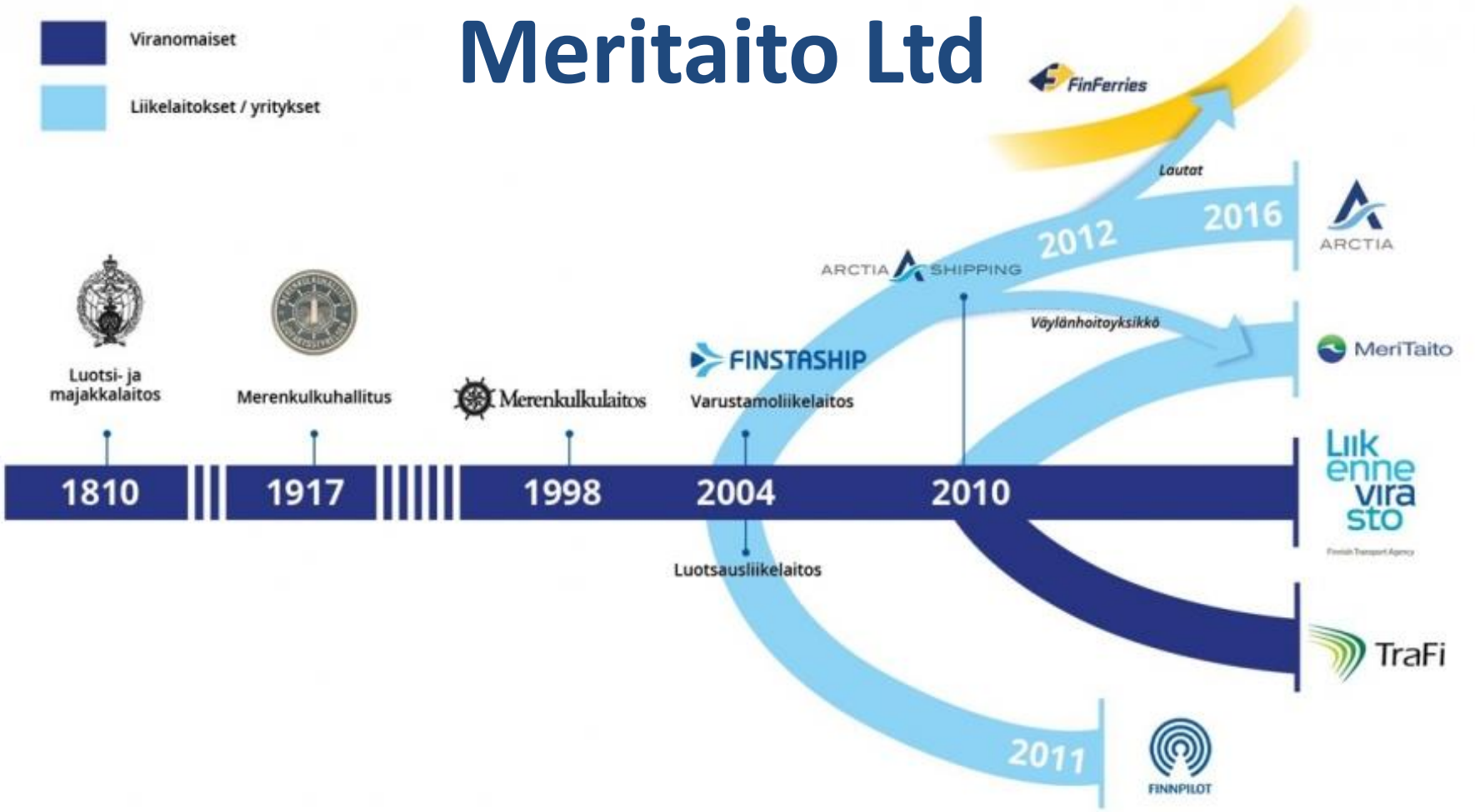
Shallow Water Hydrographic Survey Project in the Baltic Sea Using a Combination of MBES and Bathymetric LiDAR

Jani Pötrönen
Survey Manager
Meritaito Ltd

Agenda

- Short introduction to Meritaito Ltd (part of Arctia Group since 12/2018)
- Combination of MBES and bathymetric lidar surveys
- Experience of bathymetric lidar data in the Baltic Sea

Meritaito Ltd



- Fairway Maintenance
- Marine Constructions
- Canals
- Marine Surveys

- Fairway Design
- Oil Spill Response
- Aids to Navigation

Meritaito Ltd

- **Project experience with Hydrographic Offices**
  - **Mareano2016 for NHS at the Barents Sea**
  - **ODIN No2 in 2017 and No5 in 2018 for SMA at the Baltic Sea**
  - **CHP Surveys for MCA in UK Waters started 2018**
    - **Up to three ASVs used for IHO Order 1A surveys in Scotland and East Coast of UK**
  - **Several projects with current TrafiCom**
    - **Three combined MBES and Bathy Lidar projects since 2017 in Finnish TW**

Combination of MBES and bathymetric lidar surveys

- Experience from three projects with FTA
- Important to combine two methods to gain best end results for the Client
  - Push contractor to pay attention to lidar survey achievement with overall responsibility of data coverage

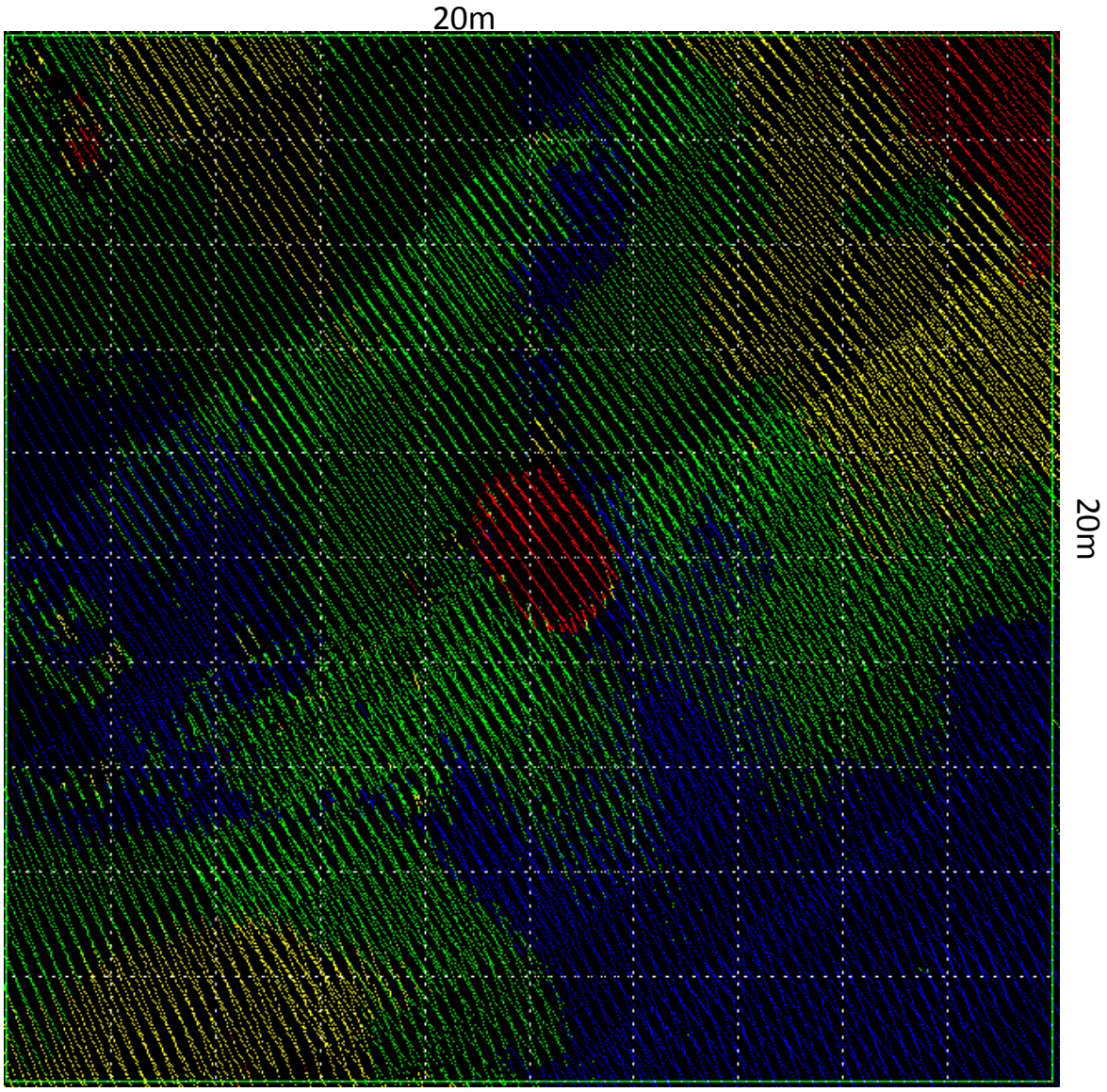
Survey Overview

- Flight Altitude 450m
- Flight speed 65m/s or 126knots
- 200% coverage
  - 60% overlap
    - Including 10% safety factor for roll/off track erros
- System used HawkEye 4X
  - Topo, Shallow and Deep sensors

- Secchi depths in the project area varies from 3 to 6 meters
  - Lidar penetration down to 11m

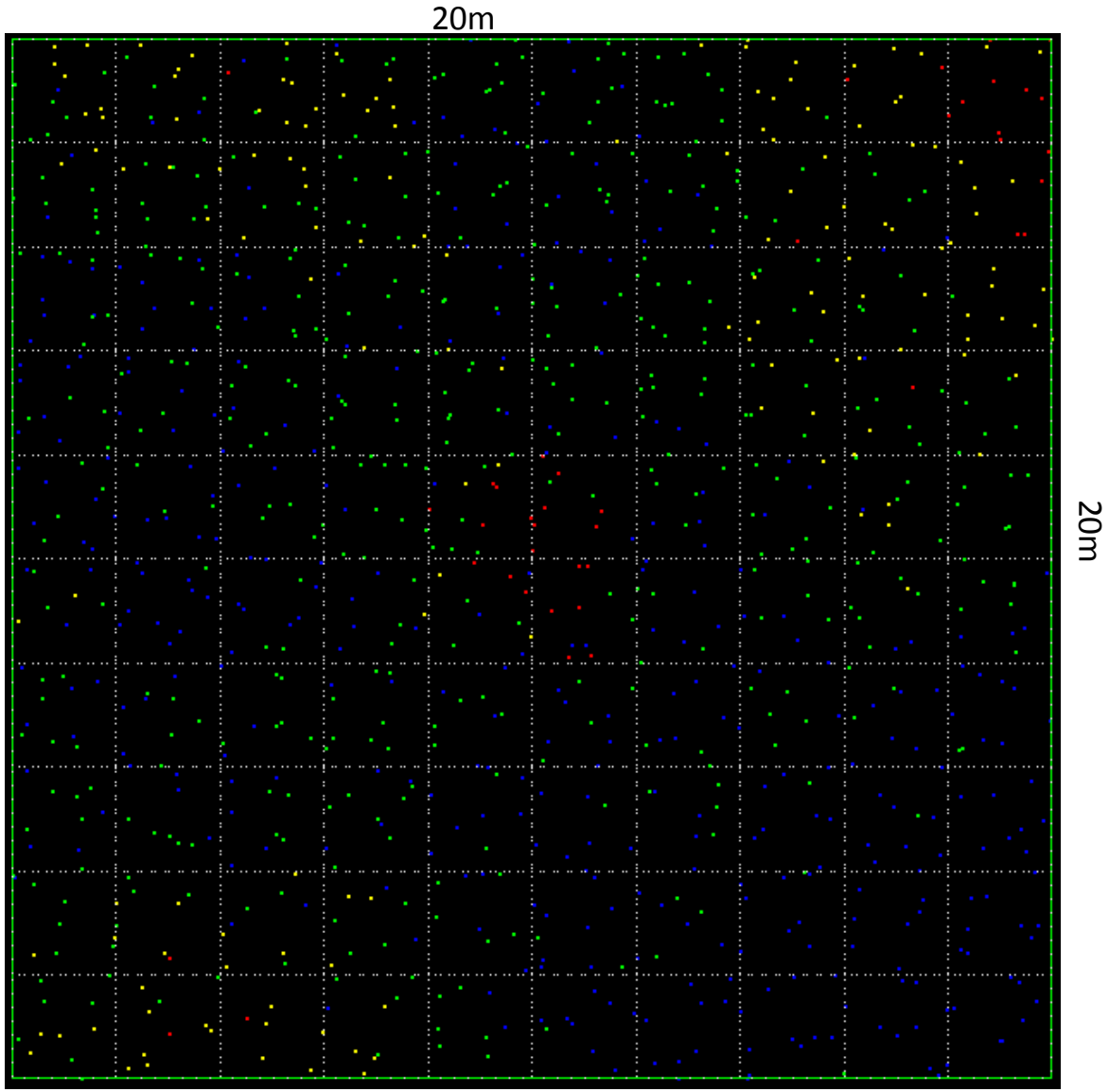
POINT DENSITY

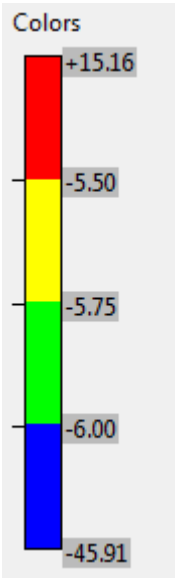
MBES Area 1



DEPTHS 4-10 m

LiDAR standard 100% coverage

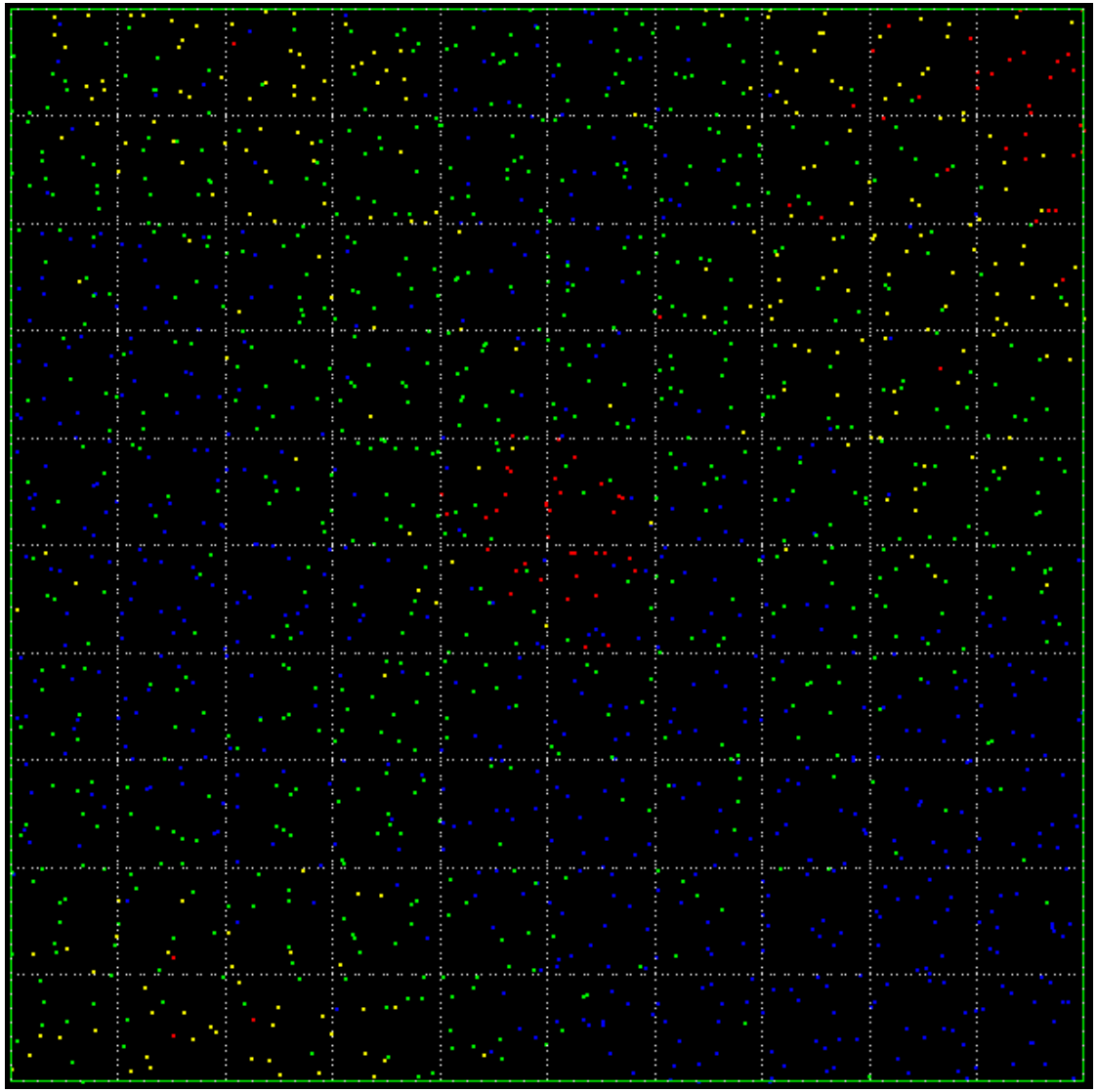




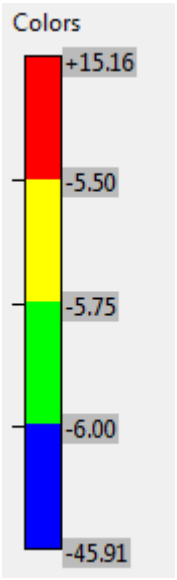
Average (20m*20m area) point density
2.490/m2

LiDAR standard 200% coverage

20m



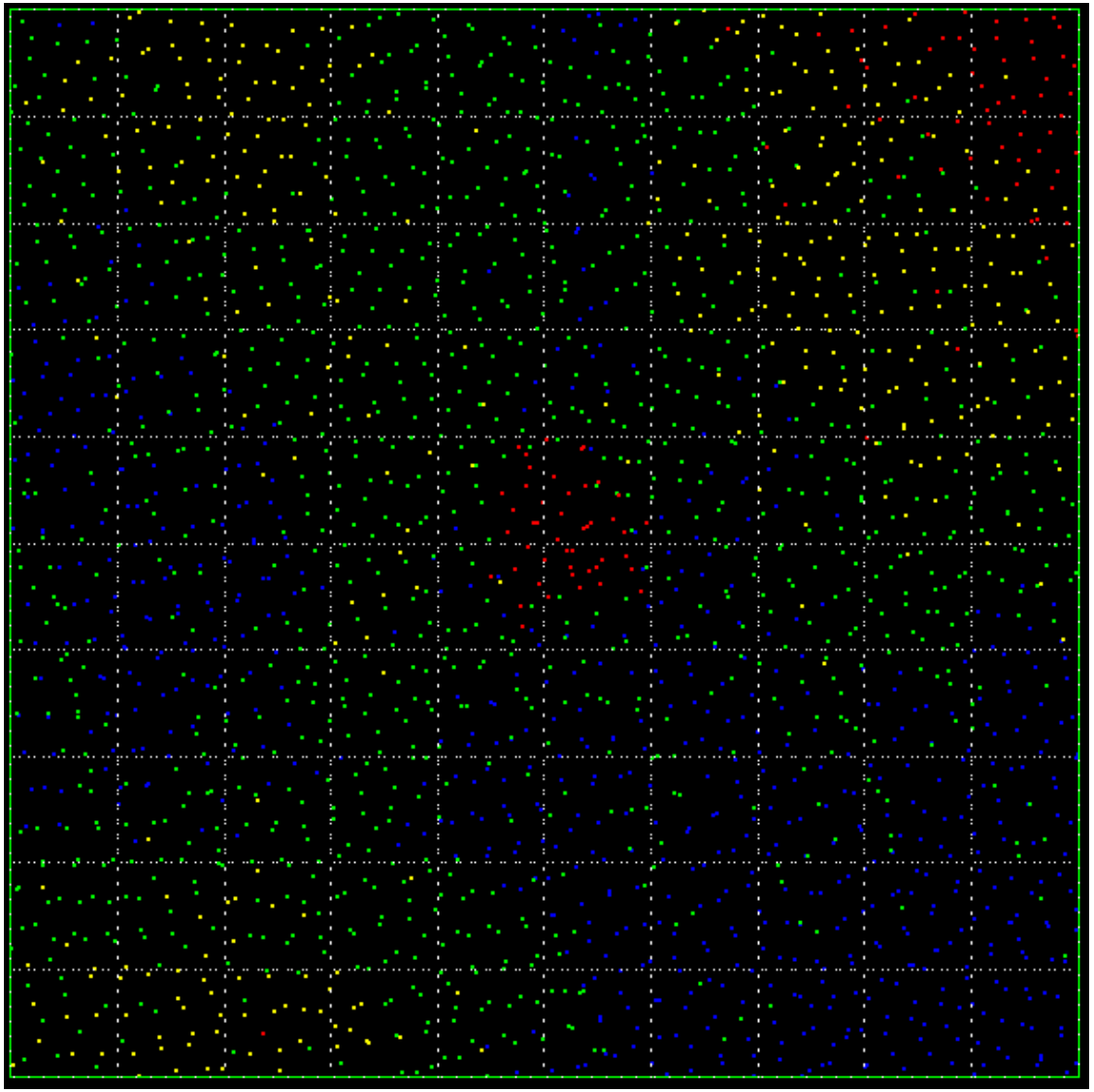
20m



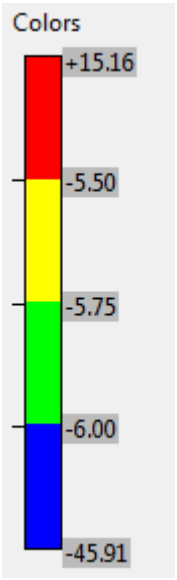
Average (20m*20m area) point density 3.942/m^2

LiDAR 4X 100% coverage

20m



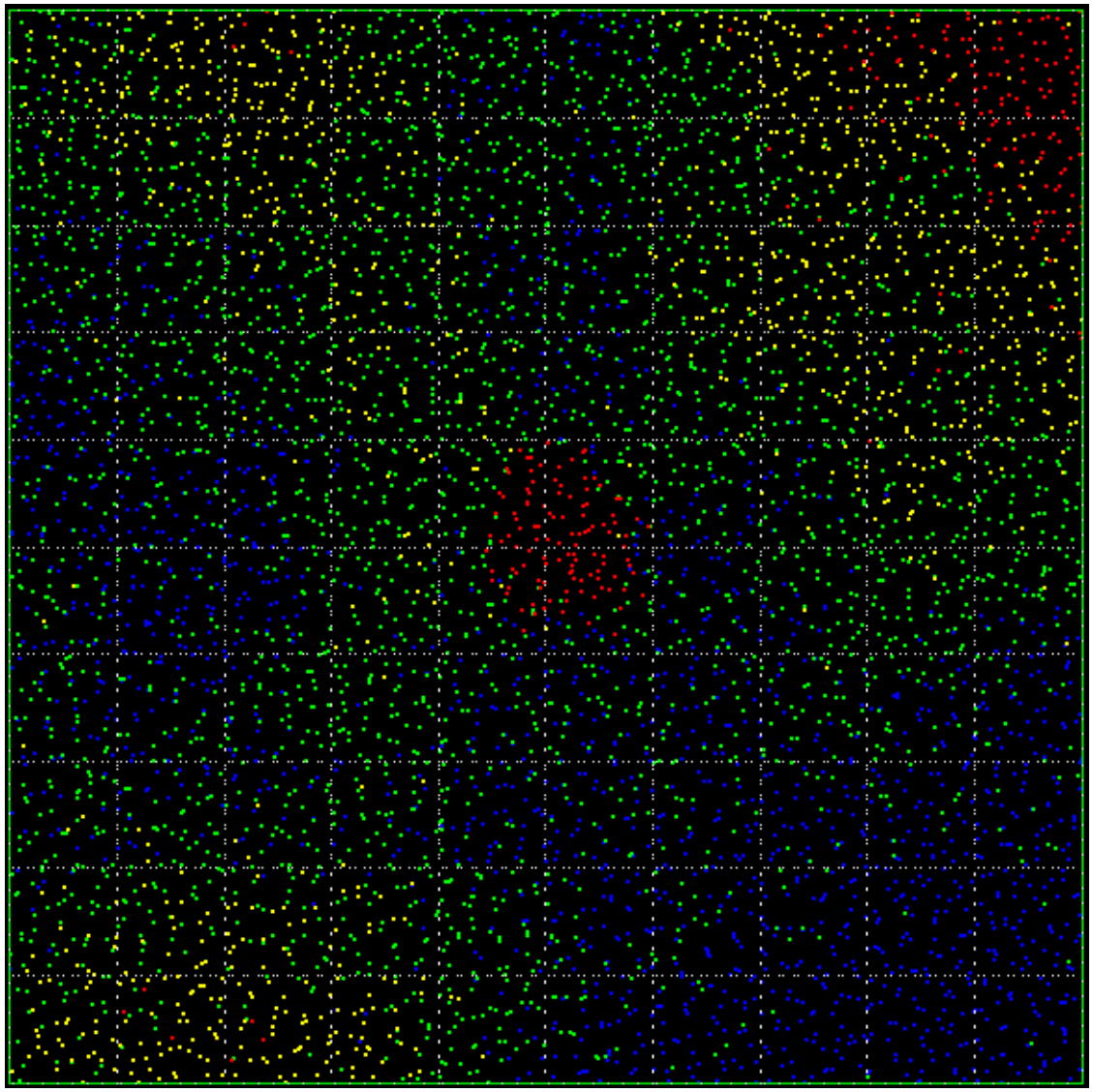
20m



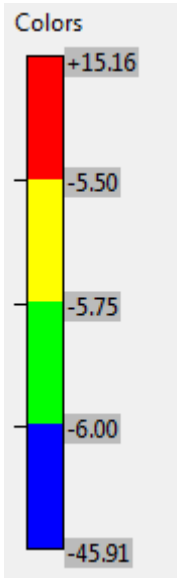
Average (20m*20m area) point density
8.595/m^2

LiDAR 4X 200% coverage

20m

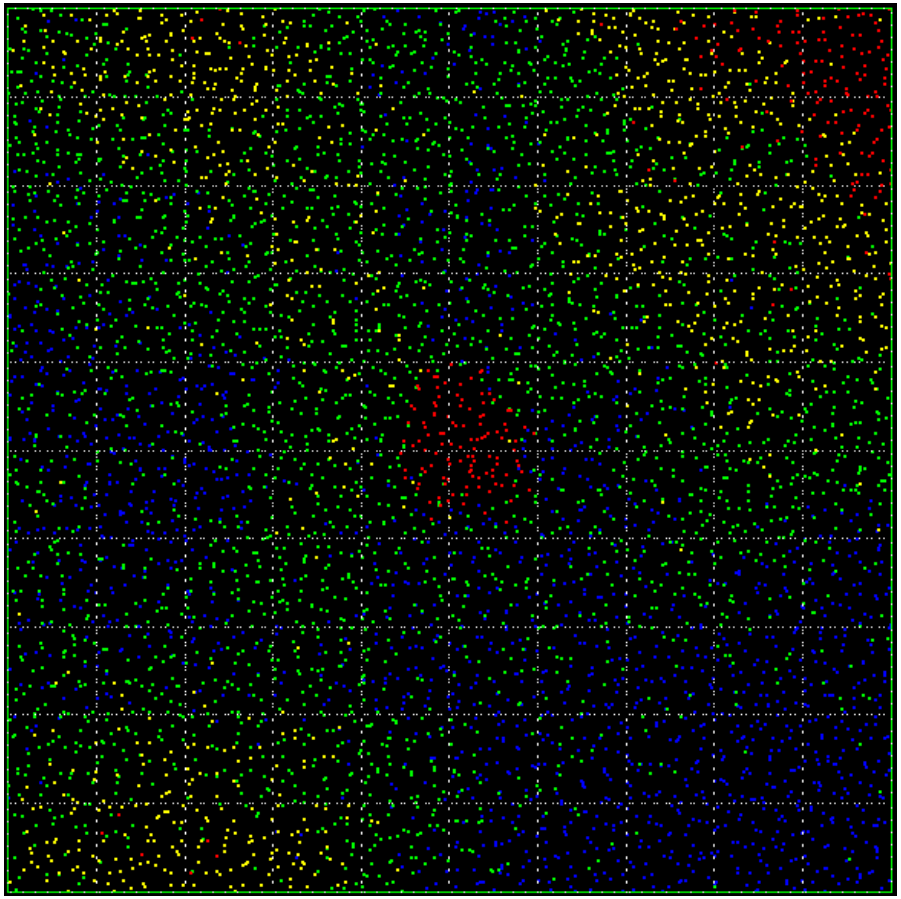


20m

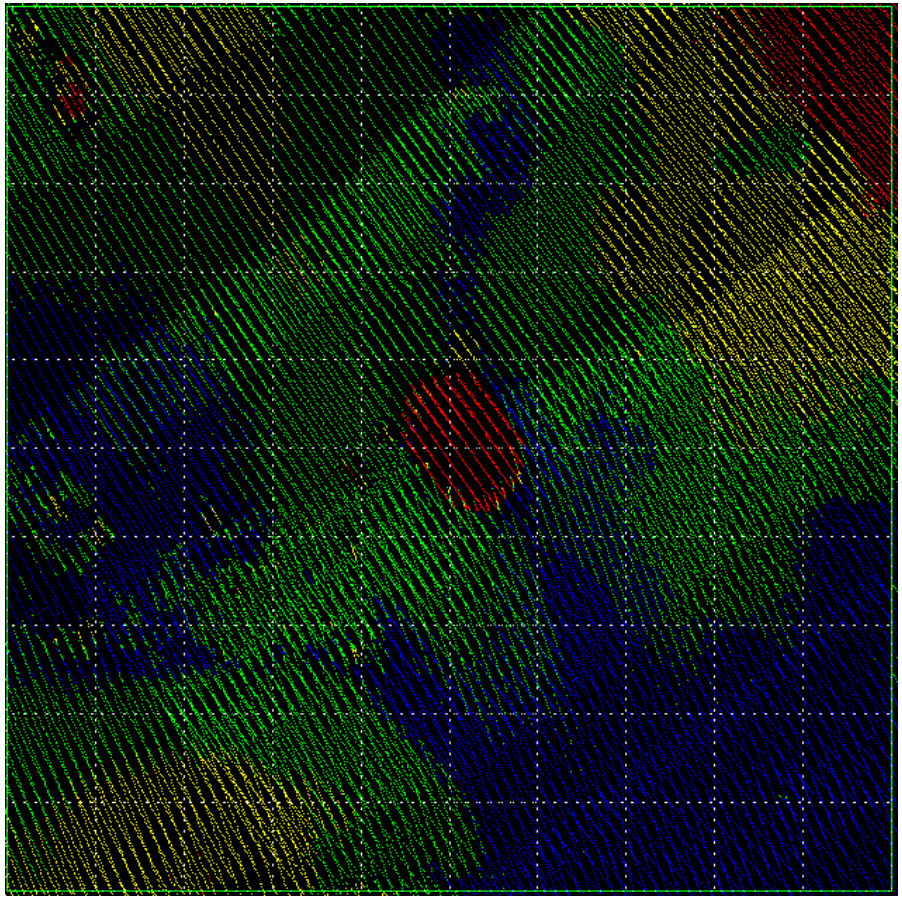


Average (20m*20m area) point density
13.935/m^2

LiDAR 4X 200% coverage VS. MBES

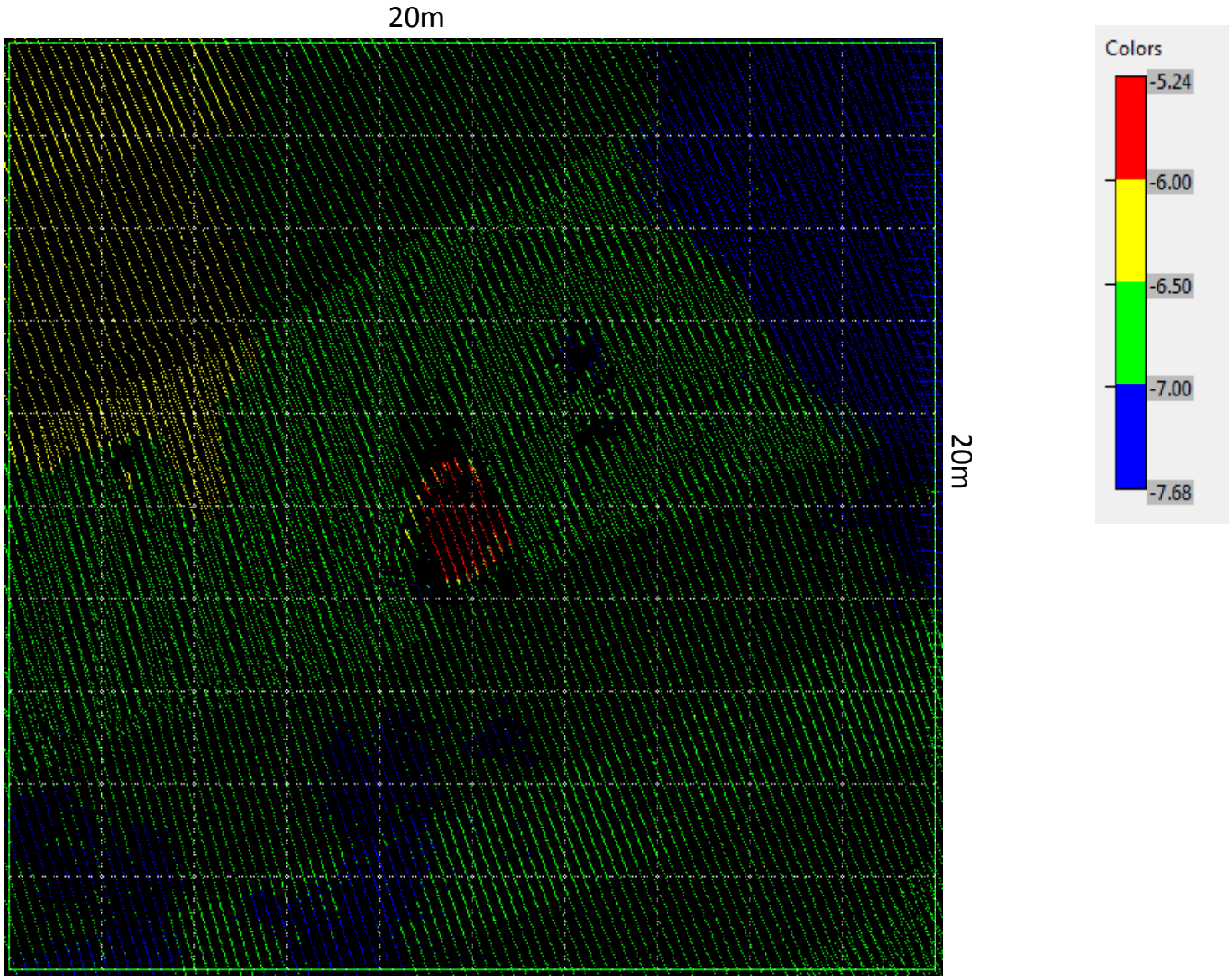


LiDAR UfourX 200% coverage



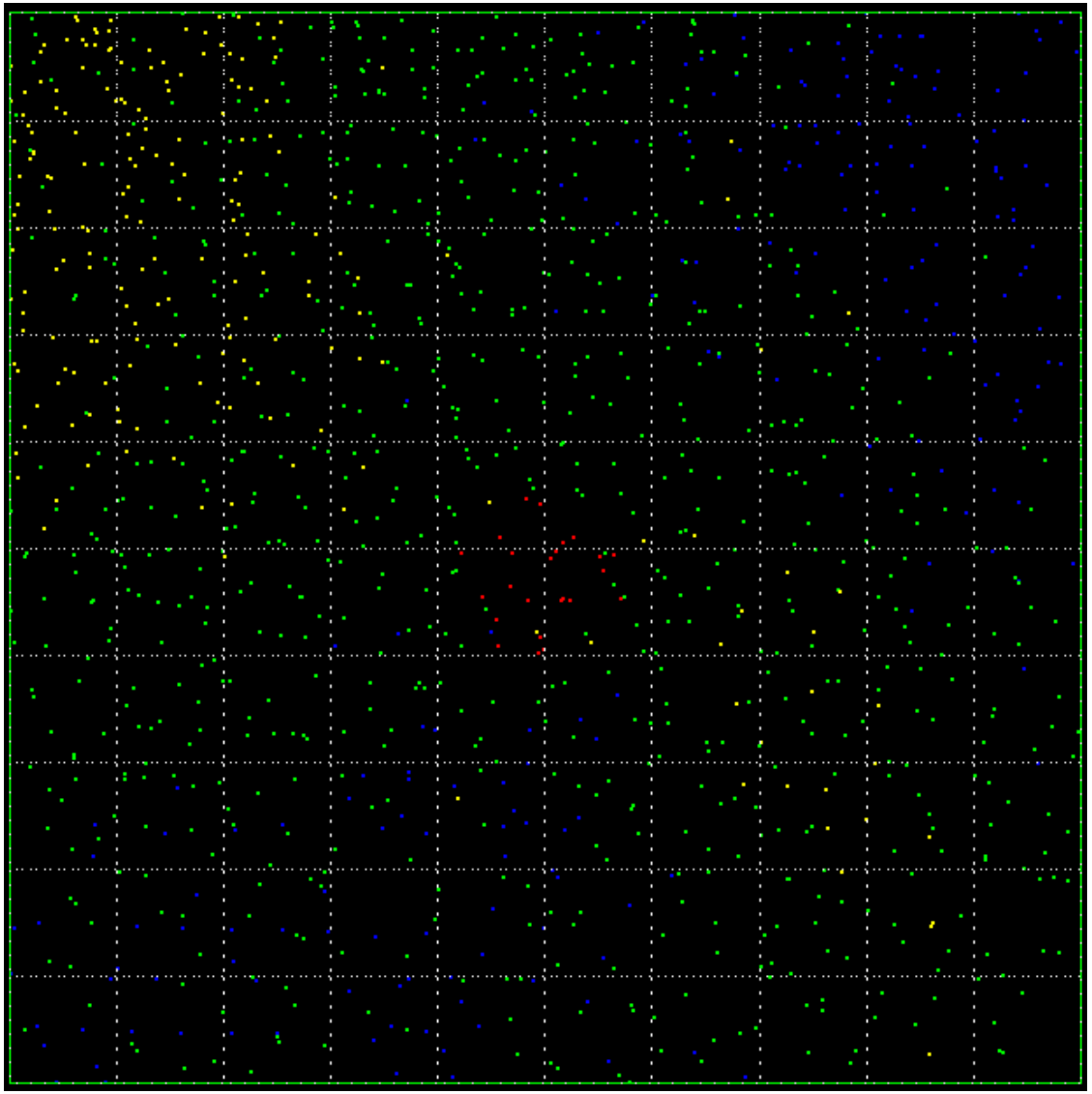
MBES

MBES Area 2

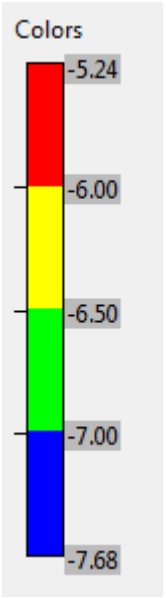


LiDAR standard 100% coverage

20m

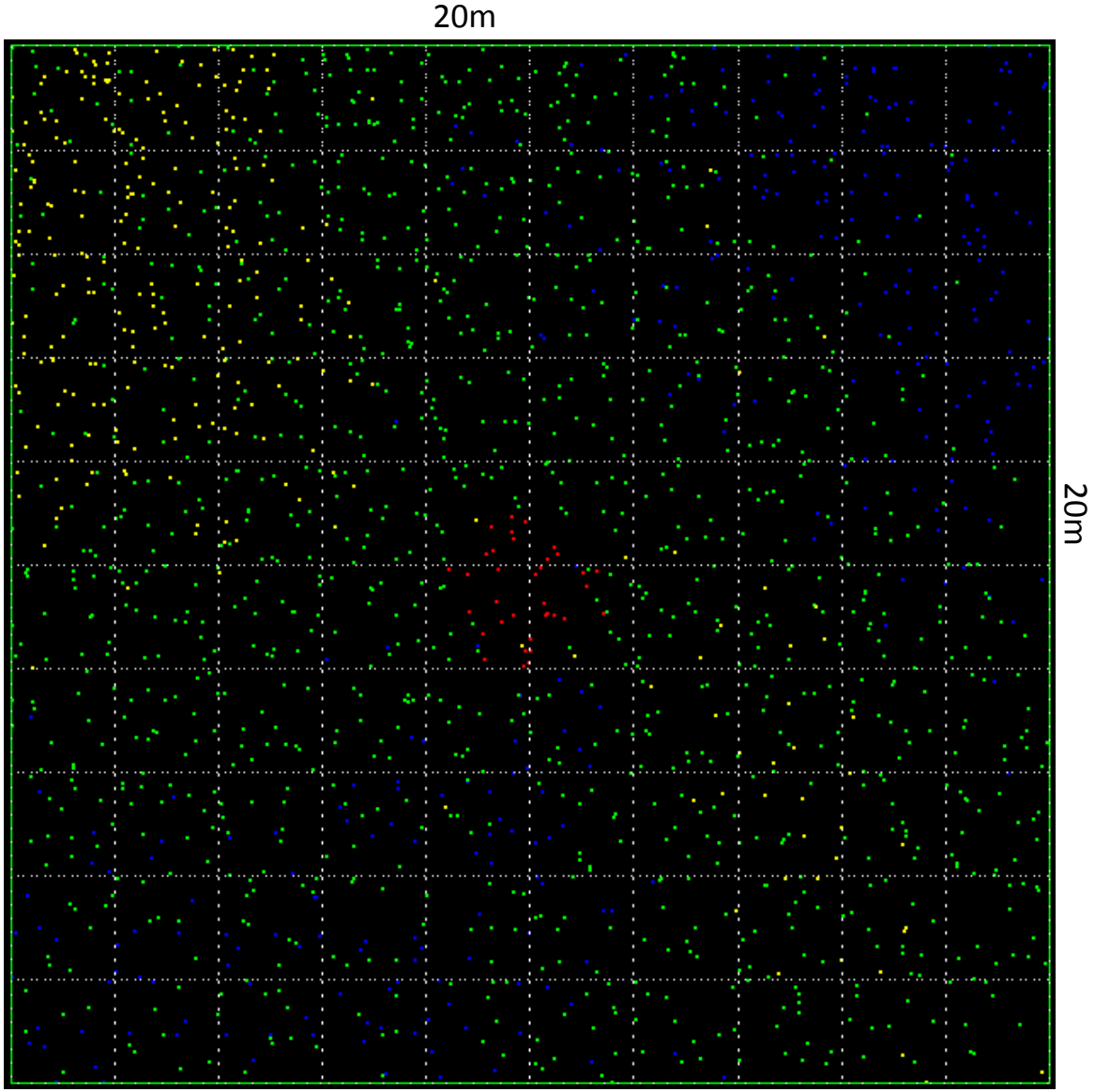


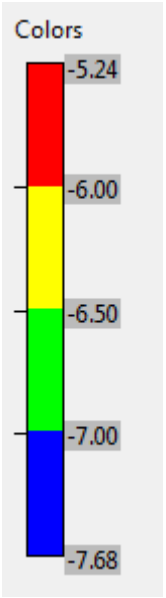
20m



Average (20m*20m area) point density 3.313/m^2

LiDAR standard 200% coverage

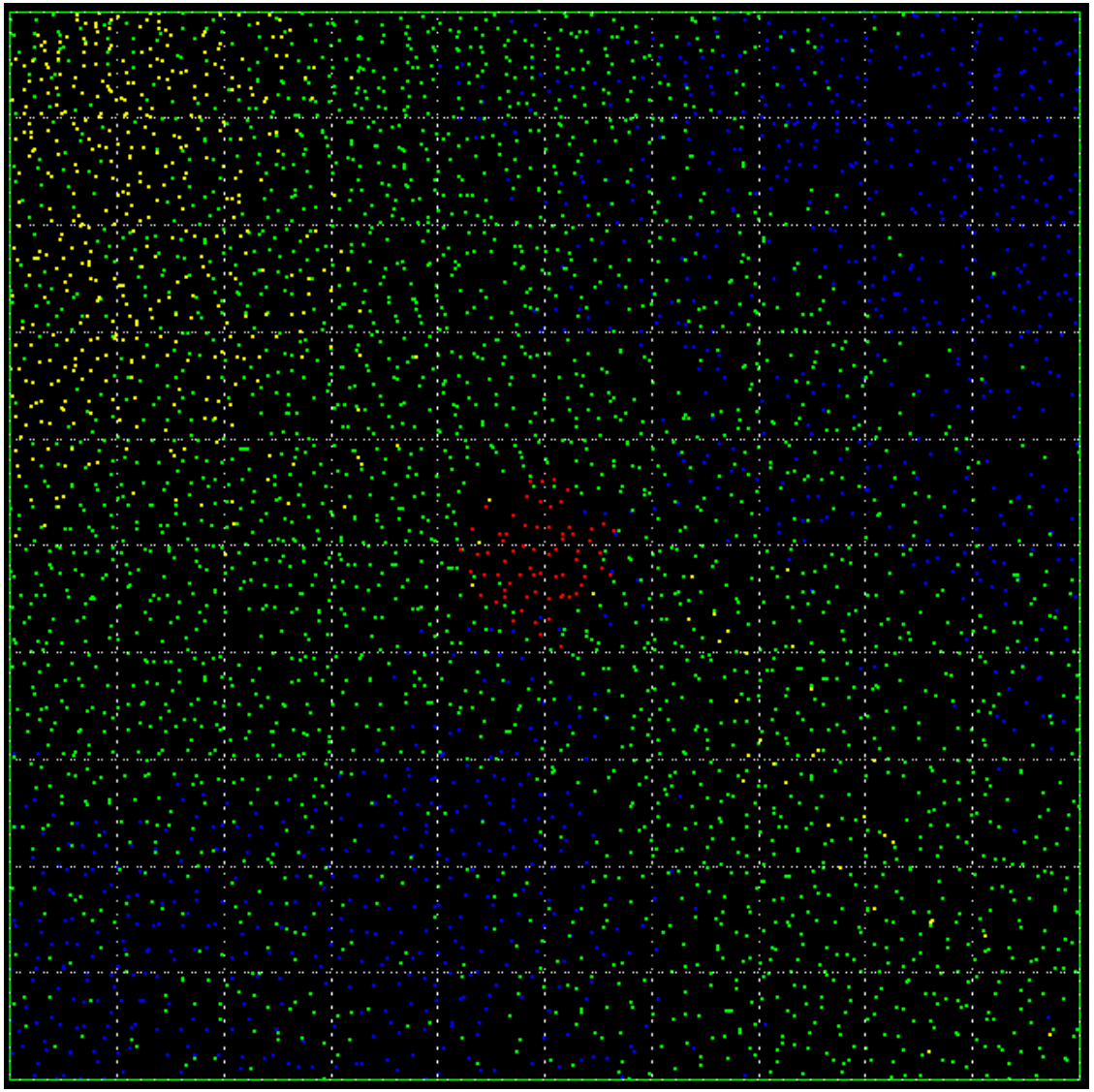




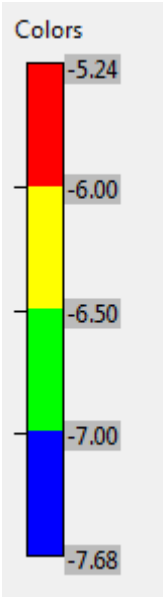
Average (20m*20m area) point density
4.825/m^2

LiDAR 4X 100% coverage

20m



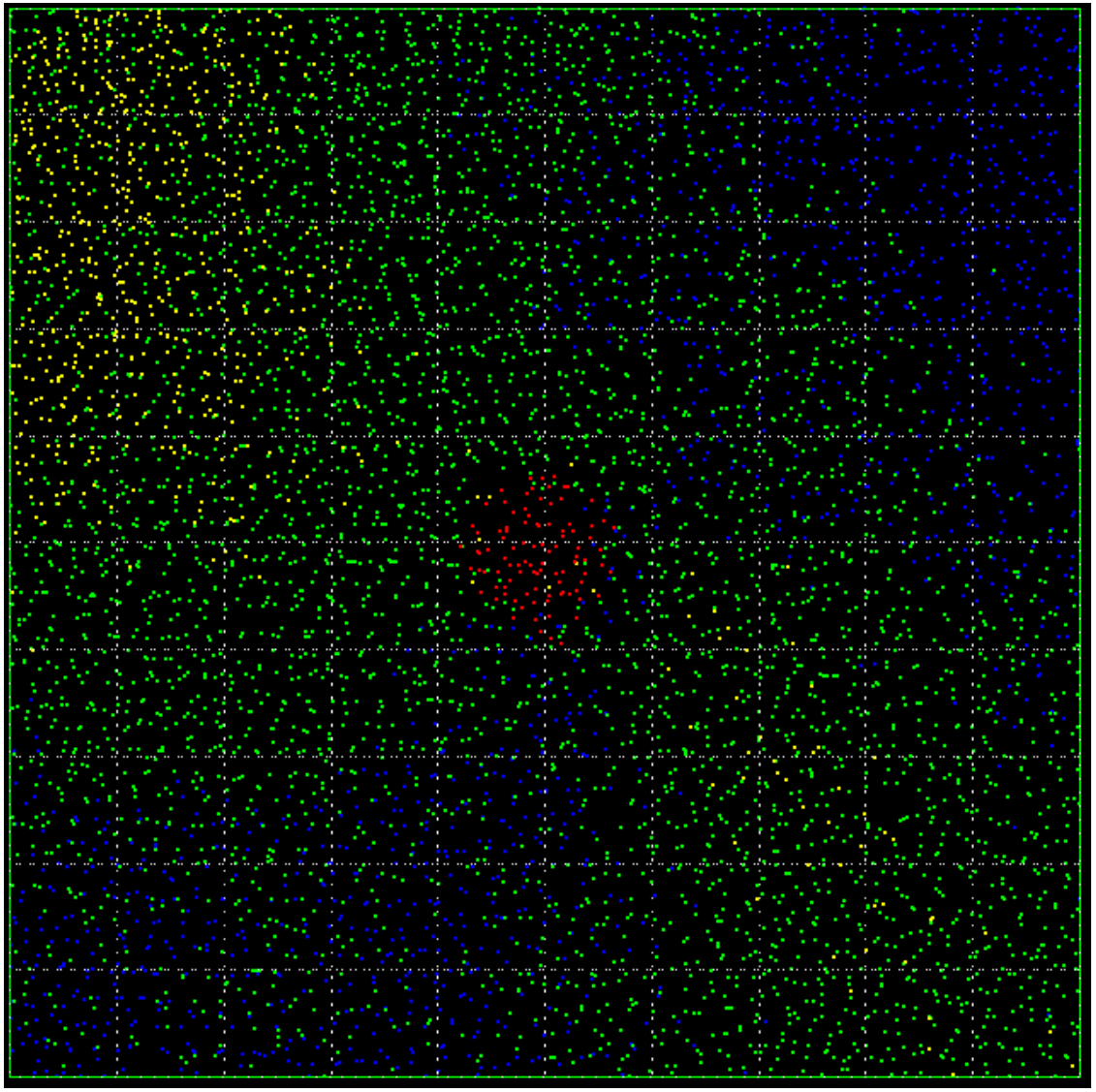
20m



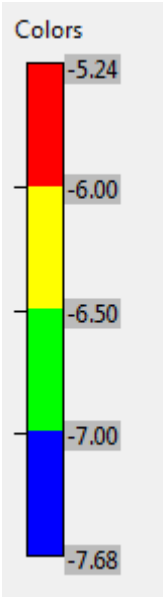
Average (20m*20m area) point density 10.338/m^2

LiDAR 4X 200% coverage

20m

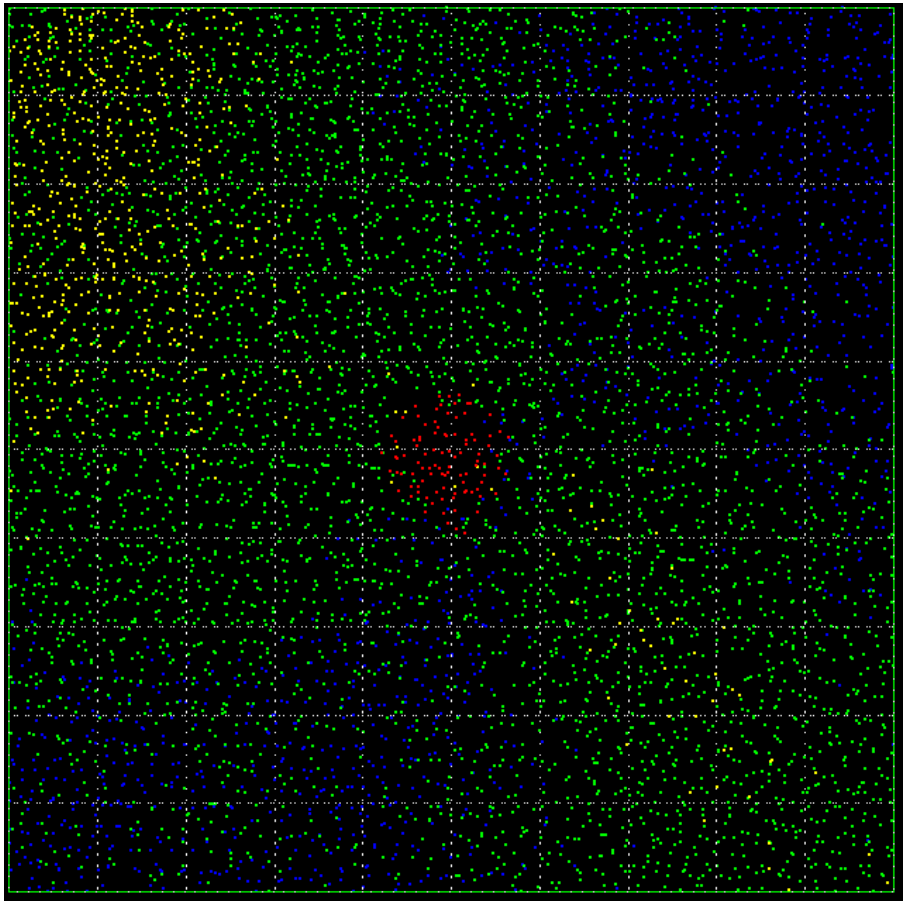


20m

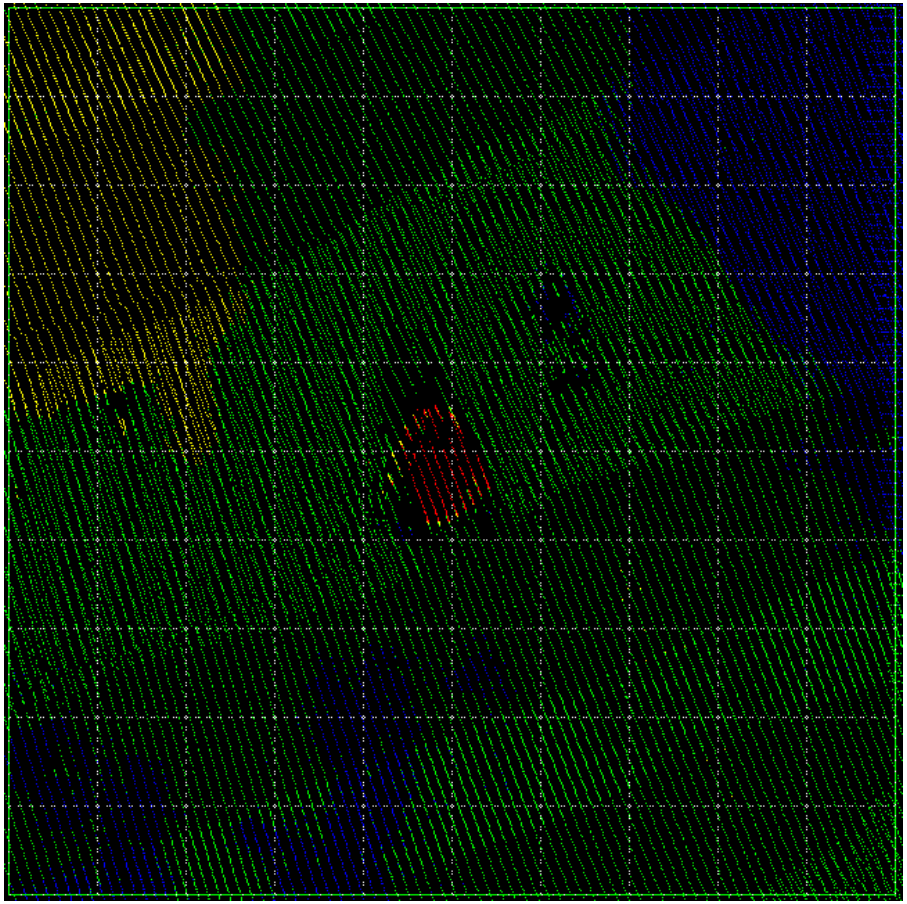


Average (20m*20m area) point density 15.300/m^2

LiDAR 4X 200% coverage VS. MBES



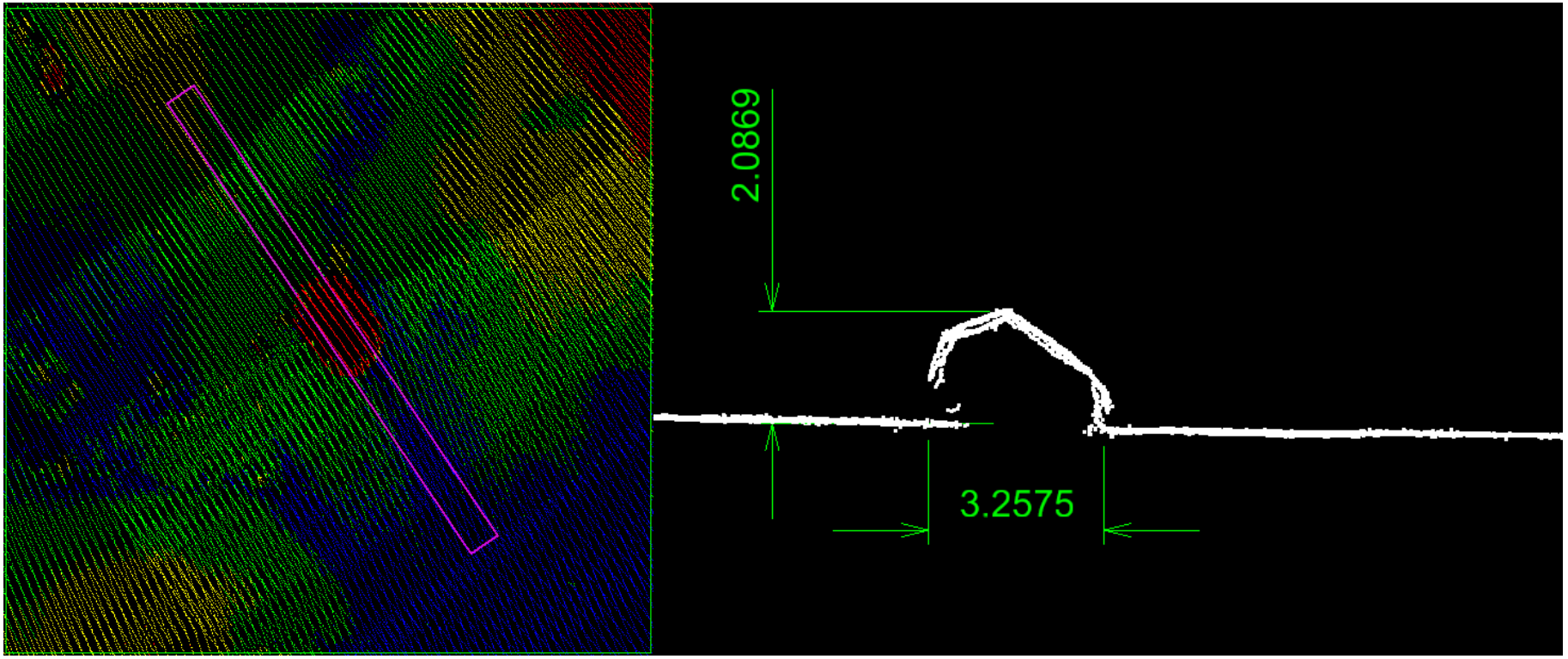
LiDAR UfourX 200% coverage



MBES

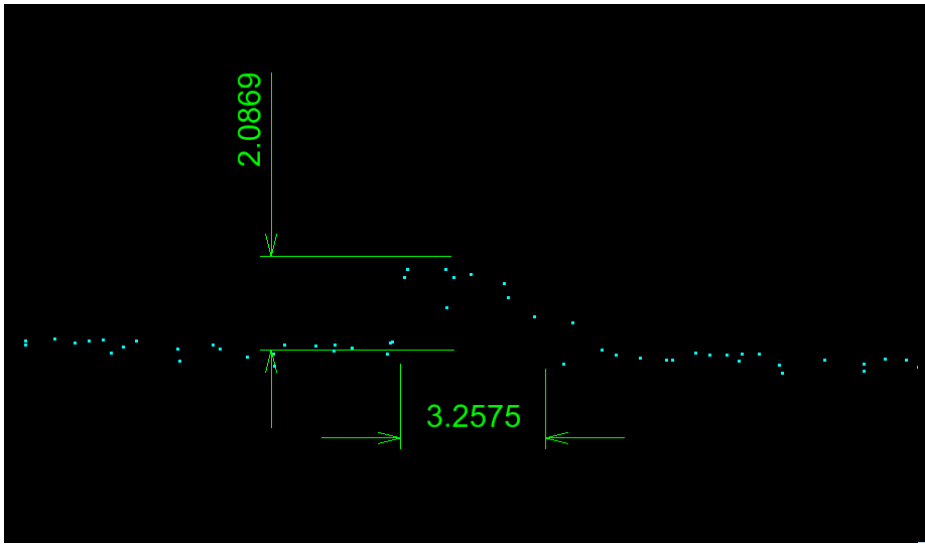
Object Detection

Object 1

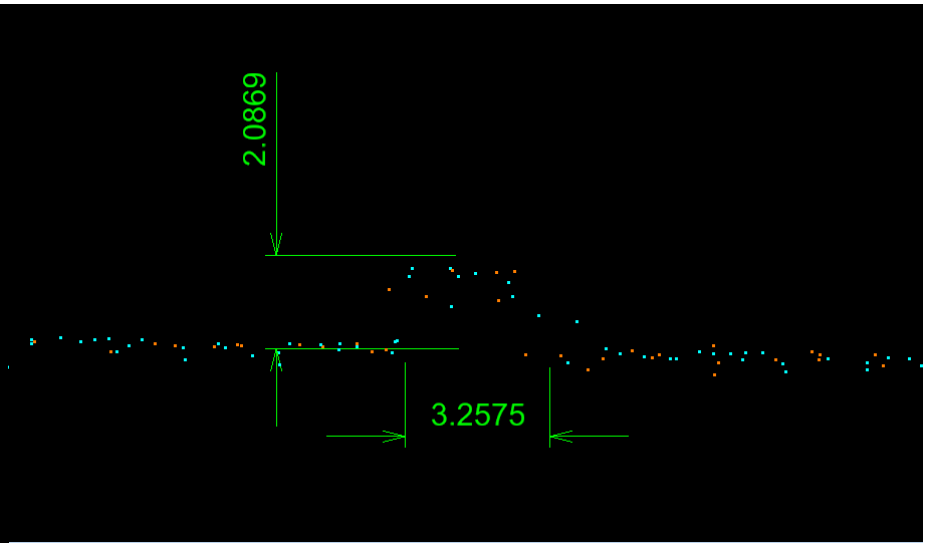


MBES reference
Depth: 5.9m
Cross section depth: 0.5m

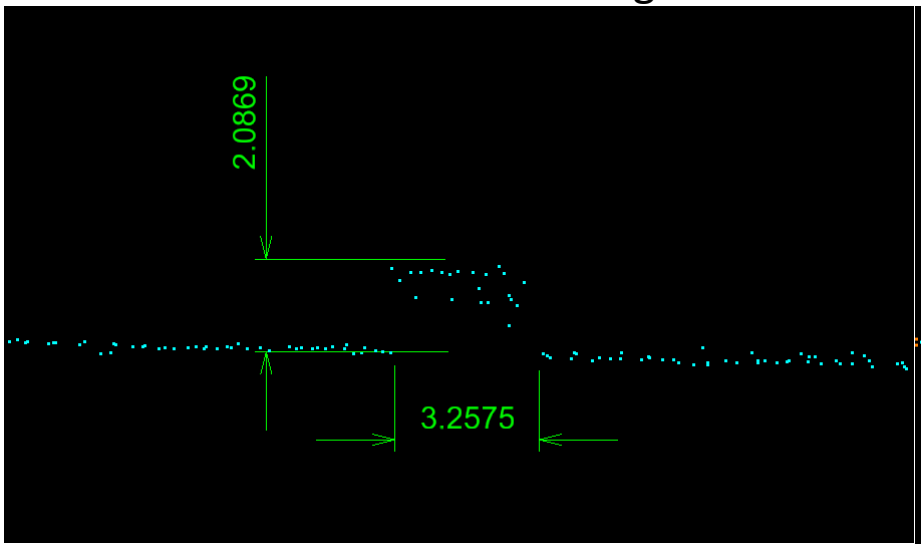
Object 1 Color By Flightlines



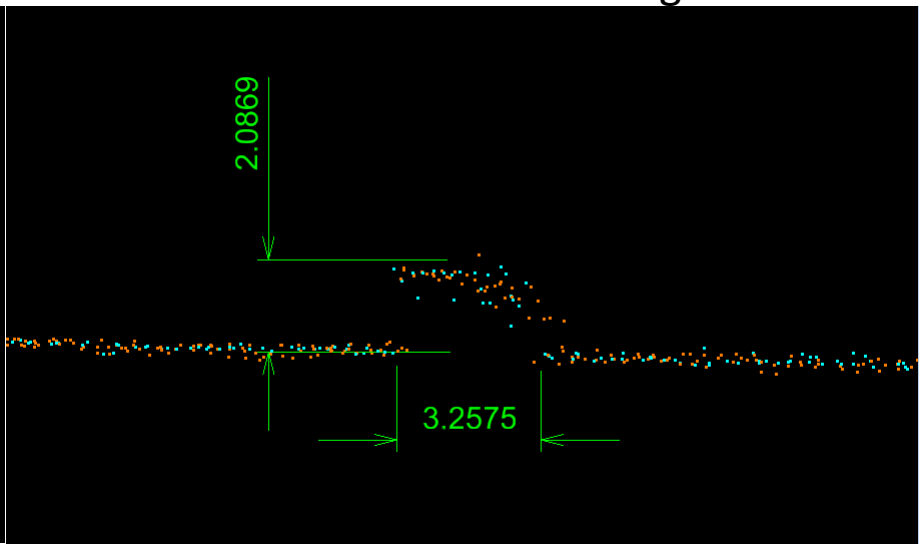
Standard LiDAR 100% coverage



Standard LiDAR 200% coverage

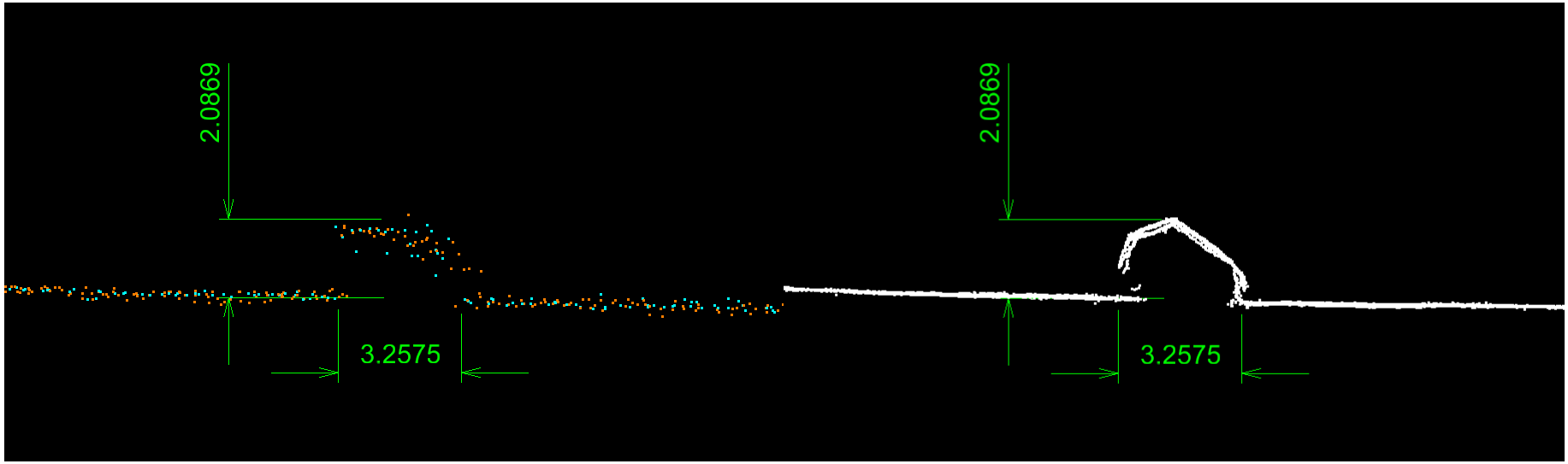


4X LiDAR 100% coverage



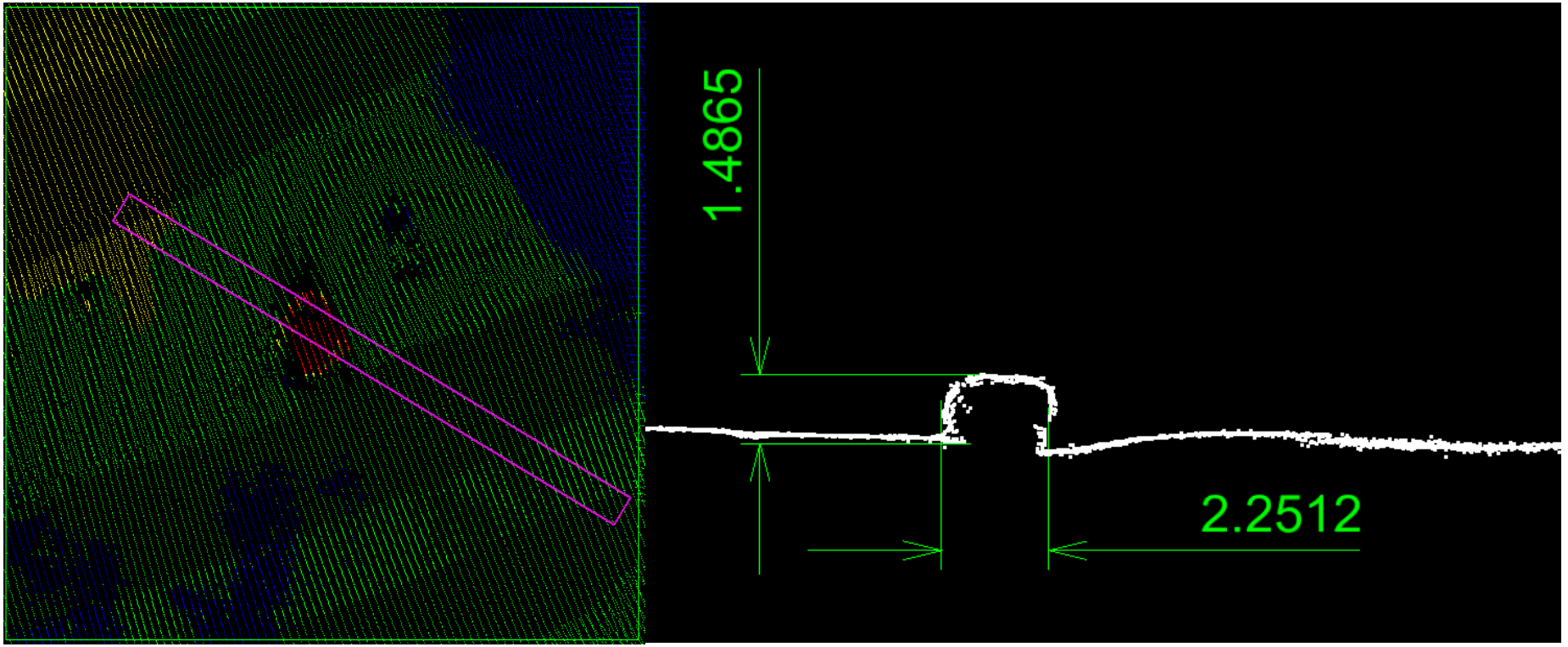
4X LiDAR 200% coverage

LiDAR 4X 200% coverage VS. MBES, object 1



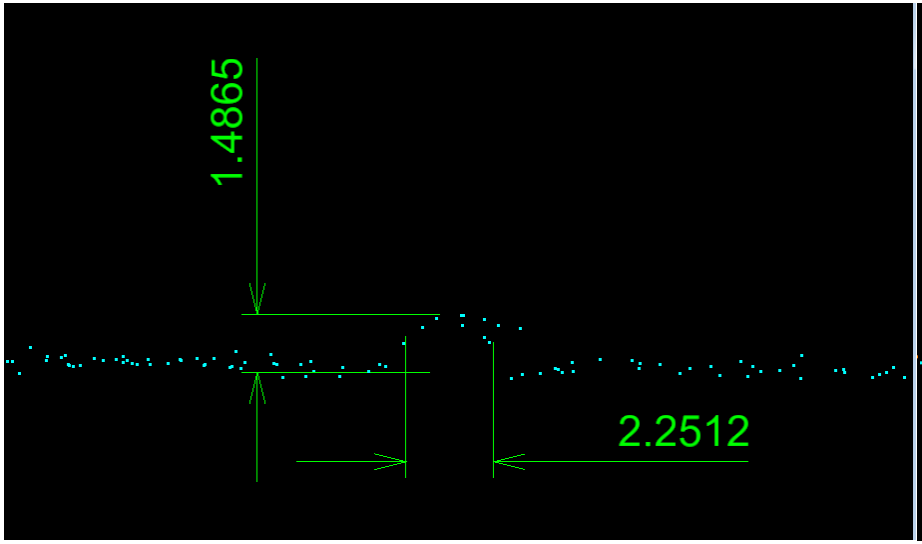
LiDAR UfourX 200% coverage MBES

Object 2

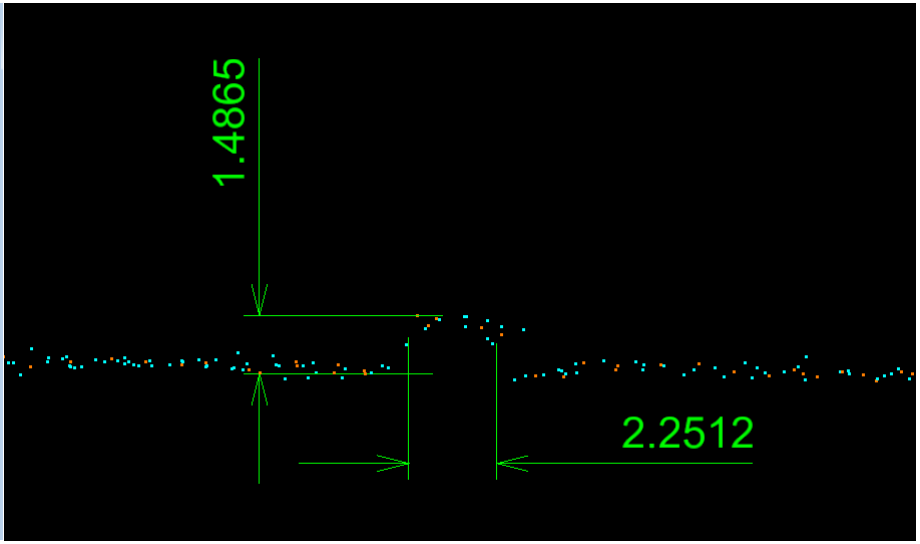


MBES reference
Depth:6.5m
Cross section depth: 0.5m

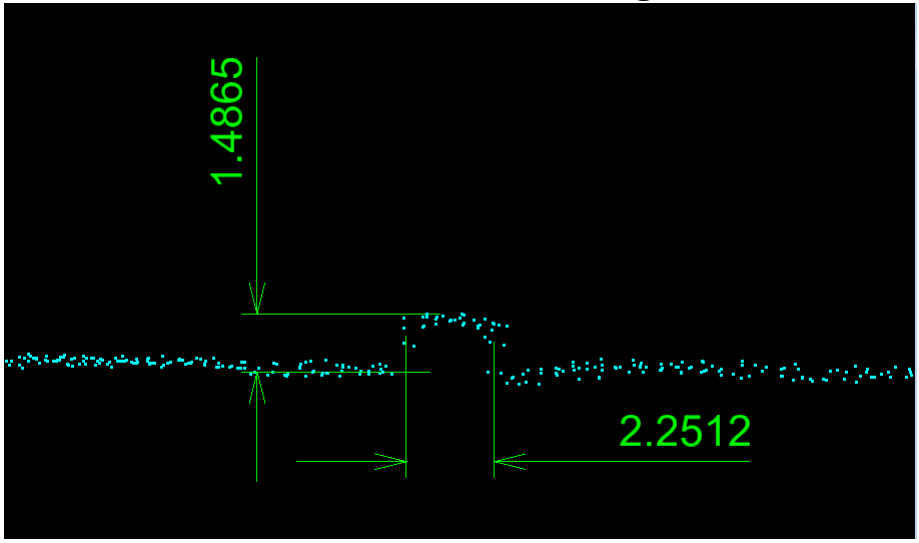
Object 2 Color By Flightlines



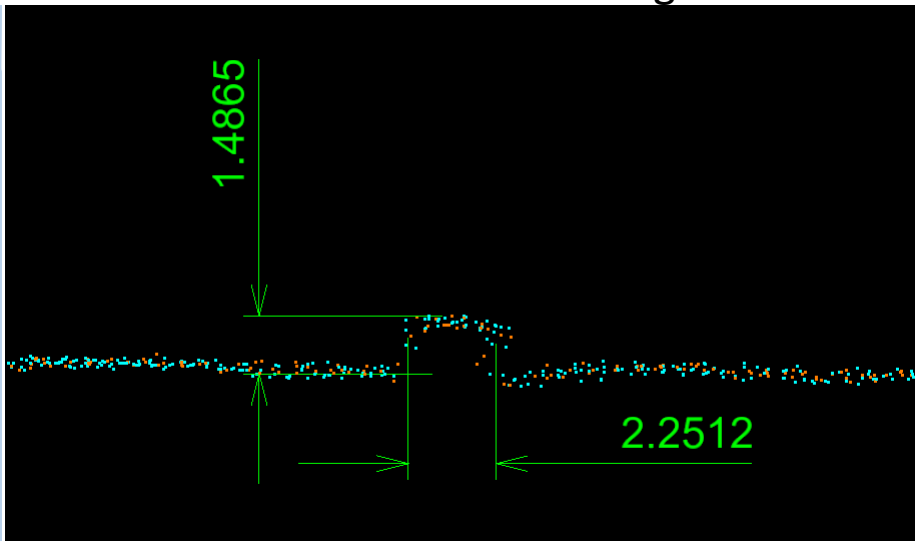
Standard LiDAR 100% coverage



Standard LiDAR 200% coverage

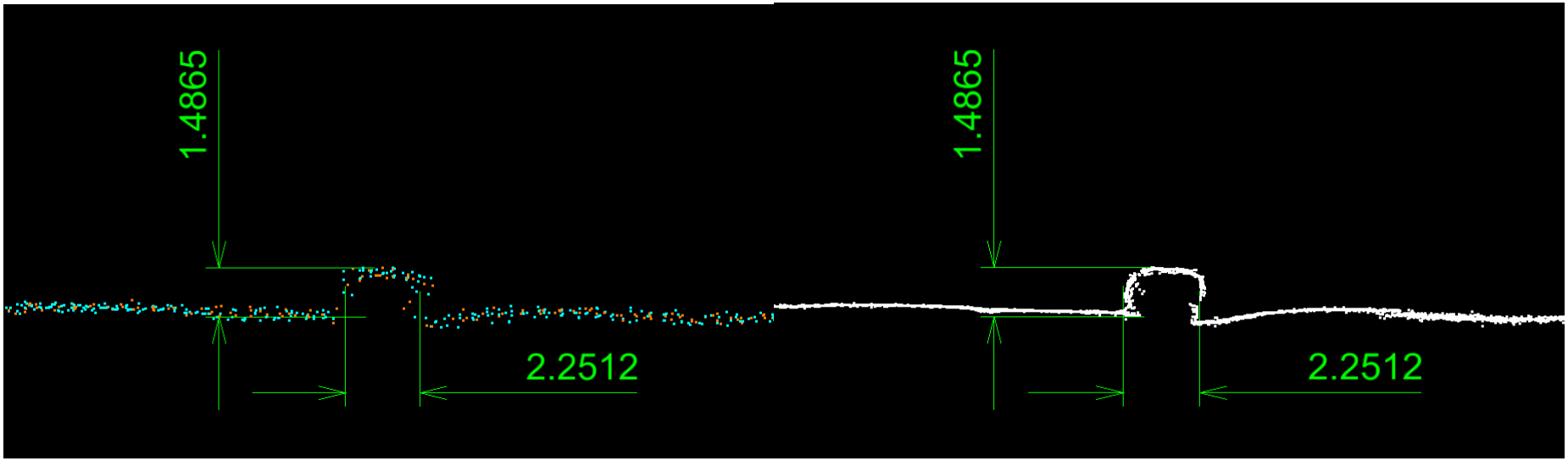


4X LiDAR 100% coverage



4X LiDAR 200% coverage

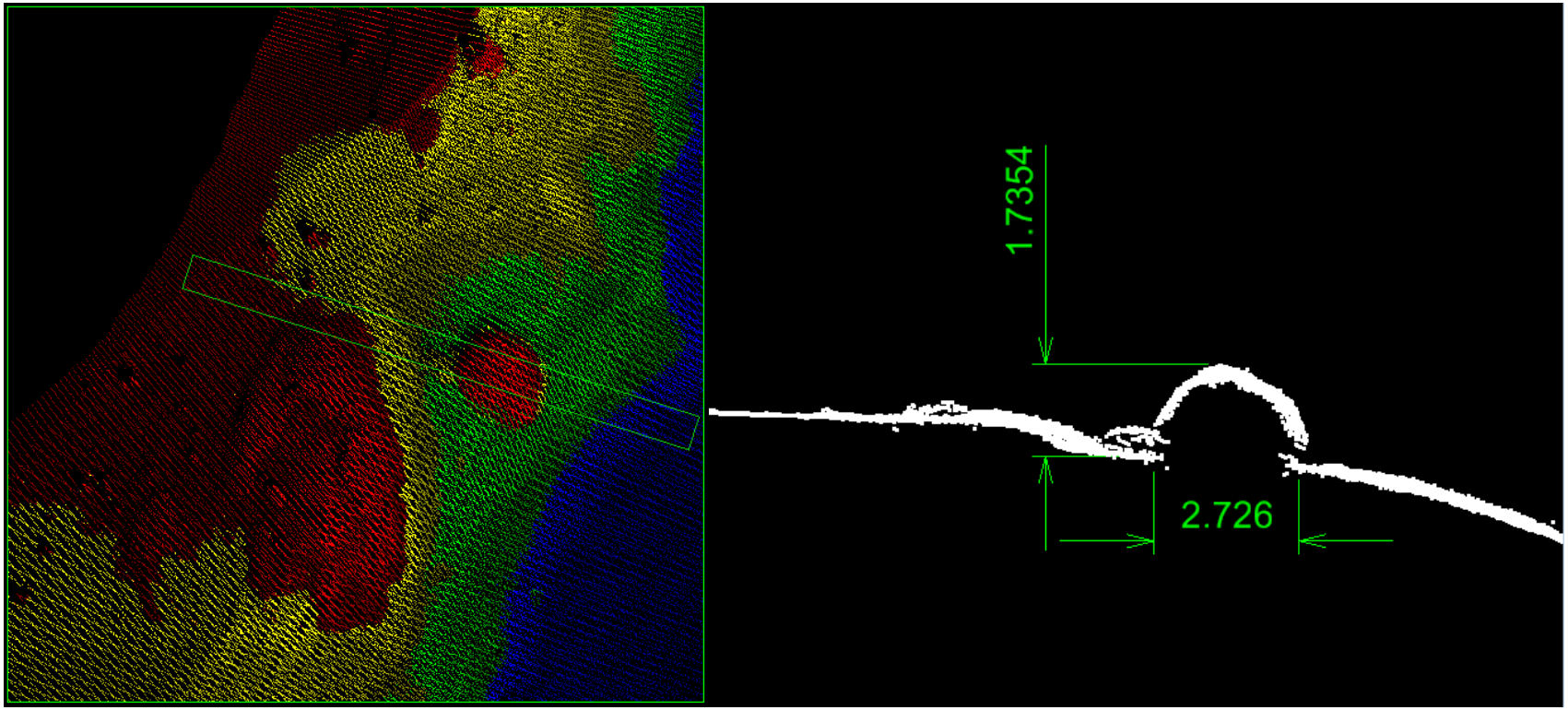
LiDAR 4X 200% coverage VS. MBES, object 2



LiDAR UfourX 200% coverage

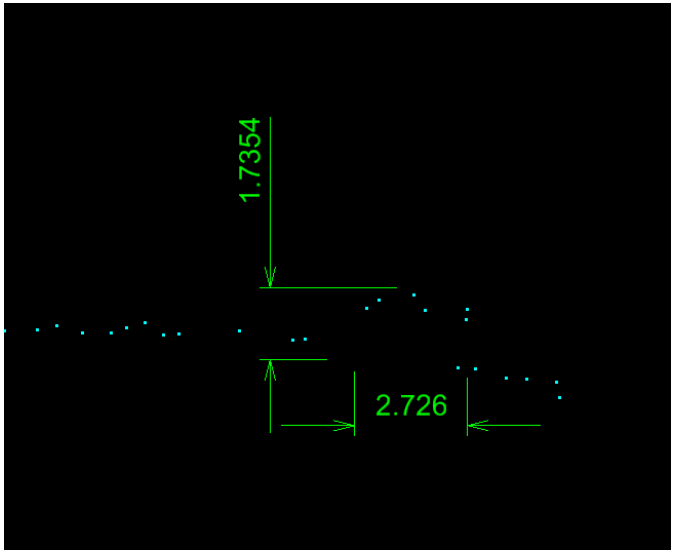
MBES

Object 3

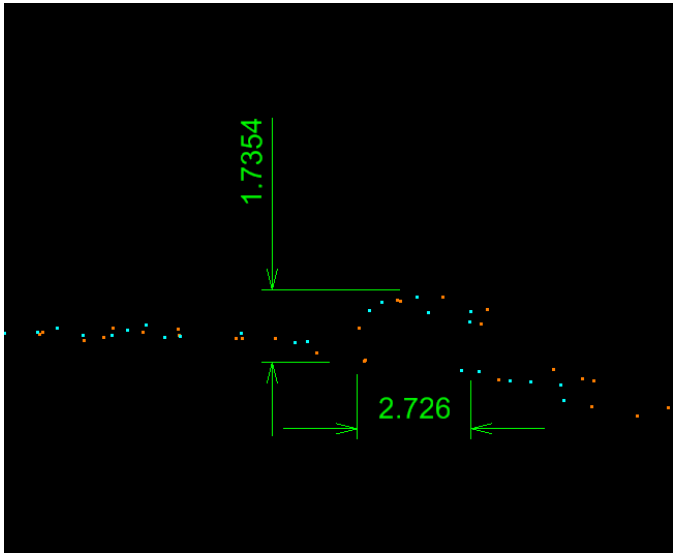


MBES reference
Depth:6.3m
Cross section depth: 0.5m

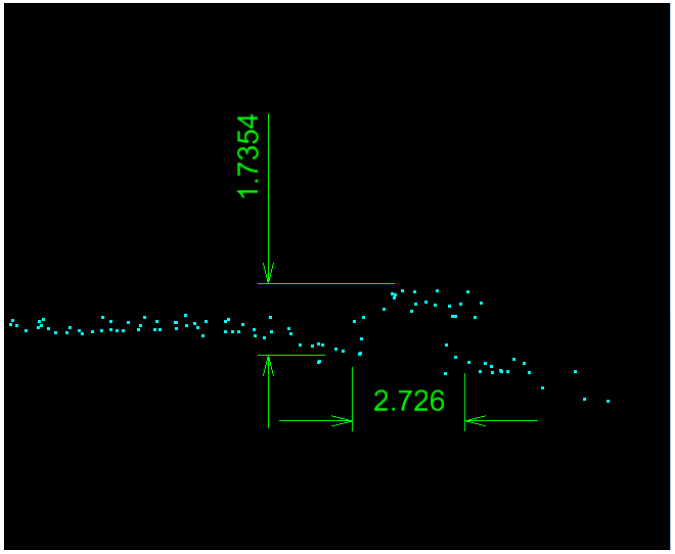
Object 3 Color By Flightlines



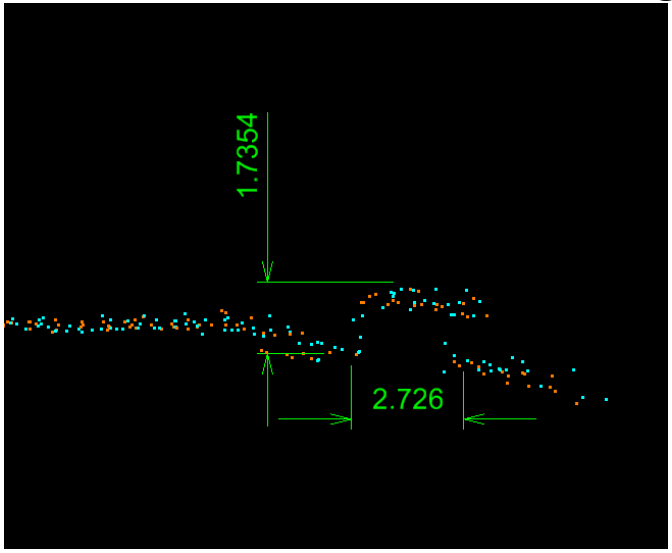
Standard LiDAR 100% coverage



Standard LiDAR 200% coverage

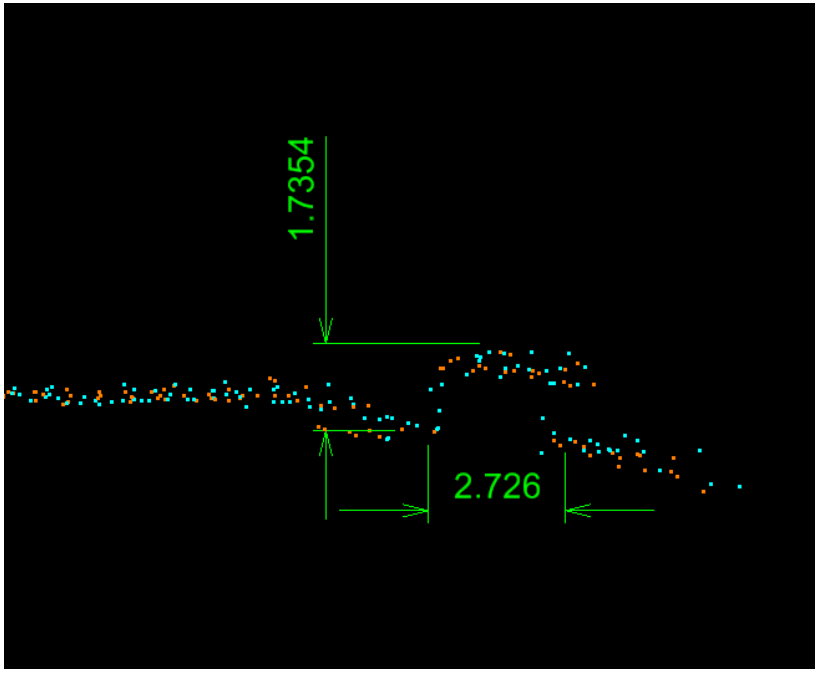


4X LiDAR 100% coverage

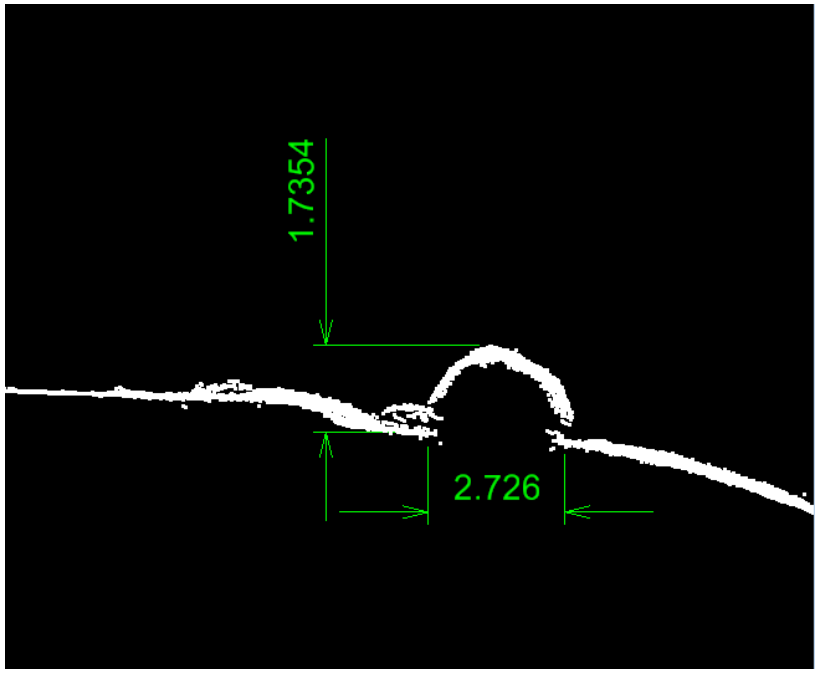


4X LiDAR 200% coverage

LiDAR 4X 200% coverage VS. MBES, object 3

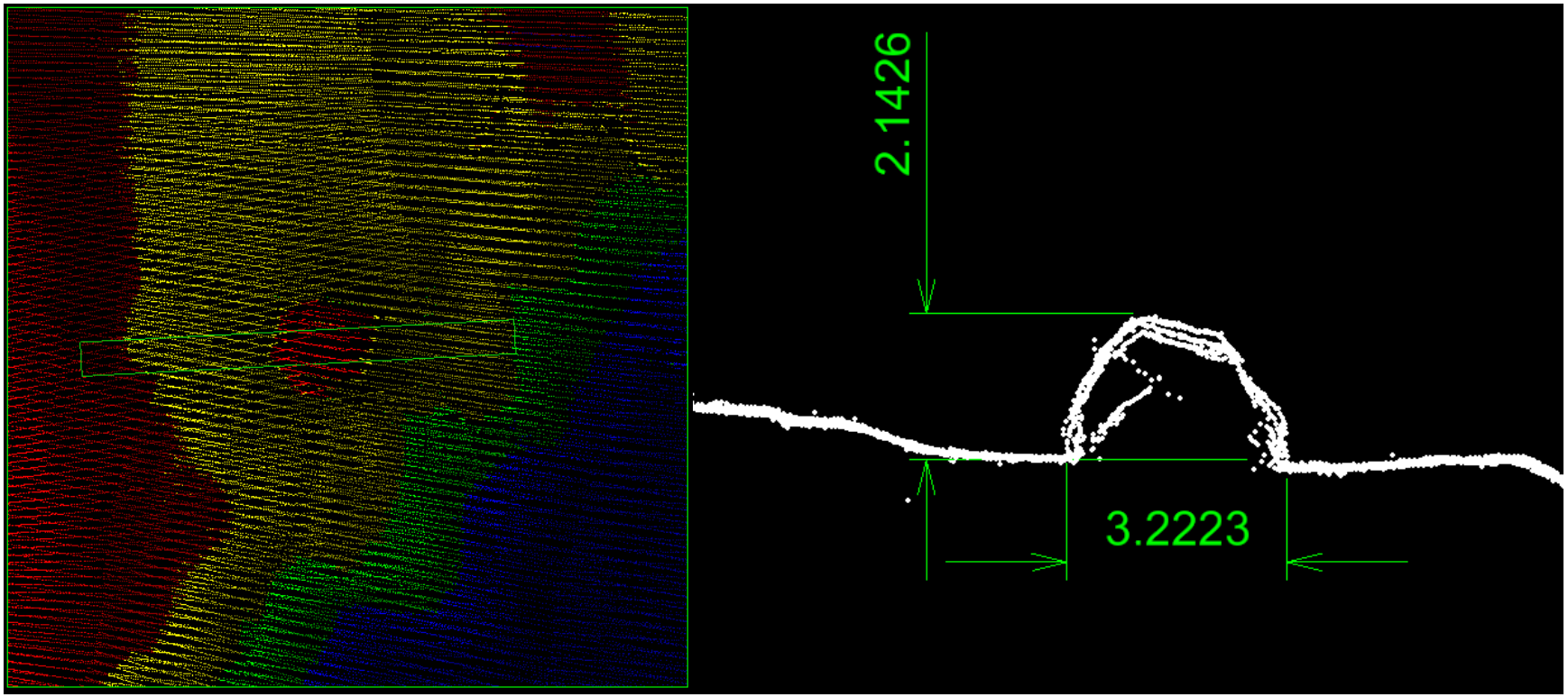


LiDAR UfourX 200% coverage



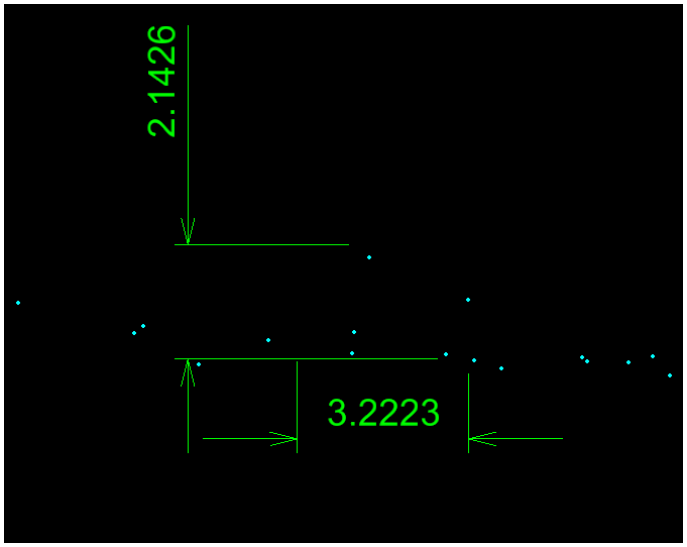
MBES

Object 4

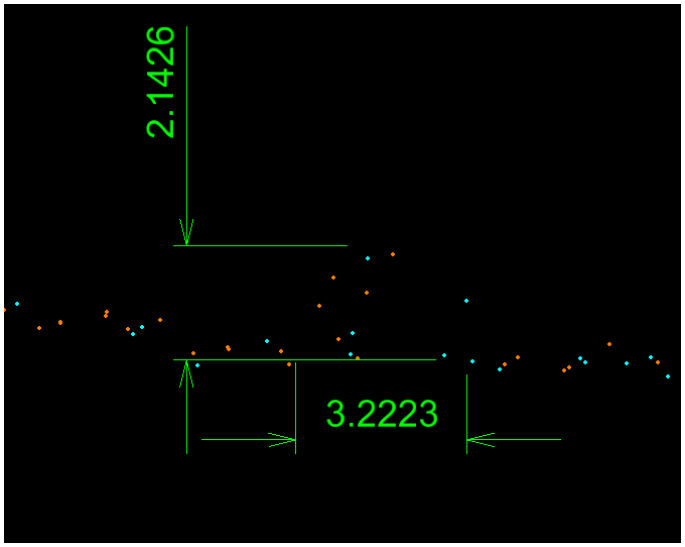


MBES reference
Depth:6.5m
Cross section depth: 0.5m

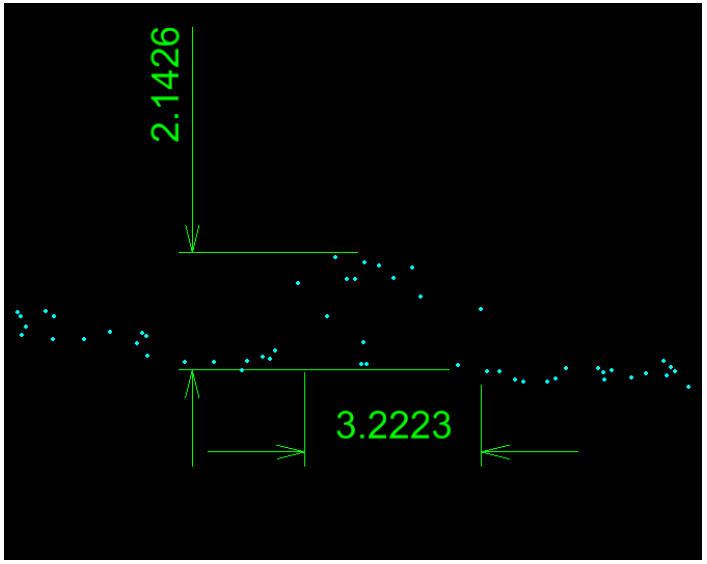
Object 4 Color By Flightlines



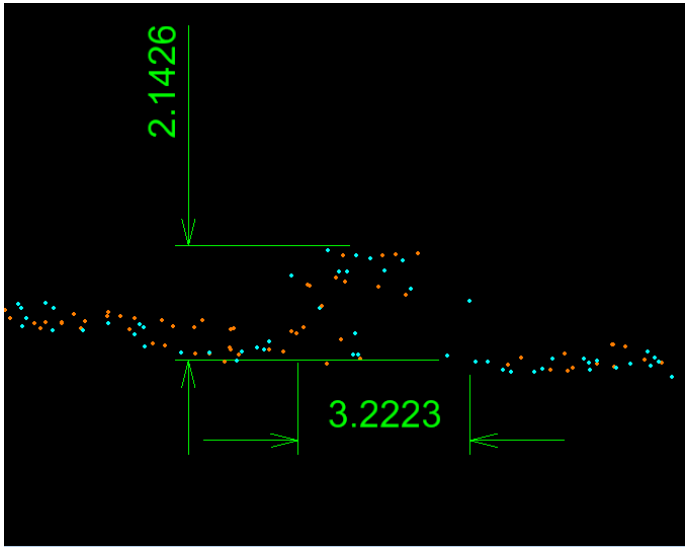
Standard LiDAR 100% coverage



Standard LiDAR 200% coverage

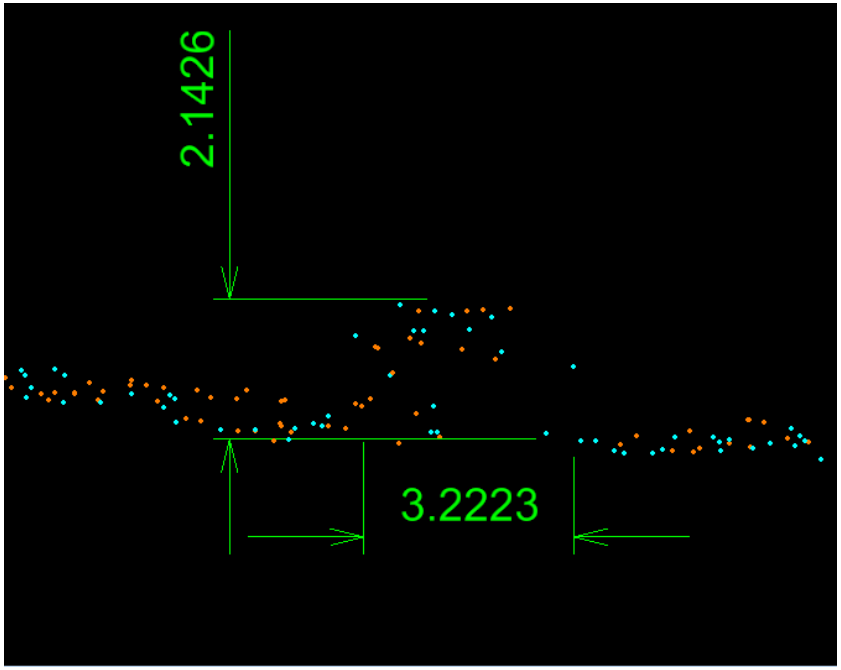


4X LiDAR 100% coverage

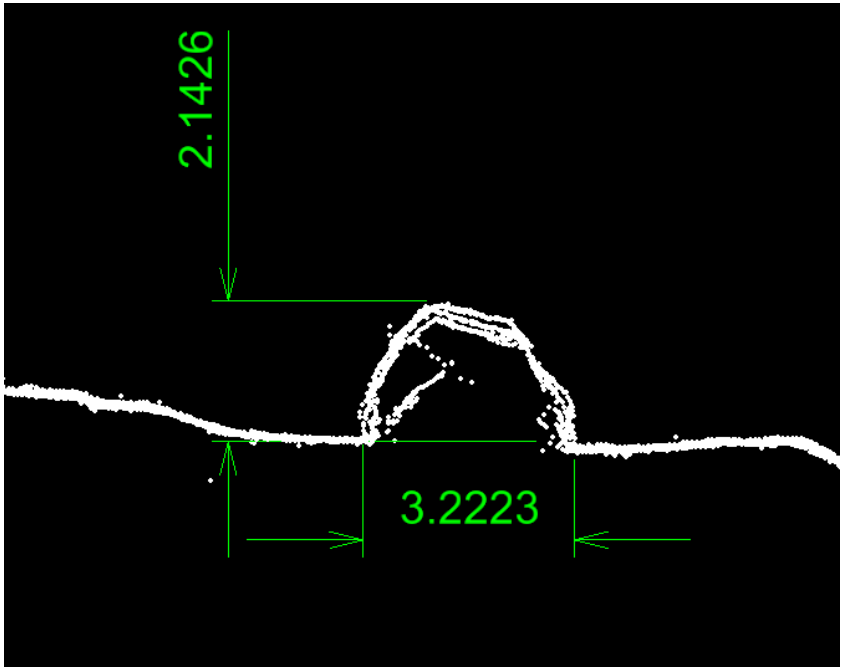


4X LiDAR 200% coverage

LiDAR 4X 200% coverage VS. MBES, object 4



LiDAR UfourX 200% coverage

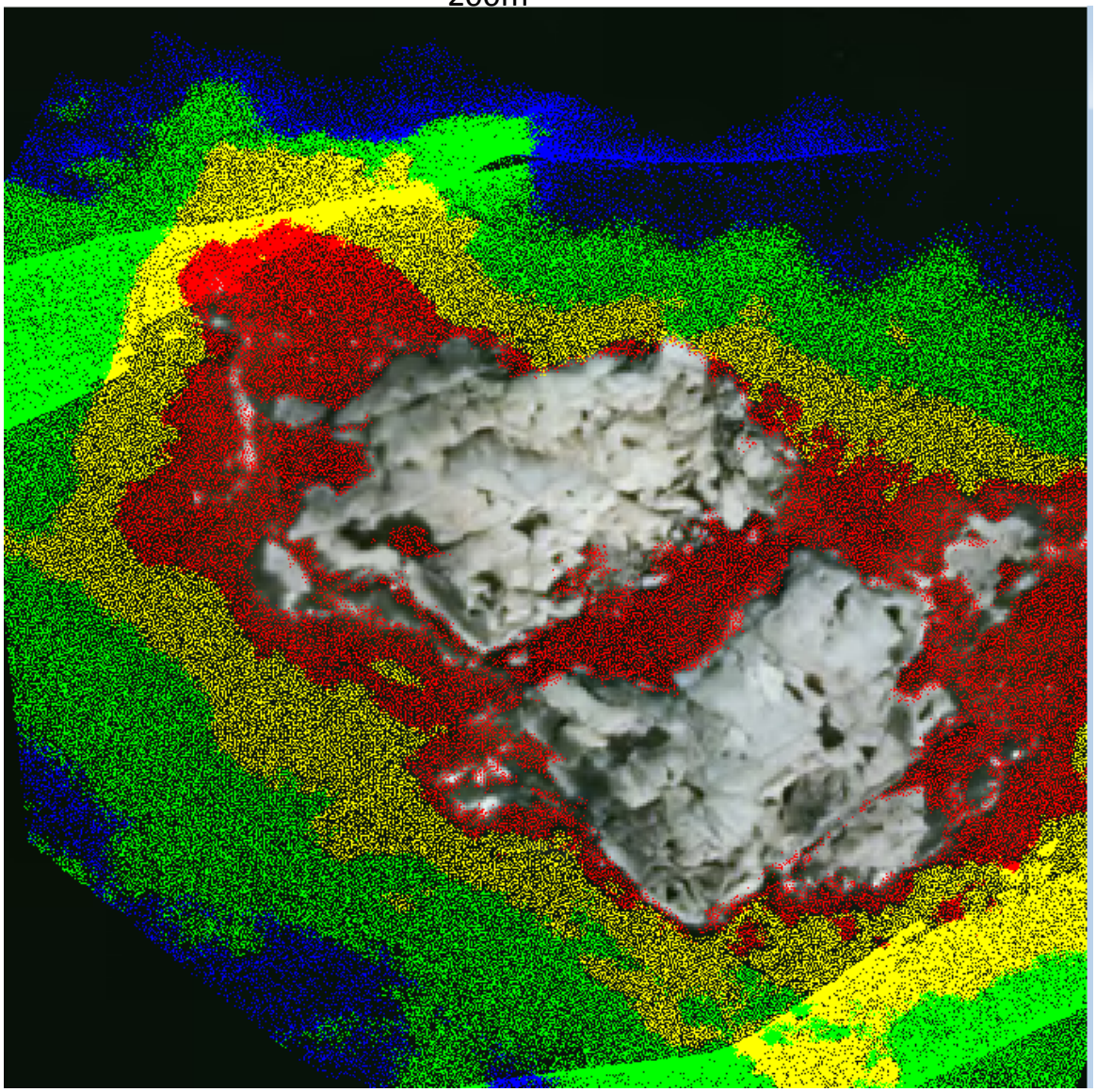


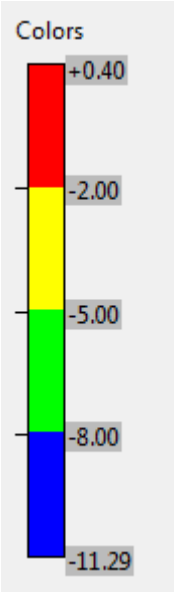
MBES

Area Coverage

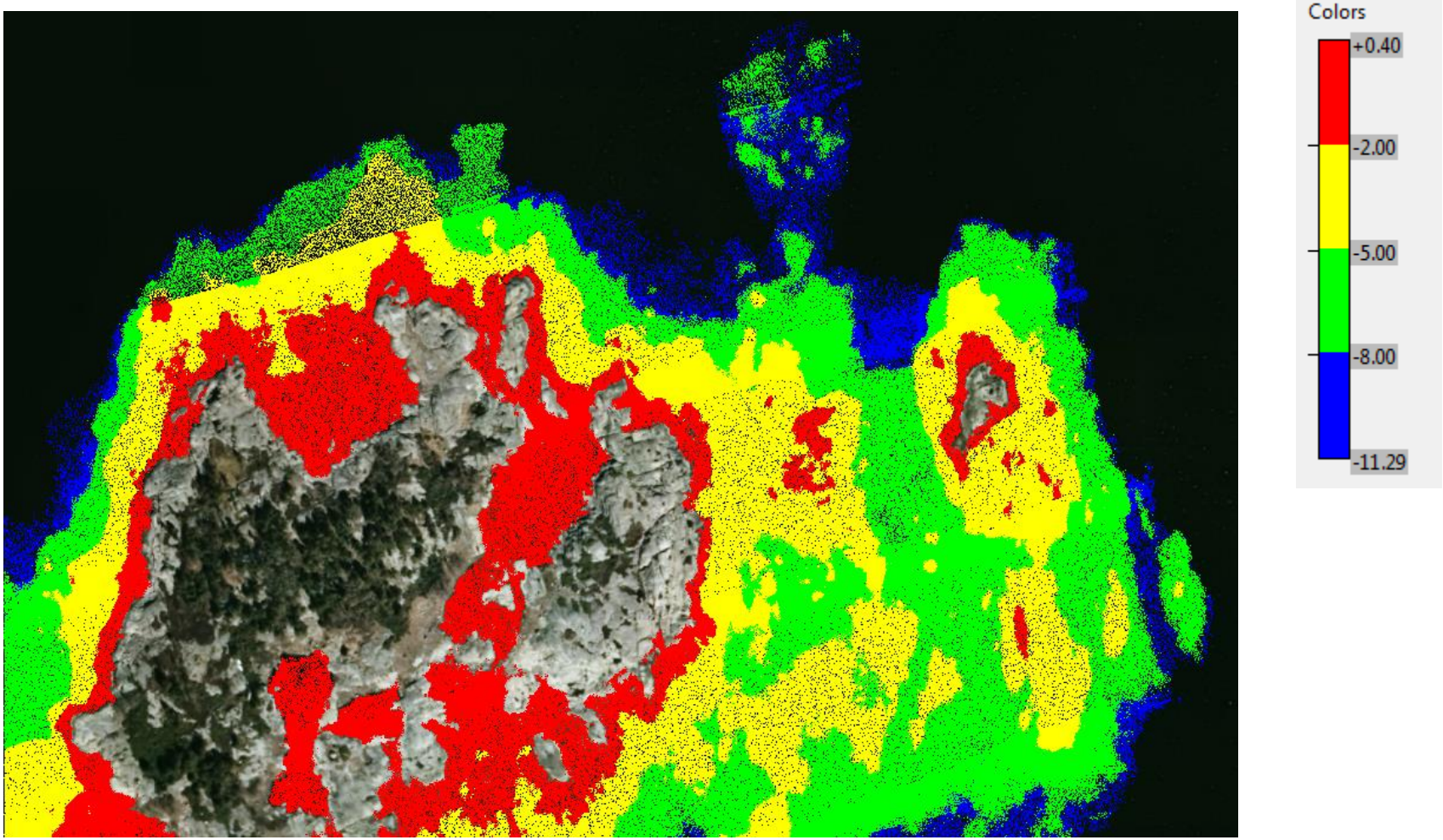
LiDAR 4X 200% coverage

200m



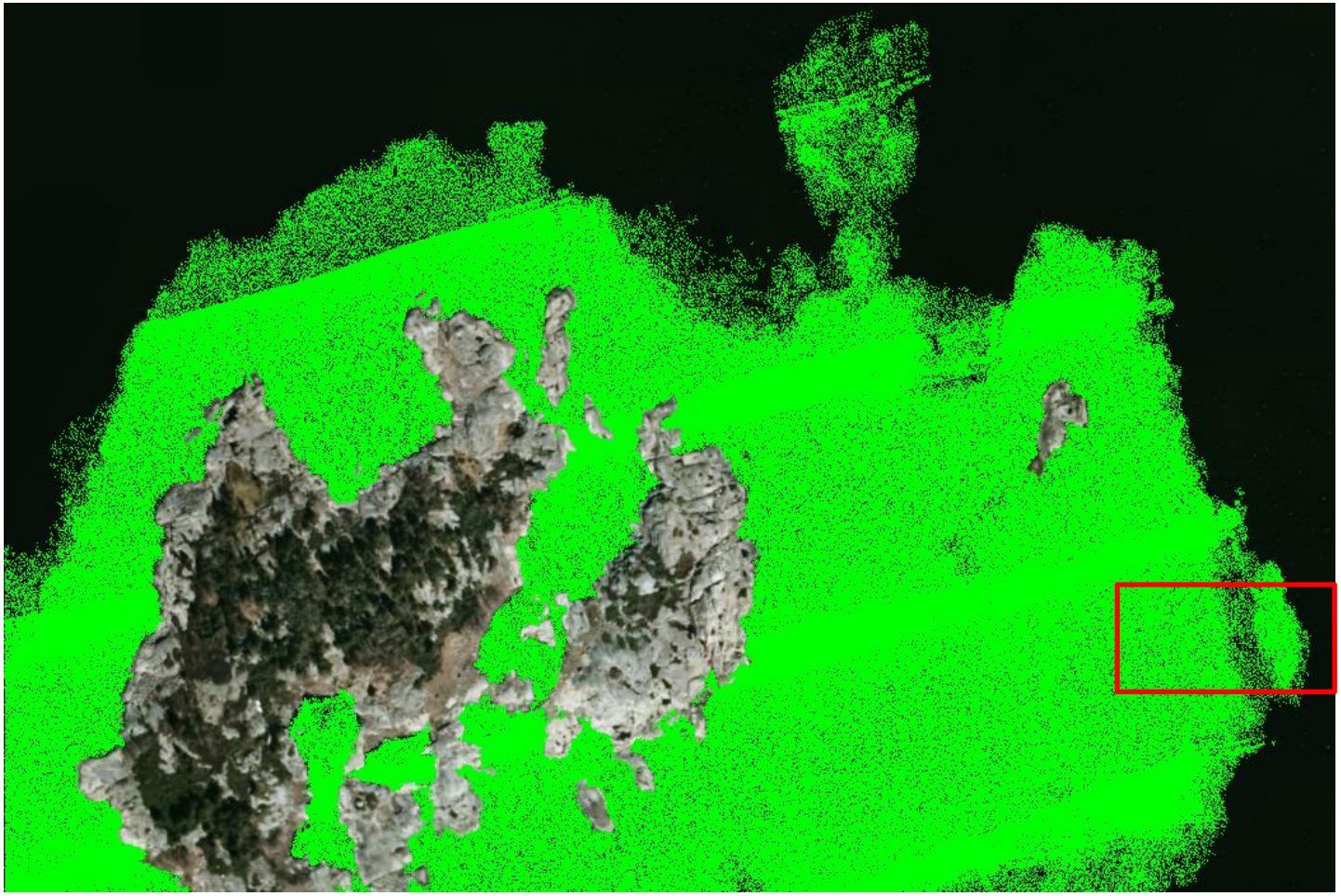


LiDAR 4X 200% coverage



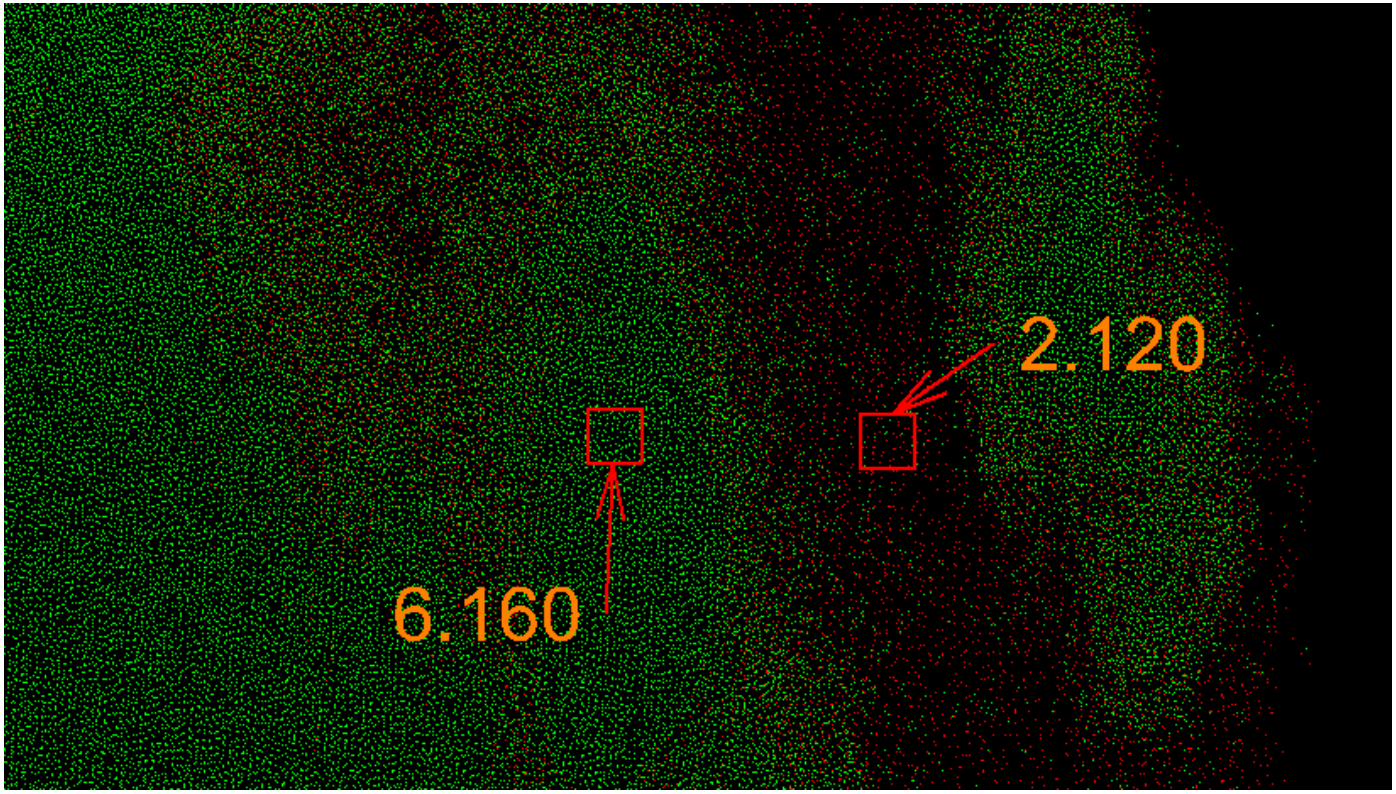
840m

LiDAR 4X 200% coverage



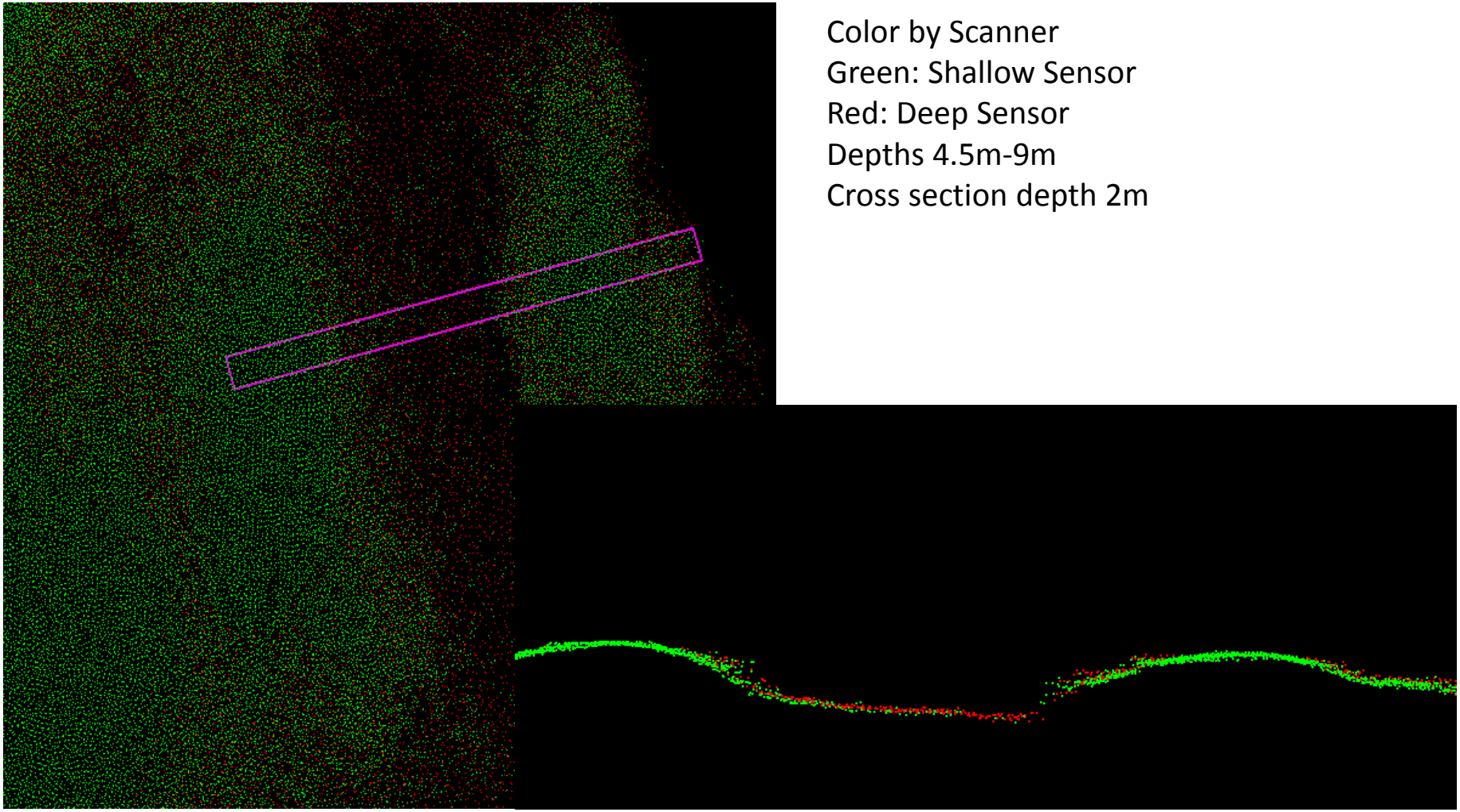
840m

LiDAR 4X 200% coverage



Point Density /m^2
Square size: 5x5m
Color by Scanner
Green: Shallow
Red: Deep
Depths 4.5m-9m

LiDAR 4X 200% coverage



Color by Scanner
Green: Shallow Sensor
Red: Deep Sensor
Depths 4.5m-9m
Cross section depth 2m

MeriTaito

Thank you for your attention!