3D Laser Scanning Applications
(Terrestrial LiDAR)

Presented By:

Jody Lounsbury, PLS

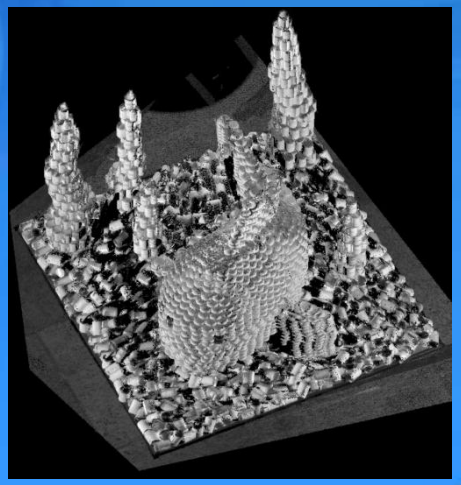
CHA

What is 3D Laser Scanning?

- LIDAR = Light Detecting and Ranging
- Real-Time, Ground Based, 360 Degree Collection of Three Dimensional Data Using Ground Based LIDAR
- Precision Instrument for Creating a “Cloud” of Data Points with Intricate Details and True Coordinate Positioning of Every Point
- Three Dimensional Database easily combined with traditional data
- Software Tools for Extracting Point Data for Generating 3D Models and Conventional CADD Drawings

3DLS Applications

- As-Built Documentation
- Spatial Validation
- GIS & Survey Integration
- Facility Asset Management
- Real Estate Visualizations and Animations
- Historical Documentation
- BIM Modeling



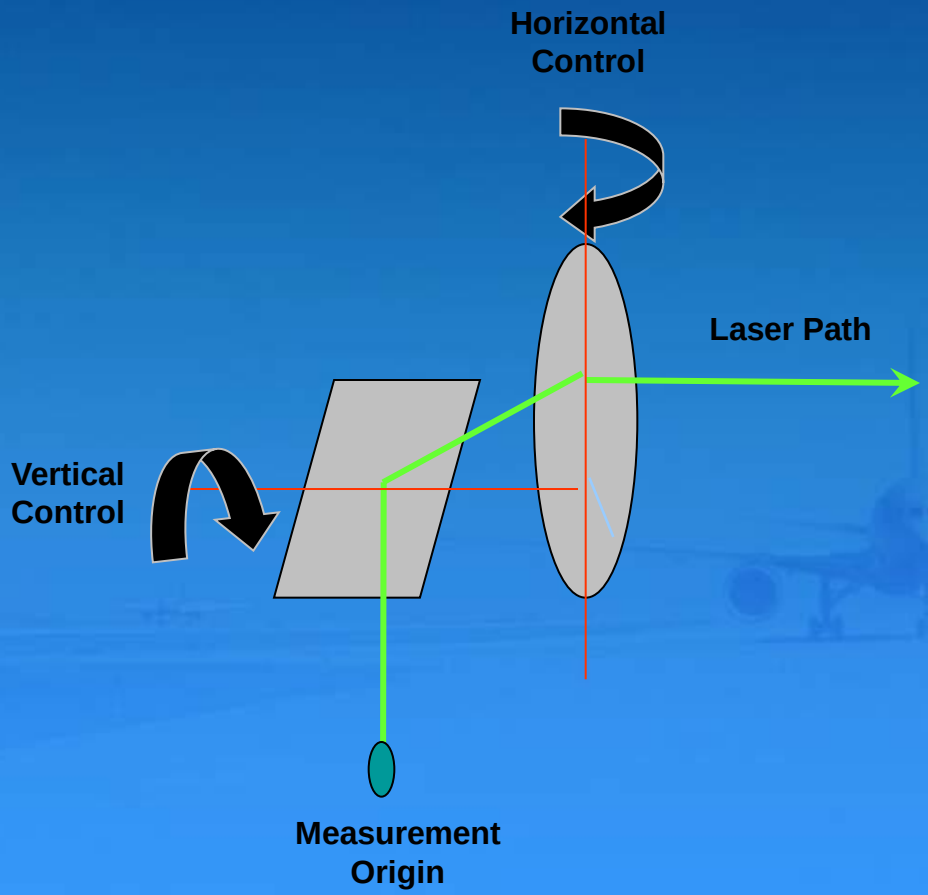
Two Base Technologies

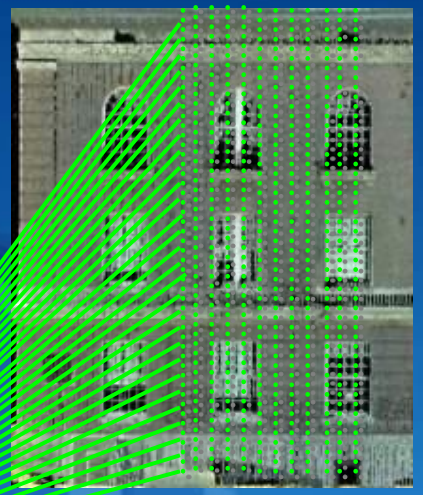
Time of Flight (Pulsed) Measurement

Phased Based (Continuous) Measurement

Time-of-Flight Range Measurement: Pulsed

Laser Operation (Typical)

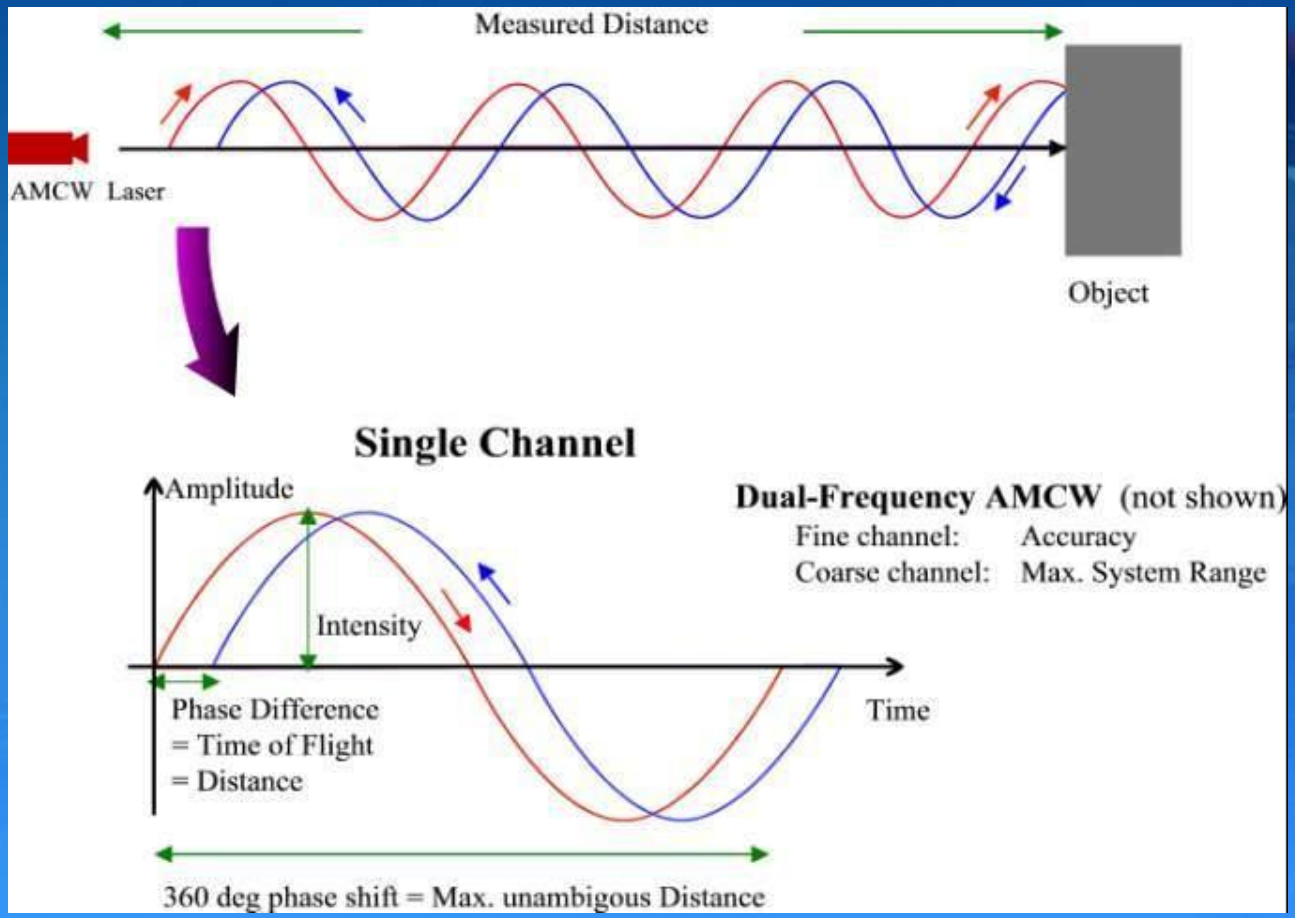




Advantage:
Long Range (to 1km), Fewer Setups, Duel Axis Compensation, Real World Coordinates

Disadvantage:
Not the Highest Speed (1500 – 50,000 pts/sec)

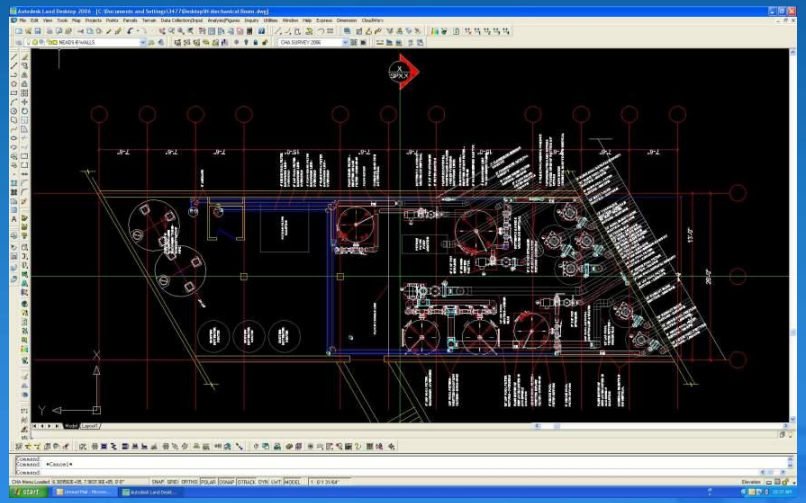
Phase-Based Range Measurement: Continuous



Advantage:
Very High Speed (>300k pts/sec), On-Board Data Storage, Wireless Operation

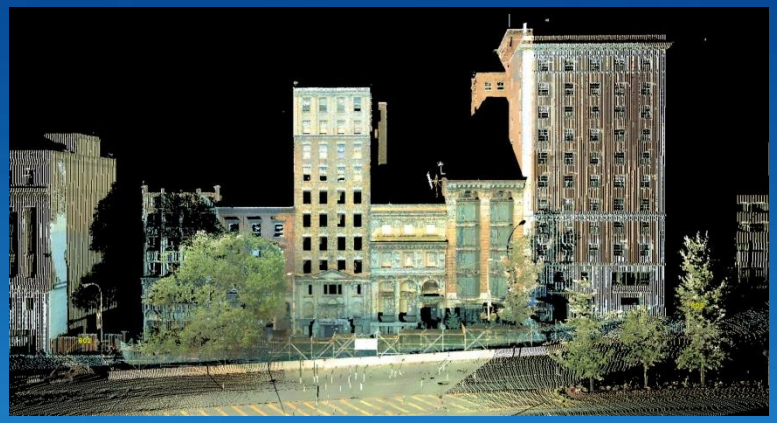
Disadvantage:
Short Range (>50m), Requires Multiple Setups

Key Highlights of Utilizing 3DLS



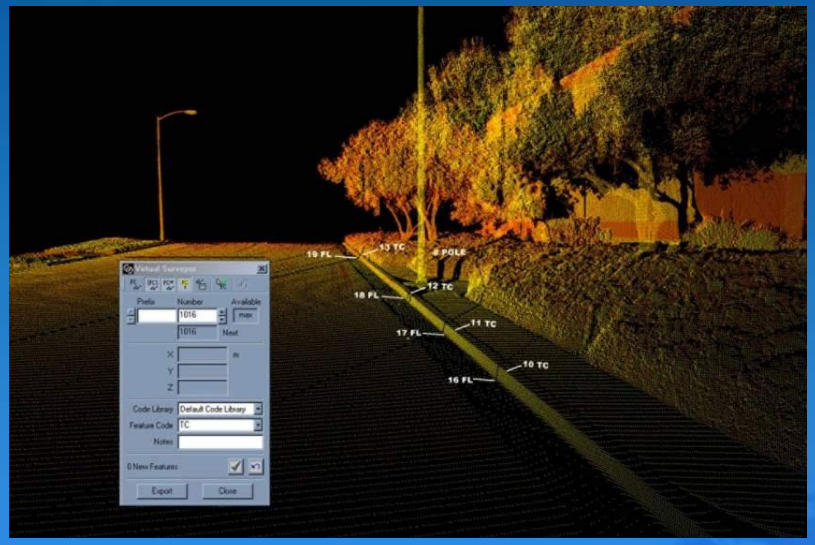
- Field Workflow Allows for Multiple Setups and Reflector-Less Acquisition of Information
- Highly Detailed Collection of Data Not Possible through Conventional Survey Methods
- Scanned Database is a Permanent Geo-Referenced Record of Site Accessible from your Office
- Millions of 4–6 mm Accurate Data Points for Creation of 2D/3D As-Builts

Field Benefits of Utilizing 3DLS



- Set Up on Known Coordinates
- Real Time Data Review
- Capture Data within Active Work Site
- Minimal Disruption to Other On-Site Activities
- 24 Hour Data Collection Capabilities
- Capture Detailed Data of Inaccessible Locations
- Increased Crew Safety
- 50k 3D Data Points Per Second
- Digital Photograph for Each Location

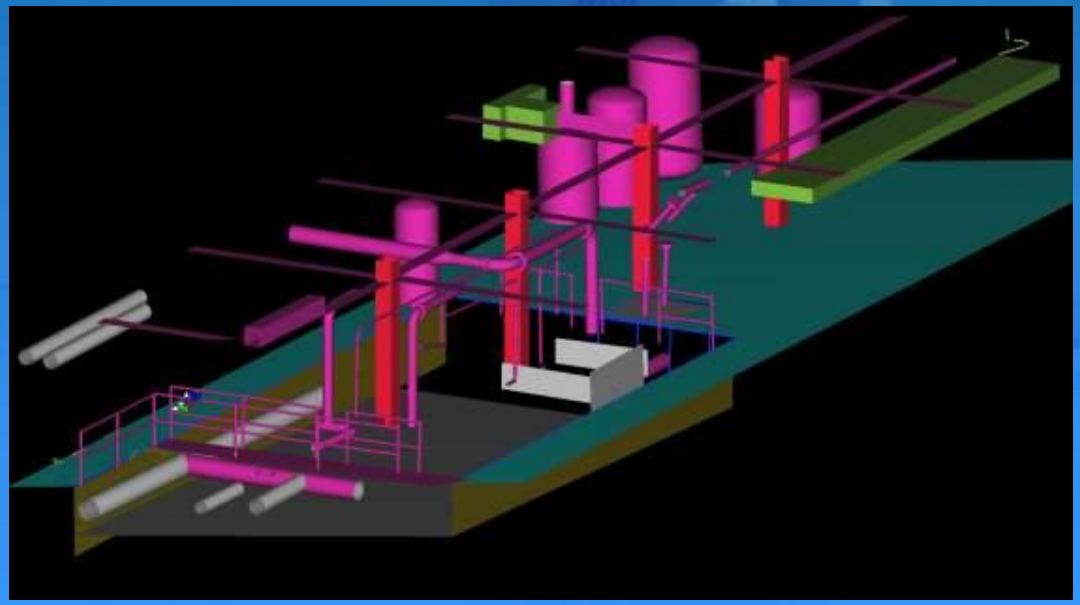
Benefits of Utilizing 3DLS-Office



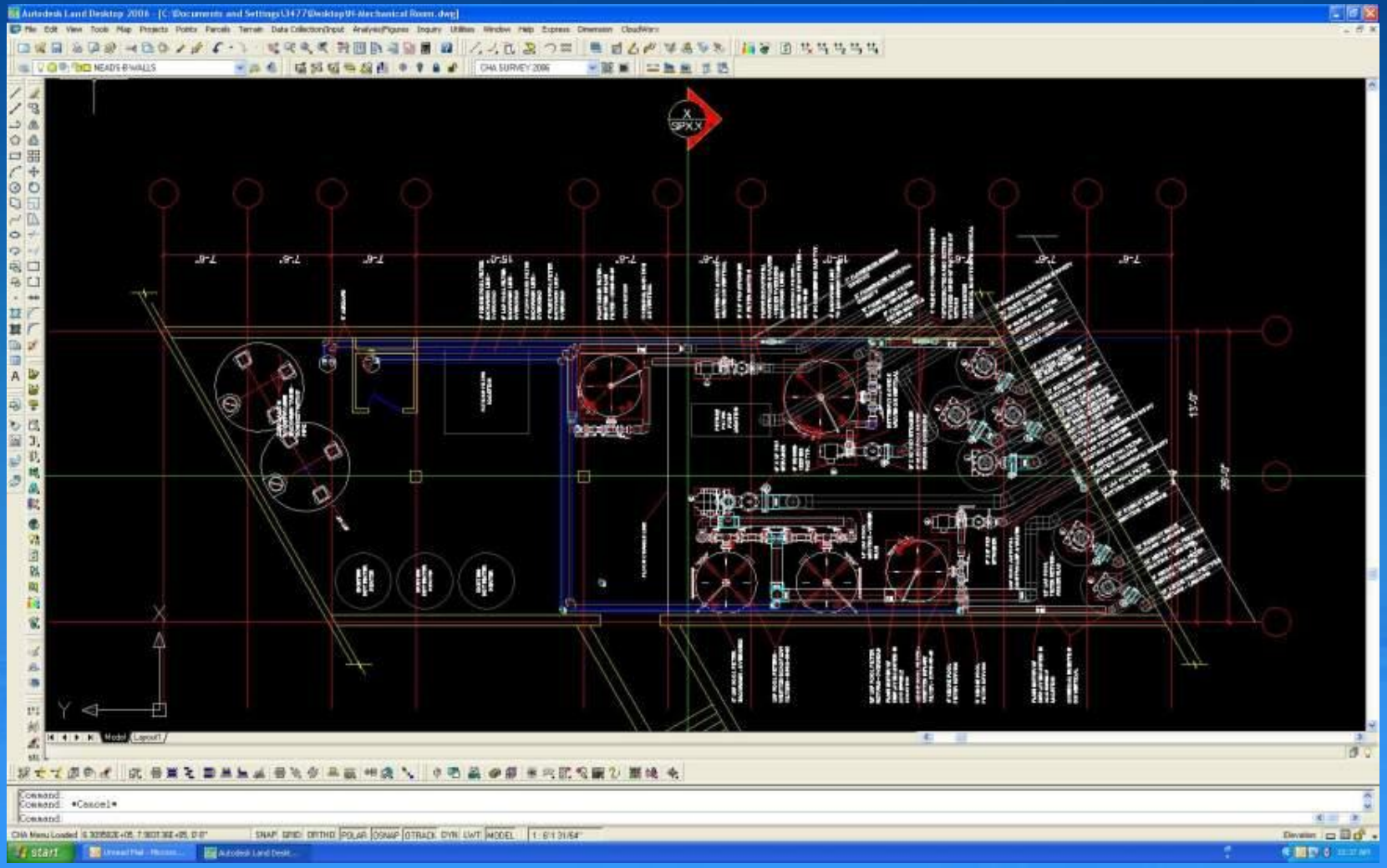
- Virtual Surveying
- Compatible with Numerous Software Platforms
- Create Intelligent As-Built Documentation
- Data Useful for Presentation/ Planning Materials
- Photographic Back-Up
- Integrates with Conventional Survey Data
- Multiple Scans Registered to Single Database
- Minimizes Return Site Visits

Facilities

- Interior Laser Scan of Pool Facility
- 3-D CADD Model
- Design Drawings
- No Operational Shut-Down Required to Perform Survey

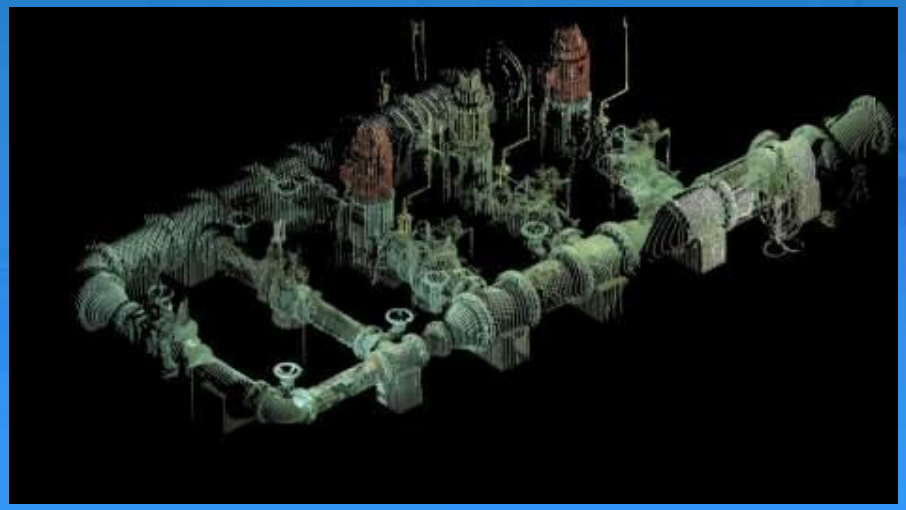


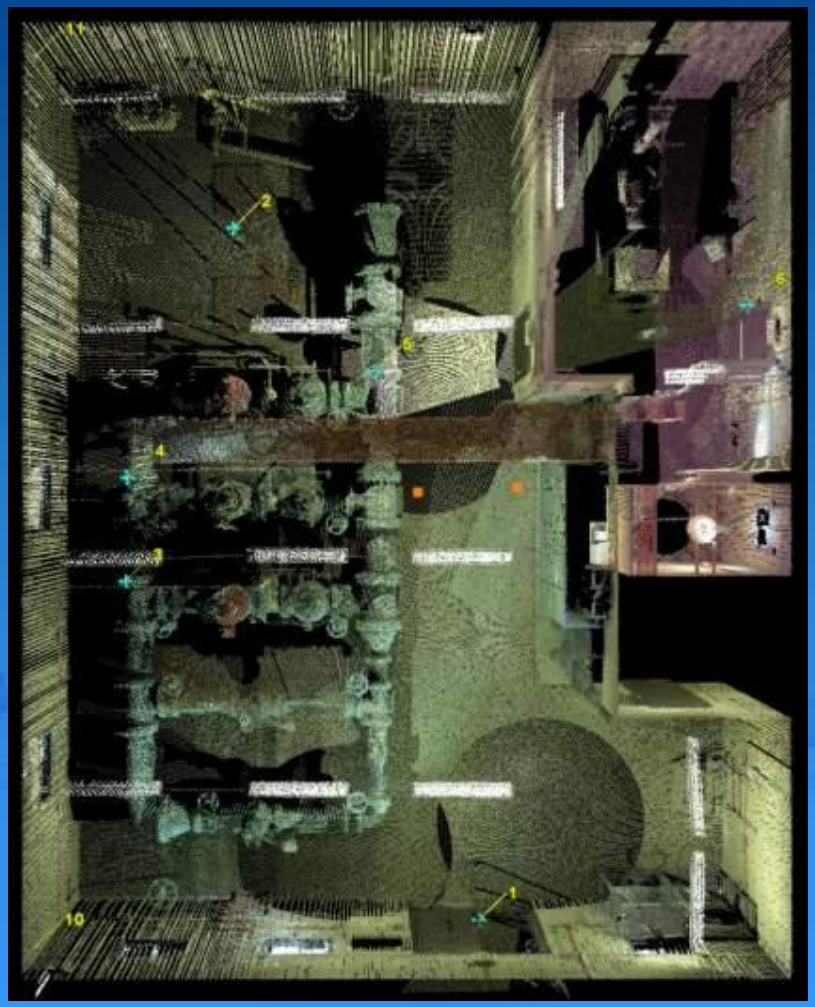
Facilities



CADD Deliverable

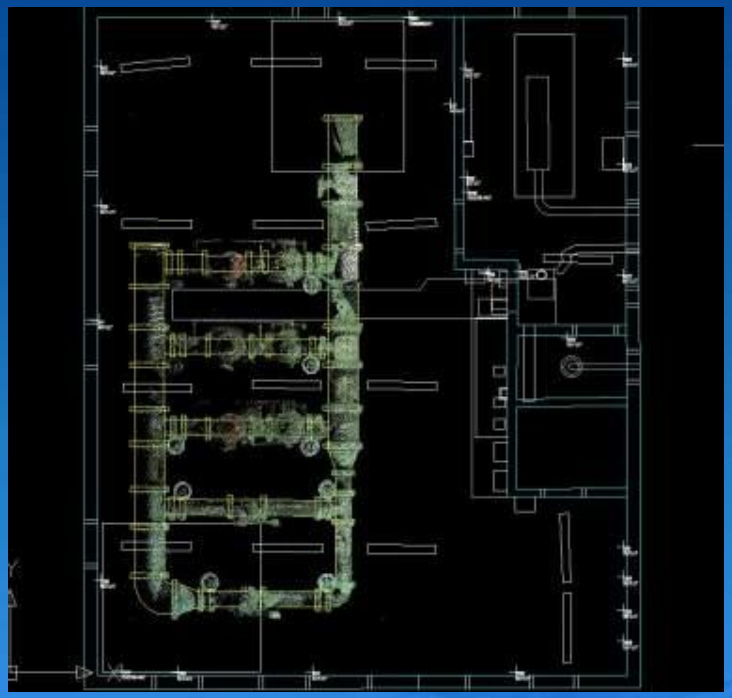
Facilities

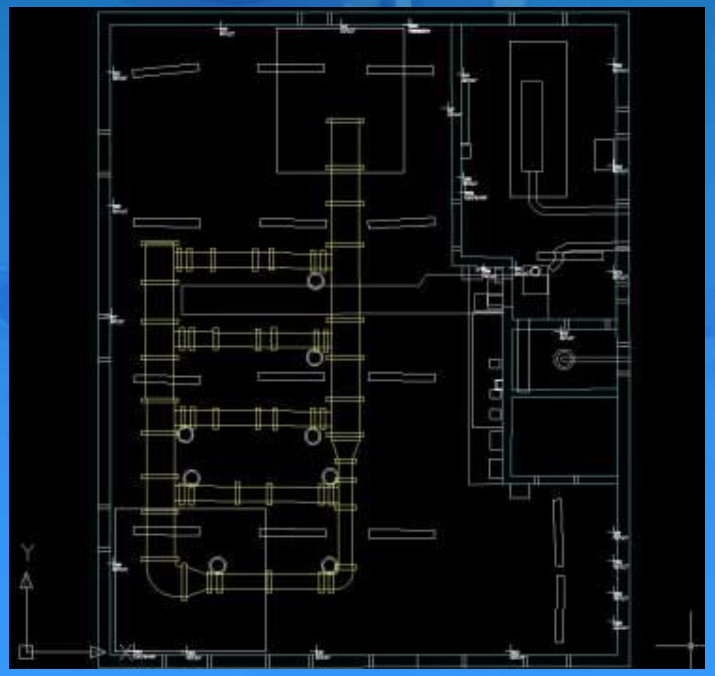




Water Treatment Plant

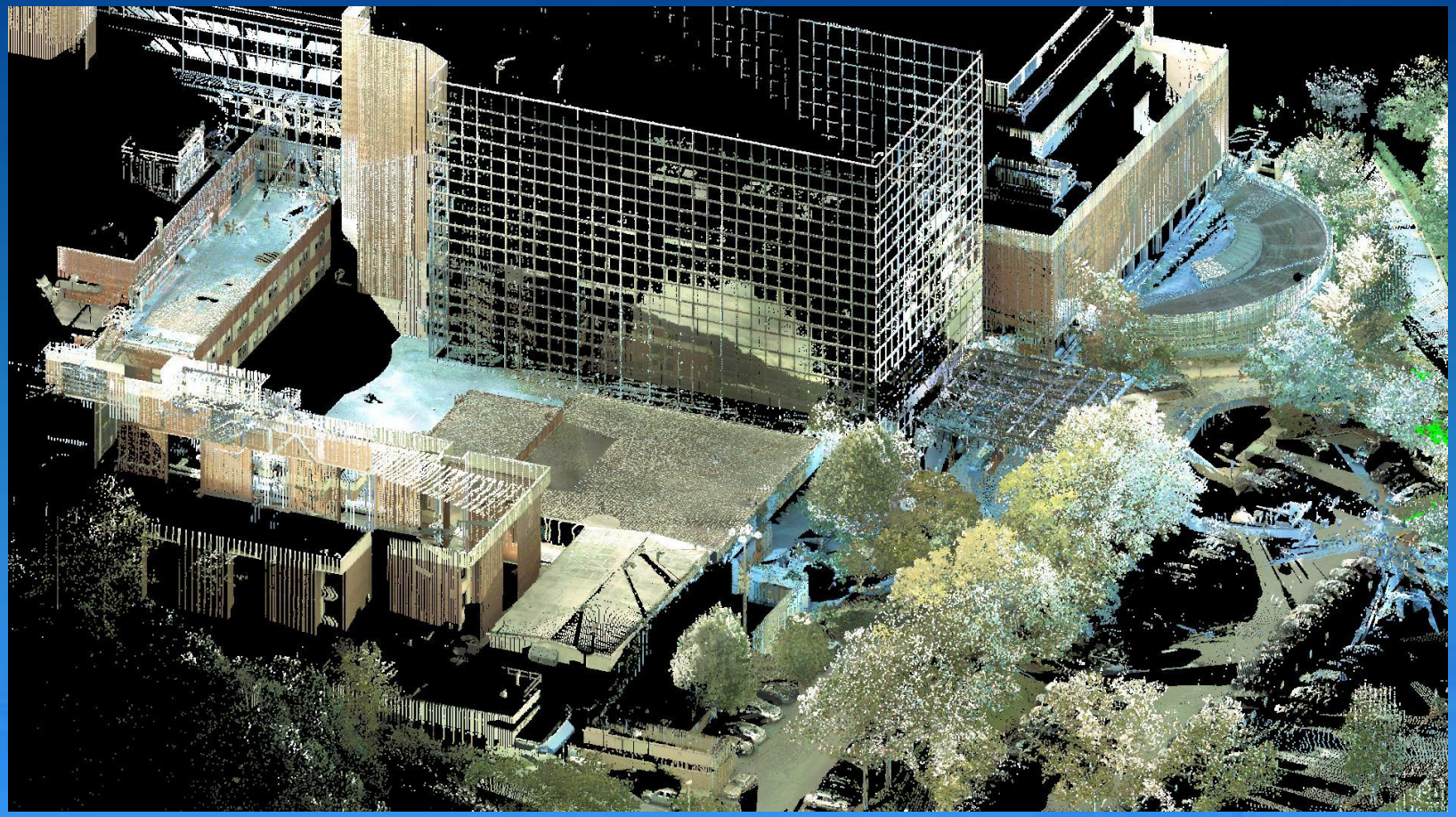
Facilities





- Simultaneous Electrical, Mechanical & Structural Data Collection
- Entire Site Capture, No Return Visits

Building & Grounds



- Façade & Roof Top Surveys
- Additional Data obtained for future applications

Building & Grounds

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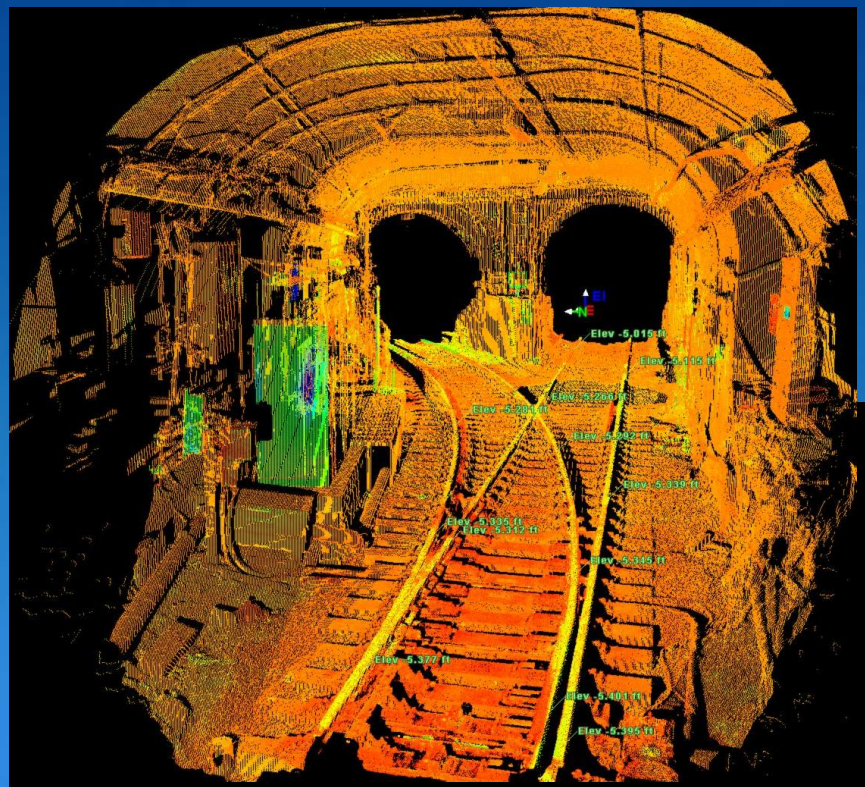
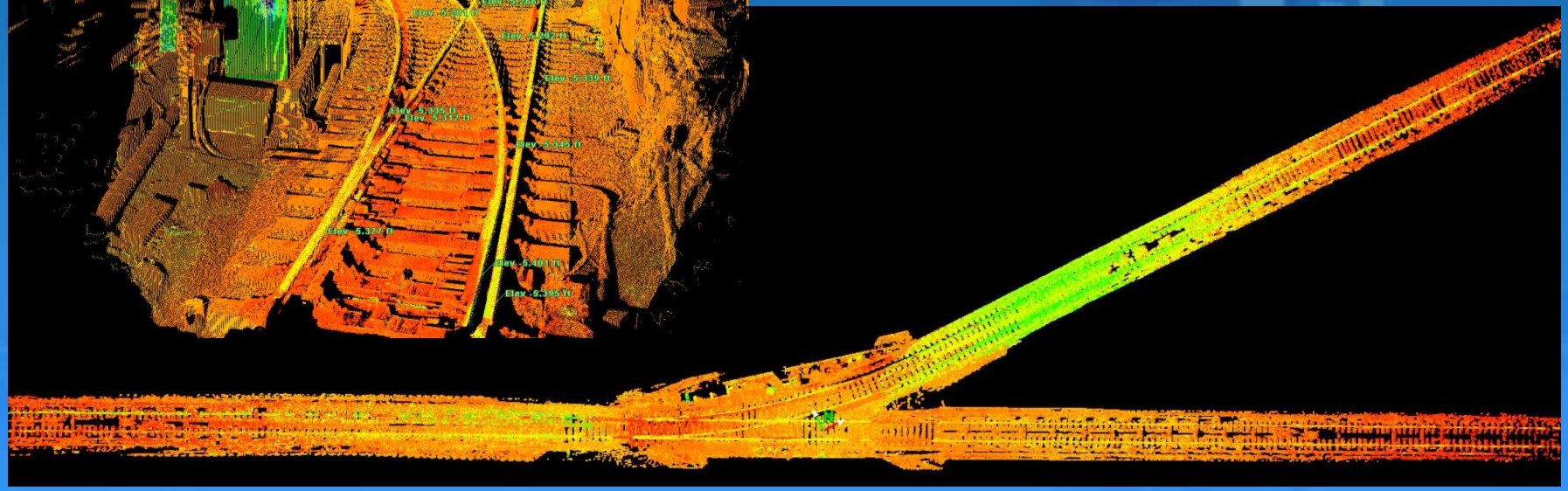
- Façade & Roof Top Surveys
- Additional Data obtained for future applications

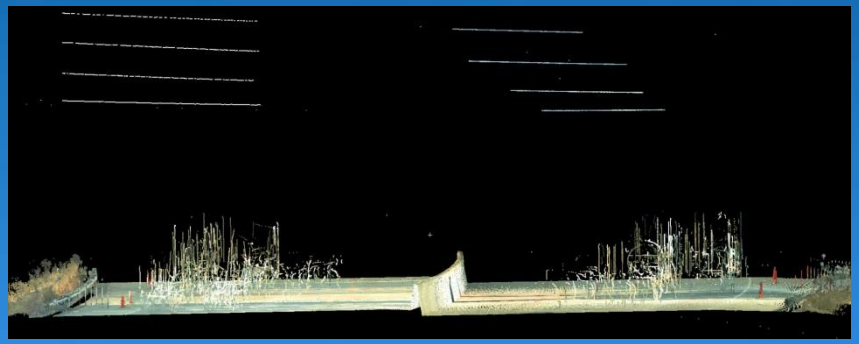
Railroad Surveys

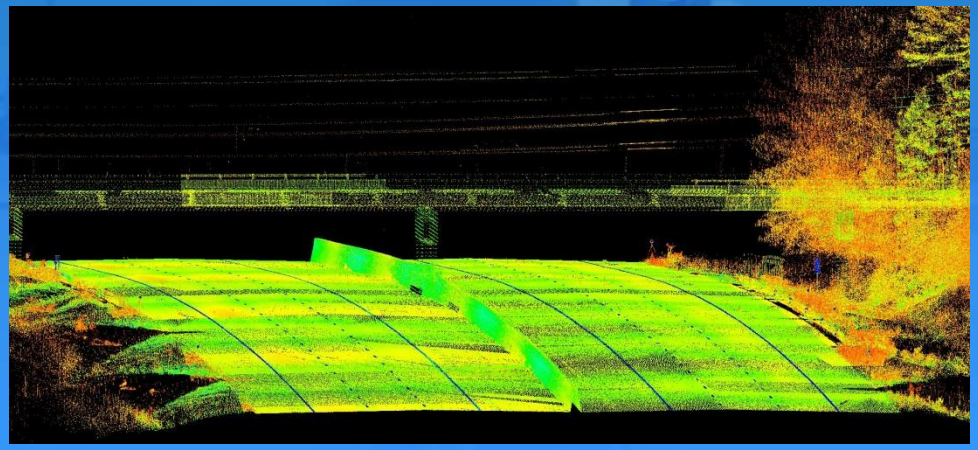


- Photographic Documentation
- Quickly Gather Data Within Short Outage Time
- Create Standard CADD Deliverables



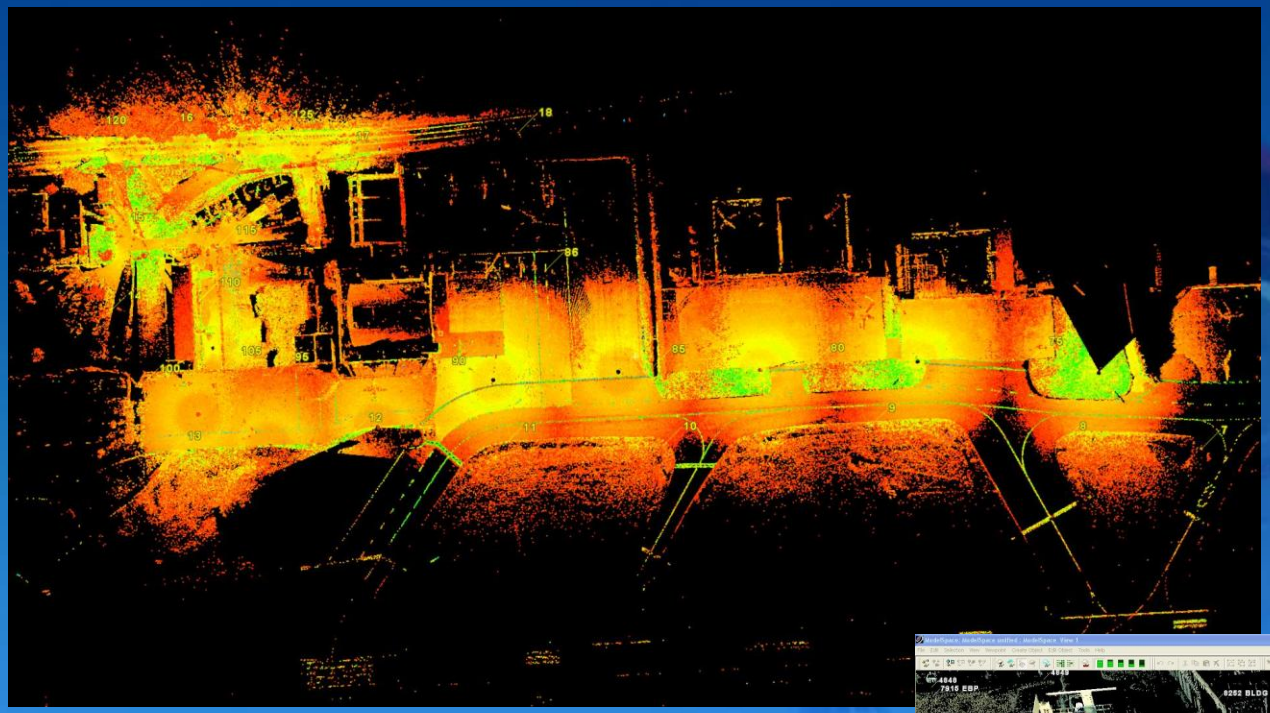
Corridor Surveys

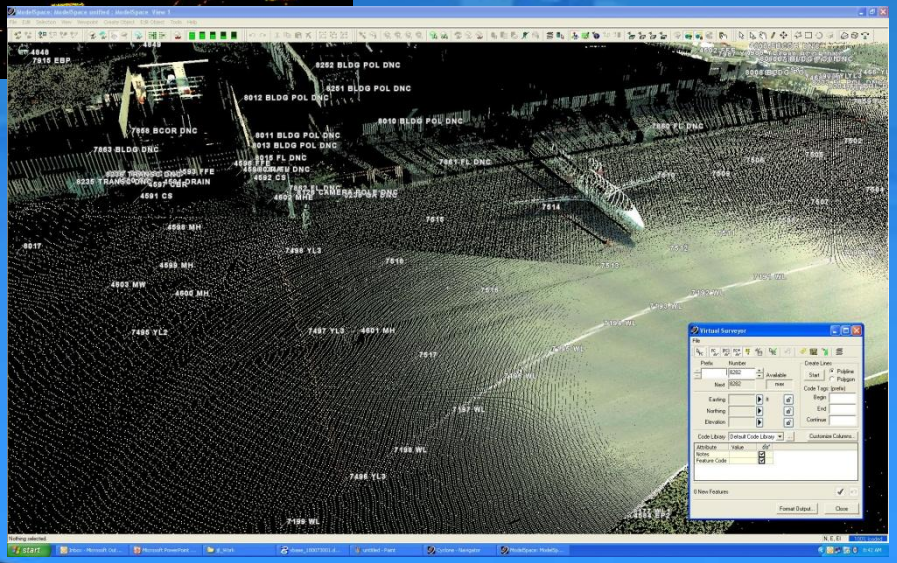




- Minimal Impact on Traffic
- Crews Out of Harms Way
- 24 Hour Data Collection

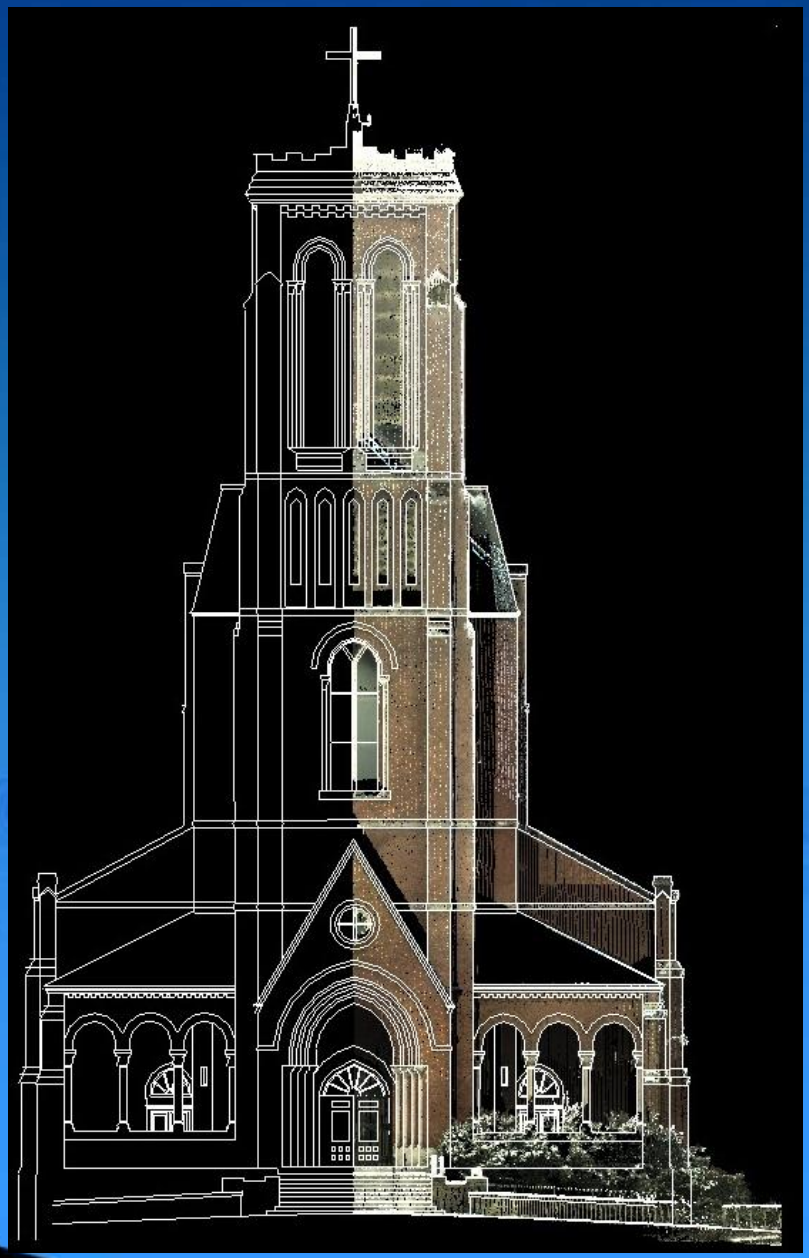
Aviation Surveys





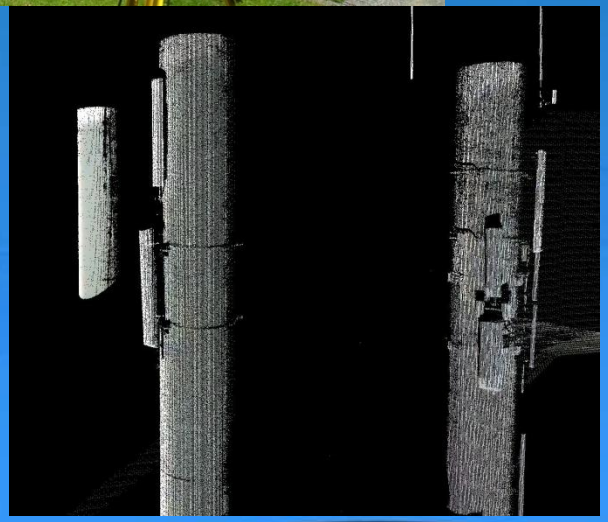
- Remote Sensing
- No Personnel in Active Operation Areas
- Highly Detailed Data Collected

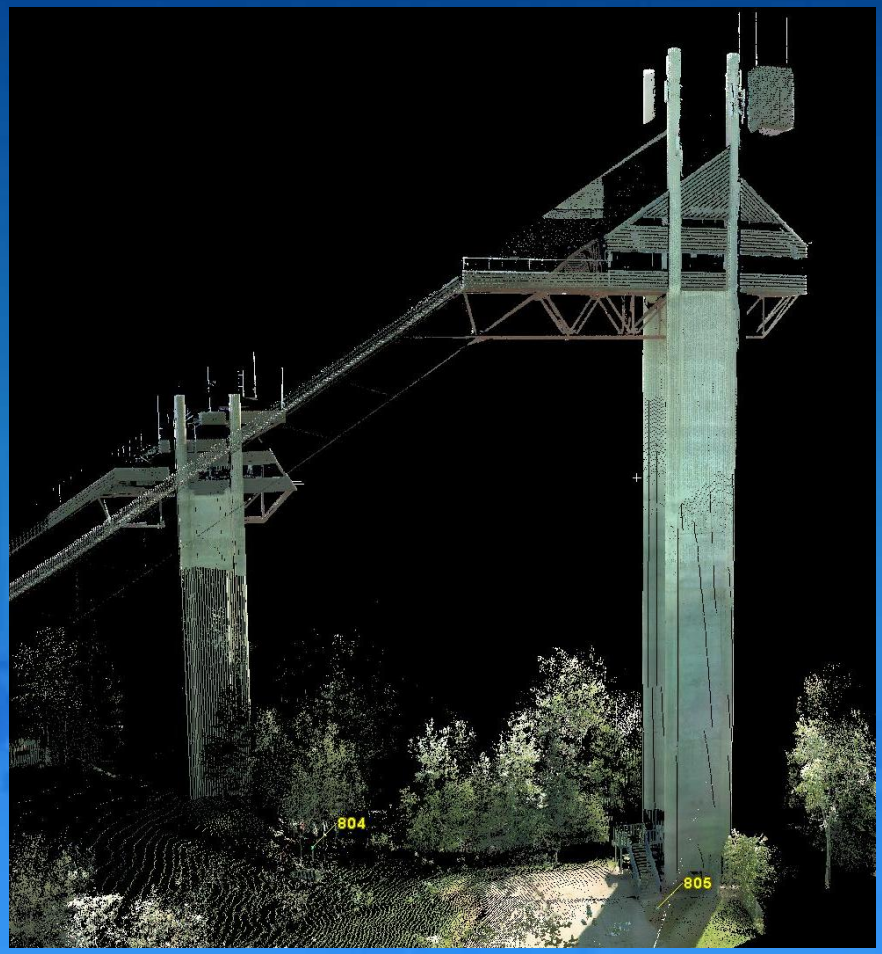
Historic Preservation



- Non-Destructive
- No Ladders, Lifts, scaffolding etc.
- Highly Detailed Data Collected
- True Scale Drawings

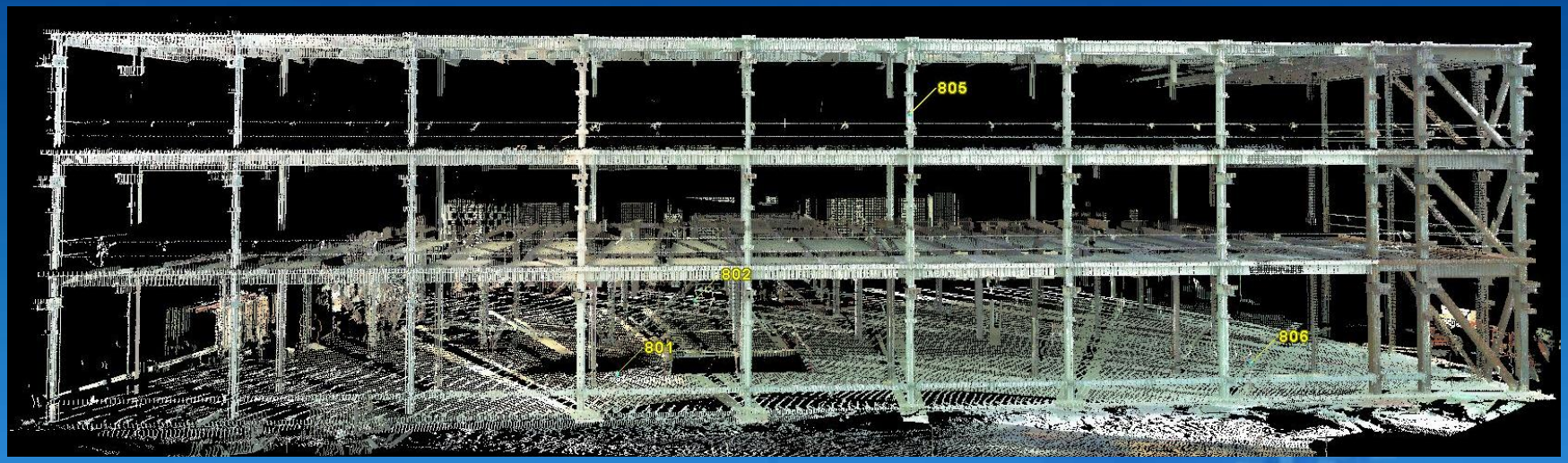
Access to Inaccessible Area



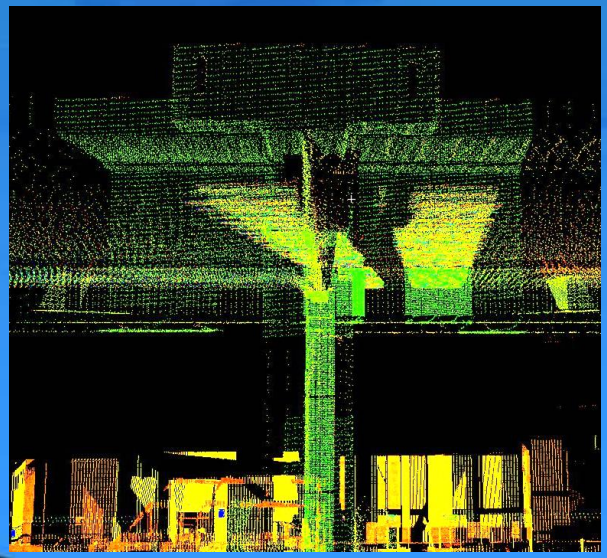


- Ground level data Collection
- Reduces Cost

Remote Sensing



- Increased Site and Worker Safety
- Minimizes Need For Scaffolding or Lifts

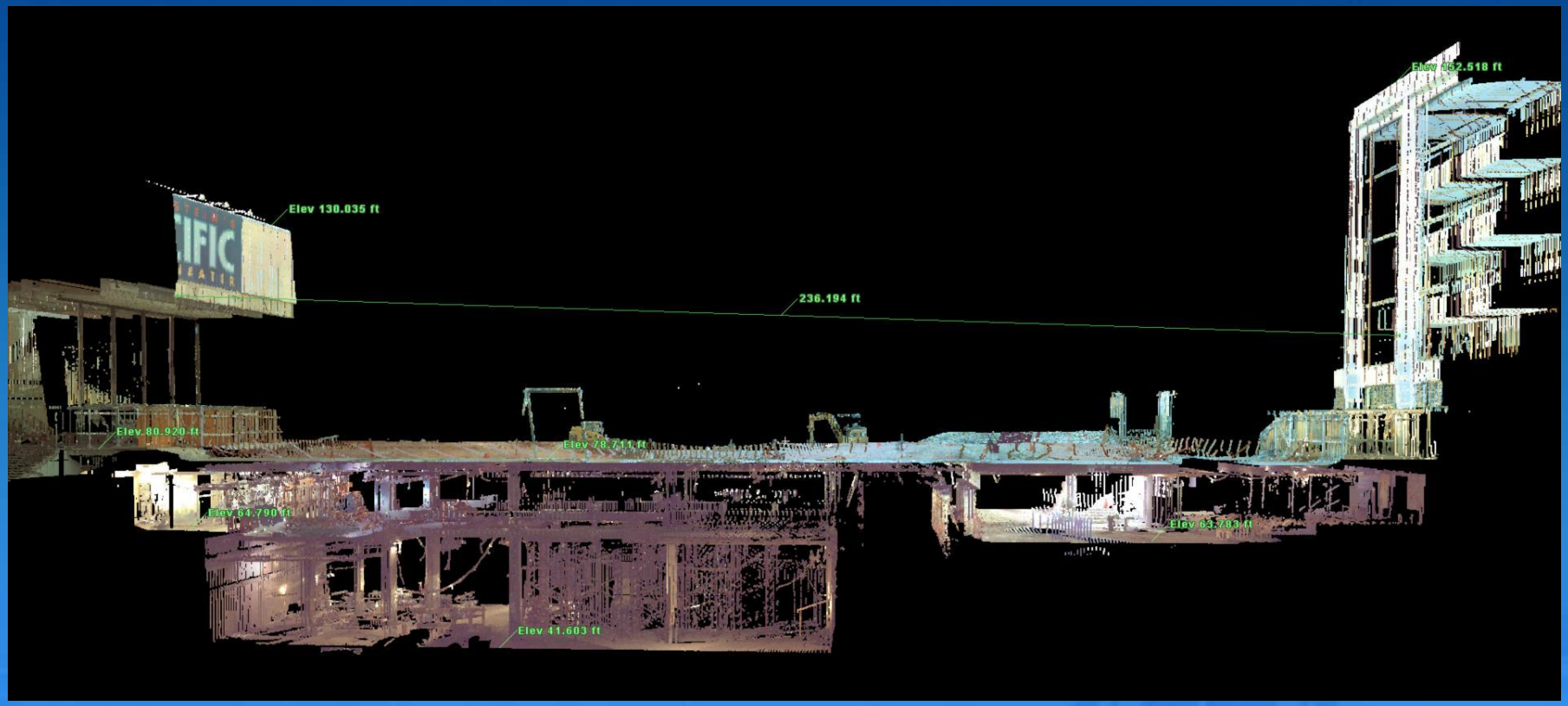


Point Cloud Data

Geo- Referenced Data

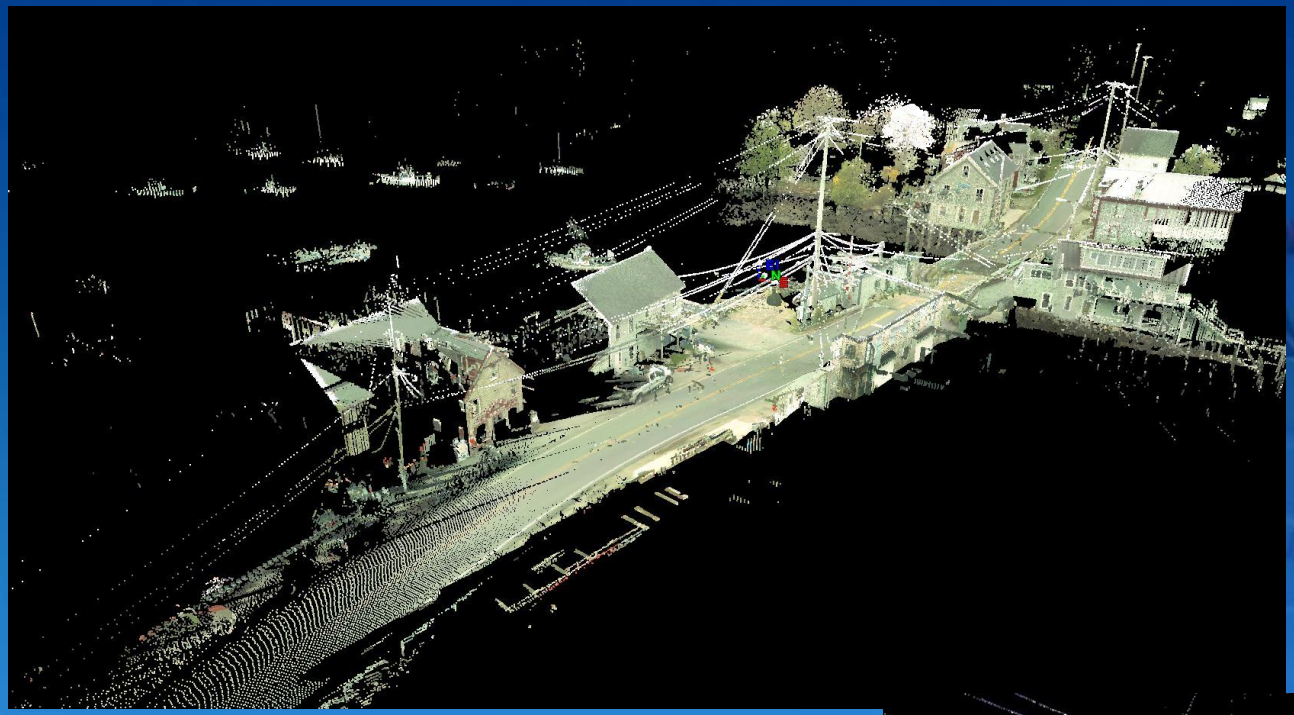
- Easily Combined with Conventional Data
- Multiple Facilities can be Geo - Linked
- Real Time Measurement Between Rooms and Floors

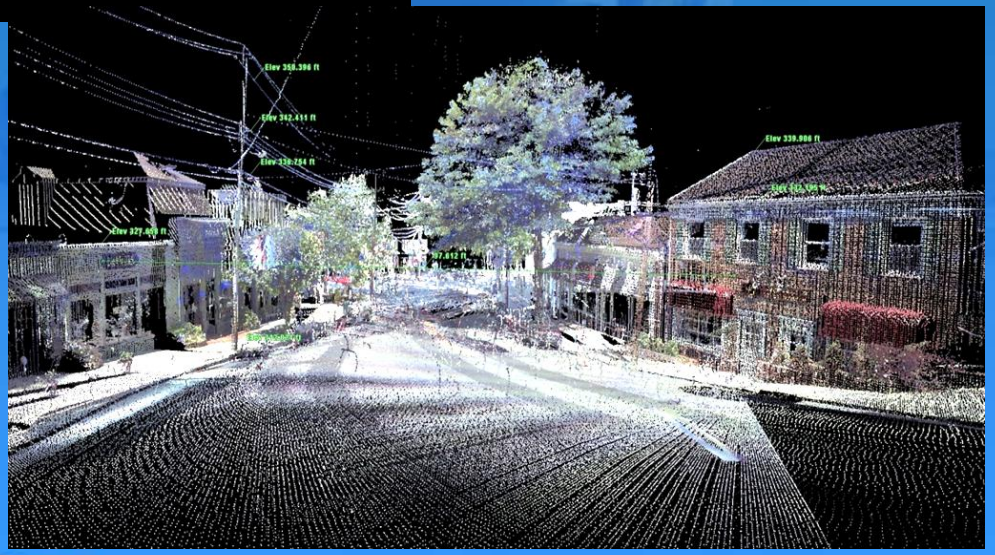
Geo- Referenced Data



- Multiple Levels within Facilities can be Geo - Linked
- Real Time Measurement Between Rooms and Floors

Planning





- Entire streetscapes captured
- 3 Dimensional true scale data
- Interior and exterior data tied together

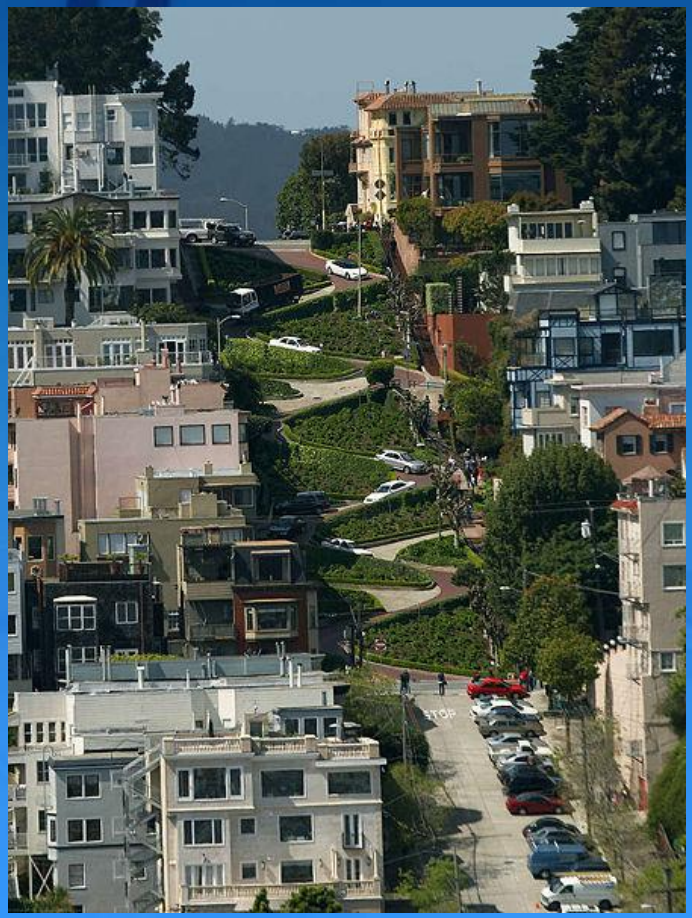
Procurement

Scoping:

- Determine if Project is Suited for Scanning
- Determine Amount of Scanning Needed
- Determine Density and Accuracy Required
- Identify Type of Hardware Needed
- Discuss Deliverables with Service Provider

Pricing:

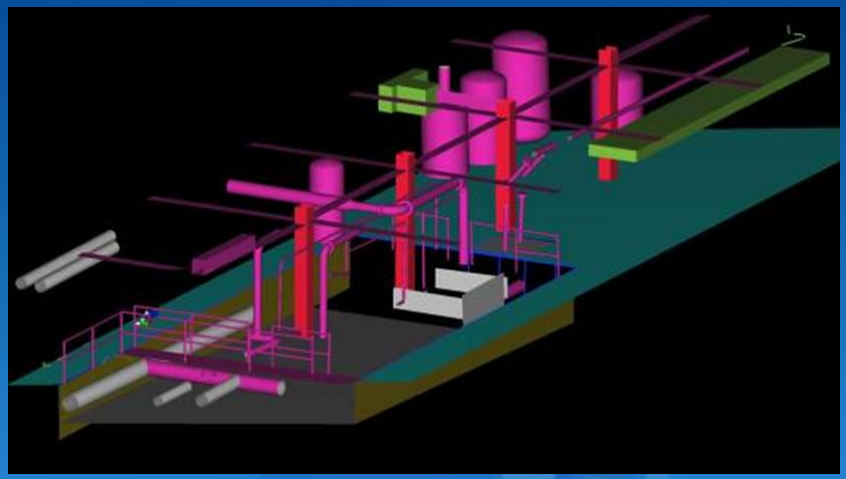
- Determine Areas Suited for Scanning
- Determine Areas Needing Conventional Survey
- Identify Potential Scanner Positions
- Identify Possible On-Site Obstacles
- Establish Horizontal and Vertical Control Plan
- Photograph Site



Execution

Field Work:

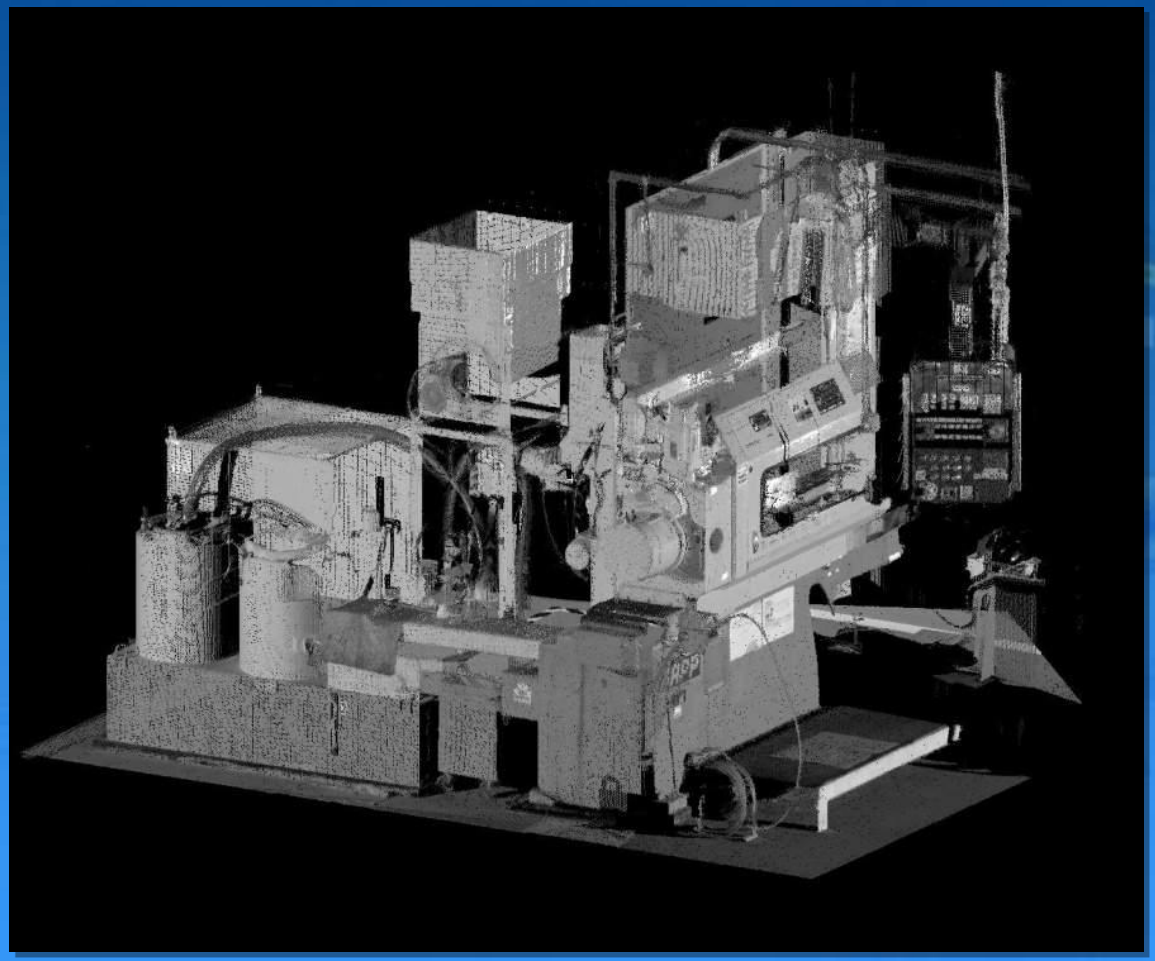
- Establish Horizontal and Vertical Control
- Perform Scanning
- Perform Conventional Survey in Obstructed Areas
- Photograph Detailed Areas
- Prepare Site Sketch
- Record Manual QA/QC Measurements
- Field Registration (when possible)



Office Procedures:

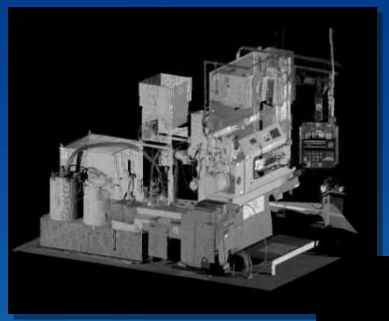
- Review and Clean-up Scan Data (point cloud)
- Reduce Conventionally Surveyed Data
- Calculate Horizontal and Vertical Control for Site
- Register Scan Data to Project Control
- Extract Points from Scan
- Combine Scan Data with Survey Data
- Export to CADD
- Generate Required Drawings

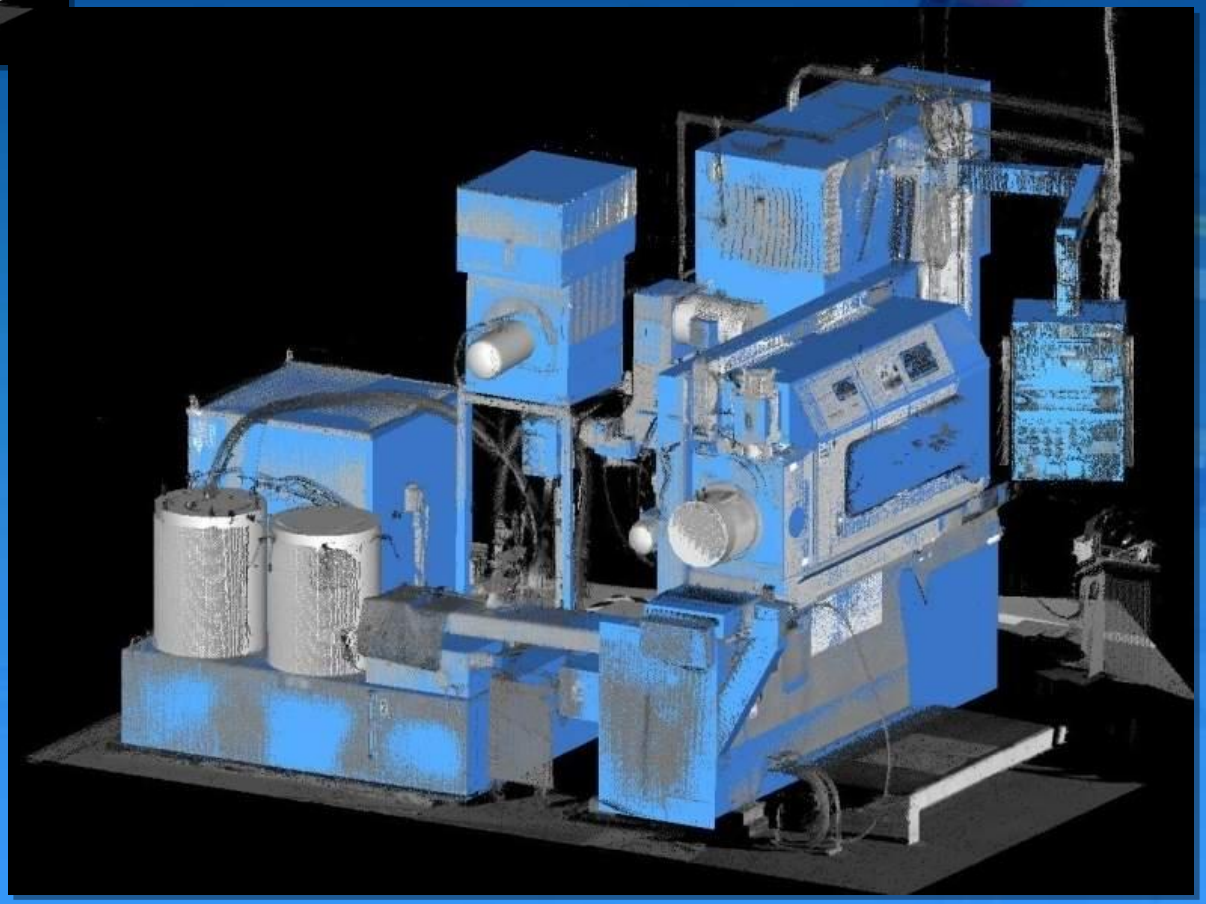
From Field to Office



Point Cloud from 3D Laser Scanner

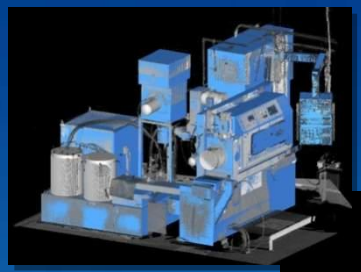
From Point Cloud to Object

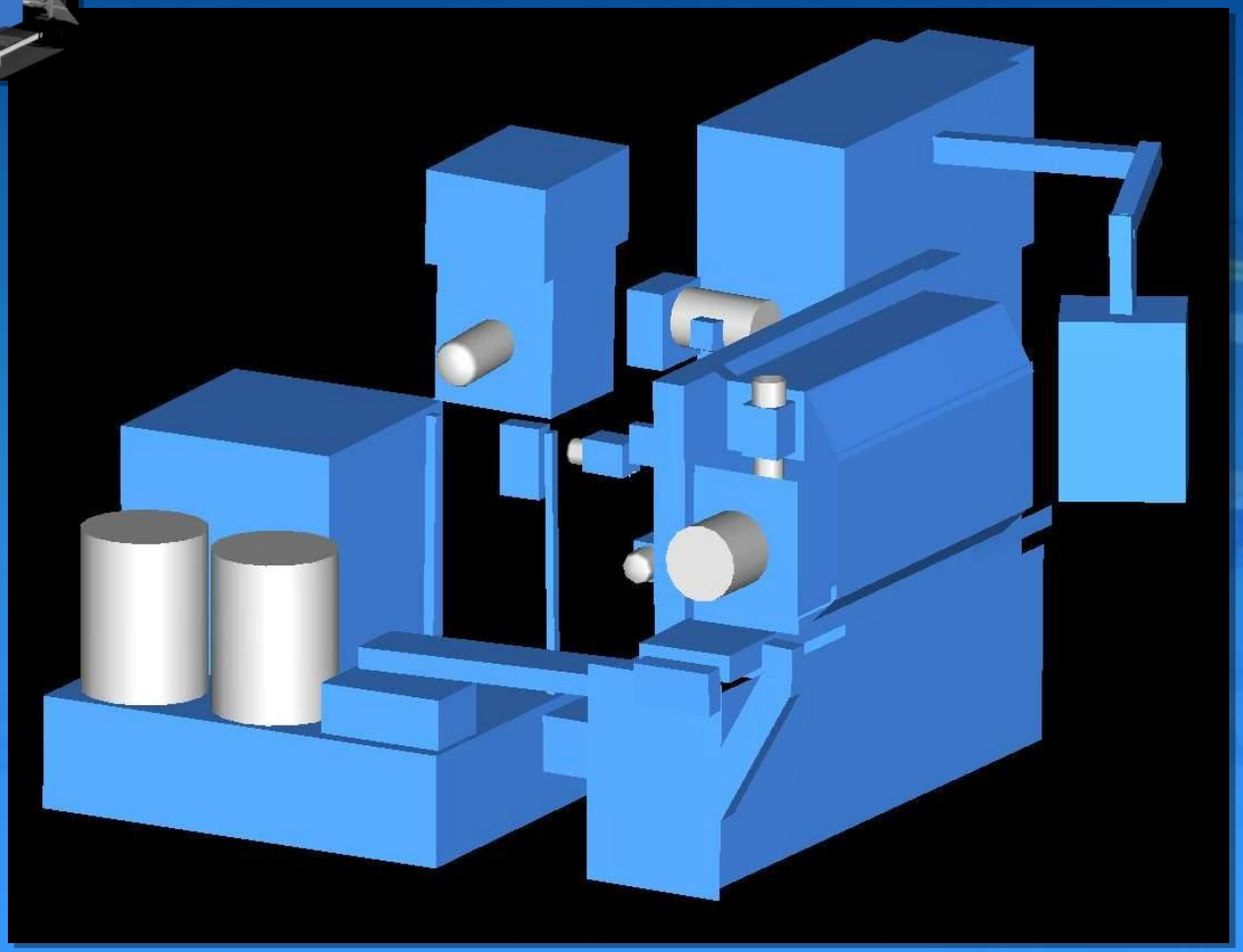




3D Simple Model Extracted
from Point Cloud

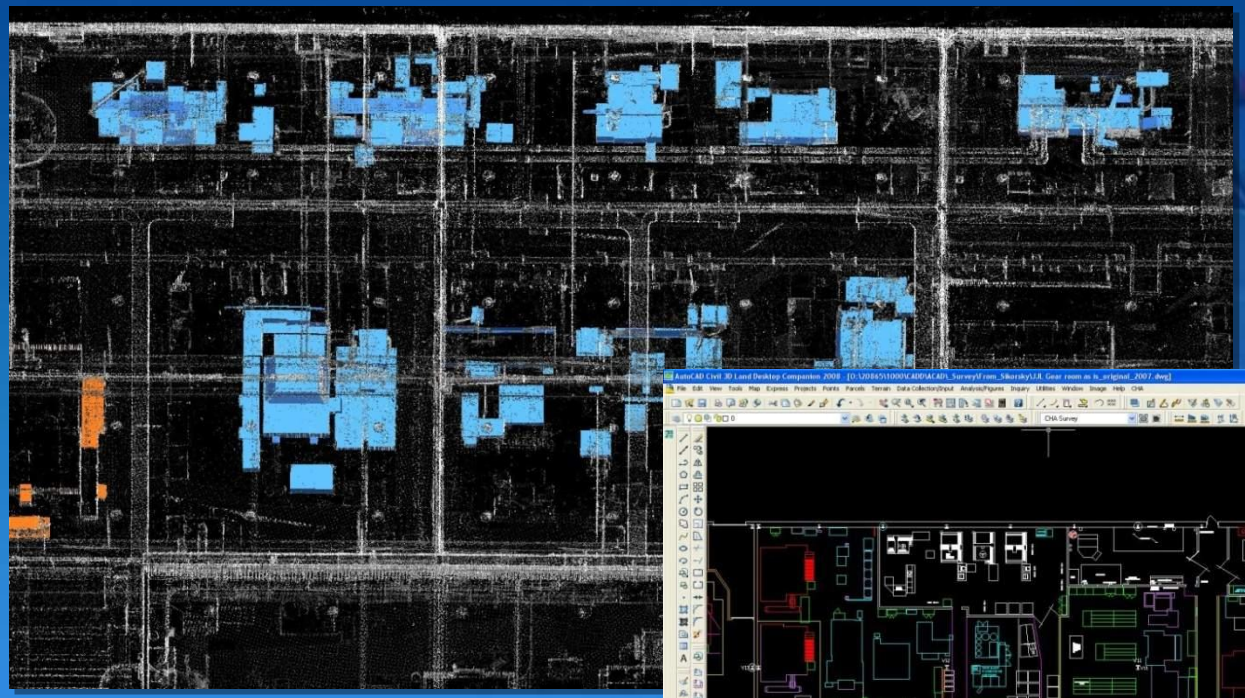
From Point Cloud to Object

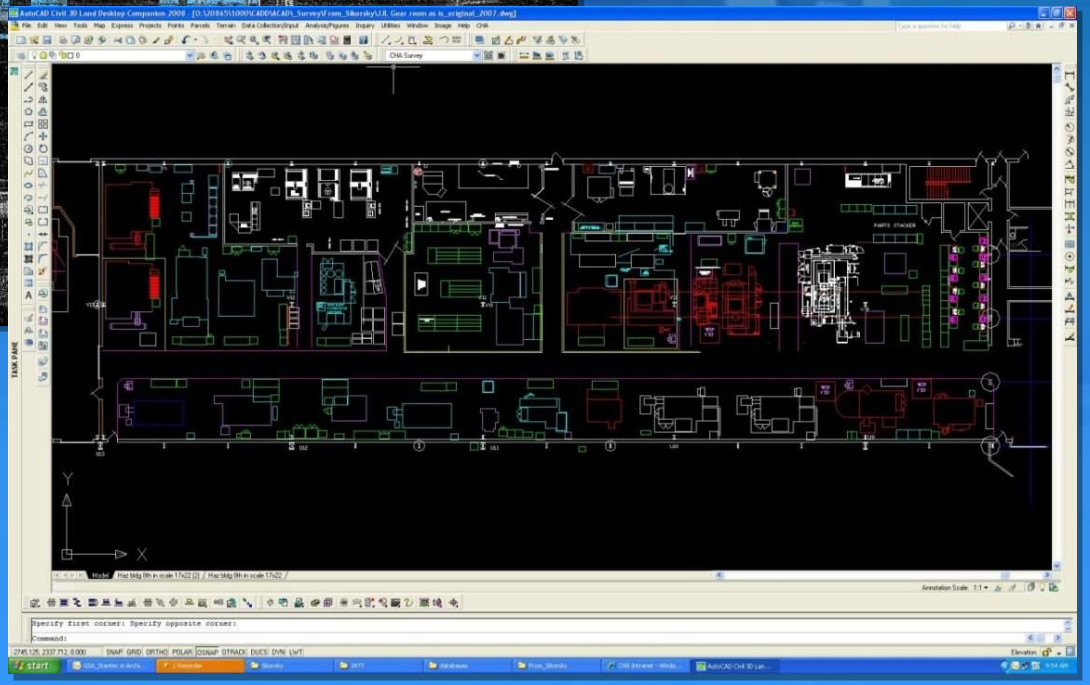




3D Simple Model Exported to Revit

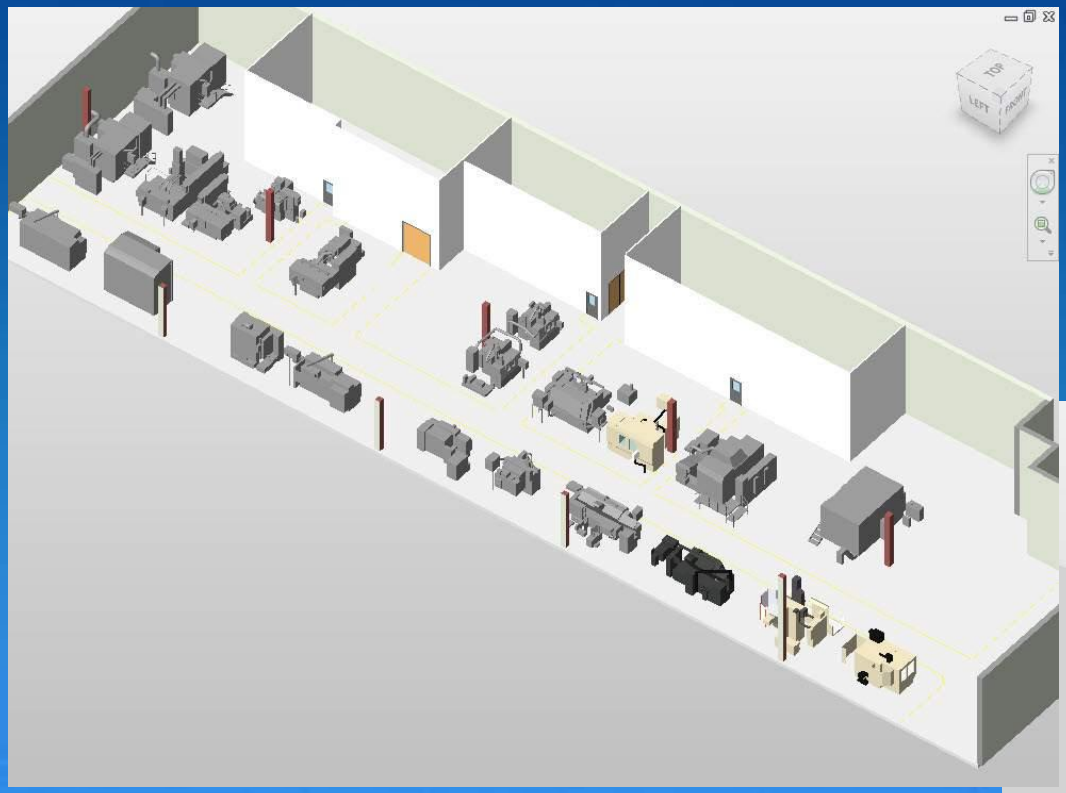
From Model to CADD

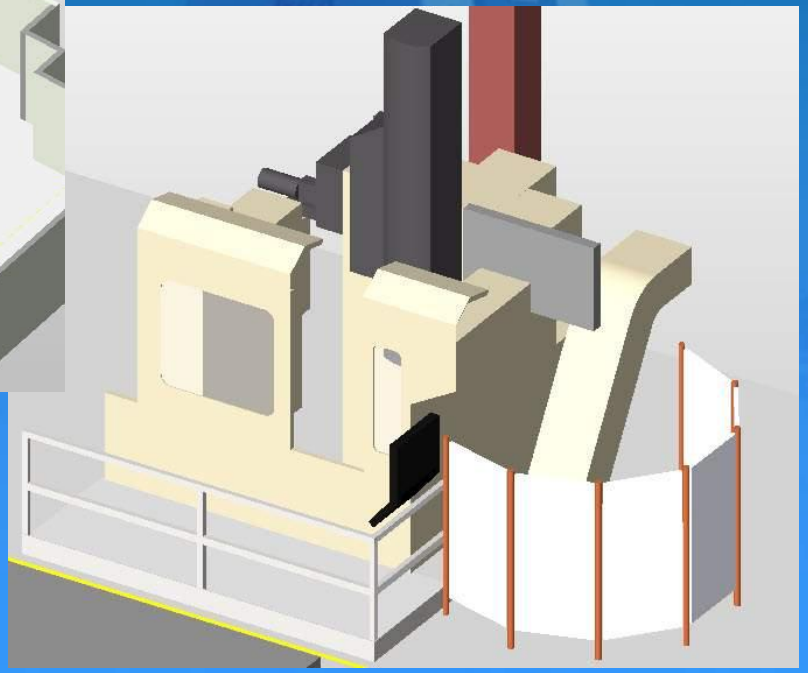




3D Models Exported
to CADD for 2D &
3D Drawings

From CADD to BIM

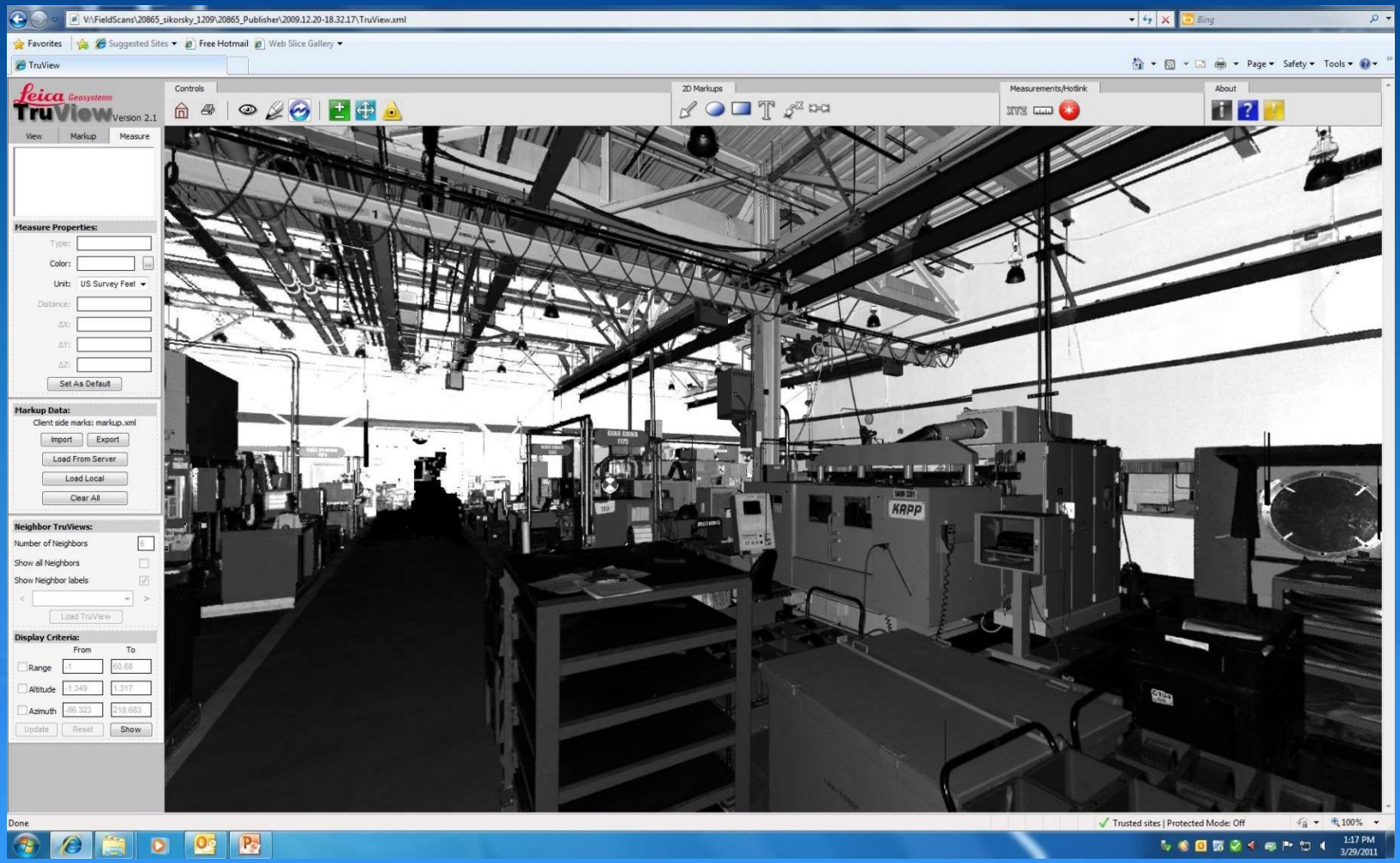




Revit Model gives client intelligent information along with real world 3D dimensions.

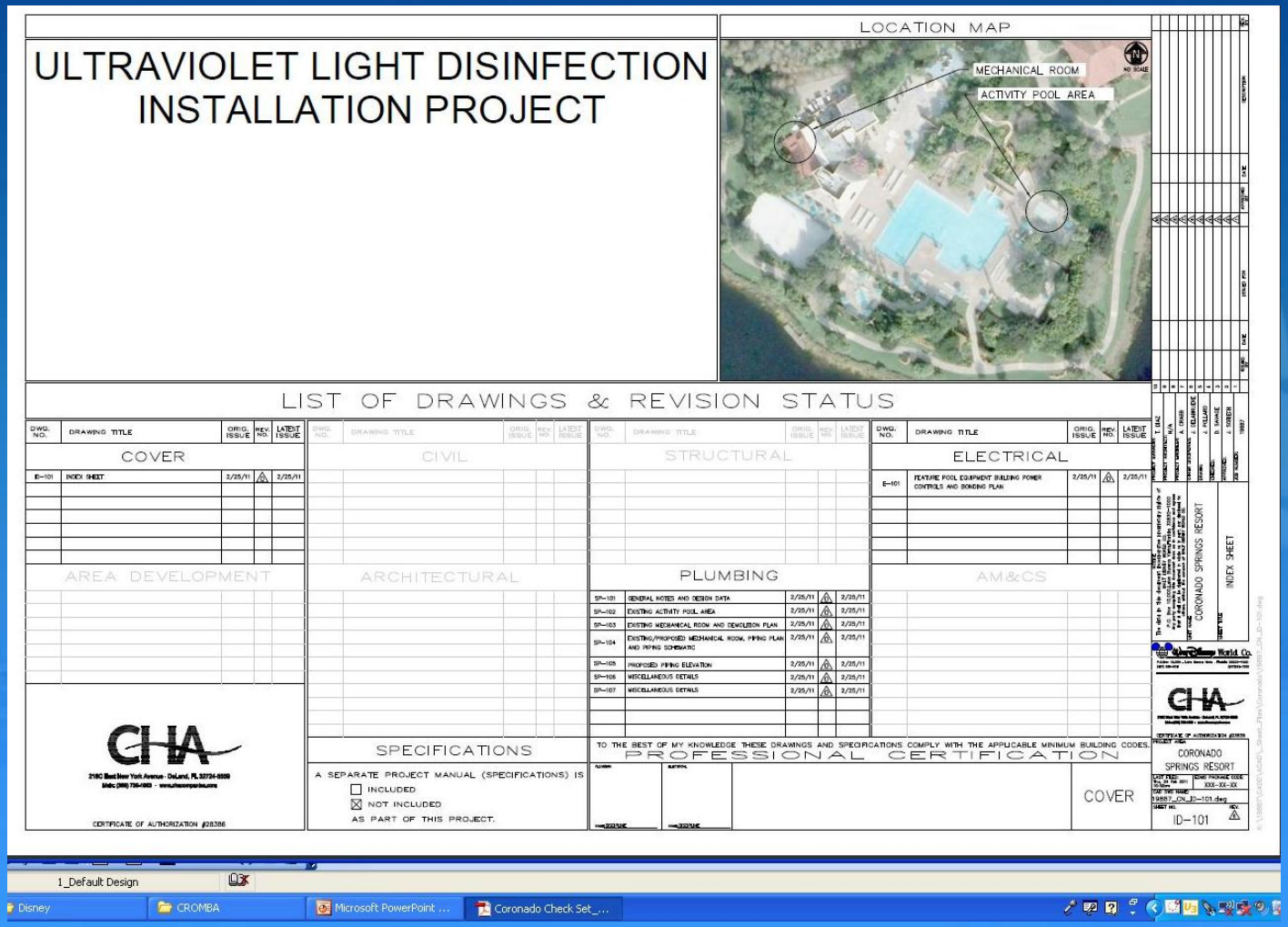
3D visualization with technical information that can be leveraged from the model

Web Based Collaboration



TruView Provides Real-Time QA/QC & Collaboration

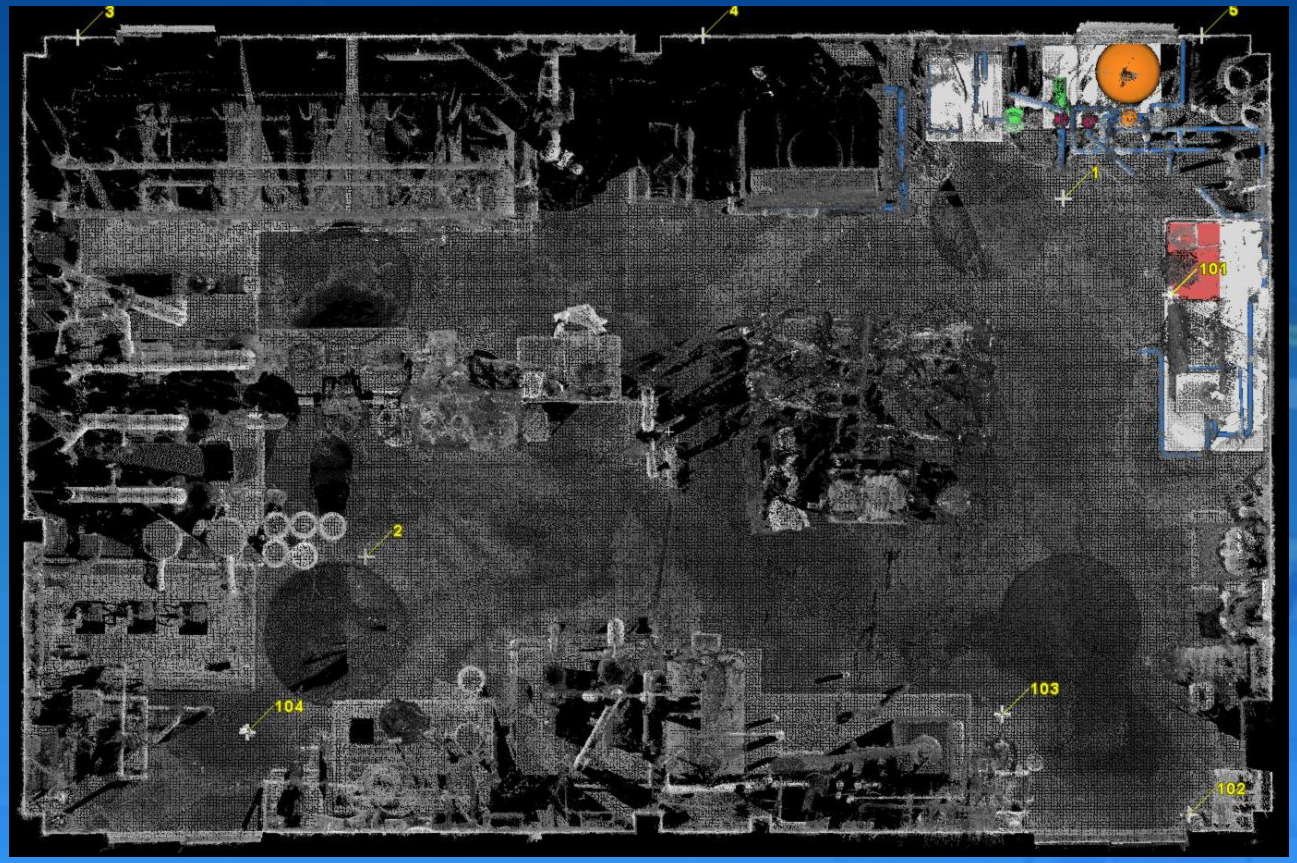
Project Sample



Project Sample

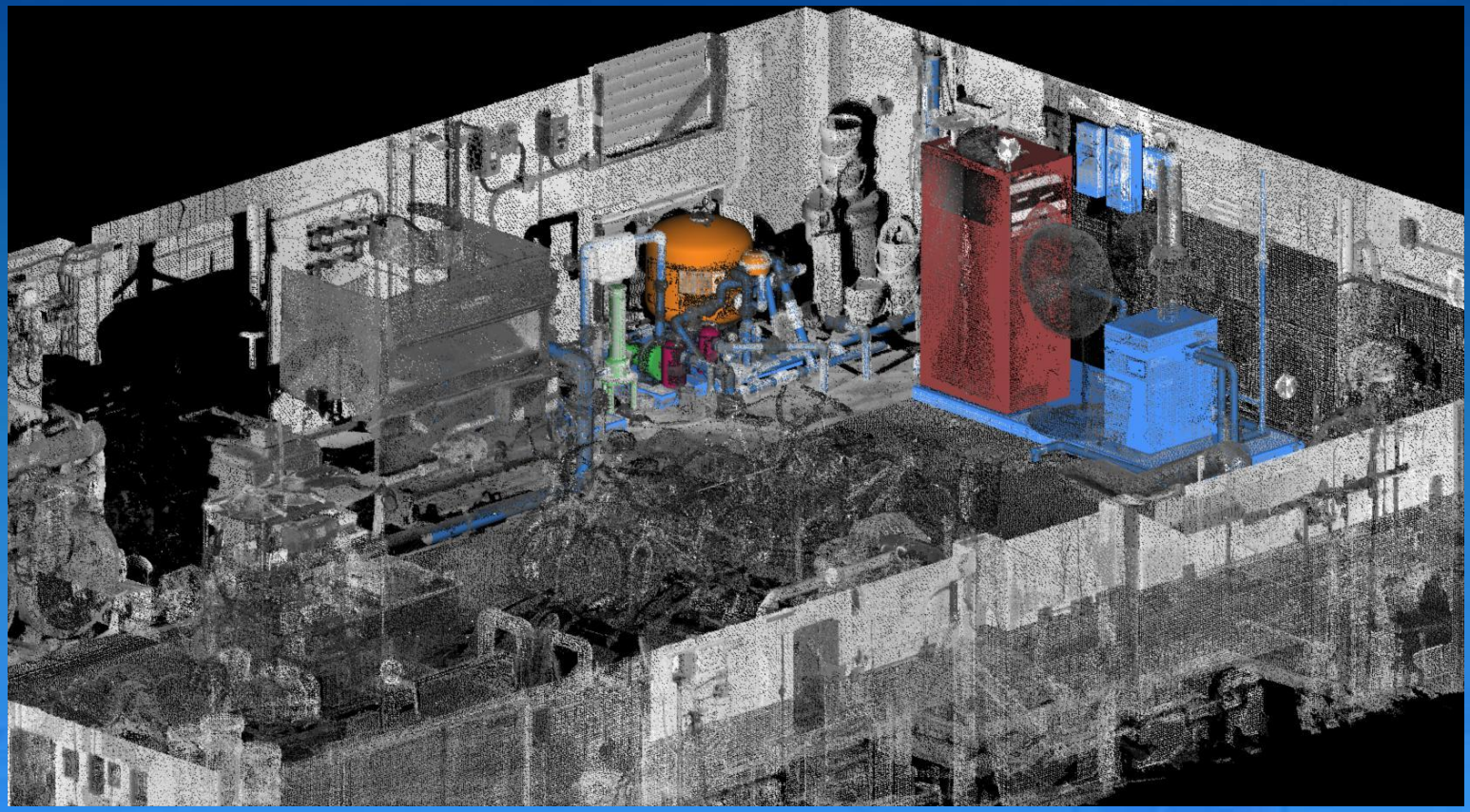
- Entire facility captured
- 4 Scans Approx. 10 Minutes Each
- 4mm Accuracy

Project Sample



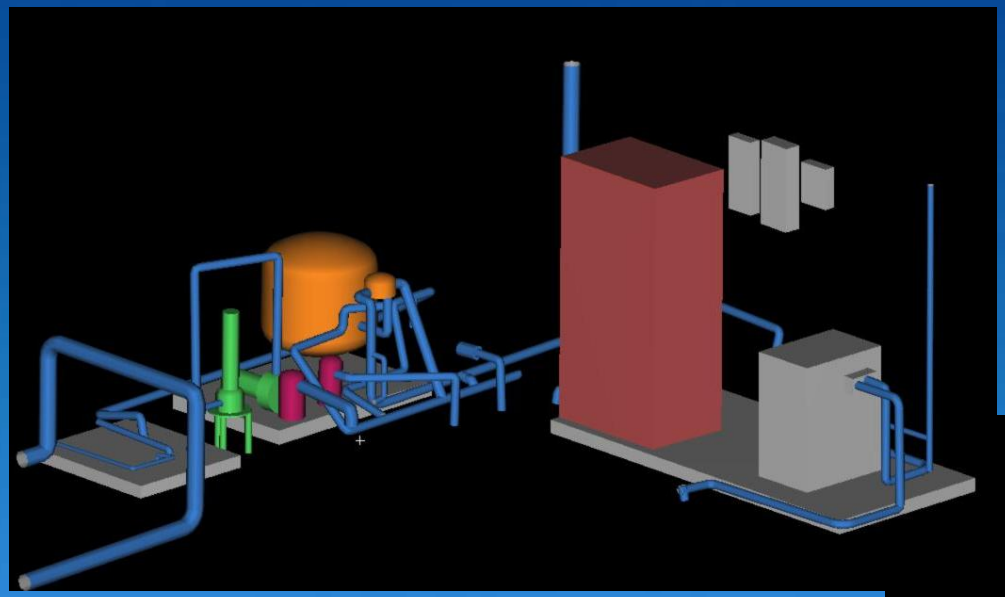
- No Site Disruption
- No need to “touch” anything
- No Systems Missed

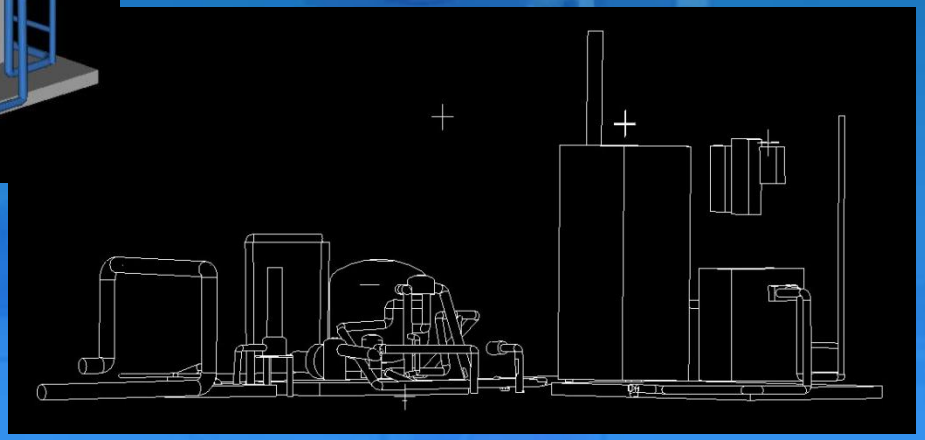
Project Sample



- Accurate As-builts
- Early Clash Detection
- Virtual Mock Up

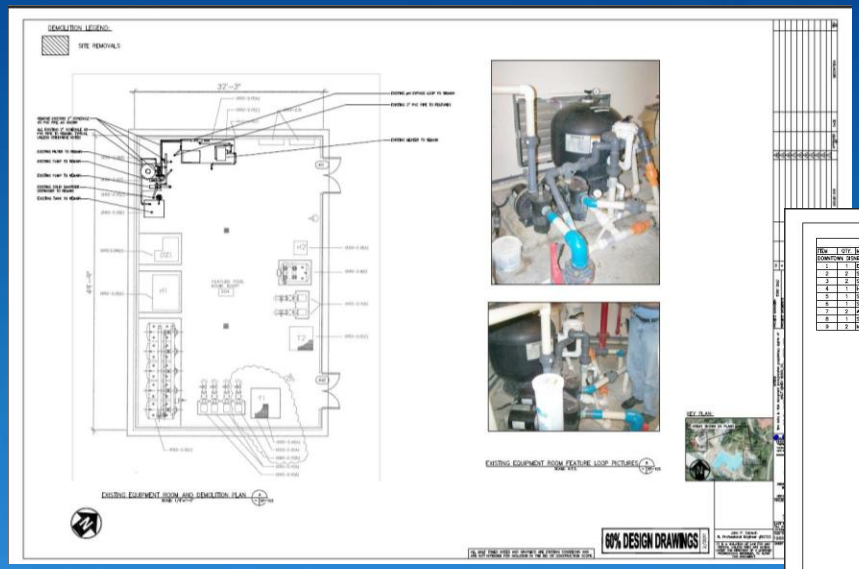
Project Sample

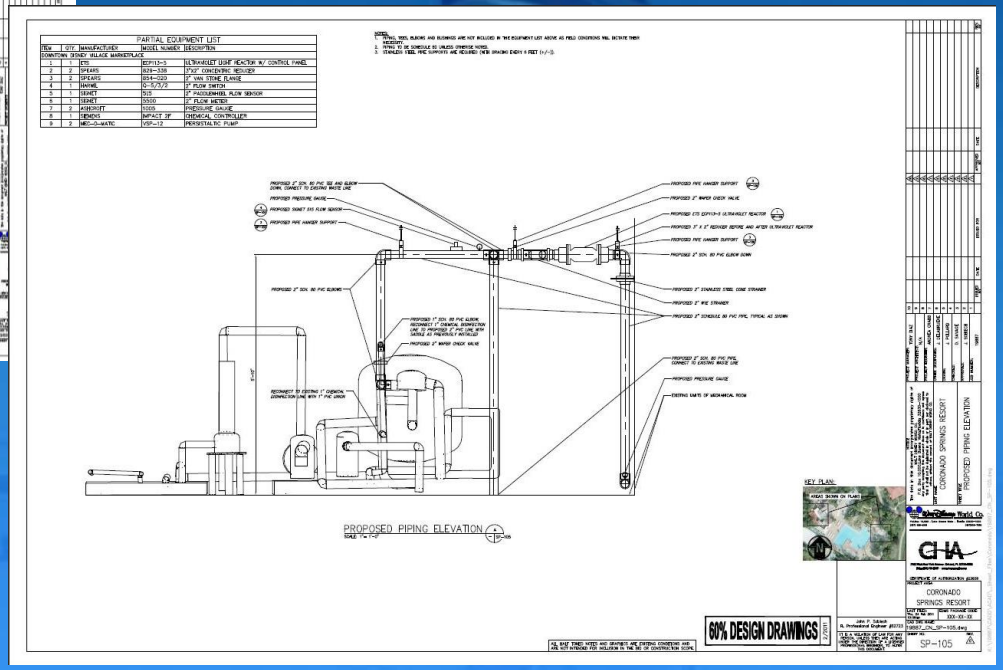




- Export to CADD
- Incorporate Design Data
- 3D Design/2D Drawings

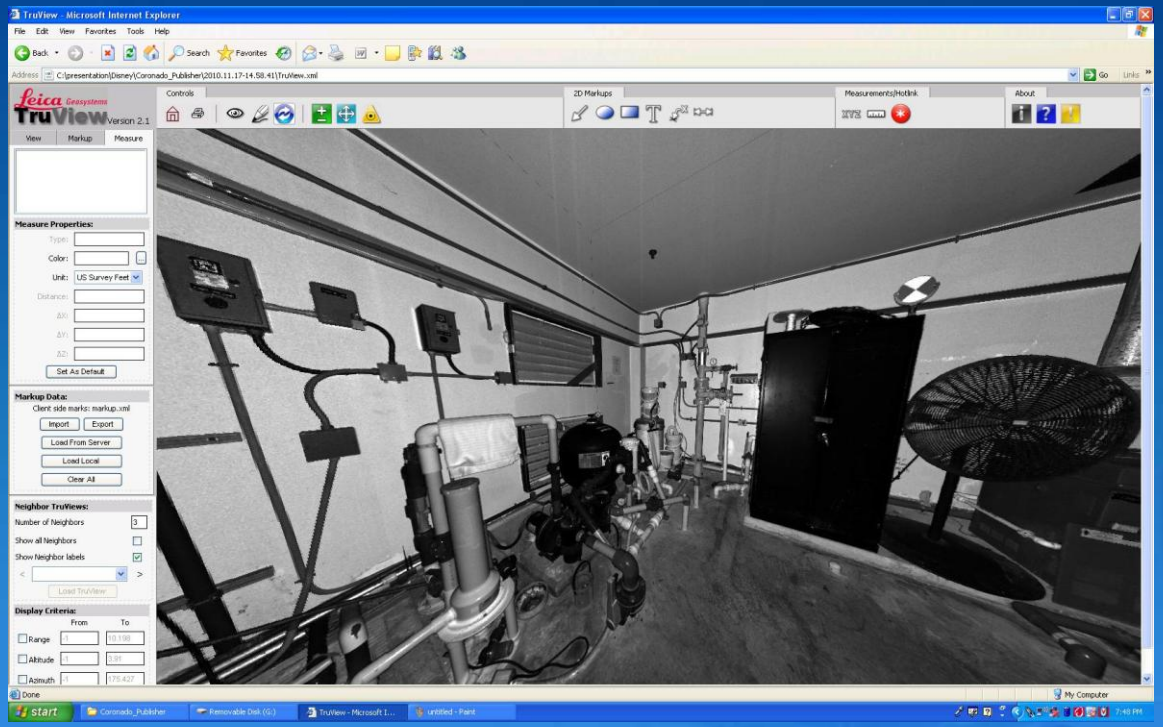
Project Sample

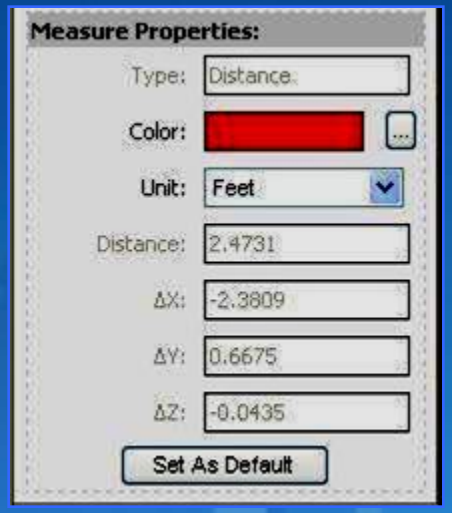




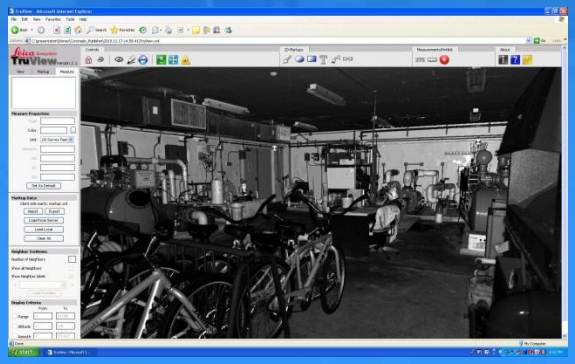
- Standard Deliverables
- True Scale
- Greater Detail

Online Collaboration

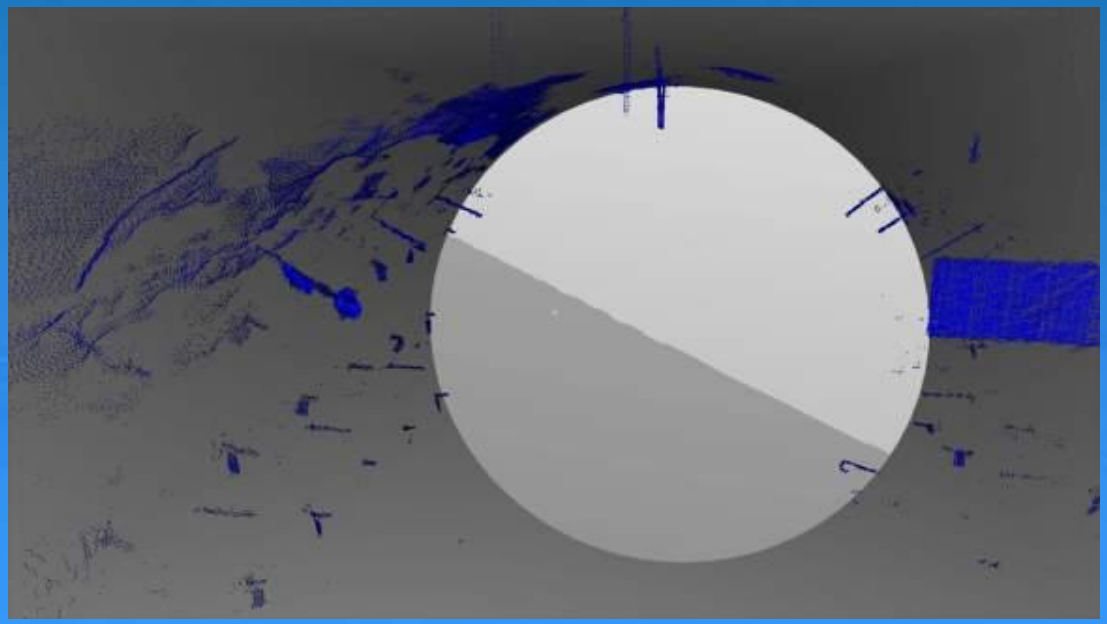


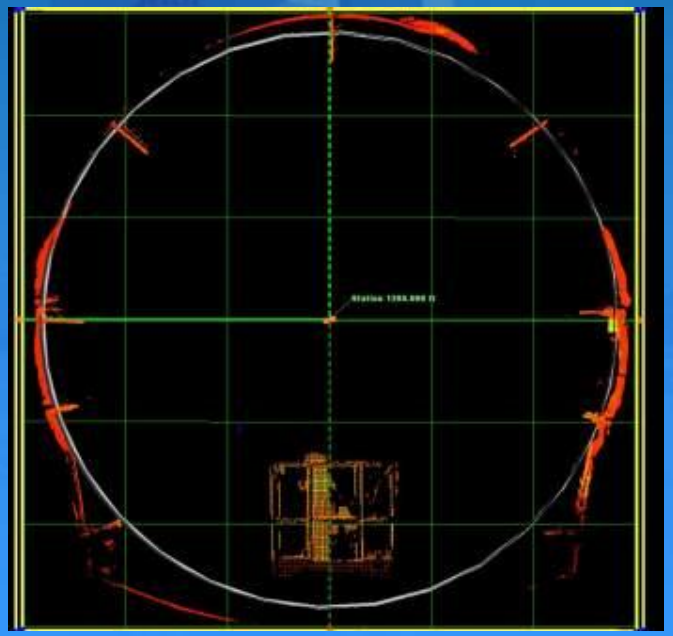


- Desk Top Access
- XML Communication
- Multi Office Collaboration



From BIM to Point Cloud

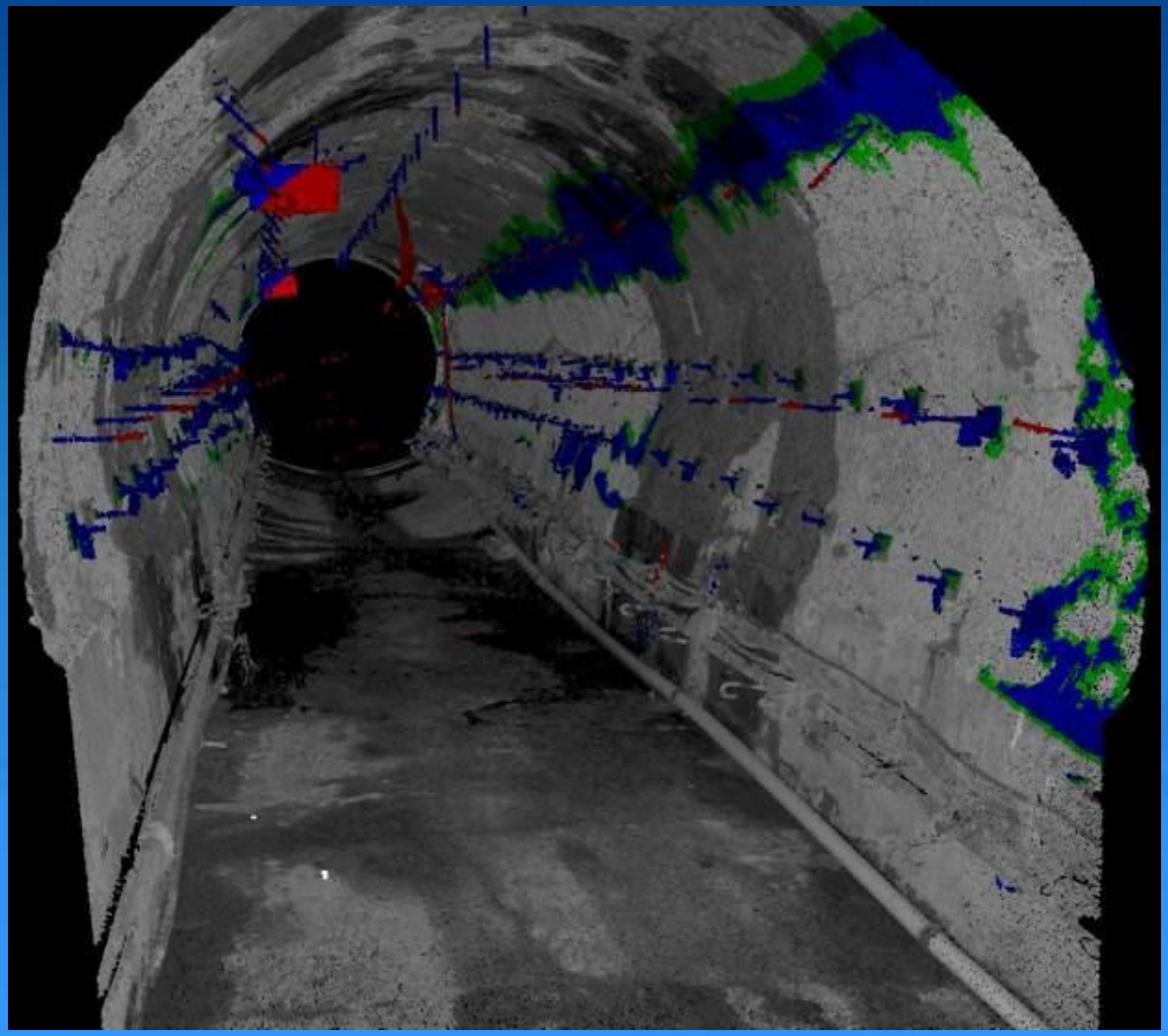




Model imported to point cloud for Clash Detection

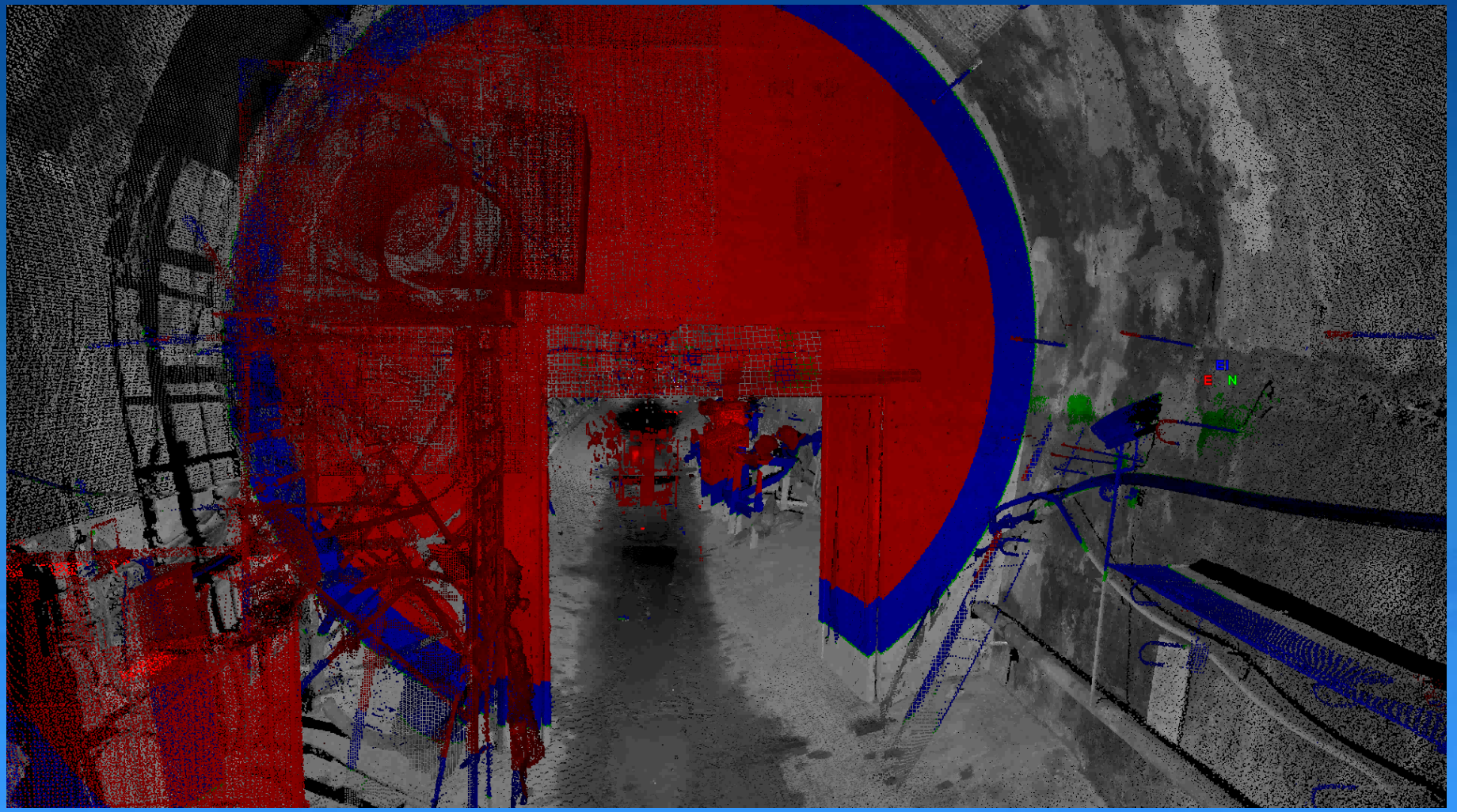
From BIM to Point Cloud

- **Interference Detection Calculation Ran on Point Cloud**
- **Rebar End Points and Interference Points Determined and Staked-Out**
- **Red = Portion of Rebar to be Removed**
- **Blue = Rebar to Remain and Cage to be Tied**



Model imported to point cloud for Clash Detection

From BIM to Point Cloud



Contact Information

Jody J. Lounsbury, PLS
CHA
3 Winners Circle
Albany New York, 12205
jlounsbury@chacompanies.com
518.453.8706

Thank You