

# OUR BIM JOURNEY



INTERNATIONAL

EOIN O'BRIEN

HEAD OF CIVIL & ENVIRONMENTAL ENGINEERING

# BIM OUR LEARNING & AMBITION



INTERNATIONAL



Energy for  
generations

Owned by ESB



650  
staff

OVER **42**  
YEARS

We have served the international  
power sector since 1975



**120** Countries

Successfully completed  
projects in over 120 countries  
around the world

**EXPERTS**

Proven experts  
in the power  
industry



**36**  
Nationalities



**2016** 100+ papers  
presented across  
the world



PRII award for  
excellence  
for brand - 1<sup>st</sup> place  
Dublin Castle



# WHAT WE DELIVER



INTERNATIONAL



**Power Generation**



**Centre of Engineering**



**Transmission & Distribution**



**Utility to Utility**



**Strategic Advisory**



**Innovation Services**

# WHAT WE DELIVER



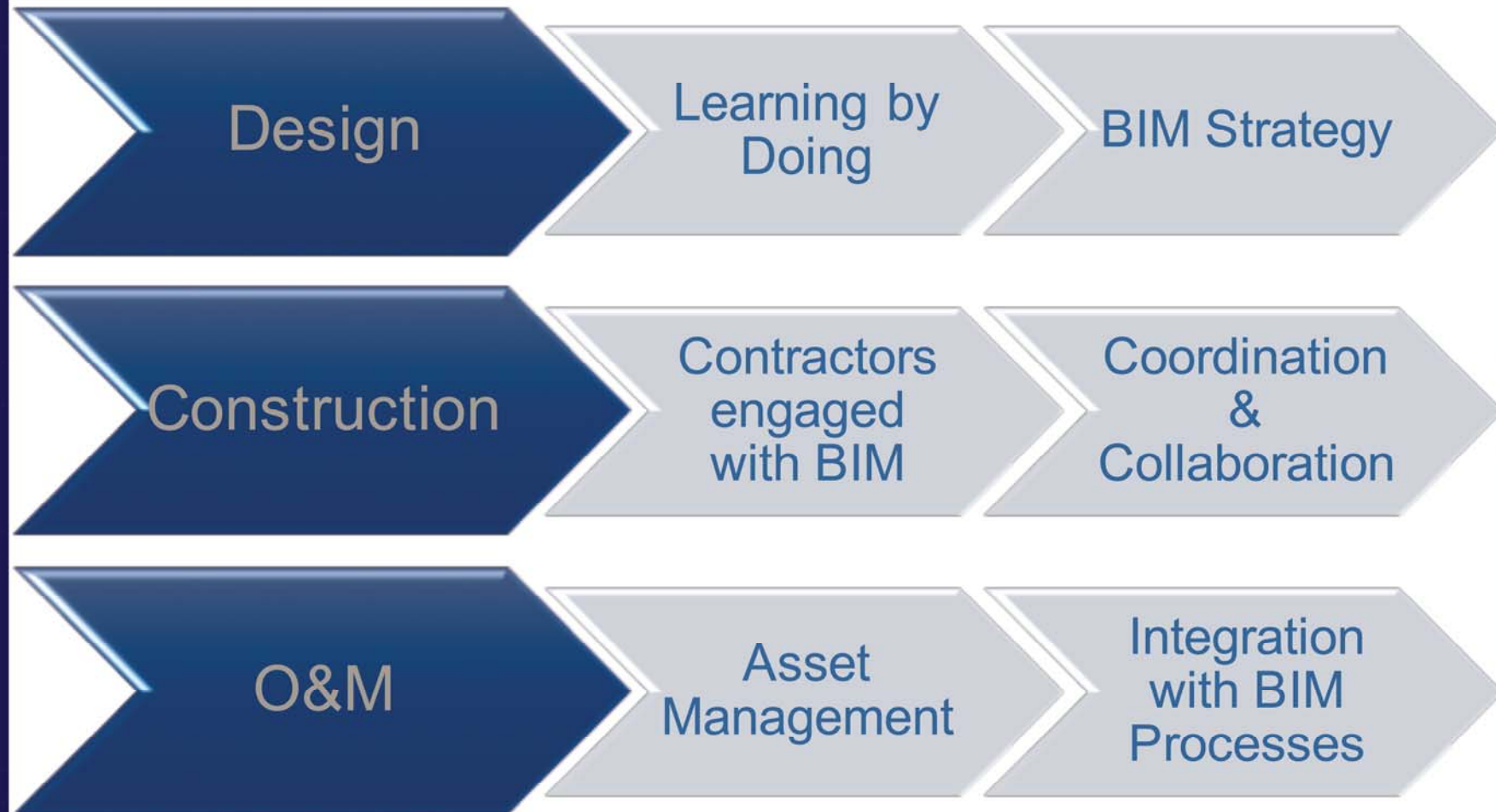
INTERNATIONAL



# BIM JOURNEY TO DATE



INTERNATIONAL



# BIM OUR LEARNING & AMBITION



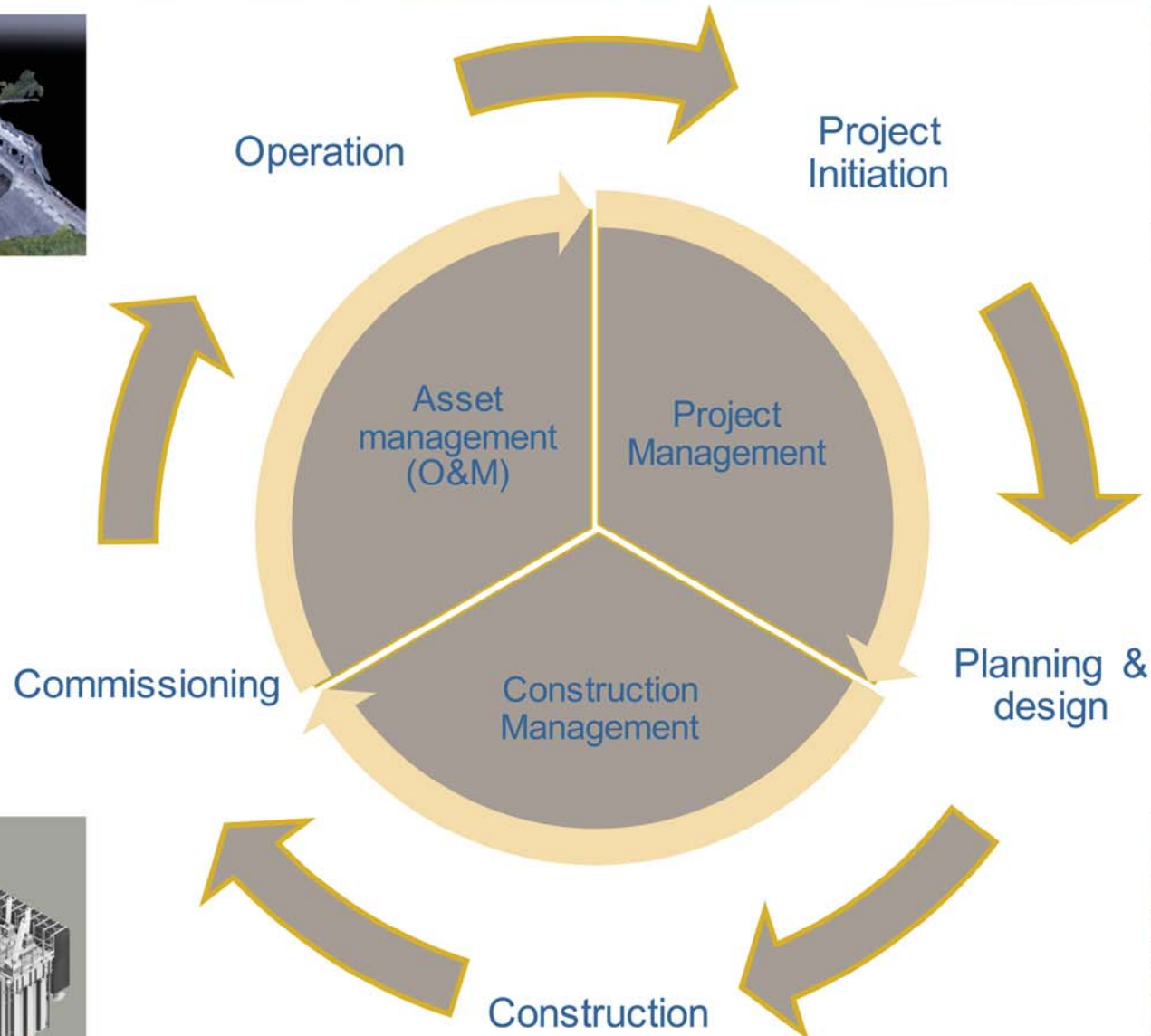
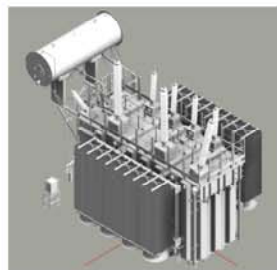
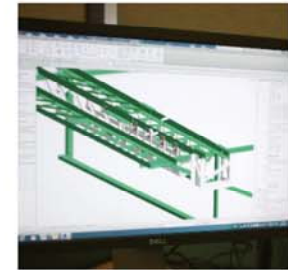
INTERNATIONAL



# PROJECT LIFE CYCLE



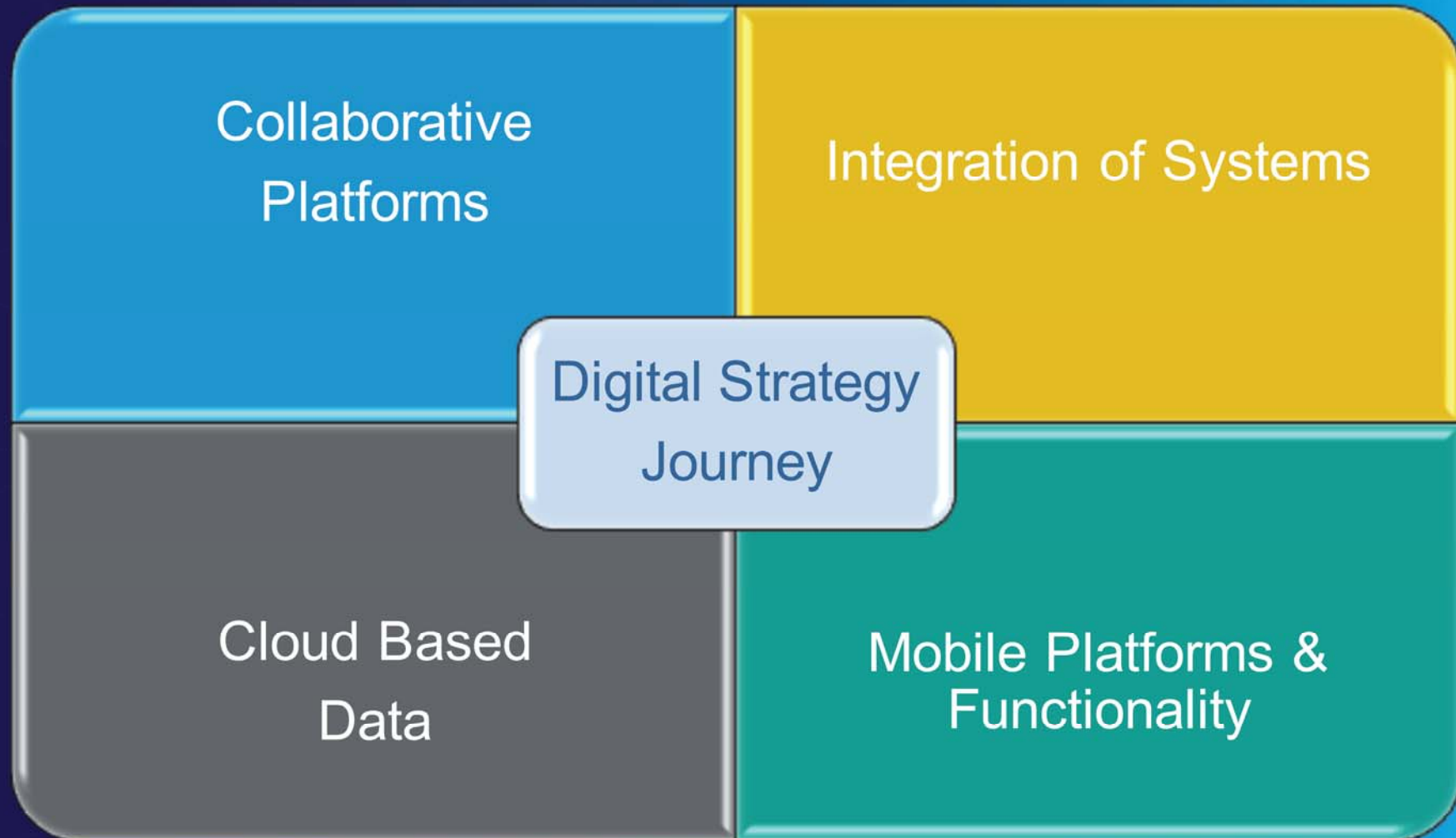
INTERNATIONAL



# BIM: A KEY COMPONENT PART OF THE ESB INTERNATIONAL DIGITAL STRATEGY JOURNEY



INTERNATIONAL

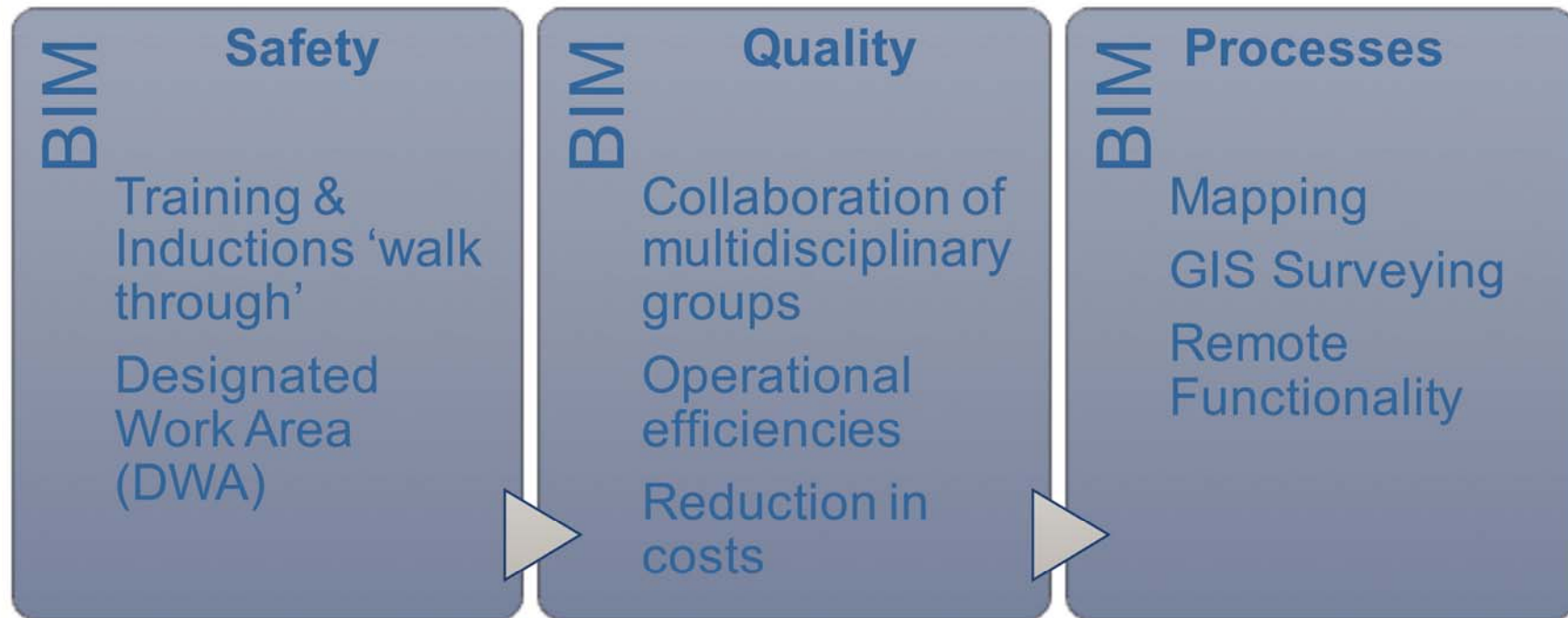


# OVERVIEW

## LEVERAGING THE VALUE



INTERNATIONAL



**Leverage the Value One Layer at a Time**

# APPLICATION OF BIM IN ELECTRICAL INFRASTRUCTURE



INTERNATIONAL

JOHN BYRNE  
ESB INTERNATIONAL

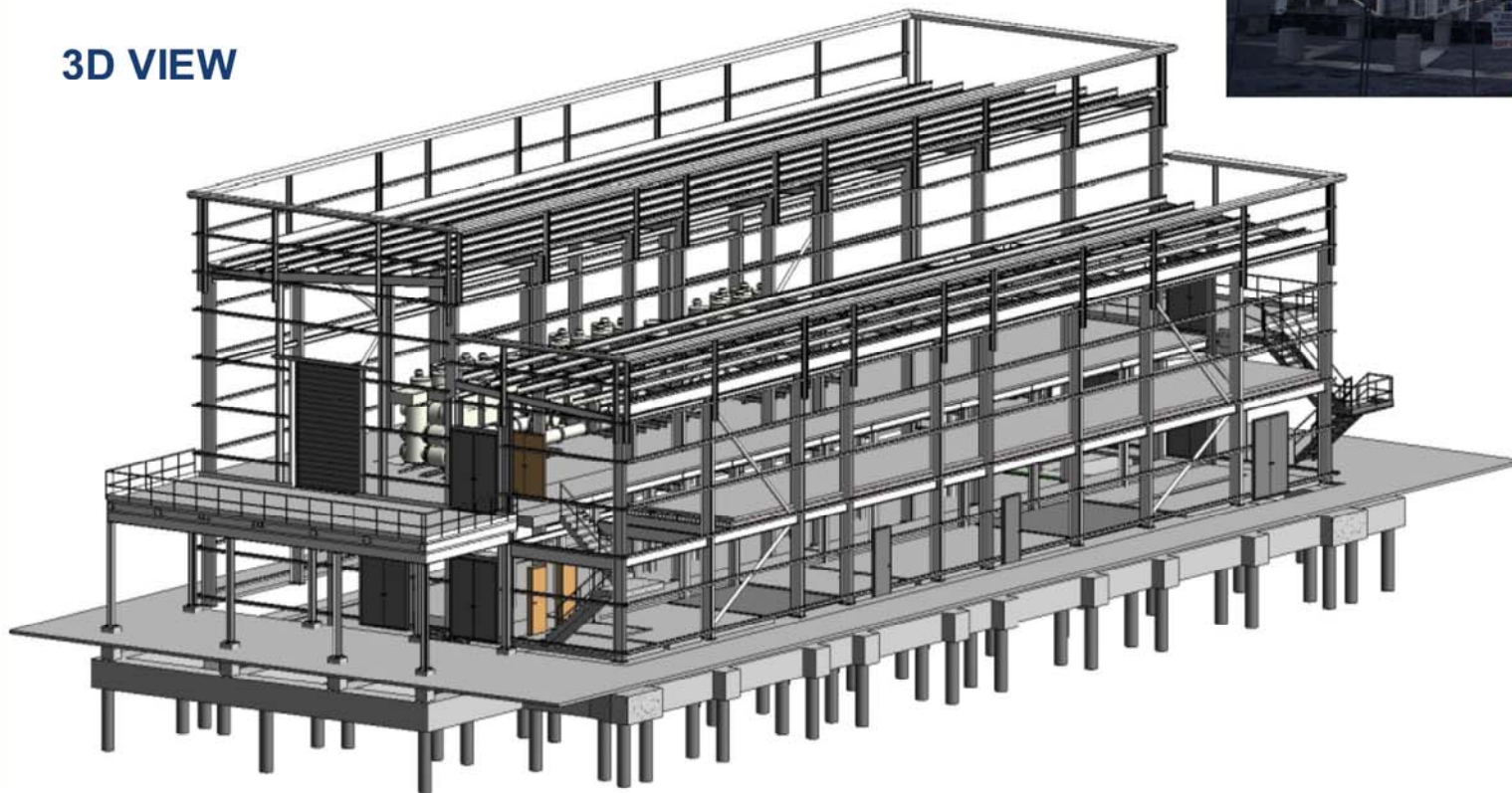
# ARDNACRUSHA

## 110 KV



INTERNATIONAL

3D VIEW

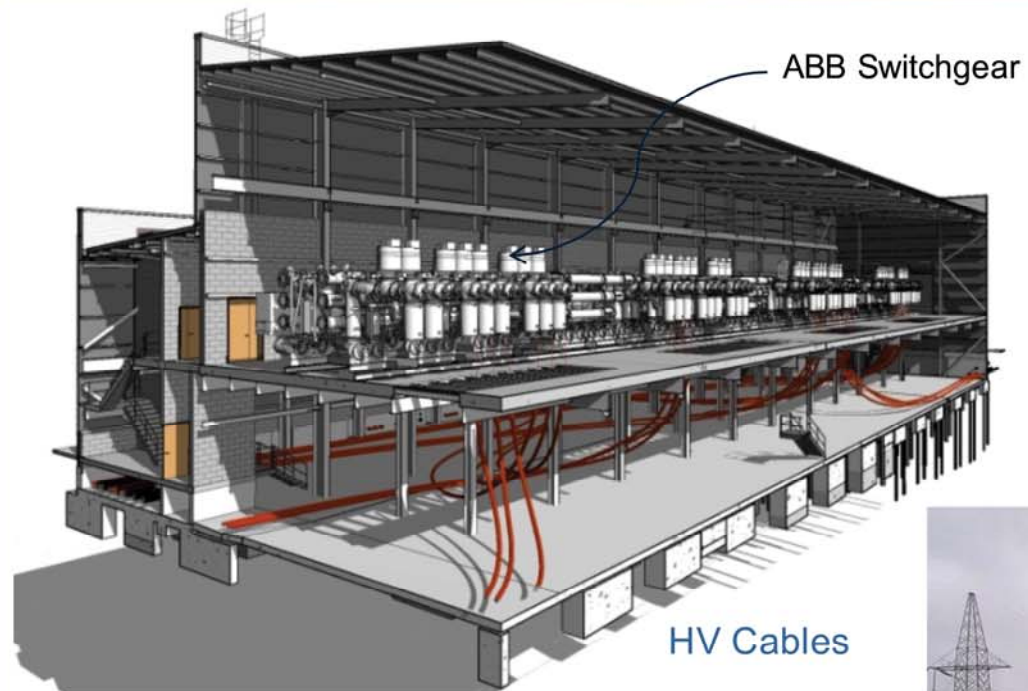


# MONEYPPOINT

## 400 KV GIS SUBSTATION



INTERNATIONAL



3D Cut View

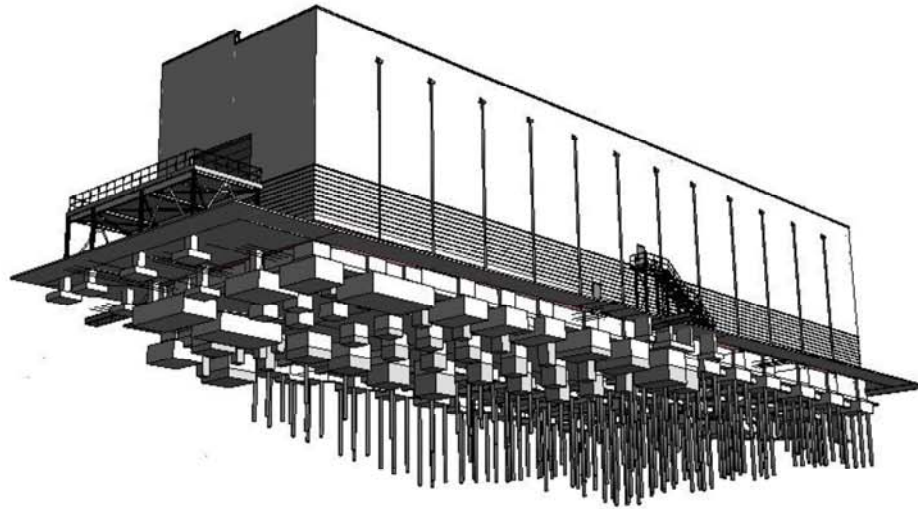


# MONEYPPOINT

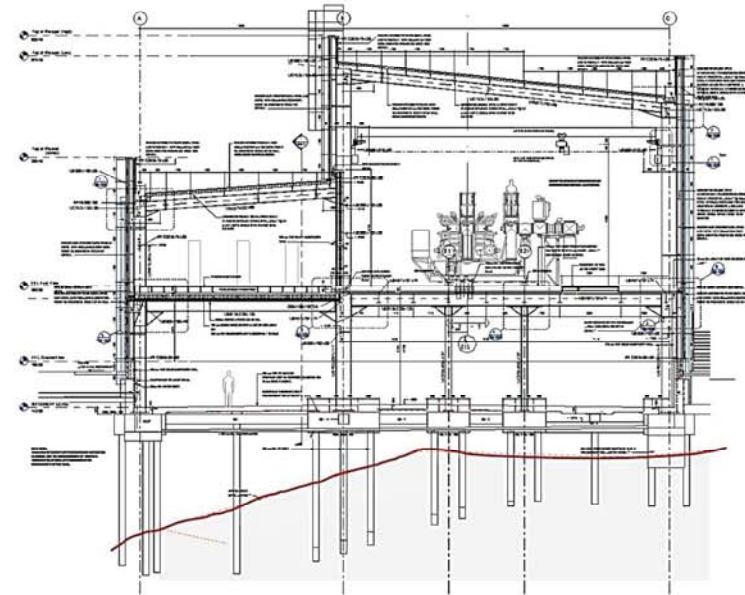
## 400 KV GIS SUBSTATION



INTERNATIONAL

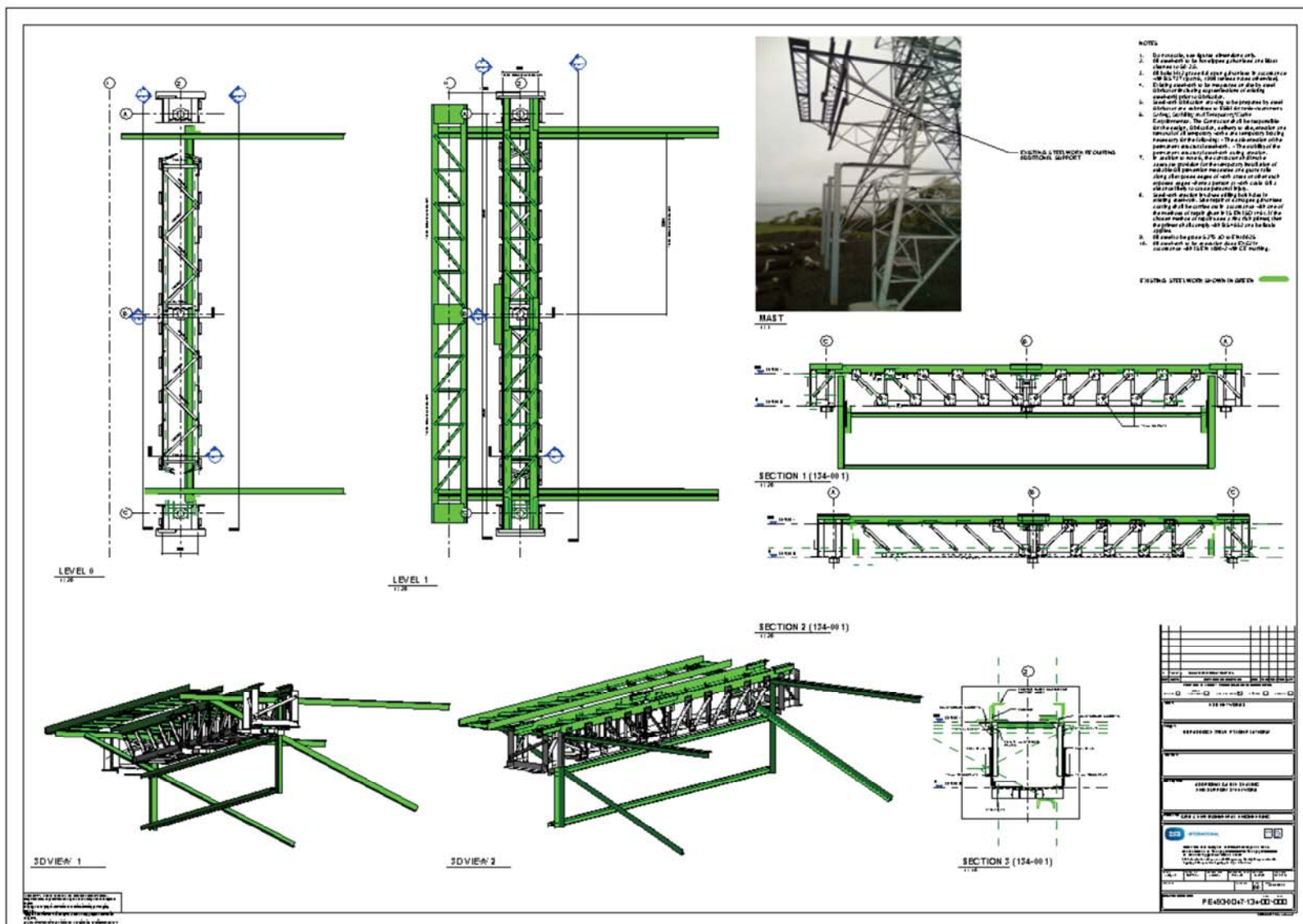


3D View



Typical Section

## INTERNATIONAL





The screenshot displays the Bentley OpenRoads Designer software interface, showing a 2D floor plan and a 3D view of a water main project.

**Top Toolbar:** Includes standard CAD tools (File, Edit, View, Measure, Create, Modify) and specific OpenRoads tools (Fabrication, Edit, Offset Connections, Pipe Insulation).

**Left Panel (Properties):** Shows the properties of the selected pipe (Diameter: 300.0 mm). The "Pipe Types" section indicates "Proposed Water Main". The "Constraints" section shows "Horizontal Justification: Center", "Vertical Justification: Top", "Reference Level: Level 1", "Offset: 1450.0", "Start Offset: 1450.0", "End Offset: 1400.0", and "Slope: 0.1962%". The "Dimensions" section shows "Outside Diameter: 323.9 mm", "Inside Diameter: 289.0 mm", "Size: 300 mm", and "Length: 25480.0". The "Mechanical" section shows "System Classification: Other", "System Type: Other", "System Abbreviation: Other 94", "Pipe Segment: Plastic - Schedule 80", "Diameter: 300.0 mm", "Connection Type: Generic", and "Roughness: 0.774 mm".

**Project Browser:** Lists the project structure, including "02\_Elevations", "03\_Sections", "04\_3D", and "2\_ARCHITECTURAL".

**Main View (Floor Plan):** Displays a 2D floor plan view of the water main project. The plan shows a network of pipes (blue, green, yellow, red) and structures (grey blocks) overlaid on a topographic map. The pipes are labeled with their diameters (e.g., 300 mm, 360 mm, 480 mm, 600 mm, 720 mm, 900 mm, 1080 mm, 1200 mm, 1440 mm, 1800 mm, 2100 mm, 2400 mm, 2700 mm, 3000 mm, 3600 mm, 4200 mm, 4800 mm, 5400 mm, 6000 mm, 6600 mm, 7200 mm, 7800 mm, 8400 mm, 9000 mm, 9600 mm, 10200 mm, 10800 mm, 11400 mm, 12000 mm, 12600 mm, 13200 mm, 13800 mm, 14400 mm, 15000 mm, 15600 mm, 16200 mm, 16800 mm, 17400 mm, 18000 mm, 18600 mm, 19200 mm, 19800 mm, 20400 mm, 21000 mm, 21600 mm, 22200 mm, 22800 mm, 23400 mm, 24000 mm, 24600 mm, 25200 mm, 25800 mm, 26400 mm, 27000 mm, 27600 mm, 28200 mm, 28800 mm, 29400 mm, 30000 mm). The structures are labeled with their names (e.g., "STRUCTURE 1", "STRUCTURE 2", "STRUCTURE 3", "STRUCTURE 4", "STRUCTURE 5", "STRUCTURE 6", "STRUCTURE 7", "STRUCTURE 8", "STRUCTURE 9", "STRUCTURE 10", "STRUCTURE 11", "STRUCTURE 12", "STRUCTURE 13", "STRUCTURE 14", "STRUCTURE 15", "STRUCTURE 16", "STRUCTURE 17", "STRUCTURE 18", "STRUCTURE 19", "STRUCTURE 20", "STRUCTURE 21", "STRUCTURE 22", "STRUCTURE 23", "STRUCTURE 24", "STRUCTURE 25", "STRUCTURE 26", "STRUCTURE 27", "STRUCTURE 28", "STRUCTURE 29", "STRUCTURE 30", "STRUCTURE 31", "STRUCTURE 32", "STRUCTURE 33", "STRUCTURE 34", "STRUCTURE 35", "STRUCTURE 36", "STRUCTURE 37", "STRUCTURE 38", "STRUCTURE 39", "STRUCTURE 40", "STRUCTURE 41", "STRUCTURE 42", "STRUCTURE 43", "STRUCTURE 44", "STRUCTURE 45", "STRUCTURE 46", "STRUCTURE 47", "STRUCTURE 48", "STRUCTURE 49", "STRUCTURE 50", "STRUCTURE 51", "STRUCTURE 52", "STRUCTURE 53", "STRUCTURE 54", "STRUCTURE 55", "STRUCTURE 56", "STRUCTURE 57", "STRUCTURE 58", "STRUCTURE 59", "STRUCTURE 60", "STRUCTURE 61", "STRUCTURE 62", "STRUCTURE 63", "STRUCTURE 64", "STRUCTURE 65", "STRUCTURE 66", "STRUCTURE 67", "STRUCTURE 68", "STRUCTURE 69", "STRUCTURE 70", "STRUCTURE 71", "STRUCTURE 72", "STRUCTURE 73", "STRUCTURE 74", "STRUCTURE 75", "STRUCTURE 76", "STRUCTURE 77", "STRUCTURE 78", "STRUCTURE 79", "STRUCTURE 80", "STRUCTURE 81", "STRUCTURE 82", "STRUCTURE 83", "STRUCTURE 84", "STRUCTURE 85", "STRUCTURE 86", "STRUCTURE 87", "STRUCTURE 88", "STRUCTURE 89", "STRUCTURE 90", "STRUCTURE 91", "STRUCTURE 92", "STRUCTURE 93", "STRUCTURE 94", "STRUCTURE 95", "STRUCTURE 96", "STRUCTURE 97", "STRUCTURE 98", "STRUCTURE 99", "STRUCTURE 100").

**Right Panel (3D View):** Displays a 3D view of the water main project, showing the pipes and structures in a 3D perspective. The pipes are colored by diameter (blue for 300 mm, green for 360 mm, yellow for 480 mm, red for 600 mm, orange for 720 mm, light blue for 900 mm, dark blue for 1080 mm, purple for 1200 mm, brown for 1440 mm, pink for 1800 mm, grey for 2100 mm, light green for 2400 mm, dark green for 2700 mm, light blue for 3000 mm, dark blue for 3600 mm, light green for 4200 mm, dark green for 4800 mm, light blue for 5400 mm, dark blue for 6000 mm, light green for 6600 mm, dark green for 7200 mm, light blue for 7800 mm, dark blue for 8400 mm, light green for 9000 mm, dark green for 9600 mm, light blue for 10200 mm, dark blue for 10800 mm, light green for 11400 mm, dark green for 12000 mm, light blue for 12600 mm, dark blue for 13200 mm, light green for 13800 mm, dark green for 14400 mm, light blue for 15000 mm, dark blue for 15600 mm, light green for 16200 mm, dark green for 16800 mm, light blue for 17400 mm, dark blue for 18000 mm, light green for 18600 mm, dark green for 19200 mm, light blue for 19800 mm, dark blue for 20400 mm, light green for 21000 mm, dark green for 21600 mm, light blue for 22200 mm, dark blue for 22800 mm, light green for 23400 mm, dark green for 24000 mm, light blue for 24600 mm, dark blue for 25200 mm, light green for 25800 mm, dark green for 26400 mm, light blue for 27000 mm, dark blue for 27600 mm, light green for 28200 mm, dark green for 28800 mm, light blue for 29400 mm, dark blue for 30000 mm). The structures are shown in grey.

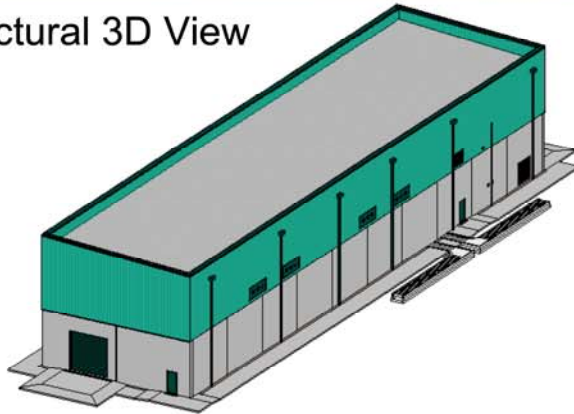
# COOLNABACKY

## 400 KV GIS SUBSTATION

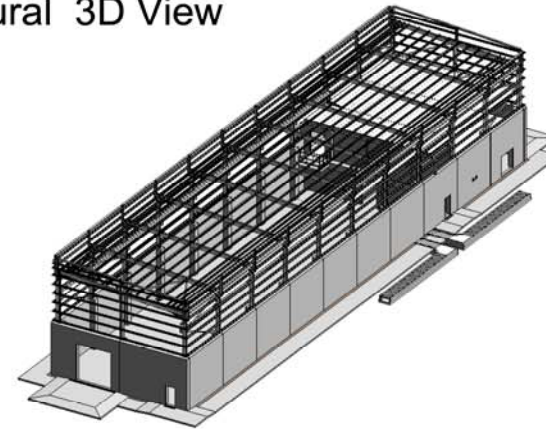


INTERNATIONAL

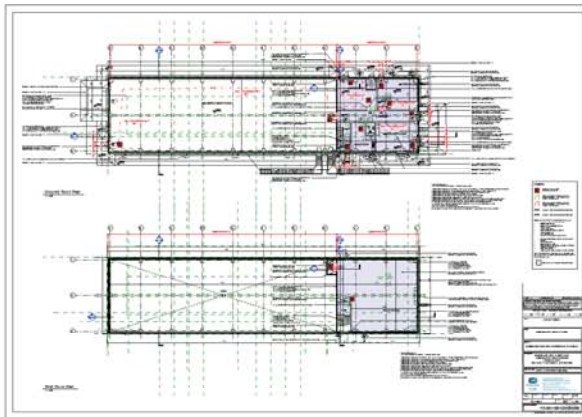
Architectural 3D View



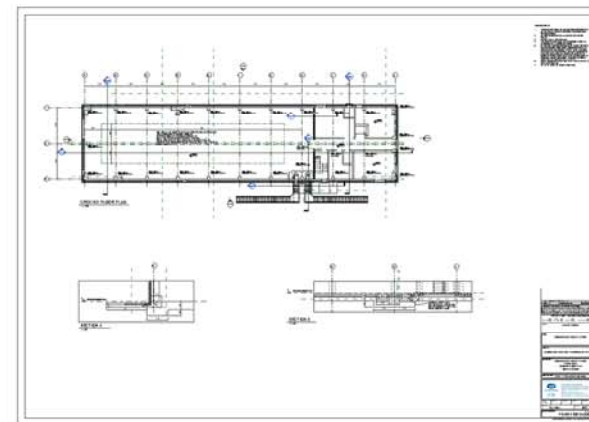
Structural 3D View



Fire Cert Plans



Structural Plan

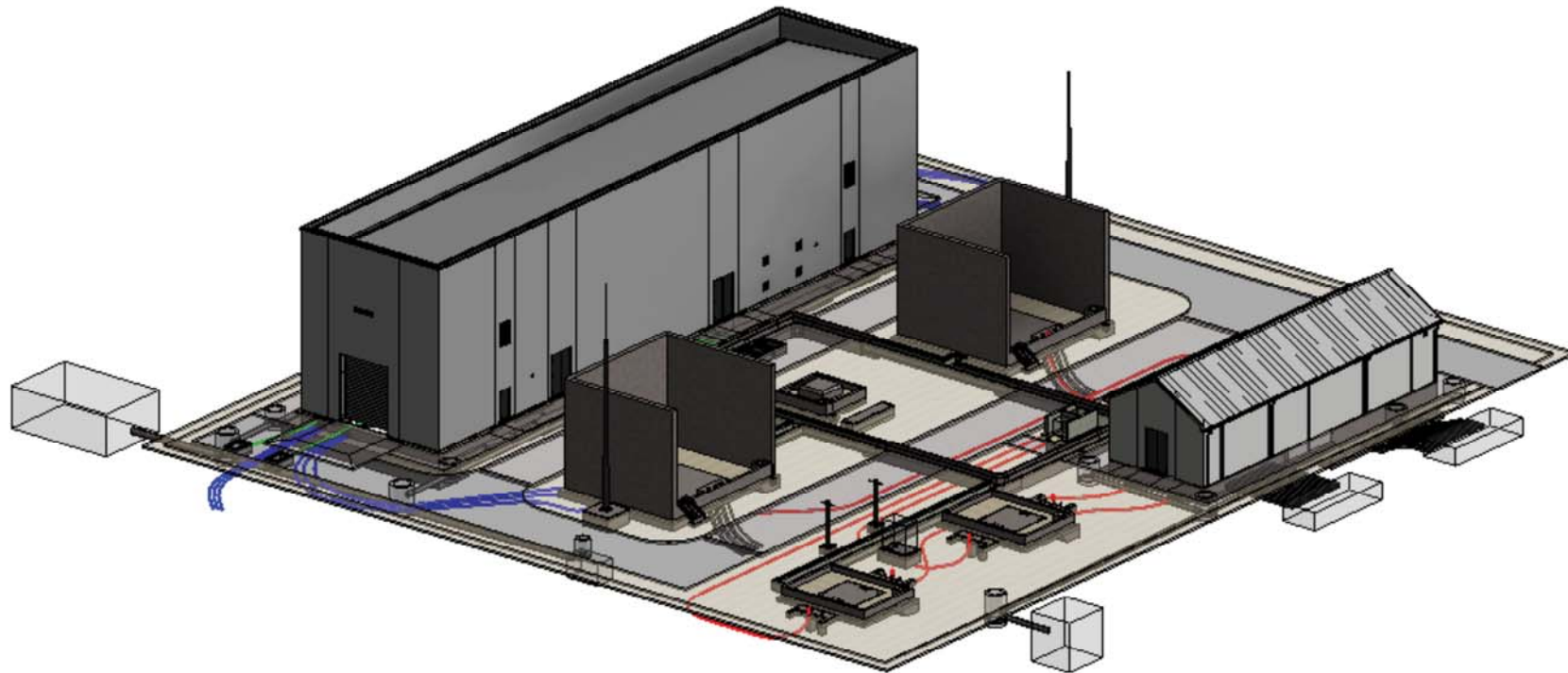


# BALLYRAGGET

## 110 KV GIS SUBSTATION

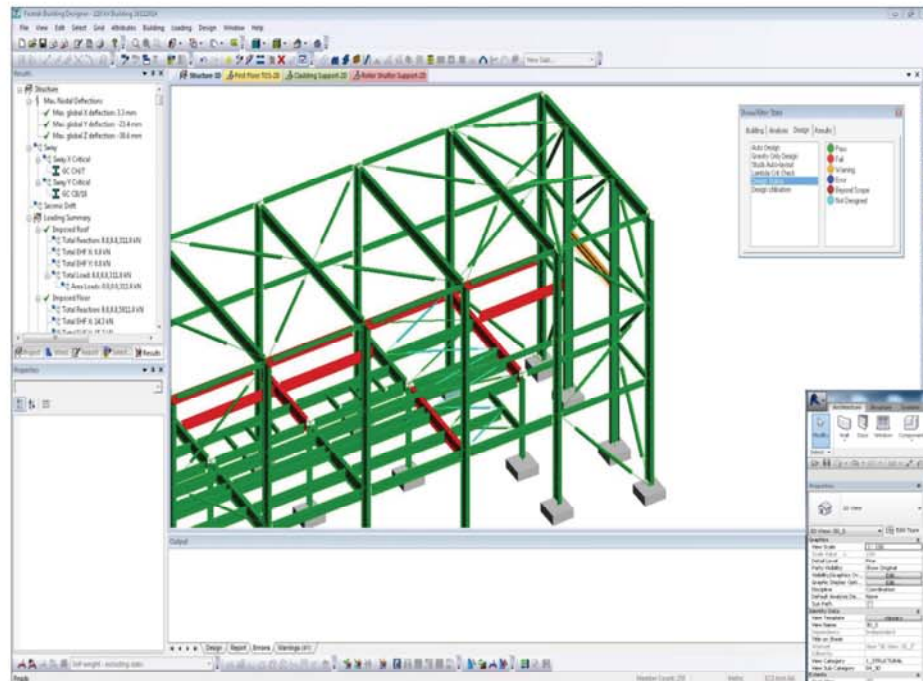


INTERNATIONAL



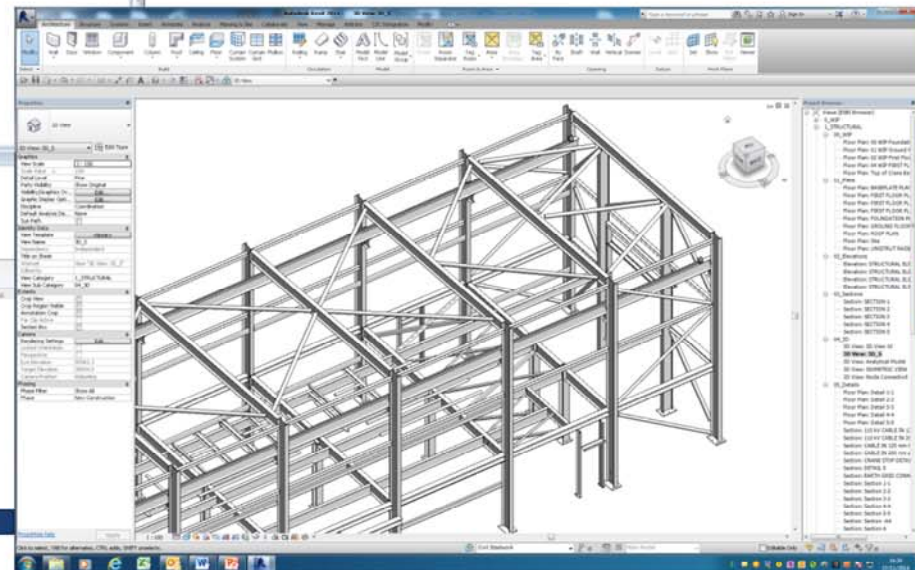
3D Site Services Coordination

# STRUCTURAL DESIGN SOFTWARE (FASTRAK)



Fastrak

Revit

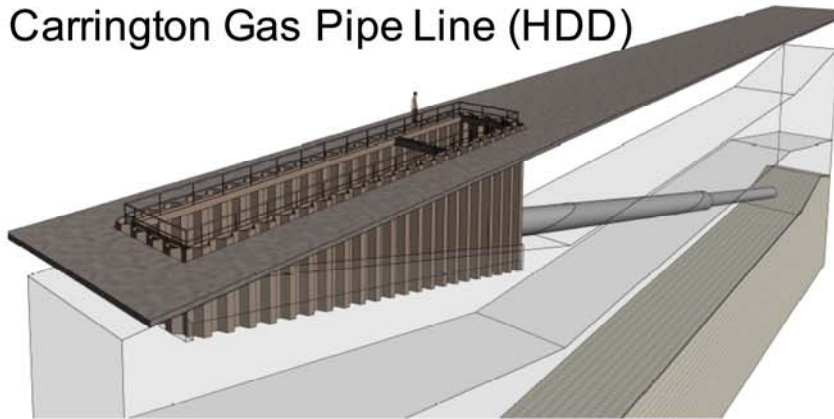


# EXAMPLES OF OTHER JOBS



INTERNATIONAL

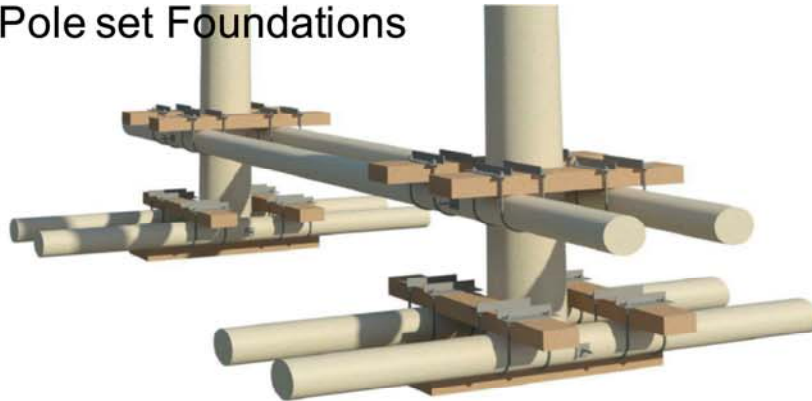
Carrington Gas Pipe Line (HDD)



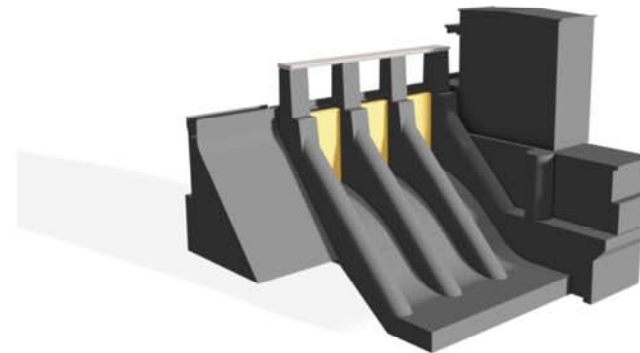
Oweninny Bridge



Pole set Foundations



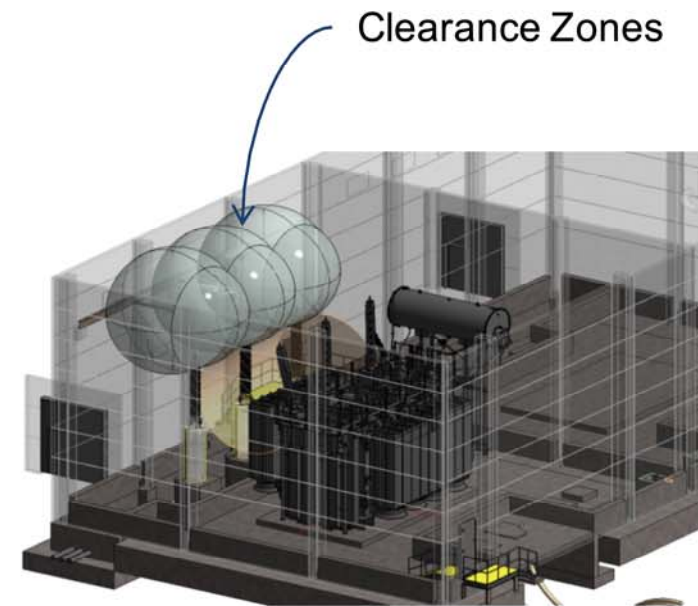
Part of the Cliff Dam



# EXAMPLE OF OTHER JOBS



Prototype Plastic Shield

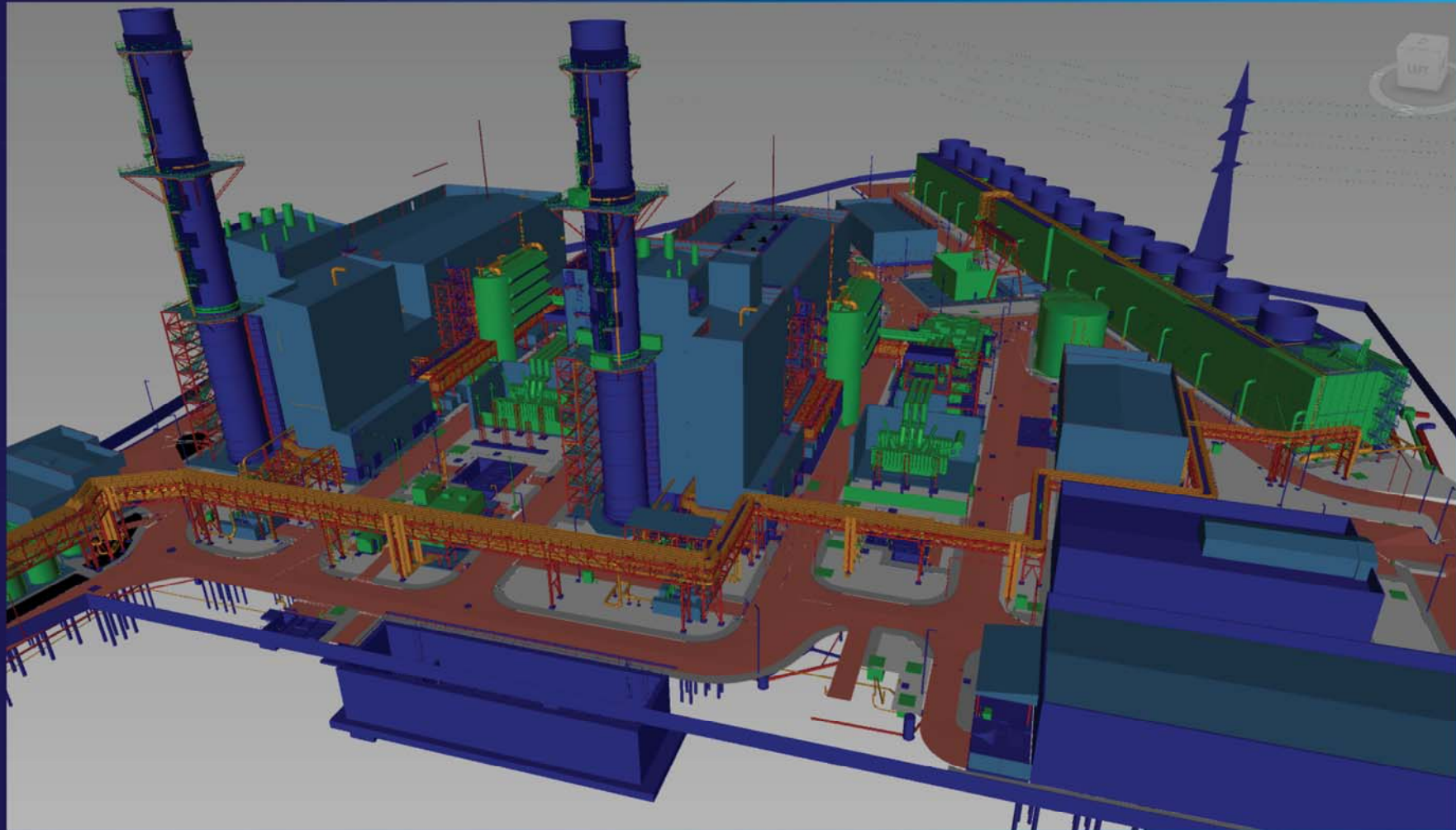


Belcamp 220 kV Transformer Bund

# CARRINGTON POWER STATION



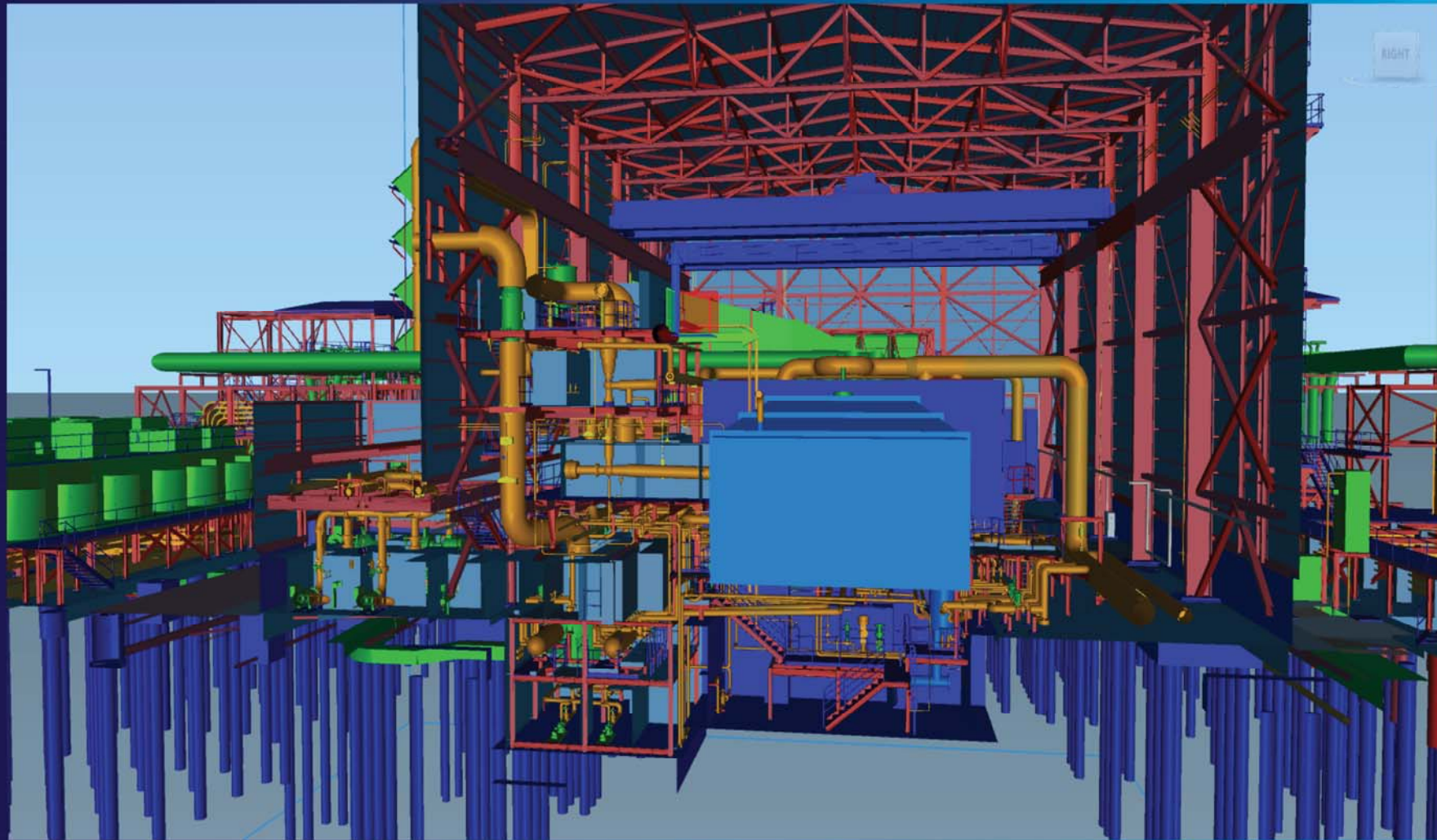
INTERNATIONAL



# CARRINGTON POWER STATION



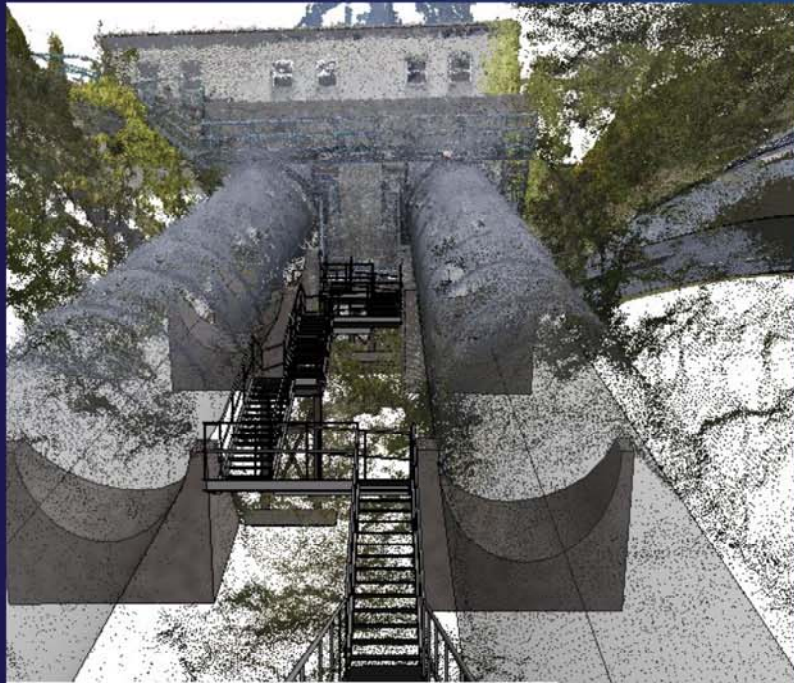
INTERNATIONAL



# POLLAPHUCA PEN STOCKS



INTERNATIONAL



**Point Cloud**

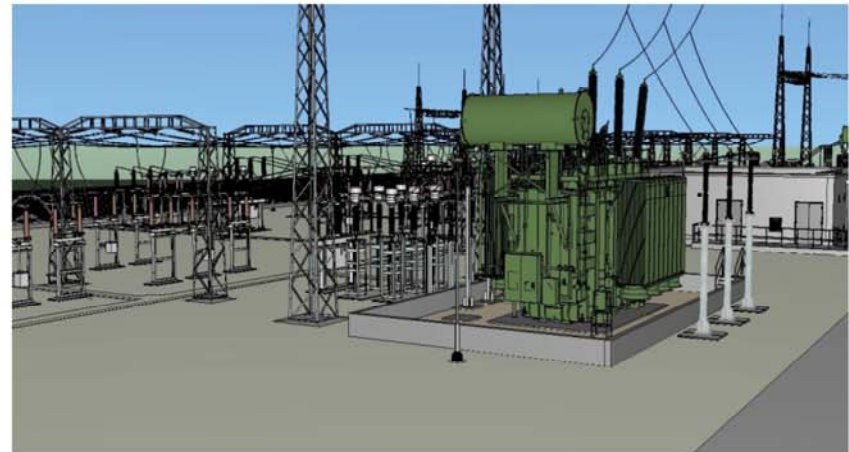
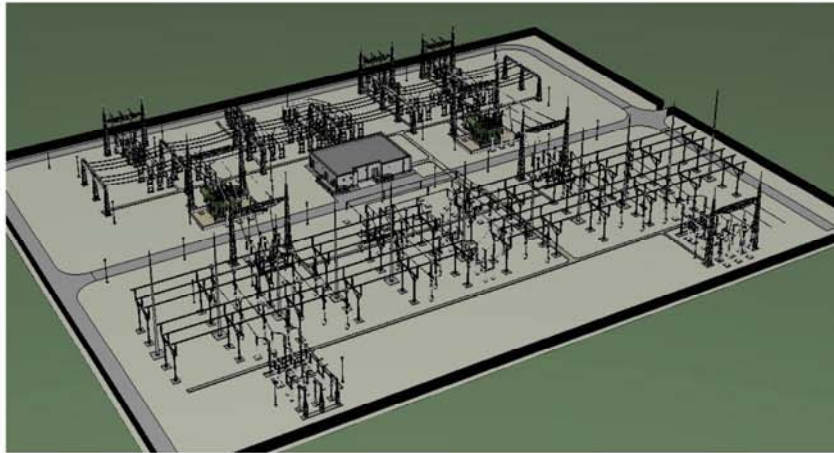


**Revit Model**

# SAMPLE SUBSTATION



INTERNATIONAL



# SAMPLE SUBSTATION ANIMATION



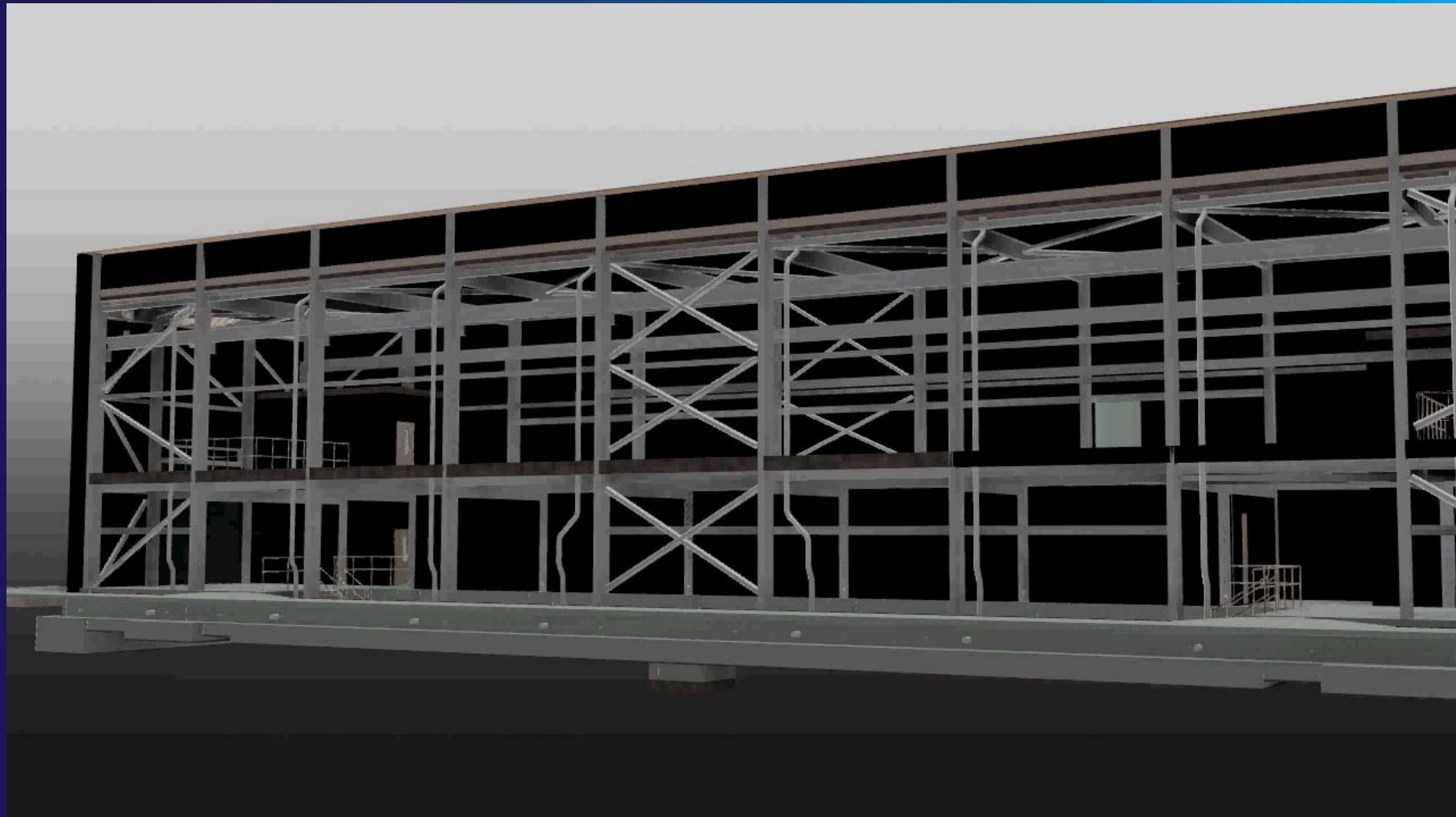
INTERNATIONAL



# BELCAMP 220 KV SUBSTATION



INTERNATIONAL



# ESB INTERNATIONAL & SUA SMALL UN-MANNED AIRCRAFT / DRONES



INTERNATIONAL

COLIN DONNELLY

SURVEYOR & CHIEF SUA PILOT ESB INTERNATIONAL

# COLLABORATION & LEARNING



INTERNATIONAL



**SkyTec Ireland**  
Unmanned Aircraft Systems Technology



**Maynooth University**  
National University of Ireland Maynooth



# COLLABORATION & LEARNING



INTERNATIONAL



# DRONE USE WITHIN ESB INTERNATIONAL



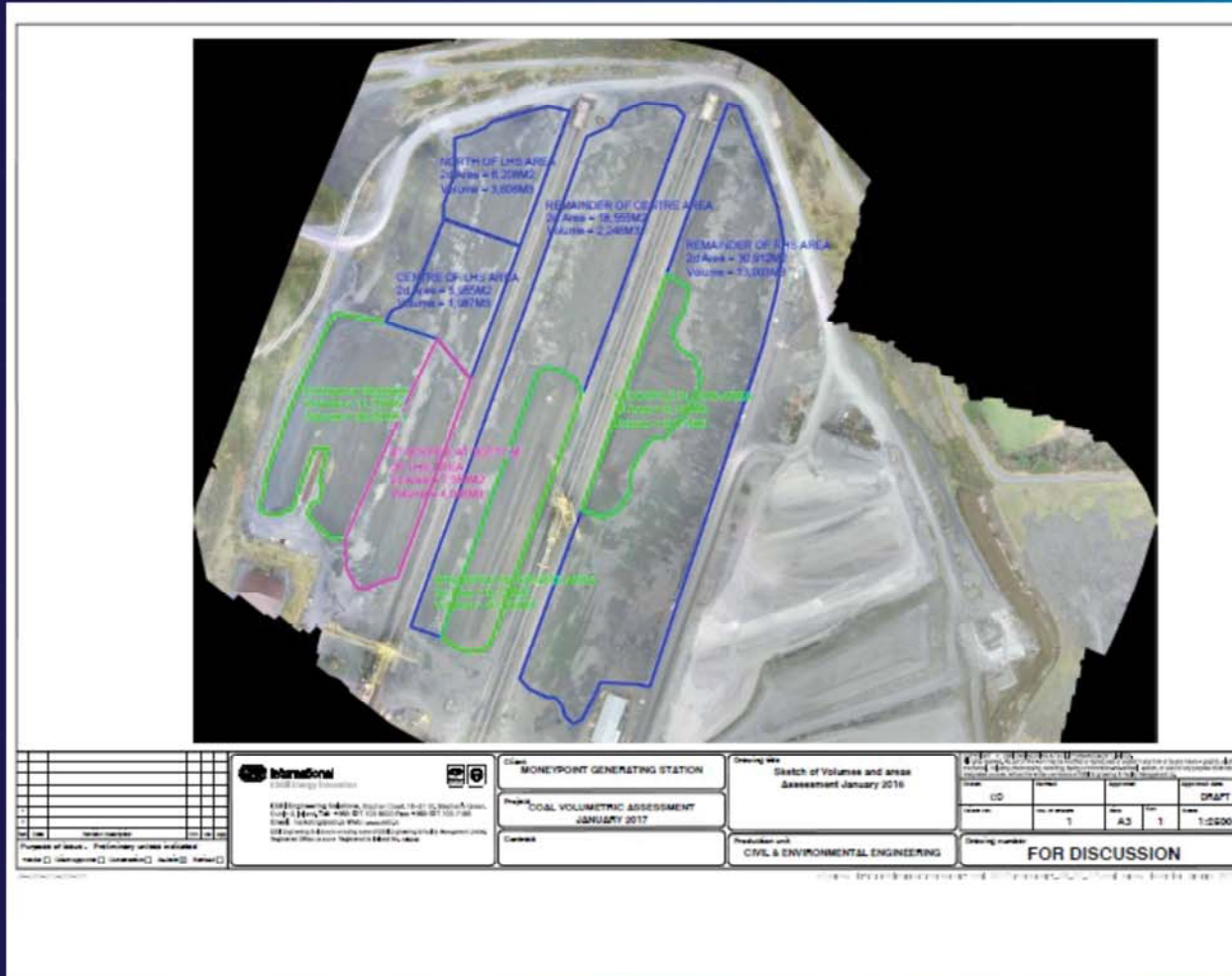
INTERNATIONAL



- Scaled Photography / Ortho Imagery
- Aerial overviews
- 2cm GSD (Ground sampling distance) compared with most available online 30cm
- Traditionally was three days surveying on foot

**Moneypoint coal stocks survey 80 Acres (1 hour flight)**

# DRONE USE WITHIN ESB INTERNATIONAL



- Point clouds
- Outputs into Civil 3d
- Having the imagery and volumetric data overlaid allows for an intuitive understanding of the survey.
- Easy to identify separate classifications of coal from imagery

# DRONE USE WITHIN ESB INTERNATIONAL



INTERNATIONAL

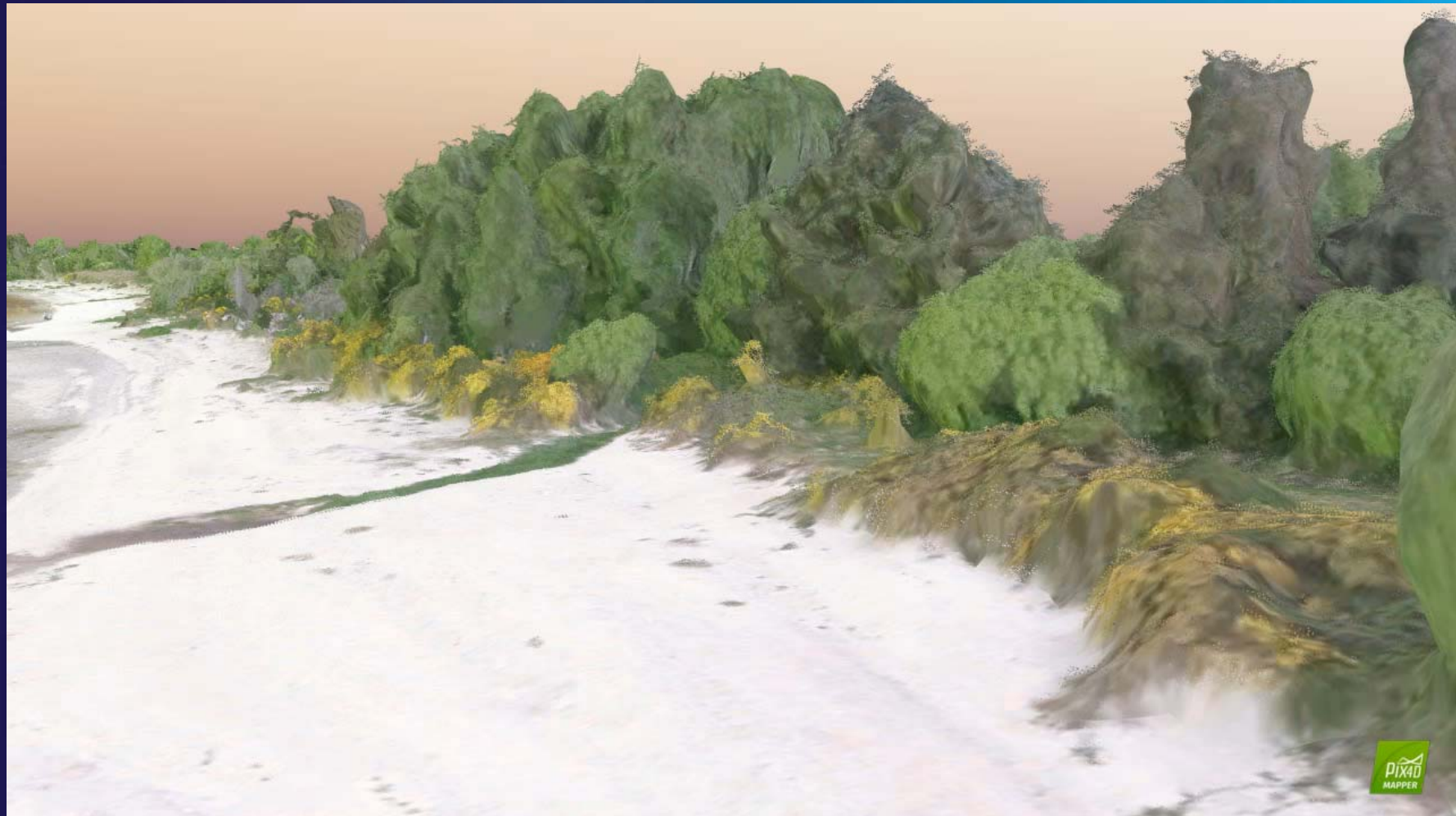


- Reduced incidents
- Very difficult to detail properly on foot given complexity of the terrain and the way piles are tipped.
- 60 Acres complex topographical survey in 30 min flight time.
- 30 minutes to install ground control to geo reference imagery

# DRONE USE WITHIN ESB INTERNATIONAL



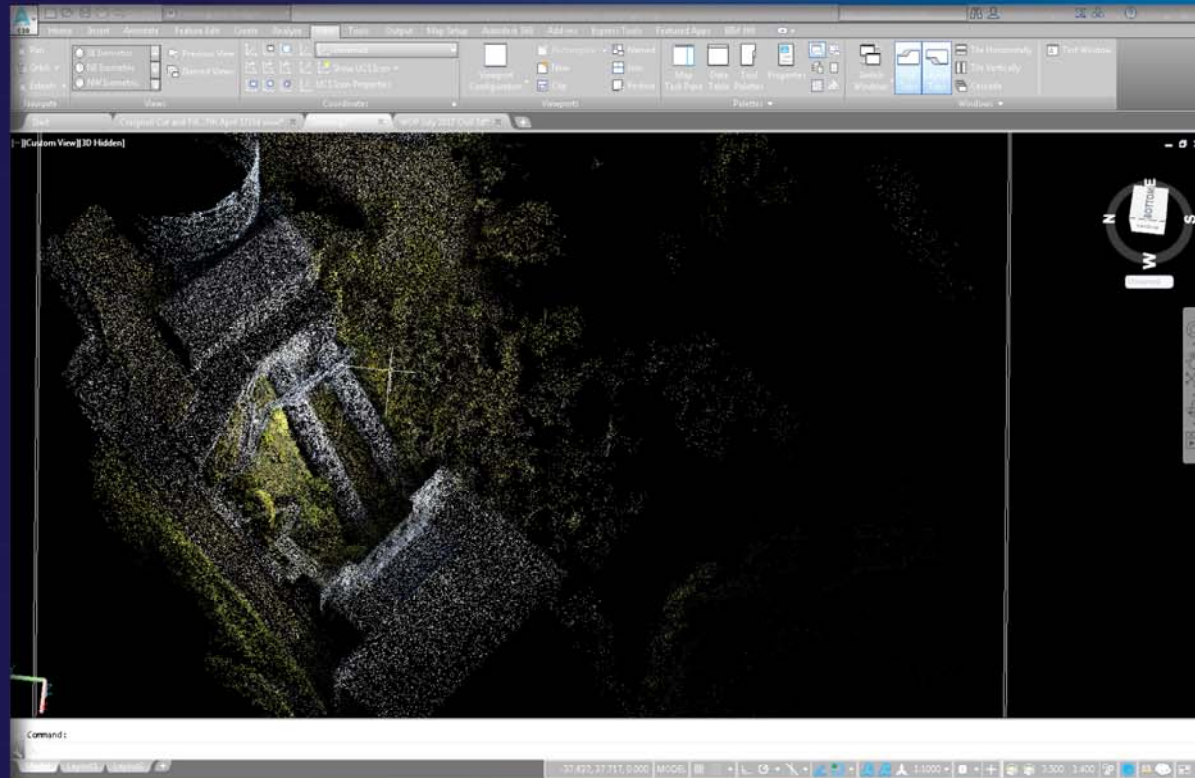
INTERNATIONAL



[illegible]

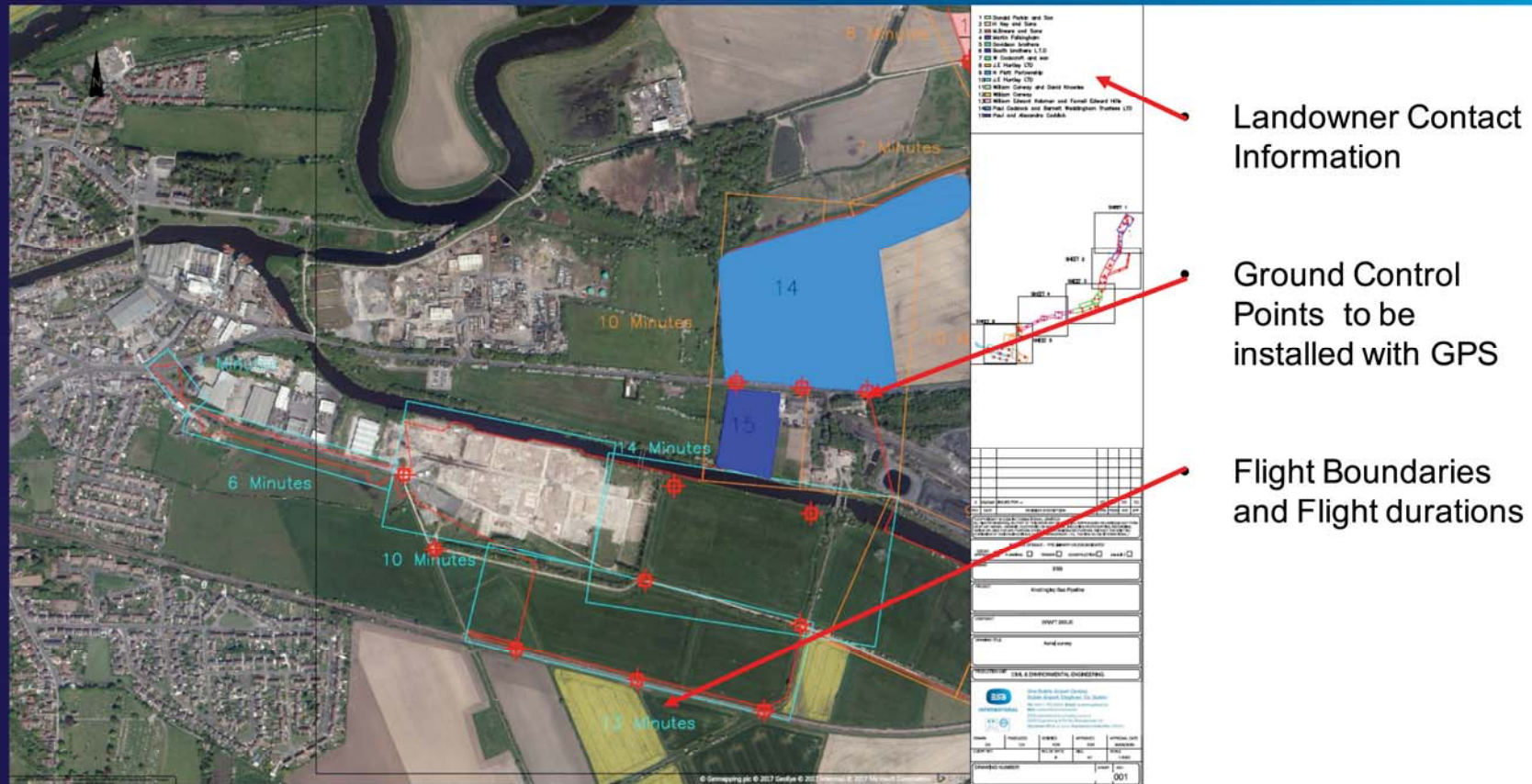
- 3.6Km Beach survey completed in three hours
- Contour plan
- Identified areas with erosion
- Overlaid on OS Mapping and landowner information

# DRONE USE WITHIN ESB INTERNATIONAL



- Point clouds used for detailed Revit design
- Significantly reduces survey times
- Scaled for measurements

# DRONE USE WITHIN ESB INTERNATIONAL



Flight Plan

# DRONE USE WITHIN ESB INTERNATIONAL



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- Felling areas
- Cut and Fill Quantities
- Road design
- Rock Outcrop
- Watercourse Identification
- Pre condition survey of road prior to works.

# LIMITATIONS



INTERNATIONAL

## NEVER OPERATE YOUR DRONE:



if it will be a hazard to another aircraft in flight



over an assembly of people (e.g. concerts, sporting events, parades)



farther than 300 metres



within 30 metres of any person, vessel, vehicle or structure not under your direct control



closer than 5 kilometres from any aerodrome



in a negligent or reckless manner so as to endanger life or property of others



over 400ft (120m) above ground level



over urban areas, such as villages, towns and cities



in civil or military controlled airspace (e.g. airspace surrounding airports)



in restricted areas (e.g. military installations or prisons)



unless you have permission from the landowner for take-off & landing



outside of your direct line of sight

## REMEMBER TO REGISTER YOUR DRONE WITH THE IAA

All drones over 1kg must be registered

## Statutory Regulations



Storage space



Processing Power



Long grass

# DRONE USE WITHIN ESB INTERNATIONAL



INTERNATIONAL



# BIM APPLIED TO WIND FARM DESIGN AND CONSTRUCTION



INTERNATIONAL

LIAM M<sup>C</sup>MANUS

CIVIL ENGINEER ESB INTERNATIONAL

# OVERVIEW



INTERNATIONAL

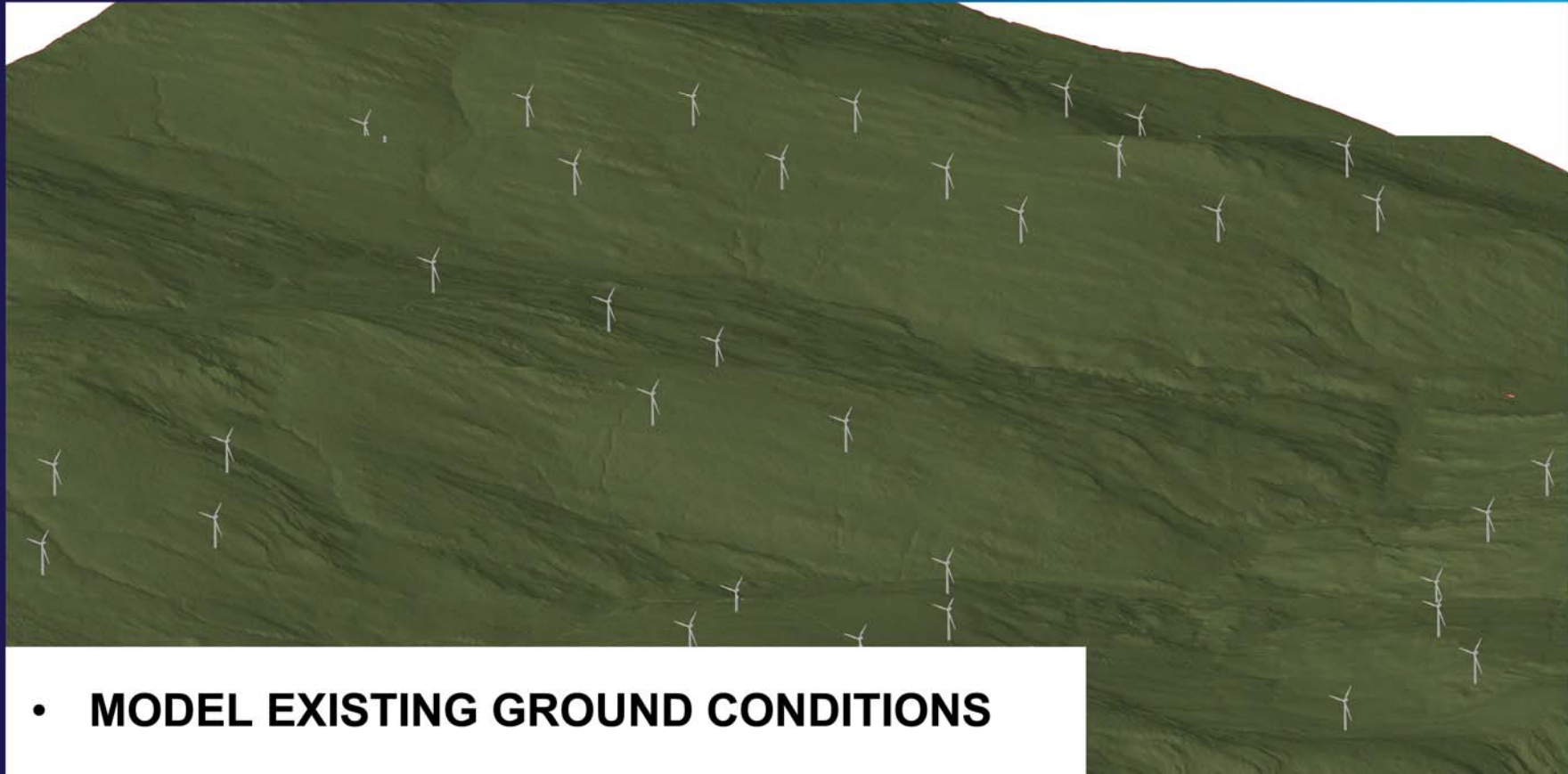
- **WHAT IS BIM FOR CIVIL PROJECTS**
- **BIM AT PLANNING STAGE**
- **BIM AT DETAILED DESIGN**
- **BIM DURING CONSTRUCTION**



# PLANNING/PRELIMINARY DESIGN



INTERNATIONAL



- **MODEL EXISTING GROUND CONDITIONS**

# PLANNING/PRELIMINARY DESIGN



INTERNATIONAL

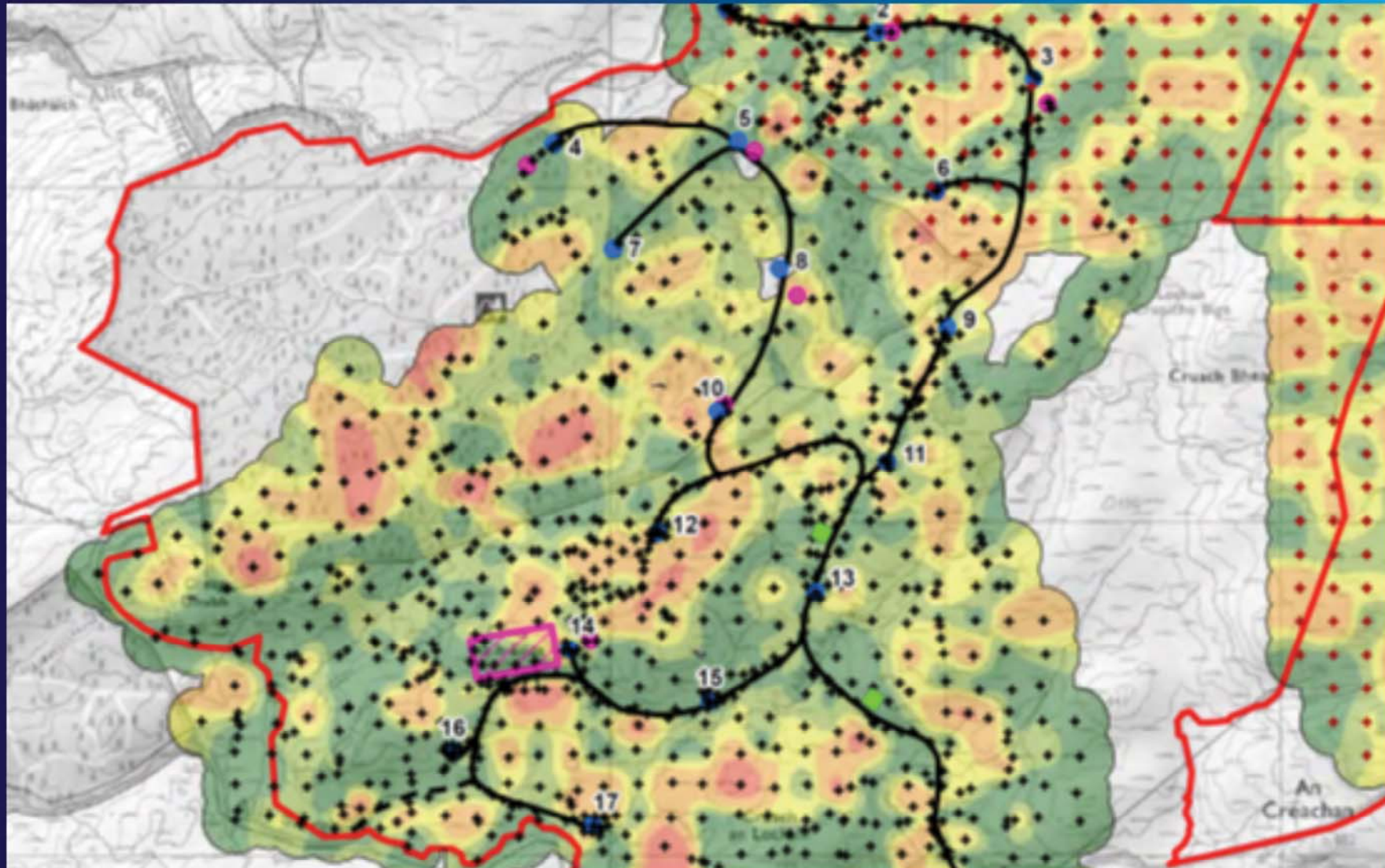


**DRONE AND GPS SURVEYS**

# PLANNING/PRELIMINARY DESIGN



INTERNATIONAL

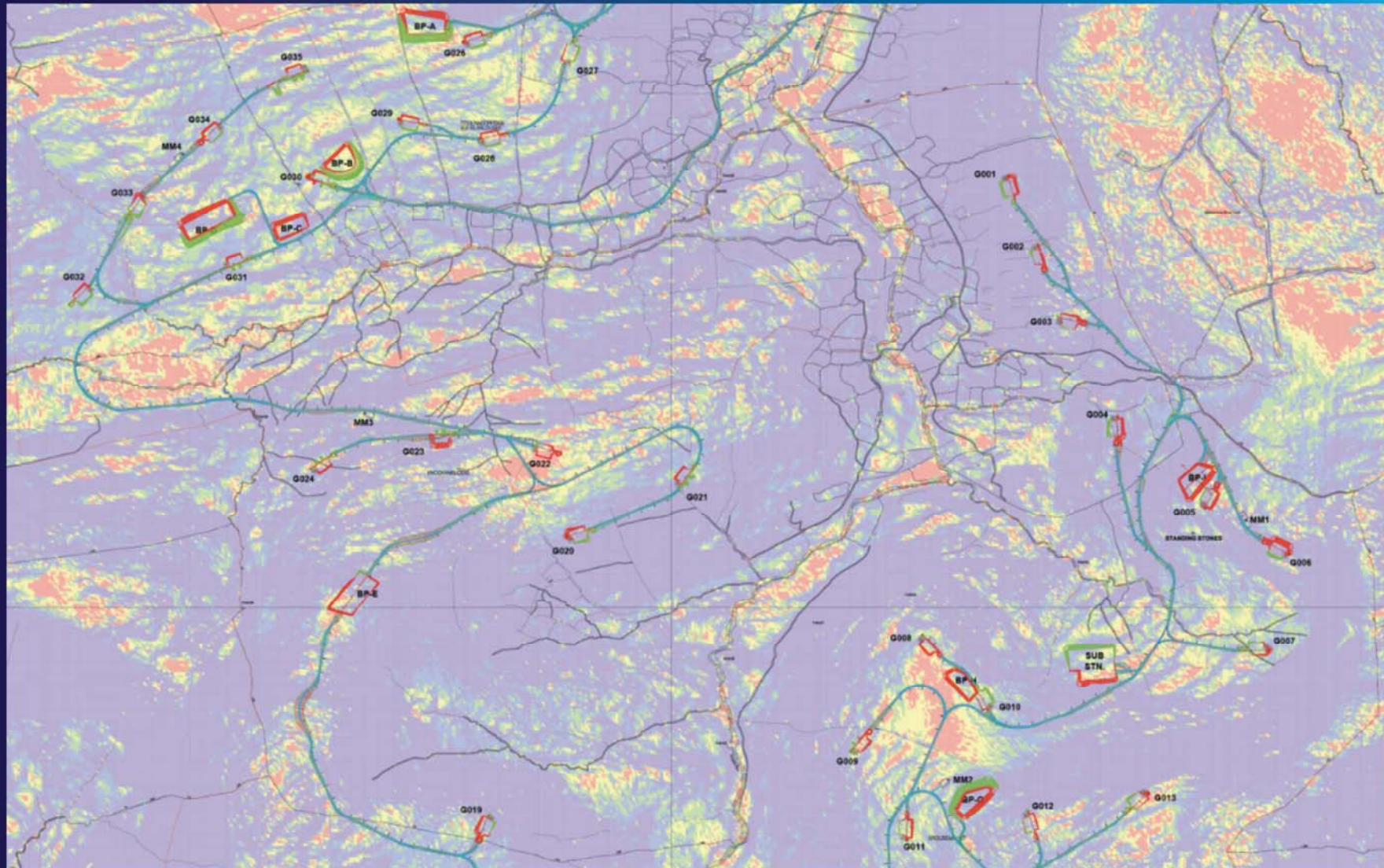


PEAT DEPTH MAP

# PLANNING/PRELIMINARY DESIGN



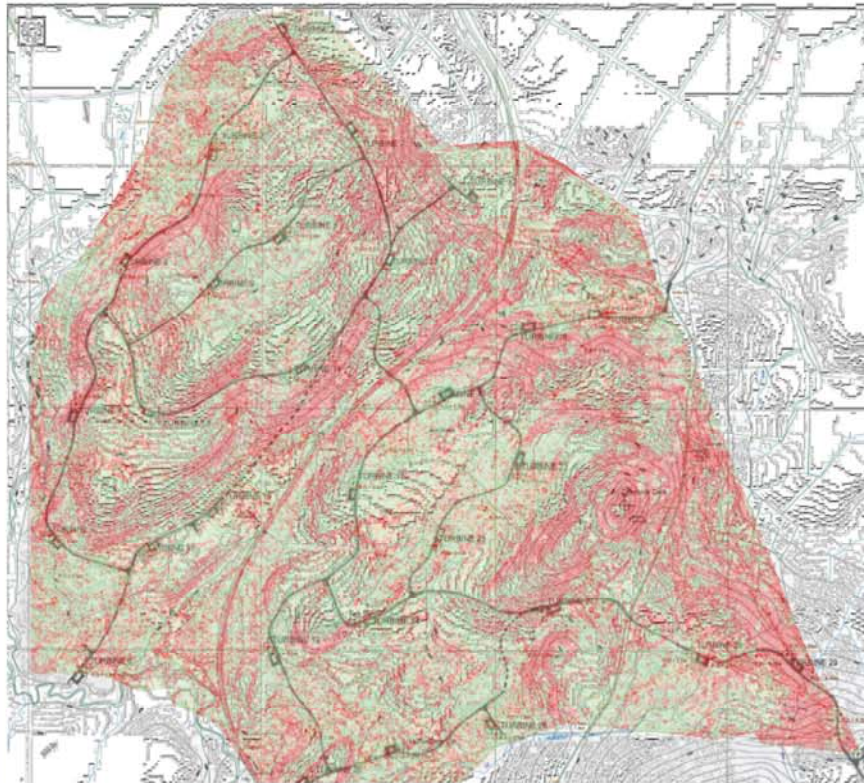
INTERNATIONAL



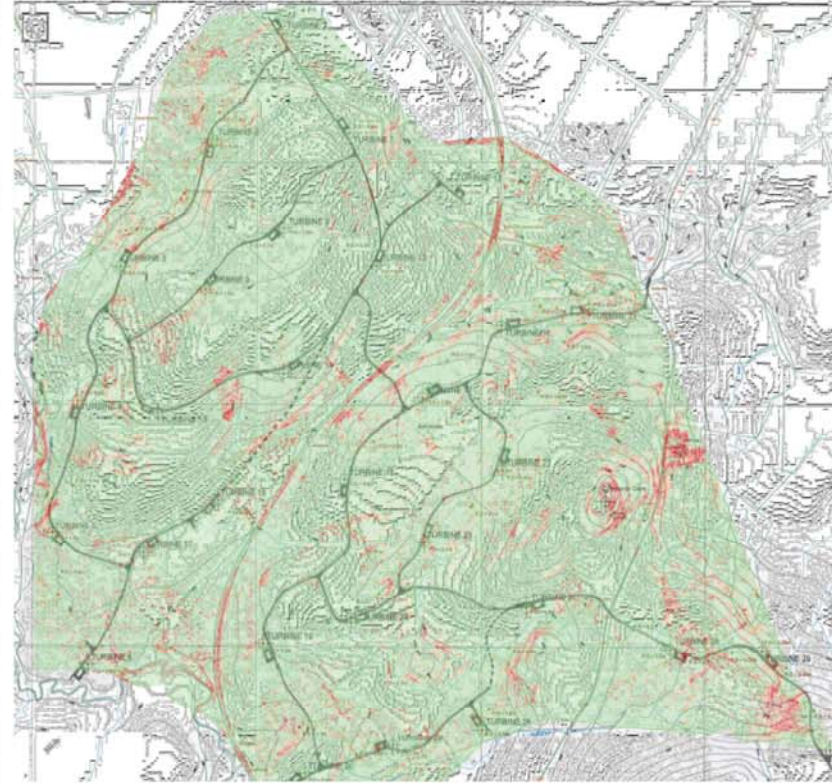
GROUND SLOPE MAP

## SAMPLE OF PEAT STABILITY INDEX MAPS

**2.5 kPa**



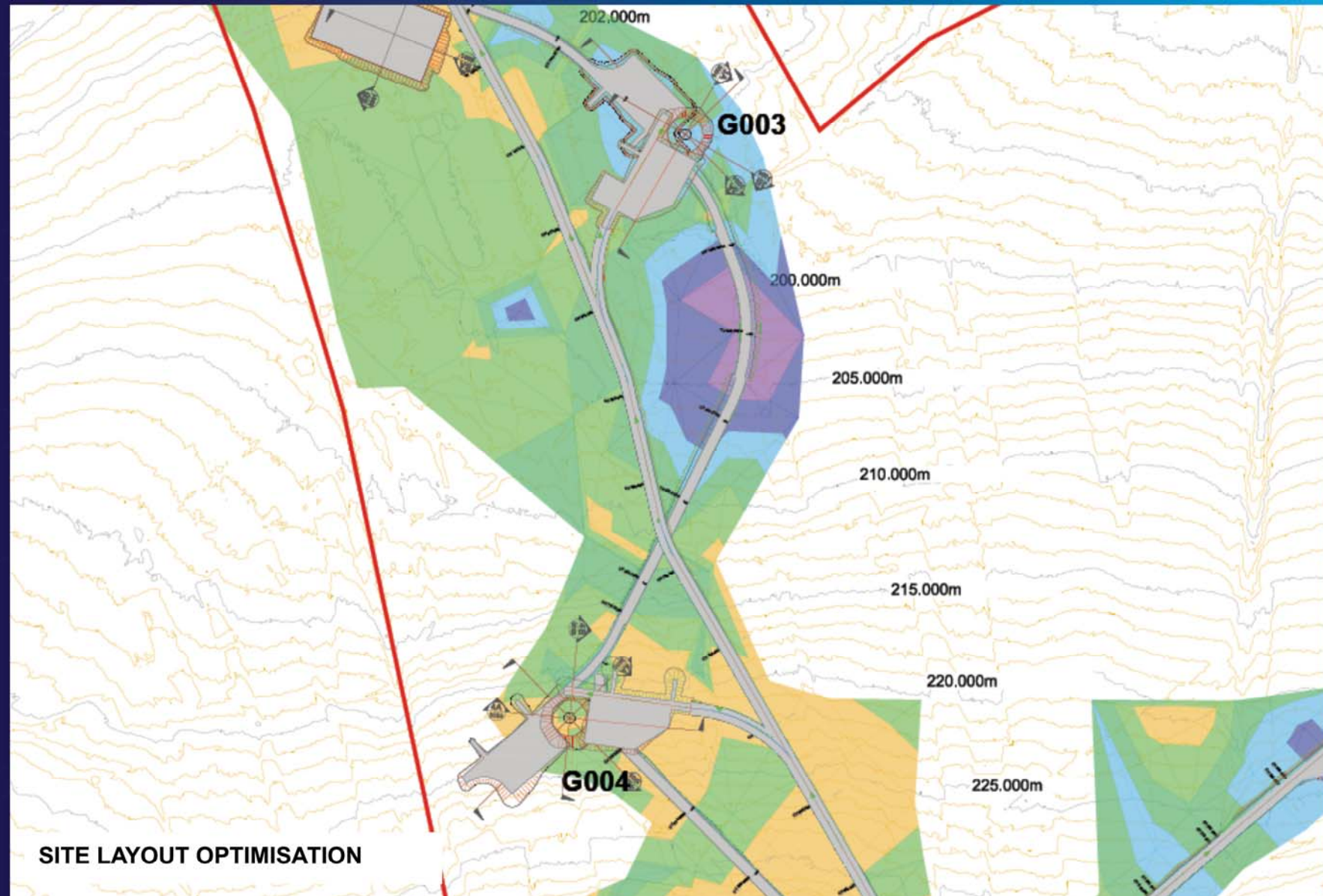
**5 kPa**



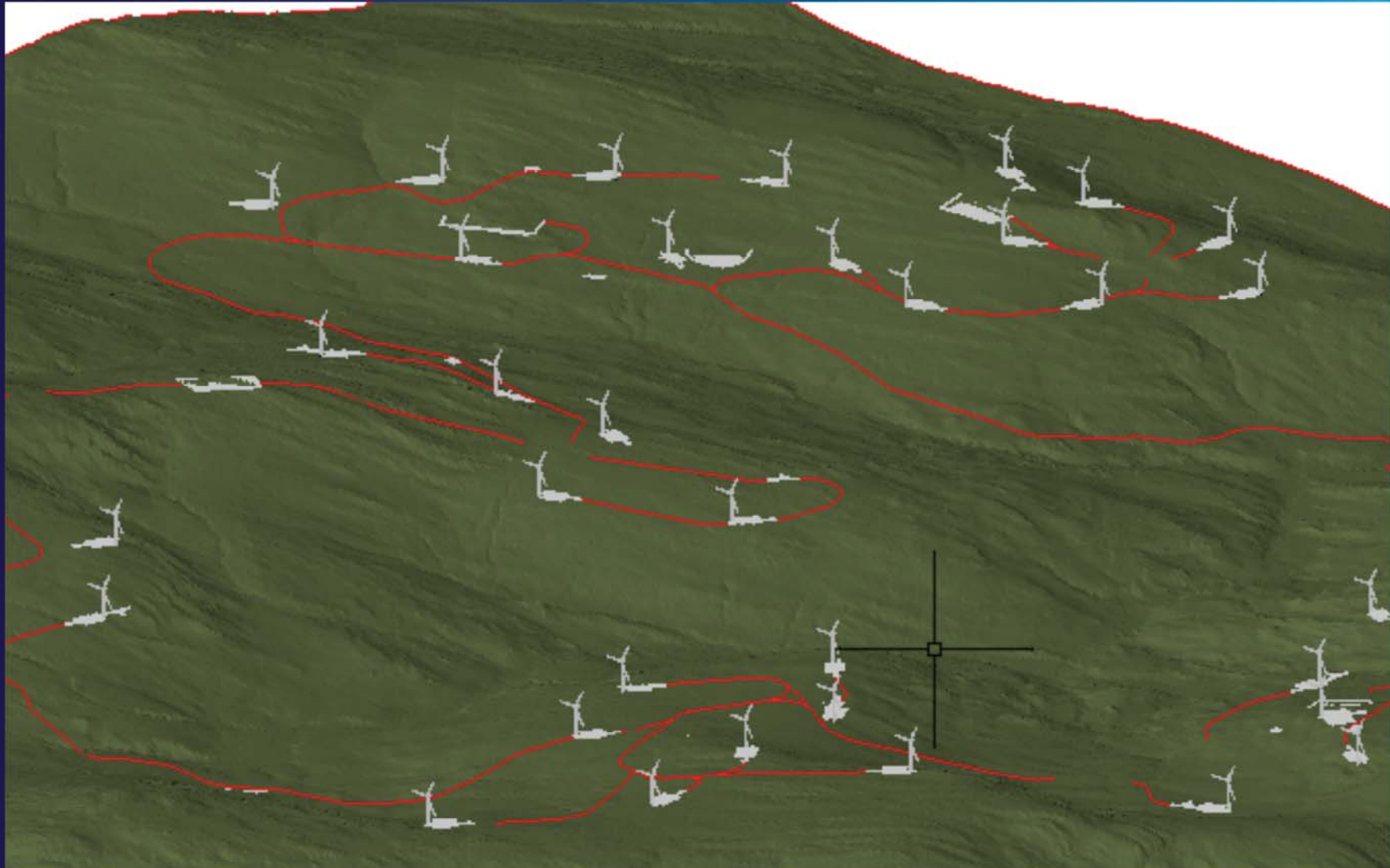
# PLANNING/PRELIMINARY DESIGN



INTERNATIONAL

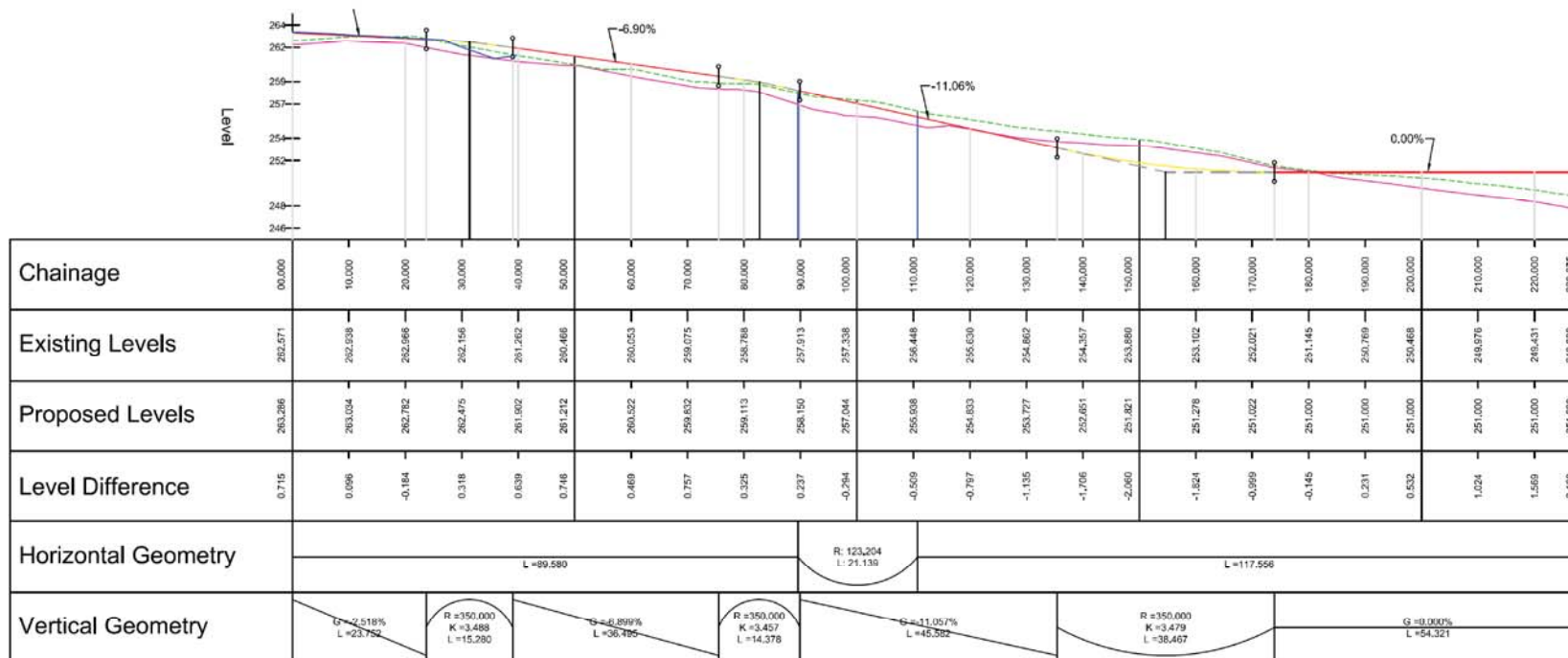


SITE LAYOUT OPTIMISATION



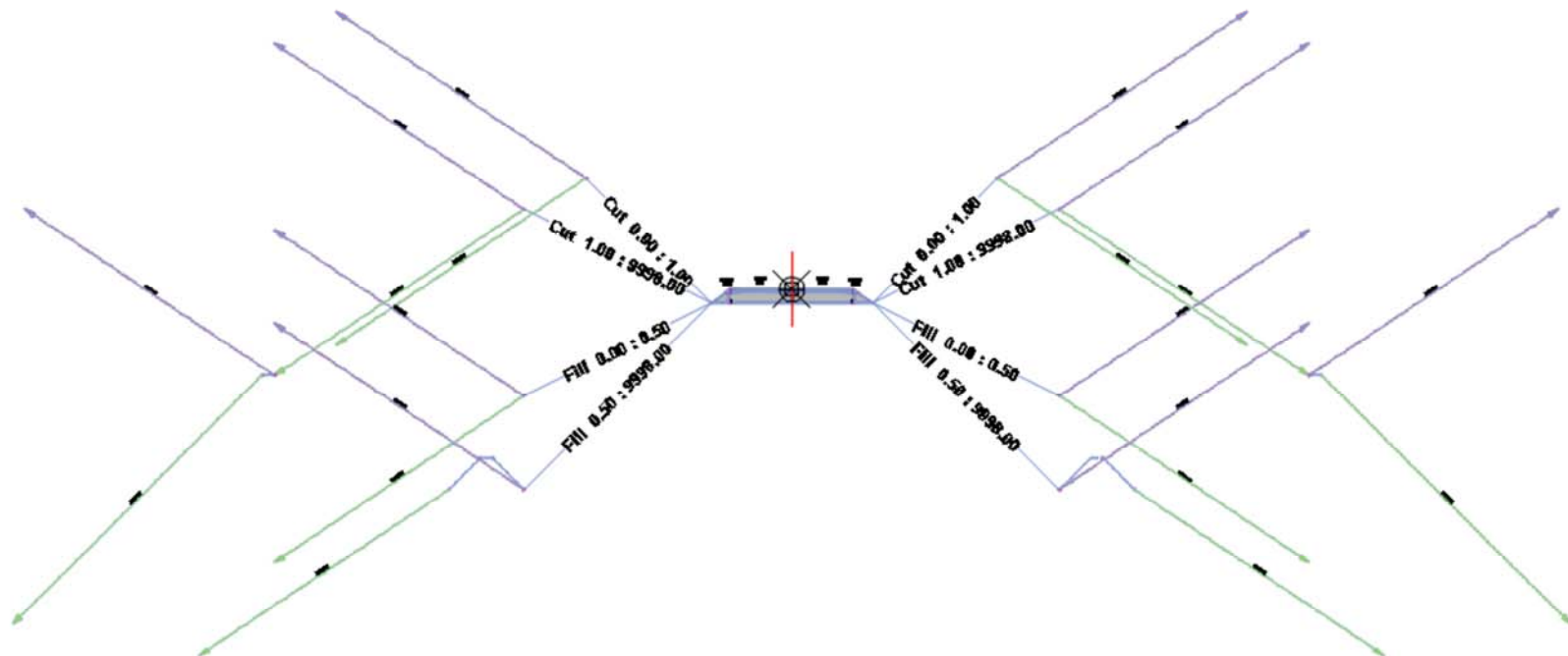
- **ALIGNMENTS**

## • PROFILES

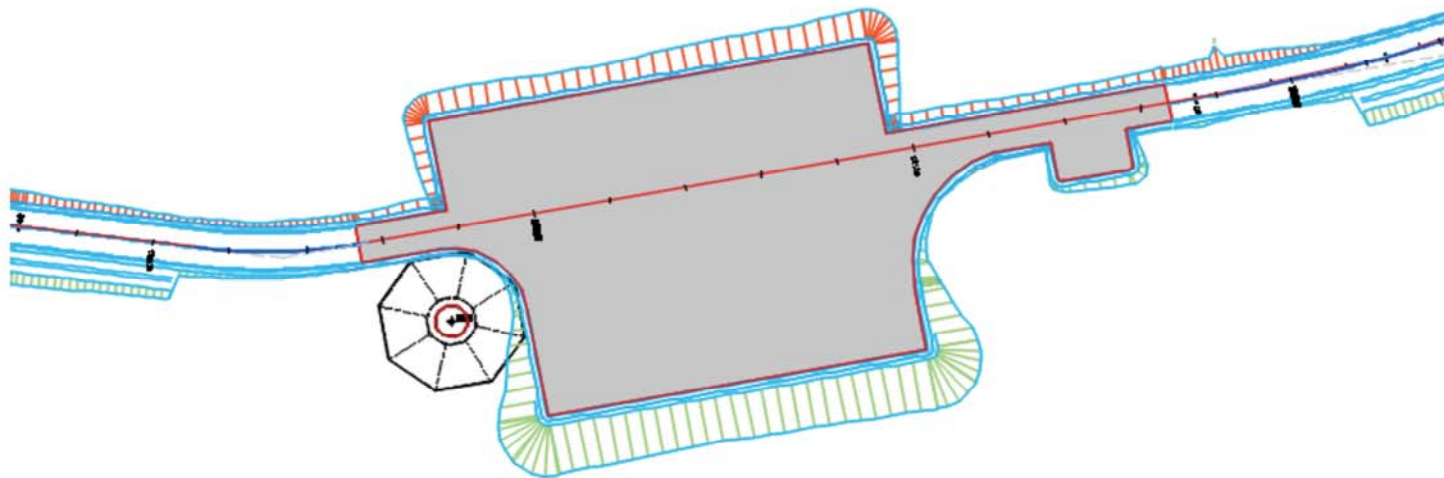


G002 SPUR  
Ch. 0.000 to 228.275  
SCALE: H 1:500, V 1:250.

- **ASSEMBLIES**

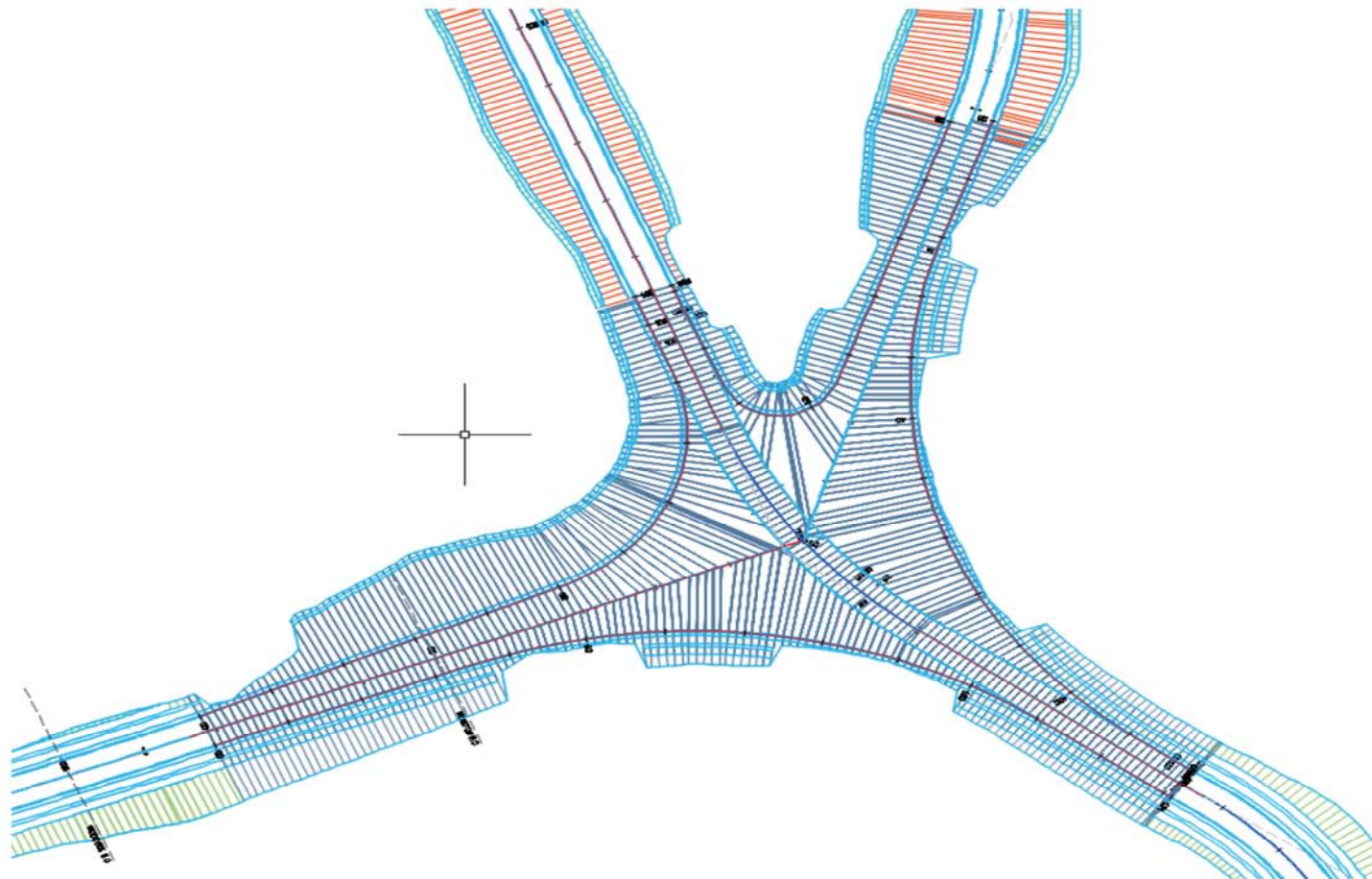


- **CORRIDORS**



**G028**

- **CORRIDORS**



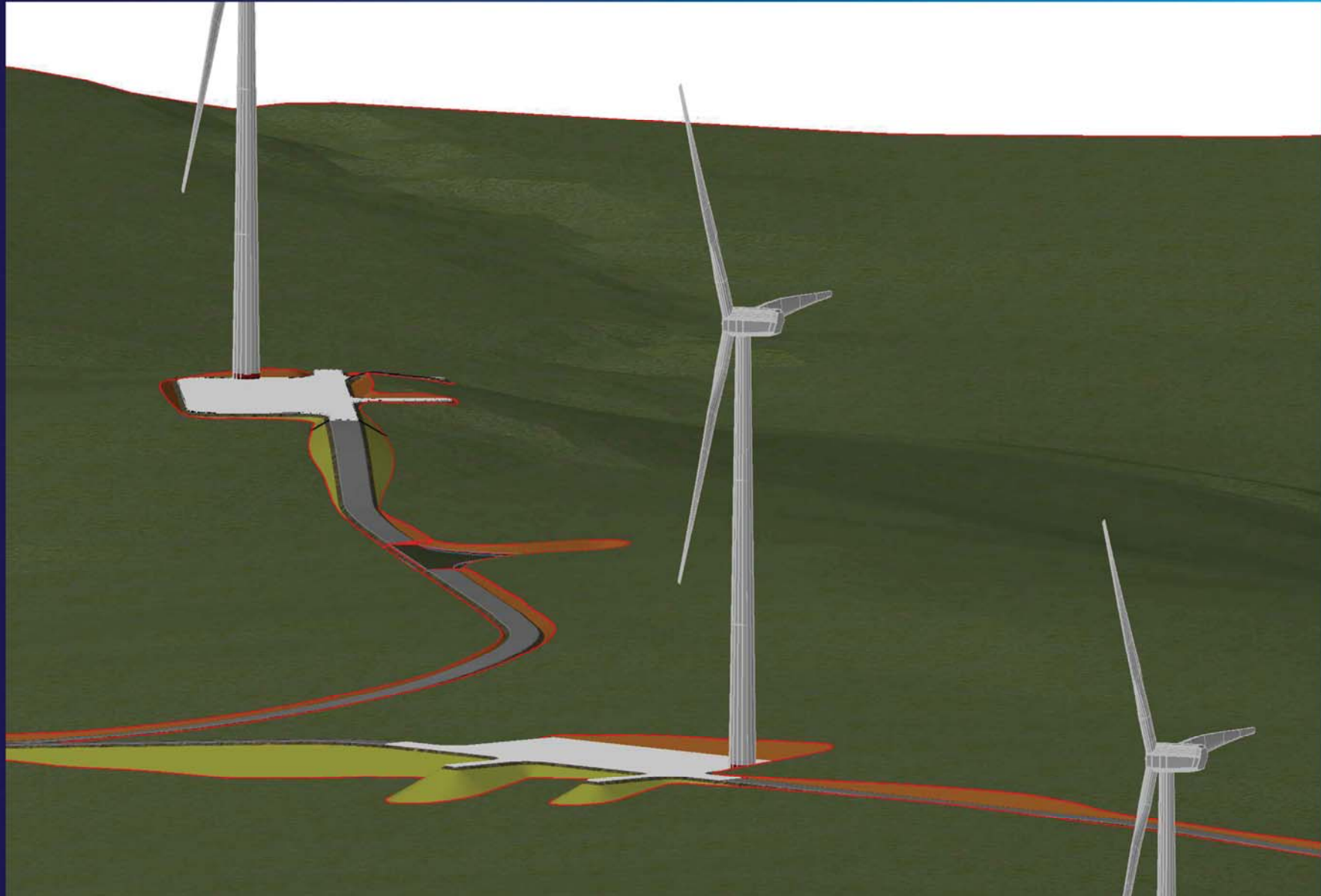
- **CORRIDORS**



# DETAILED DESIGN



INTERNATIONAL



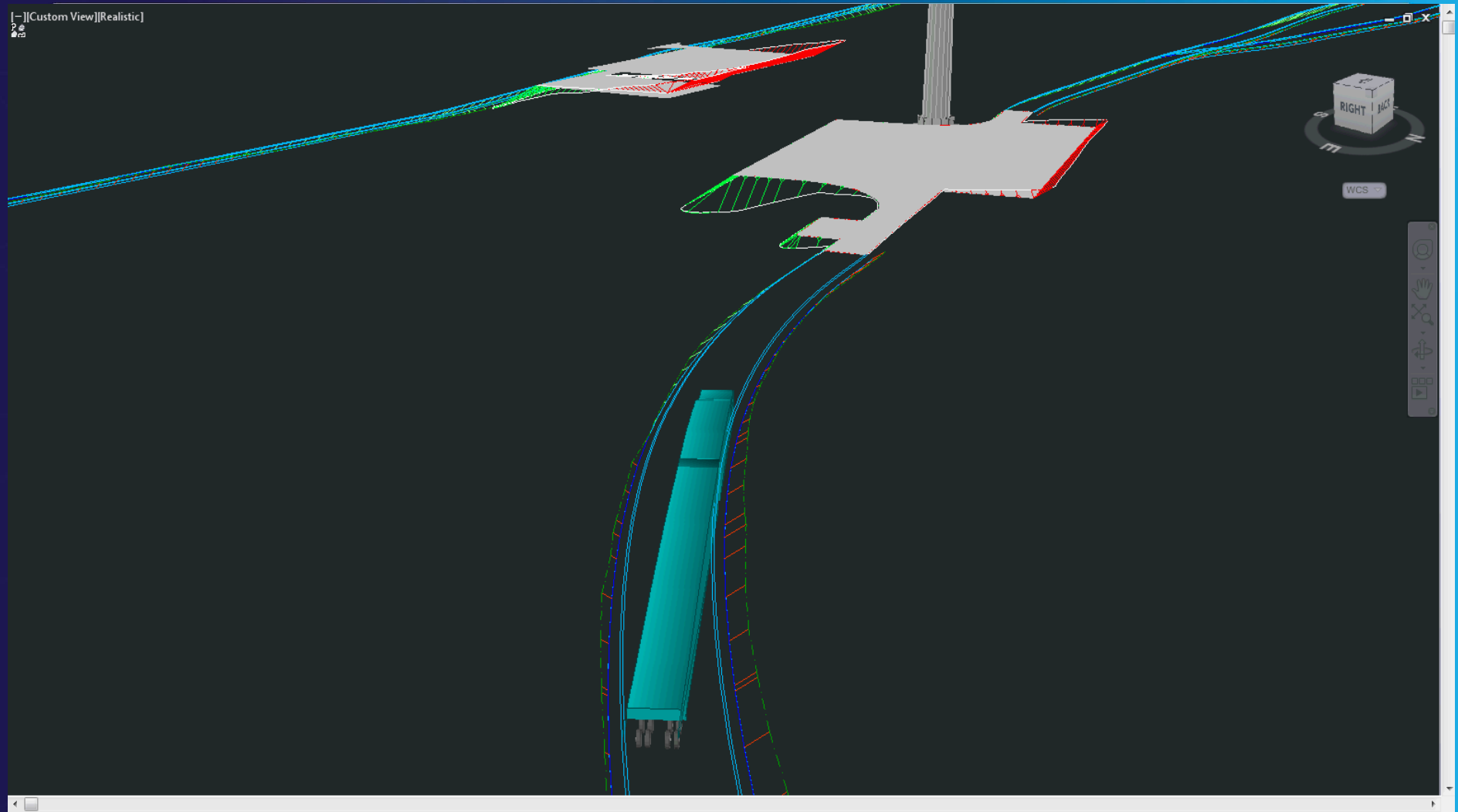
- SWEPT PATH ANALYSIS



# DETAILED DESIGN



INTERNATIONAL



- SWEPT PATH ANALYSIS



# DETAILED DESIGN



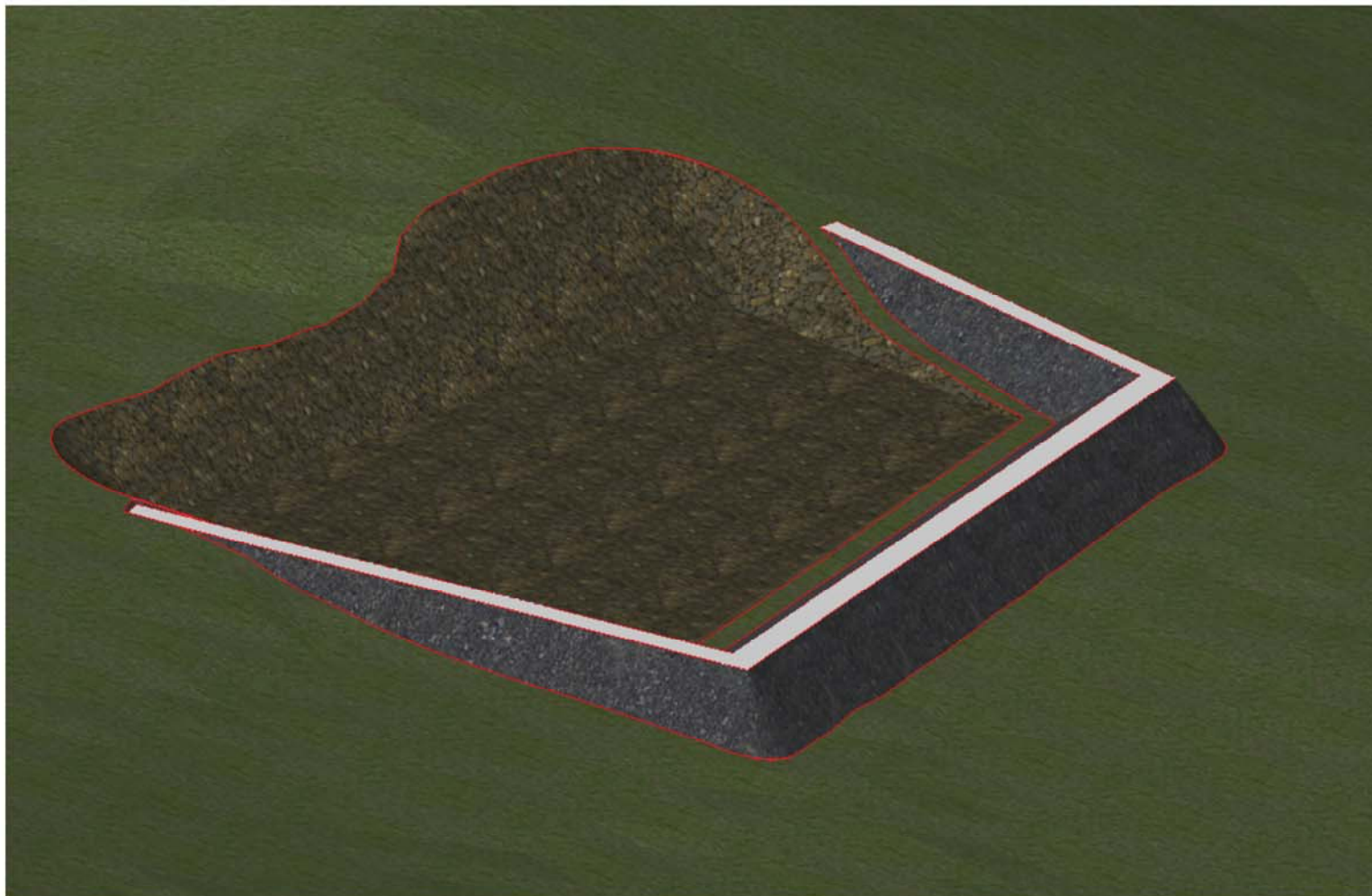
INTERNATIONAL

## □ MATERIAL QUANTITIES

				Total Volume Table			
Chainage	Cut Area	Fill Area	Cut Vol	Fill Vol	Cum Cut Vol	Cum Fill Vol	Net Vol
50.000	0.000m2	0.000m2	0.000m3	0.000m3	0.000m3	0.000m3	0.000m3
100.000	0.000m2	0.000m2	152.434m3	0.015m3	152.434m3	0.015m3	152.419m3
150.000	0.000m2	0.000m2	467.295m3	0.124m3	619.728m3	0.139m3	619.589m3
200.000	0.000m2	0.000m2	174.743m3	0.021m3	794.471m3	0.160m3	794.311m3
250.000	0.000m2	0.000m2	36.773m3	26.417m3	831.244m3	26.577m3	804.667m3
300.000	0.000m2	0.000m2	18.230m3	5.387m3	849.474m3	31.965m3	817.509m3
350.000	0.000m2	0.000m2	0.431m3	51.166m3	849.905m3	83.131m3	766.775m3
400.000	0.000m2	0.000m2	24.923m3	30.842m3	874.829m3	113.972m3	760.856m3
450.000	0.000m2	0.000m2	43.914m3	5.207m3	918.743m3	119.179m3	799.564m3
500.000	0.000m2	0.000m2	2.194m3	354.765m3	920.937m3	473.944m3	446.993m3
550.000	0.000m2	0.000m2	11.796m3	270.040m3	932.733m3	743.984m3	188.749m3
600.000	0.000m2	0.000m2	30.657m3	36.164m3	963.389m3	780.148m3	183.242m3
650.000	0.000m2	0.000m2	5.514m3	115.362m3	968.903m3	895.510m3	73.393m3
700.000	0.000m2	0.000m2	9.931m3	290.050m3	978.834m3	1185.560m3	-206.726m3

	Footprint (m <sup>2</sup> )	Rock <sup>1</sup> (m <sup>3</sup> )	Mineral soil <sup>1</sup> (m <sup>3</sup> )	Peat <sup>1</sup> (m <sup>3</sup> )	Bulked Peat volume(m <sup>3</sup> ) <sup>2</sup>
T1	830	0	2,485	108	145.8
T2	2014	5,183	1,309	1018	1374.3
T3	1532	1,876	3,370	1193	1610.55
T4	1244	2,384	746	1636	2208.6
T5	1081	2,795	703	553	746.55
T6	739	312	517	775	1046.25
T7	902	682	722	1183	1597.05
T8	754	770	679	794	1071.9
T9	571	0	451	548	739.8
T10	1068	0	2,980	795	1073.25
T11	1152	9	3,226	916	1236.6
T12	638	0	1,089	467	630.45
T13	1359	0	4,030	1867	2520.45
T14	921	0	1,364	1413	1907.55
T15	1110	1,383	1,887	460	621
T16	643	686	193	469	633.15
Substation	-	-	-	20000	27000
Roads	-	-	-	18000	24300
<b>Total (m<sup>3</sup>)</b>	<b>-</b>	<b>16,080</b>	<b>25,751</b>	<b>52,195</b>	<b>70,463.25</b>

## ❑ MATERIAL QUANTITIES



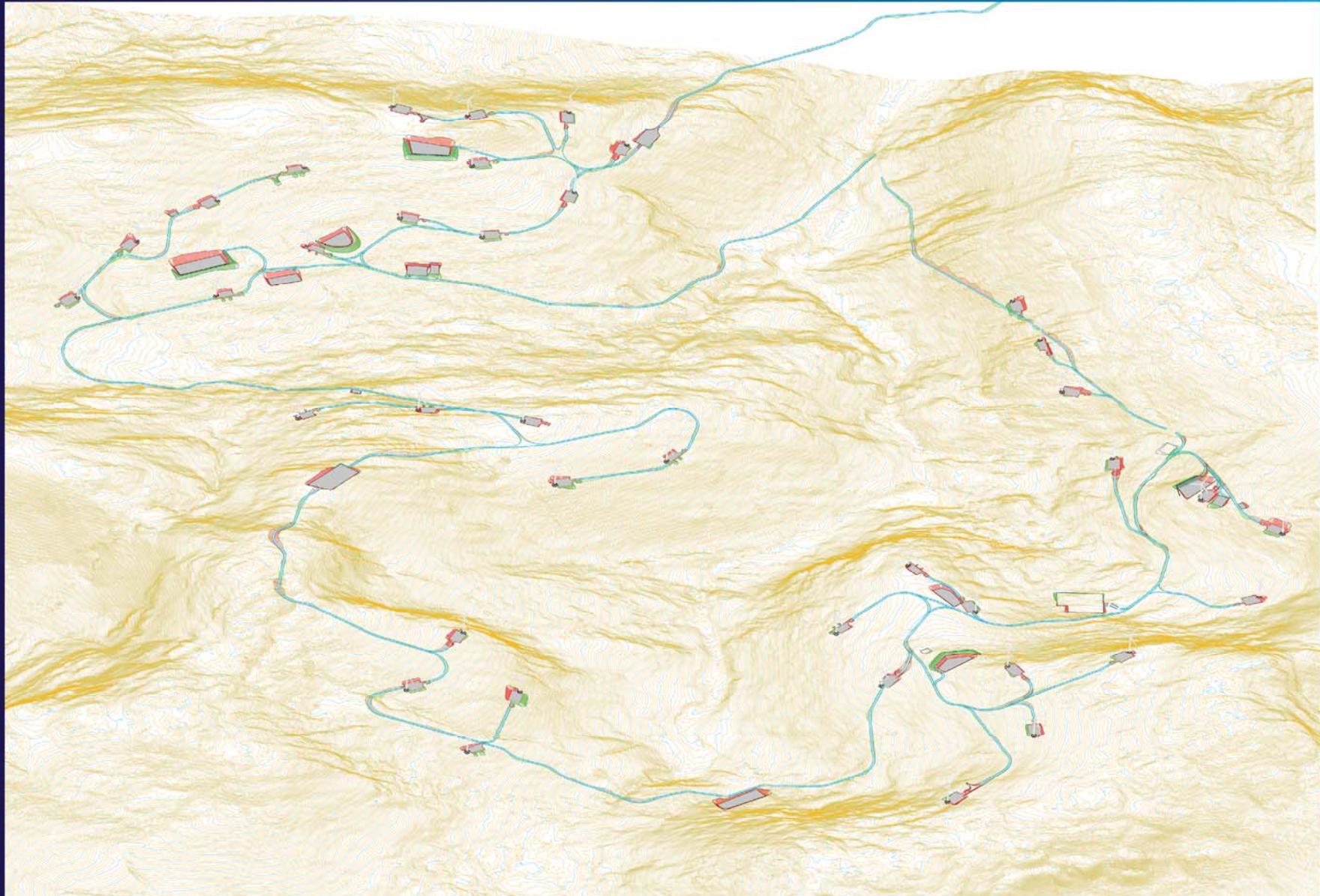
G014



# 3D VISUALIZATION



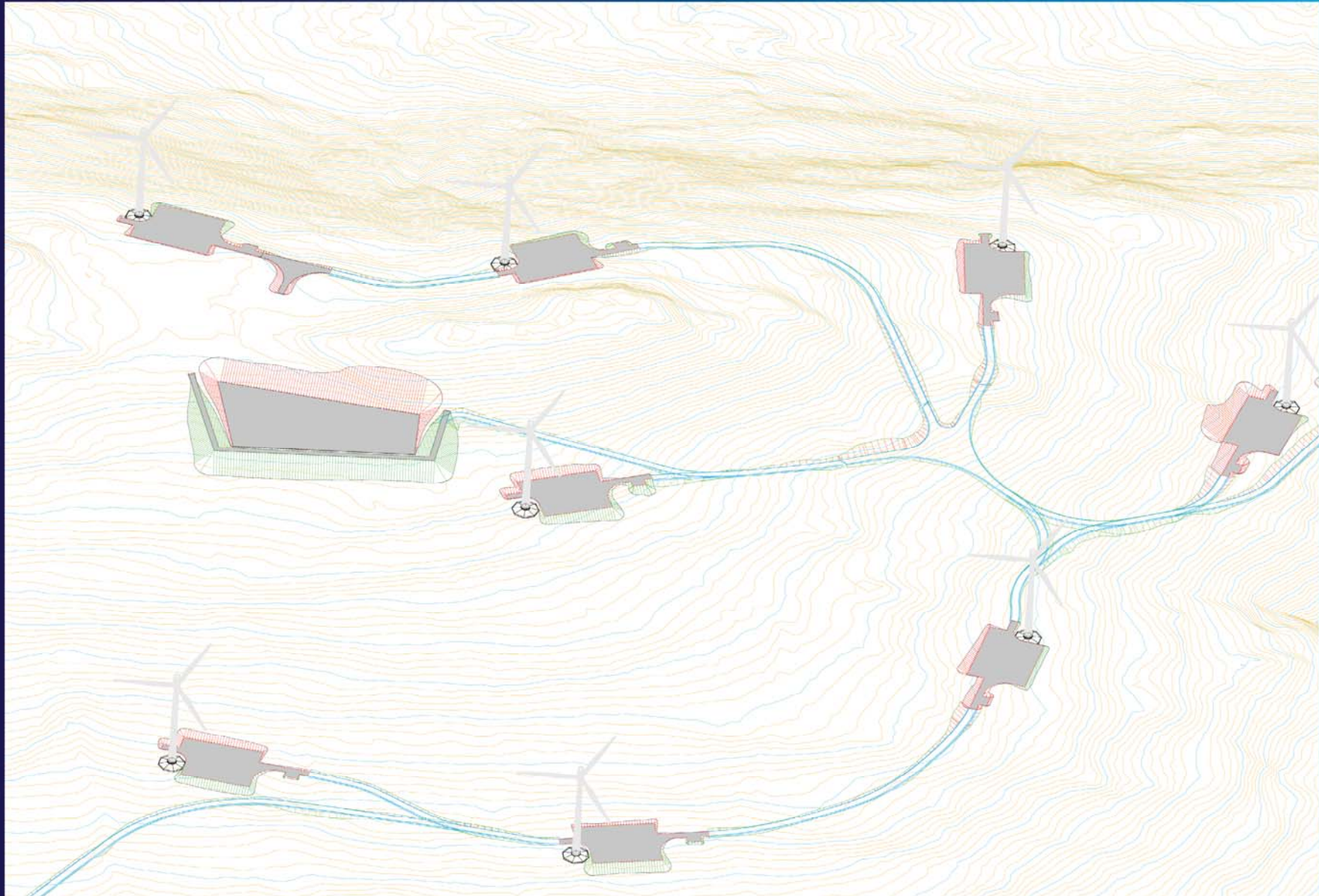
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# 3D VISUALIZATION



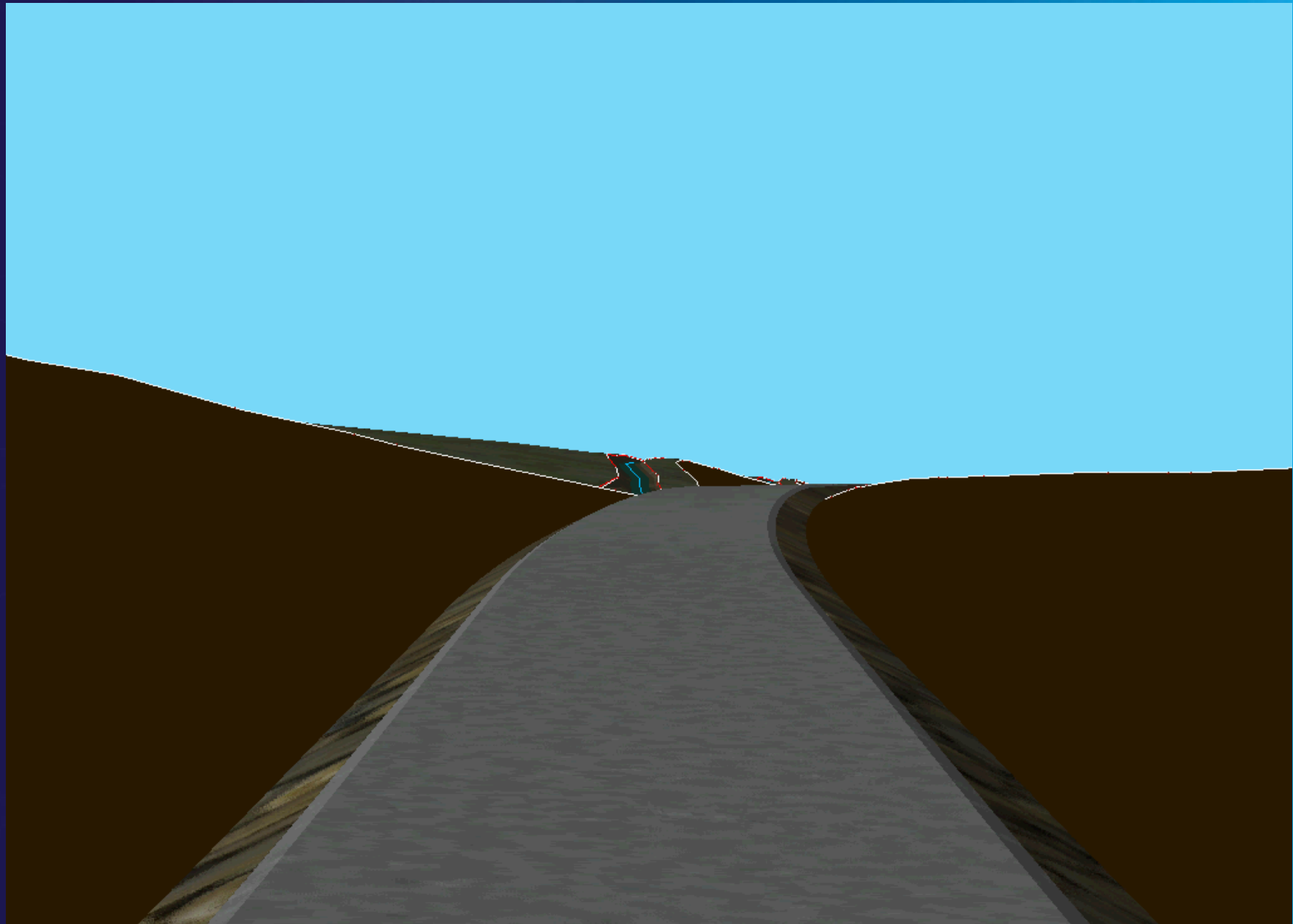
INTERNATIONAL



# 3D VISUALIZATION



INTERNATIONAL



# 3D VISUALIZATION



INTERNATIONAL

