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17 February 2025

Stage 5 – 3 Belgium Road, Pukekohe

GEOTECHNICAL COMPLETION REPORT

Cabra Pukekohe JV

Job No. AKS2021-0009AU | Version 0

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Version Control

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For and on behalf of CMW Geosciences

Review and Update History

Version	Date	Comments
A	07 February 2025	Initial draft for internal review
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Appendices

1.0 INTRODUCTION

In accordance with our instructions, this Geotechnical Completion Report has been prepared for Cabra Pukekohe JV as part of the documentation to be submitted to Auckland Council following earthworks to form Stage 5 of the 3 Belgium Road development in Pukekohe.

This report covers the construction period from November 2021 through to October 2024 and is intended to be used for certification purposes for new lots (listed below) created from Lot 134, DP 580011 (now Lot 139 DP 594131) as follows:

- 37 new residential lots numbered Lots 91 to 127 inclusive;
- 2 new Superlots numbered Lots 128 and 129;
- 1 new road numbered Lot 131, an extension of the existing Rongoa Maori Way;
- 1 new stormwater reserve numbered Lot 138;
- 3 private accessways numbered Lots 150, 151 and 152.

This stage of the 3 Belgium Road Development is located off the end of the existing Rongoa Maori Way. As can be seen from the as-built plans, 36 of the lots have been affected by filling as part of the earthworks operations, to a maximum depth of approximately 6.5 metres.

Construction of this subdivision has been undertaken in general accordance with:

- Auckland Council's Resource Consent number BUN60326339, Subdivision Consent number SUB60358839 and Engineering Approval letter ENG60408842.
- Auckland Council's Building Consent BCO10360765 for cantilever pole retaining walls numbered 1, 2, 4 to 9, 11 to 13 and 15 to 23.
- NZS4431:2022
- Auckland Council's Code of Practice for Land Development and Subdivision, Chapter 2 - Earthworks and Geotechnical, Version 1.3.
- McKenzie & Co consented drawings set referenced 2398, dated January 2023.
- The reports listed in Table 1.

Table 1: Project Geotechnical Documents

Report Type	Reference and/or Comments
Ground Consulting Limited Preliminary Site Assessment Report for a Proposed Subdivision	Ref. R2242-1A. dated 9 March 2016
CMW Geotechnical Investigation Report for Stage 5, 3 Belgium Road, Pukekohe	Ref. AKS2021-0009AJ Rev 0, dated 23 December 2021
CMW Cantilever Timber Pole / UC Steel & Segmental Block Retaining Wall Design for Stage 5, Pukekohe East Road (Formerly 3 Belgium Road), Pukekohe	Ref. AKS2021-0009AO Rev 2, dated 9 March 2023

For the construction of this stage of the development, the following roles were fulfilled as defined in NZS 4431:2022 and the Ministry for the Environment Contaminated Land Management Guidelines:

- Geotechnical Designer: CMW Geotechnical NZ Limited
- Certifier: CMW Geotechnical NZ Limited
- Recognised Laboratory: CMW Geotechnical NZ Limited
- Contractor (Earthworks and Civil): West City Construction

As CMW has fulfilled the roles of both Geotechnical Designer and earth fills Certifier, this report has been prepared as a combined report covering both of these aspects of the project work.

2.0 DESCRIPTION OF WORKS

Earthworks within Stage 5 of the development commenced in November 2021. These initial works comprised the cleaning out of minor gullies and unsuitable organic materials, particularly within the gully running from Lots 124/125 and extending underneath Rongoa Maori Way through to Lots 103, 99 and 100. A new subsoil drain was installed to tap into the spring encountered along the eastern site boundary during these undercuts (Lots 124/125), discharging within the existing main gully / stream west of Lot 129, with additional short sections of subsoil drain installed where further springs were encountered. A network of additional drains was also installed, running perpendicular to the main drain described above, and discharging to the gully / stream running adjacent to Stage 5's northern boundary.

Bulk earthworks then started from January 2022 with the stripping of the northern and western areas of the site, generally underneath Rongoa Maori Way, Lots 99-103 and Lots 120-129. Undercutting of unsuitable organic materials, and replacement with engineered fill was also undertaken, predominantly within and around the edge of the existing stream area, extending underneath Rongoa Maori Way and Lot 129.

Settlement monitoring plates were then installed within Lots 124/125 and Lot 102, and monitoring commenced in mid-January 2022 as fill earthworks progressed across the lower part of the site.

Earthworks within Stage 5 were paused during the winter and early spring months while Stage 3-4 was being completed. During this time, the northern part of the site which was essentially at design level (Lots 126 to 129) was used as a stockpile areas.

Bulk earthworks started again within Stage 5 from December 2022 with the stripping of the remaining areas up to the culvert leading to Lots 111-114. Unsuitable organic materials were encountered within Lots 96-97 requiring additional undercutting. Additional settlement markers were also installed within Lots 107 and 110, with monitoring continuing until May 2024.

Retaining wall construction commenced in August 2023 and continued progressively until December 2023, when construction was paused while works were being completed within the culvert area, in order to provide access to the remaining part of the site. Works resumed in March 2024 and continued until July 2024.

Earthworks within the culvert area leading to Lots 111-114 commenced in February 2024, comprising deep undercuts of unsuitable organic materials below the JOAL alignment and extending along the edge of the gully below Lot 114. This undercut was replaced with compacted hardfill up to the original ground level, and then clay fill was placed to the finished design surface.

Civil services installation commenced in March 2023 and continued progressively until July 2024.

Preparation of road subgrades commenced in late February 2024 and continued through to mid-July 2024.

The main items of plant used by the contractors included:

- 825 Compactor
- Bulldozers and Scoops
- Tractor and Discs
- 5 to 30 tonne Excavators
- Loaders and 6 Wheel Dump Trucks
- Graders; and
- Water Trucks

3.0 GEOTECHNICAL QUALITY CONTROL

3.1 Site Observations

During the works, site visits were typically undertaken several times each week to assess compliance with NZS 4431 and project specific design recommendations and specifications.

Site visits were carried out to observe and confirm compliance relating to:

- Adequate topsoil stripping;
- Fill areas prior to the placement of fill materials to ascertain that all mullock and soft inorganic subsoils had been removed;
- Installation of subsoil drains and underfill drains but excluding road under-channel drains;
- Backfilling of subsoil drains;
- Excavation and backfilling of sewer and stormwater trenches;
- Subsoil drain connections to outlets;
- Construction of cantilever pole retaining walls including ground conditions, pile size, spacing and depth; and
- Placement and compaction of engineered fills.

4.0 QUALITY ASSURANCE TESTING

Compaction of engineered earth fills was controlled by undrained shear strengths measured by handheld shear vane calibrated using the NZGS 2001 method and by air voids as defined by NZS4402.

The criteria for fill testing are summarised in the table below.

Table 2: Compaction Test Criteria for Cohesive Soil Engineered Filling

Fill Type	Air Voids (1)		Vane Shear Strength (2)		Clegg Impact Hammer	Moisture Content (3)	Dry Density (3)
	Average 10 Consecutive Tests	Maximum Single Value	Average 10 Consecutive Tests	Minimum Single Value	Minimum Single Value	Maximum	Minimum
General Fill	10%	12%	140 kPa	110 kPa	20	40%	1.25 t/m^3
High Strength Fill	8%	10%	150 kPa	120 kPa	25	40%	1.3 t/m^3
Landscape Fill	TBC by Geotechnical Engineer of case-by-case basis						

(1) Air Voids Percentage (as defined in NZS 4402:1986)
(2) Undrained Shear Strength (Measured by handheld shear vane – calibrated using NZGS 2001 method)
(3) Moisture content and minimum dry density non-compliance may be accepted on site by the Geotechnical Engineer on a case-by-case basis depending on the nature of the material and the other criteria results.

Vane shear strength, water content and in situ density tests, and Clegg Impact tests as necessary, were carried out on all areas of the engineered filling to at least the frequency required by the project specification.

While these tests showed on occasions that the contractor was struggling to achieve the required compaction standards with the prevailing site and soil conditions, to the best of our knowledge, all areas of fill were re-worked as necessary. Subsequent testing confirmed compliance with the specification.

5.0 EVALUATION OF COMPLETED EARTHWORKS

5.1 Natural Hazards

The appended as-built drawings depict the extents of a series of zones that contain limitations intended to ensure that future building and/ or earthworks on the lots is undertaken in a manner that does not lead to buildings being subject to any of the natural hazards described in Section 71(3) of the Building Act, i.e. erosion, falling debris, subsidence, slippage, and inundation. Consideration of the inundation hazard was outside the scope of CMW's brief and has been assessed by others. The applied zones include:

- Specific Design Zones (retaining) - intended to protect the retaining walls from overloading at the crest or undermining at the toe that could lead to instability;
- Specific Design Zones (slope) – intended to protect building development from long term creep effects on or adjacent to steep slopes and to protect the slopes from inappropriate loading or undermining.

Full descriptions of the restrictions associated with each of these zones are presented in our Opinion on Suitability in *Appendix A*, with Limitation Zone plans showing the extent of these zones included in *Appendix C*. Additional information is also provided in some of the following sections.

5.2 Liquefaction

The liquefaction risk for the lots on this development has been assessed as follows:

- Review of Auckland Council GIS maps confirms the damage category to be: Very Low Vulnerability;
- In accordance with MBIE/NZGS guidance[1] the liquefaction susceptibility of the soils at this site was assessed with respect to geological age and compositional (soil fabric and density) criteria during initial investigations. Our assessment was described in our Factual and Interpretative Report referenced in Section 1 above and found a very low risk of liquefaction.

5.3 Land Stability and Erosion

The subdivision scheme layout includes a series of terraces for building platforms.

Design of the works to provide appropriate stability conditions that meet regulatory requirements for the land within these stages has led to the construction of cantilever pole retaining walls and a shear key through the northern edge of Lots 111 and 114.

Stability conditions for finished ground profiles have been assessed under a range of groundwater conditions which satisfy ultimate limit state design criteria. The soil parameters for the analyses were selected from extensive investigation undertaken at the site and from experience in this terrain. We consider that the stability results are satisfactory for all building platform areas, and we are therefore satisfied that these areas are not subject to the natural stability hazards described in the Building Act.

On all steep land, including on engineered batter slopes, surface stability can be compromised by indiscriminate disposal of stormwater onto the ground surface and/ or by removal of vegetation. The engineered fill placed to form the batter slopes within Lots 96, 99, 107 to 111, 114, 115 and 123 to 129 inclusive is considered to be stable under normal conditions. However, any development into these areas will require specific design to ensure the ongoing integrity of the swale drain along the crest of this slope.

[1] Earthquake Geotechnical Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards", (November 2021)

Building and landscape designers must ensure that all runoff from solid surfaces is directed into the stormwater system. It is also important that care is paid to the disposal of stormwater during construction so that concentrated discharges (e.g. from unconnected spouting) are not directed towards steep ground.

Depths of mulch and topsoil applied to sloping areas should be limited to less than 150mm to minimise the risks of saturation leading to localised slumping on batter face. Wherever practical on such land, and particularly on steep batters, existing vegetation and grass cover should be well maintained. Any vegetation cleared beyond the immediate area of building platforms for temporary construction purposes should be replanted or replaced as soon as possible. The roots of an established vegetation cover can serve to bind the surface soils while the foliage can reduce rain infiltration and soil saturation, resulting in better resistance to erosion and shallow slumping.

5.4 Retaining Walls

Cantilever pole retaining walls have been constructed in the locations shown on the appended As-built Plans. These walls reach a maximum height of approximately 3.10 metres and were designed by CMW. The construction of these walls was also observed by CMW. A copy of the Producer Statement – Construction Review is provided in *Appendix G*.

Descriptions of the building and earthworks restrictions within the vicinity of these walls (Specific Design Zones – retaining) are contained in our Opinion on Suitability in *Appendix A.*

5.5 Fill Induced Settlement

The majority of the filling on this stage of the development was placed prior to mid-November 2023, with isolated earthworks completed through to March 2024. A series of settlement markers was installed in areas of deeper proposed fill prior to commencement of the filling operations (within Lots 100, 107, 110 and 124) and were periodically monitored for both horizontal and vertical movements. Horizontal changes have been noted to be within the survey accuracy limits, while vertical movements do not show any significant drop in level and appear to be simply depicting seasonal shrink/ swell variations. Results of the monitoring are provided in the summary graph in *Appendix F.*

On the basis of the results, we are satisfied that t_{90} primary consolidation settlement has been achieved here and that fill induced settlement does not pose a hazard to NZS 3604 type building development.

5.6 Service Line Trenches

As part of the civil works, sanitary sewer and stormwater services were trenched throughout the development as shown on the appended Stormwater and Sanitary Sewer As-built Plans.

As is normal on all subdivisions, building developments involving foundations within a 45-degree zone of influence from pipe inverts will require engineering input. The Auckland Council drawing referenced SW22 provided in *Appendix C* extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision depicts their requirements for stormwater pipes. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures.

Lots 92, 93, 94, 100 to 107, 114 and 119 to 129 are known to have service trenches within the lots as shown on the appended stormwater and wastewater as-built plans. The resulting restrictions are presented in our Opinion on Suitability in *Appendix A*.

In addition to the above, an existing section of wastewater line within Lots 97 and 99, between Manholes MH R/1 and MH R/3, was abandoned following installation of the new lines. Prior to installation of the new lines, the overlying trench backfill was excavated and replaced with compacted engineered fill. Following installation

of the new lines, the original section was grout filled. There are no applicable development limitations associated with this abandoned section of line.

5.7 Subsoil Drains and Groundwater

The appended "Stage 5 As-Built Drawings Earthworks Overall Plan" as-built plan (drawings no. 2398-5-AB200 to 203, Rev A) shows the positions of subsoil drains and their outlets that were installed during the earthworks as described in the following sub-sections.

Descriptions of restrictions associated with these drains and outlets are contained in our appended Opinion on Suitability in *Appendix A*.

5.7.1 Underfill Drains

These drains were installed at the bases of fills to assist with the earthworks operations by capturing seepages at the cleared ground level. They require no specific maintenance and while their ongoing function is not critical to stability conditions, they provide ongoing control of groundwater levels and pore water pressure relief so their ongoing function should not be compromised by future works.

Typically, these drains comprise punched draincoils surrounded by drainage gravel. McKenzie & Co As-built drawings 201 and 202 show the drain locations with spot levels on the top of the drain pipe. Based on the as-built contours, it is apparent that the subsoil drains are located at between 3m and 5m below the finished ground surface.

5.7.2 Subsoil Drain Outlets

Retaining wall subsoil drainage typically discharges to a field catchpit that then connects to the reticulated stormwater system, as shown on the McKenzie & Co As-built plans 150 to 153 in *Appendix C*. However, several of the retaining wall drains, and all underfill subsoil drains, discharge to either the adjacent stream, gully or stormwater swale. Where the drainage does not connect into the reticulated system, it is important that the function of these outlets is maintained.

5.8 Road Subgrades

Penetration resistance testing was carried out on the road subgrades during construction and the results of this testing were forwarded to McKenzie & Co Limited for pavement remedial design.

5.9 Reserves

The appended as-built plans depict the formation of a stormwater reserve numbered Lot 138 (directly to the west of Lot 129).

Although cuts and fills to form this reserve have been undertaken in accordance with the earthworks specifications, any future development within the vicinity of this reserve will require specific investigation and design.

In addition, there is a stormwater swale comprised within the western edge of Lots 98 and 106 to 110, southern edge of Lots 110 and 115, and northern edge of Lots 111 and 114, which is delineated on the Limitation Zone Plans in *Appendix C*. No development shall be undertaken within this swale.

5.10 Design of Shallow Foundations

5.10.1 Bearing Capacity

Once bulk earthworks and top-soiling of the building platforms had been completed, our staff drilled hand auger boreholes on platforms in natural ground to determine representative finished ground conditions and hence evaluate likely foundation options for future building development. Our assessments of bearing capacity for the design of shallow foundations on each building platform are contained in our Opinion on Suitability in ***Appendix A.***

If higher geotechnical ultimate bearing capacities are required than have been specified, further specific site investigation and design of foundations should be carried out prior to Building Consent application.

5.10.2 Foundation Settlements

At the bearing pressures specified in ***Appendix A*** and subject to the design requirements for soil expansiveness provided below, differential settlement of shallow foundations for buildings designed in accordance with NZS 3604 (including the 600mm subfloor fill depth limit) should be within code limits.

5.10.3 Soil Expansiveness Classification

Seasonal soil moisture variations within most clay-rich soils typically result in the soil swelling during winter months and then shrinking during summer months. These seasonal movements can cause issues such as cracking of concrete floors, brittle cladding and masonry walls or distortion of building frames causing doors and windows to jam from differential settlement. The effects are further compounded by local influences that worsen differential movements. These may include growth of high demand trees and shrubs that cause localised soil drying or either leaking pipes or tree root removal, leading to localised wetting.

The potential effects need to be managed in a combination of appropriate:

- classification of the level of risk
- design of foundations
- management of soil moisture conditions by contractors during construction
- management of landscaping and plantings by homeowners throughout a building's lifetime

Testing on 14 samples was completed in accordance with the requirements of NZS 3604 and ACCoPs. All testing was completed by RoadTest Limited, a testing laboratory accredited by IANZ for the tests undertaken. Results are provided in ***Appendix E***.

The testing confirms that:

- All of the soils tested were expansive in terms of the NZS 3604 definition and were therefore outside the definition of "good ground".
- The samples tested demonstrated a limited range of expansivity characteristics.

Results of our assessment of the maximum characteristic surface movement (ys) for each lot are contained in our Statement of Opinion on Suitability of Land in ***Appendix A.***

5.10.4 Site (Seismic) Class

Our assessments of NZS 1170.5 site Class(es) is provided in our Opinion of Suitability and the Summary Table, both in ***Appendix A***.

5.11 Topsoil Depths

Topsoil depths have been checked by the drilling of a borehole in the approximate centre of the building platform on each lot. The results are considered indicative for each lot but may be subject to variations. Topsoil depths are between 150 and 300mm on this stage of the development.

Site specific findings are contained in our Opinion on Suitability Summary in ***Appendix A***. However, it is possible that further levelling works have been undertaken since our investigations and accordingly, we strongly recommend that lot purchasers complete their own checks of topsoil depths.

5.12 Site Preparation During Construction

Foundation contractors need to be aware of the extreme damage potentially caused by expansive soils and the imperativeness of maintaining optimum moisture contents in all footing excavations and across building platform subgrades between the time of excavation and the pouring of concrete. Pouring foundations on dry, desiccated ground in summer months can lead to heaving and cracking, requiring extensive repairs or even complete house re-builds. Similarly, where perimeter foundations have been treated but floor slabs have been poured on dry ground, infiltration of moisture via pipe bedding can lead to localised heave, uplift and significant slab damage.

Remedial actions that may be appropriate include combinations of platform protection with a hard fill layer, pouring of a blinding layer of concrete in footing bases and soaking of the building platform with sprinklers for an extended period. However, over-use of sprinklers, ponding of excessive surface water and/ or trafficking of wet soils could also lead to dramatic strength loss and subgrade degradation, so careful management of site surface conditions is always required.

5.13 Site Maintenance and Landscaping

Due to soil expansivity, landowners must be mindful of the potential impacts of planting or removal of high water demand plants. Where their roots may extend close to footings (i.e. within a lateral distance of 1.5 times the mature tree height), these actions can lead to significant settlement or heave damage.

For a comprehensive understanding of the potential effects of expansive soils, maintenance recommendations and vegetation management information, we strongly recommend that land owners obtain a copy of CSIRO publication BTF 18 (Foundation Maintenance and Footing Performance – A Homeowners Guide) that is available online.

6.0 CLOSURE

This report, its appended statement(s) of opinion and suitability and the associated as-built plans must be read and/ or reproduced together in their entirety for a full understanding of the condition of the land.

Additional important information regarding the use of your CMW report is provided in the '*Using your CMW Report*' document attached to this report.

This report has been prepared for use by Cabra Pukekohe JV in relation to the Stage 5 – 3 Belgium Road, Pukekohe project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Although regular site visits have been undertaken for observation, for providing guidance and instruction and for testing purposes, the geotechnical services scope did not include full time site presence. To this end, our Opinion on Suitability in ***Appendix A*** and our Suitability Statement in ***Appendix B*** also rely on the Contractors'

work practices and assumes that, when we have not been present to observe the work, it has been completed to high standards and in accordance with the drawings, instructions and Consent Conditions provided to them.

Similarly, they assume that all as-built information and other details provided to the Client and/ or CMW by other members of the project team are accurate and correct in all respects.

Where a party other than Cabra Pukekohe JV seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental matters are not covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

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APPENDIX A

Statement of Professional Opinion on Suitability of Land for Building Construction

STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development: Stage 5 of the Pukekohe East Road (formerly 3 Belgium Road) Development
Developer: Cabra Pukekohe JV
Location: Rongoa Maori Way (formerly 3 Belgium Road)

I, Andrew Linton, of CMW Geotechnical NZ Limited, Auckland, hereby confirm that:

1. As a Chartered Professional Engineer experienced in the field of geotechnical engineering, I am a Geo-professional as defined in Clause 1.2.2 of NZS 4404:2010 and was retained by the Developer as the geo-professional on the above development.
2. The extent of investigations caried out to date are described in the following reports:
    a. Ground Consulting Limited, Preliminary Site Assessment Report for a Proposed Subdivision, Ref. R2242-1A, dated 9 March 2016; and
    b. CMW Geosciences Stage 5 Geotechnical Investigation Report, Ref. AKS2021-0009AJ Rev. 0, dated 23 December 2021.

The conclusions and recommendations of those documents have been re-evaluated in the preparation of this report. The extent of my inspections during construction, and the results of all tests and/ or evaluations carried out are as described in my Geotechnical Completion Report dated 17 February 2025.

3. My certification of the earth fills placed on this site is contained in ***Appendix B***.
4. In my professional opinion, not to be construed as a guarantee, I consider that:
    a. The completed earthworks take into account land slope and foundation stability considerations on the building platform areas, but as shown on the appended Building Limitation Zones plans (CMW Drawings 500 to 502), areas on Lots 96, 97, 107 to 111, 114, 115 and 123 to 129 inclusive have gradients steeper than 1(v) in 4 (h) or are adjacent to land having such gradients. Accordingly, restrictions incorporating Specific Design Zones (Slope) have been applied as depicted on the as-built plans.

        No building construction and no earthworks (i.e. cut or fills of any depth) should take place within the designated **Specific Design Zone (Slope) areas** unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report. The endorsement will need to consider the implications of the proposals on both global stability conditions and soil creep on the building, the interaction with service pipes and associated trench backfills, control of surface water, construction sequencing, timing and temporary support requirements construction of all earthworks, foundations and retaining walls and if necessary, comment on what aspects require engineering inspections and certification.

        This limitation also applies to long-term landscaping works, including any proposed minor cuts either on or near batter toes to be retained by new landscaping walls that might not normally require engineering, and to landscaping fills on or immediately above the batter slopes.

    b. **No Build / Stormwater Swale Easement Zone** areas defined on Lots 98, 106 to 111, 114 and 115 inclusive on the as-built plans are designated no-build zones because of the presence of a stormwater swale.

        No building construction and no earthworks may take place in these areas.

    c. **Specific Design Zone (Retaining) areas** have been applied on Lots 91 to 94, 98 to 108 and 110 to 123, inclusive, for the protection of the function of the retaining walls as depicted on the as-built plans. The retaining walls on this stage of the development were designed for a range of design actions, including a maximum 25kPa surcharge load, 15° surcharge slope and 5° toe slope.

No building construction and no earthworks (i.e. cut or fills) should take place within these Specific Design Zones that exceed these design limits on the walls unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report who consider the stability implications of the earthworks and/ or building proposals on the retaining walls. A copy of the wall design cases and design details is included in ***Appendix C***.

d. The function of the subsoil drains installed beneath Lots 99 to 103, 124 to 129 and 138 inclusive as shown on the as-built plans must not be impaired by any building development or landscaping works. Any bored or driven piles must be positioned to avoid damaging the draincoils. Given the depth to the subsoil drainage network, it is considered unlikely that the subsoil drains will be encountered where shallow strip footing or rib-raft slab designs are undertaken. However, should any subsoil drain be intercepted by building works, it must be reinstated under the direction of a Chartered Professional Engineer to ensure the integrity of the subsoil drainage system.

e. The formed drainage outlets depicted on the as-built plans adjacent to Lots 127 to 129 inclusive, and within Lot 138, must be kept free of debris and otherwise maintained as necessary to ensure their ongoing function.

f. A geotechnical ultimate bearing capacity of 300kPa may be assumed for shallow foundation design on the building platforms of all of Lots 91 to 129 inclusive.

g. The site (seismic) subsoil class for each lot has been assessed in accordance with NZS1170.5:2004 Clause 3.1.3 from borelogs that included measurements of geotechnical properties. Our assessment is that all lots are Class C- shallow soil.

h.

Table 3: Assessment of Characteristic Surface Movements and Design Classes for NZS 3604 Compliant Buildings

Lots	Assessed AS2870 Site Class / 300 Year Design Characteristic Surface Movement (Ys)	Anticipated Equivalent NZBC B1/AS1 Expansivity Class for Design / 500 Year Design Characteristic Surface Movement(Ys)
100 – 103, 108 – 110, 122, 129	H1 (highly reactive) / 60mm	H / 78mm
91 – 99, 104 – 107, 111 – 121, 123 – 128	H2 (highly reactive) / 75mm	H / 78mm

B1/AS1 provides an Acceptable Solution through NZS 3604 for foundation design applying to a limited range of compliant building sizes, shapes and materials and only for concrete floor design with strip footings. In all other cases, NZS 3604 directs the use of AS2870 or a specific design.

If AS2870 is used for the design solution, it must be noted that the characteristic surface movements in that code apply to a (less conservative) 300 year return period drought while B1/AS1 provides for a 500 year return period drought.

Prior to the introduction of the B1/AS1 design information in November 2019, minimum foundation depths recommended as appropriate by geotechnical consultants in Auckland for shallow footing design underAS2870 were typically of the order of 750mm for Class H1 and 900mm for Class H2.

i. No building development should take place within the 45 degree zone of influence of stormwater or sewer line or manhole inverts unless endorsed by specific design and by construction inspections undertaken by a Chartered Professional Engineer experienced in geomechanics to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of pipes and trench backfills. A copy of drawing SW22 extracted from Chapter 4

of the Auckland Council Code of Practice for Land development and Subdivision this document is provided in ***Appendix C*** for clarification. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures.

j. On the basis of the earth fill certification and subject to the geotechnical limitations, restrictions and recommendations contained in clauses 4(a), 4(b), 4(c), 4(d), 4(e), 4(f), 4(g), 4(h) and 4(i) above:

- The filled and natural ground is generally suitable for buildings constructed in accordance with NZS 3604 and the requirements of either NZBC Clause B1/AS1 where appropriate, or AS2870 for the expansive soil class associated with the characteristic surface movement.
- Where shallow foundations are appropriate, design may be carried out in accordance with AS 2870 (Class H1 or HA2) or alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer.
- Specific site investigations, design modifications and construction inspections should be carried out as necessary by a Chartered Professional Engineer, experienced in geomechanics, for all buildings exceeding these limitations, but in any event, we consider it prudent for all land owners to engage a Chartered Professional Engineer to undertake site specific investigation and foundation design with a view to optimising bearing capacities, design loads, earthworks and retaining walls.

5. Road subgrades have been formed with appropriate regard for slope stability and settlement risks.
6. Stormwater swales and reserve areas have been formed with appropriate regard for slope stability and seepage risks.

The following table summarises the conditions on each of the lots.

For and on behalf of CMW Geosciences

Andrew Linton

Principal Geotechnical Engineer CMEngNZ, CPEng

Table 4: GCR Summary Table

Condition	Specific Design Zone (slope)	Stormwater Easement / No Build Zone	Specific Design Zone (retaining)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	NZS 1170.5 Site (seismic) Class	AS2870 Expansive Class	Service Lines Restrictions	Indicative Topsoil Depth (mm)
GCR SOPO Clause	4(a)	4(b)	4(c)	4(d)	4(f)	4(g)	4(h)	4(i)	
Lot number									
91			✓		300	C	H2		200
92			✓		300	C	H2	✓	200
93			✓		300	C	H2	✓	250
94			✓		300	C	H2	✓	250
95					300	C	H2		200
96	✓				300	C	H2	✓	200
97	✓				300	C	H2		150
98		✓	✓		300	C	H2	✓	200
99			✓	✓	300	C	H2		200
100			✓	✓	300	C	H1	✓	250
101			✓	✓	300	C	H1	✓	200
102			✓	✓	300	C	H1	✓	200
103			✓	✓	300	C	H1	✓	250
104			✓		300	C	H2	✓	200
105		✓	✓		300	C	H2	✓	200
106		✓	✓		300	C	H2	✓	200
107	✓	✓	✓		300	C	H2	✓	250
108	✓	✓	✓		300	C	H1		200
109	✓	✓			300	C	H1		100
110	✓	✓	✓		300	C	H1		200
111	✓	✓	✓		300	C	H2		200
112			✓		300	C	H2		200
113			✓		300	C	H2		200
114	✓	✓	✓		300	C	H2		200
115	✓	✓	✓		300	C	H2		200
116			✓		300	C	H2		200
117			✓		300	C	H2		200

Condition	Specific Design Zone (slope)	Stormwater Easement / No Build Zone	Specific Design Zone (retaining)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	NZS 1170.5 Site (seismic) Class	AS2870 Expansive Class	Service Lines Restrictions	Indicative Topsoil Depth (mm)
GCR SOPO Clause	4(a)	4(b)	4(c)	4(d)	4(f)	4(g)	4(h)	4(i)	
118			✓		300	C	H2		200
119			✓		300	C	H2	✓	150
120			✓		300	C	H2	✓	200
121			✓		300	C	H2	✓	150
122			✓		300	C	H1	✓	300
123	✓		✓		300	C	H2	✓	250
124	✓			✓	300	C	H2	✓	300
125	✓			✓	300	C	H2	✓	200
126	✓			✓	300	C	H2	✓	200
127	✓			✓	300	C	H2	✓	200
128	✓			✓	300	C	H2	✓	250
129	✓			✓	300	C	H1	✓	250

CMW Geosciences
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APPENDIX B

Statement of Suitability of Engineered Fill for Lightweight Structures

STATEMENT OF SUITABILITY OF ENGINEERED FILLS FOR LIGHTWEIGHT STRUCTURES

To:	Auckland Council
Development:	Stage 5 of the Pukekohe East Road (formerly 3 Belgium Road) Development
Land Title(s):	Lot 134 DP58011 (now Lot 139 DP 594131)
Location:	Pukekohe East Road – Formerly 3 Belgium Road
Resource Consent Nos:	BUN60326339, LUC60326362, EPA 60408842
Developer:	Cabra Pukekohe JV
Geotechnical Designer:	Andrew Linton of CMW Geotechnical NZ Limited
Certifier:	Andrew Linton of CMW Geotechnical NZ Limited

This Statement of Suitability is provided as an appendix to the CMW Geosciences Geotechnical Completion Report referenced in the page footer below, that also contains all as-built plans and test results relevant to the work completed.

1. I, Andrew Linton, confirm that I am qualified as a certifier as defined in NZS4431:2022.
2. During this work, I was retained as certifier and I or my certifier's representative undertook inspections and testing as documented in the Geotechnical Completion Report.
3. I am satisfied that the engineered fill shown in the attached as-built survey was placed, compacted and tested in accordance with the earthworks specification and that all variations and non-compliances have been documented in the Geotechnical Completion report.
4. Based on the information available, I certify that, to the best of my knowledge, the intent of the geotechnical designer (as presented in the design, drawings and Geotechnical Investigation Report) has been achieved.
5. The fill areas shown on the McKenzie & Co as-built cut and fill plan(s) attached are considered suitable for development as per NZS 3604 subject to any other restrictions described in the Geotechnical Completion Report.
6. This certification does not remove the necessity for normal inspection and design of foundations as would be made in natural ground.

For and on behalf of CMW Geosciences

Andrew Linton

Principal Geotechnical Engineer CMEngNZ, CPEng

CMW Geosciences
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APPENDIX C
As-Built Drawings

Title	Reference No.	Date	Revision
McKenzie & Co Plans			
Retaining Walls Overall Plan	2398-5-AB150	20/01/2025	A
Retaining Walls Sheet 1 to Sheet 3	2398-5-AB151 to 153	20/01/2025	A
Earthworks Overall Plan	2398-5-AB200	29/01/2025	A
Earthworks Sheet 1 to Sheet 3	2398-5-AB201 to 203	29/01/2025	A
Earthworks Overall Plan	2398-5-AB210	29/01/2025	A
Earthworks Plans Sheet 1 to Sheet 3	2398-5-AB211 to 213	29/01/2025	A
Stormwater Overall Plan	2398-5-AB400	29/01/2025	A
Stormwater Plan Sheet 1 to Sheet 3	2398-5-AB401 to 403	29/01/2025	A
Stormwater Data	2398-5-AB410	29/01/2025	A
Wastewater Overall Plan	2398-5-AB500	09/12/2024	A
Wastewater Plan Sheet 1 to Sheet 3	2398-5-AB501 to 503	09/12/2024	A
Wastewater Data	2398-5-AB510	29/01/2025	A
CMW Plans			
Limitation Zone Plan	CMW - 500 to 501	12-02-2025	0
Auckland Council			
Stormwater Pipe and Manhole Construction Clearance Requirements	SW22	1/11/2015	2
CMW – Retaining Wall Design Plans			
Design Statement	01	18/11/22	0
Retaining Wall Location Plan	03	08/03/2023	1
Retaining Wall Design (Case 1 to 7)	04	18/12/2022	0
Summary Tables	05 - 06	18/12/2022	0
Timber / UC Pole Retaining Wall Design	07	18/12/2022	0
Retaining Wall Design (Case 8)	08	17/12/2022	0
UC Pole Bridging Details	09	18/12/2022	0

NOTES:

1. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
2. WALL SUBSOIL DRAINAGE OUTLET LOCATION INFORMATION HAS BEEN COLLECTED AND SUPPLIED BY WESTCITY CONSTRUCTION LTD

LEGEND:

- STAGE BOUNDARY
- FINAL CONTOURS – MAJOR 1.0m INTERVALS (51.0)
- FINAL CONTOURS – MINOR 0.5m INTERVALS
- SUBSOIL DRAINS
- RETAINING WALLS
- DIMENSION FROM BOUNDARY (0.6m)
- WALL SUBSOIL DRAINAGE OUTLET LOCATION

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The Coordinate (X, Y) are in terms of NZTM on NZGD (2000), and are within ±50mm.
- The level (Z) are in terms of the NZVD 2016 (MSL) LINZ datum (DOSLI datum), and are within the following tolerances:

  - For all pipe inverts & roadside channels to be within ±10mm (local circuit i.e. internal/relative consistency required only)
  - For all other assets ±20mm (e.g. Manhole covers, Earthworks)

Name: Peter Cottle

Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date: 20/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	20/01/25

CLIENT: CABRA PUKEKOHE JV

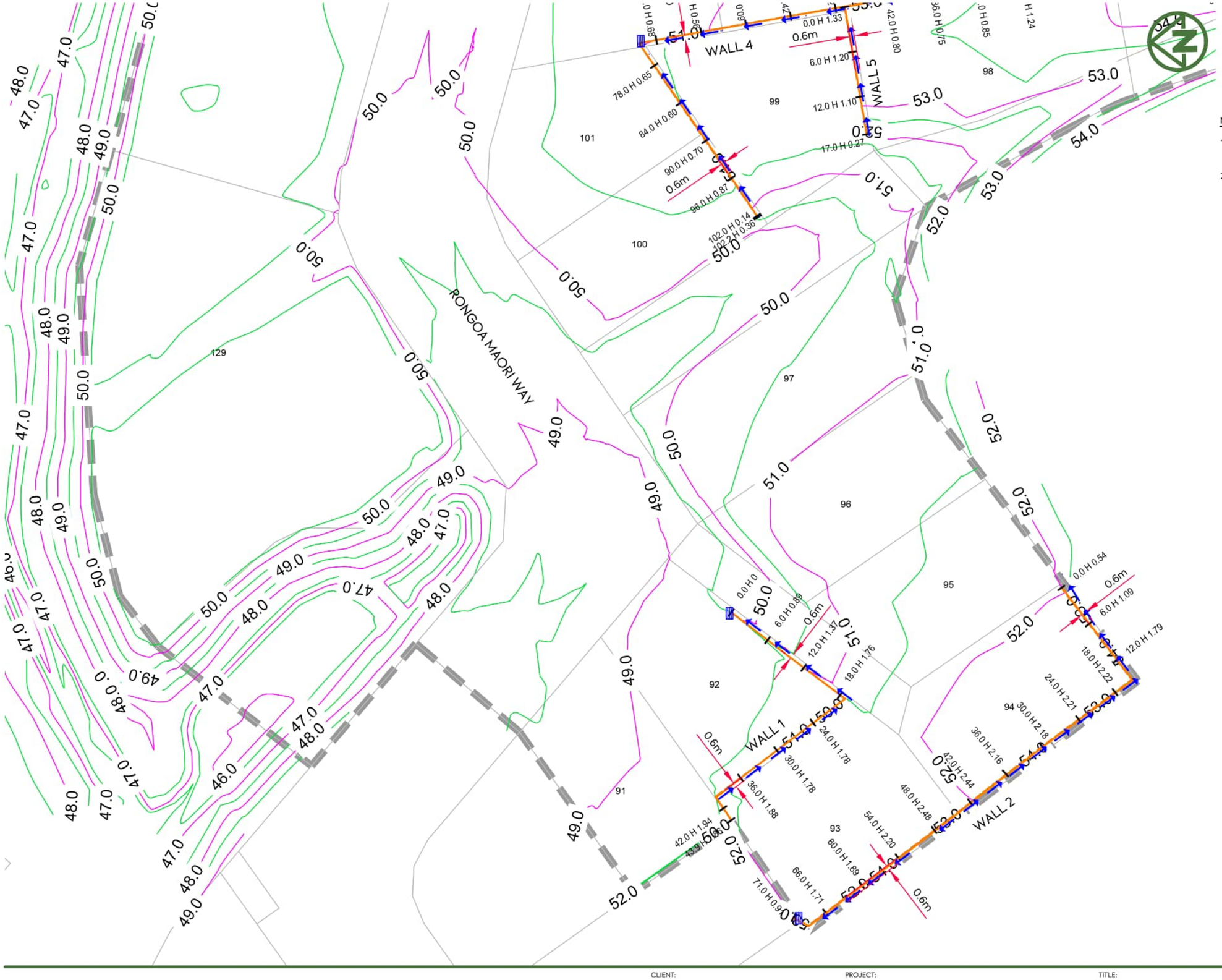
PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS RETAINING WALLS OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1 DO NOT SCALE

DRAWING NO: 2398-5-AB150 REV: A



NOTES:

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2. WALL SUBSOIL DRAINAGE OUTLET LOCATION INFORMATION HAS BEEN COLLECTED AND SUPPLIED BY WESTCITY CONSTRUCTION LTD

LEGEND:

- STAGE BOUNDARY
- FINAL CONTOURS – MAJOR 1.0m INTERVALS (51.0)
- FINAL CONTOURS – MINOR 0.5m INTERVALS
- SUBSOIL DRAINS
- RETAINING WALLS
- DIMENSION FROM BOUNDARY (0.6m)
- WALL SUBSOIL DRAINAGE OUTLET LOCATION

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date: 20/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS RETAINING WALLS SHEET 1

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

DRAWING NO: 2398-5-AB151 REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	20/01/25

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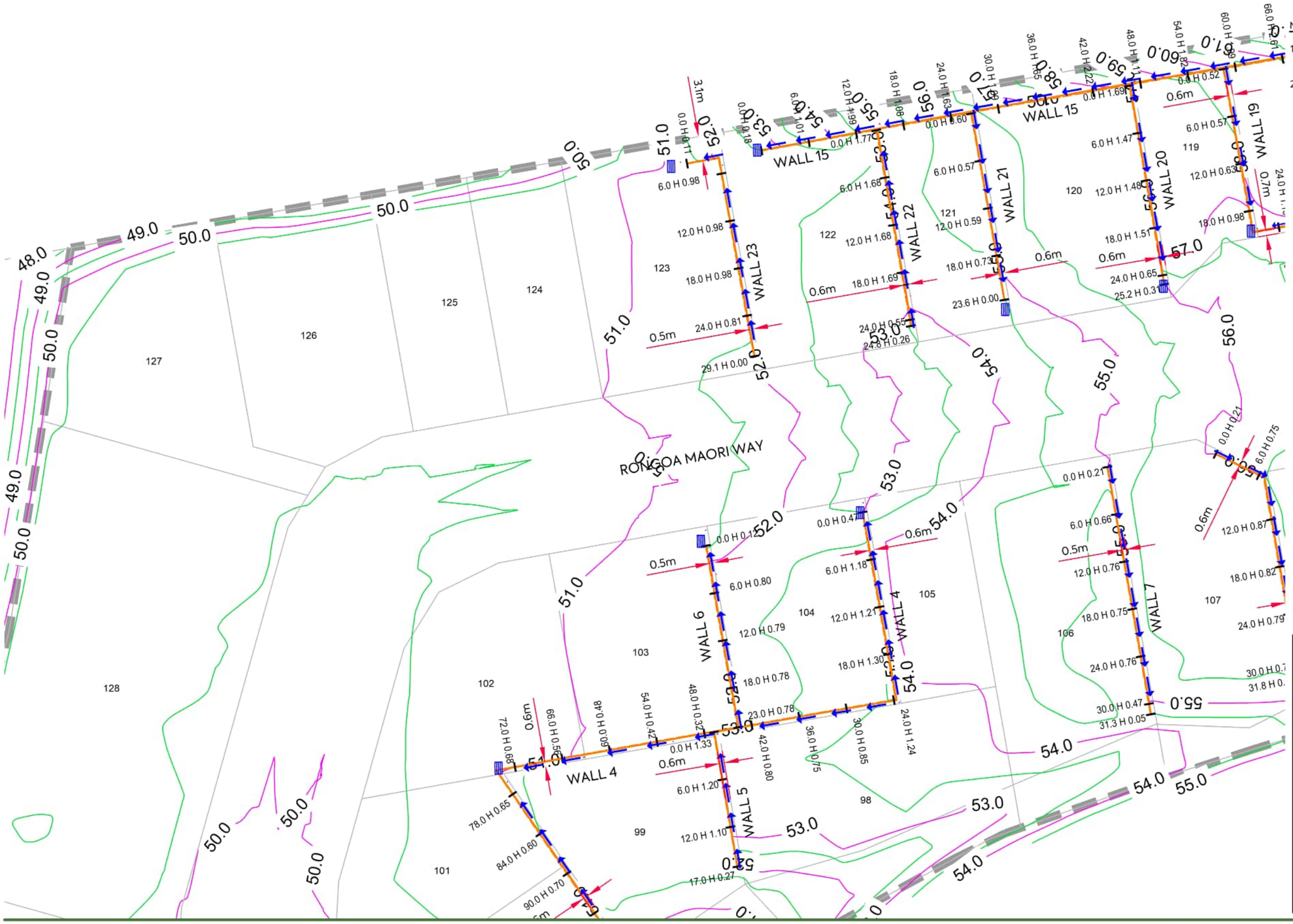

NOTES:

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LEGEND:

- STAGE BOUNDARY
- FINAL CONTOURS – MAJOR 1.0m INTERVALS (51.0)
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- SUBSOIL DRAINS
- RETAINING WALLS
- DIMENSION FROM BOUNDARY (0.6m)
- WALL SUBSOIL DRAINAGE OUTLET LOCATION

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS RETAINING WALLS SHEET 2

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

DRAWING NO: 2398-5-AB152 REV: A

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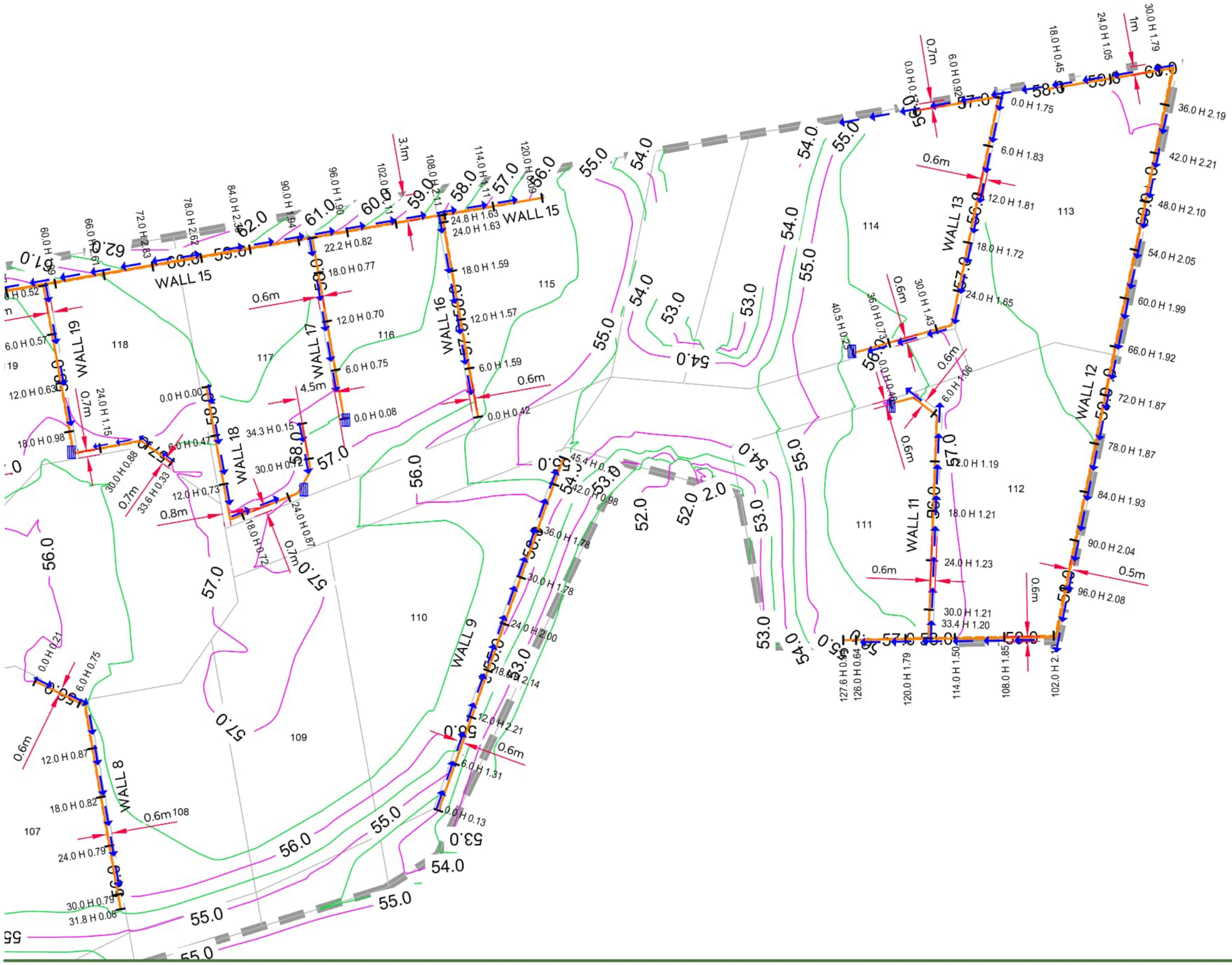
A	FIRST ISSUE	DW	DS	PC	20/01/25



NOTES:

1. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
2. WALL SUBSOIL DRAINAGE OUTLET LOCATION INFORMATION HAS BEEN COLLECTED AND SUPPLIED BY WESTCITY CONSTRUCTION LTD

LEGEND:

- STAGE BOUNDARY
- FINAL CONTOURS – MAJOR 1.0m INTERVALS (51.0)
- FINAL CONTOURS – MINOR 0.5m INTERVALS
- SUBSOIL DRAINS
- RETAINING WALLS
- DIMENSION FROM BOUNDARY (0.6m)
- WALL SUBSOIL DRAINAGE OUTLET LOCATION

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	20/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS RETAINING WALLS SHEET 3

PURPOSE OF ISSUE: AS-BUILT

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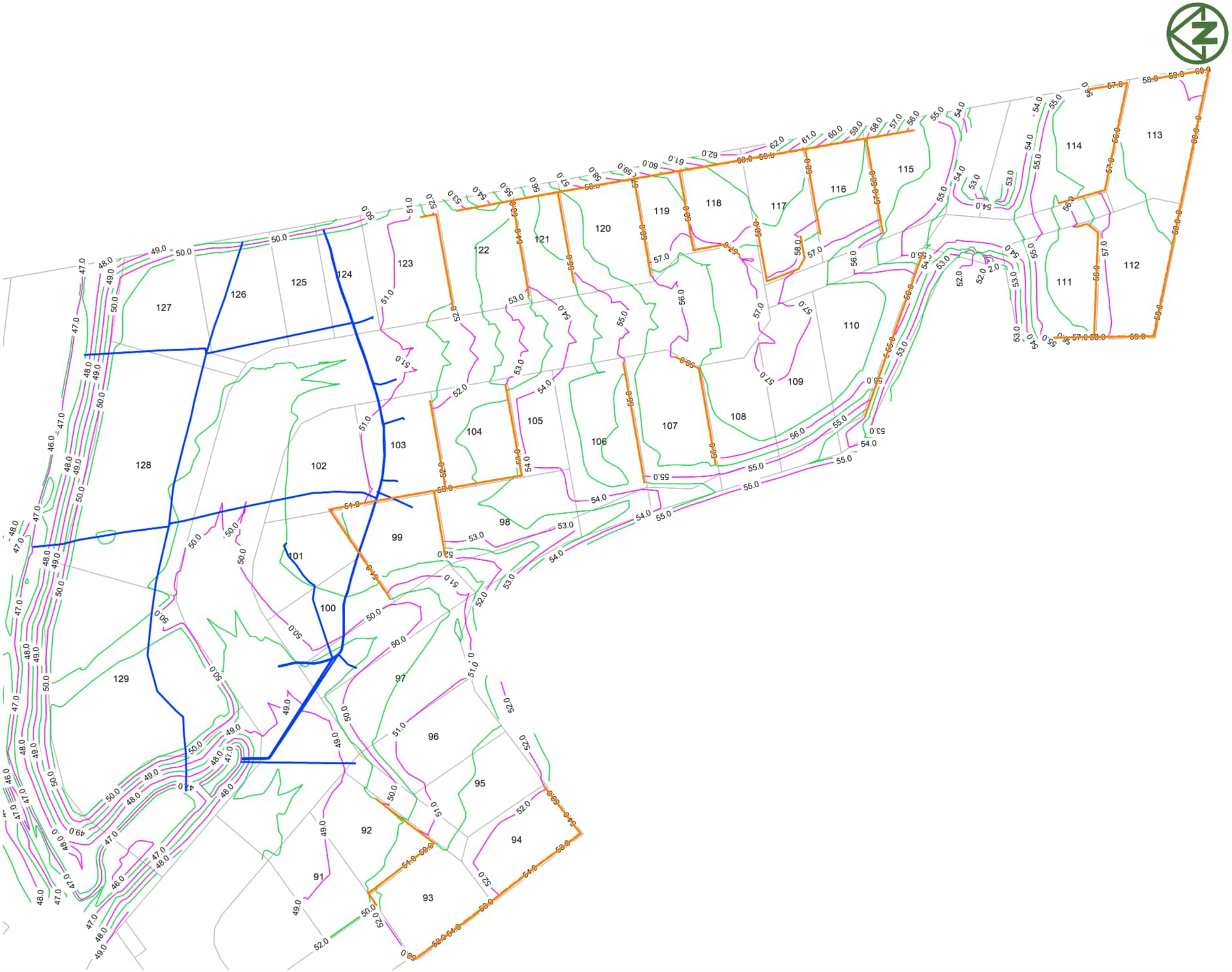

NOTES:

1. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
2. UNDERFILL DRAINS SURVEYED AND PROVIDED BY WEST CITY CONSTRUCTION LTD.

LEGEND:

FINAL CONTOURS – MAJOR 1.0m INTERVALS — 51.0

FINAL CONTOURS – MINOR 0.5m INTERVALS

UDERFILL DRAINS

RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Name: Peter Cottle

Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date:29/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1000m DO NOT SCALE

DRAWING NO: 2398-5-AB200 REV: A

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RL 45.94
RL 45.31
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RL 46.62
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RL 47.35
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RL 45.76
RL 46.79

NOTES:

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LEGEND:

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- FINAL CONTOURS – MINOR 0.5m INTERVALS
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- RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Signed:

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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 1

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

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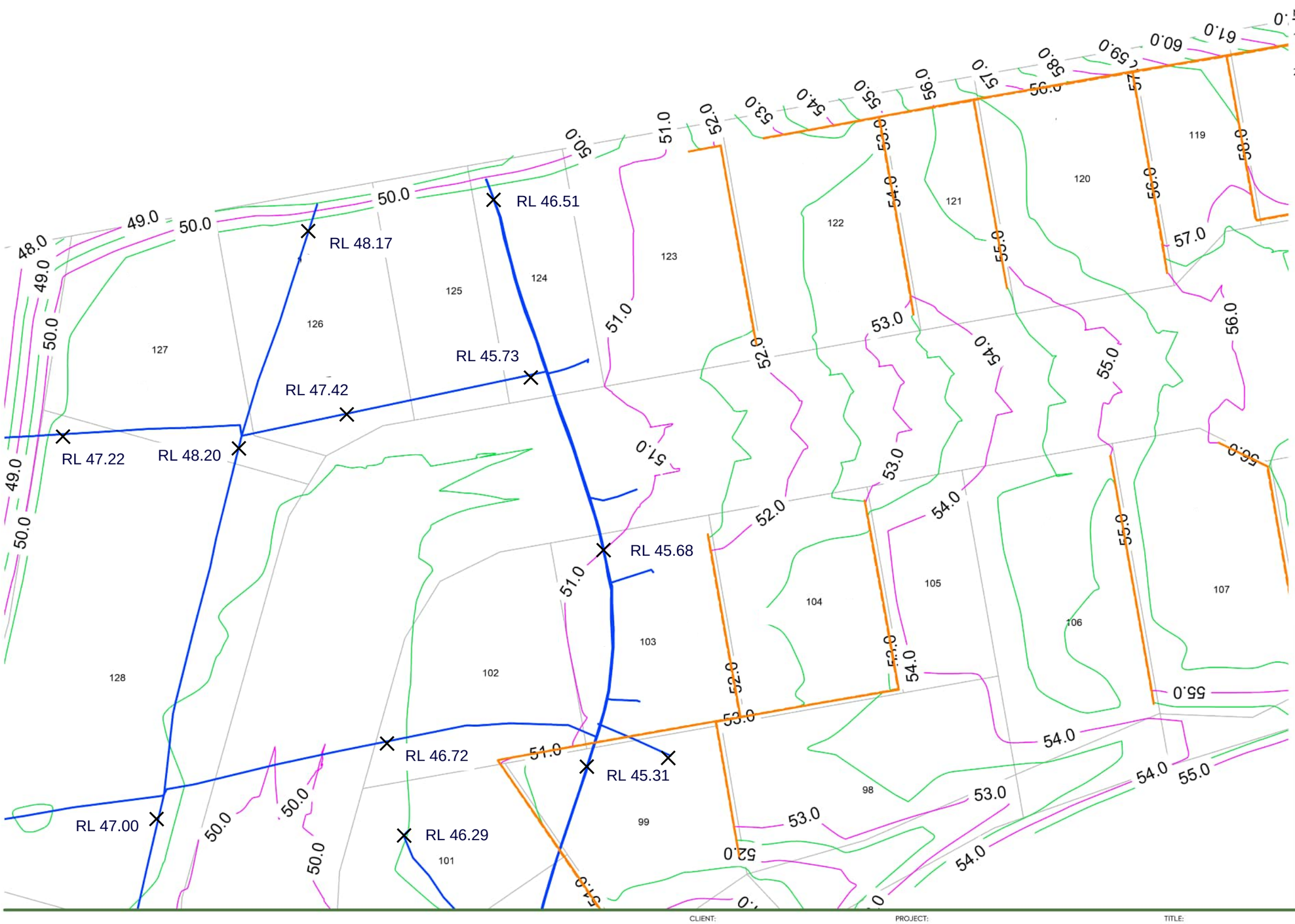

NOTES:

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LEGEND:

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- RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Licensed Cadastral Surveyor
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Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

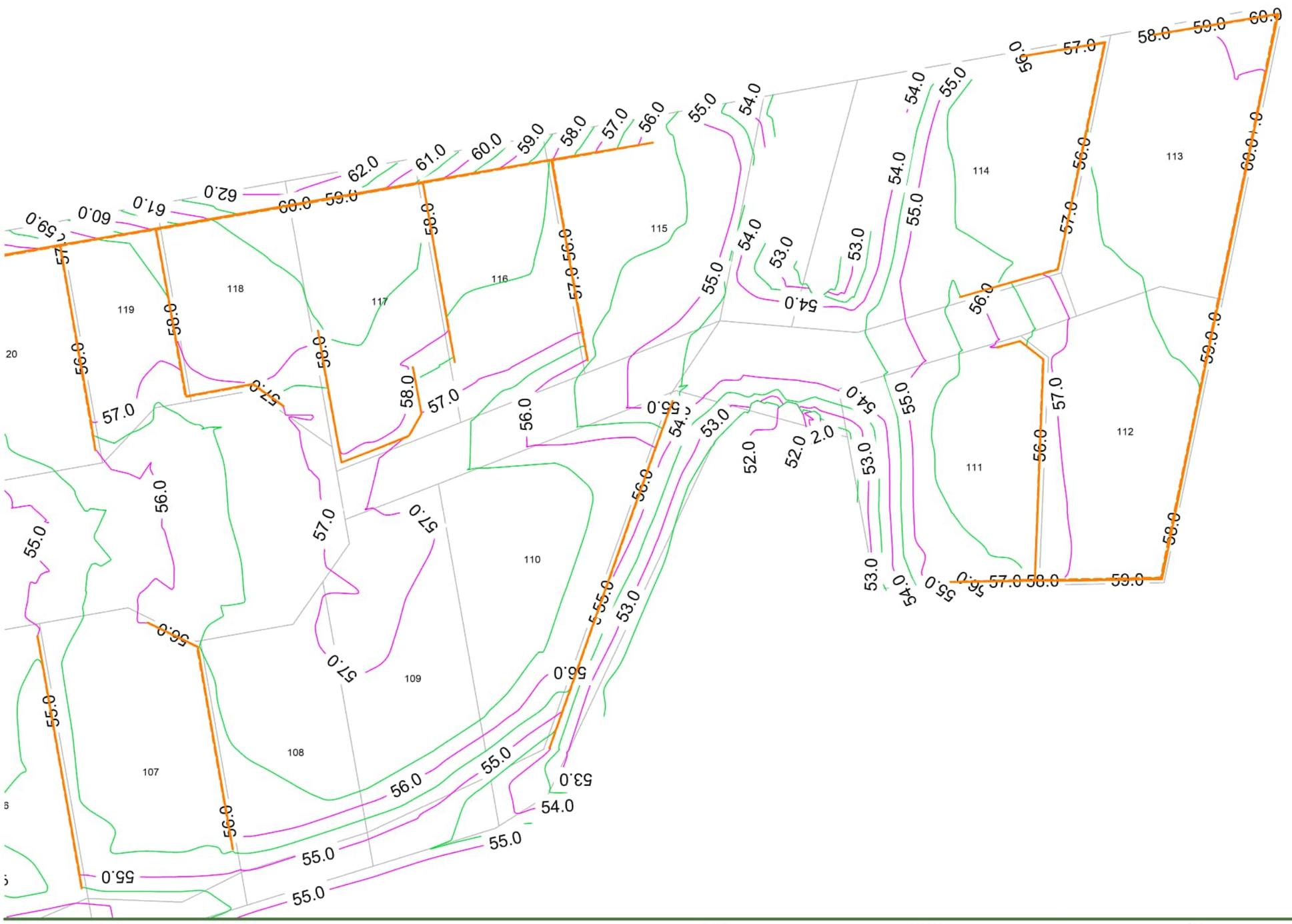
TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 2

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB202

REV: A



NOTES:

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2. UNDERFILL DRAINS SURVEYED AND PROVIDED BY WEST CITY CONSTRUCTION LTD.

LEGEND:

- FINAL CONTOURS – MAJOR 1.0m INTERVALS
- FINAL CONTOURS – MINOR 0.5m INTERVALS
- UDERFILL DRAINS
- RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Name: Peter Cottle

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Licensed Cadastral Surveyor

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 3

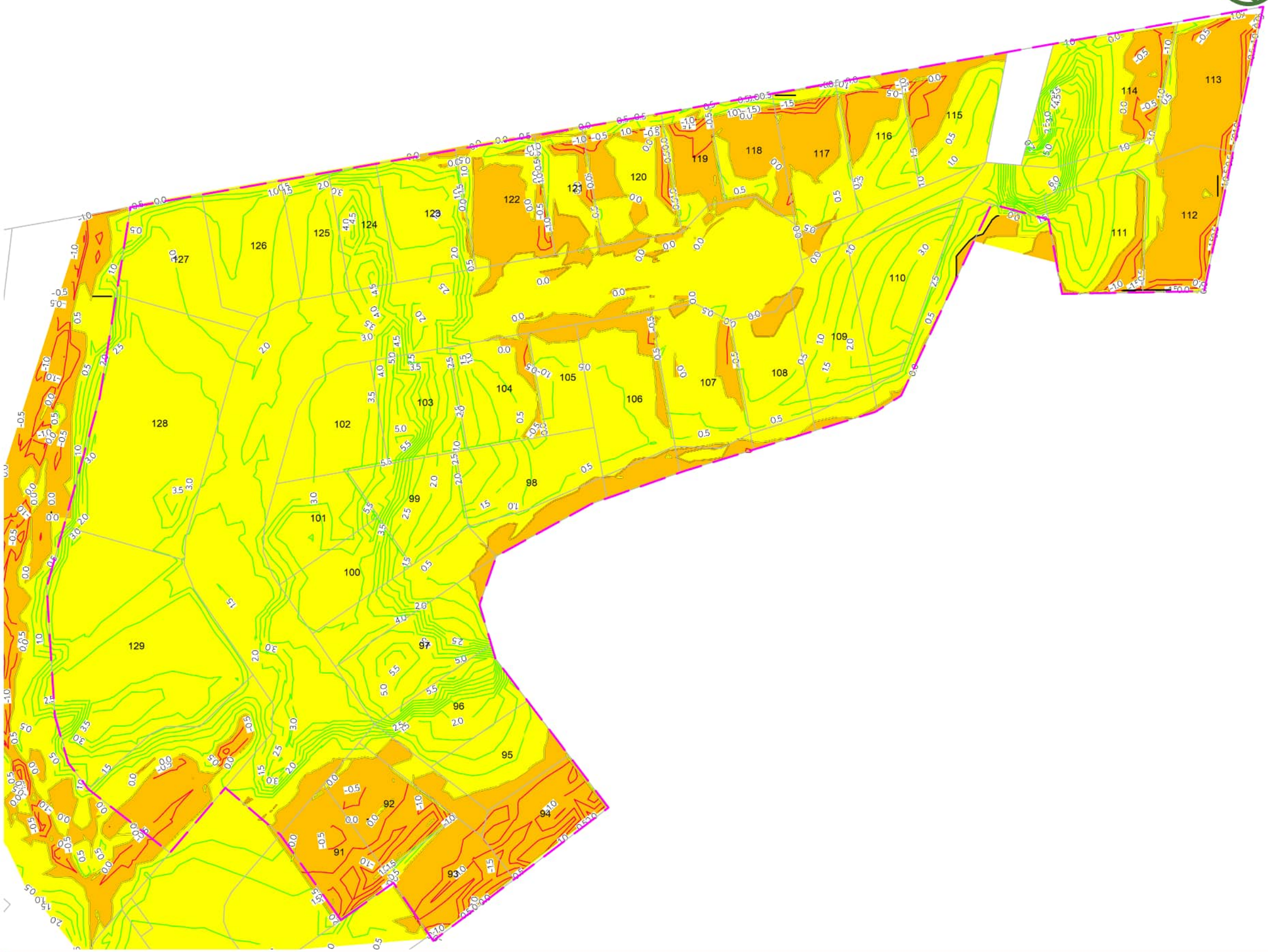
PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB203

REV: A

C:\12DS\DATA\MCKFS01\2398 3 BELGIUM ROAD_1178\DRAWINGS\STAGE 5\STAGE 5 AS BUILT\2398-5-AB200.DWG



NOTES:

1. CUT FILL CONTOURS ARE A COMPARISON BETWEEN THE LOWEST SURFACE AND THE FINISHED GROUND SURFACE.

LEGEND:

- STAGE 5 BOUNDARY
- FILL AREA
- CUT AREA
- FILL CONTOUR (0.5m INT) — 0.5
- CUT CONTOUR (0.5m INT) — -0.5

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

I certify that these As-built Plans are an accurate record of the works undertaken and that:

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  - For all other assets ±20mm (e.g. Manhole covers, Earthworks)

Name: Peter Cottle

Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date:29/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	TB	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1000 DO NOT SCALE

DRAWING NO: 2398-5-AB210 REV: A

NOTES:

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- CUT AREA
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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

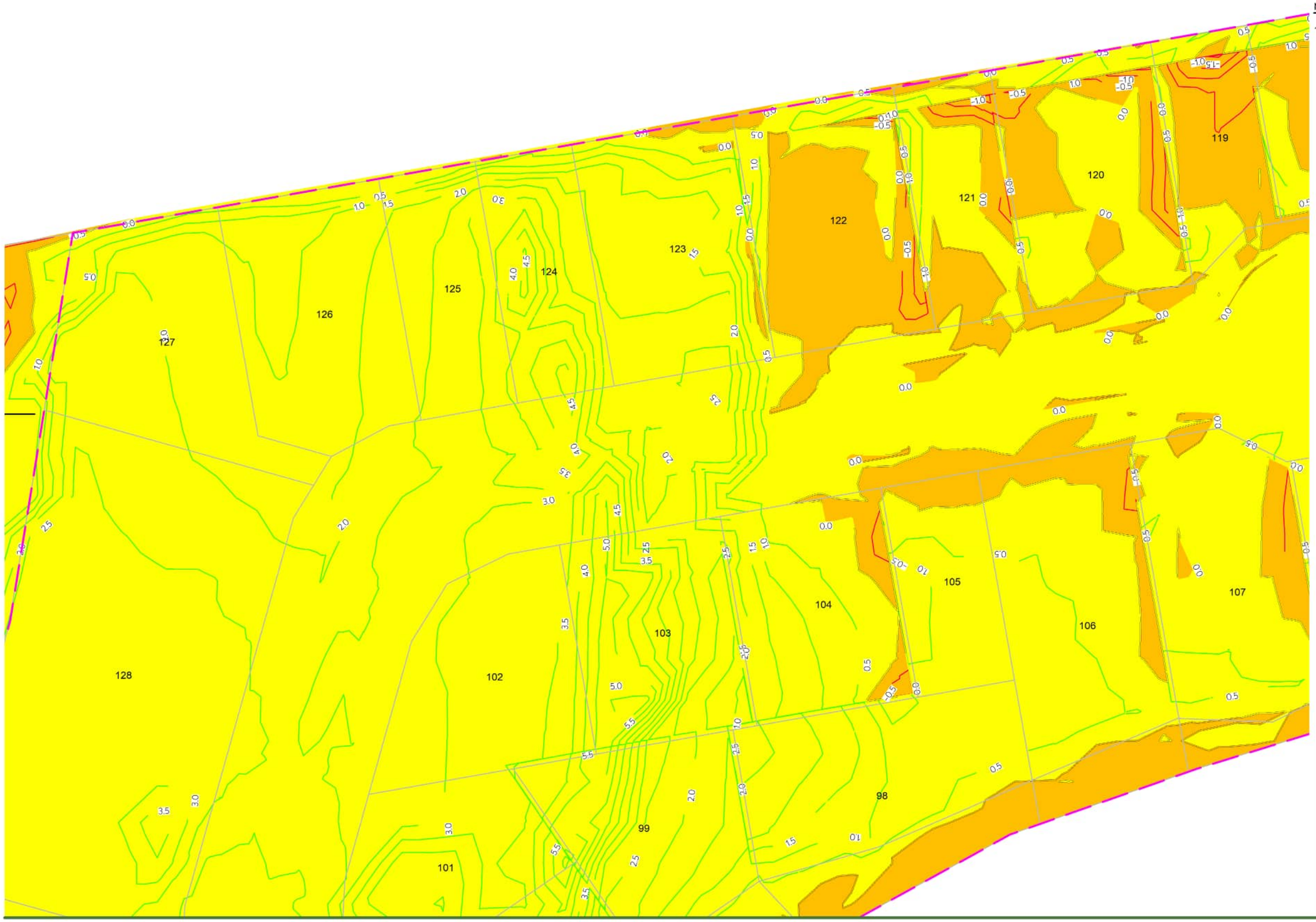
TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS PLANS SHEET 1

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

DRAWING NO: 2398-5-AB211 REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	TB	DS	PC	29/01/25



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EPA NUMBER: 60408842

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	TB	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS PLANS SHEET 2

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

DRAWING NO: 2398-5-AB212

REV: A

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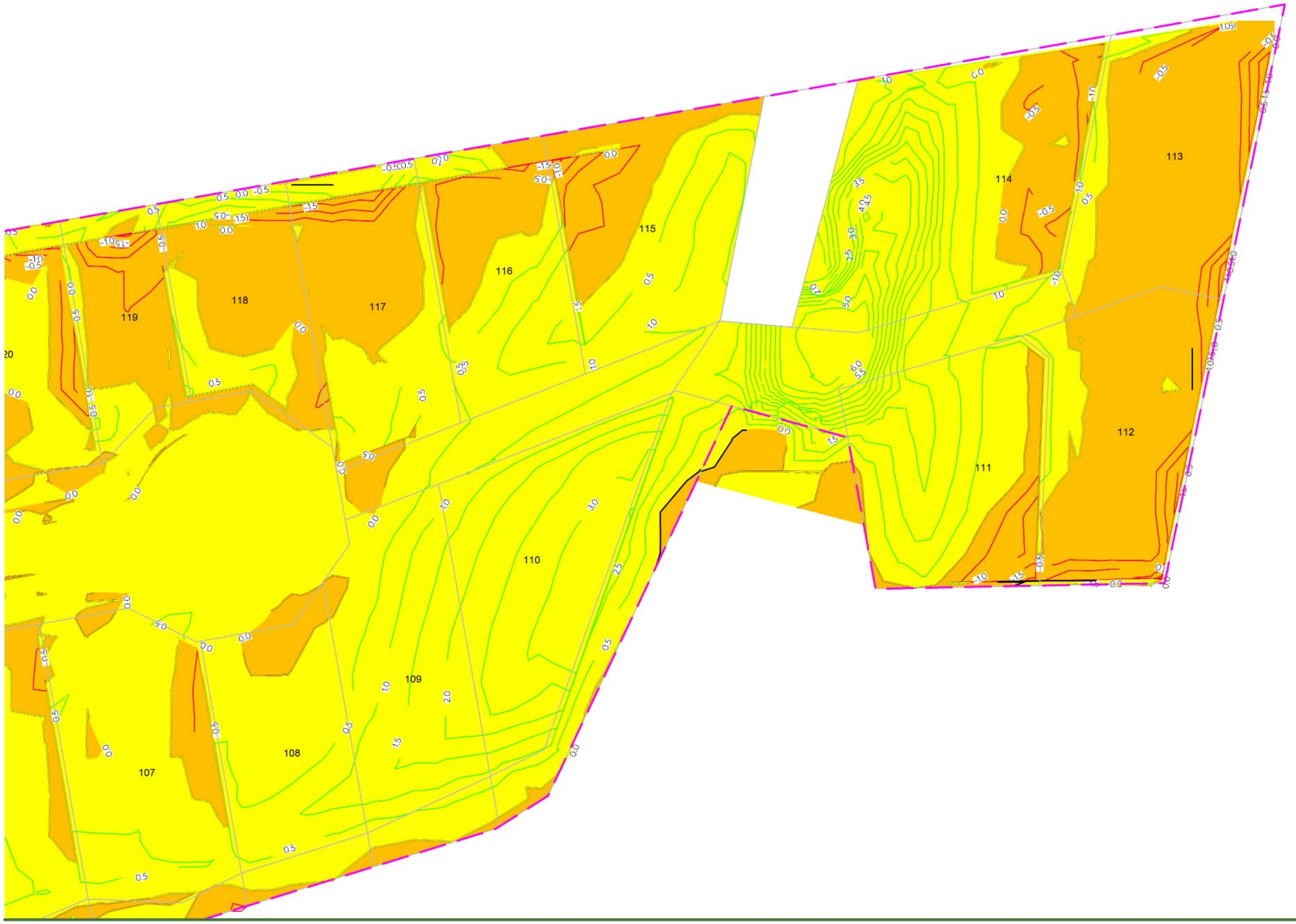

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LEGEND:

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- FILL AREA
- CUT AREA
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EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

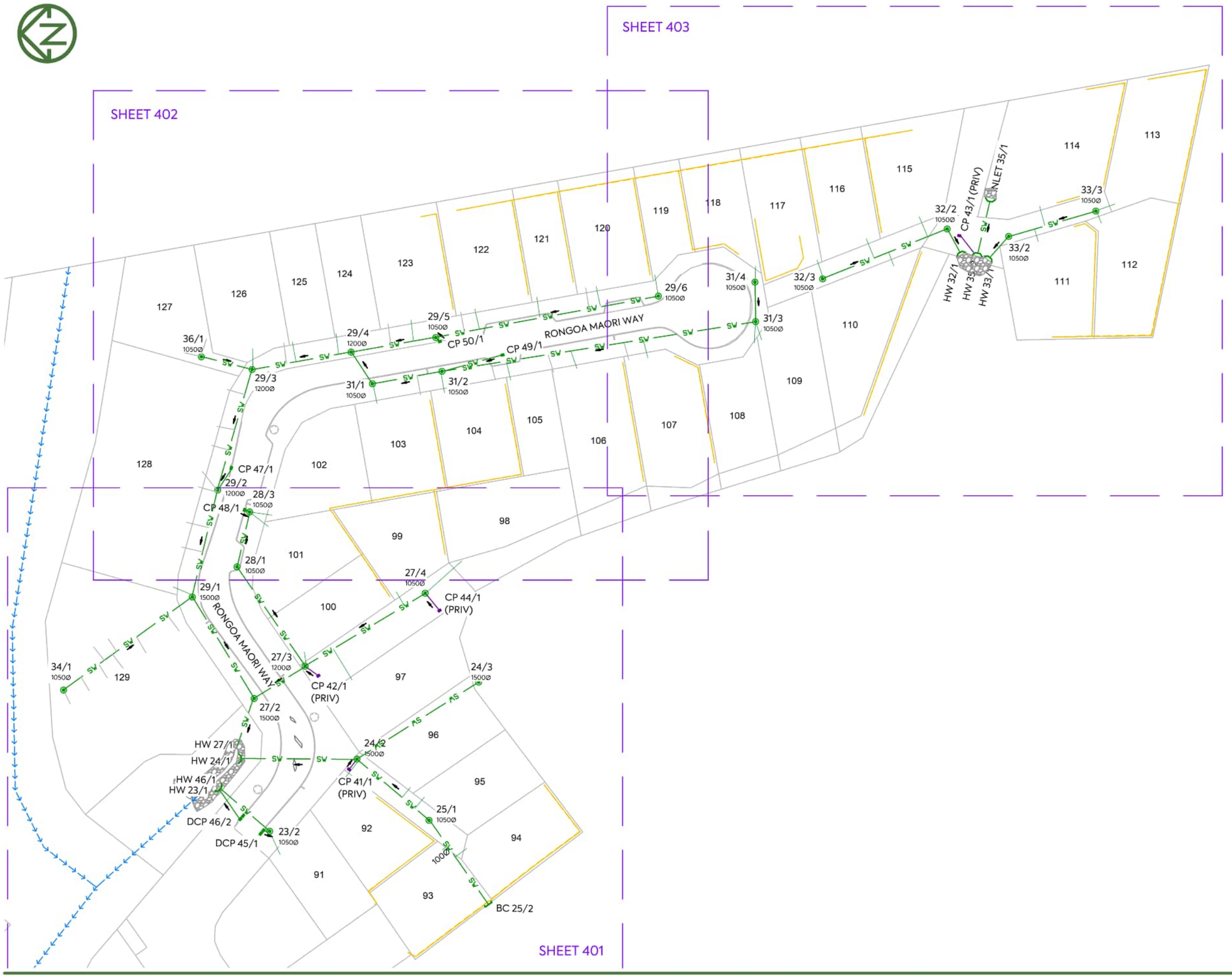
TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS PLANS SHEET 3

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500
DO NOT SCALE

DRAWING NO: 2398-5-AB213 REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	TB	DS	PC	29/01/25



NOTES:

1. ORIGIN OF COORDINATES MARK – ALP 7 DP 491030 (NZGD CODE – F5CU)
2. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016. ORIGIN OF LEVELS –MARK: ALP 7 DP 491030 (NZGD CODE – F5CU) – R.L.: 53.00m
3. ALL CESSPITS AND MH IN PLANS ARE NEW PUBLIC LINES UNLESS SHOWN OTHERWISE.
4. BEDDING FOR STORMWATER PIPES COMPLIES WITH AUCKLAND COUNCIL ENGINEERING QUALITY STANDARDS.
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8. THE LOT NUMBER AND THE DISTANCE TO THE DOWN STREAM MANHOLE IS SHOWN ON THE LOT CONNECTIONS.
9. MANHOLE & PIT INFORMATION ARE DETAILED IN THE TABLES – ON DRAWING 410 AND 411.

LEGEND

- NEW STORMWATER LINE
- NEW LOT CONNECTION
- FUTURE LOT CONNECTION
- NEW STORMWATER MANHOLE
- NEW CATCHPIT
- NEW STORMWATER WINGWALL OUTLET
- NEW PRIVATE STORMWATER PIPE
- NEW PRIVATE CATCHPIT
- NEW DOUBLE CATCHPIT
- NEW STORMWATER ROCK RIPWRAP APPRON
- EXISTING WATERCOURSE STREAM
- EXISTING STORMWATER LINE

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Contact Number : 0212726722
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REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	29/01/25

MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS STORMWATER OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1000m DO NOT SCALE

DRAWING NO: 2398-5-AB400

REV: A

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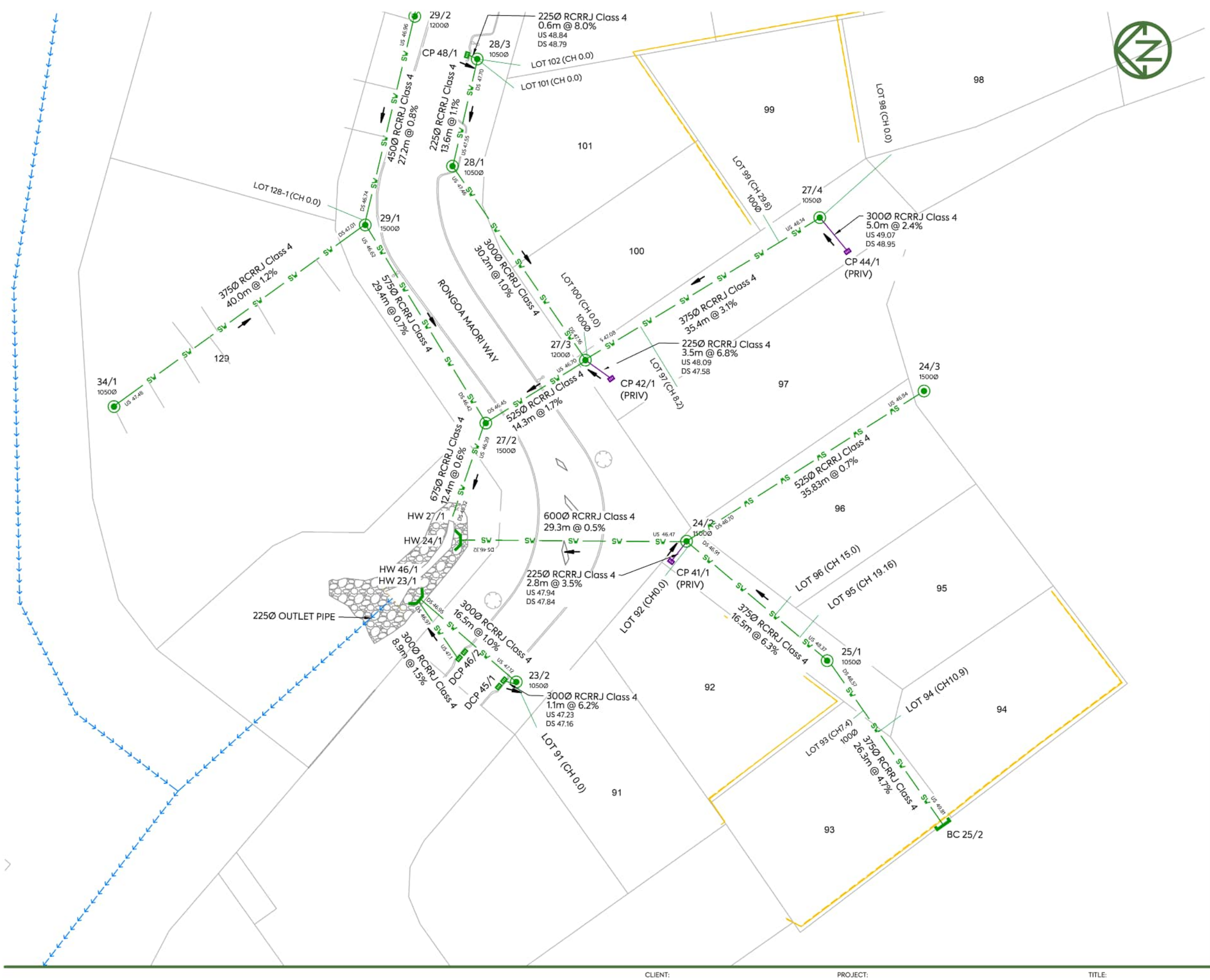

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- NEW LOT CONNECTION
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- NEW CATCHPIT
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- EXISTING WATERCOURSE STREAM
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EPA NUMBER: 60408842

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REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	29/01/25

MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS STORMWATER PLAN SHEET 1

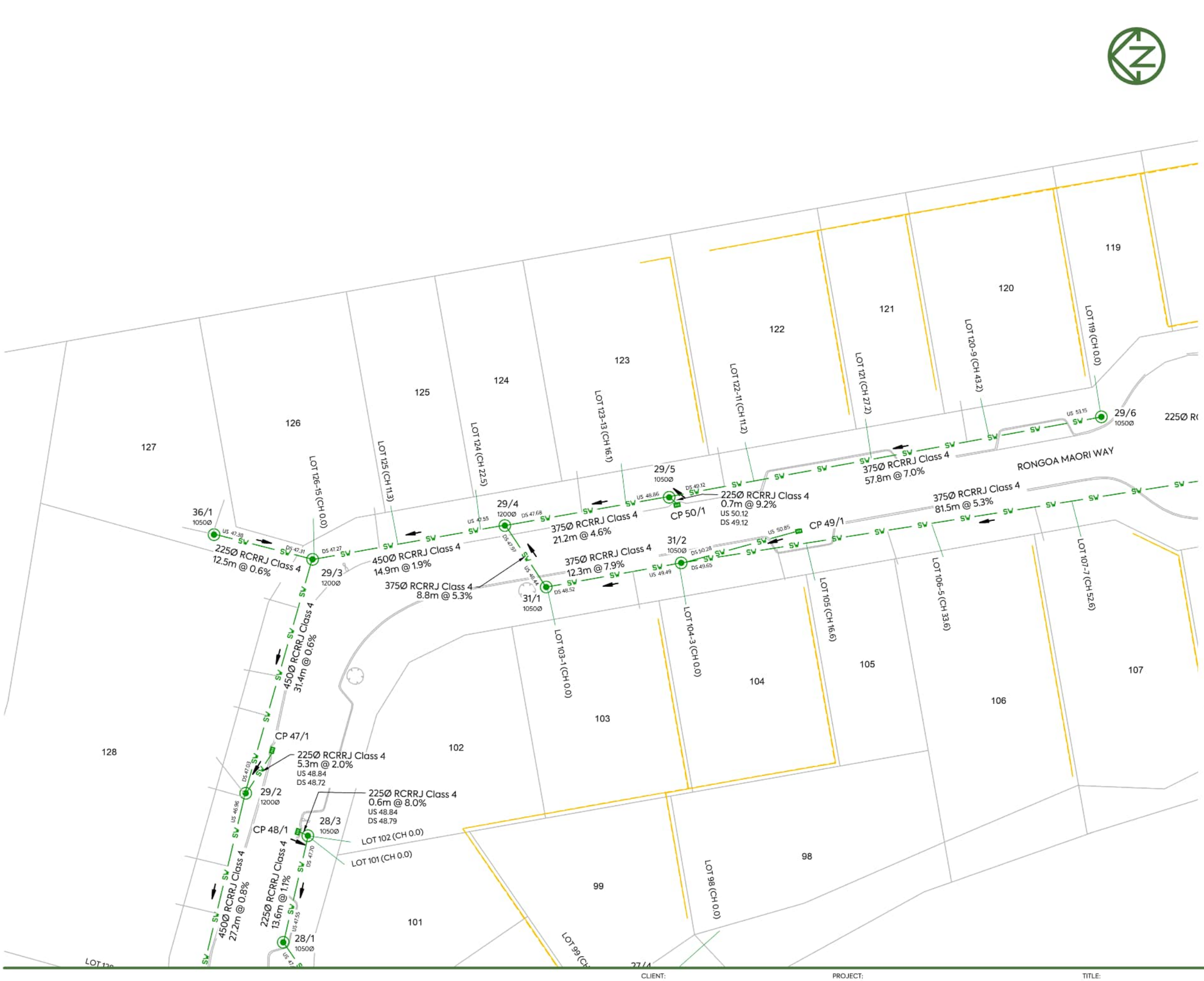
PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB401

REV: A

LUC60326362-C



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REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

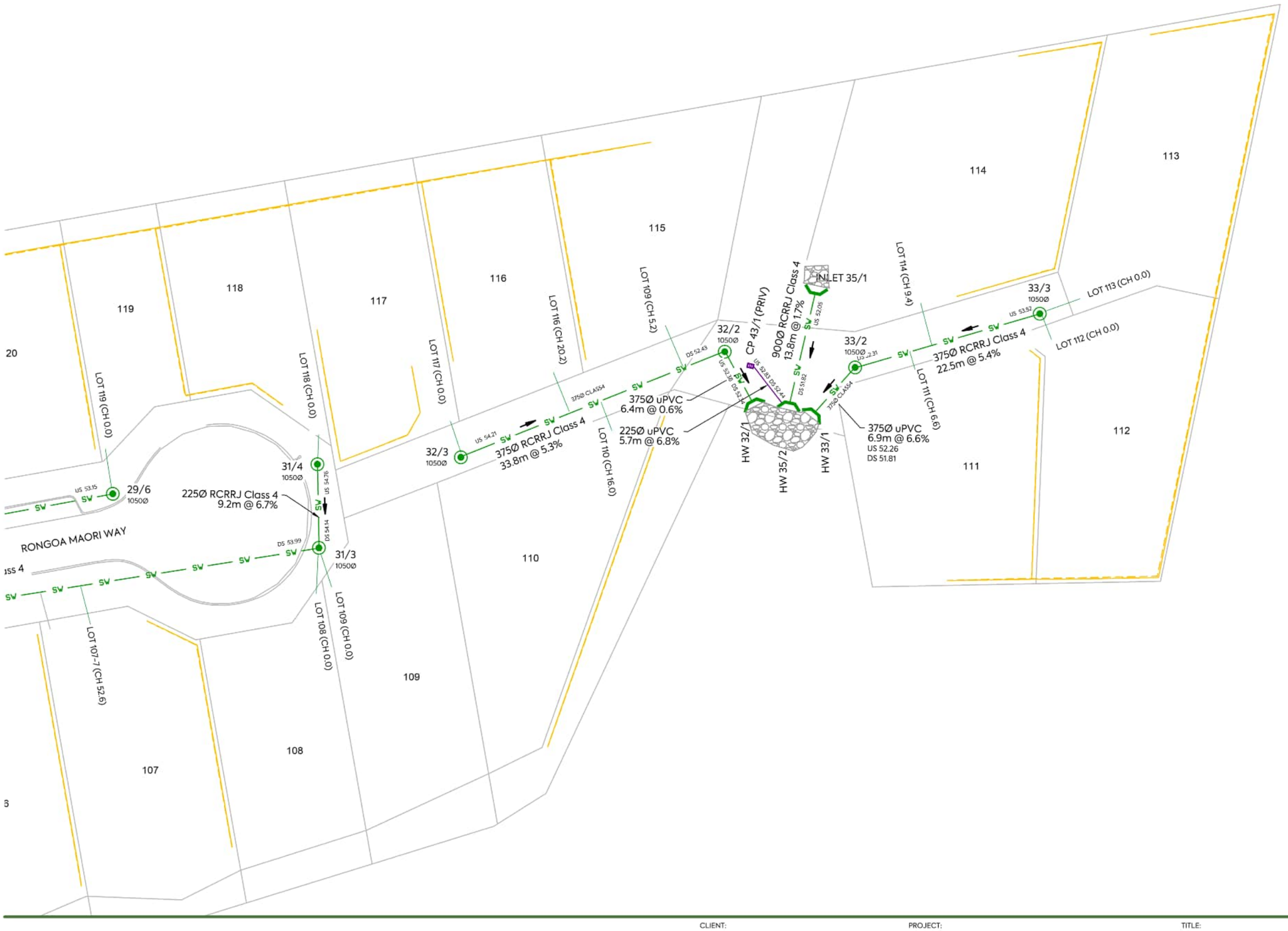
PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS STORMWATER PLAN SHEET 2

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB402 REV: A



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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS STORMWATER PLAN SHEET 3

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB403

REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DS	DW	PC	29/01/25

C:\12DS\DATA\MCKFS01\2398 3 BELGIUM ROAD_1178\DRAWINGS\STAGE 5\STAGE 5 AS BUILT\2398-5-AB400.DWG

Upstream Manhole					Downstream Manhole		Stormwater Pipe (As-Built Data)						
Manhole Name	As-built Dia.(mm)	Easting	Northing	Lid Level	Manhole Name	As-built Dia.(mm)	Upstream Outlet (m)	Downstream Inlet (m)	Pipe Dia. (mm)	Pipe Length (m)	Pipe Material	Pipe Class	Constructed Grade (%)
Line 23													
SDMH 23/2	1050	1770495.39	5881823.69	48.46	HW 46/1	-	47.12	46.95	300	16.50	RCRRJ	CLASS 4	1.0%
Line 24													
MH 24/3	1500	1770533.09	5881768.68	51.28	MH 24/2	1500	46.94	46.70	525	35.83	RCRRJ	CLASS 4	0.7%
MH 24/2	1500	1770513.69	5881800.67	49.17	HW 24/1	-	46.47	46.32	600	29.30	RCRRJ	CLASS 4	0.5%
HW 24/1	-	1770514.42	5881830.74	46.32	-								
Line 25													
BC 25/2	-	1770475.27	5881767.17	-	MH 25/1	1050	49.81	48.57	375	26.30	RCRRJ	CLASS 4	4.7%
MH 25/1	1050	1770497.46	5881782.24	50.88	MH 24/2	1500	48.37	46.91	375	23.20	RCRRJ	CLASS 4	6.3%
MH 24/2	1500	1770513.69	5881800.67	49.17	-	-							
Line 27													
MH 27/4	1050	1770556.43	5881782.13	50.27	MH 27/3	1200	48.14	47.08	375	35.4	RCRRJ	CLASS 4	3.0%
MH 27/3	1200	1770538.04	5881813.69	49.39	MH 27/2	1500	46.70	46.45	525	14.30	RCRRJ	CLASS 4	1.7%
MH 27/2	1500	1770529.91	5881827.10	49.28	HW 27/1	-	46.39	46.32	675	12.40	RCRRJ	CLASS 4	0.6%
HW 27/1	-	1770517.61	5881831.74	-	-								
Line 28													
MH 28/3	1050	1770578.38	5881827.35	50.18	MH 28/1	1050	47.70	47.55	225	13.60	RCRRJ	CLASS 4	1.1%
MH 28/1	1050	1770564.18	5881830.90	49.83	MH 27/3	1200	47.46	47.16	300	30.20	RCRRJ	CLASS 4	1.0%
MH 27/3	1200	1770538.04	5881813.69	49.39	-								
Line 29													
MH 29/6	1050	1770632.42	5881720.12	55.84	MH 29/5	1050	53.15	49.12	375	57.80	RCRRJ	CLASS 4	7.0%
MH 29/5	1050	1770622.74	5881778.16	51.51	MH 29/4	1200	48.86	47.68	375	21.20	RCRRJ	CLASS 4	5.6%
MH 29/4	1200	1770619.37	5881800.22	50.72	MH 29/3	1200	47.55	47.27	450	14.90	RCRRJ	CLASS 4	1.9%
MH 29/3	1200	1770615.33	5881826.03	50.50	MH 29/2	1200	47.22	47.03	450	31.40	RCRRJ	CLASS 4	0.6%
MH 29/2	1200	1770584.21	5881835.56	50.14	MH 29/1	1500	46.96	46.74	450	27.20	RCRRJ	CLASS 4	0.8%
MH 29/1	1500	1770556.57	5881842.66	49.73	MH 27/2	1500	46.62	46.42	525	29.40	RCRRJ	CLASS 4	0.7%
MH 27/2	1500	1770529.91	5881827.10	49.28	-								
Line 31													
MH 31/4	1050	1770635.58	5881694.96	57.05	MH 31/3	1050	54.76	54.14	225	9.20	RCRRJ	CLASS 4	6.7%
MH 31/3	1050	1770625.33	5881694.96	56.97	MH 31/2	1050	53.99	49.65	375	81.50	RCRRJ	CLASS 4	5.3%
MH 31/2	1050	1770613.93	5881776.71	51.51	MH 31/1	1050	49.49	48.52	375	12.30	RCRRJ	CLASS 4	7.9%
MH 31/1	1050	1770611.037	5881794.83	50.76	MH 29/4	1200	48.44	47.97	375	8.80	RCRRJ	CLASS 4	5.3%
MH 29/4	1200	1770619.37	5881800.22	50.72	-								
Line 32													
MH 32/3	1050	1770636.10	5881677.35	56.54	MH 32/2	1050	54.21	52.43	375	33.80	RCRRJ	CLASS 4	5.3%
MH 32/2	1050	1770648.44	5881644.76	54.18	HW 32/1	-	52.38	52.34	375	6.40	RCRRJ	CLASS 4	0.6%
HW 32/1	-	1770642.29	5881641.53	52.34	-								
Line 33													
MH 33/3	1050	1770652.37	5881606.04	56.68	MH 33/2	1050	53.52	52.31	375	22.50	RCRRJ	CLASS 4	5.4%
MH 33/2	1050	1770646.21	5881628.80	54.28	HW 33/1	-	52.26	51.81	375	6.9	RCRRJ	CLASS 4	6.6%
HW 33/1	-	1770640.807	5881633.839	51.851	-								
Line 34													
MH 34/1	1050	1770533.03	5881876.57	50.42	MH 29/1		47.48	47.01	375	40.00	RCRRJ	CLASS 4	1.2%
MH 29/1	1500	1770556.57	5881842.66	49.73	-	-							
Line 35													
HW 35/2	-	1770642.01	5881636.90	51.83	HW 35/1	-	52.06	51.82	900	13.80	RCRRJ	CLASS 4	1.7%
HW 35/1	-	1770655.38	5881633.53	52.02	-								
Line 36													
MH 36/1	1050	1770618.87	5881839.16	50.67	MH 29/3	1200	47.38	47.31	225	12.50	RCRRJ	CLASS 4	0.6%
MH 29/3	1200	1770615.328	5881826.026	50.50	-	-							

Catch Pits			
Catch pit Name	Easting	Northing	Lid Level
CP 47	1770589.89	5881831.90	50.08
CP 48	1770578.94	5881828.69	48.60
CP 49	1770617.89	5881760.90	52.48
CP 50	1770621.69	5881777.12	51.36
DCP 45 a	1770494.83	5881826.05	48.22
DCP 45 b	1770495.66	5881825.33	48.24
DCP 46 a	1770499.507	5881830.51	48.24
DCP 46 b	1770498.677	5881831.25	48.23

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

I certify that these As-built Plans are an accurate record of the works undertaken and that:

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  - For all other assets ±20mm (e.g. Manhole covers, Earthworks)

Name: Peter Cottle

Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date:29/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 STORMWATER DATA

PURPOSE OF ISSUE: AS-BUILT

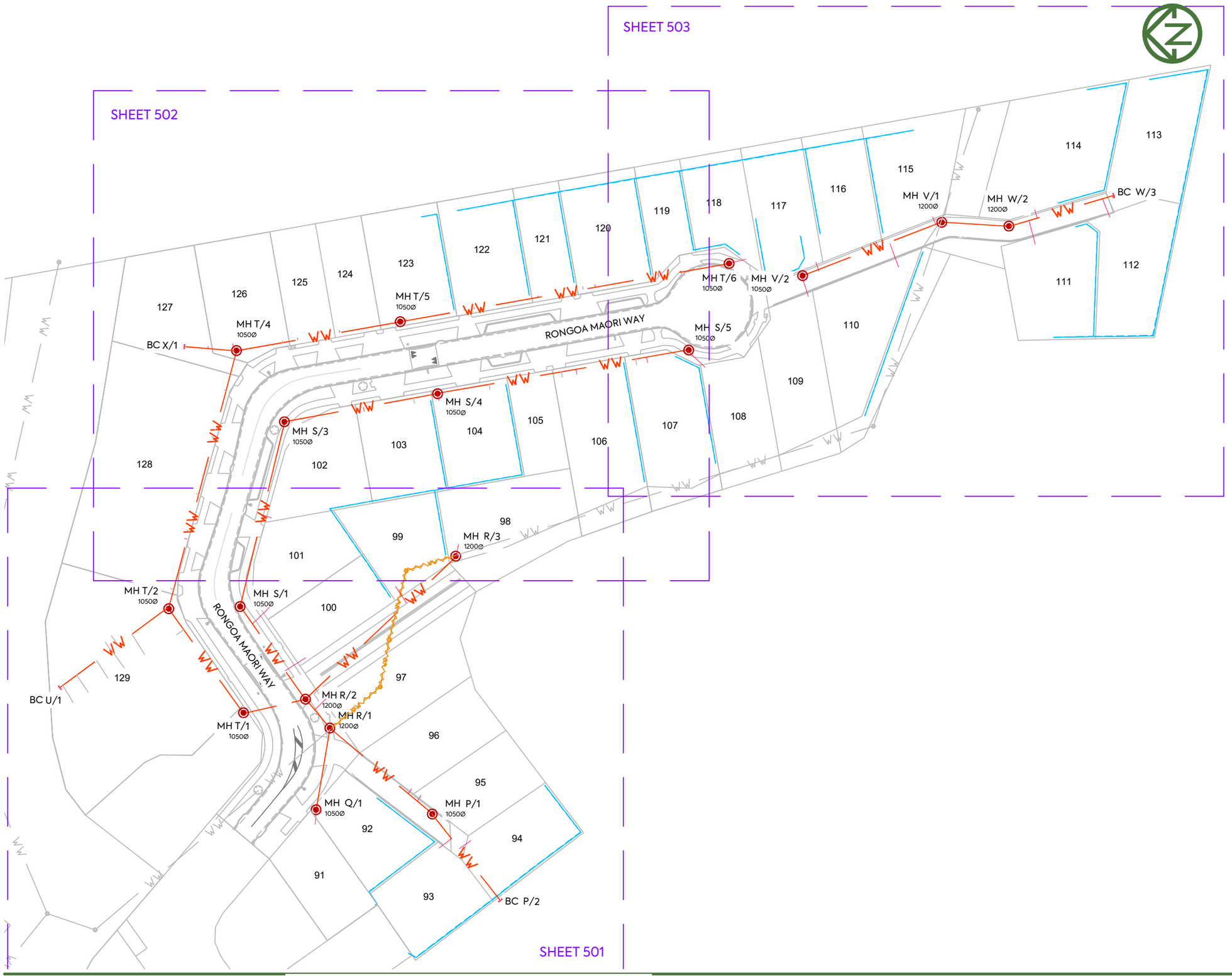
SCALE: N.A

DO NOT SCALE

DRAWING NO: 2398-5-AB410

REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	29/01/25



NOTES:

1. ORIGIN OF COORDINATES MARK: ALP 7 DP 491030 (NZGD CODE - F5CU)
2. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016. ORIGIN OF LEVELS -MARK: ALP 7 DP 491030 (NZGD CODE - F5CU) - R.L.: 53.00m
3. ALL LOT CONNECTIONS ARE 100mm DIAMETER uPVC SN16. ALL LOT CONNECTION TERMINATION POINTS STAKED.
4. ALL NEW PUBLIC LINES ARE 150mm DIAMETER uPVC SN16.
5. FOR MANHOLE INFORMATION REFER TO DRAWING 2398-3-AB-510.
6. LOT CONNECTION AND BLANK CAP POSITIONS AND DEPTHS PROVIDED BY WEST CITY CONTRACTORS LTD SURVEYORS.
7. ALL MANHOLES ARE 1050mmØ UNLESS STATED ON PLAN 510

LEGEND:

- LOT BOUNDARIES
- NEW WASTEWATER LINE — WW
- NEW LOT CONNECTION
- FUTURE LOT CONNECTION
- NEW WASTEWATER MANHOLE
- NEW WASTEWATER BLANK CAP
- EXISTING WASTEWATER LINE — WW
- EXISTING WASTEWATER LINE ABANDONED
- NEW RETAINING WALL

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DS	DW	PC	09/12/24

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS WASTEWATER OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1000m
DO NOT SCALE

DRAWING NO: 2398-5-AB500

REV: A

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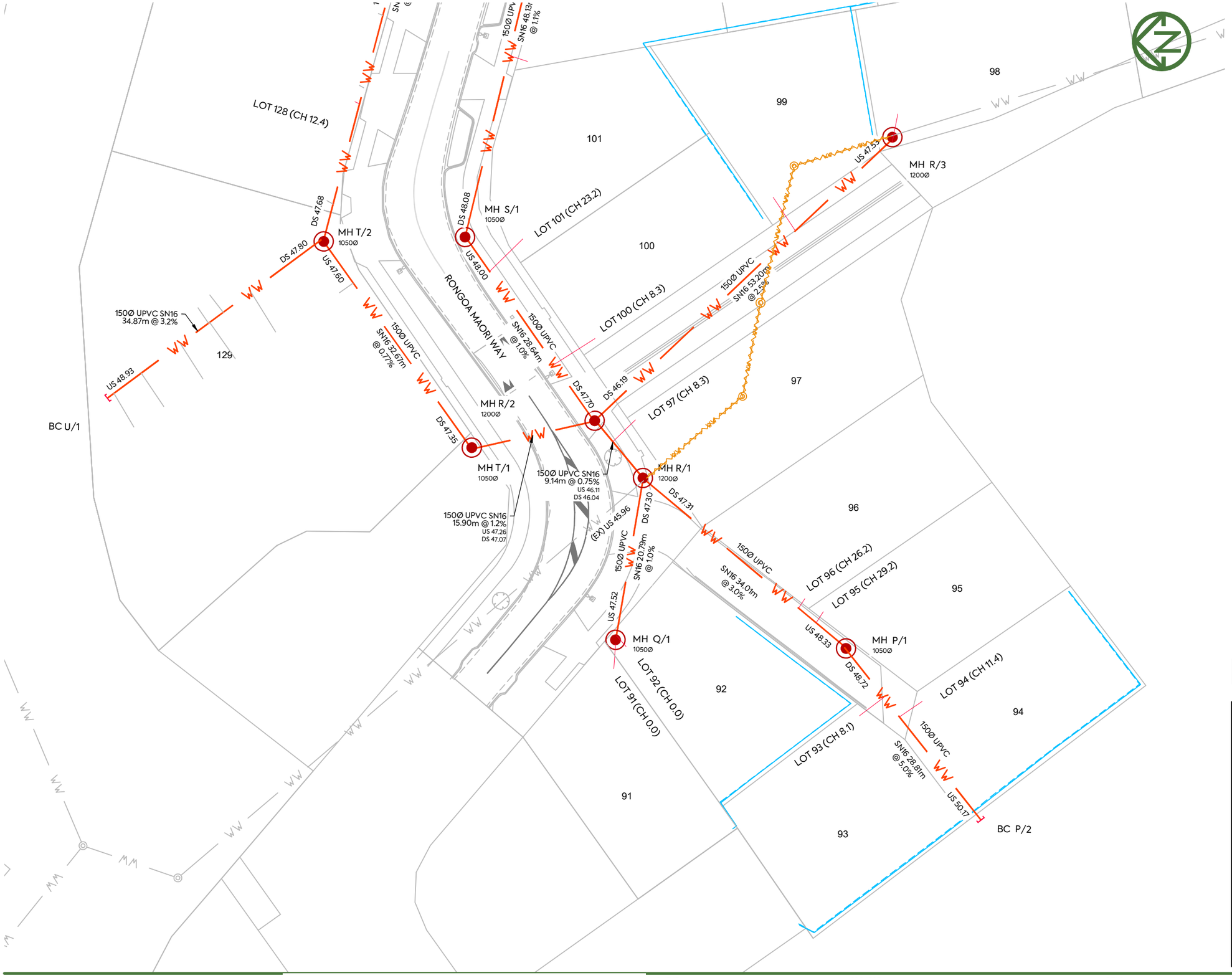

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6. LOT CONNECTION AND BLANK CAP POSITIONS AND DEPTHS PROVIDED BY WEST CITY CONTRACTORS LTD SURVEYORS.
7. ALL MANHOLES ARE 1050mmØ UNLESS STATED ON PLAN 510

LEGEND:

- LOT BOUNDARIES
- NEW WASTEWATER LINE
- NEW LOT CONNECTION
- FUTURE LOT CONNECTION
- NEW WASTEWATER MANHOLE
- NEW WASTEWATER BLANK CAP
- EXISTING WASTEWATER LINE
- EXISTING WASTEWATER LINE ABANDONED
- NEW RETAINING WALL

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DS	DW	PC	09/12/24

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS WASTEWATER PLAN SHEET 1

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB501

REV: A

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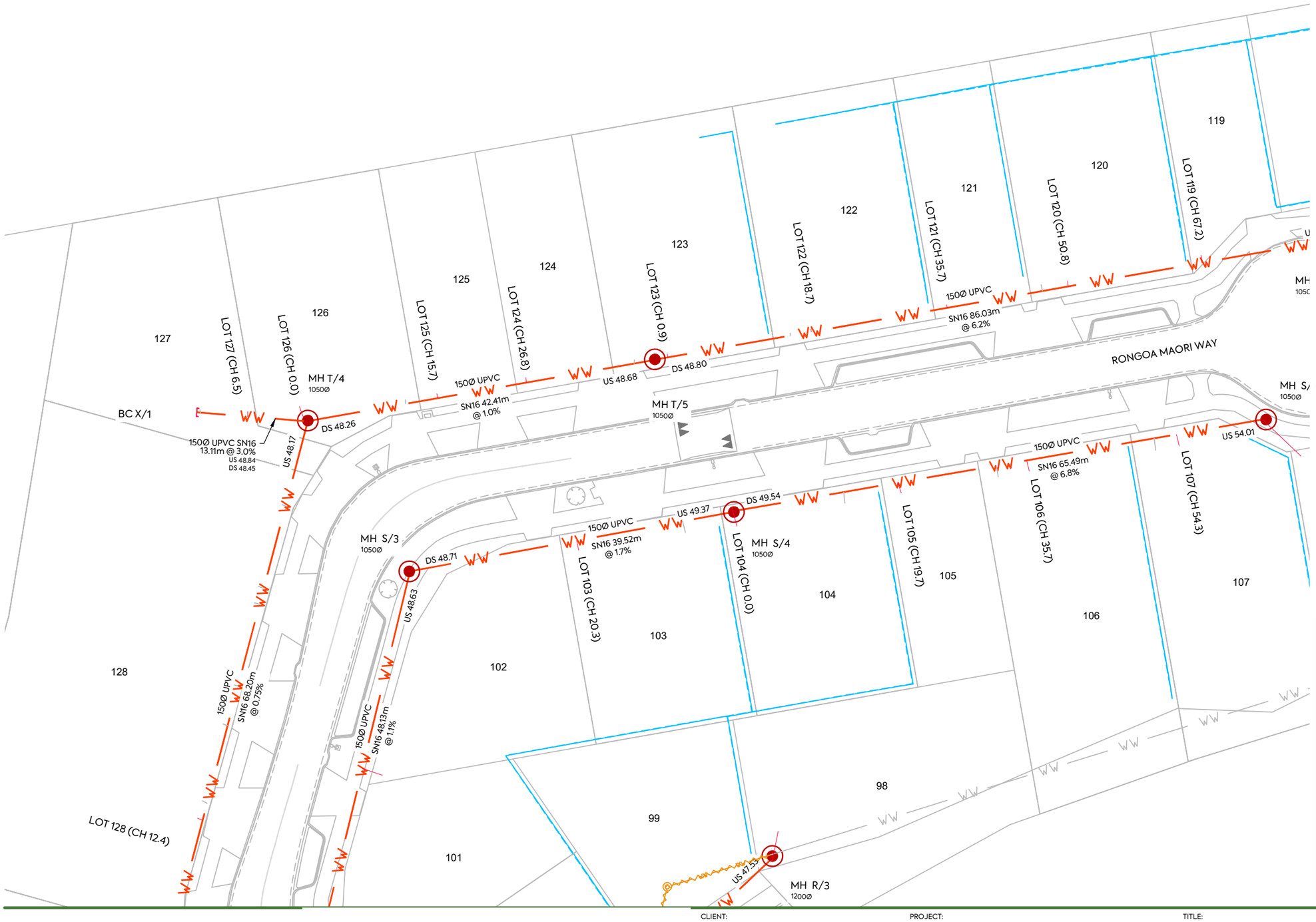

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6. LOT CONNECTION AND BLANK CAP POSITIONS AND DEPTHS PROVIDED BY WEST CITY CONTRACTORS LTD SURVEYORS.
7. ALL MANHOLES ARE 1050mmØ UNLESS STATED ON PLAN 510

LEGEND:

- LOT BOUNDARIES
- NEW WASTEWATER LINE
- NEW LOT CONNECTION
- FUTURE LOT CONNECTION
- NEW WASTEWATER MANHOLE
- NEW WASTEWATER BLANK CAP
- EXISTING WASTEWATER LINE
- EXISTING WASTEWATER LINE ABANDONED
- NEW RETAINING WALL

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWINGS WASTEWATER PLAN SHEET 2

PURPOSE OF ISSUE: AS BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB502

REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	09/12/24

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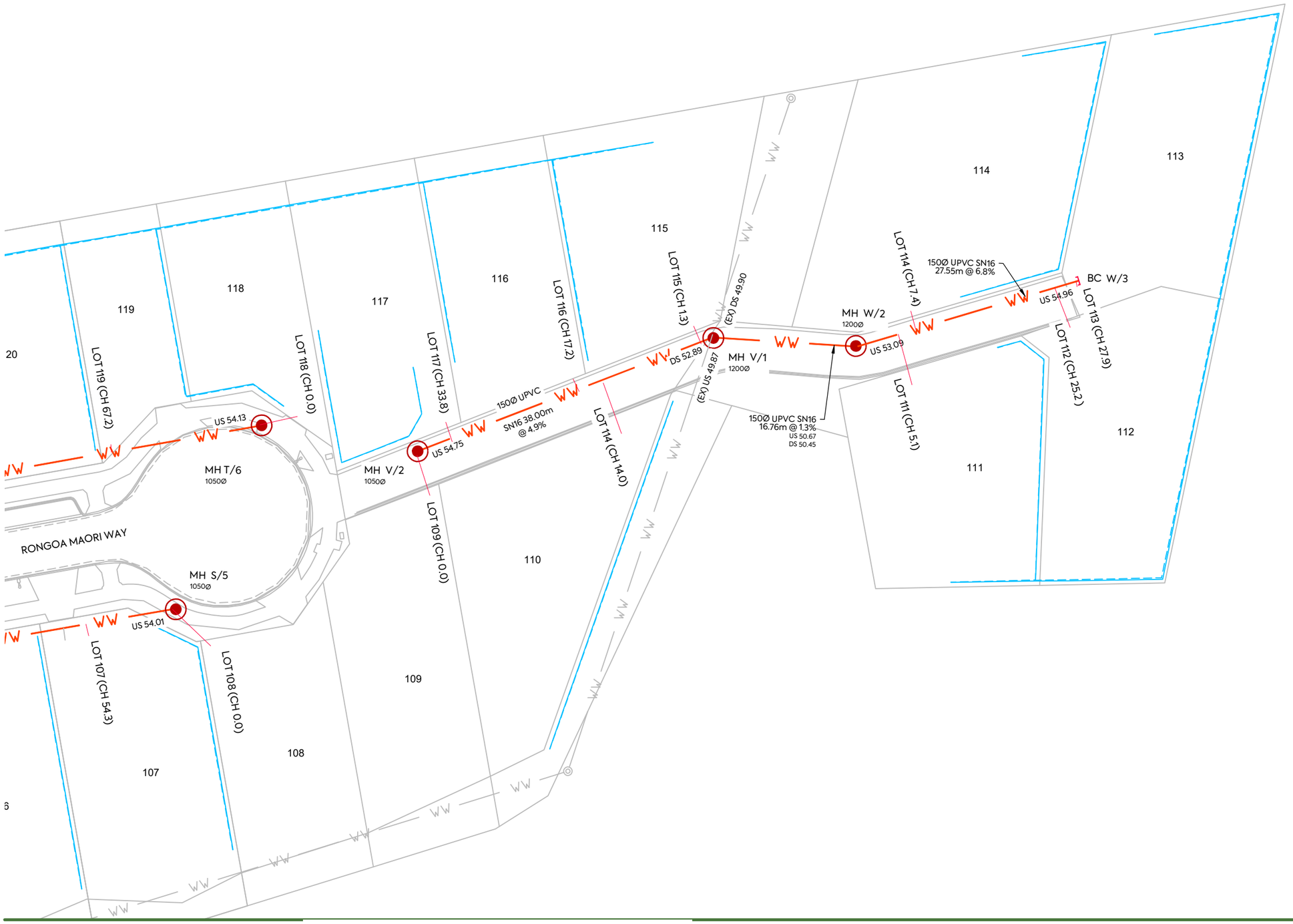

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2. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016. ORIGIN OF LEVELS -MARK: ALP 7 DP 491030 (NZGD CODE - F5CU) - R.L.: 53.00m
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5. FOR MANHOLE INFORMATION REFER TO DRAWING 2398-3-AB-510.
6. LOT CONNECTION AND BLANK CAP POSITIONS AND DEPTHS PROVIDED BY WEST CITY CONTRACTORS LTD SURVEYORS.
7. ALL MANHOLES ARE 1050mmØ UNLESS STATED ON PLAN 510

LEGEND:

- LOT BOUNDARIES
- NEW WASTEWATER LINE
- NEW LOT CONNECTION
- FUTURE LOT CONNECTION
- NEW WASTEWATER MANHOLE
- NEW WASTEWATER BLANK CAP
- EXISTING WASTEWATER LINE
- EXISTING WASTEWATER LINE ABANDONED
- NEW RETAINING WALL

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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Registration Number: #1163883 Date:29/01/2025

Contact Number : 0212726722
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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	09/10/24

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 AS-BUILT DRAWING WASTEWATER PLAN SHEET 3

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

DRAWING NO: 2398-5-AB503 REV: A

Upstream Manhole					Downstream Manhole		Wastewater Pipe (As-Built Data)						
Manhole Name	As-built Dia.(mm)	Easting	Northing	Lid Level	Manhole Name	As-built Dia.(mm)	Upstream Outlet (m)	Downstream Inlet (m)	Pipe Dia. (mm)	Pipe Length (m)	Pipe Material	Pipe Class	Constructed Grade (%)
Line P													
BC P/2	-	1770476.45	5881764.23	-	MH P/1	1050	50.17	48.72	150	28.81	uPVC	SN16	5.0%
MH P/1	1050	1770499.24	5881781.50	50.87	MH R/1	1200	48.33	47.31	150	34.01	uPVC	SN16	3.0%
Line Q													
MH Q/1	1050	1770500.93	5881811.65	48.95	MH R/1	1200	47.52	47.30	150	20.79	uPVC	SN16	1.0%
Line R													
MH R/3	1200	1770566.03	5881774.18	52.10	MH R/2	1200	47.53	46.19	150	53.20	uPVC	SN16	2.5%
MH R/2	1200	1770529.65	5881813.85	49.06	MH R/1	1200	46.11	46.04	150	9.14	uPVC	SN16	0.77%
MH R/1	1200	1770522.04	5881807.67	48.98	-								
Line S													
MH S/5	1050	1770618.35	5881712.73	56.28	MH S/4	1050	54.01	49.54	150	65.49	uPVC	SN16	6.8%
MH S/4	1050	1770608.24	5881778.10	51.51	MH S/3	1050	49.37	48.71	150	39.52	uPVC	SN16	1.7%
MH S/3	1050	1770601.71	5881817.98	50.48	MH S/1	1050	48.63	48.08	150	48.13	uPVC	SN16	1.1%
MH S/1	1050	1770554.00	5881830.37	49.73	MH R/2	1200	48.00	47.70	150	28.64	uPVC	SN16	1.0%
Line T													
MH T/6	1050	1770640.61	5881701.83	56.87	MH T/5	1050	54.13	48.80	150	86.03	uPVC	SN16	6.2%
MH T/5	1050	1770627.11	5881787.43	51.18	MH T/4	1050	48.68	48.26	150	42.41	uPVC	SN16	1.0%
MH T/4	1050	1770620.41	5881830.06	50.64	MH T/2	1050	48.17	47.68	150	68.2	uPVC	SN16	0.75%
MH T/2	1050	1770553.77	5881848.89	49.95	MH T/1	1050	47.60	47.35	150	32.67	uPVC	SN16	0.77%
MH T/1	1050	1770526.43	5881830.00	49.32	MH R/2	1200	47.26	47.07	150	15.90	uPVC	SN16	1.2%
Line U													
BC U/1	-	1770533.78	5881877.60	-	MH T/2	1050	48.93	47.8	150	34.9	uPVC	SN16	3.2%
Line V													
MH V/2	1050	1770637.10	5881682.82	56.83	MH V/1	1200	54.75	52.89	150	38.00	uPVC	SN16	4.9%
MH V/1	1200	1770650.25	5881646.44	54.32	-								
Line W													
BC W/3	-	1770656.42	5881601.66	-	MH W/2	1200	54.96	53.09	150	27.55	uPVC	SN16	6.8%
MH W/2	1200	1770648.95	5881629.05	54.33	MH V/1	1200	50.67	50.45	150	16.76	uPVC	SN16	1.3%
Line X													
BC X/1	-	1770621.68	5881843.64	-	MH T/4	1050	48.84	48.45	150	13.11	uPVC	SN16	3.0%

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Name: Peter Cottle

Signed:

Licensed Cadastral Surveyor

Registration Number: #1163883 Date:29/01/2025

Contact Number : 0212726722
Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	AS-BUILT	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE

TITLE: STAGE 5 WASTEWATER DATA

PURPOSE OF ISSUE: AS-BUILT

SCALE: N.A

DO NOT SCALE

DRAWING NO: 2398-5-AB510

REV: A

NOTES:

1. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
2. UNDERFILL DRAINS SURVEYED AND PROVIDED BY WEST CITY CONSTRUCTION LTD.

- Specific Design Zone - Walls
- Specific Design Zone - Slope
- Stormwater Swale

LEGEND:

- FINAL CONTOURS – MAJOR 1.0m INTERVALS
- FINAL CONTOURS – MINOR 0.5m INTERVALS
- UDERFILL DRAINS
- RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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AKS2021-0009 Belgium Road Stage 5
Limitation Zone Plan - Drawing 500
AJL - 12-02-2025 Rev 0

MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 1

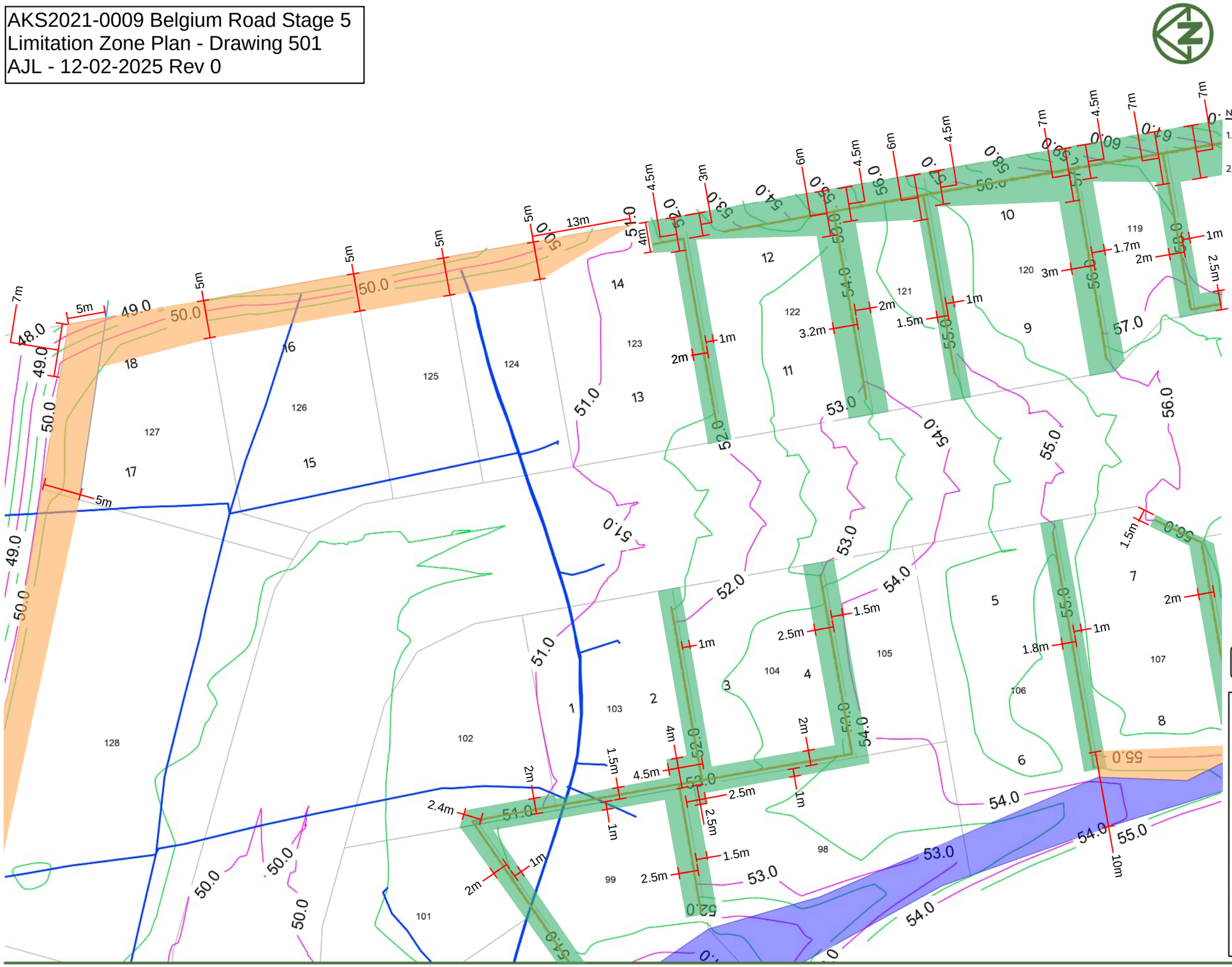
PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500 DO NOT SCALE

DRAWING NO: 2398-5-AB201 REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

AKS2021-0009 Belgium Road Stage 5
Limitation Zone Plan - Drawing 501
AJL - 12-02-2025 Rev 0



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Contact Number : 0212726722
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MCKENZIE & CO.

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

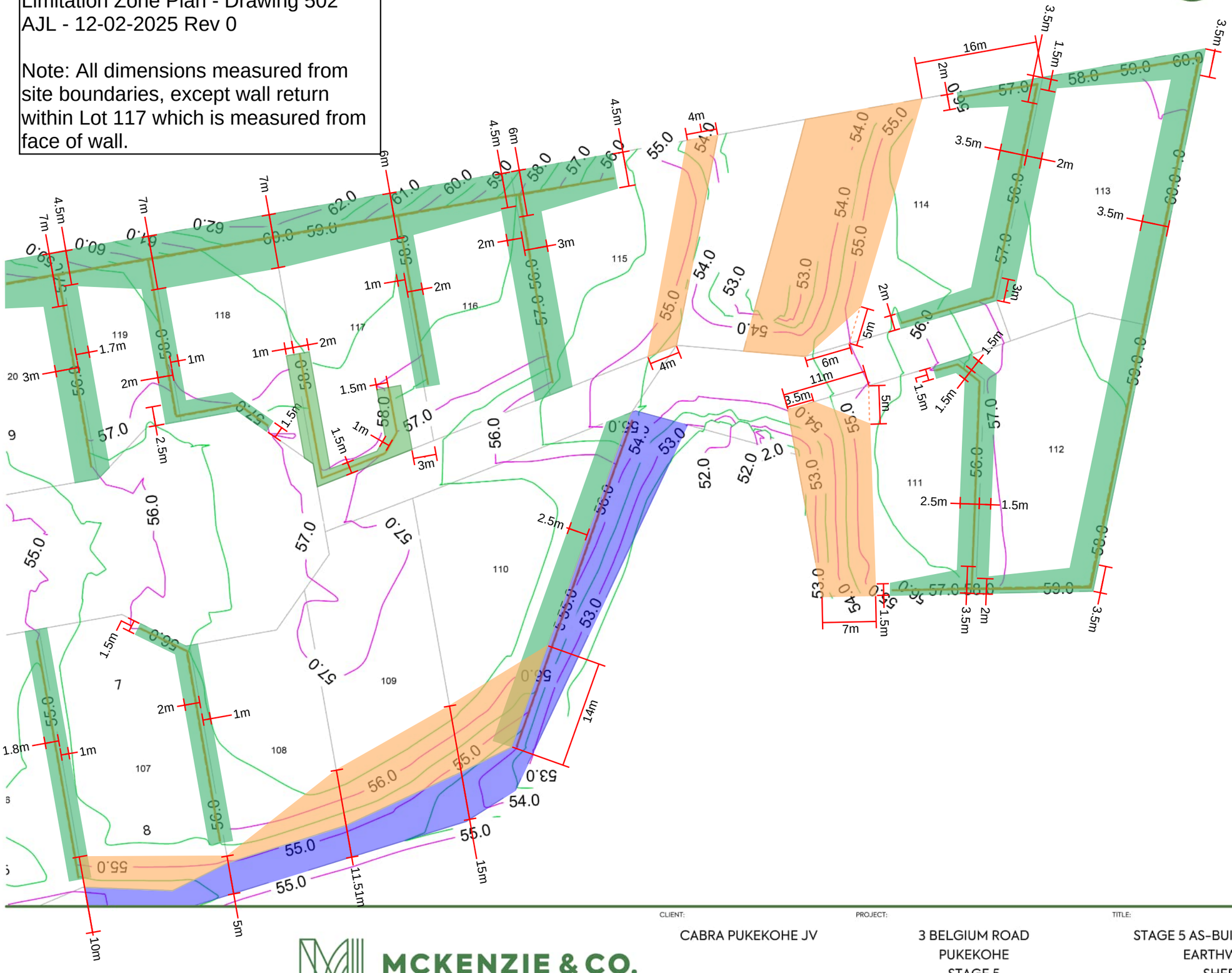
TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 2

PURPOSE OF ISSUE: AS-BUILT
SCALE: 1:500m
DO NOT SCALE
DRAWING NO: 2398-5-AB202 REV: A

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

AKS2021-0009 Belgium Road Stage 5
Limitation Zone Plan - Drawing 502
AJL - 12-02-2025 Rev 0

Note: All dimensions measured from site boundaries, except wall return within Lot 117 which is measured from face of wall.



NOTES:

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2. UNDERFILL DRAINS SURVEYED AND PROVIDED BY WEST CITY CONSTRUCTION LTD.

Specific Design Zone - Walls

Specific Design Zone - Slope

Stormwater Swale

LEGEND:

FINAL CONTOURS – MAJOR 1.0m INTERVALS — 51.0

FINAL CONTOURS – MINOR 0.5m INTERVALS

UDERFILL DRAINS

RETAINING WALLS

EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60326362-C

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MCKENZIE & CO.

REV	DESCRIPTION	DRN BY	CHK BY	APP BY	DATE
A	FIRST ISSUE	DW	DS	PC	29/01/25

CLIENT: CABRA PUKEKOHE JV

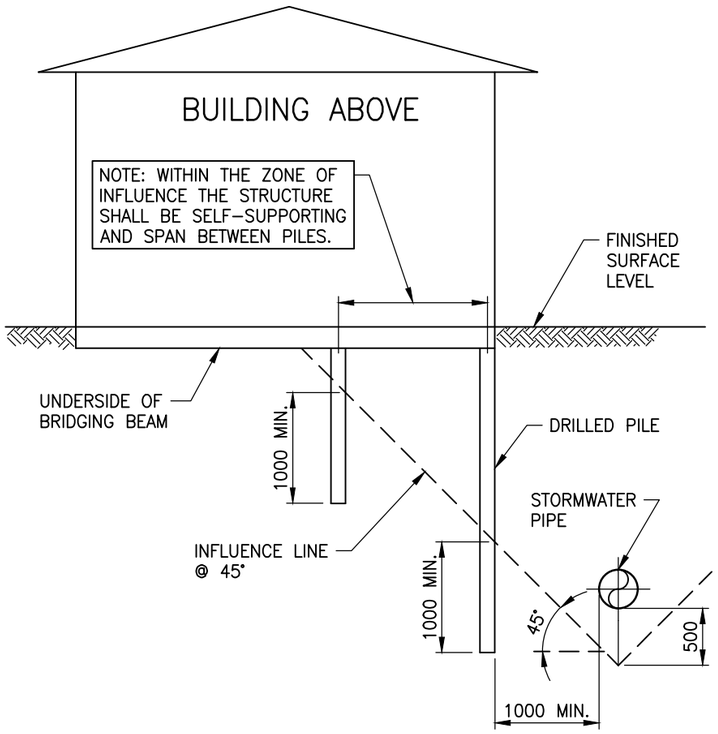
PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS SHEET 3

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:500m DO NOT SCALE

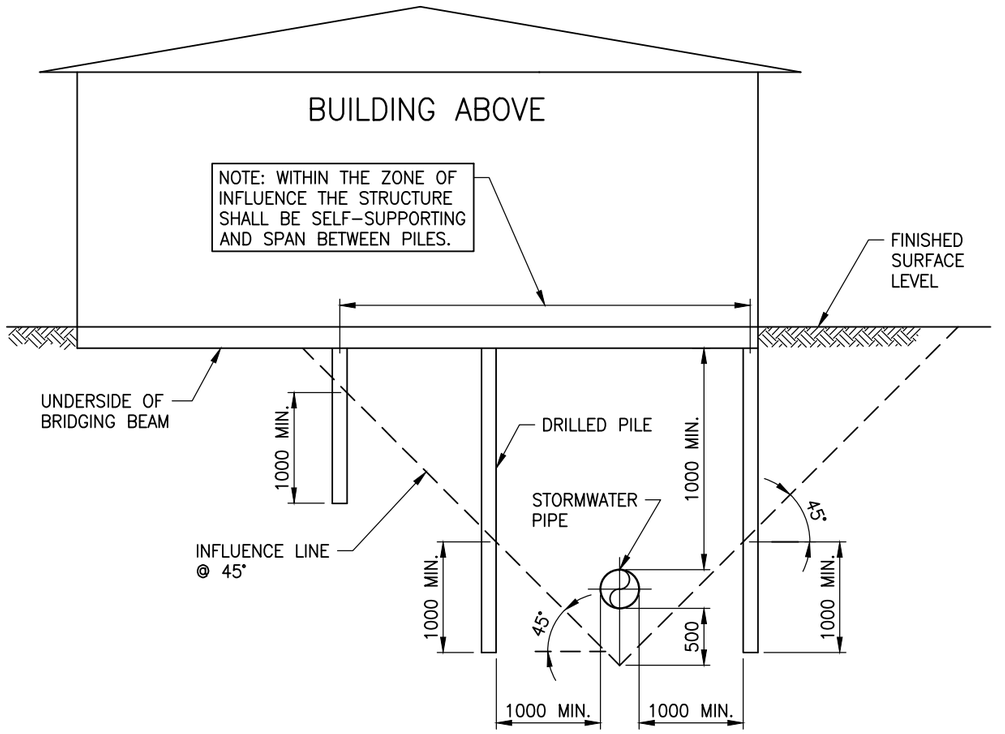
DRAWING NO: 2398-5-AB203 REV: A



BUILD CLOSE

"BUILD CLOSE" NOTES:

1. OUTSIDE ZONE OF INFLUENCE, NORMAL FOUNDATION REQUIREMENTS APPLY.
2. SPECIFIC APPROVAL IS REQUIRED FROM AUCKLAND COUNCIL IF BUILDING IS ADJACENT TO PIPES LARGER THAN 375mm INTERNAL DIAMETER, OR GREATER THAN 2.0m DEEP.
3. BUILDING SHALL GENERALLY BE OUTSIDE ALL OVERLAND FLOW PATHS AND FLOODPLAINS. SEE SECTION 4.3.5.6 AND 4.3.5.7 OF THE SWCoP FOR FURTHER DETAILS.
4. PILES SHALL BE CONSTRUCTED TO A DEPTH OF 1.0m BELOW INFLUENCE LINE.



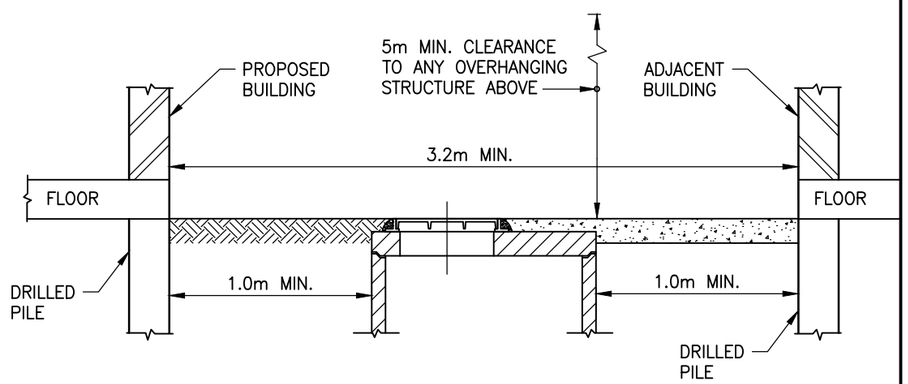
BUILD OVER

"BUILD OVER" NOTES:

1. OUTSIDE ZONE OF INFLUENCE, NORMAL FOUNDATION REQUIREMENTS APPLY.
2. THE DETAIL APPLIES TO STORMWATER PIPES 375mm NOMINAL DIAMETER OR LESS.
3. BRIDGING OVER PIPES LARGER THAN 375mm NOMINAL DIAMETER IS GENERALLY NOT ALLOWED.
4. PILES SHALL BE CONSTRUCTED TO A DEPTH OF 1.0m BELOW INFLUENCE LINE.
5. BRIDGING IS GENERALLY NOT ALLOWED OVER PIPES WHERE CLEAR VERTICAL SEPARATION DISTANCE FROM TOP OF PIPE TO UNDERSIDE OF BRIDGING BEAM IS LESS THAN 1.0m.

GENERAL NOTES:

1. THE INFORMATION ON THIS PAGE IS INTENDED TO SHOW EXAMPLES OF TYPICAL SCENARIOS AND SHALL BE USED FOR GENERAL GUIDANCE PURPOSES ONLY. SIGNIFICANT VARIATIONS ON A SITE-BY-SITE BASIS ARE TO BE EXPECTED AND IT IS IN NO WAY IMPLIED THAT MEETING ANY OF THESE REQUIREMENTS WILL GUARANTEE APPROVAL.
2. REQUIREMENTS FOR FOUNDATION DESIGN, ETC. APPLY TO BOTH SIDES OF THE PIPE.
3. NO DRIVEN PILES ARE PERMITTED WITHIN 10m OF BRICK STORMWATER STRUCTURES, OR WITHIN 5m OF ALL OTHER STORMWATER STRUCTURES.
4. SPECIFIC APPROVAL IS REQUIRED FROM AUCKLAND COUNCIL FOR DRIVEN PILES IN PARTIALLY DRILLED HOLES, WITHIN THE 5m-10m ZONE.
5. PILES THAT MAY BE REQUIRED TO RESIST HORIZONTAL FORCES WILL REQUIRE SPECIFIC DESIGN.
6. PILE/FOOTING LOCATION POINT MUST BE BELOW 45° "ZONE OF INFLUENCE".
7. ALL MANHOLES SHALL HAVE 24 HOURS UNOBSTRUCTED ACCESS.
8. MANHOLES IN BASEMENTS, OR IN LOCATIONS WHERE SUFFICIENT CLEARANCE IS UNAVAILABLE, ARE NOT PERMITTED.
9. ALL PIPE BUILDOVERS WILL REQUIRE APPROVAL BY AUCKLAND COUNCIL.
10. REFER TO SECTION 4.3.23 OF THE SWCoP FOR PIPE BUILDOVER REQUIREMENTS.
11. FOR MANHOLES GREATER THAN 4m DEEP OR LARGER THAN 1200mm DIA. SPECIFIC DESIGN (INCLUDING CLEARANCE REQUIREMENTS) IS REQUIRED.



MANHOLE CONSTRUCTION CLEARANCE

STORMWATER CODE OF PRACTICE
STANDARD DETAILS

REVISION: 2
REV DATE: 1 NOVEMBER 2015
CAD FILENAME: AC-STD-SW22.DWG

AUCKLAND COUNCIL

STORMWATER PIPE AND MANHOLE CONSTRUCTION CLEARANCE REQUIREMENTS

MANHOLES NEAR BUILDINGS AND BUILDING CLOSE OVER PIPES

ENVIRONMENTAL-SW

ORIGINAL SCALE A3
SCALE: N.T.S.
DRAWING SET SWCoP
SHEET 1 OF 1
DRAWING No. SW22
REV 2

PLOT DATE 12/8/2015 11:54 AM I:\AENW\Projects\AE04840 AC CoP Ch1\04 Deliverables\Drawings\AC-STD-SW22.dwg

SCOPE

CMW Geosciences (CMW) was engaged by Cabra Pukekohe JV to undertake detailed design of the proposed retaining walls at Belgium Road Stage 5, comprising cantilever timber pole / steel UC retaining walls, and one segmental / keystone / Allan Block retaining wall having maximum above ground retained heights of 3.1m. Wall types were not selected by CMW. The wall design cases are listed in the Design Loading section below.

REFERENCES

- CMW Geotechnical Investigation Report referenced AKS2021-0009AJ Rev 0 and dated 23 December 2021.
- McKenzie & Co Drawing set references, 3 Belguim Road, Pukekohe, Stage 5 Earthworks and Retaining Walls Plans, drawings 2398-5-200 to 292 (refer to ***Appendix B***)
- Boundaryline Fence details and PS1 (refer to ***Appendix E***)

GROUND MODEL

Ground model based on investigation data and experience on previous stages of the development. The walls will generally be founded in natural soils and supporting a combination of natural soils and engineering filling.

Ground Model Summary					
Geological Unit	**Depth Range (m)**	**γ (kN/m3)**	**c' (kPa)**	**Φ' (deg)**	**Su (kPa)**
Natural Soils or Engineered Fills	0 – 5	18	5	30	80
NOTE: γ = unit weight, c' = effective cohesion, ϕ' = effective friction angle, Su = undrained shear strength					

GENERAL ARRANGEMENT

General arrangement details and long sections of the walls have been provided in the McKensie & Co plan set appended.

DESIGN CRITERIA

The proposed retaining walls have been designed to comply with the following standards where applicable:

- NZ Building Code clause B1
- NZS1170:2004
- Auckland Council Code of Practice for Land Development and Subdivision
- Earthquake Geotechnical Engineering Practice: Module 1: Overview of the Guidelines
- Earthquake Geotechnical Engineering Practice: Module 6: Earthquake Resistant Retaining Wall Design
- NZS3603:1993

DESIGN METHODOLOGY

With the exception of Cases 7A, 8 & Case 9, we have used the CMW in-house spreadsheet based on

- Coulomb's Theory for calculating active earth pressure applied to laterally loaded piles
- Passive pressure resistance calculated in accordance with the NZ Building Code B1/VM4, using Broms Method for undrained soil conditions under both static and seismic loading.

For the design of Cases 7A and 8, we have modelled lateral pile reactions using the proprietary software Wallap v6.06 adopting trial wedge analyses for the active (or retained) side of the wall and the Burland-Potts method for the passive (or embedded) side of the wall under both static and seismic loading.

The segmental block retaining walls have been designed CMW in-house spreadsheet by checking the factor of safety against sliding and bearing capacity failure.

Safety Handrail / Barrier to be as per design completed by Boundary Line (refer to ***Appendix E***).

Given the requirement for a drainage curtain to be installed behind the retaining walls, hydrostatic pressures have not been considered in the retaining wall designs (refer to Appendix B retaining wall construction details).

Design life of 50 years based on an Importance Level of 2 in accordance with Table 3.2 of AS/NZS 1170.0.

DESIGN CASES SUMMARY

Retaining Wall Design Cases Assumptions						
Design Case	**Wall Type**	**Design Retained Height Range (m)**	**Maximum Surcharge Slope Angle**	**Maximum Toe Slope Angle**	**Dead Load Surcharge Load (kPa)**	**Live Load Surcharge Load (kPa)**
Case 1	Timber Pole	0 – 3.0	5º	5º	5	12
Case 2	Timber Pole	0 - 3.1	15º	5º	0	0
Case 3	Timber Pole	1.8 - 2.3	15º	5º	10	0
Case 4	Timber Pole	2.6 – 3.1	0º	5º	25	0
Case 5	Timber Pole	0 – 2.6	5º	5º	5	12
Case 6	Timber Pole	0 – 2.6	15º	5º	0	0
Case 7	Timber Pole	0 – 3.1	10º	5º	5	12
Case 7A	Steel UC (Bridging)	3.1m	10º	N/A Buried Service Line	5	12
Case 8	Timber Pole / Steel UC (Sewer Line Toe Bridging)	0 – 2.5m	0º	N/A Buried Service Line	10	0
Case 9	Keystone / Allan Block	0 – 1.5m	0º	5º	5	12

MATERIALS AND MAINTENANCE

- Handling and maintenance of proprietary products must be in accordance with the manufacturer's instructions.
- Compliance with clause B2 (durability) of the building code for specifically designed structural elements will be achieved for the 50-year design life as follows:

REV	DATE	DESCRIPTION	BY
A	16/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT:	**CABRA PUKEKOHE JV**	DRAWN:	EC	PROJECT NO:	AKS2021-0009AO
PROJECT:	**STAGE 5, PUKEKOHE EAST ROAD (FORMERLY 3 BELGIUM ROAD), PUKEKOHE**	CHECKED:	SG	DRAWING:	**01**
		REVISION:	0	SCALE:	**NA**
TITLE:	**DESIGN STATEMENT**	DATE:	18/11/22	SHEET SIZE:	**A3**

LEGEND:

- CASE 1
- CASE 2
- CASE 3
- CASE 4
- CASE 5
- CASE 6
- CASE 7
- CASE 7A
- CASE 8
- CASE 9

NOTES:

1. BASE PLAN ADAPTED FROM: AUCKLAND COUNCIL GIS

1:1000 0 10 20 30 40 50 m

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV		DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5		CHECKED: EC	DRAWING: 03
		REVISION: 1	SCALE: 1:1000
TITLE: RETAINING WALL LOCATION PLAN		DATE: 08/03/2023	SHEET: A3 L

C:\USERS\CMWAKSDESIGN\CMW GEOSCIENCES PTY LTD\SOUTH AUCKLAND OFFICE - AKS2021-0009 3 BELGIUM ROAD, PUKEKOHE\DRAWINGS\STAGE 5\AKS2021-0009 RETAINING WALL LAYOUT PLAN.DWG

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RETAINING WALL DESIGN REPORT REFERENCE: AKS2021-0009A0 REV 0.

SPECIFICATION OF TIMBER POLE OPTION

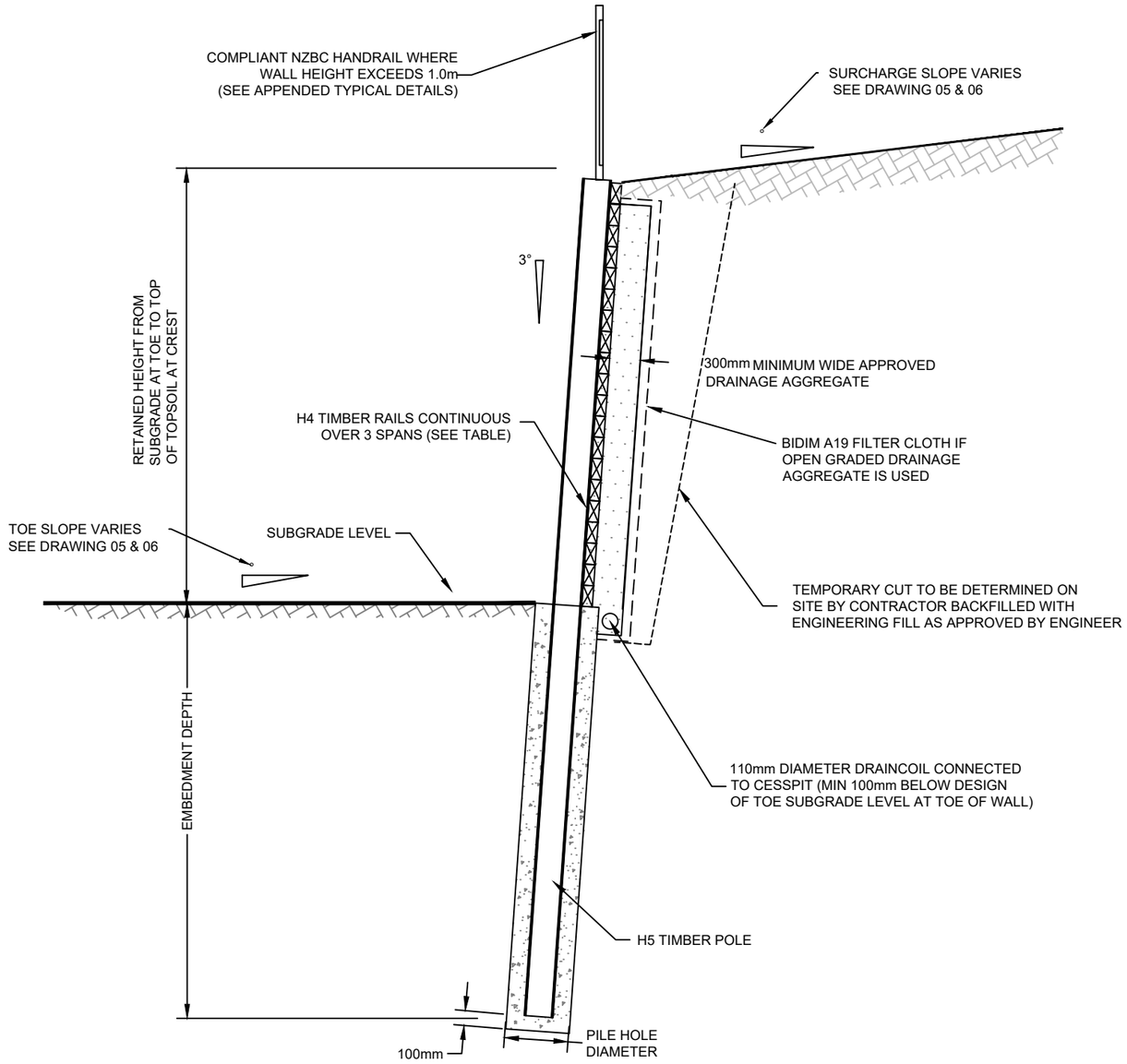
1. MATERIAL PROPERTIES

CONCRETE:	CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 20 MPa UNLESS OTHERWISE NOTED.
TIMBER RAILINGS:	H4 TREATED RADIATA PINE SG8 OR SG6 - SEE DESIGN CASE TABLE
RAILING FIXINGS:	GALVANISED NAILS
DRAIN COIL:	110mm DIAMETER
DRAINAGE AGGREGATE:	APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA (USE OF COMPOSITE DRAINAGE PRODUCTS OR POLYSTYRENE NOT APPROVED)

2. FOR LOCATION AND EXTENT OF THE RETAINING WALL REFER TO PROJECT ENGINEERING DRAWINGS. SET OUT LOCATIONS TO BE PROVIDED BY OTHERS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
3. MINIMUM CONCRETE COVER TO TIMBER POLES IS 50mm WITH A MINIMUM COVER OF 100mm AT THE PILE BASE. THIS WILL REQUIRE EITHER A PACKER OR POURING OF A PUNCH PAD TO ACHIEVE DESIGN. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
4. RAILS SHOULD BE CONTINUOUS OVER 3 SPANS WITH STAGGERED JOINTS. CUTTING OF TIMBERS SHALL BE AVOIDED WHEREVER POSSIBLE. TONGUE AND GROOVE BOARDS ARE NOT TO BE USED FOR RAILS. USE A NAIL WIDTH GAP BETWEEN RAILS.
5. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
6. IF CUTTING OF POLES OR RAILS IS NECESSARY THE EXPOSED SURFACES SHALL BE FLOODED WITH A COPPER NAPTHENATE TYPE WOOD PRESERVATIVE.
7. THE MAXIMUM RETAINING HEIGHT, TOE SLOPE AND SURCHARGE SLOPE SHALL BE AS SPECIFIED ON THE DESIGN AND SHALL NOT BE EXCEEDED UNLESS APPROVED BY THE DESIGN ENGINEER IN WRITING. NOTE THAT RETAINED HEIGHT SHOWN ON THESE CMW DRAWINGS IGNORES TOPSOIL DEPTH AT THE TOE OF WALL.
8. THE EXTENT OF EXCAVATION REQUIRED SHALL BE MARKED OUT ON THE GROUND HAVING REGARD TO THE POSITIONS OF POLES, WORKING SPACE FOR CONSTRUCTION, BACKFILL AND DRAINAGE PROVISIONS.
9. ALL PILE HOLES TO BE AUGERED AND DRILLING SPOIL DISPOSED OF AWAY FROM THE RETAINING WALL.
10. A PERFORATED SUBSOIL DRAIN WITHOUT FILTER SOCK SHALL BE LAID AND SURROUNDED IN APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA WITH INVERT BELOW DESIGN TOE SUBGRADE LEVELS CONNECTED TO A FREE OUTLET AT A POINT OF SAFE DISCHARGE OR CONNECTED TO STORMWATER SYSTEM.
11. THE CONTRACTOR SHALL REFER TO THE DESIGN ENGINEER AS SOON AS POSSIBLE FOR FURTHER INSTRUCTION SHOULD ANY UNFORESEEN CIRCUMSTANCE OR ABNORMAL SITE CONDITION BE ENCOUNTERED DURING CONSTRUCTION.
12. A CUT-OFF DRAINAGE CHANNEL SHOULD BE INSTALLED ABOVE THE WALL.
13. WHERE EXCAVATIONS ARE UNDERTAKEN MORE THAN A FEW DAYS IN ADVANCE OF WALL CONSTRUCTION, THE CUT FACE MUST BE COVERED WITH POLYTHENE TO PREVENT IT DRYING OUT AND CRACKING, ESPECIALLY WHERE EXPANSIVE CLAY SOILS ARE PRESENT. SIMILARLY DURING PERIODS OF WET WEATHER THE EXCAVATION FACE SHOULD BE PROTECTED WITH POLYTHENE AND SURFACE WATER DIRECTED AWAY FROM THE CREST AND TOE OF THE EXCAVATION.
14. CONTRACTOR IS RESPONSIBLE FOR PILES EXCAVATIONS ARE STAGED SO THAT EXCAVATED FACES ARE NOT LEFT UNSUPPORTED FOR ANY SIGNIFICANT LENGTH OF TIME. THIS IS ESPECIALLY CRITICAL FOR BOUNDARY CUT FACES.

INSPECTION HOLD POINTS:

1. GROUND CONDITIONS IN PILE HOLES - PRIOR TO INSERTING POLES.
2. MEASUREMENT OF POLE AND RAIL SIZES AND CONFIRMATION OF TREATMENT.
3. DRAINCOIL PLACEMENT - PRIOR TO RAILING UP.
4. DRAINAGE AGGREGATE QUALITY AND RAILING - PRIOR TO BACKFILL WITH DRAINAGE AGGREGATE.
5. FINAL INSPECTION AND DRAINAGE CONNECTIONS.



TIMBER POLE RETAINING WALL DETAIL

NOTES

1. PROPERTY BOUNDARY LOCATION MUST BE CONFIRMED PRIOR TO COMMENCEMENT OF ANY EXCAVATIONS.
2. DESIGN CASES 1, 5, 6 & 7 THERE ARE NO KNOWN EXISITNG STRUCTURES WITHIN CLOSE PROXIMITY TO THE PROPOSED WALLS. TEMPORARY BATTERS MUST NOT EXTEND ACROSS BOUNDARY/S UNLESS CONSENTED AND/OR APPROVED BY COUNCIL & NEIGHBOURING LANDOWNER.
3. DESIGN CASE 2 & 3 (RW15 & RE23) WILL REQUIRE STAGED EXCAVATION & / OR TOP-DOWN CONSTRUCTION GIVEN OVERALL DEPTH OF CUT IN THE ORDER OF 4.0m.
4. DESIGN CASE 4 (RW3) WILL REQUIRE STAGED EXCAVATION & / OR TOP-DOWN CONSTRUCTION GIVEN PRESENCE OF EXISTING 1.0m RETAINING WALL.
5. METHODOLOGY TO BE CONFIRMED IN WRITING WITH GEOTECHNICAL ENGINEER & CONTRACTOR PRIOR TO ANY EXCAVATIONS COMMENCING.

REV	DATE	DESCRIPTION	BY
A	18/09/2022	FOR INTERNAL REVIEW	EC
0	18/09/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV	DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD, PUKEKOHE STAGE 5	CHECKED: EC	DRAWING: 04
	REVISION: 0	SCALE: NTS
TITLE: TIMBER POLE RETAINING WALL DESIGN (CASE 1,2,3,4,5,6,7)	DATE: 18/12/2022	SHEET: A3

\\CMWGEOSCIENCES.SHAREPOINT.COM@SSL\DAVWWWROOT\SITES\TICHSTEAM\SHARED DOCUMENTS\SOUTH AUCKLAND PROJECT DOCUMENTS\2021\AKS2021-0009 3 BELGIUM ROAD, PUKEKOHE\DRAWINGS\STAGE 5\AKS-0009 RETAINING WALL DESIGN.DWG

Timber Pole Retaining Wall Design - Case 1

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 5 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 5 kPa
Live Load Surcharge UDL (Q): 12 kPa

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
3.00	1.2	375	425	575	625	3.3	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.75	1.2	350	375	550	575	3.0	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.50	1.2	325	350	525	550	2.8	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.25	1.2	300	325	475	500	2.5	2 No. 50mm x 150mm	1 No. 50mm x 150mm
2.00	1.2	250	275	425	450	2.2	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.75	1.2	225	250	400	425	1.9	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.50	1.2	175	200	350	375	1.5	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.25	1.2	150	175	325	350	1.3	1 No. 50mm x 150mm	1 No. 50mm x 150mm
1.00	1.2	150	150	300	300	1.0	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.75	1.2	150	150	300	325	1.1	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.50	1.2	150	150	300	300	1.0	1 No. 50mm x 150mm	1 No. 50mm x 150mm

Timber Pole Retaining Wall Design - Case 2

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 15 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 0 kPa
Live Load Surcharge UDL (Q): 0 kPa

Note - Wall is offset from boundary by 2.5m and therefore outside of boundary surcharge influence.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
3.10	1.2	375	400	575	600	3.2	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.85	1.2	325	375	525	575	3.0	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.60	1.2	300	350	500	550	2.7	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.35	1.2	275	300	450	475	2.4	2 No. 50mm x 150mm	1 No. 50mm x 150mm
2.10	1.2	250	275	425	450	2.1	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.85	1.2	200	225	375	400	1.9	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.60	1.2	175	200	350	375	1.6	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.35	1.2	150	150	325	325	1.4	1 No. 50mm x 150mm	1 No. 50mm x 150mm
1.10	1.2	150	150	300	300	1.1	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.85	1.2	150	150	300	325	1.1	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.60	1.2	150	150	275	300	0.9	1 No. 50mm x 150mm	1 No. 50mm x 150mm

Timber Pole Retaining Wall Design - Case 3

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 15 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 10 kPa
Live Load Surcharge UDL (Q): 0 kPa

Note - Wall is offset from boundary by 2.5m with existing 1m high retaining wall along boundary - applied dead load 10 kPa - see appended calculation sheet.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
2.30	1.2	325	350	525	550	2.8	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.05	1.2	275	325	450	500	2.5	2 No. 50mm x 150mm	2 No. 50mm x 150mm
1.80	1.2	250	275	425	450	2.2	2 No. 50mm x 150mm	1 No. 50mm x 150mm

Timber Pole Retaining Wall Design - Case 4

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 0 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 25 kPa
Live Load Surcharge UDL (Q): 0 kPa

Note - Existing 1m high retaining wall along boundary - applied dead load 25 kPa - construction methodology to be confirmed with contractor prior to any construction to avoid undermining this wall.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
3.1	1.0	400	450	600	650	3.8	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.9	1.2	400	450	600	650	3.7	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.6	1.2	375	425	575	625	3.4	2 No. 50mm x 150mm	2 No. 50mm x 150mm

REV	DATE	DESCRIPTION	BY
A	18/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV		DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD, PUKEKOHE STAGE 5		CHECKED: EC	DRAWING: 05
		REVISION: 0	SCALE: NTS
TITLE: TIMBER POLE RETAINING WALL SUMMARY TABLES (CASE 1,2,3,4)		DATE: 18/12/2022	SHEET: A3

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Timber Pole Retaining Wall Design - Case 5

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 18 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 5 kPa
Live Load Surcharge UDL (Q): 12 kPa

Note - Wall is directly below existing boundary with 15 degree slope above.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
2.60	1.2	350	400	550	600	3.2	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.40	1.2	325	375	525	575	3.0	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.20	1.2	300	350	475	525	2.8	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.00	1.2	275	325	450	500	2.5	2 No. 50mm x 150mm	2 No. 50mm x 150mm
1.80	1.2	250	275	425	450	2.2	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.60	1.2	225	250	400	425	2.0	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.40	1.2	200	225	375	400	1.7	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.20	1.2	175	200	350	375	1.5	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.00	1.2	175	175	350	350	1.4	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.80	1.2	175	200	350	375	1.4	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.60	1.2	150	150	325	325	1.2	1 No. 50mm x 150mm	1 No. 50mm x 150mm

Timber Pole Retaining Wall Design - Case 6

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 25 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 0 kPa
Live Load Surcharge UDL (Q): 0 kPa

Note - Wall is directly below existing boundary with 25 degree batter slope above.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
2.60	1.2	350	375	550	575	3.0	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.35	1.2	325	350	525	550	2.8	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.10	1.2	275	325	450	500	2.5	2 No. 50mm x 150mm	2 No. 50mm x 150mm
1.85	1.2	250	275	425	450	2.2	2 No. 50mm x 150mm	2 No. 50mm x 150mm
1.60	1.2	225	250	400	425	2.0	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.35	1.2	175	200	350	375	1.6	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.10	1.2	150	175	325	350	1.3	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.85	1.2	150	150	300	325	1.1	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.60	1.2	150	150	275	300	0.9	1 No. 50mm x 150mm	1 No. 50mm x 150mm

Timber Pole Retaining Wall Design - Case 7

Wall inclination (B): 3 deg
Upslope Gradient gradient (i): 10 deg
Downslope Gradient (i): 5 deg
Overdig Allowance: 0 m
Dead Load Surcharge UDL (G): 5 kPa
Live Load Surcharge UDL (Q): 12 kPa

Note - Wall is directly below existing boundary with 10 degree slope above.

Soil density (γ): 18 kN/m3
Friction Angle (ϕ'): 30 deg
Undrained shear strength (Su): 80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
3.1	1.2	400	450	600	650	3.6	3 No. 50mm x 150mm	2 No. 50mm x 150mm
2.9	1.2	375	400	575	600	3.2	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.6	1.2	350	375	550	575	3	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.4	1.2	300	350	500	550	2.7	2 No. 50mm x 150mm	2 No. 50mm x 150mm
2.1	1.2	275	300	450	475	2.4	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.9	1.2	250	275	425	450	2.1	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.6	1.2	225	250	400	425	1.9	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.4	1.2	200	225	375	400	1.6	2 No. 50mm x 150mm	1 No. 50mm x 150mm
1.1	1.2	175	175	350	350	1.4	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.9	1.2	175	175	350	350	1.4	1 No. 50mm x 150mm	1 No. 50mm x 150mm
0.6	1.2	150	150	300	325	1.1	1 No. 50mm x 150mm	1 No. 50mm x 150mm

REV	DATE	DESCRIPTION	BY
A	18/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV		DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD, PUKEKOHE STAGE 5		CHECKED: EC	DRAWING: 06
		REVISION: 0	SCALE: NTS
TITLE: TIMBER POLE RETAINING WALL SUMMARY TABLES (CASE 5,6,7)		DATE: 18/12/2022	SHEET: A3

\\CMWGEOSCIENCES.SHAREPOINT.COM@SSL\DAVWWWROOT\SITES\TICHSTEAM\SHARED DOCUMENTS\SOUTH AUCKLAND PROJECT DOCUMENTS\2021\AKS2021-0009 3 BELGIUM ROAD, PUKEKOHE\DRAWINGS\STAGE 5\AKS-0009 RETAINING WALL DESIGN.DWG

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RETAINING WALL DESIGN REPORT REFERENCE: AKS2021-0009A0 REV 0.

SPECIFICATION OF STEEL POST OPTION

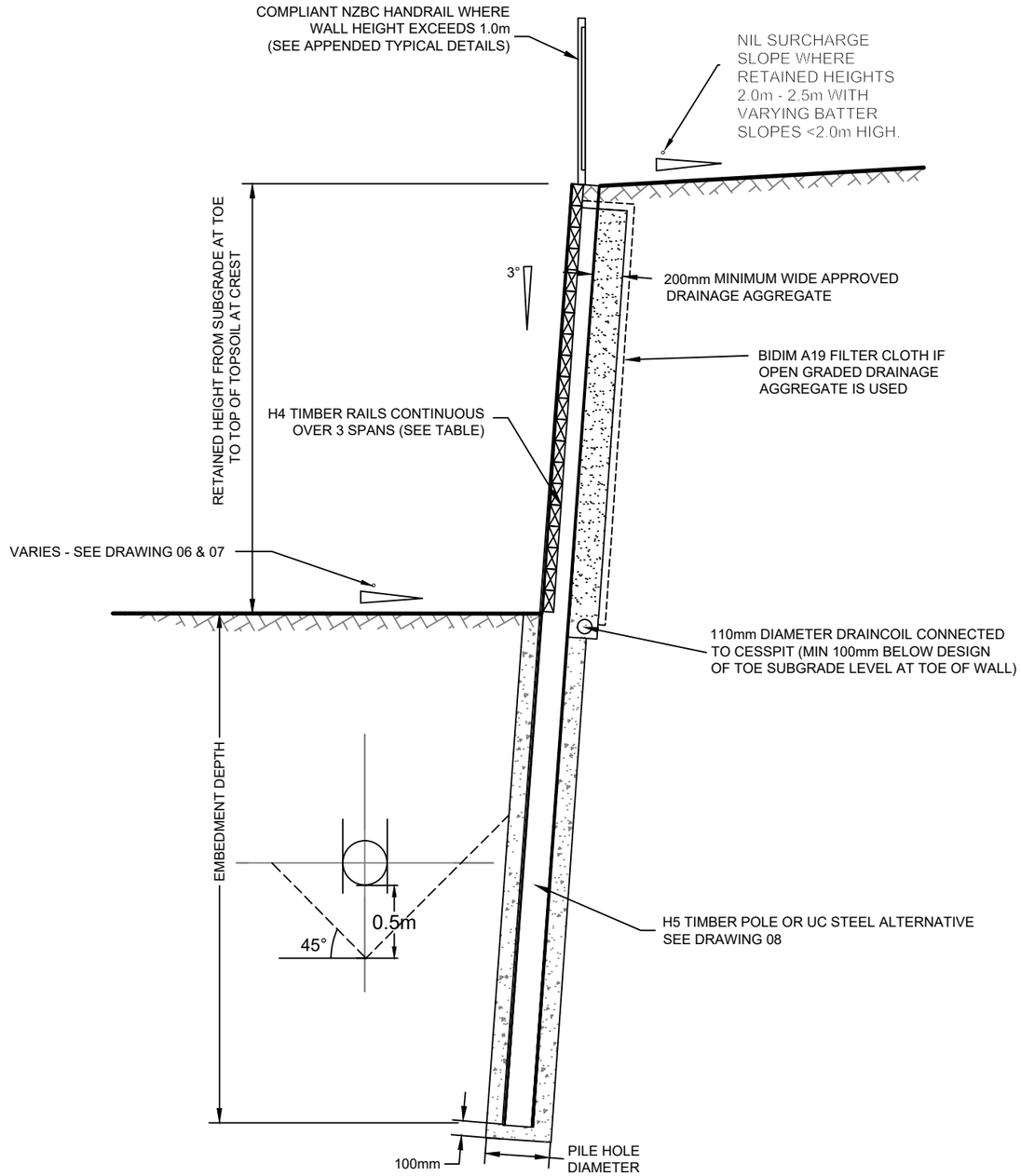
1. MATERIAL PROPERTIES

CONCRETE:	CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 20 MPa UNLESS OTHERWISE NOTED.
STEEL POLES:	MINIMUM G300 STRUCTURAL STEEL. HOT DIPPED GALVANISED IN ACCORDANCE WITH AS/NZS4680.2006. MINIMUM COATING MASS 900g/m^3. GALVANISE TO 300mm BGI
TIMBER RAILINGS:	H4 TREATED RADIATA PINE SG8 OR SG6 - SEE DESIGN CASE TABLE
RAILING FIXINGS:	GALVANISED NAILS
DRAIN COIL:	110mm DIAMETER
DRAINAGE AGGREGATE:	APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA (USE OF COMPOSITE DRAINAGE PRODUCTS OR POLYSTYRENE NOT APPROVED)

2. FOR LOCATION AND EXTENT OF THE RETAINING WALL REFER TO PROJECT ENGINEERING DRAWINGS. SET OUT LOCATIONS TO BE PROVIDED BY OTHERS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
3. MINIMUM CONCRETE COVER TO STEEL POST IS 75mm OR 50mm FOR TIMBER POLE WITH A MINIMUM COVER OF 100mm AT THE PILE BASE. THIS WILL REQUIRE EITHER A PACKER OR POURING OF A PUNCH PAD TO ACHIEVE DESIGN. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
4. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
5. CUTTING OF STEEL POST SHALL BE AVOIDED WHEREVER POSSIBLE. TONGUE AND GROOVE BOARDS ARE NOT TO BE USED FOR RAILS. USE A NAIL WIDTH GAP BETWEEN RAILS.
6. IF CUTTING OF TIMBER POLES / RAILS IS NECESSARY THE EXPOSED SURFACES SHALL BE FLOODED WITH A COPPER NAPTHENATE TYPE WOOD PRESERVATIVE.
7. THE MAXIMUM RETAINING HEIGHT, TOE SLOPE AND SURCHARGE SLOPE SHALL BE AS SPECIFIED ON THE DESIGN AND SHALL NOT BE EXCEEDED UNLESS APPROVED BY THE DESIGN ENGINEER IN WRITING. NOTE THAT RETAINED HEIGHT SHOWN ON THESE CMW DRAWINGS IGNORES TOPSOIL DEPTH AT THE TOE OF WALL.
8. THE EXTENT OF EXCAVATION REQUIRED SHALL BE MARKED OUT ON THE GROUND HAVING REGARD TO THE POSITIONS OF POLES, WORKING SPACE FOR CONSTRUCTION, BACKFILL AND DRAINAGE PROVISIONS.
9. ALL PILE HOLES TO BE AUGERED AND DRILLING SPOIL DISPOSED OF AWAY FROM THE RETAINING WALL.
10. A PERFORATED SUBSOIL DRAIN WITHOUT FILTER SOCK SHALL BE LAID AND SURROUNDED IN APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA WITH INVERT BELOW DESIGN TOE SUBGRADE LEVELS CONNECTED TO A FREE OUTLET AT A POINT OF SAFE DISCHARGE OR CONNECTED TO STORMWATER SYSTEM.
11. THE CONTRACTOR SHALL REFER TO THE DESIGN ENGINEER AS SOON AS POSSIBLE FOR FURTHER INSTRUCTION SHOULD ANY UNFORESEEN CIRCUMSTANCE OR ABNORMAL SITE CONDITION BE ENCOUNTERED DURING CONSTRUCTION.
12. A CUT-OFF DRAINAGE CHANNEL SHOULD BE INSTALLED ABOVE THE WALL.
13. WHERE EXCAVATIONS ARE UNDERTAKEN MORE THAN A FEW DAYS IN ADVANCE OF WALL CONSTRUCTION, THE CUT FACE MUST BE COVERED WITH POLYTHENE TO PREVENT IT DRYING OUT AND CRACKING, ESPECIALLY WHERE EXPANSIVE CLAY SOILS ARE PRESENT. SIMILARLY DURING PERIODS OF WET WEATHER THE EXCAVATION FACE SHOULD BE PROTECTED WITH POLYTHENE AND SURFACE WATER DIRECTED AWAY FROM THE CREST AND TOE OF THE EXCAVATION.
14. CONTRACTOR IS RESPONSIBLE FOR ENSURING EXCAVATIONS ARE STAGED SO THAT EXCAVATED FACES ARE NOT LEFT UNSUPPORTED FOR ANY SIGNIFICANT LENGTH OF TIME. THIS IS ESPECIALLY CRITICAL FOR BOUNDARY CUT FACES.

INSPECTION HOLD POINTS:

1. GROUND CONDITIONS IN PILE HOLES - PRIOR TO INSERTING POLES / PILES.
2. MEASUREMENT OF POLE / PILES AND RAIL SIZES AND CONFIRMATION OF TREATMENT.
3. DRAINCOIL PLACEMENT - PRIOR TO RAILING UP.
4. DRAINAGE AGGREGATE QUALITY AND RAILING - PRIOR TO BACKFILL WITH DRAINAGE AGGREGATE.
5. FINAL INSPECTION AND DRAINAGE CONNECTIONS.



RETAINING WALL 9 -DESIGN CASE 8 - TIMBER POLE OR STEEL UC

REV	DATE	DESCRIPTION	BY
A	18/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV		DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5		CHECKED: EC	DRAWING: 07
		REVISION: 0	SCALE: NTS
TITLE: TIMBER / UC POLE RETAINING WALL DESIGN		DATE: 18/12/2022	SHEET: A3

\\CMWGEOSCIENCES.SHAREPOINT.COM@SSL\DAVWWWROOT\SITES\TICHSTEAM\SHARED DOCUMENTS\SOUTH AUCKLAND PROJECT DOCUMENTS\2021\AKS2021-0009 3 BELGIUM ROAD, PUKEKOHE\DRAWINGS\STAGE 5\AKS-0009 RETAINING WALL DESIGN.DWG

Timber Pole Retaining Wall Design - Case 8

Wall inclination (B):	3 deg	Note - Existing sewer line running below and parallel to the RW9.	
Upslope Gradient gradient (i):	VARIES deg		
Downslope Gradient (i):	15 deg		
Overdig Allowance:	0 m	Soil density (γ):	18 kN/m3
Dead Load Surcharge UDL (G):	10 kPa	Friction Angle (ϕ'):	30 deg
Live Load Surcharge UDL (Q):	0 kPa	Undrained shear strength (Su):	80 kPa

Retained Height (m)	Upright Spacing (m)	HD Pole Size (SED)	ND Pole Size (SED)	HD Hole Diameter (mm)	ND Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
2.5	1.0	425	N/A	600	N/A	8.9	2 No. 50mm x 150mm	2 No. 50mm x 150mm
0 - 2.0	1.0	400	N/A	600	N/A	8.4	2 No. 50mm x 150mm	1 No. 50mm x 150mm

Alternative design using UC steel sections

Retained Height (m)	Upright Spacing (m)	UC Steel Size (UC)	Hole Diameter (mm)	Minimum Embedment Depth (m)	SG6 Timber Rail Lagging	SG8 Timber Rail Lagging
2.5	1.0	250UC72	500	8.9	2 No. 50mm x 150mm	2 No. 50mm x 150mm
0 - 2.0	1.0	250UC59	500	8.4	2 No. 50mm x 150mm	1 No. 50mm x 150mm

REV	DATE	DESCRIPTION	BY
A	18/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV	DRAWN: JS	PROJECT: AKS2021-0009
PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5	CHECKED: EC	DRAWING: 08
	REVISION: 0	SCALE: NTS
TITLE: UC / TIMBER POLE RETAINING WALL SUMMARY TABLES (CASE 8)	DATE: 17/12/2022	SHEET: A3

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RETAINING WALL DESIGN REPORT REFERENCE: AKS2021-0009A0 REV 0.

SPECIFICATION OF STEEL POST OPTION

1. MATERIAL PROPERTIES

CONCRETE:	CHARACTERISTIC COMPRESSIVE STRENGTH F'C = 20 MPa UNLESS OTHERWISE NOTED.
STEEL POLES:	MINIMUM G300 STRUCTURAL STEEL. HOT DIPPED GALVANISED IN ACCORDANCE WITH AS/NZS4680.2006. MINIMUM COATING MASS 900g/m^3. GALVANISE TO 300mm BGI
TIMBER RAILINGS:	H4 TREATED RADIATA PINE
RAILING FIXINGS:	GALVANISED NAILS
DRAIN COIL:	110mm DIAMETER
DRAINAGE AGGREGATE:	APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA (USE OF COMPOSITE DRAINAGE PRODUCTS OR POLYSTYRENE NOT APPROVED)

2. FOR LOCATION AND EXTENT OF THE RETAINING WALL REFER TO PROJECT ENGINEERING DRAWINGS. SET OUT LOCATIONS TO BE PROVIDED BY OTHERS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
3. MINIMUM CONCRETE COVER TO STEEL POST IS 75mm WITH A MINIMUM COVER OF 100mm AT THE PILE BASE. THIS WILL REQUIRE EITHER A PACKER OR POURING OF A PUNCH PAD TO ACHIEVE DESIGN. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
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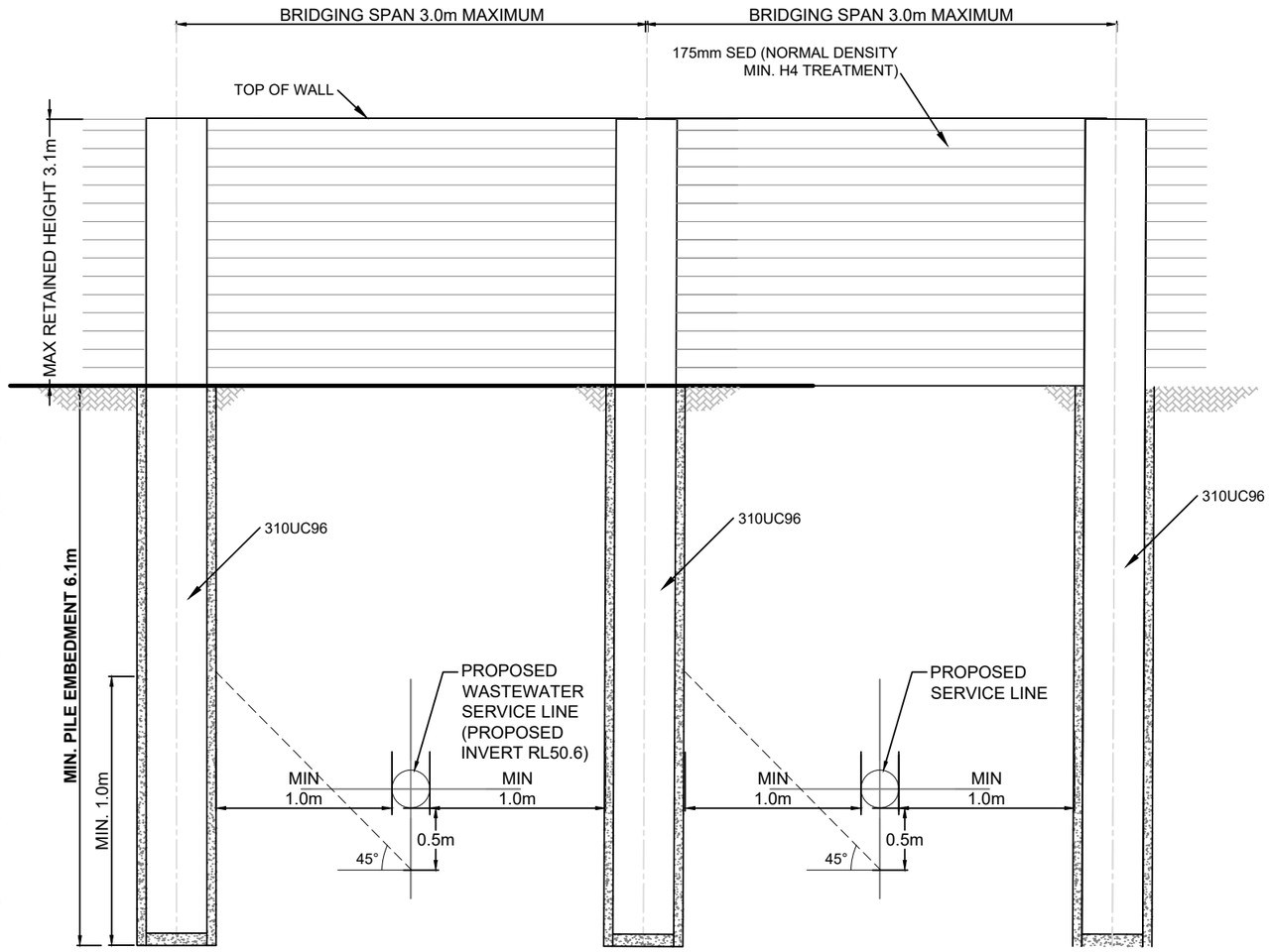
5. POLE HOLE DIAMETER MAY ONLY BE VARIED BY DESIGNER IN WRITING.
6. IF CUTTING OF RAILS IS NECESSARY THE EXPOSED SURFACES SHALL BE FLOODED WITH A COPPER NAPTHENATE TYPE WOOD PRESERVATIVE.
7. THE MAXIMUM RETAINING HEIGHT, TOE SLOPE AND SURCHARGE SLOPE SHALL BE AS SPECIFIED ON THE DESIGN AND SHALL NOT BE EXCEEDED UNLESS APPROVED BY THE DESIGN ENGINEER IN WRITING. NOTE THAT RETAINED HEIGHT SHOWN ON THESE CMW DRAWINGS IGNORES TOPSOIL DEPTH AT THE TOE OF WALL.
8. THE EXTENT OF EXCAVATION REQUIRED SHALL BE MARKED OUT ON THE GROUND HAVING REGARD TO THE POSITIONS OF POLES, WORKING SPACE FOR CONSTRUCTION, BACKFILL AND DRAINAGE PROVISIONS.
9. ALL PILE HOLES TO BE AUGERED AND DRILLING SPOIL DISPOSED OF AWAY FROM THE RETAINING WALL.
10. A PERFORATED SUBSOIL DRAIN WITHOUT FILTER SOCK SHALL BE LAID AND SURROUNDED IN APPROVED DRAINAGE-GRADED AGGREGATE OR SCORIA WITH INVERT BELOW DESIGN TOE SUBGRADE LEVELS CONNECTED TO A FREE OUTLET AT A POINT OF SAFE DISCHARGE OR CONNECTED TO STORMWATER SYSTEM.
11. THE CONTRACTOR SHALL REFER TO THE DESIGN ENGINEER AS SOON AS POSSIBLE FOR FURTHER INSTRUCTION SHOULD ANY UNFORESEEN CIRCUMSTANCE OR ABNORMAL SITE CONDITION BE ENCOUNTERED DURING CONSTRUCTION.
12. A CUT-OFF DRAINAGE CHANNEL SHOULD BE INSTALLED ABOVE THE WALL.
13. WHERE EXCAVATIONS ARE UNDERTAKEN MORE THAN A FEW DAYS IN ADVANCE OF WALL CONSTRUCTION, THE CUT FACE MUST BE COVERED WITH POLYTHENE TO PREVENT IT DRYING OUT AND CRACKING, ESPECIALLY WHERE EXPANSIVE CLAY SOILS ARE PRESENT. SIMILARLY DURING PERIODS OF WET WEATHER THE EXCAVATION FACE SHOULD BE PROTECTED WITH POLYTHENE AND SURFACE WATER DIRECTED AWAY FROM THE CREST AND TOE OF THE EXCAVATION.
14. CONTRACTOR IS RESPONSIBLE FOR ENSURING EXCAVATIONS ARE STAGED SO THAT EXCAVATED FACES ARE NOT LEFT UNSUPPORTED FOR ANY SIGNIFICANT LENGTH OF TIME. THIS IS ESPECIALLY CRITICAL FOR BOUNDARY CUT FACES.



INSPECTION HOLD POINTS:

1. GROUND CONDITIONS IN PILE HOLES - PRIOR TO INSERTING PILES.
2. MEASUREMENT OF PILES AND RAIL SIZES AND CONFIRMATION OF TREATMENT.
3. DRAINCOIL PLACEMENT - PRIOR TO RAILING UP.
4. DRAINAGE AGGREGATE QUALITY AND RAILING - PRIOR TO BACKFILL WITH DRAINAGE AGGREGATE.
5. FINAL INSPECTION AND DRAINAGE CONNECTIONS.

BRIDGING DETAILS FOR RETAINING WALL 2-DESIGN CASE 7A

REV	DATE	DESCRIPTION	BY
A	18/11/2022	FOR INTERNAL REVIEW	EC
0	18/11/2022	FOR FINAL ISSUE FOR BUILDING CONSENT	EC

CMW Geosciences

CLIENT: CABRA PUKEKOHE JV	DRAWN: JS	PROJECT No: AKS2021-0009	
PROJECT: 3 BELGIUM ROAD, PUKEKOHE STAGE 5	CHECKED: EC	DRAWING: 09	
	REVISION: 0	SCALE: NTS	
TITLE: UC POLE BRIDGING DETAILS	DATE: 18/12/2022	SHEET: A3 L	

\\CMWGEOSCIENCES.SHAREPOINT.COM@SSL\DAVWWWROOT\SITES\TICHSTEAM\SHARED DOCUMENTS\SOUTH AUCKLAND PROJECT DOCUMENTS\2021\AKS2021-0009 3 BELGIUM ROAD, PUKEKOHE\DRAWINGS\STAGE 5\AKS2021-0009 TYPICAL BRIDGING DETAILS.DWG

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APPENDIX D
Field Test Data

152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Test results indicated as not accredited are outside the scope of the laboratory's accreditation

Signatory - Zach Hooton

Job Name : **Belgium Road Stage 5**
Client : CMW Geosciences Ltd
Address : PO Box 300206
Albany, Auckland 0754
Attention : Andrew Linton

Project No. : 24 0029 17
Date of Order : 10.03.24

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m^3)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m^3)	SOLID DENSITY (t/m^3) Assumed	AIR VOIDS %	FIELD SHEAR STRENGTH in kPa				RL (m)	EASTING	NORTHING	NOTES
1	AS	28.01.22	See Plan	150	1.79	36.5	1.31	2.7	3.5	222++	222++	222++	222++	-	-	-	Lot 127
2	AAA	10.02.22	See Plan	150	1.72	39.8	1.23	2.7	5.7	204	202	212+	212+	-	-	-	Lot 111
3	AAA	01.04.22	See Plan	150	1.66	51.1	1.10	2.7	3.5	212+	212+	212+	170	-	-	-	Lot 99
4	AS	05.04.22	See Plan	150	1.67	50.5	1.11	2.7	3.1	222++	222++	222++	222++	-	-	-	Lot 99
5	AS	05.04.22	See Plan	150	1.64	54.0	1.06	2.7	3.3	222++	222++	222++	222++	-	-	-	Lot 110
6	AS	11.04.22	See Plan	150	1.72	46.1	1.18	2.7	2.1	222++	222++	222++	222++	-	-	-	Lot 111
7	AS	11.04.22	See Plan	150	1.69	48.6	1.14	2.7	2.4	159	175	222+	222+	-	-	-	Lot 110
8	DT	18.01.23	See Plan	150	1.91	36.1	1.40	2.7	0.0	214++	214++	214++	214++	-	-	-	Lot 97
9	DT	18.01.23	See Plan	150	1.82	35.0	1.34	2.7	3.2	214++	214++	214++	214++	-	-	-	Lot 129
10	DT	18.01.23	See Plan	150	1.81	44.7	1.25	2.7	0.0	214++	214++	214++	214++	-	-	-	Lot 117
11	DT	18.01.23	See Plan	150	1.69	41.7	1.19	2.7	6.3	214++	214++	214++	214++	-	-	-	Lot 119
12	JR	06.04.23	See Plan	150	1.82	38.6	1.31	2.7	0.8	177+	177++	177++	177++	48.531	413975.51	765031.06	
13	JR	06.04.23	See Plan	150	1.76	39.5	1.26	2.7	3.7	177++	177++	177++	177++	47.846	413965.65	765021.43	
14	JR	06.04.23	See Plan	150	1.72	44.3	1.19	2.7	2.9	114	125	136	150	47.021	413950.10	765021.20	
15	JR	06.04.23	See Plan	150	1.62	38.6	1.17	2.7	11.9	170++	170++	170++	170++	47.172	413961.54	765015.67	
16	KC	13.04.23	See Plan	150	1.74	43.0	1.22	2.7	2.7	140	153	152	177++	-	-	-	
17	KC	17.04.23	See Plan	150	1.79	48.9	1.20	2.7	0.0	122	122	124	128	-	-	-	-
18	KC	17.04.23	See Plan	150	1.79	38.4	1.29	2.7	2.5	138	153	131	134	-	-	-	-
19	KC	19.04.23	See Plan	150	1.77	36.2	1.30	2.7	4.9	177++	177++	177++	177++	-	-	-	Waste Water Fill
20	KC	19.04.23	See Plan	150	1.81	35.1	1.34	2.7	3.2	177++	177++	177++	177++	-	-	-	Lot 128
21	KC	20.04.23	See Plan	150	1.79	40.5	1.27	2.7	1.4	146	155	153	167	-	-	-	Waste water MH - Lot 128 - finish level
22	KC	20.04.23	See Plan	150	1.87	37.0	1.37	2.7	0.0	177++	177++	167	153	-	-	-	Waste water MH - Lot 128 - finish level
23	JR	21.04.23	See Plan	150	1.69	53.1	1.11	2.7	0.2	128	115	125	138	-	-	-	Lot 110
24	JR	26.04.23	See Plan	150	1.77	47.2	1.20	2.7	0.0	128	98	91	101	-	-	-	
25	JR	26.04.23	See Plan	150	1.68	55.8	1.08	2.7	0.0	132	136	136	193	-	-	-	
26	DT	31.08.23	See Plan	150	1.81	44.6	1.25	2.7	0.0	198	182	182	171	46.984	413954.58	765047.64	
27	DT	01.09.23	See Plan	150	1.77	44.3	1.23	2.7	0.4	198	182	171	162	48.377	413953.75	765053.85	
28	DT	01.09.23	See Plan	150	1.77	44.9	1.22	2.7	0.0	158	158	162	146	48.534	413961.74	765047.80	
29	JR	14.09.23	See Plan	150	1.78	40.8	1.26	2.7	1.7	228+	228++	228++	228++	48.850	413955.13	765048.15	Roadway

Checked By: ZH
Date: 17.12.24

NT = Not Tested

152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : **Belgium Road Stage 5**
Client : CMW Geosciences Ltd
Address : PO Box 300206
Albany, Auckland 0754
Attention : Andrew Linton

Project No. : 24 0029 17
Date of Order : 10.03.24

ACCREDITED IANZ TESTING LABORATORY
Test results indicated as not accredited are outside the scope of the laboratory's accreditation
Signatory - Zach Hooton

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m^3)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m^3)	SOLID DENSITY (t/m^3) Assumed	AIR VOIDS %	FIELD SHEAR STRENGTH in kPa				RL (m)	EASTING	NORTHING	NOTES
30	JR	14.09.23	See Plan	150	1.52	64.4	0.93	2.7	6.0	128	111	121	115	47.980	413951.05	765009.00	Reynolds Manhole
31	JR	18.09.23	See Plan	150	1.76	40.0	1.26	2.7	3.1	228++	228++	228++	228++	49.150	413953.53	765008.99	Reynolds Manhole re-test of 14/09/2023
32	JR	18.09.23	See Plan	150	1.76	42.5	1.24	2.7	1.6	150	214	228+	228+	47.844	414034.97	765095.32	Lot 128 Decant
33	JR	18.09.23	See Plan	150	1.71	52.4	1.12	2.7	0.0	228++	228++	228++	228++	49.437	413949.52	765015.25	Reynolds Manhole
34	JR	19.09.23	See Plan	150	1.80	40.6	1.28	2.7	0.5	214	228++	228++	228++	49.946	413947.51	765009.37	Reynolds Manhole
35	KC	20.09.23	See Plan	150	1.85	40.5	1.32	2.7	0.0	178++	178++	155	174	50.364	413949.55	765013.51	Reynolds Manhole
36	KC	20.09.23	See Plan	150	1.83	44.9	1.26	2.7	0.0	178++	178++	140	135	48.782	414035.16	765098.83	Lot 128 Decant
37	DT	21.09.23	See Plan	150	1.74	41.0	1.24	2.7	3.5	214+	214+	214+	214+	48.722	413984.29	765111.83	
38	DT	21.09.23	See Plan	150	1.70	54.3	1.10	2.7	0.0	214+	214+	214+	214+	54.309	414053.12	764909.76	
39	DT	21.09.23	See Plan	150	1.64	54.0	1.06	2.7	3.3	214+	214+	214+	214+	54.740	414039.13	764910.87	
40	ZH	05.10.23	See Plan	150	1.84	40.6	1.31	2.7	0.0	204	171	190	217+	50.988	413955.79	765018.10	Lot 96
41	ZH	05.10.23	See Plan	150	1.81	39.0	1.30	2.7	0.7	217+	217+	217+	217+	50.684	413953.03	765028.40	Lot 96
42	KC	10.10.23	See Plan	150	1.85	40.8	1.31	2.7	0.0	178++	178++	178++	155	49.18	413975.44	765073.61	
43	KC	10.10.23	See Plan	150	1.78	49.0	1.20	2.7	0.0	178++	178++	178++	178++	49.42	413994.12	765073.00	
44	KC	10.10.23	See Plan	150	1.70	44.1	1.18	2.7	4.0	178++	178++	178++	178++	49.58	414014.45	765068.44	
45	KC	10.10.23	See Plan	150	1.72	52.2	1.13	2.7	0.0	178++	178++	178++	178++	49.81	414027.16	765063.27	
46	KC	10.10.23	See Plan	150	1.78	43.1	1.25	2.7	0.1	178++	178++	178++	178++	50.08	414040.34	765050.16	
47	JR	12.10.23	See Plan	150	1.82	37.0	1.33	2.7	1.4	228++	228++	228++	228++	51.310	414022.093	755024.740	Lot 103
48	JR	12.10.23	See Plan	150	1.81	37.0	1.32	2.7	2.4	228+	210	125	193	51.895	414000.592	765022.811	Lot 99
49	JR	16.10.23	See Plan	150	1.73	42.4	1.22	2.7	3.4	228++	228++	228++	228++	49.306	413978.828	765068.457	Roadway
50	JR	16.10.23	See Plan	150	1.72	40.5	1.22	2.7	5.3	228++	228++	228++	228++	49.479	413996.730	765072.065	Roadway
51	JR	16.10.23	See Plan	150	1.70	45.4	1.17	2.7	3.7	228++	228++	228++	228++	49.774	414024.406	765066.430	Roadway
52	JR	16.10.23	See Plan	150	1.68	37.0	1.23	2.7	9.2	228++	228++	228++	228++	50.092	413999.388	765044.949	Lot 101
53	KC	19.10.23	See Plan	150	1.81	40.6	1.29	2.7	0.0	228++	228++	228++	228++	49.780	413988.800	765071.910	
54	KC	19.10.23	See Plan	150	1.77	41.0	1.25	2.7	2.2	228++	228++	228++	228++	50.020	414007.320	765069.440	
55	KC	19.10.23	See Plan	150	1.70	38.8	1.23	2.7	7.0	228++	228++	228++	228++	50.010	414022.850	765066.900	
56	KC	19.10.23	See Plan	150	1.83	39.6	1.31	2.7	0.0	228++	228++	228++	228++	50.050	414002.340	765055.750	
57	KC	07.11.23	See Plan	150	1.79	44.2	1.24	2.7	0.0	178++	178++	141	145	49.610	414019.682	765087.617	
58	KC	07.11.23	See Plan	150	1.77	42.9	1.24	2.7	1.0	178++	178++	178++	178++	49.617	41400.808	765090.770	

Checked By: ZH
Date: 17.12.24

NT = Not Tested

152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Test results indicated as not accredited are outside the scope of the laboratory's accreditation

Signatory - Zach Hooton

Job Name : **Belgium Road Stage 5**
Client : CMW Geosciences Ltd
Address : PO Box 300206
Albany, Auckland 0754
Attention : Andrew Linton

Project No. : 24 0029 17
Date of Order : 10.03.24

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m^3)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m^3)	SOLID DENSITY (t/m^3) Assumed	AIR VOIDS %	FIELD SHEAR STRENGTH in kPa				RL (m)	EASTING	NORTHING	NOTES
59	KC	07.11.23	See Plan	150	1.66	44.1	1.15	2.7	6.4	178++	178++	178++	178++	50.276	414062.712	765036.442	
60	KC	07.11.23	See Plan	150	1.82	33.0	1.37	2.7	4.1	178++	178++	178++	178++	50.658	414073.230	765025.747	
61	KC	08.11.23	See Plan	150	1.69	57.9	1.07	2.7	0.0	178++	178++	178++	178++	50.799	414068.578	765030.059	
62	KC	10.11.23	See Plan	150	1.72	46.2	1.17	2.7	2.3	143	141	178++	178++	55.661	414036.268	764921.742	
63	KC	10.11.23	See Plan	150	1.70	53.7	1.10	2.7	0.0	178++	178++	151	143	55.059	414051.399	764975.514	
64	JR	13.11.23	See Plan	150	1.66	52.5	1.09	2.7	2.5	228++	228++	228++	228++	55.874	414038.880	764913.668	Lot 109
65	JR	13.11.23	See Plan	150	1.59	50.6	1.06	2.7	7.3	228++	228++	228++	228++	55.655	414047.537	764908.481	Lot 110
66	DT	16.11.23	See Plan	150	1.72	42.8	1.21	2.7	3.6	217++	217++	217++	217++	50.500	414008.643	765106.167	
67	DT	16.11.23	See Plan	150	1.72	45.4	1.18	2.7	2.4	217++	217++	217++	217++	50.717	414040.026	765099.611	
68	JR	17.11.23	See Plan	150	1.61	40.1	1.15	2.7	11.3	228++	228++	228++	228++	49.752	413979.355	765117.019	Esplanade Fill
69	JR	30.11.23	See Plan	150	1.58	58.1	1.00	2.7	5.0	136	167	150	143	55.537	414086.960	764897.024	Lot 115
70	JR	30.11.23	See Plan	150	1.67	52.0	1.10	2.7	2.2	228++	228++	228++	228++	56.913	414084.021	764909.709	Lot 116
71	JR	30.11.23	See Plan	150	1.68	48.4	1.13	2.7	3.4	150	154	193	186	56.904	414074.071	764919.534	Lot 116
72	DT	09.12.23	See Plan	150	1.73	50.3	1.15	2.7	0.0	150	150	168	185	54.228	414061.365	764897.792	
73	DT	09.12.23	See Plan	150	1.71	52.5	1.12	2.7	0.0	150	171	182	171	54.125	414071.852	764894.550	
74	DT	11.03.24	See Plan	150	1.62	56.7	1.03	2.7	3.1	217++	217++	217++	217++	-	-	-	Accessway
75	DT	12.03.24	See Plan	150	1.65	47.7	1.12	2.7	5.1	166	182	187	198	-	-	-	Accessway
76	DT	26.03.24	See Plan	150	1.55	50.5	1.03	2.7	9.9	217++	217++	217++	217++	-	-	-	Accessway
77	DT	26.03.24	See Plan	150	1.68	46.4	1.15	2.7	4.4	217++	217++	217++	217++	-	-	-	Accessway
78	DT	16.08.24	See Plan	150	1.71	50.3	1.14	2.7	0.8	214+	214+	214+	214+	-	-	-	Lot 129
79	DT	16.08.24	See Plan	150	1.61	50.3	1.07	2.7	6.3	214+	214+	214+	214+	-	-	-	Lot 129 / Drainage Reserve
80	KC	12.09.24	See Plan	150	1.87	39.2	1.34	2.7	0.0	202++	202++	202++	202++	50.570	414067.33	765067.96	Lot 127
81	DT	13.09.24	See Plan	150	1.76	44.9	1.22	2.7	0.2	217++	217++	217++	140	-			Lot 103
82	DT	13.09.24	See Plan	150	1.79	39.7	1.28	2.7	1.6	217++	217++	217++	217++	-			Lot 99
83	DT	13.09.24	See Plan	150	1.80	43.2	1.26	2.7	0.0	217++	217++	174	188	-			Lot 101

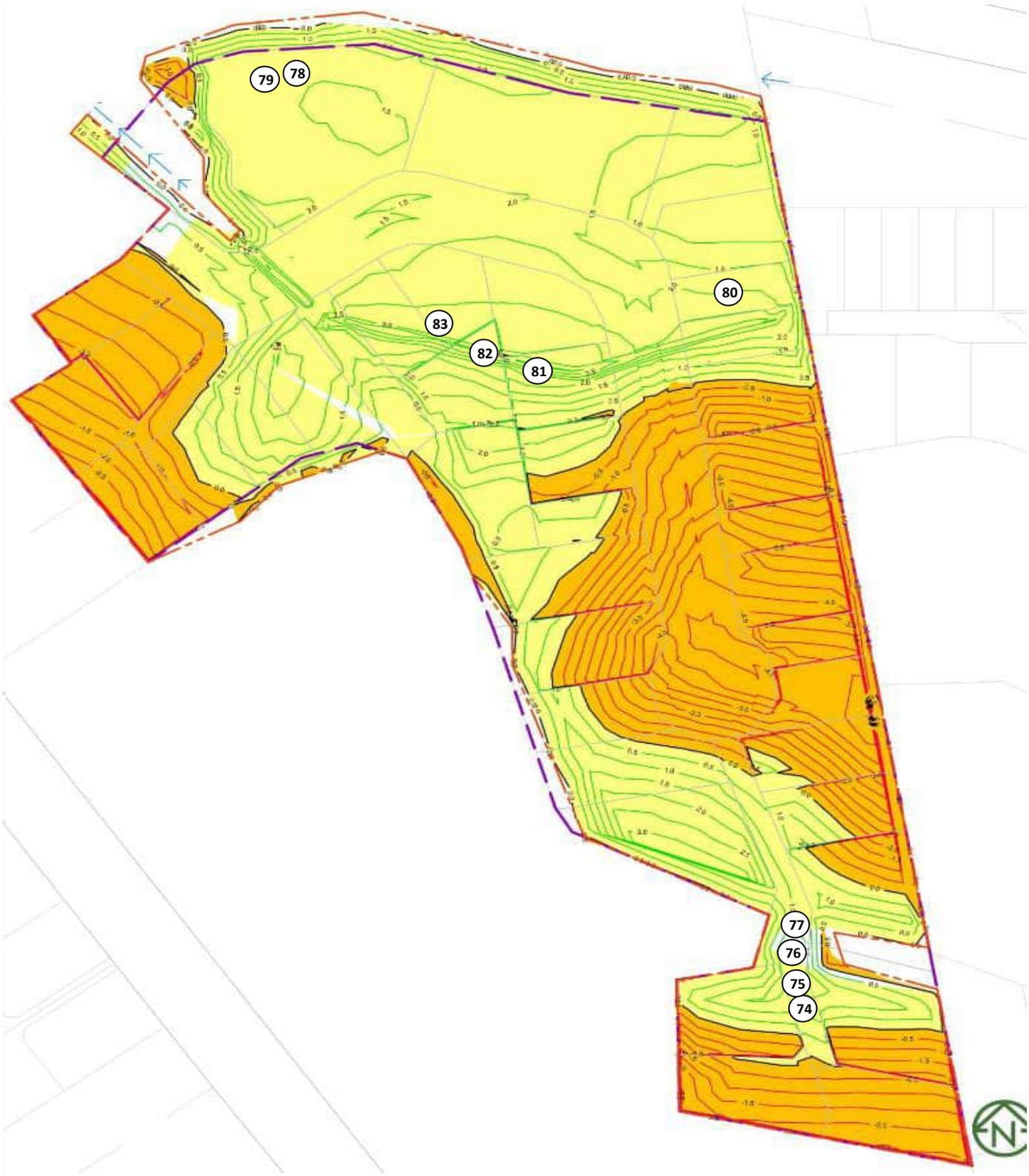
Checked By: ZH
Date: 17.12.24

NT = Not Tested

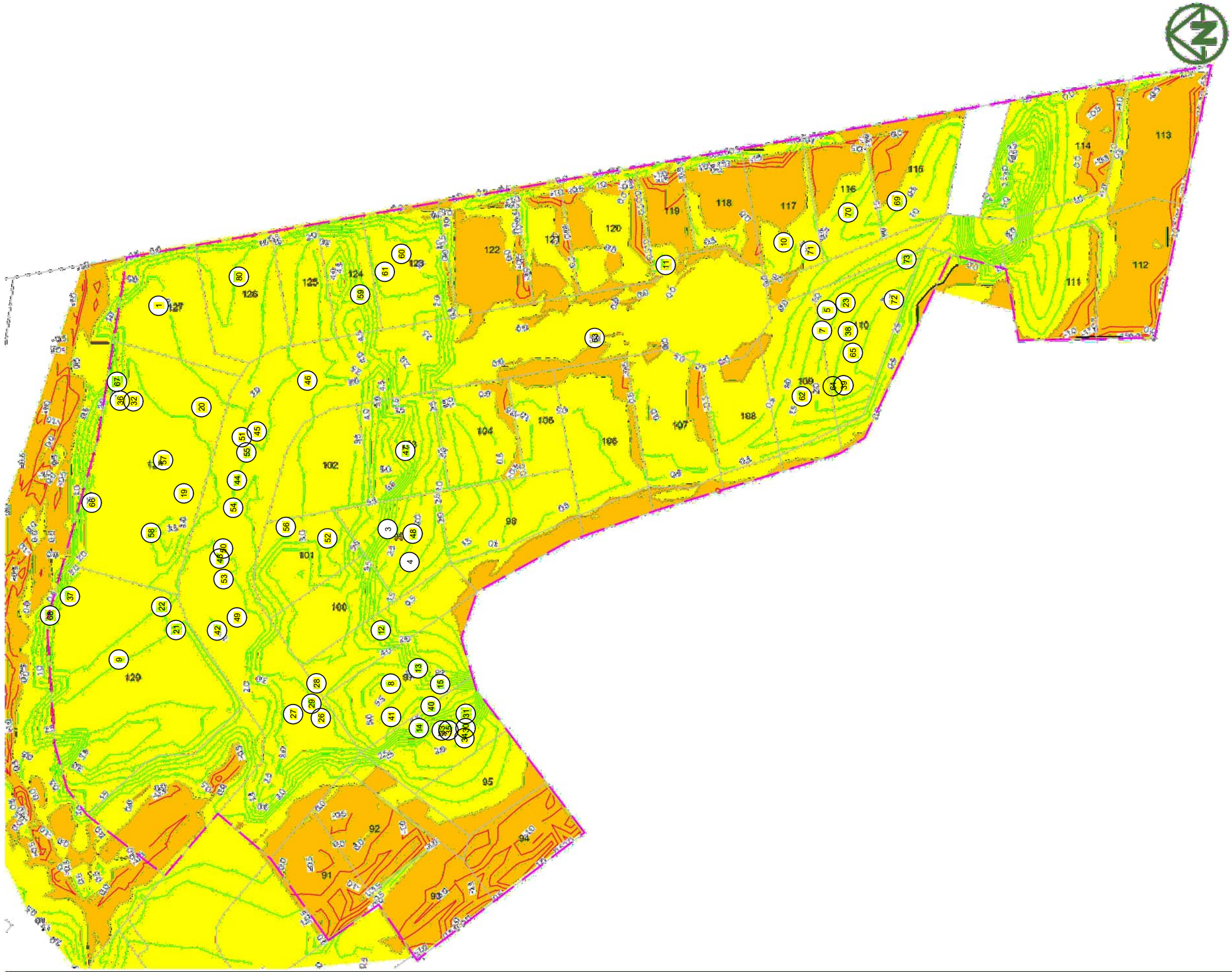
Report No : 24 0029
Page :

Job Name : **Belgium Road Stage 5**
Location : **-**

Site Plan - Not to scale



Tested By : Date :
Checked By : Date :



EPA NUMBER: 60408842

RESOURCE CONSENT NUMBER: LUC60396382-C

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The Coordinate (X, Y) are in terms of NZTM on NZGD (2000), and are within ±50mm.
- The level (Z) are in terms of the NZVD 2016 (MSL) LINZ datum (DOSLI datum), and are within the following tolerances:
  - For all pipe inverts & roadside channels to be within ±10mm (local circuit ie. internal/relative consistency required only)
  - For all other assets ±20mm (e.g. Manhole covers, Earthworks)

Name: Peter Cobie

Signed: Licensed Cadastral Surveyor

Registration Number: #1166858 Date: 29/01/2025

Contact Number : 021 2726722

Email : peter@mckenzieandco.co.nz

MCKENZIE & CO.

REV	DESCRIPTION	DRWN	CHKD	APP'D	DATE
A	PARTIAL	TB	RS	PC	15/01/25

CLIENT: CABRA PUKEKOHE JV

PROJECT: 3 BELGIUM ROAD PUKEKOHE STAGE 5

TITLE: STAGE 5 AS-BUILT DRAWINGS EARTHWORKS OVERALL PLAN

PURPOSE OF ISSUE: AS-BUILT

SCALE: 1:1000

DO NOT SCALE

DRAWING NO: 2398-5-AB210

REV: A

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APPENDIX E
Laboratory Test Data

ROADTEST LTD

Revision: 1

DETERMINATION OF THE WATER CONTENT, CONE PENETRATION LIMIT, PLASTIC LIMIT, PLASTICITY INDEX & LINEAR SHRINKAGE

TEST METHOD NZS 4402 : 1986 TEST 2.1, 2.3, 2.4, 2.5 & 2.6

Project Name :	**3 Belgium Road, Pukekohe - Stage 5**		
		Project No :	24 0001
Client :	CMW Geosciences Ltd		
Address :	PO Box 300206 Albany, Auckland	Date of Order :	02.09.24
		Sample Method :	Hand Auger
Attention :	Flo Delavoye - Renaudet	Sample Date :	20.08.24
		Sampled By :	CMW Geosciences Ltd

Test Details :	Test performed on :	Whole Sample	
	History :	Natural	
Tested By:	KC	Date :	03 to 06.09.24
Calculated By :	KC	Date :	09.09.24
Checked By :	ZH	Date :	10.09.24

Sample No.	Location	Depth (m)	Cone Penetration (CPL)	Plastic Limit (PL)	Plasticity Index (PI)	Linear Shrinkage (LS)	Natural Water Content (%)
990T	HA98 - 24	0.5 to 1.0	98	44	54	23	47.9
991T	HA100 - 24	0.5 to 1.0	91	37	55	21	38.5
992T	HA102 - 24	0.5 to 1.0	90	36	54	20	40.5
993T	HA106 - 24	0.5 to 1.0	105	52	53	25	55.3
994T	HA110 - 24	0.5 to 1.0	91	44	46	21	42.2
995T	HA111 - 24	0.5 to 1.0	110	48	62	24	53.9
996T	HA113 - 24	0.5 to 1.0	101	69	32	22	53.2
997T	HA115 - 24	0.5 to 1.0	105	64	41	23	62.9
998T	HA118 - 24	0.5 to 1.0	104	61	43	24	49.2

ROADTEST LTD

Revision: 1

DETERMINATION OF THE WATER CONTENT, CONE PENETRATION LIMIT, PLASTIC LIMIT, PLASTICITY INDEX & LINEAR SHRINKAGE

TEST METHOD NZS 4402 : 1986 TEST 2.1, 2.3, 2.4, 2.5 & 2.6

Project Name :	**3 Belgium Road, Pukekohe**		
		Project No :	24 0001 73
Client :	CMW Geosciences Ltd		
Address :	PO Box 300206 Albany, Auckland	Date of Order :	22.10.24
		Sample Method :	Hand Auger
Attention :	Flo Delavoye-Renaudet	Sample Date :	15.10.24
		Sampled By :	CMW Geosciences Ltd

Test Details :	Test performed on :	Whole Sample
	History :	Natural

Tested By:	KC	Date :	23.10.24 to 25.10.24
Calculated By :	DT	Date :	28.10.24
Checked By :	ZH	Date :	29.10.24

Sample No.	Location	Depth (m)	Cone Penetration (CPL)	Plastic Limit (PL)	Plasticity Index (PI)	Linear Shrinkage (LS)	Natural Water Content (%)
142U	HA91-24	0.5 to1.0	146	89	57	25	117.2
143U	HA94-24	0.5 to1.0	115	68	47	22	68.1
144U	HA122-24	0.5 to1.0	101	59	42	17	55.3
145U	HA127-24	0.5 to1.0	99	47	52	23	41.2
146U	HA129-24	0.5 to1.0	90	48	41	16	42.5

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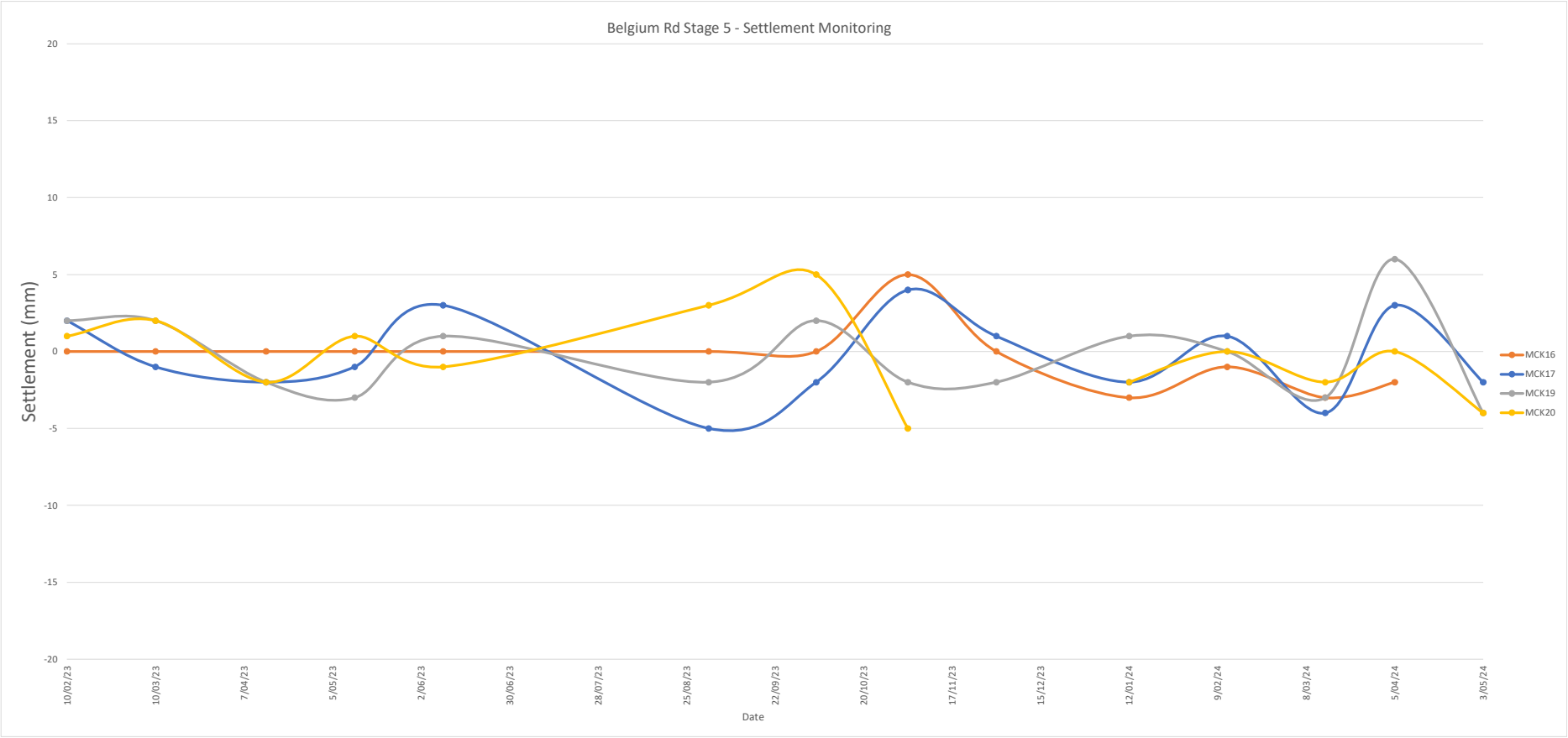
APPENDIX F
Settlement Monitoring Data


Belgium Rd Stage 5 - Settlement Monitoring
Settlement (mm)
20
15
10
5
0
-5
-10
-15
-20
10/02/23
10/03/23
7/04/23
5/05/23
2/06/23
30/06/23
28/07/23
25/08/23
22/09/23
20/10/23
17/11/23
15/12/23
12/01/24
9/02/24
8/03/24
5/04/24
3/05/24
Date
MCK16
MCK17
MCK19
MCK20

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APPENDIX G
Retaining Wall PS4

PRODUCER STATEMENT – PS4
CONSTRUCTION REVIEW

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** AKS2021-0009

ISSUED BY: CMW Geotechnical NZ Limited
(Construction Monitoring Firm)
TO: Cabra Pukekoke JV
(Owner/Developer)
TO BE SUPPLIED TO: Auckland Council
(Building Consent Authority)
IN RESPECT OF: Construction of Timber Pole & UC Steel Retaining Walls - Stage 5, 3 Belgium Road Development
(Description of Building Work)
AT: Pukekohe East Road, Pukekohe, Auckland 2677 (formerly 3 Belgium Road, Pukekohe)
(Address, Town/City)
LEGAL DESCRIPTION: Lot 129 DP 551433 **N/A** ☐

We have been engaged by the owner/developer referred to above to provide CM 3 **level of construction monitoring relating to** the Clause(s) named above of the Building Code for the building work which is covered by PS1(s) issued by CMW Geosciences (*Engineering Design Firm*) and which is described in the documents relating to the Building Consent No. BCO10360765 and those relating to Building Consent Amendment(s) No. BCO10360765-A issued during the course of the works, .

We have sighted these Building Consents and the conditions attached to them.
If any of the fields above are too small, please write "refer the Schedule".

Authorised instructions/variation(s) detailed/listed in the Schedule have been issued during the course of the works.

On the basis of these review(s) and information supplied by the contractor during the course of the works and **on behalf of the engineering firm** undertaking this Construction Monitoring, **I believe on reasonable grounds** that the building works covered by the above-mentioned PS1(s) have been completed in accordance with the relevant requirements of the Building Consent and Building Consent Amendments identified above or in the Schedule on page 2, with respect to Clause(s) B1 of the Building Code. I also believe on reasonable grounds that the persons who have undertaken this construction review have the necessary competency to do so.

I, *(Name of Construction Monitoring Professional)* Sam Gibb (AC Author #3126) , am:

- CPEng number 1023416
- I hold the following qualifications BSc, CPEng, IntBE ,

The Construction Monitoring Firm holds a current policy of Professional Indemnity Insurance no less than $200,000 The Construction Monitoring Firm Is a member of ACE New Zealand.

SIGNED BY *(Name of Construction Monitoring Professional)*: Sam Gibb (AC Author #3126)
(Signature below):

19/12

ON BEHALF OF *(Construction Monitoring Firm)*: CMW Geotechnical NZ Limited Date: 19/12/24

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Construction Monitoring Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Forms 6 or 8 of the Building (Forms) Regulations 2004** for the issue of a Code Compliance Certificate.

SCHEDULE to PS4

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

CMW Geosciences Cover Letter referenced AKS2021-0009AV Rev 0.
CMW Site Inspection Notes

CMW Cantilever Timber Pole / UC Steel & Segmental Block Retaining Wall Design for Stage 5, Pukekohe East Road (Formerly 3 Belgium Road), Pukekohe - referenced AKS2021-0009AO Rev 2, dated 9 March 2023.

CMW Geotechnical Investigation Report for Stage 5, 3 Belgium Road, Pukekohe - referenced AKS2021-0009AJ Rev 0, dated 23 December 2021.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Auckland

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New Zealand

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