MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT



WEST EMBANKMENT DRAIN DESIGN REPORT

PREPARED FOR:

Montana Resources, LLP
600 Shields Avenue
Butte, Montana
USA 59701

PREPARED BY:

Knight Piésold Ltd.
Suite 1400 – 750 West Pender Street
Vancouver, BC V6C 2T8 Canada
p. +1.604.685.0543 • f. +1.604.685.0147

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Knight Piésold
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MONTANA RESOURCES, LLP
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Knight Piésold Ltd.
Suite 1400
750 West Pender Street
Vancouver, British Columbia Canada V6C 2T8
Telephone: (604) 685-0543
Facsimile: (604) 685-0147
www.knightpiesold.com

Knight Piésold
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EXECUTIVE SUMMARY

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine located within the northeastern part of Butte, Montana. The operation includes a mill throughput of roughly 50,000 short tons per day and a small-scale leaching operation. The Yankee Doodle Tailings Impoundment (YDTI) is the tailings storage facility for the mine. The YDTI was originally constructed in 1963 and has been continuously expanded to EL. 6,400 ft. The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment that for descriptive purposes is divided into three embankments according to the geometry of each limb of the continuous embankment.

Property boundaries, topography, and groundwater conditions along the west side of the YDTI necessitated construction of the West Embankment. This report describes the design basis and design features of the West Embankment, including the tailings seepage management features supporting continued construction of the YDTI that were incorporated into the initial detailed design of the West Embankment up to a crest of EL. 6,400 ft. This report provides supporting information relevant to continued construction of the YDTI and should be read in conjunction with the other reports supporting the permit amendment application. ▲R1

The groundwater elevations are shown to be depressed within a saddle in the central portion of the West Ridge as indicated by the groundwater level measurements. This area of depressed water levels is considered the critical section for the design.

The embankment will be constructed along the eastern side of the West Ridge at the margin of the current tailings pond. The position of the West Embankment in this manner (instead of closer to the catchment divide) limits the potential for impact to the groundwater system in the ridge. The West Embankment will incorporate an upstream seepage collection drain, the West Embankment Drain (WED), and several other seepage control features to maintain a groundwater piezometric surface similar to current conditions on the western boundary of the impoundment, thereby relying on hydraulic confinement by maintaining elevated groundwater pressures within the West Ridge, along with an easterly hydraulic gradient towards the YDTI.

The WED will consist of a subsurface aggregate drain located along the upstream toe of the West Embankment. The drain has been designed to allow it to passively drain by gravity from the northern extent of the West Embankment southward and through a rock cut beyond the topographic boundary known as ‘Rocky Knob’. The WED will connect and work in conjunction with other seepage management features of the West Embankment, including the Extraction Pond, Extraction Basin, contingency drain pods, and secondary seepage collection drains.

An Extraction Pond will be constructed at the end of the WED on the southern side of Rocky Knob, at the toe of the East-West Embankment. The Extraction Pond will form the gravity outlet of the WED. A pump system will be installed in the pond to redirect the recovered seepage to the YDTI.

An Extraction Basin will be constructed adjacent to the WED alignment. The Extraction Basin is located in a topographic low that coincides with the area of the locally depressed water table on the West Ridge. The WED will flow by gravity to the Extraction Pond where continuous pumping will be maintained up to the design flow rate. However, an Extraction Basin was also included in the design to have an operations ready alternative pumping option as a redundant seepage water recovery system.

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ABBREVIATIONS

ACC ..... Anaconda Copper Company
CMP ..... Construction Management Plan
DBR ..... Design Basis Report
DEQ ..... Montana Department of Environmental Quality
EOR ..... Engineer of Record
GPM ..... gallons per minute
GPS ..... Global Positioning System
HsB ..... Horseshoe Bend
KP ..... Knight Piésold Ltd.
MCA ..... Montana Code Annotated
MR ..... Montana Resources, LLP
MW ..... monitoring well
NRCS ..... United States Natural Resource Conservation Service
TAC ..... The Anaconda Company
WED ..... West Embankment Drain
XRD ..... X-Ray Diffraction
YDTI ..... Yankee Doodle Tailings Impoundment

1 – INTRODUCTION

1.1 PURPOSE AND SCOPE

Montana Resources, LLP (MR) operates an open pit copper and molybdenum mine located within the northeastern part of Butte, Montana. The operation includes a mill throughput of roughly 50,000 short tons per day and a small-scale dump leaching operation.

The Yankee Doodle Tailings Impoundment (YDTI) is the tailings storage facility for the mine. The YDTI was originally constructed in 1963 using rockfill obtained from Berkeley Pit stripping operations and has been continuously expanded to EL. 6,400 ft using rockfill from the Berkeley Pit (until 1982) and from the Continental Pit (beginning in 1986). The YDTI comprises a valley-fill style impoundment created by a continuous rockfill embankment that for descriptive purposes is divided into three rockfill embankments according to the general geometry of each limb of the continuous embankment. These embankments are the:

- North-South Embankment - The North-South Embankment forms the eastern to southeastern limb of the YDTI and runs approximately north to south in orientation. The North-South Embankment abuts onto the base of Rampart Mountain, forming the eastern limit of the MR mine site.
- East-West Embankment - The East-West Embankment forms the southwestern limb of the YDTI and runs approximately east to west in orientation. The East-West Embankment is constructed upstream of Horseshoe Bend and the Berkeley Pit.
- West Embankment - The West Embankment forms the western limb of the YDTI and runs approximately north to south in orientation. The West Embankment is constructed into the side of the West Ridge and forms the western battery limit of the facility.

Property boundaries, topography, and groundwater conditions along the west side of the YDTI necessitated construction of the West Embankment. This report, prepared by Knight Piésold Ltd (KP), describes the design basis and design features of the West Embankment, including the tailings seepage management features supporting the continued construction of the YDTI that were incorporated into the initial detailed design of the West Embankment up to a crest of EL. 6,400 ft. ▲R1
This report provides supporting information relevant to the YDTI construction and should be read in conjunction with the other reports supporting the permit amendment application. The proposed permit amendment considers the YDTI with embankments constructed to a crest elevation of 6,450 ft ▲R1 and commencing operation of the West Embankment Drain (WED).

Select detailed design drawings for the West Embankment and WED are provided in Appendix A.

Select KP correspondence pertaining to the design and specifications for the West Embankment and WED are provided in Appendix B.

1.2 ENGINEER OF RECORD

The requirement for an Engineer of Record (EOR) for the YDTI is described in Montana Code Annotated (MCA) Title 82 Chapter 4 Part 3 Section 75 (MCA 82-4-375). The EOR is required to be a Professional Engineer licensed in the State of Montana. The EOR for the YDTI is Mr. Ken Brouwer, P.E., of Knight Piésold Ltd.

The EOR is responsible for the following:

- Review the design and other documents pertaining to the tailings storage facility.
- Certify and seal designs or other documents pertaining to the tailings storage facility submitted to the Department of Environmental Quality (DEQ).
- Complete an annual inspection of the tailings storage facility.
- Notify the operator when credible evidence indicates the tailings storage facility is not performing as intended.
- Immediately notify the operator and the DEQ when credible evidence indicates that the tailings storage facility presents an imminent threat or a high potential for imminent threat to human health or the environment.

1.3 COORDINATE SYSTEM

The design of the YDTI references the site coordinate system known as the ‘Anaconda Mine Grid’ established by The Anaconda Company (TAC) in 1957. The Anaconda Mine Grid is based on the Anaconda Copper Company (ACC) Datum established in 1915. All elevations are stated in Anaconda Mine Grid coordinates with respect to the ACC Vertical Datum unless specifically indicated otherwise. The Montana Resources GPS Site Coordinate System is based on the ‘Anaconda Mine Grid’ and utilizes International Feet. ▲R1

2 – WEST RIDGE HYDROGEOLOGIC CONDITIONS

The design basis of West Embankment and seepage management features is to maintain a groundwater piezometric surface similar to current conditions thereby preventing seepage from the YDTI migrating west past the property boundaries. Controlling the hydraulic gradient is the only preventative measure to manage hydrogeological risks on the West Ridge, making it the best available technology (KP, 2016a). All other options would include varying amounts of expected unrecoverable seepage and would increase the potential for offsite water quality impacts. The seepage control features will be incorporated in the foundation to provide drained conditions within the West Embankment.

The presence of the mounded water table in the groundwater system along the West Ridge has been the subject of several site investigation programs and is a focus of ongoing groundwater monitoring by MR. The site investigation programs are described in the Site Characterization Report (KP, 2016b). The current supernatant pond elevation within the YDTI is EL. 6,340 ft, and the pond generally rises at a rate of approximately 6 ft per year.

A detailed description of the interpreted hydrogeological conditions of the West Ridge is provided in the Site Characterization Report (KP, 2016b). The groundwater elevations are shown to be depressed within a saddle in the central portion of the West Ridge as indicated by the groundwater level measurements. This area of depressed water levels is considered the critical section for the design. The water level monitoring data indicates that the lowest water level was in monitoring well MW12-16, and was approximately elevation 6,379 ft as of July 2015. A plot of the water level measurements collected to date in MW12-16 is shown on Figure 2.1. The conceptual groundwater potentiometric surface and inferred groundwater flow directions in the West Ridge area are shown on Figure 2.2. The current pond elevation is below the lowest water level within the West Ridge, therefore the hydraulic gradient continues to prevent seepage migration to the west from the YDTI.

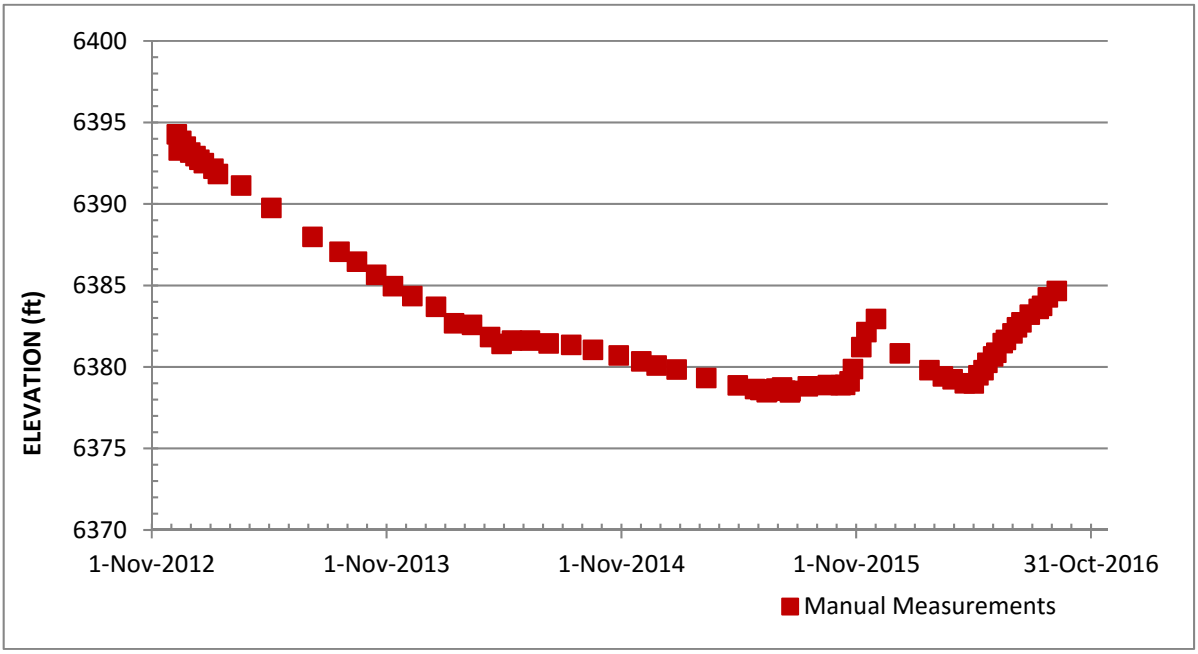
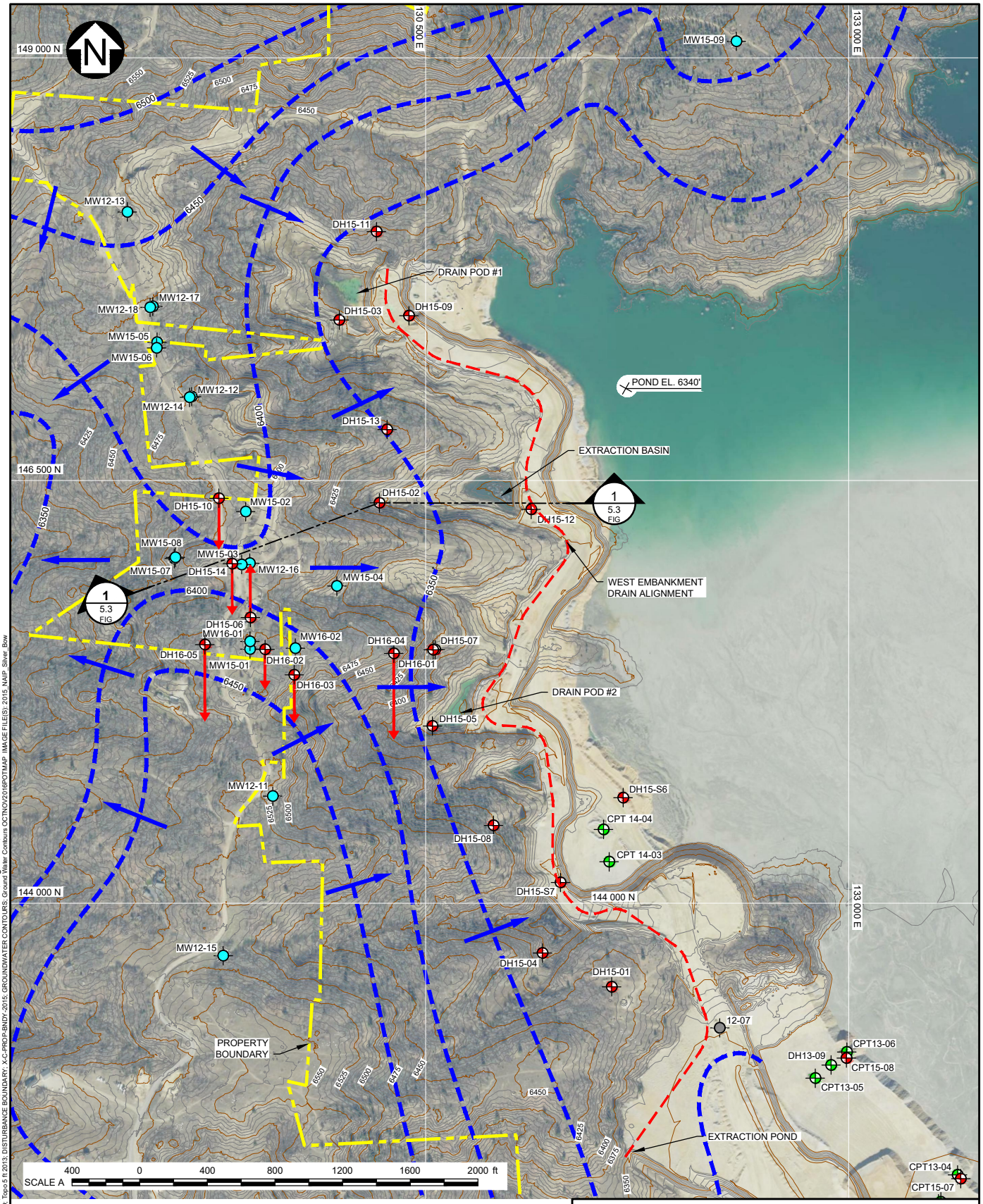


Figure 2.1 Water Level Measurements in MW12-16



LEGEND:

- WEST EMBANKMENT DRAIN
- GROUNDWATER CONTOUR
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPERTY BOUNDARY
- GEOTECHNICAL DRILLHOLE
- MONITORING WELL

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	13DEC'16	ISSUED WITH REPORT	DDF	RM	KJB

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST RIDGE GROUNDWATER CONTOURS AND FLOW DIRECTIONS

Knight Piésold CONSULTING

P/A NO. VA101-126/13

REF NO. 3

FIGURE 2.2

REV 0

3 – WEST EMBANKMENT DESCRIPTION

The West Embankment is a zoned earthfill and rockfill embankment that extends along the West Ridge in a north to south orientation and forms the western boundary of the YDTI. The West Embankment at the ultimate configuration will be approximately 7,000 ft long. ▲R1

The embankment will be constructed along the eastern side of the West Ridge at the margin of the present day tailings pond, and the ridge will act as a buttress to the downstream slope of the embankment. The position of the West Embankment in this manner (instead of closer to the catchment divide) limits the potential for impact to the groundwater system in the ridge, and also decreases the storage capacity of the YDTI. The West Embankment design incorporates multiple independent systems to contain water within the YDTI. This is a 'defense in depth' (Peck, 1990) approach with specific seepage control features to maintain hydraulic containment of YDTI contact water within the valley.

The pond elevation within the future YDTI will rise to approximately elevation 6,428 ft at the proposed embankment crest elevation of 6,450 ft. If the tailings were allowed to accumulate against the natural topography higher up, the hydraulic gradient could reverse in this area and seepage from the impoundment could migrate to the west of the property boundary. In order to counter this potential effect, the West Embankment has been designed to incorporate an upstream seepage collection drain, the West Embankment Drain (WED), and several other seepage control features to locally depress the water table on the western boundary of the impoundment, thereby maintaining the easterly hydraulic gradient within the West Ridge towards the YDTI. The design of these seepage control features is the topic of this report. ▲R1

Figure 3.1 shows the general arrangement of the West Embankment with an embankment crest of EL. 6,400 ft. Figure 3.2 shows the future configuration of the West Embankment with an embankment crest of EL. 6,450 ft. The seepage management features included in the design of the West Embankment are described below. ▲R1

Potential changes to the current West Ridge groundwater system are limited by positioning the West Embankment at the margin of the present day tailings pond, minimizing the footprint area of the YDTI to the maximum practical extent.

The West Embankment will be comprised of a free draining upstream zone (Zone U) and less permeable downstream zone (Zone D1). Zone U will be constructed in a manner that promotes infiltration of seepage into the WED. Zone D1 will be constructed to act as an impediment to drainage and horizontal migration of perched seepage flow towards the downstream face of the embankment and to encourage free draining behavior in Zone U such that seepage flows are ultimately collected in the WED. The Zone U material will be placed in a manner that is consistent with the placement methodology of the rockfill zones for the existing embankment. Zone U rockfill will be hauled and end-dumped by 240-ton haul trucks in approximately 50 ft thick horizontal lifts. Segregation will occur as the rockfill is end-dumped at the crest of each lift. The finer particles tend to accumulate near the top of the lift and the cobbles and boulders roll further down the slope and accumulate at the toe. Therefore, a segregated cobble and boulder layer typically forms along the bottom of the lift. The Zone D1 material will comprise a finer gradation rock fill compared with the Zone U material. This will allow the material to be compacted with either a vibratory roller or 240-ton haul truck traffic in thinner lifts up to a maximum thickness of 5 ft. The Zone D1 material will be

selectively sourced from the Continental Pit. Further detail relating to material specifications and construction quality control protocols is provided in the Construction Management Plan (KP, 2016c).

The WED is positioned along the upstream toe of the West Embankment and below where future tailings will be deposited. The WED hydraulically connects the entire upstream side of the West Embankment with the extraction facilities described below.

The permanent 'Extraction Pond' is positioned on the southern side of Rocky Knob at the end of the WED. Seepage collected within the WED will drain by gravity to the Extraction Pond. A pump system will be installed in the Extraction Pond to pump back the recovered flows to the YDTI.

The 'Extraction Basin' is a specially constructed high permeability feature that is positioned within a topographic depression along the West Embankment and is connected to the WED. Submersible pumping systems can be installed within the Extraction Basin if required to maintain a depressed water table in the WED by pumping back captured flows to the YDTI.

The pumping systems for the Extraction Basin and Extraction Pond are each designed to manage the full design flow of the WED, and can operate independently or collaboratively to dewater the WED and to maintain drained conditions within the West Embankment.

Two contingency 'drain pods' are positioned in topographic depressions along the West Embankment and connected to the WED. The drain pods are designed so that they can be drilled into later to install pumping systems and increase the amount of extraction pumping from the WED. These contingency features will not be utilized unless the performance of the systems in the Extraction Pond and Extraction Basin are inadequate to meet the design objectives, or if the objectives are altered by unforeseen circumstances.

The 'Secondary Seepage Collection Drains' comprise several 'finger drains' running perpendicular to the embankment alignment and connect the Zone D1 and Zone U boundary of the West Embankment to the WED. These secondary drains encourage free draining behavior in Zone U so that flows are ultimately collected in the WED.

The West Embankment design drawing package for crest EL. 6,400 ft is included as Appendix A.

YANKEE DOODLE TAILINGS IMPOUNDMENT

DISCHARGE PIPES TO TAILINGS IMPOUNDMENT (INDICATIVE ONLY) PIPE RAMP NOT SHOWN FOR CLARITY

WEST EMBANKMENT SETTING OUT LINE

SAFETY BERM

EXTRACTION BASIN

EXTRACTION POND

WEST EMBANKMENT DRAIN

DRAIN POD #1

DRAIN POD #2

MOULTON ROAD (APPROXIMATE)

132 000 E
131 000 E
130 000 E
129 000 E
128 000 E

149 000 N
148 000 N
147 000 N
146 000 N
145 000 N
144 000 N
143 000 N

125+00
120+00
115+00
105+00
100+00
95+00
90+00
85+00
80+00
75+00
70+00
65+00
60+00
55+00

EL. 6400'
EL. 6370'
EL. 6385'
EL. 6380'
EL. 6350'

3H:1V

LEGEND:

- TOPSOIL STOCKPILE LOCATION
- EL. XXXX' SPOT ELEVATION
- PROPERTY BOUNDARY
- SAFETY BERM

NOTES:

1. COORDINATE GRID IS ANACONDA MINE GRID.
2. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.

SCALE A 250 0 250 500 750 1000 1250 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	13DEC'16	ISSUED WITH REPORT	JRG	RM	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT GENERAL ARRANGEMENT 6400 EMBANKMENT CREST

Knight Piésold CONSULTING

P/A NO. VA101-126/13 | REF NO. 3

FIGURE 3.1 | REV 0

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XREF FILES(S): XC-EMBK-TOPO, XC-EMBK-WEST-6400-DESIG, XC-EMBK-WEST-6400-MRH-003, XC-EMBK-WEST-SITE-PREP, XC-PHDP-SNDY-2015, XC-WELL West Embankment Drain - OPZ, XC-DH---SLIMES, 2015 Contours - 5' West Embankment Drain - Stage 1, West Embankment Drain - Stage 2 IMAGE FILES(S):

YANKEE DOODLE TAILINGS IMPOUNDMENT

SEE DRAWING MR-C2310 FOR EAST-WEST EMBANKMENT

TAILINGS BEACHES TYPICALLY DEVELOPED ALONG THE WEST EMBANKMENT

DISCHARGE PIPES TO TAILINGS IMPOUNDMENT

WEST EMBANKMENT DRAIN

WEST EMBANKMENT SETTING OUT LINE

WEST EMBANKMENT (CREST EL. 6450 ft)

SAFETY BERM

FIELD FIT PIPE RAMP, NOT SHOWN FOR CLARITY

ACCESS CAUSEWAY TO WELL HEAD

EXTRACTION BASIN

EXTRACTION POND

DRAIN POD #1

DRAIN POD #2

SETTING OUT LINE (SOL)

448 ft

220 ft

MOULTON ROAD (APPROXIMATE)

EL. 6450'

EL. 6425'

EL. 6430'

EL. 6406'

EL. 6385'

EL. 6370'

EL. 6380'

3H:1V

2.5H:1V

LEGEND:

- PROPOSED TOPSOIL STOCKPILE
- EL. XXX ft — SPOT ELEVATION
- PROPERTY BOUNDARY
- SAFETY BERM

NOTES:

1. COORDINATE GRID IS ANACONDA MINE GRID.
2. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.

SCALE A: 250 0 250 500 750 1000 1250 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	07JUL'17	ISSUED WITH REPORT	JRG	MJC	DDF

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT GENERAL ARRANGEMENT 6450 EMBANKMENT CREST

Knight Piésold CONSULTING

P/A NO. VA101-126/13 | REF NO. 3

FIGURE 3.2 | REV 1

SAVED: M:\101\00126\13\AA\acad\FIGS\B3\0_r1, 7/7/2017 2:37:05 PM, MCOUTTS PRINTED: 7/7/2017 2:38:04 PM, FIG 3.2, MCOUTTS
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4 – WEST EMBANKMENT DRAIN DESIGN BASIS

4.1 DESIGN FLOW

The WED is designed to transmit 4,500 gallons per minute (gpm) without allowing the piezometric surface within the West Embankment to exceed the minimum groundwater elevation on the West Ridge in order to provide hydraulic confinement to preclude seepage migration through the ridge to the west. This minimum groundwater elevation was estimated to be EL. 6,379 ft as recorded periodically in monitoring well MW12-16 on the West Ridge as shown previously on Figure 2.2.

The WED design flow has been selected based on historic seepage flow rates recorded at Horseshoe Bend (HsB). A conservative assumption has been made that the WED will have adequate flow capacity to transfer the total peak seepage flows from the YDTI.

A histogram of historical flow rates recorded at HsB is provided on Figure 4.1. The design flow rate of 4,500 gpm is equal to approximately the 98th percentile of the historic flows recorded at HsB since the year 2000. Seepage flow rates during operations typically are in the range of 3,000 to 4,000 gpm. Seepage reduced to below 3,000 gpm during a temporary period of suspended operations between Years 2000 and 2003, which is representative of early closure conditions.

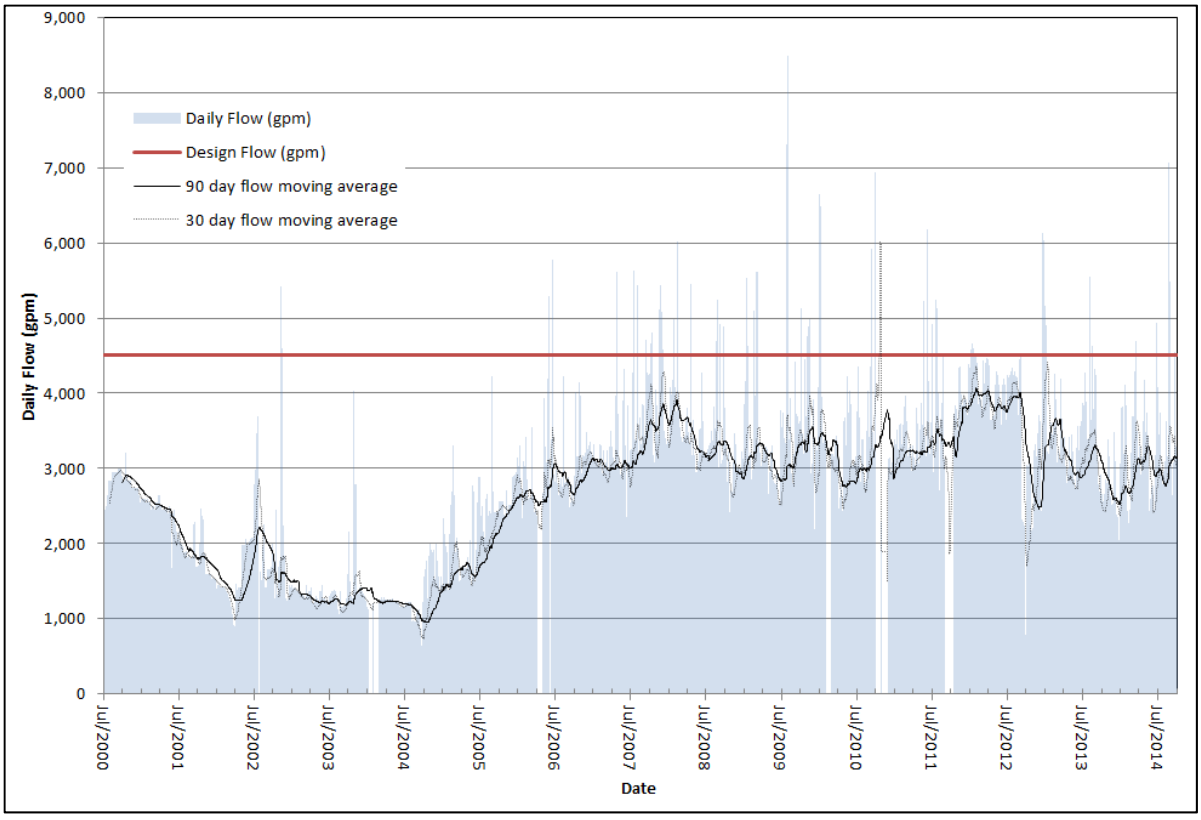


Figure 4.1 Horseshoe Bend Historical Flow Rates

4.2 CROSS SECTIONAL AREA AND FLOW VELOCITY

The design cross sectional area for the WED was determined from the design basis flow of 4,500 gpm. The design contemplates a flow-through rockfill drain with a shallow design slope following the Wilkins equation for non-Darcy flow through porous media (Wilkins, J.K., 1956). Considerations for application of the Wilkins equation to rockfill drain design were further investigated and limitations of the methods described by the Department of Civil Engineering at The University of Ottawa (V.K. Garga et al., 1990).

The Wilkins equation is formulated in metric units and is described below.

$$V_{VOIDS} = W \times m^{0.5} \times i^{1/N}$$

Where:

V_{VOIDS} = velocity of flow in the voids
W = Wilkins empirical constant = 5.243
m = hydraulic mean radius
i = effective hydraulic gradient = drain slope = 0.25%
N = empirically derived parameter between 1 and 2, typically = 1.852

The following additional equations are required to use the above Wilkins equation to determine the drain cross sectional area:

$$Q = V_{VOIDS} \times n \times A$$

$$m = \frac{e \times D}{6 \times r_e}$$

Where:

Q = design flow = 4,500 gpm = 0.284 m^3/sec
n = porosity (%) = 35% = 0.35
A = drain cross sectional area
e = void ratio, where e = n / (1 - n) = 0.538
D = D_{50} of the rock drain material = 10 inches = 0.254 m
r_e = particle surface area efficiency ratio = 1.15

Reorganizing the equations to solve for the cross sectional area of the drain:

$$A = \frac{Q}{n \times W \times m^{0.5} \times i^{1/N}}$$

The design cross sectional area of the drain was determined to be approximately 300 ft^2 (28 m^2) with a porosity of 35% to support a design flow of 4,500 gpm (284 L/s). The velocity of the flow in the voids for this drain cross section at a 0.25% grade was estimated to be 0.1 ft/s (3 cm/s). The drain can operate partially full at lower flows, with flow conveyed in the drain at a similar velocity.

5 – WEST EMBANKMENT DRAIN DESIGN DETAILS

5.1 GENERAL

The WED will consist of a subsurface aggregate drain located along the upstream toe of the West Embankment. The drain will be approximately 7,000 ft long and graded at a decline from north to south of approximately 0.25%. The drain was designed to allow it to passively drain from the northern extent of the West Embankment (from the area known as 'Bum Town') southward along the West Embankment and through a rock cut beyond the topographic boundary known as 'Rocky Knob'.

The WED will connect with and work in conjunction with other seepage management features of the West Embankment, including the Extraction Pond, Extraction Basin, contingency drain pods, and Secondary Seepage Collection Drains. The design details of the WED and associated seepage management features are described in this section of the report.

5.2 WEST EMBANKMENT DRAIN

5.2.1 Drain Cross Section Zoning

The typical drain cross section to achieve a drain rock cross sectional area of 300 ft^2 is shown on Figure 5.1. The drain rock zone will be approximately 7 ft thick and 43 ft wide on average including the sloped sides of the drain. The drain rock zone will be covered by a two stage filter to limit the ingress of tailings and rockfill fines to the drain zone. The drain will be placed over a non-woven geotextile and a bedding layer of gravel to prevent ingress of fines from the foundation and to protect geotextile from damage during placement of the angular drain rock.

The length of the drain located south of the Rocky Knob cut, within historic rockfill, will be lined with an HDPE geomembrane to contain and prevent the collected seepage from migrating downstream of the embankment. The typical drain section will be maintained through this section. ▲R1

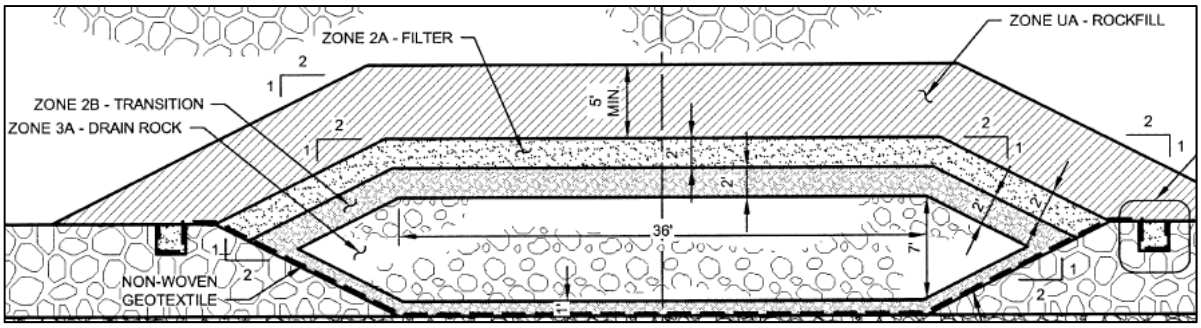


Figure 5.1 Typical Drain Cross Section

The WED fill material zones are indicated on Figure 5.1 and described below. The fill material specifications including gradation envelopes for Zone 3A, Zone 2B, and Zone 2A are included on Figure 5.2.

Zone 3A - Drain Rock

The drain zone of the WED is drain rock comprised of uniformly graded, durable, erosion resistant boulders and cobbles. The coarse limit has a maximum particle (D_{100}) size of 24 inches and the fine limit has a particle (D_{10}) size specification of 3 inches.

Zone 2B - Transition Zone

A transition zone will surround the Zone 3A - Drain Rock. The Zone 2B – Transition Zone is comprised of durable, well graded, cobbles and gravels. The Zone 2B – Transition Zone is typically 1 ft thick over the base and 2 ft thick over the top and exposed sides of the drain zone. The coarse limit has a maximum particle (D_{100}) size of 6 inches and the fine limit has a particle (D_5) size specification of ½ inch.

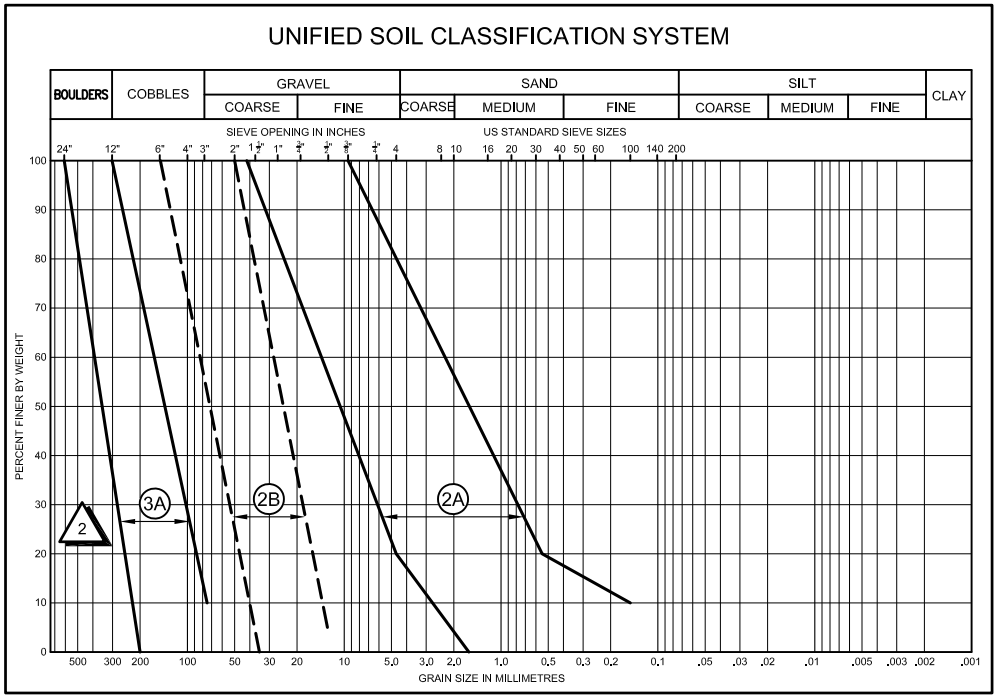
Zone 2A - Filter Zone

A filter zone will typically be placed above the transition zone to provide a filter relationship that will prevent tailings ingress into the Zone 3A – Drain Rock. The Zone 2A - Filter Zone consists of a well graded sand and gravel. The filter zone is designed to be free draining to maintain recharge of the drain and to promote the development of a well-drained tailings mass above the WED. The Zone 2A – Filter Zone has been designed in general accordance with the US Natural Resource Conservation Service (NRCS) filter design requirements (NRCS, 1994).

Zone UA – Protective Cap

The WED will be protected from construction damage during the placement of the overlying 50 ft lifts of Zone U Rockfill. This will be achieved by the placement of a select zone of mined rockfill specified as Zone UA – Protective Cap material. Zone UA – Protective Cap will be placed in a 5 ft thick lift. It will also be placed as a protective layer over the secondary seepage collection drains.

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE 2A - FILTER / ZONE 2B - TRANSITION / ZONE 3A - DRAIN ROCK

ZONE 2A - FILTER

SIZE	GRADATION LIMITS ZONE 2A - FILTER	
U.S. Std Sieve (ASTM E-11 04) / Inches	FINE LIMIT	COARSE LIMIT
1 & 3/4"		100
1 & 1/2"		96
1"		83
3/4"		71
1/2"		57
3/8"	100	46
1/4"	88	31
#4	80	20
#8	61	7
#10	57	4
#12	52	0
#16	42	
#20	33	
#30	22	
#40	18	
#50	15	
#60	14	
#100	10	

ZONE 2B - TRANSITION

SIZE	GRADATION LIMITS ZONE 2B - TRANSITION	
U.S. Std Sieve (ASTM E-11 04) / Inches	FINE LIMIT	COARSE LIMIT
6"		100
4"		72
3"		55
2"	100	26
1 & 3/4"	93	19
1 & 1/2"	79	5
1"	55	0
3/4"	32	
1/2"	5	

ZONE 3A - DRAIN ROCK 2

SIZE	GRADATION LIMITS ZONE 3A - DRAIN ROCK	
U.S. Std Sieve (ASTM E-11 04) / Inches	FINE LIMITS	COARSE LIMITS
24"		100
20"		82
16"		62
12"	100	37
11"	94	29
8"	73	0
6"	55	
4"	29	
3"	10	

NOTES:

1. THE MATERIAL SPECIFICATIONS PROVIDED IN THIS FIGURE ARE BASED ON THE MATERIAL SPECIFICATIONS PRESENTED IN DRAWING MR-C0011_r4. WHERE THERE IS A DISCREPANCY BETWEEN THE FIGURE AND THE DRAWING, THE DRAWING SHALL GOVERN. THIS FIGURE SHOULD BE CHECKED TO CONFIRM THAT IT REFLECTS THE CURRENT REVISION OF THE MATERIAL SPECIFICATIONS DRAWING (MR-C0011) PRIOR TO MATERIAL PRODUCTION.
2. SIEVE SPECIFICATION AS PER ASTM E11.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
2	02NOV'16	ZONE 3A - DRAIN ROCK GRADATION UPDATED	JRG	RM	DDF
1	17MAY'16	ZONE 3A - DRAIN ROCK GRADATION UPDATED	JRG	KJM	RSS
0	01DEC'15	ISSUED FOR INFORMATION	JRG	ABN	ACR

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT DRAIN
FILL MATERIAL SPECIFICATIONS

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P/A NO. VA101-126/13 | REF NO. 3

FIGURE 5.2 | REV 2

5.2.2 Hydraulic Grade Lines

Two potential conditions in the filter zone above the drain could have the potential to impact the inflow into the WED. The first condition is that the filter zone is free draining and encourages drained conditions in the overlying fill materials. This condition is consistent with drained conditions observed within the rockfill embankments in other areas of the YDTI, and would not inhibit drain function. The second condition considered is if the filter zone functioned in a manner that was not free draining and then limited flow into the drain. This condition would generate hydrostatic pore pressures (and an increase in hydraulic head) above the filter zone in order to recharge the drain.

The second condition is the critical condition requiring further analysis with respect to seepage control at the groundwater low on the West Ridge. The minimum groundwater elevation of the West Ridge was measured in MW12-16. There have been seasonal fluctuations; however, the minimum observed water elevation was 6,379 ft as described previously. A conceptual cross section of this critical area is included as Figure 5.3.

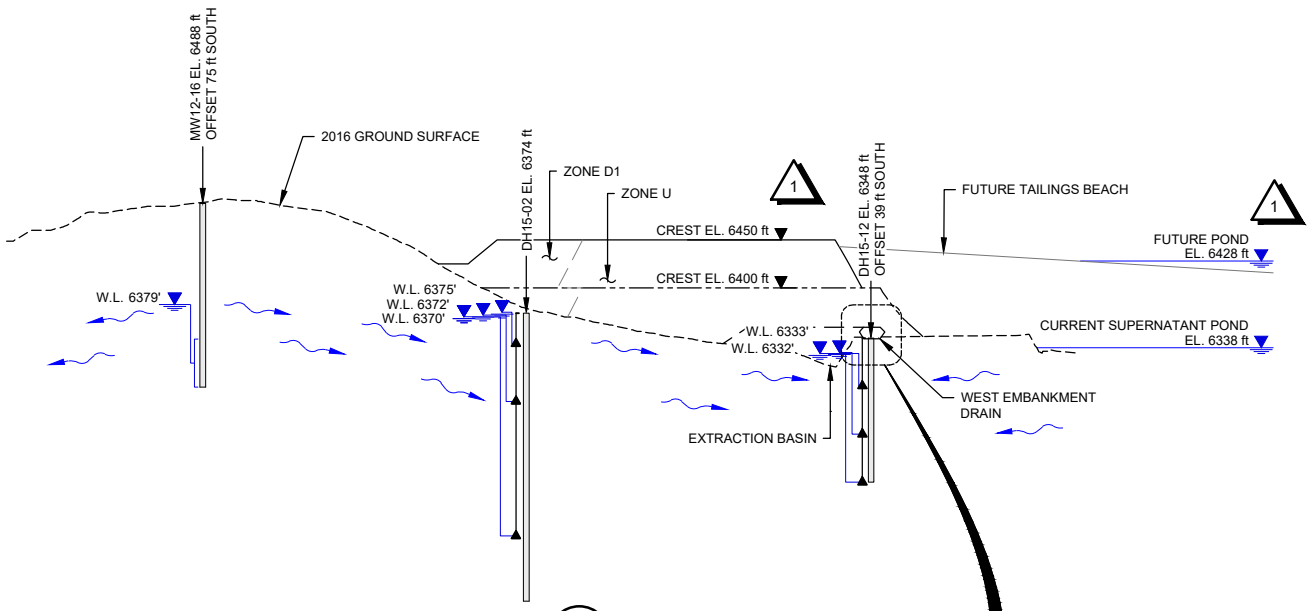
The elevation of the drain crown in this section is approximately 6,362 ft, and represents the top of the filter zone. The difference in elevation between the lowest recorded water level in MW12-16 and the drain crown is 17 ft. An increase in hydraulic head above the drain crown of 17 ft in this area could have the potential to impact the hydraulic gradient of the West Ridge piezometric surface. A 17 ft increase in hydrostatic head above the drain is defined as the critical maximum ($\Delta H_{CRITICAL}$) above which hydraulic confinement is potentially impacted.

The design adopts a lesser allowable increase in hydrostatic head ($\Delta H_{ALLOWABLE}$) to provide an additional safety factor for design to manage uncertainty associated with the long-term groundwater levels in the West Ridge. A 10 ft increase in hydrostatic head above the drain crown is defined as the allowable maximum for design as indicated on Figure 5.3.

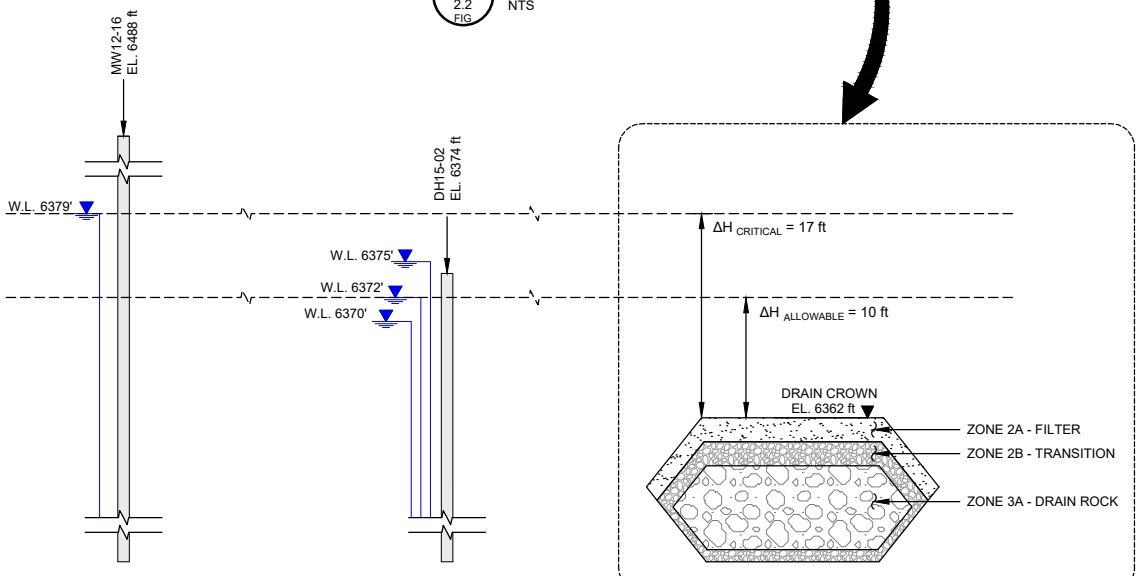
A limiting value of hydraulic conductivity (permeability) of the filter zone was determined to support the design by establishing a critical and measurable control to achieve the maximum allowable hydraulic head at the design flow rate. The hydraulic conductivity establishes a minimum permeability of the filter zone for reliable drain recharge without the potential for adverse impacts to the piezometric surface within the embankment and West Ridge. The minimum allowable permeability ($k_{MIN.}$) for the filter zone was determined to be 2×10^{-04} cm/s (~8×10^{-06} ft/s).

The allowable hydraulic grade line (effective hydraulic gradients) for the design flow of 4,500 gpm and a filter zone permeability of 2×10^{-04} cm/s has been superimposed onto the WED profile on Figure 5.4 to demonstrate the predicted piezometric surface along the drain alignment relative to the water levels in the West Ridge. The figure demonstrates that the allowable hydraulic grade line is maintained below the minimum groundwater elevation in the West Ridge. The hydraulic grade line represents a conservative operating scenario when there is gravity flow to the Extraction Pond only, with no pumping taking place from the Extraction Basin.

The allowable hydraulic grade line is essentially a 10 ft increase in hydraulic head above the drain crown for the entire length of the drain. The actual hydrostatic pressure on the filter zone and hydraulic head above the drain crown, if any, will depend on the actual hydraulic conductivity (k) of the filter zone in any area. There is expected to be limited hydrostatic pressure above the drain at the design flow for $k = 10^{-03}$ cm/s and negligible hydrostatic pressure for $k = 10^{-02}$ cm/s with free draining conditions governing.



1 / 2.2 FIG — **SECTION** NTS



A / - FIG — **DETAIL** NTS

LEGEND:

- ▲ VIBRATING WIRE PIEZOMETER (VWP)
- WATER LEVEL (W.L.)
- GROUNDWATER FLOW DIRECTION

NOTES:

1. ELEVATIONS ARE IN ANACONDA MINE GRID.
2. GROUNDWATER LEVEL AT VWP SENSORS REPORTED ON JANUARY 18, 2016.
3. GROUNDWATER LEVEL AT MW12-16 IS THE LOWEST MEASURED LEVEL FROM JULY 2015.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	07JUL'17	ISSUED WITH REPORT	DDF	MJC	KJB

MONTANA RESOURCES, LLP

YANKEE DOODLE TALINGS IMPOUNDMENT

WEST EMBANKMENT DRAIN
ALLOWABLE HYDRAULIC HEAD
CONCEPTUAL SECTION AND DETAIL

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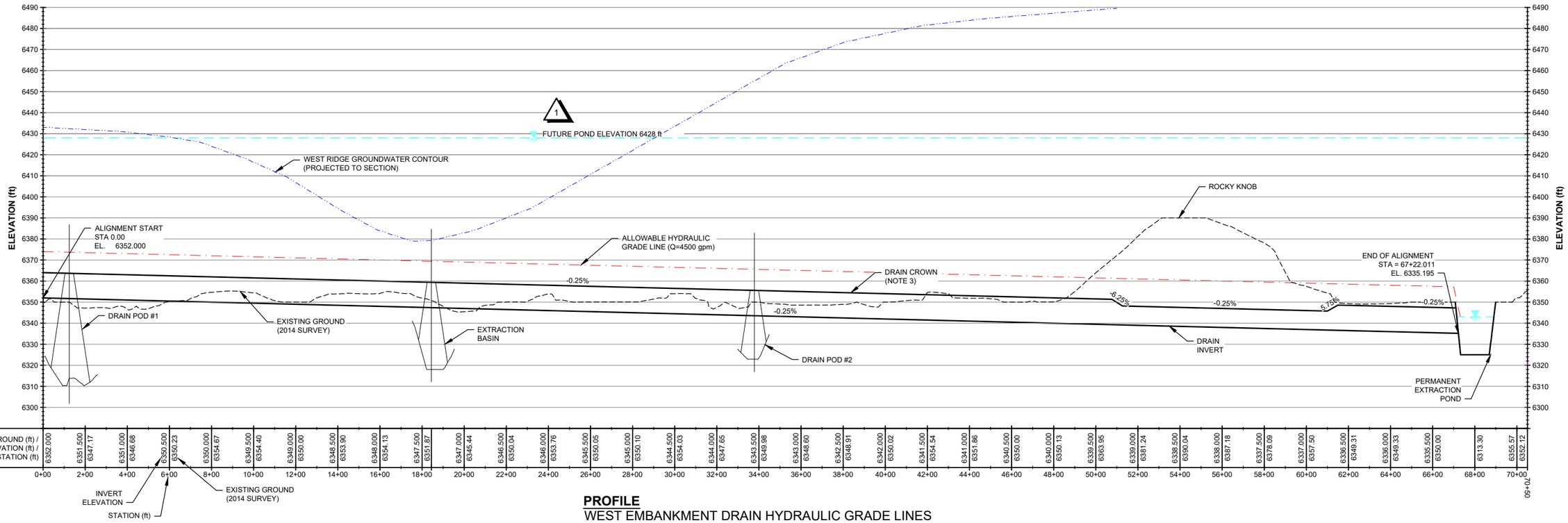
P/A NO. VA101-126/13 | REF NO. 3

FIGURE 5.3 | REV 1



PROFILE
WEST EMBANKMENT DRAIN HYDRAULIC GRADE LINES
(PUMPING FROM EXTRACTION POND ONLY)

HORIZONTAL SCALE A
VERTICAL SCALE B

SCALE B: 25 0 25 50 75 100 125 ft

SCALE A: 250 0 250 500 750 1000 1250 ft

LEGEND:

- WEST RIDGE GROUNDWATER CONTOUR
- HYDRAULIC GRADE LINES
- GROUND (2014 SURVEY)
- WEST EMBANKMENT DRAIN / EXTRACTION BASIN / DRAIN POD CROWN / INVERT
- POND FUTURE ELEVATION

NOTES:

1. COORDINATE GRID IS ANACONDA MINE GRID.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. THE DRAIN CROWN, EXTRACTION BASIN, AND DRAIN POD SURFACES REPRESENT THE FINAL GRADE OF THE ZONE 2A - FILTER. THE ZONE UA ROCKFILL HAS BEEN OMITTED FOR CLARITY.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	07JUL'17	ISSUED WITH REPORT	DDF	MJC	KJB

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT DRAIN
ALLOWABLE HYDRAULIC GRADE LINE
PROFILE

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P/A NO. VA101-126/13 | REF NO. 3

FIGURE 5.4 | REV 1

5.2.3 Design Flow Capacity Sensitivity

The flow velocity in the drain is controlled primarily by the hydraulic gradient (slope) of the drain and material characteristics of the drain material. The slope of the drain is fixed by topographical limitations and groundwater piezometric conditions described previously. A sensitivity analysis was prepared to evaluate the sensitivity of the flow capacity of the drain to certain drain material characteristics assuming the design cross sectional area of 300 ft^2.

The flow capacity of the WED is sensitive to the gradation and porosity of the rockfill aggregate comprising the drain zone. The most suitable and appropriate way to meet the drain design flow requirements is to control the size and quality of the aggregate within the drain.

Considering the equations presented in Section 4.2, the porosity of the drain effects both the determination of hydraulic mean radius used to determine the velocity in the voids and the calculation of flow within the drain. The flow capacity of the drain will increase and decrease with the porosity of the drain. The porosity of the drain material was estimated to be 35% for the specification of the drain cross section and fill materials. A porosity of 35% is consistent with typical values for rock armouring and riprap with a ratio between the D_{85} and D_{15} particle sizes of greater than 2 (Look, B.G, 2007), which is consistent with the fill material specifications on Figure 5.2. Porosity was varied between 25% and 45% for the sensitivity analysis presented on Figure 5.5.

The D_{50} particle size also influences the flow capacity of the drain through the determination of the hydraulic mean radius. The fill material specifications presented on Figure 5.2 include an acceptable D_{50} range between 14 inches for the coarse limit and 6 inches for the fine limit with a median value of 10 inches. The median size of 10 inches was used for the design of the rock drain (blue line below) with a porosity of 35% as described above. The flow capacity of the drain for a porosity of 35% could range between 3,500 and 5,300 gpm depending on the actual D_{50} particle size.

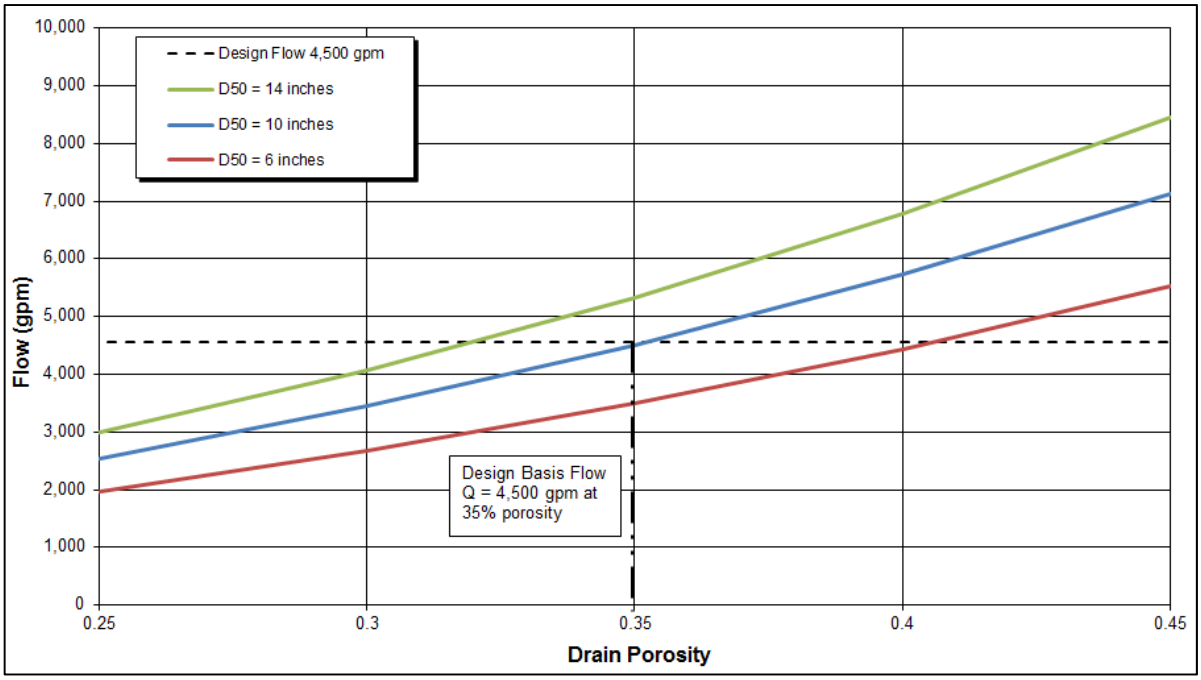

Figure 5.5 Flow Capacity Sensitivity of the WED

The flow capacity in the drain could be between 2,000 and 3,000 gpm even if the porosity of the drain was as low as 25%, and the flow capacity could be substantially higher if the actual porosity is greater than the estimate of 35%.

5.2.4 Drain Construction Sequencing

The WED will be constructed in two stages. Stage 1 of the drain construction will involve the construction of approximately 4,900 ft of the drain from start of the drain to a temporary extraction pond located on the northern side of Rocky Knob. Stage 2 will comprise the completion of the drain construction from the temporary extraction pond to the permanent Extraction Pond south of Rocky Knob. Stage 2 of the drain construction will involve a rock cut through Rocky Knob and will be approximately 2,100 ft in length. Staging the drain construction will assist with temporary water management during excavation and placement of the drain. Stage 2 of the WED will allow passive drainage by gravity over the long-term in closure if this is desirable, or the collected flows at the Extraction Pond can continue to be pumped to the YDTI. A memorandum describing the planned construction sequencing for the WED in further detail is provided in Appendix B4. ▲R1 ▲R1

5.3 EXTRACTION POND

An Extraction Pond will be constructed on the southern side of Rocky Knob, at the toe of the East-West Embankment. The Extraction Pond will form the gravity outlet of the WED. The Extraction Pond will be excavated partially in native material, and partially in rockfill already placed for the East-West Embankment. Seepage collected within the WED will gravity drain back to the Extraction Pond. A pump system will be installed in the pond to redirect the recovered seepage back to the YDTI.

Detailed design of the Extraction Pond is in progress and only conceptual drawings are available at this time.

5.3.1 Extraction Pond Design Criteria

The pond will be designed to store 12 hours of the design seepage inflow rate of 4,500 gpm (16,100 yd^3 of seepage volume), plus the 1 in 10 Year 24-hour rainfall event and snowmelt of the pond area. Snowmelt was estimated based on information presented in the Design Basis Report (KP, 2016d). Diversion berms or ditches will surround the pond to divert non-contact water. The total additional storage volume of the pond is approximately 17,900 yd^3. ▲R1

The pond will include a spillway to pass the design seepage rate of 4,500 gpm, plus the 1 in 200 Year 24-hour rainfall event including snowmelt. The spillway will consist of a rectangular weir inlet and channel to release the flows to beyond the pond in emergency conditions.

5.3.2 Pumping System

The seepage water from the WED collected within the pond will be managed and pumped back to the YDTI using two independent pumping units. Each pump will have a capacity that exceeds 2,250 gpm (half of the design flow rate) and will be connected to a stainless steel suction line housed within a screened HDPE well. The suction lines of the pumps will be located within a depressed zone of the pond to allow for full drainage, if required. The HDPE and stainless steel components will be specified to transport the potentially acidic seepage water.

The configuration of the pump and pipeline system will be further developed in future design packages.

5.4 EXTRACTION BASIN

5.4.1 Location and Purpose

An Extraction Basin will be constructed adjacent to the alignment of the WED. The Extraction Basin is located in a topographic low at station 18+68 along the WED. This area generally coincides with the area of the locally depressed water table on the West Ridge identified in MW12-16.

The Extraction Basin will be constructed from Zone 3A – Drain Rock backfilled around two wells that will extend to the crest of the West Embankment. A submersible pump can be installed in each well. This will allow seepage to be extracted from the basin and returned to the YDTI.

The WED was designed to operate with continuous pumping at the Extraction Pond at a design flow rate of 4,500 gpm. However, the Extraction Basin was included in the design to have an operations ready alternative pumping option for several reasons:

- The Extraction Basin doubles the total installed extraction capacity for the drain to 9,000 gpm when combined with the pumping system at the Extraction Pond.
- The Extraction Basin can operate separately or collaboratively with the Extraction Pond, and provides an alternative pumping location if maintenance is required for the Extraction Pond.
- Pumping from the Extraction Basin can reduce hydraulic pressure in this critical area of the West Embankment, if hydraulic head is approaching the maximum allowable hydraulic head.

5.4.2 Pumping System

The Extraction Basin design includes two submersible pumps, and each pump will have a capacity that exceeds 2,250 gpm (half of the design flow rate). The submersible pumps connect to a stainless steel suction line housed within a screened HDPE DR11 well extending from the Extraction Basin base to the embankment crest. The system includes a pressure transducer and a combination air release valve and flow meter. The submersible pump systems are designed to be installed at the 6,400 ft crest elevation and progressively raised to match the embankment crest elevation as the embankment construction is completed. Seepage pumped from the Extraction Basin will be pumped back to the YDTI via HDPE discharge pipelines. ▲R1

5.5 CONTINGENCY DRAIN PODS

The WED includes two contingency drain pods (Drain Pods 1 and 2). The purpose of the drain pods is to provide the capacity to further control the piezometric surface within the West Embankment in the unlikely event of a blockage or flow constriction within the WED. Blocking of the drain is considered unlikely based on the observed performance of aggregate testing described in Section 6.

The drain pods are located in topographic lows along the WED alignment and are hydraulically connected to the WED in a similar manner as the Extraction Basin. The drain pods are constructed from Zone 3A – Drain Rock. Pumping from the drain pods will be achieved, if necessary, by drilling a series of 12-inch diameter drillholes from the West Embankment crest to the base of the drain pod. A screened well with a submersible pump system would be installed in each drillhole. Seepage entering the drain pods would be extracted in a manner similar to the Extraction Basin and conveyed into the YDTI. A conceptual design for the contingency pump wells is provided in Appendix B5.

5.6 SECONDARY SEEPAGE COLLECTION DRAINS

A series of secondary finger drains comprised of Zone 2B – Transition material surrounded by a non-woven geotextile fabric will be constructed in the topographic lows of the West Embankment footprint. The purpose of the secondary seepage collection drains is to direct any seepage that accumulates at the interface between Zone D1 and Zone U to the WED.

6 – AGGREGATE SPECIFICATIONS AND SOURCES

Durability and mineralogical testing was undertaken at the direction of KP to assess the suitability of a number of aggregate sources for use in the construction of the WED. The following sources were assessed:

- Pipestone Quarry.
- Bonneville Quarry.
- Mungas Contracting LLC waste stockpile.

The testing undertaken included Los Angeles (LA) Abrasion testing and chemical compatibility analysis using acidic seepage water obtained from HsB. LA Abrasion testing was undertaken on split samples of the aggregates before and after saturation of the samples in the seepage water. The testing was intended to model the worst case chemical environment that would be encountered within the WED in order to assess the potential for degradation of the aggregates following long-term exposure to acidic conditions. X-Ray Diffraction (XRD) testing was also undertaken to assess the mineralogy of the aggregate sources.

A memorandum detailing the prescribed testing program is provided in Appendix B1. The results of the testing are summarized as follows:

- The XRD testing indicates that the Mungas samples have approximately 10% Calcite. The calcite may react with the acidic seepage water and dissolve over time changing its characteristics and also potentially resulting in precipitation of solids and potential plugging.
- The results of the LA Abrasion testing showed reasonable losses of approximately 27% to 30% for the Mungas and Bonneville samples and losses around 12% for the Pipestone material. The data did not show significantly different losses depending on whether the sample was exposed to the acidic seepage water or not.

A memorandum detailing the results and conclusions of the aggregate source assessment is provided in Appendix B2. KP provided the following recommendations regarding the suitability of the assessed borrow sources:

- The ‘Pipestone’ borrow source was considered the preferred borrow source for the WED materials. The Pipestone borrow source was considered a suitable source for the Zone 2A - Filter, Zone 2B - Transition, and Zone 3A – Drain Rock.
- The ‘Bonneville’ borrow source was considered a suitable source for the Zone 3A – Drain Rock only.
- The ‘Mungas’ borrow source was not considered an acceptable borrow source for either the Zone 2A – Filter, Zone 2B – Transition or Zone 3A – Drain Rock due to the high calcium carbonate content of the material.

MR produced aggregate from the Pipestone Quarry following the recommendations provided by KP. MR completed a series of control gradation tests prior to hauling the material to the mine site. The material gradations were accepted by KP and deemed to be compliant with the gradation specifications. A memorandum detailing acceptance of the Pipestone material is provided in Appendix B3.

7 – REFERENCES

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Knight Piésold Ltd. (KP, 2015a). *West Embankment Drain Materials Laboratory Durability Testing*, KP Reference No. VA15-02953, August 7, 2015

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8 – CERTIFICATION

This report was prepared and reviewed by the undersigned.

Prepared: _____

Daniel Fontaine, P.Eng.
Senior Civil Engineer | Associate

Reviewed: _____

Ken Brouwer, P.Eng.
President

Approval that this document adheres to Knight Piésold Quality Systems: KJB

APPENDIX A

SELECT DESIGN DRAWINGS

(Pages A-1 to A-38)

Knight Piésold CONSULTING

TABLE A.1

MONTANA RESOURCES, LLP
YANKEE DOODLE TAILINGS IMPOUNDMENT

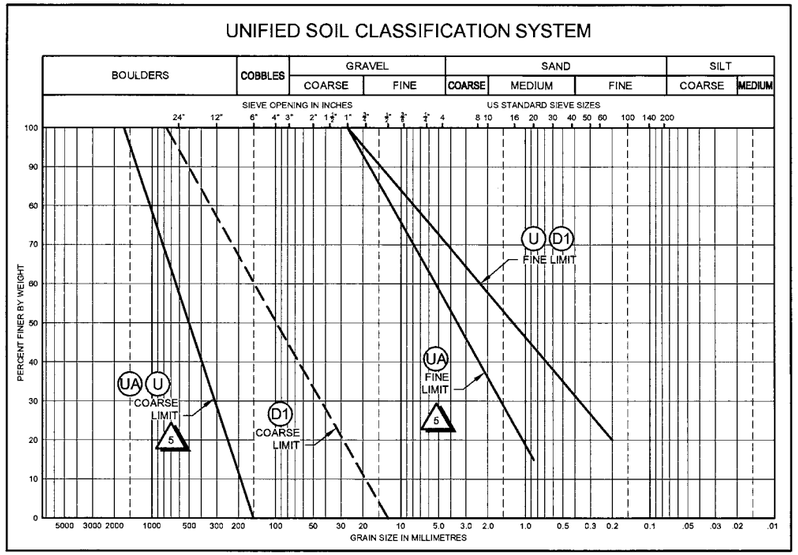
WEST EMBANKMENT DRAIN DESIGN REPORT
DRAWING LIST

Print: Dec/13/2016 09:34:19

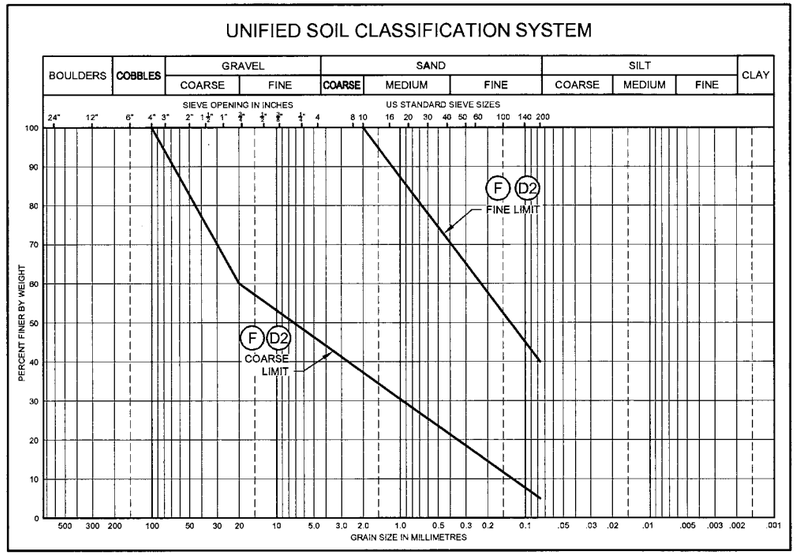
Drawing Number	Rev.	Revision Date	Drawing Status	Drawing Title
MR-C0011	5	13-Dec-16	Issued for Construction	Fill Material Specifications
MR-C1100	4	25-Nov-16	Issued for Construction	West Embankment - 6400 Crest - Site Preparation Plan
MR-C1110	3	25-Nov-16	Issued for Construction	West Embankment - 6400 Crest - Plan
MR-C1111	1	23-Mar-16	Issued for Construction	West Embankment - 6400 Crest - Setting Out Details
MR-C1130	1	23-Mar-16	Issued for Construction	West Embankment - 6400 Crest - Sections - Sheet 1
MR-C1131	3	25-Nov-16	Issued for Construction	West Embankment - 6400 Crest - Sections - Sheet 2
MR-C1132	2	25-Nov-16	Issued for Construction	West Embankment - 6400 Crest - Sections - Sheet 3
MR-C1205	F	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Plan and Profile
MR-C1206	2	25-Nov-16	Issued for Construction	West Embankment 6400 Crest - Secondary Seepage Collection Drains - Plan
MR-C1208	2	25-Nov-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Plan and Profile Stage 1
MR-C1209	B	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Plan and Profile Stage 2
MR-C1210	0	23-Mar-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Work Plan - Sta 0+00 to 10+00
MR-C1211	1	25-Nov-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Work Plan - Sta 10+00 to 20+25
MR-C1212	0	23-Mar-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Work Plan - Sta 20+25 to 30+50
MR-C1213	1	14-Jun-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Work Plan - Sta 30+50 to 40+75
MR-C1214	1	20-Jun-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Work Plan - Sta 40+75 to 51+00
MR-C1220	A	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Work Plan Stage 2 - Sta 48+36 to 55+00
MR-C1221	A	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Work Plan Stage 2 - Sta 55+00 to 62+00
MR-C1222	A	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Work Plan Stage 2 - Sta 62+00 to 67+22
MR-C1233	0	23-Mar-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Typical Sections - Stage 1
MR-C1234	B	25-Nov-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Typical Sections - Stage 2
MR-C1235	0	23-Mar-16	Issued for Construction	West Embankment 6400 Crest - Secondary Seepage Collection Drains - Sections and Details
MR-C1240	2	22-Apr-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Drain Pod #1 - Plan and Sections
MR-C1245	2	20-Oct-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Plan and Section
MR-C1246	3	20-Oct-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Well Section
MR-C1250	2	14-Jun-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Drain Pod #2 - Plan and Sections
MR-C1270	0	6-May-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Pump Base Concrete Outline and Reinforcement
MR-C1280	1	20-Jun-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Temporary Extraction Pond - Plans and Sections
MR-C1290	A	24-Mar-16	For Information Only	West Embankment 6400 Crest - West Embankment Drain - Permanent Exctraction Pond - Plan and Sections
MR-M1712	0	6-May-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Typical Discharge Assembly
MR-M1713	2	21-Nov-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Typical Intake Details
MR-M1714	0	6-May-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Typical Connections and Details
MR-M1715	0	13-May-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Typical Connections and Details
MR-M1716	0	6-May-16	Issued for Construction	West Embankment 6400 Crest - West Embankment Drain - Extraction Basin - Lifting Lug Details
MR-C1910	4	25-Nov-16	Issued for Construction	West Embankment 6400 Crest - Instrumentation Plan
MR-C1930	1	22-Apr-16	Issued for Construction	West Embankment 6400 Crest - Geotechnical Instrumentation - Typical Details
MR-C1931	B	24-Mar-16	For Information Only	West Embankment - Geotechnical Instrumentation - Drillhole Installation - Details

\\KPL\VA-Prj$\1\01\00126\13\A\Report\3 - West Embankment Drain Design Report\Rev A\Appendix A\[Table A.1 - Drawing List.xlsx]ALL DWGS

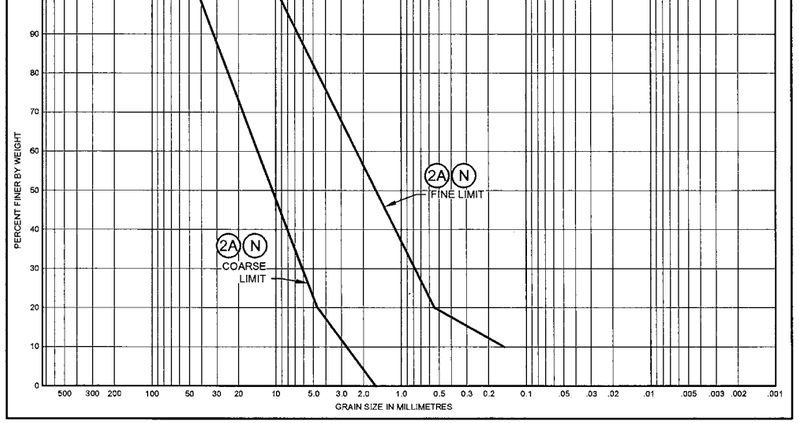
REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	13DEC'16	ISSUED WITH REPORT VA101-126/13-3	DDF	KJB



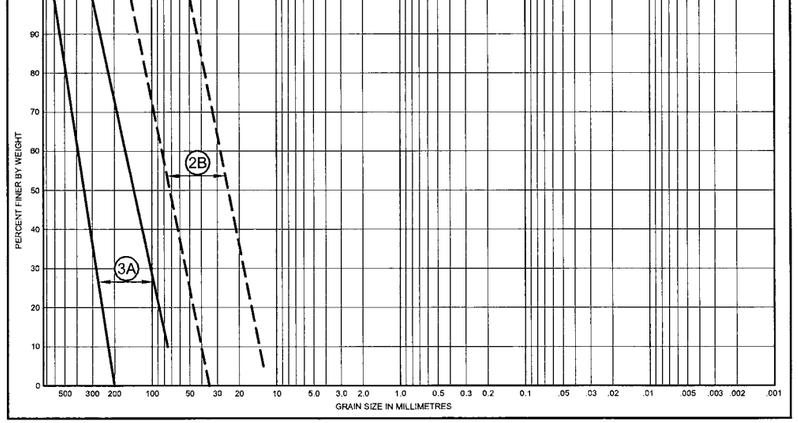
ZONE U / ZONE D1 / ZONE UA



ZONE F / ZONE D2



ZONE N - INSTRUMENTATION BEDDING / ZONE 2A - FILTER



ZONE 2B - TRANSITION / ZONE 3A - DRAIN ROCK

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

ZONE AND MATERIAL TYPE	PLACING AND COMPACTION REQUIREMENTS
ZONE F - UPSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF ALLUVIUM, FREE OF LOAM, TREE STUMPS, ROOTS, AND OTHER DELETERIOUS OR ORGANIC MATTER. THE MATERIAL SHALL BE END-DUMPED. THE MAXIMUM END DUMPED HEIGHT SHALL BE A MAXIMUM OF 50 ft. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE U - UPSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE END DUMPED IN 50 ft LIFTS . FILL MATERIAL WILL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE UA - PROTECTIVE CAP	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN 5 ft. LIFTS. FILL MATERIAL WILL BE DOZER COMPACTED. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE D1 - DOWNSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY-WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN MAXIMUM 3 ft LIFTS PRIOR TO COMPACTION. MATERIAL SHALL HAVE A RELATIVELY LOW ACID GENERATING POTENTIAL. MATERIAL SHALL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. WHERE THE WORKING AREA DOES NOT PERMIT THE USE OF THE MINE HAUL FLEET COMPACTION SHALL CONSIST OF A MINIMUM OF 8 PASSES OF A 12.5 METRIC TON (DRUM WEIGHT) SMOOTH DRUM VIBRATORY ROLLER, UNLESS OTHERWISE NOTED. THE METHOD SPECIFICATION SHALL BE VERIFIED BY COMPLETING A TEST FILL AT THE DIRECTION OF THE ENGINEER. THE FILL SHALL BE PLACED IN A MANNER TO ENSURE NO SEGREGATION. MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE D2 - DOWNSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF NON-ACID GENERATING ALLUVIUM FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN 3 ft LIFTS WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER
ZONE N - INSTRUMENTATION BEDDING	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. BEDDING TO BE PLACED AND SPREAD IN 1' THICK LIFTS. NOMINAL COMPACTION.
ZONE 2A - FILTER MATERIAL	FILTER MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. FILTER MATERIAL TO BE PLACED AND SPREAD IN 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER.
ZONE 2B - TRANSITION MATERIAL	TRANSITION MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. TRANSITION MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFICED SMOOTH DRUM VIBRATORY ROLLER
ZONE 3A - DRAIN ROCK	DRAIN ROCK SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED ROCK FILL. DRAIN ROCK TO BE PLACED AND SPREAD IN 3' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER OR AS DIRECTED BY THE ENGINEER. (5)

NOTES:

1. THESE MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS APPLY TO ALL COMPONENTS OF THE WORKS EXCEPT WHERE NOTED OTHERWISE.
2. THE MAXIMUM DIMENSION OF ANY PARTICLE SHALL NOT EXCEED 2/3 OF THE MAXIMUM LIFT THICKNESS.
3. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN. QUALITY CONTROL AND RECORD TESTING SHALL BE UNDERTAKEN AT THE FREQUENCIES IDENTIFIED IN THE CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR IT'S CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

ISSUED FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
5	13DEC'16	ZONE UA GRADATION LIMITS UPDATED	ACR	RM	DDF	KJB
4	20JUN'16	ZONE 3A GRADATION LIMITS UPDATED	ACR	RM	DDF	KJB
3	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB
2	17DEC'15	ISSUED FOR CONSTRUCTION	ACR	ABN	KJB	KJB
1	20NOV'15	ISSUED FOR CONSTRUCTION	ACR	ABN	KJB	KJB
0	21OCT'15	ISSUED FOR CONSTRUCTION	ACR	ELG/ABN	KJB	KJB

REVISIONS

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REVISIONS

KEN J. BROUWER 10020 PE Dec 14, 2016 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

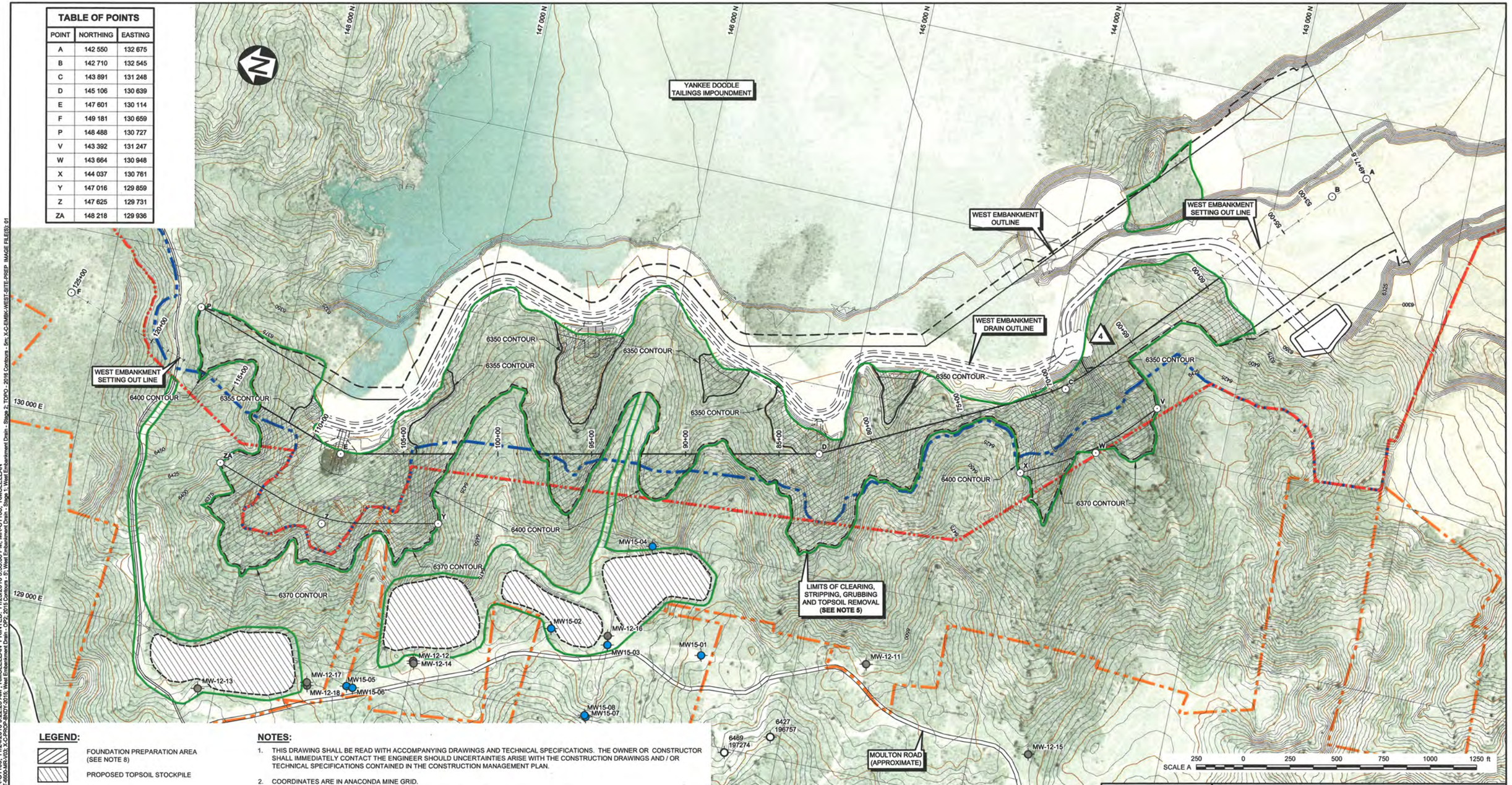
MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

FILL MATERIAL SPECIFICATIONS

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C0011	5

TABLE OF POINTS		
POINT	NORTHING	EASTING
A	142 550	132 675
B	142 710	132 545
C	143 891	131 248
D	145 106	130 639
E	147 601	130 114
F	149 181	130 659
P	148 488	130 727
V	143 392	131 247
W	143 664	130 948
X	144 037	130 761
Y	147 016	129 859
Z	147 625	129 731
ZA	148 218	129 936



LEGEND:

- FOUNDATION PREPARATION AREA (SEE NOTE 8)
- PROPOSED TOPSOIL STOCKPILE
- 646189 PRIVATE WELL
- MW-12-18 2012 MONITORING WELL
- MW15-02 2015 MONITORING WELL
- PROPERTY BOUNDARY
- PERMIT BOUNDARY
- DISTURBANCE BOUNDARY
- LIMITS OF CLEARING, STRIPPING, GRUBBING AND TOPSOIL REMOVAL

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. THE OWNER OR CONSTRUCTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATES ARE IN ANACONDA MINE GRID.
3. CONTOUR DATA IS BASED ON SURVEY INFORMATION PROVIDED BY MONTANA RESOURCES, LLP.
4. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
5. LIMITS OF CLEARING, STRIPPING, GRUBBING AND TOPSOIL REMOVAL TO BE EXTENDED A NOMINAL 10 FEET OUTSIDE THE NOTED LIMIT.
6. TOPSOIL STOCKPILE FOOTPRINT AREAS REQUIRE NO TOPSOIL REMOVAL.
7. THE PREPARED FOUNDATION SHALL BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO FILL PLACEMENT. EMBANKMENT FILL SHALL BE KEYED INTO PREPARED SLOPE. UNSUITABLE MATERIALS IDENTIFIED AT THIS TIME SHALL BE CORRECTED. CORRECTIVE PROCEDURES SHALL BE DEPENDENT UPON CONDITIONS ENCOUNTERED AND MAY INCLUDE UNDERCUTTING OF UNSUITABLE MATERIALS AND REPLACEMENT WITH SUITABLE COMPACTED FILL. THE ENGINEER SHALL BE NOTIFIED IF SOFT OR UNSUITABLE MATERIALS ARE ENCOUNTERED IN THE EXPOSED SUBGRADE.
8. FOUNDATION PREPARATION REQUIRING THE REMOVAL OF NOMINAL 3 FEET OF OVERBURDEN AND / OR WEATHERED BEDROCK. ULTIMATE FOUNDATION PREPARATION REQUIREMENTS TO BE AT THE ENGINEERS DIRECTION FOLLOWING FIELD SUBGRADE INSPECTION.

DRG. NO.	DESCRIPTION
-	-

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
4	25NOV'16	WEST EMBANKMENT DRAIN UPDATED	JRG	ABN/RM	DDF	KJB
3	20JUN'16	WEST EMBANKMENT DRAIN UPDATED	JRG	ABN/RM	DDF	KJB
2	23MAR'16	WEST EMBANKMENT DRAIN UPDATED	ACR	ABN	DDF	KJB
1	05OCT'15	ISSUED FOR CONSTRUCTION	ACR	ABN	ACR	KJB
0	04SEP'15	ISSUED FOR CONSTRUCTION	RSM	SIR/ABN	DDF	KJB

REVISIONS

ISSUED FOR CONSTRUCTION

KEN J. BROUWER 10020 PE REGISTERED PROFESSIONAL ENGINEER
NOV 25, 2016

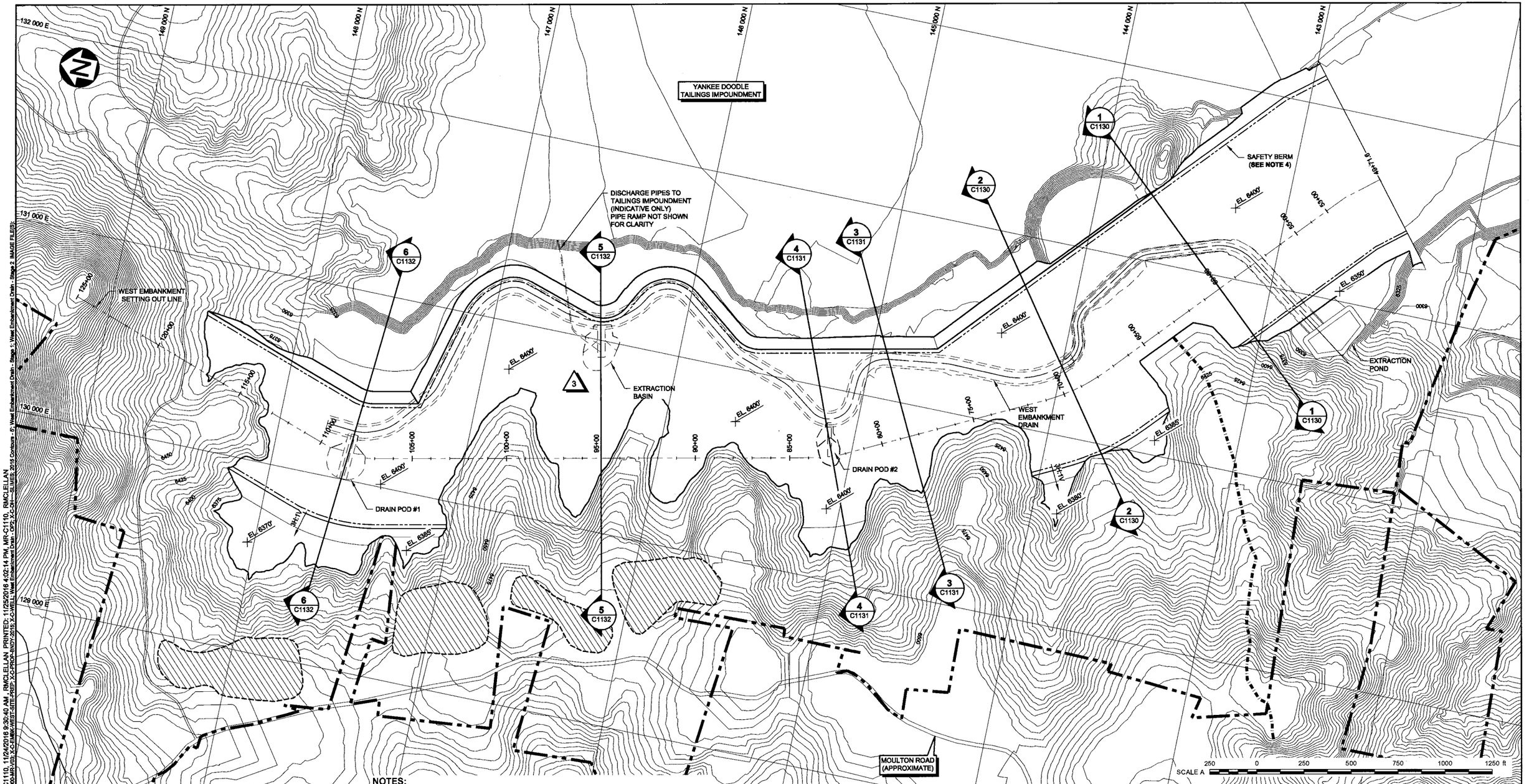
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST SITE PREPARATION PLAN

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1100	4



LEGEND:

- TOPSOIL STOCKPILE LOCATION
- EL. XXXX' SPOT ELEVATION
- PROPERTY BOUNDARY
- CATCHMENT BOUNDARY
- SAFETY BERM

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR CONSTRUCTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
MR-C1132	WEST EMBANKMENT - 6400 CREST - SECTIONS - SHEET 3
MR-C1131	WEST EMBANKMENT - 6400 CREST - SECTIONS - SHEET 2
MR-C1130	WEST EMBANKMENT - 6400 CREST - SECTIONS - SHEET 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
3	25NOV'16	WEST EMBANKMENT DRAIN UPDATED	JRG	ABN/RM	DDF	KJB
2	20JUN'16	WEST EMBANKMENT DRAIN UPDATED	JRG	ABN/RM	DDF	KJB
1	23MAR'16	WEST EMBANKMENT DRAIN UPDATED	ACR	ABN	DDF	KJB
0	03DEC'15	ISSUED FOR CONSTRUCTION	RSM	ABN	ACR	KJB

REVISIONS

MONTANA
KEN J. BROUWER
10020 PE
REGISTERED PROFESSIONAL ENGINEER
DATE: NOV 25, 2016

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST PLAN

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1110	3

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XREF FILE(S): XC-BASE-TOPO; XC-EMBK-WEST-6400-DESG; XC-EMBK-WEST-6600-MR-V02; XC-EMBK-WEST-SITE-PREP; XC-PROP-BNDY-2015; XC-WELL; West Embankment Drain; XC-DH---SLIMES; 2015 Contours - 5' IMAGE FILE(S)

LEGEND:

EL. XXXX' — SPOT ELEVATION

PROPERTY BOUNDARY

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR IT'S CONTRACTOR SHALL IMMEDIATELY CONTACT THE OWNER'S REPRESENTATIVE SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.

SETTING OUT LINE SETTING OUT POINTS

POINT	NORTHING	EASTING	ELEVATION (ft)
1	142550.19	132675.35	6400
2	142709.85	132545.38	6400
3	142792.34	132454.78	6400
4	144505.37	132058.67	6400
5	143765.94	131385.44	6400
6	143901.58	131281.53	6400
7	144057.60	131164.52	6400
8	145206.11	130924.89	6400
9	145071.78	130656.64	6400
10	145107.25	130641.64	6400
11	145144.35	130631.31	6400
12	147569.04	130632.22	6400
13	147466.11	130142.93	6400
14	147600.18	130133.19	6400
15	147732.00	130159.52	6400
16	149180.66	130658.94	6400

WEST CREST SETTING OUT POINTS

POINT	NORTHING	EASTING	ELEVATION (ft)
17	142376.58	132462.08	6400
18	142520.32	132345.07	6400
19	143150.41	131653.01	6400
20	143391.67	131246.93	6400
21	143492.35	131136.34	6400
22	143678.18	130966.59	6400
23	143891.93	130833.69	6400
24	144036.58	130761.25	6400
25	144860.02	130388.59	6400
26	145179.47	130303.96	6400
27	147016.22	129859.47	6400
28	147389.95	129780.85	6400
29	147623.23	129763.91	6400
30	147852.59	129809.72	6400
31	148217.86	129935.65	6400

EAST CREST SETTING OUT POINTS

POINT	NORTHING	EASTING	ELEVATION (ft)
32	142941.79	133156.43	6400
33	143137.36	132997.23	6400
34	143690.44	132389.77	6400
35	144665.66	131318.65	6400
36	145622.15	131274.82	6400
37	145590.45	131124.11	6400
38	145656.64	131124.73	6400
39	145716.46	131153.07	6400
40	146098.59	131191.68	6400
41	145973.97	131352.55	6400
42	146141.70	131390.56	6400
43	146278.64	131286.53	6400
44	146462.15	131268.59	6400
45	146325.90	131196.82	6400
46	146403.70	131126.12	6400

EAST CREST SETTING OUT POINTS

POINT	NORTHING	EASTING	ELEVATION (ft)
47	146508.74	131121.81	6400
48	146902.69	131049.10	6400
49	146845.66	131228.76	6400
50	146938.35	131234.20	6400
51	147022.38	131194.72	6400
52	146820.81	130902.82	6400
53	147045.27	131175.91	6400
54	147118.33	131093.72	6400
55	147162.60	130993.06	6400
56	147299.57	130474.31	6400
57	147525.81	130426.72	6400
58	147582.12	130422.63	6400
59	147637.48	130433.69	6400
60	148487.87	130726.86	6400

ISSUED FOR CONSTRUCTION

SCALE A: 250 0 250 500 750 1000 1250 ft

KEN J. PROUWER 10020 PE PROFESSIONAL ENGINEER REGISTERED Mar 23, 2016

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST SETTING OUT DETAILS

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1111	1

DRG. NO.	DESCRIPTION
-	-

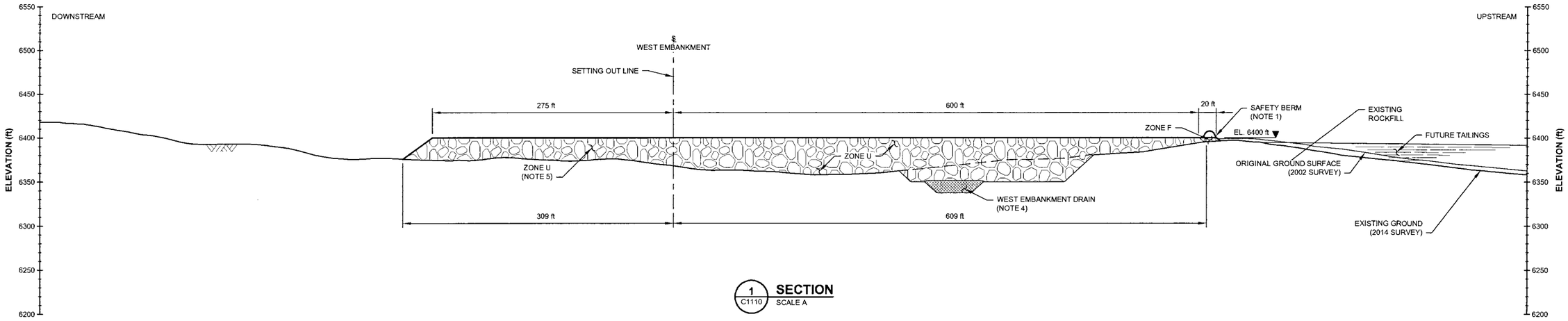
REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

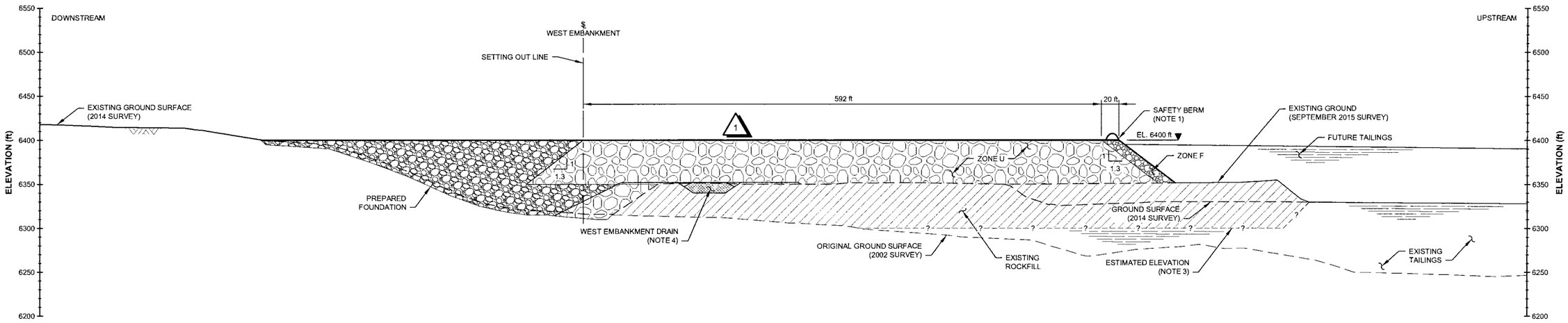
REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	23MAR'16	ISSUED FOR CONSTRUCTION	RSM	ABN	DDF	RJB
0	03DEC'15	ISSUED FOR CONSTRUCTION	RSM	ABN	ACR	KJB

REVISIONS



1 C1110 **SECTION**
SCALE A



2 C1110 **SECTION**
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- DRAIN POD / EXTRACTION BASIN/ WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- EXISTING WASTE ROCK

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. ELEVATION OF EXISTING TAILINGS AND EXISTING WASTE ROCK INTERFACE ASSUMED AT EL. 6300'.
4. WEST EMBANKMENT DRAIN ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWINGS FOR MATERIALS.
5. ZONE U - ROCKFILL MATERIAL TO BE PLACED WEST OF THE SETTING OUT LINE FROM STA. 49+72 TO STA. 63+00.
6. ZONE D1 - ROCKFILL TO BE PLACED WEST OF THE SETTING OUT LINE FROM STA. 63+00 TO STA. 125+00.

ISSUED FOR CONSTRUCTION

SCALE A 50 0 50 100 150 200 250 300 ft

KEN J. BROUWER 40020 PE Mar 23, 2016 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST SECTIONS SHEET 1

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1130	1

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C0011	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	23MAR'16	WEST EMBANKMENT DRAIN UPDATED	ACR	ABN	DDF	KJB
0	03DEC'15	ISSUED FOR CONSTRUCTION	RSM	ABN	ACR	KJB

REVISIONS

SAVED: M:\101\001\26\13\AA\cad\DWG\SMR-C1130\MR-C1130, 3/24/2016 9:28:19 AM, EGUEVARRA PRINTED: 3/24/2016 11:43:36 AM, MR-C1130, EGUEVARRA
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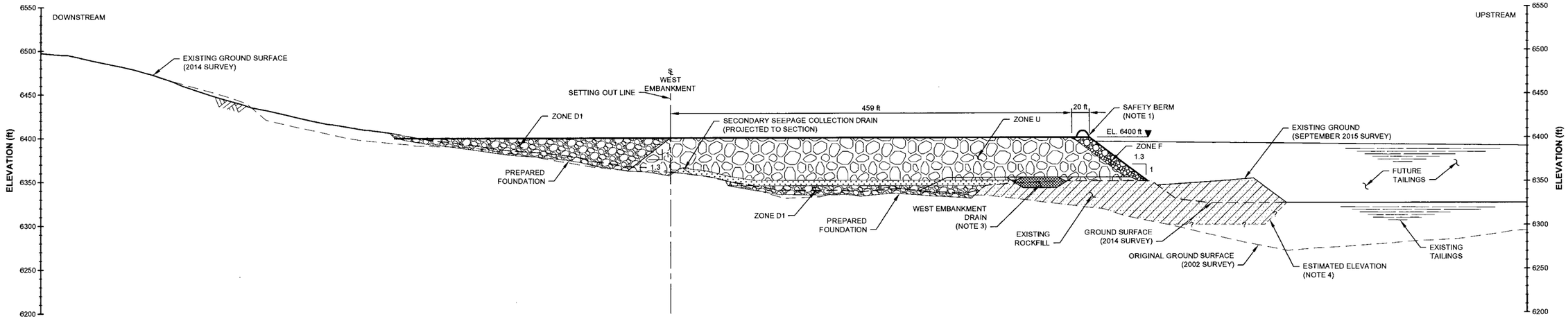
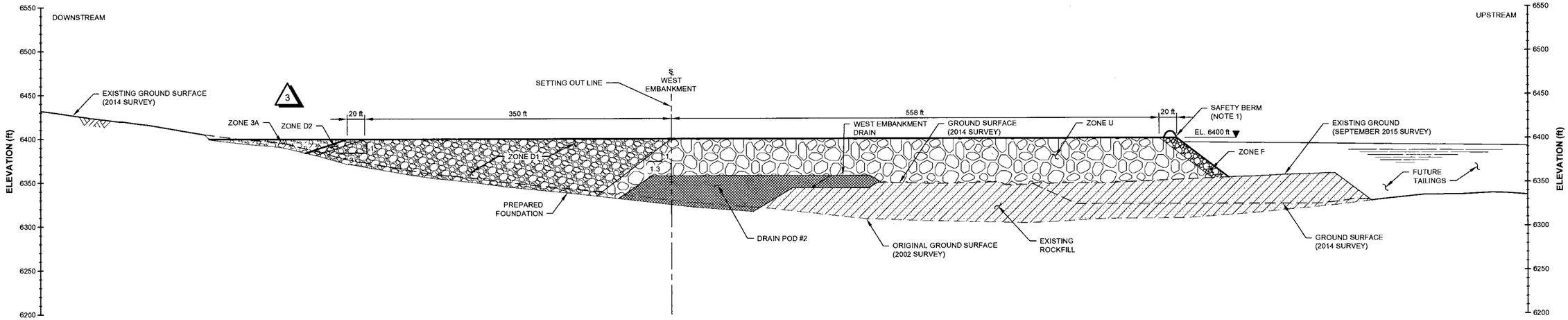


3 C1110 **SECTION**
SCALE A



4 C1110 **SECTION**
SCALE A

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE D1 - ROCKFILL
- DRAIN POD / EXTRACTION BASIN / WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- EXISTING WASTE ROCK

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. WEST EMBANKMENT DRAIN AND DRAIN POD ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWINGS FOR MATERIALS.
4. ELEVATION OF EXISTING TAILINGS AND EXISTING ROCKFILL INTERFACE ESTIMATED TO BE AT EL. 6300'.

ISSUED FOR CONSTRUCTION

SCALE A 50 0 50 100 150 200 250 300 ft

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C0011	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
3	25NOV'16	SUMP AND HOLD CLOUD REMOVED	JRG	RM	DDF	KJB
2	14JUN'16	UPDATED DRAIN POD GEOMETRY	ACR	RM	DDF	KJB
1	23MAR'16	WEST EMBANKMENT DRAIN UPDATED	ACR	ABN	DDF	KJB
0	03DEC'15	ISSUED FOR CONSTRUCTION	RSM	ABN	ACR	KJB

REVISIONS

MONTANA KEN J BROUWER 10920-PE 29 JUNE 2016 REGISTERED PROFESSIONAL ENGINEER

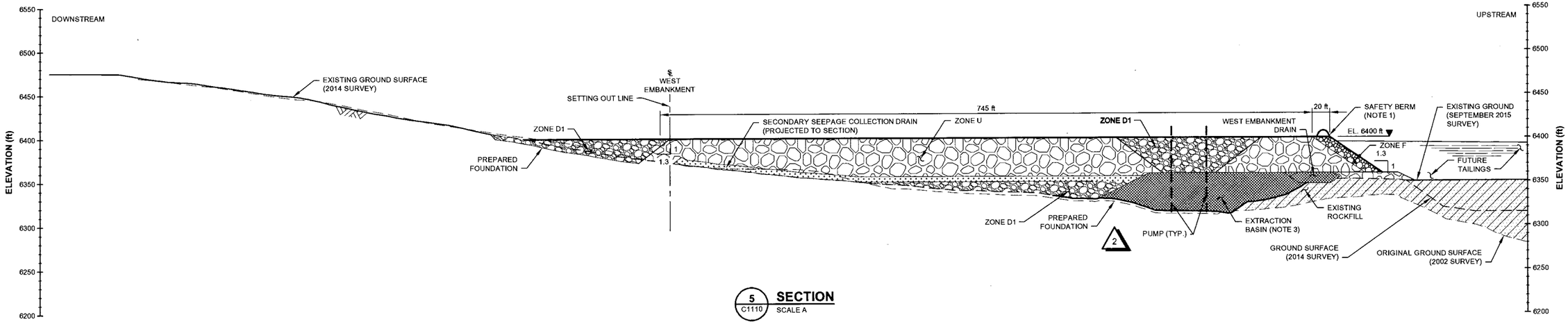
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

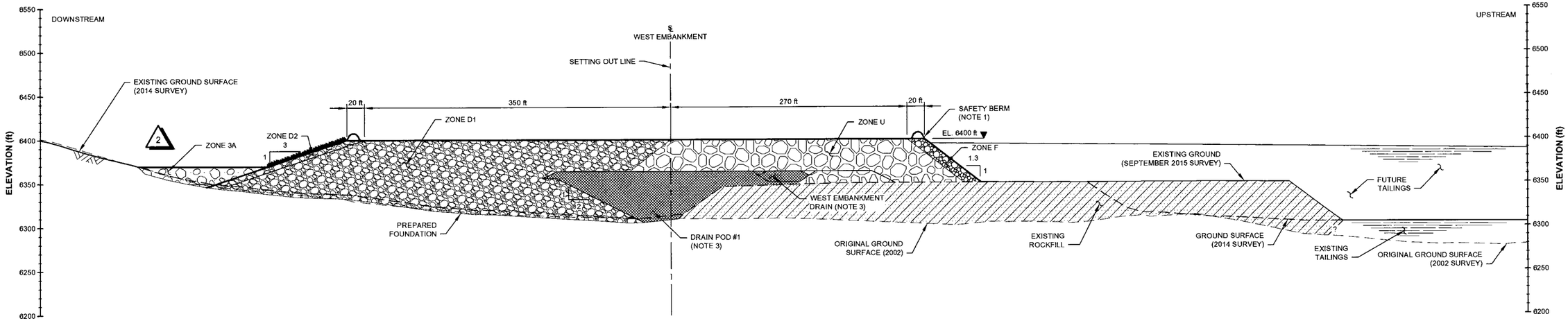
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST SECTIONS SHEET 2

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1131	3



5 C1110 **SECTION**
SCALE A



6 C1110 **SECTION**
SCALE A

ISSUED FOR CONSTRUCTION

SCALE A 50 0 50 100 150 200 250 300 ft

LEGEND:

- ZONE F - EARTHFILL
- ZONE U - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE D1 - ROCKFILL
- ZONE 3A - DRAIN ROCK
- DRAIN POD / EXTRACTION BASIN / WEST EMBANKMENT DRAIN
- SECONDARY SEEPAGE COLLECTION DRAIN
- GRASS
- EXISTING WASTE ROCK

NOTES:

1. SAFETY BERMS SHALL BE MID AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE.
2. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
3. WEST EMBANKMENT DRAIN, DRAIN PODS AND EXTRACTION BASIN ZONATION NOT SHOWN FOR CLARITY. REFER TO SPECIFIC DETAIL DRAWINGS FOR MATERIALS.

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C0011	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	25NOV'16	EXTRACTION BASIN UPDATED, MONITORING SUMP REMOVED	JRG	RM	DDF	KJB
1	23MAR'16	WEST EMBANKMENT DRAIN UPDATED	ACR	ABN	DDF	KJB
0	03DEC'15	ISSUED FOR CONSTRUCTION	RSM	ABN	ACR	KJB

REVISIONS

MONTANA
KEN J. BROUWER
10020 PE
Nov 28, 2016
REGISTERED PROFESSIONAL ENGINEER

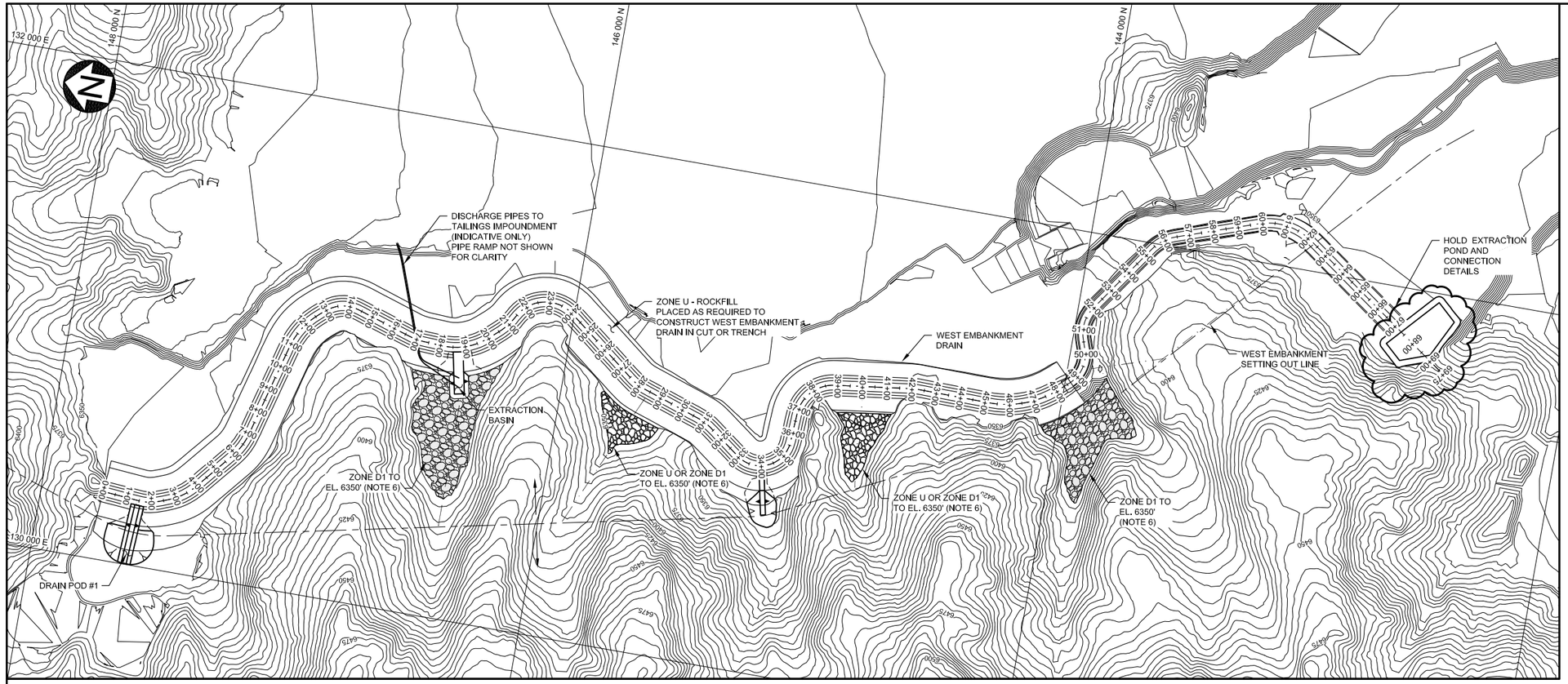
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

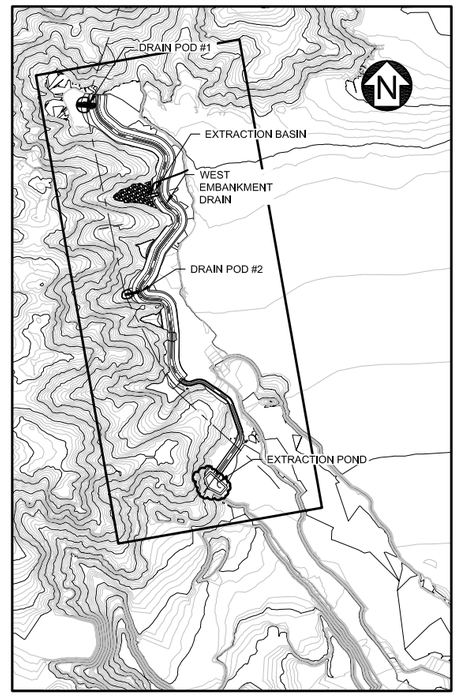
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6400 CREST
SECTIONS
SHEET 3

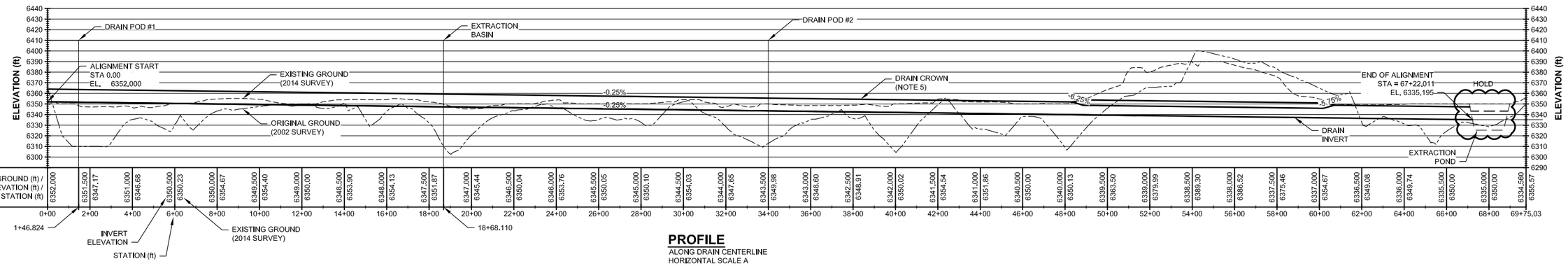
PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1132	2



PLAN
SCALE A



KEY PLAN
NTS



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

NOT FOR CONSTRUCTION

NOTES:

1. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA PROVIDED BY MONTANA RESOURCES.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. COORDINATES ARE IN ANACONDA MINE GRID.
4. THE SETTING OUT LINE DEFINES THE BOUNDARY BETWEEN THE ZONE U AND ZONE D1 FOR THE WEST EMBANKMENT. (SEE DRAWING MR-C1110)
5. THE DRAIN CROWN, EXTRACTION BASIN AND DRAIN POD SURFACES REPRESENT THE FINAL GRADE OF THE ZONE 2A - FILTER. THE ZONE UA ROCKFILL HAS BEEN OMITTED FOR CLARITY.
6. INFILL LOW AREAS WITH ZONE D1 OR U WHERE NOTED TO ELEVATION AS NOTED FOLLOWING FOUNDATION PREPARATION.

LEGEND:

ZONE U - ROCKFILL

ZONE D1 - ROCKFILL

SCALE B: 50 0 50 100 150 200 250 ft

SCALE A: 250 0 250 500 750 1000 1250 ft

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
F	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-
E	20JUN'16	ISSUED FOR CLIENT REVIEW	ACR/JRG	ABN	-	-
D	17DEC'15	ISSUED FOR CLIENT REVIEW	ACR	ELG	-	-
C	05OCT'15	ISSUED FOR CLIENT REVIEW	ACR	ELG	-	-
B	14SEP'15	ISSUED FOR CLIENT REVIEW	ACR	ELG	-	-
A	14AUG'15	ISSUED FOR CLIENT REVIEW	ACR	ABN	-	-

REVISIONS

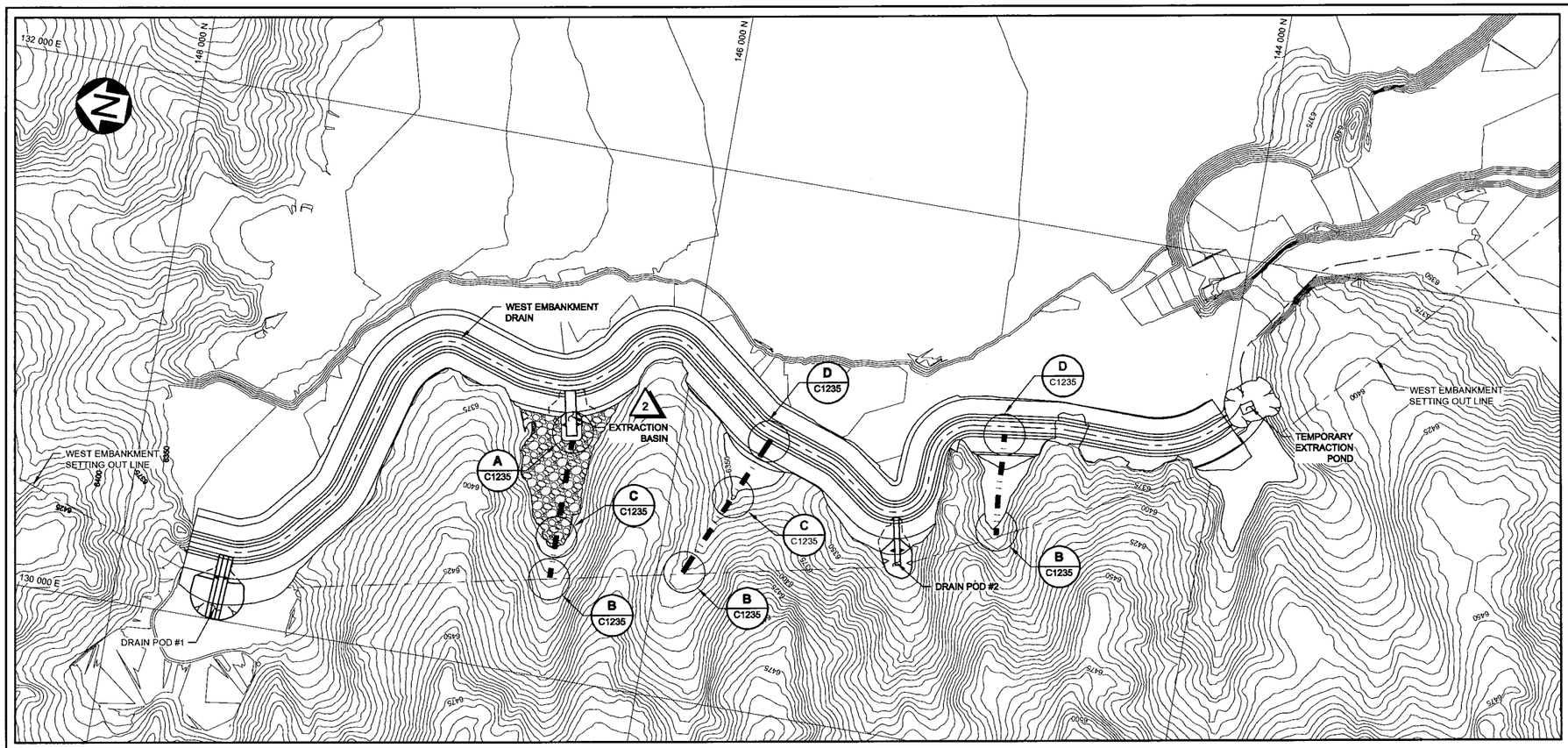
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
PLAN AND PROFILE

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1205	F



PLAN
SCALE A

LEGEND:

ZONE D1 - ROCKFILL

SECONDARY SEEPAGE COLLECTION DRAIN

NOTES:

1. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA PROVIDED BY MONTANA RESOURCES.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. COORDINATES ARE IN ANACONDA MINE GRID.
4. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

ISSUED FOR CONSTRUCTION

250 0 250 500 750 1000 1250 ft
SCALE A

STATE OF MONTANA
KEN J. BROUWER
10020 PE
REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6400 CREST
SECONDARY SEEPAGE COLLECTION DRAINS
PLAN

DRAWING NO.	REVISION
VA101-126/13 MR-C1206	2

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	25NOV'16	UPDATED WITH EXTRACTION BASIN DETAILS	JRG	ABN/RM	DDF	KJB
1	20JUN'16	UPDATED WITH DRAIN POD & TEMP. EXT. POND DETAILS	JRG	ABN/RM	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR/JRG	ELG/ABN	DDF	KJB

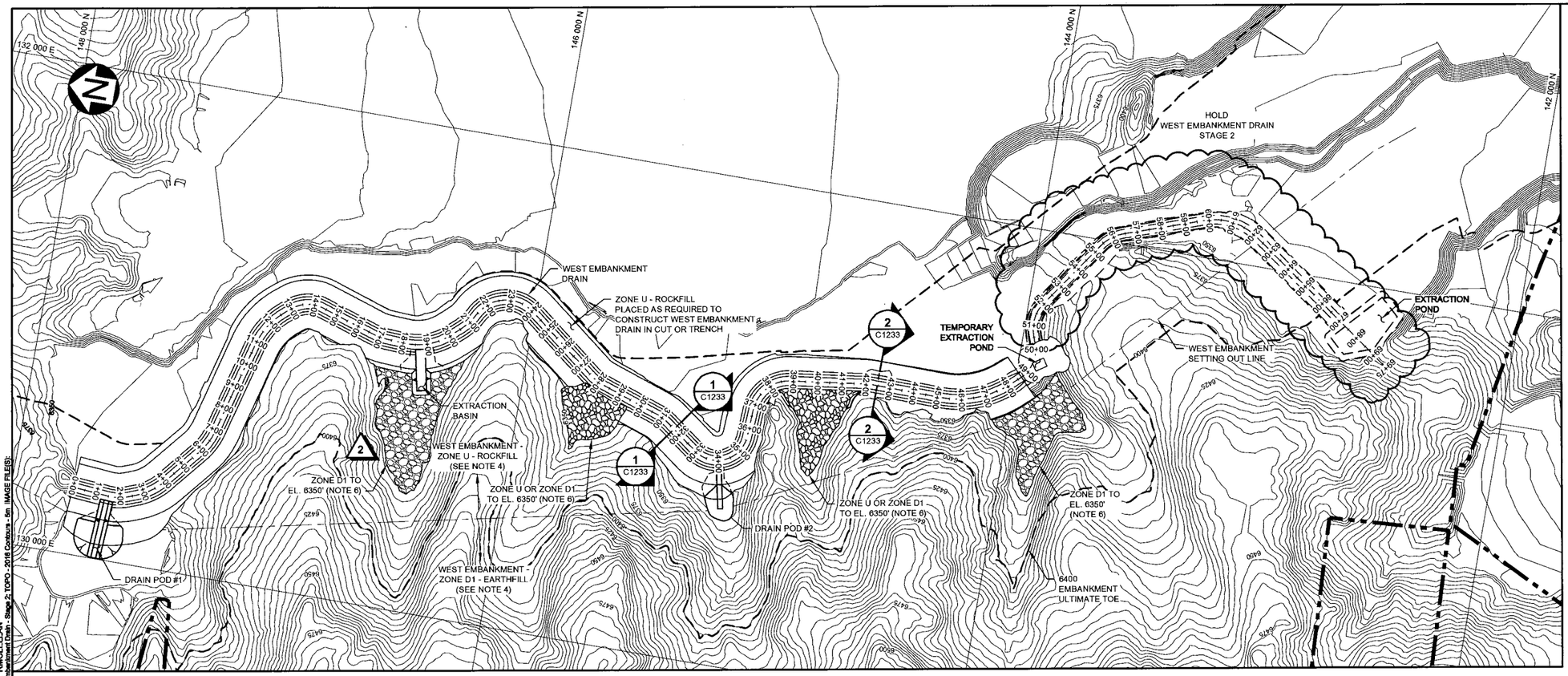
REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

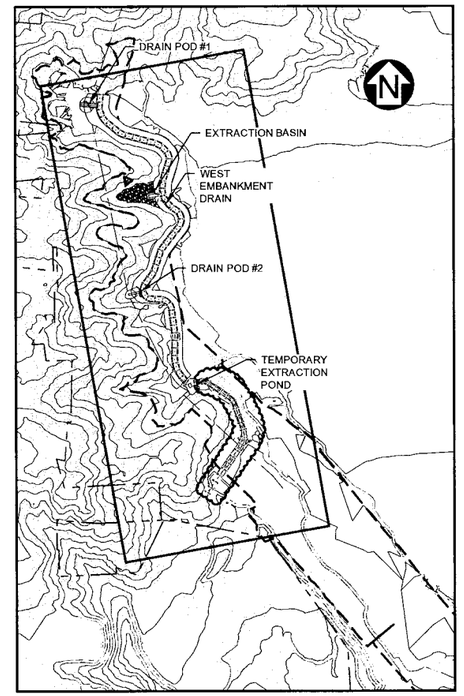
REVISIONS

DRG. NO.	DESCRIPTION
MR-C1235	SECONDARY SEEPAGE COLLECTION DRAINS SECTIONS AND DETAILS

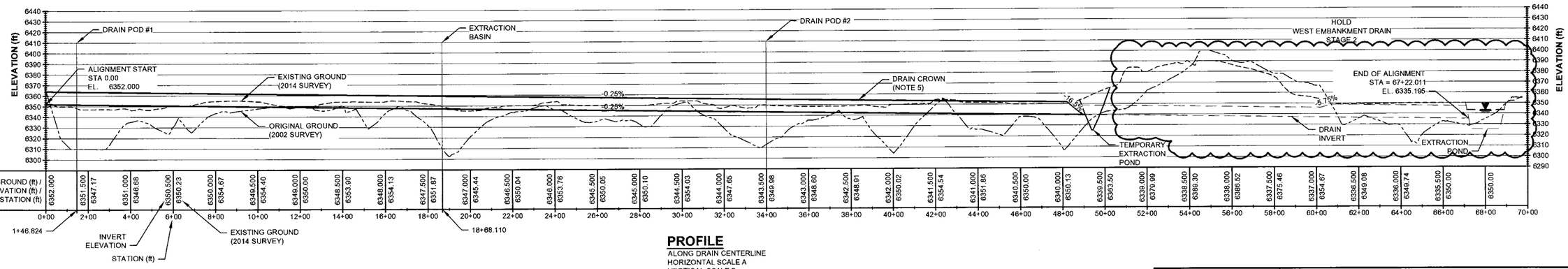
REFERENCE DRAWINGS



PLAN
SCALE A



KEY PLAN
NTS



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- PROPERTY BOUNDARY

NOTES:

1. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA PROVIDED BY MONTANA RESOURCES.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. COORDINATE GRID IS IN ANACONDA MINE GRID.
4. THE SETTING OUT LINE DEFINES THE BOUNDARY BETWEEN THE ZONE U AND ZONE D1 FOR THE WEST EMBANKMENT. (SEE DRAWING MR-C1110)
5. THE DRAIN CROWN, EXTRACTION BASIN AND DRAIN POD SURFACES REPRESENT THE FINAL GRADE OF THE ZONE 2A - FILTER. THE ZONE UA ROCKFILL HAS BEEN OMITTED FOR CLARITY.
6. INFILL LOW AREAS WITH ZONE D1 OR U WHERE NOTED TO ELEVATION AS NOTED FOLLOWING FOUNDATION PREPARATION.

ISSUED FOR CONSTRUCTION

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 250 0 250 500 750 1000 1250 ft

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C1233	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - TYPICAL SECTIONS - STAGE 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	25NOV'16	UPDATED WITH EXTRACTION BASIN DETAILS	JRG	ABN/RM	DDF	KJB
1	20JUN'16	UPDATED WITH DRAIN POD & TEMP. EXT. POND DETAILS	JRG	ABN/RM	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE — REGISTERED PROFESSIONAL ENGINEER — MONTANA — Nov 28, 2016

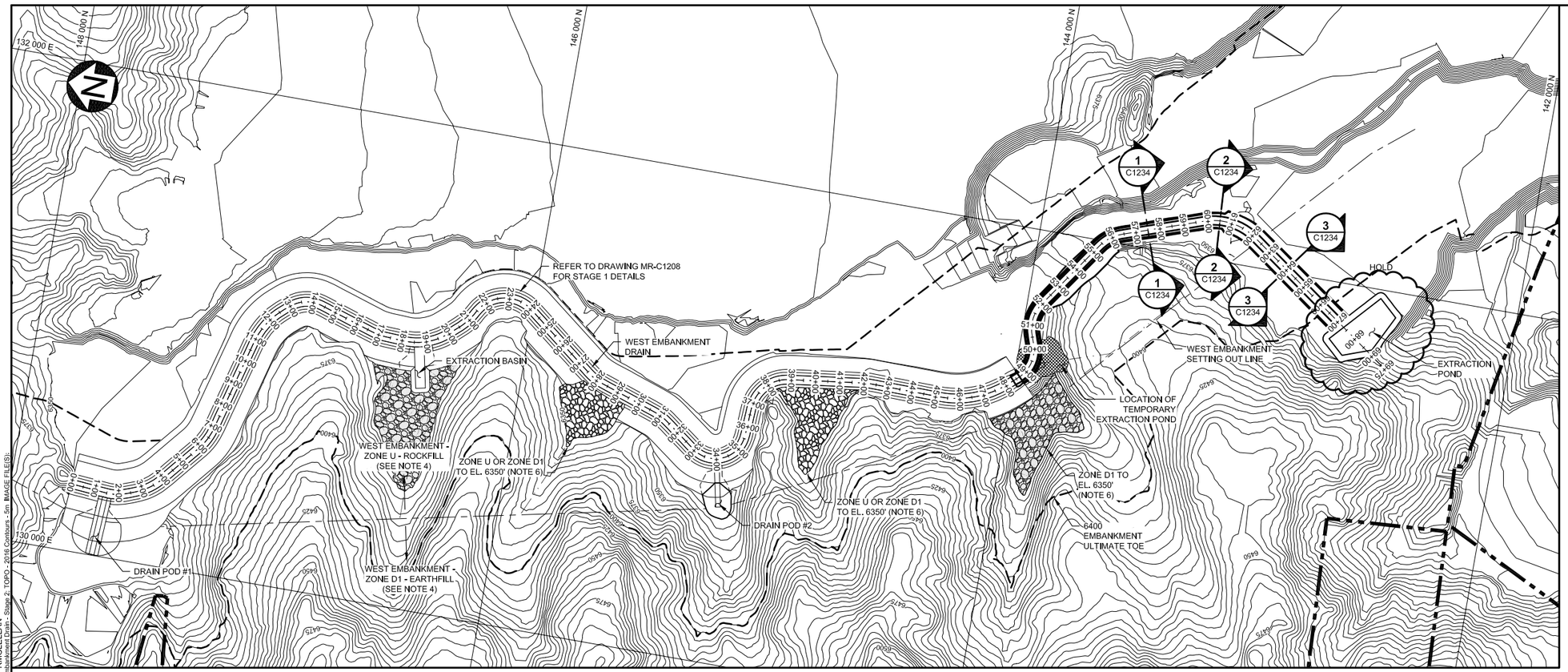
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

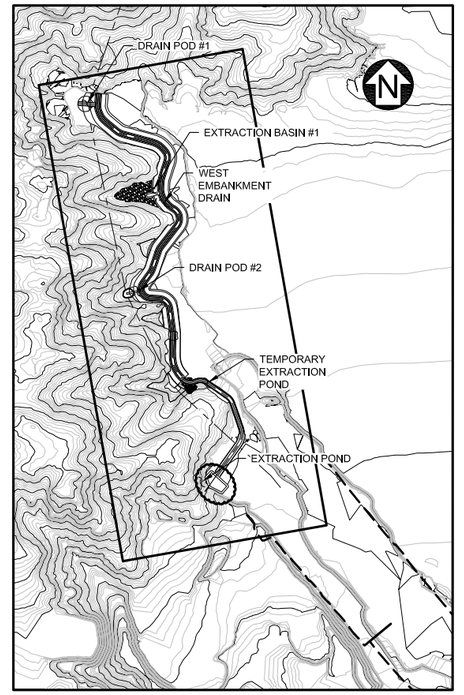
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST WEST EMBANKMENT DRAIN PLAN AND PROFILE STAGE 1

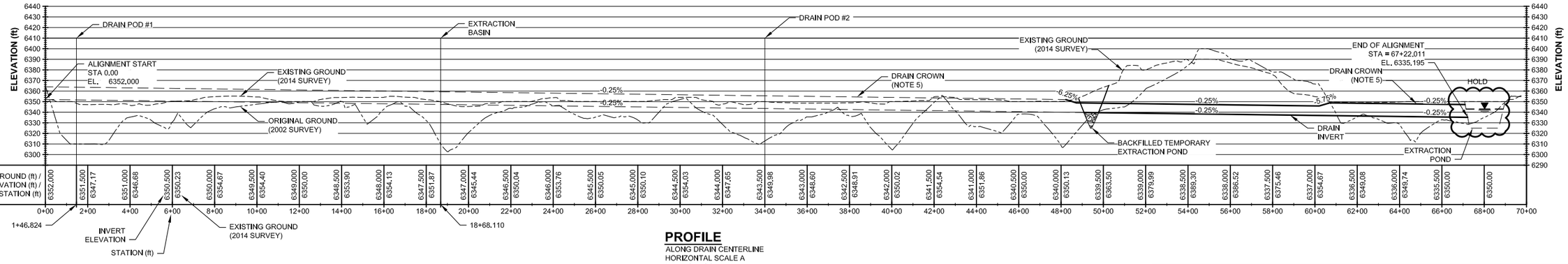
PROJECT NO. VA101-126/13 | DRAWING NO. MR-C1208 | REVISION 2



PLAN
SCALE A



KEY PLAN
NTS



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- PROPERTY BOUNDARY

NOTES:

1. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA PROVIDED BY MONTANA RESOURCES.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. COORDINATE GRID IS IN ANACONDA MINE GRID.
4. THE SETTING OUT LINE DEFINES THE BOUNDARY BETWEEN THE ZONE U AND ZONE D1 FOR THE WEST EMBANKMENT. (SEE DRAWING MR-C1110)
5. THE DRAIN CROWN, EXTRACTION BASIN AND DRAIN POD SURFACES REPRESENT THE FINAL GRADE OF THE ZONE 2A - FILTER OR ZONE 2B - TRANSITION (LARGE STAGE 2 CUT). THE ZONE UA ROCKFILL HAS BEEN OMITTED FOR CLARITY.
6. INFILL LOW AREAS WITH ZONE D1 OR U WHERE NOTED TO ELEVATION AS NOTED FOLLOWING FOUNDATION PREPARATION.

NOT FOR CONSTRUCTION

SCALE B 50 0 50 100 150 200 250 ft
SCALE A 250 0 250 500 750 1000 1250 ft

DRG. NO.	DESCRIPTION
MR-C1208	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - PLAN AND PROFILE STAGE 1
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C1234	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - TYPICAL SECTIONS - STAGE 2

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
B	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-
A	23MAR'16	ISSUED FOR CLIENT REVIEW	JRG/ACR	ABN	-	-

REVISIONS

Knight Piésold CONSULTING

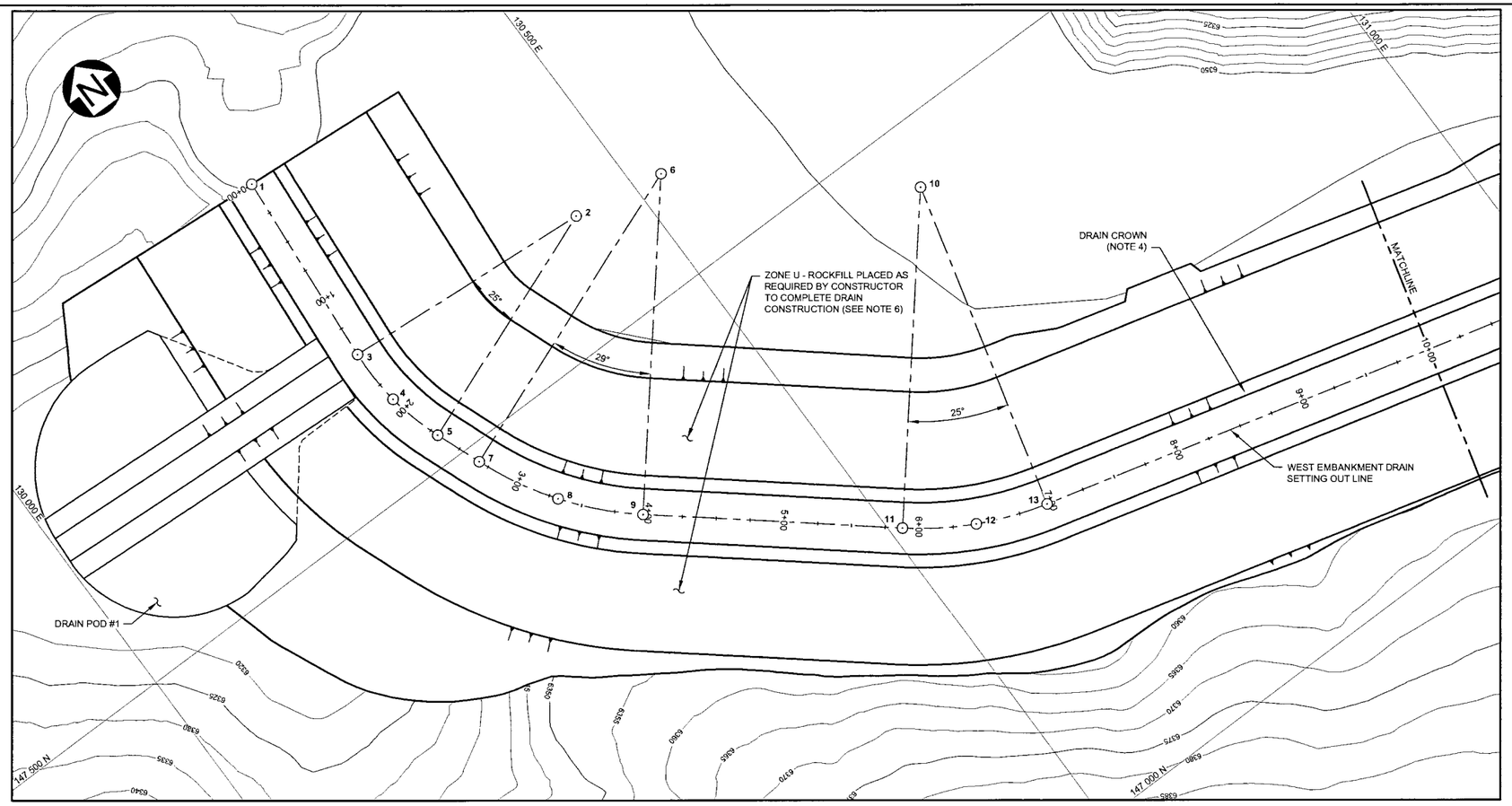
MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

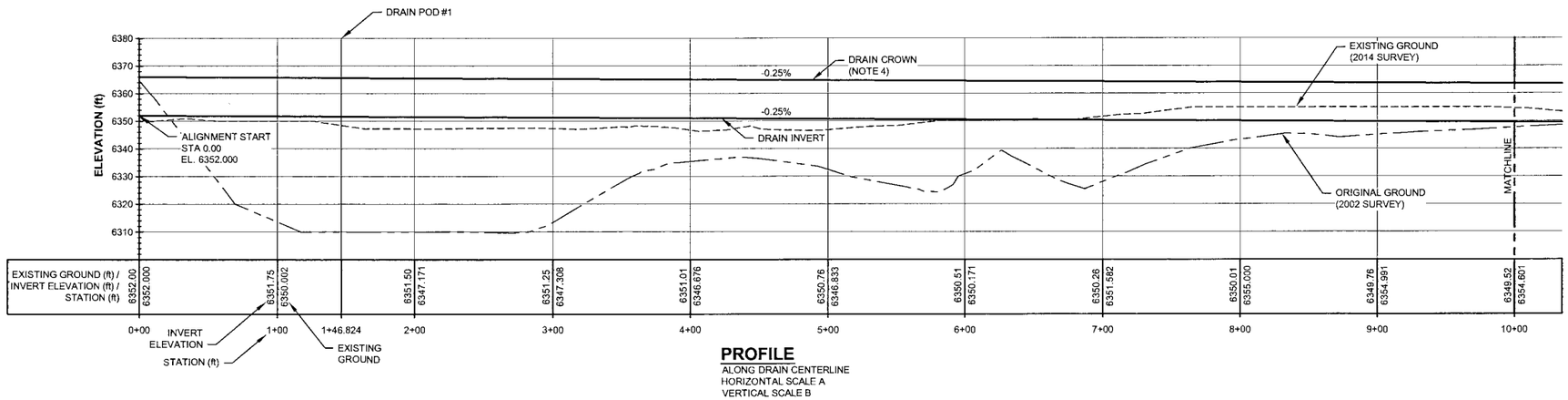
WEST EMBANKMENT 6400 CREST WEST EMBANKMENT DRAIN PLAN AND PROFILE STAGE 2

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1209	B

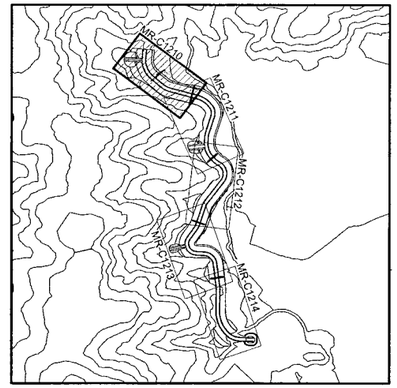
SAVED: \\KPLVA-P\$\101\101001261\3\A\acad\DWGS\MR-C1209\MR-C1209_11/25/2016 2:34:13 PM, RMCLELLAN PRINTED: 11/25/2016 4:00:41 PM, Layout: RMCLELLAN
XREF FILE(S): West Embankment Drain - OP2; 2015 Contours - 5'; X-C-PHOP-BNDY-2015; X-C-EMBK-EAST-6400-DES0; X-C-EMBK-WEST-6400-DES0; West Embankment Drain - Stage 1; West Embankment Drain - Stage 2; TOPO - 2016 Contours - 5m IMAGE FILE(S):



PLAN
SCALE A



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B



KEY PLAN

SETTING OUT POINTS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	147750.20	130274.94	6352.00	BOA
2	147588.17	130452.55	-	COC
3	147603.36	130263.16	6351.63	BOC
4	147561.52	130264.43	6351.53	MOC
5	147520.97	130274.83	6351.43	EOC
6	147575.52	130521.48	-	COC
7	147487.09	130287.64	6351.34	BOC
8	147430.53	130317.82	6351.18	MOC
9	147383.50	130361.40	6351.02	EOC
10	147452.69	130668.82	-	COC
11	147260.67	130508.73	6350.54	BOC
12	147230.68	130553.86	6350.40	MOC
13	147211.13	130604.40	6350.27	EOC

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA SUPPLIED BY MONTANA RESOURCES.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
5. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
6. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION

SCALE B: 25 0 25 50 75 100 125 ft
SCALE A: 50 0 50 100 150 200 250 ft

REFERENCE DRAWINGS	
MR-C1233	WEST EMBANKMENT DRAIN TYPICAL SECTIONS - STAGE 1
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 1
DRG. NO.	DESCRIPTION

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KLS

KEN J. DROUWER 10020 PE
PROFESSIONAL ENGINEER
REGISTERED
Montana 23, 24, 6

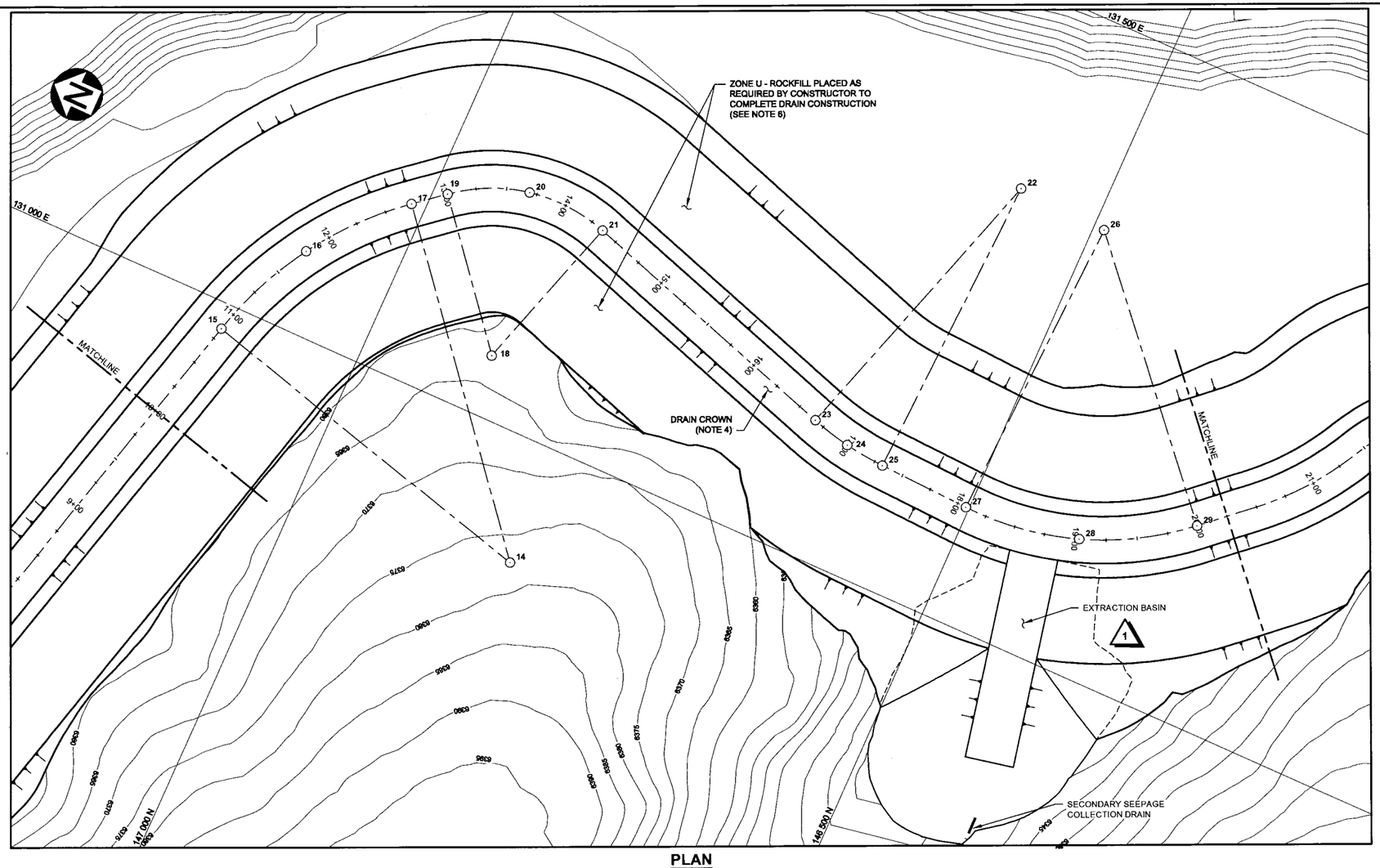
Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

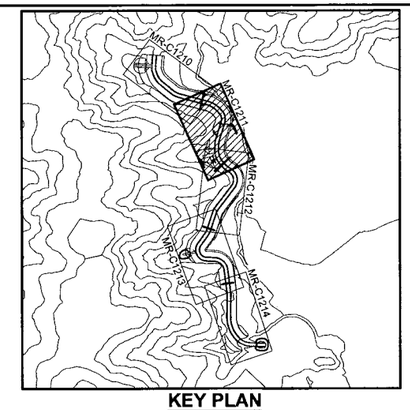
YANKEE DOODLE TAILING IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORK PLAN - STAGE 1
STA 0+00 TO 10+00

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1210	0



PLAN
SCALE A



KEY PLAN

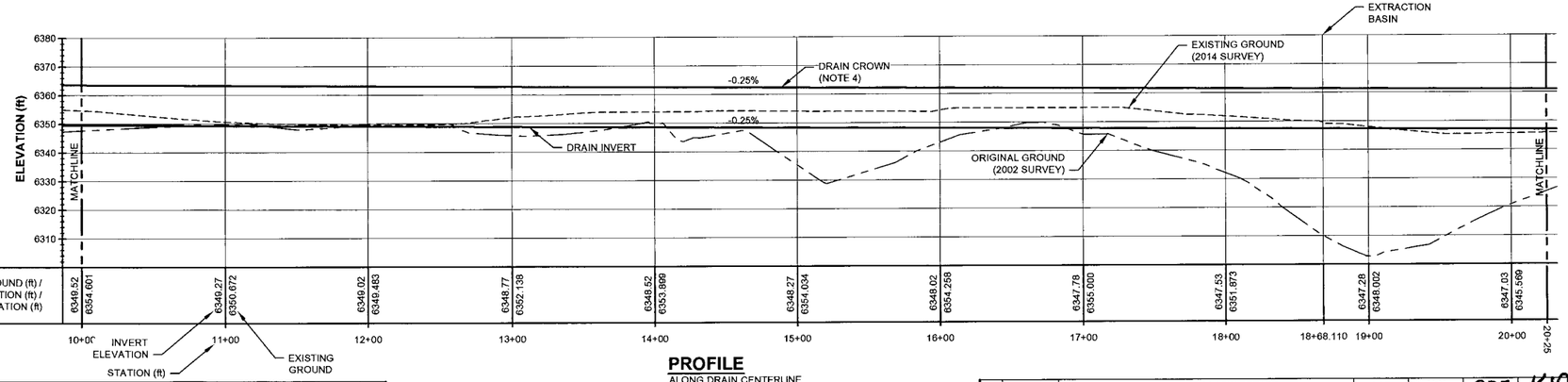
SETTING OUT POINTS

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
14	146821.13	130902.56	-	COC
15	147111.00	130979.86	6349.30	BOC
16	147073.42	131064.88	6349.07	MOC
17	147011.62	131134.32	6348.84	EOC
18	146902.69	131049.10	-	COC
19	146988.41	131153.39	6348.77	BOC
20	146928.23	131181.66	6348.60	MOC
21	146861.84	131177.77	6348.43	EOC
22	146566.36	131346.27	-	COC
23	146642.00	131107.99	6347.86	BOC
24	146610.28	131100.16	6347.78	MOC
25	146577.81	131096.53	6347.70	EOC
26	146491.27	131342.83	-	COC
27	146502.72	131093.09	6347.51	BOC
28	146408.24	131107.02	6347.27	MOC
29	146325.88	131155.36	6347.03	EOC

NOTES:

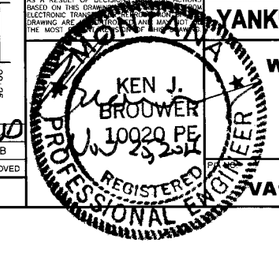
1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA SUPPLIED BY MONTANA RESOURCES DATED JUNE 2014.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
5. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
6. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

SCALE B: 25 0 25 50 75 100 125 ft
SCALE A: 50 0 50 100 150 200 250 ft



Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILING IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORK PLAN - STAGE 1
STA 10+00 TO 20+25

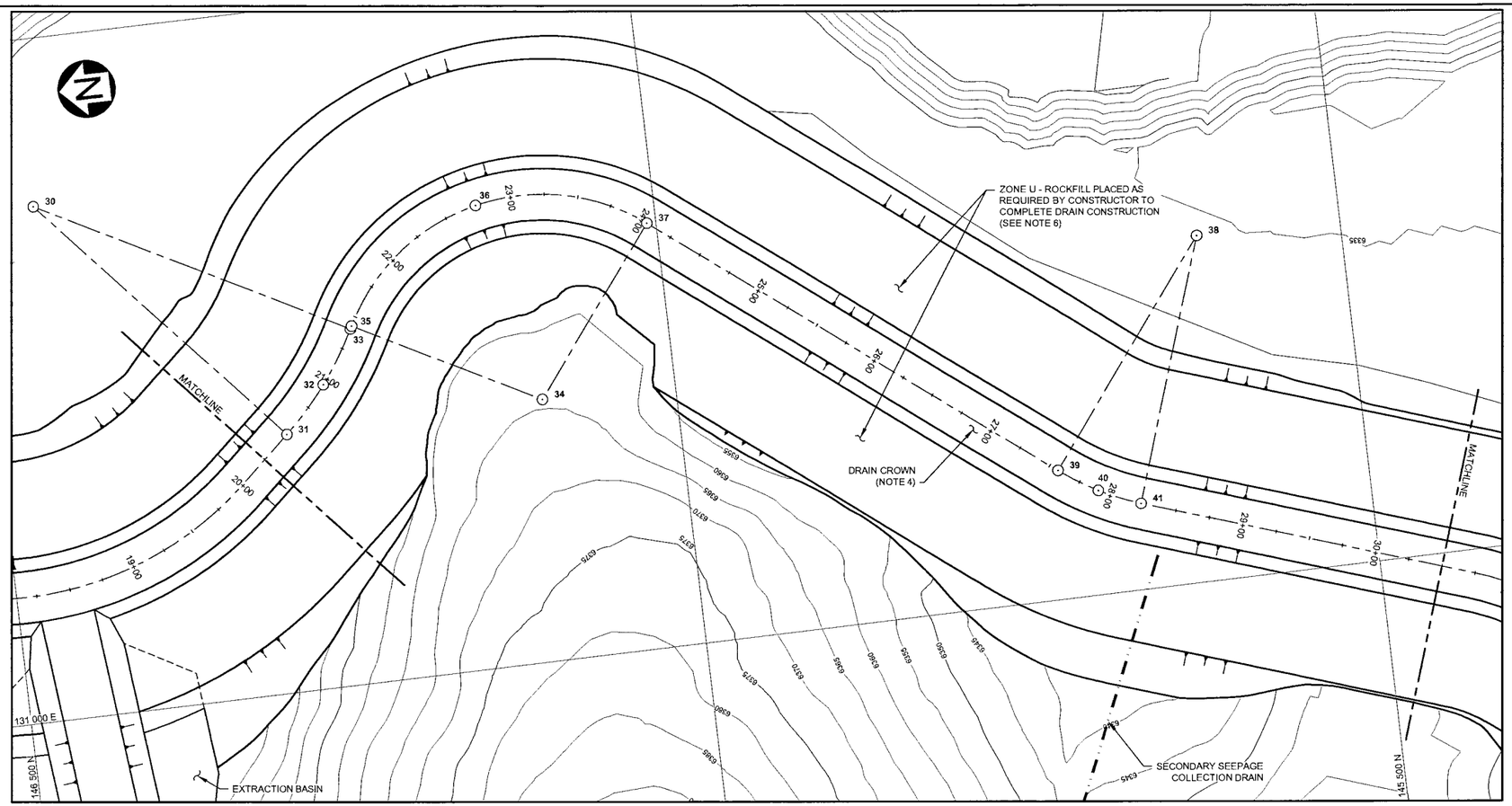
PROJECT NO. VA101-126/13 | DRAWING NO. MR-C1211 | REVISION 1

DRG. NO.	DESCRIPTION
MR-C1233	WEST EMBANKMENT DRAIN TYPICAL SECTIONS - STAGE 1
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 1

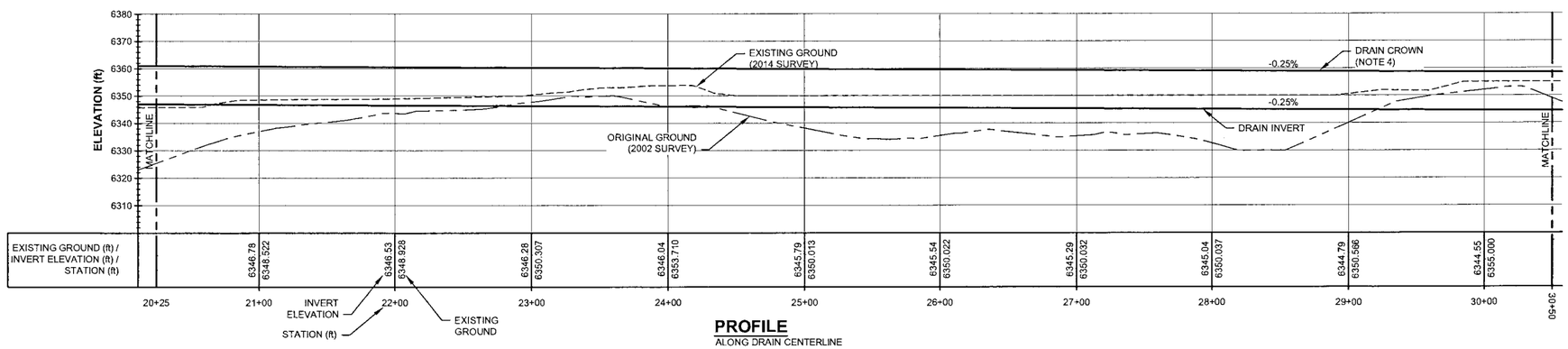
REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	25NOV'16	UPDATED WITH EXTRACTION BASIN DETAILS	ACR	ABN	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

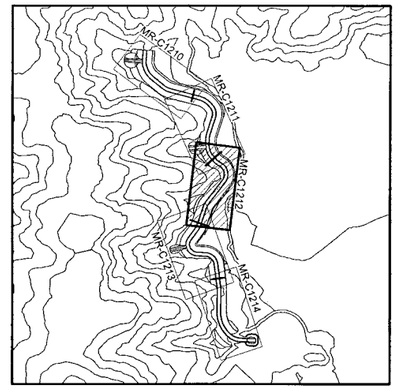
REVISIONS



PLAN
SCALE A



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B



KEY PLAN

SETTING OUT POINTS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
30	146453.54	131376.11	-	COC
31	146288.15	131188.64	6346.91	BOC
32	146257.02	131221.58	6346.79	MOC
33	146232.36	131259.59	6346.68	EOC
34	146098.59	131191.68	-	COC
35	146231.30	131261.59	6346.68	BOC
36	146130.36	131338.27	6346.35	MOC
37	146006.73	131310.26	6346.02	EOC
38	145605.66	131252.55	-	COC
39	145728.14	131094.44	6345.15	BOC
40	145700.17	131076.30	6345.07	MOC
41	145669.58	131063.04	6344.98	EOC

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA SUPPLIED BY MONTANA RESOURCES.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
5. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
6. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION

SCALE B: 25 0 25 50 75 100 125 ft
SCALE A: 50 0 50 100 150 200 250 ft

DRG. NO.	DESCRIPTION
MR-C1233	WEST EMBANKMENT DRAIN TYPICAL SECTIONS - STAGE 1
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE — PROFESSIONAL ENGINEER — 23 Mar 2016

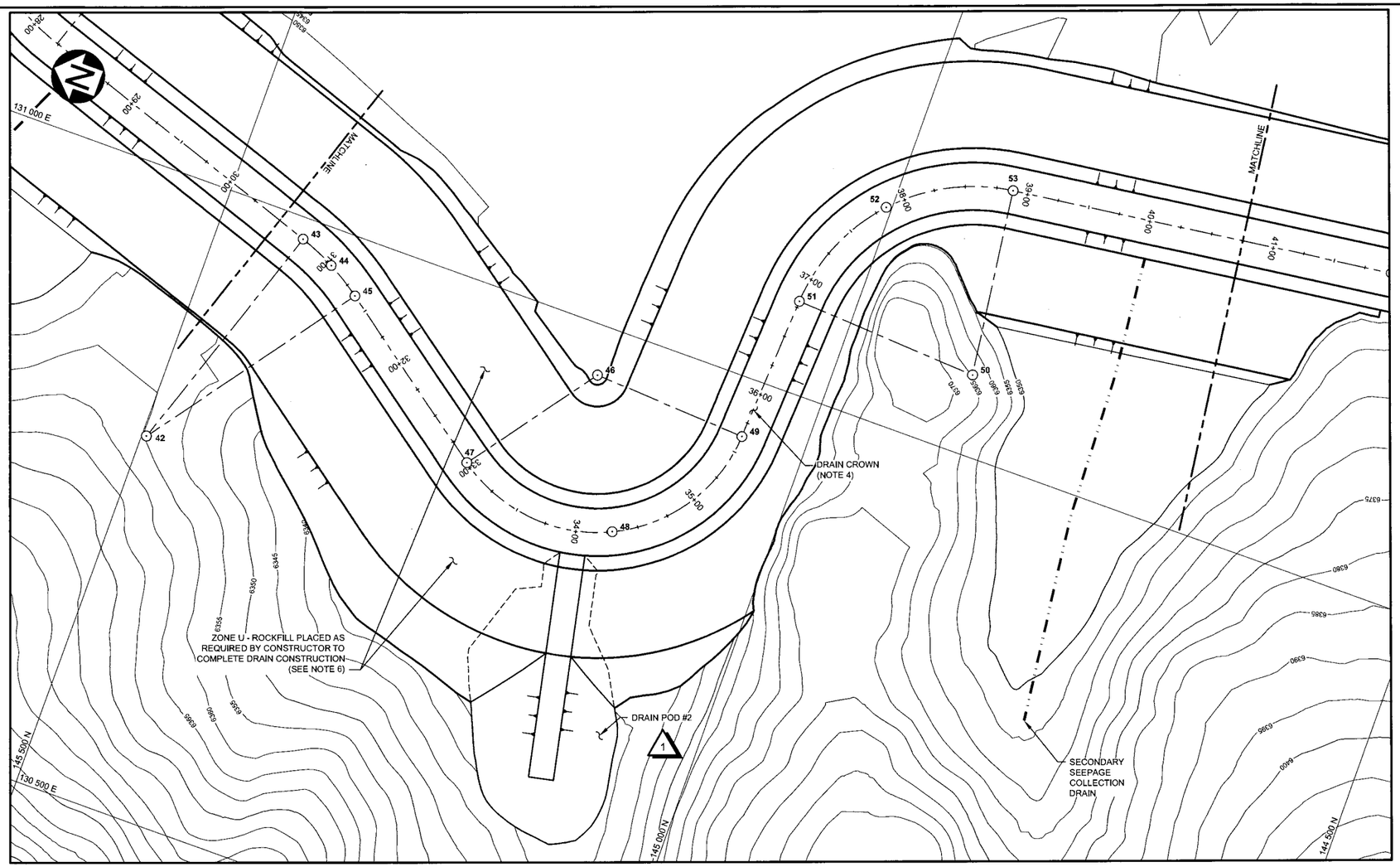
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

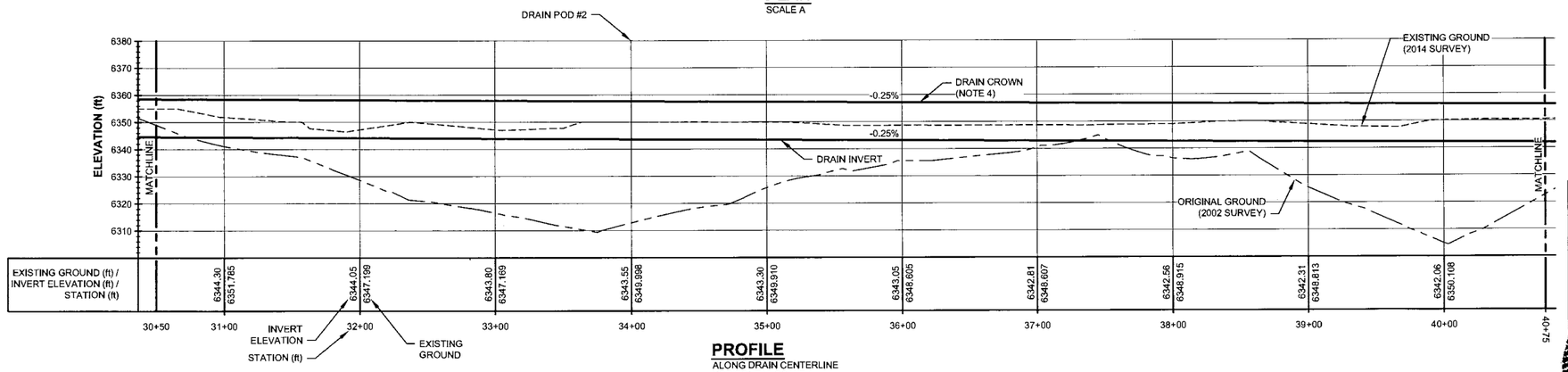
YANKEE DOODLE TAILING IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORK PLAN - STAGE 1
STA 20+25 TO 30+50

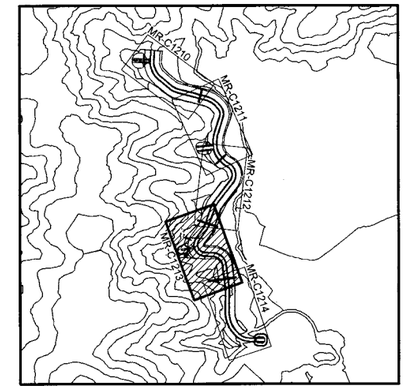
PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1212	0



PLAN
SCALE A



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B



KEY PLAN

SETTING OUT POINTS

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
42	145496.33	130793.54	-	COC
43	145432.41	130983.05	6344.36	BOC
44	145404.10	130971.00	6344.28	MOC
45	145377.97	130954.75	6344.21	EOC
46	145175.52	130961.18	-	COC
47	145249.50	130860.42	6343.81	BOC
48	145122.16	130848.14	6343.48	MOC
49	145050.71	130954.26	6343.14	EOC
50	144894.47	131062.56	-	COC
51	145044.24	131070.87	6342.85	BOC
52	145004.43	131164.59	6342.60	MOC
53	144913.95	131211.29	6342.34	EOC

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA SUPPLIED BY MONTANA RESOURCES.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
5. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
6. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION

SCALE B: 25 0 25 50 75 100 125 ft
SCALE A: 50 0 50 100 150 200 250 ft

DRG. NO.	DESCRIPTION
MR-C1233	WEST EMBANKMENT DRAIN TYPICAL SECTIONS - STAGE 1
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	14JUN'16	UPDATED DRAIN POD GEOMETRY	ACR	ABN/RM	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE June 23/16 REGISTERED PROFESSIONAL ENGINEER

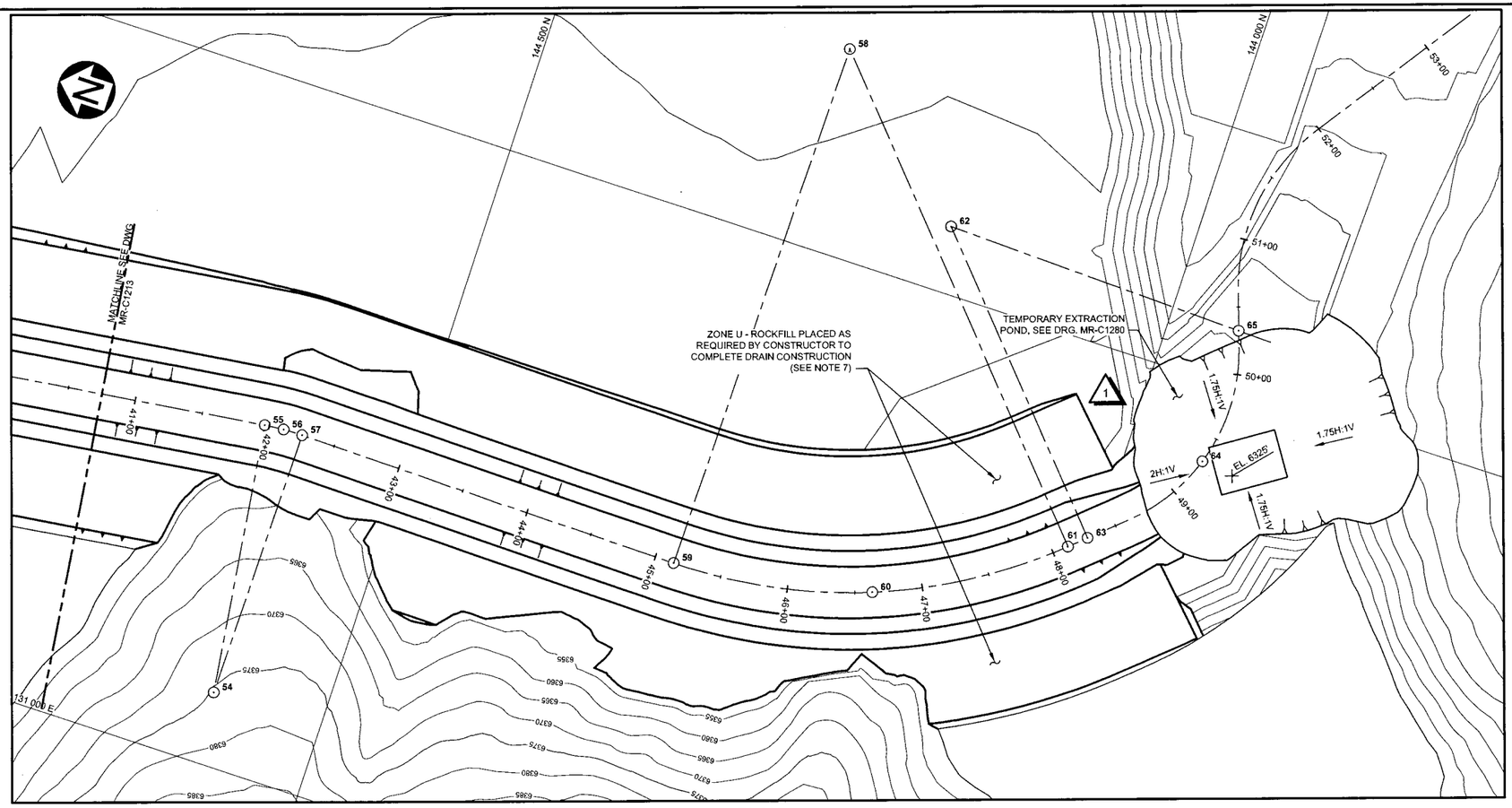
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

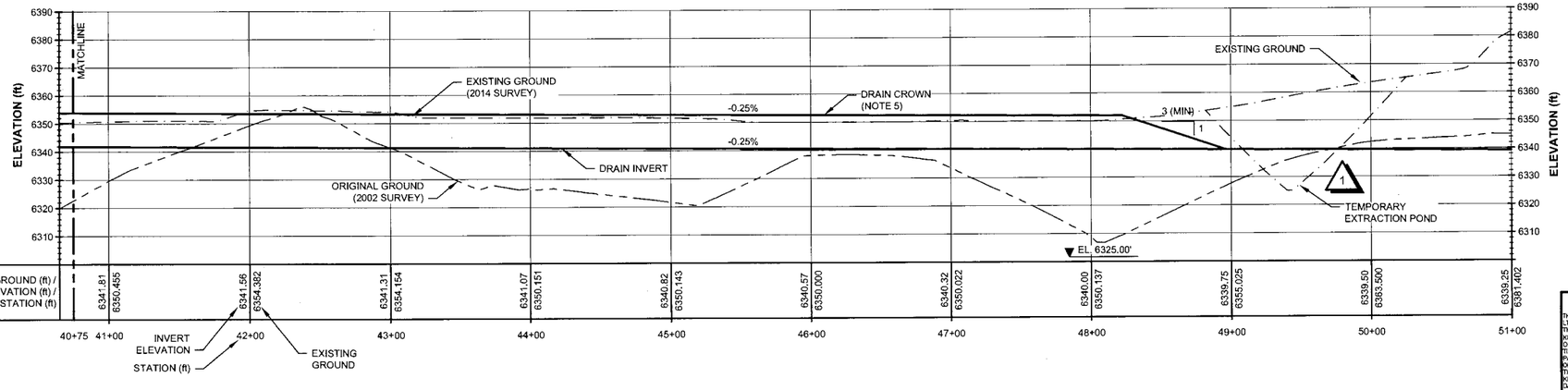
YANKEE DOODLE TAILING IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORK PLAN - STAGE 1
STA 30+50 TO 40+75

VA101-126/13	DRAWING NO. MR-C1213	REVISION 1

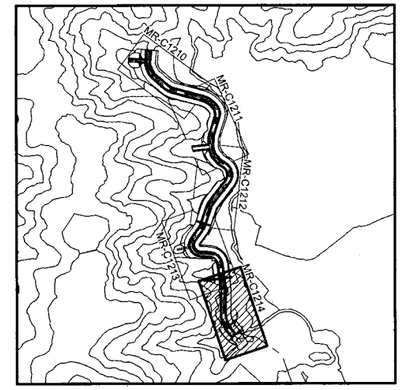


PLAN
SCALE A



SCALE B 25 0 25 50 75 100 125 ft

SCALE A 50 0 50 100 150 200 250 ft



KEY PLAN

SETTING OUT POINTS			
POINT NO.	NORTHING	EASTING	DESCRIPTION
54	144582.12	131053.05	COC
55	144608.09	131251.35	BOC
56	144593.88	131252.70	MOC
57	144579.60	131253.03	EOC
58	144285.61	131649.35	COC
59	144290.66	131249.39	BOC
60	144144.94	131274.91	MOC
61	144018.46	131351.65	EOC
62	144173.62	131548.31	COC
63	144006.65	131362.24	BOC
64	143943.97	131442.06	MOC
65	143948.63	131541.58	EOC

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA SUPPLIED BY MONTANA RESOURCES.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. INFERRED BEDROCK SURFACE PROVIDED BY MONTANA RESOURCES.
5. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
6. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
7. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION

REFERENCE DRAWINGS	
MR-C1280	WEST EMBANKMENT DRAIN - TEMPORARY EXTRACTION POND - PLAN & SECT.
MR-C1233	WEST EMBANKMENT DRAIN TYPICAL SECTIONS - STAGE 1 SHEET 1 OF 2
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 1
DRG. NO.	DESCRIPTION

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED	
1	20JUN'16	UPDATED WITH TEMP. EXTRACTION POND DETAILS	JRG	ABN/RM	DDF	KJB	
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB	

KEN J. BROUWER 18020 PE Jun 23/16 REGISTERED PROFESSIONAL ENGINEER

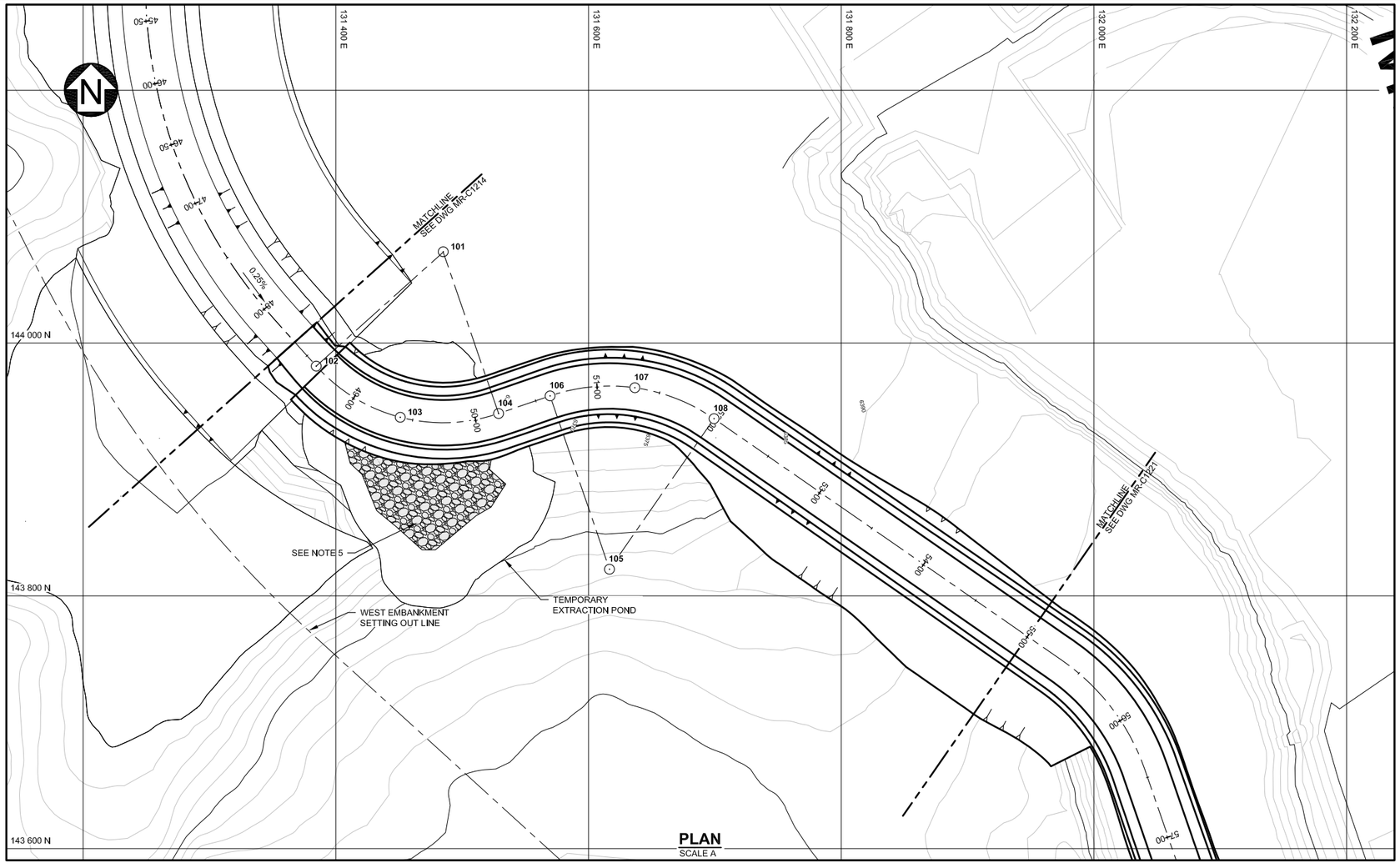
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

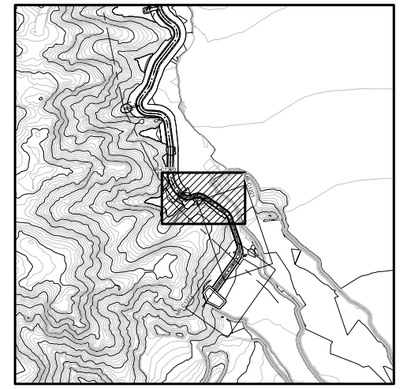
YANKEE DOODLE TAILING IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORK PLAN - STAGE 1
STA 40+75 TO 50+50

CONSULT. NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1214	1

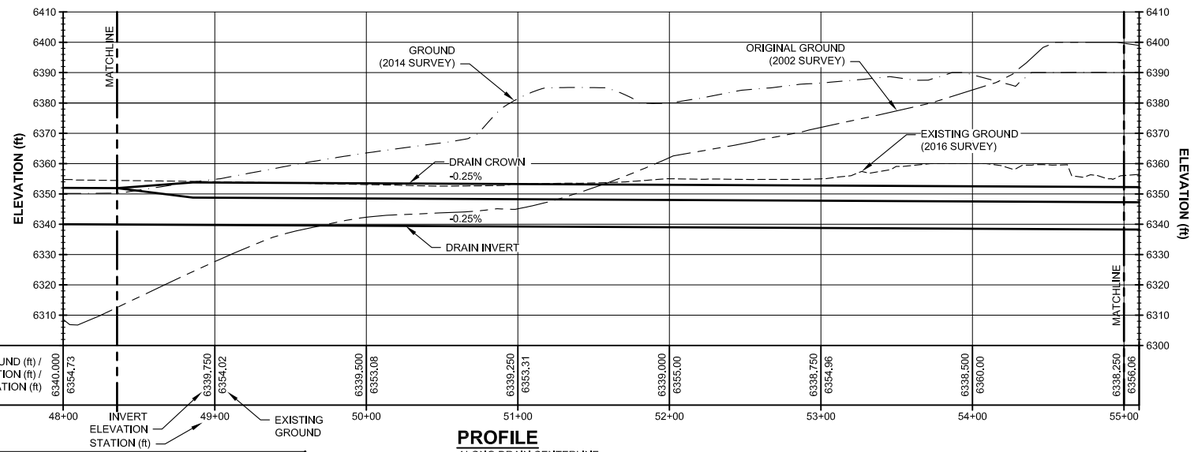


PLAN
SCALE A



KEY PLAN

SETTING OUT POINTS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
101	144072.25	131485.03	-	COC
102	143981.79	131384.55	6339.85	BOC
103	143941.31	131451.03	6339.65	MOC
104	143944.25	131528.81	6339.45	EOC
105	143821.07	131616.62	-	COC
106	143958.23	131569.61	6339.34	BOC
107	143964.68	131636.62	6339.18	MOC
108	143940.17	131699.34	6339.00	EOC



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

LEGEND:

ZONE D1 - ROCKFILL

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
5. TEMPORARY EXTRACTION POND TO BE BACKFILLED WITH ZONE D1 - ROCKFILL TO DRAIN INVERT. NON-WOVEN GEOTEXTILE TO BE PLACED ABOVE ZONE D1 BACKFILL.

NOT FOR CONSTRUCTION

20 0 20 40 60 80 100 ft
SCALE B
50 0 50 100 150 200 250 ft
SCALE A

REFERENCE DRAWINGS	
MR-C1234	WEST EMBANKMENT DRAIN - TYPICAL SECTIONS STAGE 2
MR-C1209	WEST EMBANKMENT DRAIN - PLAN AND PROFILE - STAGE 2
DRG. NO.	DESCRIPTION

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS						
A	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

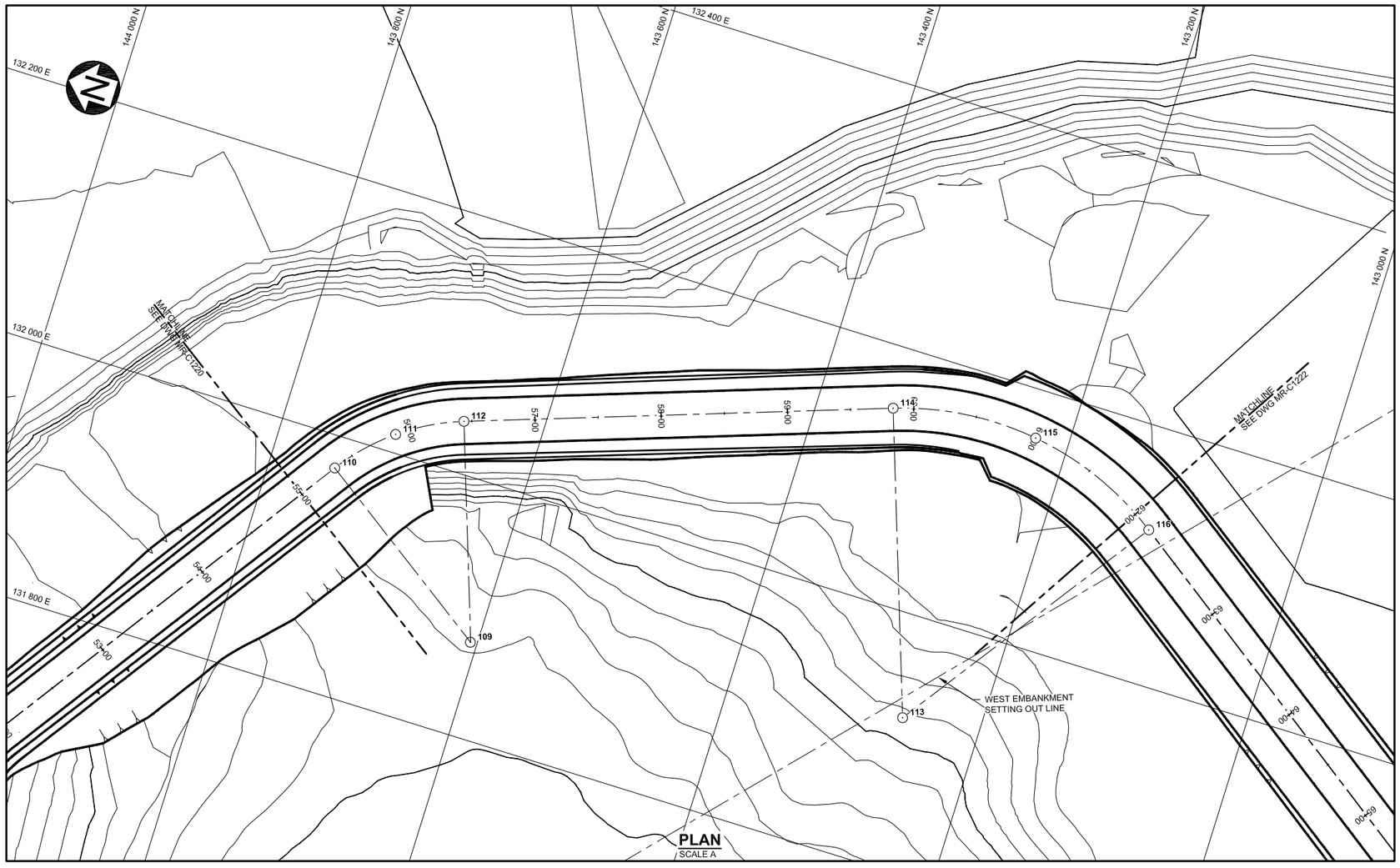
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

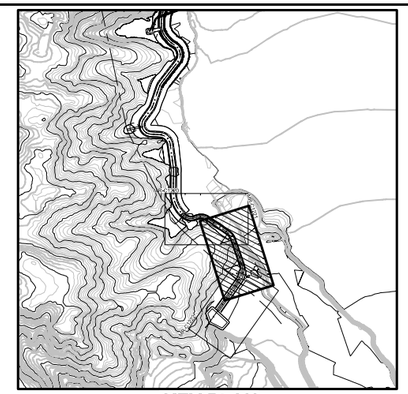
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORKPLAN - STAGE 2
STA 48+36 TO 57+00

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1220	A



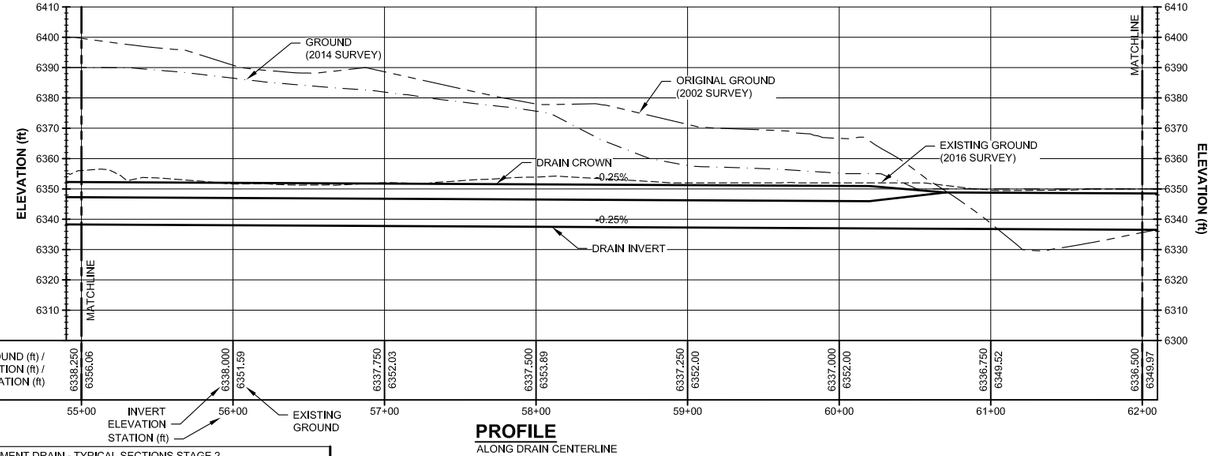
PLAN
SCALE A



KEY PLAN

SETTING OUT POINTS

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
109	143605.43	131874.96	-	COC
110	143748.87	131974.79	6338.17	BOC
111	143710.77	132014.48	6338.03	MOC
112	143662.26	132040.37	6337.89	EOC
113	143261.06	131917.74	-	COC
114	146988.41	131153.39	6337.04	BOC
115	143226.25	132162.25	6336.75	MOC
116	143119.22	132119.50	6339.46	EOC



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

NOT FOR CONSTRUCTION

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 50 0 50 100 150 200 250 ft

DRG. NO.	DESCRIPTION
MR-C1234	WEST EMBANKMENT DRAIN - TYPICAL SECTIONS STAGE 2
MR-C1209	WEST EMBANKMENT DRAIN - PLAN AND PROFILE STAGE 2

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
A	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-

REVISIONS

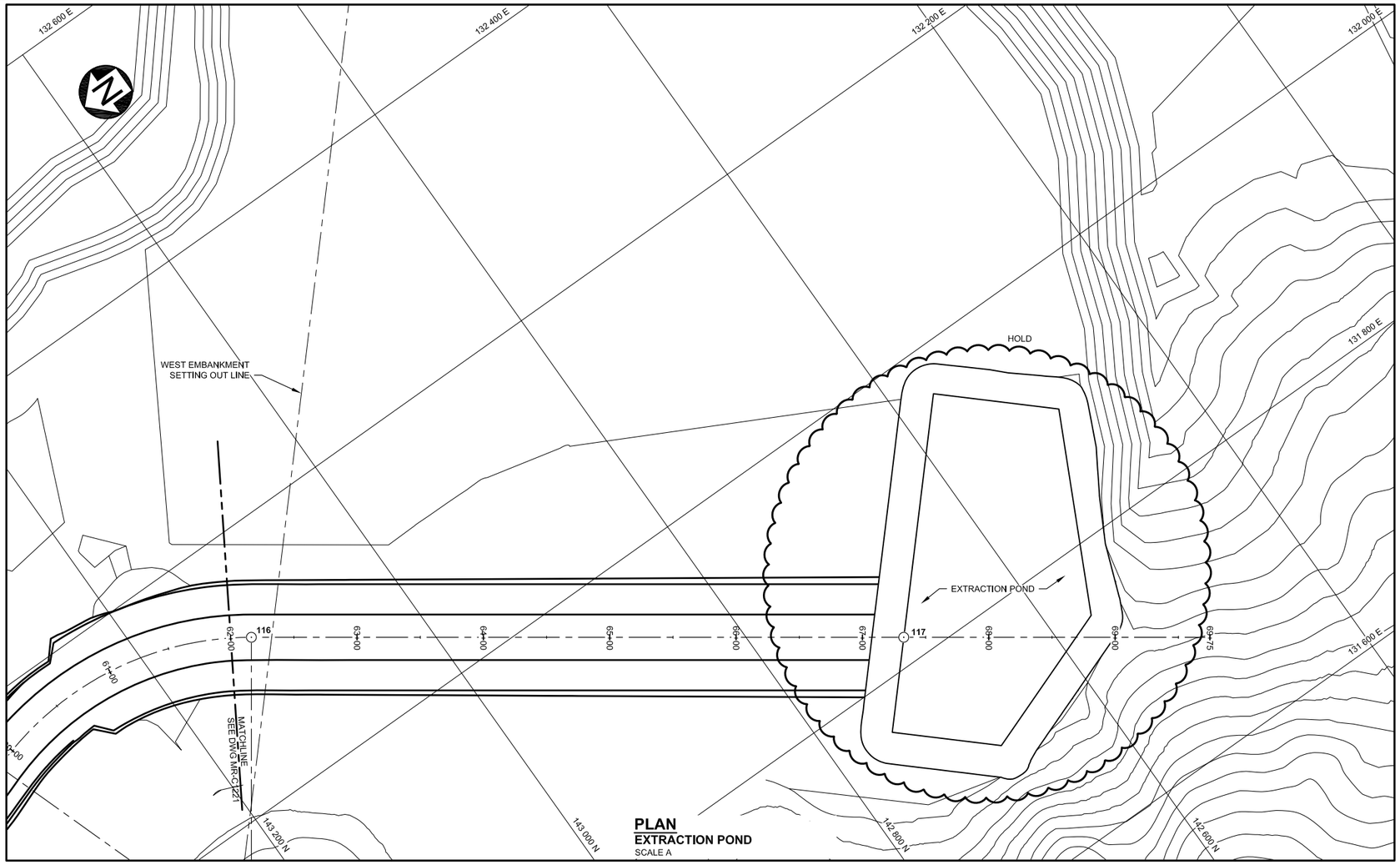
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

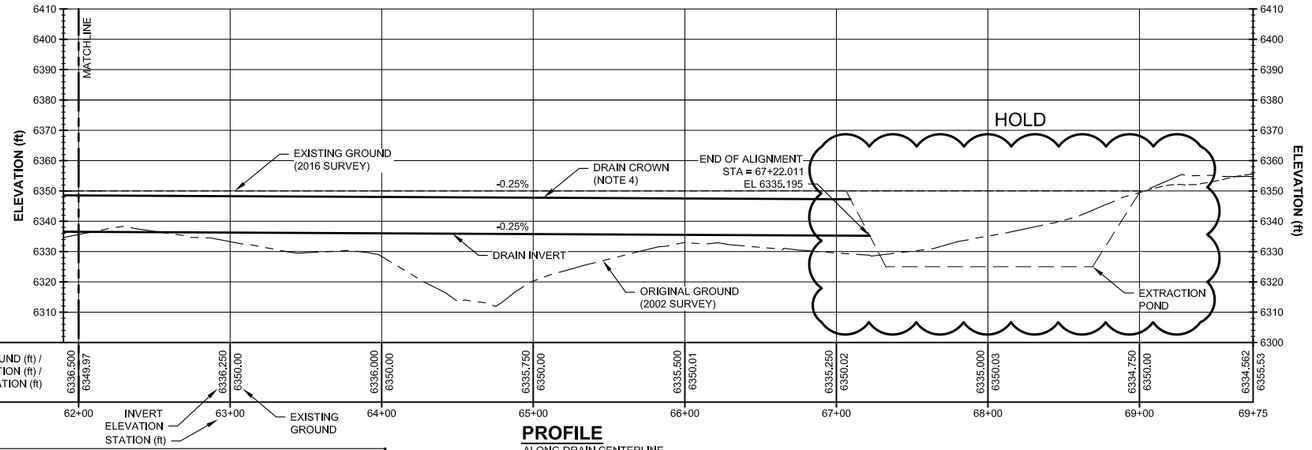
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORKPLAN - STAGE 2
STA 55+00 TO 62+00

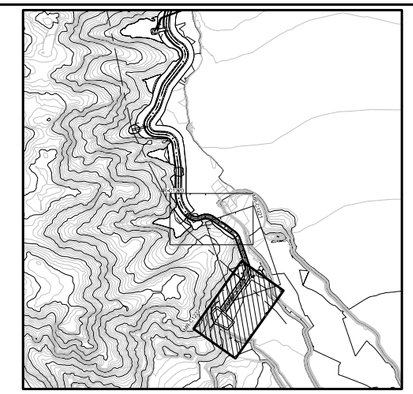
P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1221	A



PLAN
EXTRACTION POND
SCALE A



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B



KEY PLAN

SETTING OUT POINTS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
116	143119.22	132119.50	6339.46	EOC
117	142698.20	131820.54	6335.19	EOA

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

NOT FOR CONSTRUCTION

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 50 0 50 100 150 200 250 ft

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

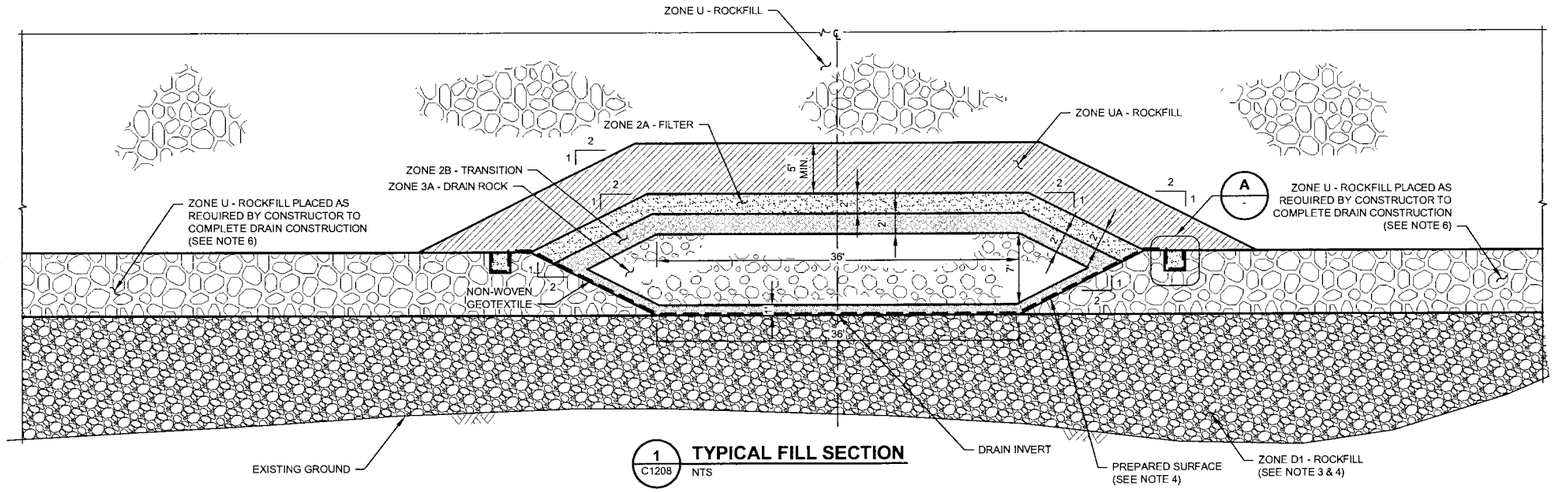
WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
WORKPLAN - STAGE 2
STA 62+00 TO 67+22

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1222	A

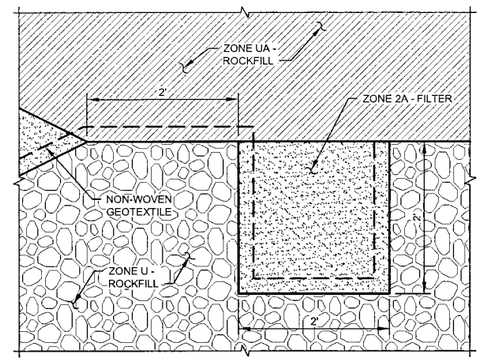
REFERENCE DRAWINGS	
MR-C1234	WEST EMBANKMENT DRAIN - TYPICAL SECTIONS STAGE 2
MR-C1209	WEST EMBANKMENT DRAIN - PLAN AND PROFILE STAGE 2
DRG. NO.	DESCRIPTION

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
A	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-

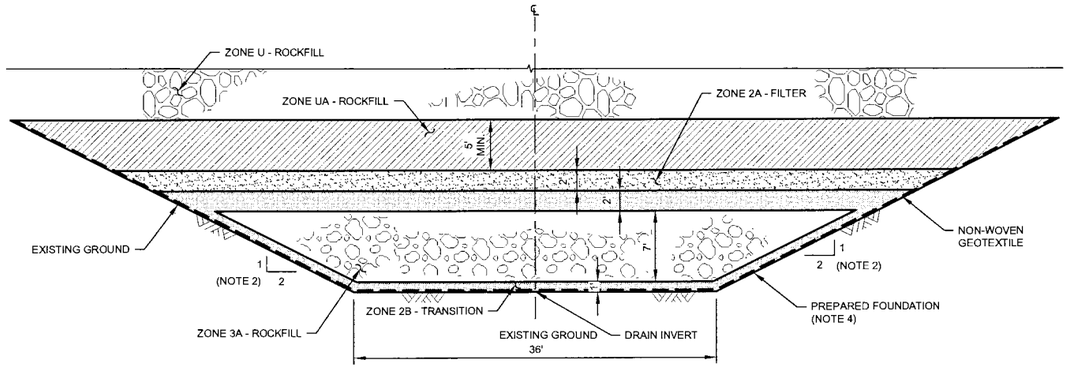
SAVED: M:\1\101\126\13\A\Acad\DWGS\MR-C1222.MR-C1222. 11/25/2016 3:04:33 PM. RMCLELLAN. PRINTED: 11/25/2016 3:05:07 PM. MR-C1222. RMCLELLAN
XREF FILE(S): West Embankment Drain -DP2- 2015 Contours - 5'; West Embankment Drain - Stage 1; West Embankment Drain - Stage 2; TOPO - 2016 Contours - 5m IMAGE FILE(S):



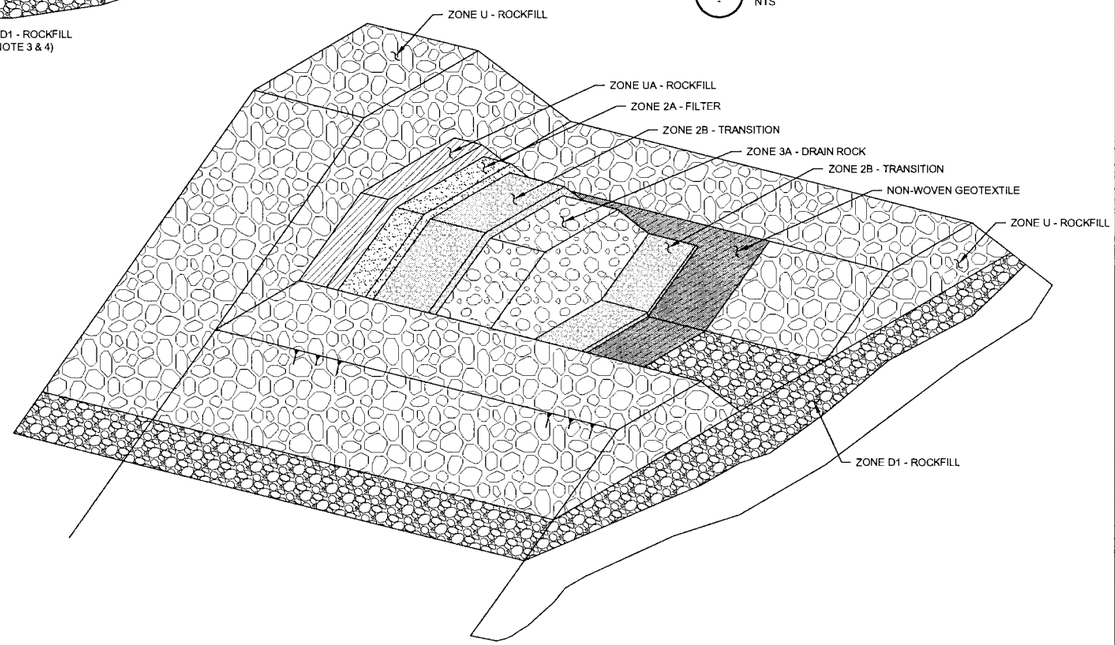
1 / C1208 **TYPICAL FILL SECTION**
NTS



A / - **DETAIL**
NTS



2 / C1208 **TYPICAL CUT SECTION**
NTS



ISOMETRIC CUT-AWAY (FILL SECTION)
NTS

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE D1 - ROCKFILL
- NON-WOVEN GEOTEXTILE

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. MAXIMUM CUT AND FILL SLOPES ARE SHOWN. FLATTER SLOPES CAN BE CONSTRUCTED AT THE CONSTRUCTORS / OWNER DISCRETION TO AID CONSTRUCTION EFFICIENCY.
3. CORRIDOR IN FILL SHALL BE RAISED TO INVERT ELEVATION USING ZONE D1 - ROCKFILL.
4. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE FILLED WITH ZONE 2A - FILTER MATERIAL TO PROVIDE AN EVEN SURFACE TO RECEIVE THE GEOTEXTILE.
5. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
6. ZONE D1 - ROCKFILL MAY BE USED IN PLACE OF ZONE U - ROCKFILL TO COMPLETE DRAIN CONSTRUCTION.

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
MR-C1208	WEST EMBANKMENT DRAIN - PLAN AND PROFILE STAGE 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR/JRG	ABN/ELG	DDF	LTS

REVISIONS

KEN J. BROUWER 10020 PE
PROFESSIONAL ENGINEER
REGISTERED
APR 23, 2016

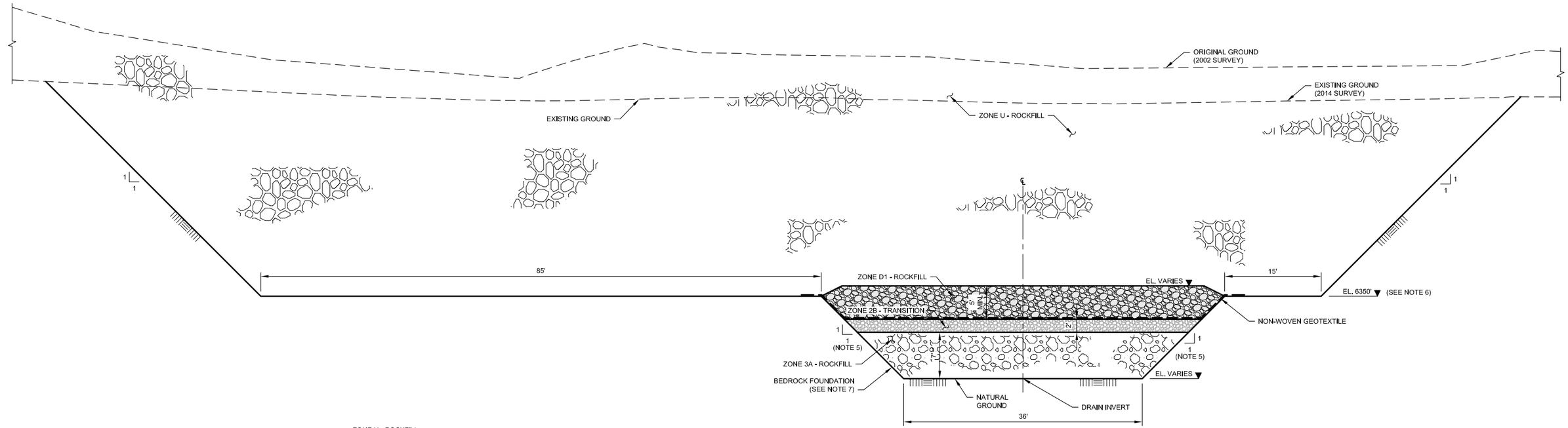
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

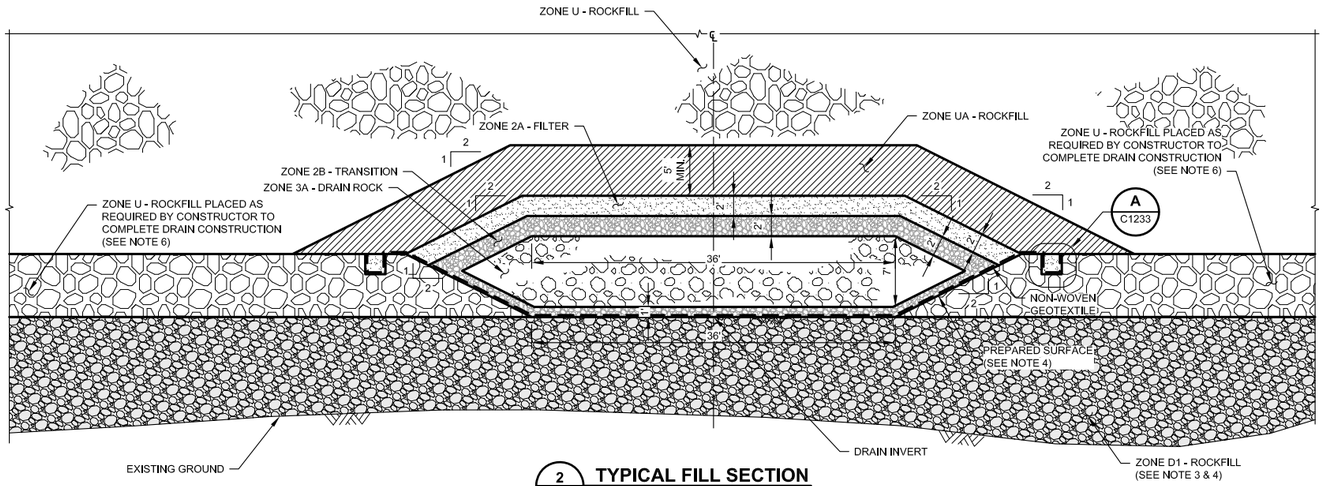
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
TYPICAL SECTIONS - STAGE 1

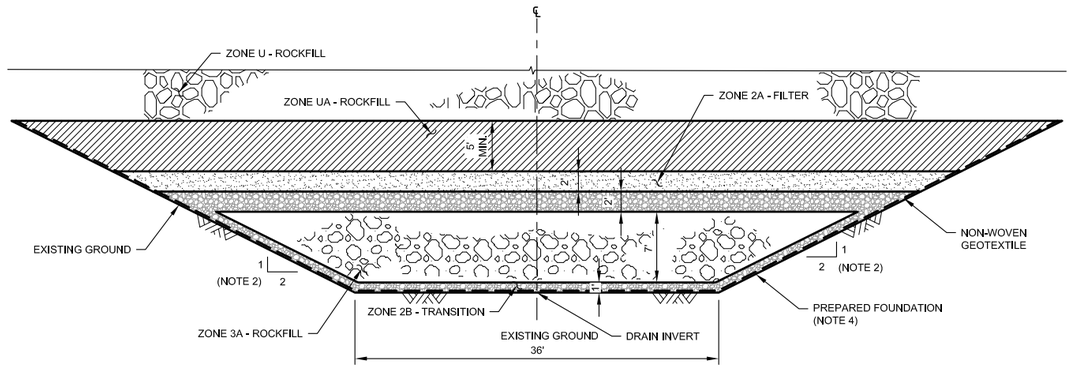
PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1233	0



1 C1209 **TYPICAL CUT SECTION**
STATION 49+00 TO STATION 61+00
NTS



2 C1209 **TYPICAL FILL SECTION**
NTS



3 C1209 **TYPICAL CUT SECTION**
STATION 61+00 TO STATION 68+00
NTS

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. MAXIMUM CUT AND FILL SLOPES ARE SHOWN. FLATTER SLOPES CAN BE CONSTRUCTED AT THE CONSTRUCTORS / OWNER DISCRETION TO AID CONSTRUCTION EFFICIENCY.
3. CORRIDOR IN FILL SHALL BE RAISED TO INVERT ELEVATION USING ZONE D1 - ROCKFILL.
4. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE FILLED WITH ZONE 2A - FILTER MATERIAL TO PROVIDE AN EVEN SURFACE TO RECEIVE THE GEOTEXTILE.
5. THE EXCAVATION BETWEEN STATION 48+00 TO 62+00 HAS BEEN MODELED WITH CUT SLOPES OF 1H:1V. IT MAY BE POSSIBLE TO CUT THE SLOPES THROUGH THE BEDROCK AT A STEEPER ANGLE FOLLOWING FURTHER REFINEMENT OF THE DESIGN AND CONSTRUCTION METHODOLOGIES.
6. BENCH CUT AND DIMENSIONS INCLUDED AT THE REQUEST OF MONTANA RESOURCES, LLP.
7. CLEAN BEDROCK FOUNDATION DOES NOT REQUIRE NON-WOVEN GEOTEXTILE. AREAS WHERE FOUNDATION CONSISTS OF BROKEN ROCKFILL OR SOIL MAY REQUIRE NON-WOVEN GEOTEXTILE, PLACED AT THE ENGINEERS DISCRETION.

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE D1 - ROCKFILL
- NON-WOVEN GEOTEXTILE

NOT FOR CONSTRUCTION

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
TYPICAL SECTIONS
STAGE 2

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1234	B

DRG. NO.	DESCRIPTION
MR-C1209	WEST EMBANKMENT DRAIN PLAN AND PROFILE - STAGE 2

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
B	25NOV'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-
A	23MAR'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-

REVISIONS

SAVED: M:\101\00126\13\AA\cad\DWGS\MR-C1234\MR-C1234, 3/24/2016 4:50:14 PM , EGUEVARRA PRINTED: 11/25/2016 2:45:45 PM, MR-C1234, RMCLELLAN
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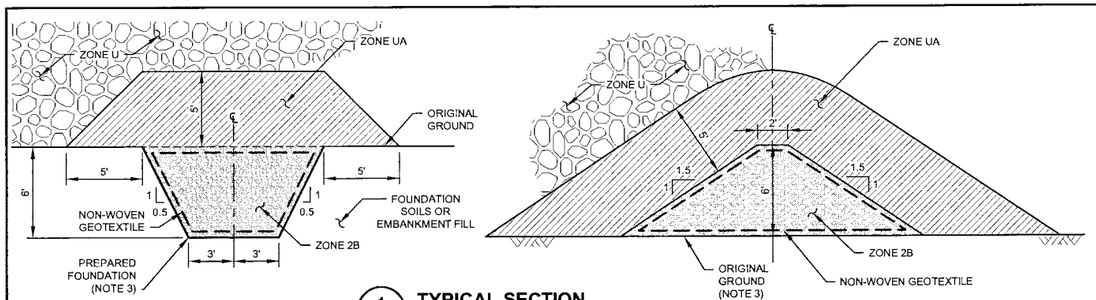
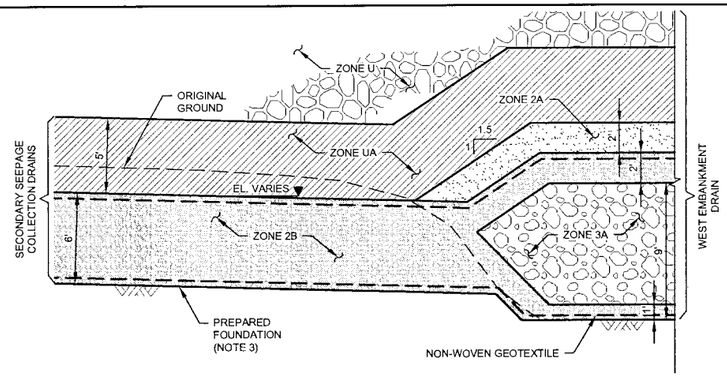
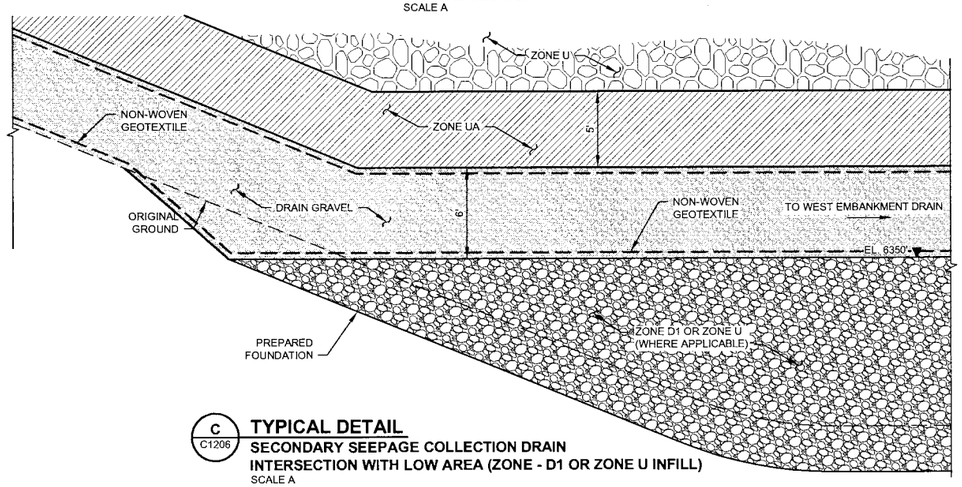


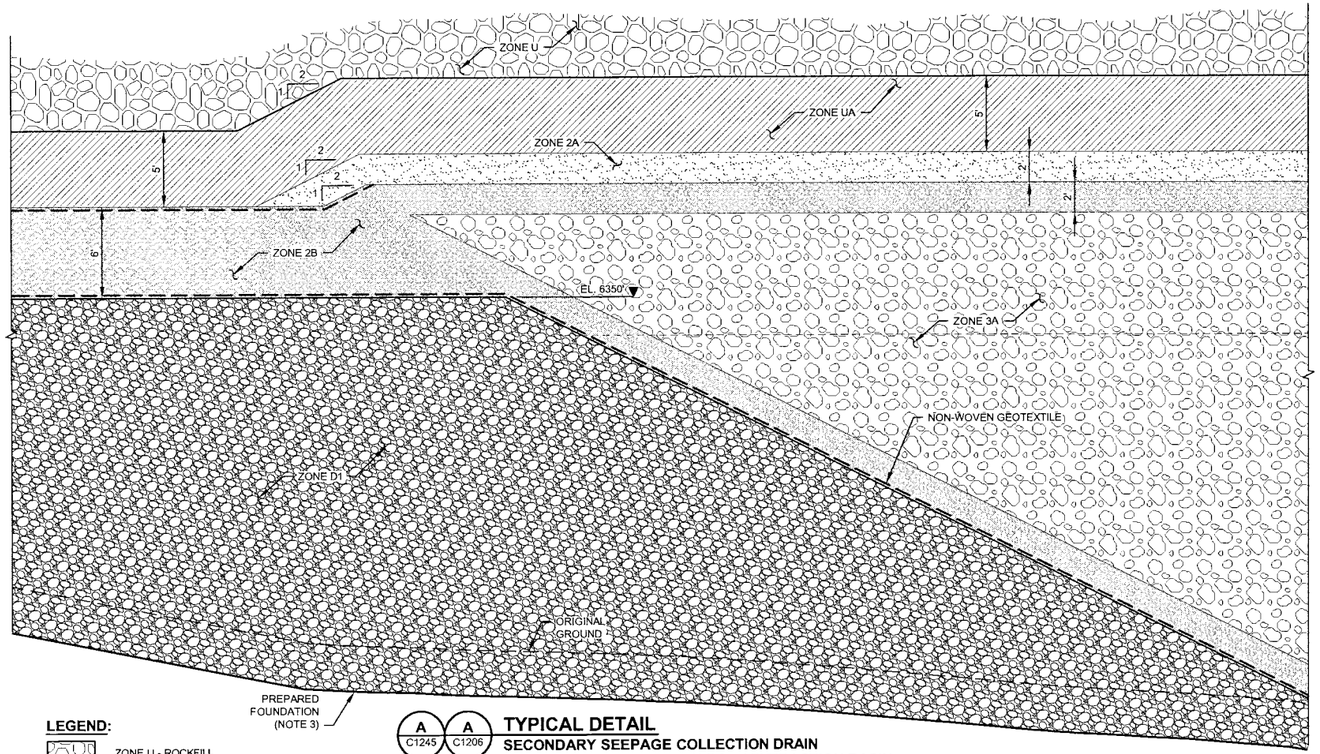
1 TYPICAL SECTION
SECONDARY SEEPAGE COLLECTION DRAIN
TYPICAL SECTIONS
SCALE A



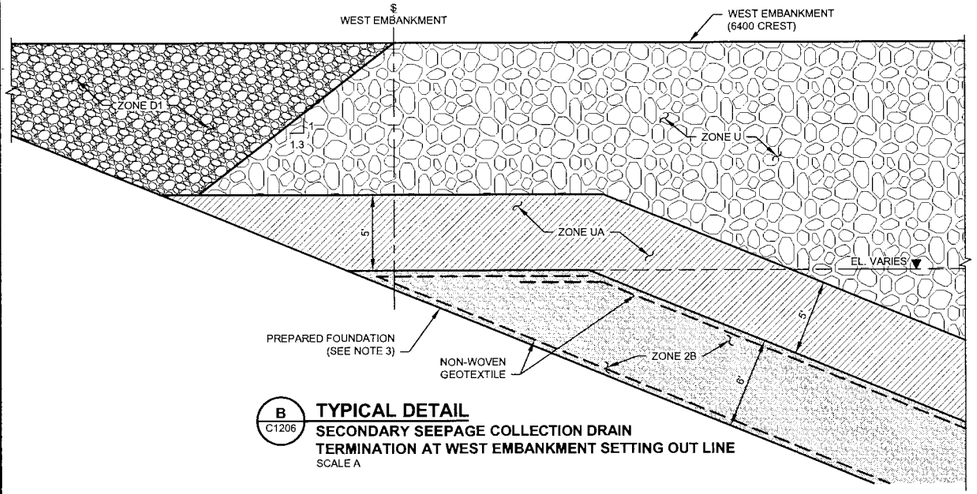
D C1206 TYPICAL DETAIL
SECONDARY SEEPAGE COLLECTION DRAIN
INTERSECTION WITH WEST EMBANKMENT DRAIN
SCALE A



C C1206 TYPICAL DETAIL
SECONDARY SEEPAGE COLLECTION DRAIN
INTERSECTION WITH LOW AREA (ZONE - D1 OR ZONE U INFILL)
SCALE A



A C1245 A C1206 TYPICAL DETAIL
SECONDARY SEEPAGE COLLECTION DRAIN
INTERSECTION WITH DRAIN POD / EXTRACTION BASIN
SCALE A



B C1206 TYPICAL DETAIL
SECONDARY SEEPAGE COLLECTION DRAIN
TERMINATION AT WEST EMBANKMENT SETTING OUT LINE
SCALE A

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE D1 - ROCKFILL
- SELECT LOW PERMEABILITY FILL
- DRAIN POD/DRAIN ROCK
- NON-WOVEN GEOTEXTILE

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR ITS CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET.
3. OVERSIZE BOULDERS PROJECTING INOT THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 - ROCKFILL OR ZONE 2A - FILTER MATERIAL TO PROVIDE AN EVEN SURFACE TO RECEIVE THE GEOTEXTILE

ISSUED FOR CONSTRUCTION

SCALE A 5 0 5 10 15 20 25 ft

MR-C1206	SECONDARY SEEPAGE COLLECTION DRAINS - PLAN
DRG. NO.	DESCRIPTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	SIR/ABN	DDF	KJB

REVISIONS

PROFESSIONAL ENGINEER
KEN J. BROUWER
10020 PE
PROVINCE OF BRITISH COLUMBIA
23 2016
REGISTERED PROFESSIONAL ENGINEER

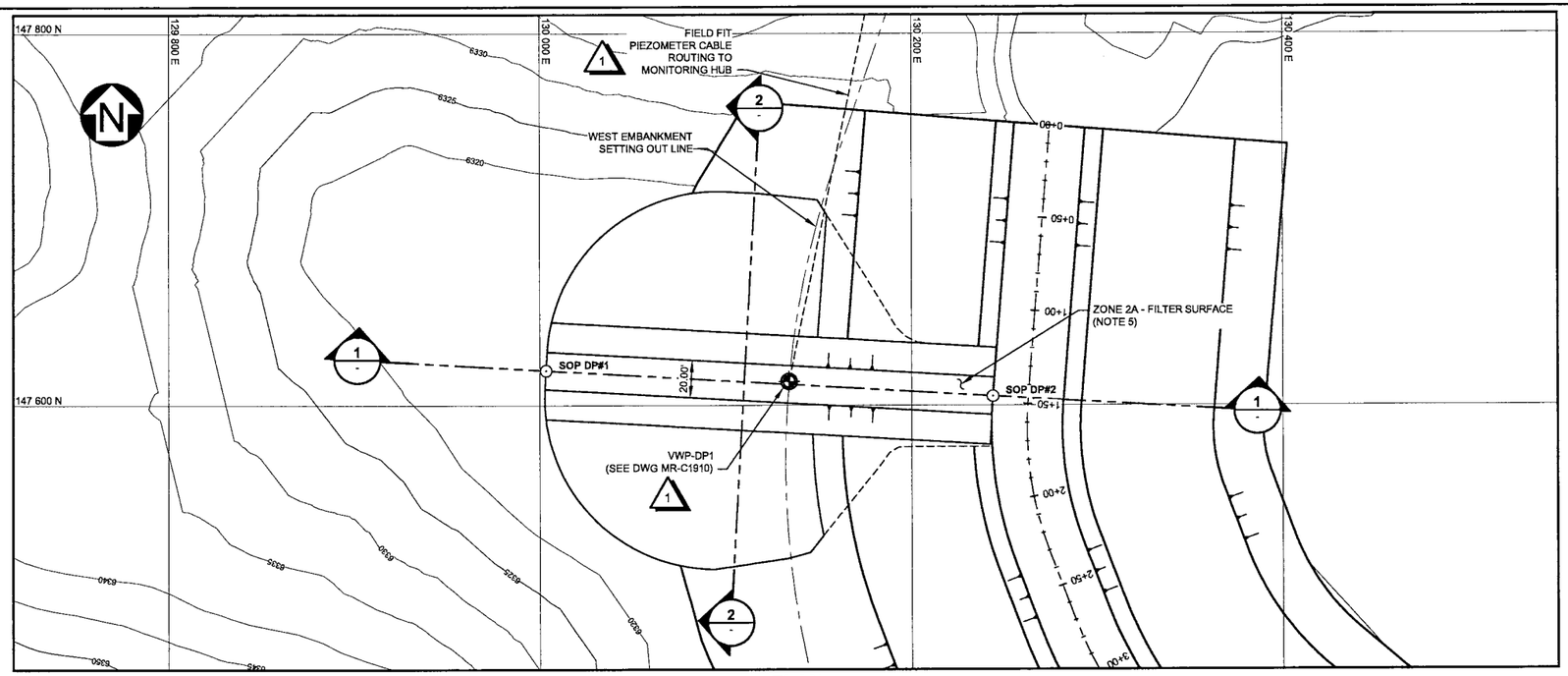
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

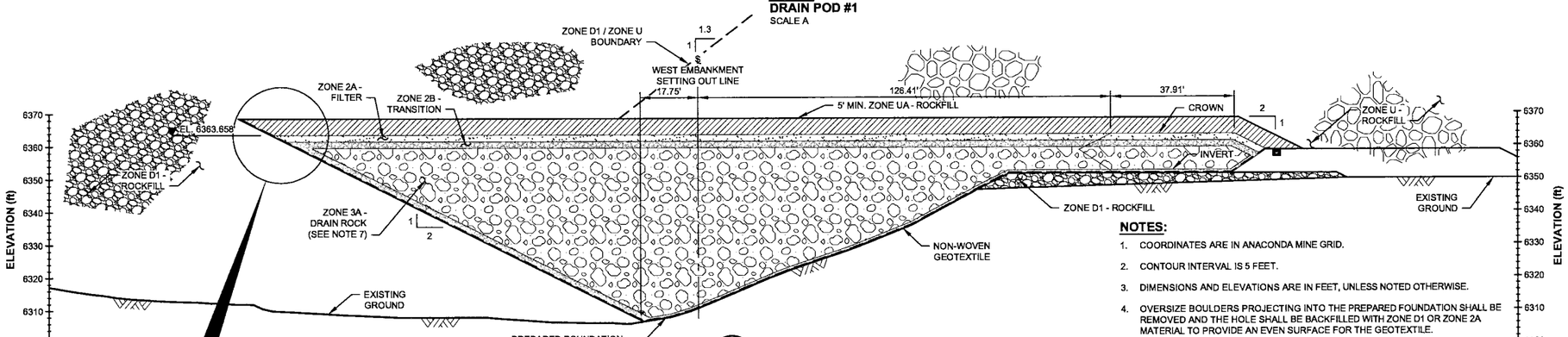
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6400 CREST
SECONDARY SEEPAGE COLLECTION DRAINS
SECTIONS AND DETAILS

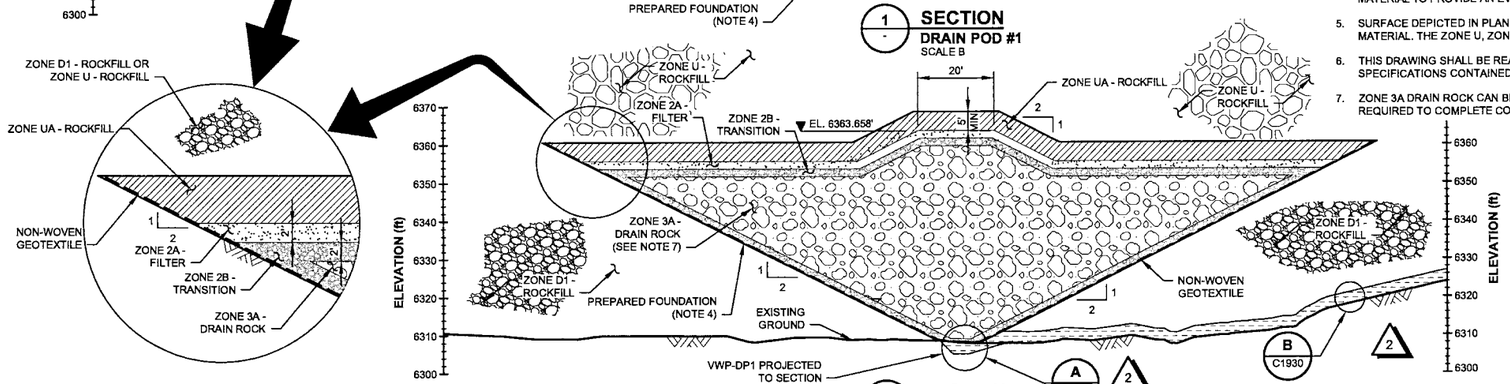
VA101-126/13	DRAWING NO. MR-C1235	REVISION 0



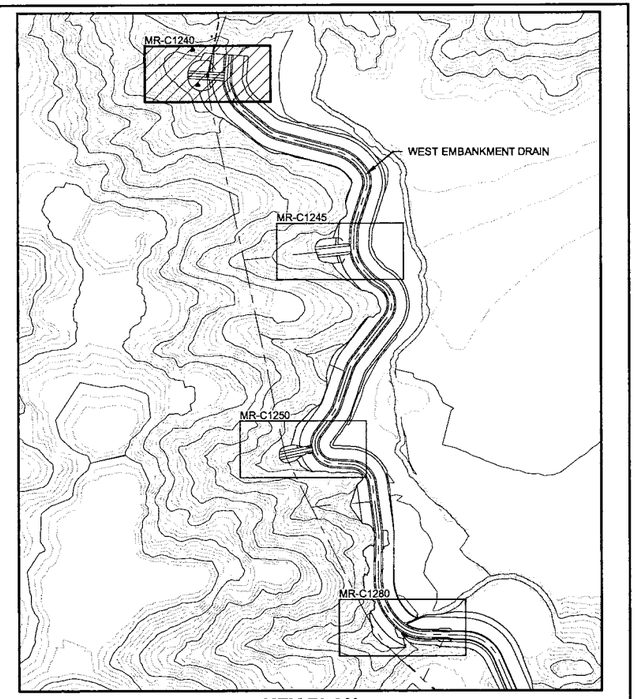
PLAN
DRAIN POD #1
SCALE A



1 SECTION
DRAIN POD #1
SCALE B



2 SECTION
DRAIN POD #1
SCALE B



KEY PLAN

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE N1 - INSTRUMENTATION BACKFILL
- NON-WOVEN GEOTEXTILE
- SECONDARY SEEPAGE COLLECTION DRAIN

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL TO PROVIDE AN EVEN SURFACE FOR THE GEOTEXTILE.
5. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
6. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
7. ZONE 3A DRAIN ROCK CAN BE REPLACED WITH ZONE 2B -TRANSITION AS REQUIRED TO COMPLETE CONSTRUCTION.

SOP	EASTING	NORTHING	ELEVATION (ft)
DP#1	130003.353	147618.706	6363.658
DP#2	130244.272	147604.878	6363.658

ISSUED FOR CONSTRUCTION

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 40 0 40 80 120 160 200 ft

DRG. NO.	DESCRIPTION
MR-C1930	WEST EMBANKMENT 6400 CREST - GEOTECHNICAL INSTRUMENTATION - TYPICAL DETAILS
MR-C1910	WEST EMBANKMENT 6400 CREST - INSTRUMENTATION PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	22APR'16	UPDATED WITH PIEZOMETER DETAILS	ACR	ABN	DDF	KJB
1	14APR'16	UPDATED WITH PIEZOMETER DETAILS	ACR	ABN	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE — REGISTERED PROFESSIONAL ENGINEER

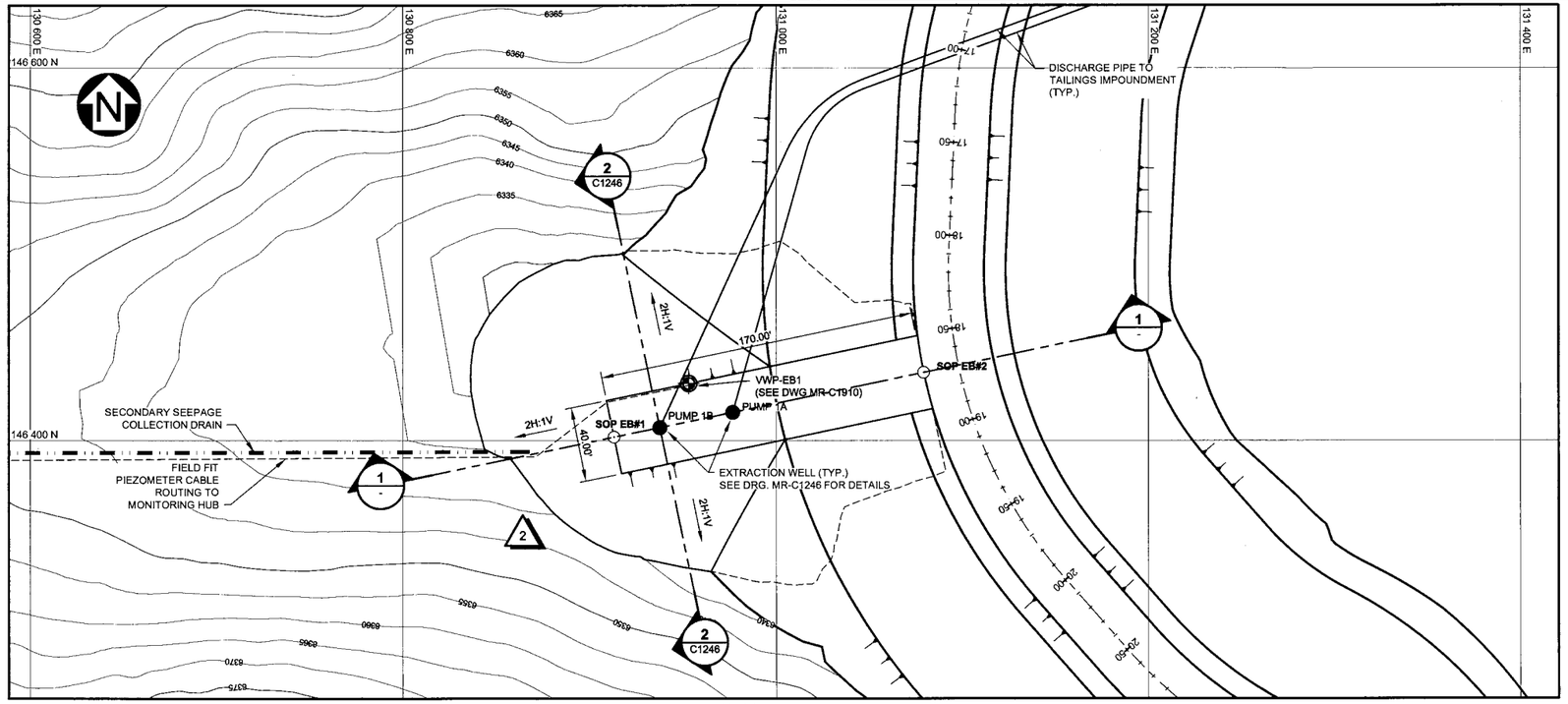
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

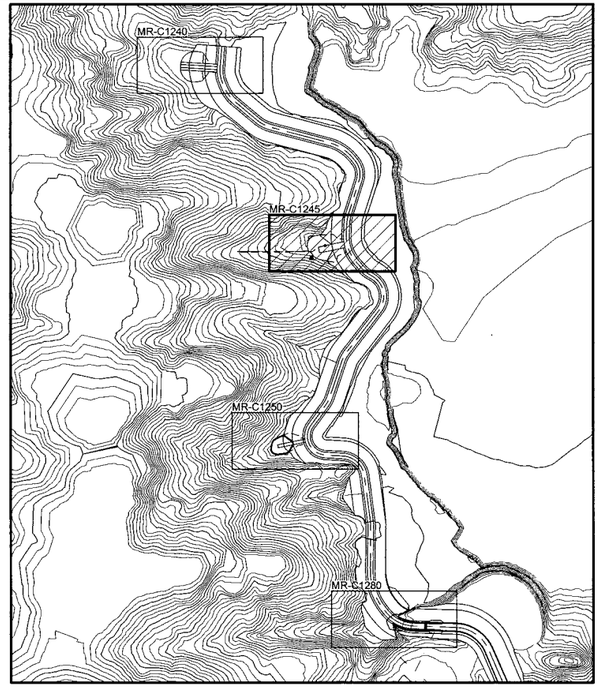
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
DRAIN POD #1
PLAN AND SECTIONS

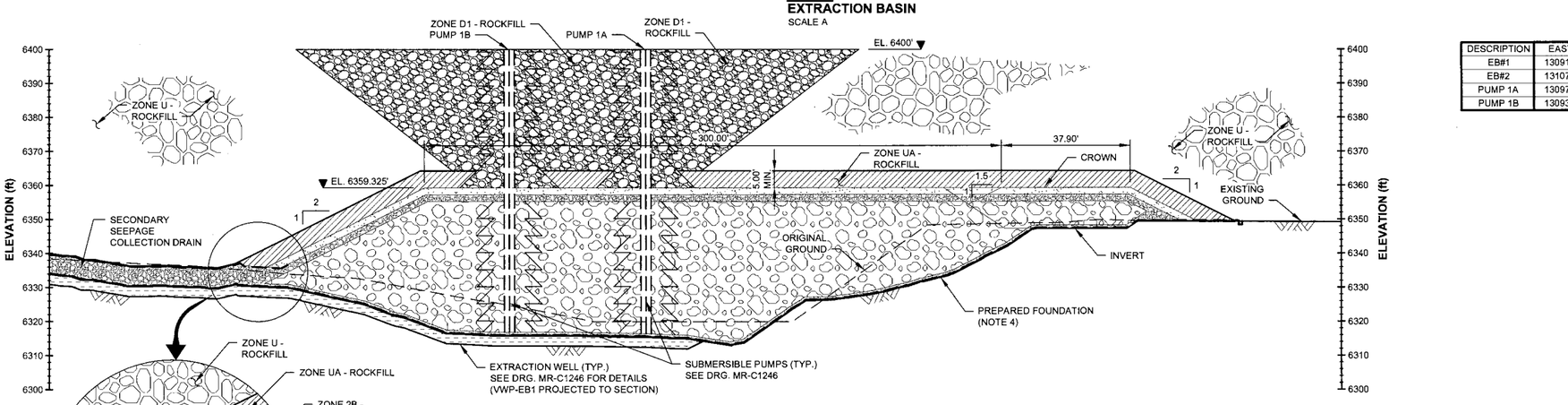
P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1240	2

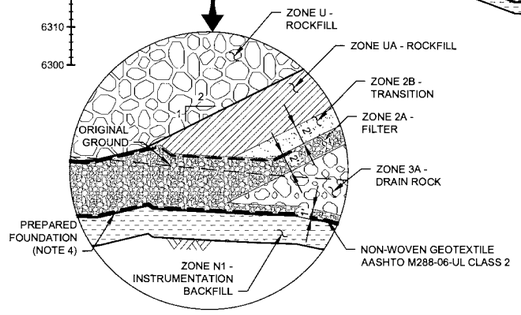


PLAN
EXTRACTION BASIN
SCALE A



KEY PLAN





SECTION
EXTRACTION BASIN
SCALE B

DESCRIPTION	EASTING	NORTHING	ELEVATION (ft)
EB#1	130913.082	146401.887	6359.325
EB#2	131079.512	146436.504	6359.325
PUMP 1A	130976.720	146415.123	-
PUMP 1B	130937.558	146406.978	-

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE N1 - INSTRUMENTATION BACKFILL
- NON-WOVEN GEOTEXTILE
- SECONDARY SEEPAGE COLLECTION DRAIN

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL TO PROVIDE AN EVEN SURFACE FOR THE GEOTEXTILE.
5. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
6. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 40 0 40 80 120 160 200 ft

DRG. NO.	DESCRIPTION
MR-C1930	WEST EMBANKMENT 6400 CREST - GEOTECHNICAL INSTRUMENTATION - TYPICAL DETAILS
MR-C1910	WEST EMBANKMENT 6400 CREST - INSTRUMENTATION PLAN
MR-C1246	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN #1 WELL SECTION
MR-C1235	WEST EMBANKMENT 6400 CREST - SECONDARY SEEPAGE COLLECTION DRAINS - SECTIONS AND DETAILS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	20OCT'16	EXTRACTION BASIN LOCATION UPDATED	JRG	ABN	DDF	KJB
1	22APR'16	UPDATED WITH PIEZOMETER DETAILS	ACR	ABN	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE 04-29-2016 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
PLAN AND SECTION

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1245	2

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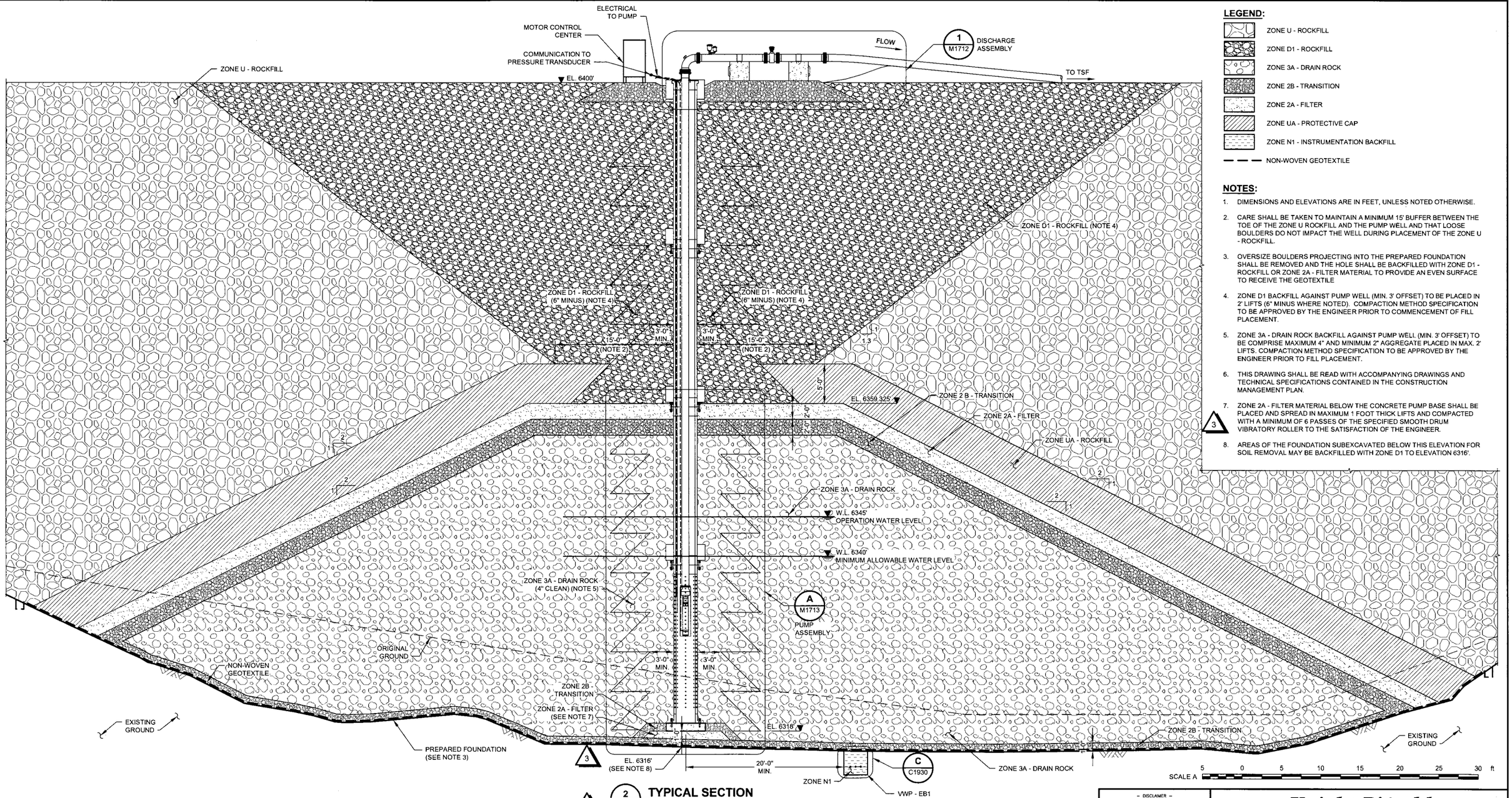

3 2 C1245 **TYPICAL SECTION**
EXTRACTION BASIN
PUMP 1A + PUMP 1B
SCALE A

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE UA - PROTECTIVE CAP
- ZONE N1 - INSTRUMENTATION BACKFILL
- NON-WOVEN GEOTEXTILE

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. CARE SHALL BE TAKEN TO MAINTAIN A MINIMUM 15' BUFFER BETWEEN THE TOE OF THE ZONE U ROCKFILL AND THE PUMP WELL AND THAT LOOSE BOULDERS DO NOT IMPACT THE WELL DURING PLACEMENT OF THE ZONE U - ROCKFILL.
3. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 - ROCKFILL OR ZONE 2A - FILTER MATERIAL TO PROVIDE AN EVEN SURFACE TO RECEIVE THE GEOTEXTILE
4. ZONE D1 BACKFILL AGAINST PUMP WELL (MIN. 3' OFFSET) TO BE PLACED IN 2' LIFTS (6" MINUS WHERE NOTED). COMPACTION METHOD SPECIFICATION TO BE APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF FILL PLACEMENT.
5. ZONE 3A - DRAIN ROCK BACKFILL AGAINST PUMP WELL (MIN. 3' OFFSET) TO BE COMPRISE MAXIMUM 4" AND MINIMUM 2" AGGREGATE PLACED IN MAX. 2' LIFTS. COMPACTION METHOD SPECIFICATION TO BE APPROVED BY THE ENGINEER PRIOR TO FILL PLACEMENT.
6. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
7. ZONE 2A - FILTER MATERIAL BELOW THE CONCRETE PUMP BASE SHALL BE PLACED AND SPREAD IN MAXIMUM 1 FOOT THICK LIFTS AND COMPACTED WITH A MINIMUM OF 6 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER TO THE SATISFACTION OF THE ENGINEER.
8. AREAS OF THE FOUNDATION SUBEXCAVATED BELOW THIS ELEVATION FOR SOIL REMOVAL MAY BE BACKFILLED WITH ZONE D1 TO ELEVATION 6316'.

DRG. NO.	DESCRIPTION
MR-C1930	WEST EMBANKMENT 6400 CREST - GEOTECHNICAL INSTRUMENTATION - TYPICAL DETAILS
MR-M1712	WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYP. DISCHARGE ASSEMBLY
MR-M1713	WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL INTAKE ASSEMBLY
MR-C1245	WEST EMBANKMENT DRAIN - EXTRACTION BASIN - PLAN AND SECTIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
3	20OCT'16	EXTRACTION BASIN LOCATION UPDATED	JRG	ABN	DDF	KJB
2	16MAY'16	REMOVED HOLD POINT	ACR	ABN	DDF	KJB
1	22APR'16	UPDATED WITH PIEZOMETER DETAILS	ACR	ABN	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. PROUWER 10020 PE REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
WELL SECTION

CONSULTANT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1246	3

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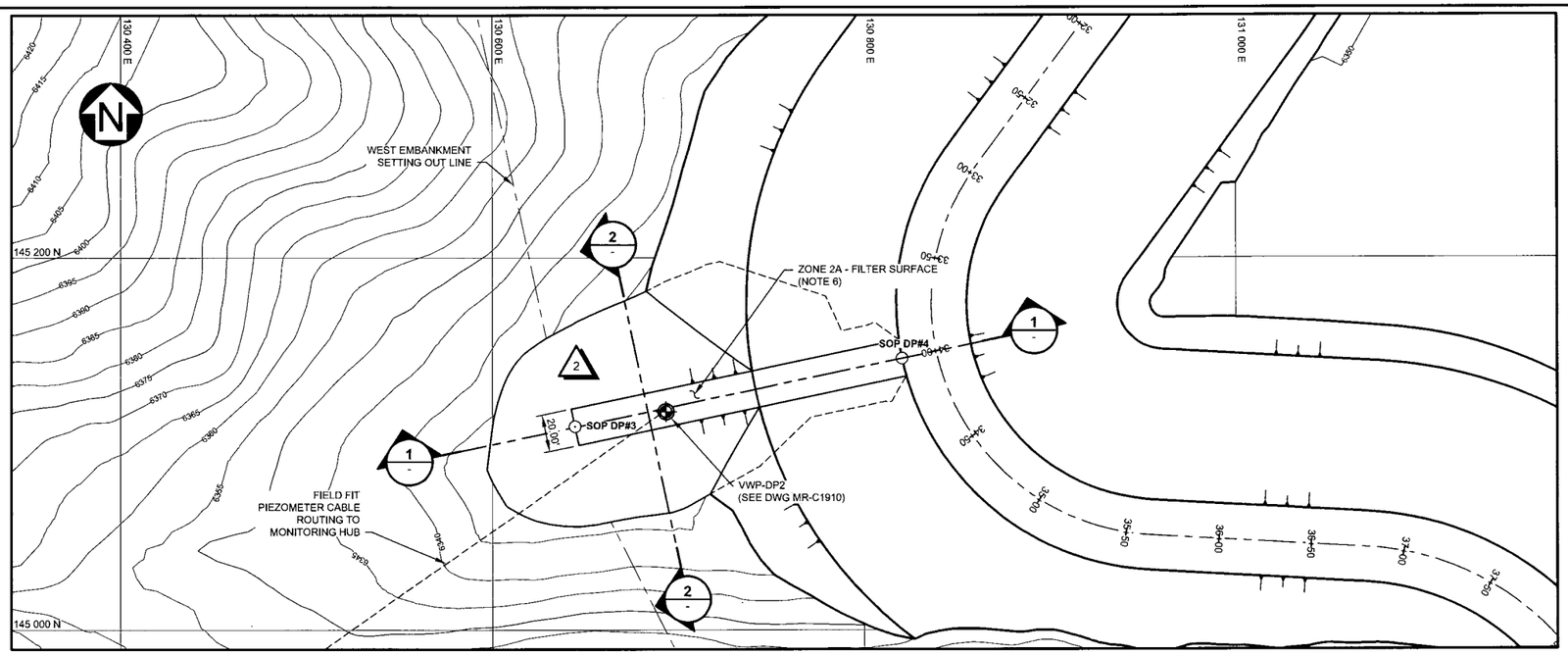
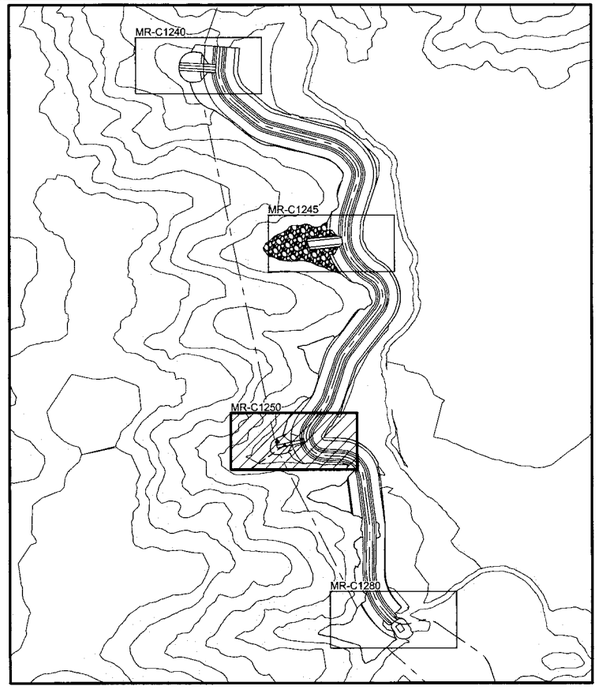
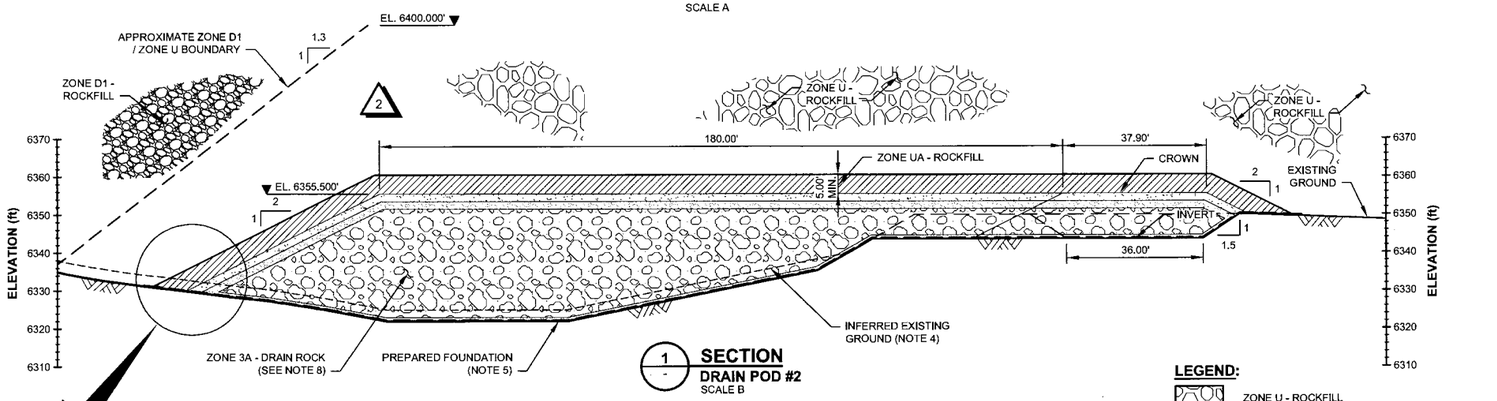


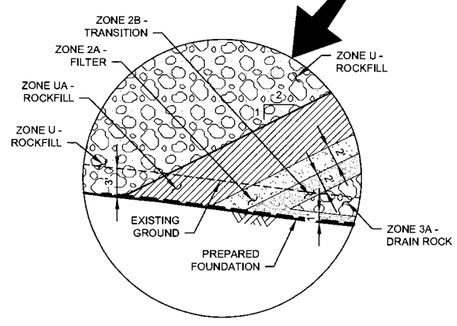
PLAN
DRAIN POD #2
SCALE A

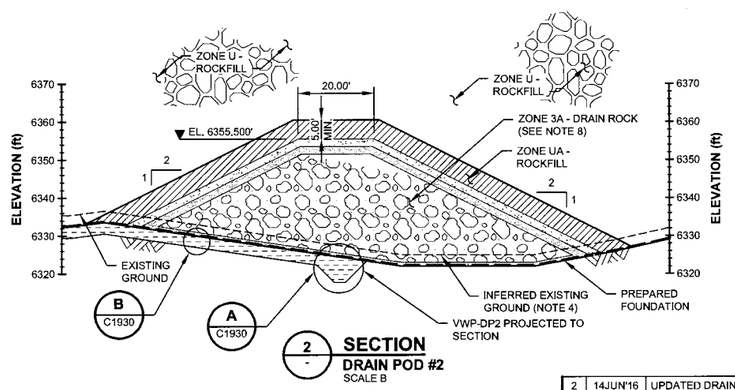


KEY PLAN



SECTION
DRAIN POD #2
SCALE B





SECTION
DRAIN POD #2
SCALE B

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE N1 - INSTRUMENTATION BACKFILL
- NON-WOVEN GEOTEXTILE

SOP	EASTING	NORTHING	ELEVATION
DP#3	130602.042	145099.999	6355.522
DP#4	130820.336	145145.800	6355.522

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. LIDAR IS CONSIDERED INACCURATE THROUGH INVERT OF DRAIN POD, DUE TO PONDING WATER. ELEVATIONS TO BE REVIEWED IN THE FIELD AND REPORTED TO THE ENGINEER PRIOR TO FILL PLACEMENT.
5. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL TO PROVIDE AN EVEN SURFACE FOR THE GEOTEXTILE.
6. SURFACE DEPICTED IN PLAN REPRESENTS THE TOP OF THE ZONE 2A - FILTER MATERIAL. THE ZONE U, ZONE UA AND ZONE D1 ARE OMITTED FOR CLARITY.
7. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
8. ZONE 3A DRAIN ROCK WITHIN DRAIN POD CAN BE REPLACED WITH ZONE 2B-TRANSITION AS REQUIRED FOR CONSTRUCTION.

ISSUED FOR CONSTRUCTION

SCALE B 20 0 20 40 60 80 100 ft
SCALE A 40 0 40 80 120 160 200 ft

ORG. NO.	DESCRIPTION
MR-C1930	WEST EMBANKMENT 6400 CREST - GEOTECHNICAL INSTRUMENTATION - TYPICAL DETAILS
MR-C1910	WEST EMBANKMENT 6400 CREST - INSTRUMENTATION PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	14JUN'16	UPDATED DRAIN POD GEOMETRY	ACR	ABN	DDF	KJB
1	22APR'16	UPDATED WITH PIEZOMETER DETAILS	ACR	ABN	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE Jun 23/16 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

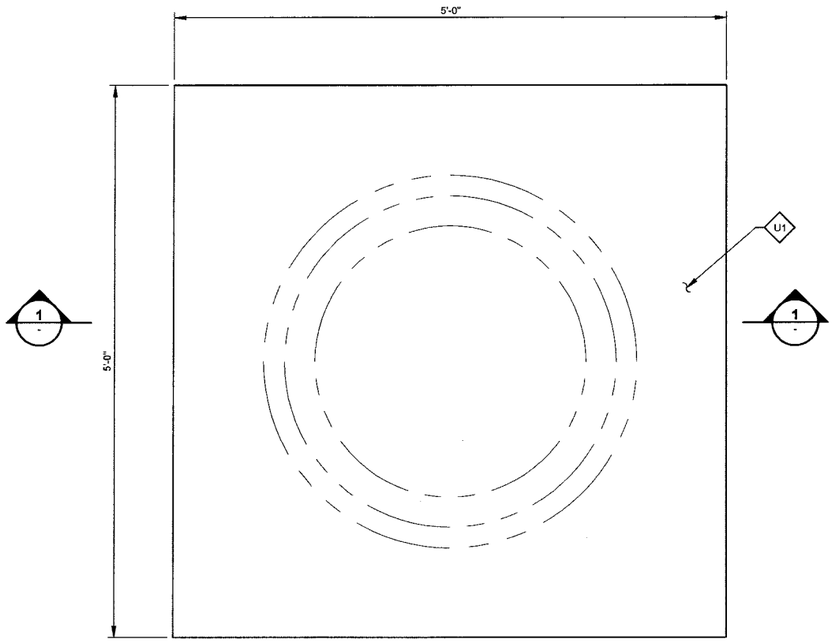
MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

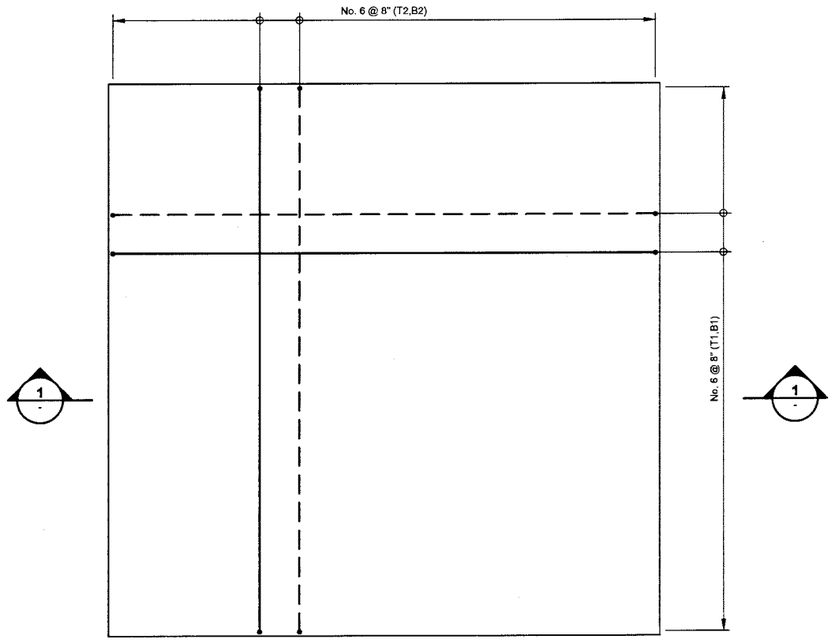
WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
DRAIN POD #2
PLAN AND SECTIONS

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1250	2

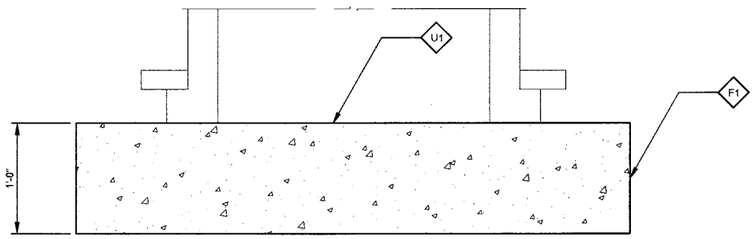
SAVED: M:\101\00126\13\A\Acad\DWGS\MR-C1250\MR-C1250, 6/14/2016 1:11:07 PM , RMCLELLAN PRINTED: 6/14/2016 1:11:37 PM, MR-C1250, RMCLELLAN
XREF FILE(S): 2015 Contours - 5' West Embankment Drain - Stage 1 IMAGE FILE(S):



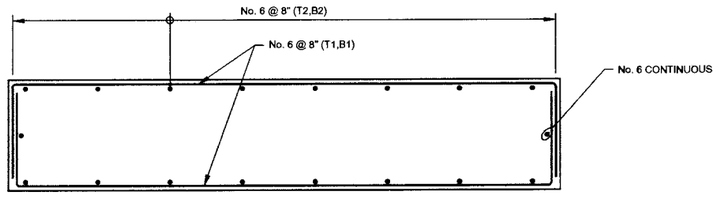
PLAN
CONCRETE OUTLINE
NTS



PLAN
REINFORCEMENT
NTS



1 SECTION
CONCRETE OUTLINE
NTS



1 SECTION
REINFORCEMENT
NTS

LEGEND:

U1 — UNFORMED FINISH: EVEN, UNIFORM FINISH; CONSOLIDATED, LEVEL AND SCREENED

F1 — FORMED FINISH: FORMS BUILT OF STANDARD FORM PLY WITH A MINIMUM OF REFINEMENT

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
3. CONCRETE STRENGTH: TYPE C30-20 (COMPRESSIVE STRENGTH 4350 psi WITH 3/4" AGGREGATE).
4. ALL EXPOSED CONCRETE CORNERS TO HAVE A 1" CHAMFER TO PREVENT CONCRETE CHIPPING UNLESS NOTED OTHERWISE.
5. FORMED SURFACES TO BE BUILT OF STANDARD FORM PLY AND UNFORMED SURFACES TO BE WOOD FLOAT FINISHED UNLESS NOTED OTHERWISE.
6. REINFORCMEENT SHALL BE DEFORMED BAR REINFORCEMENT IN ACCORDANCE WITH ASTM A615 GRADE 60.

ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — E. J. SCHERMAN # 28740 — 2016/05/16

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PROFESSIONAL ENGINEER — PROVINCE OF MONTANA — KEVIN J. BROUWER 10020 PE — REGISTERED — 5/16/16

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
PUMP BASE CONCRETE OUTLINE AND REINFORCEMENT

DRAWING NO.	REVISION
VA101-126/13	MR-C1270 / 0

MR-M1713	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL INTAKE DETAILS

REFERENCE DRAWINGS

DRG. NO.	DESCRIPTION

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	06MAY'16	ISSUED FOR CONSTRUCTION	KTW	ELG		

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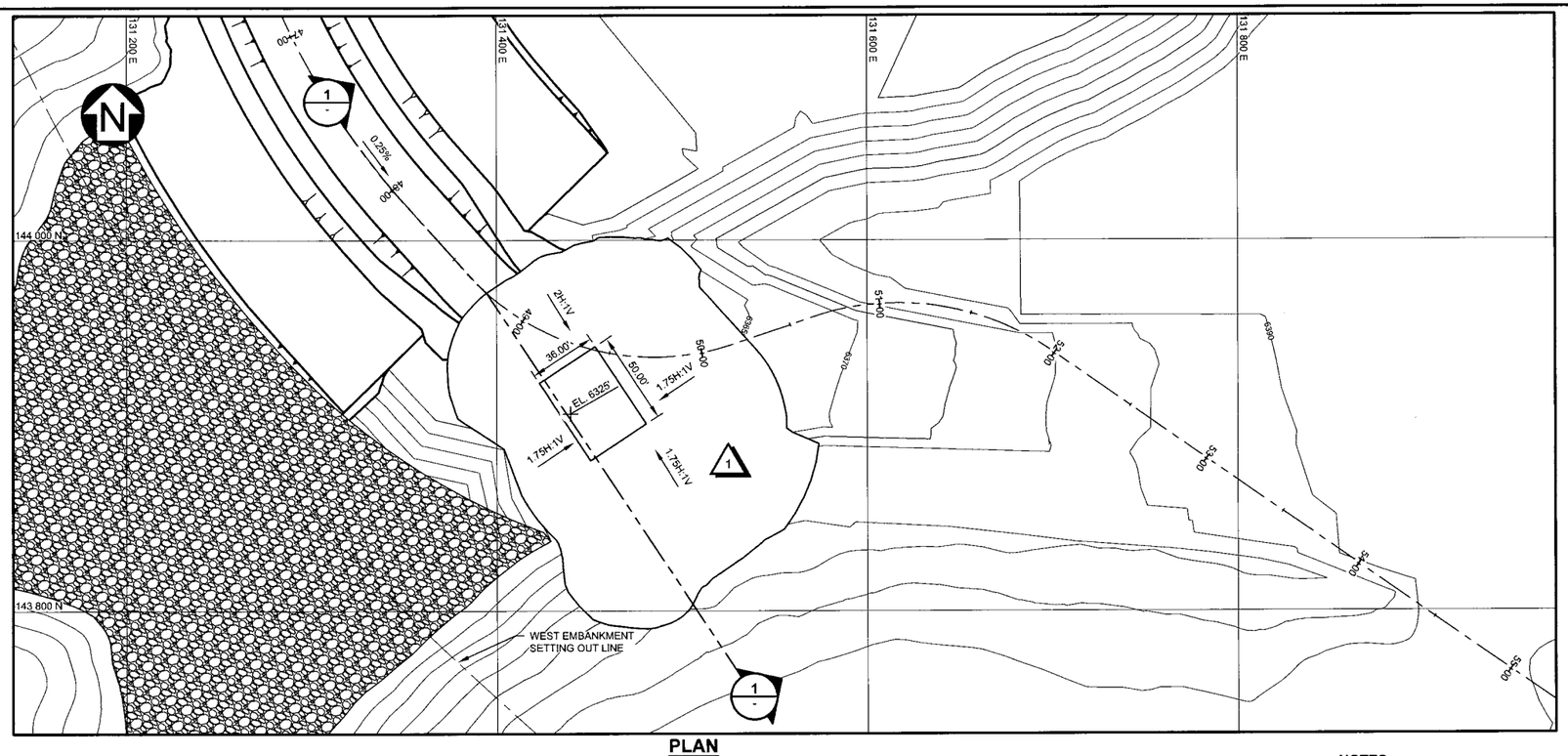
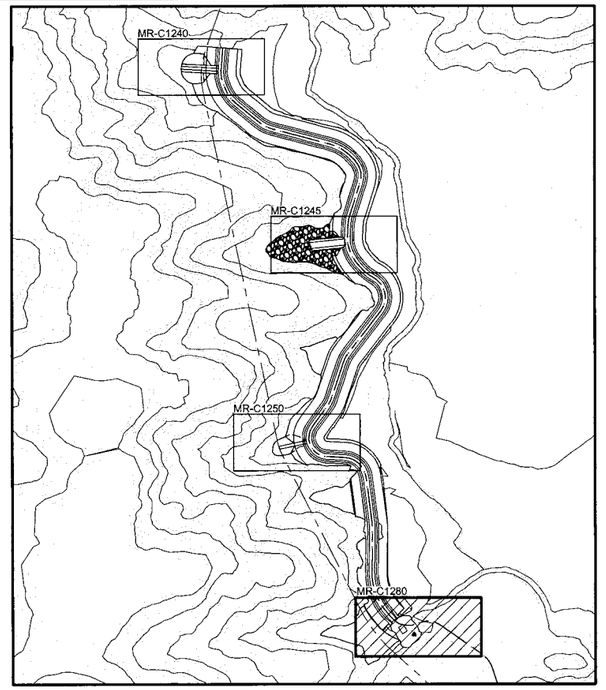


PLAN
TEMPORARY EXTRACTION POND
SCALE A



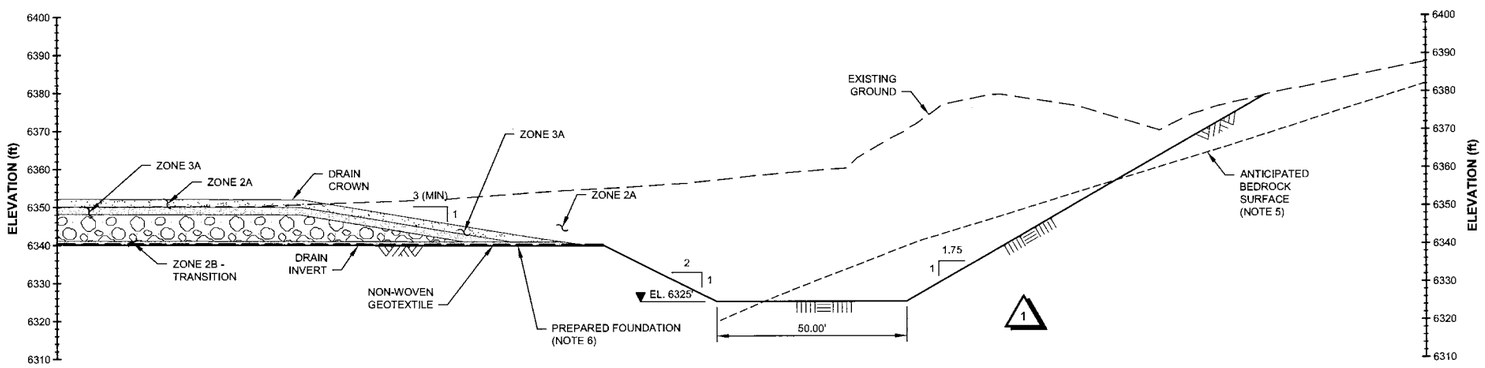
KEY PLAN

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. MAXIMUM CUT SLOPES ARE SHOWN. FLATTER SLOPES CAN BE CONSTRUCTED AT THE CONSTRUCTORS DISCRETION TO AID CONSTRUCTION EFFICIENCY. BENCH CUTS MAY BE INCLUDED UNDER THE CONDITION THAT THE OVERALL SLOPE ANGLE IS ACHIEVED AS SHOWN.
5. EXCAVATE TO BEDROCK SURFACE ON SOUTHEAST END OF TEMPORARY EXTRACTION POND. BEDROCK CONTOURS PROVIDED BY MONTANA RESOURCES.
6. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL.
7. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- NON-WOVEN GEOTEXTILE



SECTION
TEMPORARY EXTRACTION POND
SCALE B

ISSUED FOR CONSTRUCTION

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 40 0 40 80 120 160 200 ft

KEN J. BROUWER 10020 PE
PROFESSIONAL ENGINEER
Jun 23/16

Knight Piésold
CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
TEMPORARY EXTRACTION POND
PLAN AND SECTIONS

REFERENCE NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1280	1

DRG. NO.	DESCRIPTION
-	-

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'16	UPDATED WITH TEMP. EXTRACTION POND DETAILS	JRG	ABN	DDF	KJB
0	24MAR'16	ISSUED FOR CONSTRUCTION	ACR/JRG	ABN	DDF	KJB

REVISIONS

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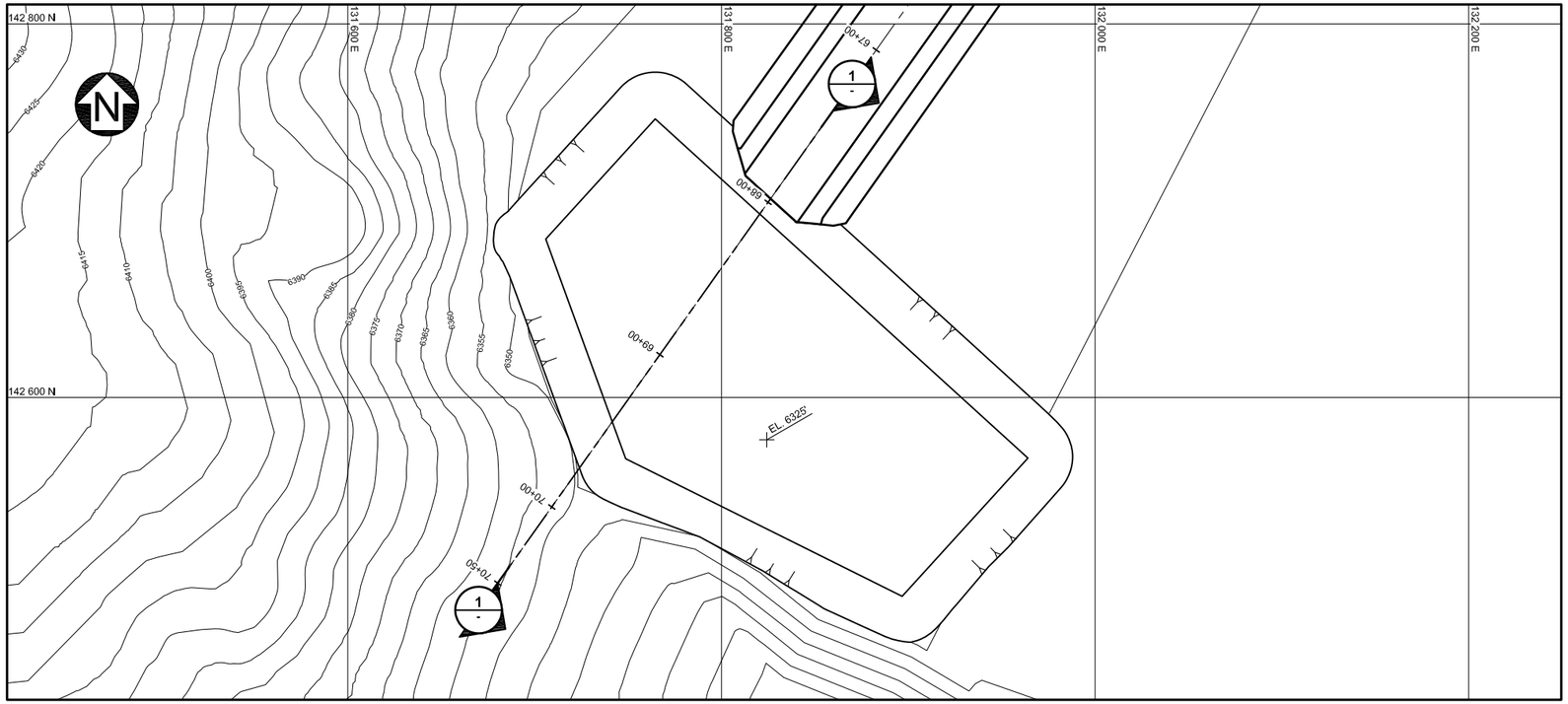
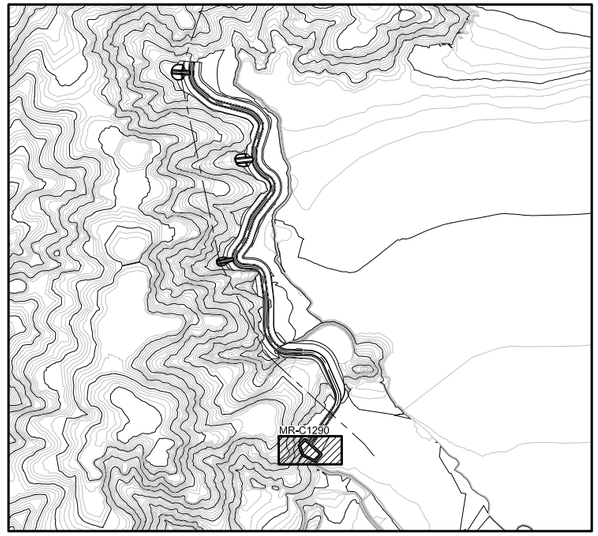


PLAN
PERMANENT EXTRACTION POND
SCALE A



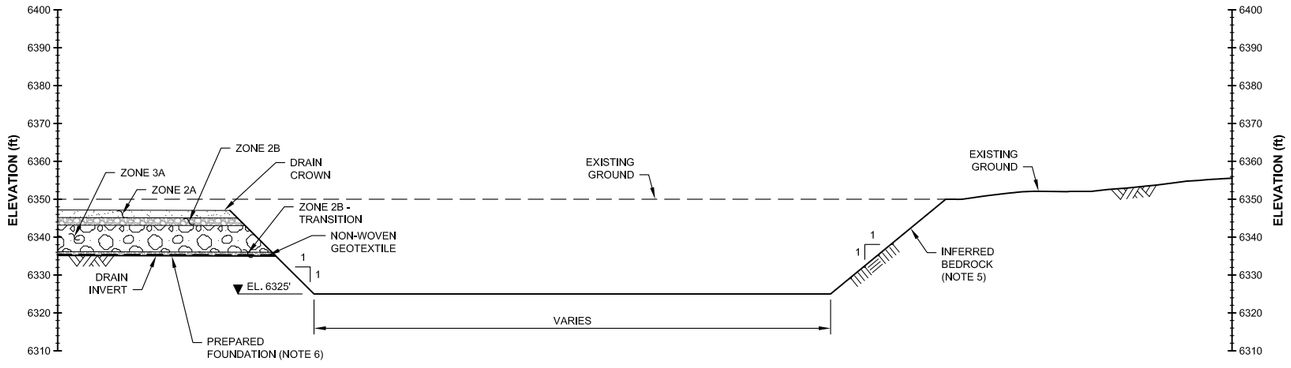
KEY PLAN

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. MAXIMUM CUT SLOPES ARE SHOWN. FLATTER SLOPES CAN BE CONSTRUCTED AT THE CONSTRUCTORS DISCRETION TO AID CONSTRUCTION EFFICIENCY.
5. EXCAVATE TO BEDROCK SURFACE ON SOUTHEAST END OF PERMANENT EXTRACTION POND. BEDROCK CONTOURS PROVIDED BY MONTANA RESOURCES.
6. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL.
7. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- NON-WOVEN GEOTEXTILE



1 - **SECTION**
PERMANENT EXTRACTION POND
SCALE B

NOT FOR CONSTRUCTION

SCALE B 20 0 20 40 60 80 100 ft
SCALE A 40 0 40 80 120 160 200 ft

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
PERMANENT EXTRACTION POND
PLAN AND SECTIONS

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1290	A

DRG. NO.	DESCRIPTION
-	-

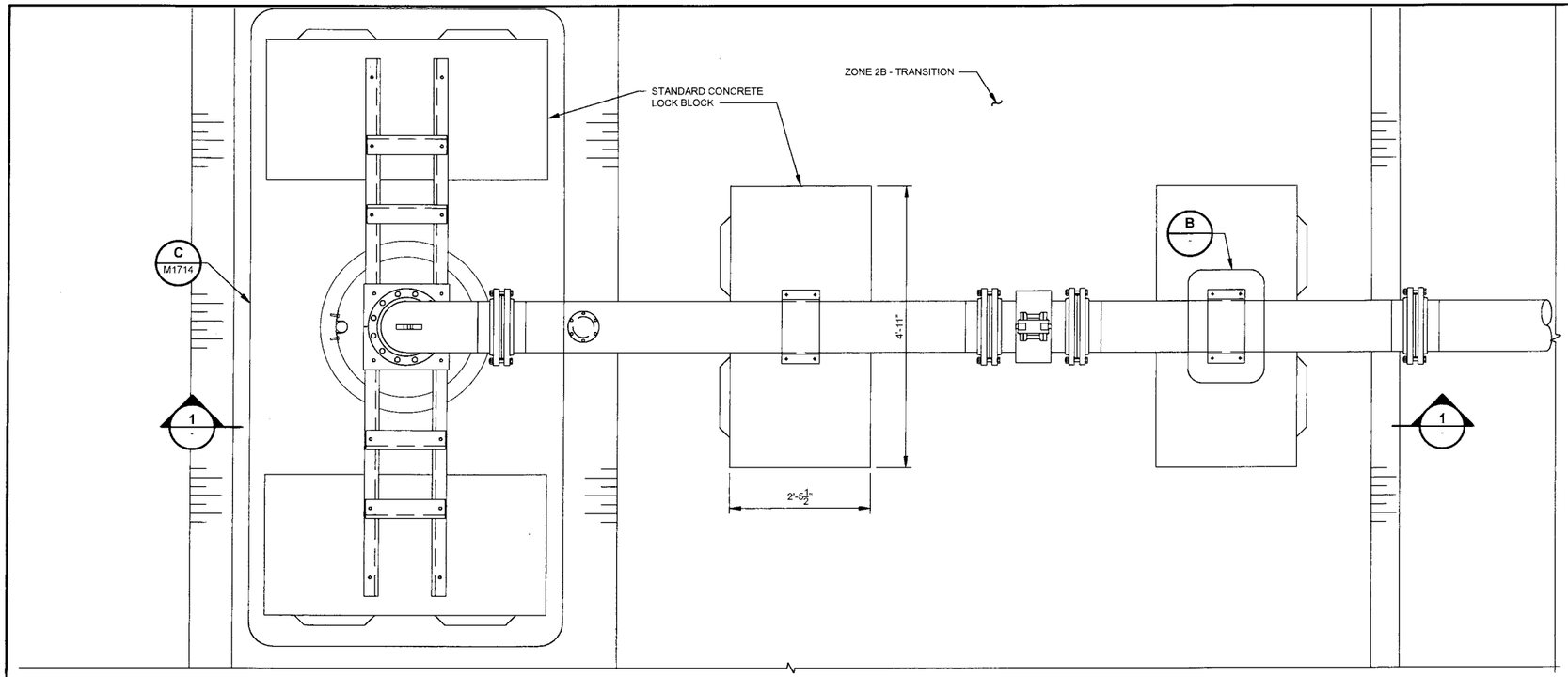
REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

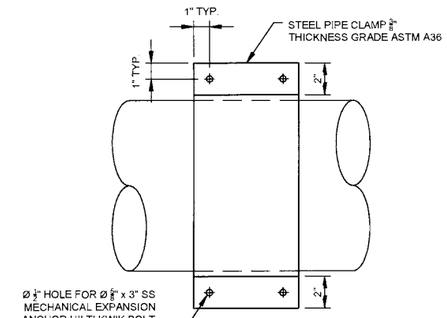
REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
A	24MAR'16	ISSUED FOR CLIENT REVIEW	JRG	ABN	-	-

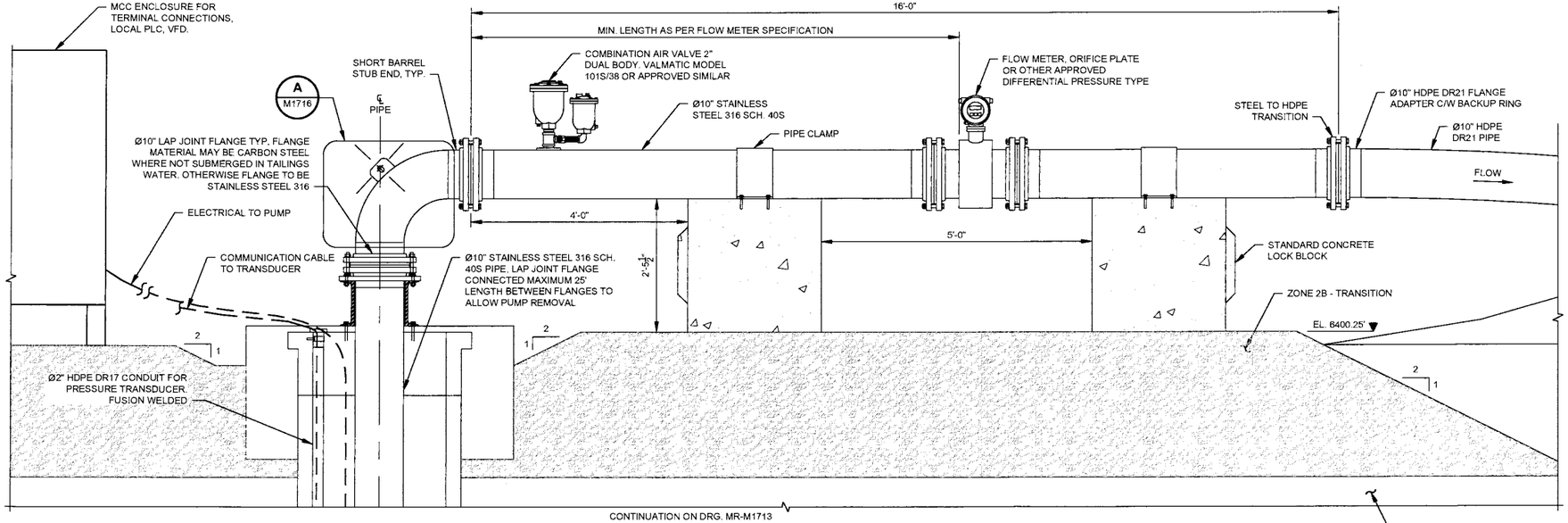
REVISIONS



PLAN
SCALE A



B DETAIL
NTS



1 C1246 SECTION
SCALE A

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. MINIMUM ALLOWABLE WATER LEVEL MUST MAINTAIN 17' ABOVE PUMP INTAKE SCREEN FOR REQUIRED NET POSITIVE SUCTION HEAD (NPSH).
3. HDPE PIPE SHALL BE CONNECTED BY BUTT FUSION UNLESS OTHERWISE NOTED.
4. ALL HDPE PIPE AND FITTINGS TO BE PE 4710.

ISSUED FOR CONSTRUCTION

SCALE A 1.25 0 1.25 2.5 3.75 5 6.25 ft

DRG. NO.	DESCRIPTION
MR-C1714	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL CONNECTIONS AND DETAILS
MR-C1713	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL INTAKE DETAILS
MR-C1246	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - WELL SECTION

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	06MAY'16	ISSUED FOR CONSTRUCTION	AJB	ELG		KAB

REVISIONS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. BOATY # 38880 16May'16

MONTANA PROFESSIONAL ENGINEER May 16, 2016 KEN J. BROUWER 10020 PE REGISTERED

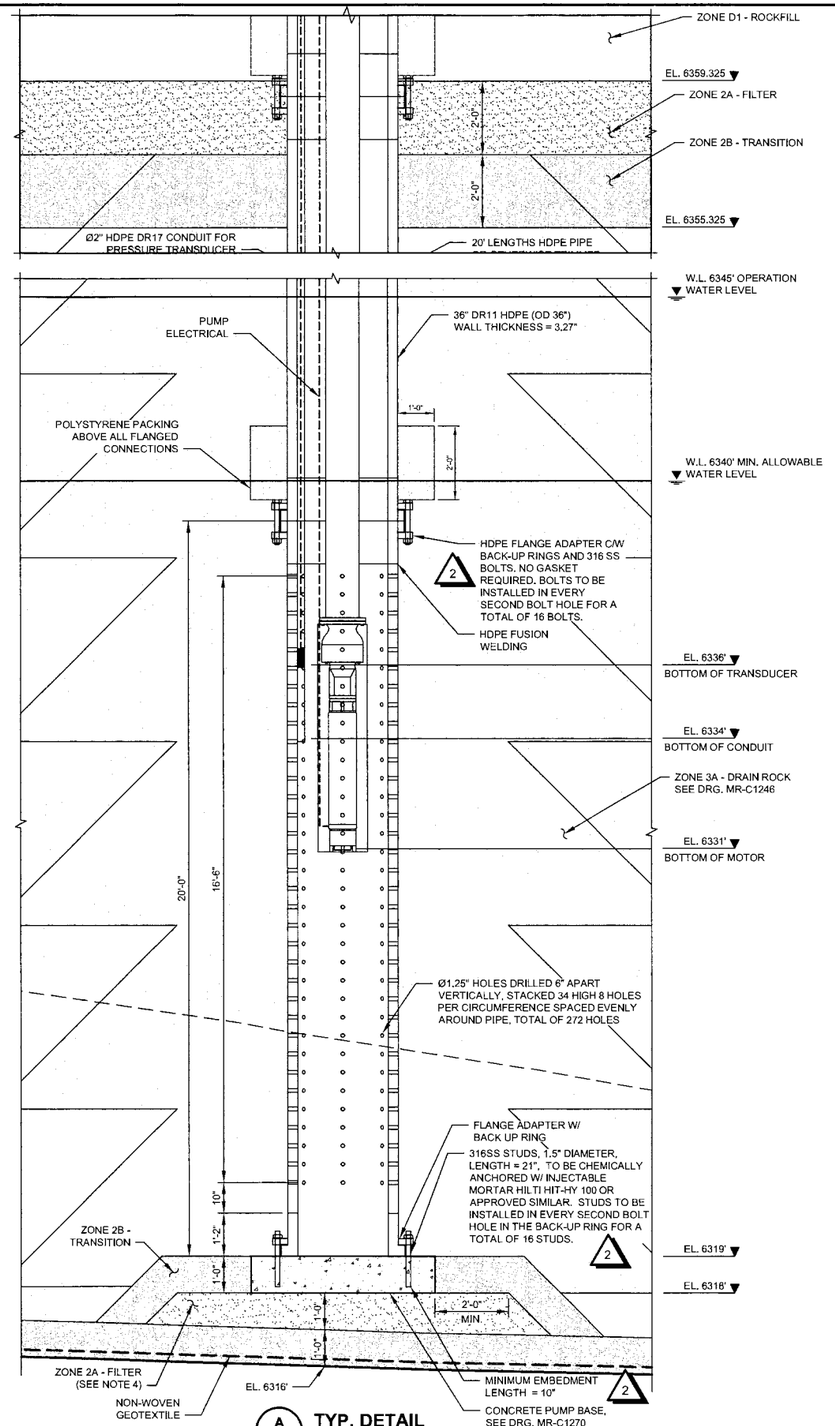
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
TYPICAL DISCHARGE ASSEMBLY

VA101-126/13	DRAWING NO. MR-M1712	REVISION 0



A C1246 **TYP. DETAIL**
PUMP 1A & 1B
NTS

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- ZONE N1 - INSTRUMENTATION BACKFILL
- NON-WOVEN GEOTEXTILE

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. MINIMUM ALLOWABLE WATER LEVEL MUST MAINTAIN 4' ABOVE PUMP INTAKE SCREEN FOR REQUIRED VORTEX SUPPRESSION.
3. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
4. ZONE 2A - FILTER MATERIAL BELOW THE CONCRETE PUMP BASE SHALL BE PLACED AND SPREAD IN MAXIMUM 1 FOOT THICK LIFTS AND COMPACTED WITH A MINIMUM OF 6 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER TO THE SATISFACTION OF THE ENGINEER.

ISSUED FOR CONSTRUCTION

SCALE A 2 0 2 4 6 8 10 ft

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. BEATY # 38880 21 Nov 16

KEN J. BROUWER 10020 PE NOV 21, 2016 REGISTERED PROFESSIONAL ENGINEER

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Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
TYPICAL INTAKE DETAILS

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
MR-C1270	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - PUMP BASE CONCRETE OUTLINE AND REINFORCEMENT
MR-C1246	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - WELL SECTION

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
2	21NOV'16	PUMP BASE BOLTS CHANGED TO STUDS	JRG	RM	DDF	KJB
1	20OCT'16	EXTRACTION BASIN LOCATION UPDATED	JRG	ABN	DDF	KJB
0	06MAY'16	ISSUED FOR CONSTRUCTION	AJB	ELG	RDA	KJB

PROJECT NO.	DRAWING NO.	REVISION
VA101-126/13	MR-M1713	2

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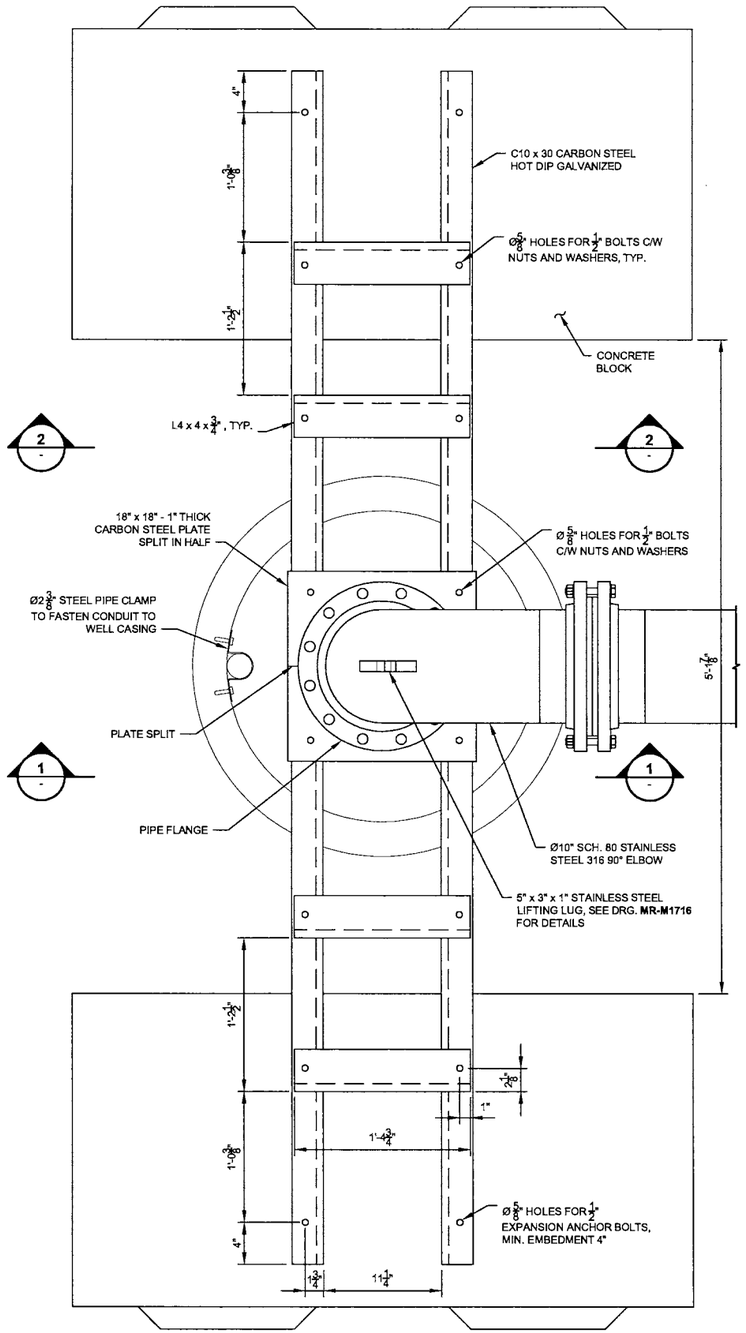
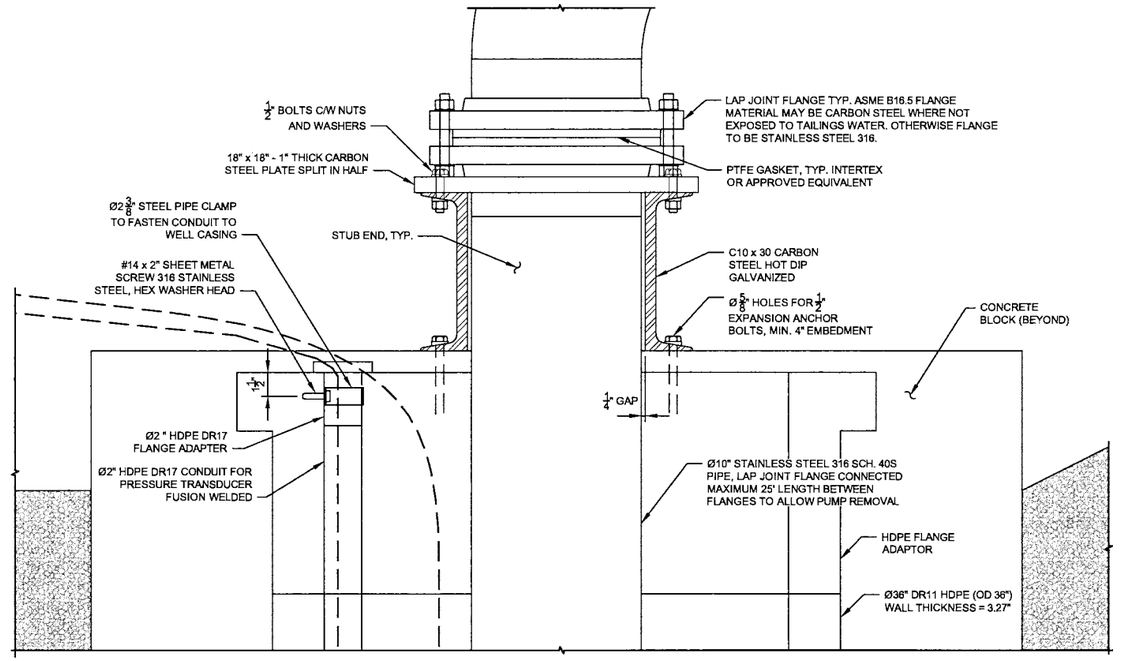
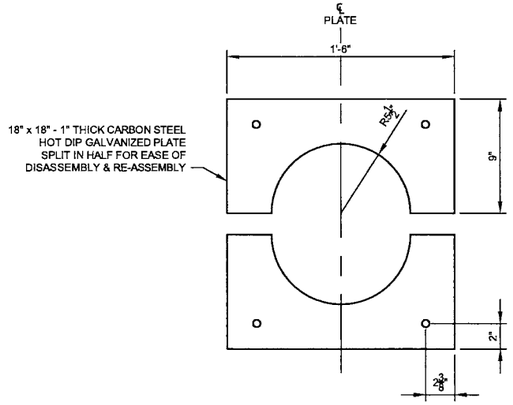


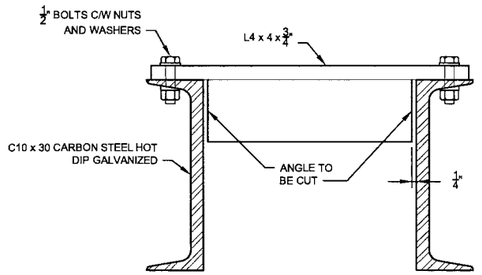
C M1712 **DETAIL**
NTS



1 **SECTION**
NTS



DETAIL - SPLIT PLATE
NTS



2 **SECTION**
NTS

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. ROLLED CHANNEL (C), ANGLE AND STEEL PLATE TO BE ASTM A572 GR. 50 OR EQUIVALENT APPROVED BY THE ENGINEER.
3. BOLTS TO BE ASTM A325 UNLESS NOTED OTHERWISE.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. BEATY # 38880 16 May '16

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
MR-C1716	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - LIFTING LUG DETAILS
MR-C1712	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL DISCHARGE ASSEMBLY

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	06MAY'16	ISSUED FOR CONSTRUCTION	AJB	ABN		

REVISIONS

KEN J. BROUWER 10020 PE 17 May 2016 PROFESSIONAL ENGINEER REGISTERED

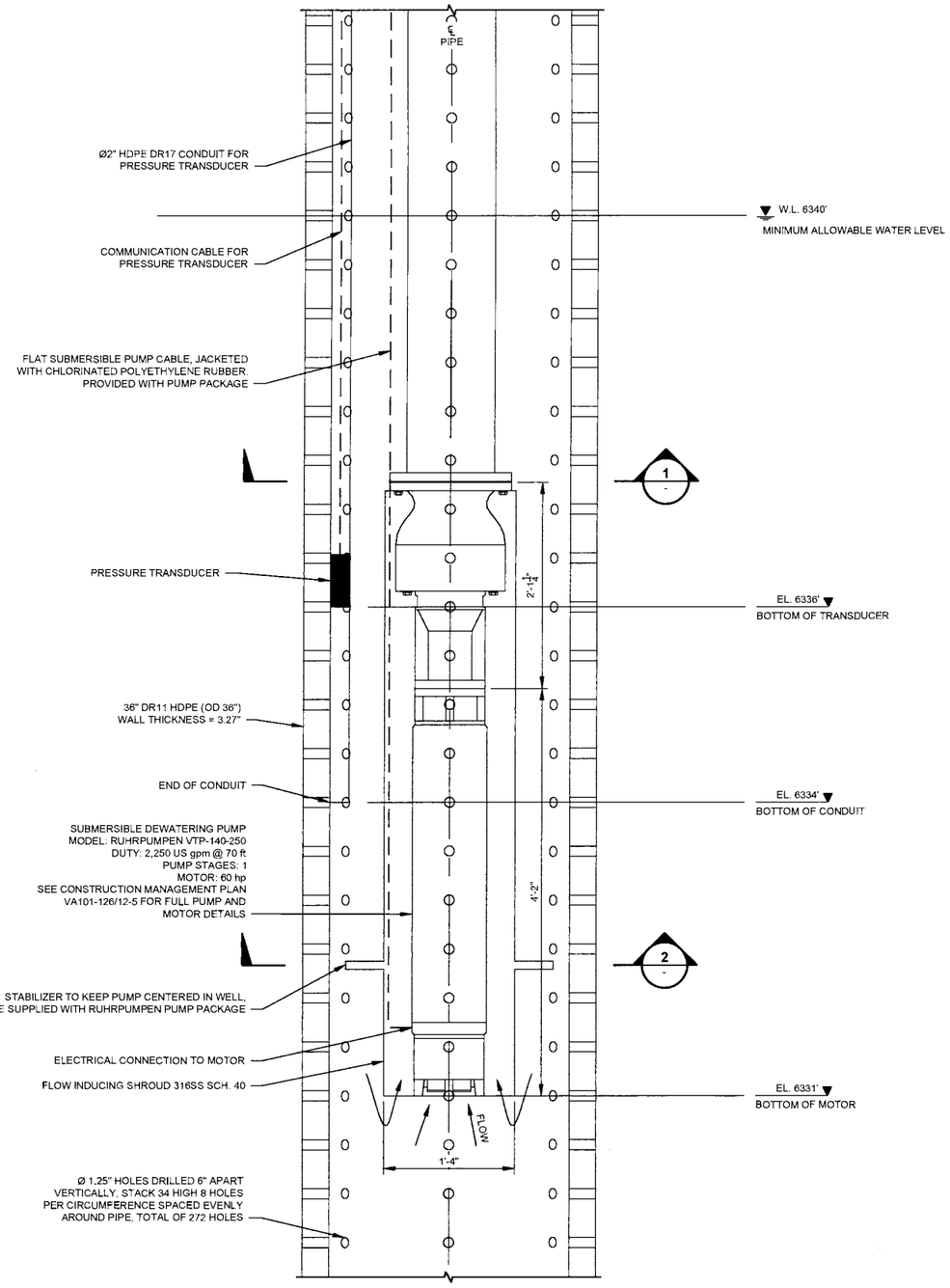
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

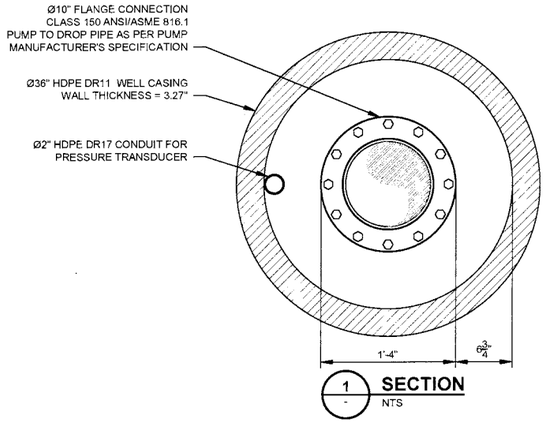
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
TYPICAL CONNECTIONS AND DETAILS

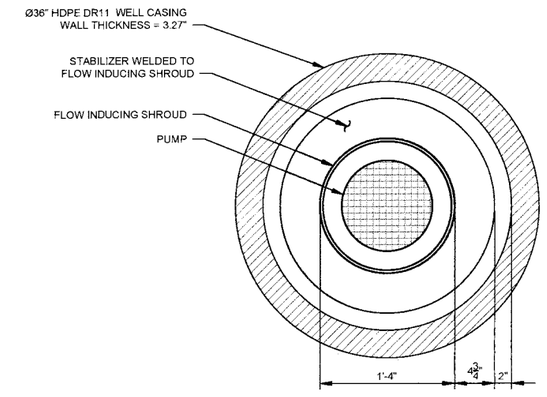
PROJECT NO. **VA101-126/13** | DRAWING NO. **MR-M1714** | REVISION **0**



A M1713 **DETAIL** NTS



1 **SECTION** NTS



2 **SECTION** NTS

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. BEATY # 38880 16 May '16

ISSUED FOR CONSTRUCTION

KEN J. BROUWER 10020 PE May 16, 2016 PROFESSIONAL ENGINEER REGISTERED

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
TYPICAL CONNECTIONS AND DETAILS

DRG. NO.	DRAWING NO.	REVISION
VA101-126/13	MR-M1715	0

MR-M1713	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL INTAKE DETAILS
DRG. NO.	DESCRIPTION

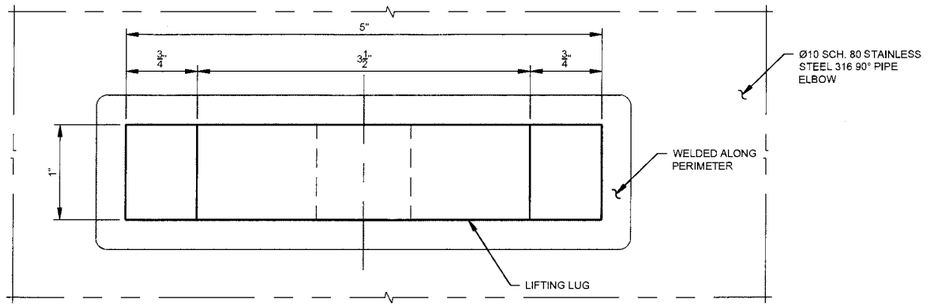
REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

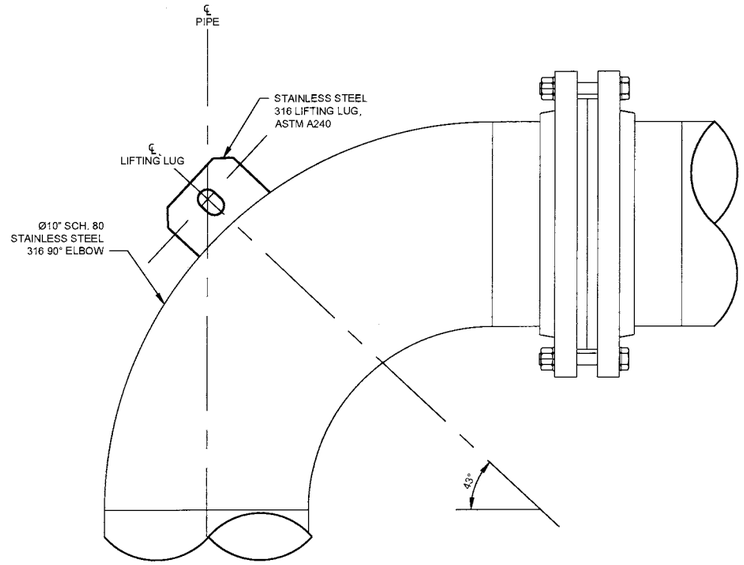
REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	13MAY'16	ISSUED FOR CONSTRUCTION	AJB	ABN	KJB	KJB

REVISIONS

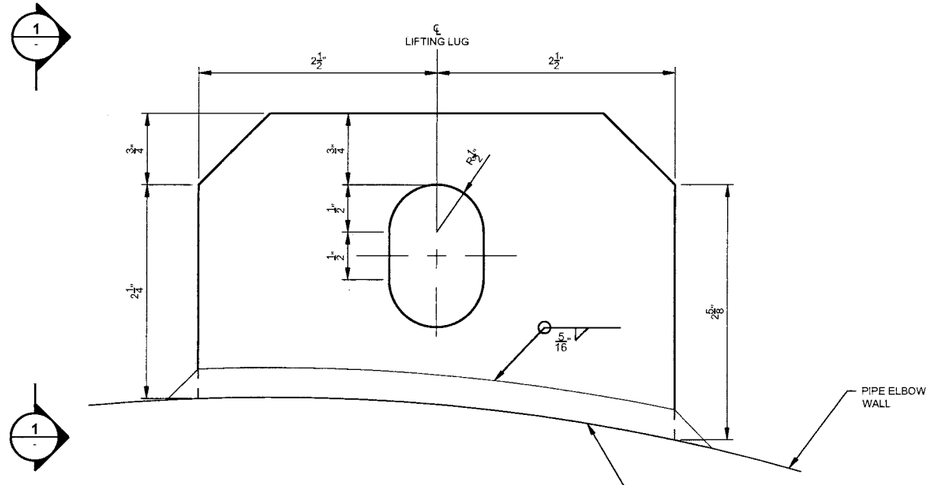


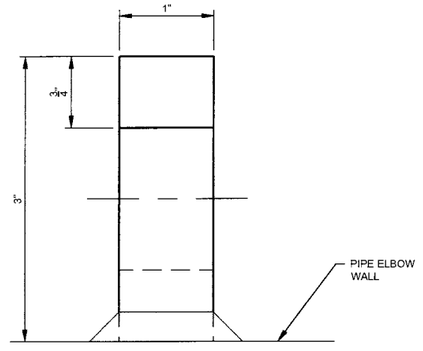
PLAN
NTS



A M1712 **DETAIL**
NTS

1 - **ELEVATION**
NTS





1 - **SECTION**
NTS

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
2. DESIGN LOAD ON LIFT LUG = 7000 lbs. APPLIED IN ANY DIRECTION.
3. GRIND OFF SURFACE DEFECTS, WELD SPLATTER, BURRS AND SHEARED EDGES TO PERMIT UNIFORM AND SMOOTH ADHESION OF LINING.
4. LIFTING LUG TO BE INSTALLED ON PIPE ELBOW DIRECTLY ABOVE VERTICAL PIPE CENTERLINE TO ALLOW FOR VERTICAL LIFTING.

ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — E. J. SCHERMAN # 28740 — 2016/05/16

KEN J. BROWER 10020 PE — REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
EXTRACTION BASIN
LIFTING LUG DETAILS

DRAWING NO.	REVISION
VA101-126/13	MR-M1716	0

DRG. NO.	DESCRIPTION
MR-M1712	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - EXTRACTION BASIN - TYPICAL DISCHARGE ASSEMBLY

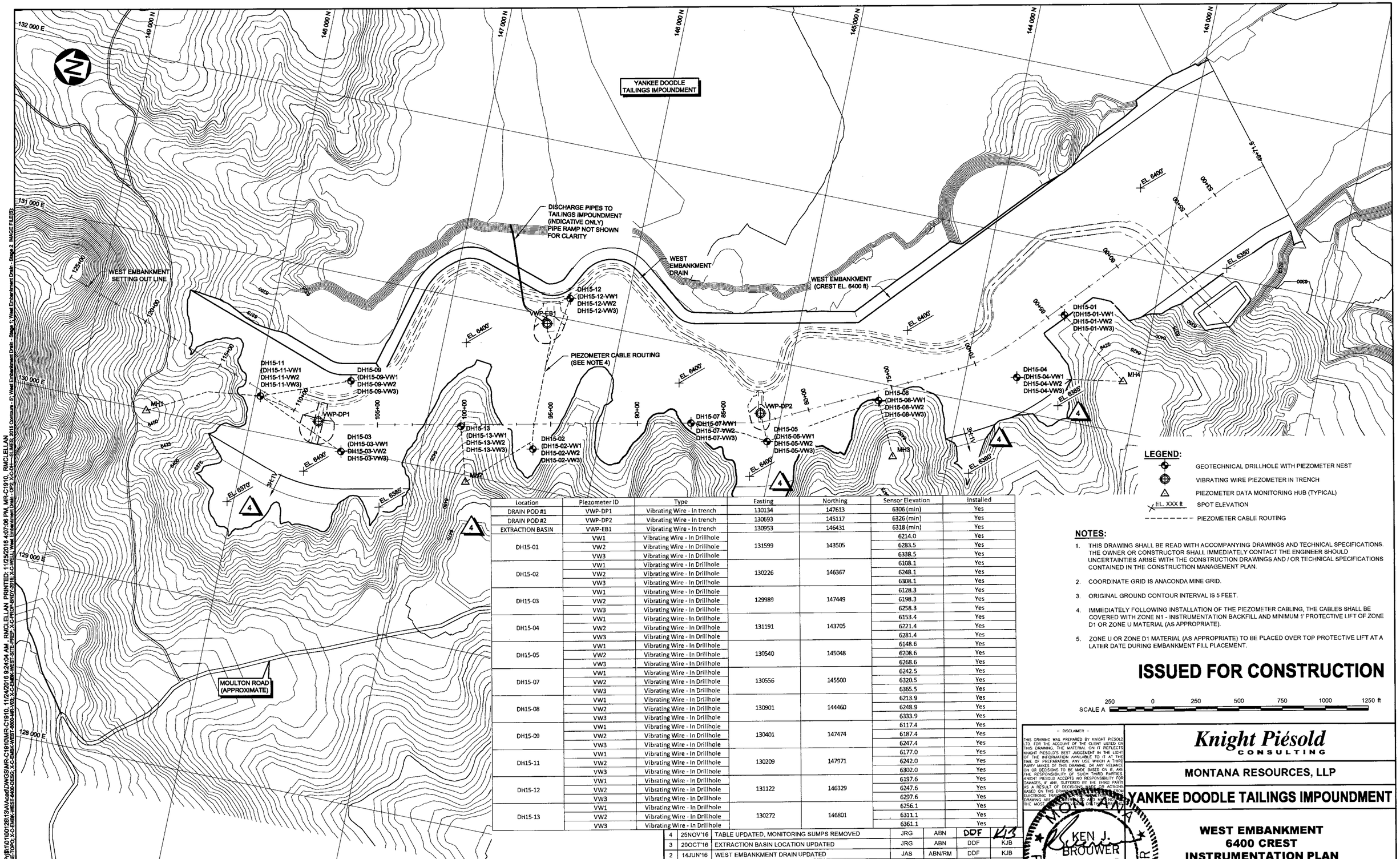
REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	06MAY'16	ISSUED FOR CONSTRUCTION	TCD	ELG		

REVISIONS



Location	Piezometer ID	Type	Easting	Northing	Sensor Elevation	Installed
DRAIN POD #1	VWP-DP1	Vibrating Wire - In trench	130134	147613	6306 (min)	Yes
DRAIN POD #2	VWP-DP2	Vibrating Wire - In trench	130693	145117	6326 (min)	Yes
EXTRACTION BASIN	VWP-EB1	Vibrating Wire - In trench	130953	146431	6318 (min)	Yes
DH15-01	VW1	Vibrating Wire - In Drillhole	131599	143505	6214.0	Yes
	VW2	Vibrating Wire - In Drillhole			6283.5	Yes
	VW3	Vibrating Wire - In Drillhole			6338.5	Yes
DH15-02	VW1	Vibrating Wire - In Drillhole	130226	146367	6108.1	Yes
	VW2	Vibrating Wire - In Drillhole			6248.1	Yes
	VW3	Vibrating Wire - In Drillhole			6308.1	Yes
DH15-03	VW1	Vibrating Wire - In Drillhole	129989	147449	6128.3	Yes
	VW2	Vibrating Wire - In Drillhole			6198.3	Yes
	VW3	Vibrating Wire - In Drillhole			6258.3	Yes
DH15-04	VW1	Vibrating Wire - In Drillhole	131191	143705	6153.4	Yes
	VW2	Vibrating Wire - In Drillhole			6221.4	Yes
	VW3	Vibrating Wire - In Drillhole			6281.4	Yes
DH15-05	VW1	Vibrating Wire - In Drillhole	130540	145048	6148.6	Yes
	VW2	Vibrating Wire - In Drillhole			6208.6	Yes
	VW3	Vibrating Wire - In Drillhole			6268.6	Yes
DH15-07	VW1	Vibrating Wire - In Drillhole	130556	145500	6242.5	Yes
	VW2	Vibrating Wire - In Drillhole			6320.5	Yes
	VW3	Vibrating Wire - In Drillhole			6365.5	Yes
DH15-08	VW1	Vibrating Wire - In Drillhole	130901	144460	6213.9	Yes
	VW2	Vibrating Wire - In Drillhole			6248.9	Yes
	VW3	Vibrating Wire - In Drillhole			6333.9	Yes
DH15-09	VW1	Vibrating Wire - In Drillhole	130401	147474	6117.4	Yes
	VW2	Vibrating Wire - In Drillhole			6187.4	Yes
	VW3	Vibrating Wire - In Drillhole			6247.4	Yes
DH15-11	VW1	Vibrating Wire - In Drillhole	130209	147971	6177.0	Yes
	VW2	Vibrating Wire - In Drillhole			6242.0	Yes
	VW3	Vibrating Wire - In Drillhole			6302.0	Yes
DH15-12	VW1	Vibrating Wire - In Drillhole	131122	146329	6197.6	Yes
	VW2	Vibrating Wire - In Drillhole			6247.6	Yes
	VW3	Vibrating Wire - In Drillhole			6297.6	Yes
DH15-13	VW1	Vibrating Wire - In Drillhole	130272	146801	6256.1	Yes
	VW2	Vibrating Wire - In Drillhole			6311.1	Yes
	VW3	Vibrating Wire - In Drillhole			6361.1	Yes

LEGEND:

- GEOTECHNICAL DRILLHOLE WITH PIEZOMETER NEST
- VIBRATING WIRE PIEZOMETER IN TRENCH
- PIEZOMETER DATA MONITORING HUB (TYPICAL)
- EL. XXX ft — SPOT ELEVATION
- PIEZOMETER CABLE ROUTING

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. THE OWNER OR CONSTRUCTOR SHALL IMMEDIATELY CONTACT THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. COORDINATE GRID IS ANACONDA MINE GRID.
3. ORIGINAL GROUND CONTOUR INTERVAL IS 5 FEET.
4. IMMEDIATELY FOLLOWING INSTALLATION OF THE PIEZOMETER CABLING, THE CABLES SHALL BE COVERED WITH ZONE N1 - INSTRUMENTATION BACKFILL AND MINIMUM 1' PROTECTIVE LIFT OF ZONE D1 OR ZONE U MATERIAL (AS APPROPRIATE).
5. ZONE U OR ZONE D1 MATERIAL (AS APPROPRIATE) TO BE PLACED OVER TOP PROTECTIVE LIFT AT A LATER DATE DURING EMBANKMENT FILL PLACEMENT.

ISSUED FOR CONSTRUCTION

SCALE A: 250 0 250 500 750 1000 1250 ft

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST INSTRUMENTATION PLAN

PROJECT NO. VA101-126/13 | DRAWING NO. MR-C1910 | REVISION 4

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
4	25NOV'16	TABLE UPDATED, MONITORING SUMPS REMOVED	JRG	ABN	DDF	KJB
3	20OCT'16	EXTRACTION BASIN LOCATION UPDATED	JRG	ABN	DDF	KJB
2	14JUN'16	WEST EMBANKMENT DRAIN UPDATED	JAS	ABN/RM	DDF	KJB
1	22APR'16	UPDATED PIEZOMETER DETAILS	JAS	ABN	DDF	KJB
0	14APR'16	ISSUED FOR CONSTRUCTION	JAS	ABN	DDF	KJB

REVISIONS

DRG NO.	DESCRIPTION
MR-C1930	WEST EMBANKMENT 6400 CREST - GEOTECHNICAL INSTRUMENTATION - TYPICAL DETAILS

REFERENCE DRAWINGS

KEN J. BROUWER 10020 PE NOV 25, 2016 REGISTERED PROFESSIONAL ENGINEER MONTANA

SAVED: \\KPJ\VA-Proj\101-126\13\DGN\acadDWG\MR-C1910.MR-C1910_11Z4Z2016 9:24:04 AM_RMCLELLAN PRINTED: 11/25/2016 4:07:06 PM_MR-C1910_RMCLELLAN
XREF FILES: X-CAMS-TOPO_100-2013.dwg; X-CAMS-WEST-6400.DESIGN.dwg; XC-EMBK-WEST-4600.MR.v03; X-C-EMBK-WEST-SITE-PREP-XC-PROP-BNDY-2016; X-C-WELL-West Embankment Drain - CP2; X-C-01—SAVED: \\KPJ\VA-Proj\101-126\13\DGN\acadDWG\MR-C1910.MR-C1910_11Z4Z2016 9:24:04 AM_RMCLELLAN PRINTED: 11/25/2016 4:07:06 PM_MR-C1910_RMCLELLAN
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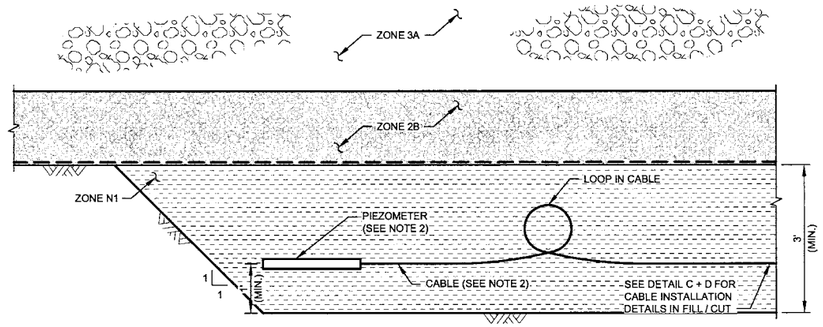


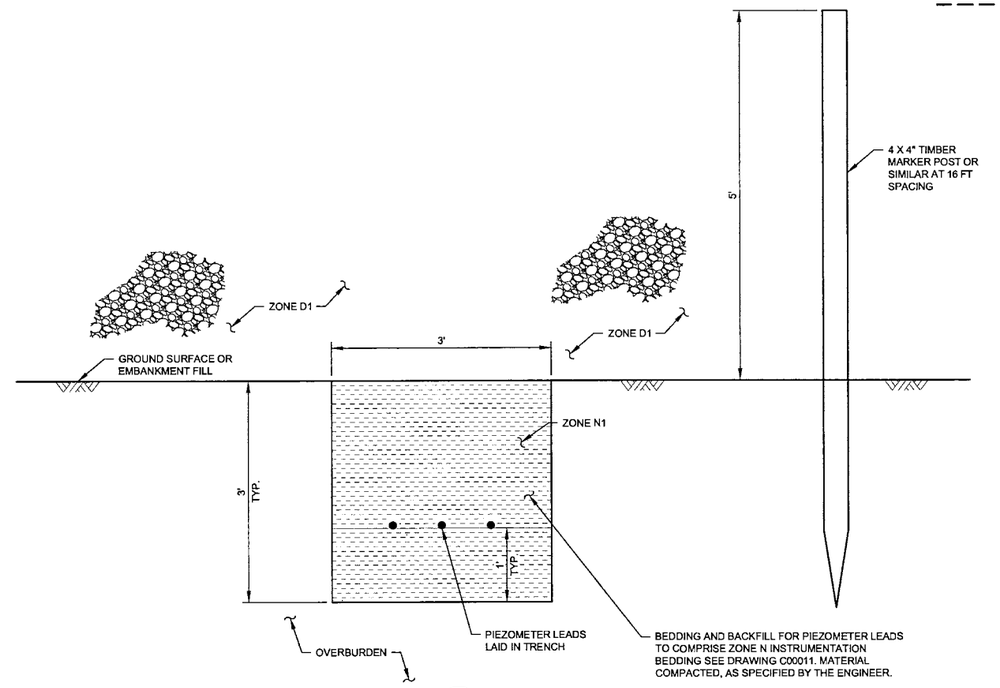
A C1240 **DETAIL**
PIEZOMETER BELOW WEST EMBANKMENT DRAIN EXTRACTION BASIN / DRAIN POD
NTS

NOTES:

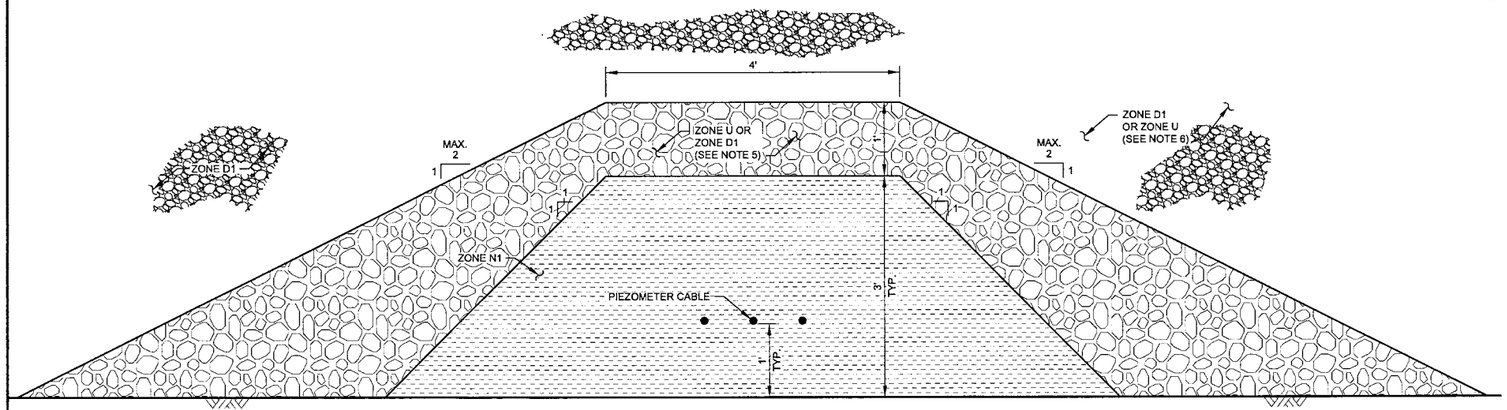
1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS IN THE CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR ITS CONTRACTOR SHALL IMMEDIATELY CONTACT THE OWNER'S REPRESENTATIVE SHOULD UNCERTAINTIES ARISE.
2. INSTRUMENTATION TO BE INSTALLED AS PER MANUFACTURER'S INSTRUCTIONS.
3. DIMENSIONS ARE IN INCHES AND FEET.
4. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
5. IMMEDIATELY FOLLOWING INSTALLATION OF THE PIEZOMETER CABLING, THE CABLES SHALL BE COVERED WITH ZONE N1 - INSTRUMENTATION BACKFILL AND MINIMUM 1' PROTECTIVE LIFT OF ZONE D1 OR ZONE U MATERIAL (AS APPROPRIATE).
6. ZONE U OR ZONE D1 MATERIAL (AS APPROPRIATE) TO BE PLACED OVER TOP PROTECTIVE LIFT AT A LATER DATE DURING EMBANKMENT FILL PLACEMENT.

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE N1 - INSTRUMENTATION BACKFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- NON-WOVEN GEOTEXTILE



C - **DETAIL**
TYPICAL PIEZOMETER LEADS TRENCH SECTION TO DOWNSTREAM FOOTPRINT OF EMBANKMENT
NTS



B C1240 **DETAIL**
PIEZOMETER CABLE LAID HORIZONTALLY IN FILL
NTS

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
MR-C1240	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - DRAIN POD #1 - PLAN AND SECTIONS
MR-C1910	WEST EMBANKMENT - 6400 CREST - INSTRUMENTATION PLAN
MR-C0011	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	22APR'16	BENTONITE PLUG DETAIL REMOVED	JAS	ABN	JRG	KJB
0	14APR'16	ISSUED FOR CONSTRUCTION	JAS	ABN	DDF	KJB

REVISIONS

KEN J. BROUWER 10020 PE Apr 25, 2016 REGISTERED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST GEOTECHNICAL INSTRUMENTATION TYPICAL DETAILS

REF. NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1930	1

SAVED: M:\101\10126\13\A\cad\DWGS\MR-C1930\MR-C1930, 4/25/2016 11:16:12 AM , RMCLELLAN PRINTED: 4/25/2016 11:17:02 AM, MR-C1930, RMCLELLAN
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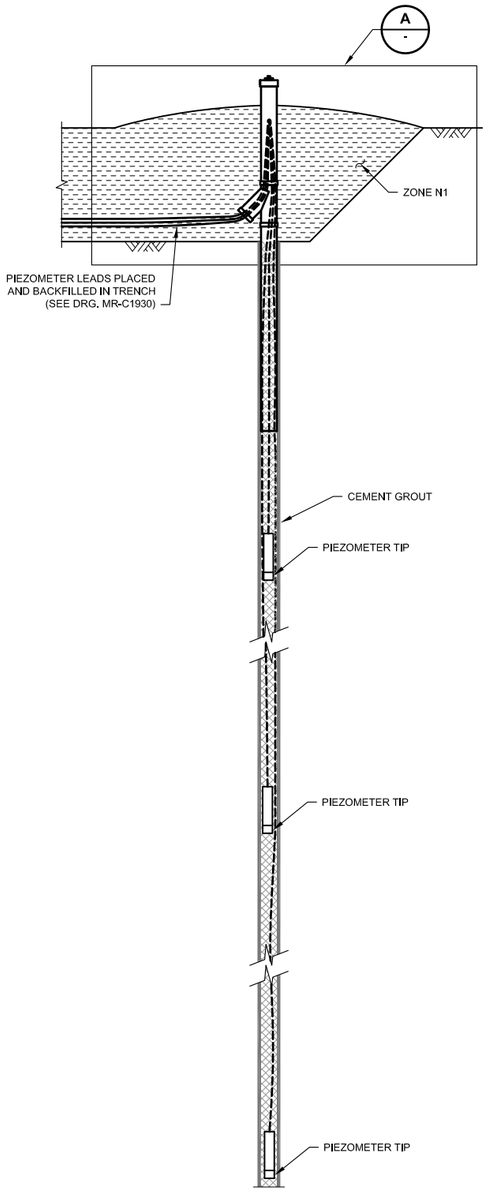
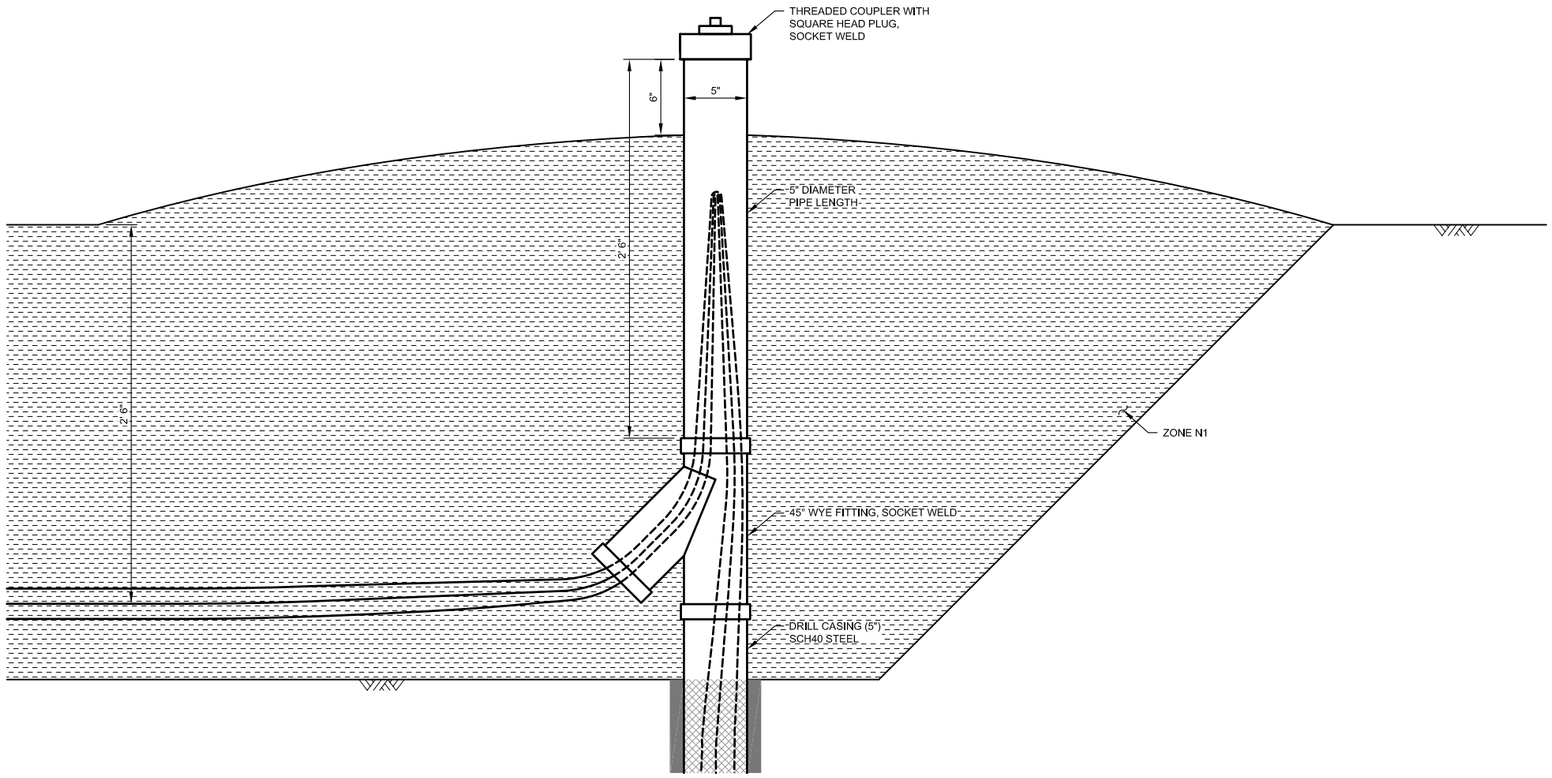


TYPICAL INSTALLATION OF PIEZOMETERS IN DRILLHOLES
NTS



A - DETAIL
NTS

LEGEND:

ZONE N1 - INSTRUMENTATION BACKFILL

PIEZOMETER CABLES

NOTES:

1. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.
2. INSTRUMENTATION TO BE INSTALLED AS PER MANUFACTURER'S INSTRUCTIONS.
3. DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
4. REFER TO DRG. NO. MR-C0011 FOR FILL MATERIAL SPECIFICATIONS.
5. SLOT DEPTH IN FILL TO BE MINIMUM 6', SLOT DEPTH IN ORIGINAL GROUND TO BE MINIMUM 4'.

NOT FOR CONSTRUCTION

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT GEOTECHNICAL INSTRUMENTATION DRILLHOLE INSTALLATION DETAILS

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1931	B

DRG. NO.	DESCRIPTION
MR-C0011	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
B	24MAR'16	ISSUED FOR CLIENT REVIEW	JAS	ABN	-	-
A	11JAN'16	ISSUED FOR TRANSMITTAL	JAS	ABN	-	-

REVISIONS

APPENDIX B

SELECT KNIGHT PIÉSOLD LTD CORRESPONDENCE

Appendix B1	VA15-02953 - West Embankment Drain Aggregate Durability Testing
Appendix B2	VA15-03359 - West Embankment Drain External Borrow Source Recommendations
Appendix B3	VA15-03405 - West Embankment Drain Pipestone Quarry Aggregates Acceptance
Appendix B4	VA16-00195 - West Embankment Drain - Construction Staging for Water Management
Appendix B5	VA15-05319 - Drain Pod Contingency Well Concept Design - Section and Details

APPENDIX B1

VA15-02953 - WEST EMBANKMENT DRAIN AGGREGATE DURABILITY TESTING

(Pages B1-1 to B1-3)

MEMORANDUM

To:	Steve Czehura	Date:	August 07, 2015
Copy To:	Nolan Smith	File No.:	VA101-00126/13
From:	Angus Robb, Steven Lange	Cont. No.:	VA15-02953
Re:	Yankee Doodle Tailings Impoundment West Embankment Drain Materials Laboratory Durability Testing		

The West Embankment Drain (WED) is an aggregate drain to be constructed along the upstream toe area of the West Embankment. The WED comprises three zones of material, a Filter Zone – Type 2A, Transition Zone – Type 2B and the Drain Rock – Type 3A. Material specifications for the drain materials are provided in drawing MR-C0011 attached.

Montana Resources (MR) are currently assessing the suitability of borrow sources for the WED materials. It is our understanding that the Drain Rock – Type 3A and Transition Zone – Type 2B will be sourced from the 'Bonneville' gravel pit. A preferred source for the Filter Zone – Type 2A material has yet to be confirmed, however it is understood the material may be sourced from the either the 'Bonneville' gravel pit, or another sand and gravel source currently being investigated by MR.

Seepage water quality testing indicates that the seepage water expected to be carried by the WED will be acidic (pH around 3) with an Oxidation-Reduction Potential (ORP) around 400 mv. Laboratory durability testing is required in order to assess the durability of the WED materials following contact with the seepage water.

The following describes the laboratory testing that is required on the WED material sources prior to approval for use in the WED.

1 – SAMPLE PREPARATION

1.1 DRAIN ROCK - TYPE 3A AND TRANSITION ZONE – TYPE 2B

An indicative sample of the source material for the Drain Rock – Type 3A and Transition Zone – Type 2B is to be prepared.

Sampling shall be undertaken in accordance with ASTM D75 and ASTM C702 and the sample shall conform to the grading specifications as identified in drawing MR-C0011 for the Transition Zone – Type 2B material. Only a sample conforming to the specifications for the Transition Zone – Type 2B specification is required as the larger surface area of this finer grained material (compared with the Drain Rock – Type 3A material) will provide a conservative assessment of the durability of both materials.

Three split samples shall be prepared from the larger sample. Approximately 10 kg of material is required for each split sample. Particle size gradation testing shall be undertaken on each of the split samples in accordance with ASTM C136.

1.2 FILTER ZONE – TYPE 2A

An indicative sample of the source material for the Filter Zone – Type 2A material is to be prepared. Should MR wish to assess the suitability of more than one source for the Filter Zone – Type 2A material, one sample should be prepared for each material source.

Sampling shall be undertaken in accordance with ASTM D75 and ASTM C702 and the sample shall conform to the grading specifications as identified in drawing MR-C0011 for the Filter Zone – Type 2A material. Three split

samples shall be prepared from the larger source sample. Approximately 10 kg of material is required for each split sample. Particle size gradation testing shall be undertaken on each of the split samples in accordance with ASTM C136.

2 – LABORATORY DURABILITY TESTING

The following laboratory durability testing is to be completed on each of the samples prepared as identified in Section 1:

- **Split Sample 1**: Los Angeles Abrasion durability testing shall be undertaken in accordance with ASTM C535 'Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.
- **Split Sample 2**: Obtain a representative sample of the seepage water. Representative seepage water can be obtained from the Horseshoe Bend outlet or other indicative source. Water quality analysis shall be undertaken on the seepage water sample. The seepage water shall be analysed for the following:
  - Major Cations
  - Major Anions
  - Trace metals, and
  - pH and Oxidation potential.

  The seepage water and gravel sample shall be weighed separately and the gravel sample shall be immersed in the seepage water for 30 days. Following 30 days, the sample shall be removed from the seepage water and durability testing shall be undertaken in accordance with ASTM C535. The water quality of the seepage water shall be re-analysed.
- **Split Sample 3**: The split sample shall be placed in a five gallon pail or similar. Holes are to be drilled into the sides of the pail to allow the free flow of water around the drain rock sample. The pail shall be immersed within the flow of seepage water (at the Horseshoe Bend outflow or similar area) for 30 days ensuring that the drain rock is completely immersed in the seepage flow, and ensuring that the seepage water is able to freely flow around the particles. Following 30 days the drain rock sample is to be removed and durability testing shall be undertaken on the sample in accordance with ASTM C535.

3 – CLOSURE

Following completion of the laboratory testing, please provide the test results to KP for review and comment. Should there be any questions or concerns regarding the information contained herein, please do not hesitate in contacting the undersigned.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. C. ROBB
174229

August 7, 2015

Prepared: _____
Angus Robb, P.Eng.
Senior Engineer

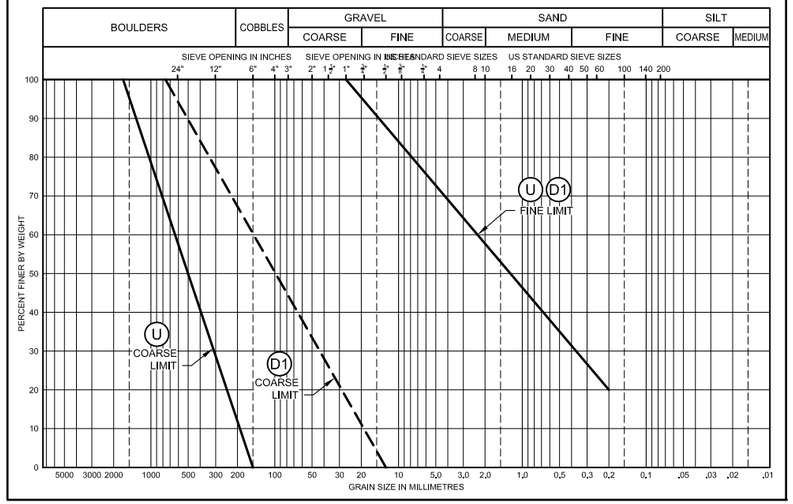
FOR

Reviewed: _____
Steve Lange, PE
Executive Project Manager

Approval that this document adheres to Knight Piésold Quality Systems: KB

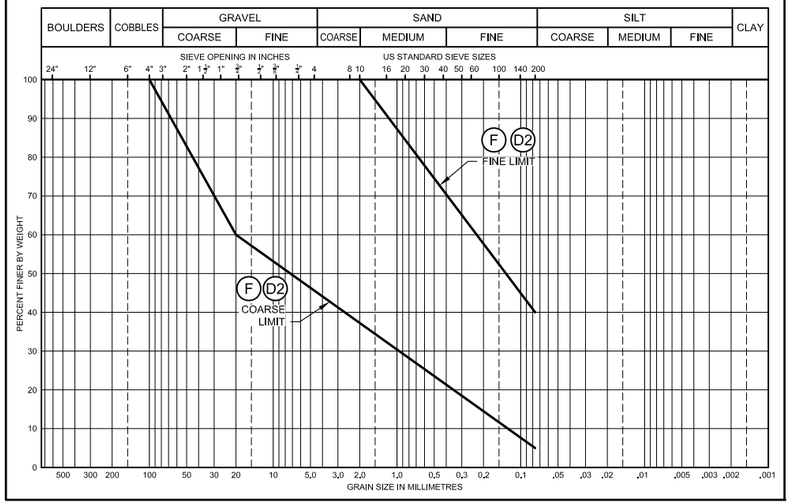
Attachments:
Drawing MR-C0011 rA Fill Material Specifications

UNIFIED SOIL CLASSIFICATION SYSTEM



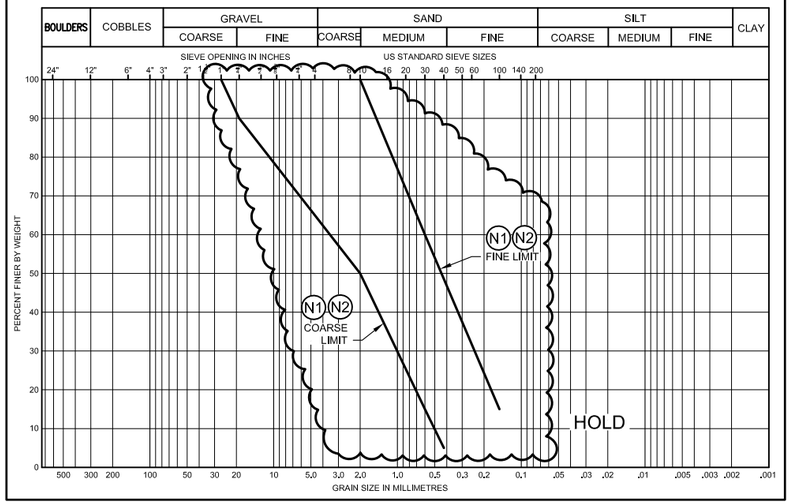
ZONE U / ZONE D1

UNIFIED SOIL CLASSIFICATION SYSTEM



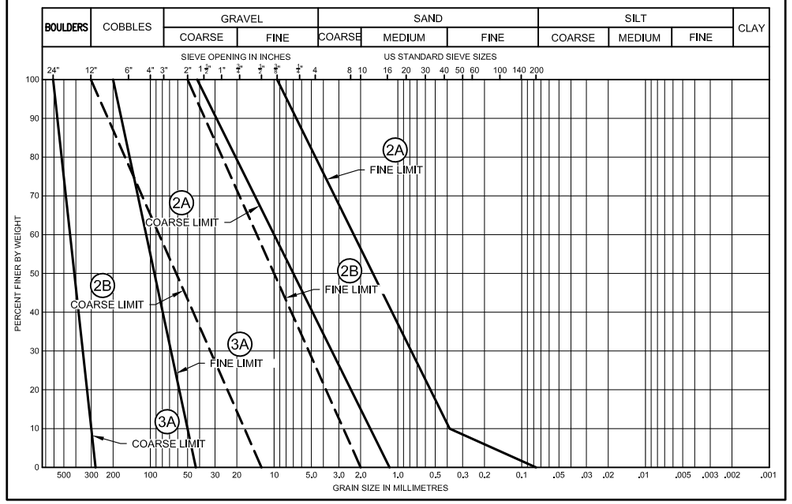
ZONE F / ZONE D2

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE N1 / ZONE N2

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE 2A / ZONE 2B / ZONE 3A

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

ZONE AND MATERIAL TYPE	PLACING AND COMPACTION REQUIREMENTS
ZONE F - UPSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF ALLUVIUM, FREE OF LOAM, TREE STUMPS, ROOTS, AND OTHER DELETERIOUS OR ORGANIC MATTER. THE MATERIAL SHALL BE END-DUMPED. THE MAXIMUM END DUMPED HEIGHT SHALL BE A MAXIMUM OF 50 ft. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE U - UPSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL, FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN MINIMUM 50 ft LAYERS AND MAXIMUM 60 ft LAYERS PRIOR TO COMPACTION. FILL MATERIAL WILL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE D1 - DOWNSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY-WEATHERED ROCKFILL, FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN MAXIMUM 5 ft LAYERS PRIOR TO COMPACTION. FILL MATERIAL SHALL CONTAIN AS LITTLE POTENTIALLY ACID GENERATING MATERIAL AS POSSIBLE. FILL MATERIAL SHALL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. WHERE THE WORKING AREA DOES NOT PERMIT THE USE OF THE MINE HAUL FLEET COMPACTION SHALL CONSIST OF A MINIMUM OF 6 PASSES OF A 18 TON SMOOTH DRUM VIBRATORY ROLLER, UNLESS OTHERWISE NOTED. THE FILL SHALL BE PLACED IN A MANNER THAT WILL ALLOW COMPACTION OF FINER MATERIAL AROUND AND BETWEEN THE LARGER PARTICLES (NO SEGREGATION). COARSER AND SEGREGATED MATERIAL SHALL BE REMOVED TO THE UPSTREAM. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE D2 - DOWNSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF NON-ACID GENERATING ALLUVIUM FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN MINIMUM 6 ft LAYER. NOMINAL COMPACTION
ZONE N1 - INSTRUMENTATION BEDDING	PLACED AND COMPACTED IN MAXIMUM 300 mm LAYERS AFTER COMPACTION. NOMINAL COMPACTION REQUIRED. BEDDING SHALL CONSIST OF WELL-GRADED MATERIAL WITH LITTLE OR NO PLASTICITY, FREE FROM ROCK, FROZEN LUMPS AND FOREIGN MATTER.
ZONE N2 - INSTRUMENTATION BACKFILL	PLACED AND COMPACTED IN MAXIMUM 150 mm LAYERS PRIOR TO COMPACTION. NOMINAL COMPACTION. BACKFILL SHALL CONSIST OF WELL-GRADED MATERIAL WITH LITTLE OR NO PLASTICITY, FREE FROM ROCK, FROZEN LUMPS AND FOREIGN MATTER.
ZONE 2A - FILTER MATERIAL	FILTER MATERIAL SHALL CONSIST OF HARD, DURABLE, NON ACID GENERATING, FRESH OR NON-WEATHERED MATERIAL FROM A SOURCE APPROVED BY THE ENGINEER. FILTER MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 1' THICK LIFTS AND COMPACTED WITH NOMINAL COMPACTIVE EFFORT.
ZONE 2B - TRANSITION MATERIAL	TRANSITION MATERIAL SHALL CONSIST OF HARD, DURABLE, NON ACID GENERATING, FRESH OR NON-WEATHERED MATERIAL FROM A SOURCE APPROVED BY THE ENGINEER. TRANSITION MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 1' THICK LIFTS AND COMPACTED WITH NOMINAL COMPACTIVE EFFORT
ZONE 3A - DRAIN ROCK	DRAIN ROCK SHALL CONSIST OF HARD, DURABLE, NON ACID GENERATING, FRESH OR NON-WEATHERED ROCK FILL FROM A SOURCE APPROVED BY THE ENGINEER. DRAIN ROCK TO BE PLACED AND SPREAD IN MAXIMUM 2' THICK LIFTS AND COMPACTED WITH NOMINAL COMPACTIVE EFFORT

NOTES:

1. THESE MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS APPLY TO ALL COMPONENTS OF THE WORKS EXCEPT WHERE NOTED OTHERWISE. MATERIALS SUBJECT TO REVIEW PRIOR TO CONSTRUCTION.
2. THE MAXIMUM DIMENSION OF ANY PARTICLE SHALL NOT EXCEED 2/3 OF THE MAXIMUM LIFT THICKNESS.
3. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. QUALITY CONTROL AND RECORD TESTING SHALL BE UNDERTAKEN AT THE FREQUENCIES IDENTIFIED IN THE TECHNICAL SPECIFICATIONS. THE OWNER OR IT'S CONTRACTOR SHALL IMMEDIATELY CONTACT THE OWNER'S REPRESENTATIVE SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS.

FOR INFORMATION ONLY

Knight Piésold CONSULTING

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT

FILL MATERIAL SPECIFICATIONS

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C0011	A

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
REVISIONS						

REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHK'D	APP'D
A	07AUG'15	ISSUED FOR CLIENT REVIEW	RSM	SIR		
REVISIONS						

APPENDIX B2

VA15-03359 - WEST EMBANKMENT DRAIN EXTERNAL BORROW SOURCE RECOMMENDATIONS

(Pages B2-1 to B2-69)

MEMORANDUM

To:	Mr. Steve Czehura	Date:	November 9, 2015
Copy To:	Mark Thompson, Josh Shutey, Nolan Smith, Steve Walsh	File No.:	VA101-00126/13-A.01
From:	Angus Robb, Ken Brouwer	Cont. No.:	VA15-03359
Re:	West Embankment Drain External Borrow Sources		

1 – INTRODUCTION

The West Embankment Drain (WED) is an aggregate drain to be constructed along the upstream toe area of the West Embankment. The WED comprises three zones of material, a Filter Zone – Type 2A, Transition Zone – Type 2B and the Drain Rock – Type 3A.

The seepage water to be carried by the drain will initially have a chemistry that is similar to the alkaline water of the impoundment supernatant pond however over time the seepage water is anticipated to become acidic with a high Oxidation Reduction Potential (ORP). Water quality testing conducted on seepage water collected at the Horseshoe Bend outflow indicates a pH as low as 3. Laboratory testing was required to assess the durability of the WED materials following contact with the seepage water in order to maintain effective long term operations of the drain. The laboratory testing was completed at the direction of Knight Piésold (KP), see KP memo VA15-02953 dated August 7, 2015. Three potential borrow materials, designated 'Bonneville', 'Mungas' and 'Pipestone' were tested to evaluate their suitability for use in constructing the WED.

The Bonneville material is sourced from the Centennial Concrete Bonneville Quarry, a local concrete aggregate quarry. The Mungas material comprises boulders and cobbles that are scalped from the excavation for a local sewer construction project. The Pipestone material is sourced from the Pipestone Quarry, a local quarry, recently acquired by Montana Resources (MR). The Bonneville and Mungas materials are described as mixed metamorphic / volcanics, and the Pipestone is andesite.

The laboratory testing included mineralogical determination by Semi-Quantitative X-Ray Diffraction (XRD), Major Element concentration and Los Angeles (LA) Abrasion Testing.

The samples were subjected to exposure to anticipated field conditions expected for the WED prior to the LA Abrasion testing. The exposure conditions included:

1. A sample was simply collected from the borrow site and tested with no contact with the acidic seepage water
2. A sample was placed in a flow weir (Weir 10) for 28 days while the acidic seepage water was constantly flowing through the sample bucket
3. A sample was placed in a closed bucket (anoxic conditions) containing the acidic seepage water

2 – LABORATORY TEST RESULT SUMMARY

The results of the testing were provided to KP by MR during October 2015. The results are appended to this memorandum in Attachment 1 and summarized as follows.

The XRD testing indicates that the Mungas samples have approximately 10% Calcite. The calcite may react with the acidic seepage water and dissolve over time changing its characteristics and also potentially resulting in precipitation of solids and potential plugging.

The results of the LA Abrasion testing showed reasonable losses of approximately 27 to 30% for the Mungas and Bonneville samples and loses around 12% for the Pipestone material. The data did not show significantly different loses depending on whether the sample was exposed to the acidic seepage water or not.

3 – RECOMMENDATIONS

KP has the following recommendations for the borrow sources:

- The 'Pipestone' borrow source is the preferred borrow source for the West Embankment Drain materials. The 'Pipestone' borrow source is considered a suitable source for the Zone 2A – Filter, Zone 2B – Transition and Zone 3A – Drain Rock.
- The 'Bonneville' borrow source is considered a suitable source for the Zone 3A – Drain Rock only
- The 'Mungas' borrow source is not considered an acceptable borrow source for either the Zone 2A – Filter, Zone 2B – Transition or Zone 3A – Drain Rock due the high calcium carbonate content of this material.

With trust the information presented herein meets your needs at this time. Please don't hesitate to contact the undersigned should you have any questions or concerns.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. C. ROBB
174229

Nov. 9 2015.

Prepared: _____
Angus Robb, P.Eng. – Senior Engineer

Reviewed: _____
for Ken Brouwer, P.E. – President

Approval that this document adheres to Knight Piésold Quality Systems:

Attachments:
Laboratory Test Results

/ar

Montana Resources, LLP (406) 496-3200
600 Shields Ave. (406) 723-9542 fax
Butte, Montana www.montanaresources.com
USA 59701

MEMORANDUM

TO: **Steve Czehura**

FROM: **Nolan Smith**

DATE: **October 22th, 2015**

SUBJECT: **Aggregate Study – Bonneville Pit**

Bonneville Pit

The Bonneville pit located outside of Anaconda is owned and operated by Centennial Concrete (CC). This pit is on private property and is composed of mixed metamorphic and volcanic rocks, rounded cobbles and sand. Filter and transition materials have been submitted for testing along with drain rock. Marty Salusso from CC submitted pricing for all three products fob pit, and delivered to MR. Preliminary testing indicates CC may be able to meet specifications for drain rock and transition material, but appears to be out of spec for filter material due to the presence of fine calcareous sands. A large spread of crushing and screening equipment is owned by CC, and they have assured us they can produce the volume of aggregate MR requires. Trucking does not appear to be a concern of CC as they have a small fleet of trucks with pup trailers.

Resistance to degradation (LA Abrasion) results for this rock is moderate at 27-28% loss. Acid resistance testing in the #10 weir was 28% loss. Anoxic testing was 28-31% loss. Attached is supporting documentation. Pulps for semi quantitative analysis were submitted to SGS on 10/2/2015, with results expected to be returned by the end of October.

YDTI Material Testing Plan 10/19/15

ID #	Material Type	Location	Date	Time	Test	Test	Notes
T-10-2	Bonneville Transition				ASTM C136	ASTM C131 A	Lithology 6/25/2015
					8/5/2015	8/5/2015	
T-10-3	Bonneville Transition	closed bucket	8/24/2015	15:20	ASTM C136	ASTM C131 A&B	
			9/25/2015	10:12	10/13/2015	10/13/2015	
T-10-4	Bonneville Transition				ASTM C136	ASTM C131 A	
					10/5/2015	10/5/2015	
F-10-1	Bonneville Filter	#10 seep	8/24/2015	14:56	ASTM C136	ASTM C131 A&B	
			9/25/2015	14:37	10/13/2015	10/13/2015	
F-10-2	Bonneville Filter	closed bucket	8/24/2015	15:20	ASTM C136	ASTM C131 A&B	
			9/25/2015	10:12	10/13/2015	10/13/2015	
D-10-4	Bonneville Drain Rock				ASTM C136	ASTM C535 1	
					10/5/2015	10/5/2015	

YDTI L.A. Abrasion Test Results 10/19/15

ID #	Material Type	Location	Loss %	Revolutions	ASTM	Grading	Notes
T-10-2	Bonneville Transition		27	500	C131	A	
T-10-3	Bonneville Transition	closed bucket	28		C131	A&B	
T-10-4	Bonneville Transition		28	500	C131	A	
F-10-1	Bonneville Filter	#10 seep	28		C131	A&B	
F-10-2	Bonneville Filter	closed bucket	31		C131	A&B	
D-10-4	Bonneville Drain Rock		27	500	C535	1	

PIONEER TECHNICAL SERVICES, INC.

August 5, 2015

Mr. Nolan Smith
Montana Resources, LLP
600 Shields Ave
Butte, MT 59701

RE: Montana Resources Material Testing
Pioneer Technical Services, Inc. Project No. 1503028

Dear Mr. Smith,

On July 27, a sample from the Bonneville Pit was delivered to our Butte-based materials testing laboratory. The sample was referenced as "Bonneville Transition" and given Lab No. BU15153. The testing was performed in general accordance with the following Standard:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C136); and
- Resistance to Degradation of Small-Size Coarse Aggregate L.A. Abrasion (ASTM C131, Grading A).

Table 2 – LA Abrasion Testing Results

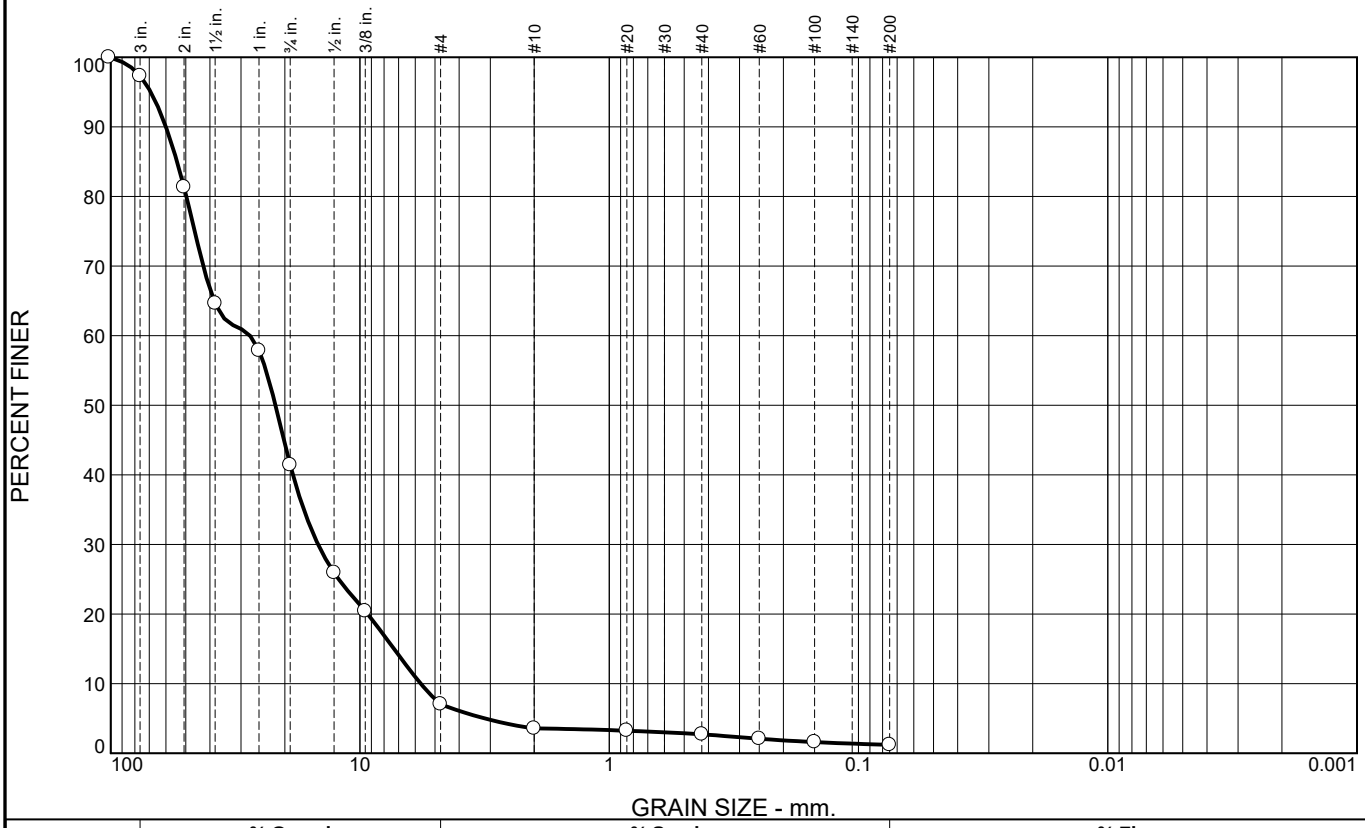
Lab No.	Material Description	Loss After 500 Revolutions (%)
BU15153	Bonneville Transition	27

The grain-size distribution curve is included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Kevin Mock
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
3	56	34	3	1	2	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4"	100		
3"	97		
2"	81		
1.5"	65		
1"	58		
3/4"	41		
1/2"	26		
3/8"	20		
#4	7		
#10	4		
#20	3		
#40	3		
#60	2		
#100	2		
#200	1.2		

* (no specification provided)

Material Description

Transition; Gravel with Silt and Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 60.0351 D_{85}= 54.1477 D_{60}= 27.6128
D_{50}= 21.8321 D_{30}= 14.7283 D_{15}= 7.2987
D_{10}= 5.6981 C_u= 4.85 C_c= 1.38

Classification

USCS= GW AASHTO=

Remarks

Source of Sample: Bonneville Pit
Sample Number: BU15153

Date: 7-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources LLC
Project: Montana Resources Materials Testing

Project No: 1503028 **Figure**

PIONEER TECHNICAL SERVICES, INC.

October 5, 2015

Mr. Steve Czehura
Montana Resources, LLP
600 Shields Ave
Butte, MT 59701

RE: Montana Resources Material Testing – P.O. 8-282394
Pioneer Technical Services, Inc. Project No. 1503028

Dear Mr. Czehura,

On September 21, five samples from the Yankee Doodle Impoundment Dam Site Investigation project were delivered to our ASTM/AASHTO accredited materials testing laboratory in Helena. The samples were identified as noted in Table 1.

Table 1 - Sample I.D.

Lab No.	Sample Identification
17574	T-10-4
17575	F-3
17576	F-4
17578	D-10-3
17579	D-10-4

The testing was performed in general accordance with the following Standards:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C136);
- Resistance to Degradation of Small-Size Coarse Aggregate L.A. Abrasion (ASTM C131, Grading A) [Lab No. 17574] ; and
- Resistance to Degradation of Large Size Coarse Aggregate L.A. Abrasion (ASTM C535, Grading 1) [Lab Nos. 17578-17579].

Table 2 – L.A. Abrasion Testing Results

Lab No.	Material Description	Loss After 500 Revolutions (%)
17574	T-10-4	28
17578	D-10-3	16
17579	D-10-4	27

Sample Lab Nos. 17575 and 17576 did not have enough material to perform the LA Wear test. No Sample was provided for Montana Resources Sample No. F-10-3.

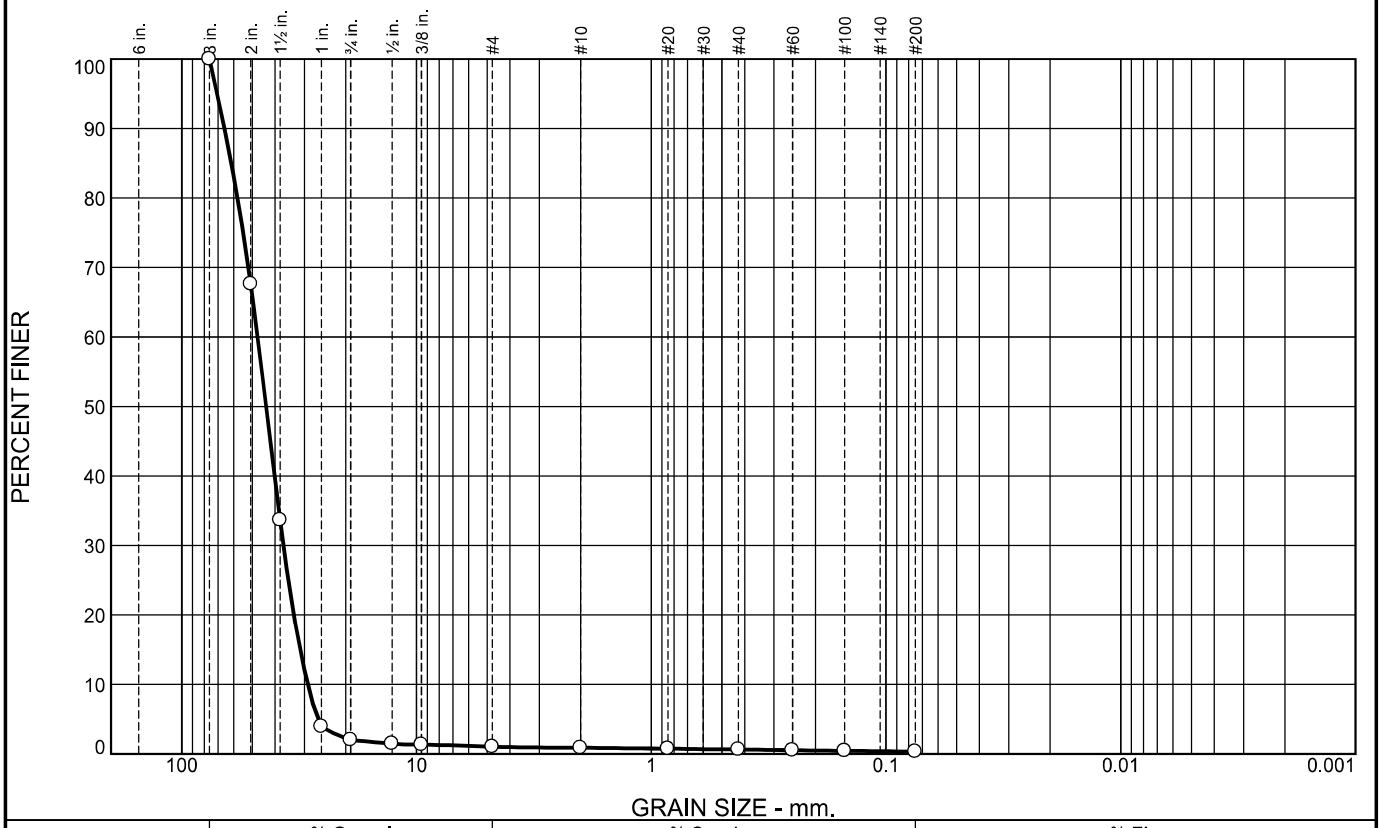
PIONEER
TECHNICAL SERVICES, INC.

The grain-size distribution curves are included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Kevin Mock
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	98	1	0	0	1	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	68		
1.5"	34		
1"	4		
3/4"	2		
1/2"	1		
3/8"	1		
#4	1		
#10	1		
#20	1		
#40	1		
#60	1		
#100	0		
#200	0.3		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 65.7981 D_{85}= 61.5244 D_{60}= 47.4698
D_{50}= 43.6941 D_{30}= 36.8430 D_{15}= 31.2796
D_{10}= 29.0681 C_u= 1.63 C_c= 0.98

Classification

USCS= GP AASHTO=

Remarks

Location: D-10-4
Sample Number: 17579

Date: 9-15-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

PIONEER TECHNICAL SERVICES, INC.

October 13, 2015

Mr. Steve Czehura
Montana Resources, LLP
600 Shields Ave
Butte, MT 59701

RE: Montana Resources Material Testing – P.O. 8-282394
Pioneer Technical Services, Inc. Project No. 1503028

Dear Mr. Czehura,

On October 5, five samples from the Yankee Doodle Impoundment Dam Site Investigation project were delivered to our ASTM/AASHTO accredited materials testing laboratory in Helena. The samples were identified as noted in Table 1.

Table 1 - Sample I.D.

Lab No.	Sample Identification
17660	T-10-3
17661	F-10-1
17662	F-10-2
17663	D-10-1
17664	D-10-2

The testing was performed in general accordance with the following Standards:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C117, C136);
- Resistance to Degradation of Small-Size Coarse Aggregate L.A. Abrasion (ASTM C131, Grading A&B) [Lab Nos. 17660, 17661, 17662]; and
- Resistance to Degradation of Large Size Coarse Aggregate L.A. Abrasion (ASTM C535, Grading 2) [Lab No. 17664].

Table 2 – L.A. Abrasion Testing Results

Lab No.	Material Description	Loss (%)
17660	T-10-3	28
17661	F-10-1	28
17662	F-10-2	31
17664	D-10-2	23

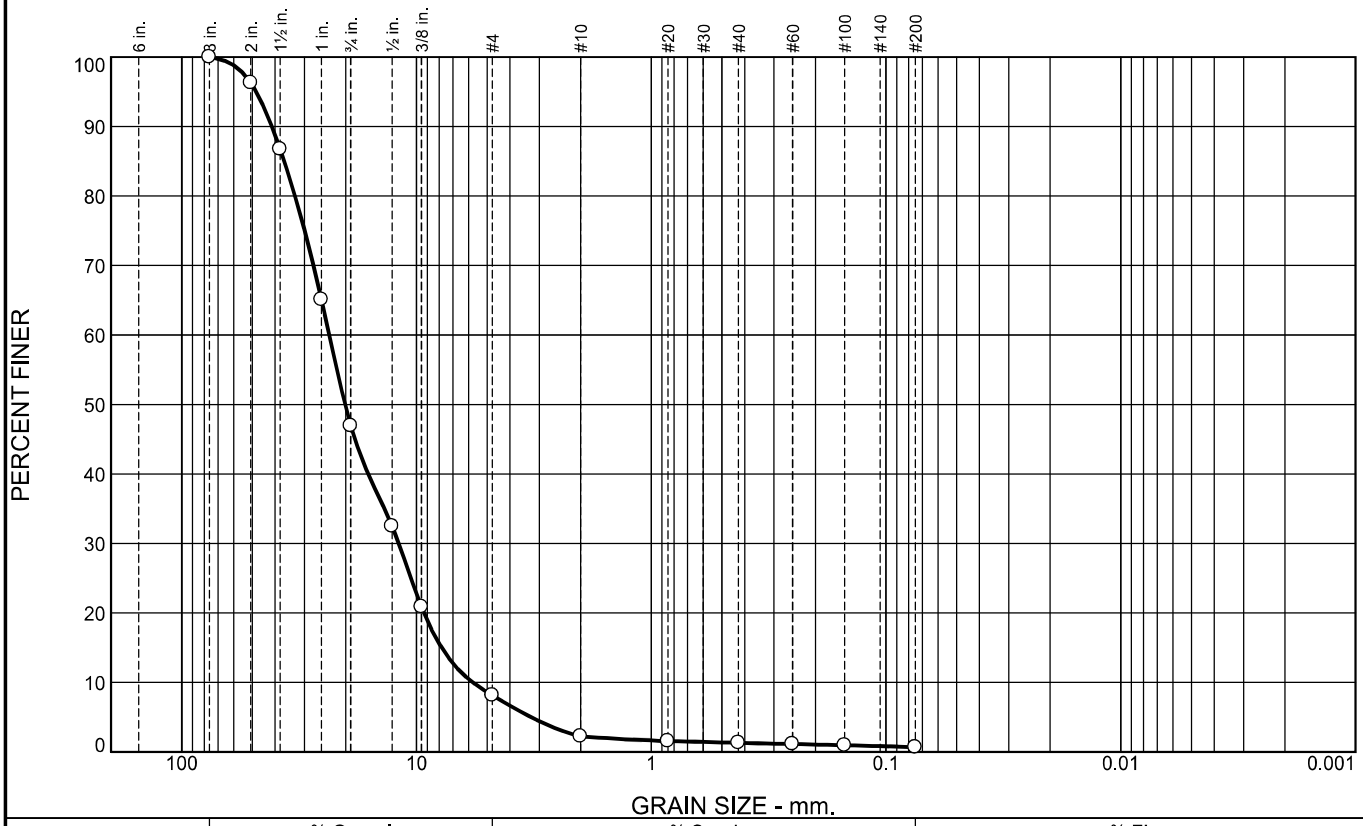
Sample Lab No.17663did not have enough material to perform the LA Wear test.

The grain-size distribution curves are included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Kevin Mock
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	53	39	6	1	0	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	96		
1.5"	87		
1"	65		
3/4"	47		
1/2"	32		
3/8"	21		
#4	8		
#10	2		
#20	2		
#40	1		
#60	1		
#100	1		
#200	0.7		

* (no specification provided)

Soil Description

Well-Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 41.3021 D_{85}= 36.5975 D_{60}= 23.5207
D_{50}= 20.1350 D_{30}= 11.9036 D_{15}= 7.8082
D_{10}= 5.7486 C_u= 4.09 C_c= 1.05

Classification

USCS= GW AASHTO=

Remarks

Location: T-10-3
Sample Number: 17660

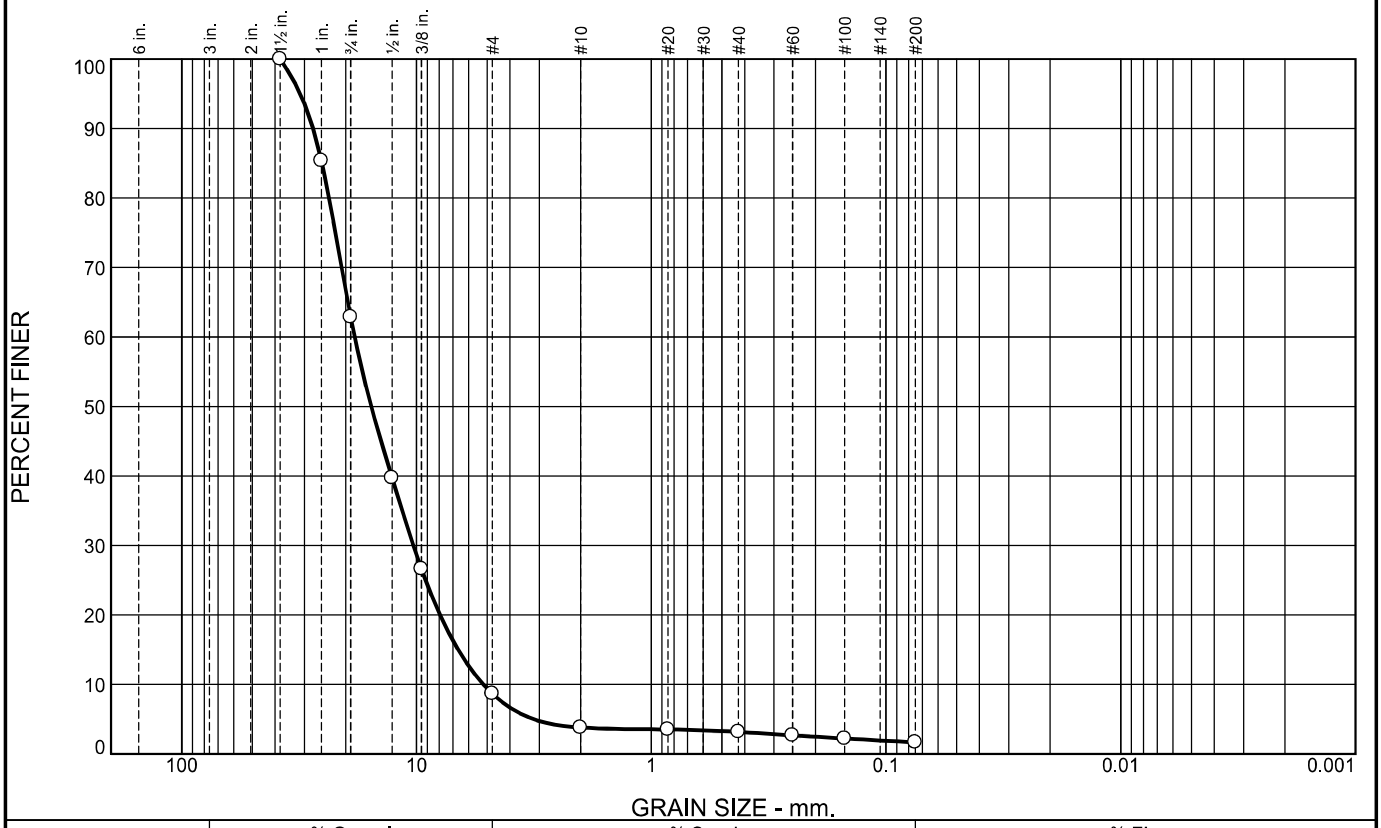
Date: 9-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	37	54	5	1	1	2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100		
1"	85		
3/4"	63		
1/2"	40		
3/8"	27		
#4	9		
#10	4		
#20	4		
#40	3		
#60	3		
#100	2		
#200	1.7		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 27.5762 D_{85}= 25.2593 D_{60}= 18.3092
D_{50}= 15.5739 D_{30}= 10.3100 D_{15}= 6.6429
D_{10}= 5.1876 C_u= 3.53 C_c= 1.12

Classification

USCS= GP AASHTO=

Remarks

Location: F-10-1
Sample Number: 17661

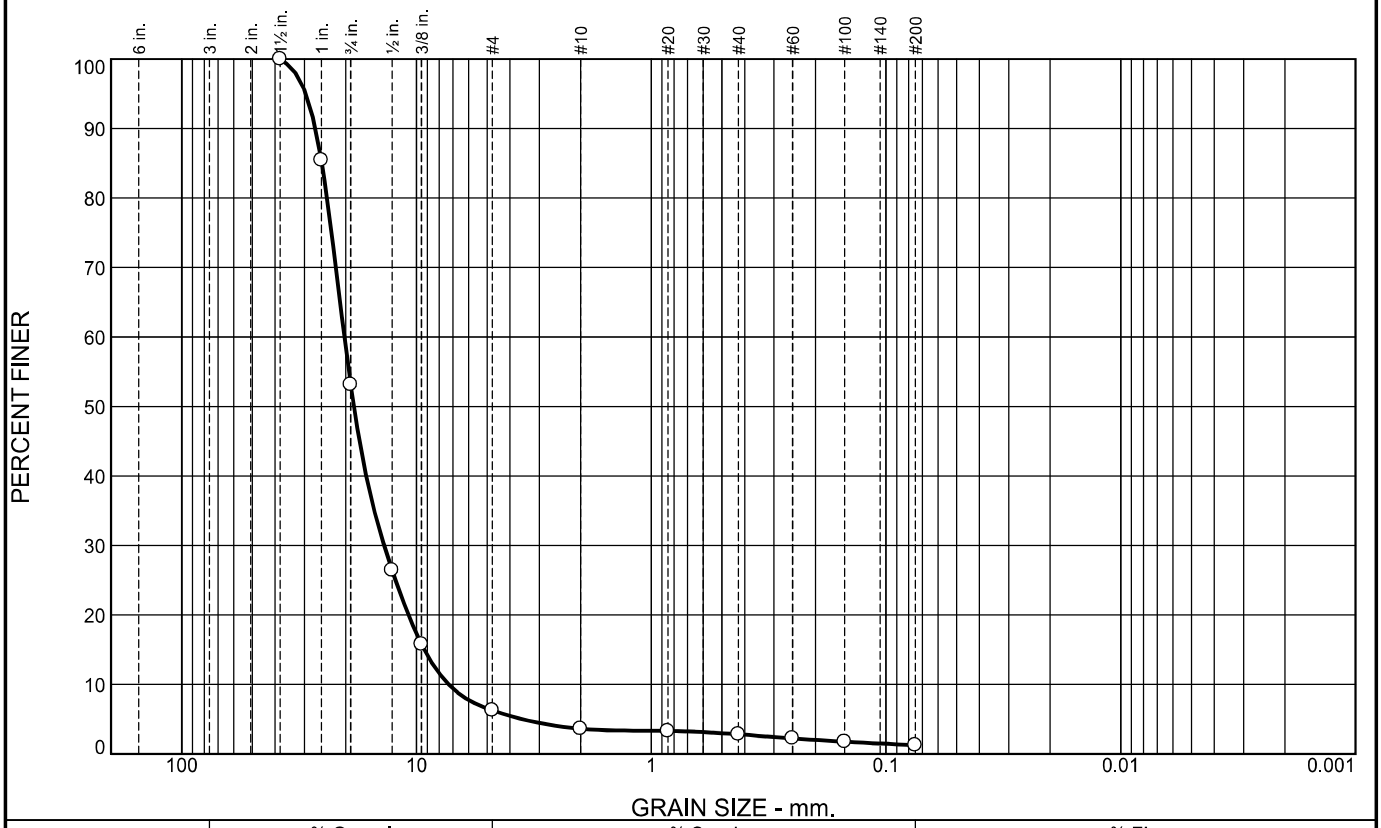
Date: 9-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	47	47	2	1	2	1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100		
1"	85		
3/4"	53		
1/2"	26		
3/8"	16		
#4	6		
#10	4		
#20	3		
#40	3		
#60	2		
#100	2		
#200	1.3		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 26.9474 D_{85}= 25.2779 D_{60}= 20.2556
D_{50}= 18.4616 D_{30}= 13.7381 D_{15}= 9.2591
D_{10}= 7.2829 C_u= 2.78 C_c= 1.28

Classification

USCS= GP AASHTO=

Remarks

Location: F-10-2
Sample Number: 17662

Date: 9-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

Montana Resources

Bonneville Gravel Pit
Lithology Description

Sample Report BN +3/4" up to 4"

Rock Type	Approximate percentage
Granite Gneiss -Rounded to sub-rounded clasts, pebbles to cobbles ~2-7cm -quartz > feldspars, overall buff to light -biotite: foliated, pressure-controlled metamorphic growth -surface oxides of iron and/or manganese "dendrites", surface carbonates -grain size variable	54%
Biotite Gneiss (and/or muscovite) -up to ~30% phyllosilicates, almost a "schist" -quartz and plagioclase abundant, iron rich -tabular banded clasts to 5cm	10%
Argillite & Quartzite -banded, green-gray, surface carbonates -clasts to 4cm	10%
"Augen" Gneiss -feldspar eyes to 5mm, distinct foliation, -clasts to 4cm	5%
Fresh granitic intrusives -quartz, plagioclase, k-feldspar, biotite, +/- muscovite -clasts to 4cm	5%
Quartz vein or **quartz-rich metamorphics** -no visible sulfides, no limonite, some foliation/lineation	5%
Altered granite or granite gneiss -heavy iron oxide staining, void spaces, biotite alteration to chlorite(?)	5%
Carbonate breccia, with carbonate cement -a single flattened clasts, max dimension 5cm	3%
Sediment, arkosic sandstone -quartz and feldspar-rich, hematite/limonite stained, coarse "arkosic" sandstone -poorly cemented, sub-rounded/semi angular clasts to 3cm	2%
Sediment, quartzite -red/buff , weak hematite staining -Belt: Mt Shields? -sub-rounded/semi angular clasts to 3cm	1%

NS/KE
6/25/2015

Sample Report BN -3/4" + No.8

Rock Type	Approximate percentage
Granite Gneiss, and biotite gneiss (minor) -sub-rounded and rounded clasts -likely represents pre-Belt metamorphic suite	35%
Fresh granite -quartz, plagioclase, k-feldspar, biotite, +/- muscovite -sub-rounded to angular clasts -proximal source?	30%
"Belt rocks"; Proterozoic metasediments -sub-rounded clasts; varying shades of red, green, and brown -quartzites, meta-pelites, and meta-conglomerates -carbonates and carbonate cemented clastic sediments	20%
Volcanics; distinctly porphyritic, poss. hypabyssal or dike rocks -sub-rounded to rounded clasts -phenocrysts: feldspar, biotite, quartz	5%
Chert; from Proterozoic belt rocks or younger sediments -cryptocrystalline silica of varying colors -sub-rounded to angular clasts	5%
Other sediments: -misc. sandstones and conglomerates -sub-rounded	5%

Note: Many clasts exhibit a carbonate surface coating up to 0.5mm. This sediment could potentially offer a small amount of acid neutralization capacity.

NS/KE
6/26/2015

Sample Report BN - No.8

Rock Type / Mineral Type	Approximate percentage
Quartz -abundant angular fragments to 3mm -minor beta quartz – from volcanics?	50%
Granite and granite gneiss -sub-rounded to angular clasts to 3mm	20%
Feldspar -sub-rounded to angular clasts of plagioclase and k-feldspar to 3mm	10%
"Belt rocks"; Proterozoic metasediments, clasts to 3mm -sub-rounded to angular clasts; varying shades of red, green, and brown -quartzites, meta-pelites, and meta-conglomerates	10%
Biotite and other phyllosilicates -muscovite, chlorite	3%
Clay and silt -includes fine carbonates	6%
Magnetite	<1%
Other: -organics -zircon -garnet -olivine -corundum	 Minor Trace Trace Trace Trace

Note: This sediment reacts vigorously with HCl, and could potentially offer some amount of acid neutralization capacity.

NS/KE
6/26/2015


247421
110-113

Montana Resources

Montana Resources, LLP (406) 496-3200
600 Shields Ave. (406) 723-9542 fax
Butte, Montana www.montanaresources.com
USA 59701

MEMORANDUM

TO: **Steve Czehura**

FROM: **Nolan Smith**

DATE: **October 20th, 2015**

SUBJECT: **Aggregate Study – Effluent Analysis**

Weir #10

Throughout the course of the aggregate testing program buckets of test materials from different sources have been immersed in the flowing effluent of the #10 weir. Buckets are filled with aggregate, holes drilled below the rim, and immersed in the flow for 30 days. Upon removal samples are subjected to LA abrasion testing. The water in the #10 weir is highly acidic (pH 2.5-3.5) with a high Iron content as well as various dissolved metals (see following analysis). To date three buckets have completed testing with a fourth bucket currently undergoing abrasion testing.

Anoxic Testing

At the request of K-P, anoxic testing was conducted on the various aggregate source materials. This test consists of placing aggregate in 5 gallon buckets, filling the bucket completely with seep effluent, sealing the bucket and allowing it to stand at room temperature for 30 days. Upon completion of the testing the effluent from the bucket was sampled and the aggregate subjected to LA abrasion testing. To date three buckets have completed testing with a third scheduled to be completed on 10/25/2015. Analysis of the effluent after thirty days shows an increase in pH of 1-2 s.u., with all the dissolved iron removed from solution, and a portion of the sulfates (1000 mg/l) also was removed from solution.

Hydrometrics has conducted all of the water sampling.

Anoxic samples are as follows:

T-10-3: Bonneville Transition Material
D-10-1: Mungas Drain Rock
F-10-2: Bonneville Filter Material

Please refer to the following pages for individual analysis.

ANALYTICAL SUMMARY REPORT

October 01, 2015

Hydrometrics Inc
3020 Bozeman Ave
Helena, MT 59601

Work Order: H15080444 Quote ID: H1136

Project Name: 12020 Montana Resources

Energy Laboratories Inc Helena MT received the following 3 samples for Hydrometrics Inc on 8/25/2015 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H15080444-001	MR-1508-100	08/24/15 10:10	08/25/15	Aqueous	Rare Earth Metals, Dissolved Rare Earth Metals, Total Recoverable Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Tot. Rec. Acidity, Total as CaCO3 Anion - Cation Balance Conductivity Mercury, Dissolved Mercury, Total Recoverable Fluoride Anions by Ion Chromatography pH Metals Digestion by EPA 200.2 Digestion, Mercury by CVAA Solids, Total Dissolved Solids, Total Suspended
H15080444-002	MR-1508-101	08/24/15 10:30	08/25/15	Aqueous	Same As Above
H15080444-003	MR-1508-102	08/24/15 10:45	08/25/15	Aqueous	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Assistant Branch Manager - Helena, MT

Digitally signed by
Amanda B. Blackburn
Date: 2015.10.01 14:43:33 -06:00

CLIENT: Hydrometrics Inc
Project: 12020 Montana Resources
Work Order: H15080444

Revised Date: 10/01/15
Report Date: 09/10/15

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

Client would like the same metals as total recoverable for dissolved. wj 9/23/15Prep Comments for Sample H15080444-001B, Test PRP-HG-245.1: The prep hold time was exceeded by 2.92 days. Prep Comments for Sample H15080444-002B, Test PRP-HG-245.1: The prep hold time was exceeded by 2.90 days.

Client contacted laboratory and requested the same metals as the Total Recoverable for the Dissoved Metals. Attached is the revised report. wj 9/23/15

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Hydrometrics Inc
Project: 12020 Montana Resources
Lab ID: H15080444-001
Client Sample ID: MR-1508-100

No. 10 Seep
Field pH=2.79
Field SC=4606
Water Temp=14.6C
DO=6.99 mg/L

Revised Date: 10/01/15
Report Date: 09/10/15
Collection Date: 08/24/15 10:10
DateReceived: 08/25/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	3.1	s.u.	H	0.1		A4500-H B	08/26/15 09:10 / SRW
Conductivity @ 25 C	5020	umhos/cm		1		A2510 B	08/26/15 09:10 / SRW
Solids, Total Suspended TSS @ 105 C	ND	mg/L		10		A2540 D	08/26/15 13:33 / SRW
Solids, Total Dissolved TDS @ 180 C	5890	mg/L	D	20		A2540 C	08/26/15 13:38 / SRW
INORGANICS							
Acidity, Total as CaCO3	1500	mg/L		4.0		A2310 B	08/27/15 09:17 / SRW
Chloride	11	mg/L		1		E300.0	08/27/15 14:56 / SRW
Sulfate	4040	mg/L	D	2		E300.0	08/27/15 14:56 / SRW
Fluoride	0.2	mg/L		0.1	4	A4500-F C	08/31/15 11:34 / SRW
METALS, DISSOLVED							
Aluminum	134	mg/L		0.03		E200.7	08/26/15 11:21 / sld
Antimony	ND	mg/L		0.0005		E200.8	09/24/15 17:30 / dck
Arsenic	0.020	mg/L		0.001		E200.8	09/24/15 17:30 / dck
Boron	ND	mg/L		0.1		E200.8	09/24/15 17:30 / dck
Cadmium	0.739	mg/L		0.00003		E200.8	09/24/15 17:30 / dck
Calcium	424	mg/L		1		E200.7	08/26/15 11:21 / sld
Chromium	0.017	mg/L		0.001		E200.8	09/25/15 11:47 / dck
Copper	52.1	mg/L		0.005		E200.7	08/26/15 11:21 / sld
Iron	84.0	mg/L		0.02		E200.7	08/26/15 11:21 / sld
Lead	0.0018	mg/L		0.0003		E200.8	09/24/15 17:30 / dck
Lithium	0.1	mg/L		0.1		E200.7	08/26/15 11:21 / sld
Magnesium	215	mg/L		1		E200.7	08/26/15 11:21 / sld
Manganese	78.0	mg/L		0.001		E200.7	08/26/15 11:21 / sld
Mercury	ND	mg/L	H	5E-06		E245.1	09/24/15 16:16 / dck
Molybdenum	0.0044	mg/L		0.0001		E200.8	09/24/15 17:30 / dck
Nickel	0.350	mg/L		0.002		E200.8	09/25/15 11:47 / dck
Rubidium	0.0205	mg/L		0.0001		E200.8	09/30/15 12:54 / eli-b
Potassium	14	mg/L		1		E200.7	08/26/15 11:21 / sld
Selenium	0.005	mg/L		0.001		E200.8	09/24/15 17:48 / dck
Silicon	26.4	mg/L		0.1		E200.7	08/26/15 11:21 / sld
Silver	ND	mg/L		0.0002		E200.8	09/24/15 17:30 / dck
Sodium	90	mg/L		1		E200.7	08/26/15 11:21 / sld
Strontium	0.97	mg/L		0.01		E200.7	08/26/15 11:21 / sld
Thallium	0.0003	mg/L		0.0002		E200.8	09/24/15 17:30 / dck
Tungsten	ND	mg/L	D	0.002		E200.8	09/30/15 12:54 / eli-b
Uranium	0.246	mg/L		0.0002		E200.8	09/24/15 17:30 / dck
Vanadium	ND	mg/L		0.1		E200.8	09/25/15 11:47 / dck
Zinc	222	mg/L		0.008		E200.7	09/30/15 00:23 / sld
METALS, TOTAL RECOVERABLE							
Aluminum	137	mg/L	D	0.03		E200.7	08/27/15 20:46 / sld
Antimony	ND	mg/L		0.0005		E200.8	09/01/15 07:36 / dck

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Hydrometrics Inc
Project: 12020 Montana Resources
Lab ID: H15080444-001
Client Sample ID: MR-1508-100

Revised Date: 10/01/15
Report Date: 09/10/15
Collection Date: 08/24/15 10:10
DateReceived: 08/25/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Arsenic	0.024	mg/L		0.001		E200.8	09/01/15 07:36 / dck
Boron	ND	mg/L		0.1		E200.7	08/27/15 20:46 / sld
Cadmium	0.768	mg/L		0.00003		E200.8	09/01/15 07:36 / dck
Chromium	0.017	mg/L		0.001		E200.8	09/01/15 07:36 / dck
Copper	53.8	mg/L	D	0.008		E200.7	08/27/15 20:46 / sld
Iron	94.7	mg/L		0.02		E200.7	08/27/15 20:46 / sld
Lead	0.0019	mg/L		0.0003		E200.8	09/01/15 07:36 / dck
Lithium	0.1	mg/L		0.1		E200.7	08/27/15 20:46 / sld
Manganese	83.5	mg/L		0.01		E200.7	08/27/15 20:46 / sld
Mercury	ND	mg/L		5E-06		E245.1	09/02/15 12:23 / rgk
Molybdenum	0.0047	mg/L		0.0001		E200.8	09/01/15 07:36 / dck
Nickel	0.341	mg/L		0.002		E200.8	09/01/15 07:36 / dck
Rubidium	0.0181	mg/L		0.0001		E200.8	09/02/15 11:32 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	09/01/15 07:36 / dck
Silicon	27.3	mg/L		0.1		E200.7	08/27/15 20:46 / sld
Silver	ND	mg/L		0.0002		E200.8	09/01/15 07:36 / dck
Strontium	1.03	mg/L		0.02		E200.7	08/27/15 20:46 / sld
Thallium	0.0003	mg/L		0.0002		E200.8	09/01/15 07:36 / dck
Tungsten	ND	mg/L	D	0.0005		E200.8	09/02/15 11:32 / eli-b
Uranium	0.252	mg/L		0.0002		E200.8	09/01/15 07:36 / dck
Vanadium	ND	mg/L		0.1		E200.8	09/01/15 07:36 / dck
Zinc	208	mg/L		0.008		E200.7	08/27/15 20:46 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ANALYTICAL SUMMARY REPORT

October 16, 2015

Hydrometrics Inc
3020 Bozeman Ave
Helena, MT 59601

Work Order: H15090550

Project Name: 12020 Montana Resources

Energy Laboratories Inc Helena MT received the following 4 samples for Hydrometrics Inc on 9/28/2015 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H15090550-001	MR-1509-100	09/25/15 10:10	09/28/15	Aqueous	Rare Earth Metals, Dissolved Rare Earth Metals, Total Recoverable Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Tot. Rec. Alkalinity Conductivity Mercury, Dissolved Mercury, Total Recoverable Fluoride Anions by Ion Chromatography pH Metals Digestion by EPA 200.2 Digestion, Mercury by CVAA Solids, Total Dissolved Solids, Total Suspended
H15090550-002	MR-1509-101	09/25/15 10:20	09/28/15	Aqueous	Rare Earth Metals, Dissolved Rare Earth Metals, Total Recoverable Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Tot. Rec. Acidity, Total as CaCO3 Alkalinity Conductivity Mercury, Dissolved Mercury, Total Recoverable Fluoride Anions by Ion Chromatography pH Metals Digestion by EPA 200.2 Digestion, Mercury by CVAA Solids, Total Dissolved Solids, Total Suspended
H15090550-003	MR-1509-102	09/25/15 10:25	09/28/15	Aqueous	Same As Above
H15090550-004	MR-1509-103	09/25/15 10:45	09/28/15	Aqueous	Rare Earth Metals, Dissolved Rare Earth Metals, Total Recoverable Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Tot. Rec. Acidity, Total as CaCO3 Conductivity Mercury, Dissolved Mercury, Total Recoverable Fluoride Anions by Ion Chromatography pH Metals Digestion by EPA 200.2 Digestion, Mercury by CVAA Solids, Total Dissolved Solids, Total Suspended

ANALYTICAL SUMMARY REPORT

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By: 

Digitally signed by
Wanda Johnson
Date: 2015.10.16 15:30:41 -06:00

CLIENT: Hydrometrics Inc
Project: 12020 Montana Resources
Work Order: H15090550

Report Date: 10/16/15

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Site D-10-1
Temp=16.7C
SC=4083micromhos/cm
DO=5.01 mg/L
pH=5.79

Client: Hydrometrics Inc
Project: 12020 Montana Resources
Lab ID: H15090550-001
Client Sample ID: MR-1509-100

Report Date: 10/16/15
Collection Date: 09/25/15 10:10
DateReceived: 09/28/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	5.9	s.u.	H	0.1		A4500-H B	09/28/15 13:56 / SRW
Conductivity @ 25 C	4240	umhos/cm		1		A2510 B	09/28/15 13:56 / SRW
Solids, Total Suspended TSS @ 105 C	17	mg/L		10		A2540 D	09/28/15 13:28 / SRW
Solids, Total Dissolved TDS @ 180 C	4680	mg/L		10		A2540 C	09/28/15 13:34 / SRW
INORGANICS							
Alkalinity, Total as CaCO3	140	mg/L		4		A2320 B	09/29/15 13:47 / SRW
Bicarbonate as HCO3	170	mg/L		4		A2320 B	09/29/15 13:47 / SRW
Chloride	10	mg/L		1		E300.0	09/29/15 00:05 / SRW
Sulfate	3070	mg/L	D	2		E300.0	09/29/15 00:05 / SRW
Fluoride	3.2	mg/L	D	0.5	4	A4500-F C	09/28/15 12:24 / SRW
METALS, DISSOLVED							
Aluminum	2.22	mg/L		0.005		E200.8	10/10/15 01:13 / dck
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:13 / dck
Arsenic	ND	mg/L		0.001		E200.8	10/10/15 01:13 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 02:45 / sld
Cadmium	0.644	mg/L		0.00003		E200.8	10/10/15 01:13 / dck
Calcium	554	mg/L		1		E200.7	09/30/15 02:45 / sld
Chromium	ND	mg/L		0.001		E200.8	10/10/15 01:13 / dck
Copper	14.8	mg/L	D	0.009		E200.7	09/30/15 02:45 / sld
Iron	ND	mg/L		0.02		E200.7	10/15/15 00:37 / sld
Lead	ND	mg/L		0.0003		E200.8	10/10/15 01:13 / dck
Lithium	0.1	mg/L		0.1		E200.7	09/30/15 02:45 / sld
Magnesium	224	mg/L		1		E200.7	09/30/15 02:45 / sld
Manganese	77.9	mg/L		0.001		E200.7	09/30/15 02:45 / sld
Mercury	ND	mg/L		5E-06		E245.1	10/08/15 14:01 / eli-b40
Molybdenum	ND	mg/L	D	0.0005		E200.8	10/11/15 20:12 / dck
Nickel	0.310	mg/L	D	0.005		E200.7	09/30/15 02:45 / sld
Rubidium	0.0170	mg/L		0.0001		E200.8	09/30/15 14:28 / eli-b
Potassium	16	mg/L		1		E200.7	09/30/15 02:45 / sld
Selenium	0.003	mg/L		0.001		E200.8	10/13/15 23:17 / sld
Silicon	11.3	mg/L		0.1		E200.7	09/30/15 02:45 / sld
Silver	ND	mg/L		0.0002		E200.8	10/10/15 01:13 / dck
Sodium	97	mg/L		1		E200.7	09/30/15 02:45 / sld
Strontium	1.16	mg/L		0.01		E200.7	09/30/15 02:45 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:13 / dck
Tungsten	ND	mg/L	D	0.0008		E200.8	09/30/15 14:28 / eli-b
Uranium	0.0265	mg/L		0.0002		E200.8	10/10/15 01:13 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:13 / dck
Zinc	172	mg/L		0.008		E200.7	09/30/15 02:45 / sld
METALS, TOTAL RECOVERABLE							
Aluminum	3.22	mg/L	D	0.03		E200.7	09/30/15 03:26 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Hydrometrics Inc	Report Date:	10/16/15
Project:	12020 Montana Resources	Collection Date:	09/25/15 10:10
Lab ID:	H15090550-001	DateReceived:	09/28/15
Client Sample ID:	MR-1509-100	Matrix:	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:25 / dck
Arsenic	0.001	mg/L		0.001		E200.8	10/10/15 01:25 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 03:26 / sld
Cadmium	0.634	mg/L		0.00003		E200.8	10/10/15 01:25 / dck
Chromium	ND	mg/L		0.001		E200.8	10/10/15 01:25 / dck
Copper	14.3	mg/L	D	0.008		E200.7	09/30/15 03:26 / sld
Iron	1.37	mg/L		0.02		E200.8	10/10/15 01:25 / dck
Lead	0.0003	mg/L		0.0003		E200.8	10/10/15 01:25 / dck
Lithium	0.1	mg/L		0.1		E200.7	09/30/15 03:26 / sld
Manganese	75.2	mg/L		0.001		E200.7	09/30/15 03:26 / sld
Mercury	ND	mg/L		5E-06		E245.1	10/07/15 16:39 / eli-b40
Molybdenum	ND	mg/L	D	0.0005		E200.8	10/11/15 20:15 / dck
Nickel	0.304	mg/L	D	0.005		E200.7	09/30/15 03:26 / sld
Rubidium	0.0168	mg/L		0.0001		E200.8	09/30/15 14:32 / eli-b
Selenium	0.002	mg/L		0.001		E200.8	10/10/15 01:25 / dck
Silicon	11.0	mg/L		0.1		E200.7	09/30/15 03:26 / sld
Silver	ND	mg/L		0.0002		E200.8	10/13/15 23:39 / sld
Strontium	1.10	mg/L		0.01		E200.7	09/30/15 03:26 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:25 / dck
Tungsten	ND	mg/L	D	0.0002		E200.8	09/30/15 14:32 / eli-b
Uranium	0.0274	mg/L		0.0002		E200.8	10/10/15 01:25 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:25 / dck
Zinc	178	mg/L		0.008		E200.7	09/30/15 03:26 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Hydrometrics Inc
Project: 12020 Montana Resources
Lab ID: H15090550-002
Client Sample ID: MR-1509-101

Site F-10-2
Temp=16.7C
SC=4164 micromho/cm
DO=3.19 mg/L
pH=5.02

Report Date: 10/16/15
Collection Date: 09/25/15 10:20
DateReceived: 09/28/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	4.9	s.u.	H	0.1		A4500-H B	09/28/15 13:58 / SRW
Conductivity @ 25 C	4260	umhos/cm		1		A2510 B	09/28/15 13:58 / SRW
Solids, Total Suspended TSS @ 105 C	94	mg/L		10		A2540 D	09/28/15 13:29 / SRW
Solids, Total Dissolved TDS @ 180 C	4870	mg/L		10		A2540 C	09/28/15 13:34 / SRW
INORGANICS							
Acidity, Total as CaCO3	530	mg/L		4.0		A2310 B	10/02/15 10:10 / SRW
Alkalinity, Total as CaCO3	8	mg/L		4		A2320 B	09/29/15 13:56 / SRW
Bicarbonate as HCO3	10	mg/L		4		A2320 B	09/29/15 13:56 / SRW
Chloride	10	mg/L		1		E300.0	09/29/15 00:16 / SRW
Sulfate	3270	mg/L	D	2		E300.0	09/29/15 00:16 / SRW
Fluoride	8.4	mg/L	D*	1.0	4	A4500-F C	09/28/15 12:36 / SRW
METALS, DISSOLVED							
Aluminum	14.8	mg/L	D	0.02		E200.7	09/30/15 02:48 / sld
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:28 / dck
Arsenic	0.001	mg/L		0.001		E200.8	10/10/15 01:28 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 02:48 / sld
Cadmium	0.592	mg/L		0.00003		E200.8	10/10/15 01:28 / dck
Calcium	542	mg/L		1		E200.7	09/30/15 02:48 / sld
Chromium	ND	mg/L		0.001		E200.8	10/10/15 01:28 / dck
Copper	21.6	mg/L	D	0.009		E200.7	09/30/15 02:48 / sld
Iron	0.03	mg/L		0.02		E200.8	10/14/15 00:02 / sld
Lead	0.0022	mg/L		0.0003		E200.8	10/10/15 01:28 / dck
Lithium	ND	mg/L		0.1		E200.7	09/30/15 02:48 / sld
Magnesium	228	mg/L		1		E200.7	09/30/15 02:48 / sld
Manganese	72.0	mg/L		0.001		E200.7	09/30/15 02:48 / sld
Mercury	8.4E-06	mg/L		5E-06		E245.1	10/12/15 14:43 / eli-b40
Molybdenum	ND	mg/L		0.0001		E200.8	10/10/15 01:28 / dck
Nickel	0.325	mg/L	D	0.005		E200.7	09/30/15 02:48 / sld
Rubidium	0.0059	mg/L		0.0001		E200.8	09/30/15 14:35 / eli-b
Potassium	17	mg/L		1		E200.7	09/30/15 02:48 / sld
Selenium	0.005	mg/L		0.001		E200.8	10/14/15 00:02 / sld
Silicon	18.3	mg/L		0.1		E200.7	09/30/15 02:48 / sld
Silver	ND	mg/L		0.0002		E200.8	10/10/15 01:28 / dck
Sodium	95	mg/L		1		E200.7	09/30/15 02:48 / sld
Strontium	1.78	mg/L		0.01		E200.7	09/30/15 02:48 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:28 / dck
Tungsten	ND	mg/L	D	0.0008		E200.8	09/30/15 14:35 / eli-b
Uranium	0.0494	mg/L		0.0002		E200.8	10/10/15 01:28 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:28 / dck
Zinc	163	mg/L		0.008		E200.7	09/30/15 02:48 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
* - The result exceeds the MCL.
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Hydrometrics Inc	Report Date:	10/16/15
Project:	12020 Montana Resources	Collection Date:	09/25/15 10:20
Lab ID:	H15090550-002	DateReceived:	09/28/15
Client Sample ID:	MR-1509-101	Matrix:	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Aluminum	18.4	mg/L	D	0.03		E200.7	09/30/15 03:29 / sld
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:31 / dck
Arsenic	0.005	mg/L		0.001		E200.8	10/10/15 01:31 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 03:29 / sld
Cadmium	0.624	mg/L		0.00003		E200.8	10/10/15 01:31 / dck
Chromium	0.004	mg/L		0.001		E200.8	10/10/15 01:31 / dck
Copper	21.0	mg/L	D	0.008		E200.7	09/30/15 03:29 / sld
Iron	5.34	mg/L		0.02		E200.7	09/30/15 03:29 / sld
Lead	0.0053	mg/L		0.0003		E200.8	10/10/15 01:31 / dck
Lithium	ND	mg/L		0.1		E200.7	09/30/15 03:29 / sld
Manganese	72.2	mg/L		0.001		E200.7	09/30/15 03:29 / sld
Mercury	0.0000440	mg/L		5E-06		E245.1	10/09/15 13:34 / eli-b40
Molybdenum	ND	mg/L	D	0.0005		E200.8	10/11/15 20:25 / dck
Nickel	0.332	mg/L	D	0.005		E200.7	09/30/15 03:29 / sld
Rubidium	0.0140	mg/L		0.0001		E200.8	09/30/15 14:39 / eli-b
Selenium	0.005	mg/L		0.001		E200.8	10/14/15 00:15 / sld
Silicon	24.5	mg/L		0.1		E200.7	09/30/15 03:29 / sld
Silver	0.0002	mg/L		0.0002		E200.8	10/14/15 00:15 / sld
Strontium	1.74	mg/L		0.01		E200.7	09/30/15 03:29 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:31 / dck
Tungsten	ND	mg/L	D	0.0002		E200.8	09/30/15 14:39 / eli-b
Uranium	0.0535	mg/L		0.0002		E200.8	10/10/15 01:31 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:31 / dck
Zinc	165	mg/L		0.008		E200.7	09/30/15 03:29 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Hydrometrics Inc
Project: 12020 Montana Resources
Lab ID: H15090550-003
Client Sample ID: MR-1509-102

Site T-10-3
Temp=16.8C
SC=4102 micromhos/cm
DO=3.75 mg/L
pH=4.65

Report Date: 10/16/15
Collection Date: 09/25/15 10:25
DateReceived: 09/28/15
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	4.7	s.u.	H	0.1		A4500-H B	09/28/15 14:01 / SRW
Conductivity @ 25 C	4190	umhos/cm		1		A2510 B	09/28/15 14:01 / SRW
Solids, Total Suspended TSS @ 105 C	110	mg/L		10		A2540 D	09/28/15 13:29 / SRW
Solids, Total Dissolved TDS @ 180 C	4770	mg/L		10		A2540 C	09/28/15 13:35 / SRW
INORGANICS							
Acidity, Total as CaCO3	600	mg/L		4.0		A2310 B	10/02/15 10:20 / SRW
Alkalinity, Total as CaCO3	5	mg/L		4		A2320 B	09/29/15 14:01 / SRW
Bicarbonate as HCO3	6	mg/L		4		A2320 B	09/29/15 14:01 / SRW
Chloride	9	mg/L		1		E300.0	09/29/15 00:27 / SRW
Sulfate	3370	mg/L	D	2		E300.0	09/29/15 00:27 / SRW
Fluoride	8.9	mg/L	D*	1.0	4	A4500-F C	09/28/15 12:37 / SRW
METALS, DISSOLVED							
Aluminum	24.3	mg/L	D	0.02		E200.7	09/30/15 02:52 / sld
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:34 / dck
Arsenic	0.001	mg/L		0.001		E200.8	10/10/15 01:34 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 02:52 / sld
Cadmium	0.644	mg/L		0.00003		E200.8	10/10/15 01:34 / dck
Calcium	500	mg/L		1		E200.7	09/30/15 02:52 / sld
Chromium	ND	mg/L		0.001		E200.8	10/10/15 01:34 / dck
Copper	29.8	mg/L	D	0.009		E200.7	09/30/15 02:52 / sld
Iron	ND	mg/L		0.02		E200.8	10/10/15 01:34 / dck
Lead	0.0021	mg/L		0.0003		E200.8	10/10/15 01:34 / dck
Lithium	0.1	mg/L		0.1		E200.7	09/30/15 02:52 / sld
Magnesium	226	mg/L		1		E200.7	09/30/15 02:52 / sld
Manganese	72.8	mg/L		0.001		E200.7	09/30/15 02:52 / sld
Mercury	9.6E-06	mg/L		5E-06		E245.1	10/12/15 14:46 / eli-b40
Molybdenum	ND	mg/L		0.0001		E200.8	10/10/15 01:34 / dck
Nickel	0.329	mg/L	D	0.005		E200.7	09/30/15 02:52 / sld
Rubidium	0.0064	mg/L		0.0001		E200.8	09/30/15 14:43 / eli-b
Potassium	18	mg/L		1		E200.7	09/30/15 02:52 / sld
Selenium	0.007	mg/L		0.001		E200.8	10/14/15 00:28 / sld
Silicon	19.9	mg/L		0.1		E200.7	09/30/15 02:52 / sld
Silver	ND	mg/L		0.0002		E200.8	10/10/15 01:34 / dck
Sodium	93	mg/L		1		E200.7	09/30/15 02:52 / sld
Strontium	1.74	mg/L		0.01		E200.7	09/30/15 02:52 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:34 / dck
Tungsten	ND	mg/L	D	0.0008		E200.8	09/30/15 14:43 / eli-b
Uranium	0.0872	mg/L		0.0002		E200.8	10/10/15 01:34 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:34 / dck
Zinc	175	mg/L		0.008		E200.7	09/30/15 02:52 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
* - The result exceeds the MCL.
H - Analysis performed past recommended holding time.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Hydrometrics Inc	Report Date:	10/16/15
Project:	12020 Montana Resources	Collection Date:	09/25/15 10:25
Lab ID:	H15090550-003	DateReceived:	09/28/15
Client Sample ID:	MR-1509-102	Matrix:	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL RECOVERABLE							
Aluminum	28.1	mg/L	D	0.03		E200.7	09/30/15 03:33 / sld
Antimony	ND	mg/L		0.0005		E200.8	10/10/15 01:37 / dck
Arsenic	0.010	mg/L		0.001		E200.8	10/10/15 01:37 / dck
Boron	ND	mg/L		0.05		E200.7	09/30/15 03:33 / sld
Cadmium	0.639	mg/L		0.00003		E200.8	10/10/15 01:37 / dck
Chromium	0.004	mg/L		0.001		E200.8	10/10/15 01:37 / dck
Copper	29.6	mg/L	D	0.008		E200.7	09/30/15 03:33 / sld
Iron	8.26	mg/L		0.02		E200.7	09/30/15 03:33 / sld
Lead	0.0061	mg/L		0.0003		E200.8	10/10/15 01:37 / dck
Lithium	0.1	mg/L		0.1		E200.7	09/30/15 03:33 / sld
Manganese	74.1	mg/L		0.001		E200.7	09/30/15 03:33 / sld
Mercury	0.000145	mg/L		5E-06		E245.1	10/09/15 13:36 / eli-b40
Molybdenum	0.0010	mg/L		0.0001		E200.8	10/10/15 01:37 / dck
Nickel	0.337	mg/L	D	0.005		E200.7	09/30/15 03:33 / sld
Rubidium	0.0130	mg/L		0.0001		E200.8	09/30/15 14:47 / eli-b
Selenium	0.006	mg/L		0.001		E200.8	10/14/15 00:57 / sld
Silicon	26.1	mg/L		0.1		E200.7	09/30/15 03:33 / sld
Silver	ND	mg/L		0.0002		E200.8	10/10/15 01:37 / dck
Strontium	1.74	mg/L		0.01		E200.7	09/30/15 03:33 / sld
Thallium	ND	mg/L		0.0002		E200.8	10/10/15 01:37 / dck
Tungsten	ND	mg/L	D	0.0002		E200.8	09/30/15 14:47 / eli-b
Uranium	0.0890	mg/L		0.0002		E200.8	10/10/15 01:37 / dck
Vanadium	ND	mg/L		0.01		E200.8	10/10/15 01:37 / dck
Zinc	178	mg/L		0.008		E200.7	09/30/15 03:33 / sld

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Montana Resources

Montana Resources, LLP (406) 496-3200
600 Shields Ave. (406) 723-9542 fax
Butte, Montana www.montanaresources.com
USA 59701

MEMORANDUM

TO: **Steve Czehura**

FROM: **Nolan Smith**

DATE: **October 27th, 2015**

SUBJECT: **Aggregate Study – L.A. Abrasion - update**

Pipestone Quarry

Abrasion testing has been conducted on the andesite source from the Pipestone Quarry over the course of many years. Data provided to MR from Pipestone Quarry, LLC has shown LA Wear percent loss values around 10% for most materials produced. Sampling conducted recently by MR and lab work by Pioneer Technical returned results from 11-13 %. The sample from the #10 weir was measured at a 13% loss. The anoxic test sample has been submitted to Pioneer Technical for abrasion testing.

Bonneville Pit

Testing is complete on Centennials Bonneville aggregate. Transition material returned LA abrasion results of 27 & 28 % loss, with anoxic transition returning 28% loss. Testing of filter material indicated a loss of 28% in the seep, and 31% loss in the anoxic test. Drain rock was measured at a 27% loss with no exposure to acidic waters.

Mungas Pit

Abrasion testing is complete on Mungas's aggregate drain rock source near Anaconda. Drain rock returned a LA abrasion result of 16 % loss, with anoxic testing returning a 23% loss.

Attached is a summary of the abrasion test results.

YDTI L.A. Abrasion Test Results 10/27/15

ID #	Material Type	Location	Loss %	Revolutions	ASTM	Grading	Notes
T-10-2	Bonneville Transition		27	500	C131	A	
T-10-3	Bonneville Transition	closed bucket	28	500	C131	A&B	
T-10-4	Bonneville Transition		28	500	C131	A	
F-10-1	Bonneville Filter	#10 weir	28	500	C131	A&B	
F-10-2	Bonneville Filter	closed bucket	31	500	C131	A&B	
D-10-2	Mungas Drain Rock	#10 weir	23	1000	C535	2	
D-10-3	Mungas Drain Rock		16	1000	C535	1	
D-10-4	Bonneville Drain Rock		27	1000	C535	1	
D-10-5	Pipestone Yard Ballast		11	1000	C535	2	
F-10-4	Pipestone Yard Ballast	#10 weir	13	500	C131	B	
F-10-5	Pipestone Yard Ballast		13	500	C131	B	
F-10-6	Pipestone Yard Ballast	closed bucket					In Progress

Montana Resources, LLP (406) 496-3200
600 Shields Ave. (406) 723-9542 fax
Butte, Montana www.montanaresources.com
USA 59701

MEMORANDUM

TO: **Steve Czehura**

FROM: **Nolan Smith**

DATE: **October 13th, 2015**

SUBJECT: **Aggregate Study – Mungas Pit**

Mungas Pit

Mungas Company, Inc. (MCI) is in the process of constructing a municipal sewer system in the West Valley outside of Anaconda. During excavation large boulders (3-5 ft.) are encountered and scalped off at about one foot to produce suitable backfill. This scalped product is generally mixed metamorphic and volcanic rock coated with caliche. Resistance to degradation (LA wear) results for this rock is low at 16%. Acid resistance testing in the #10 weir was 23% loss. Attached is supporting documentation. Pulps for semi quantitative analysis were submitted to SGS on 10/2/2015, with results expected to be returned by the end of October.

Mungas has offered this drain rock to MR at their cost for transportation as it in the way of operations in their laydown area. They will probably generate 2,000 tons of this rock before completing their project by the end of the year.

YDTI Material Testing Plan 10/19/15

ID #	Material Type	Location	Date	Time	Test	Test	Notes
D-10-1	Mungas Drain Rock	closed bucket	8/24/2015	15:20	ASTM C136	ASTM C535	Spilt Net Analysis 8/28/2015
			9/25/2015	10:12	10/13/2015	NS	Lithology 8/21/2015
D-10-2	Mungas Drain Rock	#10 seep	8/25/2015	13:40	ASTM C136	ASTM C535 2	
			9/25/2015	14:37	10/13/2015	10/13/2015	
D-10-3	Mungas Drain Rock				ASTM C136	ASTM C535 1	
					10/5/2015	10/5/2015	

YDTI L.A. Abrasion Test Result 10/19/15

ID #	Material Type	Location	Loss %	Revolutions	ASTM	Grading	Notes
D-10-1	Mungas Drain Rock	closed bucket	NS				
D-10-2	Mungas Drain Rock	#10 seep	23		C535	2	
D-10-3	Mungas Drain Rock		16	500	C535	1	

PIONEER TECHNICAL SERVICES, INC.

October 5, 2015

Mr. Steve Czehura
Montana Resources, LLP
600 Shields Ave
Butte, MT 59701

RE: Montana Resources Material Testing – P.O. 8-282394
Pioneer Technical Services, Inc. Project No. 1503028

Dear Mr. Czehura,

On September 21, five samples from the Yankee Doodle Impoundment Dam Site Investigation project were delivered to our ASTM/AASHTO accredited materials testing laboratory in Helena. The samples were identified as noted in Table 1.

Table 1 - Sample I.D.

Lab No.	Sample Identification
17574	T-10-4
17575	F-3
17576	F-4
17578	D-10-3
17579	D-10-4

The testing was performed in general accordance with the following Standards:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C136);
- Resistance to Degradation of Small-Size Coarse Aggregate L.A. Abrasion (ASTM C131, Grading A) [Lab No. 17574] ; and
- Resistance to Degradation of Large Size Coarse Aggregate L.A. Abrasion (ASTM C535, Grading 1) [Lab Nos. 17578-17579].

Table 2 – L.A. Abrasion Testing Results

Lab No.	Material Description	Loss After 500 Revolutions (%)
17574	T-10-4	28
17578	D-10-3	16
17579	D-10-4	27

Sample Lab Nos. 17575 and 17576 did not have enough material to perform the LA Wear test. No Sample was provided for Montana Resources Sample No. F-10-3.

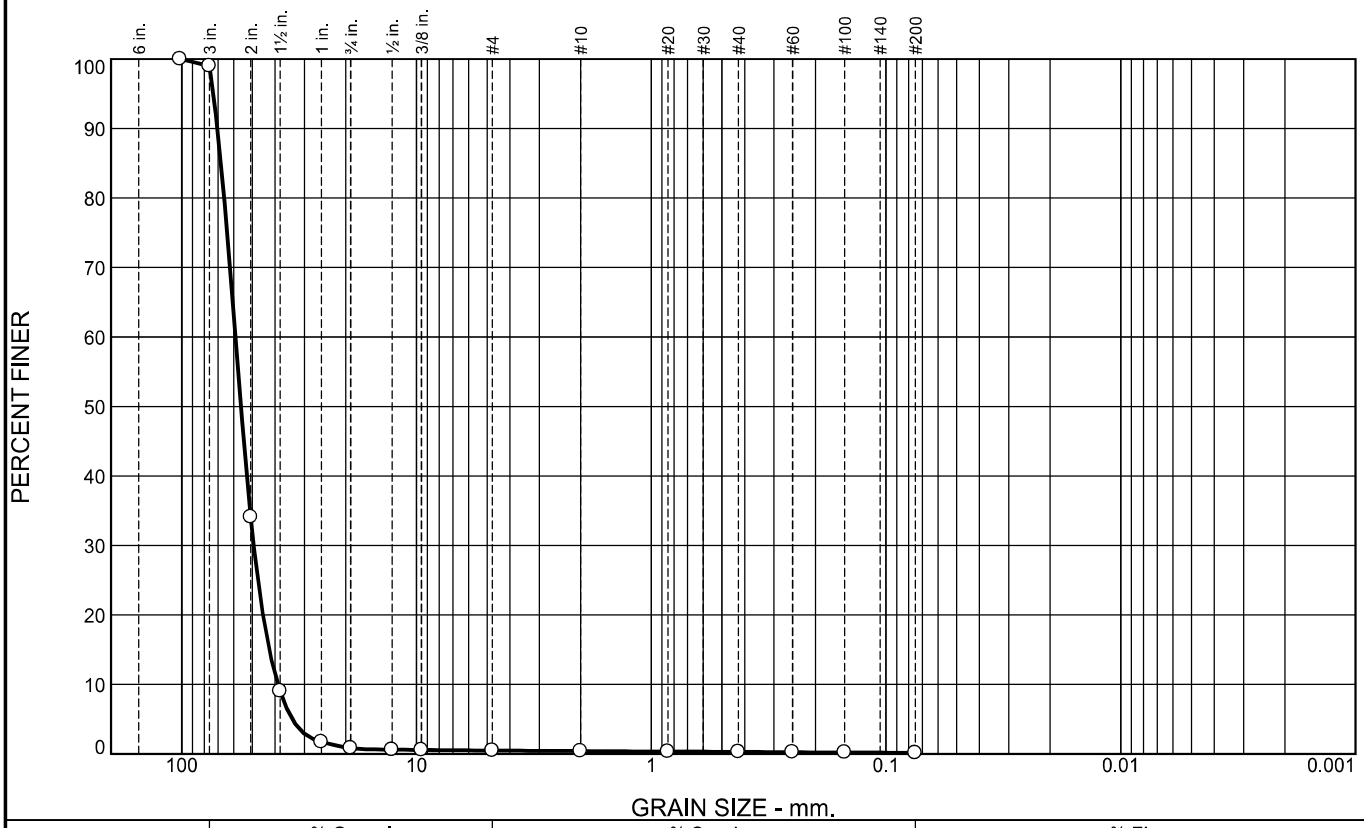
PIONEER
TECHNICAL SERVICES, INC.

The grain-size distribution curves are included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Kevin Mock
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
1	98	0	1	0	0	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4"	100		
3"	99		
2"	34		
1.5"	9		
1"	2		
3/4"	1		
1/2"	1		
3/8"	1		
#4	1		
#10	0		
#20	0		
#40	0		
#60	0		
#100	0		
#200	0.2		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 70.3465 D_{85}= 68.0046 D_{60}= 59.0356
D_{50}= 55.9176 D_{30}= 49.3207 D_{15}= 42.3539
D_{10}= 38.8872 C_u= 1.52 C_c= 1.06

Classification

USCS= GP AASHTO=

Remarks

Location: D-10-3
Sample Number: 17578

Date: 9-15-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

PIONEER TECHNICAL SERVICES, INC.

October 13, 2015

Mr. Steve Czehura
Montana Resources, LLP
600 Shields Ave
Butte, MT 59701

RE: Montana Resources Material Testing – P.O. 8-282394
Pioneer Technical Services, Inc. Project No. 1503028

Dear Mr. Czehura,

On October 5, five samples from the Yankee Doodle Impoundment Dam Site Investigation project were delivered to our ASTM/AASHTO accredited materials testing laboratory in Helena. The samples were identified as noted in Table 1.

Table 1 - Sample I.D.

Lab No.	Sample Identification
17660	T-10-3
17661	F-10-1
17662	F-10-2
17663	D-10-1
17664	D-10-2

The testing was performed in general accordance with the following Standards:

- Sieve Analysis of Coarse and Fine Aggregate (ASTM C117, C136);
- Resistance to Degradation of Small-Size Coarse Aggregate L.A. Abrasion (ASTM C131, Grading A&B) [Lab Nos. 17660, 17661, 17662]; and
- Resistance to Degradation of Large Size Coarse Aggregate L.A. Abrasion (ASTM C535, Grading 2) [Lab No. 17664].

Table 2 – L.A. Abrasion Testing Results

Lab No.	Material Description	Loss (%)
17660	T-10-3	28
17661	F-10-1	28
17662	F-10-2	31
17664	D-10-2	23

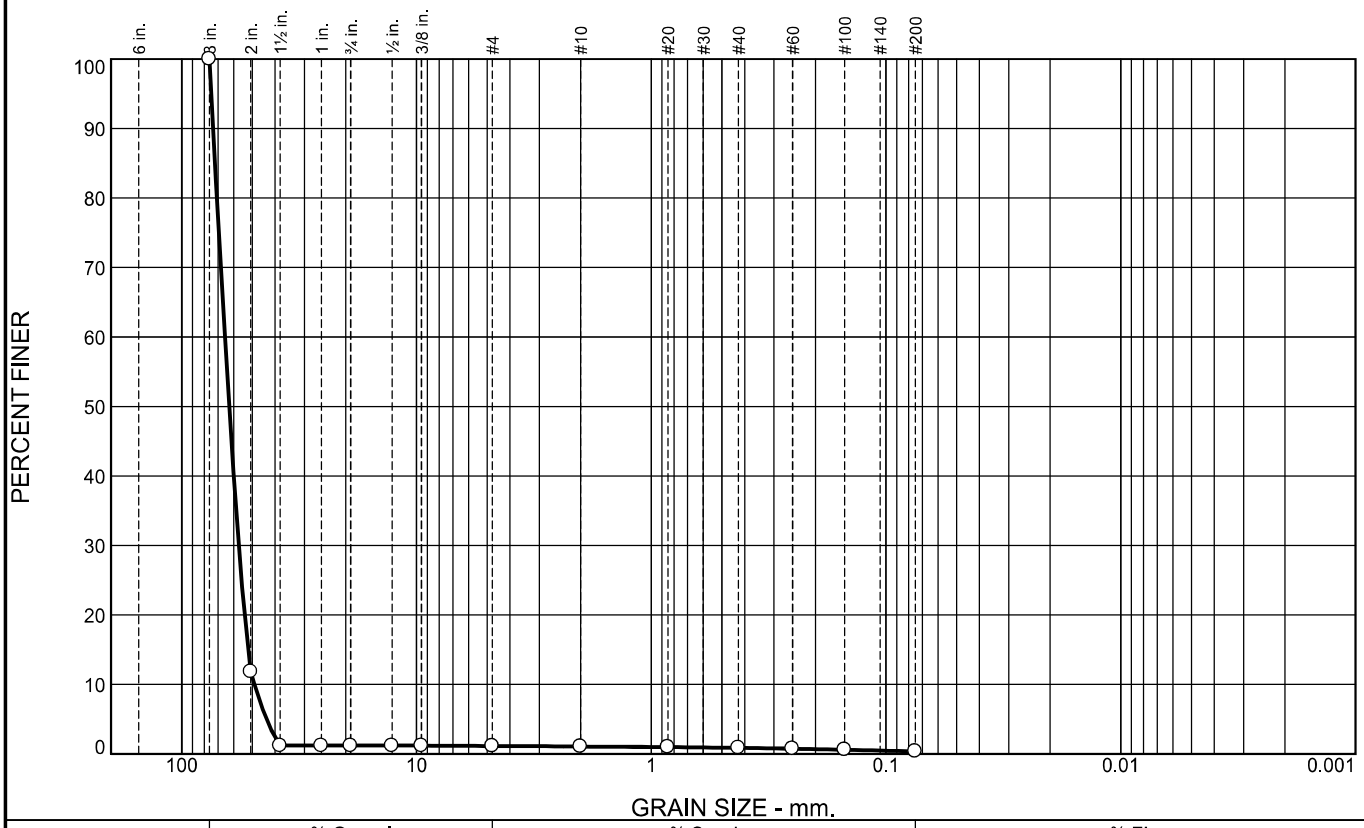
Sample Lab No.17663did not have enough material to perform the LA Wear test.

The grain-size distribution curves are included with this report. We thank you for using Pioneer Technical Services, Inc. for your geotechnical and materials testing requirements. If you have any questions regarding these results, please contact Kevin Mock at (406) 443-6053.

Sincerely,
PIONEER TECHNICAL SERVICES, INC.

Kevin Mock
Materials Testing Supervisor

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	99	0	0	0	1	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	12		
1.5"	1		
1"	1		
3/4"	1		
1/2"	1		
3/8"	1		
#4	1		
#10	1		
#20	1		
#40	1		
#60	1		
#100	1		
#200	0.4		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 73.4278 D_{85}= 72.0715 D_{60}= 65.4429
D_{50}= 62.7865 D_{30}= 57.1812 D_{15}= 52.1392
D_{10}= 48.9834 C_u= 1.34 C_c= 1.02

Classification

USCS= GP AASHTO=

Remarks

Location: D-10-1
Sample Number: 17663

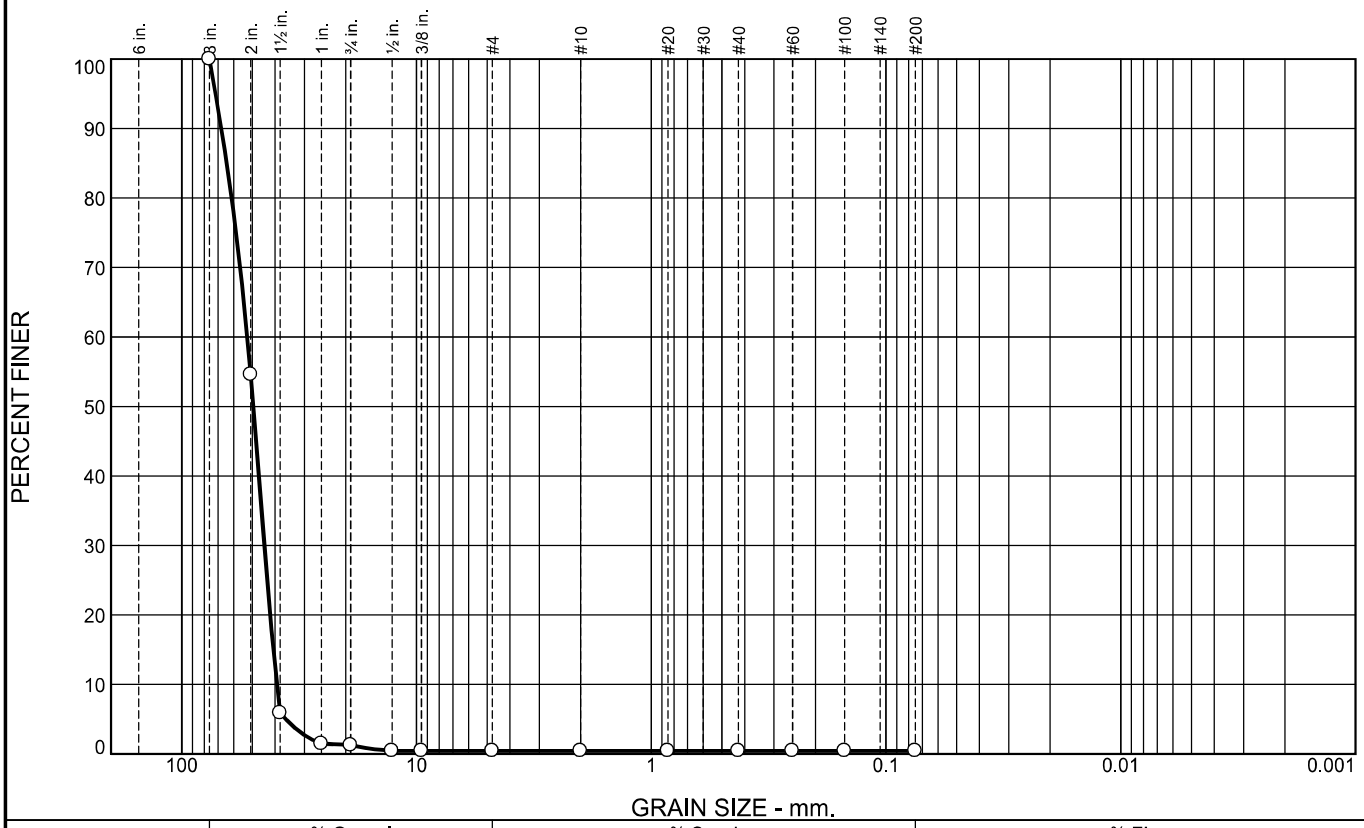
Date: 9-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	99	1	0	0	0	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	55		
1.5"	6		
1"	1		
3/4"	1		
1/2"	0		
3/8"	0		
#4	0		
#10	0		
#20	0		
#40	0		
#60	0		
#100	0		
#200	0.5		

* (no specification provided)

Soil Description

Poorly Graded Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 67.8295 D_{85}= 64.3267 D_{60}= 52.5264
D_{50}= 49.4773 D_{30}= 44.4438 D_{15}= 40.7664
D_{10}= 39.3918 C_u= 1.33 C_c= 0.95

Classification

USCS= AASHTO=

Remarks

Location: D-10-2
Sample Number: 17664

Date: 9-28-15

PIONEER TECHNICAL SERVICES, INC.

Client: Montana Resources
Project: Yankee Doodle Impoundment Dam Site Inestigation

Project No: Figure

MONTANA RESOURCES

Sample Report "Bucket O' Cobbles" Mungas
Kyle Eastman
8/21/2015

Clasts are mostly rounded to well-rounded; 5-10cm.

Rock Type	Approximate percentage
Intrusive Igneous -granodiorites and diorites -Volc/dike rocks (one clast)	 15% 3%
Schists (+/- Bt), and Gneisses -foliated silicate metamorphic rocks	15%
Quartzites -weakly metamorphosed -Some arkosic	15%
Mudstone/siltstone -poorly indurated, porous clast to 10cm	 5%
Carbonate seds -Dark gray/Fe-stained (Belt supergroup?) *-angular clast*	3%
Chert -light colored, banded	2%
Calc-silicate metamorphic rocks -green/gray/white -fine to med-grained, some recrystallization of carbonates -meta dolostones, marls -poor to moderate reaction with cold HCl	40%
Fines, <2cm -mostly similar rock types, minor garnet and magnetite	2%

Note: Carbonate surface coatings ("caliche") are present on all clasts; these coatings react vigorously with cold HCl, and could potentially offer some amount of acid neutralization capacity.

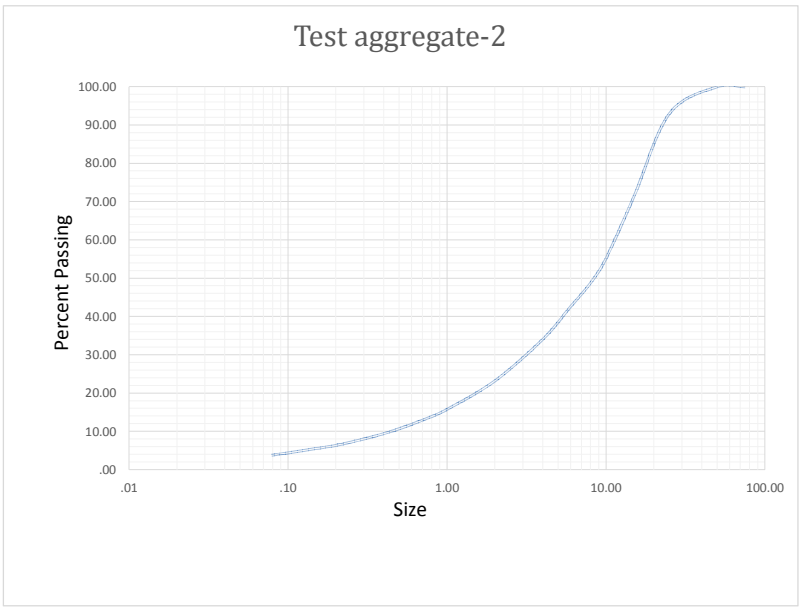
(N:) Kyle Eastman: Sample Reports: "Bucket O' Cobbles"

SPLIT ENGINEERING

Digital Image Analysis Software

Systems & Services

Client	**Montana Resources**	Contact	**BRIAN GARY**
Date	**8/28/2015**	Email	**Bgary@SplitEng.com**
Images	**26**	Phone	**520-256-3396**
Units	**Inch**		

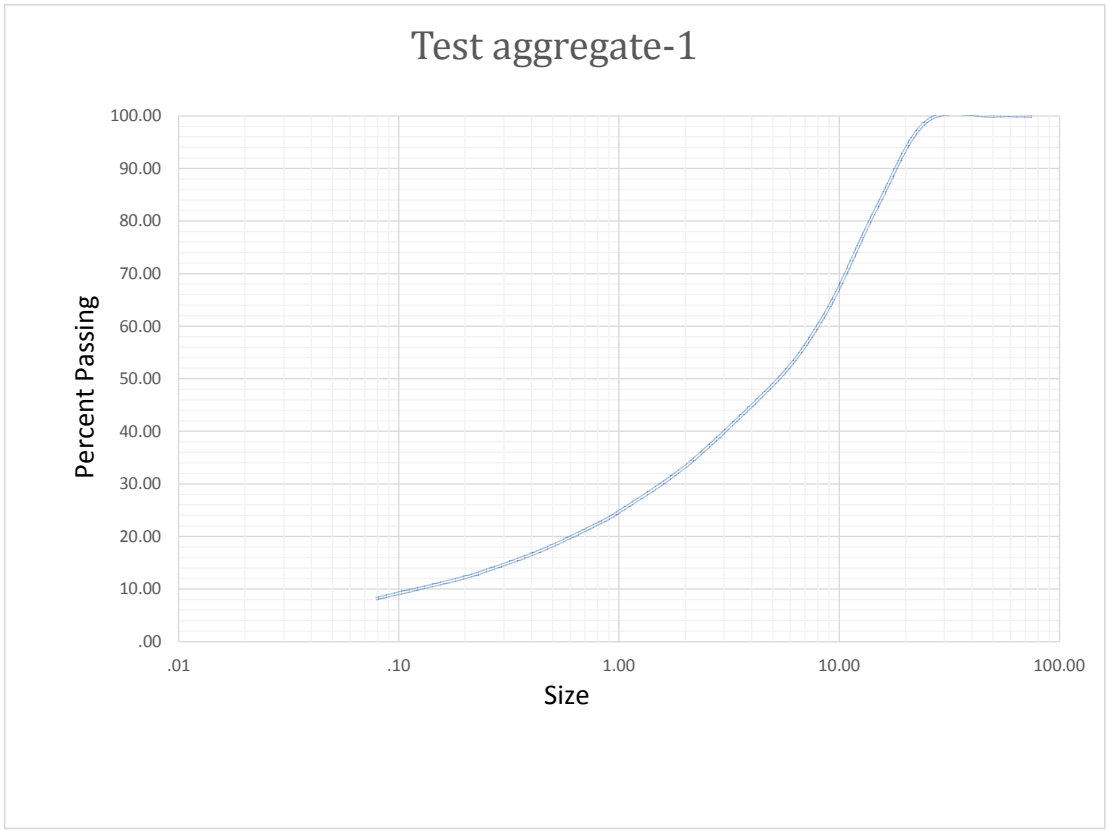


	Test aggregate-2	**DSCF0192**
Size	% Passing	% Passing
75.00	100.00	100.00
50.00	100.00	100.00
25.00	93.00	93.00
15.00	71.46	71.46
10.00	55.25	55.25
8.00	48.84	48.84
6.00	42.67	42.67
4.00	34.10	34.10
2.00	23.22	23.22
1.00	15.79	15.79
.75	13.45	13.45
.50	10.72	10.72
.38	9.12	9.12
.25	7.26	7.26
.19	6.16	6.16
.08	3.79	3.79

	Test aggregate-2	**DSCF0192**
% Passing	Size	Size
10	.44	.44
20	1.53	1.53
30	3.17	3.17
40	5.34	5.34
50	8.37	8.37
60	11.46	11.46
70	14.53	14.53
80	17.96	17.96
90	22.47	22.47
Top Size(99.95%)	37.43	37.43

Fines Cutoff	6.06	6.06
Fines Factor	50	50

Client	**Montana Resources**	Contact	**BRIAN GARY**
Date	**8/28/2015**	Email	**Bgary@SplitEng.com**
Images	**26**	Phone	**520-256-3396**
Units	**Inch**		



	Test aggregate-1	DSCF0191
Size	% Passing	% Passing
75.00	100.00	100.00
50.00	100.00	100.00
25.00	98.97	98.97
15.00	82.99	82.99
10.00	67.38	67.38
8.00	60.03	60.03
6.00	52.53	52.53
4.00	44.88	44.88
2.00	33.32	33.32
1.00	24.71	24.71
.75	21.81	21.81
.50	18.29	18.29
.38	16.13	16.13
.25	13.52	13.52
.19	11.91	11.91
.08	8.17	8.17

	Test aggregate-1	DSCF0191
% Passing	Size	Size
10	.13	.13
20	.61	.61
30	1.57	1.57
40	3.06	3.06
50	5.26	5.26
60	7.99	7.99
70	10.75	10.75
80	13.84	13.84
90	18.40	18.40
Top Size(99.95%)	26.44	26.44
Fines Cutoff	4.88	4.88
Fines Factor	50	50

Certificate of Analysis
Work Order : VC152640
[Report File No.: 0000013413]

Date: October 30, 2015

To: **Met - Sarah Prout**
F400101 SGS CANADA INC
3260 PRODUCTION WAY
BURNABY BC V5A 4W4

P.O. No.: AMF/MI7000-OCT15
Project No.: CAVM-15359-101
Samples: 8
Received: Oct 7, 2015
Pages: Page 1 to 3
(Inclusive of Cover Sheet)

Methods Summary

No. Of Samples	Method Code	Description
8	G_LOG02	Pre-preparation processing, sorting, logging, boxing
8	GO_XRF76V	Ore grade Borate fusion, XRF
8	GC_CSA06V	Total Sulfur, Leco Method

Storage: Pulp & Reject
PULP STORAGE : RETURN AFTER 90 DAYS

Comments:
Sample ID's have been updated.
This Report cancels and supersedes the Report No. 013079 dated Oct 09, 2015 issued by SGS Canada (Production Way).

Certified By :
Cam Chiang
Assistant Operations Manager

SGS Minerals Services Geochemistry Vancouver conforms to the requirements of ISO/IEC 17025 for specific tests as listed on their scope of accreditation which can be found at http://www.scc.ca/en/search/palcan/sgs

Report Footer:
L.N.R. = Listed not received
n.a. = Not applicable
I.S. = Insufficient Sample
-- = No result
*INF = Composition of this sample makes detection impossible by this method
M after a result denotes ppb to ppm conversion, % denotes ppm to % conversion
Methods marked with an asterisk (e.g. *NAA08V) were subcontracted
Elements marked with the @ symbol (e.g. @Cu) denote assays performed using accredited test methods

Element	@LOI	@SiO2	@Al2O3	@Fe2O3	@MgO	@CaO	@K2O	@Na2O
Method	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V
Det.Lim.	-10.000	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Units	%	%	%	%	%	%	%	%
Bonneville D-10-4 A	0.838	76.5	12.6	1.77	0.47	1.28	3.65	3.41
Bonneville D-10-4 B	0.910	75.4	12.7	1.89	0.47	1.29	3.68	3.34
Mungus Drain Rock D-10-3 A	6.03	61.9	9.20	3.39	4.37	11.3	2.21	1.16
Mungus Drain Rock D-10-3 B	5.64	62.6	9.22	3.42	4.31	11.0	2.20	1.13
Maiden F-3 A	0.030	98.1	0.53	1.98	0.05	0.10	0.17	<0.01
Maiden F-3 B	0.060	98.2	0.51	2.02	0.07	0.09	0.16	<0.01
Conda F-4 A	2.04	56.0	15.5	9.89	4.08	5.91	2.42	2.68
Conda F-4 B	1.95	56.4	15.5	9.71	4.08	5.84	2.46	2.58

Element	@TiO2	@MnO	@P2O5	@Cr2O3	@V2O5	Sum	S
Method	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GO_XRF76V	GC_CSA06V
Det.Lim.	0.01	0.01	0.01	0.01	0.01	0	0.005
Units	%	%	%	%	%	%	%
Bonneville D-10-4 A	0.16	0.03	0.08	0.03	<0.01	100.9	0.009
Bonneville D-10-4 B	0.17	0.04	0.08	0.03	<0.01	100.0	0.010
Mungus Drain Rock D-10-3 A	0.33	0.06	0.13	0.02	0.01	100.1	0.028
Mungus Drain Rock D-10-3 B	0.34	0.06	0.12	0.03	<0.01	100.0	0.016
Maiden F-3 A	0.05	0.02	0.04	0.06	<0.01	101.1	0.011
Maiden F-3 B	0.05	0.02	0.04	0.05	<0.01	101.2	0.010
Conda F-4 A	0.79	0.15	0.26	0.02	0.03	99.8	0.021
Conda F-4 B	0.79	0.16	0.27	0.03	0.03	99.8	0.021

Semi-Quantitative X-Ray Diffraction

Report Prepared for:	*SGS Canada Inc*
Project Number/ LIMS No.	*15359-101/MI4504-OCT15*
Sample Receipt:	*October 7, 2015*
Sample Analysis:	*October 8, 2015*
Reporting Date:	*October 23, 2015*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 40 kV, 35 mA Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70°
Interpretations:	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva software.
Detection Limit:	0.5-2%. Strongly dependent on crystallinity.

Contents:

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

Method Summary

The Semi-Quantitative Mineral Identification by XRD (ME-LR-MIN-MET-MN-D03) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involve matching the diffraction pattern of a test sample material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) and released on software as a database of Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (Whole Rock Analysis, Inductively Coupled Plasma - Optical Emission Spectroscopy, etc.).

Semi-Quantitative Analysis:

The Semi-Quantitative analysis (RIR method) is performed based on each mineral's relative peak heights and of their respective I/Icor values, which are available from the PDF database. Mineral abundances for the bulk sample (in weight %) are generated by Bruker-EVA Software. These data are reconciled with a bulk chemistry (e.g. whole rock analysis including SiO_2, Al_2O_3, Na_2O, K_2O, CaO, MgO, Fe_2O_3, Cr_2O_3, MnO, TiO_2, P_2O_5, V_2O_5 or other chemical data). A chemical balance table shows the difference between the assay results and elemental concentrations determined by XRD.

Summary of Semi-Quantitative X-ray Diffraction Results

Crystalline Mineral Assemblage (relative proportions based on peak height)

Sample	Major (>30% Wt)	Moderate (10% -30% Wt)	Minor (2% -10% Wt)	Trace (<2% Wt)
(1) Bonneville D-10-4 A	quartz	plagioclase, potassium-feldspar	pyroxene, mica	*apatite, *magnetite, *iron
(2) Bonneville D-10-4 B	quartz	plagioclase, potassium-feldspar	pyroxene, mica	*apatite, *magnetite, *hematite, *chlorite, *iron
(3) Mungus Drain Rock D-10-3 A	quartz	calcite	plagioclase, pyroxene, dolomite, mica, chlorite, amphibole, potassium-feldspar	*magnetite
(4) Mungus Drain Rock D-10-3 B	quartz	pyroxene	plagioclase, calcite, dolomite, chlorite, amphibole, mica, potassium-feldspar	*magnetite
(5) Maiden F-3 A	quartz	-	-	*iron, *montmorillonite, *illite
(6) Maiden F-3 B	quartz	-	-	*iron, *montmorillonite, *illite
(7) Conda F-4 A	-	quartz, plagioclase, amphibole	potassium-feldspar, diopside, chlorite, magnetite, epidote, mica	*calcite, *hematite, *pyrite, *rutile
(8) Conda F-4 B	-	quartz, plagioclase, amphibole	potassium-feldspar, diopside, chlorite, magnetite, epidote, mica	*calcite, *hematite, *pyrite, *rutile

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

Mineral List

Mineral	Composition
Amphibole	$(Na,K)Ca_2(Fe,Mg)_5(Al,Si)_8O_{22}(OH)_2$
Apatite	$Ca_5(PO_4)_3(F,Cl,OH)$
Calcite	$CaCO_3$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Dolomite	$CaMg(CO_3)_2$
Epidote	$Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$
Hematite	Fe_2O_3
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$
Iron	Fe
Magnetite	Fe_3O_4
Mica	$K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10(H_2O)$
Plagioclase	$(NaSi,CaAl)AlSi_2O_8$
Potassium-Feldspar	$KAlSi_3O_8$
Pyrite	FeS_2
Pyroxene	$(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)_2O_6$
Quartz	SiO_2
Rutile	TiO_2

Semi-Quantitative X-ray Diffraction Results

Mineral	Bonneville D-10-4 A (wt %)	Bonneville D-10-4 B (wt %)	Mungus Drain Rock D-10-3 A (wt %)	Mungus Drain Rock D-10-3 B (wt %)	Maiden F-3 A (wt %)	Maiden F-3 B (wt %)	Conda F-4 A (wt %)	Conda F-4 B (wt %)
Quartz	39.6	38.2	35.9	36.1	96.8	97.2	15.3	15.3
Albite	26.4	26.8	7.4	8.1	-	-	10.4	10.4
Anorthite	4.9	5.0	7.2	6.8	-	-	29.6	29.7
Microcline	19.1	19.4	8.5	9.0	-	-	9.4	9.5
Biotite	1.7	1.8	3.4	3.2	-	-	10.4	10.4
Diopside	2.6	2.9	9.4	10.3	-	-	2.4	2.4
Magnesiohornblende	-	-	-	-	-	-	10.6	10.6
Calcite	-	-	10.0	9.8	-	-	0.6	0.3
Muscovite	3.9	4.0	5.8	5.4	-	-	-	-
Dolomite	-	-	5.9	5.1	-	-	-	-
Clinochlore	-	0.0	2.5	2.4	-	-	2.6	2.6
Actinolite	-	-	3.5	3.3	-	-	-	-
Epidote	-	-	-	-	-	-	2.6	2.7
Magnetite	0.6	0.4	0.6	0.7	-	-	2.5	2.5
Pyrite	-	-	-	-	-	-	1.8	1.8
Iron	0.6	0.4	-	-	1.1	1.1	-	-
Montmorillonite	-	-	-	-	1.5	1.3	-	-
Hematite	-	0.7	-	-	-	-	1.1	1.1
Rutile	-	-	-	-	-	-	0.7	0.7
Hydroxylapatite	0.6	0.6	-	-	-	-	-	-
Illite	-	-	-	-	0.6	0.5	-	-
TOTAL	100	100	100	100	100	100	100	100

Chemical Balance

Bonneville D-10-4 A

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	76.5	76.2	0.28	Both
Al2O3	12.6	12.2	0.39	Both
K2O	3.65	3.72	-0.07	Both
Na2O	3.41	3.47	-0.06	Both
Fe2O3	1.77	1.77	0.00	Both
CaO	1.28	1.21	0.07	Both
MgO	0.47	0.79	-0.32	Both
TiO2	0.16	-	0.16	XRF
P2O5	0.08	0.12	-0.04	Both
MnO	0.03	-	0.03	XRF
Cr2O3	0.03	-	0.03	XRF
H2O	-	0.25	0.25	SQD
PbO	-	0.46	0.46	SQD

Bonneville D-10-4 B

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	75.4	75.5	-0.08	Both
Al2O3	12.7	12.4	0.29	Both
K2O	3.68	3.78	-0.10	Both
Na2O	3.34	3.52	-0.18	Both
Fe2O3	1.89	1.96	-0.07	Both
CaO	1.29	1.30	-0.01	Both
MgO	0.47	0.85	-0.38	Both
TiO2	0.17	-	0.17	XRF
P2O5	0.08	0.12	-0.04	Both
MnO	0.04	-	0.04	XRF
Cr2O3	0.03	-	0.03	XRF
H2O	-	0.26	0.26	SQD
PbO	-	0.46	0.46	SQD

1. Values measured by chemical assay.

2. Values calculated based on mineral/compound formulas and quantites identified by semi-quantitative XRD.

Chemical Balance

Mungus Drain Rock D-10-3 A

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	61.9	61.2	0.73	Both
CaO	11.3	10.9	0.38	Both
Al2O3	9.20	8.91	0.29	Both
MgO	4.37	4.47	-0.10	Both
Fe2O3	3.39	3.12	0.27	Both
K2O	2.21	2.41	-0.20	Both
Na2O	1.16	1.33	-0.17	Both
TiO2	0.33	-	0.33	XRF
P2O5	0.13	-	0.13	XRF
SO3	0.07	-	0.07	XRF
MnO	0.06	-	0.06	XRF
Cr2O3	0.02	-	0.02	XRF
H2O	-	0.76	0.76	SQD
CO2	-	7.18	7.18	SQD

Mungus Drain Rock D-10-3 B

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	62.6	62.1	0.52	Both
CaO	11.0	10.7	0.26	Both
Al2O3	9.22	8.77	0.45	Both
MgO	4.31	4.39	-0.08	Both
Fe2O3	3.42	3.04	0.38	Both
K2O	2.20	2.43	-0.23	Both
Na2O	1.13	1.38	-0.25	Both
TiO2	0.34	-	0.34	XRF
P2O5	0.12	-	0.12	XRF
MnO	0.06	-	0.06	XRF
SO3	0.05	-	0.05	XRF
Cr2O3	0.03	-	0.03	XRF
H2O	-	0.71	0.71	SQD
CO2	-	6.73	6.73	SQD

1. Values measured by chemical assay.

2. Values calculated based on mineral/compound formulas and quantites identified by semi-quantitative XRD.

Chemical Balance

Maiden F-3 A

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	98.1	97.6	0.45	Both
Fe2O3	1.98	1.71	0.27	Both
Al2O3	0.53	0.37	0.17	Both
K2O	0.17	0.03	0.14	Both
CaO	0.10	-	0.10	XRF
Cr2O3	0.06	-	0.06	XRF
MgO	0.05	0.18	-0.13	Both
TiO2	0.05	-	0.05	XRF
P2O5	0.04	-	0.04	XRF
MnO	0.02	-	0.02	XRF
H2O	-	0.51	0.51	SQD
Na2O	-	0.03	0.03	SQD

Maiden F-3 B

Name	Assay[1]	SQD[2]	Delta	Status
SiO2	98.2	97.9	0.31	Both
Fe2O3	2.02	1.66	0.36	Both
Al2O3	0.51	0.30	0.21	Both
K2O	0.16	0.03	0.13	Both
CaO	0.09	-	0.09	XRF
MgO	0.07	0.15	-0.07	Both
Cr2O3	0.05	-	0.05	XRF
TiO2	0.05	-	0.05	XRF
P2O5	0.04	-	0.04	XRF
MnO	0.02	-	0.02	XRF
H2O	-	0.42	0.42	SQD
Na2O	-	0.02	0.02	SQD

1. Values measured by chemical assay.

2. Values calculated based on mineral/compound formulas and quantites identified by semi-quantitative XRD.

Chemical Balance

Conda F-4 A

Name	Assay[1]	SQD[2]	Delta	Status
Oxygen	45.0	45.3	-0.32	Both
Silicon	26.2	26.4	-0.22	Both
Aluminum	8.20	8.30	-0.10	Both
Iron	6.92	6.97	-0.05	Both
Calcium	4.22	4.55	-0.32	Both
Magnesium	2.46	2.45	0.01	Both
Potassium	2.01	2.12	-0.11	Both
Sodium	1.99	2.16	-0.17	Both
Titanium	0.47	0.59	-0.12	Both
Manganese	0.12	-	0.12	XRF
Phosphorus	0.11	-	0.11	XRF
Sulfur	0.02	0.95	-0.93	Both
Vanadium	0.02	-	0.02	XRF
Chromium	0.01	-	0.01	XRF
Hydrogen	-	0.11	-0.11	SQD
Carbon	-	0.07	-0.07	SQD

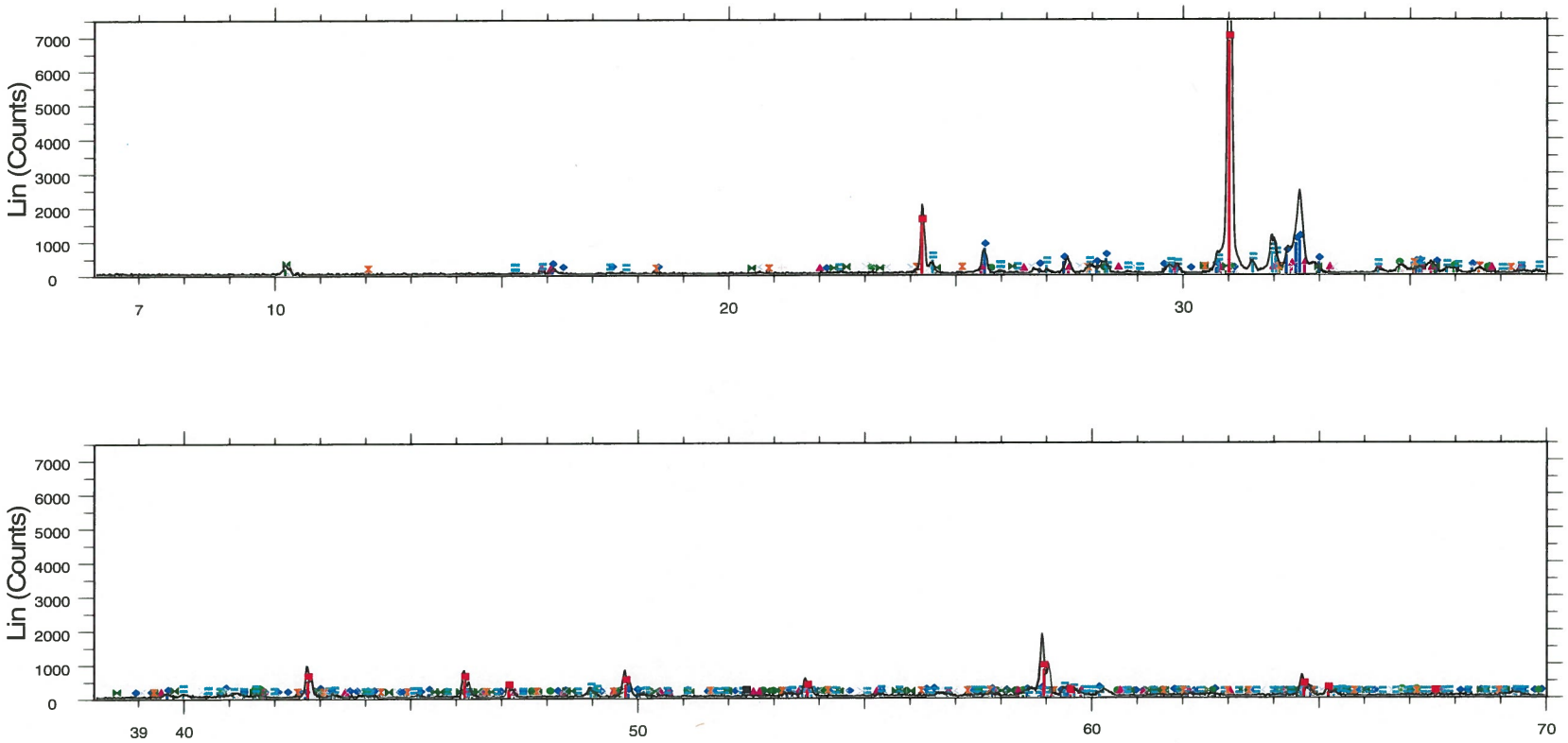
Conda F-4 B

Name	Assay[1]	SQD[2]	Delta	Status
Oxygen	45.1	45.3	-0.18	Both
Silicon	26.4	26.5	-0.12	Both
Aluminum	8.20	8.33	-0.13	Both
Iron	6.79	6.99	-0.20	Both
Calcium	4.17	4.42	-0.25	Both
Magnesium	2.46	2.46	0.00	Both
Potassium	2.04	2.13	-0.09	Both
Sodium	1.91	2.16	-0.25	Both
Titanium	0.47	0.59	-0.12	Both
Manganese	0.12	-	0.12	XRF
Phosphorus	0.12	-	0.12	XRF
Chromium	0.02	-	0.02	XRF
Sulfur	0.02	0.96	0.94	Both
Vanadium	0.02	-	0.02	XRF
Hydrogen	-	0.11	0.11	SQD
Carbon	-	0.03	0.03	SQD

1. Values measured by chemical assay.

2. Values calculated based on mineral/compound formulas and quantites identified by semi-quantitative XRD.

Bonneville D-10-4 A



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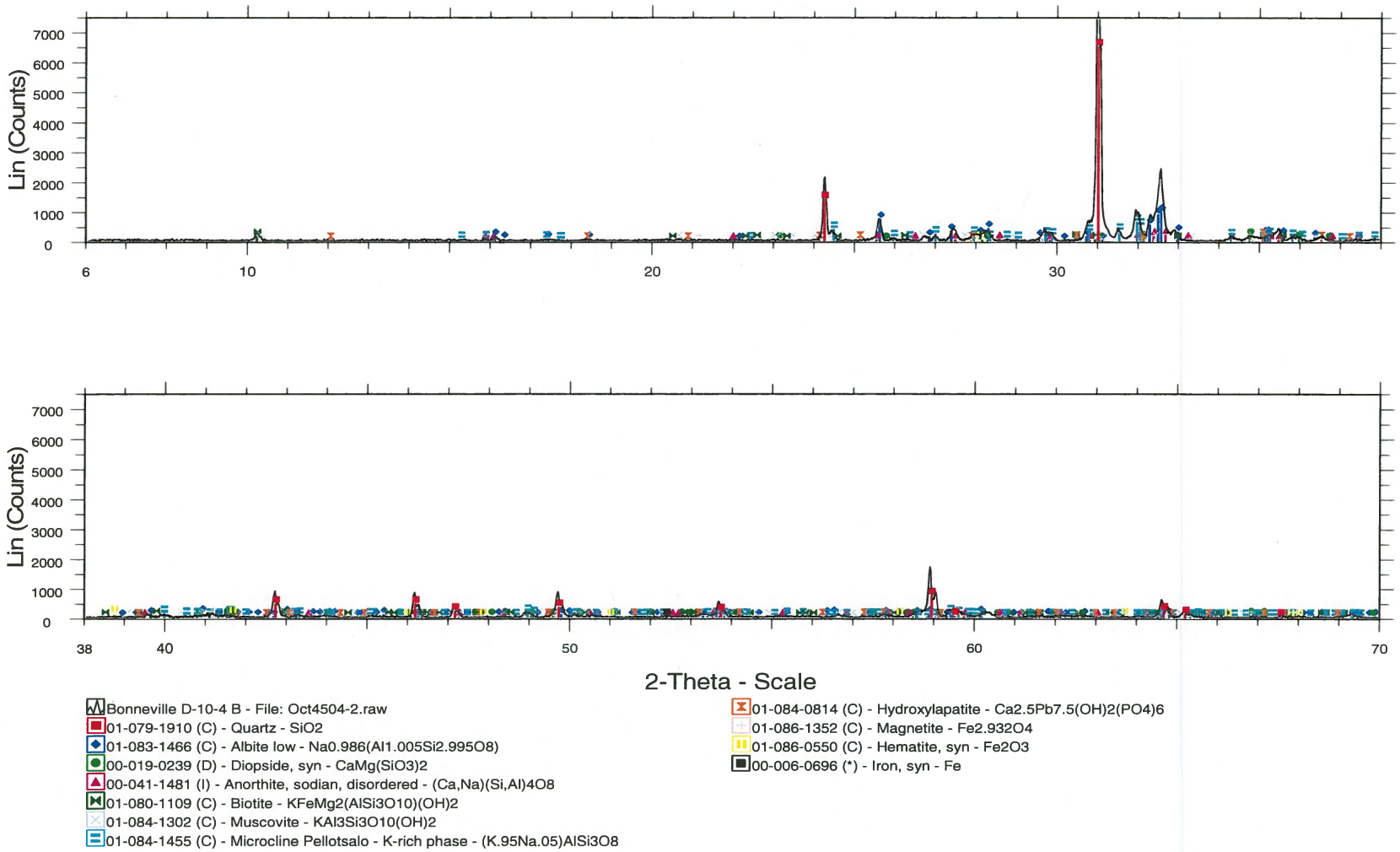
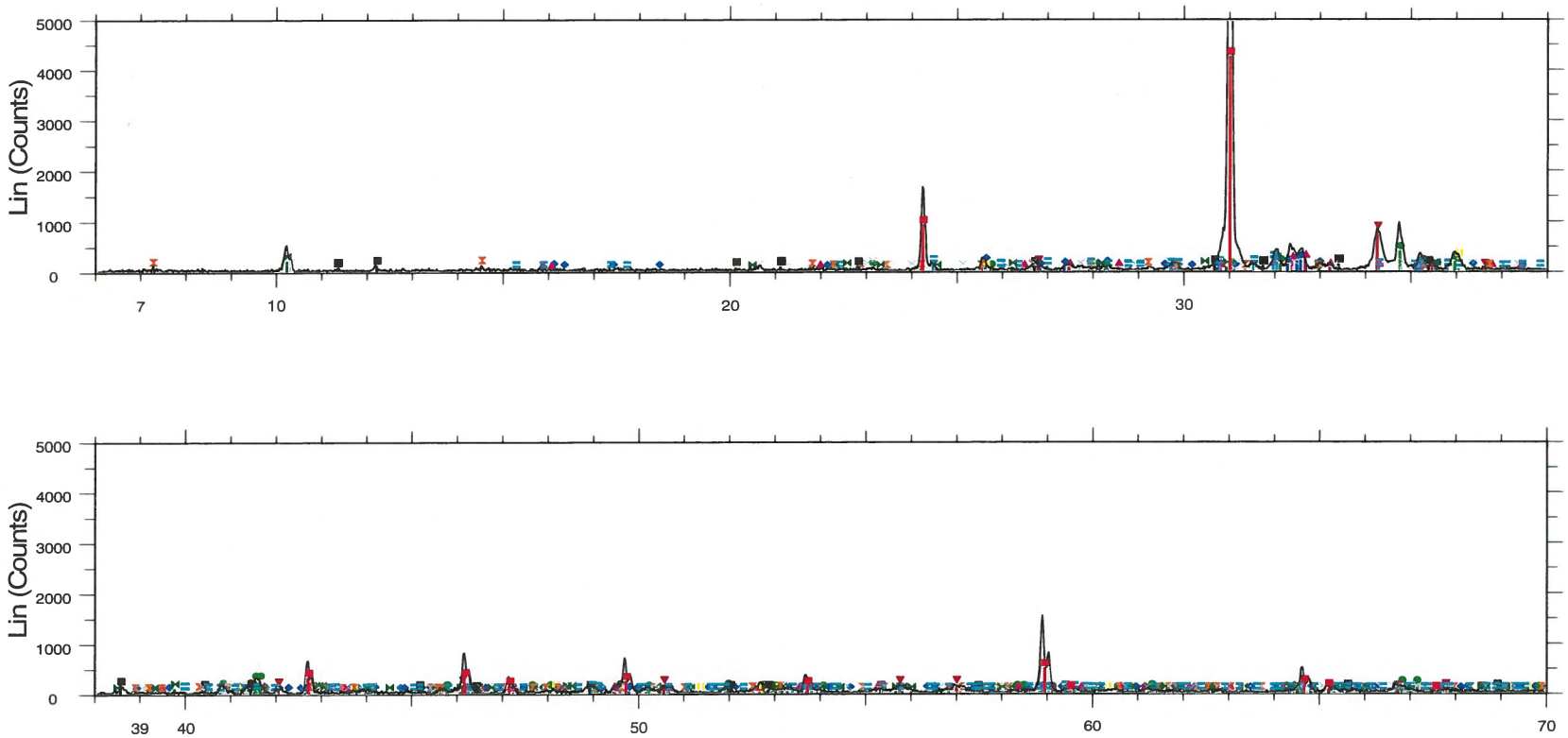
01-079-1910 (C) - Quartz - SiO2
01-083-1466 (C) - Albite low - Na0.986(Al1.005Si2.995O8)
00-019-0239 (D) - Diopside, syn - CaMg(SiO3)2
00-041-1481 (I) - Anorthite, sodian, disordered - (Ca,Na)(Si,Al)4O8
01-080-1109 (C) - Biotite - KFeMg2(AlSi3O10)(OH)2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
01-084-1455 (C) - Microcline Pellotsalo - K-rich phase - (K.95Na.05)AlSi3O8
01-084-0814 (C) - Hydroxylapatite - Ca2.5Pb7.5(OH)2(PO4)6
01-086-1352 (C) - Magnetite - Fe2.932O4
00-006-0696 (*) - Iron, syn - Fe

Bonneville D-10-4 B



Mungus Drain Rock D-10-3 A



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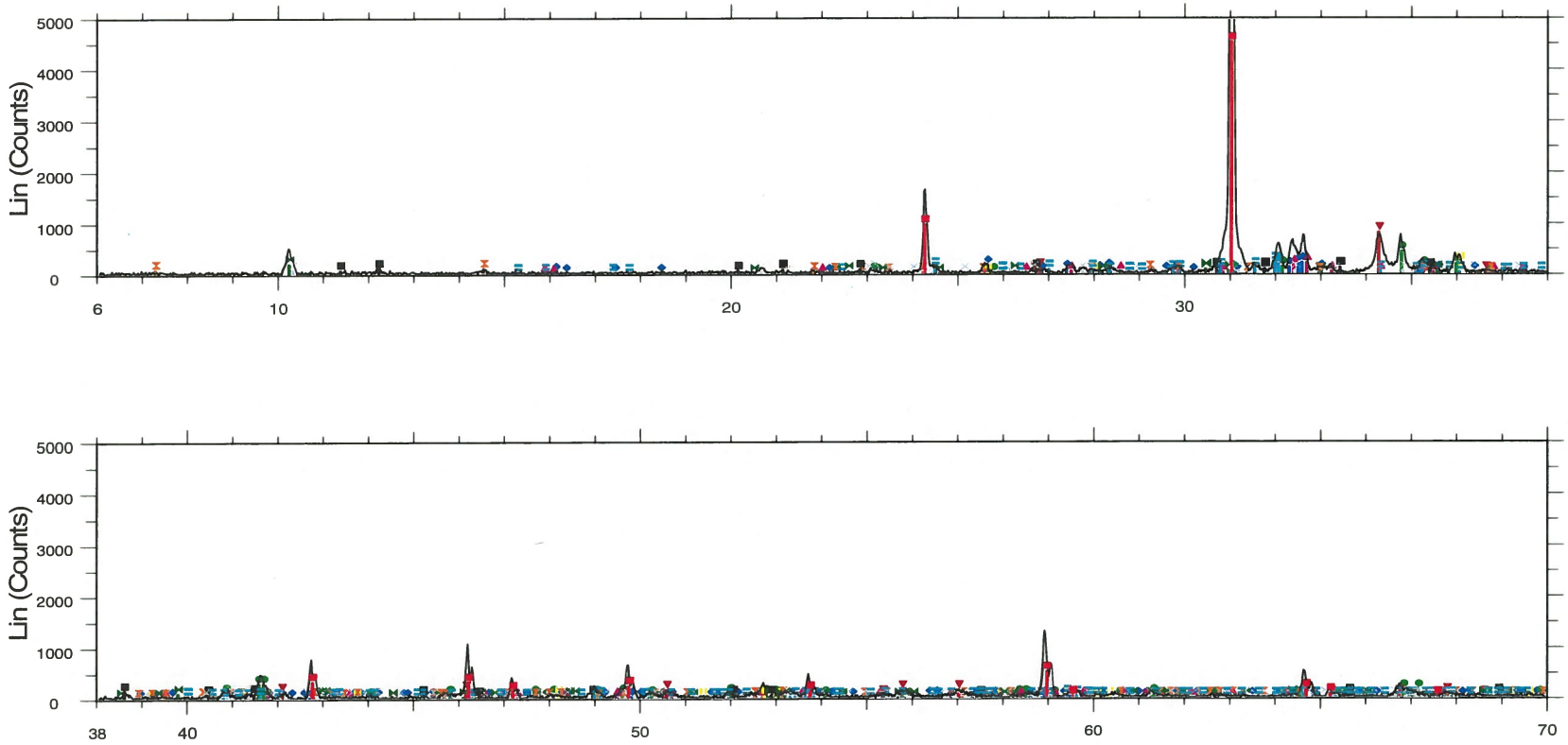
00-019-0239 (D) - Diopside, syn - CaMg(SiO3)2
00-041-1481 (I) - Anorthite, sodian, disordered - (Ca,Na)(Si,Al)4O8
00-005-0586 (*) - Calcite, syn - CaCO3
00-036-0426 (*) - Dolomite - CaMg(CO3)2
01-080-1109 (C) - Biotite - KFeMg2(AlSi3O10)(OH)2
01-079-1270 (C) - Clinochlore - (Mg2.96Fe1.55Fe.136Al1.275)(Si2.622Al1.376O10)(OH)8
00-007-0336 (D) - Actinolite - Ca2(Mg,Fe+2)5Si8O22(OH)2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
01-084-1455 (C) - Microcline Pellotsalo - K-rich phase - (K.95Na.05)AlSi3O8
01-086-1358 (C) - Magnetite - Fe2.929O4

Mungus Drain Rock D-10-3 B



Mungus Drain Rock D-10-3 B - File: Oct4504-4.raw
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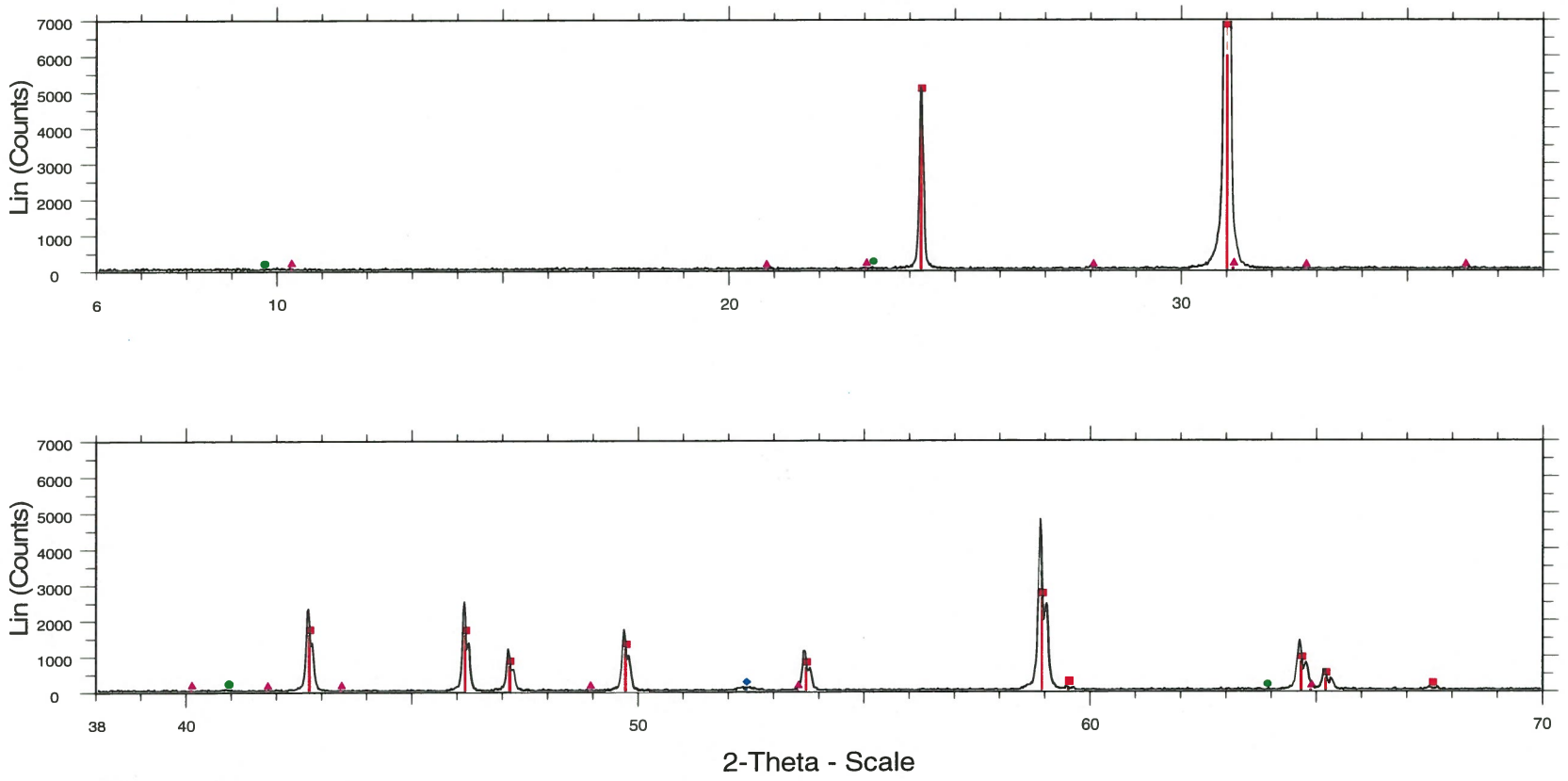
01-083-1466 (C) - Albite low - Na0.986(Al1.005Si2.995O8)
00-019-0239 (D) - Diopside, syn - CaMg(SiO3)2
00-041-1481 (I) - Anorthite, sodian, disordered - (Ca,Na)(Si,Al)4O8
00-005-0586 (*) - Calcite, syn - CaCO3
00-036-0426 (*) - Dolomite - CaMg(CO3)2
01-080-1109 (C) - Biotite - KFeMg2(AlSi3O10)(OH)2
01-079-1270 (C) - Clinochlore - (Mg2.96Fe1.55Fe.136Al1.275)(Si2.622Al1.376O10)(OH)
00-007-0336 (D) - Actinolite - Ca2(Mg,Fe+2)5Si8O22(OH)2
01-084-1302 (C) - Muscovite - KAl3Si3O10(OH)2
01-084-1455 (C) - Microcline Pellotsalo - K-rich phase - (K.95Na.05)AlSi3O8
01-086-1358 (C) - Magnetite - Fe2.929O4

Maiden F-3 A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10
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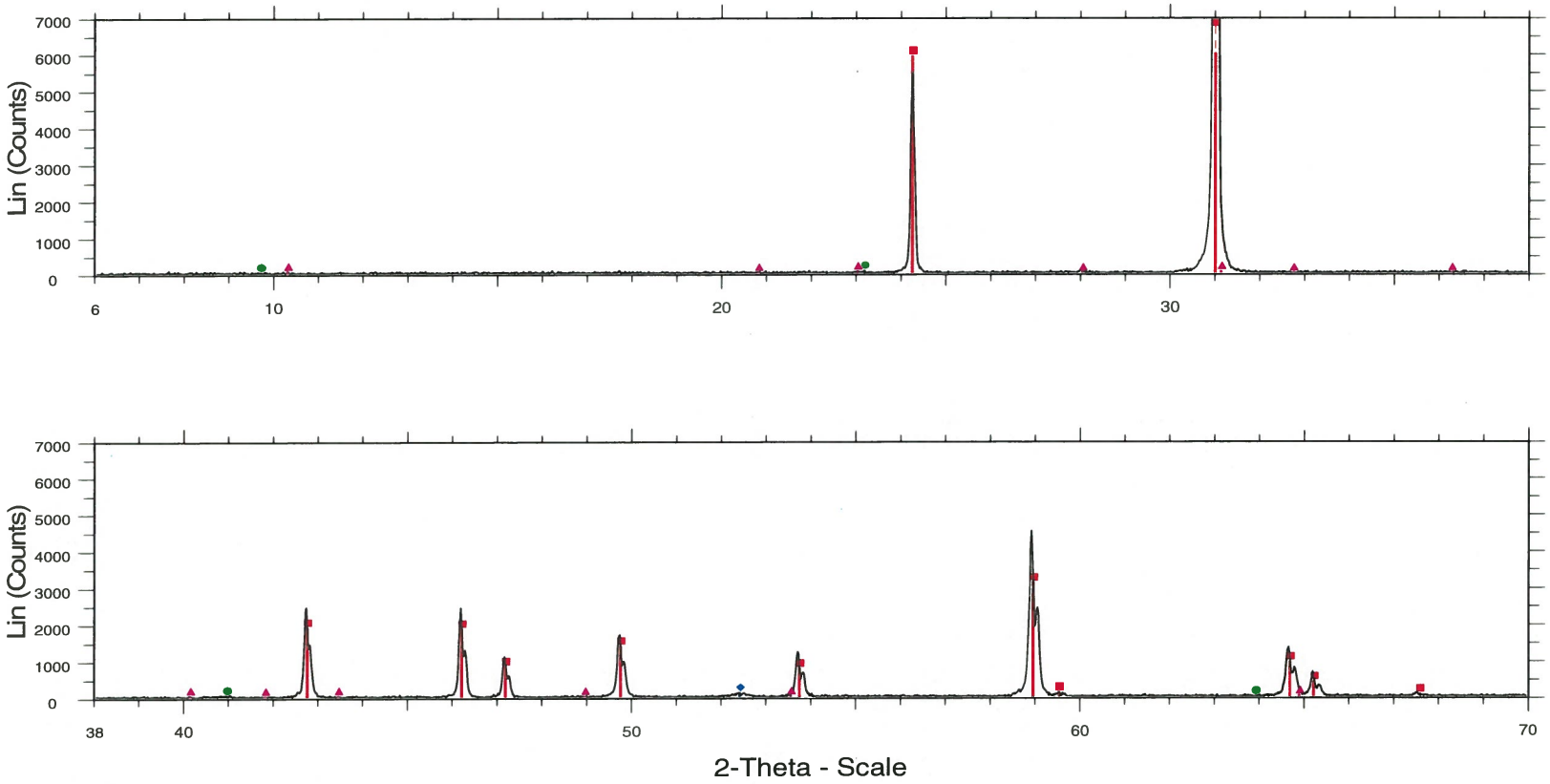
2-Theta - Scale
Maiden F-3 A - File: Oct4504-5.raw
01-079-1910 (C) - Quartz - SiO2
00-006-0696 (*) - Iron, syn - Fe
00-029-1499 (*) - Montmorillonite-21A - Na0.3(Al,Mg)2Si4O10(OH)2·8H2O
00-009-0343 (D) - Illite, trioctahedral - K0.5(Al,Fe,Mg)3(Si,Al)4O10(OH)2

Maiden F-3 B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Lin (Counts)
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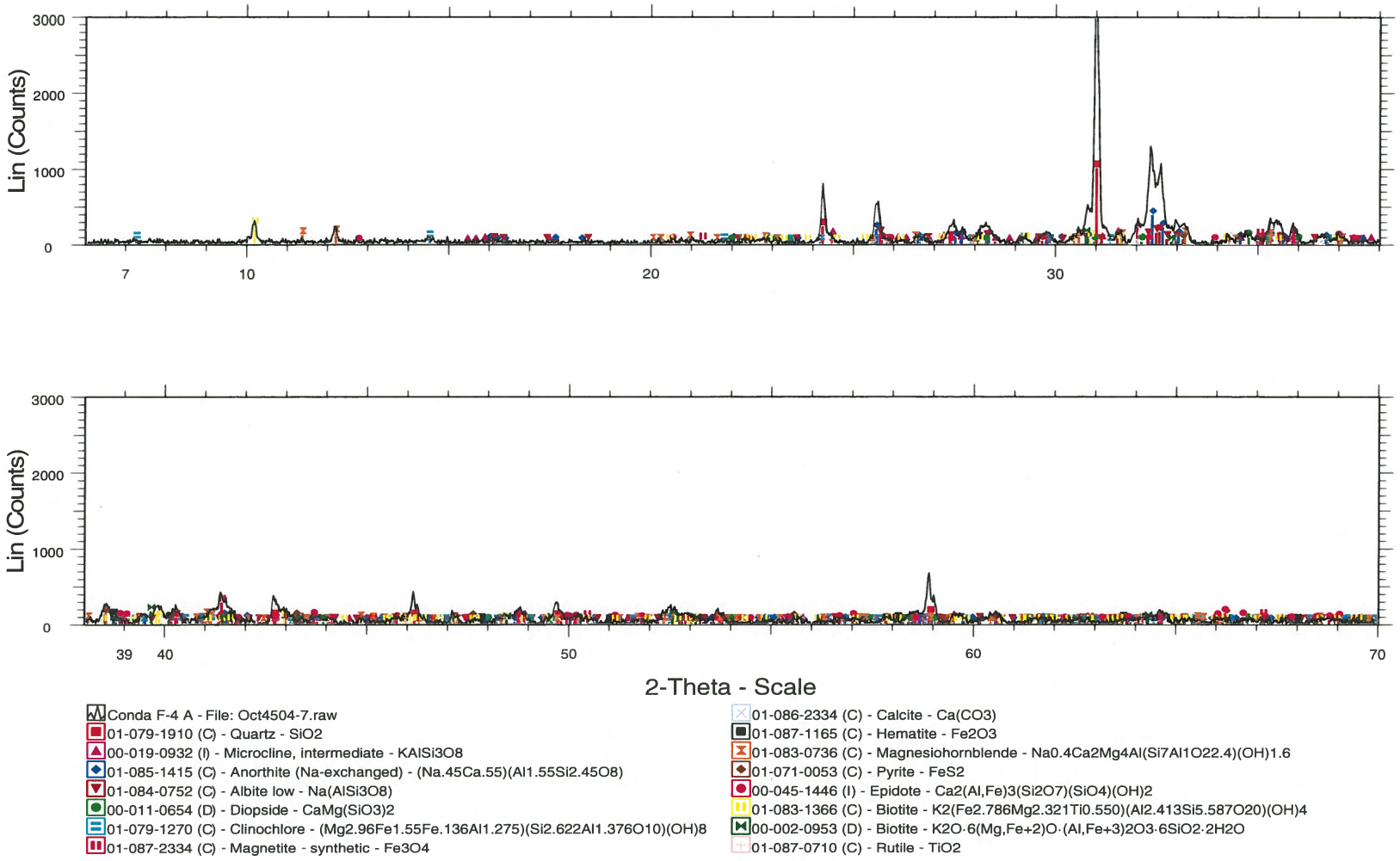
5000
4000
3000
2000
1000
0
38
40
50
60
70
2-Theta - Scale
Maiden F-3 B - File: Oct4504-6.raw
01-079-1910 (C) - Quartz - SiO2
00-006-0696 (*) - Iron, syn - Fe
00-029-1499 (*) - Montmorillonite-21A - Na0.3(Al,Mg)2Si4O10(OH)2·8H2O
00-009-0343 (D) - Illite, trioctahedral - K0.5(Al,Fe,Mg)3(Si,Al)4O10(OH)2

Conda F-4 A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Lin (Counts)
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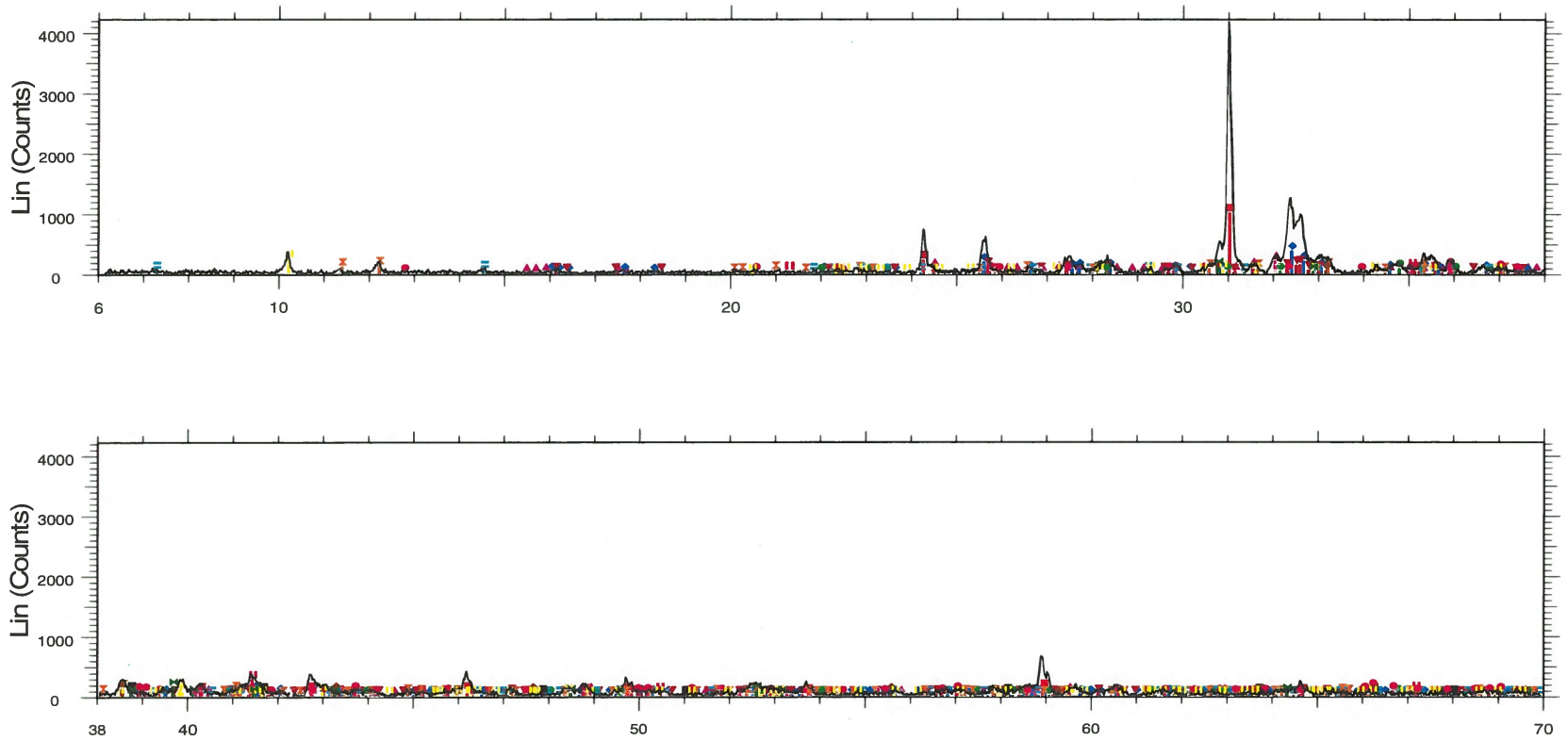
2-Theta - Scale
Conda F-4 A - File: Oct4504-7.raw
01-079-1910 (C) - Quartz - SiO2
00-019-0932 (I) - Microcline, intermediate - KAlSi3O8
01-085-1415 (C) - Anorthite (Na-exchanged) - (Na.45Ca.55)(Al1.55Si2.45O8)
01-084-0752 (C) - Albite low - Na(AlSi3O8)
00-011-0654 (D) - Diopside - CaMg(SiO3)2
01-079-1270 (C) - Clinochlore - (Mg2.96Fe1.55Fe.136Al1.275)(Si2.622Al1.376O10)(OH)8
01-087-2334 (C) - Magnetite - synthetic - Fe3O4
01-086-2334 (C) - Calcite - Ca(CO3)
01-087-1165 (C) - Hematite - Fe2O3
01-083-0736 (C) - Magnesiohornblende - Na0.4Ca2Mg4Al(Si7Al1O22.4)(OH)1.6
01-071-0053 (C) - Pyrite - FeS2
00-045-1446 (I) - Epidote - Ca2(Al,Fe)3(Si2O7)(SiO4)(OH)2
01-083-1366 (C) - Biotite - K2(Fe2.786Mg2.321Ti0.550)(Al2.413Si5.587O20)(OH)4
00-002-0953 (D) - Biotite - K2O·6(Mg,Fe+2)O·(Al,Fe+3)2O3·6SiO2·2H2O
01-087-0710 (C) - Rutile - TiO2

Conda F-4 B



Conda F-4 B - File: Oct4504-8.raw
01-079-1910 (C) - Quartz - SiO2
00-019-0932 (I) - Microcline, intermediate - KAlSi3O8
01-085-1415 (C) - Anorthite (Na-exchanged) - (Na.45Ca.55)(Al1.55Si2.45O8)
01-084-0752 (C) - Albite low - Na(AlSi3O8)
00-011-0654 (D) - Diopside - CaMg(SiO3)2
01-079-1270 (C) - Clinochlore - (Mg2.96Fe1.55Fe.136Al1.275)(Si2.622Al1.376O10)(OH)
01-087-2334 (C) - Magnetite - synthetic - Fe3O4
01-086-2334 (C) - Calcite - Ca(CO3)
01-087-1165 (C) - Hematite - Fe2O3
01-083-0736 (C) - Magnesiohornblende - Na0.4Ca2Mg4Al(Si7Al1O22.4)(OH)1.6
01-071-0053 (C) - Pyrite - FeS2
00-045-1446 (I) - Epidote - Ca2(Al,Fe)3(Si2O7)(SiO4)(OH)2
01-083-1366 (C) - Biotite - K2(Fe2.786Mg2.321Ti0.550)(Al2.413Si5.587O20)(OH)4
00-002-0953 (D) - Biotite - K2O·6(Mg,Fe+2)O·(Al,Fe+3)2O3·6SiO2·2H2O
01-087-0710 (C) - Rutile - TiO2

APPENDIX B3

VA15-03405 - WEST EMBANKMENT DRAIN PIPESTONE QUARRY AGGREGATES ACCEPTANCE

(Pages B3-1 to B3-3)

MEMORANDUM

To:	Mr. Steve Czehura	Date:	November 20, 2015
Copy To:	Steve Walsh, Mark Thompson, Josh Shutey	File No.:	VA101-00126/13-A.01
From:	Angus Robb, Ken Brouwer	Cont. No.:	VA15-03405
Re:	West Embankment Drain Construction Pipestone Quarry Aggregates Acceptance		

Knight Piésold Ltd. (KP) have reviewed the control gradation test data provided by Montana Resources (MR) for the Pipestone Quarry 'Reject' aggregate, and the Pipestone Quarry 'Ballast' aggregate. The suitability of the aggregates has been assessed with reference to the material specifications for the West Embankment Drain, provided attached in drawing MR-C0011 r1.

The stockpiled Pipestone Quarry 'Reject' aggregate is acceptable for use as the Zone 2A – Filter and the stockpiled Pipestone Quarry 'Ballast' aggregate is acceptable for use as the Zone 2B – Transition.

Further control gradation testing shall be completed at frequencies to be agreed upon by MR and KP to verify the quality of the produced aggregates. Should further control testing of the aggregates indicate that an unacceptable proportion of the sample shows a gradation that falls outside the specification envelope, the suitability of the material source may need to be reassessed.

A plot of the control test data provided to KP is provided in Figure 1 and Figure 2.

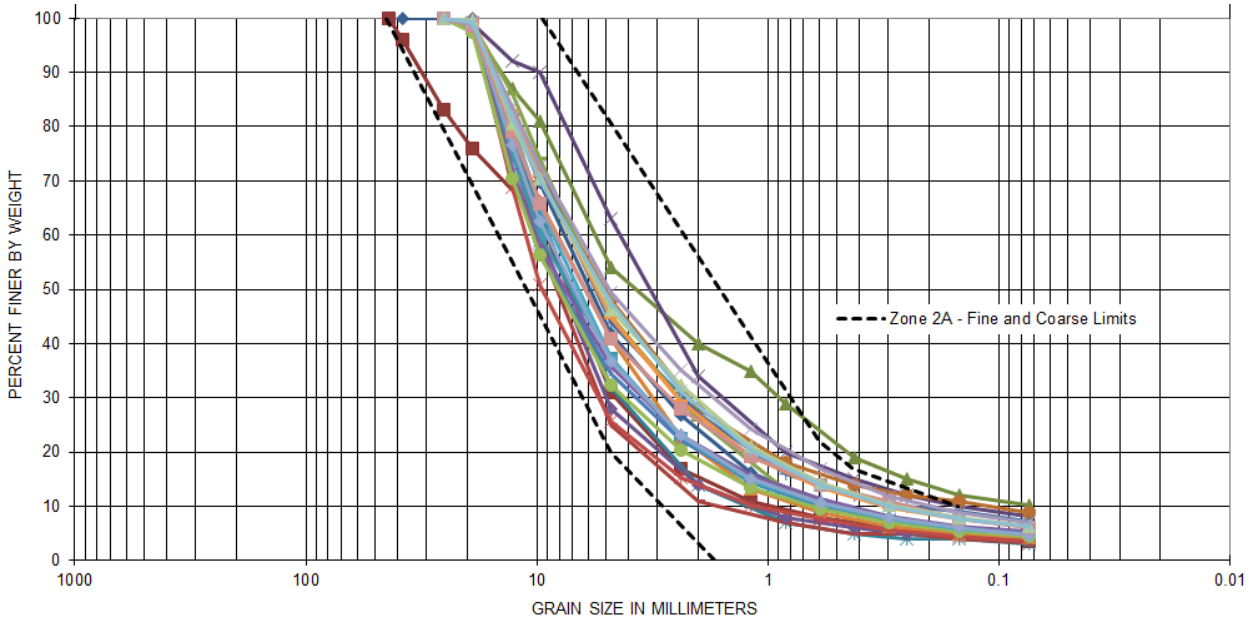


Figure 1 Pipestone Quarry 'Reject' Material Control Gradation Test Results

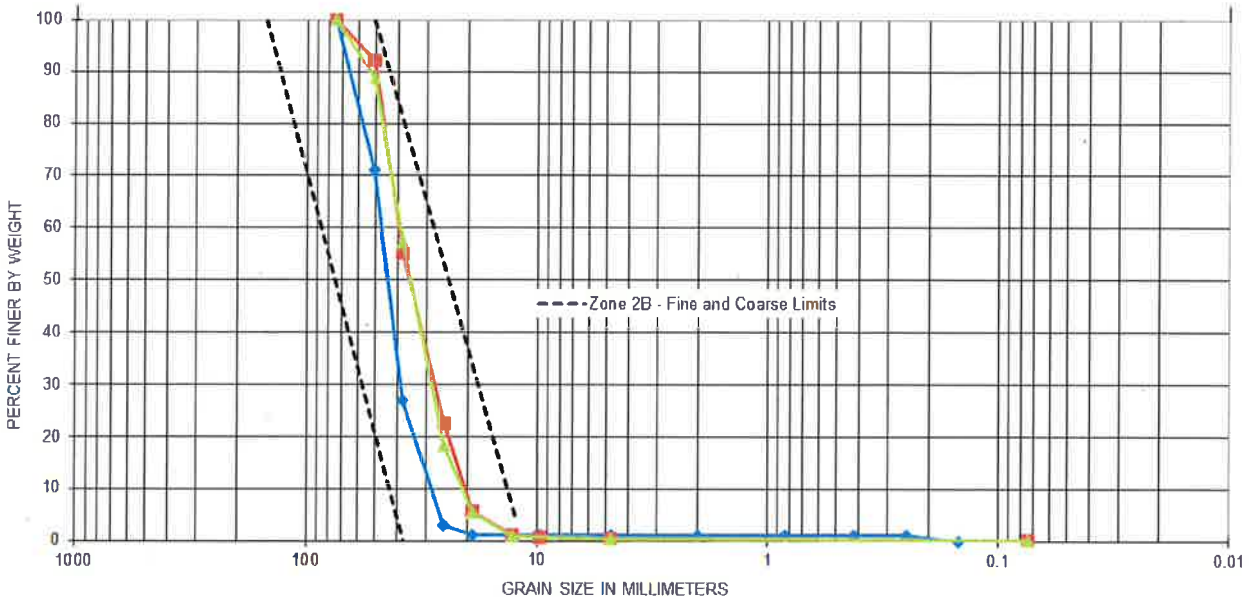


Figure 2 Pipestone Quarry 'Ballast' Material Control Gradation Test Results

Prepared:

Angus Robb, P.Eng. – Senior Engineer

Reviewed:

Ken Brouwer, P.E. – President

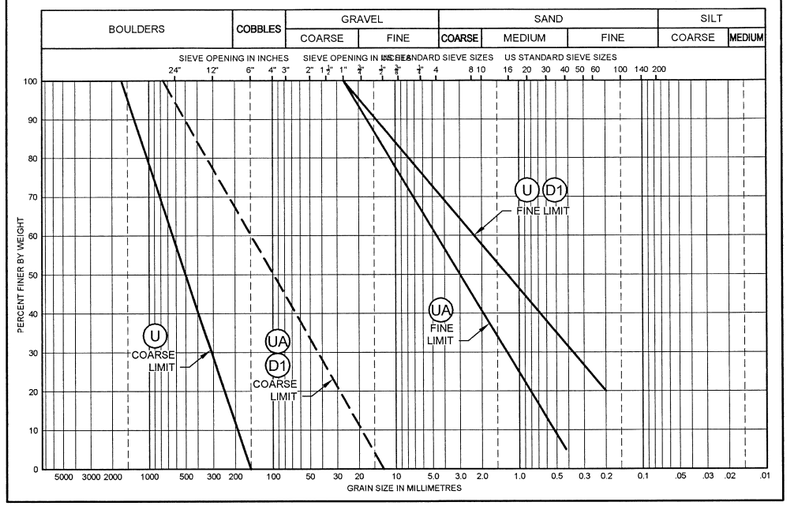
MONTANA
KEN J. BROUWER
10020 PE
NOV 20
PROFESSIONAL ENGINEER

Approval that this document adheres to Knight Piésold Quality Systems: KJB

Attachments:
MR-C0011 Rev 1 Fill Material Specifications

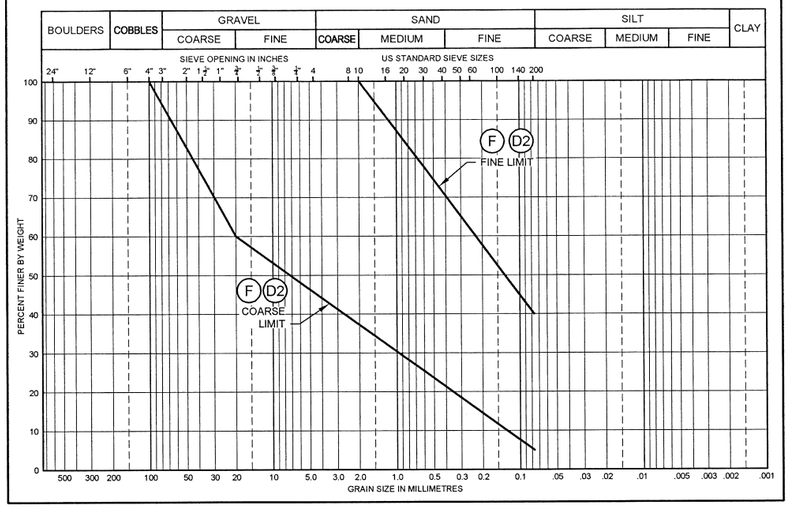
/dr

UNIFIED SOIL CLASSIFICATION SYSTEM



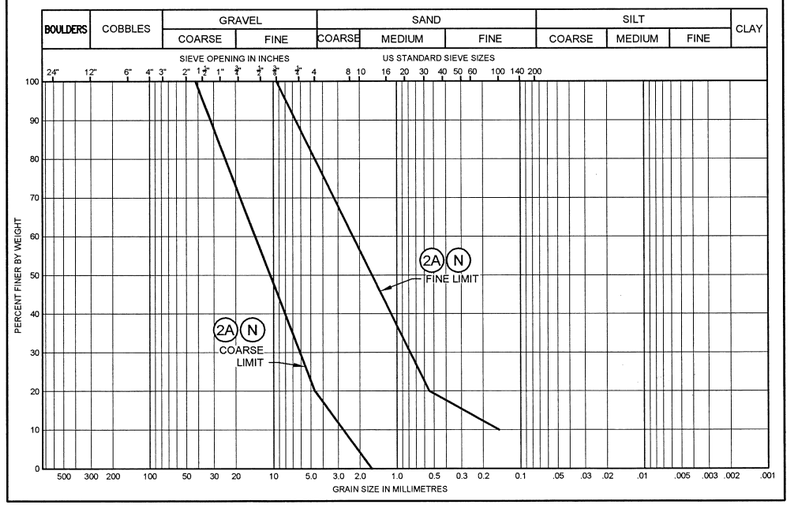
ZONE U / ZONE D1 / ZONE UA

UNIFIED SOIL CLASSIFICATION SYSTEM



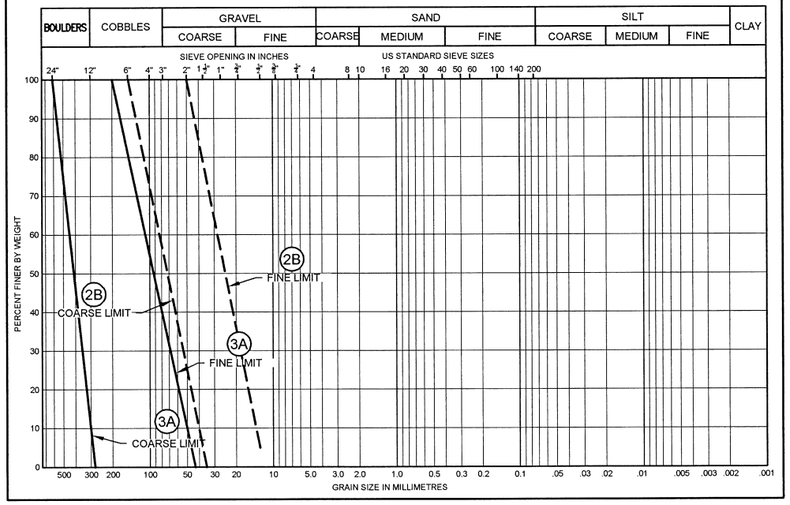
ZONE F / ZONE D2

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE N - INSTRUMENTATION BEDDING /
ZONE 2A - FILTER

UNIFIED SOIL CLASSIFICATION SYSTEM



ZONE 2B - TRANSITION /
ZONE 3A - DRAIN ROCK

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

ZONE AND MATERIAL TYPE	PLACING AND COMPACTION REQUIREMENTS
ZONE F - UPSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF ALLUVIUM, FREE OF LOAM, TREE STUMPS, ROOTS, AND OTHER DELETERIOUS OR ORGANIC MATTER. THE MATERIAL SHALL BE END-DUMPED. THE MAXIMUM END DUMPED HEIGHT SHALL BE A MAXIMUM OF 50 ft. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE U - UPSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE END DUMPED IN 50 ft LIFTS . FILL MATERIAL WILL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE UA - PROTECTIVE CAP	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN 5 ft. LIFTS. FILL MATERIAL WILL BE DOZER COMPACTED. THE MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE. COMPACTED RUNNING SURFACES WILL BE CROSS RIPPED PRIOR TO PLACING SUCCESSIVE LIFTS.
ZONE D1 - DOWNSTREAM ROCKFILL	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH TO MODERATELY-WEATHERED ROCKFILL MATERIAL AND SHALL BE PLACED AND SPREAD IN MAXIMUM 3 ft LIFTS PRIOR TO COMPACTION. MATERIAL SHALL HAVE A RELATIVELY LOW ACID GENERATING POTENTIAL. MATERIAL SHALL BE TRAFFIC COMPACTED BY THE MINE HAUL FLEET, EQUALLY DISTRIBUTED OVER THE ENTIRE LAYER WIDTH. WHERE THE WORKING AREA DOES NOT PERMIT THE USE OF THE MINE HAUL FLEET COMPACTION SHALL CONSIST OF A MINIMUM OF 6 PASSES OF A 12.5 METRIC TON (DRUM WEIGHT) SMOOTH DRUM VIBRATORY ROLLER, UNLESS OTHERWISE NOTED. THE METHOD SPECIFICATION SHALL BE VERIFIED BY COMPLETING A TEST FILL AT THE DIRECTION OF THE ENGINEER. THE FILL SHALL BE PLACED IN A MANNER TO ENSURE NO SEGREGATION. MATERIAL SHALL CONTAIN A BROAD RANGE OF WELL-GRADED SOILS ACROSS THE ENTIRE SPECIFIED GRAIN SIZE ENVELOPE.
ZONE D2 - DOWNSTREAM EARTHFILL	FILL MATERIAL SHALL CONSIST OF NON-ACID GENERATING ALLUVIUM FREE OF LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. MATERIAL SHALL BE PLACED AND SPREAD IN 3 ft LIFTS WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER
ZONE N - INSTRUMENTATION BEDDING	FILL MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. FILTER MATERIAL TO BE PLACED AND SPREAD IN 1' THICK LIFTS. NOMINAL COMPACTION.
ZONE 2A - FILTER MATERIAL	FILTER MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. FILTER MATERIAL TO BE PLACED AND SPREAD IN 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER.
ZONE 2B - TRANSITION MATERIAL	TRANSITION MATERIAL SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED MATERIAL. TRANSITION MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 2' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFICED SMOOTH DRUM VIBRATORY ROLLER
ZONE 3A - DRAIN ROCK	DRAIN ROCK SHALL CONSIST OF HARD, DURABLE, FRESH OR NON-WEATHERED ROCK FILL. DRAIN ROCK TO BE PLACED AND SPREAD IN 3' THICK LIFTS AND COMPACTED WITH 2 PASSES OF THE SPECIFIED SMOOTH DRUM VIBRATORY ROLLER

NOTES:

1. THESE MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS APPLY TO ALL COMPONENTS OF THE WORKS EXCEPT WHERE NOTED OTHERWISE.
2. THE MAXIMUM DIMENSION OF ANY PARTICLE SHALL NOT EXCEED 2/3 OF THE MAXIMUM LIFT THICKNESS.
3. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND CONSTRUCTION MANAGEMENT PLAN. QUALITY CONTROL AND RECORD TESTING SHALL BE UNDERTAKEN AT THE FREQUENCIES IDENTIFIED IN THE CONSTRUCTION MANAGEMENT PLAN. THE OWNER OR IT'S CONTRACTOR SHALL IMMEDIATELY CONTACT THE OWNER'S REPRESENTATIVE SHOULD UNCERTAINTIES ARISE WITH THE CONSTRUCTION DRAWINGS AND / OR TECHNICAL SPECIFICATIONS.

ISSUED FOR CONSTRUCTION

KEN J. BROUWER 10020 PE
PROFESSIONAL ENGINEER
PERMIT TO PRACTICE
KNIGHT PIÉSOLD LTD.
NOV 23/15

Knight Piésold CONSULTING

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT

FILL MATERIAL SPECIFICATIONS

P/A NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C0011	1

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20NOV'15	ISSUED FOR CONSTRUCTION	ACR	ABN	KJB	KJB
0	21OCT'15	ISSUED FOR CONSTRUCTION	ACR	ELG/ABN	KJB	KJB
REVISIONS						

APPENDIX B4

VA16-00195 - WEST EMBANKMENT DRAIN - CONSTRUCTION STAGING FOR WATER MANAGEMENT

(Pages B4-1 to B4-5)

MEMORANDUM

To:	Mr. Josh Shutey	Date:	October 25, 2016
Copy To:	Mark Thompson	File No.:	VA101-00126/15-A.01
From:	Daniel Fontaine	Cont. No.:	VA16-00195
Re:	West Embankment Drain - Construction Staging for Water Management		

This memorandum describes the considerations for staging of the West Embankment Drain (WED) to provide control of water flows during the construction period. The question of "how water will be controlled during construction of the gravity drain" was raised during the weekly meeting between KP and MR on January 26, 2016. The intent of this memorandum is to provide information to consider in planning the construction of the WED.

The supernatant pond was at approximately elevation (EL.) 6,334 ft at the end of 2015, indicating a gain of approximately 7.5 ft over the calendar year. The elevation is indicative of accumulation of additional water in the pond for the winter period, and is not expected to sustain that rate of rise over the next several years if a steady pond volume is maintained. Table 1 indicates the tailings discharge elevations and pond elevations that are expected over the next five years assuming that the pond volume remains steady.

Table 1 Tailings Discharge and YDTI Pond Elevations

End of Year	Tailings Discharge Elevation (ft)	YDTI Pond Elevation (ft)	Minimum Crest Elevation (ft)
2016	6,365	6,338	6,370
2017	6,369	6,342	6,374
2018	6,372	6,349	6,377
2019	6,375	6,356	6,381
2020	6,382	6,362	6,387

NOTES:

1. SUMMARIZED FROM FILLING CURVE FIGURE IN KP TRANSMITTAL VA15-03514.
2. MINIMUM CREST ELEVATION IS APPROXIMATE, AND IS EITHER 5 FT ABOVE THE TAILINGS DISCHARGE ELEVATION OR 25 FT ABOVE THE POND ELEVATION, WHICHEVER IS A GREATER ELEVATION.

The intent of the WED is to provide drained conditions within the West Embankment and to maintain a groundwater potentiometric surface similar to current conditions thereby preventing seepage from the YDTI migrating west past the property boundaries. The primary driver of the design of the WED has been the elevation of groundwater in monitoring well MW12-16, which is approximately EL. 6,380 ft. Additional evaluation of vibrating wire piezometric data at the West Ridge is in progress. The WED will not need to perform its intended function for several years when the YDTI pond elevation begins to approach the water level measured in MW12-16.

The WED invert will be EL. 6,352 ft at Station 0+00 (Bumtown) and EL. 6,340 ft at Station 50+00 (Rocky Knob). The invert of the permanent Extraction Pond at Station 68+00 will be approximately 6,325 ft. Drainage from precipitation and groundwater discharge occurring along the West Ridge presently collects in several low areas along the drain alignment where the planned extraction basin and drain pods are located. These conditions are

expected to persist until these low areas are dewatered and backfilled. Groundwater will then fill the void space and saturate the drain pods and extraction basin until the drain invert is reached and the drain begins to convey flow. This flow should not be substantial based on conditions encountered during site preparation.

The pond elevation will not be high enough to potentially impact drain construction between Bumtown and Rocky Knob until mid to late 2017 when the pond exceeds EL. 6340 ft. However, there is a substantial horizontal width of rockfill separating the current tailings surface from the WED alignment. This width presently ranges from 200 to 600 ft. Tailings beach development will further isolate the pond from the WED once tailings discharge begins in this area in 2017 and will further limit the potential for flow of seepage from the YDTI pond to the WED. The WED will not see substantial flow from the YDTI pond until several years from now.

Vertical infiltration of water to the WED during tailings deposition may occur if the discharge location along the West Embankment is positioned vertically above or close to the WED alignment. This has the potential to be the primary driver of any higher flows in the near term.

The flow rate in the WED is not expected to exceed 1,000 gpm if construction is completed by the end of 2017, once tailings beaches are established along the extent of the West Embankment, and the pond volume remains steady. The estimated flow rate ranges from 10 gpm to 1,000 gpm depending on the conditions considered. Runoff from storm events was not considered in the estimate.

The presence of Rocky Knob provides a substantial benefit to staging construction of the drain. The existing East-West Embankment and the new West Embankment can be constructed to an elevation of 6,380 ft or potentially higher through this area without impacting the extents of the rock excavation required to cut the drain through Rocky Knob. The bedrock will limit groundwater flow in the excavation through this section. The WED construction can be split into two stages in order to take advantage of the presence of Rocky Knob. This will spread both the construction schedule and the capital expenditures over a two year period.

The two attached drawings show Stage 1 of the drain and the temporary works to control water during construction.

- Drawing MR-C1208 (Rev 1) shows the entire drain alignment in plan and profile. The drain will be constructed during 2016 to approximately Station 51+30. The drain can be fully constructed through this section, and embankment fill can progress above the drain to reach the minimum crest elevation shown in Table 1 or the final design crest of EL. 6400 ft. An access ramp should remain to extend access to the temporary extraction pond beyond to allow for construction water management.
- Drawing MR-C1280 (Rev 1) shows the temporary extraction pond between Stations 51+30 and 52+00. The temporary extraction pond will dead end in the start of the Rocky Knob excavation. Surface dewatering pumps will be positioned adjacent to the pond to direct inflows from the temporary pond to the tailings impoundment for storage.

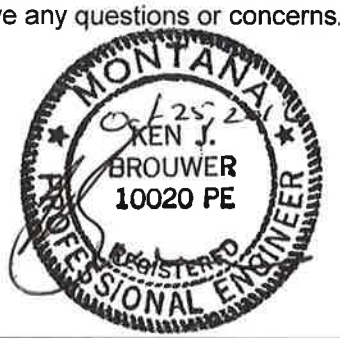
Construction of the Stage 2 WED can commence in 2017 from the other side of Rocky Knob to connect to Stage 1 of the drain. Stage 2 can also include the permanent Extraction Pond at the end of the drain. The benefits of separating the WED into two stages are as follows:

- Focus for construction in 2016 will be on the section of the drain that is on the critical path for construction of the West Embankment.
- Prevents the possibility of an undesired release of water from the drain beyond Rocky Knob during the current construction season.
- Excavation of the temporary extraction pond will provide preliminary information on conditions to be encountered during the Stage 2 excavation through Rocky Knob.
- Construction schedule and capital expenditures will be spread over two year period, including deferring the large rock excavation to 2017.

We trust this meets your needs at this time. Please let us know if you have any questions or concerns.

Prepared: 

Daniel Fontaine, P.Eng.
Senior Engineer

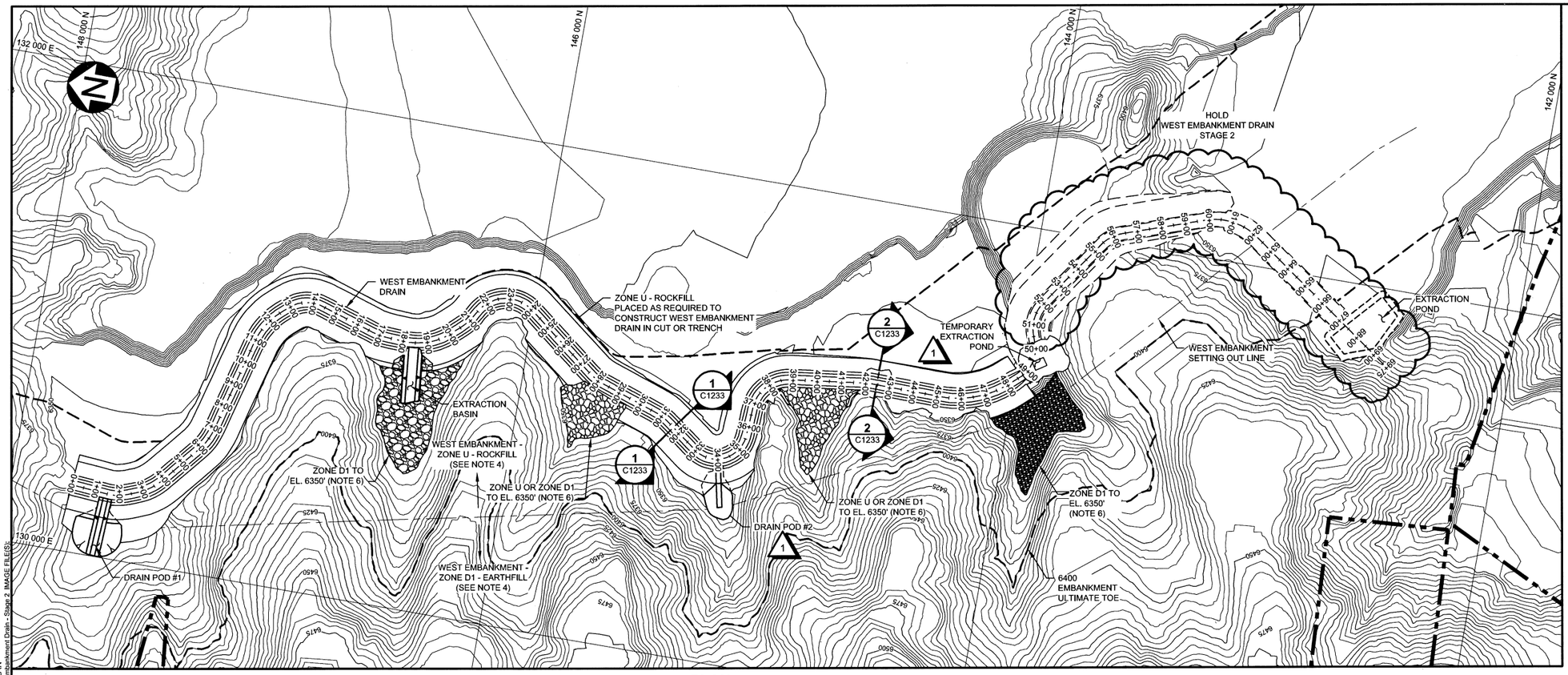
Reviewed: 

Ken Brouwer, P.Eng.
President

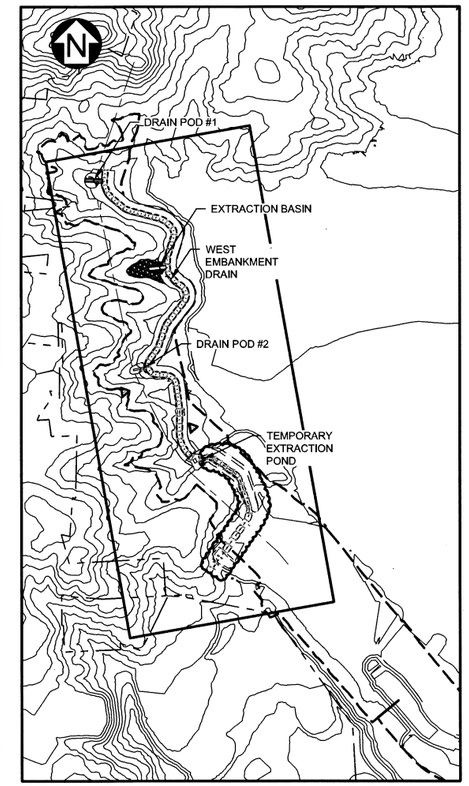
Approval that this document adheres to Knight Piésold Quality Systems: KJB

Attachments:
Drawing MR-C1208 Rev 1
Drawing MR-C1280 Rev 1

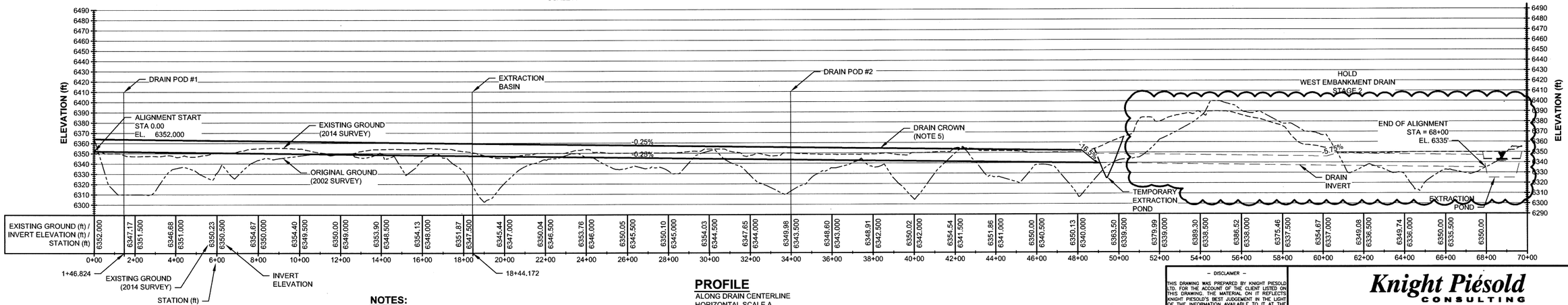
/ddf



PLAN
SCALE A



KEY PLAN
NTS



PROFILE
ALONG DRAIN CENTERLINE
HORIZONTAL SCALE A
VERTICAL SCALE B

LEGEND:

- ZONE U - ROCKFILL
- ZONE D1 - ROCKFILL
- PROPERTY BOUNDARY

NOTES:

1. CONTOUR INTERVAL IS 5 FEET BASED ON SURVEY DATA PROVIDED BY MONTANA RESOURCES.
2. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
3. COORDINATE GRID IS IN ANACONDA MINE GRID.
4. THE SETTING OUT LINE DEFINES THE BOUNDARY BETWEEN THE ZONE U AND ZONE D1 FOR THE WEST EMBANKMENT. (SEE DRAWING MR-C1110)
5. THE DRAIN CROWN EXTRACTION BASIN AND DRAIN POD SURFACES REPRESENT THE FINAL GRADE OF THE ZONE 2A - FILTER. THE ZONE UA ROCKFILL HAS BEEN OMITTED FOR CLARITY.
6. INFILL LOW AREAS WITH ZONE D1 OR U WHERE NOTED TO ELEVATION AS NOTED FOLLOWING FOUNDATION PREPARATION.

ISSUED FOR CONSTRUCTION

SCALE B: 50 0 50 100 150 200 250 ft
SCALE A: 250 0 250 500 750 1000 1250 ft

DRG. NO.	DESCRIPTION
MR-C1110	WEST EMBANKMENT - 6400 CREST - PLAN
MR-C1233	WEST EMBANKMENT 6400 CREST - WEST EMBANKMENT DRAIN - TYPICAL SECTIONS - STAGE 1

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'16	UPDATED WITH DRAIN POD & TEMP. EXT. POND DETAILS	JRG	ABN/RM	DDF	KJB
0	23MAR'16	ISSUED FOR CONSTRUCTION	ACR	ABN	DDF	KJB

REVISIONS

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KEN J. BROUWER 10020 PE June 23/16 REGISTERED PROFESSIONAL ENGINEER

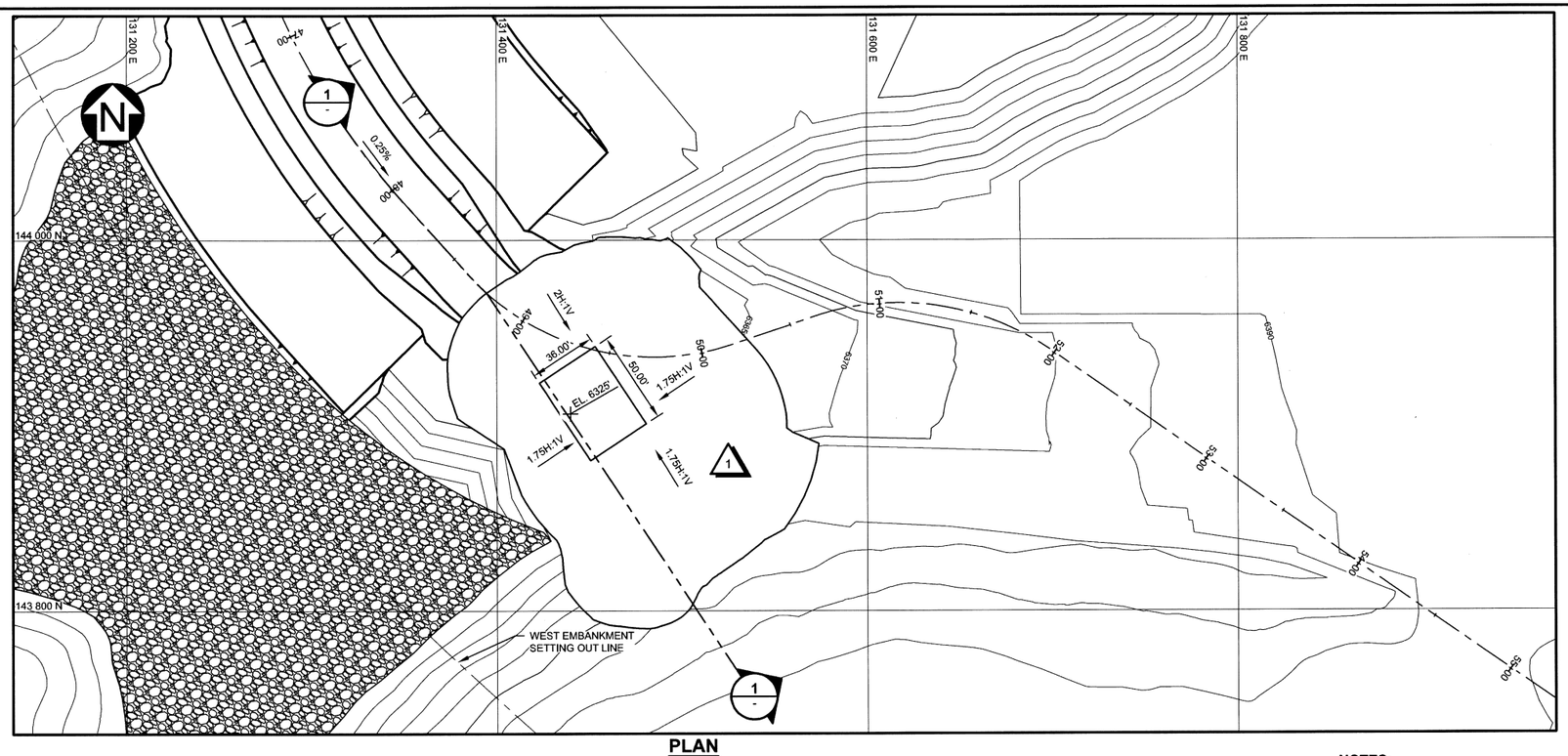
Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

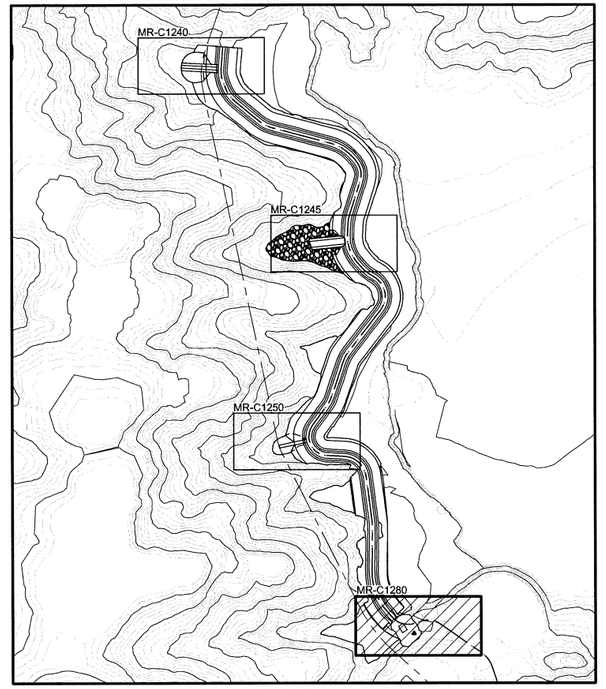
YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT
6400 CREST
WEST EMBANKMENT DRAIN
PLAN AND PROFILE STAGE 1

VA101-126/13 | DRAWING NO. MR-C1208 | REVISION 1



PLAN
TEMPORARY EXTRACTION POND
SCALE A



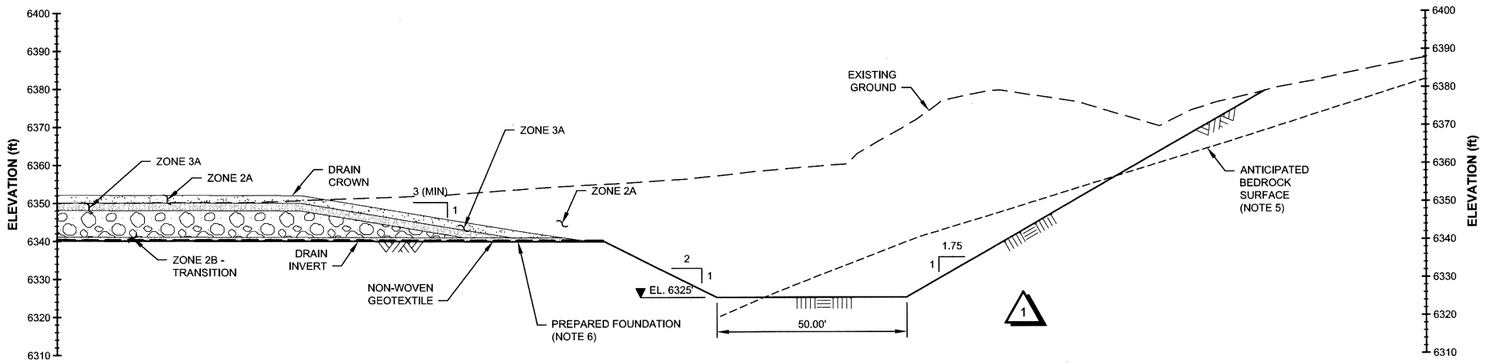
KEY PLAN

NOTES:

1. COORDINATES ARE IN ANACONDA MINE GRID.
2. CONTOUR INTERVAL IS 5 FEET.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.
4. MAXIMUM CUT SLOPES ARE SHOWN. FLATTER SLOPES CAN BE CONSTRUCTED AT THE CONSTRUCTORS DISCRETION TO AID CONSTRUCTION EFFICIENCY. BENCH CUTS MAY BE INCLUDED UNDER THE CONDITION THAT THE OVERALL SLOPE ANGLE IS ACHIEVED AS SHOWN.
5. EXCAVATE TO BEDROCK SURFACE ON SOUTHEAST END OF TEMPORARY EXTRACTION POND. BEDROCK CONTOURS PROVIDED BY MONTANA RESOURCES.
6. OVERSIZE BOULDERS PROJECTING INTO THE PREPARED FOUNDATION SHALL BE REMOVED AND THE HOLE SHALL BE BACKFILLED WITH ZONE D1 OR ZONE 2A MATERIAL.
7. THIS DRAWING SHALL BE READ WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS CONTAINED IN THE CONSTRUCTION MANAGEMENT PLAN.

LEGEND:

- ZONE U - ROCKFILL
- ZONE UA - ROCKFILL
- ZONE D1 - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE 3A - DRAIN ROCK
- ZONE 2B - TRANSITION
- ZONE 2A - FILTER
- NON-WOVEN GEOTEXTILE



1 SECTION
TEMPORARY EXTRACTION POND
SCALE B

ISSUED FOR CONSTRUCTION

SCALE B: 20 0 20 40 60 80 100 ft
SCALE A: 40 0 40 80 120 160 200 ft

KEN J. BROUWER 10020 PE
23/16
ASSOCIATED PROFESSIONAL ENGINEER

Knight Piésold CONSULTING

MONTANA RESOURCES, LLP

YANKEE DOODLE TAILINGS IMPOUNDMENT

WEST EMBANKMENT 6400 CREST
WEST EMBANKMENT DRAIN
TEMPORARY EXTRACTION POND
PLAN AND SECTIONS

CONSULTANT'S NO.	DRAWING NO.	REVISION
VA101-126/13	MR-C1280	1

DRG. NO.	DESCRIPTION
-	-

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
1	20JUN'16	UPDATED WITH TEMP. EXTRACTION POND DETAILS	JRG	ABN	DDF	KJB
0	24MAR'16	ISSUED FOR CONSTRUCTION	ACR/JRG	ABN	DDF	KJB

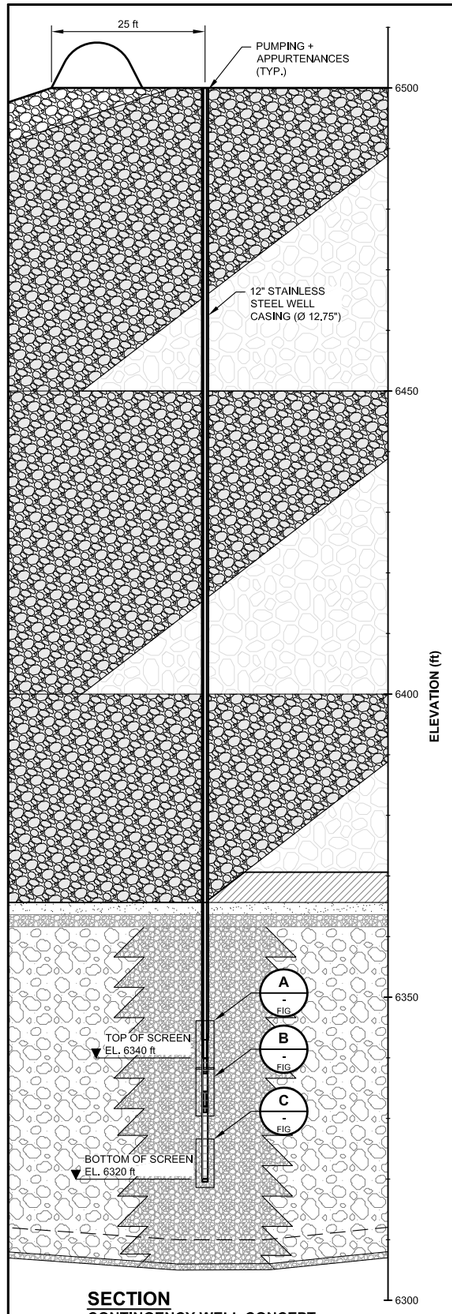
REVISIONS

SAVED: M:\101\100\126\13\A\Acad\DWGS\MR-C1280\MR-C1280_6/20/2016 8:23:46 AM . RMCLELLAN PRINTED: 6/20/2016 1:27:21 PM, MR-C1255. RMCLELLAN
XREFS: FLEGS 2000 Contours - 5' West Embankment Drain - Stage 1 - Model Files)

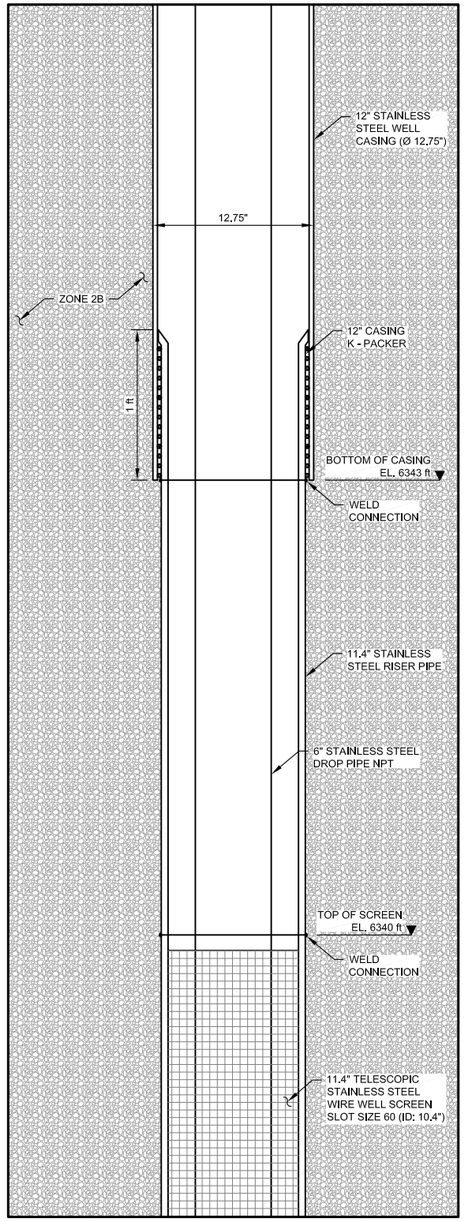
APPENDIX B5

VA15-05319 - DRAIN POD CONTINGENCY WELL CONCEPT DESIGN - SECTION AND DETAILS

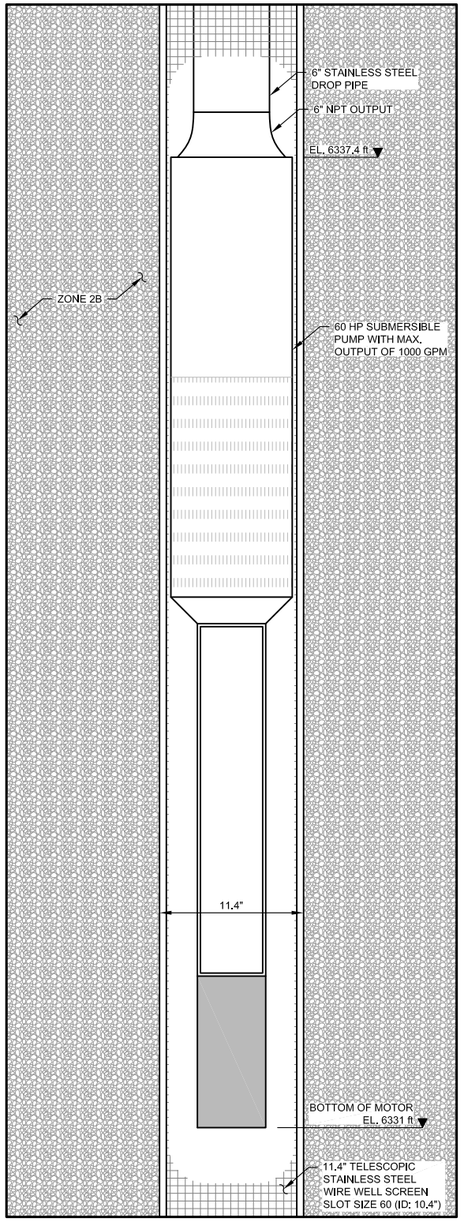
(Page B5-1)



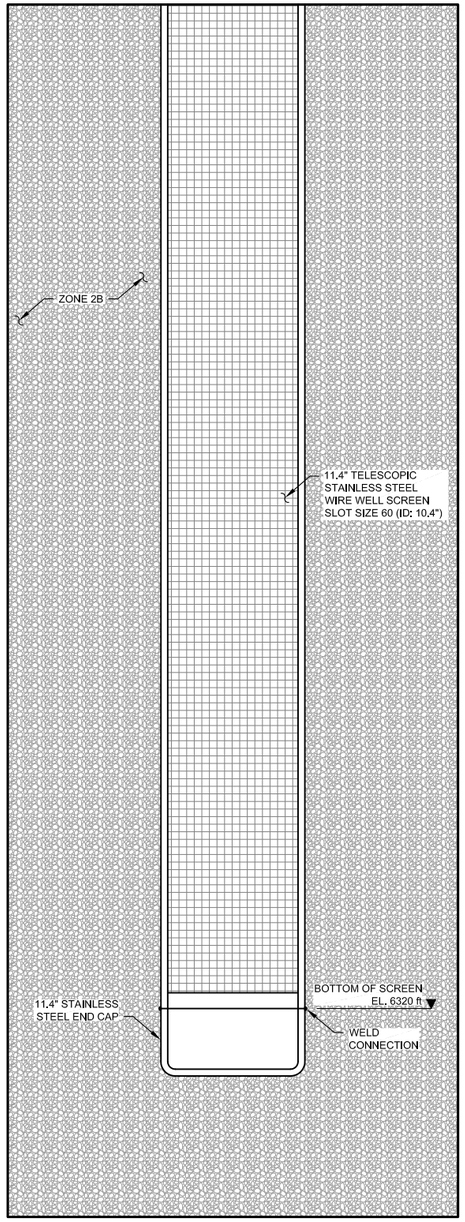
SECTION
CONTINGENCY WELL CONCEPT
SCALE A



A - FIG DETAIL
CASING AND SCREEN CONNECTION
SCALE B



B - FIG DETAIL
SUBMERSIBLE PUMP AND MOTOR
SCALE B



C - FIG DETAIL
BOTTOM OF SCREEN
SCALE B

LEGEND:

- ZONE U - ROCKFILL
- ZONE D2 - EARTHFILL
- ZONE D1 - ROCKFILL
- ZONE 2B - TRANSITION / EXTRACTION BASIN
- ZONE 3A - DRAIN ROCK
- ZONE UA - ROCKFILL
- ZONE 2A - FILTER
- WELL SCREEN

NOTES:

1. SUBMERSIBLE PUMP DETAILS BASED ON A GRUNDFOS MODEL 1100S-2AA.
2. WELL SCREEN SPECIFICATIONS BASED ON A JOHNSON SCREEN FREE FLOW 304 STAINLESS STEEL SCREEN.
3. DIMENSIONS AND ELEVATIONS ARE IN FEET, UNLESS NOTED OTHERWISE.

INSTALLATION PROCEDURE:

1. DRILL TO SPECIFIED WELL DEPTH USING A DUAL ROTARY RIG AND WELDED STAINLESS STEEL CASING.
2. INSERT WELL SCREEN WITH ATTACHED K-PACKER, RISER PIPE AND END CAP TO THE BOTTOM OF THE HOLE USING A BAILER PIPE.
3. PULL BACK STEEL CASING UNTIL K-PACKER IS SECURED IN THE BOTTOM OF THE CASING LEAVING THE WELL SCREEN EXPOSED.
4. SECURE CASING TO SURFACE AND REMOVE THE BAILING PIPE.
5. INSTALL SUBMERSIBLE PUMP TO SPECIFIED DEPTH AND BEGIN DEVELOPMENT OF WELL.

FOR INFORMATION ONLY

SCALE B: 0.5 0 0.5 1.0 1.5 2.0 2.5 ft
SCALE A: 12,5 0 12,5 25 37,5 50 62,5 ft

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
A	07DEC'15	ISSUED FOR CLIENT REVIEW	CAV/JRG	ABN	-

MONTANA RESOURCES

YANKEE DOODLE TAILINGS IMPOUNDMENT

DRAIN POD
CONTINGENCY WELL CONCEPT DESIGN
SECTION AND DETAILS

Knight Piésold CONSULTING

P/A NO. VA101-126/13 | REF NO. VA15-03519

FIGURE 1 | REV A