

CSV ARCHITECTS

sustainable design · conception écologique

28 October 2021

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Matthew Rocheleau
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OCS Holdings Group Inc.
996-B St-Augustin
Embrun, ON K0A 1W0

**Re: 5497 Manotick Main Street Cultural Heritage Impact Statement
(Revision 01)
CSV Project No.: 2021-0480**

Dear Sir,

Attached, you will find the revised Cultural Heritage Impact Statement for 5497 Manotick Main Street in Manotick, Ontario that I have modified to reflect the updated Architectural Design Provided on October 14, 2021.

This Cultural Heritage Impact Statement has been prepared based on a visit and investigation of the site, carried out on August 12, 2021, and a review of existing documentation provided by OCS Holdings Group. Inc.

This report is based on a generally accepted format for a Heritage Impact Statement, and follows principles established by the *Standards and Guidelines for the Conservation of Historic Places in Canada*.

I trust this will be to your satisfaction.

Yours sincerely,



Camille Lewis, OAA BOATT MRAIC CAHP
Project Architect, CSV Architects

Cultural Heritage Impact Statement

(Revision 01)

5497 Manotick Main Street
Manotick, Ontario

October 28, 2021

Prepared For:

12213559 Canada Inc.
996-B St-Augustin
Embrun, ON, K0A 1W0

Prepared By:

CSV ARCHITECTS

190 O'Connor Street, Suite 100
Ottawa, ON K2P 2R3
[t] 613-564-8118
[f] 613-729-3362

CSV project # 2021-0480

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1.0 General Information

1.1 Address of Current Property

5497 Manotick Main Street,
Manotick, Ontario
K4M 0E2

1.2 Current Owner Contact Information

12213559 Canada Inc.
996-B St-Augustin
Embrun ON K0A 1W0

Project Manager: Matthew Rocheleau
matthew.rocheleau@doliogroup.com

1.3 Zoning & Location Information

Current Zoning: Village Mixed Use, Subzone 9 (VM9)

Location Plan: See Appendix A.

2.0 Current Conditions / Introduction to Development Site

The subject property is located on the northeast side of Manotick Main Street and has frontage on the west branch of the Rideau River facing Long Island. An existing bungalow is located on the property. The riverfront portion of the property is located on the Rideau River flood plain and is subject to regulation by the Rideau Valley Conservation Authority.

The heritage value of this property relates to its landscape and location facing the Rideau Canal World Heritage Site. The City of Ottawa has no heritage overlay applicable to this property.

3.0 Background Research & Analysis

The village of Manotick is situated on the traditional lands of the Algonquin-Anishinabek people. Moss Kent Dickinson, the village founder, named the village 'Manotick', after the Algonquin word for 'island'.

Under the supervision of Lieutenant-Colonel John By, construction of the Rideau Canal started in 1826 and was completed in 1832. Shortly after, in 1833, the village of Long Island Locks was settled on Long Island near the locks constructed by Colonel By as part of the canal system.

It was not until 1859, when a bulkhead was constructed across the west branch of the Rideau River, that Moss Kent Dickinson and his partner Joseph Merrill Currier obtained the water rights and constructed a stone mill on the present location of the Village of Manotick. The mill, now known as Watson's Mill, and Dickinson House have been preserved as heritage properties and remain as the historic centerpiece of the village today.

Before the arrival of European settlers, the Rideau River was the principal transportation route of the Algonquin-Anishinabek people. The river and its natural setting remained as an important commercial travel route up until the beginning of the twentieth century. Preservation of the natural setting of the Rideau River should be a priority for any new development in this historic area.

4.0 Statement of Significance

The significance of the property at 5497 Manotick Main Street is due to its relationship and frontage on the Rideau River which forms part of the Rideau Canal system. The Rideau Canal has been recognized as the best-preserved example of a slackwater canal in North America. The canal has been designated a National Historic Site of Canada and a UNESCO World Heritage Site.

Much of the property facing the Rideau River in the Village of Manotick has been developed and much of the natural habitat of the shoreline has been lost. In contrast, the property at 5497 Manotick Main Street has retained much of its natural character with mature trees and a natural vegetated buffer along the riverfront.

5.0 Description of the Proposed Development

The proposed development on the site will be a three-storey, 21-unit residential building. Residential units will include ten one-bedroom and eleven two-bedroom units. The proposed allocation of units will be as follows:

Ground floor:	5 residential units
Second Floor:	8 residential units
<u>Third Floor:</u>	<u>8 residential units</u>
Total:	21 residential units

Underground parking will be provided for 16 vehicles, with surface parking at the front of building for ten vehicles.

The rear elevation directly opposite the heritage river shoreline includes a proposed masonry retaining wall running the width of the building. A centrally located staircase leads down to a paved Amenity Area serving as common space for resident use. The Amenity Area is surrounded by the existing natural landscape with picturesque views of the Rideau River.

Proposed Drawings

- Site Plan: See Appendix A.
- Floor Plans, Elevations, and Massing Study: See Appendix B.

6.0 Impact of Proposed Development

The existing building has no heritage value and will be demolished as part of the new development. The proposed development will bring a higher intensity of use to the property. This higher density development is comparable to other nearby recently constructed properties.

The location of parking below grade and at the front of the building is the best solution for reducing the environmental and visual impact of vehicles on the riverfront location.

The proposed outdoor amenity area on the river side of the building should be constructed as far as possible from the waterfront, without harming or removing any existing trees. A naturalized shoreline and protection of the existing habitat for fish, amphibians, waterfowl, small animals and native plants should be encouraged.

There are no designated heritage properties on this part of Manotick Main Street and no heritage overlay exists for this property or any of its adjoining properties in the zoning bylaw. For this reason, the architectural character and exterior materials of the proposed development are not considered to negatively impact the significance of this property.

We believe that the Heritage Impact of the proposed development of 5497 Manotick Main Street will not adversely affect its significance as part of the Rideau Canal National Historic Site of Canada. The preservation of the natural landscape on the river side of the new development will be key to conserving the heritage value of the site.

7.0 Alternatives & Mitigation Strategies

The design of the proposed development attached to this report is the third of three concepts that have been considered. The first concept was revised based on comments received from the community. This first concept was for a contemporary style, flat roof building with a combination of brick and siding for the exterior cladding.

The second design of the proposed development was a pseudo-heritage design that took cues from a neighbouring retirement home that was constructed in 2014. This revised design comprised of heavy stone masonry cladding on all elevations. A flat roofline was paired with sections of traditional steep mansard roofs clad in metal. The central portion of the front elevation was punctuated with an eyebrow roofline. In response to current heritage practice, a previous version of this report noted that a pseudo-heritage design for new construction on this property adjacent to the heritage designated Rideau River was not appropriate. The Standards and Guidelines for the Conservation of Historic Places in Canada recommends that new work should demonstrate “a clear distinction between what is historic and what is new.” We recommended revision to a contemporary design that is subordinate, distinguishable and compatible with the existing buildings.

The third design, which is included in this revised report, is a response to the heritage recommendation to keep in line with The Standards and Guidelines for the Conservation of Historic Places in Canada. The new design sheds a large percentage of the heavy stone cladding. The stone has been reserved for elements grounding and supporting the building. Modern cladding materials have been introduced in the form of earth tone fiber cement panels in two colours. Metal cornices adorn the flat roofline. The central portion of the front elevation remains punctuated with an eyebrow roofline. This revised design blends a combination of modern materials with hints of traditional design elements. Plans, elevations, and a massing study for the revised design can be seen in Appendix B.

A substantial retaining wall has been introduced at the rear elevation and it directly faces the heritage shoreline and its natural landscape. The retaining wall runs the entire width of the building. A centrally located staircase is supported by the top of the retaining wall and leads down to a paved Amenity Area. Product data and shop drawings of the proposed retaining wall material have been shared for heritage consultation. The selected retaining wall system consists of solid precast modular concrete blocks with chamfered edges and a textured face. Given the expanse of the retaining wall, consideration should be given to the views from the heritage designated Rideau River and the mandated goal of preservation of the natural shoreline and surrounding landscape. Although the retaining wall is set back from the water's edge, it remains highly visible. To minimize the impact of the development on the heritage banks of the Rideau River, it is our recommendation that natural stone be considered for the retaining wall to better fit in with the river's natural landscape. Natural quarry rock products exist that are sourced from the local region. These are readily available with uniform shapes and dimensions for use on retaining wall, and landscape applications. The currently proposed retaining wall material and shop drawings can be seen in Appendix C.

8.0 Bibliography & List of People Contacted

8.1 Bibliography

Parks Canada Website:

<https://www.pc.gc.ca/en/culture/spm-whs/sites-canada/sec02n>

UNESCO World Heritage List:

<https://whc.unesco.org/en/list/1221/>

Wikipedia:

<https://en.wikipedia.org/wiki/Manotick>

Native Land website:

<https://native-land.ca/maps/territories/algonquin/>

8.2 List of People Contacted

- Matthew Rocheleau, OCS Holdings Group Inc
- Paul Robinson, P H Robinson Consulting
- Patrick England, p2concepts

9.0 APPENDICES

- 9.1 Appendix A – Location Plan & Site Plan
- 9.2 Appendix B – Concept Drawings & Massing Study
- 9.3 Appendix C – Proposed Retaining Wall Products & Shop Drawings
- 9.4 Appendix D – Site Images
- 9.5 Appendix E – City of Ottawa Pre-Application Consultation Meeting Notes

APPENDIX A

Location Plan & Site Plan



5497 Manotick Main Street

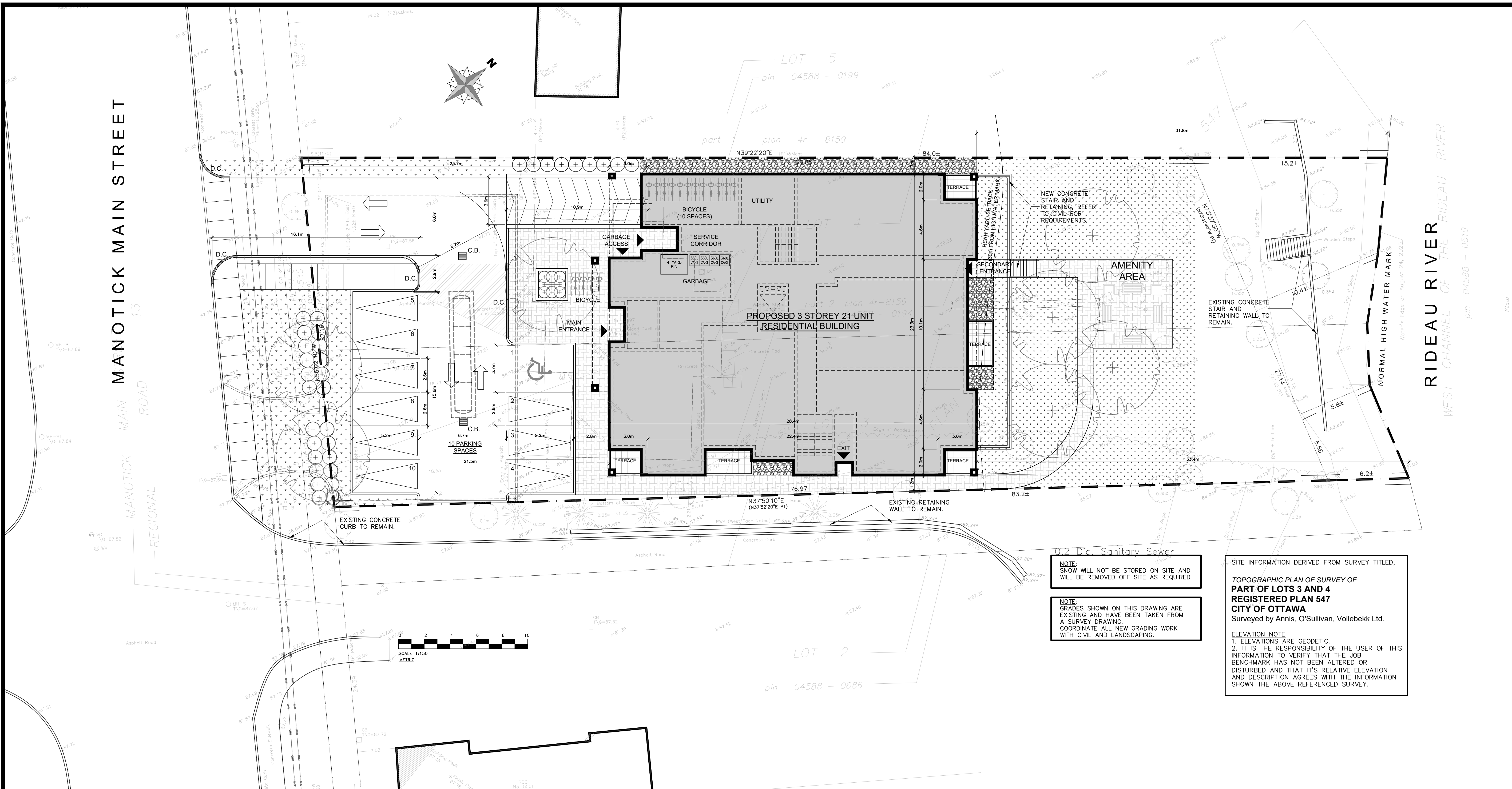
MANOTICK MAIN STREET

BRIDGE STREET

Image Credit: Google Maps
Prepared By: CSV Architects

LOCATION PLAN
5497 Manotick Main Street
Manotick, ON
August 24, 2021





NOTE:
SNOW WILL NOT BE STORED ON SITE AND WILL BE REMOVED OFF SITE AS REQUIRED

NOTE:
GRADES SHOWN ON THIS DRAWING ARE EXISTING AND HAVE BEEN TAKEN FROM A SURVEY DRAWING. COORDINATE ALL NEW GRADING WORK WITH CIVIL AND LANDSCAPING.

SITE INFORMATION DERIVED FROM SURVEY TITLED,
TOPOGRAPHIC PLAN OF SURVEY OF PART OF LOTS 3 AND 4 REGISTERED PLAN 547 CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebek Ltd.

ELEVATION NOTE
1. ELEVATIONS ARE GEODETIC.
2. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN THE ABOVE REFERENCED SURVEY.

1 SITE PLAN
SP-01
SCALE = 1:150

SITE STATISTICS 5497 MANOTICK MAIN		
ITEM	REQUIRED	PROVIDED
Zone	VM9 Village Mixed Use	VM9 - EXCEPTION
Lot Area	1350 SQ. M.	2169 SQ. M.
Lot Width	20 M. min.	27.2 M.
Maximum Building Height	6.7 M MIN. - 11.0M MAX	10.9 M - 3 STOREYS
Front Yard	3.0 M MAX	VARY (21.1m AT CLOSEST)
Side Yard	Corner Interior	N/A 1.2M
Rear Yard	7.5M MIN. (30.0 M FROM WATER MARK)	(30.0 M FROM WATER MARK)
Building Footprint		608 SQ. M.
Lot Coverage	NO MAX	
Number of Dwelling units		21 UNITS (10 ONE BEDROOM, 11 TWO BEDROOMS)
PARKING SPACES REQUIRED RESIDENTIAL	1.2 PER x 21 = 25 SPACES	(10 SURFACE) (16 UNDERGROUND) 26 SPACES
Required Bike Racks	10.5 REQUIRED (0.5 SPACES/DWELLING)	10 INTERIOR and 4 EXTERIOR
Landscaping	Hard Soft	

- LEGEND:**
- PROPOSED NEW BUILDING
 - NEW UNIT PAVERS
 - PROPERTY LINE
 - ADJACENT LOT PROPERTY LINES
 - EXISTING OVERHEAD HYDRO LINE
 - NEW WOOD FENCE
 - EXISTING HYDRO POLE TO REMAIN
 - ENTRANCE ARROWS
 - NEW BIKE RACKS
 - NEW PARKING
 - EXISTING CONCRETE CURB
 - LIGHT STANDARD
 - WALL MOUNTED LIGHTING FIXTURE
 - EXTERIOR SOFFIT LIGHTING FIXTURE
 - EXTERIOR WALL MOUNTED LIGHT FIXTURE

No.	REVISIONS	BY	DATE
13	FOR REVIEW	PE	OCT. 13 2021
12	FOR REVIEW	PE	AUG 19 2021
11	FOR REVIEW	PE	JUNE 29 2021
10	FOR REVIEW	PE	MAY 14 2021
09	FOR REVIEW	PE	APR. 27 2021
08	FOR REVIEW OVERALL REDESIGN	PE	APR. 16 2021
07	FOR REVIEW	PE	MAR. 16 2021
06	FOR REVIEW	PE	FEB. 16 2021
05	REVISIONS TO SITE ACCESS	PE	JAN. 06 2021
04	FOR REVIEW	PE	NOV. 24 2020
03	FOR REVIEW	PE	NOV. 16 2020
02	FOR REVIEW	PE	OCT. 09 2020
01	FOR REVIEW	PE	SEPT. 24 2020

DESIGNED BY: P.E.
DRAWN BY: P.E.
APPROVED BY: B.K.

PROJECT
5497 MANOTICK MAIN

DRAWING TITLE
SITE PLAN

PROJECT NO.
0387
DATE
OCT. 23, 2020

SP-01

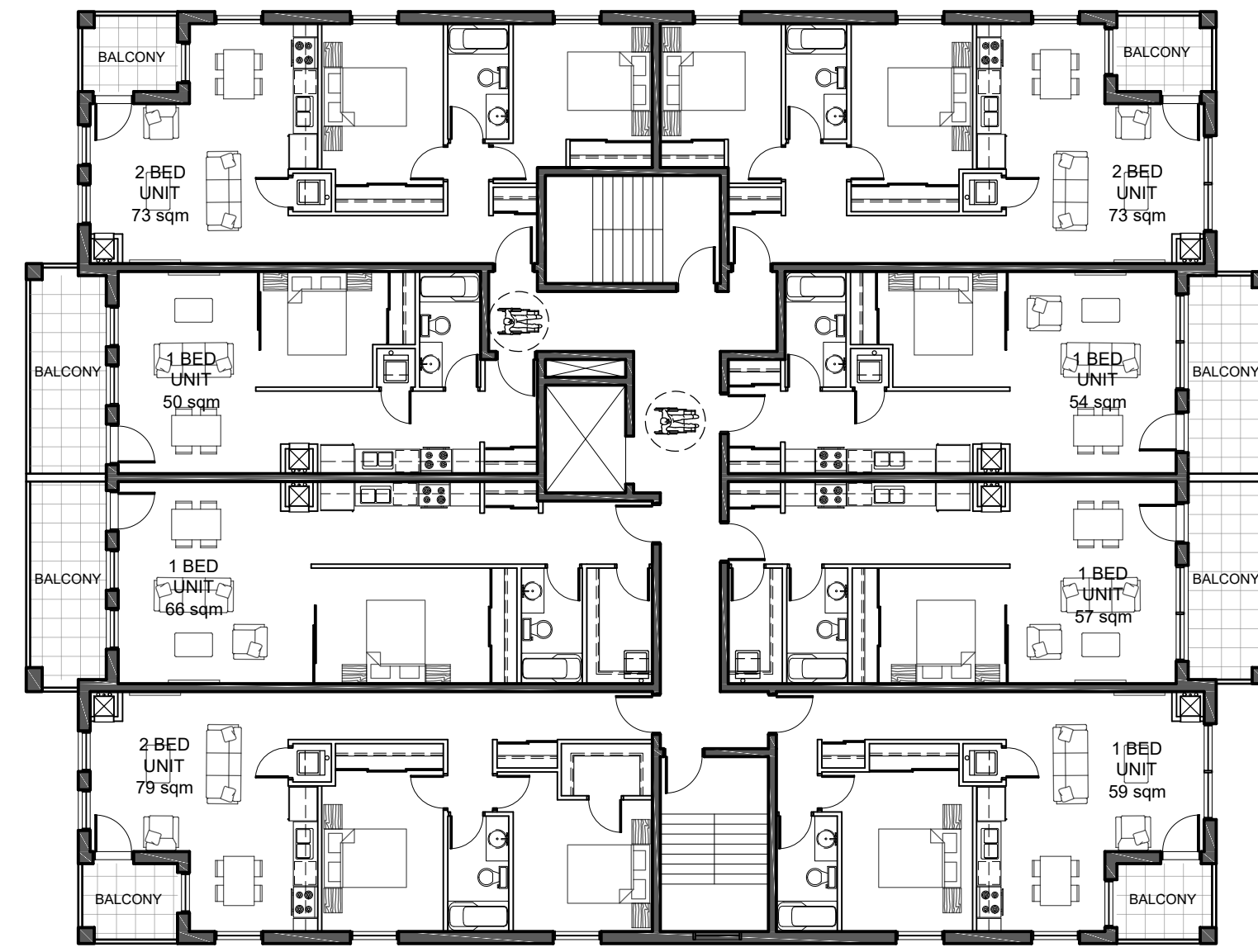
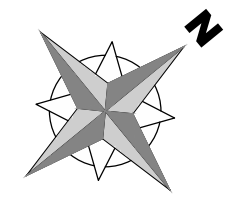
APPENDIX B

Concept Drawings & Massing Study

Prepared by p2concepts

MANOTICK MAIN STREET

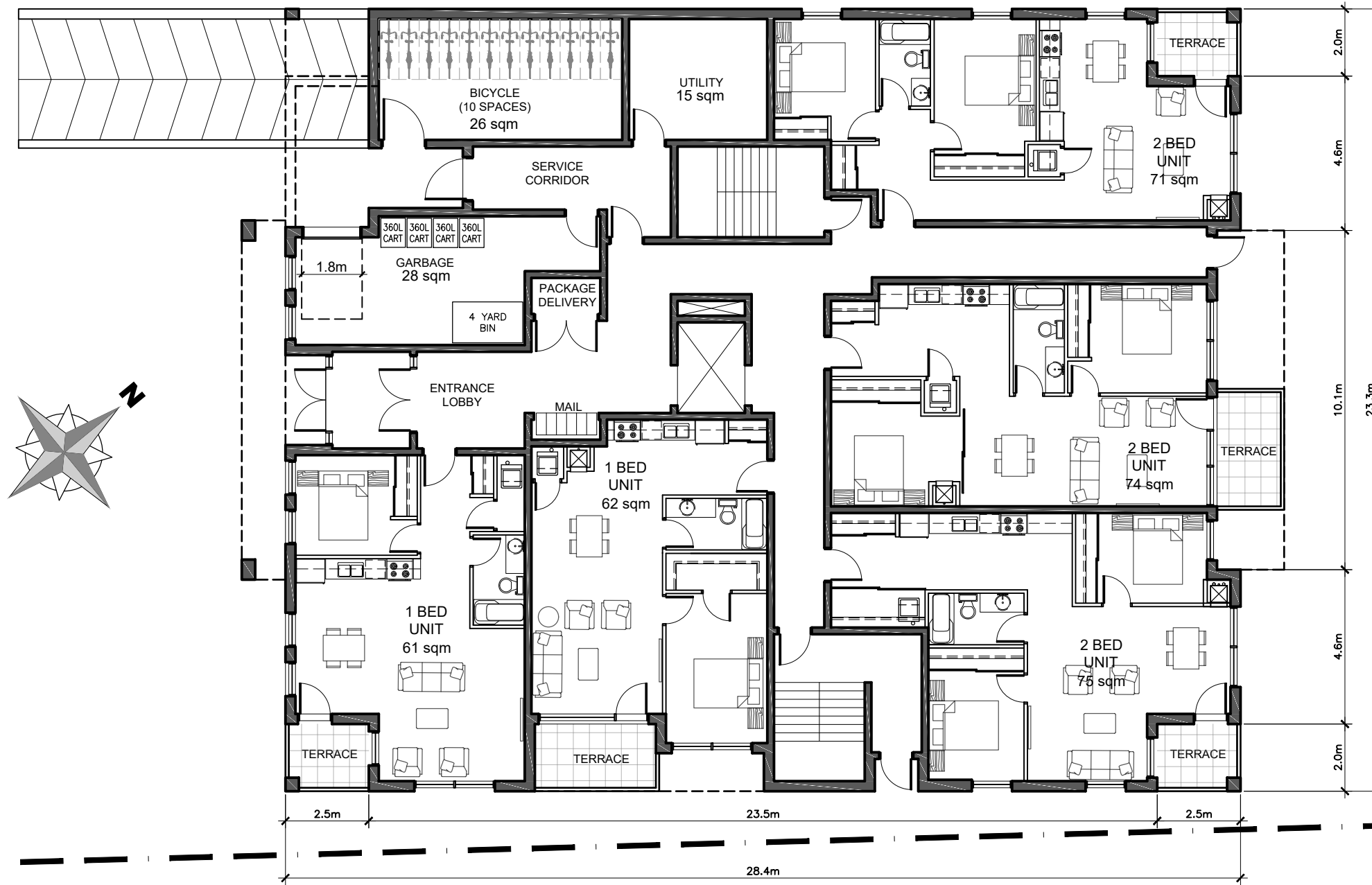
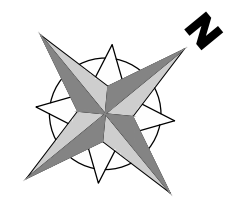
RIDEAU RIVER



SECOND AND THIRD LEVEL
629 sqm

MANOTICK MAIN STREET

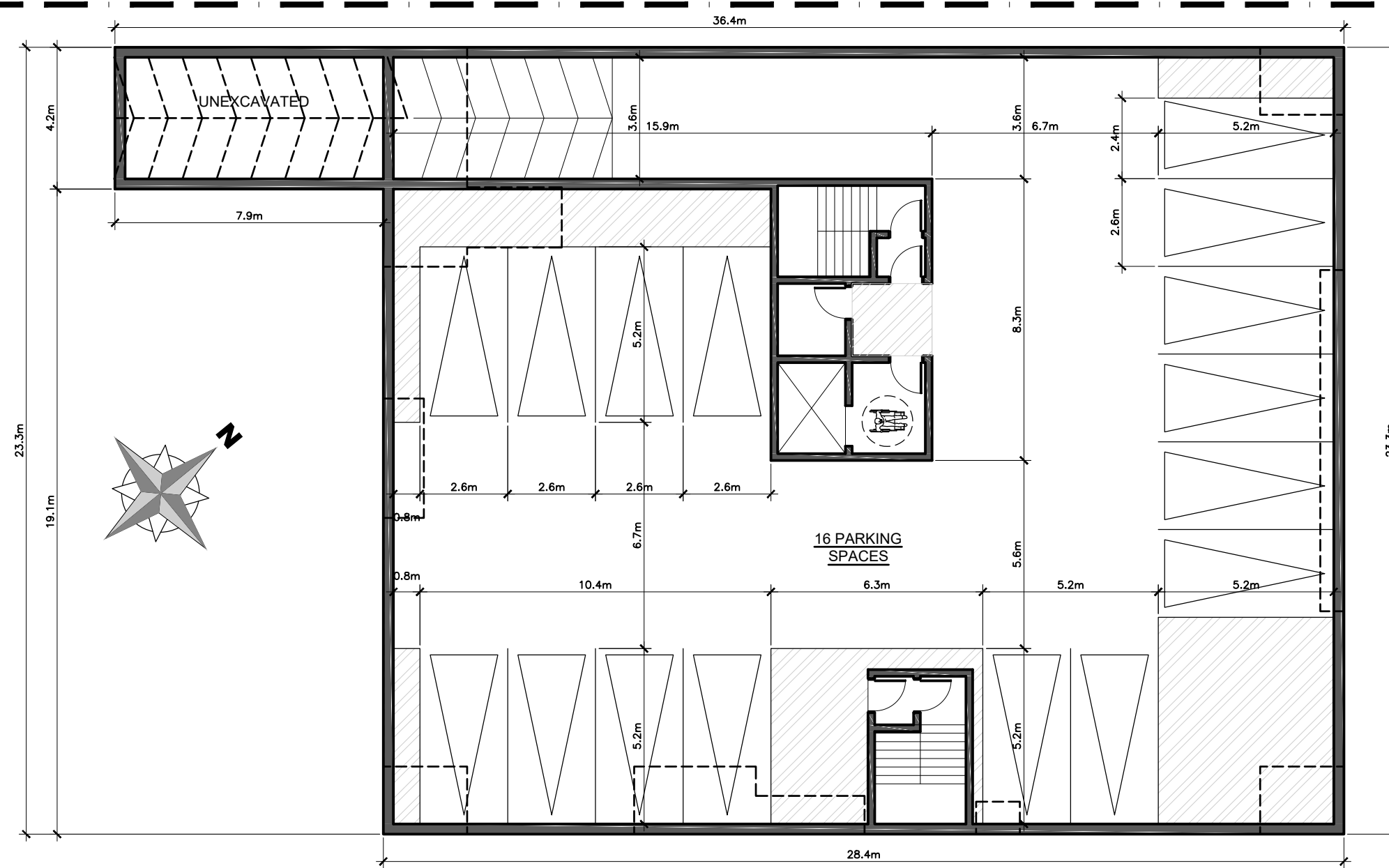
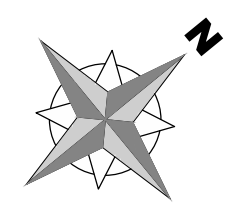
RIDEAU RIVER



MAIN / ENTRANCE LEVEL
528 sqm

MANOTICK MAIN STREET

RIDEAU RIVER



UNDER GROUND PARKING LEVEL
663 sqm

11			
10			
09			
08			
07			
06			
05			
04	FOR REVIEW	PE	JUNE 29 2021
03	FOR REVIEW	PE	MAY 14 2021
02	FOR REVIEW	PE	APR. 27 2021
01	FOR REVIEW	PE	APR. 16 2021
No.	REVISIONS	BY	DATE

STAMP NORTH ARROW

DESIGNED BY: P.E. DRAWN BY: P.E. APPROVED BY: B.K.

PROJECT

5497 MANOTICK MAIN

DRAWING TITLE

SITE PLAN



1 FRONT ELEVATION
SCALE = 1:75



2 RIGHT SIDE ELEVATION
SCALE = 1:75

CLIENT:
12213559
Canada Inc

P²
concepts
738 PROSPERITY AVE. UNIT 801
OTTAWA, ONTARIO, K1V 6A8

11			
10			
09			
08			
07			
06	FOR REVIEW	PE	SEPT 24 2021
05	FOR REVIEW	PE	SEPT 14 2021
04	FOR REVIEW	PE	JUNE 29 2021
03	FOR REVIEW	PE	MAY 14 2021
02	FOR REVIEW	PE	APR. 27 2021
01	FOR REVIEW	PE	APR. 16 2021
No.	REVISIONS	BY	DATE

STAMP NORTH ARROW

DESIGNED BY: P.E. DRAWN BY: P.E. APPROVED BY: B.K.

PROJECT
5497 MANOTICK MAIN

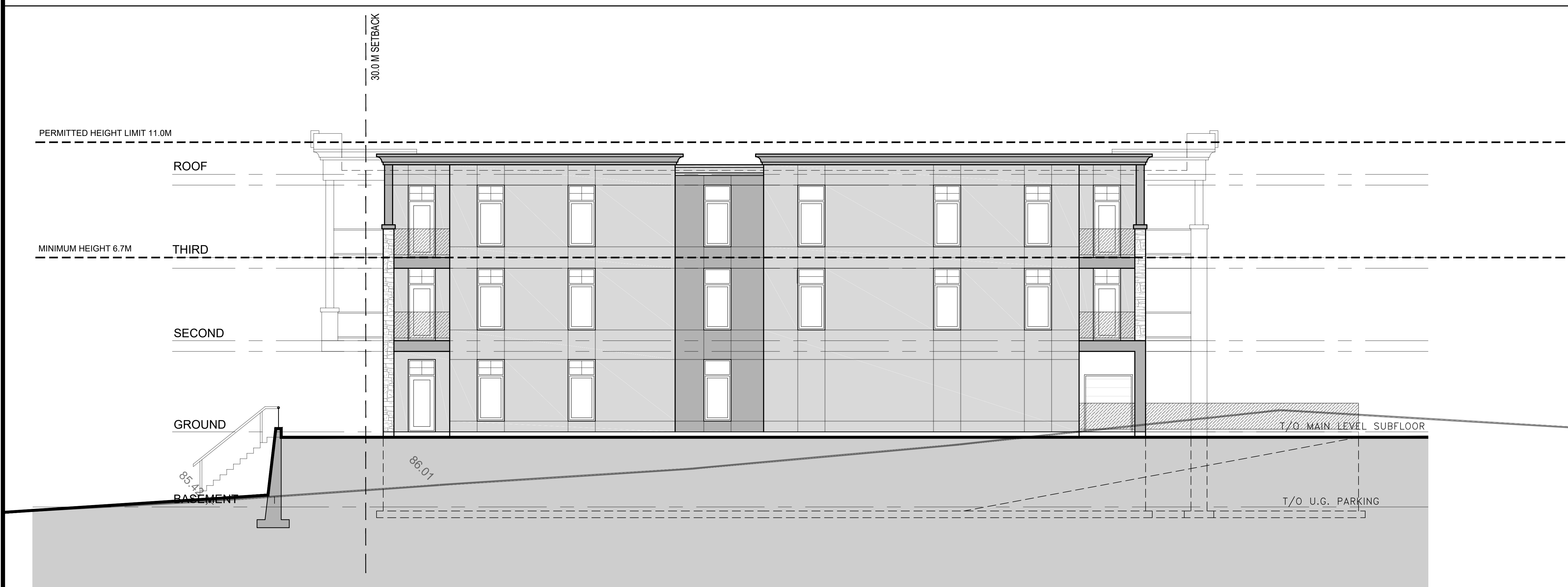
DRAWING TITLE
FRONT & RIGHT SIDE ELEVATIONS

PROJECT NO.
0387
DATE
SEPT. 24, 2021

A-02



1
A-3
REAR ELEVATION
SCALE = 1:75



2
A-3
LEFT SIDE ELEVATION
SCALE = 1:75

RIDEAU RIVER
NORMAL HIGH WATER MARK

CLIENT:
12213559
Canada Inc

P²
concepts
738 PROSPERITY AVE. SUITE 201
OTTAWA, ONTARIO, K1V 4A8

11			
10			
09			
08			
07			
06			
05			
04			
03	FOR REVIEW	PE	SEPT. 24, 2021
02	FOR REVIEW	PE	SEPT. 17, 2021
01	FOR REVIEW	PE	JUNE 30, 2021
No.	REVISIONS	BY	DATE

STAMP NORTH ARROW

DESIGNED BY: P.E.
DRAWN BY: P.E.
APPROVED BY: B.K.

PROJECT
5497 MANOTICK MAIN

DRAWING TITLE
REAR & LEFT SIDE ELEVATIONS

PROJECT NO.
0387
DATE
SEPT 24, 2021

A-03



1 NORTH EAST VIEW
A-4 SCALE = N/A



3 NORTH WEST VIEW
A-4 SCALE = N/A



2 SOUTH WEST VIEW
A-4 SCALE = N/A



4 SOUTH VIEW
A-4 SCALE = N/A

CLIENT:
12213559
Canada Inc

P²
concepts
737 PROVENCHER AVENUE, SUITE 301
OTTAWA, ONTARIO, K1V 5A8

11			
10			
09			
08			
07			
06			
05			
04			
03	FOR REVIEW	PE	SEPT. 24, 2021
02	FOR REVIEW	PE	SEPT. 17, 2021
01	FOR REVIEW	PE	JUNE 30, 2021
No.	REVISIONS	BY	DATE

STAMP	NORTH ARROW

DESIGNED BY: P.E. DRAWN BY: P.E. APPROVED BY: B.K.

PROJECT
5497 MANOTICK MAIN

DRAWING TITLE
MASSING STUDY

PROJECT NO.
0387
DATE
SEPT 24, 2021

A-04

APPENDIX C

Proposed Retaining Wall Product & Shop Drawings



SienaStone[®]
segmental retaining wall

Installation Guide



RisiStone[®]
retaining wall systems



Report Information Form

Engineer: **Eric Jonasson, P.Eng.**

Email: **eric@risistone.com**

Date: **Sept. 28, 2021**

Project Details

Report Type: **Approval Only**

Product: **SienaStone**

Job Name: **New Multipurpose Development**

Job Location: **5497 Manotick Main St., Manotick, ON**

Project No.: **202109023**

Distribution:

Customer Details

Name:

Company:

Address:

GRE Name:

GRE Company:



RisiStone[®]
retaining wall systems

Approval Only Report on Proposed

SienaStone

Segmental Retaining Wall

New Multipurpose Development
5497 Manotick Main St., Manotick, ON

Project No.
202109023

Distribution

Risi Stone Inc.

10-480 Harry Walker Pkwy S.

Newmarket ON Canada L3Y 0B3

P 905.868.9255 | **F** 905.868.9254

E eric@risistone.com

www.risistone.com



RisiStone
retaining wall systems

Contents

1. Cover Letter
2. Letter of Intent
3. Vespa Output
4. Construction Review & Inspection Guidelines
5. Design Drawings
6. Specifications
7. Retaining Wall Budget & Design

The Solid Choice.



RisiStone[®]

retaining wall systems

Risi Stone Inc.

10-480 Harry Walker Pkwy S.
Newmarket ON Canada L3Y 0B3

P 905.868.9255

F 905.868.9254

E eric@risistone.com

www.risistone.com

Sept. 28, 2021

Attn:

Re: New Multipurpose Development

Proposed SRW: SienaStone

Project No.: 202109023

Please find enclosed the Wall Design for the above noted project. Information on the design is provided in the Drawings.

A qualified Professional Engineer must be retained to provide Geotechnical Inspection of the Wall and General Review of Construction in accordance with Division C – Part 1, Section 1.2.2 of the Ontario building Code. Risi Stone Inc. does not provide these services. Refer to the Specification for further explanation of these requirements.

Included in this report are:

- 1 VESPA Report:** Contains wall layout information and quantity calculations for wall face area, geogrid requirements, infill quantities (Estimate based on infill required within the reinforced zone. Does not account for other infill that may be required beyond the infill zone), base quantities, drainage quantities, coping quantities, etc. Contractor must review the layout information provided and ensure the wall dimensions (lengths, TW/BW elevations) match the most recent grading and site information available. (all quantities can be found on the first page of the Vespa Report)
- 2 Construction Review & Inspection Guidelines:** Guidelines provided by Risi Stone Inc. to aid in the Geotechnical Inspection, General Review, and Contractor Quality Assurance of the Wall(s).
- 3 Design Drawings & Specifications:** These must be sealed by a Professional Engineer to be used for Construction. If these drawings are not sealed, they are Preliminary only and can not be used for Construction.

Please advise this office if further design services are required.

Sincerely,

Eric Jonasson, P.Eng.

Letter of Intent for General Review Engineer

Project Name: New Multipurpose Development

Project Number: 202109023

Date: Sept. 28, 2021

General Review Engineer:

Company Name:

Has been retained to provide the General Review of the wall(s) in accordance with the Design, Notes, and Specifications contained with this.

In addition, I undertake to ensure that the overall Global Stability of the proposed wall/slope configuration will be addressed by this firm or the Site Geotechnical Engineer (if they are not the same) prior to construction.

Signature

Date

*Please provide a completed copy of this letter of intent to the Contractor, Site Civil Engineer, and Risi Stone Inc.
Please send to Risi Stone Inc. via fax 905.882.4556 or email julie@risistone.com*



RisiStone[®]
retaining wall systems

Vespa Output

Project: 202109023 New Multipurpose Developmenet

Site: 5497 Manotick Main St., Manotick, ON

Date: 2021-09-28

Wall: Rear Wall Layout

Project Information

Client unilock
Name 202109023 New Multipurpose Developmenet
Site 5497 Manotick Main St., Manotick, ON
Revision 1 **Created** 2021-09-28
Standard National Concrete Masonry Association 3rd Edition

Number
Designer ECJ
Modified 2021-09-28

Seismic As 0.32 Default Deflection of 50.80 mm
Comments

Selected Facing Unit

Licenser/Product Line: Risi Stone Systems
Name: Siena Stone 500 - 48 inch

NOTE: THESE CALCULATIONS, QUANTITIES, AND LAYOUTS ARE FOR PRELIMINARY DESIGN ONLY
AND SHOULD NOT BE USED FOR CONSTRUCTION WITHOUT REVIEW BY A QUALIFIED ENGINEER

Project Summary

Geogroups

Geogroup	Layer	Length (m)
A	All	1.60

Quantities

Wall Length	27.00 m
Steps in Bottom of Wall	3
Total Wall Area	43.0 m ²
Cap Area	5.0 m ²
Exposed Area (includes cap)	37.2 m ²
Embedded Area	5.7 m ²
Tallest Panel Height	1.67 m
Longest reinforcement length	1.60 m
Base soil volume	3.2 m ³
Infill soil volume	45.6 m ³
Gravity Face Drain	0.1 m ³

Reinforcement

SG200 - StrataGrid 200	78.7 m ²
------------------------	---------------------

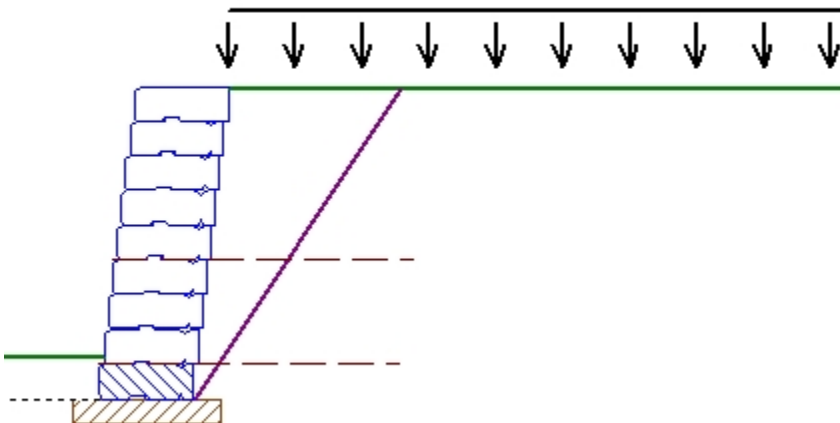
Note ⚠: Total Facing Unit quantity is based on using full-sized units only on bottom course and an even mix of defined facing sizes, as identified elsewhere in this report, on remaining courses of each Section. The use of corners, tapered or cut units is not reflected in this quantity.

Note ⚠: Reinforced fill values are calculated based on the average geogrid length in each Section. They do not account for anything beyond the reinforced zone (end of the geogrids). Actual infill values may be significantly higher.

Note ⚠: Drainage fill does not include the drainage stone within block. Core fill are calculated based on the percentage hollow core of the wall unit selected. If the percentage hollow core is not defined then the Core fill value within block will not be calculated.

Tallest Section

Section Height 1.67 m



NOTE: THESE CALCULATIONS, QUANTITIES, AND LAYOUTS ARE FOR PRELIMINARY DESIGN ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION WITHOUT REVIEW BY A QUALIFIED ENGINEER

Project Design Inputs

Design Standard National Concrete Masonry Association 3rd Edition

Minimum Factors of Safety

Conventional

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.50	FSsl	Internal Sliding	1.50		
FSbc	Bearing Capacity	2.00	FSsc	Shear Capacity	1.50		
FSot	Overturning	1.50					

MultiDepth

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.50					
FSbc	Bearing Capacity	2.00					
FSsh	Interface Shear	1.50					
FSot	Overturning	1.50					

No Fines

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.50					
FSbc	Bearing Capacity	2.00					
FSot	Overturning	1.50					

Reinforced

External		Value	Internal		Value	Facing		Value
FSsl	Base Sliding	1.50	FSsl	Internal Sliding	1.50	FScs	Connection Strength	1.50
FSbc	Bearing Capacity	2.00	FSpO	Pullout	1.50	FSsc	Facing Shear	1.50
FSct	Crest Toppling	1.50	FSto	Tensile Overstress	1.50			
FSot	Overturning	2.00						

Seismic

Conventional

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.10	FSsl	Internal Sliding	1.10		
FSbc	Bearing Capacity	1.10	FSsc	Shear Capacity	1.10		
FSot	Overturning	1.10					

MultiDepth

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.10					
FSbc	Bearing Capacity	1.10					
FSsh	Interface Shear	1.50					
FSot	Overturning	1.10					

No Fines

External		Value	Internal		Value	Facing	Value
FSsl	Base Sliding	1.10					
FSbc	Bearing Capacity	1.50					
FSot	Overturning	1.10					

Reinforced

External		Value	Internal		Value	Facing		Value
FSsl	Base Sliding	1.10	FSsl	Internal Sliding	1.10	FScs	Connection Strength	1.10
FSbc	Bearing Capacity	1.50	FSpO	Pullout	1.10	FSsc	Facing Shear	1.10
FSct	Crest Toppling	1.10	FSto	Tensile Overstress	1.10			
FSot	Overturning	1.50						

Design Factors

Term	Description	Minimum (as appl.)	Maximum (as appl.)
RC	Reinforced coverage ratio	1.00	0.00

NOTE: THESE CALCULATIONS, QUANTITIES, AND LAYOUTS ARE FOR PRELIMINARY DESIGN ONLY
AND SHOULD NOT BE USED FOR CONSTRUCTION WITHOUT REVIEW BY A QUALIFIED ENGINEER

Selected Facing Unit

Licenser/Product Line:	Risi Stone Systems		
Name:	Siena Stone 500 - 48 inch		
Facing Height	Hu		0.19 m
Facing Width	Lu		1.20 m
Facing Depth	Wu		0.50 m
Facing Weight	Xu		22.8 kN/m ³
Center of Gravity	Gu		0.25 m
Setback	su		0.02 m
Batter	mu		7.12 °
Cap Height	Hcu		0.19 m
Initial Shear Capacity	au		42.00 kN/m
Apparent Shear Angle	fu		80.00 °
Maximum Shear Capacity	Vu(max)		147.00 kN/m

Selected Reinforcement Types**Reinforcements**

SG200 - StrataGrid 200	Supplier: Strata Systems, Inc., Fill Type: 20mm- gravels or aggregate						
Tult	52.55 kN/m	RFcr	1.55	RFd	1.10	LTDS	26.80 kN/m
RFid	1.15	Cds	0.90	Ci	0.90		

Connection/Shear Properties

zcs1	13.70 kN/m	IP-1	17.50 kN/m	zcs2	22.60 kN/m	IP-2	17.50 kN/m
zcs max	22.60 kN/m	au	42.00 kN/m	fu	80.00 kN/m	Vu(max)	147.00 kN/m

Selected Soil Types

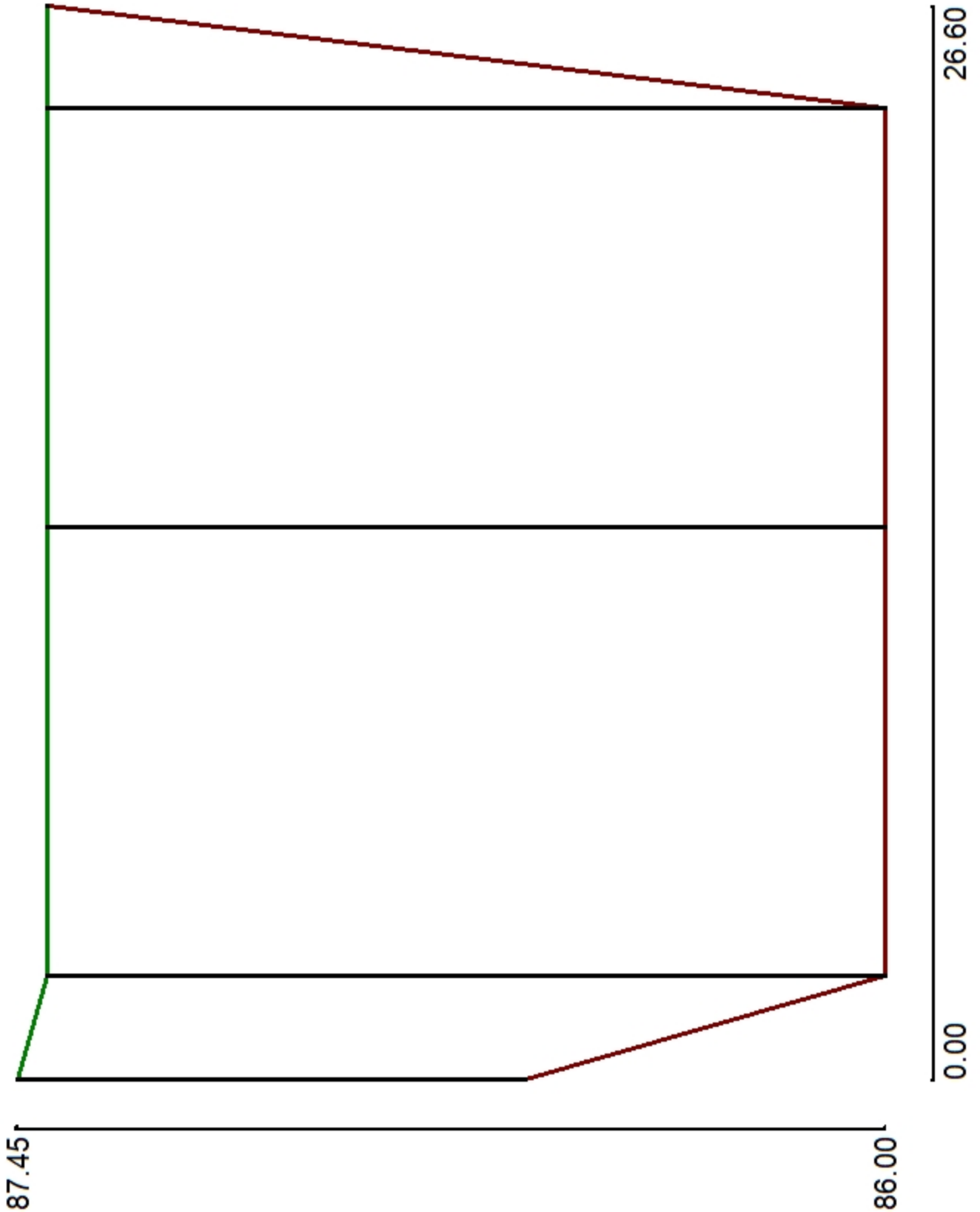
Soil Zone	Soil Type	Friction Angle γ	In Situ	
			Density ρ [kN/m ³]	Cohesion Cf [kN/m ²]
Infill (i)	GW	35°	22.00	n/a
Retained (r)	CL	28°	19.95	n/a
Foundation (f)	CL	28°	19.95	0.00
Base (b)	GW	39°	22.00	n/a
Drainage (d)	GP	38°	19.64	n/a

Soil Glossary

CH:	Inorganic clays, high plasticity
CL:	Inorganic clays, low to medium plasticity, gravelly, sandy, silty, lean clays
GC:	Clayey gravels, poorly graded gravel-sand-clay mixtures
GM:	Silty gravels, poorly graded gravel-sand-silt mixtures
GP:	1/2"-3/4" clean crushed stone or crushed gravel
GW:	Well-graded gravels, gravel-sand. Little or no fines.
MH:	Inorganic clayey silts, elastic silts
ML:	Inorganic silts, very fine sands, silty or clayey, slight plasticity
SC:	Clayey sands, poorly graded sand-clay mixtures
SM:	Silty sands, poorly graded sand-silt mixtures
SP:	Poorly-graded sands, gravelly sands. Little or no fines.
SW:	Well-graded sands, gravelly sands. Little or no fines.

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Station Detail



NOTE: THESE CALCULATIONS, QUANTITIES, AND LAYOUTS ARE FOR PRELIMINARY DESIGN ONLY
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Note: Station Layout is the face view of the wall, looking at it from left to right

Station Layout

No.	Station [m]	Top [m]	Bottom [m]	Height [m]
1	0.00	87.45	86.60	0.85
2	2.54	87.40	86.00	1.40
3	13.66	87.40	86.00	1.40
4	24.04	87.40	86.00	1.40
5	26.60	87.40	87.40	0.00

Station Wall Length	26.60 m
Minimum Height	0.00 m
Maximum Height	1.40 m

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Section Geometry

Markers

No.	Station	Code	Note
1	2.55	c	
2	24.03	c	

Section Extents

Section	Top Elevation [m]	Base Elevation [m]	Left Side [m]	Right Side [m]	Bottom Grade Elevation [m]
1	87.45	86.15	0.00	1.20	86.32
2	87.45	85.78	1.20	24.60	86.00
3	87.45	86.15	24.60	25.80	86.31
4	87.45	86.71	25.80	27.00	86.96

Section Measurements

Section	Height [m]	Design Height [m]	Width [m]	Face Area [m ²]	Embedment [m]	Infill Volume [m ³]
1	1.30	1.30	1.20	1.6	0.16	1.7
2	1.67	1.64	23.40	39.0	0.22	42.2
3	1.30	1.25	1.20	1.6	0.15	1.6
4	0.74	0.69	1.20	0.9	0.25	0.0

Section Slopes

Section	Crest Slope [°]	Crest Offset [m]	Toe Slope [°]	Toe Offset [m]
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00

Section Loads

Section	Live Load [kN/m ²]	Live Offset [m]	Dead Load [kN/m ²]	Dead Offset [m]
1	4.8	0.00	0.0	0.00
2	4.8	0.00	0.0	0.00
3	4.8	0.00	0.0	0.00
4	4.8	0.00	0.0	0.00

Reinforcement Details

Section	Course	Length [m]	Area [m ²]	Reinforcement
1	2	1.60	1.92	SG200 - StrataGrid 200
2	4	1.60	37.44	SG200 - StrataGrid 200
	1	1.60	37.44	SG200 - StrataGrid 200
3	2	1.60	1.92	SG200 - StrataGrid 200

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RisiStone[®]
retaining wall systems

Construction Review & Inspection Guidelines

Inspection Checklist

(To be Used in Conjunction with Project Design, Specifications, and Sound Engineering Judgement)

Steps	Inspection Items	Remarks
Survey	<input type="checkbox"/> All stake locations and elevations in agreement with design.	<hr/> <hr/>
Excavation	<input type="checkbox"/> All utilities, structures, etc. are located prior to excavation and approval granted from governing bodies. <input type="checkbox"/> Excavation requirements are met or exceeded to allow for construction of wall, including required wall embedment and base depth. <input type="checkbox"/> The exposed retained and foundation soil conditions meet or exceed design requirements (internal friction angle, soil type, and unit weight). <input type="checkbox"/> All excavations conducted in accordance with regulatory requirements. In areas where safe excavations are not possible due to property line constraints/other structures, etc., temporary shoring may be required. <input type="checkbox"/> Presence of existing or proposed structures relative to the wall noted and designer is notified if these lie within impact zone of wall. <input type="checkbox"/> If water encountered, proper dewatering techniques used to ensure dry base construction.	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
Foundation Preparation	<input type="checkbox"/> The foundation soil (sub-grade) meets minimum allowable bearing capacity stated in the design. <input type="checkbox"/> Unsuitable soil removed and replaced under direction of Site Geotechnical Engineer. For geogrid reinforced structures, replacement of unsuitable material must include entire footprint of wall (facing AND geogrid reinforced zone). Replacement material must extend at 1H:1V from front and back of footprint to suitable founding depth. <input type="checkbox"/> Engineered fill material compacted to 95% SPD or as specified in the design.	<hr/> <hr/> <hr/> <hr/>
Base Preparation	<input type="checkbox"/> Base material is as specified in the design (well-graded angular gravel). <input type="checkbox"/> Compaction density not less than 98% SPD. <input type="checkbox"/> Base dimensions are as specified in the design. <input type="checkbox"/> The surface is level front to back and side to side. A 50mm (2in) unreinforced concrete leveling pad may be placed on top of the gravel base. <input type="checkbox"/> Base stepping as per design to ensure minimum required embedment is maintained at all times.	<hr/> <hr/> <hr/> <hr/> <hr/>



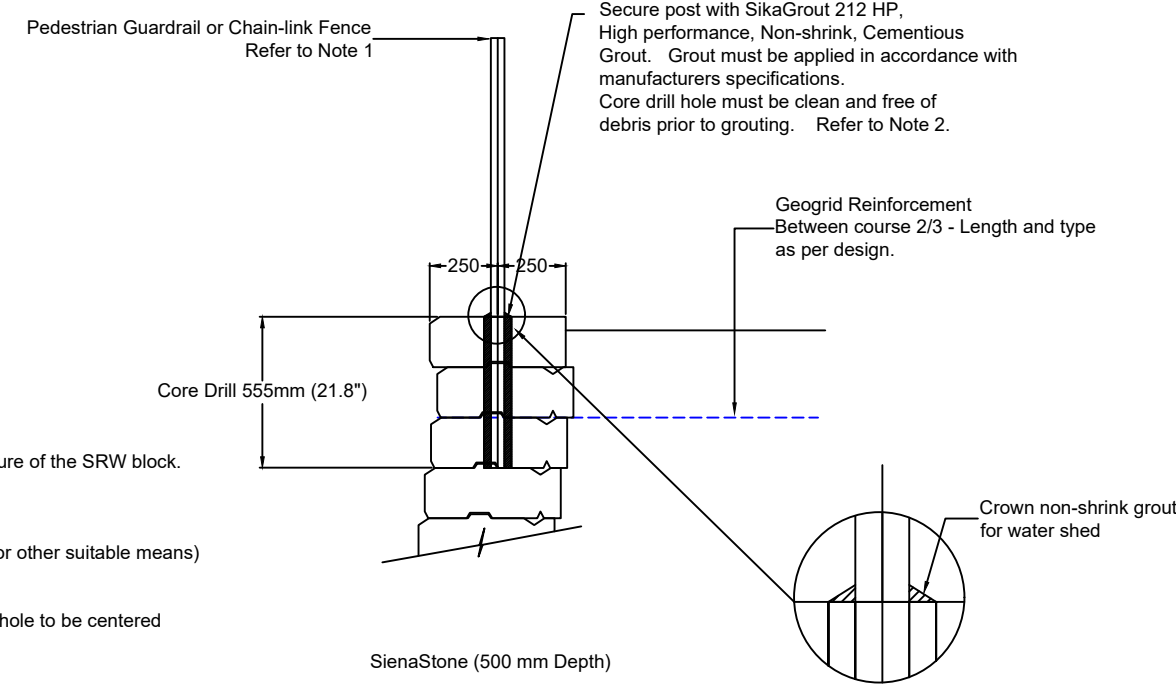
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Design Drawings

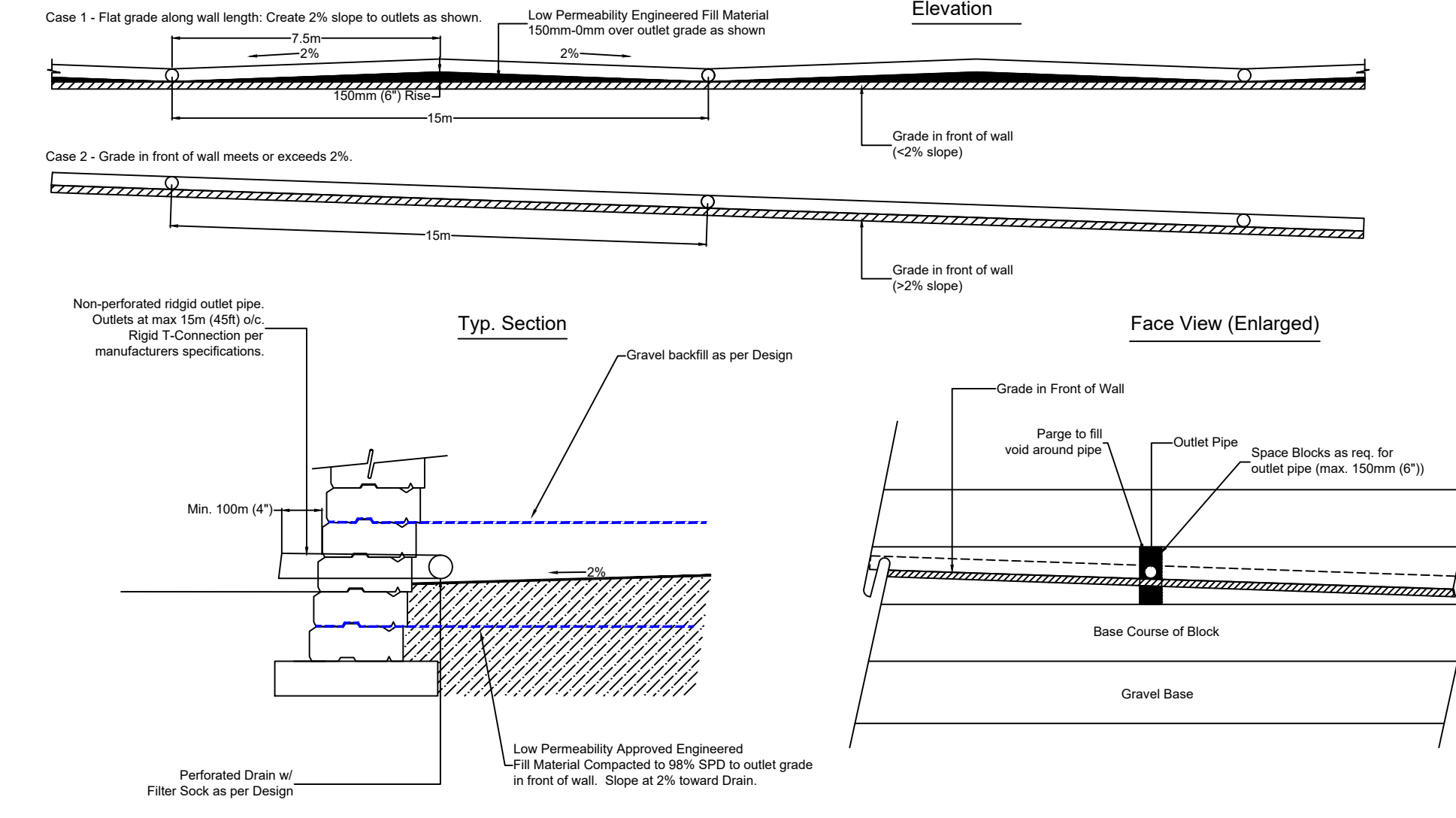
Detail - Pedestrian Guardrail Installation

Notes:

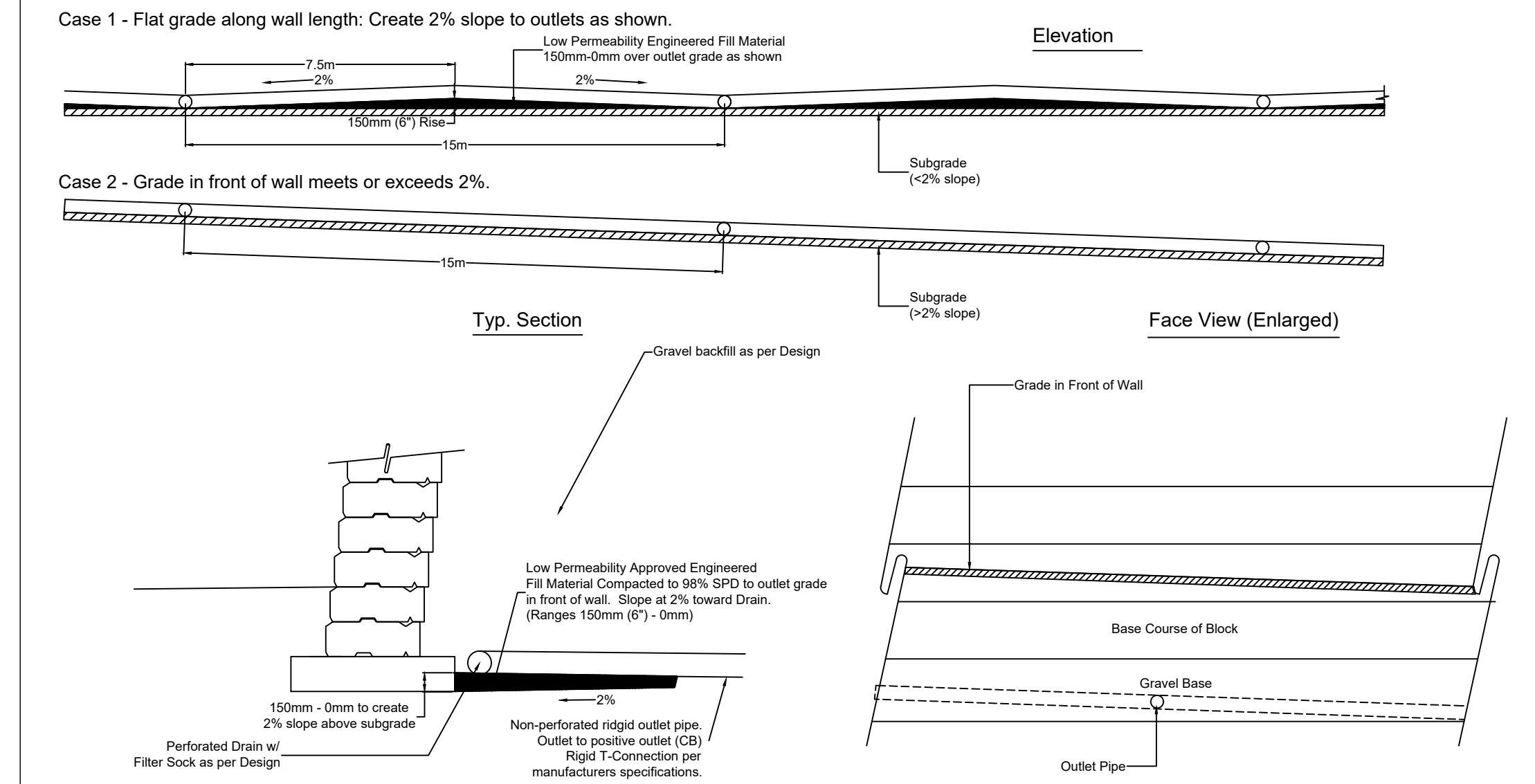
1. Pedestrian Guardrail or Chain Link Fence (Designed by others)
 - a) Must be non-wind bearing. Wall Designed to resist loads as specified in the Ontario Building Code.
 - b) Max. Post O/D = 75mm (3")
 - c) Post shape to be circular. If square post is required, circular post must be sleeved into square post as per fence designers detail.
 - d) Grouted portion of the post must be unpainted.
 - e) Post must be sealed or capped from the top to prevent infiltration of water.
 - f) Post must be filled with grout inside and outside to crowing elevations (just above top of block)
 - g) Max. 1.8 m post spacing or as per design.
2. Grouting and Core Drilling
 - a) Grout manufacturers specifications must be adhered to. Failure to follow these specifications may lead to failure of the SRW block.
 - b) Holes are to be core drilled. Use of percussion type instrument is not allowed.
 - c) Core drill hole to extend completely through the specified number of courses to allow high pressure water jet (or other suitable means) to clean hole of dust and debris prior to grouting.
 - d) O/D of core drill hole not to exceed 100mm. Core drill hole O/D to exceed post O/D by min. 25mm. Core drill hole to be centered midway through block as shown. Min. 300mm offset to either end of block.
 - e) Installation must take place during the grout manufacturer's recommended temperature ranges.
 - f) The core drilled holes must be cleaned and free of dust and debris prior to pouring of the grout.
 - g) The core drill holes must be wet down prior to pouring of the grout to promote a damp curing environment.
 - h) The grout must be brought up to just above the top of the coping unit and sloped away (crowned) from the post to prevent the future infiltration of water into the core drill hole. Contractor must ensure water is prevented from infiltrating post hole.
 - i) All contaminated water (used in cleaning the hole or core drilling) must be washed from the face of the wall to prevent staining.
 - j) Additional requirements and provisions are required by Grout manufacturer for proper performance than those noted here. Strict adherence to specifications required.
 - k) The Ontario Building Code requires that the contractor retain a General Review Engineer to ensure installation is in compliance with design and specifications (Wall and grout manufacturers specs).



Detail - Drain Outlet Thru Face of Wall



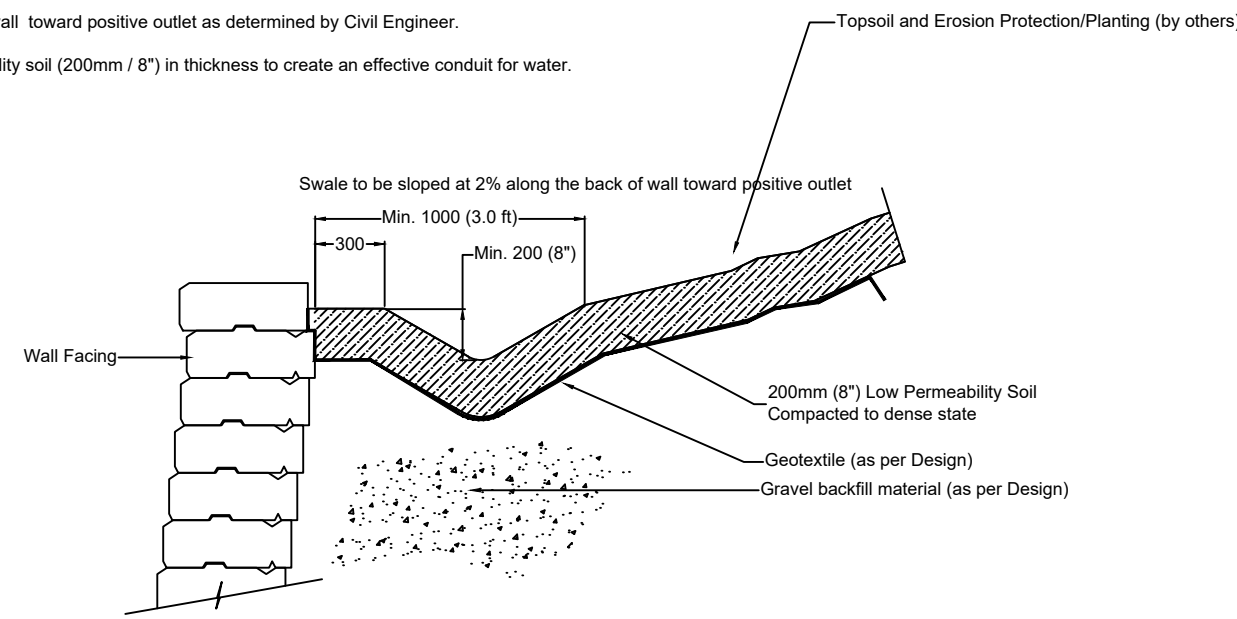
Detail - Drain at Base of Wall



Detail - Swale Detail (Typical - Dim. to be provided by Civil Engineer)

Notes:

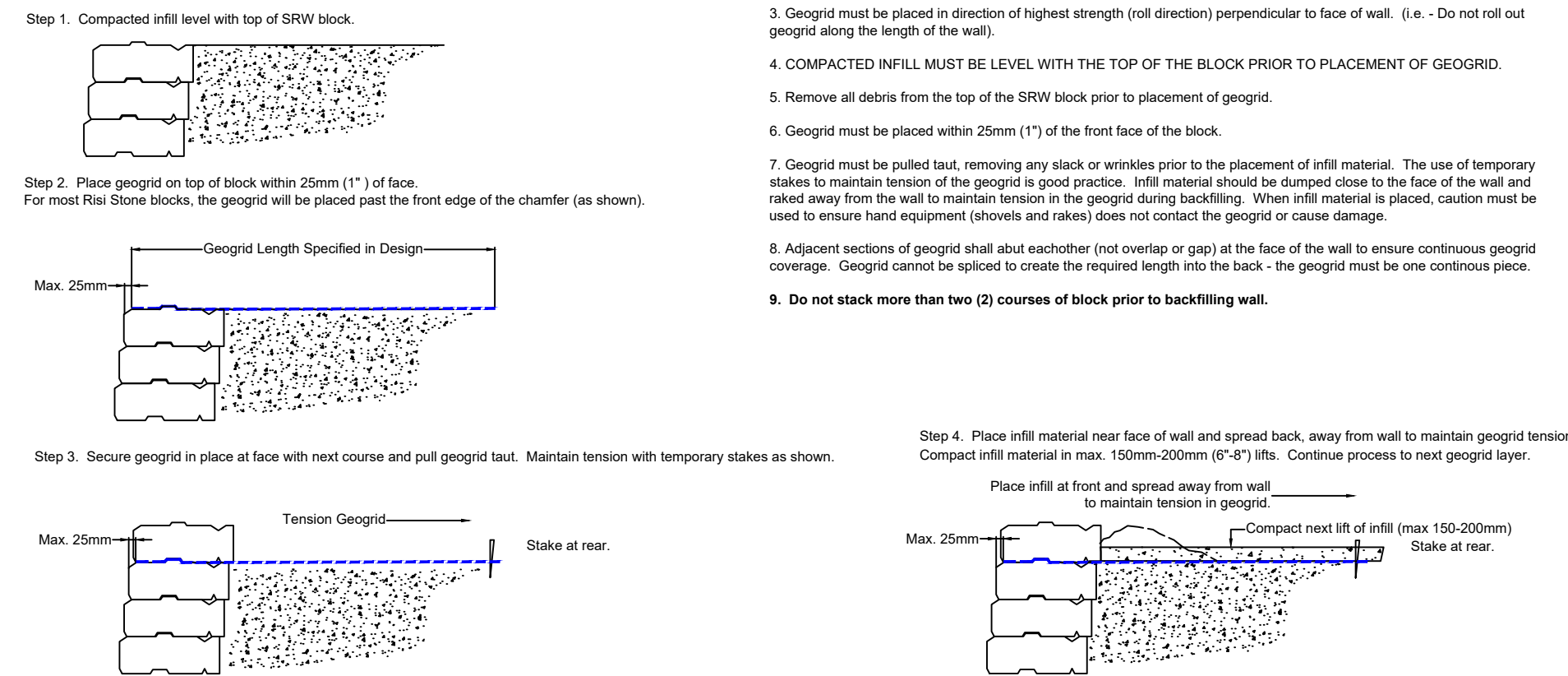
1. Swale to be dimensioned by Civil Engineer based on site drainage plan.
2. Swale to slope at min. 2% along the back of wall toward positive outlet as determined by Civil Engineer.
3. Swale must be constructed with low permeability soil (200mm / 8") in thickness to create an effective conduit for water.



Detail - Geogrid Installation

Notes:

1. Follow geosynthetic manufacturer's installation instructions and specifications. Care must be taken to ensure geogrid is not damaged during construction or subject to UV exposure.
2. Do not allow ANY tracked equipment directly on top of the geogrid. For necessary travel on the geogrid, use only lightweight rubber tread equipment operating at slow speeds (less than 10 rpm); do not allow braking or sharp turning.
3. Geogrid length, placement and type shall be as indicated in the Wall Design.
4. Geogrid must be placed in direction of highest strength (roll direction) perpendicular to face of wall. (i.e. - Do not roll out geogrid along the length of the wall).
5. COMPACTED INFILL MUST BE LEVEL WITH THE TOP OF THE BLOCK PRIOR TO PLACEMENT OF GEOGRID.
6. Remove all debris from the top of the SRW block prior to placement of geogrid.
7. Geogrid must be placed within 25mm (1") of the front face of the block.
8. Geogrid must be pulled taut, removing any slack or wrinkles prior to the placement of infill material. The use of temporary stakes to maintain tension of the geogrid is good practice. Infill material should be dumped close to the face of the wall and raised away from the wall to maintain tension in the geogrid during backfilling. When infill material is placed, caution must be used to ensure hand equipment (shovels and rakes) does not contact the geogrid or cause damage.
9. Adjacent sections of geogrid shall abut each other (not overlap or gap) at the face of the wall to ensure continuous geogrid coverage. Geogrid cannot be spliced to create the required length into the back - the geogrid must be one continuous piece.
10. Do not stack more than two (2) courses of block prior to backfilling wall.

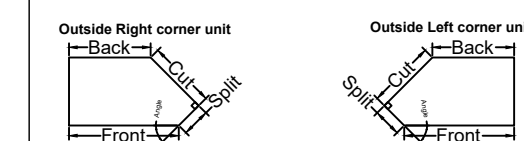


Detail - Outside Corner Construction

SIENASTONE® (1.2m) Outside Modified Corners

Angle (degrees)	Front (mm)	Back (mm)	Split (mm)	Cut (mm)	Unit to Modify
5	622	600	22	500	Standard
10	644	600	44	500	Standard
15	666	600	66	500	Standard
20	688	600	88	500	Standard
25	714	600	114	500	Standard
30	738	600	138	500	Standard
35	762	600	162	500	Standard
40	787	600	187	500	90° corner
45	809	600	209	500	90° corner
50	829	600	229	500	90° corner
55	847	600	247	500	90° corner
60	863	600	263	500	90° corner
65	877	600	277	500	90° corner
70	889	600	289	500	90° corner
75	899	600	299	500	90° corner
80	907	600	307	500	90° corner
85	913	600	313	500	90° corner
90	916	600	316	500	90° corner
95	917	600	317	500	90° corner
100	916	600	316	500	90° corner
105	913	600	313	500	90° corner
110	907	600	307	500	90° corner
115	899	600	299	500	90° corner
120	889	600	289	500	90° corner
125	877	600	277	500	90° corner
130	863	600	263	500	90° corner
135	847	600	247	500	90° corner
140	829	600	229	500	90° corner
145	809	600	209	500	90° corner
150	787	600	187	500	90° corner
155	762	600	162	500	90° corner
160	738	600	138	500	90° corner
165	714	600	114	500	90° corner
170	688	600	88	500	90° corner
175	666	600	66	500	90° corner
180	644	600	44	500	90° corner
185	622	600	22	500	90° corner
91-180	Use manufactured 90° corner unit. Not recommended.				

Angle (degrees)	Front (mm)	Back (mm)	Split (mm)	Cut (mm)	Unit to Modify
5	622	600	22	500	Standard
10	644	600	44	500	Standard
15	666	600	66	500	Standard
20	688	600	88	500	Standard
25	714	600	114	500	Standard
30	738	600	138	500	Standard
35	762	600	162	500	Standard
40	787	600	187	500	90° corner
45	809	600	209	500	90° corner
50	829	600	229	500	90° corner
55	847	600	247	500	90° corner
60	863	600	263	500	90° corner
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70	889	600	289	500	90° corner
75	899	600	299	500	90° corner
80	907	600	307	500	90° corner
85	913	600	313	500	90° corner
90	916	600	316	500	90° corner
95	917	600	317	500	90° corner
100	916	600	316	500	90° corner
105	913	600	313	500	90° corner
110	907	600	307	500	90° corner
115	899	600	299	500	90° corner
120	889	600	289	500	90° corner
125	877	600	277	500	90° corner
130	863	600	263	500	90° corner
135	847	600	247	500	90° corner
140	829	600	229	500	90° corner
145	809	600	209	500	90° corner
150	787	600	187	500	90° corner
155	762	600	162	500	90° corner
160	738	600	138	500	90° corner
165	714	600	114	500	90° corner
170	688	600	88	500	90° corner
175	666	600	66	500	90° corner
180	644	600	44	500	90° corner
91-180	Use manufactured 90° corner unit. Not recommended.				

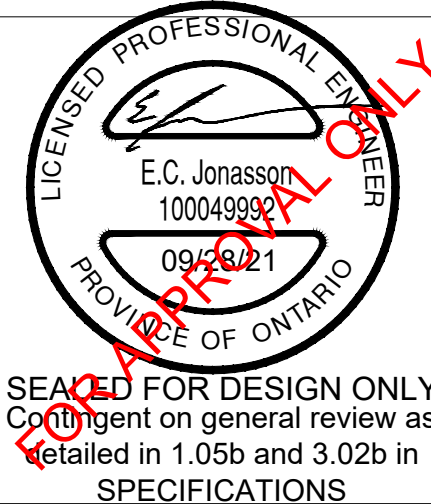


1. Create modified right corner unit using required unit.
 - a. Identify inside angle required. Mark corresponding Front and Back dimensions from left end of unit.
 - b. Mark Split and Cut dimensions on square. Line up marks on square with marks on unit.
 - c. Scribe Split and Cut lines on unit.
 - d. Use concrete saw to cut along Cut line.
 - e. Use chisel and hammer to score then split along Split line.
 - f. If necessary, use concrete saw to remove knob from the right end, leaving approximately 57.5mm (2.3 inches) of the key intact on the right side.
2. Place modified right corner unit on first course.
3. Create modified left corner unit using required unit.
 - a. Identify inside angle required. Mark corresponding Front and Back dimensions from right end of unit.
 - b. Mark Split and Cut dimensions on square. Line up marks on square with marks on block.
 - c. Scribe Split and Cut lines on unit.
 - d. Use concrete saw to cut along Cut line.
 - e. Use chisel and hammer to score then split along Split line.
 - f. If necessary, use concrete saw to remove knob from the left end, leaving approximately 57.5mm (2.3 inches) of the key intact on the left side.
4. Place modified left corner unit on next course.
5. Repeat step 1 through 4 until desired height is achieved.

SIENASTONE® Wall System Information

SIENASTONE® System Units	Face Width	Back Width	Height	Depth	Weight
Standard Unit	48" (39")*	48" (39")*	7.25"	20"	570 lbs (463 lbs)*
	1200 mm (991 mm)*	1200 mm (991 mm)*	185 mm	500 mm	259 kg (210 kg)*
925 Unit	48" (39")*	48" (39")*	7.25"	36"	1102 lbs (895 lbs)*
	1200 mm (991 mm)*	1200 mm (991 mm)*	185 mm	925 mm	450 kg (366 kg)*
Left Corner Unit	44" (35")*	44" (35")*	7.25"	20"	525 lbs (426 lbs)*
	1100 mm (900 mm)*	1100 mm (900 mm)*	185 mm	500 mm	238 kg (194 kg)*
Right Corner Unit	44" (35")*	44" (35")*	7.25"	20"	525 lbs (426 lbs)*
	1100 mm (900 mm)*	1100 mm (900 mm)*	185 mm	500 mm	238 kg (194 kg)*
45 Degree Corner Unit	34"	34"	7.25"	20"	330 lbs
	856 mm	856 mm	185 mm	500 mm	150 kg
Coping Unit	48" (39")*	48" (39")*	7.25"	20"	570 lbs (463 lbs)*
	1200 mm (991 mm)*	1200 mm (991 mm)*	185 mm	500 mm	259 kg (210 kg)*

*Indicates dimensions of alternate units available in some locations



Project: Multipurpose Development
5497 Manotick Dr.
Manotick, Ontario
RSS Project No: 202109023

SIENASTONE®
Geogrid Reinforced
Segmental Retaining Wall

Drawn By: ECJ
Design: ECJ
Check: +
Date: 09/28/21
Dwg No: 2 of 2
Dwg. File: 202109023RW2



http://www.risistone.com

No.	Date	By	Revisions

RETAINING WALL
DETAIL SHEET

SHEET
RW-2

DWG NO.
2 of 2



RisiStone[®]
retaining wall systems

Specifications

SECTION 32 32 23 - SEGMENTAL RETAINING WALL

July 2014

PART 1 GENERAL

1.01 Description

- A. The work covered by this section includes the furnishing of all labour, materials, equipment, and incidentals for the Design, inspection, and construction of a modular concrete Segmental Retaining Wall ("SRW") including drainage system and geosynthetic reinforcement as shown in the Construction Documents and as described by this Specification. The work included in this section consists of, but is not limited, to the following:
- 1) Design of an SRW system.
 - 2) Review of the site conditions with respect to suitability of the SRW Design.
 - 3) Inspection of all construction operations and materials related to the SRW.
 - 4) Excavation and foundation soil preparation.
 - 5) Furnishing and placement of the Leveling Base.
 - 6) Furnishing and placement of the Drainage system.
 - 7) Furnishing and placement of Geotextile Filter (if applicable).
 - 8) Furnishing and placement of SRW units.
 - 9) Furnishing and placement of Geosynthetic Reinforcement.
 - 10) Furnishing, placement, and compaction of Reinforced, Drainage, and Retained Fills.
 - 11) Furnishing of final grading.

1.02 Related Work

- A. Section 31 10 00 - Site Preparation
B. Section 31 20 00 - Earth Moving

1.03 Reference Standards (Refer to most recent versions)

A. Segmental Retaining Wall Design

- 1) Design Manual for Segmental Retaining Walls, National Concrete Masonry Association, Third Edition which will be referred to as the "NCMA Design Manual"

B. Segmental Retaining Wall Units

- 1) ASTM C140, "Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units"
- 2) ASTM C1262, "Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units"
- 3) ASTM C1372, "Standard Specification for Dry-Cast Segmental Retaining Wall Units"

- 4) ASTM D6638, "Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)"
- 5) ASTM D6916, "Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks)"

C. Geotextile Filter

- 1) ASTM D4491, "Standard Test Methods for Water Permeability of Geotextiles by Permittivity"
- 2) ASTM D4751, "Standard Test Method for Determining Apparent Opening Size of a Geotextile"
- 3) ASTM D5261, "Standard Test Method for Measuring Mass per Unit Area of Geotextiles"

D. Geosynthetic Reinforcement

- 1) ASTM D4595, "Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method"
- 2) ASTM D5262, "Standard Test Method for Evaluating the Unconfined Tension Creep Rupture Behavior of Geosynthetics"
- 3) ASTM D5321, "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method"
- 4) ASTM D5818, "Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics"
- 5) ASTM D6637, "Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method"
- 6) ASTM D6706, "Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil"
- 7) ASTM D6992 – Standard Test Method for Accelerated Tensile Creep and Creep-Rupture of Geosynthetic Materials Based on Time-Temperature Superposition Using Stepped Isothermal Method.

E. Soils

- 1) ASTM D422, "Standard Test Method for Particle-Size Analysis of Soils"
- 2) ASTM D698, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))"
- 3) ASTM D1556, "Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method"
- 4) ASTM D1557, "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))"
- 5) ASTM D2487 "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)"

- 6) ASTM D6938, "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods"
- 7) ASTM D4318, "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils"
- 8) ASTM D6919, "Standard Test Methods for Particle-Size Distribution (gradation) of Soils Using Sieve Analysis"
- 9) ASTM G51, "Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing"

F. Drainage Pipe

- 1) ASTM F758, "Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage"
- 2) ASTM F405, "Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings"

G. Where specifications and reference documents conflict, the Owner or Owner's Representative shall make the final determination of applicable document.

1.04 Delivery, Material Handling, and Storage

- A. The Installer shall check all materials delivered to the site to ensure that the materials specified in the Construction Documents have been received and are in good condition.
- B. The Installer shall store and handle all materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, handling, or other causes.

1.05 Roles and Responsibilities

Although other parties may have responsibilities related to the Retaining Wall, the following Four (4) main entities have direct responsibilities for the Design, Review and Construction of the Segmental Retaining Wall. This outline of roles and responsibilities is based on Section 3 and Section 12 of the NCMA Design Manual for Segmental Retaining Walls, 3rd Edition.

- A. The term **Installer** shall refer to the individual or Firm that will construct the SRW. The Installer must have the necessary experience and understanding of SRWs for the project and have successfully completed projects of similar scope and size.
- B. The **Site Geotechnical Engineer** is the individual Professional Geotechnical Engineer or Geotechnical Engineering Firm that has been retained to provide all Geotechnical verifications for the Wall, including verifying Site Soils and Groundwater conditions, Materials testing, and Global Stability. Refer to Section 3.02 and 3.03.

C. The term **General Review Engineer** refers to the individual Professional Engineer or Professional Engineering Firm that has been retained to provide “General Review” of the Wall construction to ensure that the Wall is constructed in general conformance with the Design and Specifications. The General Review Engineer and the Site Geotechnical Engineer can be, and are often the same Party. Refer to Section 3.02 and 3.03.

D. The term **Wall Designer** refers to the individual Professional Engineer or Professional Engineering Firm that is experienced in the design of SRWs and is responsible for generating a sealed SRW Design based on information that is provided to the Designer, created in accordance with Section 3.01. The Designer may retain the services of other professionals to augment their own capabilities, skills, and knowledge. The Wall Designer and General Review Engineer (GRE) are not required to be the same individual or firm. Any issues in the field, such as differences between assumed Design conditions and actual field conditions, will be brought to the attention of the Wall Designer by the GRE.

1.06 Submittals - per Contract Documents.

1.07 Measurement for Payment - per Contract Documents.

1.08 Approved Segmental Retaining Wall System

The Segmental Retaining Wall (SRW) System shall be the Risi Stone SRW System noted in the attached Design.

PART 2 MATERIALS

2.01 Definitions

- A. Segmental Retaining Wall ("SRW") is the entire retaining wall structure(s) including: SRW Units, Coping, Drainage Pipe, Geotextile Filter, Geosynthetic Reinforcement and Drainage, Reinforced, Retained, and Base Fills. A Segmental Retaining wall structure can be classified as follows:
- 1) Conventional SRW - SRW Units stacked on a Leveling Base with a Drainage system behind.
 - 2) Multi-Depth SRW - SRW Units of different depths with larger units at the bottom, and smaller units at the top, stacked on a Leveling Base with a Drainage system behind.
 - 3) Reinforced SRW - SRW Units stacked on a Leveling Base with a Drainage system, Reinforced Fill including Geosynthetic Reinforcement located behind.
 - 4) Crib SRW - SRW Units stacked parallel and perpendicular to the SRW direction forming bin like structures, built on a Leveling Base with a Drainage system behind.
- B. Segmental Retaining Wall Units are modular, solid, dry-cast concrete blocks, designed specifically for the task of earth retention, that form the external facia of an SRW system.
- C. Coping Units are the last course of concrete units used to finish the top of the SRW. Coping Units are also referred to as cap units.
- D. Leveling Base is the compacted granular soil, or if specified in the Construction Documents, an unreinforced concrete footing, placed beneath the first course of SRW units.
- E. Drainage Fill is a free draining aggregate with high permeability placed directly behind the modular concrete units. This will include a Drainage Pipe and may be separated from other Fill with a suitable Geotextile Filter.
- F. Reinforced Fill is placed directly behind the Drainage Fill, placed in layers and compacted, that will include horizontal layers of Geosynthetic Reinforcement. If the Reinforced Fill is considered to be a "draining material", the Drainage Fill may not be required.
- G. Retained Fill is the soil placed between the Reinforced Fill and the Retained Soil in Reinforced SRWs or between the Drainage Fill and Retained Soil in Conventional SRWs.
- H. Retained Soil in cut situations is the undisturbed native soil embankment. In soil fill situations this will be the compacted engineered site fill.
- I. Foundation Soil is the undisturbed native soil or engineered fill beneath the SRW structure.

- J. Drainage Pipe is a perforated pipe used to carry water, collected from within the SRW, to outlets, to prevent pore water pressures from building up within the SRW and specifically behind the SRW Units.
- K. Geotextile Filter is a permeable planar polymer structure that will allow the passage of water from one soil medium to another while preventing the migration of fine particles that might clog the downstream fill. Selection of a Geotextile Filter is based on the characteristics of the different soils used in and surrounding the SRW.
- L. Geosynthetic Reinforcement is an open planar polymer structure having tensile strength and durability properties that are suitable for soil reinforcement applications. Geogrid is a commonly used type of Geosynthetic Reinforcement.
- M. All values stated in metric units shall be considered as accurate. Values in parenthesis stated in imperial units are the nominal equivalents.

2.02 Material Requirements

- A. All approved products will be identified in the Construction Documents. No substitutions will be allowed unless approved in writing by the Designer.
- B. The Risi Stone SRW units will be specified in the Construction Documents which shall include the manufacturer's name, product name, dimensions, colour, and finish. Additionally the SRW units must:
 - 1) Meet the minimum standard as defined by ASTM C1372 for:
 - a) Strength
 - b) Absorption
 - c) Freeze - Thaw durability
 - d) Permissible variation in dimensions
 - e) Finish and Appearance
 - 2) Meet the physical properties listed below as tested using ASTM C140:
 - a) Dimensional tolerance shall be +/- 3 mm (1/8 in.) for height, width, and length.
 - b) The minimum 28-day compressive strength of 35 MPa (5000 psi).
 - c) The maximum moisture absorption shall be 1.0 kN/cubic m (6.5 lbs/cubic ft).
 - 3) Use an integral shear key connection that shall be offset to create, as specified in the Construction Documents, either:
 - a) A minimum batter as stated in the Construction Documents, or
 - b) A near vertical alignment. Special construction procedures are required for vertical SRWs. See Section 3.04.D.
 - 4) If required, summary test data shall be provided with the SRW Design and shall include:
 - a) SRW Unit shear strength as per ASTM D6916
 - b) SRW Unit - Geosynthetic Reinforcement connection strength as per ASTM D6638
- C. Reinforced Fill

- 1) If the SRW Units by themselves provide sufficient stability, the Designer may choose to omit the Reinforced Fill
- 2) The Reinforced Fill shall be specified in the Construction Documents as "select imported fill"
 - a) Unified Soil Classification System designation as per ASTM D2487
 - b) % passing #200 sieve
 - c) Effective friction angle (direct shear or triaxial test)
 - d) Minimum compacted density
- 3) Additional information may be required which could include:
 - a) Soil gradation curve (ASTM D422)
 - b) Liquid limit, plastic limit, and plasticity index (ASTM D4318)
 - c) Soil pH (ASTM G51)
 - d) Permeability coefficient "Q"

D. Leveling Base

- 1) The leveling base material shall be non-frost susceptible, well-graded, compacted angular gravel-sand mixture (GW as per ASTM D2487).
- 2) Additional information may be required which could include:
 - a) Effective friction angle (direct shear or triaxial)
 - b) Soil gradation curve (ASTM D422)
 - c) Soil pH (ASTM G51)
 - d) Permeability coefficient "Q"
 - e) Potential for consolidation
- 3) Alternately, the Construction Documents may specify the leveling base shall be an unreinforced concrete footing with specified dimensions.

E. Drainage Fill

- 1) If the Reinforced Fill has adequate drainage characteristics, the Designer may choose to omit the Drainage Fill.
- 2) The Drainage Fill shall be a free-draining angular, gravel material of uniform particle size smaller than 25 mm (1 inch) and greater than 6mm (1/4 inch). If shown in the Construction Documents, the Drainage Fill shall be separated from the Reinforced Fill or Retained Fill by a specified Geotextile Filter.
- 3) Additional information may be required which could include:
 - a) Effective friction angle (direct shear or triaxial)
 - b) Soil gradation curve (ASTM D422)
 - c) Soil pH (ASTM G51)
 - d) Permeability coefficient "Q"
 - e) Potential for consolidation

F. Drainage Pipe

- 1) The Drainage Pipe shall be specified in the Construction Documents and shall either be a perforated corrugated polyethylene or perforated PVC pipe, with a minimum diameter of 100 mm (4 inches), protected by a Geotextile Filter to prevent the migration of soil particles into the Drainage Pipe.

G. Geotextile Filter

- 1) If the gradation of adjacent soils permits, the Geotextile Filter may not be required per the Design.
- 2) If required, summary test data shall be provided with the SRW Design and shall include:
 - a) Apparent opening size "AOS" (ASTM D4751)
 - b) Unit weight (ASTM D5261)
 - c) Coefficient of permeability (ASTM D4491)

H. Geosynthetic Reinforcement

- 1) If the SRW Units by themselves provide sufficient stability, the Designer may choose to omit the Geosynthetic Reinforcement.
- 2) The Geosynthetic Reinforcement shall be specified in the Construction Documents and shall include the manufacturer's name, product name, and Long Term Design Strength ("LTDS") as calculated according to section 3.01.A.5.
- 3) If required, summary test data shall be provided with the SRW Design and shall include:
 - a) Tensile strength (ASTM D6637)
 - b) Creep potential reduction factor (ASTM D5262)
 - c) Installation damage reduction factor
 - d) Durability reduction factor (chemical and biological)
 - e) Soil pullout resistance (ASTM D6706)
 - f) Connection strength (ASTM D6638)
 - g) Coefficient of interaction "Ci"
 - h) Coefficient of interaction "Cds"

I. Concrete Adhesive

- 1) If the Coping Unit by itself provides sufficient stability, the Designer may choose to omit the Coping Adhesive.
- 2) The adhesive is used to permanently secure the coping unit to the top course of the SRW. The adhesive must provide sufficient strength and remain flexible for the expected life of the SRW.

PART 3 EXECUTION

3.01 Segmental Retaining Wall Design

A. Design Standard

- 1) The Designer is responsible for providing an SRW Design based on the proposed site development documents. The design life of the structure shall be 75 years unless otherwise specified in the Construction Documents.
- 2) The Designer shall create the SRW Design in accordance with recommendations of the NCMA Design Manual for Segmental Retaining Walls, Third Edition, for Internal, External, and Internal Compound Stability under Static and Seismic conditions.
- 3) If required, an alternate design method may be used and must be identified in the SRW Design. The alternate design method must be comprehensive and adequately evaluate all possible modes of failure.
- 4) The Wall Designer is not responsible for analyzing the global stability of the SRW structure for circular slip failure planes that are completely external to the SRW structure. The Global Stability analysis is to be conducted by the Geotechnical Engineer (SGE) in accordance with NCMA guidelines. Refer to Section 1.05.

B. Design Assumptions – Refer to Notes on Design Drawing

C. Design Parameters

- 1) Site Parameters
 - a) The length, height, and overall elevations of the SRW Design must be derived from the provided site grading plan, elevation details, cross-section details, and station information.
 - b) Surcharges, anticipated usage and slopes above, as well as slopes below, all sections of the SRW must be indicated on the site grading plan.
 - c) The minimum SRW embedment shall be the greater of:
 - i. The height of an SRW unit, or
 - ii. The minimum embedment required based on the slope below the SRW.

Slope Below SRW	Minimum Embedment
No Slope	H/10
3 : 1 (18.4 deg)	H/10
2 : 1 (26.5 deg)	H/7
 - iii. The Site Geotechnical Engineer may determine it is necessary to increase embedment due to erosion potential or global stability requirements.

2) Site Soil Parameters

- a) All site soil parameters used in the design shall be stated in the SRW Design. This should include soil classification (ASTM D2487), effective friction angle, compacted density, and cohesion.
 - b) Site-specific soil parameters obtained from site geotechnical investigations shall be used in the design calculations. If a site geotechnical investigation is not available or does not provide specific parameters for the SRW, assumed soil parameters may be used and the SRW Design shall state the assumed values and that assumed soil parameters have been used.
 - c) If select on-site soils are to be used as SRW fill materials, additional testing of the re-compacted soil will be required for the design calculations. Soil parameters for the select on-site fill shall be used in the design calculations. If fill parameters are not available, assumed fill parameters may be used and the Design Drawings shall state the assumed values and that assumed fill parameters have been used.
- 3) Product Design Parameters
- a) All relevant Product Design Parameters for materials incorporated in the SRW shall be obtained from the supplier or manufacturer and used in the design calculations. All values used shall be obtained from testing conducted in accordance with the Reference Standards identified in Section 1.03. If product test results are not available, assumed parameters may be used and the Design Drawings shall state the assumed values and that assumed product design parameters have been used.

3.02 Segmental Retaining Wall Design Review

This section states the minimum review process that is required prior to construction of an SRW. Other parties such as municipalities, architects, developers, owners, and other designers should review the SRW Design prior to acceptance to ensure specific requirements of each party are met.

- A. Review of Design by the GRE (General Review Engineer). The General Review Engineer is not responsible for the Wall Design. The role of the GRE is to ensure that the Design produced by the Wall Designer is followed in the field. As such, the GRE must review and understand the Design. Refer to 1.05.C and 3.03.
- B. Review of the Design by the SGE (Site Geotechnical Engineer). The SGE must review the Design to verify that the Site Soil and Groundwater Conditions assumed in the Design are correct for the Site, or provide new values/conditions to the Wall Designer. The SGE must also review the Design to determine if a Global Stability analysis is required based on soil conditions, Wall geometry and slopes, groundwater, etc.
- C. Review of the Design by the Civil Engineer. The Project Civil Engineer must be provided with a copy of the SRW Design so they may review it for general compatibility with the site.
 - 1) Review should include, but is not limited to, the following specific elements:
 - a) All surface drainage must direct water away from the SRW including slopes and paved surfaces.
 - b) The SRW drainage system delivers outflow to approved locations.
 - c) All site services must be located outside of SRW construction area unless otherwise noted in Design.
 - d) The SRW structure or excavation limits must not cross over property boundaries unless approved prior to construction.
 - e) All structures located near the SRW must be shown in the Construction Documents.
 - f) Anticipated use above wall during and after construction must be as shown in the Construction Documents.
 - 2) The Project Civil Engineer must contact the Designer to address any outstanding issues, questions, or concerns regarding the SRW Design and resolve these issues prior to the General Review Engineer authorizing the SRW Design to be used as Construction Documents.
- D. Review of the Design by the Landscape Architect. If applicable, the Project Landscape Architect must be provided with a copy of the SRW Design so they may review it for general compatibility with the site.
 - 1) The review should include, but is not limited to, the following specific elements:

- a) Ensure plant and tree species to be placed above the SRW are suited to the environment created by the SRW.
 - b) Limit irrigation near SRW structure.
 - c) Grading above and below the SRW structure.
 - d) It may be necessary to incorporate a root barrier (as required by others) to prevent the migration of tree roots into the drainage layer.
 - e) Larger plants and trees must be kept outside of the Reinforced Fill to ensure
 - i. The Geosynthetic Reinforcement is not damaged by excavation for the root ball
 - ii. The SRW is not subjected to any additional load from plants or trees.
- 2) The Project Landscape Architect must contact the Designer to address any outstanding issues, questions, or concerns regarding the SRW Design and resolve these issues prior to the General Review Engineer issuing Construction Documents or authorising the SRW Design to be used as Construction Documents.

3.03 Inspection

Wall Construction must be regularly inspected as follows.

- A. Geotechnical Inspection. This is to be performed by a Geotechnical Engineer (SGE) retained by either the Installer or Owner (depending on the requirements of the Contract Documents). The Geotechnical Inspection includes, but may not be limited to, the following:
- a. Verifying assumed Design soil parameters and groundwater conditions are acceptable for the Site, or provide the Wall Designer with alternate values/conditions.
 - b. Verifying subgrade Bearing Capacity meets or exceeds values required by the Design, or provide recommendations to the Installer to achieve the required values (i.e. removal and replacement of subgrade materials, foundation improvement, etc).
 - c. Determining the need for Global Stability Analysis, and supplying this analysis if necessary per the NCMA guidelines (Section 12).
 - d. Providing Construction inspection and testing of on-site and fill soils (i.e. compaction testing).
 - e. Ensuring groundwater conditions and/or other water sources have been identified and compared with the assumptions made in the design. Additional water sources noted on site such as seepage from the cut embankment must be identified and the Designer notified if these are not noted in the Construction Documents.
- B. General Review of Construction. The General Review Engineer is retained by the Installer or Owner (depending on the requirements of the Contract Documents) to provide the

following services. (Note that the General Review Engineer may be the same individual as the Site Geotechnical Engineer. This is often the most efficient method of ensuring proper Inspection).

- a. Inform the Designer in writing that they will be acting as the General Review Engineer for the project prior to construction.
 - b. The GRE is to ensure that the Site Geotechnical Engineer (SGE) has verified the Geotechnical conditions as noted above.
 - c. The GRE is to ensure that the SGE has determined if Global Stability analysis is required and conducted if need be.
 - d. Testing and acceptance of all materials used to construct the SRW.
 - e. Inspection of the methods used to construct the SRW.
 - f. Determine if the wall is constructed in general conformance with the Construction Documents.
 - g. The General Review Engineer must contact the Designer to address any outstanding issues, questions, or concerns regarding the SRW Design and resolve these issues prior to issuing Construction Documents or authorize the SRW Design to be used as Construction Documents. During construction, the GRE should notify the Designer of any discrepancies between the Design and actual Site Conditions.
 - h. Ensure the SRW and associated excavation remains outside of the loading influence of other adjacent structures, unless they have been specifically accounted for in the SRW Design and shown in the Construction Documents and ensure stability of excavations and conformance with applicable regulations.
 - i. Ensure that surface water runoff and/or other sources of water are being controlled during construction and directed away from the SRW to a functioning drain.
- C. The Owner may engage a testing and inspection agency for their own quality assurance, but this does not replace the Site Geotechnical Engineer and General Review Engineer's inspection function described in Section 1.05 and Section 3.03.
- D. Installer's Quality Assurance Program
- 1) The Installer is responsible to ensure the SRW is constructed in accordance with the Construction Documents. The Installer must be qualified in the construction of SRWs, knowledgeable of acceptable methods of construction, and have thoroughly reviewed and understood the Construction Documents.
 - 2) It is recommended that the Installer shall keep a construction journal to document the construction of the SRW as part of a thorough quality control program. The

General Review Engineer shall be provided with copies of the construction journal throughout the construction process.

- 3) The Installer's field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the SRW construction.
- 4) The Installer must notify the General Review Engineer of critical stages in the construction of the SRW in order that they may be present to observe and inspect the work. The General Review Engineer must be notified reasonably well in advance of the scheduled date(s) for construction.

E. Construction Tolerances

- 1) Installation of SRW facia shall be within all the following acceptable tolerances:

Vertical Control	+/- 1.25 inches over a 10 ft distance
Horizontal Control	Straight lines: +/- 1.25 inches over a 10 ft distance
Rotation of the SRW face	Maximum 2.0 degrees from established SRW plan batter or +/-10.0% from total established horizontal setback
Bulging	+/- 1.25 inch over a 10 ft distance

3.04 Construction

A. Site Preparation

- 1) Comply with all current Federal, Provincial/State, and local regulations for execution of the work, including local building codes and excavation regulations. Provide excavation support as required to maintain stability of the area during excavation and SRW construction and to protect existing structures, utilities, landscape features, property, or improvements.
- 2) Prior to grading or excavation of the site, confirm the location of the SRW and all underground features, including utility locations within the area of construction. Ensure surrounding structures are protected from effects of SRW excavation.
- 3) Coordinate installation of underground utilities with SRW installation.
- 4) Control surface water drainage and prevent inundation of the SRW construction area during the construction process.
- 5) The Foundation Soil shall be excavated or filled as required to the grades and dimensions shown in the Construction Documents.
- 6) The Foundation Soil shall be proof rolled and examined by the General Review Engineer to ensure that it meets the minimum strength requirements specified in the Construction Documents. If unacceptable Foundation Soil is encountered, the General Review Engineer should contact the Designer to discuss options and determine the most appropriate course of action.

- 7) In cut situations, the native soil shall be excavated to the lines and grades shown in the Construction Documents and removed from the site or stockpiled for reuse as

Reinforced or Retained Fill as identified in the Construction Documents. Care should be taken not to contaminate or overly saturate the stockpiled fill material.

B. Installing Drainage System

- 1) If specified in the Construction Documents, the approved Geotextile Filter shall be set against the back of the first SRW Unit, over the prepared foundation soil extending towards the back of the excavation, up the excavation face and eventually over the top of the Drainage Fill to the back of the SRW Units near the top of the wall or as shown in the Construction Documents. Geotextile overlaps shall be a minimum of 300 mm (1 ft.) and shall be shingled down the face of the excavation in order to prevent the migration of particles from one fill type to another.
- 2) The Drainage Pipe shall be placed as shown in the Construction Documents, in accordance with the overall drainage plan for the site. The main collection drain pipe shall be a minimum of 100mm (4 inches) in diameter. The pipe shall be laid to ensure gravity flow of water from the Reinforced Fill. Connect drainage collection pipe at a storm sewer catch basin or daylight along slope at an elevation lower than lowest point of pipe within Reinforced Fill mass, every 15 m (50 feet) maximum.
- 3) If other sources of water are discovered during excavation or anticipated, other drainage measures/systems such as chimney or blanket drains may be required. The General Review Engineer should contact the Designer to discuss options and determine the most appropriate course of action.

C. Leveling Base or Spread Footing Placement

- 1) The Leveling Base shall be the specified material placed in the location to the dimensions shown in the Construction Documents.

D. Installation of Segmental Retaining Wall Units

- 1) The bottom row of SRW Units shall be placed on the Leveling Base as shown in the Construction Documents. The units shall be placed in the middle of the Leveling Base. Care shall be taken to ensure that the SRW Units are aligned properly, leveled from side to side and front to back, and are in complete contact with the Leveling Base.
- 2) The SRW Units above the bottom course shall be placed to interconnect the shear key and then pushed forward, creating the specified batter of the SRW face.
- 3) The SRW Units shall be swept clean before placing additional courses to ensure that no dirt, concrete, or other foreign materials become lodged between successive lifts of the SRW Units.
- 4) Successive courses shall be placed to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it. Cut SRW Units may need to be placed to ensure the vertical line between adjacent SRW Units remains within the middle third of the SRW Unit below.
- 5) A maximum of three courses of SRW units can be placed above the level of the Reinforced Fill at any time.
 - 6) The Installer shall check the level of SRW Units with each lift to ensure that no gaps are formed between successive lifts that may affect the performance of the SRW.

- 7) Care shall be taken to ensure that the SRW Units and Geosynthetic Reinforcement, where applicable, are not damaged during handling and placement.
- 8) No heavy equipment, for compaction, fill placement or other, shall be allowed within 1 metre (3 ft.) of the back of the SRW Units.

E) Drainage Fill

- 1) Drainage Fill may not be required as indicated in the Construction Documents.
- 2) The Drainage Fill will be placed behind the SRW Units with a minimum width of 300 mm (1 ft.) and separated from other soils using the specified Geotextile Filter.
- 3) Drainage Fill shall be placed behind the SRW facing in maximum lifts of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor.

F. Reinforced Fill

- 1) Reinforced Fill may not be required as indicated in the Construction Documents.
- 2) Reinforced Fill shall be placed behind the SRW Units or Drainage Fill with a maximum lift thickness of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor Maximum Dry Density (ASTM D698) at a moisture content from 2% below to 2% above optimum.
- 3) The Reinforced Fill shall be placed and compacted level with the top of the SRW Units at the specified Geosynthetic Reinforcement elevations to ensure no voids exist under the Geosynthetic Reinforcement as it extends out over the Reinforced Fill.
- 4) Care shall be taken to ensure that the Geosynthetic Reinforcement lays flat and taut during placement of the Reinforced Fill. This is best achieved by placing the Reinforced Fill on top of the Geosynthetic Reinforcement near the SRW facia and spreading toward the back of the Reinforced Fill.
- 5) At the end of each day's operation, slope the last lift of Reinforced Fill away from the SRW facing to rapidly direct runoff away from the SRW facia. Do not allow surface runoff from adjacent areas to enter the SRW construction area.

G. Geosynthetic Reinforcement

- 1) Geosynthetic Reinforcement may not be required as indicated in the Construction Documents.
- 2) Verify type and primary strength direction of the Geosynthetic Reinforcement.
- 3) Cut Geosynthetic Reinforcement in sheets to the length shown in the Construction Documents.
- 4) Geosynthetic Reinforcement sheets shall be placed horizontally with the primary strength direction perpendicular to the SRW face, at the elevations shown in the Construction Documents. The sheets are to be placed adjacent to one another, without overlapping and without gaps between them.
- 5) Sweep the top of the SRW Units to ensure the SRW Units are clean and free of debris.
- 6) The Geosynthetic Reinforcement shall be placed over the compacted Reinforced Fill and the SRW Units with the outside edge extending over the shear key of the SRW Unit to within 25 mm (1 in.) of the front facing unit.

- 7) The next course of SRW Units shall be carefully placed on top of the lower course to ensure that no pieces of concrete are chipped off and become lodged between courses and the Geosynthetic Reinforcement is in complete contact with the top and bottom surfaces of the successive SRW courses.
- 8) With the Geosynthetic Reinforcement secured in place, the Geosynthetic Reinforcement shall be pulled taut away from the back the SRW Units during placement of Reinforced Fill. Alternatively, suitable anchoring pins or staples can be used to ensure that there are no wrinkles or slackness prior to placement of the Reinforced Fill. The Geosynthetic Reinforcement shall lay flat when pulled back perpendicular to the back of the SRW facia.
- 9) No construction equipment shall be allowed to operate directly on top of the Geosynthetic Reinforcement until a minimum thickness of 150 mm (6 inches) of fill has been placed. Equipment may drive on Reinforced Fill at slow speeds and should exercise care not to stop suddenly or make sharp turns. No heavy equipment shall be allowed within 1 metre (3 ft.) of the back of the SRW Units.

H. Retained Fill

- 1) Retained Fill may not be required as indicated in the Construction Documents.
- 2) Retained Fill shall be placed and compacted behind the Reinforced Fill or Drainage Fill in Conventional SRW applications, in maximum lift thickness of 150 mm (6 inches).

I. Continuing Wall Construction

- 1) Repeat section 3.04.D through to 3.04.H until the grades indicated in the Construction Documents are achieved.

J. Secure Coping

- 1) The Coping Adhesive may not be required as indicated in the Construction Documents.
- 2) If coping adhesive is required by Design, coping units shall be secured to the top of the SRW with two 10 mm (3/8 inch) beads of Concrete Adhesive positioned 50mm (2 inches) in front and behind the tongue of the last course of SRW units.

K. Finishing SRW

- 1) Finish grading above the SRW to direct surface runoff water away from the SRW. A swale system must be used above the SRW if the grade slopes toward the back of the wall. Construct the swale with the materials and to the dimensions specified in the Construction Documents. Final grading must be established immediately to ensure the Reinforced Fill is protected from water infiltration.
- 2) Upon completion of the SRW, additional structures (fences, handrails, vehicular guardrails, buildings, pools/ponds, etc.) or changes to grading/loading (increased height, slopes, parking areas, changes in proximity to water flow, etc.), other than those shown in the Construction Documents, cannot be installed/implemented without the review and consent of the General Review Engineer who will typically have to consult the Designer.
- 3) If the Installer is not responsible for the final landscaping and grading above or around the SRW, the Installer must ensure the firm who is responsible for the final landscaping and grading understands the SRW's limitations with respect to allowable

depth of topsoil, excavation behind the SRW for planting, offset for heavy equipment and allowable surcharge. This also extends to firms who will be responsible for installations like handrails, fences, and signs that will apply additional loads to the SRW and will impact the SRW's performance.

Retaining Wall Budget & Design



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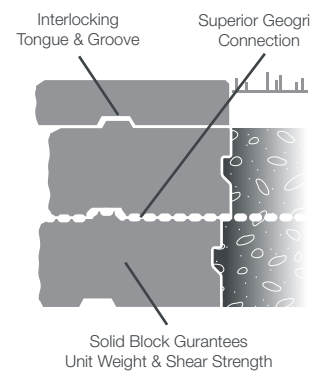
Comparing the Installed Cost

The "Installed" Cost of a Retaining Wall will vary based on a number of factors including the Wall Height, Application (heavy loading, water & steep slopes), Site Access, Aesthetics, Etc. Usually, the higher the wall and more critical the application, the greater the Final Installed Cost. The Installed Cost should include the Block, as well as Infill/Drainage Materials, Base, Wall Excavation (within footprint), Drainage pipe and labour/machine time. It is always important to compare product design and quality, as not all products are correct for every application.

Light duty walls, like Rivercrest, Pisa2 and RomanPisa are great for complex layouts (tight radii, intricate geometries) and applications where site access may be limited for heavy equipment (residential). Heavy duty walls, such as SienaStone, SonomaStone, and DuraHold are ideal for more critical applications, commercial use, and large scale installations where machine placing can save time and labour costs. For additional detailed information about selecting the right product for your project, please contact your Unilock Sales Representative, or Risi Stone Engineer.



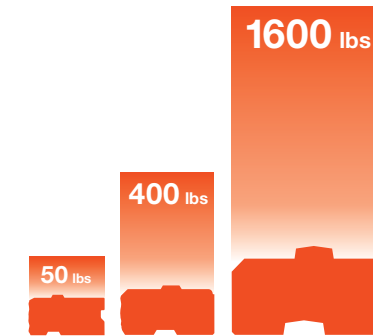
We have the longest, most proven track record in the SRW industry. The very first Concrete SRW System was invented by Angelo Risi in 1974.



Our simple solid block design ensures guaranteed performance. Block weight, shear strength, wall alignment & geogrid connection strength are all integrated right into the block.



Our Engineers have over 75 years of combined SRW design experience. We strive to provide you with precise, efficient information, advice & accurate Engineer Sealed designs.



We offer a complete range of product sizes, from hand-placed, to massive machine placed blocks. All of our products are purposely dimensioned for maximum versatility in any application.



Our SienaStone system has been evaluated & MTO approved against the most stringent design, manufacturing & quality checks.

Budgeting & Selecting the Right Product

The chart below provides comprehensive details about products, wall height restrictions and optimal application.

	Rivercrest [®] Natural	Pisa2 [®] Classic	PisaSmooth [™] Modern	SienaSmooth [™] Modern Colossal	SienaStone [®] Colossal	SonomaStone [®] Colossal	DuraHold [®] Colossal
Block Dimensions	Hand-Placed 31 x 5.7 x 24 cm 7 Kg / 15 Lbs Vertical	Hand-Placed 20 x 15 x 30 cm 21 Kg / 46 Lbs Vertical / Battered	Hand-Placed 55 x 8.5 x 27 cm 24 Kg / 54 Lbs Near / Vertical	Machine-Placed 120 x 18 x 37.5 cm 170 Kg / 375 Lbs Near / Vertical	Machine-Placed 120 x 18.5 x 50 cm 256 Kg / 570 Lbs Vertical / Battered	Machine-Placed 120 x 18.5 x 37.5 cm 175 Kg / 385 Lbs Vertical / Battered	Machine-Placed 183 x 30.5 x 61 cm 732 Kg / 1610 Lbs Vertical / Battered
Wall Height	< 0.6m	< 1.8m	< 1m	< 1m	< 1.5m	< 1.5-3m	< 1.8m
Wall Configuration	Gravity	Reinforced	Gravity	Reinforced	Gravity	Gravity & Multi-Depth	Gravity
Application	Complex Geometry, Residential	Complex Geometry, Commercial, Residential	Complex Geometry, Residential	Complex Geometry, Commercial, Residential	Modern Linear Geometry, Residential	Modern Linear Geometry, Commercial, Residential	Commercial, Machine Placed, Space Restrictions Property Lines
Style & Appearance	Natural	Classic	Modern	Modern	Colossal	Colossal	Colossal

Retaining Wall Design Process



1.800.UNILOCK
www.unilock.com



1.800.626.WALL
www.risistone.com

Comprehensive Designs & Solid Support

At Risi Stone Systems, we know Wall Design and we know what a comprehensive Design involves. While many competitors offer some form of "typical" or preliminary design, we are able to offer complete Designs that are specific to your Project and Region. Our Engineers use Vespa.RS, a cutting edge SRW design software that can layout and analyze your wall design ensuring it's fully compliant with NCMA or AASHTO Design Methodologies.

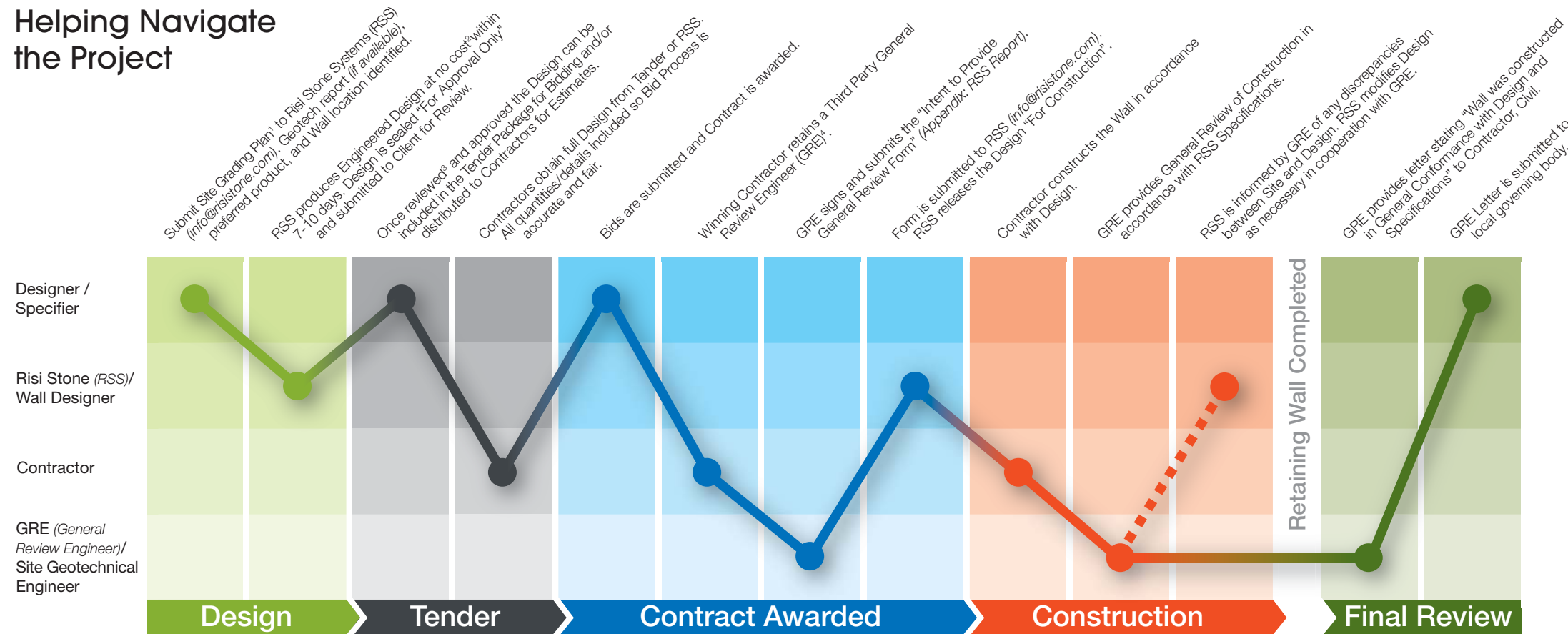
Total Cost vs Block Cost

On any Wall Project, the actual cost of the block is approximately 25%-30% of the Total cost of the Installed Wall, therefore, minor differences in "block" price rarely have a significant impact on the Total Installed Wall Cost.

Block Quality

Unilock blocks are the highest quality in the industry ensuring long term performance. With a minimum 5000 psi compressive strength and maximum 5% water absorption, our Systems are manufactured under the strictest quality control for proven long term durability and performance. Many other systems on the market are 2500-3000 psi compressive strength, are hollow, and require more labour time to place and level the units (core filling, shimming due to dimensional problems, addition of connectors). In the end, the "cheaper" alternative ends up costing about the same, but more of the project dollars are directed into the labour costs to install the block, not the quality of the block itself. And remember, it is the Block that will be there for the next 75+ years. The laborer leaves the site after the job is done.

Helping Navigate the Project



Appearance



¹ If you are requiring a Fully Engineered Wall Design, please provide us with what you consider to be a "Final" grading plan, so that we do not incur numerous and costly revisions as you continually revise the Plan. We appreciate it!
² A nominal fee is charged to the Contractor who is awarded the Project. For very complex Designs, with multiple revisions, a subsidized Design Fee may be negotiated between Risi Stone and the Client for Wall Design Services.
³ Wall Design is not reviewed with respect to Structural Stability, Compliance with the Building Code, etc. Review is only to ensure the Design, as shown, fits within the constraints (space, property lines) of your Project and meets the Grading Plan requirements. RSS is the Structural Designer of the Wall and take full responsibility for the Wall Design.
⁴ Ideally, the GRE is the same individual or firm providing Geotechnical Inspection on the Site. The GRE is not responsible to review the Design for Structural adequacy; they are only to ensure that the Wall is being constructed in General Conformance with the Design.

APPENDIX D

Site Images

Cultural Heritage Impact Study 5497 Manotick Main Street

SGH Project No.: 2021-0480



Site Image 01: 5497 Manotick Main Street (center) and adjacent properties, as seen from Manotick Main Street.



Site Image 02: 5497 Manotick Main Street as seen from street access, with parking at front of site.

Cultural Heritage Impact Study 5497 Manotick Main Street

SGH Project No.: 2021-0480



Site Image 03: Adjoining commercial plaza east of the site.



Site Image 04: Adjoining residential property west of the site.

Cultural Heritage Impact Study 5497 Manotick Main Street

SGH Project No.: 2021-0480



Site Image 05: Approach to the river, north of the site. The wall of the existing house is seen to the right.



Site Image 06: Rear yard of 5497 Manotick Main St, with buffer of mature trees along the riverbank.

Cultural Heritage Impact Study 5497 Manotick Main Street

SGH Project No.: 2021-0480



Site Image 07: Rear property line at the Rideau River water's edge.



Site Image 08: View from rear property line of neighbouring properties across the Rideau River.

Cultural Heritage Impact Study
5497 Manotick Main Street

SGH Project No.: 2021-0480



Site Image 09: Lush vegetation at rear property line, looking north to the Rideau River.



Site Image 10: View looking south to rear of existing house on property, from water's edge.

APPENDIX E

City of Ottawa Pre-Application Consultation Notes

Pre-Application Consultation Meeting Notes

Property Address: 5497 Manotick Main Street
PC2021-0183
Wednesday, May 26, 2021; Online Teams meeting

Attendees:

Sarah McCormick, City of Ottawa, Planner II
Sarah.McCormick@ottawa.ca

Harry Alvey, City of Ottawa, Project Manager
Harry.Alvey@ottawa.ca

Matthew Hayley, City of Ottawa, Environmental Planner II
Matthew.Hayley@ottawa.ca

Josiane Gervais, City of Ottawa, Transportation Engineer
Josiane.Gervais@ottawa.ca

Randolph Wang, City of Ottawa, Urban Design
Randolph.Wang@ottawa.ca

Reid Shepherd, City of Ottawa, Parks Planner
Reid.Shepherd@ottawa.ca

Eric Lalande, Rideau Valley Conservation Authority, Planner
eric.lalande@rvca.ca

Paul Robinson, applicant, P H Robinson Consulting
probinson@probinsonconsulting.com

Eric Brisson, Oligo Group
eric.brisson@oligogroup.com

Regrets:

Subject: 5497 Manotick Main Street

Meeting notes:

Overview of Proposal

- Proposal is for a 3 storey, residential building (retail and residential) with a mix of at grade (13 spaces) and below grade (13 spaces) parking spaces.
- Rental residential apartment are proposed with 10 one bedroom and 6 two bedroom units.
- Discussions with Councillor Moffat as well as discussions in March to the Manotick Village Association board of directors (previous plan)
- Concerns from Manotick Viallge board of directors and councillor:
 - Congestion at the intersection; with their entrance on the east side of the property; and impacts on cars in/out to the commercial plaza.
 - Rear yard parking with lighting (across river – houses have issues with the headlights and parking lot lighting).
- Now entrance is as far north as possible.
- 21 residential rental apartments on 3 floors, 26 parking spaces (10 at grade at front of the property, and remainder underground on 1 level) – parking meets the minimum parking required.
- Zoning to request:

- Minimum front yard setback (current maximum 3m)
- Add an apartment building – low rise (change from dwelling units only)
 - Councillor and Manotick Village Association on board.
- Properties in shape size and location does not lend to a retail use, plus retail is taking a hit and already empty spaces on Manotick Main Street now.
- Less than 20 parking spaces underground; a reduced ramp width is permitted.
- 14 bicycle spaces (above and below ground)
- 510-850 sq ft units; all units have a terrace.

Preliminary comments and questions from staff and agencies, including follow-up actions:

- Planning
 - Official Plan: Village
 - Schedules G and H of the Official Plan identifies Manotick Main Street as an existing arterial with a protected ROW width of 30m (15m from CL of the road).
 - From aerial photography, it seems the total ROW width is already in City ownership.
 - Schedule J of the Official Plan identifies Manotick Main Street as a Spine Route and as a Scenic Entry Route.
 - Manotick Secondary Plan
 - Goals and objectives of the Secondary Plan:
 - Enhance and develop Manotick as a vibrant, walkable and cycle friendly community and gathering place for both residents and visitors.
 - Ensure the Village Core is a focus of commercial and community activity.
 - Improve connectivity that provides ways for residents and visitors to easily travel throughout the Village.
 - Schedule A designates the property as Village Core
 - Focus of non-residential and residential development.
 - Main Street is identified as a Design Priority Area and is subject to review by the City's Urban Design Review Panel. Design review will focus on achieving streetscape improvements and high design standards for both public and private sector development project.
 - An informal pre-consultation is encouraged for this property/proposal
 - Schedule B designates the property as Main Street Character Area
 - Main Street character Area is the commercial spine in the Village.
 - Permitted uses include a variety of commercial, retail, office and personal service uses.
 - Residential dwellings are limited to above-grade locations.
 - It is staff's opinion that an Official Plan amendment would be required to permit a completely residential building in the Main Street Character Area.
 - Current Zoning: Village Mixed Use, Subzone 9 (VM9)
 - An apartment building, low-rise is prohibited in the VM9 zone. To add a permitted use, a major zoning by-law amendment is required.

- The proposed increase in front yard setback would need to be accounted for in the zoning amendment and must be rationalized in a planning rationale.
 - Zone provisions are identified in the parent VM Zone.
 - Section 69 of the Zoning By-law outlines the requirements related to water setbacks.
 - Please refer to Section 137 regarding required amenity area for the residential units in a low-rise apartment building.
 - While there is open area between the proposed building and the river, an identified amenity area must be identified as per the zoning requirements. As the building is propose at the 30m mark from the water, the amenity space must be provided in a way which will not negatively impact the watercourse, and associated riparian buffer. The Conservation Authority must approve of the location of the amenity space.
 - Please review Section 107 of the Zoning By-law related to Aisle and Driveway Provisions.
 - Section 107(1)(a)(iii) does permit a reduced ramp/drive aisle of 3.6m if It leads to a parking garage for an apartment building of less than 20 parking spaces.
- Discussion
 - As mentioned above, staff maintain the position that an Official Plan amendment is required to permit a stand-alone apartment building.
 - It is staff's position that the Zoning By-law Amendment application would be a major zoning given a new permitted use (which is currently prohibited in the zoning) is proposed to be added to the property.
 - A sidewalk is required to connect the pedestrian assess to the sidewalk on the far side of the shopping plaza entrance.
 - While preparing a zoning application, please ensure you verify setback from balconies and projections, ensuring all required relief is being requested.
 - Please review the Private Approach By-law to ensure the access meets all requirements. Staff recommends discussing the revised proposal with the owners of the property to the north.
 - Refer to Section 2.2.6, Design Guidelines in the Village Core, for direction on built form and landscape/streetscape design.
 - What is proposed as part of the amenity area? The required landscape plan will need to identify any vegetation to be removed; additional planting will be encouraged to naturalize the area near the Rideau River.
 - Exterior bicycle parking is recommended so that retail customers are aware of their availability. Bicycle parking should be located in an area that is visible from the street. Section 111(4) of the Zoning By-law states that *bicycle parking spaces must be located in order to provide convenient access to main entrances or well-used areas.*
 - As per Section 110 of the Zoning By-law a 3m landscape strip is required between a lot line abutting a street and the parking lot.
 - As the intent of the Secondary Plan and Zoning is to have parking located away from the street – the site plan must be diesign ensuring adequate screening of the parking lot from the street. This should include landscaping and fencing

- Please ensure there is sufficient area on the site plan to accommodate snow storage. Snow storage will not be accepted within the 30m water setback.
 - Heritage staff has confirmed that a Cultural Heritage Impact Statement would still be required for the zoning application but can be scoped to be brief. An updated report would then be required for the Site Plan application to discuss the details. If the intent is to continue with all application concurrently, only the full report would be required.
- Urban Design
 - The new proposal is very different from the previous one. However, comments provided in the initial pre-consultation regarding the requirements for a Design Brief and the UDRP review remain.
 - The massing and the orientation of the building as well as the general site plan layout appear to be reasonable for the context. It will be useful the present the site plan in context to include the existing development on the shopping plaza to the south and any proposed new development on the neighbouring property to the north to understand the relationships.
 - Considerations should be given to incorporating the parking ramp into the building.
 - Considerations should also be given to redesigning the ground floor to:
 - Avoid having unit in close proximity to the property line and the proposed walkway;
 - Locate garbage and bike storage at a convenient yet discreet location;
 - Make the main entrance more visible and prominent.
 - Considerations should also be given to minimizing front yard parking and maximizing landscaping.
 - Front yard parking must be screened by proper soft and hard landscaping, including decorative fencing and shrubs
 - Engineering
 - Same comments apply as previous:
 - Along the frontage of the parcel is a 600mm Sanitary Sewer, 406mm Watermain and a 375mm Storm Sewer. Will need Boundary Conditions for Watermain to send to modeling to determine capacity in watermain.
 - Pre 5yr to Post 100-yr SWM design with onsite quantity storage of any capacity greater than the pre 5yr discharge rate and volume
 - This site is located in a special assessment zone and additional charges are required for development to cover upgrades to water & sewer.
 - Water Service Boundary Conditions will need to be revised due to changed use and Fire flow requirements based on changed use.
 - Transfer Review ECA for OGS will be needed in addition, an ETV Protocol documentation will be required.
 - Area to Northeast of Rear Yard setback is protected habitat and minimal changes are allowed to the grades and tree plantings.
 - In the past a retaining wall was proposed along this rear yard setback to make up grade changes. How will this be accomplished moving forward.
 - Note retaining walls were needed along the side yard locations to make up grade differences between the adjacent parcels and this site. How will the grade difference be addressed in this new configuration?

- The previous design had a smaller building footprint and larger above ground parking which was used for SWM. The proposed development will cover more of the site. How will SWM be handled as there is less surface area and limited depth.
 - Please provide 'flattened' *.pdf versions of documents that include no 'comments' or 'edits' and represent what final printed version will look like.
 - Minimum Size of all text is 2mm.
 - All Pages/Sheets should be formatted to standard size pages/drawing sizes.
- Transportation
 - Follow Traffic Impact Assessment Guidelines:
 - A TIA is required based upon both location and safety triggers (within area of influence of traffic signal and access within auxiliary lane of the intersection). The TIA will be a reduced scope (it will need to address the Design Review Component). Note that the previously submitted Strategy report can be updated and submitted as part of the application;
 - An update to the TRANS Trip Generation Manual has been completed (October 2020). This manual is to be utilized for this TIA. A copy of this document can be provided upon request;
 - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable);
 - Request base mapping asap if RMA is required. Contact Engineering Services (<https://ottawa.ca/en/city-hall/planning-and-development/engineering-services>).
 - ROW protection on Manotick Main Street between Bankfield and Century East is 23 m even;
 - Clear throat requirement for this site is 15m. Include this dimension on the site plan;
 - The access further away from the signalized intersection is supported;
 - Consider providing a pedestrian pathway to the main entrance from the sidewalk;
 - As per per TMP, Manotick Main Street is a cycling Spine Route and Scenic Entry Route (Map 2);
 - A new new concrete sidewalk is to be provided across the site frontage. Sidewalk should be depressed and continuous across the site access as per City Specification 7.1.
 - On the Site Plan:
 - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks;
 - Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site;
 - Turning movement diagrams required for internal movements (loading areas, garbage);
 - Show turning movement for vehicle parked closest to the east to ensure access/egress from the parking stall is provided;
 - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible;
 - Show lane/aisle widths and dimensions on site;

- Show slope of garage ramp on site plan. Note that underground ramps should be limited to a 12% grade and must contain a subsurface melting device when exceeding 6%. Ramp grades greater than 15% can be psychological barriers to some drivers;
 - Grey out any area that will not be impacted by this application.
 - AODA legislation is in effect for all organizations, please ensure that the design conforms to these standards. Initial notes are to include the following:
 - An access aisle must be provided adjacent to the accessible parking stall;
 - Exterior paths of travel should be 1.5m wide; and
 - Provide a depressed curb at the access aisle.
 - A Noise Impact Study is required for the following:
 - Road, Manotick Main Street is an arterial
 - Stationary due to the proximity to neighboring exposed mechanical equipment or if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses.
- Environmental
 - All comments below still apply:
 - An Environmental Impact Statement (EIS) is required to address the Rideau River and the following aspects:
 - Significant valley - the River in this location is in a bit of a valley which is considered significant. The EIS will need to identify the limit of the significant valley (As per OP Section 2.4.2 which defines the various parts of the natural heritage features.
 - Species at risk - within the river (turtles) and also in the setback (butternut)
 - Significant wildlife habitat.
 - 30 metre setback to water course - good. Need to confirm the measurements. The amenity area, needs to be addressed in the EIS, no trees should be removed to allow for the amenity area.
 - Snow storage - needs to be provided and not in the watercourse setback.
 - Tree Conservation Report required, can be combined with EIS. The report will need to identify all boundary trees and trees along property line to ensure they are protected (e.g., the trees along drive aisle).
 - Amenity area; make sure there are no concerns from an environmental perspective; Your environmental consultant will need to discuss the amenity space sizing and location in the EIS, and proposed any required mitigation.
 - 30m setback – must have the RVCA on board with where it is measured from.
- Parks
 - Cash-in-lieu (CIL) of parkland will be required for the site.
 - The CIL will be determined based on the increase in residential units.
 - Based on units; not square footage (due to residential)
 - (question from Paul on whether the existing dwelling unit gets credit)
 - Currently we would need evidence that CIL was provided for that unit previously.
- Rideau Valley Conservation Authority
 - Do not see any concerns with the elevation being used to measure the normal highwater mark (NHWM).

- Amenity area seems larger than the original proposal, and the building is also closer to the NHWM.
- Water setback will be measured from the balcony, not face of building.
- The RVCA was open to working with a smaller amenity area at approximately this location. However, with a larger amenity area proposed and the building proposed in closer proximity to the water, there is a greater impact. The RVCA will be looking for a design that will further minimize the impacts on the watercourse.

Submission requirements and fees

- Please see the accompanying Plans and Studies list for submission requirements for this application.
- Additional information regarding fees related to planning applications can be found [here](#).

Next steps

- Staff encourage the applicant to discuss the proposal with Councillor, local community groups and neighbours