The Use of Laser Mobile Laser Scanning to map old U/G workings.

Matthew du Toit

James Abson

Senlis Consultancy PL

44 Sandringham Drive

Alex Park

Harare

Zimbabwe

Introduction

Who are we?

ZimScan T/A under Senlis Consultancy, Geology & Mining technical consulting service.

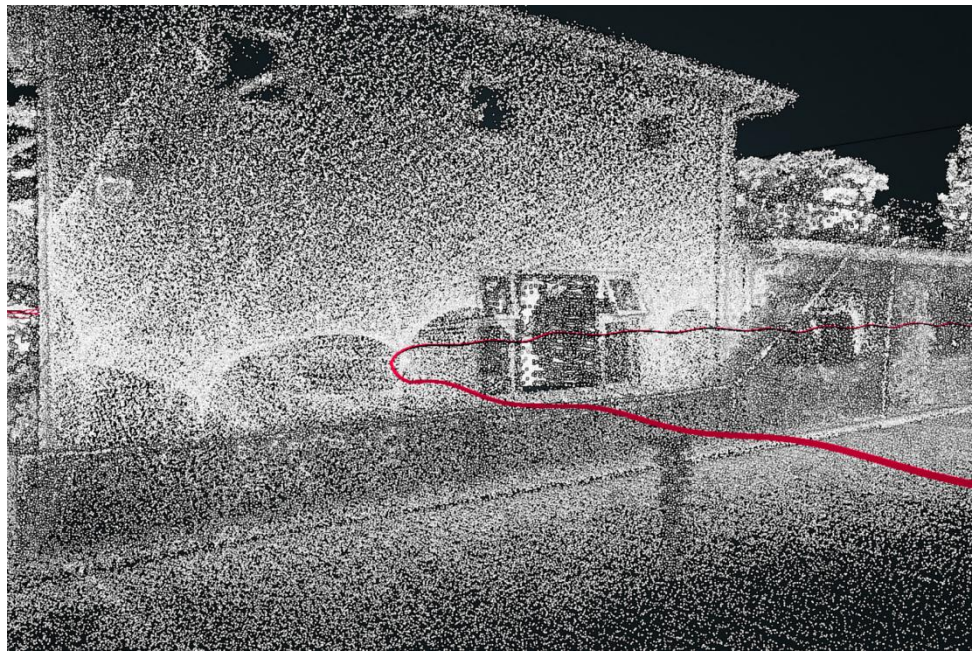
What do we do?

- We are a LOCALLY BASED company that brings outside reality into your office;
- We use drones to generate maps, such as elevation maps, plant health maps and orthomosaic maps, as well as 3d maps;
- We use Laser scanners to generate up to date 3D models of structures, such as underground mines, stock piles and building plans (2D & BIM);
- We provide GIS interpretation of all the above data sets as required by the client.

Introduction: What is Mobile Scanning

SLAM

- Simultaneous
- Localisation
- And
- Mapping



ZimScan

Scanning set up

- Cost - equipment costs
  - scanner plus various accessories – new technology comes at a cost;
  - computer processing power – adds to cost;
  - One off & annual maintenance processing software costs – often more than one software package required for multiple tasks;
  - Lack of Zimbabwean back-up (RSA or UK).
- Operator skills (surveying skills; GIS skills; SLAM knowledge; computer & data processing skills);

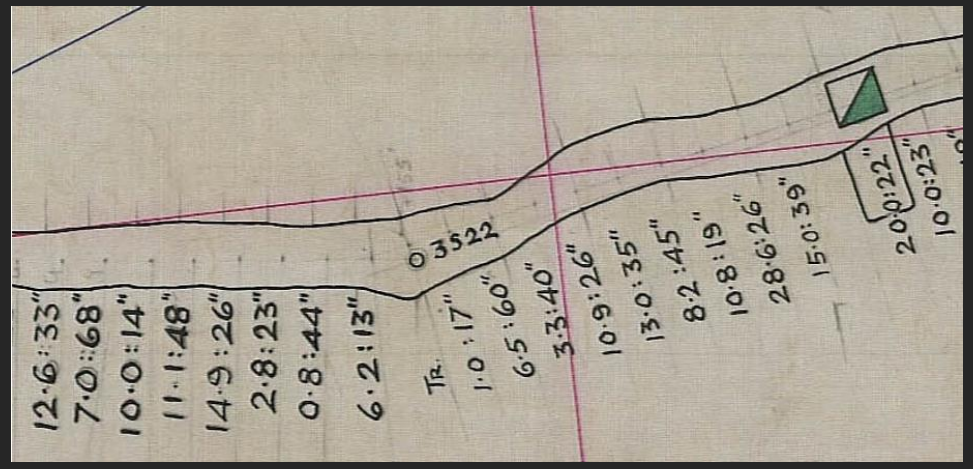
Preparation before U/G Scan

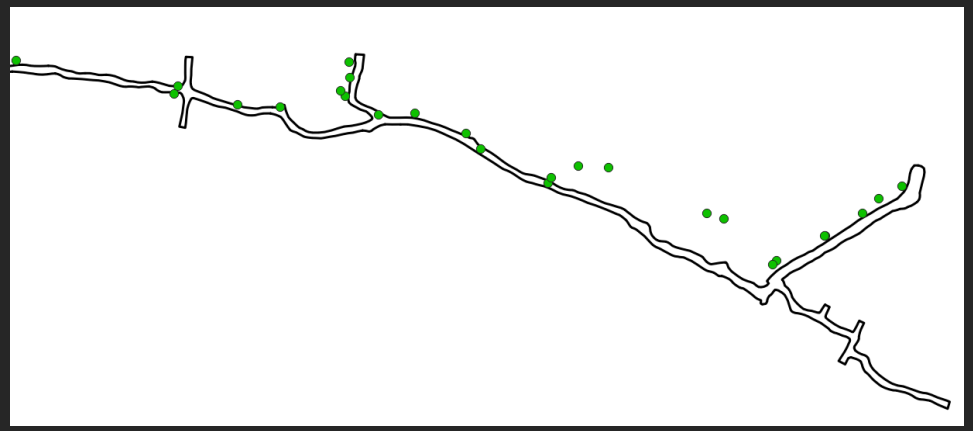
- Prerequisite: have to have a modern surface datum and new mine grid;
- Transfer to u/g levels using plumbing;
- Have to have u/g pegs to georeferenced;
- To visit prior to scanning & plan the scans
- Scanning quick & accurate –
  - Relative accuracy 1-3cm (scanner);
  - Global accuracy 3-30cm (DGPS georeferenced)
  - In terms of BCM or m^3 this is $\pm$3% accuracy.

ZimScan

Typical historic U/G information

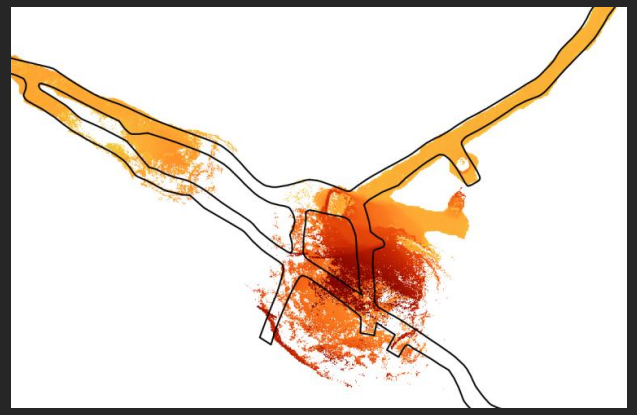
- If you are lucky there are accurate underground peg logbooks with their associated 2D level plans of the underground workings.
- Most of the time this is not the case.

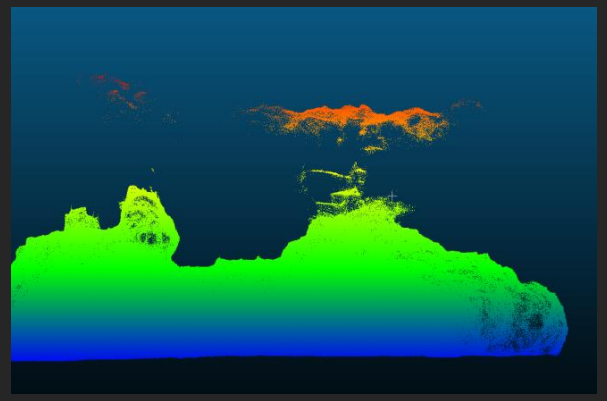




Missing Information from Old U/G data

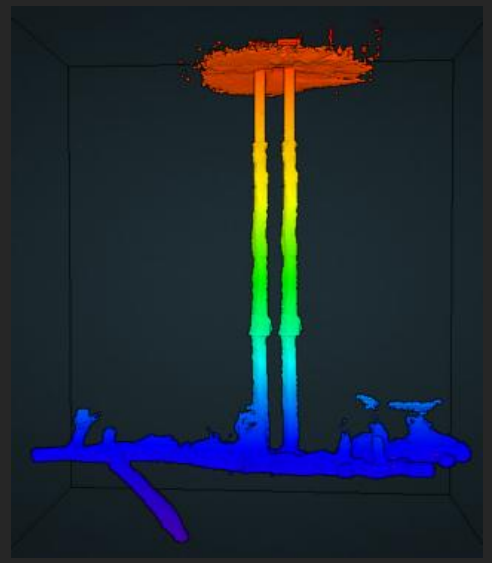
- There is a major issue if have an incomplete data set (XYZ where? Accuracy?);
- What was the local mine grid and datum used; where are the original surface & u/g pegs etc.? destroyed;
- Lack of detail (e.g. no ore pass box positions etc.);
- Were the plans you have the latest most up to date at mine closure? Were there post closure collapses; makorakosa invasions and damage etc.?

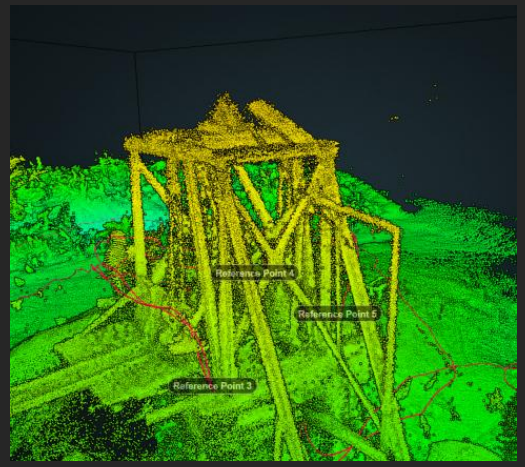




U/G Scanning issues

- access & danger (pre-scan inspection; safety)
- can slow survey down – e.g. access into voids
- Photos
- Geo-referencing
- Scanning in action photos
- XYZ Drift
- drift error examples double shafts etc.
- to re-do costly & time consuming – get right first time

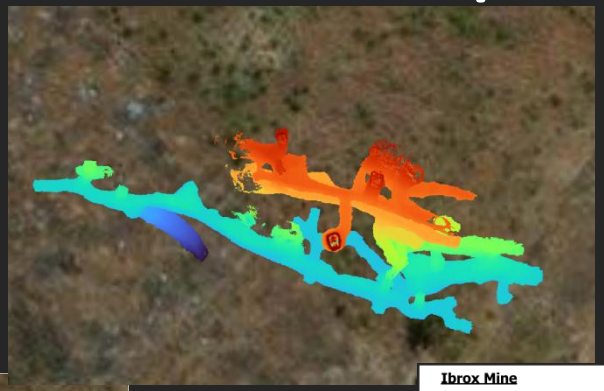


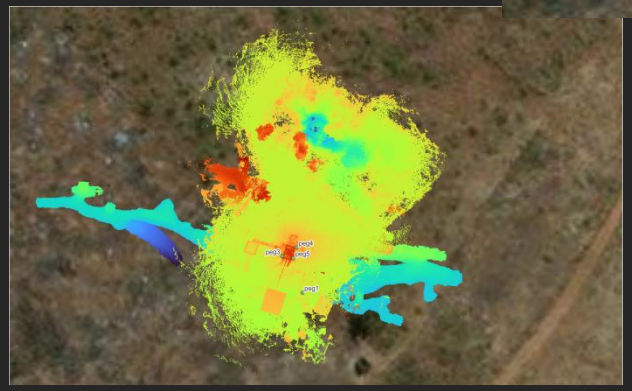


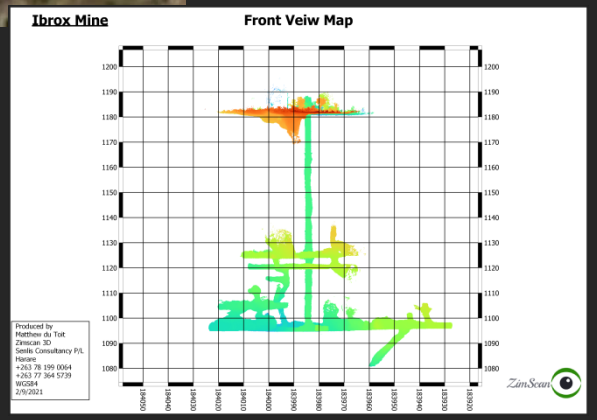
Adjustment reference points with error values

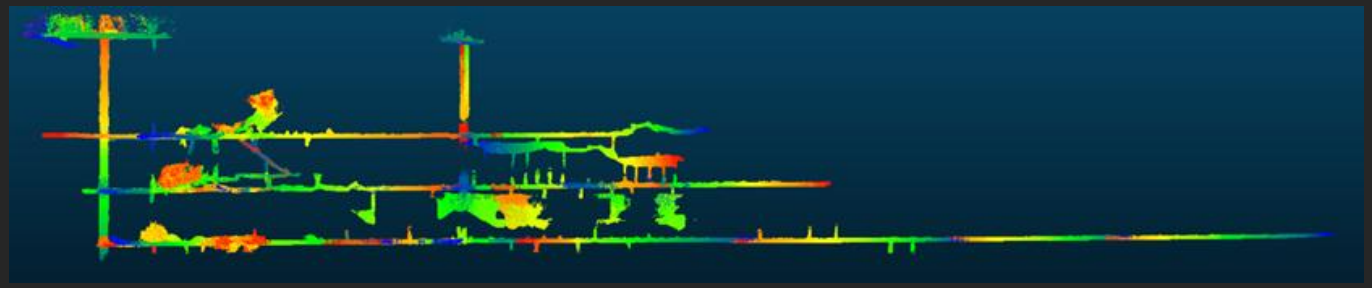
	Target			Actual			
Name	X	Y	Z	X	Y	Z	Error(m)
peg3	183983.120	7974201.284	1184.516	183983.148	7974201.286	1184.505	0.030
peg4	183986.419	7974203.191	1184.606	183986.409	7974203.184	1184.606	0.012
peg5	183985.701	7974200.795	1184.609	183985.683	7974200.800	1184.620	0.022
					RMS Error(m)		0.023

2D Scan examples



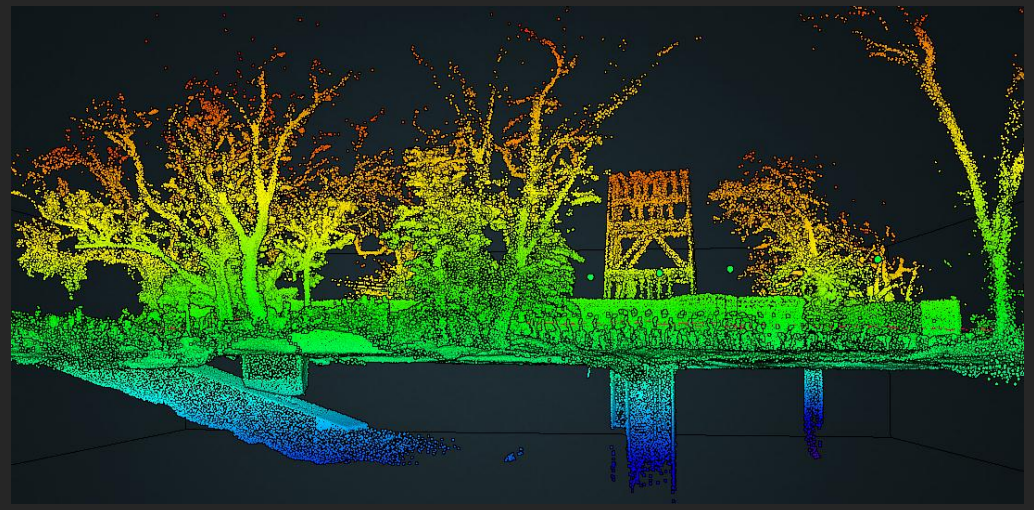


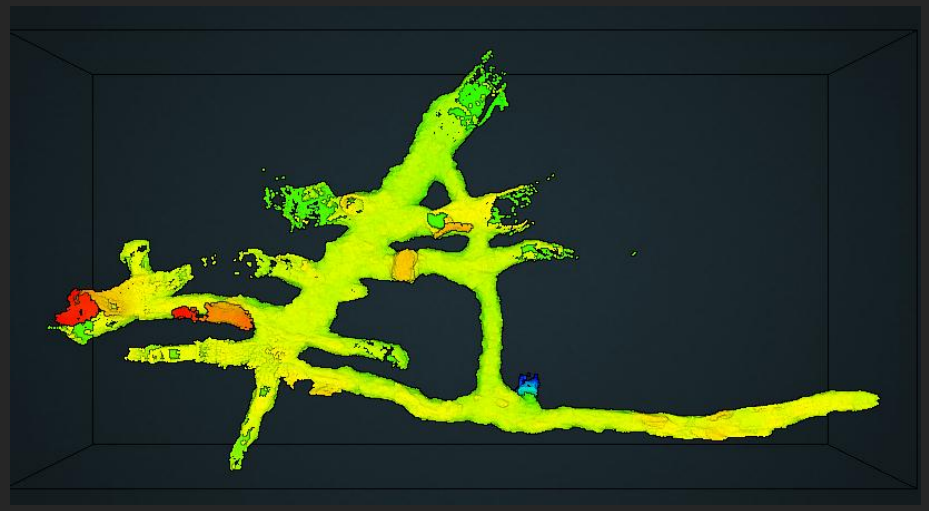




ZimScan

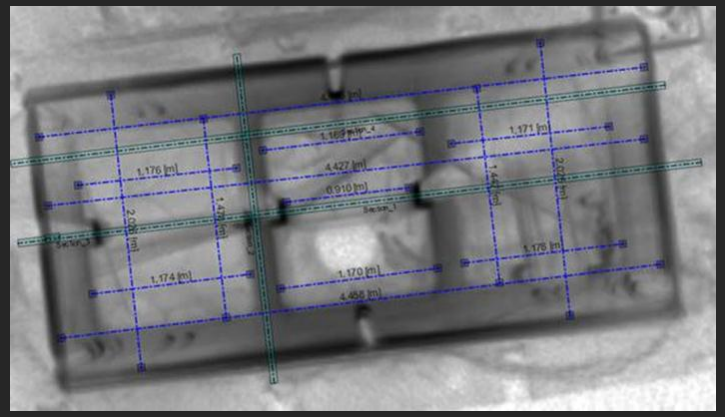
3D Scan examples

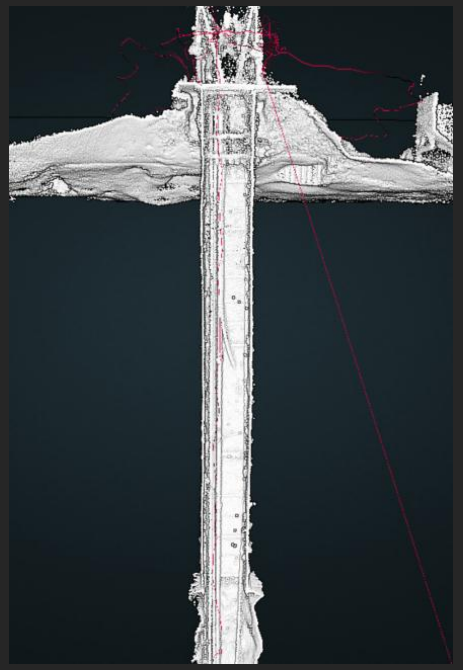


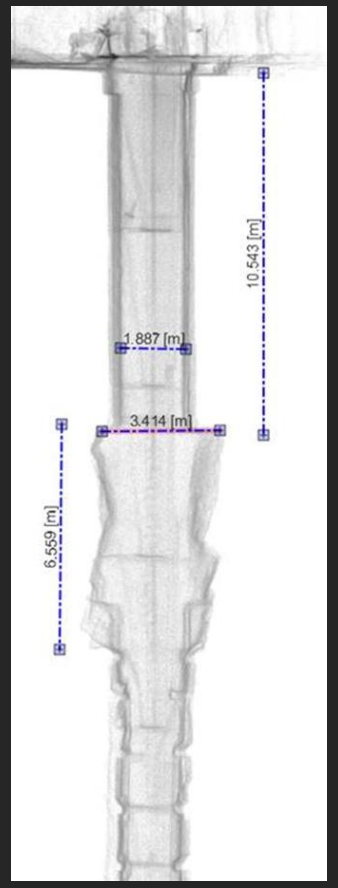


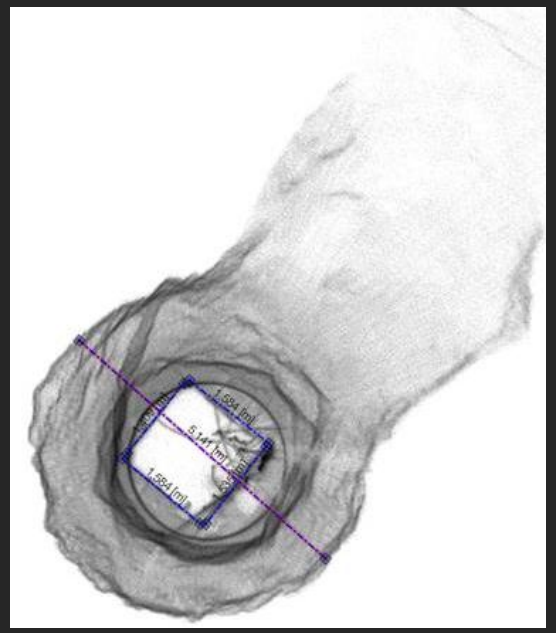
ZimScan

Scan examples

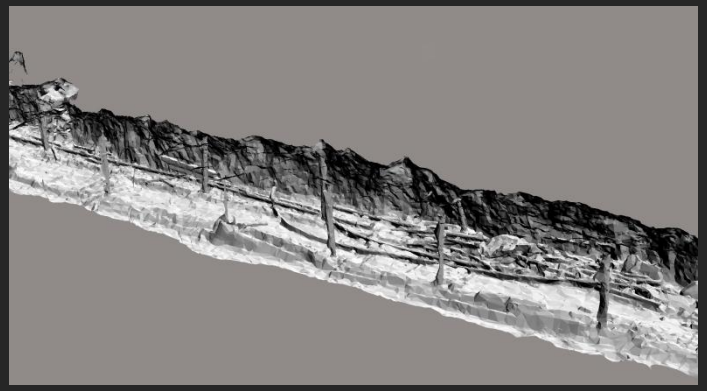


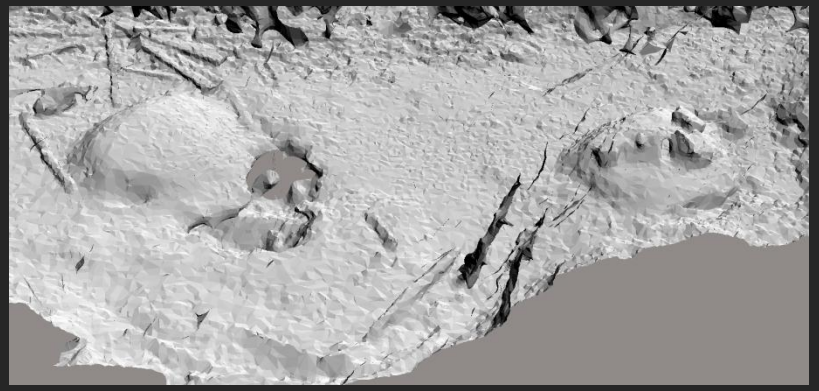


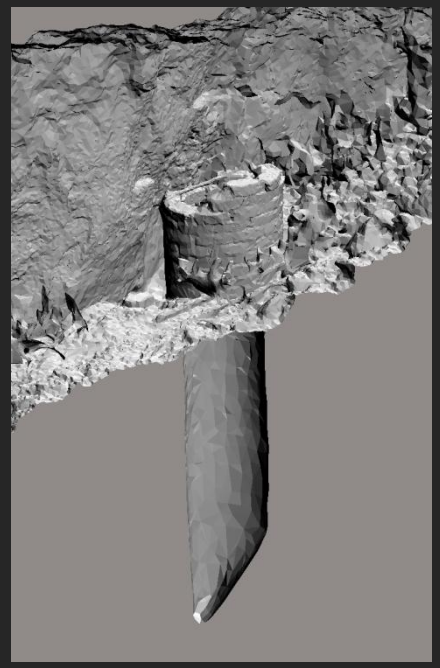


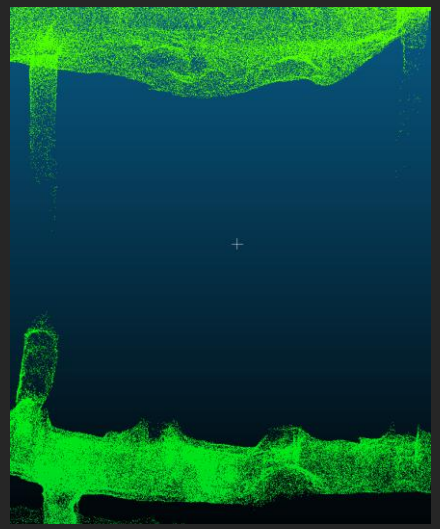


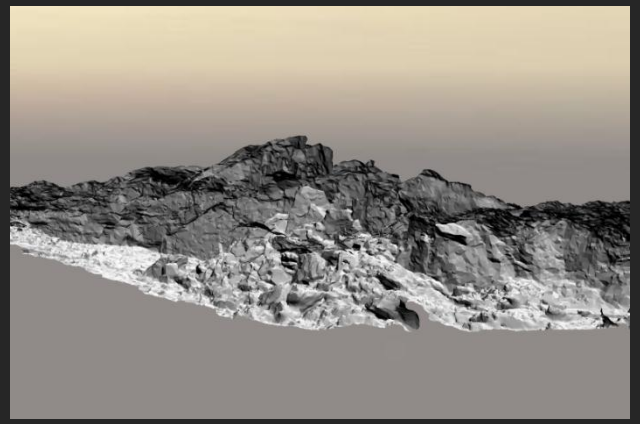
Mesh examples





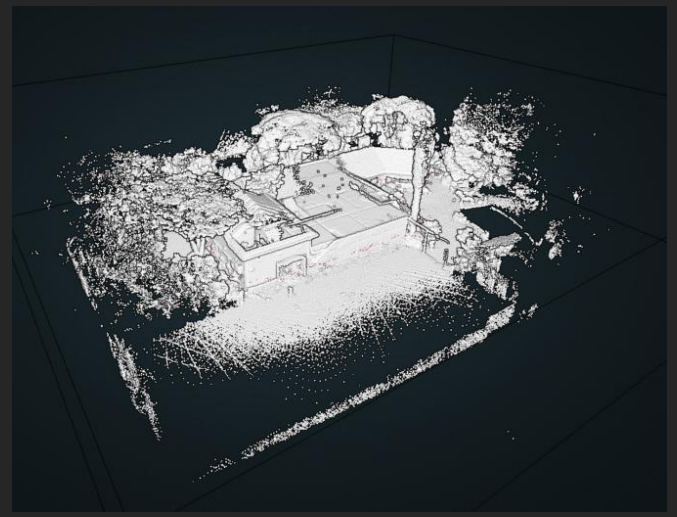


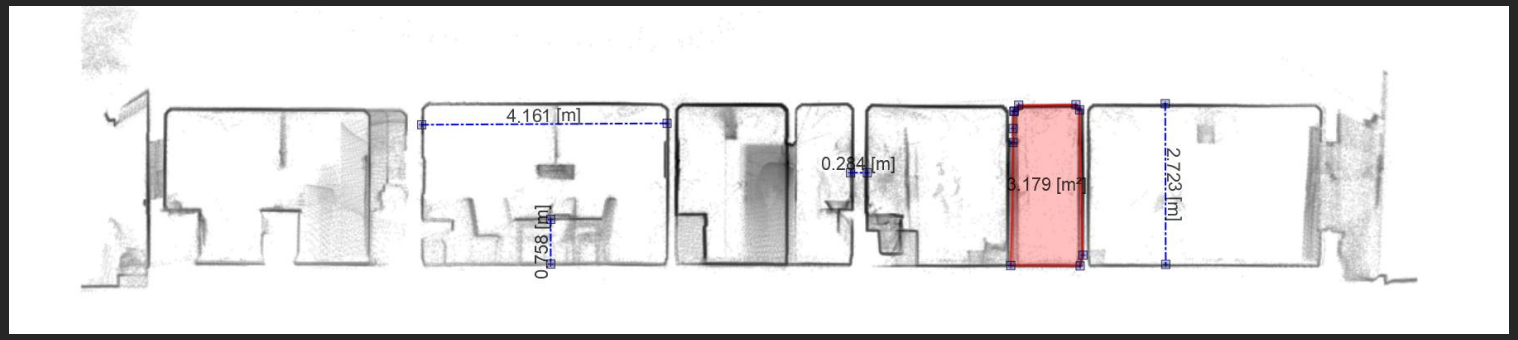




ZimScan

House Scan examples





ZimScan

Thank you

ZimScan