

On-Site Infrastructure North & South



On-Site Infra

David Bristow
Bologna June 2017



- **Current Activities.....South**
- On-Site Characterisation Activities
- Site Design: Progress RIBA 3, 4 News
- Roads
- Underground Services
- Buildings
- Power
- Buildings

Site Characterisation: Geotechnical Site Investigation Study

Geotechnical Contract and Progress



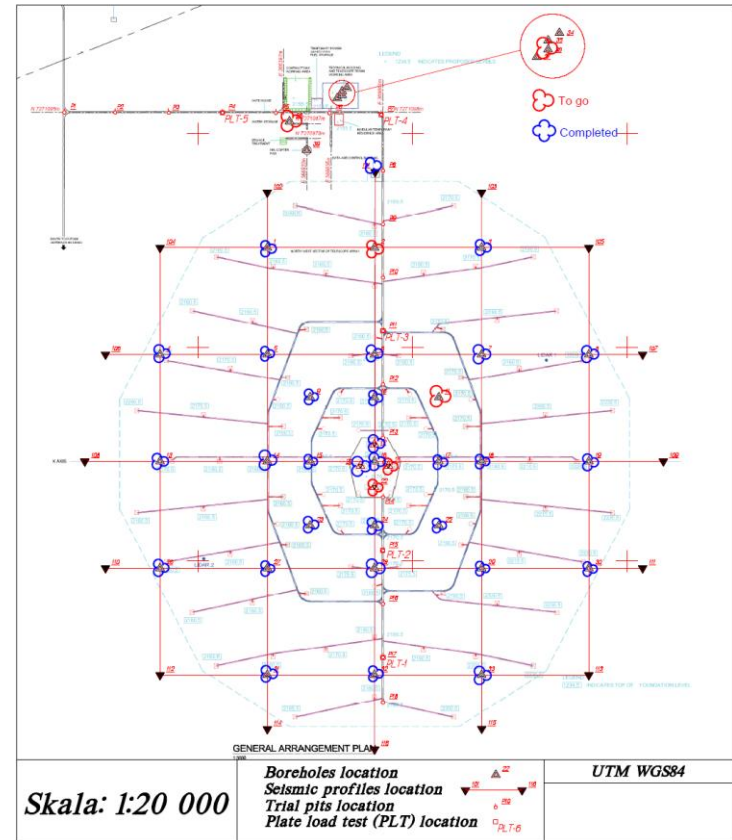
Contract – Geotechnical Site Investigation Study

- On January 30th, 2017, a contract between ESO (on behalf CTAO) and University of Warsaw.
- Site work started on April the 3st, 2017
- All geodetic and geophysics testing / measurement at the site were completed on May the 3st, 2017 (such us; seismic profile and load testing).
- Drilling activities for boreholes started on April 18th, 2017. There is scheduled about 436 meters to be drilled, depending on how deep the fresh rock is found.
- As per May 14st, 2017, 81% of the scheduled meters of drilling has been completed (354 meters), still 82 meters to go in order to complete this work.

DRILLING FORECAST

Borehole Number	Executed (Up to May 14)	To Go	Forecast
Borehole - 01	5.40	0	5.40
Borehole - 02	12.00	18.00	30.00
Borehole - 03	5.00	0	5.00
Borehole - 04	4.50	0	4.50
Borehole - 05	10.00	0	10.00
Borehole - 06	12.00	0	12.00
Borehole - 07	12.00	0	12.00
Borehole - 08	9.50	0	9.50
Borehole - 09	12.30	0	12.30
Borehole - 10	16.70	-	16.70
Borehole - 11	-	10	10.00
Borehole - 12	12.00	0	12.00
Borehole - 13	4.80	-	4.80
Borehole - 14	5.70	-	5.70
Borehole - 15	13.00	-	13.00
Borehole - 16	10.00	0	10.00
Borehole - 17	11.40	-	11.40
Borehole - 18	13.80	-	13.80
Borehole - 19	14.50	-	14.50
Borehole - 20	30.00	-	30.00
Borehole - 21	6.00	4	10.00
Borehole - 22	-	10	10.00
Borehole - 23	3.80	0	3.80
Borehole - 24	15.00	-	15.00
Borehole - 25	12.00	-	12.00
Borehole - 26	5.00	-	5.00
Borehole - 27	14.50	-	14.50
Borehole - 28	12.20	-	12.20
Borehole - 29	8.00	-	8.00
Borehole - 30	4.35	-	4.35
Borehole - 31	16.20	-	16.20
Borehole - 32	30.00	-	30.00
Borehole - 33	12.20	-	12.20
Borehole - 34	-	-	0
Borehole - 35	-	-	0
Borehole - 36	-	30	30.00
Borehole - 37	-	-	0
Borehole - 38	-	10	10
Borehole - 39	-	-	0
Total	353.85	82.00	435.85

Borehole Drilling Forecast



Borehole Plan

Geotechnical Prospection



Geotechnical Activities

Borehole Drilling Rig



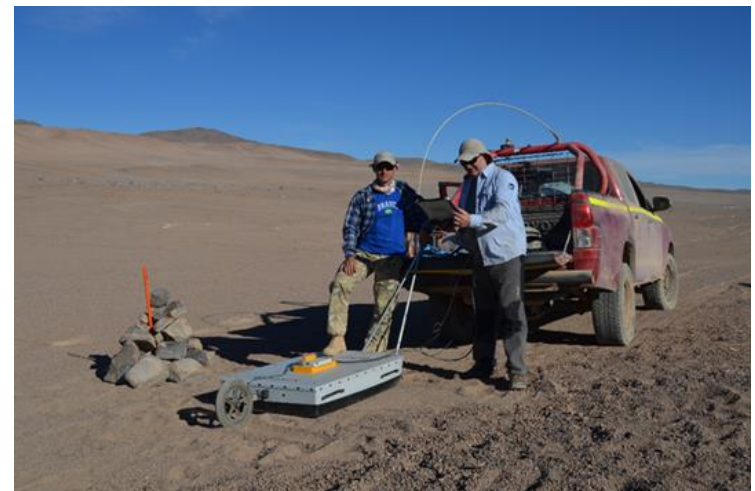
Geotechnical Prospection



Boreholes Site Representation



Plate Load Testing



Geotechnical Prospection



Seismic Profile Measurement



Plate Load Test



Geotechnical Prospection



Boreholes Samples Collection Area - General



Boreholes Samples Collection Area – Samples Selected for Laboratory Test





Example of Boreholes Samples (Number 20 – from 6 to 9 mts)

Geological Framework



Geomorphological Characteristics:

Some conclusions from the study.

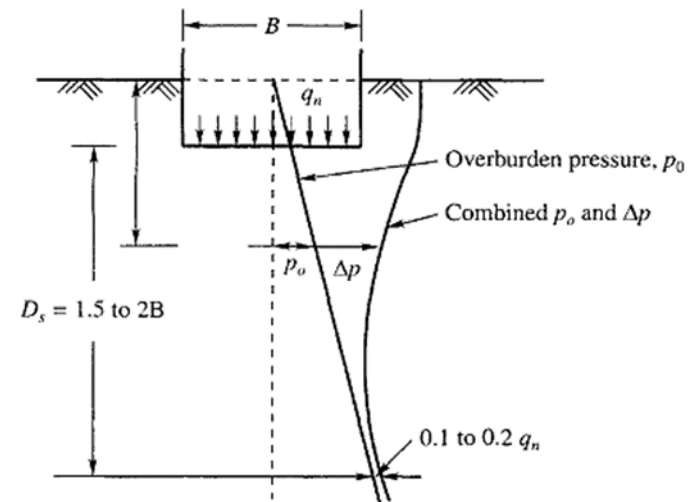
- Wide valley with a flat base
- Slopes are granite covered with a 1 or 2 metre layer of weathered rocks.
- Central part of the valley is filled with sandy soils
- The consistency is very dense (based on SPT test, density index is about 0.90 or more).
- There are deep tectonic structures crossing this valley.



Preliminary Geotechnical Framework



Foundation Type	Shape	Diam	Width	Length	Depth	sqm (m ²)	Weight (Tons) Telescope	Max Static Load Kg/cm ²	Bearing Capacity qf (Kg/cm ²) / SF = 80%	Deep (Ds) Mts	
SST	Square		4	4	1.5	16.00	75	58	0.99	11	7
MST	Square		7	7	1.3	49.00	86	153	0.59	12	7
LST (3)	Circular	26				208.97	116	696	0.40	6	9



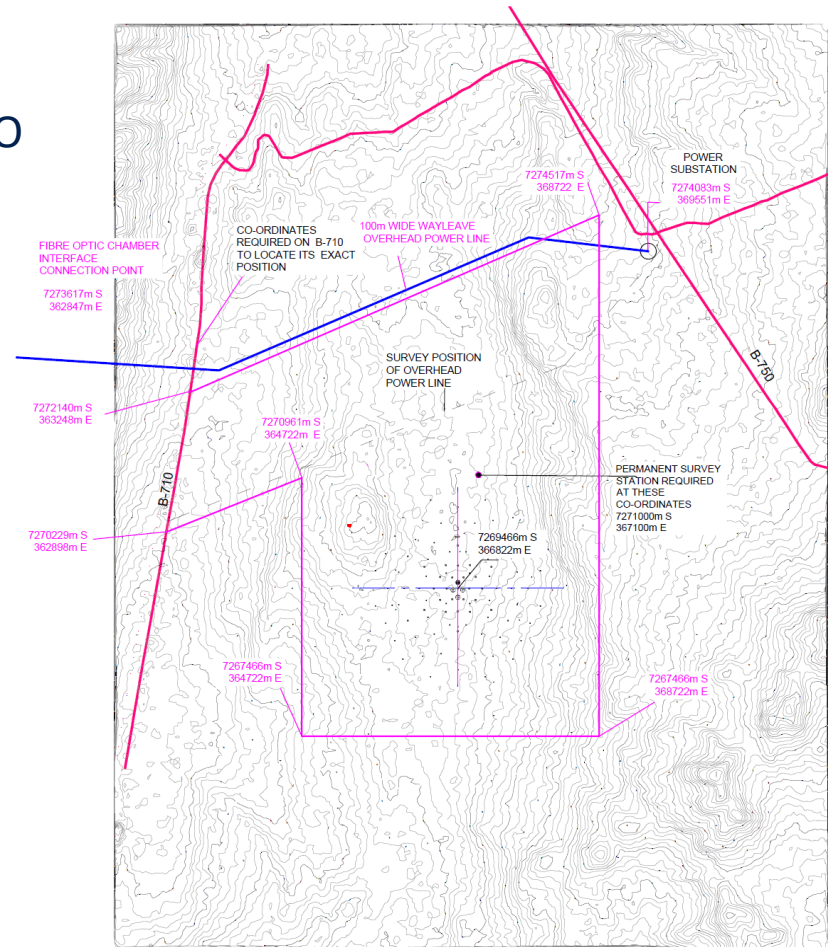
Site Characterisation: Topographical Survey

Topographical Survey



CTA Site defined as per agreement with ESO

Access to the site from the B-710 highway



PLAN VIEW

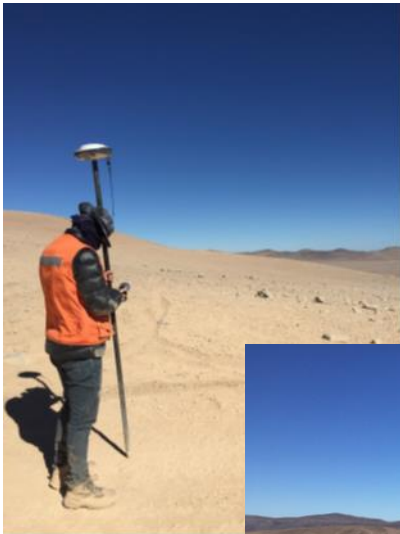


Topographical Survey

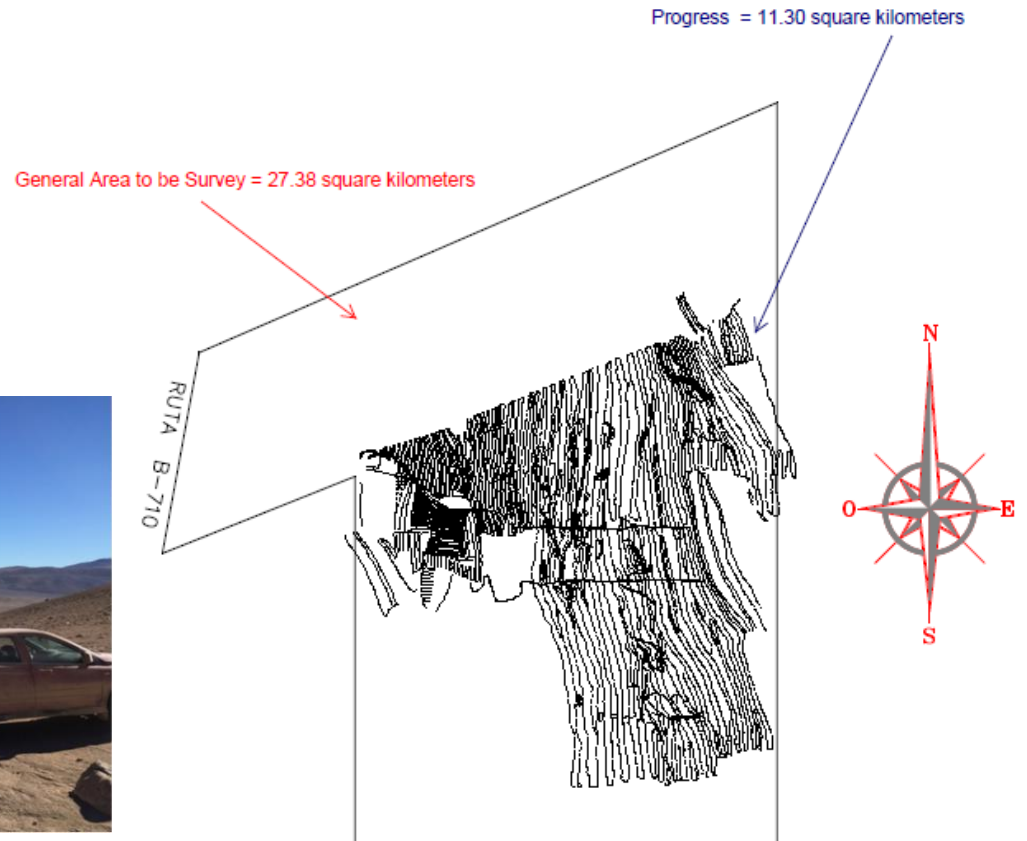


Topographical Survey (UTM WGS84)

- Site work started on May the 5th, 2017.
- Total area scheduled to be survey is 27,38 square kilometers (as per CTAO / ESO Agreement)
- As per May the 14th, 2017, 41 % of the scheduled area has been completed (11,3 square kilometers).

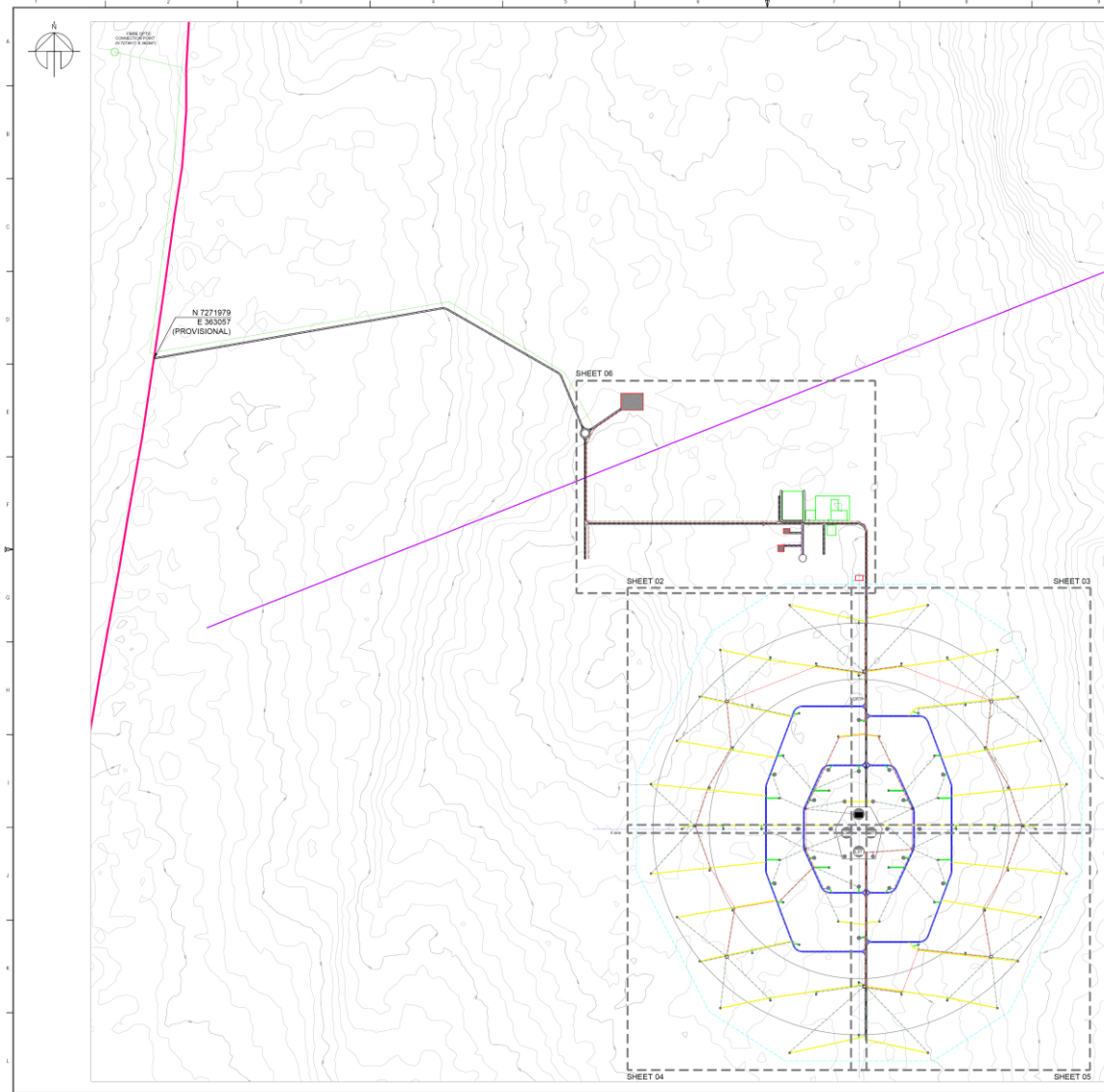


Field Works



Site Design: Progress RIBA 3, 4 News

CTA-South General Arrangement



NOTES

1. ARRAY NORTH IS ROTATED 0.890° RESPECT TOP GEOGRAPHIC NORTH
2. THE COORDINATES OF THE SITE ARE GIVEN IN THE UTM SYSTEM
3. ALL DIMENSIONS ARE IN MM AND ALL ELEVATIONS ARE IN M

- EXISTING ROADS
- POWER SUPPLY CABLE
- POWER AND NETWORK MAIN RING
- - - POWER SUPPLY DUCTS
- - - NETWORK DUCTS

PLAN VIEW
SCALE 1:10000

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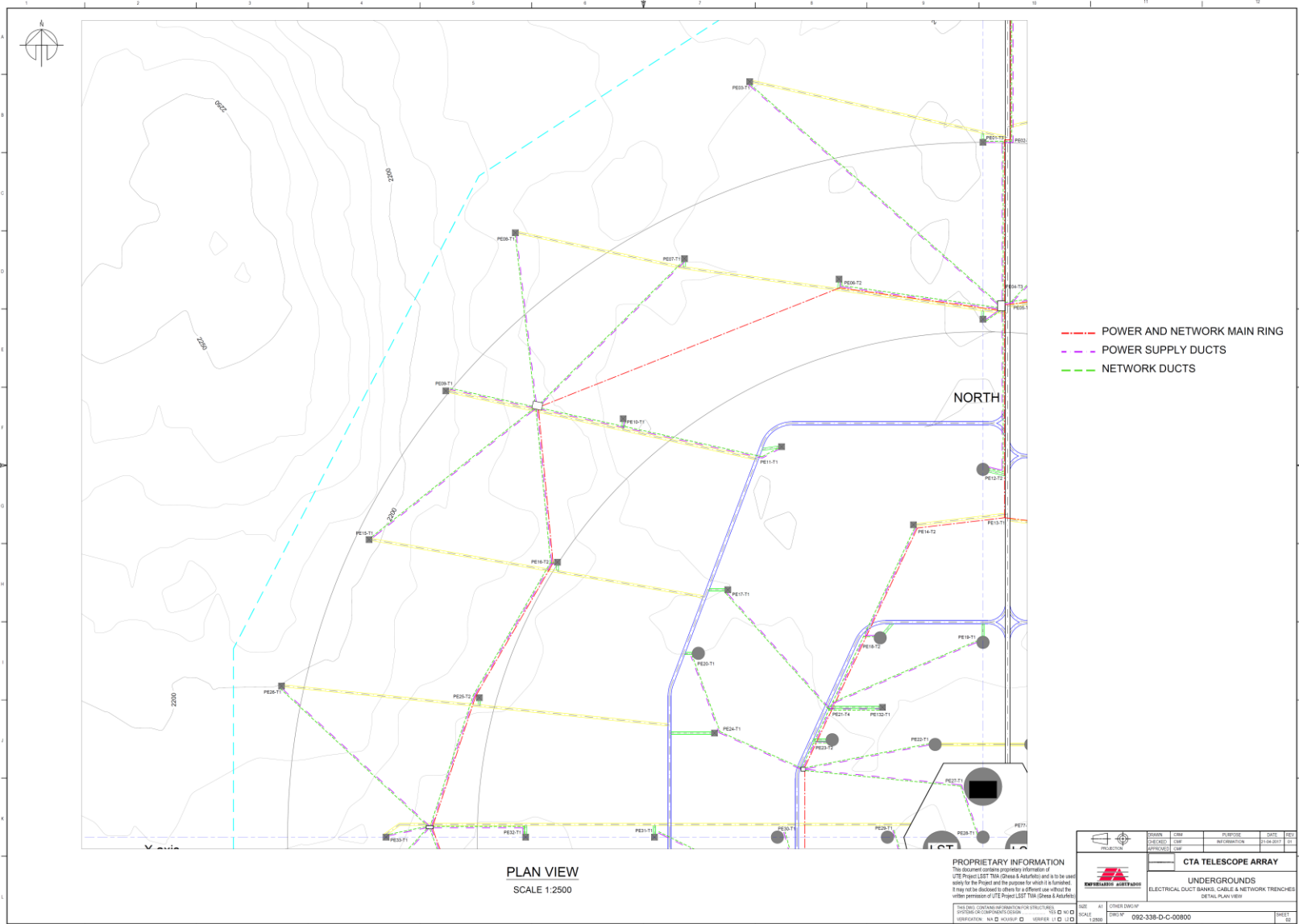
THESE DOCUMENTS ARE PREPARED FOR STRUCTURES
IN THE INTEREST OF COMPANIES DESIGN

NO.	DATE	BY	REVISION
01	2017.04.20	OMP	DESIGN INFORMATION
02	2017.04.20	OMP	DESIGN INFORMATION
03	2017.04.20	OMP	DESIGN INFORMATION

CTA TELESCOPE ARRAY	
UNDERGROUNDS	
ELECTRICAL DUCT BANK, CABLE & NETWORK TRENCHES GENERAL PLAN VIEW	

NO.	002-338-D-C-00800
SCALE	1:10000
DATE	2017.04.20
BY	OMP
CHECKED	OMP
DESIGNED	OMP
APPROVED	OMP

CTA-South Underground Ducting Layout



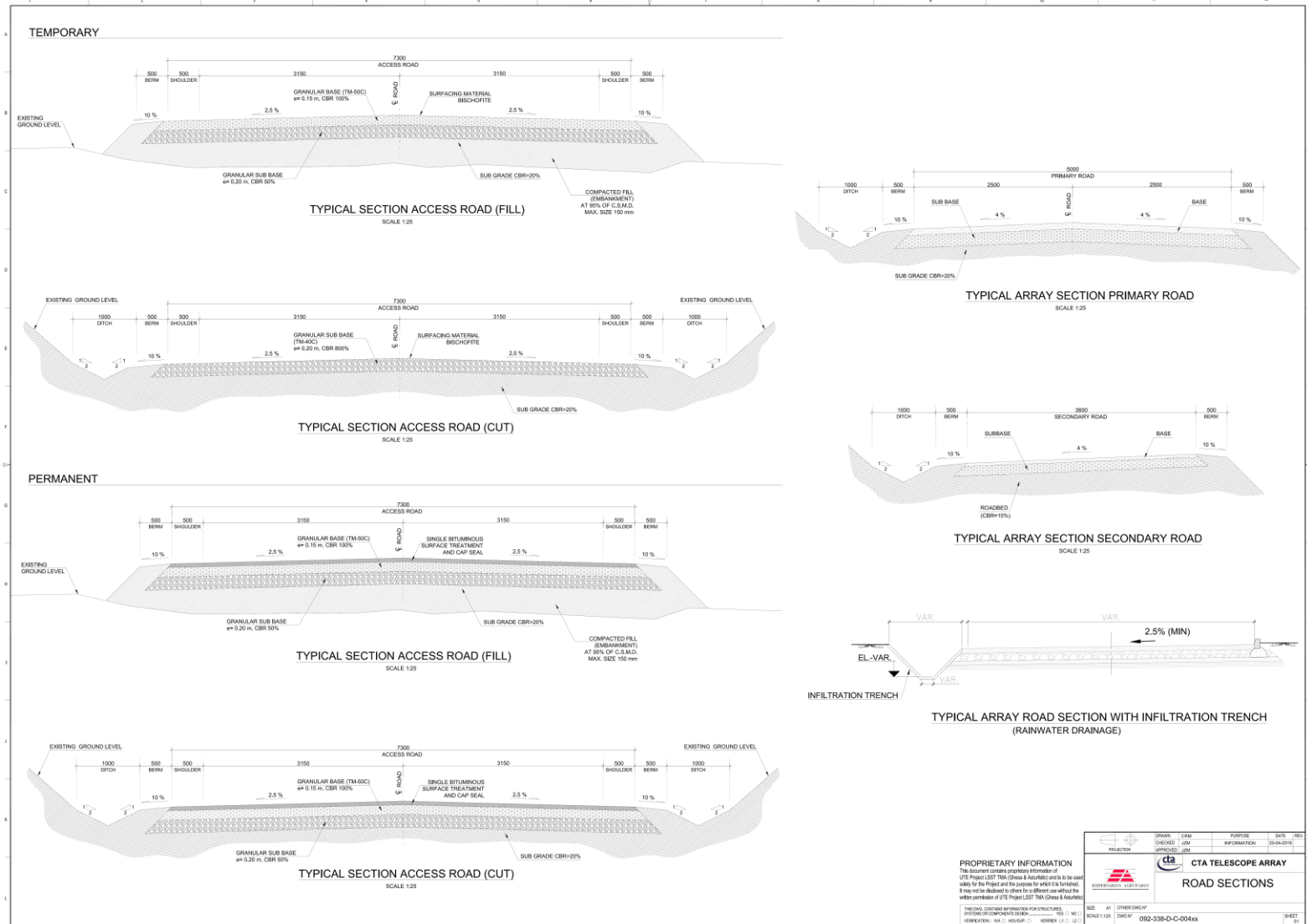
- - - POWER AND NETWORK MAIN RING
- - - POWER SUPPLY DUCTS
- - - NETWORK DUCTS

PLAN VIEW
SCALE 1:2500

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	DESIGN	CHK	REVISED	DATE	REV
	APPROVED	EMP	SCHEMATIC	01/20/2017	01
CTA TELESCOPE ARRAY					
UNDERGROUNDS					
ELECTRICAL DUCT BANKS, CABLE & NETWORK TRENCHES DETAIL PLAN VIEW					
OWNER: CTA SCALE: 1:2500 DRAWN: 092-338-D-C-00800 SHEET: 08		PROJECT: 092-338-D-C-00800 SHEET: 08			

CTA-South Road Types & Sections

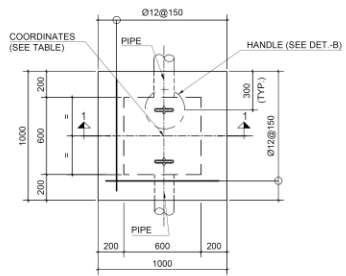


REVISION	DATE	BY	CHKD	APP'D	DESCRIPTION

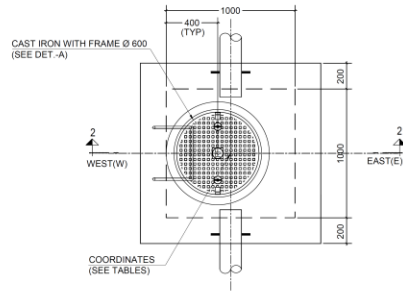
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BASE: A1 SCALE: 1:25 DWG NO: 092-338-D-C-004xx	SHEET: 01
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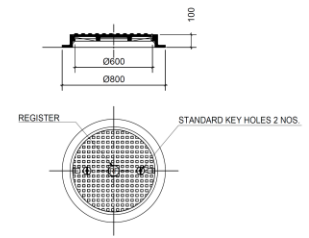
CTA-South Underground Services



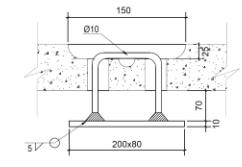
SANITARY PIT (S.P.)
1:15



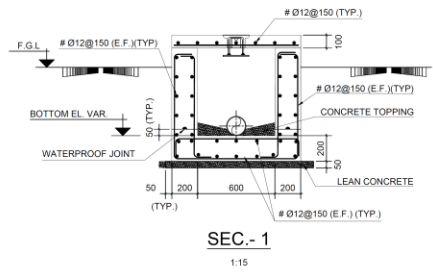
SANITARY MANHOLE CAST IRON COVER (S.M.)
1:15



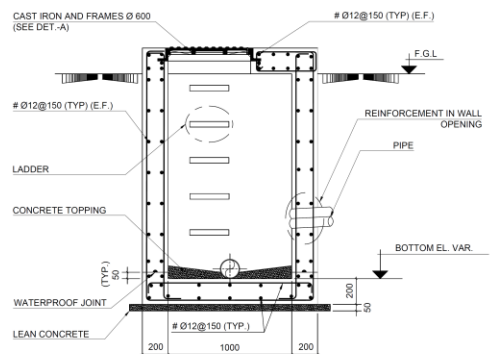
DET.-A FOUNDATION ISOLATION COVER



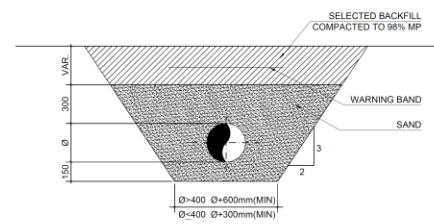
DET.-B HANDLE
N.T.S.



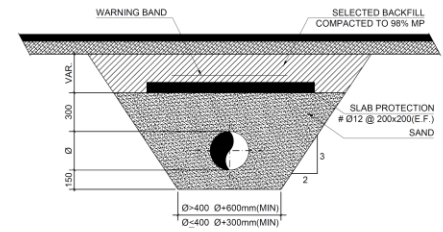
SEC.- 1
1:15



SEC. 2
1:15



TRENCH WITHOUT TRAFFIC LOAD
1:15



TRENCH WITH TRAFFIC LOAD
1:15

SANITARY WATER MANHOLE (S.M.)			
ITEM	COORDINATE X	COORDINATE Y	ORIENTATION
COVER			
S M-01	366421.002	7270983.935	N
S M-02	366468.425	7270983.935	N
S M-03	366516.049	7270983.935	E
S M-04	366516.049	7271024.741	E
S M-05	366516.049	7271065.597	E
S M-06	366516.049	7271093.338	E
S M-07	366465.549	7271093.338	N
S M-08	366415.049	7271093.338	N
S M-09	366364.549	7271093.338	N
S M-10	366516.049	7271106.403	W
S M-11	366568.253	7271106.403	N
S M-12	366619.957	7271106.403	N
S M-13	366672.361	7271106.403	E
S M-14	366672.361	7271093.338	W
S M-15	366713.150	7271093.338	N
S M-16	366763.550	7271093.338	N
S M-17	366813.950	7271093.338	N
S M-18	366838.732	7271079.415	NE
S M-19	366854.732	7271054.143	E
S M-20	366854.732	7271007.749	E
S M-21	366854.732	7270961.354	E
S M-22	366854.732	7270914.860	E
S M-23	366854.732	7270868.566	E
S M-24	366854.732	7270822.171	E
S M-25	366316.949	7271093.338	N
S M-26	366295.549	7271093.338	N
S M-27	366214.149	7271093.338	N
S M-28	366162.749	7271093.338	N
S M-29	366111.349	7271093.338	N
S M-30	366059.949	7271093.338	N
S M-31	366008.549	7271093.338	N
S M-32	365957.149	7271093.338	N
S M-33	365905.749	7271093.338	N
S M-34	365854.349	7271093.338	N
S M-35	365802.949	7271093.338	N
S M-36	365751.549	7271093.338	N
S M-37	365700.149	7271093.338	N
S M-38	365648.749	7271093.338	N
S M-39	365597.349	7271093.338	N
S M-40	365545.949	7271093.338	N
S M-41	365494.549	7271093.338	N
S M-42	365443.149	7271093.338	N
S M-43	365391.749	7271093.338	N
S M-44	365336.651	7271077.448	N
S M-45	365336.651	7271026.049	E
S M-46	365336.651	7270974.648	E
S M-47	365336.651	7270923.248	E

SANITARY WATER PIT (S.P.)		
ITEM	COORDINATE X	COORDINATE Y
S P-01	366672.361	7271121.536
S P-02	366672.361	7271087.165
S P-03	366568.253	7271089.750
S P-04	366840.256	7270822.171
S P-05	366317.005	7271091.403

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CTA TELESCOPE ARRAY
UNDERGROUNDS
SEWAGE DRAINAGE SYSTEM
IN DETAIL

Building Modelling: Technical Building Studies



3D Image of Technical Building



3D Image of Data Control Building

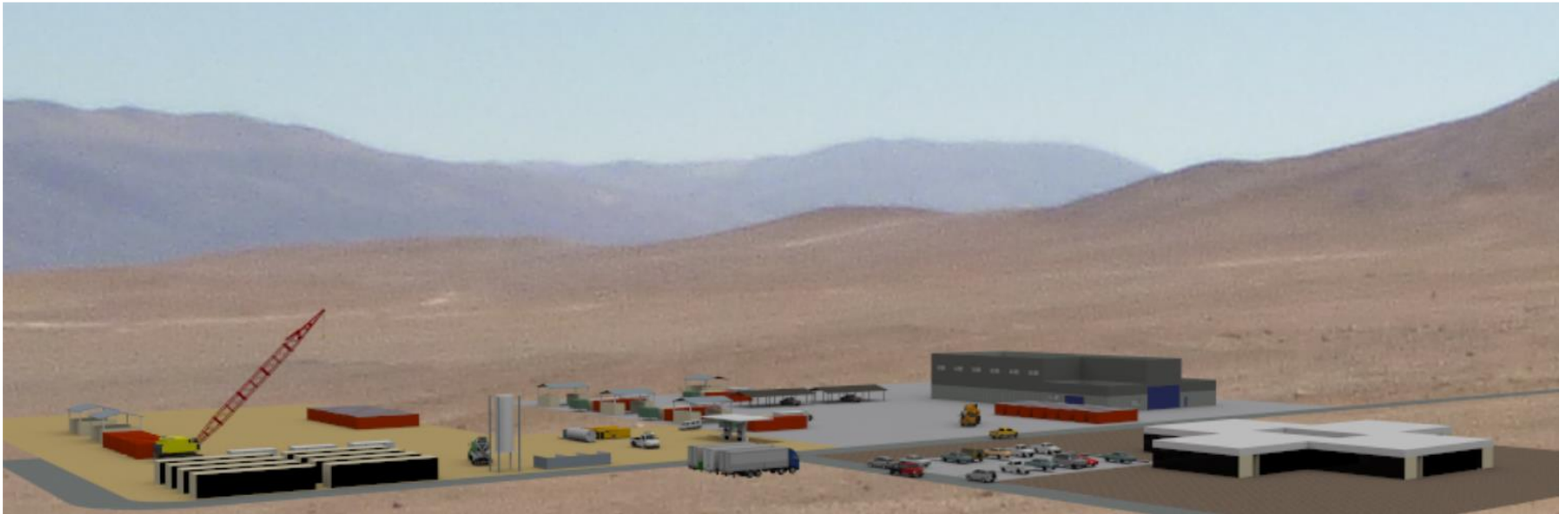


3D Image of Data Control Building

CTA-South



3D Image of Data Control Building



3D Image of Final Site Layout

Forthcoming Activities.

- INFRA Technical workshop in Bologna 8th June
- Internal reviews of RIBA studies
- Final Report - Geotechnical Site Investigation Study
- External Design Authority Reviews



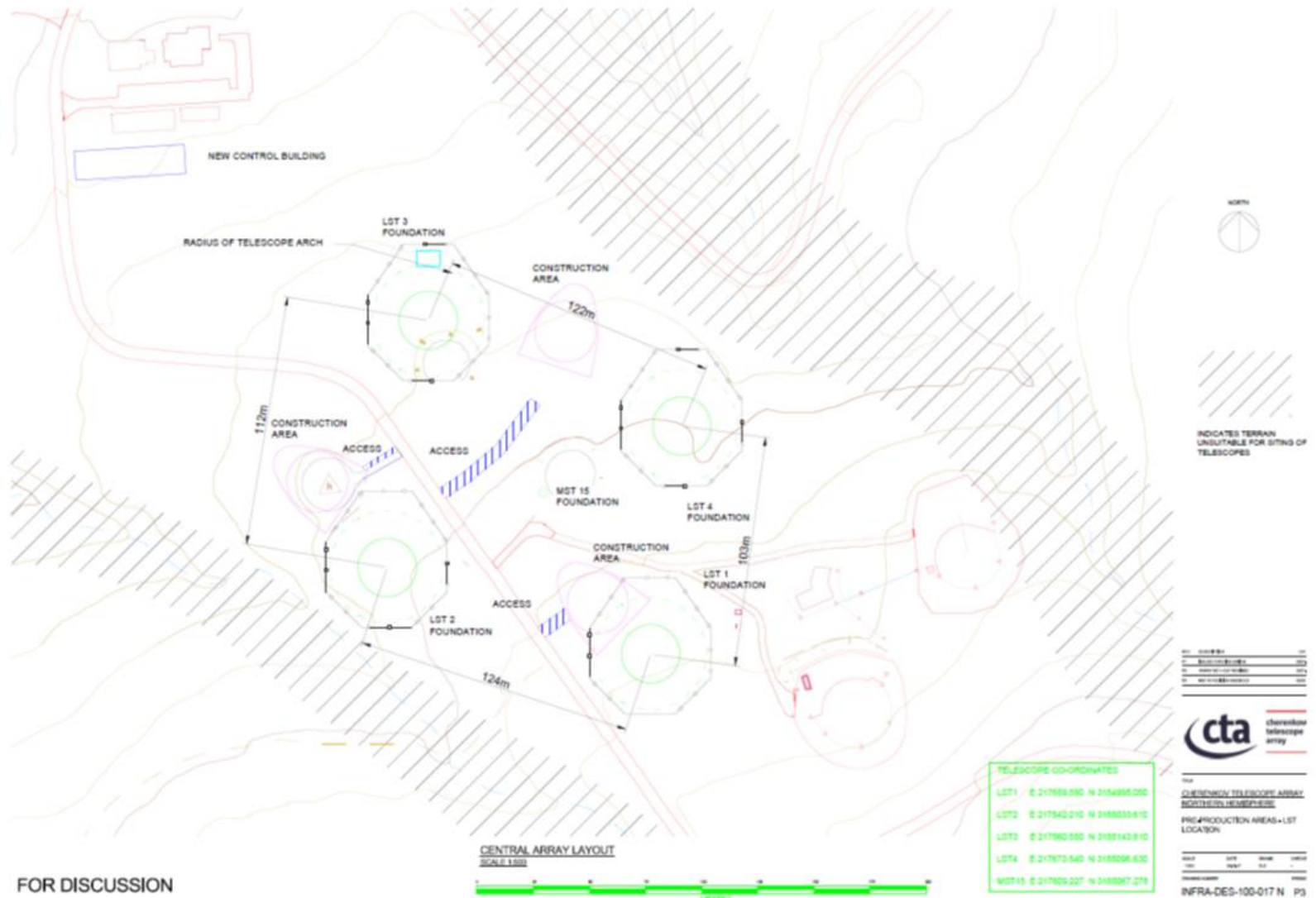
CTA - NORTH

Current Activities.....

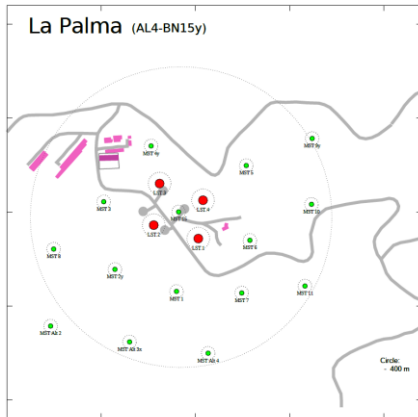
CTA – North Site Characterisation Activities

Topographical Study - permits and approvals – awaiting permission to start site activities.

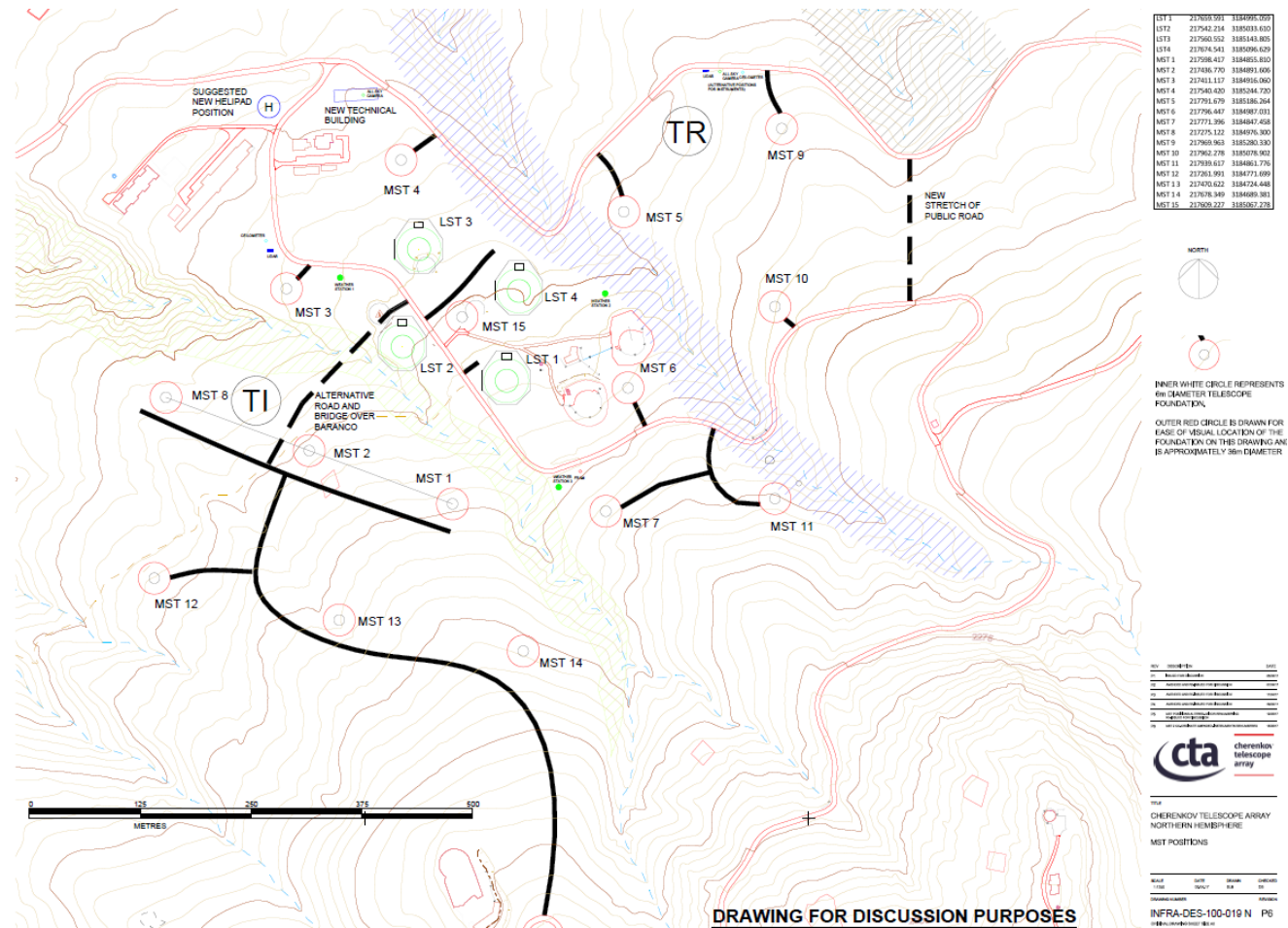
- LST – Telescope positions/coordinates agreed
- MST – Telescope positions/coordinates agreed
- CCF Equipment, Lidar, FRAM, Ceilometer, All Sky Camera



CTA-North Site General Arrangement



AL4-BN15y layout: 4 LSTs, 15 MSTs



DRAWING FOR DISCUSSION PURPOSES

Site Plan: MST Layout



Artist Impression of Operations Building – Front Elevation



Artist Impression of Operations Building – Rear Elevation



Artist Impression of Operations Building – Front Elevation

Forthcoming Activities:

Start the Tender Process for LST2-4, MST15 and MST? Plus supporting foundations Design

Commission Geotechnical Site Investigation Study

Start the Tendering Process for RIBA Design contracts looking at the site holistically, considering planning and environmental and IAC considerations at the ORM.

The End



Thank you.

Infrastructure North & South



WP10 CSI

On site ICT and Power Infrastructure

Presentation provided by: **Carla Crovari**

c.crovari@cta-observatory.org

Rio de Janerio May 2017



1. **On site ICT Infrastructure (subWP in WP10 CSI, Central Scientific Instrumentation)**
 - **Team and Scope**
 - **Status Update and Next steps**
 - **General Diagram**
2. **On site Power Infrastructure (belong to WP 2. Infra)**
 - **Team and Scope**
 - **Status Update and Next steps**

Team

Coordinator: Carla Crovari (PO)

Technical Leader: Peter Wegner

Technical team: Rico Lindemann

Scope

Technical design and planning of the On-site Data Centers for both CTA sites, including:

Networking : interconnection of all installed components, i.e. telescopes, cameras, auxiliary devices, and camera servers to the central computing and storage facilities. Plus external connection via a firewall to the outside world.

Computing/ storage : architecture of the compute and storage servers, specifications of the hardware.

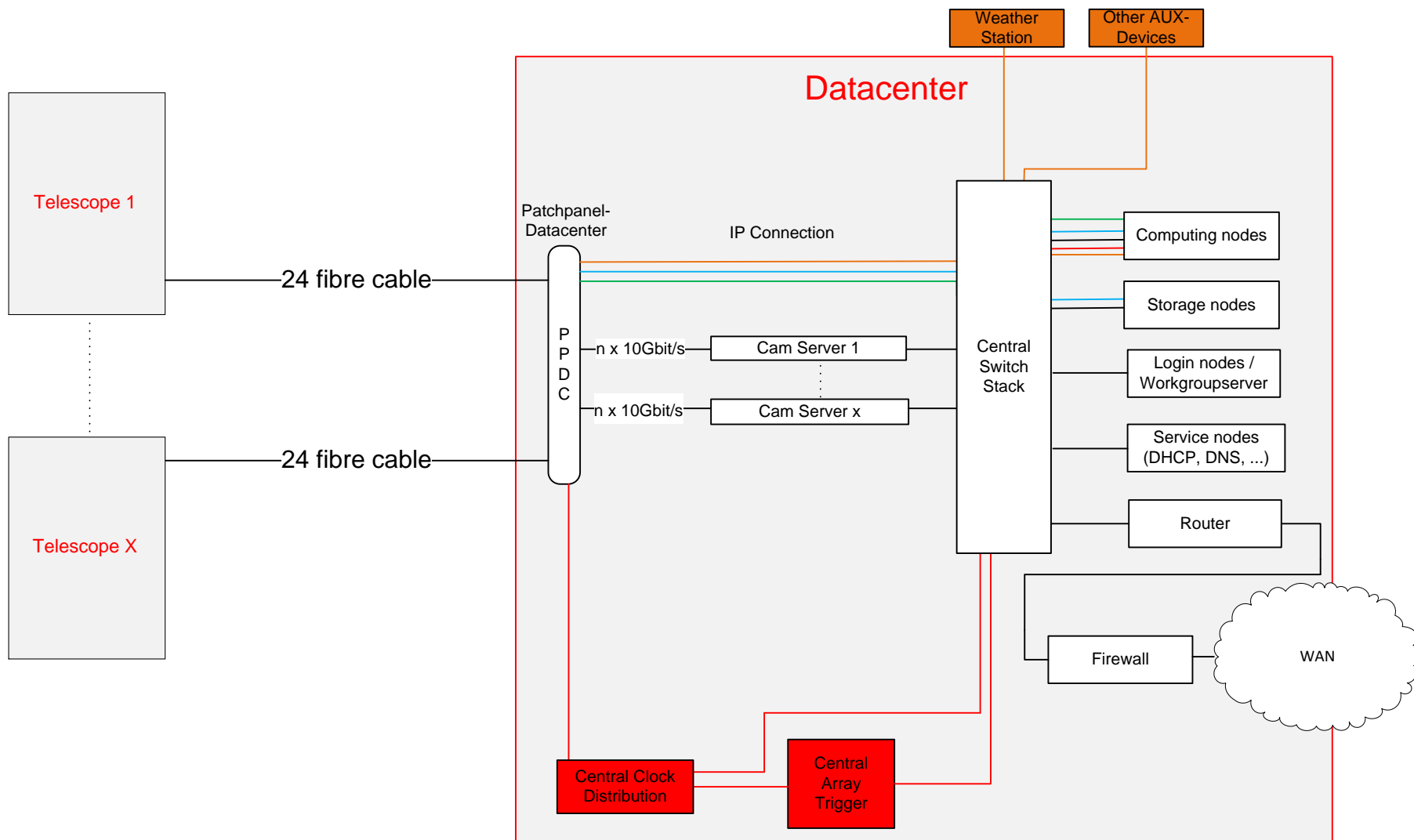
System software: like operating system, system services, monitoring tools.

On site ICT Infrastructure: Status Update and Next steps



- **Status Update:**
 - **Update documentation (work in progress. Existing TDR from ACTL group before reshuffle)**
 - **CTA North**
 - **Provide Specifications for LST – University of Tokyo tendering process for Equipment for on site Datacenter**
- **Next Steps**
 - **Integration of CCF, Central clock and timing system**
 - **Planning for CTA South tendering process**

On site ICT Infrastructure Preliminary Diagram



Power Infrastructure



Coordinator: **Carla Crovari (PO)**

Scope:

Design of the Power Distribution system in the sites CTA North and South. Including the following items and in accordance to RAMS requirements:

- Connection to the grid
- Backup Power system
- Distribution network to connect the Telescopes, Operational Buildings including Datacenter, and Calibration instruments.
- Both power and fiber network topologies will to be coincident.

Power Infrastructure: Status Update and Next steps



- **Status Update May 2017**
 - **New Requirements for the Requirements Database Jama. (Power reqs were missing)**
 - **For CTA North:**
 - **Conceptual study for Power Distribution (in elaboration with Consultant company, Fichtner).**
 - **Proposal for Array layout and Operational building**
 - **Coordination with IAC and the Power Operator (Endesa)**
 - **For CTA South:**
 - **Conceptual study for Power Distribution was elaborated in the last years**
- **Next Steps**
 - **Reviews of Concept Designs North and South**
 - **For CTA South, Coordination with ESO**
 - **Tendering processes for Design**
 - *Please contact Carla for further information...*

The End



Thank you.