Technics Group
Geospatial Consultant Surveyors

OGC RFI on Underground Infrastructure Mapping and Modelling

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About Technics Group

Technics are a group qualified geospatial consultant surveyors, specialising in all aspects of survey data collection across many sectors.

Relevant Standards Governing our Industry

- British Standards Institute - PAS 128:2014 Specification for underground utility detection, verification and location
- British Standards Institute - PAS 256: Buried assets Collection, recording and sharing of location information data – Code of Practice. Due for launch in April 2017
- British Standards Institute – BS1192:2007+A2:2016 Collaborative production of architectural, engineering and construction information – Code of practice
- RICS professional guidance, global. Measured surveys of land, buildings and utilities 3rd edition
- The Survey Association - The Essential Guide to Utility Surveys
- NJUG - Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus
- Health & Safety Executive - Avoiding Danger from Underground Services
- Highways England - Interim Advice Note 184/14
- Uniclass 2015 – Unified Classification System for the UK covering all construction sectors

Implementations Tried

Technics Land & Utilities CAD and modelling standards document produced, which builds upon the standards/guidance listed above and is included for your information. Our vision is to achieve a unified CAD Standard within our industry, making data sharing via a common data environment more achievable.

Existing Technologies

Mobile multi-channel array ground penetrating radar systems which allow the quick mapping of the underground utilities within large areas.

http://idsgeoradar.com/products/ground-penetrating-radar/stream-em

For the future

Automatic pipe/target recognition GPR collection software, which allows pipes to be mapped automatically in real time, ending the need for labour-intensive and time consuming post processing of data, allowing results to be delivered quicker.

Use Case Studies

Project Details			
Project Name	London Bridge Station Redevelopment		
Type of Survey Undertaken	GPR Utility Survey		
Principal Contractor Reference	Costain – Dean Bain		
Project Value	£190,000	Format of Results	3D Microstation Network Rail Standards through ProjectWise
Project Duration	8 Months		

Technics Team Members

Utility Surveys Lead Surveyor - Tim Pullen
Tim has worked with Technics as an Utility Surveyor for more than 12 years. In that time, he has worked on a number of high profile projects and is specialising in delivering results in Microstation.

Utility Surveyor - Alex White
Alex started with Technics in 2013 as a Trainee and has worked hard to achieve "Surveyor" status. Alex holds qualifications in Confined Space working and breathing equipment.

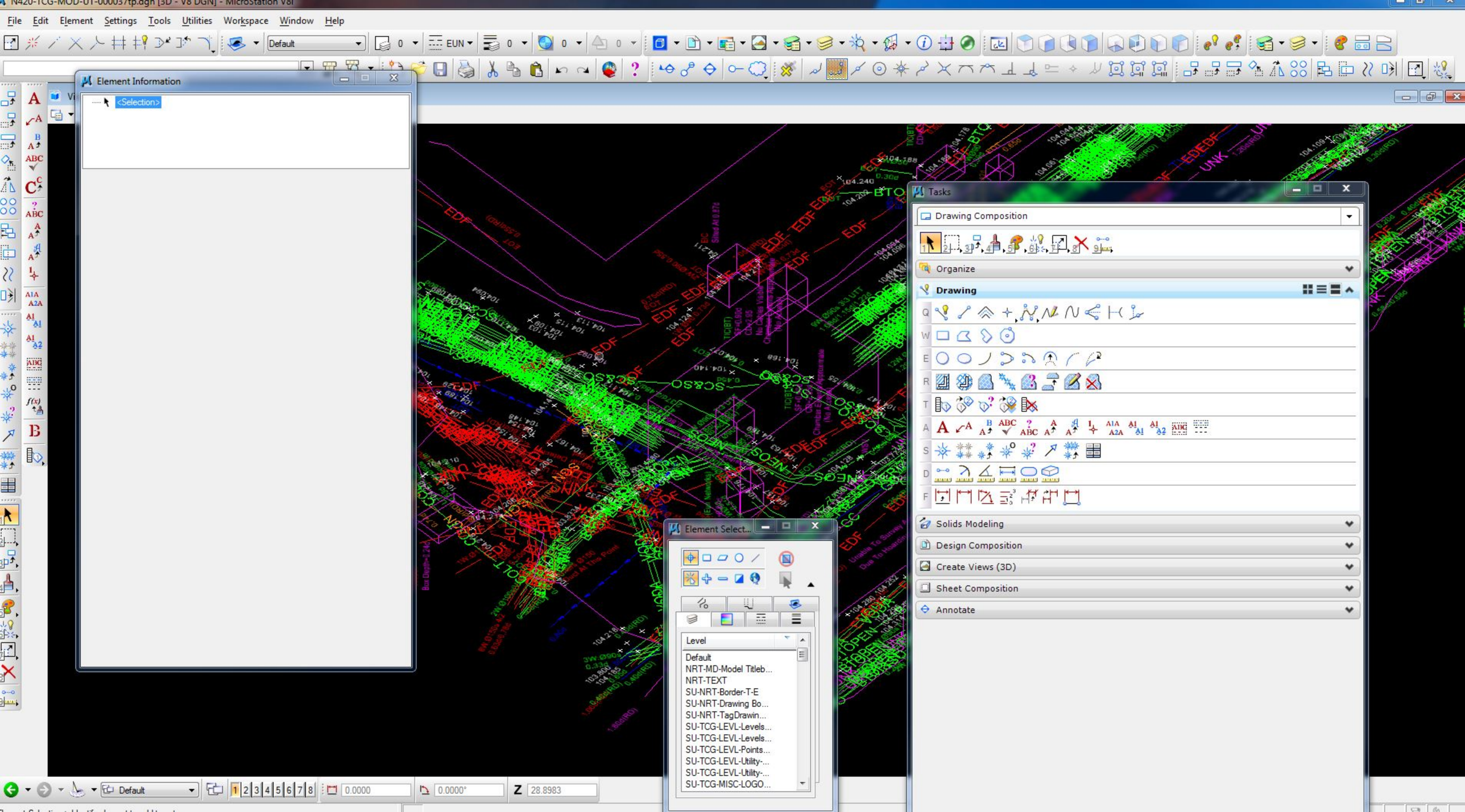
Training:
Tim Pullen – QCF Level 3 and 5
Alex White – QCF Level 3 and 5

Case Study

The project brief was to complete full services detection on all roads and pavements of the surrounding development to inform the design and installation of new station security measures. These included impact bollards and rising bollards.

Project Issues:
- Working in a live construction site
- Working in a functioning railway station
- Cooperation and coordination of Health & Safety Arrangements
- Working and communicating with other contractors working on site to ensure collaborative working
- Working with and in traffic management
- Reviewing and incorporating legacy data and as-built information to produce one holistic model

Project Issues Resolved:
- Cooperation and coordination requirements with others discussed and outlined in pre-contract meeting
- Where there are multiple supplier's method statements & SSoW, these are merged and briefed through Main Contractor
- Co-operation and coordination initially briefed through site induction
- Start of shift nightly or daily briefing meetings held for all contractors and suppliers to identify works overlap, potential conflicts to be addressed and to advise all staff of health and safety implications. This is an ideal time to identify opportunities for collaborative working
- All planned works detailed on task briefing sheets, Health and Safety risks identified and control measures recorded
- All surveyors on site NRSWA Unit 002 trained and traffic management supplied
- All legacy data obtained and reviewed through efficient project management and consultation with the client's Survey CAD Manager at on site meetings to review accuracy and currency.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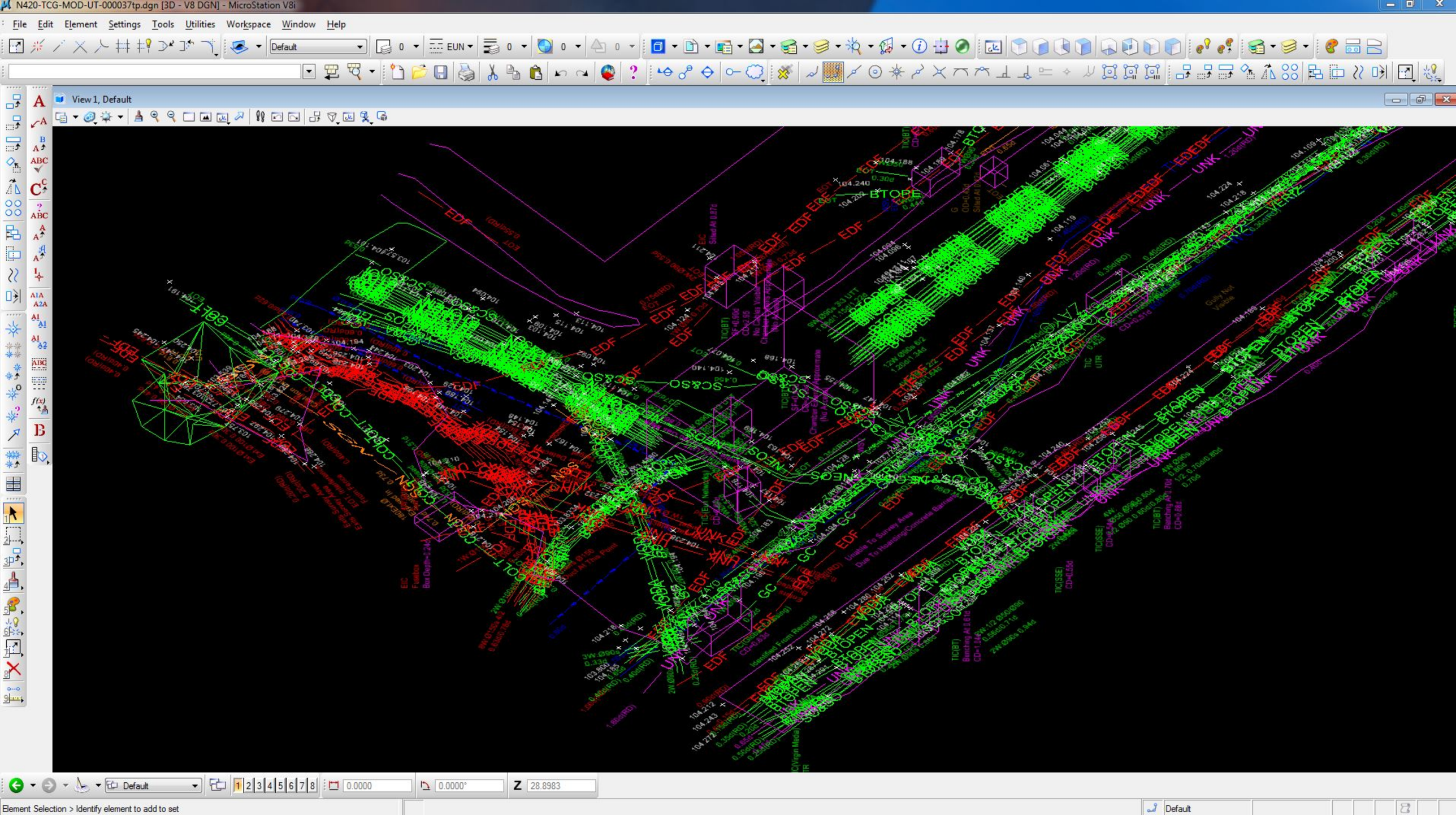
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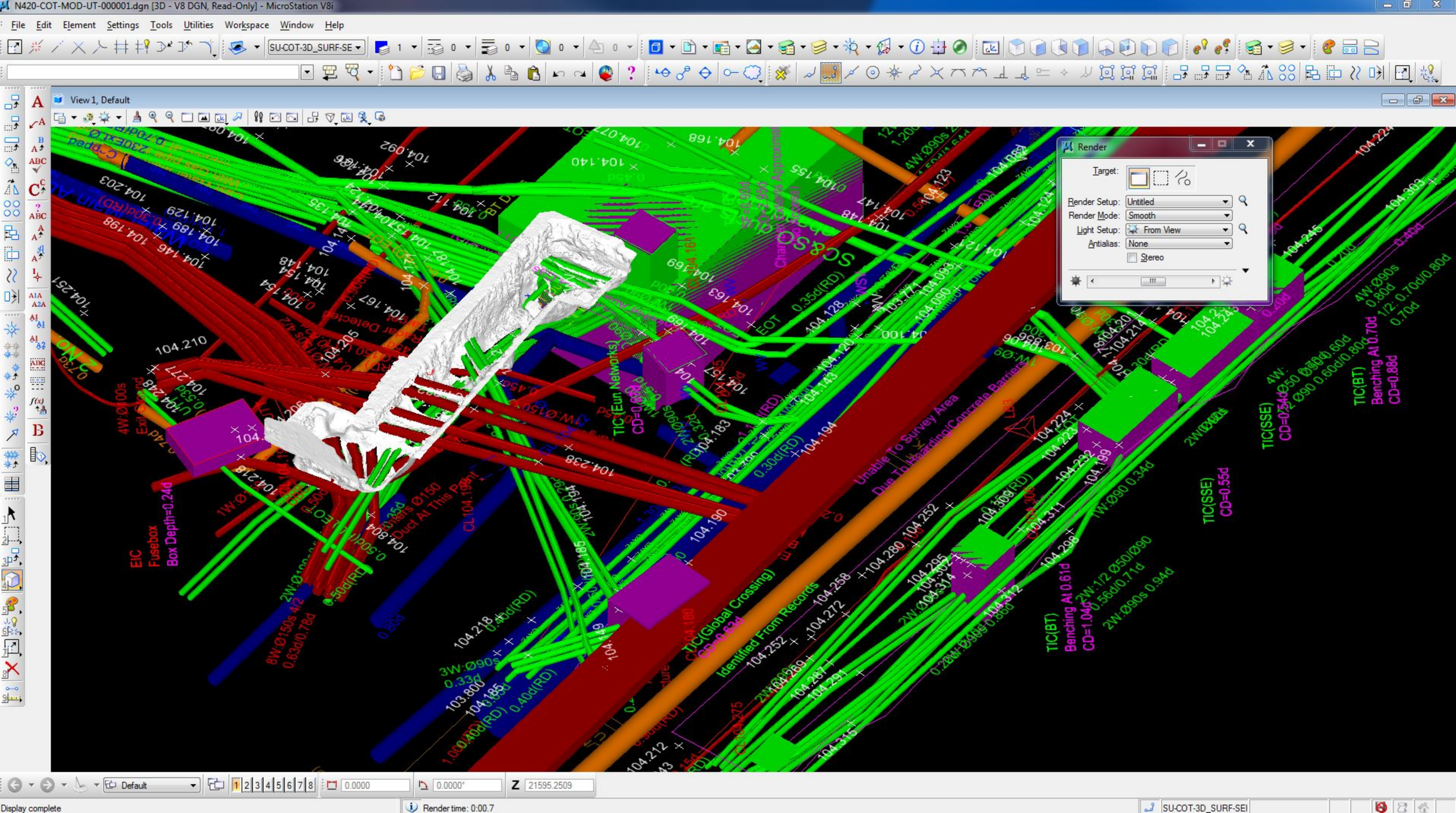
Element Selection > Identify element to add to set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Antialias: None
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Display complete
Render time: 0:00.7
SU-COT-3D_SURF-SEI

Technics

Case Study

Project Details			
Project Name	CPS 1881 – Tranche 4 Schemes, Heathrow Airport		
Type of Survey Undertaken	PAS 128 Utility and 3D Topographical Surveys		
Principal Contractor Reference	Morgan Sindall – Andy Swann		
Project Value	£400,000	Format of Results	3D AutoCAD
Project Duration	10 Months		

Technics Team Members

Utility Surveys Lead Surveyor – Jak Harper
Jak has over 10 years' experience in Utility Surveys at Heathrow Airport and is fully conversant in PAS 128 'Specification for Underground utility detection, verification and location'

Topographical Survey Lead Surveyor – Mark Grimshaw
Mark has over 15 years' experience in Measured Building, 2D and 3D Topographical Surveys.

Training:
Jak Harper
QCF Level 3 and 5 qualifications to work at Airports.

Mark Grimshaw
QCF Level 3 and 5 qualifications to work at Airports.

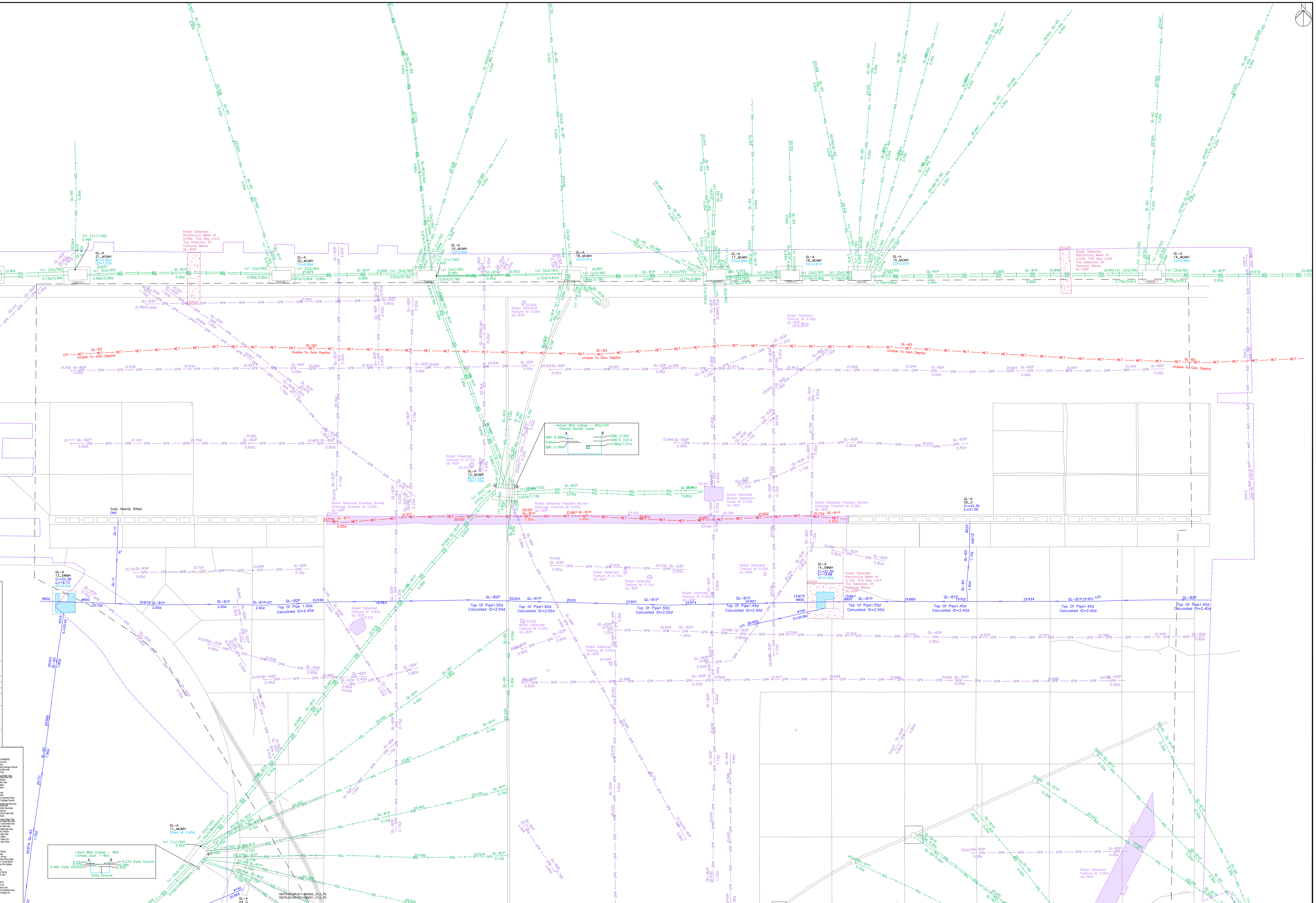
Case Study

The project brief was to complete a full PAS 128 'Specification for Underground utility detection, verification and location' over 8 schemes/areas, with a full 3D Utility Model and a full points and lines 3D Topographical Survey.

Project Issues:
- Working on a live Airport
- Logistics, Full and Temporary Security Passes, on-site H&S Audits
- Working at Night
- Cooperation and Coordination of Health & Safety Arrangements

Project Issues resolved:
- All out of hours working strictly to Heathrow Airport Limited protocols.
- Dedicated in house department dealing with Rapid Screening, logistics, Full, Temporary Passes and weekly on-site progress meetings with all client project managers and design teams. Monthly H&S Audit carried out by Technics Group project manager during the night work shift.
- Task and Floodlighting and associated head and clip on torches.
- Cooperation and coordination requirements with others discussed and outlined in pre-contract meeting
- Where there are multiple supplier's method statements & SSoW, these are merged and briefed through Main Contractor
- Co-operation and coordination initially briefed through site induction
- Start of shift nightly or daily briefing meetings held for all contractors and suppliers to identify works overlap, potential conflicts to be addressed and to advise all staff of health and safety implications. This is an ideal time to identify opportunities for collaborative working.
- All planned works detailed on NAB's\DAB's briefing sheets, Health and Safety risks identified and control measures recorded.
- Emergency reporting process agreed for each site, communicated by main contractor at induction for all suppliers.
- Daily performance review against planned works detailed on NAB's\DAB's, comments addressed and working processes adjusted where applicable.
- Complaints handled through complaints procedure.

Deliverables:
- 3D Utility Model and a full points and lines 3D Topographical Survey.



Quality Level Key

QL-B1P
Horizontal and vertical location of utility detected by multiple geophysical techniques used.
QL-B2 or QL-B2P
Horizontal and vertical location of utility detected by one of the geophysical techniques used. Not including depths from EML equipment
QL-B3
Horizontal location only of the utility, detected by EML equipment and obtaining unreliable Electronic depth readings
QL-B3P
Horizontal location only of the utility, detected by inconsistent GPR responses from post processing and obtaining unreliable depth readings

PAS 128 Quality Level	Heathrow Quality Level	Detection accuracy actually achieved PAS 128	
		Horizontal	Vertical
QL-A	Q1	+/-50mm	+/-25mm
QL-B1P	Q2	+/-150mm	15%
QL-B2	QL-3	+/-250mm	40%
QL-B2P			
QL-B3	Q3	+/-500mm	Undefined(No Reliable Depth Measurement Possible)
QL-B3P			
QL-C	Q7	Unable to detect	
QL-C			
QL-D			

Key

STREET FURNITURE		LEVELS & DEPTHS		INSPECTION CHAMBERS	
AGL	Airport Ground Lighting	A	Approximate	AC	Access Cover
BB	Belisha Beacon	BD	Back Drop Depth	BH	Borehole
BL	Basement Light	BDL	Back Drop Level	CDC	Concrete Drainage Channel
Bin	Litter Bin	CD	Chamber Depth	ELMH	Electric Man Hole
BO	Bollard	CL	Cover Level	ER	Earth Rod
BS	Bus Stop	DPC	Damp Proof Course	FWG	Foul Water Gully
CPO	Concrete Post	EL	Eaves Level	FWMH	Foul Water Man Hole
EC	Electric Cupboard	FFL	Finished Floor Level	FH	Fire Hydrant
EFP	Electric Feeder Pillar	FRL	Flat Roof Level	GIC	Gas Man Hole
EP	Electric Pole	IBDL	Internal Back Drop	GM	Gas Meter
FB	Flower Bed	ID	Invert Depth	GV	Gas Valve
FHM	Fire Hydrant Marker	IL	Invert Level	G	Gully
FL	Flood Light	OD	Outlet Depth	IC	Man Hole
FP	Flag Pole	OL	Outlet Level	KI	Kerb Inlet
FPO	Fence Post	PWL	Parapet Wall Level	LHP	London Hydraulic Power
JB	Junction Box	RL	Ridge Level	MDC	Metal Drainage Channel
GB	Grit Box	SD	Sump Depth	MUMH	Multiple Use Man Hole
GMK	Gas Marker Post	SF	Soffit Depth	MW	Monitoring Well
GPO	Gate Post	SFL	Soffit Level	NFI	No Further Information
IBO	Illuminated Bollard	SiltL	Silt Level	RE	Rodding Eye
LH	Lamp Hole	SL	Sump Level	SDMH	Service Duct Man Hole
LP	Lamp Post	SSL	Structural Slab Level	SV	Stop Valve
LPO	Lockable Post	TFL	Top Of Fence Level	SWG	Surface Water Gully
MK	Marker	THL	Threshold Level	SWMH	Surface Water Man Hole
MPO	Metal Post	TWL	Top Of Wall Level	TCMH	Traffic Control Man Hole
NP	Name Plate	WL	Water Level	TMH	Telecom Man Hole
PB	Post Box			UMH	Unidentified Man Hole
PM	Parking Meter	FENCES & WALLS		UTR	Unable To Raise
RPO	Reflector Post	BW	Block Wall	WMH	Water Man Hole
RS	Road Sign	BRP	Brick Pier	WM	Water Meter
SI	Sign	BRTW	Brick Retaining Wall	WWO	Water Wash Out
STN	Survey Station	BRW	Brick Wall	WSV	Water Stop Valve
Tap	Attached to Wall/Building etc	BWF	Barbed Wire Fence		
TCB	Telephone Call Box	CBF	Close Board Fence	SURFACES	
TL	Traffic Light	CIF	Corrugated Iron Fence	BPav	Brick Paving
TLCB	Traffic Light Control Box	CLF	Chain Link Fence	Conc	Concrete
TP	Telegraph Pole	CPF	Chestnut Paling Fence	CPav	Crazy Paving
TPO	Timber Post	CRW	Concrete Retaining Wall	CPS	Concrete Paving Slabs
		CW	Concrete Wall	FB	Flower / Shrub Border
PIPES & CABLES		CWF	Chicken Wire Fence	KFC	Kidney Flint Cobbles
DBC	Directly Buried Cable	DIL	Dilapidated	T	Tiles
DP	Down Pipe	HR	Hand Rail	Tmac	Tarmac
EOT	End Of Trace	IWF	Interwoven Fence	TPav	Tactile Paving
FWP	Foul Water Pipe	LF	Lattice Fence	TS	Trench Scar
GP	Gas Pipe	MF	Miscellaneous Fence		
ONV	Outlet Not Visible	MRF	Metal Railing Fence	MEASUREMENTS	
RWP	Rain Water Pipe	OBF	Open Board Fence	d	Depth (m)
SP	Stand Pipe	PCF	Post & Chain Fence	Ø	Diameter (mm)
SVP	Soil Vent Pipe	PNF	Panel Fence	Ext.Ø	External Diameter (mm)
UTT	Unable To Trace	PRF	Post & Rail Fence	H	Object Height (m)
VP	Vent Pipe	PWF	Post & Wire Fence		
WP	Waste Pipe	RTW	Retaining Wall		
		STW	Stone Wall		
		SRTW	Stone Retaining Wall		
		WMF	Wire Mesh Fence		

zz12_V7_0_baa-a0l-b

Notes:

1. The base topographical survey is as supplied by the client and has not been checked for accuracy.
2. The topographical survey was produced by Technics Group Limited.
3. The Ground Penetrating Radar was deployed using PAS 128 method M4P and achieved an average depth penetration of 1.65 meters.
4. The Electromagnetic Locator survey was deployed using PAS 128 method M4.
5. A number of technologies were used to obtain the information shown on this drawing. Varying ground conditions can affect the performance of these systems, therefore 100% detection is not guaranteed. Always Exercise Caution When Excavating. See HSG-47.
6. Where electric, metallic & GPR services are illustrated on this drawing as a single utility line, these may represent multiple pipes/cables.
7. Unloaded electric cables or perfectly balanced electric cables may not be detectable using Electromagnetic Radio Frequency locators.
8. GPR radar targets detected to PAS128 QL-M3P show the position of suspected underground linear features, these features have produced an inconsistent response to the radar.
9. It is not always possible to differentiate between construction features and pipes, it is therefore possible that some of the features shown are not pipes or cables.
10. The correct identification of the utility types can not be 100% guaranteed, therefore these should be independently verified prior to use in any design/ building works.
11. Where possible, the ownership of Inspection covers has been derived from information on the covers or from cable tags. This does not necessarily mean that they use or are sole users of the apparatus.
12. All pipe diameters and levels are assumed to be correct, however due to non entry to inspection chambers, these should be verified before any works commence.
13. All utility depths are in meters.
14. All pipe/duct sizes are in millimetres.
15. Copyright of all data produced by Technicsgroup shall remain with Technicsgroup unless otherwise agreed.
16. Information provided should not be altered or modified in any way. It should not be used for any purpose other than for which it was intended and should not be issued to other parties without prior agreement of Technicsgroup.
17. Technicsgroup cannot accept any responsibility for any damage to computer systems which may result from viruses which may be contained in the data provided.
18. If the AutoCAD drawing is being read by any system other than AutoCAD it should be checked against a hard copy. Technicsgroup cannot accept liability for omissions.
19. Dimensions should not be scaled. All dimensions should be checked on site before any fabrication / construction / excavation.
20. The Utility Survey has been surveyed to an accuracy commensurate with 1:200 scale and plotted at 1:100 scale for clarity of information.
21. Drawing to be read in conjunction with Heathrow's Service Protection Process DM No:00000-XX-PR-XXX-000642.

Legend:

ELECTRIC: 11Kv CABLE; 33Kv CABLE; 22Kv CABLE; 11Kv DUCTED; 33Kv DUCTED; LV CABLE; ELECTRIC DUCT; STREET LIGHTING; TRAFFIC CONTROL; EARTHING; AIRFIELD GROUND LIGHTING PRIMARY DUCTED; AIRFIELD GROUND LIGHTING PRIMARY UNDUCTED; AIRFIELD GROUND LIGHTING SECONDARY DUCT; AIRFIELD GROUND LIGHTING CHASE

WATER: POTABLE WATER MAIN; HIGH TEMP HOT WATER; LOW TEMP HOT WATER; FIRE MAIN

GAS: GAS SUPPLY; GAS MAIN

COMMUNICATIONS: GENERAL DUCTS; COMMUNICATIONS DUCT; BAIR CABLE; BASIS CABLE; CCTV CABLE; CONTROL CABLE; FIBRE OPTIC CABLE; BT DUCTED CABLE; BT UNDUCTED CABLE; FIRE ALARM CABLE

DRAINAGE: FOUL PIPE; FOUL PUMPING MAIN; SURFACE WATER PIPE; SURFACE WATER PUMPING MAIN

FUEL: FUEL MAIN

GPR & UNKNOWN: GPR SURVEY AREA; SURVEY AREA; UNKNOWN LINEAR GPR; GPR AREA OF ANOMALY; GPR AREA OF REBAR; UNKNOWN METALLIC PIPE/CABLE; CHAMBER EXTENT; UNKNOWN CHAMBER EXTENT

Model / Content References List - Name, Version & Status:

Technics Group
Geospatial Consultant Surveyors

Key Plan

Ver	Date	Description Of Change	Drn
1.0	25/01/2016	P2 - For Information	AW

Title

Project Name

Location-Level-Sub Series/System-Identifier

Version

Document Uncontrolled When Printed

ISO A0 La

Appendix A

Technics Land & Utility CAD Standards Extracts

Below is an extract from the Technics Land & Utility CAD Standards Document.

1.Definition

1.1 Objectives

This Standard sets out the requirements for all CAD content creation activities undertaken as part of all Technics standard projects. Data consistency and successful collaboration is essential for efficient delivery. Production of compliant structured data allows efficient co-ordination and re-use without loss or misinterpretation.

1.2 Scope

The standard is to be applied by Technics in the composition of all CAD documents except for projects that are governed by an external client CAD standard, such as Heathrow and AWE.

The standard builds on the guidelines defined in BS1192:2007+A2:2016, PAS 128:2014, RICS Measured surveys of land, building & utilities and the AEC(UK) protocol for layer naming.

2.Layer Naming

Layers are used to logically group sets of similar elements. When grouping elements in this manner, it is imperative that the groups can be identified quickly and easily by anyone who needs to access or use the information. This means that the layer names should conform to a consistent naming convention so that everyone always knows where to look for the information they require to "communicate, re-use, and share data efficiently without loss, contradiction or misinterpretation".

Layer naming should be common throughout all types of digital production data. It should not differ for 2D or 3D elements – that is picked up by the filename.

Technics Protocol for Layer Naming provides five fields, the first four are separated by a hyphen or dash and the last field is separated by an underscore. Viewed complete, it provides a unique reference to a logical collection of elements:

Table 2.0 below shows two example layer names.

Role	Classification	Presentation	Quality	Description
U	Ss_55_20_34	M	QLB2P	LowPressureGasMain
G	Ss_30_75_40	M	QLFF	Kerb

Table 2.0