Attachment 9

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MNP Ltd.
Suite 430 - 505 Burrard Street
Vancouver, BC
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July 8, 2025
File: 23403-A/B/C
R3

Attention: Mario Minella

Re: Preliminary Geotechnical Comments: Septic Infiltration – Proposed Subdivision Development Pinnacle Ridge, Anmore, BC

As part of the submission of the Rezoning Addendum for the Pinnacle Ridge Hillside Development Application, we understand the Village of Anmore has requested comment on the feasibility of septic infiltration from a hydrogeological perspective. The relevant geotechnical item #4 submitted by the Village of Anmore via email on June 17, 2025, is shown below in italics and is followed by our corresponding review and response.

4. ***Hydrogeological Impact Assessment***

> *Hydrogeological Impact Assessment may be required to speak to cumulative impacts of all septic systems on the subject site and adjacent sites. Staff have concerns of the effects of combined effluent discharges from all the individual onsite sewerage systems in the subdivisions on the groundwater and on adjacent properties in regard to runoff.*

Development Overview:

The Pinnacle Ridge Hillside Estate is comprised of four parcels, totalling approximately 75 acres, along the Village of Anmore's eastern boundary. These parcels are under the ownership of three entities: MNP Ltd., Anmore Gate Limited Partnership and Bella Terra Investments 2 Inc. The collaborative efforts between the landowners have yielded a thoughtfully united site design that emphasizes connectivity throughout the area, a large network of green space and trails and strategically clustered housing to reduce the amount of development on steep slopes.

This application seeks to rezone the site from Residential 1 (R-1) zone to Comprehensive Development (CD) zone. Rezoning the site to the CD zone will allow for specific land use controls to address the site's hillside topography and allow for clustered housing. The proposed CD zone introduces new housing types (semi-detached and townhomes) in addition to single family homes which will be regulated by specific land use controls within the CD zone.

The intention is to cluster residential homes in areas of a gentler slope, whilst preserving steeper slopes as dedicated green spaces. The large areas of green space across the site are to be complemented with an extensive trail network, enriching the outdoor recreational opportunities for future residents.

According to the preliminary design drawing by Ekistics Town Planning (dated July 3, 2025), the four parcels of development would include the extension of the existing Ridge Mountain Drive, which provides access to the east portion of the sites, the extension of North Charlotte Drive, which connects to Charlotte Crescent in Port Moody, along with new internal roads and cul-de-sacs.

Each subdivision includes single family, semi-detached homes and townhomes over up to a single level of below grade. Due to the sloping topography of the site, we envisage basements would typically daylight downslope and below grade foundation walls may extend up to 2 levels at the up-slope side of structures. The elevation of the basement slabs will vary across the site.

Septic Field Design:

The septic field conceptual design plan, dated July 4, 2025 and prepared by Landmark Engineering & Planning Ltd., is presented in Appendix A for reference. The drawings indicate Type 3 septic fields would be utilized generally at each individual lot which we understand process effluent and produce clean water flows to be infiltrated into the subgrade soils. The drawings indicate a maximum Total Daily Design Flow of 2.3 m^3/day per septic field.

Based on information provided by Landmark Engineering & Planning Ltd:

- We understand a "time dosing" system is proposed, which acts to distribute the effluent throughout the day, assuming 10 timed doses per day. Thus, for example, a "single family c/w a suite" would produce 2.3 m^3/day, and "time dosing" would be utilized to pump every 2.4 hours (24 hours/10 times) to pump only 230 L at a time.

- We understand it is proposed to utilize "mound sand" at septic fields which allows for 120 L/day/m^2, which may or may not be placed atop pervious soils.

Subsurface Soil and Groundwater Conditions:

Based on the Geological Survey of Canada Map 1484A – the site is underlain by Vashon Drift (Va) deposits comprised of lodgement till (with sandy loam matrix) and minor flow till containing lenses and interbeds of glaciolacustrine laminate stony silt, and the site is underlain by Pre-Tertiary Mesozoic bedrock (PT) including granitic and associated rock types; where bedrock is not at the surface, it is overlain by glacial deposits and colluvium. Based on the Geological Survey of Canada Map 1151A – the glacial deposits are underlain by granodiorite of the Coast Plutonic Rocks.

The subsurface soil conditions were investigated in 2023 utilizing solid stem auger drill to complete 20 test holes throughout the proposed development property, and detailed soil logs and are presented in our geotechnical investigation reports. In general, the soil conditions consist of forest litter/topsoil extending 0.3 to 0.6 m below grade, underlain by post-glacial sandy silt to silty sand extending 0.5 to 0.9 m below grade or sand and gravel up to 1.1 m below grade, underlain by silty sand and gravel glacial till which extended to the end of borehole up to 6.1 m below grade or was locally underlain by per-tertiary bedrock at 3.7 to 4.7 m below grade, at test hole locations.

Eight groundwater monitoring wells were installed throughout the site as part of the 2023 site investigation, and detailed monitoring well logs are presented in our hydrogeological report. The purpose of these wells was to confirm the elevation of the assumed perched groundwater across the site and to facilitate hydraulic property testing.

Manual groundwater level measurements were obtained on multiple occasions using a Heron Instruments water level meter. These water levels are summarised on Table 1 presented on the following page.

Table 1 – Manual Groundwater Monitoring Measurements (in meters below grade)

Well No.	7th Nov, 2023	13th Nov, 2023	30th Jan, 2024	16th Oct, 2024	13th June, 2025	Range (m)
TH23-01A (MW23-01A)	2.80	2.70	2.55	2.80	n/a	2.55 – 2.80
TH23-04A (MW23-02A)	1.85	1.75	0.75	1.65	n/a	0.75 – 1.85
TH23-06A (MW23-03A)	0.72	0.80	1.15	0.65	n/a	0.65 – 1.15
TH23-02B (MW23-01B)	3.00	2.30	0.60	0.80	1.07	0.60 – 3.00
TH23-07B (MW23-02B)	0.60	0.30	0.35	0.55	0.79	0.30 – 0.79
TH23-09B (MW23-03B)	2.60	2.20	1.12	2.90	1.61	1.12 – 2.90
TH23-02C (MW23-01C)	2.10	1.33	0.58	1.75	1.00	0.58 – 2.10
TH23-03C (MW23-02C)	4.27	4.25	3.07	3.50	2.85	2.85 – 4.27

***n/a indicates well is inaccessible**

The following graph (Figure 1) shows the groundwater levels recorded using automated pressure transducers at the site for the period between November 2023 and June 2025.

Figure 1 – Groundwater Levels recorded using Automated Pressure Transducers

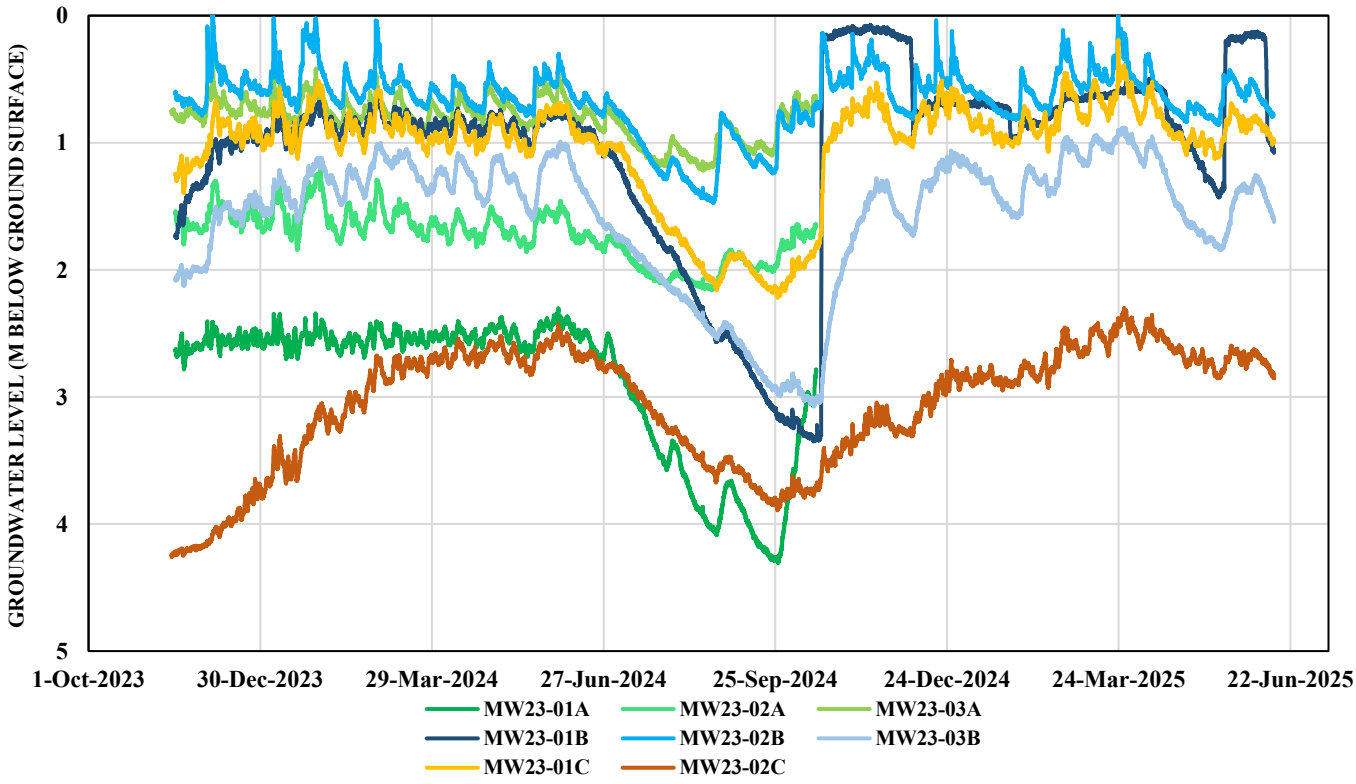

Figure 1, shown previously, presents the groundwater monitoring results relative to ground surface at each of the monitoring wells. The water levels have been presented in m below ground surface for simplification, due to the considerable variation in elevations across the site.

Based on the data presented on Figure 1, groundwater levels are at their highest between November 2023 to June 2024 and October 2024 to April 2025. The lowest groundwater levels are observed in September to October 2024 at all monitoring well locations. This is consistent with our understanding of seasonal variation in groundwater levels whereby groundwater elevations generally increase through the wetter winter months and decrease during the drier summer months.

The groundwater trends presented above are representative of typical variation in perched groundwater in shallow glacial till soils. The groundwater levels presented would suggest that, depending on the time of year of excavation, that shallow perched groundwater may be encountered during excavation at depths of between about 0.3 m and 4.2 m.

GeoPacific Preliminary Comments on Septic Infiltration Feasibility:

We understand the nearby single family residential developments in the area, including those through the adjacent Pinnacle Ridge Estates hillside, have successfully utilized septic tank and septic field infiltration systems, and therefore it is reasonable to utilize similar systems for the proposed subdivision.

Our test hole information indicates that the near surface soil overlying the glacial till would have some capacity for septic flow infiltration. Based on information provided to us, we understand the septic systems would be designed as follows:

- Designs based on Sewage System Regulations.
- Type 3 septic fields proposed which process effluent and produce clean flows for infiltration.
- Mound sand likely to be utilized at septic fields.
- Maximum septic flow per septic field 2.3 m^3/day.
- Septic field placement to be confirmed and finalized during DP or BP stage. Septic Fields should be extended along the contour as best as possible and to avoid stacking.
- Septic System to be on “time dosing” which evens out the flow throughout the day and not “demand” (which has heavier dosing during morning and evenings). Assume maximum 230 L every 2.4 hours per septic field.

In general, the proposed septic field conceptual design is considered feasible, from a geotechnical and hydrogeological perspective, for the proposed development. The subsurface soils generally consist of silty sand and gravel glacial till which has some limited ability to infiltrate septic flows provided that the septic fields are sized suitably for the soils infiltration capacity. GeoPacific will complete supplementary in-situ testing utilizing industry standard Double Ring Infiltration Test (DRIT) methods at the native subsurface soils at septic field locations, results from which to be utilized by others in the future detailed design of the proposed septic fields.

Some increase in grading through and below septic fields may be required to provide adequate cover and infiltration, and we anticipate that such increase in grading would be completed as part of the detailed grading design for lots, effectively increasing the area of infiltration into the native soils. Although detailed grading plans are not completed at this time, we anticipate that septic fields would be placed on relatively level graded areas. We suggest infiltration fields are placed setback from native sloped areas to permit infiltration and minimize seepage from daylighting onto native slopes. We understand that for the majority of the lots, downslope of infiltration areas, retaining walls (as part of site grading) and ditches (as part of proposed internal roadways) would be in place which would act to intercept nominal septic flows if encountered prior to infiltration.

We anticipate the native soil below and surrounding the septic fields may also be over-excavated and filled with mound sand to create an infiltration containment area to better contain septic flows during timed flow releases and to minimize septic flows from draining downslope along the glacial till interface, prior to full infiltration.

Furthermore, the measured perched groundwater elevation is generally 0.3 m to 4.2 m below existing grades which provides some capacity for mounding of septic flow infiltration into the native soils and mitigation of daylighting or runoff of the processed septic flows onto the existing natural slope, hydrological features, or adjacent properties. Once grading plans and septic designs are finalized, a detailed hydrologic assessment may be required to evaluate and confirm there is no significant impact of the septic field infiltration.

From a geotechnical and hydrogeological perspective, permitted the septic fields are designed accordingly to the native soil infiltration capacity, it is our opinion the combined clean septic flows discharged from all the individual Type 3 onsite septic field systems in the subdivisions would not adversely affect adjacent properties in regard to runoff or groundwater.

We are pleased to assist you with this project and we trust that this information is helpful and sufficient for your purposes at this time. Should you require any further details or if you would like clarification of any of the above, please do not hesitate to call or contact us.

For:

GeoPacific Consultants Ltd.

Reviewed by:

Wyatt Johnson, B.Eng., P.Eng.
Project Engineer

Matt Kokan, M.A.Sc., P.Eng.
Principal

APPENDIX A

Conceptual Septic Field Design (By Others)

DEVELOPMENT BOUNDARY

PROP. SEPTIC LOCATION (TYP.)

TREZ – SINGLE FAMILY LOTS 1–13 & 17–23 (BASED ON 4–BDRM + 1–BDRM SUITE) APPROXIMATE SEPTIC FIELD SIZE IS 24.0m2.

TREZ – TOWNHOME LOTS 14–16 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (MAX 4 UNITS PER FIELD)

A.G. – TOWNHOME LOTS 1–4 & 24–26 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (MAX 4 UNITS PER FIELD)

PROP. BASAL AREA PROVIDED (TYP.)

B.T. – SINGLE FAMILY LOTS 1–4 (BASED ON 4–BDRM + 1–BDRM SUITE) APPROXIMATE SEPTIC FIELD SIZE IS 24.0m2.

TREZ – TOWNHOME LOTS 24–26 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (MAX 4 UNITS PER FIELD)

ROAD "A"

ROAD "B"

TREZ

BELLA TERRA

ANMORE GATE

RIDGE MOUNTAIN DR

CHARLOTTE CRESCENT

TREZ – SINGLE FAMILY LOTS 27, 32, 40, 41, 44 & 47–52 (BASED ON 4–BDRM + 1–BDRM SUITE) APPROXIMATE SEPTIC FIELD SIZE IS 24.0m2.

A.G. – SEMI–DETACHED LOT 11 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (2 UNITS PER FIELD)

B.T. – TOWNHOME LOTS 5, 6 & 7 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (MAX 4 UNITS PER FIELD)

TREZ – SEMI–DETACHED LOTS 28–31, 33–39, 42, 43, 45, 46 & 53 (BASED ON 3–BDRM PER UNIT), APPROXIMATE SEPTIC FIELD SIZE PER UNIT IS 13.5m2 (2 UNITS PER FIELD)

A.G. – SINGLE FAMILY LOTS 5–10 & 12–25 (BASED ON 4–BDRM + 1–BDRM SUITE) APPROXIMATE SEPTIC FIELD SIZE IS 24.0m2.

DEVELOPMENT BOUNDARY

PROP. SEPTIC LOCATION (TYP.)

PROP. BASAL AREA PROVIDED (TYP.)

Overall Septic Calculations - Preliminary Layout Review

DATE July 4, 2025

Trez Developments

Lots	Size of Lots (Sq. M)	Size of Homes (Sq. Ft.)	Size of Homes (Sq. M)	No. of Bedrooms	D.O.F (L/Day)	Secondary suite?(Y/N)	No. of Bedrooms	D.O.F (L/Day)	D.O.F/Unit (L/Day)	Units Per Lot	Total D.O.F. Lot (L/Day)	Field Type	H.L.R. (L/Day/m2)	Total A.I.S. Per Lot (m2)	L.L.R. (L/Day/m)	Septic Field Length (m2)	Septic Field Width (m)
Single Family:																	
Smallest lot	780	5000	465	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Average lot size	1072	5000	465	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Largest lot	2083	5000	465	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Semi Detached:																	
Smallest lot	910	3000	279	3	1300	N	-	-	1,300	2	2,600	"Type 3" P.D.	120	27.1	200-400	19.6	1.4
Average lot size	1,122	3000	279	3	1300	N	-	-	1,300	2	2,600	"Type 3" P.D.	120	27.1	200-400	19.6	1.4
Largest lot	1,482	3000	279	3	1300	N	-	-	1,300	2	2,600	"Type 3" P.D.	120	27.1	200-400	19.6	1.4
Townhomes:																	
Lot 14 Townhomes (11 units)	4,430	2400	223	3	1300	N	-	-	1,300	11	14,300	"Type 3" P.D.	120	149.0	200-400	107.9	1.4
Lot 15 Townhomes (14 units)	4,798	2400	223	3	1300	N	-	-	1,300	14	18,200	"Type 3" P.D.	120	189.6	200-400	137.4	1.4
Lot 16 Townhomes (15 units)	5,466	2400	223	3	1300	N	-	-	1,300	15	19,500	"Type 3" P.D.	120	203.1	200-400	147.2	1.4
Lot 22 Townhomes (12 units)	4,229	2000	186	3	1300	N	-	-	1,300	12	15,600	"Type 3" P.D.	120	162.5	200-400	117.8	1.4
Lot 23 Townhomes (12 units)	5,210	2000	186	3	1300	N	-	-	1,300	12	15,600	"Type 3" P.D.	120	162.5	200-400	117.8	1.4
Lot 24 Townhomes (10 units)	4,228	2000	186	3	1300	N	-	-	1,300	10	13,000	"Type 3" P.D.	120	135.4	200-400	98.1	1.4

Anmore Gate

Lots	Size of Lots (Sq. M)	Size of Homes (Sq. Ft.)	Size of Homes (Sq. M)	No. of Bedrooms	D.O.F (L/Day)	Secondary suite?(Y/N)	No. of Bedrooms	D.O.F (L/Day)	TOTAL D.O.F (L/Day)	Units Per Lot	Total D.O.F. Lot (L/Day)	Field Type	H.L.R. (L/Day/m2)	Total A.I.S. Per Lot (m2)	L.L.R. (L/Day/m)	Septic Field Length (m2)	Septic Field Width (m)
Single Family:																	
Smallest lot	814	3800	353	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Average lot size	1,029	4200	390	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Largest lot	1,280	5500	511	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Townhomes:																	
Lot 1 Townhomes (12 units)	9,065	2400	223	3	1300	N	-	-	1,300	12	15,600	"Type 3" P.D.	120	162.5	200-400	117.8	1.4
Lot 2 Townhomes (12 units)	8,535	2400	223	3	1300	N	-	-	1,300	12	15,600	"Type 3" P.D.	120	162.5	200-400	117.8	1.4
Lot 3 Townhomes (11 units)	8,535	2400	223	3	1300	N	-	-	1,300	11	14,300	"Type 3" P.D.	120	149.0	200-400	107.9	1.4
Lot 4 Townhomes (8 units)	8,535	2400	223	3	1300	N	-	-	1,300	8	10,400	"Type 3" P.D.	120	108.3	200-400	78.5	1.4
Lot 24 Townhomes (8 units)	11,380	2400	223	3	1300	N	-	-	1,300	8	10,400	"Type 3" P.D.	120	108.3	200-400	78.5	1.4
Lot 25 Townhomes (11 units)	9,135	2400	223	3	1300	N	-	-	1,300	11	14,300	"Type 3" P.D.	120	149.0	200-400	107.9	1.4
Lot 26 Townhomes (8 units)	9,135	2400	223	3	1300	N	-	-	1,300	8	10,400	"Type 3" P.D.	120	108.3	200-400	78.5	1.4

Bella Terra

Lots	Size of Lots (Sq. M)	Size of Homes (Sq. Ft.)	Size of Homes (Sq. M)	No. of Bedrooms	D.O.F (L/Day)	Secondary suite?(Y/N)	No. of Bedrooms	D.O.F (L/Day)	TOTAL D.O.F (L/Day)	Units Per Lot	Total D.O.F. Lot (L/Day)	Field Type	H.L.R. (L/Day/m2)	Total A.I.S. Per Lot (m2)	L.L.R. (L/Day/m)	Septic Field Length (m2)	Septic Field Width (m)
Single Family:																	
Average lot size	1,040	5000	465	4	1600	Y	1	700	2,300	1	2,300	"Type 3" P.D.	120	24.0	200-400	17.4	1.4
Townhomes:																	
Lot 5 Townhomes (16 units)	5,340	2400	223	3	1300	N	-	-	1,300	16	20,800	"Type 3" P.D.	120	216.7	200-400	157.0	1.4
Lot 6 Townhomes (12 units)	5,580	2400	223	3	1300	N	-	-	1,300	12	15,600	"Type 3" P.D.	120	162.5	200-400	117.8	1.4
Lot 7 Townhomes (10 units)	5,305	2400	223	3	1300	N	-	-	1,300	10	13,000	"Type 3" P.D.	120	135.4	200-400	98.1	1.4

* Based on a Type-3 "Sand Mound" septic field (using "mound sand") c/w Pressure Distribution, Timed Dosing and Treatment System.

H.L.R. could be lower with other design parameters which include different infiltration media and treatment type. This would lead to a larger septic field area

Assessment of prepared basil area under the septic field still needs to be assessed

The Village of Anmore

ENGINEER:
LANDMARK ENGINEERING & PLANNING LTD.
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NOTES

- THIS DRAWING IS FOR DISCUSSION PURPOSES ONLY, AND SUBJECT TO FURTHER REVIEW AND MUNICIPAL APPROVAL.
- LOT CONFIGURATION, LAYOUT AND CIVIL INFRASTRUCTURE SHOWN IS UNDER ASSESSMENT, THUS SUBJECT TO CHANGE/UPDATE
- THIS DRAWING IS NOT TO BE USED FOR LEGAL TRANSACTIONS

LEGEND:

EXISTING CONTOURS ---270---
DEVELOPMENT BOUNDARY
LOT ADDRESSES 2345
ROAD NAMES EAST RD
HYDRANT
WATERMAIN
STORM MAIN
SEPTIC FIELD 85m2

FOR INFORMATION
FOR REZONING ONLY

No.	DESCRIPTION	DATE	SIGN
4	REVISIONS TO SOME LOTS & UNITS	7/04/25	G.S.W
3	REVISIONS TO SOME LOTS & UNITS	5/28/25	G.S.W
2	RE–ISSUED FOR REZONING APPLICATION	5/08/25	G.S.W
1	REVISIONS TO SEPTIC FIELD LOCATIONS	11/22/24	G.S.W
0	ISSUED FOR REZONING APPLICATION	6/27/24	G.S.W

REVISIONS

DESIGN: G.S.W.
DRAWN: J.R.G.
CHECKED: J.R.G.
DATE: JUNE 27, 2024
B.M.:
ELEV.:
SCALE: Horz. 1:1000 Vert. N/A

PROJECT: Pinnacle Ridge - Phase 2

TITLE: SEPTIC LOCATION & SIZING PLAN (PRELIMINARY LAYOUT REVIEW)

CONSULTANTS No. 2023_013
SHEET No. 1 OF 1
GRID No. REV. No. 4
SKETCH No. SAN–04

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