TECHNICAL MEMORANDUM

DATE June 26, 2020

Project No. 20145976

TO Mr. Tim Lee, Land Development Coordinator
Richcraft Homes

FROM Ali Ghirian, P.Eng.

EMAIL aghirian@golder.com

GRADE RAISE SUMMARY AND REVIEW
RIVERSIDE SOUTH PHASE 8 (BLOCK 221)
RALPH HENNESSY ROAD
OTTAWA, ONTARIO

This memo provides geotechnical guidelines on the grading and foundation design for Riverside South Development – Phase 8 (Block 221) located northeast of the intersection of Earl Armstrong Road, and Ralph Hennessy Road in Ottawa Ontario.

Background

The results of the geotechnical investigation for this project as well as guidelines on the geotechnical aspects of developing the site were provided in:

- Golder report titled "*Geotechnical Investigation, Proposed Residential Development, Riverside South Development (Phase 8), Ottawa, Ontario*", dated May 2015 (report number 1418804).

The attached Summary of Design Details table, as well as the following sections, summarize the recommendations provided in the above report and technical memorandum.

Grading Plan Review

Block Numbering

The block numbering used in the attached Summary of Design Details table was obtained from the Site Plan drawing SP-1 Revision 20 dated May 12, 2020, provided by Richcraft Homes.

Based on this drawing, the proposed Phase 8 (Block 221) development consists of 11 Back to Back townhomes with between 6 and 12 units per block.

As these are back to back townhomes i.e. there are two front faces of the blocks for orientation purposes for Blocks 1 to 6 and Blocks 7 to 11 front facing is assumed to be in looking in the south and east directions, respectively.

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Grade Raise Restrictions

The existing and finished grades as well as the Underside of Footing (USF) elevations for the proposed development are provided on the grading plan grading plan drawing No. GP-1 (Revision 4), dated May 21, 2020 provided by Stantec Consulting Ltd. It should be noted that the north orientation of Block 221 is 180° from that indicated on the Site Plan drawing noted above.

Based on recommendations provided in our geotechnical report, the fill to be placed above the original grade and the backfill within the garages should have a unit weight of no more than 19.5 kN/m^3 and the house footings are to be designed using a maximum allowable bearing pressure of 75 kPa. The proposed Phase 8 (Block 221) is within the area designated as Zone B in our geotechnical report. Given the above noted restrictions, the maximum permissible grade raise is therefore 1.9 m for the proposed development.

The finished grades were reviewed in comparison to the permissible grade raises and the proposed development was found to be in accordance with the guidelines and recommendations provided in the geotechnical report prepared for this site and, as such, are considered acceptable from a geotechnical point of view.

Underside of Footing Elevations

The selection of the founding levels (in relation to the groundwater level) is also impacted by City of Ottawa (City) requirements associated with the use of sump pumps. The USF elevations for all structures must be at or above the elevation of the spring line of the storm sewer installed in the adjacent roadways, and at or above the groundwater level. The elevations of the spring line of the storm sewer have not been provided to us at time of writing this technical memo.

The USF elevations for the proposed buildings for Phase 8 (Block 221) development were reviewed in comparison with City sump pump requirements. Based on the review, the USF of the blocks were found to be at or up to about 500 mm below the groundwater level. The average groundwater level was assumed to be at about Elevation 91.7 m, based on the groundwater measurements at the borehole 14-10, 14-11, and 14-12 locations. As such, installation of a sump pump may be required for the proposed development.

Allowable Bearing Pressures

Based on the subsurface conditions encountered, the native soils on this site are considered suitable for the support of conventional wood frame houses on spread footing foundations. Provided the grade raises are maintained to those indicated in the reviewed grading plans, strip footings up to 0.6 m in width and pad footings up to 2.0 m in size can be designed using a maximum allowable bearing pressure (i.e. SLS bearing resistance) of 75 kPa for the silty clay (provided these soils have not been disturbed by groundwater inflow or construction traffic). The house footings may therefore be sized in accordance with Part 9 of the Ontario Building Code (OBC).

Post-construction total and differential settlements of footings supported on soil and sized using the above maximum allowable bearing pressures should be less than 25 and 20 mm, respectively, provided that the soil at or below founding level is not disturbed before or during construction. Suitable control of the groundwater inflow is required if such disturbance is to be avoided.

Frost Protection

The soils at this site are considered to be highly frost susceptible. All exterior perimeter foundation elements or foundation elements in unheated areas should therefore be provided with a minimum of 1.5 m of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8 m of earth cover.

Based on the review of the final grades and the proposed USF elevations, all lots meet the minimum frost cover requirements and insultation for frost protection will not be required for the Phase 8 (Block 221) development.

Trees

Based on the results of the Atterberg Limits and grain size distribution testing presented in our geotechnical report, the silty clay encountered at the site of the proposed development can be classified as medium to high plasticity. The plasticity index values of this material is generally less than 40% and therefore, the tree to foundation setback distance should be kept to a minimum 4.5 m for small (mature tree height up to 7.5 m) and medium sized trees (mature tree height of 7.5 to 14 m), provided that the tree is of low to moderate water demand. Large trees (mature height greater than 14 m) can also be considered, provided that the setback distance is equal to or greater than the full mature height of the tree.

In accordance with current City guidelines (*Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines*), the following conditions must also be met:

- The USF elevation must be 2.1 m or greater below the lowest finished grade.
- Available soil volume must be provided for small and medium trees as per the guidelines.
- Tree species must be very low to moderate Potential Subsistence Risk.
- The foundation walls should be reinforced at least nominally, to provide ductility.
- The grading must promote drainage towards the tree root zone.

Based on the review of the provided landscape plan drawing No. L200 (Revision 3), dated April 2, 2020 by Stantec, the minimum setback of the proposed tree plantation locations that front Ralph Hennessy Avenue is 5.8 m. The minimum provided tree setbacks for buildings that front Markdale Terrace and Earl Armstrong Road are 6.7 and 9.1 m, respectively. As such, the proposed tree plantation arrangement meets the City requirements.

Seismic Design

The seismic design provisions of the OBC depend, in part, on the characteristics of the upper 30 m of soil and/or bedrock below founding level.

It is considered that a Site Class E as indicated in the geotechnical report would be applicable for the design of this residential development. It should be noted that the seismic Site Class is not directly applicable to structures such as conventional housing designed in accordance with Part 9 of the OBC.

Addition

Any proposed addition to a house (regardless of size) will require a geotechnical assessment. Written approval from a geotechnical engineer should be required by the City prior to the building permit being issued.

Closure

We trust that this memo provides sufficient information for your present requirements. If you have any questions concerning this memo, please do not hesitate to contact us.

Yours truly,

Golder Associates Ltd.

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AG/RK/KCP/WC/hdw
https://golderassociates.sharepoint.com/sites/129478/project files/6 deliverables/grade raise review block 221/20145976-tm-revc-grade raise review 2020-06-25.docx

Attachments: Table 1 – Summary of Design Details

SUMMARY OF DESIGN DETAILS

Grading Plan Summary for JOB #: 20145976
River South - Phase 8 - Block 221 DATE: 2020-06-25
RICHCRAFT HOMES

Block	Existing Grades					USF	Proposed Finished Grades					Grade Raise Limit	Calculated Grade Raises				Exceeding Front Grade Raise Limit?	Exceeding Rear Grade Raise Limit?	USF From Lowest Proposed Front Grade	USF From Lowest Proposed Rear Grade	Front Frost Protection Required (USF < 1.8 m Below Finished Grade)	Rear Frost Protection Required (USF < 1.8 m Below Finished Grade)	Lower USF For Tree Planting (USF < 2.1 m Below Finished Grade)	Average Groundwater Level Elevation	USF Above Groundwater Level
	FL	FR	RL	RR	**AVE**		FL	FR	RL	RR	**AVE**		FL	FR	RL	RR									
1	92.85	92.64	92.78	92.82	**92.77**	90.78	93.17	93.18	93.18	93.18	**93.18**	1.90	0.32	0.54	0.40	0.36	No	No	2.4	2.4	Yes	Yes	Yes	90.70	Yes
2	92.85	92.80	92.77	92.78	**92.80**	90.78	93.14	93.14	93.14	93.18	**93.15**	1.90	0.29	0.34	0.37	0.40	No	No	2.4	2.4	Yes	Yes	Yes	90.70	Yes
3	92.02	93.04	92.15	92.77	**92.50**	90.72	93.10	93.14	93.10	93.14	**93.12**	1.90	1.08	0.10	0.95	0.37	No	No	2.4	2.4	Yes	Yes	Yes	90.70	Yes
4	91.87	92.02	92.05	91.70	**91.91**	90.47	92.80	92.90	92.80	92.90	**92.85**	1.90	0.93	0.88	0.75	1.20	No	No	2.3	2.3	Yes	Yes	Yes	90.70	No
5	92.11	92.05	92.06	92.06	**92.07**	90.22	92.50	92.50	92.50	92.32	**92.46**	1.90	0.39	0.45	0.44	0.26	No	No	2.3	2.1	Yes	Yes	Yes	90.70	No
6	92.10	92.15	92.17	92.00	**92.11**	90.62	92.95	92.95	92.95	92.77	**92.91**	1.90	0.85	0.80	0.78	0.77	No	No	2.3	2.1	Yes	Yes	Yes	90.70	No
7	92.34	92.54	92.20	92.48	**92.39**	90.40	92.80	92.80	92.80	92.80	**92.80**	1.90	0.46	0.26	0.60	0.32	No	No	2.4	2.4	Yes	Yes	Yes	90.70	No
8	92.41	92.31	91.91	92.13	**92.19**	90.32	92.37	92.72	92.37	92.72	**92.55**	1.90	-0.04	0.41	0.46	0.59	No	No	2.1	2.1	Yes	Yes	Yes	90.70	No
9	92.60	92.38	92.34	92.38	**92.43**	90.29	92.69	92.69	92.69	92.69	**92.69**	1.90	0.09	0.31	0.35	0.31	No	No	2.4	2.4	Yes	Yes	Yes	90.70	No
10	92.40	92.90	93.45	93.10	**92.96**	90.61	92.84	93.01	92.84	93.01	**92.93**	1.90	0.44	0.11	-0.61	-0.09	No	No	2.2	2.2	Yes	Yes	Yes	90.70	No
11	92.66	93.14	93.07	93.00	**92.97**	90.58	92.98	92.98	92.98	92.98	**92.98**	1.90	0.32	-0.16	-0.09	-0.02	No	No	2.4	2.4	Yes	Yes	Yes	90.70	No