

3D Scanning – From Concept to Reality

Presented by: Alta Mine Services
Michigan Aggregates Annual Meeting 2024

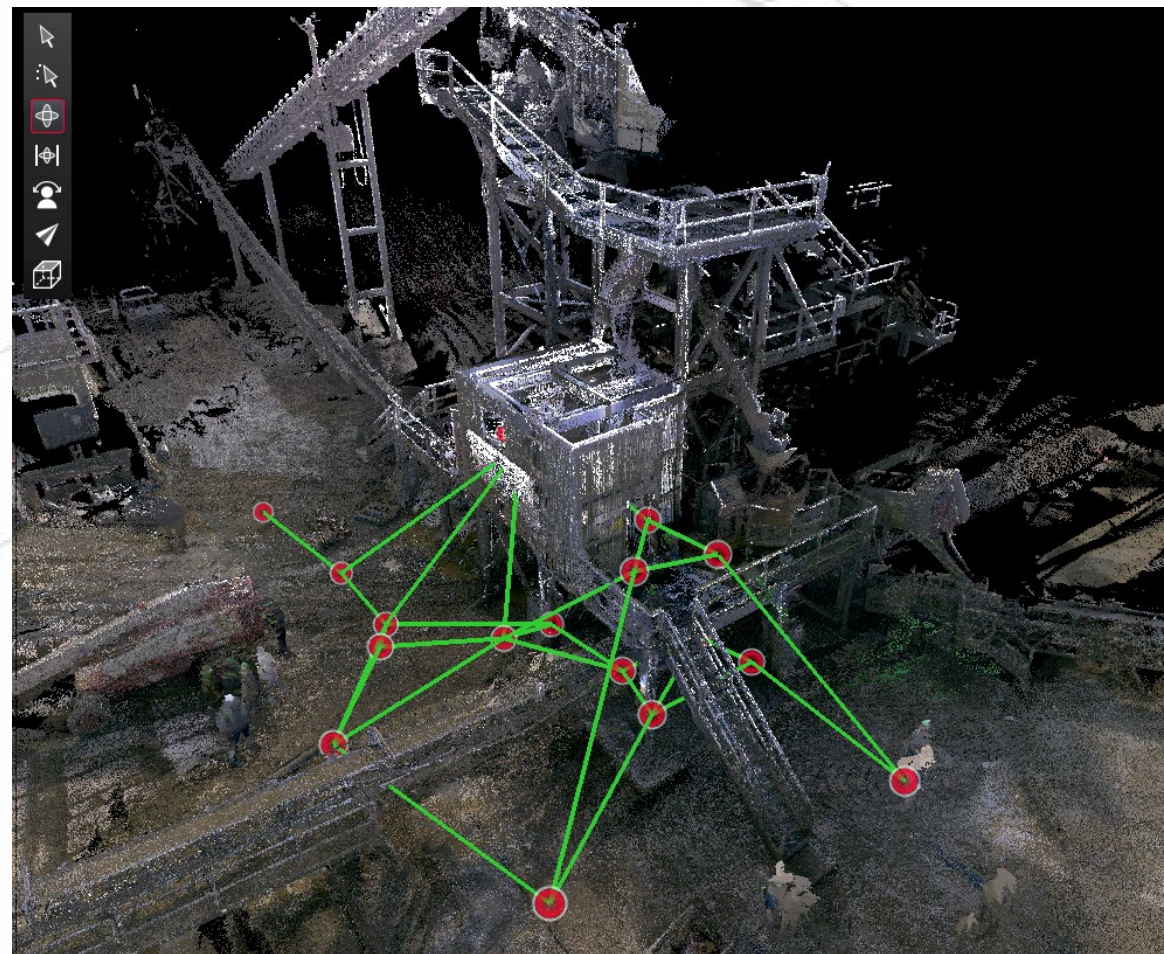
MEET THE TEAM

- Tim Meighan
 - Mining Engineer, Midwest Mine Services
 - 10+ years industry experience
- Bob Keaton III
 - General Manager, Midwest Mine Services
 - 15+ years industry experience



3D SCANNING – What is it?

- A quick, highly accurate way to measure our surroundings
 - Millions of data points acquired through the use of reflective laser
 - Data points are linked through common features to stitch together a model
 - Produces a point cloud, panoramic picture, and can even measure for temperature differentials
 - Model is capable of being viewed, measured from, rotated around, etc.



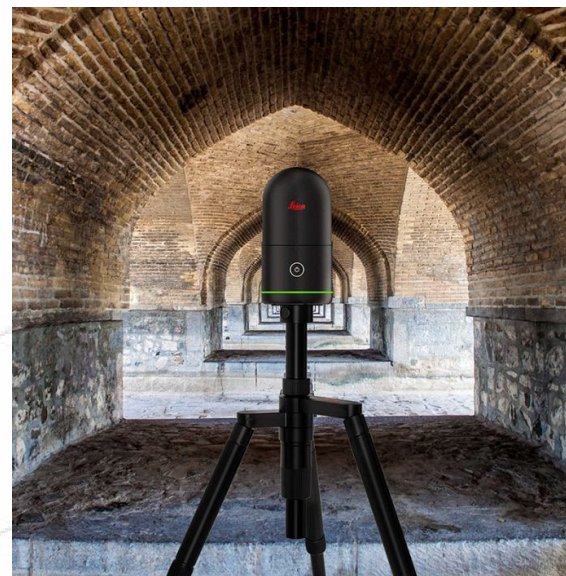
3D SCANNING – Industry Uses

- Civil Engineering and Architectural Firms
- Agricultural, Forestry, etc.
- Mapping
- Forensic Investigations
- Automotive
- Historians
- Medical



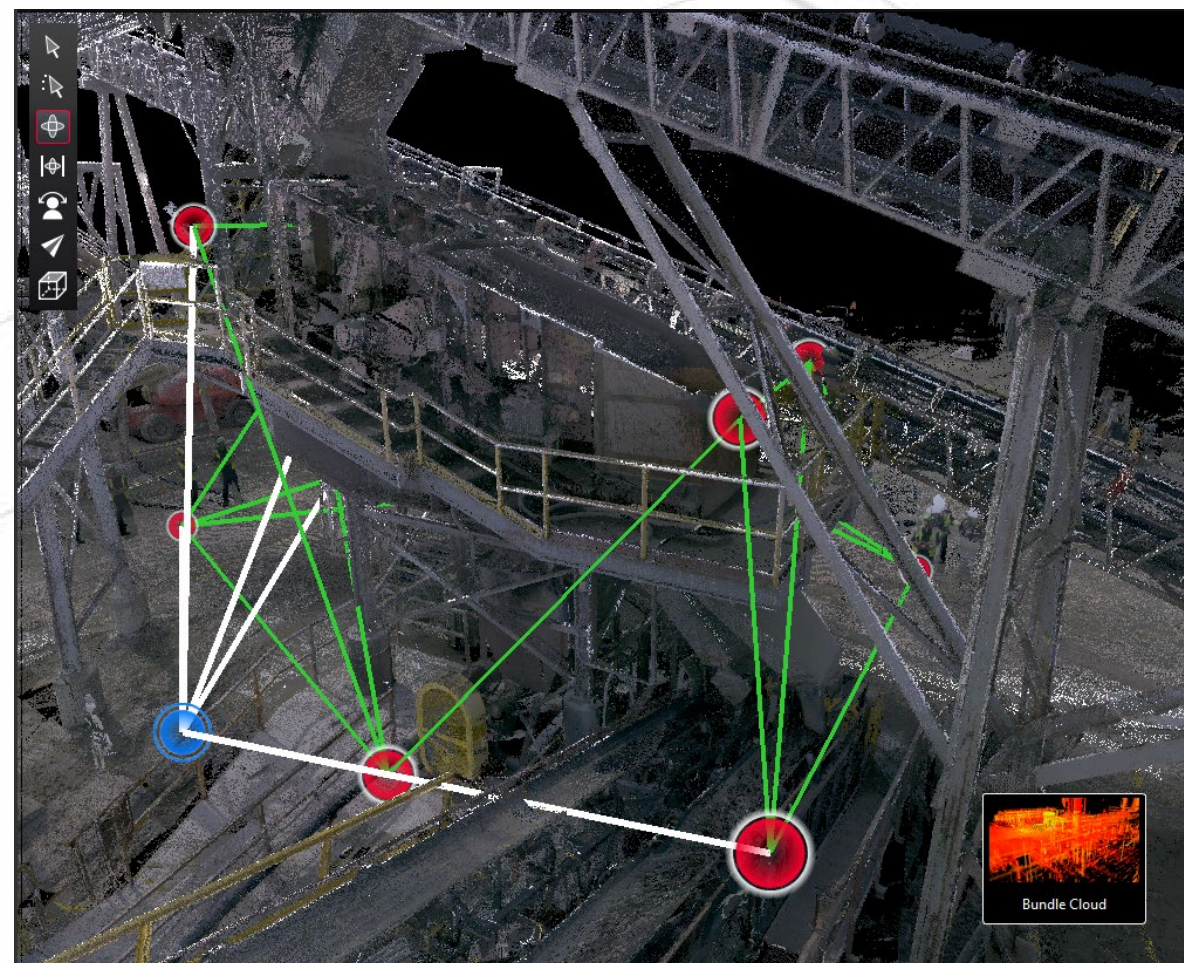
3D SCANNING – How do we do it?

- Typically a single day, onsite visit
 - Multiple ways to acquire these data points:
 - Drone mapping
 - Handheld laser scanners
 - Tripod mounted laser scanners ←
 - Even continuous 24/7 monitoring – Surveillance
 - To date, we've scanned over 125 separate projects



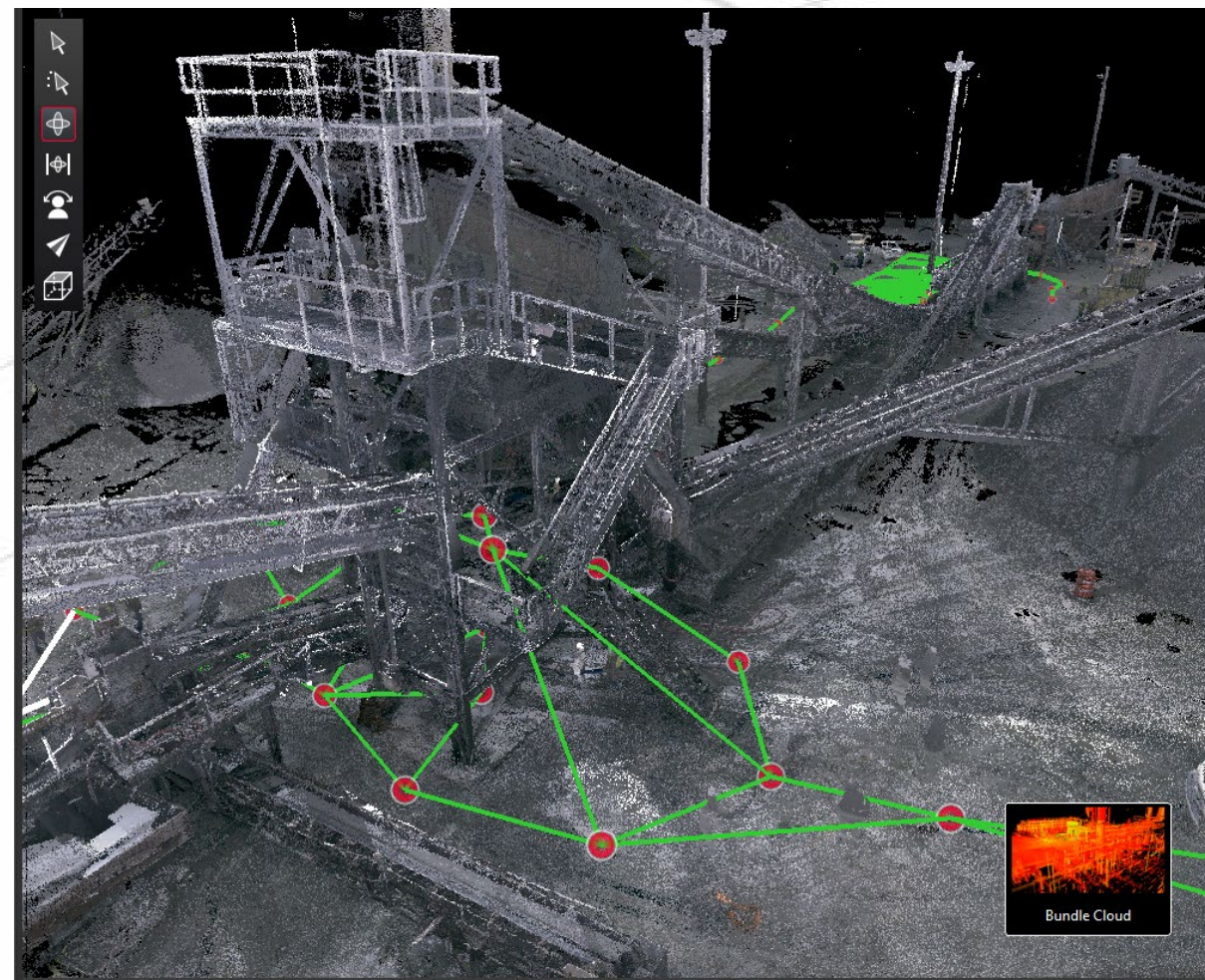
3D SCANNING – Tripod Mounted Laser Scanning

- Tripod is set up and leveled, approx. 20 ft away from object to be surveyed
- Scan begins, typical scan time is 3 to 4 minutes per setup
- Each scan must be able to “see” a previous scan point.
 - Closer the points are, the more accurate the scan image is. We typically space about 10 ft apart
- As each scan is completed, the scans are linked to each other providing a map of the subject area
- Scan image capable of being viewed on a tablet as it progresses to ensure all desired features are captured



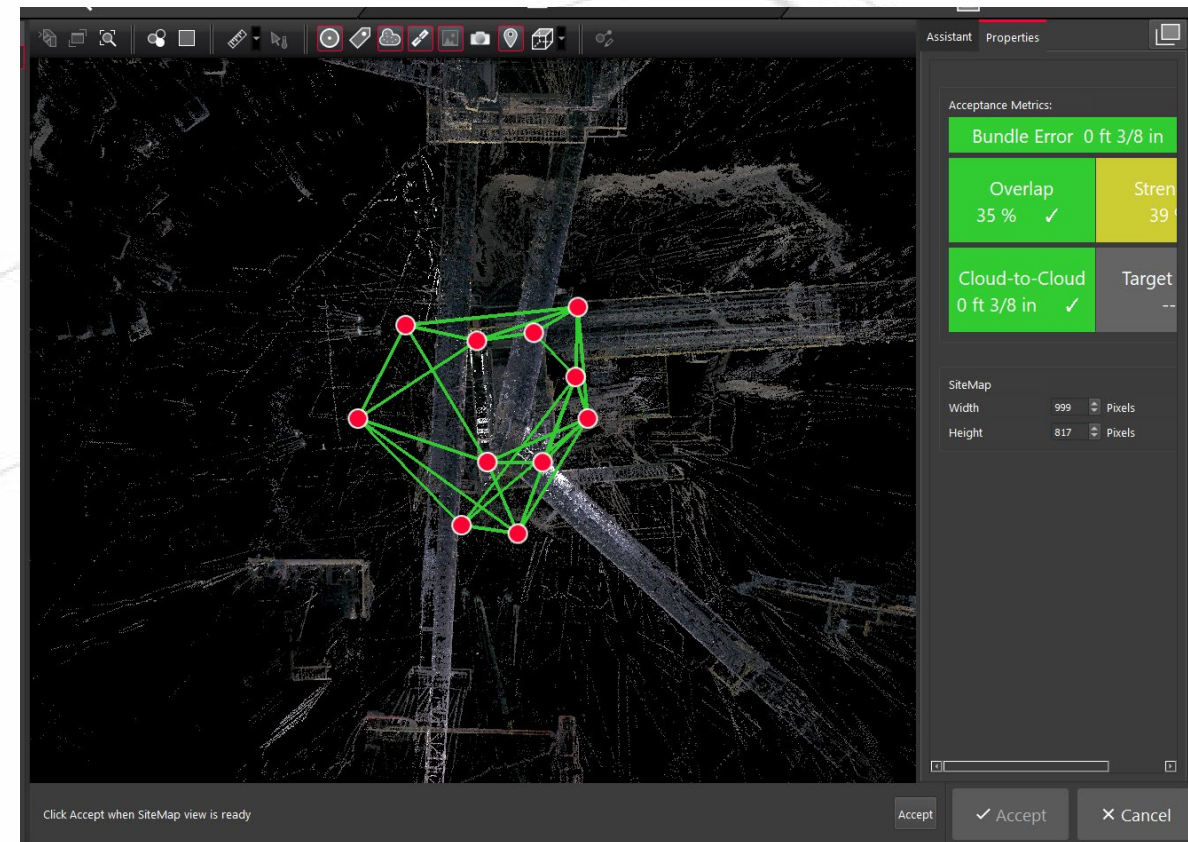
3D SCANNING – How do we do it?

- If the feature to be surveyed is multiple levels:
 - Use a manlift if stable (ex. Low wind) to elevate the scans
 - Use staircases as ways to link floors
 - LOTO equipment and set up directly on it
 - Use of drones



3D SCANNING – After field scanning

- Once a scan is complete, we will download this data to an integration software
 - This software optimizes the data and consolidates the scans into a single project
 - This project features a point cloud that is able to be:
 - Modeled (use in designs)
 - Measured (accuracies to within ¼")
 - Presented (high definition pictures)



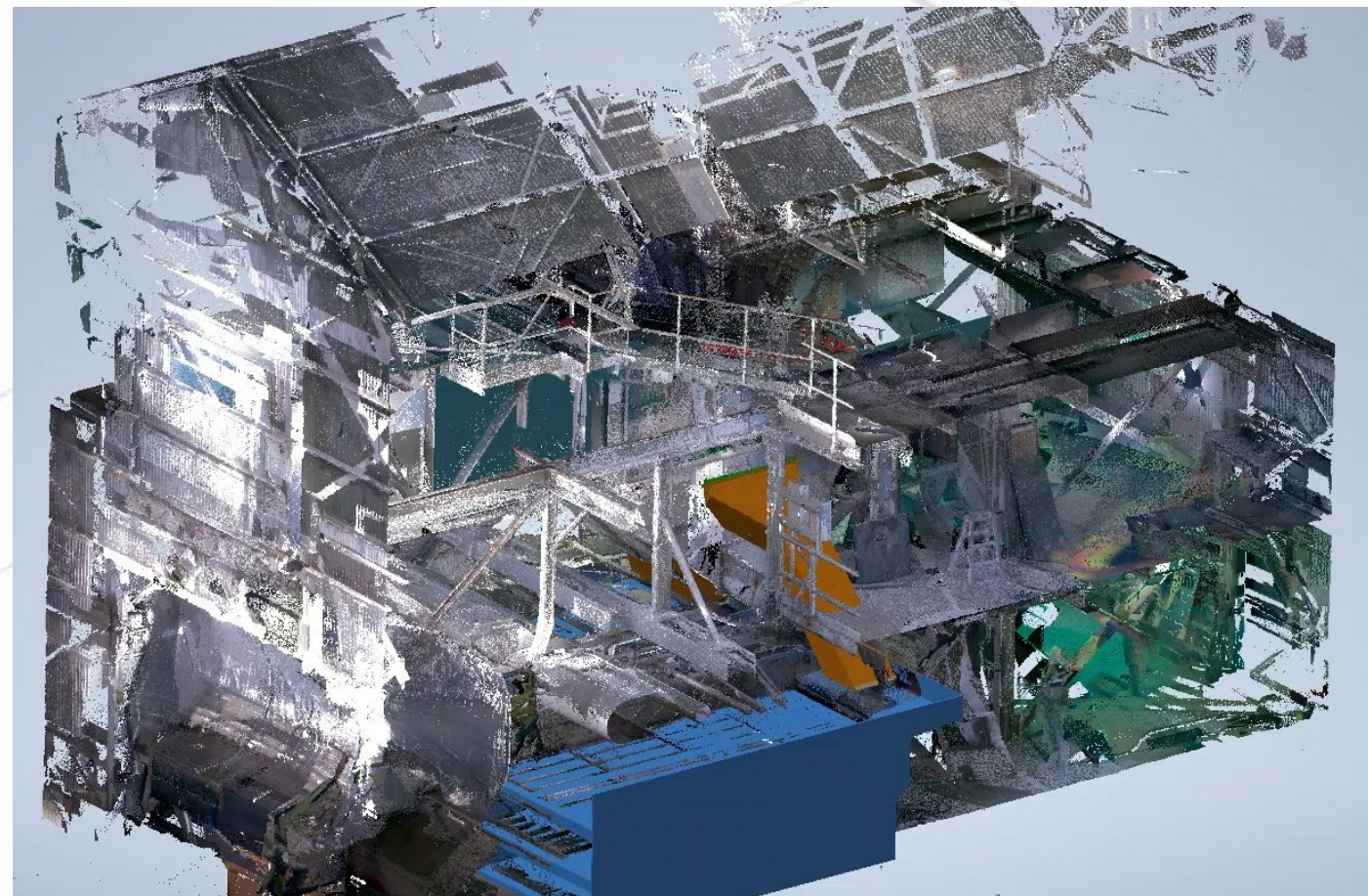
3D SCANNING – What do we use it for?

- Chute and structure design
 - Able to see interferences, complex designs that would be impossible to measure by hand
- Data gathering
 - Measuring for quote purposes such as relining chutes, conveyor designs, etc.
- Quote Presentations
 - Complete plant designs
- Feasibility analyses
 - Ex. Equipment retrofits
- Troubleshooting
 - Ex. Conveyor alignment issues
- Surveying



3D SCANNING – Example of Chute Design

- Example:
 - Chutes within a mill underneath a series of wash screens
 - Required to reline chutes, however the outer skin of the chute work was compromised
 - Complex angles, flow issues onto wash screens
 - Limited completion time:
 - 2 weeks to design, fabricate and install



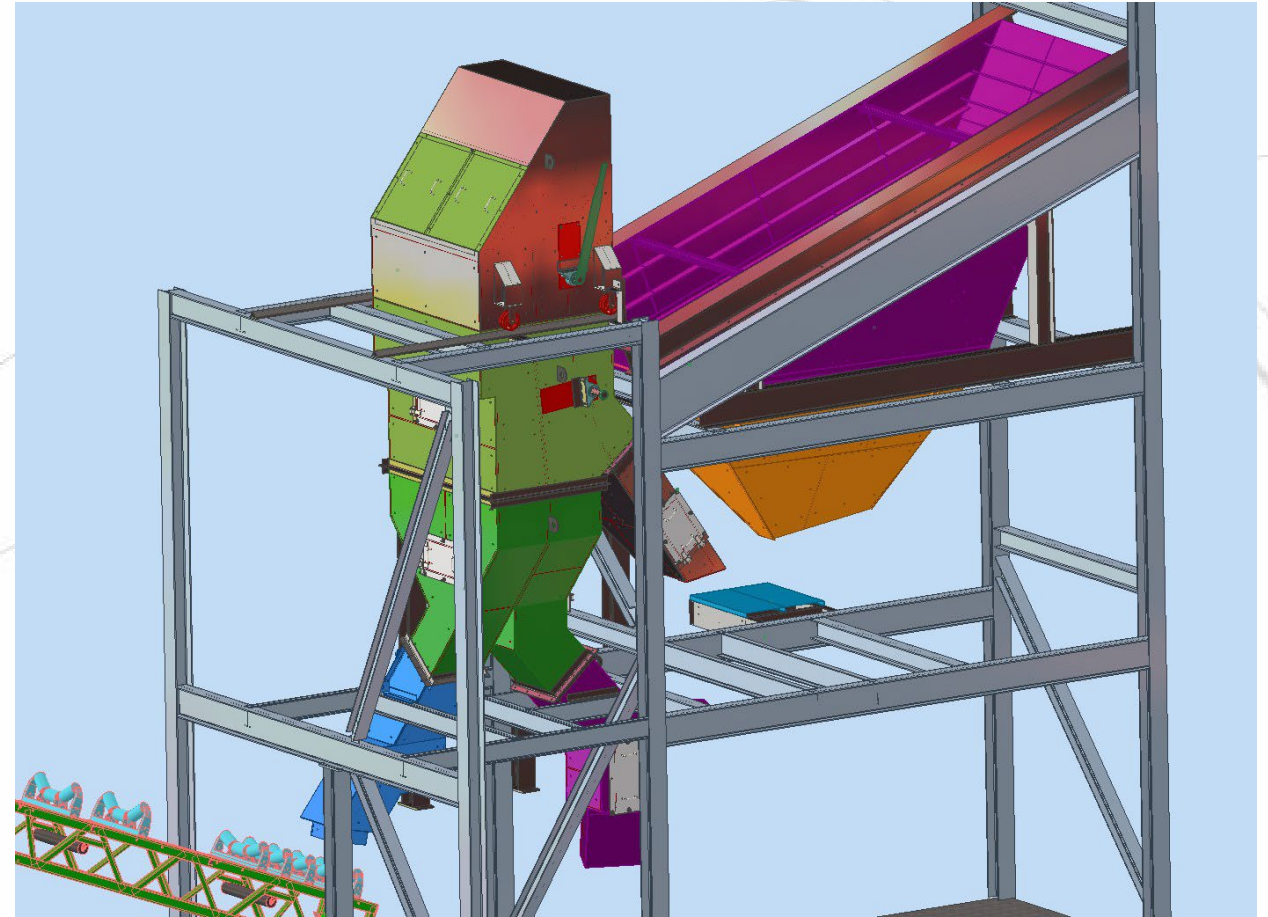
3D SCANNING – Example of Chute Design

- Example:
 - 8' x 20' Triple Deck Incline Screen Structure
 - Replacing:
 - Fines hopper (under screen)
 - Trunk Chutes
 - Rollaways
 - Flop gates
 - Utilizing existing structure

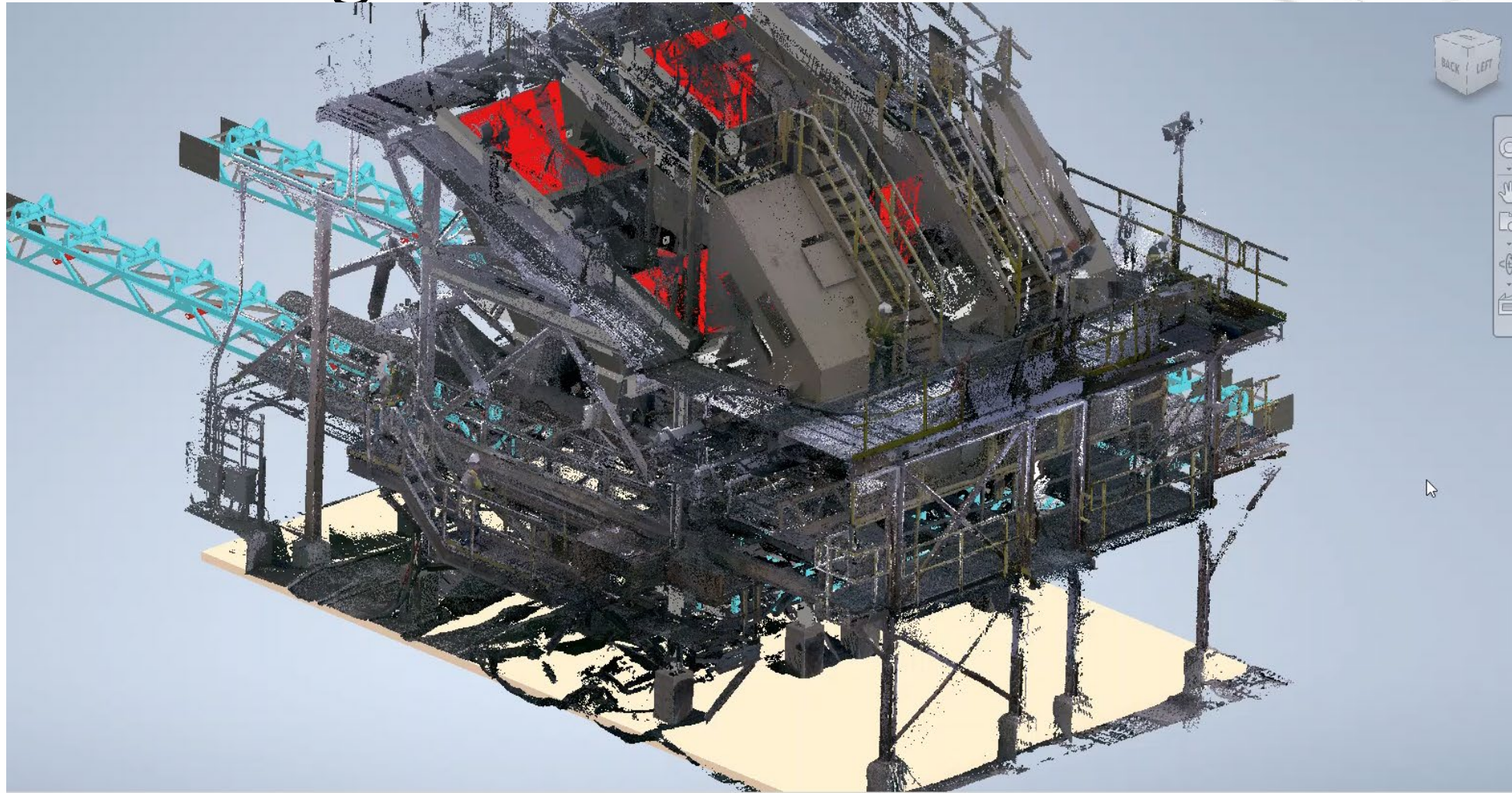


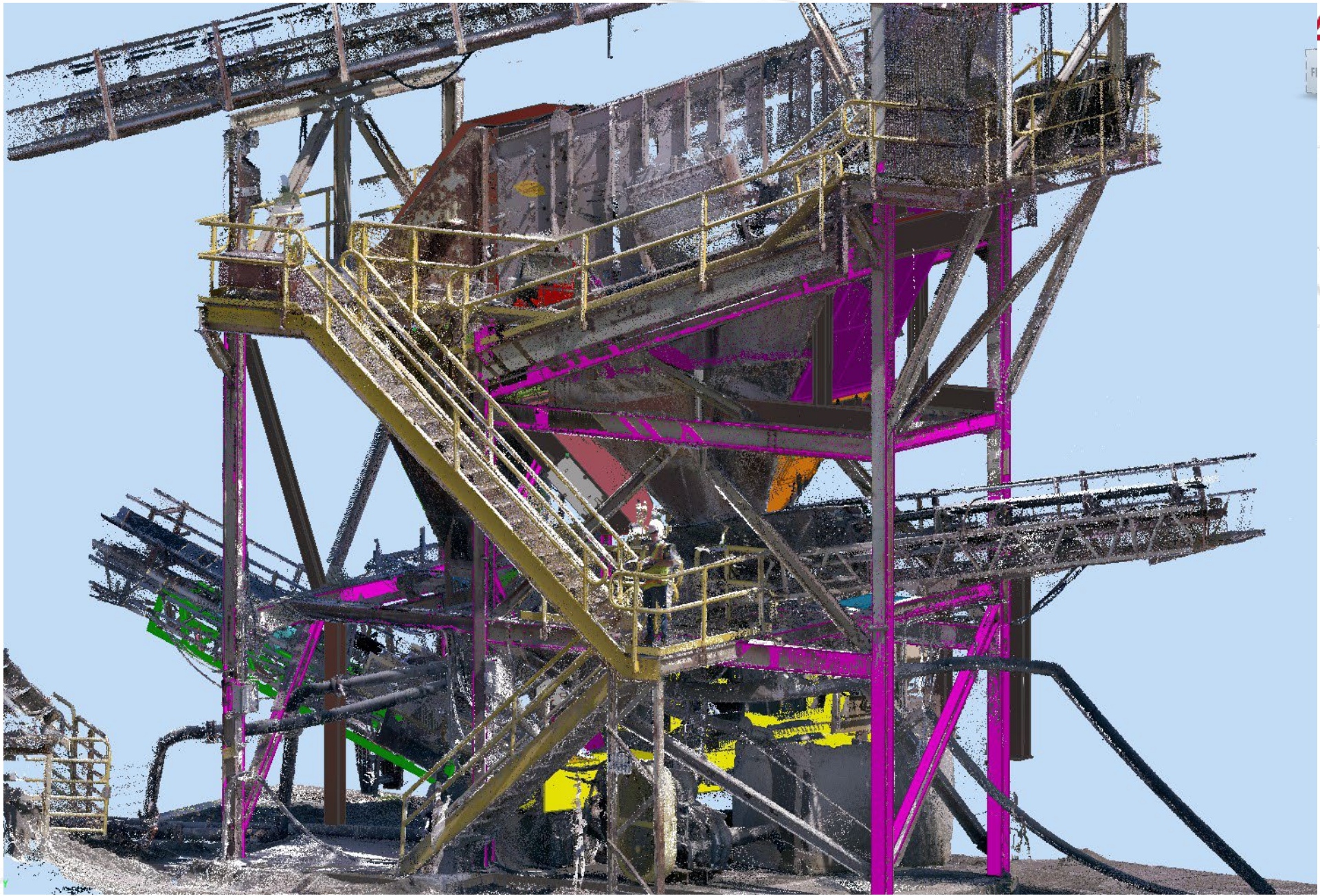
3D SCANNING – Example of Chute Design

- Our engineers drew in the existing steel work (what is shown in grey to the right)
- Measurements were obtained through the scan data to determine beam sizes, lengths, etc.
- Next the chute work was designed and inserted into the model. This model was then placed into the 3D scan to present to the customer...

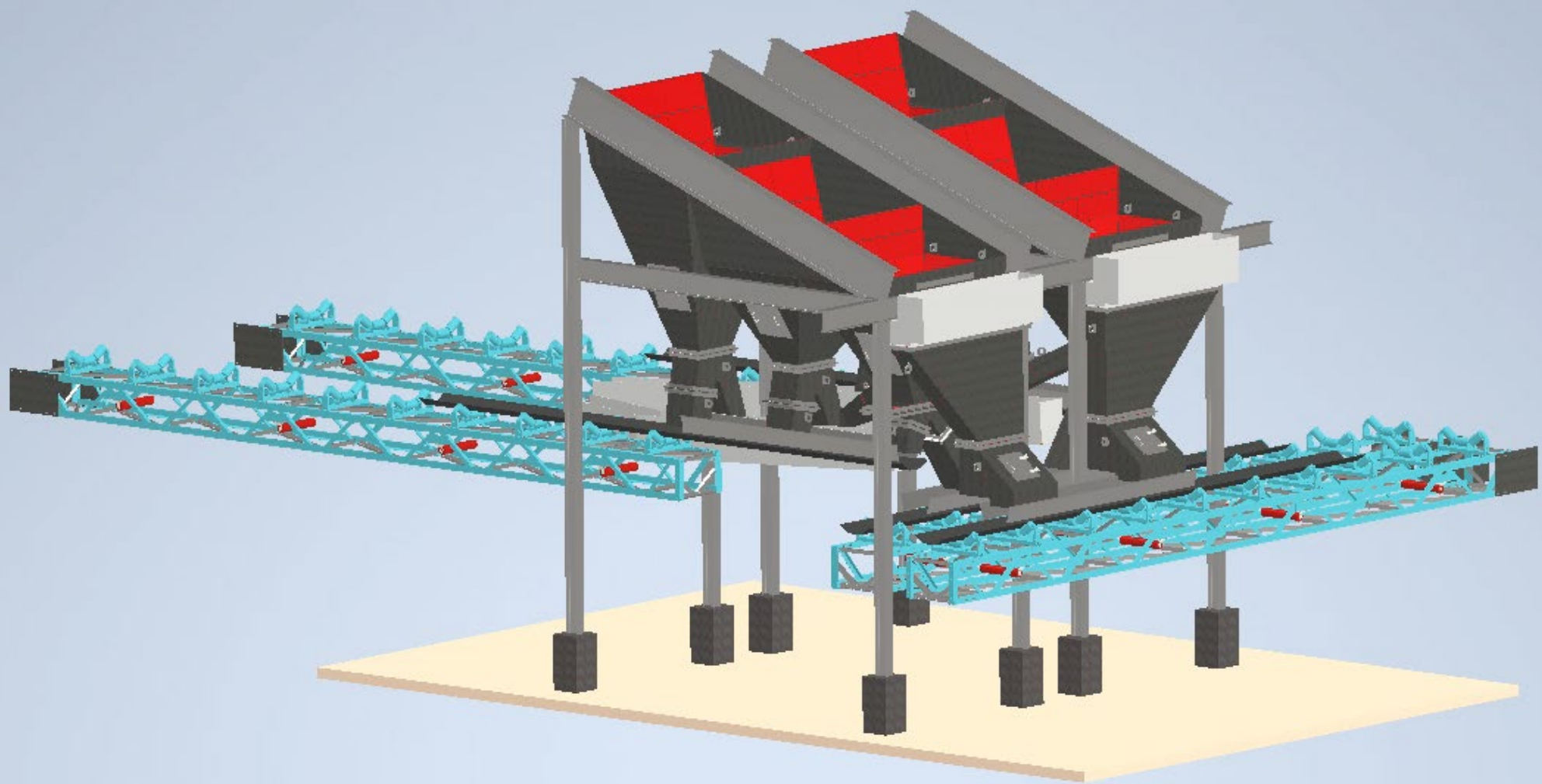


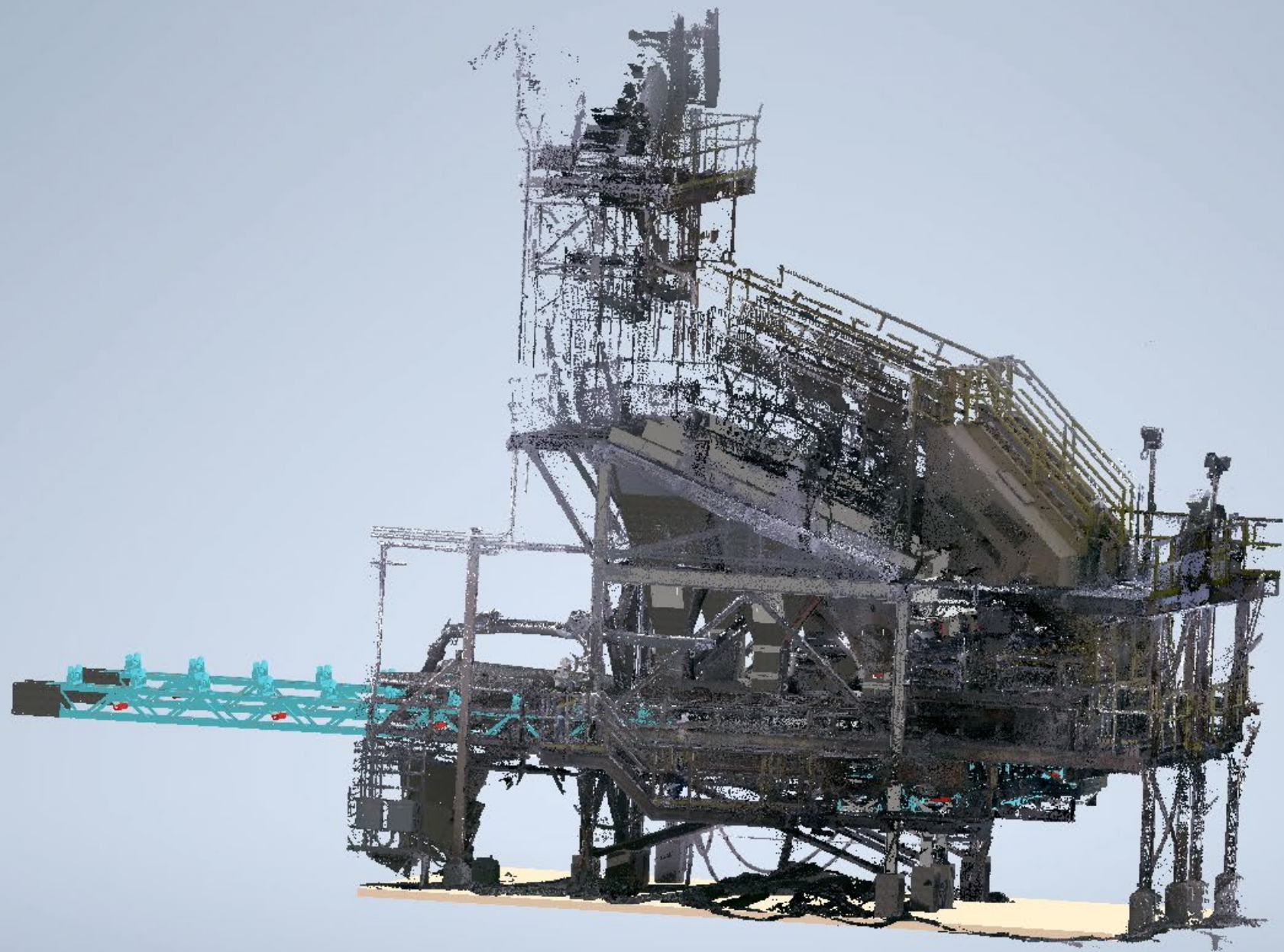
3D Scanning - Quote Presentations





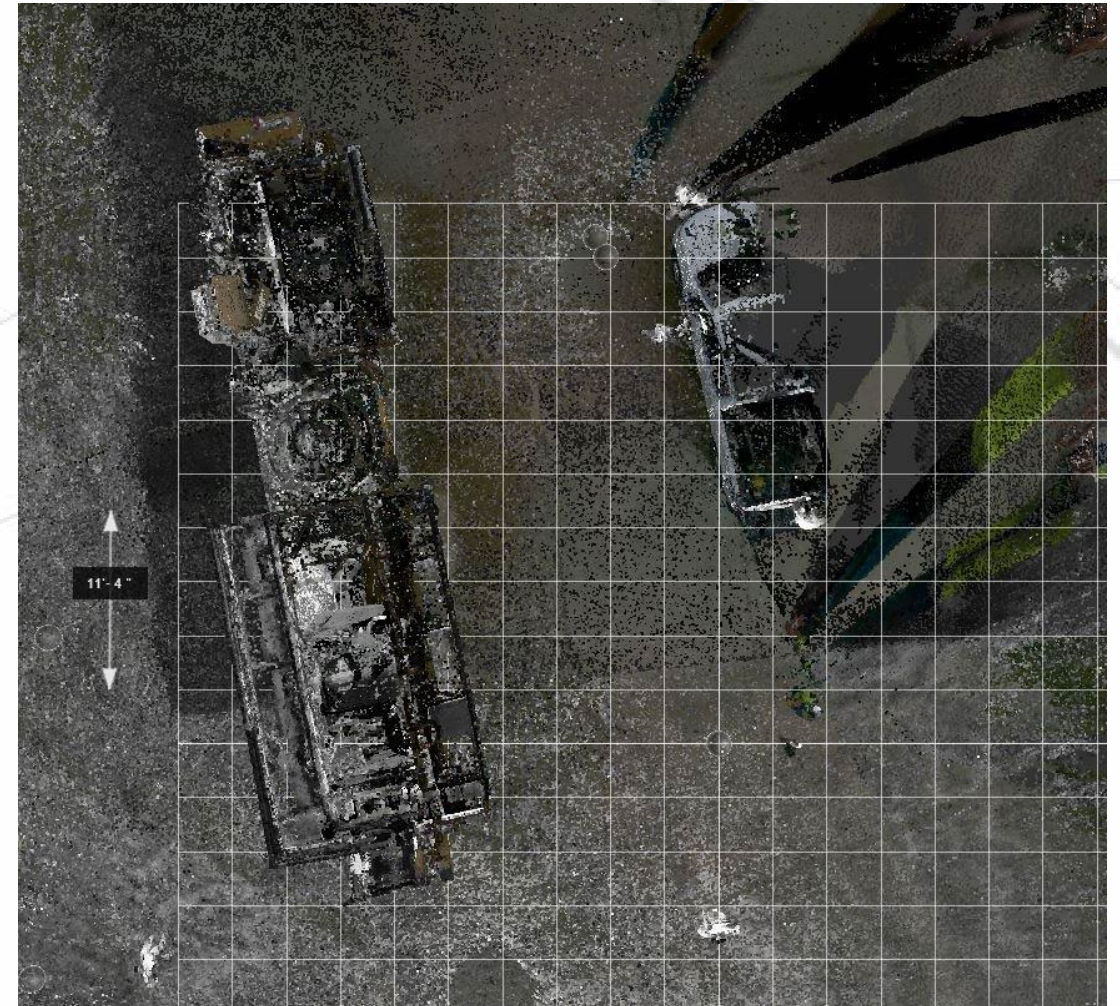
UPTIME MATTERS





3D SCANNING – Data Gathering

- Measuring existing equipment for quotation purposes and conceptual layouts
- After scanning of the area, measurements can be pulled to any feature that is visible
- Measurements can be highly accurate – $\frac{1}{4}$ " or greater in some cases

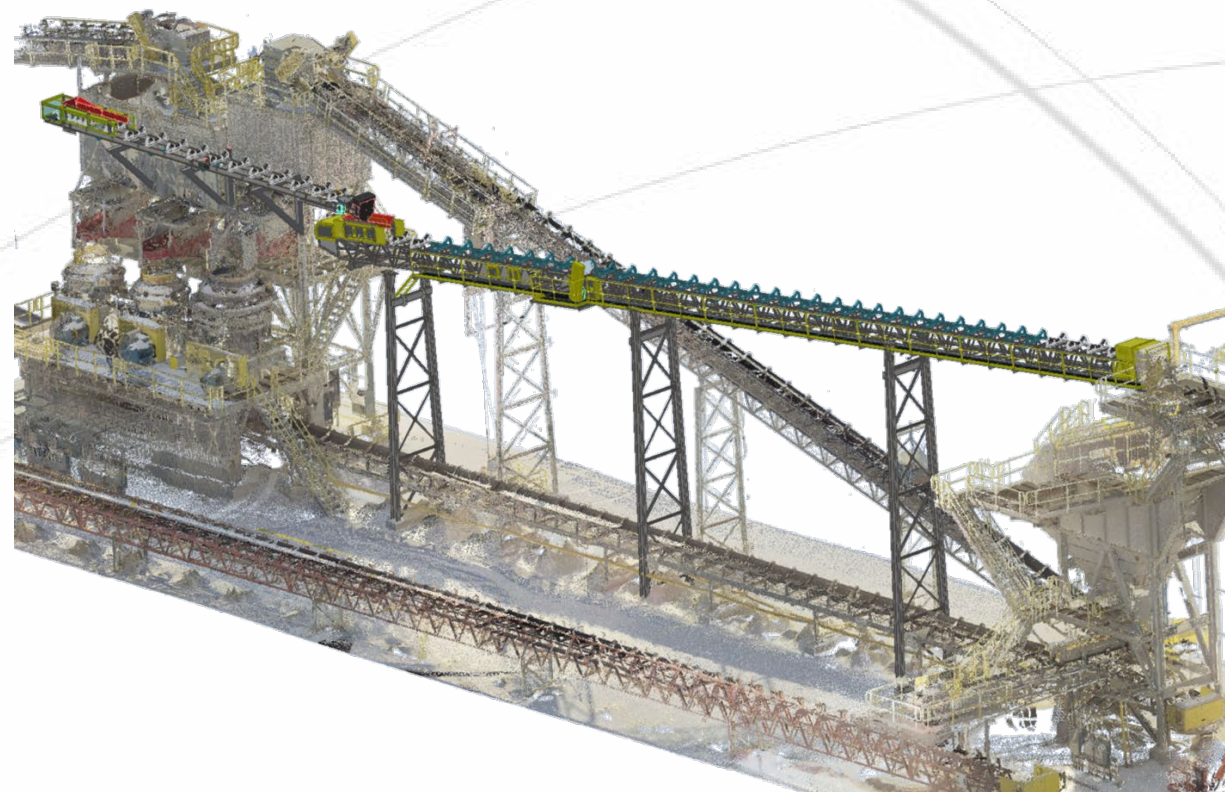




UPTIME MATTERS

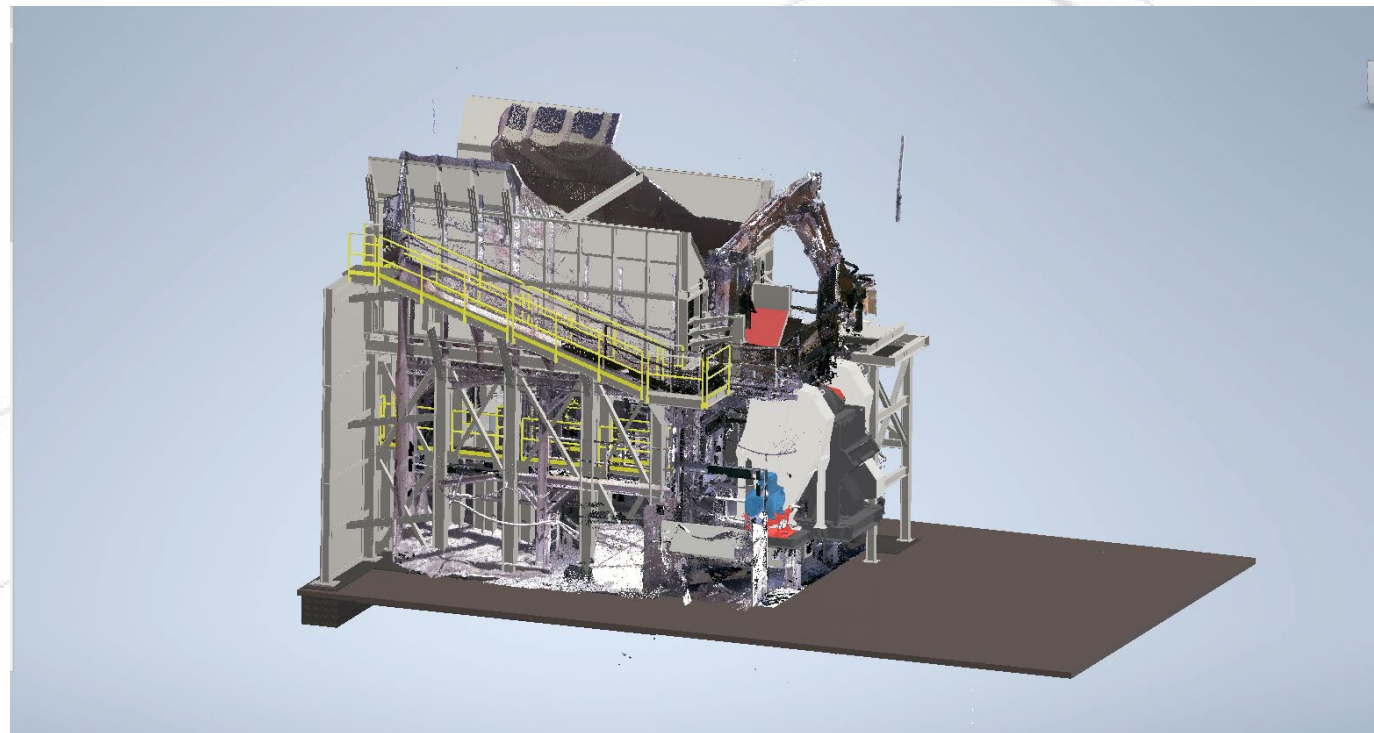
3D Scanning - Quote Presentations

- For larger projects and quotations, we will often scan an area and incorporate this scan into our quotation package
- This allows for a visual reference to accompany our proposals
 - In this case to the right, this was a concept that was envisioned by the plant manager – how to run the plant 100% dry in the winter
 - We were able to design a bypass system to allow base to be run during winter months



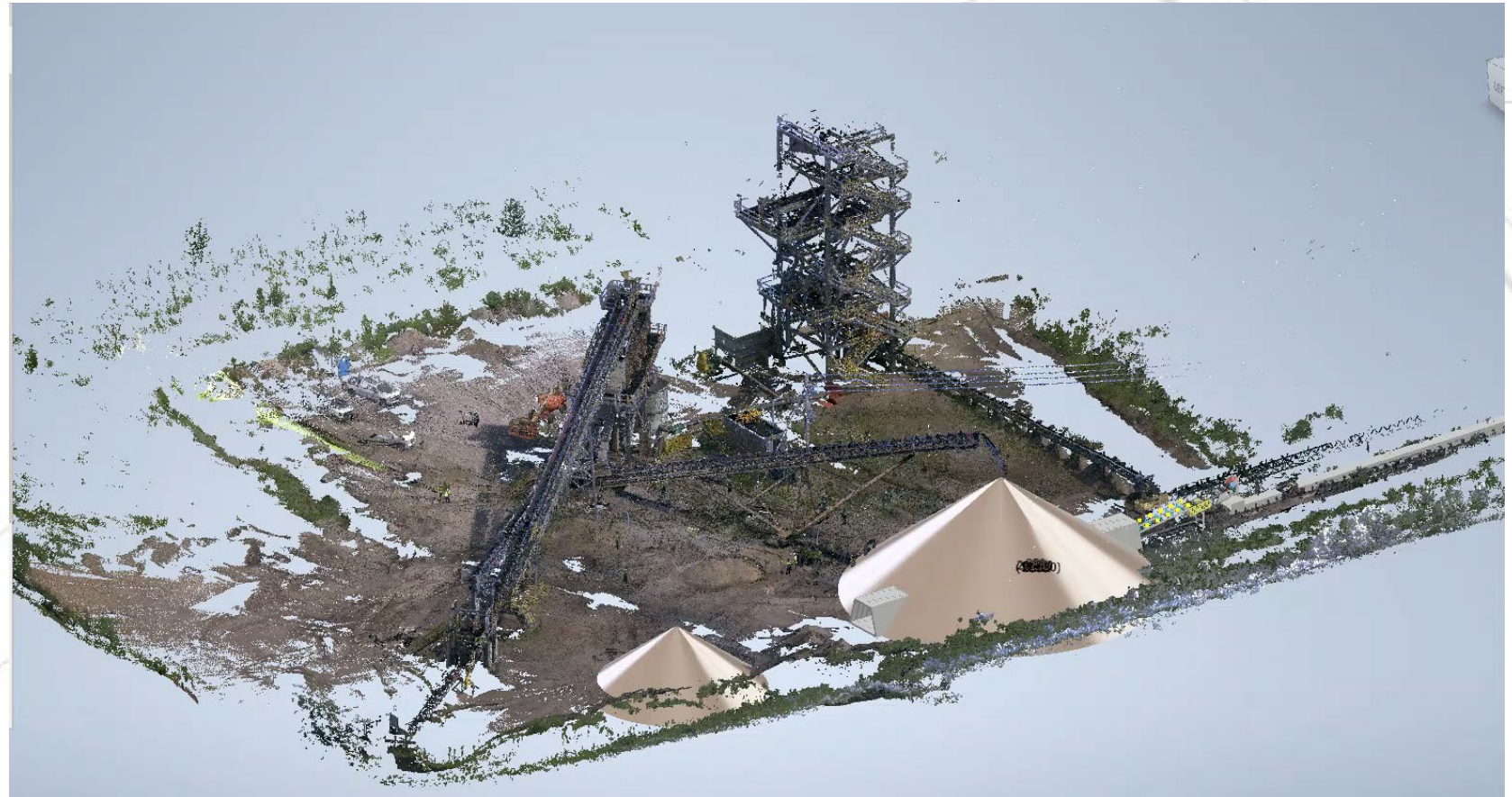
3D Scanning - Quote Presentations

- 100 Ton Primary Hopper Build
- Re-using existing crusher
- Re-using existing dump location
- Discharge conveyors remained



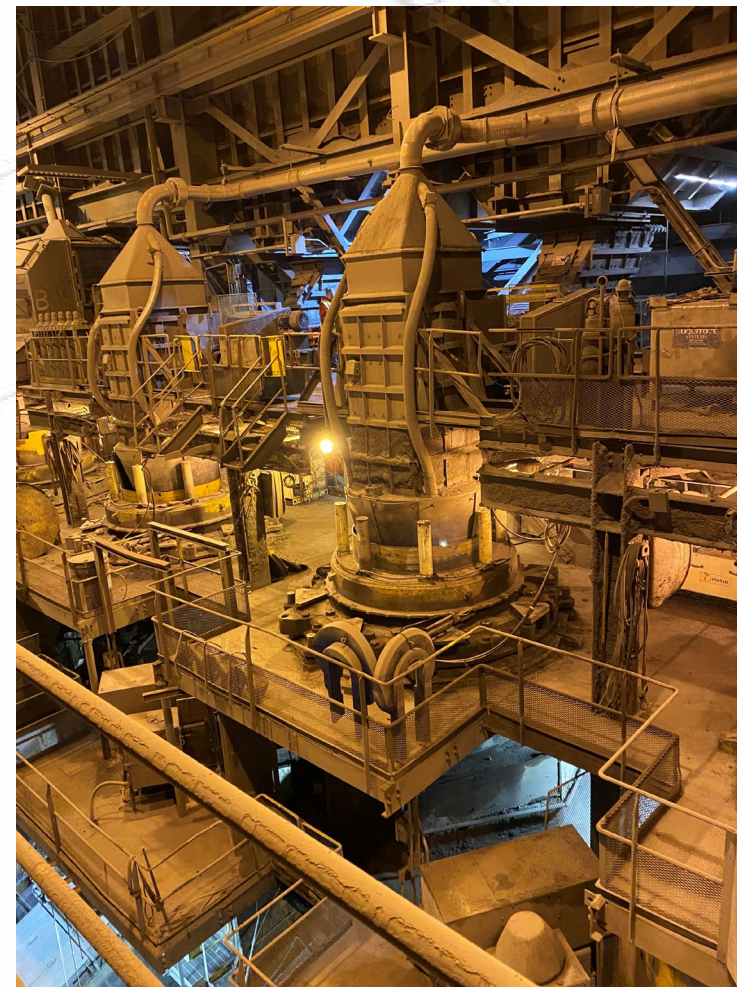
3D Scanning - Feasibility Presentations

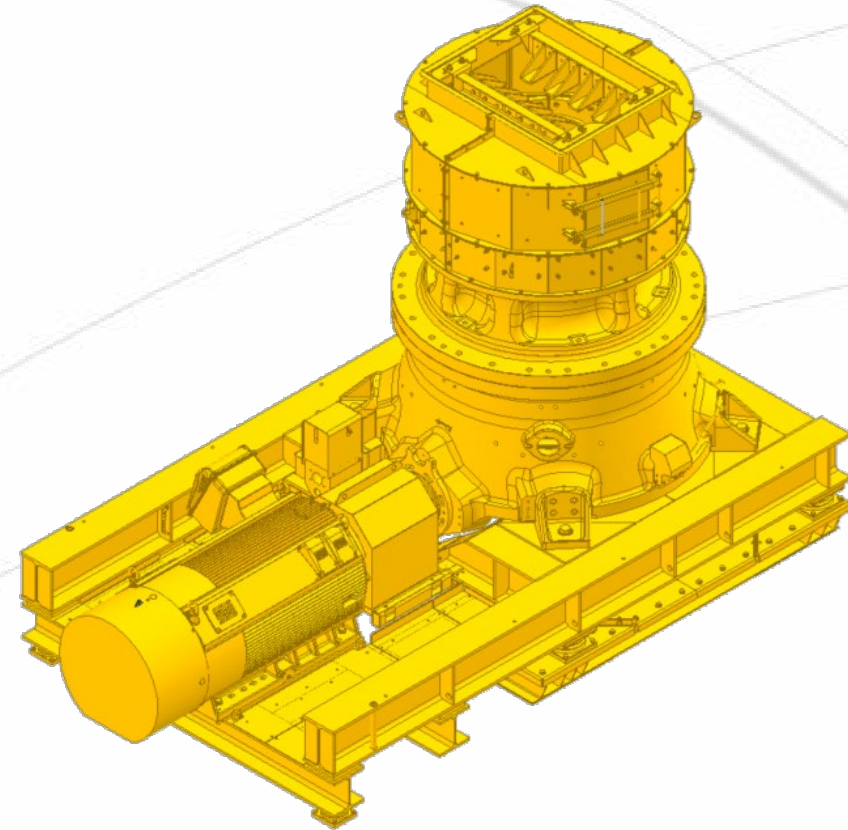
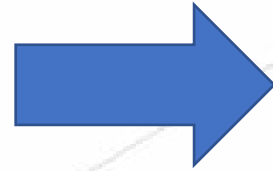
- Surge Pile
- Surge Tunnel
- Disconnecting the gravel side of the plant from the sand side
- Provided theoretical capacities, stockpile locations, etc.



3D SCANNING – Feasibility Analyses

- Example:
 - Replacing a Symons 7' HD Standard Crusher (1 of 14 in this facility)
 - Crusher spanned over 5 levels
 - Lube room, discharge box, crusher, feed box, dust collection box
 - Operation runs 365 days a year, minimal shut down window allotted for measurement taking
 - Crusher footprints feature adapter plates but checking for critical interferences
 - Remote site 12 hours away
 - Over 80 scans collected





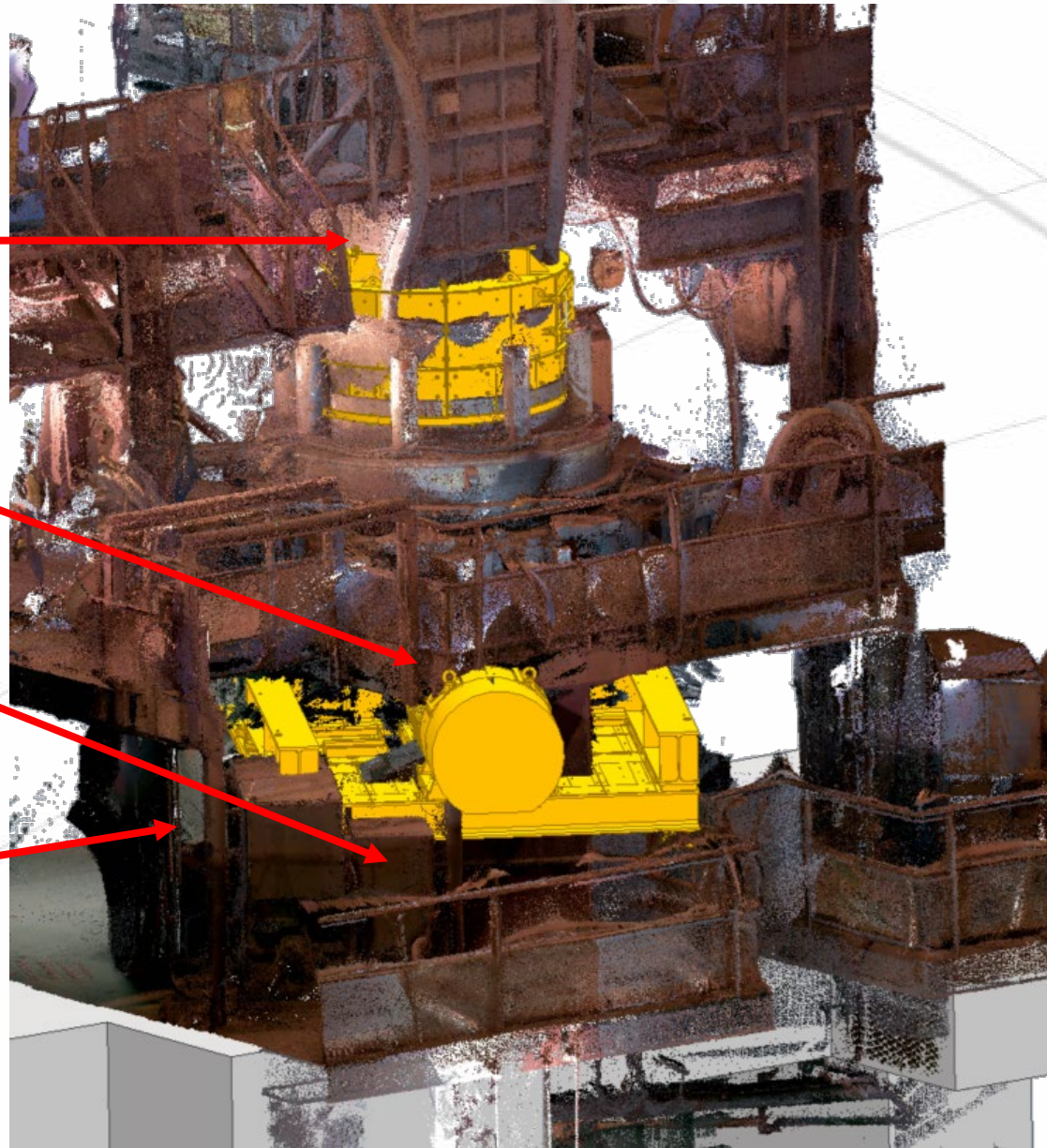
Key Points to Review

Feedbox Orientation

Access Platform

Crusher Drive Support

Mounting



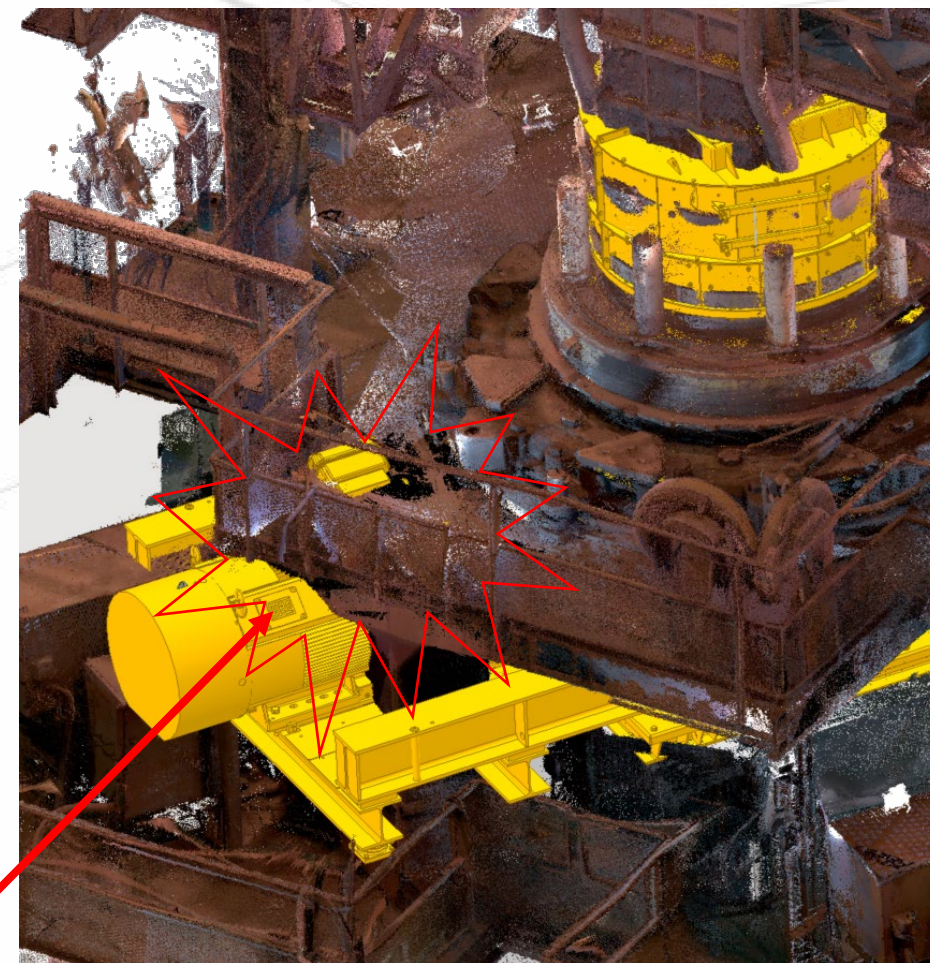
3D Scan Overlay with CH865

Access Platform

- Maintenance level access platform has interference with the drive unit of the crusher
 - This area will need trimmed out to accept the new crusher's drive unit
 - What access is needed in this area for the new crusher's maintenance



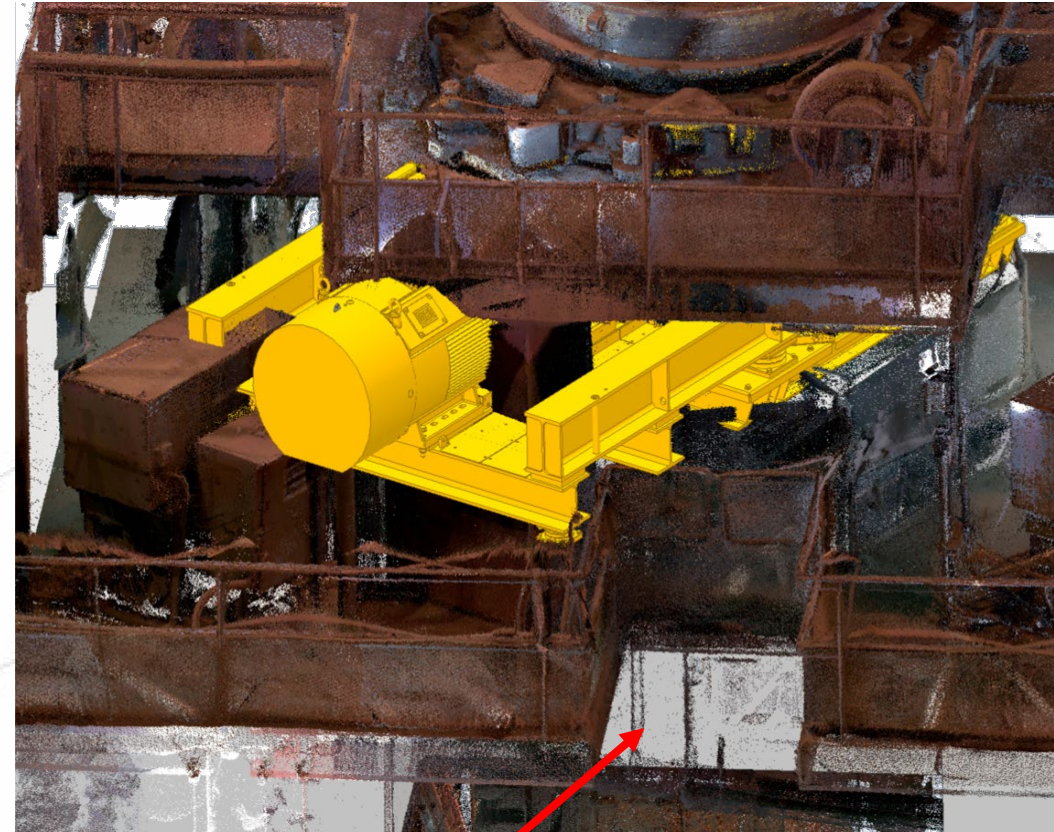
Minimal Drive Interference
with Maintenance level



3D Scan Overlay with CH865

Drive Support

- The base frame of the crusher protrudes into the rope access cutout for the screen below
 - Need to consider rotating to different position?
 - Belt drive options?
 - Confirm winch access requirement
- Additional support required as the base frame will overhang existing concrete support
 - Build a base frame to accommodate



Some interference with Rope access
Additional support required

3D SCANNING – Troubleshooting

- We can also use scans to troubleshoot items such as:
 - Conveyor misalignment
 - Chute work material flow
 - Conveyor layouts
 - Plant moves
 - Stockpile footprints



3D SCANNING – Surveying

- Customer requested a data package that included not only a 3D scan of their asphalt plant, but a GPS oriented scan
- We used both our 3D scanning technology and Trimble GPS surveyor to tie the two methods together



3D SCANNING – Surveying

- Pin markers were fabricated prior to traveling onsite
- These pins were intended to be permanent, easily readable, and picked up on scans
- A series of 5 pins were drove in around the property to be able to survey from



3D SCANNING – Surveying

- Pins were surveyed with a Trimble Geo7x
- State plane coordinates were obtained
- 3D scanning was done over the entire area, ensuring these pins could be seen in the scan



3D SCANNING – Surveying

- The scan was downloaded and a point cloud created
- This point cloud was oriented to the GPS points that were obtained
- Any point within the point cloud could be clicked upon and be surveyed exactly on location
- Used in future plant expansion projects – RAP feed system was incorporated



Thank you!

Questions?