GEOSURVEY
GEOENGENHARIA, LDA

18th Plenary Meeting of SAIHC

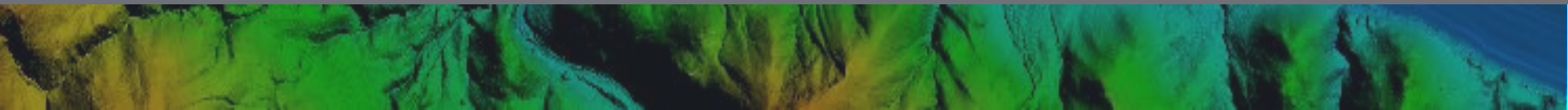
9th - 13th May 2022

GEOMATICS ENGINEERING

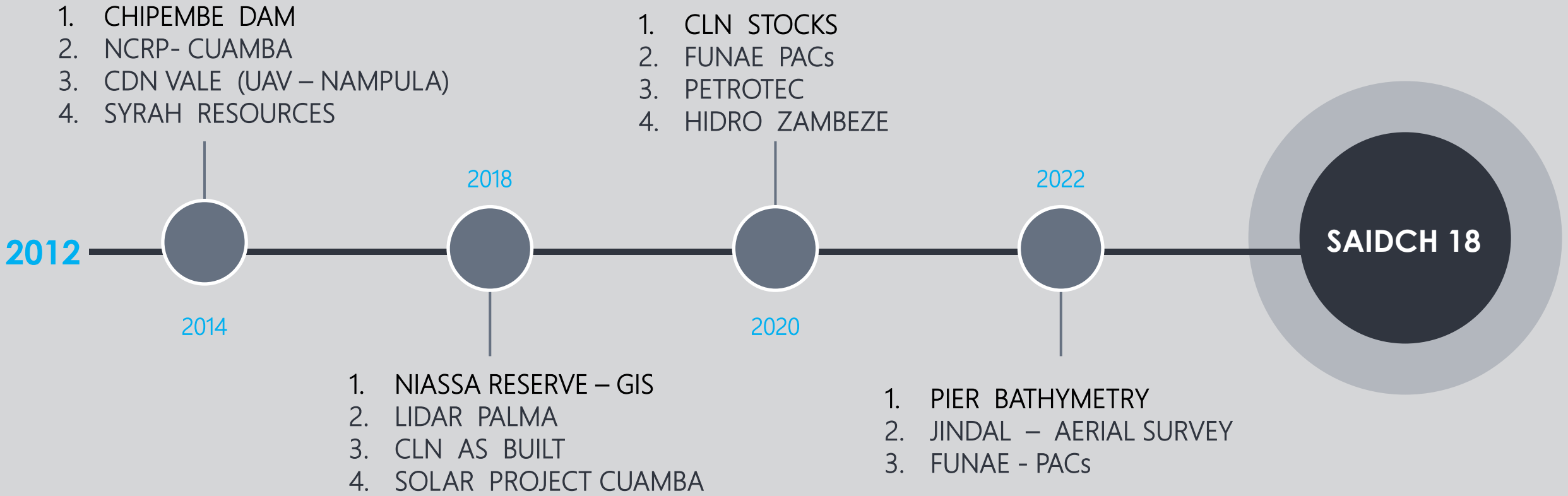
Paulo Martinho

GEOSURVEY – GEOENGENHARIA, LDA is a Geomatic Engineering company with more than 10 years based in Mozambique.

1. **SURVEYING** Land/ Industrial.
2. **HYDROGRAPHY** (Single Beam, Multi-Beam, Side Scan Sonar)
3. **GEODESY**, geodetic networks, high precision levelling lines.
4. **MONITORING** Structures and deformation analysis.
5. **MAPPING AND GIS**, Thematic mapping and GIS implementation.
6. **REMOTE SENSE**, Lidar and Photogrametry using UAVs.
7. **CONSULTING**, Project design and planning, Data Models Design and Implement.



COMPANY TIMELINE
(RELEVANT PRJECTS)



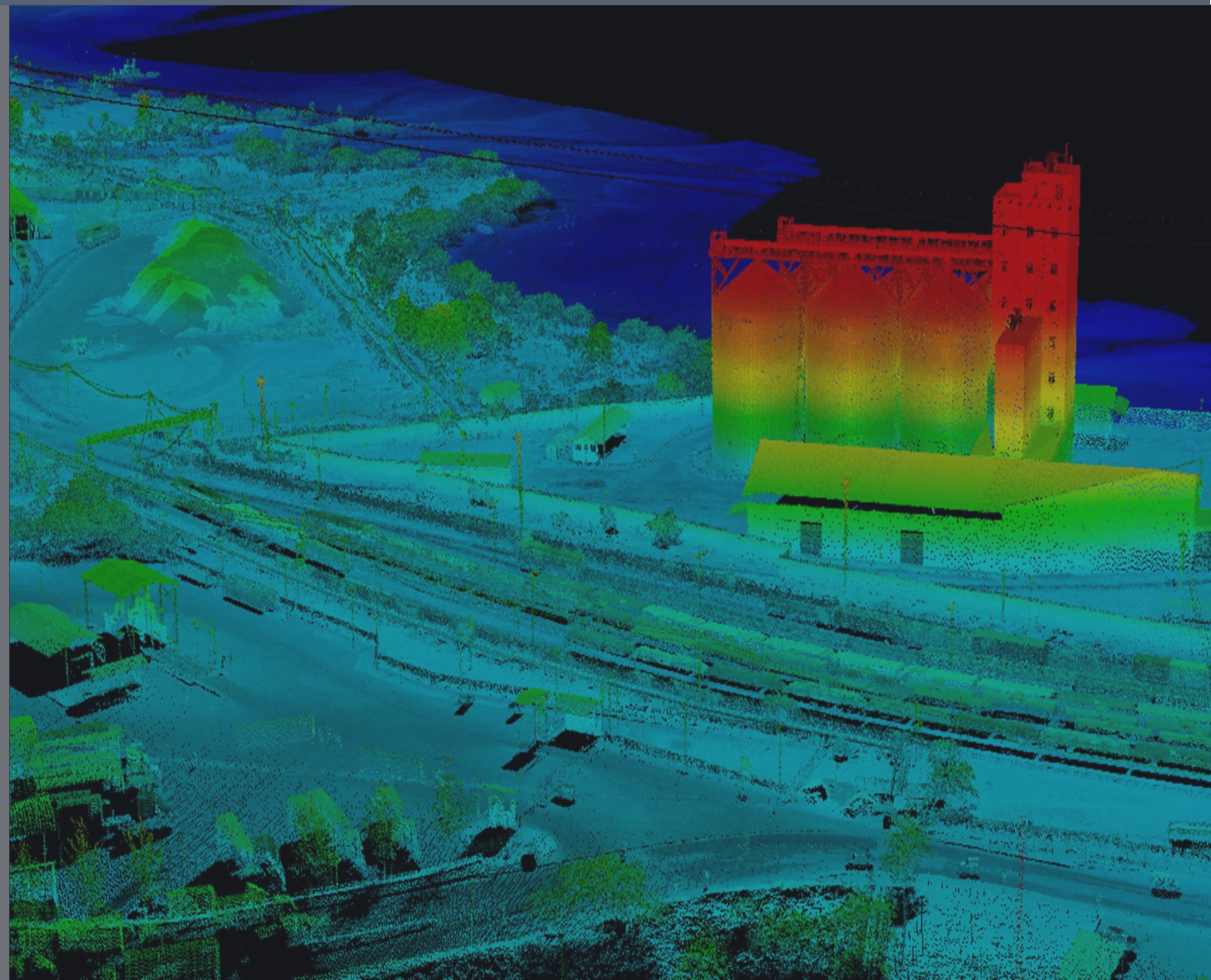
Precision is our Job
Safety our Culture

CONTENTS

01 METHODOLOGY
- Acquisition & Data processing

02 WORKS DONE
- Example of some work done

03 FINAL CONSIDERATIONS
- Doubts & Questions



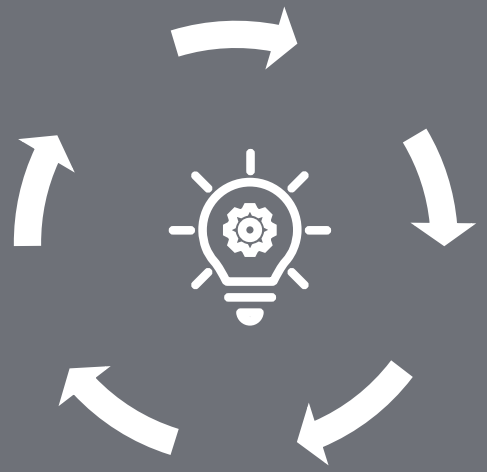
METHODOLOGY

1 SECTION PLANNING

• Surveying Sections • Estimated working time

2 ACQUISITION

• Types and Field operation



3 QUALITY CONTROL & DATA VALIDATION

• RTK Signal • Frequencies Analysis

4 DATA PROCESSING

• Data Filtering • 3D Modelling

5 ANALYSIS & RESULTS

• Volume Calculations • Cartographic Production

1 - WORKS DONE

CHIPEMBE DAM | 2014

DATA ACQUISITION
(Aerial and Bathymetric Survey)

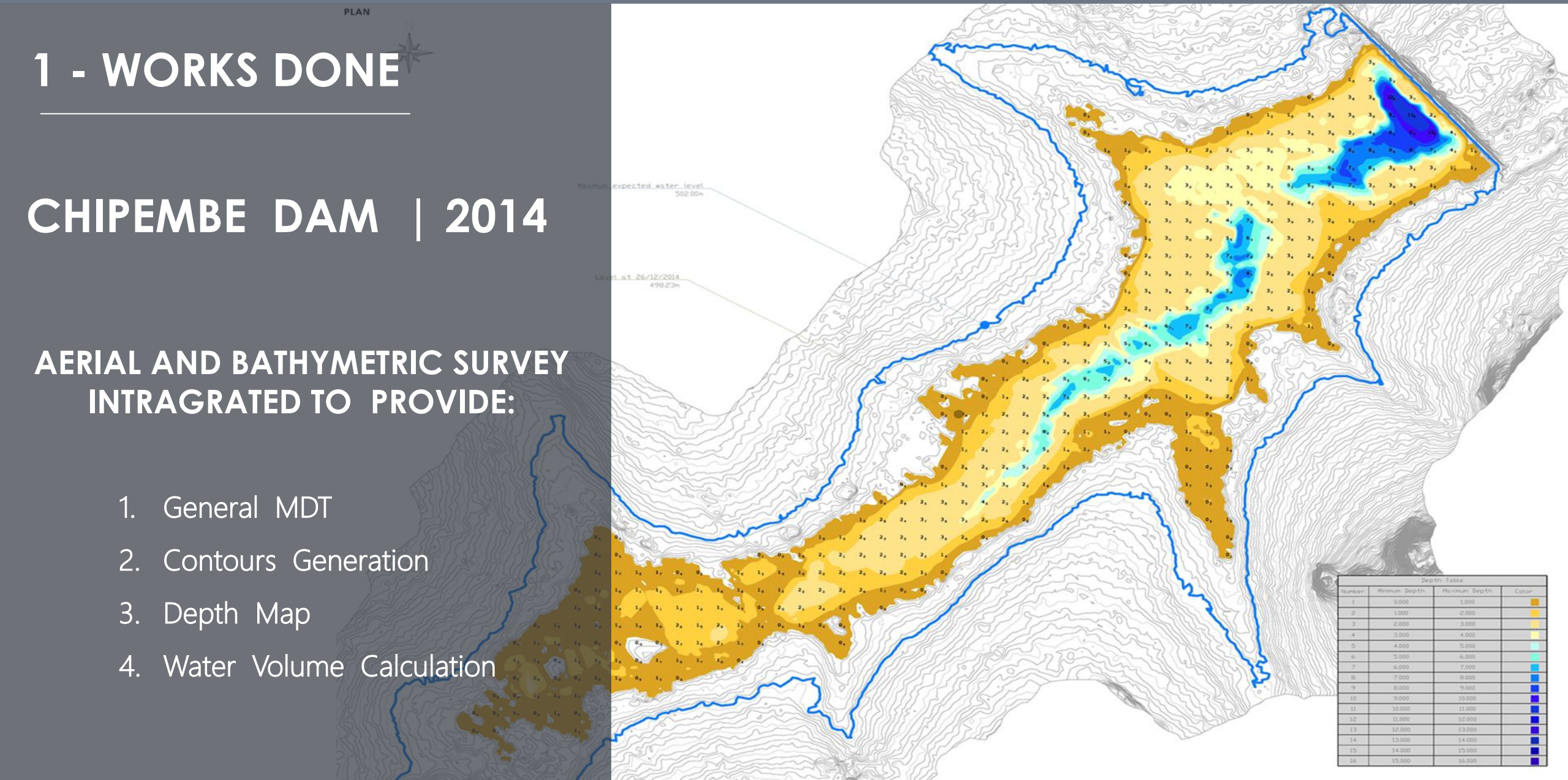
1. Ground Sample Distance (GSD) = 25cm
2. UAV – eBee
3. SBES – Single Beam Echosounder

1 - WORKS DONE

CHIPEMBE DAM | 2014

AERIAL AND BATHYMETRIC SURVEY INTRAGRATED TO PROVIDE:

1. General MDT
2. Contours Generation
3. Depth Map
4. Water Volume Calculation

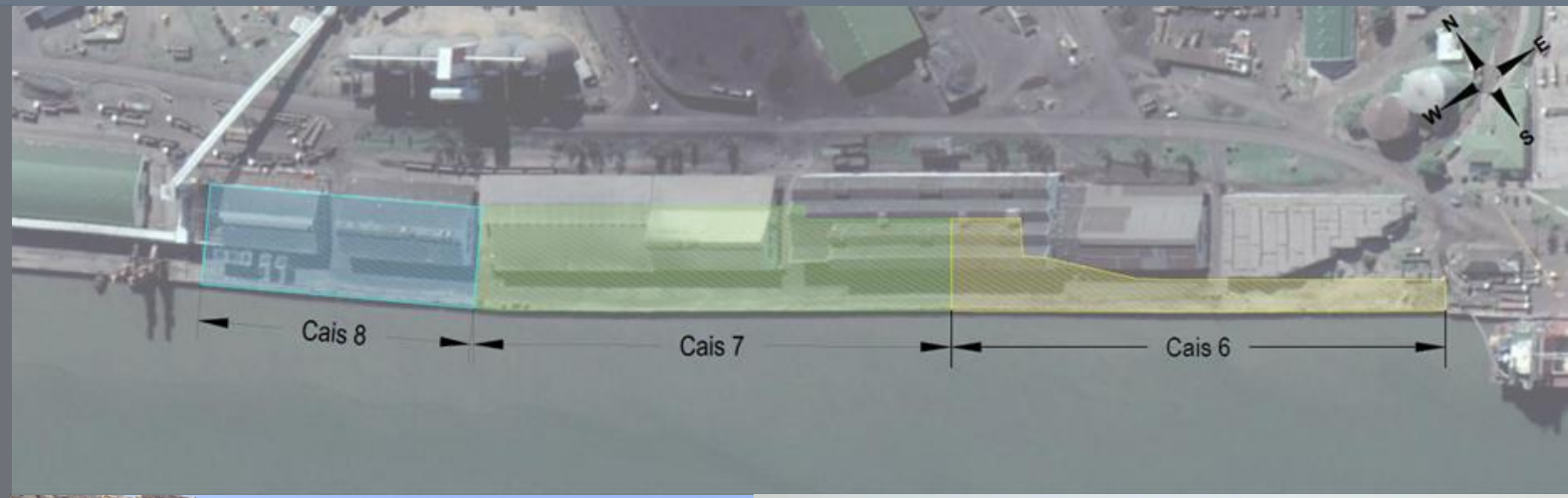


2 - WORKS DONE

MPDC | 2018

DATA ACQUISITION (Mobile Laser Scan)

1. Laser Scan = RIEGL VUX-1UAV
2. Pulse =300KHz
3. Point Density = 106 Lps
4. Speed : 7- 10 km/h
5. Survey Angle: 0 , +15 and - 15

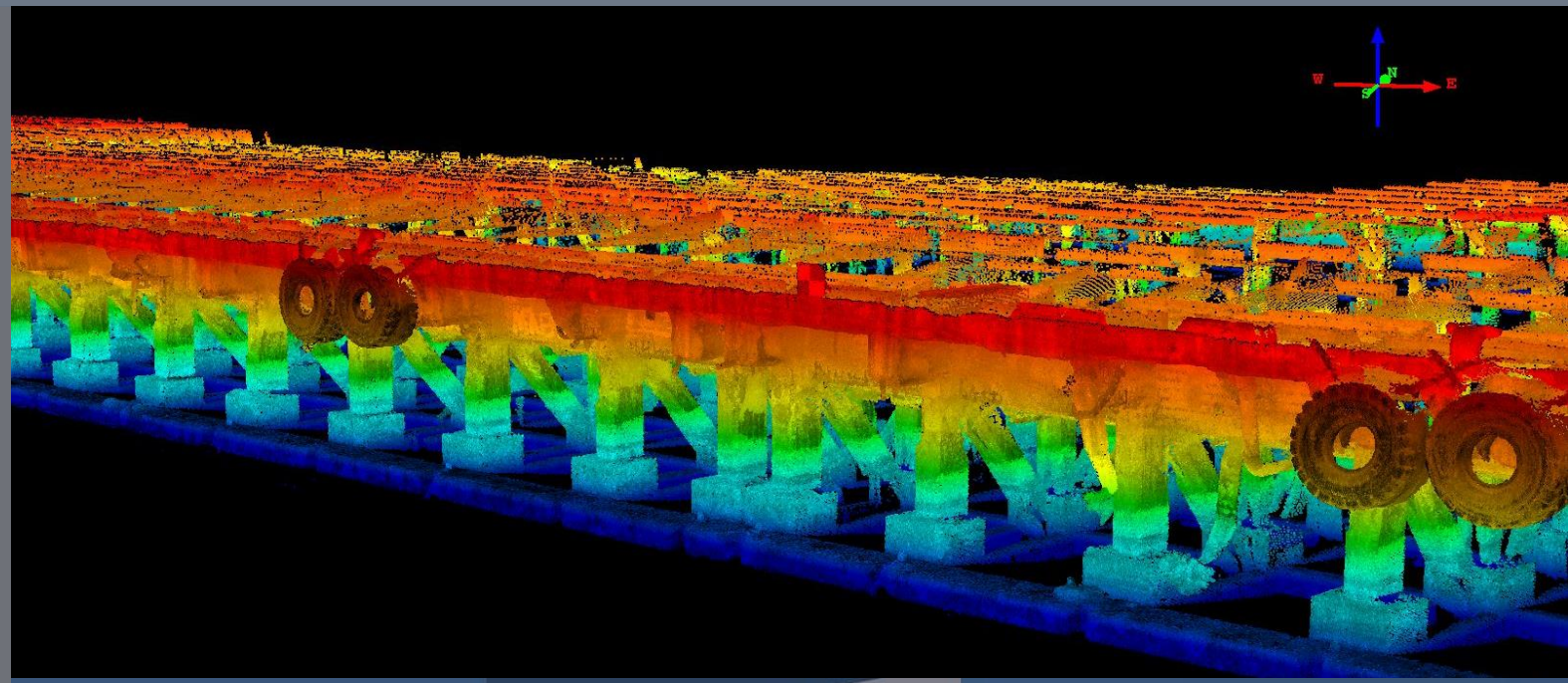


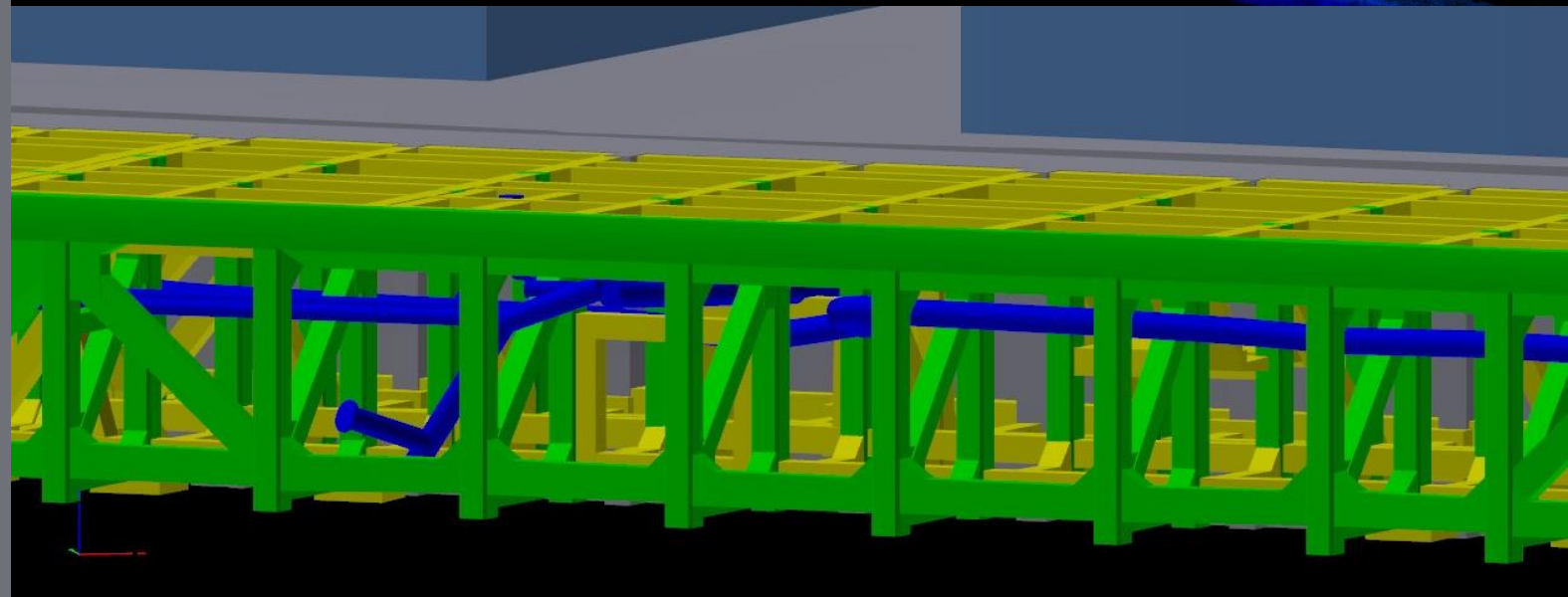
2 - WORKS DONE

MPDC | 2018

BATHYMETRIC AND LIDAR SURVEY INTRAGRATED TO PROVIDE:

1. Point Cloud
2. 3D Model
3. Structures and Deformation Analysis





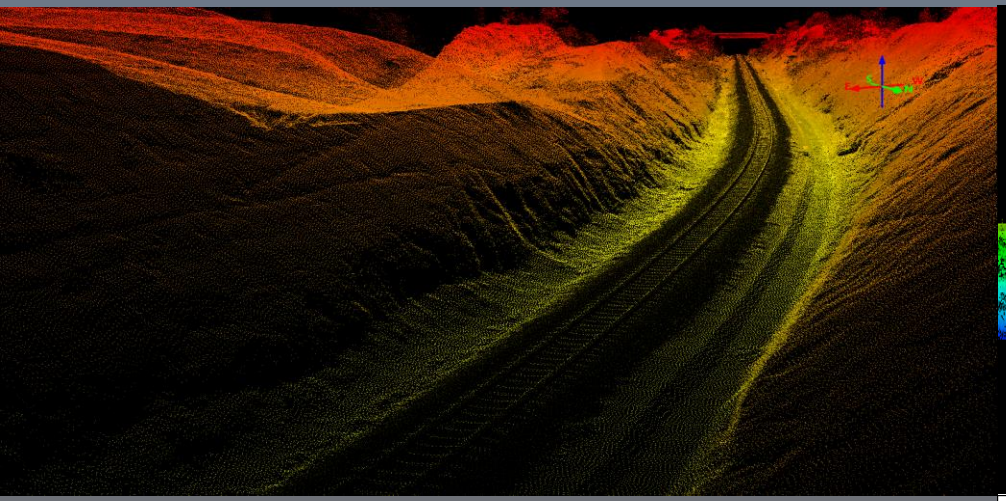
3 - WORKS DONE

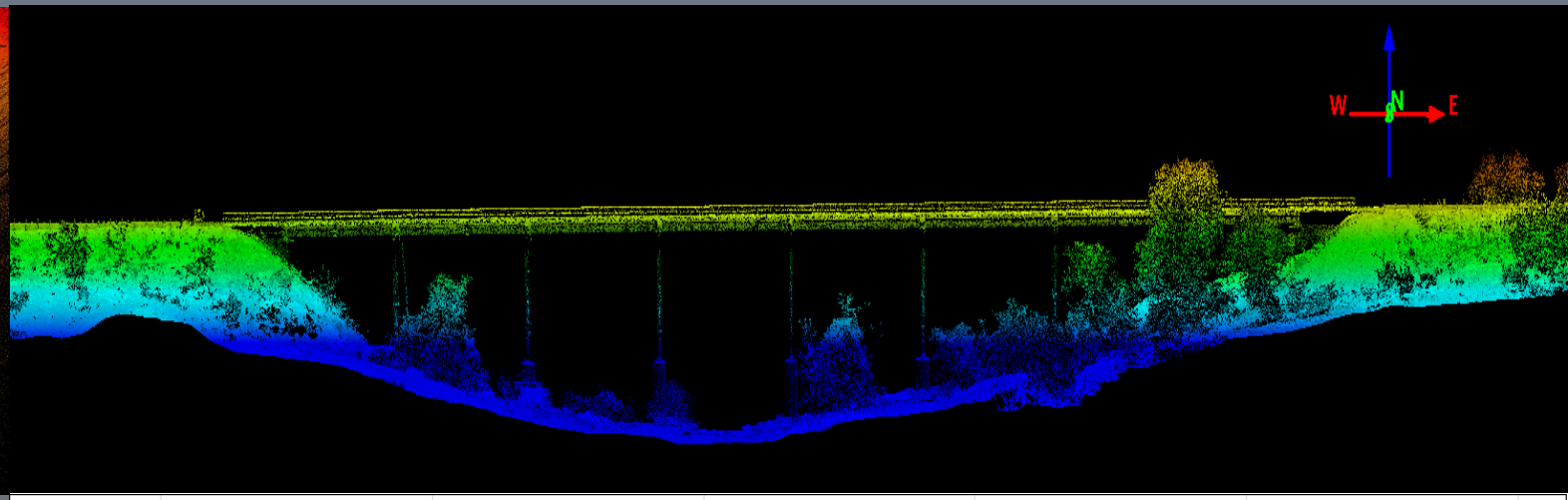
CLN As BUILT | 2018

Aprox. 1000km
(From Nacala to Moatize)

DATA ACQUISITION
(VP1- Mobile Laser Scan)

1. Laser Scan = RIEGL VUX-1UAV
2. Pulse =500KHz
3. Point Density = 200 Lps
4. Speed : 60 km/h
5. WorkDays = 11

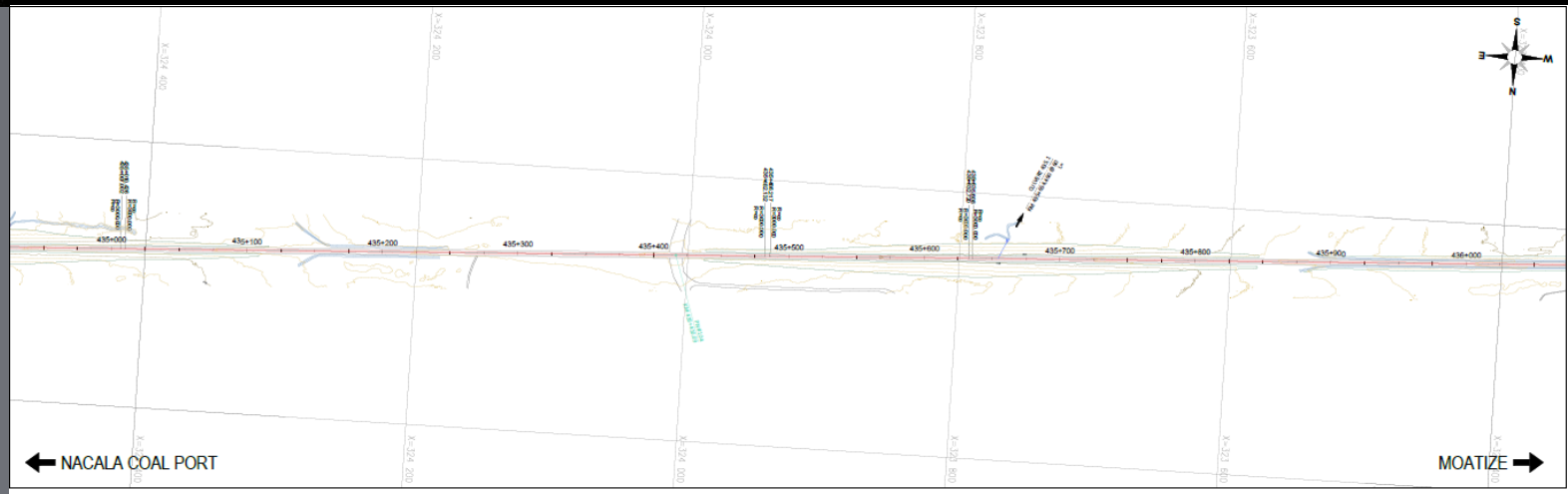


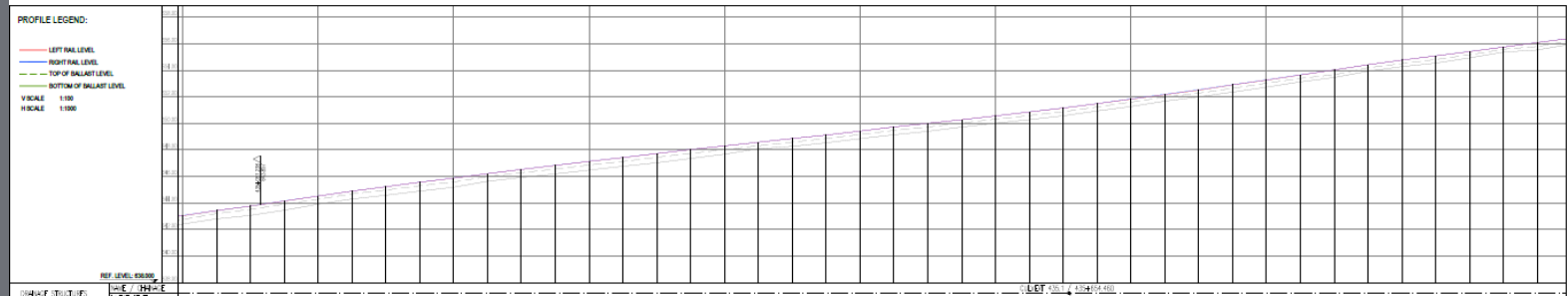


CLN As BUILT | 2018

(VP1 - LIDAR SURVEY)

1. Accuracy < 2.5 cm
2. Point Cloud
3. DTM
4. Longitudinal Profile
5. Cartography





4 - WORKS DONE

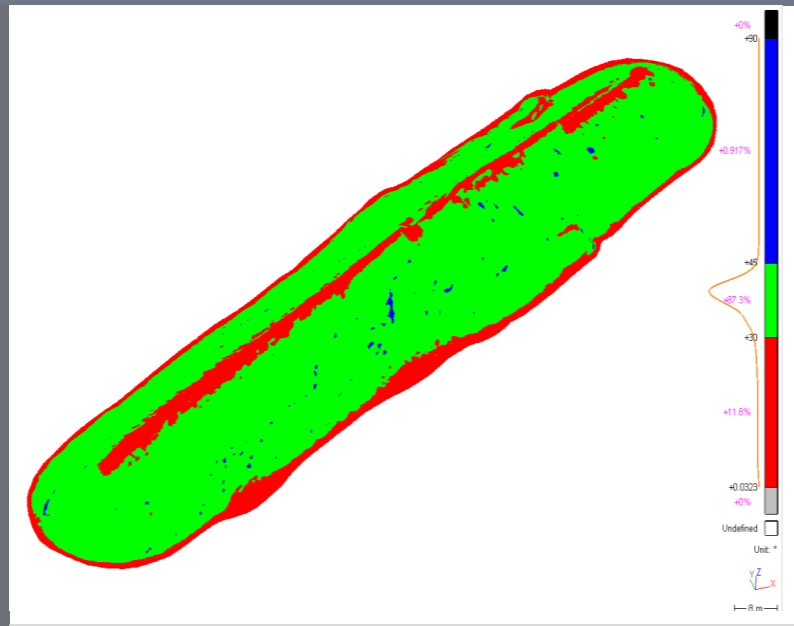
CLN STOCKS | 2020 Week Campaigns

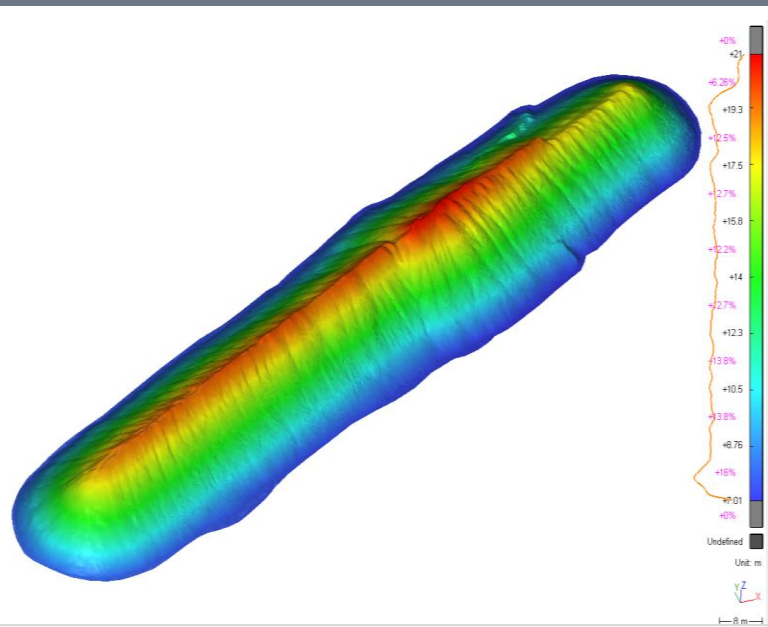
DATA ACQUISITION (AERIAL SURVEY - AIBOT AX20)

1. Flight Height = 150m
2. GSD = 2.4 cm
3. Overlap = 70 / 70
4. 150 Images
5. Duration = 15 min
6. Speed = 7m/s)

4 - WORKS DONE

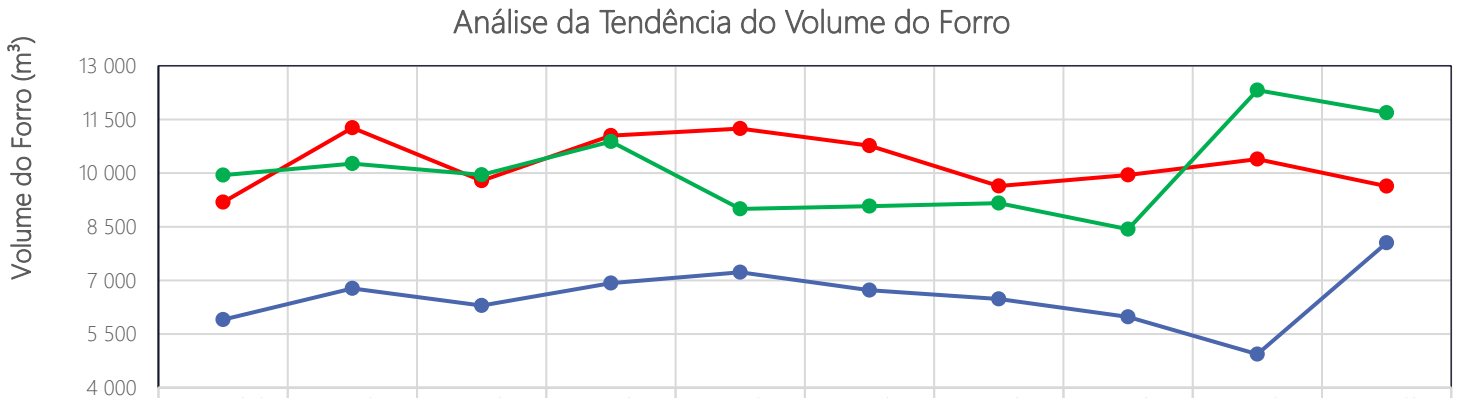
CLN STOCKS | 2020





RESUTLS:

1. Image Processing
2. Point Cloud Generation
3. Volume Calculation
4. Stock Height and Inclination
5. Volume Tendency



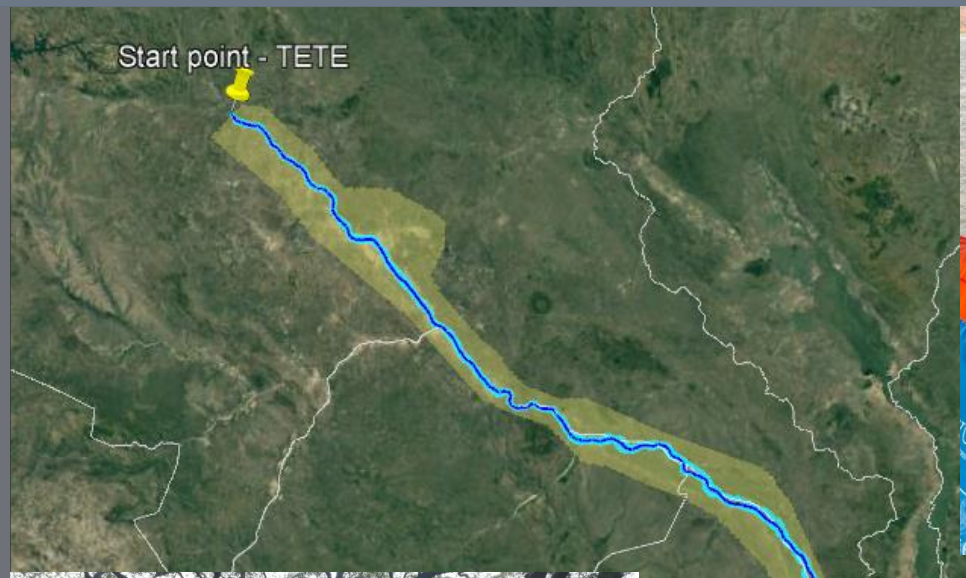
	MED#101	MED#102	MED#103	MED#104	MED#105	MED#106	MED#107	MED#108	MED#109	MED#110
PÁTIO A	5 903	6 775	6 296	6 921	7 228	6 727	6 481	5 979	4 936	8 052
PÁTIO B	9 187	11 268	9 785	11 048	11 247	10 769	9 641	9 947	10 392	9 633
PÁTIO C	9 945	10 265	9 954	10 881	8 999	9 074	9 161	8 433	12 320	11 690
TOTAL	25 035	28 308	26 035	28 850	27 474	26 570	25 283	24 359	27 648	29 375

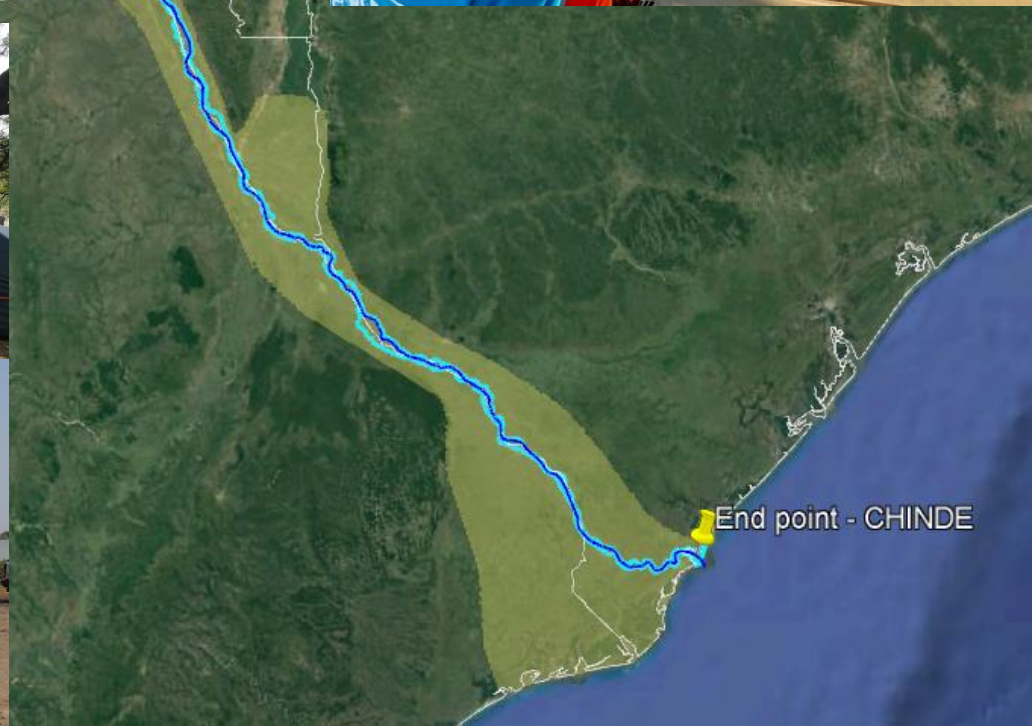
5 - WORKS DONE

ZAMBEZE RIVER | 2020

DATA ACQUISITION (Bathymetric Survey: 580 km From Tete to Chinde)

1. SBES – KONGSBERG EA440
2. Speed : 4 – 5 knt
3. ADCP - Current Measurements
4. Ground Control Points = 36





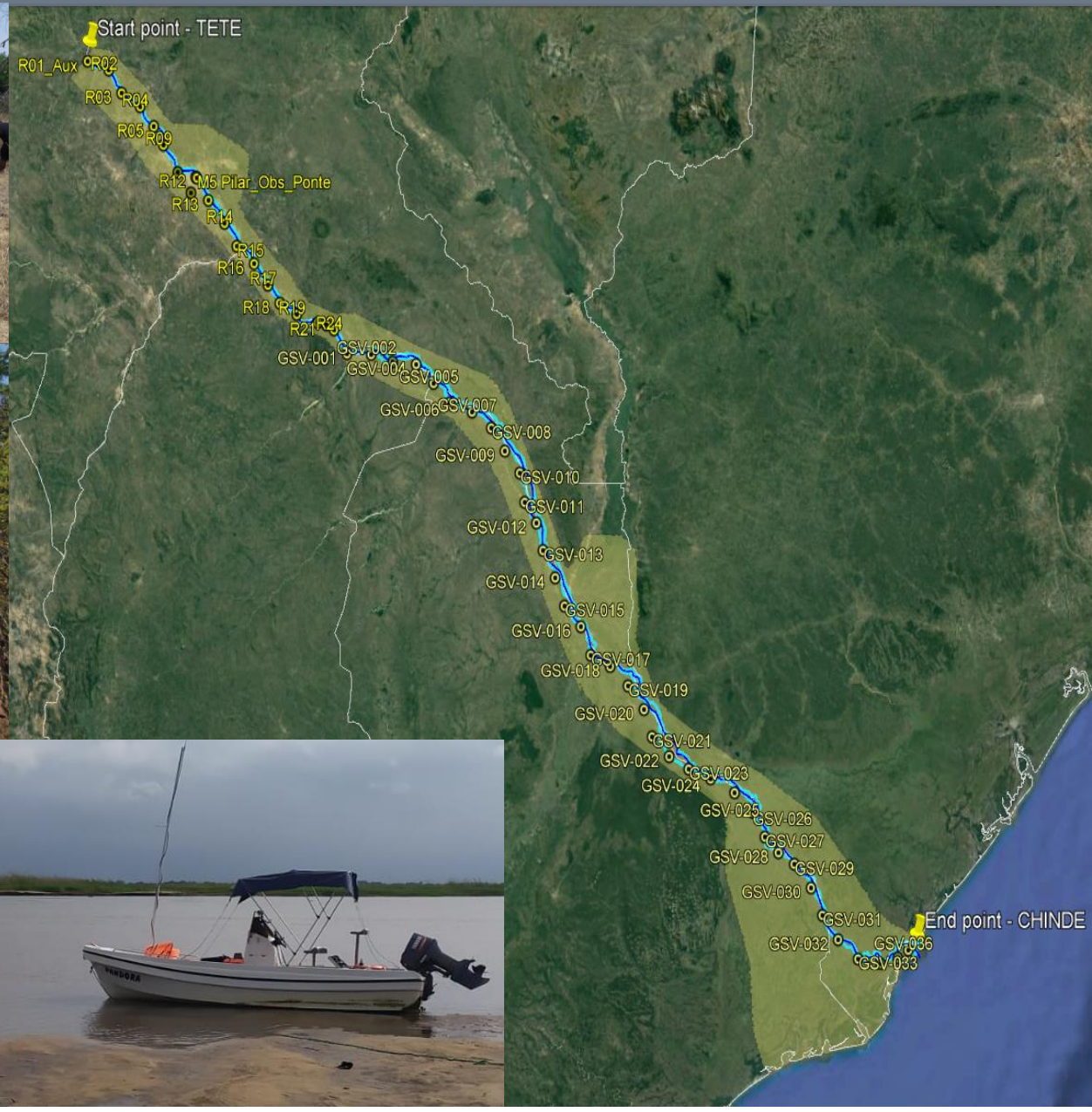
5 - WORKS DONE

ZAMBEZE RIVER | 2020

DATA ACCURACY

(Bathymetric Survey: 580 km From Tete to Chinde)

1. Horizontal < 5 cm
2. Vertical < 5 cm
3. Ground Control Points = 36
4. Leica GNSS RTK
5. External Radio (> 40km Range)

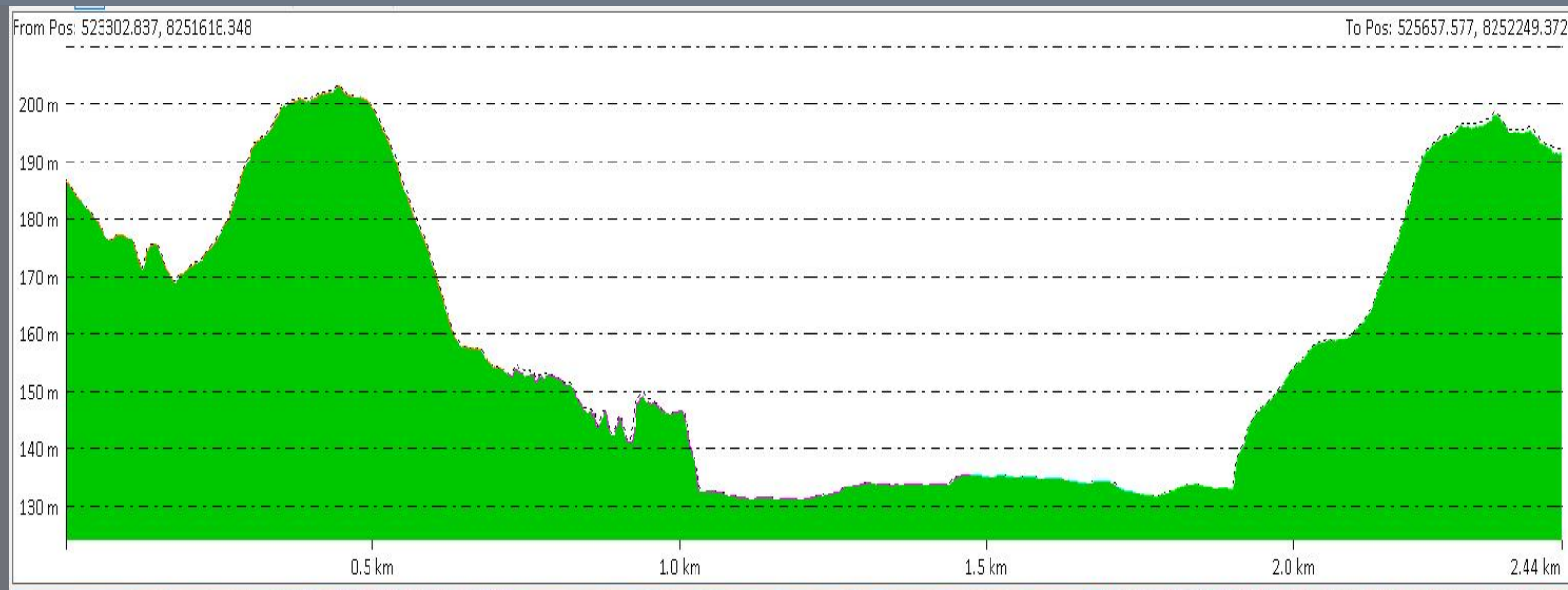


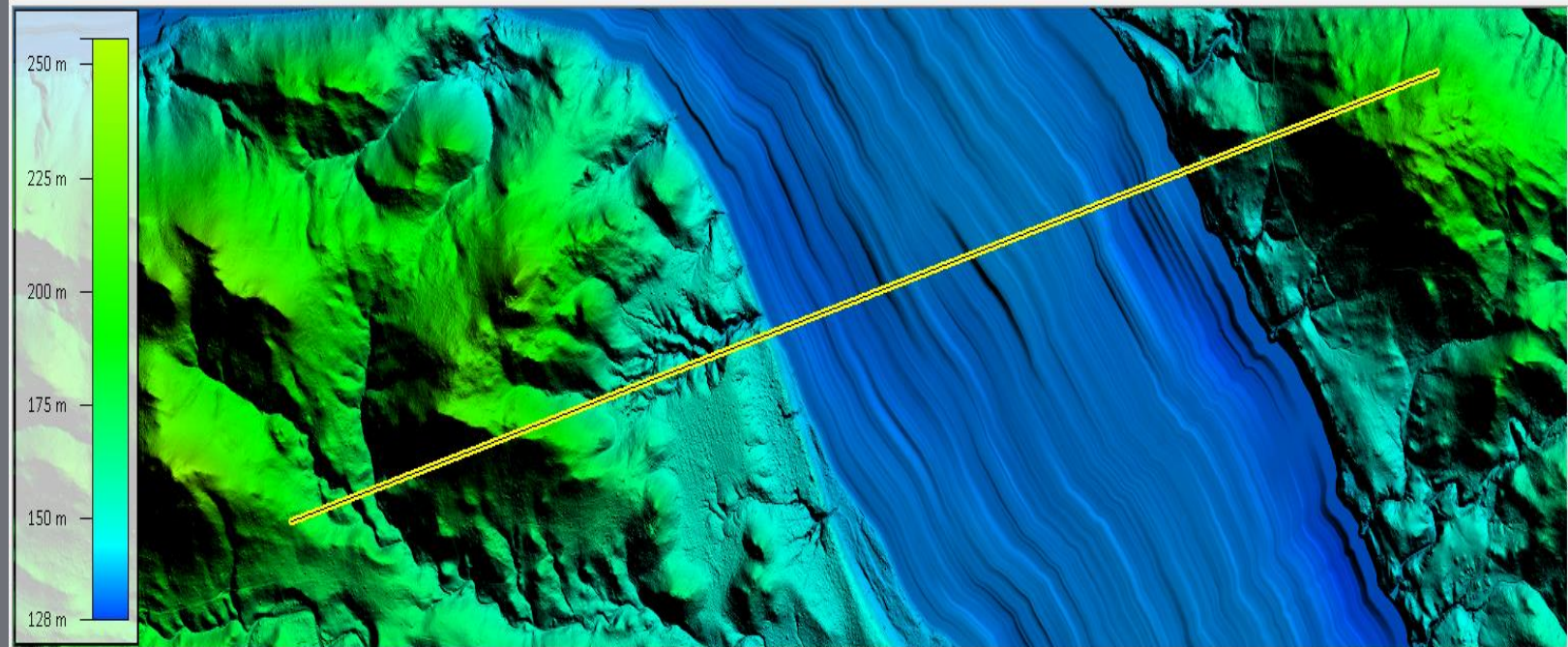
5 - WORKS DONE

ZAMBEZE RIVER | 2020

BATHYMETRIC AND LIDAR SURVEY INTRAGRATED TO PROVIDE:

1. Digital Terrain Model (DTM)
2. Digital Elevation Model (DEM)
3. Depth Map
4. Cross Sections





6 - WORKS DONE

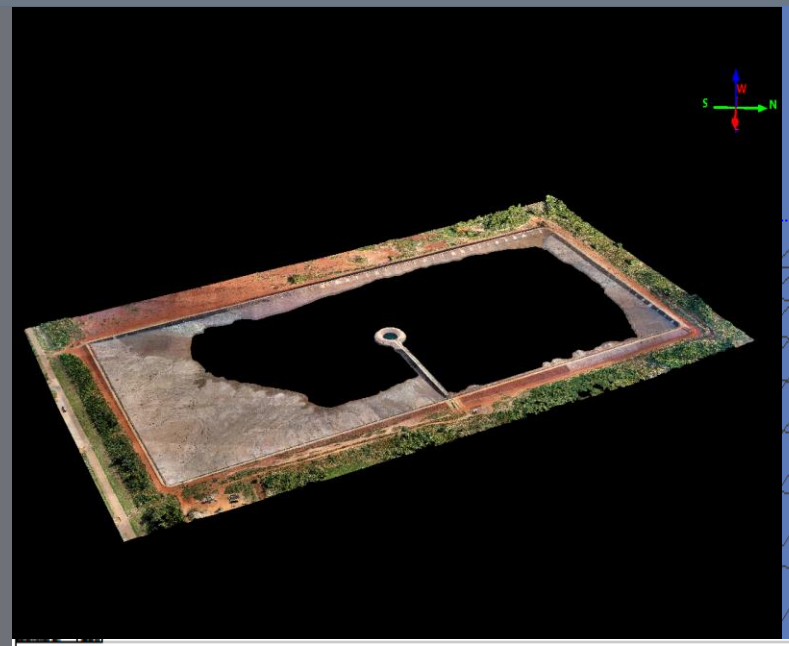
TSF BALAMA | 2021

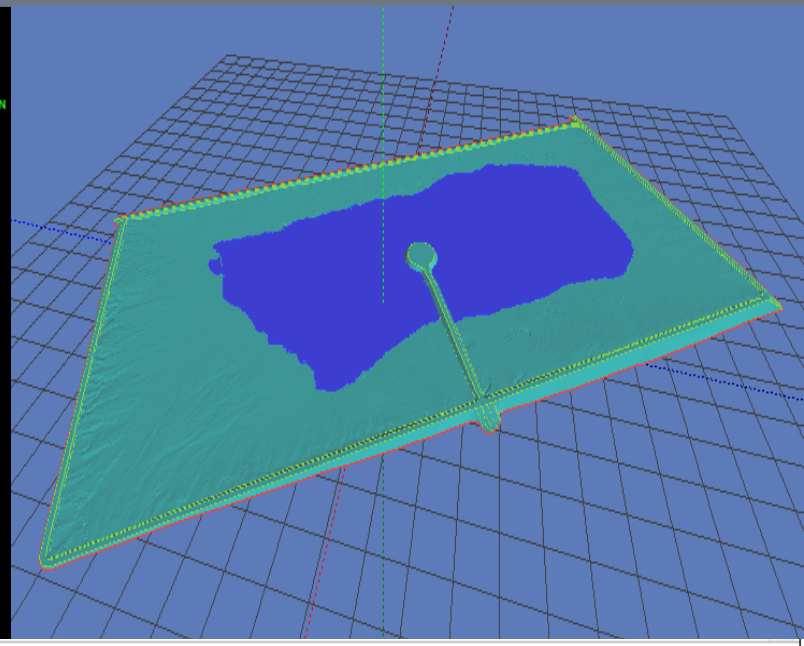
DATA ACQUISITION (BATHYMETRIC & AERIAL SURVEY)

1. SBES – Single Beam Echosounder
2. Speed : 4 – 5 knt
3. UAV Flight Height = 150m
4. GSD = 2.4 cm
5. Overlap = 70 / 70

6 - WORKS DONE

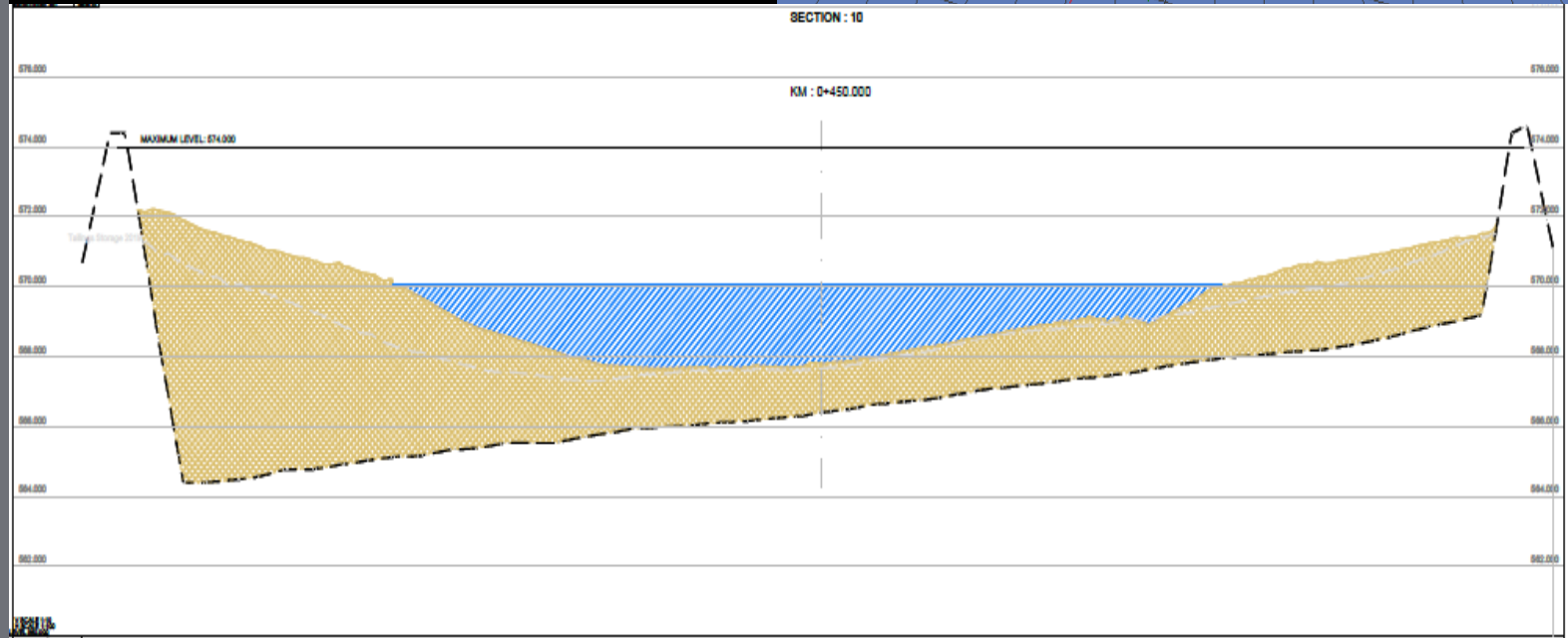
TSF BALAMA | 2021





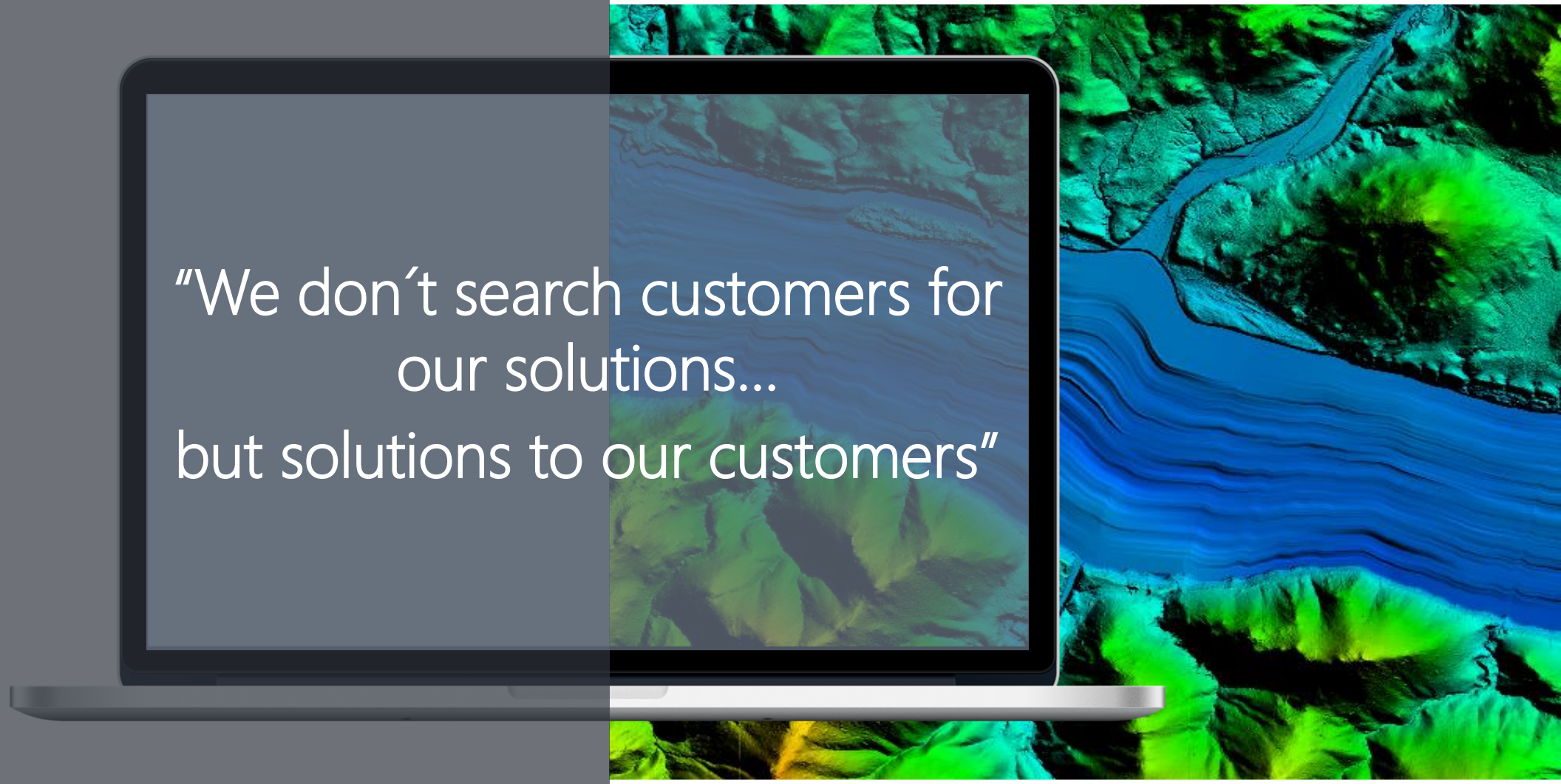
BATHYMETRIC AND AERIAL SURVEY INTRAGRATED TO PROVIDE:

1. Tailing Storage Volume
2. Water Column
3. Dam Maximum Capacity
4. Digital Elevation Model (DEM)
5. Cross Section



GEOSURVEY
GEOENGENHARIA, LDA

18th Plenary meeting of SAIHC



THANKS.