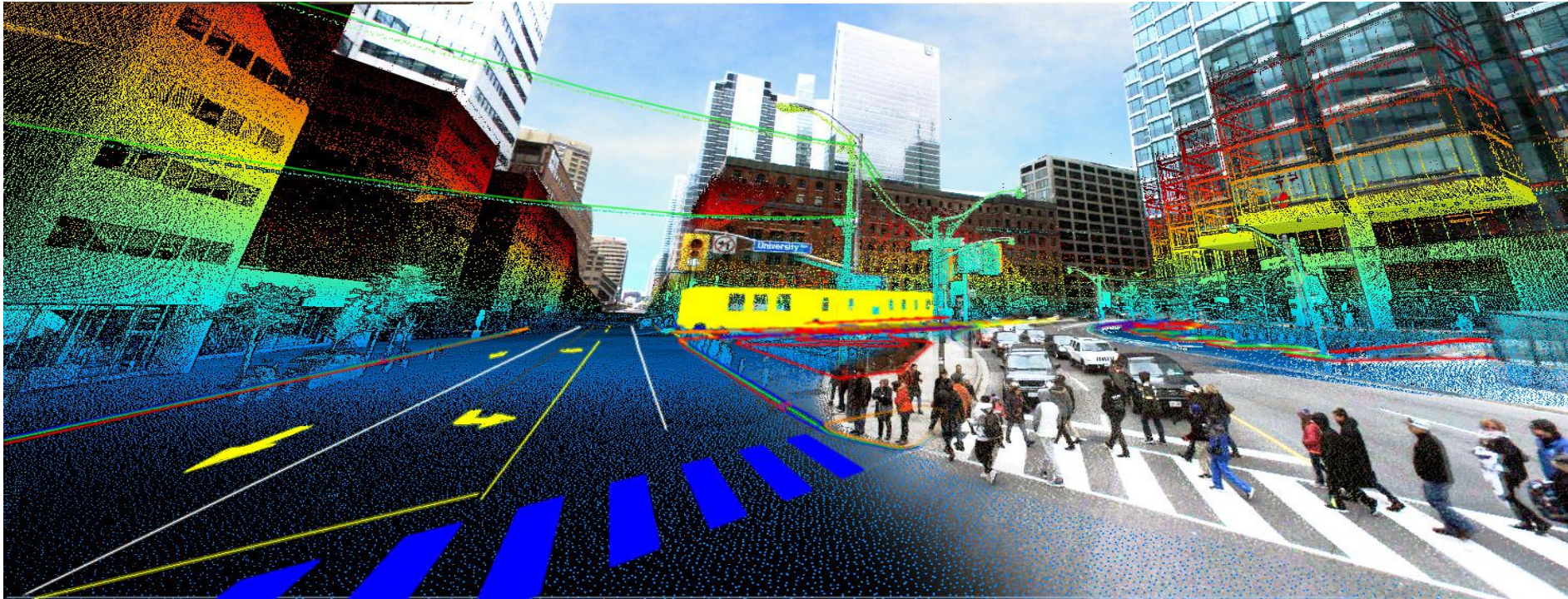


What is the biggest single hurdle in moving your projects forward from concept to completion?



3D Scanning and Digitized Reality



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rradovanovic@mcelhanney.com Tel : 403-461-4056



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What is Digitized Reality?

- **A digital representation of real spaces compiled from collected 3D data sets**
- **A virtual diorama that lets people explore and understand how a proposal affects their current situation**



What is Digitized Reality?



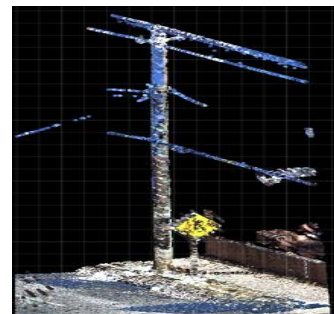
McElhanney

What is Digitized Reality?

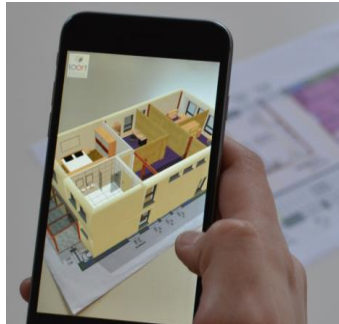
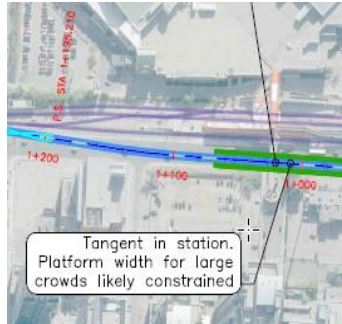
Data Capture



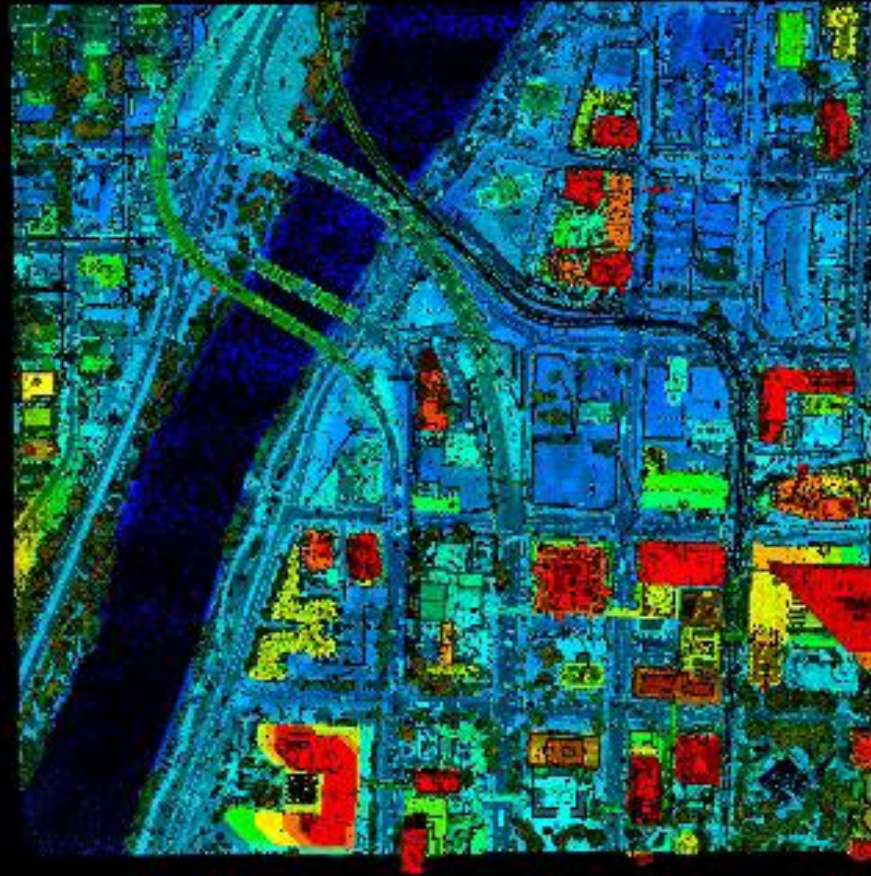
Data Processing



Distribution



Data Capture : Point Clouds

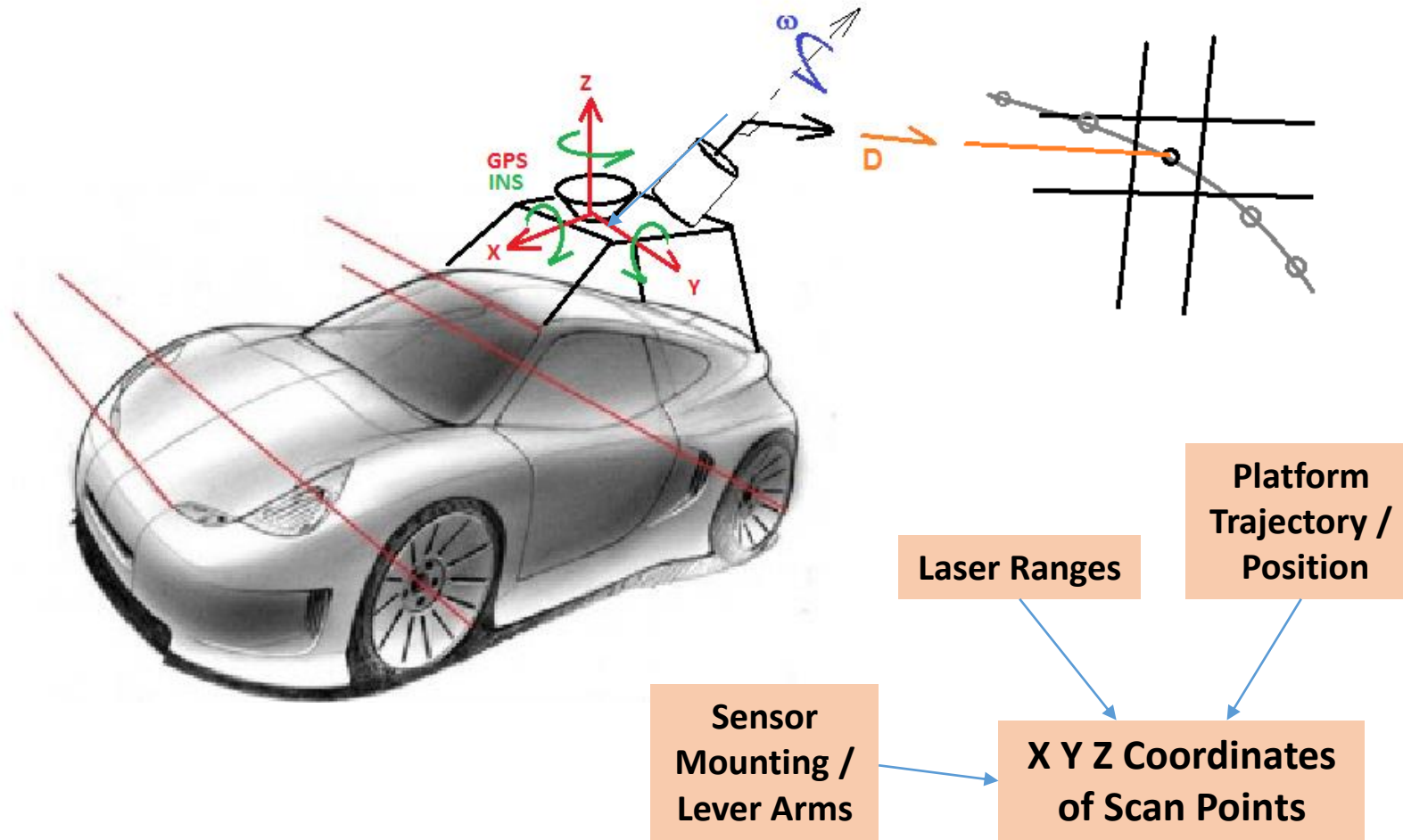


Data Capture : Geo-oriented Photos



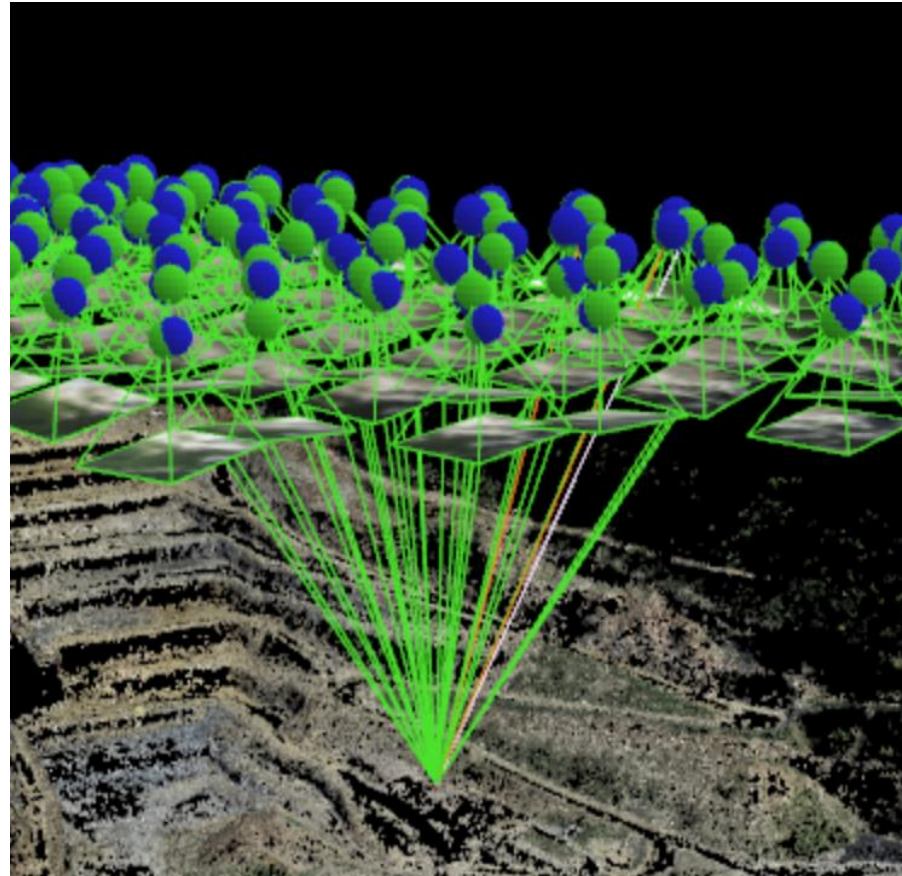
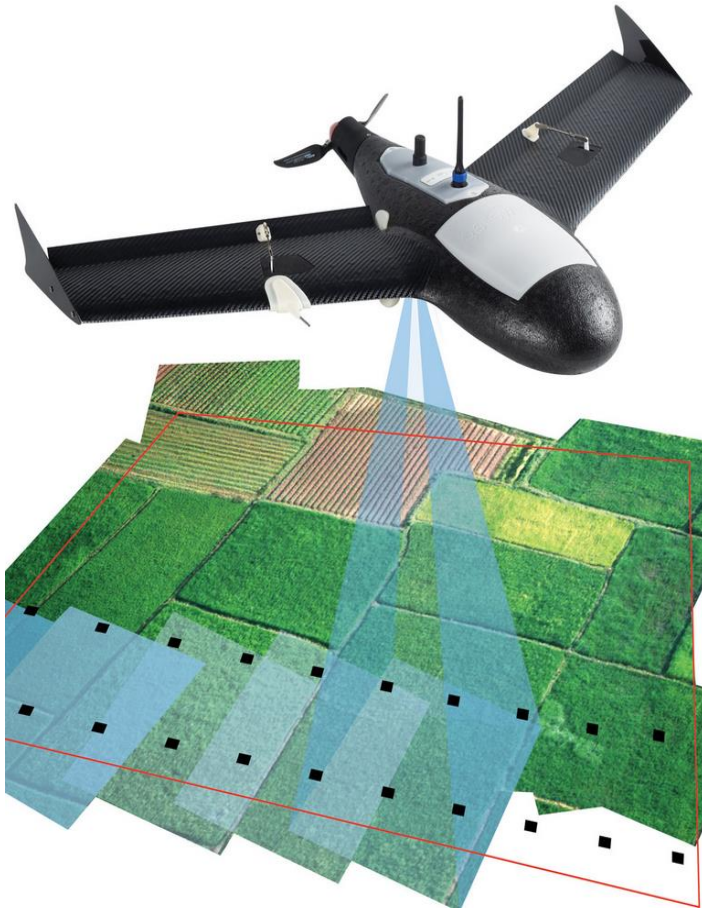
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How Does it Work? – Scanners -



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How Does It Work? – Photogrammetry -

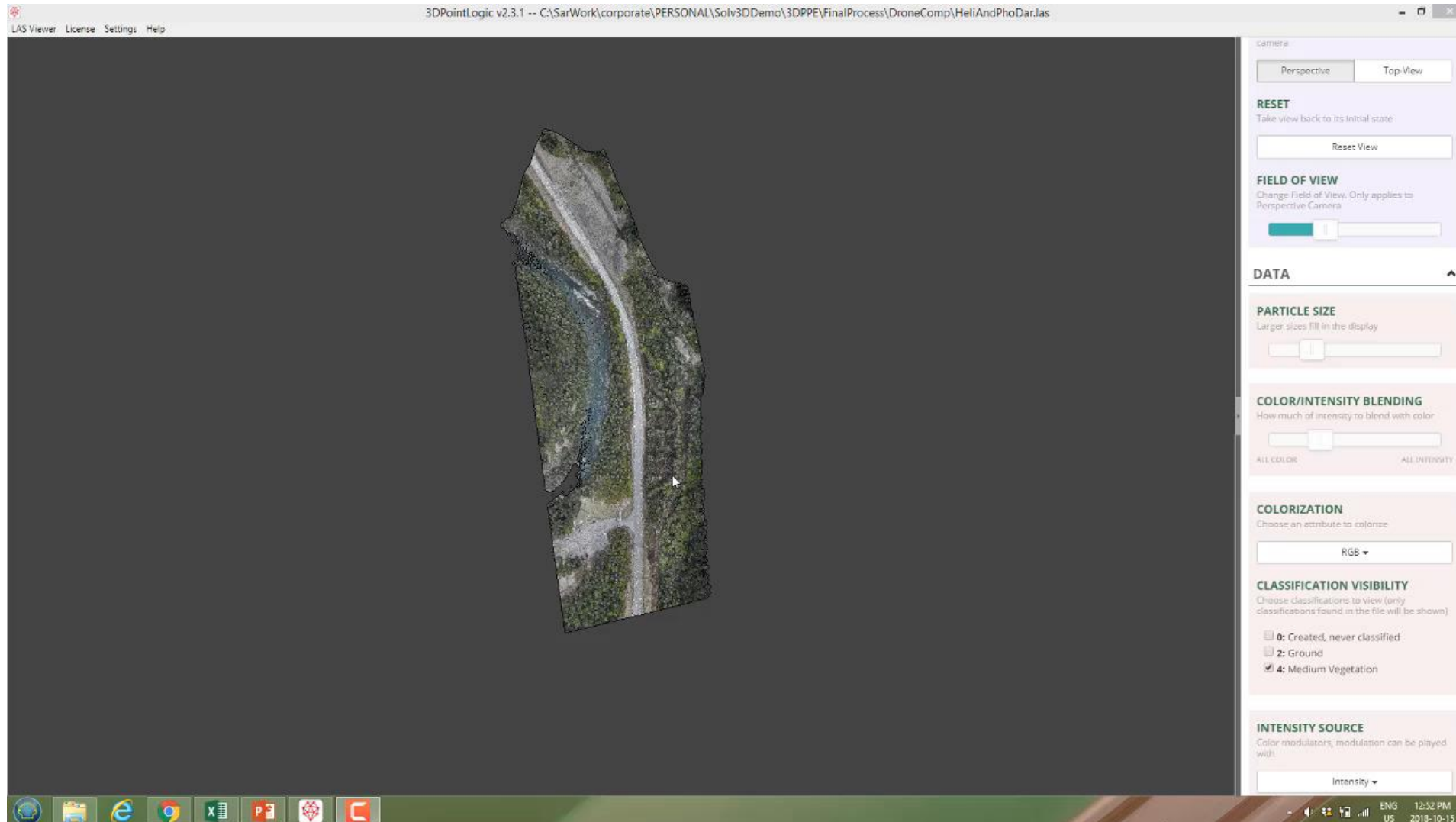


(From Pix4D)



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Point Clouds are NOT all the same!



What Can Scanning / UAV's NOT Do?

- Replace conventional surveying *completely*
- Drop data acquisition costs to zero
- *Instantaneously* provide 3D CAD models
- See undergrounds / through walls / past trees / etc.
- See through snow!



Data Processing

‘Dumb’ Point Cloud



‘Smart’ Products

Digital Elevation Model

Curb and Gutter Linework

Lane Marking Linework

Location of Manholes / Catchbasins

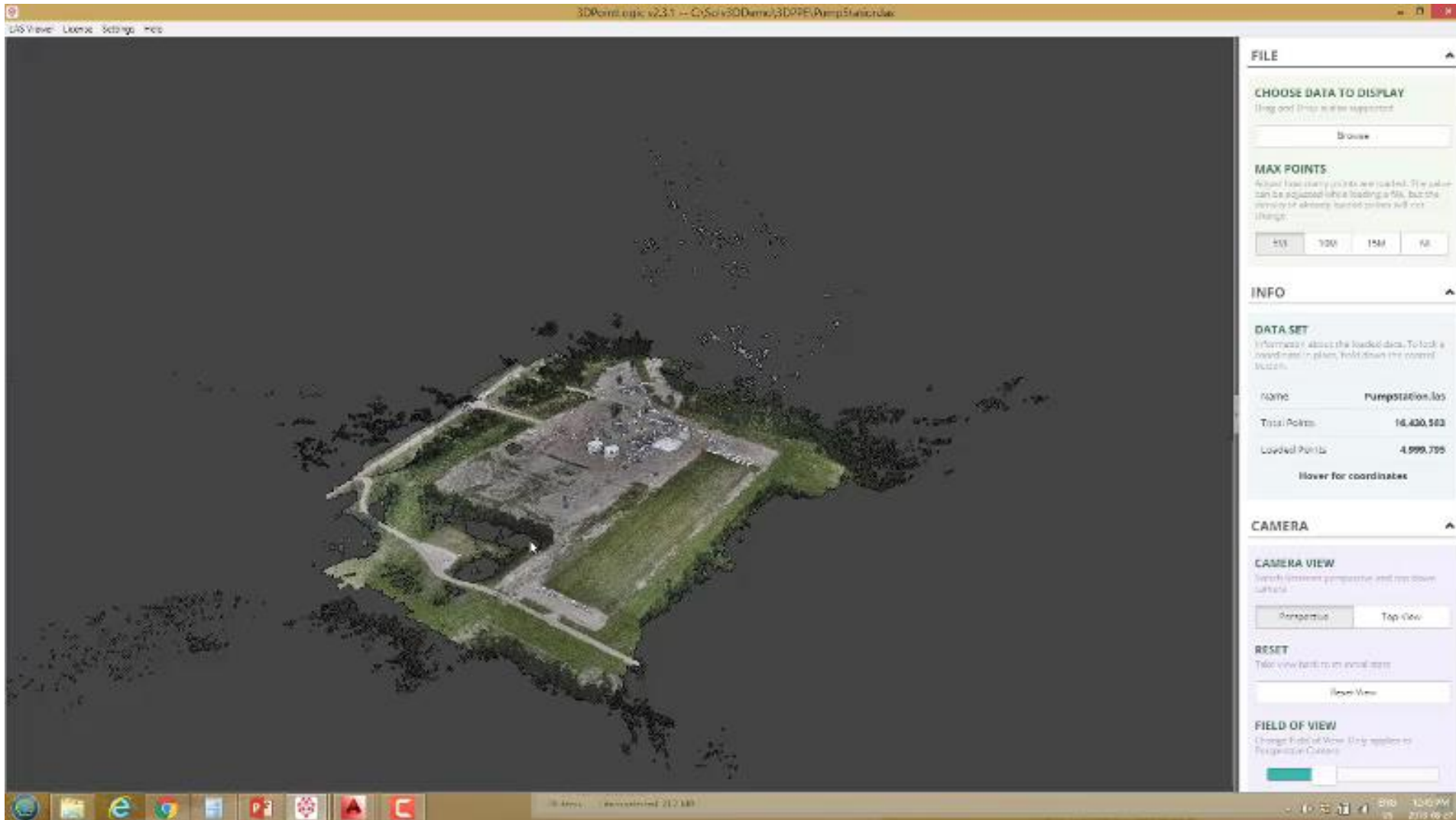
BIM models

Many, many hours of Virtual Surveying and Modelling!



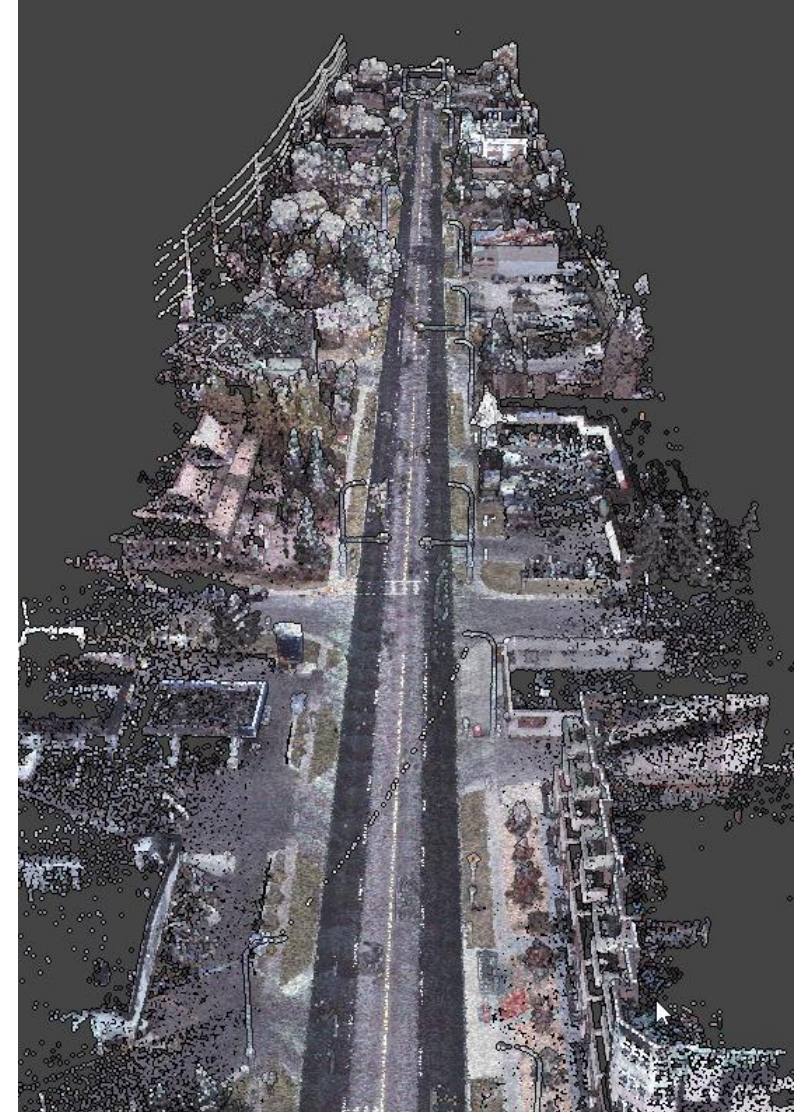
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Data Processing



Feature Extraction – Do not try this at home

- File sizes associated with Digitized Reality are *huge*
- Typical 1 km segment of road has 50 million points and is 2 gb in size!
- **Modelling is a time consuming business**



Mobile Scanning Workflow / Timelines

Scan Data Collection

10-50 mi per day

Survey Control

5-10 mi per day

Scan Cloud Processing

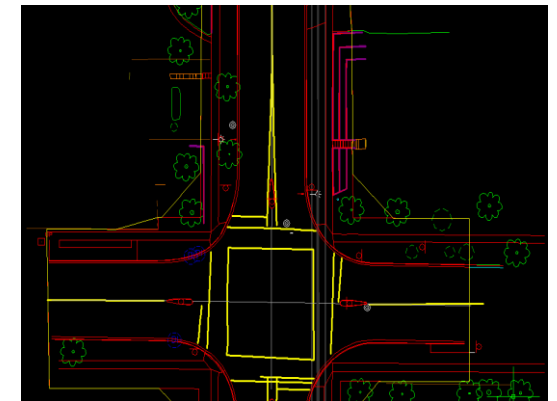
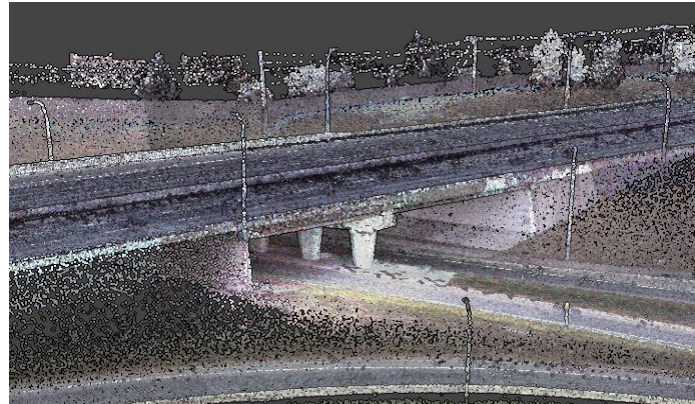
1-2 days

QA/QC

5 mi / day

Feature Extraction

2 mi / week



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Typical Costs

Type	Cost / mile
Urban / Full Extraction	\$10 000 - \$15 000
Highway / Profiles and Features	\$ 2 000 - \$ 3 000
Highway / Collection Only	\$ 200



- Validation and Extraction Costs are considerable portion of total
- Minimum project cost ~ \$10 000

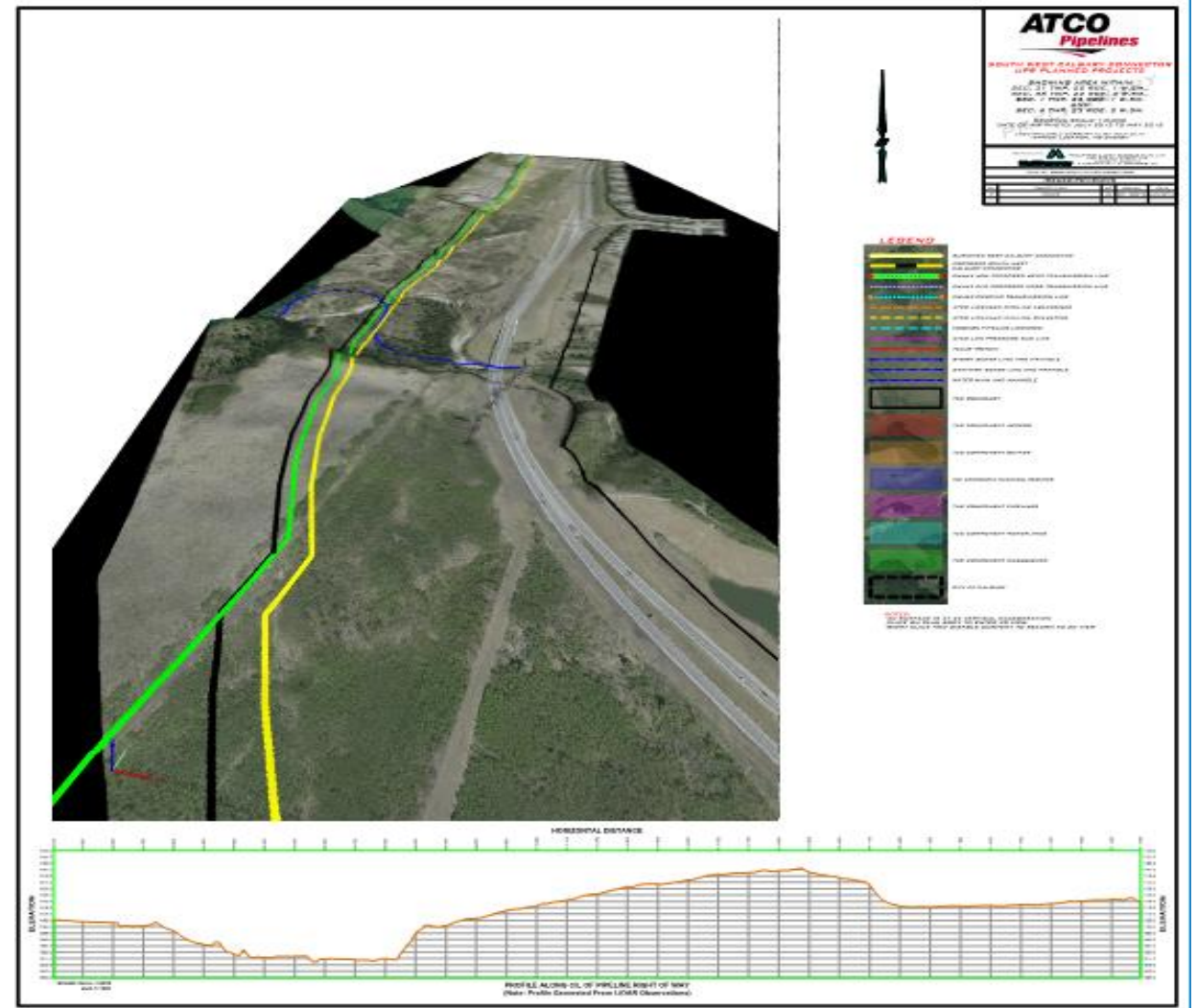
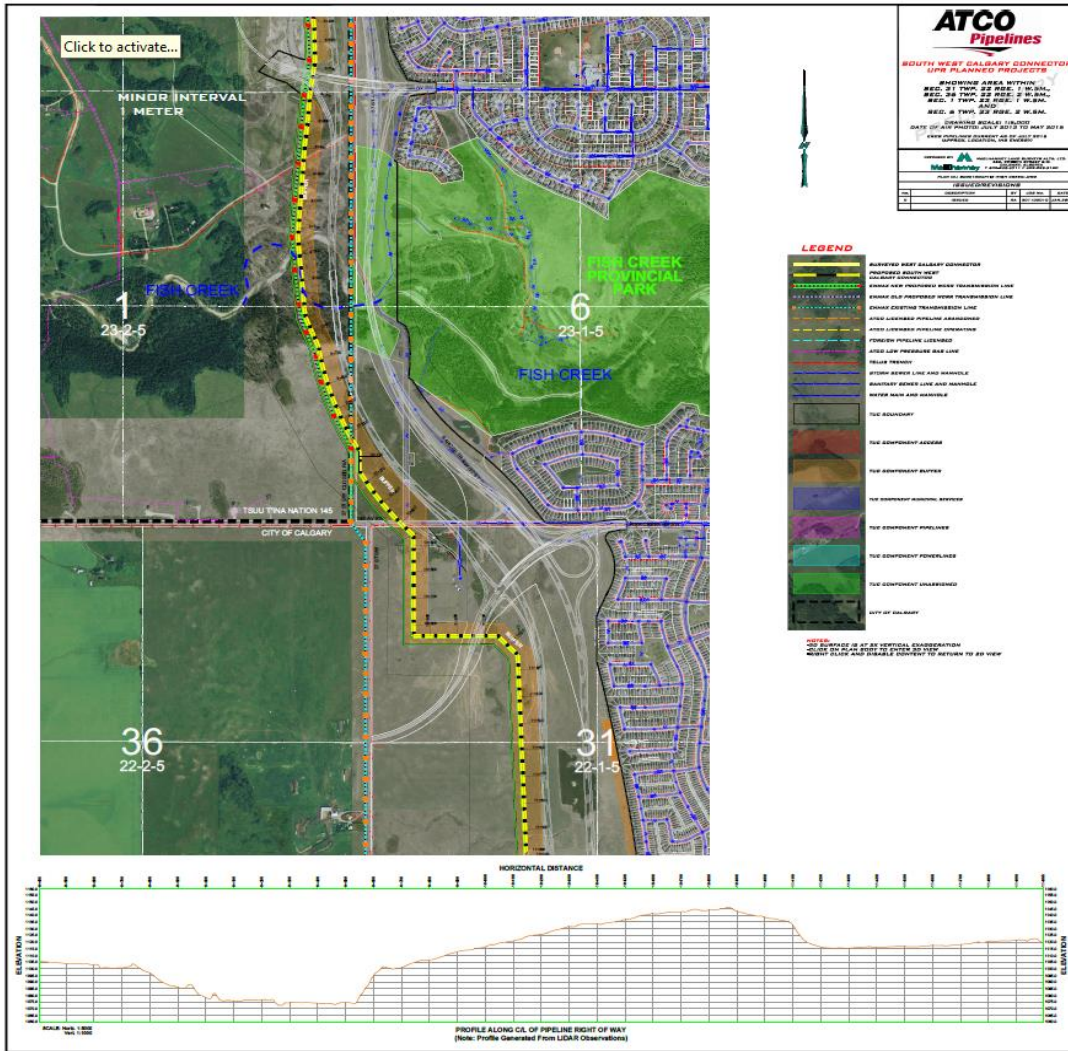


Data Delivery – Static Renders

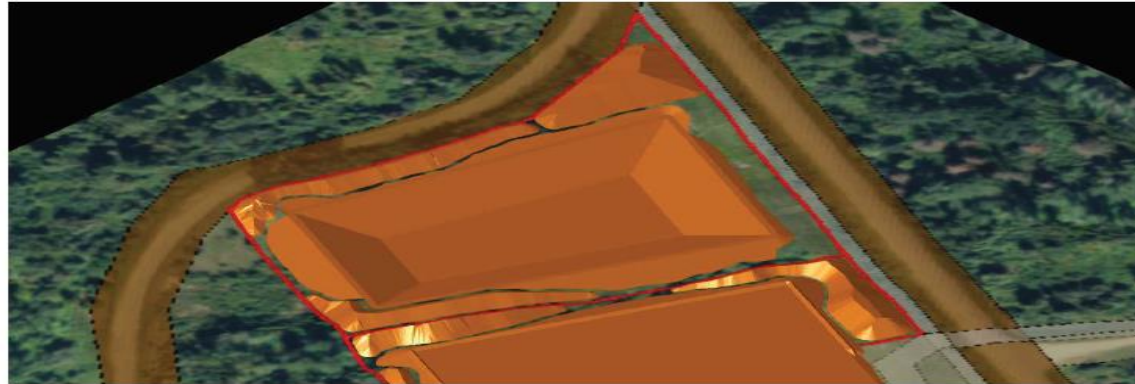


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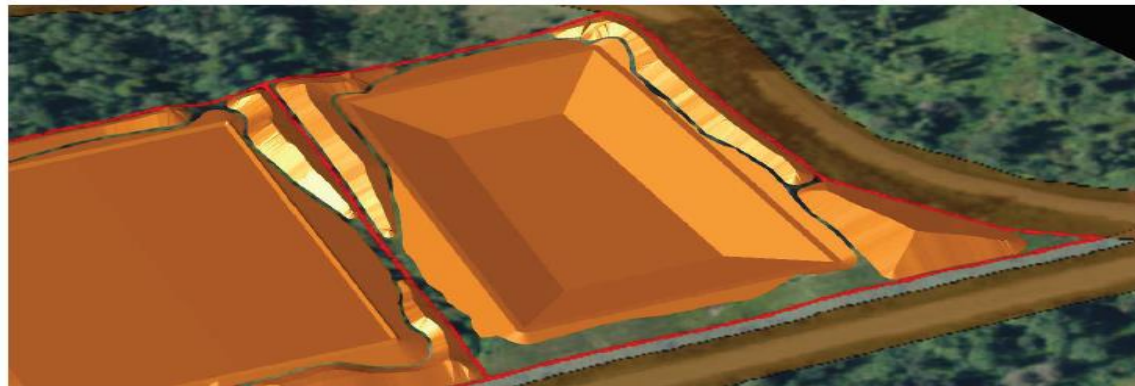
Data Delivery – Static Renders



Data Delivery – Static Renders



View from the S looking N (NTS)



View from the E looking W (NTS)

NOTES

1. The design shown in this package is purely geometric and is for volume estimation and right of way determination only. No material compaction or expansion factors, civil or other geotechnical considerations are accounted for in the design.
2. Plan information is based on LiDAR Data collected by Valtus Imagery (January 1, 2007 to December 31, 2007). Coordinates in 10TMz11 NAD 83 CSRS CGVD28. Orthometric elevations reference the HTV2.0 Geoid model. No field Verification Performed.

SITE SPECIFIC NOTES

1. This location falls within an Alberta Energy Regulator "Green" Area.
2. FMU: G16
3. FMA: Weyerhaeuser Company Limited (Grande Prairie)
4. The topsoil piles are designed with 2:1 slopes and can hold a maximum of 1749m³.
5. The subsoil piles are designed with 3:1 slopes and can hold a maximum of 1961m³.

**PRELIMINARY
FOR APPROVAL ONLY**

Plan Showing Preliminary Site Layout

OIL CO. HZ WAPITI

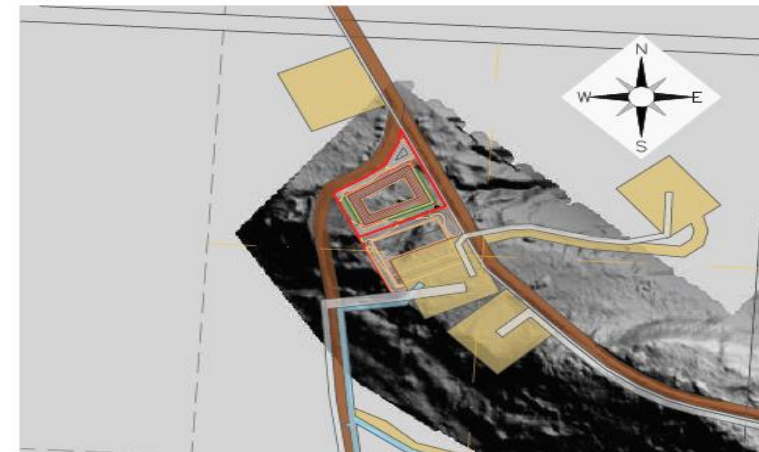
Proposed Water Pond In

L.S.15 Sec.10 Twp. 67 Rge. 8 W.6 M.

M.D. of Greenview No. 16 - ALBERTA

BARE EARTH 3D LIDAR MODEL

Background Image derived from Bare Earth LiDAR data



Revision #	Revision Note	Date
0	Original Issue	February 22, 2016

OIL CO. LTD.



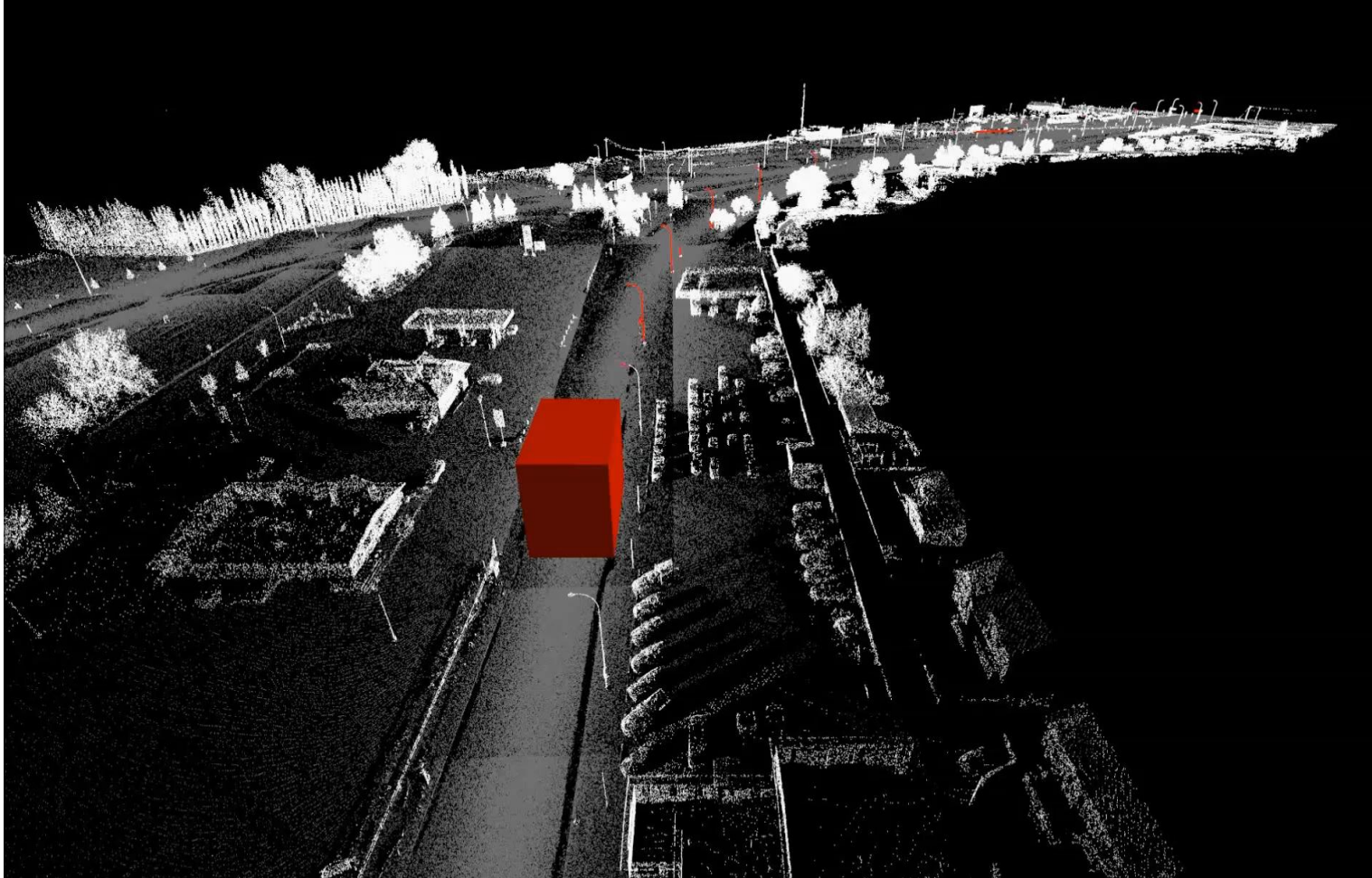
McElhanney Geomatics Engineering Ltd.
100, 402 - 11th Avenue SE
Calgary, AB
T(403)245-4711 F(403)229-9160

Acad File: Borrow Demo.dwg	Drafted by: LM/VE	Checked by: LPM
Scale: 1:7500	75 0 75 150 225 300 375	Page 7

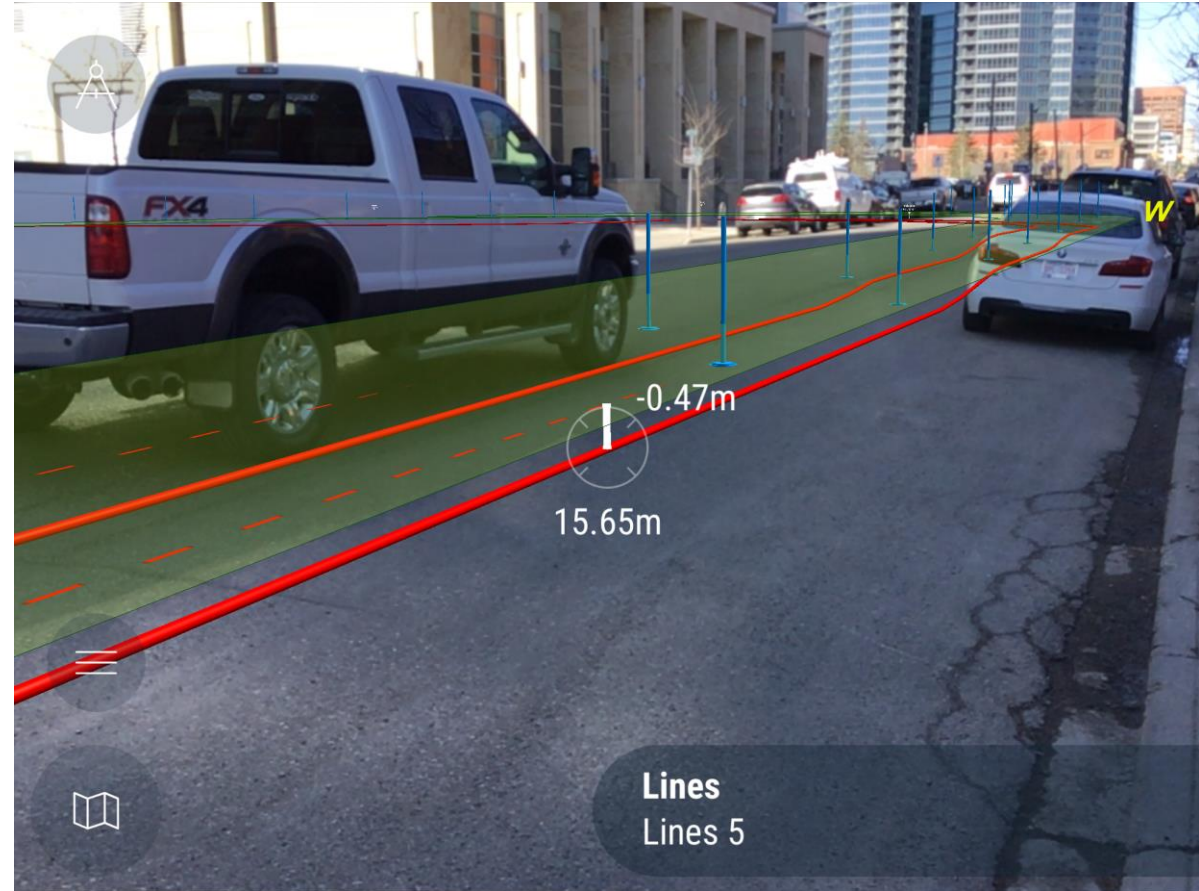


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Data Delivery – Smart Models

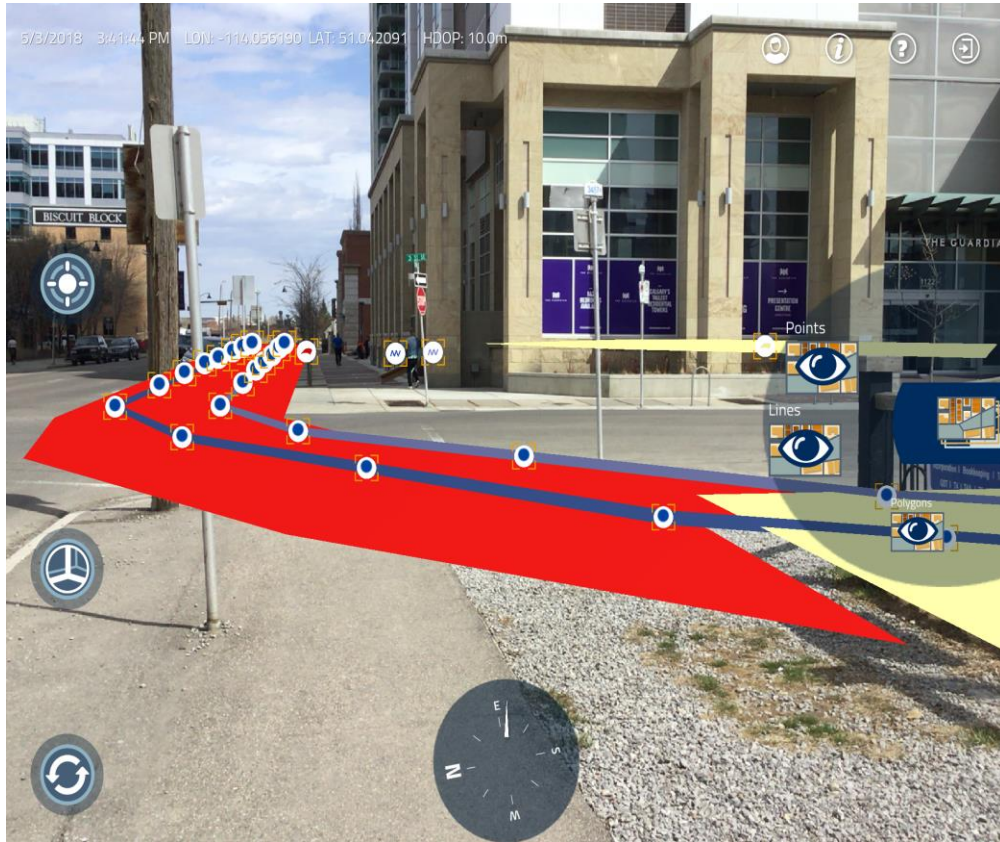


Data Delivery – Augmented Reality



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Data Delivery – Augmented Reality



Data Delivery – Virtual Reality



Ok, so what is this all good for?



Schedule, Rework and Collaboration



The cost estimate for this project is \$450 million USD.
(UDOT, 2018)

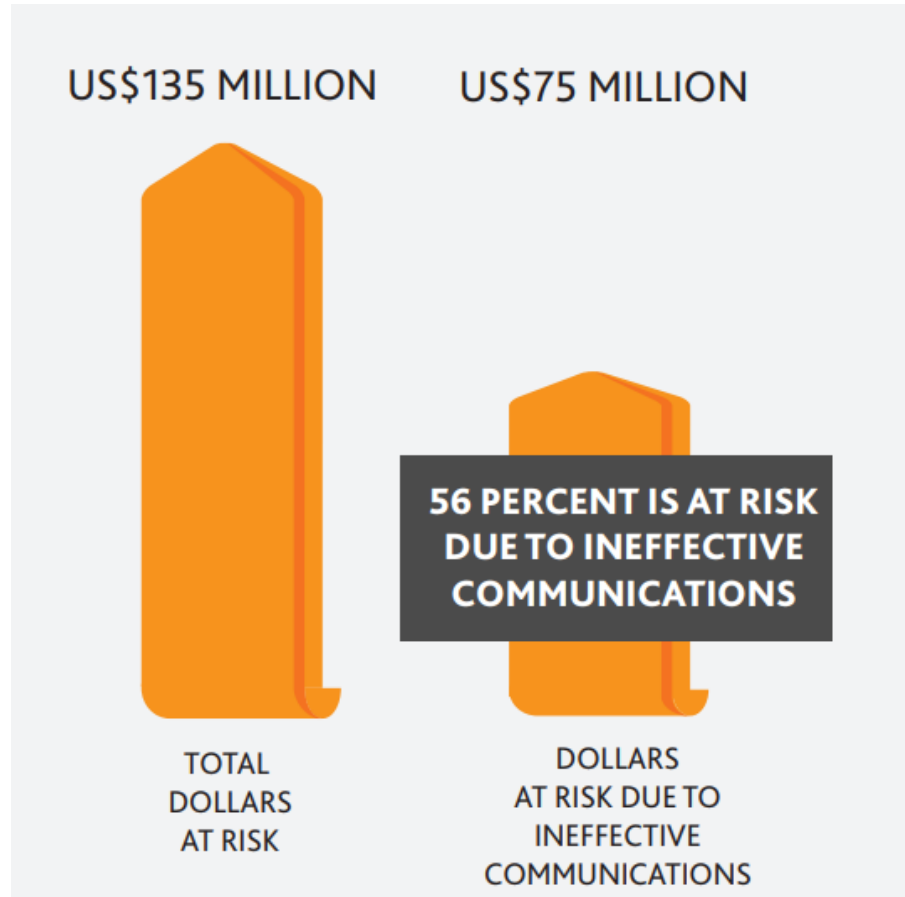
Most likely, it will go 80% over budget and be delayed by 20 months.
(McKinsey & Co, 2016)

Using drones and 3D laser scanners could *instead* save 5% on the total installed cost through better situational awareness.
(Higgins, 2004; Beroe, 2017)

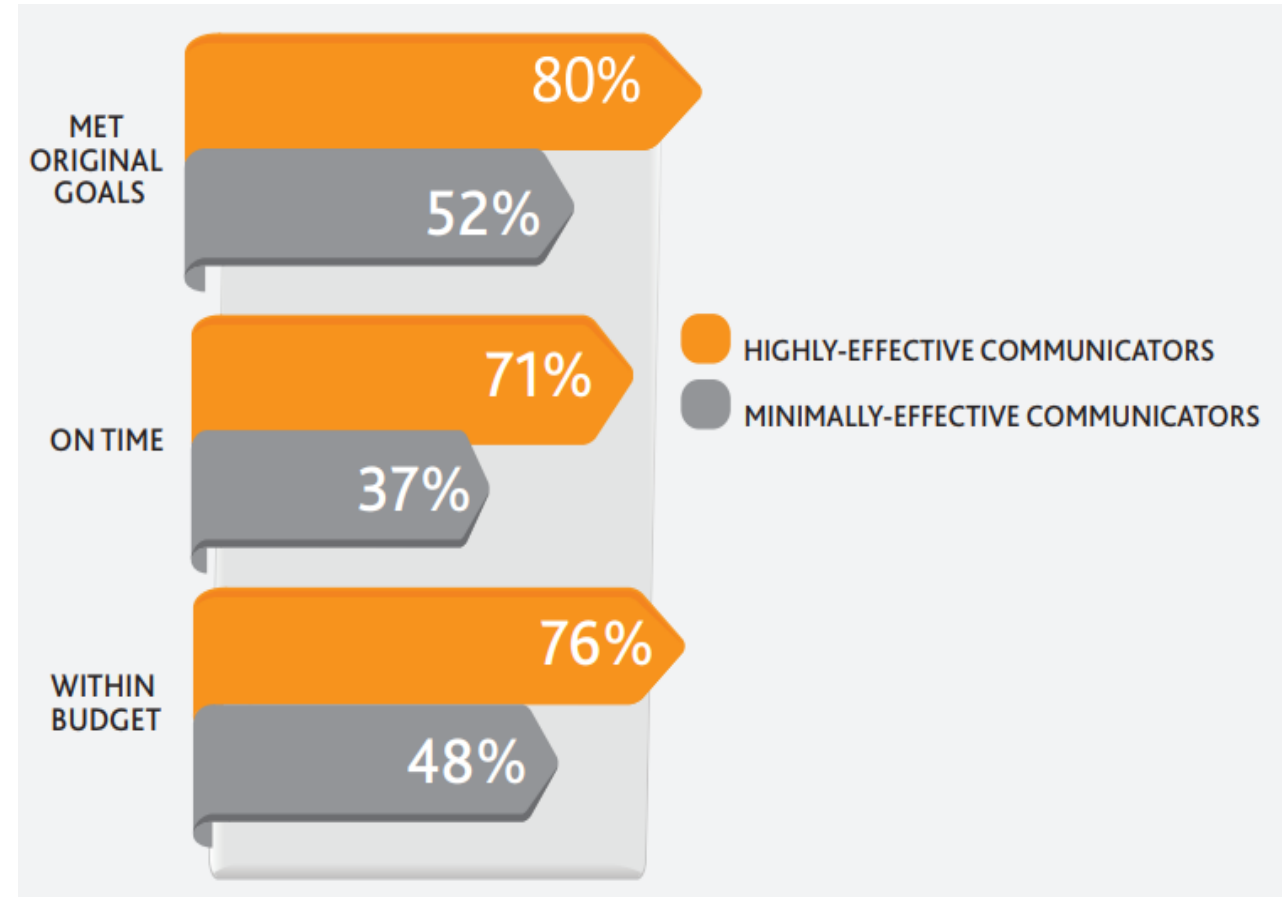
.

Communication is key to good project outcomes

Amount at Risk per \$1 Billion Budgeted



Project Outcomes vs. Communication



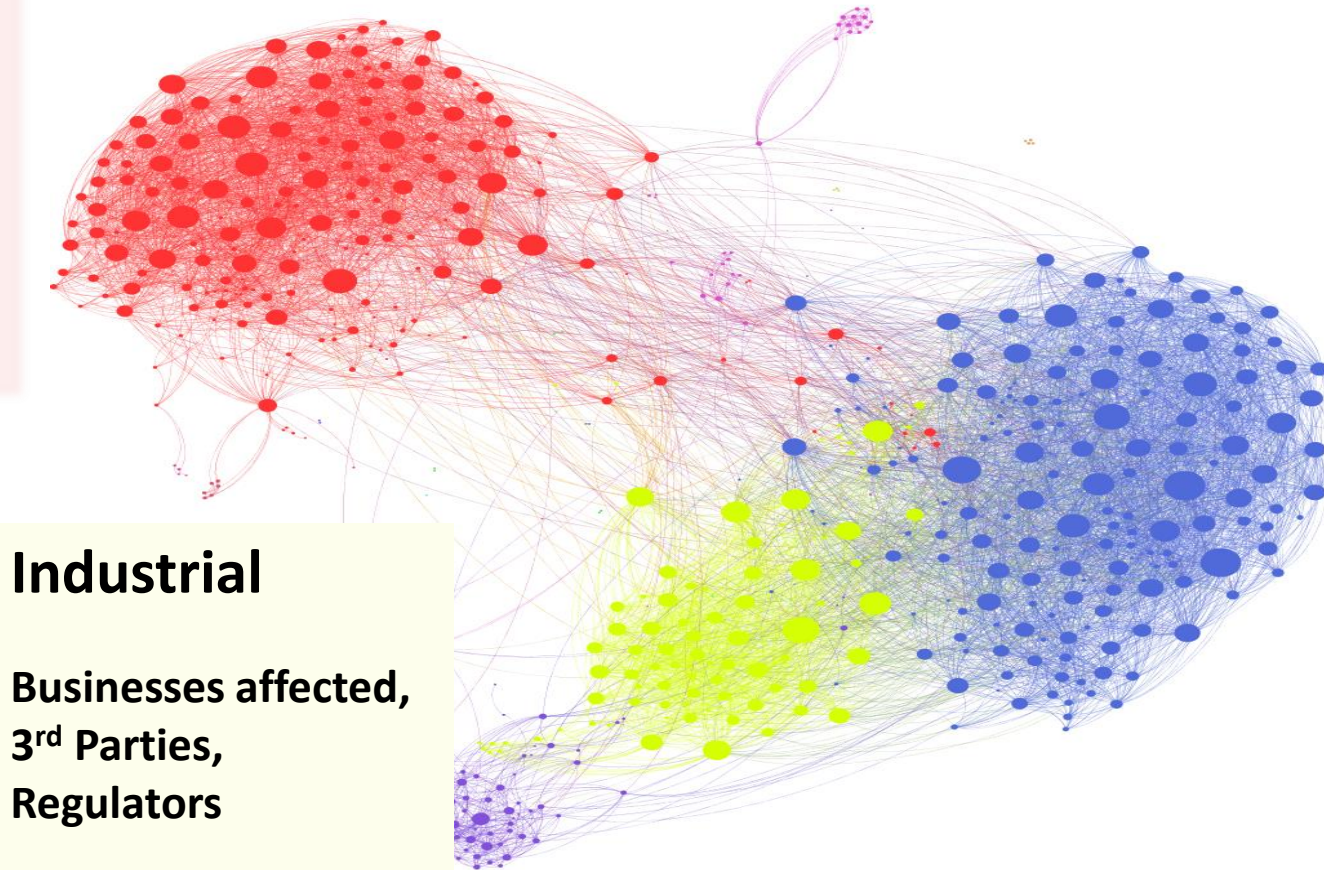
Project Management Institute, Pulse of the Profession, 2013

Different stakeholders have different concerns

Internal

Project Partners

Technical concerns,
identify clashes,
coordinate, etc.



Industrial

Businesses affected, 3rd Parties, Regulators

Technical concerns,
numbers driven

Public

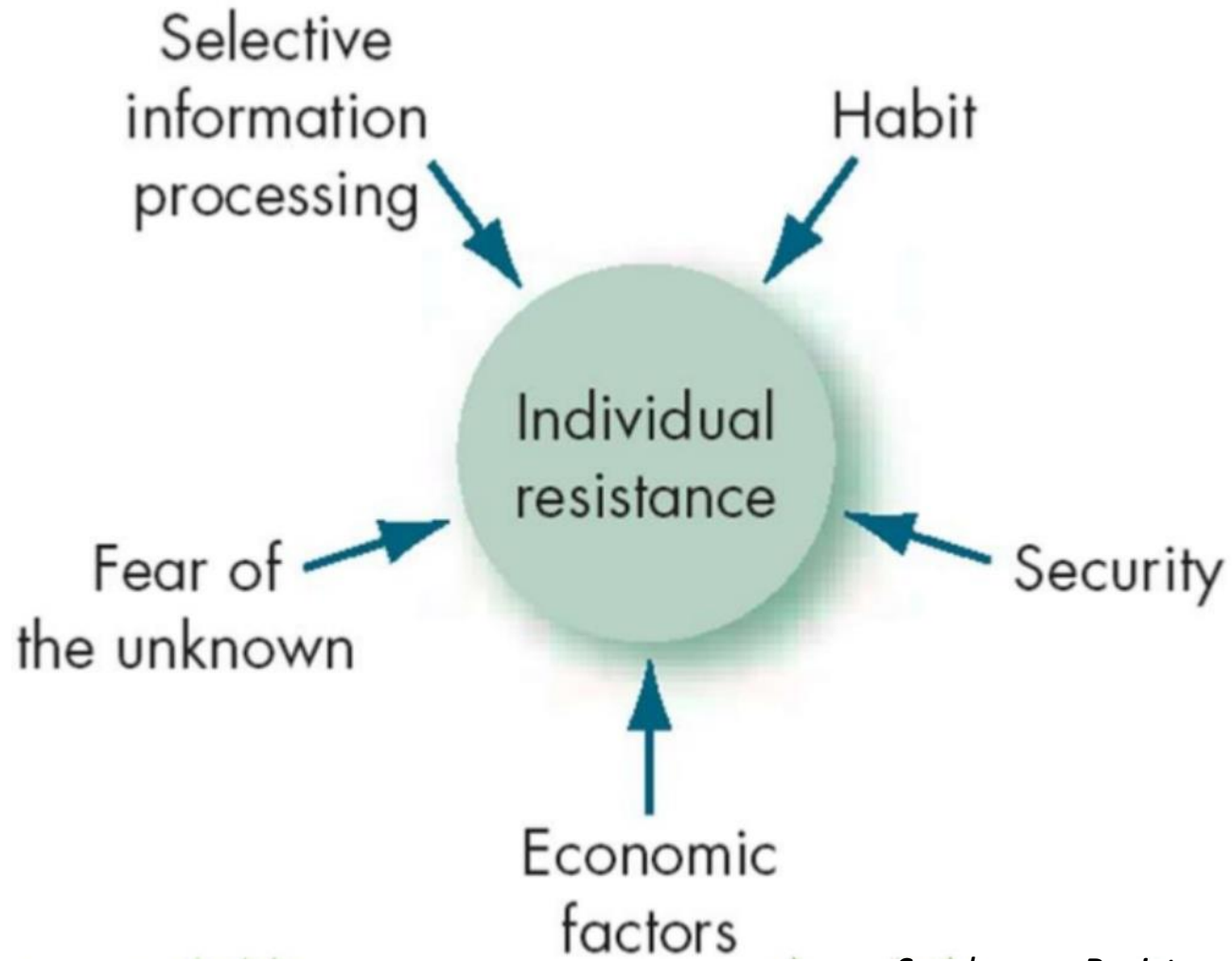
Residents, Landowners, Interested People

“How does this affect
me?”, emotionally
driven, varying levels of
technical tools



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People resist what they don't understand



Sundaram, Resistance to Change, 2015

Digitized Reality Gets Everyone on the Same Page

- Single, consistent, unbiased source of information
- Immersive experience that everyone can understand
- Multiple perspectives of the project can be quickly generated
- Distributed stakeholders can virtually collaborate

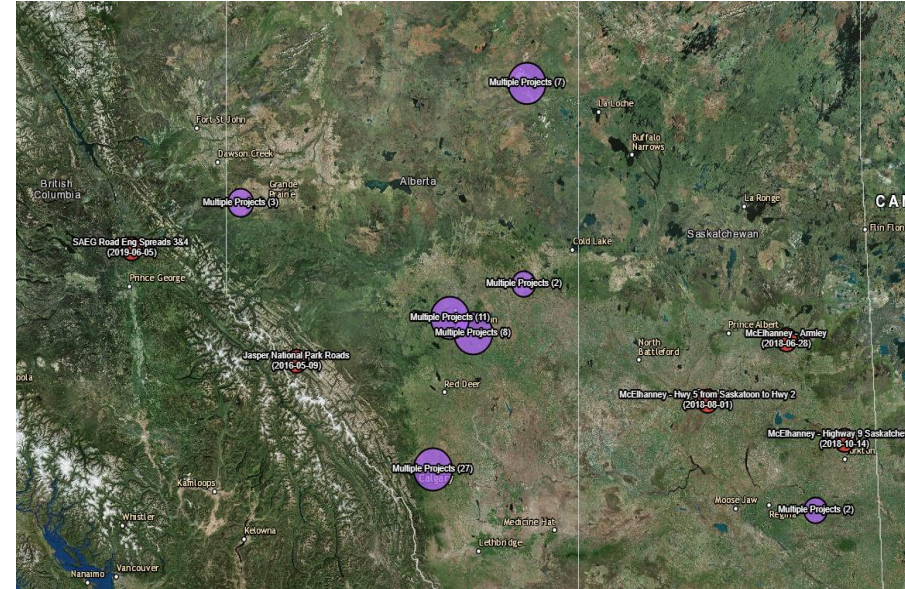


Solv3D, 2017



McElhanney

CorridorMaps – www.corridormaps.com



Available Projects

SEARCH BY AREA

Alberta

Airdrie

Calgary

Cochrane

Drumheller

Edmonton

Fort Saskatchewan

Leduc

Nisku

Okotoks

Sherwood Park

Tofield

Coming Soon


114 Ave SE
Calgary, Alberta


14 St SW
Calgary, Alberta


14th Street NW
Calgary, Alberta


16 Ave / 19
Street NE
Calgary, Alberta


2018 Inglewood
Calgary, Alberta


50 Street 76th-
90th Ave
Edmonton, Alberta

CorridorMaps™

A McElhanney Geomatics
Engineering Ltd Product

14 STREET SW

Calgary, Alberta

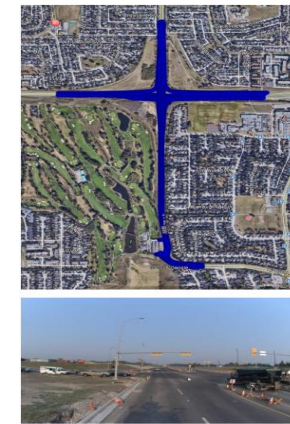
August 2018

Scan / Photography Collection Data Sheet

CorridorMaps™ are highly detailed, accurate, 3D point clouds of corridors-of-interest collected to support engineering planning and design. These data sets can be used to augment existing survey data sets or to verify provided project data such as CAD files and surfaces.

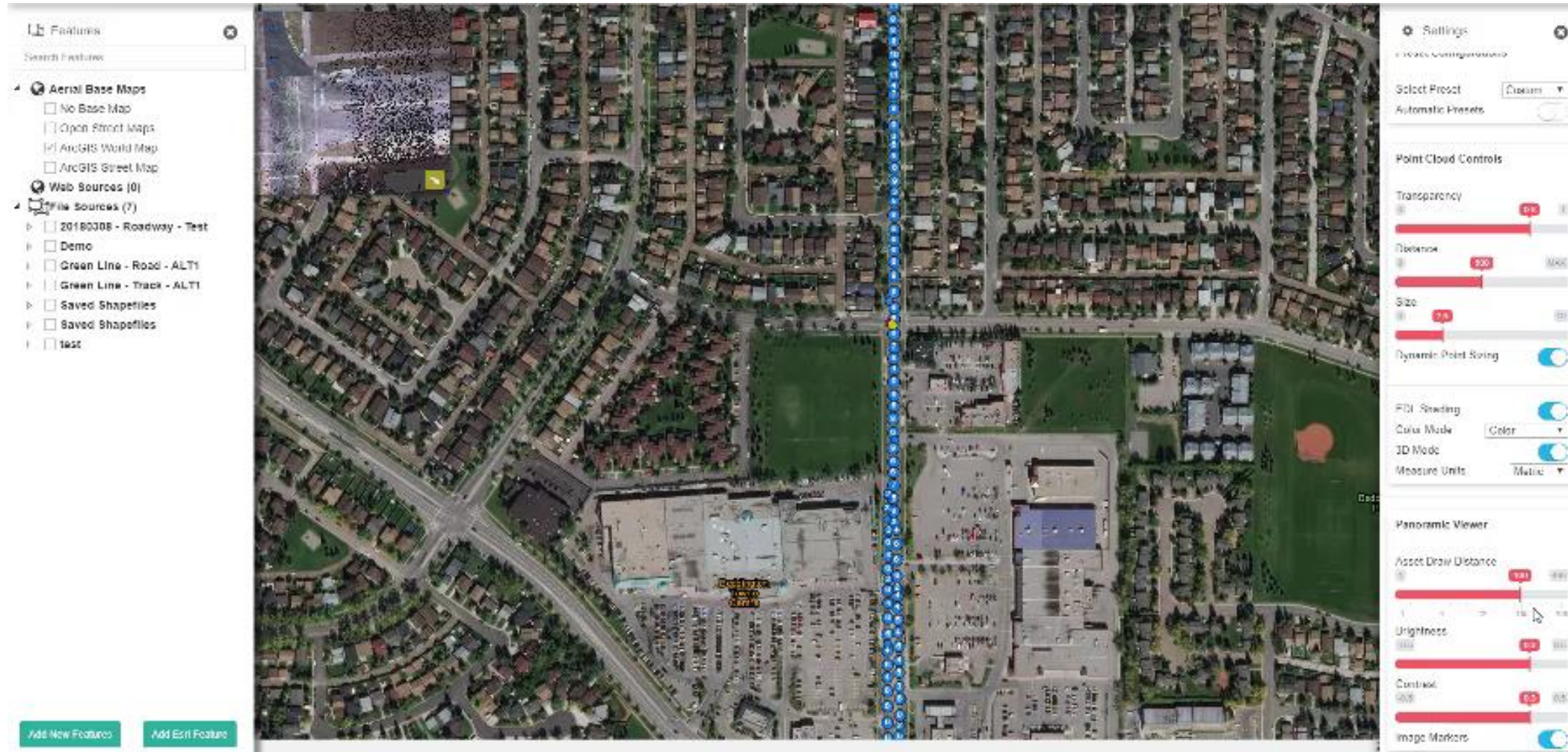
To provide the highest level of situational awareness for your project, CorridorMaps™ also include high-resolution, georeferenced 360-degree photography. Features can be extracted from these data sets to create complete 3D CAD files for ease of use in existing design workflows.

Go to www.corridormaps.com for more information.



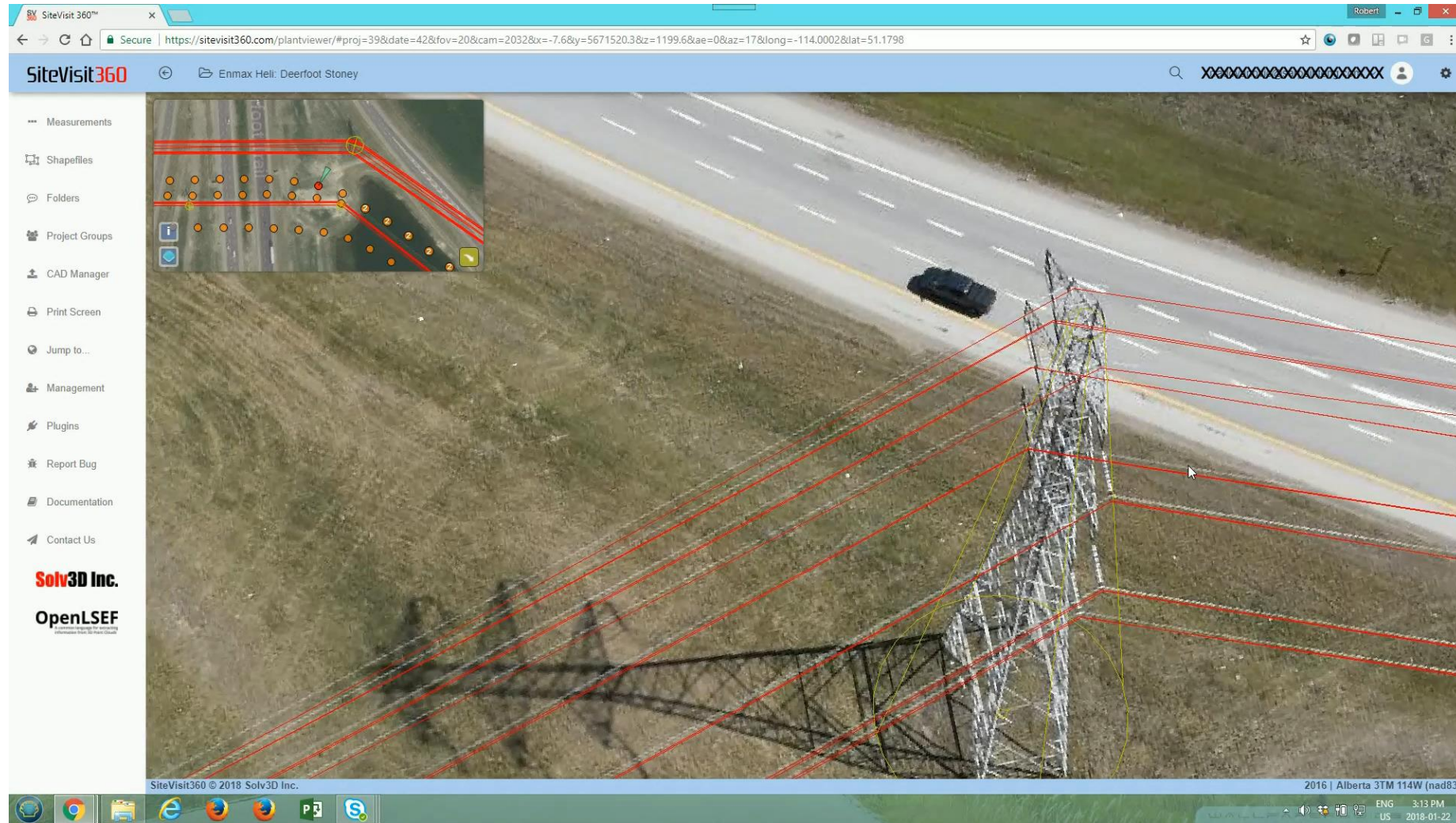
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CorridorMaps – www.corridormaps.com



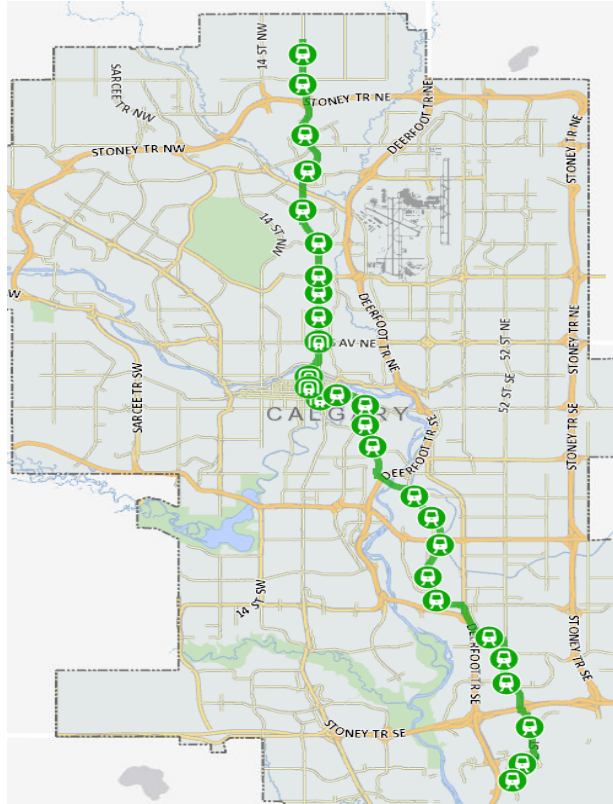
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CorridorMaps – www.corridormaps.com

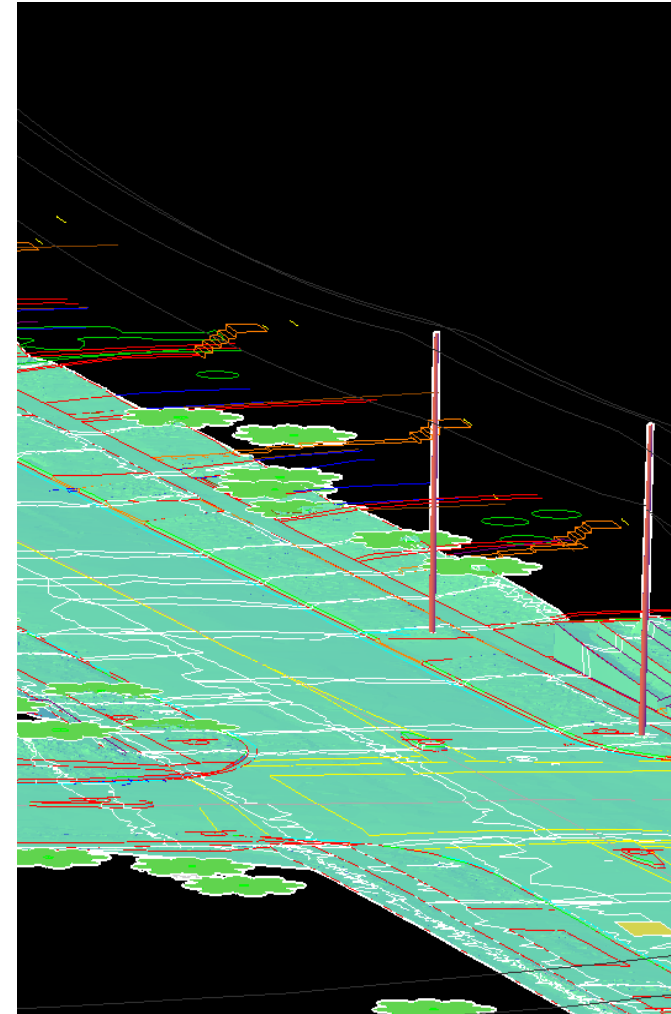
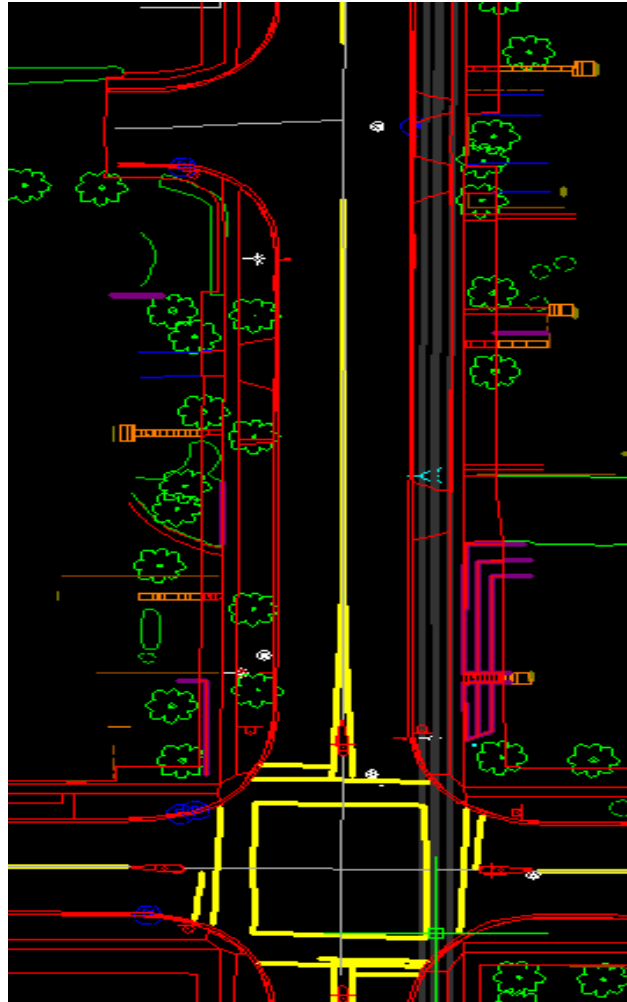
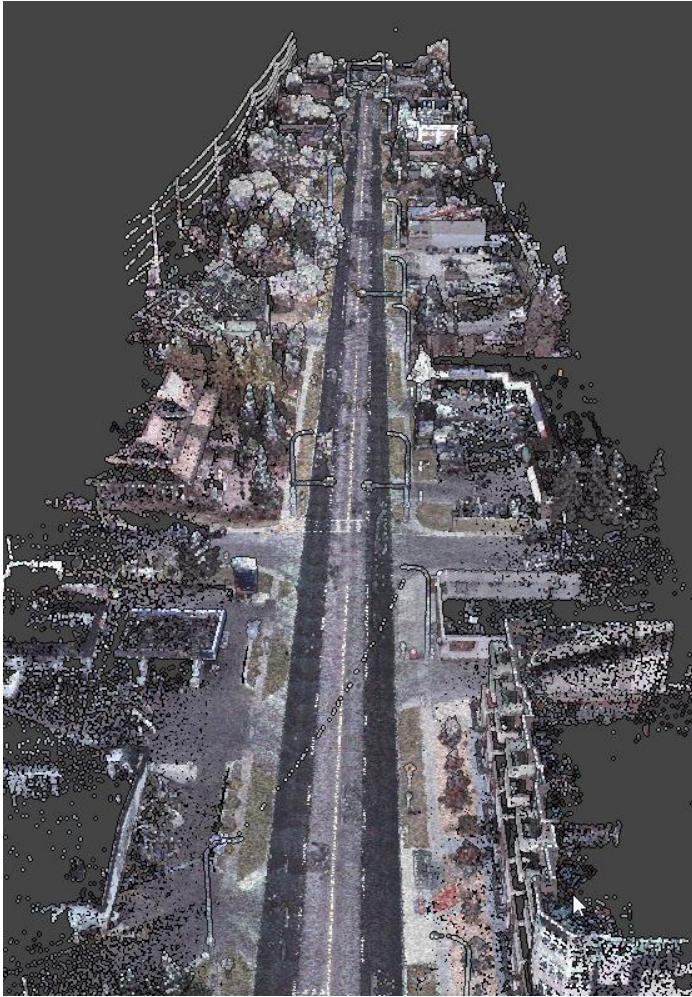


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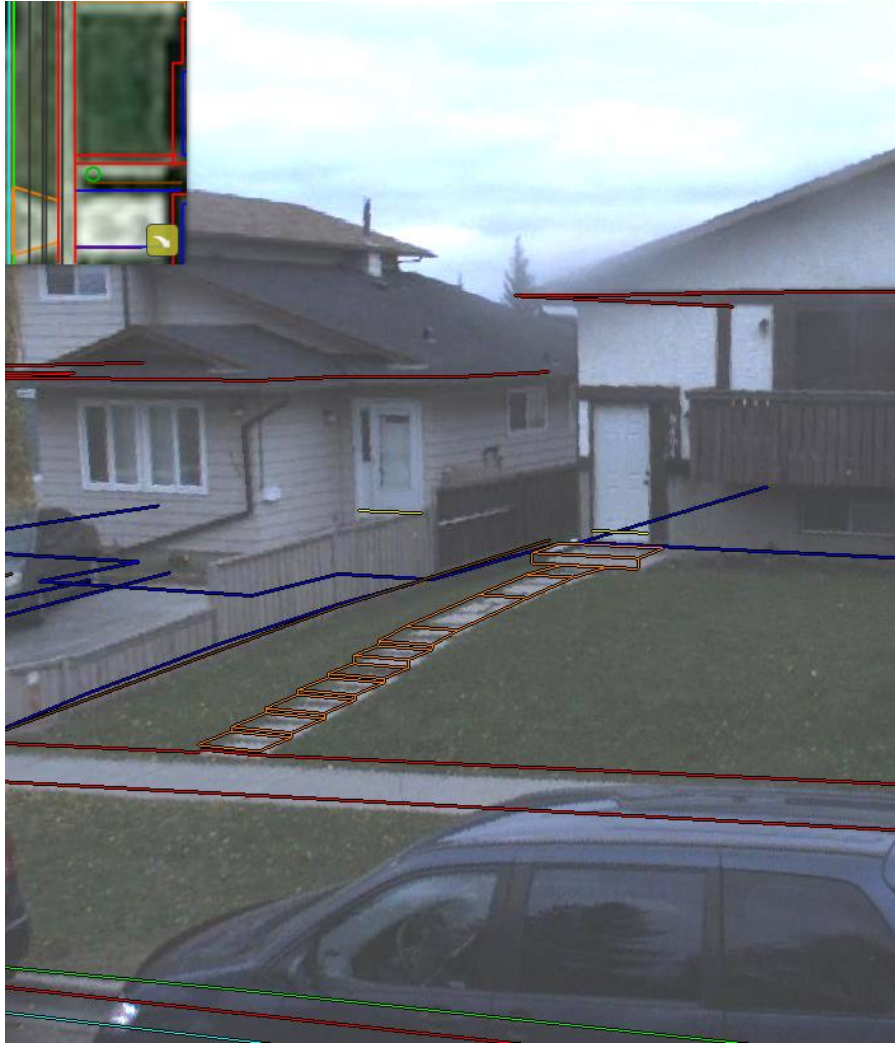
Case Study – Light Rail Transit



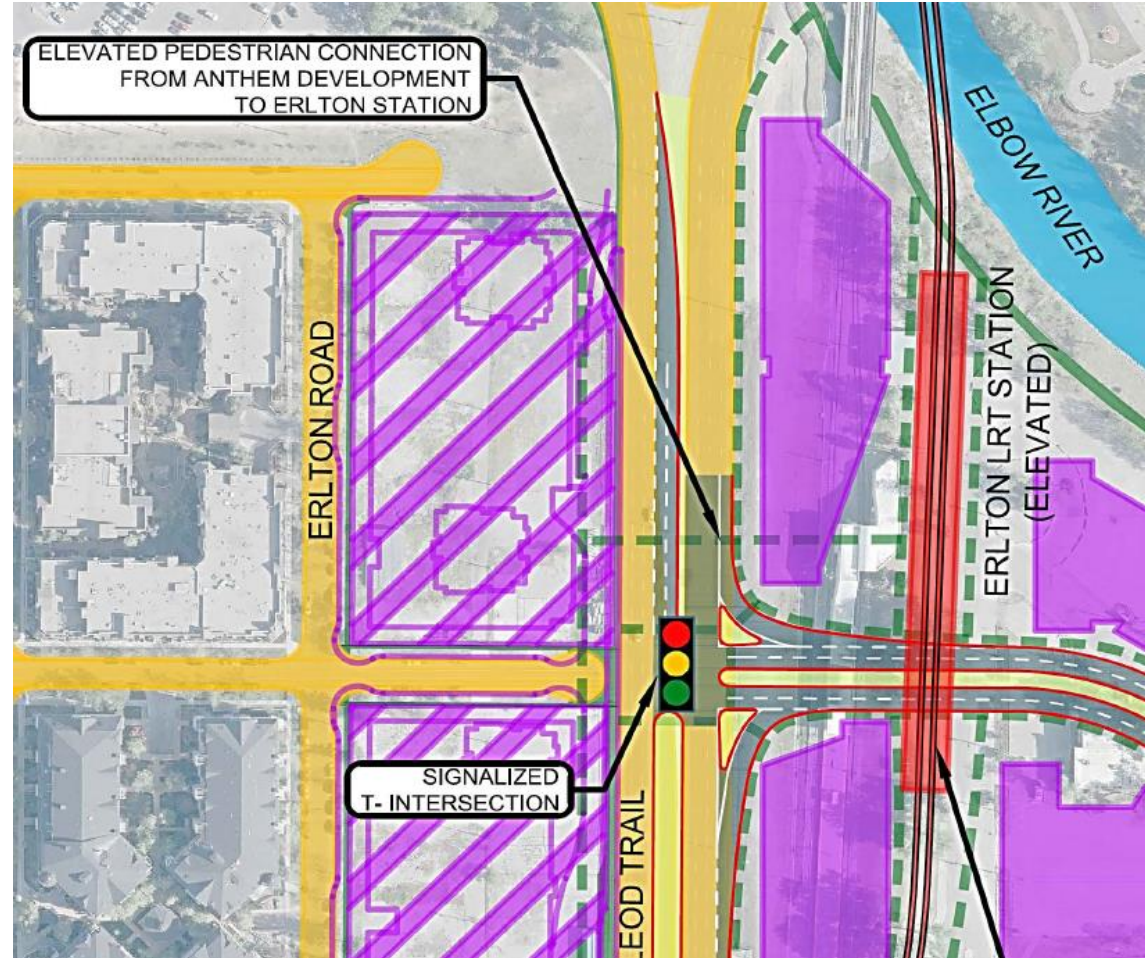
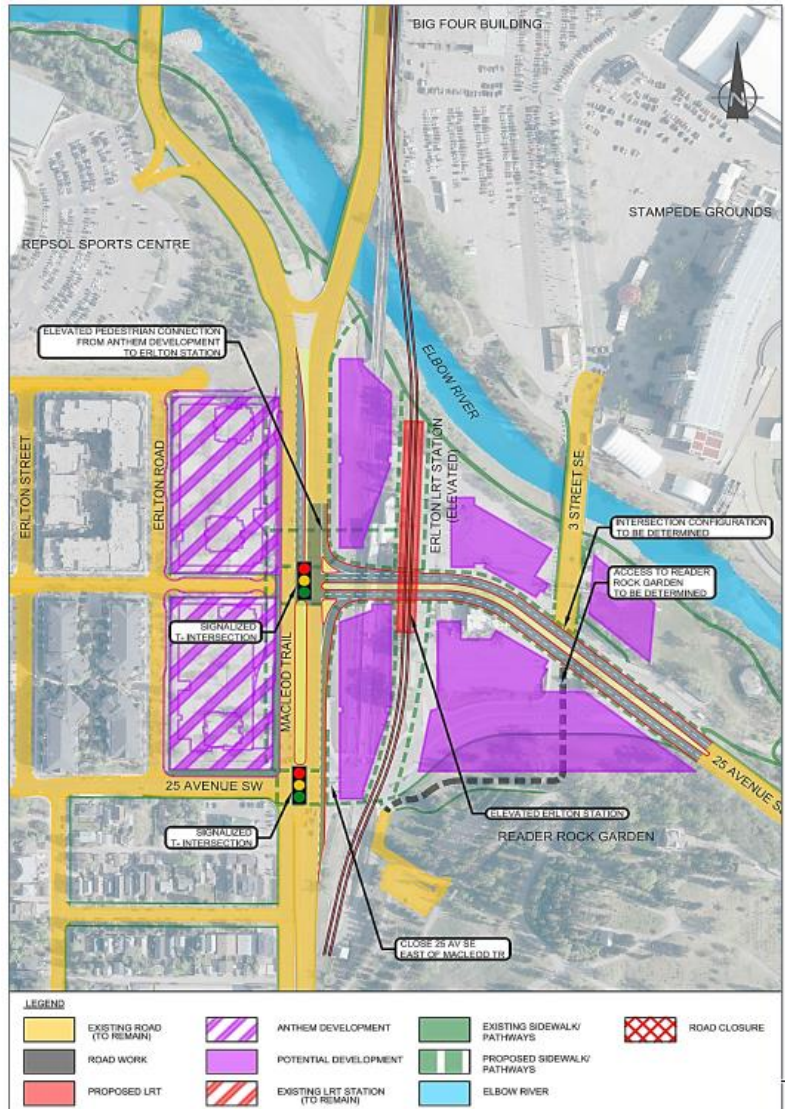
Case Study – Light Rail Transit



Case Study – Light Rail Transit



Case Study – Light Rail Transit



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Case Study – Light Rail Transit



Case Study – Light Rail Transit



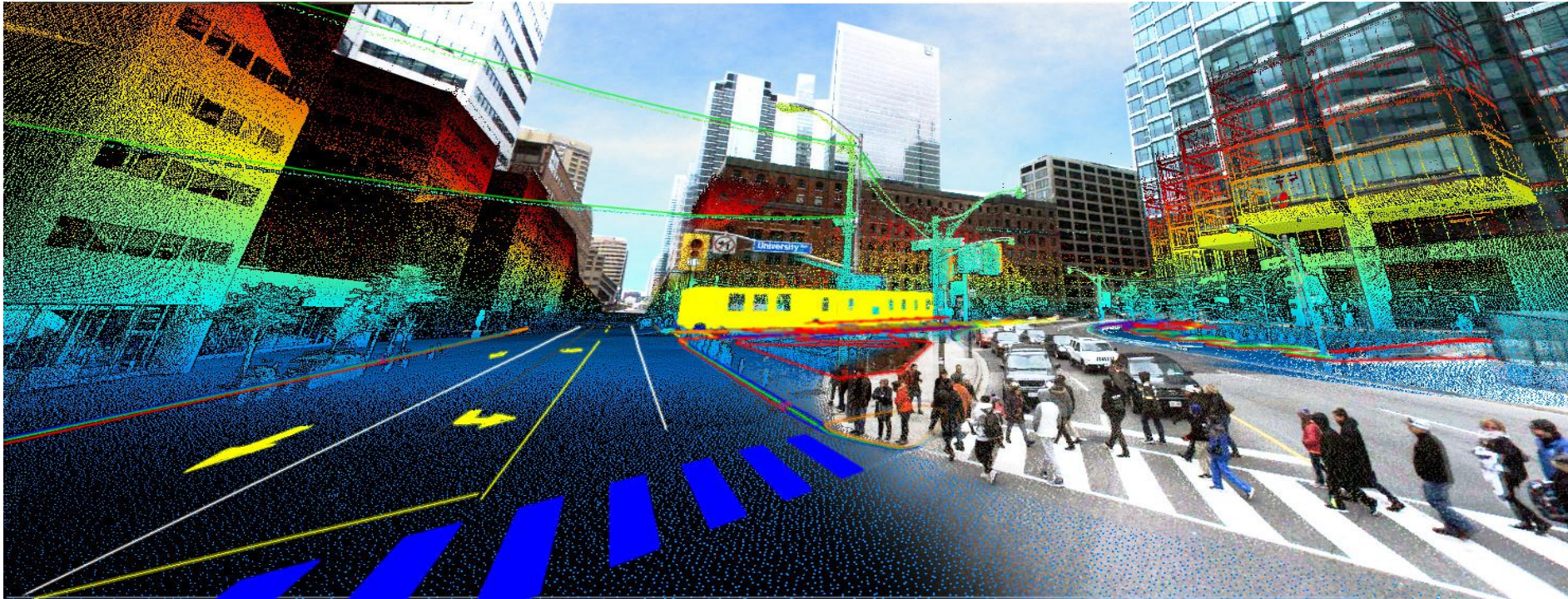
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Conclusions

- **Digitized Reality is becoming more accessible for projects**
 - Data Capture
 - Data Processing
 - Delivery
- **Digitized Reality improves project comprehension and collaboration**
 - Single Source of Information
 - Personalized perspectives can be quickly created
 - Data can be mined for multiple purposes



3D Scanning and Digitized Reality



Dr. Robert Radovanovic, P.Eng., A.L.S., C.L.S.

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