



CLIC Civil Engineering Design Updates

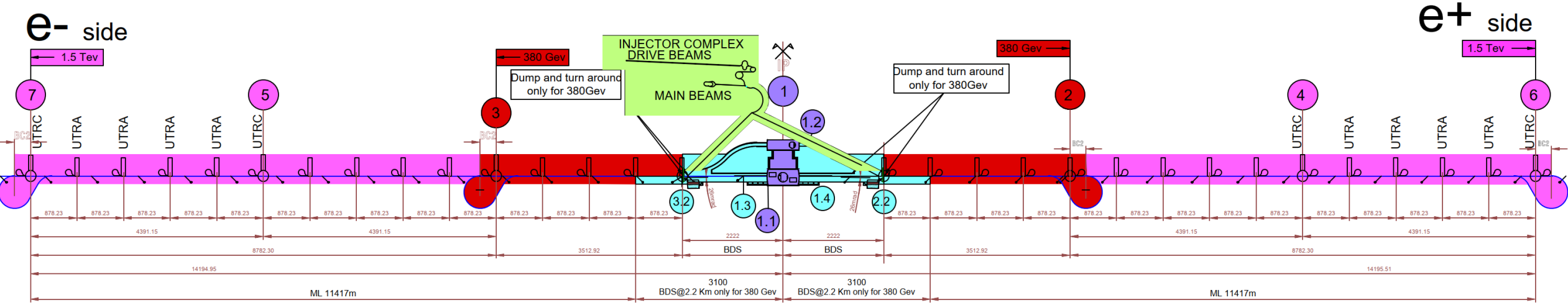
11th Dec 2024

Edward MacTavish, John Osborne

With thanks to Angel Navascues Cornago and Amine Mejri for the drawings.

SCE-SAM-FS

Underground Structures Schematic



Legend : 380GeV 1.5 TeV
 ML
 Main/Drive beam Injectors
 BDS
 Detectors Area

	main beam turn-around	BC2	e- side ML	BDS	e+ side ML	TOTAL
380 GeV	3898	600	3513	4444	3513	15968
1.5 TeV	3898	600	11417	6200	11417	33532

main + drive beam injector complex
 see drawing N°
 CLIC.CE-1.1799.0002-M

	BC2	e- side ML	BDS	e+ side ML	TOTAL
380 GeV	600	3513	4444	3513	12070
1.5 TeV	600	11417	6200	11417	29634

Area	beam turn-around	e- e+ sides ML	BDS
section dims.	Ø3 m	Ø5.6m	Ø5.6 m

Point	1.1	1.2	2	2.2	3	3.2	4	5	6	7
Øm	18	12	9	9	9	9	9	9	9	9

Point	2, 3	4, 5, 6, 7
(LxWxH)m	55 x 16 x 18 2 storeys	

Number	8 x	8 x	8 x
(LxWxH)m	40 x 10 x 7.2	45 x 10 x 7.2	50 x 10 x 7.2

Point	1	1.2
(LxWxH)m		

Point	1, 1
(LxWxH)m	60 x 30 x 33.5

Point	BDS CAVERNS 1, 3, 1.4	BDS SERVICE HALLS 2, 2, 3, 2
(LxWxH)m	20 x 8 x 14 + 1 storey	49 x 16 x 18 3 storeys

Number	At each UTRAs, UTRCs and Tune-up
(LxWxH)m	10 x 22 x 2 x 6 x 9 x 5

Number	10 x	26 x
(LxWxH)m	63 x 2.4 x 3	

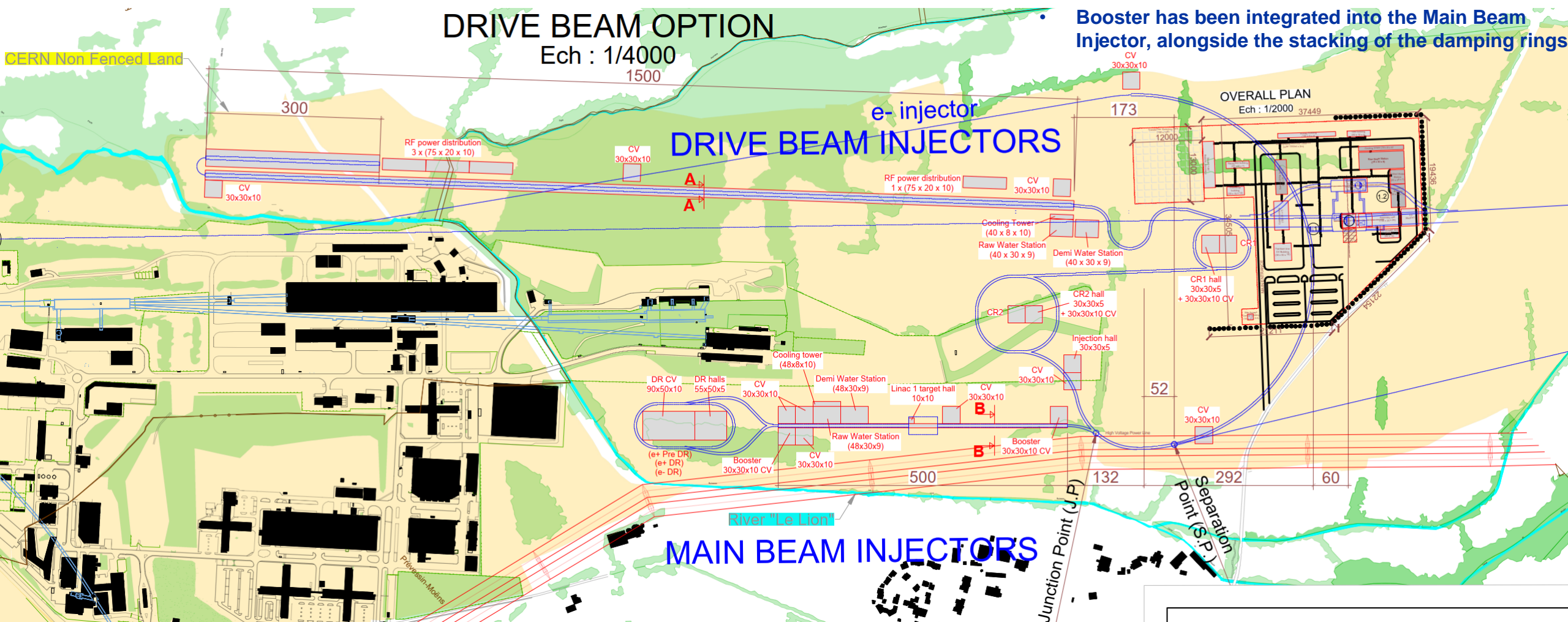
Number	2 x	2 x
(LxWxH)m	100 x 10 x 3	

UTR = Underground Technical Room

- Now only considering the Drive Beam option and not the Klystron option.
- The 3TeV stage is no longer being considered.
- Laser Straight
- 380GeV Main Tunnel length of 12.1Km (Displayed in Red).
- 1.5TeV Main Tunnel length of 29.6Km (Displayed in Pink).

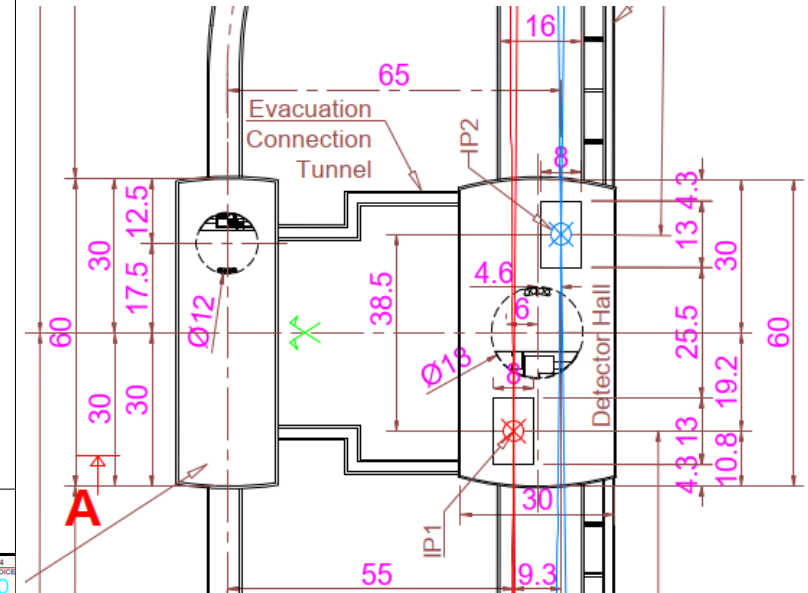
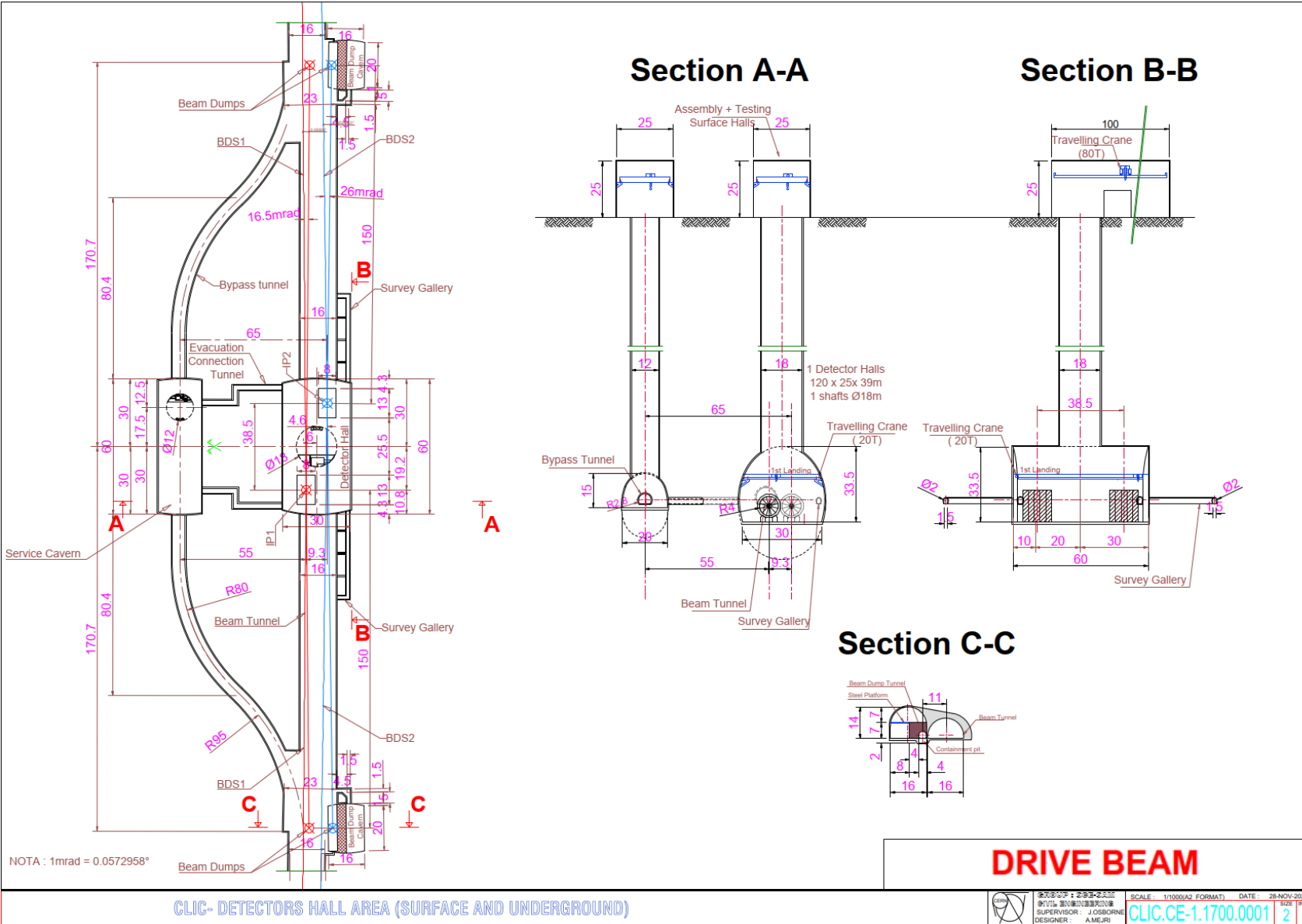
Injector Complex Layout on Prévessin Site

- Whole Injector Complex is located on CERN land.
- The complex now avoids all existing CERN infrastructure.
- Drive Beam Injectors Location has been adjusted to avoid the river 'Le Lion'.
- Booster has been integrated into the Main Beam Injector, alongside the stacking of the damping rings

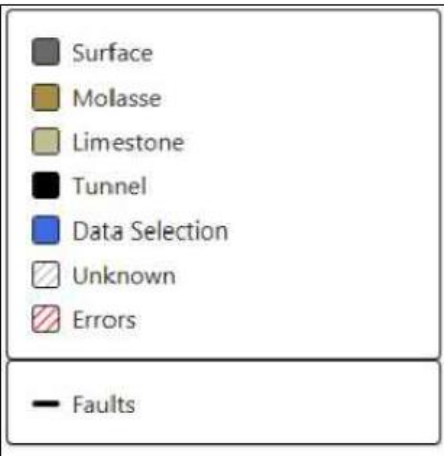
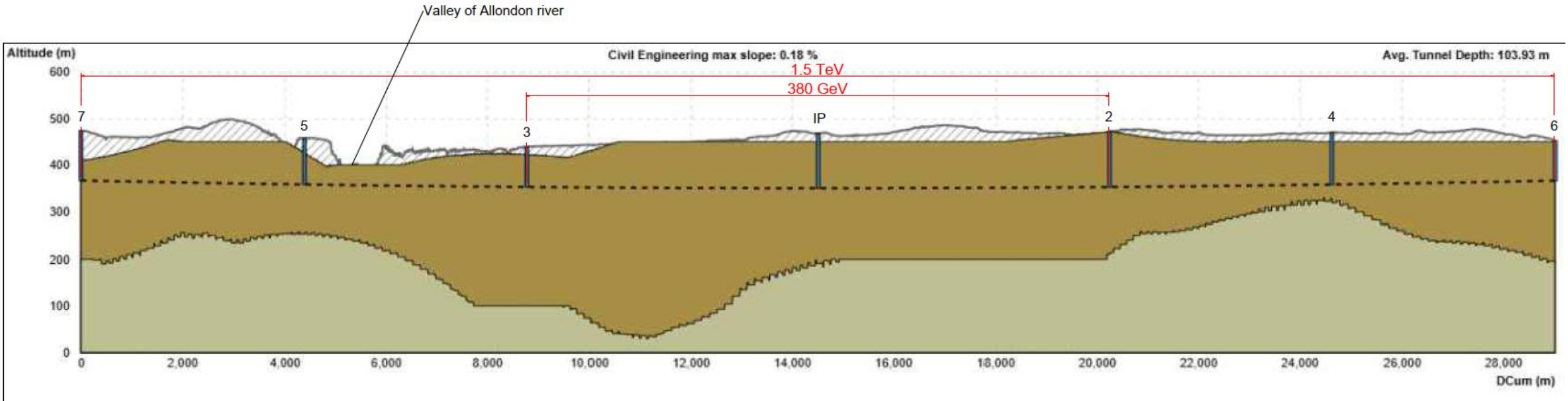


Interaction Region

- Updated to facilitate 2 Detectors.
- A 30m x 60m Detector Hall facilitates both detectors with their centers separated by 38.5m.
- Main LINAC's have a 20mrad crossing angle and the Beams have crossing angles of 16.5mrad and 26mrad.
- BDS Tunnel has been widened to 16m to account for both beam lines and the 9.3m separation between them.
- Tunnel Widening occurs over 2km either side of the Detector hall.



Geological Profile



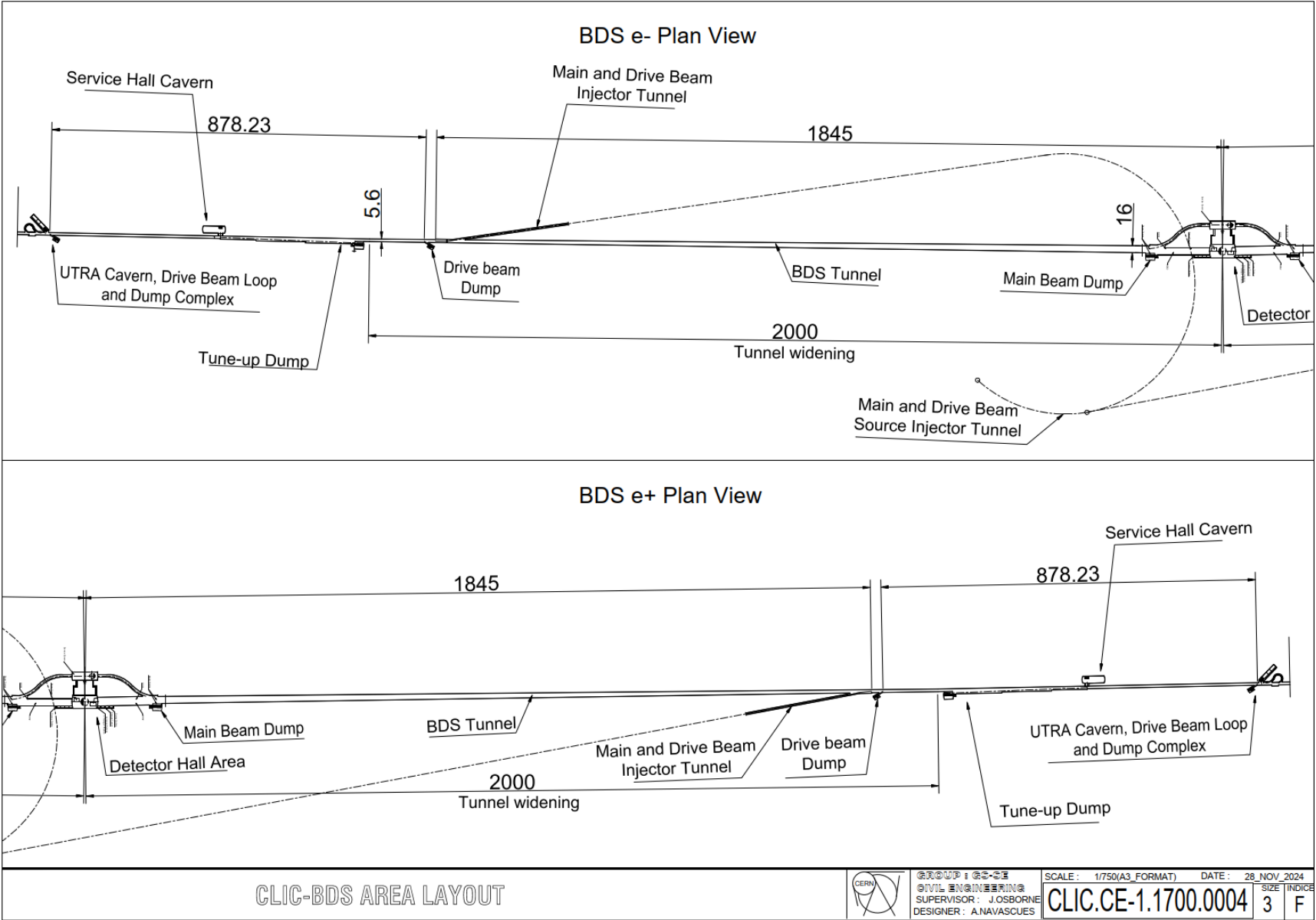
- **Geological Profile for 380GeV and 1.5TeV stages with 3TeV removed.**
- **Comfortably housed within good Molasse rock. (no need for site investigation to confirm this)**
- **Gland Depression is no longer an issue, thus there is scope to reduce the shaft depths.**
- **There is also an ongoing exercise to share the same shaft locations and alignment for CLIC and ILC.**
- **With these drawings nearly frozen, we are in a position to complete an updated costing for the Civil Engineering works.**



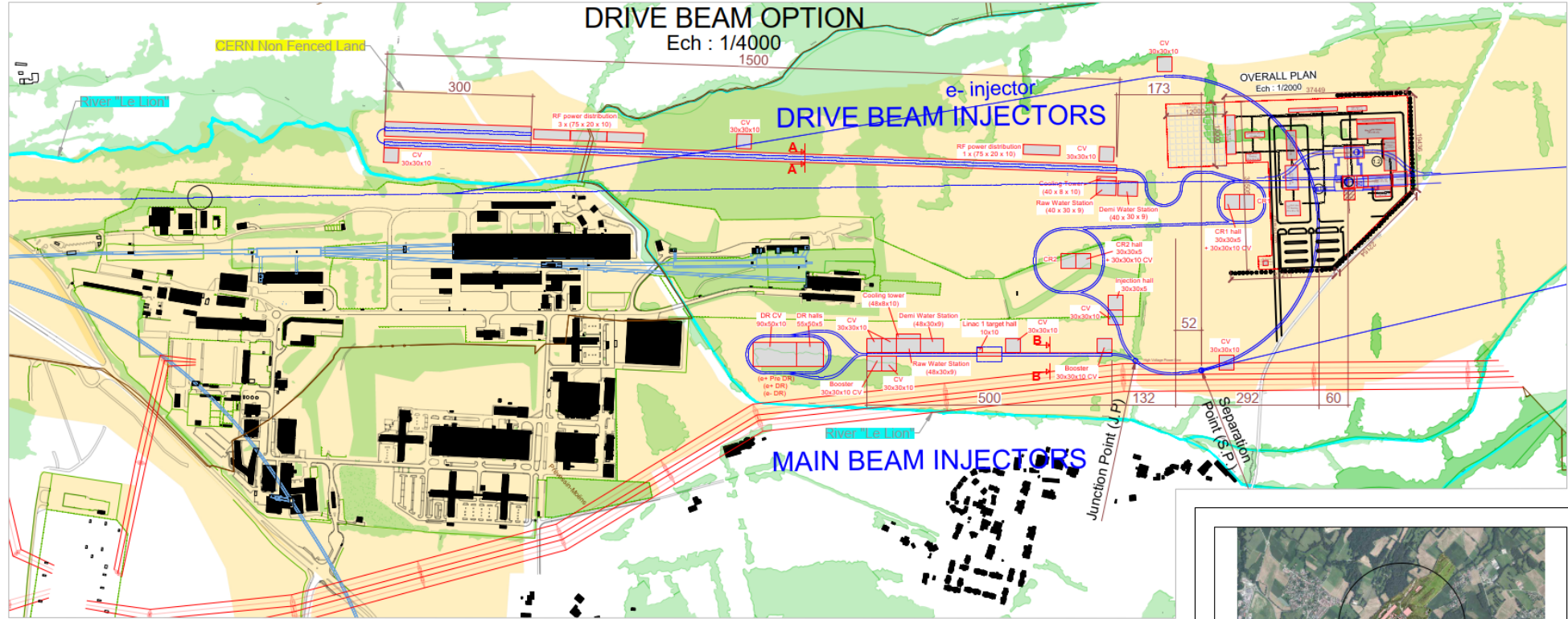
Additional Civil Engineering Slides

11th Dec 2024

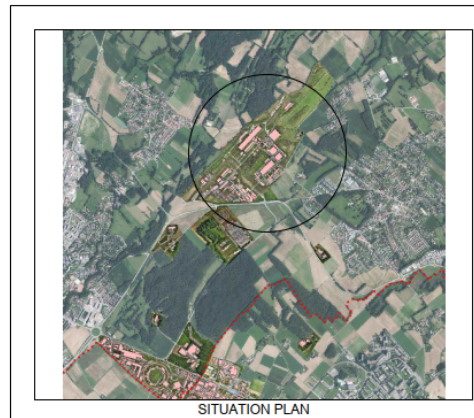
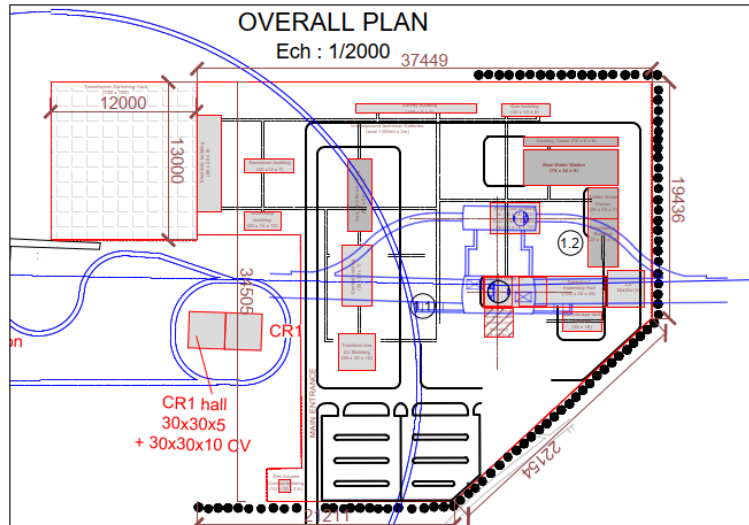
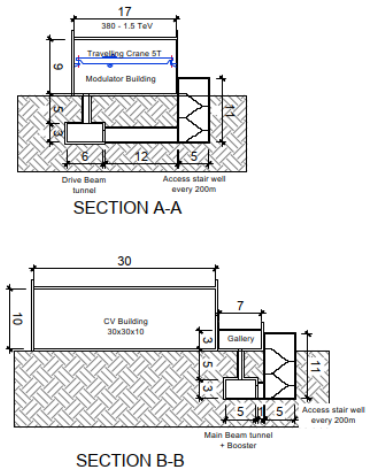
BDS Area Layout



- Tunnel widens linearly from 5.6m internal diameter to 16m internal diameter.
- Beginning 2km both sides from the center of the detector hall.



Main Beam & Drive Beam Injector Cross Sections
Ech : 1/400



Scale: As indicated

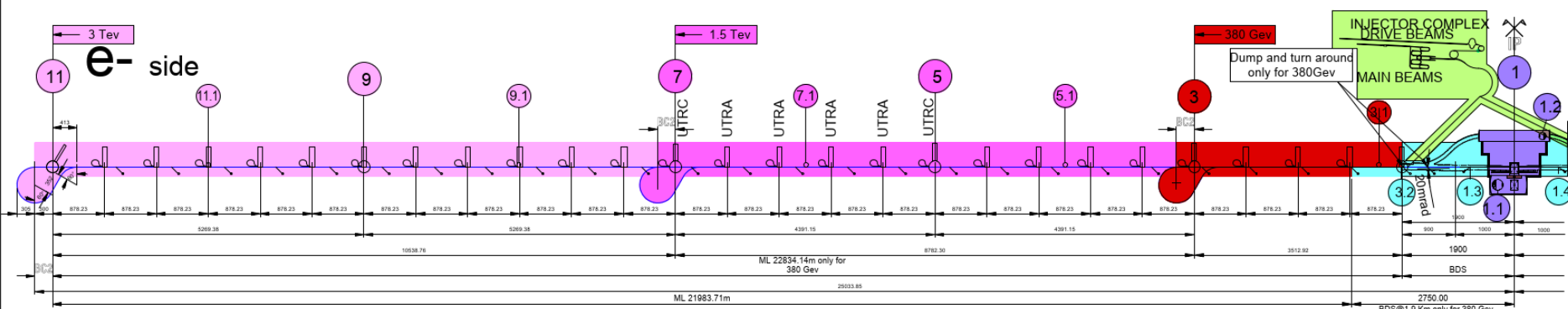
SCE-SAM CIVIL ENGINEERING

NO.	DATE	DRAWN BY	CHECKED BY	MODIFICATION	APPROVED BY
1	19/11/2024	A.M.B.	M. NACTANDE	REVISED DRG 2	J. BISSONNE

PROJECT PHASE: DRAWING TYPE: CLIC - MAIN/DRIVE BEAM INJECTORS AND EXPERIMENTAL AREA SURFACE BUILDINGS LAYOUT

NOT VALID FOR EXECUTION

QC - CLIC CE-1 1799 0005



TUNNEL LENGTHS (m)

	main beam turn-around	BC2	e- side ML	BDS	e+ side ML	TOTAL
380 GeV	3 898	600	3 513	3 800	3 513	15 324
1.5 TeV	3 898	600	8 783	5 500	8 783	27 564
3 TeV	3 898	600	10 510	5 500	10 510	31 018
Total	11 694	1800	22 806	5 500	22 806	64 606

SITE LENGTHS (m)

	main beam turn-around	BC2	e- side ML	BDS	e+ side ML	TOTAL
380 GeV	610	600	3 513	3 800	3 513	12 036
1.5 TeV	610	600	8 783	5 500	8 783	23 971
3 TeV	610	600	10 510	5 500	10 510	27 425
Total	1 830	1800	22 806	5 500	22 806	54 742

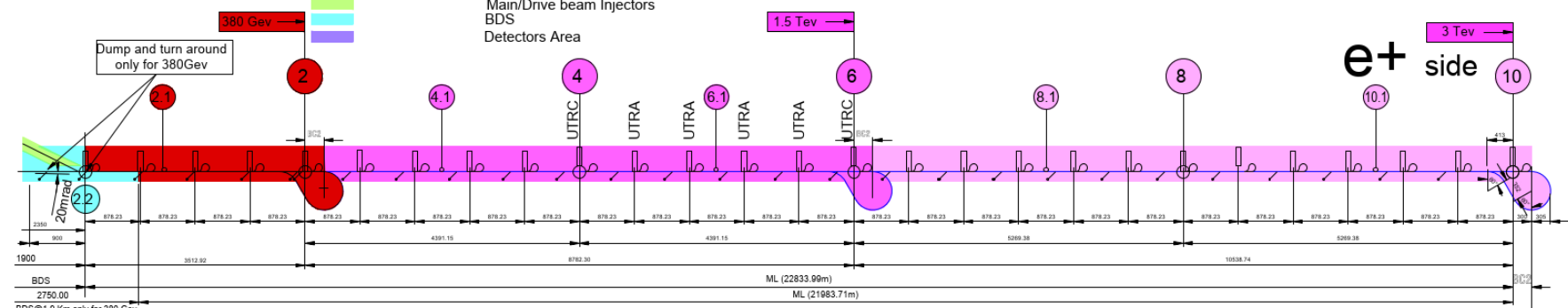
main + drive beam injector complex
see drawing N°
CLIC.CE-1.1799.0002.3

TUNNELS SECTIONS

Area	beam turn-around	e- e+ sides ML	BDS
section dims.	Ø3 m	Ø5.6m	Ø5.6 m

Legend : 380GeV 1.5 TeV 3 TeV

ML
Main/Drive beam Injectors
BDS
Detectors Area



SHAFTS

Point	1.1	1.2	2	2.2	3	3.2	4	5	6	7	8	9	10	11
Øm	18	12	9	9	9	9	9	9	9	9	9	9	9	GALLERY 6 X 5.3

SURVEY BORINGS

Point	2.1, 3.1	4.1, 5.1, 6.1, 7.1, 8.1, 9.1, 10.1, 11.1
Øm	1.50	1.50

SHAFT BASE CAVERNS (10 UTRC)

Point	2, 3, 4, 5, 6, 7, 8, 9, 10, 11
(LxWxH)m	55 x 16 x 18 2 storeys

UTRA CAVERNS

Number	8 x	8 x	8 x	10 x	10 x
(LxWxH)m	40 x 10 x 7.2	45 x 10 x 7.2	50 x 10 x 7.2	55 x 10 x 7.2	65 x 10 x 7.2

SERVICE CAVERN & IP

Point	1	1.2
(LxWxH)m

DETECTORS HALL

Point	1.1
(LxWxH)m	62 x 31.5 x 33.5

MAIN BEAM DUMP CAVERNS & SERVICE HALLS (✓)

Point	BDS CAVERNS 1.3, 1.4	BDS SERVICE HALLS 2.2, 3.2
(LxWxH)m	20 x 8 x 14 + 1 storey	49 x 16 x 18 3 storeys

DRIVE BEAM DUMP CAVERNS (✓)

Number	At each UTRAs, UTRCs and Tune-up		
(LxWxH)m	10 x	20 x	22 x
	6 x 9 x 5		

DRIVE BEAM RETURN LOOP

Number	10 x	26 x	48 x
(LxWxH)m	63 x 2.4 x 3		

BC2 CAVERNS

Number	2 x	2 x	2 x
(LxWxH)m	100 x 10 x 3		

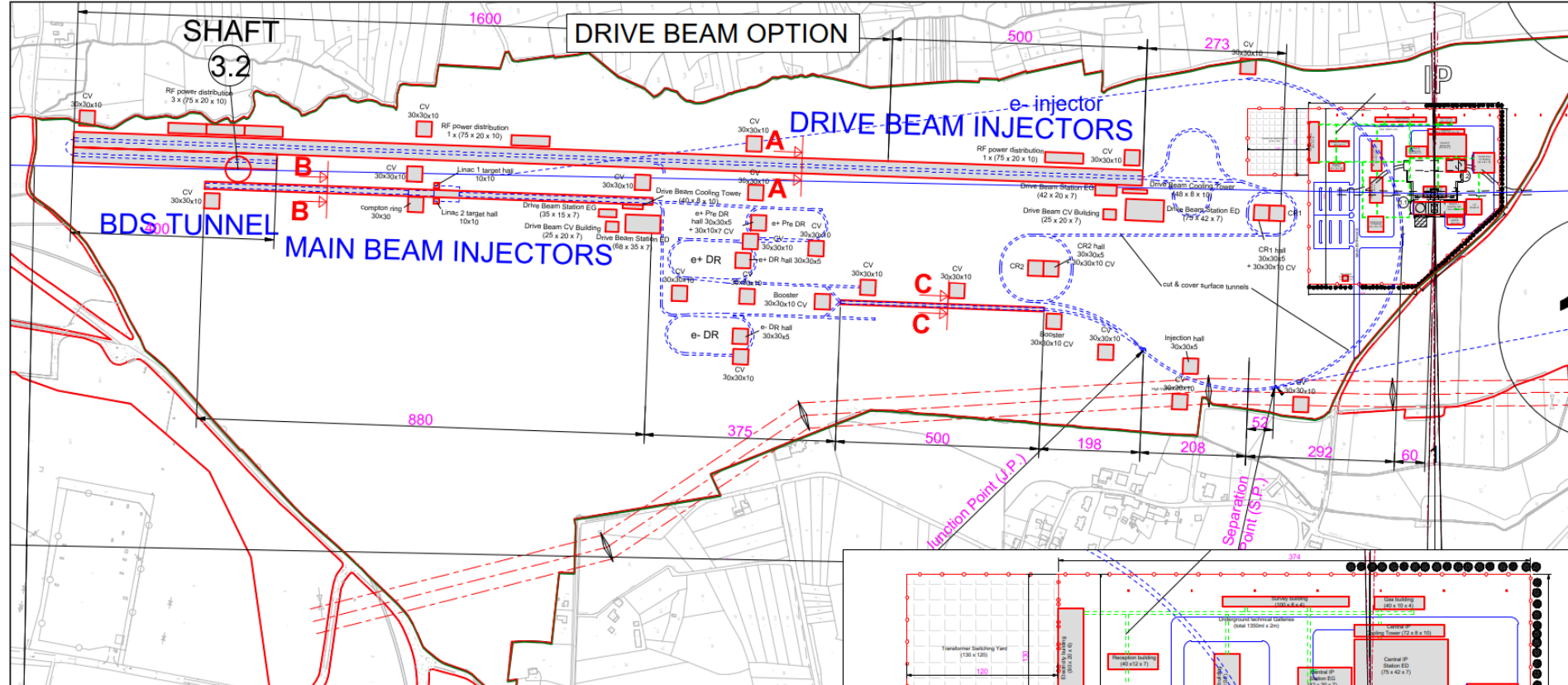
UTR = Underground Technical Room

CLIC - UNDERGROUND STRUCTURES SCHEMATIC LAYOUT(COLOURED BY ZONES)

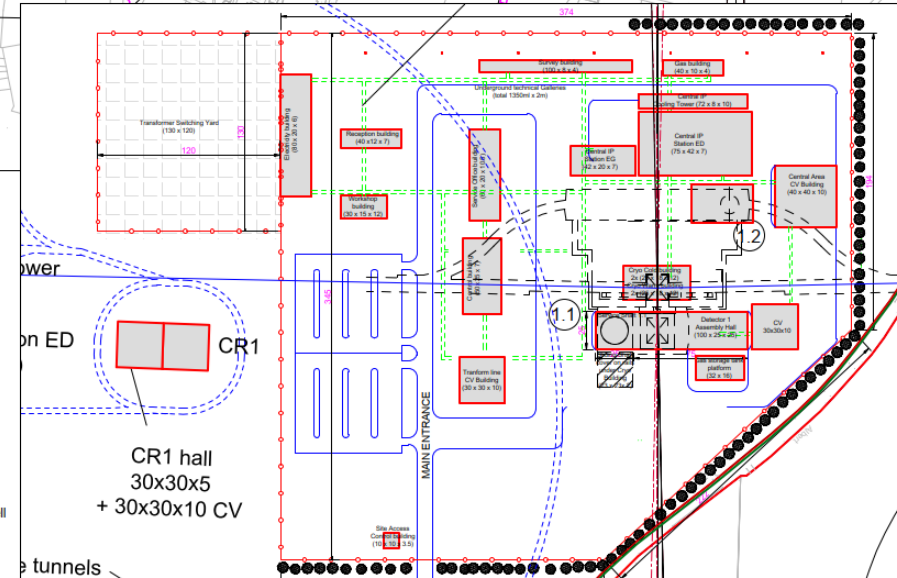
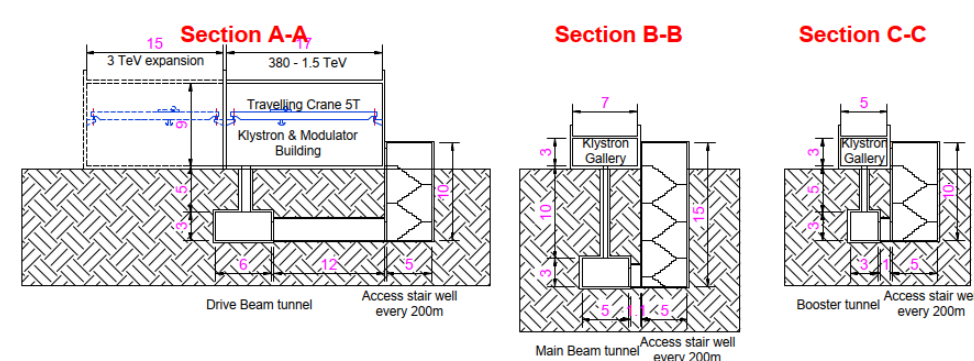


GROUP : GS-500B
CIVIL ENGINEERING
SUPERVISOR : JOSBORNE
DESIGNER : P.SERAFINO


SCALE : 1/62500(A3_FORMAT) DATE : 23-MAR-2018
CLIC.CE-1.1749.0003
SIZE INDEXE 3 M



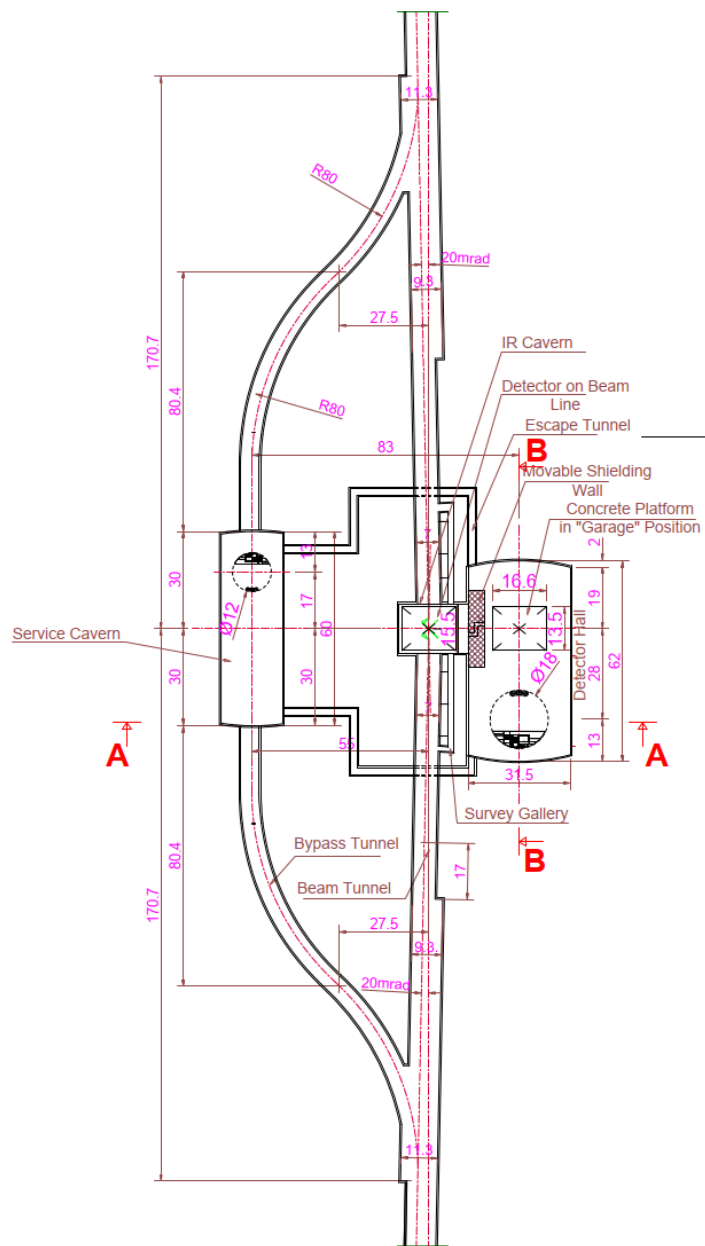
Main Beam & Drive Beam Injector Cross Sections



CLIC- MAIN / DRIVE BEAM INJECTORS AND EXPERIMENTAL AREA SURFACE BUILDINGS LAYOUT

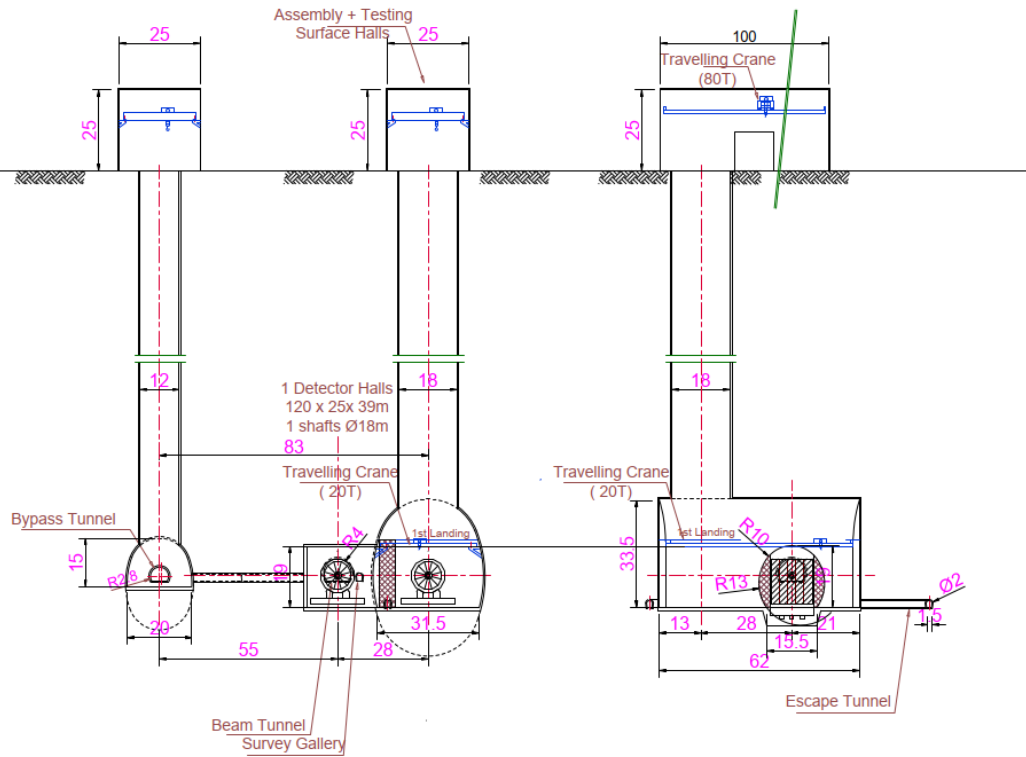

 GROUP : CE-ST
 CIVIL ENGINEERING
 SUPERVISOR : J.OSBORNE
 DESIGNER : P.SERAFINO

SCALE : 1/7500(A3_FORMAT) DATE : 17-OCT-2018
 CLIC.CE-1.1799.0005 SIZE IN DICE 3 G



Section A-A

Section B-B



KLYSTRON & DRIVE BEAM

CLIC- DETECTORS HALL AREA (SURFACE AND UNDERGROUND)

	中国核工业集团 中国核动力研究设计院	SCALE: 1/11000(A2 FORMAT)	DATE: 19-NOV-2018
	SUPERVISOR: J.OSBORNE DESIGNER: P.SERAFINO	CLIC.CE-1.1700.0001	SHEET NO: 2 N