Buckley Powder Co. BLAST REPORT

SERVICE SITE LOCATION: Louviers ORDER NO.: 7403357

BLAST NUMBER: 1-2017 BLAST TIME: 8:50 am BLAST DATE: 04/11/2017

CUSTOMER: MARTIN MARIETTA MATERIA MINE: RED CANYON ADDRESS: Colorado Springs, CO

ROCK TYPE: Granite Tons/Yd3: 2.00 EXPECTED VIBRATION: 0.600 IPS

LOCATION OF BLAST

LOCATION OF BLAST IN MINE: East BENCH: Level 1

BLAST GPS POINTS: N 038 36 23.40000 & W -104 56 46.98000

WEATHER

WEATHER: Partly Cloudy CEILING: High TEMPERATURE: 55 F WIND DIRECTION & SPEED: North 3 MPH

NEAREST NON-OWNED STRUCTURE

NAME: North Hillside GPS Points: N 038 36 22.41000 & W -104 56 31.21980

DISTANCE: 1,253 (FT) DIRECTION: 94°

SEISMOGRAPH DATA

	LOCATION	DISTANCE	GPS POINTS	CALIBRATION DATE
1	North Hillside	1,253 (FT)	N 038 36 22.41000 & W -104 56 31.21980	04/20/2016

	L	(F)	T	(F)	V	(F)	AIR (db)	SEISMOGRAPH	SERIAL	OPERATOR
1	0.058	21	0.050	15	0.045	8	119	VibraTech 9656	9656	

BLAST DATA

NUMBER OF HOLES (EA)	89
HOLE DIAMETER (IN)	5
HOLE DEPTH (FT)	48
FACE HEIGHT (FT)	
SUB DRILLING (FT)	0
AVG. STEM FACE HOLES (FT)	
STEM OTHER HOLES (FT)	12
BURDEN FRONT ROW (FT)	
BURDEN OTHER ROWS (FT)	14
SPACING FRONT ROW (FT)	
SPACING OTHER ROWS (FT)	8.5 - 17

EXPLOSIVES SIZE, TYPE & WEIGHT

SIZE	TYPE	WEIGHT
0.75	SPARTAN 350SR	66.75
BULK	TITAN 1000 XL	25,700
	TOTAL WEIGHT (LB):	25,766.75

DETONATORS USED IN BLAST: Electronic MATS USED: No STEM TYPE: 3/4 x 1/2 CRUSHED TOTAL DRILL DEPTH: 4,272 (FT

TYPE	MFG	DATE CODE	USED	TYPE	MFG	DATE CODE	USED
DIGISHOT 30 FT	Dyno Nobel Global	20FE17	39	DIGISHOT 30 FT	Dyno Nobel Global	06MA17	30
DIGISHOT DETONATOR 50FT	Dyno Nobel Global	06FE17	96	SPARTAN 350SR	Dyno Nobel Global	15NO16	165

CU YDS IN SHOT: 26,021 SCALED DISTANCE FACTOR: 32 % OF ANFO: 0

TONS IN SHOT: 52,043 HOLES/DELAY : 5 FUEL OIL % (BULK): 0

MAX LBS/DELAY: 1,448 AVERAGE LBS/HOLE: 290

POWDER FACTOR (TONS/LB): 2.02 POWDER FACTOR POUNDS/YD3: 0.99

BLASTERS NAME: Stephens, Daniel BLASTERS NUMBER & STATE: CO 1-059-01452

BLASTERS SIGNATURE: Dan Stephens SITE SAFETY INSPECTION PERFORMED: Yes

NUMBER OF PERSONNEL ON SITE: 5

REMARKS : Shot came out good. Blast box was set for bench box not standalone.

START TIME	END TIME	TOTAL TIME	TRUCK NUMBERS
9:10 AM	4:00 PM	06:50	5013

APPENDIX A

Date: 4/11/2017 Location: MM Red Canyon shot # : 1-2017

BLASTER'S CHECKLIST *Must be filled out as you go!*

PRE-TRIP CHECKLIST

yes / no / NA	
✓	Measuring Tapes and lead ends
✓	Burden pole Tape/ Profiler
✓	Loading Poles
✓	Marking Paint
✓	Starter and primers
✓	Blasting Signs & cones
✓	Sirens in working order
✓	Set back stakes
✓	Digitial video camera & Tripod

yes / no / NA	
✓	Scientific Calculator
✓	Pocket Mirror
✓	Empty Shot bags
✓	Powder Punch
✓	GPS
✓	Non sparking Knife
✓	Wire strippers
✓	Splices
✓	Flash Light & Batteries

yes / no / NA	
✓	Drill Logs
✓	Shot reports
✓	Hold Harmlesses
✓	Seismographs
✓	Density Cup and Scales
✓	Two Way Radios / fully
✓	Wheel Chocks
✓	Harness & Lanyard / "T" post
✓	First Aid Kits

PRESHIFT CHECKLIST

yes / no / NA	
✓	Inspect blast area for Unsafe Working Conditions (including face) for voids, cracks, caves, etc..
✓	Ensure all employees have their site specific training.
✓	Secure blast site with warning signs and cones (including floor in front of face)
✓	Check shot access including traffic activity
✓	Pre shift inspections on all equipment -*OK and safe to operate* (includes back up alarms, brakes, horns, etc..)
✓	Mark fall zone area at least six(6) feet from the crest
✓	Inspect Harness/ Lanyard ***before each use*** if needed for fall zone or on top of trucks
✓	Insure all needed products are present-enough boosters, detonators etc
✓	Calculate Minimum Burden and Measure front row burden with burden pole or profiler (Document)
✓	Check drill log and all holes for proper depth and blockage
✓	Insure blast design is consistent with closest structures requirements
✓	Any need for calling assistance (Hold Harmless, equipment to close, drilling problems, etc...)
✓	Conduct pre-blast safety meeting with blast crew. *If there is not a timing diagram, detonator tie-in must be discussed at the*
	Calculate pounds per delay: Expl density x expl diam^2 x .3405 = _____ lbs/ ft x avg powder column= _____ lbs/hole x expected _____ holes / delay =_____ lbs/delay
	Calculate scale distance: 1) Distance _____2) divided by lbs/delay _____ 3) hit square root then equals_____ =S.D. (4)
	Calculate expected vibratiion: S.D.(4)_____ Push 1/x on calculator. Push (yx) key then 1.6 hit equals x 160 = _____exp. vib.

TIE-IN CHECKLIST

yes/ no / NA	
✓	Shot tie inspected and signed off by two persons prior to shot including lead line *(include names below)*
✓	Dan Stephens David Clifton
✓	Blast area is cleared and blocked before attaching starter cap and lead line
✓	Blaster in charge in communication with all guards at this time
✓	Blaster in charge will insure blast area has been cleared and guarded before the siren is sounded
✓	After proper waiting time blaster in charge will contact all guards before firing blast
✓	Seismograph located at nearest off site structure or at the Property Line related to nearest off-site
✓	Video Recording Made of Shot

POST BLAST CHECKLIST

yes / no / NA	
✓	Maintain guards until shot is cleared and "all clear" is sounded
✓	Check for misfires, undetonated explosives or burning product and other dangers
✓	Sound all clear that is audible to all parties
✓	Dispose of lead line in approved manner
✓	Dispose of empty boxes in approved methods only
✓	Complete all required paper work prior to leaving customer location- shipping Papers, delivery ticket, Blaster's
✓	Make one final check of blast site before leaving property to insure no materials have been left
✓	and that no hazards are present that may have been missed during clearing process
✓	

Must completed and turned in daily- end of shift

Blaster In Charge Dan Stephens

14X17

Seismic Analysis
Velocity Waveform Analysis

Serial Number:	9835
Firmware Version:	0C-06.05
Event Date:	04/12 2017 09:33:52 (UTC -06:00)
Event number:	9
Recording Time:	5 s
Client:	Martin Marietta
Operation:	Red Canyon Quarry
Location:	North Hill Side
Distance:	
Operator:	Vibra Tech
Comment:	Pueblo, Colorado
Seismic Trigger:	0.02 in/s
Sound Trigger:	133 dB

Additional Info:

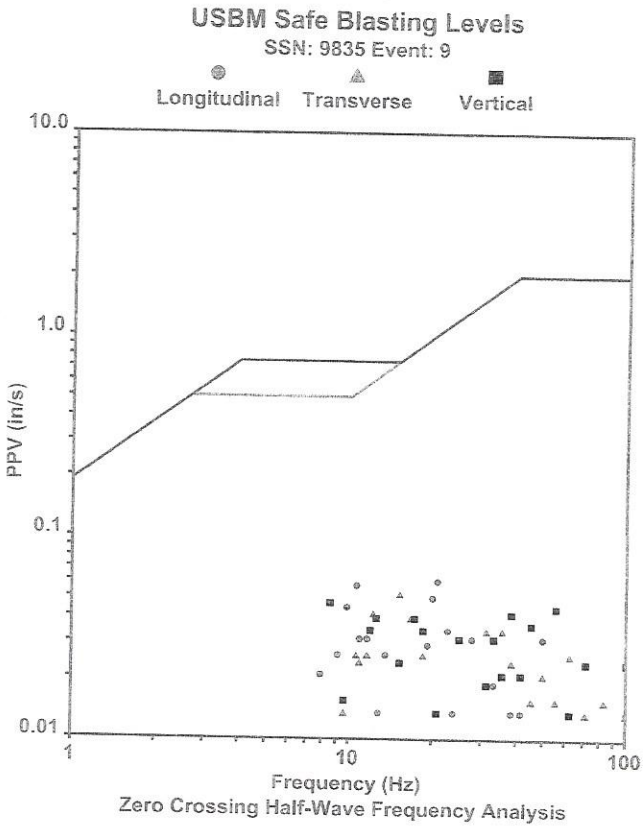
j-GEO-16060
N38 36 22 W104 56 31

Summary Data

	L	T	V
PPV (in/s):	0.058	0.05	0.045
FREQ (HZ):	20.8	14.7	8.3
PD (.001"):	0.7	0.52	0.55
PPA (g):	0.026	0.033	0.046

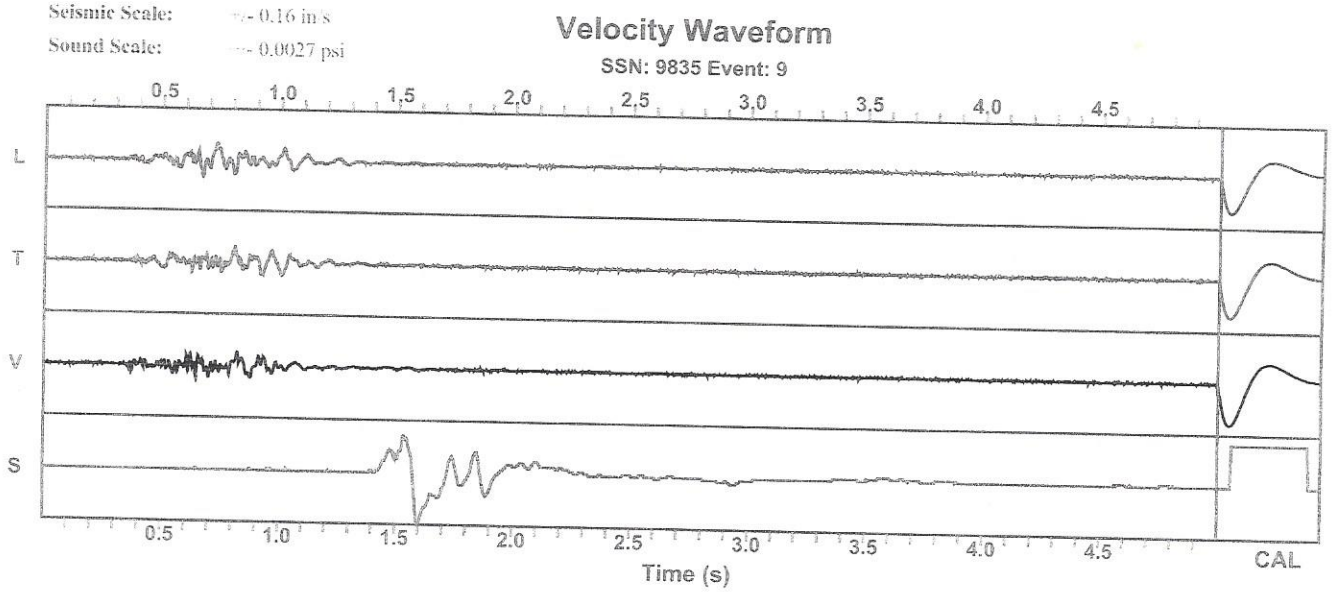
Peak Vector Sum: 0.068 in/s
Peak Air Pressure: 119 dB
0.0028 psi @ 3.4 HZ

Shaketable Calibrated
On: 10/21/2016 (UTC -06:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.



Waveform Graph Scale

Time Scale: 0.1 s
Seismic Scale: +/- 0.16 in/s
Sound Scale: +/- 0.0027 psi

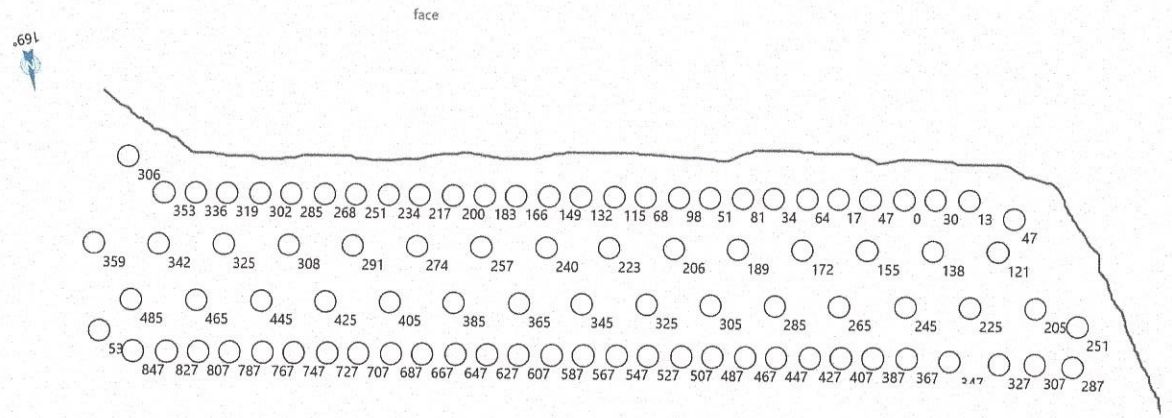


Buckley Powder Co.

CUSTOMER NAME: RED CANYON
BENCH: Level 1
BLASTER'S NAME: Stephens, Daniel

DIAGRAM

BLAST DATE: 04/11/2017
BLAST NUMBER: 1-2017



Martin Marietta

Red Canyon Quarry, CO

#1 – Bench 4

April 11, 2017

JD Farmer

Summary

# Holes	89
Tonnage Blasted	52,043 tons
Explosives Weight	25,767 lb
Powder Factor	2.02 tons / lb
Bulk Product Type	Titan XL 1000
Priming	DigiShot / Spartan 350SR Double Primed
Hole Diameter	5”
Face Height	52’

	Main Shot (ft)	**Face Row (ft)**
Burden x Spacing	14 x 17	20 x 12
Hole Depth	44 - 52	44 - 52
Subdrill	4	4
Stemming	12	Custom

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Summary (continued)

- **Performance**
  - Consistent expression from face
  - Good fragmentation throughout most of the shot with some oversize on the Western face which had heavy burden.
  - Major joint plane which caused the slip on this shot looks to continue into shot behind with crack visible in bench.
- **Loading Notes**
  - Face 3D profiled for shot lay out using 3D Laser and drone. Face row custom loaded accordingly.
    - ✓ Corner hole loaded with shot bags to reduce energy as it had ~12.5ft of burden the whole way down.
    - ✓ All other holes loaded to 14ft minimum burden.
  - Back row layed out at 120 degree angle from highwall using drone survey.
  - Back row double stitched with toe loaded holes for wall control.
  - Shot loaded well
- **Maximum Air Blast**
  - 119dB at North Hillside.

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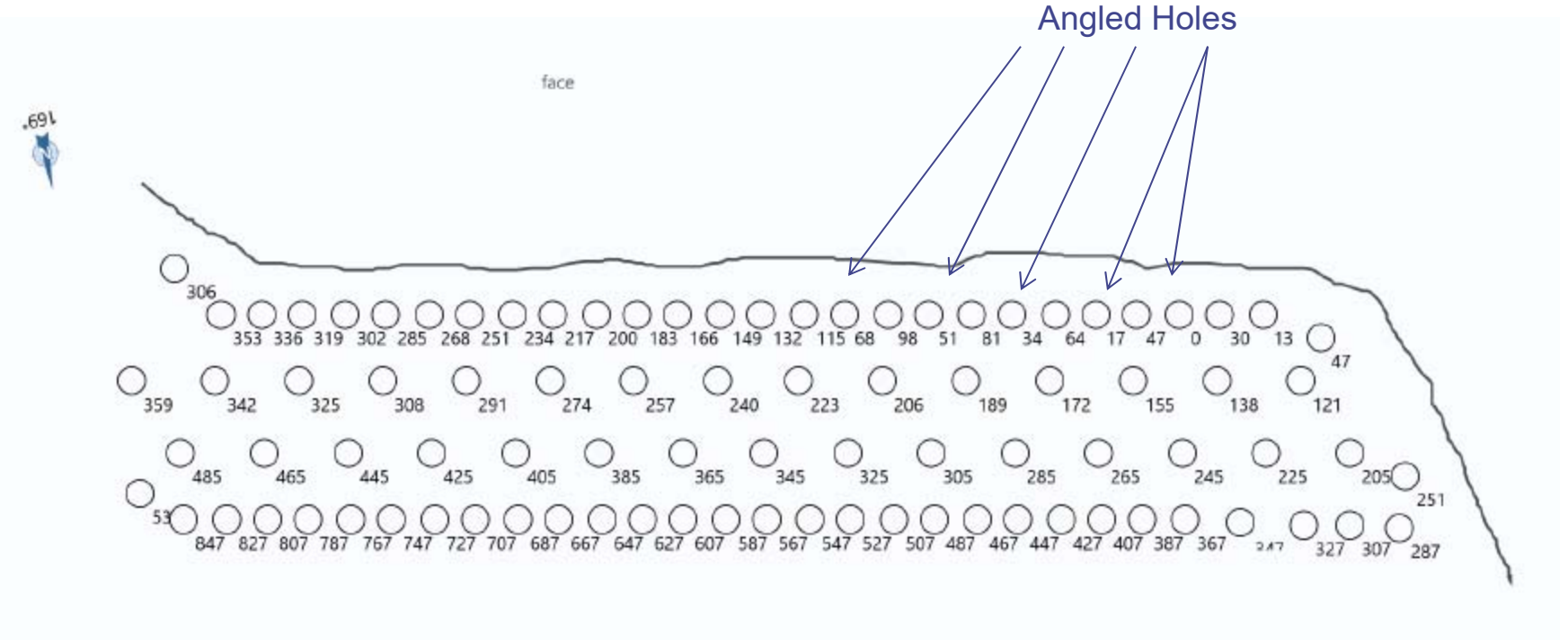

Blast Diagram

Orthophoto

Drone Aerial

Blast Video

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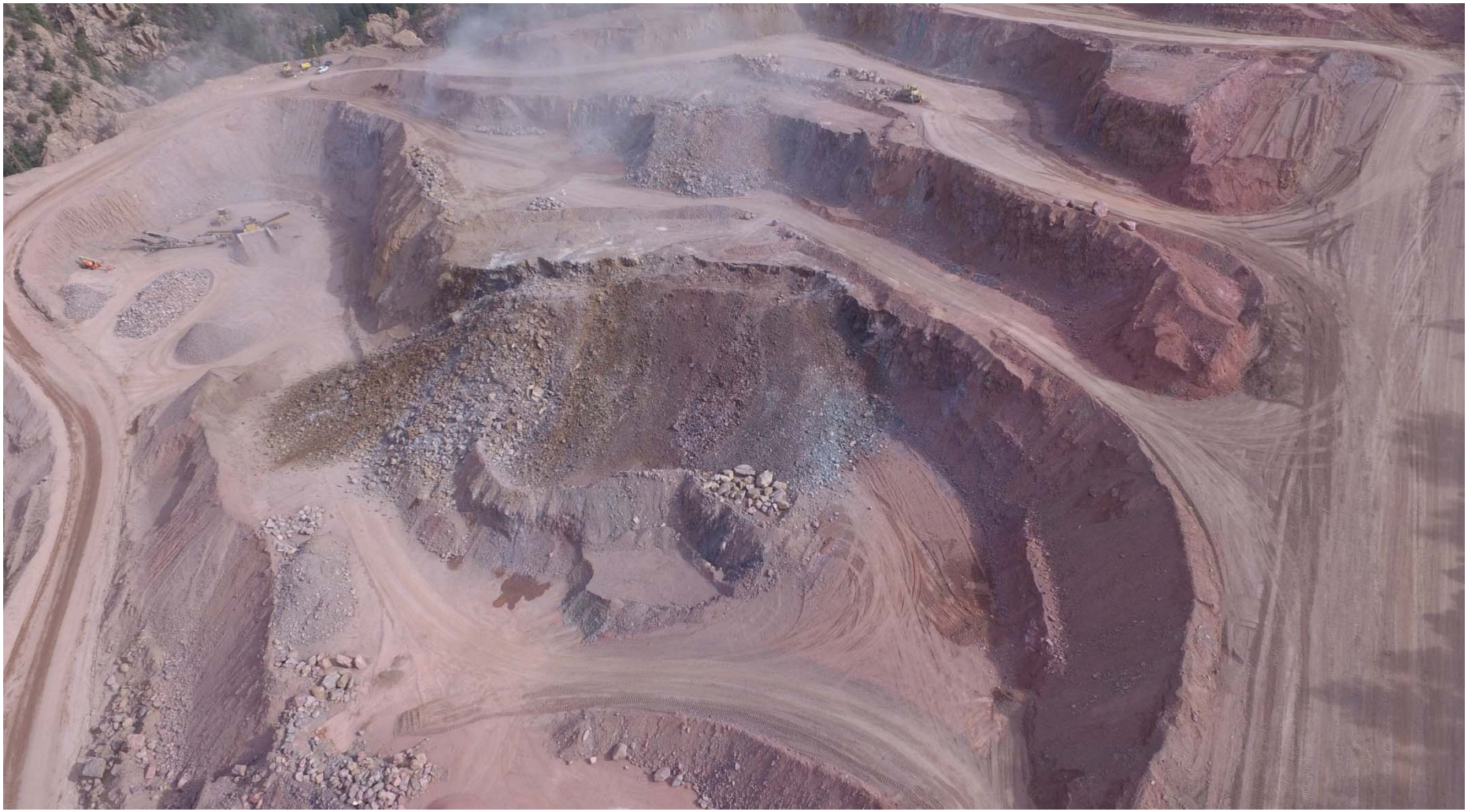
Muckpile



Muckpile