

Rio Tinto Kennecott



***2014 Mine Design, Operations & Closure
Conference***

Lessons from Kennecott Utah Copper's Manefay Slide
Cody Sutherlin, Manager Cornerstone Operations

April 2014

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Rio Tinto Kennecott Overview

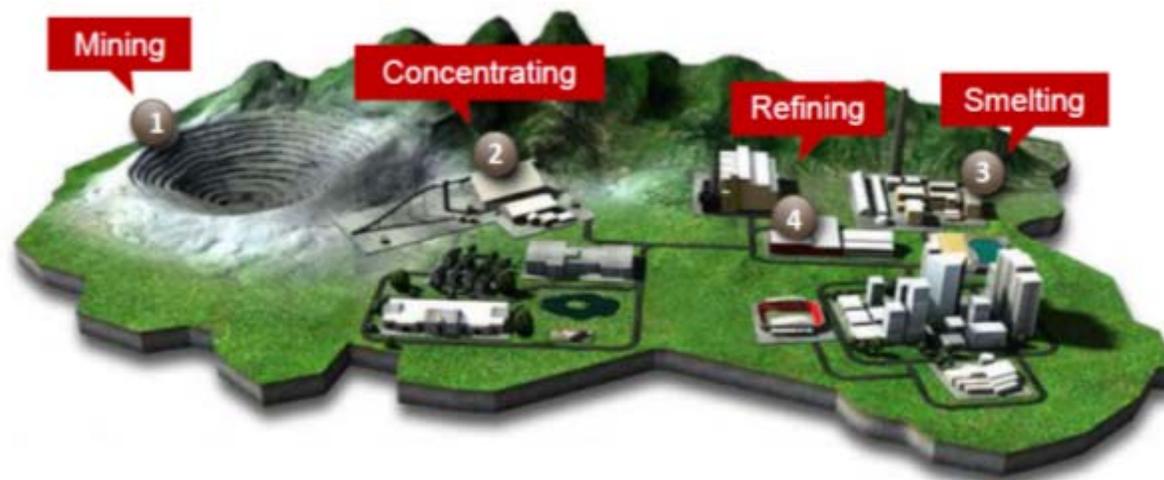
Asset details:

- Location: Salt Lake City, Utah, USA
- Ownership: Rio Tinto 100%
- History: RTZ acquired from BP in 1989
- Products:
 - Cu cathode (200kt per annum)
 - Molybdenum (10-30mlbs)
 - Gold (200koz)
 - Silver (3moz)
 - Sulphuric Acid (900mt)



Operations:

- Open pit
- Mill & tailings
- Smelter
- Refinery & PM plant
- Acid plant
- Power plant



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Rio Tinto Kennecott – Bingham Pit Mine



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Before the Manefay Slide - April 9th 2013



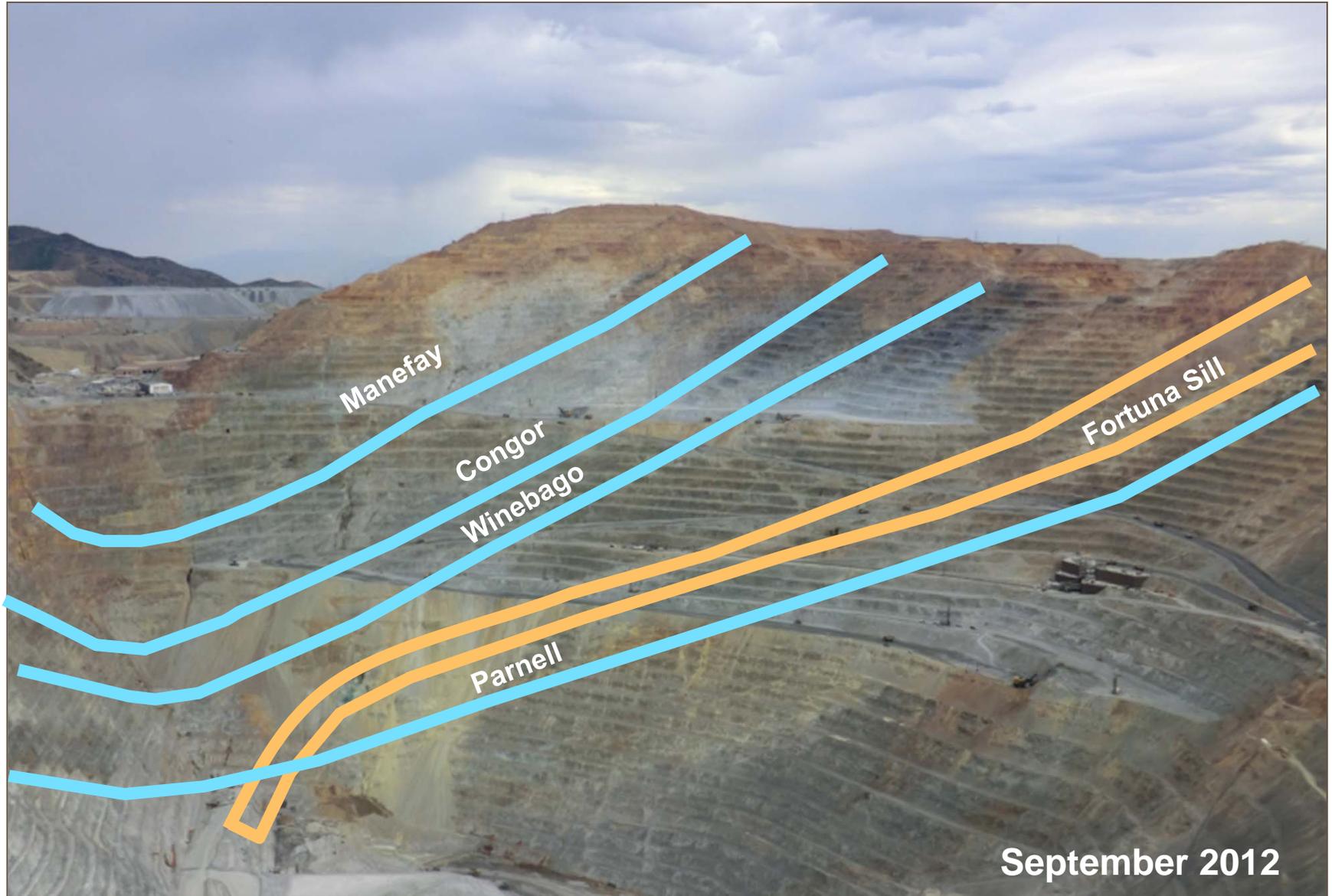
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After the Manefay Slide



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East Wall Geology



Incident Area

Expected Impact Area
10% of pit floor covered



Actual Impact Area
95% of pit floor covered



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Pre-Incident Photo of West Pit Floor



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Post-Incident Photo of West Pit Floor



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P&H 4100 C Shovel



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Komatsu 930 SE Haul trucks



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Bingham Truck Shop



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April 10, 2013

Employees were safely
evacuated and accounted
for with **no injuries**  

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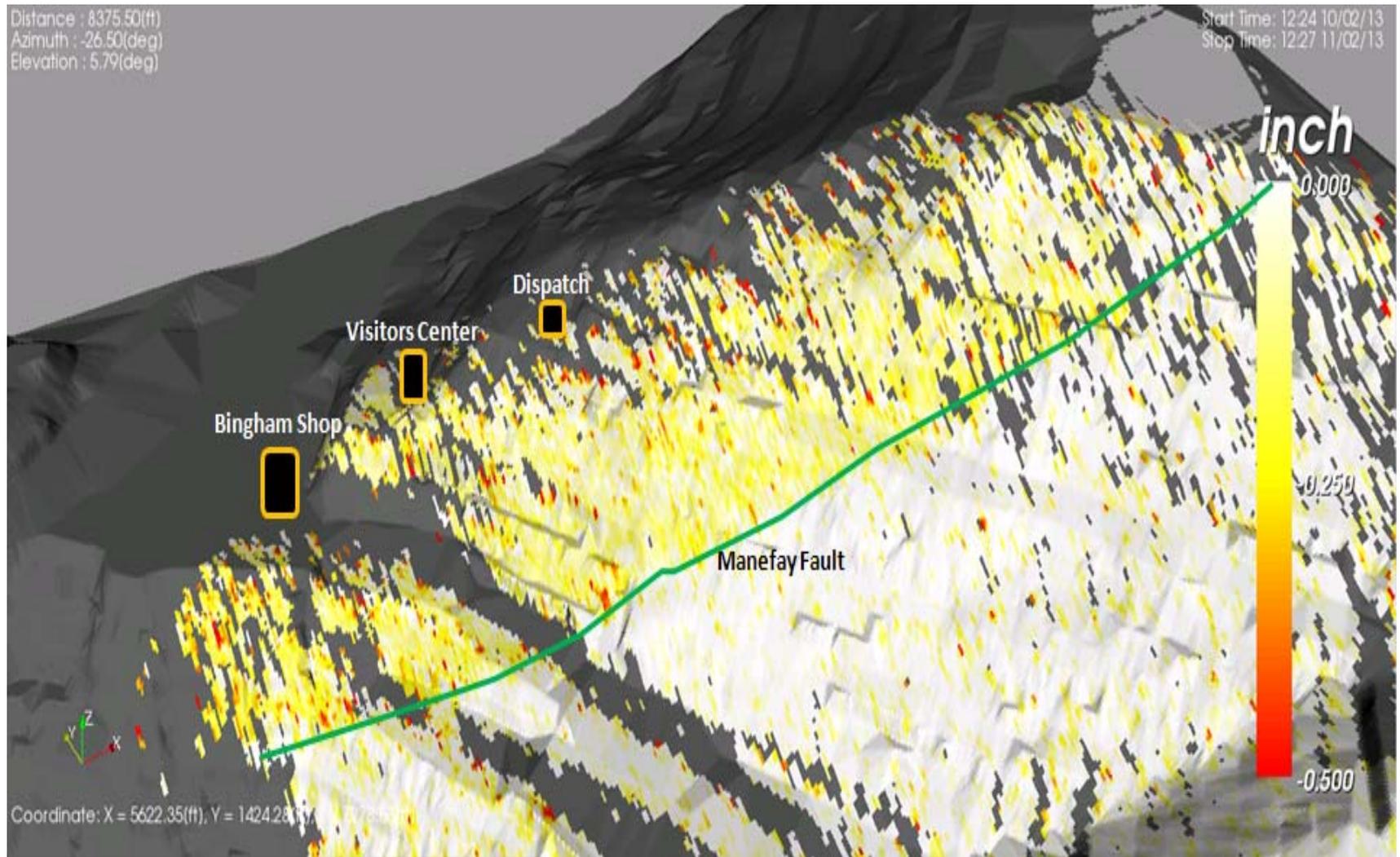
Nine layers of protection

The Geotechnical monitoring system at the Bingham Canyon Mine provides nine layers of safety, mitigating a potentially catastrophic event during Manefay slide



- 1) 800+ trained eyes everywhere
- 2) Routine documented inspections
- 3) IBIS slope stability radars
- 4) GroundProbe slope stability radars
- 5) 300+ Prism network and five RTS skyboxes
- 6) Time Domain Reflectometry
- 7) GPS Monitoring
- 8) Extensometers
- 9) Micro seismic array

IBIS radar Manefay data

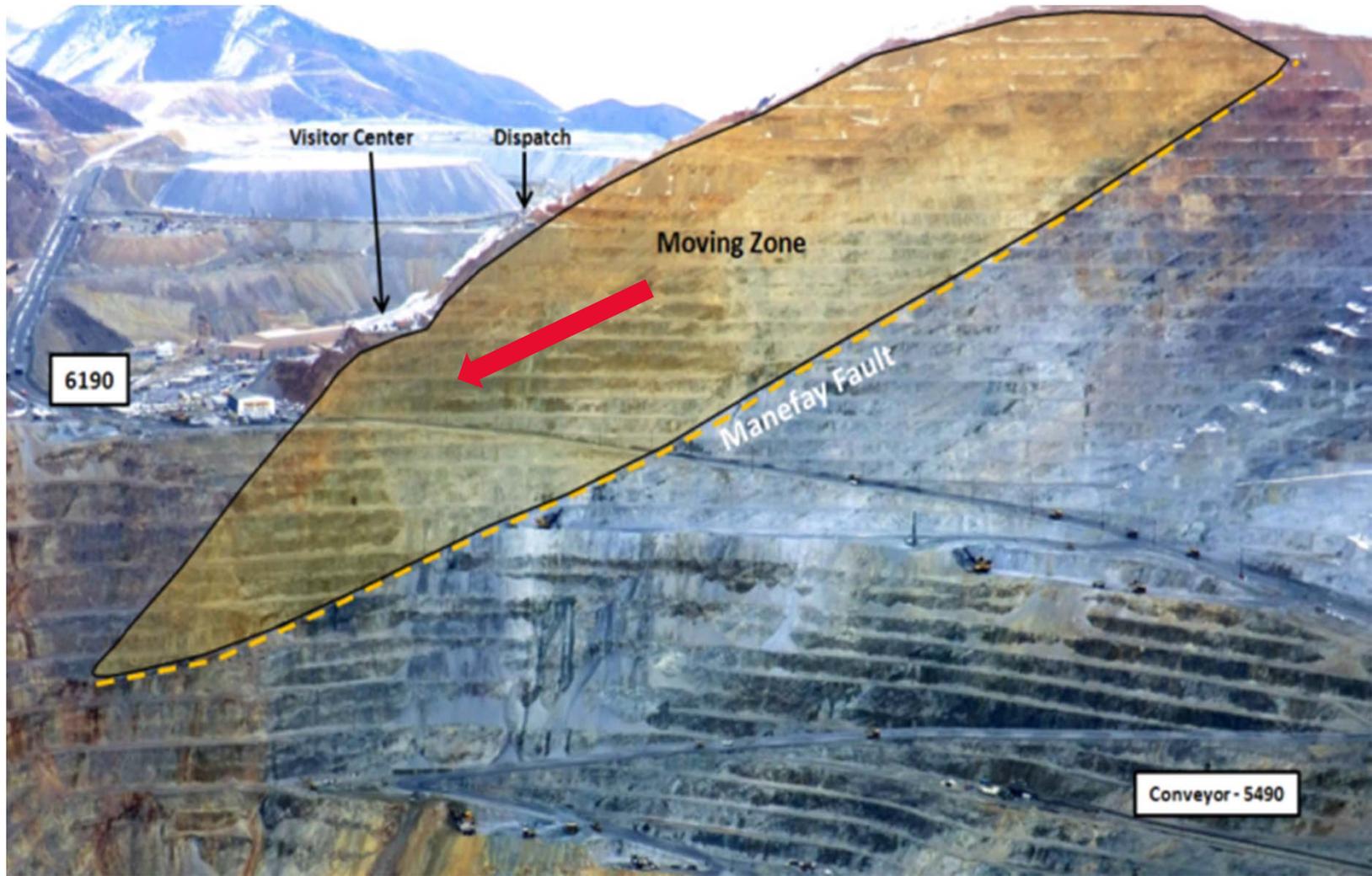


IBIS Radar Manefay Movement

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Pre-incident movement zone

Consolidated movement estimated to exceed 100 million tons



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Geotech Daily Manefay Status Update

Daily Manefay Status Update

Thursday, April 4, 2013

Current Manefay Response Level is GREEN

- Current 'Upper Manefay' overall movement rates are **0.50"/day**
- Current 'Lower Manefay' overall movement rates are **0.55"/day**
- Current Movement Trend: Steady

Daily Manefay Status Update

Friday, April 5, 2013

Current Manefay Response Level is YELLOW

- Current 'Upper Manefay' overall movement rates are **0.60"/day**
- Current 'Lower Manefay' overall movement rates are **0.60"/day**
- Current Movement Trend: Gradual acceleration with localized increased

Daily Manefay Status Update

Wednesday, April 10, 2013

Current Manefay Response Level is ORANGE

- Current 'Upper Manefay' overall movement rates are **2.6"/day**
- Current 'Lower Manefay' overall movement rates are **2.6"/day**
- Current Movement Trend: Increasing acceleration with localized rockfall
- Actions Required:
 - Close the upper 10% to all traffic
 - Evacuate the lower pit and suspend mining until further notice
 - Close the mine access road from the notch to 6190
 - Route essential traffic through the 4H road
 - Maintain spotters and sentries at key locations
 - Prioritize activities in alignment with Orange response

ons
ment with Yellow response
any changes in slope conditions to
10%

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Infrastructure Relocation



Building Relocation



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Available Assets



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Keystone Access



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Keystone Access

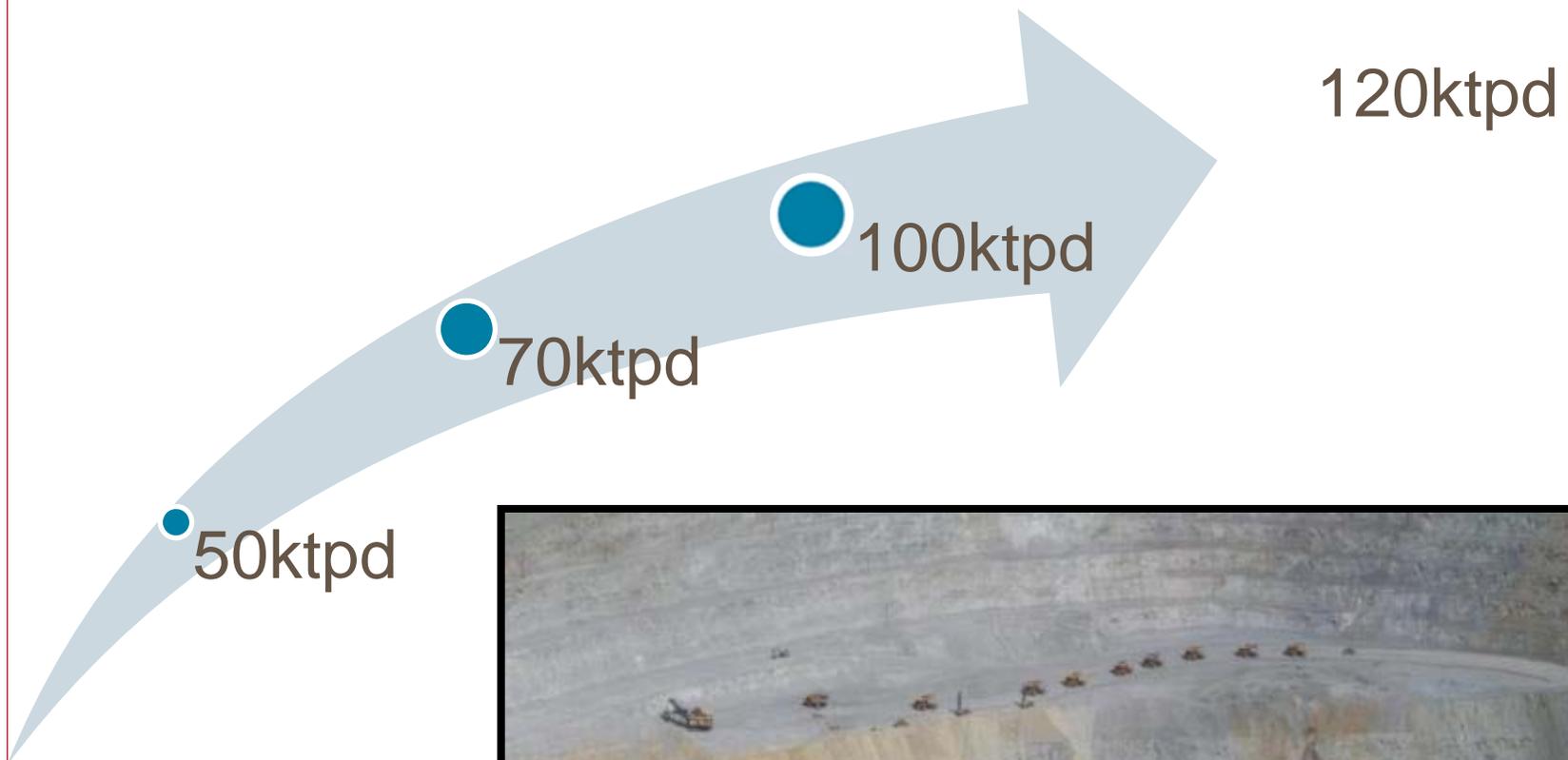


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Daily Average Exceeded



Producing Beyond Historical Rates



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Equipment Delivery

Support from our partners was critical to our success

Total Equipment

Haul Trucks	20
Dozers	38
Drills	4
Excavators	15
Loaders	3
Shovels	2
Remote Systems	25

Manufactures and Suppliers

- Caterpillar
- Komatsu
- Joy Global (P&H)
- Hitachi
- Atlas Copco
- Sandvik
- Arnold Equipment
- TORC Robotics
- ASI
- Remote Control Technologies

Hitachi EX5600 Hydraulic Shovel Build



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Hitachi Shovel Build Completed



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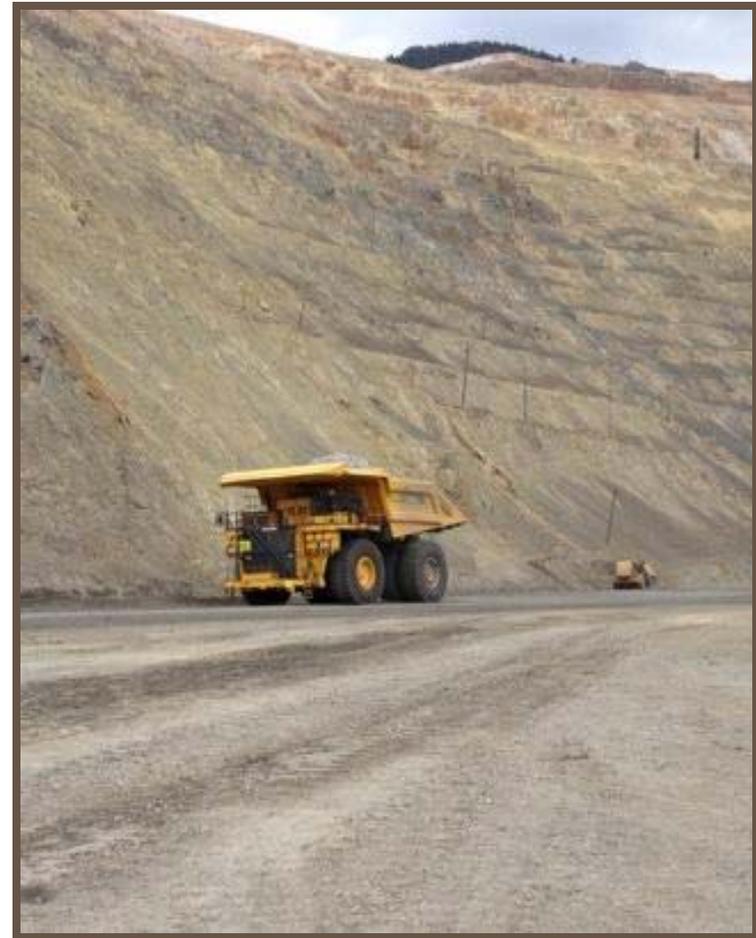
Komatsu 930 SE Trucks in Pit Bottom



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Komatsu 930 SE Truck Milestones

- First truck commissioned – June 30th
- First truck in pit bottom - July 26th
- Fourth truck in pit bottom - August 15th
- 20th truck commissioned - October 31st



First new 930 SE Truck in Pit Bottom

Remediation Work

+400ft Vertical Scarps

Remaining Rock mass
on slide plane – Poss.
Of 20Mt failure

Truck Shop Destroyed

Pit Access Road
Destroyed +1500ft

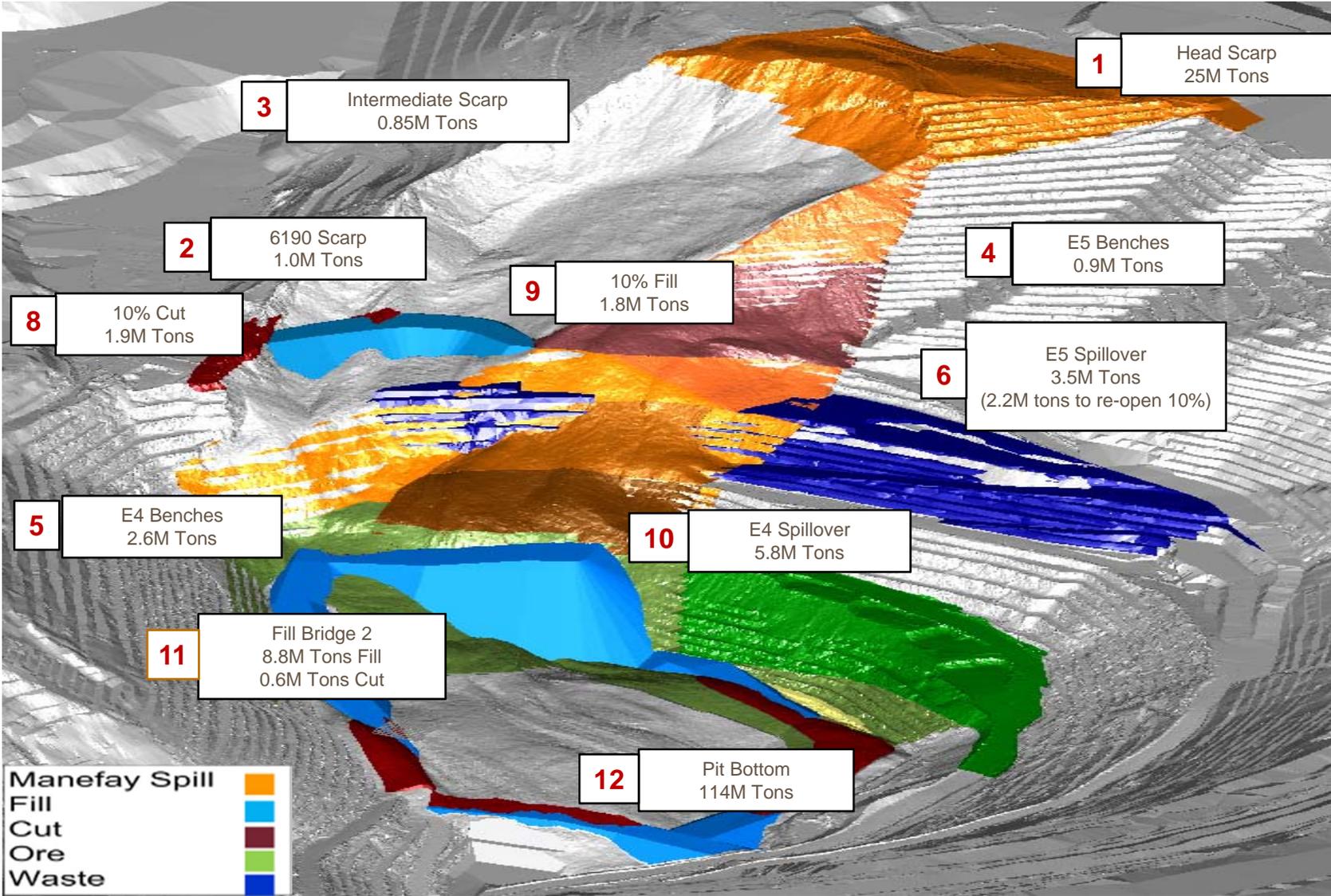
More than 2000
vertical feet of covered
benches

Bottom of pit covered
+300ft deep



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Slide Remediation Workstreams



Remediation Timeline

Next Ore Team Time Line		5/13	6/13	7/13	8/13	9/13	10/13	11/13	12/13
<u>Original Plan vs. Actual</u>	Head Scarp	Yellow	Yellow	Yellow	Yellow	Red	Red	Red	
	Bingham Shop Removal		Yellow						
	Intermediate Scarp		Yellow	Yellow	Red				
	6190 Scarp		Yellow	Yellow	Red				
	E5 Bench Cleanup		Yellow	Yellow	Red				
	10% Ramp Cut				Yellow	Red			
	10% Ramp Fill					Yellow	Red		
	Mine In 10%						Yellow		
	Fill Bridge 2				Yellow	Yellow	Red	Red	
	E5 Trim				Yellow				
	E4 Cleaning					Yellow	Yellow	Yellow	
	E5 Mining							Yellow	Yellow
	E4 Mining (Next Ore)							Yellow	Yellow
			Plan	Yellow		Actual	Red		

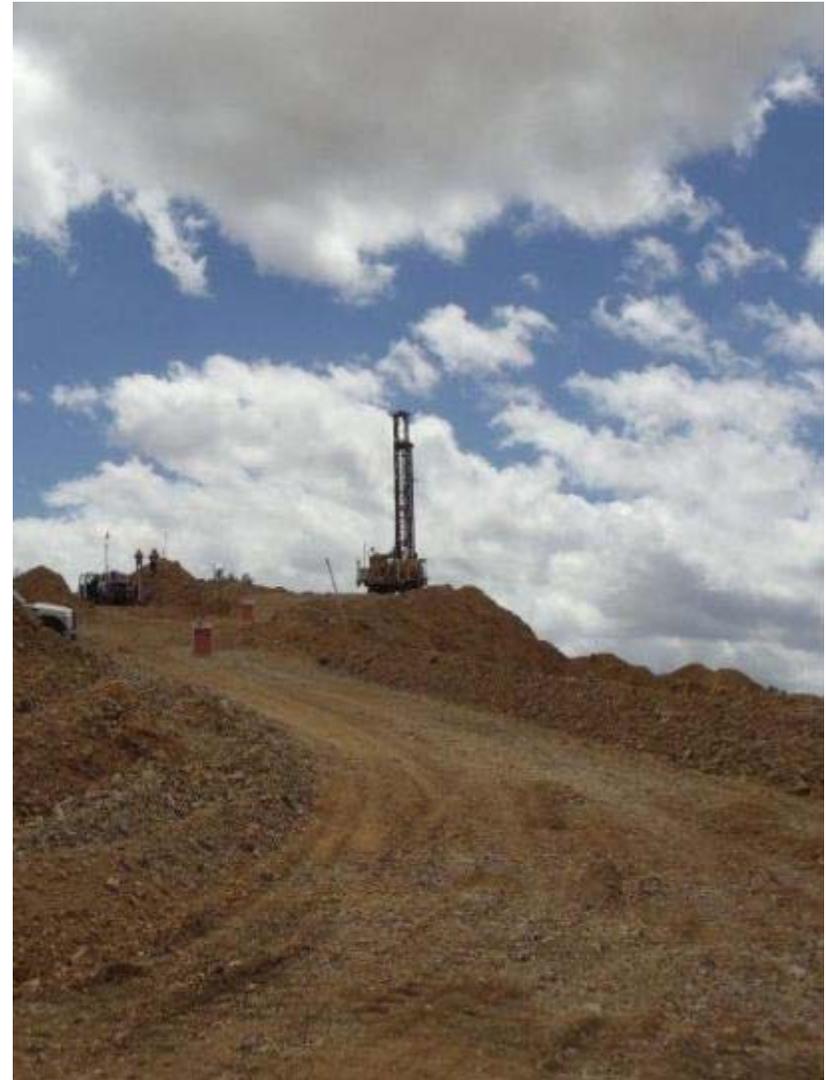


Head Scarp Mining – May 2013



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Autonomous Drilling



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Remote and Manned Equipment Working Together



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Head Scarp Mining – September 2013



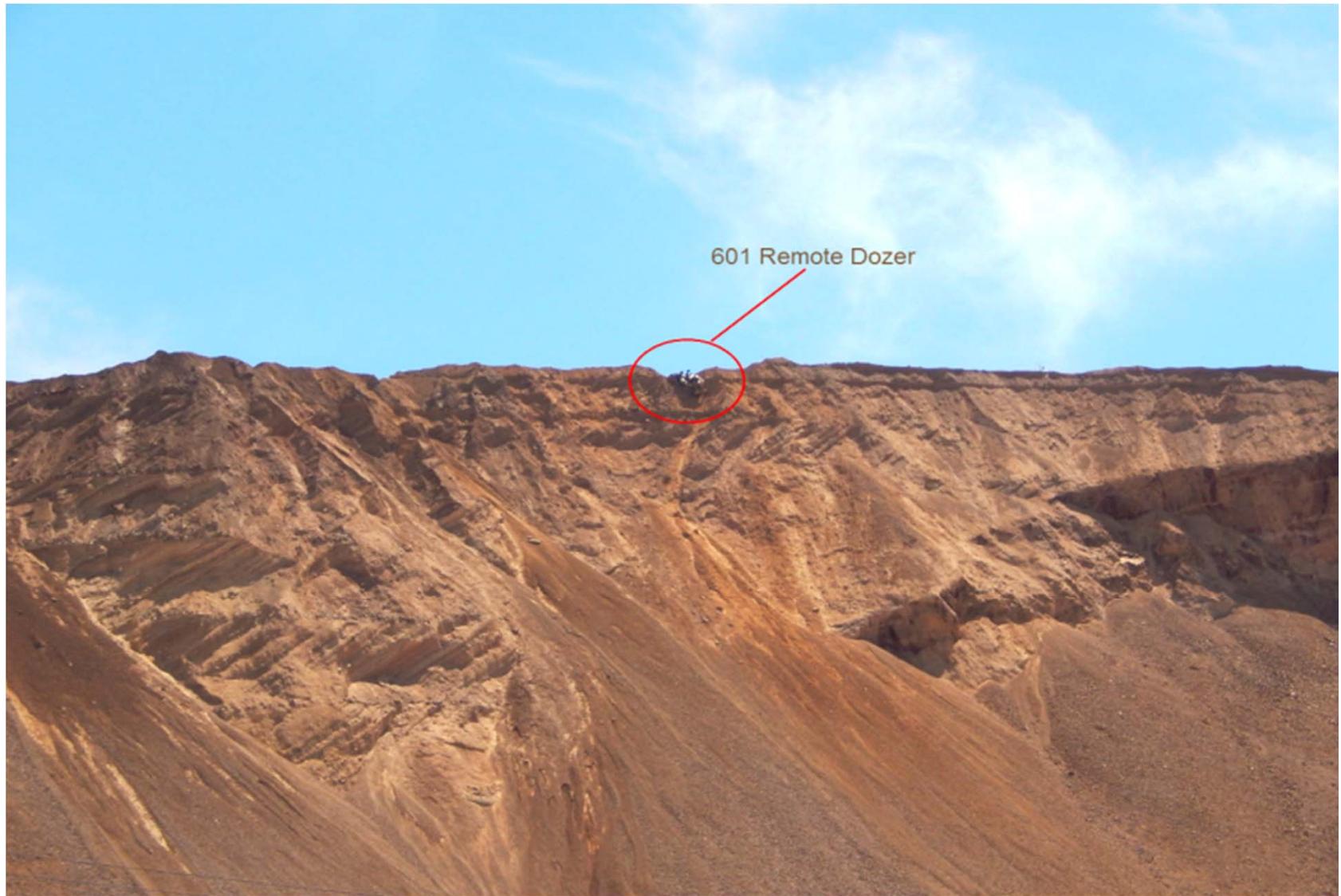
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Head Scarp Completion – November 2013



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Remote Dozer Recovery



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Remote Dozer Recovery



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Bingham Shop Removal



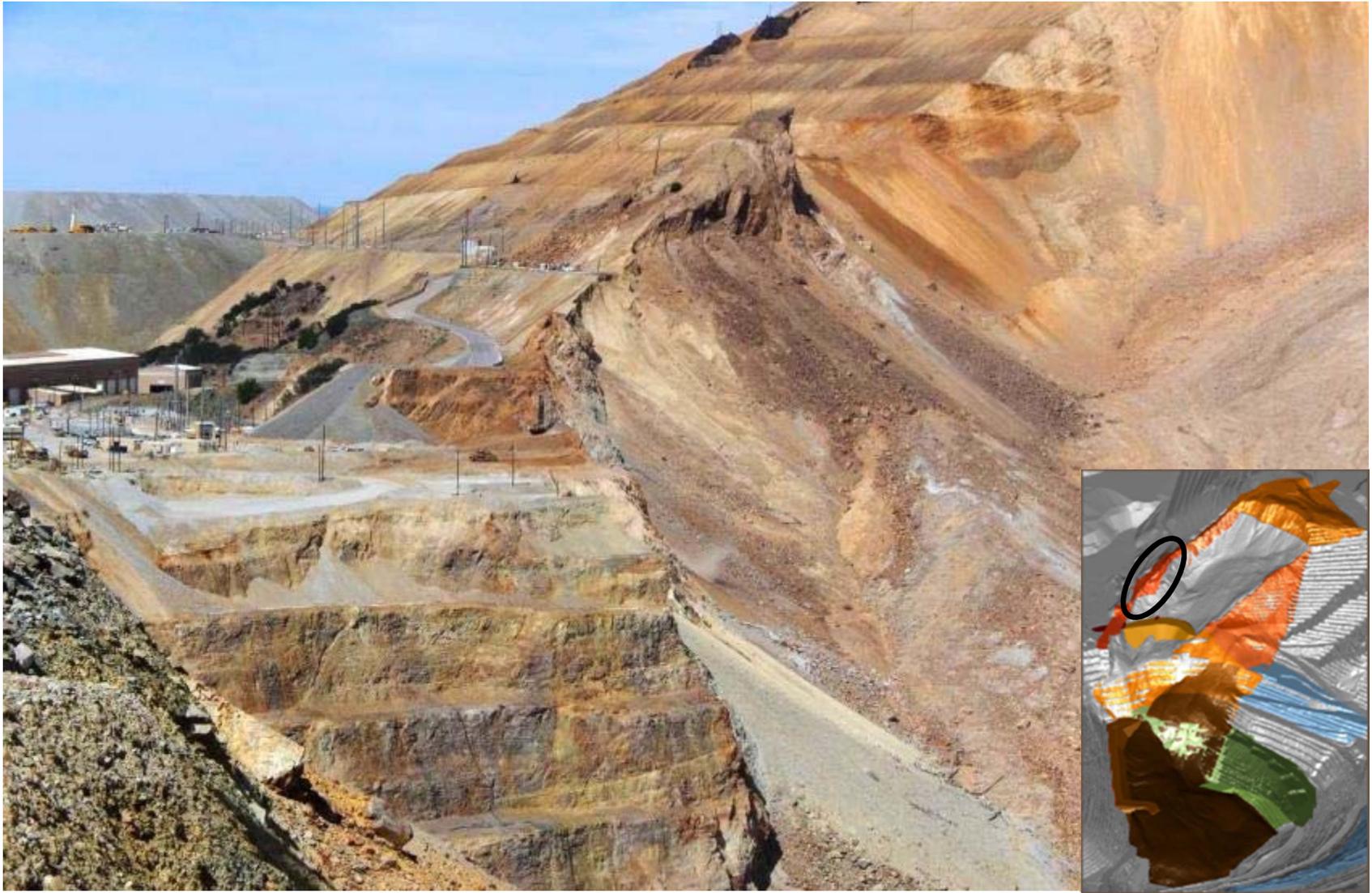
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Bingham Shop Removal With Remote Excavator



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6690 Knob Remediation



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6690 Knob Remediation



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6690 Knob Remediation



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6690 Knob Completion



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E5 Bench Cleaning



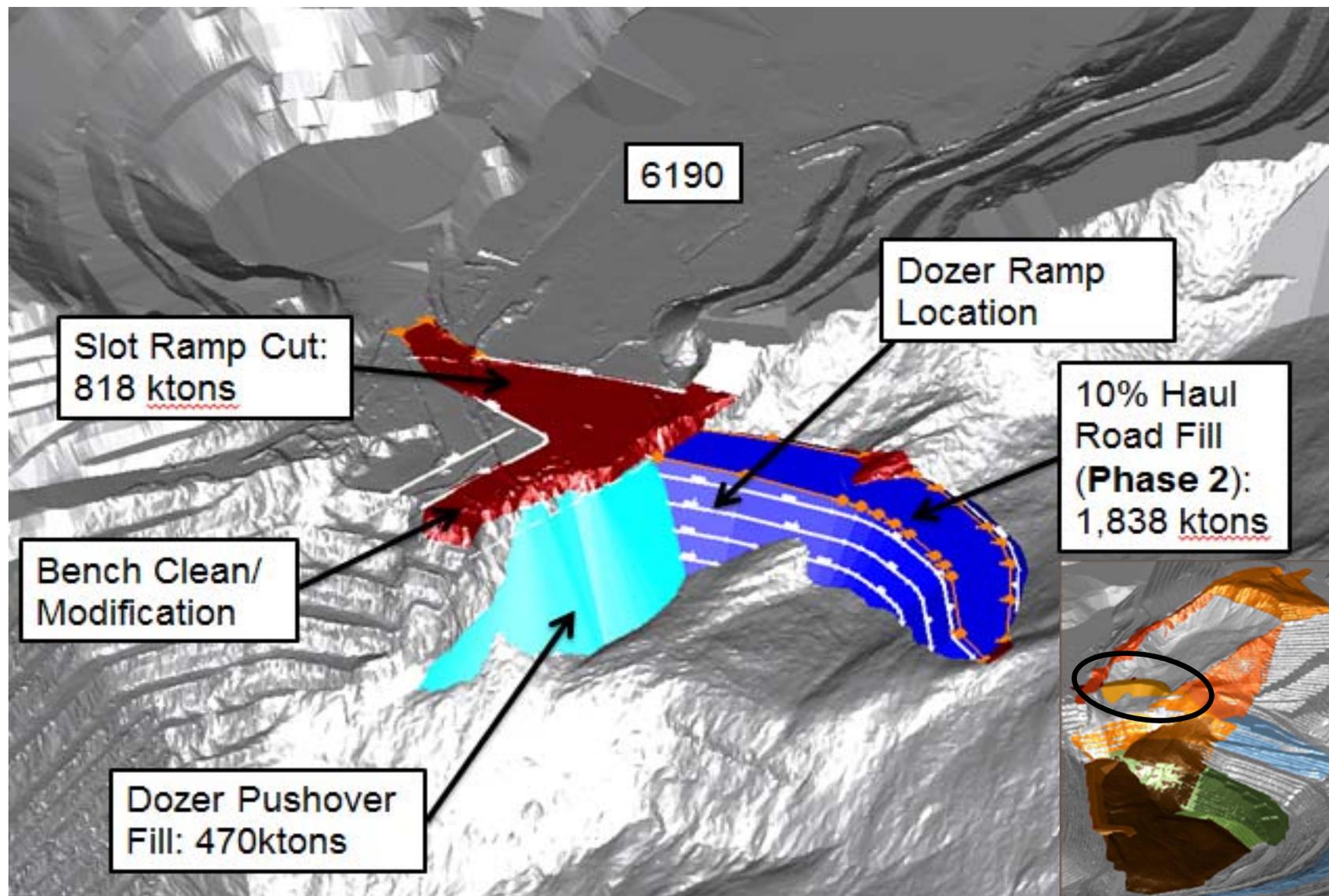
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E5 Bench Cleaning Completion



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New Pit Access Road Design



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New Pit Access Road Construction



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New Pit Access Road Mining



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Uncovering E4 North



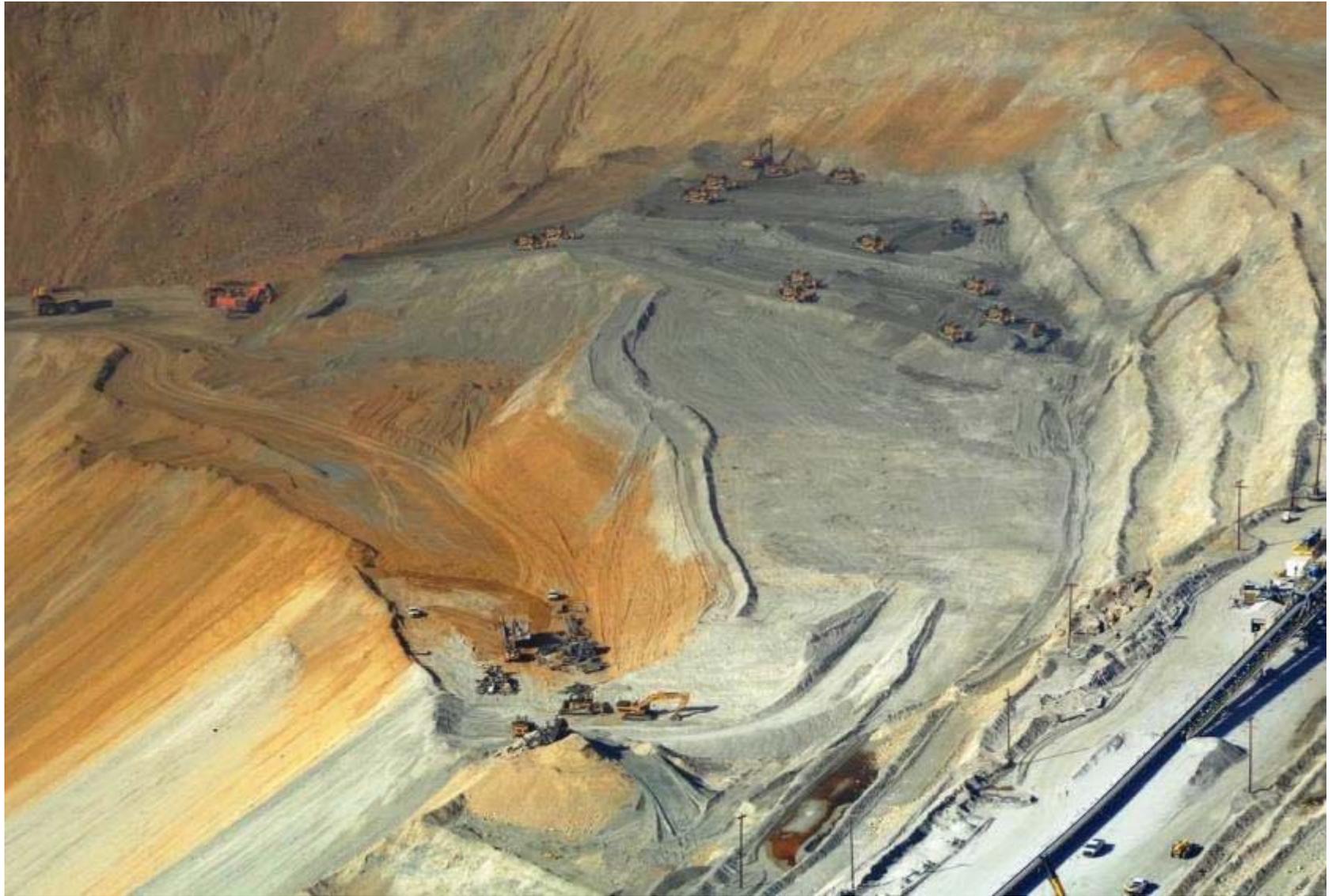
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Fill Bridge Road and E4 North



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E4 North Mining – Nov. 2013



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E4 North Mining – Jan. 2014



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Delivered Ahead of Schedule and Without Injury!



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Kennecott Utah Copper Rising To The Occasion!



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