

CONSULTANCY SERVICES FOR SURVEY, DESIGN AND EIA WORKS OF WATER SUPPLY AND  
SEWERAGE FACILITIES IN 6 ISLANDS, MALDIVES

PACKAGE 5

## SEWERAGE SYSTEM OF M. NAALAAFUSHI, MALDIVES

For Ministry of National Planning, Housing and Infrastructure, Republic of Maldives



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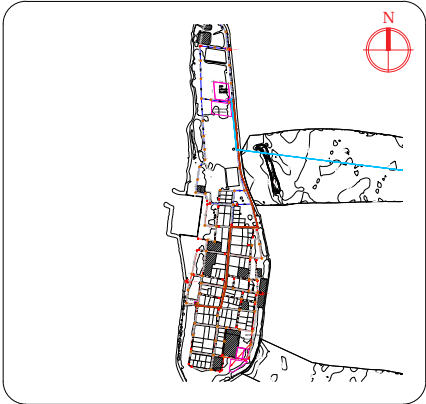
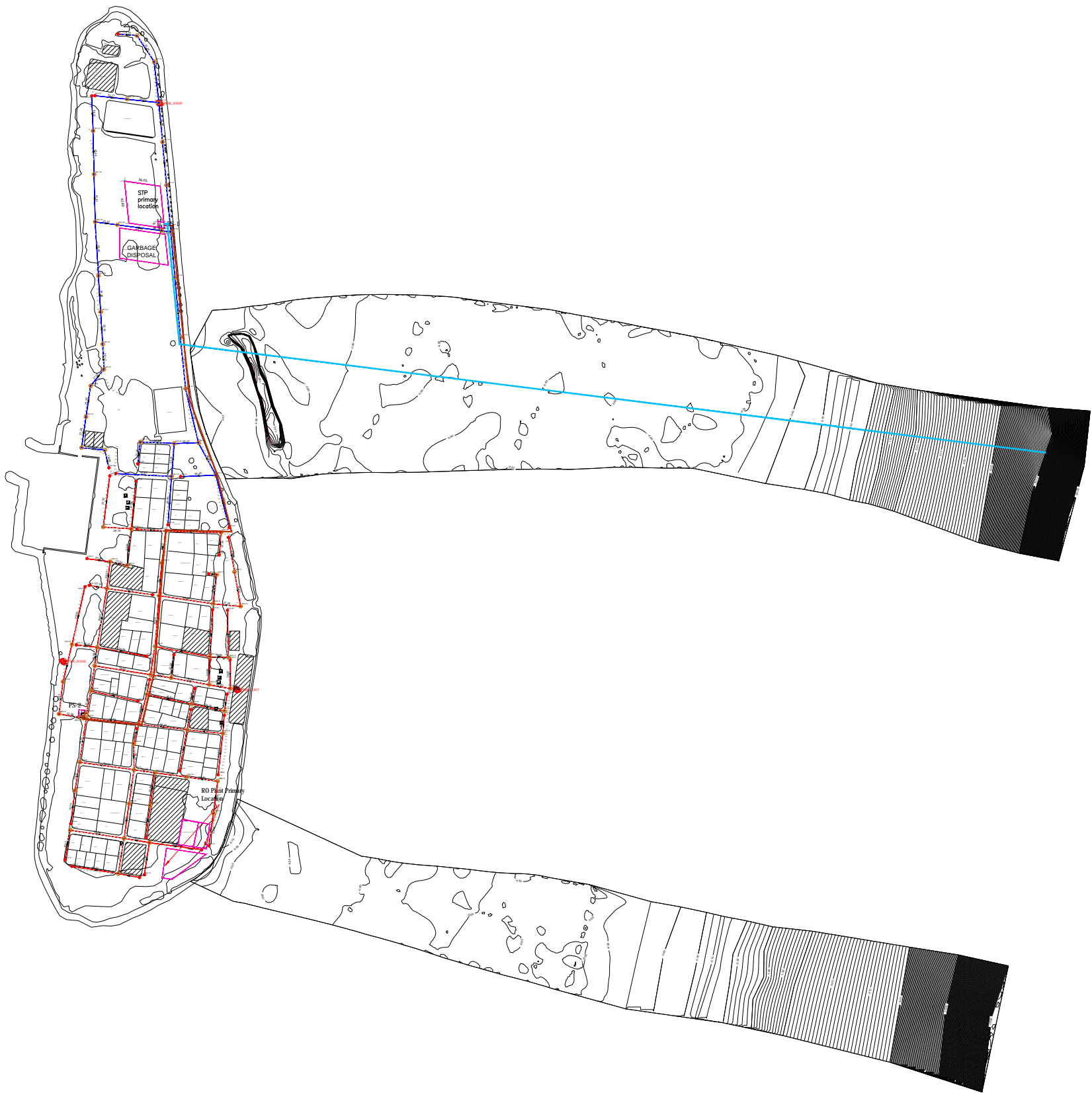




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Legend

- 160mm Ø uPVC PS1 Gravity Sewer Main (SN4, SDR41) - 1324 m
- 160mm Ø uPVC PS2 Gravity Sewer Main (SN4, SDR41) - 2739 m
- 110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11) - 647 m
- 160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11) - 136 m on land - 881 m offshore - 997 m total
- 600mm Ø PE/PP Maintenance Shaft - 77 nos
- 160mmØ uPVC Clean Out - 43 nos
- PERMANENT SURVEY MARK PSM\_0307 341981.3607E, 319937.985N 0.718m From MSL
- PERMANENT SURVEY MARK PSM\_0308 341807.612E, 319966.2321N 0.673m From MSL
- PERMANENT SURVEY MARK PSM\_0309 341903.701E, 320524.753N 0.802m From MSL

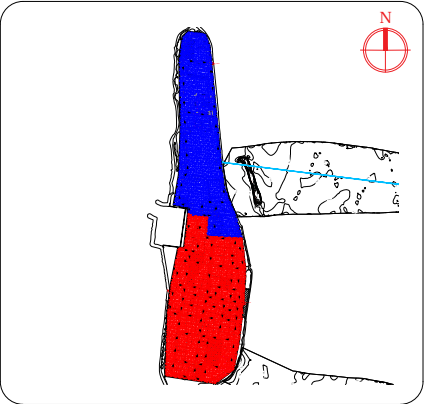
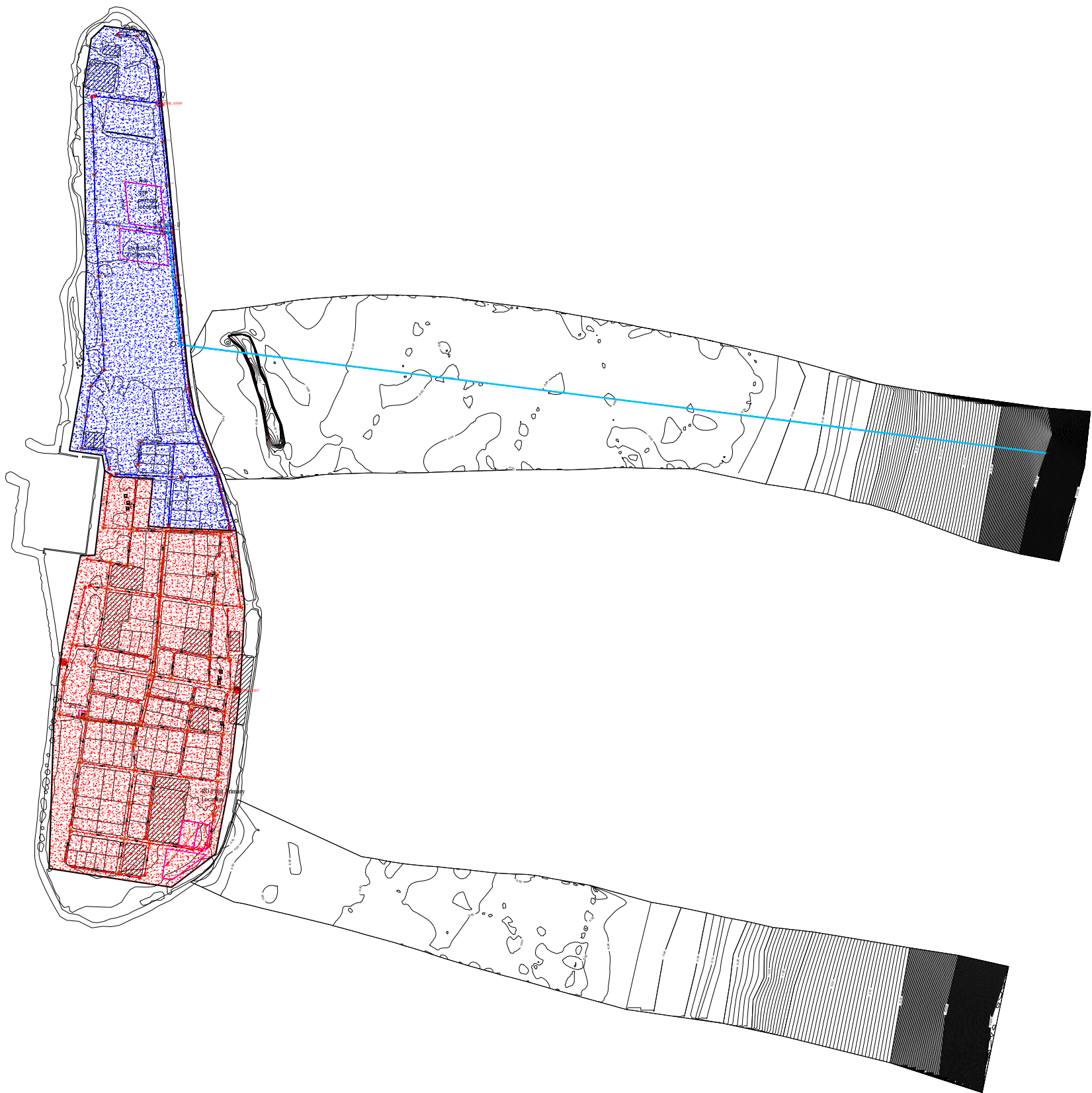
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Title:  
Consultancy Services for  
Survey, Design and EIA works of  
Water Supply and Sewerage  
Facilities  
in 6 islands, Maldives – Package 5  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
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Date: Nov 2020	SCALE (A3): 1:5000		
Project No: EP-WS/2019/05			
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Legend

- PS-1 Catchment Area
- PS-2 Catchment Area

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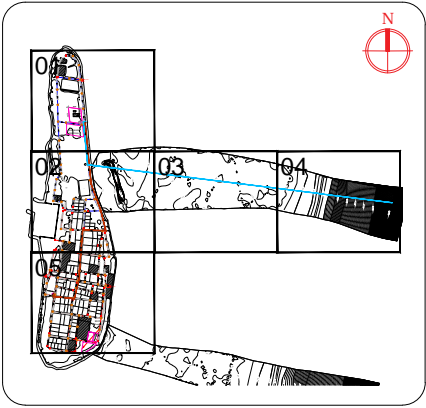
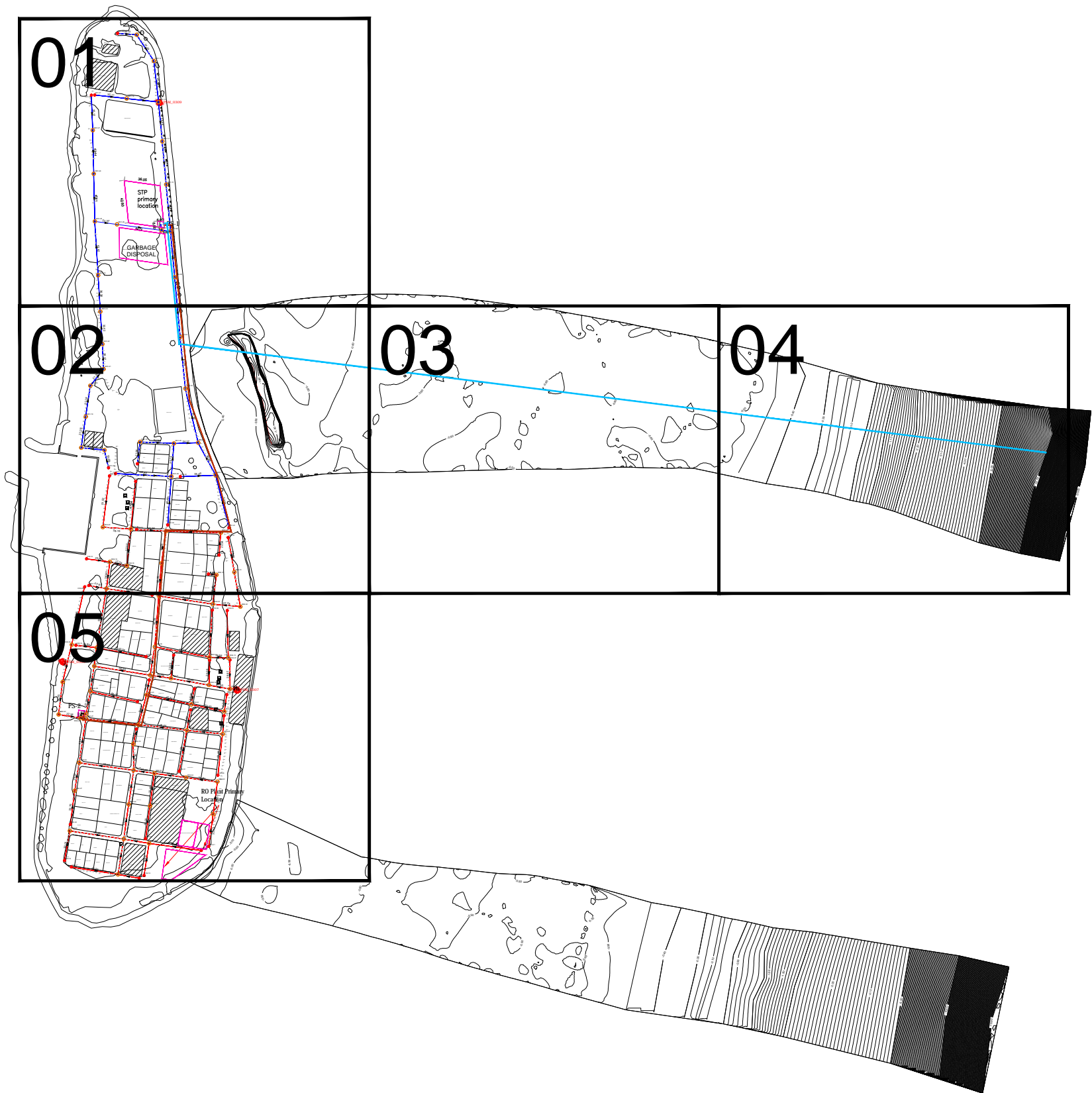
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Legend

- 160mm Ø uPVC PS1 Gravity Sewer Main (SN4, SDR41)
- 160mm Ø uPVC PS2 Gravity Sewer Main (SN4, SDR41)
- 600mm Ø PE/PP Maintenance Shaft
- 160mmØ uPVC Clean Out
- 110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11)
- 160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11)

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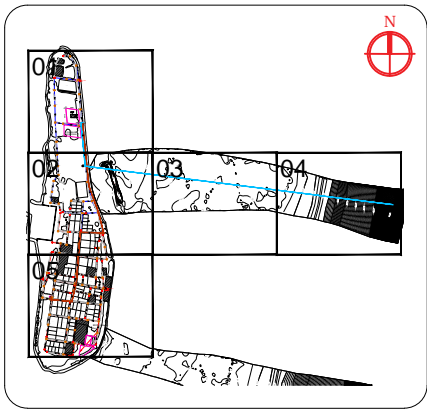
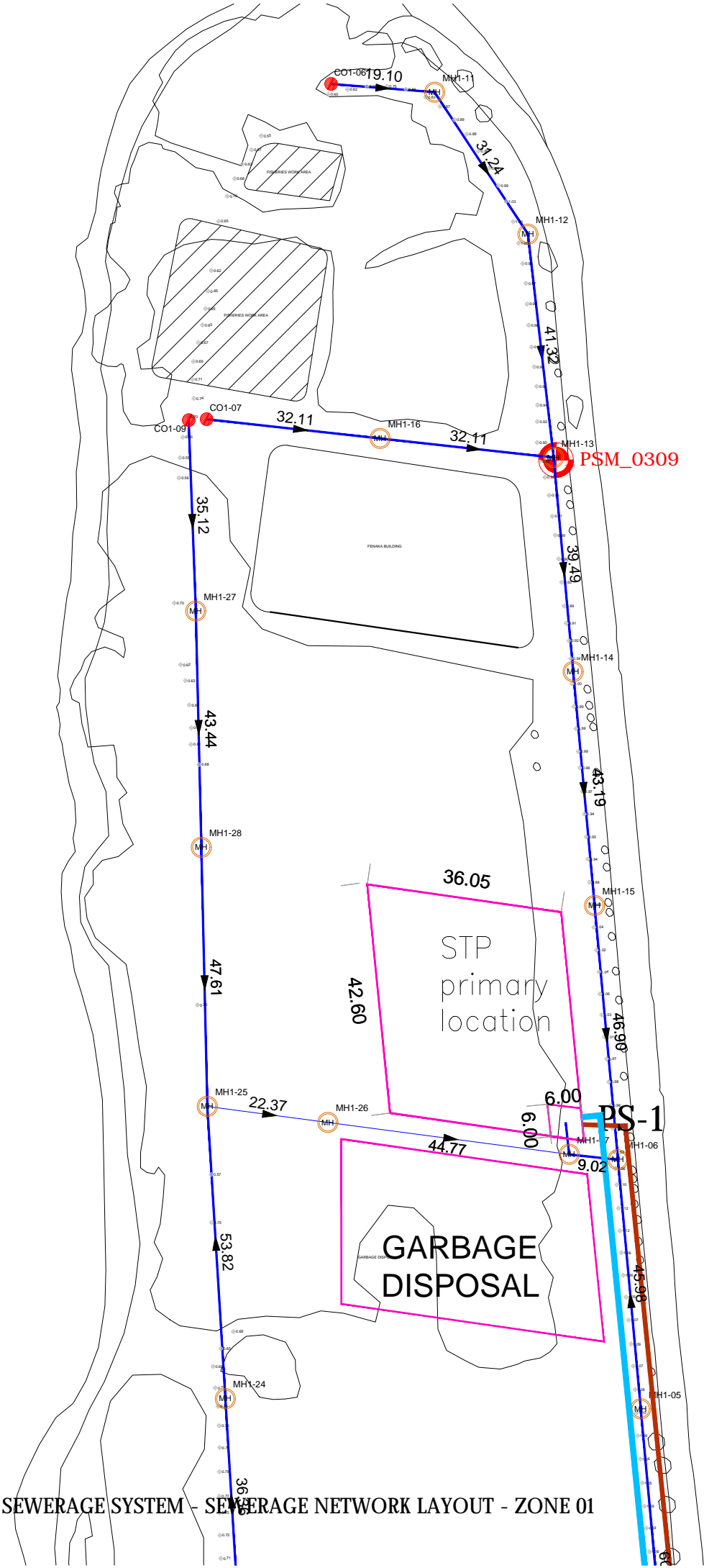
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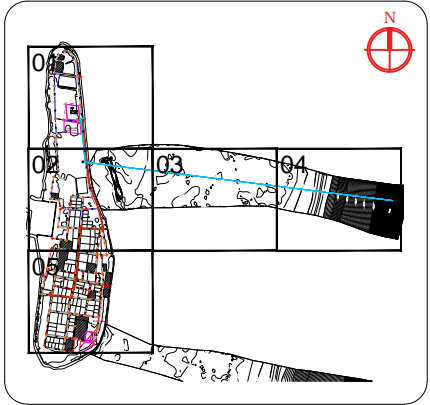
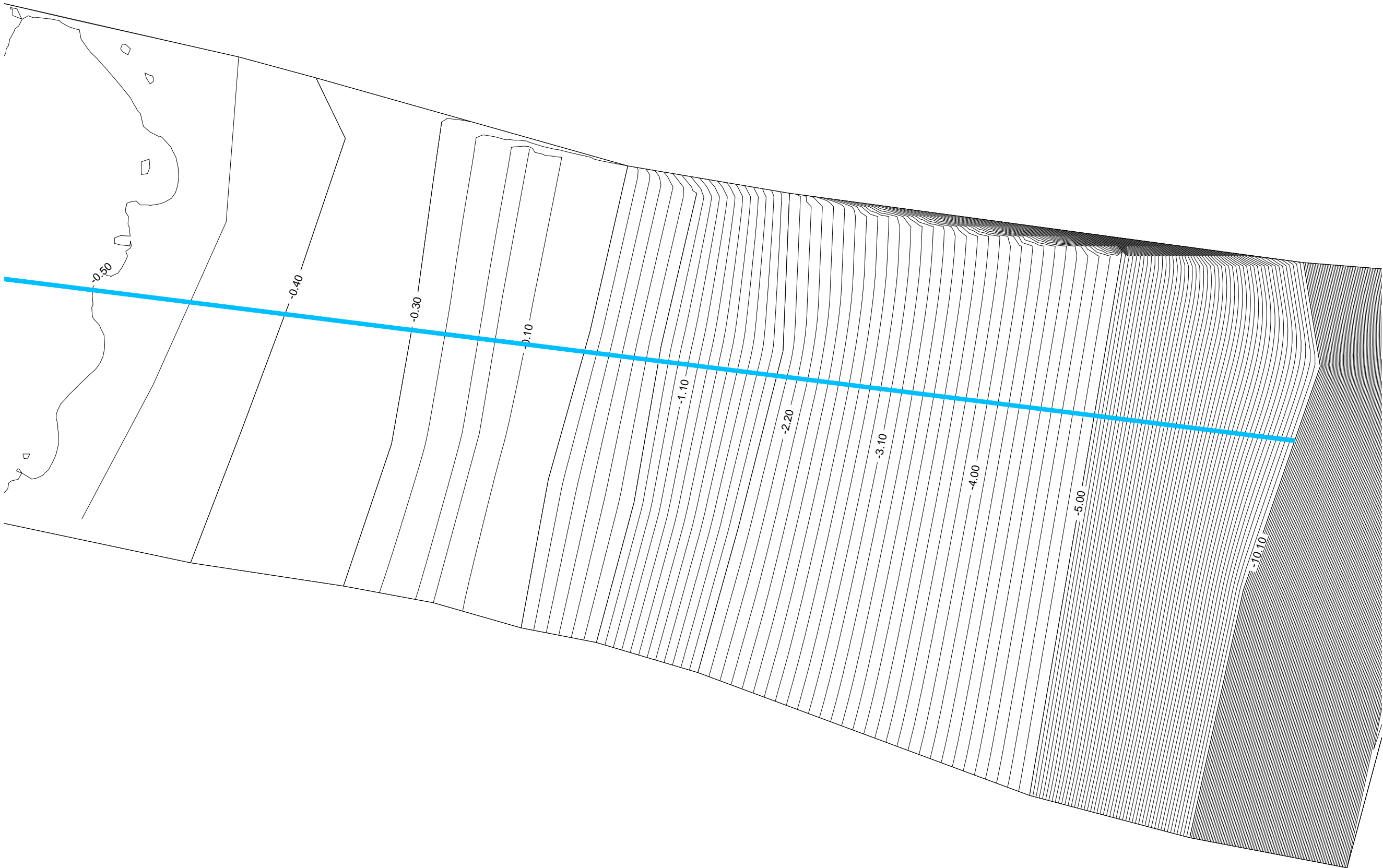












Legend

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- 160mm Ø uPVC PS2 Gravity Sewer Main (SN4, SDR41)
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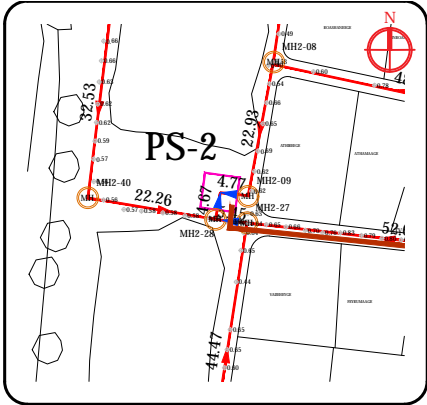
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### Legend

— 160mm Ø uPVC PS2 Gravity Sewer Main (SN4, SDR41)

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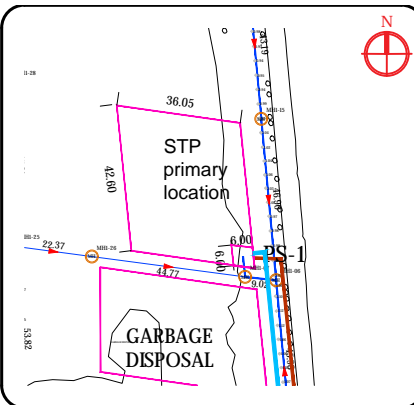
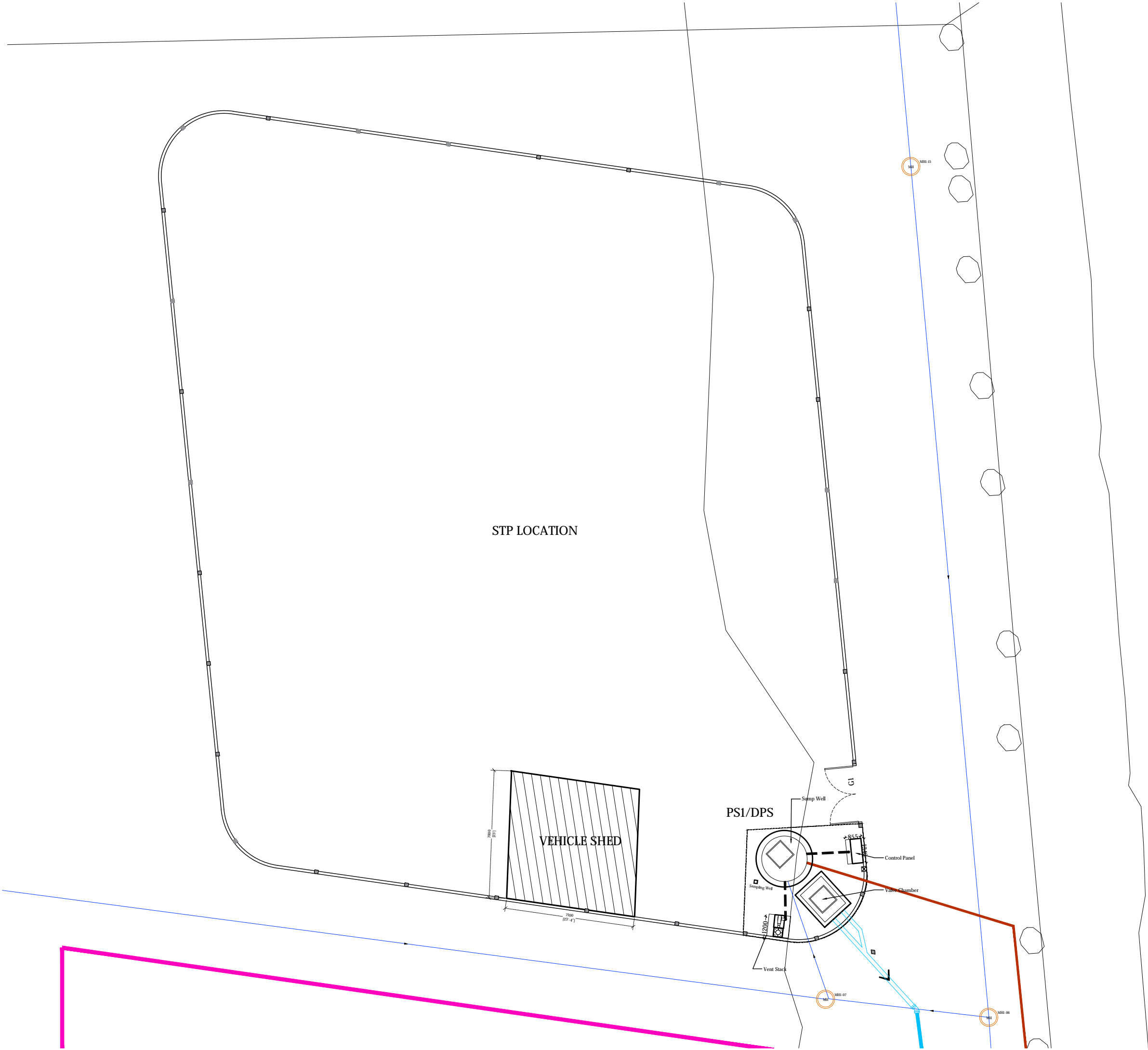
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## PUMP STATION (PS2) LAYOUT





- Legend**
- 160mm Ø uPVC PS1 Gravity Sewer Main (SN4, SDR41)
  - 110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11)
  - 160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11)

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Sub Title:  
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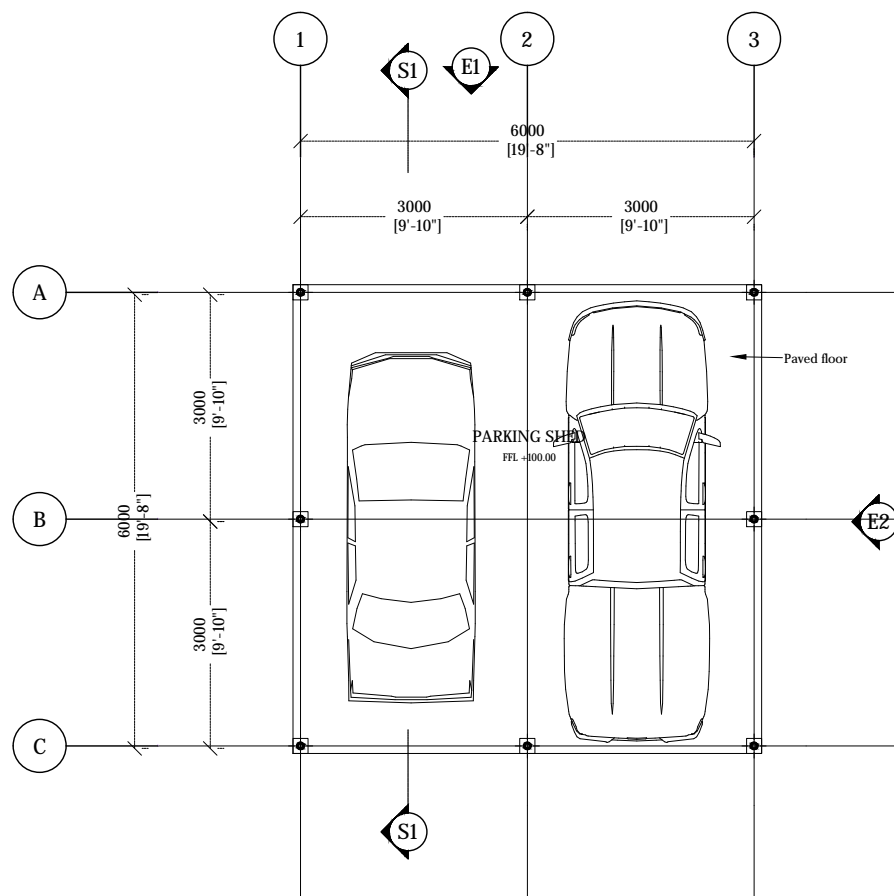


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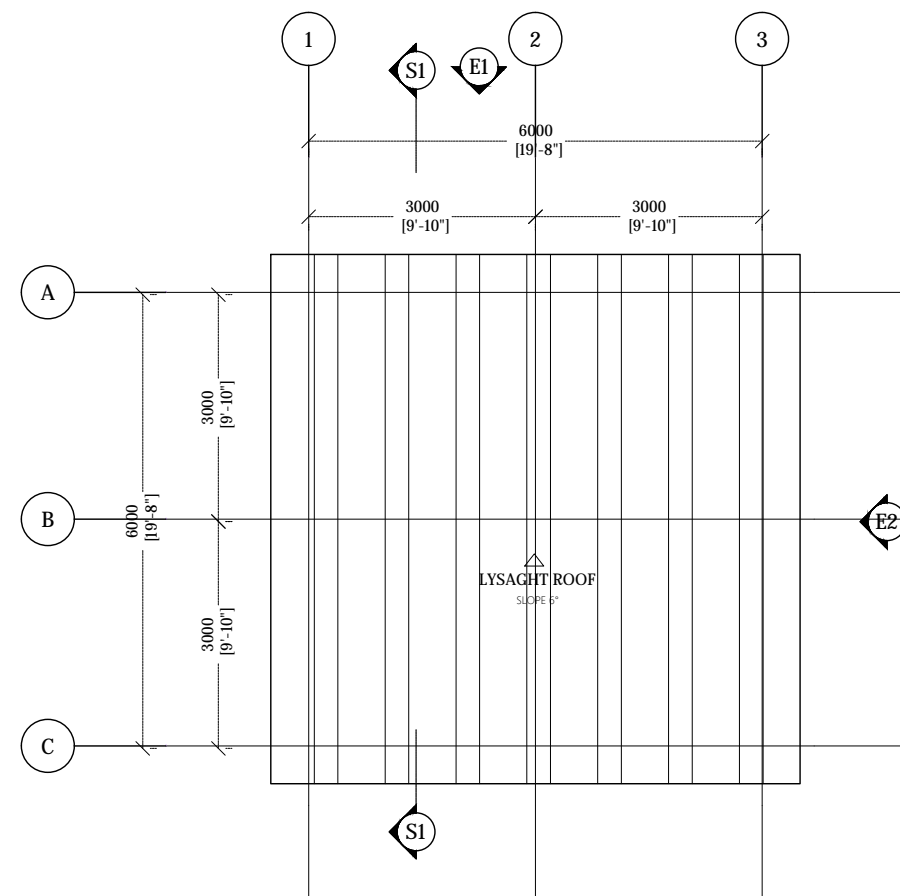
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STP/DPS LAYOUT  
1:200





1:100

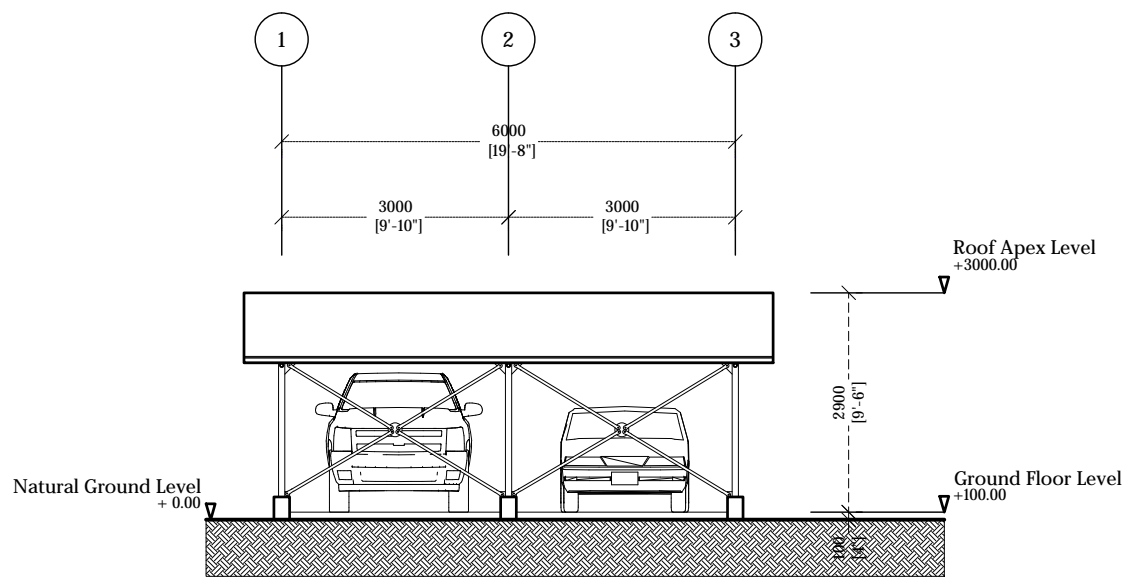


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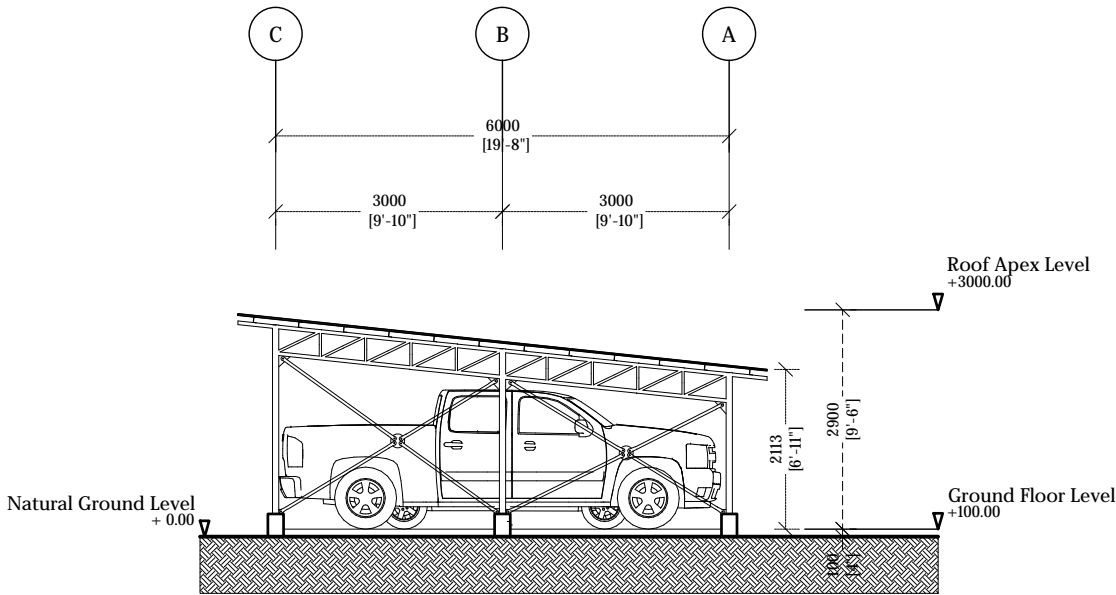
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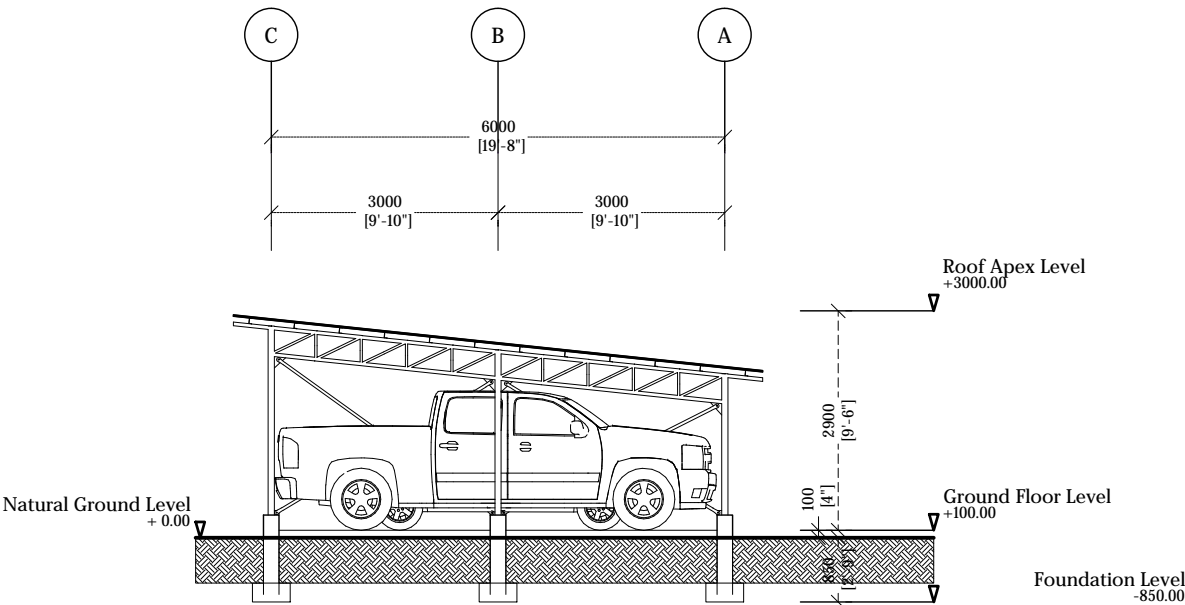
VEHICLE SHED ELEVATION E1

1:100



VEHICLE SHED ELEVATION E2

1:100



VEHICLE SHED SECTION S1

1:100



Legend

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Supply and Sewerage Facilities in  
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Maldivian Infrastructure Developments

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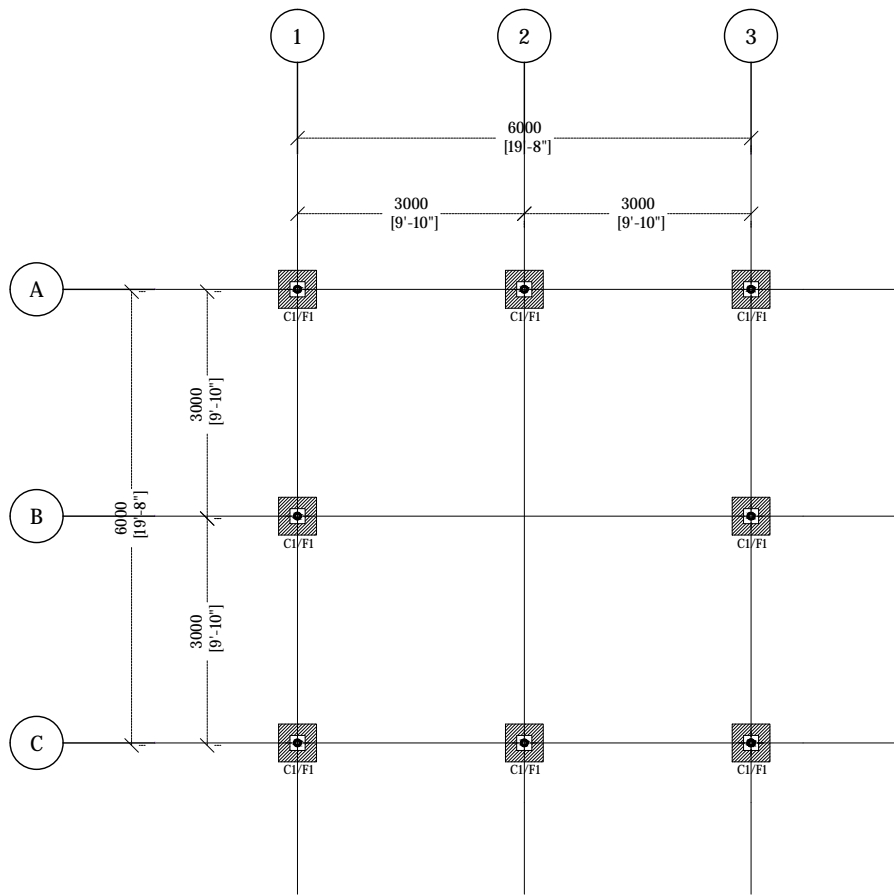
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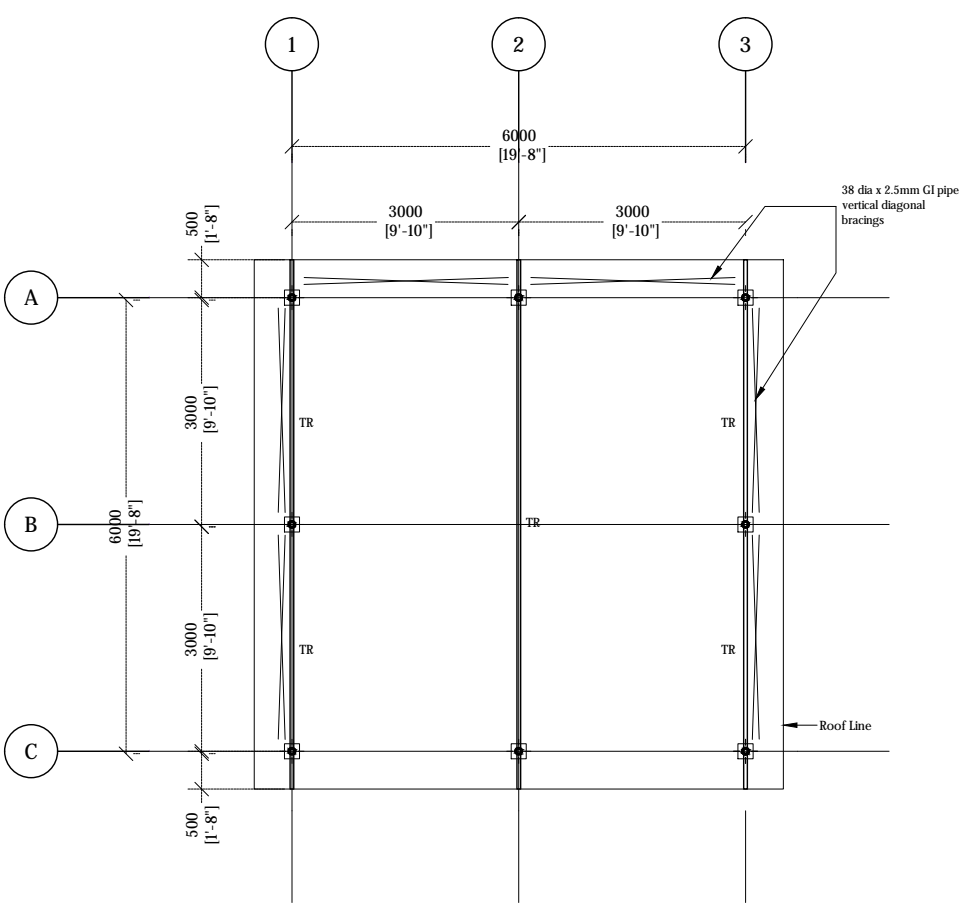
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VEHICLE SHED FOUNDATION PLAN

1:100



VEHICLE SHED ROOF TRUSS PLAN

1:100



Legend

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Maldivian Infrastructure Development

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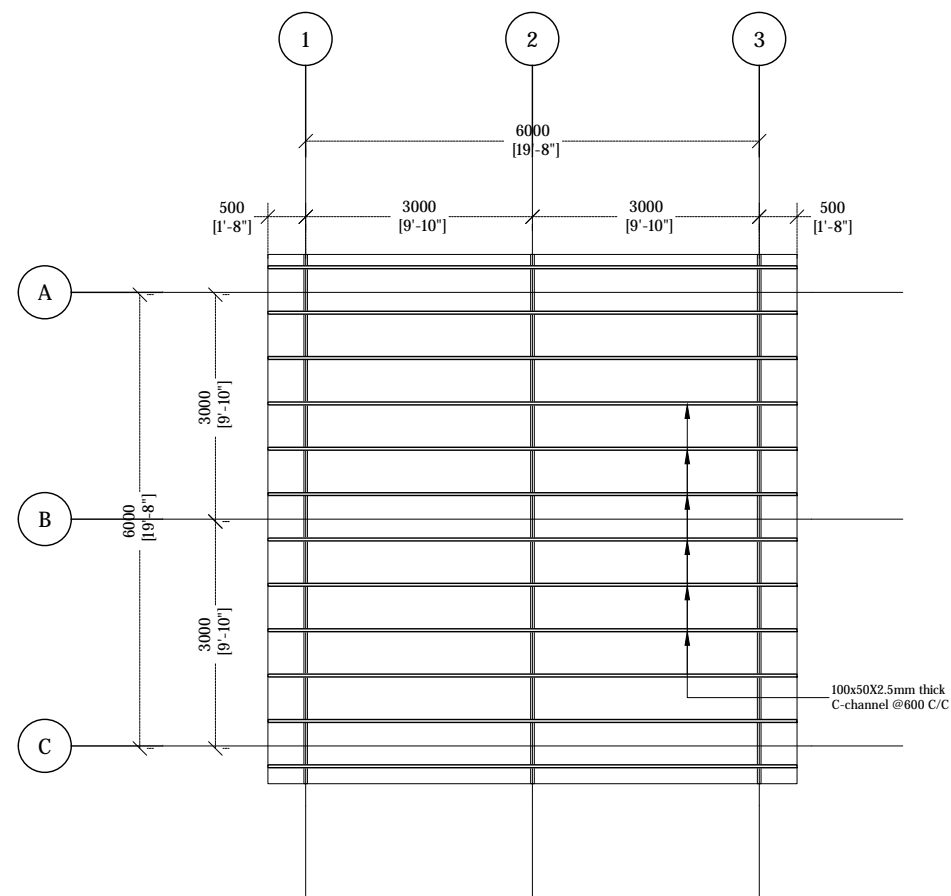
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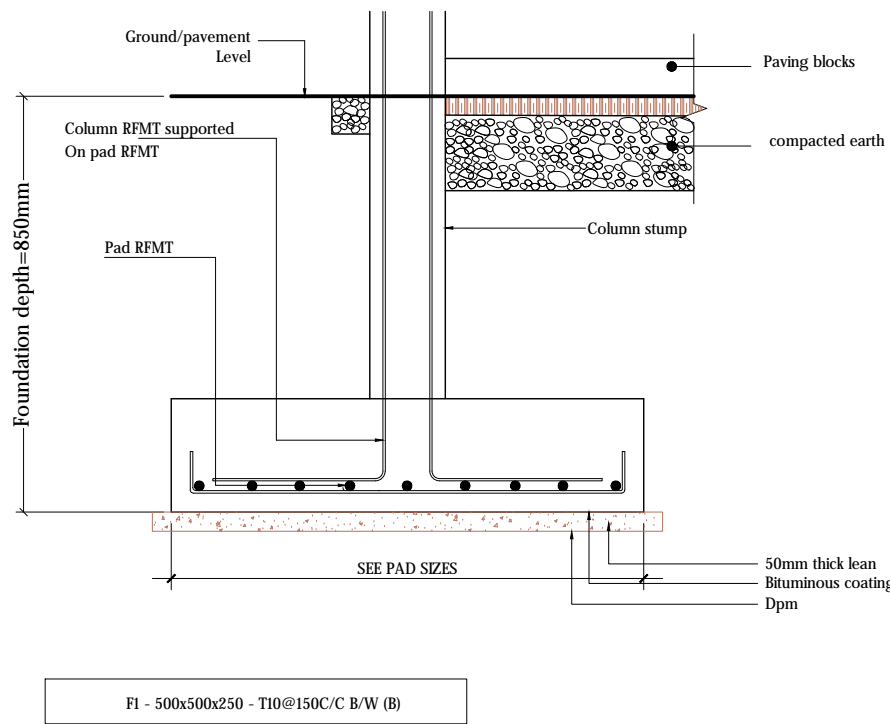




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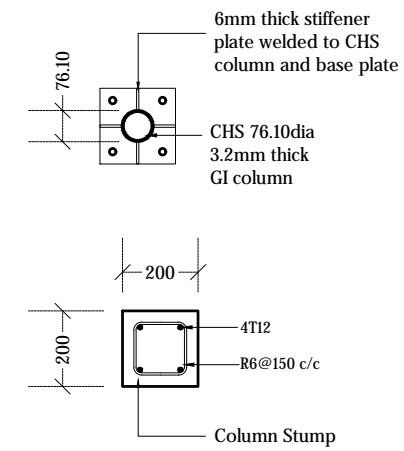
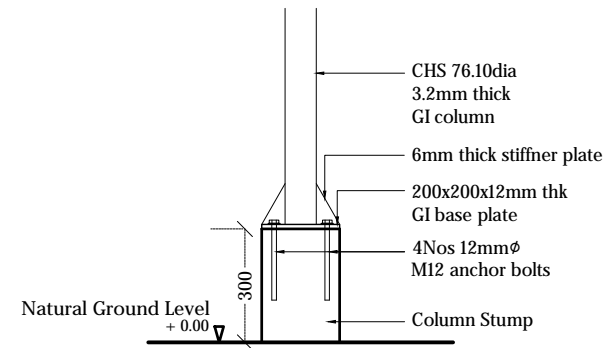




FOUNDATION PAD DETAILS

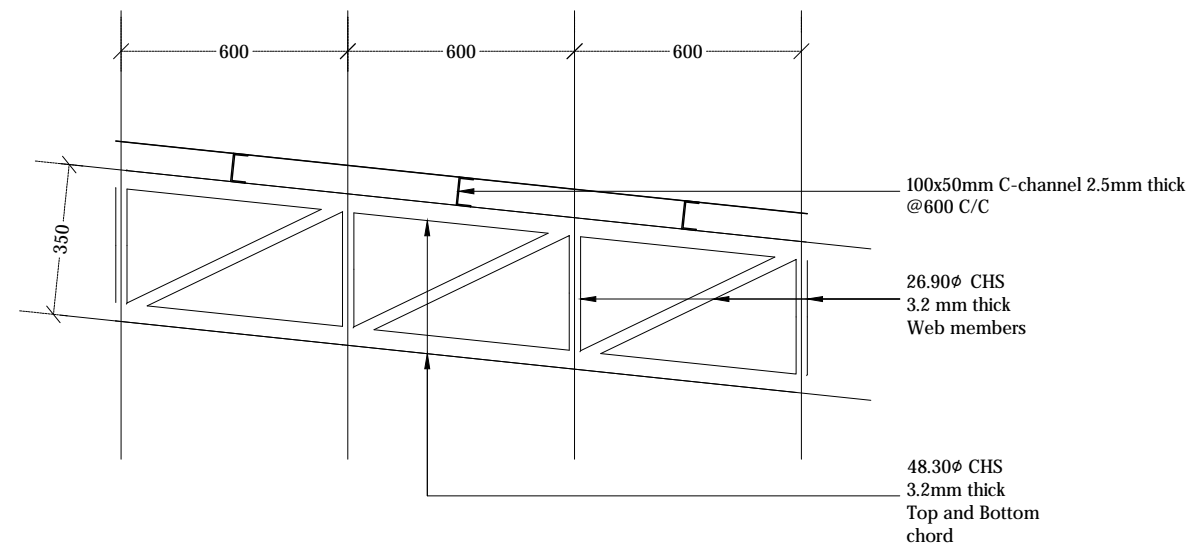
VEHICLE SHED FOOTING DETAIL

1:20



COLUMN DETAIL

1:20



TRUSS DETAIL

1:20



Legend

Notes:

- \*All CHS shall have minimum yield stress of 275MPa
- \*All welds shall be 6mm thick full perimeter fillet welds
- \*All Truss ends shall be end capped with 6mm plates
- \*All truss members shall be protected with anti corrosive coatings
- \*38 dia x 2.5mm GI pipe to be used for all bracings.
- \*Cover for footings shall be 50mm.
- \*Cover for columns shall be 40mm.
- \*Concrete shall be of grade C25.

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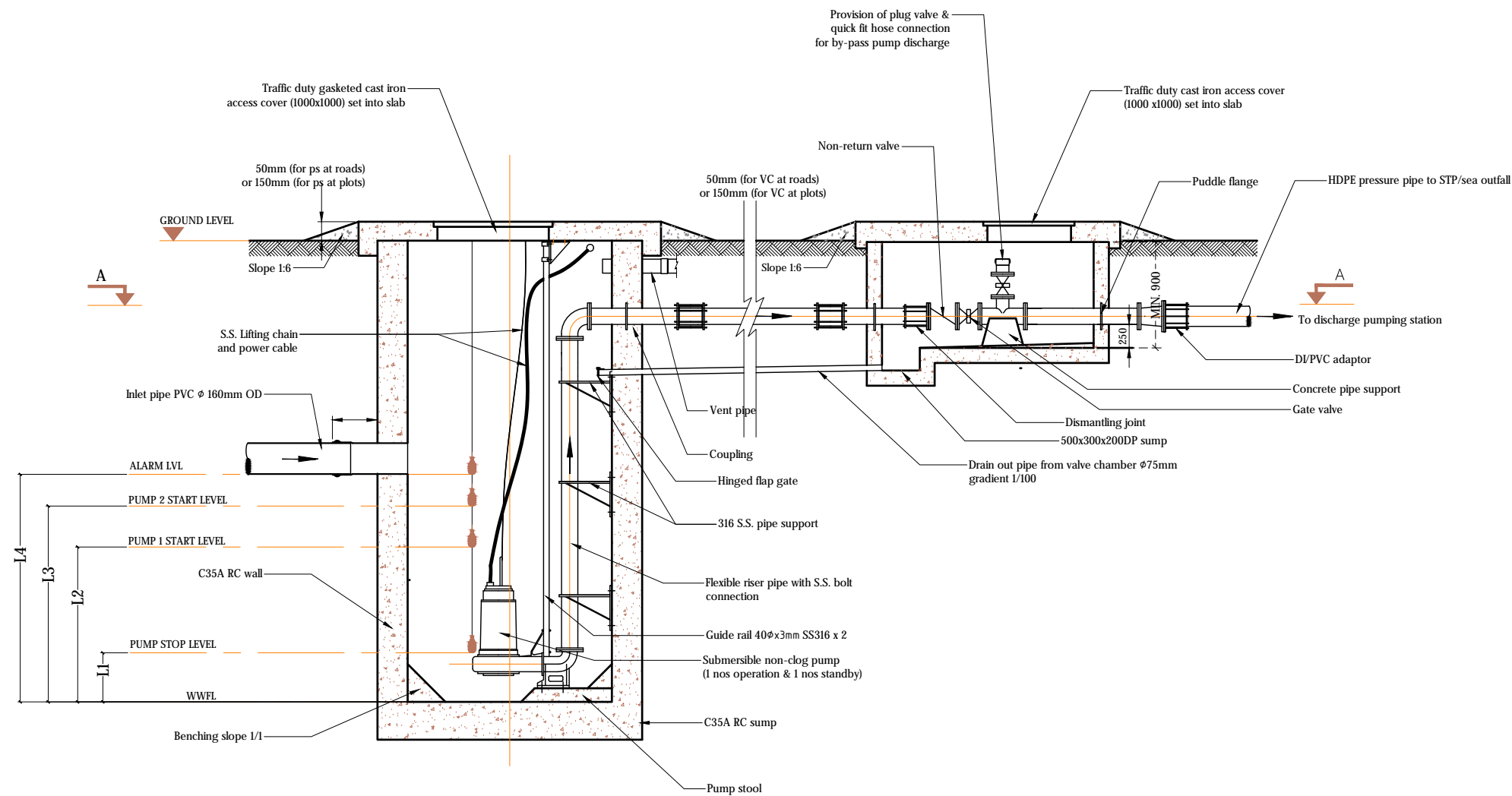
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Rev: Page: VS-S(3)





PUMP STATION DESIGN DETAILS

(15 YEARS)

Pump Station	Diameter (φ)	Depth (D)	Inlet Depth	Pump Capacity	Head	Levels			
						L1	L2	L3	L4
PS1/ DPS	2.5m	3.30m	2.477m	5.0 l/s	29.3 m	0.300m	0.604m	0.754m	0.904m
PS2	2.0m	3.20m	2.075m, 1.823m	3.3 l/s	14.5 m	0.300m	0.653m	0.803m	0.953m

PUMP STATION DETAILS - LONGITUDINAL SECTION  
NTS



Legend

Notes:

- Pumps, pipe work, fittings and control panel shall be installed in accordance with manufacturers recommendations.
- Orientation of valve chamber pipework to suit location.
- All structural concrete shall be of grade C35A.
- All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
- All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
- A cover of 75mm should be given for all reinforcements.
- Internal concrete surfaces to be coated with 5mm thickness of epoxy bonded glass fibre and finished with gel coat or 500 microns epoxy paint coating.
- External concrete surfaces to be painted with 3 coats of bitumen/rubber emulsion and protected by 500 micron polyethene.
- All concrete cold joints shall be casted with bonding agent

List of main instruments of pumping station:

1. Sewage pumps (1 duty & 1 standby)
2. Power cable
3. Auto-coupling with 40x3mm SS316 guide rails
4. Stainless steel (316) suspension chain
5. Cable with float control and weight
6. Discharge pipe
7. Puddle flange
8. Bitumen emulsion and 500 micron polythene sheet protection to external concrete surfaces
9. Construction joint / water bars
10. Manhole cover double seal ductile heavy duty cast iron / SS 316 cover
11. Vent pipe with vent cowl

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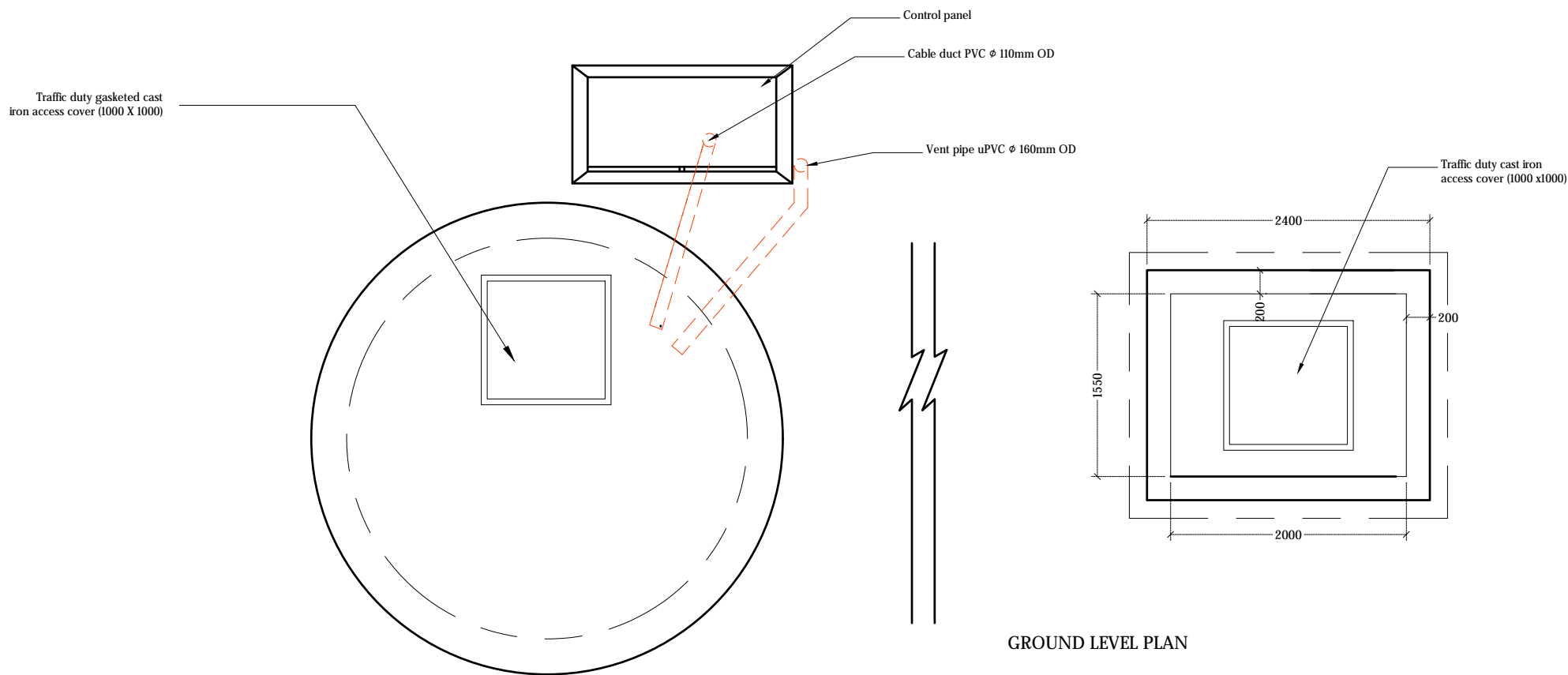
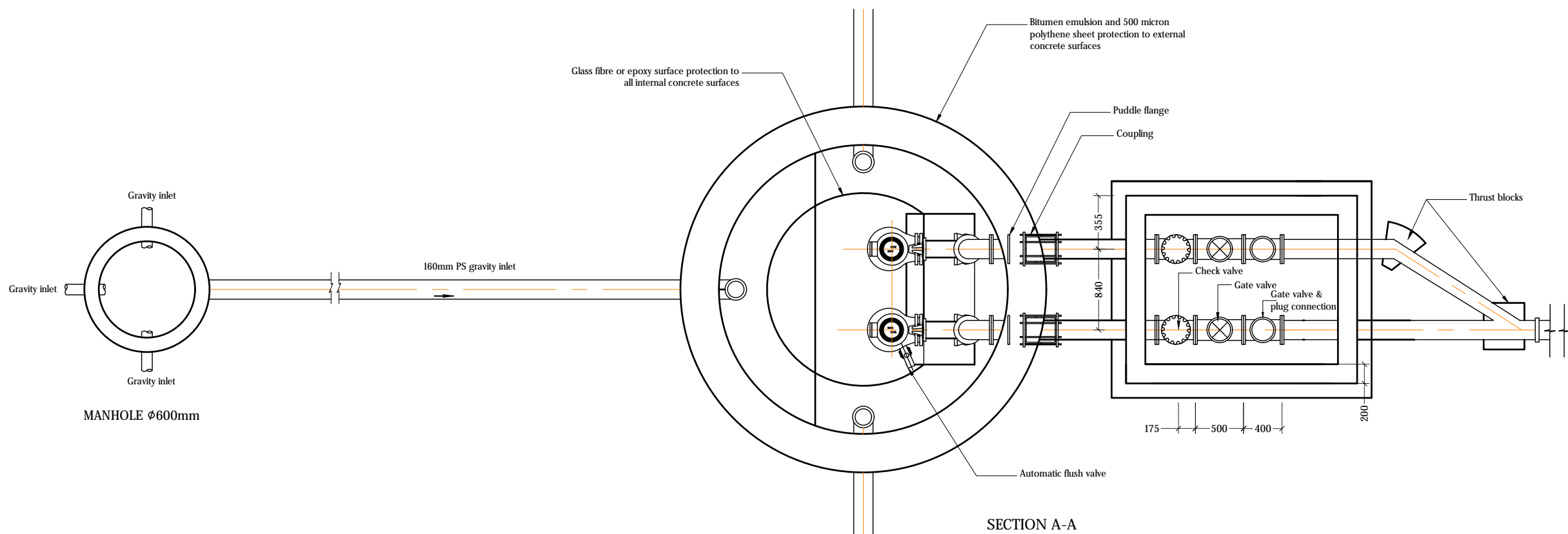
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PUMP STATION DETAILS - PLAN VIEW  
NTS



#### Legend

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Husnuheena Magu, Male', Maldives



Drawn: F.I.A. Checked: M.S.S.

Designed: F.I.A. Approved: I.W.

Date: Sep 2020 SCALE (A3): NTS

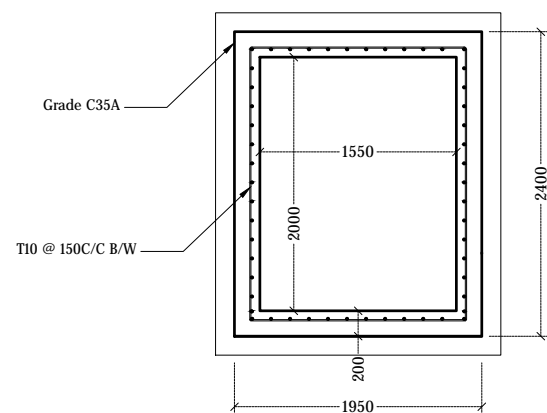
Project No: EP-WS/2019/05

Rev: Page:

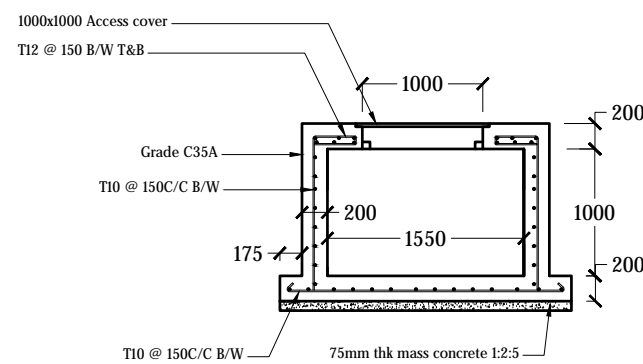
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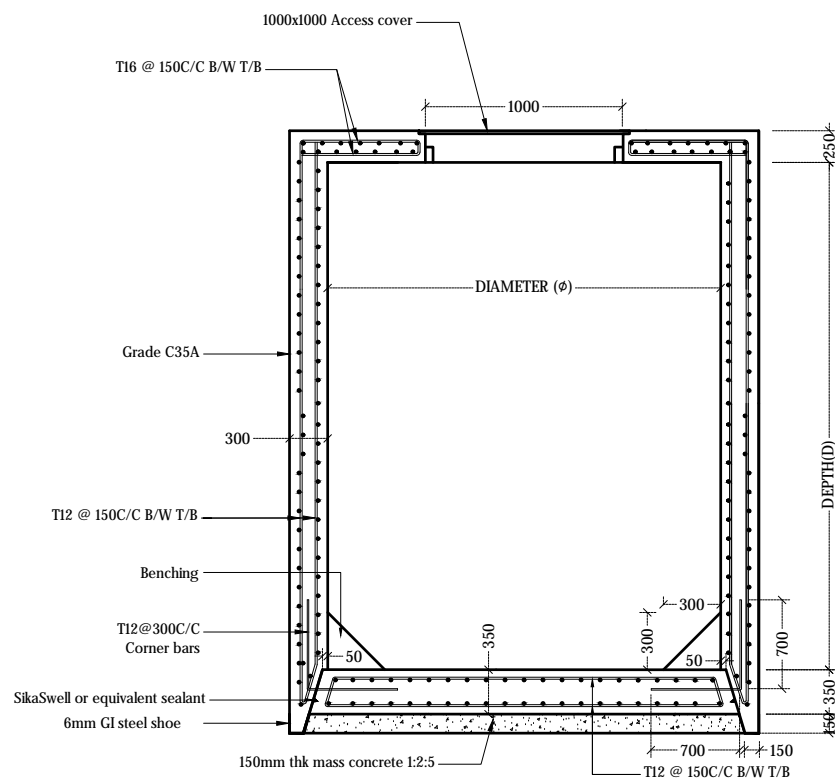
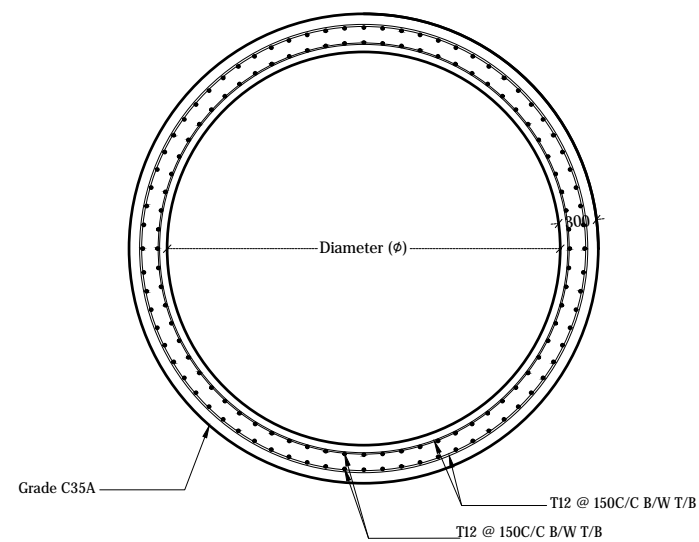
PLAN VIEW



SECTION



VALVE CHAMBER DETAIL



PUMP STATION DETAIL

Pump Station	Diameter (φ)	Depth (D)	Inlet Depth
PS1/ DPS	2.0m	3.20m	2.477m
PS2	2.5m	3.30m	2.075m, 1.823m

## PUMP STATION STRUCTURAL DETAILS

NTS



## Legend

## Notes:

- Pumps, pipe work, fittings and control panel shall be installed in accordance with manufacturers recommendations.
- Orientation of valve chamber pipework to suit location.
- All structural concrete shall be of grade C35A.
- All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
- All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
- A cover of 75mm should be given for all reinforcements.
- Internal concrete surfaces to be coated with 5mm thickness of epoxy bonded glass fibre and finished with gel coat or 500 microns epoxy paint coating.
- External concrete surfaces to be painted with 3 coats of bitumen/rubber emulsion and protected by 500 micron polythene.
- All concrete cold joints shall casted with bonding agent
- Corner bars (3T16 @ 75C/C T/B) shall be provided around top slab openings

## List of main instruments of pumping station:

1. Sewage pumps (1 duty & 1 standby)
2. Power cable
3. Auto-coupling with 400x3mm SS316 guide rail
4. Stainless steel (316) suspension chain
5. Cable with float control and weight
6. Discharge pipe
7. Puddle flange
8. Bitumen emulsion and 500 micron polythene sheet protection to external concrete surfaces
9. Construction joint / water bars
10. Manhole cover double seal ductile heavy duty cast iron / SS 316 cover
11. Vent pipe with vent cowl

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.
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Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



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Hunuheenna Magu, Male', Maldives



Drawn: F.I.A. Checked: M.S.S.

Designed: F.I.A. Approved: I.W.

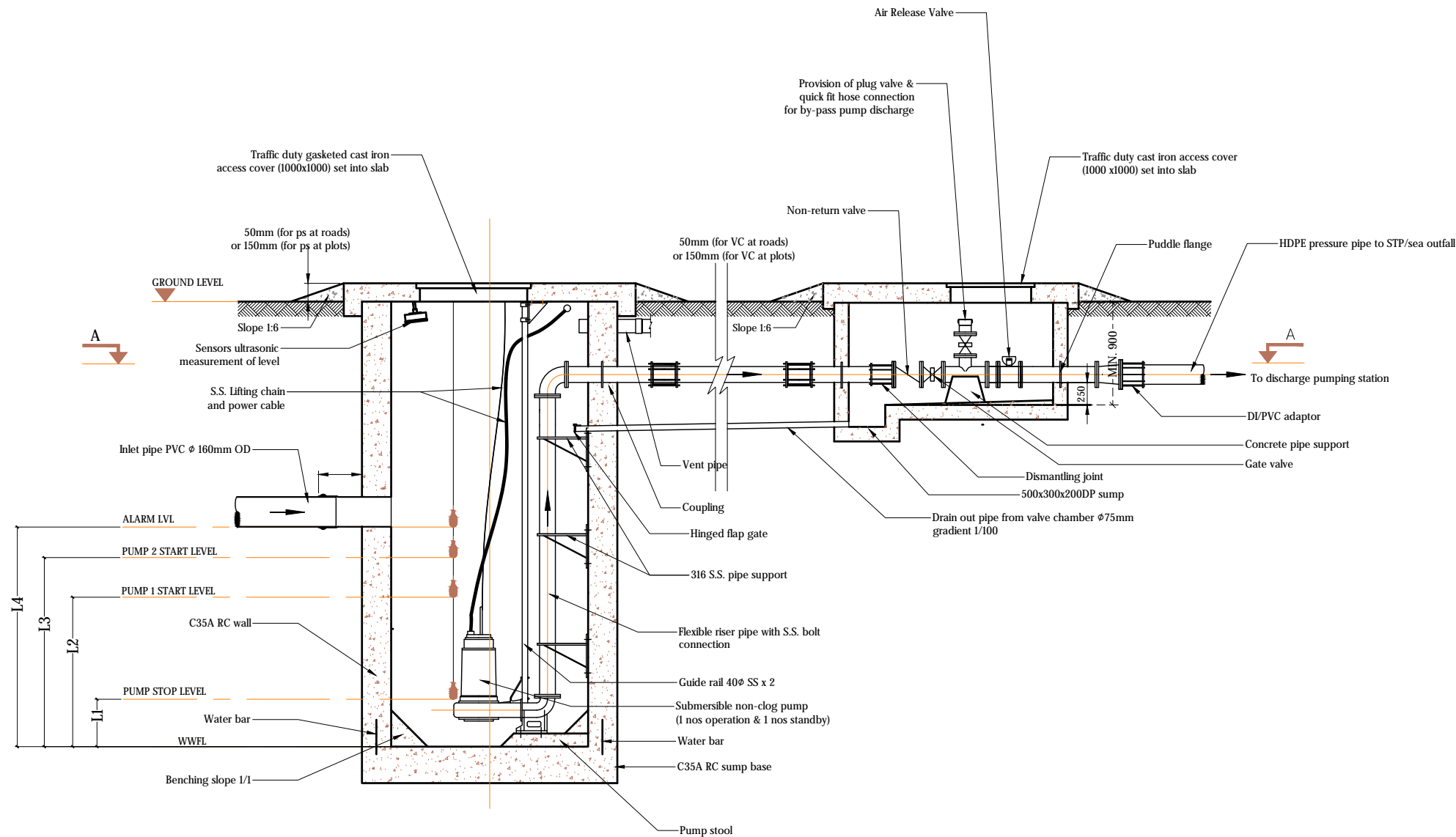
Date: Sep 2020 SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev: Page:

W-(5)





DISCHARGE PUMP STATION DESIGN DETAILS

(15 YEARS)

DPS	2.5m	2.70m	0.8m	10.6 l/s	23.6 m	Levels			
						0.300m	0.624m	0.774m	0.924m

## DISCHARGE PUMP STATION DETAILS - LONGITUDINAL SECTION

NTS



### Legend

#### Notes:

- Pumps, pipe work, fittings and control panel shall be installed in accordance with manufacturers recommendations.
- Orientation of valve chamber pipework to suit location.
- All structural concrete shall be of grade C35A.
- All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
- All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
- A cover of 75mm should be given for all reinforcements.
- Internal concrete surfaces to be coated with 5mm thickness of epoxy bonded glass fibre and finished with gel coat or 500 microns epoxy paint coating.
- External concrete surfaces to be painted with 3 coats of bitumen/rubber emulsion and protected by 500 micron polythene.
- All concrete cold joints shall casted with bonding agent

#### List of main instruments of pumping station:

1. Sewage pumps (1 duty & 1 standby)
2. Power cable
3. Auto-coupling with 40Øx3mm SS316 guide rails
4. Stainless steel (316) suspension chain
5. Cable with float control and weight
6. Discharge pipe
7. Puddle flange
8. Bitumen emulsion and 500 micron polythene sheet protection to external concrete surfaces
9. Construction joint / water bars
10. Manhole cover double seal ductile heavy duty cast iron / SS 316 cover
11. Vent pipe with vent cowl

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.
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#### Title:

Consultancy Services for Survey, Design and EIA works of Water Supply and Sewerage Facilities in 6 islands, Maldives - Package 5

#### Sub Title:

Sewerage System in M. Naalaafushi

#### Client:

Ministry of National Planning, Housing and Infrastructure, Republic of Maldives



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Husuheenna Magu, Male', Maldives



Drawn: F.I.A. Checked: M.S.S.

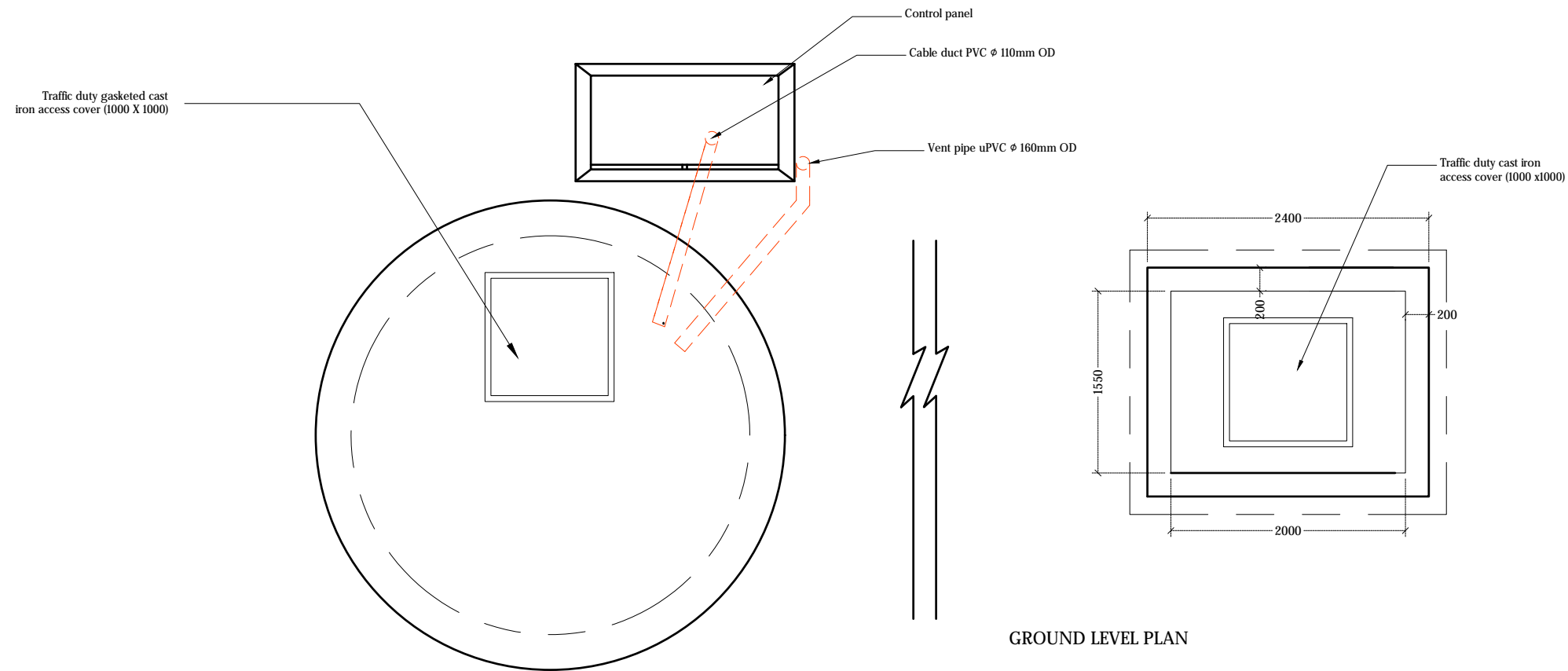
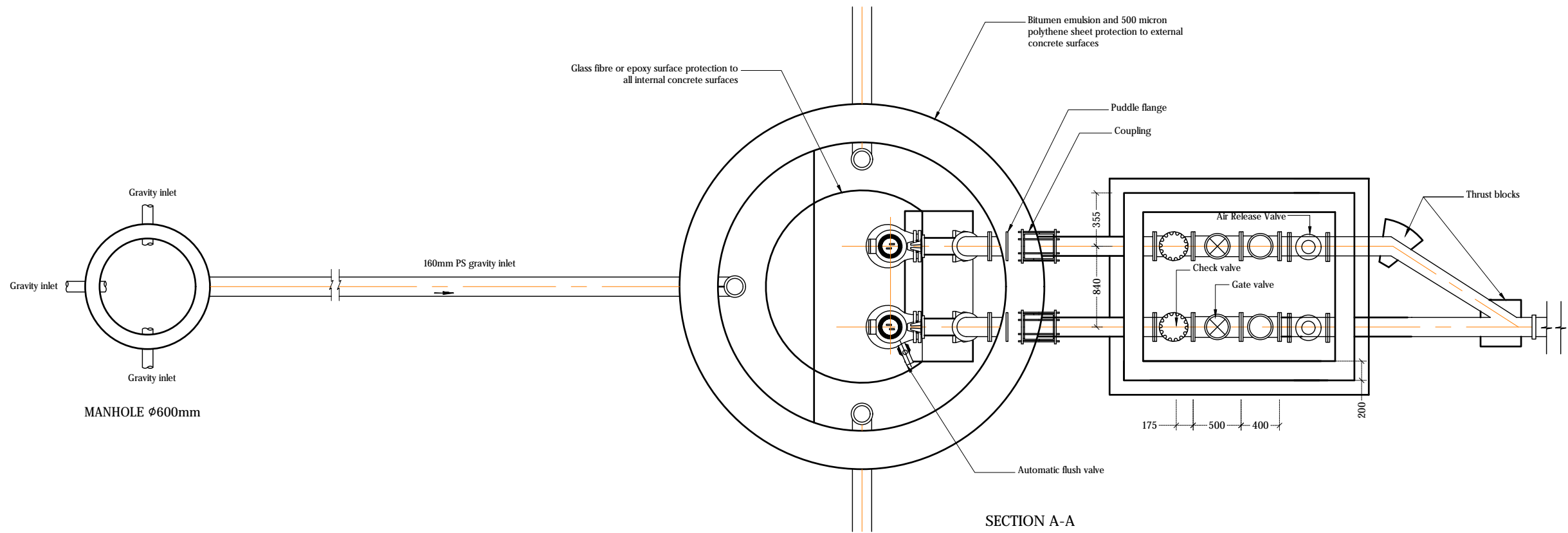
Designed: F.I.A. Approved: I.W.

Date: Sep 2020 SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev: Page: W-(24)





## DISCHARGE PUMP STATION DETAILS - PLAN VIEW

NTS



### Legend

#### Notes:

- Pumps, pipe work, fittings and control panel shall be installed in accordance with manufacturers recommendations.
- Orientation of valve chamber pipework to suit location.
- All structural concrete shall be of grade C35A.
- All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
- All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
- A cover of 75mm should be given for all reinforcements.
- Internal concrete surfaces to be coated with 5mm thickness of epoxy bonded glass fibre and finished with gel coat or 500 microns epoxy paint coating.
- External concrete surfaces to be painted with 3 coats of bitumen/rubber emulsion and protected by 500 micron polythene.
- All concrete cold joints shall casted with bonding agent

#### List of main instruments of pumping station:

1. Sewage pumps (1 duty & 1 standby)
2. Power cable
3. Auto-coupling with 400x3mm SS316 guide rails
4. Stainless steel (316) suspension chain
5. Cable with float control and weight
6. Discharge pipe
7. Puddle flange
8. Bitumen emulsion and 500 micron polythene sheet protection to external concrete surfaces
9. Construction joint / water bars
10. Manhole cover double seal ductile heavy duty cast iron / SS 316 cover
11. Vent pipe with vent cowl

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

#### Title:

Consultancy Services for Survey, Design and EIA works of Water Supply and Sewerage Facilities in 6 islands, Maldives - Package 5

#### Sub Title:

Sewerage System in M. Naalaafushi

#### Client:

Ministry of National Planning, Housing and Infrastructure, Republic of Maldives



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Drawn: F.I.A. Checked: M.S.S.

Designed: F.I.A. Approved: I.W.

Date: Sep 2020 SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev: Page:

W-(25)

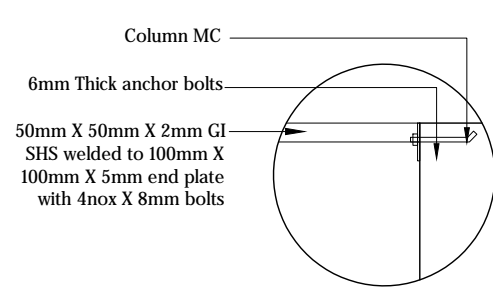
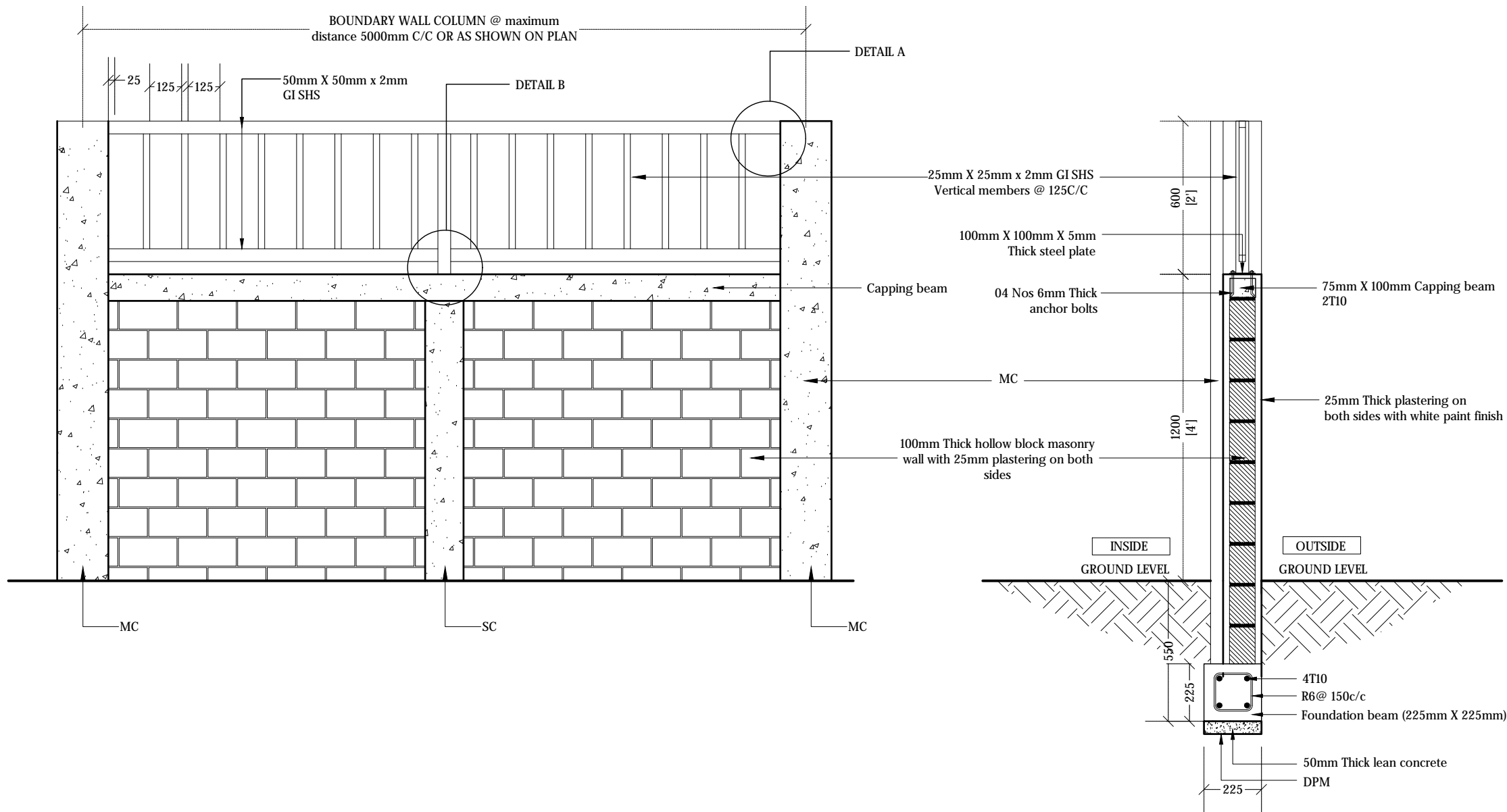




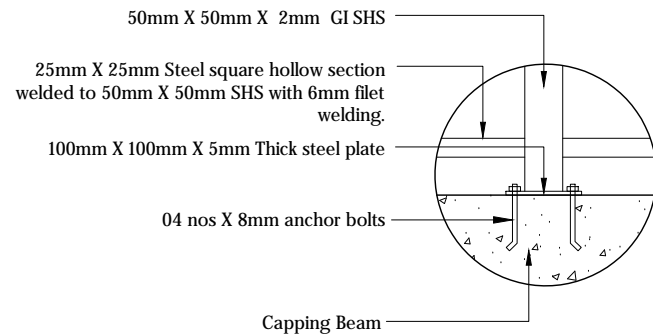




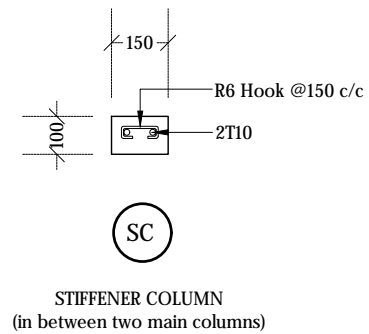
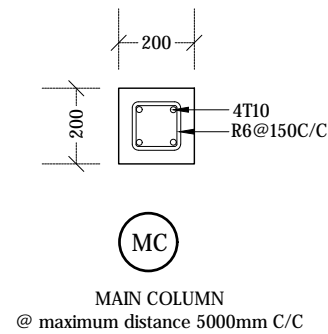




DETAIL A  
1:10



DETAIL B  
1:10



#### Legend

#### Notes:

- FRAME MATERIAL : Steel gate frame 2.5mm thick GI sections SHS
- All steel members and GI SHS to be applied with 2 coats of anti-corrosive paint with epoxy finishing paint
- Allowance shall be made to fix pad lock in Gates
- Cover for foundation beams shall be 50mm
- Cover for columns (MC) shall be 40mm
- Concrete shall be of grade C25
- All concrete cold joints shall be casted with bonding agent

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
**Consultancy Services for Survey, Design and EIA works of Water Supply and Sewerage Facilities in 6 islands, Maldives - Package 5**

Sub Title:  
**Sewerage System in M. Naalaafushi**

Client:  
**Ministry of National Planning, Housing and Infrastructure, Republic of Maldives**

**EPOCH**  
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**FOODBACK INFRA**  
MALDIVES

Drawn: F.I.A. Checked: M.S.S.

Designed: F.I.A. Approved: I.W.

Date: Sep 2020 SCALE (A3): 1:20

Project No: EP-WS/2019/05

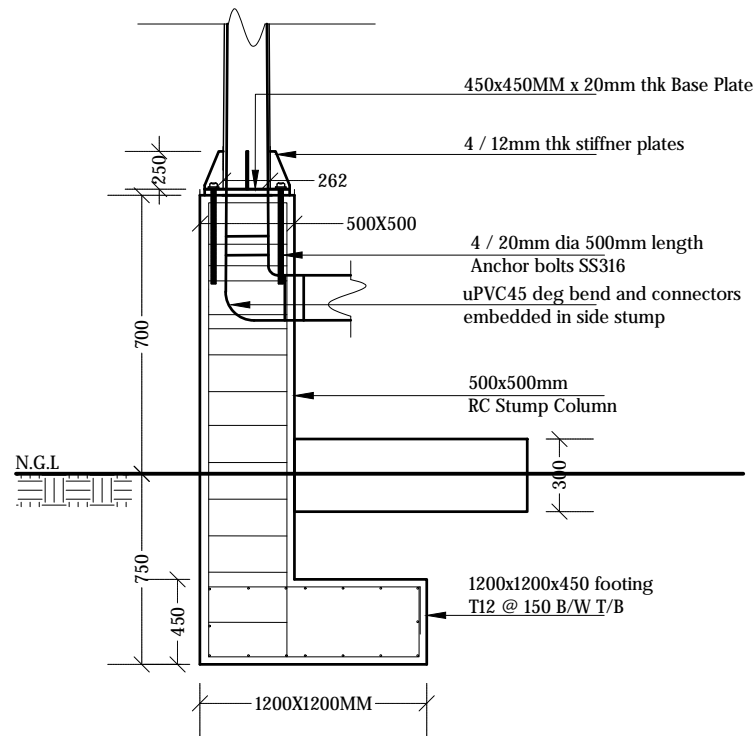
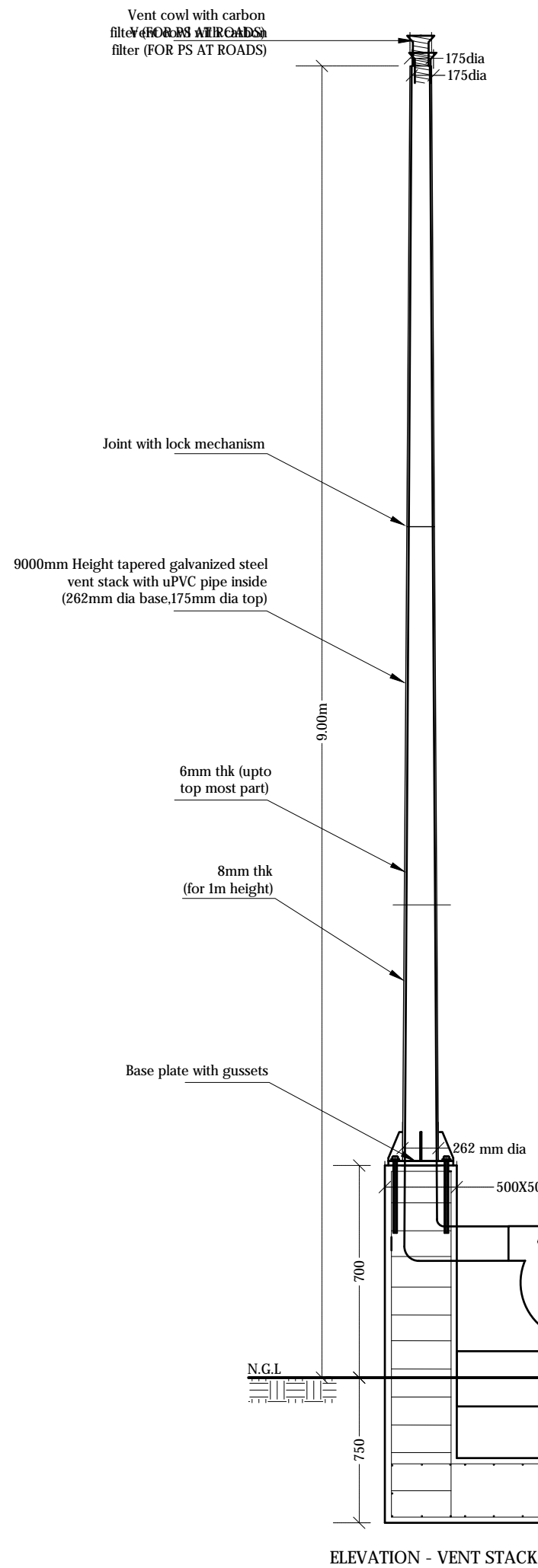
Rev: Page:

W-(7)

## PS & STP BOUNDARY WALL AND FENCING DETAILS

1:20





SECTION - S

## VENT STACK DETAILS

NTS

### Legend

#### Notes:

- Vent stack shall be galvanized (minimum 250 micron) and finished with epoxy paint
- All anchor bolts shall be SS316
- Cover for footings shall be 50mm
- Cover for stump shall be 40mm
- Concrete shall be of grade C25
- All concrete cold joints shall be casted with bonding agent

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

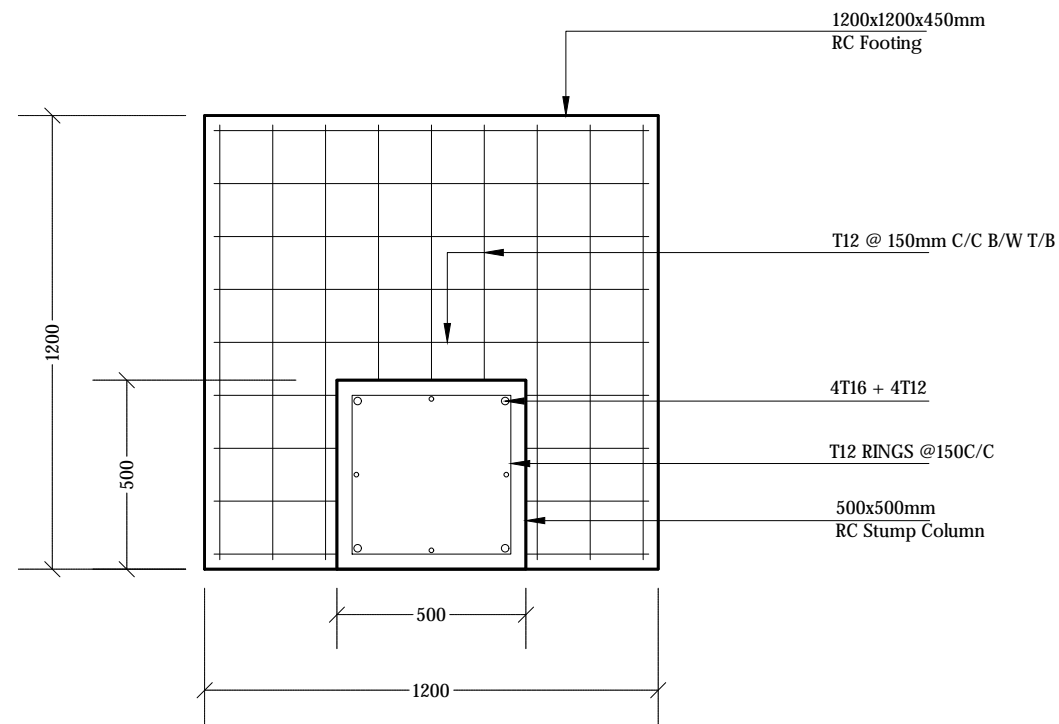
Client:  
Ministry of National Planning, Housing and  
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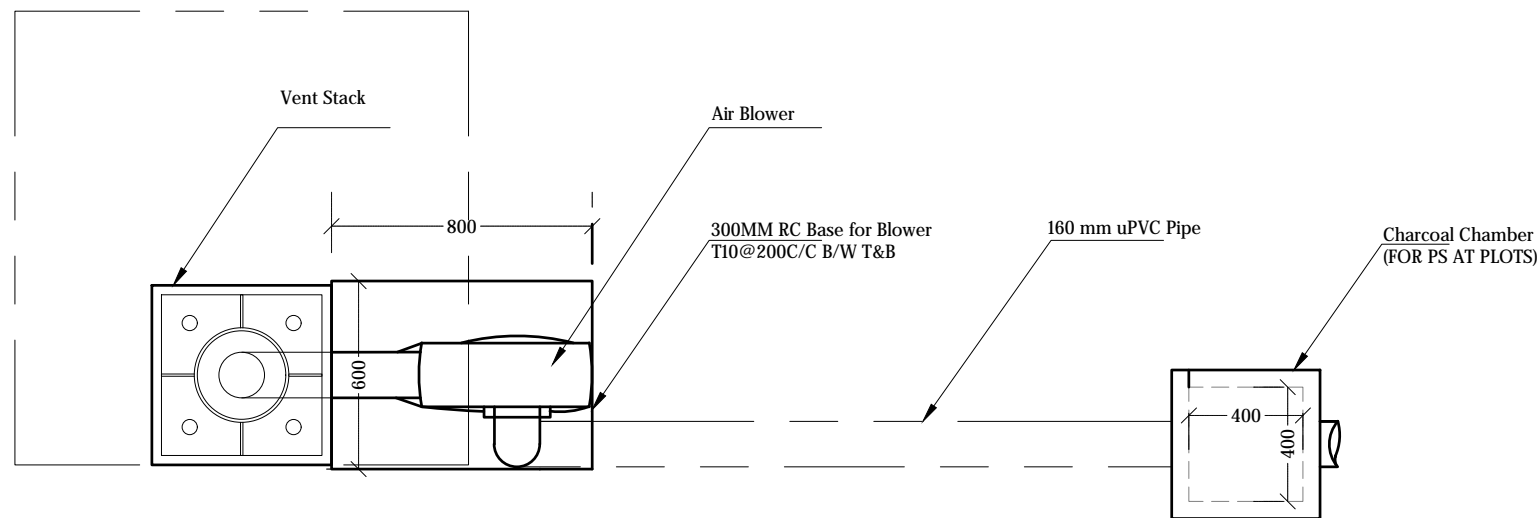
**DBACK INFRA**  
Building Sustainable Infrastructure

Drawn: F.I.A.	Checked: M.S.S.
Designed: F.I.A.	Approved: I.W.
Date: Sep 2020	SCALE (A3): NTS
Project No: EP-WS/2019/05	Rev: Page: W-(8)





FOOTING & STUMP DETAILS OF VENT STACK



AIR BLOWER DETAILS (Plan View)

# VENT STACK AND AIR BLOWER DETAILS

NTS



## Legend

- Notes:
- All anchor bolts shall be SS316
  - Cover for footings shall be 50mm
  - Cover for stump shall be 40mm
  - Concrete shall be of grade C25
  - All concrete cold joints shall be casted with bonding agent

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
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Husuheena Magu, Male', Maldives



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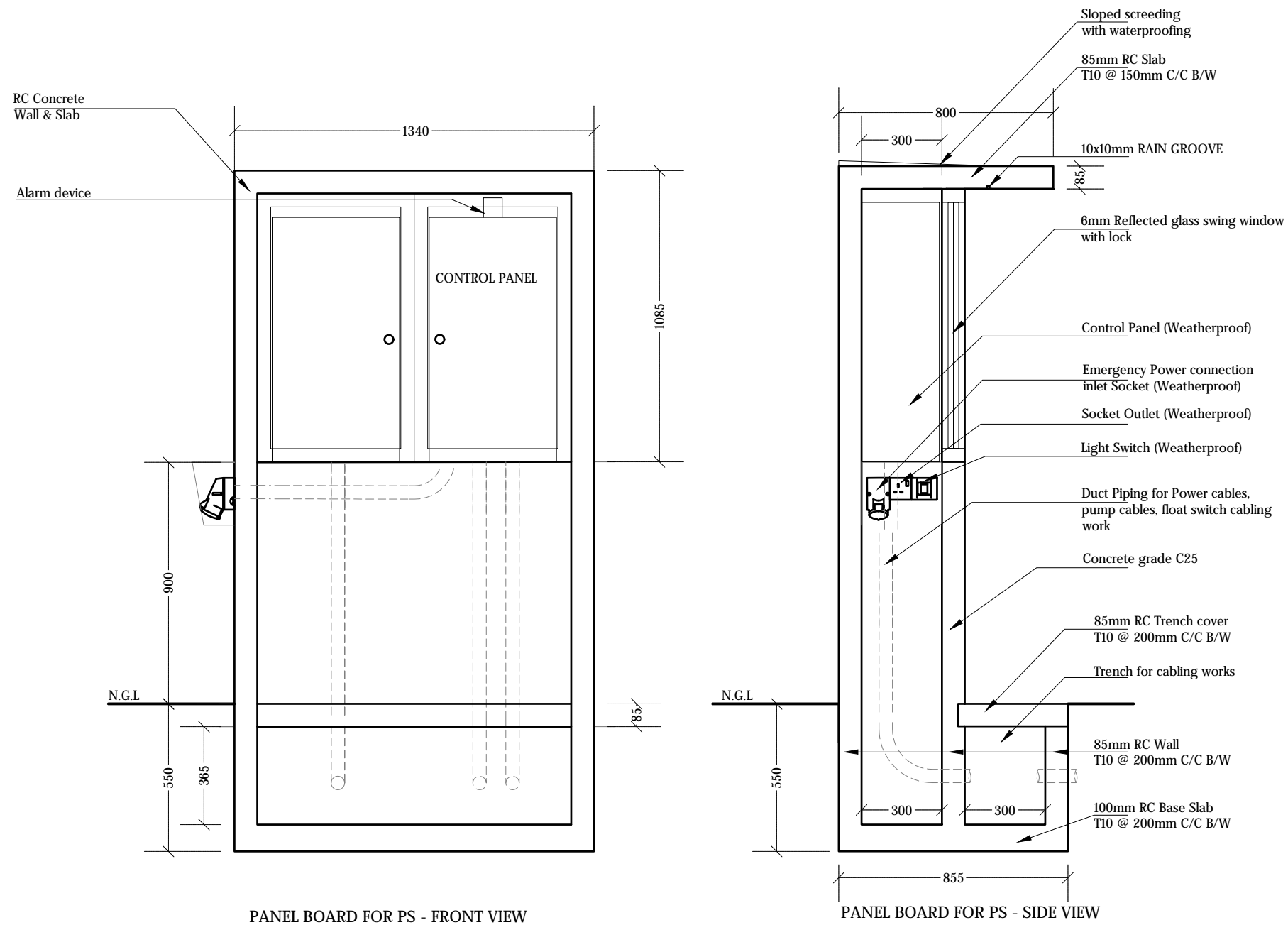
Designed: F.I.A. Approved: I.W.

Date: Sep 2020 SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev: Page: W-(9)





## CONTROL PANEL BOARD DETAILS

NTS

Legend

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

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T: +960 333 3528  
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Husnuheena Magu, Male', Maldives

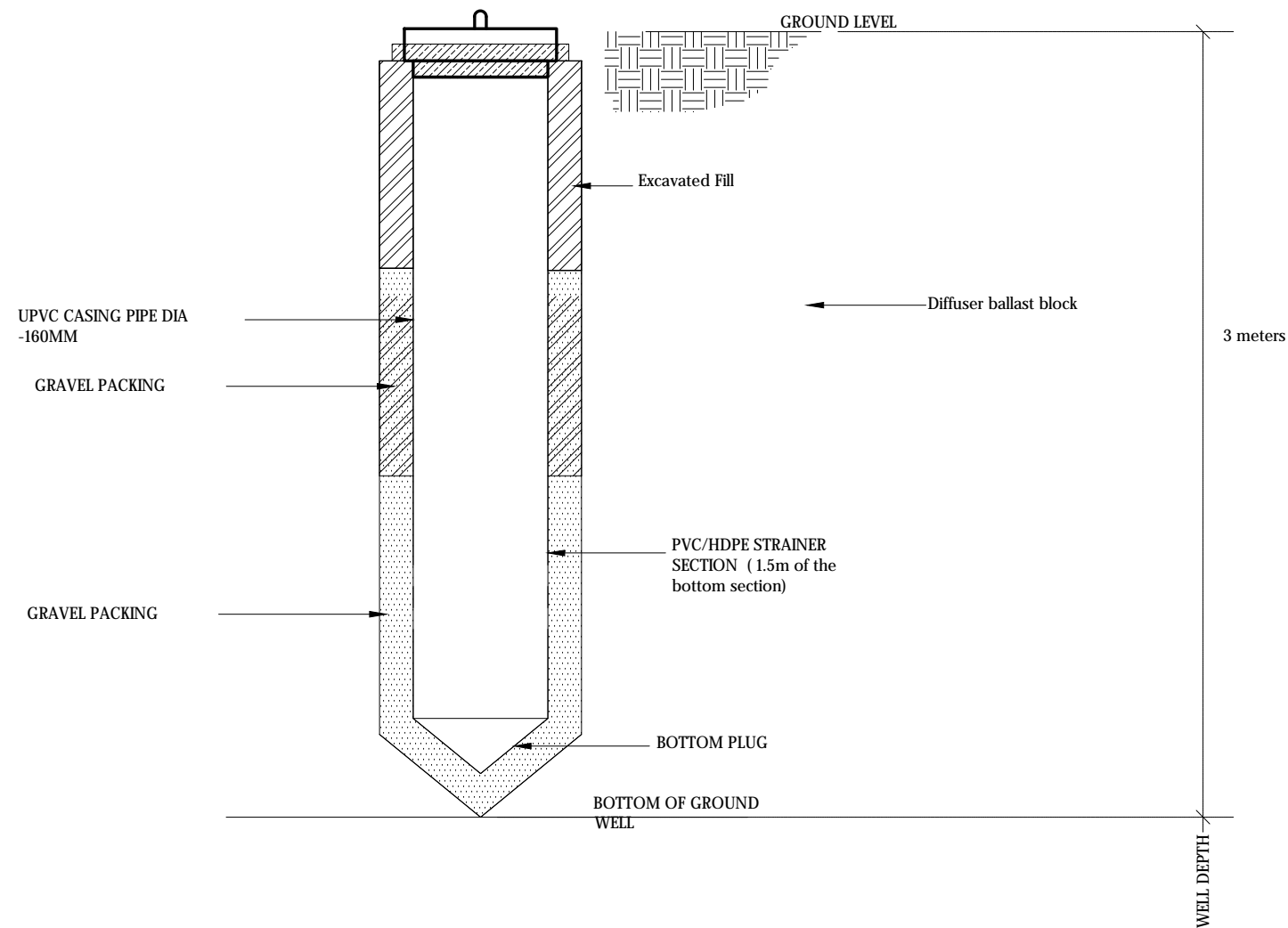
**FDBACK INFRA**  
Maldivian Infrastructure Development

Drawn: F.I.A.	Checked: M.S.S.
Designed: F.I.A.	Approved: I.W.
Date: Sep 2020	SCALE (A3): NTS
Project No: EP-WS/2019/05	Page: W-(10)









## SAMPLING WELL SECTION

NTS



### Legend

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

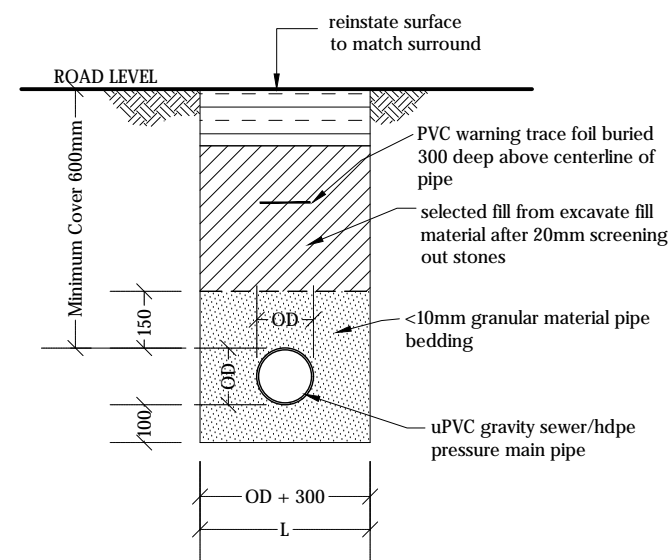
Client:  
Ministry of National Planning, Housing and  
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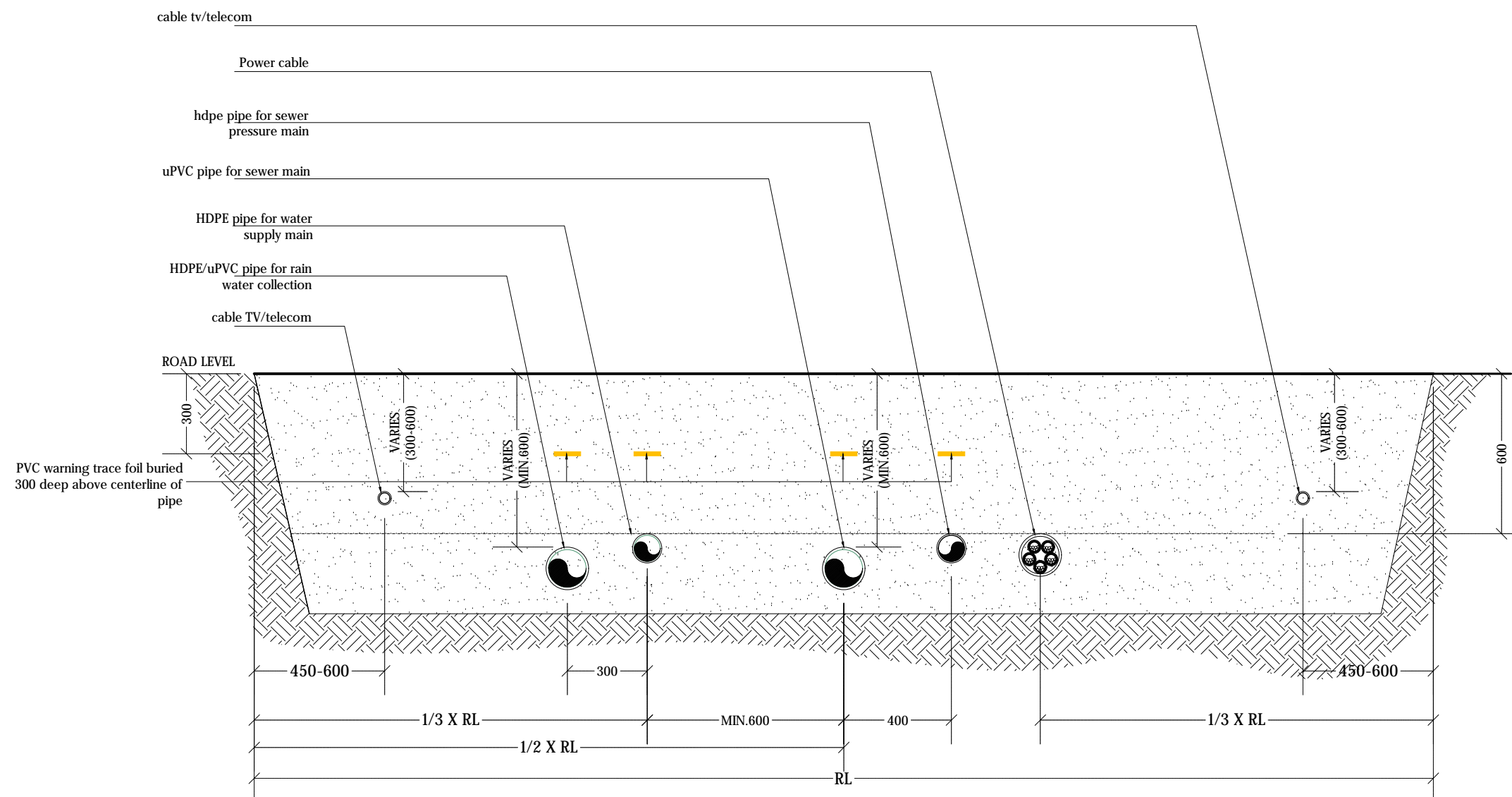
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Maldivian Infrastructure Development

Drawn: F.I.A.	Checked: M.S.S.
Designed: F.I.A.	Approved: I.W.
Date: Sep 2020	SCALE (A3): NTS
Project No: EP-WS/2019/05	Page: W-(23)





TRENCH & BEDDING DETAILS



TYPICAL ROAD SECTION

## TRENCH AND BEDDING DETAILS

1:20

### Legend

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
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Designed: F.I.A. Approved: I.W.

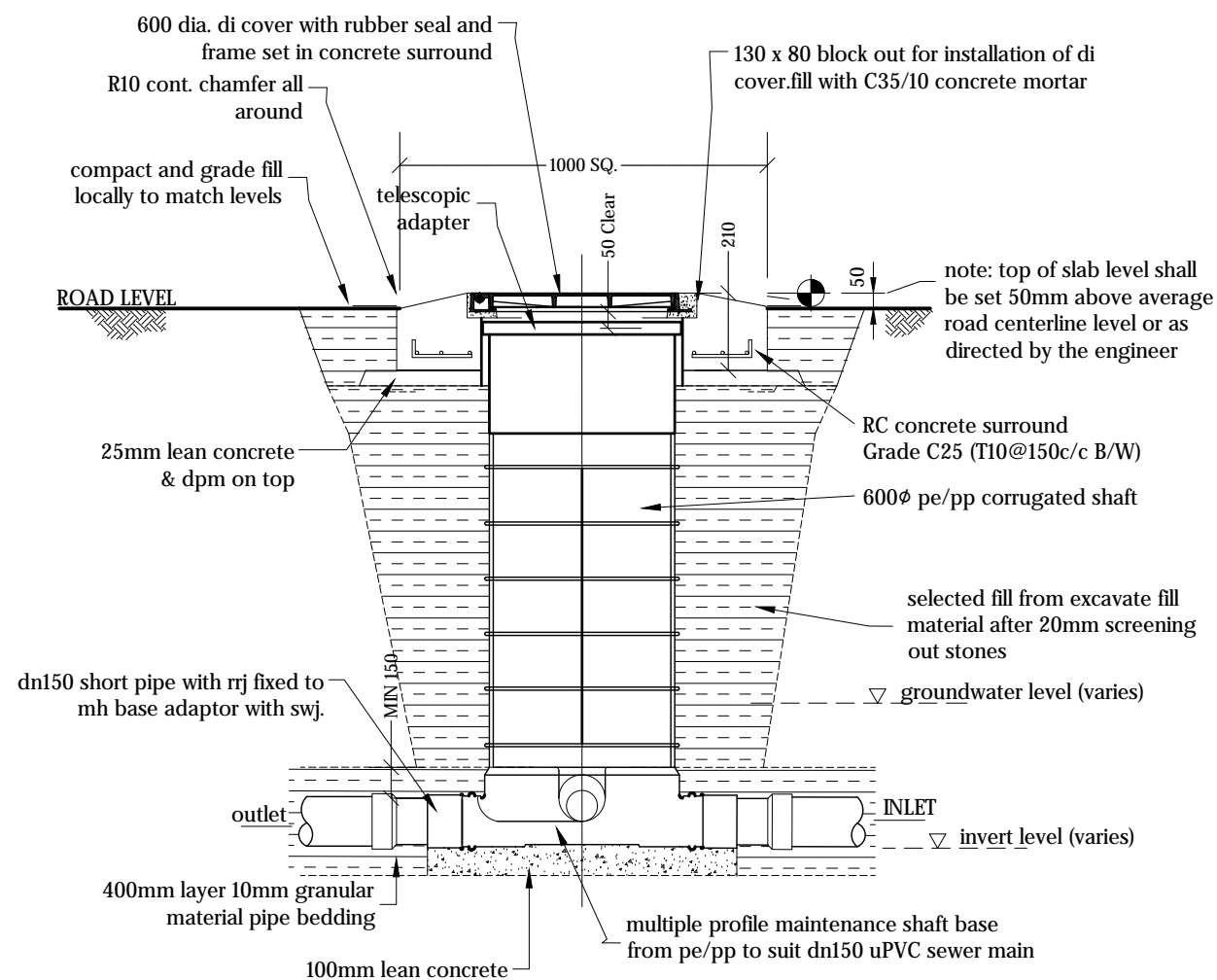
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Project No: EP-WS/2019/05

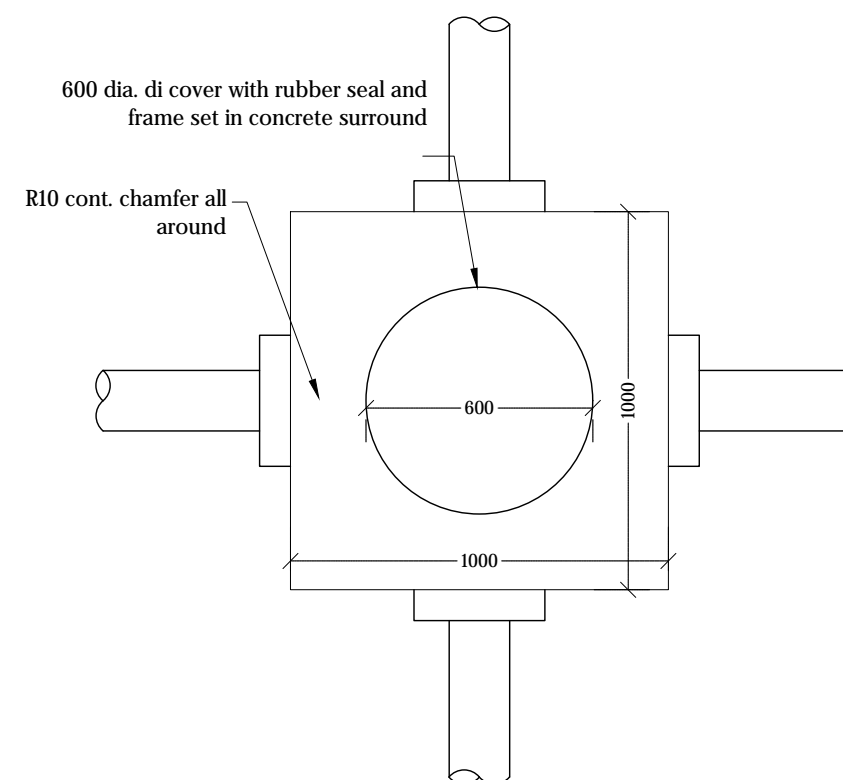
Rev: Page:

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ELEVATION - MAINTENANCE SHAFT (MH)



PLAN VIEW - MAINTENANCE SHAFT (MH)

## MAINTENANCE SHAFT (MH) DETAILS

1:20



Legend

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
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Infrastructure, Republic of Maldives



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Designed: F.I.A. Approved: I.W.

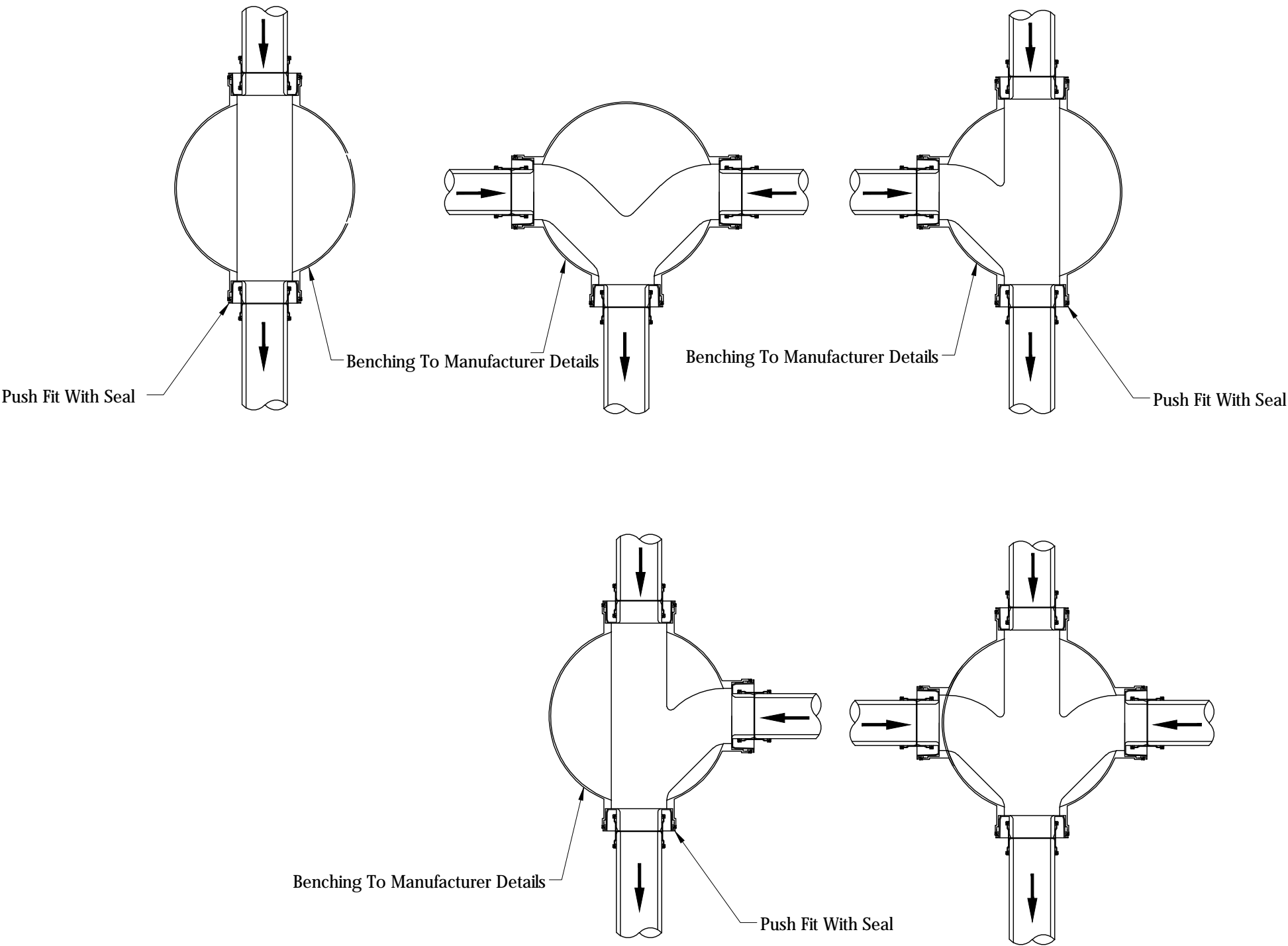
Date: Sep 2020 SCALE (A3): 1:20

Project No: EP-WS/2019/05

Rev: Page:

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TYPICAL MANHOLE BASE DETAILS

NTS



Legend

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
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Husuheena Magu, Male', Maldives

FDBACK INFRA  
Building Infrastructure Happier

Drawn: F.I.A.      Checked: M.S.S.

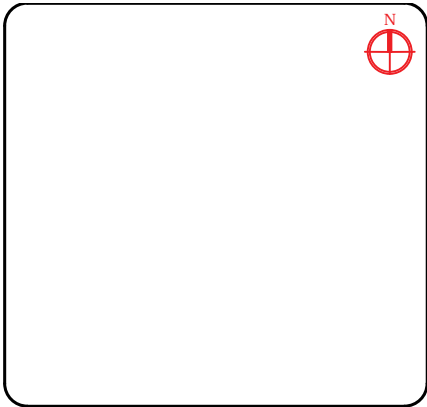
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Date: Sep 2020      SCALE (A3): NTS

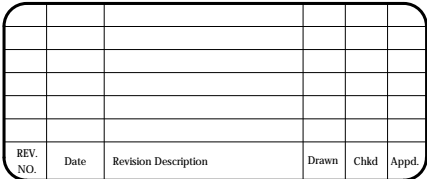
Project No: EP-WS/2019/05

Rev:      Page: W-(14)





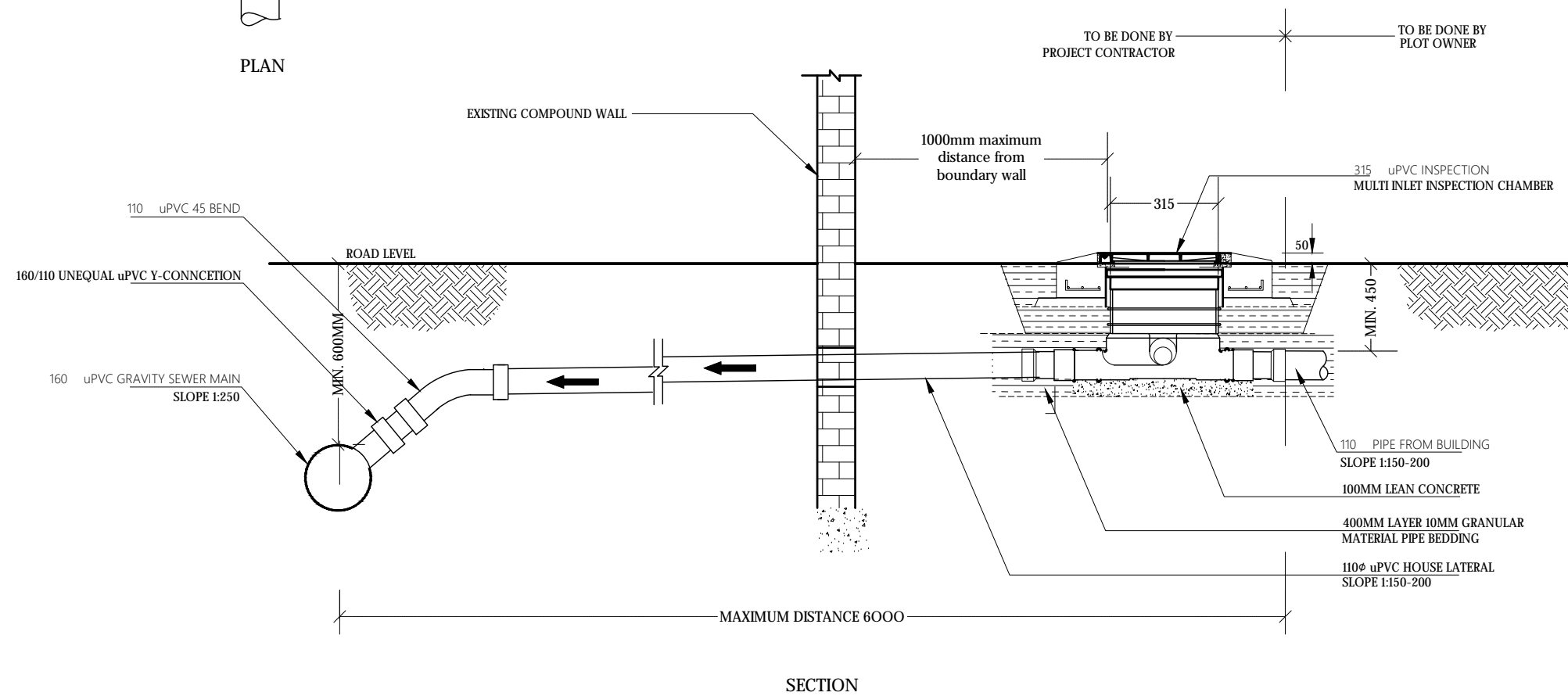
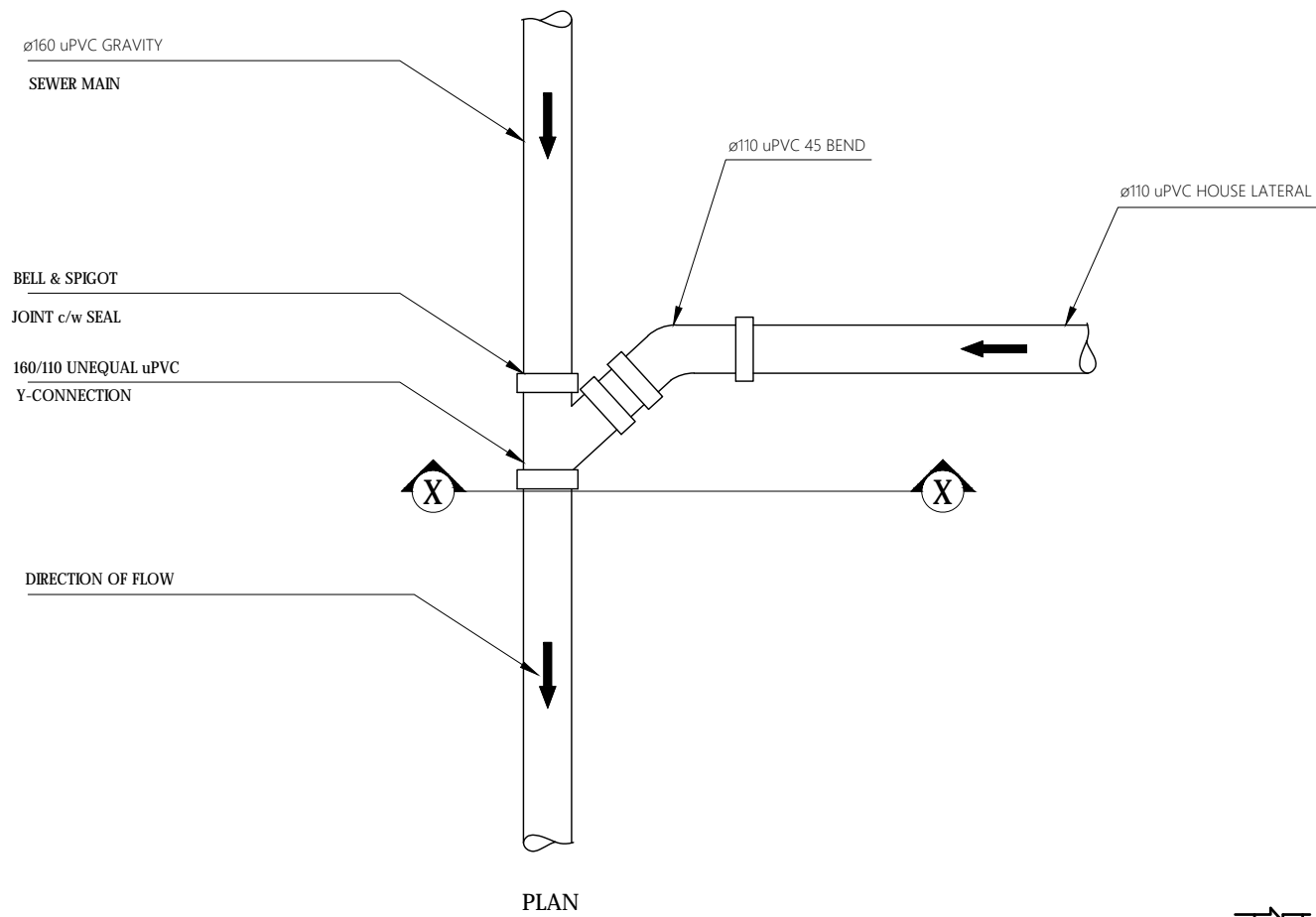
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W-(15)

NTS







NTS

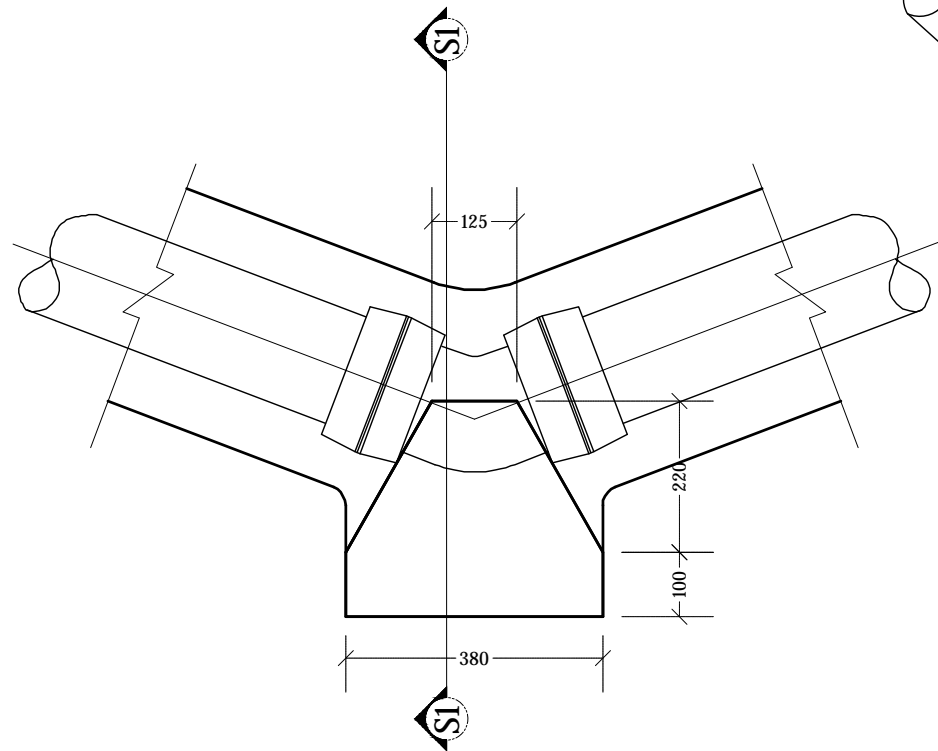
1. Invert level at house inspection chamber and invert level of the sewer main on the road should be checked during the house connection survey and invert level should be adjusted in order to facilitate gravity flow from house inspection chamber to sewer main.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

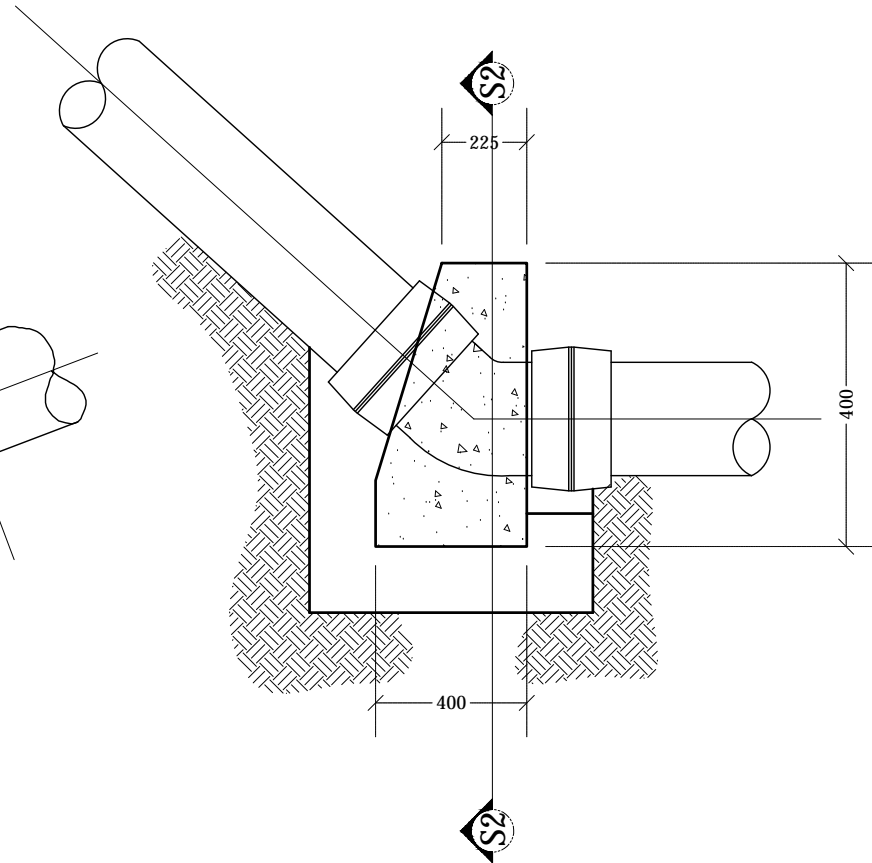
Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

 <p><b>EPOCH</b> ASSOCIATES</p> <p>T. +960 333 3528 E. info@epoch.associates W: www.epoch.associates A: C. Rosary West, Huzumbeena Magu, Male', Maldives</p>	 <p><b>FEDBACK INFRA</b> Building Self-Constructive Skippers</p>
<p>Drawn: F.I.A.</p> <p>Designed: F.I.A.</p> <p>Date: Sep 2020</p> <p>Project No:</p>	<p>Checked: M.S.S.</p> <p>Approved: I.W.</p> <p>SCALE (A3): NTS</p>
<p align="center"><b>EP-WS/2019/05</b></p>	
<p>Rev:</p>	<p>Page: <b>W-(16)</b></p>

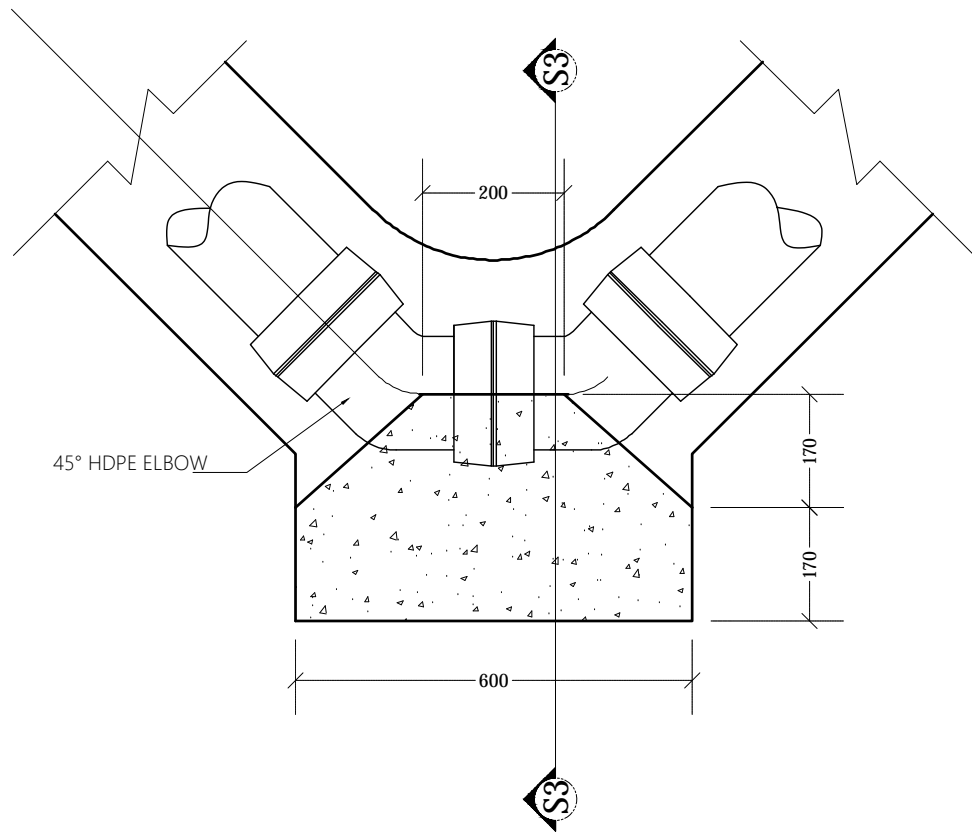




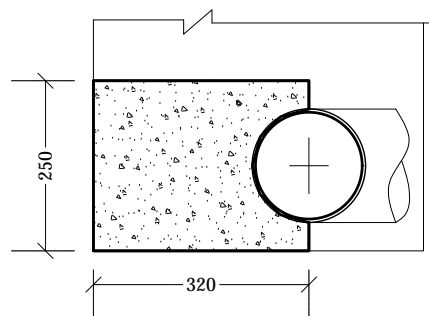
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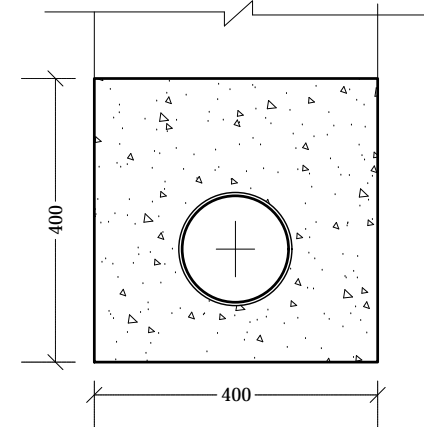
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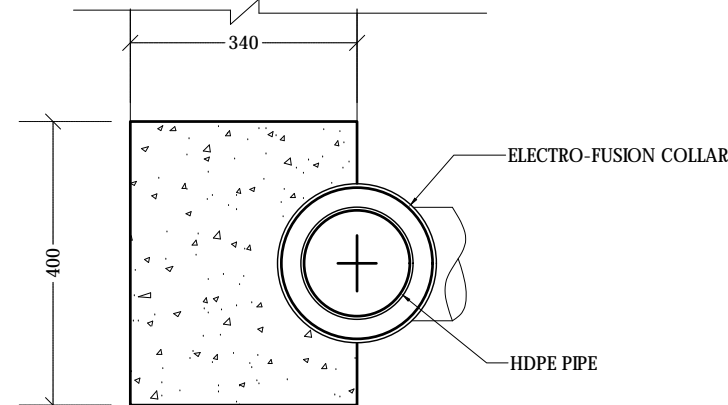
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SECTION S1-S1  
NTS



SECTION S2-S2  
NTS



SECTION S3-S3  
NTS

THRUST BLOCK DETAILS  
NTS

Legend

- Notes:
- Concrete shall be of grade C25

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



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Husuheena Magu, Male', Maldives



Drawn: F.I.A. Checked: M.S.S.

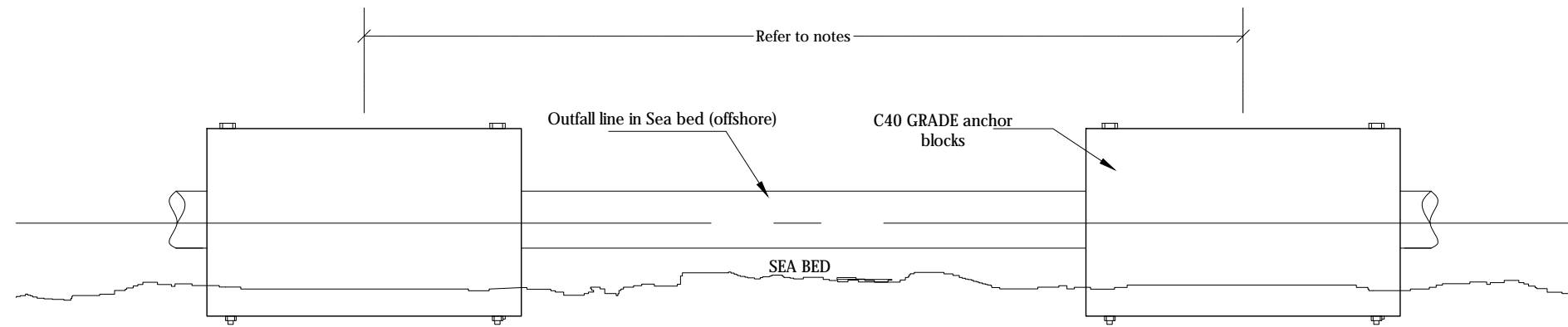
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Date: Sep 2020 SCALE (A3): NTS

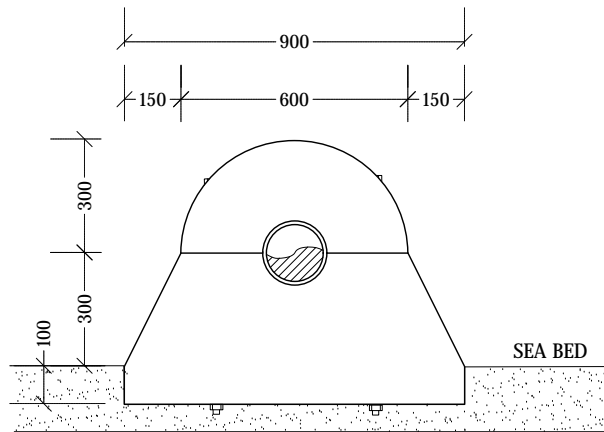
Project No: EP-WS/2019/05

Rev: Page:

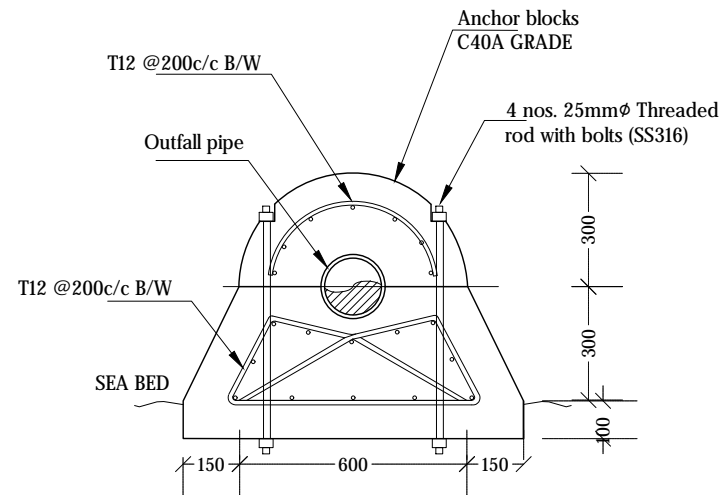




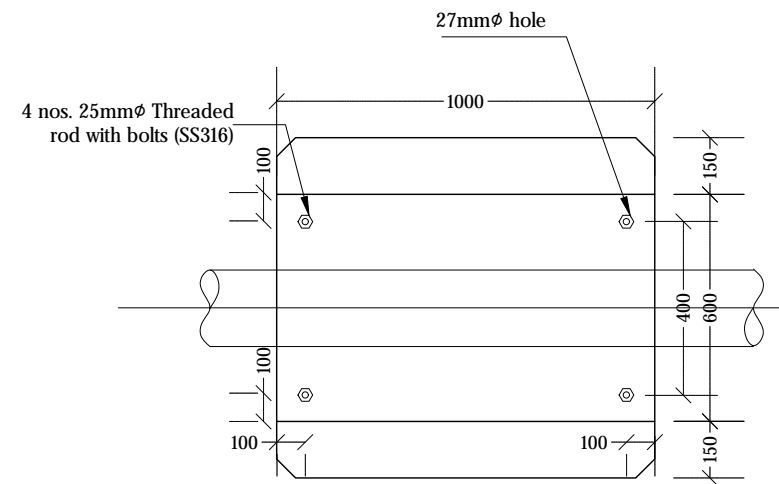
BALLAST BLOCK SIDE ELEVATION



BALLAST BLOCK FRONT ELEVATION



BALLAST BLOCK SECTION



BALLAST BLOCK PLAN

## BALLAST BLOCK DETAILS

NTS



### Legend

#### Notes:

1. All backing rings for stub flanges , nuts and bolts shall be grade 316 stainless steel.
2. All pipe work shall be bedded on 10mm thick neoprene rubber seat in semicircular recess matching the O.D. the pipe.
3. Fabricate specific pipe clamps to provide firm clamping action according to pipe O.D.
4. All structural concrete shall be of grade C40A.
5. All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
6. All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
7. A cover of 75mm should be given for all reinforcements.
8. In shallow water (regions where the depth is less than 1m), the ballast block spacing is 3.5m. In deeper water (regions where the depth is greater than 1m), the ballast block spacing is 2.0m. All distances are from c/c of blocks.
9. All pipe connections shall be within blocks.

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



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Husnuheena Magu, Male', Maldives



Drawn: F.I.A. Checked: M.S.S.

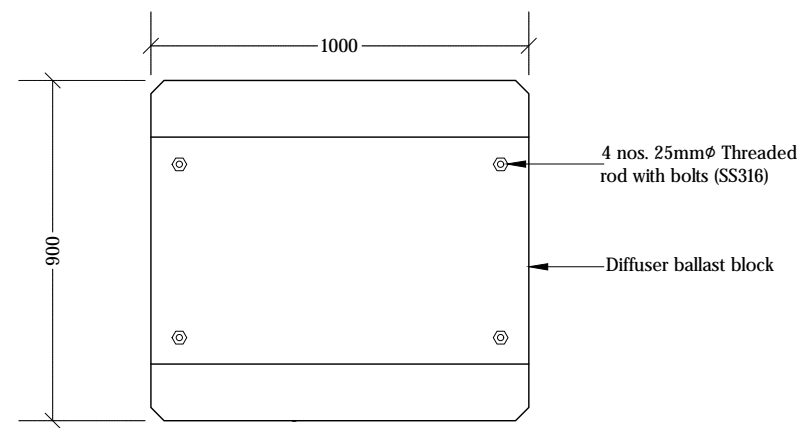
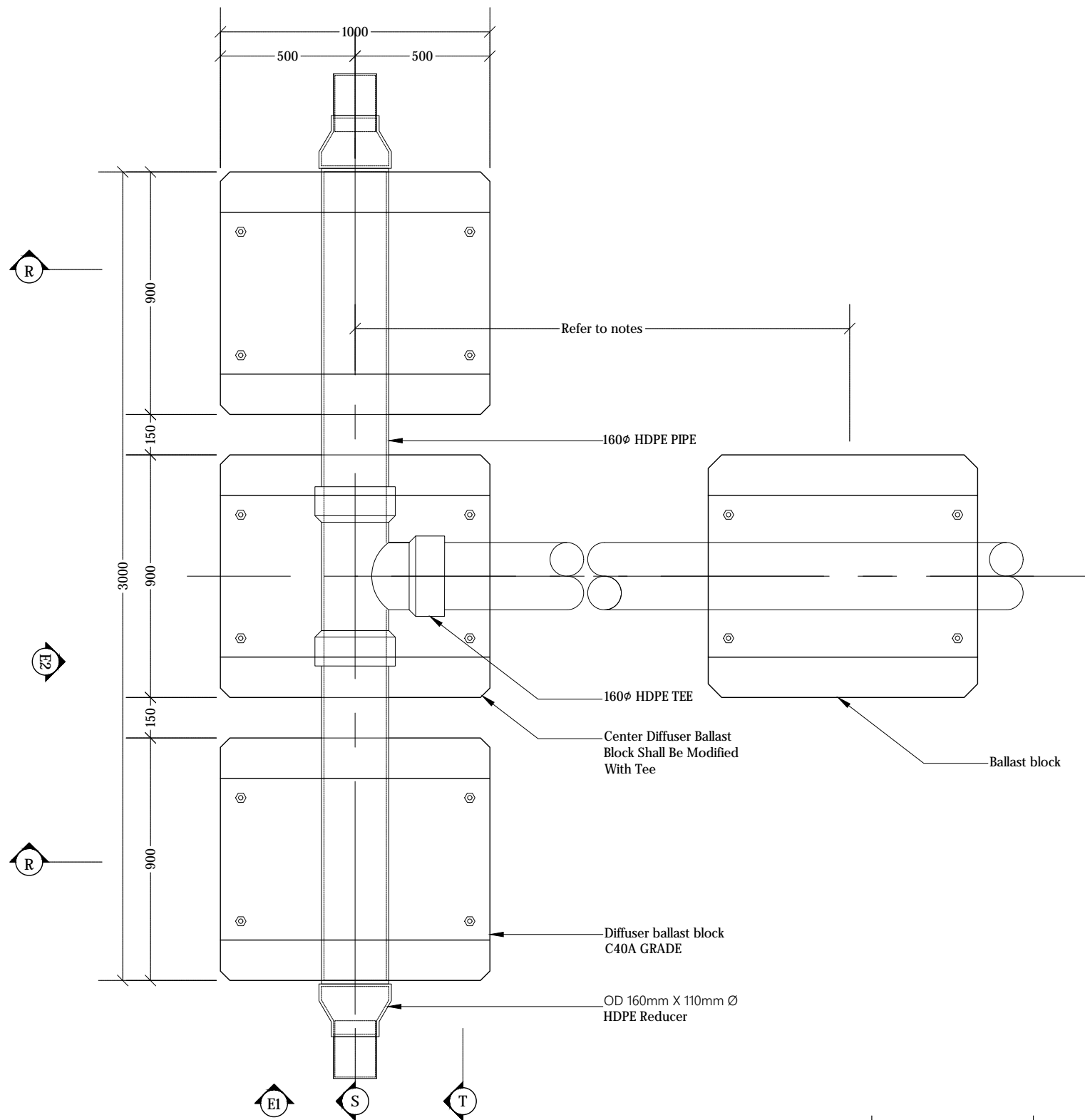
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Date: Sep 2020 SCALE (A3): NTS

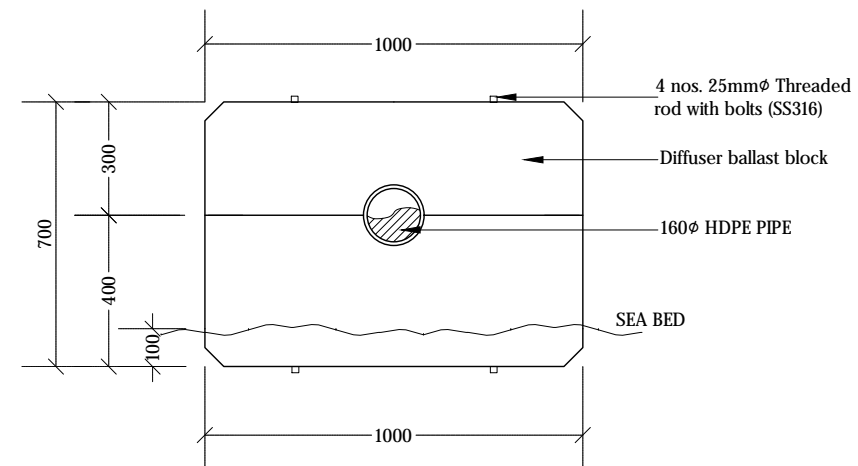
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Rev: Page: W-(18)

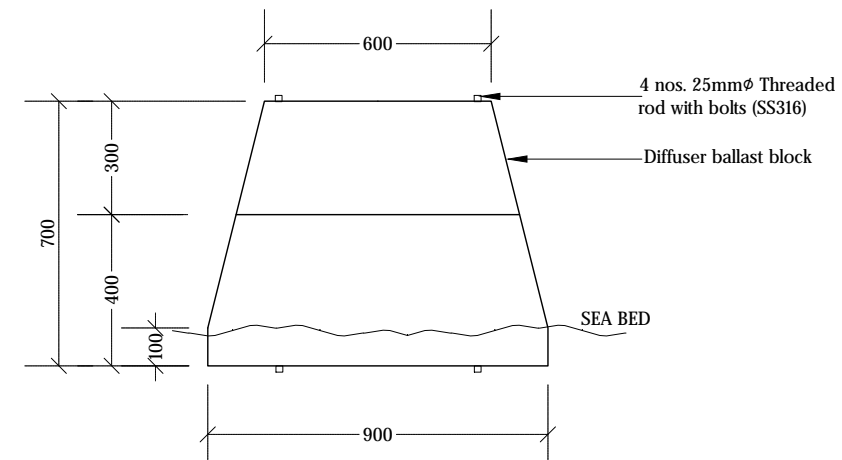




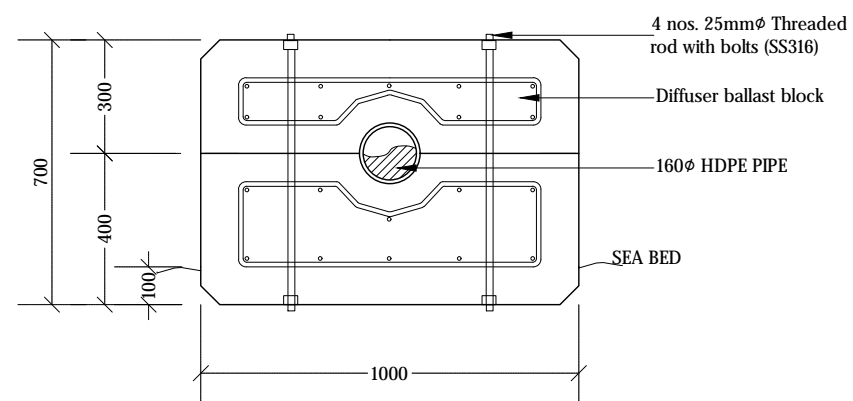
DIFFUSER BALLAST BLOCK PLAN



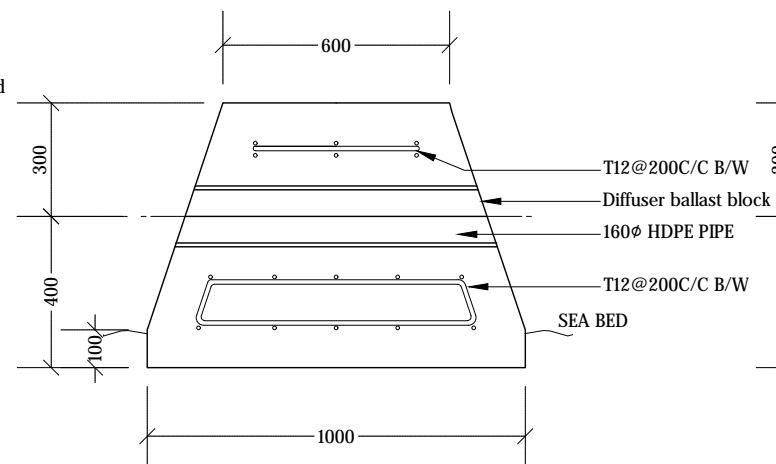
DIFFUSER BALLAST BLOCK FRONT ELEVATION - E1



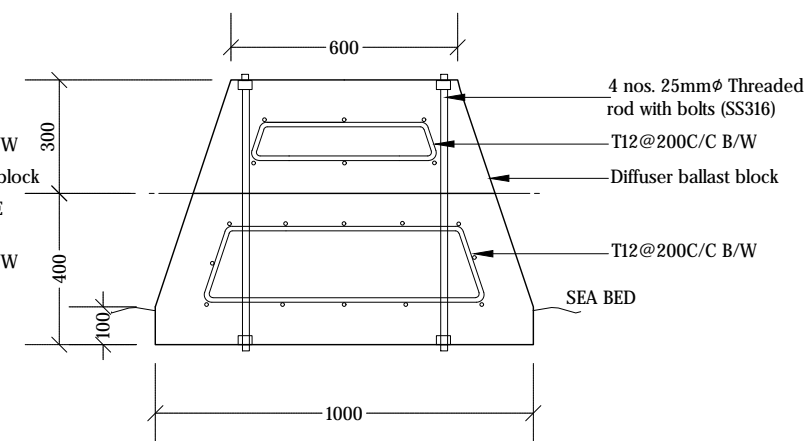
DIFFUSER BALLAST BLOCK FRONT ELEVATION - E2



DIFFUSER BALLAST BLOCK SECTION - R



DIFFUSER BALLAST BLOCK SECTION - S



DIFFUSER BALLAST BLOCK SECTION - T

**DIFFUSER DETAILS**  
NTS

Legend

Notes:

1. All backing rings for stub flanges, nuts and bolts shall be grade 316 stainless steel.
2. All pipe work shall be bedded on 10mm thick neoprene rubber seat in semicircular recess matching the O.D. the pipe.
3. Fabricate specific pipe clamps to provide firm clamping action according to pipe O.D.
4. All structural concrete shall be of grade C40A.
5. All castings shall be done using sulphate resistant portland cement to BS 4027:1996.
6. All structural reinforcement shall be epoxy coating of non-pre-stressed reinforcement to ASTM-A775/A775M.
7. A cover of 75mm should be given for all reinforcements.
8. In shallow water (regions where the depth is less than 1m), the ballast block spacing is 3.5m. In deeper water (regions where the depth is greater than 1m), the ballast block spacing is 2.0m. All distances are from c/c of blocks.

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
**Consultancy Services for Survey, Design and EIA works of Water Supply and Sewerage Facilities in 6 islands, Maldives - Package 5**

Sub Title:  
**Sewerage System in M. Naalaafushi**

Client:  
**Ministry of National Planning, Housing and Infrastructure, Republic of Maldives**

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**INFRA**  
Maldives

Drawn: F.I.A. Checked: M.S.S.

Designed: F.I.A. Approved: I.W.

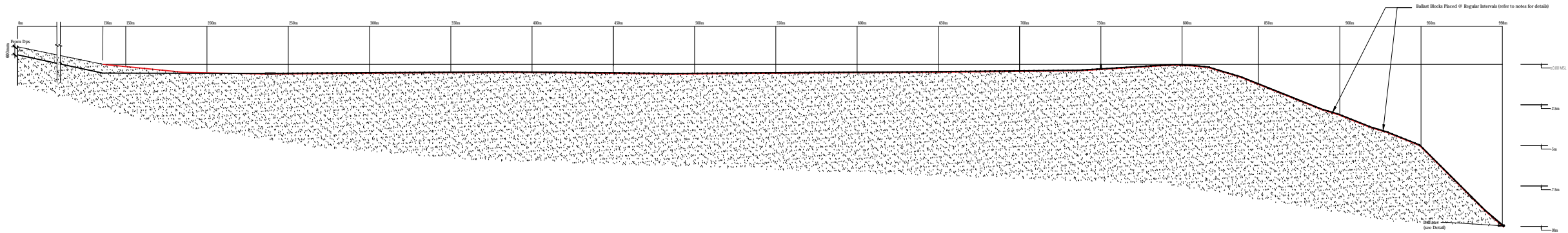
Date: Sep 2020 SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev: Page:

W-(19)





SEA OUTLET DETAILS  
NTS



Legend

Notes:

1. Contractor should carry out a detailed bathymetric survey for the proposed area, revise and present a shop drawing for the outfall layout prior to commencement of outfall works.
2. In shallow water (regions where the depth is less than 1m), the ballast block spacing is 3.5m. In deeper water (regions where the depth is greater than 1m), the ballast block spacing is 2.0m. All distances are from c/c of blocks.

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
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Feedback Infrastructure

Drawn: F.I.A.      Checked: M.S.S.

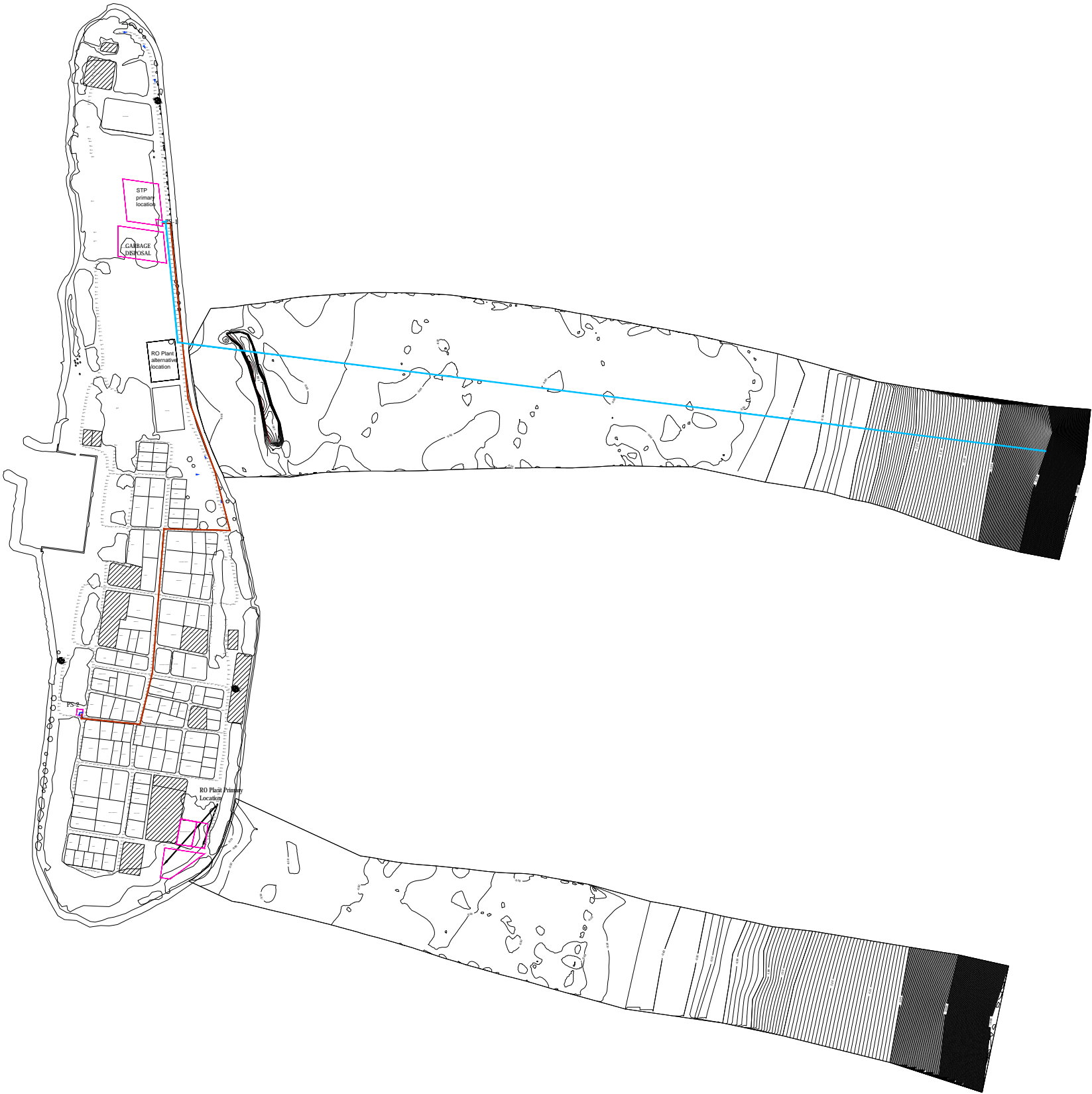
Designed: F.I.A.      Approved: I.W.

Date: Sep 2020      SCALE (A3): NTS

Project No: EP-WS/2019/05

Rev:      Page: W-(20)





M. NAALAAFUSHI SEWERAGE SYSTEM - PRESSURE NETWORK LAYOUT  
1:5000



- Legend**
- 110 mm Ø HDPE Pumping Main (PE100, PN16, SDR11)
  - 160 mm Ø HDPE Sea Outfall Pipe (PE100, PN16, SDR11)

REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for  
Survey, Design and EIA works of  
Water Supply and Sewerage  
Facilities  
in 6 islands, Maldives – Package 5  
Sewerage System in M. Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

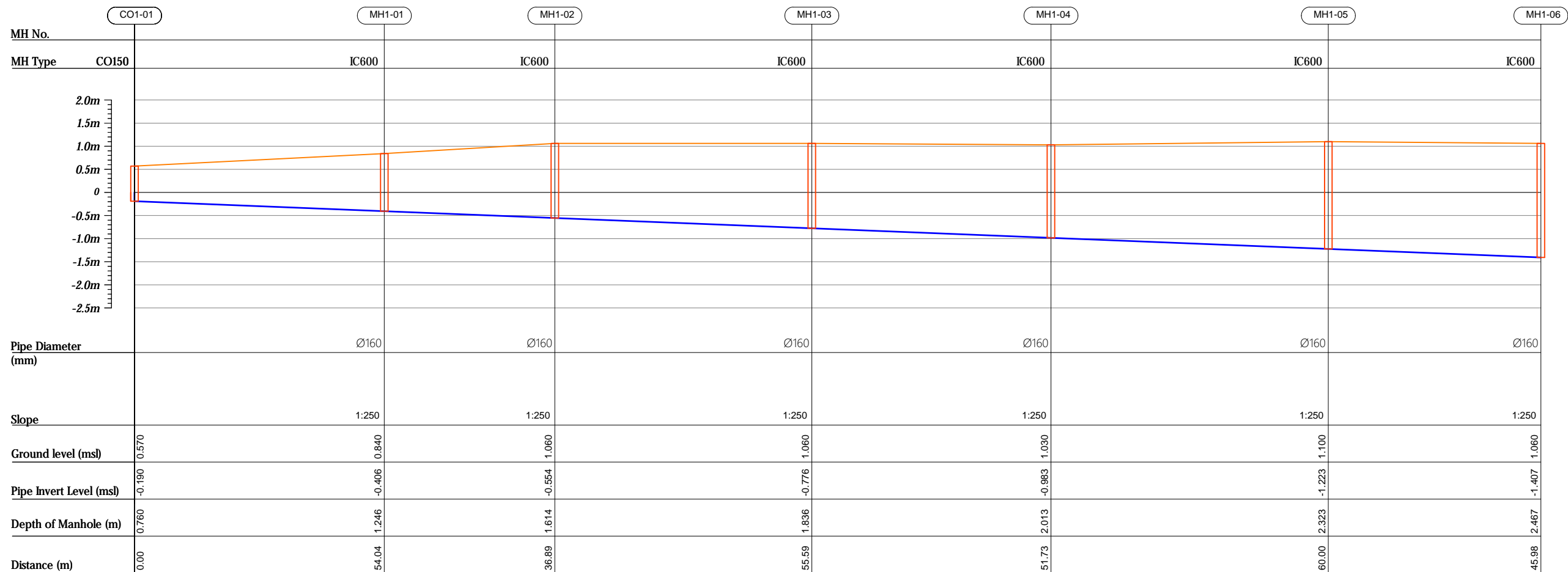
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**DBACK INFRA**  
Maldives Infrastructure Development

Drawn: F.I.A.	Checked: M.S.S.
Designed: F.I.A.	Approved: I.W.
Date: Sep 2020	SCALE (A3): 1:5000
Project No: EP-WS/2019/05	Page:



## Profile 01



R00	JUNE 2020	STAGE -1	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
*Consultancy Services for Survey,  
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6 islands, Maldives - Package 5*

Sub Title:  
*Sewerage System in M.Naalaafushi*

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



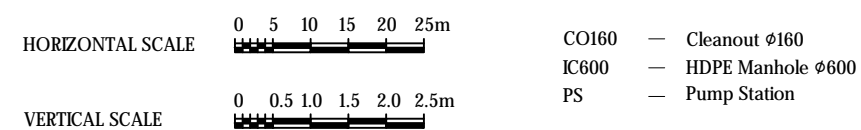
Drawn: A.R.W	Checked: M.S.S
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Designed: F.L.A	Approved: LW
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Date: Aug 2020	SCALE (A3): 1:100
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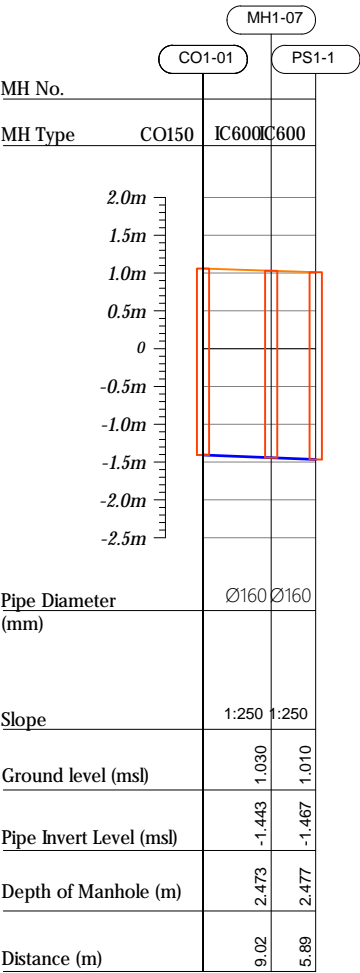
Project No: 01010101

Rev: <i>R-01</i>	Page: <i>PS1-01</i>
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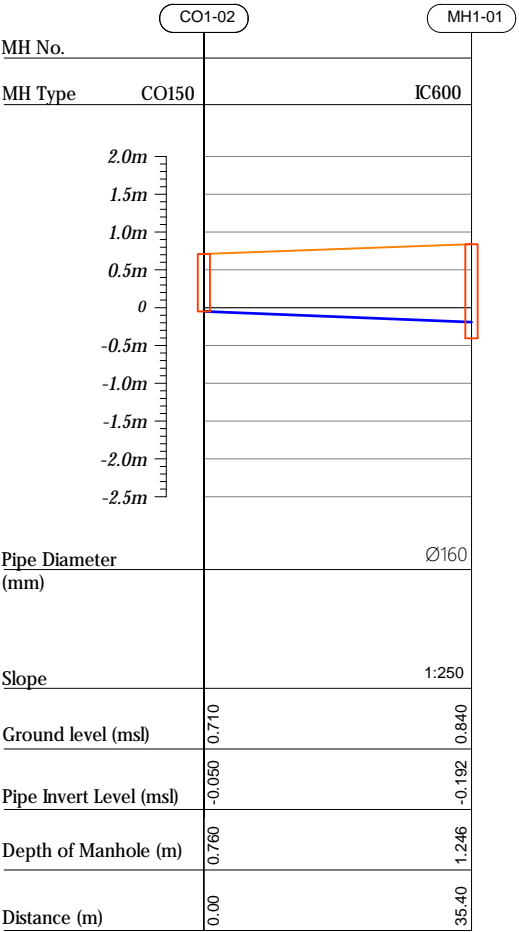




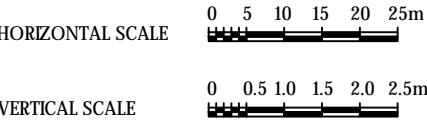
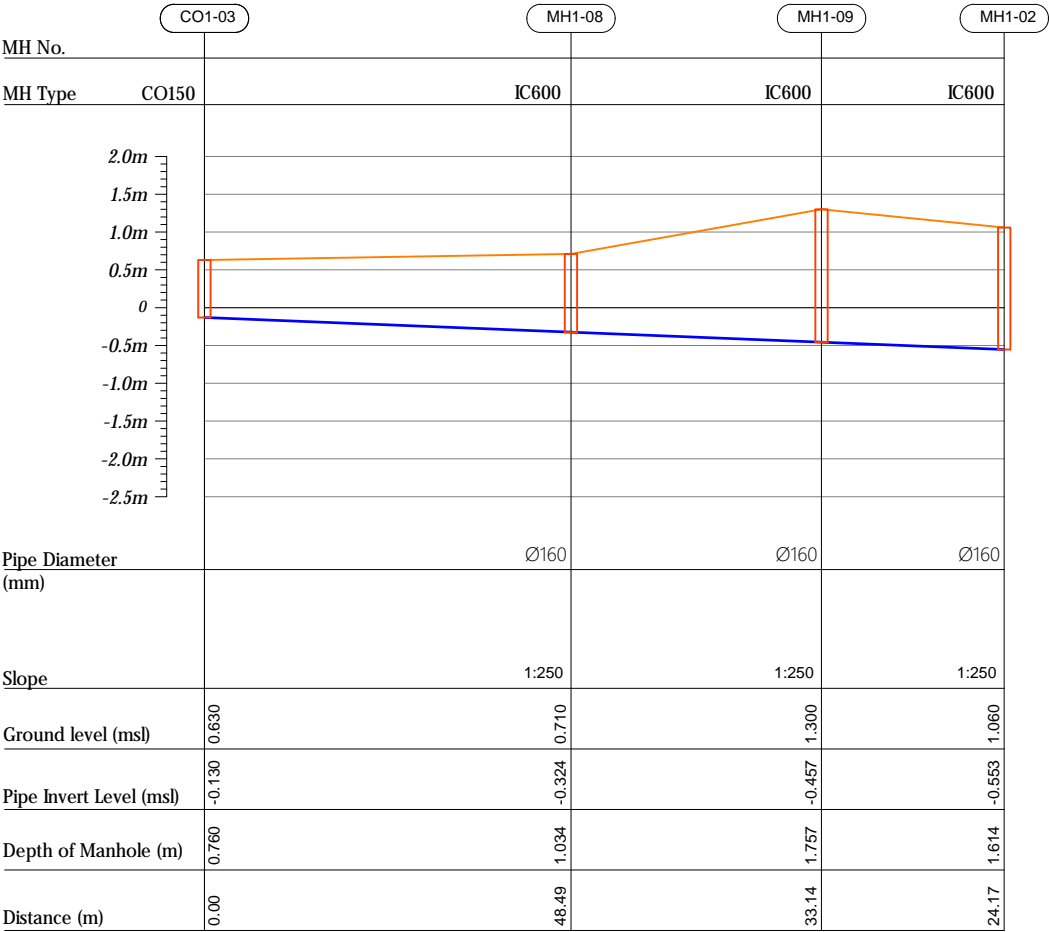
Profile 01



Profile 02



Profile 03



CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
Ministry of National Planning, Housing and  
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DBAC INFRA  
Maldivu Infrastructure Developmen

Drawn: A.R.W Checked: M.S.S

Designed: F.L.A Approved: L.W

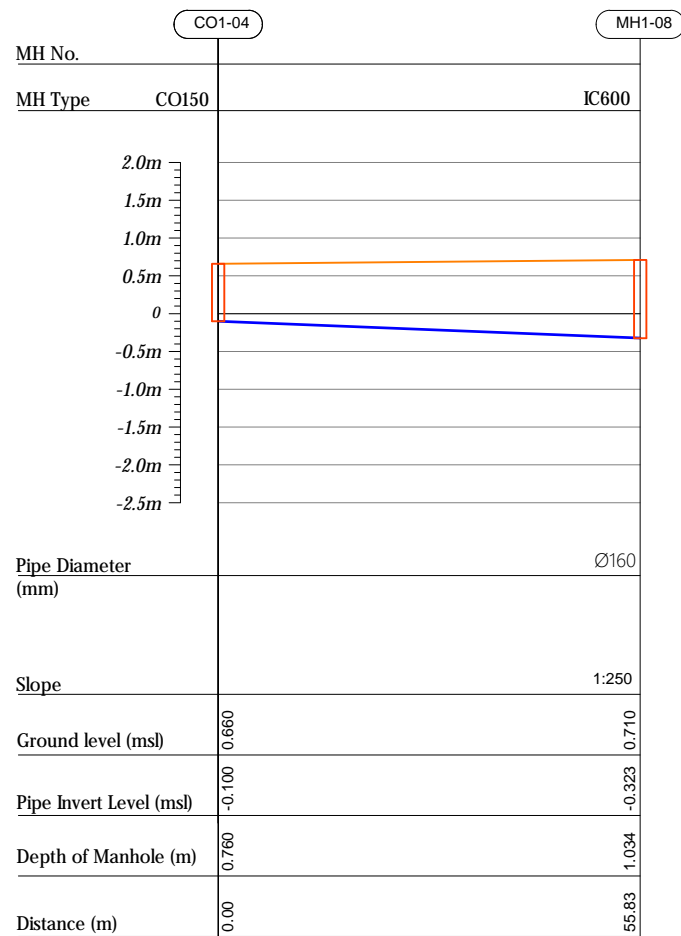
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Project No: 01010101

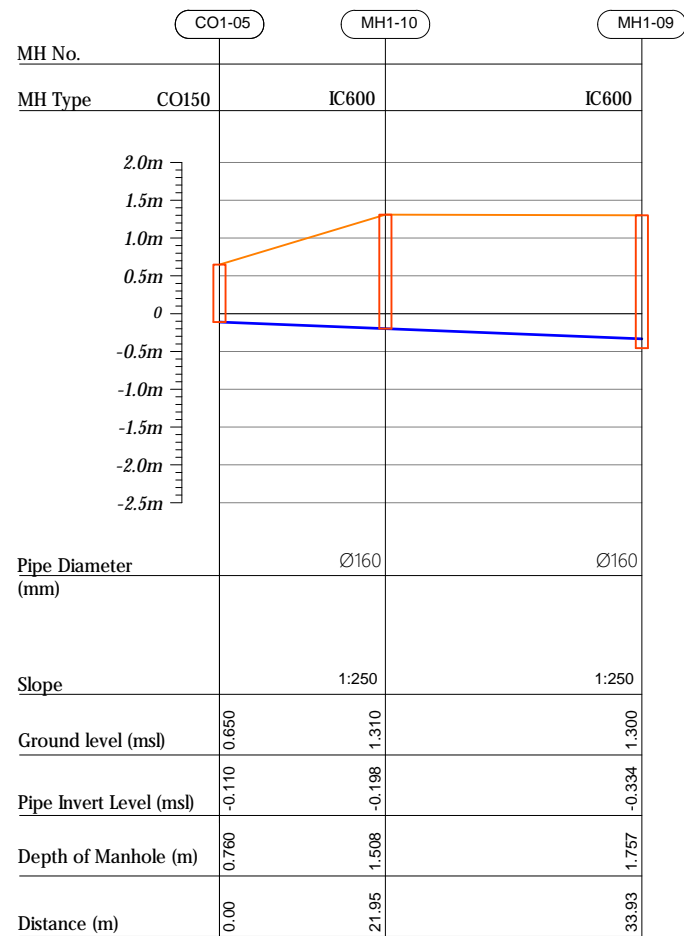
Rev: R-01 Page: PS1-02



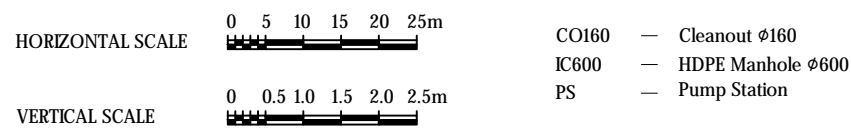
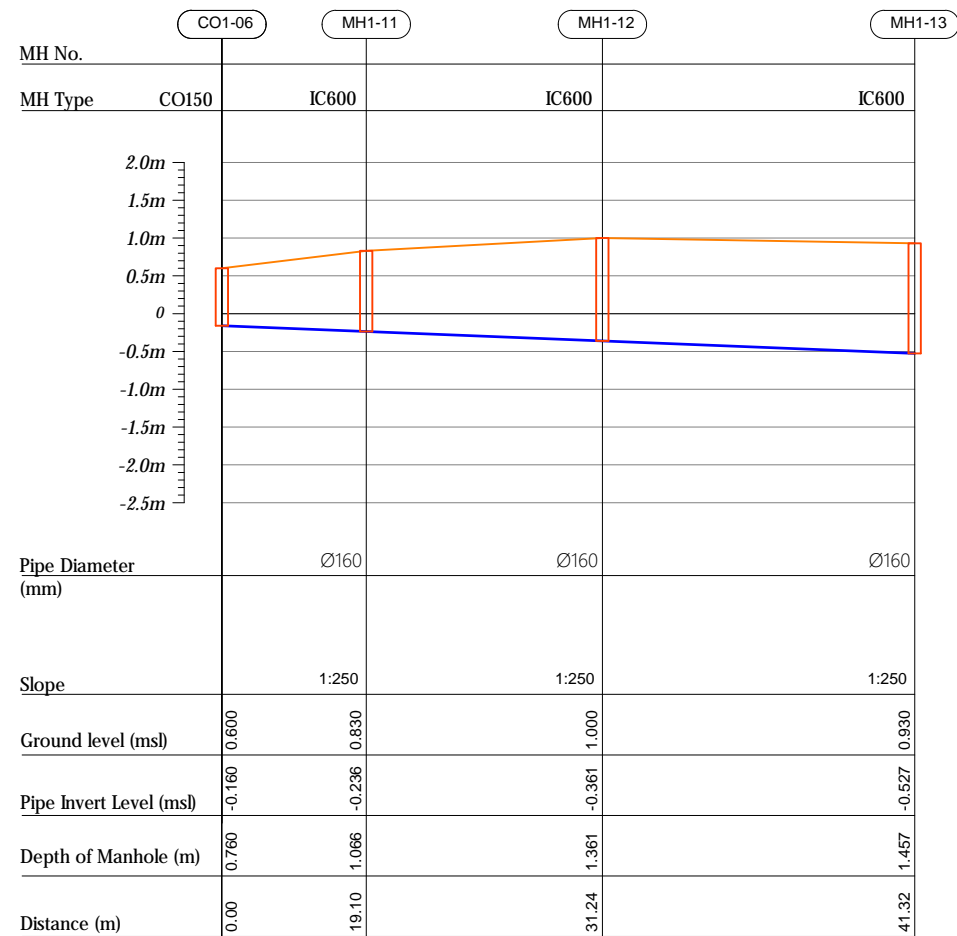
## Profile 04



## Profile 05



## Profile 06



R00	JUNE 2020	STAGE -1	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

**Title:**  
*Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5*

Sub Title:  
*Sewerage System in M.Naalaafushi*

**Client:**  
*Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives*

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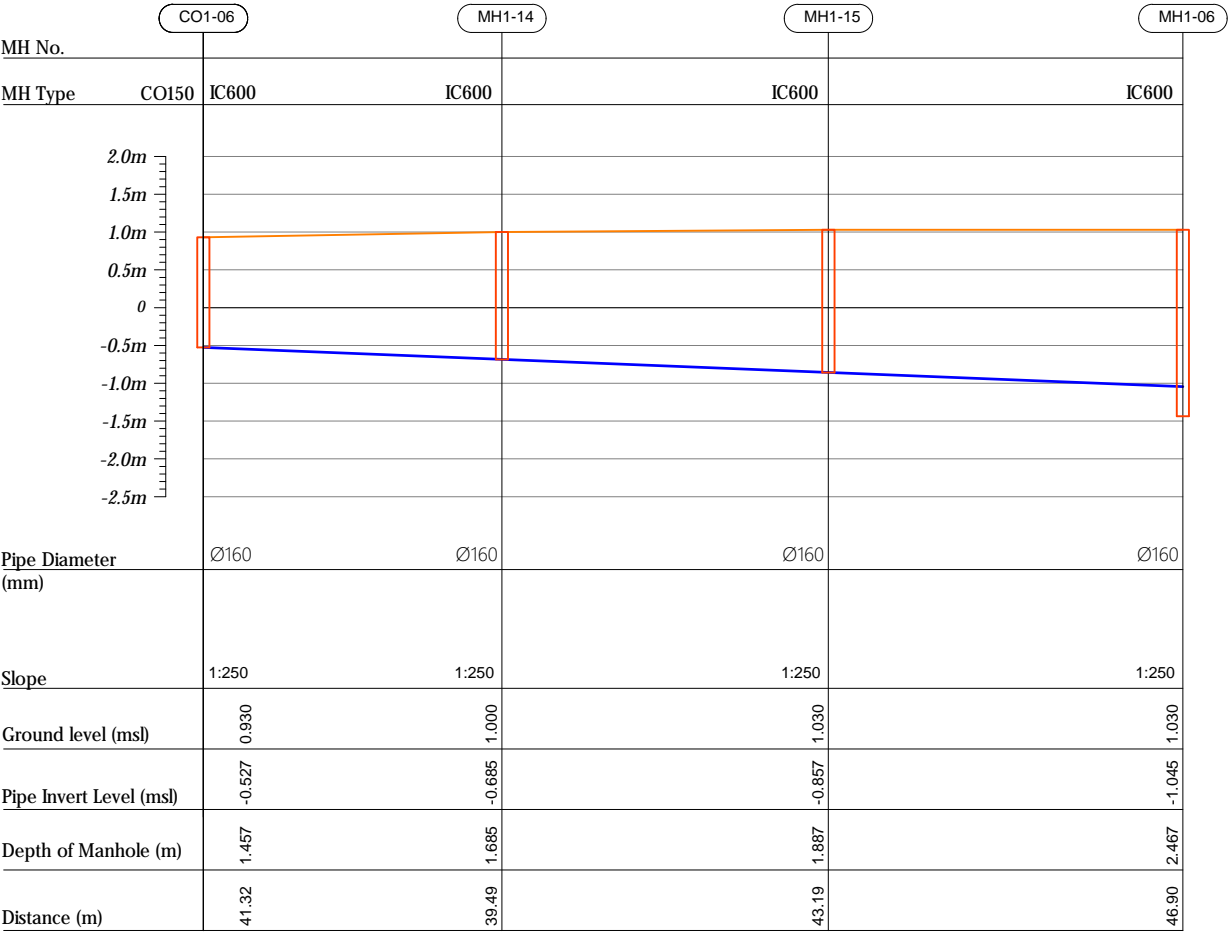
**FEEDBACK INFRA**  
*Making Infrastructure Happen*

Drawn: A.R.W	Checked: M.S.S
Designed: F.I.A	Approved: L.W
Date: Aug 2020	SCALE (A3): 1:100
Project No: 01010101	

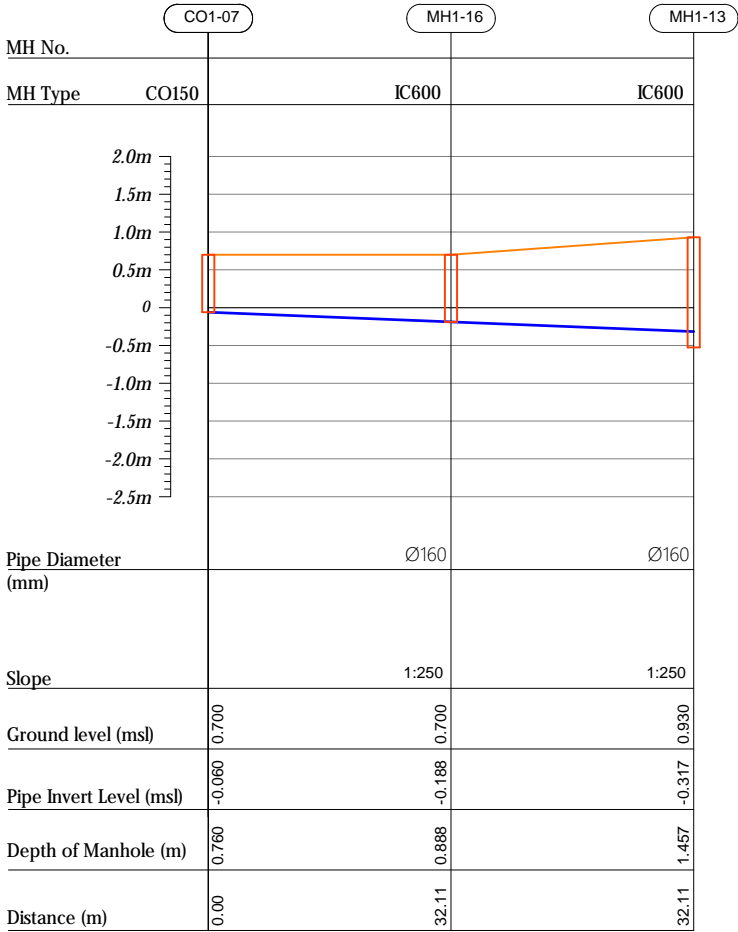
Rev. <i>R-01</i>	Page: <i>PS1-03</i>
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Profile 06



Profile 07



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
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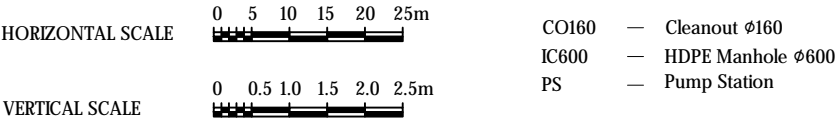
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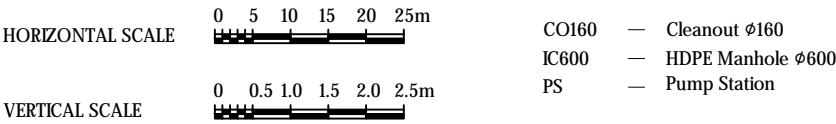
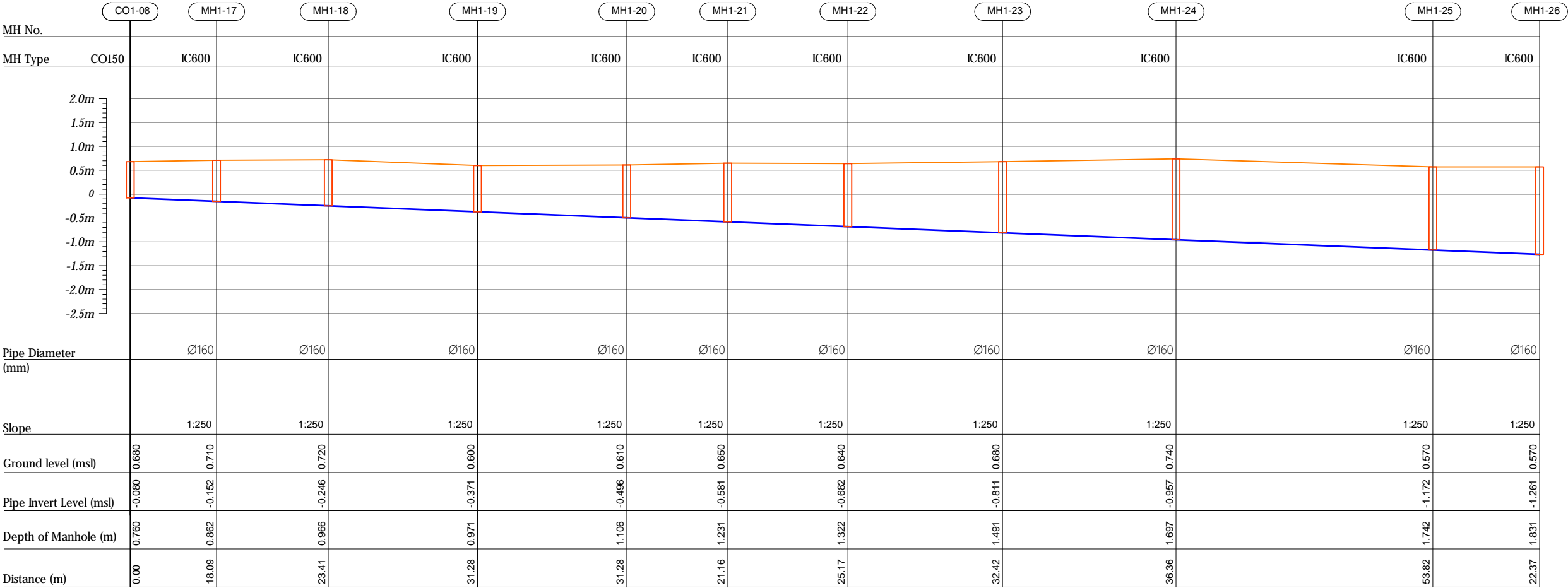
Project No: 01010101

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Profile 08



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

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Drawn: A.R.W

Checked: M.S.S

Designed: F.L.A

Approved: L.W

Date: Aug 2020

SCALE (A3): 1:100

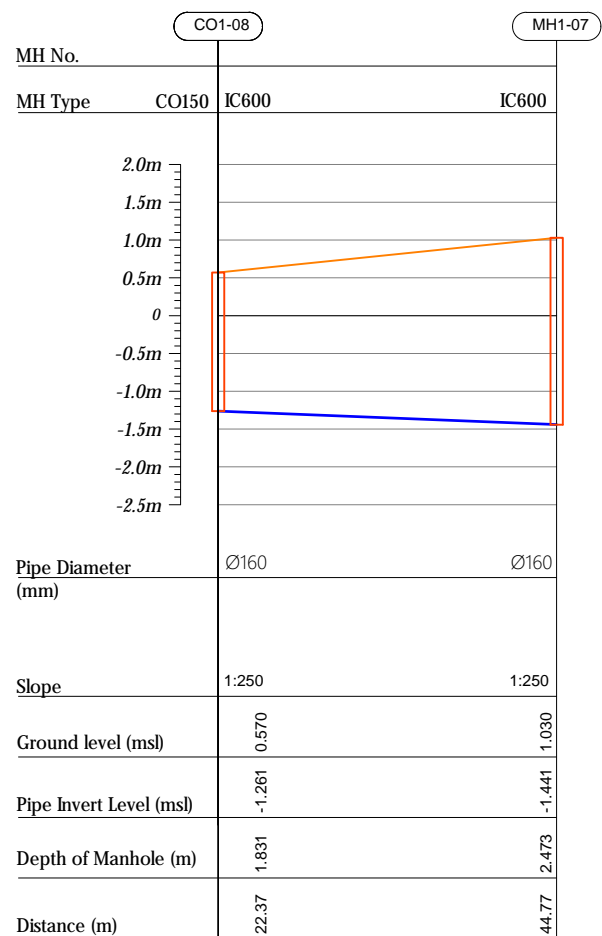
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Rev: R-01

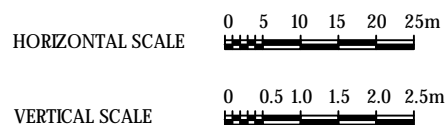
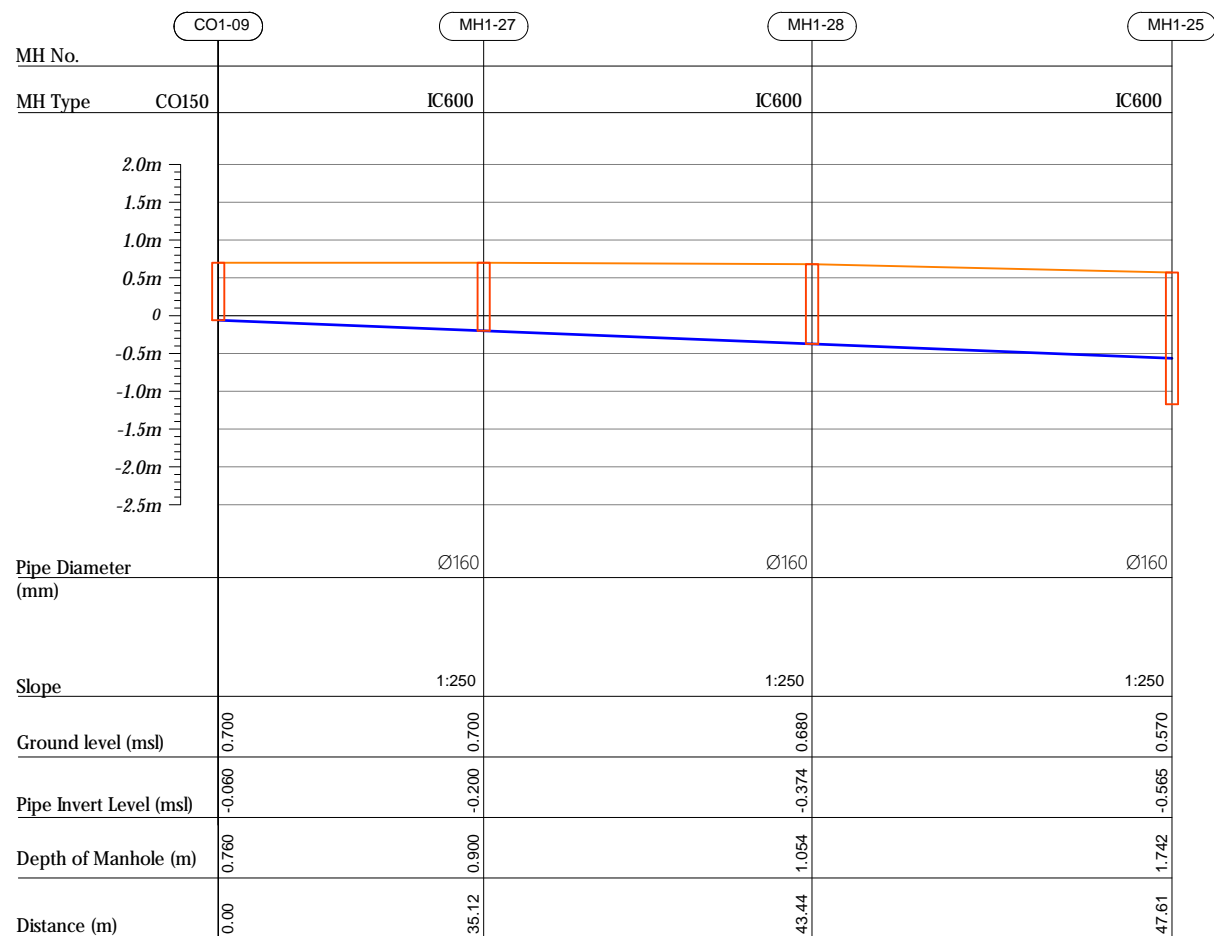
Page: PS1-05



## Profile 08



## Profile 09




CO160	—	Cleanout $\phi 160$
IC600	—	HDPE Manhole $\phi 600$
PS	—	Pump Station

000	JUNE 2020	STAGE -1	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appr

Title:  
*Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5*

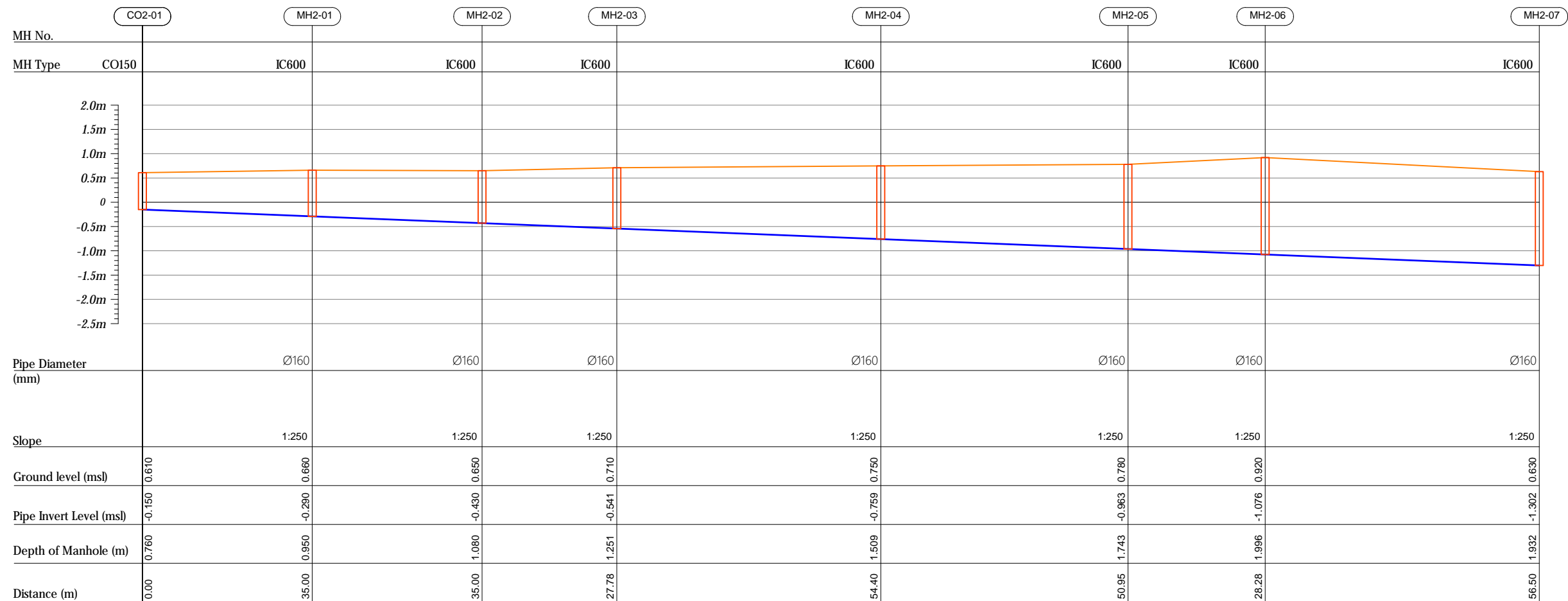
Sub Title:  
*Sewerage System in M.Naalaafushi*

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

 <p><b>EPOCH</b> ASSOCIATES</p>	<p><b>FEEDBACK INFRA</b> <i>Making Infrastructure Happen</i></p>
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<p>Drawn: A.R.W</p>	<p>Checked: M.S.S</p>
<p>Designed: F.L.A</p>	<p>Approved: I.W</p>
<p>Date: Aug 2020</p>	<p>SCALE (A3): 1:100</p>
<p>Project No:</p>	<p>01010101</p>
<p>Rev:</p>	<p>Page:</p>
<p>R-01</p>	<p>PS1-01</p>



## Profile 01



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

**Title:**  
*Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5*

Sub Title:  
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Husnuheena Magu, Male', Maldives

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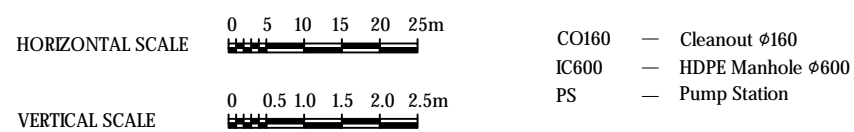
Drawn: A.R.W	Checked: M.S.S
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Designed: F.L.A	Approved: LW
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Date: Aug 2020	SCALE (A3): 1:100
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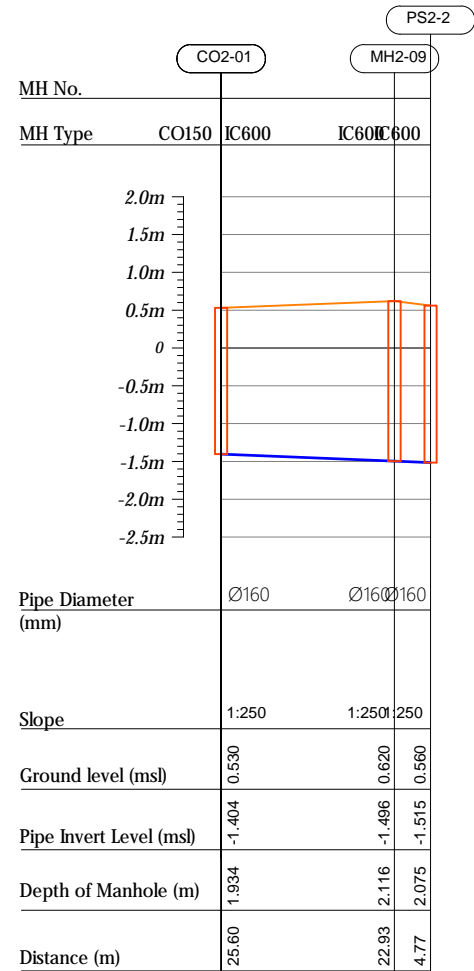
Project No: 01010101

Rev: <i>R-01</i>	Page: <i>PS2-01</i>
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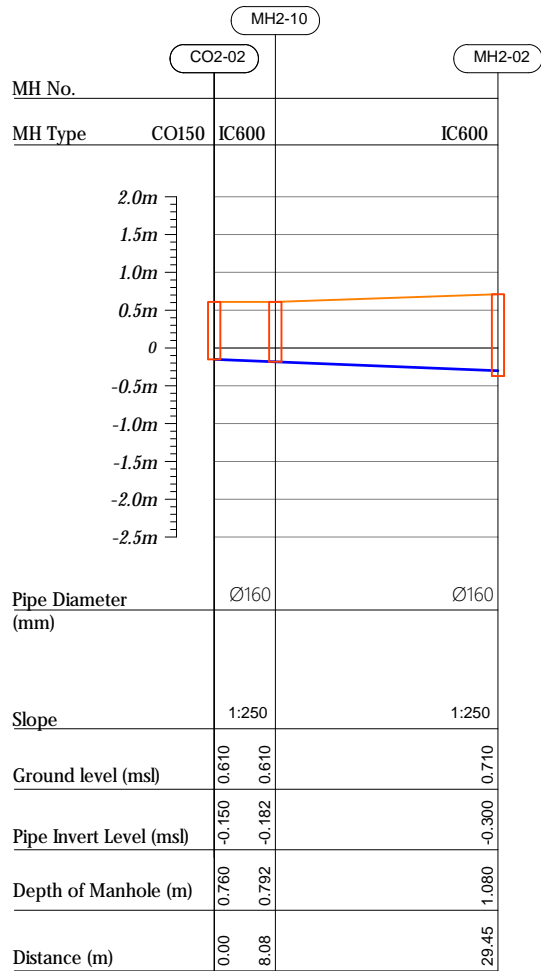




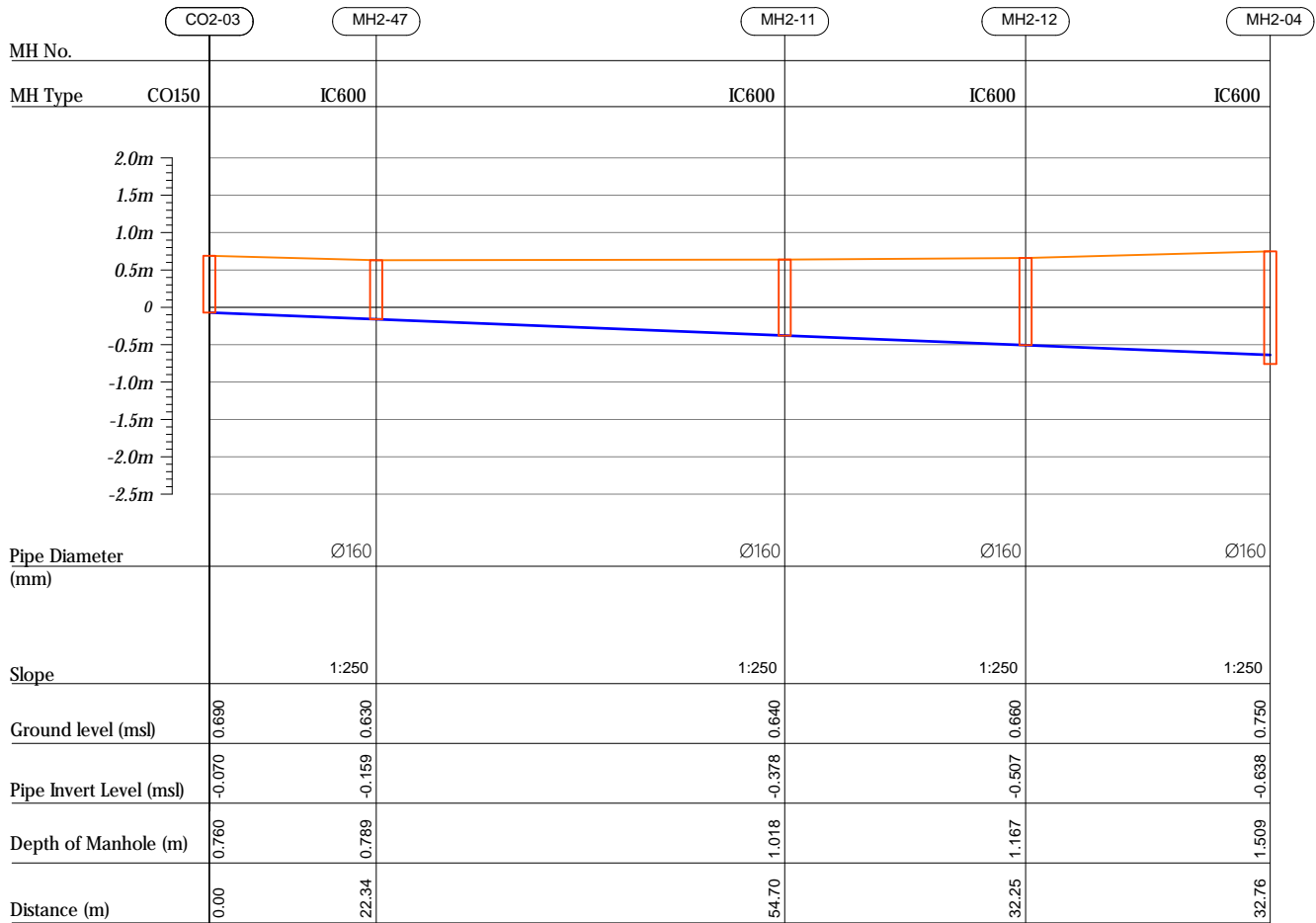
Profile 01



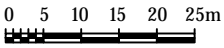
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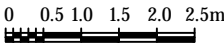
Profile 03



HORIZONTAL SCALE



VERTICAL SCALE



CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
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Hussuvehemaa Magu, Male', Maldives

DBAC INFRA  
Maldivaq Infrastructure Develop

Drawn: A.R.W. Checked: M.S.S.

Designed: F.I.A. Approved: L.W.

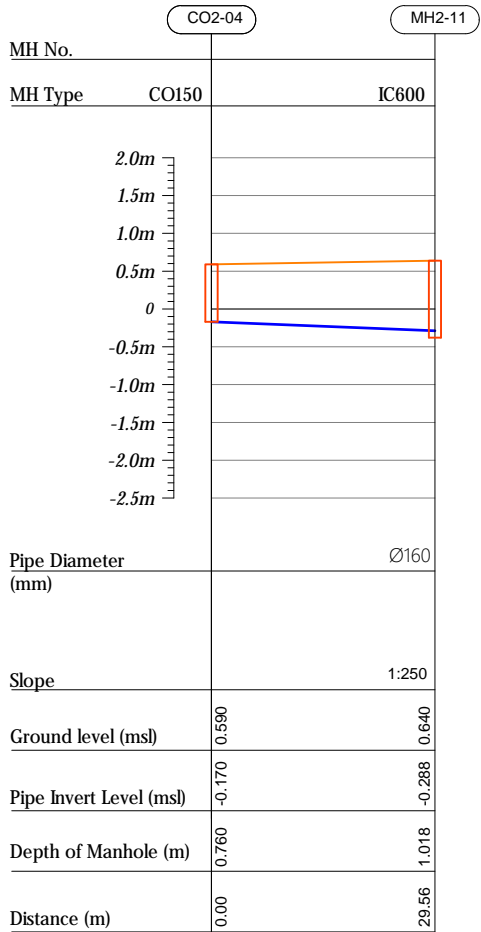
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Project No: 01010101

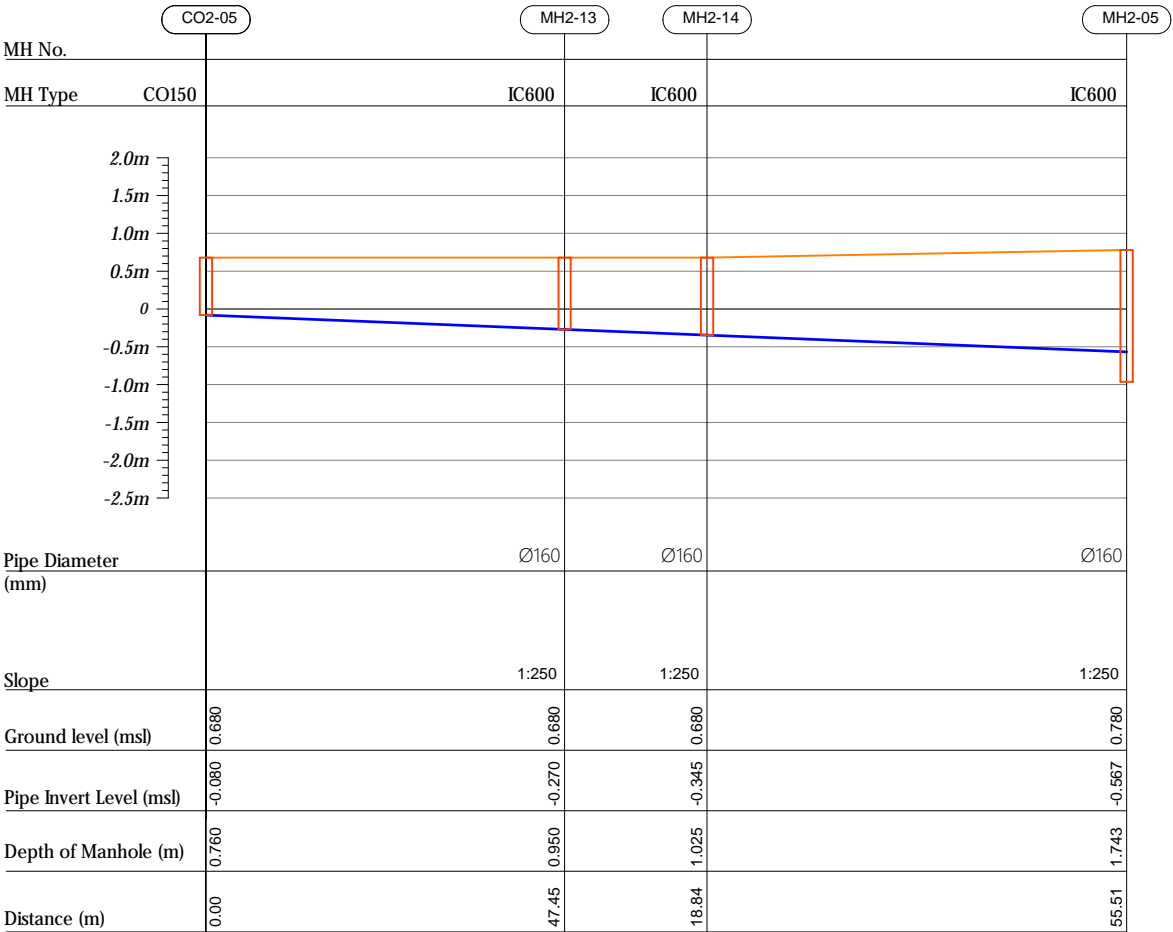
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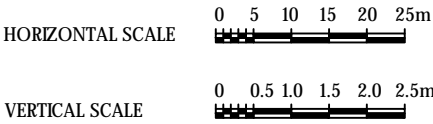
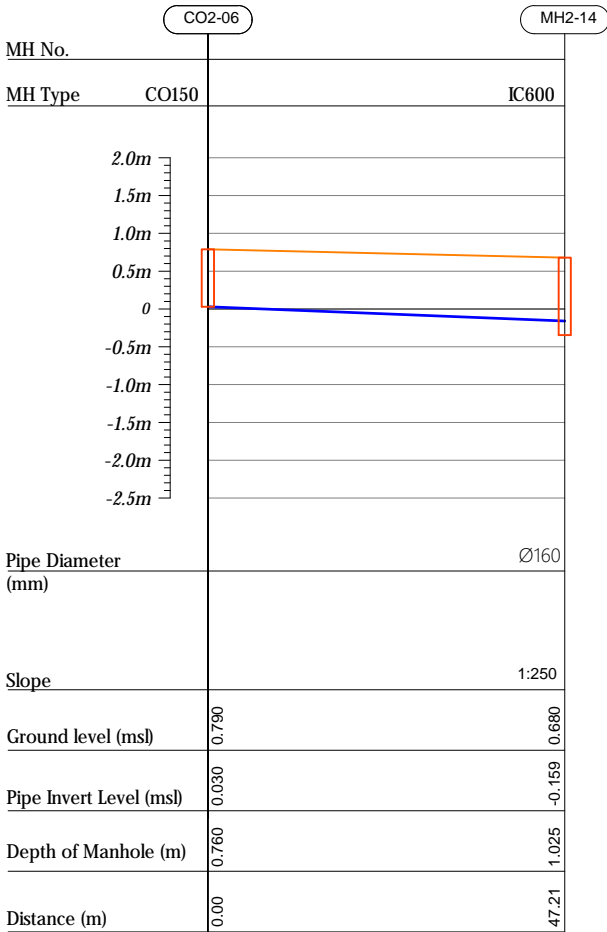
Profile 04



Profile 05



Profile 06



CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
*Consultancy Services for Survey, Design and EIA works of Water Supply and Sewerage Facilities in 6 islands, Maldives - Package 5*

Sub Title:  
*Sewerage System in M.Naalaafushi*

Client:  
*Ministry of National Planning, Housing and Infrastructure, Republic of Maldives*



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E: info@epoch.associates  
W: www.epoch.associates  
A: G. Rosary West,  
Husnuheemaa Magu, Male', Maldives

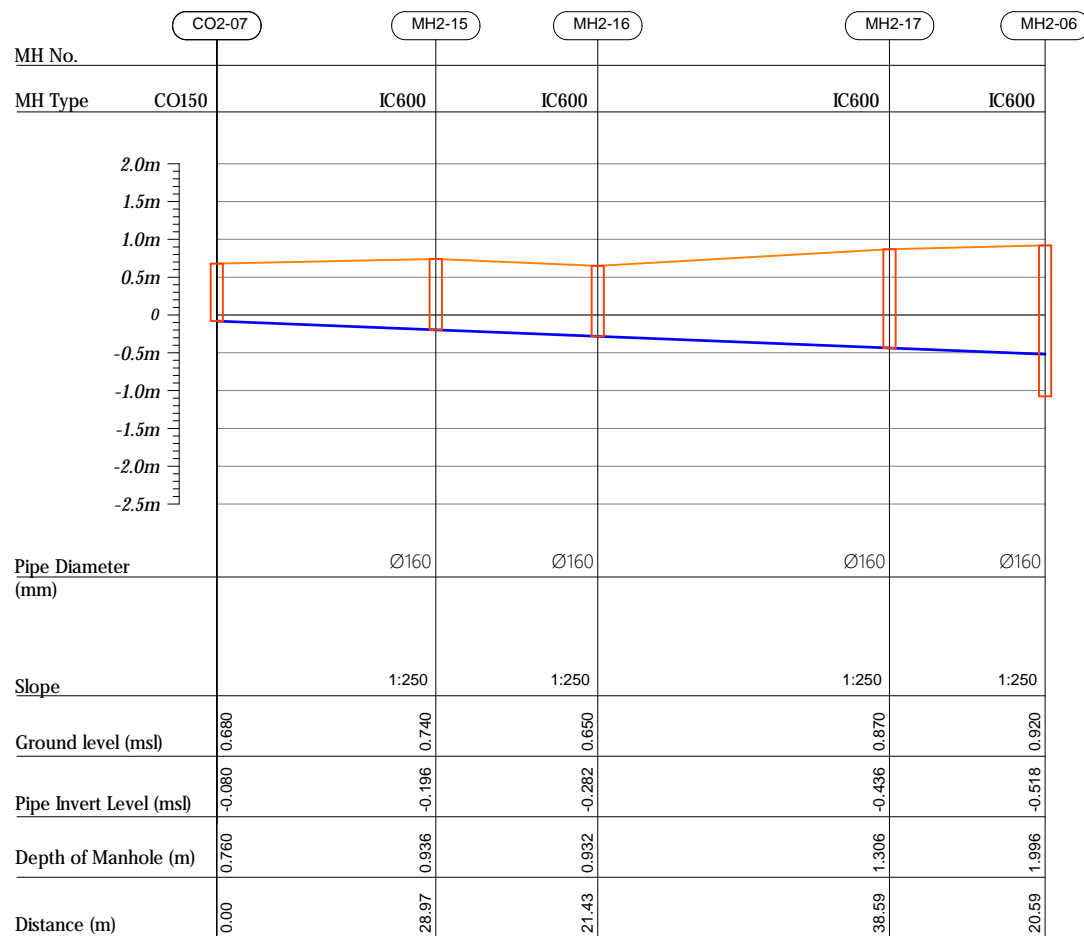


Makhuq Infrastructure -Lappan

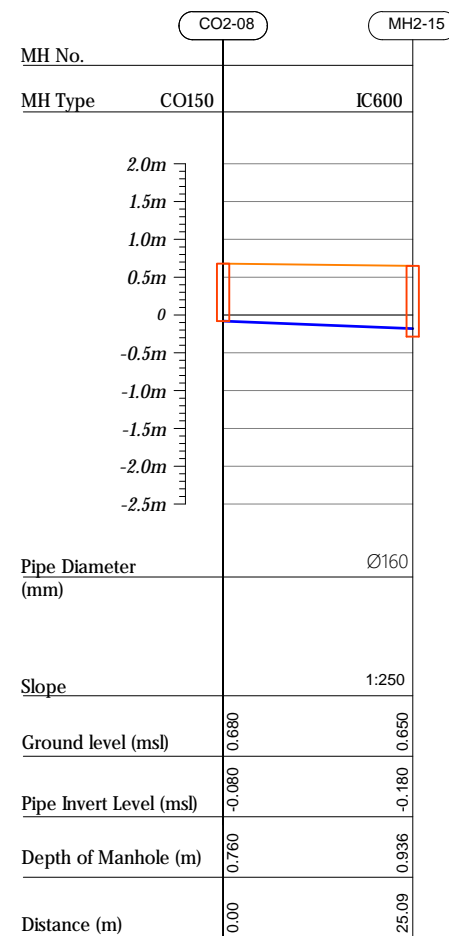
Drawn: A.R.W	Checked: M.S.S
Designed: F.I.A	Approved: LW
Date: Aug 2020	SCALE (A3): 1:100
Project No:	01010101



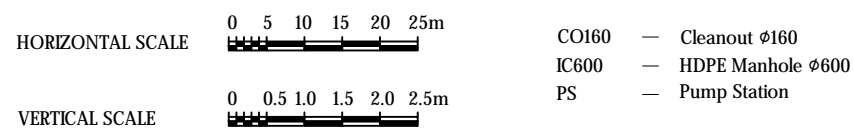
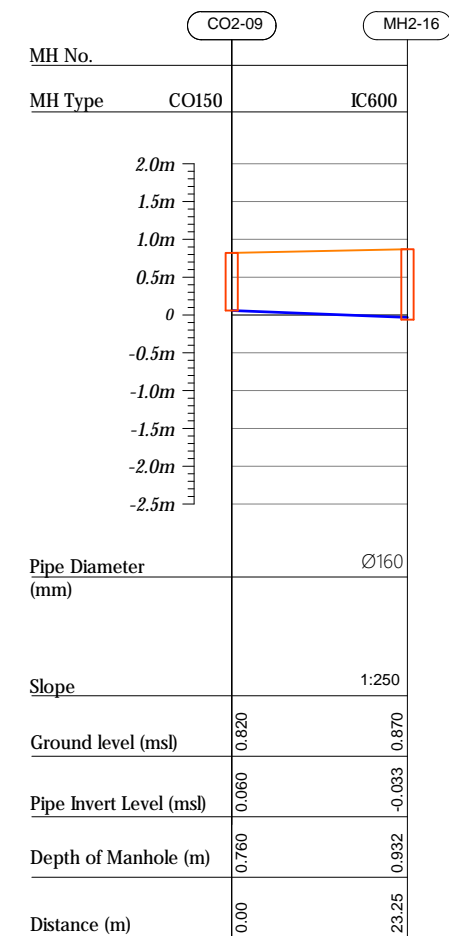
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## Profile 08



## Profile 09



R00	JUNE 2020	STAGE -1	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
*Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5*

Sub Title:  
*Sewerage System in M.Naalaafushi*

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

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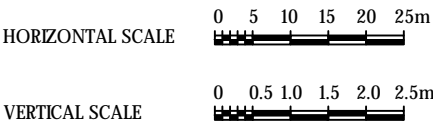
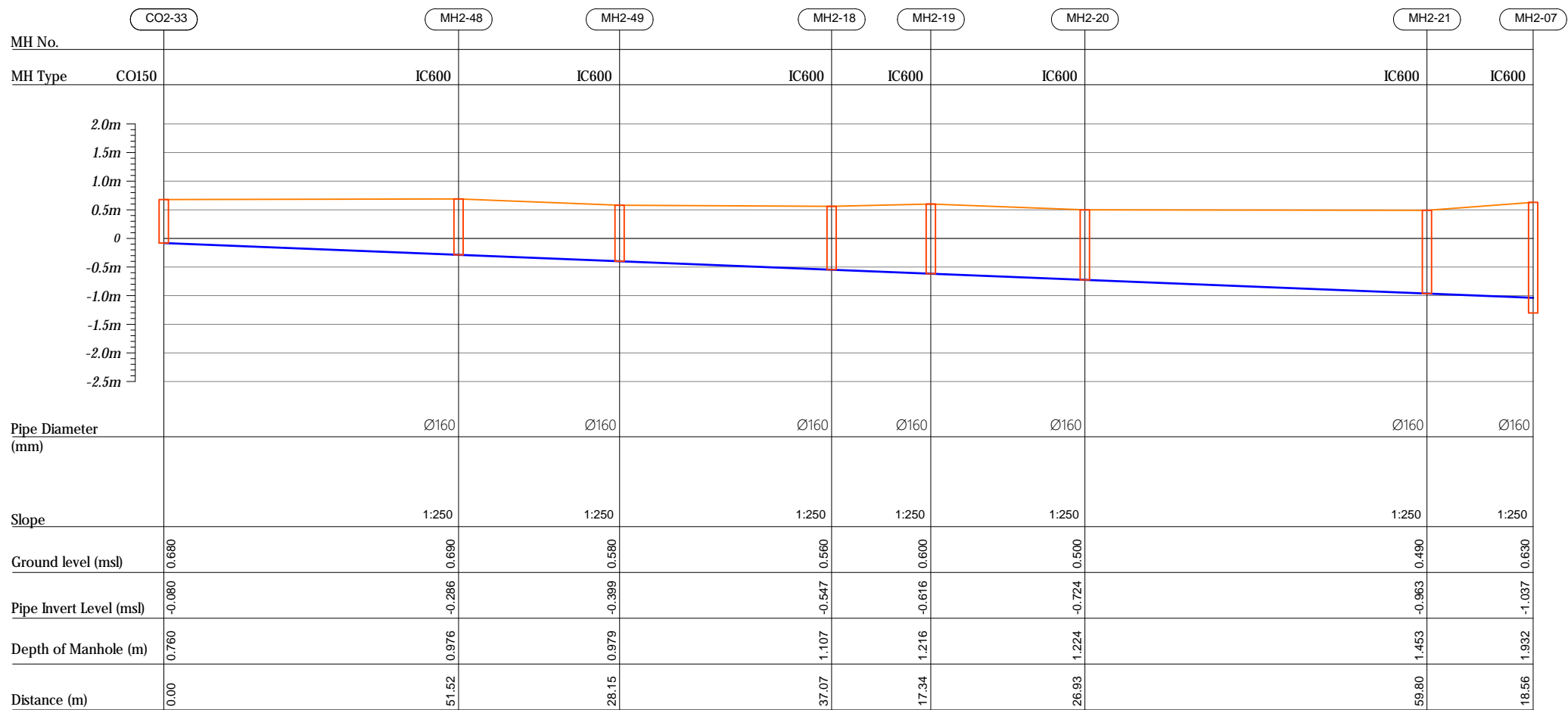
T: +960 333 3528  
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A: G. Eosary West,  
Husnuheenna Magu, Male\*, Maldives

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Drawn: A.R.W	Checked: M.S.S
Designed: F.L.A	Approved: L.W
Date: Aug 2020	SCALE (A3): 1:100
Project No: 01010101	
Rev: R-01	Page: PS2-04



Profile 33



CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -1	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



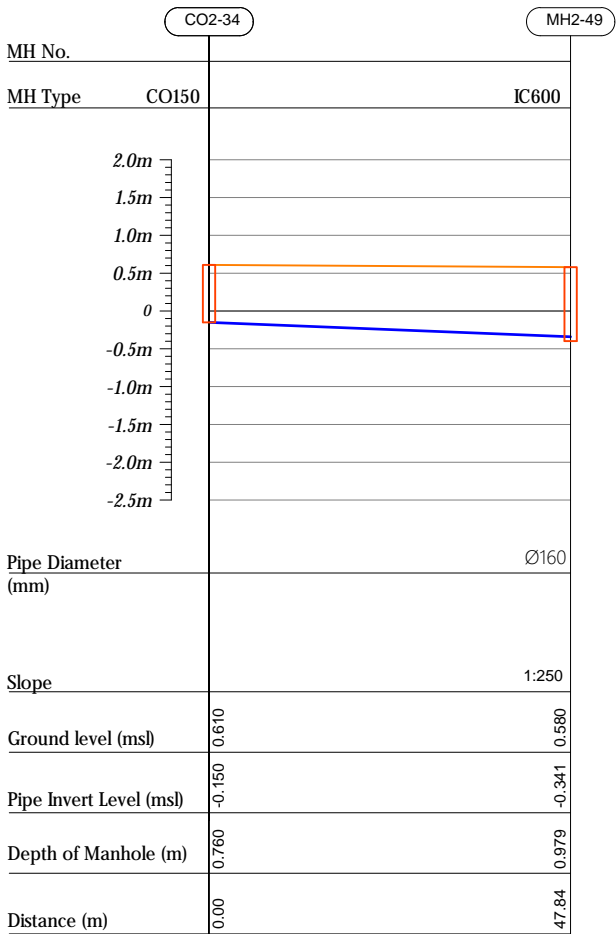
T: +960 333 3528  
E: info@epoch.associates  
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A: G. Rosary West,  
Hussuvehena Magu, Male', Maldives

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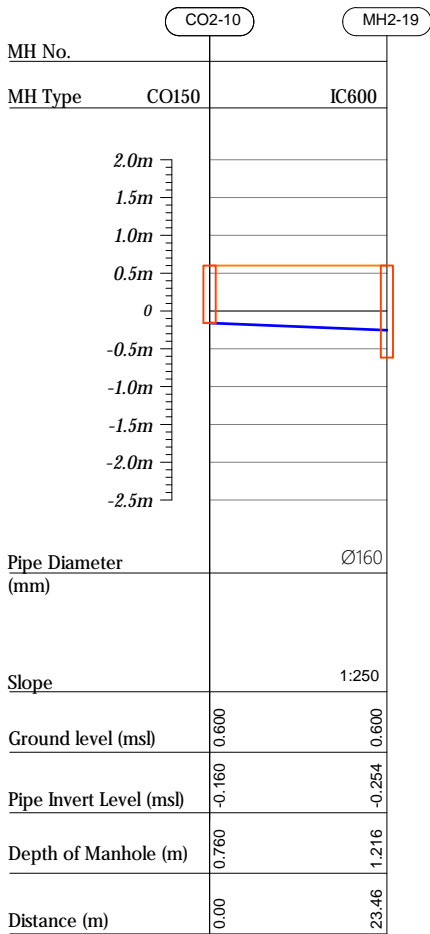
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Designed: F.L.A	Approved: L.W
Date: Aug 2020	SCALE (A3): 1:100
Project No:	01010101



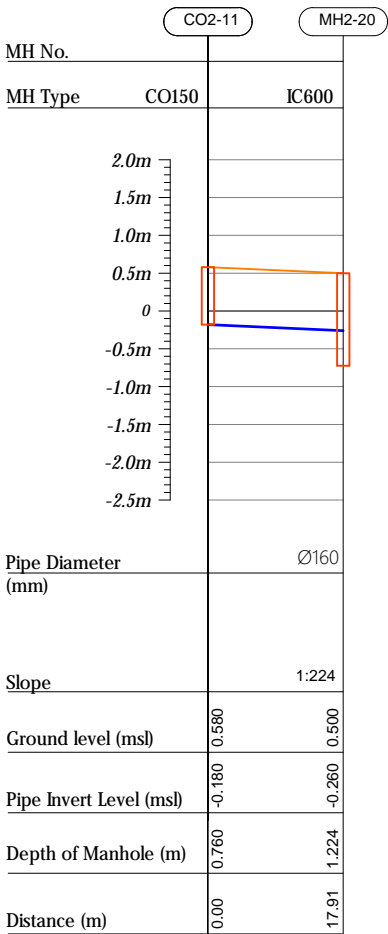
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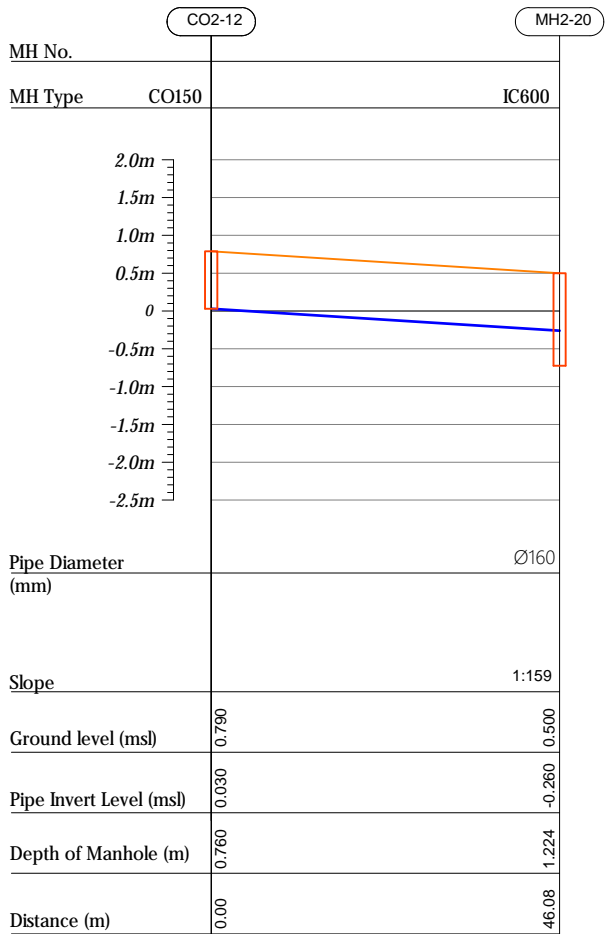
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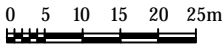
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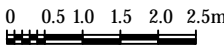
Profile 12



HORIZONTAL SCALE



VERTICAL SCALE



- CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
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Sub Title:  
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Client:  
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Hussuvehemaa Magu, Male', Maldives

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Drawn: A.R.W

Checked: M.S.S

Designed: F.L.A

Approved: L.W

Date: Aug 2020

SCALE (A3): 1:100

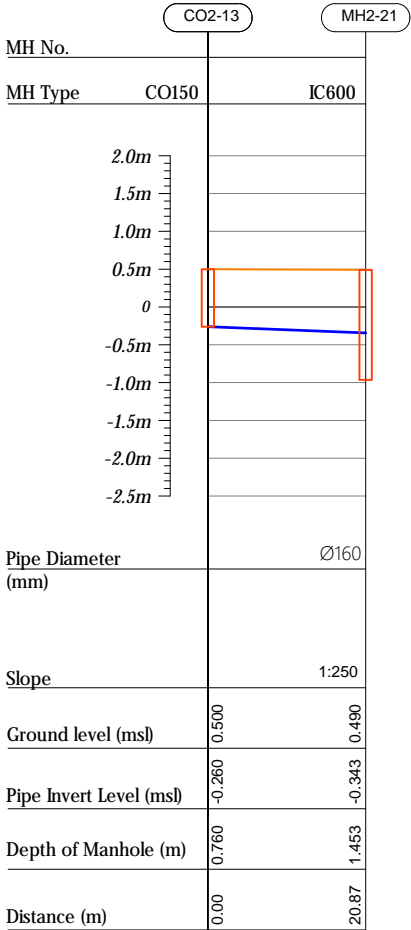
Project No: 01010101

Rev:  
R-01

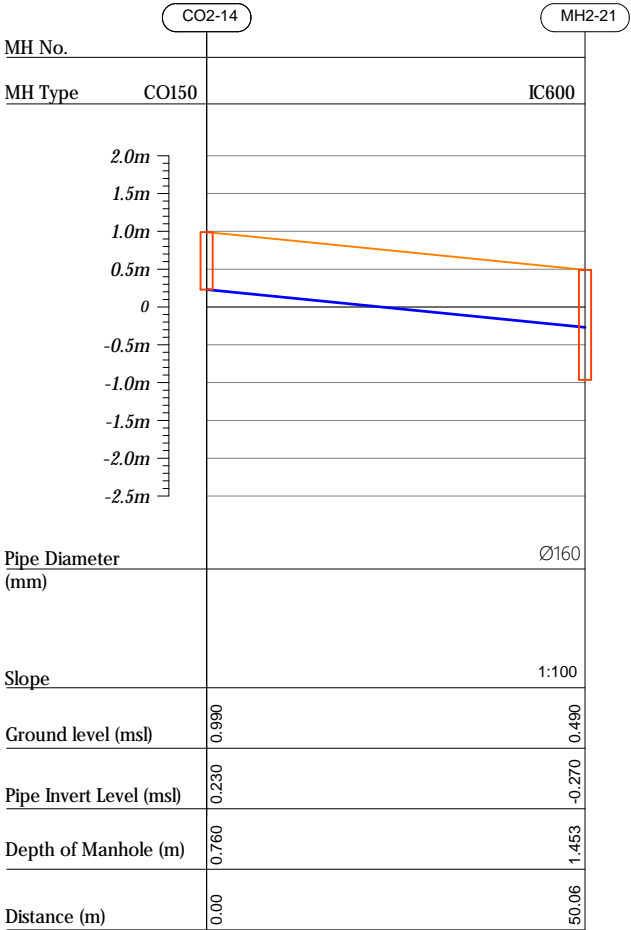
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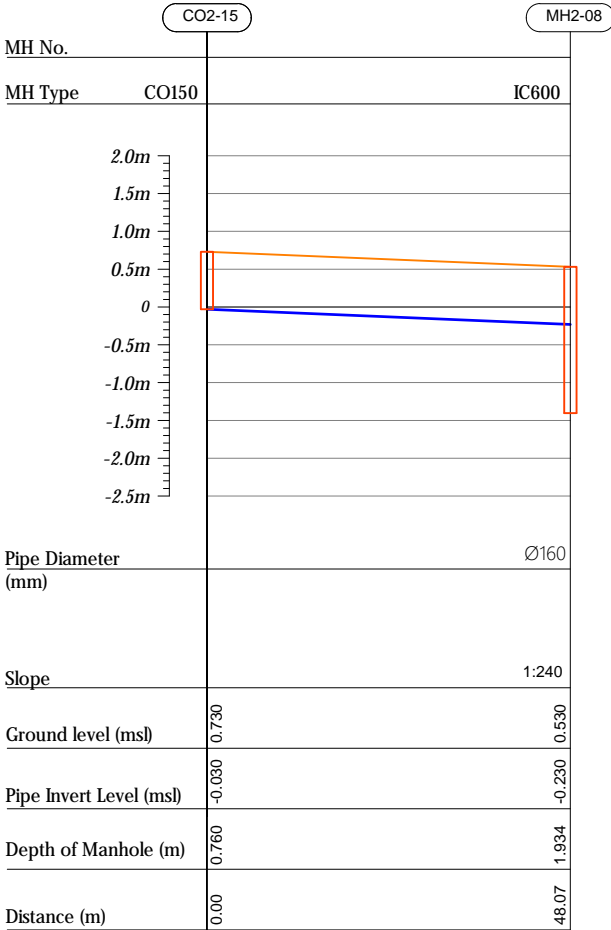
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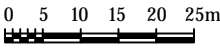
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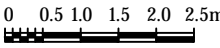
Profile 15



HORIZONTAL SCALE



VERTICAL SCALE



- CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

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Hussuhenias Magu, Male', Maldives

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Maldivu Infrastructure Develop

Drawn: A.R.W Checked: M.S.S

Designed: F.L.A Approved: L.W

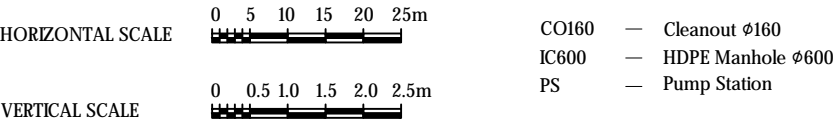
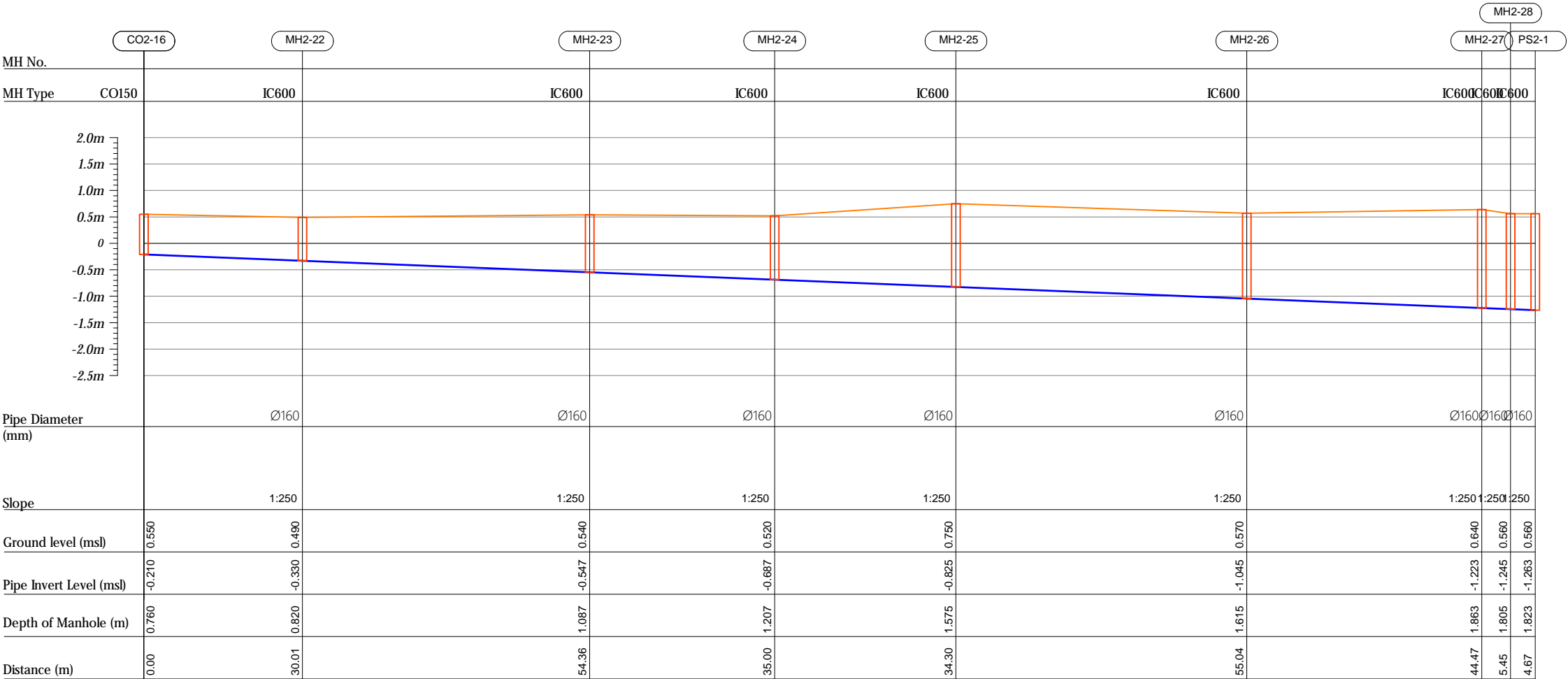
Date: Aug 2020 SCALE (A3): 1:100

Project No: 01010101

Rev: R-01 Page: PS2-07



Profile 16



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives

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Hussuiveemaa Magu, Male', Maldives

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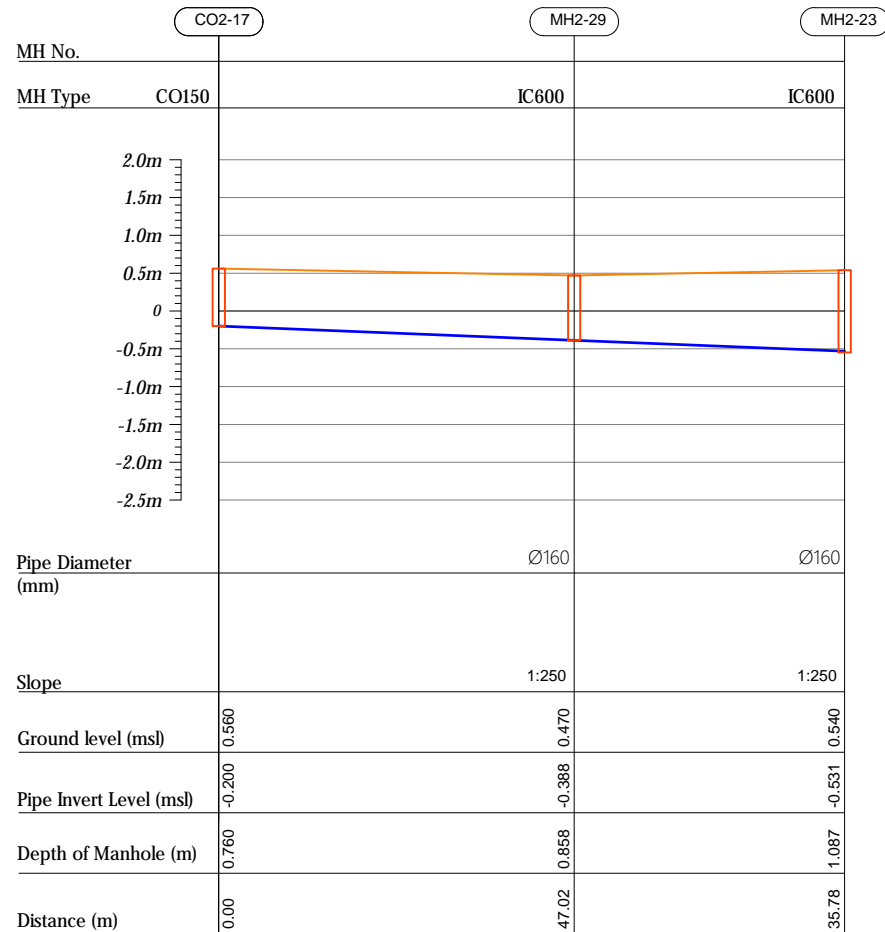
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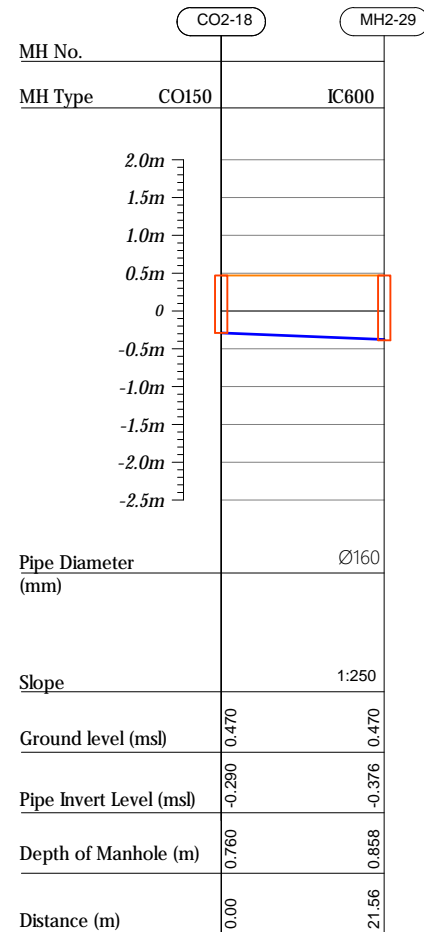
Drawn: A.R.W	Checked: M.S.S
Designed: F.L.A	Approved: L.W
Date: Aug 2020	SCALE (A3): 1:100
Project No: 01010101	
Rev: R-01	Page: PS2-08



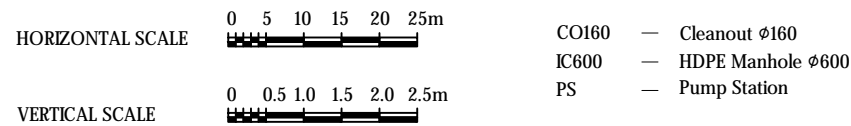
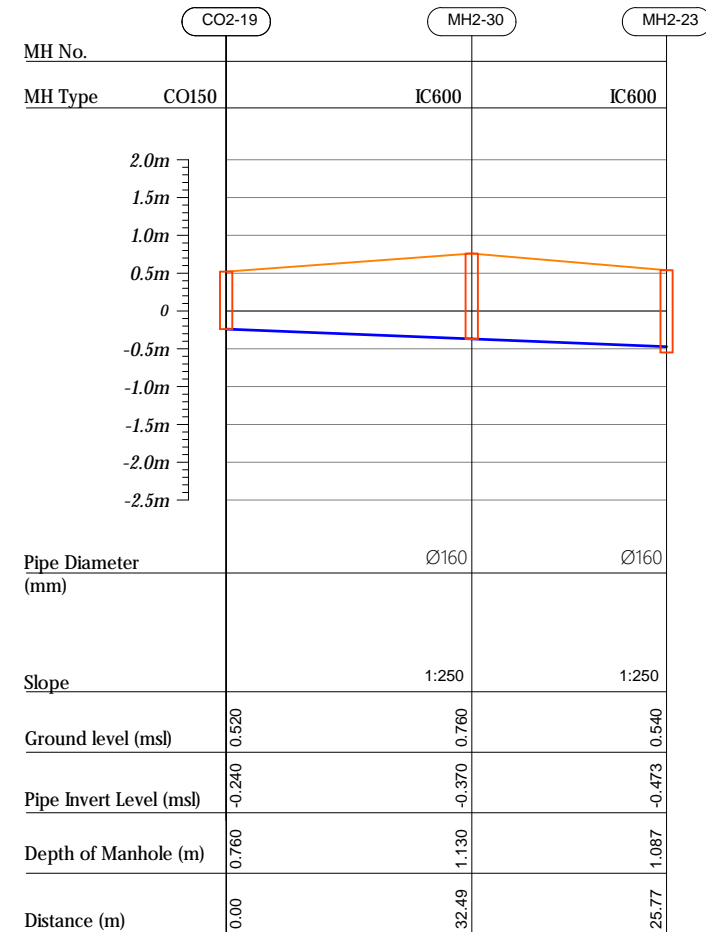
## Profile 17



## Profile 18



## Profile 19



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

**Title:**  
*Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5*

Sub Title:  
*Sewerage System in M.Naalaafushi*

Client:  
*Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives*



Drawn: A.R.W	Checked: M.S.S
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Designed: F.I.A	Approved: LW
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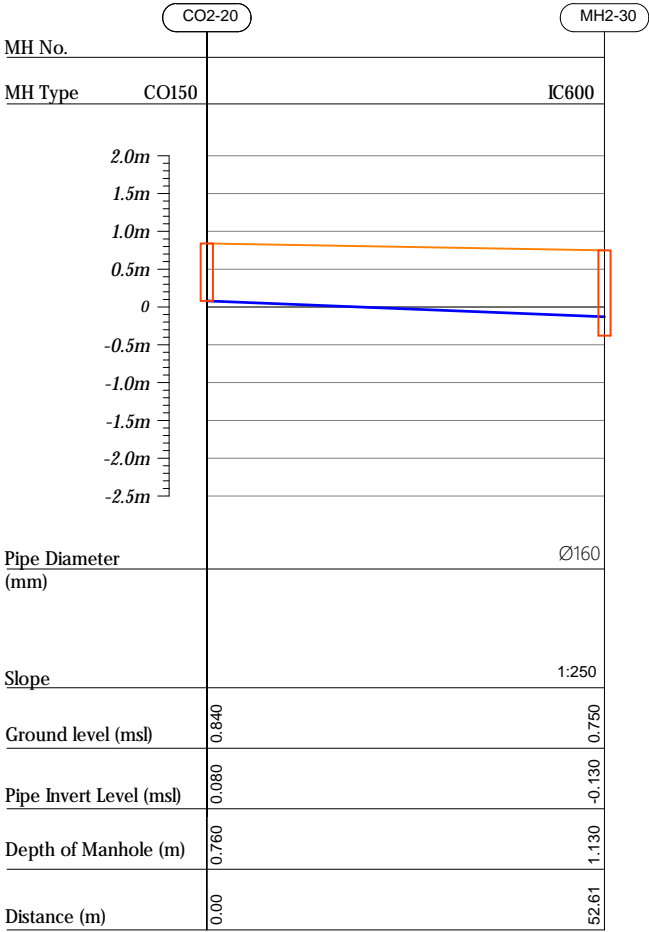
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Project No: 01010101

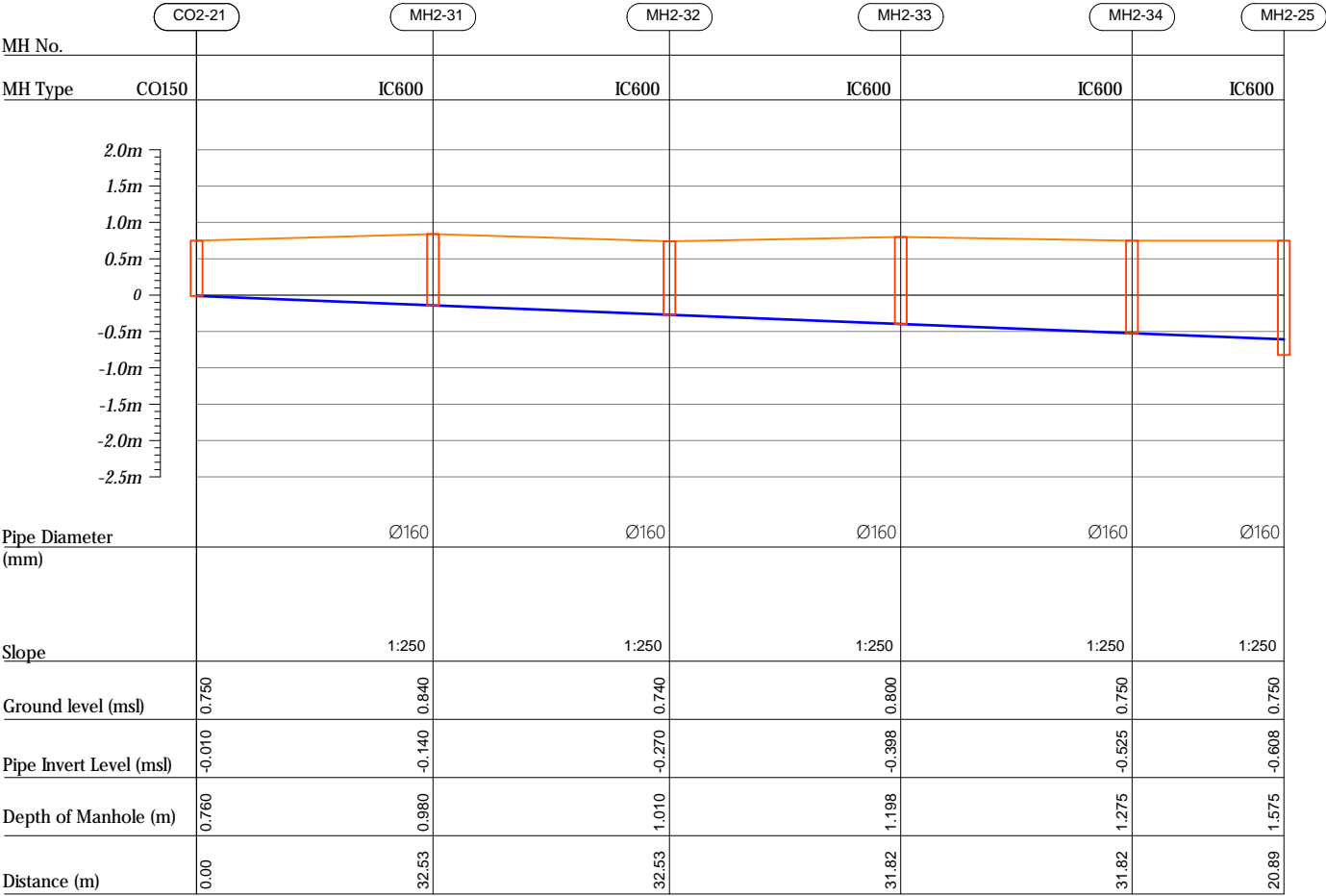
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R-01	PS2-09



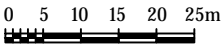
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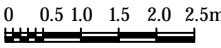
Profile 21



HORIZONTAL SCALE



VERTICAL SCALE



- CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
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Client:  
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Drawn: A.R.W Checked: M.S.S

Designed: F.L.A Approved: L.W

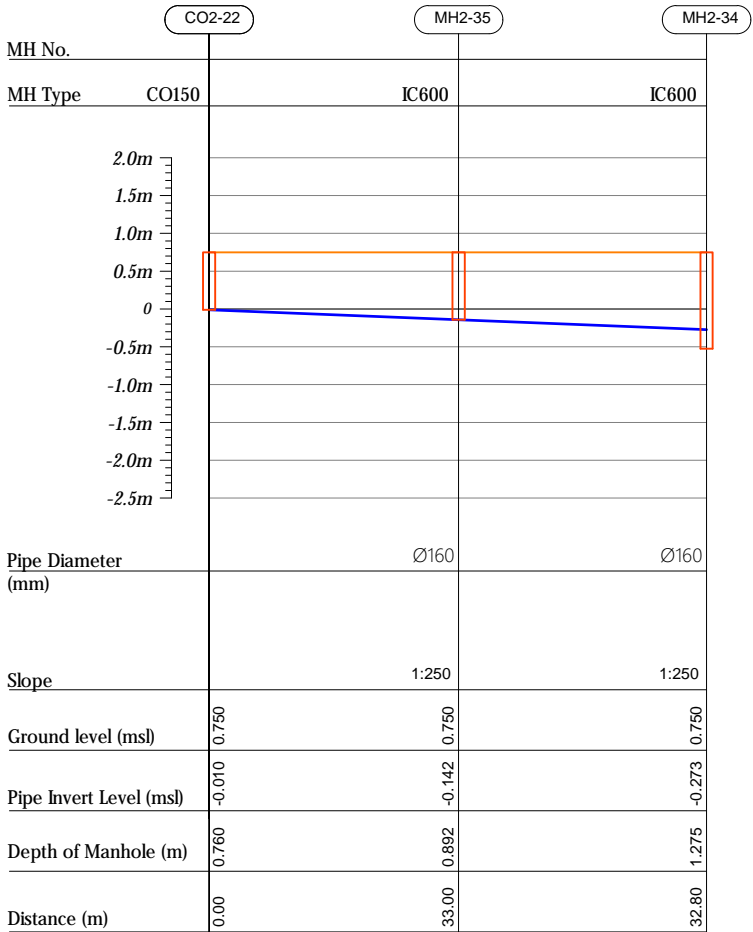
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Project No: 01010101

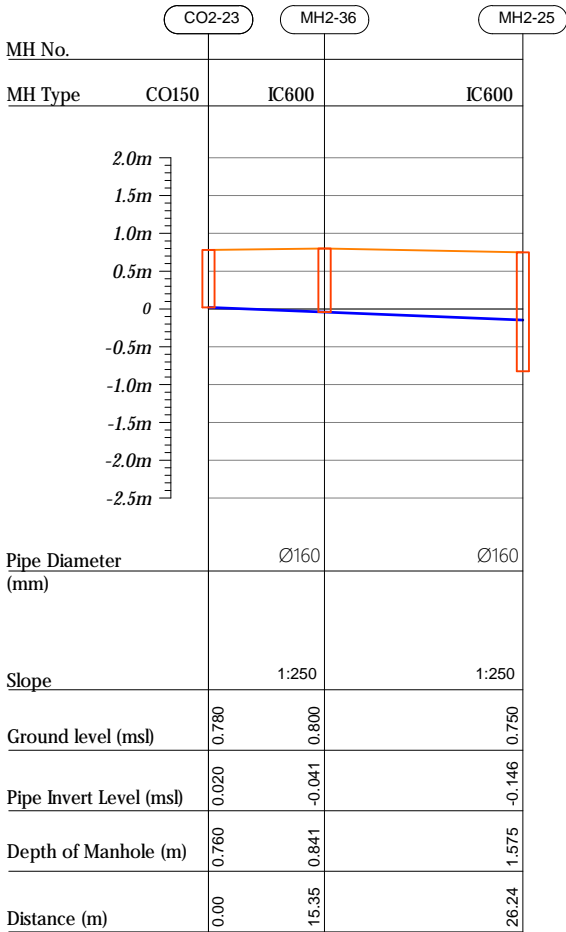
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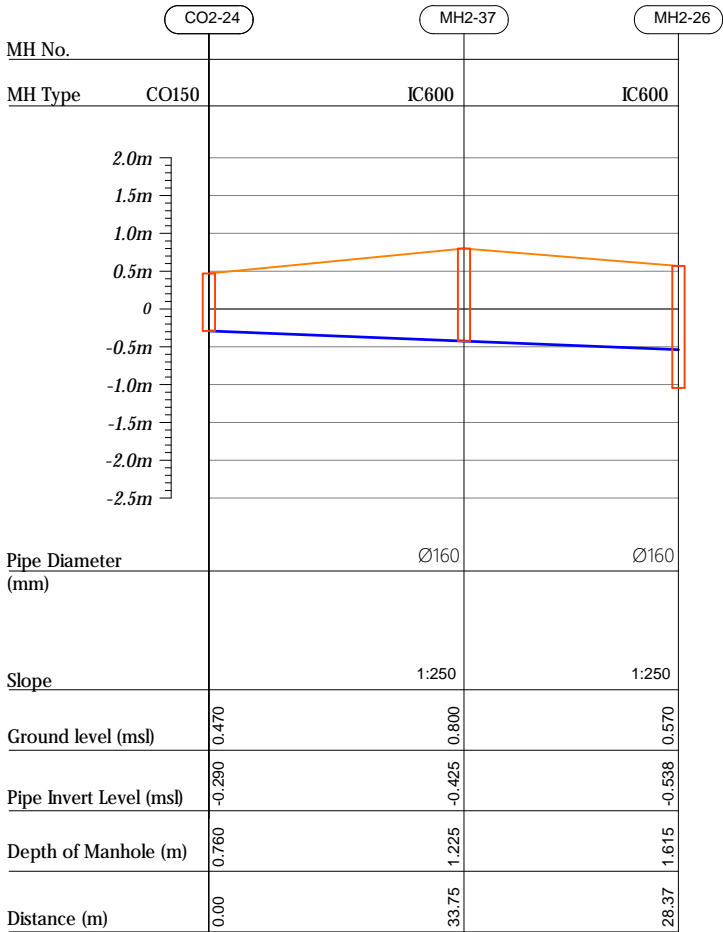
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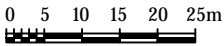
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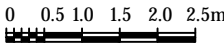
Profile 24



HORIZONTAL SCALE



VERTICAL SCALE



- CO160 — Cleanout Ø160
- IC600 — HDPE Manhole Ø600
- PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
Ministry of National Planning, Housing and  
Infrastructure, Republic of Maldives



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Hussuvehemaa Magu, Male', Maldives

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Maldivu Infrastructure Develop

Drawn: A.R.W Checked: M.S.S

Designed: F.I.A Approved: L.W

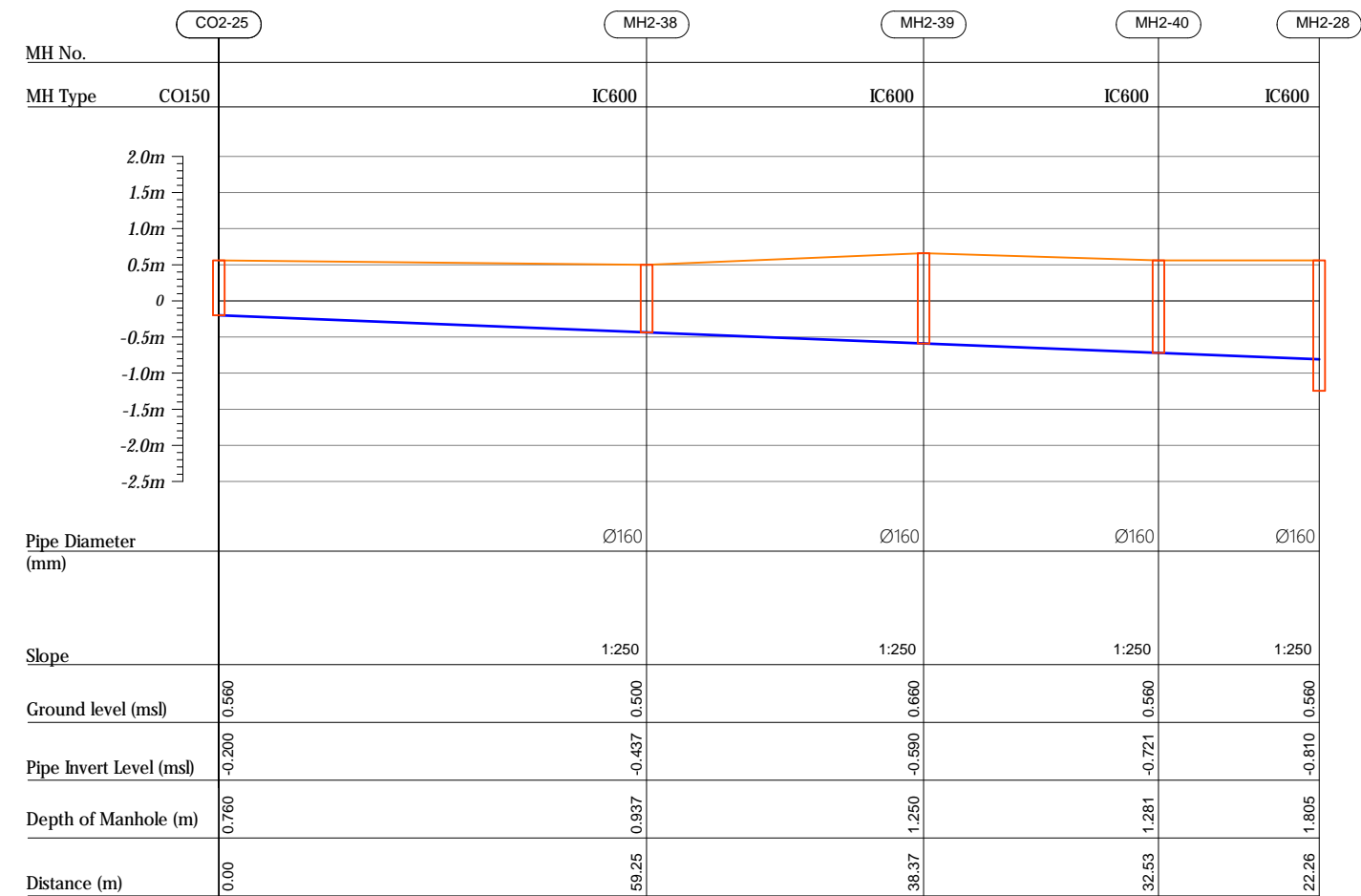
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Project No: 01010101

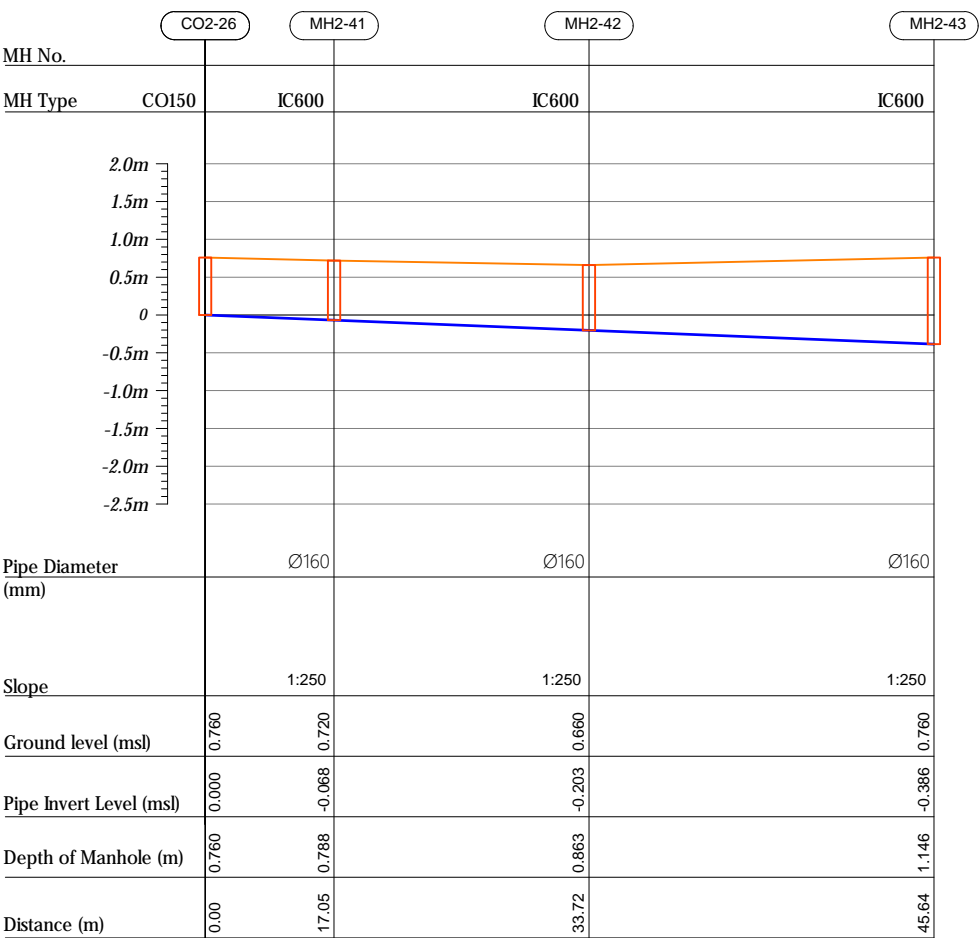
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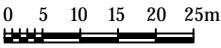
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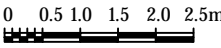
Profile 26



HORIZONTAL SCALE



VERTICAL SCALE



CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
Supply and Sewerage Facilities in  
6 islands, Maldives - Package 5

Sub Title:  
Sewerage System in M.Naalaafushi

Client:  
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DBAC INFRA  
Maldivu Infrastructure Develop

Drawn: A.R.W Checked: M.S.S

Designed: F.L.A Approved: L.W

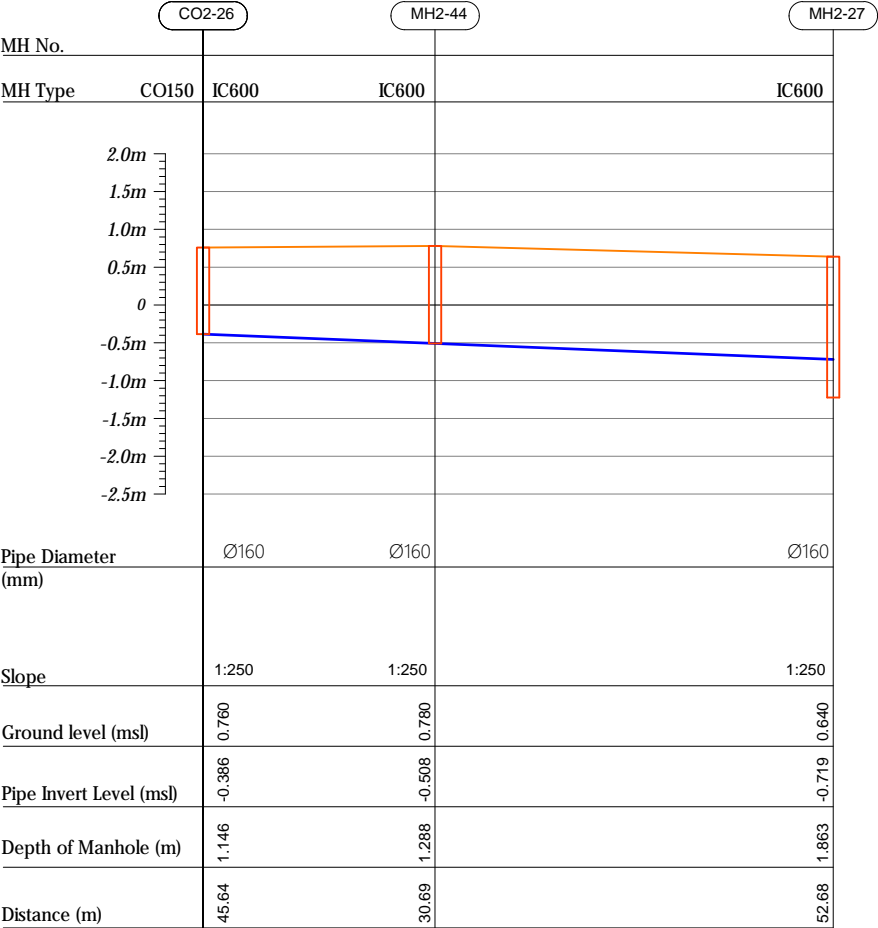
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Project No: 01010101

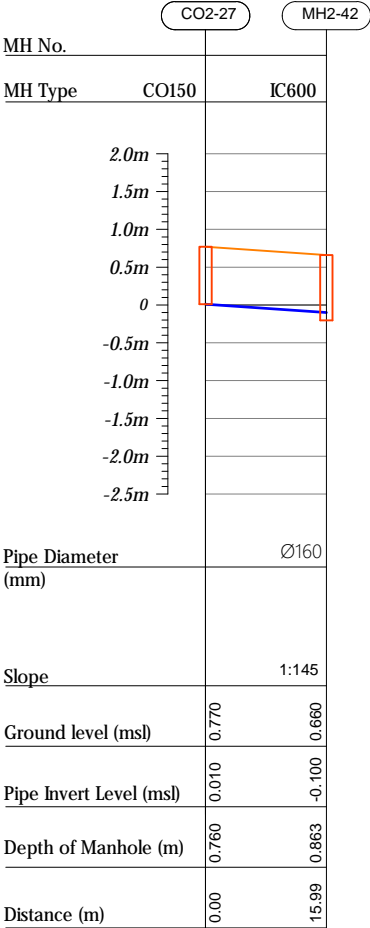
Rev: R-01 Page: PS2-12



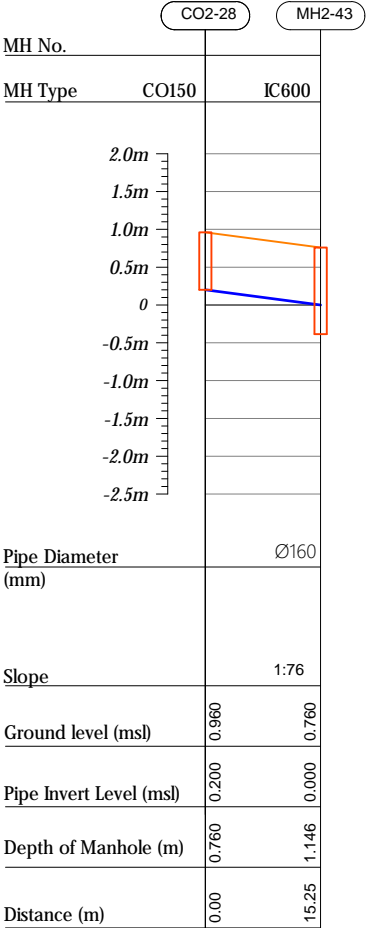
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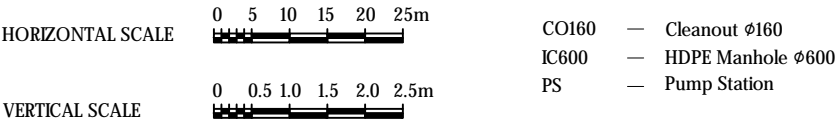
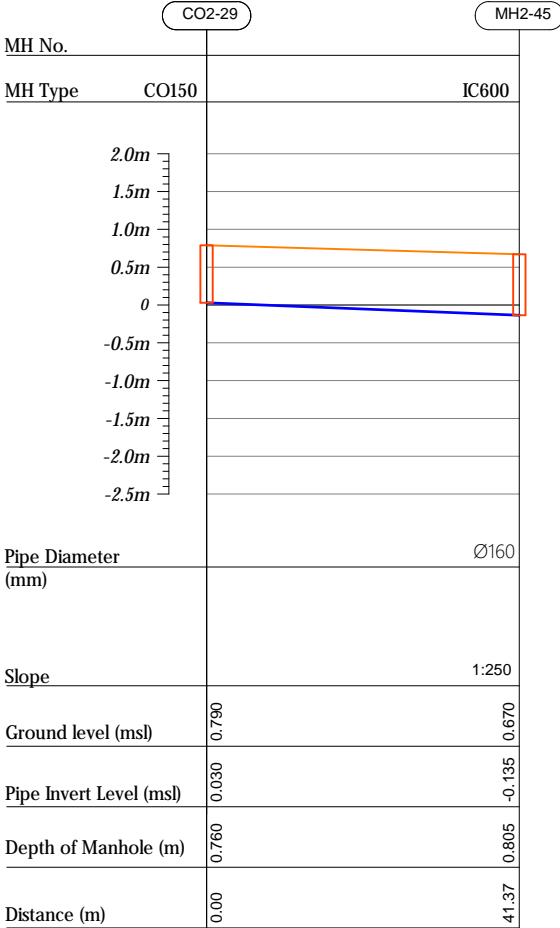
Profile 27



Profile 28



Profile 29



R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
Design and EIA works of Water  
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Drawn: A.R.W      Checked: M.S.S

Designed: F.I.A      Approved: L.W

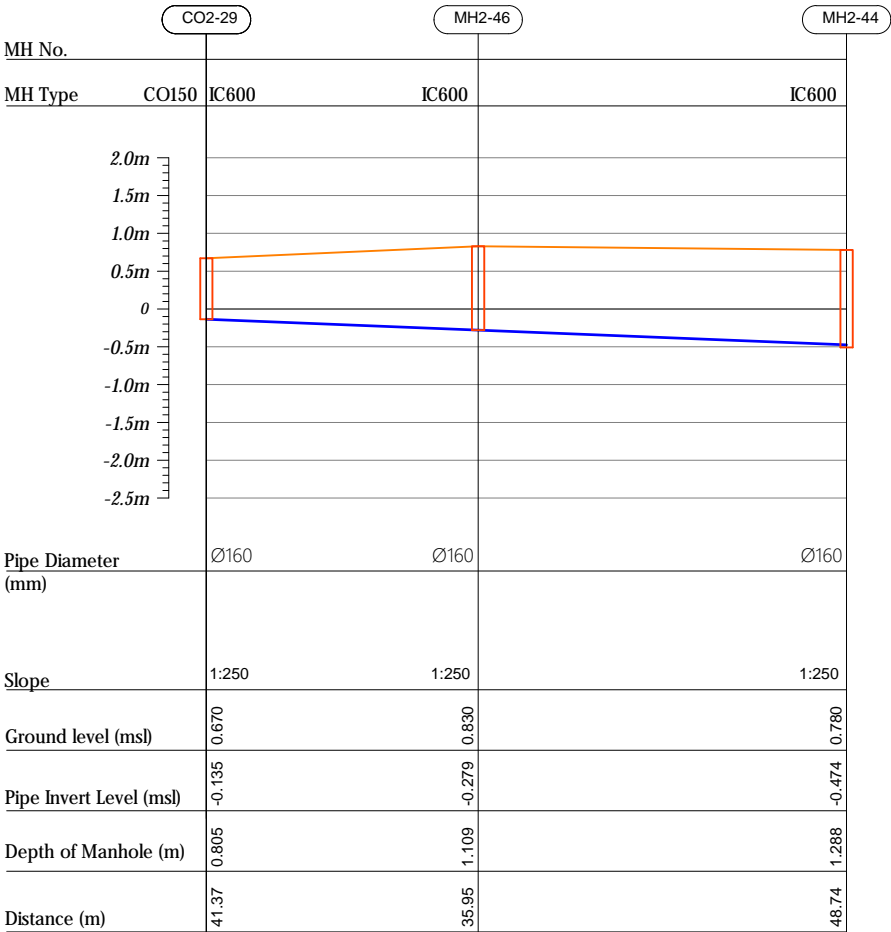
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Project No: 01010101

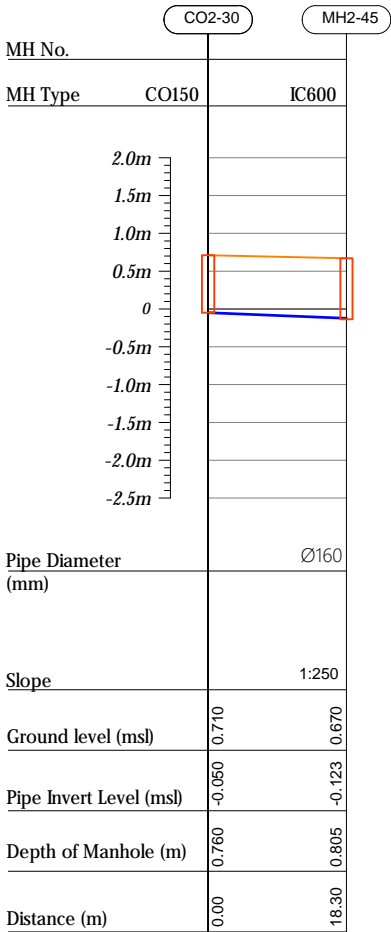
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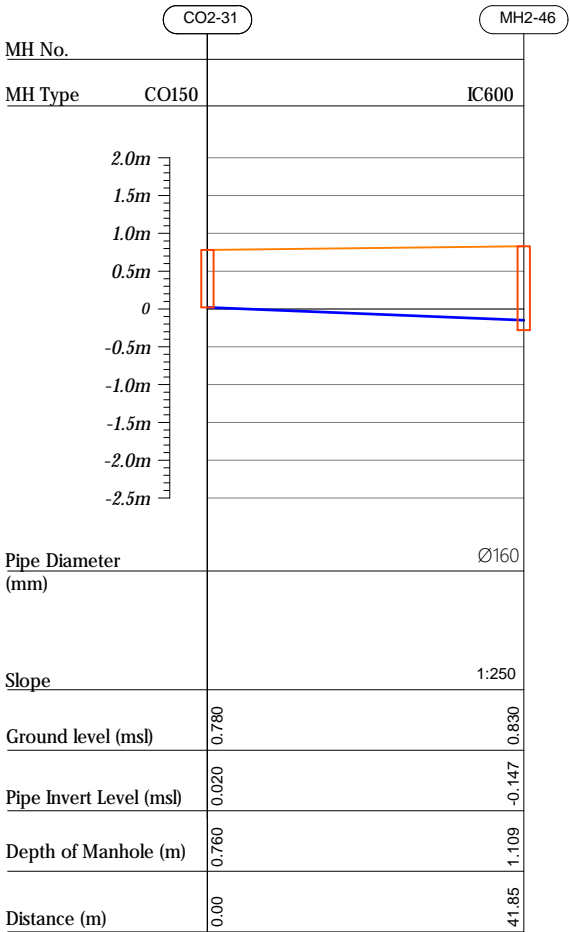
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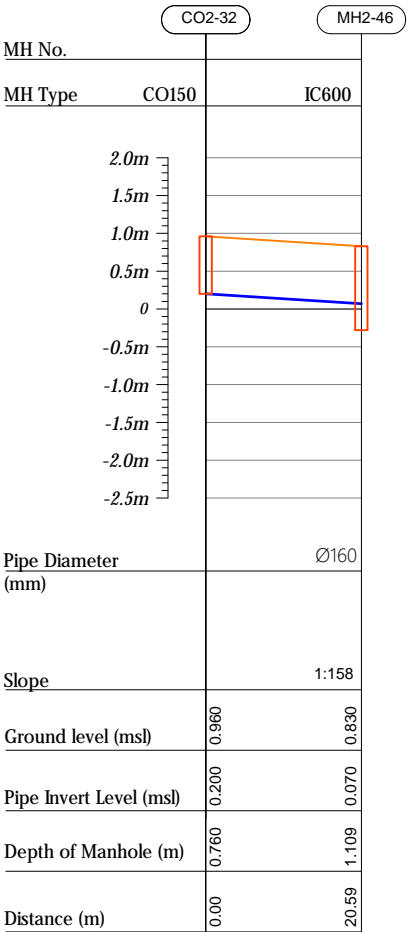
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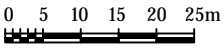
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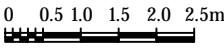
Profile 32



HORIZONTAL SCALE



VERTICAL SCALE



- CO160 — Cleanout Ø160  
IC600 — HDPE Manhole Ø600  
PS — Pump Station

R00	JUNE 2020	STAGE -I	PD	SBC	SD
REV. NO.	Date	Revision Description	Drawn	Chkd	Appd.

Title:  
Consultancy Services for Survey,  
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Hussuhenias Magu, Male', Maldives

INFRA  
Maldivu Infrastructure Develop

Drawn: A.R.W Checked: M.S.S

Designed: F.I.A Approved: LW

Date: Aug 2020 SCALE (A3): 1:100

Project No: 01010101

Rev: R-01 Page: PS2-14