICAL DAMAGE.

SECTION 08: EXPOSURE CONTROLS/PERSONAL PROTECTION

INGREDIENTS	ACGIH TLV TWA	ACGIH TLV STEL	OSHA PEL PEL	OSHA PEL STEL	NIOSH REL
ISOPROPANOL	400 ppm				
SODIUM ISOPROPYL XANTHATE	NOT AVAILABLE				

PRODUCT: SODIUM ISOPROPYL XANTHATE

SECTION 08: EXPOSURE CONTROLS/PERSONAL PROTECTION

INGREDIENTS	ACGIH TLV TWA	ACGIH TLV STEL	OSHA PEL PEL	OSHA PEL STEL	NIOSH REL
SODIUM HYDROXIDE	2 mg/m3 (CEILING) ACGIH				
SODIUM SULFIDE	NOT AVAILABLE				

EXPOSURE LIMIT OF MATERIAL:..... TLV FOR DUST: 2 mg/m3; TLV FOR VAPOURS FROM DECOMP.: 31 mg/m3 (see ACGIH).

PROTECTIVE EQUIPMENT:

GLOVES/TYPE:..... WEAR IMPERVIOUS GLOVES (E.G. NEOPRENE, RUBBER) WHEN THERE IS GREATER EXPOSURE RISK.

RESPIRATOR/TYPE:..... IF RESPIRATORY PROTECTION IS REQUIRED, INSTITUTE A COMPLETE RESPIRATORY PROTECTION PROGRAM INCLUDING SELECTION, FIT TESTING, TRAINING, MAINTENANCE AND INSPECTION. REFER TO THE CAS STANDARD Z94.4-M1982 "SELECTION, CARE, AND USE OF RESPIRATORS" WHICH IS AVAILABLE FROM CANADIAN STANDARDS ASSOCIATION, REXDALE ONTARIO, M9W 1R3. IF VAPOURS ARE PRESENT, USE A NIOSH OR MSHA APPROVED RESPIRATOR FOR ACIDIC VAPOURS OR A SELF CONTAINED BREATHING APPARATUS.

EYE/TYPE:..... FACE SHIELD. SAFETY GLASSES WITH SIDE-SHIELDS.

FOOTWEAR/TYPE:..... SAFETY BOOTS.

CLOTHING/TYPE:..... WEAR ADEQUATE PROTECTIVE CLOTHES.

OTHER/TYPE:..... AN EYE WASH STATION AND SAFETY SHOWER SHOULD BE NEAR THE WORK AREA.

ENGINEERING CONTROLS:..... EXPLOSION PROOF MECHANICAL VENTILATION TO LIMIT VAPOUR CONCENTRATION BELOW T.L.V.

SECTION 09: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:..... SOLID.

ODOUR/APPEARANCE:..... YELLOW TO YELLOW-GREEN.

ODOUR THRESHOLD:..... NOT AVAILABLE.

pH:..... 10% H2O 13 +/- 1.

FREEZING POINT °C:..... >182 Deg C.

BOILING POINT:..... NOT APPLICABLE. M.P. 150 - 250 (decomposes).

FLASH POINT:..... NOT APPLICABLE. -30 °C FOR CARBON DISULPHIDE VAPOURS.

EVAPORATION RATE:..... NOT APPLICABLE.

% VOLATILE:..... NOT AVAILABLE .

BY VOLUME..... < 20.

BY WEIGHT..... NOT AVAILABLE.

UPPER EXPLOSION LIMIT:..... 50% (RESIDUAL CARBON DISULPHIDE).

LOWER EXPLOSION LIMIT:..... 1.25% (RESIDUAL CARBON DISULPHIDE).

VAPOUR PRESSURE:..... NOT APPLICABLE.

REL. VAPOUR DENSITY..... NOT APPLICABLE.

SPECIFIC GRAVITY:..... NOT APPLICABLE.

SOLUBILITY IN WATER (20 °C):..... SOLUBLE.

COEFFICIENT WATER/OIL DIST.:..... NOT AVAILABLE.

AUTO IGNITION TEMPERATURE °C:..... NOT AVAILABLE.

SECTION 10: STABILITY AND REACTIVITY

REACTS VIOLENTLY WITH..... VAPORS OR DUSTS MAY EXPLODE.

CHEMICAL STABILITY:

YES.

NO, WHICH CONDITIONS?..... SOLID XANTHATES ARE STABLE WHEN KEPT COOL AND DRY, EXPOSURE TO HEAT CAUSES DECOMPOSITION. ACIDS AND OXIDIZING AGENTS ACCELERATE AGING. IN SOLUTION, XANTHATES WILL DECOMPOSE SLOWLY EVEN AT ROOM TEMPERATURE.

COMPATIBILITY WITH OTHER SUBSTANCES:

YES.

NO, WHICH ONES?..... STRONG ACIDS. OXIDIZING AGENTS.

RATE OF BURNING:..... NOT AVAILABLE.

EXPLOSIVE POWER:..... NOT AVAILABLE.

EXPLOSION DATA:..... NOT AVAILABLE.

SENSITIVITY TO STATIC DISCHARGE:. CARBON DISULPHIDE VAPOURS WHICH MAY EVOLVE DUE TO DECOMPOSITION CAN BE READILY IGNITED BY STATIC DISCHARGE.

SENSITIVITY TO IMPACT:..... NOT AVAILABLE.

DECOMPOSITION:..... CARBON DISULPHIDE. TRITHIOCARBONATE. ISOPROPYL ALCOHOL.

PRODUCT: SODIUM ISOPROPYL XANTHATE

SECTION 11: TOXICOLOGICAL INFORMATION

INGREDIENTS	LC50	LD50
ISOPROPANOL	FISH: >1400 MG/L, 96 HOURS	NOT AVAILABLE
SODIUM ISOPROPYL XANTHATE	NOT AVAILABLE	ORAL RAT 250-2000mg/ Kg
SODIUM HYDROXIDE	NOT AVAILABLE	140 - 340 MG/KG RAT ORAL
SODIUM SULFIDE	NO AVAILABLE	ORAL RAT 208 MG/KG

ROUTE OF ENTRY:	EYE, SKIN CONTACT, INHALATION, INGESTION.
IRRITANCY OF MATERIAL:	IRRITANT. REFER TO ROUTE OF ENTRY, SECTION 3.
SKIN CONTACT:	DUST OR VAPORS MAY BE IRRITATING. XANTHATE SOLUTIONS WILL CAUSE SEVERE SKIN IRRITATION.
SKIN ABSORPTION:	NOT AVAILABLE.
EYE	DUST OR VAPORS MAY IRRITATE. XANTHATE SOLUTIONS WILL CAUSE SEVERE EYE IRRITATION.
INGESTION	CAN CAUSE GASTRO-INTESTINAL IRRITATION, NAUSEA, VOMITING AND DIARRHEA.
INHALATION	AIRBORNE DUST MAY CAUSE IRRITATION OF RESPIRATORY AIRWAYS. VAPOURS FROM DECOMPOSITION (CARBON DISULPHIDE) CAN CAUSE SEVERE DISTURBANCES OF MOOD AND BEHAVIOR, INCLUDING EXCITATION, ANGER AND VIOLENT DREAMS.
MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:	MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE TO THIS PRODUCT HAVE NOT BEEN ESTABLISHED. UNNECESSARY EXPOSURE TO THIS PRODUCT OR ANY OTHER CHEMICAL SHOULD BE AVOIDED.
EFFECTS OF ACUTE EXPOSURE:	REFER TO ROUTE OF ENTRY.
EFFECTS OF CHRONIC EXPOSURE:	REFER TO ROUTE OF ENTRY.
INHALATION CHRONIC:	HIGH CONCENTRATIONS OF DECOMPOSITION PRODUCT (CARBON DISULPHIDE) CAN CAUSE DEATH.
REPRODUCTIVE EFFECTS:	NOT AVAILABLE.
REPRODUCTIVE TOXICITY:	NOT AVAILABLE.
SENSITIZING CAPABILITY OF MATERIAL:	NOT AVAILABLE.
SYNERGISTIC MATERIALS:	NOT AVAILABLE.
MUTAGENICITY:	NOT AVAILABLE.
TERATOGENICITY & EMBRYOTOXICITY:	NOT AVAILABLE.
CARCINOGENICITY OF MATERIAL:	NOT AVAILABLE.
ACUTE ORAL TOXICITY	NOT AVAILABLE. SEE SECTION 3, HAZARDOUS INGREDIENTS.
LC 50 OF MATERIAL, SPECIES & ROUTE:	NOT AVAILABLE. SEE SECTION 3, HAZARDOUS INGREDIENTS.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL	NOT AVAILABLE. DO NOT ALLOW TO ENTER SOIL, WATERWAYS OR WASTE WATER. THIS PRODUCT MAY BE HARMFUL TO AQUATIC LIFE. .
BIODEGRADABILITY	NOT AVAILABLE.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL, METHOD AND EQUIPMENT:	ALL WASTE FROM THIS PRODUCT INCLUDING ALL EMPTY CONTAINERS MUST BE DISPOSED OF IN ACCORDANCE WITH MUNICIPAL, PROVINCIAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

T.D.G. CLASSIFICATION:	CLASS 4.2 UN 3342 P.G. II.
T.D.G. SHIPPING NAME:	XANTHATES.
T.D.G. SHIPPING INFORMATION:	THE DANGEROUS GOODS ARE DESCRIBED IN ACCORDANCE WITH THE UN RECOMMENDATIONS.

SECTION 15: REGULATORY INFORMATION

WHMIS CLASSIFICATION:	CLASS B DIV. 6. CLASS D DIV. 1 SUB. B.
CPR COMPLIANCE	THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE SDS CONTAINS ALL OF THE INFORMATION REQUIRED BY THE CPR.
DSL/NDSL:	ALL COMPONENTS ARE LISTED ON THE DSL.

PRODUCT: SODIUM ISOPROPYL XANTHATE

SECTION 16: OTHER INFORMATION

MSDS REVISION DATE:.....	JUNE 19, 2018.
NOTES:.....	The information on this Safety Data Sheet has been obtained from the manufacturer, and where applicable, from other reliable sources such as CCOHS and RTECS. However, CHARLES TENNANT & COMPANY (CANADA) LTD. makes no warranties, expressed or implied, as to the accuracy, completeness or accuracy of the information contained herein, and shall not be held liable (regardless of fault) to anyone directly or indirectly for damages or injuries in the use of this product arising out of or in connection with the accuracy, completeness or adequacy of such information. To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material of the information in this SDS and any other information regarding hazards or safety, (2) furnish this same information to each of its customers for the product; and (3) requests its customers to notify their employees, customers, and other users of the product of this information.
PREPARED BY	Regulatory Affairs
PREPARATION DATE.....	JUN 21/2018

Flocculant AF-309

SAFETY DATA SHEET

According to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: **HYPERFLOC™ AF 309**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Company:
SNF Inc.
1 Chemical Plant Road
Riceboro, GA 31323
United States

Telephone: 912-884-3366

Telefax: 912-884-8770

E-mail address: regs@snf.com

1.4. Emergency telephone number

24-hour emergency number: 800-424-9300 CHEMTREC (CCN 20412), Outside U.S. 703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to paragraph (d) of 29 CFR 1910.1200:

Not classified.

2.2. Label elements

Labelling according to paragraph (f) of 29 CFR 1910.1200:

Hazard symbol(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

2.3. Other hazards

Aqueous solutions or powders that become wet render surfaces extremely slippery.

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

Hazardous components
Contains no reportable hazardous substances.

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:
Move to fresh air. No hazards which require special first aid measures.

Skin contact:
Wash off with soap and plenty of water. Get medical attention if irritation develops and persists.

Eye contact:
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of persistent eye irritation, consult a physician.

Ingestion:
Rinse mouth with water. Do NOT induce vomiting. Get medical attention if symptoms occur.

4.2. Most important symptoms and effects, both acute and delayed

Powder can cause localised skin irritation in folds of the skin or under tight clothing. Moderate eye irritation due to effects all powders have on conjunctivae.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:
Aqueous solutions or powders that become wet render surfaces extremely slippery.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media:
Water. Water spray. Foam. Carbon dioxide (CO2). Dry powder.
Warning! Aqueous solutions or powders that become wet render surfaces extremely slippery.

Unsuitable extinguishing media:
None known.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products:
Thermal decomposition may produce: nitrogen oxides (NOx), carbon oxides (COx). Ammonia (NH3). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters

Protective measures:
In the event of fire, wear self-contained breathing apparatus.

Other information:
Aqueous solutions or powders that become wet render surfaces extremely slippery.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions:
Aqueous solutions or powders that become wet render surfaces extremely slippery.

Protective equipment:
Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:
Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

As with all chemical products, do not flush into surface water.

6.3. Methods and material for containment and cleaning up

Small spills:
Do not flush with water.Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal.

Large spills:
Do not flush with water.Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal.

Residues:
After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Aqueous solutions or powders that become wet render surfaces extremely slippery. Use personal protective equipment.

7.2. Conditions for safe storage, including any incompatibilities

Keep in a dry place. Keep container closed when not in use.
Incompatible with strong bases and oxidizing agents.

7.3. Specific end use(s)

This information is not available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits:
None known.

8.2. Exposure controls

Appropriate engineering controls:

Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dusts.

Individual protection measures, such as personal protective equipment:

a) Eye/face protection:
Safety glasses with side-shields. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

b) Skin protection:
i) Hand protection: PVC or other plastic material gloves. The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.
ii) Other: Workclothes protecting arms, legs and body. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

c) Respiratory protection:
No personal respiratory protective equipment normally required. Dust safety masks recommended where working powder concentration is more than 10 mg/m^3. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

d) Additional advice:
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. Wash hands before breaks and at the end of workday.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

a) Appearance:	Granular solid, White.
b) Odour:	None.
c) Odour Threshold:	Not applicable.
d) pH:	5 - 9 @ 5 g/L (See Technical Bulletin or Product Specifications for a more precise value, if available)
e) Melting point/freezing point:	> 150°C
f) Initial boiling point and boiling range:	Not applicable.
g) Flash point:	Not applicable.
h) Evaporation rate:	Not applicable.
i) Flammability (solid, gas):	No data available.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	Not applicable.
l) Vapour density:	Not applicable.
m) Relative density:	0.6 - 0.9 (See Technical Bulletin or Product Specifications for a more precise value, if available)
n) Solubility(ies):	Soluble in water.
o) Partition coefficient:	-2
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
s) Explosive properties:	Kst = 0 Non-flammable to ignition sources of less than 2.5 kJ.
t) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

SECTION 10: Stability and reactivity

10.1. Reactivity

None known.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Oxidizing agents may cause exothermic reactions. Contact with strong bases liberates ammonia.

10.4. Conditions to avoid

None known.

10.5. Incompatible materials

Incompatible with strong bases and oxidizing agents.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NOx), carbon oxides (COx). Ammonia (NH3). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

Acute oral toxicity:	LD50/oral/rat > 5000 mg/kg
Acute dermal toxicity:	LD50/dermal/rat > 5000 mg/kg.
Acute inhalation toxicity:	The product is not expected to be toxic by inhalation.
Skin corrosion/irritation:	Not irritating.
Serious eye damage/eye irritation:	Not irritating.
Respiratory/skin sensitisation:	Not sensitizing.
Mutagenicity:	Not mutagenic.
Carcinogenicity:	Not carcinogenic.
Reproductive toxicity:	Not toxic for reproduction.
STOT - Single exposure:	No known effects.
STOT - Repeated exposure:	No known effect.

Aspiration hazard: No hazards resulting from the material as supplied.

SECTION 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Danio rerio/96 hours > 100 mg/L (OECD 203) LC50/Fathead minnow/96 hours > 100 mg/L (OECD 203)
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours > 100 mg/L (OECD 202)
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours > 100 mg/L (OECD 201)
Chronic toxicity to fish:	No data available.
Chronic toxicity to invertebrates:	No data available.
Toxicity to microorganisms:	No data available.
Effects on terrestrial organisms:	No known effects.
Sediment toxicity:	No data available.

12.2. Persistence and degradability

Information on the product as supplied:

Degradation:	Not readily biodegradable.
Hydrolysis:	Does not hydrolyse.
Photolysis:	No data available.

12.3. Bioaccumulative potential

Information on the product as supplied:

Not bioaccumulating.

Partition co-efficient (Log Pow):	-2
Bioconcentration factor (BCF):	~0

12.4. Mobility in soil

Information on the product as supplied:

None.

12.5. Other adverse effects

None known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste from residues/unused products:

Dispose in accordance with local and national regulations. Can be landfilled or incinerated, when in compliance with local regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations. Can be landfilled or incinerated, when in compliance with local regulations.

Recycling:

In accordance with local and national regulations.

SECTION 14: Transport information

Land transport (DOT)

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Information on the product as supplied:

TSCA Chemical Substances Inventory:

All components of this product are either listed as active on the inventory or are exempt from listing.

US SARA Reporting Requirements:

SARA (Section 311/312) hazard class:
Not concerned.

SARA Title III Sections:

Section 302 (TPQ) - Reportable Quantity:
Not concerned.

Section 304 - Reportable Quantity:
Not concerned.

Section 313 (De minimis concentration):
Not concerned.

Clean Water Act

Section 311 Hazardous Substances (40 CFR 117.3) - Reportable Quantity:
Not concerned.

Clean Air Act

Section 112(r) Accidental release prevention requirements (40 CFR 68) - Reportable Quantity:
Not concerned.

CERCLA

Hazardous Substances List (40 CFR 302.4) - Reportable Quantity:
Not concerned.

RCRA status :

Not RCRA hazardous.

California Proposition 65 Information:

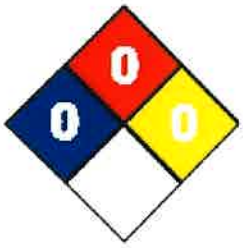
WARNING! This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm, Acrylamide

SECTION 16: Other information

NFPA and HMIS Ratings:

NFPA:

Health:	0
Flammability:	0
Instability:	0



HMIS:

Health:	0
Flammability:	0
Physical Hazard:	0
PPE Code:	B

This data sheet contains changes from the previous version in section(s):

SECTION 8. Exposure controls/personal protection, SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms
STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

U.S. Code of Federal Regulations 29 CFR 1910.1200

Version: 20.01.b

PRAC001

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Aerophine 3418A

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name AEROPHINE® 3418A PROMOTER

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Mining chemicals

1.3 Details of the supplier of the safety data sheet

Company

CYTEC CANADA INC.
9061 Garner Road, Niagara Falls,
Ontario, Canada L2H 0Y2
Tel:+1-905-356-9000

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

Disclaimer

The ® indicates a Registered Trademark in the United States and the ™ indicates a trademark in the United States. The mark may also be registered, subject of an application for registration, or a trademark in other countries.

SECTION 2: Hazards identification

Although WHMIS has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects

2.1 Classification of the substance or mixture

Hazardous Products Regulations (WHMIS 2015)

Serious eye damage, Category 1	H318: Causes serious eye damage.
Skin sensitization, Sub-category 1B	H317: May cause an allergic skin reaction.
Health hazards not otherwise classified, Category 1	Contact with acids liberates toxic gas.

2.2 Label elements

Hazardous Products Regulations (WHMIS 2015)

Pictogram

Signal Word

- Danger

Hazard Statements

- H317 May cause an allergic skin reaction.
- H318 Causes serious eye damage.

Precautionary Statements

Prevention

- P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
- P272 Contaminated work clothing should not be allowed out of the workplace.
- P280 Wear protective gloves/ eye protection/ face protection.

Response

- P302 + P352 IF ON SKIN: Wash with plenty of water.
- P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
- P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
- P362 + P364 Take off contaminated clothing and wash it before reuse.

Disposal

- P501 Dispose of contents/ container to an approved waste disposal plant.

Hazard Statements

- Contact with acids liberates toxic gas.

2.3 Other hazards which do not result in classification

None identified

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

- Chemical nature Modified dithiophosphinate

WHMIS Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [% wt/wt or V/V]
Dithiophosphinate	*****	48 - 60

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation

- Quickly move the person away from the contaminated area. Make the affected person rest.
- Obtain medical attention.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of skin contact

- Wash off immediately with plenty of water for at least 15 minutes.
- Use appropriate protective equipment when treating a contaminated person.

- Obtain medical attention.
- Show this sheet to the doctor.
- Be prepared to provide first aid or medical support if necessary.

In case of eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Keep eye wide open while rinsing.
- Show this sheet to the doctor.
- Always obtain medical advice, even if there are no symptoms.
- Be prepared to provide first aid or medical support if necessary.

In case of ingestion

- Do NOT induce vomiting.
- Immediate medical attention is required.
- Show this sheet to the doctor.
- Do not give anything to drink.
- Be prepared to provide first aid or medical support if necessary.

4.2 Most important symptoms and effects, both acute and delayed

Effects

- Effects on health may appear after exposure.
- The effects will depend on target organs.
- Chronic exposure may cause allergic dermatitis.
- Exposure may cause allergic rhinitis, conjunctivitis, asthma or shock.
- Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
- Risk of respiratory disorder
- Chronic exposure may cause dermatitis.
- May cause irreversible eye damage.
- Loss of the eye

Symptoms

- Symptoms will depend on the target organs.
- Inhalation may provoke the following symptoms:
- Cough
- Breathing difficulties
- Irritation
- Redness
- Swelling of tissue
- Ingestion may provoke the following symptoms:
- Nausea
- Diarrhea
- Abdominal pain
- allergic rhinitis
- Severe allergic skin reactions, bronchiospasm and anaphylactic shock
- Itching
- Dermatitis
- Causes skin burns.
- Lachrymation
- Conjunctivitis
- Causes eye burns.
- The gas deadens the sense of smell. Do not depend on odor to detect presence of gas.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician

- Be aware to maintain life support if necessary.
- Take victim to hospital if symptoms persist.
- Get medical advice/ attention.
- Consult with an ophthalmologist immediately in all cases.
- Burns must be treated by a physician.
- Treat symptomatically.
- Contact a poison control center.
- Keep under medical follow up for at least 48 hours.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

- Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- Under fire conditions:
- Will burn
- On combustion, toxic gases are released.

Hazardous combustion products:

- Sulfur dioxide or hydrogen sulfide may be formed under fire conditions.

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
- Wear a positive-pressure supplied-air respirator with full facepiece.
- For further information refer to section 8 "Exposure controls / personal protection."

Specific fire fighting methods

- Cool containers/tanks with water spray.
- Do not use a solid water stream as it may scatter and spread fire.

Further information

- Do not flush to sewer which may contain acid.
- This could result in generation of toxic and flammable hydrogen sulfide.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Where exposure level is not known, wear approved, positive pressure, self-contained respirator.
- Where exposure level is known, wear approved respirator suitable for level of exposure.
- In addition to the protective clothing/equipment in Section 8, wear a two piece PVC suit with hood or PVC overalls with hood.

6.2 Environmental precautions

- Stop the leak. Turn leaking containers leak-side up to prevent the escape of liquid.
- Contain the spilled material by diking.
- Do not let product enter drains.
- Do not allow uncontrolled discharge of product into the environment.

6.3 Methods and materials for containment and cleaning up

- Stop leak if safe to do so.
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.
- Wash nonrecoverable remainder with large amounts of water.
- Soak up with inert absorbent material and dispose of as hazardous waste.
- Decontaminate tools, equipment and personal protective equipment in a segregated area.
- Dispose of in accordance with local regulations.
- Never return spills in original containers for re-use.

6.4 Reference to other sections

- 7. HANDLING AND STORAGE
- 8. EXPOSURE CONTROLS/PERSONAL PROTECTION
- 13. DISPOSAL CONSIDERATIONS

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Large quantities of undiluted product should not be mixed with acids, since evolution of toxic and flammable hydrogen sulfide could result. In particular, precautions must be taken to avoid the accidental discharge of large volumes of the product in acid storage tanks or any tank or containment containing acidic materials. This precaution does not, of course, apply to addition of this reagent to flotation pulps in amounts customarily used in flotation, where the reagent amounts are small and instantly diluted to concentrations well below the solubility limits.

Hygiene measures

- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Do not freeze.

Requirements for storage rooms and vessels

Recommended storage temperature: 32 - 95 °F (0 - 35 °C)

- To guarantee the quality and properties of the product keep according to Storage temperature and conditions.

7.3 Specific end use(s)

- no data available

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

- Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Control measures

Engineering measures
- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection
- Keep in a well-ventilated place.

Hand protection
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).
- Impervious gloves

Suitable material
- Nitrile or fluorinated rubber gloves.

Eye protection
- Chemical resistant goggles must be worn.
- Tightly fitting safety goggles

Skin and body protection
- Impervious clothing
- Full protective suit
- Change working clothes after each work-shift.
- Contaminated work clothing should not be allowed out of the workplace.

Hygiene measures
- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
- When using do not eat, drink or smoke.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Physical state: liquid Color: colorless to pale yellow
Odor	odorless
Odor Threshold	No data available
Molecular weight	232 g/mol
pH	9.0 - 11.0
Melting point/freezing point	Crystallization temperature: ca. 10 °F (-12 °C)
Initial boiling point and boiling range	Boiling point/boiling range: 223 °F (106 °C)
Flash point	Pensky-Martens closed cup No flash up to boiling point
Evaporation rate (Butylacetate = 1)	Not applicable
Flammability (solid, gas)	No data available
Flammability (liquids)	No data available
Flammability / Explosive limit	Lower flammability/explosion limit: Type: Lower flammability limit Not applicable Upper flammability/explosion limit: Type: Upper flammability limit Not applicable
Autoignition temperature	819 °F (437 °C)
Vapor pressure	17.5 mmHg (23.33 hPa) (68 °F (20 °C)) water, The product itself has not been tested.
Vapor density	Not applicable
Density	1.1 g/cm3 (77 °F (25 °C))
Relative density	No data available
Solubility	Water solubility: completely soluble
Partition coefficient: n-octanol/water	Not applicable
Decomposition temperature	> 662 °F (> 350 °C)
Viscosity	Viscosity, dynamic : 16.6 mPa.s (77 °F (25 °C))
Explosive properties	No data available
Oxidizing properties	Not considered as oxidizing.

9.2 Other information

Corrosion of Metals	Not corrosive to metals.

Peroxides	The substance or mixture is not classified as organic peroxide.
Reactions with water / air	Contact with acids liberates toxic gas.

SECTION 10: Stability and reactivity

10.1 Reactivity

- no data available

10.2 Chemical stability

- Stable

10.3 Possibility of hazardous reactions

- no data available

10.4 Conditions to avoid

- Contact with strong acids or bases may liberate toxic gases.

10.5 Incompatible materials

- Mineral acids.
- Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products
- Carbon dioxide (CO_2)

Thermal decomposition
- Carbon monoxide
- Sulfur oxides

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	LD50 : 3,350 mg/kg - Rat Unpublished internal reports
Acute inhalation toxicity	Not classified as hazardous for acute inhalation toxicity according to GHS. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Acute dermal toxicity Dithiophosphinate	LD50 : > 2,000 mg/kg - Rat , male and female Method: OECD Test Guideline 402 Not classified as hazardous for acute dermal toxicity according to GHS. Occlusive No mortality observed at this dose. Unpublished reports

Acute toxicity (other routes of administration)	Not applicable

Skin corrosion/irritation

Dithiophosphinate	Human No skin irritation Method: OECD Test Guideline 439 Unpublished reports

Serious eye damage/eye irritation

Dithiophosphinate	Bovine cornea Corrosive Method: OECD Test Guideline 437 Unpublished reports

Respiratory or skin sensitization

Dithiophosphinate	Local lymph node assay - Mouse EC 3 value > 2 % Classified as a skin sensitizer sub-category 1B according to GHS criteria Method: OECD Test Guideline 429 Unpublished reports

Mutagenicity

Genotoxicity in vitro

Dithiophosphinate	Mutagenicity (Salmonella typhimurium - reverse mutation assay) with and without metabolic activation negative Method: OECD Test Guideline 471 Unpublished reports Chromosome aberration test in vitro Strain: Human lymphocytes with and without metabolic activation negative Method: OECD Test Guideline 473 Unpublished reports Gene mutation assays in mammalian cells. Strain: mouse lymphoma cells with and without metabolic activation negative Method: OECD Test Guideline 476 Unpublished reports
Genotoxicity in vivo	Product is not considered to be genotoxic According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Carcinogenicity	The product is not considered to be carcinogenic. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.

Toxicity for reproduction and development

Toxicity to reproduction / fertility	The product is not considered to affect fertility.,According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
Developmental Toxicity/Teratogenicity	The product is not considered to be toxic for development.,According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.

STOT

STOT-single exposure	The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data.
STOT-repeated exposure	The substance or mixture is not considered to cause damage to organs through prolonged or repeated exposure. According to the available data on the components. According to the classification criteria for mixtures. Unpublished reports and/or published data. The product itself has not been tested.

Experience with human exposure

Experience with human exposure : Inhalation

In contact with acid

Symptoms: Released substances:
Hydrogen sulphide
Inhalation may provoke the following symptoms:
Irritating to the respiratory system and mucous membranes.
Coma
cardiorespiratory failure
Neurological disorders
Gastrointestinal disturbance

Experience with human exposure : Skin contact

No data is available on the product itself.

Experience with human exposure : Eye contact

No data is available on the product itself.

Experience with human exposure : Ingestion

No data is available on the product itself.

Aspiration toxicity	No aspiration toxicity classification, According to the available data on the components, According to the classification criteria for mixtures.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish

Dithiophosphinate	LC50 - 96 h : 375 mg/l - Lepomis macrochirus (Bluegill sunfish) static test Analytical monitoring: yes Method: OECD Test Guideline 203 Not harmful to fish (LC/LL50 > 100 mg/L) Unpublished reports

Acute toxicity to daphnia and other aquatic invertebrates

Dithiophosphinate	EC50 - 48 h : 149 mg/l - Daphnia magna (Water flea) static test Analytical monitoring: yes Method: OECD Test Guideline 202 Not harmful to aquatic invertebrates. (EC/EL50 > 100 mg/L) Unpublished reports

Toxicity to aquatic plants

Dithiophosphinate	ErC50 - 96 h : 115 mg/l - Pseudokirchneriella subcapitata (microalgae) static test Analytical monitoring: yes Endpoint: Growth rate Method: OECD Test Guideline 201 Not harmful to algae (EC/EL50 > 100 mg/L) Unpublished reports NOErC - 96 h : 20 mg/l - Pseudokirchneriella subcapitata (green algae) static test Analytical monitoring: yes Endpoint: Growth rate Method: OECD Test Guideline 201 No adverse chronic effect observed up to and including the threshold of 1 mg / L. Unpublished reports
Toxicity to microorganisms	The product itself has not been tested.
Chronic toxicity to fish	The product itself has not been tested.
Chronic toxicity to daphnia and other aquatic invertebrates	The product itself has not been tested.

Sediment compartment

Toxicity to benthic organisms	The product itself has not been tested.

Terrestrial Compartment

Toxicity to soil dwelling organisms	The product itself has not been tested.
Toxicity to terrestrial plants	The product itself has not been tested.
Toxicity to above ground organisms	The product itself has not been tested.

12.2 Persistence and degradability

Abiotic degradation

Stability in water	Conclusion is not possible for a mixture as a whole.
Photodegradation	Conclusion is not possible for a mixture as a whole.
Other Physicochemical reactions	Conclusion is not possible for a mixture as a whole.

Physical- and photo-chemical elimination

Physico-chemical removability	Conclusion is not possible for a mixture as a whole.

Biodegradation

Biodegradability	Ready biodegradability study: Method: OECD Test Guideline 301 D 78.8 % - 28 Days The substance fulfills the criteria for ultimate aerobic biodegradability and ready biodegradability Published data
Ratio BOD / COD	Conclusion is not possible for a mixture as a whole.
Ratio BOD / ThOD	Conclusion is not possible for a mixture as a whole.
Biochemical Oxygen Demand (BOD)	Conclusion is not possible for a mixture as a whole.
Dissolved organic carbon (DOC)	Conclusion is not possible for a mixture as a whole.
Chemical Oxygen Demand (COD)	Conclusion is not possible for a mixture as a whole.
Adsorbed organic bound halogens (AOX)	Conclusion is not possible for a mixture as a whole.

Degradability assessment

Dithiophosphinate	The product is considered to be rapidly degradable in the environment

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water	Conclusion is not possible for a mixture as a whole.
Bioconcentration factor (BCF)	As bioaccumulation is not relevant for mixtures, all the components of the mixture were assessed individually. Conclusion is not possible due to incomplete or heterogeneous data on the components Unpublished reports Published data

12.4 Mobility in soil

Adsorption potential (Koc)	Conclusion is not possible for a mixture as a whole.
Known distribution to environmental compartments	Conclusion is not possible due to incomplete or heterogeneous data on the components

12.5 Results of PBT and vPvB assessment

According to the available data on the components
This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).
This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).

12.6 Other adverse effects

Ecotoxicity assessment

Short-term (acute) aquatic hazard

No acute environmental hazard identified.
According to the available data on the components.
According to the classification criteria for mixtures.
Unpublished reports and/or published data.

Long-term (chronic) aquatic hazard

No chronic environmental hazard identified.
According to the available data on the components.
According to the classification criteria for mixtures.
Unpublished reports and/or published data.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- The Company encourages the recycle, recovery and reuse of materials, where permitted. If disposal is necessary, The Company recommends that organic materials, especially when classified as hazardous waste, be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed.

SECTION 14: Transport information

TDG
not regulated

DOT
not regulated

NOM
not regulated

IMDG
not regulated

IATA
not regulated

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1Notification status

Inventory Information	Status
United States TSCA Inventory	- All substances listed as active on the TSCA inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	- When purchased from a Solvay legal entity based in the EEA ("European Economic Area"), this product is compliant with the registration provisions of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, and/or registered. When purchased from a legal entity outside of the EEA, please contact your local representative for additional information.
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- One or more components not listed on inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
Taiwan Chemical Substance Inventory (TCSI)	- One or more components not listed on inventory
New Zealand. Inventory of Chemical Substances	- All components are listed on the NZIOC inventory. The HSNO status of the product has not been assessed.

15.2 National Regulations

Canada. CEPA 1999 Significant New Activity (SNAc) List:

- No substances are subject to a Significant New Activity Notification.

SECTION 16: Other information

Revision Date:

04/17/2020

NFPA (National Fire Protection Association) - Classification

Health	3 serious
Flammability	1 slight
Instability or Reactivity	0 minimal

Key or legend to abbreviations and acronyms used in the safety data sheet

- ACGIH: American Conference of Governmental Industrial Hygienists
- OSHA: Occupational Safety and Health Administration
- NTP: National Toxicology Program
- IARC: International Agency for Research on Cancer
- NIOSH: National Institute for Occupational Safety and Health
- ADR: European Agreement on International Carriage of Dangerous Goods by Road.
- ADN: European Agreement on the International Carriage of Dangerous Goods by Inland Waterways.
- RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.
- IATA: International Air Transport Association.
- ICAO-TI: Technical Specification for Safe Transport of Dangerous Goods by Air.
- IMDG: International Maritime Dangerous Goods.
- TWA: Time weighted average
- ATE: Estimated value of acute toxicity
- EC: European Community number
- CAS: Chemical Abstracts Service.
- LD50: Substance that causes 50% (half) death in the test animals group (Median Fatal Dose).
- LC50: Substance concentration causing 50% (half) death in the test animals group.
- EC50: Effective Concentration of the substance causing the maximum of 50%.
- PBT: Persistent, Bioaccumulative and Toxic substance.
- vPvB: Very Persistent and Very Bioaccumulative.
- SEA: Classification, labeling, packaging regulation
- DNEL: Derived No Effect Level
- PNEC: Predicted No Effect Concentration
- BHOT: Specific Target Organ Toxicity

Not all acronyms listed above are referenced in this SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

Sodium Metabisulfite

SAFETY DATA SHEET

SODIUM METABISULFITE,NON FOOD

Section 1. Identification

Product identifier : SODIUM METABISULFITE,NON FOOD

Product code : Q10410

Relevant identified uses of the substance or mixture

Identified uses
Industrial applications

Supplier's details : QUADRA CHEMICALS LTD.
3901 F.X Tessier
Vaudreuil-Dorion, QC
CANADA J7V 5V5
1-800-665-6553

Emergency telephone number (with hours of operation) : **TRANSPORTATION EMERGENCY - 24HRS/DAY - 7 DAYS/WEEK IN CANADA - CALL 1-888-922-3330**

Section 2. Hazard identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 4
EYE IRRITATION - Category 2A

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Harmful if swallowed.
Causes serious eye irritation.

Precautionary statements

Prevention : Wear eye or face protection. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Percentage of the mixture consisting of ingredient(s) of unknown dermal toxicity: 99.8%
Percentage of the mixture consisting of ingredient(s) of unknown inhalation toxicity: 99.8%

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	% (w/w)	CAS number
sodium metabisulphite	75 - 100	7681-57-4
sodium sulphite	0 - 3	7757-83-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 4. First-aid measures

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical powder.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : May form explosible dust-air mixture if dispersed.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
sulfur oxides
metal oxide/oxides
Sulfur dioxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Avoid dust generation. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
sodium metabisulphite	**ACGIH TLV (United States, 3/2018).** TWA: 5 mg/m³ 8 hours.
sodium sulphite	-

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles. If operating conditions cause high dust concentrations to be produced, use dust goggles.

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Physical state	:	Solid. [Crystalline powder.]
Color	:	White to pale yellow.
Odor	:	Faint odor. Sulfur dioxide
Odor threshold	:	Not available.
pH	:	4 to 8 [Conc. (% w/w): 5%]
Melting point	:	Not available.
Boiling point	:	Not available.
Flash point	:	Not available.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	Not available.
Vapor pressure	:	Not available.
Vapor density	:	Not available.
Relative density	:	Not available.
Density	:	2.36 g/cm³ [20°C (68°F)]
Solubility	:	Easily soluble in the following materials: cold water.
Solubility in water	:	667 g/l
Dispersibility properties	:	Not available.
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	>150°C (>302°F)
Viscosity	:	Not available.
Volatility	:	Not available.

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
Incompatible materials	:	oxidizing materials acids moisture
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 10. Stability and reactivity

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
sodium metabisulphite	LD50 Oral	Rat	1131 mg/kg	-
SODIUM METABISULFITE, NON FOOD	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5.5 mg/l	4 hours
	LD50 Dermal	Rat - Male, Female	>2000 mg/kg	-
	LD50 Oral	Rat - Male, Female	1540 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
sodium metabisulphite	Eyes - Mild irritant	Rabbit	-	24 hours 100 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Carcinogenicity Classification

Product/ingredient name	IARC	NTP	ACGIH
sodium metabisulphite	3	-	A4

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Section 11. Toxicological information

Skin contact : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
sodium metabisulphite SODIUM METABISULFITE, NON FOOD	Acute LC50 32 mg/l Fresh water EC50 43.8 mg/l EC50 89 mg/l LC50 316 mg/l NOEC >21 mg/l NOEC >316 mg/l	Fish - Lepomis macrochirus Aquatic plants Daphnia - Daphnia magna Fish - Leuciscus idus Daphnia - Daphnia magna Fish - Brachydanio rerio	96 hours 72 hours 48 hours 96 hours 21 days 34 days

Persistence and degradability

Not available.

Bioaccumulative potential

Section 12. Ecological information

Product/ingredient name	$LogP_{ow}$	BCF	Potential
sodium metabisulphite	-3.7	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	TDG Classification
UN number	Not regulated.
UN proper shipping name	-
Transport hazard class(es)	-
Packing group	-
Additional information	Not available.

Section 15. Regulatory information

Canada inventory : All components are listed or exempted.

Section 16. Other information

History

Date of issue/Date of revision : 7 November 2019

Prepared by : Regulatory Affairs

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations
HPR = Hazardous Products Regulations

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 4 EYE IRRITATION - Category 2A	On basis of test data Calculation method

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Appendix 3
2015 Tailing Geotechnical Testing

CTL | THOMPSON

July 16, 2015

Fortune Revenue Silver Mines
1900 Main Street
Ouray, Colorado 81427

Attention: Clint Fletcher

Subject: Laboratory Test Results
Mill Tailings
Project No. DN47,709.000-300

This letter transmits the results of laboratory tests performed on a sample delivered to our office on January 27, 2015. The test results transmitted at this time are those requested by Greg Lewicki when the sample was submitted.

The testing consisted of two direct shear tests (one test run with the sample flooded and one test run with the sample not flooded) and one consolidated-undrained triaxial test (CU) with pore pressure measurement. For all tests the samples were remolded to 95 percent of 115.5 pcf at a moisture content of 15.5 percent. The sample was tested in general accordance with American Society for Testing and Materials (ASTM) standards. Test results are presented in the attached Figures 1 through 3.

Should you have any questions regarding these test results, please call.

Very truly yours,

CTL | THOMPSON, INC.

Alan J. Lisowy, P.E.
Associate Engineer

AJL/bg
(2 copies)

Via email: cfletcher@fortuneminerals.com
jtrujllo@fortuneminerals.com
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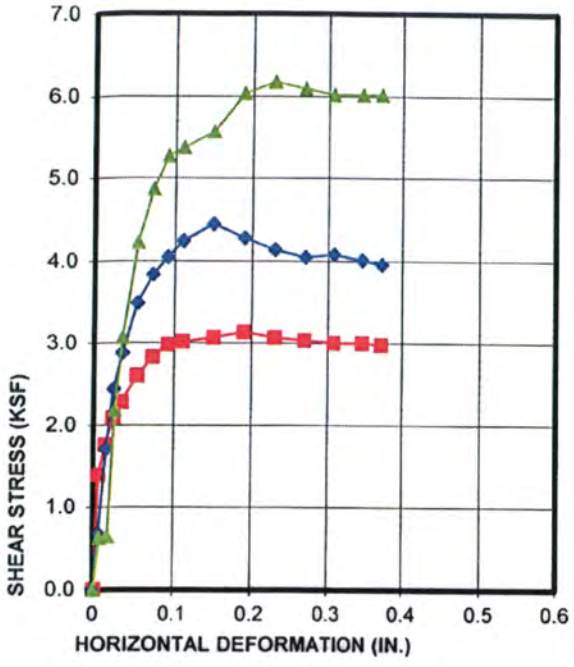
greg@lewicki.biz

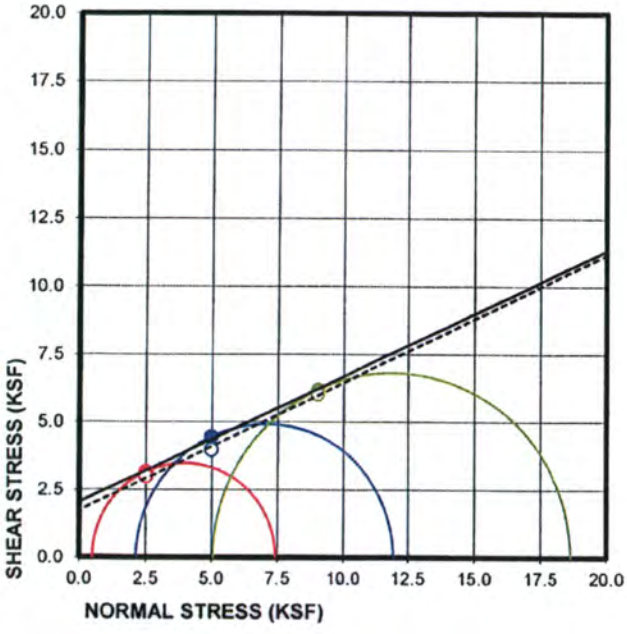


Sample No.	Boring No.	Depth (FT)	Moisture Content (%) Before	Moisture Content (%) After	Dry Density (PCF)
1 ■	mill tailings	0.00	15.4	19.8	109.9
2 ◆	mill tailings	0.00	15.4	18.3	109.8
3 ▲	mill tailings	0.00	15.4	17.0	109.8

LL, %: 28 PI, %: 8 -200: 77 Clay Content, %

Thickness (in): 1.0 Diameter (in): 1.935

Shearing Rate (in/min): 0.0063



Sample No.	Normal Stress (KSF)	Peak Shear Stress (KSF) ●	Large Displacement Shear Stress (KSF) ○	Large Displacement Displacement (IN.) ○
1 ■	2.5	3.14	2.98	0.37
2 ◆	5	4.45	3.96	0.37
3 ▲	9	6.17	6.02	0.37

Peak ϕ (DEG): 25

Large Displacement. ϕ (DEG): 25

Peak C (PSF): 2040

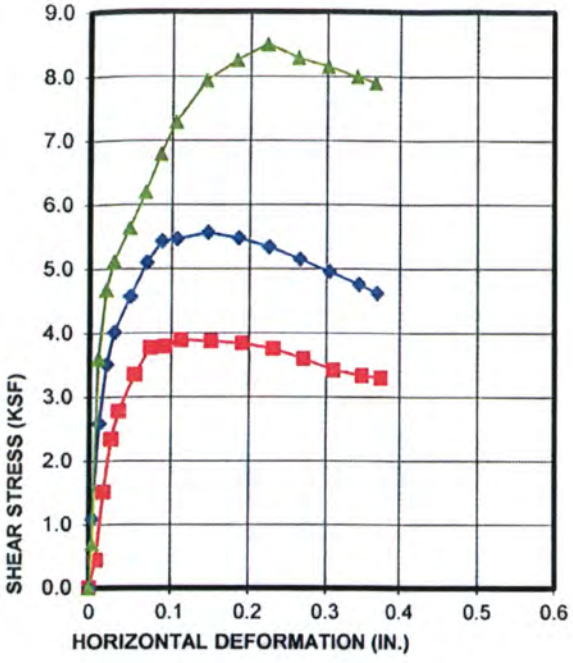
Large Displacement C (PSF): 1730

Sample Description: Mill Tailings - Sand Clay (CL)

Sample Type: Remolded to 95% of 115.5 at 15.5% moisture content

Remarks: Test was conducted on a flooded sample.

Direct Shear Test Results

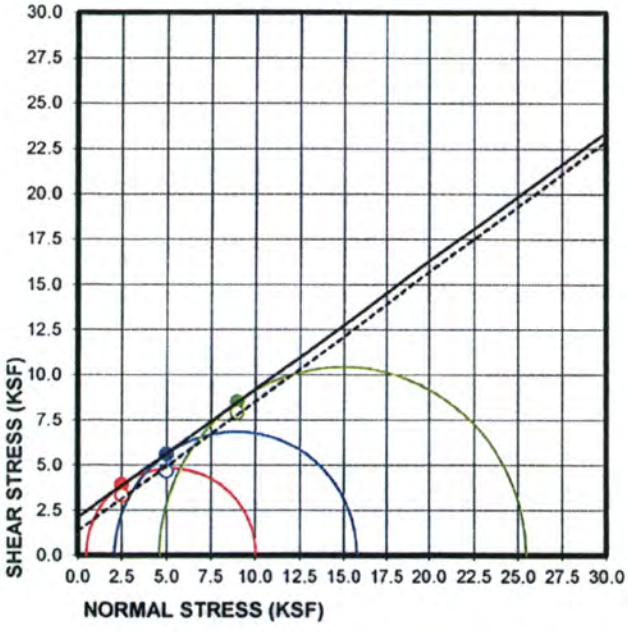


Sample No.	Boring No.	Depth (FT)	Moisture Content (%) Before	After	Dry Density (PCF)
1 ■	mill tailings	0.00	15.4	14.4	109.9
2 ◆	mill tailings	0.00	15.4	14.3	109.8
3 ▲	mill tailings	0.00	15.4	14.1	109.8

LL, %: 28 PI, %: 8 -200: 77 Clay Content, %: 0.0

Thickness (in): 1.0 Diameter (in): 1.935

Shearing Rate (in/min): 0.0063



Sample No.	Normal Stress (KSF)	Peak Shear Stress (KSF) ●	Large Displacement Shear Stress (KSF) ○	Large Displacement Displacement (IN.) ○
1 ■	2.5	3.89	3.3	0.37
2 ◆	5	5.56	4.62	0.37
3 ▲	9	8.5	7.9	0.37

Peak ϕ (DEG): 35

Large Displacement. ϕ (DEG): 36

Peak C (PSF): 2080

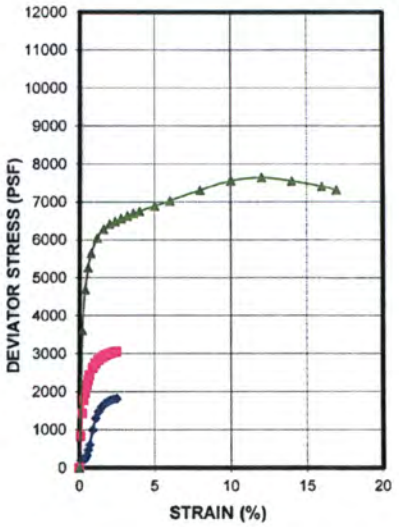
Large Displacement C (PSF): 1320

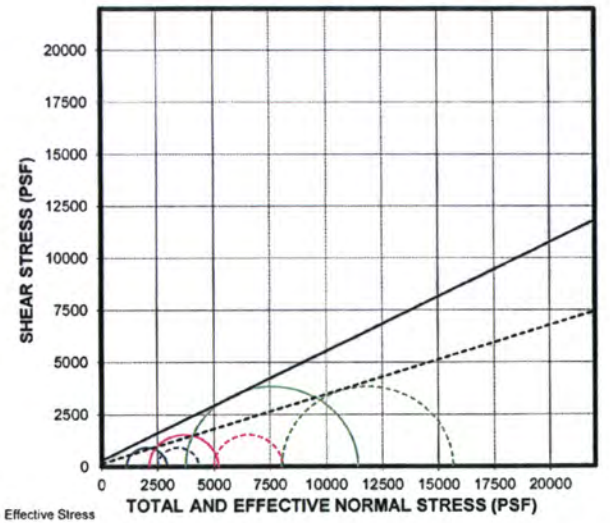
Sample Description: Mill Tailings - Sandy Clay (CL)

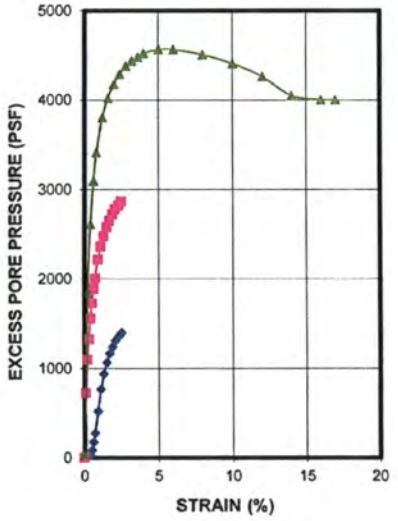
Sample Type: Remolded to 95% of 115.5 at 15.5% moisture content.

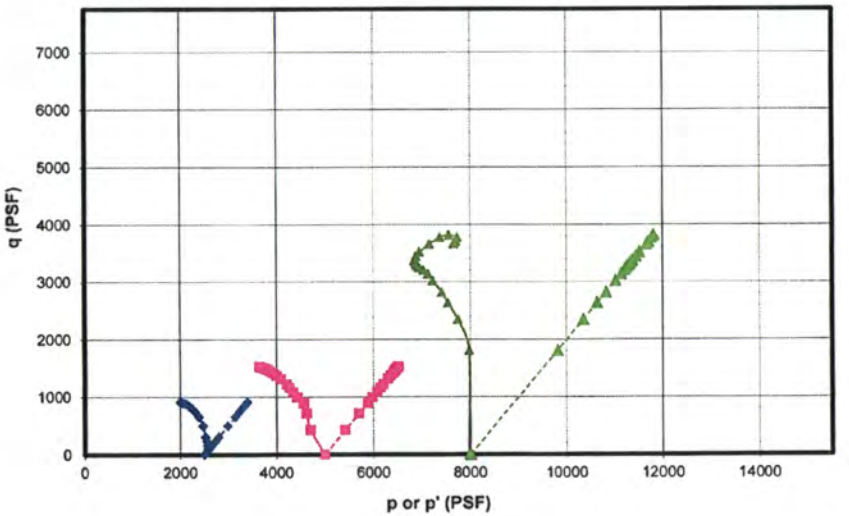
Remarks: Test was conducted with sample flooded.

Direct Shear Test Results









TYPE OF SPECIMEN

Sample Description:

Mill Tailings - Remolded to 95% of 115.5 at 15.5% moisture content.

Soil Classification: Sandy Clay (CL)

LL, %: 25 PI, %: 8 -200, %: 77 Clay Content,%

Test No.	1	2	3
Symbol	◆	■	▲
Boring Hole No.	0	0	0
Depth (ft.)	0	0	0
Initial Water Content, (%)	15.4	15.4	15.4
After Test Water Content (%)	17.5	17.5	17.5
Dry Density (pcf)	109.9	109.9	109.9
Specimen Diameter (in.)	3.000	3.000	3.000
Initial Height (in.)	6.00	6.00	6.00
Consolidation Pressure (psf)	2491.2	4996.8	8006.4

At Maximum Deviator Stress

Eff. Major Princ. Stress, $\overline{\sigma_1}$ (psf)	2910	5184	11381
Eff. Min. Princ. Stress, $\overline{\sigma_3}$ (psf)	1094	2131	3744
Excess Pore Pressure, Δu (psf)	1397	2866	4262
Tot. Major Prin. Stress, σ_1 (psf)	4307	8050	15643
Tot. Min. Prin. Stress, σ_3 (psf)	2491	4997	8006
Strain at Max. Deviator Stress(%)	2.5	2.5	12.0

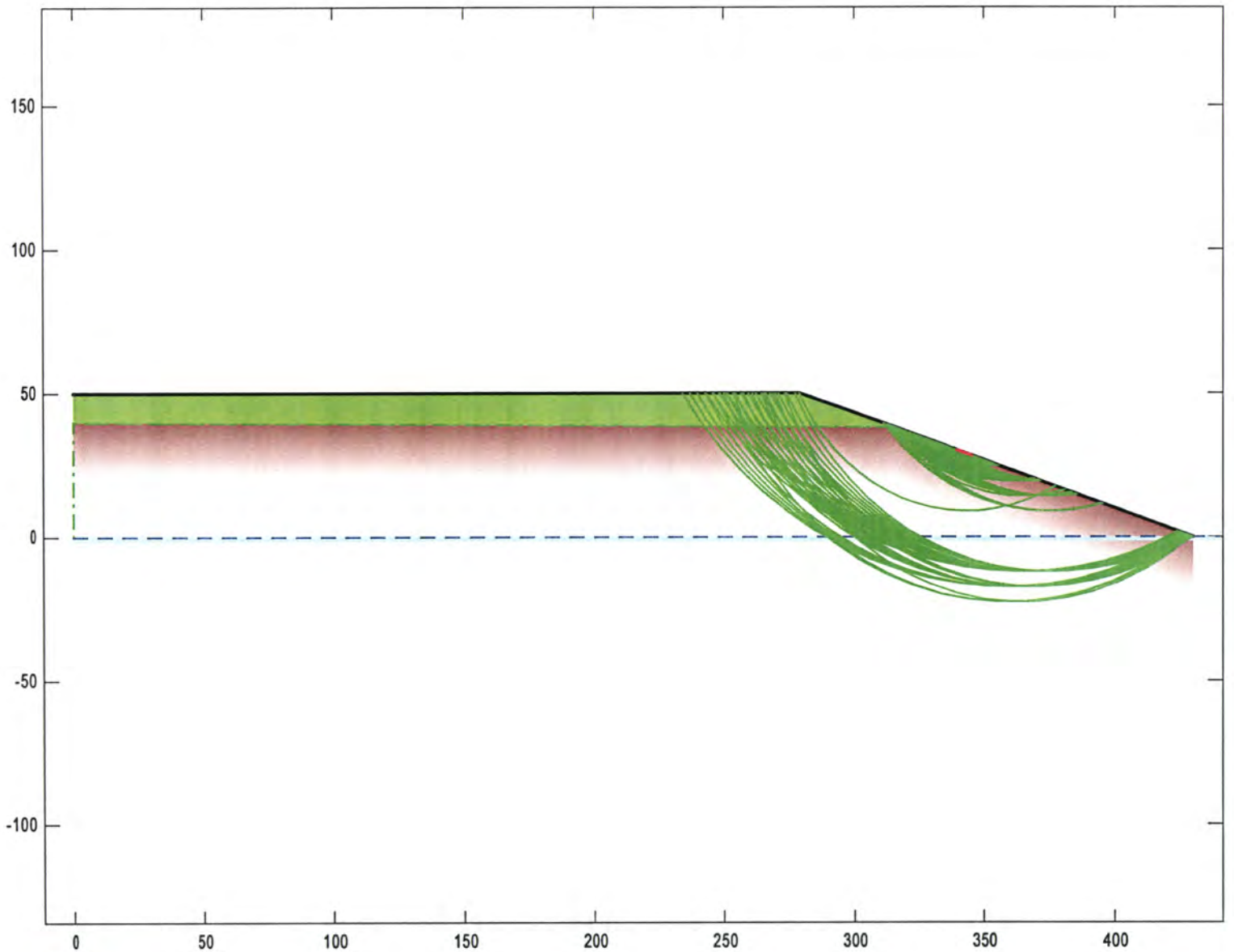
Effective Stress Friction Angle, $\overline{\phi}$ (°):	30
Effective Stress Cohesion, $\overline{C}$ (psf)	300
Total Stress Friction Angle, ϕ (°):	19
Total Stress Cohesion, C (psf)	150

Remarks:

CU Triaxial Test Results

No. DN47,709-300

Fig. 3



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Material Keys

Existing waste rock

Mill tailings

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

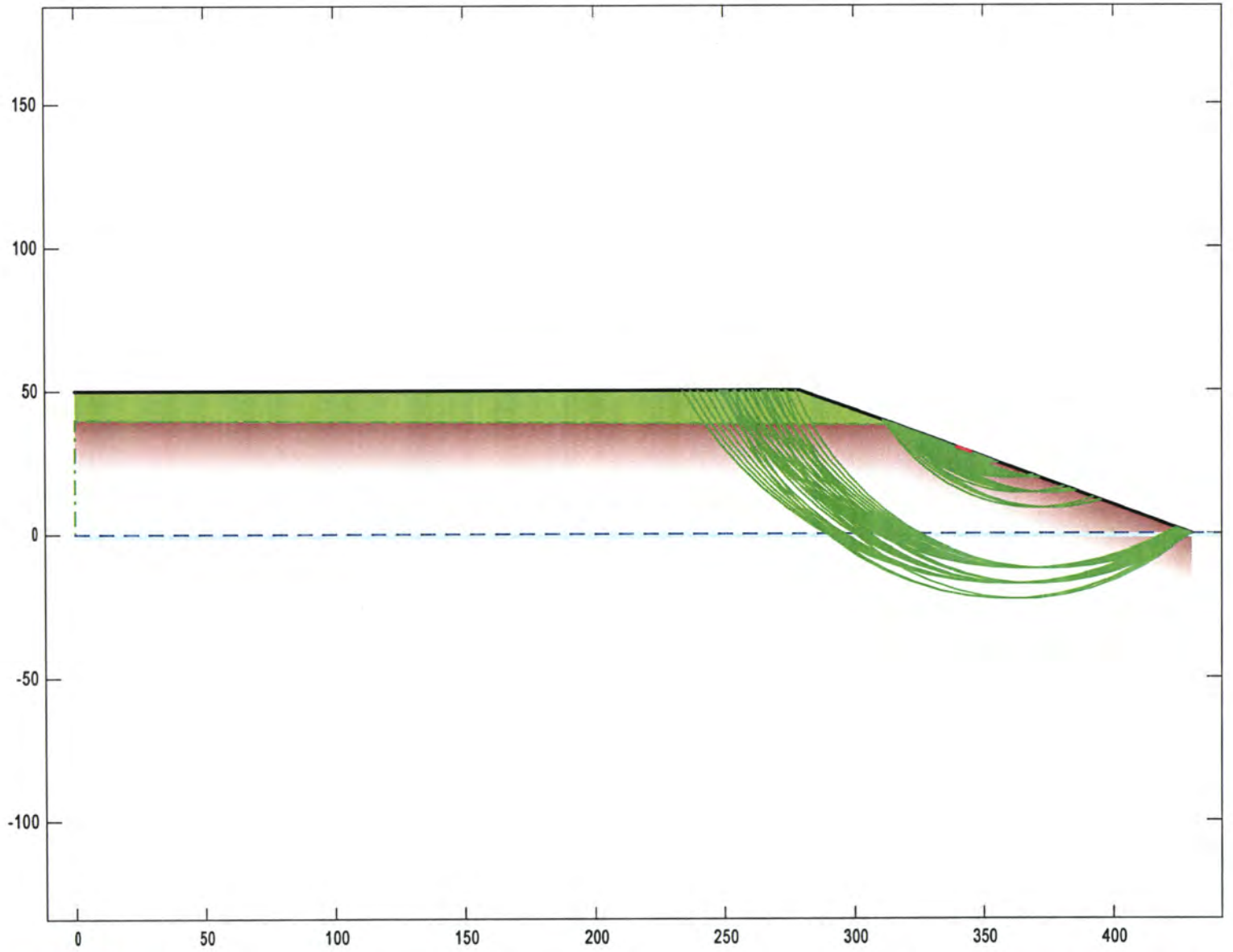
Critical Factor of Safety: 3.00

Project Ouray Silver Mine - Revenue Waste Pile
Lab Scenario 1

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 1.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates



GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 3.00

Project Ouray Silver Mine - Revenue Waste Pile
Lab Scenario 2

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 2.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

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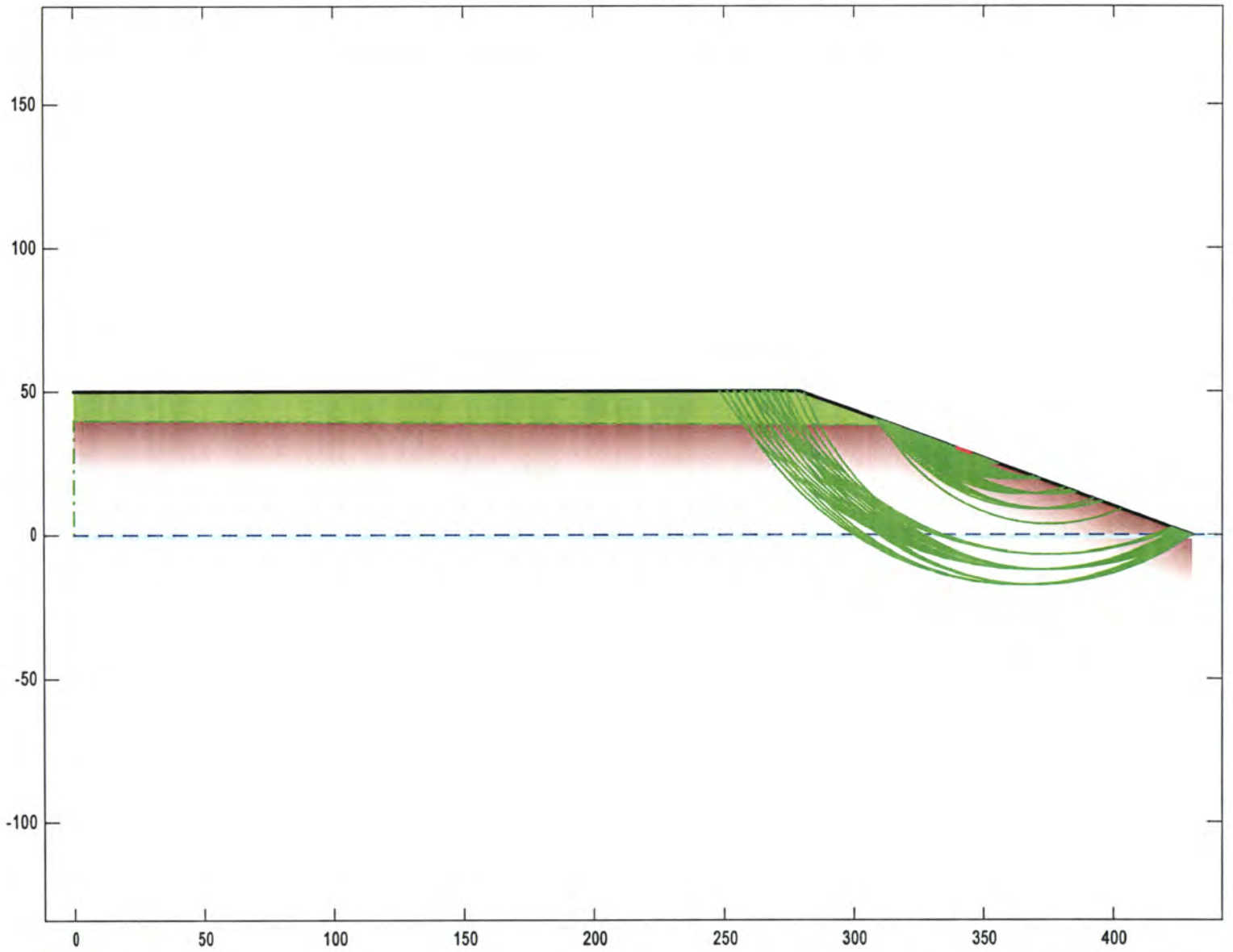

GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 3.00

Project Ouray Silver Mine - Revenue Waste Pile
Lab Scenario 3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 3.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

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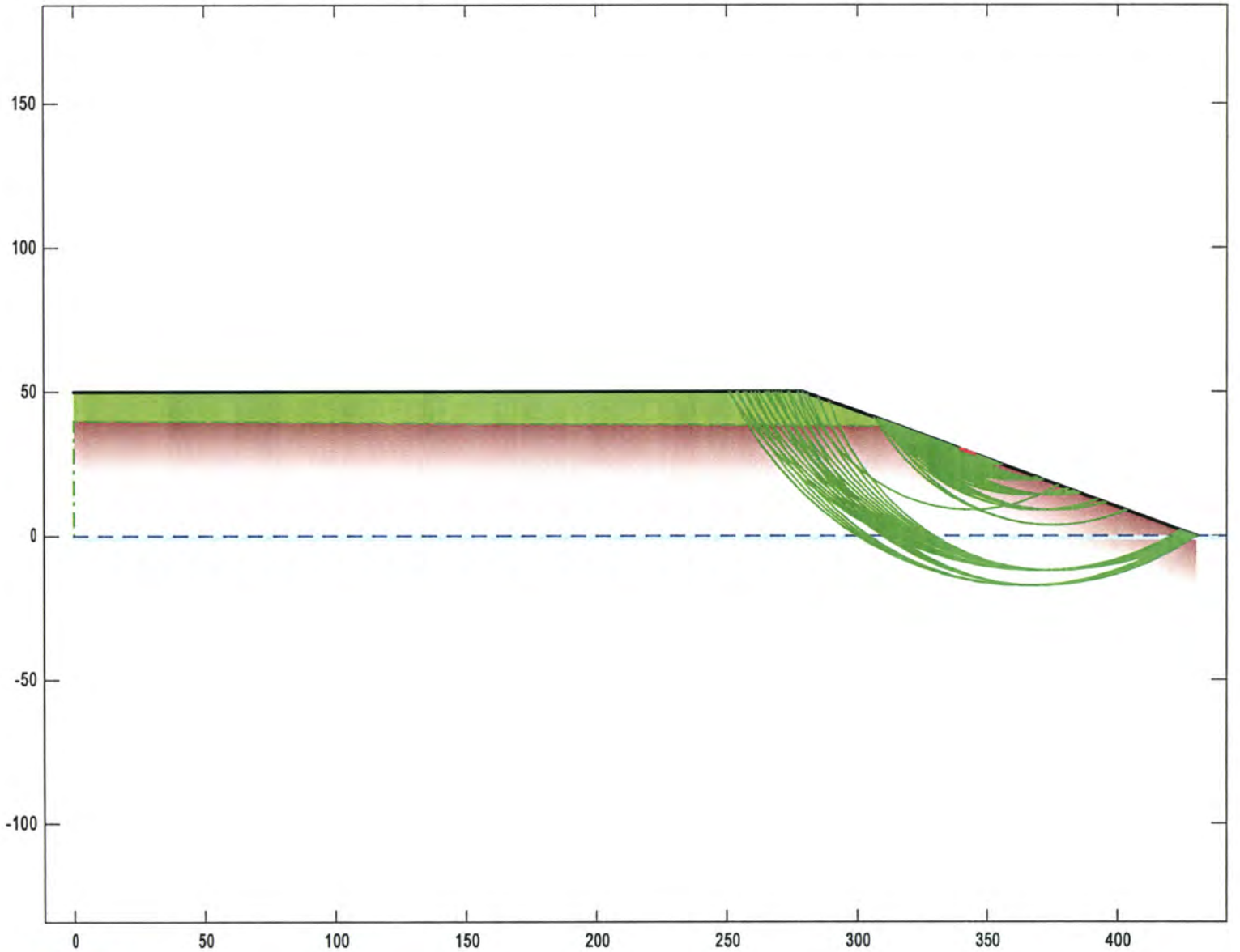

GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 3.00

Project Ouray Silver Mine - Revenue Waste Pile
Lab Scenario 4

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 4.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

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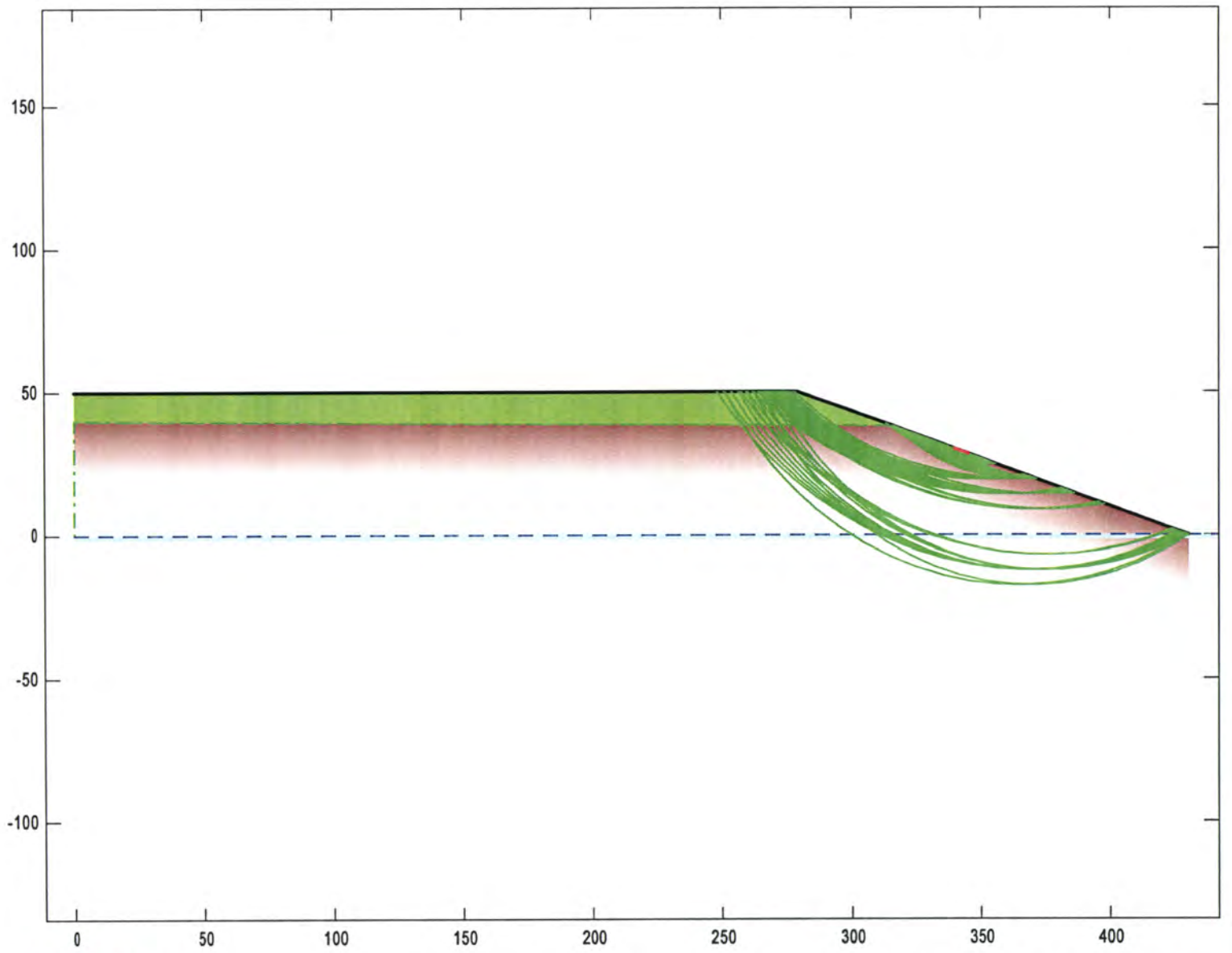

GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 3.00

Project Ouray Silver Mine - Revenue Waste Pile
Lab Scenario 5

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 5.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

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Project: Ouray Silver Mine - Revenue Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 5.gmf
Processed: 13 Nov 2015 10:39:52

DATA: Analysis 1 - Lab Scenario 5

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
300.00	30.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 265.00 YL: 50.00 XR: 337.61 YR: 30.80
Centre: XC: 325.00 YC: 130.00 Radius: R: 100.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	100.00
Trial positions within range:	20	20	20

RESULTS: Analysis 1 - Lab Scenario 5

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.59

There were: 4178 successful analyses from a total of 8001 trial circles
3823 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
2	323.82	35.39	329.18	33.61	353.95	116.84	86.84	3.001
3	328.25	33.92	334.22	31.93	348.68	85.26	55.26	3.004
4	344.04	28.65	350.01	26.66	364.47	80.00	55.26	3.004
5	328.19	33.94	343.75	28.75	375.00	148.42	123.68	3.006
6	317.69	37.44	332.15	32.62	353.95	122.11	92.11	3.009
7	333.48	32.17	347.94	27.35	369.74	116.84	92.11	3.009
8	323.19	35.60	345.60	28.13	375.00	153.68	128.95	3.011
9	339.20	30.27	351.70	26.10	364.47	85.26	60.53	3.016
10	323.41	35.53	335.91	31.36	348.68	90.53	60.53	3.016
11	329.01	33.66	349.25	26.92	369.74	122.11	97.37	3.016
12	318.83	37.06	346.80	27.73	375.00	158.95	134.21	3.016
13	325.00	35.00	350.10	26.63	369.74	127.37	102.63	3.022
14	335.25	31.58	352.48	25.84	364.47	90.53	65.79	3.026
15	319.46	36.85	336.70	31.10	348.68	95.79	65.79	3.026
16	321.22	36.26	350.72	26.43	369.74	132.63	107.89	3.028
17	317.58	37.47	351.21	26.26	369.74	137.89	113.16	3.033
18	331.59	32.80	352.98	25.67	364.47	95.79	71.05	3.034
19	328.08	33.97	353.34	25.55	364.47	101.05	76.32	3.041
20	324.65	35.12	353.61	25.46	364.47	106.32	81.58	3.048
21	321.28	36.24	353.82	25.39	364.47	111.58	86.84	3.053
22	317.95	37.35	354.00	25.33	364.47	116.84	92.11	3.058

23	316.61	37.80	339.55	30.15	343.42	80.00	50.00	3.081
24	329.19	33.60	355.39	24.87	359.21	80.00	55.26	3.086
25	341.77	29.41	371.23	19.59	375.00	80.00	60.53	3.091
26	325.99	34.67	355.44	24.85	359.21	85.26	60.53	3.091
27	338.58	30.47	371.26	19.58	375.00	85.26	65.79	3.095
28	322.79	35.74	355.47	24.84	359.21	90.53	65.79	3.095
29	335.40	31.53	371.29	19.57	375.00	90.53	71.05	3.099
30	319.61	36.80	355.50	24.83	359.21	95.79	71.05	3.099
31	316.43	37.86	355.52	24.83	359.21	101.05	76.32	3.102
32	332.21	32.60	371.31	19.56	375.00	95.79	76.32	3.102
33	329.04	33.65	371.33	19.56	375.00	101.05	81.58	3.104
34	325.86	34.71	371.35	19.55	375.00	106.32	86.84	3.106
35	322.69	35.77	371.36	19.55	375.00	111.58	92.11	3.108
36	319.52	36.83	371.38	19.54	375.00	116.84	97.37	3.110
37	316.35	37.88	371.39	19.54	375.00	122.11	102.63	3.112
38	315.81	38.06	337.19	30.94	348.68	101.05	71.05	3.119
39	316.21	37.93	371.52	19.49	369.74	106.32	86.84	3.161
40	319.37	36.88	371.52	19.49	369.74	101.05	81.58	3.162
41	322.54	35.82	371.52	19.49	369.74	95.79	76.32	3.163
42	325.70	34.77	371.51	19.50	369.74	90.53	71.05	3.165
43	328.86	33.71	371.51	19.50	369.74	85.26	65.79	3.167
44	332.02	32.66	371.50	19.50	369.74	80.00	60.53	3.169
45	316.24	37.92	355.71	24.76	353.95	85.26	60.53	3.169
46	319.40	36.87	355.71	24.76	353.95	80.00	55.26	3.172
47	264.73	50.00	429.74	0.09	375.00	116.84	128.95	3.174
48	248.19	50.00	429.31	0.23	369.74	137.89	150.00	3.200
49	267.73	50.00	429.03	0.32	375.00	111.58	123.68	3.200
50	250.91	50.00	428.68	0.44	369.74	132.63	144.74	3.205
51	253.69	50.00	428.02	0.66	369.74	127.37	139.47	3.212
52	272.50	50.00	385.02	14.99	369.74	164.21	150.00	3.218
53	256.54	50.00	427.34	0.89	369.74	122.11	134.21	3.223
54	269.19	50.00	383.57	15.48	364.47	158.95	144.74	3.223
55	267.23	50.00	383.67	15.44	364.47	164.21	150.00	3.225
56	271.19	50.00	383.47	15.51	364.47	153.68	139.47	3.227
57	274.45	50.00	384.96	15.01	369.74	158.95	144.74	3.230
58	316.99	37.67	370.75	19.75	364.47	90.53	71.05	3.233
59	271.90	50.00	397.89	10.70	375.00	158.95	150.00	3.234
60	270.83	50.00	428.30	0.57	375.00	106.32	118.42	3.234
61	273.23	50.00	383.36	15.55	364.47	148.42	134.21	3.237
62	320.20	36.60	370.69	19.77	364.47	85.26	65.79	3.241
63	270.30	50.00	370.30	19.90	359.21	164.21	144.74	3.243
64	251.18	50.00	429.43	0.19	364.47	111.58	128.95	3.244
65	259.47	50.00	426.63	1.12	369.74	116.84	128.95	3.245
66	270.64	50.00	368.95	20.35	353.95	148.42	128.95	3.246
67	267.96	50.00	381.68	16.11	359.21	148.42	134.21	3.246
68	268.51	50.00	370.34	19.89	359.21	169.47	150.00	3.246
69	257.43	50.00	424.90	1.70	375.00	143.16	150.00	3.246
70	268.73	50.00	369.03	20.32	353.95	153.68	134.21	3.247
71	270.05	50.00	381.53	16.16	359.21	143.16	128.95	3.247
72	274.01	50.00	397.76	10.75	375.00	153.68	144.74	3.247
73	266.63	50.00	396.13	11.29	369.74	158.95	150.00	3.249
74	265.92	50.00	381.83	16.06	359.21	153.68	139.47	3.249
75	272.13	50.00	370.26	19.91	359.21	158.95	139.47	3.249
76	323.42	35.53	370.64	19.79	364.47	80.00	60.53	3.250
77	266.26	50.00	429.99	0.00	369.74	95.79	113.16	3.251
78	272.59	50.00	368.87	20.38	353.95	143.16	123.68	3.251
79	268.75	50.00	395.97	11.34	369.74	153.68	144.74	3.251
80	260.01	50.00	424.43	1.86	375.00	137.89	144.74	3.251
81	276.45	50.00	384.89	15.04	369.74	153.68	139.47	3.252
82	266.86	50.00	369.10	20.30	353.95	158.95	139.47	3.254
83	275.32	50.00	383.25	15.58	364.47	143.16	128.95	3.255
84	272.19	50.00	381.37	16.21	359.21	137.89	123.68	3.256
85	263.93	50.00	381.97	16.01	359.21	158.95	144.74	3.256
86	273.99	50.00	370.22	19.93	359.21	153.68	134.21	3.257
87	270.91	50.00	395.79	11.40	369.74	148.42	139.47	3.258
88	269.32	50.00	367.21	20.93	348.68	137.89	118.42	3.259
89	313.25	38.89	371.40	19.53	375.00	127.37	107.89	3.260
90	262.47	50.00	425.88	1.37	369.74	111.58	123.68	3.260
91	262.64	50.00	423.93	2.02	375.00	132.63	139.47	3.260
92	271.37	50.00	367.07	20.98	348.68	132.63	113.16	3.261
93	277.76	50.00	386.13	14.62	375.00	164.21	150.00	3.263
94	273.78	50.00	371.14	19.62	364.47	169.47	150.00	3.265
95	267.32	50.00	367.34	20.89	348.68	143.16	123.68	3.265
96	274.59	50.00	368.78	20.41	353.95	137.89	118.42	3.266
97	265.04	50.00	369.17	20.28	353.95	164.21	144.74	3.266
98	261.97	50.00	382.10	15.97	359.21	164.21	150.00	3.267
99	276.18	50.00	397.62	10.79	375.00	148.42	139.47	3.269

Critical Failure Circle

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34
Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Generated failure surface: (20 points)

339.61	30.13	339.89	30.03	340.17	29.93	340.45	29.82	340.73	29.72
341.01	29.63	341.29	29.53	341.57	29.43	341.85	29.34	342.13	29.24
342.42	29.15	342.70	29.05	342.98	28.96	343.26	28.87	343.55	28.78
343.83	28.69	344.11	28.60	344.40	28.52	344.68	28.43	344.97	28.34

Slice Geometry and Properties (38 slices)

Slice	X-Left	X-S Area	Base Angle	Base Width	Base Length	Base Mat1	Base Cohesion	Base Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	339.61	0.00	20.2	0.14	0.15	1	0.00	45.0	0.03	0.00	0.20	0.95
2	339.75	0.00	20.2	0.14	0.15	1	0.00	45.0	0.11	0.00	0.71	0.95
3	339.89	0.00	20.0	0.14	0.15	1	0.00	45.0	0.18	0.00	1.13	0.95
4	340.03	0.00	20.0	0.14	0.15	1	0.00	45.0	0.25	0.00	1.58	0.95
5	340.17	0.00	19.8	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
6	340.31	0.00	19.8	0.14	0.15	1	0.00	45.0	0.37	0.00	2.34	0.95
7	340.45	0.00	19.6	0.14	0.15	1	0.00	45.0	0.42	0.00	2.69	0.95
8	340.59	0.00	19.6	0.14	0.15	1	0.00	45.0	0.47	0.00	2.98	0.95
9	340.73	0.00	19.4	0.14	0.15	1	0.00	45.0	0.52	0.00	3.30	0.95
10	340.87	0.01	19.4	0.14	0.15	1	0.00	45.0	0.56	0.00	3.56	0.95
11	341.01	0.01	19.2	0.14	0.15	1	0.00	45.0	0.59	0.00	3.79	0.95
12	341.15	0.01	19.2	0.14	0.15	1	0.00	45.0	0.62	0.00	3.98	0.95
13	341.29	0.01	19.0	0.14	0.15	1	0.00	45.0	0.66	0.00	4.20	0.95
14	341.43	0.01	19.0	0.14	0.15	1	0.00	45.0	0.68	0.00	4.36	0.95
15	341.57	0.01	18.8	0.14	0.15	1	0.00	45.0	0.71	0.00	4.50	0.95
16	341.71	0.01	18.8	0.14	0.15	1	0.00	45.0	0.72	0.00	4.61	0.95
17	341.85	0.01	18.6	0.14	0.15	1	0.00	45.0	0.73	0.00	4.69	0.95
18	341.99	0.01	18.6	0.14	0.15	1	0.00	45.0	0.74	0.00	4.73	0.95
19	342.13	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
20	342.28	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
21	342.42	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.74	0.95
22	342.56	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.69	0.95
23	342.70	0.01	18.0	0.14	0.15	1	0.00	45.0	0.72	0.00	4.63	0.95
24	342.84	0.01	18.0	0.14	0.15	1	0.00	45.0	0.71	0.00	4.52	0.95
25	342.98	0.01	17.8	0.14	0.15	1	0.00	45.0	0.69	0.00	4.39	0.95
26	343.12	0.01	17.8	0.14	0.15	1	0.00	45.0	0.66	0.00	4.23	0.95
27	343.26	0.01	17.7	0.14	0.15	1	0.00	45.0	0.63	0.00	4.01	0.95
28	343.41	0.01	17.7	0.14	0.15	1	0.00	45.0	0.60	0.00	3.81	0.95
29	343.55	0.01	17.5	0.14	0.15	1	0.00	45.0	0.56	0.00	3.60	0.95
30	343.69	0.00	17.5	0.14	0.15	1	0.00	45.0	0.52	0.00	3.34	0.95
31	343.83	0.00	17.3	0.14	0.15	1	0.00	45.0	0.47	0.00	3.00	0.95
32	343.97	0.00	17.3	0.14	0.15	1	0.00	45.0	0.42	0.00	2.71	0.95
33	344.11	0.00	17.1	0.14	0.15	1	0.00	45.0	0.37	0.00	2.38	0.95
34	344.26	0.00	17.1	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
35	344.40	0.00	16.9	0.14	0.15	1	0.00	45.0	0.25	0.00	1.60	0.95
36	344.54	0.00	16.9	0.14	0.15	1	0.00	45.0	0.18	0.00	1.18	0.95
37	344.68	0.00	16.7	0.14	0.15	1	0.00	45.0	0.11	0.00	0.70	0.95
38	344.83	0.00	16.7	0.14	0.15	1	0.00	45.0	0.04	0.00	0.24	0.95
X-S Area:		0.17	Path Length:		5.65		X-S Weight:		18.88			

DATA: Analysis 2 - Lab Scenario 5 pt2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
2080.00 35.0 109.90 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock
0.00 0.00 0.00 40.00 316.00 38.00 430.00 0.00
Profile: 2 (4 points) Material beneath: 2 - Mill tailings
0.00 50.00 279.00 50.00 316.00 38.00 0.00 40.00

Slope Surface (4 points)

0.00 50.00 279.00 50.00 316.00 38.00 430.00 0.00

Phreatic Surface (2 points)

0.00 0.00 500.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34
Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	10.00	10.00	10.00
Trial positions within range:	20	20	20

RESULTS: Analysis 2 - Lab Scenario 5 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.00

There were: 4022 successful analyses from a total of 8001 trial circles
3979 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	338.02	30.66	342.14	29.29	368.95	116.58	91.32	3.000
2	342.76	29.08	346.88	27.71	373.68	115.00	91.32	3.001
3	339.60	30.13	343.72	28.76	370.53	116.05	91.32	3.001
4	335.21	31.60	339.58	30.14	365.26	114.47	88.16	3.001
5	337.15	30.95	341.75	29.42	366.32	110.79	85.00	3.001
6	336.78	31.07	341.16	29.61	366.84	113.95	88.16	3.001
7	341.52	29.49	345.90	28.03	371.58	112.37	88.16	3.001
8	344.68	28.44	349.06	26.98	374.74	111.32	88.16	3.001
9	338.73	30.42	343.33	28.89	367.89	110.26	85.00	3.001
10	339.94	30.02	344.32	28.56	370.00	112.89	88.16	3.001
11	338.36	30.55	342.74	29.09	368.42	113.42	88.16	3.001
12	343.46	28.85	348.06	27.31	372.63	108.68	85.00	3.001
13	341.88	29.37	346.48	27.84	371.05	109.21	85.00	3.001
14	343.10	28.97	347.48	27.51	373.16	111.84	88.16	3.001
15	341.18	29.61	345.30	28.23	372.11	115.53	91.32	3.001
16	335.57	31.48	340.17	29.94	364.74	111.32	85.00	3.001
17	340.31	29.90	344.91	28.36	369.47	109.74	85.00	3.001
18	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
19	345.04	28.32	349.64	26.79	374.21	108.16	85.00	3.001
20	340.68	29.77	345.47	28.18	368.95	106.58	81.84	3.001
21	339.10	30.30	343.90	28.70	367.37	107.11	81.84	3.001
22	337.53	30.82	342.32	29.23	365.79	107.63	81.84	3.001
23	341.70	29.43	347.61	27.46	373.68	115.53	91.84	3.002
24	340.12	29.96	346.03	27.99	372.11	116.05	91.84	3.002
25	334.22	31.93	340.26	29.91	365.26	115.00	88.68	3.002
26	338.55	30.48	344.45	28.52	370.53	116.58	91.84	3.002
27	343.69	28.77	349.73	26.76	374.74	111.84	88.68	3.002
28	338.95	30.35	345.00	28.33	370.00	113.42	88.68	3.002
29	342.11	29.30	348.15	27.28	373.16	112.37	88.68	3.002
30	340.53	29.82	346.57	27.81	371.58	112.89	88.68	3.002
31	335.79	31.40	341.84	29.39	366.84	114.47	88.68	3.002
32	337.37	30.88	343.42	28.86	368.42	113.95	88.68	3.002
33	334.63	31.79	340.79	29.74	364.74	111.84	85.53	3.002
34	339.37	30.21	345.53	28.16	369.47	110.26	85.53	3.002
35	337.79	30.74	343.95	28.68	367.89	110.79	85.53	3.002
36	342.53	29.16	348.68	27.11	372.63	109.21	85.53	3.002
37	344.11	28.63	350.26	26.58	374.21	108.68	85.53	3.002
38	336.21	31.26	342.37	29.21	366.32	111.32	85.53	3.002
39	340.95	29.68	347.11	27.63	371.05	109.74	85.53	3.002
40	336.64	31.12	342.89	29.04	365.79	108.16	82.37	3.002
41	338.22	30.59	344.47	28.51	367.37	107.63	82.37	3.002
42	341.37	29.54	347.63	27.46	370.53	106.58	82.37	3.002
43	339.79	30.07	346.05	27.98	368.95	107.11	82.37	3.002
44	338.14	30.62	345.49	28.17	370.00	113.95	89.21	3.002
45	333.40	32.20	340.76	29.75	365.26	115.53	89.21	3.002
46	339.72	30.09	347.07	27.64	371.58	113.42	89.21	3.002
47	336.56	31.15	343.91	28.70	368.42	114.47	89.21	3.002
48	334.98	31.67	342.33	29.22	366.84	115.00	89.21	3.002
49	342.88	29.04	350.23	26.59	374.74	112.37	89.21	3.002
50	341.30	29.57	348.65	27.12	373.16	112.89	89.21	3.003
51	341.74	29.42	349.15	26.95	372.63	109.74	86.05	3.003
52	337.01	31.00	344.41	28.53	367.89	111.32	86.05	3.003
53	335.43	31.52	342.84	29.05	366.32	111.84	86.05	3.003
54	343.32	28.89	350.73	26.42	374.21	109.21	86.05	3.003
55	340.16	29.95	347.57	27.48	371.05	110.26	86.05	3.003
56	335.88	31.37	343.33	28.89	365.79	108.68	82.89	3.003
57	338.59	30.47	345.99	28.00	369.47	110.79	86.05	3.003
58	340.62	29.79	348.07	27.31	370.53	107.11	82.89	3.003
59	333.85	32.05	341.26	29.58	364.74	112.37	86.05	3.003
60	339.04	30.32	346.49	27.84	368.95	107.63	82.89	3.003
61	337.46	30.85	344.91	28.36	367.37	108.16	82.89	3.003
62	342.20	29.27	349.65	26.78	372.11	106.58	82.89	3.003
63	339.00	30.33	347.47	27.51	371.58	113.95	89.74	3.003
64	334.26	31.91	342.74	29.09	366.84	115.53	89.74	3.003
65	332.68	32.44	341.16	29.61	365.26	116.05	89.74	3.003
66	337.42	30.86	345.90	28.03	370.00	114.47	89.74	3.003
67	340.58	29.81	349.05	26.98	373.16	113.42	89.74	3.003
68	342.16	29.28	350.63	26.46	374.74	112.89	89.74	3.003
69	335.84	31.39	344.32	28.56	368.42	115.00	89.74	3.003
70	336.31	31.23	344.80	28.40	367.89	111.84	86.58	3.003
71	333.15	32.28	341.64	29.45	364.74	112.89	86.58	3.004
72	341.05	29.65	349.53	26.82	372.63	110.26	86.58	3.004
73	337.89	30.70	346.37	27.88	369.47	111.32	86.58	3.004
74	339.47	30.18	347.95	27.35	371.05	110.79	86.58	3.004

75	334.73	31.76	343.22	28.93	366.32	112.37	86.58	3.004
76	342.63	29.12	351.11	26.30	374.21	109.74	86.58	3.004
77	339.94	30.02	348.43	27.19	370.53	107.63	83.42	3.004
78	336.78	31.07	345.27	28.24	367.37	108.68	83.42	3.004
79	343.10	28.97	351.59	26.14	373.68	106.58	83.42	3.004
80	339.92	30.03	349.40	26.87	373.16	113.95	90.26	3.004
81	341.52	29.49	350.01	26.66	372.11	107.11	83.42	3.004
82	335.20	31.60	343.69	28.77	365.79	109.21	83.42	3.004
83	335.18	31.61	344.66	28.45	368.42	115.53	90.26	3.004
84	338.36	30.55	346.85	27.72	368.95	108.16	83.42	3.004
85	338.34	30.55	347.82	27.39	371.58	114.47	90.26	3.004
86	333.60	32.13	343.08	28.97	366.84	116.05	90.26	3.004
87	341.50	29.50	350.97	26.34	374.74	113.42	90.26	3.004
88	332.03	32.66	341.50	29.50	365.26	116.58	90.26	3.004
89	336.76	31.08	346.24	27.92	370.00	115.00	90.26	3.004
90	332.51	32.50	341.96	29.35	364.74	113.42	87.11	3.004
91	338.83	30.39	348.28	27.24	371.05	111.32	87.11	3.004
92	334.09	31.97	343.54	28.82	366.32	112.89	87.11	3.004
93	341.98	29.34	351.44	26.19	374.21	110.26	87.11	3.004
94	340.40	29.87	349.86	26.71	372.63	110.79	87.11	3.004
95	335.67	31.44	345.12	28.29	367.89	112.37	87.11	3.004
96	337.25	30.92	346.70	27.77	369.47	111.84	87.11	3.004
97	340.89	29.70	350.32	26.56	372.11	107.63	83.95	3.005
98	336.16	31.28	345.58	28.14	367.37	109.21	83.95	3.005
99	339.32	30.23	348.74	27.09	370.53	108.16	83.95	3.005

Critical Failure Circle

Intersects: XL: 338.02 YL: 30.66 XR: 342.14 YR: 29.29
Centre: XC: 368.95 YC: 116.58 Radius: R: 91.32
Generated failure surface: (20 points)

338.02	30.66	338.23	30.58	338.45	30.51	338.67	30.43	338.88	30.35
339.10	30.28	339.31	30.21	339.53	30.13	339.75	30.06	339.96	29.99
340.18	29.91	340.40	29.84	340.61	29.77	340.83	29.70	341.05	29.63
341.27	29.56	341.48	29.49	341.70	29.42	341.92	29.35	342.14	29.29

Slice Geometry and Properties (38 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	338.02	0.00	19.7	0.11	0.11	1	0.00	45.0	0.01	0.00	0.10	0.95
2	338.13	0.00	19.7	0.11	0.11	1	0.00	45.0	0.05	0.00	0.40	0.95
3	338.23	0.00	19.6	0.11	0.11	1	0.00	45.0	0.08	0.00	0.65	0.95
4	338.34	0.00	19.6	0.11	0.11	1	0.00	45.0	0.11	0.00	0.89	0.95
5	338.45	0.00	19.4	0.11	0.11	1	0.00	45.0	0.13	0.00	1.11	0.95
6	338.56	0.00	19.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
7	338.67	0.00	19.3	0.11	0.11	1	0.00	45.0	0.18	0.00	1.52	0.95
8	338.77	0.00	19.3	0.11	0.11	1	0.00	45.0	0.20	0.00	1.69	0.95
9	338.88	0.00	19.2	0.11	0.11	1	0.00	45.0	0.22	0.00	1.86	0.95
10	338.99	0.00	19.2	0.11	0.11	1	0.00	45.0	0.24	0.00	2.00	0.95
11	339.10	0.00	19.0	0.11	0.11	1	0.00	45.0	0.26	0.00	2.14	0.95
12	339.20	0.00	19.0	0.11	0.11	1	0.00	45.0	0.27	0.00	2.26	0.95
13	339.31	0.00	18.9	0.11	0.11	1	0.00	45.0	0.29	0.00	2.37	0.95
14	339.42	0.00	18.9	0.11	0.11	1	0.00	45.0	0.30	0.00	2.46	0.95
15	339.53	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.53	0.95
16	339.64	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.59	0.95
17	339.75	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
18	339.85	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.67	0.95
19	339.96	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
20	340.07	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
21	340.18	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
22	340.29	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
23	340.40	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.60	0.95
24	340.50	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.54	0.95
25	340.61	0.00	18.0	0.11	0.11	1	0.00	45.0	0.29	0.00	2.43	0.95
26	340.72	0.00	18.0	0.11	0.11	1	0.00	45.0	0.28	0.00	2.36	0.95
27	340.83	0.00	17.9	0.11	0.11	1	0.00	45.0	0.27	0.00	2.28	0.95
28	340.94	0.00	17.9	0.11	0.11	1	0.00	45.0	0.26	0.00	2.16	0.95
29	341.05	0.00	17.7	0.11	0.11	1	0.00	45.0	0.24	0.00	1.99	0.95
30	341.16	0.00	17.7	0.11	0.11	1	0.00	45.0	0.22	0.00	1.87	0.95
31	341.27	0.00	17.6	0.11	0.11	1	0.00	45.0	0.21	0.00	1.71	0.95
32	341.38	0.00	17.6	0.11	0.11	1	0.00	45.0	0.18	0.00	1.48	0.95
33	341.48	0.00	17.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
34	341.59	0.00	17.4	0.11	0.11	1	0.00	45.0	0.14	0.00	1.13	0.95
35	341.70	0.00	17.3	0.11	0.11	1	0.00	45.0	0.10	0.00	0.86	0.95
36	341.81	0.00	17.3	0.11	0.11	1	0.00	45.0	0.08	0.00	0.66	0.95
37	341.92	0.00	17.1	0.11	0.11	1	0.00	45.0	0.05	0.00	0.41	0.95
38	342.03	0.00	17.1	0.11	0.11	1	0.00	45.0	0.01	0.00	0.11	0.95
		0.07			4.34				8.16			

X-S Area: 0.07 Path Length: 4.34 X-S Weight: 8.16

GALENA 6.10 Analysis Results — Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Revenue Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 1.gmf
Processed: 13 Nov 2015 10:15:43

DATA: Analysis 1 - Lab Scenario 1

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1730.00	25.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 265.00 YL: 50.00 XR: 337.61 YR: 30.80
Centre: XC: 325.00 YC: 130.00 Radius: R: 100.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	100.00
Trial positions within range:	20	20	20

RESULTS: Analysis 1 - Lab Scenario 1

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 8.66

There were: 4178 successful analyses from a total of 8001 trial circles
3823 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
2	323.82	35.39	329.18	33.61	353.95	116.84	86.84	3.001
3	328.25	33.92	334.22	31.93	348.68	85.26	55.26	3.004
4	344.04	28.65	350.01	26.66	364.47	80.00	55.26	3.004
5	328.19	33.94	343.75	28.75	375.00	148.42	123.68	3.006
6	317.69	37.44	332.15	32.62	353.95	122.11	92.11	3.009
7	333.48	32.17	347.94	27.35	369.74	116.84	92.11	3.009
8	323.19	35.60	345.60	28.13	375.00	153.68	128.95	3.011
9	339.20	30.27	351.70	26.10	364.47	85.26	60.53	3.016
10	323.41	35.53	335.91	31.36	348.68	90.53	60.53	3.016
11	329.01	33.66	349.25	26.92	369.74	122.11	97.37	3.016
12	318.83	37.06	346.80	27.73	375.00	158.95	134.21	3.016
13	325.00	35.00	350.10	26.63	369.74	127.37	102.63	3.022
14	335.25	31.58	352.48	25.84	364.47	90.53	65.79	3.026
15	319.46	36.85	336.70	31.10	348.68	95.79	65.79	3.026
16	321.22	36.26	350.72	26.43	369.74	132.63	107.89	3.028
17	317.58	37.47	351.21	26.26	369.74	137.89	113.16	3.033
18	331.59	32.80	352.98	25.67	364.47	95.79	71.05	3.034
19	328.08	33.97	353.34	25.55	364.47	101.05	76.32	3.041
20	324.65	35.12	353.61	25.46	364.47	106.32	81.58	3.048
21	321.28	36.24	353.82	25.39	364.47	111.58	86.84	3.053
22	317.95	37.35	354.00	25.33	364.47	116.84	92.11	3.058

23	316.61	37.80	339.55	30.15	343.42	80.00	50.00	3.081
24	329.19	33.60	355.39	24.87	359.21	80.00	55.26	3.086
25	341.77	29.41	371.23	19.59	375.00	80.00	60.53	3.091
26	325.99	34.67	355.44	24.85	359.21	85.26	60.53	3.091
27	338.58	30.47	371.26	19.58	375.00	85.26	65.79	3.095
28	322.79	35.74	355.47	24.84	359.21	90.53	65.79	3.095
29	335.40	31.53	371.29	19.57	375.00	90.53	71.05	3.099
30	319.61	36.80	355.50	24.83	359.21	95.79	71.05	3.099
31	316.43	37.86	355.52	24.83	359.21	101.05	76.32	3.102
32	332.21	32.60	371.31	19.56	375.00	95.79	76.32	3.102
33	329.04	33.65	371.33	19.56	375.00	101.05	81.58	3.104
34	325.86	34.71	371.35	19.55	375.00	106.32	86.84	3.106
35	322.69	35.77	371.36	19.55	375.00	111.58	92.11	3.108
36	319.52	36.83	371.38	19.54	375.00	116.84	97.37	3.110
37	316.35	37.88	371.39	19.54	375.00	122.11	102.63	3.112
38	316.21	37.93	371.52	19.49	369.74	106.32	86.84	3.161
39	319.37	36.88	371.52	19.49	369.74	101.05	81.58	3.162
40	322.54	35.82	371.52	19.49	369.74	95.79	76.32	3.163
41	325.70	34.77	371.51	19.50	369.74	90.53	71.05	3.165
42	328.86	33.71	371.51	19.50	369.74	85.26	65.79	3.167
43	332.02	32.66	371.50	19.50	369.74	80.00	60.53	3.169
44	316.24	37.92	355.71	24.76	353.95	85.26	60.53	3.169
45	319.40	36.87	355.71	24.76	353.95	80.00	55.26	3.172
46	316.99	37.67	370.75	19.75	364.47	90.53	71.05	3.233
47	320.20	36.60	370.69	19.77	364.47	85.26	65.79	3.241
48	323.42	35.53	370.64	19.79	364.47	80.00	60.53	3.250
49	318.15	37.28	385.38	14.87	375.00	95.79	81.58	3.282
50	321.40	36.20	385.28	14.91	375.00	90.53	76.32	3.292
51	324.67	35.11	385.17	14.94	375.00	85.26	71.05	3.304
52	327.95	34.02	385.05	14.98	375.00	80.00	65.79	3.317
53	316.97	37.68	383.39	15.54	369.74	85.26	71.05	3.376
54	279.01	50.00	377.33	17.56	343.42	80.00	71.05	3.389
55	320.33	36.56	383.19	15.60	369.74	80.00	65.79	3.396
56	314.92	38.35	385.47	14.84	375.00	101.05	86.84	3.453
57	315.46	38.18	369.13	20.29	359.21	80.00	60.53	3.479
58	318.25	37.25	394.75	11.75	375.00	80.00	71.05	3.528
59	315.81	38.06	337.19	30.94	348.68	101.05	71.05	3.534
60	314.77	38.40	395.09	11.64	375.00	85.26	76.32	3.634
61	313.66	38.76	383.57	15.48	369.74	90.53	76.32	3.719
62	313.82	38.71	370.79	19.74	364.47	95.79	76.32	3.810
63	264.73	50.00	429.74	0.09	375.00	116.84	128.95	3.834
64	266.26	50.00	429.99	0.00	369.74	95.79	113.16	3.852
65	267.73	50.00	429.03	0.32	375.00	111.58	123.68	3.857
66	251.18	50.00	429.43	0.19	364.47	111.58	128.95	3.869
67	270.83	50.00	428.30	0.57	375.00	106.32	118.42	3.888
68	254.35	50.00	428.51	0.50	364.47	106.32	123.68	3.889
69	250.91	50.00	428.68	0.44	369.74	132.63	144.74	3.893
70	248.19	50.00	429.31	0.23	369.74	137.89	150.00	3.894
71	253.69	50.00	428.02	0.66	369.74	127.37	139.47	3.896
72	311.72	39.39	385.55	14.82	375.00	106.32	92.11	3.896
73	269.74	50.00	428.97	0.34	369.74	90.53	107.89	3.902
74	256.54	50.00	427.34	0.89	369.74	122.11	134.21	3.903
75	257.62	50.00	427.54	0.82	364.47	101.05	118.42	3.913
76	259.47	50.00	426.63	1.12	369.74	116.84	128.95	3.916
77	313.06	38.95	381.02	16.33	364.47	80.00	65.79	3.921
78	311.34	39.51	395.39	11.54	375.00	90.53	81.58	3.922
79	274.01	50.00	427.53	0.82	375.00	101.05	113.16	3.930
80	262.47	50.00	425.88	1.37	369.74	111.58	123.68	3.932
81	250.00	50.00	429.20	0.27	359.21	95.79	118.42	3.945
82	260.99	50.00	426.52	1.16	364.47	95.79	113.16	3.947
83	265.56	50.00	425.10	1.63	369.74	106.32	118.42	3.958
84	234.02	50.00	429.55	0.15	359.21	132.63	150.00	3.966
85	236.89	50.00	428.73	0.42	359.21	127.37	144.74	3.967
86	273.35	50.00	427.90	0.70	369.74	85.26	102.63	3.968
87	239.82	50.00	427.88	0.71	359.21	122.11	139.47	3.970
88	242.83	50.00	426.99	1.00	359.21	116.84	134.21	3.976
89	266.32	50.00	429.13	0.29	364.47	80.00	102.63	3.983
90	253.56	50.00	427.99	0.67	359.21	90.53	113.16	3.984
91	277.30	50.00	426.71	1.10	375.00	95.79	107.89	3.985
92	245.92	50.00	426.06	1.31	359.21	111.58	128.95	3.987
93	313.11	38.94	371.53	19.49	369.74	111.58	92.11	3.990
94	264.48	50.00	425.45	1.52	364.47	90.53	107.89	3.992
95	268.75	50.00	424.28	1.91	369.74	101.05	113.16	3.993
96	248.43	50.00	424.94	1.69	364.47	127.37	139.47	3.996
97	245.64	50.00	425.64	1.45	364.47	132.63	144.74	3.996
98	242.92	50.00	426.31	1.23	364.47	137.89	150.00	4.000
99	251.28	50.00	424.22	1.93	364.47	122.11	134.21	4.000

Critical Failure Circle

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34

Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Generated failure surface: (20 points)

339.61	30.13	339.89	30.03	340.17	29.93	340.45	29.82	340.73	29.72
341.01	29.63	341.29	29.53	341.57	29.43	341.85	29.34	342.13	29.24
342.42	29.15	342.70	29.05	342.98	28.96	343.26	28.87	343.55	28.78
343.83	28.69	344.11	28.60	344.40	28.52	344.68	28.43	344.97	28.34

Slice Geometry and Properties (38 slices)

Slice	X-Left	X-S Area	Base Angle	Base Width	Base Length	Base Matl	Base Cohesion	Base Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	339.61	0.00	20.2	0.14	0.15	1	0.00	45.0	0.03	0.00	0.20	0.95
2	339.75	0.00	20.2	0.14	0.15	1	0.00	45.0	0.11	0.00	0.71	0.95
3	339.89	0.00	20.0	0.14	0.15	1	0.00	45.0	0.18	0.00	1.13	0.95
4	340.03	0.00	20.0	0.14	0.15	1	0.00	45.0	0.25	0.00	1.58	0.95
5	340.17	0.00	19.8	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
6	340.31	0.00	19.8	0.14	0.15	1	0.00	45.0	0.37	0.00	2.34	0.95
7	340.45	0.00	19.6	0.14	0.15	1	0.00	45.0	0.42	0.00	2.69	0.95
8	340.59	0.00	19.6	0.14	0.15	1	0.00	45.0	0.47	0.00	2.98	0.95
9	340.73	0.00	19.4	0.14	0.15	1	0.00	45.0	0.52	0.00	3.30	0.95
10	340.87	0.01	19.4	0.14	0.15	1	0.00	45.0	0.56	0.00	3.56	0.95
11	341.01	0.01	19.2	0.14	0.15	1	0.00	45.0	0.59	0.00	3.79	0.95
12	341.15	0.01	19.2	0.14	0.15	1	0.00	45.0	0.62	0.00	3.98	0.95
13	341.29	0.01	19.0	0.14	0.15	1	0.00	45.0	0.66	0.00	4.20	0.95
14	341.43	0.01	19.0	0.14	0.15	1	0.00	45.0	0.68	0.00	4.36	0.95
15	341.57	0.01	18.8	0.14	0.15	1	0.00	45.0	0.71	0.00	4.50	0.95
16	341.71	0.01	18.8	0.14	0.15	1	0.00	45.0	0.72	0.00	4.61	0.95
17	341.85	0.01	18.6	0.14	0.15	1	0.00	45.0	0.73	0.00	4.69	0.95
18	341.99	0.01	18.6	0.14	0.15	1	0.00	45.0	0.74	0.00	4.73	0.95
19	342.13	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
20	342.28	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
21	342.42	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.74	0.95
22	342.56	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.69	0.95
23	342.70	0.01	18.0	0.14	0.15	1	0.00	45.0	0.72	0.00	4.63	0.95
24	342.84	0.01	18.0	0.14	0.15	1	0.00	45.0	0.71	0.00	4.52	0.95
25	342.98	0.01	17.8	0.14	0.15	1	0.00	45.0	0.69	0.00	4.39	0.95
26	343.12	0.01	17.8	0.14	0.15	1	0.00	45.0	0.66	0.00	4.23	0.95
27	343.26	0.01	17.7	0.14	0.15	1	0.00	45.0	0.63	0.00	4.01	0.95
28	343.41	0.01	17.7	0.14	0.15	1	0.00	45.0	0.60	0.00	3.81	0.95
29	343.55	0.01	17.5	0.14	0.15	1	0.00	45.0	0.56	0.00	3.60	0.95
30	343.69	0.00	17.5	0.14	0.15	1	0.00	45.0	0.52	0.00	3.34	0.95
31	343.83	0.00	17.3	0.14	0.15	1	0.00	45.0	0.47	0.00	3.00	0.95
32	343.97	0.00	17.3	0.14	0.15	1	0.00	45.0	0.42	0.00	2.71	0.95
33	344.11	0.00	17.1	0.14	0.15	1	0.00	45.0	0.37	0.00	2.38	0.95
34	344.26	0.00	17.1	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
35	344.40	0.00	16.9	0.14	0.15	1	0.00	45.0	0.25	0.00	1.60	0.95
36	344.54	0.00	16.9	0.14	0.15	1	0.00	45.0	0.18	0.00	1.18	0.95
37	344.68	0.00	16.7	0.14	0.15	1	0.00	45.0	0.11	0.00	0.70	0.95
38	344.83	0.00	16.7	0.14	0.15	1	0.00	45.0	0.04	0.00	0.24	0.95
X-S Area:		0.17	Path Length:		5.65		X-S Weight:		18.88			

DATA: Analysis 2 - Lab Scenario 1 pt2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
1730.00 25.0 109.90 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock
0.00 0.00 0.00 40.00 316.00 38.00 430.00 0.00
Profile: 2 (4 points) Material beneath: 2 - Mill tailings
0.00 50.00 279.00 50.00 316.00 38.00 0.00 40.00

Slope Surface (4 points)

0.00 50.00 279.00 50.00 316.00 38.00 430.00 0.00

Phreatic Surface (2 points)

0.00 0.00 500.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34
Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	10.00	10.00	10.00
Trial positions within range:	20	20	20

RESULTS: Analysis 2 - Lab Scenario 1 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.00

There were: 4022 successful analyses from a total of 8001 trial circles
3979 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	338.02	30.66	342.14	29.29	368.95	116.58	91.32	3.000
2	342.76	29.08	346.88	27.71	373.68	115.00	91.32	3.001
3	339.60	30.13	343.72	28.76	370.53	116.05	91.32	3.001
4	335.21	31.60	339.58	30.14	365.26	114.47	88.16	3.001
5	337.15	30.95	341.75	29.42	366.32	110.79	85.00	3.001
6	336.78	31.07	341.16	29.61	366.84	113.95	88.16	3.001
7	341.52	29.49	345.90	28.03	371.58	112.37	88.16	3.001
8	344.68	28.44	349.06	26.98	374.74	111.32	88.16	3.001
9	338.73	30.42	343.33	28.89	367.89	110.26	85.00	3.001
10	339.94	30.02	344.32	28.56	370.00	112.89	88.16	3.001
11	338.36	30.55	342.74	29.09	368.42	113.42	88.16	3.001
12	343.46	28.85	348.06	27.31	372.63	108.68	85.00	3.001
13	341.88	29.37	346.48	27.84	371.05	109.21	85.00	3.001
14	343.10	28.97	347.48	27.51	373.16	111.84	88.16	3.001
15	341.18	29.61	345.30	28.23	372.11	115.53	91.32	3.001
16	335.57	31.48	340.17	29.94	364.74	111.32	85.00	3.001
17	340.31	29.90	344.91	28.36	369.47	109.74	85.00	3.001
18	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
19	345.04	28.32	349.64	26.79	374.21	108.16	85.00	3.001
20	340.68	29.77	345.47	28.18	368.95	106.58	81.84	3.001
21	339.10	30.30	343.90	28.70	367.37	107.11	81.84	3.001
22	337.53	30.82	342.32	29.23	365.79	107.63	81.84	3.001
23	341.70	29.43	347.61	27.46	373.68	115.53	91.84	3.002
24	340.12	29.96	346.03	27.99	372.11	116.05	91.84	3.002
25	334.22	31.93	340.26	29.91	365.26	115.00	88.68	3.002
26	338.55	30.48	344.45	28.52	370.53	116.58	91.84	3.002
27	343.69	28.77	349.73	26.76	374.74	111.84	88.68	3.002
28	338.95	30.35	345.00	28.33	370.00	113.42	88.68	3.002
29	342.11	29.30	348.15	27.28	373.16	112.37	88.68	3.002
30	340.53	29.82	346.57	27.81	371.58	112.89	88.68	3.002
31	335.79	31.40	341.84	29.39	366.84	114.47	88.68	3.002
32	337.37	30.88	343.42	28.86	368.42	113.95	88.68	3.002
33	334.63	31.79	340.79	29.74	364.74	111.84	85.53	3.002
34	339.37	30.21	345.53	28.16	369.47	110.26	85.53	3.002
35	337.79	30.74	343.95	28.68	367.89	110.79	85.53	3.002
36	342.53	29.16	348.68	27.11	372.63	109.21	85.53	3.002
37	344.11	28.63	350.26	26.58	374.21	108.68	85.53	3.002
38	336.21	31.26	342.37	29.21	366.32	111.32	85.53	3.002
39	340.95	29.68	347.11	27.63	371.05	109.74	85.53	3.002
40	336.64	31.12	342.89	29.04	365.79	108.16	82.37	3.002
41	338.22	30.59	344.47	28.51	367.37	107.63	82.37	3.002
42	341.37	29.54	347.63	27.46	370.53	106.58	82.37	3.002
43	339.79	30.07	346.05	27.98	368.95	107.11	82.37	3.002
44	338.14	30.62	345.49	28.17	370.00	113.95	89.21	3.002
45	333.40	32.20	340.76	29.75	365.26	115.53	89.21	3.002
46	339.72	30.09	347.07	27.64	371.58	113.42	89.21	3.002
47	336.56	31.15	343.91	28.70	368.42	114.47	89.21	3.002
48	334.98	31.67	342.33	29.22	366.84	115.00	89.21	3.002
49	342.88	29.04	350.23	26.59	374.74	112.37	89.21	3.002
50	341.30	29.57	348.65	27.12	373.16	112.89	89.21	3.003
51	341.74	29.42	349.15	26.95	372.63	109.74	86.05	3.003
52	337.01	31.00	344.41	28.53	367.89	111.32	86.05	3.003
53	335.43	31.52	342.84	29.05	366.32	111.84	86.05	3.003
54	343.32	28.89	350.73	26.42	374.21	109.21	86.05	3.003
55	340.16	29.95	347.57	27.48	371.05	110.26	86.05	3.003
56	335.88	31.37	343.33	28.89	365.79	108.68	82.89	3.003
57	338.59	30.47	345.99	28.00	369.47	110.79	86.05	3.003
58	340.62	29.79	348.07	27.31	370.53	107.11	82.89	3.003
59	333.85	32.05	341.26	29.58	364.74	112.37	86.05	3.003
60	339.04	30.32	346.49	27.84	368.95	107.63	82.89	3.003
61	337.46	30.85	344.91	28.36	367.37	108.16	82.89	3.003
62	342.20	29.27	349.65	26.78	372.11	106.58	82.89	3.003
63	339.00	30.33	347.47	27.51	371.58	113.95	89.74	3.003
64	334.26	31.91	342.74	29.09	366.84	115.53	89.74	3.003
65	332.68	32.44	341.16	29.61	365.26	116.05	89.74	3.003
66	337.42	30.86	345.90	28.03	370.00	114.47	89.74	3.003
67	340.58	29.81	349.05	26.98	373.16	113.42	89.74	3.003
68	342.16	29.28	350.63	26.46	374.74	112.89	89.74	3.003
69	335.84	31.39	344.32	28.56	368.42	115.00	89.74	3.003
70	336.31	31.23	344.80	28.40	367.89	111.84	86.58	3.003
71	333.15	32.28	341.64	29.45	364.74	112.89	86.58	3.004
72	341.05	29.65	349.53	26.82	372.63	110.26	86.58	3.004
73	337.89	30.70	346.37	27.88	369.47	111.32	86.58	3.004
74	339.47	30.18	347.95	27.35	371.05	110.79	86.58	3.004

75	334.73	31.76	343.22	28.93	366.32	112.37	86.58	3.004
76	342.63	29.12	351.11	26.30	374.21	109.74	86.58	3.004
77	339.94	30.02	348.43	27.19	370.53	107.63	83.42	3.004
78	336.78	31.07	345.27	28.24	367.37	108.68	83.42	3.004
79	343.10	28.97	351.59	26.14	373.68	106.58	83.42	3.004
80	339.92	30.03	349.40	26.87	373.16	113.95	90.26	3.004
81	341.52	29.49	350.01	26.66	372.11	107.11	83.42	3.004
82	335.20	31.60	343.69	28.77	365.79	109.21	83.42	3.004
83	335.18	31.61	344.66	28.45	368.42	115.53	90.26	3.004
84	338.36	30.55	346.85	27.72	368.95	108.16	83.42	3.004
85	338.34	30.55	347.82	27.39	371.58	114.47	90.26	3.004
86	333.60	32.13	343.08	28.97	366.84	116.05	90.26	3.004
87	341.50	29.50	350.97	26.34	374.74	113.42	90.26	3.004
88	332.03	32.66	341.50	29.50	365.26	116.58	90.26	3.004
89	336.76	31.08	346.24	27.92	370.00	115.00	90.26	3.004
90	332.51	32.50	341.96	29.35	364.74	113.42	87.11	3.004
91	338.83	30.39	348.28	27.24	371.05	111.32	87.11	3.004
92	334.09	31.97	343.54	28.82	366.32	112.89	87.11	3.004
93	341.98	29.34	351.44	26.19	374.21	110.26	87.11	3.004
94	340.40	29.87	349.86	26.71	372.63	110.79	87.11	3.004
95	335.67	31.44	345.12	28.29	367.89	112.37	87.11	3.004
96	337.25	30.92	346.70	27.77	369.47	111.84	87.11	3.004
97	340.89	29.70	350.32	26.56	372.11	107.63	83.95	3.005
98	336.16	31.28	345.58	28.14	367.37	109.21	83.95	3.005
99	339.32	30.23	348.74	27.09	370.53	108.16	83.95	3.005

Critical Failure Circle

Intersects: XL: 338.02 YL: 30.66 XR: 342.14 YR: 29.29
Centre: XC: 368.95 YC: 116.58 Radius: R: 91.32
Generated failure surface: (20 points)

338.02	30.66	338.23	30.58	338.45	30.51	338.67	30.43	338.88	30.35
339.10	30.28	339.31	30.21	339.53	30.13	339.75	30.06	339.96	29.99
340.18	29.91	340.40	29.84	340.61	29.77	340.83	29.70	341.05	29.63
341.27	29.56	341.48	29.49	341.70	29.42	341.92	29.35	342.14	29.29

Slice Geometry and Properties (38 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	338.02	0.00	19.7	0.11	0.11	1	0.00	45.0	0.01	0.00	0.10	0.95
2	338.13	0.00	19.7	0.11	0.11	1	0.00	45.0	0.05	0.00	0.40	0.95
3	338.23	0.00	19.6	0.11	0.11	1	0.00	45.0	0.08	0.00	0.65	0.95
4	338.34	0.00	19.6	0.11	0.11	1	0.00	45.0	0.11	0.00	0.89	0.95
5	338.45	0.00	19.4	0.11	0.11	1	0.00	45.0	0.13	0.00	1.11	0.95
6	338.56	0.00	19.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
7	338.67	0.00	19.3	0.11	0.11	1	0.00	45.0	0.18	0.00	1.52	0.95
8	338.77	0.00	19.3	0.11	0.11	1	0.00	45.0	0.20	0.00	1.69	0.95
9	338.88	0.00	19.2	0.11	0.11	1	0.00	45.0	0.22	0.00	1.86	0.95
10	338.99	0.00	19.2	0.11	0.11	1	0.00	45.0	0.24	0.00	2.00	0.95
11	339.10	0.00	19.0	0.11	0.11	1	0.00	45.0	0.26	0.00	2.14	0.95
12	339.20	0.00	19.0	0.11	0.11	1	0.00	45.0	0.27	0.00	2.26	0.95
13	339.31	0.00	18.9	0.11	0.11	1	0.00	45.0	0.29	0.00	2.37	0.95
14	339.42	0.00	18.9	0.11	0.11	1	0.00	45.0	0.30	0.00	2.46	0.95
15	339.53	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.53	0.95
16	339.64	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.59	0.95
17	339.75	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
18	339.85	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.67	0.95
19	339.96	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
20	340.07	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
21	340.18	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
22	340.29	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
23	340.40	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.60	0.95
24	340.50	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.54	0.95
25	340.61	0.00	18.0	0.11	0.11	1	0.00	45.0	0.29	0.00	2.43	0.95
26	340.72	0.00	18.0	0.11	0.11	1	0.00	45.0	0.28	0.00	2.36	0.95
27	340.83	0.00	17.9	0.11	0.11	1	0.00	45.0	0.27	0.00	2.28	0.95
28	340.94	0.00	17.9	0.11	0.11	1	0.00	45.0	0.26	0.00	2.16	0.95
29	341.05	0.00	17.7	0.11	0.11	1	0.00	45.0	0.24	0.00	1.99	0.95
30	341.16	0.00	17.7	0.11	0.11	1	0.00	45.0	0.22	0.00	1.87	0.95
31	341.27	0.00	17.6	0.11	0.11	1	0.00	45.0	0.21	0.00	1.71	0.95
32	341.38	0.00	17.6	0.11	0.11	1	0.00	45.0	0.18	0.00	1.48	0.95
33	341.48	0.00	17.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
34	341.59	0.00	17.4	0.11	0.11	1	0.00	45.0	0.14	0.00	1.13	0.95
35	341.70	0.00	17.3	0.11	0.11	1	0.00	45.0	0.10	0.00	0.86	0.95
36	341.81	0.00	17.3	0.11	0.11	1	0.00	45.0	0.08	0.00	0.66	0.95
37	341.92	0.00	17.1	0.11	0.11	1	0.00	45.0	0.05	0.00	0.41	0.95
38	342.03	0.00	17.1	0.11	0.11	1	0.00	45.0	0.01	0.00	0.11	0.95
		0.07			4.34				8.16			

X-S Area: 0.07 Path Length: 4.34 X-S Weight: 8.16

Project: Ouray Silver Mine - Revenue Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 2.gmf
Processed: 13 Nov 2015 10:25:24

DATA: Analysis 1 - Lab Scenario 2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2040.00	25.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 265.00 YL: 50.00 XR: 337.61 YR: 30.80
Centre: XC: 325.00 YC: 130.00 Radius: R: 100.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	100.00
Trial positions within range:	20	20	20

RESULTS: Analysis 1 - Lab Scenario 2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 9.84

There were: 4177 successful analyses from a total of 8001 trial circles
3823 analyses terminated due to unacceptable geometry
1 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
2	323.82	35.39	329.18	33.61	353.95	116.84	86.84	3.001
3	328.25	33.92	334.22	31.93	348.68	85.26	55.26	3.004
4	344.04	28.65	350.01	26.66	364.47	80.00	55.26	3.004
5	328.19	33.94	343.75	28.75	375.00	148.42	123.68	3.006
6	317.69	37.44	332.15	32.62	353.95	122.11	92.11	3.009
7	333.48	32.17	347.94	27.35	369.74	116.84	92.11	3.009
8	323.19	35.60	345.60	28.13	375.00	153.68	128.95	3.011
9	339.20	30.27	351.70	26.10	364.47	85.26	60.53	3.016
10	323.41	35.53	335.91	31.36	348.68	90.53	60.53	3.016
11	329.01	33.66	349.25	26.92	369.74	122.11	97.37	3.016
12	318.83	37.06	346.80	27.73	375.00	158.95	134.21	3.016
13	325.00	35.00	350.10	26.63	369.74	127.37	102.63	3.022
14	335.25	31.58	352.48	25.84	364.47	90.53	65.79	3.026
15	319.46	36.85	336.70	31.10	348.68	95.79	65.79	3.026
16	321.22	36.26	350.72	26.43	369.74	132.63	107.89	3.028
17	317.58	37.47	351.21	26.26	369.74	137.89	113.16	3.033
18	331.59	32.80	352.98	25.67	364.47	95.79	71.05	3.034
19	328.08	33.97	353.34	25.55	364.47	101.05	76.32	3.041
20	324.65	35.12	353.61	25.46	364.47	106.32	81.58	3.048
21	321.28	36.24	353.82	25.39	364.47	111.58	86.84	3.053

22	317.95	37.35	354.00	25.33	364.47	116.84	92.11	3.058
23	316.61	37.80	339.55	30.15	343.42	80.00	50.00	3.081
24	329.19	33.60	355.39	24.87	359.21	80.00	55.26	3.086
25	341.77	29.41	371.23	19.59	375.00	80.00	60.53	3.091
26	325.99	34.67	355.44	24.85	359.21	85.26	60.53	3.091
27	338.58	30.47	371.26	19.58	375.00	85.26	65.79	3.095
28	322.79	35.74	355.47	24.84	359.21	90.53	65.79	3.095
29	335.40	31.53	371.29	19.57	375.00	90.53	71.05	3.099
30	319.61	36.80	355.50	24.83	359.21	95.79	71.05	3.099
31	316.43	37.86	355.52	24.83	359.21	101.05	76.32	3.102
32	332.21	32.60	371.31	19.56	375.00	95.79	76.32	3.102
33	329.04	33.65	371.33	19.56	375.00	101.05	81.58	3.104
34	325.86	34.71	371.35	19.55	375.00	106.32	86.84	3.106
35	322.69	35.77	371.36	19.55	375.00	111.58	92.11	3.108
36	319.52	36.83	371.38	19.54	375.00	116.84	97.37	3.110
37	316.35	37.88	371.39	19.54	375.00	122.11	102.63	3.112
38	316.21	37.93	371.52	19.49	369.74	106.32	86.84	3.161
39	319.37	36.88	371.52	19.49	369.74	101.05	81.58	3.162
40	322.54	35.82	371.52	19.49	369.74	95.79	76.32	3.163
41	325.70	34.77	371.51	19.50	369.74	90.53	71.05	3.165
42	328.86	33.71	371.51	19.50	369.74	85.26	65.79	3.167
43	332.02	32.66	371.50	19.50	369.74	80.00	60.53	3.169
44	316.24	37.92	355.71	24.76	353.95	85.26	60.53	3.169
45	319.40	36.87	355.71	24.76	353.95	80.00	55.26	3.172
46	316.99	37.67	370.75	19.75	364.47	90.53	71.05	3.233
47	320.20	36.60	370.69	19.77	364.47	85.26	65.79	3.241
48	323.42	35.53	370.64	19.79	364.47	80.00	60.53	3.250
49	318.15	37.28	385.38	14.87	375.00	95.79	81.58	3.282
50	321.40	36.20	385.28	14.91	375.00	90.53	76.32	3.292
51	324.67	35.11	385.17	14.94	375.00	85.26	71.05	3.304
52	327.95	34.02	385.05	14.98	375.00	80.00	65.79	3.317
53	316.97	37.68	383.39	15.54	369.74	85.26	71.05	3.376
54	320.33	36.56	383.19	15.60	369.74	80.00	65.79	3.396
55	314.92	38.35	385.47	14.84	375.00	101.05	86.84	3.485
56	315.46	38.18	369.13	20.29	359.21	80.00	60.53	3.506
57	318.25	37.25	394.75	11.75	375.00	80.00	71.05	3.528
58	315.81	38.06	337.19	30.94	348.68	101.05	71.05	3.623
59	314.77	38.40	395.09	11.64	375.00	85.26	76.32	3.659
60	313.66	38.76	383.57	15.48	369.74	90.53	76.32	3.785
61	313.82	38.71	370.79	19.74	364.47	95.79	76.32	3.916
62	313.06	38.95	381.02	16.33	364.47	80.00	65.79	4.004
63	311.34	39.51	395.39	11.54	375.00	90.53	81.58	4.006
64	264.73	50.00	429.74	0.09	375.00	116.84	128.95	4.008
65	311.72	39.39	385.55	14.82	375.00	106.32	92.11	4.014
66	266.26	50.00	429.99	0.00	369.74	95.79	113.16	4.014
67	267.73	50.00	429.03	0.32	375.00	111.58	123.68	4.029
68	251.18	50.00	429.43	0.19	364.47	111.58	128.95	4.045
69	270.83	50.00	428.30	0.57	375.00	106.32	118.42	4.058
70	254.35	50.00	428.51	0.50	364.47	106.32	123.68	4.063
71	269.74	50.00	428.97	0.34	369.74	90.53	107.89	4.064
72	250.91	50.00	428.68	0.44	369.74	132.63	144.74	4.081
73	253.69	50.00	428.02	0.66	369.74	127.37	139.47	4.081
74	248.19	50.00	429.31	0.23	369.74	137.89	150.00	4.084
75	256.54	50.00	427.34	0.89	369.74	122.11	134.21	4.086
76	257.62	50.00	427.54	0.82	364.47	101.05	118.42	4.086
77	259.47	50.00	426.63	1.12	369.74	116.84	128.95	4.096
78	274.01	50.00	427.53	0.82	375.00	101.05	113.16	4.097
79	262.47	50.00	425.88	1.37	369.74	111.58	123.68	4.112
80	250.00	50.00	429.20	0.27	359.21	95.79	118.42	4.117
81	260.99	50.00	426.52	1.16	364.47	95.79	113.16	4.119
82	273.35	50.00	427.90	0.70	369.74	85.26	102.63	4.129
83	265.56	50.00	425.10	1.63	369.74	106.32	118.42	4.135
84	313.11	38.94	371.53	19.49	369.74	111.58	92.11	4.142
85	266.32	50.00	429.13	0.29	364.47	80.00	102.63	4.143
86	277.30	50.00	426.71	1.10	375.00	95.79	107.89	4.151
87	311.35	39.51	392.21	12.60	369.74	80.00	71.05	4.154
88	253.56	50.00	427.99	0.67	359.21	90.53	113.16	4.155
89	236.89	50.00	428.73	0.42	359.21	127.37	144.74	4.157
90	239.82	50.00	427.88	0.71	359.21	122.11	139.47	4.158
91	234.02	50.00	429.55	0.15	359.21	132.63	150.00	4.158
92	242.83	50.00	426.99	1.00	359.21	116.84	134.21	4.162
93	264.48	50.00	425.45	1.52	364.47	90.53	107.89	4.163
94	268.75	50.00	424.28	1.91	369.74	101.05	113.16	4.169
95	245.92	50.00	426.06	1.31	359.21	111.58	128.95	4.172
96	313.25	38.89	371.40	19.53	375.00	127.37	107.89	4.182
97	249.09	50.00	425.09	1.64	359.21	106.32	123.68	4.187
98	248.43	50.00	424.94	1.69	364.47	127.37	139.47	4.190
99	251.28	50.00	424.22	1.93	364.47	122.11	134.21	4.192

Critical Failure Circle

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34

Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Generated failure surface: (20 points)

339.61	30.13	339.89	30.03	340.17	29.93	340.45	29.82	340.73	29.72
341.01	29.63	341.29	29.53	341.57	29.43	341.85	29.34	342.13	29.24
342.42	29.15	342.70	29.05	342.98	28.96	343.26	28.87	343.55	28.78
343.83	28.69	344.11	28.60	344.40	28.52	344.68	28.43	344.97	28.34

Slice Geometry and Properties (38 slices)

Slice	X-Left	X-S Area	Base Angle	Base Width	Base Length	Base Matl	Base Cohesion	Base Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	339.61	0.00	20.2	0.14	0.15	1	0.00	45.0	0.03	0.00	0.20	0.95
2	339.75	0.00	20.2	0.14	0.15	1	0.00	45.0	0.11	0.00	0.71	0.95
3	339.89	0.00	20.0	0.14	0.15	1	0.00	45.0	0.18	0.00	1.13	0.95
4	340.03	0.00	20.0	0.14	0.15	1	0.00	45.0	0.25	0.00	1.58	0.95
5	340.17	0.00	19.8	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
6	340.31	0.00	19.8	0.14	0.15	1	0.00	45.0	0.37	0.00	2.34	0.95
7	340.45	0.00	19.6	0.14	0.15	1	0.00	45.0	0.42	0.00	2.69	0.95
8	340.59	0.00	19.6	0.14	0.15	1	0.00	45.0	0.47	0.00	2.98	0.95
9	340.73	0.00	19.4	0.14	0.15	1	0.00	45.0	0.52	0.00	3.30	0.95
10	340.87	0.01	19.4	0.14	0.15	1	0.00	45.0	0.56	0.00	3.56	0.95
11	341.01	0.01	19.2	0.14	0.15	1	0.00	45.0	0.59	0.00	3.79	0.95
12	341.15	0.01	19.2	0.14	0.15	1	0.00	45.0	0.62	0.00	3.98	0.95
13	341.29	0.01	19.0	0.14	0.15	1	0.00	45.0	0.66	0.00	4.20	0.95
14	341.43	0.01	19.0	0.14	0.15	1	0.00	45.0	0.68	0.00	4.36	0.95
15	341.57	0.01	18.8	0.14	0.15	1	0.00	45.0	0.71	0.00	4.50	0.95
16	341.71	0.01	18.8	0.14	0.15	1	0.00	45.0	0.72	0.00	4.61	0.95
17	341.85	0.01	18.6	0.14	0.15	1	0.00	45.0	0.73	0.00	4.69	0.95
18	341.99	0.01	18.6	0.14	0.15	1	0.00	45.0	0.74	0.00	4.73	0.95
19	342.13	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
20	342.28	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
21	342.42	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.74	0.95
22	342.56	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.69	0.95
23	342.70	0.01	18.0	0.14	0.15	1	0.00	45.0	0.72	0.00	4.63	0.95
24	342.84	0.01	18.0	0.14	0.15	1	0.00	45.0	0.71	0.00	4.52	0.95
25	342.98	0.01	17.8	0.14	0.15	1	0.00	45.0	0.69	0.00	4.39	0.95
26	343.12	0.01	17.8	0.14	0.15	1	0.00	45.0	0.66	0.00	4.23	0.95
27	343.26	0.01	17.7	0.14	0.15	1	0.00	45.0	0.63	0.00	4.01	0.95
28	343.41	0.01	17.7	0.14	0.15	1	0.00	45.0	0.60	0.00	3.81	0.95
29	343.55	0.01	17.5	0.14	0.15	1	0.00	45.0	0.56	0.00	3.60	0.95
30	343.69	0.00	17.5	0.14	0.15	1	0.00	45.0	0.52	0.00	3.34	0.95
31	343.83	0.00	17.3	0.14	0.15	1	0.00	45.0	0.47	0.00	3.00	0.95
32	343.97	0.00	17.3	0.14	0.15	1	0.00	45.0	0.42	0.00	2.71	0.95
33	344.11	0.00	17.1	0.14	0.15	1	0.00	45.0	0.37	0.00	2.38	0.95
34	344.26	0.00	17.1	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
35	344.40	0.00	16.9	0.14	0.15	1	0.00	45.0	0.25	0.00	1.60	0.95
36	344.54	0.00	16.9	0.14	0.15	1	0.00	45.0	0.18	0.00	1.18	0.95
37	344.68	0.00	16.7	0.14	0.15	1	0.00	45.0	0.11	0.00	0.70	0.95
38	344.83	0.00	16.7	0.14	0.15	1	0.00	45.0	0.04	0.00	0.24	0.95
X-S Area:		0.17	Path Length:		5.65		X-S Weight:		18.88			

DATA: Analysis 2 - Lab Scenario 2 pt2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2040.00	25.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34

Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	10.00	10.00	10.00
Trial positions within range:	20	20	20

RESULTS: Analysis 2 - Lab Scenario 2 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.00

There were: 4022 successful analyses from a total of 8001 trial circles
3979 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	338.02	30.66	342.14	29.29	368.95	116.58	91.32	3.000
2	342.76	29.08	346.88	27.71	373.68	115.00	91.32	3.001
3	339.60	30.13	343.72	28.76	370.53	116.05	91.32	3.001
4	335.21	31.60	339.58	30.14	365.26	114.47	88.16	3.001
5	337.15	30.95	341.75	29.42	366.32	110.79	85.00	3.001
6	336.78	31.07	341.16	29.61	366.84	113.95	88.16	3.001
7	341.52	29.49	345.90	28.03	371.58	112.37	88.16	3.001
8	344.68	28.44	349.06	26.98	374.74	111.32	88.16	3.001
9	338.73	30.42	343.33	28.89	367.89	110.26	85.00	3.001
10	339.94	30.02	344.32	28.56	370.00	112.89	88.16	3.001
11	338.36	30.55	342.74	29.09	368.42	113.42	88.16	3.001
12	343.46	28.85	348.06	27.31	372.63	108.68	85.00	3.001
13	341.88	29.37	346.48	27.84	371.05	109.21	85.00	3.001
14	343.10	28.97	347.48	27.51	373.16	111.84	88.16	3.001
15	341.18	29.61	345.30	28.23	372.11	115.53	91.32	3.001
16	335.57	31.48	340.17	29.94	364.74	111.32	85.00	3.001
17	340.31	29.90	344.91	28.36	369.47	109.74	85.00	3.001
18	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
19	345.04	28.32	349.64	26.79	374.21	108.16	85.00	3.001
20	340.68	29.77	345.47	28.18	368.95	106.58	81.84	3.001
21	339.10	30.30	343.90	28.70	367.37	107.11	81.84	3.001
22	337.53	30.82	342.32	29.23	365.79	107.63	81.84	3.001
23	341.70	29.43	347.61	27.46	373.68	115.53	91.84	3.002
24	340.12	29.96	346.03	27.99	372.11	116.05	91.84	3.002
25	334.22	31.93	340.26	29.91	365.26	115.00	88.68	3.002
26	338.55	30.48	344.45	28.52	370.53	116.58	91.84	3.002
27	343.69	28.77	349.73	26.76	374.74	111.84	88.68	3.002
28	338.95	30.35	345.00	28.33	370.00	113.42	88.68	3.002
29	342.11	29.30	348.15	27.28	373.16	112.37	88.68	3.002
30	340.53	29.82	346.57	27.81	371.58	112.89	88.68	3.002
31	335.79	31.40	341.84	29.39	366.84	114.47	88.68	3.002
32	337.37	30.88	343.42	28.86	368.42	113.95	88.68	3.002
33	334.63	31.79	340.79	29.74	364.74	111.84	85.53	3.002
34	339.37	30.21	345.53	28.16	369.47	110.26	85.53	3.002
35	337.79	30.74	343.95	28.68	367.89	110.79	85.53	3.002
36	342.53	29.16	348.68	27.11	372.63	109.21	85.53	3.002
37	344.11	28.63	350.26	26.58	374.21	108.68	85.53	3.002
38	336.21	31.26	342.37	29.21	366.32	111.32	85.53	3.002
39	340.95	29.68	347.11	27.63	371.05	109.74	85.53	3.002
40	336.64	31.12	342.89	29.04	365.79	108.16	82.37	3.002
41	338.22	30.59	344.47	28.51	367.37	107.63	82.37	3.002
42	341.37	29.54	347.63	27.46	370.53	106.58	82.37	3.002
43	339.79	30.07	346.05	27.98	368.95	107.11	82.37	3.002
44	338.14	30.62	345.49	28.17	370.00	113.95	89.21	3.002
45	333.40	32.20	340.76	29.75	365.26	115.53	89.21	3.002
46	339.72	30.09	347.07	27.64	371.58	113.42	89.21	3.002
47	336.56	31.15	343.91	28.70	368.42	114.47	89.21	3.002
48	334.98	31.67	342.33	29.22	366.84	115.00	89.21	3.002
49	342.88	29.04	350.23	26.59	374.74	112.37	89.21	3.002
50	341.30	29.57	348.65	27.12	373.16	112.89	89.21	3.003
51	341.74	29.42	349.15	26.95	372.63	109.74	86.05	3.003
52	337.01	31.00	344.41	28.53	367.89	111.32	86.05	3.003
53	335.43	31.52	342.84	29.05	366.32	111.84	86.05	3.003
54	343.32	28.89	350.73	26.42	374.21	109.21	86.05	3.003
55	340.16	29.95	347.57	27.48	371.05	110.26	86.05	3.003
56	335.88	31.37	343.33	28.89	365.79	108.68	82.89	3.003
57	338.59	30.47	345.99	28.00	369.47	110.79	86.05	3.003
58	340.62	29.79	348.07	27.31	370.53	107.11	82.89	3.003
59	333.85	32.05	341.26	29.58	364.74	112.37	86.05	3.003
60	339.04	30.32	346.49	27.84	368.95	107.63	82.89	3.003
61	337.46	30.85	344.91	28.36	367.37	108.16	82.89	3.003
62	342.20	29.27	349.65	26.78	372.11	106.58	82.89	3.003
63	339.00	30.33	347.47	27.51	371.58	113.95	89.74	3.003
64	334.26	31.91	342.74	29.09	366.84	115.53	89.74	3.003
65	332.68	32.44	341.16	29.61	365.26	116.05	89.74	3.003
66	337.42	30.86	345.90	28.03	370.00	114.47	89.74	3.003
67	340.58	29.81	349.05	26.98	373.16	113.42	89.74	3.003
68	342.16	29.28	350.63	26.46	374.74	112.89	89.74	3.003
69	335.84	31.39	344.32	28.56	368.42	115.00	89.74	3.003
70	336.31	31.23	344.80	28.40	367.89	111.84	86.58	3.003
71	333.15	32.28	341.64	29.45	364.74	112.89	86.58	3.004
72	341.05	29.65	349.53	26.82	372.63	110.26	86.58	3.004
73	337.89	30.70	346.37	27.88	369.47	111.32	86.58	3.004

74	339.47	30.18	347.95	27.35	371.05	110.79	86.58	3.004
75	334.73	31.76	343.22	28.93	366.32	112.37	86.58	3.004
76	342.63	29.12	351.11	26.30	374.21	109.74	86.58	3.004
77	339.94	30.02	348.43	27.19	370.53	107.63	83.42	3.004
78	336.78	31.07	345.27	28.24	367.37	108.68	83.42	3.004
79	343.10	28.97	351.59	26.14	373.68	106.58	83.42	3.004
80	339.92	30.03	349.40	26.87	373.16	113.95	90.26	3.004
81	341.52	29.49	350.01	26.66	372.11	107.11	83.42	3.004
82	335.20	31.60	343.69	28.77	365.79	109.21	83.42	3.004
83	335.18	31.61	344.66	28.45	368.42	115.53	90.26	3.004
84	338.36	30.55	346.85	27.72	368.95	108.16	83.42	3.004
85	338.34	30.55	347.82	27.39	371.58	114.47	90.26	3.004
86	333.60	32.13	343.08	28.97	366.84	116.05	90.26	3.004
87	341.50	29.50	350.97	26.34	374.74	113.42	90.26	3.004
88	332.03	32.66	341.50	29.50	365.26	116.58	90.26	3.004
89	336.76	31.08	346.24	27.92	370.00	115.00	90.26	3.004
90	332.51	32.50	341.96	29.35	364.74	113.42	87.11	3.004
91	338.83	30.39	348.28	27.24	371.05	111.32	87.11	3.004
92	334.09	31.97	343.54	28.82	366.32	112.89	87.11	3.004
93	341.98	29.34	351.44	26.19	374.21	110.26	87.11	3.004
94	340.40	29.87	349.86	26.71	372.63	110.79	87.11	3.004
95	335.67	31.44	345.12	28.29	367.89	112.37	87.11	3.004
96	337.25	30.92	346.70	27.77	369.47	111.84	87.11	3.004
97	340.89	29.70	350.32	26.56	372.11	107.63	83.95	3.005
98	336.16	31.28	345.58	28.14	367.37	109.21	83.95	3.005
99	339.32	30.23	348.74	27.09	370.53	108.16	83.95	3.005

Critical Failure Circle

Intersects: XL: 338.02 YL: 30.66 XR: 342.14 YR: 29.29
Centre: XC: 368.95 YC: 116.58 Radius: R: 91.32
Generated failure surface: (20 points)

338.02	30.66	338.23	30.58	338.45	30.51	338.67	30.43	338.88	30.35
339.10	30.28	339.31	30.21	339.53	30.13	339.75	30.06	339.96	29.99
340.18	29.91	340.40	29.84	340.61	29.77	340.83	29.70	341.05	29.63
341.27	29.56	341.48	29.49	341.70	29.42	341.92	29.35	342.14	29.29

Slice Geometry and Properties (38 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	338.02	0.00	19.7	0.11	0.11	1	0.00	45.0	0.01	0.00	0.10	0.95
2	338.13	0.00	19.7	0.11	0.11	1	0.00	45.0	0.05	0.00	0.40	0.95
3	338.23	0.00	19.6	0.11	0.11	1	0.00	45.0	0.08	0.00	0.65	0.95
4	338.34	0.00	19.6	0.11	0.11	1	0.00	45.0	0.11	0.00	0.89	0.95
5	338.45	0.00	19.4	0.11	0.11	1	0.00	45.0	0.13	0.00	1.11	0.95
6	338.56	0.00	19.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
7	338.67	0.00	19.3	0.11	0.11	1	0.00	45.0	0.18	0.00	1.52	0.95
8	338.77	0.00	19.3	0.11	0.11	1	0.00	45.0	0.20	0.00	1.69	0.95
9	338.88	0.00	19.2	0.11	0.11	1	0.00	45.0	0.22	0.00	1.86	0.95
10	338.99	0.00	19.2	0.11	0.11	1	0.00	45.0	0.24	0.00	2.00	0.95
11	339.10	0.00	19.0	0.11	0.11	1	0.00	45.0	0.26	0.00	2.14	0.95
12	339.20	0.00	19.0	0.11	0.11	1	0.00	45.0	0.27	0.00	2.26	0.95
13	339.31	0.00	18.9	0.11	0.11	1	0.00	45.0	0.29	0.00	2.37	0.95
14	339.42	0.00	18.9	0.11	0.11	1	0.00	45.0	0.30	0.00	2.46	0.95
15	339.53	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.53	0.95
16	339.64	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.59	0.95
17	339.75	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
18	339.85	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.67	0.95
19	339.96	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
20	340.07	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
21	340.18	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
22	340.29	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
23	340.40	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.60	0.95
24	340.50	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.54	0.95
25	340.61	0.00	18.0	0.11	0.11	1	0.00	45.0	0.29	0.00	2.43	0.95
26	340.72	0.00	18.0	0.11	0.11	1	0.00	45.0	0.28	0.00	2.36	0.95
27	340.83	0.00	17.9	0.11	0.11	1	0.00	45.0	0.27	0.00	2.28	0.95
28	340.94	0.00	17.9	0.11	0.11	1	0.00	45.0	0.26	0.00	2.16	0.95
29	341.05	0.00	17.7	0.11	0.11	1	0.00	45.0	0.24	0.00	1.99	0.95
30	341.16	0.00	17.7	0.11	0.11	1	0.00	45.0	0.22	0.00	1.87	0.95
31	341.27	0.00	17.6	0.11	0.11	1	0.00	45.0	0.21	0.00	1.71	0.95
32	341.38	0.00	17.6	0.11	0.11	1	0.00	45.0	0.18	0.00	1.48	0.95
33	341.48	0.00	17.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
34	341.59	0.00	17.4	0.11	0.11	1	0.00	45.0	0.14	0.00	1.13	0.95
35	341.70	0.00	17.3	0.11	0.11	1	0.00	45.0	0.10	0.00	0.86	0.95
36	341.81	0.00	17.3	0.11	0.11	1	0.00	45.0	0.08	0.00	0.66	0.95
37	341.92	0.00	17.1	0.11	0.11	1	0.00	45.0	0.05	0.00	0.41	0.95
38	342.03	0.00	17.1	0.11	0.11	1	0.00	45.0	0.01	0.00	0.11	0.95
		0.07			4.34				8.16			

X-S Area: 0.07 Path Length: 4.34 X-S Weight: 8.16

Project: Ouray Silver Mine - Revenue Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 3.gmf
Processed: 13 Nov 2015 10:28:10

DATA: Analysis 1 - Lab Scenario 3

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1320.00	35.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R

Intersects:	XL:	265.00	YL:	50.00	XR:	337.61	YR: 30.80
Centre:	XC:	325.00	YC:	130.00		Radius:	R: 100.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	100.00
Trial positions within range:	20	20	20

RESULTS: Analysis 1 - Lab Scenario 3

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 7.81

There were: 4178 successful analyses from a total of 8001 trial circles
3823 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
2	323.82	35.39	329.18	33.61	353.95	116.84	86.84	3.001
3	328.25	33.92	334.22	31.93	348.68	85.26	55.26	3.004
4	344.04	28.65	350.01	26.66	364.47	80.00	55.26	3.004
5	328.19	33.94	343.75	28.75	375.00	148.42	123.68	3.006
6	317.69	37.44	332.15	32.62	353.95	122.11	92.11	3.009
7	333.48	32.17	347.94	27.35	369.74	116.84	92.11	3.009
8	323.19	35.60	345.60	28.13	375.00	153.68	128.95	3.011
9	339.20	30.27	351.70	26.10	364.47	85.26	60.53	3.016
10	323.41	35.53	335.91	31.36	348.68	90.53	60.53	3.016
11	329.01	33.66	349.25	26.92	369.74	122.11	97.37	3.016
12	318.83	37.06	346.80	27.73	375.00	158.95	134.21	3.016
13	325.00	35.00	350.10	26.63	369.74	127.37	102.63	3.022
14	335.25	31.58	352.48	25.84	364.47	90.53	65.79	3.026
15	319.46	36.85	336.70	31.10	348.68	95.79	65.79	3.026
16	321.22	36.26	350.72	26.43	369.74	132.63	107.89	3.028
17	317.58	37.47	351.21	26.26	369.74	137.89	113.16	3.033
18	331.59	32.80	352.98	25.67	364.47	95.79	71.05	3.034
19	328.08	33.97	353.34	25.55	364.47	101.05	76.32	3.041
20	324.65	35.12	353.61	25.46	364.47	106.32	81.58	3.048
21	321.28	36.24	353.82	25.39	364.47	111.58	86.84	3.053
22	317.95	37.35	354.00	25.33	364.47	116.84	92.11	3.058

23	316.61	37.80	339.55	30.15	343.42	80.00	50.00	3.081
24	329.19	33.60	355.39	24.87	359.21	80.00	55.26	3.086
25	341.77	29.41	371.23	19.59	375.00	80.00	60.53	3.091
26	325.99	34.67	355.44	24.85	359.21	85.26	60.53	3.091
27	338.58	30.47	371.26	19.58	375.00	85.26	65.79	3.095
28	322.79	35.74	355.47	24.84	359.21	90.53	65.79	3.095
29	335.40	31.53	371.29	19.57	375.00	90.53	71.05	3.099
30	319.61	36.80	355.50	24.83	359.21	95.79	71.05	3.099
31	316.43	37.86	355.52	24.83	359.21	101.05	76.32	3.102
32	332.21	32.60	371.31	19.56	375.00	95.79	76.32	3.102
33	329.04	33.65	371.33	19.56	375.00	101.05	81.58	3.104
34	325.86	34.71	371.35	19.55	375.00	106.32	86.84	3.106
35	322.69	35.77	371.36	19.55	375.00	111.58	92.11	3.108
36	319.52	36.83	371.38	19.54	375.00	116.84	97.37	3.110
37	316.35	37.88	371.39	19.54	375.00	122.11	102.63	3.112
38	316.21	37.93	371.52	19.49	369.74	106.32	86.84	3.161
39	319.37	36.88	371.52	19.49	369.74	101.05	81.58	3.162
40	322.54	35.82	371.52	19.49	369.74	95.79	76.32	3.163
41	325.70	34.77	371.51	19.50	369.74	90.53	71.05	3.165
42	328.86	33.71	371.51	19.50	369.74	85.26	65.79	3.167
43	332.02	32.66	371.50	19.50	369.74	80.00	60.53	3.169
44	316.24	37.92	355.71	24.76	353.95	85.26	60.53	3.169
45	319.40	36.87	355.71	24.76	353.95	80.00	55.26	3.172
46	316.99	37.67	370.75	19.75	364.47	90.53	71.05	3.233
47	320.20	36.60	370.69	19.77	364.47	85.26	65.79	3.241
48	323.42	35.53	370.64	19.79	364.47	80.00	60.53	3.250
49	318.15	37.28	385.38	14.87	375.00	95.79	81.58	3.282
50	321.40	36.20	385.28	14.91	375.00	90.53	76.32	3.292
51	324.67	35.11	385.17	14.94	375.00	85.26	71.05	3.304
52	327.95	34.02	385.05	14.98	375.00	80.00	65.79	3.317
53	316.97	37.68	383.39	15.54	369.74	85.26	71.05	3.376
54	320.33	36.56	383.19	15.60	369.74	80.00	65.79	3.396
55	314.92	38.35	385.47	14.84	375.00	101.05	86.84	3.403
56	315.81	38.06	337.19	30.94	348.68	101.05	71.05	3.404
57	315.46	38.18	369.13	20.29	359.21	80.00	60.53	3.438
58	318.25	37.25	394.75	11.75	375.00	80.00	71.05	3.528
59	314.77	38.40	395.09	11.64	375.00	85.26	76.32	3.596
60	313.66	38.76	383.57	15.48	369.74	90.53	76.32	3.620
61	313.82	38.71	370.79	19.74	364.47	95.79	76.32	3.652
62	311.72	39.39	385.55	14.82	375.00	106.32	92.11	3.728
63	313.11	38.94	371.53	19.49	369.74	111.58	92.11	3.771
64	313.25	38.89	371.40	19.53	375.00	127.37	107.89	3.781
65	313.06	38.95	381.02	16.33	364.47	80.00	65.79	3.799
66	311.34	39.51	395.39	11.54	375.00	90.53	81.58	3.800
67	264.73	50.00	429.74	0.09	375.00	116.84	128.95	3.854
68	267.73	50.00	429.03	0.32	375.00	111.58	123.68	3.865
69	270.83	50.00	428.30	0.57	375.00	106.32	118.42	3.883
70	266.26	50.00	429.99	0.00	369.74	95.79	113.16	3.902
71	310.38	39.82	383.74	15.42	369.74	95.79	81.58	3.903
72	274.01	50.00	427.53	0.82	375.00	101.05	113.16	3.911
73	269.74	50.00	428.97	0.34	369.74	90.53	107.89	3.940
74	311.35	39.51	392.21	12.60	369.74	80.00	71.05	3.941
75	277.30	50.00	426.71	1.10	375.00	95.79	107.89	3.951
76	307.94	40.61	395.67	11.44	375.00	95.79	86.84	3.957
77	312.21	39.23	369.26	20.25	359.21	85.26	65.79	3.967
78	256.54	50.00	427.34	0.89	369.74	122.11	134.21	3.967
79	259.47	50.00	426.63	1.12	369.74	116.84	128.95	3.968
80	253.69	50.00	428.02	0.66	369.74	127.37	139.47	3.971
81	314.69	38.42	354.14	25.29	364.47	122.11	97.37	3.974
82	262.47	50.00	425.88	1.37	369.74	111.58	123.68	3.976
83	250.91	50.00	428.68	0.44	369.74	132.63	144.74	3.977
84	251.18	50.00	429.43	0.19	364.47	111.58	128.95	3.985
85	248.19	50.00	429.31	0.23	369.74	137.89	150.00	3.988
86	308.54	40.42	385.62	14.79	375.00	111.58	97.37	3.988
87	265.56	50.00	425.10	1.63	369.74	106.32	118.42	3.989
88	273.35	50.00	427.90	0.70	369.74	85.26	102.63	3.991
89	254.35	50.00	428.51	0.50	364.47	106.32	123.68	3.994
90	280.99	49.36	425.86	1.38	375.00	90.53	102.63	3.997
91	257.62	50.00	427.54	0.82	364.47	101.05	118.42	4.010
92	268.75	50.00	424.28	1.91	369.74	101.05	113.16	4.012
93	265.33	50.00	423.42	2.19	375.00	127.37	134.21	4.022
94	268.10	50.00	422.88	2.37	375.00	122.11	128.95	4.024
95	262.64	50.00	423.93	2.02	375.00	132.63	139.47	4.025
96	260.01	50.00	424.43	1.86	375.00	137.89	144.74	4.032
97	260.99	50.00	426.52	1.16	364.47	95.79	113.16	4.033
98	270.93	50.00	422.31	2.56	375.00	116.84	123.68	4.034
99	310.05	39.93	402.99	9.00	375.00	80.00	76.32	4.034

Critical Failure Circle

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34

Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Generated failure surface: (20 points)

339.61	30.13	339.89	30.03	340.17	29.93	340.45	29.82	340.73	29.72
341.01	29.63	341.29	29.53	341.57	29.43	341.85	29.34	342.13	29.24
342.42	29.15	342.70	29.05	342.98	28.96	343.26	28.87	343.55	28.78
343.83	28.69	344.11	28.60	344.40	28.52	344.68	28.43	344.97	28.34

Slice Geometry and Properties (38 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	339.61	0.00	20.2	0.14	0.15	1	0.00	45.0	0.03	0.00	0.20	0.95
2	339.75	0.00	20.2	0.14	0.15	1	0.00	45.0	0.11	0.00	0.71	0.95
3	339.89	0.00	20.0	0.14	0.15	1	0.00	45.0	0.18	0.00	1.13	0.95
4	340.03	0.00	20.0	0.14	0.15	1	0.00	45.0	0.25	0.00	1.58	0.95
5	340.17	0.00	19.8	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
6	340.31	0.00	19.8	0.14	0.15	1	0.00	45.0	0.37	0.00	2.34	0.95
7	340.45	0.00	19.6	0.14	0.15	1	0.00	45.0	0.42	0.00	2.69	0.95
8	340.59	0.00	19.6	0.14	0.15	1	0.00	45.0	0.47	0.00	2.98	0.95
9	340.73	0.00	19.4	0.14	0.15	1	0.00	45.0	0.52	0.00	3.30	0.95
10	340.87	0.01	19.4	0.14	0.15	1	0.00	45.0	0.56	0.00	3.56	0.95
11	341.01	0.01	19.2	0.14	0.15	1	0.00	45.0	0.59	0.00	3.79	0.95
12	341.15	0.01	19.2	0.14	0.15	1	0.00	45.0	0.62	0.00	3.98	0.95
13	341.29	0.01	19.0	0.14	0.15	1	0.00	45.0	0.66	0.00	4.20	0.95
14	341.43	0.01	19.0	0.14	0.15	1	0.00	45.0	0.68	0.00	4.36	0.95
15	341.57	0.01	18.8	0.14	0.15	1	0.00	45.0	0.71	0.00	4.50	0.95
16	341.71	0.01	18.8	0.14	0.15	1	0.00	45.0	0.72	0.00	4.61	0.95
17	341.85	0.01	18.6	0.14	0.15	1	0.00	45.0	0.73	0.00	4.69	0.95
18	341.99	0.01	18.6	0.14	0.15	1	0.00	45.0	0.74	0.00	4.73	0.95
19	342.13	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
20	342.28	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
21	342.42	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.74	0.95
22	342.56	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.69	0.95
23	342.70	0.01	18.0	0.14	0.15	1	0.00	45.0	0.72	0.00	4.63	0.95
24	342.84	0.01	18.0	0.14	0.15	1	0.00	45.0	0.71	0.00	4.52	0.95
25	342.98	0.01	17.8	0.14	0.15	1	0.00	45.0	0.69	0.00	4.39	0.95
26	343.12	0.01	17.8	0.14	0.15	1	0.00	45.0	0.66	0.00	4.23	0.95
27	343.26	0.01	17.7	0.14	0.15	1	0.00	45.0	0.63	0.00	4.01	0.95
28	343.41	0.01	17.7	0.14	0.15	1	0.00	45.0	0.60	0.00	3.81	0.95
29	343.55	0.01	17.5	0.14	0.15	1	0.00	45.0	0.56	0.00	3.60	0.95
30	343.69	0.00	17.5	0.14	0.15	1	0.00	45.0	0.52	0.00	3.34	0.95
31	343.83	0.00	17.3	0.14	0.15	1	0.00	45.0	0.47	0.00	3.00	0.95
32	343.97	0.00	17.3	0.14	0.15	1	0.00	45.0	0.42	0.00	2.71	0.95
33	344.11	0.00	17.1	0.14	0.15	1	0.00	45.0	0.37	0.00	2.38	0.95
34	344.26	0.00	17.1	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
35	344.40	0.00	16.9	0.14	0.15	1	0.00	45.0	0.25	0.00	1.60	0.95
36	344.54	0.00	16.9	0.14	0.15	1	0.00	45.0	0.18	0.00	1.18	0.95
37	344.68	0.00	16.7	0.14	0.15	1	0.00	45.0	0.11	0.00	0.70	0.95
38	344.83	0.00	16.7	0.14	0.15	1	0.00	45.0	0.04	0.00	0.24	0.95
		0.17			5.65				18.88			

X-S Area: 0.17 Path Length: 5.65 X-S Weight: 18.88

DATA: Analysis 2 - Lab Scenario 3 pt2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1320.00	35.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34

Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	10.00	10.00	10.00
Trial positions within range:	20	20	20

RESULTS: Analysis 2 - Lab Scenario 3 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.00

There were: 4022 successful analyses from a total of 8001 trial circles
3979 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	338.02	30.66	342.14	29.29	368.95	116.58	91.32	3.000
2	342.76	29.08	346.88	27.71	373.68	115.00	91.32	3.001
3	339.60	30.13	343.72	28.76	370.53	116.05	91.32	3.001
4	335.21	31.60	339.58	30.14	365.26	114.47	88.16	3.001
5	337.15	30.95	341.75	29.42	366.32	110.79	85.00	3.001
6	336.78	31.07	341.16	29.61	366.84	113.95	88.16	3.001
7	341.52	29.49	345.90	28.03	371.58	112.37	88.16	3.001
8	344.68	28.44	349.06	26.98	374.74	111.32	88.16	3.001
9	338.73	30.42	343.33	28.89	367.89	110.26	85.00	3.001
10	339.94	30.02	344.32	28.56	370.00	112.89	88.16	3.001
11	338.36	30.55	342.74	29.09	368.42	113.42	88.16	3.001
12	343.46	28.85	348.06	27.31	372.63	108.68	85.00	3.001
13	341.88	29.37	346.48	27.84	371.05	109.21	85.00	3.001
14	343.10	28.97	347.48	27.51	373.16	111.84	88.16	3.001
15	341.18	29.61	345.30	28.23	372.11	115.53	91.32	3.001
16	335.57	31.48	340.17	29.94	364.74	111.32	85.00	3.001
17	340.31	29.90	344.91	28.36	369.47	109.74	85.00	3.001
18	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
19	345.04	28.32	349.64	26.79	374.21	108.16	85.00	3.001
20	340.68	29.77	345.47	28.18	368.95	106.58	81.84	3.001
21	339.10	30.30	343.90	28.70	367.37	107.11	81.84	3.001
22	337.53	30.82	342.32	29.23	365.79	107.63	81.84	3.001
23	341.70	29.43	347.61	27.46	373.68	115.53	91.84	3.002
24	340.12	29.96	346.03	27.99	372.11	116.05	91.84	3.002
25	334.22	31.93	340.26	29.91	365.26	115.00	88.68	3.002
26	338.55	30.48	344.45	28.52	370.53	116.58	91.84	3.002
27	343.69	28.77	349.73	26.76	374.74	111.84	88.68	3.002
28	338.95	30.35	345.00	28.33	370.00	113.42	88.68	3.002
29	342.11	29.30	348.15	27.28	373.16	112.37	88.68	3.002
30	340.53	29.82	346.57	27.81	371.58	112.89	88.68	3.002
31	335.79	31.40	341.84	29.39	366.84	114.47	88.68	3.002
32	337.37	30.88	343.42	28.86	368.42	113.95	88.68	3.002
33	334.63	31.79	340.79	29.74	364.74	111.84	85.53	3.002
34	339.37	30.21	345.53	28.16	369.47	110.26	85.53	3.002
35	337.79	30.74	343.95	28.68	367.89	110.79	85.53	3.002
36	342.53	29.16	348.68	27.11	372.63	109.21	85.53	3.002
37	344.11	28.63	350.26	26.58	374.21	108.68	85.53	3.002
38	336.21	31.26	342.37	29.21	366.32	111.32	85.53	3.002
39	340.95	29.68	347.11	27.63	371.05	109.74	85.53	3.002
40	336.64	31.12	342.89	29.04	365.79	108.16	82.37	3.002
41	338.22	30.59	344.47	28.51	367.37	107.63	82.37	3.002
42	341.37	29.54	347.63	27.46	370.53	106.58	82.37	3.002
43	339.79	30.07	346.05	27.98	368.95	107.11	82.37	3.002
44	338.14	30.62	345.49	28.17	370.00	113.95	89.21	3.002
45	333.40	32.20	340.76	29.75	365.26	115.53	89.21	3.002
46	339.72	30.09	347.07	27.64	371.58	113.42	89.21	3.002
47	336.56	31.15	343.91	28.70	368.42	114.47	89.21	3.002
48	334.98	31.67	342.33	29.22	366.84	115.00	89.21	3.002
49	342.88	29.04	350.23	26.59	374.74	112.37	89.21	3.002
50	341.30	29.57	348.65	27.12	373.16	112.89	89.21	3.003
51	341.74	29.42	349.15	26.95	372.63	109.74	86.05	3.003
52	337.01	31.00	344.41	28.53	367.89	111.32	86.05	3.003
53	335.43	31.52	342.84	29.05	366.32	111.84	86.05	3.003
54	343.32	28.89	350.73	26.42	374.21	109.21	86.05	3.003
55	340.16	29.95	347.57	27.48	371.05	110.26	86.05	3.003
56	335.88	31.37	343.33	28.89	365.79	108.68	82.89	3.003
57	338.59	30.47	345.99	28.00	369.47	110.79	86.05	3.003
58	340.62	29.79	348.07	27.31	370.53	107.11	82.89	3.003
59	333.85	32.05	341.26	29.58	364.74	112.37	86.05	3.003
60	339.04	30.32	346.49	27.84	368.95	107.63	82.89	3.003
61	337.46	30.85	344.91	28.36	367.37	108.16	82.89	3.003
62	342.20	29.27	349.65	26.78	372.11	106.58	82.89	3.003
63	339.00	30.33	347.47	27.51	371.58	113.95	89.74	3.003
64	334.26	31.91	342.74	29.09	366.84	115.53	89.74	3.003
65	332.68	32.44	341.16	29.61	365.26	116.05	89.74	3.003
66	337.42	30.86	345.90	28.03	370.00	114.47	89.74	3.003
67	340.58	29.81	349.05	26.98	373.16	113.42	89.74	3.003
68	342.16	29.28	350.63	26.46	374.74	112.89	89.74	3.003
69	335.84	31.39	344.32	28.56	368.42	115.00	89.74	3.003
70	336.31	31.23	344.80	28.40	367.89	111.84	86.58	3.003
71	333.15	32.28	341.64	29.45	364.74	112.89	86.58	3.004
72	341.05	29.65	349.53	26.82	372.63	110.26	86.58	3.004
73	337.89	30.70	346.37	27.88	369.47	111.32	86.58	3.004
74	339.47	30.18	347.95	27.35	371.05	110.79	86.58	3.004

75	334.73	31.76	343.22	28.93	366.32	112.37	86.58	3.004
76	342.63	29.12	351.11	26.30	374.21	109.74	86.58	3.004
77	339.94	30.02	348.43	27.19	370.53	107.63	83.42	3.004
78	336.78	31.07	345.27	28.24	367.37	108.68	83.42	3.004
79	343.10	28.97	351.59	26.14	373.68	106.58	83.42	3.004
80	339.92	30.03	349.40	26.87	373.16	113.95	90.26	3.004
81	341.52	29.49	350.01	26.66	372.11	107.11	83.42	3.004
82	335.20	31.60	343.69	28.77	365.79	109.21	83.42	3.004
83	335.18	31.61	344.66	28.45	368.42	115.53	90.26	3.004
84	338.36	30.55	346.85	27.72	368.95	108.16	83.42	3.004
85	338.34	30.55	347.82	27.39	371.58	114.47	90.26	3.004
86	333.60	32.13	343.08	28.97	366.84	116.05	90.26	3.004
87	341.50	29.50	350.97	26.34	374.74	113.42	90.26	3.004
88	332.03	32.66	341.50	29.50	365.26	116.58	90.26	3.004
89	336.76	31.08	346.24	27.92	370.00	115.00	90.26	3.004
90	332.51	32.50	341.96	29.35	364.74	113.42	87.11	3.004
91	338.83	30.39	348.28	27.24	371.05	111.32	87.11	3.004
92	334.09	31.97	343.54	28.82	366.32	112.89	87.11	3.004
93	341.98	29.34	351.44	26.19	374.21	110.26	87.11	3.004
94	340.40	29.87	349.86	26.71	372.63	110.79	87.11	3.004
95	335.67	31.44	345.12	28.29	367.89	112.37	87.11	3.004
96	337.25	30.92	346.70	27.77	369.47	111.84	87.11	3.004
97	340.89	29.70	350.32	26.56	372.11	107.63	83.95	3.005
98	336.16	31.28	345.58	28.14	367.37	109.21	83.95	3.005
99	339.32	30.23	348.74	27.09	370.53	108.16	83.95	3.005

Critical Failure Circle

Intersects: XL: 338.02 YL: 30.66 XR: 342.14 YR: 29.29
Centre: XC: 368.95 YC: 116.58 Radius: R: 91.32
Generated failure surface: (20 points)

338.02	30.66	338.23	30.58	338.45	30.51	338.67	30.43	338.88	30.35
339.10	30.28	339.31	30.21	339.53	30.13	339.75	30.06	339.96	29.99
340.18	29.91	340.40	29.84	340.61	29.77	340.83	29.70	341.05	29.63
341.27	29.56	341.48	29.49	341.70	29.42	341.92	29.35	342.14	29.29

Slice Geometry and Properties (38 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	338.02	0.00	19.7	0.11	0.11	1	0.00	45.0	0.01	0.00	0.10	0.95
2	338.13	0.00	19.7	0.11	0.11	1	0.00	45.0	0.05	0.00	0.40	0.95
3	338.23	0.00	19.6	0.11	0.11	1	0.00	45.0	0.08	0.00	0.65	0.95
4	338.34	0.00	19.6	0.11	0.11	1	0.00	45.0	0.11	0.00	0.89	0.95
5	338.45	0.00	19.4	0.11	0.11	1	0.00	45.0	0.13	0.00	1.11	0.95
6	338.56	0.00	19.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
7	338.67	0.00	19.3	0.11	0.11	1	0.00	45.0	0.18	0.00	1.52	0.95
8	338.77	0.00	19.3	0.11	0.11	1	0.00	45.0	0.20	0.00	1.69	0.95
9	338.88	0.00	19.2	0.11	0.11	1	0.00	45.0	0.22	0.00	1.86	0.95
10	338.99	0.00	19.2	0.11	0.11	1	0.00	45.0	0.24	0.00	2.00	0.95
11	339.10	0.00	19.0	0.11	0.11	1	0.00	45.0	0.26	0.00	2.14	0.95
12	339.20	0.00	19.0	0.11	0.11	1	0.00	45.0	0.27	0.00	2.26	0.95
13	339.31	0.00	18.9	0.11	0.11	1	0.00	45.0	0.29	0.00	2.37	0.95
14	339.42	0.00	18.9	0.11	0.11	1	0.00	45.0	0.30	0.00	2.46	0.95
15	339.53	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.53	0.95
16	339.64	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.59	0.95
17	339.75	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
18	339.85	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.67	0.95
19	339.96	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
20	340.07	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
21	340.18	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
22	340.29	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
23	340.40	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.60	0.95
24	340.50	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.54	0.95
25	340.61	0.00	18.0	0.11	0.11	1	0.00	45.0	0.29	0.00	2.43	0.95
26	340.72	0.00	18.0	0.11	0.11	1	0.00	45.0	0.28	0.00	2.36	0.95
27	340.83	0.00	17.9	0.11	0.11	1	0.00	45.0	0.27	0.00	2.28	0.95
28	340.94	0.00	17.9	0.11	0.11	1	0.00	45.0	0.26	0.00	2.16	0.95
29	341.05	0.00	17.7	0.11	0.11	1	0.00	45.0	0.24	0.00	1.99	0.95
30	341.16	0.00	17.7	0.11	0.11	1	0.00	45.0	0.22	0.00	1.87	0.95
31	341.27	0.00	17.6	0.11	0.11	1	0.00	45.0	0.21	0.00	1.71	0.95
32	341.38	0.00	17.6	0.11	0.11	1	0.00	45.0	0.18	0.00	1.48	0.95
33	341.48	0.00	17.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
34	341.59	0.00	17.4	0.11	0.11	1	0.00	45.0	0.14	0.00	1.13	0.95
35	341.70	0.00	17.3	0.11	0.11	1	0.00	45.0	0.10	0.00	0.86	0.95
36	341.81	0.00	17.3	0.11	0.11	1	0.00	45.0	0.08	0.00	0.66	0.95
37	341.92	0.00	17.1	0.11	0.11	1	0.00	45.0	0.05	0.00	0.41	0.95
38	342.03	0.00	17.1	0.11	0.11	1	0.00	45.0	0.01	0.00	0.11	0.95
		0.07			4.34				8.16			

X-S Area: 0.07 Path Length: 4.34 X-S Weight: 8.16

Project: Ouray Silver Mine - Revenue Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Rev Pile Lab Scenario 4.gmf
Processed: 13 Nov 2015 10:37:00

DATA: Analysis 1 - Lab Scenario 4

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2080.00	35.0	109.90	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock

0.00	0.00	0.00	40.00	316.00	38.00	430.00	0.00

Profile: 2 (4 points) Material beneath: 2 - Mill tailings

0.00	50.00	279.00	50.00	316.00	38.00	0.00	40.00

Slope Surface (4 points)

0.00	50.00	279.00	50.00	316.00	38.00	430.00	0.00

Phreatic Surface (2 points)

0.00	0.00	500.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 265.00 YL: 50.00 XR: 337.61 YR: 30.80
Centre: XC: 325.00 YC: 130.00 Radius: R: 100.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	100.00
Trial positions within range:	20	20	20

RESULTS: Analysis 1 - Lab Scenario 4

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 10.69

There were: 4178 successful analyses from a total of 8001 trial circles
3823 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
2	323.82	35.39	329.18	33.61	353.95	116.84	86.84	3.001
3	328.25	33.92	334.22	31.93	348.68	85.26	55.26	3.004
4	344.04	28.65	350.01	26.66	364.47	80.00	55.26	3.004
5	328.19	33.94	343.75	28.75	375.00	148.42	123.68	3.006
6	317.69	37.44	332.15	32.62	353.95	122.11	92.11	3.009
7	333.48	32.17	347.94	27.35	369.74	116.84	92.11	3.009
8	323.19	35.60	345.60	28.13	375.00	153.68	128.95	3.011
9	339.20	30.27	351.70	26.10	364.47	85.26	60.53	3.016
10	323.41	35.53	335.91	31.36	348.68	90.53	60.53	3.016
11	329.01	33.66	349.25	26.92	369.74	122.11	97.37	3.016
12	318.83	37.06	346.80	27.73	375.00	158.95	134.21	3.016
13	325.00	35.00	350.10	26.63	369.74	127.37	102.63	3.022
14	335.25	31.58	352.48	25.84	364.47	90.53	65.79	3.026
15	319.46	36.85	336.70	31.10	348.68	95.79	65.79	3.026
16	321.22	36.26	350.72	26.43	369.74	132.63	107.89	3.028
17	317.58	37.47	351.21	26.26	369.74	137.89	113.16	3.033
18	331.59	32.80	352.98	25.67	364.47	95.79	71.05	3.034
19	328.08	33.97	353.34	25.55	364.47	101.05	76.32	3.041
20	324.65	35.12	353.61	25.46	364.47	106.32	81.58	3.048
21	321.28	36.24	353.82	25.39	364.47	111.58	86.84	3.053
22	317.95	37.35	354.00	25.33	364.47	116.84	92.11	3.058

23	316.61	37.80	339.55	30.15	343.42	80.00	50.00	3.081
24	329.19	33.60	355.39	24.87	359.21	80.00	55.26	3.086
25	341.77	29.41	371.23	19.59	375.00	80.00	60.53	3.091
26	325.99	34.67	355.44	24.85	359.21	85.26	60.53	3.091
27	338.58	30.47	371.26	19.58	375.00	85.26	65.79	3.095
28	322.79	35.74	355.47	24.84	359.21	90.53	65.79	3.095
29	335.40	31.53	371.29	19.57	375.00	90.53	71.05	3.099
30	319.61	36.80	355.50	24.83	359.21	95.79	71.05	3.099
31	316.43	37.86	355.52	24.83	359.21	101.05	76.32	3.102
32	332.21	32.60	371.31	19.56	375.00	95.79	76.32	3.102
33	329.04	33.65	371.33	19.56	375.00	101.05	81.58	3.104
34	325.86	34.71	371.35	19.55	375.00	106.32	86.84	3.106
35	322.69	35.77	371.36	19.55	375.00	111.58	92.11	3.108
36	319.52	36.83	371.38	19.54	375.00	116.84	97.37	3.110
37	316.35	37.88	371.39	19.54	375.00	122.11	102.63	3.112
38	316.21	37.93	371.52	19.49	369.74	106.32	86.84	3.161
39	319.37	36.88	371.52	19.49	369.74	101.05	81.58	3.162
40	322.54	35.82	371.52	19.49	369.74	95.79	76.32	3.163
41	325.70	34.77	371.51	19.50	369.74	90.53	71.05	3.165
42	328.86	33.71	371.51	19.50	369.74	85.26	65.79	3.167
43	332.02	32.66	371.50	19.50	369.74	80.00	60.53	3.169
44	316.24	37.92	355.71	24.76	353.95	85.26	60.53	3.169
45	319.40	36.87	355.71	24.76	353.95	80.00	55.26	3.172
46	316.99	37.67	370.75	19.75	364.47	90.53	71.05	3.233
47	320.20	36.60	370.69	19.77	364.47	85.26	65.79	3.241
48	323.42	35.53	370.64	19.79	364.47	80.00	60.53	3.250
49	318.15	37.28	385.38	14.87	375.00	95.79	81.58	3.282
50	321.40	36.20	385.28	14.91	375.00	90.53	76.32	3.292
51	324.67	35.11	385.17	14.94	375.00	85.26	71.05	3.304
52	327.95	34.02	385.05	14.98	375.00	80.00	65.79	3.317
53	316.97	37.68	383.39	15.54	369.74	85.26	71.05	3.376
54	320.33	36.56	383.19	15.60	369.74	80.00	65.79	3.396
55	314.92	38.35	385.47	14.84	375.00	101.05	86.84	3.479
56	315.46	38.18	369.13	20.29	359.21	80.00	60.53	3.500
57	318.25	37.25	394.75	11.75	375.00	80.00	71.05	3.528
58	315.81	38.06	337.19	30.94	348.68	101.05	71.05	3.617
59	314.77	38.40	395.09	11.64	375.00	85.26	76.32	3.653
60	313.66	38.76	383.57	15.48	369.74	90.53	76.32	3.773
61	313.82	38.71	370.79	19.74	364.47	95.79	76.32	3.902
62	313.06	38.95	381.02	16.33	364.47	80.00	65.79	3.990
63	311.34	39.51	395.39	11.54	375.00	90.53	81.58	3.997
64	311.72	39.39	385.55	14.82	375.00	106.32	92.11	4.004
65	313.11	38.94	371.53	19.49	369.74	111.58	92.11	4.130
66	311.35	39.51	392.21	12.60	369.74	80.00	71.05	4.144
67	313.25	38.89	371.40	19.53	375.00	127.37	107.89	4.172
68	310.05	39.93	402.99	9.00	375.00	80.00	76.32	4.226
69	279.01	50.00	377.33	17.56	343.42	80.00	71.05	4.240
70	310.38	39.82	383.74	15.42	369.74	95.79	81.58	4.241
71	264.73	50.00	429.74	0.09	375.00	116.84	128.95	4.267
72	307.94	40.61	395.67	11.44	375.00	95.79	86.84	4.269
73	267.73	50.00	429.03	0.32	375.00	111.58	123.68	4.272
74	270.83	50.00	428.30	0.57	375.00	106.32	118.42	4.285
75	266.26	50.00	429.99	0.00	369.74	95.79	113.16	4.288
76	274.01	50.00	427.53	0.82	375.00	101.05	113.16	4.307
77	269.74	50.00	428.97	0.34	369.74	90.53	107.89	4.322
78	277.30	50.00	426.71	1.10	375.00	95.79	107.89	4.341
79	312.21	39.23	369.26	20.25	359.21	85.26	65.79	4.355
80	273.35	50.00	427.90	0.70	369.74	85.26	102.63	4.370
81	280.99	49.36	425.86	1.38	375.00	90.53	102.63	4.378
82	306.40	41.11	403.51	8.83	375.00	85.26	81.58	4.396
83	259.47	50.00	426.63	1.12	369.74	116.84	128.95	4.398
84	262.47	50.00	425.88	1.37	369.74	111.58	123.68	4.404
85	285.03	48.05	424.95	1.68	375.00	85.26	97.37	4.406
86	251.18	50.00	429.43	0.19	364.47	111.58	128.95	4.407
87	256.54	50.00	427.34	0.89	369.74	122.11	134.21	4.407
88	307.82	40.65	392.62	12.46	369.74	85.26	76.32	4.408
89	254.35	50.00	428.51	0.50	364.47	106.32	123.68	4.409
90	265.56	50.00	425.10	1.63	369.74	106.32	118.42	4.412
91	253.69	50.00	428.02	0.66	369.74	127.37	139.47	4.416
92	257.62	50.00	427.54	0.82	364.47	101.05	118.42	4.423
93	309.66	40.06	381.30	16.23	364.47	85.26	71.05	4.427
94	250.91	50.00	428.68	0.44	369.74	132.63	144.74	4.428
95	268.75	50.00	424.28	1.91	369.74	101.05	113.16	4.430
96	308.54	40.42	385.62	14.79	375.00	111.58	97.37	4.432
97	289.12	46.72	423.99	2.00	375.00	80.00	92.11	4.435
98	277.11	50.00	426.76	1.08	369.74	80.00	97.37	4.436
99	260.99	50.00	426.52	1.16	364.47	95.79	113.16	4.442

Critical Failure Circle

Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34
Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84
Generated failure surface: (20 points)

339.61	30.13	339.89	30.03	340.17	29.93	340.45	29.82	340.73	29.72
341.01	29.63	341.29	29.53	341.57	29.43	341.85	29.34	342.13	29.24
342.42	29.15	342.70	29.05	342.98	28.96	343.26	28.87	343.55	28.78
343.83	28.69	344.11	28.60	344.40	28.52	344.68	28.43	344.97	28.34

Slice Geometry and Properties (38 slices)

Slice	X-Left	X-S Area	Base Angle	Base Width	Base Length	Base Matl	Base Cohesion	Base Phi	Weight	PoreWater Force	Normal Stress	Test Factor
1	339.61	0.00	20.2	0.14	0.15	1	0.00	45.0	0.03	0.00	0.20	0.95
2	339.75	0.00	20.2	0.14	0.15	1	0.00	45.0	0.11	0.00	0.71	0.95
3	339.89	0.00	20.0	0.14	0.15	1	0.00	45.0	0.18	0.00	1.13	0.95
4	340.03	0.00	20.0	0.14	0.15	1	0.00	45.0	0.25	0.00	1.58	0.95
5	340.17	0.00	19.8	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
6	340.31	0.00	19.8	0.14	0.15	1	0.00	45.0	0.37	0.00	2.34	0.95
7	340.45	0.00	19.6	0.14	0.15	1	0.00	45.0	0.42	0.00	2.69	0.95
8	340.59	0.00	19.6	0.14	0.15	1	0.00	45.0	0.47	0.00	2.98	0.95
9	340.73	0.00	19.4	0.14	0.15	1	0.00	45.0	0.52	0.00	3.30	0.95
10	340.87	0.01	19.4	0.14	0.15	1	0.00	45.0	0.56	0.00	3.56	0.95
11	341.01	0.01	19.2	0.14	0.15	1	0.00	45.0	0.59	0.00	3.79	0.95
12	341.15	0.01	19.2	0.14	0.15	1	0.00	45.0	0.62	0.00	3.98	0.95
13	341.29	0.01	19.0	0.14	0.15	1	0.00	45.0	0.66	0.00	4.20	0.95
14	341.43	0.01	19.0	0.14	0.15	1	0.00	45.0	0.68	0.00	4.36	0.95
15	341.57	0.01	18.8	0.14	0.15	1	0.00	45.0	0.71	0.00	4.50	0.95
16	341.71	0.01	18.8	0.14	0.15	1	0.00	45.0	0.72	0.00	4.61	0.95
17	341.85	0.01	18.6	0.14	0.15	1	0.00	45.0	0.73	0.00	4.69	0.95
18	341.99	0.01	18.6	0.14	0.15	1	0.00	45.0	0.74	0.00	4.73	0.95
19	342.13	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
20	342.28	0.01	18.4	0.14	0.15	1	0.00	45.0	0.75	0.00	4.76	0.95
21	342.42	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.74	0.95
22	342.56	0.01	18.2	0.14	0.15	1	0.00	45.0	0.74	0.00	4.69	0.95
23	342.70	0.01	18.0	0.14	0.15	1	0.00	45.0	0.72	0.00	4.63	0.95
24	342.84	0.01	18.0	0.14	0.15	1	0.00	45.0	0.71	0.00	4.52	0.95
25	342.98	0.01	17.8	0.14	0.15	1	0.00	45.0	0.69	0.00	4.39	0.95
26	343.12	0.01	17.8	0.14	0.15	1	0.00	45.0	0.66	0.00	4.23	0.95
27	343.26	0.01	17.7	0.14	0.15	1	0.00	45.0	0.63	0.00	4.01	0.95
28	343.41	0.01	17.7	0.14	0.15	1	0.00	45.0	0.60	0.00	3.81	0.95
29	343.55	0.01	17.5	0.14	0.15	1	0.00	45.0	0.56	0.00	3.60	0.95
30	343.69	0.00	17.5	0.14	0.15	1	0.00	45.0	0.52	0.00	3.34	0.95
31	343.83	0.00	17.3	0.14	0.15	1	0.00	45.0	0.47	0.00	3.00	0.95
32	343.97	0.00	17.3	0.14	0.15	1	0.00	45.0	0.42	0.00	2.71	0.95
33	344.11	0.00	17.1	0.14	0.15	1	0.00	45.0	0.37	0.00	2.38	0.95
34	344.26	0.00	17.1	0.14	0.15	1	0.00	45.0	0.31	0.00	1.96	0.95
35	344.40	0.00	16.9	0.14	0.15	1	0.00	45.0	0.25	0.00	1.60	0.95
36	344.54	0.00	16.9	0.14	0.15	1	0.00	45.0	0.18	0.00	1.18	0.95
37	344.68	0.00	16.7	0.14	0.15	1	0.00	45.0	0.11	0.00	0.70	0.95
38	344.83	0.00	16.7	0.14	0.15	1	0.00	45.0	0.04	0.00	0.24	0.95
X-S Area:		0.17	Path Length:		5.65			X-S Weight:	18.88			

DATA: Analysis 2 - Lab Scenario 4 pt2

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
2080.00 35.0 109.90 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Existing waste rock
0.00 0.00 0.00 40.00 316.00 38.00 430.00 0.00
Profile: 2 (4 points) Material beneath: 2 - Mill tailings
0.00 50.00 279.00 50.00 316.00 38.00 0.00 40.00

Slope Surface (4 points)

0.00 50.00 279.00 50.00 316.00 38.00 430.00 0.00

Phreatic Surface (2 points)

0.00 0.00 500.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 339.61 YL: 30.13 XR: 344.97 YR: 28.34
Centre: XC: 369.74 YC: 111.58 Radius: R: 86.84

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	10.00	10.00	10.00
Trial positions within range:	20	20	20

RESULTS: Analysis 2 - Lab Scenario 4 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.00

There were: 4022 successful analyses from a total of 8001 trial circles
3979 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.00

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	338.02	30.66	342.14	29.29	368.95	116.58	91.32	3.000
2	342.76	29.08	346.88	27.71	373.68	115.00	91.32	3.001
3	339.60	30.13	343.72	28.76	370.53	116.05	91.32	3.001
4	335.21	31.60	339.58	30.14	365.26	114.47	88.16	3.001
5	337.15	30.95	341.75	29.42	366.32	110.79	85.00	3.001
6	336.78	31.07	341.16	29.61	366.84	113.95	88.16	3.001
7	341.52	29.49	345.90	28.03	371.58	112.37	88.16	3.001
8	344.68	28.44	349.06	26.98	374.74	111.32	88.16	3.001
9	338.73	30.42	343.33	28.89	367.89	110.26	85.00	3.001
10	339.94	30.02	344.32	28.56	370.00	112.89	88.16	3.001
11	338.36	30.55	342.74	29.09	368.42	113.42	88.16	3.001
12	343.46	28.85	348.06	27.31	372.63	108.68	85.00	3.001
13	341.88	29.37	346.48	27.84	371.05	109.21	85.00	3.001
14	343.10	28.97	347.48	27.51	373.16	111.84	88.16	3.001
15	341.18	29.61	345.30	28.23	372.11	115.53	91.32	3.001
16	335.57	31.48	340.17	29.94	364.74	111.32	85.00	3.001
17	340.31	29.90	344.91	28.36	369.47	109.74	85.00	3.001
18	339.61	30.13	344.97	28.34	369.74	111.58	86.84	3.001
19	345.04	28.32	349.64	26.79	374.21	108.16	85.00	3.001
20	340.68	29.77	345.47	28.18	368.95	106.58	81.84	3.001
21	339.10	30.30	343.90	28.70	367.37	107.11	81.84	3.001
22	337.53	30.82	342.32	29.23	365.79	107.63	81.84	3.001
23	341.70	29.43	347.61	27.46	373.68	115.53	91.84	3.002
24	340.12	29.96	346.03	27.99	372.11	116.05	91.84	3.002
25	334.22	31.93	340.26	29.91	365.26	115.00	88.68	3.002
26	338.55	30.48	344.45	28.52	370.53	116.58	91.84	3.002
27	343.69	28.77	349.73	26.76	374.74	111.84	88.68	3.002
28	338.95	30.35	345.00	28.33	370.00	113.42	88.68	3.002
29	342.11	29.30	348.15	27.28	373.16	112.37	88.68	3.002
30	340.53	29.82	346.57	27.81	371.58	112.89	88.68	3.002
31	335.79	31.40	341.84	29.39	366.84	114.47	88.68	3.002
32	337.37	30.88	343.42	28.86	368.42	113.95	88.68	3.002
33	334.63	31.79	340.79	29.74	364.74	111.84	85.53	3.002
34	339.37	30.21	345.53	28.16	369.47	110.26	85.53	3.002
35	337.79	30.74	343.95	28.68	367.89	110.79	85.53	3.002
36	342.53	29.16	348.68	27.11	372.63	109.21	85.53	3.002
37	344.11	28.63	350.26	26.58	374.21	108.68	85.53	3.002
38	336.21	31.26	342.37	29.21	366.32	111.32	85.53	3.002
39	340.95	29.68	347.11	27.63	371.05	109.74	85.53	3.002
40	336.64	31.12	342.89	29.04	365.79	108.16	82.37	3.002
41	338.22	30.59	344.47	28.51	367.37	107.63	82.37	3.002
42	341.37	29.54	347.63	27.46	370.53	106.58	82.37	3.002
43	339.79	30.07	346.05	27.98	368.95	107.11	82.37	3.002
44	338.14	30.62	345.49	28.17	370.00	113.95	89.21	3.002
45	333.40	32.20	340.76	29.75	365.26	115.53	89.21	3.002
46	339.72	30.09	347.07	27.64	371.58	113.42	89.21	3.002
47	336.56	31.15	343.91	28.70	368.42	114.47	89.21	3.002
48	334.98	31.67	342.33	29.22	366.84	115.00	89.21	3.002
49	342.88	29.04	350.23	26.59	374.74	112.37	89.21	3.002
50	341.30	29.57	348.65	27.12	373.16	112.89	89.21	3.003
51	341.74	29.42	349.15	26.95	372.63	109.74	86.05	3.003
52	337.01	31.00	344.41	28.53	367.89	111.32	86.05	3.003
53	335.43	31.52	342.84	29.05	366.32	111.84	86.05	3.003
54	343.32	28.89	350.73	26.42	374.21	109.21	86.05	3.003
55	340.16	29.95	347.57	27.48	371.05	110.26	86.05	3.003
56	335.88	31.37	343.33	28.89	365.79	108.68	82.89	3.003
57	338.59	30.47	345.99	28.00	369.47	110.79	86.05	3.003
58	340.62	29.79	348.07	27.31	370.53	107.11	82.89	3.003
59	333.85	32.05	341.26	29.58	364.74	112.37	86.05	3.003
60	339.04	30.32	346.49	27.84	368.95	107.63	82.89	3.003
61	337.46	30.85	344.91	28.36	367.37	108.16	82.89	3.003
62	342.20	29.27	349.65	26.78	372.11	106.58	82.89	3.003
63	339.00	30.33	347.47	27.51	371.58	113.95	89.74	3.003
64	334.26	31.91	342.74	29.09	366.84	115.53	89.74	3.003
65	332.68	32.44	341.16	29.61	365.26	116.05	89.74	3.003
66	337.42	30.86	345.90	28.03	370.00	114.47	89.74	3.003
67	340.58	29.81	349.05	26.98	373.16	113.42	89.74	3.003
68	342.16	29.28	350.63	26.46	374.74	112.89	89.74	3.003
69	335.84	31.39	344.32	28.56	368.42	115.00	89.74	3.003
70	336.31	31.23	344.80	28.40	367.89	111.84	86.58	3.003
71	333.15	32.28	341.64	29.45	364.74	112.89	86.58	3.004
72	341.05	29.65	349.53	26.82	372.63	110.26	86.58	3.004
73	337.89	30.70	346.37	27.88	369.47	111.32	86.58	3.004
74	339.47	30.18	347.95	27.35	371.05	110.79	86.58	3.004

75	334.73	31.76	343.22	28.93	366.32	112.37	86.58	3.004
76	342.63	29.12	351.11	26.30	374.21	109.74	86.58	3.004
77	339.94	30.02	348.43	27.19	370.53	107.63	83.42	3.004
78	336.78	31.07	345.27	28.24	367.37	108.68	83.42	3.004
79	343.10	28.97	351.59	26.14	373.68	106.58	83.42	3.004
80	339.92	30.03	349.40	26.87	373.16	113.95	90.26	3.004
81	341.52	29.49	350.01	26.66	372.11	107.11	83.42	3.004
82	335.20	31.60	343.69	28.77	365.79	109.21	83.42	3.004
83	335.18	31.61	344.66	28.45	368.42	115.53	90.26	3.004
84	338.36	30.55	346.85	27.72	368.95	108.16	83.42	3.004
85	338.34	30.55	347.82	27.39	371.58	114.47	90.26	3.004
86	333.60	32.13	343.08	28.97	366.84	116.05	90.26	3.004
87	341.50	29.50	350.97	26.34	374.74	113.42	90.26	3.004
88	332.03	32.66	341.50	29.50	365.26	116.58	90.26	3.004
89	336.76	31.08	346.24	27.92	370.00	115.00	90.26	3.004
90	332.51	32.50	341.96	29.35	364.74	113.42	87.11	3.004
91	338.83	30.39	348.28	27.24	371.05	111.32	87.11	3.004
92	334.09	31.97	343.54	28.82	366.32	112.89	87.11	3.004
93	341.98	29.34	351.44	26.19	374.21	110.26	87.11	3.004
94	340.40	29.87	349.86	26.71	372.63	110.79	87.11	3.004
95	335.67	31.44	345.12	28.29	367.89	112.37	87.11	3.004
96	337.25	30.92	346.70	27.77	369.47	111.84	87.11	3.004
97	340.89	29.70	350.32	26.56	372.11	107.63	83.95	3.005
98	336.16	31.28	345.58	28.14	367.37	109.21	83.95	3.005
99	339.32	30.23	348.74	27.09	370.53	108.16	83.95	3.005

Critical Failure Circle

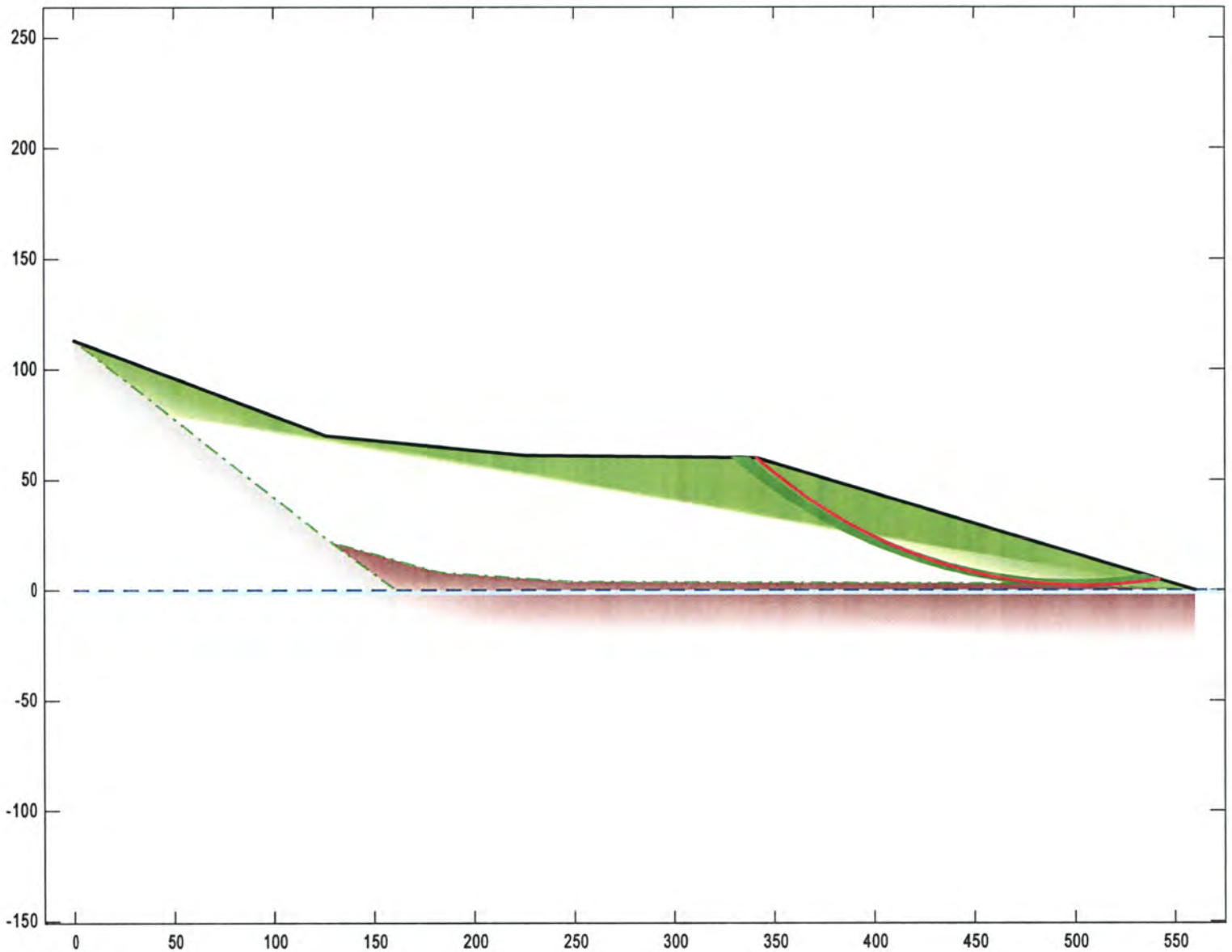
Intersects: XL: 338.02 YL: 30.66 XR: 342.14 YR: 29.29
Centre: XC: 368.95 YC: 116.58 Radius: R: 91.32
Generated failure surface: (20 points)

338.02	30.66	338.23	30.58	338.45	30.51	338.67	30.43	338.88	30.35
339.10	30.28	339.31	30.21	339.53	30.13	339.75	30.06	339.96	29.99
340.18	29.91	340.40	29.84	340.61	29.77	340.83	29.70	341.05	29.63
341.27	29.56	341.48	29.49	341.70	29.42	341.92	29.35	342.14	29.29

Slice Geometry and Properties (38 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	338.02	0.00	19.7	0.11	0.11	1	0.00	45.0	0.01	0.00	0.10	0.95
2	338.13	0.00	19.7	0.11	0.11	1	0.00	45.0	0.05	0.00	0.40	0.95
3	338.23	0.00	19.6	0.11	0.11	1	0.00	45.0	0.08	0.00	0.65	0.95
4	338.34	0.00	19.6	0.11	0.11	1	0.00	45.0	0.11	0.00	0.89	0.95
5	338.45	0.00	19.4	0.11	0.11	1	0.00	45.0	0.13	0.00	1.11	0.95
6	338.56	0.00	19.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
7	338.67	0.00	19.3	0.11	0.11	1	0.00	45.0	0.18	0.00	1.52	0.95
8	338.77	0.00	19.3	0.11	0.11	1	0.00	45.0	0.20	0.00	1.69	0.95
9	338.88	0.00	19.2	0.11	0.11	1	0.00	45.0	0.22	0.00	1.86	0.95
10	338.99	0.00	19.2	0.11	0.11	1	0.00	45.0	0.24	0.00	2.00	0.95
11	339.10	0.00	19.0	0.11	0.11	1	0.00	45.0	0.26	0.00	2.14	0.95
12	339.20	0.00	19.0	0.11	0.11	1	0.00	45.0	0.27	0.00	2.26	0.95
13	339.31	0.00	18.9	0.11	0.11	1	0.00	45.0	0.29	0.00	2.37	0.95
14	339.42	0.00	18.9	0.11	0.11	1	0.00	45.0	0.30	0.00	2.46	0.95
15	339.53	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.53	0.95
16	339.64	0.00	18.7	0.11	0.11	1	0.00	45.0	0.31	0.00	2.59	0.95
17	339.75	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
18	339.85	0.00	18.6	0.11	0.11	1	0.00	45.0	0.32	0.00	2.67	0.95
19	339.96	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
20	340.07	0.00	18.4	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
21	340.18	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.66	0.95
22	340.29	0.00	18.3	0.11	0.11	1	0.00	45.0	0.32	0.00	2.64	0.95
23	340.40	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.60	0.95
24	340.50	0.00	18.1	0.11	0.11	1	0.00	45.0	0.31	0.00	2.54	0.95
25	340.61	0.00	18.0	0.11	0.11	1	0.00	45.0	0.29	0.00	2.43	0.95
26	340.72	0.00	18.0	0.11	0.11	1	0.00	45.0	0.28	0.00	2.36	0.95
27	340.83	0.00	17.9	0.11	0.11	1	0.00	45.0	0.27	0.00	2.28	0.95
28	340.94	0.00	17.9	0.11	0.11	1	0.00	45.0	0.26	0.00	2.16	0.95
29	341.05	0.00	17.7	0.11	0.11	1	0.00	45.0	0.24	0.00	1.99	0.95
30	341.16	0.00	17.7	0.11	0.11	1	0.00	45.0	0.22	0.00	1.87	0.95
31	341.27	0.00	17.6	0.11	0.11	1	0.00	45.0	0.21	0.00	1.71	0.95
32	341.38	0.00	17.6	0.11	0.11	1	0.00	45.0	0.18	0.00	1.48	0.95
33	341.48	0.00	17.4	0.11	0.11	1	0.00	45.0	0.16	0.00	1.32	0.95
34	341.59	0.00	17.4	0.11	0.11	1	0.00	45.0	0.14	0.00	1.13	0.95
35	341.70	0.00	17.3	0.11	0.11	1	0.00	45.0	0.10	0.00	0.86	0.95
36	341.81	0.00	17.3	0.11	0.11	1	0.00	45.0	0.08	0.00	0.66	0.95
37	341.92	0.00	17.1	0.11	0.11	1	0.00	45.0	0.05	0.00	0.41	0.95
38	342.03	0.00	17.1	0.11	0.11	1	0.00	45.0	0.01	0.00	0.11	0.95
		0.07			4.34				8.16			

X-S Area: 0.07 Path Length: 4.34 X-S Weight: 8.16



GALENA Version 6.10

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Material Keys

- Existing waste rock
- Mill tailings
- Bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

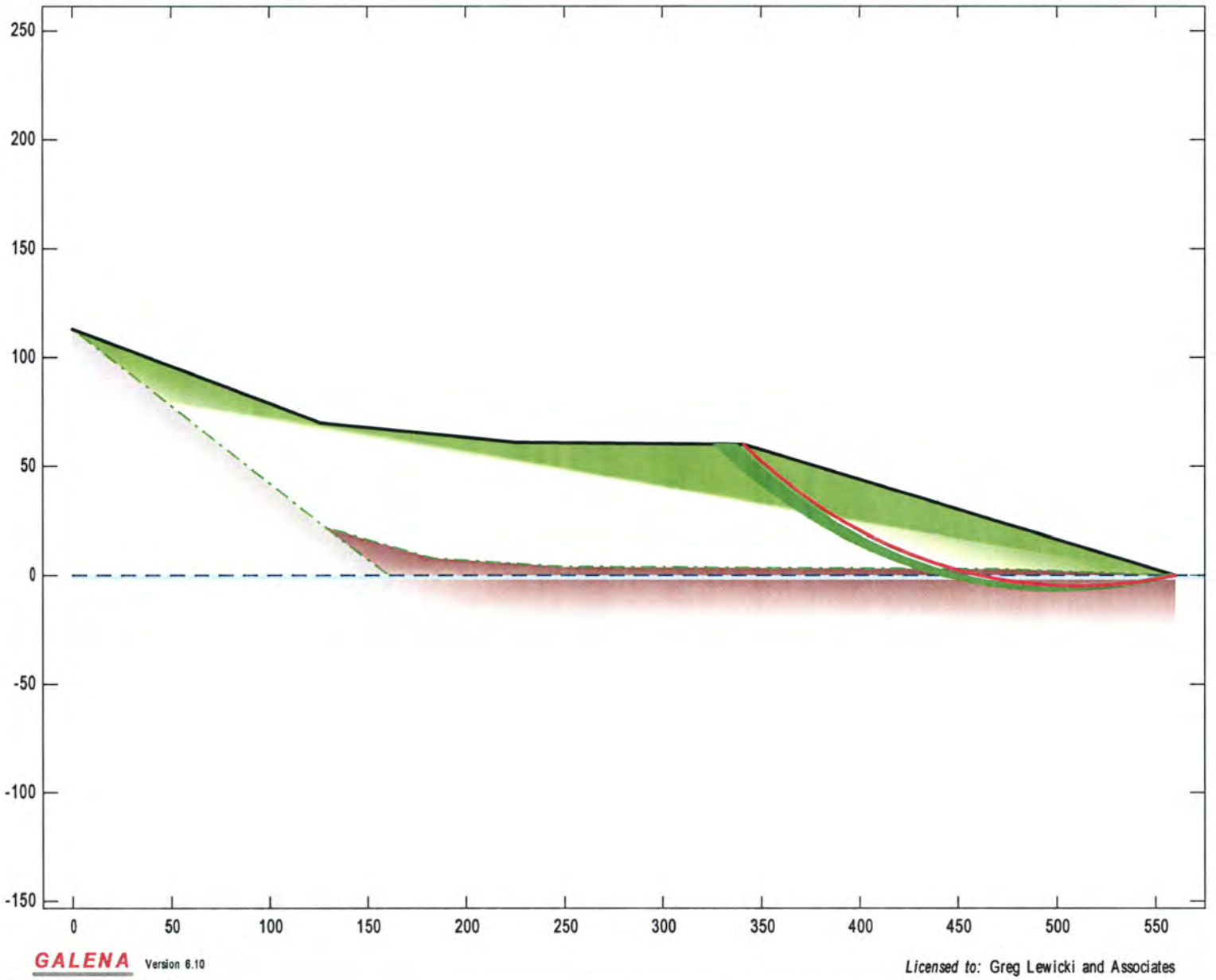
Critical Factor of Safety: 2.87

Project Ouray Silver Mine - Atlas Waste Pile
Lab Scenario 5 pt3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 5.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates



GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

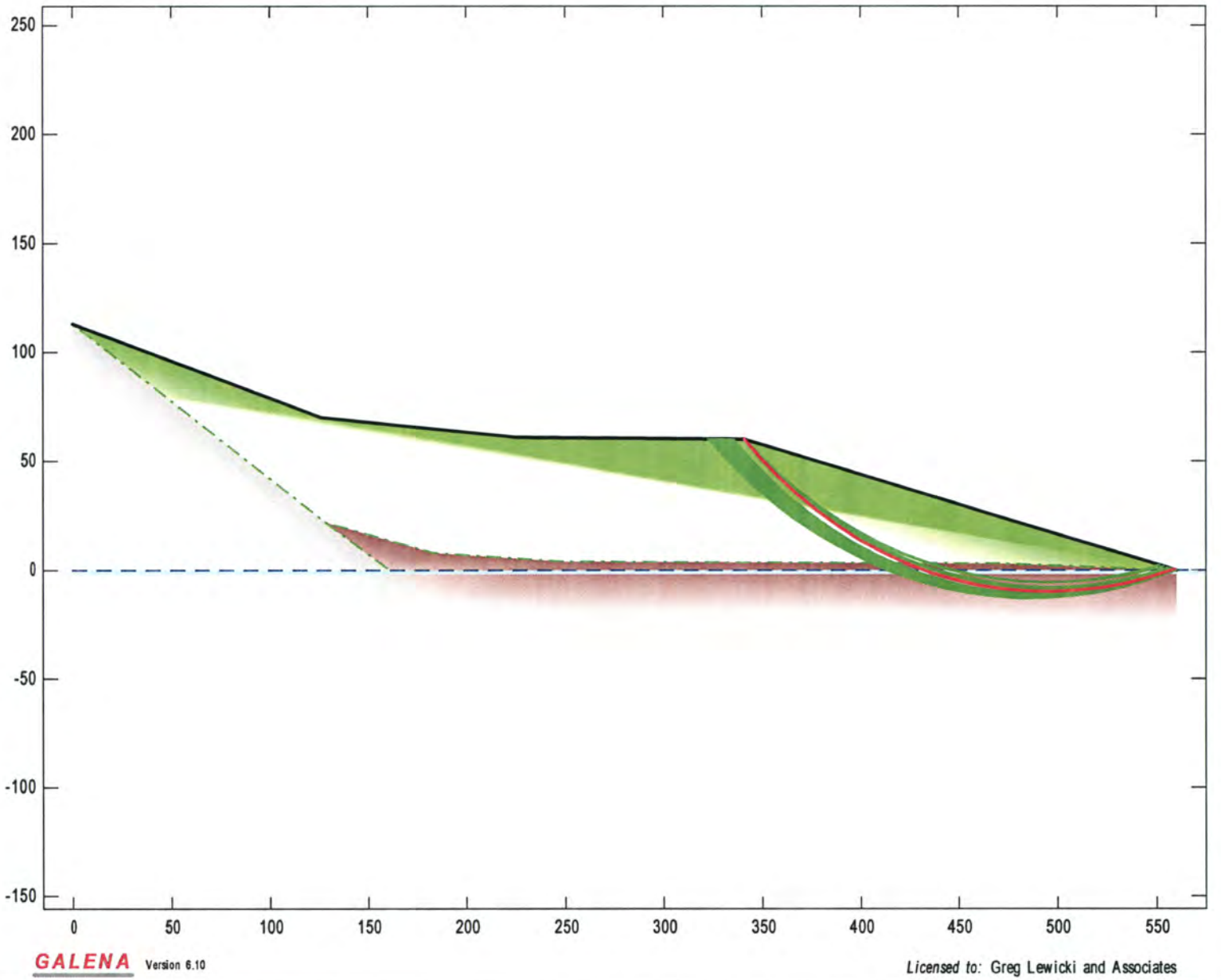
Critical Factor of Safety: 3.20

Project Ouray Silver Mine - Atlas Waste Pile
Lab Scenario 1 pt3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 1.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates



GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

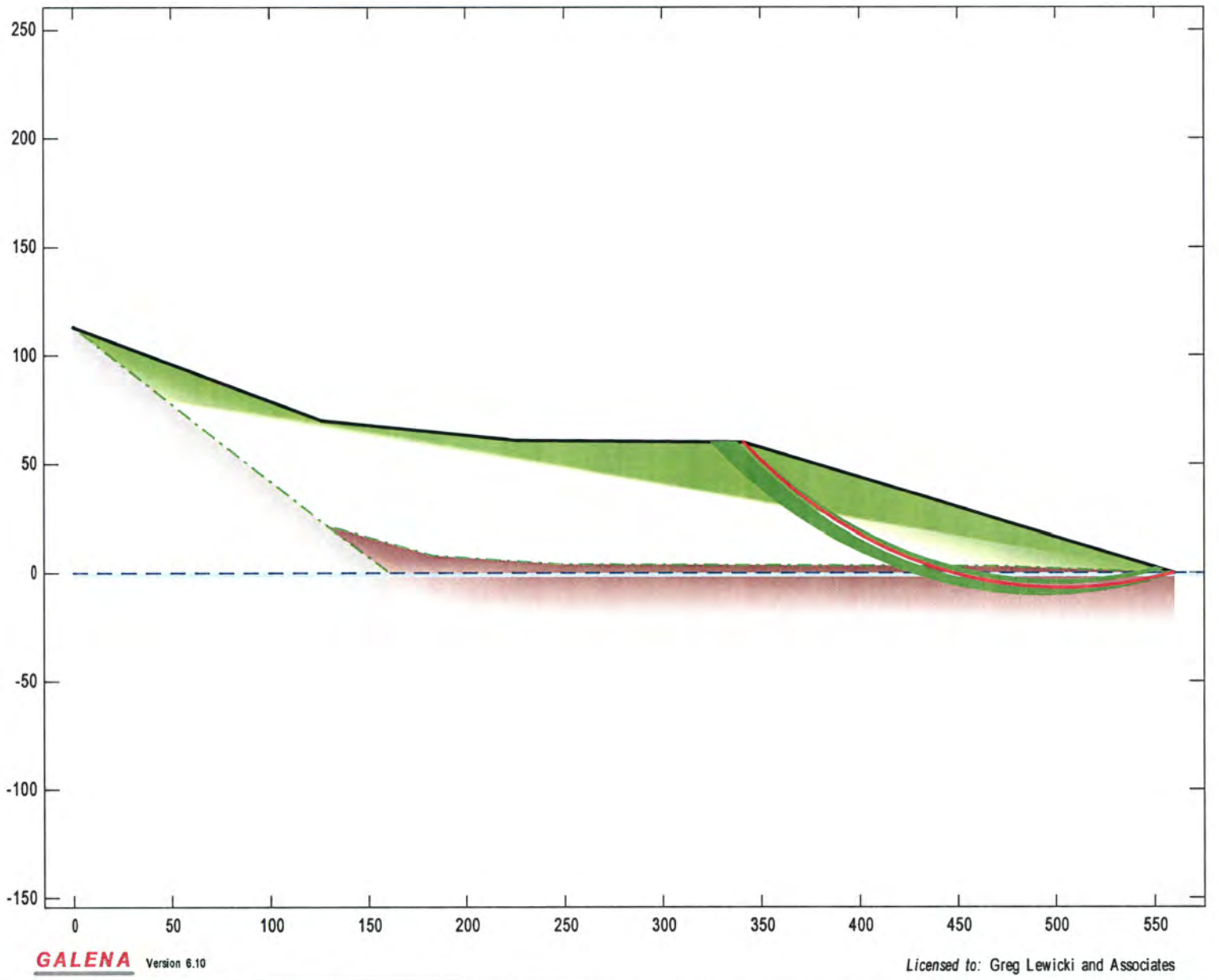
Critical Factor of Safety: 3.31

Project Ouray Silver Mine - Atlas Waste Pile
Lab Scenario 2 pt3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 2.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates



GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

- Existing waste rock
- Mill tailings
- Bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

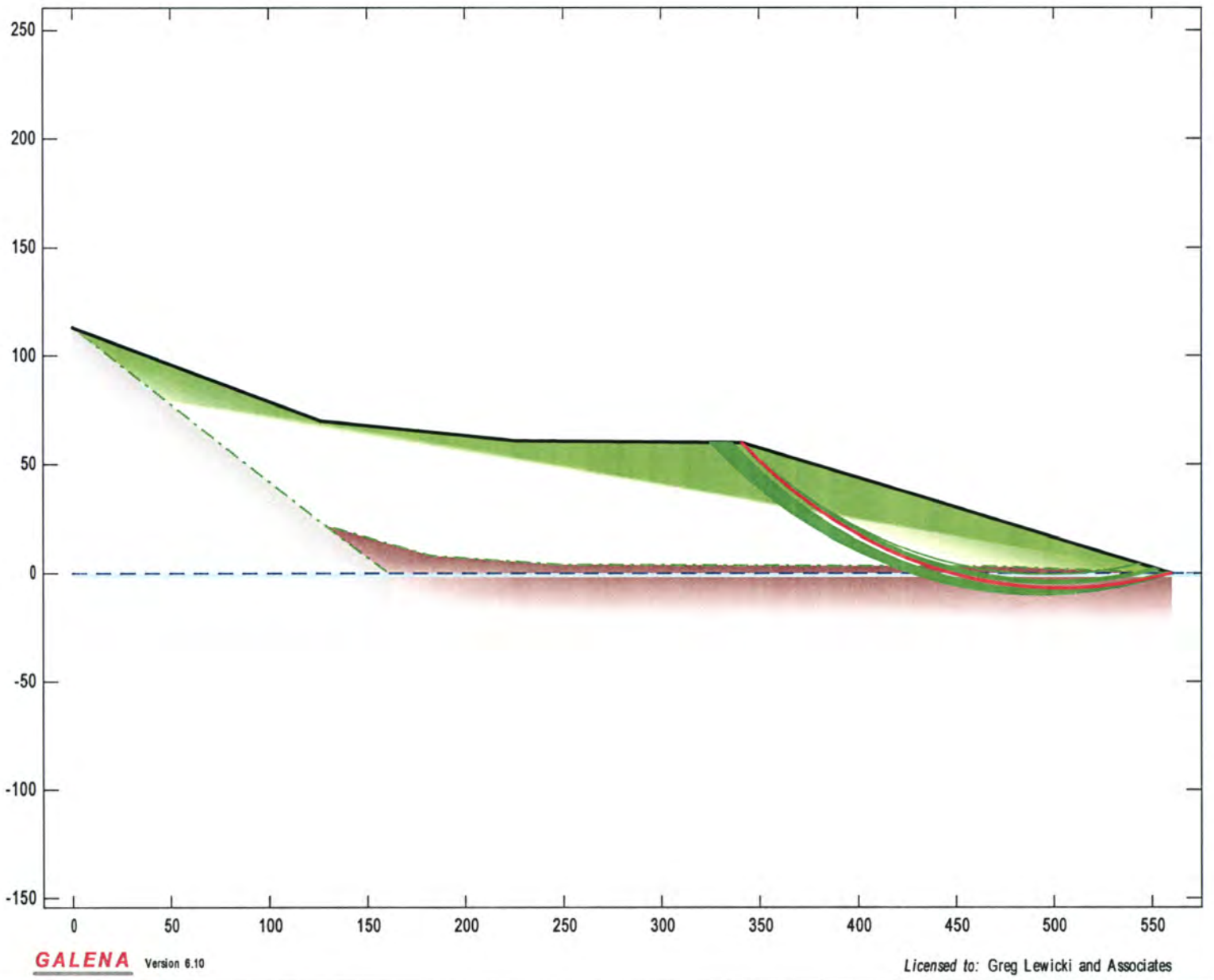
Critical Factor of Safety: 3.85

Project Ouray Silver Mine - Atlas Waste Pile
Lab Scenario 3 pt3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 3.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates



GALENA Version 6.10

Licensed to: Greg Lewicki and Associates

Material Keys

Existing waste rock

Mill tailings

Bedrock

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 4.08

Project Ouray Silver Mine - Atlas Waste Pile
Lab Scenario 4 pt3

File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 4.gmf

Edited: 13 Nov 2015
Processed: 13 Nov 2015

Greg Lewicki And Associates

GALENA 6.10 Analysis Results — Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Atlas Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 5.gmf
Processed: 13 Nov 2015 13:01:29

DATA: Analysis 1 - Lab Scenario 5

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
300.00	30.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 364.56 YL: 53.54 XR: 443.13 YR: 32.02
Centre: XC: 465.00 YC: 266.00 Radius: R: 235.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	200.00
Trial positions within range:	100	100	100

RESULTS: Analysis 1 - Lab Scenario 5

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 6.56

There were: 259461 successful analyses from a total of 1000001 trial circles
740539 analyses terminated due to unacceptable geometry
1 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 2.88

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.04	59.99	538.59	5.87	501.87	259.43	256.21	2.881
2	341.07	59.98	536.37	6.47	496.82	245.29	242.07	2.881
3	341.05	59.99	531.41	7.83	495.81	251.35	246.11	2.905
4	341.04	59.99	527.72	8.84	487.73	229.13	223.89	2.910
5	341.07	59.98	526.18	9.27	484.70	221.05	215.81	2.913
6	341.07	59.98	524.24	9.80	489.75	243.27	236.01	2.930
7	341.02	59.99	518.86	11.27	482.68	228.12	219.85	2.948
8	341.04	59.99	531.46	7.82	512.98	313.98	306.72	2.969
9	341.06	59.98	511.67	13.24	476.62	220.04	209.75	2.975
10	329.25	60.10	540.02	5.47	497.83	276.61	274.39	2.987
11	329.96	60.10	539.96	5.49	497.83	274.59	272.37	2.987
12	328.88	60.10	540.49	5.35	498.84	280.65	278.43	2.987
13	328.18	60.11	540.54	5.33	498.84	282.67	280.45	2.987
14	329.57	60.10	540.44	5.36	498.84	278.63	276.41	2.988

15	327.49	60.12	540.60	5.32	498.84	284.69	282.47	2.988
16	330.66	60.09	539.90	5.51	497.83	272.57	270.35	2.988
17	330.27	60.09	540.38	5.38	498.84	276.61	274.39	2.988
18	326.80	60.12	540.65	5.30	498.84	286.71	284.49	2.988
19	328.51	60.11	540.95	5.22	499.85	284.69	282.47	2.988
20	329.20	60.10	540.90	5.23	499.85	282.67	280.45	2.988
21	327.82	60.11	541.00	5.20	499.85	286.71	284.49	2.988
22	327.14	60.12	541.05	5.19	499.85	288.73	286.52	2.988
23	329.90	60.10	540.85	5.25	499.85	280.65	278.43	2.988
24	331.37	60.08	539.84	5.52	497.83	270.55	268.33	2.988
25	330.98	60.09	540.33	5.39	498.84	274.59	272.37	2.988
26	326.11	60.13	540.70	5.29	498.84	288.73	286.52	2.988
27	328.16	60.11	541.40	5.10	500.86	288.73	286.52	2.989
28	328.84	60.10	541.35	5.11	500.86	286.71	284.49	2.989
29	326.45	60.13	541.10	5.18	499.85	290.75	288.54	2.989
30	330.60	60.09	540.79	5.26	499.85	278.63	276.41	2.989
31	327.47	60.12	541.45	5.08	500.86	290.75	288.54	2.989
32	329.53	60.10	541.30	5.12	500.86	284.69	282.47	2.989
33	325.43	60.13	540.75	5.27	498.84	290.75	288.54	2.989
34	326.79	60.12	541.50	5.07	500.86	292.77	290.56	2.989
35	332.08	60.08	539.79	5.54	497.83	268.53	266.31	2.989
36	331.68	60.08	540.27	5.41	498.84	272.57	270.35	2.989
37	330.23	60.09	541.25	5.14	500.86	282.67	280.45	2.989
38	325.77	60.13	541.15	5.16	499.85	292.77	290.56	2.989
39	331.30	60.08	540.74	5.28	499.85	276.61	274.39	2.990
40	341.02	60.00	523.16	10.09	501.87	289.74	280.45	2.990
41	328.50	60.11	541.79	4.99	501.87	290.75	288.54	2.990
42	327.82	60.11	541.84	4.97	501.87	292.77	290.56	2.990
43	329.18	60.10	541.75	5.00	501.87	288.73	286.52	2.990
44	326.11	60.13	541.55	5.06	500.86	294.79	292.58	2.990
45	330.92	60.09	541.20	5.15	500.86	280.65	278.43	2.990
46	327.14	60.12	541.89	4.96	501.87	294.79	292.58	2.990
47	329.87	60.10	541.70	5.01	501.87	286.71	284.49	2.990
48	324.75	60.14	540.81	5.26	498.84	292.77	290.56	2.990
49	325.09	60.14	541.20	5.15	499.85	294.79	292.58	2.990
50	332.39	60.07	540.21	5.42	498.84	270.55	268.33	2.990
51	326.46	60.13	541.93	4.95	501.87	296.81	294.60	2.990
52	332.00	60.08	540.69	5.29	499.85	274.59	272.37	2.990
53	325.44	60.13	541.60	5.04	500.86	296.81	294.60	2.990
54	332.80	60.07	539.73	5.55	497.83	266.51	264.29	2.991
55	330.56	60.09	541.65	5.03	501.87	284.69	282.47	2.991
56	328.16	60.11	542.22	4.87	502.88	294.79	292.58	2.991
57	328.84	60.10	542.18	4.88	502.88	292.77	290.56	2.991
58	327.48	60.12	542.27	4.86	502.88	296.81	294.60	2.991
59	331.62	60.08	541.15	5.16	500.86	278.63	276.41	2.991
60	329.52	60.10	542.13	4.89	502.88	290.75	288.54	2.991
61	325.79	60.13	541.98	4.94	501.87	298.83	296.62	2.991
62	326.81	60.12	542.31	4.85	502.88	298.83	296.62	2.991
63	324.07	60.15	540.86	5.24	498.84	294.79	292.58	2.991
64	328.55	60.11	540.07	5.46	497.83	278.63	276.41	2.991
65	324.42	60.14	541.25	5.14	499.85	296.81	294.60	2.991
66	331.25	60.08	541.60	5.04	501.87	282.67	280.45	2.991
67	330.20	60.09	542.09	4.91	502.88	288.73	286.52	2.991
68	324.76	60.14	541.64	5.03	500.86	298.83	296.62	2.991
69	326.14	60.13	542.36	4.83	502.88	300.85	298.64	2.992
70	325.12	60.14	542.03	4.92	501.87	300.85	298.64	2.992
71	332.70	60.07	540.63	5.31	499.85	272.57	270.35	2.992
72	328.50	60.11	542.60	4.77	503.89	296.81	294.60	2.992
73	327.83	60.11	542.64	4.75	503.89	298.83	296.62	2.992
74	333.10	60.07	540.16	5.44	498.84	268.53	266.31	2.992
75	332.32	60.07	541.10	5.18	500.86	276.61	274.39	2.992
76	329.18	60.10	542.56	4.78	503.89	294.79	292.58	2.992
77	330.89	60.09	542.04	4.92	502.88	286.71	284.49	2.992
78	327.16	60.12	542.69	4.74	503.89	300.85	298.64	2.992
79	333.51	60.06	539.67	5.57	497.83	264.48	262.27	2.992
80	331.94	60.08	541.55	5.05	501.87	280.65	278.43	2.992
81	329.86	60.10	542.51	4.79	503.89	292.77	290.56	2.992
82	325.47	60.13	542.40	4.82	502.88	302.87	300.66	2.992
83	323.74	60.15	541.30	5.12	499.85	298.83	296.62	2.992
84	323.39	60.15	540.91	5.23	498.84	296.81	294.60	2.992
85	326.49	60.13	542.73	4.73	503.89	302.87	300.66	2.992
86	324.09	60.15	541.69	5.02	500.86	300.85	298.64	2.992
87	324.45	60.14	542.07	4.91	501.87	302.87	300.66	2.993
88	327.86	60.11	540.13	5.44	497.83	280.65	278.43	2.993
89	330.54	60.09	542.47	4.80	503.89	290.75	288.54	2.993
90	331.58	60.08	541.99	4.93	502.88	284.69	282.47	2.993
91	325.83	60.13	542.77	4.72	503.89	304.89	302.68	2.993
92	328.18	60.11	543.01	4.65	504.90	300.85	298.64	2.993
93	328.85	60.10	542.97	4.67	504.90	298.83	296.62	2.993
94	327.51	60.12	543.05	4.64	504.90	302.87	300.66	2.993
95	324.80	60.14	542.45	4.81	502.88	304.89	302.68	2.993
96	333.41	60.07	540.58	5.32	499.85	270.55	268.33	2.993
97	333.02	60.07	541.05	5.19	500.86	274.59	272.37	2.993
98	329.53	60.10	542.93	4.68	504.90	296.81	294.60	2.993
99	326.85	60.12	543.09	4.63	504.90	304.89	302.68	2.993

Critical Failure Circle

Intersects: XL: 341.04 YL: 59.99 XR: 538.59 YR: 5.87

Centre: XC: 501.87 YC: 259.43 Radius: R: 256.21

Generated failure surface: (20 points)

341.04	59.99	349.82	53.22	358.89	46.83	368.22	40.84	377.80	35.26
387.62	30.11	397.65	25.38	407.88	21.09	418.28	17.24	428.84	13.85
439.53	10.92	450.34	8.46	461.25	6.46	472.24	4.94	483.28	3.90
494.35	3.33	505.44	3.25	516.52	3.64	527.58	4.52	538.59	5.87

Slice Geometry and Properties (38 slices)

Slice	X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	4.79	-85.5	4.43	56.78	2	300.00	30.0	526.61	0.00	-928.52	-8.21
2	345.43	14.38	37.6	4.39	5.54	2	300.00	30.0	1580.29	0.00	242.17	1.09
3	349.82	24.22	35.2	4.53	5.54	2	300.00	30.0	2661.52	0.00	450.22	1.07
4	354.35	33.06	35.2	4.53	5.54	2	300.00	30.0	3633.59	0.00	638.13	1.07
5	358.89	42.60	32.7	4.67	5.54	2	300.00	30.0	4681.27	0.00	829.59	1.05
6	363.55	50.60	32.7	4.67	5.54	2	300.00	30.0	5561.06	0.00	996.64	1.05
7	368.22	59.60	30.2	4.79	5.54	2	300.00	30.0	6550.58	0.00	1169.87	1.04
8	373.01	66.68	30.2	4.79	5.54	2	300.00	30.0	7328.11	0.00	1315.16	1.04
9	377.80	74.95	27.7	4.91	5.54	2	300.00	30.0	8237.17	0.00	1468.79	1.02
10	382.71	81.01	27.7	4.91	5.54	2	300.00	30.0	8903.13	0.00	1591.54	1.02
11	387.62	88.35	25.2	5.02	5.54	2	300.00	30.0	9710.18	0.00	1724.10	1.01
12	392.64	93.32	25.2	5.02	5.54	2	300.00	30.0	10256.12	0.00	1823.56	1.01
13	397.65	99.58	22.8	5.11	5.54	2	300.00	30.0	10943.45	0.00	1934.01	1.00
14	402.76	103.38	22.8	5.11	5.54	2	300.00	30.0	11361.64	0.00	2009.46	1.00
15	407.88	108.39	20.3	5.20	5.54	2	300.00	30.0	11912.02	0.00	2096.58	0.99
16	413.08	110.97	20.3	5.20	5.54	2	300.00	30.0	12196.10	0.00	2147.43	0.99
17	418.28	114.62	17.8	5.28	5.54	2	300.00	30.0	12596.22	0.00	2210.30	0.99
18	423.56	115.93	17.8	5.28	5.54	2	300.00	30.0	12740.45	0.00	2235.96	0.99
19	428.84	118.10	15.3	5.35	5.54	2	300.00	30.0	12978.85	0.00	2273.62	0.98
20	434.18	118.09	15.3	5.35	5.54	2	300.00	30.0	12978.51	0.00	2273.57	0.98
21	439.53	118.71	12.8	5.41	5.54	2	300.00	30.0	13046.43	0.00	2285.15	0.98
22	444.94	117.37	12.8	5.41	5.54	2	300.00	30.0	12898.61	0.00	2259.01	0.98
23	450.34	116.38	10.4	5.45	5.54	2	300.00	30.0	12790.40	0.00	2243.74	0.98
24	455.80	113.67	10.4	5.45	5.54	2	300.00	30.0	12492.33	0.00	2191.02	0.98
25	461.25	111.05	7.9	5.49	5.54	2	300.00	30.0	12204.82	0.00	2148.14	0.98
26	466.75	106.97	7.9	5.49	5.54	2	300.00	30.0	11755.52	0.00	2068.53	0.98
27	472.24	102.72	5.4	5.52	5.54	2	300.00	30.0	11288.51	0.00	1997.27	0.99
28	477.76	97.25	5.4	5.52	5.54	2	300.00	30.0	10687.78	0.00	1890.48	0.99
29	483.28	91.39	2.9	5.54	5.54	2	300.00	30.0	10044.28	0.00	1790.24	0.99
30	488.82	84.56	2.9	5.54	5.54	2	300.00	30.0	9293.09	0.00	1655.95	0.99
31	494.35	77.15	0.4	5.54	5.54	2	300.00	30.0	8478.96	0.00	1526.09	1.00
32	499.90	68.97	0.4	5.54	5.54	2	300.00	30.0	7579.37	0.00	1364.08	1.00
33	505.44	60.08	-2.0	5.54	5.54	2	300.00	30.0	6602.70	0.00	1203.86	1.01
34	510.98	50.57	-2.0	5.54	5.54	2	300.00	30.0	5558.09	0.00	1013.99	1.01
35	516.52	40.32	-4.5	5.53	5.54	2	300.00	30.0	4430.72	0.00	822.85	1.02
36	522.05	29.53	-4.5	5.53	5.54	2	300.00	30.0	3245.41	0.00	604.95	1.02
37	527.58	18.02	-7.0	5.50	5.54	2	300.00	30.0	1980.57	0.00	382.07	1.03
38	533.08	6.01	-7.0	5.50	5.54	2	300.00	30.0	660.27	0.00	136.11	1.03
X-S Area:		2933.35	Path Length:		261.93			X-S Weight:	322374.72			

DATA: Analysis 2 - Lab Scenario 5 pt2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
300.00	30.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R

Intersects:	XL:	341.04	YL:	59.99	XR:	538.59	YR: 5.87
Centre:	XC:	501.87	YC:	259.43	Radius:	R:	256.21

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	50.00	50.00	50.00
Trial positions within range:	50	50	50

RESULTS: Analysis 2 - Lab Scenario 5 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 2.88

There were: 63763 successful analyses from a total of 125001 trial circles
61238 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.87

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.08	59.98	541.99	4.93	504.42	261.99	259.78	2.867
2	341.04	59.99	538.59	5.87	501.87	259.43	256.21	2.881
3	341.08	59.98	534.63	6.95	493.20	235.45	232.23	2.885
4	341.02	59.99	532.95	7.41	494.22	242.60	238.35	2.896
5	341.01	60.00	531.56	7.79	496.26	252.80	247.54	2.907
6	341.04	59.99	529.32	8.41	491.15	238.52	233.25	2.908
7	341.02	60.00	527.93	8.79	493.20	248.72	242.44	2.920
8	341.02	59.99	524.31	9.78	490.13	244.64	237.33	2.933
9	341.05	59.99	538.28	5.95	496.26	239.54	237.33	2.938
10	341.03	59.99	520.69	10.77	487.07	240.56	232.23	2.947
11	328.41	60.11	540.31	5.39	498.30	280.35	278.15	2.987
12	328.77	60.11	540.29	5.40	498.30	279.33	277.13	2.987
13	329.12	60.10	540.26	5.41	498.30	278.31	276.11	2.987
14	329.47	60.10	540.23	5.42	498.30	277.29	275.09	2.987
15	329.83	60.10	540.20	5.42	498.30	276.27	274.07	2.987
16	330.18	60.09	540.17	5.43	498.30	275.25	273.05	2.987
17	328.74	60.11	540.73	5.28	499.32	282.39	280.19	2.988
18	328.39	60.11	540.76	5.27	499.32	283.41	281.21	2.988
19	329.09	60.10	540.70	5.29	499.32	281.37	279.17	2.988
20	329.45	60.10	540.68	5.29	499.32	280.35	278.15	2.988
21	330.54	60.09	540.14	5.44	498.30	274.23	272.03	2.988
22	329.80	60.10	540.65	5.30	499.32	279.33	277.13	2.988
23	330.89	60.09	540.12	5.45	498.30	273.21	271.01	2.988
24	330.15	60.09	540.62	5.31	499.32	278.31	276.11	2.988
25	330.50	60.09	540.60	5.32	499.32	277.29	275.09	2.988
26	331.25	60.08	540.09	5.46	498.30	272.19	269.99	2.988
27	329.43	60.10	541.12	5.17	500.34	283.41	281.21	2.988
28	330.86	60.09	540.57	5.32	499.32	276.27	274.07	2.989
29	329.78	60.10	541.09	5.18	500.34	282.39	280.19	2.989
30	330.13	60.09	541.06	5.19	500.34	281.37	279.17	2.989
31	331.61	60.08	540.06	5.46	498.30	271.17	268.97	2.989
32	331.21	60.08	540.54	5.33	499.32	275.25	273.05	2.989
33	330.48	60.09	541.04	5.20	500.34	280.35	278.15	2.989
34	330.83	60.09	541.01	5.20	500.34	279.33	277.13	2.989
35	331.97	60.08	540.03	5.47	498.30	270.15	267.95	2.989
36	331.57	60.08	540.51	5.34	499.32	274.23	272.03	2.989
37	331.18	60.08	540.98	5.21	500.34	278.31	276.11	2.990
38	332.33	60.07	540.00	5.48	498.30	269.13	266.93	2.990
39	331.93	60.08	540.48	5.35	499.32	273.21	271.01	2.990
40	330.46	60.09	541.47	5.08	501.36	283.41	281.21	2.990
41	330.81	60.09	541.44	5.08	501.36	282.39	280.19	2.990
42	331.54	60.08	540.96	5.22	500.34	277.29	275.09	2.990
43	332.28	60.08	540.46	5.35	499.32	272.19	269.99	2.990
44	332.69	60.07	539.97	5.49	498.30	268.11	265.91	2.990
45	331.16	60.08	541.42	5.09	501.36	281.37	279.17	2.990
46	331.89	60.08	540.93	5.22	500.34	276.27	274.07	2.991
47	331.51	60.08	541.39	5.10	501.36	280.35	278.15	2.991
48	332.24	60.08	540.90	5.23	500.34	275.25	273.05	2.991
49	332.64	60.07	540.43	5.36	499.32	271.17	268.97	2.991
50	333.05	60.07	539.94	5.50	498.30	267.09	264.89	2.991
51	331.86	60.08	541.37	5.10	501.36	279.33	277.13	2.991
52	328.06	60.11	540.34	5.39	498.30	281.37	279.17	2.992
53	327.71	60.11	540.37	5.38	498.30	282.39	280.19	2.992
54	333.00	60.07	540.40	5.37	499.32	270.15	267.95	2.992
55	332.60	60.07	540.88	5.24	500.34	274.23	272.03	2.992
56	332.21	60.08	541.34	5.11	501.36	278.31	276.11	2.992
57	333.41	60.07	539.91	5.50	498.30	266.07	263.87	2.992
58	331.49	60.08	541.82	4.98	502.38	283.41	281.21	2.992
59	331.84	60.08	541.79	4.99	502.38	282.39	280.19	2.992

60	327.36	60.12	540.40	5.37	498.30	283.41	281.21	2.992
61	332.96	60.07	540.85	5.25	500.34	273.21	271.01	2.992
62	333.36	60.07	540.37	5.38	499.32	269.13	266.93	2.992
63	332.57	60.07	541.32	5.12	501.36	277.29	275.09	2.993
64	333.77	60.06	539.88	5.51	498.30	265.05	262.84	2.993
65	332.19	60.08	541.77	4.99	502.38	281.37	279.17	2.993
66	333.31	60.07	540.82	5.25	500.34	272.19	269.99	2.993
67	333.72	60.06	540.34	5.39	499.32	268.11	265.91	2.993
68	332.92	60.07	541.29	5.13	501.36	276.27	274.07	2.993
69	332.54	60.07	541.74	5.00	502.38	280.35	278.15	2.994
70	334.13	60.06	539.85	5.52	498.30	264.03	261.82	2.994
71	333.67	60.06	540.79	5.26	500.34	271.17	268.97	2.994
72	333.28	60.07	541.26	5.13	501.36	275.25	273.05	2.994
73	334.08	60.06	540.31	5.39	499.32	267.09	264.89	2.994
74	332.89	60.07	541.72	5.01	502.38	279.33	277.13	2.994
75	334.50	60.06	539.82	5.53	498.30	263.01	260.80	2.995
76	332.52	60.07	542.16	4.89	503.40	283.41	281.21	2.995
77	333.63	60.06	541.24	5.14	501.36	274.23	272.03	2.995
78	334.03	60.06	540.77	5.27	500.34	270.15	267.95	2.995
79	333.25	60.07	541.69	5.02	502.38	278.31	276.11	2.995
80	334.44	60.06	540.28	5.40	499.32	266.07	263.87	2.995
81	332.87	60.07	542.14	4.89	503.40	282.39	280.19	2.995
82	334.86	60.05	539.79	5.54	498.30	261.99	259.78	2.996
83	333.99	60.06	541.21	5.15	501.36	273.21	271.01	2.996
84	333.60	60.06	541.67	5.02	502.38	277.29	275.09	2.996
85	334.39	60.06	540.74	5.28	500.34	269.13	266.93	2.996
86	334.80	60.05	540.26	5.41	499.32	265.05	262.84	2.996
87	333.22	60.07	542.12	4.90	503.40	281.37	279.17	2.996
88	334.35	60.06	541.18	5.16	501.36	272.19	269.99	2.997
89	333.95	60.06	541.64	5.03	502.38	276.27	274.07	2.997
90	335.23	60.05	539.76	5.55	498.30	260.96	258.76	2.997
91	334.75	60.05	540.71	5.28	500.34	268.11	265.91	2.997
92	333.57	60.06	542.09	4.91	503.40	280.35	278.15	2.997
93	335.17	60.05	540.23	5.42	499.32	264.03	261.82	2.997
94	334.31	60.06	541.62	5.04	502.38	275.25	273.05	2.998
95	334.70	60.05	541.16	5.16	501.36	271.17	268.97	2.998
96	333.93	60.06	542.07	4.91	503.40	279.33	277.13	2.998
97	335.11	60.05	540.68	5.29	500.34	267.09	264.89	2.998
98	335.59	60.05	539.73	5.55	498.30	259.94	257.74	2.998
99	328.92	60.10	534.78	6.91	491.15	263.01	259.78	2.998

Critical Failure Circle

Intersects: XL: 341.08 YL: 59.98 XR: 541.99 YR: 4.93
Centre: XC: 504.42 YC: 261.99 Radius: R: 259.78
Generated failure surface: (20 points)

341.08	59.98	350.00	53.08	359.22	46.57	368.70	40.47	378.45	34.79
388.43	29.53	398.63	24.72	409.03	20.35	419.61	16.43	430.35	12.98
441.23	10.00	452.23	7.50	463.33	5.47	474.50	3.93	485.73	2.87
497.00	2.31	508.28	2.23	519.55	2.64	530.80	3.54	541.99	4.93

Slice Geometry and Properties (38 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	4.97	-85.4	4.54	56.71	2	300.00	30.0	545.97	0.00	-943.87	-8.28
2	345.54	14.91	37.7	4.46	5.64	2	300.00	30.0	1638.63	0.00	247.74	1.09
3	350.00	25.12	35.2	4.61	5.64	2	300.00	30.0	2760.42	0.00	459.83	1.07
4	354.61	34.29	35.2	4.61	5.64	2	300.00	30.0	3768.61	0.00	651.41	1.07
5	359.22	44.19	32.7	4.74	5.64	2	300.00	30.0	4856.07	0.00	846.64	1.05
6	363.96	52.49	32.7	4.74	5.64	2	300.00	30.0	5768.79	0.00	1016.96	1.05
7	368.70	61.84	30.3	4.87	5.64	2	300.00	30.0	6796.18	0.00	1193.64	1.04
8	373.58	69.18	30.3	4.87	5.64	2	300.00	30.0	7603.12	0.00	1341.85	1.04
9	378.45	77.77	27.8	4.99	5.64	2	300.00	30.0	8547.01	0.00	1498.52	1.02
10	383.44	84.06	27.8	4.99	5.64	2	300.00	30.0	9238.27	0.00	1623.74	1.02
11	388.43	91.69	25.3	5.10	5.64	2	300.00	30.0	10077.05	0.00	1759.06	1.01
12	393.53	96.85	25.3	5.10	5.64	2	300.00	30.0	10643.58	0.00	1860.48	1.01
13	398.63	103.35	22.8	5.20	5.64	2	300.00	30.0	11357.64	0.00	1973.20	1.00
14	403.83	107.29	22.8	5.20	5.64	2	300.00	30.0	11791.60	0.00	2050.15	1.00
15	409.03	112.50	20.3	5.29	5.64	2	300.00	30.0	12363.93	0.00	2139.14	0.99
16	414.32	115.19	20.3	5.29	5.64	2	300.00	30.0	12658.98	0.00	2191.06	0.99
17	419.61	118.97	17.8	5.37	5.64	2	300.00	30.0	13074.98	0.00	2255.28	0.99
18	424.98	120.33	17.8	5.37	5.64	2	300.00	30.0	13224.81	0.00	2281.48	0.99
19	430.35	122.59	15.3	5.44	5.64	2	300.00	30.0	13472.66	0.00	2319.98	0.98
20	435.79	122.59	15.3	5.44	5.64	2	300.00	30.0	13472.50	0.00	2319.94	0.98
21	441.23	123.24	12.8	5.50	5.64	2	300.00	30.0	13543.54	0.00	2331.89	0.98
22	446.73	121.84	12.8	5.50	5.64	2	300.00	30.0	13389.93	0.00	2305.19	0.98
23	452.23	120.82	10.3	5.55	5.64	2	300.00	30.0	13277.79	0.00	2289.70	0.98
24	457.78	118.00	10.3	5.55	5.64	2	300.00	30.0	12968.44	0.00	2235.92	0.98
25	463.33	115.29	7.9	5.59	5.64	2	300.00	30.0	12669.90	0.00	2192.23	0.98
26	468.92	111.04	7.9	5.59	5.64	2	300.00	30.0	12203.31	0.00	2110.97	0.98
27	474.50	106.63	5.4	5.62	5.64	2	300.00	30.0	11718.72	0.00	2038.40	0.99
28	480.12	100.95	5.4	5.62	5.64	2	300.00	30.0	11094.80	0.00	1929.37	0.99
29	485.73	94.87	2.9	5.63	5.64	2	300.00	30.0	10426.73	0.00	1827.16	0.99
30	491.37	87.78	2.9	5.63	5.64	2	300.00	30.0	9646.85	0.00	1690.10	0.99
31	497.00	80.09	0.4	5.64	5.64	2	300.00	30.0	8801.40	0.00	1557.61	1.00
32	502.64	71.59	0.4	5.64	5.64	2	300.00	30.0	7867.34	0.00	1392.23	1.00
33	508.28	62.36	-2.1	5.64	5.64	2	300.00	30.0	6853.61	0.00	1228.80	1.01
34	513.92	52.49	-2.1	5.64	5.64	2	300.00	30.0	5769.05	0.00	1034.97	1.01
35	519.55	41.84	-4.6	5.62	5.64	2	300.00	30.0	4598.67	0.00	839.88	1.02

36	525.18	30.65	-4.6	5.62	5.64	2	300.00	30.0	3368.34	0.00	617.47	1.02
37	530.80	18.71	-7.1	5.60	5.64	2	300.00	30.0	2055.76	0.00	390.00	1.03
38	536.40	6.23	-7.1	5.60	5.64	2	300.00	30.0	685.17	0.00	138.86	1.03

X-S Area: 3044.59 Path Length: 265.40 X-S Weight: 334600.09

DATA: Analysis 3 - Lab Scenario 5 pt3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
300.00	30.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R

Intersects: XL: 341.08 YL: 59.98 XR: 541.99 YR: 4.93

Centre: XC: 504.42 YC: 261.99 Radius: R: 259.78

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	20.00	20.00	20.00
Trial positions within range:	20	20	20

RESULTS: Analysis 3 - Lab Scenario 5 pt3

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 2.87

There were: 6491 successful analyses from a total of 8001 trial circles
1510 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.87

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.08	59.98	541.99	4.93	504.42	261.99	259.78	2.867
2	341.03	59.99	542.21	4.87	504.95	263.56	261.36	2.869
3	341.04	59.99	538.48	5.90	501.79	259.35	256.10	2.881
4	341.05	59.99	534.74	6.92	498.63	255.14	250.84	2.893
5	331.66	60.08	540.20	5.42	498.63	271.99	269.78	2.989
6	332.03	60.08	540.17	5.43	498.63	270.93	268.73	2.990
7	332.40	60.07	540.14	5.44	498.63	269.88	267.68	2.990
8	332.77	60.07	540.11	5.45	498.63	268.83	266.63	2.991
9	332.72	60.07	540.58	5.32	499.68	271.99	269.78	2.991
10	333.14	60.07	540.08	5.46	498.63	267.77	265.57	2.992
11	333.09	60.07	540.55	5.33	499.68	270.93	268.73	2.992
12	333.51	60.06	540.05	5.47	498.63	266.72	264.52	2.992
13	333.46	60.06	540.52	5.34	499.68	269.88	267.68	2.993
14	333.89	60.06	540.02	5.47	498.63	265.67	263.47	2.993

15	333.83	60.06	540.49	5.34	499.68	268.83	266.63	2.994
16	334.26	60.06	539.99	5.48	498.63	264.62	262.42	2.994
17	333.79	60.06	540.96	5.22	500.74	271.99	269.78	2.995
18	334.20	60.06	540.47	5.35	499.68	267.77	265.57	2.995
19	334.64	60.05	539.96	5.49	498.63	263.56	261.36	2.995
20	334.16	60.06	540.93	5.22	500.74	270.93	268.73	2.995
21	334.58	60.06	540.44	5.36	499.68	266.72	264.52	2.996
22	335.01	60.05	539.93	5.50	498.63	262.51	260.31	2.996
23	334.53	60.06	540.90	5.23	500.74	269.88	267.68	2.996
24	334.95	60.05	540.41	5.37	499.68	265.67	263.47	2.997
25	335.46	60.05	539.41	5.64	497.58	258.30	256.10	2.997
26	335.39	60.05	539.90	5.51	498.63	261.46	259.26	2.997
27	334.90	60.05	540.87	5.24	500.74	268.83	266.63	2.998
28	335.32	60.05	540.38	5.38	499.68	264.62	262.42	2.998
29	335.84	60.04	539.38	5.65	497.58	257.25	255.05	2.998
30	334.85	60.05	541.33	5.12	501.79	271.99	269.78	2.998
31	335.77	60.05	539.87	5.52	498.63	260.41	258.20	2.999
32	335.27	60.05	540.84	5.25	500.74	267.77	265.57	2.999
33	329.13	60.10	536.20	6.52	494.42	271.99	268.73	2.999
34	335.70	60.05	540.35	5.38	499.68	263.56	261.36	2.999
35	329.49	60.10	536.17	6.53	494.42	270.93	267.68	2.999
36	329.86	60.10	536.14	6.54	494.42	269.88	266.63	2.999
37	336.22	60.04	539.34	5.66	497.58	256.20	253.99	3.000
38	335.22	60.05	541.30	5.12	501.79	270.93	268.73	3.000
39	330.23	60.09	536.11	6.55	494.42	268.83	265.57	3.000
40	330.60	60.09	536.07	6.55	494.42	267.77	264.52	3.000
41	335.08	60.05	539.44	5.63	497.58	259.35	257.15	3.000
42	335.64	60.05	540.82	5.26	500.74	266.72	264.52	3.000
43	336.14	60.04	539.84	5.52	498.63	259.35	257.15	3.000
44	334.70	60.05	539.47	5.62	497.58	260.41	258.20	3.000
45	330.19	60.09	536.58	6.42	495.47	271.99	268.73	3.000
46	330.97	60.09	536.04	6.56	494.42	266.72	263.47	3.000
47	334.32	60.06	539.51	5.61	497.58	261.46	259.26	3.000
48	330.56	60.09	536.55	6.42	495.47	270.93	267.68	3.000
49	336.08	60.04	540.32	5.39	499.68	262.51	260.31	3.000
50	331.34	60.08	536.01	6.57	494.42	265.67	262.42	3.001
51	333.95	60.06	539.54	5.61	497.58	262.51	260.31	3.001
52	330.92	60.09	536.52	6.43	495.47	269.88	266.63	3.001
53	335.59	60.05	541.27	5.13	501.79	269.88	267.68	3.001
54	333.57	60.06	539.57	5.60	497.58	263.56	261.36	3.001
55	336.60	60.04	539.31	5.67	497.58	255.14	252.94	3.001
56	331.71	60.08	535.98	6.58	494.42	264.62	261.36	3.001
57	331.29	60.08	536.49	6.44	495.47	268.83	265.57	3.001
58	336.01	60.04	540.79	5.26	500.74	265.67	263.47	3.001
59	333.20	60.07	539.60	5.59	497.58	264.62	262.42	3.001
60	336.52	60.04	539.80	5.53	498.63	258.30	256.10	3.001
61	332.08	60.08	535.95	6.59	494.42	263.56	260.31	3.002
62	331.66	60.08	536.46	6.45	495.47	267.77	264.52	3.002
63	332.82	60.07	539.63	5.58	497.58	265.67	263.47	3.002
64	331.26	60.08	536.96	6.31	496.52	271.99	268.73	3.002
65	332.45	60.07	539.66	5.57	497.58	266.72	264.52	3.002
66	336.45	60.04	540.29	5.40	499.68	261.46	259.26	3.002
67	332.45	60.07	535.92	6.60	494.42	262.51	259.26	3.002
68	332.03	60.08	536.43	6.46	495.47	266.72	263.47	3.002
69	335.96	60.04	541.25	5.14	501.79	268.83	266.63	3.002
70	331.62	60.08	536.93	6.32	496.52	270.93	267.68	3.002
71	332.08	60.08	539.70	5.56	497.58	267.77	265.57	3.002
72	336.98	60.03	539.28	5.68	497.58	254.09	251.89	3.003
73	332.40	60.07	536.40	6.47	495.47	265.67	262.42	3.003
74	336.39	60.04	540.76	5.27	500.74	264.62	262.42	3.003
75	331.99	60.08	536.90	6.33	496.52	269.88	266.63	3.003
76	331.70	60.08	539.73	5.55	497.58	268.83	266.63	3.003
77	332.83	60.07	535.89	6.61	494.42	261.46	258.20	3.003
78	336.90	60.04	539.77	5.54	498.63	257.25	255.05	3.003
79	335.92	60.04	541.70	5.01	502.84	271.99	269.78	3.003
80	331.33	60.08	539.76	5.55	497.58	269.88	267.68	3.003
81	332.36	60.07	536.87	6.34	496.52	268.83	265.57	3.003
82	332.77	60.07	536.37	6.47	495.47	264.62	261.36	3.003
83	336.83	60.04	540.26	5.41	499.68	260.41	258.20	3.003
84	336.33	60.04	541.22	5.15	501.79	267.77	265.57	3.003
85	333.20	60.07	535.86	6.61	494.42	260.41	257.15	3.004
86	330.96	60.09	539.79	5.54	497.58	270.93	268.73	3.004
87	332.73	60.07	536.84	6.34	496.52	267.77	264.52	3.004
88	333.14	60.07	536.34	6.48	495.47	263.56	260.31	3.004
89	336.76	60.04	540.73	5.28	500.74	263.56	261.36	3.004
90	332.32	60.07	537.33	6.21	497.58	271.99	268.73	3.004
91	337.37	60.03	539.24	5.69	497.58	253.04	250.84	3.004
92	330.59	60.09	539.82	5.53	497.58	271.99	269.78	3.004
93	333.58	60.06	535.82	6.62	494.42	259.35	256.10	3.004
94	337.28	60.03	539.74	5.55	498.63	256.20	253.99	3.004
95	336.28	60.04	541.67	5.02	502.84	270.93	268.73	3.005
96	333.09	60.07	536.81	6.35	496.52	266.72	263.47	3.005
97	332.69	60.07	537.30	6.22	497.58	270.93	267.68	3.005
98	333.52	60.06	536.31	6.49	495.47	262.51	259.26	3.005
99	336.71	60.04	541.19	5.15	501.79	266.72	264.52	3.005

Critical Failure Circle

Intersects: XL: 341.08 YL: 59.98 XR: 541.99 YR: 4.93

Centre: XC: 504.42 YC: 261.99 Radius: R: 259.78

Generated failure surface: (20 points)

341.08	59.98	350.00	53.08	359.22	46.57	368.70	40.47	378.45	34.79
388.43	29.53	398.63	24.72	409.03	20.35	419.61	16.43	430.35	12.98
441.23	10.00	452.23	7.50	463.33	5.47	474.50	3.93	485.73	2.87
497.00	2.31	508.28	2.23	519.55	2.64	530.80	3.54	541.99	4.93

Slice Geometry and Properties (38 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	4.97	-85.4	4.54	56.71	2	300.00	30.0	545.97	0.00	-943.87	-8.28
2	345.54	14.91	37.7	4.46	5.64	2	300.00	30.0	1638.63	0.00	247.74	1.09
3	350.00	25.12	35.2	4.61	5.64	2	300.00	30.0	2760.42	0.00	459.83	1.07
4	354.61	34.29	35.2	4.61	5.64	2	300.00	30.0	3768.61	0.00	651.41	1.07
5	359.22	44.19	32.7	4.74	5.64	2	300.00	30.0	4856.07	0.00	846.64	1.05
6	363.96	52.49	32.7	4.74	5.64	2	300.00	30.0	5768.79	0.00	1016.96	1.05
7	368.70	61.84	30.3	4.87	5.64	2	300.00	30.0	6796.18	0.00	1193.64	1.04
8	373.58	69.18	30.3	4.87	5.64	2	300.00	30.0	7603.12	0.00	1341.85	1.04
9	378.45	77.77	27.8	4.99	5.64	2	300.00	30.0	8547.01	0.00	1498.52	1.02
10	383.44	84.06	27.8	4.99	5.64	2	300.00	30.0	9238.27	0.00	1623.74	1.02
11	388.43	91.69	25.3	5.10	5.64	2	300.00	30.0	10077.05	0.00	1759.06	1.01
12	393.53	96.85	25.3	5.10	5.64	2	300.00	30.0	10643.58	0.00	1860.48	1.01
13	398.63	103.35	22.8	5.20	5.64	2	300.00	30.0	11357.64	0.00	1973.20	1.00
14	403.83	107.29	22.8	5.20	5.64	2	300.00	30.0	11791.60	0.00	2050.15	1.00
15	409.03	112.50	20.3	5.29	5.64	2	300.00	30.0	12363.93	0.00	2139.14	0.99
16	414.32	115.19	20.3	5.29	5.64	2	300.00	30.0	12658.98	0.00	2191.06	0.99
17	419.61	118.97	17.8	5.37	5.64	2	300.00	30.0	13074.98	0.00	2255.28	0.99
18	424.98	120.33	17.8	5.37	5.64	2	300.00	30.0	13224.81	0.00	2281.48	0.99
19	430.35	122.59	15.3	5.44	5.64	2	300.00	30.0	13472.66	0.00	2319.98	0.98
20	435.79	122.59	15.3	5.44	5.64	2	300.00	30.0	13472.50	0.00	2319.94	0.98
21	441.23	123.24	12.8	5.50	5.64	2	300.00	30.0	13543.54	0.00	2331.89	0.98
22	446.73	121.84	12.8	5.50	5.64	2	300.00	30.0	13389.93	0.00	2305.19	0.98
23	452.23	120.82	10.3	5.55	5.64	2	300.00	30.0	13277.79	0.00	2289.70	0.98
24	457.78	118.00	10.3	5.55	5.64	2	300.00	30.0	12968.44	0.00	2235.92	0.98
25	463.33	115.29	7.9	5.59	5.64	2	300.00	30.0	12669.90	0.00	2192.23	0.98
26	468.92	111.04	7.9	5.59	5.64	2	300.00	30.0	12203.31	0.00	2110.97	0.98
27	474.50	106.63	5.4	5.62	5.64	2	300.00	30.0	11718.72	0.00	2038.40	0.99
28	480.12	100.95	5.4	5.62	5.64	2	300.00	30.0	11094.80	0.00	1929.37	0.99
29	485.73	94.87	2.9	5.63	5.64	2	300.00	30.0	10426.73	0.00	1827.16	0.99
30	491.37	87.78	2.9	5.63	5.64	2	300.00	30.0	9646.85	0.00	1690.10	0.99
31	497.00	80.09	0.4	5.64	5.64	2	300.00	30.0	8801.40	0.00	1557.61	1.00
32	502.64	71.59	0.4	5.64	5.64	2	300.00	30.0	7867.34	0.00	1392.23	1.00
33	508.28	62.36	-2.1	5.64	5.64	2	300.00	30.0	6853.61	0.00	1228.80	1.01
34	513.92	52.49	-2.1	5.64	5.64	2	300.00	30.0	5769.05	0.00	1034.97	1.01
35	519.55	41.84	-4.6	5.62	5.64	2	300.00	30.0	4598.67	0.00	839.88	1.02
36	525.18	30.65	-4.6	5.62	5.64	2	300.00	30.0	3368.34	0.00	617.47	1.02
37	530.80	18.71	-7.1	5.60	5.64	2	300.00	30.0	2055.76	0.00	390.00	1.03
38	536.40	6.23	-7.1	5.60	5.64	2	300.00	30.0	685.17	0.00	138.86	1.03
		3044.59			265.40				334600.09			

X-S Area: 3044.59 Path Length: 265.40 X-S Weight: 334600.09

GALENA 6.10 Analysis Results — Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Atlas Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 1.gmf
Processed: 13 Nov 2015 12:08:24

DATA: Analysis 1 - Lab Scenario 1

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1730.00	25.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings									
0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00
Profile: 2 (5 points) Material beneath: 1 - Existing waste rock									
128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00
Profile: 3 (3 points) Material beneath: 3 - Bedrock									
0.00	113.00	128.00	22.00	161.00	0.00				

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 364.56 YL: 53.54 XR: 443.13 YR: 32.02
Centre: XC: 465.00 YC: 266.00 Radius: R: 235.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	200.00
Trial positions within range:	100	100	100

RESULTS: Analysis 1 - Lab Scenario 1

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 27.24

There were: 259454 successful analyses from a total of 1000001 trial circles
740539 analyses terminated due to unacceptable geometry
8 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.28

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.00	60.00	557.46	0.69	505.91	237.21	242.07	3.283
2	341.04	59.99	552.66	2.01	500.86	228.12	231.97	3.385
3	315.48	60.22	559.85	0.04	483.69	217.01	229.95	4.135
4	319.49	60.19	559.90	0.03	486.72	218.02	229.95	4.142
5	311.48	60.25	559.73	0.07	480.66	216.00	229.95	4.142
6	320.37	60.18	559.72	0.08	486.72	216.00	227.93	4.142
7	310.59	60.26	559.93	0.02	480.66	218.02	231.97	4.143
8	314.46	60.23	559.28	0.20	482.68	217.01	229.95	4.146
9	313.58	60.24	559.48	0.14	482.68	219.03	231.97	4.147
10	312.70	60.24	559.67	0.09	482.68	221.05	233.99	4.147
11	311.82	60.25	559.86	0.04	482.68	223.07	236.01	4.148
12	316.72	60.21	559.71	0.08	485.71	222.06	233.99	4.150
13	315.86	60.22	559.89	0.03	485.71	224.08	236.01	4.150
14	317.60	60.20	559.53	0.13	485.71	220.04	231.97	4.150

15	318.47	60.19	559.34	0.18	485.71	218.02	229.95	4.150
16	319.35	60.19	559.16	0.23	485.71	216.00	227.93	4.151
17	310.46	60.26	559.15	0.23	479.65	216.00	229.95	4.155
18	306.60	60.30	559.76	0.07	477.63	217.01	231.97	4.155
19	309.57	60.27	559.36	0.18	479.65	218.02	231.97	4.156
20	305.70	60.30	559.97	0.01	477.63	219.03	233.99	4.157
21	308.69	60.28	559.56	0.12	479.65	220.04	233.99	4.158
22	312.56	60.25	558.91	0.30	481.67	219.03	231.97	4.159
23	307.80	60.29	559.76	0.06	479.65	222.06	236.01	4.159
24	311.68	60.25	559.10	0.25	481.67	221.05	233.99	4.160
25	316.58	60.21	558.97	0.28	484.70	220.04	231.97	4.160
26	315.71	60.22	559.15	0.23	484.70	222.06	233.99	4.160
27	314.84	60.23	559.33	0.18	484.70	224.08	236.01	4.160
28	313.97	60.23	559.51	0.13	484.70	226.10	238.03	4.160
29	323.51	60.15	559.87	0.03	489.75	219.03	229.95	4.160
30	310.81	60.26	559.30	0.19	481.67	223.07	236.01	4.161
31	313.12	60.24	559.69	0.09	484.70	228.12	240.05	4.161
32	306.93	60.29	559.96	0.01	479.65	224.08	238.03	4.161
33	309.93	60.27	559.49	0.14	481.67	225.09	238.03	4.162
34	312.26	60.25	559.86	0.04	484.70	230.14	242.07	4.162
35	324.39	60.14	559.70	0.08	489.75	217.01	227.93	4.163
36	319.90	60.18	559.84	0.04	488.74	225.09	236.01	4.163
37	309.07	60.28	559.67	0.09	481.67	227.11	240.05	4.163
38	320.76	60.17	559.67	0.09	488.74	223.07	233.99	4.164
39	321.63	60.17	559.50	0.14	488.74	221.05	231.97	4.165
40	308.21	60.28	559.86	0.04	481.67	229.13	242.07	4.165
41	322.49	60.16	559.33	0.18	488.74	219.03	229.95	4.167
42	323.37	60.15	559.16	0.23	488.74	217.01	227.93	4.169
43	313.44	60.24	558.71	0.35	481.67	217.01	229.95	4.170
44	317.17	60.21	559.63	0.10	487.73	229.13	240.05	4.170
45	305.58	60.31	559.17	0.23	476.62	217.01	231.97	4.170
46	316.33	60.21	559.79	0.06	487.73	231.15	242.07	4.170
47	318.03	60.20	559.46	0.15	487.73	227.11	238.03	4.170
48	315.48	60.22	559.96	0.01	487.73	233.17	244.09	4.170
49	318.88	60.19	559.29	0.19	487.73	225.09	236.01	4.171
50	307.67	60.29	558.98	0.28	478.64	220.04	233.99	4.171
51	312.96	60.24	558.96	0.29	483.69	226.10	238.03	4.171
52	319.74	60.18	559.12	0.24	487.73	223.07	233.99	4.171
53	317.45	60.20	558.78	0.33	484.70	218.02	229.95	4.172
54	304.69	60.31	559.39	0.17	476.62	219.03	233.99	4.172
55	312.10	60.25	559.14	0.24	483.69	228.12	240.05	4.172
56	306.79	60.29	559.19	0.22	478.64	222.06	236.01	4.173
57	311.24	60.26	559.31	0.19	483.69	230.14	242.07	4.173
58	318.33	60.20	558.60	0.38	484.70	216.00	227.93	4.174
59	303.80	60.32	559.60	0.11	476.62	221.05	236.01	4.174
60	308.92	60.28	558.92	0.30	480.66	225.09	238.03	4.175
61	310.39	60.26	559.49	0.14	483.69	232.16	244.09	4.175
62	305.91	60.30	559.39	0.17	478.64	224.08	238.03	4.175
63	309.54	60.27	559.66	0.09	483.69	234.18	246.11	4.176
64	308.05	60.28	559.11	0.24	480.66	227.11	240.05	4.177
65	302.62	60.33	559.52	0.13	474.60	216.00	231.97	4.177
66	302.91	60.33	559.81	0.05	476.62	223.07	238.03	4.177
67	305.03	60.31	559.59	0.11	478.64	226.10	240.05	4.177
68	308.70	60.28	559.84	0.04	483.69	236.20	248.13	4.178
69	307.19	60.29	559.30	0.19	480.66	229.13	242.07	4.179
70	316.16	60.21	559.09	0.25	486.72	229.13	240.05	4.179
71	301.72	60.34	559.74	0.07	474.60	218.02	233.99	4.179
72	315.31	60.22	559.25	0.20	486.72	231.15	242.07	4.179
73	308.55	60.28	558.78	0.33	478.64	218.02	231.97	4.179
74	309.45	60.27	558.57	0.39	478.64	216.00	229.95	4.180
75	314.46	60.23	559.42	0.16	486.72	233.17	244.09	4.180
76	304.17	60.32	559.79	0.06	478.64	228.12	242.07	4.180
77	313.62	60.24	559.58	0.11	486.72	235.19	246.11	4.180
78	306.33	60.30	559.49	0.14	480.66	231.15	244.09	4.181
79	312.79	60.24	559.74	0.07	486.72	237.21	248.13	4.181
80	300.82	60.35	559.96	0.01	474.60	220.04	236.01	4.182
81	311.96	60.25	559.90	0.03	486.72	239.23	250.15	4.182
82	313.82	60.23	558.78	0.33	483.69	224.08	236.01	4.183
83	303.30	60.32	559.98	0.00	478.64	230.14	244.09	4.183
84	305.48	60.31	559.67	0.09	480.66	233.17	246.11	4.183
85	314.69	60.23	558.59	0.38	483.69	222.06	233.99	4.184
86	320.61	60.18	558.95	0.29	487.73	221.05	231.97	4.184
87	309.79	60.27	558.73	0.35	480.66	223.07	236.01	4.184
88	310.66	60.26	558.54	0.40	480.66	221.05	233.99	4.185
89	304.63	60.31	559.86	0.04	480.66	235.19	248.13	4.185
90	315.56	60.22	558.41	0.44	483.69	220.04	231.97	4.185
91	311.54	60.25	558.34	0.45	480.66	219.03	231.97	4.186
92	309.37	60.27	558.94	0.29	482.68	232.16	244.09	4.186
93	312.42	60.25	558.14	0.51	480.66	217.01	229.95	4.187
94	321.48	60.17	558.78	0.33	487.73	219.03	229.95	4.187
95	316.43	60.21	558.22	0.49	483.69	218.02	229.95	4.187
96	303.67	60.32	558.80	0.33	475.61	219.03	233.99	4.188
97	323.11	60.15	559.86	0.04	491.77	228.12	238.03	4.188
98	308.53	60.28	559.12	0.24	482.68	234.18	246.11	4.188
99	317.32	60.20	558.04	0.54	483.69	216.00	227.93	4.189

Critical Failure Circle

Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69

Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Generated failure surface: (20 points)

341.00	60.00	350.20	51.86	359.81	44.20	369.78	37.04	380.11	30.40
390.76	24.28	401.71	18.72	412.92	13.71	424.38	9.28	436.04	5.44
447.89	2.20	459.88	-0.44	472.00	-2.47	484.20	-3.88	496.45	-4.67
508.73	-4.84	521.00	-4.39	533.24	-3.31	545.40	-1.62	557.46	0.69

Slice Geometry and Properties (43 slices)

Slice	X-S	Base							PoreWater	Normal	Test
X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.46	-85.3	4.60	56.12	2	1730.00	25.0	709.51	0.00	-9036.76	-16.80
2	345.60	19.37	41.5	4.60	6.14	2	1730.00	25.0	2128.77	0.00	-2.83	1.19
3	350.20	32.99	38.6	4.80	6.14	2	1730.00	25.0	3625.51	0.00	300.84	1.15
4	355.00	45.06	38.6	4.80	6.14	2	1730.00	25.0	4951.82	0.00	549.01	1.15
5	359.81	58.62	35.7	4.99	6.14	2	1730.00	25.0	6441.88	0.00	828.63	1.12
6	364.79	69.66	35.7	4.99	6.14	2	1730.00	25.0	7655.71	0.00	1049.45	1.12
7	369.78	82.75	32.8	5.16	6.14	2	1730.00	25.0	9094.27	0.00	1302.99	1.09
8	374.95	92.60	32.8	5.16	6.14	2	1730.00	25.0	10177.16	0.00	1495.13	1.09
9	380.11	104.85	29.9	5.33	6.14	2	1730.00	25.0	11522.67	0.00	1720.88	1.07
10	385.43	113.36	29.9	5.33	6.14	2	1730.00	25.0	12458.02	0.00	1883.26	1.07
11	390.76	124.40	27.0	5.47	6.14	2	1730.00	25.0	13671.27	0.00	2079.52	1.05
12	396.23	131.42	27.0	5.47	6.14	2	1730.00	25.0	14443.32	0.00	2211.08	1.05
13	401.71	140.95	24.0	5.61	6.14	2	1730.00	25.0	15489.92	0.00	2376.51	1.03
14	407.32	146.36	24.0	5.61	6.14	2	1730.00	25.0	16085.16	0.00	2476.33	1.03
15	412.92	154.10	21.1	5.73	6.14	2	1730.00	25.0	16935.10	0.00	2609.79	1.02
16	418.65	157.79	21.1	5.73	6.14	2	1730.00	25.0	17341.22	0.00	2677.00	1.02
17	424.38	163.50	18.2	5.83	6.14	2	1730.00	25.0	17969.14	0.00	2777.43	1.01
18	430.21	165.39	18.2	5.83	6.14	2	1730.00	25.0	18176.22	0.00	2811.34	1.01
19	436.04	120.95	15.3	4.24	4.40	2	1730.00	25.0	13292.65	0.00	2877.78	1.00
20	440.29	120.95	15.3	4.24	4.40	2	1730.00	25.0	13292.65	0.00	2877.78	1.00
21	444.53	95.88	15.3	3.36	3.49	1	0.00	45.0	10537.80	0.00	2892.77	0.96
22	447.89	141.68	12.4	4.99	5.11	1	0.00	45.0	15571.19	0.00	2923.48	0.96
23	452.88	140.34	12.4	4.99	5.11	1	0.00	45.0	15424.21	0.00	2895.89	0.96
24	457.87	56.16	12.4	2.01	2.06	1	0.00	45.0	6172.46	28.44	2877.42	0.96
25	459.88	153.29	9.5	5.56	5.64	1	0.00	45.0	16848.30	319.38	2886.65	0.96
26	465.44	149.99	9.5	5.56	5.64	1	0.00	45.0	16487.14	646.77	2827.65	0.96
27	471.00	26.51	9.5	1.00	1.01	1	0.00	45.0	2913.95	150.37	2792.85	0.96
28	472.00	159.20	6.6	6.10	6.14	1	0.00	45.0	17499.86	1082.11	2777.19	0.97
29	478.10	153.32	6.6	6.10	6.14	1	0.00	45.0	16853.10	1352.55	2676.28	0.97
30	484.20	147.13	3.7	6.13	6.14	1	0.00	45.0	16173.26	1563.54	2593.32	0.98
31	490.32	139.26	3.7	6.13	6.14	1	0.00	45.0	15309.07	1715.09	2455.48	0.98
32	496.45	130.69	0.8	6.14	6.14	1	0.00	45.0	14367.36	1806.99	2331.44	1.00
33	502.59	120.88	0.8	6.14	6.14	1	0.00	45.0	13288.77	1839.26	2156.51	1.00
34	508.73	110.05	-2.1	6.14	6.14	1	0.00	45.0	12098.54	1811.83	1990.73	1.01
35	514.87	98.34	-2.1	6.14	6.14	1	0.00	45.0	10810.86	1724.73	1778.66	1.01
36	521.00	85.42	-5.0	6.12	6.14	1	0.00	45.0	9390.87	1578.06	1570.41	1.03
37	527.12	71.88	-5.0	6.12	6.14	1	0.00	45.0	7901.91	1371.81	1321.22	1.03
38	533.24	57.08	-7.9	6.08	6.14	1	0.00	45.0	6275.82	1106.26	1069.66	1.05
39	539.32	41.79	-7.9	6.08	6.14	1	0.00	45.0	4594.77	781.40	783.35	1.05
40	545.40	19.54	-10.8	4.22	4.29	1	0.00	45.0	2147.94	324.58	536.25	1.08
41	549.62	11.26	-10.8	4.22	4.29	1	0.00	45.0	1237.85	108.19	310.18	1.08
42	553.84	1.36	-10.8	0.92	0.94	1	0.00	45.0	149.48	0.00	172.07	1.08
43	554.76	1.70	-10.8	2.71	2.75	2	1730.00	25.0	187.26	0.00	174.90	1.05
		4164.27			283.32				457703.72			

X-S Area: 4164.27 Path Length: 283.32 X-S Weight: 457703.72

DATA: Analysis 2 - Lab Scenario 1 pt2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1730.00	25.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69
Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	50.00	50.00	50.00
Trial positions within range:	50	50	50

RESULTS: Analysis 2 - Lab Scenario 1 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.28

There were: 53404 successful analyses from a total of 125001 trial circles
71585 analyses terminated due to unacceptable geometry
12 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.20

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.06	59.98	559.97	0.01	510.50	248.95	253.81	3.200
2	341.04	59.99	559.67	0.09	506.42	234.66	240.54	3.216
3	341.07	59.98	559.67	0.09	503.36	223.44	230.34	3.216
4	341.05	59.99	558.47	0.42	504.38	229.56	235.44	3.254
5	341.00	60.00	557.46	0.69	505.91	237.21	242.07	3.283
6	341.06	59.98	554.01	1.64	497.24	212.21	218.09	3.354
7	341.04	59.99	551.62	2.30	496.22	213.23	218.09	3.415
8	341.03	59.99	549.21	2.96	495.19	214.25	218.09	3.469
9	341.04	59.99	546.78	3.62	494.17	215.27	218.09	3.519
10	341.07	59.98	544.33	4.29	493.15	216.29	218.09	3.565
11	316.42	60.21	559.98	0.00	483.97	215.27	228.30	4.130
12	316.87	60.21	559.88	0.03	483.97	214.25	227.27	4.130
13	317.32	60.20	559.79	0.06	483.97	213.23	226.25	4.130
14	317.77	60.20	559.69	0.09	483.97	212.21	225.23	4.130
15	313.29	60.24	559.64	0.10	480.91	212.21	226.25	4.134
16	312.84	60.24	559.75	0.07	480.91	213.23	227.27	4.135
17	312.38	60.25	559.85	0.04	480.91	214.25	228.30	4.135
18	311.93	60.25	559.96	0.01	480.91	215.27	229.32	4.135
19	320.91	60.17	559.95	0.01	487.03	215.27	227.27	4.137
20	321.35	60.17	559.86	0.04	487.03	214.25	226.25	4.138
21	321.80	60.17	559.76	0.06	487.03	213.23	225.23	4.139
22	322.25	60.16	559.67	0.09	487.03	212.21	224.21	4.140
23	315.39	60.22	559.41	0.16	482.95	215.27	228.30	4.141
24	315.84	60.22	559.31	0.19	482.95	214.25	227.27	4.141
25	314.94	60.22	559.51	0.13	482.95	216.29	229.32	4.141
26	316.29	60.21	559.21	0.22	482.95	213.23	226.25	4.141
27	314.49	60.23	559.61	0.11	482.95	217.31	230.34	4.141
28	316.74	60.21	559.11	0.24	482.95	212.21	225.23	4.141
29	314.04	60.23	559.70	0.08	482.95	218.33	231.36	4.141
30	313.60	60.24	559.80	0.05	482.95	219.35	232.38	4.141
31	313.15	60.24	559.90	0.03	482.95	220.38	233.40	4.142
32	312.71	60.24	560.00	0.00	482.95	221.40	234.42	4.142
33	317.22	60.21	559.94	0.02	486.01	221.40	233.40	4.144
34	317.66	60.20	559.85	0.04	486.01	220.38	232.38	4.144
35	318.10	60.20	559.76	0.07	486.01	219.35	231.36	4.145
36	318.54	60.19	559.66	0.09	486.01	218.33	230.34	4.145
37	318.99	60.19	559.57	0.12	486.01	217.31	229.32	4.145
38	319.43	60.19	559.48	0.14	486.01	216.29	228.30	4.146
39	319.88	60.18	559.39	0.17	486.01	215.27	227.27	4.146
40	320.32	60.18	559.29	0.19	486.01	214.25	226.25	4.147
41	320.77	60.17	559.20	0.22	486.01	213.23	225.23	4.147
42	321.22	60.17	559.10	0.25	486.01	212.21	224.21	4.148
43	313.91	60.23	558.93	0.29	481.93	216.29	229.32	4.152
44	313.46	60.24	559.03	0.27	481.93	217.31	230.34	4.152
45	313.01	60.24	559.13	0.24	481.93	218.33	231.36	4.153
46	312.57	60.25	559.23	0.21	481.93	219.35	232.38	4.153
47	312.12	60.25	559.33	0.18	481.93	220.38	233.40	4.154
48	311.68	60.25	559.42	0.16	481.93	221.40	234.42	4.154
49	316.19	60.21	559.38	0.17	484.99	221.40	233.40	4.154
50	316.63	60.21	559.29	0.20	484.99	220.38	232.38	4.154
51	315.75	60.22	559.47	0.15	484.99	222.42	234.42	4.154
52	317.07	60.21	559.19	0.22	484.99	219.35	231.36	4.154
53	315.31	60.22	559.56	0.12	484.99	223.44	235.44	4.154

54	317.51	60.20	559.10	0.25	484.99	218.33	230.34	4.154
55	314.87	60.23	559.65	0.10	484.99	224.46	236.46	4.154
56	317.96	60.20	559.01	0.27	484.99	217.31	229.32	4.155
57	311.24	60.26	559.52	0.13	481.93	222.42	235.44	4.155
58	314.44	60.23	559.74	0.07	484.99	225.48	237.48	4.155
59	314.00	60.23	559.83	0.05	484.99	226.50	238.50	4.155
60	313.57	60.24	559.92	0.02	484.99	227.52	239.52	4.155
61	310.80	60.26	559.62	0.10	481.93	223.44	236.46	4.155
62	310.36	60.26	559.71	0.08	481.93	224.46	237.48	4.156
63	309.92	60.27	559.81	0.05	481.93	225.48	238.50	4.157
64	309.48	60.27	559.91	0.03	481.93	226.50	239.52	4.157
65	309.04	60.28	560.00	0.00	481.93	227.52	240.54	4.158
66	320.86	60.17	559.99	0.00	489.07	223.44	234.42	4.159
67	324.96	60.14	559.94	0.02	490.09	216.29	227.27	4.159
68	321.29	60.17	559.90	0.03	489.07	222.42	233.40	4.159
69	321.73	60.17	559.82	0.05	489.07	221.40	232.38	4.160
70	325.40	60.13	559.85	0.04	490.09	215.27	226.25	4.160
71	322.17	60.16	559.73	0.07	489.07	220.38	231.36	4.161
72	322.61	60.16	559.65	0.10	489.07	219.35	230.34	4.162
73	325.85	60.13	559.76	0.07	490.09	214.25	225.23	4.162
74	323.05	60.15	559.56	0.12	489.07	218.33	229.32	4.163
75	314.36	60.23	558.83	0.32	481.93	215.27	228.30	4.163
76	326.29	60.13	559.67	0.09	490.09	213.23	224.21	4.163
77	314.81	60.23	558.73	0.35	481.93	214.25	227.27	4.163
78	323.49	60.15	559.47	0.14	489.07	217.31	228.30	4.164
79	315.26	60.22	558.63	0.38	481.93	213.23	226.25	4.164
80	317.23	60.20	559.95	0.01	488.05	229.56	240.54	4.165
81	323.93	60.15	559.38	0.17	489.07	216.29	227.27	4.165
82	314.28	60.23	559.00	0.27	483.97	223.44	235.44	4.165
83	317.66	60.20	559.86	0.04	488.05	228.54	239.52	4.165
84	326.74	60.12	559.59	0.11	490.09	212.21	223.19	4.165
85	318.09	60.20	559.78	0.06	488.05	227.52	238.50	4.165
86	313.84	60.23	559.09	0.25	483.97	224.46	236.46	4.165
87	318.53	60.19	559.70	0.08	488.05	226.50	237.48	4.165
88	315.71	60.22	558.53	0.40	481.93	212.21	225.23	4.165
89	313.41	60.24	559.18	0.22	483.97	225.48	237.48	4.165
90	318.96	60.19	559.61	0.11	488.05	225.48	236.46	4.165
91	318.40	60.19	558.91	0.30	484.99	216.29	228.30	4.166
92	319.39	60.19	559.53	0.13	488.05	224.46	235.44	4.166
93	312.97	60.24	559.27	0.20	483.97	226.50	238.50	4.166
94	324.37	60.14	559.30	0.19	489.07	215.27	226.25	4.166
95	319.83	60.18	559.44	0.15	488.05	223.44	234.42	4.166
96	312.54	60.25	559.36	0.17	483.97	227.52	239.52	4.166
97	320.26	60.18	559.35	0.18	488.05	222.42	233.40	4.167
98	310.65	60.26	558.85	0.31	480.91	221.40	234.42	4.167
99	312.10	60.25	559.45	0.15	483.97	228.54	240.54	4.167

Critical Failure Circle

Intersects: XL: 341.06 YL: 59.98 XR: 559.97 YR: 0.01
Centre: XC: 510.50 YC: 248.95 Radius: R: 253.81
Generated failure surface: (20 points)

341.06	59.98	350.48	51.94	360.28	44.37	370.44	37.29	380.93	30.71
391.73	24.65	402.81	19.12	414.15	14.14	425.72	9.72	437.48	5.87
449.43	2.60	461.52	-0.09	473.72	-2.18	486.02	-3.67	498.37	-4.57
510.75	-4.86	523.13	-4.54	535.48	-3.63	547.77	-2.11	559.97	0.01

Slice Geometry and Properties (40 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.43	-85.1	4.77	56.17	2	1730.00	25.0	706.29	0.00	-9146.82	-16.59
2	345.77	19.28	40.5	4.71	6.19	2	1730.00	25.0	2119.23	0.00	-10.21	1.17
3	350.48	32.74	37.7	4.90	6.19	2	1730.00	25.0	3597.69	0.00	284.54	1.14
4	355.38	44.71	37.7	4.90	6.19	2	1730.00	25.0	4913.14	0.00	525.84	1.14
5	360.28	58.00	34.9	5.08	6.19	2	1730.00	25.0	6374.33	0.00	797.07	1.11
6	365.36	68.92	34.9	5.08	6.19	2	1730.00	25.0	7574.77	0.00	1011.64	1.11
7	370.44	81.69	32.1	5.25	6.19	2	1730.00	25.0	8977.40	0.00	1257.46	1.08
8	375.68	91.40	32.1	5.25	6.19	2	1730.00	25.0	10045.26	0.00	1443.99	1.08
9	380.93	103.28	29.3	5.40	6.19	2	1730.00	25.0	11350.71	0.00	1662.75	1.06
10	386.33	111.66	29.3	5.40	6.19	2	1730.00	25.0	12271.19	0.00	1820.33	1.06
11	391.73	122.33	26.5	5.54	6.19	2	1730.00	25.0	13443.73	0.00	2010.51	1.04
12	397.27	129.23	26.5	5.54	6.19	2	1730.00	25.0	14202.04	0.00	2138.09	1.04
13	402.81	138.40	23.7	5.67	6.19	2	1730.00	25.0	15209.96	0.00	2298.40	1.03
14	408.48	143.71	23.7	5.67	6.19	2	1730.00	25.0	15793.57	0.00	2395.15	1.03
15	414.15	151.13	20.9	5.78	6.19	2	1730.00	25.0	16609.55	0.00	2524.51	1.01
16	419.93	154.75	20.9	5.78	6.19	2	1730.00	25.0	17007.29	0.00	2589.66	1.01
17	425.72	160.21	18.1	5.88	6.19	2	1730.00	25.0	17607.55	0.00	2687.02	1.00
18	431.60	162.06	18.1	5.88	6.19	2	1730.00	25.0	17810.11	0.00	2719.89	1.00
19	437.48	139.80	15.3	5.05	5.23	2	1730.00	25.0	15364.04	0.00	2784.35	1.00
20	442.53	139.80	15.3	5.05	5.23	2	1730.00	25.0	15364.04	0.00	2784.35	1.00
21	447.58	51.17	15.3	1.85	1.92	1	0.00	45.0	5623.49	0.00	2803.64	0.96
22	449.43	161.09	12.5	5.85	5.99	1	0.00	45.0	17704.99	0.00	2830.56	0.96
23	455.28	159.33	12.5	5.85	5.99	1	0.00	45.0	17511.29	0.00	2799.58	0.96
24	461.13	132.58	10.0	4.94	5.01	1	0.00	45.0	14572.42	138.59	2799.71	0.96
25	466.06	130.08	9.7	4.94	5.01	1	0.00	45.0	14298.40	403.08	2753.03	0.96
26	471.00	70.68	9.7	2.72	2.76	1	0.00	45.0	7768.67	335.51	2714.22	0.96
27	473.72	155.81	6.9	6.15	6.19	1	0.00	45.0	17126.74	986.60	2690.22	0.97
28	479.87	150.05	6.9	6.15	6.19	1	0.00	45.0	16494.40	1275.41	2592.83	0.97
29	486.02	144.03	4.1	6.18	6.19	1	0.00	45.0	15832.58	1506.14	2512.39	0.98

30	492.19	136.34	4.1	6.18	6.19	1	0.00	45.0	14987.56	1678.76	2379.21	0.98
31	498.37	128.00	1.3	6.19	6.19	1	0.00	45.0	14071.65	1793.10	2258.82	0.99
32	504.56	118.40	1.3	6.19	6.19	1	0.00	45.0	13016.55	1849.14	2089.68	0.99
33	510.75	107.86	-1.5	6.19	6.19	1	0.00	45.0	11858.05	1846.82	1928.66	1.01
34	516.94	96.39	-1.5	6.19	6.19	1	0.00	45.0	10597.31	1786.13	1723.43	1.01
35	523.13	83.80	-4.2	6.17	6.19	1	0.00	45.0	9212.75	1667.16	1521.06	1.03
36	529.30	70.52	-4.2	6.17	6.19	1	0.00	45.0	7753.16	1489.89	1279.74	1.03
37	535.48	56.07	-7.0	6.15	6.19	1	0.00	45.0	6164.20	1254.54	1035.27	1.05
38	541.62	41.05	-7.0	6.15	6.19	1	0.00	45.0	4513.47	961.10	757.76	1.05
39	547.77	24.91	-9.8	6.08	6.17	1	0.00	45.0	2738.62	608.28	470.95	1.07
40	553.84	8.40	-9.7	6.16	6.25	1	0.00	45.0	923.00	202.64	156.53	1.07

X-S Area: 4086.09 Path Length: 285.29 X-S Weight: 449111.28

DATA: Analysis 3 - Lab Scenario 1 pt3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
1730.00 25.0 109.90 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock
Cohesion Phi UnitWeight Ru
0.00 50.0 130.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings
0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00
Profile: 2 (5 points) Material beneath: 1 - Existing waste rock
128.00 22.00 183.00 8.00 248.00 4.00 471.00 3.00 560.00 0.00
Profile: 3 (3 points) Material beneath: 3 - Bedrock
0.00 113.00 128.00 22.00 161.00 0.00

Slope Surface (5 points)

0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.06 YL: 59.98 XR: 559.97 YR: 0.01
Centre: XC: 510.50 YC: 248.95 Radius: R: 253.81

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	20.00	20.00	20.00
Trial positions within range:	20	20	20

RESULTS: Analysis 3 - Lab Scenario 1 pt3

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.20

There were: 4025 successful analyses from a total of 8001 trial circles
3970 analyses terminated due to unacceptable geometry
6 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.20

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.06	59.98	559.97	0.01	510.50	248.95	253.81	3.200
2	341.07	59.98	558.55	0.40	507.87	242.10	246.96	3.240
3	327.16	60.12	559.99	0.00	500.50	250.53	257.49	4.315
4	327.57	60.12	559.93	0.02	500.50	249.47	256.44	4.317
5	327.99	60.11	559.88	0.03	500.50	248.42	255.38	4.319

6	328.40	60.11	559.82	0.05	500.50	247.37	254.33	4.321
7	328.81	60.11	559.76	0.07	500.50	246.32	253.28	4.323
8	329.23	60.10	559.70	0.08	500.50	245.26	252.23	4.325
9	329.65	60.10	559.64	0.10	500.50	244.21	251.17	4.327
10	330.06	60.09	559.58	0.11	500.50	243.16	250.12	4.330
11	330.48	60.09	559.52	0.13	500.50	242.10	249.07	4.332
12	330.90	60.09	559.46	0.15	500.50	241.05	248.02	4.335
13	331.32	60.08	559.40	0.16	500.50	240.00	246.96	4.338
14	331.97	60.08	559.96	0.01	501.55	241.05	248.02	4.339
15	331.74	60.08	559.34	0.18	500.50	238.95	245.91	4.340
16	332.39	60.07	559.90	0.03	501.55	240.00	246.96	4.342
17	332.81	60.07	559.84	0.04	501.55	238.95	245.91	4.346
18	329.10	60.10	559.64	0.10	503.66	257.89	263.81	4.391
19	329.50	60.10	559.59	0.11	503.66	256.84	262.75	4.393
20	329.90	60.10	559.54	0.13	503.66	255.79	261.70	4.396
21	330.31	60.09	559.49	0.14	503.66	254.74	260.65	4.398
22	330.71	60.09	559.44	0.15	503.66	253.68	259.59	4.401
23	328.03	60.11	559.18	0.23	502.61	257.89	263.81	4.402
24	331.12	60.09	559.39	0.17	503.66	252.63	258.54	4.404
25	331.37	60.08	559.96	0.01	504.71	254.74	260.65	4.405
26	328.44	60.11	559.13	0.24	502.61	256.84	262.75	4.405
27	326.97	60.12	558.71	0.35	501.55	257.89	263.81	4.406
28	331.78	60.08	559.91	0.02	504.71	253.68	259.59	4.408
29	328.84	60.10	559.07	0.25	502.61	255.79	261.70	4.408
30	327.37	60.12	558.66	0.37	501.55	256.84	262.75	4.409
31	332.18	60.08	559.86	0.04	504.71	252.63	258.54	4.411
32	325.91	60.13	558.23	0.48	500.50	257.89	263.81	4.411
33	329.24	60.10	559.02	0.27	502.61	254.74	260.65	4.412
34	327.78	60.11	558.60	0.38	501.55	255.79	261.70	4.412
35	326.31	60.13	558.18	0.50	500.50	256.84	262.75	4.414
36	332.59	60.07	559.81	0.05	504.71	251.58	257.49	4.414
37	329.65	60.10	558.97	0.28	502.61	253.68	259.59	4.415
38	328.18	60.11	558.55	0.40	501.55	254.74	260.65	4.415
39	326.71	60.12	558.13	0.51	500.50	255.79	261.70	4.416
40	333.00	60.07	559.76	0.07	504.71	250.53	256.44	4.418
41	328.59	60.11	558.50	0.41	501.55	253.68	259.59	4.418
42	330.06	60.09	558.92	0.30	502.61	252.63	258.54	4.418
43	327.12	60.12	558.08	0.53	500.50	254.74	260.65	4.419
44	331.53	60.08	559.34	0.18	503.66	251.58	257.49	4.420
45	333.41	60.07	559.71	0.08	504.71	249.47	255.38	4.421
46	328.99	60.10	558.45	0.43	501.55	252.63	258.54	4.422
47	330.46	60.09	558.87	0.31	502.61	251.58	257.49	4.422
48	327.52	60.12	558.02	0.54	500.50	253.68	259.59	4.422
49	331.93	60.08	559.29	0.20	503.66	250.53	256.44	4.424
50	333.81	60.06	559.66	0.09	504.71	248.42	254.33	4.425
51	329.40	60.10	558.39	0.44	501.55	251.58	257.49	4.425
52	327.93	60.11	557.97	0.56	500.50	252.63	258.54	4.425
53	330.87	60.09	558.81	0.32	502.61	250.53	256.44	4.426
54	332.34	60.07	559.24	0.21	503.66	249.47	255.38	4.428
55	328.34	60.11	557.91	0.57	500.50	251.58	257.49	4.428
56	329.81	60.10	558.34	0.46	501.55	250.53	256.44	4.428
57	334.23	60.06	559.60	0.11	504.71	247.37	253.28	4.428
58	331.28	60.08	558.76	0.34	502.61	249.47	255.38	4.430
59	328.74	60.11	557.86	0.59	500.50	250.53	256.44	4.431
60	330.22	60.09	558.29	0.47	501.55	249.47	255.38	4.432
61	334.64	60.05	559.55	0.12	504.71	246.32	252.23	4.432
62	332.75	60.07	559.18	0.22	503.66	248.42	254.33	4.432
63	331.69	60.08	558.71	0.35	502.61	248.42	254.33	4.434
64	329.15	60.10	557.81	0.60	500.50	249.47	255.38	4.435
65	330.63	60.09	558.23	0.48	501.55	248.42	254.33	4.435
66	335.05	60.05	559.50	0.14	504.71	245.26	251.17	4.436
67	333.16	60.07	559.13	0.24	503.66	247.37	253.28	4.437
68	332.10	60.08	558.66	0.37	502.61	247.37	253.28	4.438
69	329.56	60.10	557.75	0.62	500.50	248.42	254.33	4.438
70	331.04	60.09	558.18	0.50	501.55	247.37	253.28	4.439
71	335.46	60.05	559.45	0.15	504.71	244.21	250.12	4.440
72	333.57	60.06	559.08	0.25	503.66	246.32	252.23	4.441
73	329.97	60.10	557.70	0.63	500.50	247.37	253.28	4.442
74	332.51	60.07	558.60	0.38	502.61	246.32	252.23	4.442
75	331.45	60.08	558.12	0.51	501.55	246.32	252.23	4.443
76	335.88	60.04	559.39	0.17	504.71	243.16	249.07	4.445
77	330.39	60.09	557.64	0.65	500.50	246.32	252.23	4.445
78	333.99	60.06	559.03	0.27	503.66	245.26	251.17	4.446
79	332.92	60.07	558.55	0.40	502.61	245.26	251.17	4.446
80	336.11	60.04	559.97	0.01	505.76	245.26	251.17	4.447
81	331.86	60.08	558.07	0.53	501.55	245.26	251.17	4.447
82	330.80	60.09	557.59	0.66	500.50	245.26	251.17	4.449
83	333.34	60.07	558.49	0.41	502.61	244.21	250.12	4.451
84	334.40	60.06	558.97	0.28	503.66	244.21	250.12	4.451
85	336.53	60.04	559.92	0.02	505.76	244.21	250.12	4.451
86	332.28	60.08	558.01	0.54	501.55	244.21	250.12	4.452
87	331.21	60.08	557.53	0.68	500.50	244.21	250.12	4.453
88	333.75	60.06	558.44	0.43	502.61	243.16	249.07	4.456
89	332.69	60.07	557.96	0.56	501.55	243.16	249.07	4.456
90	334.82	60.05	558.92	0.30	503.66	243.16	249.07	4.456
91	336.94	60.03	559.87	0.04	505.76	243.16	249.07	4.456
92	331.63	60.08	557.47	0.69	500.50	243.16	249.07	4.457
93	333.11	60.07	557.90	0.57	501.55	242.10	248.02	4.460
94	334.17	60.06	558.38	0.44	502.61	242.10	248.02	4.460
95	332.04	60.08	557.42	0.71	500.50	242.10	248.02	4.461

96	337.36	60.03	559.82	0.05	505.76	242.10	248.02	4.461
97	335.23	60.05	558.86	0.31	503.66	242.10	248.02	4.461
98	336.29	60.04	559.34	0.18	504.71	242.10	248.02	4.463
99	333.52	60.06	557.85	0.59	501.55	241.05	246.96	4.465

Critical Failure Circle

Intersects: XL: 341.06 YL: 59.98 XR: 559.97 YR: 0.01
Centre: XC: 510.50 YC: 248.95 Radius: R: 253.81
Generated failure surface: (20 points)

341.06	59.98	350.48	51.94	360.28	44.37	370.44	37.29	380.93	30.71
391.73	24.65	402.81	19.12	414.15	14.14	425.72	9.72	437.48	5.87
449.43	2.60	461.52	-0.09	473.72	-2.18	486.02	-3.67	498.37	-4.57
510.75	-4.86	523.13	-4.54	535.48	-3.63	547.77	-2.11	559.97	0.01

Slice Geometry and Properties (40 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.43	-85.1	4.77	56.17	2	1730.00	25.0	706.29	0.00	-9146.82	-16.59
2	345.77	19.28	40.5	4.71	6.19	2	1730.00	25.0	2119.23	0.00	-10.21	1.17
3	350.48	32.74	37.7	4.90	6.19	2	1730.00	25.0	3597.69	0.00	284.54	1.14
4	355.38	44.71	37.7	4.90	6.19	2	1730.00	25.0	4913.14	0.00	525.84	1.14
5	360.28	58.00	34.9	5.08	6.19	2	1730.00	25.0	6374.33	0.00	797.07	1.11
6	365.36	68.92	34.9	5.08	6.19	2	1730.00	25.0	7574.77	0.00	1011.64	1.11
7	370.44	81.69	32.1	5.25	6.19	2	1730.00	25.0	8977.40	0.00	1257.46	1.08
8	375.68	91.40	32.1	5.25	6.19	2	1730.00	25.0	10045.26	0.00	1443.99	1.08
9	380.93	103.28	29.3	5.40	6.19	2	1730.00	25.0	11350.71	0.00	1662.75	1.06
10	386.33	111.66	29.3	5.40	6.19	2	1730.00	25.0	12271.19	0.00	1820.33	1.06
11	391.73	122.33	26.5	5.54	6.19	2	1730.00	25.0	13443.73	0.00	2010.51	1.04
12	397.27	129.23	26.5	5.54	6.19	2	1730.00	25.0	14202.04	0.00	2138.09	1.04
13	402.81	138.40	23.7	5.67	6.19	2	1730.00	25.0	15209.96	0.00	2298.40	1.03
14	408.48	143.71	23.7	5.67	6.19	2	1730.00	25.0	15793.57	0.00	2395.15	1.03
15	414.15	151.13	20.9	5.78	6.19	2	1730.00	25.0	16609.55	0.00	2524.51	1.01
16	419.93	154.75	20.9	5.78	6.19	2	1730.00	25.0	17007.29	0.00	2589.66	1.01
17	425.72	160.21	18.1	5.88	6.19	2	1730.00	25.0	17607.55	0.00	2687.02	1.00
18	431.60	162.06	18.1	5.88	6.19	2	1730.00	25.0	17810.11	0.00	2719.89	1.00
19	437.48	139.80	15.3	5.05	5.23	2	1730.00	25.0	15364.04	0.00	2784.35	1.00
20	442.53	139.80	15.3	5.05	5.23	2	1730.00	25.0	15364.04	0.00	2784.35	1.00
21	447.58	51.17	15.3	1.85	1.92	1	0.00	45.0	5623.49	0.00	2803.64	0.96
22	449.43	161.09	12.5	5.85	5.99	1	0.00	45.0	17704.99	0.00	2830.56	0.96
23	455.28	159.33	12.5	5.85	5.99	1	0.00	45.0	17511.29	0.00	2799.58	0.96
24	461.13	132.58	10.0	4.94	5.01	1	0.00	45.0	14572.42	138.59	2799.71	0.96
25	466.06	130.08	9.7	4.94	5.01	1	0.00	45.0	14298.40	403.08	2753.03	0.96
26	471.00	70.68	9.7	2.72	2.76	1	0.00	45.0	7768.67	335.51	2714.22	0.96
27	473.72	155.81	6.9	6.15	6.19	1	0.00	45.0	17126.74	986.60	2690.22	0.97
28	479.87	150.05	6.9	6.15	6.19	1	0.00	45.0	16494.40	1275.41	2592.83	0.97
29	486.02	144.03	4.1	6.18	6.19	1	0.00	45.0	15832.58	1506.14	2512.39	0.98
30	492.19	136.34	4.1	6.18	6.19	1	0.00	45.0	14987.56	1678.76	2379.21	0.98
31	498.37	128.00	1.3	6.19	6.19	1	0.00	45.0	14071.65	1793.10	2258.82	0.99
32	504.56	118.40	1.3	6.19	6.19	1	0.00	45.0	13016.55	1849.14	2089.68	0.99
33	510.75	107.86	-1.5	6.19	6.19	1	0.00	45.0	11858.05	1846.82	1928.66	1.01
34	516.94	96.39	-1.5	6.19	6.19	1	0.00	45.0	10597.31	1786.13	1723.43	1.01
35	523.13	83.80	-4.2	6.17	6.19	1	0.00	45.0	9212.75	1667.16	1521.06	1.03
36	529.30	70.52	-4.2	6.17	6.19	1	0.00	45.0	7753.16	1489.89	1279.74	1.03
37	535.48	56.07	-7.0	6.15	6.19	1	0.00	45.0	6164.20	1254.54	1035.27	1.05
38	541.62	41.05	-7.0	6.15	6.19	1	0.00	45.0	4513.47	961.10	757.76	1.05
39	547.77	24.91	-9.8	6.08	6.17	1	0.00	45.0	2738.62	608.28	470.95	1.07
40	553.84	8.40	-9.7	6.16	6.25	1	0.00	45.0	923.00	202.64	156.53	1.07
		4086.09			285.29				449111.28			

X-S Area: 4086.09 Path Length: 285.29 X-S Weight: 449111.28

GALENA 6.10 Analysis Results — Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Atlas Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 2.gmf
Processed: 13 Nov 2015 12:31:13

DATA: Analysis 1 - Lab Scenario 2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2040.00	25.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 364.56 YL: 53.54 XR: 443.13 YR: 32.02
Centre: XC: 465.00 YC: 266.00 Radius: R: 235.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	200.00
Trial positions within range:	100	100	100

RESULTS: Analysis 1 - Lab Scenario 2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 31.82

There were: 259457 successful analyses from a total of 1000001 trial circles
740539 analyses terminated due to unacceptable geometry
5 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 4.30

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	311.48	60.25	559.73	0.07	480.66	216.00	229.95	4.302
2	310.59	60.26	559.93	0.02	480.66	218.02	231.97	4.303
3	315.48	60.22	559.85	0.04	483.69	217.01	229.95	4.306
4	306.60	60.30	559.76	0.07	477.63	217.01	231.97	4.307
5	305.70	60.30	559.97	0.01	477.63	219.03	233.99	4.309
6	310.46	60.26	559.15	0.23	479.65	216.00	229.95	4.314
7	309.57	60.27	559.36	0.18	479.65	218.02	231.97	4.315
8	314.46	60.23	559.28	0.20	482.68	217.01	229.95	4.317
9	313.58	60.24	559.48	0.14	482.68	219.03	231.97	4.317
10	308.69	60.28	559.56	0.12	479.65	220.04	233.99	4.317
11	312.70	60.24	559.67	0.09	482.68	221.05	233.99	4.317
12	311.82	60.25	559.86	0.04	482.68	223.07	236.01	4.318
13	307.80	60.29	559.76	0.06	479.65	222.06	236.01	4.318
14	306.93	60.29	559.96	0.01	479.65	224.08	238.03	4.320
15	302.62	60.33	559.52	0.13	474.60	216.00	231.97	4.321

16	305.58	60.31	559.17	0.23	476.62	217.01	231.97	4.322
17	304.69	60.31	559.39	0.17	476.62	219.03	233.99	4.324
18	301.72	60.34	559.74	0.07	474.60	218.02	233.99	4.324
19	319.49	60.19	559.90	0.03	486.72	218.02	229.95	4.324
20	320.37	60.18	559.72	0.08	486.72	216.00	227.93	4.325
21	303.80	60.32	559.60	0.11	476.62	221.05	236.01	4.326
22	300.82	60.35	559.96	0.01	474.60	220.04	236.01	4.326
23	312.56	60.25	558.91	0.30	481.67	219.03	231.97	4.328
24	302.91	60.33	559.81	0.05	476.62	223.07	238.03	4.328
25	311.68	60.25	559.10	0.25	481.67	221.05	233.99	4.329
26	310.81	60.26	559.30	0.19	481.67	223.07	236.01	4.330
27	307.67	60.29	558.98	0.28	478.64	220.04	233.99	4.330
28	315.86	60.22	559.89	0.03	485.71	224.08	236.01	4.331
29	316.72	60.21	559.71	0.08	485.71	222.06	233.99	4.331
30	309.93	60.27	559.49	0.14	481.67	225.09	238.03	4.331
31	317.60	60.20	559.53	0.13	485.71	220.04	231.97	4.331
32	306.79	60.29	559.19	0.22	478.64	222.06	236.01	4.332
33	318.47	60.19	559.34	0.18	485.71	218.02	229.95	4.332
34	309.07	60.28	559.67	0.09	481.67	227.11	240.05	4.332
35	319.35	60.19	559.16	0.23	485.71	216.00	227.93	4.333
36	305.91	60.30	559.39	0.17	478.64	224.08	238.03	4.334
37	308.21	60.28	559.86	0.04	481.67	229.13	242.07	4.334
38	305.03	60.31	559.59	0.11	478.64	226.10	240.05	4.336
39	301.60	60.34	558.92	0.30	473.59	216.00	231.97	4.337
40	304.17	60.32	559.79	0.06	478.64	228.12	242.07	4.338
41	303.67	60.32	558.80	0.33	475.61	219.03	233.99	4.339
42	315.71	60.22	559.15	0.23	484.70	222.06	233.99	4.339
43	314.84	60.23	559.33	0.18	484.70	224.08	236.01	4.340
44	316.58	60.21	558.97	0.28	484.70	220.04	231.97	4.340
45	313.97	60.23	559.51	0.13	484.70	226.10	238.03	4.340
46	300.70	60.35	559.15	0.23	473.59	218.02	233.99	4.340
47	308.55	60.28	558.78	0.33	478.64	218.02	231.97	4.340
48	309.45	60.27	558.57	0.39	478.64	216.00	229.95	4.341
49	313.12	60.24	559.69	0.09	484.70	228.12	240.05	4.341
50	303.30	60.32	559.98	0.00	478.64	230.14	244.09	4.341
51	302.78	60.33	559.01	0.27	475.61	221.05	236.01	4.341
52	313.44	60.24	558.71	0.35	481.67	217.01	229.95	4.341
53	312.26	60.25	559.86	0.04	484.70	230.14	242.07	4.342
54	308.92	60.28	558.92	0.30	480.66	225.09	238.03	4.343
55	299.80	60.36	559.37	0.17	473.59	220.04	236.01	4.343
56	301.89	60.34	559.23	0.21	475.61	223.07	238.03	4.344
57	308.05	60.28	559.11	0.24	480.66	227.11	240.05	4.345
58	298.91	60.36	559.59	0.11	473.59	222.06	238.03	4.346
59	301.01	60.34	559.44	0.15	475.61	225.09	240.05	4.346
60	307.19	60.29	559.30	0.19	480.66	229.13	242.07	4.346
61	297.74	60.37	559.45	0.15	471.57	217.01	233.99	4.347
62	304.89	60.31	558.82	0.32	477.63	224.08	238.03	4.347
63	306.33	60.30	559.49	0.14	480.66	231.15	244.09	4.348
64	298.02	60.37	559.81	0.05	473.59	224.08	240.05	4.349
65	300.14	60.35	559.65	0.10	475.61	227.11	242.07	4.349
66	296.83	60.38	559.68	0.09	471.57	219.03	236.01	4.350
67	304.56	60.31	558.58	0.39	475.61	217.01	231.97	4.350
68	304.02	60.32	559.02	0.27	477.63	226.10	240.05	4.350
69	312.96	60.24	558.96	0.29	483.69	226.10	238.03	4.350
70	312.10	60.25	559.14	0.24	483.69	228.12	240.05	4.351
71	305.48	60.31	559.67	0.09	480.66	233.17	246.11	4.351
72	311.24	60.26	559.31	0.19	483.69	230.14	242.07	4.352
73	303.15	60.33	559.22	0.21	477.63	228.12	242.07	4.352
74	299.26	60.36	559.85	0.04	475.61	229.13	244.09	4.352
75	295.93	60.39	559.91	0.02	471.57	221.05	238.03	4.352
76	304.63	60.31	559.86	0.04	480.66	235.19	248.13	4.353
77	310.39	60.26	559.49	0.14	483.69	232.16	244.09	4.353
78	317.45	60.20	558.78	0.33	484.70	218.02	229.95	4.354
79	309.79	60.27	558.73	0.35	480.66	223.07	236.01	4.355
80	309.54	60.27	559.66	0.09	483.69	234.18	246.11	4.355
81	302.28	60.33	559.41	0.16	477.63	230.14	244.09	4.355
82	310.66	60.26	558.54	0.40	480.66	221.05	233.99	4.356
83	323.51	60.15	559.87	0.03	489.75	219.03	229.95	4.356
84	319.90	60.18	559.84	0.04	488.74	225.09	236.01	4.356
85	308.70	60.28	559.84	0.04	483.69	236.20	248.13	4.356
86	311.54	60.25	558.34	0.45	480.66	219.03	231.97	4.357
87	318.33	60.20	558.60	0.38	484.70	216.00	227.93	4.357
88	320.76	60.17	559.67	0.09	488.74	223.07	233.99	4.357
89	294.79	60.40	559.71	0.08	469.55	216.00	233.99	4.357
90	301.42	60.34	559.61	0.11	477.63	232.16	246.11	4.358
91	312.42	60.25	558.14	0.51	480.66	217.01	229.95	4.358
92	324.39	60.14	559.70	0.08	489.75	217.01	227.93	4.358
93	306.65	60.30	558.41	0.44	477.63	220.04	233.99	4.359
94	321.63	60.17	559.50	0.14	488.74	221.05	231.97	4.359
95	305.77	60.30	558.61	0.38	477.63	222.06	236.01	4.359
96	307.54	60.29	558.20	0.49	477.63	218.02	231.97	4.359
97	308.43	60.28	557.99	0.55	477.63	216.00	229.95	4.359
98	298.78	60.36	558.78	0.34	472.58	220.04	236.01	4.359
99	293.88	60.41	559.95	0.01	469.55	218.02	236.01	4.361

Critical Failure Circle

Intersects: XL: 311.48 YL: 60.25 XR: 559.73 YR: 0.07
Centre: XC: 480.66 YC: 216.00 Radius: R: 229.95
Generated failure surface: (20 points)

311.48	60.25	321.45	50.07	332.04	40.53	343.19	31.66	354.88	23.50
367.04	16.08	379.65	9.42	392.64	3.56	405.97	-1.48	419.58	-5.69
433.43	-9.05	447.46	-11.54	461.62	-13.16	475.86	-13.90	490.11	-13.76
504.32	-12.73	518.44	-10.82	532.42	-8.05	546.20	-4.41	559.73	0.07

Slice Geometry and Properties (41 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	311.48	12.58	45.6	4.99	7.13	2	2040.00	25.0	1383.02	0.00	-186.14	1.29
2	316.47	37.75	45.6	4.99	7.13	2	2040.00	25.0	4149.07	0.00	313.30	1.29
3	321.45	65.93	42.0	5.29	7.13	2	2040.00	25.0	7245.66	0.00	857.72	1.23
4	326.75	90.94	42.0	5.29	7.13	2	2040.00	25.0	9994.33	0.00	1330.87	1.23
5	332.04	95.47	38.5	4.48	5.72	2	2040.00	25.0	10492.48	0.00	1808.91	1.18
6	336.52	111.26	38.5	4.48	5.72	2	2040.00	25.0	12227.40	0.00	2165.40	1.18
7	341.00	59.61	38.5	2.19	2.80	2	2040.00	25.0	6551.32	0.00	2401.51	1.18
8	343.19	169.28	34.9	5.84	7.13	2	2040.00	25.0	18603.81	0.00	2652.58	1.13
9	349.04	183.77	34.9	5.84	7.13	2	2040.00	25.0	20195.91	0.00	2905.96	1.13
10	354.88	205.13	31.4	6.08	7.13	2	2040.00	25.0	22543.62	0.00	3204.69	1.10
11	360.96	217.56	31.4	6.08	7.13	2	2040.00	25.0	23910.34	0.00	3415.43	1.10
12	367.04	236.85	27.8	6.30	7.13	2	2040.00	25.0	26029.78	0.00	3670.37	1.07
13	373.35	246.94	27.8	6.30	7.13	2	2040.00	25.0	27138.37	0.00	3836.80	1.07
14	379.65	263.48	24.3	6.50	7.13	2	2040.00	25.0	28955.99	0.00	4046.14	1.05
15	386.14	270.95	24.3	6.50	7.13	2	2040.00	25.0	29777.45	0.00	4166.72	1.05
16	392.64	200.23	20.7	4.71	5.03	1	0.00	45.0	22005.49	0.00	4296.71	0.98
17	397.34	202.54	20.7	4.71	5.03	1	0.00	45.0	22260.68	0.00	4346.54	0.98
18	402.05	170.18	20.7	3.91	4.19	1	0.00	45.0	18704.33	193.43	4395.93	0.98
19	405.97	298.20	17.2	6.81	7.13	1	0.00	45.0	32775.81	1126.59	4502.22	0.98
20	412.77	299.83	17.2	6.81	7.13	1	0.00	45.0	32956.32	2062.38	4535.78	0.98
21	419.58	305.07	13.6	6.93	7.13	1	0.00	45.0	33533.61	2903.51	4605.70	0.97
22	426.51	303.55	13.6	6.93	7.13	1	0.00	45.0	33368.46	3649.99	4588.71	0.97
23	433.43	304.39	10.1	7.02	7.13	1	0.00	45.0	33461.80	4300.37	4604.20	0.98
24	440.45	299.65	10.1	7.02	7.13	1	0.00	45.0	32941.75	4854.66	4536.11	0.98
25	447.46	295.98	6.5	7.08	7.13	1	0.00	45.0	32539.36	5311.79	4496.49	0.98
26	454.54	287.98	6.5	7.08	7.13	1	0.00	45.0	31660.46	5671.77	4376.87	0.98
27	461.62	185.62	3.0	4.69	4.69	1	0.00	45.0	20407.11	3890.90	4310.79	0.99
28	466.31	180.74	3.0	4.69	4.69	1	0.00	45.0	19870.95	3962.20	4197.97	0.99
29	471.00	182.05	3.0	4.86	4.86	1	0.00	45.0	20015.58	4178.99	4083.06	0.99
30	475.86	256.09	-0.6	7.13	7.13	1	0.00	45.0	28155.89	6164.27	3958.78	1.00
31	482.98	241.67	-0.6	7.13	7.13	1	0.00	45.0	26570.75	6132.25	3735.78	1.00
32	490.11	225.11	-4.1	7.11	7.13	1	0.00	45.0	24751.05	6002.12	3527.58	1.02
33	497.21	207.63	-4.1	7.11	7.13	1	0.00	45.0	22828.68	5773.85	3253.05	1.02
34	504.32	187.41	-7.7	7.06	7.13	1	0.00	45.0	20606.79	5447.94	2987.78	1.04
35	511.38	167.02	-7.7	7.06	7.13	1	0.00	45.0	18364.90	5024.36	2661.96	1.04
36	518.44	143.68	-11.2	6.99	7.13	1	0.00	45.0	15797.91	4503.91	2339.15	1.07
37	525.43	120.59	-11.2	6.99	7.13	1	0.00	45.0	13259.65	3886.64	1962.60	1.07
38	532.42	94.73	-14.8	6.89	7.13	1	0.00	45.0	10416.10	3173.70	1581.53	1.10
39	539.31	69.19	-14.8	6.89	7.13	1	0.00	45.0	7608.49	2365.11	1154.80	1.10
40	546.20	41.09	-18.3	6.65	7.01	1	0.00	45.0	4517.79	1446.35	718.58	1.14
41	552.86	14.31	-18.3	6.88	7.24	1	0.00	45.0	1573.38	481.59	242.40	1.14
		7552.04			270.78				830151.75			

X-S Area: 7552.04 Path Length: 270.78 X-S Weight: 830151.75

DATA: Analysis 2 - Lab Scenario 2 pt2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2040.00	25.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R

Intersects:	XL:	311.48	YL:	60.25	XR:	559.73	YR:	0.07
Centre:	XC:	480.66	YC:	216.00			Radius: R:	229.95

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	50.00	50.00	50.00
Trial positions within range:	50	50	50

RESULTS: Analysis 2 - Lab Scenario 2 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 4.30

There were: 62189 successful analyses from a total of 125001 trial circles
62801 analyses terminated due to unacceptable geometry
11 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.37

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.00	60.00	556.70	0.90	496.47	204.27	212.09	3.367
2	341.04	59.99	552.69	2.00	495.45	208.35	214.13	3.434
3	341.06	59.98	550.61	2.57	492.39	201.20	206.99	3.481
4	319.73	60.18	559.95	0.01	480.15	191.00	206.99	4.243
5	314.35	60.23	559.93	0.02	477.09	193.04	210.05	4.246
6	311.95	60.25	559.98	0.00	475.04	191.00	209.03	4.246
7	314.84	60.23	559.81	0.05	477.09	192.02	209.03	4.246
8	315.33	60.22	559.68	0.09	477.09	191.00	208.01	4.247
9	316.28	60.21	559.95	0.01	479.13	196.10	212.09	4.250
10	316.77	60.21	559.83	0.05	479.13	195.08	211.07	4.251
11	317.25	60.20	559.71	0.08	479.13	194.06	210.05	4.252
12	317.73	60.20	559.58	0.11	479.13	193.04	209.03	4.252
13	318.22	60.20	559.46	0.15	479.13	192.02	208.01	4.253
14	318.71	60.19	559.34	0.18	479.13	191.00	206.99	4.254
15	321.67	60.17	559.92	0.02	482.19	194.06	209.03	4.255
16	322.15	60.16	559.80	0.05	482.19	193.04	208.01	4.257
17	322.63	60.16	559.69	0.09	482.19	192.02	206.99	4.258
18	310.90	60.26	559.95	0.01	476.06	198.14	215.15	4.258
19	311.38	60.26	559.82	0.05	476.06	197.12	214.13	4.259
20	311.86	60.25	559.69	0.08	476.06	196.10	213.11	4.259
21	312.35	60.25	559.57	0.12	476.06	195.08	212.09	4.259
22	312.83	60.24	559.44	0.15	476.06	194.06	211.07	4.259
23	323.12	60.15	559.57	0.12	482.19	191.00	205.97	4.260
24	313.32	60.24	559.31	0.19	476.06	193.04	210.05	4.260
25	313.81	60.23	559.18	0.22	476.06	192.02	209.03	4.260
26	314.30	60.23	559.05	0.26	476.06	191.00	208.01	4.260
27	318.25	60.20	559.90	0.03	481.17	199.16	214.13	4.261
28	310.93	60.26	559.35	0.18	474.02	191.00	209.03	4.261
29	309.45	60.27	559.75	0.07	474.02	194.06	212.09	4.261
30	309.94	60.27	559.62	0.10	474.02	193.04	211.07	4.261
31	310.43	60.26	559.49	0.14	474.02	192.02	210.05	4.261
32	308.96	60.28	559.89	0.03	474.02	195.08	213.11	4.261
33	318.73	60.19	559.78	0.06	481.17	198.14	213.11	4.261
34	312.87	60.24	559.94	0.02	478.11	201.20	217.19	4.262
35	313.34	60.24	559.82	0.05	478.11	200.18	216.17	4.262
36	313.82	60.23	559.70	0.08	478.11	199.16	215.15	4.262
37	314.30	60.23	559.58	0.12	478.11	198.14	214.13	4.262
38	319.20	60.19	559.67	0.09	481.17	197.12	212.09	4.262
39	314.78	60.23	559.46	0.15	478.11	197.12	213.11	4.262
40	315.26	60.22	559.34	0.18	478.11	196.10	212.09	4.263
41	319.68	60.18	559.55	0.12	481.17	196.10	211.07	4.263
42	315.74	60.22	559.21	0.22	478.11	195.08	211.07	4.263
43	316.22	60.21	559.09	0.25	478.11	194.06	210.05	4.264
44	320.16	60.18	559.43	0.16	481.17	195.08	210.05	4.264
45	316.71	60.21	558.97	0.28	478.11	193.04	209.03	4.265
46	317.19	60.21	558.84	0.32	478.11	192.02	208.01	4.265
47	320.64	60.18	559.31	0.19	481.17	194.06	209.03	4.265
48	317.68	60.20	558.72	0.35	478.11	191.00	206.99	4.266
49	321.12	60.17	559.20	0.22	481.17	193.04	208.01	4.267
50	321.61	60.17	559.08	0.25	481.17	192.02	206.99	4.268
51	307.56	60.29	559.62	0.10	471.98	191.00	210.05	4.268
52	307.06	60.29	559.76	0.07	471.98	192.02	211.07	4.269
53	306.57	60.30	559.90	0.03	471.98	193.04	212.09	4.269
54	322.09	60.16	558.96	0.29	481.17	191.00	205.97	4.269
55	314.40	60.23	559.98	0.01	480.15	205.29	220.26	4.270
56	314.87	60.23	559.86	0.04	480.15	204.27	219.24	4.270

57	315.34	60.22	559.75	0.07	480.15	203.24	218.21	4.270
58	315.81	60.22	559.64	0.10	480.15	202.22	217.19	4.270
59	316.28	60.21	559.52	0.13	480.15	201.20	216.17	4.271
60	316.75	60.21	559.41	0.16	480.15	200.18	215.15	4.271
61	317.22	60.20	559.29	0.19	480.15	199.16	214.13	4.272
62	317.70	60.20	559.18	0.23	480.15	198.14	213.11	4.272
63	311.32	60.26	558.94	0.29	475.04	195.08	212.09	4.273
64	318.18	60.20	559.06	0.26	480.15	197.12	212.09	4.273
65	310.84	60.26	559.07	0.25	475.04	196.10	213.11	4.273
66	323.16	60.15	559.93	0.02	484.23	198.14	212.09	4.273
67	310.35	60.26	559.20	0.22	475.04	197.12	214.13	4.274
68	311.81	60.25	558.81	0.32	475.04	194.06	211.07	4.274
69	309.87	60.27	559.33	0.18	475.04	198.14	215.15	4.274
70	312.29	60.25	558.69	0.36	475.04	193.04	210.05	4.274
71	318.65	60.19	558.94	0.29	480.15	196.10	211.07	4.274
72	309.39	60.27	559.45	0.15	475.04	199.16	216.17	4.274
73	308.91	60.28	559.58	0.12	475.04	200.18	217.19	4.274
74	308.44	60.28	559.70	0.08	475.04	201.20	218.21	4.275
75	319.13	60.19	558.82	0.32	480.15	195.08	210.05	4.275
76	307.96	60.28	559.83	0.05	475.04	202.22	219.24	4.275
77	326.57	60.12	559.97	0.01	485.25	193.04	206.99	4.275
78	323.64	60.15	559.82	0.05	484.23	197.12	211.07	4.275
79	312.32	60.25	559.21	0.22	477.09	200.18	216.17	4.275
80	311.84	60.25	559.33	0.18	477.09	201.20	217.19	4.275
81	312.79	60.24	559.09	0.25	477.09	199.16	215.15	4.275
82	311.37	60.26	559.45	0.15	477.09	202.22	218.21	4.275
83	307.48	60.29	559.95	0.01	475.04	203.24	220.26	4.275
84	313.27	60.24	558.97	0.28	477.09	198.14	214.13	4.275
85	310.42	60.26	559.69	0.09	477.09	204.27	220.26	4.275
86	310.89	60.26	559.57	0.12	477.09	203.24	219.24	4.275
87	313.75	60.23	558.84	0.32	477.09	197.12	213.11	4.276
88	314.23	60.23	558.72	0.35	477.09	196.10	212.09	4.276
89	309.95	60.27	559.81	0.05	477.09	205.29	221.28	4.276
90	319.32	60.19	559.99	0.00	483.21	204.27	218.21	4.276
91	309.49	60.27	559.92	0.02	477.09	206.31	222.30	4.276
92	324.11	60.15	559.71	0.08	484.23	196.10	210.05	4.277
93	309.41	60.27	558.85	0.31	473.00	192.02	210.05	4.277
94	309.90	60.27	558.72	0.35	473.00	191.00	209.03	4.277
95	319.79	60.18	559.88	0.03	483.21	203.24	217.19	4.277
96	308.92	60.28	558.99	0.28	473.00	193.04	211.07	4.277
97	308.43	60.28	559.12	0.24	473.00	194.06	212.09	4.277
98	307.94	60.29	559.26	0.20	473.00	195.08	213.11	4.277
99	327.05	60.12	559.86	0.04	485.25	192.02	205.97	4.277

Critical Failure Circle

Intersects: XL: 341.00 YL: 60.00 XR: 556.70 YR: 0.90
Centre: XC: 496.47 YC: 204.27 Radius: R: 212.09
Generated failure surface: (20 points)

341.00	60.00	349.70	51.16	358.89	42.85	368.56	35.09	378.66	27.90
389.17	21.32	400.04	15.36	411.24	10.05	422.73	5.40	434.48	1.44
446.43	-1.84	458.56	-4.41	470.82	-6.27	483.16	-7.41	495.55	-7.83
507.94	-7.52	520.30	-6.48	532.57	-4.73	544.72	-2.27	556.70	0.90

Slice Geometry and Properties (39 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	7.01	-85.5	4.35	55.75	2	2040.00	25.0	770.92	0.00	-10297.22	-16.67
2	345.35	21.04	45.5	4.35	6.20	2	2040.00	25.0	2312.68	0.00	-73.41	1.25
3	349.70	36.34	42.1	4.60	6.20	2	2040.00	25.0	3993.46	0.00	285.14	1.20
4	354.30	49.66	42.1	4.60	6.20	2	2040.00	25.0	5457.26	0.00	568.09	1.20
5	358.89	65.37	38.8	4.83	6.20	2	2040.00	25.0	7184.55	0.00	900.01	1.15
6	363.73	77.73	38.8	4.83	6.20	2	2040.00	25.0	8542.60	0.00	1152.91	1.15
7	368.56	93.28	35.4	5.05	6.20	2	2040.00	25.0	10251.48	0.00	1455.35	1.12
8	373.61	104.43	35.4	5.05	6.20	2	2040.00	25.0	11477.26	0.00	1676.26	1.12
9	378.66	119.26	32.1	5.25	6.20	2	2040.00	25.0	13106.52	0.00	1946.82	1.09
10	383.92	128.99	32.1	5.25	6.20	2	2040.00	25.0	14175.55	0.00	2134.08	1.09
11	389.17	142.57	28.7	5.44	6.20	2	2040.00	25.0	15668.03	0.00	2370.57	1.06
12	394.60	150.66	28.7	5.44	6.20	2	2040.00	25.0	16557.31	0.00	2522.63	1.06
13	400.04	162.54	25.4	5.60	6.20	2	2040.00	25.0	17862.71	0.00	2723.37	1.04
14	405.64	168.81	25.4	5.60	6.20	2	2040.00	25.0	18552.70	0.00	2838.98	1.04
15	411.24	178.58	22.0	5.75	6.20	2	2040.00	25.0	19625.82	0.00	3002.34	1.02
16	416.99	182.89	22.0	5.75	6.20	2	2040.00	25.0	20099.23	0.00	3080.35	1.02
17	422.73	212.72	18.7	6.56	6.93	2	2040.00	25.0	23377.76	0.00	3207.29	1.01
18	429.30	169.88	18.7	5.18	5.47	1	0.00	45.0	18670.48	0.00	3274.86	0.96
19	434.48	172.75	15.3	5.24	5.44	1	0.00	45.0	18986.46	0.00	3349.35	0.96
20	439.72	221.24	15.3	6.71	6.96	1	0.00	45.0	24317.17	399.49	3353.81	0.96
21	446.43	198.67	12.0	6.06	6.20	1	0.00	45.0	21837.74	960.06	3397.35	0.96
22	452.50	196.40	12.0	6.06	6.20	1	0.00	45.0	21588.30	1457.35	3363.40	0.96
23	458.56	195.04	8.6	6.13	6.20	1	0.00	45.0	21440.24	1885.70	3360.98	0.97
24	464.69	190.45	8.6	6.13	6.20	1	0.00	45.0	20935.98	2245.13	3284.72	0.97
25	470.82	186.04	5.3	6.17	6.20	1	0.00	45.0	20451.88	2535.01	3236.15	0.98
26	476.99	179.12	5.3	6.17	6.20	1	0.00	45.0	19691.53	2755.35	3117.19	0.98
27	483.16	171.69	1.9	6.19	6.20	1	0.00	45.0	18875.19	2905.75	3021.51	0.99
28	489.35	162.47	1.9	6.19	6.20	1	0.00	45.0	17861.63	2986.25	2859.62	0.99
29	495.55	152.16	-1.4	6.20	6.20	1	0.00	45.0	16728.76	2996.69	2716.27	1.01
30	501.75	140.69	-1.4	6.20	6.20	1	0.00	45.0	15467.34	2937.06	2511.26	1.01
31	507.94	127.70	-4.8	6.18	6.20	1	0.00	45.0	14040.05	2807.48	2319.34	1.03
32	514.12	114.06	-4.8	6.18	6.20	1	0.00	45.0	12540.69	2607.91	2071.26	1.03

33	520.30	98.69	-8.1	6.14	6.20	1	0.00	45.0	10850.69	2338.77	1829.93	1.05
34	526.43	83.00	-8.1	6.14	6.20	1	0.00	45.0	9125.87	2000.02	1538.79	1.05
35	532.57	65.60	-11.5	6.07	6.20	1	0.00	45.0	7212.96	1592.19	1247.12	1.09
36	538.64	48.00	-11.5	6.07	6.20	1	0.00	45.0	5277.81	1115.35	913.05	1.09
37	544.72	22.71	-14.8	4.28	4.43	1	0.00	45.0	2496.33	470.20	623.39	1.12
38	549.00	12.82	-14.8	4.28	4.43	1	0.00	45.0	1409.74	156.74	354.13	1.12
39	553.28	3.14	-14.8	3.42	3.53	2	2040.00	25.0	345.39	0.00	271.37	1.07

X-S Area: 4814.23 Path Length: 285.09 X-S Weight: 529168.06

DATA: Analysis 3 - Lab Scenario 2 pt3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2040.00	25.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.00 YL: 60.00 XR: 556.70 YR: 0.90
Centre: XC: 496.47 YC: 204.27 Radius: R: 212.09

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	20.00	20.00	20.00
Trial positions within range:	20	20	20

RESULTS: Analysis 3 - Lab Scenario 2 pt3

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.37

There were: 4677 successful analyses from a total of 8001 trial circles
3320 analyses terminated due to unacceptable geometry
4 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.31

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.06	59.98	558.81	0.33	494.89	194.27	204.20	3.314
2	341.03	59.99	557.22	0.76	494.89	197.42	206.30	3.354
3	341.00	60.00	556.70	0.90	496.47	204.27	212.09	3.367
4	341.05	59.99	555.59	1.21	494.89	200.58	208.41	3.372
5	341.07	59.98	553.59	1.76	497.00	212.16	217.88	3.402
6	341.04	59.99	551.50	2.33	493.84	204.79	210.51	3.466
7	325.93	60.13	559.96	0.01	486.47	199.53	212.62	4.293
8	326.41	60.13	559.85	0.04	486.47	198.48	211.57	4.295
9	326.90	60.12	559.74	0.07	486.47	197.42	210.51	4.297

10	327.39	60.12	559.63	0.10	486.47	196.37	209.46	4.300
11	327.87	60.11	559.52	0.13	486.47	195.32	208.41	4.302
12	328.36	60.11	559.41	0.16	486.47	194.27	207.36	4.305
13	323.66	60.15	559.81	0.05	487.53	210.05	222.09	4.321
14	326.60	60.12	560.00	0.00	488.58	205.84	217.88	4.322
15	324.12	60.15	559.71	0.08	487.53	209.00	221.04	4.322
16	324.59	60.14	559.61	0.11	487.53	207.95	219.99	4.324
17	327.07	60.12	559.90	0.03	488.58	204.79	216.83	4.324
18	325.06	60.14	559.51	0.13	487.53	206.90	218.93	4.325
19	327.54	60.12	559.80	0.06	488.58	203.74	215.78	4.326
20	325.54	60.13	559.41	0.16	487.53	205.84	217.88	4.327
21	322.59	60.16	559.22	0.21	486.47	210.05	222.09	4.327
22	323.06	60.15	559.12	0.24	486.47	209.00	221.04	4.328
23	328.02	60.11	559.70	0.08	488.58	202.69	214.72	4.329
24	326.01	60.13	559.31	0.19	487.53	204.79	216.83	4.329
25	323.53	60.15	559.02	0.27	486.47	207.95	219.99	4.330
26	326.48	60.13	559.21	0.22	487.53	203.74	215.78	4.331
27	328.50	60.11	559.60	0.11	488.58	201.63	213.67	4.331
28	324.00	60.15	558.92	0.30	486.47	206.90	218.93	4.331
29	326.96	60.12	559.11	0.24	487.53	202.69	214.72	4.333
30	330.52	60.09	559.99	0.00	489.63	199.53	211.57	4.333
31	328.98	60.10	559.50	0.14	488.58	200.58	212.62	4.334
32	327.44	60.12	559.00	0.27	487.53	201.63	213.67	4.335
33	329.46	60.10	559.39	0.17	488.58	199.53	211.57	4.336
34	331.00	60.09	559.89	0.03	489.63	198.48	210.51	4.337
35	329.94	60.10	559.29	0.19	488.58	198.48	210.51	4.339
36	331.48	60.08	559.78	0.06	489.63	197.42	209.46	4.340
37	330.42	60.09	559.19	0.22	488.58	197.42	209.46	4.342
38	331.97	60.08	559.68	0.09	489.63	196.37	208.41	4.343
39	330.91	60.09	559.08	0.25	488.58	196.37	208.41	4.346
40	332.45	60.07	559.58	0.12	489.63	195.32	207.36	4.347
41	324.47	60.14	558.82	0.32	486.47	205.84	217.88	4.347
42	331.39	60.08	558.98	0.28	488.58	195.32	207.36	4.349
43	324.95	60.14	558.72	0.35	486.47	204.79	216.83	4.350
44	332.94	60.07	559.47	0.14	489.63	194.27	206.30	4.350
45	327.92	60.11	558.90	0.30	487.53	200.58	212.62	4.351
46	325.42	60.13	558.61	0.38	486.47	203.74	215.78	4.353
47	328.40	60.11	558.80	0.33	487.53	199.53	211.57	4.355
48	325.90	60.13	558.51	0.41	486.47	202.69	214.72	4.356
49	328.88	60.10	558.69	0.36	487.53	198.48	210.51	4.359
50	326.38	60.13	558.41	0.44	486.47	201.63	213.67	4.359
51	327.82	60.11	559.82	0.05	490.68	211.11	222.09	4.362
52	326.85	60.12	558.31	0.46	486.47	200.58	212.62	4.363
53	329.36	60.10	558.59	0.39	487.53	197.42	209.46	4.363
54	328.28	60.11	559.73	0.07	490.68	210.05	221.04	4.364
55	326.75	60.12	559.24	0.21	489.63	211.11	222.09	4.365
56	327.34	60.12	558.20	0.49	486.47	199.53	211.57	4.366
57	331.88	60.08	558.87	0.31	488.58	194.27	206.30	4.366
58	328.74	60.11	559.63	0.10	490.68	209.00	219.99	4.366
59	329.84	60.10	558.49	0.41	487.53	196.37	208.41	4.367
60	327.22	60.12	559.15	0.23	489.63	210.05	221.04	4.367
61	329.21	60.10	559.54	0.13	490.68	207.95	218.93	4.369
62	327.68	60.11	559.06	0.26	489.63	209.00	219.99	4.369
63	327.82	60.11	558.10	0.52	486.47	198.48	210.51	4.370
64	330.33	60.09	558.38	0.44	487.53	195.32	207.36	4.371
65	329.68	60.10	559.45	0.15	490.68	206.90	217.88	4.372
66	331.21	60.08	559.93	0.02	491.74	205.84	216.83	4.373
67	328.30	60.11	557.99	0.55	486.47	197.42	209.46	4.373
68	330.15	60.09	559.35	0.18	490.68	205.84	216.83	4.375
69	330.82	60.09	558.27	0.47	487.53	194.27	206.30	4.376
70	331.68	60.08	559.84	0.04	491.74	204.79	215.78	4.376
71	328.78	60.11	557.89	0.58	486.47	196.37	208.41	4.377
72	330.62	60.09	559.26	0.20	490.68	204.79	215.78	4.377
73	332.15	60.08	559.75	0.07	491.74	203.74	214.72	4.380
74	331.09	60.09	559.17	0.23	490.68	203.74	214.72	4.380
75	329.27	60.10	557.78	0.61	486.47	195.32	207.36	4.381
76	332.62	60.07	559.65	0.10	491.74	202.69	213.67	4.383
77	331.56	60.08	559.07	0.25	490.68	202.69	213.67	4.384
78	328.15	60.11	558.96	0.28	489.63	207.95	218.93	4.385
79	329.76	60.10	557.67	0.64	486.47	194.27	206.30	4.386
80	325.69	60.13	558.67	0.36	488.58	211.11	222.09	4.386
81	333.10	60.07	559.56	0.12	491.74	201.63	212.62	4.387
82	328.62	60.11	558.87	0.31	489.63	206.90	217.88	4.389
83	326.16	60.13	558.57	0.39	488.58	210.05	221.04	4.389
84	333.57	60.06	559.46	0.15	491.74	200.58	211.57	4.391
85	326.62	60.12	558.48	0.42	488.58	209.00	219.99	4.392
86	329.09	60.10	558.78	0.34	489.63	205.84	216.83	4.393
87	334.05	60.06	559.36	0.17	491.74	199.53	210.51	4.395
88	327.09	60.12	558.39	0.44	488.58	207.95	218.93	4.396
89	335.11	60.05	559.95	0.01	492.79	199.53	210.51	4.396
90	329.56	60.10	558.68	0.36	489.63	204.79	215.78	4.397
91	324.63	60.14	558.09	0.52	487.53	211.11	222.09	4.397
92	334.53	60.06	559.27	0.20	491.74	198.48	209.46	4.399
93	327.56	60.12	558.29	0.47	488.58	206.90	217.88	4.399
94	325.10	60.14	558.00	0.55	487.53	210.05	221.04	4.400
95	335.59	60.05	559.85	0.04	492.79	198.48	209.46	4.400
96	330.03	60.09	558.58	0.39	489.63	203.74	214.72	4.401
97	332.04	60.08	558.97	0.28	490.68	201.63	212.62	4.401
98	328.03	60.11	558.19	0.49	488.58	205.84	216.83	4.403
99	335.01	60.05	559.17	0.23	491.74	197.42	208.41	4.403

Critical Failure Circle

Intersects: XL: 341.06 YL: 59.98 XR: 558.81 YR: 0.33
Centre: XC: 494.89 YC: 194.27 Radius: R: 204.20
Generated failure surface: (20 points)

341.06	59.98	349.63	50.76	358.74	42.08	368.38	33.98	378.50	26.49
389.06	19.64	400.02	13.45	411.34	7.94	422.98	3.15	434.89	-0.92
447.03	-4.24	459.36	-6.82	471.81	-8.62	484.36	-9.66	496.95	-9.92
509.52	-9.41	522.05	-8.12	534.47	-6.06	546.73	-3.24	558.81	0.33

Slice Geometry and Properties (40 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	7.36	-85.5	4.34	55.54	2	2040.00	25.0	809.10	0.00	-10115.88	-16.10
2	345.34	22.09	47.1	4.28	6.29	2	2040.00	25.0	2427.93	0.00	-83.43	1.28
3	349.63	38.40	43.6	4.56	6.29	2	2040.00	25.0	4219.97	0.00	299.50	1.22
4	354.19	52.49	43.6	4.56	6.29	2	2040.00	25.0	5768.38	0.00	599.01	1.22
5	358.74	69.49	40.1	4.82	6.29	2	2040.00	25.0	7636.67	0.00	954.56	1.17
6	363.56	82.64	40.1	4.82	6.29	2	2040.00	25.0	9082.00	0.00	1222.81	1.17
7	368.38	99.64	36.5	5.06	6.29	2	2040.00	25.0	10950.20	0.00	1547.60	1.13
8	373.44	111.57	36.5	5.06	6.29	2	2040.00	25.0	12261.98	0.00	1782.45	1.13
9	378.50	127.91	33.0	5.28	6.29	2	2040.00	25.0	14056.95	0.00	2073.49	1.09
10	383.78	138.36	33.0	5.28	6.29	2	2040.00	25.0	15206.13	0.00	2272.95	1.09
11	389.06	153.43	29.5	5.48	6.29	2	2040.00	25.0	16861.58	0.00	2527.97	1.06
12	394.54	162.16	29.5	5.48	6.29	2	2040.00	25.0	17821.12	0.00	2690.14	1.06
13	400.02	175.40	25.9	5.66	6.29	2	2040.00	25.0	19276.45	0.00	2907.07	1.04
14	405.68	182.19	25.9	5.66	6.29	2	2040.00	25.0	20023.21	0.00	3030.54	1.04
15	411.34	190.44	22.4	5.74	6.21	2	2040.00	25.0	20929.23	0.00	3206.96	1.02
16	417.08	194.99	22.4	5.74	6.21	2	2040.00	25.0	21428.98	0.00	3289.24	1.02
17	422.82	162.06	19.0	4.69	4.96	1	0.00	45.0	17811.12	0.00	3438.83	0.96
18	427.51	163.55	18.9	4.69	4.96	1	0.00	45.0	17974.98	0.00	3472.77	0.96
19	432.20	94.37	18.9	2.69	2.84	1	0.00	45.0	10372.76	81.38	3500.39	0.96
20	434.89	213.64	15.3	6.07	6.29	1	0.00	45.0	23482.33	687.19	3581.19	0.96
21	440.96	213.64	15.3	6.07	6.29	1	0.00	45.0	23483.42	1340.40	3589.29	0.96
22	447.03	215.61	11.8	6.16	6.29	1	0.00	45.0	23700.08	1919.54	3636.67	0.96
23	453.20	213.13	11.8	6.16	6.29	1	0.00	45.0	23428.55	2424.60	3599.96	0.96
24	459.36	198.02	8.3	5.82	5.88	1	0.00	45.0	21768.16	2657.07	3601.31	0.97
25	465.18	193.65	8.3	5.82	5.88	1	0.00	45.0	21288.73	2967.15	3524.60	0.97
26	471.00	215.77	5.2	6.68	6.71	1	0.00	45.0	23721.41	3696.76	3471.46	0.98
27	477.68	207.24	4.7	6.68	6.70	1	0.00	45.0	22783.34	3925.20	3341.85	0.98
28	484.36	186.19	1.2	6.29	6.29	1	0.00	45.0	20469.44	3819.90	3236.32	0.99
29	490.65	176.16	1.2	6.29	6.29	1	0.00	45.0	19367.44	3871.25	3062.36	0.99
30	496.95	164.81	-2.3	6.29	6.29	1	0.00	45.0	18120.47	3846.43	2909.70	1.01
31	503.24	152.36	-2.3	6.29	6.29	1	0.00	45.0	16751.54	3745.40	2689.50	1.01
32	509.52	138.10	-5.9	6.26	6.29	1	0.00	45.0	15183.69	3568.37	2484.62	1.04
33	515.79	123.33	-5.9	6.26	6.29	1	0.00	45.0	13559.67	3315.32	2218.23	1.04
34	522.05	106.51	-9.4	6.21	6.29	1	0.00	45.0	11710.64	2986.77	1960.20	1.07
35	528.26	89.55	-9.4	6.21	6.29	1	0.00	45.0	9846.60	2582.71	1647.57	1.07
36	534.47	70.62	-12.9	6.13	6.29	1	0.00	45.0	7764.46	2103.85	1335.14	1.10
37	540.60	51.66	-12.9	6.13	6.29	1	0.00	45.0	5680.52	1550.25	976.67	1.10
38	546.73	29.14	-16.5	5.48	5.72	1	0.00	45.0	3204.07	867.52	626.82	1.14
39	552.22	12.02	-16.5	5.48	5.72	1	0.00	45.0	1321.01	289.18	259.61	1.14
40	557.70	0.35	-16.5	1.11	1.15	2	2040.00	25.0	38.34	0.00	226.11	1.09
		5200.03			288.43				571592.56			

X-S Area: 5200.03 Path Length: 288.43 X-S Weight: 571592.56

GALENA 6.10 Analysis Results Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Atlas Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 3.gmf
Processed: 13 Nov 2015 13:13:24

DATA: Analysis 1 - Lab Scenario 3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1320.00	35.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 364.56 YL: 53.54 XR: 443.13 YR: 32.02
Centre: XC: 465.00 YC: 266.00 Radius: R: 235.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	200.00
Trial positions within range:	100	100	100

RESULTS: Analysis 1 - Lab Scenario 3

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 22.06

There were: 259408 successful analyses from a total of 1000001 trial circles
740539 analyses terminated due to unacceptable geometry
54 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 3.97

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.00	60.00	557.46	0.69	505.91	237.21	242.07	3.967
2	341.04	59.99	552.66	2.01	500.86	228.12	231.97	4.088
3	341.03	59.99	552.45	2.07	507.93	254.38	256.21	4.194
4	315.48	60.22	559.85	0.04	483.69	217.01	229.95	4.225
5	320.37	60.18	559.72	0.08	486.72	216.00	227.93	4.226
6	341.01	60.00	550.94	2.48	504.90	246.30	248.13	4.227
7	319.49	60.19	559.90	0.03	486.72	218.02	229.95	4.227
8	341.08	59.98	549.36	2.92	501.87	238.22	240.05	4.228
9	311.48	60.25	559.73	0.07	480.66	216.00	229.95	4.233
10	310.59	60.26	559.93	0.02	480.66	218.02	231.97	4.235
11	319.35	60.19	559.16	0.23	485.71	216.00	227.93	4.237
12	314.46	60.23	559.28	0.20	482.68	217.01	229.95	4.238
13	318.47	60.19	559.34	0.18	485.71	218.02	229.95	4.238
14	317.60	60.20	559.53	0.13	485.71	220.04	231.97	4.239

15	323.51	60.15	559.87	0.03	489.75	219.03	229.95	4.240
16	313.58	60.24	559.48	0.14	482.68	219.03	231.97	4.240
17	324.39	60.14	559.70	0.08	489.75	217.01	227.93	4.240
18	316.72	60.21	559.71	0.08	485.71	222.06	233.99	4.241
19	312.70	60.24	559.67	0.09	482.68	221.05	233.99	4.242
20	315.86	60.22	559.89	0.03	485.71	224.08	236.01	4.243
21	311.82	60.25	559.86	0.04	482.68	223.07	236.01	4.244
22	310.46	60.26	559.15	0.23	479.65	216.00	229.95	4.247
23	321.63	60.17	559.50	0.14	488.74	221.05	231.97	4.249
24	322.49	60.16	559.33	0.18	488.74	219.03	229.95	4.249
25	323.37	60.15	559.16	0.23	488.74	217.01	227.93	4.249
26	320.76	60.17	559.67	0.09	488.74	223.07	233.99	4.250
27	309.57	60.27	559.36	0.18	479.65	218.02	231.97	4.250
28	319.90	60.18	559.84	0.04	488.74	225.09	236.01	4.250
29	316.58	60.21	558.97	0.28	484.70	220.04	231.97	4.251
30	306.60	60.30	559.76	0.07	477.63	217.01	231.97	4.251
31	308.69	60.28	559.56	0.12	479.65	220.04	233.99	4.253
32	315.71	60.22	559.15	0.23	484.70	222.06	233.99	4.253
33	312.56	60.25	558.91	0.30	481.67	219.03	231.97	4.254
34	305.70	60.30	559.97	0.01	477.63	219.03	233.99	4.254
35	314.84	60.23	559.33	0.18	484.70	224.08	236.01	4.255
36	307.80	60.29	559.76	0.06	479.65	222.06	236.01	4.256
37	311.68	60.25	559.10	0.25	481.67	221.05	233.99	4.256
38	313.97	60.23	559.51	0.13	484.70	226.10	238.03	4.257
39	310.81	60.26	559.30	0.19	481.67	223.07	236.01	4.259
40	306.93	60.29	559.96	0.01	479.65	224.08	238.03	4.259
41	313.12	60.24	559.69	0.09	484.70	228.12	240.05	4.259
42	317.45	60.20	558.78	0.33	484.70	218.02	229.95	4.259
43	319.74	60.18	559.12	0.24	487.73	223.07	233.99	4.260
44	318.33	60.20	558.60	0.38	484.70	216.00	227.93	4.260
45	318.88	60.19	559.29	0.19	487.73	225.09	236.01	4.261
46	313.44	60.24	558.71	0.35	481.67	217.01	229.95	4.261
47	309.93	60.27	559.49	0.14	481.67	225.09	238.03	4.261
48	312.26	60.25	559.86	0.04	484.70	230.14	242.07	4.262
49	318.03	60.20	559.46	0.15	487.73	227.11	238.03	4.262
50	317.17	60.21	559.63	0.10	487.73	229.13	240.05	4.263
51	330.30	60.09	559.98	0.01	493.79	216.00	225.91	4.264
52	326.69	60.12	559.92	0.02	492.78	222.06	231.97	4.264
53	309.07	60.28	559.67	0.09	481.67	227.11	240.05	4.264
54	316.33	60.21	559.79	0.06	487.73	231.15	242.07	4.265
55	327.55	60.12	559.77	0.06	492.78	220.04	229.95	4.265
56	315.48	60.22	559.96	0.01	487.73	233.17	244.09	4.267
57	328.41	60.11	559.61	0.11	492.78	218.02	227.93	4.267
58	308.21	60.28	559.86	0.04	481.67	229.13	242.07	4.267
59	320.61	60.18	558.95	0.29	487.73	221.05	231.97	4.268
60	305.58	60.31	559.17	0.23	476.62	217.01	231.97	4.268
61	307.67	60.29	558.98	0.28	478.64	220.04	233.99	4.268
62	321.48	60.17	558.78	0.33	487.73	219.03	229.95	4.269
63	329.28	60.10	559.45	0.15	492.78	216.00	225.91	4.269
64	312.96	60.24	558.96	0.29	483.69	226.10	238.03	4.270
65	323.11	60.15	559.86	0.04	491.77	228.12	238.03	4.270
66	323.96	60.15	559.71	0.08	491.77	226.10	236.01	4.270
67	322.35	60.16	558.61	0.38	487.73	217.01	227.93	4.270
68	324.81	60.14	559.55	0.12	491.77	224.08	233.99	4.270
69	325.67	60.13	559.39	0.17	491.77	222.06	231.97	4.271
70	304.69	60.31	559.39	0.17	476.62	219.03	233.99	4.271
71	306.79	60.29	559.19	0.22	478.64	222.06	236.01	4.271
72	326.53	60.12	559.23	0.21	491.77	220.04	229.95	4.272
73	309.45	60.27	558.57	0.39	478.64	216.00	229.95	4.272
74	312.10	60.25	559.14	0.24	483.69	228.12	240.05	4.272
75	327.39	60.12	559.07	0.25	491.77	218.02	227.93	4.273
76	308.55	60.28	558.78	0.33	478.64	218.02	231.97	4.274
77	303.80	60.32	559.60	0.11	476.62	221.05	236.01	4.274
78	316.16	60.21	559.09	0.25	486.72	229.13	240.05	4.274
79	302.62	60.33	559.52	0.13	474.60	216.00	231.97	4.275
80	305.91	60.30	559.39	0.17	478.64	224.08	238.03	4.275
81	311.24	60.26	559.31	0.19	483.69	230.14	242.07	4.275
82	316.43	60.21	558.22	0.49	483.69	218.02	229.95	4.276
83	317.32	60.20	558.04	0.54	483.69	216.00	227.93	4.276
84	315.56	60.22	558.41	0.44	483.69	220.04	231.97	4.276
85	308.92	60.28	558.92	0.30	480.66	225.09	238.03	4.276
86	314.69	60.23	558.59	0.38	483.69	222.06	233.99	4.276
87	315.31	60.22	559.25	0.20	486.72	231.15	242.07	4.276
88	313.82	60.23	558.78	0.33	483.69	224.08	236.01	4.277
89	322.94	60.16	559.18	0.23	490.76	226.10	236.01	4.278
90	310.39	60.26	559.49	0.14	483.69	232.16	244.09	4.278
91	322.09	60.16	559.33	0.18	490.76	228.12	238.03	4.278
92	302.91	60.33	559.81	0.05	476.62	223.07	238.03	4.278
93	301.72	60.34	559.74	0.07	474.60	218.02	233.99	4.278
94	305.03	60.31	559.59	0.11	478.64	226.10	240.05	4.278
95	321.25	60.17	559.49	0.14	490.76	230.14	240.05	4.278
96	314.46	60.23	559.42	0.16	486.72	233.17	244.09	4.279
97	312.42	60.25	558.14	0.51	480.66	217.01	229.95	4.279
98	308.05	60.28	559.11	0.24	480.66	227.11	240.05	4.279
99	320.41	60.18	559.64	0.10	490.76	232.16	242.07	4.279

Critical Failure Circle

Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69

Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Generated failure surface: (20 points)

341.00	60.00	350.20	51.86	359.81	44.20	369.78	37.04	380.11	30.40
390.76	24.28	401.71	18.72	412.92	13.71	424.38	9.28	436.04	5.44
447.89	2.20	459.88	-0.44	472.00	-2.47	484.20	-3.88	496.45	-4.67
508.73	-4.84	521.00	-4.39	533.24	-3.31	545.40	-1.62	557.46	0.69

Slice Geometry and Properties (43 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Mat1	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.46	-85.3	4.60	56.12	2	1320.00	35.0	709.51	0.00	-3667.44	-10.65
2	345.60	19.37	41.5	4.60	6.14	2	1320.00	35.0	2128.77	0.00	145.78	1.15
3	350.20	32.99	38.6	4.80	6.14	2	1320.00	35.0	3625.51	0.00	429.37	1.12
4	355.00	45.06	38.6	4.80	6.14	2	1320.00	35.0	4951.82	0.00	671.57	1.12
5	359.81	58.62	35.7	4.99	6.14	2	1320.00	35.0	6441.88	0.00	934.15	1.09
6	364.79	69.66	35.7	4.99	6.14	2	1320.00	35.0	7655.71	0.00	1150.13	1.09
7	369.78	82.75	32.8	5.16	6.14	2	1320.00	35.0	9094.27	0.00	1389.26	1.07
8	374.95	92.60	32.8	5.16	6.14	2	1320.00	35.0	10177.16	0.00	1577.58	1.07
9	380.11	104.85	29.9	5.33	6.14	2	1320.00	35.0	11522.67	0.00	1791.18	1.05
10	385.43	113.36	29.9	5.33	6.14	2	1320.00	35.0	12458.02	0.00	1950.64	1.05
11	390.76	124.40	27.0	5.47	6.14	2	1320.00	35.0	13671.27	0.00	2136.68	1.03
12	396.23	131.42	27.0	5.47	6.14	2	1320.00	35.0	14443.32	0.00	2266.12	1.03
13	401.71	140.95	24.0	5.61	6.14	2	1320.00	35.0	15489.92	0.00	2422.94	1.02
14	407.32	146.36	24.0	5.61	6.14	2	1320.00	35.0	16085.16	0.00	2521.34	1.02
15	412.92	154.10	21.1	5.73	6.14	2	1320.00	35.0	16935.10	0.00	2647.51	1.00
16	418.65	157.79	21.1	5.73	6.14	2	1320.00	35.0	17341.22	0.00	2713.89	1.00
17	424.38	163.50	18.2	5.83	6.14	2	1320.00	35.0	17969.14	0.00	2808.08	0.99
18	430.21	165.39	18.2	5.83	6.14	2	1320.00	35.0	18176.22	0.00	2841.62	0.99
19	436.04	120.95	15.3	4.24	4.40	2	1320.00	35.0	13292.65	0.00	2902.60	0.99
20	440.29	120.95	15.3	4.24	4.40	2	1320.00	35.0	13292.65	0.00	2902.60	0.99
21	444.53	95.88	15.3	3.36	3.49	1	0.00	45.0	10537.80	0.00	2931.70	0.97
22	447.89	141.68	12.4	4.99	5.11	1	0.00	45.0	15571.19	0.00	2955.50	0.97
23	452.88	140.34	12.4	4.99	5.11	1	0.00	45.0	15424.21	0.00	2927.60	0.97
24	457.87	56.16	12.4	2.01	2.06	1	0.00	45.0	6172.46	28.44	2908.78	0.97
25	459.88	153.29	9.5	5.56	5.64	1	0.00	45.0	16848.30	319.38	2910.53	0.97
26	465.44	149.99	9.5	5.56	5.64	1	0.00	45.0	16487.14	646.77	2850.54	0.97
27	471.00	26.51	9.5	1.00	1.01	1	0.00	45.0	2913.95	150.37	2815.16	0.97
28	472.00	159.20	6.6	6.10	6.14	1	0.00	45.0	17499.86	1082.11	2792.55	0.98
29	478.10	153.32	6.6	6.10	6.14	1	0.00	45.0	16853.10	1352.55	2690.78	0.98
30	484.20	147.13	3.7	6.13	6.14	1	0.00	45.0	16173.26	1563.54	2601.12	0.99
31	490.32	139.26	3.7	6.13	6.14	1	0.00	45.0	15309.07	1715.09	2462.74	0.99
32	496.45	130.69	0.8	6.14	6.14	1	0.00	45.0	14367.36	1806.99	2332.90	1.00
33	502.59	120.88	0.8	6.14	6.14	1	0.00	45.0	13288.77	1839.26	2157.84	1.00
34	508.73	110.05	-2.1	6.14	6.14	1	0.00	45.0	12098.54	1811.83	1987.40	1.01
35	514.87	98.34	-2.1	6.14	6.14	1	0.00	45.0	10810.86	1724.73	1775.71	1.01
36	521.00	85.42	-5.0	6.12	6.14	1	0.00	45.0	9390.87	1578.06	1564.20	1.03
37	527.12	71.88	-5.0	6.12	6.14	1	0.00	45.0	7901.91	1371.81	1316.03	1.03
38	533.24	57.08	-7.9	6.08	6.14	1	0.00	45.0	6275.82	1106.26	1062.91	1.05
39	539.32	41.79	-7.9	6.08	6.14	1	0.00	45.0	4594.77	781.40	778.37	1.05
40	545.40	19.54	-10.8	4.22	4.29	1	0.00	45.0	2147.94	324.58	531.38	1.07
41	549.62	11.26	-10.8	4.22	4.29	1	0.00	45.0	1237.85	108.19	307.17	1.07
42	553.84	1.36	-10.8	0.92	0.94	1	0.00	45.0	149.48	0.00	170.25	1.07
43	554.76	1.70	-10.8	2.71	2.75	2	1320.00	35.0	187.26	0.00	137.59	1.05
		4164.27			283.32				457703.72			

X-S Area: 4164.27 Path Length: 283.32 X-S Weight: 457703.72

DATA: Analysis 2 - Lab Scenario 3 pt2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
1320.00	35.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69
Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	50.00	50.00	50.00
Trial positions within range:	50	50	50

RESULTS: Analysis 2 - Lab Scenario 3 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.97

There were: 53416 successful analyses from a total of 125001 trial circles
71585 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.85

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.07	59.98	559.67	0.09	503.36	223.44	230.34	3.849
2	341.04	59.99	559.67	0.09	506.42	234.66	240.54	3.878
3	341.06	59.98	559.97	0.01	510.50	248.95	253.81	3.902
4	341.05	59.99	558.47	0.42	504.38	229.56	235.44	3.911
5	341.06	59.98	559.42	0.16	513.56	261.19	265.03	3.958
6	341.00	60.00	557.46	0.69	505.91	237.21	242.07	3.967
7	341.04	59.99	557.91	0.57	510.50	253.03	256.87	3.990
8	341.06	59.98	554.01	1.64	497.24	212.21	218.09	3.998
9	341.04	59.99	551.62	2.30	496.22	213.23	218.09	4.077
10	341.08	59.98	554.26	1.57	507.44	248.95	251.76	4.098
11	341.05	59.99	551.55	2.31	502.34	235.68	238.50	4.149
12	341.03	59.99	549.21	2.96	495.19	214.25	218.09	4.155
13	317.77	60.20	559.69	0.09	483.97	212.21	225.23	4.216
14	317.32	60.20	559.79	0.06	483.97	213.23	226.25	4.216
15	316.87	60.21	559.88	0.03	483.97	214.25	227.27	4.217
16	316.42	60.21	559.98	0.00	483.97	215.27	228.30	4.217
17	322.25	60.16	559.67	0.09	487.03	212.21	224.21	4.219
18	321.80	60.17	559.76	0.06	487.03	213.23	225.23	4.220
19	321.35	60.17	559.86	0.04	487.03	214.25	226.25	4.220
20	320.91	60.17	559.95	0.01	487.03	215.27	227.27	4.220
21	313.29	60.24	559.64	0.10	480.91	212.21	226.25	4.222
22	312.84	60.24	559.75	0.07	480.91	213.23	227.27	4.223
23	312.38	60.25	559.85	0.04	480.91	214.25	228.30	4.224
24	311.93	60.25	559.96	0.01	480.91	215.27	229.32	4.225
25	316.74	60.21	559.11	0.24	482.95	212.21	225.23	4.228
26	316.29	60.21	559.21	0.22	482.95	213.23	226.25	4.229
27	315.84	60.22	559.31	0.19	482.95	214.25	227.27	4.230
28	321.22	60.17	559.10	0.25	486.01	212.21	224.21	4.230
29	315.39	60.22	559.41	0.16	482.95	215.27	228.30	4.230
30	320.77	60.17	559.20	0.22	486.01	213.23	225.23	4.231
31	320.32	60.18	559.29	0.19	486.01	214.25	226.25	4.231
32	319.88	60.18	559.39	0.17	486.01	215.27	227.27	4.231
33	314.94	60.22	559.51	0.13	482.95	216.29	229.32	4.231
34	319.43	60.19	559.48	0.14	486.01	216.29	228.30	4.231
35	318.99	60.19	559.57	0.12	486.01	217.31	229.32	4.232
36	314.49	60.23	559.61	0.11	482.95	217.31	230.34	4.232
37	318.54	60.19	559.66	0.09	486.01	218.33	230.34	4.232
38	318.10	60.20	559.76	0.07	486.01	219.35	231.36	4.233
39	341.04	59.99	546.78	3.62	494.17	215.27	218.09	4.233
40	314.04	60.23	559.70	0.08	482.95	218.33	231.36	4.233
41	317.66	60.20	559.85	0.04	486.01	220.38	232.38	4.233
42	317.22	60.21	559.94	0.02	486.01	221.40	233.40	4.234
43	313.60	60.24	559.80	0.05	482.95	219.35	232.38	4.234
44	324.96	60.14	559.94	0.02	490.09	216.29	227.27	4.235
45	313.15	60.24	559.90	0.03	482.95	220.38	233.40	4.235
46	325.40	60.13	559.85	0.04	490.09	215.27	226.25	4.235
47	325.85	60.13	559.76	0.07	490.09	214.25	225.23	4.236
48	326.29	60.13	559.67	0.09	490.09	213.23	224.21	4.236
49	312.71	60.24	560.00	0.00	482.95	221.40	234.42	4.236
50	326.74	60.12	559.59	0.11	490.09	212.21	223.19	4.237
51	321.73	60.17	559.82	0.05	489.07	221.40	232.38	4.243
52	323.05	60.15	559.56	0.12	489.07	218.33	229.32	4.243
53	322.61	60.16	559.65	0.10	489.07	219.35	230.34	4.243
54	322.17	60.16	559.73	0.07	489.07	220.38	231.36	4.243

55	323.49	60.15	559.47	0.14	489.07	217.31	228.30	4.243
56	323.93	60.15	559.38	0.17	489.07	216.29	227.27	4.243
57	321.29	60.17	559.90	0.03	489.07	222.42	233.40	4.243
58	317.96	60.20	559.01	0.27	484.99	217.31	229.32	4.243
59	324.37	60.14	559.30	0.19	489.07	215.27	226.25	4.244
60	320.86	60.17	559.99	0.00	489.07	223.44	234.42	4.244
61	324.82	60.14	559.21	0.22	489.07	214.25	225.23	4.244
62	317.51	60.20	559.10	0.25	484.99	218.33	230.34	4.244
63	325.26	60.14	559.12	0.24	489.07	213.23	224.21	4.244
64	317.07	60.21	559.19	0.22	484.99	219.35	231.36	4.245
65	313.91	60.23	558.93	0.29	481.93	216.29	229.32	4.245
66	325.71	60.13	559.03	0.27	489.07	212.21	223.19	4.245
67	316.63	60.21	559.29	0.20	484.99	220.38	232.38	4.245
68	313.46	60.24	559.03	0.27	481.93	217.31	230.34	4.246
69	316.19	60.21	559.38	0.17	484.99	221.40	233.40	4.246
70	313.01	60.24	559.13	0.24	481.93	218.33	231.36	4.247
71	315.75	60.22	559.47	0.15	484.99	222.42	234.42	4.247
72	312.57	60.25	559.23	0.21	481.93	219.35	232.38	4.248
73	315.31	60.22	559.56	0.12	484.99	223.44	235.44	4.248
74	314.87	60.23	559.65	0.10	484.99	224.46	236.46	4.249
75	312.12	60.25	559.33	0.18	481.93	220.38	233.40	4.249
76	314.44	60.23	559.74	0.07	484.99	225.48	237.48	4.250
77	311.68	60.25	559.42	0.16	481.93	221.40	234.42	4.250
78	314.00	60.23	559.83	0.05	484.99	226.50	238.50	4.251
79	318.40	60.19	558.91	0.30	484.99	216.29	228.30	4.251
80	311.24	60.26	559.52	0.13	481.93	222.42	235.44	4.252
81	318.85	60.19	558.82	0.32	484.99	215.27	227.27	4.252
82	313.57	60.24	559.92	0.02	484.99	227.52	239.52	4.252
83	319.30	60.19	558.72	0.35	484.99	214.25	226.25	4.252
84	315.71	60.22	558.53	0.40	481.93	212.21	225.23	4.252
85	315.26	60.22	558.63	0.38	481.93	213.23	226.25	4.252
86	314.81	60.23	558.73	0.35	481.93	214.25	227.27	4.252
87	322.02	60.16	559.01	0.27	488.05	218.33	229.32	4.252
88	314.36	60.23	558.83	0.32	481.93	215.27	228.30	4.252
89	319.74	60.18	558.63	0.38	484.99	213.23	225.23	4.252
90	321.58	60.17	559.09	0.25	488.05	219.35	230.34	4.252
91	321.14	60.17	559.18	0.22	488.05	220.38	231.36	4.253
92	310.80	60.26	559.62	0.10	481.93	223.44	236.46	4.253
93	320.19	60.18	558.53	0.40	484.99	212.21	224.21	4.253
94	320.70	60.18	559.27	0.20	488.05	221.40	232.38	4.253
95	320.26	60.18	559.35	0.18	488.05	222.42	233.40	4.253
96	319.83	60.18	559.44	0.15	488.05	223.44	234.42	4.254
97	310.36	60.26	559.71	0.08	481.93	224.46	237.48	4.254
98	319.39	60.19	559.53	0.13	488.05	224.46	235.44	4.254
99	318.96	60.19	559.61	0.11	488.05	225.48	236.46	4.255

Critical Failure Circle

Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34

Generated failure surface: (20 points)

341.07	59.98	350.16	51.44	359.69	43.40	369.64	35.89	379.99	28.92
390.70	22.53	401.74	16.73	413.07	11.53	424.67	6.96	436.50	3.02
448.53	-0.28	460.72	-2.92	473.03	-4.89	485.43	-6.20	497.89	-6.83
510.36	-6.79	522.81	-6.08	535.20	-4.69	547.50	-2.63	559.67	0.09

Slice Geometry and Properties (40 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.87	-85.3	4.61	55.90	2	1320.00	35.0	755.40	0.00	-3598.11	-10.13
2	345.61	20.63	43.2	4.54	6.24	2	1320.00	35.0	2266.74	0.00	150.76	1.17
3	350.16	35.33	40.1	4.77	6.24	2	1320.00	35.0	3882.27	0.00	455.43	1.13
4	354.92	48.26	40.1	4.77	6.24	2	1320.00	35.0	5304.06	0.00	714.04	1.13
5	359.69	63.10	37.0	4.98	6.24	2	1320.00	35.0	6934.76	0.00	997.62	1.10
6	364.67	75.01	37.0	4.98	6.24	2	1320.00	35.0	8243.21	0.00	1228.77	1.10
7	369.64	89.49	33.9	5.17	6.24	2	1320.00	35.0	9834.50	0.00	1488.17	1.07
8	374.82	100.16	33.9	5.17	6.24	2	1320.00	35.0	11007.42	0.00	1690.19	1.07
9	379.99	113.81	30.8	5.35	6.24	2	1320.00	35.0	12507.91	0.00	1922.75	1.05
10	385.34	123.07	30.8	5.35	6.24	2	1320.00	35.0	13525.20	0.00	2094.14	1.05
11	390.70	135.47	27.7	5.52	6.24	2	1320.00	35.0	14888.25	0.00	2297.62	1.03
12	396.22	143.14	27.7	5.52	6.24	2	1320.00	35.0	15730.94	0.00	2436.99	1.03
13	401.74	153.90	24.6	5.67	6.24	2	1320.00	35.0	16913.78	0.00	2609.30	1.02
14	407.40	159.83	24.6	5.67	6.24	2	1320.00	35.0	17565.16	0.00	2715.36	1.02
15	413.07	168.62	21.5	5.80	6.24	2	1320.00	35.0	18531.09	0.00	2854.76	1.00
16	418.87	172.67	21.5	5.80	6.24	2	1320.00	35.0	18976.51	0.00	2926.41	1.00
17	424.67	172.78	18.4	5.70	6.01	2	1320.00	35.0	18988.41	0.00	3030.65	0.99
18	430.38	174.71	18.4	5.70	6.01	2	1320.00	35.0	19200.14	0.00	3065.67	0.99
19	436.08	176.13	15.6	5.72	5.93	1	0.00	45.0	19357.56	0.00	3158.61	0.97
20	441.80	176.13	15.3	5.72	5.93	1	0.00	45.0	19358.33	0.00	3162.08	0.97
21	447.51	31.39	15.3	1.02	1.06	1	0.00	45.0	3450.02	9.19	3162.78	0.97
22	448.53	186.74	12.2	6.09	6.24	1	0.00	45.0	20525.21	365.30	3191.85	0.97
23	454.63	184.61	12.2	6.09	6.24	1	0.00	45.0	20291.55	878.76	3159.95	0.97
24	460.72	153.32	9.1	5.14	5.21	1	0.00	45.0	16853.50	1082.09	3155.72	0.97
25	465.86	150.32	9.1	5.14	5.21	1	0.00	45.0	16524.35	1350.07	3096.31	0.97
26	471.00	58.60	9.1	2.03	2.06	1	0.00	45.0	6441.23	607.59	3054.83	0.97
27	473.03	174.85	6.0	6.20	6.24	1	0.00	45.0	19221.30	2031.36	3025.86	0.98
28	479.23	168.37	6.0	6.20	6.24	1	0.00	45.0	18509.23	2285.54	2915.19	0.98
29	485.43	161.50	2.9	6.23	6.24	1	0.00	45.0	17754.71	2474.27	2819.16	0.99
30	491.66	152.85	2.9	6.23	6.24	1	0.00	45.0	16803.94	2597.50	2668.74	0.99

31	497.89	143.33	-0.2	6.24	6.24	1	0.00	45.0	15757.24	2655.10	2528.96	1.00
32	504.12	132.55	-0.2	6.24	6.24	1	0.00	45.0	14572.23	2647.03	2338.76	1.00
33	510.36	120.52	-3.3	6.22	6.24	1	0.00	45.0	13250.72	2573.33	2154.70	1.02
34	516.58	107.68	-3.3	6.22	6.24	1	0.00	45.0	11838.47	2433.98	1924.72	1.02
35	522.81	93.38	-6.4	6.20	6.24	1	0.00	45.0	10266.81	2229.20	1695.87	1.04
36	529.00	78.56	-6.4	6.20	6.24	1	0.00	45.0	8637.20	1958.98	1426.29	1.04
37	535.20	62.27	-9.5	6.15	6.24	1	0.00	45.0	6846.07	1623.72	1151.98	1.06
38	541.35	45.58	-9.5	6.15	6.24	1	0.00	45.0	5011.30	1223.43	842.98	1.06
39	547.50	27.01	-12.6	5.88	6.03	1	0.00	45.0	2969.71	741.98	528.32	1.09
40	553.38	9.83	-12.6	6.29	6.44	1	0.00	45.0	1080.63	246.16	180.13	1.09

X-S Area: 4552.35 Path Length: 286.60 X-S Weight: 500377.06

DATA: Analysis 3 - Lab Scenario 3 pt3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
1320.00 35.0 109.90 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock
Cohesion Phi UnitWeight Ru
0.00 50.0 130.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings
0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00
Profile: 2 (5 points) Material beneath: 1 - Existing waste rock
128.00 22.00 183.00 8.00 248.00 4.00 471.00 3.00 560.00 0.00
Profile: 3 (3 points) Material beneath: 3 - Bedrock
0.00 113.00 128.00 22.00 161.00 0.00

Slope Surface (5 points)

0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	20.00	20.00	20.00
Trial positions within range:	20	20	20

RESULTS: Analysis 3 - Lab Scenario 3 pt3

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 3.85

There were: 4095 successful analyses from a total of 8001 trial circles
3906 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 3.85

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.07	59.98	559.67	0.09	503.36	223.44	230.34	3.849
2	341.02	59.99	553.67	1.73	499.67	221.86	226.65	4.042
3	341.07	59.98	553.60	1.75	502.83	233.44	237.18	4.068
4	341.05	59.99	552.39	2.09	500.73	228.17	231.91	4.096
5	341.06	59.98	551.14	2.43	498.62	222.91	226.65	4.116
6	329.86	60.10	559.98	0.00	493.36	215.54	225.60	4.259
7	330.32	60.09	559.90	0.03	493.36	214.49	224.55	4.260

8	330.77	60.09	559.81	0.05	493.36	213.44	223.49	4.261
9	328.99	60.10	559.95	0.01	495.46	226.07	235.07	4.296
10	329.43	60.10	559.88	0.03	495.46	225.02	234.02	4.297
11	325.73	60.13	559.79	0.06	494.41	231.33	240.34	4.298
12	329.87	60.10	559.80	0.05	495.46	223.96	232.97	4.298
13	326.17	60.13	559.71	0.08	494.41	230.28	239.28	4.298
14	326.61	60.12	559.64	0.10	494.41	229.23	238.23	4.299
15	327.04	60.12	559.56	0.12	494.41	228.17	237.18	4.299
16	330.31	60.09	559.72	0.08	495.46	222.91	231.91	4.299
17	327.48	60.12	559.49	0.14	494.41	227.12	236.13	4.300
18	330.76	60.09	559.65	0.10	495.46	221.86	230.86	4.301
19	327.92	60.11	559.41	0.16	494.41	226.07	235.07	4.301
20	328.36	60.11	559.34	0.18	494.41	225.02	234.02	4.302
21	331.20	60.08	559.57	0.12	495.46	220.81	229.81	4.302
22	328.81	60.11	559.26	0.20	494.41	223.96	232.97	4.303
23	333.16	60.07	559.96	0.01	496.52	218.70	227.70	4.303
24	329.25	60.10	559.18	0.22	494.41	222.91	231.91	4.304
25	331.65	60.08	559.49	0.14	495.46	219.75	228.76	4.304
26	324.67	60.14	559.25	0.20	493.36	231.33	240.34	4.304
27	325.11	60.14	559.18	0.23	493.36	230.28	239.28	4.305
28	333.61	60.06	559.88	0.03	496.52	217.65	226.65	4.305
29	332.10	60.08	559.41	0.16	495.46	218.70	227.70	4.305
30	332.55	60.07	559.34	0.18	495.46	217.65	226.65	4.307
31	334.06	60.06	559.80	0.05	496.52	216.59	225.60	4.307
32	333.00	60.07	559.26	0.20	495.46	216.59	225.60	4.309
33	334.51	60.06	559.72	0.08	496.52	215.54	224.55	4.309
34	333.45	60.07	559.18	0.22	495.46	215.54	224.55	4.311
35	334.97	60.05	559.65	0.10	496.52	214.49	223.49	4.312
36	325.54	60.13	559.10	0.25	493.36	229.23	238.23	4.314
37	329.70	60.10	559.10	0.25	494.41	221.86	230.86	4.314
38	335.42	60.05	559.57	0.12	496.52	213.44	222.44	4.314
39	325.98	60.13	559.03	0.27	493.36	228.17	237.18	4.315
40	330.14	60.09	559.03	0.27	494.41	220.81	229.81	4.316
41	326.42	60.13	558.95	0.29	493.36	227.12	236.13	4.317
42	326.86	60.12	558.87	0.31	493.36	226.07	235.07	4.318
43	330.59	60.09	558.95	0.29	494.41	219.75	228.76	4.319
44	327.30	60.12	558.79	0.33	493.36	225.02	234.02	4.319
45	331.04	60.09	558.87	0.31	494.41	218.70	227.70	4.321
46	327.75	60.11	558.72	0.35	493.36	223.96	232.97	4.321
47	328.19	60.11	558.64	0.37	493.36	222.91	231.91	4.323
48	331.49	60.08	558.79	0.33	494.41	217.65	226.65	4.323
49	333.90	60.06	559.10	0.25	495.46	214.49	223.49	4.323
50	328.63	60.11	558.56	0.39	493.36	221.86	230.86	4.324
51	331.94	60.08	558.71	0.35	494.41	216.59	225.60	4.326
52	329.08	60.10	558.48	0.42	493.36	220.81	229.81	4.326
53	334.36	60.06	559.02	0.27	495.46	213.44	222.44	4.326
54	332.39	60.07	558.63	0.37	494.41	215.54	224.55	4.328
55	329.53	60.10	558.40	0.44	493.36	219.75	228.76	4.328
56	329.98	60.10	558.32	0.46	493.36	218.70	227.70	4.330
57	332.84	60.07	558.55	0.40	494.41	214.49	223.49	4.331
58	330.43	60.09	558.24	0.48	493.36	217.65	226.65	4.332
59	333.30	60.07	558.47	0.42	494.41	213.44	222.44	4.334
60	330.88	60.09	558.16	0.50	493.36	216.59	225.60	4.335
61	331.33	60.08	558.08	0.53	493.36	215.54	224.55	4.337
62	331.78	60.08	558.00	0.55	493.36	214.49	223.49	4.340
63	332.24	60.08	557.92	0.57	493.36	213.44	222.44	4.342
64	331.07	60.09	559.97	0.01	498.62	232.38	240.34	4.344
65	331.50	60.08	559.90	0.03	498.62	231.33	239.28	4.346
66	330.00	60.09	559.45	0.15	497.57	232.38	240.34	4.346
67	331.93	60.08	559.83	0.05	498.62	230.28	238.23	4.347
68	330.44	60.09	559.38	0.17	497.57	231.33	239.28	4.347
69	332.36	60.07	559.76	0.06	498.62	229.23	237.18	4.348
70	330.87	60.09	559.31	0.19	497.57	230.28	238.23	4.349
71	331.30	60.08	559.24	0.21	497.57	229.23	237.18	4.350
72	332.80	60.07	559.70	0.08	498.62	228.17	236.13	4.351
73	333.24	60.07	559.63	0.10	498.62	227.12	235.07	4.352
74	333.67	60.06	559.56	0.12	498.62	226.07	234.02	4.354
75	334.11	60.06	559.49	0.14	498.62	225.02	232.97	4.357
76	334.55	60.06	559.42	0.16	498.62	223.96	231.91	4.359
77	335.61	60.05	559.94	0.02	499.67	223.96	231.91	4.359
78	334.99	60.05	559.35	0.18	498.62	222.91	230.86	4.361
79	331.74	60.08	559.17	0.23	497.57	228.17	236.13	4.362
80	328.94	60.10	558.93	0.29	496.52	232.38	240.34	4.362
81	336.05	60.04	559.87	0.03	499.67	222.91	230.86	4.362
82	329.37	60.10	558.86	0.31	496.52	231.33	239.28	4.364
83	335.43	60.05	559.28	0.20	498.62	221.86	229.81	4.364
84	332.17	60.08	559.10	0.25	497.57	227.12	235.07	4.364
85	336.50	60.04	559.80	0.05	499.67	221.86	229.81	4.365
86	329.81	60.10	558.79	0.33	496.52	230.28	238.23	4.365
87	335.88	60.04	559.21	0.22	498.62	220.81	228.76	4.367
88	332.61	60.07	559.03	0.26	497.57	226.07	234.02	4.367
89	330.24	60.09	558.72	0.35	496.52	229.23	237.18	4.368
90	336.94	60.04	559.73	0.07	499.67	220.81	228.76	4.368
91	330.68	60.09	558.65	0.37	496.52	228.17	236.13	4.370
92	333.05	60.07	558.96	0.28	497.57	225.02	232.97	4.370
93	327.88	60.11	558.41	0.44	495.46	232.38	240.34	4.371
94	337.38	60.03	559.66	0.09	499.67	219.75	227.70	4.371
95	331.11	60.09	558.58	0.39	496.52	227.12	235.07	4.372
96	333.49	60.06	558.89	0.30	497.57	223.96	231.91	4.372
97	328.31	60.11	558.34	0.46	495.46	231.33	239.28	4.373

98	331.55	60.08	558.51	0.41	496.52	226.07	234.02	4.374
99	328.74	60.11	558.27	0.48	495.46	230.28	238.23	4.374

Critical Failure Circle

Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34
Generated failure surface: (20 points)

341.07	59.98	350.16	51.44	359.69	43.40	369.64	35.89	379.99	28.92
390.70	22.53	401.74	16.73	413.07	11.53	424.67	6.96	436.50	3.02
448.53	-0.28	460.72	-2.92	473.03	-4.89	485.43	-6.20	497.89	-6.83
510.36	-6.79	522.81	-6.08	535.20	-4.69	547.50	-2.63	559.67	0.09

Slice Geometry and Properties (40 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.87	-85.3	4.61	55.90	2	1320.00	35.0	755.40	0.00	-3598.11	-10.13
2	345.61	20.63	43.2	4.54	6.24	2	1320.00	35.0	2266.74	0.00	150.76	1.17
3	350.16	35.33	40.1	4.77	6.24	2	1320.00	35.0	3882.27	0.00	455.43	1.13
4	354.92	48.26	40.1	4.77	6.24	2	1320.00	35.0	5304.06	0.00	714.04	1.13
5	359.69	63.10	37.0	4.98	6.24	2	1320.00	35.0	6934.76	0.00	997.62	1.10
6	364.67	75.01	37.0	4.98	6.24	2	1320.00	35.0	8243.21	0.00	1228.77	1.10
7	369.64	89.49	33.9	5.17	6.24	2	1320.00	35.0	9834.50	0.00	1488.17	1.07
8	374.82	100.16	33.9	5.17	6.24	2	1320.00	35.0	11007.42	0.00	1690.19	1.07
9	379.99	113.81	30.8	5.35	6.24	2	1320.00	35.0	12507.91	0.00	1922.75	1.05
10	385.34	123.07	30.8	5.35	6.24	2	1320.00	35.0	13525.20	0.00	2094.14	1.05
11	390.70	135.47	27.7	5.52	6.24	2	1320.00	35.0	14888.25	0.00	2297.62	1.03
12	396.22	143.14	27.7	5.52	6.24	2	1320.00	35.0	15730.94	0.00	2436.99	1.03
13	401.74	153.90	24.6	5.67	6.24	2	1320.00	35.0	16913.78	0.00	2609.30	1.02
14	407.40	159.83	24.6	5.67	6.24	2	1320.00	35.0	17565.16	0.00	2715.36	1.02
15	413.07	168.62	21.5	5.80	6.24	2	1320.00	35.0	18531.09	0.00	2854.76	1.00
16	418.87	172.67	21.5	5.80	6.24	2	1320.00	35.0	18976.51	0.00	2926.41	1.00
17	424.67	172.78	18.4	5.70	6.01	2	1320.00	35.0	18988.41	0.00	3030.65	0.99
18	430.38	174.71	18.4	5.70	6.01	2	1320.00	35.0	19200.14	0.00	3065.67	0.99
19	436.08	176.13	15.6	5.72	5.93	1	0.00	45.0	19357.56	0.00	3158.61	0.97
20	441.80	176.13	15.3	5.72	5.93	1	0.00	45.0	19358.33	0.00	3162.08	0.97
21	447.51	31.39	15.3	1.02	1.06	1	0.00	45.0	3450.02	9.19	3162.78	0.97
22	448.53	186.74	12.2	6.09	6.24	1	0.00	45.0	20525.21	365.30	3191.85	0.97
23	454.63	184.61	12.2	6.09	6.24	1	0.00	45.0	20291.55	878.76	3159.95	0.97
24	460.72	153.32	9.1	5.14	5.21	1	0.00	45.0	16853.50	1082.09	3155.72	0.97
25	465.86	150.32	9.1	5.14	5.21	1	0.00	45.0	16524.35	1350.07	3096.31	0.97
26	471.00	58.60	9.1	2.03	2.06	1	0.00	45.0	6441.23	607.59	3054.83	0.97
27	473.03	174.85	6.0	6.20	6.24	1	0.00	45.0	19221.30	2031.36	3025.86	0.98
28	479.23	168.37	6.0	6.20	6.24	1	0.00	45.0	18509.23	2285.54	2915.19	0.98
29	485.43	161.50	2.9	6.23	6.24	1	0.00	45.0	17754.71	2474.27	2819.16	0.99
30	491.66	152.85	2.9	6.23	6.24	1	0.00	45.0	16803.94	2597.50	2668.74	0.99
31	497.89	143.33	-0.2	6.24	6.24	1	0.00	45.0	15757.24	2655.10	2528.96	1.00
32	504.12	132.55	-0.2	6.24	6.24	1	0.00	45.0	14572.23	2647.03	2338.76	1.00
33	510.36	120.52	-3.3	6.22	6.24	1	0.00	45.0	13250.72	2573.33	2154.70	1.02
34	516.58	107.68	-3.3	6.22	6.24	1	0.00	45.0	11838.47	2433.98	1924.72	1.02
35	522.81	93.38	-6.4	6.20	6.24	1	0.00	45.0	10266.81	2229.20	1695.87	1.04
36	529.00	78.56	-6.4	6.20	6.24	1	0.00	45.0	8637.20	1958.98	1426.29	1.04
37	535.20	62.27	-9.5	6.15	6.24	1	0.00	45.0	6846.07	1623.72	1151.98	1.06
38	541.35	45.58	-9.5	6.15	6.24	1	0.00	45.0	5011.30	1223.43	842.98	1.06
39	547.50	27.01	-12.6	5.88	6.03	1	0.00	45.0	2969.71	741.98	528.32	1.09
40	553.38	9.83	-12.6	6.29	6.44	1	0.00	45.0	1080.63	246.16	180.13	1.09

X-S Area: 4552.35 Path Length: 286.60 X-S Weight: 500377.06

GALENA 6.10 Analysis Results — Licensee: Greg Lewicki and Associates

Project: Ouray Silver Mine - Atlas Waste Pile
File: D:\Dropbox\Revenue Mine\mill\mill certification\Slope Stablity\Atlas Pile Lab Scenario 4.gmf
Processed: 13 Nov 2015 13:07:21

DATA: Analysis 1 - Lab Scenario 4

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2080.00	35.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Profile: 2 (5 points) Material beneath: 1 - Existing waste rock

128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00

Profile: 3 (3 points) Material beneath: 3 - Bedrock

0.00	113.00	128.00	22.00	161.00	0.00

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00	0.00	600.00	0.00

Failure Surface

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 364.56 YL: 53.54 XR: 443.13 YR: 32.02
Centre: XC: 465.00 YC: 266.00 Radius: R: 235.00

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	100.00	100.00	200.00
Trial positions within range:	100	100	100

RESULTS: Analysis 1 - Lab Scenario 4

Bishop Simplified Method of Analysis - Circular Failure Surface

Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 33.27

There were: 259423 successful analyses from a total of 1000001 trial circles
740539 analyses terminated due to unacceptable geometry
39 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 4.24

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.00	60.00	557.46	0.69	505.91	237.21	242.07	4.243
2	225.03	61.00	556.34	1.00	425.10	221.05	256.21	4.335
3	341.04	59.99	552.66	2.01	500.86	228.12	231.97	4.392
4	341.03	59.99	552.45	2.07	507.93	254.38	256.21	4.546
5	341.08	59.98	549.36	2.92	501.87	238.22	240.05	4.584
6	341.01	60.00	550.94	2.48	504.90	246.30	248.13	4.591
7	311.48	60.25	559.73	0.07	480.66	216.00	229.95	4.617
8	306.60	60.30	559.76	0.07	477.63	217.01	231.97	4.617
9	310.59	60.26	559.93	0.02	480.66	218.02	231.97	4.619
10	305.70	60.30	559.97	0.01	477.63	219.03	233.99	4.620
11	302.62	60.33	559.52	0.13	474.60	216.00	231.97	4.622
12	301.72	60.34	559.74	0.07	474.60	218.02	233.99	4.626
13	300.82	60.35	559.96	0.01	474.60	220.04	236.01	4.629
14	310.46	60.26	559.15	0.23	479.65	216.00	229.95	4.631

15	305.58	60.31	559.17	0.23	476.62	217.01	231.97	4.632
16	309.57	60.27	559.36	0.18	479.65	218.02	231.97	4.633
17	304.69	60.31	559.39	0.17	476.62	219.03	233.99	4.636
18	308.69	60.28	559.56	0.12	479.65	220.04	233.99	4.636
19	315.48	60.22	559.85	0.04	483.69	217.01	229.95	4.637
20	307.80	60.29	559.76	0.06	479.65	222.06	236.01	4.638
21	301.60	60.34	558.92	0.30	473.59	216.00	231.97	4.639
22	303.80	60.32	559.60	0.11	476.62	221.05	236.01	4.639
23	297.74	60.37	559.45	0.15	471.57	217.01	233.99	4.639
24	294.79	60.40	559.71	0.08	469.55	216.00	233.99	4.640
25	306.93	60.29	559.96	0.01	479.65	224.08	238.03	4.641
26	300.70	60.35	559.15	0.23	473.59	218.02	233.99	4.642
27	302.91	60.33	559.81	0.05	476.62	223.07	238.03	4.643
28	296.83	60.38	559.68	0.09	471.57	219.03	236.01	4.643
29	293.88	60.41	559.95	0.01	469.55	218.02	236.01	4.644
30	299.80	60.36	559.37	0.17	473.59	220.04	236.01	4.646
31	295.93	60.39	559.91	0.02	471.57	221.05	238.03	4.647
32	314.46	60.23	559.28	0.20	482.68	217.01	229.95	4.648
33	313.58	60.24	559.48	0.14	482.68	219.03	231.97	4.649
34	307.67	60.29	558.98	0.28	478.64	220.04	233.99	4.650
35	298.91	60.36	559.59	0.11	473.59	222.06	238.03	4.650
36	303.67	60.32	558.80	0.33	475.61	219.03	233.99	4.651
37	312.70	60.24	559.67	0.09	482.68	221.05	233.99	4.651
38	306.79	60.29	559.19	0.22	478.64	222.06	236.01	4.653
39	311.82	60.25	559.86	0.04	482.68	223.07	236.01	4.653
40	298.02	60.37	559.81	0.05	473.59	224.08	240.05	4.655
41	302.78	60.33	559.01	0.27	475.61	221.05	236.01	4.655
42	305.91	60.30	559.39	0.17	478.64	224.08	238.03	4.656
43	296.72	60.38	558.85	0.32	470.56	217.01	233.99	4.657
44	301.89	60.34	559.23	0.21	475.61	223.07	238.03	4.658
45	305.03	60.31	559.59	0.11	478.64	226.10	240.05	4.659
46	293.77	60.41	559.10	0.25	468.54	216.00	233.99	4.660
47	309.45	60.27	558.57	0.39	478.64	216.00	229.95	4.660
48	308.55	60.28	558.78	0.33	478.64	218.02	231.97	4.660
49	312.56	60.25	558.91	0.30	481.67	219.03	231.97	4.661
50	295.82	60.39	559.08	0.25	470.56	219.03	236.01	4.661
51	304.56	60.31	558.58	0.39	475.61	217.01	231.97	4.661
52	301.01	60.34	559.44	0.15	475.61	225.09	240.05	4.662
53	304.17	60.32	559.79	0.06	478.64	228.12	242.07	4.663
54	311.68	60.25	559.10	0.25	481.67	221.05	233.99	4.663
55	298.78	60.36	558.78	0.34	472.58	220.04	236.01	4.664
56	292.86	60.41	559.34	0.18	468.54	218.02	236.01	4.664
57	310.81	60.26	559.30	0.19	481.67	223.07	236.01	4.665
58	294.92	60.40	559.31	0.19	470.56	221.05	238.03	4.666
59	300.14	60.35	559.65	0.10	475.61	227.11	242.07	4.666
60	303.30	60.32	559.98	0.00	478.64	230.14	244.09	4.666
61	320.37	60.18	559.72	0.08	486.72	216.00	227.93	4.667
62	319.49	60.19	559.90	0.03	486.72	218.02	229.95	4.667
63	297.89	60.37	559.00	0.27	472.58	222.06	238.03	4.668
64	309.93	60.27	559.49	0.14	481.67	225.09	238.03	4.668
65	291.95	60.42	559.59	0.11	468.54	220.04	238.03	4.668
66	341.01	60.00	552.93	1.94	513.99	275.60	276.41	4.670
67	294.02	60.40	559.55	0.12	470.56	223.07	240.05	4.670
68	309.07	60.28	559.67	0.09	481.67	227.11	240.05	4.670
69	299.26	60.36	559.85	0.04	475.61	229.13	244.09	4.670
70	289.92	60.44	559.57	0.12	466.52	217.01	236.01	4.671
71	300.58	60.35	558.32	0.46	472.58	216.00	231.97	4.671
72	304.89	60.31	558.82	0.32	477.63	224.08	238.03	4.671
73	297.00	60.38	559.22	0.21	472.58	224.08	240.05	4.672
74	299.68	60.36	558.55	0.40	472.58	218.02	233.99	4.673
75	291.05	60.43	559.83	0.05	468.54	222.06	240.05	4.673
76	313.44	60.24	558.71	0.35	481.67	217.01	229.95	4.674
77	308.21	60.28	559.86	0.04	481.67	229.13	242.07	4.674
78	304.02	60.32	559.02	0.27	477.63	226.10	240.05	4.675
79	319.35	60.19	559.16	0.23	485.71	216.00	227.93	4.675
80	293.13	60.41	559.77	0.06	470.56	225.09	242.07	4.675
81	289.00	60.45	559.82	0.05	466.52	219.03	238.03	4.675
82	318.47	60.19	559.34	0.18	485.71	218.02	229.95	4.675
83	317.60	60.20	559.53	0.13	485.71	220.04	231.97	4.676
84	296.12	60.39	559.44	0.15	472.58	226.10	242.07	4.676
85	316.72	60.21	559.71	0.08	485.71	222.06	233.99	4.677
86	315.86	60.22	559.89	0.03	485.71	224.08	236.01	4.678
87	303.15	60.33	559.22	0.21	477.63	228.12	242.07	4.678
88	299.99	60.35	558.85	0.31	474.60	225.09	240.05	4.679
89	308.43	60.28	557.99	0.55	477.63	216.00	229.95	4.680
90	308.92	60.28	558.92	0.30	480.66	225.09	238.03	4.681
91	295.24	60.39	559.66	0.09	472.58	228.12	244.09	4.681
92	286.98	60.47	559.75	0.07	464.49	216.00	236.01	4.681
93	307.54	60.29	558.20	0.49	477.63	218.02	231.97	4.681
94	306.65	60.30	558.41	0.44	477.63	220.04	233.99	4.681
95	302.28	60.33	559.41	0.16	477.63	230.14	244.09	4.682
96	305.77	60.30	558.61	0.38	477.63	222.06	236.01	4.682
97	303.54	60.32	557.99	0.55	474.60	217.01	231.97	4.683
98	299.12	60.36	559.07	0.26	474.60	227.11	242.07	4.683
99	291.84	60.42	558.73	0.35	467.53	218.02	236.01	4.684

Critical Failure Circle

Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69

Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Generated failure surface: (20 points)

341.00	60.00	350.20	51.86	359.81	44.20	369.78	37.04	380.11	30.40
390.76	24.28	401.71	18.72	412.92	13.71	424.38	9.28	436.04	5.44
447.89	2.20	459.88	-0.44	472.00	-2.47	484.20	-3.88	496.45	-4.67
508.73	-4.84	521.00	-4.39	533.24	-3.31	545.40	-1.62	557.46	0.69

Slice Geometry and Properties (43 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Mat1	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.46	-85.3	4.60	56.12	2	2080.00	35.0	709.51	0.00	-6080.12	-12.13
2	345.60	19.37	41.5	4.60	6.14	2	2080.00	35.0	2128.77	0.00	25.53	1.16
3	350.20	32.99	38.6	4.80	6.14	2	2080.00	35.0	3625.51	0.00	321.83	1.13
4	355.00	45.06	38.6	4.80	6.14	2	2080.00	35.0	4951.82	0.00	565.98	1.13
5	359.81	58.62	35.7	4.99	6.14	2	2080.00	35.0	6441.88	0.00	839.95	1.10
6	364.79	69.66	35.7	4.99	6.14	2	2080.00	35.0	7655.71	0.00	1057.51	1.10
7	369.78	82.75	32.8	5.16	6.14	2	2080.00	35.0	9094.27	0.00	1306.90	1.08
8	374.95	92.60	32.8	5.16	6.14	2	2080.00	35.0	10177.16	0.00	1496.47	1.08
9	380.11	104.85	29.9	5.33	6.14	2	2080.00	35.0	11522.67	0.00	1719.36	1.05
10	385.43	113.36	29.9	5.33	6.14	2	2080.00	35.0	12458.02	0.00	1879.79	1.05
11	390.76	124.40	27.0	5.47	6.14	2	2080.00	35.0	13671.27	0.00	2074.30	1.03
12	396.23	131.42	27.0	5.47	6.14	2	2080.00	35.0	14443.32	0.00	2204.43	1.03
13	401.71	140.95	24.0	5.61	6.14	2	2080.00	35.0	15489.92	0.00	2369.04	1.02
14	407.32	146.36	24.0	5.61	6.14	2	2080.00	35.0	16085.16	0.00	2467.91	1.02
15	412.92	154.10	21.1	5.73	6.14	2	2080.00	35.0	16935.10	0.00	2601.31	1.01
16	418.65	157.79	21.1	5.73	6.14	2	2080.00	35.0	17341.22	0.00	2667.96	1.01
17	424.38	163.50	18.2	5.83	6.14	2	2080.00	35.0	17969.14	0.00	2768.94	1.00
18	430.21	165.39	18.2	5.83	6.14	2	2080.00	35.0	18176.22	0.00	2802.60	1.00
19	436.04	120.95	15.3	4.24	4.40	2	2080.00	35.0	13292.65	0.00	2870.04	0.99
20	440.29	120.95	15.3	4.24	4.40	2	2080.00	35.0	13292.65	0.00	2870.04	0.99
21	444.53	95.88	15.3	3.36	3.49	1	0.00	45.0	10537.80	0.00	2944.06	0.97
22	447.89	141.68	12.4	4.99	5.11	1	0.00	45.0	15571.19	0.00	2965.63	0.97
23	452.88	140.34	12.4	4.99	5.11	1	0.00	45.0	15424.21	0.00	2937.64	0.97
24	457.87	56.16	12.4	2.01	2.06	1	0.00	45.0	6172.46	28.44	2918.71	0.97
25	459.88	153.29	9.5	5.56	5.64	1	0.00	45.0	16848.30	319.38	2918.06	0.98
26	465.44	149.99	9.5	5.56	5.64	1	0.00	45.0	16487.14	646.77	2857.76	0.98
27	471.00	26.51	9.5	1.00	1.01	1	0.00	45.0	2913.95	150.37	2822.19	0.98
28	472.00	159.20	6.6	6.10	6.14	1	0.00	45.0	17499.86	1082.11	2797.38	0.98
29	478.10	153.32	6.6	6.10	6.14	1	0.00	45.0	16853.10	1352.55	2695.33	0.98
30	484.20	147.13	3.7	6.13	6.14	1	0.00	45.0	16173.26	1563.54	2603.57	0.99
31	490.32	139.26	3.7	6.13	6.14	1	0.00	45.0	15309.07	1715.09	2465.01	0.99
32	496.45	130.69	0.8	6.14	6.14	1	0.00	45.0	14367.36	1806.99	2333.35	1.00
33	502.59	120.88	0.8	6.14	6.14	1	0.00	45.0	13288.77	1839.26	2158.26	1.00
34	508.73	110.05	-2.1	6.14	6.14	1	0.00	45.0	12098.54	1811.83	1986.36	1.01
35	514.87	98.34	-2.1	6.14	6.14	1	0.00	45.0	10810.86	1724.73	1774.80	1.01
36	521.00	85.42	-5.0	6.12	6.14	1	0.00	45.0	9390.87	1578.06	1562.28	1.03
37	527.12	71.88	-5.0	6.12	6.14	1	0.00	45.0	7901.91	1371.81	1314.42	1.03
38	533.24	57.08	-7.9	6.08	6.14	1	0.00	45.0	6275.82	1106.26	1060.83	1.04
39	539.32	41.79	-7.9	6.08	6.14	1	0.00	45.0	4594.77	781.40	776.83	1.04
40	545.40	19.54	-10.8	4.22	4.29	1	0.00	45.0	2147.94	324.58	529.89	1.07
41	549.62	11.26	-10.8	4.22	4.29	1	0.00	45.0	1237.85	108.19	306.24	1.07
42	553.84	1.36	-10.8	0.92	0.94	1	0.00	45.0	149.48	0.00	169.69	1.07
43	554.76	1.70	-10.8	2.71	2.75	2	2080.00	35.0	187.26	0.00	168.43	1.05
		4164.27			283.32				457703.72			

X-S Area: 4164.27 Path Length: 283.32 X-S Weight: 457703.72

DATA: Analysis 2 - Lab Scenario 4 pt2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings

Cohesion	Phi	UnitWeight	Ru
2080.00	35.0	109.90	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock

Cohesion	Phi	UnitWeight	Ru
0.00	50.0	130.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points)	Material beneath: 2 - Mill tailings								
0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00
Profile: 2 (5 points)	Material beneath: 1 - Existing waste rock								
128.00	22.00	183.00	8.00	248.00	4.00	471.00	3.00	560.00	0.00
Profile: 3 (3 points)	Material beneath: 3 - Bedrock								
0.00	113.00	128.00	22.00	161.00	0.00				

Slope Surface (5 points)

0.00	113.00	126.00	70.00	225.00	61.00	341.00	60.00	560.00	0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.00 YL: 60.00 XR: 557.46 YR: 0.69
Centre: XC: 505.91 YC: 237.21 Radius: R: 242.07

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	50.00	50.00	50.00
Trial positions within range:	50	50	50

RESULTS: Analysis 2 - Lab Scenario 4 pt2

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 4.24

There were: 53402 successful analyses from a total of 125001 trial circles
71585 analyses terminated due to unacceptable geometry
14 analyses that failed to produce a result

Critical (minimum) Factor of Safety: 4.08

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.07	59.98	559.67	0.09	503.36	223.44	230.34	4.076
2	341.04	59.99	559.67	0.09	506.42	234.66	240.54	4.126
3	341.05	59.99	558.47	0.42	504.38	229.56	235.44	4.164
4	341.06	59.98	559.97	0.01	510.50	248.95	253.81	4.166
5	341.06	59.98	559.42	0.16	513.56	261.19	265.03	4.243
6	341.00	60.00	557.46	0.69	505.91	237.21	242.07	4.243
7	341.06	59.98	554.01	1.64	497.24	212.21	218.09	4.258
8	341.04	59.99	557.91	0.57	510.50	253.03	256.87	4.281
9	341.04	59.99	551.62	2.30	496.22	213.23	218.09	4.365
10	341.08	59.98	554.26	1.57	507.44	248.95	251.76	4.416
11	341.03	59.99	549.21	2.96	495.19	214.25	218.09	4.469
12	341.05	59.99	551.55	2.31	502.34	235.68	238.50	4.478
13	341.04	59.99	546.78	3.62	494.17	215.27	218.09	4.577
14	313.29	60.24	559.64	0.10	480.91	212.21	226.25	4.607
15	312.84	60.24	559.75	0.07	480.91	213.23	227.27	4.608
16	312.38	60.25	559.85	0.04	480.91	214.25	228.30	4.609
17	311.93	60.25	559.96	0.01	480.91	215.27	229.32	4.609
18	317.77	60.20	559.69	0.09	483.97	212.21	225.23	4.627
19	317.32	60.20	559.79	0.06	483.97	213.23	226.25	4.628
20	316.87	60.21	559.88	0.03	483.97	214.25	227.27	4.628
21	316.42	60.21	559.98	0.00	483.97	215.27	228.30	4.629
22	316.74	60.21	559.11	0.24	482.95	212.21	225.23	4.638
23	316.29	60.21	559.21	0.22	482.95	213.23	226.25	4.638
24	315.84	60.22	559.31	0.19	482.95	214.25	227.27	4.639
25	315.39	60.22	559.41	0.16	482.95	215.27	228.30	4.639
26	314.94	60.22	559.51	0.13	482.95	216.29	229.32	4.640
27	314.49	60.23	559.61	0.11	482.95	217.31	230.34	4.641
28	314.04	60.23	559.70	0.08	482.95	218.33	231.36	4.641
29	313.60	60.24	559.80	0.05	482.95	219.35	232.38	4.642
30	313.15	60.24	559.90	0.03	482.95	220.38	233.40	4.643
31	312.71	60.24	560.00	0.00	482.95	221.40	234.42	4.644
32	341.06	59.98	546.74	3.63	497.24	226.50	228.30	4.647
33	313.91	60.23	558.93	0.29	481.93	216.29	229.32	4.651
34	313.46	60.24	559.03	0.27	481.93	217.31	230.34	4.652
35	313.01	60.24	559.13	0.24	481.93	218.33	231.36	4.653
36	312.57	60.25	559.23	0.21	481.93	219.35	232.38	4.654
37	312.12	60.25	559.33	0.18	481.93	220.38	233.40	4.655
38	311.68	60.25	559.42	0.16	481.93	221.40	234.42	4.656
39	311.24	60.26	559.52	0.13	481.93	222.42	235.44	4.657
40	310.80	60.26	559.62	0.10	481.93	223.44	236.46	4.659
41	320.91	60.17	559.95	0.01	487.03	215.27	227.27	4.660
42	310.36	60.26	559.71	0.08	481.93	224.46	237.48	4.660
43	321.35	60.17	559.86	0.04	487.03	214.25	226.25	4.660
44	321.80	60.17	559.76	0.06	487.03	213.23	225.23	4.660
45	322.25	60.16	559.67	0.09	487.03	212.21	224.21	4.660
46	309.92	60.27	559.81	0.05	481.93	225.48	238.50	4.661
47	309.48	60.27	559.91	0.03	481.93	226.50	239.52	4.662
48	314.36	60.23	558.83	0.32	481.93	215.27	228.30	4.664
49	309.04	60.28	560.00	0.00	481.93	227.52	240.54	4.664
50	314.81	60.23	558.73	0.35	481.93	214.25	227.27	4.664
51	315.26	60.22	558.63	0.38	481.93	213.23	226.25	4.664
52	315.71	60.22	558.53	0.40	481.93	212.21	225.23	4.665
53	320.32	60.18	559.29	0.19	486.01	214.25	226.25	4.668

54	320.77	60.17	559.20	0.22	486.01	213.23	225.23	4.668
55	319.88	60.18	559.39	0.17	486.01	215.27	227.27	4.668
56	319.43	60.19	559.48	0.14	486.01	216.29	228.30	4.668
57	321.22	60.17	559.10	0.25	486.01	212.21	224.21	4.668
58	318.99	60.19	559.57	0.12	486.01	217.31	229.32	4.668
59	310.65	60.26	558.85	0.31	480.91	221.40	234.42	4.668
60	318.54	60.19	559.66	0.09	486.01	218.33	230.34	4.668
61	318.10	60.20	559.76	0.07	486.01	219.35	231.36	4.669
62	317.66	60.20	559.85	0.04	486.01	220.38	232.38	4.669
63	317.22	60.21	559.94	0.02	486.01	221.40	233.40	4.669
64	310.21	60.27	558.95	0.29	480.91	222.42	235.44	4.670
65	309.77	60.27	559.05	0.26	480.91	223.44	236.46	4.671
66	309.33	60.27	559.14	0.23	480.91	224.46	237.48	4.672
67	341.08	59.98	550.43	2.62	508.46	260.17	260.95	4.673
68	308.89	60.28	559.24	0.21	480.91	225.48	238.50	4.674
69	341.04	59.99	545.55	3.96	495.19	221.40	223.19	4.675
70	308.45	60.28	559.34	0.18	480.91	226.50	239.52	4.675
71	308.02	60.28	559.43	0.16	480.91	227.52	240.54	4.677
72	317.96	60.20	559.01	0.27	484.99	217.31	229.32	4.677
73	317.51	60.20	559.10	0.25	484.99	218.33	230.34	4.677
74	317.07	60.21	559.19	0.22	484.99	219.35	231.36	4.678
75	307.58	60.29	559.53	0.13	480.91	228.54	241.56	4.678
76	316.63	60.21	559.29	0.20	484.99	220.38	232.38	4.678
77	316.19	60.21	559.38	0.17	484.99	221.40	233.40	4.679
78	315.75	60.22	559.47	0.15	484.99	222.42	234.42	4.680
79	307.14	60.29	559.62	0.10	480.91	229.56	242.58	4.680
80	315.31	60.22	559.56	0.12	484.99	223.44	235.44	4.680
81	311.99	60.25	558.55	0.40	480.91	218.33	231.36	4.681
82	311.54	60.25	558.65	0.37	480.91	219.35	232.38	4.681
83	312.43	60.25	558.45	0.42	480.91	217.31	230.34	4.681
84	311.10	60.26	558.75	0.34	480.91	220.38	233.40	4.681
85	312.88	60.24	558.35	0.45	480.91	216.29	229.32	4.681
86	314.87	60.23	559.65	0.10	484.99	224.46	236.46	4.681
87	313.33	60.24	558.25	0.48	480.91	215.27	228.30	4.681
88	313.78	60.23	558.15	0.51	480.91	214.25	227.27	4.682
89	306.71	60.30	559.72	0.08	480.91	230.58	243.60	4.682
90	314.23	60.23	558.05	0.53	480.91	213.23	226.25	4.682
91	314.44	60.23	559.74	0.07	484.99	225.48	237.48	4.682
92	314.68	60.23	557.95	0.56	480.91	212.21	225.23	4.682
93	314.00	60.23	559.83	0.05	484.99	226.50	238.50	4.683
94	306.28	60.30	559.81	0.05	480.91	231.60	244.62	4.684
95	313.57	60.24	559.92	0.02	484.99	227.52	239.52	4.684
96	305.85	60.30	559.90	0.03	480.91	232.62	245.64	4.685
97	305.42	60.31	560.00	0.00	480.91	233.64	246.66	4.687
98	341.07	59.98	544.33	4.29	493.15	216.29	218.09	4.687
99	318.40	60.19	558.91	0.30	484.99	216.29	228.30	4.690

Critical Failure Circle

Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34
Generated failure surface: (20 points)

341.07	59.98	350.16	51.44	359.69	43.40	369.64	35.89	379.99	28.92
390.70	22.53	401.74	16.73	413.07	11.53	424.67	6.96	436.50	3.02
448.53	-0.28	460.72	-2.92	473.03	-4.89	485.43	-6.20	497.89	-6.83
510.36	-6.79	522.81	-6.08	535.20	-4.69	547.50	-2.63	559.67	0.09

Slice Geometry and Properties (40 slices)

Slice		X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.87	-85.3	4.61	55.90	2	2080.00	35.0	755.40	0.00	-5888.84	-11.28
2	345.61	20.63	43.2	4.54	6.24	2	2080.00	35.0	2266.74	0.00	16.46	1.18
3	350.16	35.33	40.1	4.77	6.24	2	2080.00	35.0	3882.27	0.00	335.53	1.14
4	354.92	48.26	40.1	4.77	6.24	2	2080.00	35.0	5304.06	0.00	596.06	1.14
5	359.69	63.10	37.0	4.98	6.24	2	2080.00	35.0	6934.76	0.00	892.54	1.11
6	364.67	75.01	37.0	4.98	6.24	2	2080.00	35.0	8243.21	0.00	1125.25	1.11
7	369.64	89.49	33.9	5.17	6.24	2	2080.00	35.0	9834.50	0.00	1396.28	1.08
8	374.82	100.16	33.9	5.17	6.24	2	2080.00	35.0	11007.42	0.00	1599.53	1.08
9	379.99	113.81	30.8	5.35	6.24	2	2080.00	35.0	12507.91	0.00	1842.65	1.06
10	385.34	123.07	30.8	5.35	6.24	2	2080.00	35.0	13525.20	0.00	2014.98	1.06
11	390.70	135.47	27.7	5.52	6.24	2	2080.00	35.0	14888.25	0.00	2228.12	1.04
12	396.22	143.14	27.7	5.52	6.24	2	2080.00	35.0	15730.94	0.00	2368.16	1.04
13	401.74	153.90	24.6	5.67	6.24	2	2080.00	35.0	16913.78	0.00	2549.37	1.02
14	407.40	159.83	24.6	5.67	6.24	2	2080.00	35.0	17565.16	0.00	2655.89	1.02
15	413.07	168.62	21.5	5.80	6.24	2	2080.00	35.0	18531.09	0.00	2803.59	1.01
16	418.87	172.67	21.5	5.80	6.24	2	2080.00	35.0	18976.51	0.00	2875.51	1.01
17	424.67	172.78	18.4	5.70	6.01	2	2080.00	35.0	18988.41	0.00	2987.57	1.00
18	430.38	174.71	18.4	5.70	6.01	2	2080.00	35.0	19200.14	0.00	3022.69	1.00
19	436.08	176.13	15.6	5.72	5.93	1	0.00	45.0	19357.56	0.00	3170.50	0.97
20	441.80	176.13	15.3	5.72	5.93	1	0.00	45.0	19358.33	0.00	3173.81	0.97
21	447.51	31.39	15.3	1.02	1.06	1	0.00	45.0	3450.02	9.19	3174.48	0.97
22	448.53	186.74	12.2	6.09	6.24	1	0.00	45.0	20525.21	365.30	3201.16	0.97
23	454.63	184.61	12.2	6.09	6.24	1	0.00	45.0	20291.55	878.76	3168.92	0.97
24	460.72	153.32	9.1	5.14	5.21	1	0.00	45.0	16853.50	1082.09	3162.29	0.97
25	465.86	150.32	9.1	5.14	5.21	1	0.00	45.0	16524.35	1350.07	3102.63	0.97
26	471.00	58.60	9.1	2.03	2.06	1	0.00	45.0	6441.23	607.59	3060.98	0.97
27	473.03	174.85	6.0	6.20	6.24	1	0.00	45.0	19221.30	2031.36	3029.86	0.98
28	479.23	168.37	6.0	6.20	6.24	1	0.00	45.0	18509.23	2285.54	2918.97	0.98
29	485.43	161.50	2.9	6.23	6.24	1	0.00	45.0	17754.71	2474.27	2820.91	0.99

30	491.66	152.85	2.9	6.23	6.24	1	0.00	45.0	16803.94	2597.50	2670.37	0.99
31	497.89	143.33	-0.2	6.24	6.24	1	0.00	45.0	15757.24	2655.10	2528.86	1.00
32	504.12	132.55	-0.2	6.24	6.24	1	0.00	45.0	14572.23	2647.03	2338.66	1.00
33	510.36	120.52	-3.3	6.22	6.24	1	0.00	45.0	13250.72	2573.33	2153.23	1.02
34	516.58	107.68	-3.3	6.22	6.24	1	0.00	45.0	11838.47	2433.98	1923.43	1.02
35	522.81	93.38	-6.4	6.20	6.24	1	0.00	45.0	10266.81	2229.20	1693.64	1.03
36	529.00	78.56	-6.4	6.20	6.24	1	0.00	45.0	8637.20	1958.98	1424.43	1.03
37	535.20	62.27	-9.5	6.15	6.24	1	0.00	45.0	6846.07	1623.72	1149.74	1.06
38	541.35	45.58	-9.5	6.15	6.24	1	0.00	45.0	5011.30	1223.43	841.36	1.06
39	547.50	27.01	-12.6	5.88	6.03	1	0.00	45.0	2969.71	741.98	526.94	1.08
40	553.38	9.83	-12.6	6.29	6.44	1	0.00	45.0	1080.63	246.16	179.64	1.08

X-S Area: 4552.35 Path Length: 286.60 X-S Weight: 500377.06

DATA: Analysis 3 - Lab Scenario 4 pt3

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Existing waste rock
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Mill tailings
Cohesion Phi UnitWeight Ru
2080.00 35.0 109.90 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock
Cohesion Phi UnitWeight Ru
0.00 50.0 130.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (3 profiles)

Profile: 1 (5 points) Material beneath: 2 - Mill tailings
0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00
Profile: 2 (5 points) Material beneath: 1 - Existing waste rock
128.00 22.00 183.00 8.00 248.00 4.00 471.00 3.00 560.00 0.00
Profile: 3 (3 points) Material beneath: 3 - Bedrock
0.00 113.00 128.00 22.00 161.00 0.00

Slope Surface (5 points)

0.00 113.00 126.00 70.00 225.00 61.00 341.00 60.00 560.00 0.00

Phreatic Surface (2 points)

0.00 0.00 600.00 0.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XC,YC,R
Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34

Variable Restraints

Parameter descriptor:	XC	YC	R
Range of variation:	20.00	20.00	20.00
Trial positions within range:	20	20	20

RESULTS: Analysis 3 - Lab Scenario 4 pt3

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Circle Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure circle approximation: 4.08

There were: 4095 successful analyses from a total of 8001 trial circles
3906 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 4.08

Negative normal stresses exist on the base of one or more slices - examine slice data and consult the GALENA Help utility
Test Factor is less than 0.2 lower limit for one or more slices - examine slice data and consult the GALENA Help utility

Circle and Results Summary (Lowest 99 Factor of Safety circles)

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS
1	341.07	59.98	559.67	0.09	503.36	223.44	230.34	4.076
2	341.02	59.99	553.67	1.73	499.67	221.86	226.65	4.328
3	341.07	59.98	553.60	1.75	502.83	233.44	237.18	4.365
4	341.05	59.99	552.39	2.09	500.73	228.17	231.91	4.402
5	341.06	59.98	551.14	2.43	498.62	222.91	226.65	4.424
6	329.86	60.10	559.98	0.00	493.36	215.54	225.60	4.767

7	330.32	60.09	559.90	0.03	493.36	214.49	224.55	4.769
8	330.77	60.09	559.81	0.05	493.36	213.44	223.49	4.771
9	341.05	59.99	544.02	4.38	496.52	229.23	229.81	4.808
10	325.73	60.13	559.79	0.06	494.41	231.33	240.34	4.834
11	326.17	60.13	559.71	0.08	494.41	230.28	239.28	4.834
12	324.67	60.14	559.25	0.20	493.36	231.33	240.34	4.835
13	326.61	60.12	559.64	0.10	494.41	229.23	238.23	4.835
14	325.11	60.14	559.18	0.23	493.36	230.28	239.28	4.836
15	327.04	60.12	559.56	0.12	494.41	228.17	237.18	4.837
16	327.48	60.12	559.49	0.14	494.41	227.12	236.13	4.838
17	327.92	60.11	559.41	0.16	494.41	226.07	235.07	4.839
18	328.99	60.10	559.95	0.01	495.46	226.07	235.07	4.839
19	328.36	60.11	559.34	0.18	494.41	225.02	234.02	4.840
20	329.43	60.10	559.88	0.03	495.46	225.02	234.02	4.841
21	328.81	60.11	559.26	0.20	494.41	223.96	232.97	4.842
22	329.87	60.10	559.80	0.05	495.46	223.96	232.97	4.843
23	329.25	60.10	559.18	0.22	494.41	222.91	231.91	4.844
24	330.31	60.09	559.72	0.08	495.46	222.91	231.91	4.845
25	330.76	60.09	559.65	0.10	495.46	221.86	230.86	4.847
26	331.20	60.08	559.57	0.12	495.46	220.81	229.81	4.849
27	331.65	60.08	559.49	0.14	495.46	219.75	228.76	4.851
28	325.54	60.13	559.10	0.25	493.36	229.23	238.23	4.852
29	332.10	60.08	559.41	0.16	495.46	218.70	227.70	4.853
30	325.98	60.13	559.03	0.27	493.36	228.17	237.18	4.854
31	332.55	60.07	559.34	0.18	495.46	217.65	226.65	4.856
32	326.42	60.13	558.95	0.29	493.36	227.12	236.13	4.856
33	333.16	60.07	559.96	0.01	496.52	218.70	227.70	4.856
34	326.86	60.12	558.87	0.31	493.36	226.07	235.07	4.858
35	333.00	60.07	559.26	0.20	495.46	216.59	225.60	4.859
36	333.61	60.06	559.88	0.03	496.52	217.65	226.65	4.859
37	329.70	60.10	559.10	0.25	494.41	221.86	230.86	4.860
38	327.30	60.12	558.79	0.33	493.36	225.02	234.02	4.861
39	333.45	60.07	559.18	0.22	495.46	215.54	224.55	4.862
40	334.06	60.06	559.80	0.05	496.52	216.59	225.60	4.862
41	327.75	60.11	558.72	0.35	493.36	223.96	232.97	4.863
42	330.14	60.09	559.03	0.27	494.41	220.81	229.81	4.864
43	334.51	60.06	559.72	0.08	496.52	215.54	224.55	4.866
44	328.19	60.11	558.64	0.37	493.36	222.91	231.91	4.866
45	330.59	60.09	558.95	0.29	494.41	219.75	228.76	4.867
46	328.63	60.11	558.56	0.39	493.36	221.86	230.86	4.869
47	334.97	60.05	559.65	0.10	496.52	214.49	223.49	4.869
48	331.04	60.09	558.87	0.31	494.41	218.70	227.70	4.870
49	329.08	60.10	558.48	0.42	493.36	220.81	229.81	4.872
50	335.42	60.05	559.57	0.12	496.52	213.44	222.44	4.872
51	331.49	60.08	558.79	0.33	494.41	217.65	226.65	4.874
52	329.53	60.10	558.40	0.44	493.36	219.75	228.76	4.875
53	331.94	60.08	558.71	0.35	494.41	216.59	225.60	4.878
54	329.98	60.10	558.32	0.46	493.36	218.70	227.70	4.878
55	333.90	60.06	559.10	0.25	495.46	214.49	223.49	4.880
56	330.43	60.09	558.24	0.48	493.36	217.65	226.65	4.881
57	332.39	60.07	558.63	0.37	494.41	215.54	224.55	4.881
58	330.88	60.09	558.16	0.50	493.36	216.59	225.60	4.884
59	334.36	60.06	559.02	0.27	495.46	213.44	222.44	4.885
60	332.84	60.07	558.55	0.40	494.41	214.49	223.49	4.886
61	331.33	60.08	558.08	0.53	493.36	215.54	224.55	4.888
62	333.30	60.07	558.47	0.42	494.41	213.44	222.44	4.890
63	331.78	60.08	558.00	0.55	493.36	214.49	223.49	4.892
64	332.24	60.08	557.92	0.57	493.36	213.44	222.44	4.896
65	330.00	60.09	559.45	0.15	497.57	232.38	240.34	4.931
66	330.44	60.09	559.38	0.17	497.57	231.33	239.28	4.933
67	331.07	60.09	559.97	0.01	498.62	232.38	240.34	4.935
68	330.87	60.09	559.31	0.19	497.57	230.28	238.23	4.935
69	331.50	60.08	559.90	0.03	498.62	231.33	239.28	4.937
70	331.30	60.08	559.24	0.21	497.57	229.23	237.18	4.937
71	331.93	60.08	559.83	0.05	498.62	230.28	238.23	4.939
72	332.36	60.07	559.76	0.06	498.62	229.23	237.18	4.942
73	332.80	60.07	559.70	0.08	498.62	228.17	236.13	4.945
74	333.24	60.07	559.63	0.10	498.62	227.12	235.07	4.947
75	328.94	60.10	558.93	0.29	496.52	232.38	240.34	4.948
76	333.67	60.06	559.56	0.12	498.62	226.07	234.02	4.950
77	329.37	60.10	558.86	0.31	496.52	231.33	239.28	4.951
78	334.11	60.06	559.49	0.14	498.62	225.02	232.97	4.953
79	329.81	60.10	558.79	0.33	496.52	230.28	238.23	4.954
80	327.88	60.11	558.41	0.44	495.46	232.38	240.34	4.955
81	331.74	60.08	559.17	0.23	497.57	228.17	236.13	4.955
82	334.55	60.06	559.42	0.16	498.62	223.96	231.91	4.957
83	330.24	60.09	558.72	0.35	496.52	229.23	237.18	4.957
84	328.31	60.11	558.34	0.46	495.46	231.33	239.28	4.958
85	332.17	60.08	559.10	0.25	497.57	227.12	235.07	4.959
86	334.99	60.05	559.35	0.18	498.62	222.91	230.86	4.960
87	330.68	60.09	558.65	0.37	496.52	228.17	236.13	4.961
88	328.74	60.11	558.27	0.48	495.46	230.28	238.23	4.961
89	326.82	60.12	557.88	0.58	494.41	232.38	240.34	4.963
90	332.61	60.07	559.03	0.26	497.57	226.07	234.02	4.963
91	335.43	60.05	559.28	0.20	498.62	221.86	229.81	4.964
92	329.18	60.10	558.20	0.49	495.46	229.23	237.18	4.964
93	335.61	60.05	559.94	0.02	499.67	223.96	231.91	4.964
94	331.11	60.09	558.58	0.39	496.52	227.12	235.07	4.964
95	327.25	60.12	557.81	0.60	494.41	231.33	239.28	4.965
96	329.61	60.10	558.12	0.51	495.46	228.17	236.13	4.967

97	333.05	60.07	558.96	0.28	497.57	225.02	232.97	4.967
98	335.88	60.04	559.21	0.22	498.62	220.81	228.76	4.967
99	336.05	60.04	559.87	0.03	499.67	222.91	230.86	4.968

Critical Failure Circle

Intersects: XL: 341.07 YL: 59.98 XR: 559.67 YR: 0.09
Centre: XC: 503.36 YC: 223.44 Radius: R: 230.34
Generated failure surface: (20 points)

341.07	59.98	350.16	51.44	359.69	43.40	369.64	35.89	379.99	28.92
390.70	22.53	401.74	16.73	413.07	11.53	424.67	6.96	436.50	3.02
448.53	-0.28	460.72	-2.92	473.03	-4.89	485.43	-6.20	497.89	-6.83
510.36	-6.79	522.81	-6.08	535.20	-4.69	547.50	-2.63	559.67	0.09

Slice Geometry and Properties (40 slices)

Slice		X-S	Base							PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	341.00	6.87	-85.3	4.61	55.90	2	2080.00	35.0	755.40	0.00	-5888.84	-11.28
2	345.61	20.63	43.2	4.54	6.24	2	2080.00	35.0	2266.74	0.00	16.46	1.18
3	350.16	35.33	40.1	4.77	6.24	2	2080.00	35.0	3882.27	0.00	335.53	1.14
4	354.92	48.26	40.1	4.77	6.24	2	2080.00	35.0	5304.06	0.00	596.06	1.14
5	359.69	63.10	37.0	4.98	6.24	2	2080.00	35.0	6934.76	0.00	892.54	1.11
6	364.67	75.01	37.0	4.98	6.24	2	2080.00	35.0	8243.21	0.00	1125.25	1.11
7	369.64	89.49	33.9	5.17	6.24	2	2080.00	35.0	9834.50	0.00	1396.28	1.08
8	374.82	100.16	33.9	5.17	6.24	2	2080.00	35.0	11007.42	0.00	1599.53	1.08
9	379.99	113.81	30.8	5.35	6.24	2	2080.00	35.0	12507.91	0.00	1842.65	1.06
10	385.34	123.07	30.8	5.35	6.24	2	2080.00	35.0	13525.20	0.00	2014.98	1.06
11	390.70	135.47	27.7	5.52	6.24	2	2080.00	35.0	14888.25	0.00	2228.12	1.04
12	396.22	143.14	27.7	5.52	6.24	2	2080.00	35.0	15730.94	0.00	2368.16	1.04
13	401.74	153.90	24.6	5.67	6.24	2	2080.00	35.0	16913.78	0.00	2549.37	1.02
14	407.40	159.83	24.6	5.67	6.24	2	2080.00	35.0	17565.16	0.00	2655.89	1.02
15	413.07	168.62	21.5	5.80	6.24	2	2080.00	35.0	18531.09	0.00	2803.59	1.01
16	418.87	172.67	21.5	5.80	6.24	2	2080.00	35.0	18976.51	0.00	2875.51	1.01
17	424.67	172.78	18.4	5.70	6.01	2	2080.00	35.0	18988.41	0.00	2987.57	1.00
18	430.38	174.71	18.4	5.70	6.01	2	2080.00	35.0	19200.14	0.00	3022.69	1.00
19	436.08	176.13	15.6	5.72	5.93	1	0.00	45.0	19357.56	0.00	3170.50	0.97
20	441.80	176.13	15.3	5.72	5.93	1	0.00	45.0	19358.33	0.00	3173.81	0.97
21	447.51	31.39	15.3	1.02	1.06	1	0.00	45.0	3450.02	9.19	3174.48	0.97
22	448.53	186.74	12.2	6.09	6.24	1	0.00	45.0	20525.21	365.30	3201.16	0.97
23	454.63	184.61	12.2	6.09	6.24	1	0.00	45.0	20291.55	878.76	3168.92	0.97
24	460.72	153.32	9.1	5.14	5.21	1	0.00	45.0	16853.50	1082.09	3162.29	0.97
25	465.86	150.32	9.1	5.14	5.21	1	0.00	45.0	16524.35	1350.07	3102.63	0.97
26	471.00	58.60	9.1	2.03	2.06	1	0.00	45.0	6441.23	607.59	3060.98	0.97
27	473.03	174.85	6.0	6.20	6.24	1	0.00	45.0	19221.30	2031.36	3029.86	0.98
28	479.23	168.37	6.0	6.20	6.24	1	0.00	45.0	18509.23	2285.54	2918.97	0.98
29	485.43	161.50	2.9	6.23	6.24	1	0.00	45.0	17754.71	2474.27	2820.91	0.99
30	491.66	152.85	2.9	6.23	6.24	1	0.00	45.0	16803.94	2597.50	2670.37	0.99
31	497.89	143.33	-0.2	6.24	6.24	1	0.00	45.0	15757.24	2655.10	2528.86	1.00
32	504.12	132.55	-0.2	6.24	6.24	1	0.00	45.0	14572.23	2647.03	2338.66	1.00
33	510.36	120.52	-3.3	6.22	6.24	1	0.00	45.0	13250.72	2573.33	2153.23	1.02
34	516.58	107.68	-3.3	6.22	6.24	1	0.00	45.0	11838.47	2433.98	1923.43	1.02
35	522.81	93.38	-6.4	6.20	6.24	1	0.00	45.0	10266.81	2229.20	1693.64	1.03
36	529.00	78.56	-6.4	6.20	6.24	1	0.00	45.0	8637.20	1958.98	1424.43	1.03
37	535.20	62.27	-9.5	6.15	6.24	1	0.00	45.0	6846.07	1623.72	1149.74	1.06
38	541.35	45.58	-9.5	6.15	6.24	1	0.00	45.0	5011.30	1223.43	841.36	1.06
39	547.50	27.01	-12.6	5.88	6.03	1	0.00	45.0	2969.71	741.98	526.94	1.08
40	553.38	9.83	-12.6	6.29	6.44	1	0.00	45.0	1080.63	246.16	179.64	1.08
		4552.35			286.60				500377.06			

X-S Area: 4552.35 Path Length: 286.60 X-S Weight: 500377.06

Appendix 4
Groundwater Well Sampling Results

Appendix 4: Groundwater Data

Analyte	GW std	GW-1A									
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/17/2015	9/18/2019	6/24/2020
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.03		0.03	0.03	0.05	0.05
Aluminum, total	N/A	4.22	1.04	2.73	0.54	0.06		0.08	0.21		
Antimony, dissolved	Report	0.0027	0.0013	0.0008	0.0009	0.0009		0.0017	0.001	0.0009	0.0007
Arsenic, dissolved	0.1	0.0027	0.0012	0.001	0.0007	0.0006		0.0008	0.001	0.0005	0.0005
Arsenic, total recoverable	N/A		0.0062	0.0156	0.0054	0.0009		0.0014	0.0023		
Barium, dissolved	Report	0.049	0.035	0.046	0.056	0.042		0.041	0.039	0.038	0.033
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.00008	0.00008
Bicarbonate as CaCO3	Report	45	24.3	34.9	38.2	39.6	38.9	45	39.3	33.3	32.8
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01		0.01	0.01	0.02	0.02
Cadmium, dissolved	0.001	0.001	0.001	0.0002	0.0002	0.0001		0.0002	0.0002	0.00017	0.00008
Cadmium, total	N/A		0.001	0.0003	0.0002	0.0001		0.0002	0.0002		
Calcium, dissolved	Report	40.7	17.1	29.2	37.2	26.9		27.1	25	23	19
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2
Cation-Anion Balance	Report	4.2	-4.3	0	0	3	0	0	-3.2	-3.4	-4
Chloride	250	1.2	0.5	0.5	0.6	0.5	0.8	0.9	0.5	0.5	0.5
Chromium, dissolved	0.1	0.0005	0.0007	0.0005	0.0005	0.0005		0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005		0.005	0.005		
Conductivity @25C	Report	260	121	199	239	175	164	170	168	152	122
Copper, dissolved	0.009	0.0017	0.0016	0.0013	0.0005	0.0014		0.001	0.001	0.0008	0.0008
Copper, total	N/A		0.01	0.02	0.01	0.01		0.01	0.01		
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003		
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.007	0.005	0.005	0.006		
Fluoride	2	0.23	0.24	0.17	0.17	0.19	0.15	0.19	0.17	0.2	0.2
Hardness as CaCO3	Report	112	49	84	107	78	74	78	72	64	54
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2
Iron, dissolved	1	0.07	0.02	0.02	0.02	0.02		0.02	0.03	0.03	0.06
Iron, total	N/A	3.24	1.28	3.4	0.66	0.04		0.1	0.24		
Iron, total recoverable	N/A		1.1	3.77	0.91	0.04		0.09	0.23		
Lead, dissolved	0.044	0.0171	0.0011	0.0017	0.0003	0.0009		0.0004	0.0005	0.0001	0.0001
Lead, total	N/A		0.017	0.0497	0.0153	0.0024		0.0035	0.0052		
Magnesium, dissolved	Report	2.4	1.6	2.6	3.5	2.5		2.4	2.3	1.7	1.5
Manganese, dissolved	1.672	0.054	0.005	0.005	0.005	0.005		0.005	0.005	0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002		0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A		0.0002	0.0002	0.0002	0.0002		0.0002	0.0002		
Molybdenum, dissolved	Report	0.0174	0.0009	0.0011	0.0013	0.0014		0.0012	0.0009	0.0008	0.001
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008		0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	1.63	0.06	0.08	0.08	0.12	0.11	0.1	0.06	0.02	0.08
Oil and Grease	N/A		2.02	2	2	2	2	2	2.1		
pH	6-9	8.2	7.4	7.7	7.7	7.7	7.5	7.5	7.9	7.7	7.7
pH measured at	Report	20	20	19.5	21.6	20.8	20.6	18.9	20.3	21.3	21.5
Phosphorus, total											0.01
Phosphorus, ortho dissolved	Report	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Potassium, dissolved	Report	1.2	0.5	0.6	0.6	0.6		0.6	0.5	0.5	0.4
Residue, Filterable (TDS)	400	170	70	122	154	94	104	156	94	88	90
Residue, Non-Filterable (TSS)	Report	19	102	50	16	5	5	5	7	5	***5***
Selenium, dissolved	0.005	0.0005	0.0002	0.0003	0.0004	0.0003		0.0004	0.0004	0.0002	0.0002
Silica, dissolved	Report	6.6	4.1	4.1	4.4	4.4		4.9	4.6	4.4	***4.5***
Silver, dissolved	0.0001	0.00008	0.00005	0.00006	0.00005	0.00005		0.00005	0.00007	0.0001	0.0001
Sodium, dissolved	Report	4.6	1.3	2	2.7	2.2		1.9	1.5	1.7	1.5
Sulfate	250	62.5	30.8	53.9	71.6	38.4	37.9	36.4	36.8	36.9	28.6
Sum of Anions	Report	2.3	1.2	1.8	2.3	1.6	1.6	1.7	1.6	1.5	1.3
Sum of Cations	Report	2.5	1.1	1.8	2.3	1.7	1.6	1.7	1.5	1.4	1.2
TDS (calculated)	Report	149	71.6	115	145	101	99.2	103	96.3	90	
TDS (ratio - measured/calculated)	Report	1.14	0.98	1.06	1.06	0.93	1.05	1.51	0.98	0.98	1.17
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	45	24.3	34.9	38.2	39.6	38.9	45	39.3	33.3	32.8
Uranium, dissolved	Report	0.0002	0.0001	0.0003	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.01
Zinc, dissolved	0.713	0.04	0.05	0.08	0.08	0.06		0.06	0.16	0.1	0.05
Zinc, total	N/A		0.07	0.12	0.08	0.06	0.06	0.07	0.08		

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-1B												
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/17/2015	9/18/2019	6/24/2020	9/1/2020	9/24/2020	11/12/2020
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05		0.05	0.05
Aluminum, total	N/A	0.42	0.24	1.06	0.07	0.07	0.08	0.07	0.1					
Antimony, dissolved	Report	0.0009	0.0011	0.0008	0.0008	0.0009	0.0011	0.0013	0.001	0.0009	0.0005		0.00091	0.00101
Arsenic, dissolved	0.1	0.0007	0.0005	0.0006	0.0004	0.0004	0.0006	0.0006	0.0006	0.0004	0.0002		0.00051	0.00062
Arsenic, total recoverable	N/A		0.001	0.0032	0.0006	0.0007	0.0009	0.0007	0.0009					
Barium, dissolved	Report	0.05	0.039	0.047	0.059	0.047	0.043	0.046	0.043	0.039	0.055		0.0462	0.0572
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00008	0.00008		0.00008	0.00008
Bicarbonate as CaCO3	Report	30	27	35.4	37.4	41.2	41.4	44.1	40.6	29.7	29.4		52.8	34.5
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02		0.02	0.02
Cadmium, dissolved	0.001	0.001	0.001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.00012	0.0002		0.000155	0.000125
Cadmium, total	N/A		0.001	0.0002	0.0005	0.0001	0.0002	0.0001	0.0001					
Calcium, dissolved	Report	35.9	18.8	28.2	36.6	27.3	25.5	26.7	25.2	22.2	28.6	28.6		34.9
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2		2	2
Cation-Anion Balance	Report	2.3	0	-2.9	0	0	0	0	-3.2	-7.1	-2.9		-10.5	-2.3
Chloride	250	1.6	0.5	0.5	0.6	0.5	1	0.8	0.5	0.5	0.5		0.5	0.6
Chromium, dissolved	0.1	0.0008	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		0.0005	0.0005
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005					
Conductivity @25C	Report	38	123	191	235	178	161	171	168	150	186		187	210
Copper, dissolved	0.009	0.0028	0.0006	0.0012	0.0005	0.001	0.0007	0.0007	0.001	0.0008	0.0008		0.0008	0.001
Copper, total	N/A		0.01	0.01	0.01	0.01	0.01	0.01	0.01					
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003		0.003	0.003
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003					
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.007	0.005	0.005	0.006					
Fluoride	2	0.27	0.23	0.16	0.15	0.17	0.16	0.18	0.16	0.2	0.2		0.2	0.17
Hardness as CaCO3	Report	98	54	81	105	79	73	77	72	62	81		81	100
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2		2	2
Iron, dissolved	1	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.07	0.03	0.06		0.06	0.06
Iron, total	N/A	0.99	0.28	1.39	0.07	0.06	0.08	0.05	0.1					
Iron, total recoverable	N/A		0.21	1.4	0.08	0.06	0.06	0.03	0.15					
Lead, dissolved	0.044	0.0057	0.0003	0.0016	0.0001	0.0021	0.0004	0.0006	0.0011	0.0001	0.0001		0.00022	0.00012
Lead, total	N/A		0.0037	0.0124	0.0015	0.0016	0.0162	0.0037	0.0022					
Magnesium, dissolved	Report	2.1	1.7	2.6	3.4	2.5	2.3	2.4	2.3	1.7	2.3		2.33	3.07
Manganese, dissolved	1.672	0.027	0.009	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01		0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002		0.0002	0.0002
Mercury, total	N/A		0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002					
Molybdenum, dissolved	Report	0.004	0.0012	0.0008	0.0011	0.0013	0.0012	0.0011	0.001	0.0009	0.0006		0.00327	0.00138
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008		0.008	0.008
Nitrate/Nitrite as N	100	1.09	0.07	0.09	0.08	0.11	0.1	0.12	0.1	0.02	0.15		0.03	0.098
Oil and Grease	N/A		2.02	2	2	2	2	2	2					
pH	6-9	8	7.5	7.7	7.7	7.7	7.6	7.5	8	7.7	7.5		7.4	7.8
pH measured at	Report	20	21	19.5	21.1	20.8	20.5	18.9	20.3	21.2	21.5		20.4	21.3
Phosphorus, total														
Phosphorus, ortho dissolved	Report	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01		0.01	0.01
Potassium, dissolved	Report	1.3	0.5	0.6	0.6	0.6	0.5	0.6	0.5	0.4	0.5		0.44	0.46
Residue, Filterable (TDS)	400	150	70	108	152	96	98	114	90	88	136		118	148
Residue, Non-Filterable (TSS)	Report	9	8	7	5	5	5	5	13	5	5		5	10
Selenium, dissolved	0.005	0.0005	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002		0.00027	0.00041
Silica, dissolved	Report	5.6	4.4	4.3	4.5	4.4	4.7	4.8	4.5	4.5	5.6		4.4	4.3
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001		0.0001	0.0001
Sodium, dissolved	Report	4.6	1.4	1.9	2.6	2.2	2	1.9	1.6	1.6	1.9		2.04	2.74
Sulfate	250	68.7	29.7	49.7	67	39.1	36.6	32.9	38.1	41.4	55.2		49.9	69.2
Sum of Anions	Report	2.1	1.2	1.8	2.2	1.7	1.6	1.6	1.6	1.5	1.8		2.1	2.2
Sum of Cations	Report	2.2	1.2	1.7	2.2	1.7	1.6	1.6	1.5	1.3	1.7		1.7	2.1
TDS (calculated)	Report	140	74.4	110	140	103	99.3	98.5	98.5	91.4	114		121	138
TDS (ratio - measured/calculated)	Report	1.07	0.94	0.98	1.09	0.93	0.99	1.16	0.91	0.96	1.19		0.98	1.07
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0001
Total Alkalinity	Report	30	27	35.4	37.4	41.2	41.4	44.1	40.6	29.7	29.4		52.8	34.5
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01		0.01	0.01
Zinc, dissolved	0.713	0.06	0.05	0.08	0.08	0.05	0.06	0.06	0.08	0.06	0.29		0.054	0.052
Zinc, total	N/A		0.05	0.1	0.08	0.05	0.06	0.07	0.07					

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-2A														
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/16/2015	9/16/2015	12/10/2015	3/10/2016	6/15/2016	8/24/2016	11/10/2016	6/13/2017
Aluminum, dissolved	5	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03
Aluminum, total	N/A	0.94	5.12	3.38	0.09	0.03	0.57	0.18	0.69	0.03	0.05	0.03	0.09	0.44	0.03	
Antimony, dissolved	Report	0.0022	0.0013	0.001	0.0008	0.0008	0.001	0.0011	0.0011	0.0009	0.0012	0.0008	0.0011	0.0016	0.0012	0.0011
Arsenic, dissolved	0.1	0.0011	0.0005	0.0005	0.0003	0.0002	0.0004	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0005	0.0003	0.0002
Arsenic, total recoverable	N/A		0.031	0.0125	0.0006	0.0003	0.0025	0.001	0.0027	0.0004	0.0006	0.0004	0.0006	0.0015	0.0004	
Barium, dissolved	Report	0.05	0.051	0.053	0.054	0.057	0.056	0.058	0.042	0.042	0.039	0.047	0.039	0.057	0.045	0.04
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Bicarbonate as CaCO3	Report	26	27.3	26.9	26.4	27	27.8	28.9	26.2	25.4	26.8	37.7	25.3	30.2	24.3	25.7
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cadmium, dissolved	0.001	0.001	0.001	0.0007	0.001	0.0005	0.0007	0.0008	0.0006	0.0006	0.0006	0.0005	0.0005	0.0007	0.0006	0.0005
Cadmium, total	N/A		0.0014	0.001	0.0006	0.0007	0.0008	0.0008	0.0006	0.0006	0.0006	0.0006	0.0005	0.0008	0.0006	
Calcium, dissolved	Report	29	25.6	28.2	32.2	33.2	33.8	37	25.5	25	24.6	30.8	24.3	29.1	24.9	22.7
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Cation-Anion Balance	Report	2.9	-3	0	2.6	0	0	-2.2	0	3.2	-3.2	-7.3	3.4	-2.7	0	0
Chloride	250	0.8	0.5	0.8	0.5	0.5	0.8	0.8	0.5	0.6	0.9	0.5	0.5	0.8	2.1	0.7
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Conductivity @25C	Report	197	170	187	209	215	215	232	181	169	172	239	175	210	177	160
Copper, dissolved	0.009	0.0043	0.0014	0.0008	0.0005	0.0008	0.001	0.0006	0.0008	0.0005	0.0005	0.0005	0.0007	0.0013	0.0005	0.0008
Copper, total	N/A		0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.006	0.006	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.005	
Fluoride	2	0.35	0.28	0.25	0.19	0.21	0.21	0.21	0.24	0.23	0.2	0.26	0.25	0.22	0.28	0.29
Hardness as CaCO3	Report	84	73	80	92	94	95	105	73	71	69.7	88	69	82	70	65
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Iron, dissolved	1	0.1	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.02	0.04	0.02	0.02	0.02	0.02	0.02
Iron, total	N/A	1.41	9.45	4.34	0.08	0.02	0.61	0.2	0.72	0.02	0.08	0.02	0.1	0.32	0.02	
Iron, total recoverable	N/A		9.2	4.32	0.1	0.02	0.57	0.19	0.68	0.02	0.08	0.03	0.12	0.31	0.04	
Lead, dissolved	0.044	0.0348	0.0031	0.0037	0.0007	0.003	0.001	0.0009	0.0023	0.0007	0.0003	0.0004	0.0012	0.0096	0.0004	0.0007
Lead, total	N/A		0.4143	0.12	0.0028	0.0006	0.0193	0.0082	0.0223	0.0011	0.0019	0.0011	0.0042	0.0197	0.0017	
Magnesium, dissolved	Report	2.7	2.3	2.3	2.7	2.7	2.6	3	2.3	2.1	2	2.6	1.9	2.3	1.8	1.9
Manganese, dissolved	1.672	0.038	0.02	0.007	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.009	0.005	0.005
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	
Molybdenum, dissolved	Report	0.0024	0.0016	0.001	0.0008	0.001	0.0009	0.0008	0.0009	0.0009	0.001	0.001	0.0009	0.0014	0.0008	0.0009
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.44	0.13	0.13	0.11	0.25	0.44	0.62	0.22	0.14	0.15	0.21	0.21	0.13	0.16	0.18
Oil and Grease	N/A		2.02	2	2	2	2	2	2	3.2	2.8	2	2	2		
pH	6-9	7.6	7.4	7.3	7.3	7.3	7.1	7.1	7.7	7.5	7.6	7.8	7.7	7.6	7.5	7.3
pH measured at	Report	20	21	19.6	21.1	20.3	20.1	18.4	19.7	19.3	22.2	23.2	21.6	23.7	22.6	20.5
Phosphorus, total																
Phosphorus, ortho dissolved	Report	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Potassium, dissolved	Report	0.8	0.7	0.6	0.7	0.7	0.6	0.6	0.6	1.4	0.6	0.7	0.4	1.3	0.4	0.5
Residue, Filterable (TDS)	400	120	100	116	134	124	136	150	108	98	94	124	106	134	88	82
Residue, Non-Filterable (TSS)	Report	30	177	57	5	5	8	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0002	0.0001	0.0003	0.0003	0.0005	0.0005	0.0004	0.0002	0.0002	0.0005	0.0004	0.0001	0.0002	0.0003	0.0002
Silica, dissolved	Report	5.3	5.2	6.4	5.4	4.9	5.3	5.7	5.2	5.9	5.2	4.5	4.7	5.6	5.8	4.9
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	***0.00015***	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00007	0.00005	0.00005
Sodium, dissolved	Report	2.5	1.8	1.7	1.8	1.9	1.9	2	1.7	1.7	1.7	2.1	1.5	3.2	3.5	1.5
Sulfate	250	55.2	55	53.8	64.3	67.7	66.8	78.8	52.6	46.3	47.1	66.1	42.9	62.1	49.3	39
Sum of Anions	Report	1.7	1.7	1.7	1.9	2	2	2.3	1.6	1.5	1.6	2.2	1.4	1.9	1.6	1.4
Sum of Cations	Report	1.8	1.6	1.7	2	2	2	2.2	1.6	1.6	1.5	1.9	1.5	1.8	1.6	1.4
TDS (calculated)	Report	115	109	113	125	130	131	148	106	101	101	132	93.5	125	105	88.9
TDS (ratio - measured/calculated)	Report	1.04	0.92	1.03	1.07	0.95	1.04	1.01	1.02	0.97	0.93	0.94	1.13	1.07	0.84	0.92
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	26	27.3	26.9	26.4	27	27.8	28.9	26.2	25.4	26.8	37.7	25.3	30.2	24.3	25.7
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Zinc, dissolved	0.713	0.43	0.37	0.52	0.57	0.6	0.58	0.66	0.45	0.5	0.45	0.47	0.39	0.52	0.47	0.4
Zinc, total	N/A		0.72	0.65	0.56	0.59	0.61	0.68	0.51	0.49	0.48	0.51	0.42	0.55	0.5	

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-2A (continued)												
		9/27/2017	11/9/2017	3/14/2018	5/9/2018	7/25/2018	12/11/2018	1/29/2019	6/25/2019	9/16/2019	11/12/2019	6/24/2020	9/24/2020	11/12/2020
Aluminum, dissolved	5	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05
Aluminum, total	N/A													
Antimony, dissolved	Report	0.0009	0.0009	0.001	0.0008	0.0013	0.001	0.0009	0.0011	0.001	0.0008	0.0008	0.00101	0.00102
Arsenic, dissolved	0.1	0.0005	0.0003	0.0007	0.0002	0.0003	0.0002	0.0002	0.0002	0.0003	0.0002	0.0003	0.00032	0.00042
Arsenic, total recoverable	N/A													
Barium, dissolved	Report	0.044	0.046	0.062	0.053	0.049	0.045	0.053	0.042	0.045	0.046	0.038	0.0508	0.0548
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
Bicarbonate as CaCO3	Report	24.7	25.4	28.7	29.2	27.5	31	28.7	37.6	29.3	35.3	25.7	27.6	25.2
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium, dissolved	0.001	0.0006	0.0005	0.0008	0.0007	0.0006	0.00053	0.00056	0.00045	0.00062	0.00054	0.00042	0.00061	0.000631
Cadmium, total	N/A													
Calcium, dissolved	Report	22.5	24	33	34.2	24.6	28.2	30.4	28.4	27	25.4	20.6	28.7	28.5
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	10	2	2	2	2	2
Cation-Anion Balance	Report	0	0	0	-2.3	0	-2.9	-2.7	-2.9	0	-9.1	4	0	0
Chloride	250	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.5	0.7	0.5	0.5	0.5
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00252	0.0005
Chromium, Trivalent Dissolved	N/A													
Conductivity @25C	Report	156	159	233	223	177	185	209	184	181	173	135	190	193
Copper, dissolved	0.009	0.0008	0.0006	0.0037	0.0004	0.0008	0.0018	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.00087
Copper, total	N/A													
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A													
Dissolved Chromium, Hexavalent	N/A													
Fluoride	2	0.21	0.18	0.2	0.09	0.22	0.28	0.21	0.2	0.2	0.2	0.2	0.2	0.23
Hardness as CaCO3	Report	64	67	93	97	69	80	86	80	76	71	58	80	80
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	10	2	2	2	2	2
Iron, dissolved	1	0.03	0.02	0.17	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.06	0.06	0.06
Iron, total	N/A													
Iron, total recoverable	N/A													
Lead, dissolved	0.044	0.0022	0.0006	0.005	0.0006	0.0028	0.0004	0.0002	0.0003	0.0005	0.0001	0.0003	0.00037	0.00014
Lead, total	N/A													
Magnesium, dissolved	Report	1.8	1.8	2.5	2.7	1.9	2.3	2.4	2.1	2	1.9	1.6	2.05	2.19
Manganese, dissolved	1.672	0.005	0.005	0.012	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A													
Molybdenum, dissolved	Report	0.0007	0.0007	0.001	0.0007	0.0008	0.0011	0.0011	0.001	0.0008	0.0025	0.0008	0.00127	0.0009
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.13	0.15	0.16	0.35	0.14	0.19	0.16	0.22	0.11	0.06	0.14	0.14	0.127
Oil and Grease	N/A													
pH	6-9	7.3	7.6	7.6	7.5	7.4	7.6	7.6	7.7	7.4	7.4	7.4	7	7.4
pH measured at	Report	22.2	21.4	23.5	21	21	22.5	22.4		20.5	21.9	21.4	20.4	21
Phosphorus, total														
Phosphorus, ortho dissolved	Report	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Potassium, dissolved	Report	0.5	0.4	0.5	0.7	0.4	0.5	0.4	0.3	0.7	0.4	0.4	0.48	0.52
Residue, Filterable (TDS)	400	88	100	150	144	104	126	146	114	110	114	106	114	118
Residue, Non-Filterable (TSS)	Report	5	5	338	5	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0002	0.0003	0.0005	0.0004	0.0003	0.0003	0.0004	0.0004	0.0002	0.0003	0.0001	0.00026	0.00039
Silica, dissolved	Report	6	5.9	4.6	5.1	5.4	5.1	4.6	5.1	5.6	5.9	4.8	5.6	5.4
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Sodium, dissolved	Report	1.6	1.6	2	2	2.2	2.1	2	2.5	2.1	1.7	1.5	2.01	2.03
Sulfate	250	42.4	42.3	65.8	74.3	45.8	53.5	64.5	50	49.6	52	32.5	55.9	57.7
Sum of Anions	Report	1.4	1.4	2	2.2	1.5	1.8	1.9	1.8	1.6	1.8	1.2	1.7	1.7
Sum of Cations	Report	1.4	1.4	2	2.1	1.5	1.7	1.8	1.7	1.6	1.5	1.3	1.7	1.7
TDS (calculated)	Report	92.2	93.7	129	139	99.2	113	124	114	107	112	78.9	114	114
TDS (ratio - measured/calculated)	Report	0.95	1.07	1.16	1.04	1.05	1.12	1.18	1	1.03	1.02	1.34	1	1.04
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	24.7	25.4	28.7	29.2	27.5	31	28.7	37.6	29.3	35.3	25.7	27.6	25.2
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.002	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01
Zinc, dissolved	0.713	0.45	0.47	0.55	0.61	0.46	0.45	0.44	0.39	0.45	0.48	0.35	0.526	0.512
Zinc, total	N/A													

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-2B														
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/16/2015	9/16/2015	12/10/2015	3/10/2016	6/15/2016	8/24/2016	11/10/2016	6/13/2017
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03
Aluminum, total	N/A	0.57	1.62	0.85	0.06	0.03	0.05	0.06	0.04	0.03	0.03	0.21	0.03	0.06	0.03	
Antimony, dissolved	Report	0.0008	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008	0.0009	0.0008	0.0009	0.0007	0.0008	0.001	0.001	0.0007
Arsenic, dissolved	0.1	0.0002	0.0005	0.0006	0.0003	0.0004	0.0002	0.0003	0.0006	0.0003	0.0002	0.0002	0.0002	0.0004	0.001	0.0002
Arsenic, total recoverable	N/A		0.0067	0.0031	0.0005	0.0003	0.0004	0.0005	0.0006	0.0004	0.0002	0.0008	0.0003	0.0005	0.0003	
Barium, dissolved	Report	0.07	0.067	0.057	0.062	0.063	0.062	0.06	0.062	0.048	0.045	0.057	0.061	0.054	0.052	0.062
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Bicarbonate as CaCO3	Report	31	35.2	30.7	28.8	28.2	29.1	29.8	31.1	28.6	28	32.2	30.7	30.1	27.9	28.9
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cadmium, dissolved	0.001	0.001	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Cadmium, total	N/A		0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	
Calcium, dissolved	Report	38.9	34.7	27.8	31.2	31.9	31.1	31.4	31.9	24.6	24.4	29.5	34.3	28.2	25.3	30.7
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Cation-Anion Balance	Report	0	-12.5	0	2.7	0	2.7	0	-2.6	0	0	-5.3	-2.4	3	0	0
Chloride	250	0.7	0.5	0.5	0.5	0.5	0.9	0.7	0.5	0.6	0.8	0.5	0.5	0.5	0.5	0.7
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.003	0.0005
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Conductivity @25C	Report	248	217	186	205	207	199	200	212	163	172	216	223	191	174	204
Copper, dissolved	0.009	0.0007	0.0008	0.0009	0.0005	0.0013	0.0009	0.0005	0.0009	0.0007	0.0005	0.0005	0.0005	0.0005	0.003	0.0004
Copper, total	N/A		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.008	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Fluoride	2	0.27	0.27	0.24	0.19	0.19	0.21	0.21	0.2	0.22	0.18	0.23	0.25	0.21	0.28	0.24
Hardness as CaCO3	Report	109	98	79	89	91	88	89	91	71	69.6	84	97	80	71	87
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Iron, dissolved	1	0.02	0.04	0.04	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Iron, total	N/A	0.73	2.4	1.09	0.05	0.02	0.06	0.06	0.06	0.02	0.02	0.18	0.04	0.08	0.05	
Iron, total recoverable	N/A		2.39	1.1	0.06	0.02	0.04	0.04	0.05	0.02	0.02	0.21	0.1	0.08	0.05	
Lead, dissolved	0.044	0.0004	0.001	0.0015	0.0003	0.0001	0.0003	0.0007	0.0027	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0001
Lead, total	N/A		0.0147	0.0071	0.002	0.0002	0.0011	0.0023	0.005	0.0007	0.0005	0.001	0.0003	0.0006	0.0001	
Magnesium, dissolved	Report	3	2.8	2.3	2.7	2.7	2.6	2.6	2.8	2.2	2.1	2.6	2.7	2.3	1.8	2.6
Manganese, dissolved	1.672	0.008	0.048	0.005	0.005	0.005	0.005	0.005	0.007	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Molybdenum, dissolved	Report	0.0009	0.0011	0.0009	0.0006	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0007	0.0008	0.0008	0.0008	0.0006
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.29	0.15	0.11	0.12	0.15	0.16	0.18	0.23	0.12	0.15	0.21	0.28	0.12	0.16	0.21
Oil and Grease	N/A		2.02	2	2	2	2	2	2	2	2	2	2	2	2	
pH	6-9	7.7	7.4	7.5	7.4	7.3	7.1	7.1	7.8	7.6	7.6	7.5	7.8	7.7	7.6	7.3
pH measured at	Report	20	21	19.5	21.4	20.5	19.6	18.3	19.8	19.2	22.1	22.7	23.2	23.8	22.7	20.5
Phosphorus, total																
Phosphorus, ortho dissolved	Report	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Potassium, dissolved	Report	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.7	0.5	0.5	0.3	0.6
Residue, Filterable (TDS)	400	160	130	112	126	120	120	190	124	92	94	120	146	116	102	120
Residue, Non-Filterable (TSS)	Report	5	13	12	5	5	5	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0003	0.0002	0.0002	0.0003	0.0004	0.0005	0.0004	0.0003	0.0002	0.0003	0.0004	0.0002	0.0002	0.0002	0.0002
Silica, dissolved	Report	5.7	6	6.2	5.7	5.2	5.3	5.4	5.6	6.1	5.5	4.8	5.5	5.9	6.1	5.7
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Sodium, dissolved	Report	2.5	2.2	1.8	2	1.8	1.9	1.8	1.8	1.6	1.6	1.8	1.9	1.7	2.3	1.8
Sulfate	250	76.3	95.8	49.1	59.8	63.4	57.2	61.8	66.5	43	43.3	62.8	68.7	48.3	43.9	61.1
Sum of Anions	Report	2.3	2.7	1.7	1.8	1.9	1.8	1.9	2	1.5	1.5	2	2.1	1.6	1.5	1.9
Sum of Cations	Report	2.3	2.1	1.7	1.9	1.9	1.9	1.9	1.9	1.5	1.5	1.8	2	1.7	1.5	1.9
TDS (calculated)	Report	149	166	109	122	125	119	124	130	98.4	97.3	124	134	108	98.9	123
TDS (ratio - measured/calculated)	Report	1.07	0.78	1.03	1.03	0.96	1.01	1.53	0.95	0.93	0.97	0.97	1.09	1.07	1.03	0.98
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
Total Alkalinity	Report	31	35.2	30.7	28.8	28.2	29.1	29.8	31.1	28.6	28	32.2	30.7	30.1	27.9	28.9
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Zinc, dissolved	0.713	0.31	0.26	0.27	0.3	0.31	0.3	0.31	0.33	0.26	0.24	0.28	0.31	0.26	0.25	0.31
Zinc, total	N/A		0.3	0.29	0.3	0.32	0.31	0.32	0.34	0.26	0.26	0.3	0.32	0.27	0.26	

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-2B (continued)													
		9/27/2017	11/9/2017	3/14/2018	5/9/2018	5/14/2018	7/25/2018	12/11/2018	1/29/2019	6/25/2019	9/16/2019	11/12/2019	6/24/2020	9/24/2020	11/12/2020
Aluminum, dissolved	5	0.04	0.03	0.05	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05
Aluminum, total	N/A														
Antimony, dissolved	Report	0.0007	0.0007	0.0036	0.0008	0.001	0.0008	0.0008	0.0011	0.001	0.001	0.0008	0.0008	0.00081	0.0011
Arsenic, dissolved	0.1	0.0004	0.0002	0.0007	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0003	0.0003	0.0007	0.00028	0.00032
Arsenic, total recoverable	N/A														
Barium, dissolved	Report	0.048	0.049	0.053	0.065	0.063	0.057	0.051	0.058	0.065	0.051	0.049	0.029	0.0503	0.0589
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
Bicarbonate as CaCO3	Report	27.8	28.9	31.1	34	30	32.2	42.7	34.2	43.2	33.9	30.1	27.3	29.4	26.4
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium, dissolved	0.001	0.0002	0.0001	0.0003	0.0003	0.0003	0.0002	0.00021	0.00023	0.00024	0.00022	0.00016	0.00011	0.000196	0.00024
Cadmium, total	N/A														
Calcium, dissolved	Report	22	25	23.7	32.9	36.5	26.3	27.2	28.1	35.3	26.9	23.7	17.5	25.4	27.1
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	10	2	2	2	2	2
Cation-Anion Balance	Report	-3.7	0	0	-4.8	10	-3	-5.6	-5.6	-2.3	0	-3.4	-4.3	-3.2	0
Chloride	250	0.5	0.5	0.9	0.5	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Chromium, dissolved	0.1	0.0005	0.0005	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A														
Conductivity @25C	Report	156	179	194	225	217	186	197	191	223	176	162	114	169	179
Copper, dissolved	0.009	0.0006	0.0004	***0.0102***	0.0006	0.0044	0.0004	0.0014	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Copper, total	N/A														
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A														
Dissolved Chromium, Hexavalent	N/A														
Fluoride	2	0.2	0.18	0.21	0.08	0.17	0.2	0.33	0.22	0.2	0.2	0.2	0.2	0.2	0.22
Hardness as CaCO3	Report	62	71	67	93	103	74	77	80	99	76	67	50	71	77
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	10	2	2	2	2	2
Iron, dissolved	1	0.03	0.04	0.09	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.06	0.06	0.06
Iron, total	N/A														
Iron, total recoverable	N/A														
Lead, dissolved	0.044	0.0006	0.0004	0.022	0.0025	0.001	0.0006	0.0001	0.0002	0.0001	0.0006	0.0001	0.0001	0.00017	0.0001
Lead, total	N/A														
Magnesium, dissolved	Report	1.8	2	1.8	2.7	2.8	2.1	2.3	2.3	2.6	2.1	1.9	1.4	1.93	2.22
Manganese, dissolved	1.672	0.005	0.005	0.047	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A														
Molybdenum, dissolved	Report	0.0006	0.0006	0.001	0.0006	0.0007	0.0007	0.0007	0.0009	0.0009	0.0008	0.0012	0.001	0.00078	0.00088
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.12	0.14	0.15	0.17	0.21	0.13	0.17	0.2	0.25	0.1	0.07	0.07	0.1	0.113
Oil and Grease	N/A														
pH	6-9	7.4	7.7	7.6	7.7	7.6	7.5	8	7.8	7.7	7.4	7.5	7.6	6.9	7.5
pH measured at	Report	22.4	21.1	23.7	21.2	20.4	21.1	22.6	23.5		20.5	21.5	21.5	19.9	20.8
Phosphorus, total															
Phosphorus, ortho dissolved	Report	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Potassium, dissolved	Report	0.5	0.6	1.6	0.9	0.8	0.4	0.8	0.7	0.7	0.7	0.5	0.4	0.46	0.52
Residue, Filterable (TDS)	400	92	98	118	152	146	104	136	130	142	108	108	84	102	110
Residue, Non-Filterable (TSS)	Report	5	5	16	5	5	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0002	0.0003	0.0002	0.0004	0.0004	0.0003	0.0003	0.0004	0.0004	0.0002	0.0002	0.0001	0.00027	0.00038
Silica, dissolved	Report	5.9	5.9	5.7	4.9	5.2	5.7	5.4	5	5.4	6.2	5.9	4.4	6	5.6
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Sodium, dissolved	Report	1.5	1.8	3.1	2.3	2.4	1.8	2.4	2.3	2.5	1.9	1.7	1.4	1.78	1.92
Sulfate	250	39.4	43.7	38.4	69.6	57	48.7	47.6	56	63.4	42.5	41.9	28.3	45.5	52.1
Sum of Anions	Report	1.4	1.5	1.5	2.2	1.8	1.7	1.9	1.9	2.2	1.6	1.5	1.2	1.6	1.6
Sum of Cations	Report	1.3	1.5	1.5	2	2.2	1.6	1.7	1.7	2.1	1.6	1.4	1.1	1.5	1.6
TDS (calculated)	Report	90.2	98.7	96.4	136	126	107	114	117	138	103	96	71.5	101	108
TDS (ratio - measured/calculated)	Report	1.02	0.99	1.22	1.12	1.16	0.97	1.19	1.11	1.03	1.05	1.13	1.17	1.01	1.02
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	27.8	28.9	31.1	34	30	32.2	42.7	34.2	43.2	33.9	30.1	27.3	29.4	26.4
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01
Zinc, dissolved	0.713	0.23	0.25	0.31	0.34	0.65	0.28	0.26	0.28	0.29	0.26	0.24	0.05	0.268	0.276
Zinc, total	N/A														

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-3A														
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/17/2015	9/16/2015	12/10/2015	3/10/2016	6/15/2016	8/24/2016	11/9/2016	11/10/2016
Aluminum, dissolved	5	0.03	0.03	0.03	0.04	0.17	0.03	0.03	0.07	0.03	0.03	0.04	0.11	0.03	0.03	
Aluminum, total	N/A	1.65	4.36	23.4	1.48	5.77	6.87	11.5	1.98	1.1	2.5	3.91	4.28	1.48	0.65	
Antimony, dissolved	Report		0.0018	0.0017	0.0023	0.0024	0.0023	0.0032	0.0037	0.002	0.0017	0.0019	0.0024	0.0027	0.0019	
Arsenic, dissolved	0.1		0.0008	0.0005	0.001	0.0032	0.0009	0.0007	0.0016	0.001	0.0005	0.0011	0.0015	0.0007	0.0007	
Arsenic, total recoverable	N/A		0.023	0.0786	0.009	0.0106	0.0526	0.0764	0.0059	0.0058	0.0049	0.0199	0.0211	0.0057	0.003	
Barium, dissolved	Report	0.046	0.06	0.045	0.041	0.076	0.046	0.045	0.068	0.038	0.032	0.051	0.069	0.041	0.039	
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	
Bicarbonate as CaCO3	Report	36	32.6	34.3	46.4	42.1	42.9	42.6	44.6	39.3	33.7	36.5	35.3	32.8	41.5	
Boron, dissolved	0.75	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Cadmium, dissolved	0.001	0.001	0.001	0.0007	0.0005	0.0008	***0.0018***	***0.0015***	0.0007	0.0005	0.0006	0.0007	0.0005	0.0008	0.0006	
Cadmium, total	N/A		0.0018	0.0054	0.003	0.0016	0.0071	0.0079	0.0011	0.0009	0.001	0.0019	0.0019	0.0011	0.001	
Calcium, dissolved	Report	26.8	26.5	36.7	58.7	72.1	80.1	69	37	42.3	35	34.9	27.5	42.5	46.9	
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Cation-Anion Balance	Report	6.3	-3	0	0	2.2	1	0	0	2	-4.5	-6.7	3	-1.9	-1.8	
Chloride	250	0.5	0.5	0.6	1.2	3.7	1.7	1.6	0.5	0.7	0.7	0.5	0.7	0.6	0.5	
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Conductivity @25C	Report	171	175	241	382	477	495	444	244	263	238	226	184	282	290	
Copper, dissolved	0.009	0.003	0.0013	0.0013	0.0007	0.0037	0.0008	0.0007	0.002	0.0007	0.0006	0.001	0.0018	0.0007	0.0005	
Copper, total	N/A		0.03	0.12	0.01	0.01	0.06	0.1	0.01	0.01	0.02	0.02	0.02	0.01	0.01	
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Fluoride	2	0.18	0.27	0.22	0.23	0.22	0.24	0.26	0.2	0.22	0.17	0.23	0.21	0.2	0.24	
Hardness as CaCO3	Report	76	74	104	160	207	230	199	104	118	98.5	97	77	120	127	
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Iron, dissolved	1	0.03	0.02	0.02	0.03	0.32	0.02	0.02	0.08	0.02	0.02	0.07	0.12	0.02	0.02	
Iron, total	N/A	1.84	6.63	23.7	1.43	2.68	10.6	20.5	1.14	1.35	1.25	5.2	5.57	1.37	0.59	
Iron, total recoverable	N/A		5.83	24.4	1.81	2.69	11	20.5	1.08	1.26	1.38	5.29	5.57	1.42	0.67	
Lead, dissolved	0.044	0.0013	0.0053	0.005	0.002	***0.0795***	0.0033	0.0044	0.0132	0.005	0.0016	0.0082	0.0114	0.0018	0.0018	
Lead, total	N/A		0.5804	2.17	0.1194	0.1802	0.9998	1.57	0.1259	0.086	0.0767	0.2974	0.3642	0.0891	0.0684	
Magnesium, dissolved	Report	2.3	2	3	3.3	6.6	7.4	6.4	2.8	3	2.7	2.5	1.9	3.4	2.5	
Manganese, dissolved	1.672	0.011	0.013	0.005	0.013	0.131	0.005	0.023	0.013	0.005	0.005	0.008	0.01	0.005	0.005	
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Mercury, total	N/A		0.0002	0.0003	0.0002	0.001	0.0002	0.0003	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	
Molybdenum, dissolved	Report	0.001	0.0036	0.0024	0.0053	0.0018	0.0054	0.0066	0.0083	0.0033	0.0018	0.0013	0.0039	0.0028	0.0018	
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
Nitrate/Nitrite as N	100	0.09	0.49	0.29	1.96	2.21	1.45	1.39	0.62	0.28	0.22	0.21	0.32	0.38	0.19	
Oil and Grease	N/A		2.02	3.3	2	2	2	2	2	2	2	2	2	2		2
pH	6-9	7.8	7.6	7.6	7.7	7.7	7.3	7.4	8	7.9	7.7	7.7	7.9	7.8	7.9	
pH measured at	Report	21	19	19.6	21.8	21.2	20.3	18.5	19.5	19.5	22.1	23.2	23.1	23.9	22.6	
Phosphorus, total																
Phosphorus, ortho dissolved	Report	0.01	0.06	0.01	0.03	0.01	0.01	0.06	0.02	0.02	0.02	0.02	0.03	0.02	0.02	
Potassium, dissolved	Report	0.6	0.7	0.7	1.2	1.4	1.4	1.5	0.9	0.8	0.7	0.5	0.6	0.7	0.6	
Residue, Filterable (TDS)	400	160	110	152	284	302	352	300	152	162	142	140	122	192	180	
Residue, Non-Filterable (TSS)	Report	62	123	320	14	29	258	497	151	16	16	75	60	28	5	
Selenium, dissolved	0.005	0.0003	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0004	0.0003	0.0004	0.0005	0.0002	0.0003	0.0003	
Silica, dissolved	Report	5.1	4.8	5.6	7.3	7	6.6	6.6	5.7	6.1	5.5	5.5	4.9	5.1	6.2	
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	***0.00014***	0.00005	0.00009	0.00005	0.00005	0.00005	0.00006	0.0001	0.00005	0.00005	
Sodium, dissolved	Report	3.3	2	2.3	10.5	8.1	6.5	7.8	3.6	3.8	3	2.5	2.3	3.2	4.7	
Sulfate	250	37.3	47	72.5	128	165	189	164	64.7	82	75.7	80.6	41.9	95	97.8	
Sum of Anions	Report	1.5	1.7	2.2	3.7	4.4	4.9	4.4	2.3	2.5	2.3	2.4	1.6	2.7	2.9	
Sum of Cations	Report	1.7	1.6	2.2	3.7	4.6	5	4.4	2.3	2.6	2.1	2.1	1.7	2.6	2.8	
TDS (calculated)	Report	99	105	144	241	293	322	286	144	165	146	151	103	172	186	
TDS (ratio - measured/calculated)	Report	1.62	1.05	1.06	1.18	1.03	1.09	1.05	1.06	0.98	0.97	0.93	1.18	1.12	0.97	
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Total Alkalinity	Report	36	32.6	34.3	46.4	42.1	42.9	42.6	44.6	39.3	33.7	36.5	35.3	32.8	41.5	
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Zinc, dissolved	0.713	0.07	0.17	0.34	0.27	0.51	***0.87***	0.65	0.25	0.26	0.27	0.33	0.2	0.32	0.27	
Zinc, total	N/A		0.7	2.13	0.37	0.65	2.02	2.47	0.4	0.37	0.37	0.67	0.6	0.43	0.35	

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-3A (continued)				
		2/15/2017	6/13/2017	7/11/2017	9/25/2017	11/9/2017
Aluminum, dissolved	5	0.06	0.54	0.21	0.2	0.22
Aluminum, total	N/A	1.94				
Antimony, dissolved	Report	0.0018	0.0045	0.0042	0.0024	0.0024
Arsenic, dissolved	0.1	0.001	0.0064	0.0031	0.003	0.0035
Arsenic, total recoverable	N/A	0.0068				
Barium, dissolved	Report	0.043	0.087	0.047	0.058	0.065
Beryllium, dissolved	0.1	0.00005	0.00008	0.00005	0.00005	0.00005
Bicarbonate as CaCO3	Report	35	45.2	59.4	43.4	41.4
Boron, dissolved	0.75	0.02	0.01	0.01	0.01	0.01
Cadmium, dissolved	0.001	0.0007	0.0009	0.0007	0.0005	0.0006
Cadmium, total	N/A	0.0013				
Calcium, dissolved	Report	41.5	41.7	34.8	42.6	45.9
Carbonate as CaCO3	Report	2	2	2	2	2
Cation-Anion Balance	Report	-2	2	-4.3	-1.9	5.7
Chloride	250	0.5	1.5	0.9	1	0.5
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A	0.005				
Conductivity @25C	Report	288	259	259	278	285
Copper, dissolved	0.009	0.0007	0.0088	0.0037	0.0028	0.0038
Copper, total	N/A	0.01				
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A	0.003				
Dissolved Chromium, Hexavalent	N/A	0.005				
Fluoride	2	0.25	0.23	0.12	0.21	0.18
Hardness as CaCO3	Report	114	115	96	117	124
Hydroxide as CaCO3	Report	2	2	2	2	2
Iron, dissolved	1	0.07	***1.18***	0.5	0.42	0.57
Iron, total	N/A	1.95				
Iron, total recoverable	N/A	2.1				
Lead, dissolved	0.044	0.0062	***0.159***	***0.0903***	***0.0442***	***0.0644***
Lead, total	N/A	0.141				
Magnesium, dissolved	Report	2.5	2.7	2.1	2.5	2.4
Manganese, dissolved	1.672	0.011	0.305	0.179	0.095	0.139
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A	0.0002				
Molybdenum, dissolved	Report	0.0011	0.0054	0.004	0.0024	0.0017
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.26	0.33	0.15	0.18	0.2
Oil and Grease	N/A	2				
pH	6-9	7.8	7.8	8.2	7.7	8
pH measured at	Report	22.3	20.4	21.1	22.4	21.2
Phosphorus, total						
Phosphorus, ortho dissolved	Report	0.02	0.02	0.02	0.02	0.02
Potassium, dissolved	Report	0.6	0.8	0.7	0.7	0.5
Residue, Filterable (TDS)	400	178	154	138	194	184
Residue, Non-Filterable (TSS)	Report	46	18	5	7	29
Selenium, dissolved	0.005	0.0004	0.0004	0.0004	0.0003	0.0004
Silica, dissolved	Report	6	7.2	6.5	6.7	7
Silver, dissolved	0.0001	0.00007	***0.0021***	***0.00062***	***0.00071***	***0.00071***
Sodium, dissolved	Report	3.6	3.4	3.6	4.8	4.5
Sulfate	250	91.7	75.4	57.2	86.6	79.4
Sum of Anions	Report	2.6	2.5	2.4	2.7	2.5
Sum of Cations	Report	2.5	2.6	2.2	2.6	2.8
TDS (calculated)	Report	170	165	145	174	169
TDS (ratio - measured/calculated)	Report	1.05	0.93	0.95	1.11	1.09
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	35	45.2	59.4	43.4	41.4
Uranium, dissolved	Report	0.0001	0.0003	0.0002	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005
Zinc, dissolved	0.713	0.3	0.3	0.21	0.2	0.26
Zinc, total	N/A	0.45				

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW- 3B														
		6/10/2014	7/22/2014	12/4/2014	2/13/2015	3/31/2015	5/1/2015	5/7/2015	6/17/2015	9/16/2015	12/10/2015	3/10/2016	6/15/2016	8/24/2016	11/9/2016	11/10/2016
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.17	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
Aluminum, total	N/A	0.3	0.83	0.73	0.05	0.77	0.06	0.07	0.03	0.04	0.03	0.03	0.05	0.03	0.03	
Antimony, dissolved	Report	0.0013	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007	0.0007	0.0006	0.0007	0.0006	0.0007	0.0009	0.0009	
Arsenic, dissolved	0.1	0.0005	0.0003	0.0004	0.0003	0.0022	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0004	0.0003	
Arsenic, total recoverable	N/A		0.0062	0.0031	0.0005	0.0054	0.0005	0.0004	0.0004	0.0003	0.0004	0.0003	0.0005	0.0005	0.0003	
Barium, dissolved	Report	0.043	0.046	0.054	0.059	0.076	0.061	0.063	0.052	0.049	0.045	0.049	0.047	0.047	0.057	
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	
Bicarbonate as CaCO3	Report	35	31.7	30.9	32	33.3	29.9	30.8	30.9	30.5	29.6	30.3	29.5	27.6	29.9	
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Cadmium, dissolved	0.001	0.001	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Cadmium, total	N/A		0.001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0005	0.0005	0.0001	0.0002	0.0001	
Calcium, dissolved	Report	26.3	27.7	33.1	37.3	40.5	37.1	38.6	33.7	32.5	30.4	30.1	30.9	30.1	34.4	
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Cation-Anion Balance	Report	3.2	0	0	0	0	0	0	-2.4	2.6	-2.7	-2.7	0	2.9	0	
Chloride	250	0.6	0.5	0.7	1	1.6	1.2	1	0.5	0.5	0.5	0.5	0.7	0.5	0.5	
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Chromium, Trivalent Dissolved	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Conductivity @25C	Report	171	181	213	237	273	232	233	229	209	205	193	201	197	213	
Copper, dissolved	0.009	0.0009	0.0007	0.0015	0.0005	0.0011	0.0005	0.0005	0.0009	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Copper, total	N/A		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Cyanide, WAD	N/A	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Dissolved Chromium, Hexavalent	N/A		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.005	0.005	
Fluoride	2	0.2	0.25	0.21	0.18	0.19	0.18	0.18	0.18	0.2	0.15	0.2	0.2	0.18	0.2	
Hardness as CaCO3	Report	75	77	92	104	114	103	108	94	92	85.4	84	86	84	95	
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Iron, dissolved	1	0.02	0.02	0.03	0.02	0.45	0.02	0.02	0.08	0.02	0.02	0.02	0.02	0.02	0.02	
Iron, total	N/A	0.43	2.24	1.61	0.04	1.84	0.06	0.08	0.05	0.03	0.02	0.02	0.1	0.06	0.02	
Iron, total recoverable	N/A		1.72	1.64	0.04	1.67	0.04	0.09	0.05	0.02	0.02	0.04	0.11	0.08	0.02	
Lead, dissolved	0.044	0.0002	0.0006	0.0024	0.0007	0.0106	0.0007	0.0004	0.001	0.0004	0.0003	0.0003	0.0003	0.0005	0.0003	
Lead, total	N/A		0.0165	0.0103	0.0017	0.012	0.0036	0.004	0.0023	0.0007	0.0007	0.0006	0.0018	0.0014	0.0003	
Magnesium, dissolved	Report	2.3	1.9	2.3	2.7	3.1	2.5	2.8	2.4	2.6	2.3	2.1	2.2	2.2	2.3	
Manganese, dissolved	1.672	0.005	0.008	0.005	0.005	0.023	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Mercury, total	N/A		0.0002	0.0002	0.0002	0.0002	0.0004	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Molybdenum, dissolved	Report	0.001	0.0012	0.0007	0.0008	0.0006	0.0006	0.0006	0.0007	0.0009	0.0007	0.0005	0.0006	0.0008	0.0007	
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
Nitrate/Nitrite as N	100	0.09	0.43	0.23	0.35	0.53	0.31	0.35	0.36	0.21	0.19	0.19	0.31	0.18	0.21	
Oil and Grease	N/A		2.02	2.3	2	2	2.2	2	2	2	2	2	2	2		2
pH	6-9	7.8	7.5	7.5	7.4	7.6	7.2	7.3	7.8	7.7	7.7	7.6	7.8	7.7	7.7	
pH measured at	Report	21	20	19.7	21.7	21.1	20.4	18.4	20.2	19.4	22.1	23	23	24	22.5	
Phosphorus, total																
Phosphorus, ortho dissolved	Report	0.02	0.01	0.01	0.01	0.03	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.02	
Potassium, dissolved	Report	0.6	0.7	0.7	0.7	0.8	0.7	0.7	0.6	0.8	0.6	0.5	0.5	0.5	0.6	
Residue, Filterable (TDS)	400	90	100	122	164	164	150	152	134	134	116	118	120	124	122	
Residue, Non-Filterable (TSS)	Report	5	28	22	5	148	5	5	5	5	5	5	5	5	5	
Selenium, dissolved	0.005	0.0003	0.0003	0.0002	0.0003	0.0004	0.0003	0.0004	0.0003	0.0002	0.0003	0.0004	0.0003	0.0003	0.0003	
Silica, dissolved	Report	4.8	5	5.6	5.8	6.1	5.5	5.7	5.2	5.7	5.4	5.5	5.3	5.2	5.3	
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	
Sodium, dissolved	Report	1.7	2.1	2.2	2.8	3.4	2.4	2.9	2.2	2.6	2.2	1.9	2	2.1	2.6	
Sulfate	250	36.3	49.7	62	74.6	83.7	74.7	80.2	71.2	62.3	63	61.4	57.3	51.9	67.7	
Sum of Anions	Report	1.5	1.7	2	2.2	2.5	2.2	2.3	2.1	1.9	1.9	1.9	1.8	1.7	2	
Sum of Cations	Report	1.6	1.7	2	2.2	2.5	2.2	2.3	2	2	1.8	1.8	1.8	1.8	2	
TDS (calculated)	Report	96	108	127	146	162	144	152	136	127	124	122	119	111	133	
TDS (ratio - measured/calculated)	Report	0.94	0.93	0.96	1.12	1.01	1.04	1	0.99	1.06	0.94	0.97	1.01	1.12	0.92	
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Total Alkalinity	Report	35	31.7	30.9	32	33.3	29.9	30.8	30.9	30.5	29.6	30.3	29.5	27.6	29.9	
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Zinc, dissolved	0.713	0.06	0.06	0.1	0.1	0.05	0.16	0.05	0.14	0.05	0.05	0.06	0.05	0.05	0.09	
Zinc, total	N/A		0.08	0.11	0.1	0.06	0.12	0.07	0.12	0.06	0.05	0.06	0.04	0.05	0.07	

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-3B (continued)															
		2/15/2017	6/13/2017	9/25/2017	11/9/2017	2/21/2018	5/9/2018	7/25/2018	12/11/2018	1/29/2019	5/29/2019	9/16/2019	11/12/2019	2/18/2020	6/24/2020	9/24/2020	11/12/2020
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Aluminum, total	N/A	0.43															
Antimony, dissolved	Report	0.001	0.0005	0.0008	0.0007	0.0006	0.0021	0.0011	0.0018	0.0011	0.0009	0.0009	0.0011	0.0007	0.0006	0.00117	0.00079
Arsenic, dissolved	0.1	0.0004	0.0002	0.0003	0.0004	0.0002	0.0004	0.0003	0.0004	0.0004	0.0003	0.0004	0.0004	0.0003	0.0003	0.00033	0.00038
Arsenic, total recoverable	N/A	0.0018															
Barium, dissolved	Report	0.052	0.05	0.048	0.052	0.05	0.05	0.043	0.038	0.047	0.051	0.038	0.043	0.051	0.04	0.0474	0.051
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
Bicarbonate as CaCO3	Report	30	29.6	29.6	29.4	32.1	31.5	30.5	31.6	29.6	45.6	36.7	30.1	27.1	30	44.6	25.9
Boron, dissolved	0.75	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium, dissolved	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00007	0.00009	0.00009	0.00009	0.00008	0.00007	0.00005	0.00009	0.000082
Cadmium, total	N/A	0.0001															
Calcium, dissolved	Report	34.3	30.4	29.8	32.4	34	31.4	26.4	27.6	30.5	33.4	28.2	28.1	35.4	27	32.5	30.4
Carbonate as CaCO3	Report	2	2	2	2	2	2	2	2	2	10	2	2	2	2	2	2
Cation-Anion Balance	Report	0	-2.7	-2.7	0	-2.4	-2.6	0	-3	-2.7	-4.8	0	0	-2.3	3.2	-7.3	0
Chloride	250	0.5	0.7	0.7	0.5	0.6	1.9	0.5	0.5	0.5	0.5	0.5	0.7	0.5	0.5	0.5	0.5
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A	0.005															
Conductivity @25C	Report	224	200	204	208	234	214	183	178	190	212	185	188	231	174	205	194
Copper, dissolved	0.009	0.0005	0.0004	0.0004	0.0004	0.0004	0.0022	0.0004	0.0031	0.0008	0.0081	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Copper, total	N/A	0.01															
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A	0.003															
Dissolved Chromium, Hexavalent	N/A	0.005															
Fluoride	2	0.22	0.22	0.19	0.17	0.14	0.08	0.16	0.23	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.19
Hardness as CaCO3	Report	96	85	84	90	94	88	73	76	84	93	78	78	98	75	90	84
Hydroxide as CaCO3	Report	2	2	2	2	2	2	2	2	2	10	2	2	2	2	2	2
Iron, dissolved	1	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.06	0.06	0.06
Iron, total	N/A	0.48															
Iron, total recoverable	N/A	0.52															
Lead, dissolved	0.044	0.0048	0.0003	0.0003	0.0015	0.0003	0.0009	0.0006	0.001	0.0006	0.0009	0.0006	0.0001	0.0001	0.0002	0.00034	0.00021
Lead, total	N/A	0.0272															
Magnesium, dissolved	Report	2.4	2.2	2.2	2.3	2.3	2.2	1.7	1.8	2	2.3	1.8	1.8	2.3	1.8	2.03	2.06
Manganese, dissolved	1.672	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A	0.0002															
Molybdenum, dissolved	Report	0.0007	0.0006	0.0009	0.0008	0.0008	0.0008	0.0007	0.0009	0.0007	0.0007	0.001	0.0009	0.0007	0.0008	0.00098	0.00072
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.28	0.26	0.17	0.18	0.16	0.25	0.18	0.21	0.22	0.25	0.21	0.05	0.13	0.21	0.21	0.192
Oil and Grease	N/A	2															
pH	6-9	7.5	7.4	7.4	7.7	7.9	7.7	7.6	7.7	7.7	7.6	7.5	7.6	7.6	7.6	7.1	7.5
pH measured at	Report	23.1	20.3	22.6	21.1	22.1	21.7	20.9	22.5	23.3		20.3	21.3	21.3	21.5	20	20.6
Phosphorus, total														***0.01***			
Phosphorus, ortho dissolved	Report	0.02	0.02	0.02	0.02	0.02	0.32	0.02	0.02	0.02	0.01	0.01	0.01		0.02	0.01	0.01
Potassium, dissolved	Report	0.6	0.5	0.6	0.5	0.5	1.9	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.45	0.51
Residue, Filterable (TDS)	400	142	116	136	140	144	130	108	126	128	140	112	126	164	126	134	126
Residue, Non-Filterable (TSS)	Report	13	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0004	0.0004	0.0003	0.0002	0.0004	0.0003	0.00029	0.00042
Silica, dissolved	Report	5.6	5.6	5.5	5.6	5.5	5.4	5.2	5.5	5.6	5.8	5.4	5.4	5.5	5.2	5.8	5.5
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Sodium, dissolved	Report	2.6	2.1	2.7	2.6	2.7	2.8	2.1	2.3	2.5	2.5	2.3	2	2.6	2.1	2.53	2.38
Sulfate	250	72.3	58.5	62	60.7	69.8	61	47.1	50.5	61.7	62.3	47.1	52.2	77.4	43.7	61.4	61
Sum of Anions	Report	2.1	1.9	1.9	1.9	2.1	2	1.6	1.7	1.9	2.2	1.7	1.7	2.2	1.5	2.2	1.8
Sum of Cations	Report	2.1	1.8	1.8	1.9	2	1.9	1.6	1.6	1.8	2	1.7	1.7	2.1	1.6	1.9	1.8
TDS (calculated)	Report	138	120	123	124	137	127	103	109	123	137	110	111	142	100	134	119
TDS (ratio - measured/calculated)	Report	1.03	0.97	1.11	1.13	1.05	1.02	1.05	1.16	1.04	1.02	1.02	1.14	1.15	1.26	1	1.06
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00014	0.0001
Total Alkalinity	Report	30	29.6	29.6	29.4	32.1	31.5	30.5	31.6	29.6	45.6	36.7	30.1	27.1	30	44.6	25.9
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01
Zinc, dissolved	0.713	0.09	0.06	0.07	0.07	0.06	0.09	0.09	0.09	0.1	0.11	0.08	0.1	0.1	0.08	0.089	0.098
Zinc, total	N/A	0.11															

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.

Appendix 4: Groundwater Dat

Analyte	GW std	GW-3R												
		3/14/2018	5/9/2018	7/25/2018	12/11/2018	1/29/2019	5/29/2019	9/16/2019	11/12/2019	2/18/2020	6/24/2020	7/28/2020	9/24/2020	11/12/2020
Aluminum, dissolved	5	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Aluminum, total	N/A													
Antimony, dissolved	Report	0.0015	0.0013	0.0014	0.0012	0.0016	0.0009	0.0012	0.001	0.0013	0.0013	0.0011	0.00134	0.00101
Arsenic, dissolved	0.1	0.0013	0.0004	0.0005	0.001	0.001	0.0005	0.0005	0.0004	0.0007	0.0018	0.0005	0.00048	0.00064
Arsenic, total recoverable	N/A													
Barium, dissolved	Report	0.025	0.047	0.029	0.019	0.026	0.049	0.028	0.035	0.028	0.023	0.027	0.0318	0.0392
Beryllium, dissolved	0.1	0.00005	0.00005	0.00005	0.00005	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008	0.00008
Bicarbonate as CaCO3	Report	39.3	33.6	29.9	47.8	49.7	39.7	33	25.5	39.7	29.2	29.3	28.4	41
Boron, dissolved	0.75	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium, dissolved	0.001	0.0003	0.0004	0.0002	0.00021	0.00021	0.00046	0.00029	0.00025	0.00023	0.00023	0.0002	0.000243	0.00026
Cadmium, total	N/A													
Calcium, dissolved	Report	59.4	44.9	24.2	54.1	54.5	45	29.7	32	51.1	21.4	24	31.8	33
Carbonate as CaCO3	Report	2	2	2	2	2	10	2	2	2	2	2	2	2
Cation-Anion Balance	Report	4.5	-1.8	-12.5	1.5	-3	-1.8	0	-2.6	-1.6	-3.7	-3.4	0	-9.5
Chloride	250	1	8.9	0.5	1.5	0.5	5.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Chromium, dissolved	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Chromium, Trivalent Dissolved	N/A													
Conductivity @25C	Report	312	285	167	305	354	294	192	210	322	141	173	204	205
Copper, dissolved	0.009	0.0019	0.0004	0.0004	0.0022	0.0008	0.0029	0.0008	0.0008	0.0008	0.0008	0.001	0.00396	0.0009
Copper, total	N/A													
Cyanide, total	0.005	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Cyanide, WAD	N/A													
Dissolved Chromium, Hexavalent	N/A													
Fluoride	2	0.19	0.05	0.14	0.28	0.23	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.14
Hardness as CaCO3	Report	159	123	66	145	146	123	81	87	137	58	65	86	90
Hydroxide as CaCO3	Report	2	2	2	2	2	10	2	2	2	2	2	2	2
Iron, dissolved	1	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.06	0.06	0.06	0.06
Iron, total	N/A													
Iron, total recoverable	N/A													
Lead, dissolved	0.044	0.0021	0.0015	0.0004	0.0009	0.0003	0.0001	0.0004	0.0001	0.0001	0.0174	0.0005	0.0001	0.00013
Lead, total	N/A													
Magnesium, dissolved	Report	2.5	2.6	1.3	2.3	2.4	2.6	1.6	1.7	2.4	1.2	1.3	1.69	1.89
Manganese, dissolved	1.672	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
Mercury, dissolved	0.01	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Mercury, total	N/A													
Molybdenum, dissolved	Report	0.0012	0.0005	0.0008	0.0014	0.0012	0.0006	0.0009	0.0009	0.0013	0.0009	0.0007	0.00099	0.00071
Nickel, dissolved	0.05	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Nitrate/Nitrite as N	100	0.17	1.2	0.17	0.18	0.15	0.81	0.29	0.24	0.12	0.22	0.29	0.25	0.242
Oil and Grease	N/A													
pH	6-9	7.9	7.6	7.7	8	8.1	7.6	7.5	7.6	7.8	7.6	7.6	7	7.5
pH measured at	Report	23.3	20.9	21	22.3	23.4		20.7	21.3	21.4	21.5	21.6	20.1	20.6
Phosphorus, total										***0.01***				
Phosphorus, ortho dissolved	Report	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01		0.01	0.01	0.01	0.01
Potassium, dissolved	Report	0.5	0.7	0.3	0.3	0.4	0.6	0.6	0.3	0.4	0.4	0.4	0.39	0.46
Residue, Filterable (TDS)	400	202	182	94	210	238	202	116	132	228	104	106	134	134
Residue, Non-Filterable (TSS)	Report	16	5	5	5	5	5	5	5	5	5	5	5	5
Selenium, dissolved	0.005	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002	0.0003	0.0001	0.0002	0.00016	0.00026
Silica, dissolved	Report	6.8	5.4	4.6	7	6.7	5.3	4.7	4.6	6.6	4.5	4.7	4.9	4.7
Silver, dissolved	0.0001	0.00005	0.00005	0.00005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	***0.0002***	0.0001	0.0001	0.0001
Sodium, dissolved	Report	6.5	3.9	2.5	7.9	5.8	6.3	3.1	2.5	4.9	2.5	2.4	2.6	2.63
Sulfate	250	114	89.7	55.2	105	116	91.5	54.3	70.7	108	37	41.6	60.6	68.7
Sum of Anions	Report	3.2	2.8	1.8	3.2	3.4	2.9	1.8	2	3.1	1.4	1.5	1.9	2.3
Sum of Cations	Report	3.5	2.7	1.4	3.3	3.2	2.8	1.8	1.9	3	1.3	1.4	1.9	1.9
TDS (calculated)	Report	217	178	108	210	218	183	116	129	200	86.4	94.3	121	138
TDS (ratio - measured/calculated)	Report	0.93	1.02	0.87	1	1.09	1.1	1	1.02	1.14	1.2	1.12	1.11	0.97
Thallium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Total Alkalinity	Report	39.3	33.6	29.9	47.8	49.7	39.7	33	25.5	39.7	29.2	29.3	28.4	41
Uranium, dissolved	Report	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vanadium, dissolved	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01	0.01
Zinc, dissolved	0.713	0.17	0.25	0.12	0.13	0.15	0.25	0.13	0.17	0.15	0.12	0.12	0.152	0.161
Zinc, total	N/A													

Notes:

Bold indicates groundwater standard exceedance.

Blank indicates analyses not performed.

All non-detects included at MDL value.