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CIVIL • STRUCTURAL • TRANSPORT • ENGINEERS

Our Reference : C157-041017- ECO_ASSESSMENTS_L01 – Rev 1
Your Reference :
Enquiries : Christopher E Nair
E-mail Address : chris@chrisen.com

Chrisen Consulting (Pty) Ltd

Civil Engineering

Unit 1, 1st Floor Right,
Cambridge Office Park
5 Bauhinia Street,
Highveld Technopark
Centurion,
South Africa, 0157
Cell: +27 0(78) 800 0369
Tel: +27 0(12) 663 3008
e-mail: chris@chrisen.com/
info@chrisen.com
website: www.chrisen.com
Chrisen Consulting (Pty)Ltd
Registration Number: 2016 / 291392 / 07

22 July 2020

ECO ASSESSMENTS

**PO BOX 441037
LINDEN
2104**

For Attention: MR MARK CUSTERS

E-mail Address: mark@ecoassessments.co.za

Contact Number: (082) 857 8480

Dear Mark,

**ACCESS DESIGN AND STORMWATER MANAGEMENT PROPOSALS FOR THE
PROPOSED FILLING STATION ON PORTION 179 OF THE FARM NIETGEDACHT
535-JQ (ACCESS OFF K33 PROVINCIAL ROUTE)**

1. INTRODUCTION

CHRISEN CONSULTING (PTY) LTD Civil, Structural and Transport Engineers have been appointed to undertake professional engineering services for Bothongo Group Holdings in support of the planning, design and approval of the Proposed New Filling Station development on Portion 179 of the Farm Nietgedacht 535-JQ. It should be noted that access to the site will be obtained from the R114 (marginal access) as well as the K33 (marginal access). In principal access approvals have been provided by the Gauteng Department of Roads and Transport (GDRT).

2. PURPOSE OF THE REPORT

This report serves to illustrate the various access proposals for the development. The status of the site development application is to apply for the second access off the K33 which will be via either a “filled” road or a road bridge that crosses over the wetland leading to the site. The alternative design proposals for the second access off the K33 is demonstrated in this report.

3. DESIGN ALTERNATIVES

The four design alternatives are listed below:

- **Layout 1 (Refer to Drawing C157-SWMP-LO-01):** This involves an access road between K33 and the proposed site. The elevation difference between K33 at the point of connection and the platform is 9.957 m and the length of the proposed access is 151.128 m. The maximum grade along the access road is 7.05 %. Due to the high grading present on the roadway, Armco barriers are proposed for the sides of the road. The layout proposes a retaining wall along the entire length of the proposed second access. This retaining wall is to be present along both embankments and is necessary because the site is being mainly supported by fill material due to the elevation of the proposed surface being higher than that of the existing ground surface. Drainage along the second access is achieved through surface drainage. This surface drainage consists:
 - I. A widened shoulder on the proposed access accompanied by grouted stone pitching to assist with the dissipation of energy and the resulting drop of velocity of surface run-off.
 - II. An additional kerb bounding the stone pitching to prevent water from flowing over the roadway and onto the bank.
 - III. Upon leaving the access road via the widened shoulder, water is proposed to enter a new stormwater headwall leading to a 600 mm dia. Concrete pipe after which is it discharged to a surface grid inlet.

Stormwater is managed on site by a network of grid inlets, catchpits and reticulation network. Upon leaving the hardened surface, stormwater is directed to a detention pond via a 375 mm dia. Concrete pipe. The detention pond is to control the release of flow out of the site in a way such that pre-development flow from the 1:50 year flood is not exceeded. Upon leaving the detention pond via a



225 mm Dia. Concrete pipe, water is directed to a new stormwater headwall and channeled under the proposed second access via a 600 mm Dia. Concrete pipe. This pipe connects to a new headwall with reno mattresses on the other side of the proposed access. The reno mattress consists energy dissipaters so that run-off flowing through it will have a decreased velocity. Upon leaving the new stormwater headwall, water is to flow along the existing ground surface until reaching the lowest point of the proposed access embankment. Rectangular portal culverts of dimensions (3600 mm x 3000 mm) are proposed through the second access road at this point to allow water to flow to the other side of the existing surface. Water will then flow the new stormwater grid inlet.

It was found that this layout proposes the lowest amount of fill material (7869 m³) to be imported to the site although the area of retaining wall to be constructed (328.21m²) is high by industry standards. The use of the retaining wall in the design and construction will offer safety in the retaining of the bank and will also mitigate the risk of the embankment encroaching into the adjacent property.

- **Layout 2 (Refer to Drawing C157-SWMP-LO-02):** This layout proposes a retaining wall over only a segment of the proposed access. The remainder of the proposed second access is to be graded toward the natural ground at a slope of 1:2 so that there is no a large elevation difference between the future ground and existing ground surface post construction. The retaining wall is proposed along the specified segment so as to avoid encroachment of the embankment to the neighboring property. Drainage along the second access is achieved through surface drainage. This surface drainage consists:
 - I. A widened shoulder on the proposed access accompanied by grouted stone pitching to assist with the dissipation of energy and the resulting drop of velocity of surface run-off.
 - II. An additional kerb bounding the stone pitching to prevent water from flowing over the roadway and onto the bank.



- III. Upon leaving the access road via the widened shoulder, water is proposed to enter a new stormwater headwall leading to a 600 mm dia. Concrete pipe after which is it discharged to a surface grid inlet.

Stormwater is managed on site by a network of grid inlets, catchpits and reticulation network. Upon leaving the hardened surface, stormwater is directed to a detention pond via a 375 mm dia. Concrete pipe. The detention pond is to control the release of flow out of the site in a way such that pre-development flow from the 1:50 year flood is not exceeded. Upon leaving the detention pond via a 225 mm Dia. Concrete pipe, water is directed to a new stormwater headwall and channeled under the proposed second access via a 600 mm Dia. Concrete pipe. This pipe connects to a new headwall with reno mattresses on the other side of the proposed access. The reno mattress consists energy dissipaters so that run-off flowing through it will have a decreased velocity. Upon leaving the new stormwater headwall, water is to flow along the existing ground surface until reaching the lowest point of the proposed access embankment. Rectangular portal culverts of dimensions (3600 mm x 3000 mm) are proposed through the second access road at this point to allow water to flow to the other side of the existing surface. Water will then flow the new stormwater grid inlet.

It was found that this layout proposes a large of amount of fill material (10709.297 m³) to be imported to the site although the area of retaining wall to be constructed (59.503 m²) is as low as it can possibly be without encroachment of the embankment into neighboring property. The resultant cost of importing such large amount of fill will be detrimental.

- **Layout 3 (Refer to Drawing C157-SWMP-LO-03):** This layout proposes a road bridge for the entire length of the proposed second access. No embankments or retaining wall are necessary in this proposed layout as the proposed access road is to be fully supported by the bridge. Drainage along the second access is achieved through surface drainage. This surface drainage consists:



- I. A widened shoulder on the proposed access accompanied by grouted stone pitching to assist with the dissipation of energy and the resulting drop of velocity of surface run-off.
- II. An additional kerb bounding the stone pitching to prevent water from flowing over the roadway and onto the bank.
- III. Upon leaving the access road via the widened shoulder, water is proposed to enter a new stormwater headwall leading to a 600 mm dia. Concrete pipe after which is it discharged to a surface grid inlet.

Stormwater is managed on site by a network of grid inlets, catchpits and reticulation network. Upon leaving the hardened surface, stormwater is directed to a detention pond via a 375 mm dia. Concrete pipe. The detention pond is to control the release of flow out of the site in a way such that pre-development flow from the 1:50 year flood is not exceeded. Upon leaving the detention pond via a 225 mm Dia. Concrete pipe, water is directed to a new stormwater headwall and channeled under the proposed second access via a 600 mm Dia. Concrete pipe. This pipe connects to a new headwall with reno mattresses on the other side of the proposed access. The reno mattress consists energy dissipaters so that run-off flowing through it will have a decreased velocity. Upon leaving the new stormwater headwall, water is to flow along the existing ground surface until reaching the lowest point of the proposed access embankment. Water will then flow to the new stormwater grid inlet through the underground bridge.

It was found that this layout proposes no amount of fill material to be imported to the site as well as well no portion of retaining wall to be provided. It does, however, include the complete provision and construction of a bridge access which will result in massive cost implications far outweighing the benefit of the proposed filling station.

- **Layout 4(Refer to Drawing C157-SWMP-LO-04):** This involves an access



road between K33 and the proposed site. The elevation difference between K33 at the point of connection and the platform is 13.913 m and the length of the proposed access is 216.345 m. The maximum grade along the access road is 6.95 %. This layout proposes an extended length of access so as to reduce the grade along the proposed second access. Retaining walls are to be present along the entire length of access so as to prevent the embankments from encroaching into neighboring property. The area under the roadbed is to be filled with imported material. Drainage along the second access is achieved through surface drainage. This surface drainage consists:

- I. A widened shoulder on the proposed access accompanied by grouted stone pitching to assist with the dissipation of energy and the resulting drop of velocity of surface run-off.
- II. An additional kerb bounding the stone pitching to prevent water from flowing over the roadway and onto the bank.
- III. Upon leaving the access road via the widened shoulder, water is proposed to enter a new stormwater headwall leading to a 600 mm dia. Concrete pipe after which is it discharged to a surface grid inlet.

Stormwater is managed on site by a network of grid inlets, catchpits and reticulation network. Upon leaving the hardened surface, stormwater is directed to a detention pond via a 375 mm dia. Concrete pipe. The detention pond is to control the release of flow out of the site in a way such that pre-development flow from the 1:50 year flood is not exceeded. Upon leaving the detention pond via a 225 mm Dia. Concrete pipe, water is directed to a new stormwater headwall and channeled under the proposed second access via a 600 mm Dia. Concrete pipe. This pipe connects to a new headwall with reno mattresses on the other side of the proposed access. The reno mattress consists energy dissipaters so that run-off flowing through it will have a decreased velocity. Upon leaving the new stormwater headwall, water is to flow along the existing ground surface until



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reaching the lowest point of the proposed access embankment. Rectangular portal culverts of dimensions (3600 mm x 3000 mm) are proposed through the second access road at this point to allow water to flow to the other side of the existing surface. Water will then flow the new stormwater grid inlet.

It was found that this layout proposes the largest amount of fill material (11126.436 m³) to be imported to the site as well a large area of retaining wall (472.037 m²) to be provided and constructed. Moreover, this layout includes the use of much more roadbed layers and accompanying layerworks due to the extension of the access road.

4. RECOMMENDATIONS

Based on the contents in this report;

- Layout one provides the safest and most economic solution to the construction of the proposed second access road although the steep grade of the access road is of concern.
- Layout 2 provides the second most safe and economic solution although the use of fill embankments as opposed to retaining walls results in the rise of amount of fill material to be imported to unacceptable levels.
- Layout 3 provides a solution without the additional costs of importing fill material and constructing retaining walls however the cost implications involved in the building of a bridge access is far too large for this option to be considered.
- Layout 4 is a viable option due to the proposal of the access grade being lessened. This is established through the extension of the length of the access road. The extension of the access road also results in an increase in the road layerworks to unacceptable levels. If the extended access layout is to be used then the client must purchase the ground area surrounding the proposed access on portion 91 and register it as a right of way servitude.

It is therefore concluded that layout one 1No. is the most viable option in terms of cost effectiveness as well as environmental impact and ease of design.

Should you have any queries, feel free to contact the undersigned.

Yours sincerely,



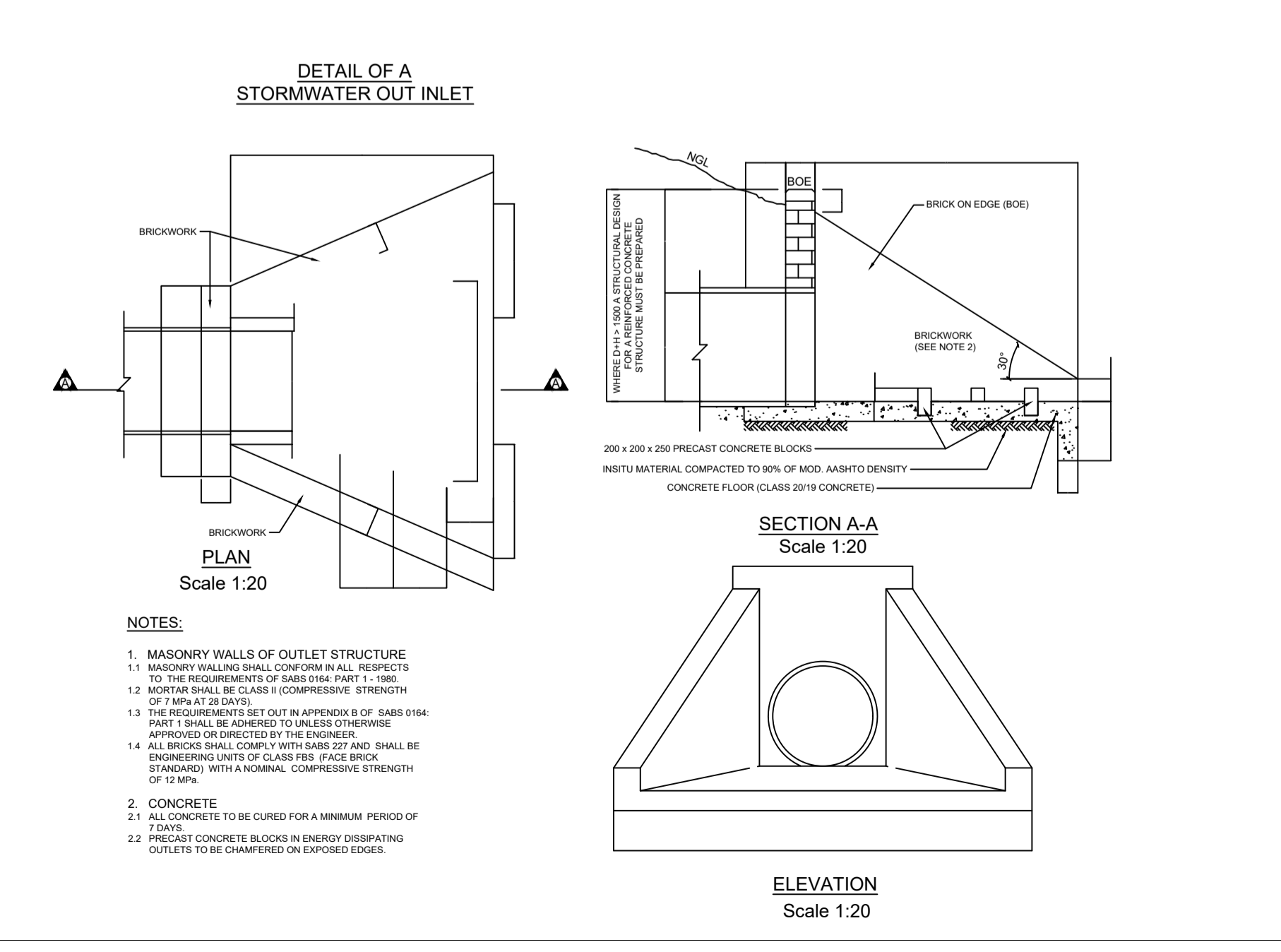
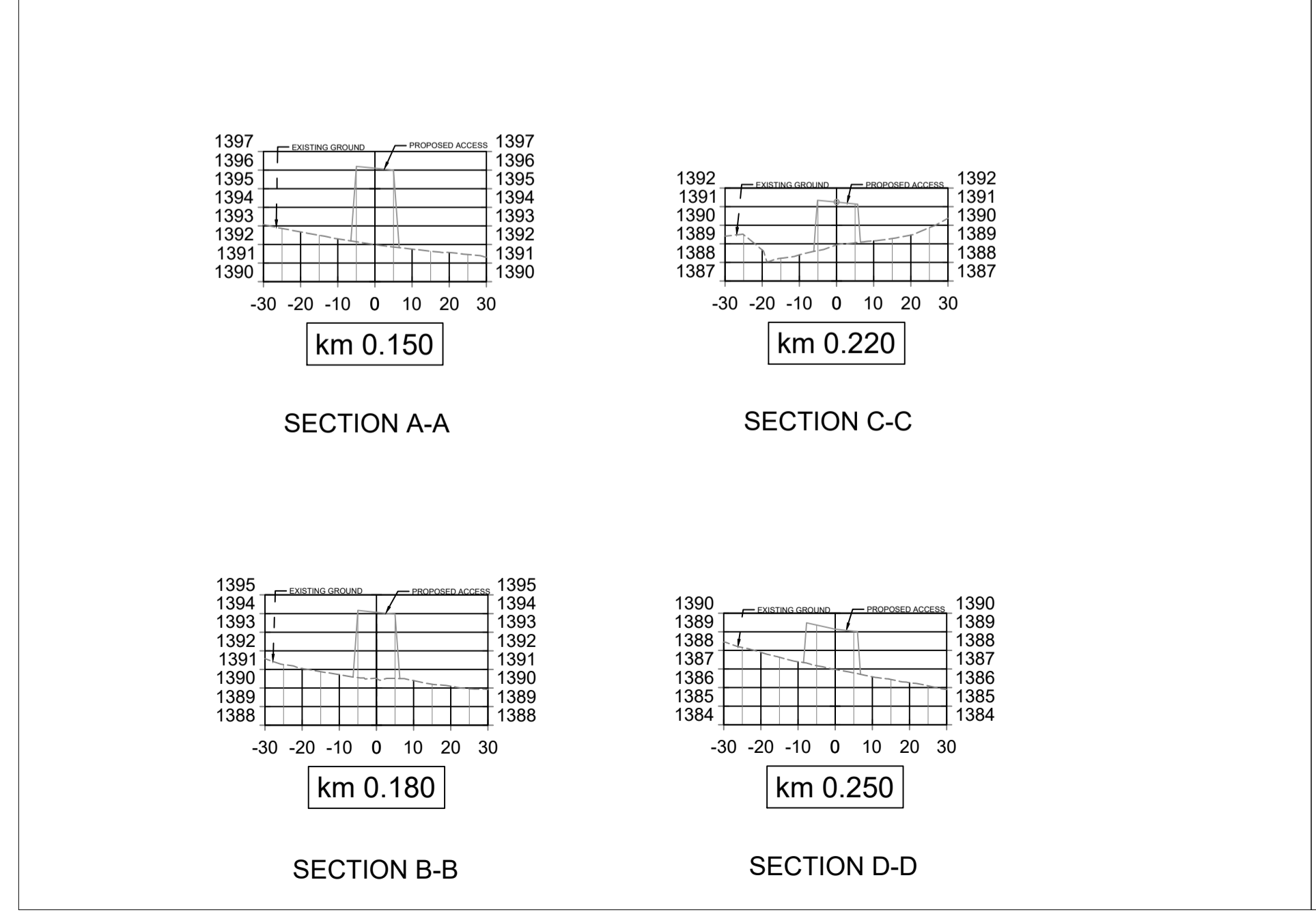
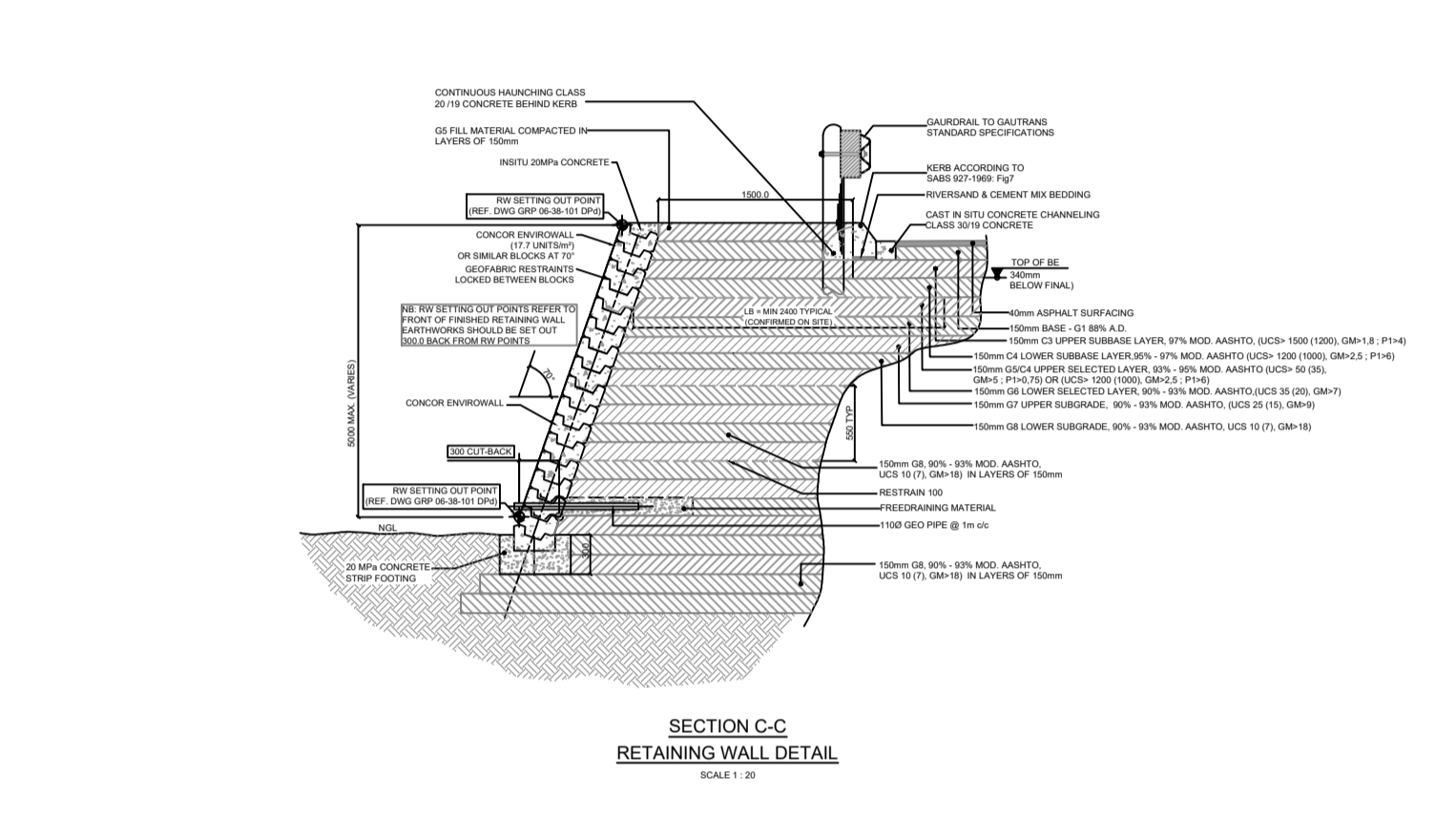
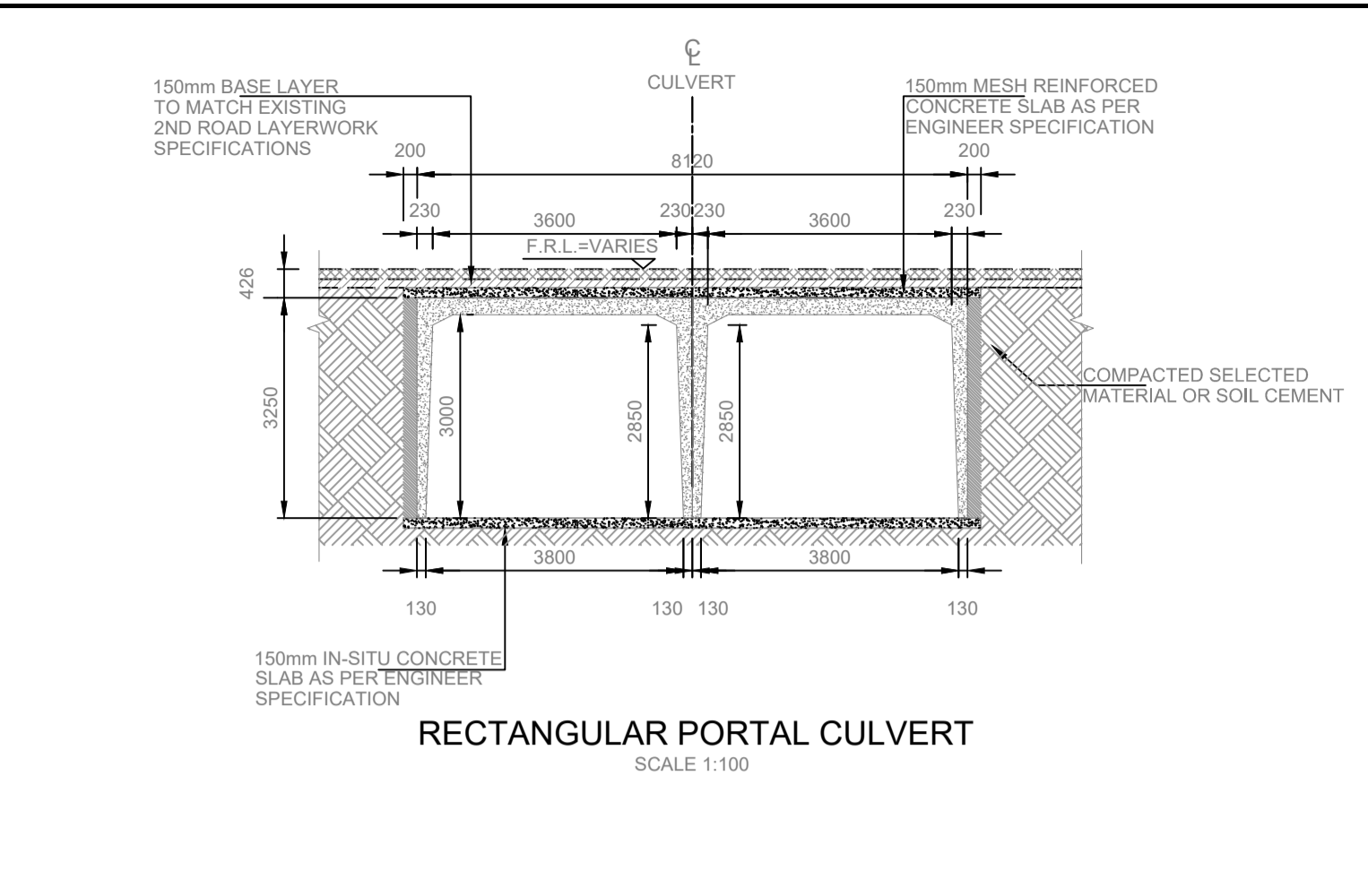
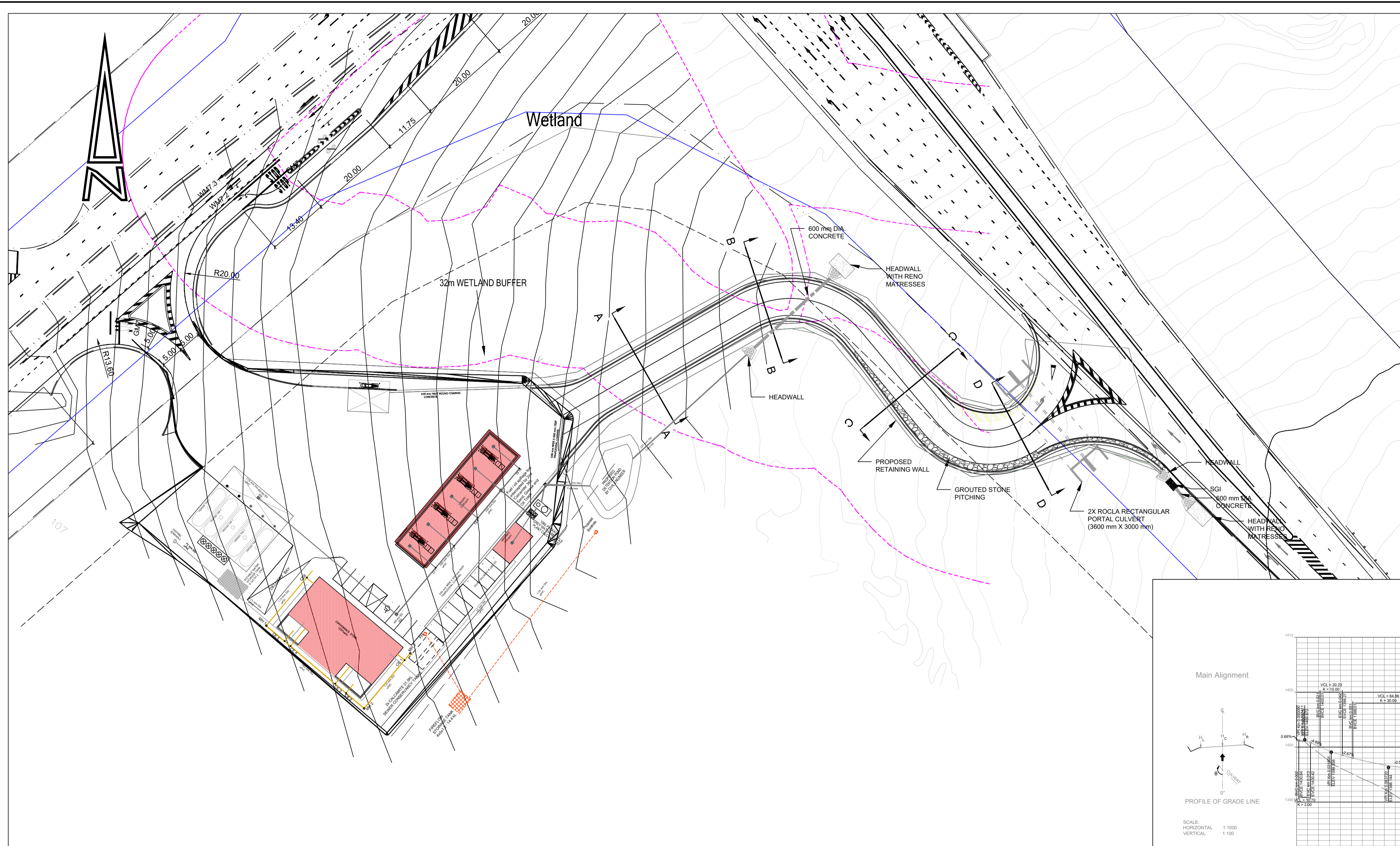
CHRISTOPHER E NAIR, Pr Eng. MEng. BSc. MSAICE
Managing Director



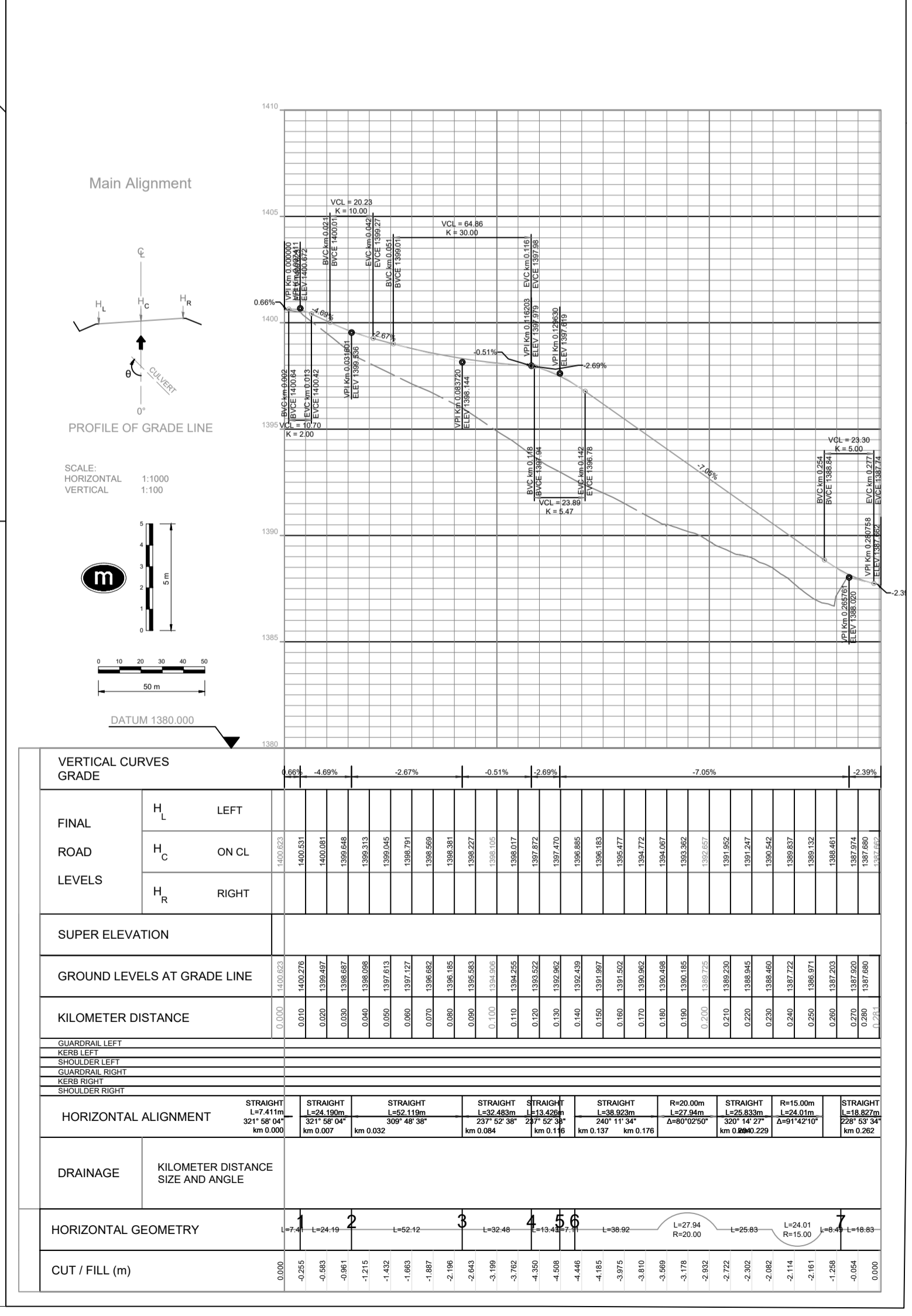
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Drawings

Drawing C157-SWMP-LO-01	PROPOSED LAYOUT 1
Drawing C157-SWMP-LO-02	PROPOSED LAYOUT 2
Drawing C157-SWMP-LO-03	PROPOSED LAYOUT 3
Drawing C157-SWMP-LO-04	PROPOSED LAYOUT 4



- NOTES:**
- MASONRY WALLS OF OUTLET STRUCTURE
 - MASONRY WALLING SHALL CONFORM IN ALL RESPECTS TO THE REQUIREMENTS OF SABS 016 PART 1 - 1992
 - MORTAR SHALL BE CLASS 8 (COMPRESSIVE STRENGTH OF 10 MPa) (20 DAYS)
 - THE REQUIREMENTS SET OUT IN APPENDIX B OF SABS 016 PART 1 SHALL BE ADHERED TO UNLESS OTHERWISE APPROVED OR DIRECTED BY THE ENGINEER
 - ALL BRICKS SHALL COMPLY WITH SABS Z77 AND SHALL BE ENGINEERING UNITS OF CLASS FBS (FACE BRICK STANDARD) WITH A NOMINAL COMPRESSIVE STRENGTH OF 12 MPa.
 - CONCRETE
 - ALL CONCRETE TO BE CURED FOR A MINIMUM PERIOD OF 7 DAYS.
 - PRECAST CONCRETE BLOCKS IN ENERGY DISSIPATING OUTLETS TO BE CHAMFERED ON EXPOSED EDGES.



REV	DATE	BY	DESCRIPTION	CHK	APD
0	2020-07-20	SP	FOR INFORMATION		

DRAWING STATUS: **FOR INFORMATION**

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CLIENT: -

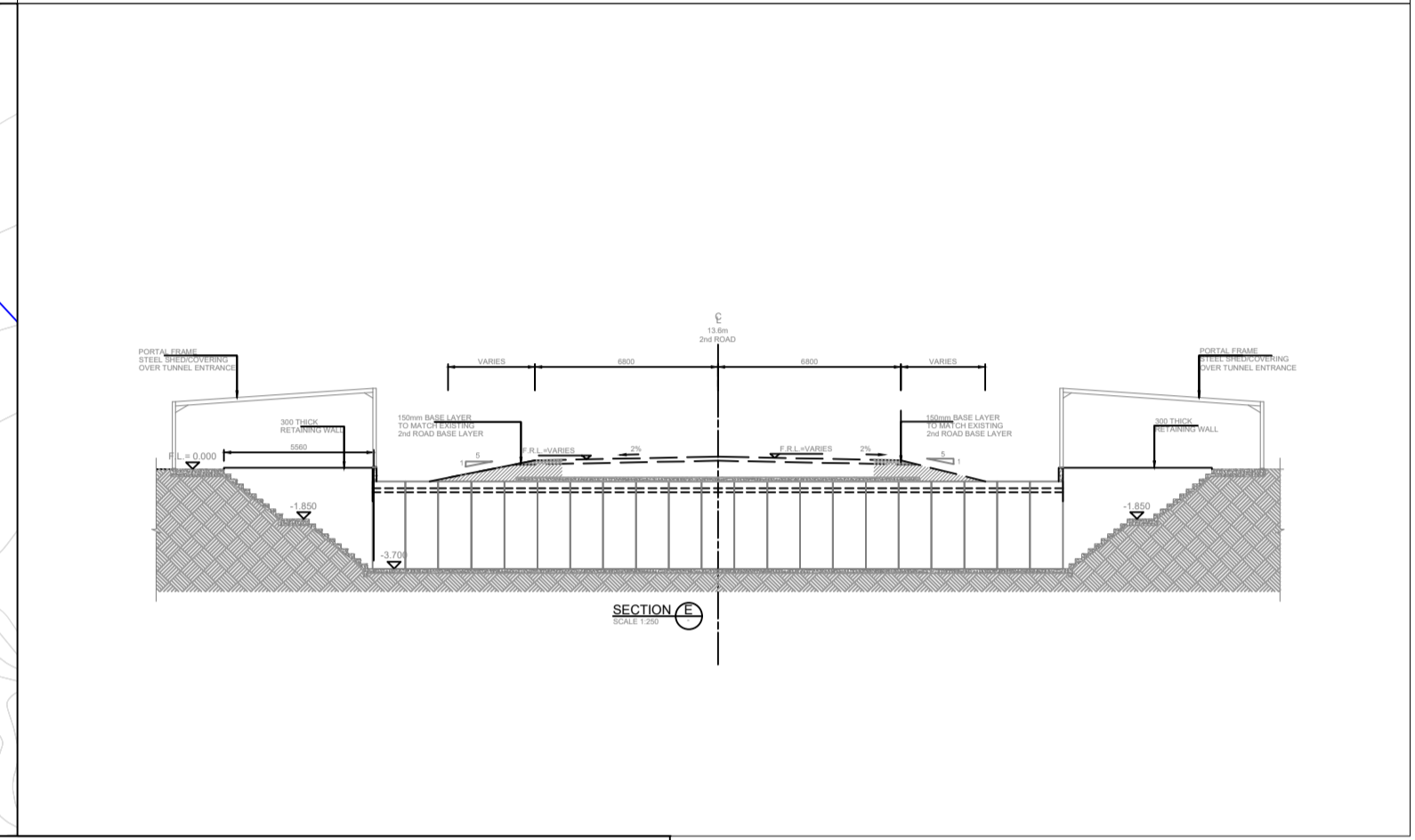
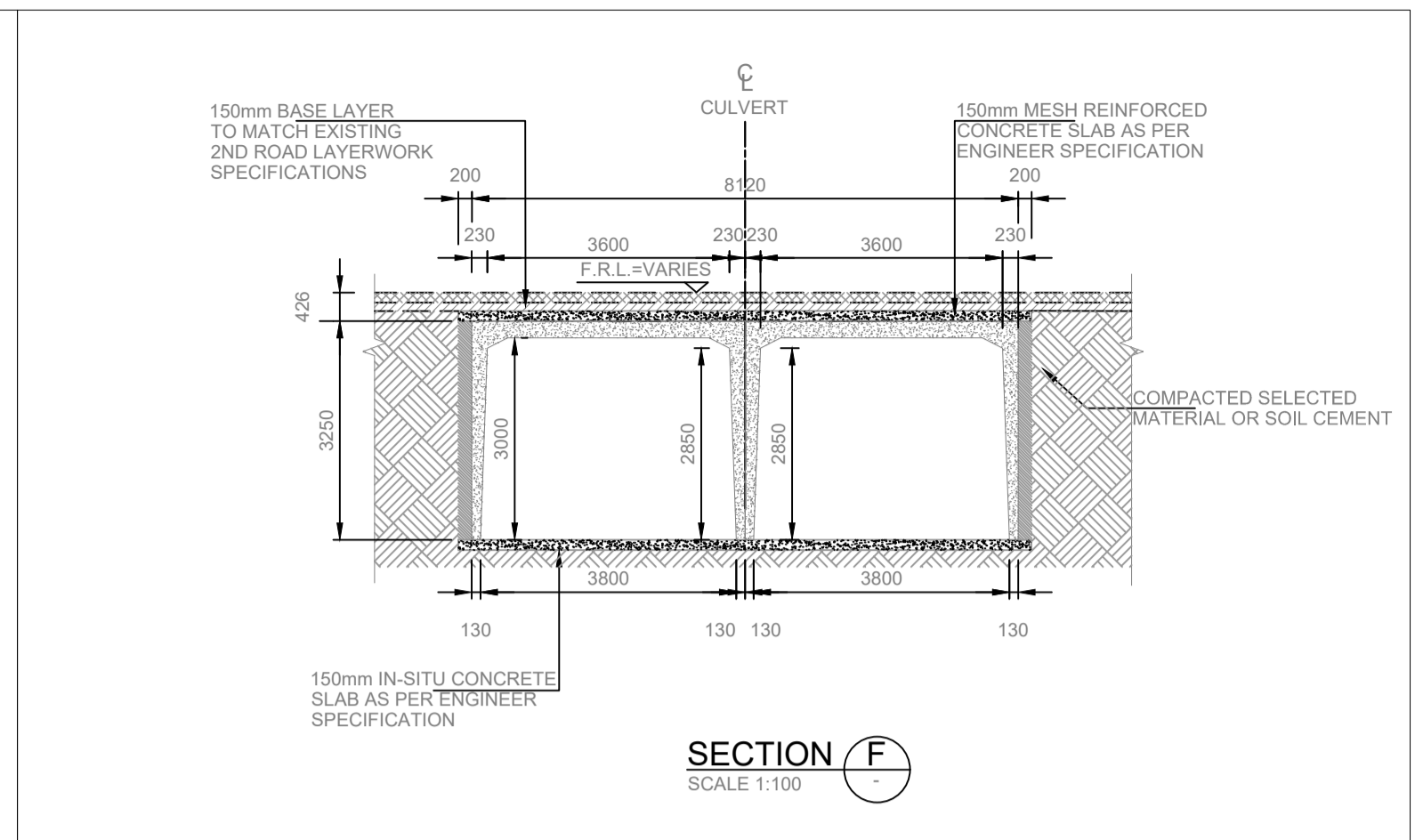
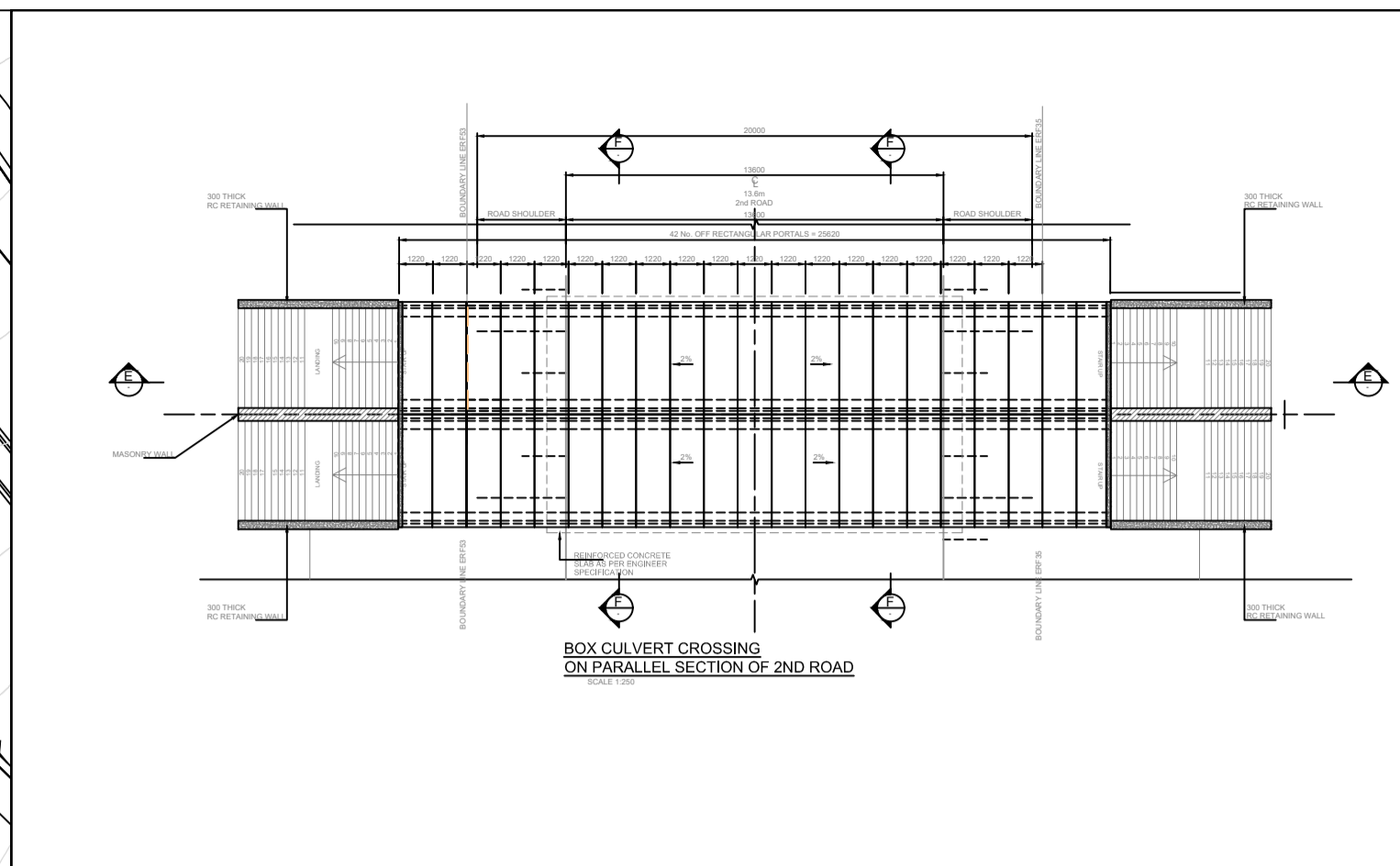
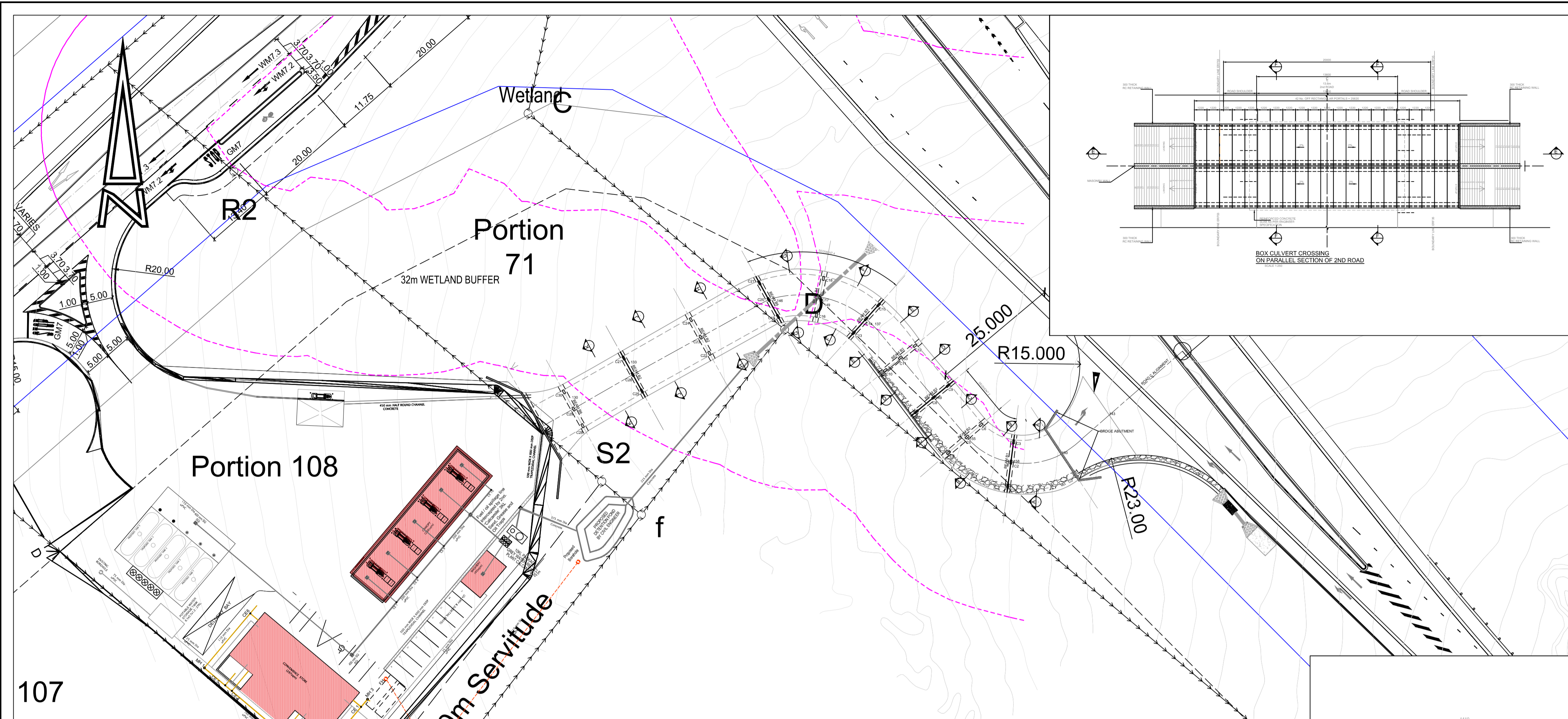
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PROJECT: **PROPOSED FILLING STATION ON PTN 179, NIETGEDACHT**

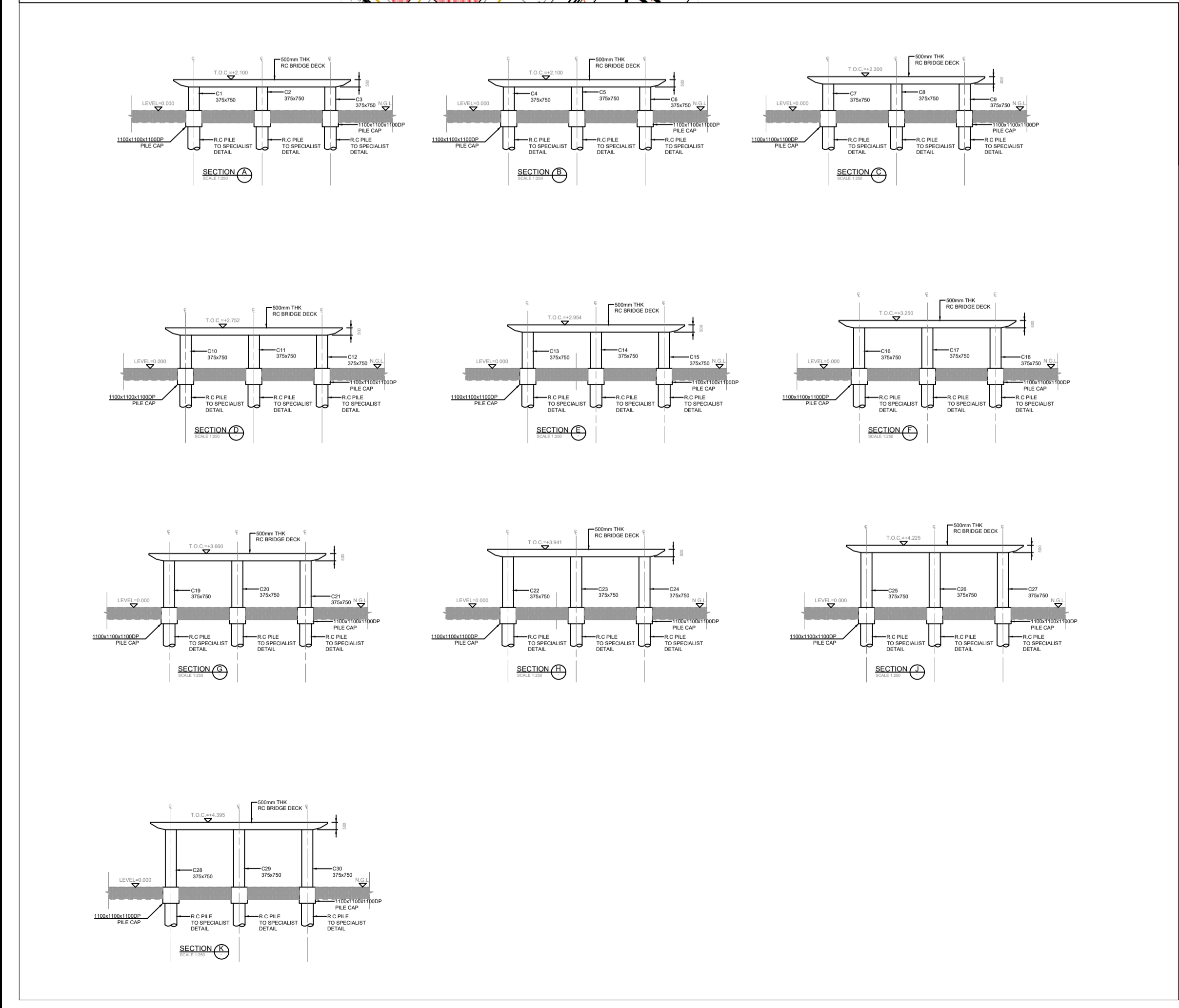
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DESIGN: S.S. PILLAY	DRAWN: S.S. PILLAY	DATE: 2020-07-20
PROJECT No: C157-041017	DRAWING No: C157-SWMP-LO-01	REV: B

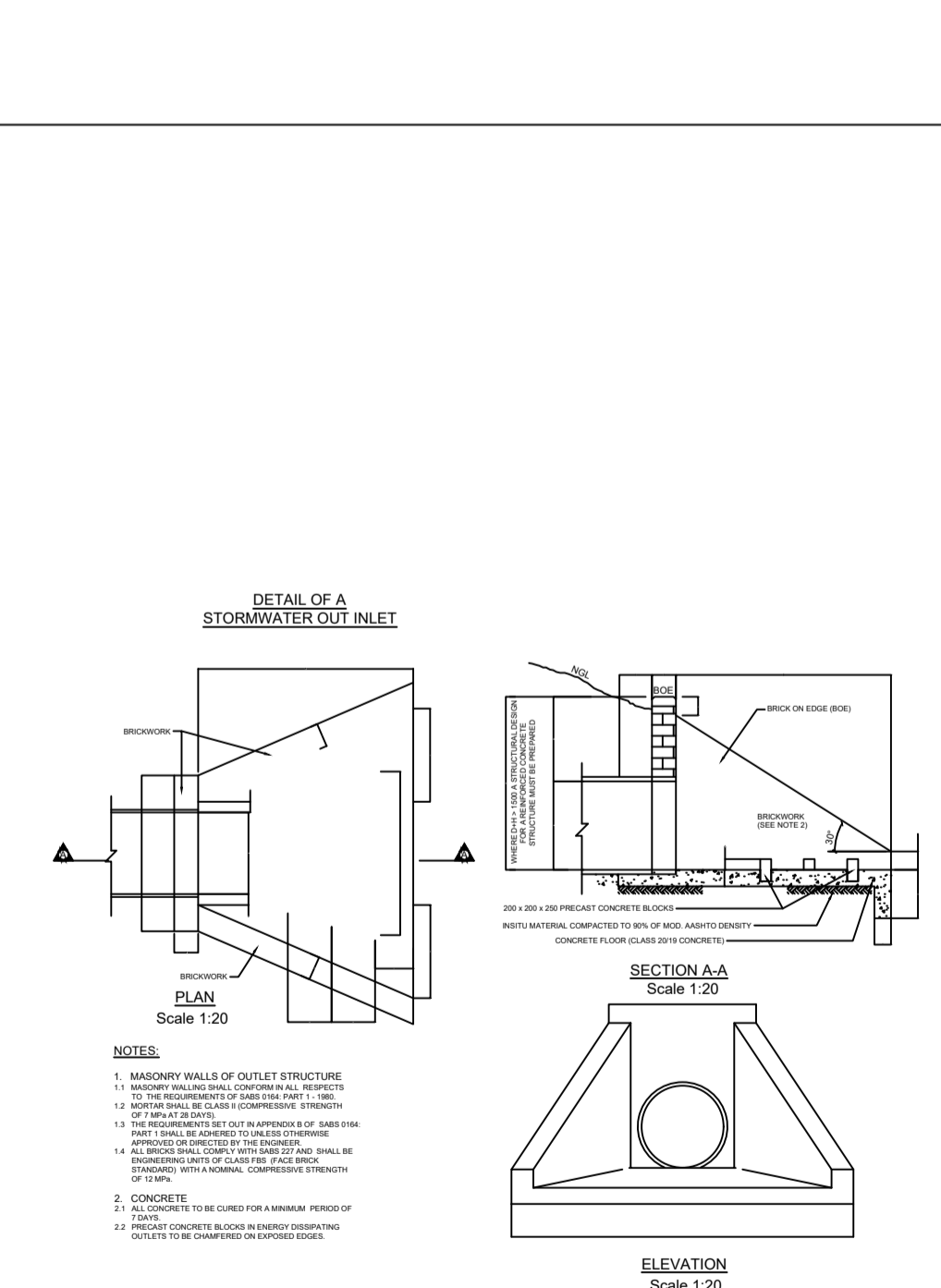
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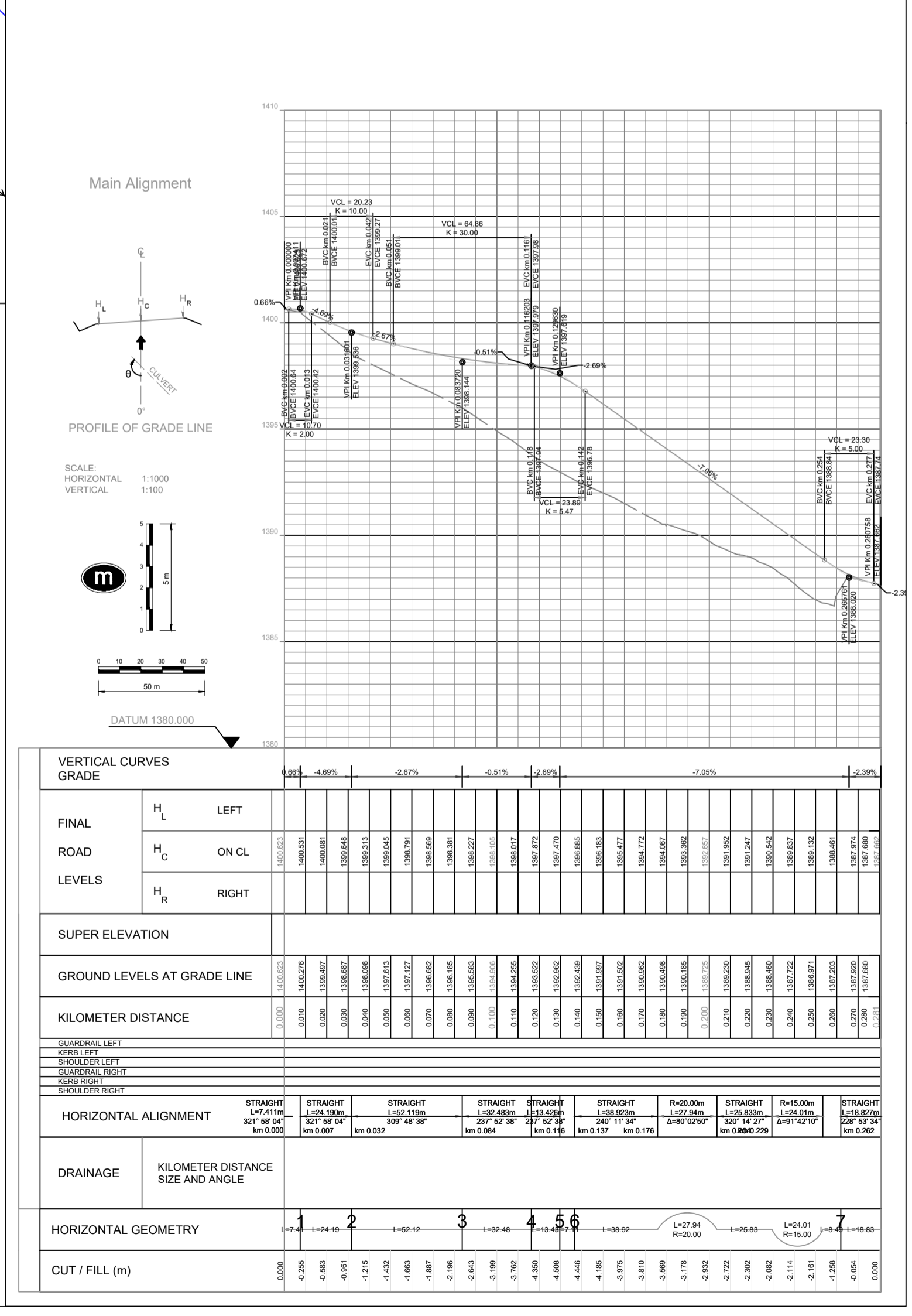
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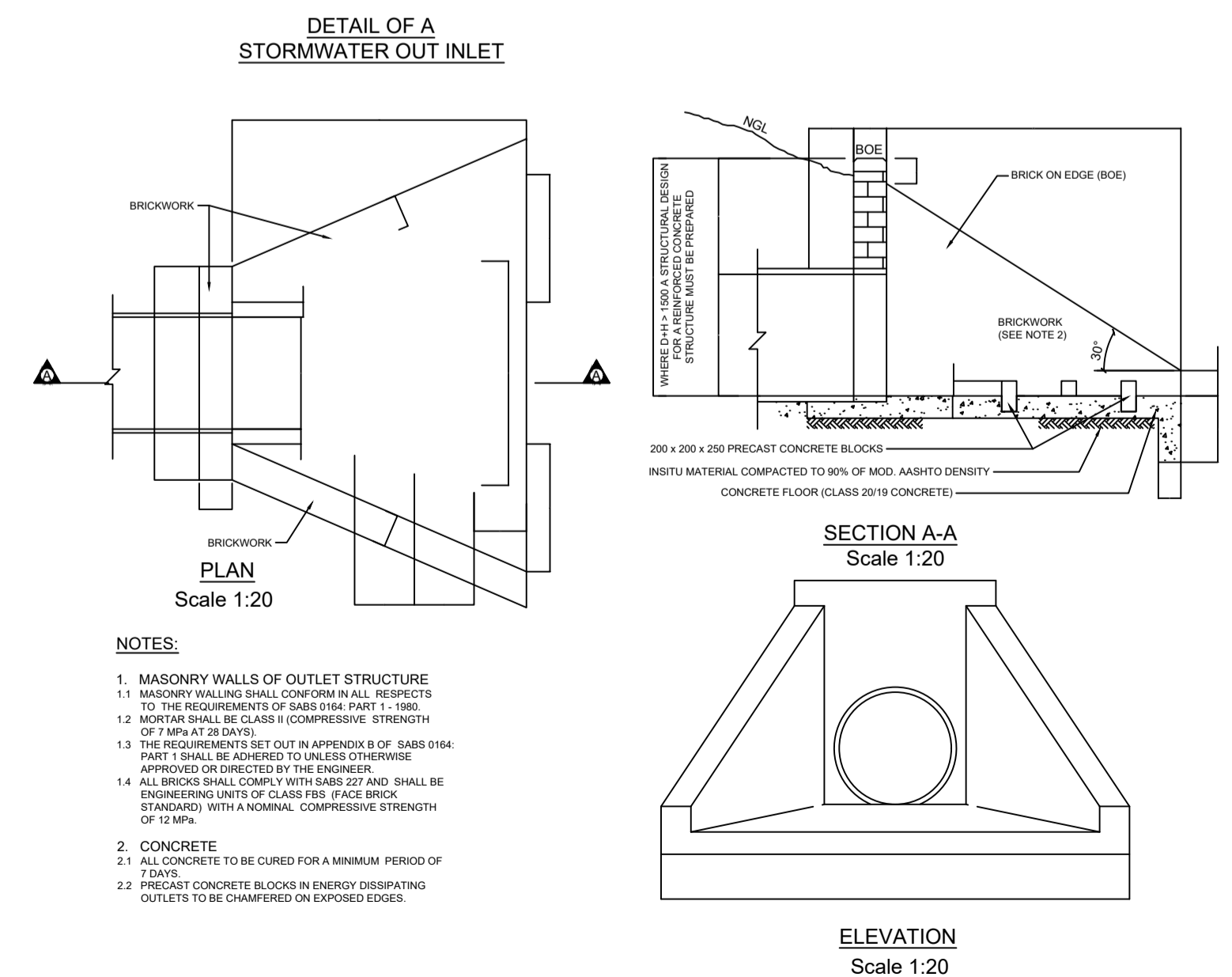
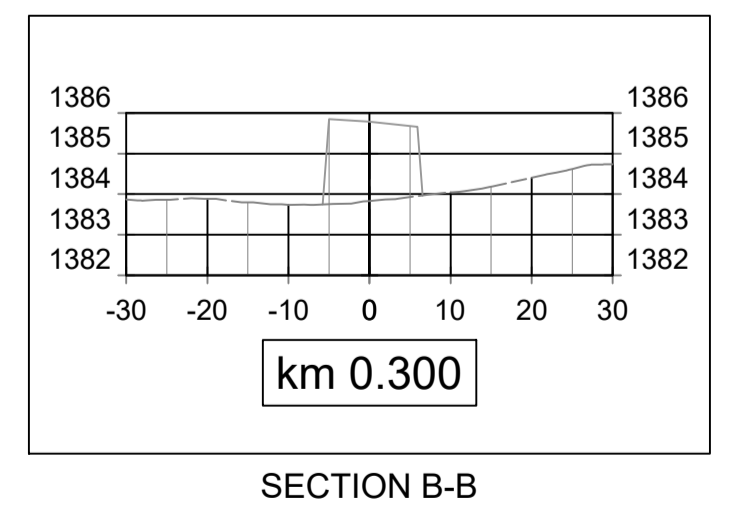
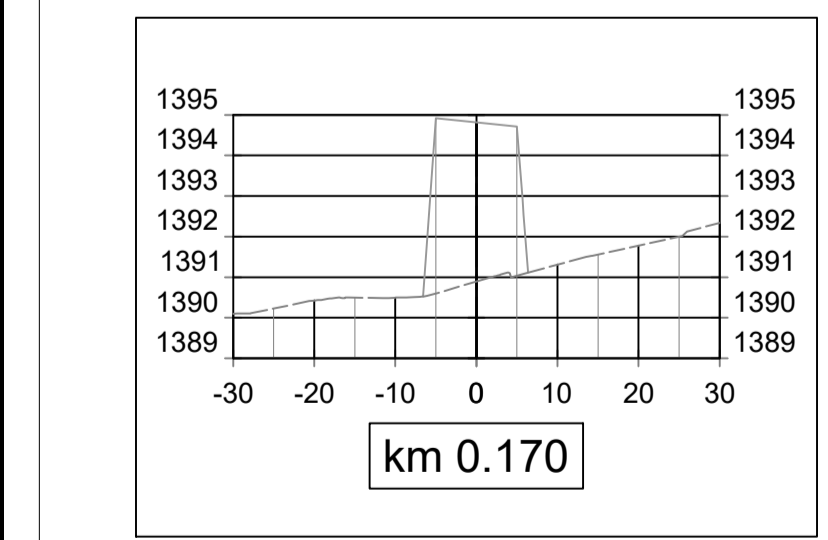
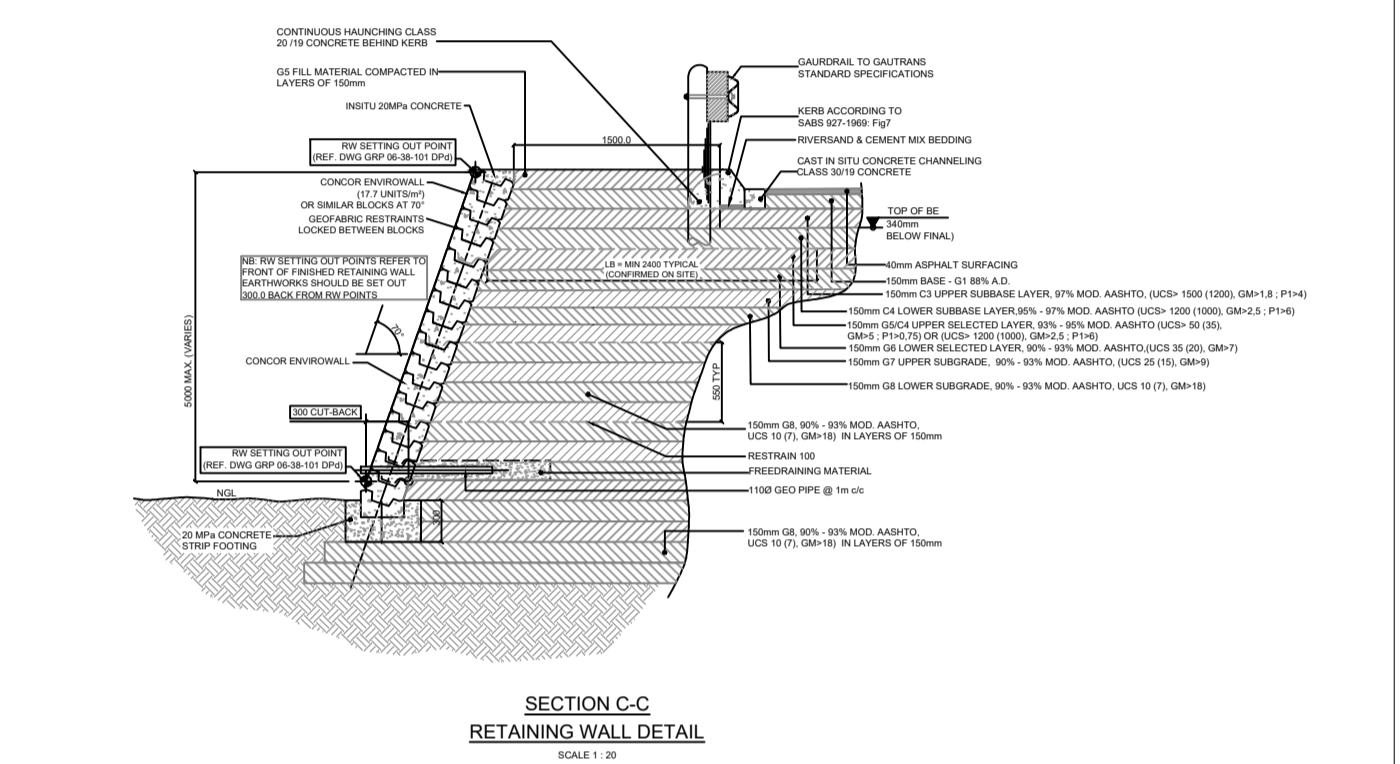
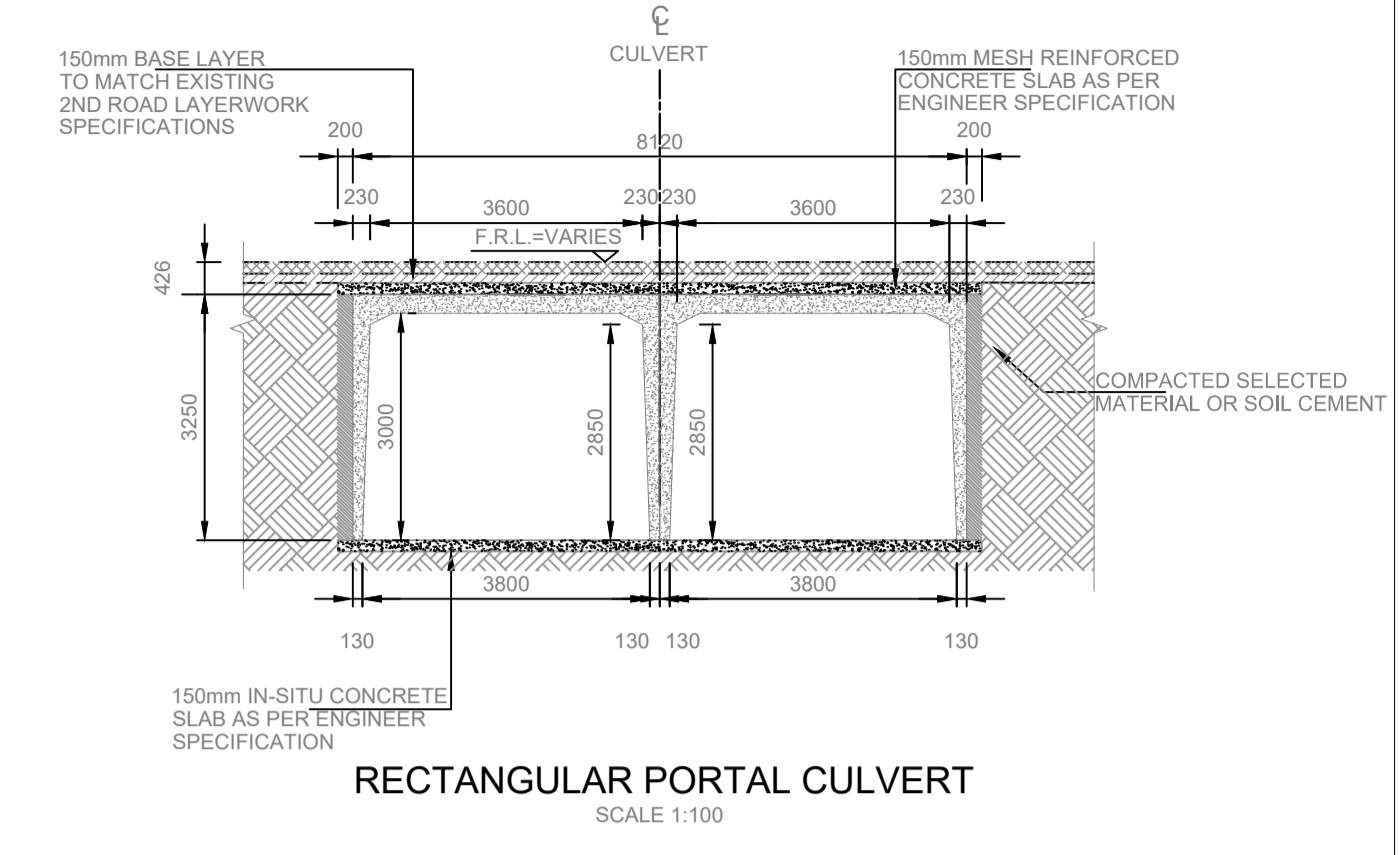
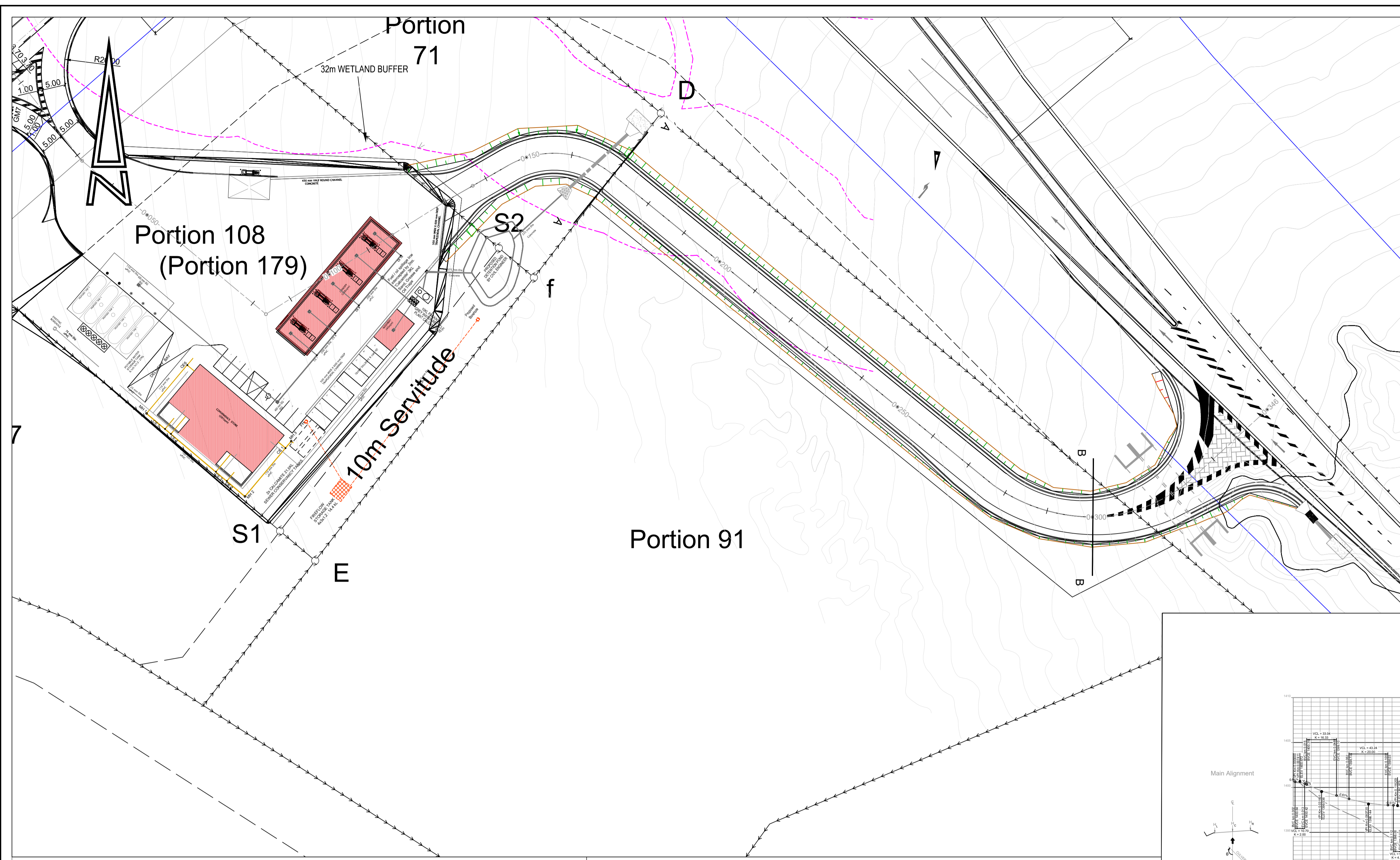
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- NOTES
1. MASONRY WALLS OF OUTLET STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF SANS 1040-1-1 AND SANS 1040-1-2.
 2. CONCRETE TO BE CAST IN PLACE AND FINISHED TO THE FINISH SPECIFIED IN THE DRAWINGS.
 3. ALL CONCRETE SHALL BE CAST AND FINISHED TO THE FINISH SPECIFIED IN THE DRAWINGS.
 4. ALL REINFORCEMENT SHALL BE CAST AND FINISHED TO THE FINISH SPECIFIED IN THE DRAWINGS.
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If drawing status = construction, a signed copy of this drawing (either in hardcopy or electronic format) is available at the office of origin and at the office of issue.					
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CLIENT: -					
ARCHITECT: -					
PROJECT: PROPOSED FILLING STATION ON PTN 179, NIETGEDACHT					
TITLE: PROPOSED LAYOUT 3					
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DESIGN:	S.S. PILLAY	DRAWN:	S.S. PILLAY	DATE:	2020-07-20
PROJECT No:	C157-041017	DRAWING No:	C157-SWMP-LO-03	REV:	B
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- NOTES:**
- MASONRY WALLS OF OUTLET STRUCTURE SHALL CONFORM TO ALL RELEVANT STANDARDS AND SPECIFICATIONS.
 - MORTAR SHALL BE CLASS 8 (COMPRESSIVE STRENGTH OF 12 MPa) AT 28 DAYS.
 - THE REQUIREMENTS SET OUT IN APPENDIX B OF SABS 0164 PART 1 SHALL BE ADHERED TO UNLESS OTHERWISE APPROVED OR DIRECTED BY THE ENGINEER.
 - ALL BRICKS SHALL COMPLY WITH SABS 277 AND SHALL BE ENGINEERING UNITS OF CLASS FB5 (FACE BRICK STANDARD) WITH A NOMINAL COMPRESSIVE STRENGTH OF 12 MPa.
 - CONCRETE
 - ALL CONCRETE TO BE CURED FOR A MINIMUM PERIOD OF 7 DAYS.
 - PRECAST CONCRETE BLOCKS IN ENERGY DISSIPATING OUTLETS TO BE CHAMFERED ON EXPOSED EDGES.

PROFILE OF GRADE LINE

SCALE: HORIZONTAL 1:100, VERTICAL 1:100

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