Golder Associates
CONSULTING GEOTECHNICAL ENGINEERS

February 16, 1978

Buchan & Moore Ltd.
Development Consultants
95 Glengarry Crescent
West Vancouver, B.C.
V7S 1B4

ATTENTION: Mr. R. Buchan

Re: Geohydrology Assessment
Hillside Subdivision
Riverside Development Ltd.

Dear Sirs:

As requested, Golder Brawner & Associates Ltd. are pleased to provide our comments and assessment of the influence of the proposed development on the surface run-off characteristics of the site or changes in the ground water regime which could induce instability of the adjacent slopes or damage to vegetation.

Our overall site evaluation report, dated July 27, 1977, was based on a site inspection and a review of the conceptual development plan, and a topographic plan of the site provided by Buchan & Moore Ltd. The purpose of the previous report was to evaluate the geotechnical considerations, which included, but were not limited to, the influences of the site development on surface and ground water flow. This report describes in greater detail our comments and recommendations concerning the geohydrological considerations influencing site development and should be read in conjunction with the

1. Site Location and Topography

The property is located east of the Seymour River at the junction of Treetops Lane and Chapman Way in the District of North Vancouver. The site is bounded to the east by the present residential development along Chapman Way and extends to the crest of the Seymour River valley which forms the boundary of the Blueridge residential area. The property is covered with dense second growth timber and underbrush. North and south of the site, the area has been cleared to the base of the valley slopes back of Treetop Lane and along the Rivergrove Crescent, respectively.

Ground surface rises from the small stream, at about elevation 215, flowing along the east perimeter of the Chapman Way, to an intermediate terrace level at about elevation 250. The terrace, some 70 to 110 ft. in width, is relatively flat, sloping gently from east to west at 6 to 12 degrees within the site area. This terrace extends north and south along the Seymour River valley slopes and is visible within the cleared area to the north and the residential areas presently under construction along Rivergrove Crescent. The Seymour River valley slope forms the east boundary of the terrace and rises to about elevation 310. There is no evidence of instability within the upper and lower slopes which have similar slope angles, ranging from 27 to 33 degrees to the horizontal.

2. Surface Run-Off and Ground Water Flow

Minor ground water seepage or surface run-off flow is presently being directed along the proposed entrance road from the terrace level down to the small stream which parallels Chapman Way. This local concentration

allowance, thus causing flow to be channelized along the debris. Local ponding of surface run-off and possibly localized ground water seepage from the proposed development area was observed to the south of the debris. No evidence of local erosion or instability was observed within the site.

A small perennial stream flows along the base of the slope and parallel to Chapman Way. This stream collects surface run-off and ground water seepage from the valley wall slopes and over a catchment area which includes the proposed development. While the stream flow increases significantly during heavy precipitation there is no evidence of significant flooding or erosion along the channel.

3. Hydrological Considerations

Development of that portion of the site consisting of the terrace area is considered feasible. There should be no detrimental influences within or adjacent to the site due to changes in surface or ground water flow characteristics provided that the following criteria are included in site development.

a) The existing vegetation cover should be left in place over the upper and lower slopes to minimize the possibility of erosion or surficial instability. Clearing operations should be restricted to the relatively flat (6 to 12 degree slope) terrace area and should be carried out using normal good construction practice to avoid significant damage to the adjacent vegetation. Should local steeper areas be cleared, provision should be made for remedial measures such as revegetation, paving, retaining walls or the like.

b) Roadway and final site grades within the terrace area should be selected to provide positive long term control of surface run-off flows. In particular, provision of drainage measures such as catch basins, ditching and natural or landscaping berms along the west edge of the access road should be included to prevent uncontrolled or concentrated surface run-off flow over the lower slopes or other unprotected areas.

c) The siting envelope of the residential structures should be such that the buildings are located within the terrace area and do not encroach upon the toe of the upper slope. Related development such as roads and services should, where ever possible, be located within the terrace zone and should conform to the existing topography. Extensive benching, filling or excavation should be avoided. Proposed cut or fill zones required locally should be inspected in detail once clearing is completed and provision should be made in the design to provide suitable grades and drainage control prior to start of construction.

d) Positive subsurface drainage should be provided around all foundations, retaining walls or other structures carried down below grade by means of perimeter drainage tile systems surrounded with free draining granular backfill. During site development, including excavations for structures, provision should be made for periodic site inspection by experienced geotechnical personnel to assess the local subsurface and hydrology conditions. If long term local

seepage zones are encountered, the drainage system should be modified to accomodate these areas by means of lateral drains, granular drainage blankets and the like.

e) During initial clearing and grading, a temporary drainage system using shallow ditching should be installed as required to control and direct surface run-off to protected discharge channels. This procedure will minimize the possibility of damage due to concentrated flows down the steeper slopes during periods of heavy precipitation. Consideration should also be given to the provision of temporary check ponds along the initial ditching. These ponds will reduce peak flows and will in addition reduce the amount of sediment carried off site during initial construction phases.

4. Summary

Considering the surface and subsurface hydrology characteristics of the site the proposed development and the general siting envelope for structures and services shown on Buchan & Moore Ltd. drawing 112A, is feasible. Provided that clearing and development activities are carried out using normal ~~ground~~ good B&S. construction practices this development should not result in decreased site stability or damage to adjacent properties.

We trust that the above information is sufficient for your immediate requirements.

Yours very truly

GOLDER BRAWNER & ASSOCIATES LTD.

Per: R.C. Butler, P. Eng.

RCB/rme

V77170A