**South site infrastructure RIBA Stage 3 Developed Design Review Plan -Civils Phase 1**

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| **This Version:** | | | | |
| Ver. | Created | Comment | Distribution | Corresponding... |
| 0.1 | 2017-12-18 | First version, for PM Approval | internal | Editor: Steve Brown  Checker:  Approver: |

**Keywords:**

Civil Engineering, Infrastructure, CTA South, Review Plan

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| **Version History:** | | | | |
| Ver. | Date | Comment | Distribution | Corresponding... |
| 0.1 | 2017-12-11 | Initial version | internal | Editor: Steve Brown |

# Introduction

The RIBA stage 3 Civil Engineering (Phase 1) infrastructure developed design carried out by Emprasarios Agrupados (EA) for the Southern Observatory located close to Paranal, Chile in an area operated by ESO is a progression of the Concept Design (RIBA stage 2) study, this being a single document created from several specialist reports and Technical Design Reviews dated between Sept 2014 and July 2016.

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| REFERENCE | DATE | DOC No |
| CTA INFRASTRUCTURE CONCEPT DESIGN RIBA STAGE 2 | 8TH JULY 2016 | 140502 V3.3 |

EA have used this document as their brief for the project and produced developed infrastructure general arrangement designs for the site approach and array roads, underground service routing and building locations.

The following drawings produced by CTA INFRA are for reference and give an overview of the concept Civil design works

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| --- | --- |
| DRAWING NO. | TITLE |
| INFRA-DES-100-023-S-P3 | INFRASTRUCTURE AREA ARRANGEMENT AND PHASING PLAN |
| INFRA-DES-100-026-S-P3 | INFRASTRUCTURE LEVELS AND ROAD SET-OUT |
| INFRA-DES-400-001-S-P3 | PROPOSED CABLING LAYOUT |

# Background Information

Below is a short statement of the design reasoning behind the Phase 1 Civil Design. Refer to EA design summary document ref 092-338-I-C-00100 for comprehensive details.

**2.1 Road Network**

The main arterial roads have a width of 7.3m. Where the road meets the centre of the array at the position of the LST’s it is intended to initially construct a platform of stone encompassing the LST’s and MST’s. This will allow adequate lay down and construction space. A designated route through the array with be agreed on completion of the construction phase.

The secondary roads have a width 3.6m.

Detailed design of the roads will consider loads from construction traffic and consider maximum gradients.

**2.2 Array Cabling Layout**

The indicated cable routes are an interpretation of specialist reports on cabling routing, array grouping and maximum cable lengths. See Doc 140502 Section 1.3.2. Fig 1.6. At points throughout the cable routing in-situ reinforced concrete cable turning pits are to be constructed. Currently the design provides for all cabling to be contained within ducts, but cabling may be buried directly in the ground surrounded in sand, tiled for protection and taped. Specific requirements and feedback on this issue is required to determine location and number of cables and duct diameters. Under road crossings ducts will be provided with redundancy to allow for future use.

**2.3 Data/Control Building location**

Careful consideration has been given to the location of this building. The proposed position close to the array is favoured by Infrastructure as it meets several design criteria .

* Complies with the requirements of Doc 140502 Section 1.3.2. Fig 1.6.
* Allows easy access to the array by personnel working in the building.
* Its position gives the ability to visually observe the array from within the building.
* Ease in control access to and within the array.
* Emergency situations better controlled closer to the array with ability of direct access to the telescopes.

A detailed brief for the various buildings needs to be developed and the design taken through to a RIBA stage 3 developed design. The location of the buildings has been considered in this phase of the design as access requirements need to be considered as part of the road network.

**2.4 Technical Building location**

The position of the Technical Building

* Considered as a possible source of light pollution during non-daylight hours.
* Considered to be a part of cluster of buildings that have an element of dependency on each and ease of access between them i.e. residence, utilities and Contractors compound.
* Dramatically reduces traffic movement on the road leading to the array, reducing congestion, risk of accidents, dust and noise adjacent to a sensitive operational area.

The building design exists in concept form and requires developing to a RIBA stage 3 developed design.

**2.5 Contractors Compound location**

* Considered as a possible source of light pollution during non-daylight hours.
* Considered to be a part of cluster of buildings that have an element of dependency on each and ease of access between them i.e. residence, utilities and technical building.
* Dramatically reduces traffic movement on the road leading to the array, reducing congestion, risk of accidents, dust and noise adjacent to a sensitive operational area.

**2.6 Temporary Power plant location**

The compound will house containerised temporary power generation, fuel storage and temporary filling station for site vehicles etc.

* This is located centrally to the buildings that it will serve.
* Ease of access and control.

**2.7 Temporary Residence location**

* Considered as a possible source of light pollution during non-daylight hours.
* Again, the location is close to where it is needed by the personnel working on the site.
* Possible modular design to allow scalability throughout the construction and commissioning stages

**2.8 Potable Water Supply**

It is considered from previous TDR that water will be delivered in tankers for under or above ground storage for distribution throughout the development. RAW water will be required for building purposes and initially thought to be required within the Contractors compound. Possible smaller storage requirements within the array area may be required for construction purposes.

Provision of such will be required at an early stage of the development of the site particularly during the Civil Engineering works.

**2.9 Sewage treatment/disposal**

Provision of such will required at an early stage of the development of the site.

**2.10 Surface water**

Early considerations are that surface water is to be disposed of locally to soakaways or holding ponds via drainage ditches. Storm water cross flows are to be intercepted and diverted to protect assets with stone filled grips and possible evaporation ponds.

# Scope of the Developed Design Review

The RIBA Stage 3 Civil Infrastructure Developed Design (Phase 1) for the CTA South site, presents an Engineered solution for the site roads, underground service connections and locations for support building infrastructure.

The goal of this Developed Design Review, is to collect expert feedback for:

* The site access design at the junction with the B710
* The approach road design from the B710 through to the telescope array
* The design of the telescope array road network.
* The developed design for underground services
* The location of Buildings.

## Contacts for the Concept Review

* Steve Brown, Civil & Architectural Design Coordinator, CTAO

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* David Bristow, Infrastructure design Coordinator, CTAO

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# Documentation to be submitted for the Review

* Access Road report 092-338-f-c-00200 Issue 1
* Array Road Report 092-338-F-C-00300 Issue 1
* Developed design drawings as listed in Section 10
* Preliminary list of Hazardous situations and Risks

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| Decision Making Authority  * The Decision Making Authority for this review is the CTA Project Manager. * Participants in the Review |  |  |  |

The following groups of review participants have been defined:

1) Presenters

2) Review Panel

3) Observers

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| **Presenters** | **Name** | **Institute/ Company** |
| Requirements Manager | X | CTAO |
| Project Designer | Carlos Martinez Munos | EA |
| Civil/Architectural coordinator | Steve Brown | CTAO |

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| **Review Panel** | **Name** | **Institute/ Company** |
| Ext. reviewer 1 |  |  |
| Ext. reviewer 2 |  |  |
| Ext. reviewer 3 | X | ESO |
| Risk Manager | Cesar Ocampo | CTAO |
| System Engineer |  | CTAO |
| **Chairperson of the Review Panel** | **Name** | **Institute/ Company** |
| Infrastructure Design Coordinator | David Bristow | CTAO |

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| **Observers** | **Name** | **Institute/ Company** |
| MST rep | Markus Garczarczyk | DESY |
| LST rep | Daniel Mazin | U. of Tokyo |
| RAMS rep | George Pruteanu | CTAO |

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| **Decision Making Authority** | **Name** | **Institute/ Company** |
| Project Manager CTAO | Wolfgang Wild | CTAO |

# Roles of the participants

* Presenters

Will be responsible for:

* + deliver the documentation to the panel chair according to the schedule in this document
  + present the relevant information needed to comply with the objectives of the review
  + comply with the agenda
  + answer the questions and consider the feedback and recommendations that the review will give as outcome
* Review panel members

Will be responsible for:

* + Review the submitted documentation
  + Identify problems or request explanations
  + Attend the presentations
  + Give feedback, by answering the questions presented in this document before or during the Review
  + Participate in the elaboration of the review report, including recommendations; as requested and coordinated by the chairperson
* Chairperson of the Review panel members
  + ensure that the agenda is completed
  + facilitate that the participants can give their feedback
  + register the minutes and action points
  + summarize the conclusions of the review panel, to the questions in Section 8. This discussion will take place in the review meeting (Agenda in Section 9)
  + ensure that the final review report is delivered.
* Observers

Will be able to participate in the meeting, making questions and giving feedback.

Additional observers may attend to the review with the permission of the review chairperson.

# Location of the Review

The location will be defined, can be Munich or Heidelberg

## Review schedule

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| --- | --- | --- | --- |
| **Week** | **Date** | **Activity** | **Responsible** |
| W1 | x | Approve Review Plan/ appoint chairperson | WW |
| W2 | x | Define/ Invite reviewers | WW, DB |
| W2 | x | Logistics: coordinate place for the Review | DB |
| W1-W3 | x | Prepare & submit documentation on BIM 360 Docs | SB DB |
| W4-W6 | x | Reviewers may submit questions to chairperson via BIM 360 Docs | Review Panel |
| W4-W6 | x | Presenters prepare answers and presentation | CMM, SB, X |
| W7 | x (TBD) | 1 day presentation and discussion. IS THIS NECESSARY | all participants |
| W9 | x | Distribution of minutes, Action Items, and Final Review report | Chairperson |

# Questions to be answered by the Panel members

1. Is the junction detail with the B710 considered satisfactory and are there any landscaping requirements?

2. Has the access road through the site been fully considered regarding its topography and to the need in minimising cut and fill material quantities?

3. Has the roadway network been designed accordance with the brief i.e. with regards to its width and gradient?

4. Are there any environmental concerns arising from proposed route of the access road?

5. Does the array road network layout fulfill the needs of the electrical and fibre cable network infrastructure layout?

6. Generally, has underground services routing been adequately designed, ensuring every part of the of the project is served?

7.Does the development adequately consider foul water disposal in the form of a waste water treatment plant? Its detailed design will be compliant to current environment protection requirements.

8. Is it acceptable for a potable water supply is to be delivered by tanker for on site storage?

8. Is accessibility throughout the site adequate?

9. Has the relationship between different land uses for the siting of buildings been fully examined?

10.Has accessibility been fully considered

11. How does the current developed design impact on the project costings?

12. Is the form of construction sustainable with regards to local resources and services?

13. Does the developed design adversely affect the availability of local resources?

14.Have project risk been assessed?

15. Does the developed design fulfill the project brief?

16 Does the developed design comply with the project requirement document?

# Agenda for the Review meeting

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| --- | --- | --- | --- | --- |
|  | **Time** | **Topic of the presentation** | **Presenter** | **Purpose** |
| 9:00 -9:10 | 10 min | Welcome by the Chairperson | David Bristow | Welcome |
| 9:10 - 9:20 | 10 min | Introduction to the Review | Carla Crovari | to present the agenda for the day and the outcome expected for this review |
| 9:20 - 10:00 | 40 min | Power Requirements | Alison Mitchel/ Jim Hinton | to present the document distributed in advance, and answer the questions from the Review panel |
| 10:00 - 11:00 | 60 min | Concept study for Power distribution CTA N - 4 alternatives - 1st part | Manfred Engelmann |
| 11:00 - 11:20 |  | Coffee Break | | |
| 11:20 - 11:40 | 20 min | Concept study for Power distribution CTA N - 4 alternatives - 2nd part | Manfred Engelmann | to answer the questions from the Review panel |
| 11:40 - 12:00 | 20 min | List of Interfaces identified for the Power distribution system | Carla Crovari | to present the document distributed in advance, and answer the questions from the Review panel |
| 12:00 - 12:20 | 20 min | List of Risks and Hazardous situations identified | Carla Crovari |
| 12:20 - 14:00 |  | Lunch | | |
| 14:00 - 16:00 | 120 min |  | Chair: David Bristow | The panel members share their answers to the questions included in the Review plan (Section 8). The purpose is to collect feedback on the requirements and interfaces, and seek input for a decision on one of the alternatives of the Concept study. |

# Material for the Review

List of drawings and documents made available on BIM360 DOCS for review

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project:** | **Architectural and Engineering Design and Planning Study for the CTAO SOUTHERN HEMISPHERE SITE** | | | |  |
| **Stage:** | **PHASE-1 //2017** |  |  | **Date** | **15/11/2017** |
|  |  |  |  |  |  |
| **ID** | **Title** | **Sheet** | **Date** | **Rev** | **Purpose** |
| **Drawings** |  |  |  |  |  |
| 092-338-D-C-00200 | Access Road | 1 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road General Plan View (1) | 2 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road General Plan View (2) | 3 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road General Plan View (3) | 4 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road General Plan View (4) | 5 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road Earth Movements  General Plan view (1) | 21 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road Earth Movements General Plan view (2) | 22 | 22/09/2017 | 1 |  |
| 092-338-D-C-00200 | Access Road Junction Detail | 23 | 22/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads General Layout | 1 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Plan View. Detail A | 2 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Plan View. Detail B | 3 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Plan View. Detail C | 4 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Plan View. Detail D | 5 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Telescopes Area Detail (1) | 8 | 29/09/2017 | 1 |  |
| 092-338-D-C-00300 | Array Roads Telescopes Area Detail (1) | 9 | 29/09/2017 | 1 |  |
| 092-338-D-C-00500 | Undergrounds Integrated undergrounds System. Main Routes Plan View | 1 | 14/06/2017 | 1 |  |
| 092-338-D-C-00600 | Undergrounds Sewage Drains System General Plan View | 1 | 12/05/2017 | 1 |  |
| 092-338-D-C-00700 | Undergrounds Water Supply System General Plan View | 1 | 12/05/2017 | 1 |  |
| 092-338-D-C-00700 | Undergrounds Water Supply System Detail Plan View | 2 | 12/05/2017 | 1 |  |
| 092-338-D-C-00700 | Undergrounds Water Supply System Detail Plan View | 3 | 12/05/2017 | 1 |  |
| 092-338-D-C-00700 | Undergrounds Water Supply System Detail Plan View | 4 | 12/05/2017 | 1 |  |
| 092-338-D-C-00700 | Undergrounds Water Supply System Detail Plan View and Typical Details | 5 | 12/05/2017 | 1 |  |
| 092-338-D-C-00800 | Undergrounds Electrical Duct Bank, Cable and Network Trenches General Plan View | 1 | 12/05/2017 | 1 |  |
| 092-338-D-C-00900 | Earth Movements of Hardstanding Areas General Plan View & Sections (1) | 1 | 22/09/2017 | 1 |  |
| **Specification** |  |  |  |  |  |
| 092-338-I-C-00100 | Summary Document According to RIBA stage 3 - Phase 1 |  | 23/03/2017 | 1 |  |
| 092-338-F-C-00200 | Access Road Report |  | 22/09/2017 | 1 |  |
| 092-338-F-C-00300 | Array Road Report |  | 29/09/2017 | 1 |  |
| **Additional Documents** |  |  |  |  |  |
| 210717/01 | Access Road alternatives (routes) |  | 21/07/2017 |  |  |
| 210717 /02 | Access road earthworks quantities |  | 21/07/2017 | 1 |  |
|  |  |  |  |  |  |