APPENDIX A

University Heights Neighbourhood Plan
L&M Engineering Limited

ENVIRONMENTAL OVERVIEW

EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

ENVIRONMENTAL OVERVIEW ASSESSMENT OF THE UNIVERSITY HEIGHTS NEIGHBOURHOOD PLAN

Prepared for:

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EDI Project Number: 06-BC-0056

May 2006

ISO 9001 REGISTERED KPMG

TABLE OF CONTENTS

1.0 INTRODUCTION

In April of 2006, EDI Environmental Dynamics Inc. (*Environmental Dynamics*) was retained by L&M Engineering Ltd. to conduct an environmental overview assessment for a proposed development within Prince George City Limits, located between the University of Northern British Columbia, Highway 16 West, Tyner Boulevard and DL 1600. The Environmental Overview Assessment will be a component of the Neighborhood Plan which will develop broad land use, transportation and servicing policy for the subject area. *Environmental Dynamics* conducted reconnaissance level ground survey of existing aquatic and terrestrial habitats within the study area in April. The reconnaissance was not structured to specific transects, but rather assessed sections of different habitat within the study area and focused on riparian and other sensitive zones.

The purpose of this document is to provide an environmental overview assessment of the study area, provide a summary of the findings during the field visit that focus on environmentally sensitive areas (ESA's), provide recommendations for design considerations pertaining to those ESA's, and identify best management practices to minimize negative environmental impacts potentially associated with development. A list of foreseeable environmental regulatory requirements potentially related to the proposed development has also been provided. As this report is based on broad observations and a general literature review it should be noted that additional studies may be required prior to finalizing development strategies or conducting any construction activities.

2.0 PROJECT LOCATION

The proposed project is located in west Prince George, BC between the University of Northern British Columbia, Highway 16 West, Tyner Boulevard and DL 1600. The study area encompasses an area of approximately 682 hectares.

3.0 METHODS

Information was collected through literature reviews, review of other planning documents such as the Fraser River Benchlands Report and supporting documents and personal communication with associated environmental professionals. There was very little existing information available about the study area.

A field assessment was conducted to collect general terrestrial and aquatic habitat information including wildlife use and significant wildlife features. Other information collected included general terrain features, sensitive environments, and vegetative cover. The field assessment was conducted in one day and was not set up as a formal study. A general foot survey through the study area was conducted and concentrated in areas thought to have higher value such as riparian areas, mature timber, and edge habitat.

4.0 SYNTHESIS OF EXISTING INFORMATION

Environmental Dynamics conducted a site visit during April, 2006. The result of the site visit is presented below. All photographs referenced in the following sections are attached in Appendix I of this document.

4.1 Vegetation and Biogeoclimatic Ecosystem Classification

As identified on the BEC subzone/variant map for the Prince George Forest District the proposed development is located within the Dry Warm Sub-Boreal Spruce subzone (SBSdw3) (MoF, 2003). The study area contains numerous variants due to localized geographic variation which influences the soil types, vegetation and ecosystem productivity (MoF 1993).

The study area contains a diverse mixture of forest types and disturbance levels. Riparian areas and wetter sites are dominated by hybrid white spruce (*Picea glauca* x *engelmannii*) and trembling aspen, while upland areas with drier soils are dominated by mixed stands of lodgepole pine (Pinus contorta) and douglas-fir (Pseudosuga menziesii). Deciduous stands of primarily trembling aspen are present throughout and two distinct areas consisting of pure lodgepole pine are present in the western portion of the study area. Sub-dominant cover included paper birch (*Betula papyrifera*) and black cottonwood (*Populus balsamifera ssp. trichocarpa*) which are also common characteristics of the (SBSdw3) (MoF, 1993).

The dominant shrub species under a coniferous canopy were identified as birch-leaved spirea (Spiraea betulifolia), soopolallie (Sheperdia canadensis) and kinnickinnick (Arctostaphylos uva-ursi). The dominant shrubs under a deciduous canopy included willow (*Salix sp.*), red osier dogwood (*Cornus stolonifera*) and devil's club (*Oplopanax horridus*) and bunchberry; all are indicator species of moist-wet environments.

Forest harvesting has occurred on a significant portion of the study area both east and west of Tyner Boulevard. These areas are currently in the shrub and seedling stage of regrowth. The block of land harvested in the southwest portion of the study area is dominated by willow and seedling pine (photo 1). The harvested area northeast of Tyner Boulevard is dominated by ribes sp., birch-leaved spiraea, willow and aspen shrubs (photo 2).

4.2 Slope and Terrain

The study area is situated on relatively low gradient slopes except near the eastern boundary. Maximum elevation of the study area is approximately 805 m and is located adjacent to the north-west boundary. The lowest point of the property, approximately 660 m, is found along the eastern boundary (PGMap 2006). Gradient of the eastern slopes are elevated and contain numerous ephemeral drainages. The OCP identifies this area as a sensitive natural feature.

4.3 Fisheries Information

The study area contains two watersheds. The western portion of the study area drains south into Parkridge Creek (100-562800) which flows into the Fraser River. The eastern portion of the study area drains east and northeast into the city storm sewer system.

Existing fisheries information for the drainages within the proposed study area is limited. In 2004 *Environmental Dynamics* conducted an overview-level fisheries inventory within the City of Prince George (CPG). Results of that study indicated that all of the drainages within the study area are either non-fish bearing or inferred non-fish bearing (photo 3). The portion of Parkridge Creek located from Domano Boulevard to the Fraser River was classified as known fish-bearing and the portion from Highway 16 West to Domano Boulevard was classified as inferred fish bearing. Chinook salmon (*Oncorhynchus tsawytscha*) and rainbow trout (*Oncorhynchus mykiss*) were captured in the lower reach of Parkridge Creek in 2004.

Several small wetlands were identified within the study area and one significant wetland (Wetland A) adjacent (outside) the southwest tip of the study area, north of Highway 16 West (photo 4). This wetland is approximately 3 ha in size and supports a vast number of wildlife and invertebrate species throughout the year. The wetland consists of a large open water pond with cattails (*typha latifolia*) dominating the aquatic vegetation along the shoreline. The pond has been identified as non-fish bearing (EDI 2004).

4.4 Wildlife Sign/Wildlife Habitat

The study area provides a variety of habitat types for many wildlife species. Moose (*Acles acles)* sign including browse, pellets and tracks were frequently observed throughout the study area. Increased pellet group densities were observed in areas with more cover while lower pellet group densities were observed in recently disturbed areas. Deer (*Ocedentials* sp.) pellets and tracks were observed throughout the study area. Canid scat and tracks were also observed in various habitats. Beaver (*Castor anadensis*) activity was noted extensively within the largest stream in the west portion of the study area. Beaver dams had created pools which provided suitable habitat for waterfowl.

Although the wetland near Highway 16 is located outside the study area it is important to note that it provides habitat for many wildlife species including waterfowl, songbirds, amphibians, rodents and other mammals. The riparian area associated with the wetland and the inlet stream provides higher value habitat for many of the species listed above. Red-wing black birds (*Agelaius phoeniceus)* were observed guarding their territory along the perimeter of the wetland and mallards (*Anas Platyrhynchos),* bufflehead (*Bucephala albeola*) and Canada geese (*Branta canadensis*) were observed on the pond.

Anecdotal information indicated the study area is known to be regularly utilized by moose, black bear (*Ursus americanus*), deer and fox (*Vulpes sp.*). Cougar (*Felis concolor*) sightings have been reported near DL 1600 in the past.

4.5 Wildlife Habitat Value

General terrestrial and aquatic wildlife use values were derived from the field assessment that summarized species use. General knowledge of species habitat requirements and the availability of adjacent habitat were also used to assess habitat value.

Use indicates an association or consumption when habitat or food resources, respectfully, are discussed (Litvaitis et al. 1996). Direct (observation) and indirect (track counts, browse observations, pellets counts nests/burrows) methods were used to document general wildlife use (photo 5). Based on ground cover alone the study area contains a variety of habitat that has been influenced by various levels of disturbance.

Disturbance does not always indicate that there is a lower wildlife value. The cleared parcel of land within DL 1600 contained abundant willow browse, moose and deer tracks and pellets. Moose activity was more prominent near the edge of the clearing, but was observed throughout. The proximity of this habitat to Stream A riparian zone and cover also increases the value of this habitat. There were several small pockets of standing water with established aquatic vegetation within the cleared area. The mature timber along the perimeter of the clearing provided perching opportunities for raptors. An unidentified raptor was observed near the center of the clearing and numerous songbirds were heard along the edge. When assessed collectively the clearing edge and the adjacent riparian zone provide suitable habitat for wildlife.

The cleared area on the east side of Tyner Boulevard does not contain similar habitat quality. Evidence of browse, tracks and pellet groups were less frequent within the clearing compared to DL 1600. However, the riparian area along the north perimeter (Stream B) and coniferous buffer along the west side of the clearing provided cover and foraging opportunities for wildlife. The proximity to Tyner Boulevard and to residential development decreases the opportunity for wildlife movement.

Upland undisturbed habitat comprises approximately two-thirds of the study area. This area includes mature mixed pine forest, pure pine forest and primarily deciduous forest. The field assessment concluded that these forests provided suitable cover and foraging opportunity for a variety of wildlife species, but wildlife use was not as evident as near the riparian area. Fewer tracks, pellet groups and browse were noted. Deer appeared to utilize the upland habitat more than moose based on direct and indirect observations. Much of the forest is second growth and there are few large coniferous or deciduous veterans. The pine beetle has impacted several pure lodgepole pine stands and woodpecker activity was abundant. Indirect hare observations were noted within deciduous dominated forests more than coniferous dominated forests.

Wetland A (adjacent to the study area) and associated Stream A are considered important habitat. Species use is diverse throughout the non-frozen months as waterfowl, songbirds, passerines, mammals and amphibians all utilize the riparian habitat. The forested buffer along the stream provides cover and security and helps maintain water quality.

4.6 Existing Disturbed Area

Approximately one-third of the study area has been disturbed through harvesting practices, road and trail construction and industrial activity. Forest harvesting accounts for the majority of the disturbance as observed within DL 1600 and east of Tyner Boulevard. A portion of DL 1600 was cleared, piled and burned, but the organic layer was left intact. Willow species, trembling aspen and grass are the dominant vegetation on site. The harvested area east of Tyner Boulevard has grown in with predominantly trembling aspen, willow species, ribes species and grass species.

Other disturbed areas include pest management patches for mountain pine beetle fall and burn operations. These patches are located in the northern section of DL 1600. Access roads used by recreational traffic area in the study area have generated erosion concerns and introduced sediment into the streams.

5.0 ENVIRONMENTALLY SENSITIVE AREAS

Land based and water based environmentally sensitive areas (ESA) are important features within a landscape because they can provide unique habitat opportunities but are sensitive to disturbance. Common ESAs include riparian areas, streams, wetlands, wildlife features and steep slopes that are prone to erosion or provide special habitat requirements for certain species. Red and blue listed plant communities or other unique vegetative communities that are rare within the local landscape can also be considered ESAs. Trail systems, trapper cabins and archeological sites are other features considered to be sensitive to disturbance.

5.1 Headwaters of Parkridge Creek (Stream A) and Associated Wetland (Wetland A)

In an effort to protect important watercourses and wetlands from environmental degradation, the CPG has identified several areas within city limits as EDPAs. One such EDPA is Parkridge Creek and designated riparian zone adjacent to it, which is sensitive to soil erosion, sediment transfer, slope instability, and possible disturbance of fish and wildlife habitat. Although Parkridge Creek is outside the study area of the University Heights Neighborhood Plan, the stream flowing south adjacent to the western boundary flows into Parkridge Creek. Development activities should be set back from the stream banks to protect water quality and channel integrity. The wetland associated with this stream provides high value habitat and the integrity of the ecosystem should be maintained during development by retaining appropriate reserve and management zones.

Wetlands provide protection as they filter out pollutants, store and recycle nutrients and help settle out natural sedimentation. Wetlands also provide groundwater recharge and offer visual relief from urbanized areas.

5.2 Other Riparian Zones and Aquatic Habitat

The riparian zones throughout the study area are an integral part of the aquatic ecosystems as they create a buffer to external development. Riparian vegetation

promotes healthy watersheds, protects fish and wildlife habitat and provides a corridor for wildlife migration. Additionally, the existing riparian zones within the study area may provide valuable "green space" that will allow ecosystem preservation.

Many of the other drainages associated with the west portion of the study area are ephemeral and typically lack a definable channel. Nonetheless, these drainages provide valuable sources of water that maintain Wetland A. Although the drainages within the east divide of the study area flow into the city system they provide important ecosystem functions and maintain riparian areas. There are two significant streams that originate in the study area and flow east across Tyner Boulevard. The northern most stream (Stream B) has been disturbed by access roads and logging activities on the east side of Tyner Boulevard (photo 6). The stream is no longer flowing in its natural channel, but rather flows along a recently developed access road before entering a reserve zone further downstream.

Important ecological values of riparian areas are listed in The Stewardship Series *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management* and are as follows:

- Support the aquatic and terrestrial food webs for fish and wildlife.
- Provide shelter, cover and temperature regulation for fish and wildlife.
- Create habitat diversity for songbirds, raptors, small mammals and other wildlife species.
- Provide wildlife migration corridors and linkages between critical habitats.
- Buffer aquatic features from pollution.
- Recharge ground water and aquifers.
- Stabilize banks and reduce erosion.
- Dissipate energy of floods.
- Retain water in soil during droughts.

5.3 Elevated Gradient Slopes

The OCP has identified the area east of Tyner Boulevard near the eastern boundary of the study area as having significant slopes. Future excavation activities could lead to decreased slope stability within these areas particularly near the eastern boundary. There are numerous drainages along the slopes east of Tyner Boulevard and disturbance of this landscape could, at a minimum, elevate the risk of sediment transport and delivery to the identified watercourses within the study area and potentially impact slope stability. Terrain analysis and slope stability assessments should be conducted within this portion of the study area prior to development.

5.4 Trail Systems

The Cranbrook Hill Greenway trail system is mostly located outside the study area, but a trailhead is situated on Kimble Road at the south end of the boundary. This trail system is actively used by the community.

5.5 UNBC Reserve Lands

The UNBC reserve lands provide teaching, research and recreational opportunities for not only UNBC, but for the community as well. The study area overlaps with the southern portion of the designated reserve land. Development within this area should be done in consultation with all parties with a vested interest to ensure that management goals and strategies of the reserve lands are maintained and that development is carried out in accordance with the OCP.

6.0 CONSTRAINTS ON DEVELOPMENT

The following existing environmental/anthropogenic features may present constraints on development activities.

To maintain the stability of the aquatic and riparian ecosystems, any development should proceed with careful planning and consideration of potential environmental impacts such as:

- Decreased slope stability.
- Increased soil erosion and sediment transfer into aquatic ecosystems.
- Loss of wildlife habitat.
- Decreased level of infiltration of runoff.
- Alterations to downstream fish habitat.
- Decreased watershed stability.
- Stability of roads and drainage crossings.

6.1 Stormwater Management

As additional stormwater generation is anticipated to result from the project and considering the project's proximity to the Fraser River, effective storm sewer management should be developed. The increase of impervious areas and routing of stormwater flows decreases the retention of precipitation by infiltration resulting in surface runoff that concentrates rapidly into significantly higher peak flows and increased runoff volumes (DFO 1993). These flow related impacts are often combined with water quality concerns and destruction of wetlands and riparian areas.

Development plans in the western portion of the study area should consider the environmental and hydrological impacts of stormwater on the aquatic environment of Parkridge Creek and the wetland on the north side of Highway 16. The culvert at the highway crossing appeared to be undersized and increases in peak flows may cause back

flooding upstream and generate impacts to the highway or local private property, which in turn could impact downstream fish habitat.

To manage storm water in an environmentally sensitive manner, mitigation measures such as a stormwater infiltration system should be considered. These systems can be environmentally beneficial to the hydrology and water quality in urbanized areas. Benefits of these systems include:

- Retention of runoff through ground water recharge.
- Filtration of contaminants within the soil layers.
- Providing recharge to local area groundwater and streams.

The DFO *Land Development Guidelines for the Protection of Aquatic Habitat* provides a more detailed overview of stormwater infiltration systems.

6.2 Connectivity of Greenways and Disruption of Wildlife Habitat

Within the proposed development the wetlands and drainages are recognized as having important environmental attributes that should be preserved within greenways. There are several ways that greenways, with careful planning, are able to benefit natural ecosystems and urban environments (DFO, 1996).

- Conservation of streams, lakes, and wetlands along with their riparian areas.
- Limitation of development on floodplains and groundwater recharge areas.
- Providing areas for stormwater detention and constructed wetlands.
- Providing vegetation filters for sediment and pollutants.
- Better water quality.
- Providing corridors to connect flora and fauna with one another, to allow for seasonal movements in response to change.
- Providing a meaningful connection to nature for the people within a community.

Greenways within the proposed development area will require special attention in order to achieve the listed benefits. Of particular concern will be the preservation of wildlife habitat and migration routes. The stream along the western boundary provides wildlife a north-south access route that is relatively sheltered due to the retention of a riparian reserve zone. The presence of this movement corridor will aid in limiting the effects of wildlife habitat fragmentation within the project area. It will also provide maintain connection to the zone designated as Wildlife Habitat by the OCP.

Another potential constrain on development is timing of construction activities. Advanced planning will aid in reducing the potential of having to suspend or alter proposed construction activities to avoid active nests. No road construction or other site modifications should occur within 500 m of an active nest during the Northern goshawk-breeding period that extends from February 15 to August 15 (MWLAP 2004). Other

raptor species, passerines and songbirds are protected during the breeding season by the provincial reduced risk timing window between August 1 and April 30. Clearing within the timing window may be considered by providing a technical rationale that is developed, signed and sealed by an appropriately qualified professional detailing how the increased risk will be mitigated or that there will not be an increased risk from the proposed works (MWLAP 2004).

7.0 RECOMENDED BEST MANAGEMENT PRACTICES (BMP'S) AND REGULATORY REQUIREMENTS

Federal, provincial and municipal guidelines applicable to development around ESAs are identified below. BMPs have also been developed by various governing bodies and accommodate the established guidelines by providing general recommendations that will help maintain the function of ESAs in their natural state and prevent disruption of downstream habitat. It is important to realize that the BMPs provided below are intended as an overview and should not be considered comprehensive. Upon commencing works, individual tasks will have a more detailed list of BMPs associated with the specific task at hand.

7.1 Riparian Areas

7.1.1 Federal Regulatory Requirements

Due to the possibility that the proposed project may include instream work, an alteration to stream habitat may occur. Under the *Fisheries Act*, Section 35(1) "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat." Section 36(3) states "…no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish…". Although the drainages have been classified as non-fish bearing or inferred non-fish bearing, streams that flow into fish bearing streams must comply with the federal requirements.

Department of Fisheries and Oceans (DFO) have prepared a document called *Land Development Guidelines for the Protection of Aquatic Habitat.* Leave strips should be provided on all watercourses that flow into or contain fish habitat. It states that the minimum leave strip on either side of the watercourse for development of a low density (7 units/acre)/residential area should be a minimum of 15 meters from the high water mark". For areas of high density/commercial (>7units/ha) near creeks "the minimum leave strip width on each side of the watercourse should be 30 meters from the high water mark". It is recommended that the guidelines be applied to the main stream and the wetland in the western portion of the study area and to the main stream east of Tyner Boulevard for low density/high density development. DFO guidelines may be relaxed depending on biological attributes of the ephemeral tributaries that lack channel definition.

7.1.2 Provincial Regulatory Requirements

Notification to the Ministry of Environment (MOE), of proposed in-stream work is required under Section 9 of the *BC Water Act* and Part 7 of the *BC Water Act – Water Regulations.* The Act and Regulation specify requirements that assure that work being done in and about a stream does not compromise water quality, fish and wildlife habitat and the rights of other water users.

A notification form for instream work is available online on the Land and Waters British Columbia Inc. website: (http://www.lwbc.bc.ca/03water/licencing/section9/index.html) under the section regarding the Water Act – Section 9.

7.1.3 Municipal Requirements

The OCP does not specify any special provisions for development in the proposed study area. Federal and provincial regulations should be enforced at the municipal level.

7.1.4 BMPs for Development Near Aquatic ESAs

It is recommended that the proponents of the proposed development review the Stewardship Series documents, Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management, Community Greenways: Linking Communities to Country, and People to Nature and Land Development Guidelines for the Protection of Aquatic Habitat. These documents provide numerous mitigative techniques and recommendations to retain natural values of aquatic and terrestrial ecosystems while integrating them into ecologically sensitive planning developments. The following list identifies some of the key BMPs.

- Maintain appropriate buffers and leave strips to protect the stream banks and riparian vegetation
- Plan greenways appropriately and accommodate recreational trail corridors and access routes to minimize disturbance.
- Plan appropriately to identify and buffer sensitive areas such as wildlife values, and physical features like eroding slopes or steep topography.
- Acknowledge that upstream activities can impact habitat downstream and plan accordingly.

A major road has been proposed within Stream A riparian zone that would link Highway 16 to Tyner Boulevard. The preferred location of the road from an environmental perspective would be outside the riparian zone so that the total number of stream crossings is minimized. The proposed road location crosses Stream A 3 times within 500 meters and it is recommended that the road remain 15 m outside the riparian zone as per DFO guidelines. Although there would be more cut and fills associated with a road located on the slope there will be less impact to water quality than if the road utilized the riparian zone. Surface erosion and sedimentation can be minimized using a variety of techniques, most importantly, the use of a vegetative buffer along the stream.

7.2 Protection of Elevated Slope Gradients

The OCP identifies steep slopes and cut banks as highly valued landscape features. Many of the steeply sloped areas are subject to *The Tree Protection Bylaw*. This includes slopes with a gradient of twenty percent or greater and pertains to slopes on the east side of the study area east of Tyner Boulevard. The OCP further states that lesser slopes may be considered for protection where slope instability concerns are indicated by a professional geotechnical engineer.

7.3 Vegetation Clearing

Land clearing activities should be conducted in a way that minimizes the potential impact on wildlife. Legislation, guidelines and Best Management Practices (BMPs) set forth by federal and provincial agencies must be consulted to ensure development impacts are minimized. Section 7.3.2 identifies reduced risk timing windows established by the Province of British Columbia.

7.3.1 Federal Regulatory Requirements

The Migratory Birds Convention Act (MBCA) is Canadian legislation that governs the 1916 Migratory Birds Convention. The MBCA has comprehensive, corresponding regulations to the Act to protect, and regulate management of certain species, including waterfowl; cranes, rails and coots; gulls and terns; pigeons and doves; insectivorous birds (excluding blackbirds); loons; grebes and herons (MWLAP 2004).

7.3.2 Provincial Regulatory Requirements

Provincial government legislation protects wildlife through Section 34 of the Wildlife Act. The Wildlife Act states;

A person who, except as provided by regulation, possesses, takes injures, molests or destroys

- a bird or its egg
- the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or
- the nest of a bird not referred to above when the nest is occupied by a bird or its egg commits an offence.

Guidelines produced by the Ministry of Water, Land and Air Protection include a reduced risk timing window for protection of wildlife. Vegetation clearing should only be undertaken during the period of August 1 through to April 30 to avoid contravention of Section 34 of the Wildlife Act (MWLAP 2004). Exemptions to the Wildlife Act are identified and should be consulted prior to the start of land clearing activities.

7.4 Definitions

The following definitions are provided to clarify site descriptions and the explanations of applicable legislation and regulations that may affect the proposed project.

Under the BC *Water Act*;

A **stream** is defined as **"**a natural watercourse or source of water supply, whether usually containing water or not, and a lake, river, creek, spring, ravine, swamp and gulch".

A **stream channel** is defined as "the bed of a stream and the banks of a stream, whether above or below the natural boundary and whether usually containing water or not, including all side channels".

A **change in and about a stream** is defined as;

a any modification to the nature of a stream including the land, vegetation, natural environment or flow of water within a stream, or

b any activity or construction within the stream channel that has or may have an impact on a stream

As defined in the DFO document, Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management;

Aquatic Habitat is a habitat unit associated with water which provide food and shelter and other elements critical to completion of an organism's life cycle. Aquatic habitats include streams, wetlands, marshes, bogs, estuaries, and riparian areas, as well as large fresh and salt water bodies.

Environmentally Sensitive Area (ESA) is defined as an area that requires special management attention to protect fish and wildlife resources and other implicit natural systems or processes. ESA's have also been broadly defined to include other scenic, historic or cultural values.

Fish Habitat includes spawning grounds and nursery, rearing, food supply and migrations areas on which fish depend directly or indirectly in order to carry out their life processes (Canada Fisheries Act sec 31.5).

Riparian Zones are the terrain directly adjacent to the normal high water level in a stream, river, lake or pond and extending to the portion of land that is directly influenced by the presence of adjacent ponded or channelized water. Riparian areas typically exemplify a rich and diverse vegetative mosaic reflecting the influence of available surface water.

Wetlands are defined as areas of permanent or temporary standing water, characterized by the absence of channel flow and the presence of vegetation which is distinct from that in neighboring, freely drained areas. The most common types of wetlands are swamps, marshes and bogs, fens and shallow water.

8.0 ENHANCEMENT OPPORTUNITIES

The University Heights Neighborhood Plan should incorporate greenways into development designs. Greenways can be used to protect riparian habitat and provide habitat for wildlife, while also serving as a social amenity for the new neighborhood.

Enhancement opportunities should be centered around wetlands, streams or significant features that can be of value to wildlife and provide the community with recreational opportunity. For example, trail systems connecting the Wetland A near Highway 16 with Cranbrook Hill Greenway trails would expand the trail network within Prince George. Consultation with UNBC during the planning stage would be beneficial for developing enhancement opportunities within the UNBC Reserve Lands. Retaining established research areas within the Reserve Lands and establishing new areas would benefit the community as a whole. Another enhancement idea centers on creating wetlands and riparian areas for stormwater management within the study area, particularly within the western portion of the study area. Green spaces are valuable visual features that are aesthetically beneficial to the landscape.

9.0 REFFERENCES

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APPENDIX I PHOTO DOCUMENTATION

Photo 1. The clearing in the southwest portion of the study area

Photo 2. The clearing East of Tyner Boulevard with two cottonwood wildlife trees.

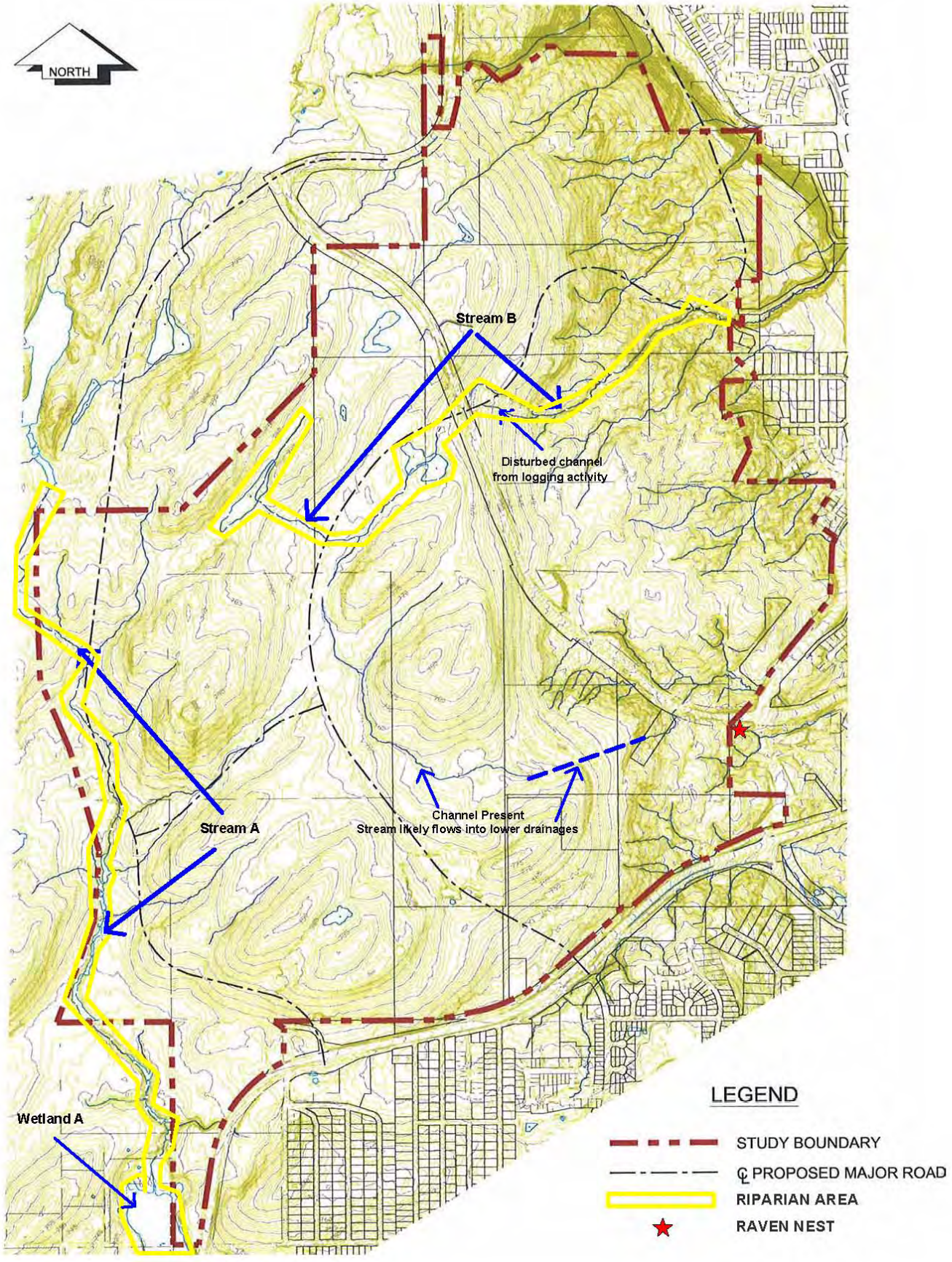
Photo 3. Stream A that feeds Wetland A near Highway 16. It was classified as inferred non-fish bearing by EDI in 2004.

Photo 4. The Wetland A adjacent to Highway 16.

Photo 5. Active nest of a common raven located near Ospika and Tyner Boulevard.

Photo 6. Erosion caused by logging practices East of Tyner Boulevard within Stream B.

APPENDIX II OVERVIEW MAP


NORTH
Stream B
Disturbed channel
from logging activity
Stream A
Channel Present
Stream likely flows into lower drainages
Wetland A
LEGEND
STUDY BOUNDARY
℄ PROPOSED MAJOR ROAD
RIPARIAN AREA
RAVEN NEST

APPENDIX B

University Heights Neighbourhood Plan
L&M Engineering Limited

WILDLIFE HABITAT ASSESSMENT

EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

University Heights Neighbourhood Plan
Wildlife Habitat Assessment

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

The objective of this assessment is to address impacts of the University Heights Neighbourhood Plan (UHNP) development activities on wildlife habitat and specifically to provide recommendations to minimize wildlife-human conflict in this urban development. An assessment of wildlife movement patterns was requested in the northern part of the UHNP area in order to reduce wildlife-human conflict including wildlife traffic collisions. An additional request and second objective of this wildlife habitat assessment is to recommend suitable riparian treatments for three watercourses, herein named Streams A, B and C. Numerous regulations under federal, provincial and municipal legislation apply to riparian assessment, and additional documents provide best management practices to address impacts of development on fish and wildlife habitat. The recommendations provided are based on field assessment and application of appropriate regulations, best management practices, and municipal long-term land use planning.

The first objective is met by recommending a wildlife corridor that spans the UHNP area. The corridor serves to maintain connectivity with adjacent wildlife habitat, and attempts to concentrate wildlife road crossings to one location. In addition, measures to minimize collisions such as speed limitation, signage and lighting must be employed along Tyner Boulevard, particularly in areas documented to have high numbers of moose crossings. To address the second objective, riparian leave-strips are recommended based on existing information of fish and wildlife values and observed attributes during field work of this overview assessment. The recommendations are consistent with Land Development Guidelines for the Protection of Aquatic Habitat (DFO 1993), the Official Community Plan (OCP 2001), and Riparian Areas Regulation (RAR 2006).

The wildlife corridor recommendation is located on Stream B and doubles as a riparian leave strip. Development is limited to the east side of Stream A, and a 30 meter variable width leave-strip is recommended on the east, or left bank, to protect fish and wildlife values. Stream A riparian area is required to maintain water quality including fish habitat to downstream reaches (ie. food supply), and to provide wildlife habitat that allows connectivity to the adjacent undeveloped area. Stream C leave strip serves to protect the riparian area and water quality while retaining existing habitat for birds and small mammals that do not pose high risk of human-wildlife conflict. In addition to a wildlife corridor on Stream B and riparian leave strip recommendations for Stream A and C, recommendations to minimize wildlife-traffic conflicts in the UHNP area are provided.

1.0 INTRODUCTION

The University Heights Neighbourhood Plan (UHNP) Area is located between the University of Northern British Columbia (UNBC) and Highway 16 West, and is bisected by Tyner Boulevard (Figure 1). The study area encompasses approximately 674 hectares and lies within an Urban Development zone as outlined in the OCP. The proposed development on undeveloped and unplanned lands subjects the project to Policy 6.3.18 of the City of Prince George Official Community Plan (OCP), creation of a Neighbourhood Plan. The OCP supports the preservation of natural landscapes, which includes fish and wildlife habitat and other significant land features such as steep slopes.

To address the requirements of the Official Community Plan (OCP), L&M Engineering requested that EDI Environmental Dynamics Inc. (EDI) conduct a literature review of relevant species information and carry out an environmental overview assessment for the proposed University Heights Neighbourhood Plan (UHNP). The overview assessment consisted of a reconnaissance level ground survey of existing aquatic and terrestrial habitats within the study area and identified significant features and sensitive zones. L&M incorporated the Environmental Overview Assessment Report into the University Heights Neighbourhood Plan for first review.

Subsequent discussions at the University Heights Planning Charette in June 2006 supported the need for further assessment of the UHNP area to ensure that wildlife and environmental features of the proposed UHNP area were addressed appropriately. Concerns from the municipality (J. White), Ministry of Environment (MOE; B. Arthur) and the general public were brought forward regarding wildlife movement across Tyner Boulevard. The proposed UHNP area has been designated for Urban Development by the OCP and according to MOE, the section of Tyner Boulevard between the University turn off and Ospika Blvd has the highest moose kill frequency in Prince George.

The expansion of urban development increases human and vehicular activities in areas frequented by wildlife. There is habitat outside the UHNP area to the west and northwest that has been designated Ungulate and Bear Habitat by the OCP (2001; Figure 1). It is recognized that although wildlife-human conflict is unwanted, it is also not desired, nor possible, to entirely restrict existing wildlife from moving move into and out of the study area. In fact, proximity to wildlife habitat may be seen as an amenity to future residents of this development and to existing residents in Prince George. However, the close proximity of residents and wildlife habitat poses potential conflicts such as vehicle collisions, nuisance animals and habituated wildlife.

To provide recommendations to minimize wildlife collisions and wildlife-human conflict within the UHNP, a wildlife habitat assessment was developed and carried out by EDI in September and December of 2006. The objectives of the assessment were to gather wildlife use data to identify specific wildlife-human conflicts, such as wildlife-vehicle collision potential, wildlife disruption during development (loss of habitat), as well as optimizing green space to encompass riparian values, wildlife corridors, fish habitat, and water quality. This assessment aimed to determine potential wildlife movement patterns within the study area. Riparian areas were assessed and recommended leave strips encompass fish and wildlife values. Additional unpublished data on wildlife movements was recently reviewed and are

incorporated into this report. The goal of this report is to document fish and wildlife attributes, recommend appropriate treatments that will mitigate impacts to fish and wildlife habitat and subsequently provide shelter/security cover that will facilitate connectivity to habitat outside the UHNP area.

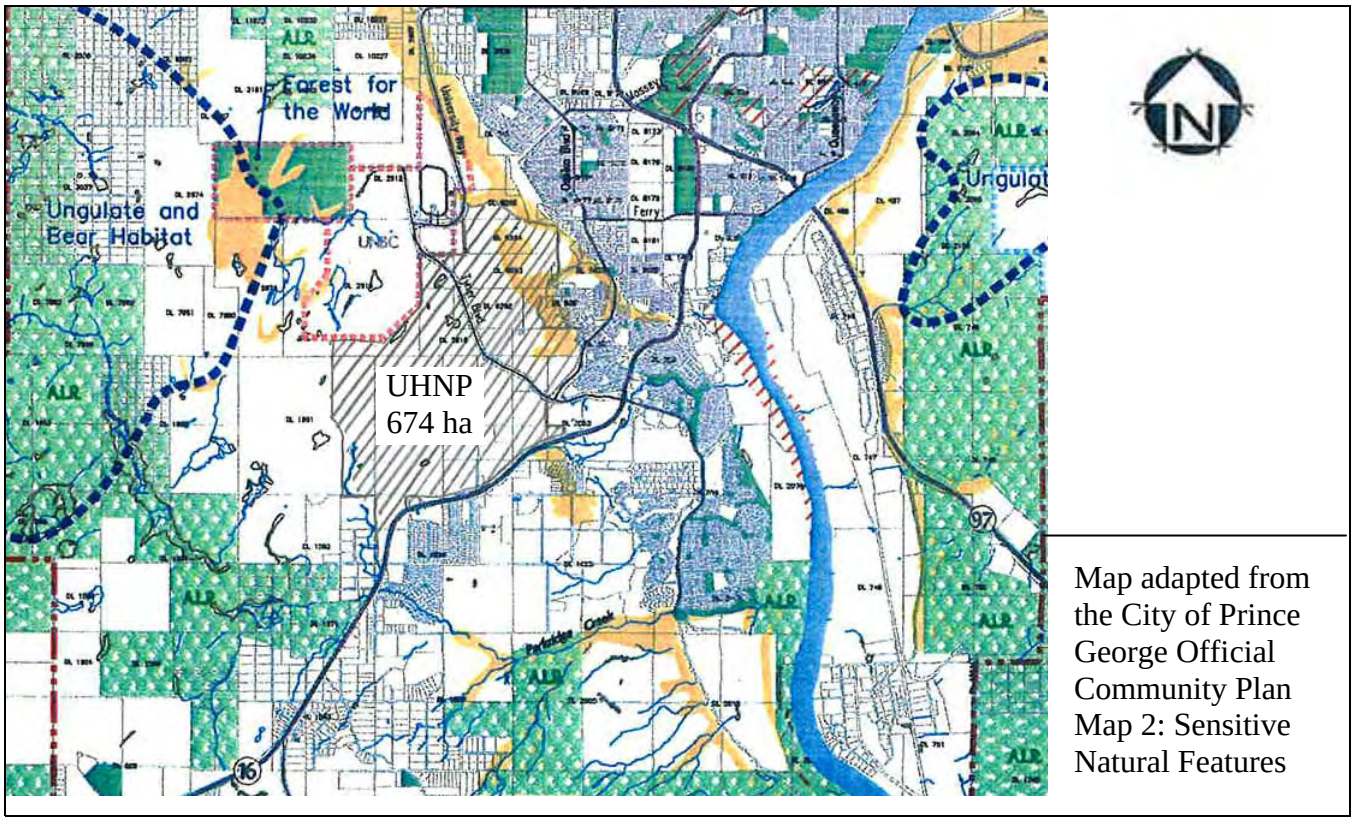

Figure 1. University Heights Neighbourhood Plan (UHNP) area is shown as hatched area in the context of UNBC and features of the City of Prince George Official Community Plan.

2.0 METHODOLOGY

Relevant legislation and literature was reviewed prior to conducting the field assessments and post field work to support the findings. The following lists the primary government documents reviewed, while peer reviewed papers were consulted and are referred to in this document as rationale for our recommendations.

- BC Water Act;
- Department of Fisheries and Oceans (DFO) Land Development Guidelines for the Protection of Aquatic Habitat;
- Resource Inventory Committee (RIC) Species Inventory Fundamentals,
- RIC Ground Based Inventory Methods for Ungulate Snow Track Surveys;
- Ministry of Forests Land Management Guidebook;
- Prince George Official Community Plan;
- Interim Standard Development Letter for City of Prince George Referrals (letter from DFO dated June 30, 2006);
- PGMap Fisheries inventory and long-range planning layers for the City of Prince George.

In order to prioritize field assessments in the 674 hectare area, the UHNP Area was stratified to address areas identified from the environmental overview and concerns of the subsequent planning charrette. Environmental assessments were conducted for streams A, B, and C. In terms of wildlife habitat the assessment focused on the northern portion spanning both sides of Tyner Boulevard due to the following criteria. A map of these areas is provided as Appendix II- Map 1.

- Known location of wildlife traffic conflicts or wildlife crossing area;
- Encompassed a variety of habitats including moose habitat;
- Included a reference site outside the UHNP area so the assessment is repeatable.

EDI used encounter transects in the wildlife assessment with Tyner Boulevard serving as the starting point (Map 1). An encounter transect is a survey in which observed species are counted continuously or at fixed points, regardless of the distance from the line (RIC 1998). A reconnaissance or presence/not detected level survey was conducted along transects to determine species presence and habitat use. Encounter transects are generally used only for reconnaissance level surveys because the lack of a measure of area surveyed makes it impossible to estimate population size (RIC 1998). However, for this purpose we measured the transects and used equal transect lengths within the UHNP area (transects 6-9), and the reference area (transects 1-5), which is outside of the development area (Map 1). Transects 1-5 will serve as the base condition for this area. They are located in undeveloped habitat, outside of the forest for the world trail network, outside of the UHNP area, and the area is not proposed for development at this time.

Wildlife transects and riparian assessments were completed in four days over two times of year, September 2006, and December 2006. The winter survey was conducted approximately 24 hours after the last snowfall which is consistent with *Ground Based Inventory Methods for Ungulate Snow Track Surveys* (RIC 2006). On the west side of Tyner, 2600 meters of transects were distributed in transects numbered 1-5, and 2600 metres of transect lines were repeated on the east side of Tyner Boulevard in transects numbered 6-9 (Appendix II –Map 1). Although Transect 6 is partially located outside the UHNP area it is located along a mapped riparian feature that is a potential area for a concentration of moose and wildlife travel and therefore a candidate for a moose corridor. A cut block is present to the south of transects 6-9.

All encounters of wildlife sign (pellets, scat, hair, tracks) along these transects were recorded. Game trails and general wildlife use data from both sides of Tyner Boulevard were collected to determine if significant movement occurs within a distinct corridor. Data were tabulated for each line transect in each season. Each wildlife sign (i.e. pellet group, track or browsed shrub) was documented. This allows for an interpretation of animal use and habitat associations and for a comparison of transects 1-5 relative to transects 6-9.

In addition, mapped streams that cross Tyner Boulevard were assessed to document stream characteristics (ephemeral or year round), and their potential to serve as corridors between the development area and the Cranbrook Hill greenbelt. Stream A and B were identified during the environmental overview assessment in May 2006; however, there were additional drainages assessed during the follow up wildlife habitat assessment including Stream C, the tributaries near the water reservoir, and an ephemeral stream that crosses Transect 7 (Map 1).

3.0 RESULTS

3.1 Wildlife

3.1.1 Known Species and Other Local Knowledge

The potential species list for the UHNP area is significant considering the diverse vegetation types and habitat structure available. Species that were noted during the Environmental Overview Assessment include: black bear, moose, deer (white tailed and mule), fox, coyote and cougar, beaver, snowshoe hare, mallard, red-winged blackbird, bufflehead and Canada goose. Numerous songbirds were heard throughout the UHNP area and one unidentified raptor was noted in the southern portion. Cougar sightings have been reported within the southern portion of the study area (Bob Brade, pers. comm.).

A review of provincially and federally listed species was conducted using the Ministry of Environment Conservation Data Centre online database and the Environment Canada Species at Risk online registry. Two federally listed species were listed, namely the western toad and the long-billed curlew. These species and eight others including caribou, grizzly bear, wolverine, fisher, sharp-tailed grouse, great blue heron and short-eared owl were provincially listed.

EDI received unpublished data (Rea 2007) after the field component was completed and utilized the data to provide further insight into wildlife movements across Tyner Boulevard. Rea (2007) documented locations of tracks crossing the road along University Way and Tyner Boulevard during the winter on a

weekly basis between 2005 and 2007. EDI tallied counts between road segments among years to assess if certain areas had more crossings than others (Table 1). Segment D (Map 2) had the highest number of moose crossings observed during the three years and is located between Stream B and the road access road to the Greenway trail system. This segment corresponds to the area transects were located to determine wildlife presence and habitat associations.

Table 1. Summary of unpublished data collected by Roy Rea between 2005 and 2007 during weekly sampling along Tyner Boulevard. Map 2 illustrates the location of these data in context of the UHNP area.

Object ID	Road Segment	Number of moose tracks	UTM zone	Point_X	Point_Y
1	A	121	10	513690	5968993
2	B	73	10	512833	5969509
3	C	78	10	512623	5970024
4	D	166	10	512484	5970433
5	E	74	10	511969	5970899
6	F	72	10	512239	5970996
7	G	60	10	512558	5971902
8	H	27	10	512210	5972887

3.1.2 Field Assessments

Wildlife sign was encountered along all ground transects surveyed during both the summer and winter surveys. Moose sign was the most dominant observation noted during both the summer and the winter surveys, except for the winter survey west of Tyner Boulevard where deer sign was observed more frequently. Table 2 summarizes the observed wildlife sign for each study area during the summer and winter surveys, and tallies observations for the base condition area (transects 1-5) and the UHNP area (transects 6-9). The two areas comprised a comparable total transect length.

Trails were documented on both sides of Tyner; most trails were considered wildlife trails that likely served as recreational trails as well. Wildlife trails encountered during the surveys were associated with riparian areas as well as upland areas that supported key forage species such as red-osier dogwood, willow and rose. An attempt was made to follow trails that were well established, but most of them were short and discontinuous. One set of moose tracks was observed crossing Tyner during the winter survey near the end of Transect 7. The moose entered a riparian area of an ephemeral drainage.

Summer surveys noted increased wildlife sign near riparian areas (transect 2, 6 and 7) as shown in Table 2. Increased sightings were common around wet depressions, ephemeral streams or drainages, or in areas with higher value forage. Increased moose activity was typically noted where ferns persisted and moose beds were commonly found in habitat dominated by fern. Tracks, beds and pellet groups were common in many wet areas. A secondary recreational road adjacent to Tyner Boulevard exhibited a large number of deer and moose tracks indicating a concentration of ungulate use along the active right-of-way.

A general observation noted during the winter assessment was that deer sign (tracks, pellet groups) was limited in habitat that had snow depths greater than 40 cm. Deer appeared to be using the habitat west

of Tyner Boulevard that was dominated by closed canopy coniferous forest with balsam and Douglas-fir regeneration.

Distinct game trails were not readily identified during the wildlife corridor assessment, observations of wildlife sign indicated that moose and deer cross the road at numerous locations.

Table 2. Raw data showing deer and moose sign observed during the summer and winter transects in 2006.

Summer								**Winter**						
	Pellets		Tracks		**Trails	Browse	*Total	Pellets		Tracks		Trails	Browse	*Total
Transect	Moose	Deer	Moose	Deer				Moose	Deer	Moose	Deer			
1	1	0	1	0	5	Yes	**7**	0	0	0	5	2	Yes	**7**
2	10	1	1	1	10	Yes	**23**	0	1	0	6	0	Yes	**7**
3	4	1	2	0	7	Yes	**14**	0	1	0	4	0	Yes	**5**
4	9	1	1	0	3	Yes	**14**	0	0	0	4	0	Yes	**4**
5	11	0	0	0	0	Yes	**11**	0	0	0	0	0	No	**0**
Total number observations							**69**	Total number observations						**23**
6	5	2	5	2	8	Yes	**22**	1	0	3	0	0	Yes	**4**
7	6	3	1	0	9	Yes	**19**	1	0	2	0	0	Yes	**3**
8	4	0	1	0	5	Yes	**10**	0	0	4	1	0	Yes	**5**
9	3	0	1	0	5	Yes	**9**	0	0	1	0	0	Yes	**1**
Total number observations							**60**	Total number observations						**13**

* Each observation was counted as one point.
** Trails were counted if there was a distinct path for 50 meters or more.

3.2 Riparian

3.2.1 Information Review

Three streams (Stream A, B and C) were noted within the proposed study area during the initial overview assessment. All three streams are considered non-fish bearing (EDI 2004) within the UHNP area, and eventually flow into either a fish bearing watercourse or the municipal storm water system. An additional ephemeral drainage has been documented including a watercourse at the north end of the study area near Transect 7. The Water Act defines a stream as "*a natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch*". These streams meet that definition and the Water Act should be followed pertaining to any works in and around these streams.

The UHNP area lies within the SBSdw3 biogeoclimatic zone which is the sub boreal spruce zone with a dry and warm subzone. Coniferous forests in this unit tend to be mixtures of lodgepole pine, Douglas-fir and hybrid white spruce (Delong *et al.* 1993). Subalpine fir is uncommon at low elevations. Deciduous forests dominated by trembling aspen are common and paper birch pockets are present on wetter sites. Black cottonwood is common along streams and riparian areas (Delong *et al.* 1993). This holds true for most of the riparian areas assessed within the UHNP area, specifically west of Tyner Boulevard where the topography is relatively flat.

3.2.2 Field Assessments

The significant drainages identified for this assessment are referred to as Stream A, B and C (Map 1). These streams have variable channel definitions and varying importance as features within the study area.

Stream A, which has been classified as non-fish bearing (EDI 2004), is a tributary to Parkridge Creek, which is classified as fish bearing and considered a designated stream by the OCP. Stream A recharges the wetland complex downstream and provides valuable riparian habitat for wildlife such as beaver, waterfowl, amphibians and other mammals and bird species. Stream A was assessed during the Environmental Overview.

Stream B may be ephemeral as it has variable channel characteristics including organic and alluvial bed material. A portion of the stream east of Tyner Boulevard has been impacted by logging activities within the harvested block and does not currently have typical stream characteristics, such as defined channel and vegetated banks at the time of the assessment. The disturbed portion of the watercourse flows into its natural channel approximately 300 meters down slope where the stream banks and riparian vegetation were retained during the harvesting activities in 2003/2004. This riparian area has value for wildlife throughout the year, considering the vegetation species observed during the assessment.

The portion of Stream B upstream of Tyner Boulevard has mixed channel definition with wetland pockets dominated by standing water. There is poor surface connection between Tyner Boulevard and the standing water 200 meters upstream, but there is evidence that overland flow is common during high water events. Subsurface flow was evident during low flows, by seepage in the ditch upslope of Tyner Boulevard. Mature black cottonwoods were well established in the riparian zone indicating moist soil conditions are persistent within the seepage area. The standing water present within the headwaters of this stream may provide a year round supply of water. Wildlife sign was common throughout the entire riparian area upstream of Tyner Boulevard including bear scat, moose pellets, browse and tracks and a visual observation of two mule deer. Ruby crowned kinglet, yellow warbler and common waterthrush were confirmed within the riparian zone during the field assessments.

Stream C was evaluated in May 2007. Stream C originates as seepage within a well-defined draw and contains a poorly defined channel with an organic substrate. The stream channel definition improves downstream where it crosses a recreation road approximately 875 meters southwest of Tyner Boulevard. Downstream of the road crossing the stream flows into standing water and the riparian area becomes wider than upstream portions. Approximately 200 meters upstream of the recreation road, the topography changes and causes the stream to pool. A height of land prevents the stream from flowing further downstream. There was no surface flow connection to the mapped tributaries northeast of Stream C. Wildlife activity was noted throughout the riparian area including bear scat and digs, moose and deer pellets, moose browse, hare pellets and numerous game trails parallel and perpendicular to the stream.

The small tributaries that flow across Tyner Boulevard north of the water reservoir do not appear connected to Stream C by surface flows. Groundwater influence from the pooled water upslope likely contributes to the seepage observed within the tributaries. There are two main tributaries that were assessed as shown in Map 1. These streams originate as seepage approximately 450 meters upslope

from Tyner Boulevard and have poor channel definition until flows reach the road where some scour and alluvial material is present. The forest in which the streams are located has been disturbed by logging and the forest cover is dominated by young trembling aspen, likely less than 25 years old. Wildlife activity appeared less in the young forest compared to the mature riparian zone of Stream C.

The stream identified near Transect 7 appears ephemeral and has been identified as non-fish bearing (EDI 2004). This stream does not support a defined channel with alluvial material; rather it consisted of an organic bed with abundant vegetative growth within the depression. The drainage carries surface flow during the spring snowmelt or when there is significant rainfall.

4.0 RECOMMENDATIONS

The wildlife transects encompassed a portion of the entire study area and were meant to supplement the environmental overview assessment and existing information. The objective of this portion of the assessment was to determine if specific routes existed where a corridor of green space could be overlaid, and to determine presence of wildlife species and habitat use for the area in general. A mitigation plan that reduces wildlife-human conflicts within the UHNP area was developed based on identified corridor routes, movement patterns and seasonal habitat use, and with consideration of relevant literature on animal movements and corridor establishment.

The study area provides a variety of habitat types for many wildlife species. Moose sign including browse, pellets and tracks were frequently observed throughout the study area. Deer pellets and tracks were observed throughout the study area. Canid scat and tracks were also observed in various habitats. Field assessments indicated moose, black bear, and deer utilize the study area.

Well-established corridors or migration routes were not observed during the field assessments, but evidence of browsing and bedding activity was noted, specifically near riparian areas. It is evident that moose utilized habitat on the west and east side of Tyner more during the summer transects, and it is inferred from the assessments that they move to adjacent habitat during the winter. The depth and duration of snow cover combined with forage quality and quantity typically determines the seasonal movement of moose, which have home ranges of 5-10 km^2 (MELP 2000). Moose and other ungulates will seek out areas with high value and dense forage during the spring and again in the winter when energy demands are higher.

Deer are known to reside throughout the UHNP area and, as the transect data indicates, they use the habitat on the west side of Tyner during the summer and winter. Deer prefer steep slopes facing south and west with lower snow pack levels during the winter. These habitats are limited to slopes near the west edge of the study area adjacent to Stream A. Documented conflicts with deer within the City of Prince George were not obtained, but deer are not thought to be a significant risk regarding wildlife-human conflict.

4.1 Wildlife Corridor

The municipality incorporates wildlife concerns in land development planning, and the OCP (2001) designates a large area of ungulate and bear habitat outside of the UHNP area. It is recognized that residential development favours human over wildlife habitat, that the UHNP area has been designated

for urban development in the OCP (2001), and that it is not desired to inflict unnecessary wildlife-human conflict within the design of a neighbourhood plan.

A wildlife corridor is defined as a travel corridor for wildlife, ranging from very wide natural corridors for large mammals to smaller corridors for birds and mammals (MWLAP 2004). In terms of conservation biology, corridors serve as a connection between habitat fragments in a fragmented landscape (USGS 2007). The purpose of a corridor in the UHNP area is to facilitate large mammals moving out of the area during development, and to subsequently provide a corridor for small mammals and birds that have lower risk of human-wildlife conflict, and also provide an amenity for future residents of the development. Applicable best management practices (MWLAP 2004) do not provide specific widths for connectivity corridors. EDI recommends planning for a wildlife corridor of a width to meet the following objective: **provide habitat and connectivity for animals with low risk of wildlife-human conflict.**

As traffic densities increase along Tyner Boulevard and the road is widened to 37 meters (personal comm. L&M 2007), wildlife movement across the four lanes (east-west) may be impeded. Busy roads with large right-of-ways tend to limit wildlife movement most severely (Underhill and Angold 2000). The portion of the corridor crossing Tyner Boulevard should be monitored as development proceeds to ensure it is functioning as intended and to assess the need for further mitigation or countermeasure implementation. The overall objective of the wildlife assessment is to minimize wildlife conflicts with traffic and residents, and to ensure safety if residents.

4.2 Human-Wildlife Countermeasures

Various countermeasures were compiled by Rea (2004) that had been implemented or studied in attempt to reduce human-wildlife conflicts. The following countermeasures are recommended for implementation in the UHNP: vegetation management, lighting/signage, traffic speed/road design, speed, and bear conflict measures. Lighting, signage and speed are factors that should be considered in particular in the vicinity of the wildlife corridor (Map 1), and areas of high moose crossing frequency documented by Roy Rea (2007; Map 2).

4.2.1 Vegetation Management

Corridors, such as linear developments and clearings, tend to provide an abundant source of preferred forage, which attracts ungulates. Right-of-ways that are managed through brushing and cutting techniques tend to be more spatially concentrated than vegetation found in natural forests and undisturbed habitat (Rea 2003). Tyner and other proposed access roads with adjacent greenbelts should be managed with this in mind to reduce the ungulate-related wildlife vehicle collisions during various stages of development. Moose are regularly observed foraging along Tyner and pose a risk to motorists utilizing this corridor, especially at night when visibility is lower. Some researchers identify dawn and dusk as the peak collision time, but information from the Prince George region does not clearly indicate the time of day when most wildlife collisions occurred (Rea 2004). Roadside vegetation management can impact the seasonal availability of browse species and fresh shoots by simply cutting the vegetation at a time of year when they will not grow back with as much vigour. Ministry of Environment has stated that roadside maintenance and vegetation management should be used to discourage foraging

adjacent to the road. These measures should be considered for most of the major roads that have green space or greenbelts nearby such as the Proposed University Way Extension, Massey Drive Extension and existing Tyner Boulevard.

4.2.2 Lighting and Signage

Increasing the lighting at locations with higher collision rates may be an effective tool to limit vehicle-wildlife collisions. The wildlife corridor crossing with Tyner Boulevard should be targeted to provide adequate lighting. Further monitoring is warranted to assess lighting effectiveness.

4.2.3 Traffic Speed and Road Design

Reducing traffic speeds on the main thoroughfares that are adjacent to greenbelts may reduce the wildlife collision rate as motorists will have more time to react to wildlife on the road. Speed bumps are effective at slowing vehicles down and could be implemented on certain roads. New roads that are constructed could be designed to reduce or prevent animal crossings by sloping road edge or excavating deeper ditches to discourage crossings.

4.2.4 Bear Conflict Countermeasures

The City has implemented the Northern Bear Awareness Program in attempt to reduce wildlife-human conflicts in residential, commercial, and industrial areas of the city. Over-ripe fruit left on the trees of residential yards has historically been one significant cause of bear problems within the city.
The goals of the program include:

- bear proof communities by minimizing unnatural attractants;
- prevent bear-human conflict
- minimize the impact of urbanization on bears;
- increase public awareness through preventative education;
- foster understanding, appreciation and tolerance of bears;
- conduct research to study bear habitat and behaviors in a community environment;
- promote community involvement.
- Planting fruit trees or palatable berry shrubs should be avoided when landscaping any new development, specifically near greenbelt areas or along road sides. This is supported by Section 3.2.7 of the UHNP that recommends building schemes that work to reduce human-wildlife conflicts, including banning fruit trees in UHNP area.

Initiatives of the Northern Bear Awareness Program should be supported within all new development communities.

4.3 Riparian

The OCP (2001) provides guidelines for riparian areas that are consistent with the Riparian Areas Regulation, and DFO Land Development Guidelines for the Protection of Aquatic Habitat.

- all watercourses should not be diverted or obstructed without approval,
- road construction shall allow the natural flow of all streams, and

- deposition of materials, surface runoff and subsurface drainage should not negatively affect any wetland, pond or watercourse.

To be consistent with these guidelines, all watercourses in the UHNP area, all of which have been determined non-fish bearing, require a minimum 15 metre leave strip from top of bank by default. Depending on characteristics such as channel width, bank width, substrate, permanence, fish habitat value, and riparian vegetation or potential vegetation, a wider leave strip or no leave strip may be justified. The emphasis of the guidelines is on mitigating loss of fish habitat. EDI looked specifically at Streams A, B and C (Map 1) in the UHNP area and the following provides recommendations considering riparian wildlife habitat value of those streams. For remaining streams, it is recommended that either the 15 metre default leave strip is implemented, or detailed riparian assessment is conducted at the detailed design stage of this development.

4.3.1 Stream A

As outlined in the Environmental Overview Assessment prepared by EDI, effort should be made to protect Stream A from disturbance. Stream A is a tributary to Parkridge Creek, which supports fish and contains suitable wildlife habitat. Stream A provides important aquatic habitat for many species and may act as a corridor for wildlife migrating in a north-south direction. Stream A recharges an important wetland near Highway 16, which in turn stabilizes flows and provides a buffer within the system. The OCP identifies Parkridge Creek as a designated watercourse.

- The proposed development adjacent to the tributary to Parkridge Creek should be set back 30 m from top of bank on the east side to protect the riparian zone, retain stream side vegetation, maintain water quality and invertebrate populations, provide suitable opportunity for wildlife to use the riparian zone, while reducing wildlife-human conflicts on the development side.
- It is understood at this time that the west side of Stream A will not be developed within UHNP.

This recommendation will facilitate wildlife to utilize the undisturbed habitat that extends west while having access to the riparian area of Stream A and avoiding the new development areas, thereby reducing wildlife-human conflicts. A recreation trail has been proposed along the west side of the stream and will likely have a low impact on wildlife. In order to mitigate impacts to riparian areas, it is recommended that the location of trails adjacent to watercourses be assessed at the detailed design stage to ensure consistency with the OCP (2001).

The goal is to retain a suitable amount of natural habitat within the riparian zone to accommodate wildlife and protect water quality, while also reducing wildlife-human conflicts from development activities and future land use. Implementing a buffer of this size may reduce the impact of noise and pollution transfer from traffic on wildlife that utilizes the riparian area and adjacent greenbelt habitat (Underhill and Angold 2000).

The UHNP map shows the University Way Extension road location may encroach on the recommended buffer on Stream A (Box A1 on Map 1). However, steep slopes to the immediate east limit the location of the future road. It is recommended that reducing the leave strip in these areas to accommodate the road is acceptable so long as the minimum of 15 metres leave strip from top of bank is intact.

- A variable width buffer should be implemented on the portion of Stream A that is outlined within the A1 Box (Map 1).

4.3.2. Stream B

- A wildlife corridor is recommended along the length of Stream B. The most valuable wildlife habitat features along Stream B is focused in two areas: the Cranbrook Hill Escarpment, and the wetlands (Box B2, B3 Map 1). A 30 metre leave strip from top of bank is recommended for these areas. The proposed corridor would extend 30 metres from top of bank on each side, from the eastern boundary of the UHNP, through the Cranbrook Hill Escarpment, up to approximately 100 metres of Tyner Boulevard. The precise distance from Tyner Boulevard must be determined and depends on the characteristics of the stream and riparian area according to Riparian Assessment Methods, which takes into account substrate material, vegetation, and channel width. It is recommended that the corridor narrow as approaching either side of the road, to a minimum of 15 metres from top of bank. The length of stream between the wetlands also requires a 15 metre minimum leave strip, and the precise location the corridor narrows between wetlands also depends on watercourse characteristics in that location.
- Box B1 Map 1. Road design and engineering constraints may encroach on the recommended buffer at the east end of the corridor. Reducing the wildlife corridor in this location to accommodate the road is acceptable due to the road being constrained by steep slopes and a minimum of 15 metres leave strip from top of bank is recommended at this location.
- Box B3 Map. Further evaluation of this wetland is recommended during the detailed design to effectively establish the recommended leave strip from the edge of the wetland.

4.3.3. Stream C

Stream C has been identified as an isolated stream within the UHNP area, but the riparian area illustrated on Map 1 associated with the stream is an important landscape feature. Although the stream is not connected by way of surface water to any drainage downstream, it provides a groundwater source.

- A 15 meter buffer from top of bank is recommended to protect water quality and protect the wildlife values associated with the riparian zone. It is important to maintain riparian features on the landscape. It is understood that development is proposed for areas around the stream, however, the riparian zone of Stream C is valuable for small birds, amphibians, and small mammals that can live in conjunction with development activities and pose low risk for human-wildlife conflict.

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APPENDIX I

Site Photos

Photo 1. Picture depicts the riparian area and channel of Stream B downstream of Tyner Blvd..

Photo 2. Pooled water within the riparian zone of Stream B 200 meters upstream of Tyner Blvd.

Photo 3. Wetland habitat at the headwaters of Stream B.

Photo 4. Wetland riparian area of Stream C at the south tip.

Photo 5. Wetland riparian area of Stream C.

Photo 6. Evidence of moose bedding down within a fern and alder patch along Transect 7 near Tyner Blvd..

Photo 7. Typical habitat observed along Transect 8. Good habitat potential for moose, deer and bear among others.

Photo 8. Photo depicts moose tracks and chew marks on a downed trembling aspen tree.

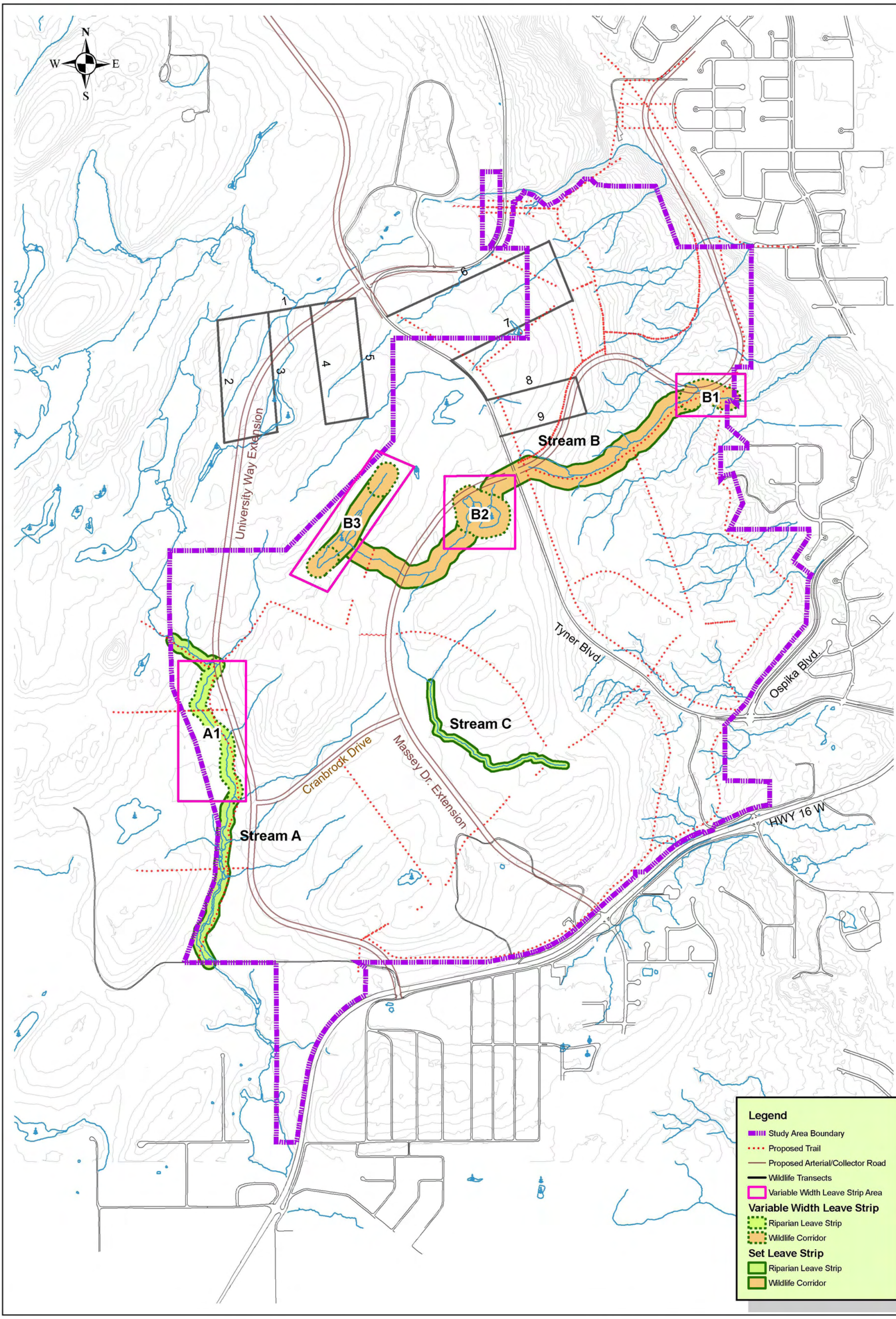
Photo 9. Photo indicates the location of the only moose crossing observed near transect 7.

Photo 10. This photo depicts the habitat present along Transect 9.

APPENDIX II

Site Maps

Map 1 - Proposed Leave Strips for the UHNP - Streams A, B and C



Map 2: Unpublished Moose Data

Transect Site	Number of tracks
A	121
B	73
C	78
D	166
E	74
F	72
G	60
H	27

N
W E
S

H
G
F
E
D
C
B
A

University Way Extension
Tyner Blvd.
Cranbrook Drive
Massey Dr. Extension

Legend

- Moose Crossing Transect
- Study Area Boundary
- Proposed Trail
- Proposed Arterial/Collector Road
- Roads
- Creeks

1:14,421
0 250 500 1,000 Meters

1. Roy Rea, Unversity of Northern British Columbia. 2007

APPENDIX C

University Heights Neighbourhood Plan
L&M Engineering Limited

GEOTECHNICAL OVERVIEW

GEOTECHNICAL OVERVIEW STUDY

PROPOSED UNIVERSITY HEIGHTS NEIGHBOURHOOD

Prepared for

L&M ENGINEERING LIMITED
PRINCE GEORGE, B.C.

Prepared by

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PROJECT No. K-2023

JULY 28, 2006

TABLE OF CONTENTS

APPENDICES

APPENDIX A	**Site Location Plan**	**Drawing 2023-A1**
	Terrain Mapping Overlay	**Drawings 2023-A2 and A3**
	Schematic Cross Sections	**Drawings 2023-A4 and A5**
APPENDIX B	**J.M. Ryder and Associates, Terrain Analysis Inc. Report**	

1.0 INTRODUCTION

L&M Engineering Limited (L&M) is preparing a development plan for the proposed University Heights Neighbourhood (the development) on behalf of BFW Land Development Corp (BFW), of Vancouver, B.C. The development is located in the southwest area of the City of Prince George and spans the area between the University of Northern British Columbia, and Highway 16 West, near Vanway. It is bounded on the west by the Cranbrook Hill Greenway and on the east by the Cranbrook Hill escarpment and existing development. The project location is shown on Drawing 2023-A1, in Appendix A.

On April 12, 2006, on behalf of BFW, L&M authorized us to proceed with the overview assessment as outlined in our proposal dated April 7, 2006. We provided preliminary comments with respect to the overview study in two letters dated June 21 and 30, 2006.

The geotechnical overview consists of several components. First, we compiled and reviewed relevant geological publications and existing background information, including BC Geological Survey and Geological Survey of Canada publications, water well logs, and existing geotechnical reports by GeoNorth and others.

Second, GeoNorth commissioned J.M. Ryder and Associates, Terrain Analysis Inc. (JMRA) of Vancouver, B.C. to carry out a terrain mapping study using historical and recent stereo aerial photographs.

Following the aerial photo mapping, we conducted several traverses of the study area, focussing on areas where the terrain mapping study indicated uncertain conditions or suggested the potential for slope instability exists.

This report presents a summary of the geological conditions, available geotechnical information, and field observations, and provides an assessment of the extent of probable soil types. The report outlines the potential for subsurface disposal of groundwater, the location of possible gravel borrow sources, and geotechnical considerations with respect to location and

construction of roads, structures and utilities, and provides recommendations for further investigation.

2.0 BACKGROUND INFORMATION

There has been extensive work done by researchers on the geological history of the Prince George area. The following section presents a summary of the available information both from a broad, regional scale and from a site specific perspective.

2.1 Regional Bedrock Geology

A publication produced by the University of British Columbia (Hawkins, 1977) presents a summary of the geological history of the Prince George area. The following discussion is taken primarily from that document, augmented with more recent information available on the British Columbia Geological Survey website (BCGS 2006). Some technical terms have been updated to modern standards.

The City of Prince George is located in a physiographic region known as the Quesnel Terrane. A terrane is defined as a region in which the bedrock units share a similar geological origin. The Quesnel Terrane consists of a wide trough, or grabben, which extends from northern B.C. to south of the Canada-U.S. border. The rock units in the grabben were faulted downward relative to the terranes to the east and west, forming a shallow sea. Rock units in this region of the Quesnel Terrain consist primarily of sedimentary and volcanic rocks of the Takla Group, deposited during the Triassic period, approximately 225 million years ago. The Takla Group also includes fragments of the older, deeper rock and metamorphic rocks derived from the sedimentary and volcanic units.

The sedimentary and volcanic rocks were derived primarily from erosion of the Cache Creek Terrane to the west and to a lesser extent from the Slide Mountain Terrane to the east. Both were regions in which intrusion and volcanism were the dominant geological processes, accompanied by tectonic uplift, or mountain building.

By the Late Jurassic period, about 150 million years ago, the region had undergone sufficient uplift that the shallow sea had drained and become the relatively flat interior plateau of central B.C. Between 35 and 55 million years ago, during the Eocene Epoch, additional volcanic rocks such as breccia and tuff deposited in the region. Between 2 and 25 million years ago another period of volcanism deposited flood basalts in the region.

The current geological mapping (BCGS, 2006) indicates that the study area is underlain primarily by volcanic rocks about 210 million years old, with the southeast corner of the study area underlain by slightly older, fine-grained sedimentary rocks. Both of these units belong to the Takla Group. Due to the age and geologic history of the Takla Group, we expect that the area also includes some metamorphosed sedimentary and volcanic rocks. Besides the Takla Group rocks, an approximately 1 km wide by 2 km long area along the south boundary of the study area is shown as being underlain by an unnamed conglomerate unit, between 2 and 35 million years old.

2.2 Regional Surficial Geology

Armstrong and Leaming (1968, 1969) identified four distinct strata of glacial till, indicating more than three separate glaciations of the Prince George area. In some areas they noted interglacial deposits between the till layers. It is therefore possible that the study area may be underlain by till at the surface, that overlies other soil types such as fluvial and lacustrine deposits.

An examination of surficial geology in the central interior of B.C. by H.W. Tipper (1971a, b) provides evidence that during the climax of the Fraser Glaciation, the Prince George Area was covered by glacial ice to about 1370 m elevation, or between about 500 and 800 m depth over the study area. The landscape is dominated by ice flow features, consisting of drumlins and striations, that indicate that the glacial ice flowed out of the Coast and Cariboo Mountains, northeast towards the Parsnip River northeast of Prince George.

Much of the Prince George area below about 760 m elevation is mantled in glaciolacustrine deposits of varying thickness. Tipper (1971a, b) indicates that the glacial lake that occupied the Prince George area was a pro-glacial lake, which accumulated in front of glacial ice retreating southward down the Fraser Valley. The level of the lake was controlled by the elevation of a bedrock lip at Summit Lake, where the glacial meltwater escaped into the Peace River Watershed. Once the ice dam in the Fraser Valley was breached, the lake drained rapidly resulting in erosion of the lake deposits.

2.3 Surficial Geology of Cranbrook Hill

As part of a previous project, GeoNorth commissioned JMRA to develop a geological model for the Cranbrook Hill escarpment. The following is an excerpt from our previous report regarding the installation of a sewer main along the toe of Cranbrook Hill (GeoNorth, 1999).

The glacial and post glacial evolution of landforms is explained by the following possible sequence of events:

1. The area, including Cranbrook Hill, was covered by a thick ice sheet during the climax of the Fraser Glaciation, about 15,000 years ago. Basal lodgement till was deposited beneath the glacial ice as it slowly advanced in a northeasterly direction.
2. Following a change in global climate, the glacial advanced stopped and melting started at higher elevation areas. During later stages of deglaciation a large lake developed across the Prince George area due to an ice dam which blocked drainage to the south. The melting ice became partially buoyant in the large glacial lake. This resulted in the formation of an ice-margin lake adjacent to Cranbrook Hill and the deposition of various sediments. The processes of deposition were complex and could have included the following:
    - fine-grained sediments, including laminated clay, silt, and fine-grained sand deposited from suspension in water;

- flow (ablation) till deposited from material flowing off the ice;
- debris deposited from the base of floating ice;
- basal melt-out till deposited below grounded ice; and
- localized sliding of lake sediments on steeper slopes.

3. The lake level likely fluctuated due to breaches and redevelopment of the ice dam. This resulted in alternate floating and grounding of ice which could have prevented or disrupted the accumulation of lake sediments in localized areas.
4. The lake probably drained catastrophically, resulting in very high water velocities and massive erosion of the lacustrine and till deposits, including at the toe of Cranbrook Hill.
5. The flowing water deposited sand, gravel, and cobbles in various proportions across the Prince George bowl area, with gravel and cobbles at locations of higher water velocity and sand and gravelly sand at locations of lower velocity.
6. Erosion of the toe of Cranbrook Hill created large landslides due to loss of toe support and lake draw-down conditions. Instability would be controlled by groundwater conditions in the slope and the relatively weaker, fine-grained, laminated clay deposits.

Dr. Ryder notes that the sedimentary sequences encountered in the test holes and test pits can be explained by the ice-margin model, but that the model indicates the deposition sequence will be complex and can not predict the lateral extent of specific geologic units. In general, fine-grained, water deposited sediments, such as clay, silt, and fine-grained sand, were deposited on the underlying basal till. The contact between the till and overlying ice-margin sediments is likely transitional and interlayered with the different sediment types. The irregular, bevelled topography suggests that the toe of the slope was eroded, likely prior to and during deposition of the outwash plain, resulting in variation in the extent of the till and ice-margin sediments at the toe.

Drawings 2023-A4 and A5 show schematic cross sections drawn by Dr. Ryder and included in the above report. The first figure illustrates the step-by-step history suggested above. The second figure shows a schematic summary of all of the above processes.

2.4 Existing Geotechnical Information

As part of previous projects in and adjacent to the study area, GeoNorth and others have excavated numerous test holes and test pits to varying depths. These subsurface investigations have focussed primarily on University Way, the University of Northern British Columbia, and the proposed Foothills Boulevard alignment at the toe of Cranbrook Hill. Without going into specific detail, the drill holes typically indicate that the stratigraphy of Cranbrook Hill is complex and highly variable. Upland areas tend to be underlain by varying thicknesses of glaciolacustrine deposits over till or gravel, while gentle areas below Cranbrook Hill in the Prince George bowl area are underlain primarily by deep deposits of sand and gravel.

There are numerous bedrock outcrops along the steeper parts of the toe of Cranbrook Hill below the study area. The rock types vary from hard, fine-grained rock, presumably volcanic in origin, to highly weathered and altered, chlorite-rich metamorphic rocks.

The results of these site investigations typically corroborate the geological models produced by aerial photo interpretation and terrain mapping studies by JMRA, as discussed above and in the following section.

3.0 TERRAIN MAPPING STUDY

As noted above, GeoNorth commissioned JMRA to carry out a terrain mapping study of the development area. The study forms our primary source of surficial geological information for this report, and is included in Appendix B. The detailed mapping delineates terrain polygons, which are areas that have similar geomorphological characteristics, such as material type, slope, drainage, and slope stability. The polygons were drawn directly on one of the air photos and numbered for reference in the accompanying report. The report gives general observations with

respect to the surficial geology and glacial history of the study area, as well as a table detailing topography, surficial soil type, drainage characteristics, soil erosion potential, slope stability, and geological hazards for each polygon.

Drawings 2023-A2 and A3, in Appendix A, show the results of the terrain mapping on the aerial photo, overlaid on a topographic base map. We scaled and positioned the photo to achieve a reasonably close match between features common to the photo and the base map. The photo was not orthorectified to correct for distortion, and therefore the polygon boundaries are not completely accurate relative to the base map. The figures should not be used to precisely delineate areas of hazard and are included for reference only. The polygon numbers shown on the figures are reference in the JMRA report.

The terrain mapping study indicates that a large portion of the development is underlain by glacial till. The till is drumlinized and has varying thickness, with the highest points of land in the study area underlain by a thin veneer of till over bedrock. This accounts for most of the study area west of Tyner Boulevard. Some of the glacial striae between drumlins contain small glaciofluvial deposits, with accumulations of organic material in shallow, poorly drained hollows.

At about 760 m elevation, the mapping study identifies beach deposits from Glacial Lake Prince George. The deposits form a narrow band, polygons 10 and 27, along the hillside from near UNBC to Highway 16. Near Highway 16, the deposit is wider and possibly contains glaciofluvial contributions. The glaciofluvial and beach deposits may be covered with a veneer of glaciolacustrine in polygon 26.

Below about elevation 760 m, the study typically indicates that the terrain is covered with a blanket of glaciolacustrine clay, silt, and fine-grained sand of variable thickness, presumably over glacial till. Below about 730 m elevation, the lacustrine units are thinner or absent, likely as a result of the processes that eroded the lower elevation areas of Cranbrook Hill, as discussed in Section 2.3, above.

3.1 Terrain Stability

The terrain mapping study did not identify any clear indications of major instability on the portion of the Cranbrook Hill escarpment in or below the study area. Dr. Ryder believes that her previous interpretation of the geological history and formation of the hill, as described above in Section 2.3, is correct. The bench above the steep escarpment (including the existing Charella-Barnes Neighbourhood) is of unknown origin, possibly created by grounded glacial ice, but in Dr. Ryder's opinion the landforms do not resemble landslide topography.

Some polygons were identified as either potentially unstable, or likely containing small unstable areas. These areas are discussed in detail below.

The steep gradient toe of Cranbrook Hill, between the flat-lying Prince George bowl area and a gentle bench level with the existing Charella-Barnes Neighbourhood, represented by polygon 34, is classified as moderately steep to steep, undifferentiated materials and veneers of colluvium over moderately steep to steep bedrock. The polygon is mapped as an initiation zone for rock fall and landslides, and is mapped as potentially unstable and likely to contain small unstable areas.

Further up slope from the toe of the escarpment, polygon 12 denotes the main gullies along Cranbrook Hill. These are incised into the gentle bench above the toe of the hill, and to some extent into the gently sloping hillside above. The terrain mapping study identified the draw sideslopes as gullied, undifferentiated, moderately steep to steep deposits and as an initiation zone for rapid mass movement, including debris slides and debris flows.

Upslope of the gentle bench above the toe of the slope, polygon 33 represents gullied and irregular terrain with moderate gradients. The slope is underlain by a blanket of glaciolacustrine sediments of variable thickness over unknown material. Seepage erosion and small slides may have been part of the slope forming processes in this polygon. Dr. Ryder recommends not developing this polygon without first thoroughly investigating the area to determine whether slope instability exists.

Near the southeast edge of the study area, several hundred metres west of the intersection of Ospika and Tyner Boulevards, the terrain mapping identified a wide depression, polygon 30, bordered on the west and southwest by a moderate gradient escarpment, polygons 28a, 28b, and 29. Dr. Ryder presented two possible explanations for the formation of this feature. Because of the arcuate (curved) shape of polygons 28 and 29, the feature resembles the crest of a large landslide. If the feature is an old slide, then polygon 30 is conspicuously flat and lacks geometry typical of a landslide deposition zone. An alternate explanation is that a large block of ice was grounded in the base of the feature and soil was deposited against its west and southwest edges, forming a large open sided kettle.

4.0 FIELD ASSESSMENT

To obtain site specific geological information and to check the results of the terrain mapping study, we conducted several traverses of the area, primarily along the areas east of Tyner Boulevard. We walked over the slopes and measured slope gradients, noted vegetation types, observed soil, bedrock, and groundwater conditions in shallow, hand-dug test pits and in existing exposures, and checked for indications of instability. To provide the most widespread coverage, our field traverse took advantage of the extensive existing network of small roads and trails throughout the area.

The steep slope at the toe of Cranbrook Hill is typically uniform to gullied, with slope gradients between 50% and 80%, for up to 70 m slope length. Near the end of Ferry Avenue, we noted a mixture of glacial till and glaciofluvial sand and gravel exposed in existing trail cut slopes. South of Ferry Avenue there are outcrops of schist bedrock at the toe of the slope. While we did not see any indications of active instability, the landforms suggest that the steep face of the slope was likely formed by shallow sliding initiated by erosion at the toe. The slope has a potential for instability if surface water is discharged over the crest, or if infiltration is increased in upslope areas.

The gentle bench above the toe of the slope, delineated by polygons 13, 14, and 15, is typically underlain by a thin veneer of glaciolacustrine silt over glacial till. We also noted an

isolated unit of fine-grained sand, likely glaciofluvial in origin, at the slope crest west of the end of Range Road. The bench typically has gentle gradients and we did not see any indications of instability.

The two draws west and southwest of the end of Ferry Avenue, in two polygons marked 12, typically have moderate slope gradients, between about 30% and 45% where the draws are on or above the gentle bench, and steeper gradients near the edge of the steep slope at the toe of Cranbrook Hill. We did not see any indications of instability in either of these two polygons.

The northern-most polygon marked 12 consists of the draw occupied by Shane Creek and borders the north edge of the study area. We did not visit this draw during our field traverse, but from previous work done by our firm, we know that the sideslopes are steep and have indications of past shallow instability. This draw should be considered unstable.

The southern-most polygon marked 12 is outside the study area, but was included in our traverse to obtain as complete geological information as possible. It is incised through the gentle bench, and is situated between the study area and the existing Charella-Barnes Neighbourhood. The sideslopes of the draw are moderately steep, with gradients typically between about 50% and 75% for up to 40 m. A nearby drill investigation in the Charella-Barnes neighbourhood indicates the slopes on the south side of the draw are underlain by up to 14.5 m of glaciolacustrine silt and clay over glacial till. There are bedrock outcrops exposed on the north side of the draw near its outlet above the end of Range Road. The overall slope profile in the draw is typically slightly concave, suggesting that the past slope processes that formed the draw consisted of downward erosion of the stream accompanied by slumping of the draw side slopes.

Between the gentle upland areas of the study area and the gentle bench above the toe of Cranbrook Hill, there is a moderate gradient, gullied slope, delineated by polygon 33. Dr. Ryder recommended not developing this slope unless it is thoroughly investigated for instability. We did not see any indications of instability during our traverse, but the terrain is gullied with frequent small, non-continuous drainages. The slope morphology suggest that surface and

seepage erosion are the dominant slope forming processes. The area is underlain by both glacial till and glaciolacustrine deposits.

The wide, gently sloping area east of Tyner Boulevard and west of Bona Dea Drive, in polygon 32, is underlain by a continuous, thick blanket of glaciolacustrine sediments. The terrain is typically rolling to undulating, and likely follows the expression of the underlying glacial till. We noted at least a 2 m thickness of varved glaciolacustrine silt and clay in existing trail cut slopes through a ridge near about 730 m elevation.

The terrain mapping identified a low ridge near highway 16, polygon 27, as consisting of glaciofluvial gravel. The ridge is underlain by well sorted, well rounded, medium to coarse grained gravel at the surface, suggesting that the surface of the ridge is a beach deposit. Due to the predominance of medium to coarse grained gravel at the surface and the apparent resistance of the ridge to wave erosion compared with the surrounding terrain, we suspect that the core of the ridge consists of glaciofluvial gravel, and may have at one time been an esker.

The gentle area surrounding the ridge, polygon 26, is underlain by a mixture of materials ranging from what appears to be glaciofluvial sand and gravel (exposed in existing, old test-pits), to fine-grained deposits, possibly either glacial till or glaciolacustrine deposits, with extensive, well rounded beach gravel. Due to the mix of soil types, we agree with Dr. Ryder that the polygon is likely underlain by glaciolacustrine over a mixture of glacial till and glaciofluvial deposits. At the time of our investigation, the existing gravel pit in polygon 26 was of limited depth and was being used as a spoil site for unwanted fill as opposed to gravel extraction. The pit floor material appeared to consist of a mixture of silt, sand, and gravel, likely glacial till.

The terrain mapping indicated the potential for the existence of a large, ancient landslide extending approximately 500 m upslope of the intersection of Tyner and Ospika Boulevards, along Tyner Boulevard. The area identified as a potential headscarp is typically gullied has variable slope gradients, with some areas up to 60%, but most areas less than about 40%. We noted a mixture of soil types consisting of glacial till, glaciolacustrine, and glacial lake beach deposits. In the gentler areas of the scarp-feature, in the area delineated by the mapping as

polygon 29, the small draws shown on the contour mapping typically contain small streams, despite the dry conditions that were prevalent at the time of our traverse. We suspect that polygon 29 is a location where groundwater exits from an aquifer of unknown size consisting of either glaciofluvial or beach deposits in polygon 26.

We did not see any indications of local, small scale instability of the scarp-like feature. Due to the large size of the feature it is not practicable to determine if the area is a landslide by field traverse alone. Based on our traverse, our initial interpretation is that the feature is likely the result of sediment deposition against grounded ice in the glacial lake, as suggested by Dr. Ryder, or that the feature might be the result of surface and seepage erosion of the glaciolacustrine soil by groundwater exiting the beach deposits.

5.0 DISCUSSION AND RECOMMENDATIONS

Our field assessment generally confirms the results of the terrain mapping study. We agree with Dr. Ryder that the majority of the study area is stable with respect to slope instability. We did not field check most of the gentle, rolling area west of Tyner Boulevard.

5.1 Surficial Materials

Most of the study area is underlain by either glaciolacustrine deposits or glacial till. Both types of deposit are predominantly fine-grained and are difficult to compact at moisture contents wet of optimum. The fine-grained deposits are also susceptible to formation of ice-lenses when frozen.

Areas underlain by glaciolacustrine silt and clay on gentle, undulating slopes are expected to be similar in nature to existing developed areas in College Heights, specifically, the area between St. Anthony Crescent and St. Lawrence Avenue. The glaciolacustrine deposits have been overconsolidated at the surface by desiccation, but become softer with depth. In its undisturbed state, the hard silt and clay provides adequate bearing support for lightly-loaded structures supported on conventional spread footings. The material often has a relatively high

in-situ moisture content and can become very soft when remoulded. The natural moisture content of this sensitive material is above the optimum for compaction, so excavated material may need to be dried before backfilling or replaced with other, drier material.

The glacial till in the Prince George area typically consists of sandy silt with some gravel and is hard in-situ. Undisturbed, hard till will typically provide adequate support for spread footings. At lower elevations in the study area, some of the till-like material is likely ablation till, and will be similar in character to the glaciolacustrine deposits, described above.

Bedrock encountered during our traverse is typically hard, but extensively jointed with significant weathering. Between Ferry Avenue and Range Road, we noted the presence of weathered schists, including a chlorite or coal rich shear zone. Excavations in rock should be designed on a site specific basis.

The beach deposits in the study area are often poorly graded, with uniform particle sizes. These deposits likely have variable composition with segregated areas of different gradation. Typically they will be freely-draining, but they may be of shallow depth or limited aerial extent and may contain lenses or layers of less permeable material.

Organic deposits where encountered in the study area will likely consist of unconsolidated peat and lacustrine silt and clay. These deposits are highly compressible and will need to be excavated and replaced with suitable borrow for the support of roads or structures.

In areas of moderate relief (similar to southern portions of College Heights), good site preparation will be advantageous to development. In the past, we have noted that common practice is to excavate material from the ridges and fill in the hollows. Often the organic material is not removed prior to filling, resulting in hidden, highly compressible layers of soil. This can result in the need to excavate relatively large volumes of fill and organic debris and to replace it with compacted structural fill during building construction. To reduce the potential for pockets of buried organic material, we suggest leaving the terrain undisturbed prior to foundation excavation.

5.2 Shallow Instability

As noted by Dr. Ryder and confirmed by our field traverse, there is a potential for shallow sliding instability of the moderately steep to steep draw side slopes on Cranbrook Hill, and in the gullied terrain separating the gentle bench above the toe of the hill and the gentle upland areas. We noted occasional indications of seepage zones and indications that seepage and surface soil erosion of the lacustrine deposits are the dominant slope forming processes.

We recommend thorough investigation by a qualified terrain stability professional prior to development of these areas. The investigation should consist of at least a detailed ground traverse up and downslope of proposed development areas and test-pitting or drilling of potentially unstable areas. We also recommend that the gentle, gullied slopes in polygon 33 be checked in the first several years following development of upslope areas for increases in seepage.

In the areas adjacent to steep slopes, we suggest leaving buffers (i.e. greenbelts) along the crests of the slopes. Where private property borders the crest of steeper slopes, land owners often discharge surface drainage or dump unwanted soil or yard waste over the crest of the slopes. The discharge of water or addition of fill at the crests of slopes could create or exacerbate slope stability hazards, potentially resulting in down-slope impacts.

5.3 Deep-Seated Instability

At the time of writing, Golder Associates Ltd. (Golder), on behalf of the City of Prince George, is in the planning phases of undertaking an investigation into the possible existence of a large, ancient landslide near the Charella-Barnes Neighbourhood. While the terrain mapping indicates that this area does not resemble landslide topography, our experience is that such features are not always apparent. We recommend that we review the results of our study after the results of the Golder investigation are reported.

The steep toe of Cranbrook Hill north of the study area has a history of landsliding. The slides are attributed to the presence of a weak layer of glaciolacustrine clay buried under glacial till or colluvium deposits. Prior to development of the gentle bench above the steep toe of the hill, we recommend deep drill investigations to check for the presence of such layers.

5.4 Stormwater Runoff

Successfully managing slope stability and erosion concerns in the development is primarily dependent on careful management of storm water runoff and infiltration. The existing sloping areas and dendritic drainage patterns result in natural concentration of runoff into the existing gully systems. These gullies are acclimatised to natural runoff levels. Following development, there will be an increase in runoff from reduced evapotranspiration of water by trees, and by reduced infiltration in paved areas.

If use of existing surface drainages is proposed for disposal of stormwater, we recommend designing appropriate detention ponds and channel treatments to minimize the downslope impacts of storm runoff from the study area. An increase in flow volume or velocity could lead to an increase in erosion in the draws, potentially leading to instability of the draw sideslopes. Following implementation of such designs, we recommend periodic reviews of the channels to monitor the effectiveness of channel treatments and to check for blockages caused by woody debris or small slides.

We understand that the developer is interested in taking advantage of any opportunities to utilize infiltration as a means of storm water disposal. In-ground disposal of storm water requires extensive, permeable soil deposits, which typically consist of granular material. Due to the prevalence of fine-grained, low-permeability soil types in the study area, subsurface dispersal of storm water will be infeasible across much of the study area.

Some areas in the development area are underlain by gravel deposits of limited or unknown extent. We recommend not disposing of storm water without a detailed groundwater hydrology study to determine the potential for down slope impacts. Granular deposits can form

aquifers that are of limited extent, or can be confined by less permeable materials. The impacts of added infiltration into these units could include saturation of the units, increased seepage at the downslope limits of the aquifer, or an increase in groundwater pressures in artesian aquifers further down slope, potentially leading to terrain instability.

6.0 CLOSURE

The results of this overview assessment indicate that most of the study area is on gently sloping, stable terrain, underlain by sandy, gravelly silt, a glacial till deposit, and silt and clay from a glacial lake deposit. There are occasional deposits of sand and gravel from eskers, beaches, and glaciofluvial processes. Moderate to steep slopes on the east side of the development are gullied in places and are identified as being potentially unstable. We recommend additional investigation prior to development of these areas.

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Please call the writers if any parts of this report need to be clarified or discussed in more detail.

Yours truly,
GeoNorth Engineering Ltd.

Per: D.A. Hughes-Games, E.I.T.

Reviewed by,
GeoNorth Engineering Ltd.

Per: D.J. McDougall, M.Eng., P.Eng.

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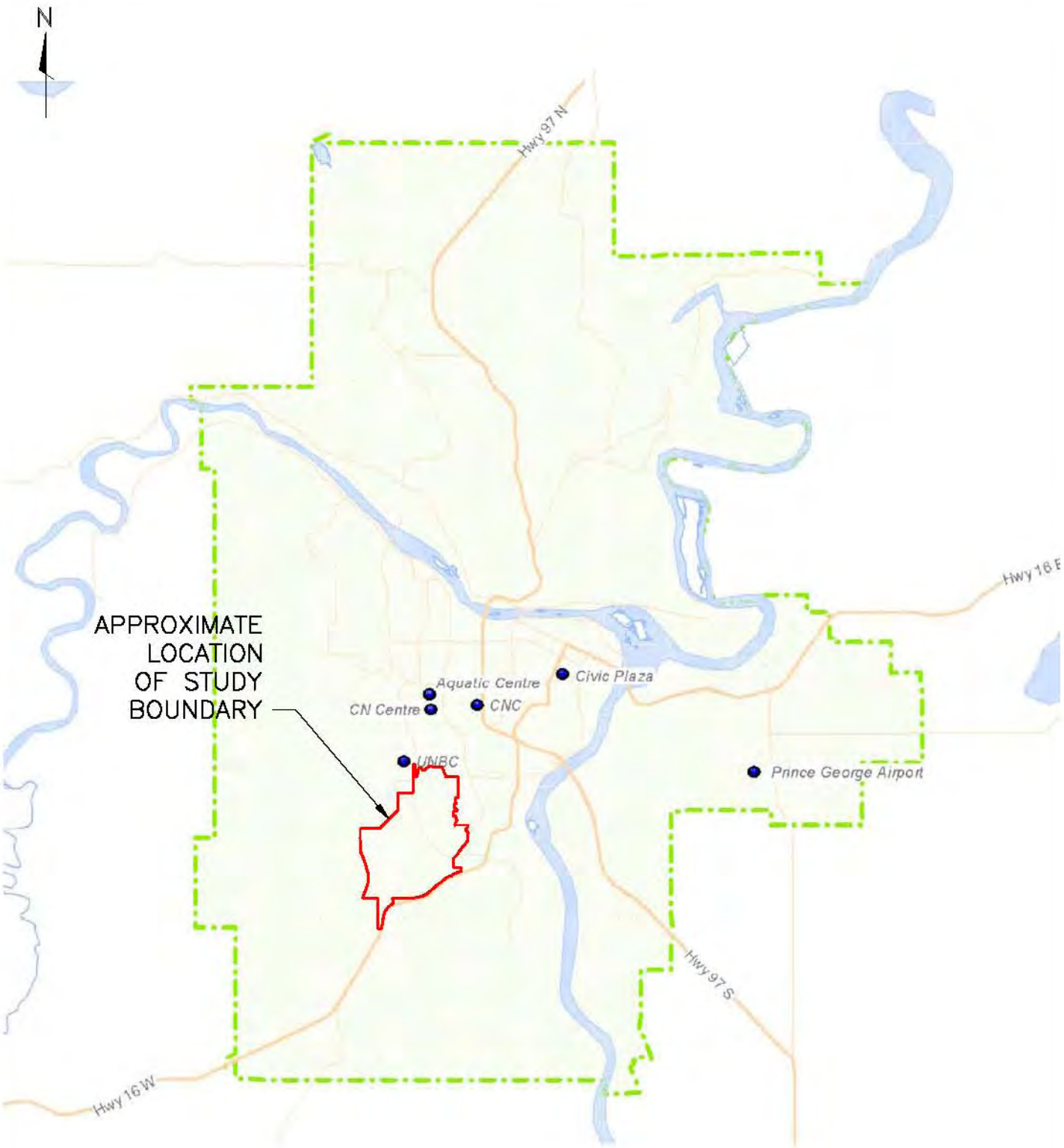
A P P E N D I X A



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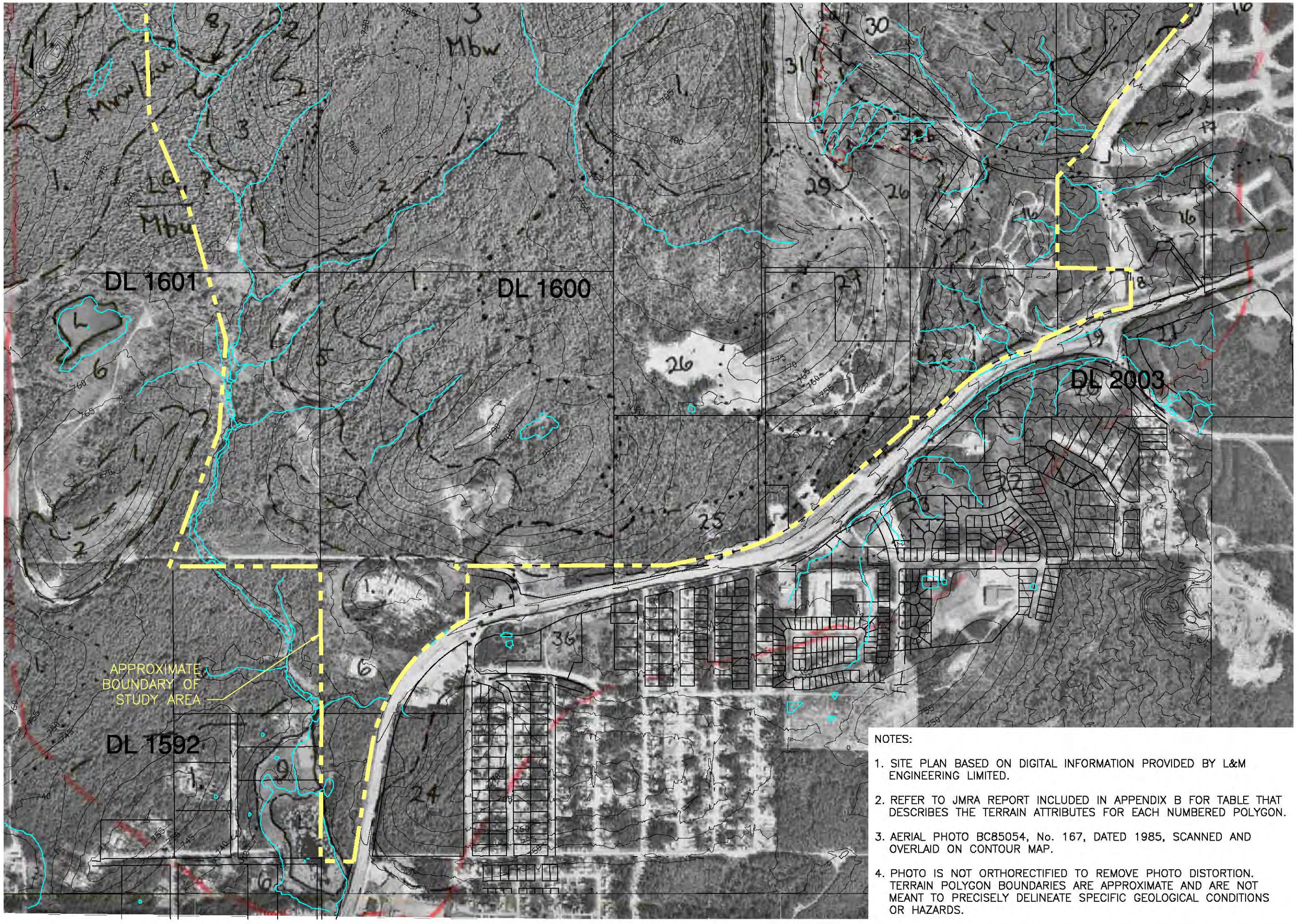
UNIVERSITY HEIGHTS NEIGHBORHOOD PLAN
PRINCE GEORGE, B.C.
SITE LOCATION PLAN

SCALE: ~1:150,000	DATE: 2006/07/28	DRAWN: LU	CHKD: –	PROJ: K-2023	DWG: 2023-A1



NOTES:

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2. REFER TO JMRA REPORT INCLUDED IN APPENDIX B FOR TABLE THAT DESCRIBES THE TERRAIN ATTRIBUTES FOR EACH NUMBERED POLYGON.
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UNIVERSITY HEIGHTS NEIGHBORHOOD PLAN
PRINCE GEORGE, B.C.
SITE PLAN SHOWING RESULTS OF TERRAIN MAPPING STUDY
BY J.M. RYDER AND ASSOCIATES, TERRAIN ANALYSIS INC.

APPROVED:	
PROJECT NO:	K-2023
REV.	-
SCALE:	1:10,000
DATE:	2006/07/28
DWN BY:	LU
MAP REF:	-
DWG NO.	2023-A2

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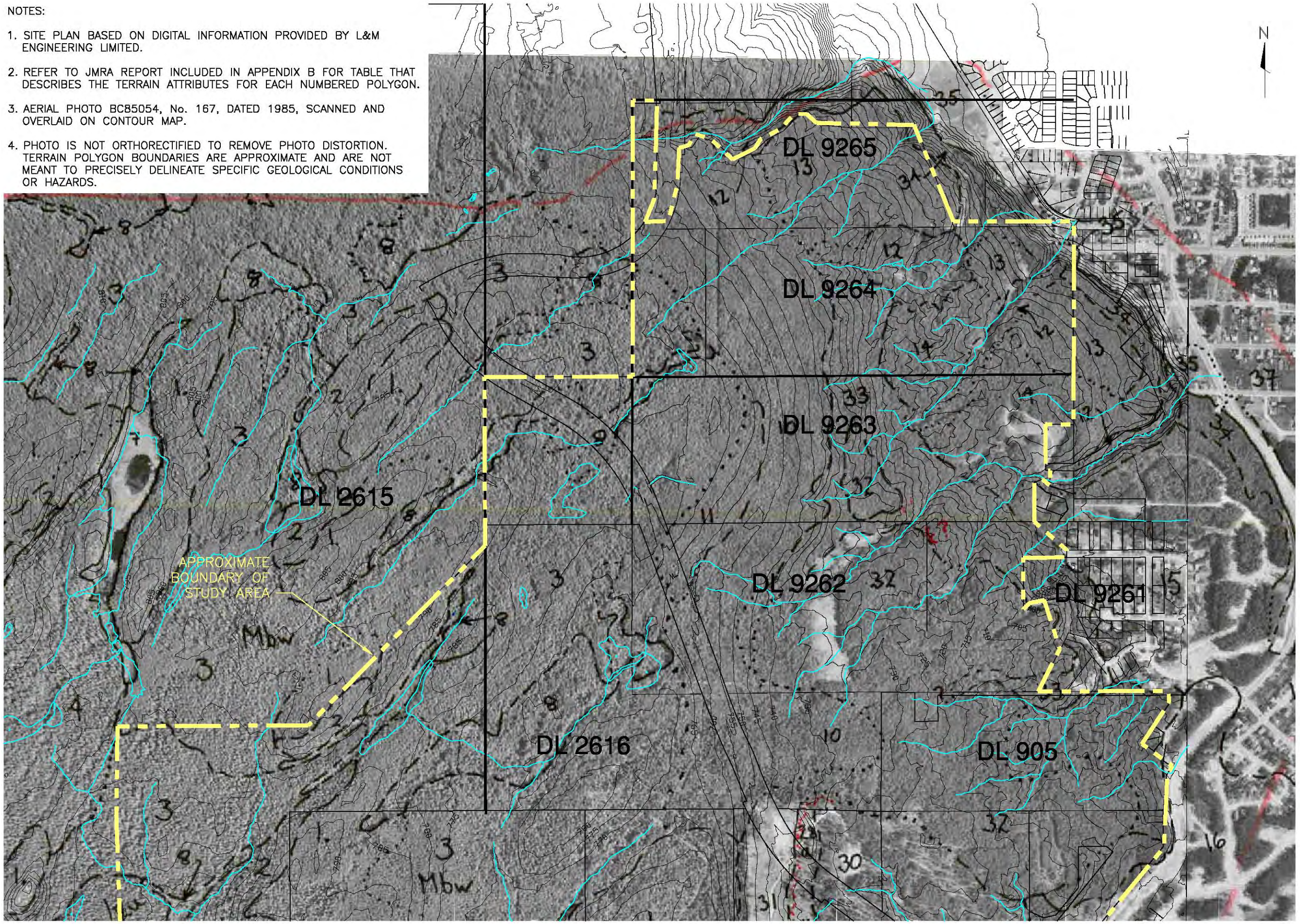

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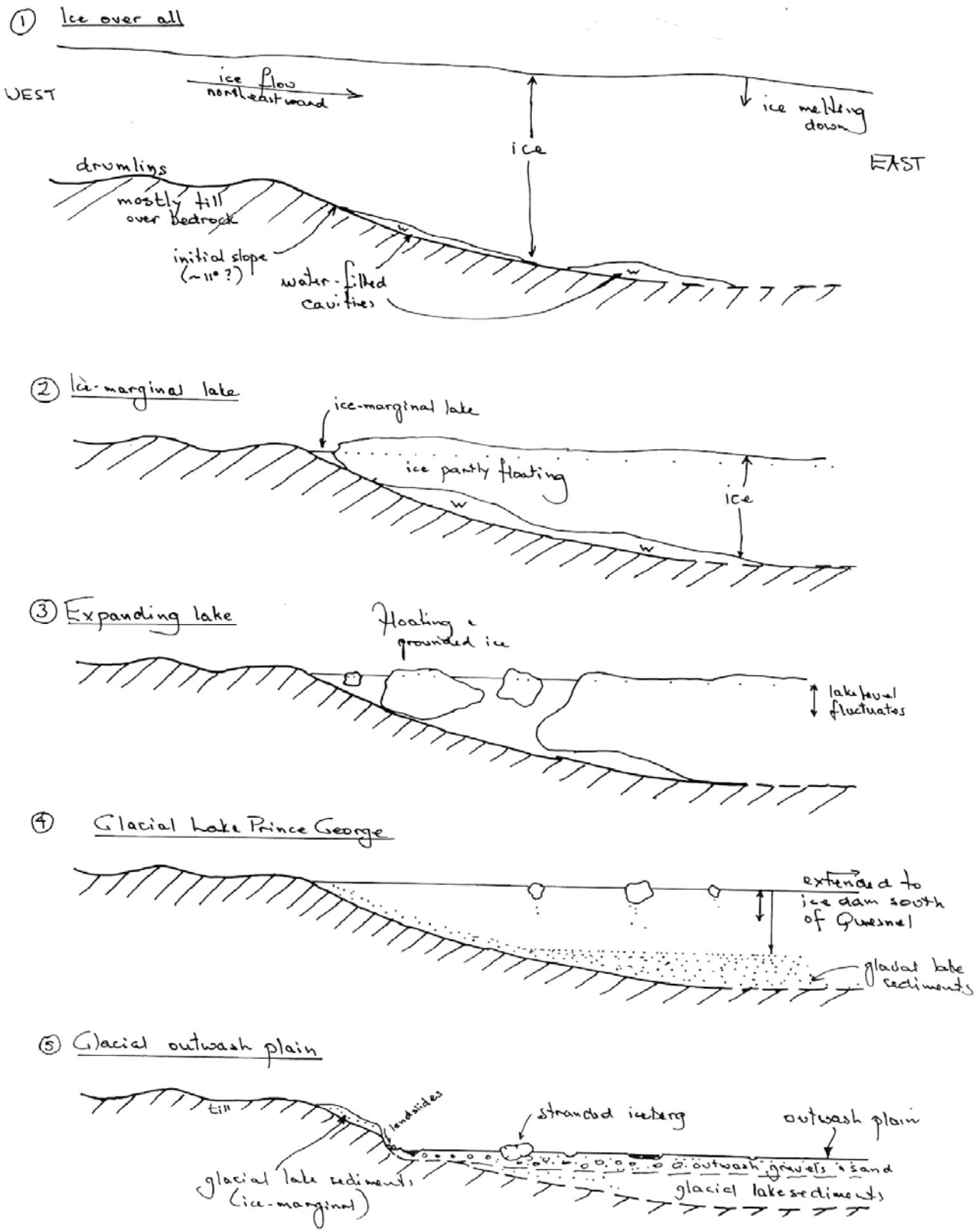
SCALE: 1:10,000	APPROVED:			PROJECT NO: K-2023	
DATE: 2006/07/28					
DWN BY: LU					
MAP REF: —				REV. —	
DWG NO. 2023-A3					



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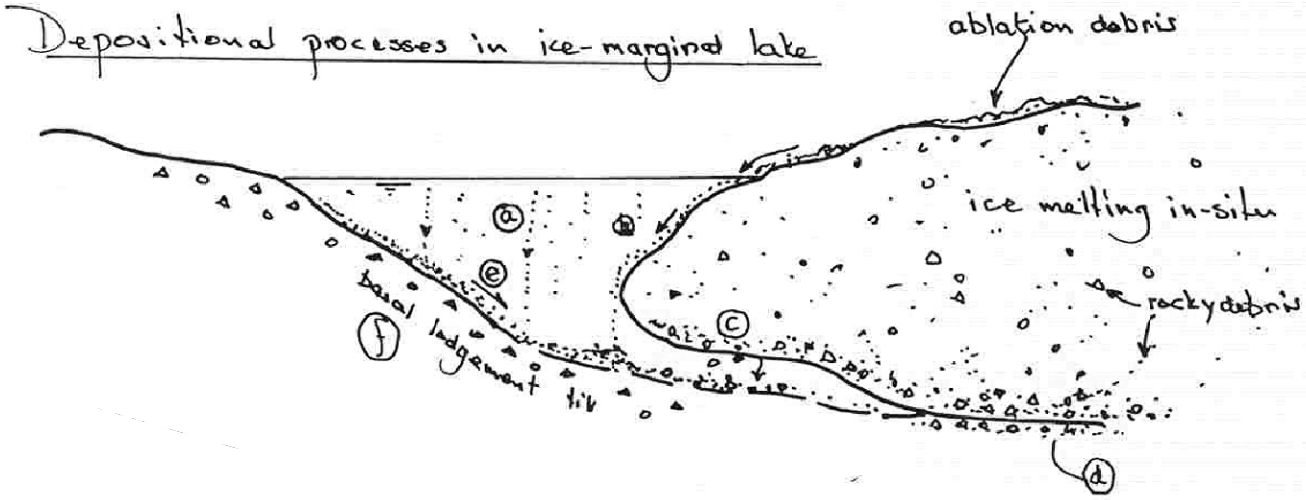
L&M ENGINEERING LIMITED
UNIVERSITY HEIGHTS NEIGHBORHOOD PLAN
PRINCE GEORGE, B.C.
SCHEMATIC SHOWING GLACIAL HISTORY OF CRANBROOK HILL

SCALE: N.T.S.	DATE: 2006/07/28	DRAWN: LU	CHKD: –	PROJ: K–2023	DWG: 2023–A4



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PRINCE GEORGE, B.C.
SCHEMATIC SHOWING DEPOSITIONAL PROCESS IN AN ICE–MARGINAL LAKE

SCALE:	DATE:
N.T.S.	2006/07/27
PROJECT NO:	DRAWING NO.
K–2023	2023–A5

A P P E N D I X B

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June 11, 2006
Our ref: GeoN 06-3
Your ref: K-2023

Terrain Mapping for Proposed University Heights Neighbourhood

Air photos and maps used:

1948; A11582: 343 – 347, 360A, 360-364; 35 000ft.
1953; A13959: 127-129; 60 000 ft.
1963; BC5070: 34-36, 65-67; 32 000 ft.
1977; BC77089: 154-157, 245-242n; 20 000 ft.
1985; BC85054: 154-56, 165-168, 273-276; 15 000 ft. – see for terrain mapping
1996; 15BCB96007: 58-60; 40 000 ft
2002; 15BCC02010: 30-32, 62-65 (colour)

1:10 000 scale orthophotos with 5 m contours
1:50 000 NTS location map

Other information:

Tipper, H.W., 1971, Surficial Geology, McLeod Lake and Surficial Geology, Prince George; both 1:250 000. Geological Survey of Canada, Maps 1286A and 1287A (accompanying GSC Bulletin 196).

Leaming, S.P. and Armstrong, J.E., 1969. Surficial Geology, Prince George, 1:250 000. Geological Survey of Canada, Map 3-1969.

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AGRA, 1996. Geotechnical Investigation Location 2A, Proposed Zone 2 Reservoir....

General

The Tipper and Leaming & Armstrong maps show that the proposed University Heights Neighbourhood includes parts of: (1) a drumlinized till upland; (2) the area formerly occupied by Glacial Lake Prince George and underlain by clayey glacial lake (LG) sediments; and a narrow strip of (3) the kettled outwash plain that supports most of the older part of Prince George city. Tipper's shoreline is slightly below the 2500 ft (762 m) contour. This elevation was used, very approximately, to separate till-dominated from LG-dominated terrain.

Notes re. Air Photo Interpretation and Mapping

The area of interest (AOI), was examined under the stereoscope on air photos from 1948,1953, 1963, 1977,1985, 1996 and 2002. Then mapping was completed on the 1985 photos because they show topography most clearly and their scale is relatively large. (No mapping – other than the AOI boundary -- was carried out on other photos because virtually all significant features are visible on the 1985 photos.

Terrain polygons were delimited on photo BC85054: 167, but terrain symbols and other polygon-based information were compiled in a table (attached). Note that polygons are not uniquely numbered; rather, polygons of very similar terrain were assigned the same number to minimize the number of columns in the table.

Difficulties were encountered in the estimation of slope steepness within polygons. Relative slope steepness is visible in stereo-view, but determination of actual gradients requires a good contour map. Close comparison of topography as seen on the air photos (under the stereoscope) with that depicted by the 5 m contours on the 1:10 000 orthophotos shows that the contours depict the tree tops rather than the ground surface and that they are inaccurate in many places. Also, although the contours appear to be "detailed" (note the extremely convoluted and zig-zag nature of the lines) they do not well represent some smaller topographic features. Gullies are typically mapped as deeper than reality. Some topographic features visible on the air photos do not appear on the contour map, and some landforms indicated by the contours could not be seen on the air photos. In the absence of better information the contours *were* used to estimate slope steepness, but these estimates should be treated with great caution.

Mapping of the upland area was straightforward. Irregularities in the drumlinoid topography suggest that the landforms are partly controlled by near-surface bedrock. So in general, bedrock is likely near the surface on the hills, and till is relatively thick beneath depressions and on gently sloping ground. Glaciofluvial deposits not distinguished by typical landforms may be present here but were not mapped.

Air photo interpretation was more difficult and is less reliable in the zone (slightly below 762 m) that approximates the upper limit of GL Prince George. Below about 760 m, gentle slopes and depressional areas were assumed to be underlain by glacial lake sediments. In only a few places were specific features indicative of LG (e.g., active erosion) visible on the air photos. Unmapped glaciofluvial deposits may be present here.

On the major escarpment (Cranbrook Hill) polygons were delimited according to slope steepness. The lower slopes were assumed to be underlain by glacial lake sediments and complex stratigraphy based on the model of glacial lake sedimentation presented in my 1999 letter report to GeoNorth re. Foothills Boulevard storm sewer extension.

Slope Stability – Cranbrook Hill

I found no clear indication of major instability on this escarpment. In general, I still agree with my previous interpretation of the gemorphological history of this area – that the steep toe slope of the escarpment was formed due to undercutting by flowing water at the end of the last glaciation. Visual evidence of this is provided by the planform of the escarpment; gentle arcuate curves are the traces of the river that flowed across the main Prince George (glacial outwash)

terrace immediately following drainage of GL Prince George. These curves are less obvious in the AOI than further north, but the steep lower facet of the slope is more or less continuous (as far as I am aware) along the length of Cranbrook Hill. The topography (flat top) of the Charella Gdns bench is harder to explain, but it does not resemble landslide topography.

The topography of the Cranbrook Hill slopes above the lower steep facet is irregular and complex, and likely includes features resulting from slope movements. In the AOI, one possible headscarp of a moderately large slide was identified (see mapping, polygons 28 and 29), but there is no clear depositional zone downslope. Two smaller features possibly related to instability were identified in polygon 10. Dense forest cover may well obscure (on the air photos) other significant features. (It would be interesting to view a LIDAR image of this slope – I understand that this technology "photographs" the ground surface through the trees – although I have no first-hand experience with this.) In general, thorough ground work -- a careful combination of the geotechnical and geomorphological approaches -- will be required to assess the (in)stability of this complex slope.

Other Characteristics
Information about terrain, soil, drainage, erosion potential, slope stability and geophysical hazards for each polygon are provided in the attached table.

Please don't hesitate to get in touch with me if you need further explanation of any of the above.

J.M.Ryder P.Geo

Table 1: Terrain, Soil Characteristics and Constraints

Poly #	***1.***	***2***	***3***	***4***	***5***	***6****
Terrain Symbol	Mvw/Ru	Mvw/Cv/R	Mbw	Mw--E(?)	Mvb	LGv?? / Mbu
Slope; Topography	gentle, <15% locally steeper; undulating;	moderate slopes, 20-50% (the steepest slopes locally)	gentle, mostly <10%; undulating	gentle, <10%; undulating; includes linear depressions that may be meltwater channels	moderate slope, 10-25%	gentle, <10%; undulating
Soil and Thickness	thin till with pockets of deeper till; near-surface rock, weathered rock, and small rock outcrops.	thin till and/or colluvium	till generally thicker and more continuous than in 1 and 2	till of variable thickness	till (thickness hard to estimate, but likely thicker than 1 and 2)	veneer of silty or sandy glacial lake sediments (LG) *may* be present over till
Drainage[1]	well to rapid	well to rapid	well; locally moderate	well to imperfect	well to rapid	well to moderate NB. small ephemeral lake (L)
Erosion Potential[2]	v. low	low under natural conditions	low under natural conditions	low under natural conditions	low-moderate	mod-high if LG present
Slope Stability	stable	stable	stable	stable	stable	stable
Potential Geophysical Hazards	none apparent	minor soil movement;	none apparent	none apparent	none apparent	none apparent

1. All drainage terms are relative to each other (standard pedological definitions may not apply).
2. Erosion potential ratings refer to bare ground (no vegetation).

- See additional comment below

(6) No direct evidence of LG seen, but this terrain is at relatively low elevation and may well have been covered by glacial Lake Prince George

Polygon #	***7***	***8****	***9***	***10****	***11***	***12***
Terrain Symbol	Op	Mb//Fp.Ov M	Ff	LGv(?) Mbw	Mbw	Uks—VR"sd
Slope; Topography	flat, <5%; plain	gentle to flat, <10%	gentle slope, <5%; fan	gentle-moderate slope, 10-20%;	moderate slope, 20-30%	steep-sided gullies >50% (?)
Soil	organic (peat)	till; probably includes narrow floodplains along streams	sand and gravel	till; may be thin sandy LG over till; may be sandy beach deposits.	till	LG sediments (silt &/or sand); complex strati-graphy; possibly rock
Drainage (& related constraints)	very poor	moderate to poor (may be locally high water table and/or seasonal flooding)	well to moderate	well, to moderate in concavities	well	well to imperfect; seepage zones likely
Erosion Potential	low	low	low	low	low tomoderate	high to v.high
Slope Stability	stable	stable	stable	stable	probably stable	gully side-slopes: unstable
Potential Geophysical Hazards	soft ground with very low bearing strength	none apparent	floods and deposition of sediment on the fan; (but no visible indication of recent disturbance)	none apparent	none apparent	debris slides on side-slopes; debris flows down channels onto fans

1. All drainage terms are relative to each other (not standard pedological definitions).

(8) I've used irregular vegetation patterns and depressional topography as indicators of relatively moderate to poor drainage. However, some of these patterns may be the result of fire rather than wet soils.

(10) The crest of this slope is close to the elevation of Glacial Lake Prince George shorelines (Tipper), so LG may be present although no visual evidence on the air photos.

Polygon #	***13****	***14***	***15****	***16***	***17***	***18***
Terrain Symbol	LGb over complex stratigraphy	LGb over complex stratigraphy	LGt M FG	LGb Mb or LGb over complex strati-graphy &/or rock	LGb—V LG rests on till, complex stratigraphy &/or rock	LGbw/Rk (LG rests on rock or poss. till &.or complex stratig.
Slope; Topography	gentle-moderate slope; 20-30"; bench	gentle10-20; bench	<10%; terrace	gentle to moderate slopes,undulating; 10-30%	open, shallow gully 20-30%	moderate slope, 30-40%
Soil	glacial lake sediments; sandy &/or silty	glacial lake sediments; (LG) sandy &/or silty	15 m LG cz & zc over 3 m till.... (see log for borehole TH96-1 log	glacial lake sediments, clay to fine sand	glacial lake sediments, clay to fine sand	glacial lake sediments, clay to sand
Drainage (& related constraints)	well, to moderate in concavities	moderate to well; wettest soils at upslope edge of polygon	moderate to imperfect	well drained on (convexities) to mod. or imperfect in concavities	well to moderate; possible seepage	well drained
Erosion Potential	high	high to v.high	high	high; very high on locally steeper slopes	very high; soil erosion evident on N side of gully	high to v. high on LG
Slope Stability	stable	stable	stable	stable	probably stable	possibly pot. unstable on steeper slopes
Potential Geophysical Hazards	possible slope failures along top edge of gullies; setbacks needed	possible slope failures along top edge of downslope gullies; setbacks needed; possible impacts of failures from upslope	possibly slope failures along top edge of gullies and scarp to east; setbacks needed; possible impacts of failures from upslope	none apparent	severe soil erosion	severe soil erosion, small debris slides

(13) "complex stratigraphy" here and elsewhere in this table refers to various kinds of glacial drift (till with variable characteristics, glacial lake sediments, glaciofluvial (outwash gravel and/or sand)) with considerable local variability re. continuity of units, texture, thickness, water-related properties, stability, etc.
(15) Site of Charella Gardens

Polygon #	***19***	***20***	***21****	***22***	***23****	***24***
Terrain Symbol	(highway)	LGb over M &/or complex stratig.	LGpu.FGpu	LGb	LGb-V	LGbv M.R(?)
Slope; Topography		moderate slope; 20-30%	gentle to flat; <10%	gentle to flat, <10%	<20%, small steeper areas in gullies	low ridge with gentle to moderate side-slopes; 0-30%
Soil		glacial lake seds: clay to fine sand	glacial lake sediments possibly clay; glacial outwash g and s	glacial lake sediments, clay to fine sand	glacial lake sediments, clay to fine sand	glacial lake sediments, clay to fine sand; ridge probably rock-cored
Drainage (& related constraints)		grading downslope from well to moderate	moderate	well	well to moderate	well, to moderate downslope
Erosion Potential		high	LG: moderate gFG: low, sFG moderate	moderate – high (increases downslope)	very high; active gully erosion	high
Slope Stability		probably stable	stable	stable	stable	stable
Potential Geophysical Hazards		erosion and sediment redeposition	none apparent	none-apparent	rapid erosion, gullying	none apparent

(21) Relative extent of LG and FG uncertain.
(23) Gully erosion appears to be related to runoff from cleared land upslope and from the highway. Erosion at this site is not visible on 2002 photos, in fact, erosion control measures (vegetation, settling basin) can be seen. 1985 features are a good e.g., of what can happen with uncontrolled surface runoff.

Polygon #	***25***	***26***	***27***	***28****	***29***	***30***
Terrain Symbol	LGbw (LG may rest on rock and poss. till &/or complex stratig	LGbv Mu underlying material may include FGu	FGmr	Uak --F"u (old)??	Uak--V	LGu Mu or may be fCu (slide debris)
Slope; Topography	moderate slope, 20-35%	gentle slopes (10%); undulating	ridge: level on top; up to 30% sideslopes	moderate slope; 20-50%	moderate slope; 20-50%	<15% undulationg
Soil	glacial lake sediments, clay to sand	glacial lake sediments, clay to sand; FG: s and g	presence of gravel pit suggests entire ridge may consist of gravel	glacial lake sediments &/or till	glacial lake sediments &/or till	glacial lake sediments; or displaced glacial lake sediments and other glacial drift (M, FG)
Drainage (& related constraints)	well drained	moderate; wetter in concavities	well	well to moderate	well to moderate	moderate to imperfect
Erosion Potential	high to v. high	low to moderate	gFG: low sFG: mod.	high (see poly.29)	very high	low to moderate if LG
Slope Stability	possibly minor instability on steeper parts	stable	stable	(see notes below)	probably stable; possibly very small debris slides	stable
Potential Geophysical Hazards	minor instability(?) soil erosion	none apparent	none apparent	soil erosion	soil erosion and downslope sedimentation	none apparent

(28) This arcuate (in plan) slope (see polygons 28 a and b and polygon 29) resembles a landslide headscarp. If a slide did occur here, then polygon 30 encompasses landslide debris that has no typical topography. The convex slope break at the upslope edge of polygon 28a is compatible with a landslide headscarp. But an alternative explanation might be that this scarp is one side of an open-sided kettle, formed when ice grounded here during an early phase of Glacial Lake Prince George (in which case the partly enclosed depression (polygon 30) is the floor of the kettle.

Polygon #	***31***	***32***	***33****	***34****	***35***	***36***
Terrain Symbol	LGw Mb	/LGvb Mb (close to upper limit of Glac. Lake PG	LGbw M and/or complex stratigraphy	Usk.Cv -- R"F" Rks.. .	Cf-Rd	LGu
Slope; Topography	slope, 15-30%	mostly <10%; bench with level to undulating surface	slope 30-50%; irregular slope with steeper and gentler sections.	Steepest facet of the Cranbrook Hill escarp-ment; approx.50-70%	0-15% colluvial fans	<10%; gentle slope to level; gently undulating
Soil	probably glacial lake sediments (clay – fine sand) at surface	discontinuous glacial lake sediments: (clay to fine sand); till elsewhere	glacial lake sediments (clay to fine sand) and possibly other materials.	glacial lake sediments; complex stratigraphy; shallow bedrock probably under thin colluvium derived from glacial sediments	colluvium derived from LG. M etc – so relatively fine textures – silt, sand, monor gravel	glacial lake sediments, fine sand, silt or clay
Drainage (& related constraints)	well-drained	moderate to imperfect in depressions	generally well to moderate; wetter in concavities; may be seepage zones	variable depending on upslope sources of runoff and local subsoil. seepage zones present.	moderate	moderate to imperfect
Erosion Potential	low to moderate	high	high to very high	very high	low	high
Slope Stability	probably stable	probably stable	variable; likely to be potentially unstable in places	potentially unstable and small areas unstable	stable	stable
Potential Geophysical Hazards	none apparent	possibly small, localized slope failures along top edge of adjacent gullies and scarps; setbacks needed	pot. instab; may be some small unstable areas &/or old slides; very susceptible to erosion by surface runoff. See below.	slope movement, rapid erosion; not suitable for development	hazard zone especially near apex: may receive debris flows &/or mudflows from gullies upslope	poss. seasonally high watertable; poss. inundation in lowest-area; (includes disturbed ground or dumped material near stream)

(33) Recommended: no further development on this slope unless *large parts* of it (not just specific building sites) are thoroughly checked re. stability first. (Some development already (1985) near Charella Gardens, (but none more recently(??)).See two sites with red landslide symbols – possible instability, or features make just be differences in tree height. (Suggest check along old road above Charella Gardens for signs of related instability (see road on 1985 photos). Also, this polygon is crossed by several gullies (too small to map) with topographic details hidden by trees. Gullies should be checked for potential slides along sideslopes and debris flow potential if any development is planned on the gentler terrain downslope.

(34) See JMR report 1999 (K-545) for origin of this scarp and reasons for variation in underlying materials.

Polygon #	***37***					
Terrain Symbol	FGp-EH					
Slope; Topography	mostly level; ouwash plain with some shallow incised channels and kettles					
Soil	sand and gravel					
Drainage (& related constraints)	well					
Erosion Potential	low					
Slope Stability	stable					
Potential Geophysical Hazards	none apparent					

Drainage Classes
The following terms are used in a relative sense – may not fit standard definitions used by pedologists: very poor (e.g., bogs and marshes); poor; imperfect; moderate; well (e.g. gravel ridges, upper slopes underlain by till; rapid, e.g., rock outcrops, talus.

Erosion Potential Ratings
low; moderate; high; very high.

Slope Stability Ratings
stable; potentially unstable, unstable

Notes re Air Photos

1948 photos

- drumlins indicate former ice-flow toward the NE;
- in W part of AOI: "drumlin" shapes are irregular, suggesting bedrock may be close to surface in places (or drumlins may have been eroded out of preexisting, thick glacial drift – in which case they will not necessarily consist of till);
- poor drainage in depressions between the drumlins;
- many small kettle lakes, some transformed to wetlands, some dry;
- in E part, old channel evident along foot of main scarp;
- no major slide on escarpment apparent in this view.

1953 photos
- . rock-control most apparent just outside and to NW of AOI
- no major slide on escarpment apparent in this view;
- scale rather small for detailed api.

1963 photos
- relatively great vertical exaggeration in stereo-view – good for seeing topography.

1977 photos

1985 photos
- largest scale of available photos
- see for terrain mapping.

1996 photos
- see for gravel pits.

2002 photos
- good for gullies on escarpment.


15BC 85054 № 167
Mbw
Mbw/Rx
Mbw/Gx/R
old landslide headscarp???
possible slope movement

APPENDIX D

University Heights Neighbourhood Plan
L&M Engineering Limited

TRIP GENERATION VOLUMES

UNIVERSITY HEIGHTS NEIGHBOURHOOD PLAN
TRIP GENERATION VOLUMES

	Area No	Single Family Dwellings dwellings	Multi Family Dwellings dwellings	Neighbourhood Commercial ha	Local Commercial ha	Highway Commercial ha	University Support ha	First Nations ha	Elementary Schools each	Secondary School each	Total
	1	160	150		1		10				
	2	520	330	10	1		10		1		
	3	420	210		1				1		
	4	750	390		1				1		
	5	590	330		1	6			1	1	
AM PEAK											
ingress volume (vph)	1	42	12		55		140				
	2	135	27	147	55		140		92		598
	3	109	17		55				92		274
	4	195	32		55				92		375
	5	153	27		55	88			92	395	811
	Subtotal	**634**	**117**	**147**	**274**	**88**	**281**		**370**	**395**	**2307**
egress volume (vph)	1	118	61		32		172				383
	2	385	134	87	32		172		76		885
	3	311	85		32				76		504
	4	555	159		32				76		821
	5	437	134		32	52			76	177	908
	Subtotal	**1806**	**573**	**87**	**161**	**52**	**343**		**302**	**177**	**3501**
total am peak volume (vph)	1	160	74		87		312				633
	2	520	162	234	87		312		168		1483
	3	420	103		87				168		778
	4	750	191		87				168		1196
	5	590	162		87	140			168	572	1719
	Subtotal	**2440**	**691**	**234**	**435**	**140**	**624**		**672**	**572**	**5808**
PM PEAK											
ingress volume (vph)	1	123	67		156		284				630
	2	399	148	630	156		284		11		1628
	3	323	94		156				11		584
	4	576	175		156				11		918
	5	453	148		156	378			11	31	1177
	Subtotal	**1874**	**633**	**630**	**780**	**378**	**567**		**43**	**31**	**4936**
egress volume (vph)	1	69	35		156		312				572
	2	225	76	630	156		312		13		1413
	3	181	49		156				13		399
	4	324	90		156				13		583
	5	255	76		156	378			13	35	913
	Subtotal	**1054**	**326**	**630**	**780**	**378**	**625**		**53**	**35**	**3881**
total pm peak volume (vph)	1	192	102		312		579				1185
	2	624	224	1260	312		579		24		3023
	3	504	143		312				24		983
	4	900	265		312				24		1501
	5	708	224		312	756			24	66	2090
	Subtotal	**2928**	**959**	**1260**	**1560**	**756**	**1157**		**96**	**66**	**8782**

APPENDIX E

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC PARTICIPATION MAIL-OUT PACKAGE #1

ENGINEERING LIMITED
PLANNING CENTRE
1210 Fourth Avenue
Prince George, BC
V2L 3J4
Tel. (250) 562-1977
Fax (250) 562-1967

Date: 03 October 2006
File: 1273-01-00

Attention: Owner or Resident

Reference: The University Heights Neighbourhood Plan
An Opportunity to Provide Comment & Input

The L&M Engineering Limited Planning Centre is in the process of creating a Neighbourhood Plan for 'University Heights' which is located in the Southwest Sector of the City of Prince George. As shown on the enclosed Explanatory Plan, the area encompasses 674 hectares of land surrounding Tyner Boulevard, extending to the University of Northern British Columbia in the north, Highway 16 in the south, the rural-urban boundary near the headwaters of Parkridge Creek in the west and the Cranbrook Hill Escarpment in the east. The development is subject to the creation of a neighbourhood plan that addresses:

- Environmentally sensitive areas,
- Geotechnical considerations,
- Provision of parks and greenspace,
- The transportation network,
- Residential housing mix and densities,
- Commercial lands,
- Public use sites, and
- Trail linkages.

The purpose of neighbourhood plans is to create a clear and comprehensive land use vision in order to provide certainty for residents, land owners, and developers regarding how an area can be developed. Neighbourhood plans must balance the desires of residents, environmental considerations, and economic realities and should result in land use planning policies that can be achieved over time.

The draft plan for University Heights Neighbourhood is in keeping with the City of Prince George's Official Community Plan (OCP) which specifies Urban Development for the Southwest Sector of Prince George. An important part of the neighbourhood planning process is public participation and the purpose of this letter is to invite your comments with respect to the proposed Neighbourhood Plan.

There are a number of ways you can provide input, including:

- Reviewing the Draft University Heights Neighbourhood Plan, complete with colour plans, which is available in its entirety on the City's web site **(www.city.pg.bc.ca/)**
- Completing the enclosed survey and returning it to the L&M Planning Centre or the City of Prince George.
- Attending the Neighbourhood Open House to be held at the Civic Centre, 808 Civic Plaza, on October 18th between 7 & 9 pm.

Highlights of University Heights

The planning vision for the University Heights Neighbourhood Plan centres on the proximity of the Plan area to the University of Northern British Columbia and the unique opportunity of working closely with the Lheidli T'enneh Nation as they move towards ownership and governance of land within and surrounding the Plan boundary. The University Heights Neighbourhood Plan area is endowed with natural features including steeply sloped escarpments, rolling topography, the headwaters of Parkridge Creek and other riparian areas, as well as beautiful vistas and large tracts of forest. In addition, the area is in close proximity to several extensive trail networks and open space recreation opportunities including the Cranbrook Hill Greenway, Forests for the World and Ginter's Field. The vastness of the area creates incredible planning and visioning possibilities while, at the same time, providing an opportunity to address major road network, infrastructure, and environmental considerations.

The University Heights Neighbourhood Plan is characterized by:

- A mix of land uses including a range of residential density options, commercial, parkland, greenspace, and institutional;
- Eleven Neighbourhood Parks;
- Two District Parks;
- Development of trails connecting with existing residential development, the University of Northern BC, the Cranbrook Hill Greenway, and Ginter's Field;
- Designed connections to the existing bicycle network;
- A pedestrian friendly environment that provides connections within University Heights and to surrounding neighbourhoods;
- Greenways to protect environmentally sensitive areas;
- The University Support Services area and Neighbourhood Centre;
- First Nations Institutional development area;
- The promotion of Traditional, Smart Growth, Winter Cities, Crime Prevention through Environmental Design and Healthy Communities design standards;
- Pilot projects for Alternative Design Standards for roads and servicing

Preparation of the University Heights Neighbourhood Plan has been guided by policies contained in the City of Prince George's OCP, as well as the principles of Smart Growth

BC and the Liveable Winter Cities Association. The OCP is available for viewing online at **http://www.city.pg.bc.ca/city_services/ocp**. Copies are also available for review in the Development Services Department at City Hall. Information regarding Smart Growth development practices can be found at **http://www.smartgrowth.bc.ca**.

GETTING INVOLVED

Public Open House

The L&M Engineering Limited Planning Centre will be holding a **Public Open House on October 18th between 7-9 pm at the Civic Centre**, at which time the first draft plan of the University Heights Neighbourhood will be available for review. In addition, representatives from the City of Prince George and L&M Engineering Limited will be available to answer questions.

Survey

Attached is a survey with a series of statements for your response. The responses received will assist the L&M Engineering Limited Planning Centre in ensuring that public input is incorporated into the development of the land use plan. Copies of all public responses will be forwarded to the City of Prince George for their review. Alternatively, you are also welcome to send your completed survey directly to the City of Prince George. You will be best able to answer the survey questions after attending the Public Open House scheduled **for October 18th between 7-9 pm at the Civic Centre** or by reviewing the complete set of plans available on the city's website **(www.city.pg.bc.ca/).**

NEXT STEPS

Following the receipt of public comments, the first draft of the University Heights Neighbourhood Plan will be submitted to the City of Prince George for review. A second Public Open House will be held in February or March of 2007, providing another opportunity for public consultation prior to consideration of the Neighbourhood Plan by Prince George City Council.

QUESTIONS?

Contact Heather Oland, Planning Associate, at L&M Engineering Limited:

- Phone… 250-562-1977
- Fax… 250-562-1967
- Email…holand@lmengineering.bc.ca , or

Grant Bain, Manager of Long Range Planning, City of Prince George

- Phone…250-561-7612
- Fax…250-561-7721
- Email…gbain@city.pg.bc.ca

Please return the survey by **November 3rd, 2006**. It can be handed in at the public open house, mailed, faxed or hand delivered to:

L&M Engineering Limited – Planning Centre.
1210 Fourth Avenue
Prince George, BC. V2L 3J4
FAX: (250) 562-1967

OR

City of Prince George – Long Range Planning Division
1100 Patricia Boulevard
Prince George BC. V2L 3V9
Fax: (250) 561-7721

P:\Job Files\1200\1273-01-00 University Heights NP\Public Participation\Mail-out & Survey.doc

University Heights Neighbourhood Plan – Community Survey

For each statement, please check the box that best describes your agreement or disagreement and provide any additional comments. You will be best able to respond after attending the **Public Open House to be held on October 18th 2006 at the Prince George Civic Centre (808 Civic Plaza) between 7pm & 9pm** or by reviewing the complete set of plans available on the City's website (http:/www.city.pg.bc.ca)

1. The proposed neighbourhood provides a good mix of housing choices (ie. ½ acre residential, low density single family, townhouses, 4 storey apartments, etc).

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. The proposed Neighbourhood Shopping location and other local convenience shopping opportunities are a benefit to the proposed neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. The University Support Services area provides a desirable mix of land uses for this area.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. The proposed First Nations Institutional land use provides a desirable mix of lands uses for this area.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. The approximate school locations identified appear to be appropriately situated

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. The trails and greenspace outlined in the plan provide good connections to the existing trail networks surrounding the plan boundary.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. The trails and greenspace within the Neighbourhood Plan provide good connections within the Neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. The parks and greenspace within the plan provide good recreational and open space opportunities.

9. Environmentally sensitive areas and their protection are adequately incorporated into the proposed Neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. The proposed road network will provide the necessary linkages to promote safe and effective transportation through this and adjacent neighbourhoods.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. The proposed pedestrian and cyclist links (road, sidewalk, greenspace, trail network, and connections to neighbouring areas) are sufficient to promote alternative transportation choices.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. Are there any issues or concerns not covered above that you want to make sure are addressed as part of the University Heights Neighbourhood planning process?

Thank you for taking the time to respond.

Please mail, hand deliver or fax (250-562-1967) your completed two-page survey to Heather Oland at L&M Engineering Limited – Planning Centre.
1210 Fourth Avenue

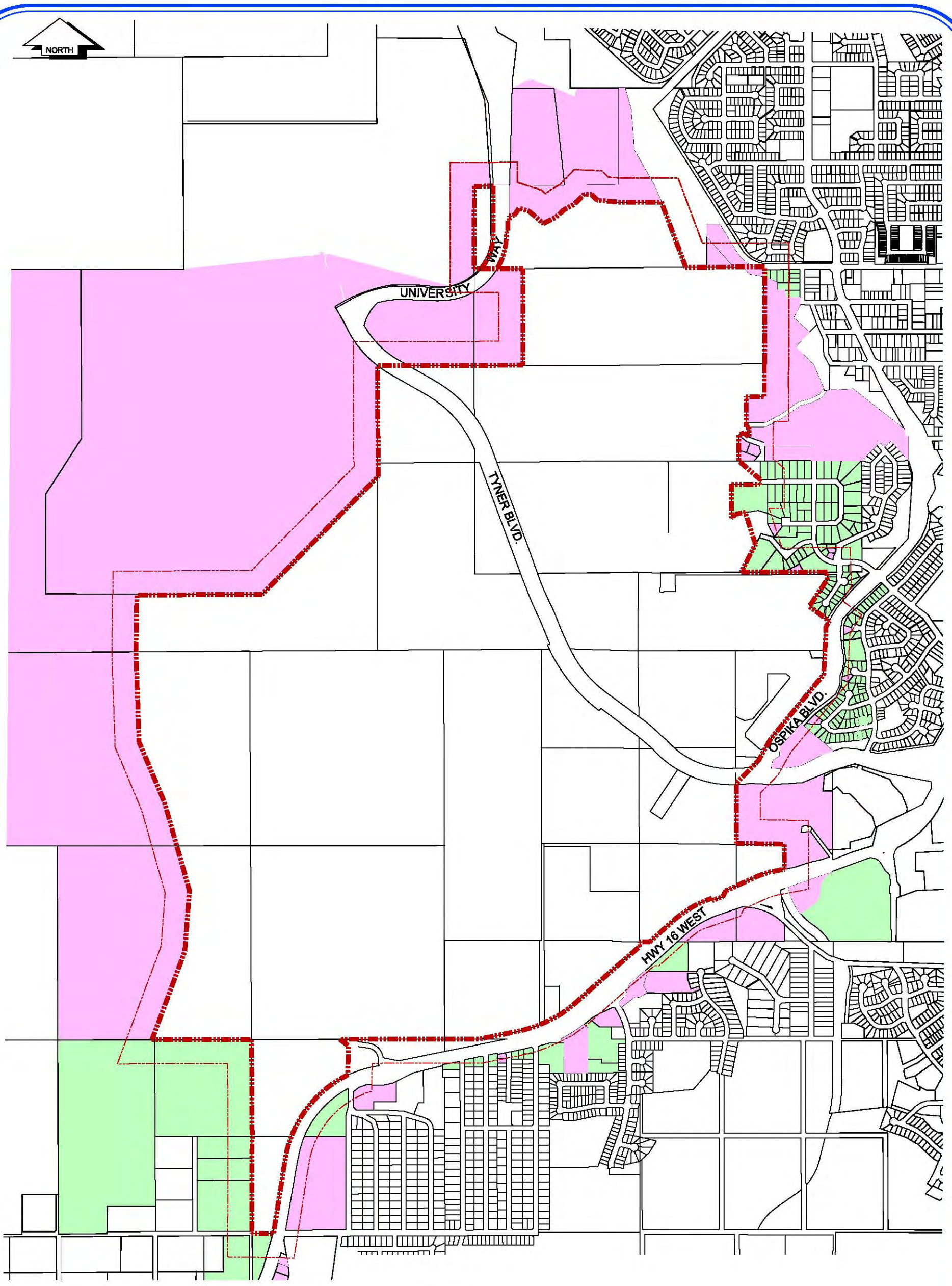
OR

Grant Bain at City of Prince George – Long Range Planning Division
1100 Patricia Boulevard
Fax (250-561-7721)

APPENDIX F

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC MAIL-OUT #1 DISTRIBUTION AREAS



LEGEND

- STUDY AREA BOUNDARY
- 100M BUFFER BOUNDARY
- INFORMATION PACKAGE MAILED
- INFORMATION PACKAGE HAND DELIVERED

L&M ENGINEERING LIMITED PLANNING CENTRE
#201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
holand@lmengineering.bc.ca

JOB No: 1273-01-00
DATE: OCTOBER 2006
DRAWN BY: KLH
SCALE: 1:15,000

UNIVERSITY HEIGHTS NEIGHBOURHOOD PLAN

PUBLIC MAIL OUT DISTRIBUTION AREAS

DWG No
A-F

APPENDIX G

University Heights Neighbourhood Plan
L&M Engineering Limited

NEWSPAPER ADVERTISEMENT #1

Public Open House for the Proposed Draft Neighbourhood Plan For University Heights will be held at The Civic Centre, 808 Civic Plaza October 18, 2006 between 7 & 9pm.

L&M Engineering Limited, on behalf of the University Heights Neighbourhood Plan Steering Committee & Property Owners, is in the process of creating a Neighbourhood Plan for the University Heights area located between UNBC and Hwy 16. This Neighbourhood Plan covers approx 674 ha of land in the fastest growing area of our community. The neighbourhood is intended to be an innovative mix of land uses including residential, neighbourhood commercial, and institutional as well as extensive parkland, greenspace, and trail network. The public open house is an opportunity for residents to review the Draft Neighbourhood Plan and provide input into the planning process. The first draft of the Neighbourhood Plan is available online at http:/www.city.pg.bc.ca/

For more information regarding the neighbourhood plan, please contact Heather Oland, Planner with L&M Engineering Limited at 562-1977, or for information regarding the development review process contact Grant Bain, Manager of Long Range Planning for the City of Prince George at 561-7612.

00490296

Edition: Citizen Classifieds Desc: Pub Date: 10/11/2006 Status: Copy Change #3
AdTrac:Pubfiles:00490296.eps (eps / 120KB / 16.5pi x 70ag) 2 x 70 at 100%
Printed on: 10/3/2006 at 11:21:14 AM By: PRD06 (Lynn R) Sales Rep: 020 Email: 0

APPENDIX H

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC SURVEY #1 –
SUMMARY OF CONTENTS

University Heights Neighbourhood Plan – Community Survey
An Opportunity to Provide Comment and Input

L&M Engineering Limited and the Steering Committee of the University Heights Neighbourhood Plan (UHNP) are committed to public participation. In order to provide the public with complete information and provide the opportunity for public comment regarding the University Heights Neighbourhood Plan, the following process was undertaken:

- On Friday October 6th 2006, L&M Engineering Ltd. hand-delivered over 200 Community Survey Packages to residents of all properties within 100m surrounding the University Heights Neighbourhood Plan boundary. Owners of undeveloped properties were sent a copy of the package by mail. Please refer to **Appendix F: Public Mail Out Distribution Areas** for an outline of the properties receiving the mail-out package. The packages included:
  - A letter describing the Neighbourhood Plan process as well as the University Heights proposal;
  - Direction to the complete Plan available on the City of Prince George web site,
  - An invitation to the Public Open House,
  - A site plan, and
  - A survey.
- In addition, surveys were distributed at the Public Information Meeting and more were made available online via the City's website.
- On Wednesday October 11th and Saturday October 14th 2006, a classified advertisement announcing the Public Information Meeting and inviting the public to attend was published in the Prince George Citizen (please refer to **Appendix G: Newspaper Advertisement**). This advertisement also included direction to the complete Plan available on the City of Prince George web site. L&M Engineering also prepared a press release for print by the Prince George Citizen, which was published on Wednesday October 11th, 2006.
- On Wednesday October 18th 2006, a Public Open House was held at the Prince George Civic Centre from 7-9pm. The open house consisted of display drawings and a power point display of site pictures for viewing, as well as four information tables attended by L&M Engineering staff (Heather Oland BA. MSc, David McWalter P.Eng, Terry Fjellstron P.Eng., Jessica Rayner and Rebecca Goodenough), Brian Mialkovic of EDI Environmental Dynamics Inc., and City of Prince George staff (Grant Bain, Manager of Long Range Planning, and Gerald Christie, Parks and Open Space Planner). Also available to answer questions, provide surveys, and facilitate the event were Kim Hattle and Christine Dunbar of L&M Engineering Limited.
- In attendance at the Public Open House were approximately 120 community members including several Neighbourhood Plan area property owners, one council member and local media.

- In addition, L&M Engineering Limited and the City of Prince George received several letters and emails requesting additional information about the University Heights Neighbourhood Plan.

The following tables represent a compilation of the comments offered by survey respondents, as well as L&M Engineering Limited's responses to the comments. Of the surveys distributed, these remarks represent the interests of the 24 community members who returned the forms.

Question 1 – The proposed neighbourhood provides a good mix of housing choices (i.e. ½ acre residential, low density single family, townhouses, 4 storey apartments, etc.)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
0	0	6	14	4	0	**24**

Questions and Comments in Response to Question 1

Comments / Suggestions	Frequency	Response
More 1 acre lots.	2	One acre lots are generally considered appropriate for suburban areas rather than urban. Half acre residential lots offer a transition between rural and urban land uses in the UHNP area.
No development on the west side of the headwaters to Parkridge Creek.	1	The Plan boundary extends west to the OCP's Urban Development boundary. Lower residential densities west of this creek offer a transition between the rural and urban land uses.
Housing to meet the needs of the retirement community (suggestions include one level houses, condos, smaller homes, townhouses, and gated strata)	3	The plan provides for a mix of housing types and densities.
Two car garages.	1	This plan provides for a variety of housing types.
More houses, fewer apartments	1	This plan provides for a mix of housing densities.

Question 2 – The proposed Neighbourhood Shopping location and other local convenience shopping opportunities are a benefit to the proposed neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
0	4	4	11	4	1	**24**

Questions and Comments in Response to Question 2

Comments / Suggestions	Frequency	Response
Commercial amenities within walking distance of the University.	1	Proposed within the University Support Services land use designation. Pedestrian connections to the University are also proposed from all other commercial areas within the Plan area.
Commercial development on a small and local scale only.	3	Proposed commercial development, including a Neighbourhood Shopping Centre, follows the policies of the City of Prince George OCP.

Question 3 – The University Support Services area provides a desirable mix of land uses for this area.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
	2	4	13	3	2	**24**

Questions and Comments in Response to Question 3

Comments / Suggestions	Frequency	Response
Year round commercial activity.	1	Commercial service provisions will be determined by business owners upon development.
Architecturally pleasing residential development.	1	Building schemes may be registered at the time of subdivision
Larger lots.	1	The University Support Services area is intended for higher densities rather than larger lots.
Specific land uses in the University Support Services area are unclear at this time.	1	Please refer to Section 3.8.4 for a list of proposed land uses.

Question 4 – The proposed First Nations Institutional land use provides a desirable mix of land uses for this area.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	0	12	7	3	1	**24**

Questions and Comments in Response to Question 4

Comments	Frequency	Response
Land use here is unclear at this time.	2	Future University Heights Neighbourhood Plan drafts will address this area in more detail.
Undesirable land use	1	The First Nations Institutional land use designation has been identified through consultation with the Lheidli T'enneh Nation and will be further developed prior to future drafts of the University Heights Neighbourhood Plan.

Question 5 – The approximate school locations identified appear to be appropriately situated.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
0	3	7	9	3	2	**24**

Questions and Comments in Response to Question 5

Comments / Suggestions	Frequency	Response
Existing schools are sufficient and should be utilized instead.	2	For consideration by the School Board. Table 9 of the Neighbourhood Plan outlines current capacity and enrolment statistics of existing schools in the area and supports the need for additional schools in conjunction with the area's development.
Schools are required immediately.	1	For consideration by the School Board.
Appropriateness of locations will depend on the development's timeline.	1	Exact locations are yet to be determined and will be guided by the direction of future development as well as detailed design.

Question 6 – The trails and greenspace outlined in the plan provide good connections to the existing trail networks surrounding the plan boundary.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	0	2	17	2	2	**24**

Questions and Comments in Response to Question 6

Comments / Suggestions	Frequency	Response
More trails.	2	Trail locations and numbers will be confirmed with more detailed designed.
Improved protection for existing trails.	1	Some existing trails are in trespass and subject to negotiation with the City of Prince George. Consultation with trail user groups, property owners and the City of Prince George is serving to identify important trail locations.
Higher percentage of park space.	2	The UHNP provides a generous amount of parks and greenspace, which will be further refined upon detailed design and geotechnical investigations.
Integrate greenspace into commercial areas (ex. outdoor open space areas supplemented with benches, water fountains, stationary art pieces).	1	City of Prince George OCP park citing criteria have been followed, and exact park locations are to be determined. Specific commercial / multiple family development proposals can incorporate urban plazas.
Light cycling and pedestrian paths through greenspace as well as along main roads.	1	City of Prince George Development Guidelines will be followed.

Question 7 – The trails and greenspace within the Neighbourhood Plan provide good connections within the Neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	1	3	14	4	1	**24**

Questions and Comments in Response to Question 7

Comments / Suggestions	Frequency	Response
More neighbourhood connections.	1	Detailed trail design and layout will take place in future stages of development, such as rezoning and subdivision.
More walk-bike paths.	1	Detailed trail design and layout will take place in future stages of development, such as rezoning and subdivision.
Unable to answer until further detail is provided.	1	Detailed trail design and layout will take place in future stages of development, such as rezoning and subdivision.

Question 8 – The parks and greenspace within the plan provide good recreational and open space opportunities.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
0	0	1	4	1	18	**24**

Questions and Comments in Response to Question 7

Comments / Suggestions	Frequency	Response
General agreement provided	5	N/A
More greenspace (particularly in areas without significant slopes.	3	Parkland acquisition standards and legislated requirements are met. Design criteria for locating parks are followed.
Inclusion of tennis courts and a skate park.	1	District Parks permit these forms of recreation.
Greenbelt too steep for recreational use.	1	Further geotechnical investigation will be required prior to land development. A mix of recreational uses for the steeply sloped areas may include mountain biking and horse-back riding.

Question 9 – Environmentally sensitive areas and their protection are adequately incorporated into the proposed neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
2	3	5	8	3	3	**24**

Questions and Comments in Response to Question 7

Comments / Suggestions	Frequency	Response
Extending Massey could negatively impact the local riparian area.	2	EDI made recommendations with respect to environmental impacts in their Environmental Overview. The exact location of the proposed Massey Extension is yet to be determined.
More information required	1	A wildlife corridor study is to be completed.
Loss of wildlife who use the area as habitat.	1	EDI is currently conducting a Wildlife Corridor Assessment to further address this issue.
Extended riparian areas.	1	Riparian area widths provided reflect the standards outlined in the Department of Fisheries and Oceans' Standard referral letter to the City of Prince George and apply to waterways identified by EDI as environmentally significant.
Geotechnical stability is uncertain	1	Detailed geotechnical investigation will be completed prior to any development.

Question 10 – The proposed road network will provide the necessary linkages to promote safe and effective transportation through this and adjacent neighbourhoods.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
0	3	9	7	3	2	**24**

Questions and Comments in Response to Question 7

Comments	Frequency	Response
As few roads as possible.	1	City of Prince George transportation planning policies are followed. Local roads will be designed to meet the demand of the neighbourhood as it is developed.
Geotechnical stability is uncertain.	2	Detailed geotechnical investigation will be completed prior to any development.
Not enough detail at this time.	1	The proposed road layout is conceptual and will be subject to detailed review and modelling.

Question 11 – The proposed pedestrian and cyclist links (road, sidewalk, greenspace, trail network, and connections to neighbouring areas) are sufficient to promote alternative transportation choices.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	4	4	11	2	2	**24**

Questions and Comments in Response to Question 7

Comments / Suggestions	Frequency	Response
More links.	3	Local road networks which are intended to contribute to the development of a connected neighbourhood, will contribute to the extent of the transportation network. Trails and greenways will be determined during detailed design.
Safe trails, including lighting.	1	CEPTED design guidelines, outlined in the Neighbourhood Plan, recommend lighting pedestrian walkways, among other safety measures. Provision of these amenities will be a decision of the City of Prince George.
Cycle lanes on all trail systems and roads.	1	The Neighbourhood Plan's design guidelines reference the City of Prince George Cycle Network Study which recommends that minimum development standards imposed by the City should include bicycle standards. The City of Prince George currently requires bike lanes on all arterial roads and on collector roads where designated. Local roads do not require bike lanes.
Off-street trail linked to the University Extension, Cranbrook Drive, and the Massey Drive Extension.	1	Designed to standards established in the Subdivision Development and Control Bylaw No.

		7652, 2004.
Paved trails.	1	Multi-use and off-street trails will be paved, as per the City's development guidelines.

Question 12 – Are there any issues or concerns not covered above that you want to make sure are addressed as part of the University Heights Neighbourhood planning process?

Comments	Frequency	Response
Consideration of wildlife.	2	EDI is currently conducting a Wildlife Corridor Assessment to further address this issue.
Seniors accommodation	2	The plan provides for a mix of housing types and densities. The City of Prince George 2001 OCP supports a range of seniors housing throughout the city, particularly near high amenity areas where services are nearby.
Housing for singles and retired couples (townhouses and one-storey plans recommended)	1	The plan provides for a mix of housing types and densities. The University Support Services area is intended for higher residential densities.
Good quality, aesthetically pleasing housing.	2	Building schemes may be registered at the time of subdivision.
More transfer stations to address solid waste management.	1	City of Prince George to address.
Drainage and soil stability concerns.	1	Detailed geotechnical investigation and a stormwater management plan will be completed prior to any development.
Subsidized housing for university students and families.	1	The plan provides for a mix of housing types and densities.

APPENDIX I

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC PARTICIPATION MAIL-OUT PACKAGE #2

L&M ENGINEERING LIMITED
PLANNING CENTRE
1210 Fourth Avenue
Prince George, BC
V2L 3J4
Tel. (250) 562-1977
Fax (250) 562-1967

Date: 20 June 2007
File: 1273-01-00

Attention: Owner or Resident

Reference: Draft University Heights Neighbourhood Plan
An Opportunity to Provide Comment & Input

L&M Engineering Limited Planning Centre would like to invite you to participate in the second phase of the public participation process for the University Heights Neighbourhood Plan. The proposed University Heights Neighbourhood is located in the southwest sector of the City of Prince George. You are receiving this letter because it is our understanding that you own property in proximity to the boundary of the Neighbourhood Plan.

As shown on the enclosed explanatory plan, the area encompasses 674 hectares of land surrounding Tyner Boulevard, extending to the University of Northern British Columbia in the north, Highway 16 in the south, the rural-urban boundary near the headwaters of Parkridge Creek in the west and the Cranbrook Hill Escarpment in the east. The development is subject to the creation of a neighbourhood plan that addresses:

- Environmentally sensitive areas,
- Geotechnical considerations,
- Provision of parks and greenspace,
- The transportation network,
- Residential housing mix and densities,
- Commercial lands,
- Public use sites, and
- Trail linkages.

The purpose of a neighbourhood plan is to create a clear and comprehensive land use vision in order to provide certainty for residents, land owners, and developers regarding how an area can be developed. Neighbourhood plans must balance the desires of residents, environmental considerations, and economic realities and should result in land use planning policies that can be achieved over time. The University Heights Neighbourhood Plan is in keeping with the City of Prince George's Official Community Plan (OCP) which specifies Urban Development for the Southwest Sector of Prince George.

An important part of the neighbourhood planning process is public participation and the purpose of this letter is to invite your comments with respect to the proposed Neighbourhood Plan. This is the second formal opportunity for the public to provide input into the planning process. The first public open house was held on October 19th, 2006 at the Prince George Civic Centre. Since that time, the Plan has been reviewed by the City of Prince George and revisions have been made on the basis of comments submitted to L&M Engineering from the City of Prince George, property owners within the Plan area, key stakeholders and the public.

There are a number of ways you can provide input, including:

- Reviewing the Draft University Heights Neighbourhood Plan, complete with colour plans, which are available at: **http://www.lmengineering.bc.ca/univ/dwgs.htm**.
- Completing the enclosed survey and returning it to the L&M Planning Centre or to the City of Prince George.
- Attending the Neighbourhood Open House to be held at the UNBC Bentley Centre on **Tuesday, June 28th between 7:00 pm and 9:00 pm**.

Highlights of University Heights Neighbourhood Plan

The planning vision for the University Heights Neighbourhood Plan is to create a *compact, connected, complete* and *complimentary* neighbourhood. The University Heights Neighbourhood Plan area is endowed with natural features including steeply sloped escarpments, rolling topography, the headwaters of Parkridge Creek and other riparian areas, as well as beautiful vistas and large tracts of forest. In addition, the area is in close proximity to several extensive trail networks and open space recreation opportunities including the Cranbrook Hill Greenway, Forests for the World and Ginter's Field. The vastness of the area creates incredible planning and visioning possibilities while, at the same time, providing an opportunity to address major road network, infrastructure, and environmental considerations.

The University Heights Neighbourhood Plan is characterized by:

- A mix of land uses including a range of residential density options, commercial, open space and institutional;
- Eleven Neighbourhood Parks;
- Two District Parks;
- Development of trails connecting with existing residential development, the University of Northern BC, the Cranbrook Hill Greenway, and Ginter's Field;
- Designed connections to the existing bicycle network;
- A pedestrian friendly environment that provides connections within University Heights and to surrounding neighbourhoods;
- Greenbelts and riparian areas to protect environmentally sensitive areas;

- The University Support Services area;
- The promotion of Smart Growth, Winter Cities, Crime Prevention through Environmental Design and Healthy Communities design standards;
- The potential for pilot projects for Alternative Design Standards for roads and servicing

Preparation of the University Heights Neighbourhood Plan has been guided by policies contained in the City of Prince George's Official Community Plan (OCP), as well as the principles of Smart Growth B.C. and the Liveable Winter Cities Association. The OCP is available for viewing online at **http://www.city.pg.bc.ca/city_services/ocp**. Copies are also available for review in the Development Services Department at City Hall. Information regarding Smart Growth development practices can be found at **http://www.smartgrowth.bc.ca**.

Several revisions have been made to the Plan since the first public open house and area summarized below:

1. **University Support Services**
   The amount of land allocated to the University Support Services land use has decreased to 10 hectares from the previous 20 hectares. The location of the University Support Services area has been moved from straddling the Plan boundary and the University lands to being located entirely within the Plan boundary and adjacent to the Neighbourhood Commercial land use west of Tyner Boulevard. In addition, the permitted uses within University Support Services have been revisited and now emphasize higher density residential so as to allow for affordable housing options as well as a number of commercial uses including retail, recreation and service-based office uses as well as child care facilities, and education services.

2. **Lheidli T'enneh Nation**
   Section 2.1.1 of the Neighbourhood Plan has been revised to reflect the recent events that have occurred under the B.C. Treaty Process. More specifically, the Neighbourhood Plan addresses the recent ratification vote as well as the next stages in the Treaty Process for the Lheidli T'enneh. As a result of the Lheidli T'enneh's decision not to ratify the Treaty package, it is no longer certain whether the lands within the Neighbourhood Plan will become the property of the Lheidli T'enneh. Accordingly, the proposed First Nations Institutional area has reverted to residential land use within the Plan.

3. **Phasing of Development**
   The City of Prince George, in consultation with L&M Engineering, has determined that a portion of the Neighbourhood Plan located adjacent to Phase A will not be subject to the development of a Watershed Drainage Plan. As such, a portion of Phase B is now termed Phase A-2; while the original Phase A land area is now termed Phase A-1. The text and mapping have been changed to reflect this

additional development phase. The remaining phases of development will be subject to a Watershed Drainage Plan that will be facilitated by the City of Prince George during 2008.

4. **Wildlife Corridor Studies**
   L&M Engineering has retained the services of EDI Environmental Dynamics Inc. to conduct a Wildlife Habitat Assessment within the Plan area. This study has identified the location of two corridors within the Plan Boundary that will serve to assist the movement of wildlife as development proceeds. The Habitat Assessment also more clearly defined set-backs from watercourses within the Plan boundary to protect riparian areas and water quality.

5. **Implementation Strategy**
   The Implementation section of the Neighbourhood Plan has been amended to recommend an expanded rezoning process through the City of Prince George to ensure the policies and recommended land uses outlined within the University Heights Neighbourhood Plan are implemented as development advances.

6. **Timing and Responsibility of Studies**
   The document has been amended to clarify the timing and responsibility of future studies. More specifically, the Plan acknowledges that the City of Prince George is responsible for conducting the Watershed Drainage Plan and that the developer is responsible for conducting subdivision level Stormwater Management Plans. Transportation modeling is being undertaken by the City of Prince George and is expected to be completed by the end of 2007.

7. **Trails**
   The provision of off-street trails in the Plan has been amended slightly to provide a boundary trail along the eastern boundary of the Plan area.

8. **New Zoning Bylaw**
   In April, the City of Prince George approved Zoning Bylaw No. 7850, 2007. The Plan has been amended to reflect the new terminology and zoning included within the bylaw.

9. **Revised Population and Dwelling Counts**
   The projected population and dwelling units for the Plan have shifted slightly as a result of the reduction in area of the University Support Services area (from 20 hectares to 10 hectares), the increase in area for Local Commercial uses (from 7 hectares to 10 hectares) and the removal of the proposed First Nations Institutional land use from the Plan. These changes have resulted in minor modifications in projected population and dwelling units. The total projected population for the University Heights Neighbourhood has increased to 11,333 from 10,724 and the total projected dwelling units have increased to 3,850 from 3,640.

10. Maps
Maps have been updated to reflect all applicable changes.

Getting Involved

Second Public Open House

The L&M Engineering Limited Planning Centre will be holding a **Public Open House on June 28th between 7:00 pm and 9:00 pm at the UNBC Bentley Centre**, at which time the University Heights Neighbourhood Plan will be available for review. In addition, representatives from the City of Prince George and L&M Engineering Limited will be available to answer questions.

Survey

Attached is a survey with a series of statements for your response. The responses received will assist the L&M Engineering Limited Planning Centre in ensuring that public input is incorporated into the development of the land use plan. Copies of all public responses will be forwarded to the City of Prince George for their review. Alternatively, you are also welcome to send your completed survey directly to the City of Prince George. You will be best able to answer the survey questions after attending the Public Open House scheduled **for Tuesday, June 28th between 7:00 pm and 9:00 pm at the UNBC Bentley Centre** or by reviewing the complete set of plans available on the city's website (**www.city.pg.bc.ca/**).

Next Steps

Following the receipt of public comments, the University Heights Neighbourhood Plan will be formally submitted to the City of Prince George for consideration by Prince George City Council.

Questions?

Contact Heather Oland, Manager of Planning, L&M Engineering Limited:

- Phone… 250-562-1977
- Fax… 250-562-1967
- Email…holand@lmengineering.bc.ca , or

Grant Bain, Manager of Long Range Planning, City of Prince George

- Phone…250-561-7612
- Fax…250-561-7721
- Email…gbain@city.pg.bc.ca

Please return the survey by **July 9th, 2007**. It can be handed in at the public open house, mailed, faxed or hand delivered to:

L&M Engineering Limited – Planning Centre.
1210 Fourth Avenue
Prince George, B.C. V2L 3J4
Fax: 250-562-1967

OR

City of Prince George – Long Range Planning Division
1100 Patricia Boulevard
Prince George B.C. V2L 3V9
Fax: 250-561-7721

UNIVERSITY HEIGHTS NEIGHBOURHOOD PLAN
Second Public Survey

For each statement, please circle the box that best describes your agreement or disagreement and provide any additional comments. You will be best able to respond after attending the **Public Open House to be held on Tuesday, June 28th, 2007 between 7:00 pm and 9:00 pm at the UNBC Bentley Centre** or by reviewing the complete set of plans available on the City's website (**http:/www.city.pg.bc.ca**).

1. The proposed neighbourhood provides a good mix of housing choices (ie. low density single family, townhouses, 4 storey apartments, etc).

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

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2. The proposed Neighbourhood Shopping location and other local convenience shopping opportunities are a benefit to the proposed neighbourhood.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

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3. The University Support Services area provides a desirable mix of land uses for this area.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

4. The number and approximate locations of schools is appropriate.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

6. The trails and open space outlined in the plan provide good connections to the existing trail networks surrounding the plan boundary.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

7. The trails and open space within the Neighbourhood Plan provide good connections within the Neighbourhood.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

8. The parks and open space within the Plan provide good recreational opportunities.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

9. Environmentally sensitive areas and their protection are appropriately addressed in the Neighbourhood Plan.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

10. Wildlife movement has been appropriately addressed in the Plan.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

11. The proposed road network will provide the necessary linkages to promote safe and effective transportation through this and adjacent neighbourhoods.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

12. The proposed pedestrian and cyclist links (road, sidewalk, greenbelt, trail network, and connections to neighbouring areas) are sufficient to promote alternative transportation choices.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

13. Overall, are you pleased with the revisions to the Plan since the first survey was distributed?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

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14. Are there any issues or concerns not covered above that you want to make sure are addressed as part of the University Heights Neighbourhood planning process?

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Thank you for taking the time to respond.

Please mail, hand deliver or fax your completed survey to:

Heather Oland at L&M Engineering Limited – Planning Centre
1210 Fourth Avenue, Prince George B.C. V2L 3J4
Fax: 250-562-1967

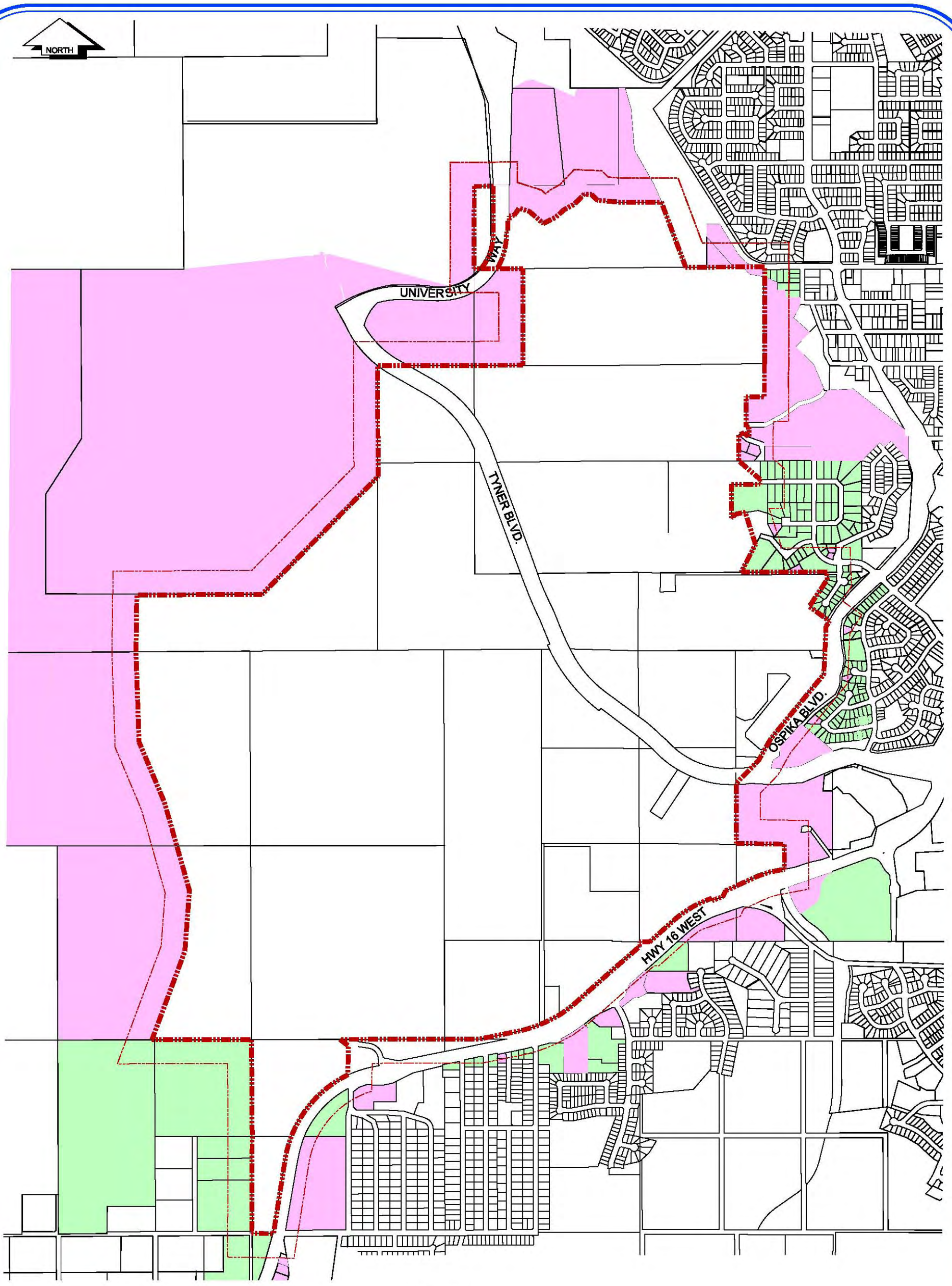
OR

Grant Bain at City of Prince George – Long Range Planning Division
1100 Patricia Boulevard, Prince George, B.C. V2L 3V9
Fax: 250-561-7721

APPENDIX J

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC MAIL-OUT #2
DISTRIBUTION AREAS



LEGEND

- STUDY AREA BOUNDARY
- 100M BUFFER BOUNDARY
- INFORMATION PACKAGE MAILED
- INFORMATION PACKAGE HAND DELIVERED

L&M ENGINEERING LIMITED PLANNING CENTRE
#201 1840 Third Ave.
PRINCE GEORGE, B.C.
V2M 1G4
Tel. (250) 562-1977
Fax (250) 562-1967
holand@lmengineering.bc.ca

JOB No: 1273-01-00
DATE: OCTOBER 2006
DRAWN BY: KLH
SCALE: 1:15,000

UNIVERSITY HEIGHTS NEIGHBOURHOOD PLAN

PUBLIC MAIL OUT DISTRIBUTION AREAS

DWG No
A-F

APPENDIX K

University Heights Neighbourhood Plan
L&M Engineering Limited

NEWSPAPER ADVERTISEMENT #2

ENGINEERING LIMITED
PLANNING CENTRE

Public Open House for the proposed University Heights Neighbourhood Plan to be held at the UNBC Bentley Centre, 3333 University Way, June 28th, 2007 between 7:00 & 9:00 pm

L&M Engineering Limited, on behalf of the University Heights Neighbourhood Plan Steering Committee & Property Owners, is in the process of creating a Neighbourhood Plan for the University Heights area located between UNBC and Hwy 16. This Neighbourhood Plan covers approx 674 ha of land in the fastest growing area of our community and the Public is invited to participate in this second opportunity to participate in the planning process. The development is intended to be an innovative mix of land uses including residential, neighbourhood commercial, and institutional as well as extensive greenbelt, parks, open space and trails. The public open house is an opportunity for residents to review the proposed Neighbourhood Plan and provide input into the planning process. The entire third draft of the Neighbourhood Plan is available online at: http:/www.lmengineering.bc.ca/univ/dwgs.htm.

For more information regarding the development proposal, please contact Heather Oland, Director of Planning with L&M Engineering Limited at 562-1977, or for information regarding the development review process contact Grant Bain, Manager of Long Range Planning for the City of Prince George at 561-7612.

00492225

APPENDIX L

University Heights Neighbourhood Plan
L&M Engineering Limited

PUBLIC SURVEY #2-
SUMMARY OF COMMENTS

University Heights Neighbourhood Plan – Community Survey
An Opportunity to Provide Comment and Input

L&M Engineering Limited and the Steering Committee of the University Heights Neighbourhood Plan (UHNP) are committed to public participation. In order to provide the public with complete information and provide the opportunity for public comment regarding the University Heights Neighbourhood Plan, the following process was undertaken to facilitate the second period of public consultation:

- On Tuesday June 19th, Wednesday June 20th, and Thursday June 21st, L&M Engineering Ltd. hand-delivered over 200 Community Survey Packages to residents of all properties within 100m surrounding the University Heights Neighbourhood Plan boundary. Owners of undeveloped properties were sent a copy of the package by mail. Please refer to **Appendix J: Public Mail Out #2 Distribution Areas** for an outline of the properties receiving the hand-delivery package. The packages included:
    - An introductory letter explaining the University Heights Neighbourhood Plan
    - An explanatory plan
    - An invitation to the Public Open House
    - A survey
    - Direction to the complete Plan available on the L&M Engineering Limited website
- In addition, surveys were distributed at the Public Open House and more were made available online via the L&M Engineering Limited website: http://www.lmengineering.bc.ca/univ/dwgs.htm
- On Friday June 22nd**,** Saturday June 23rd, and Tuesday June 26th, an advertisement announcing the Public Open House and inviting the public to attend was published in the Prince George Citizen (please refer to **Appendix K: Newspaper Advertisement #2**). This advertisement also included direction to the complete Plan available on the L&M Engineering Limited website. L&M Engineering also prepared a press release sent to various media outlets on June 18th 2007 and June 26th 2007.
- On Thursday June 28th 2007, a Public Open House was held at the University of Northern British Columbia Bentley Centre from 7-9pm. The Open House consisted of display drawings and information tables attended by L&M staff (Heather Oland BA. MSc, Terry Fjellstrom P.Eng., Jason Boyes P.Eng., Rebecca Goodenough BA. BPl, Pascal Charest BPl), City of Prince George staff (Grant Bain, Manager of Long Range Planning), and Cathy Makay of EDI Environmental Dynamics. Also available to answer questions, provide surveys, and facilitate the event were Ali Stinson and Claire Negrin of L&M Engineering Limited.

- In attendance at the Public Open House were approximately 45 community members including several Neighbourhood Plan area property owners and the local media.

The following tables represent a compilation of the comments offered by survey respondents, as well as L&M Engineering Limited's responses to the comments. Of the surveys distributed, these remarks represent the interests of the 17 community members who returned the forms.

Question 1 – The proposed Neighbourhood provides a good mix of housing choices (i.e. ½ acre residential, low density single family, townhouses, 4 storey apartments, etc.)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
2			12	4	1	19

Questions and Comments in Response to Question 1

Comments/ Suggestions	Frequency	Response
Eliminate apartments from the plan for esthetic reasons	1	Policy direction contained with the OCP requires the provision of a range of housing options

Question 2 – The proposed Neighbourhood Shopping location and other local convenience shopping opportunities are a benefit to the proposed neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1		3	6	7	2	19

Questions and Comments in Response to Question 2

No comments were provided for this question by the people who returned the survey

Question 3 – The University Support Services area provides a desirable mix of land uses for this area.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
		2	11	4	2	19

Questions and Comments in Response to Question 3

Comments/ Suggestions	Frequency	Response
See no reason for Neighbourhood Shopping Center in this area	1	The OCP contains policy direction for a Neighbourhood Shopping Centre within University Heights. Part of the intention of providing neighbourhood level shopping is to encourage alternative transportation choices and an active lifestyle.
It will be nice to have services close to the University	1	

Question 4 – The number and approximate locations of schools is appropriate.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
	2	6	7	3	1	19

Questions and Comments in Response to Question 4

Comments/ Suggestions	Frequency	Response
SD.57 will not be able to sustain the number of schools in the plan, must be reduced to 2 elementary schools	2	SD 57 has been consulted as part of the planning process and has indicated that they are considering alternative school forms. The Plan needs to set aside enough land for current school models to service the estimated population.

Question 5 – The trails and open space outlined in the plan provide good connections to the existing trail networks surrounding the plan boundary.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1		1	7	8	2	19

Questions and Comments in Response to Question 5

Comments/ Suggestions	Frequency	Response
Trails and open spaces inadequate above Charella Dr.	1	The intent of the trail plan is to provide good trail connections throughout the neighbourhood.
Prince George Equestrian Society would like to see a circle route from exhibition grounds to Blue Spruce and back.	1	A circle route has been illustrated on the trails plan.
Early Plans look good very good. Lot plans for phase 2, however, do not show and trails and show greenspace as potential for light industrial use.	1	The Plan does not contain any proposed Industrial use. Trails will be included on the more detailed lotting plans for Phase 1.

Question 6 – The trails and greenspace within the Neighbourhood Plan provide good connections within the Neighbourhood.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
2			8	8	1	19

Questions and Comments in Response to Question 6

Comments/ Suggestions	Frequency	Response
It seems so, but until layouts are shown it's hard to say	1	The intention of the trail plan is to show conceptual connections throughout the neighbourhood. Detailed design will provide trails based on the policy recommendations within The Neighbourhood Plan.
Prince George Horse Society would like to see a circle route enabling them to go from the exhibition grounds to Blue Spruce and back	1	A circle route has been illustrated on the trails plan.
"Paved Trail System" should be included in the Plan to connect parks, houses, greenbelt	1	This is already included in the trails plan. Refer to section 3.3.5 of the Plan points 8, 9 and 10.

Question 7 – The parks and open space within the Plan provide good recreational opportunities.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	1		12	4	1	19

Questions and Comments in Response to Question 7

Comments/ Suggestions	Frequency	Response
Trails and open spaces are non-existent in the plan except on steep land not suited for development.	1	229 ha or 34% of the total plan area is dedicated to parks, trails, and open spaces.

Question 8 - Environmentally sensitive areas and their protection are appropriately addressed in the Neighbourhood Plan.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	2	3	5	7	1	19

Questions and Comments in Response to Question 8

Comments/ Suggestions	Frequency	Response
The extension of Massey Dr. and University Way come close to Riparian areas and should be avoided if possible	1	The City's transportation modeling work will determine if Massey Dr. extension is required. Detailed design will have to balance geotechnical, grade, and riparian issues.
More preservation needed above Charella Dr. and Bona Dea for wildlife use	1	The area is designated for urban development. Unsafe interaction between people and wildlife should be discouraged.
Important for this area of town and felt it was given a good amount of thought and planning	1	

Question 9 - Wildlife movement has been appropriately addressed in the Plan.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	1	3	8	4	2	19

Questions and Comments in Response to Question 9

Comments/ Suggestions	Frequency	Response
Development will drive larger animals out of the area. When large animal movement does occur, the wildlife corridors used and mitigation measures will need to be taken	1	This is also the conclusion of the Wildlife Habitat Assessment.
Hillside corridor too narrow above Charella Dr.	1	Wildlife Habitat Assessment reports recommends appropriate distances.
Very important and was addressed appropriately	2	
One area in the southwest corner of Plan does not seem adequate to serve the entire plan.	1	The Plan contains almost 29% greenbelt, riparian areas, and wildlife corridors.

Question 10 - The proposed road network will provide the necessary linkages to promote safe and effective transportation through this and adjacent neighbourhoods.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	1		9	6	2	19

Questions and Comments in Response to Question 10

Comments/ Suggestions	Frequency	Response
The extension of Massey Dr. is not necessary	1	This will be determined by the City of Prince George network modeling.
No need to extend Bona Dea. Increase in traffic should not affect existing neighbourhoods	1	Bona Dea is not proposed for extension.
The major links shown will benefit the City	1	

Question 11 - The proposed pedestrian and cyclist links (road, sidewalk, greenbelt, trail network, and connections to neighbouring areas) are sufficient to promote alternative transportation choices.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
1	1	3	5	6	3	19

Questions and Comments in Response to Question 11

Comments/ Suggestions	Frequency	Response
Greenbelt & Trail Network is inadequate	1	229 ha or 34% of the total plan area is dedicated to parks, trails, and open spaces.
Provide for cyclist links on all proposed road links leading to UNBC	1	An off-street trail has been included along Tyner Blvd. The City of Prince George designates all other cycling routes.

Question 12 - Overall, are you pleased with the revisions to the Plan since the first survey was distributed?

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No Response	Total
2		1	6	3	7	19

Questions and Comments in Response to Question 12

Comments/ Suggestions	Frequency	Response
No improvement in which the Plan infringes on Charella Dr. and Bona Dea.	1	The development area is separated from Charella and Bona Dea by significant slopes. Land use impacts are not expected in those areas.
Not if the lot plans are the current ones.	1	Preliminary lotting of Phase 1 has been completed, but not finalized.

Question 13 - Are there any issues or concerns not covered above that you want to make sure are addressed as part of the University Heights Neighbourhood planning process?

Questions and Comments in Response to Question 13

Comments/ Suggestions	Frequency	Response
There are no provisions for churches/ houses of worship in the Plan	1	The Plan dedicates 2.5% of the area for institutional uses and siting criteria for Places of Worship is provided.
Availability of Medical and Dental Facilities	1	Medical and Dental facilities are permitted in University Support Services, Neighbourhood and Local Commercial.
Don't want a "Lower Mainland" Neighbourhood that have cookie cutter houses with no trees or yards	1	
More explanation of Green Concepts	1	Pilot projects for alternative development standards are being considered.
Will the lots be developer constructed homes or will home-owners be able to develop? If so, what is the time frame for this?	1	Combination of the two. Construction is estimated to begin in the Spring of 2008.

APPENDIX M

University Heights Neighbourhood Plan
L&M Engineering Limited

LAND USE & POPULATION CALCULATIONS

Land Use and Population Calculation Spreadsheet

Table 1 - Land Use Allocation by Area

	Gross Area (ha)	5% Parks (ha)	2.5% Institutional (ha)	14% Roads (ha)	1% Neighbourhood Commercial (ha)	0.75% Local Commercial (ha)	Existing Visitor Commercial (ha)	Highway Commercial (ha)	University Support Services (ha)	First Nations Institutional (ha)	Greenspace (ha)	Riparian Area (ha)	Off-Street Trail	Net Residential Area (ha)	Net Residential Area as % of Gross Area
Total Area	**674**	**34**	**17**	**94**	**10**	**5**	**12**	**6**	**10**	**0**	**161**	**33**	**1**	**291**	**43**
Area One	97	5	2	14	0	1	0	0	0	0	54	0	0	21	21
Area Two	141	7	4	20	10	1	0	0	10	0	13	14	0	63	44
Area Three	131	7	3	18	0	1	0	0	0	0	46	6	0	49	38
Area Four	166	8	4	23	0	1	0	0	0	0	34	7	0	88	53
Area Five	139	7	4	19	0	1	12	6	0	0	14	6	0	70	50

Table 2 - Dwelling Units by Housing Mix and Area

	Residential Designation	Net Residential Area (ha)	% of Total Dwelling Units	% of Total Area	Total Area (ha)	Dwelling Units per hectare	Number of Dwelling Units	Total Dwelling Units
Total Area	**Single Family**	**291**	**64**	**84**	**244**	**10**	**2440**	**3850**
	Multiple Family		**36**	**16**	**47**	**30**	**1410**	
Area One	Single Family	21	50	76	16	10	160	310
	Multiple Family		50	24	5	30	150	
Area Two	Single Family	63	60	82	52	10	520	850
	Multiple Family		40	18	11	30	330	
Area Three	Single Family	49	65	85	42	10	420	630
	Multiple Family		35	15	7	30	210	
Area Four	Single Family	88	65	85	75	10	750	1140
	Multiple Family		35	15	13	30	390	
Area Five	Single Family	70	65	85	59	10	590	920
	Multiple Family		35	15	11	30	330	

Table 3 - Population by Area					
	Residential Designation	Total DU (d.u.)	Persons per Dwelling Unit	Total Population	
Total Area	**Single Family**	**2,440**	**3.2**	**7808**	**11,333**
	Multiple Family	**1,410**	**2.5**	**3525**	
Area One	Single Family	160	3.2	512	887
	Multiple Family	150	2.5	375	
Area Two	Single Family	520	3.2	1664	2,489
	Multiple Family	330	2.5	825	
Area Three	Single Family	420	3.2	1344	1,869
	Multiple Family	210	2.5	525	
Area Four	Single Family	750	3.2	2400	3,375
	Multiple Family	390	2.5	975	
Area Five	Single Family	590	3.2	1888	2,713
	Multiple Family	330	2.5	825	

Table 4 - People per Gross Hectare and People per Net Hectare					
	Total Population	Gross Area (ha)	Net Residential Area (ha)	People per Gross Hectare (ha)	People per Net hectare (ha)
Total Area	**11,333**	**674**	**291**	**17**	**39**
Area One	887	97	21	9	43
Area Two	2,489	141	63	18	40
Area Three	1,869	131	49	14	38
Area Four	3,375	166	88	20	38
Area Five	2,713	139	70	20	39

Table 5 - Elementary Schools by Area					
	Dwelling Units	Average Students/ Dwelling Unit	Number of Elementary-Aged Students	Average Students/ Elementary School	Elementary Schools
Total Area	**3,850**	**0.4**	**1,540**	**400**	**4**
Area One	310	0.4	124	400	0
Area Two	850	0.4	340	400	1
Area Three	630	0.4	252	400	1
Area Four	1,140	0.4	456	400	1
Area Five	920	0.4	368	400	1

Table 6 - Secondary Schools by Area

	Dwelling Units	Average Students/ Dwelling Unit	Number of Secondary-Aged Students	Average Students/ Secondary School	Secondary Schools
Total Area	**3,850**	**0.28**	**1078**	**1,100**	**1**
Area One	310	0.28	87	1,100	0
Area Two	850	0.28	238	1,100	0
Area Three	630	0.28	176	1,100	0
Area Four	1,140	0.28	319	1,100	0
Area Five	920	0.28	258	1,100	0

Table 7 - Neighbourhood Park Acquisition Standard (2 ha/ 1,000 Residents)

	Total Population	2 ha/ 1,000 Residents	Neighbourhood Parks (ha)	Number of Neighbourhood Parks
Total Area	**11,333**	**0.002**	**23**	**11**
Area One	887	0.002	2	1
Area Two	2,489	0.002	5	2
Area Three	1,869	0.002	4	2
Area Four	3,375	0.002	6	3
Area Five	2,713	0.002	5	3

Table 8 - District Park Acquisition Standard (1ha/ 1,000 Residents)

	Total Population	1 ha/ 1,000 Residents	District Parks (ha)	Number of District Parks
Total Area	**11,333**	**0.001**	**11**	**2**
Area One	887	0.001	1	0
Area Two	2,489	0.001	2	1
Area Three	1,869	0.001	2	0
Area Four	3,375	0.001	3	1
Area Five	2,713	0.001	3	0

APPENDIX N

University Heights Neighbourhood Plan
L&M Engineering Limited

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