REGIONAL DISTRICT OF NANAIMO
PROJECT NUMBER: CA0031245.2853

GEOHAZARD ASSESSMENT
AND RISK PRIORITIZATION STUDY

FINAL

JULY 09, 2025

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REGIONAL DISTRICT OF NANAIMO

FINAL REPORT – REV 1

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Regional District of Nanaimo (RDN) retained WSP Canada Inc. (WSP) to undertake a Geohazard Risk Prioritization Study within the District. The study was of a desktop nature and was carried out under the terms of a contract between the RDN and WSP, dated February 28, 2024.

The primary objective of the study, which was adjusted through several discussions between RDN and WSP over the course of the project, was to identify, map, and characterize steep slope hazards within those portions of the RDN zoned for potential land development. The intent of the study is to develop mapping to assist the RDN to assess geohazard risks for new or existing developments, and to support planning decisions to manage possible adverse consequences in relation to public safety and economic loss to property and infrastructure.

This Report presents the following:

- Scope and methodology of the study;
- Summary of reviewed background information for the study area;
- The results of the geohazard assessment;
- Guidance on interpretation of hazard mapping; and
- Recommendations for risk management and future work.

Appended to this report are the standard limitations, a detailed list of study limitations, and a bibliography. This report was revised following commentary from the RDN and has been released as Revision 1.

Geohazard maps are provided in Appendix A (map data has also been provided to the RDN in digital format). The accompanying data table, providing additional details to the mapped data, is provided in Appendix B.

1.2 SCOPE

The scope of the desktop study included the following tasks:

1. Delineation of the study area;
2. Aggregation and review of data sources to support the study (topographic data, geological mapping, aerial imagery, historical studies and previous geotechnical reports);
3. Development of a hazard assessment framework and methodology to map and categorize geohazards within the study area;
4. Mapping of geohazard polygons and recommended buffer zones within the study area;
5. Preparation of the geohazard assessment report, including a summary of findings, geohazard maps (including digital submission of hazard polygons for integration into the RDN's web mapping system), and recommendations for further work;
6. Development of workshops to present the findings of the study to the RDN.

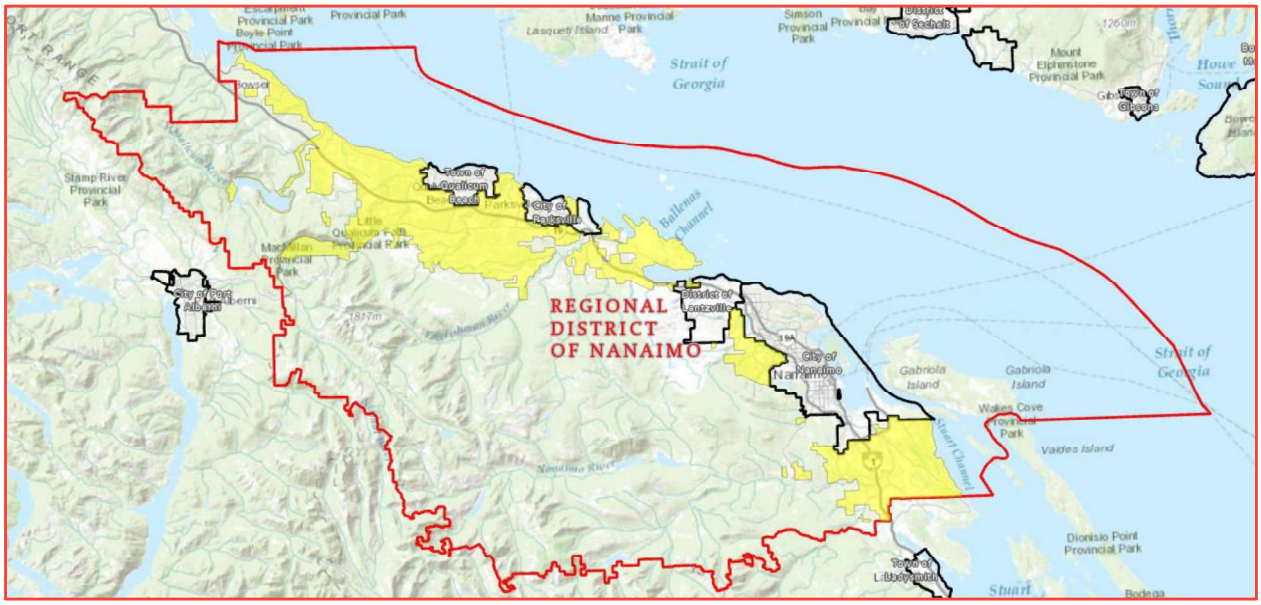
The study area was determined in collaboration with the RDN, covering parts of RDN's electoral areas A, C, E, F, G, and H, as shown in Figure 1, covering an area of approximately 150 km^2 (excluding from the study area the limits of towns and Cities, and forestry lands).

The geohazard assessment was limited to potential steep-slope hazards including the following:

- Unconsolidated (soil) slopes: landslides, debris flows, earthflows
- Rock slopes: rockfalls, topples, rockslides
- Snow Avalanches

The mapping scale to designate the geohazard polygons was targeted at about 1:5,000 (1 cm = 50 m). At this scale, the minimum mappable feature was about 50 x 50 m or, for a linear feature such as a steep bank, about 15 m long on the ground (about 3 mm wide at the map scale).

Figure 1: Study Area Extents. The below map excerpt shows extents of the RDN, as well as the study area consisting of developable lands (yellow) defined by the RDN, with excluded communities of Qualicum Beach, Parksville, Lantzville, and Nanaimo outlined in black.



The RFP originally submitted by the RDN included a risk-based component to the study intended to consider possible geohazard consequence. After initial discussions between the RDN and WSP, the study was adjusted to focus on identifying, mapping, and classifying geohazard areas, without quantifying consequences and, therefore, risk. The rationale to focus on the mapping of hazard rather than risk was to better support the RDN's primary aim to produce mapping to assist in guiding land development and in identifying the requirements for technical studies that might be needed in support of the development approval process.

Note that from an engineering perspective:

Risk = Hazard x Consequences (presuming that hazard is triggered)

As such, a "risk" based polygon could change in severity depending on whether the land was developed or not, despite being susceptible to the same level of hazard.

While consequences (and risk) have been excluded from the mapping component of this study, the Report includes risk-based discussion and guidance, along with recommendations for a risk-assessment framework for consideration in the land development approval process. It is noted that while the mapped hazard polygons provide basic information relevant to developments upslope and downslope of the hazard zone, the mapping is specifically not intended to be used by third parties on a site by site basis but rather to assist the RDN in their role in development approvals to identify whether further detailed studies may be required in support of the land development approval process.

2 BACKGROUND INFORMATION

2.1 ADMINISTRATION

The majority of the RDN's territory adjacent or in close proximity to the major steep river valley slopes that cut through the Coastal Plain is zoned Agriculture (AG) or Resource Management (RM), with some areas zoned Rural Residential (RR). A few Residential (RS) and other developable land use zones are also present in these areas, mostly concentrated near the river deltas closer to the coastline. The Big Qualicum River has a dedicated Institutional (IN) zone along most of the valley floor.

Most of the land along the coastline is zoned Rural Residential (RR), Residential (RS), with a few commercial (C) zones.

Around Horne and Cameron lakes, the land use zones include the Horne Lake Comprehensive Development zone (CD10), Forestry Resource lands (FR), and several Recreation (RC) zoned areas.

The RDN has seven Electoral Areas representing unincorporated communities across the district. Only Electoral Area B (Gabriola Island) was excluded from this study. Under the legislative framework of the Local Government Act, each Electoral Area is able to adopt an Official Community Plan (OCP) to describe the broad objectives and policies of the Electoral Area. That plan provides opportunity for the Electoral Area to identify and place restrictions on the development of lands that are considered environmentally sensitive or subject to a hazard. As enabled by the Local Government Act within the scope of the OCP's, the RDN can designate Development Permit Areas (DPA's) that identify lands that are considered environmentally sensitive or hazardous within which a Development Permit is required prior to advancing the land development process towards subdivision or building permit. WSP's review of the current status of the RDN's Development Permit Areas for hazardous lands identified several Electoral Areas with DPA designations primarily focussed on environmental protection and flooding hazard. DPA considerations related to steep slope and landslide hazard were identified only in Electoral Areas G and H and the level of detail appeared preliminary in nature.

The RDN's general Land Use Bylaw (2500) applies to Electoral Areas A,C,E,G and H and provides the administration to regulate development within the Development Permit Areas identified in the respective OCP's. This includes the regulation for building setbacks from watercourses and the coast, as detailed in Schedule 3E. Bylaw 1285 applies to Electoral Area F. Setback requirements in the RDN by-laws are specified as a minimum distance measured from the "natural boundary" of a watercourse, or from the top-of-bank. WSP's review indicated that in the absence of a defined DPA for hazardous lands, there appeared to be uncertainty in the application of the land use bylaws related to landslide hazards.

The RDN also provides additional guidance in the Sustainable Site Planning Guide (2020), including reference to publicly available contour mapping, air photos, and other data to assist owners and developers in planning their developments.

2.2 PHYSIOGRAPHY

The study area falls within the geographical area generally referred to as the Nanaimo Lowlands (Yorath and Nasmith 1995), also called the Coastal Plain, with the inclusion of Horne and Cameron Lakes, which fall in the eastern part of the North Vancouver Island Ranges. The study area spans about 80 km between Deep Bay and Quennell Lake, and in most areas extends less than 10 km inland from the Strait of Georgia.

The Nanaimo Lowlands region, a part of the Georgia Depression (Bednarski 2015), is relatively flat to undulating (typically <60 m relief), with elevations reaching up to approximately 200 m amsl. The lowland is incised by several rivers and streams, including (north to south) Nile Creek, Big Qualicum River, Little Qualicum River, French Creek, Englishman River, and Nanaimo River, which flow from the mountain ranges in the west to the Strait of Georgia in the east.

The North Vancouver Island Ranges form the central and largest part of Vancouver Island, with steep mountains, deep fjords and inlets along the west coast. The study area encroaches into the eastern part of the mountains around Horne and Cameron Lakes, with elevations reaching up to 1,150 m.

Both areas have been modified by Pleistocene glaciation that rounded and smoothed the lowlands and carved steep valleys and fjords in the mountain ranges (Guthrie 2005). Further terrain modifications included subsequent marine inundation and downcutting by streams across the area.

2.3 GEOLOGY

2.3.1 BEDROCK

Bedrock throughout the Nanaimo Lowlands portion of the study area typically consists of sedimentary bedrock including shale, sandstone, coal and conglomerate belonging to the Nanaimo Group. Exceptions occur in the central and western parts of the study area, where older volcanic rocks are present. The bedrock surface has been extensively eroded by glaciers, creating an irregular bedrock surface, resulting in a series of what have been described as "cuesta-like" ridges and longitudinal valleys, which are more apparent in areas with a thin cover of overburden – for example, around Quennell Lake (Halstead 1963, Bednarski 2015). The ridges are mostly comprised of sandstone and conglomerate beds, and the valleys are underlain by shales or align with fault zones. The general northwest-southeast orientation of these features is coincident with the movement of the glaciers in past glaciations. Bednarski notes that most of the rivers passing through this region have nick points (sudden changes in river profile, like waterfalls or lakes), coinciding with bedrock faults as well as surficial glacial features.

Vancouver Island also has a high concentration of karst topography (bedrock characterized by dissolution of carbonate rocks, resulting in formation of features like caves and sinkholes). Within the RDN, mapped areas of karst are limited to areas around Horne Lake (such as the Horne Lake Caves). However, other mapped areas of limestone deposits occur with karst potential (notably, the area surrounding Dolphin Beach) (Stokes et al. 2010).

Vancouver Island is subject to major seismic effects due to its proximity to several tectonic plate boundaries and the underlying subduction zone (seismic issues are not within the scope of this report). Earthquakes are due in part to the subduction of the Juan de Fuca plate beneath the North American plate, as well as faulting in the overlying and underlying plates. The largest earthquakes are the "megathrust" earthquakes (magnitude 8 to 9), originating at the subduction zone, the most recent of which was the M9.0 Cascadia earthquake of 1700. The average recurrence interval of these large earthquakes is about 500 years, though intervals of less than 200 years have been estimated. Crustal or sub-crustal earthquakes occurring within the North American plate or the subducting Juan de Fuca plate, respectively, tend to have lower magnitudes (7 to 7.5) but are estimated to occur roughly every 30-40 years (Clague and Bobrowsky 1999).

While detailed review of seismic issues is beyond the scope of this report, it should be noted that some geohazards including slides, liquefaction failures, rock movements, and rock fall, may be triggered by seismic movements. Major rock falls and liquefaction failures occurred at various locations along the east side of Vancouver Island during an earthquake in 1946.

2.3.2 SURFICIAL GEOLOGY

Most surficial geological information available for subject area follows the work of Fyles (1963) and Halstead (1963), and subsequently advanced by J.J. Clague. Bednarski (2015) describes the Coastal Plain region as being mantled by thick unconsolidated materials of variable thickness, discontinuous strata, and frequent bedrock outcrops. The surficial soil units primarily comprise deposits from two glaciations (Dashwood, followed by Vashon Drifts) which are separated by non-glacial fluvial and marine sediments (Cowichan Head and Quadra Sediments). Post glacial marine inundation and subsequent down cutting are responsible for a range of more recent marine and fluvial deposits. Many of the materials are locally derived from underlying materials, nevertheless some materials

have been transported great distances by the glaciers. The pertinent soil units, as described by Bednarski, are listed below, in chronological order of deposition (oldest to youngest):

- **Dashwood Drift (pre-glacial)**: Glacial deposits of sandy to silty diamicton (till) containing silt and gravel lenses, overlain by glaciomarine stony silts and clay with sand lenses and shells. The till has been found to be locally underlain by glacial deposits of sand, silt, clay and minor gravel called "Mapleguard Sediments".
- **Cowichan Head**: Marine stony clay, silt, and shells; overlain by marine to fluvial pebble-gravel and peat, with pebbles and wood.
- **Quadra Sand**: Glaciofluvial stratified well sorted sand, minor gravel and silt, locally organic-rich (near base).
- **Vashon Drift**: Glacial sandy to clayey diamicton (till), overlain by Glaciofluvial / ice contact deposits consisting of poorly sorted, stratified gravels, sands, and silt; kames and kame deltas.
- **Capilano Sediments (post-glacial)**: Glaciomarine to marine stoney silt, sand, and clay containing marine shells and are wood; overlain by glaciofluvial to fluvial stratified sand and gravels and deltaic sediments and channel floodplain deposits; overlain by alluvial fans of poorly sorted gravels and colluvium.
- **Salish Sediments**: Fluvial deltaic and channel floodplain deposits of stratified gravel, sand and silt and peat.

Pre-Vashon and Quadra Sediment deposits tend to be exposed at the ground surface only along exposed sea cliffs and steep river valleys.

2.4 CLIMATE

Under the Koppen classification, the RDN falls within the warm-summer Mediterranean group (Csb) (Beck et al. 2023).

A brief summary of climactic conditions based on PCIC (2023) is provided below. The referenced report should be referred to for greater detail.

Average annual precipitation varies significantly spatially throughout the RDN, as well as exhibiting seasonality (wet winters and dry summers), and a high degree of year-to-year variability. Annual rainfall amounts within the RDN average from under 1,000 to over 3,500 mm. Within the Coastal Plain, which makes up the majority of the study area, precipitation is relatively lower than the western part of the RDN. Here, annual rainfall typically averages 1,000 to 1,500 mm, and snowfall about 380 mm.

Atmospheric Rivers (Zhu and Newell 1994) have been recently recognized as major contributors to high intensity precipitation events. There is evidence that these events may be becoming more frequent due to climate warming. Atmospheric rivers are increasingly recognized as a major element with respect to triggering of erosion and other geohazards.

Temperatures are reported to average -0.5 to 4°C in the winter, and 10 to 20°C in the summer (nighttime lows and daytime highs, respectively).

The PCIC's climate projections (temperature and precipitation) suggest the following trends for the coming decades:

- Total annual precipitation is expected to rise 5% by the 2050's and 11% by the 2080's, with the expectation of a higher rate of occurrence of extreme monthly rainfall amounts (potentially 600 mm, or 100-200 mm more than current monthly peaks).
- More precipitation during heavy rainfall events (1-in-20 year maximum 1-day and 5-day rainfalls expected to rise by about 20-30%).
- Snowfall expected to drop by 56% by the 2050's and 76% by the 2080's.

- Frost days (days with daily minimum <0°C) decreasing by 42 % from 83 days by 2050s, and 59% by 2080s (variability between lowland and highland areas should be noted).
- Annual average temperatures increasing by 2.4° by 2050s and about 3.8° by 2080s.

2.5 SEA LEVELS AND COASTAL FLOODING

Based on data from the Nanaimo Harbour tide station (07917) the sea water levels range from 0.02 to 5.02 m (LLWLT and HHWLT, respectively), with the mean water level at 3.08 m (relative to chart datum).

The above figures correspond to a range of -3.94 m to 2.06 m with respect to mean sea level (MSL).

A coastal floodplain mapping study, carried out for the RDN by Ebbwater Consulting (2021), provides coastal flood maps based on a Flood Construction Level (FCL). The FCL's ranged from about 5 to 11 m (the FCL includes wave runup effects accounting for up to 7 m, sea level rise of +1 m, storm surge of up to +1 m, and freeboard of +0.6 m)

A sea level rise study was also carried out by the City of Nanaimo (Associated Engineering 2018). For future projections, AE recommended adjustments of +0.38 and +0.88 m to account for expected sea level rise (SLR) for the years 2050 and 2100, respectively. Taking into account an SLR adjustment of land uplift of the east coast of Vancouver Island, and incorporating a +1.25 m storm surge (for 200-year conditions) AE provided a designated flood level (DFL) of 3.31 m (based on 2018 data) and projected water levels of +3.57 and +3.98 for the years 2050 and 2100 (the DFL excludes wave effects and freeboard). Note that in the event of a major subduction earthquake, additional vertical terrain movements (rise or drop) may be expected.

The rivers and creeks throughout the RDN are also subject to seasonal floods. Recent flood assessments and maps have been produced for the Englishman River (2021), Little Qualicum River (2022), and Nanaimo River (2023) by Kerr Wood Leidal (KWL).

3 METHODOLOGY

3.1 REVIEW OF AVAILABLE DATA

Data to support this study has been collected primarily from publicly available resources as well as data and private reports provided by the RDN. Table 1, below, lists the data and data sources which have been obtained by WSP and assessed, together with how the data was used during the study. Only data that was deemed relevant to the project has been included in the list.

Table 1: Summary of Reviewed Data Sources

Data	Sources	Usage
Topographic Data		
LiDAR Point Cloud	LidarBC – partial LiDAR coverage of study area, 1 m resolution, c. 2019.	Base topographic model providing partial coverage of the study area in a high level of detail, used to produce a digital elevation model hillshade and contour overlay to assess the terrain, slopes, ravines, recent and historic landslides, and other relevant topographic features.
"High Resolution Digital Elevation Model" (HRDEM)	NRC - partial DEM coverage of study area, based on 1 m resolution LiDAR, c. 2018-2019.	Same as above, used in areas with no LidarBC coverage.
RDN's Digital Elevation Model	RDN – origin uncertain, 2x2 m cell size with 1 m elevations, data c. 2017.	Alternative topographic model in less detail providing full coverage of the study area, used to supplement the other datasets where there was no coverage.
Aerial Imagery		
Historical aerial imagery	RDN Archive – 1967 to 2002 Stereo photographs / prints.	Identification of historical slope instabilities, rockfalls, earthflows, shoreline loss, river channel stability, human activity, and other topographic changes.
	RDN Selected Orthophotos – 1996, 2007, 2012, and 2016 in digital form.	
Geological / geotechnical data		
Previous geotechnical assessment reports	RDN Archives – package of geotechnical assessments produced by various consultants provided by the RDN.	Identification of soil conditions, geohazards, historic instabilities, and relevant processes at sites subject to the assessments (primarily available in coastal areas).
Surficial Geology Mapping	Geological Survey of Canada – Surficial Geology Maps *Horne Lake – Parksville* (Open File No.	Identification of soil conditions, some geohazards, and some relevant processes. Surficial geology (along with topography)

Data	Sources	Usage
	7681, shapefile) and *Nanaimo* (Map 27-1963, PDF).	is one of the key inputs used in assessing geohazard risks and likelihood of occurrence.
Bedrock Mapping	BC Geological Survey Open File 1994-6 (digital map / shapefile)	Geology is one useful input to the overall identification of some geohazards and relevant bedrock-governed processes (e.g. rockfalls, block toppling).
Previous landslide inventories and studies, and technical journals (various)	Published reports, studies, and technical journals, including: *Flooding and Landslide Events Southern British Columbia 1808-2006* (September 2007) (BC Ministry of Environment) *Terrain Stability Mapping on British Columbia Forest Lands: A Historical Perspective* (Schwab and Geertsema 2008) (BC Ministry of Forests and Range) *Geomorphology of Vancouver Island: Mass Wasting Potential* (Guthrie 2005) (BC Ministry of Environment) Others listed in reference section.	Identification of the locations and nature of historical / current slope instabilities and slope-related hazards, and approaches used to evaluate hazards and risks in areas with comparable terrain and geology to the RDN.
Cadastral data (selected legal / administrative polygon overlays)		
Developable Areas	RDN Spatial Data	Used to establish the extents of the study area. The area was buffered based on topography to include potential geohazards which may originate outside the study area (for example, rockfall runout zones).
Crown Lands	RDN Spatial Data	Included for reference. Some crown lands were included within the buffer area as discussed above.
Private Managed Forestry Lands	RDN Spatial Data	Included for reference. Generally excluded from study area except where “developable areas” may overlapped with Forestry lands. May be within the buffer areas as above.
Streams and Rivers polygons	BC Freshwater Atlas (FWA)	Supplemental digital elevation model to help identify areas exposed to long-term reduction in slope stability due to erosion, particularly lateral erosion.

Data	Sources	Usage
Climate / flood/ sea level data		
Historical climate data, climate change estimates	Climate Projections for the Regional District of Nanaimo, Pacific Climate Impacts Consortium (2023).	To assist in forecasting future change in hazard/risk levels based on climate change estimates (e.g. high intensity precipitation).
Flood / sea level studies	Englishman River Flood Mapping (KWL 2021) Little Qualicum River Flood Hazard Mapping (KWL 2022) Nanaimo River Flood Hazard Mapping (KWL 2023) Coastal Floodplain Mapping (Ebbwater 2021) City of Nanaimo Sea Level Rise Flood Study (AE 2018)	To assist in identifying areas vulnerable to toe-erosion along river channels and the sea coast.
Other data		
Professional Practice Guidelines	*Landslide Assessments in British Columbia* (EGBC Professional Practice Guidelines 2023, v 4.1)	To assist in selection of engineering methods and techniques to be used for the study, and conformance to standard practice. Note that the Guidelines apply to assessments of local areas or properties and were not formulated for regional studies.
Hazard and Risk Vulnerability Analyses (HRVA)	RDN HRVA (2021)	Reports were reviewed to assist in the development of an appropriate hazard assessment framework suitable for the RDN.
Reference geotechnical risk assessment reports from BC Interior Region	RDN – Various reports prepared by geotechnical consultants	

3.2 GEOHAZARD ASSESSMENT

3.2.1 HAZARD ASSESSMENT FRAMEWORK

A preliminary review of available LiDAR data (LidarBC) showed that the LiDAR provided sufficient detail to assess and map all terrain features, where coverage existed (the majority of the study area). As such, our assessment of steep slope hazards relied heavily on the review of a three dimensional digital elevation model (DEM) generated from the LiDAR point cloud, and was supported by overlays of surficial geological maps, historical aerial imagery, and other data.

Following a high-level review of the DEM and other data available for the study area, and subsequent discussions with the RDN, the following hazard assessment framework was developed.

1. Based on topographic data, the study area was filtered to identify slope features which were steeper than 15° (30%) and/or greater than 5 m in relief, to broadly identify target areas within the RDN that may be subject to steep slope related hazards. Lesser features were assessed on a case-by-case basis and included in the mapping where deemed appropriate.
2. Data for identified slope features (such as river valleys, coastlines, and others slopes) was reviewed to assess land form characteristics, history, and present state of these slopes (noting signs of historical instabilities, and potential active processes such as erosion, gullying, retrogression, etc.).
3. The slope features were delineated by polygons representing areas with similar physical characteristics that were expected to generally show similar behaviour.
4. For each polygon, the relevant "primary" geohazard type (e.g. debris flow, rockfall etc.) was identified based on a combination of the geomorphology of the area, surficial geology mapping, historical reports, and WSP's local knowledge.
5. Each polygon was assessed a likelihood of occurrence of the identified geohazard (on a 3-level qualitative scale of low, medium and high), and together with key triggers of the primary geohazard.
6. Key characteristics of each polygon were recorded in a data table (information included as attributes of the digital map polygons).
7. Active/existing slope instabilities and evidence or signs of historic instabilities identified from the data were marked on the map using scarp type symbols.

Mapping of polygons aimed for a minimum resolution of approximately 20 m, which was considered appropriate for this planning level study. In most areas covered by the LidarBC or HRDEM data, the resolution was exceeded.

3.2.2 GEOHAZARD TRIGGERS

In the context of this study, a trigger is identified as any event or process which results in the occurrence of the geohazard. The identified key triggers of instabilities included the following:

1. Heavy and/or prolonged precipitation events (rainfall, spring snowmelt)
2. Active erosion processes (stream or coast bank toe erosion)
3. Time-dependent strength loss
4. Human activity
5. Forest Fires
6. Groundwater changes
7. Seismic shaking

Triggers 1 to 3 above were considered in the scope of this study. Specifically, seismic shaking leading to landslides, rockfall or lateral spread of liquified soil deposits was excluded from WSP's scope of work.

For this assessment, WSP made the following pragmatic generalizations to select an appropriate key trigger for a given area:

- Where a triggering process (such as toe erosion) was present, or could be imminently present, it was typically identified as the key trigger for a given polygon.
- Slides on soil slopes not subject to toe erosion were generally deemed to be most likely triggered by a high precipitation or precipitation/snowmelt event, with the likelihood of triggering for a given precipitation event generally depending on the soil conditions and geometry of the slopes.
- Geohazards within exposed bedrock slopes not subject to toe erosion were typically considered most likely to be triggered by high precipitation, erosion, tree root displacement, or time-dependent strength loss including weathering.

The above assumptions were checked and adjusted using historical records and topographic and photographic evidence of past instabilities.

Further discussion of the geotechnical aspects of triggers is provided in Section 4.2.3.

3.2.3 LIKELIHOOD OF HAZARD OCCURRENCE

Likelihood of occurrence of the identified primary hazard in each of the mapped polygons was qualitatively assessed on a three-level scale (high, medium, low) based on geomorphology, geometry, surficial geology mapping, historical reports, and WSP's local knowledge. The mapped polygons were colour coded red, orange, and green corresponding to our assessment of high, medium and low likelihood of occurrence, respectively. The designation of "high", "medium", and "low" hazard likelihood was considered within the lifespan of typical developments (~100 years). Low hazard areas can generally be thought of as "indefinitely stable" for the lifespan of a typical development (excluding consideration of Triggers 4 to 7 referred to above), medium hazard areas as "possibly unstable", and high hazard areas as "likely unstable".

A notional estimate of Annual Occurrence Probability (AOP) was provided for each of the three levels of likelihood of occurrence, as shown in Table 2. These estimates are intended to be used as a general guide, and are not intended for quantitative risk-based decision making.

Table 2, provides the general criteria that were considered in assessing the likelihood of hazard occurrence. Due to the qualitative nature of the assessment, these should be viewed as broad characteristics, and some areas may have assigned ratings not completely consistent with this table due to other factors.

Table 2: Hazard Likelihood of Occurrence – Generalized Criteria

Hazard likelihood of occurrence (qualitative)	General Description	Representative slope characteristics	Notional Annual Likelihood of Occurrence (Return Period)
High	Steep slopes which show signs of active or recent instability, and areas experiencing some active degradational process (e.g. slope toe erosion on coastlines or ravines), which are expected to be frequently trigger instabilities. The designation considers climate change considerations of increased precipitation and sea level rise.	Typically >35° steep for soil slopes, and >45° for rock Over steepened (eroded) toe Signs of active soil or rock instability (trails, scars, scarps) Active toe erosion by stream or sea	>5% (1:20 years)
Medium	Slopes that appear generally stable, not experiencing any apparent erosional process, but could potentially be activated in a rare triggering event. For example, river channel slopes of a large-flood floodplain, which appear stable and are not presently subject to toe erosion.	Typically <35 degrees for soil slopes, and <45° for rock Not subject to active erosional processes, but with the potential of change within the projected 100 year period.	1% (1:100 years)
Low	Ancient slopes (such as remnants of the last glaciation period), and relict river terrace slopes that do not show signs of instability, are not exposed and are not expected to be exposed to on-going erosional processes within a ~100 year period Slopes close to long-term stable angle and not prone to landslide-type movements.	Typically <25 degrees steep for soil slopes and <30° for rock. Not expected to be subjected to active (concentrated) erosional processes within the projected 100 year period.	<0.4% (1:250 years)
N/A	Not mapped	Gentle slopes (typically <15 degrees for soil, <25 degrees for rock)	N/A

3.2.4 HAZARD MAPPING

The mapping of potential hazard areas was carried out using Global Mapper v25.1 software. Geomorphology was analyzed using a hillshade representation of a 3D digital elevation model (DEM) generated from the available LidarBC point cloud for the area. Where the study area extended outside the boundaries of the LidarBC dataset, the HRDEM was used, or the less detailed DEM model supplied by the RDN, where there was no HRDEM coverage.

Additional base layers were analyzed together with the hillshade model to assist in the overall interpretation, including aerial ortho imagery (RDN), geological mapping, streams and rivers inventory, sensitive environmental and wetlands mapping.

The mapping process generally proceeded as follows:

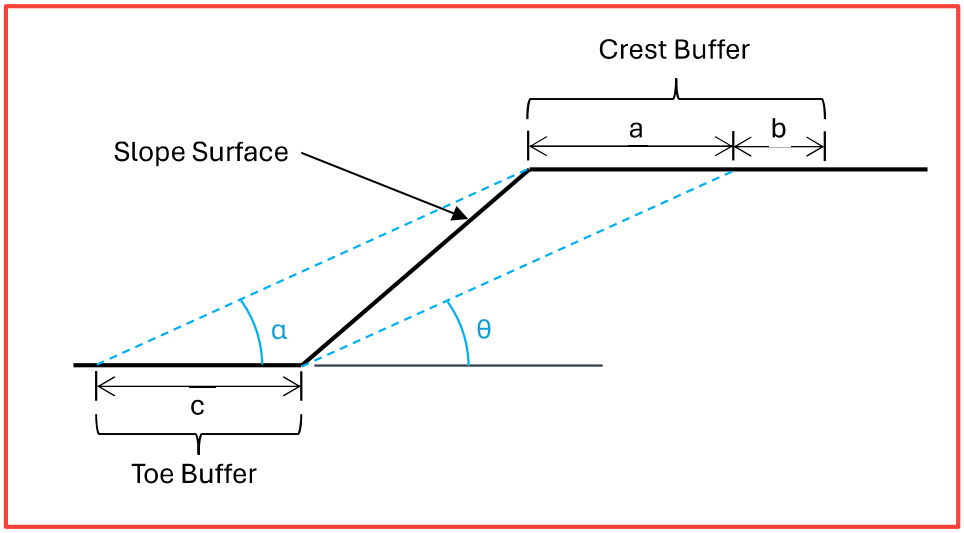
1. Identify the relevant geohazard type for each identified site/area including identification of any active/existing slope instabilities with appropriate map symbols.
2. Determine the critical (most important) mechanism that may trigger a geohazard event to occur at the site.
3. Estimate the likelihood of occurrence of the geohazard based on the likelihood of the primary triggering mechanism, factoring in surficial geology, vulnerability to climate change effects, evidence of prior events in the area, etc.
4. Establish buffer zones of potential consequence adjacent to geohazard polygons where appropriate (e.g. a buffer zone behind the crest of a steep slope, or a potential rockfall runout area extending from the toe of a steep slope).
5. The general approach used to establish the buffer zones is described below and conceptually illustrated on Figure 2.
    a. For predominantly soil slopes:
        i. The buffer area along the crest of the slope was established by projecting a sloped line starting from the toe of the slope at an angle assessed to be likely stable in the long term (i.e. Fahrböschung angle, as described by Cruden (1989), and Heim (1932)). The buffer zone represents an area which could be impacted over time through the occurrence of instabilities and the regression of slope crest. Review of topographic features within the RDN suggests that a projected inclination of about 20-25° may be appropriate for most areas under static conditions. For the purpose of this planning level study, we adopted a value of 20° in most cases. For slopes inferred to be comprised of more competent soils such as raised gravel terraces and glacial till, a higher value was selectively used. In layered soils, or areas of greater uncertainty, the inferred long-term stable angle was chosen based on the weaker of the soil layers. It should be noted that in cases of strong seismic shaking and seismically induced liquefaction, slopes may retrogress to much flatter angles than specified above (as noted above, a seismic trigger was not considered within this study).
        ii. The buffer area along the toe of the slope was established using the same concept as described above, but typically using a lower value for the runout angle, depending on the prevailing topography. An initial figure of 12° was adopted as a baseline reflecting the planning objectives of the study, based on historical events, topographic evidence, and available literature (Geertsema and Cruden 2014). It should be noted that slide runout distances are dependent on a number of variables, and are difficult to estimate without direct empirical data. In general, judgement based on local conditions was used, with typical values of about 12 to 17°.
    b. For predominantly bedrock-controlled slopes where rockfall/toppling geohazards were identified:
        i. The buffer area below the slope (where it extends outside the hazard polygon) represents a runout zone determined by a shadow angle of 27.5 degrees taken from the top of the talus slope, based on Evans and Hungr (1993).

ii. Where the slope crest was deemed susceptible to retrogression, an additional buffer was added at the crest and the rationale noted in the polygon description.

c. For slopes subjected to active erosion by a stream or the sea, an additional buffer area was established to account for possible stream bank loss over a projected nominal 100 year period (typically 25 m was applied to exposed sea slopes, and 8 to 15 m was used adjacent to creeks and rivers based on estimated rates from historical photo comparison).

d. Rockslide, and debris flow susceptible areas, where identified, were assessed on a case-by-case basis including consideration of any colluvial/alluvial fan cone at the toe of the area.

Figure 2: Illustration of Buffer Zone Delineation



Note:
θ – long term stable slope angle under static loading conditions
α – runout angle
a – component of crest buffer zone based on long-term stable angle
b – component of crest buffer zone accounting for erosion at slope toe
c – toe buffer based on runout angle

Each polygon was assigned a unique identification number (ID) with corresponding information provided in a data table (intended to be integrated as attributes into the RDN's GIS platform). Attributes which were recorded for each polygon included the polygon ID, key geohazard type, key trigger(s), average slope height and steepness, interpreted surficial geology, and existing developments in proximity (or within) the polygon.

The polygon ID's were assigned a prefix "S" (for predominantly soil slopes) and "R" (for predominantly bedrock controlled slopes).

As part of the assessment of geohazards throughout the study area, signs of active and historic landslides, or locations of recorded landslides, were marked with appropriate map symbols.

In addition, documented slides within the report archive provided by the RDN were added to the map where they could be located.

4 GEOHAZARD ASSESSMENT

4.1 GENERAL

4.1.1 INTRODUCTION

The primary objective of the study was to identify, map, and characterize steep slope geohazards throughout the RDN. The intent is that the results of the study may be used by the RDN to screen for potential geohazard risks to support the planning process and decisions that might include identifying the need for further geotechnical studies to support an application. Administratively, there may be opportunity to incorporate the findings into new or existing Development Permit Area designation to manage possible adverse consequences stemming from these geohazards in relation to public safety, economy, and the environment.

WSP understands that the completed Geohazard Assessment is the first study of this kind for the RDN. Through the study, there should be greater understanding and awareness of the prevalent mass wasting / erosional processes occurring within the study area in the context of topography, ground and groundwater conditions, climate, and human development. Over 600 hazard polygons were mapped and a large number of existing or historical geohazard features were identified during the assessment.

The geohazard maps produced as part of this assessment are included, along with an index map, in Appendix A. The mapping has also been submitted digitally to the RDN which may in the future be incorporated in the RDN's publicly accessible web-based GIS platform. The study limitations appended to this report should be carefully reviewed when

As part of the scope of work, workshops have been held with RDN staff and key stakeholders within the study area to discuss the study methodology and results, inform key areas of concern, and received feedback was incorporated into the final report.

The following sections provide a brief summary of the completed assessment together with geotechnical discussion to assist in the interpretation and usage of the produced maps; a summary of the processes and geohazards which characterize the study area; events that can trigger the geohazards; potential impacts of the particular geohazard; and a more detailed description of the processes and relevant geohazards within regions of the study area. The assessments were generally organized based on watershed or significant topographic features. Recommendations for further work are also provided.

4.1.2 GEOLOGY & GEOHAZARDS

Guthrie (2005) wrote:

> "Geology, physiography, climate, and tectonic regime combine on Vancouver Island to produce a steep, youthful terrain that is generally prone to landsliding. Landslides on Vancouver Island are commonly attributed to large storms and less commonly, but importantly, to earthquakes such as the 1946 earthquake near Courtenay. It is clear, however, that whatever the ultimate trigger mechanism, landslides are a result of the cumulative effect of major physical controls."

It should be noted that, in comparison to other physiographic regions on Vancouver Island, landslides in the Nanaimo Lowlands, are relatively modest in size and generally associated with steep areas along river and stream banks and steep coastlines. These areas are typically exposed to active erosional processes that trigger destabilization over time. However, Guthrie (2005) notes that this area of the Island has also experienced the most urbanization and agricultural development and has been heavily logged. As such, although landslide frequencies are comparatively lower than other more mountainous areas on the Island, there is potential for changes in drainage and run-off to create landslide geohazards and pose a risk to human life, and infrastructure.

The physiographical setting of the study area is diverse, including steep mountainous slopes featuring volcanic and sedimentary bedrock outcrops near Horne and Cameron Lakes, and coastal slopes and river channels incised through various surficial deposits ranging from soft fine grained marine and glaciomarine soils, to dense glacial tills, to bedrock-dominated gorges; or Frequent gullies occur in areas of extensive erosion-prone Quadra sand deposits. Correspondingly, there is a wide variety in the type and frequency of landslide geohazards throughout the study area. Understanding of the nature of the various geohazard types is critical to access and manage the impacts of geohazards, and to determine the type and nature of specific reports that may be required to support the land development approval process.

4.1.3 REVIEWED DATA

The digital elevation model (DEM) generated from the LidarBC point cloud provided sufficient detail to assess site topography to identify active and old slides, gully formations, old river terraces, and other topographical features at the scale of mapping.

The topographic data provided by the RDN was used in selected (western) parts of the study area, where there was no LidarBC or HRDEM coverage. This data was less detailed, and could not be used to assess topographical features and map hazard areas to the same level of detail as the higher resolution datasets. The RDN data was adequate where relief was significant (e.g. Horne and Cameron Lake areas), but was not detailed enough for proper delineation and assessment of details of smaller features such as smaller creek/river valleys. As such, geohazard mapping of a small percentage of the study area (identified on the maps) was excluded from the assessment due to insufficient resolution of the data to be able to accurately assess and map geohazard polygons (see Section 4.2.6 for more information). Recommendations are provided that include increasing the coverage of LiDAR data to those areas and updating the study in a future revision.

Aerial imagery assisted in the identification of active slide features where scars were visible or vegetation was removed by a slope instability or rockfall; however, it was found that in many cases (primarily along ravine slopes) slides that were evident on the LiDAR could not be detected on the aerial imagery. This may be due to regeneration of vegetation, dense tree cover, no stereo imagery available in recent years, and due to areas where slides were moving slowly and not significantly disturbing vegetation).

Historical geotechnical reports provided some detailed, site-specific information, including slope stability assessments as well as records of some of the slope failures which have occurred throughout the RDN. This data was valuable in assessing the geohazard types and triggers in various areas, which have been summarized below.

4.2 GEOHAZARD MAP INTERPRETATION

4.2.1 LANDSLIDE GEOHAZARD CLASSIFICATION

The landslide geohazards identified in this study are described in general accordance with the classification system proposed by Cruden and Varnes (1978, 1996), which provides a means of describing landslide types by material, and the type of movement, as shown in Table 3. The descriptions of landslides can become more complicated, but for the purposes of this study, WSP limited the classification of landslides to material type and type of movement.

The Geohazard Assessment was limited to steep-slope hazards including unconsolidated (soil) slopes (e.g. earth slides/flows, debris slides/flows); rock slopes (rockfalls, topples, rockslides); and snow avalanches (which were not identified within study area). The term “soil slide” was used in place of “earth slide”.

Table 3: Landslide Hazard Types (Varnes 1978).

TYPE OF MOVEMENT		TYPE OF MATERIAL		
		BEDROCK	ENGINEERING SOILS	
			Predominantly coarse	Predominantly fine
FALLS		Rock fall	Debris fall	Earth fall
TOPPLES		Rock topple	Debris topple	Earth topple
SLIDES	ROTATIONAL	Rock slide	Debris slide	Earth slide
	TRANSLATIONAL			
LATERAL SPREADS		Rock spread	Debris spread	Earth spread
FLOWS		Rock flow (deep creep)	Debris flow	Earth flow
			(soil creep)	
COMPLEX		Combination of two or more principal types of movement		

Note: Landslide types identified during this study are highlighted in green.

The majority of the study area is characterized by relatively flat and gently rolling terrain, that is incised by several river/creek channels, generally flowing from the southwest to the northeast coastline. The most commonly identified landslide geohazards in the study area were instabilities of steep soil slopes along stream valleys and along the coastline. The landslide geohazards identified on the steep soil slopes included earth and debris slides, active gully formation from a combination of erosion and blow-off (also called "blowout") failures, and from flows.

An additional landslide geohazard was associated with areas of steep rock bluffs or ridges subject to rock fall or rock block topple. Some of these bluffs were very high, if sufficiently large volumes fail at one time and/or if mixed with saturated soil, could potentially result in higher velocity landslides or flows. The Horne Lake and Cameron Lake areas are two of the few areas within the study area where extensive bedrock exposures with slopes over 40° are present, which are subject to rock-related geohazards including rockslides and toppling, as well as steep mountain gullies potentially prone to higher velocity debris flows.

Avalanche hazards were not identified within this study. Avalanche occurrence, if any, would be limited to the steep mountain areas, few of which can be found inside the study area. In the Horne and Cameron Lake areas, no physical signs or records of avalanches were found. These slopes were typically well treed, which has a stabilizing effect on snowpack. Forest fires, which were excluded from this study, could significantly change drainage patterns, run-off and erosion and increase the potential for landslide or possibly avalanche geohazards.

Assessment of material type characterizing any given hazard polygon was predominantly guided by published surficial and bedrock geology mapping. No ground truthing was carried out during the study. As such, the accuracy of the identified material type within each polygon is limited by the accuracy of the surficial geology mapping (i.e. "debris" vs. "earth" distinction is difficult to make). These maps provide a good general idea of surficial deposit distribution, but not at a high level of detail and not at depth.

The type of movement was inferred primarily based on topographical evidence of past instabilities combined with surficial geological data. It should be understood that, in the context of this study, landslides are very localized features which may be due to site-specific conditions that cannot be accurately assessed at the scale of mapping without ground truthing.

Landslides may occur at highly variable rates ranging from very slow creep movements (order of millimetres per year) to very rapid flow movements (order of metres per second), and can affect small or large areas. This has significant implications for the damage potential of these geohazards, and any attempt at assessing risk must therefore consider those factors along with the hazard potential.

This assessment was focused on identifying and categorizing landslide geohazard areas within the study area. Preliminary comments on hazard consequences are included in Section 4.2.5.

4.2.2 MASS WASTING AND EROSION PROCESSES

Mass wasting is broadly described as movement of rock and soil down a slope under the force of gravity. This process tends to flatten unstable slopes over time (e.g. landslides) leading to increased stability. Erosion is a similar process distinguished by entrainment of the moving particles in a "medium" of water, air, or ice (e.g. a stream of water). Where erosion is present at the toe of a slope commonly in the form of coastal or river erosion, the failed material may be eroded and removed promoting the continuation of the mass wasting process.

Cruden and Varnes (1996) separated landslide-causing processes into three broad categories, those that:

1. Increase shear stresses – processes that lead to removal of lateral support (e.g. toe erosion), additional surcharge to the top of the slope, and transitory stresses (such as earthquakes).
2. Contribute to low strength – material characteristics that make a soil or rock mass prone to movements, such as the presence of weak organic deposits and clays (low shear strength), loose soil (low shear strength or liquefaction), rocks vulnerable to chemical weathering, adversely inclined bedding discontinuities, etc.
3. Reduce material strength – weathering, groundwater pressures, high precipitation events, freeze thaw cycles, and human activity can reduce the strength of materials or available strength along the shear surface (for example, high pore pressures, loss of cohesion in clay, chemical changes, or disintegration of rock masses).

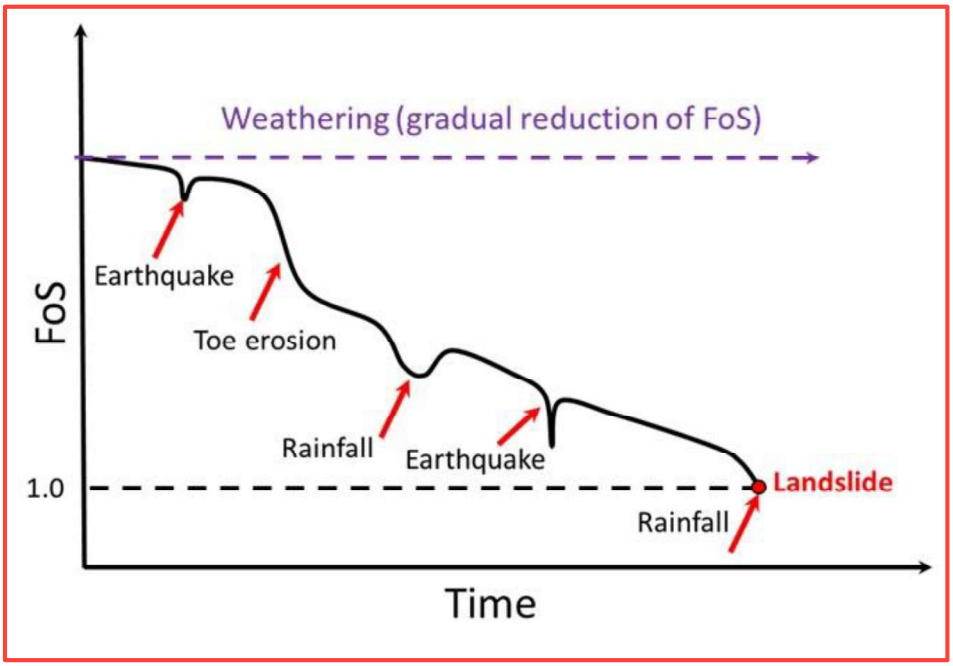
Related processes in steeply dipping rock discontinuities include the very high lateral ephemeral pressures that may be generated by infiltrating precipitation and the longer term but slower displacement of rock blocks via tree root growth and tree movement due to wind. Both are major contributors to loosening and displacement of individual rock blocks and rock toppling failures.

It is important to understand that all or some of these processes be factors in the present and future stability of a slope. Stable slopes not exposed to or not vulnerable to these processes may remain stable for indefinite periods of time. However, a slope that is currently stable can become unstable through a combination of processes, with the last identifiable event being called a "trigger."

4.2.3 HAZARD TRIGGERS

An inferred trigger has been identified for each hazard polygon; however, as discussed above, the occurrence of any given landslide geohazard is typically a result of several factors, each of which has a negative effect on slope stability. The "trigger" can be thought of as the chronologically last identifiable process which ultimately results in a slope failure. This concept is illustrated in Figure 3, with a precipitation event being the trigger that ultimately results in a slope failure.

Figure 3: Schematic - Weathering Process Resulting in Gradual Destabilization of a Slope



Note: FoS = Factor of Safety. FoS decreasing below 1.0 represents the condition at which a slope becomes unstable and movement occurs. Figure from WG/WLI (1994).

Within the time scale of a typical development (assumed for this study to be 100 years), certain processes (such as erosion, time dependent strength loss, some impacts from human activity, some groundwater changes) can be relatively slow, continuous processes that may occur over the course of many years. Other processes represent discrete, significant events (such as heavy precipitation events, seismic shaking, some human activity, some groundwater changes). Any one of the processes may trigger the landslide event.

Human activity was not assessed as a potential trigger due to uncertainty about present and future land uses, and impacts; however, it should be noted that human activity and developments often lead to triggering events. Existing human impacts (such as logging, wildfire, or impacts related to existing developments) were to some extent indirectly captured in the assessed likelihood of occurrence, in areas where they have may already resulted in identifiable instabilities or signs of erosion (as any such features would be considered in the assessment of geohazard likelihood of occurrence).

The RDN Sustainable Site Planning Guide (2020) notes that typically less than 1% of precipitation flows directly over land (roughly 45% is absorbed by plants, and 55% infiltrates into the ground). Human development can dramatically shift this balance, leading to increased surface flows, which can become concentrated, cause erosion, and trigger a landslide. Reduction in surface vegetation can also reduce the amount of water absorbed by plants. Both of the above can result in a change to the local groundwater regime and can have significant impacts on slope stability conditions. Forest fires and logging can have a similar effect, in addition to damaging the physical stabilizing effect that trees and root systems may have on slopes (there may be an exception close to steep slope crests).

Forest fires, groundwater regime changes, and seismic shaking were not evaluated as possible triggers of landslide geohazards within the scope of this study. It is noted that each of these triggers can have a significant impact on slope stability conditions, and should be considered when assessing slope stability conditions in detail for existing and future developments in proximity of slopes or geologically recent sediments.

4.2.4 CLIMATE CHANGE IMPACTS

Climate projections throughout the study area suggest trends of increasing precipitation (with increased peak flows), rising flood and sea levels, and increases in temperatures. These projections are generally negative in terms of their influence on landslide-causing processes and slope stability conditions with the potential exception of a reduction in freeze-thaw physical weathering. Given that many instabilities are driven by surface runoff events and toe erosion, such instabilities may occur more frequently than in the past. Some areas and slopes not previously subjected to toe erosion may become subject to this process in the future, which could introduce a hazard not previously present.

For coastal slopes, the possibility of toe erosion was considered for areas which may not currently be subjected to toe erosion, based on a flood water level of 4 m amsl. In particular, many of the coast areas have a wide coastal platform that has provided protection for much of the tide cycle. With higher water levels, there will be significantly increased erosion, also driven by higher storm winds depending on exposure. The need for more detailed studies to better quantify climate change impacts may be identified by the RDN on a site by site basis during the land development approval process.

4.2.5 LANDSLIDE GEOHAZARD TYPES AND CONSEQUENCES

Slope failures can vary widely in terms of size, material and rate, and therefore vary greatly in terms of consequence and how they are approached from a standpoint of hazard and risk management. For example, a large, slowly creeping landslide can cover areas of several square kilometers and cause significant damage to buried facilities, infrastructure, and human developments but may not pose a significant risk to life. In contrast, small, high velocity debris flows or a rock fall could affect a limited footprint but leave insufficient time for evacuation, therefore posing a direct threat to life safety.

Picarelli et al. (2005):

> "Hazard characterization is the most difficult and important step in any risk-based landslide assessment. We must remember that thorough understanding of the varied processes involved in destabilization and failure of slopes lies at the foundation of any subsequent analysis, especially if quantitative results need to be achieved. No amount of analytical or statistical analysis, or even testing and instrumentation, can substitute for such understanding."

This study was focused on hazard characterization for the purpose of land development planning for the RDN. It may, however, assist the RDN in identifying the need for further, more focused studies, including risk assessments that may be required in the development process.

Historical records including site-specific reports by geotechnical consultants have documented a variety of slope failures throughout the RDN. A generalized summary of typical types of geohazards which have been encountered in areas of the RDN is provided below:

- Rapid translational debris-slide failures have been documented in non-channelized steep slope areas, especially along the sea coast and steep river valley slopes, where a loose, relatively cohesionless overburden layer may slide over a deposit of dense till or bedrock; typically triggered by heavy precipitation or groundwater.
- Rotational and translation debris and soil slides along sea coast and oversteepened river and creek banks, especially where undercut by stream or marine erosion;
- Rockfalls/topples and rockslides have been recorded on the mountain slopes around Cameron and Horne Lakes and may occur on other rock bluffs. Several of large failures were triggered by seismic events that are outside the scope of this study; however, they may also be triggered by high precipitation that infiltrates along the steep discontinuities producing very high lateral forces, as well as time-dependent strength loss due to weathering and tree root displacement.
- Channelized debris flows have occurred along sea and river valley slopes, which may be triggered by high flows possibly augmented by temporary blockage of the watercourse and temporary impoundment of water.

- Non or channelized debris blow-off flow failures where groundwater drainage is impeded by shallow colluvial cover enabling the build-up of piezometric pressures and stored groundwater in the bedded water-bearing sediments (Cavers 2003).
- Gully and rill erosion caused by concentrated surface water erosion typically seen in areas of exposed non-cohesive deposits.
- Large seismically-induced liquefaction lateral spreads have occurred during previous seismic events; future seismically triggered movements are not considered in this study.
- Large, seismically-induced rockslides could possibly occur within the mountainous regions around Horne and Cameron lake, or the north slopes of Mt. Benson; future triggered seismic landslides are not considered in this study.

4.2.6 MAP USAGE

The geohazard maps produced in this study are intended to aid land-use planning decisions by the RDN. There may be an opportunity to refine the maps for use in the designation of one or more development permit area (DPA), and/or emergency response planning, among other possible applications. The maps are not sufficiently detailed or ground truthed for site-specific assessments in support for the land development permit approval process.

Mapped geohazard polygons may include a buffer zone representing areas which may affected by retrogression or runout such as a rockfall runout area). Narrow buffers (< 5 m width) were generally not mapped.

It should be noted that the likelihood of occurrence is not in itself an indication of the potential consequence of a landslide geohazard. For rainfall triggered landslides, there appears to be an inverse relationship (power law) between the magnitude of the event and the likelihood of occurrence (i.e. the greatest geohazards by area or volume will tend to happen less frequently than smaller ones (Fuji 1969). From a public safety point of view, frequently occurring hazards of low intensity may be less impactful than infrequent hazards of large magnitude.

Scarp marks indicate the scarps of visible past or active landslides, as well as escarpment-like sharp slope crests. Drainage path marks indicate visible erosional drainage channels, gullies, or small streams (primarily seasonal). The presence of scarps and/or drainage paths can in some cases indicate a higher likelihood of slope failure.

With respect to buffer areas, the assessed “likelihood of occurrence” attributed to a geohazard polygon or buffer area does not represent the likelihood that the complete area will be impacted by a single geohazard event. Generally, the likelihood of impact within a buffer area will decrease with distance from the crest or toe of the geohazard polygon. At the edge of the buffer zone, the likelihood of geohazard occurrence over the typical lifespan of a development would be low.

Polygons marked as “Unclassified Hazard Areas”, include areas that potentially contain mappable slopes and geohazards, but which could not be evaluated in this study. The areas include inferred man-made slopes, as well as areas with potential geohazards which were not covered by the higher resolution topographic datasets and which could not be reasonably assessed and mapped using the lower resolution digital elevation model provided by the RDN. As such, further review, acquisition of new higher resolution topographic data, and/or ground truthing to assess geohazards within these areas may be required.

WSP emphasizes that, at the scale of the mapping carried out for this study, there will be local conditions and local topographical features that were not captured on the mapping. The extents of the hazard and buffer zones provided in the maps are not intended to be used directly to inform development and construction. Geohazard boundaries have not been ground truthed and the mapped location may vary from the actual location. Any future development in proximity to or within the identified hazard zones should be looked at on a case-by-case basis, and site-specific geotechnical review may be required.

Discussion of landslide geohazards specific to regions and major watercourses within the study area that have a higher occurrence of features are provided in the following sections. As noted, no ground truthing was completed as part of this study and so the discussion is preliminary.

4.3 GEOHAZARDS BY REGION

4.3.1 DEEP BAY TO BOWSER COASTLINE

The approximately 6 km long coastline from Deep Bay to Bowser features steep slopes on the order of 30-35°, with slope heights averaging 20 to 30 m above mean tide and the highest slopes up to about 40 m. This coastal section includes the Nile Creek delta.

The geology of the area consists predominantly of glaciomarine deposits overlying dense till and Quadra Sediments. In certain cliff sections, the pre-Quada Dashwood Drift and Mapleguard Sediments are exposed at the toe (Fyles 1963).

The coastal geomorphology contains incised gully-like features extending from the slope face into the Coastal Plain, which are interpreted to have formed through processes of blow-off and gully erosion associated with groundwater in the Quadra Sand aquifer and a concentration of surface water. Soil transport may have included historical debris slides and entrapped soil. The largest of these gully features extends over 200 m inland with a basal slope of about 10 degrees, with banks up to 20-25 m in height at 45°.

The majority of the upland plain area behind the coast slope has been developed with rural residences. However, there are also several residences along the toe of the slope.

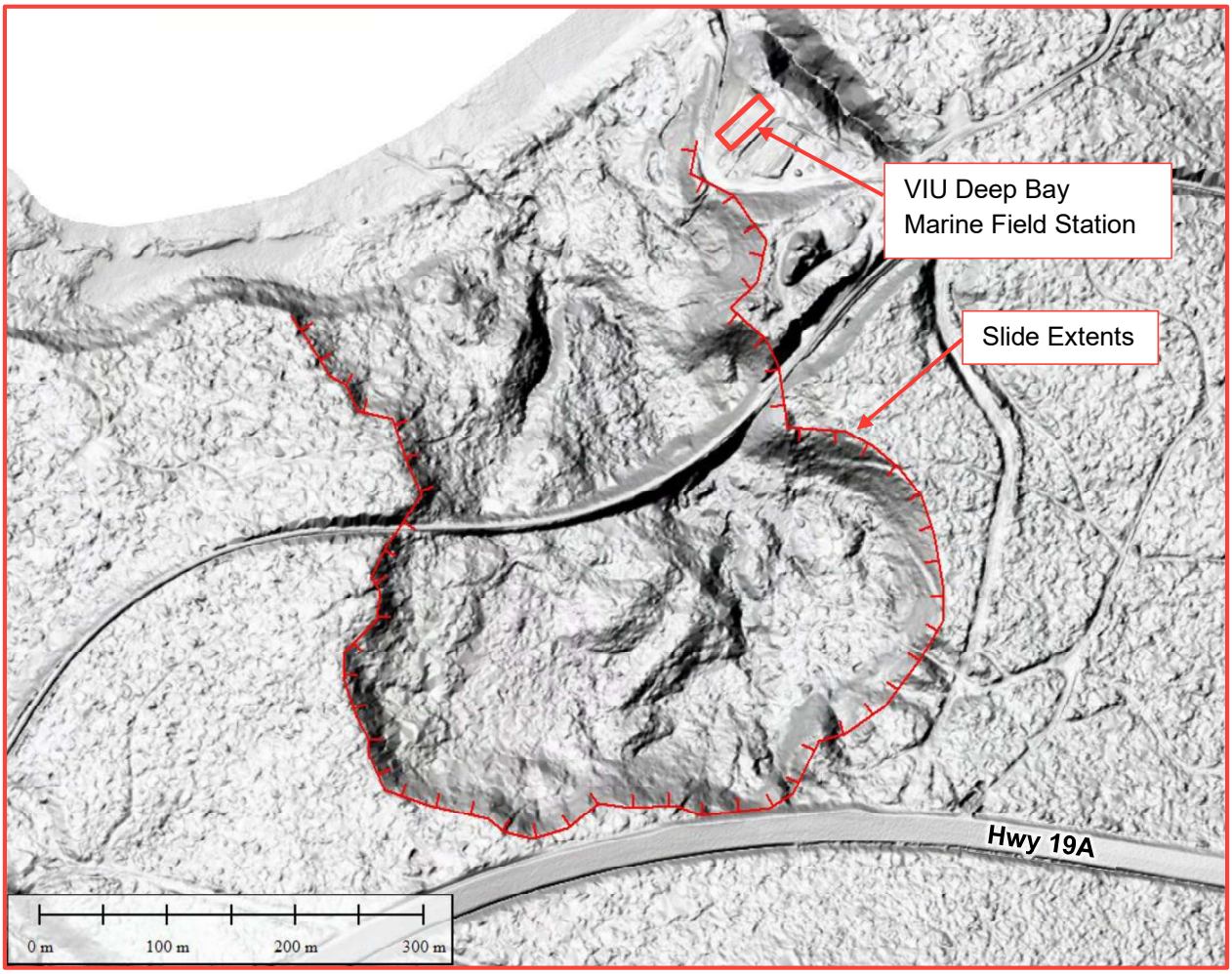
Several small shallow landslides have been reported in the area (LEA 2021a, b) which appear to be translational type debris slides (consisting of loose overburden materials sliding over the dense till surface). This type of movement can occur rapidly and is commonly triggered by high precipitation events. One such slide (Hardy 1991) was reported to have occurred with a width of about 10 m, and a runout length beyond the toe of 8 m (about half the slope height). The slide occurred after a period of heavy precipitation, causing damage to a cabin at the bottom of the slope. These types of failures that initiate on the face of the slope pose a greater hazard below the slope where the failed material is liquefied and may reach considerable speeds and run out distances from the slope toe.

Site topography reveals evidence of a large historic landslide just west of Deep Bay, covering an area of about 500 by 500 m (see Figure 4). No historical information was found for this landslide, which apparently predates the 1946 earthquake. This landslide is inferred to have been triggered by a large earthquake and likely dates back hundreds of years, possibly to the Cascadia earthquake (M9.0) of 1700.

Generally, key landslide geohazard triggers within this area are the long-term toe erosion of the slopes by the sea (which is expected to increase with anticipated sea level rise), heavy precipitation events including spring runoff, which can cause shallow failures of loose overburden materials on the steeper parts of the slope, and blow-off failures related to elevated groundwater pressures caused by less permeable materials on the slope face. In addition, surface and groundwater regime changes caused by development of areas along the slope crest can concentrate flows and increase the likelihood and rate of recession of the gully-type features.

The majority of the slopes in the area have been classified as “high” or “medium” Annual Occurrence Probability (AOP).

Figure 4: Liquefaction Slide West of Deep Bay (Hillshade Model)



4.3.2 QUALICUM BAY TO DASHWOOD COASTLINE

The approximately 7 km long coastline from Qualicum Bay to Dashwood features steep slopes ("Dashwood Cliffs") inclined on the order of 35-45°, and locally with slope heights of 50 to 70 m. This section of coastline includes the estuaries of both the Big Qualicum and Little Qualicum Rivers.

The geology of the area consists predominantly of glaciomarine deposits overlying dense till and Quadra sand deposits. Local areas expose the pre-Quadra Dashwood Drift and Mapleguard Sediments at the toe.

The coastline slope contains gully-like cone-shaped features which are deeply incised and more pronounced than those found on the coastline between Deep Bay to Bowser (Figure 5). The formation of these features is inferred to be similar to those described above for the Deep Bay to Bowser shoreline.

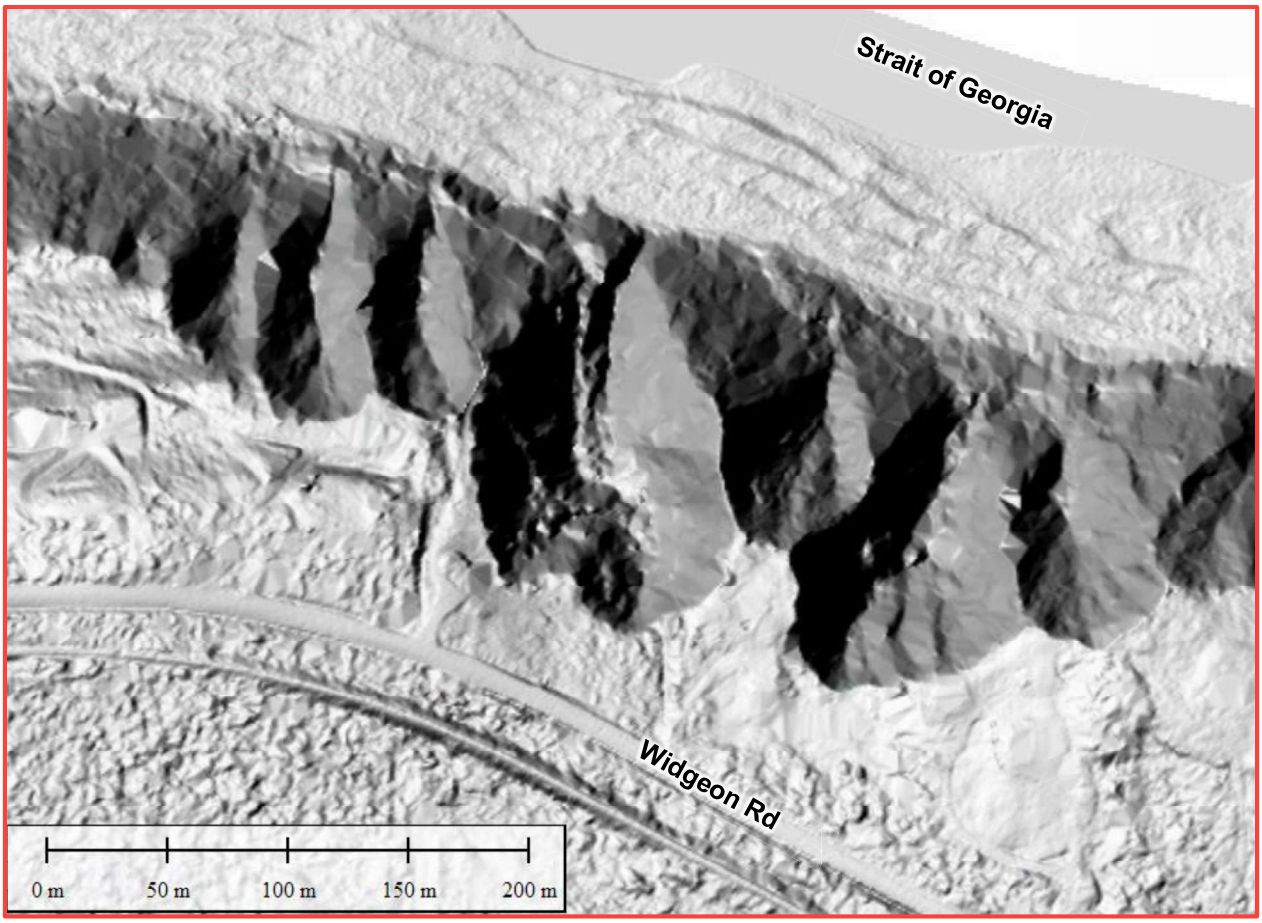
Several block-type landslides were identified in this region, which may be old, but with some potential for reactivation in the event of future sea level erosion.

The majority of the upland area along the coast slope in this area has been developed with rural residences, while the area along the toe is largely undeveloped except for a small group of residences near Dashwood and the river delta areas.

Generally, key geohazard triggers within this area are inferred to be long-term toe erosion of the slopes by the sea (which can be exacerbated by anticipated sea level rise), heavy precipitation events including spring runoff, which can cause shallow failures of loose overburden materials on the steeper parts of the slope, and blow-off failures of the slope caused by increased groundwater pressures. Surface and groundwater regime changes caused by development of areas along the slope crest can concentrate flows and increase the likelihood and rate of these types of failures.

The majority of the slopes in the area have been classified as “high” or “medium” AOP.

Figure 5: Cone-shaped Gullies Along the Sea Coast Between Qualicum Bay and Dashwood



4.3.3 THAMES CREEK

Thames Creek flows into the Strait of Georgia about 2 km south of Bowser. The creek originates in the mountain ranges about 6 km west of the coastline, and passes through the study area over a distance of about 2.5 km. Within the study area, the creek features slopes of about 25 to 35° (locally over steepened by the creek), with slope heights of typically 10-20 m. Through the study area, the creek has developed a floodplain width of about 50 m.

The geology surrounding the creek within the study area predominantly consists of glaciomarine or marine deposits up to 10 m thick, overlying dense till.

The ravine slopes show rough and variable topography, suggesting a history of small slumps and slides along the creek banks. Generally, these are likely to be relatively small and slow-moving instabilities, typically triggered along slopes undercut by the creek.

The majority of the area surrounding the creek is undeveloped except a small community near the mouth of the creek.

Key triggers that may activate instabilities of the creek banks include long-term toe erosion of the slopes by the creek, and heavy precipitation events including spring runoff, which can contribute to slumping and sloughing of the creek banks. Future development along the creek is also likely to increase the likelihood of these types of failures.

The majority of the slopes in the area have been classified as “medium” to “high” AOP.

4.3.4 NILE CREEK

Nile Creek flows into the Strait of Georgia between the communities of Bowser and Qualicum Bay, originating in the mountain ranges about 6 km west of the coastline. The creek passes through the study area over a distance of about 2.5 km, and features slopes inclined at about 25 to 30° (locally over steepened to 40-50° by the creek). Slope heights range from 10 m near the creek delta, to about 25 m further inland. Through the study area, the creek has developed a floodplain width of about 180 to 200 m.

The creek cuts through a surficial deposit of glaciofluvial deltaic terrace deposits (coarse grained) overlying dense till. Some areas along the creek (such as near the creek delta) consist of a glaciomarine veneer in place of the glaciofluvial deltaic deposits. West of the study area, the published mapping indicates that the creek penetrates deeper into about 30 m of the underlying Quadra Sediments.

The north bank of the creek features a number of relict river terraces and old terrace slopes which appear to be stable at angles of about 30°. It is inferred that most of the landslide geohazards along Nile Creek are related to slumping and sliding of surficial soils where the creek banks are over steepened or undercut by the creek. In some of these areas, the topographic data indicates that the slopes have been over steepened beyond 45°.

The majority of the area adjacent to the creek is undeveloped except for a small community near the mouth of the creek. In that area, houses have been constructed along the crest of both banks of the creek, as well as within the 200 m wide floodplain. The present creek channel runs along the toe of the north bank of the creek, resulting in active erosion along portions of those slopes, which is considered likely to trigger slope instabilities and retrogression of the creek bank in the future.

Key triggers of creek bank instability include the ongoing toe erosion of the slopes by the creek, and heavy precipitation events including spring runoff. There is considered to be blow-off failure potential in the exposed Quadra Sediments in the western portion of the creek where groundwater recharge may be occurring to the creek. Development within the area may also impact surface and groundwater regimes within the area, affecting the likelihood of gully erosion.

Slopes in the area have generally been classified as “medium” to “high” AOP (high along over steepened slopes subject to active creek undercutting). A “low” likelihood of occurrence has been assigned to geologically older terrace slopes with no apparent signs of movement and areas unlikely to experience toe erosion in the near future.

4.3.5 BIG QUALICUM RIVER

Within the study area, the Big Qualicum River flows from Horne Lake and discharges into the Strait of Georgia at the community of Qualicum Bay. Flow is controlled by a dam at Horne Lake. Hunts Creek, a tributary of the river, merges with the main channel about 4 km upstream of Qualicum Bay.

The study area encompasses the length of the river channel from Horne Lake to the coast.

The inclination of the slopes of the river banks are generally 25 to 35° (locally over steepened to 45° by the river). Slope heights increase from 15-30 m near the mouth of the river, to up to 100 m near the Illusion Lakes. The floodplain averages about 200 m wide.

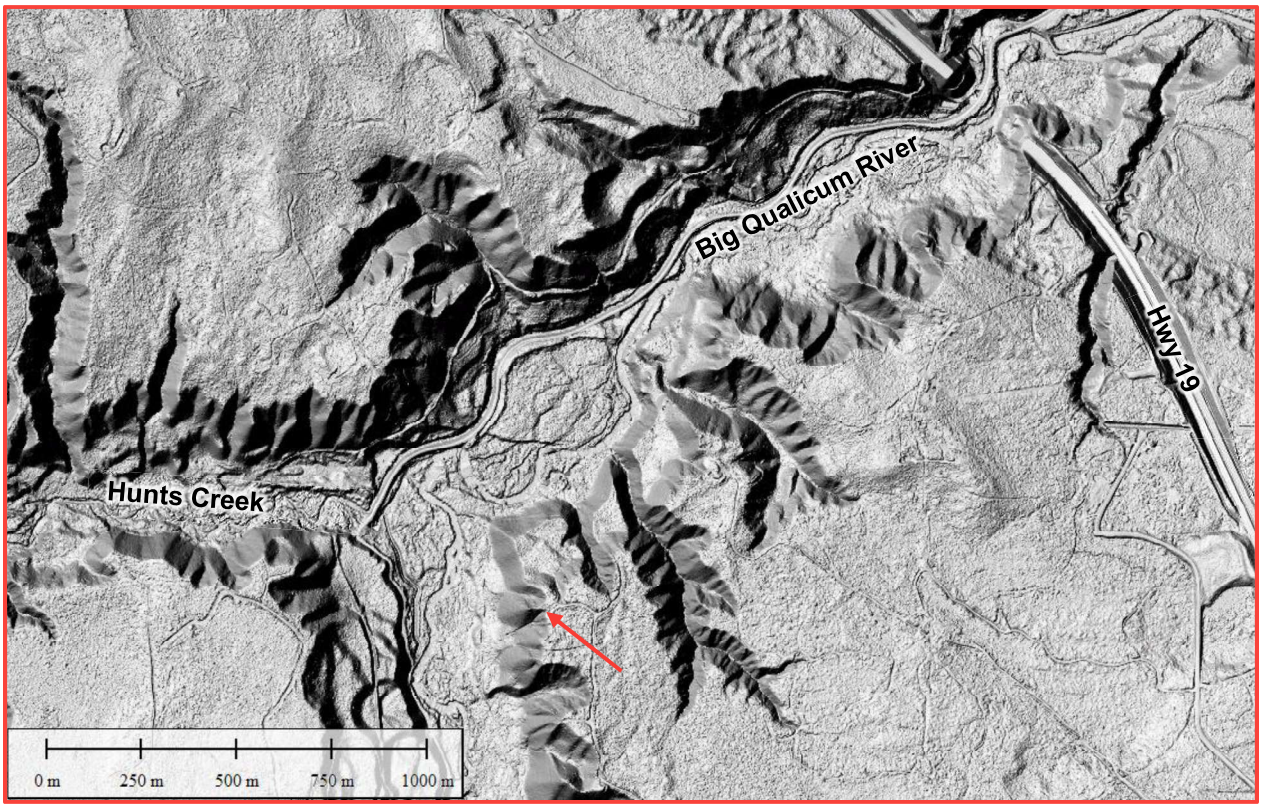
Based on Fyles (1963), the geological profile exposed in the banks of the river consists of glaciomarine soils (varying thickness, up to 15 m) overlying glacial till, and the Quadra Sediments. The exposed height of the Quadra Sediments can be substantial (about 50 m). In some areas the mapping suggests that the valley penetrates below the

Quadra Sediments into older deposits of (Cowichan Head and Dashwood Drift), including a layer of peat or peat-containing soil about 50 m below the crest. Layers of weak clay and compressed clay have been associated with coastal block slides up to 400 m in width in the City of Nanaimo North Slope study (HBT AGRA Ltd. 1993).

The river valley – particularly west of Hwy 19 – is characterised by extensive gully formations (Figure 6) extending hundreds of metres on either side of the main river channel with channel bed slopes on the order of 5° (8%). A high level review of geological conditions throughout the RDN area suggests that the development of these gully formations is associated with the presence of the Quadra Sand deposits that may have been triggered by a combination of blow-off from groundwater and/or gully formation from concentrated surface water erosion.

The most common landslide geohazards within the Big Qualicum River system appear to be associated with the gullying processes, which likely involve combinations of surface erosion and blow-off failures leading to debris and earth flows (Figure 7). Slides may be triggered by periods of heavy precipitation. Extensive logging activity throughout this river system may exacerbate spikes in surface runoff and/or infiltration, further increasing the likelihood and frequency of these instabilities, and further growth of the gullies (also

Figure 6: Big Qualicum River at Confluence with Hunts Creek. Note extensive gully formations with numerous cone-shaped scars. Arrow indicates closeup of area on Figure 7 (following page). Cone-shaped gullies along the sea coast between Qualicum Bay and Dashwood.



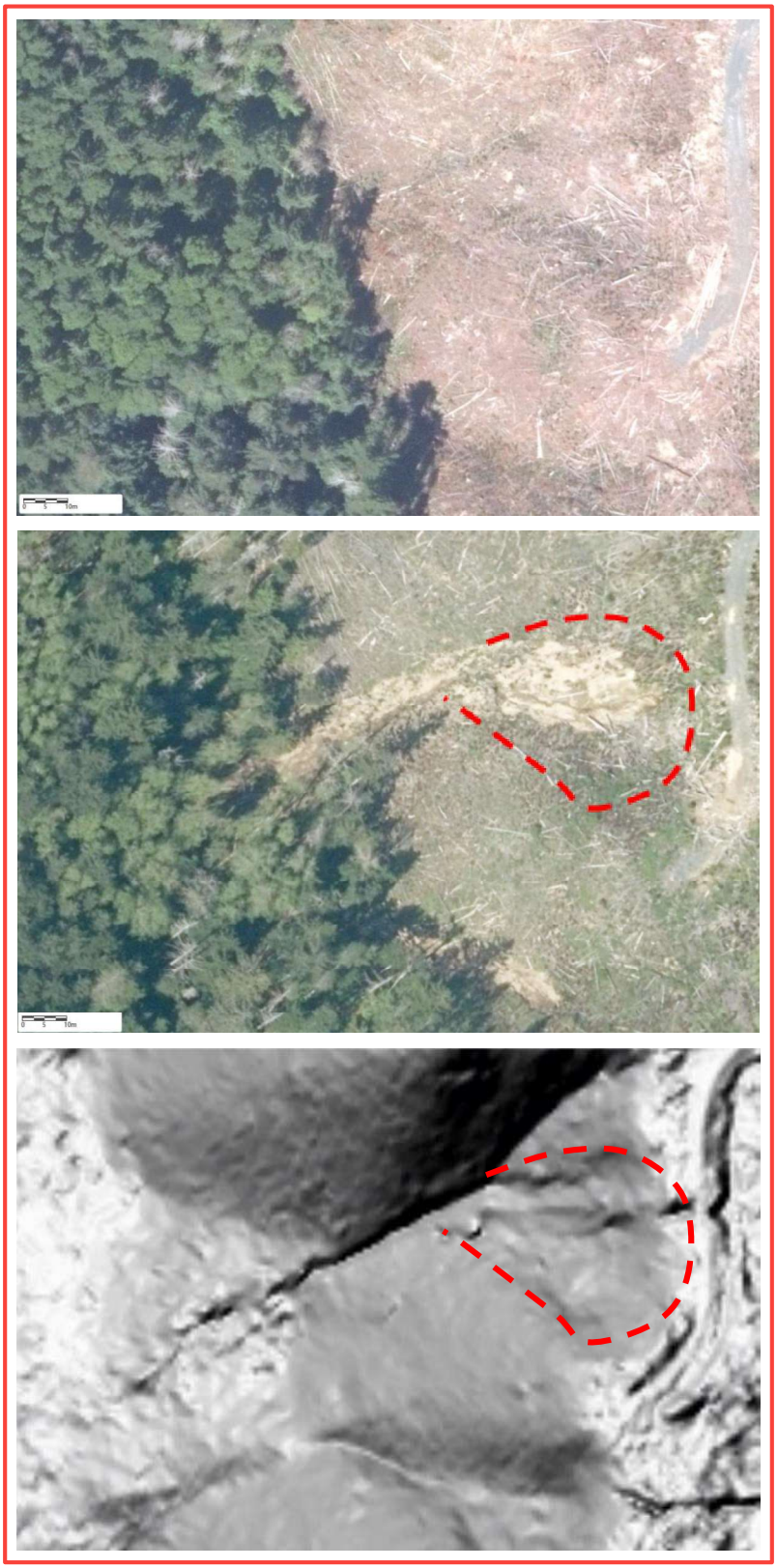


Figure 7: Blow-off Failure and Debris Flow Following Logging Activity

Top: 2018 aerial image from RDN showing freshly logged area along Big Qualicum River. Terrain slopes down to the left side of image.

Middle: 2020 aerial image of the same area, showing the triggering of a slope failure (likely surface erosion and earthflow), with the approximate failure initiation "bowl" identified by the dashed red line.

Bottom: Lidar-based hillshade model (2019 data) showing the same location. The bowl-shaped depression at the top of the slope appears larger than the triggered failure visible in the photographs, which might indicate a repeated occurrence (with potentially larger historical flows at the same location). Note the depositional cone at the toe of the slope, which appears to be roughly 50 m in length (likely accumulated from prior slope failures).

The overall slope is about 50 m high, and inclined at 35 degrees at the failure initiation location. Image width = 180 m.

The majority of land surrounding the river is currently undeveloped, with few buildings or infrastructure that would be affected by further retrogression of these gully systems. Gully development may however be relevant for any future developments, linear infrastructure and environmental protection in the area.

Existing development is mostly confined to the floodplain near the mouth of the river. In addition, a recreational trail follows the Little Qualicum River to Horne Lake. In this area, the valley slopes are up to about 20 m high and do not appear to display the same gully formations as discussed previously. The majority of slope retrogression in this area appears to driven by toe erosion from the river, which is inferred to result in shallow, translational type debris/earth slides and slumps in those areas.

Slopes in the area have generally been classified as "high" AOP in areas displaying gully formations as described previously, as well as along over steepened slopes subject to active toe erosion by the river. A "low" likelihood of occurrence has been assigned along geologically older terrace slopes with no sign of active movement, and inferred stable slopes unlikely to experience toe erosion in the near future.

Land development planning adjacent to portions of the river valley should consider the gullying process and the relatively high-hazard potential to development due to the significant potential retrogression of the slope crest.

4.3.6 LITTLE QUALICUM RIVER

The Little Qualicum River flows from Cameron Lake and discharges into the Strait of Georgia between the communities of Dashwood and Qualicum Beach. A small weir has been constructed at the natural outlet from Cameron Lake, however, the flow is uncontrolled during the high fall and winter flood flows (KWL 2022).

The study area encompasses the full length of the channel, plus the Kinkade Creek tributary from the west.

The inclination of the slopes of the river banks ranges from 20 to 30° (locally over steepened to 45° by river erosion). Slope heights range from 20-30 m near the mouth of the river, up to 60-70 m west of Hwy 19.

Emerging from Cameron Lake, the floodplain widens to about 200 m for about 3.5 km, before passing through a narrow gorge over a distance of about 1.5 km at Little Qualicum Falls. The channel then opens to over 400 m wide before narrowing again just before the mouth of the river.

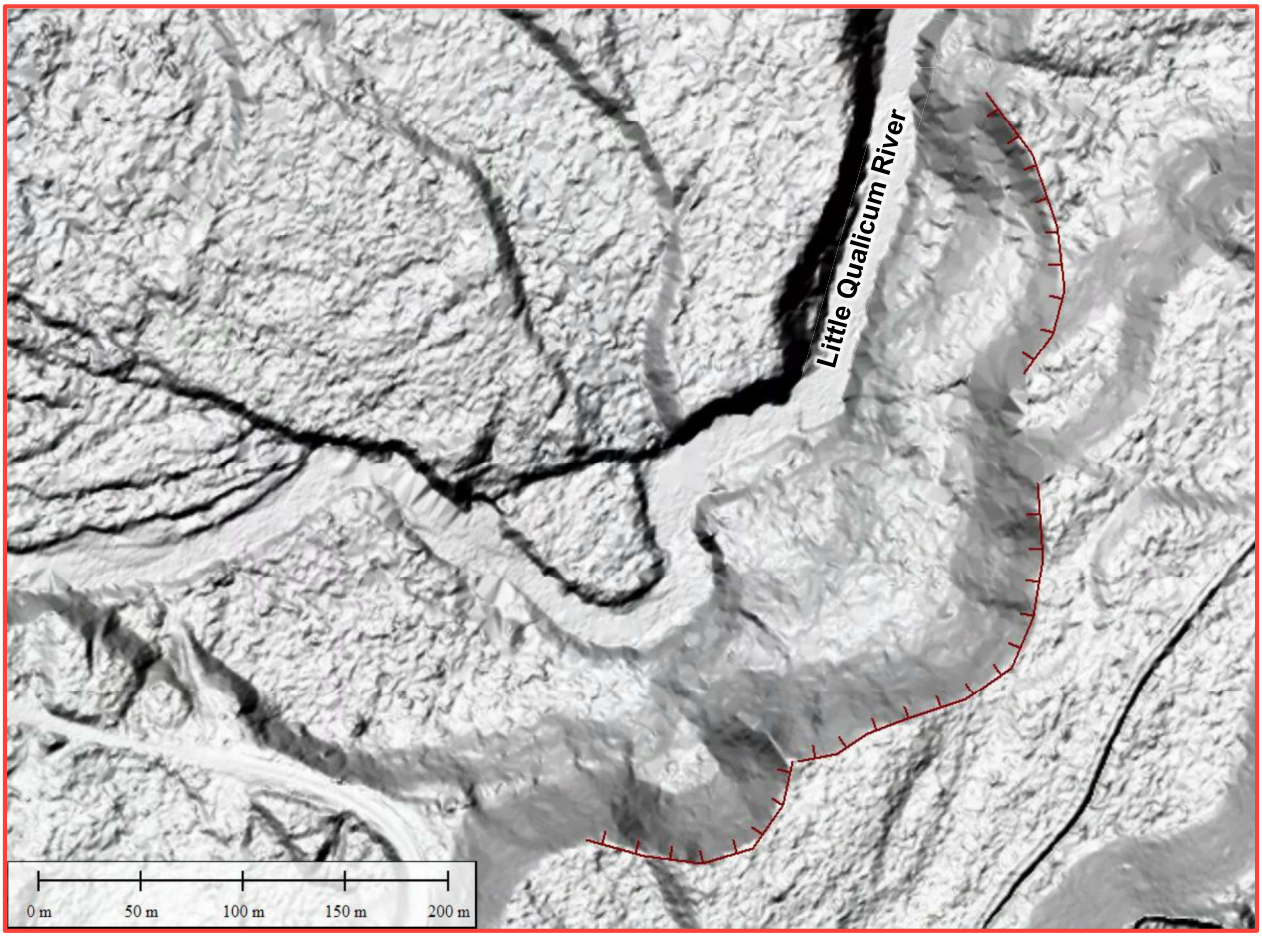
Published mapping indicates that the geological profile exposed in the banks of the river consists of glaciofluvial (coarse) sediments overlying till.

The river bank slopes cut primarily through the glaciofluvial sediments (with heights up to 60 m) tend to be have regular, consistent slope profiles at angles of 33-34°. Slopes cutting primarily through the till deposits appear to regress to 23-25°, with several existing and historical landslides evident throughout (see Figure 8).

Localized deposits of surficial glaciomarine deposits are present along the north bank of the river, where slope topography suggests past debris flow or slide activity.

Kinkade Creek, a tributary to the Little Qualicum River, has downcut through a deposit of fine glaciomarine blanket over a large portion of its length (not present along the main Little Qualicum River channel) that shows extensive development of gullies. Generally, the slopes along the Kinkade Creek system are impacted by landslides and there are widespread instabilities along the creek banks. The geomorphology in this area suggests that the deposits are vulnerable to erosion and potentially the influence of elevated groundwater pressures.

Figure 8: Landslide on Little Qualicum River. Large landslide, over 300 m in length, which may be active or recently active. The slope is about 40 m high, and the slide mass has a slope angle of about 14 degrees. The site is just south of Hwy 19 along the right bank of the river. Recent logging activity is evident throughout the area.



Generally, the Little Qualicum River valley features a range of soil conditions and identified geohazards, including relatively large block type landslides, signs of debris and/or earth flows (see Figure 9, Figure 10), as well as mature slopes indicative of good long term stability conditions.

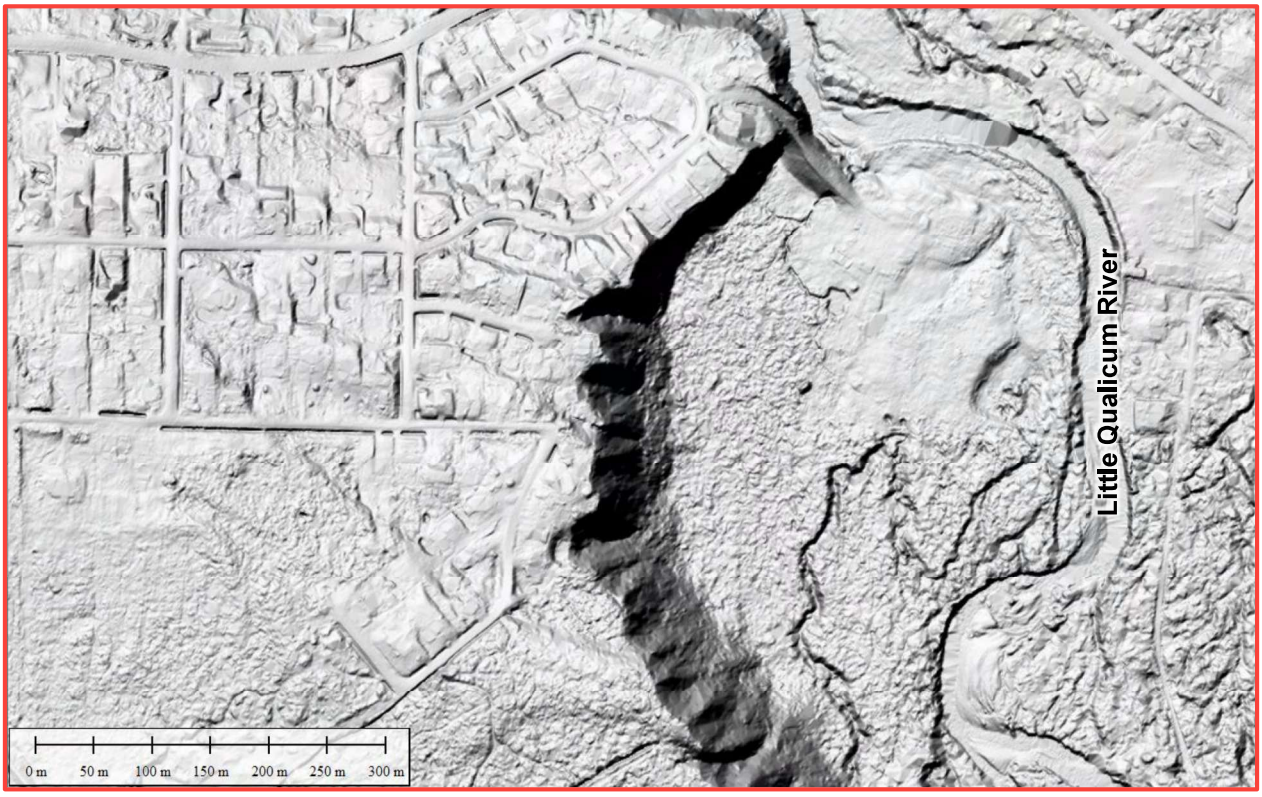
There has been extensive logging activity throughout this river system, which may have altered surface and ground water flows that has likely contributed to some of the instabilities noted throughout the area.

There has been little development along the south bank of the Little Qualicum River, however, the communities of Meadowood and the Little Qualicum River Village have been developed along the north bank. WSP suggests a careful review of future development in that area. Some geohazard activity has been reported in this region related to high precipitation, including a high velocity debris slide (RDN 2015) which destroyed a private residence, resulted in injury, and prompted a temporary evacuation of the area (Figure 9).

Figure 9: Debris Slide in Little Qualicum River Village Area

Above: 2014 aerial imagery (RDN), showing a recently constructed house at the base of a wooded slope. **Below:** 2016 aerial imagery, following landslide in late 2015, showing the destruction of the house. Note the negligible impact of the landslide on slope vegetation (to the extent that is visible on the aerial imagery), demonstrating the importance of alternative resources (e.g. LiDAR surveys, visual site reviews) in identifying such instabilities

Figure 10: Cone-shaped gullies along the slope near the mouth of the Little Qualicum River. Located adjacent to a residential area, which may be associated with blow-off or surface water flows leading to crest retrogression. The slope is 25-30 m high at about 35 degrees steep.



Likelihood of occurrence for slopes in the river bank area have been assessed as “low” to “high”. As described above, the failure modes vary widely throughout the river system. The higher resolution topographic data did not extend south of the Little Qualicum River Park, which prevented WSP from being able to assess the ground surface and topographic features for this study. As such, portions of this area were marked as “Unclassified Hazard Areas”.

Possible impacts to instability and land development along the Little Qualicum River are expected to be relatively higher than many other parts of the RDN due to the considerable population in proximity of the slopes, including developments at the toe of slopes which may be vulnerable to higher velocity debris-type slides or flows, as shown historically. This area may warrant further data gathering and assessment.

4.3.7 WHISKY CREEK

Whisky Creek flows into the mouth of the Little Qualicum River. The creek has a mappable length of about 4 km through the study area, and features slopes of typically 25-35° with heights of up to 20-30 m. The creek cuts through a glaciomarine blanket of variable deposits overlying till.

Geomorphologically similar to the Thames Creek channel, the ravine slopes show a rough and variable topography, suggesting historical slumping and slides along the creek banks that are modest in extent and typically triggered by river erosion and undercutting. Some signs of rapid shallow debris flows or slides were also noted in secondary channels leading to the main channel.

The majority of the area adjacent to the creek is undeveloped except for some agricultural properties along the south bank. The area beyond the creek has been extensively logged, which may have contributed to runoff and infiltration changes and acceleration of instabilities and retrogression of the ravine slopes.

Key triggers of the creek banks are inferred to be the long-term toe erosion of the slopes by the creek, and heavy precipitation events. Impacts from future development along the creek will need to be considered in terms of an increase to the likelihood of these types of failures.

The majority of the slopes in the area have been classified as “high” or “medium” AOP. The consequence of impacts are currently low due to a low development density in proximity of the creek.

4.3.8 FRENCH CREEK

French Creek flows into the Strait of Georgia at the community of French Creek. The creek has a mappable length of about 9 km through the study area, and features slopes of typically 30-35° and 20-40 m high. The mapping indicates that the creek cuts through a veneer or blanket of fine and coarse glaciomarine, over till.

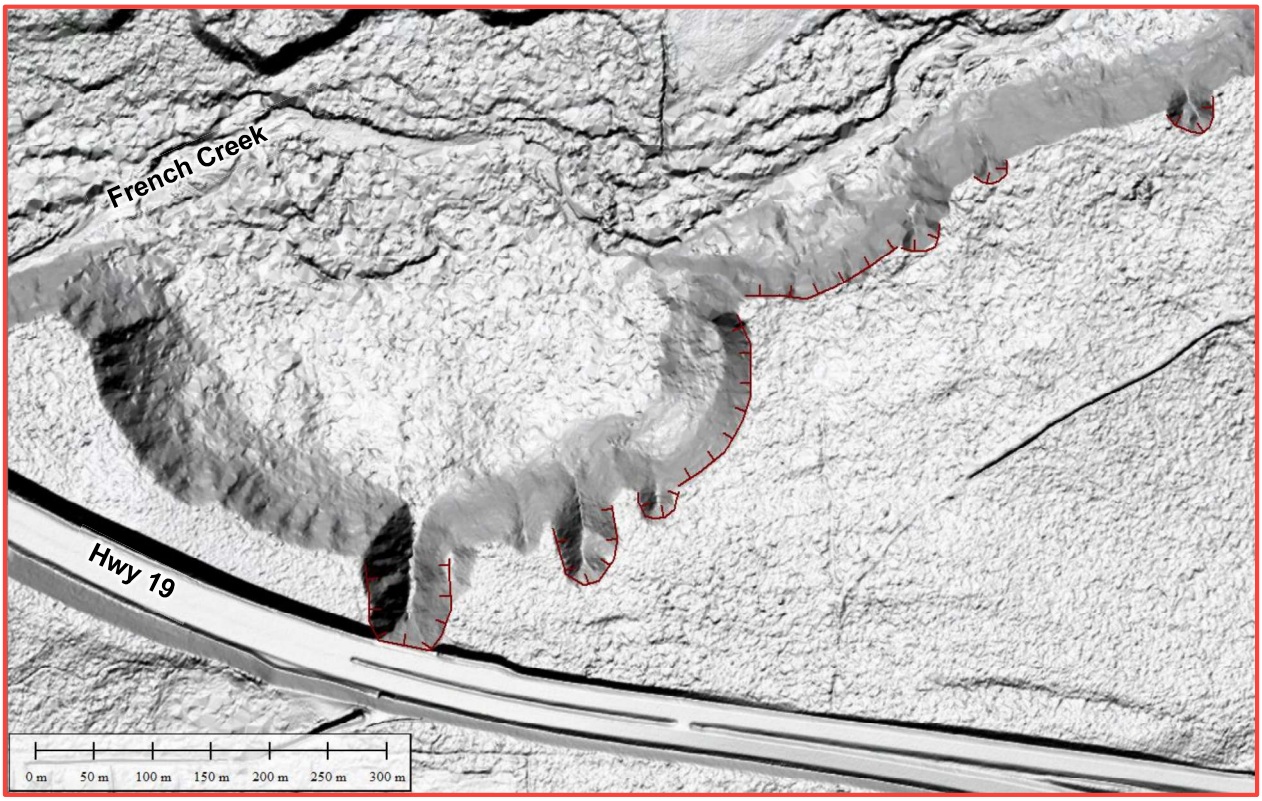
A review of aerial imagery indicated that the valley banks do not show widespread instabilities, however, some areas (particularly slopes over steepened by creek erosion) show signs of local instability including small gullying and cone-shaped scars which may be associated with higher velocity flows (See Figure 11).

The French Creek valley has a floodplain of 300-400 m wide downstream of Hwy 19 that features extensive relict floodplain terraces. Old terrace slopes appear to have remained stable at about 27 to 30°, however, some flatter slopes (~20°) also occur, suggesting areas of mass wasting. Around Coombs, the valley narrows and numerous bedrock exposures occur in the channel on the surficial geological mapping, suggesting the presence of bedrock and possible considerations of rockfall and rockslide.

The creek passes through the community of French Creek over a length of about 1.5 km (towards the mouth of the creek), where there are residential developments adjacent to the valley crests, as well as a small neighbourhood within the floodplain. Upstream of the community, the creek is primarily surrounded by undeveloped forestry and agricultural lands, as well as the community of Coombs, with mostly rural residential properties further south.

Morningstar Creek runs adjacent to Whisky Creek (through the community of French Creek), having formed a ravine about 10 m deep with side slopes of about 30 degrees. This creek may be subject to frequent local sloughing and slumping of the banks, but generally no large-scale instability was observed.

Figure 11: Localized formations of gullies along French Creek.



Key triggers that can activate instabilities along the French Creek banks are creek toe erosion and heavy precipitation events including spring runoff.

The majority of the slopes in the area have been classified as “medium” or “high” AOP. Occurrences of landslides are most likely along areas experiencing active toe erosion by the creek. The community of French Creek is the most populated potentially affected by the creek, however, it is situated near the mouth, where the creek banks are not as high (10 m) and appear relatively stable. Liquefaction and lateral spread are beyond the scope of this study but may need to be considered in site specific land development assessments.

The detailed LidarBC dataset does not provide coverage in the southernmost parts of French Creek and its tributaries within the study area, preventing WSP from being able to assess the ground surface and topographic features. Unclassified hazard areas have been mapped where mappable geohazards are likely to exist but could not be assessed.

4.3.9 ENGLISHMAN RIVER

The Englishman River originates in the mountains and crosses about 14 km over the Coastal Plain, discharging into the Strait of Georgia east of Parksville.

The study area encompasses the eastern parts of the channel. About 8 km upstream of the outlet, the river channel splits into four tributaries, which are called (north to south) Morison Creek, the Englishman River, an unnamed creek, and the South Englishman River.

The slopes of the river bank generally fall in the range of 25 to 35° (locally over steepened to over 50° or more by river erosion). Slope heights average 20-30 m, although the slopes of the South Englishman River approach 60 m in height.

At the confluence of the four streams, the floodplain widens to over 1 km in width which is maintained until close to Hwy 19A, where the channel is confined through a narrow gorge, before opening again into a large delta over 3 km in length.

The geological profile exposed in the banks of the river valley consists primarily of glaciofluvial deposits overlying glacial till. In some areas, a surface layer of glaciomarine soils is present. Slopes undercut by the river are very steep (near vertical).

Generally, the river banks do not show signs of gully formation, or widespread crest retrogression (except where undercut by the river channel).

The most common landslide geohazards through the Englishman River system were associated with instability of over steepened slopes undercut by the river channel. This would expect to be exacerbated during periods of high flow and with climate change. One such area is known as the "clay banks", located roughly 3.5 km upstream of the Hwy 19 crossing (see Figure 12).

Figure 12: "Clay Banks" along the Englishman River. Note oversteepened portion of the river bank, undercut by river erosion, and visible sloughing of material into the channel.

Localized areas of debris flows and slumps/slides may also occur. It should be noted that projections suggest that peak annual flows may increase by 17% by the year 2080 (Weston Guthrie and McTaggart-Cowan 2003).

Recent logging activity is apparent within the southern parts of the river system, the effects of which on bank stability are not known.

Much of the upland area surrounding the river system has been developed, primarily with rural residential developments. It appears that little if any development has occurred within the floodplain, except within the actual delta (near Parksville).

The LidarBC and HRDEM datasets cover most of the study area within this region, except the southern portion of the main river channel (up to about 1.5 km north of Englishman River Falls), and western part of Morison Creek. Because of the higher degree of uncertainty in areas lacking high definition topographic data, these areas have been mapped as "Unclassified Hazard Areas", as previously discussed, and recommendations for further data collection have been made.

Slopes in the area have been generally classified as “high” AOP along over steepened slopes subject to active fluvial erosion and undercutting by the river. A “medium” likelihood of occurrence has been assessed through most of the remaining area, accounting for the possibility of future river erosion to be considered in site specific studies.

4.3.10 NANAIMO RIVER

The Nanaimo River originates in the mountains and crosses about 23 km of the Coastal Plain before discharging into the Strait of Georgia in southern Nanaimo. The study area encompasses a length of the channel of about 12 km from the coast.

West of Hwy 1, the river channel is confined to a narrow gorge where rock slopes upwards of 45° (up to vertical) are inferred, with slope heights typically on the order of 30-40 m.

East of Hwy 1, the channel opens to wide delta with very flat or poorly defined banks, the heights of which are mostly below the mapping scale.

Most of the identified landslide geohazards in this area are concentrated within the steeper parts of the river bank, west of Hwy 1.

The geological profile through this area is quite variable, but within the critical parts of the river channel, the mapping indicates that it typically consists of glaciofluvial deposits overlying bedrock.

The most common geohazards are expected to be associated with instability of the steepest portions of the slopes along the river that are exposed to active erosional processes, which may occur as localized areas of debris slides overlying bedrock, and gradual retrogression of the near-vertical bedrock slopes through rockfalls/topples. The confined nature of the channel suggests that the rate of lateral erosion (and crest retrogression) is likely low.

Parts of the upland area adjacent to the river have been developed, primarily with rural residential developments, as well as some residential development within the floodplain area.

Slopes in the area are quite variable in character, and our assessment of the likelihood of hazard occurrence in ranges from “low” to “high’.

4.3.11 NANOOSE BAY AREA

The Nanoose Bay area, north of Nanoose Harbour, features irregular, bedrock-controlled terrain with typical relief of 20-30 m, with the highest peak being Nanoose Hill (approaching 250 m amsl).

The area is characterized by shallow bedrock (under a till veneer) with frequent bedrock exposures. The majority of the low slopes in this area are not mappable per the criteria laid out for this study. Mappable slopes are located along the lakes and coastline found throughout this area. Generally, the terrain is very rough, and it is likely that many steep or potentially hazardous localized rock features might exist, which cannot be captured at the scale of mapping. Geohazard occurrence in this area is generally expected to be low. However, a more detailed review and mapping of these areas would be warranted.

Much of the study area within this region has been settled (primarily residential and a few rural-residential zones), with most of the population concentrated along the north coastline, near the community of Dolphin Beach.

The most common geohazards in this area would be expected to consist of shallow slides occurring within overburden on steeper parts of the underlying bedrock, as well as possible rockfall and rockslides in areas of steep bedrock exposures. Shoreline areas along the coastline may experience retrogression of loose or eroded rock.

The majority of the area (where mappable features were present) was assessed as “low” to “medium” AOP.

4.3.12 QUENNELL LAKE AREA

Quennell Lake occupies an area of about 1.4 km at an elevation of about 33 m and is located about 2.5 km south of the community of Cedar.

The general area surrounding Quennell Lake features rolling terrain with relief of up to 30 m. The area has been eroded by glaciers with subsequent glaciofluvial erosion, resulting in a series of what have been described as "cuesta-like" ridges and longitudinal valleys. Quenell lake occupies several parallel longitudinal valleys. The area is characterized by shallow bedrock (under a till veneer) with frequent bedrock exposures. The area surrounding the lake is lightly settled with rural residences.

The majority of the slopes in this area are not mappable per the study criteria, however, some mappable slopes of up to 40° were noted in the area. Similar to the Nanoose Bay area, it is likely that steep or potentially hazardous localized rock features exist which could not be captured at the scale of mapping. As such, a more detailed review and mapping of this area would be warranted.

Geohazard occurrence in this low lying area is generally expected to be low, but could occur locally in areas not captured at the mapping scale of this study. The majority of the area (where mappable features were present) was assessed as "low" AOP.

The most common landslide geohazards in this area would be expected to consist of shallow slides of overburden on steep bedrock. The hazard of possible rock sliding or falling in some areas (with rocky exposures) have also been identified in background reports in the area.

The Strait of Georgia coastline in the vicinity of Quennell Lake was also part of the study area. The southern part of the coastline through this region features a low sandstone bluff up to 10 m high. At the scale of this study, these rock slopes are generally considered to be "low" AOP. Minor retrogression of these banks can be expected to occur over time through gradual erosion of the rock bluff, and a minimum buffer for future developments would be prudent (10 m was used in this study but detailed study is required). Shoreline areas below the bluffs (undeveloped) would be more likely to be impacted by rock fall.

The northern part of the coastline features a marine veneer and till slope, which is considered to be vulnerable to sea erosion, and is likely to experience translational earth and debris slides leading to retrogression of the crest (in the absence of site specific review, these were assigned high AOP).

4.3.13 HORNE LAKE

Horne Lake occupies an area of 8.2 square kilometres at an elevation of about 120 m, situated at the southern end of the Beaufort Range of mountains. The lake is surrounded by mountainous terrain with elevations of about 500 m, including Mt. Mark along the north side of the lake, which rises to an elevation of 950 m.

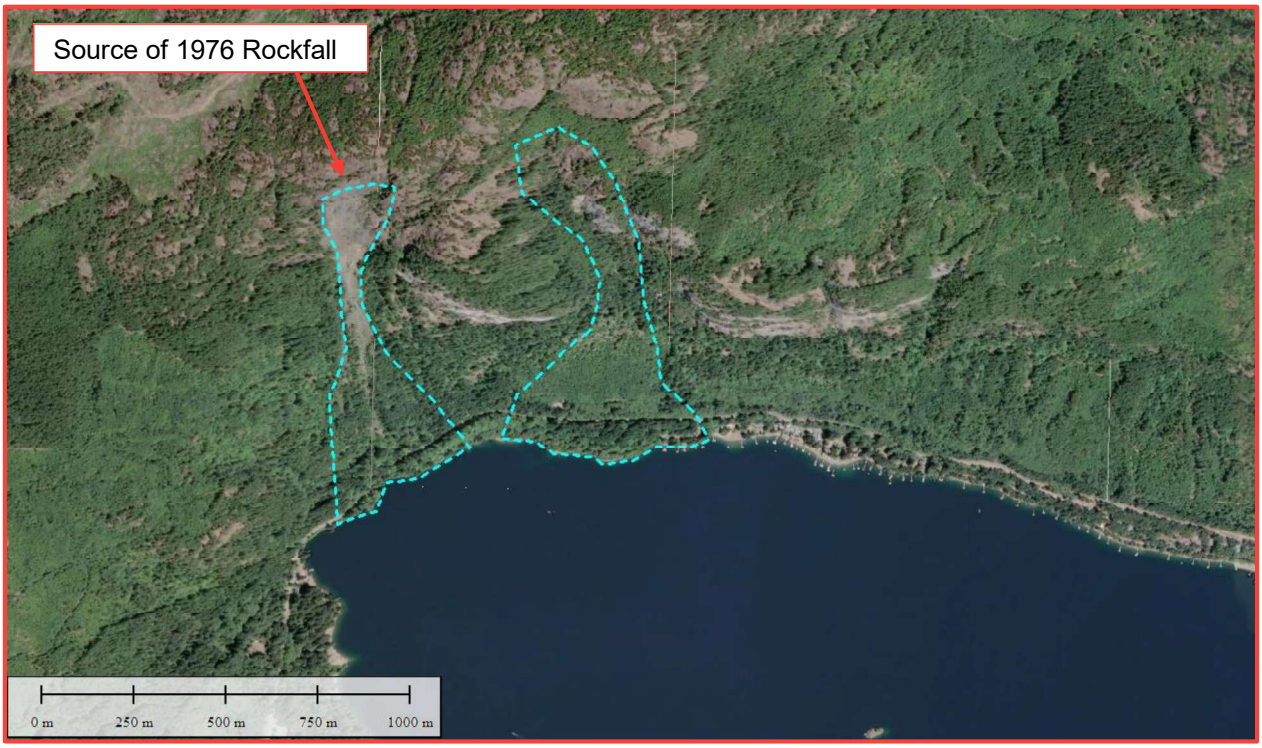
The inclination of the surrounding slopes is in the range of 30°, except along the north side of the lake (Mt. Mark) where many steep slopes (over 45°) occur, including several near-vertical bedrock exposures that provide sources for rockfall.

Where bedrock is not exposed, it is expected to be covered by a relatively thin veneer of till.

Geological mapping indicates that the majority of the bedrock exposures around the lake are of volcanic origin. However, the Mt. Mark south slope features large exposures of sedimentary and intrusive rock. It is within these sedimentary exposures that the steepest slopes are found. To the west of the lake are limestones with well developed karst formations including significant cave systems.

Available data shows that rock fall from the southern slope of Mt. Mark is relatively active, including a notable rockslide which occurred in 1976 that triggered a re-location of a small cabin development along the lake shoreline. Based on a historical review, the rockfall hazard area was likely active long before this event, as signs of rockfalls or rock sliding along the same path are evident in earlier aerial photographs (1968). A significantly larger colluvial fan exists about 800 m east of the slide area, but does not show any signs of recent larger scale instability as far back as the photographic record was available (see Figure 13). Previous investigations by WSP indicate that most of the north shoreline of Horne Lake has been impacted by large rock fall and rock slides.

Figure 13: Colluvial Fans and a Recent Rockslide along the north side of Horne Lake



The most pertinent landslide geohazards in the Horne Lake area are associated with the steep slopes of the sedimentary rocks along the north side of the lake (Mr. Mark area). Available data and the site topography indicate a history of rockslides and rockfalls. The area may also be vulnerable to shallow slides occurring within the overburden (which may occur as a consequence of rockfalls or rockslides occurring from higher up the mountain).

The slopes along the north shore of Horne Lake, which include the 1976 rockslide, are considered to have a high likelihood of occurrence of future slides and falls, based on historical evidence. Other areas along the south slope of Mt. Mark are anticipated to experience similar occurrences and show topographical evidence of such occurrences in the past. The frequency of these events is difficult to assess. Historical aerial imagery does not show any visible activity of significant rockfall over the past ~50 years but other rock slides are considered possible.

Generally, these types of instabilities can be attributed to local high groundwater pressures in discontinuities or seismic shaking. Progressive deformation over time may also be occurring. Major precipitation events, spring snowmelt, and earthquake shaking may in some cases serve as the final "trigger" after a period of slow, gradual weakening through weathering.

The rest of the slope around the lake, which features shallower slopes and volcanic bedrock formations, did not show signs of instability. Nevertheless, a residual ("low" AOP" risk of rockfall in these areas has been inferred where slopes exceed about 40 degrees. These areas should be verified based on more detailed assessments.

Developments most exposed to the identified landslide geohazards consist of private residences along the north shore of Horne Lake. Although these developments appear to have been re-located away from the area of the 1976 landslide, many of these cabins remain below very steep sedimentary rock bluffs that are likely to generate rockfalls and/or slides in the future.

4.3.14 CAMERON LAKE

Cameron Lake occupies an area of 4.8 square kilometres at an elevation of about 184 m beside Highway 4. The lake is surrounded by mountainous terrain with elevations of up to about 1,000 m. Mt. Horne and Mt. Wesley are located along the northwestern side of the lake, while a larger unnamed peak is located along the south side.

The northern slopes surrounding the lake are typically 40°, with local very steep (near vertical) portions, while the southern slopes tend to be shallower (30-35°) except at the Cameron Bluffs area and road improvements for Highway 4.

The geology of the area is dominated by exposed bedrock of volcanic origin in the upper parts of the surrounding peaks. Below 500 m elevation, most of the terrain is covered with a till/colluvial veneer, except where slopes are in excess of about 45°, where exposed bedrock remains.

Available data shows that rockfalls on the northern slopes of the lake (Mt. Wesley) are common, including a recent failure (2021/2022) occurring on a near-vertical bedrock exposure at an elevation of about 600 m, with the runout approaching the railroad tracks along the north shore of the lake (Figure 14). Exposed rock faces suggest that similar events have likely occurred in the past. Slope topography suggests that these occurrences are likely fairly regular. Signs of instability (possibly rockfalls) were also evident further down the slope in the vicinity of this rockslide, with visible activity spanning across many years, suggesting regular occurrence (likely every 20-30 years or more frequently).

Several shallow slides were noted close to the toe of the north slope along the lake (in close proximity to the railroad tracks). Historical movements were visible on historical imagery through different years, dating back to at least 1980. These slides are interpreted to be relatively shallow movements within the colluvial or till veneer overlying steep bedrock slopes in these areas.

No signs of instabilities were noted along the southern slope of the lake, however, the topography indicates the presence of numerous V-shaped gullies discharging to the lake that may be subject to higher velocity debris flow type failures. Generally, the southern slopes are less steep (<35°) than the north slopes, and do not appear to feature near-vertical source rock exposures like the north slopes. As such, rockslide and rockfall hazards are thought to be unlikely in these areas (except Cameron Bluffs area). The colluvial or till veneer within the lower portions of these slopes may be vulnerable to sliding and sloughing, similar to that observed along the north slopes of the lake. Generally, these types of movements are expected to be triggered by gradual movement and periods of heavy precipitation and spring snowmelt. Such events can be exacerbated by logging activity or (for example) the recent wildfires near Cameron Lake.

The Cameron Bluffs area features steep rock exposures along Hwy 4 that introduces rockfall hazard. Two large drainage gullies (200-300 m deep) cut into the slope on either side of the bluffs that have developed alluvial cones visibly protruding into the body of the lake. There is some indication that large (ancient) rockslides may have occurred within this area based on topographic mapping, which may warrant further assessment.

A “high” AOP has been assigned to most of the northern slope along the lake, which has shown a regular occurrence of rockfall geohazards. With the exception of Cameron Bluffs (“high” AOP), most of the southern slopes have been assessed as “low” to “medium” AOP based on a roll out buffer.

Figure 14: Recent rockfall (2022) on Cameron Lake north slope. Image courtesy of RDN.

The northern shoreline of Cameron Lake appears to be largely undeveloped with the exception of widely spaced recreational cabins. The southern shoreline, however, contains Hwy 4, and consequences of geohazards occurring in this area would be significant (economic impact, life safety, etc.). As such, the Cameron Bluffs area ("high" AOP) is of particular concern and may warrant further assessment.

Our review indicated that other parts of the slopes along the southern parts of Horne Lake did not show signs of frequent instability. However, there may be a longer return period to some of the more significant events such as large rockslides, which could cause extreme consequences. As noted, this area is recommended for further geotechnical assessment

5 SUMMARY COMMENTS

Our assessment of the potential of landslide geohazards within the study area suggests that soil slides, blow-out slides sometimes causing debris flows, gully erosion and debris flows are the most frequent types of slope failures in the study area and are primarily located within the river/stream valleys and along coastal slopes. Rockfalls and debris slides appear to be the most common geohazards within the mountainous regions near Horne and Cameron Lakes.

While impacts are variable and site specific, broad generalizations and recommendations are provided below. These recommendations are intended to guide interpretation of the map data and use of the geohazard data aiming to incorporate elements of consequence and risk:

- Landslide hazard has been identified from the study in a number of the Electoral Areas within the RDN. Our review of the various OCP's for each of the Electoral Areas indicates that there is opportunity for a coordinated initiative by the RDN to identify and establish Development Permit Areas related to hazardous lands to better inform the land development approval process and the necessary studies that may be required within that process. It is recommended that the findings from this assessment be considered within the current DPA framework for hazardous lands and reflected in the administrative by-laws that govern land development in the RDN.
- Generally, from a consequence point of view, debris flow failures pose a greater risk to properties below the toes of slopes, since the moving mass may attain significant velocity and runout well beyond slope toe. Note though that velocity is limited by the vertical drop and length of path. Debris flows typically have an extended runout zone compared to other slides while crest retrogression may be small. As such, these types of failures may disproportionately affect developments at the toes of slopes. Consequently, for the purpose of planning, the study has designated preliminary buffers along toe of slopes that are based on a lower runout angle (12-17°) compared to the crest buffer delineation that used long-term stable angles of around 20-25° projected upwards from the toe.
- Certain areas (particularly along the Big Qualicum River) show a tendency to develop gullies with channel gradients of typically 3-7° extending back from the main river channel. These features were more frequent in Quadra Sand deposits. Once formed, these features may regress quite rapidly into areas of flatter Coastal Plain. As such, preliminary buffer zones for areas where such gullies have developed were based on a projected gully base angle of 10° encompassed the overall extent of lands between gully features. It is noted that 10° may not be conservative in the longer term, and that these areas should be carefully assessed from the point of view of any future developments.
- The areas surrounding Horne and Cameron Lakes feature steep mountain slopes, over 1,000 m in elevation, and represent the highest topography within the study area. The desktop review, our in-house experience and published records indicate that rockfall/topple and rockslide instabilities have occurred over wide areas. These areas may pose the highest direct risk to life within the study area depending on location and length of exposure time. Based on historical documentation, there is potential for large rockslides to occur in these areas, which could (for example) be seismically triggered or triggered by high precipitation/snow melt. These types of slides would have potential to cause damage over significant areas. As such, WSP suggests that further studies related to development in these areas is warranted.
- Slope failures driven by toe erosion along streams and some coastal areas will tend to cause retrogression of slope crests over time. The rate of retrogression varies and is difficult to estimate due to factors such as river channel stability, change rates of precipitation and sea level rise. This study has designated preliminary buffers to recognize possible lateral erosion effects along the major river channels and steep coastal slopes throughout the study area. Further site specific studies would be required to support new development in such areas. A review of future of Lidar data acquisitions over time may provide greater insight into rates of regression to allow for a refinement of these buffers produced in this study. As noted, retrogression may be episodic and may be triggered by extreme precipitation or other events, rather than being a smooth progression over time.

- The Regional District of Nanaimo is located in an area of high seismic hazard. Earthquake shaking can trigger landslides and induce liquefaction in susceptible soils causing slides (may be low angle), lateral spread or liquefaction. The extent of landslide movement triggered by a major earthquake may extend beyond the limits of the mapped hazards and buffer zones used in this report, and may impact areas not designated hazards under normal static conditions. Indications of at a few such historical landslides were identified in this study. These types of events, while occurring infrequently, can cause widespread damage to development, infrastructure, and pose a resulting threat to life. The 1946 Vancouver Island earthquake (M7.3) was documented to have caused extensive slumping and liquefaction, especially along the shoreline between Deep Bay and Campell River (north of study area), along with other topographical changes like craters and sand boils, and a submarine landslide near Deep Bay (Hodgson 1946). Another suspected liquefaction-related landslide was noted west of Deep Bay, inferred to have occurred prior to the 1946 earthquake. Generally, the findings suggest that, within the study area, the Deep Bay area may be one of the most vulnerable to liquefaction-related slope geohazards. Guthrie (2005) indicates that major earthquakes (larger than M9) are expected occur about every 500 years on Vancouver Island, which would have potential to cause much greater damage than the 1946 event. It is noted that the last major earthquake occurred approximately 325 years ago. As such, the RDN may wish to consider seismic ground response and undertake further work to identify liquefaction-prone areas (and possible submarine landslides) throughout the RDN. Seismically triggered tsunamis may also be a consideration in low elevation near coastal areas.
- Future assessments would greatly benefit from the acquisition of new high-resolution LiDAR data, particularly in areas of the RDN where there is no existing LidarBC coverage. Furthermore, additional LiDAR datasets would allow for comparison of topography over time using Change Detection methods, providing insight into active progresses of erosion and their effects on slope crest regression.

6 CLOSURE

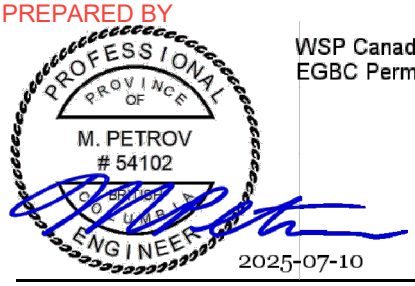
This report has been prepared by WSP Canada Inc. for the exclusive use of the Regional District of Nanaimo in relation to the Geohazard Risk Prioritization Study project.

This report discusses regional geohazards over wide areas intended to be used at a high-level of land-use planning. The report is not intended to be used for conclusions involving geohazards at individual properties. WSP and the authors of the report accept no liability for use of this report relative to individual properties or small groups of properties. The study is not intended to be used for detailed assessment of individual properties or local areas. Such areas should be studied in detail by geotechnical engineers or geoscientists with appropriate experience.

The report has been prepared in accordance with the appended Standard Limitations. In addition, limitations of the study are also appended. Both sets of limitations should be read to understand the limitations that arise from the nature of the methodology and govern the findings of the study.

We trust the information provided in this report meets with your immediate requirements. Please do not hesitate to contact us if you have any questions or require further information.

PREPARED BY



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The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

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This limitations statement is considered an integral part of this report.

STUDY LIMITATIONS

This Report and the accompanying maps are subject to the following limitations:

1. The geohazard assessment was completed strictly as a desktop study, based on analysis of LiDAR data, surficial geological maps, and aerial imagery. As such, the accuracy of the mapping is highly dependent on the accuracy of these data sources, and the extent to which they can be assessed.
2. Geohazard types, likelihood of occurrence, and buffer zones were based on our assessment of available data, which may not be representative of actual in-situ conditions.
3. Only steep-slope related hazards were identified as part of this study.
4. This study was completed as regional mapping intended to guide land-use planning decisions, and cannot be used to make any development-specific assessments.
5. The study does not supersede any local, site specific assessments which may have been previously conducted within the same study area.
6. Hazard mapping was limited by scale and is not comprehensive. Unidentified geohazard areas may exist which fall below the mapping scale, and would not be reflected on these maps (especially in areas dominated by rough, bedrock terrain). Generally, features with relief of less than 5 m and/or slopes less than 15 degrees steep were below the established threshold and were not mapped.
7. Triggers of seismic shaking, forest fires, human activity, and groundwater changes were not considered in the assessment of hazard likelihood. The mapped hazard and buffer zones also do not factor in areas which may be affected by seismically triggered liquefaction, which can affect very large areas.
8. Multiple geohazards may be relevant to each polygon. For the purposes of this study, only the most pertinent hazard(s) were identified.
9. Mapping of terrain features including scarps and drainage paths is not exhaustive.
10. Any stabilization efforts or human modification of river channels/slopes was not considered in assessment (e.g. toe armoring can reduce the likelihood of hazard occurrence, which was not factored into this study)
11. Slopes inferred to be man-made fills or cuts were excluded from the assessment.
12. Although the study followed a general framework as described herein, it was nevertheless necessary to use a level of engineering judgment in assessing hazard type, trigger, and probability of occurrence, as well as long-term stable angle, and appropriate buffers.
13. Hazard mapping within the study area outside of the coverage of LidarBC and HRDEM datasets was based on the topographic data provided by the RDN, which has a lower resolution and accuracy compared to the LidarBC dataset. Correspondingly, the mapping of these areas is limited in its accuracy. While the provided data was acceptable to assess major topographic features (i.e. mountainous areas), certain areas within the study area with lesser relief, which could not be reliably assessed based on this data, have been mapped as unclassified hazard areas (no hazard likelihood was assigned).
14. Some hazards areas have been mapped beyond the boundary of the study area to provide continuity and context. However, mapping outside the study area must not be relied upon without consulting WSP.
15. The local groundwater regime can have a significant impact on slope stability conditions. However, the extent to which groundwater level could be assessed on a regional level is insufficient to reliably consider groundwater levels in the assessment of hazard likelihood at the scale of the provided mapping.
16. Assessed probability of hazard occurrence provide notional Annual Probability of Occurrence figures intended to provide a relative understanding of hazard likelihood, not intended for direct use in statistical analyses or quantitative risk-based decision making.

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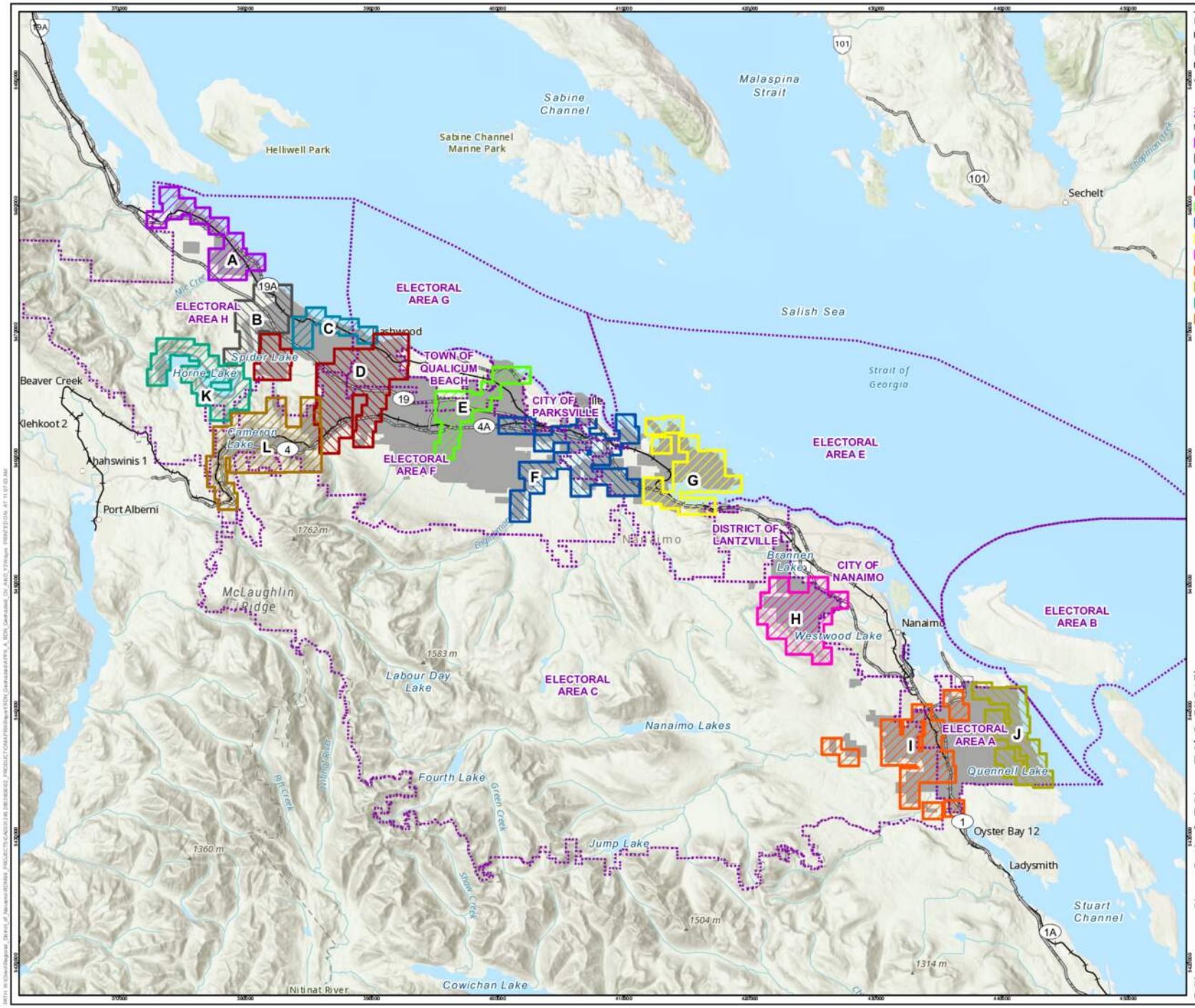
APPENDIX

A GEOHAZARD MAPS



LEGEND

PROJECT DATA

- STUDY AREA

BASE DATA

- HIGHWAY
- RAILROAD
- ELECTORAL AREA

MAP BOOK SECTION

- A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)
- B - BIG QUALICUM RIVER
- C - QUALICUM BAY TO DASHWOOD COASTLINE
- D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)
- E - FRENCH CREEK
- F - ENGLISHMAN RIVER AREA
- G - NANOOSE HARBOUR AREA
- H - WESTWOOD LAKE AREA
- I - NANAIMO RIVER AREA
- J - QUENNELL AND HOLDEN LAKES AREA
- K - HORNE LAKE
- L - CAMERON LAKE

0 6 12

KILOMETRES

REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM ZONE 10N

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

OVERVIEW MAP

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	1

LEGEND

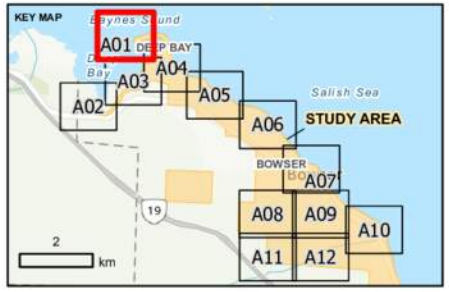
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - LOCAL
- ELECTORAL AREA
- PARCEL



0 100 200
METRES

NOTE(S)
1. MEAN SEA LEVEL + CONTINGENCY INCLUDES: 2 m (HIGH TIDE), + 1 m (SEA LEVEL RISE TO 2100), + 1 m (STORM SURGE).
2. HHWLT (+2.0m) + STORM SURGE (+1.0 m) + SLR (+1.0 m)
3. HHWLT = HIGHER HIGH WATER LARGE TIDE
4. SLR = SEA LEVEL RISE (PROJECTED TO 2100)

LIMITATION(S)
1. THESE MAP SHEETS SHOULD BE REVIEWED TOGETHER WITH THE ACCOMPANYING REPORT TITLED "GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY, REGIONAL DISTRICT OF NANAIMO" (REV. 1 DATED JULY 2025).
2. ONLY STEEP-SLOPE RELATED GEOHAZARDS WERE IDENTIFIED AS PART OF THIS STUDY.
3. HAZARD MAPPING WAS LIMITED BY SCALE AND IS NOT COMPREHENSIVE. LOCAL GEOHAZRDS MAY EXIST WHERE NO HAZARDS HAVE BEEN IDENTIFIED. FEATURES WITH RELIEF OF LESS THAN 5 M AND/OR SLOPES LESS THAN 15 DEGREES STEEP WERE BELOW THE ESTABLISHED LEVEL OF DETAIL AND WERE GENERALLY NOT MAPPED.
4. AREAS MARKED AS "UNCLASSIFIED" ARE LIKELY TO CONTAIN STEEP-SLOPE HAZARDS BUT WERE NOT ASSESSED AS PART OF THIS STUDY. BUFFER ZONES MAY ALSO CONTAIN UNCLASSIFIED STEEP SLOPE HAZARDS.
5. SOME HAZARD POLYGONS ARE MAPPED OUTSIDE OF THE STUDY AREA FOR CONTINUITY AND CONTEXT. HOWEVER, ANY HAZARD MAPPING OUTSIDE THE STUDY AREA SHOULD NOT BE RELIED UPON WITHOUT REVIEW BY WSP.

REFERENCE(S)
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2. RAILROAD AND ABORIGINAL LANDS DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – CANADA.
3. PARCEL AND ELECTORAL AREA DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – REGIONAL DISTRICT OF NANAIMO.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

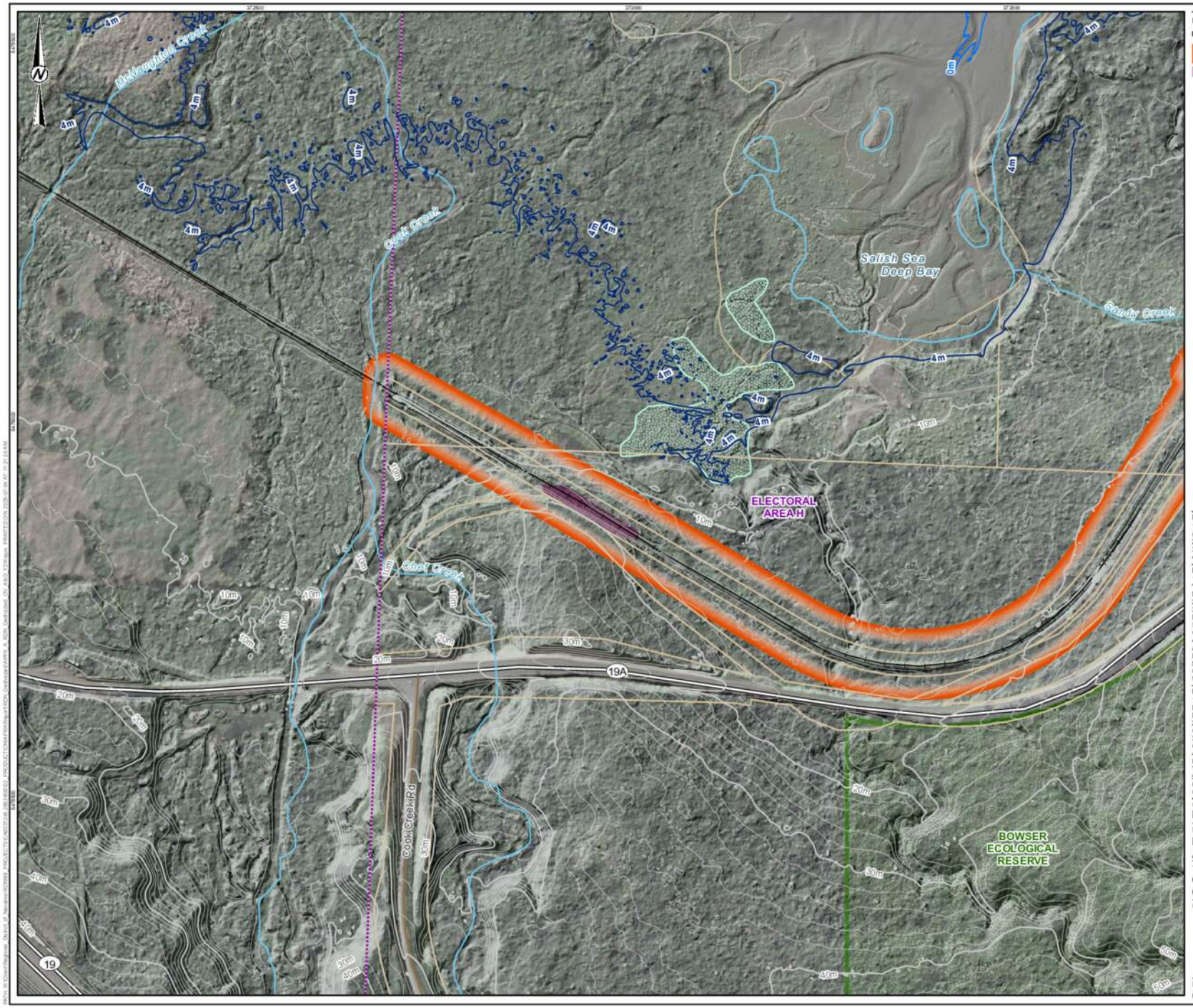
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A01



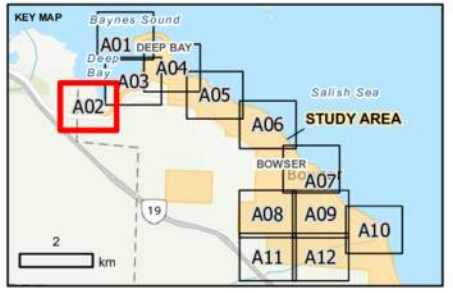
LEGEND

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- RAILROAD
- WATERCOURSE
- WETLAND
- PARK / PROTECTED AREA
- ELECTORAL AREA
- PARCEL



0 100 200
METRE(S)

NOTE(S)

1. MEAN SEA LEVEL + CONTINGENCY INCLUDES: 2 m (HIGH TIDE), + 1 m (SEA LEVEL RISE TO 2100), + 1 m (STORM SURGE).
2. HHWLT (+2.0m) + STORM SURGE (+1.0 m) + SLR (+1.0 m)
3. HHWLT = HIGHER HIGH WATER LARGE TIDE
4. SLR = SEA LEVEL RISE (PROJECTED TO 2100)

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

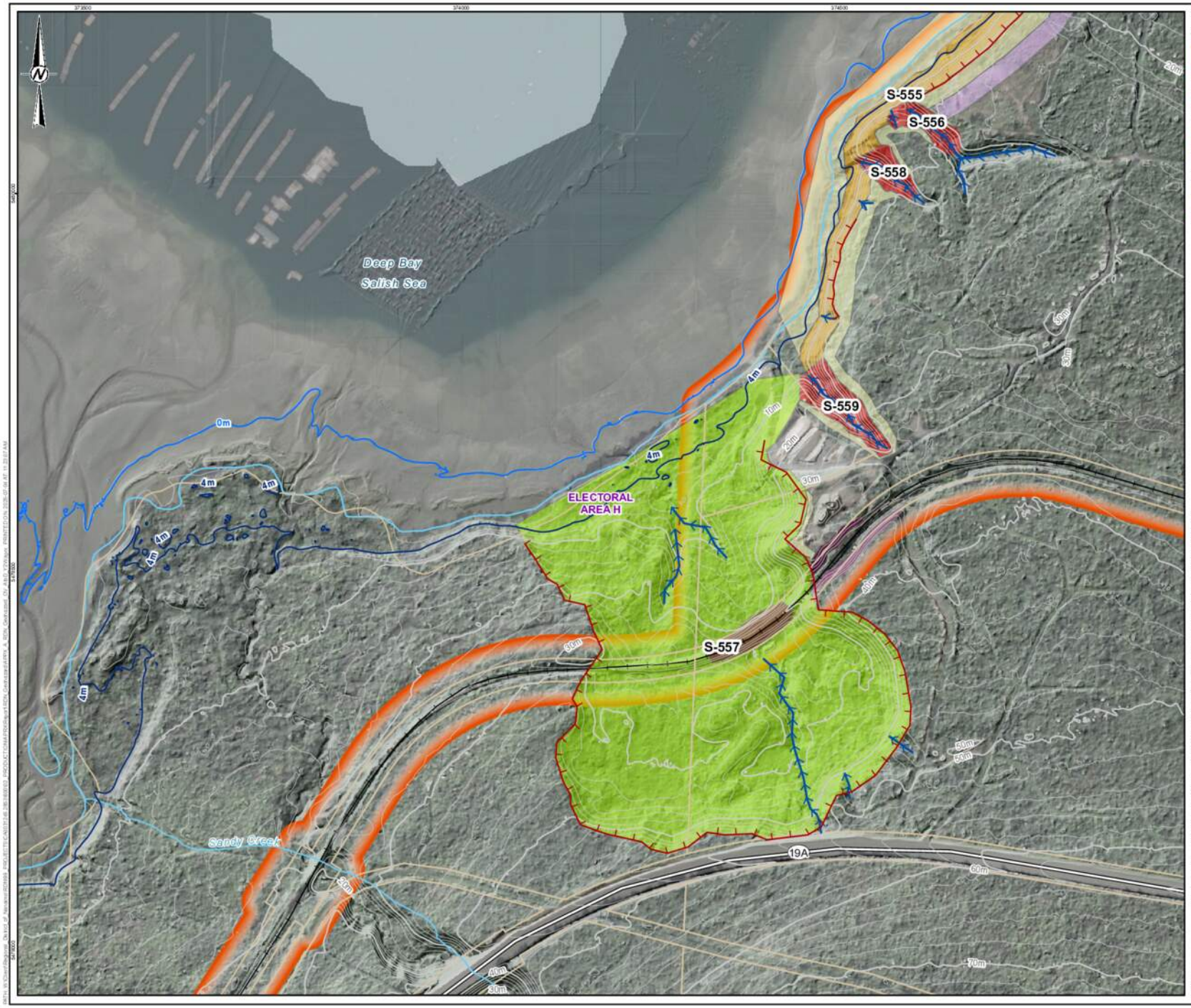
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A02



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)

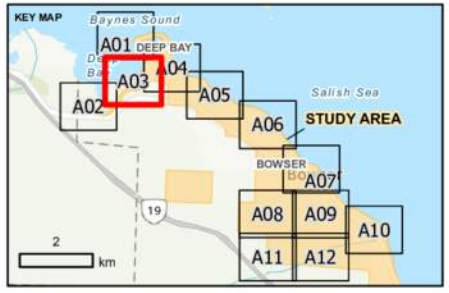
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



0 100 200

METRES

NOTE(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

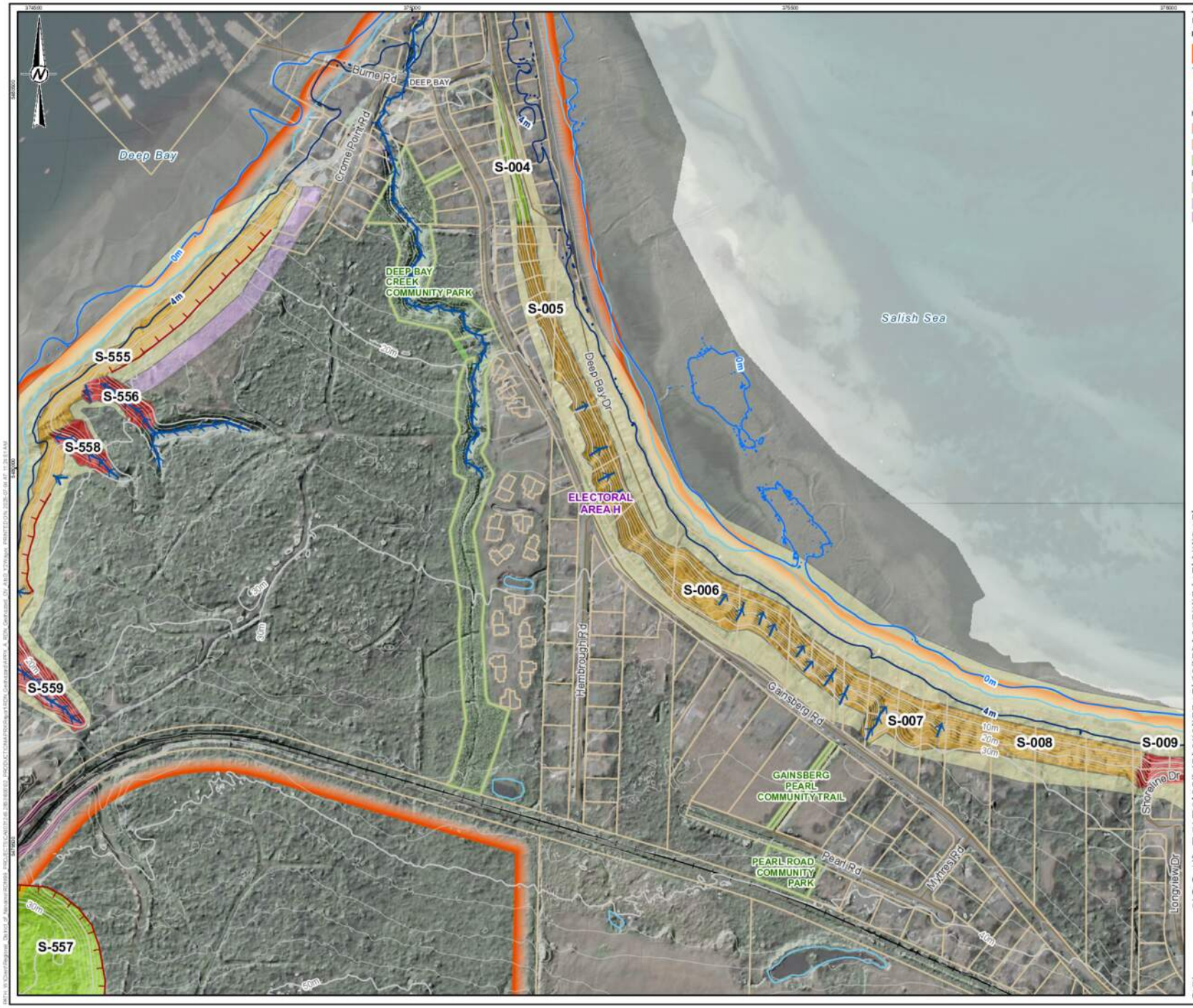
TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A03

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)

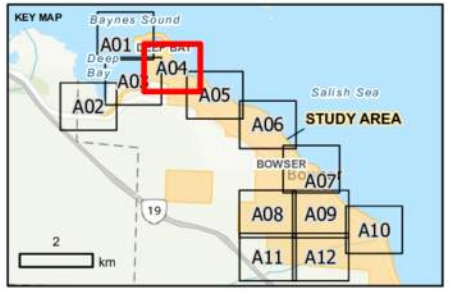
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - LOCAL
- RAILROAD
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



0 100 200

METRES

NOTE(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A04

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)

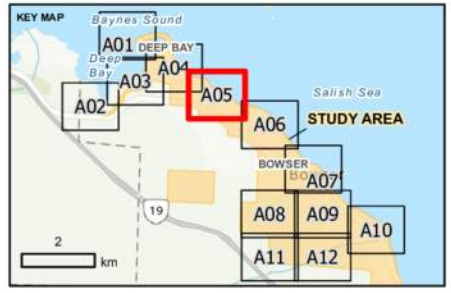
- HIGH
- MEDIUM

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WETLAND
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



0 100 200

METRES

NOTE(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

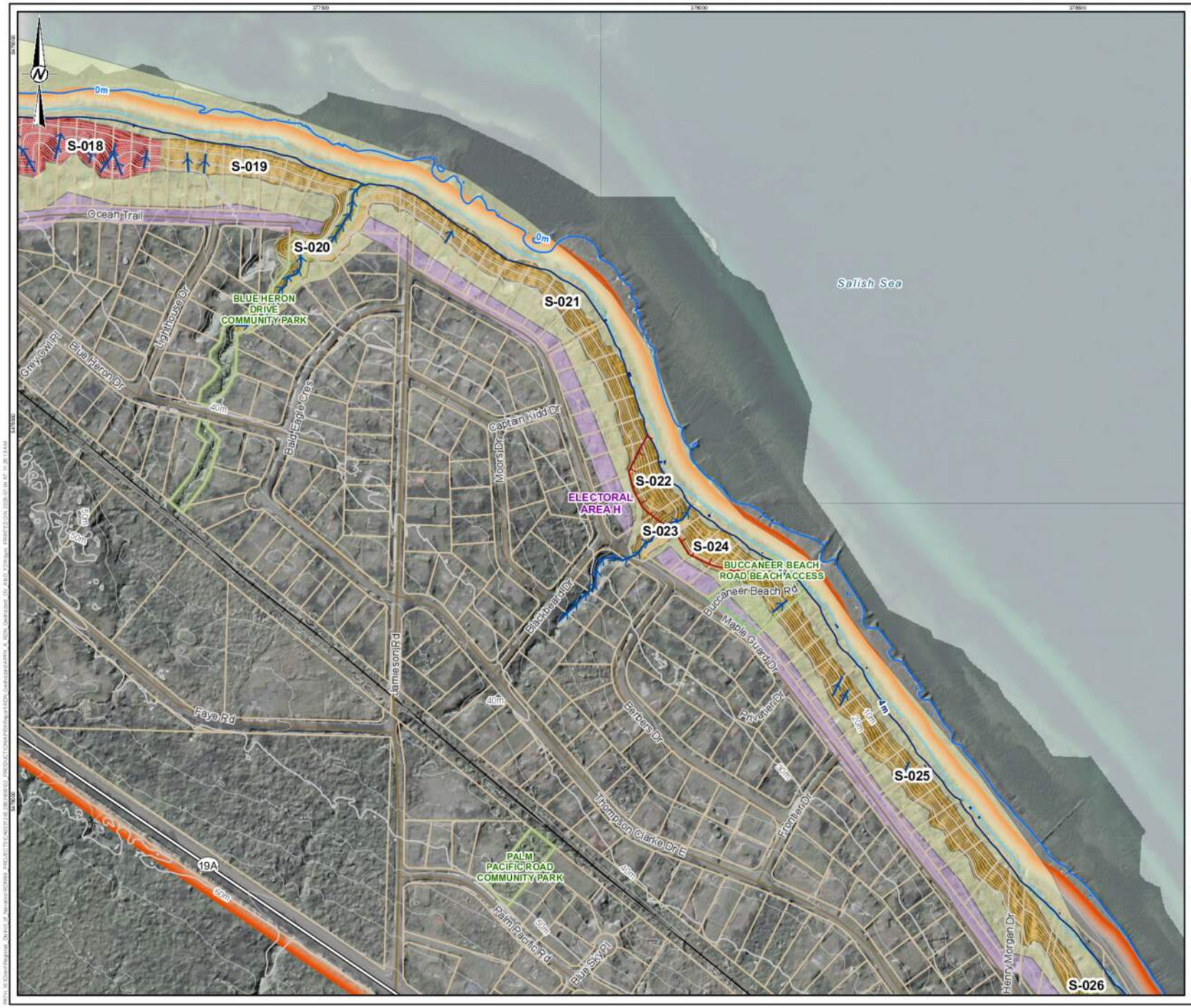
TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A05



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
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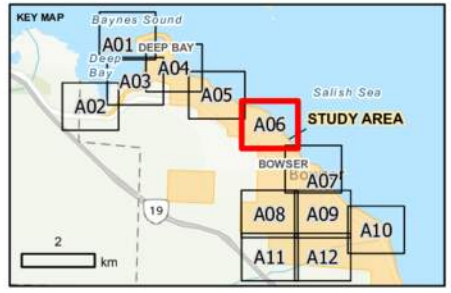
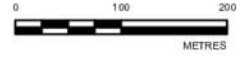
- RAILROAD
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL





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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A06

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
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- CONTOUR (2 m INTERVAL)
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- HIGH SEA LEVEL (EL. 4 m)
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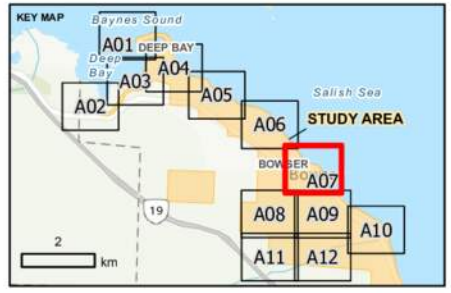
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

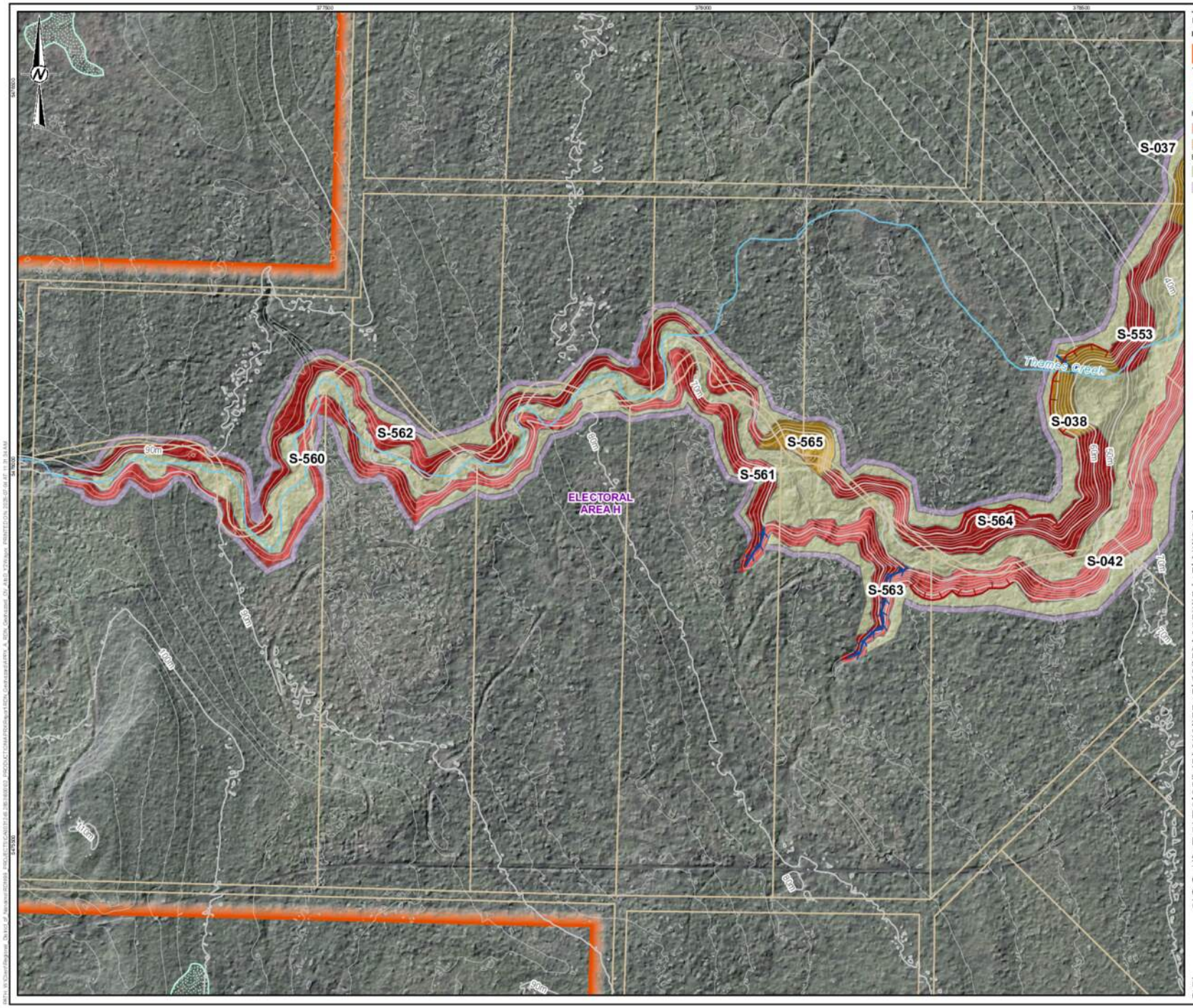
TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A07

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

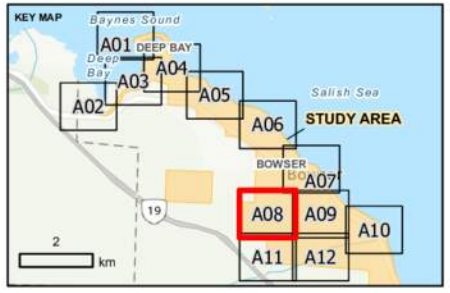
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- WETLAND
- ELECTORAL AREA
- PARCEL



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A08

LEGEND

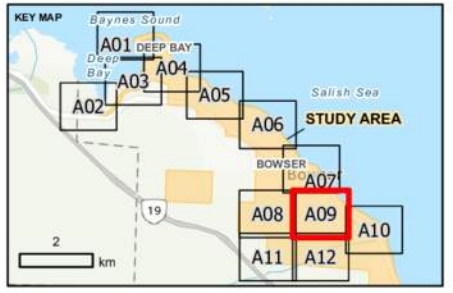
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

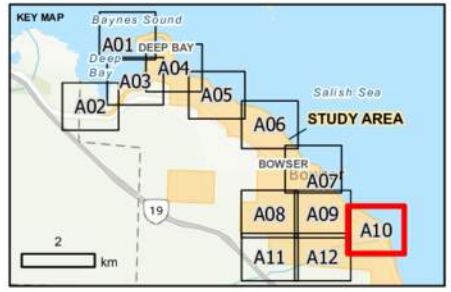
YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A09

LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
  - SCARP
- HAZARD AREA (AOP)
  - HIGH
  - MEDIUM
  - LOW
- BUFFER ZONE
  - BUFFER (CREST / TOE)
  - BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- ELECTORAL AREA
- PARCEL



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

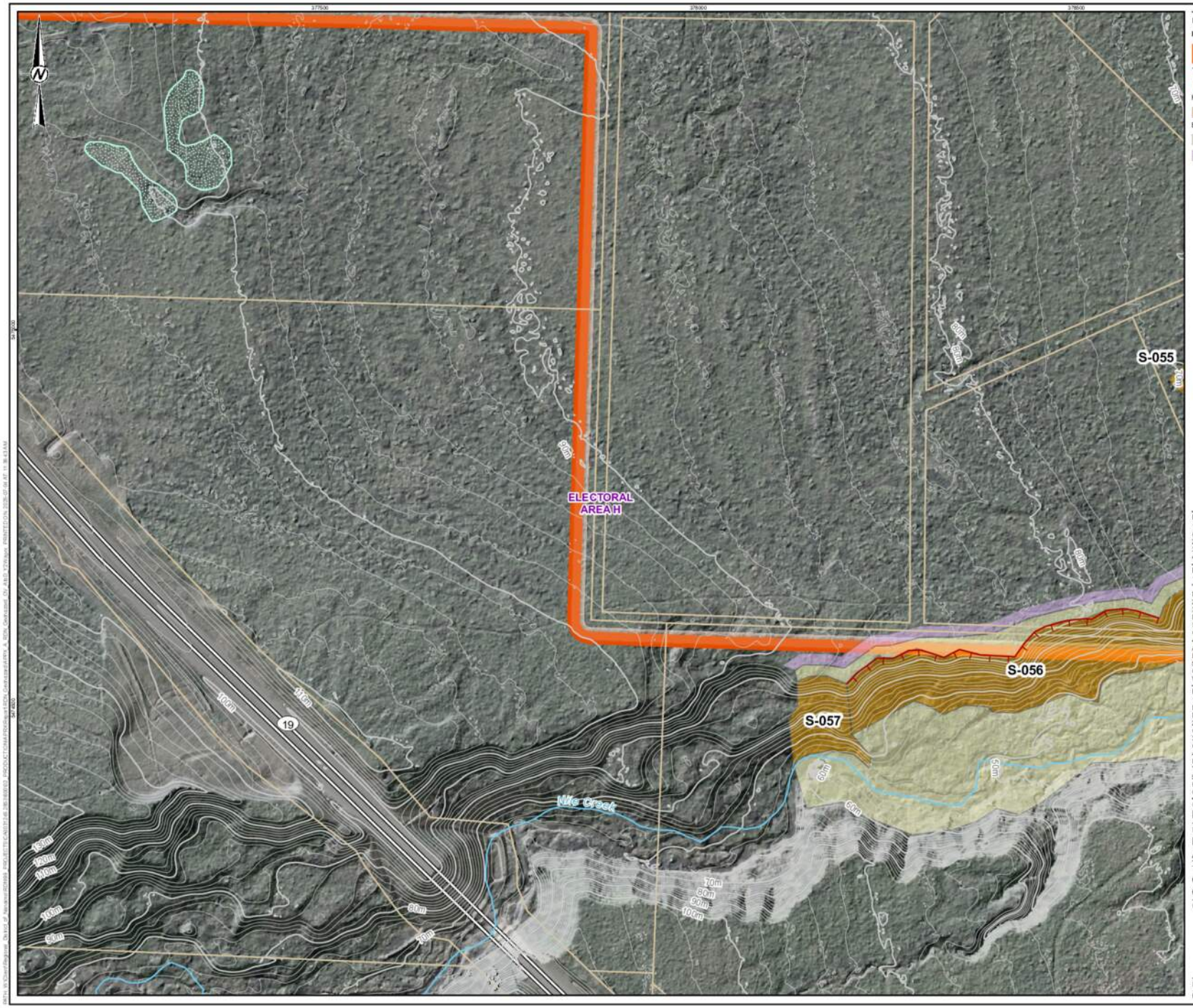
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A10



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- SCARP

HAZARD AREA (AOP)

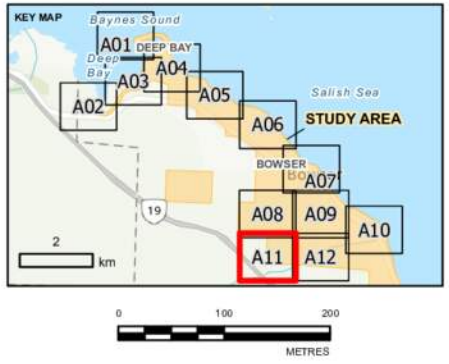
- MEDIUM

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- WETLAND
- ELECTORAL AREA
- PARCEL



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

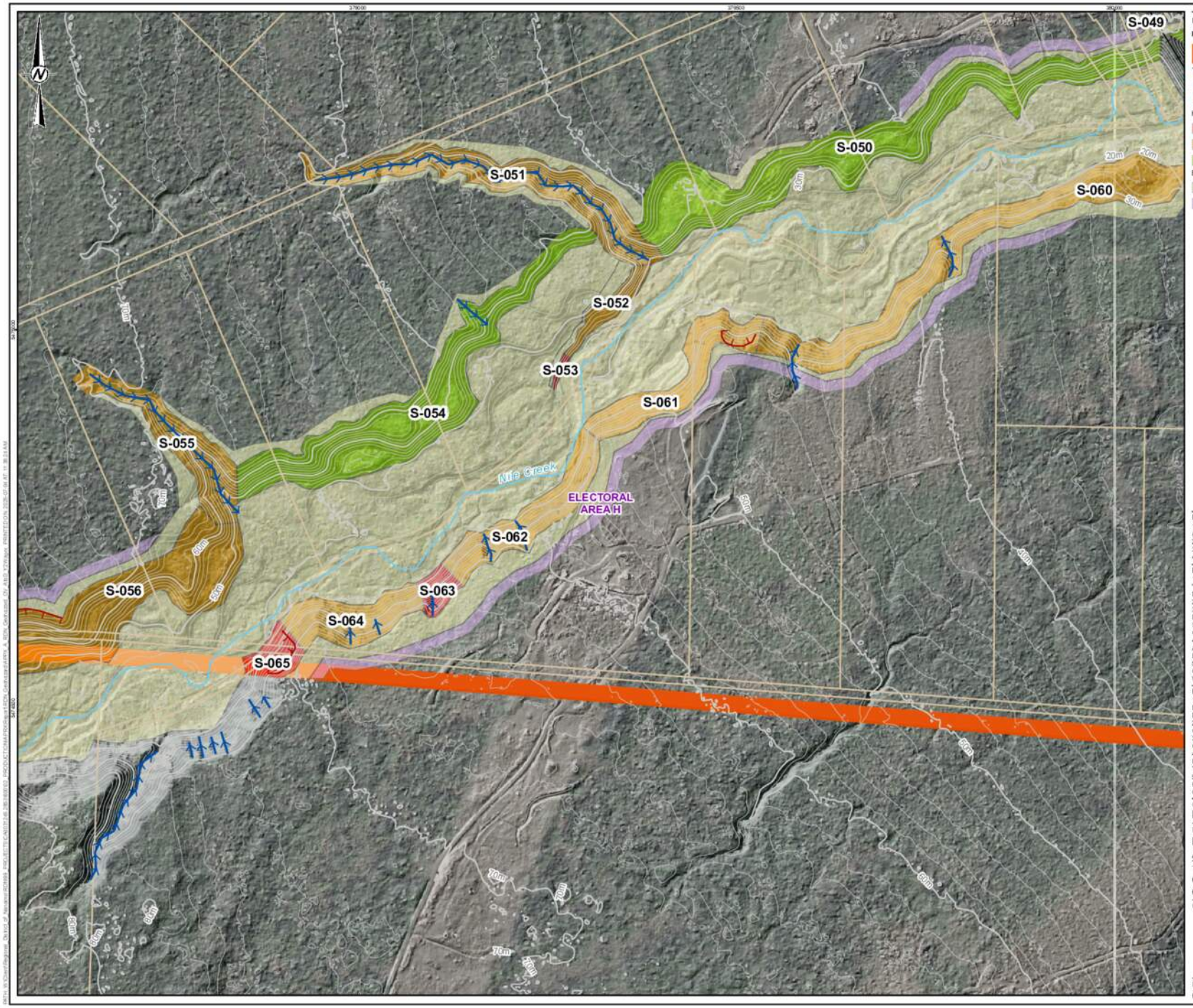
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A11



LEGEND

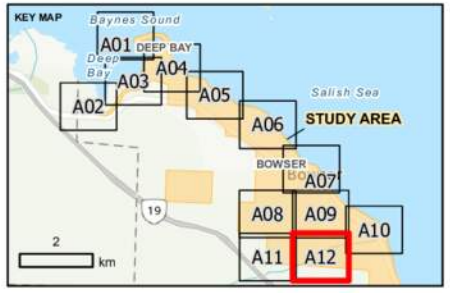
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- RAILROAD
- WATERCOURSE
- ELECTORAL AREA
- PARCEL



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

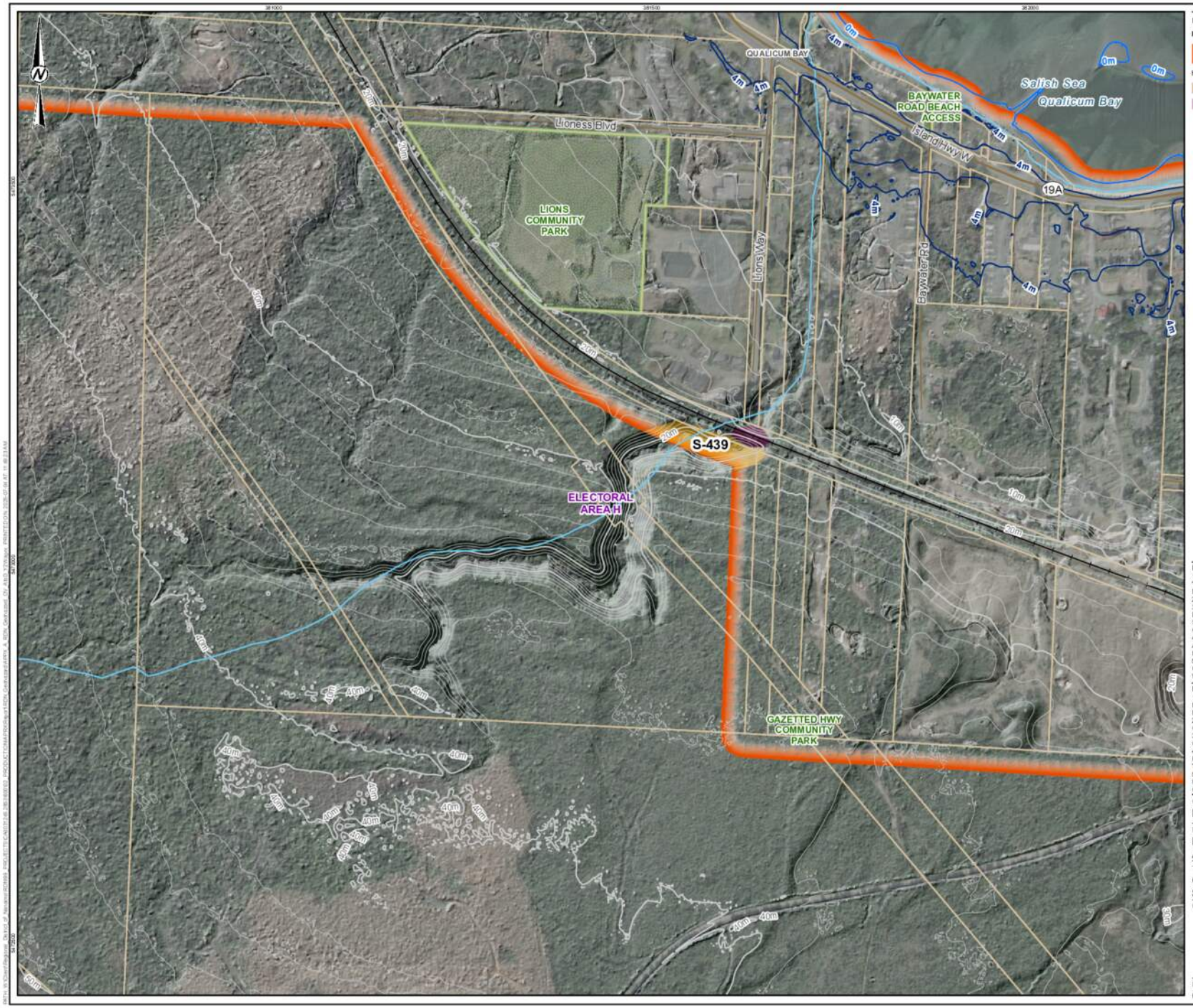
TITLE
GEOHAZARD MAPPING SECTION A - DEEP BAY TO BOWSER COASTLINE (INCL. NILE AND THAMES CREEKS)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	A12

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

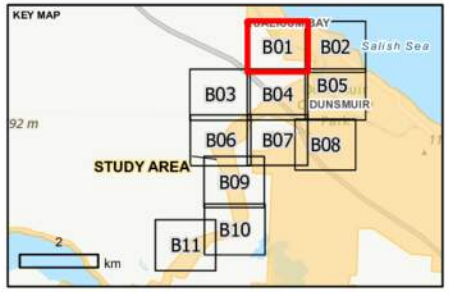
- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B01

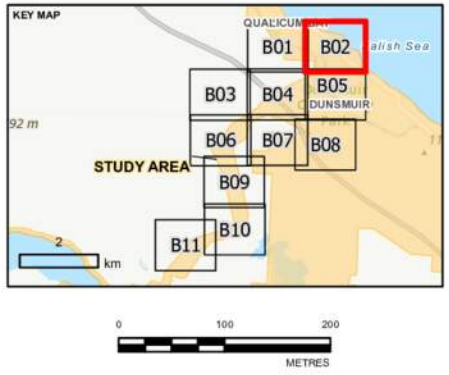
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WATERBODY
- RESERVE LAND
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
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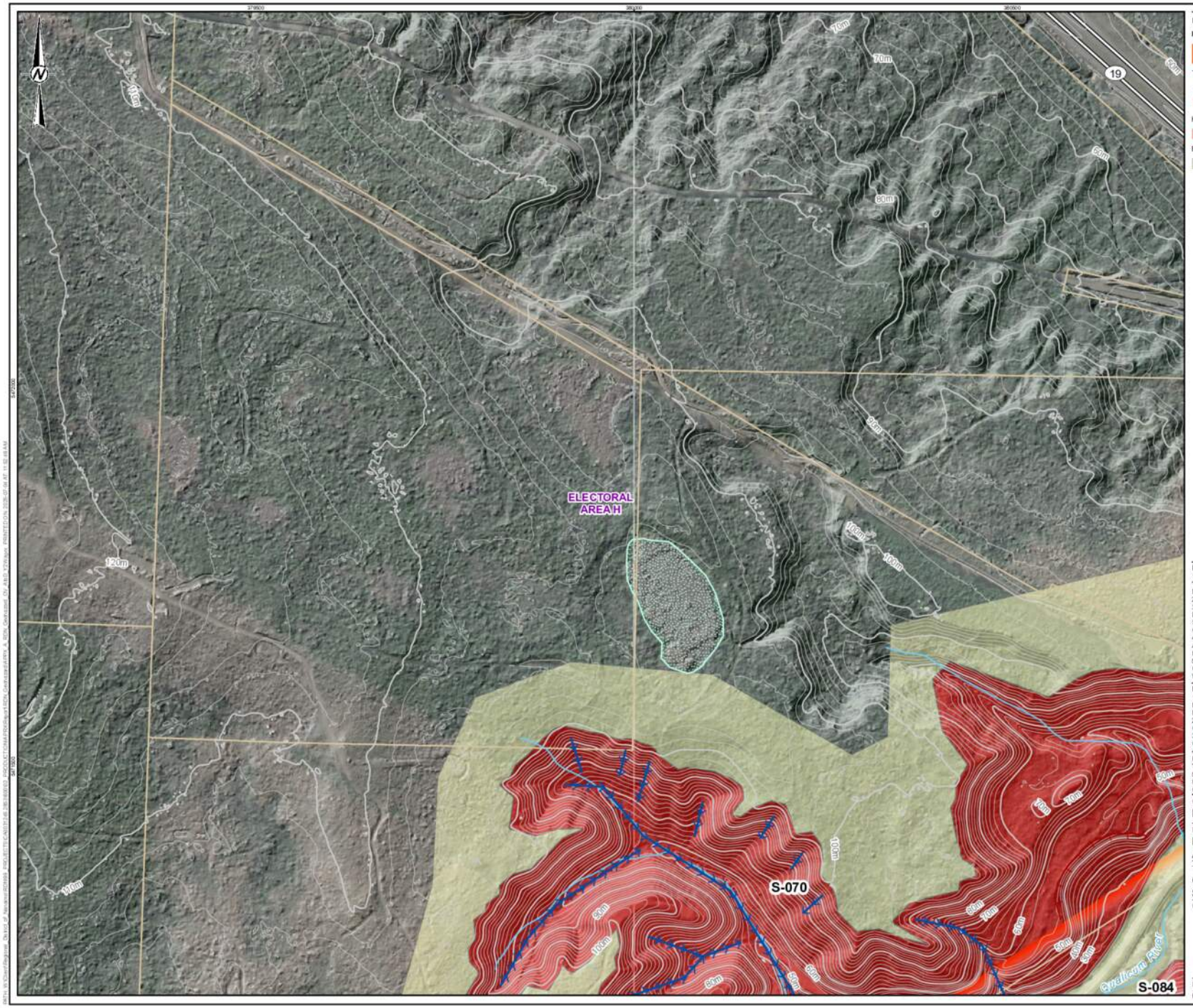


LEGEND

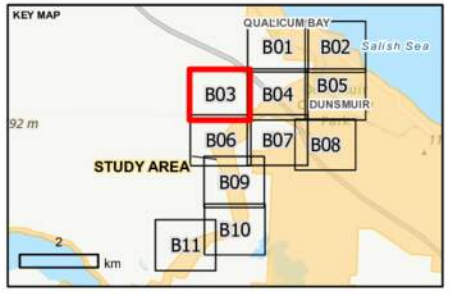
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B03

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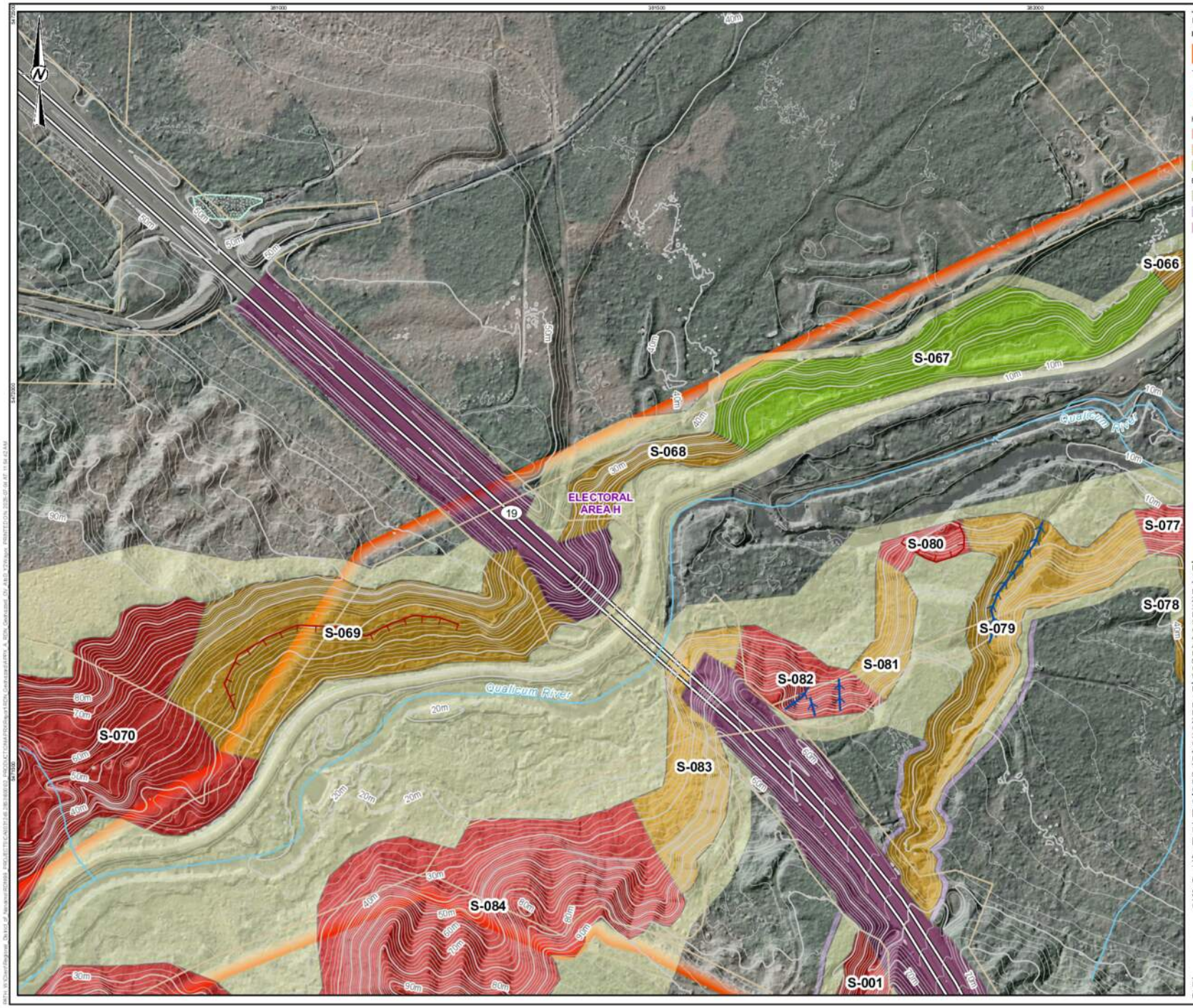


LEGEND

PROJECT DATA
- STUDY AREA

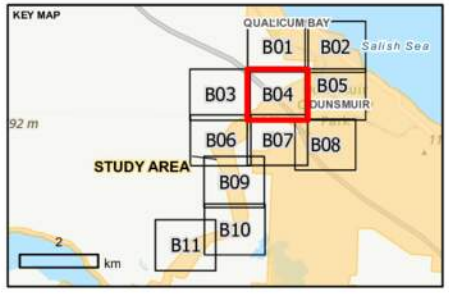
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- PARCEL
- ELECTORAL AREA

KEY MAP



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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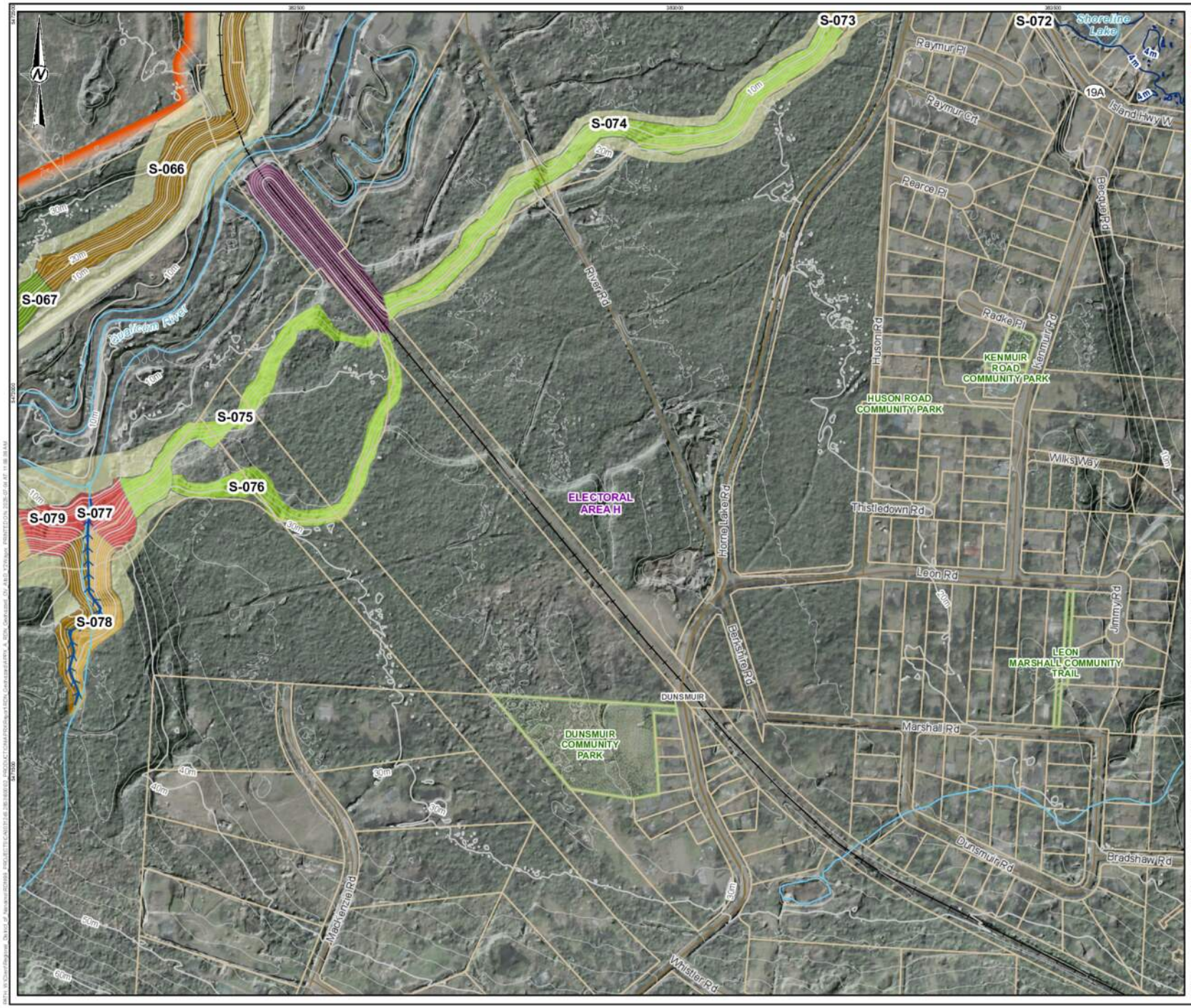
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B04



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)

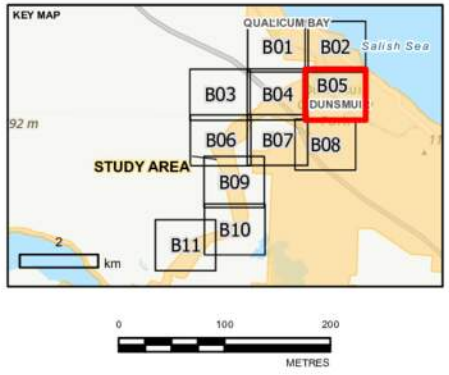
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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REGIONAL DISTRICT OF NANAIMO, BC

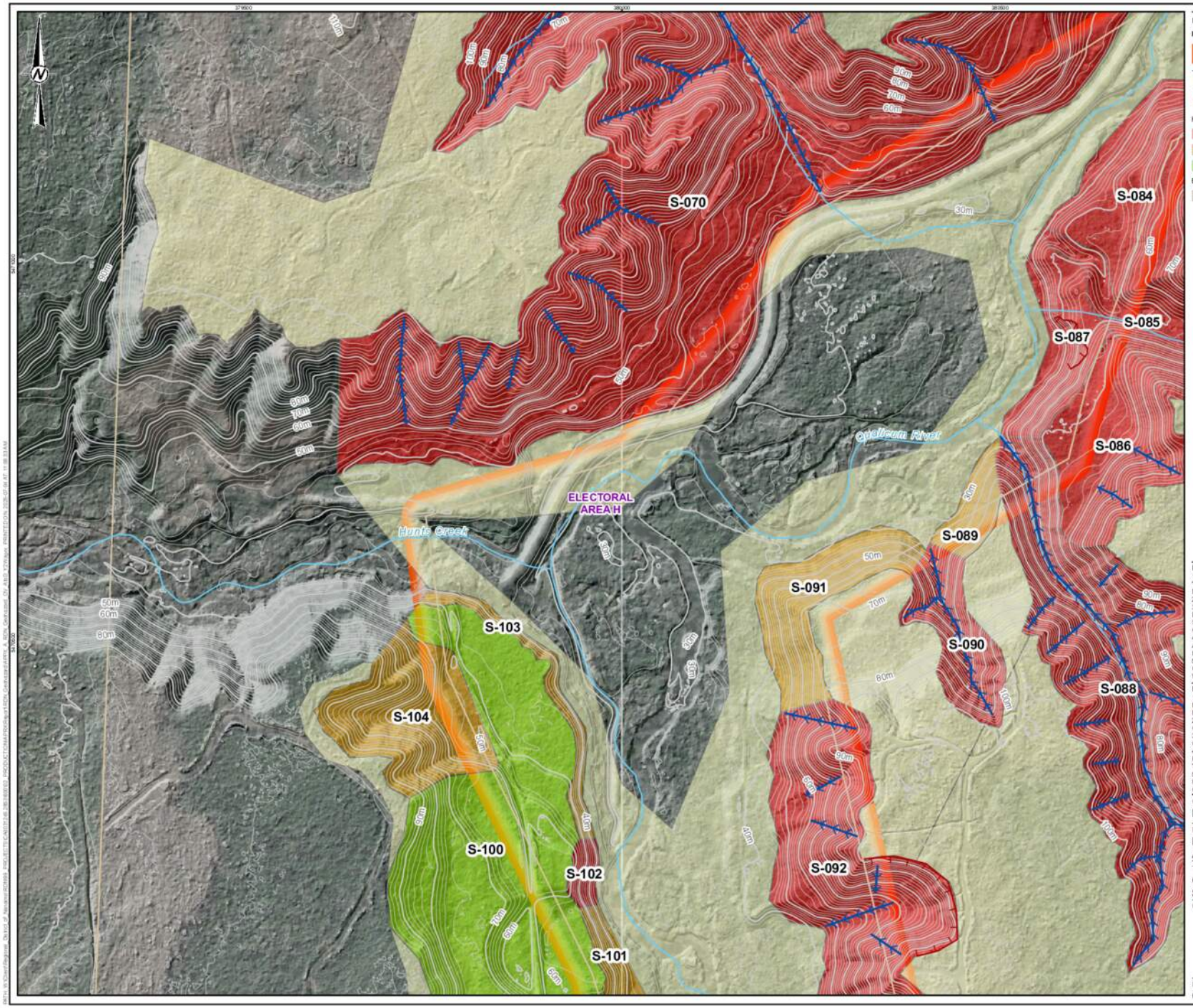
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B05



LEGEND

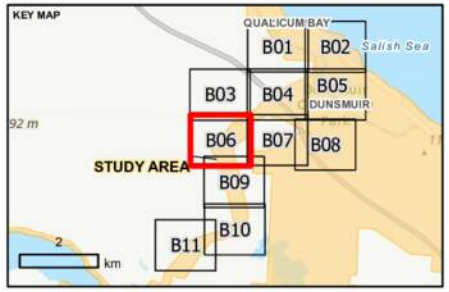
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
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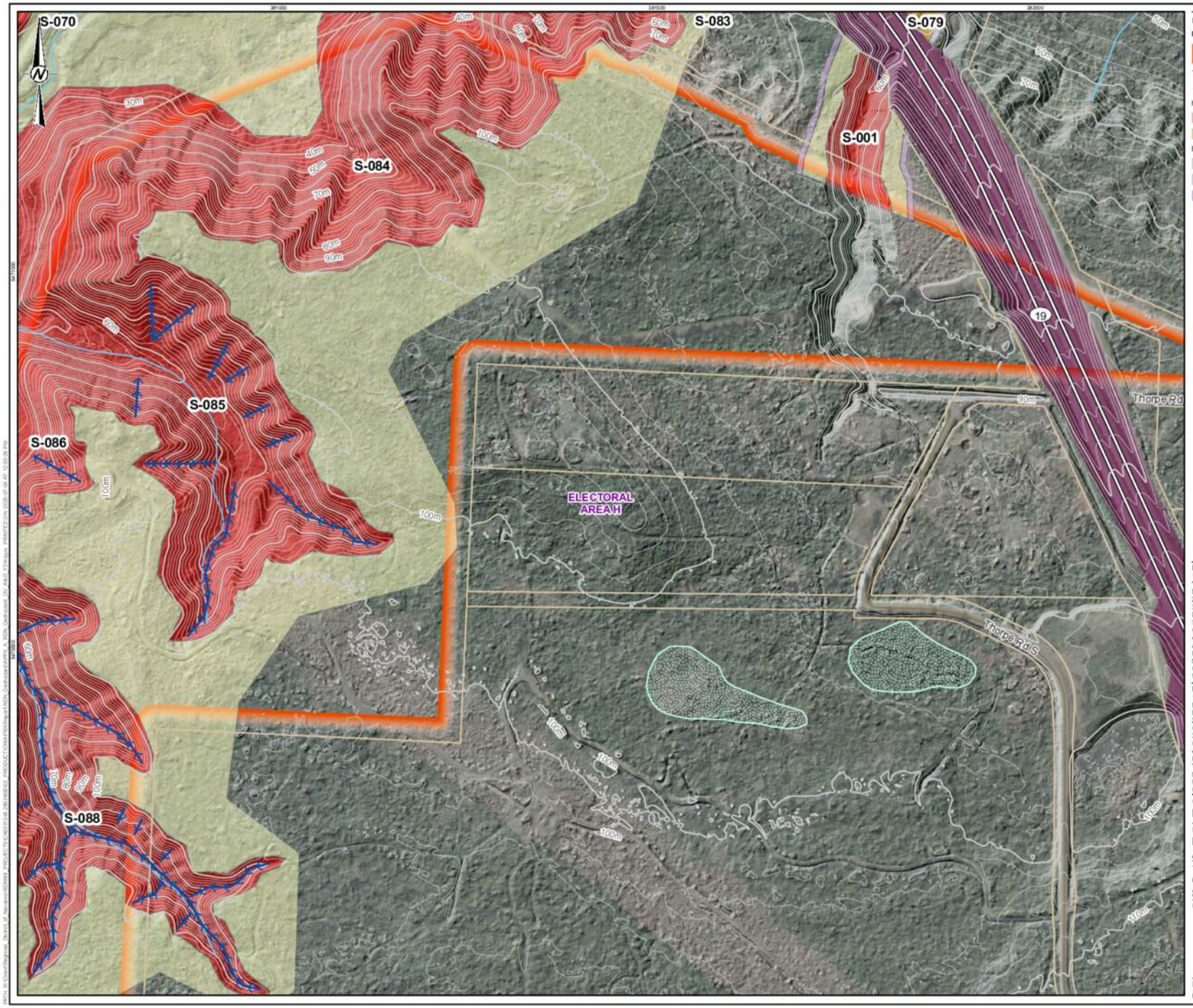
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B06



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PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
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BUFFER ZONE
- BUFFER (CREST / TOE)
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- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
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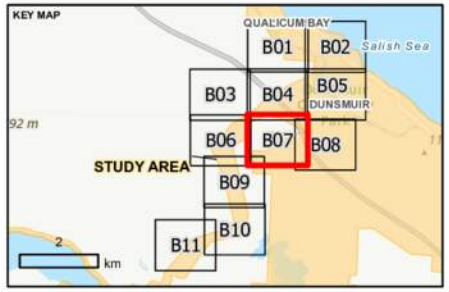

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

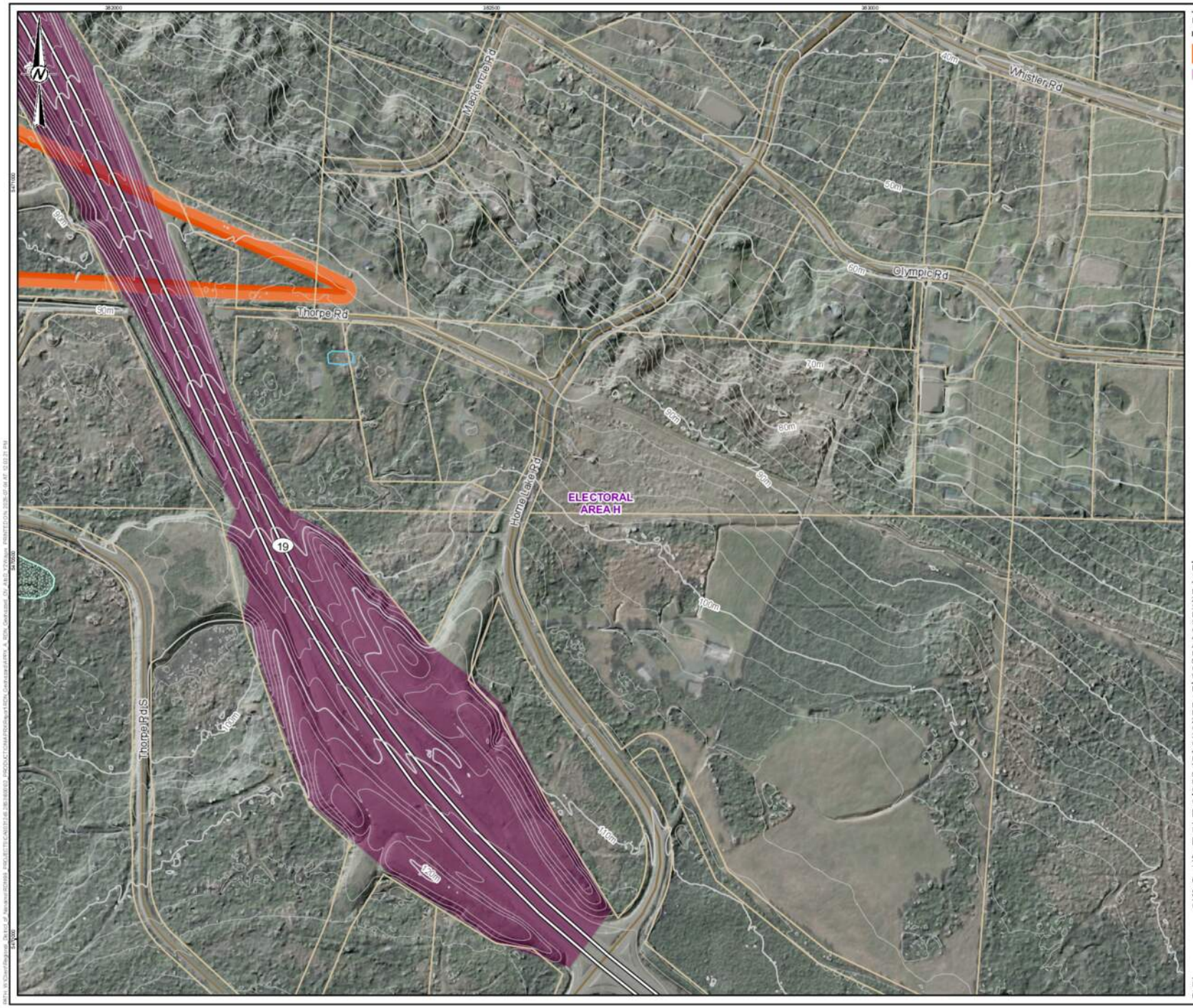
TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B07

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
20mm



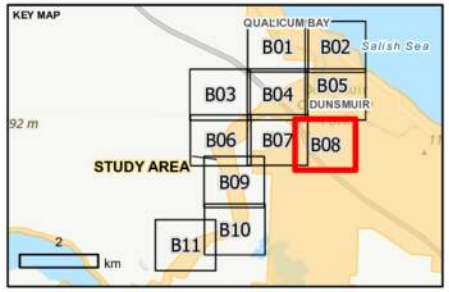
LEGEND

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
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SECTION B - BIG QUALICUM RIVER

CONSULTANT

YYYY-MM-DD	2025-07-04
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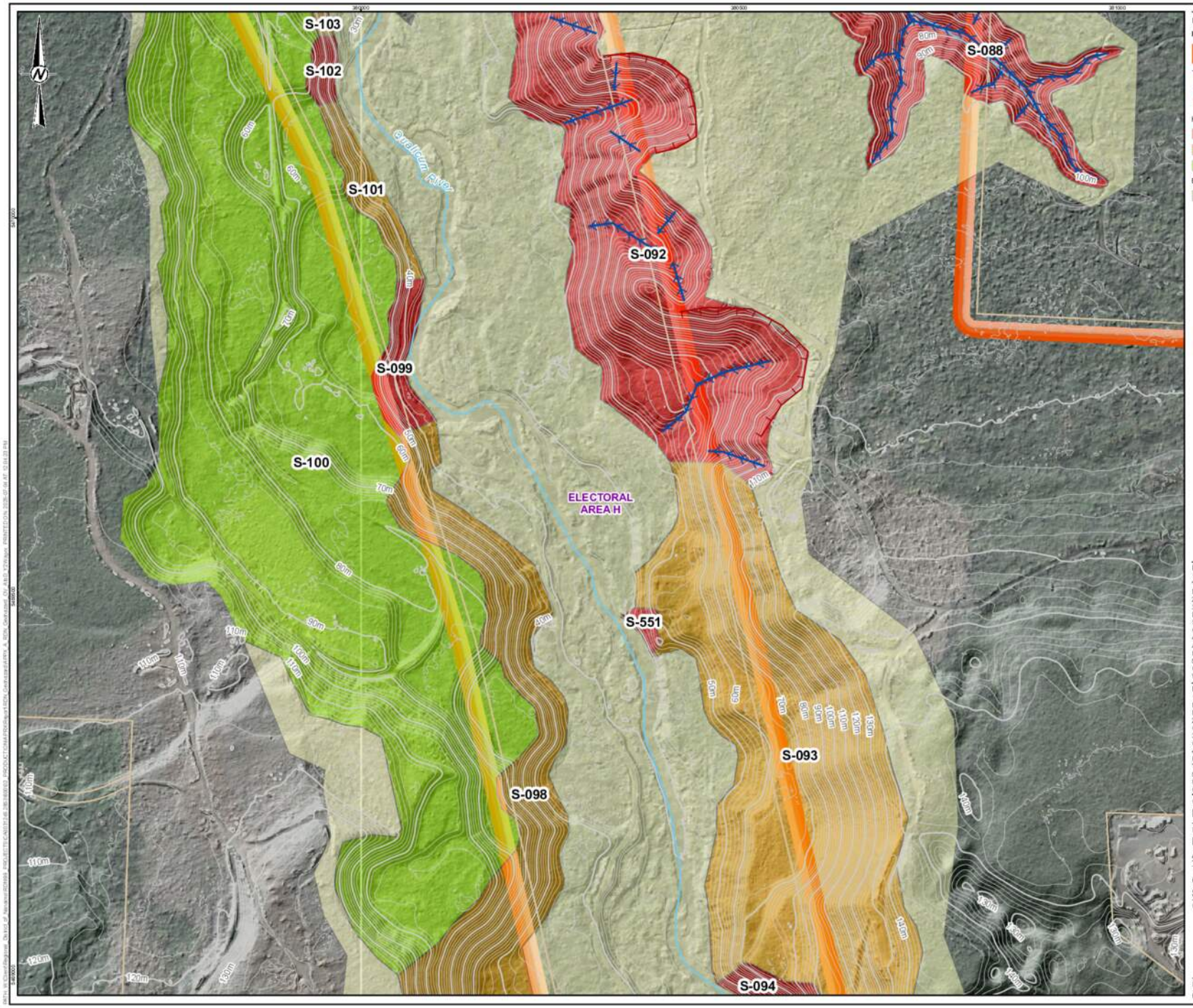
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B08



LEGEND

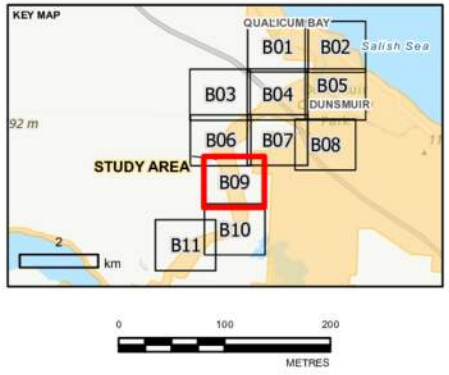
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT

YYYY-MM-DD	2025-07-04
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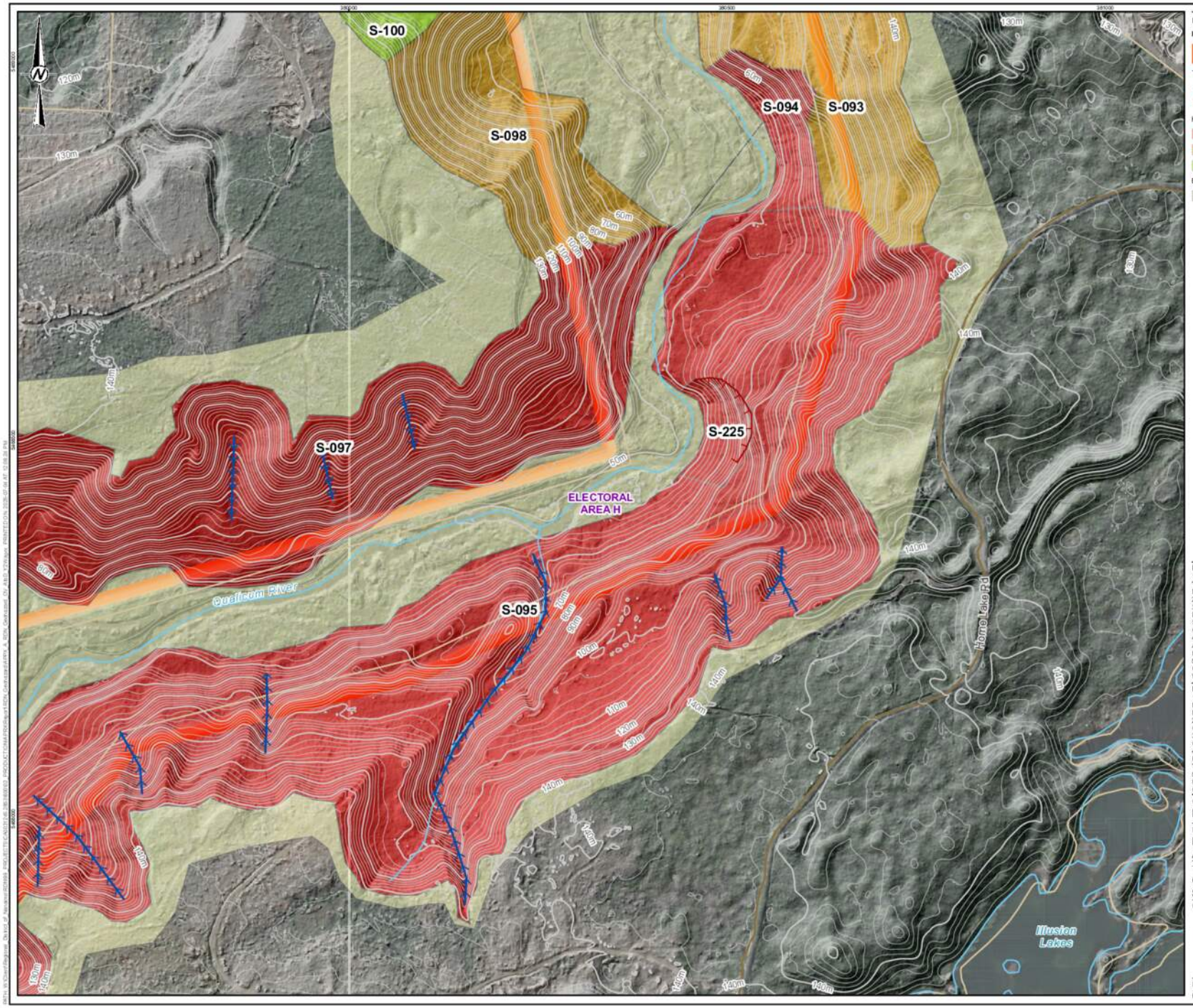
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B09



LEGEND

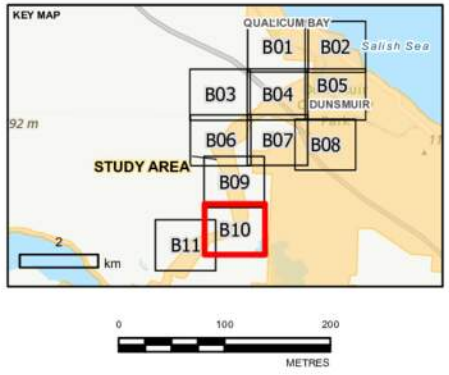
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B10

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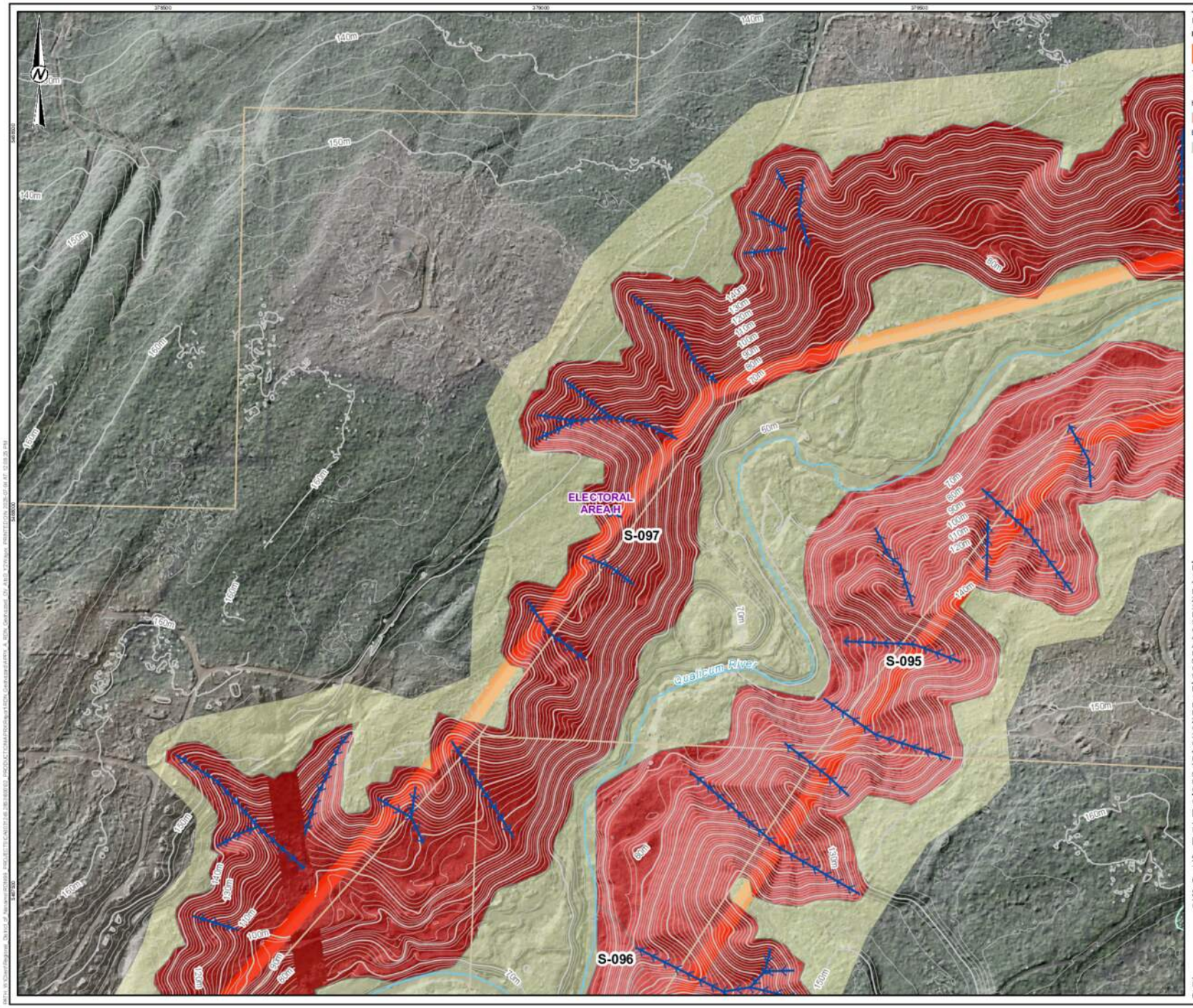
20mm



LEGEND

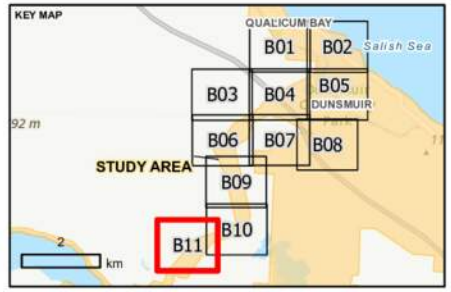
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

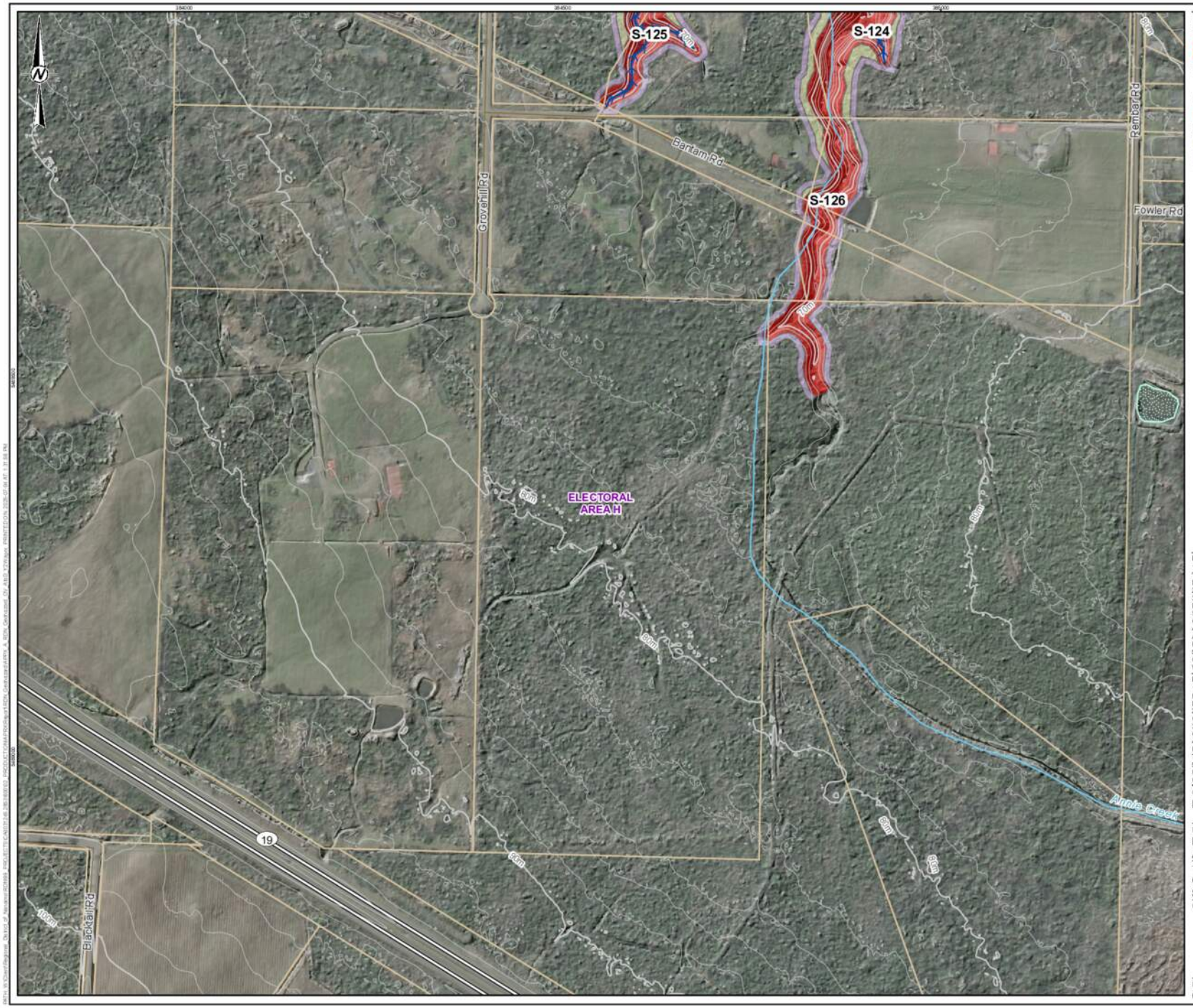
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION B - BIG QUALICUM RIVER

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	B11



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
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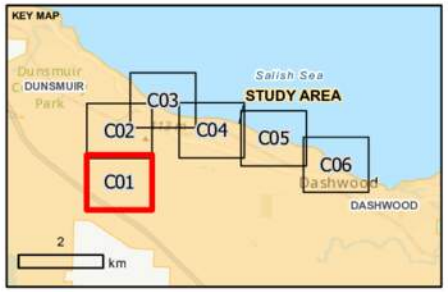

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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C01

LEGEND

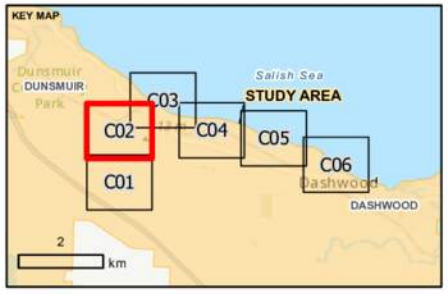
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C02

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

LEGEND

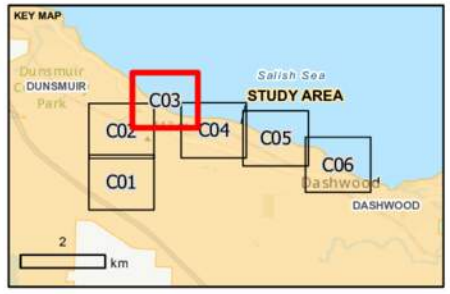
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

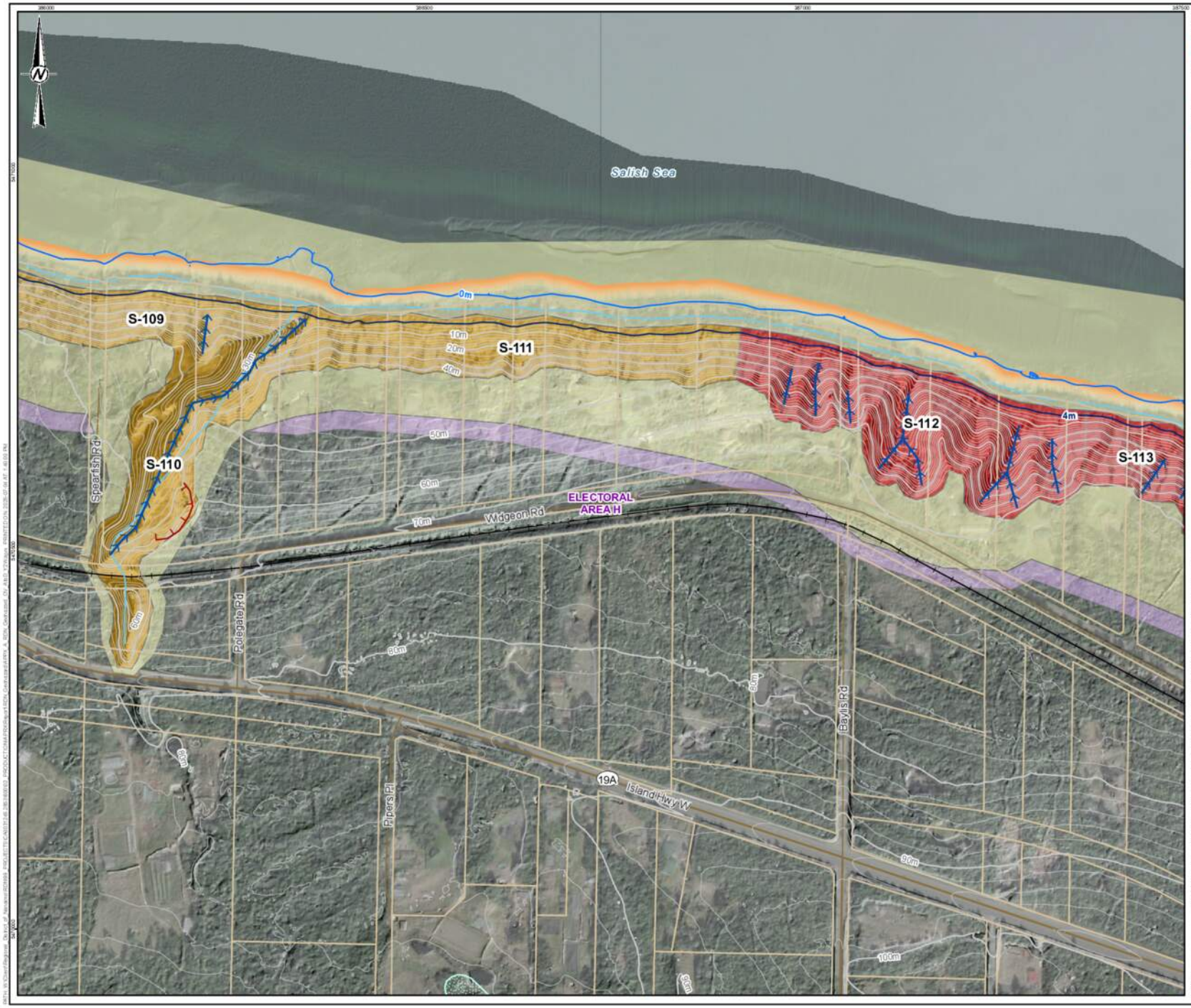
TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C03



LEGEND

PROJECT DATA
- STUDY AREA

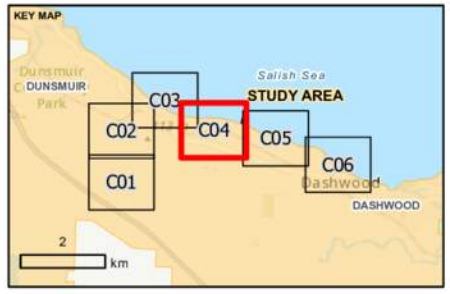
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA

KEY MAP



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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

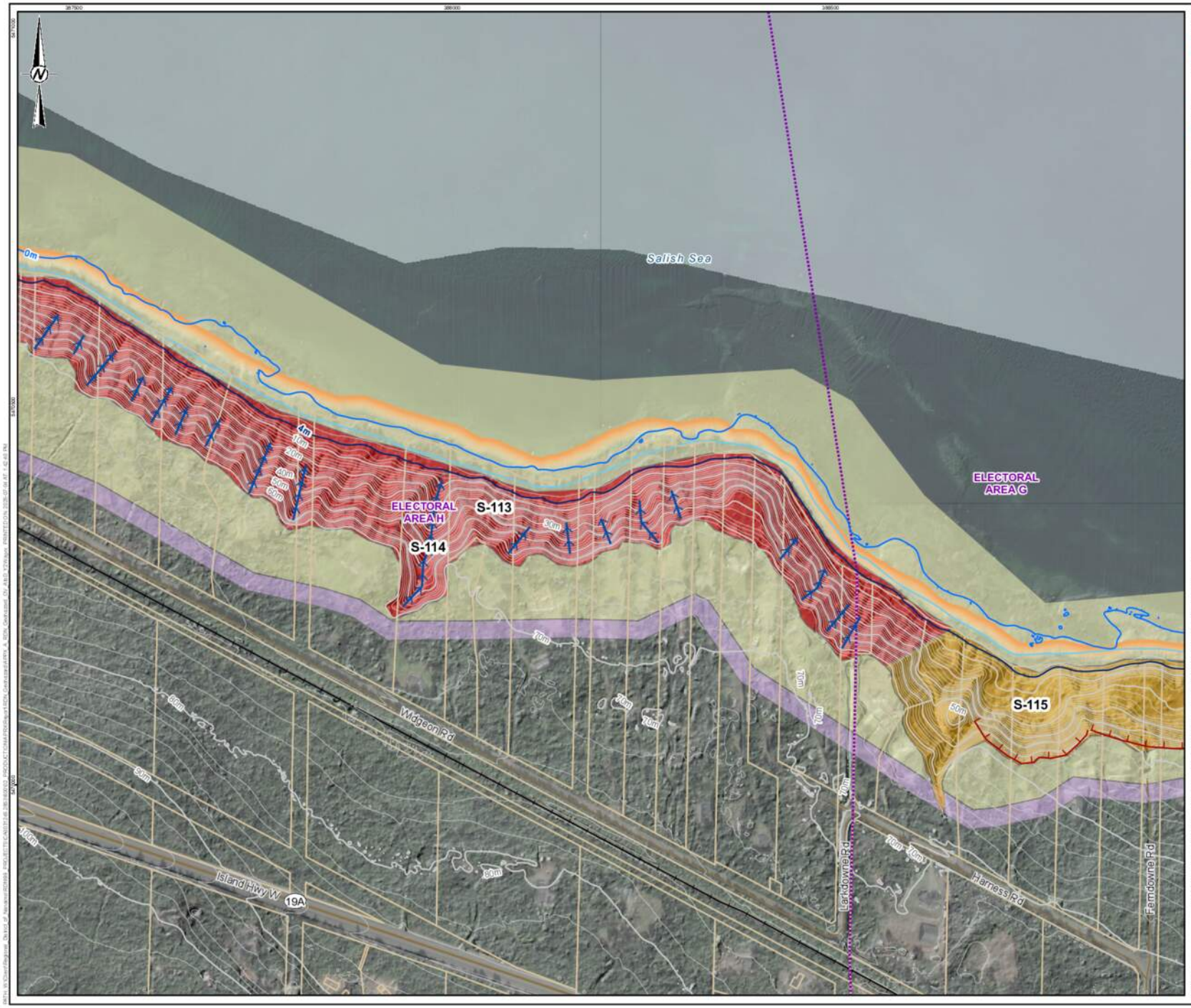
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C04



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
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- CONTOUR (2 m INTERVAL)
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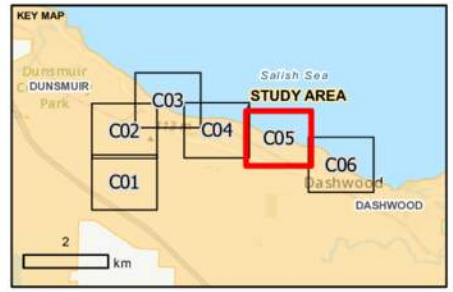
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N.

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

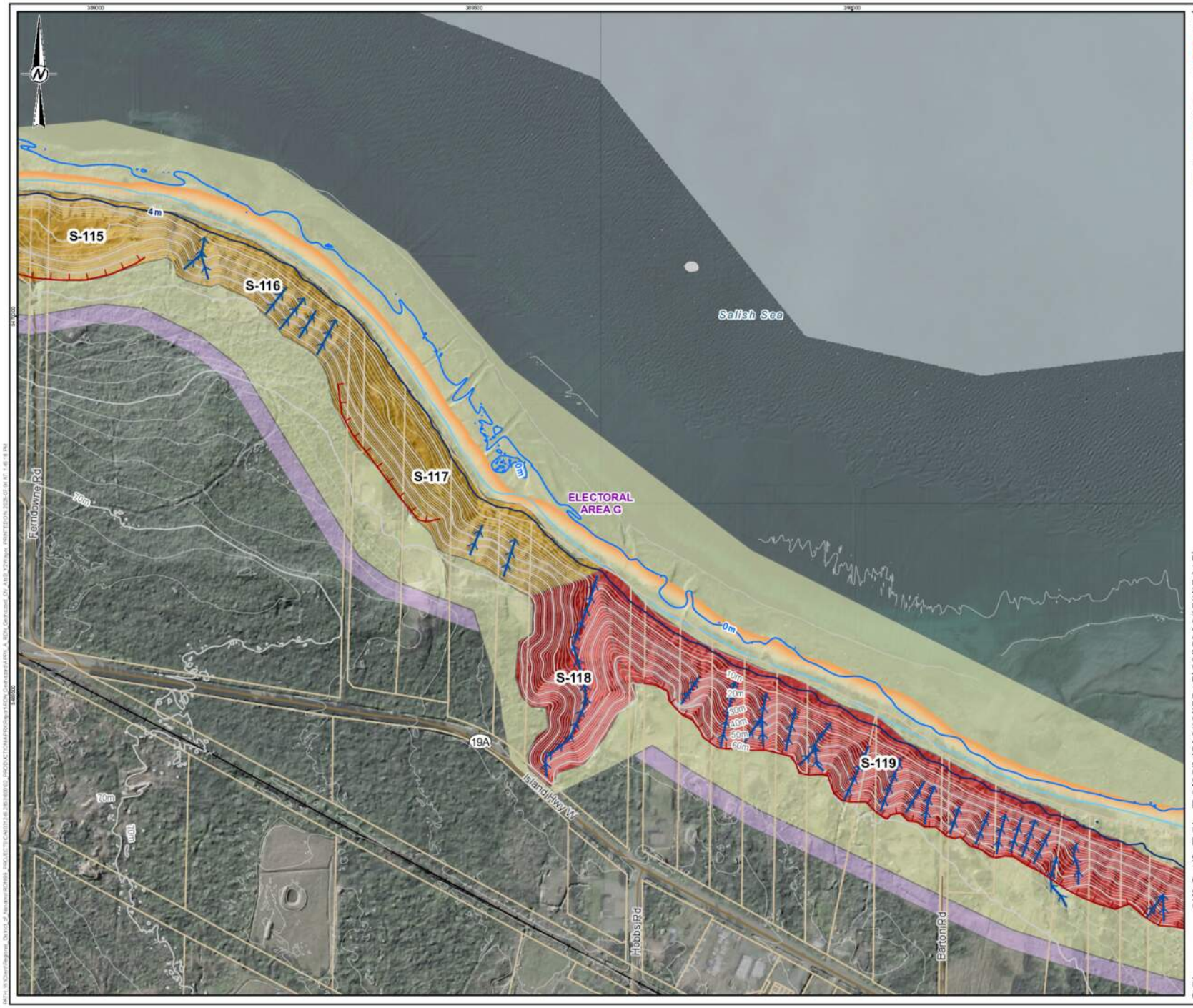
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C05



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
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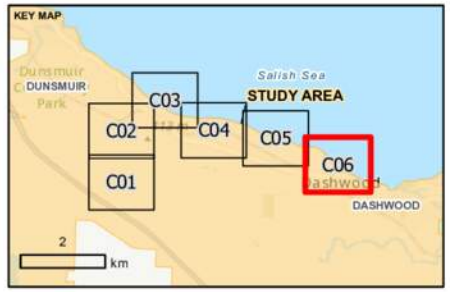
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

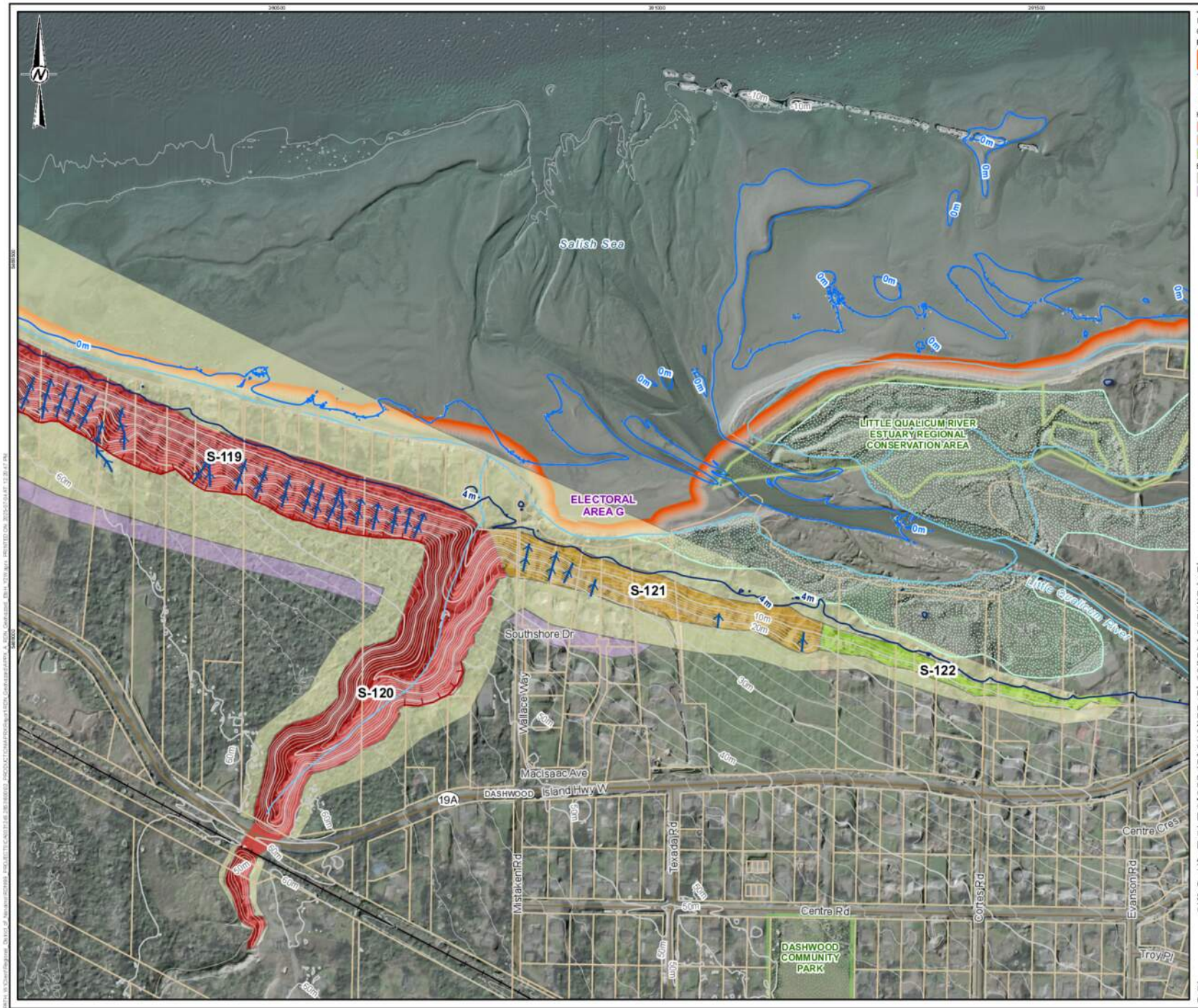
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION C - QUALICUM BAY TO DASHWOOD COASTLINE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	C06



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
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BASE DATA
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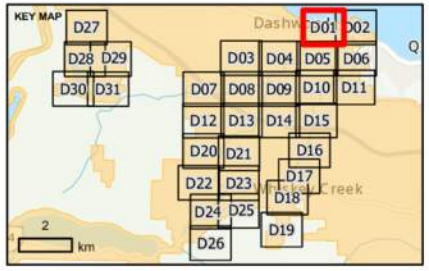
- ELECTORAL AREA

KEY MAP



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D01

LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
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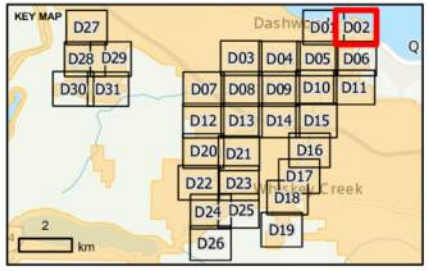

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PROJECT
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TITLE
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SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

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wsp

YYYY-MM-DD	2025-07-04
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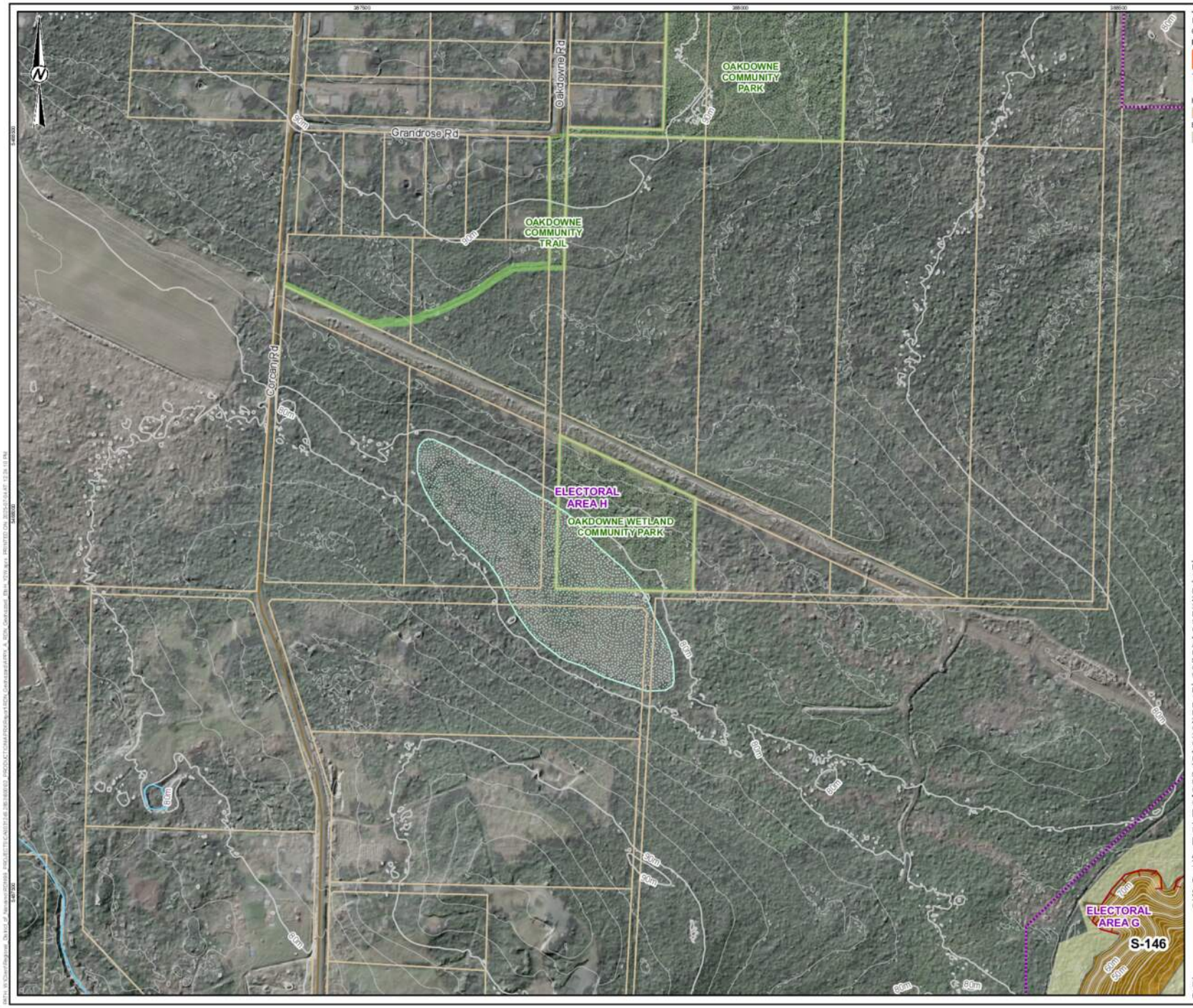
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D02



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- MEDIUM

BUFFER ZONE
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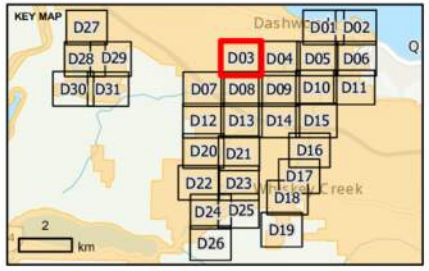
KEY MAP



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

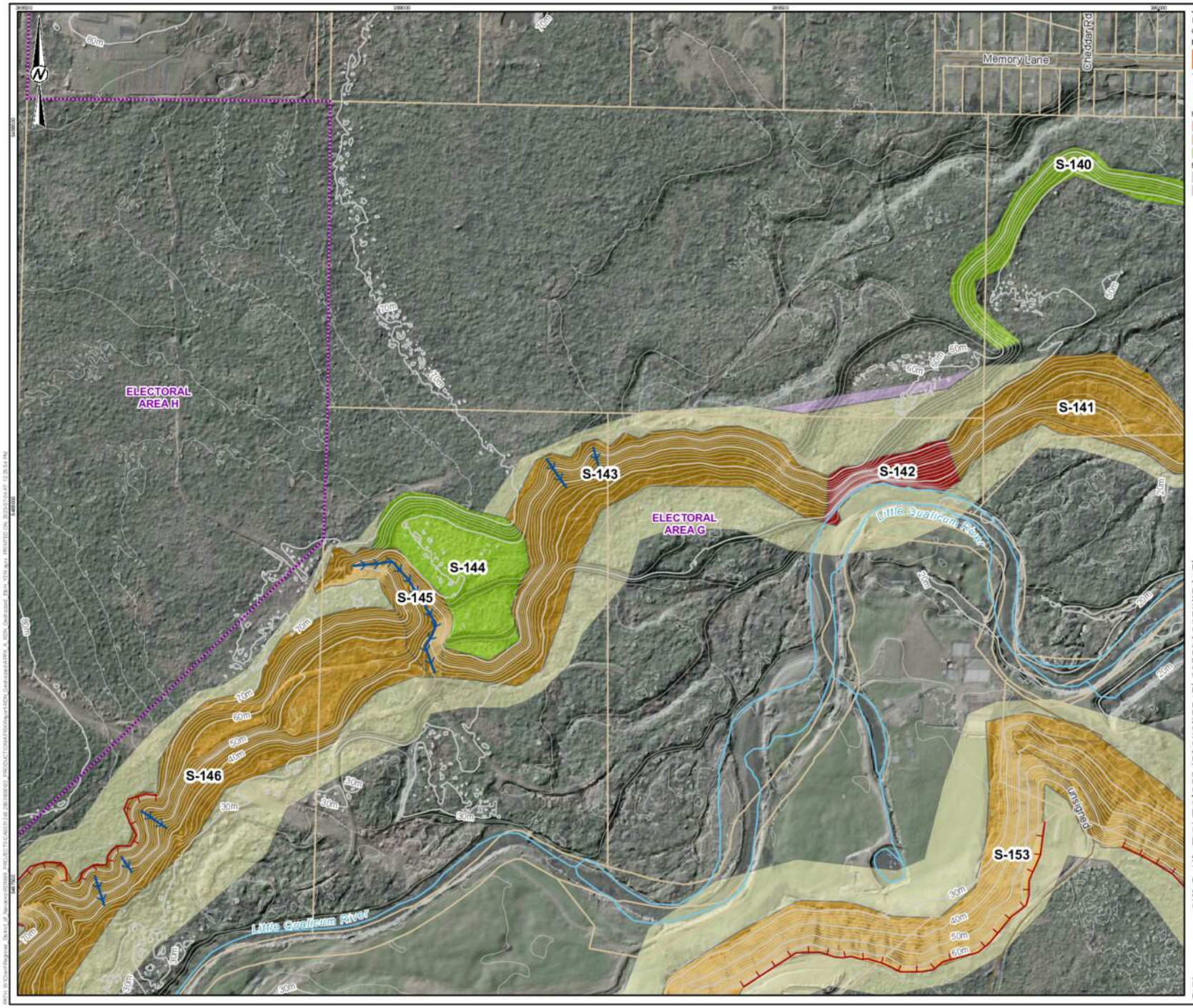
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D03



LEGEND

GEOHAZARD FEATURE

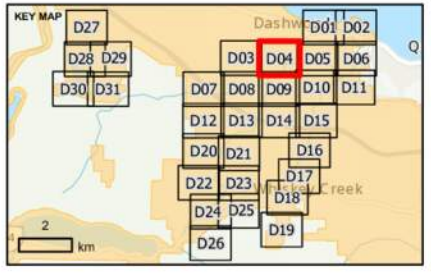
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

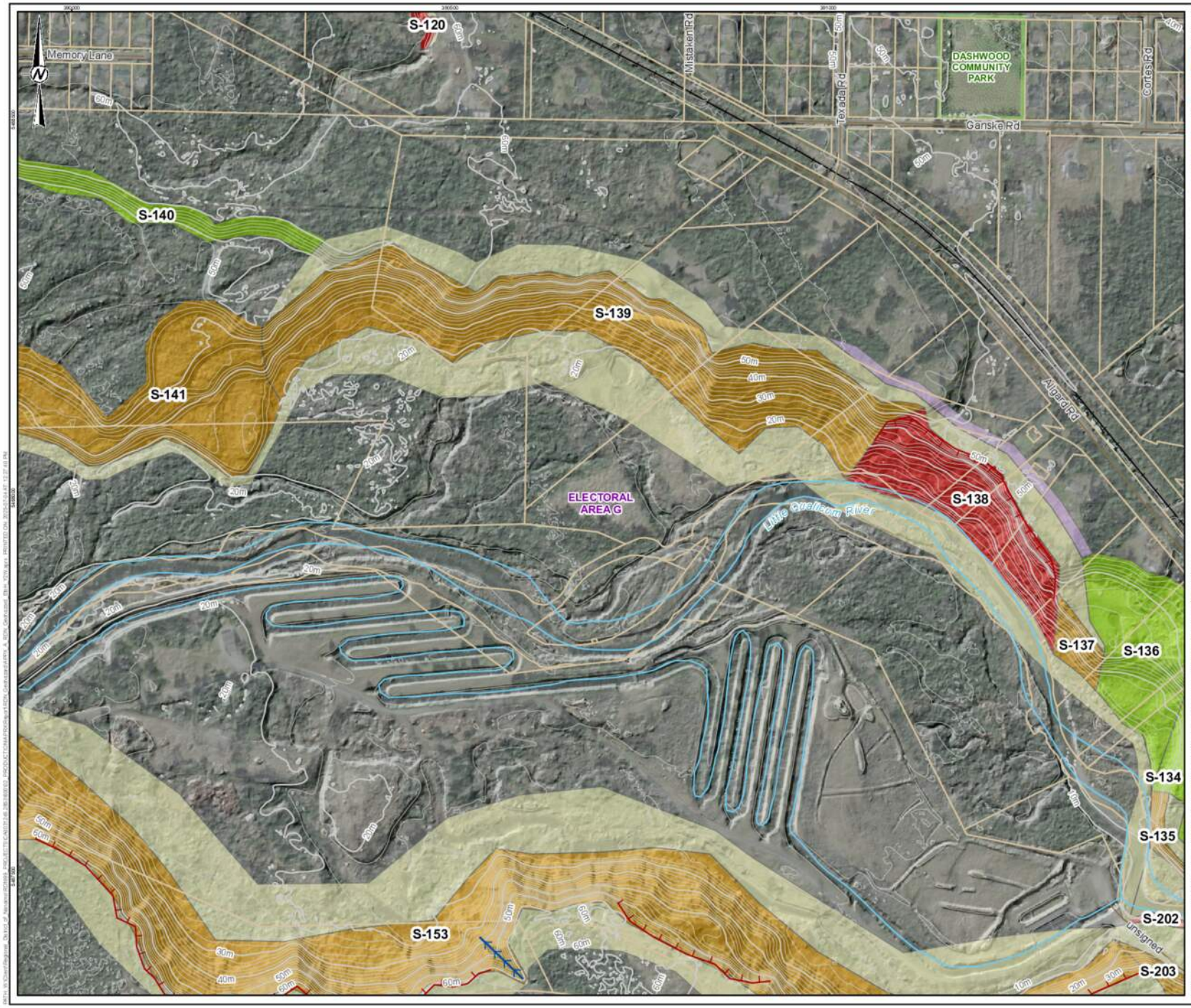
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D04



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

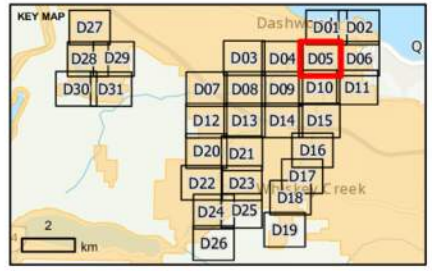
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA

KEY MAP



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

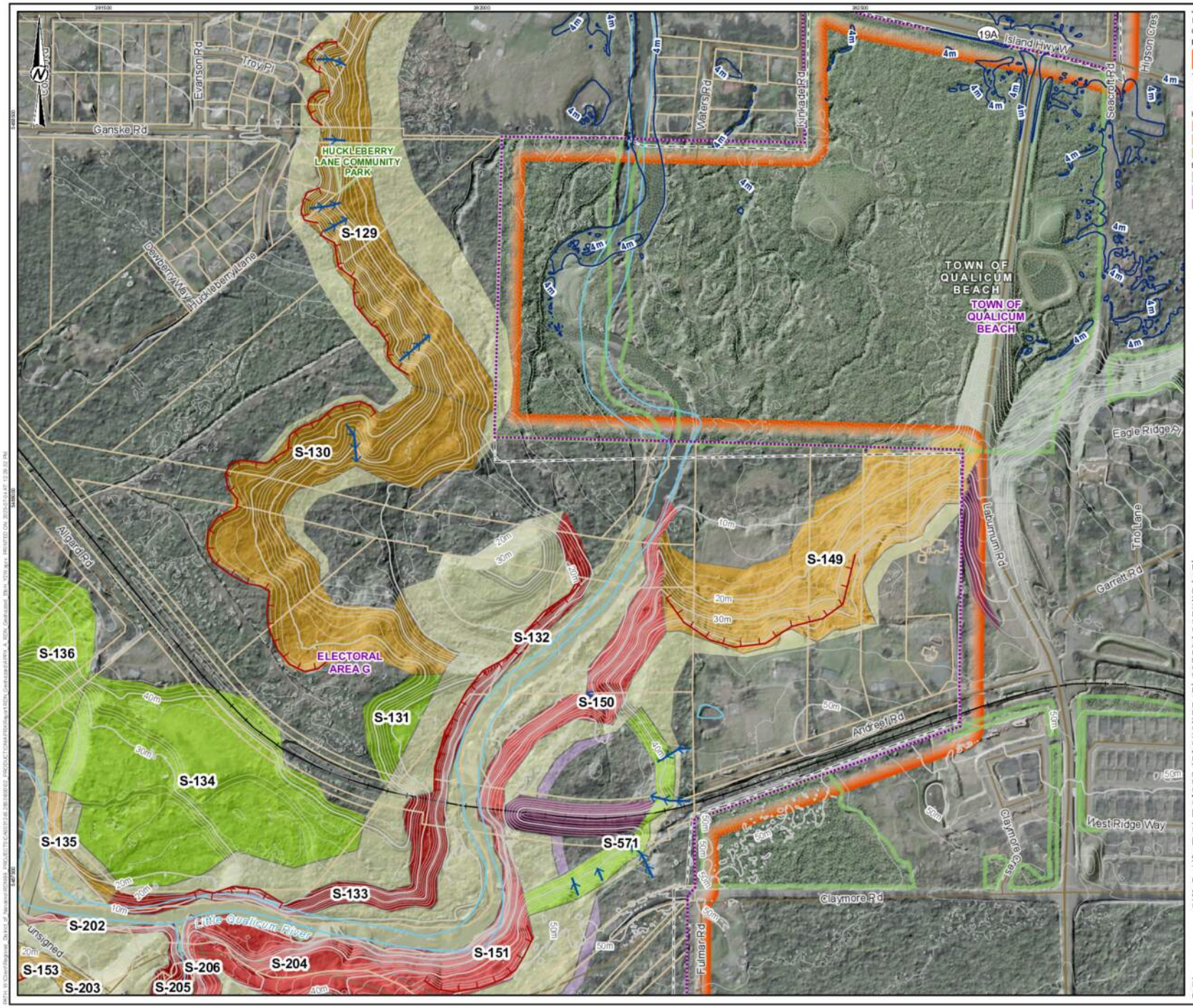
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D05



LEGEND

GEOHAZARD FEATURE

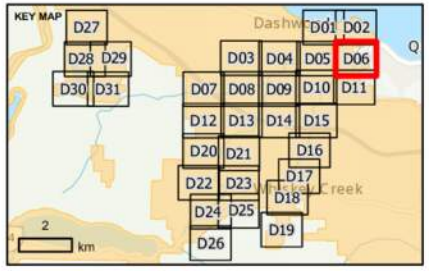
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

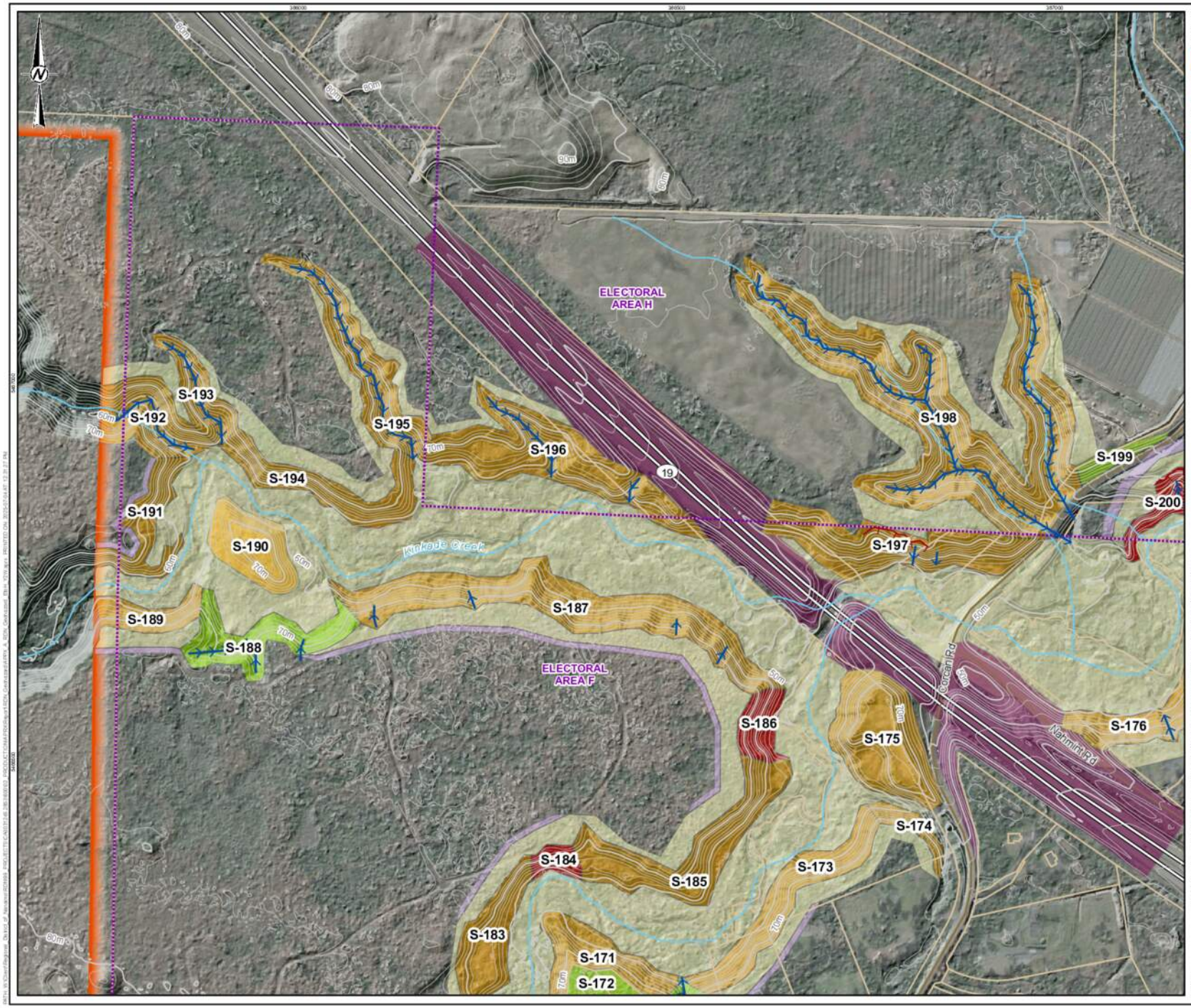
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D06



LEGEND

GEOHAZARD FEATURE

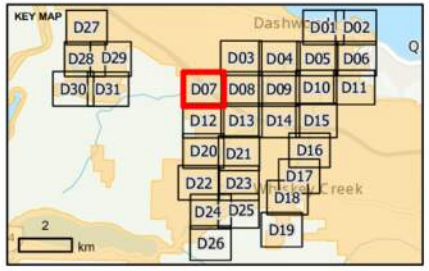
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
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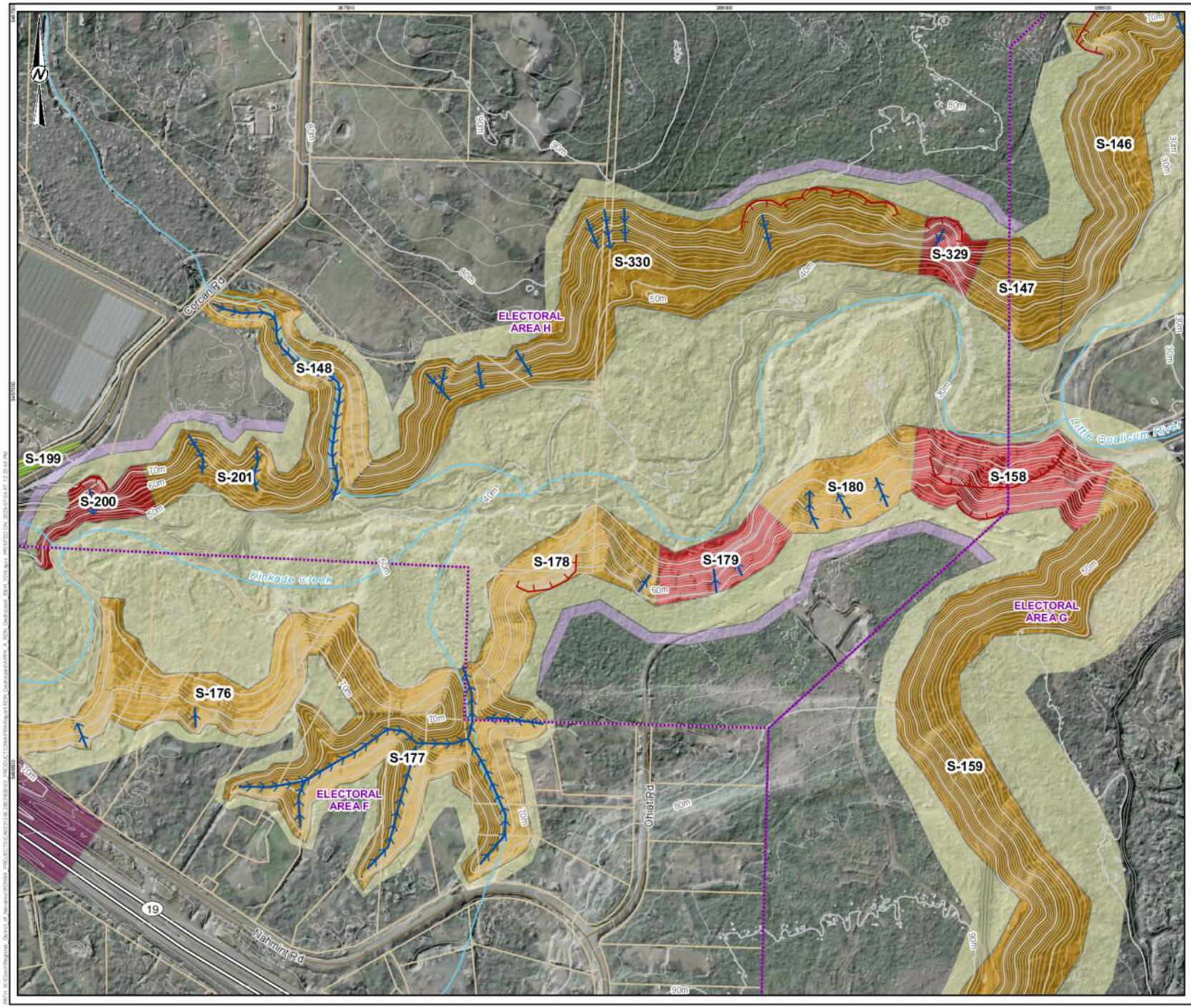

LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
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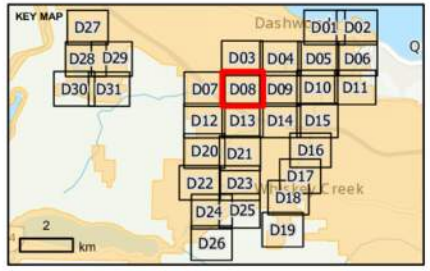
- ELECTORAL AREA



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
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PREPARED	LH
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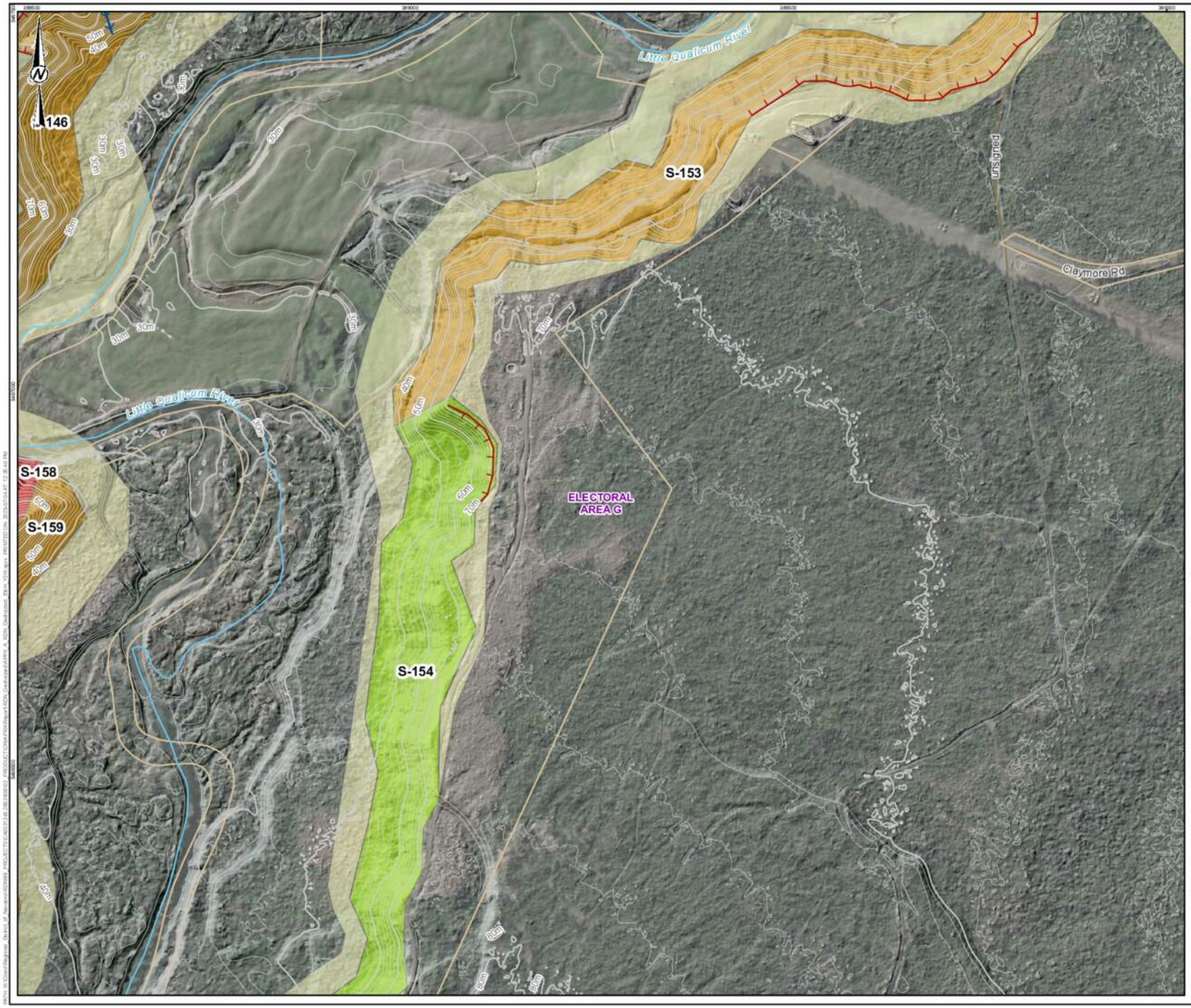
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D08



LEGEND

GEOHAZARD FEATURE

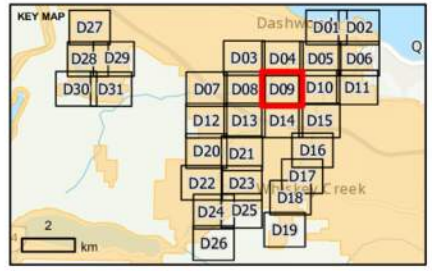
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



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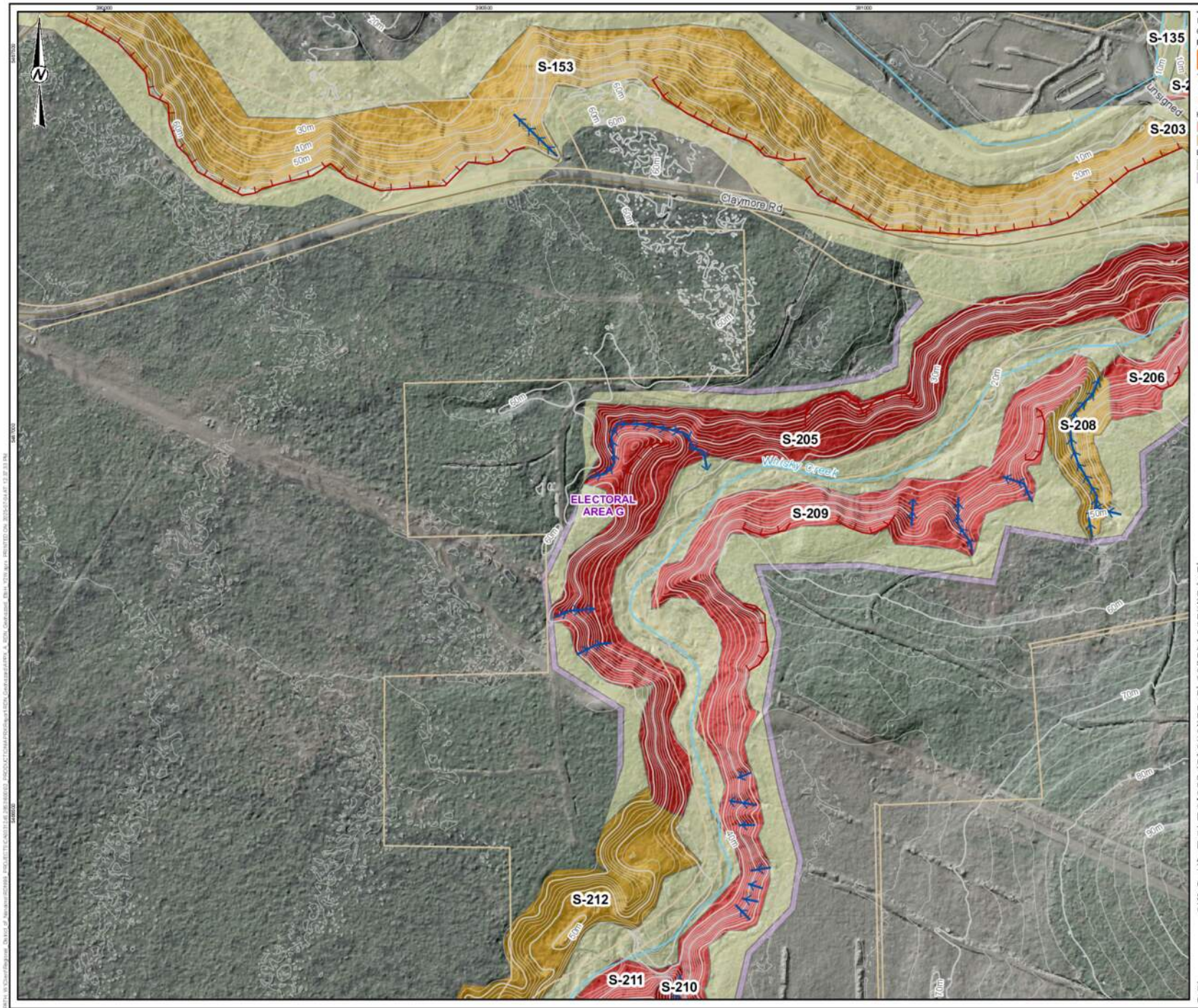
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D09

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

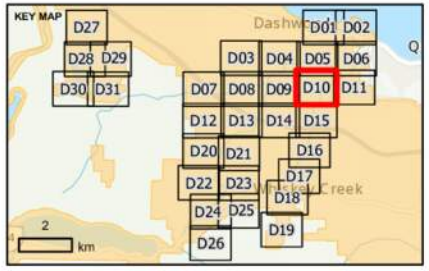
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA

KEY MAP



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

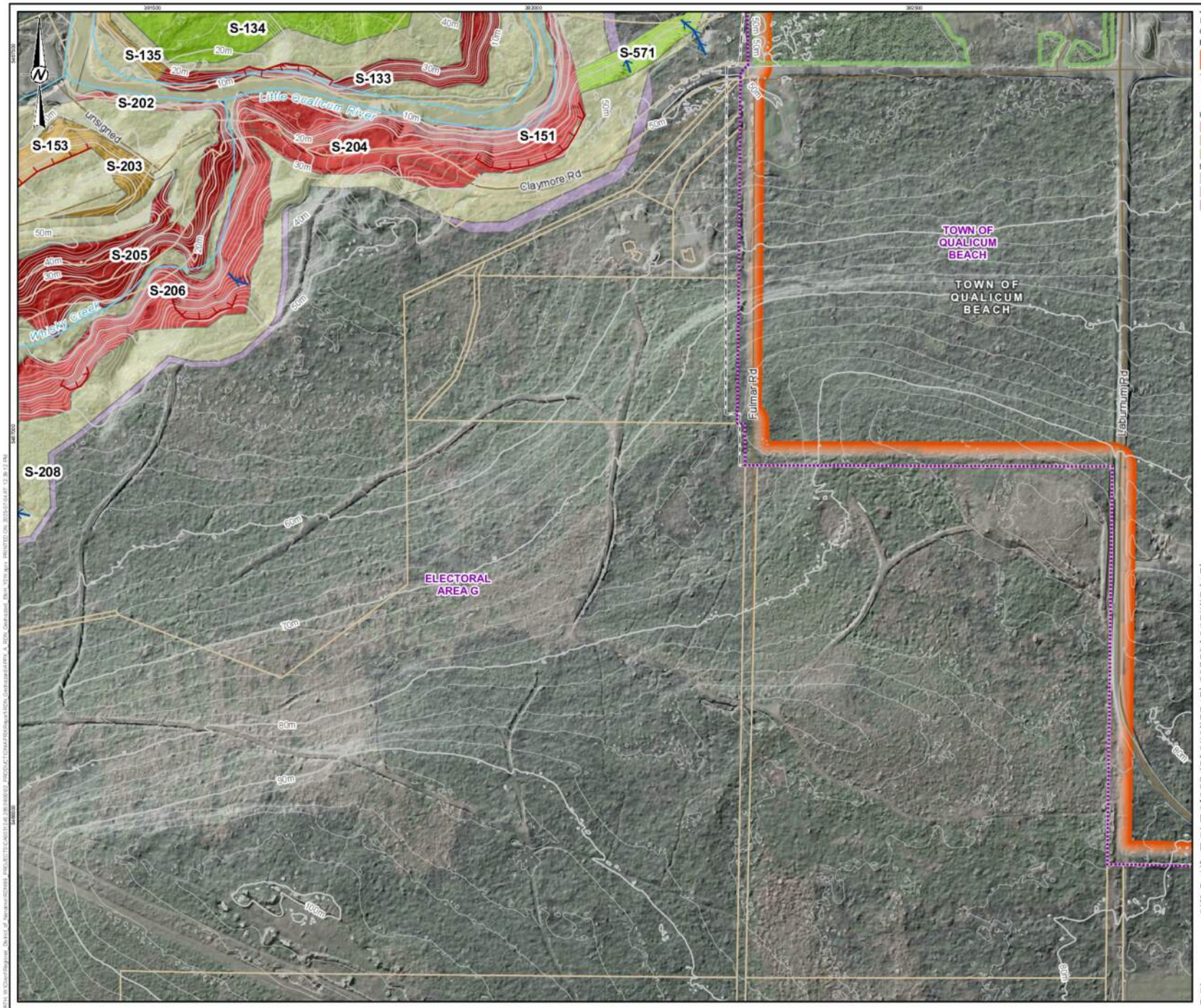
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D10



LEGEND

GEOHAZARD FEATURE

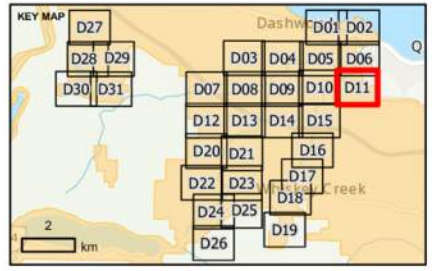
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

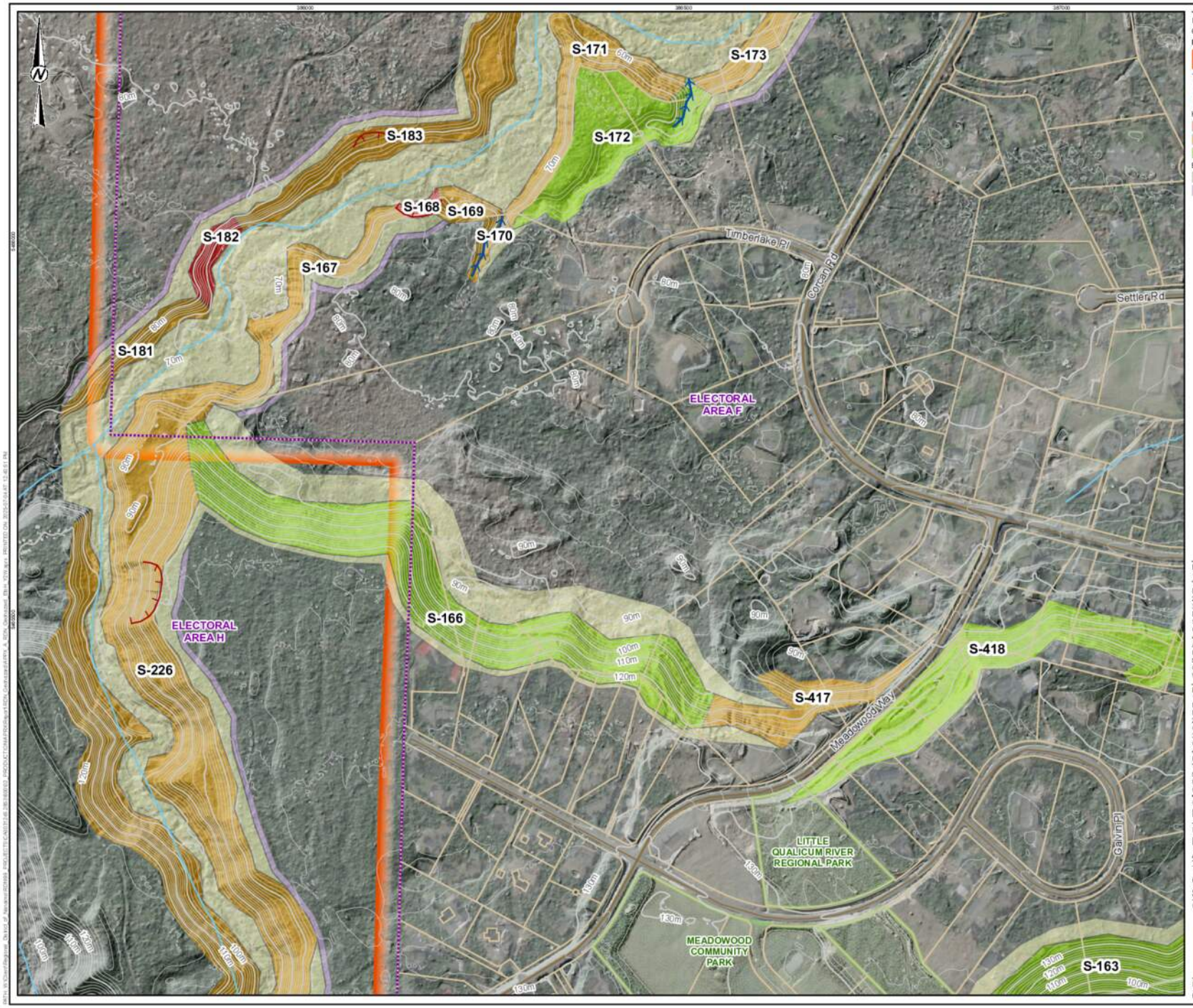
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D11

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

GEOHAZARD FEATURE

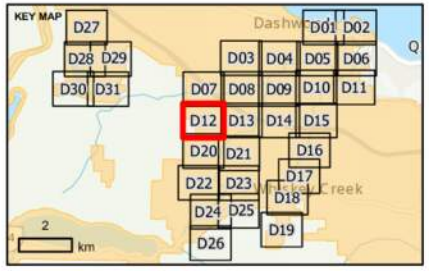
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

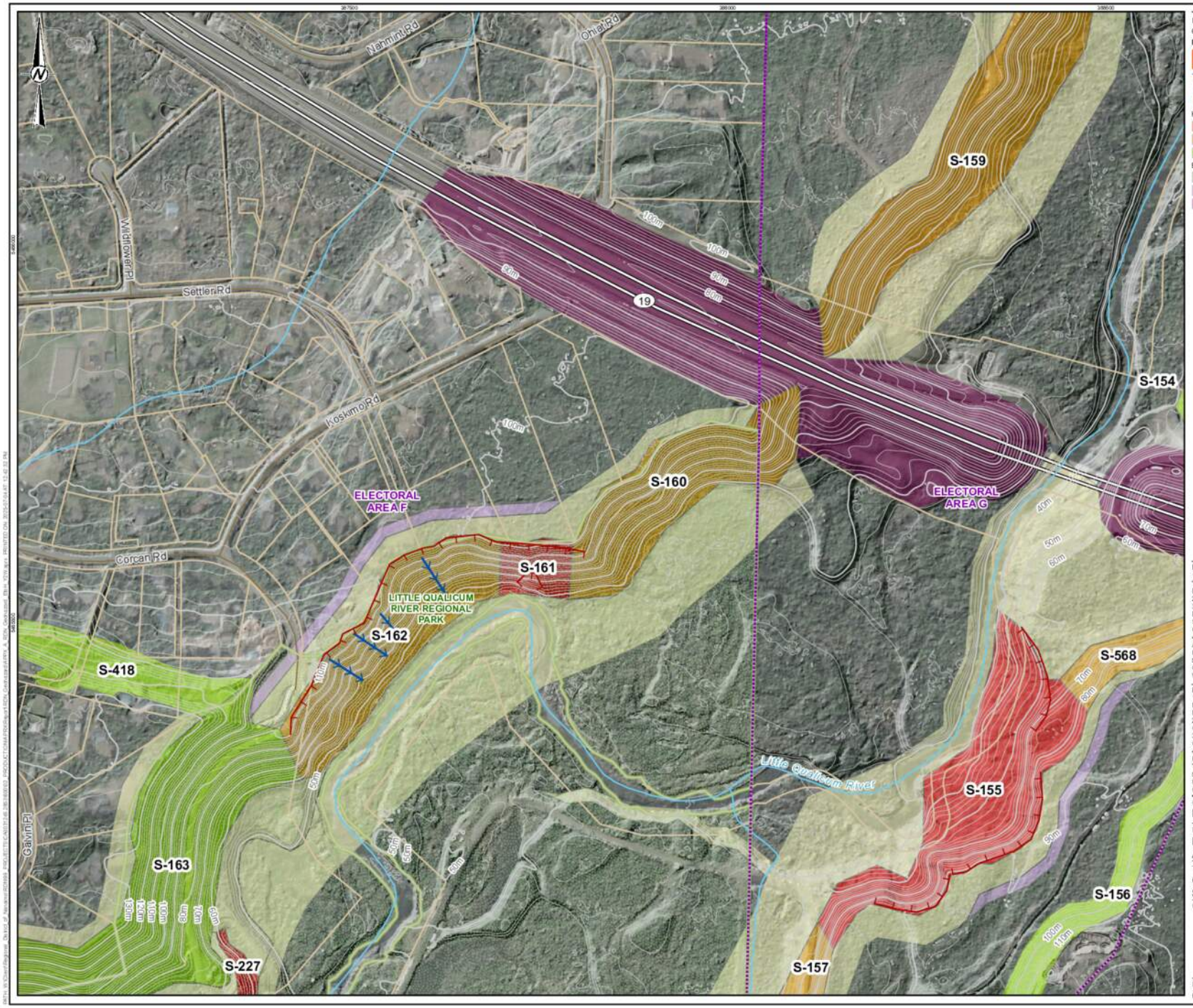
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D12



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

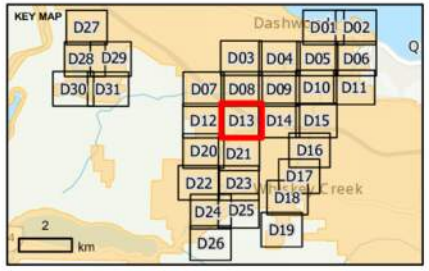
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA

KEY MAP



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D13

LEGEND

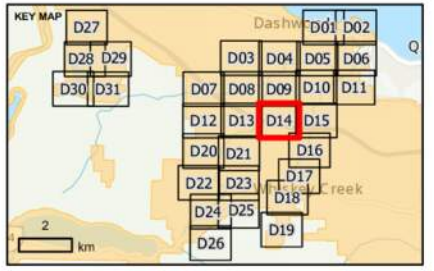
GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
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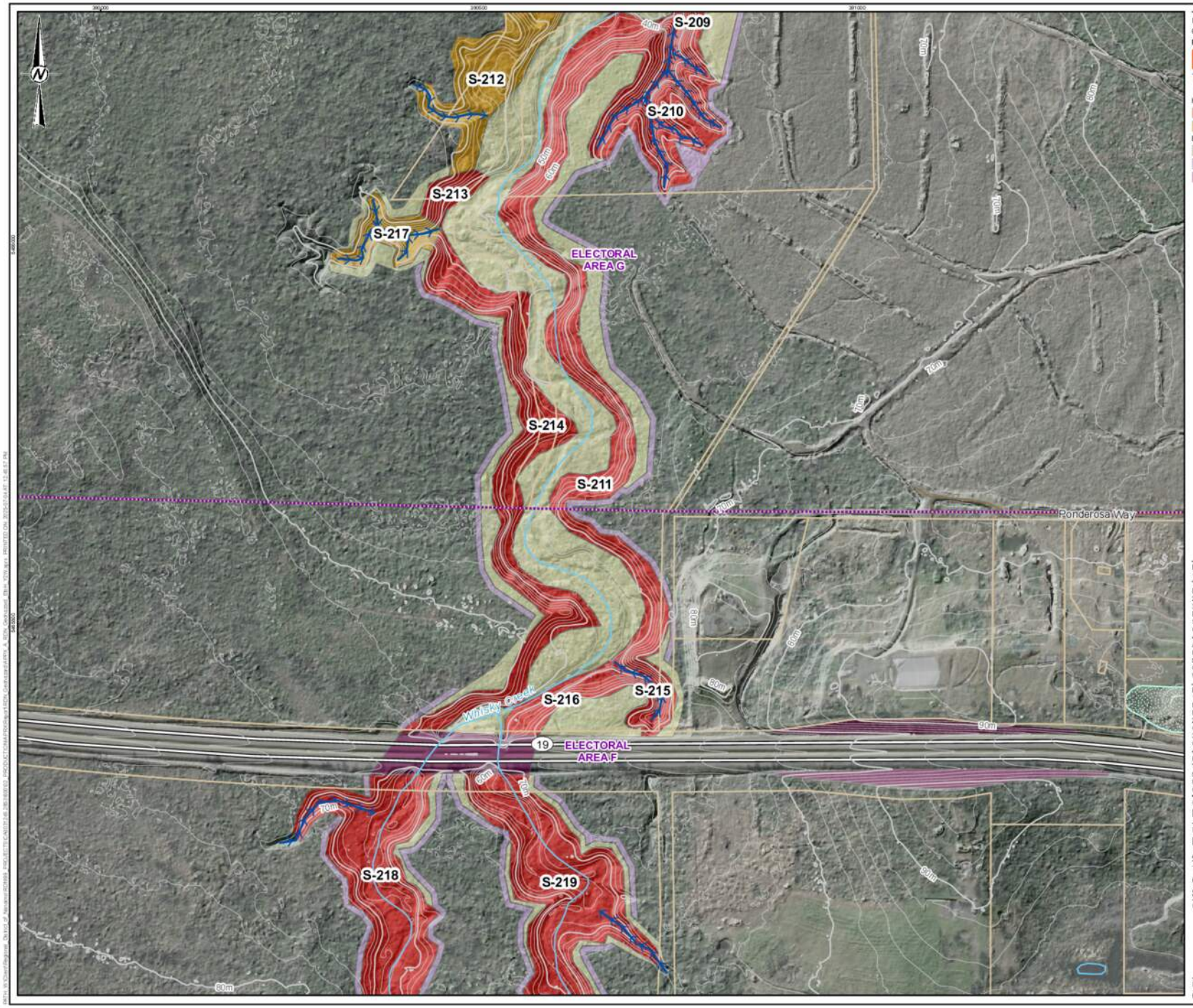
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D14



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
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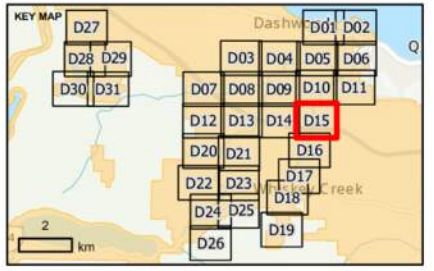
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA

KEY MAP



0 100 200
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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

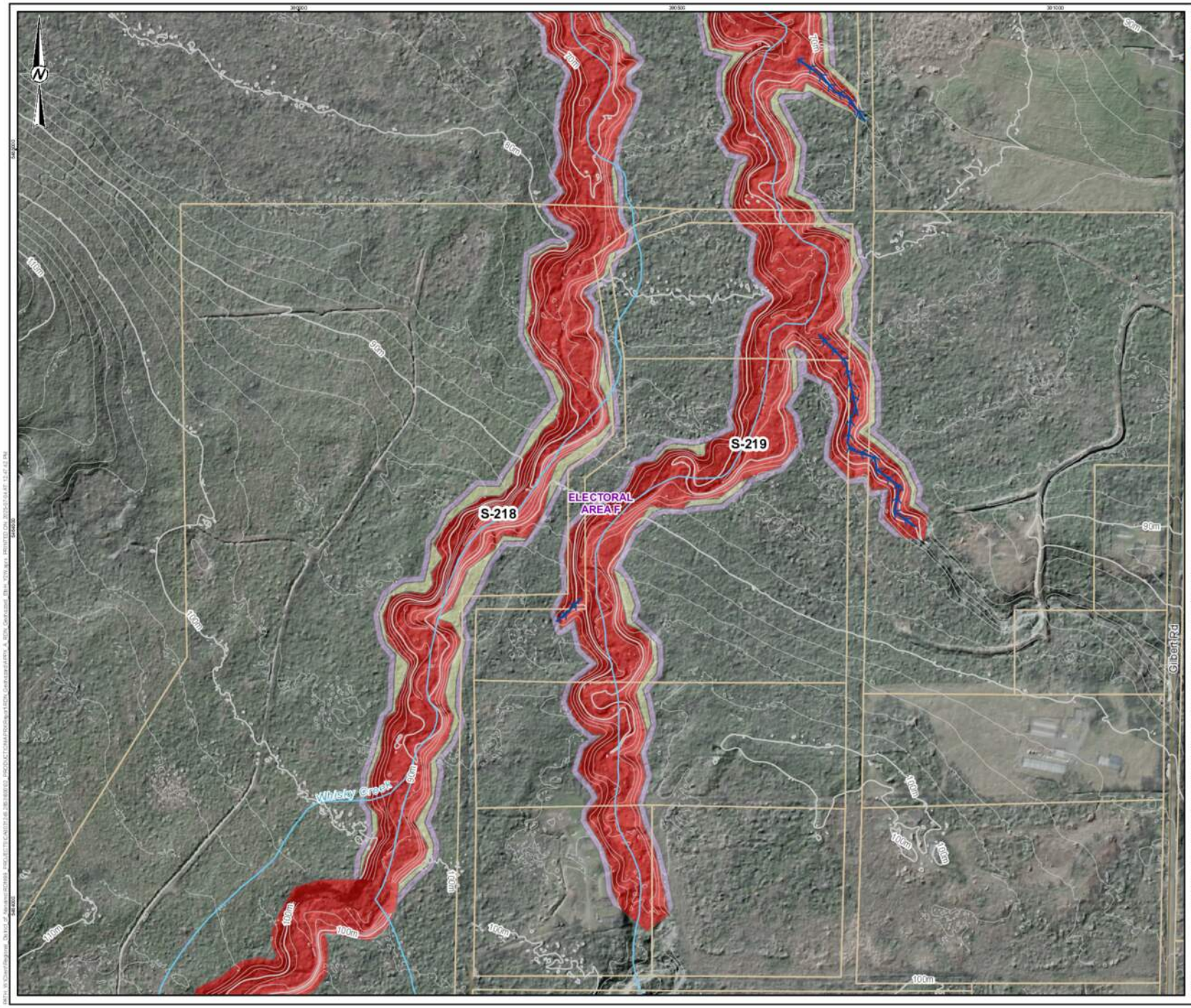
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D15



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
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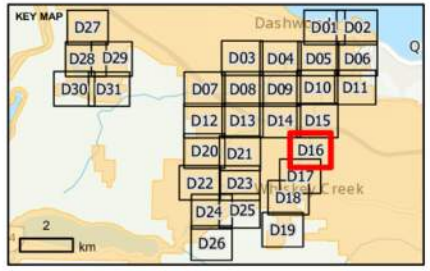
- ELECTORAL AREA

KEY MAP



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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

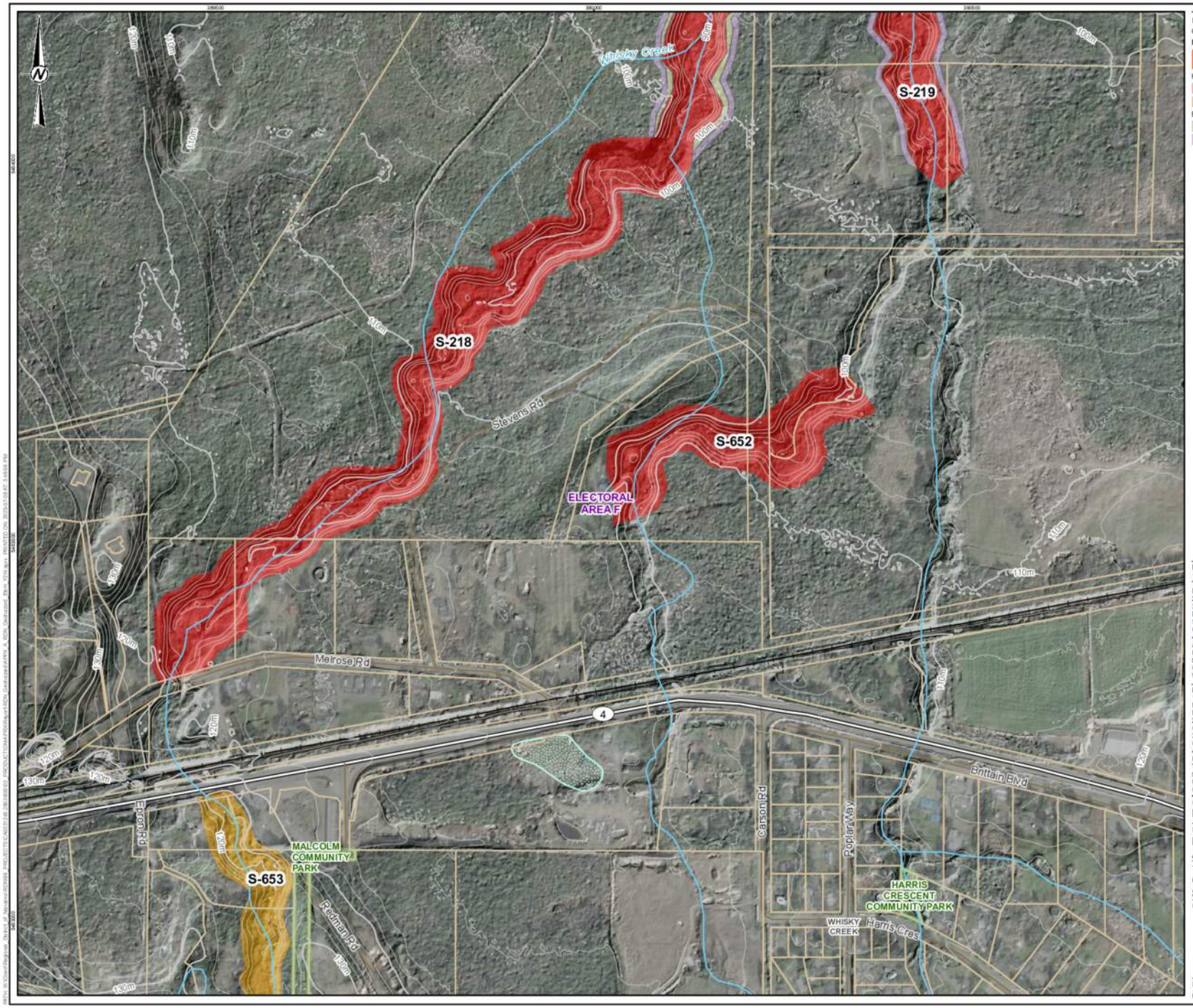
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D16



LEGEND

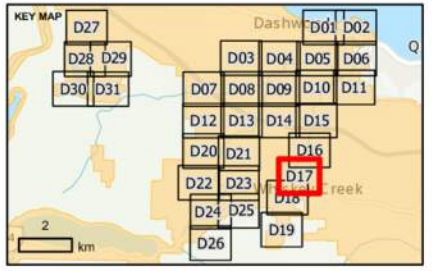
GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-08
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
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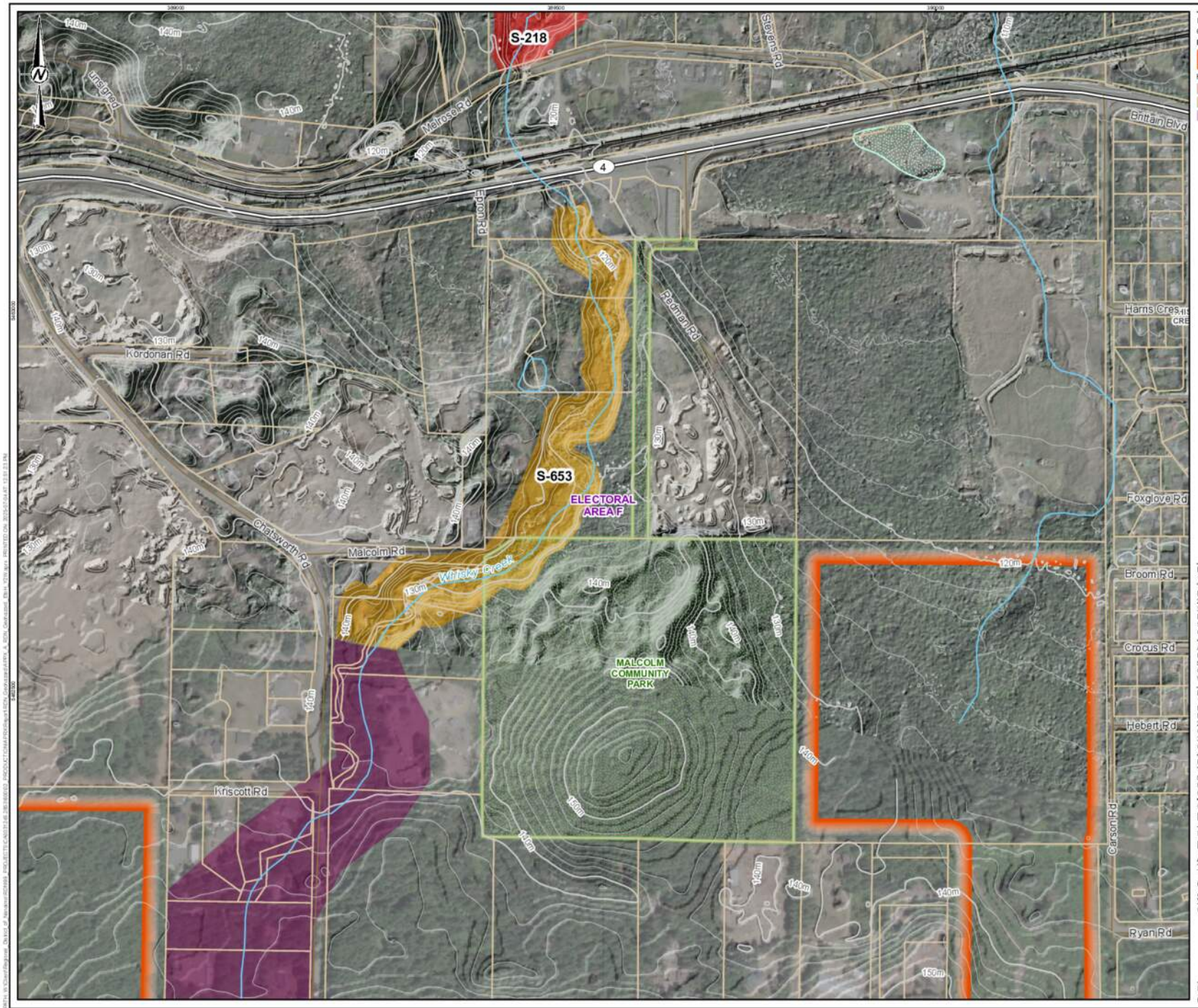


LEGEND

GEOHAZARD FEATURE

PROJECT DATA

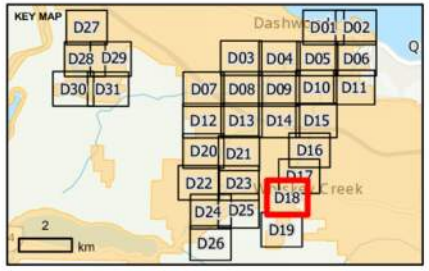
- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

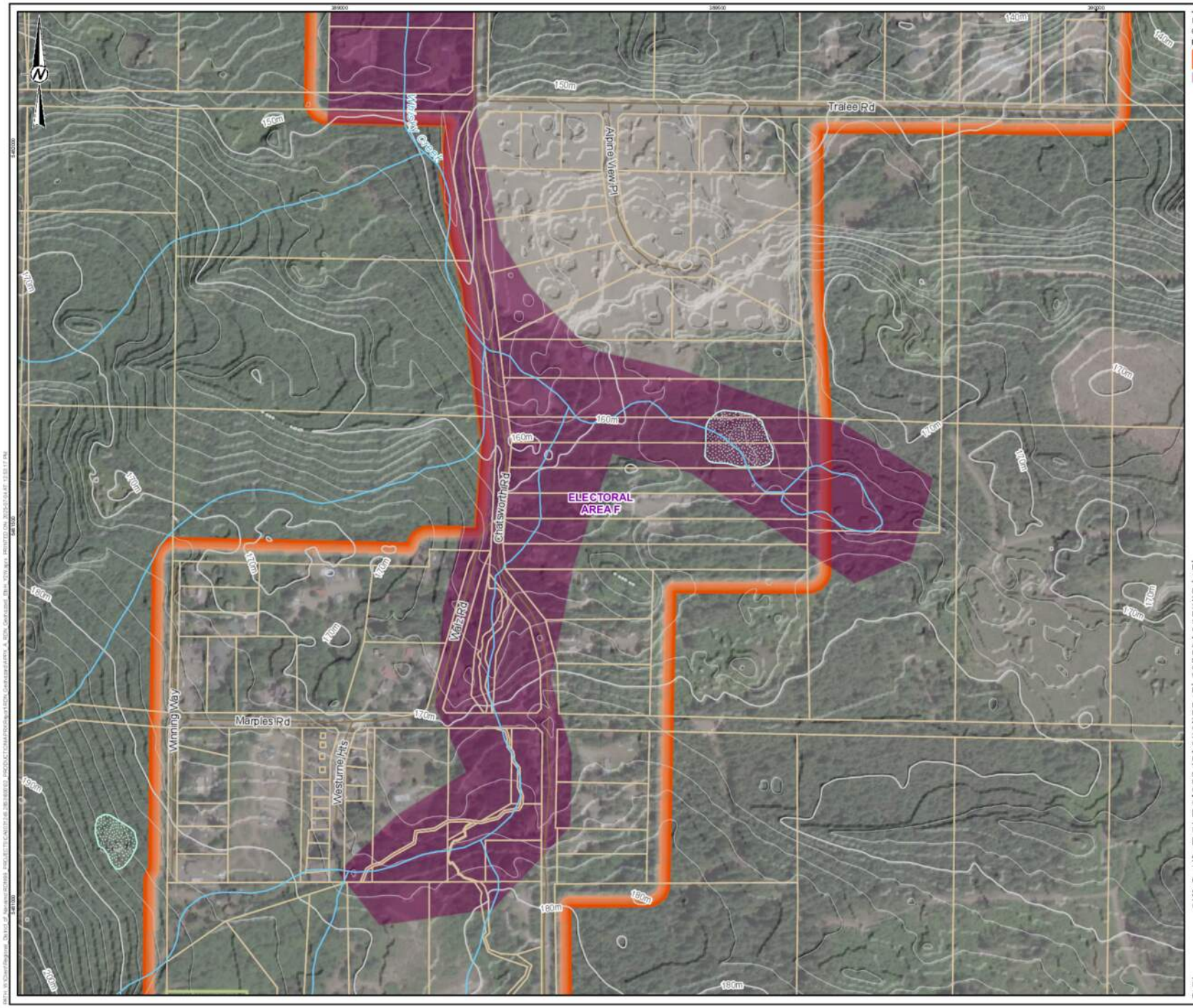
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D18



LEGEND

GEOHAZARD FEATURE

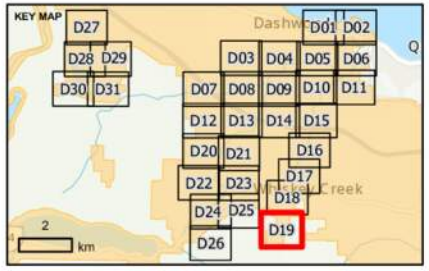
PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA

KEY MAP



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

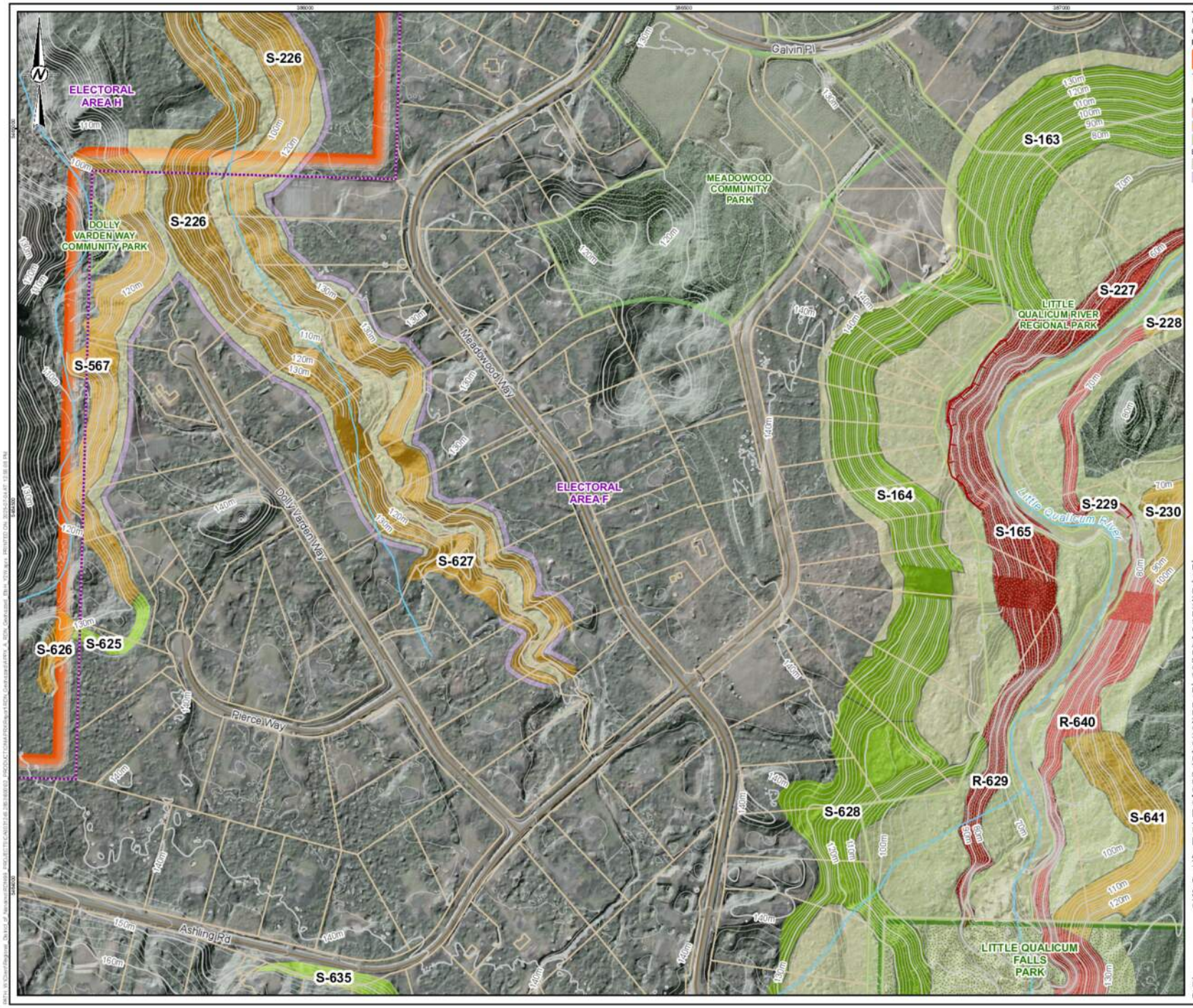
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D19



LEGEND

GEOHAZARD FEATURE

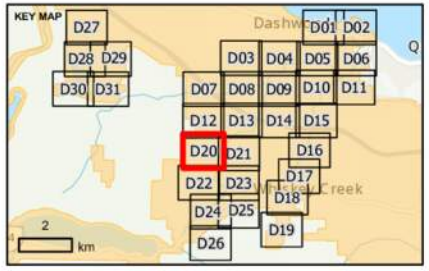
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

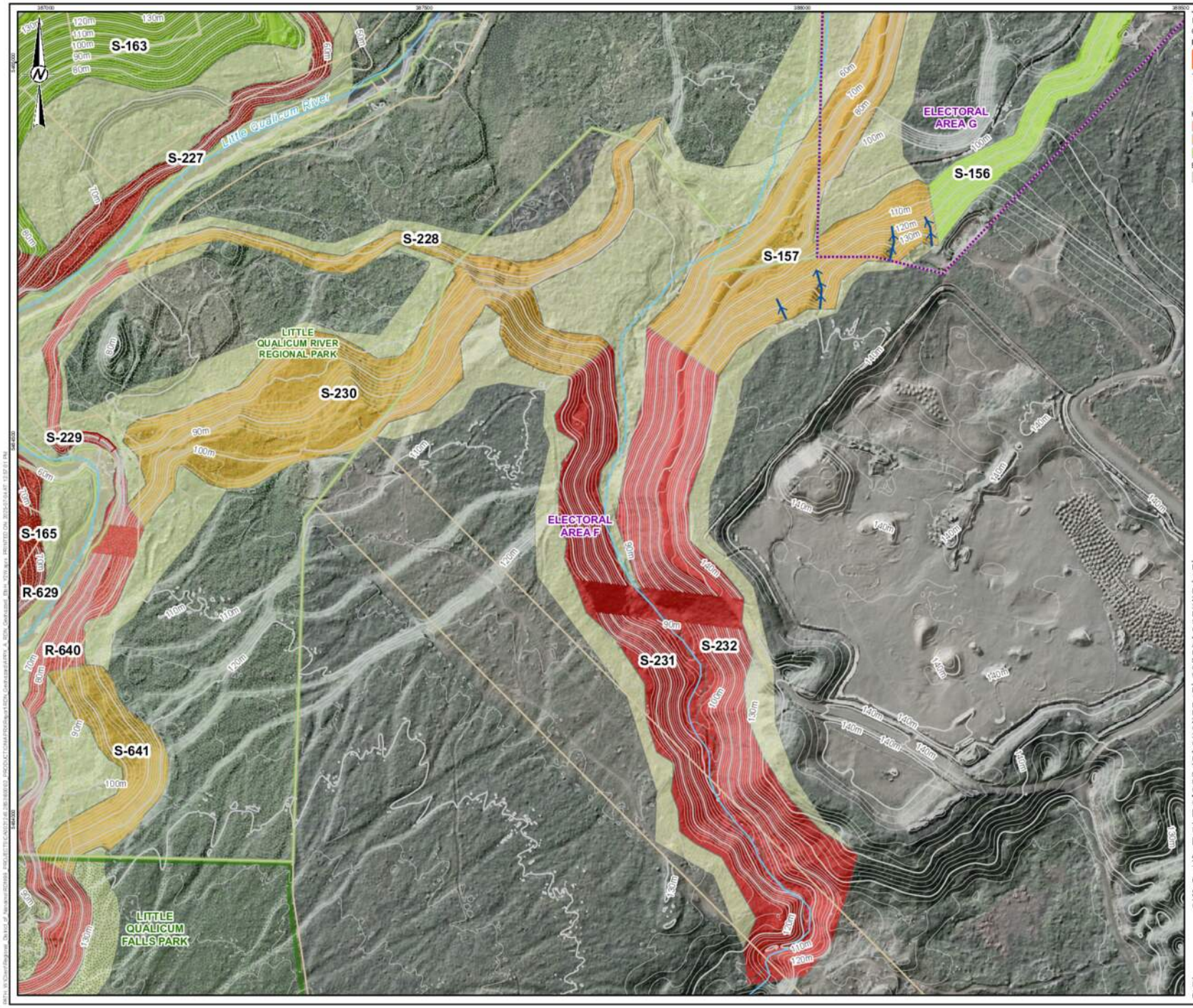
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D20



LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA

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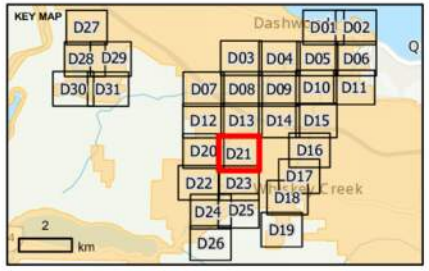

0 100 200
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

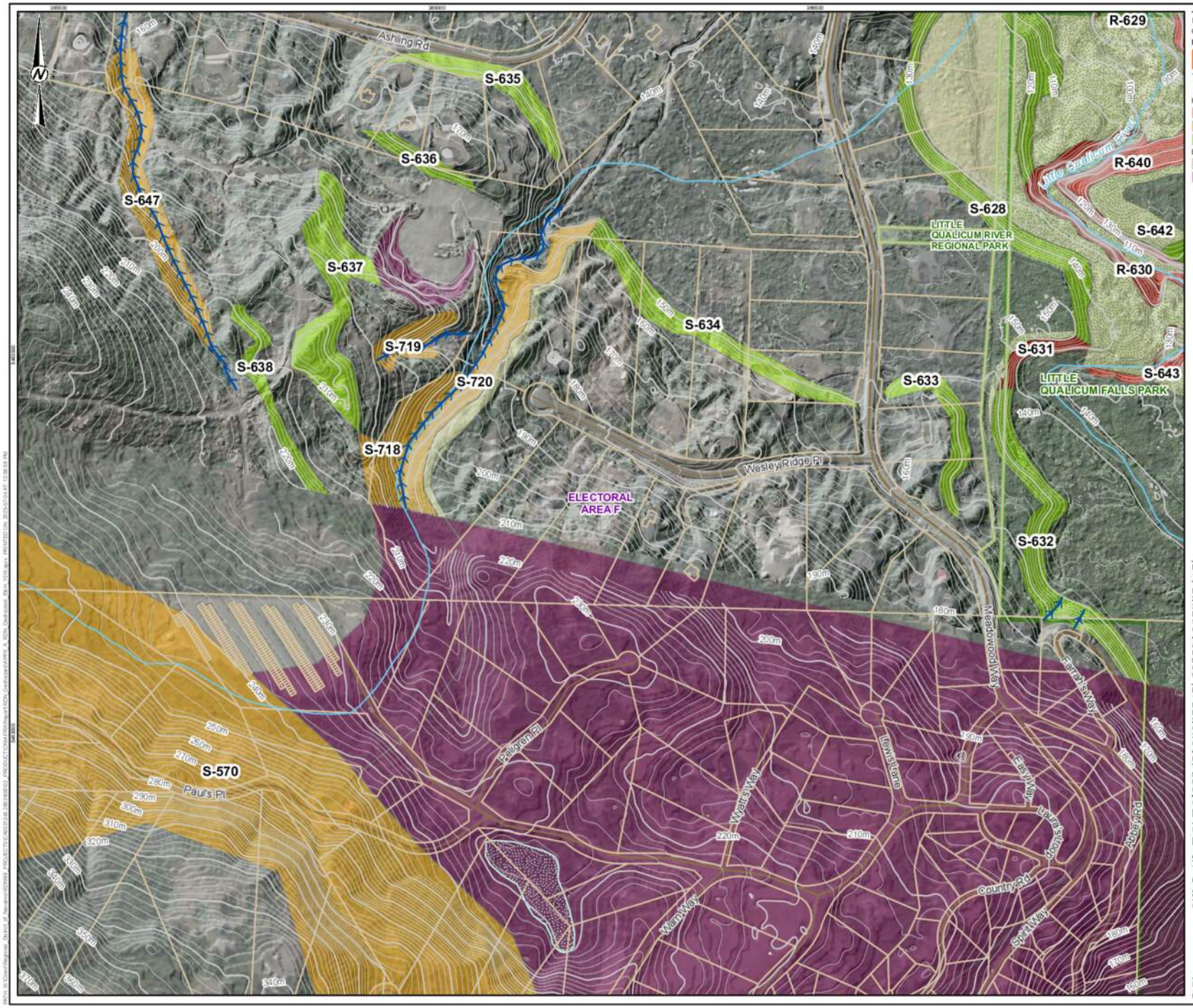
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

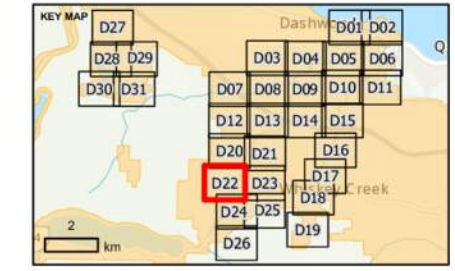
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D21





0 100 200
METRES

LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

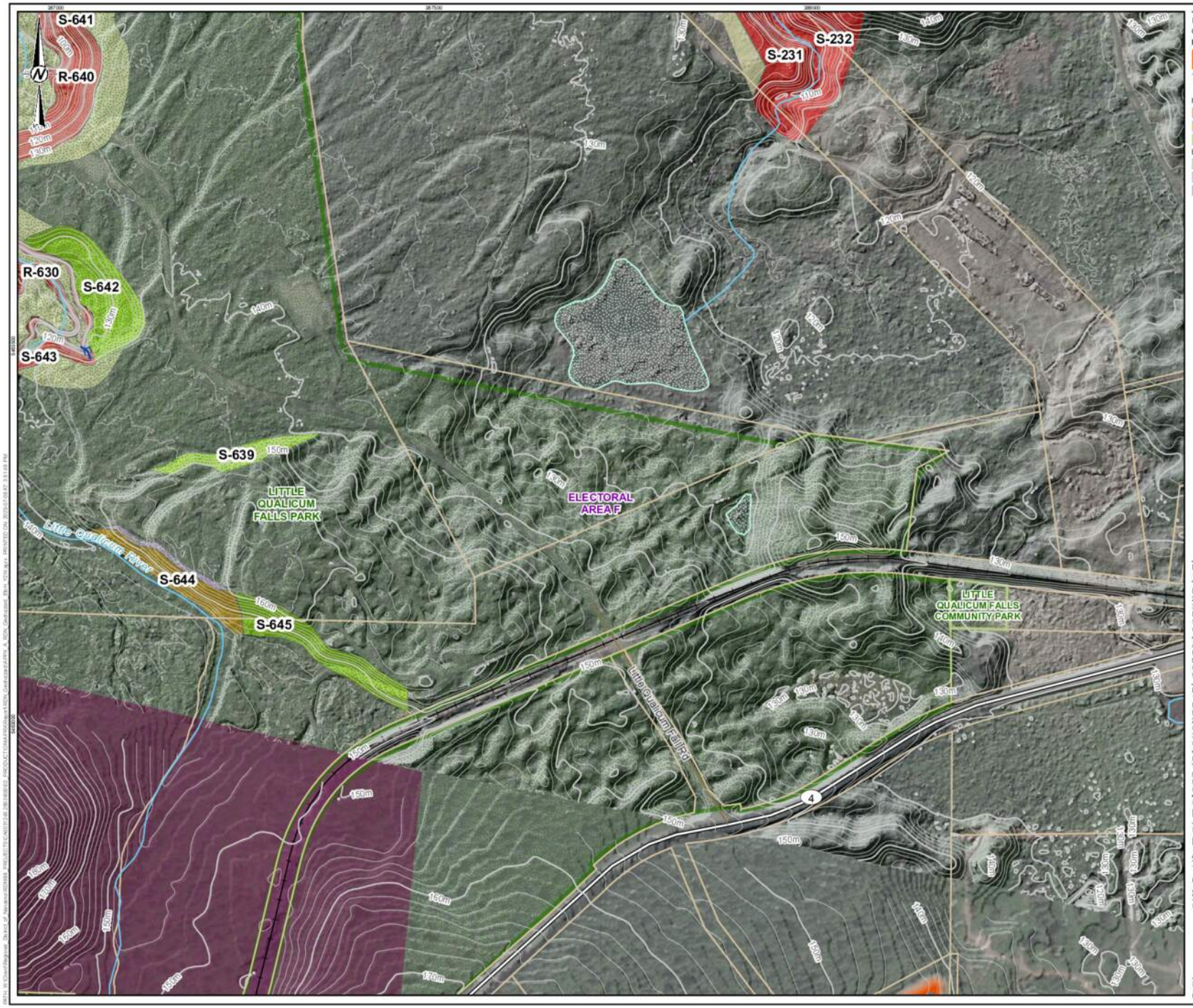
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D22



LEGEND

GEOHAZARD FEATURE

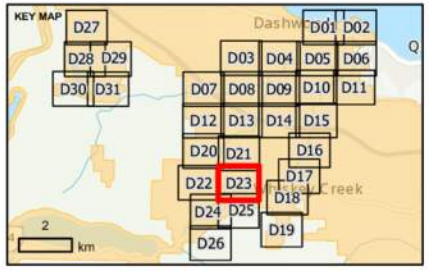
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

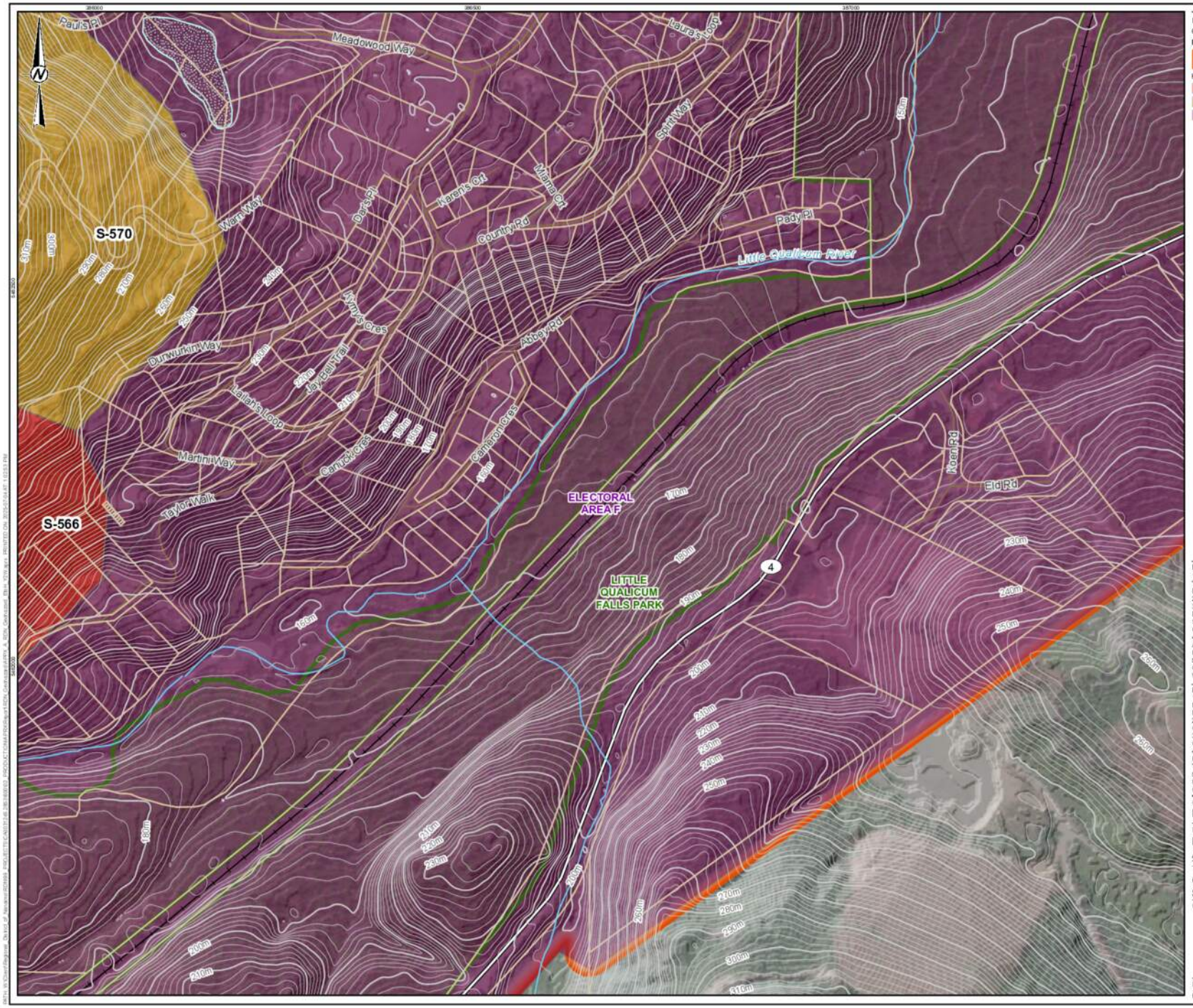
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-08
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D23



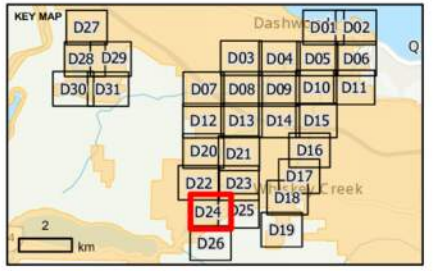
LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

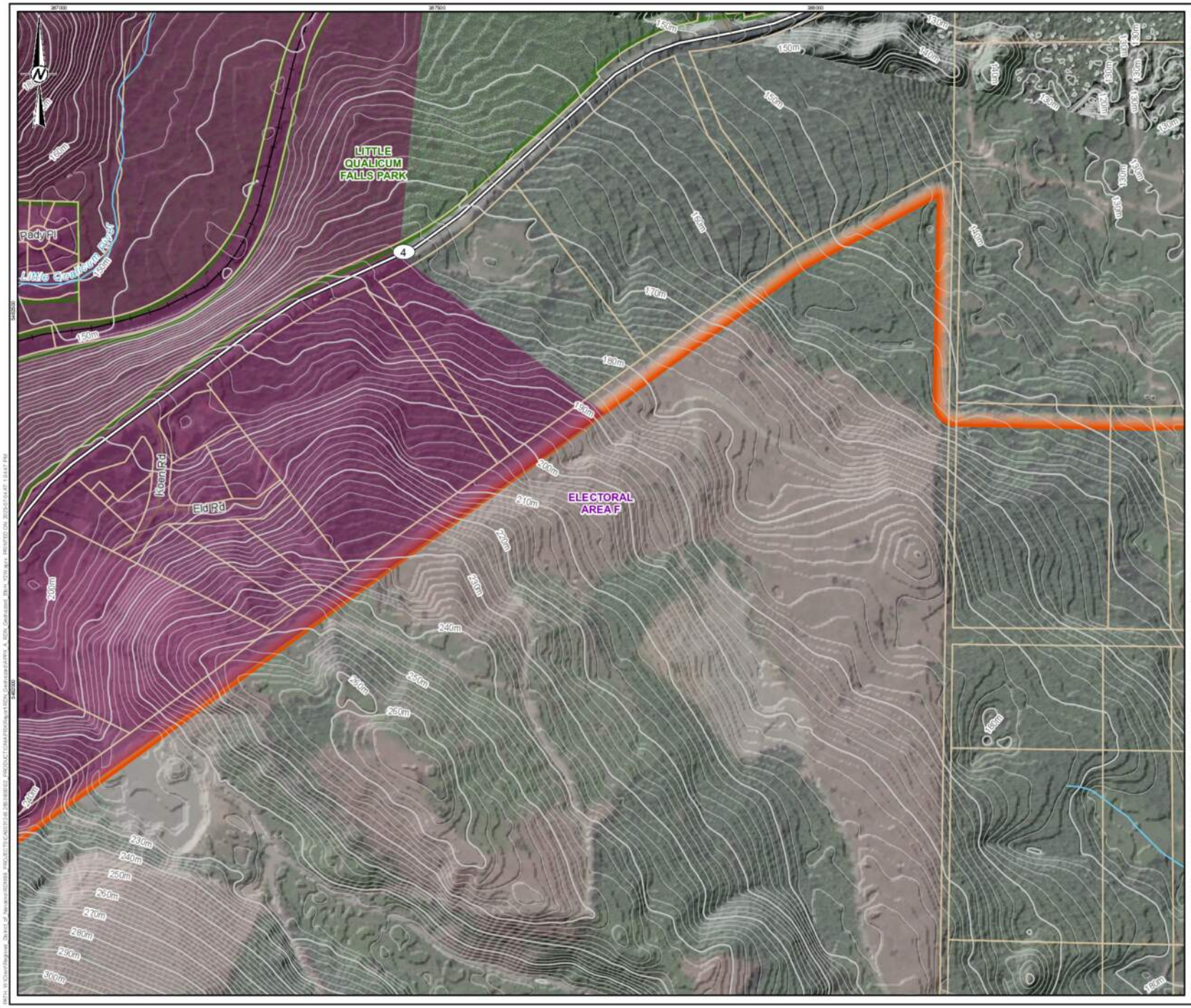
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D24



LEGEND

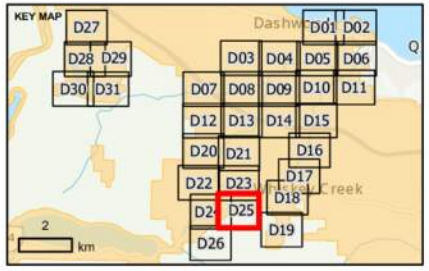
GEOHAZARD FEATURE

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

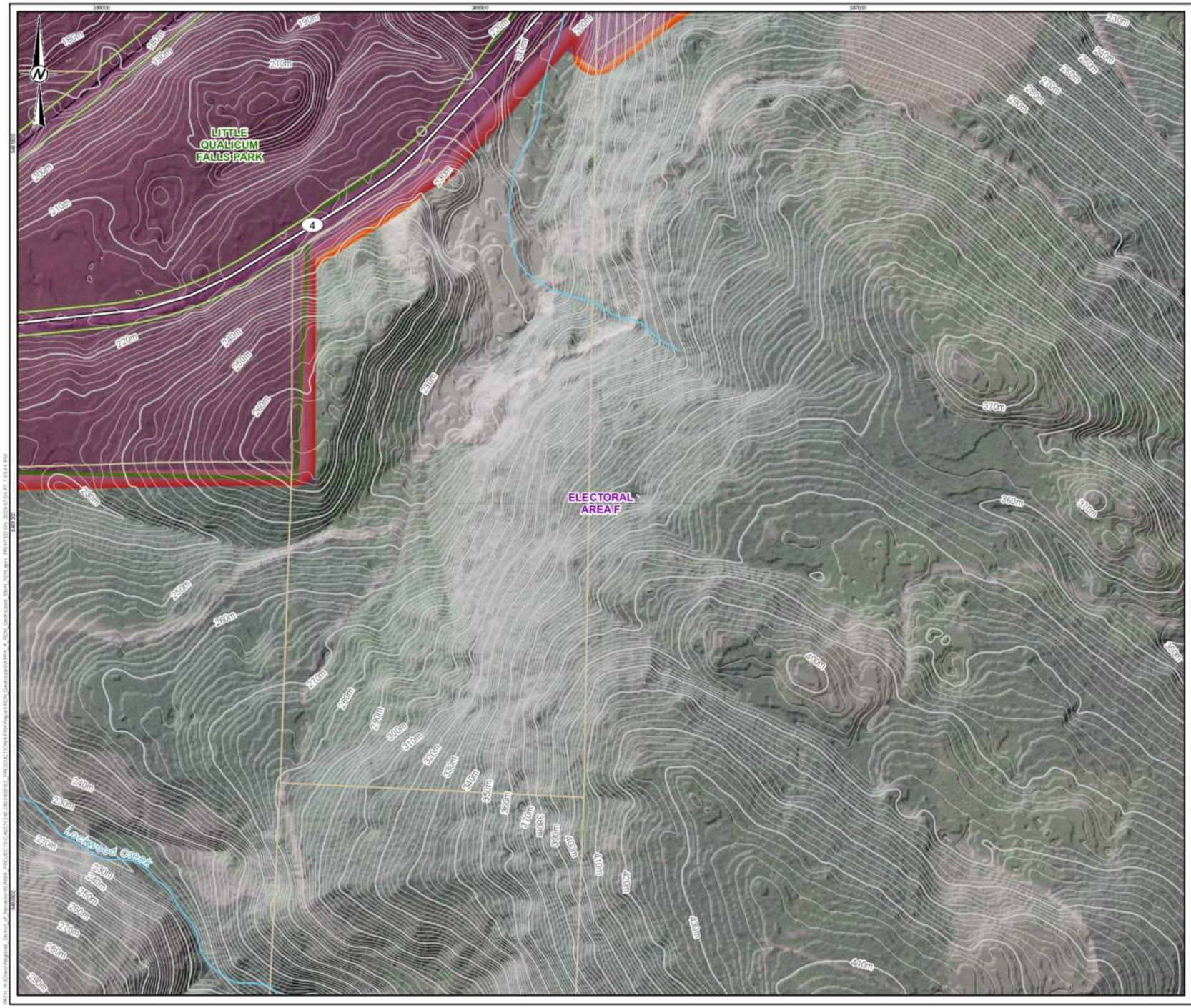
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D25



LEGEND

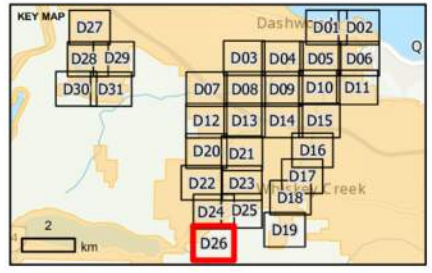
GEOHAZARD FEATURE

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D26

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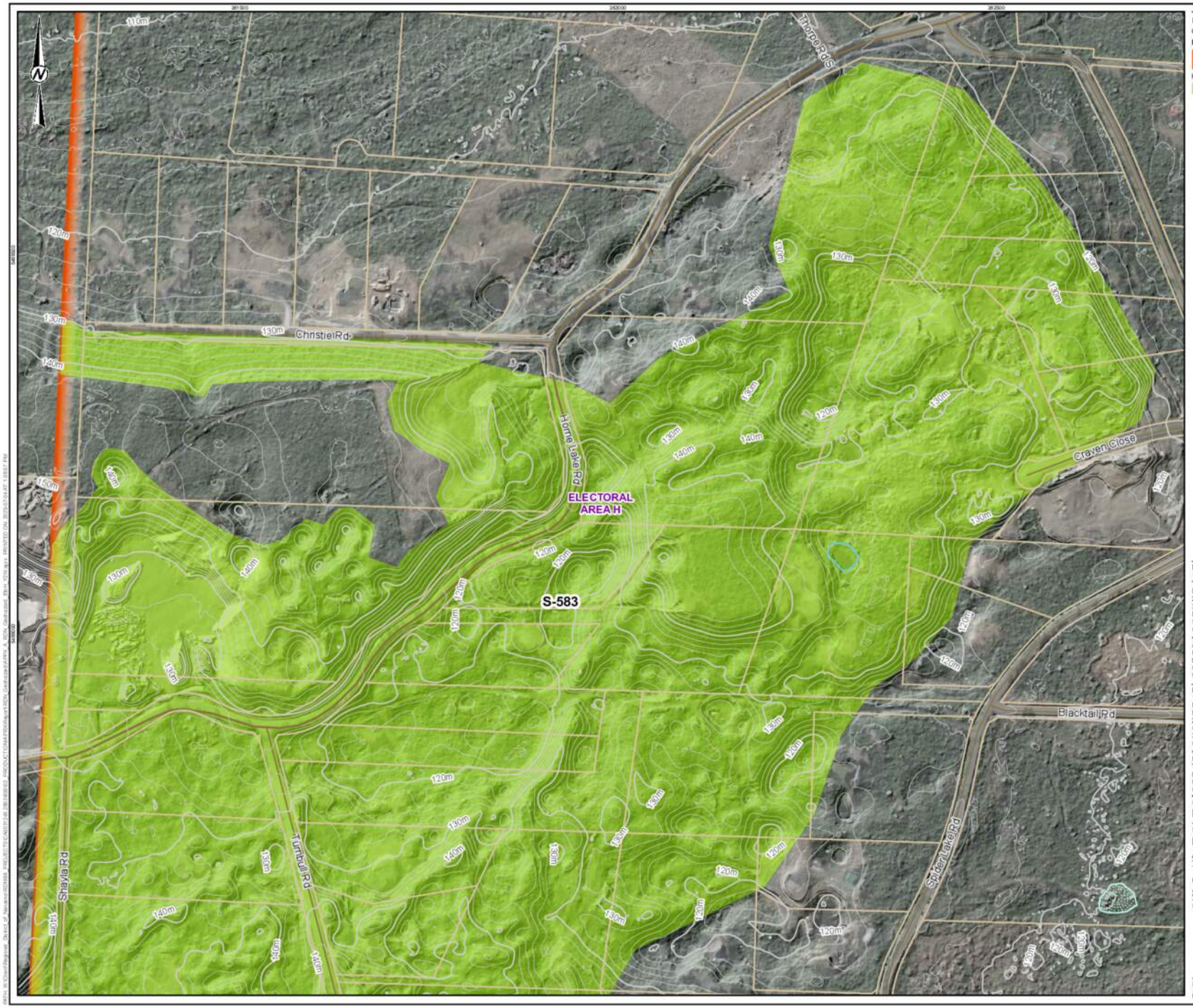


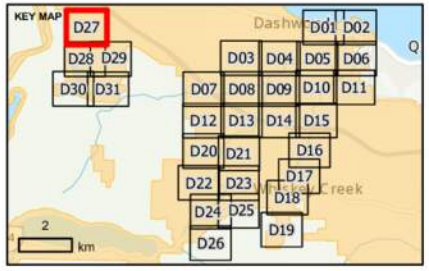
LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- LOW

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WETLAND
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

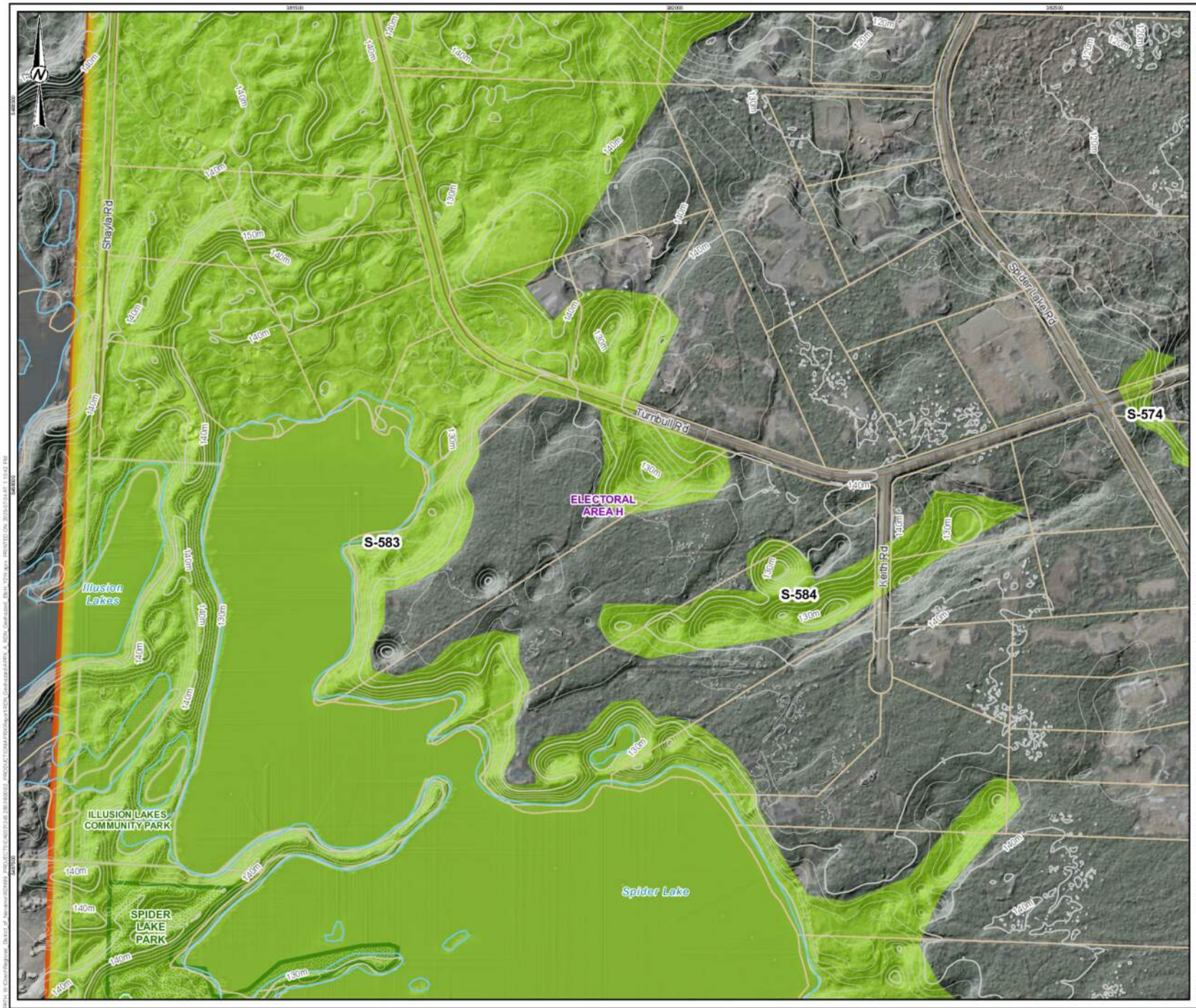
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D27



LEGEND

GEOHAZARD FEATURE

PROJECT DATA

STUDY AREA

HAZARD AREA (AOP)

LOW

BASE DATA

CONTOUR (10 m INTERVAL)

CONTOUR (2 m INTERVAL)

ROAD - LOCAL

WATERCOURSE

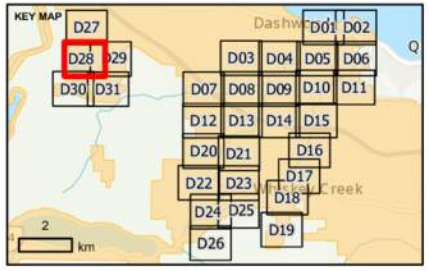
WETLAND

LOCAL AND REGIONAL GREENSPACE

PARK / PROTECTED AREA

PARCEL

ELECTORAL AREA



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REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

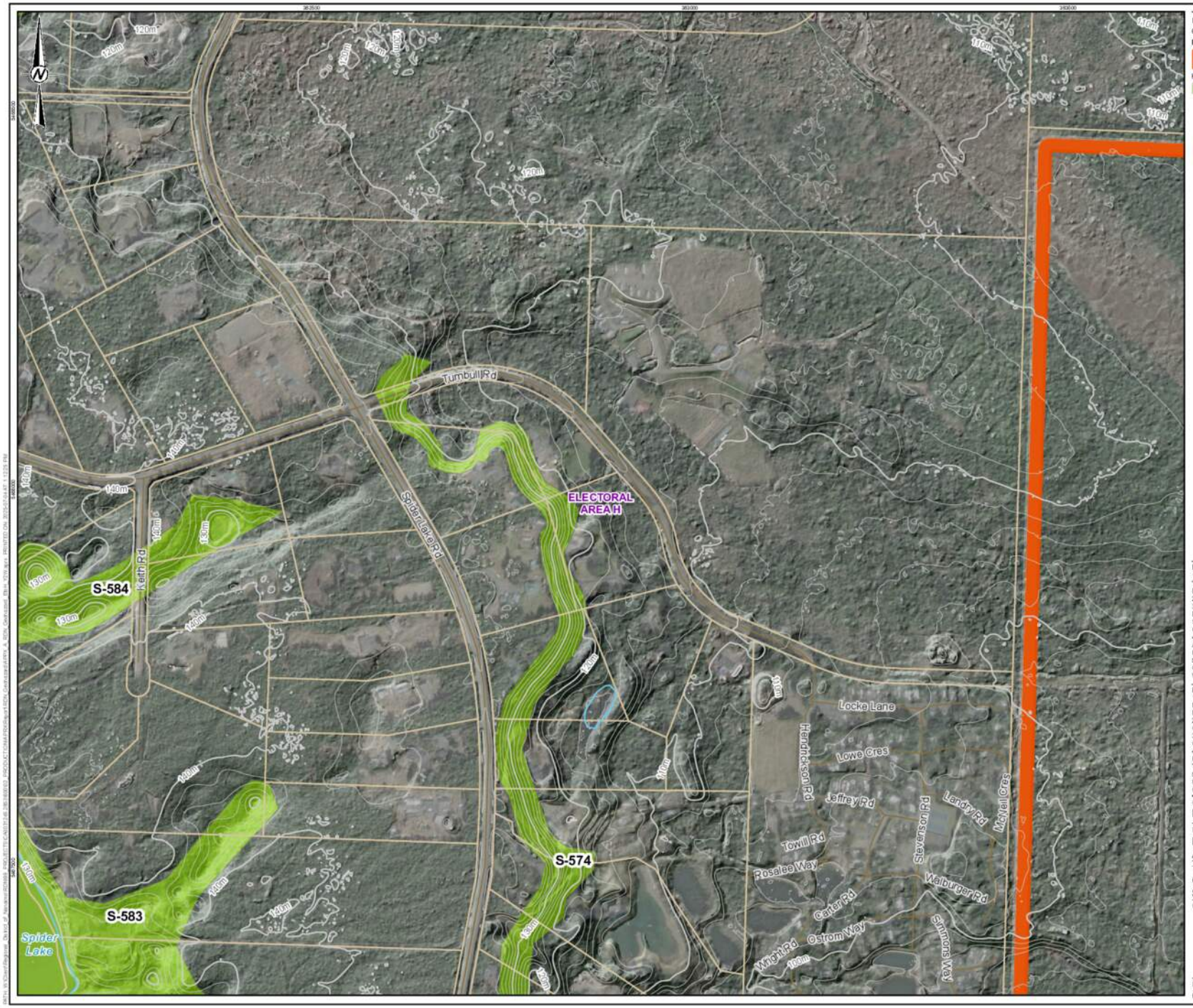
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D28



LEGEND

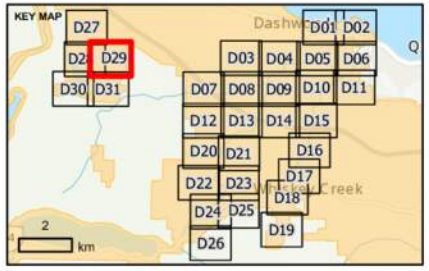
GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- LOW

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WETLAND
- PARCEL
- ELECTORAL AREA

KEY MAP



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

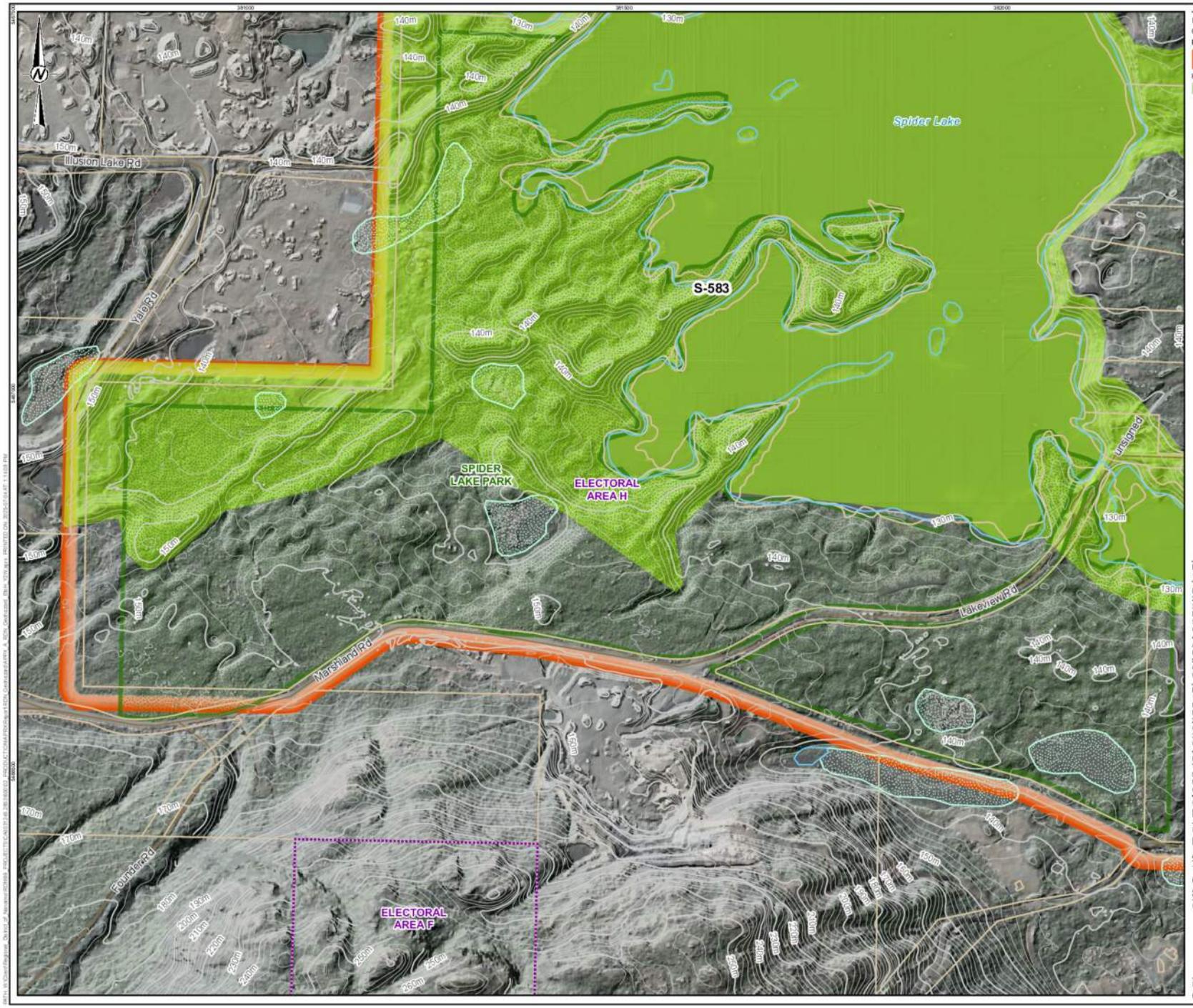
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D29



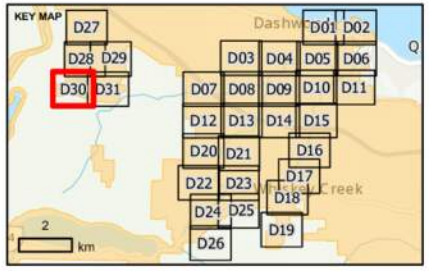
LEGEND

GEOHAZARD FEATURE

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- LOW

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

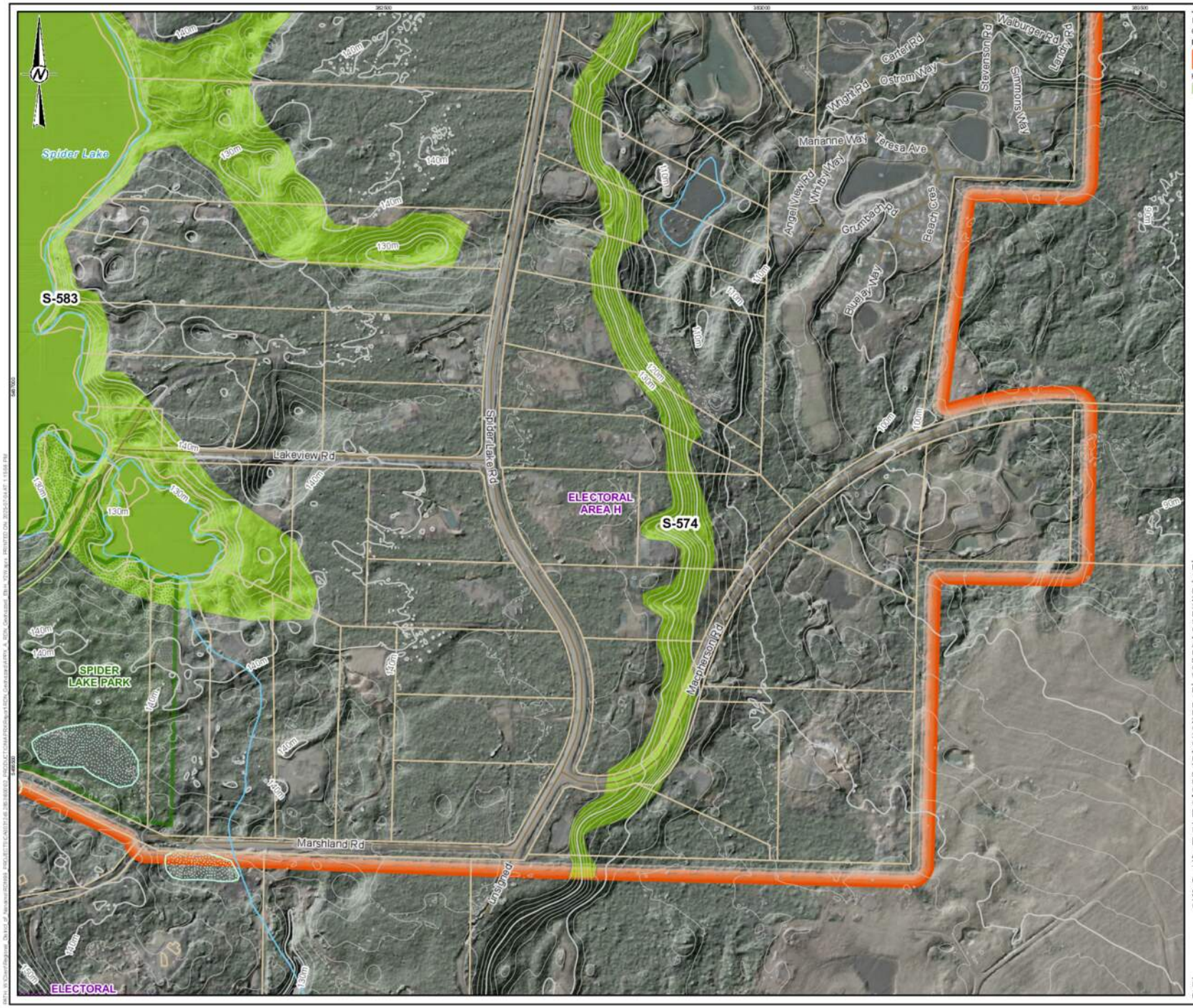
TITLE
GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D30



LEGEND

GEOHAZARD FEATURE

PROJECT DATA

STUDY AREA

HAZARD AREA (AOP)

LOW

BASE DATA

CONTOUR (10 m INTERVAL)

CONTOUR (2 m INTERVAL)

ROAD - LOCAL

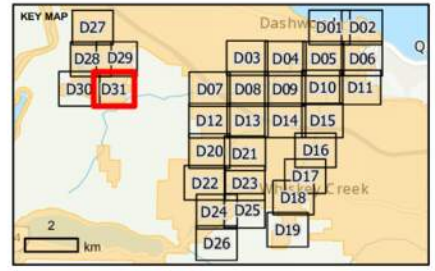
WATERCOURSE

WETLAND

PARK / PROTECTED AREA

PARCEL

ELECTORAL AREA



0 100 200

METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

GEOHAZARD MAPPING
SECTION D - LITTLE QUALICUM RIVER (INCL. WHISKY CREEK)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	D31

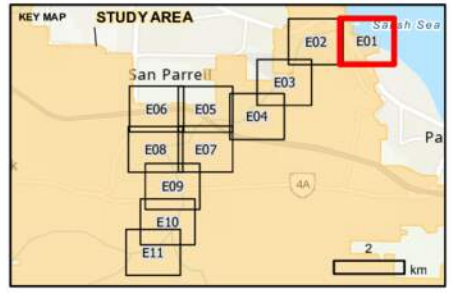
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

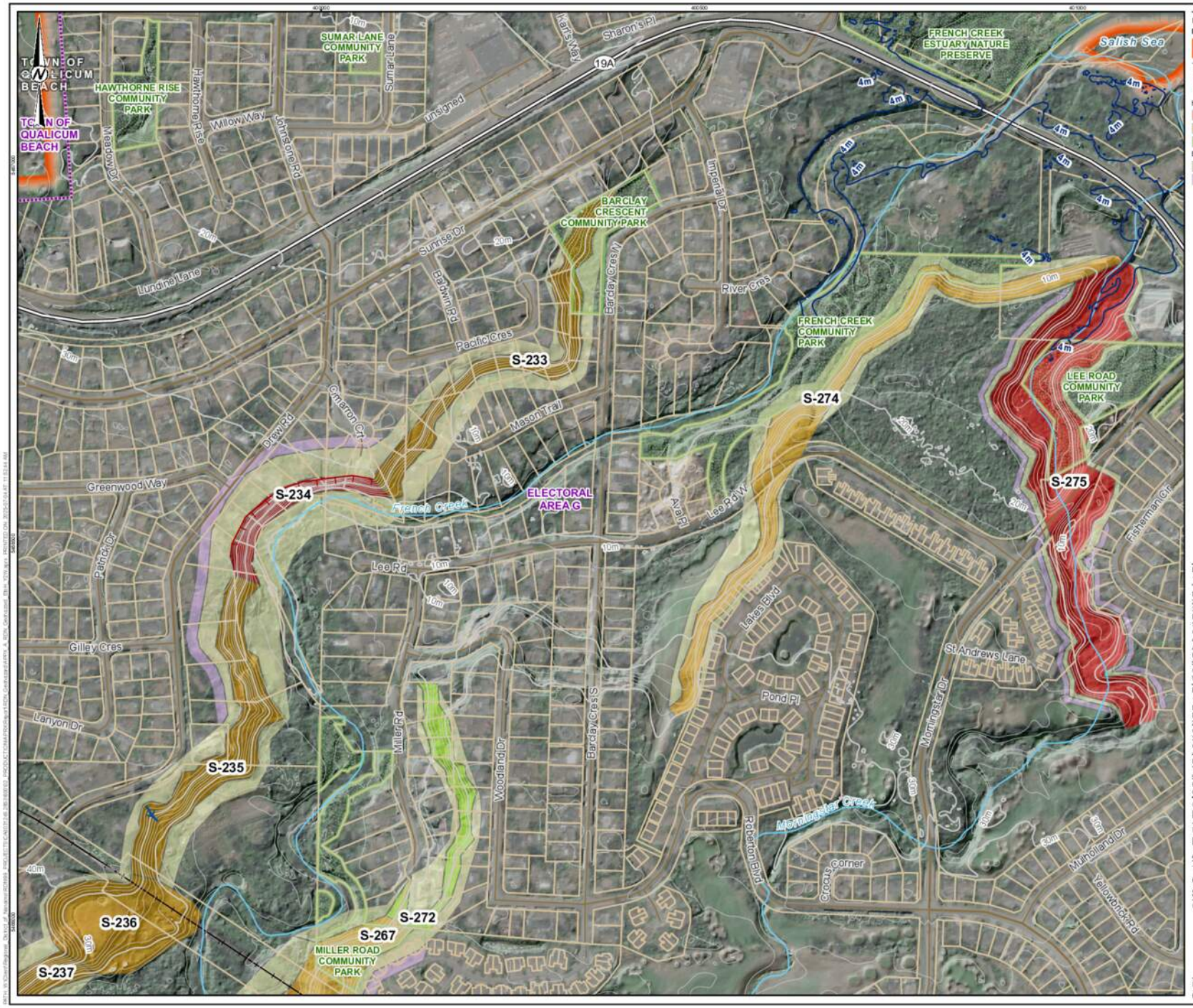
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E01



LEGEND

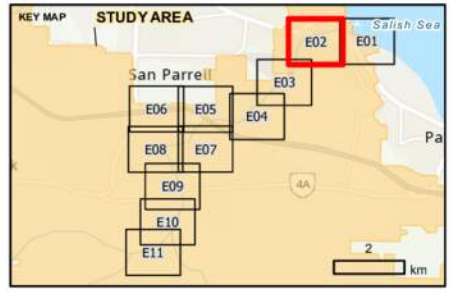
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

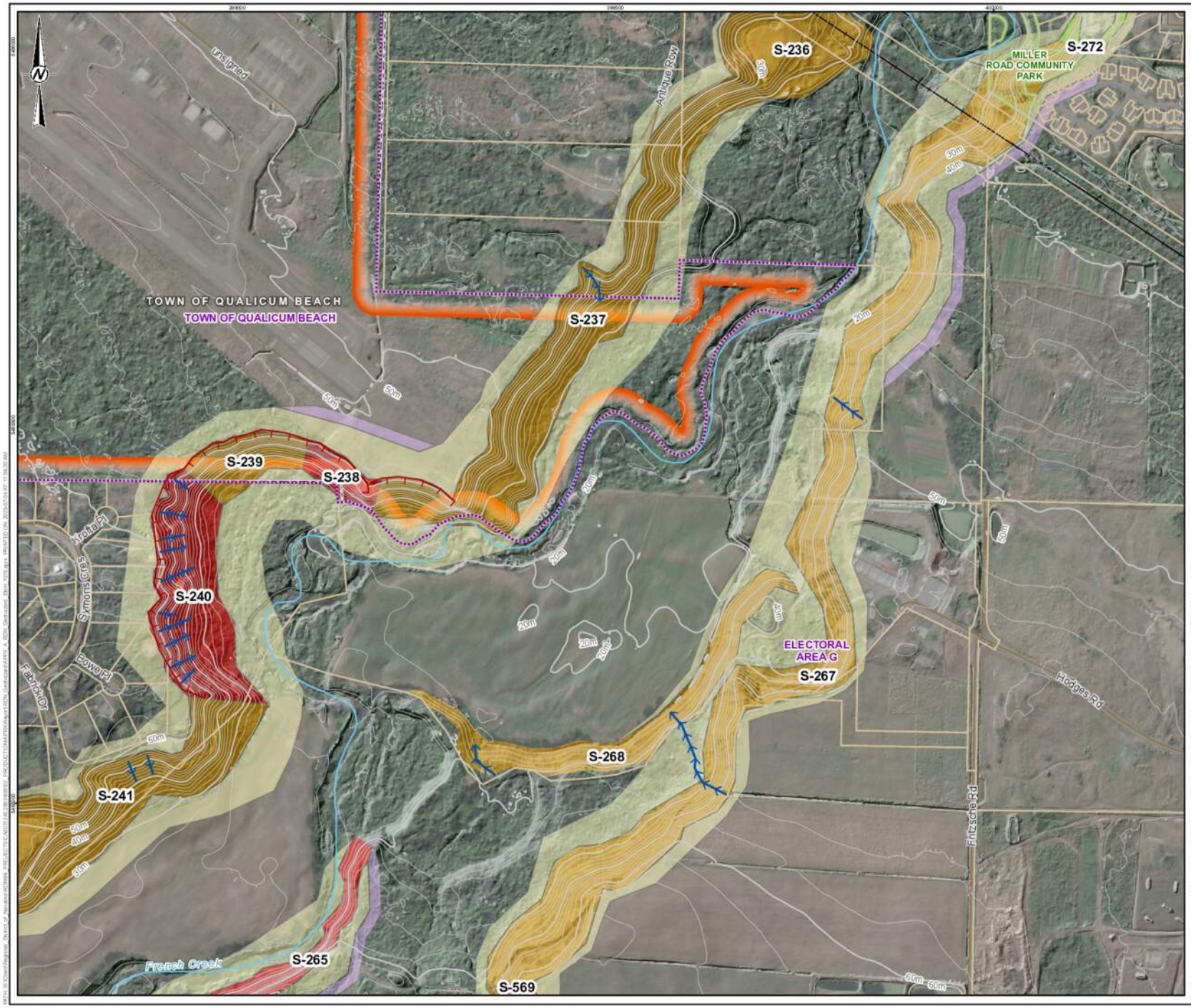
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E02



LEGEND

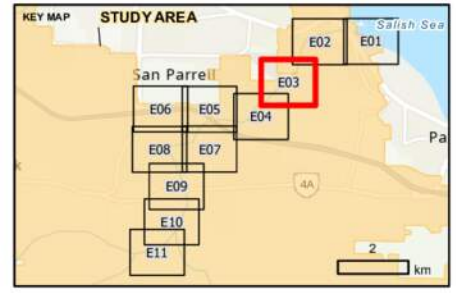
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

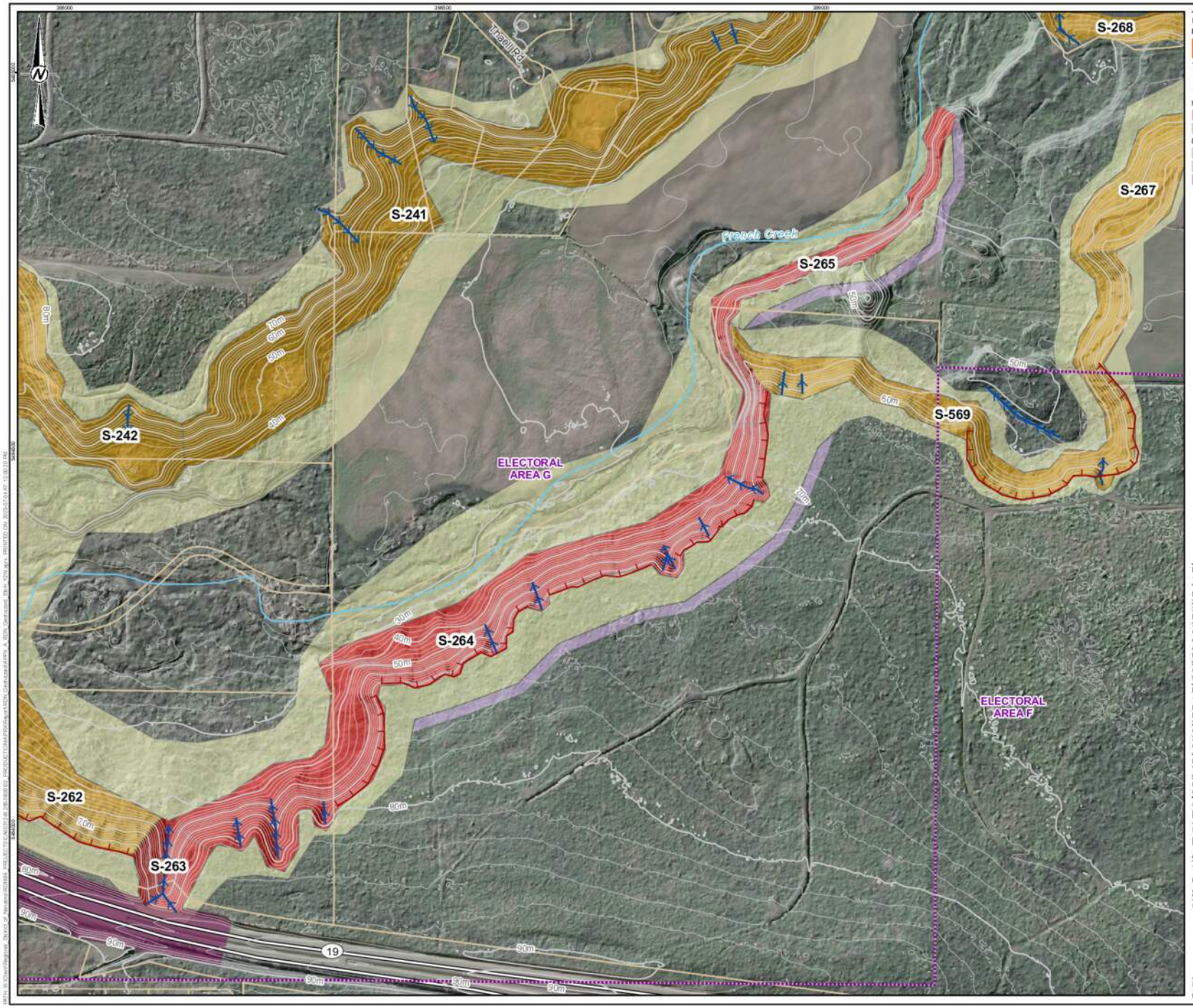
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E03



LEGEND

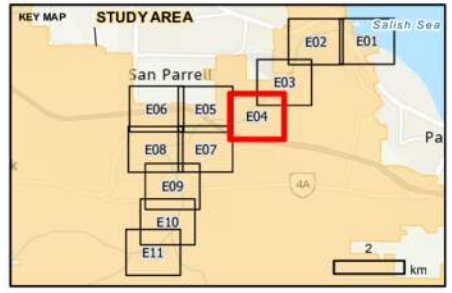
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

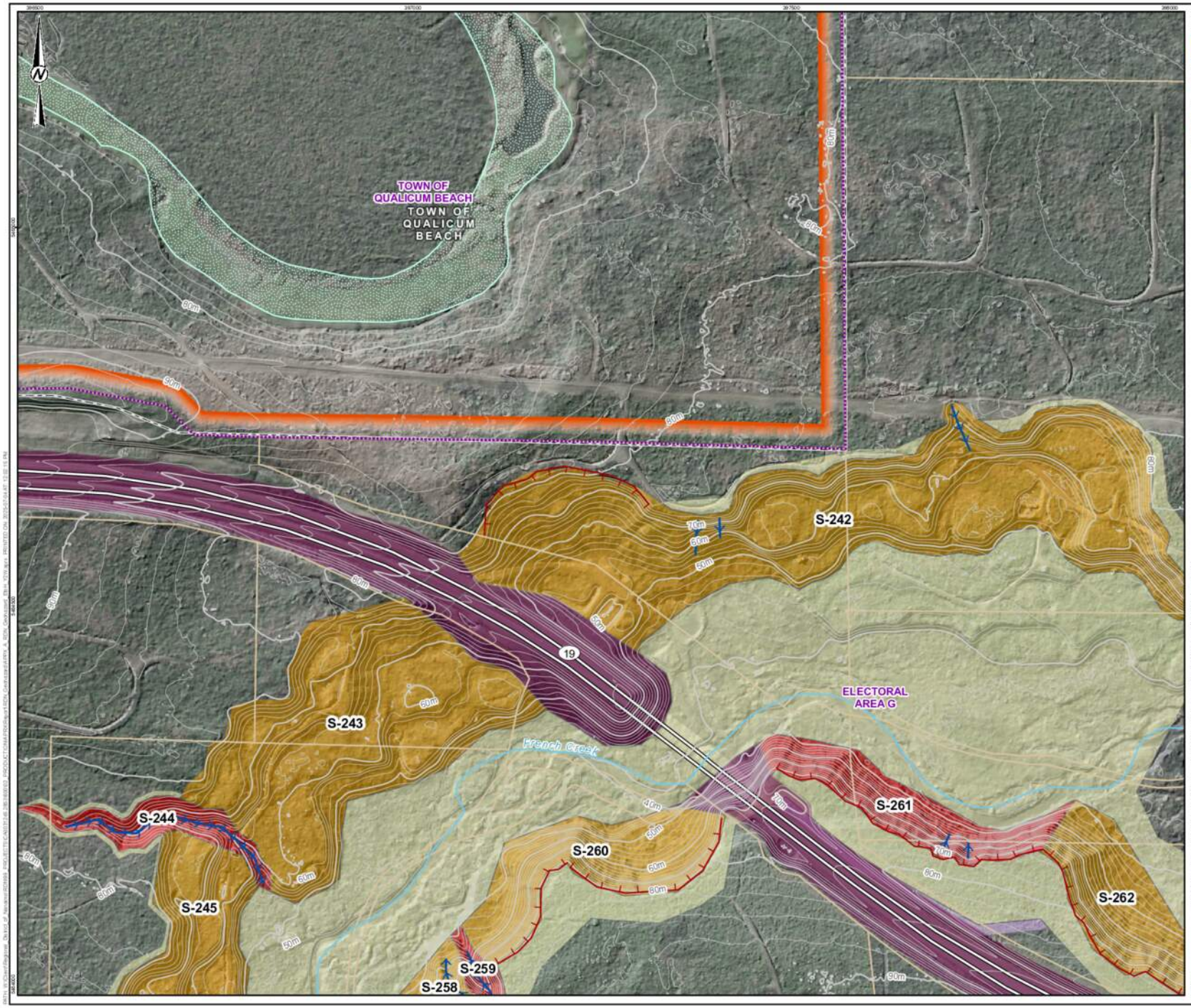
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E04



LEGEND

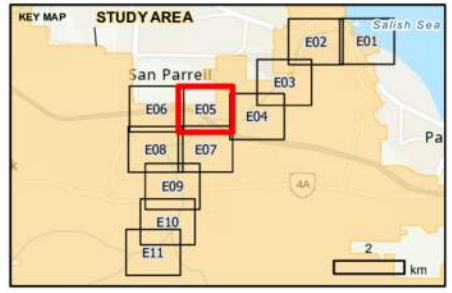
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- WETLAND
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E05

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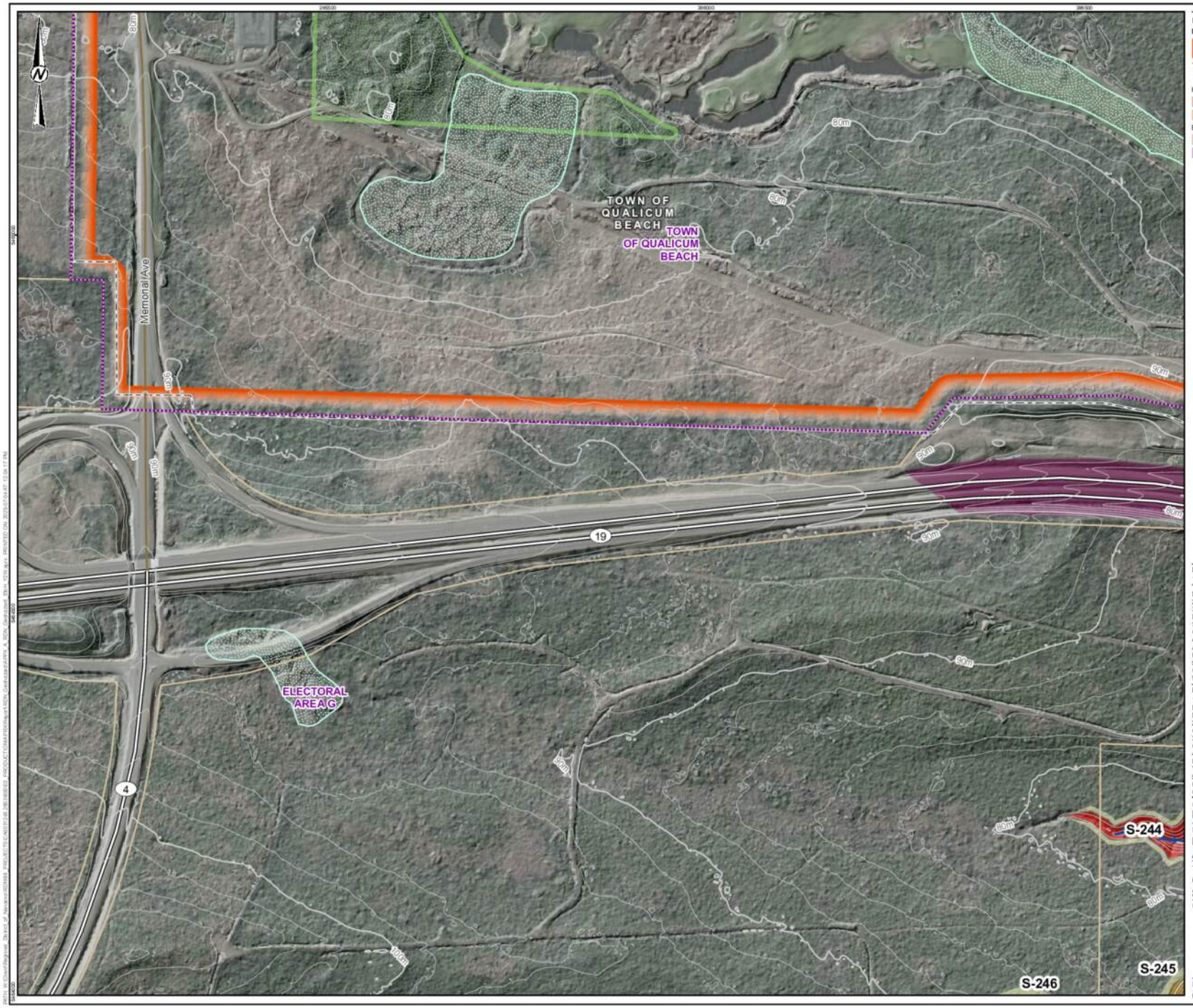


LEGEND

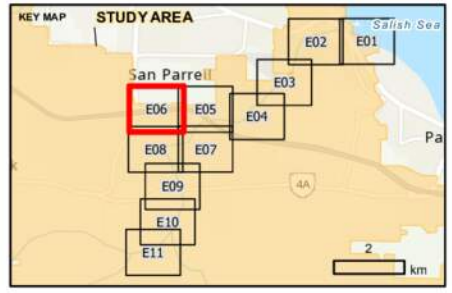
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

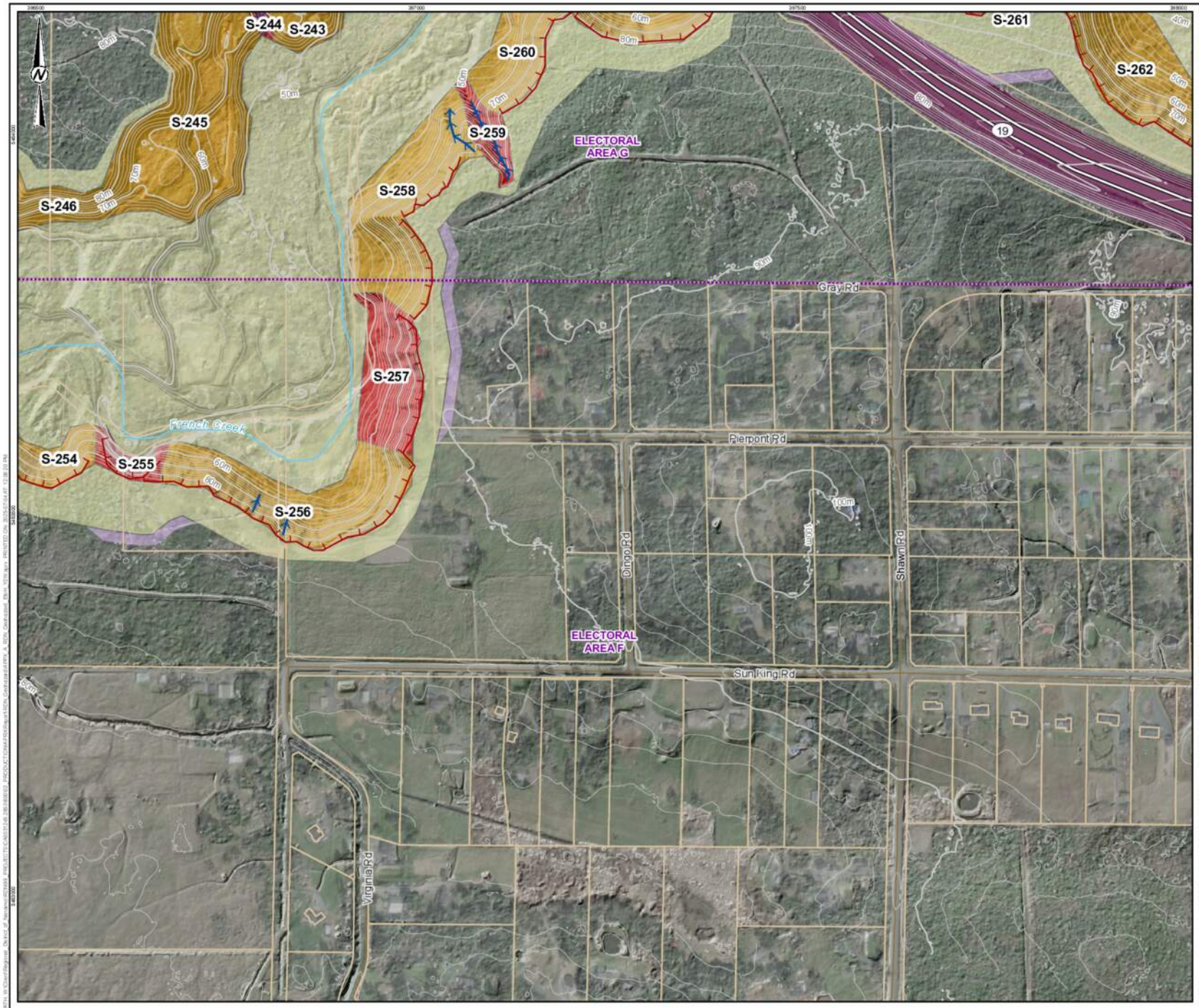
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E06



LEGEND

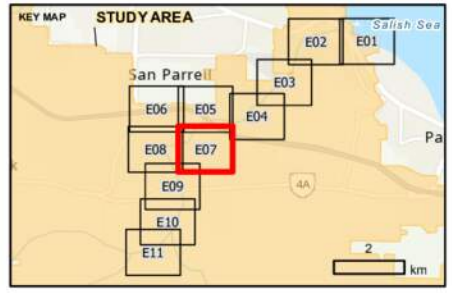
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E07

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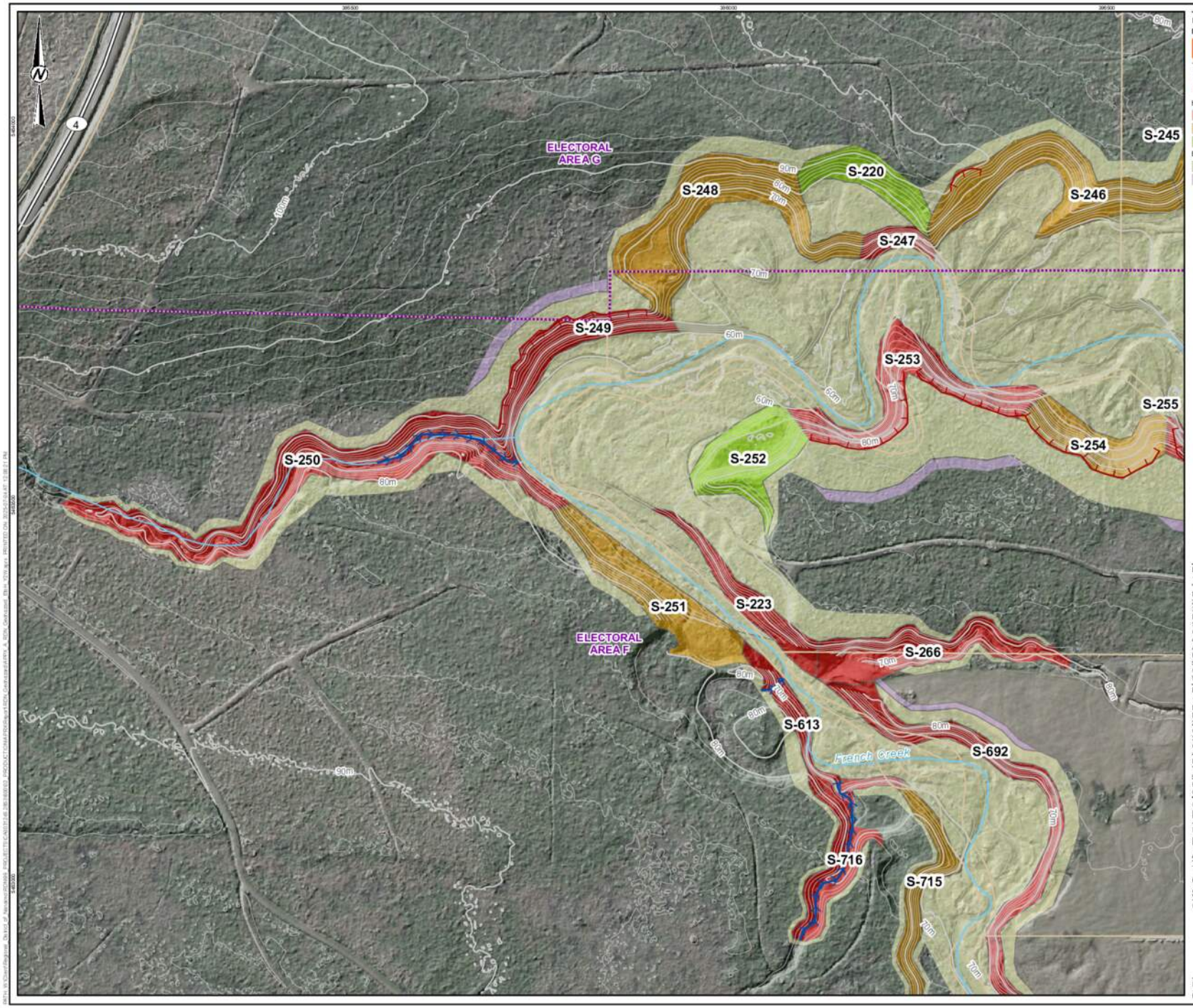

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
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BUFFER ZONE
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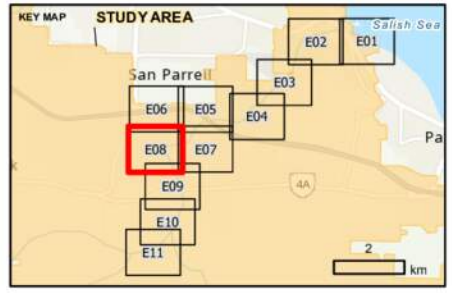
BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E08

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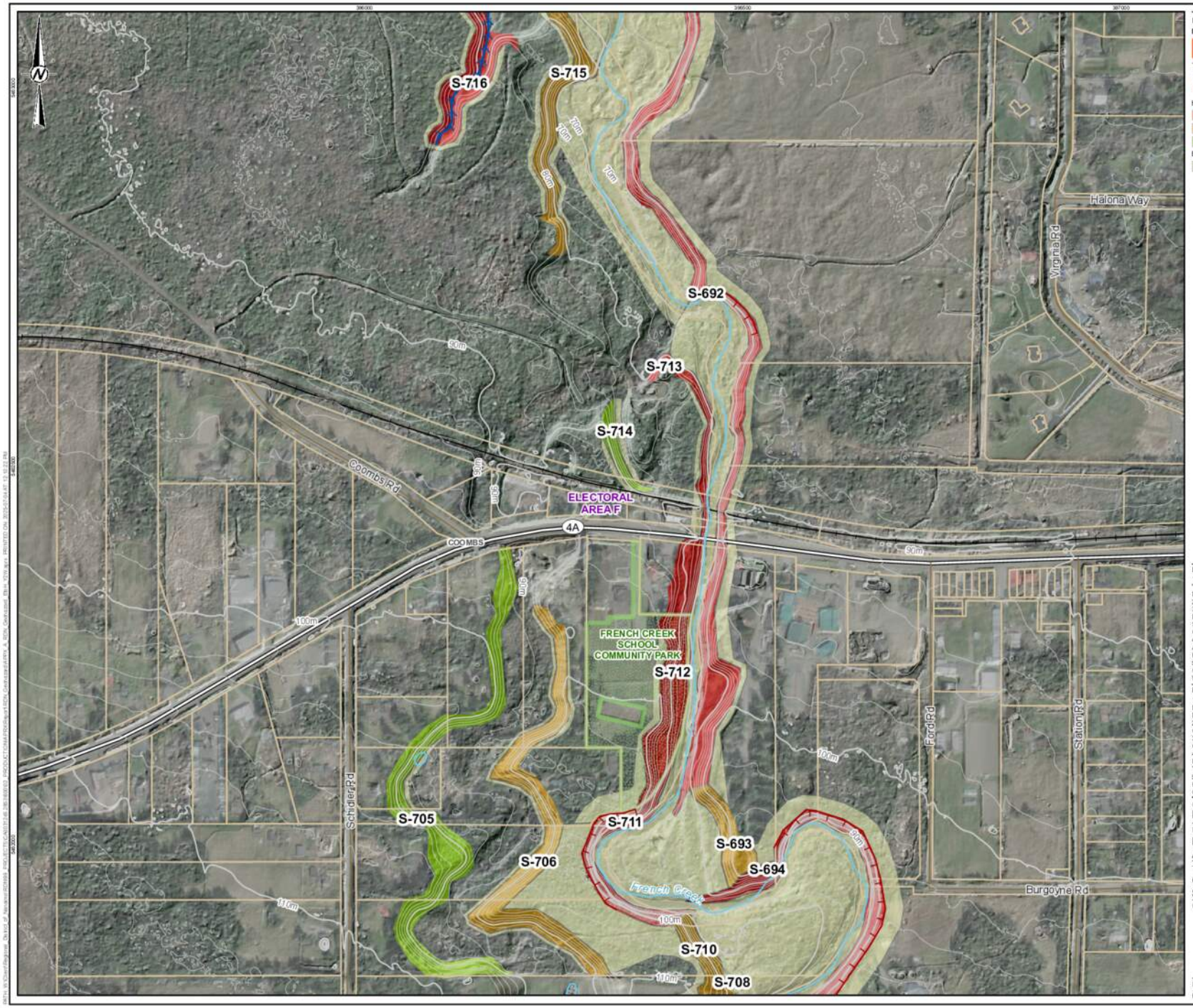

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
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- HIGH
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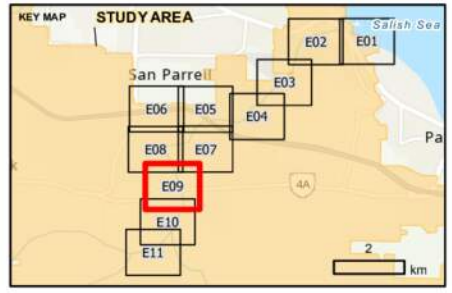

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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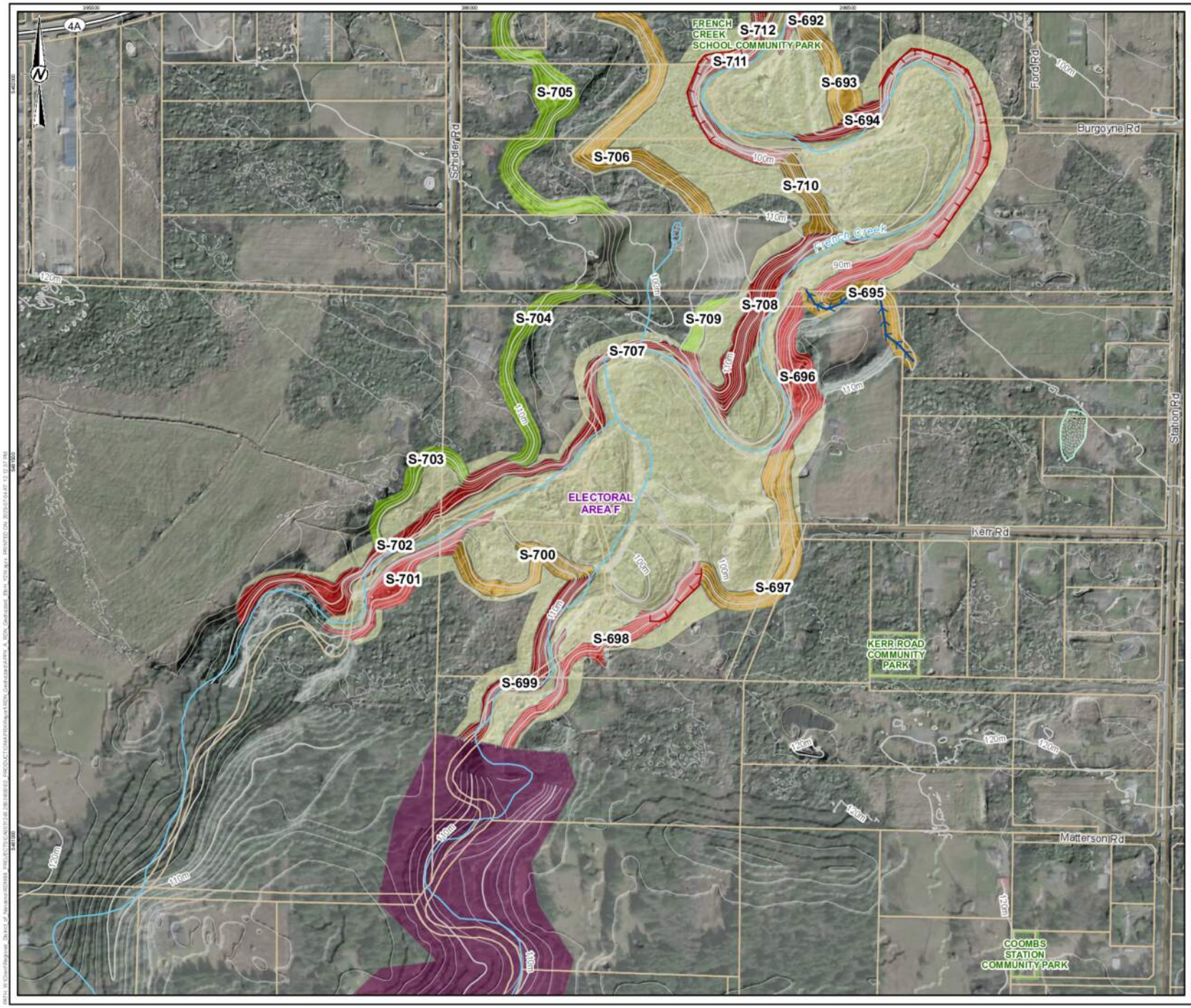
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E09



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PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
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- SCARP

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- HIGH
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BUFFER ZONE
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- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
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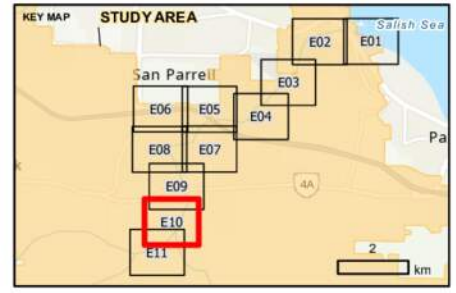

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

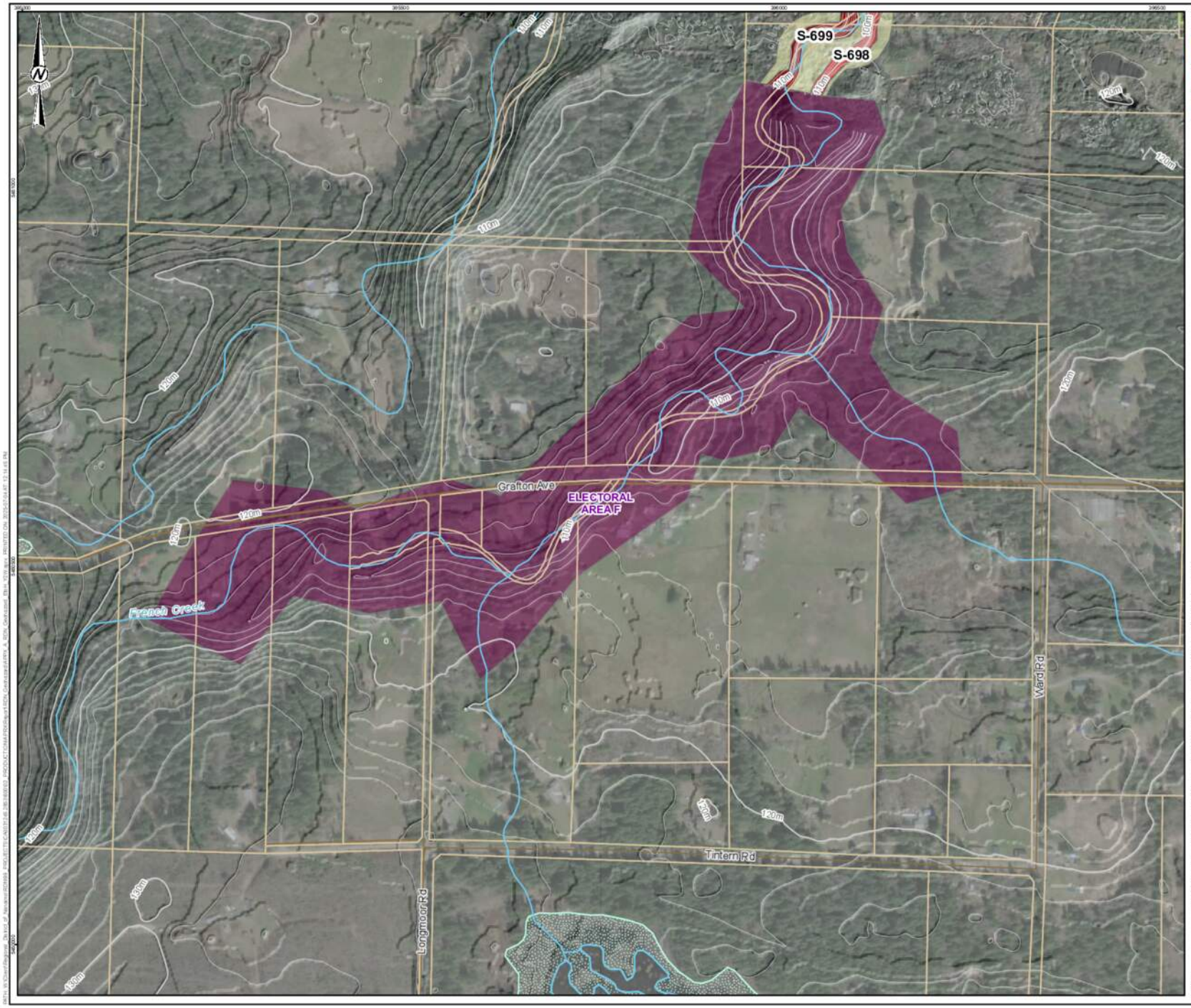
TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



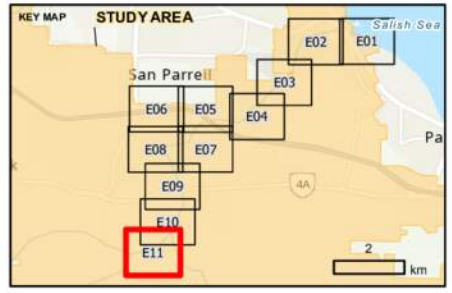
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

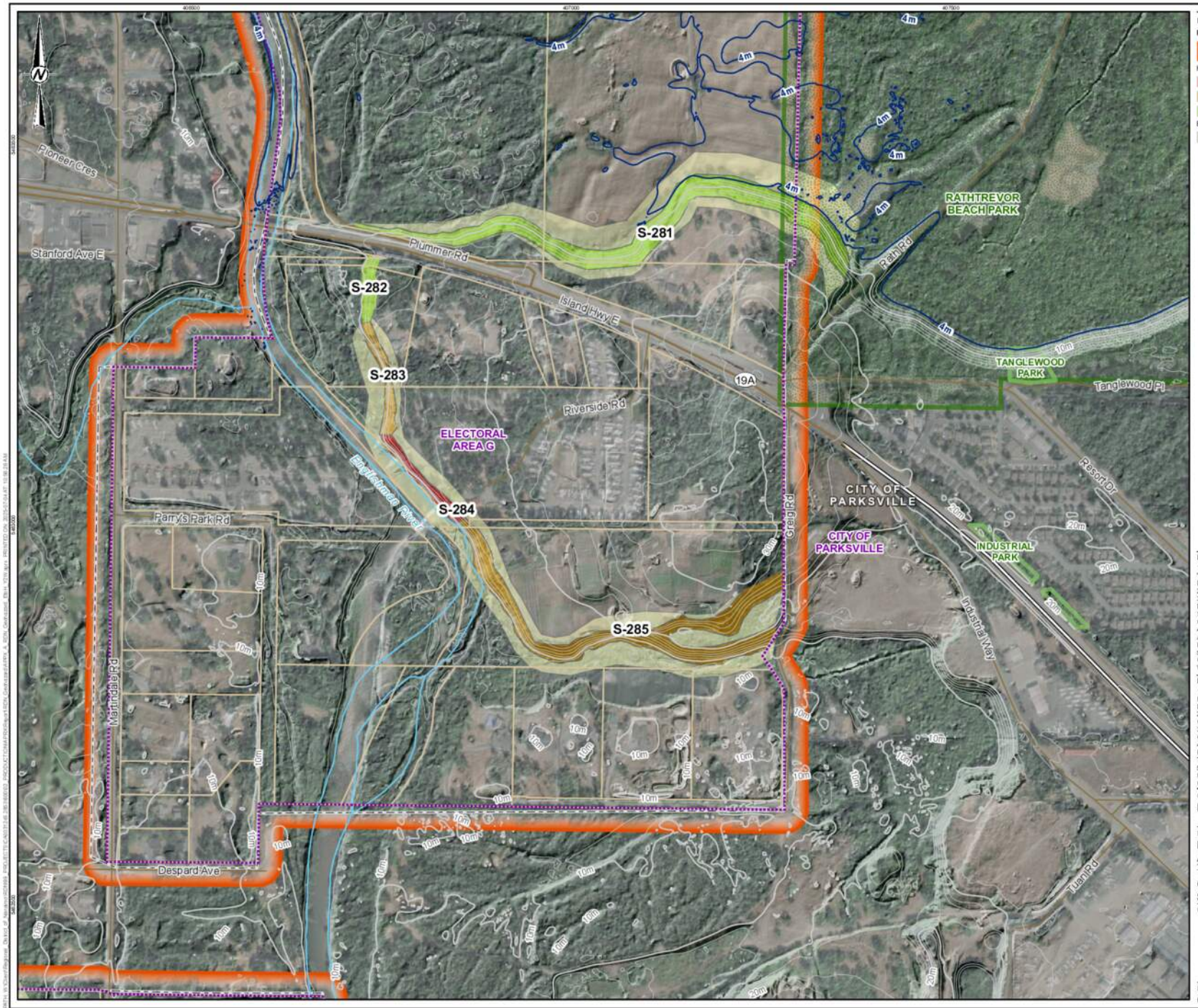
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION E - FRENCH CREEK

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	E11



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

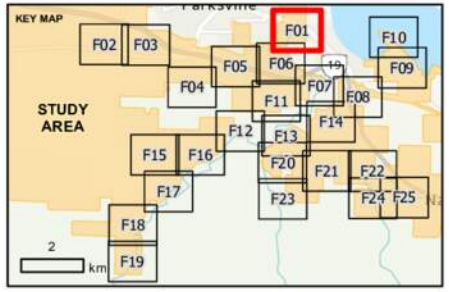
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

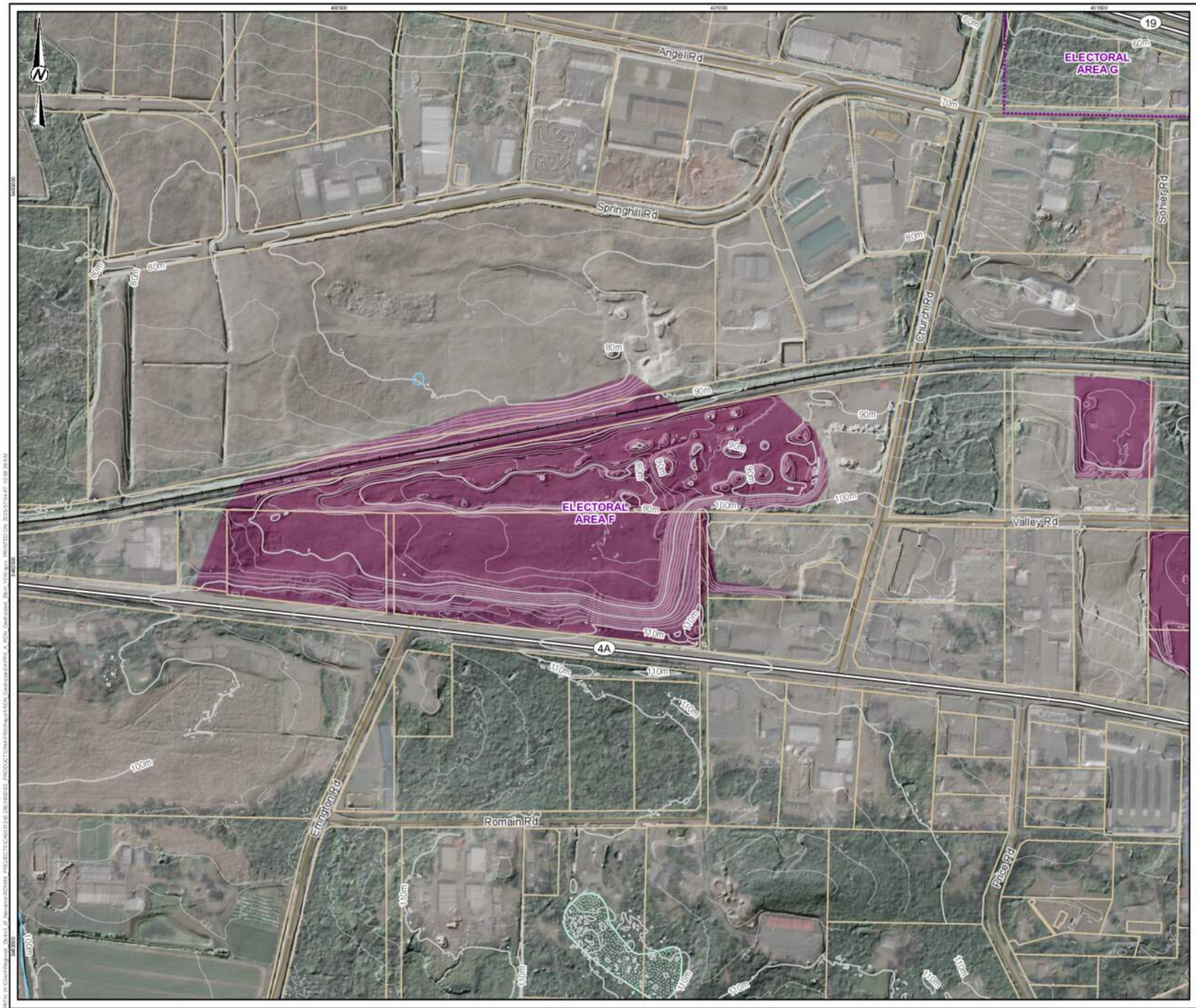
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F01



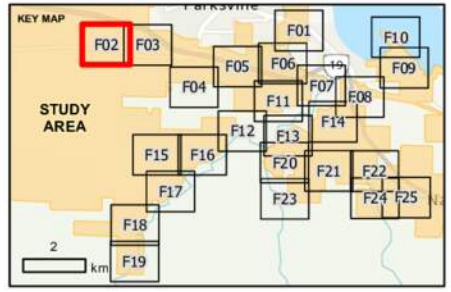
LEGEND

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

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CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

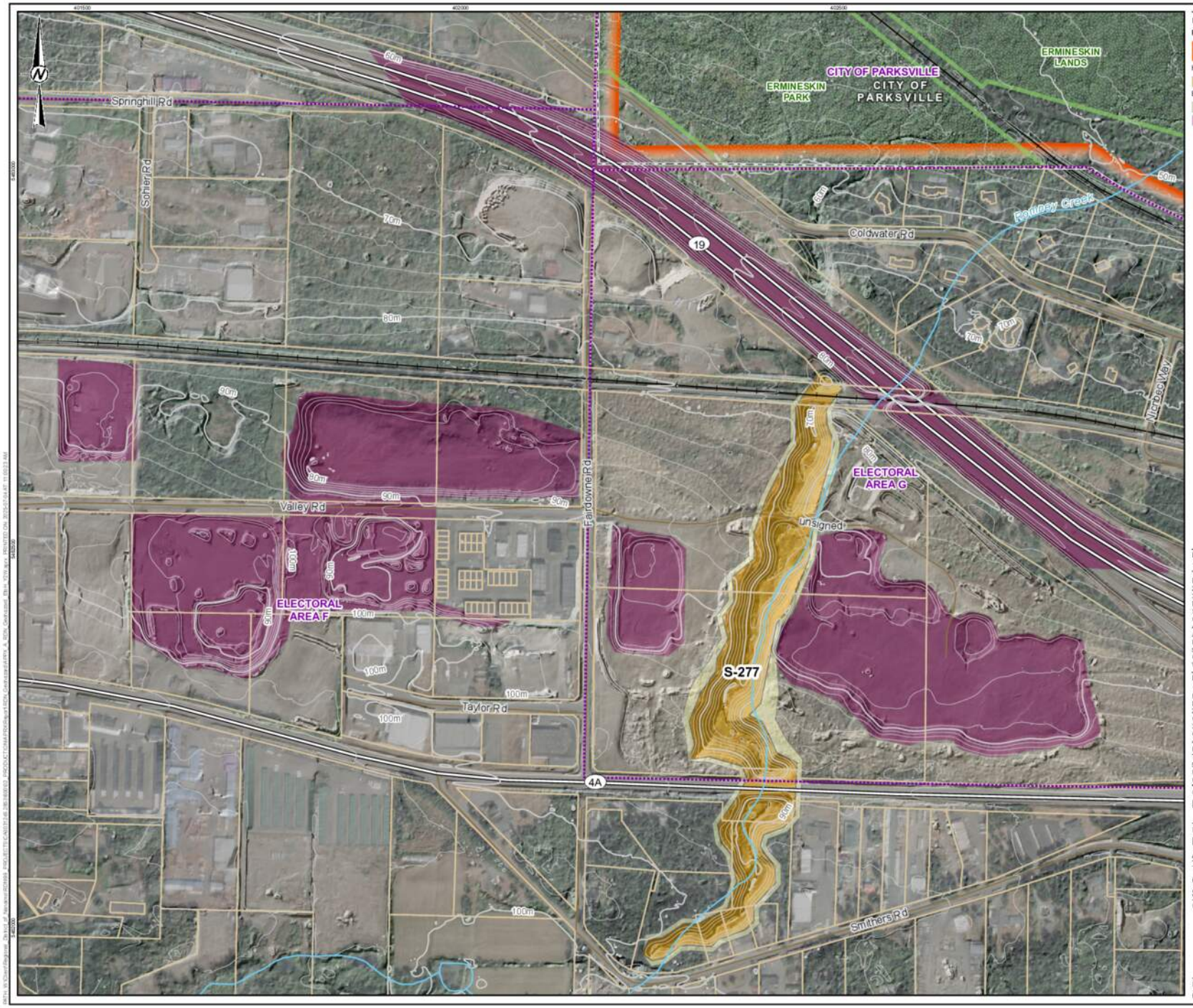
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F02



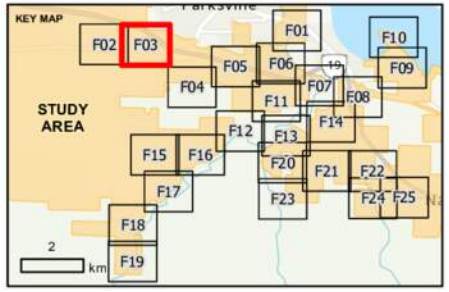
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOI)
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

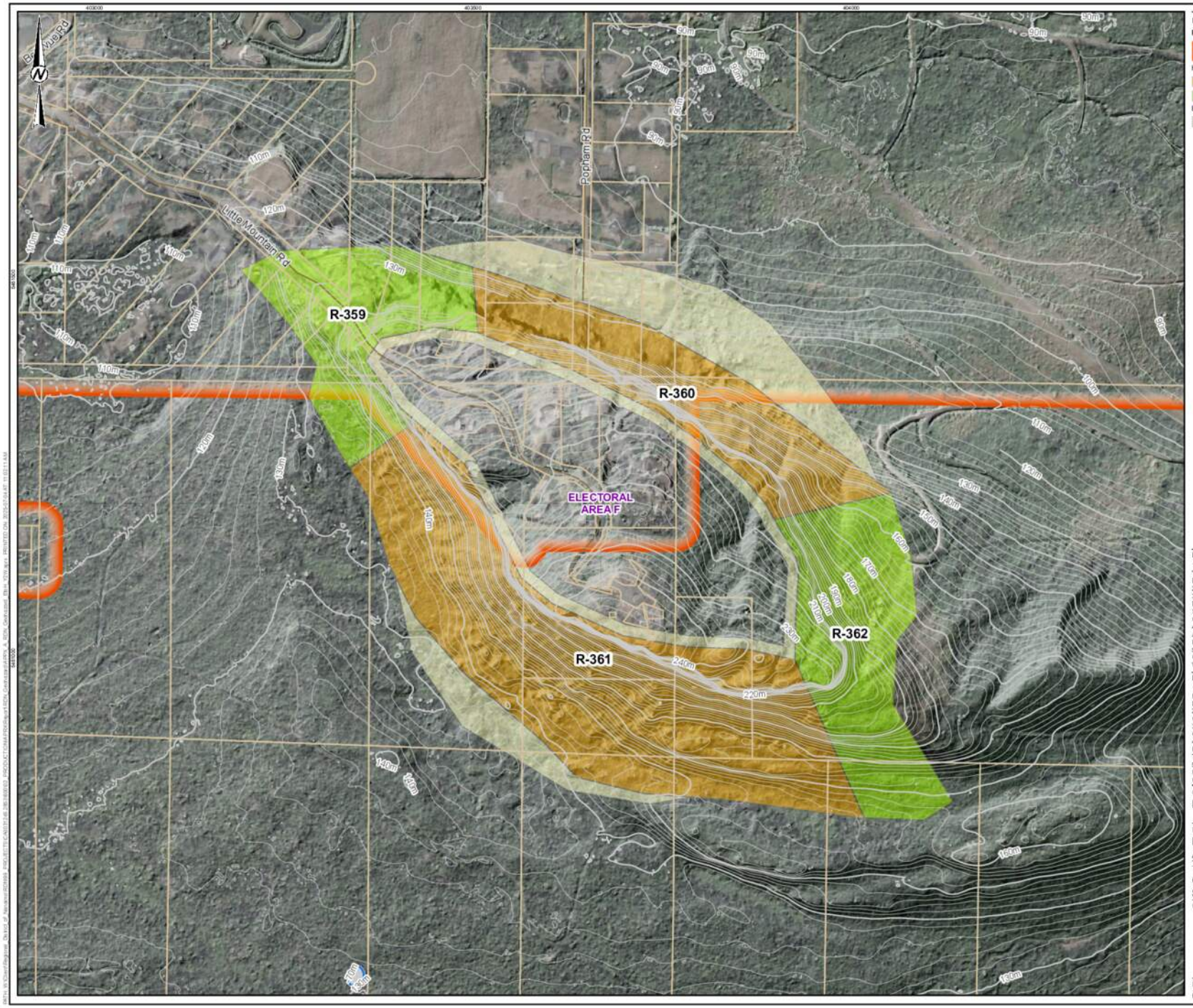
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F03



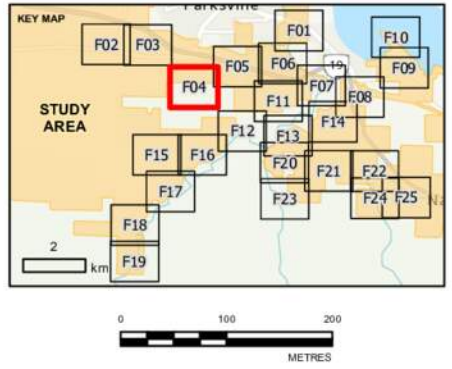
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - LOCAL
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

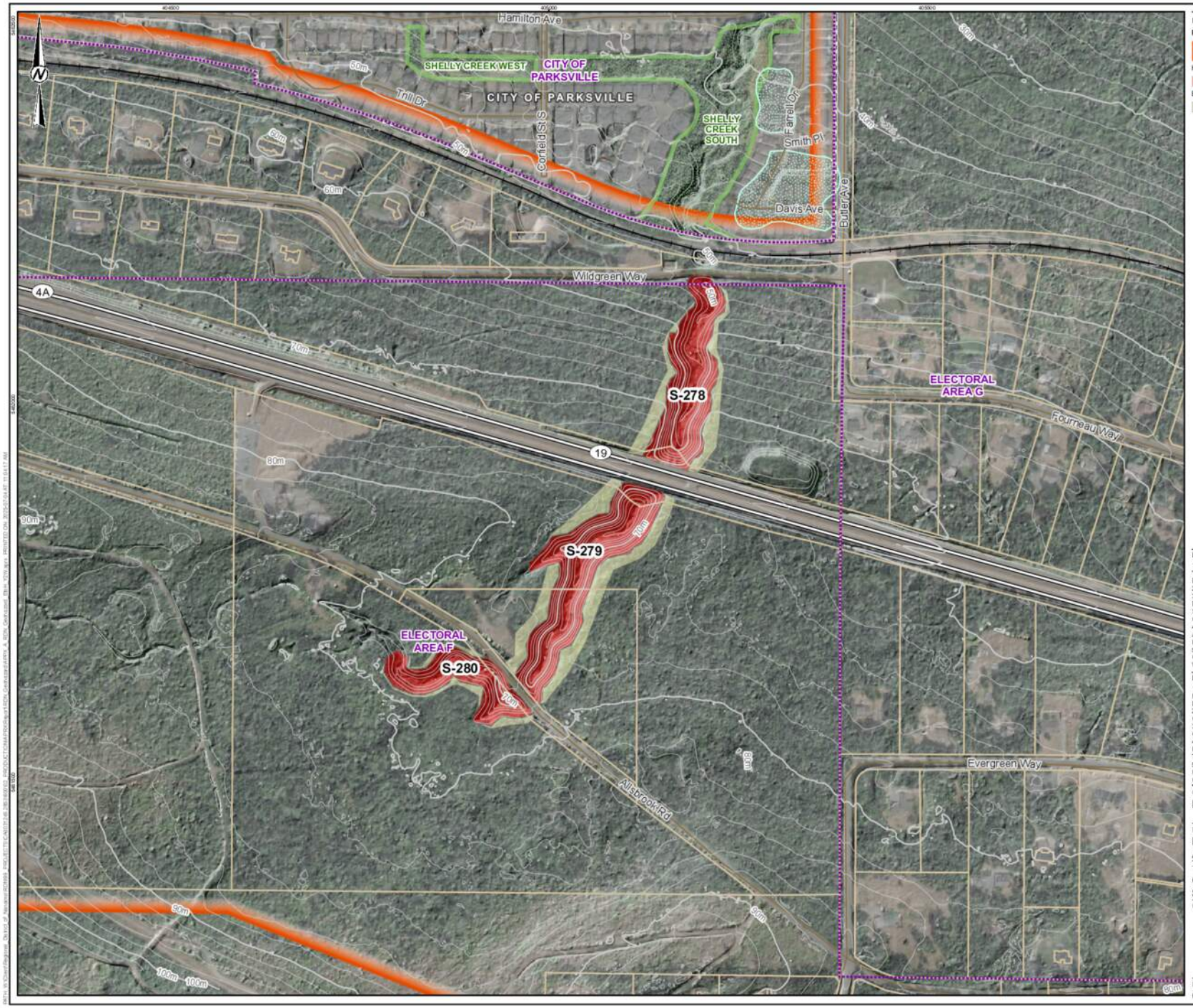
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F04

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B.



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - HIGH
- BUFFER ZONE
  - BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
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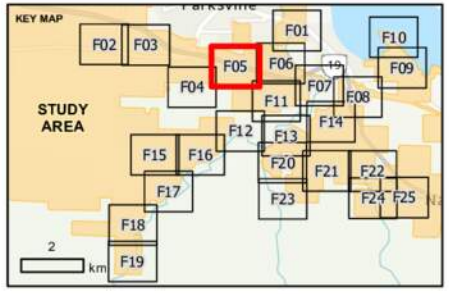

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

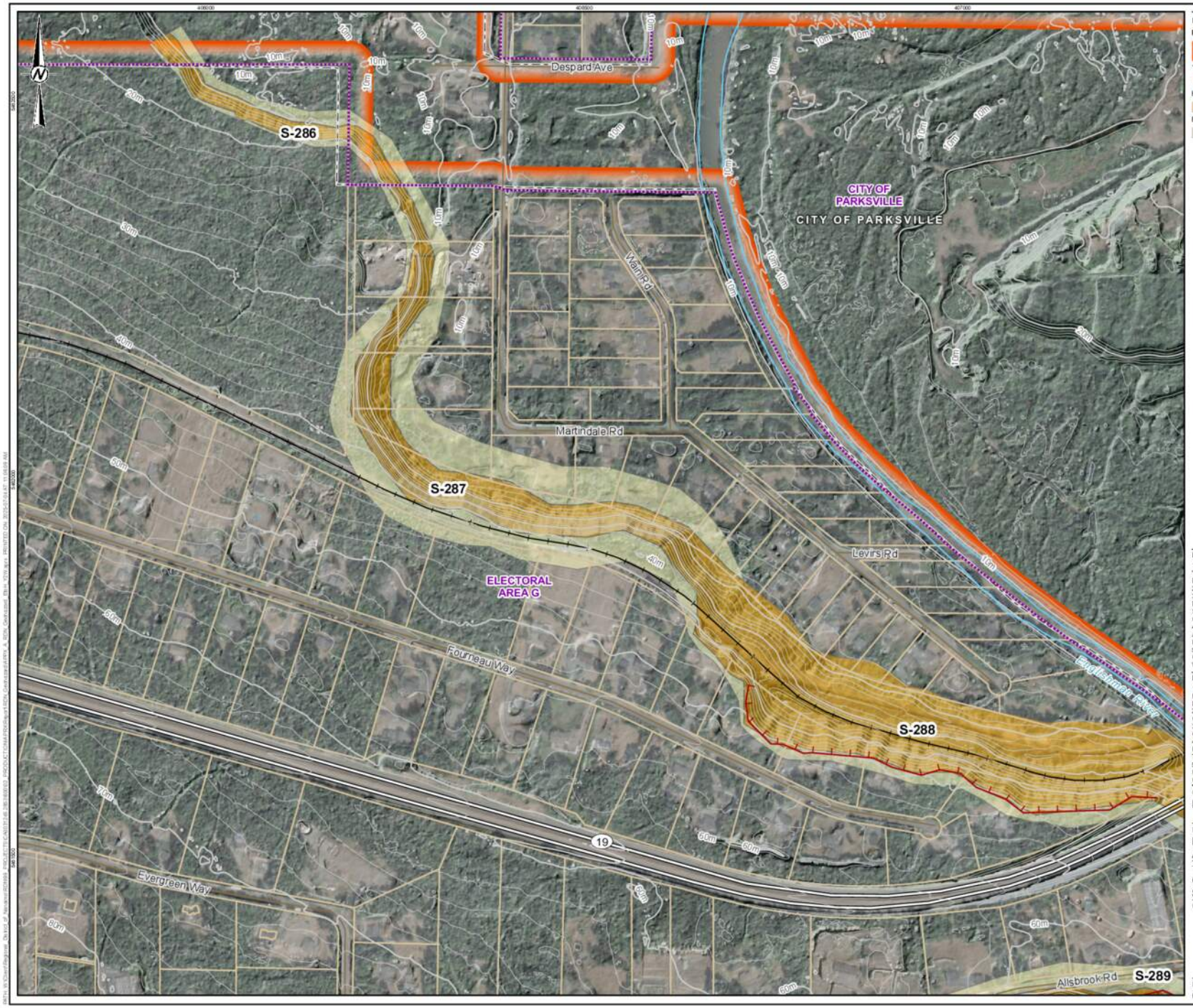
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

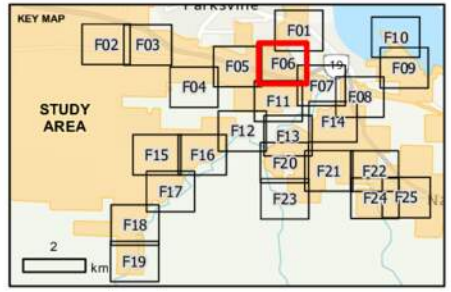
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F05

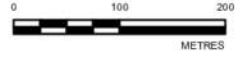


LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
  - SCARP
- HAZARD AREA (AOP)
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERBODY
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA





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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

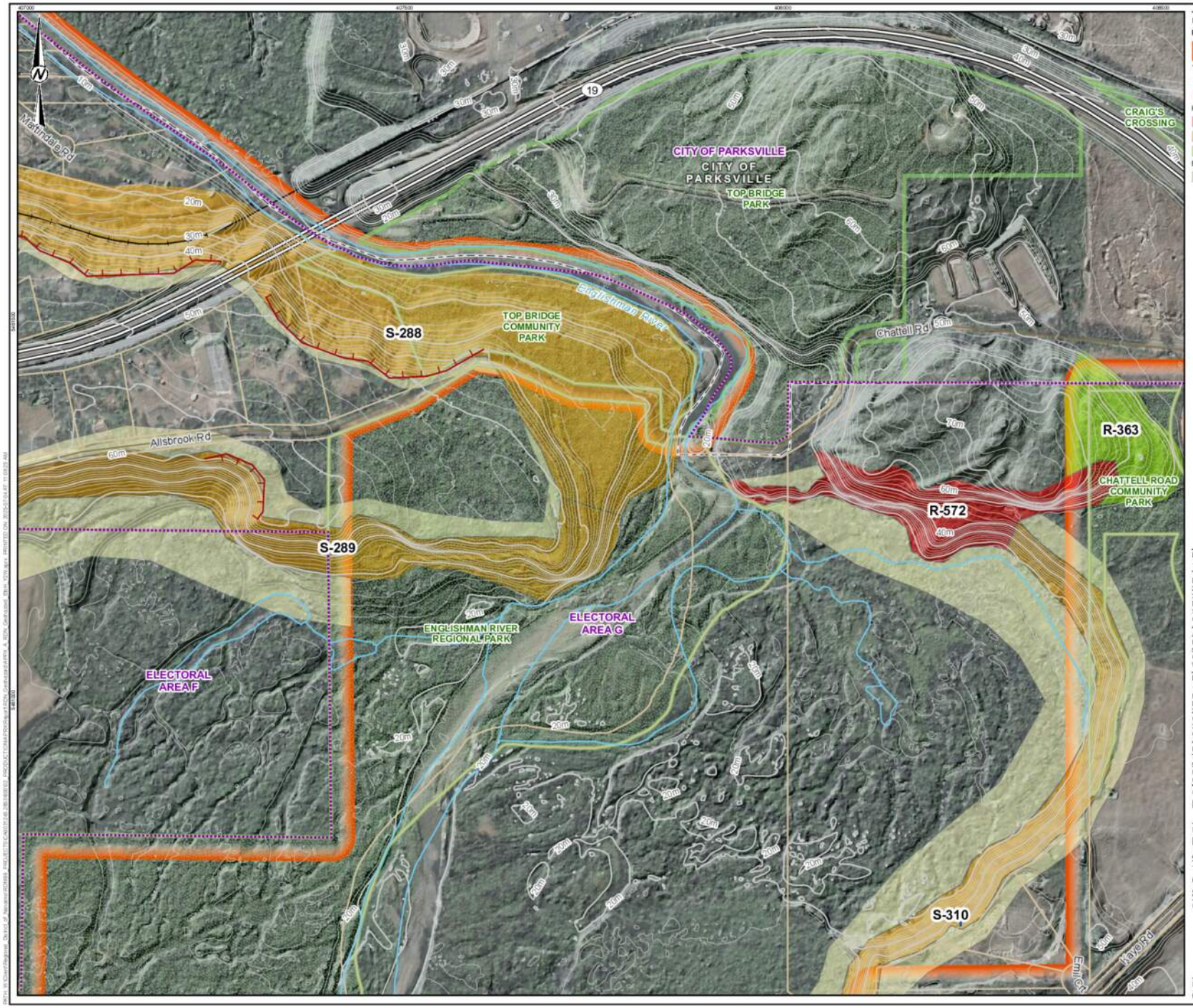
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F06



LEGEND

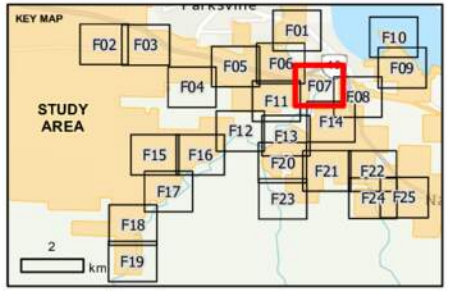
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

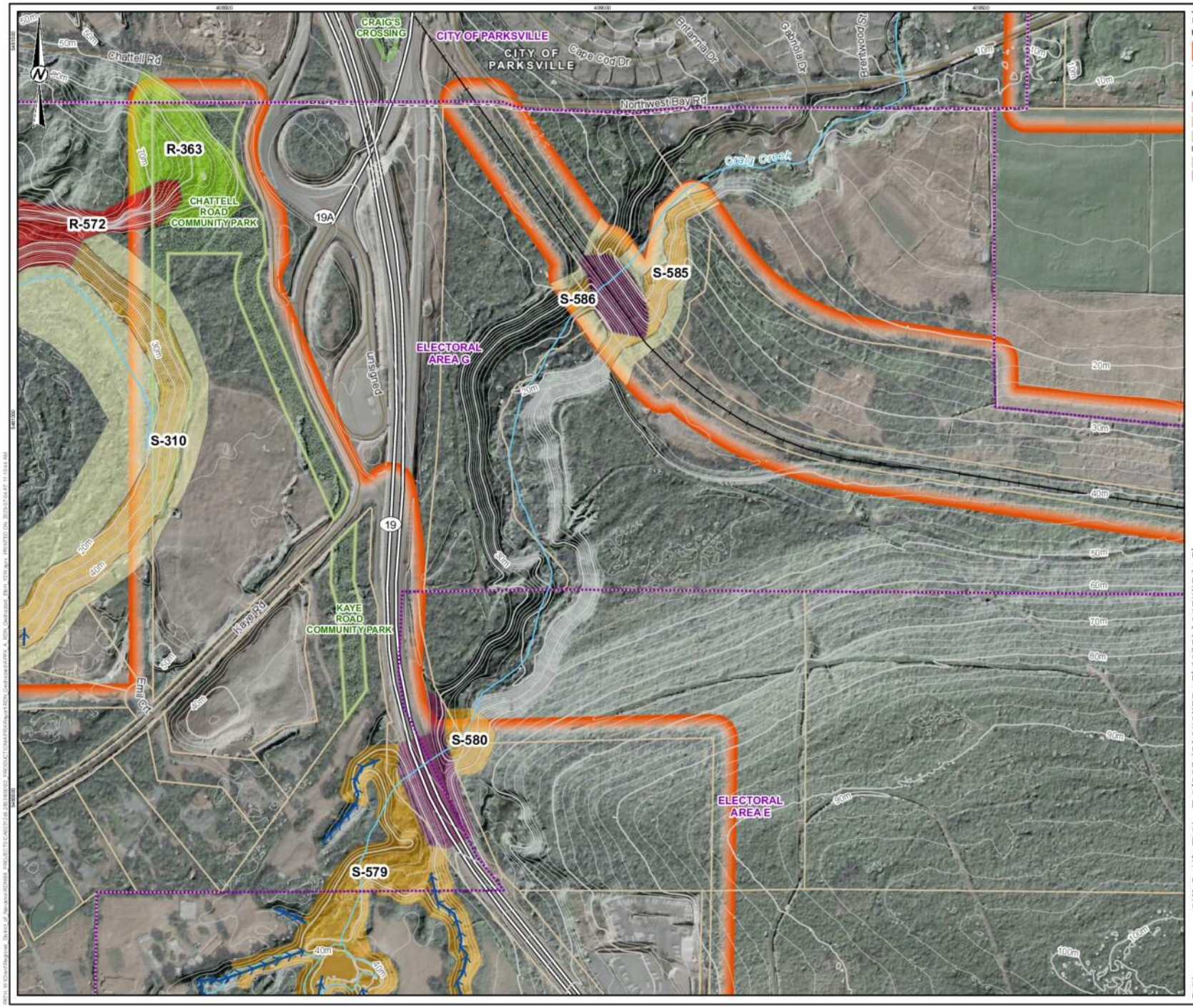
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F07

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B.



LEGEND

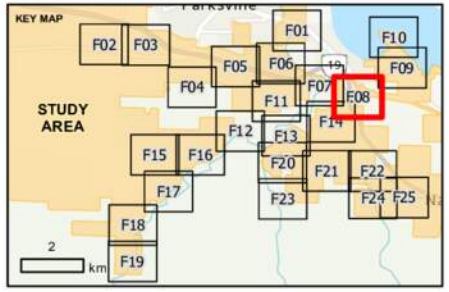
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F08

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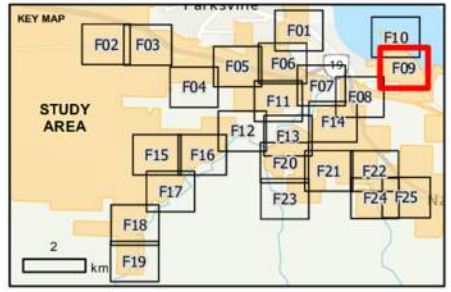
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F09

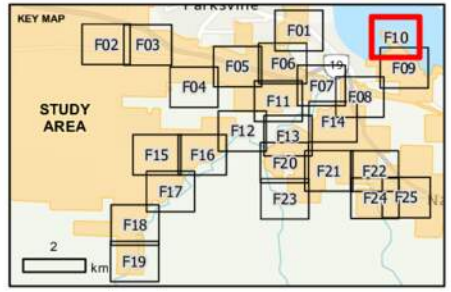
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - LOCAL
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

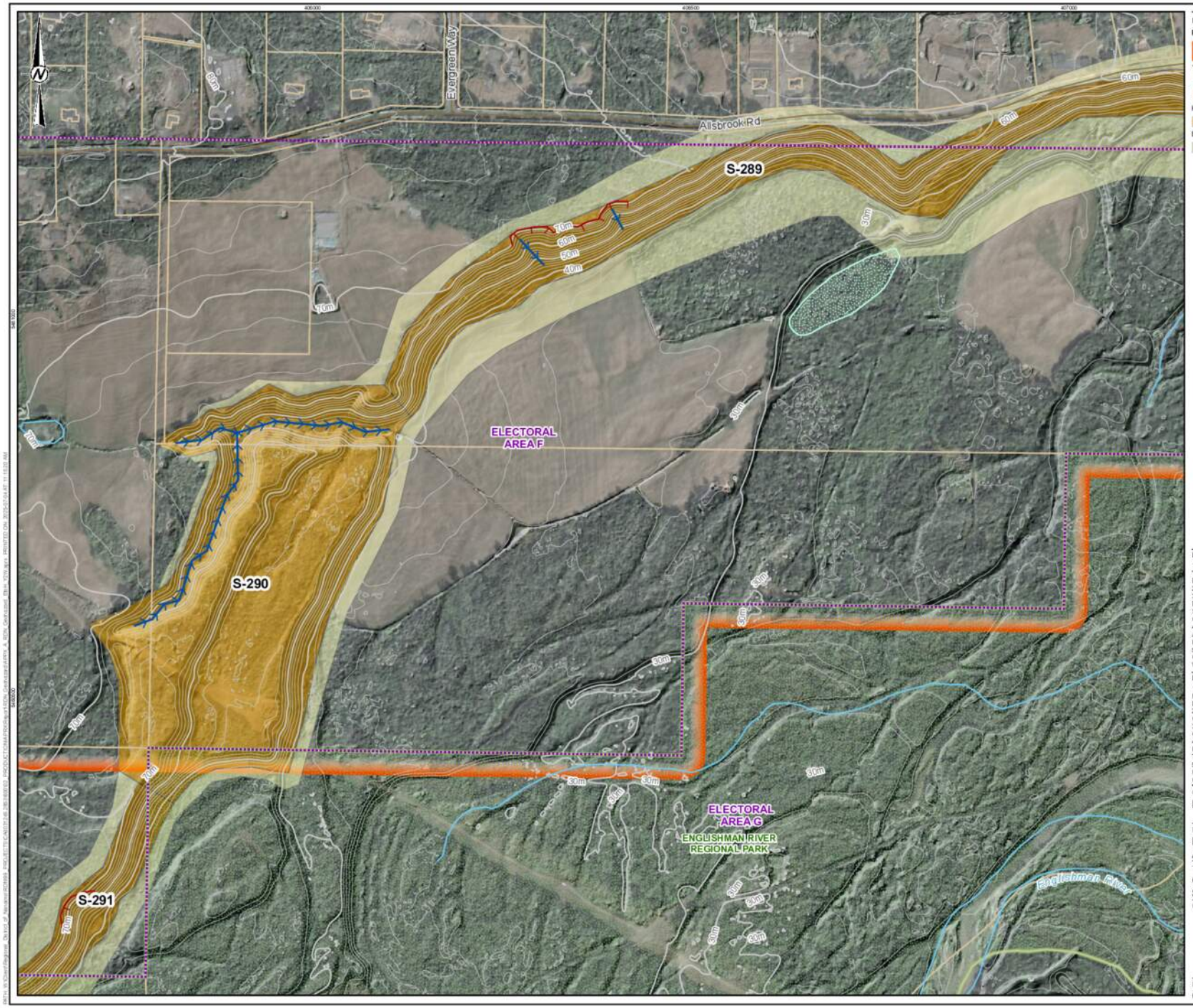
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F10



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- WETLAND
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- PARCEL
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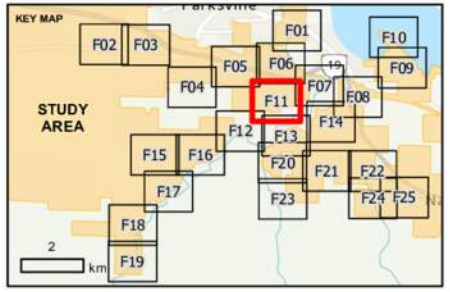

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

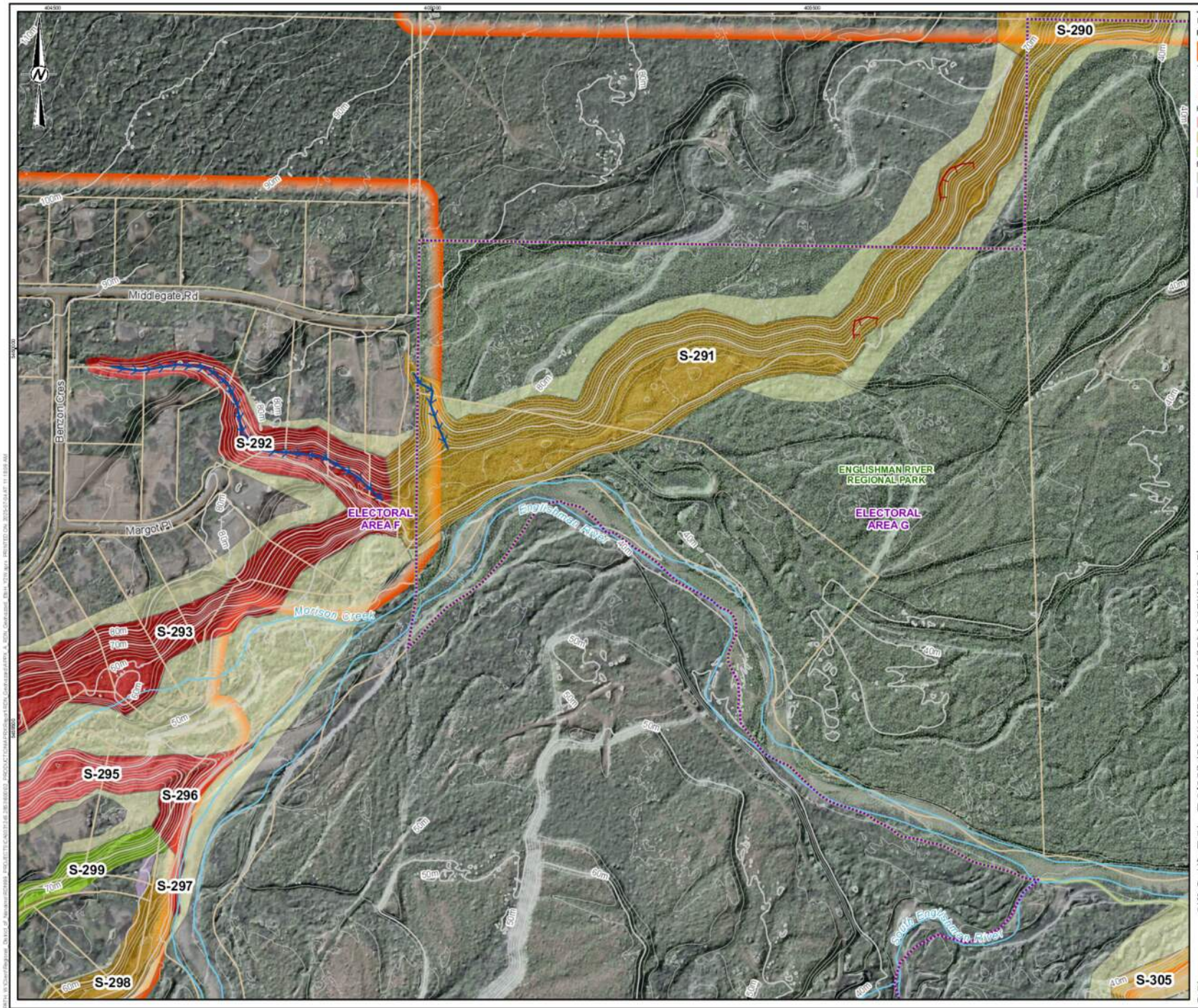
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F11



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
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- ROAD - LOCAL
- WATERCOURSE
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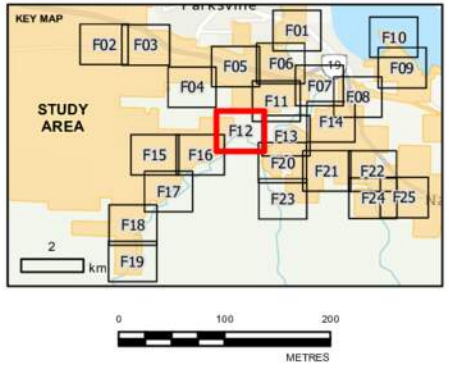

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

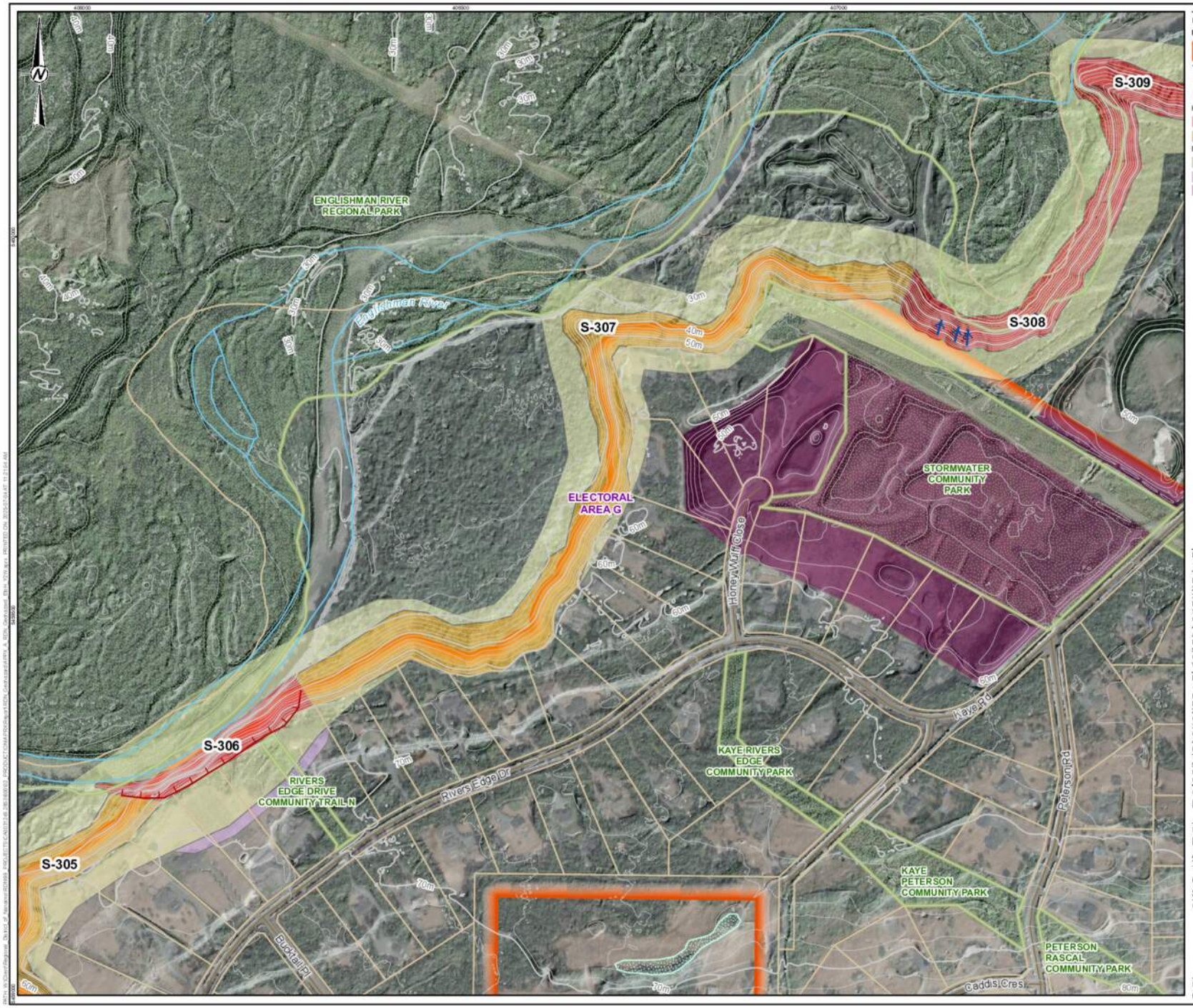
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F12

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B.



LEGEND

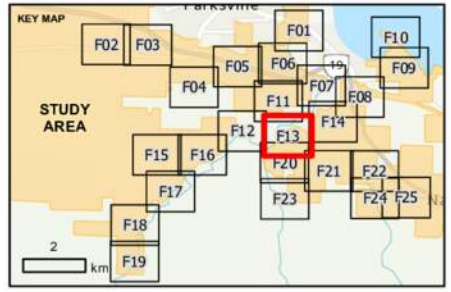
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

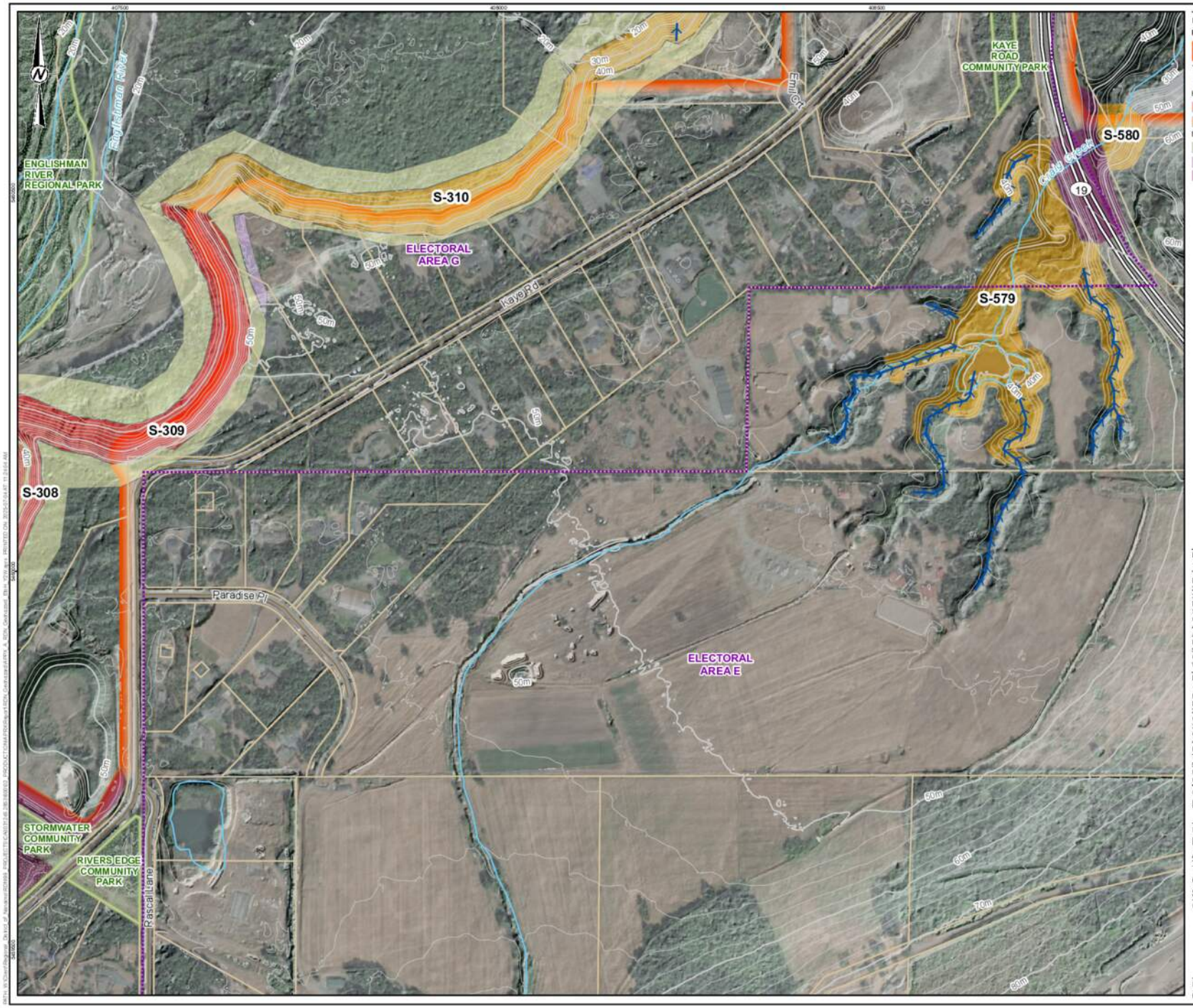
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F13



LEGEND

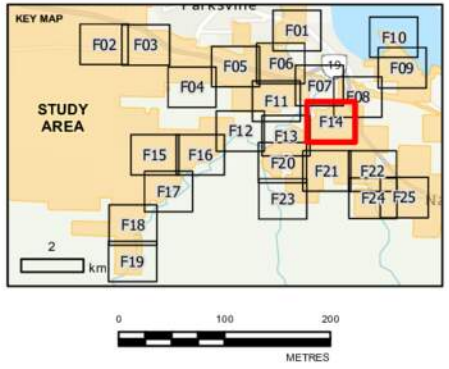
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

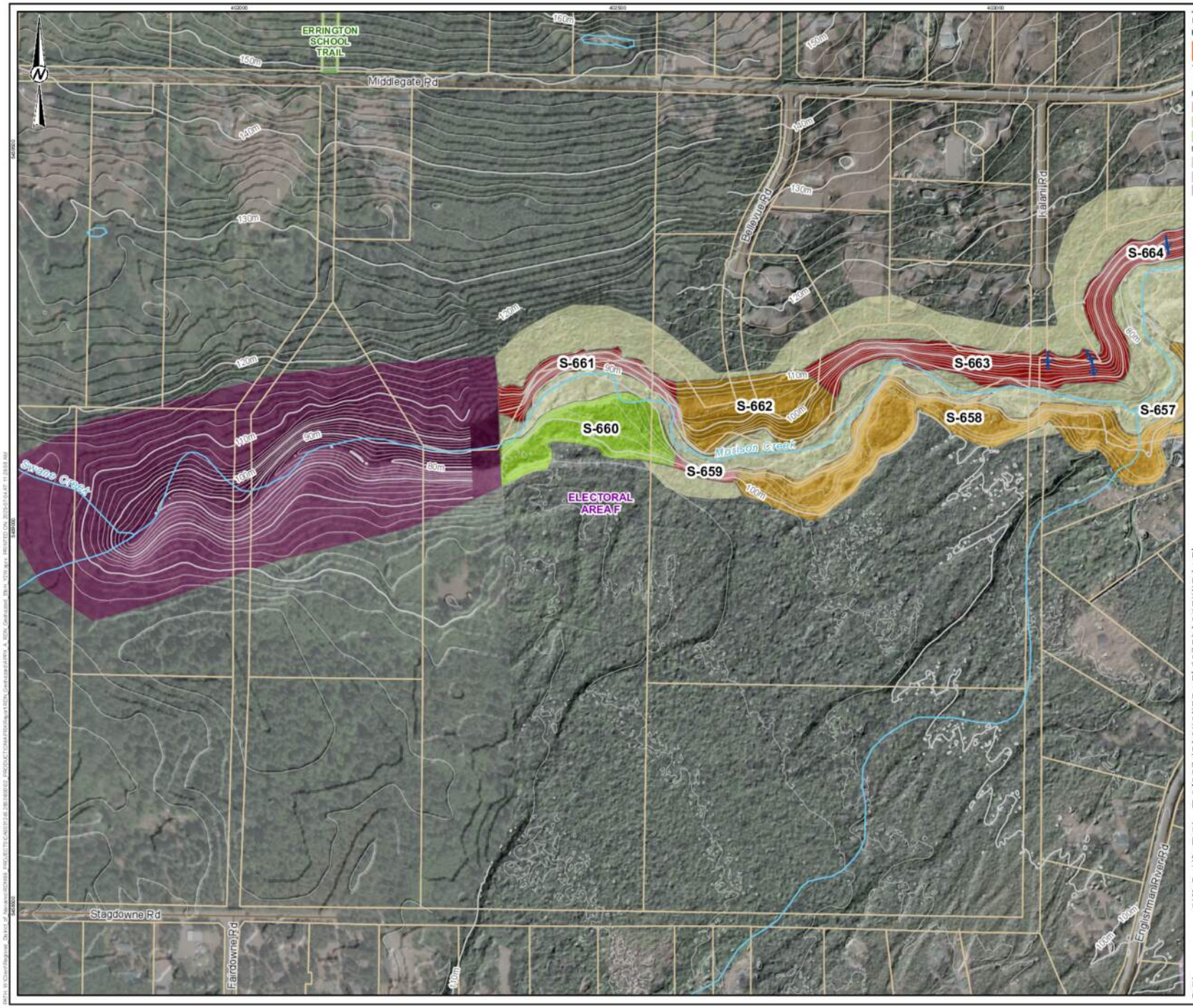
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F14



LEGEND

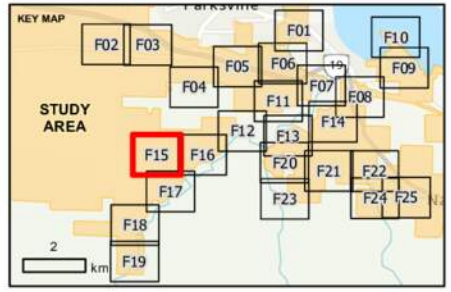
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

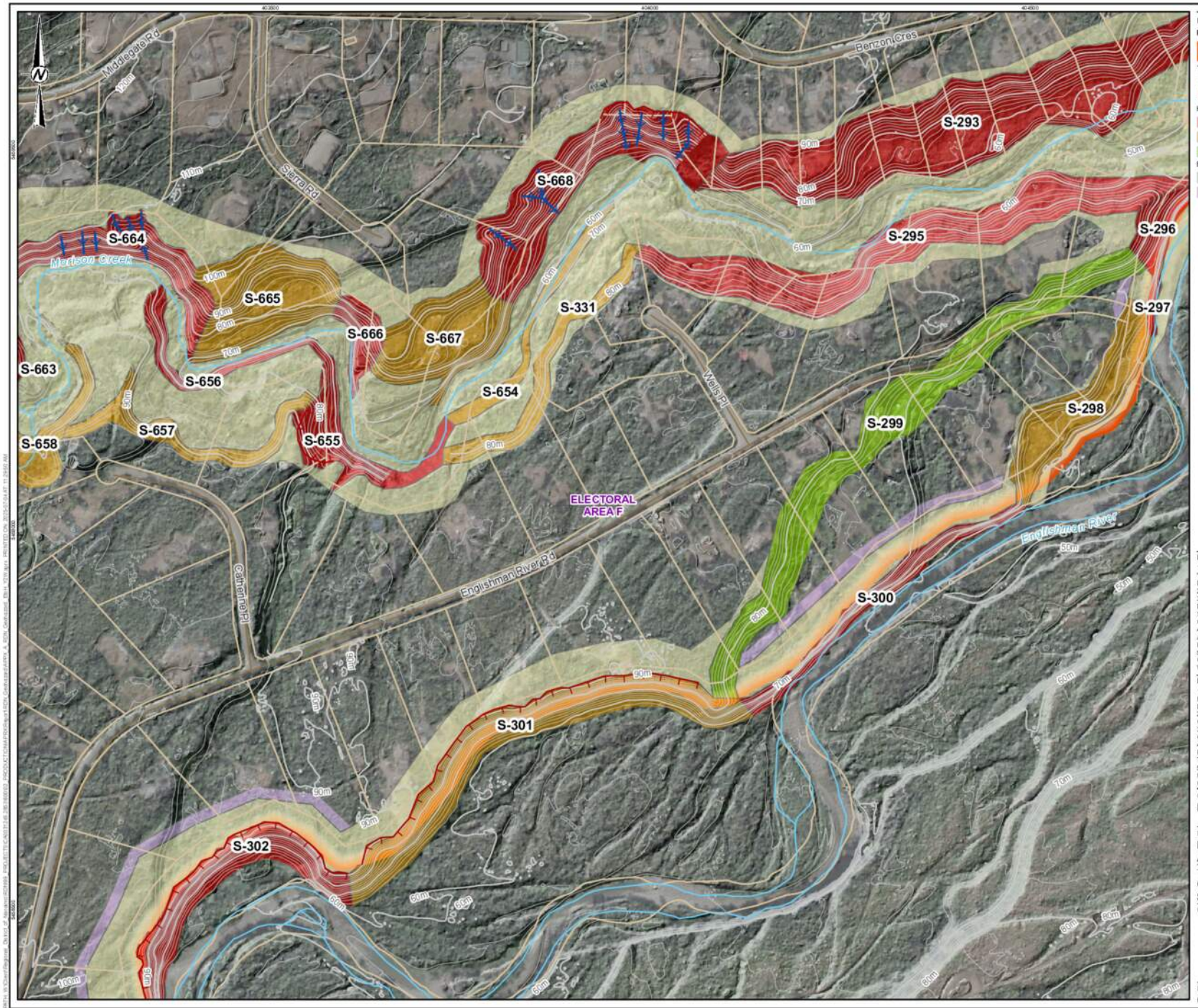
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B.



LEGEND

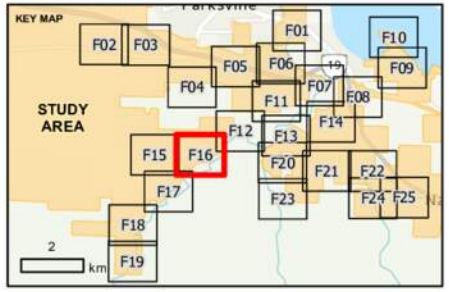
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

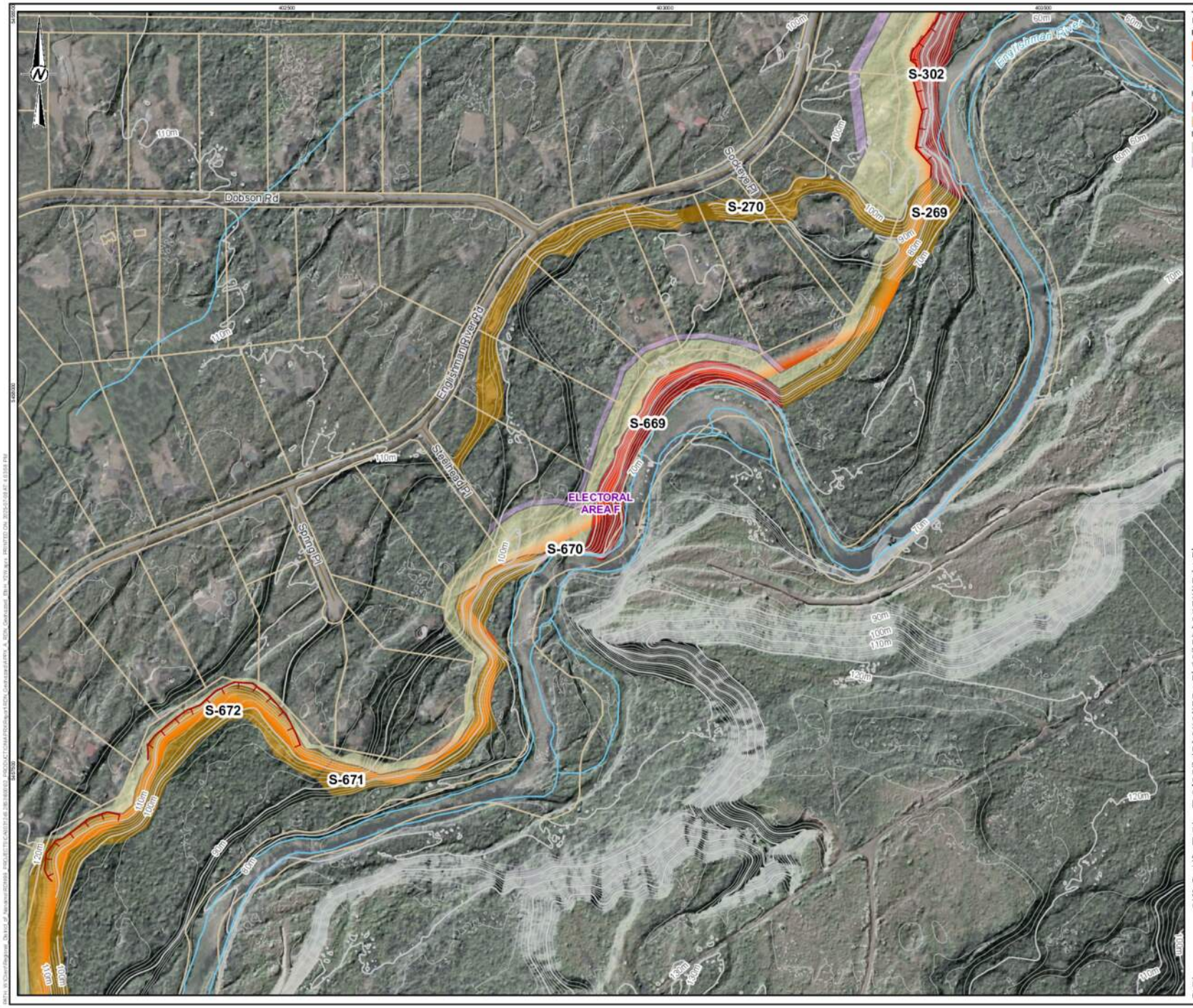
TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F16

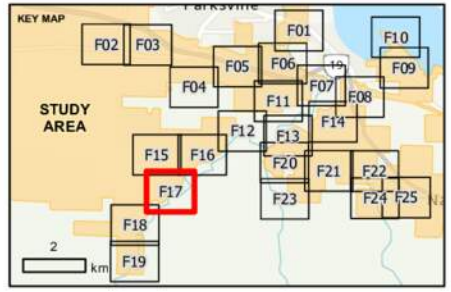
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B.



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
  - SCARP
- HAZARD AREA (AOP)
  - HIGH
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)
  - BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

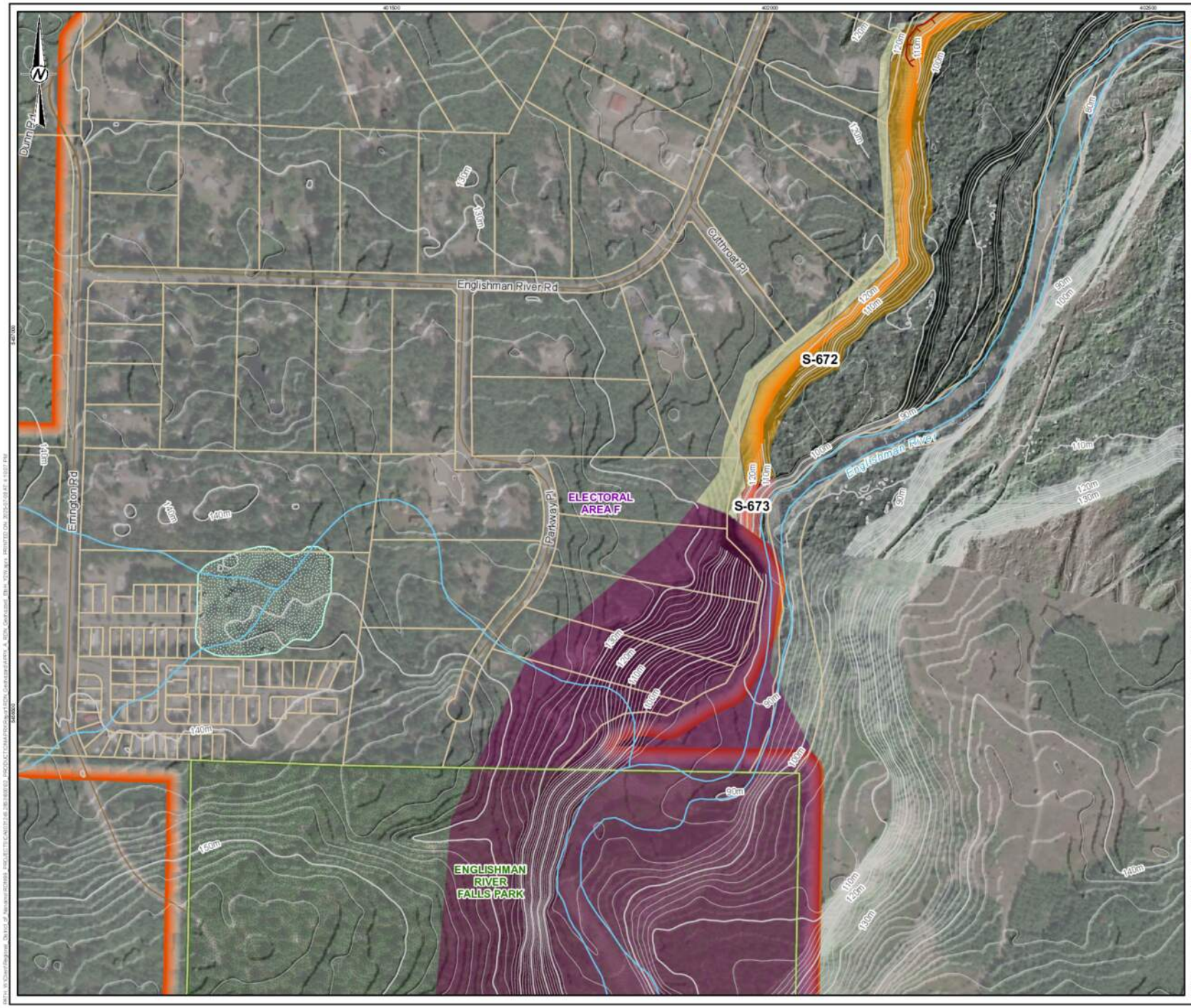
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-08
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

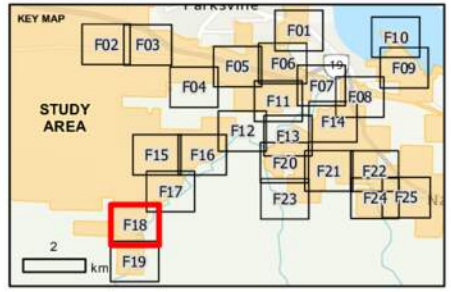
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F17



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
  - SCARP
- HAZARD AREA (AOP)
  - HIGH
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)
  - UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- WETLAND
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

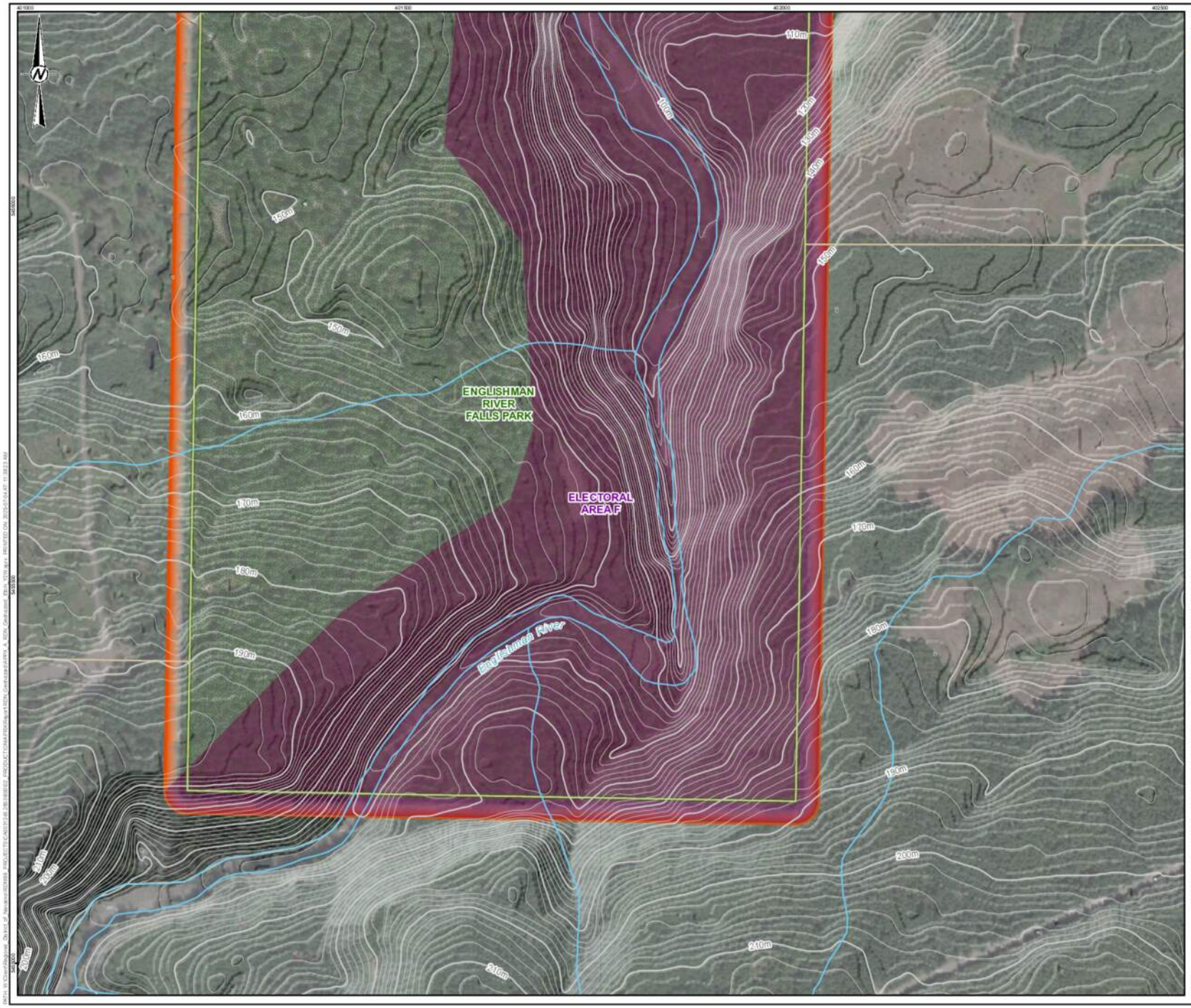
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-08
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F18



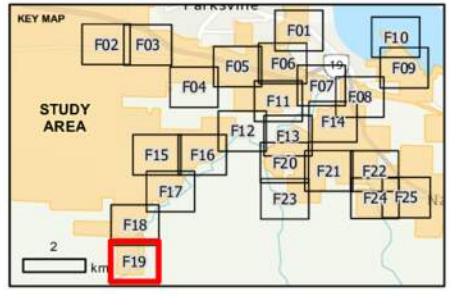
LEGEND

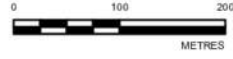
PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA





LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

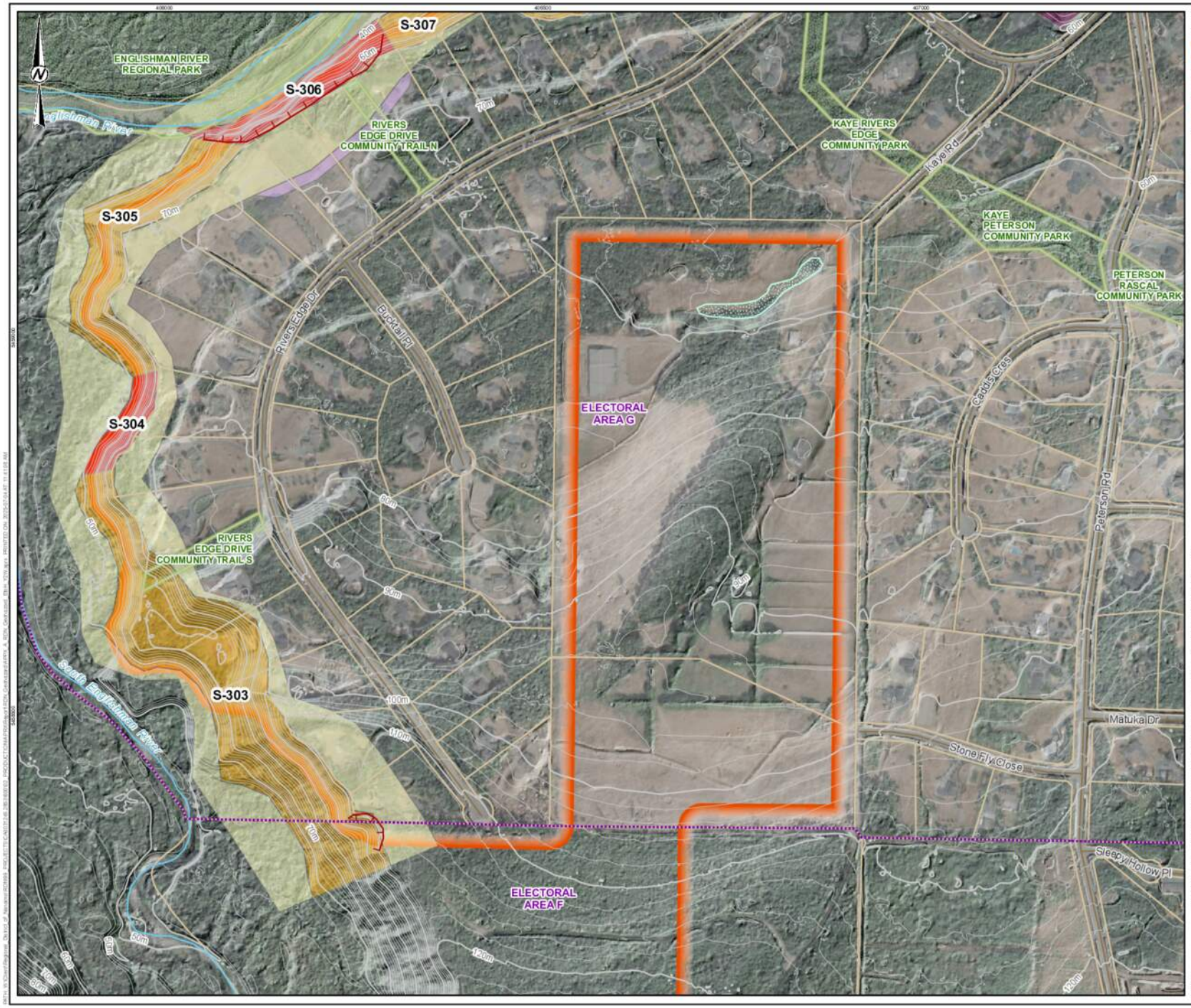
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F19



LEGEND

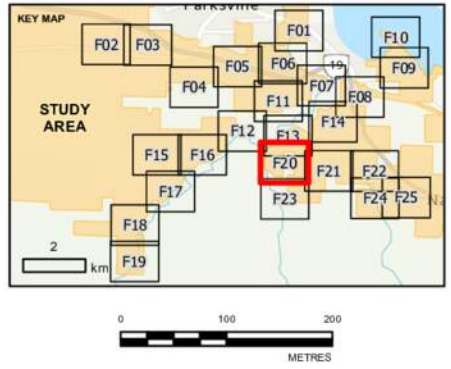
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F20

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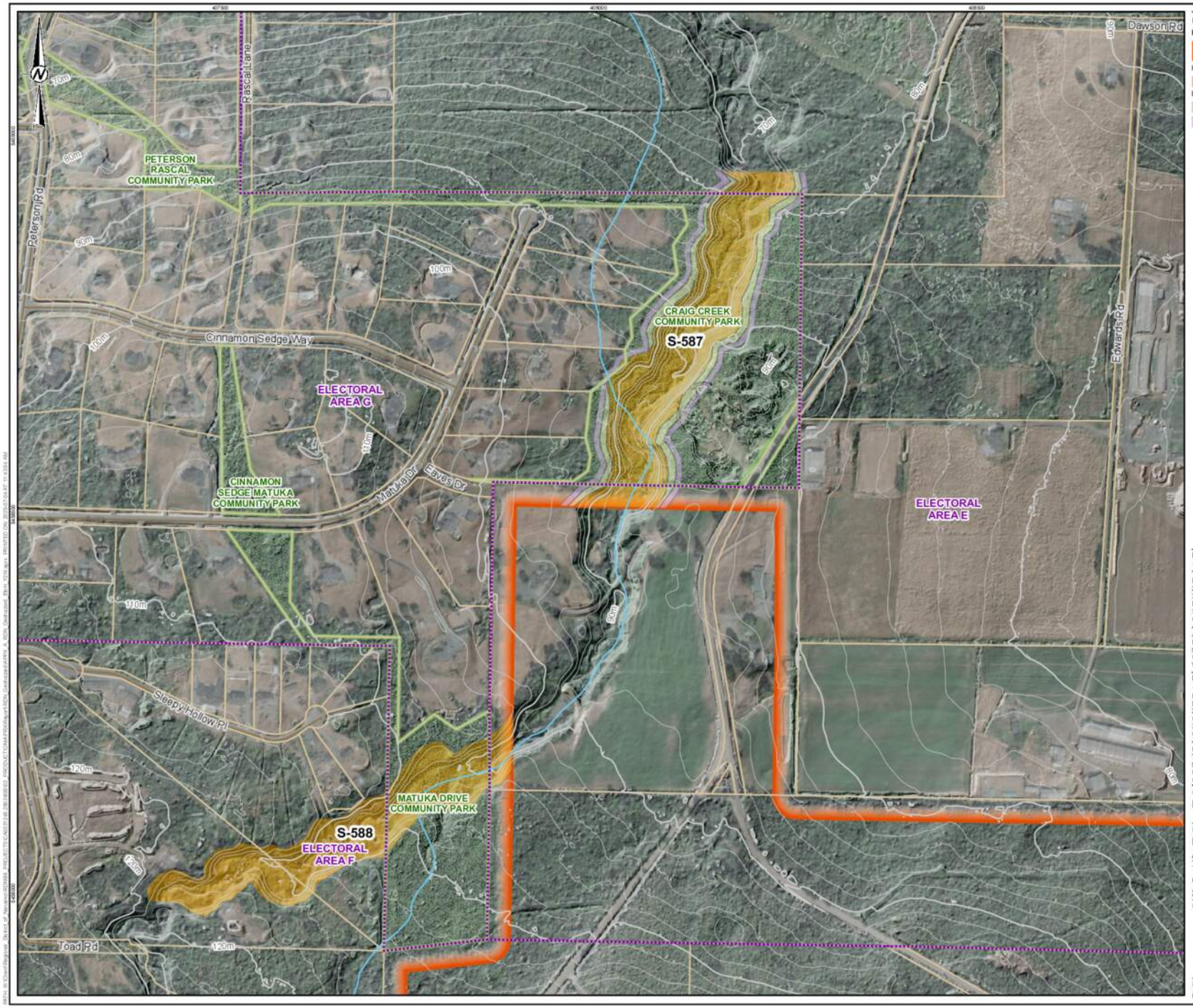
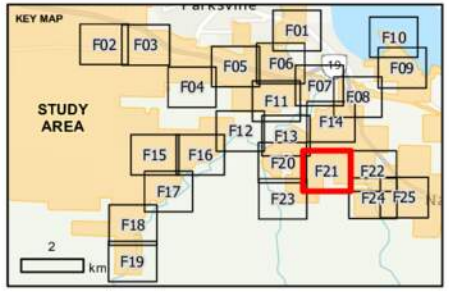


LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
- MEDIUM
- BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

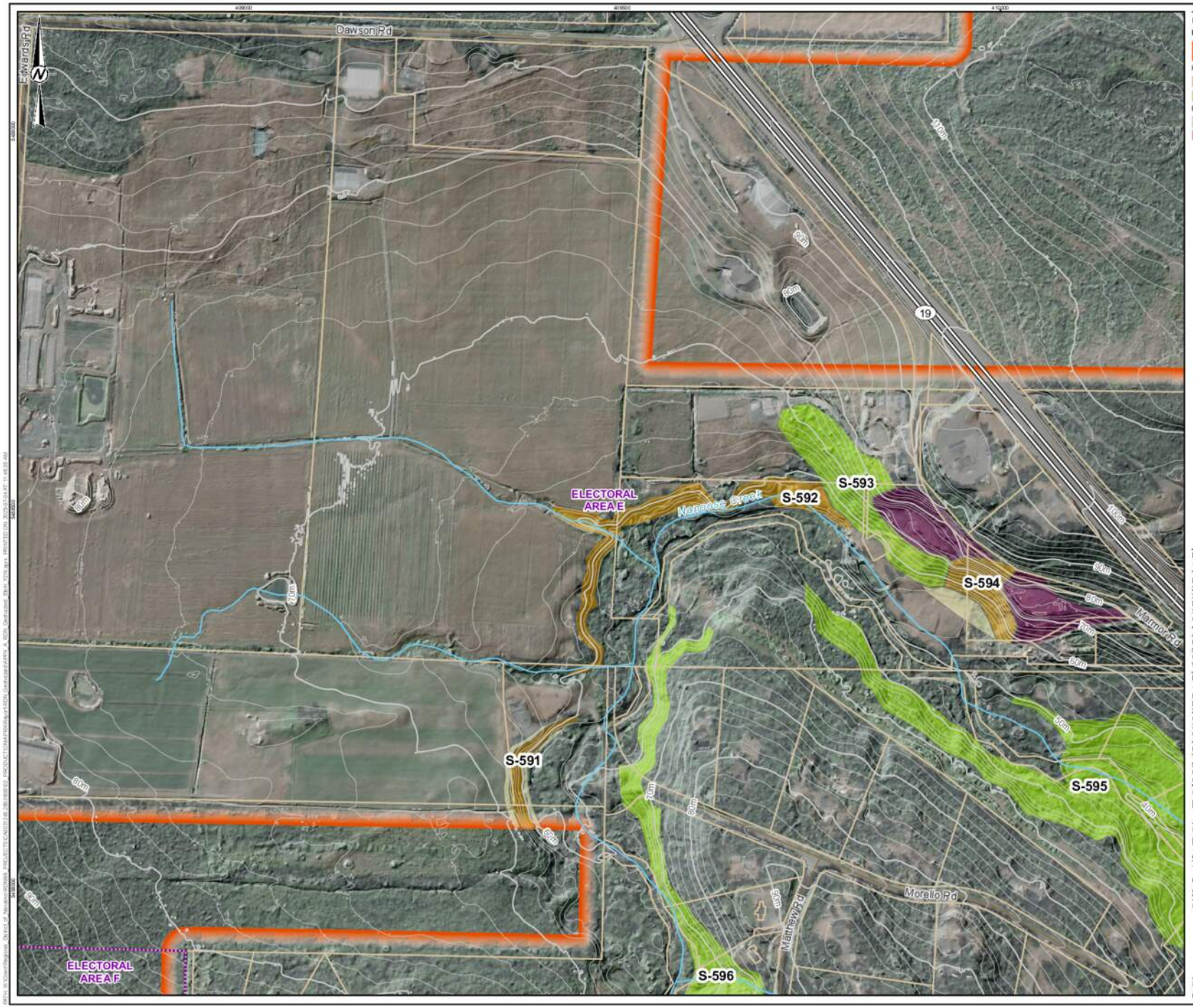
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F21



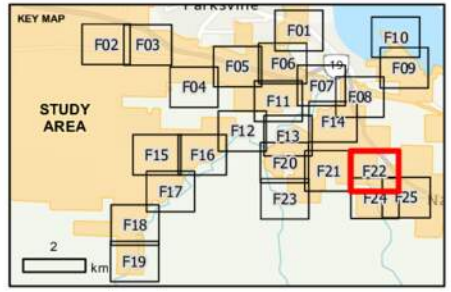
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

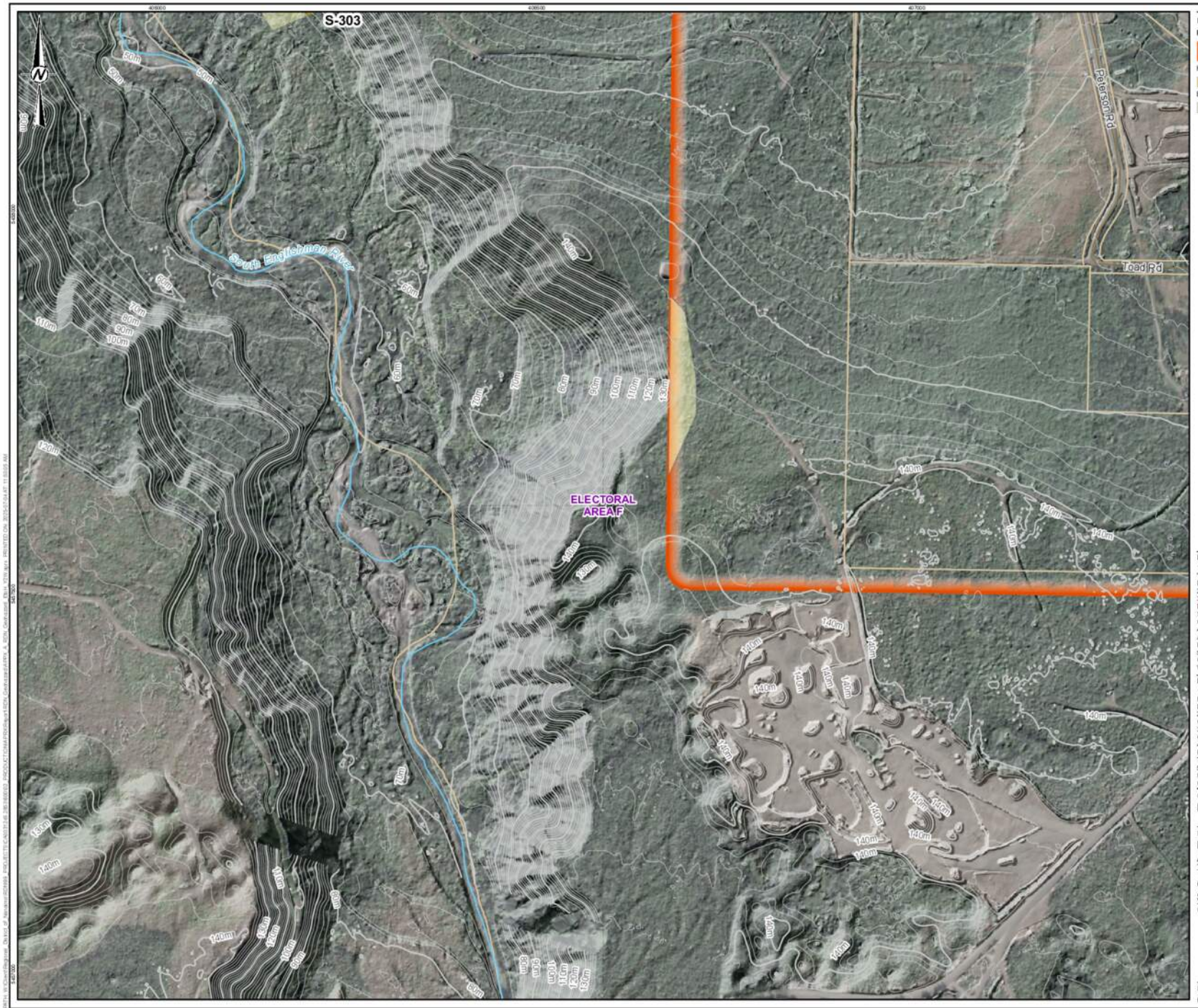
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

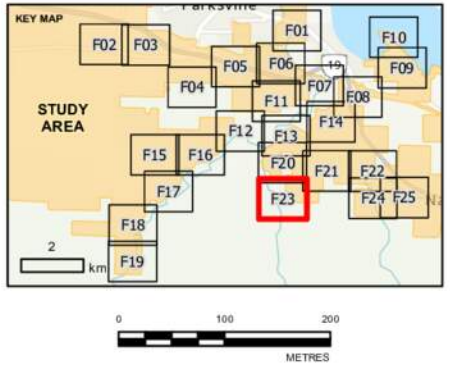
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F22



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
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SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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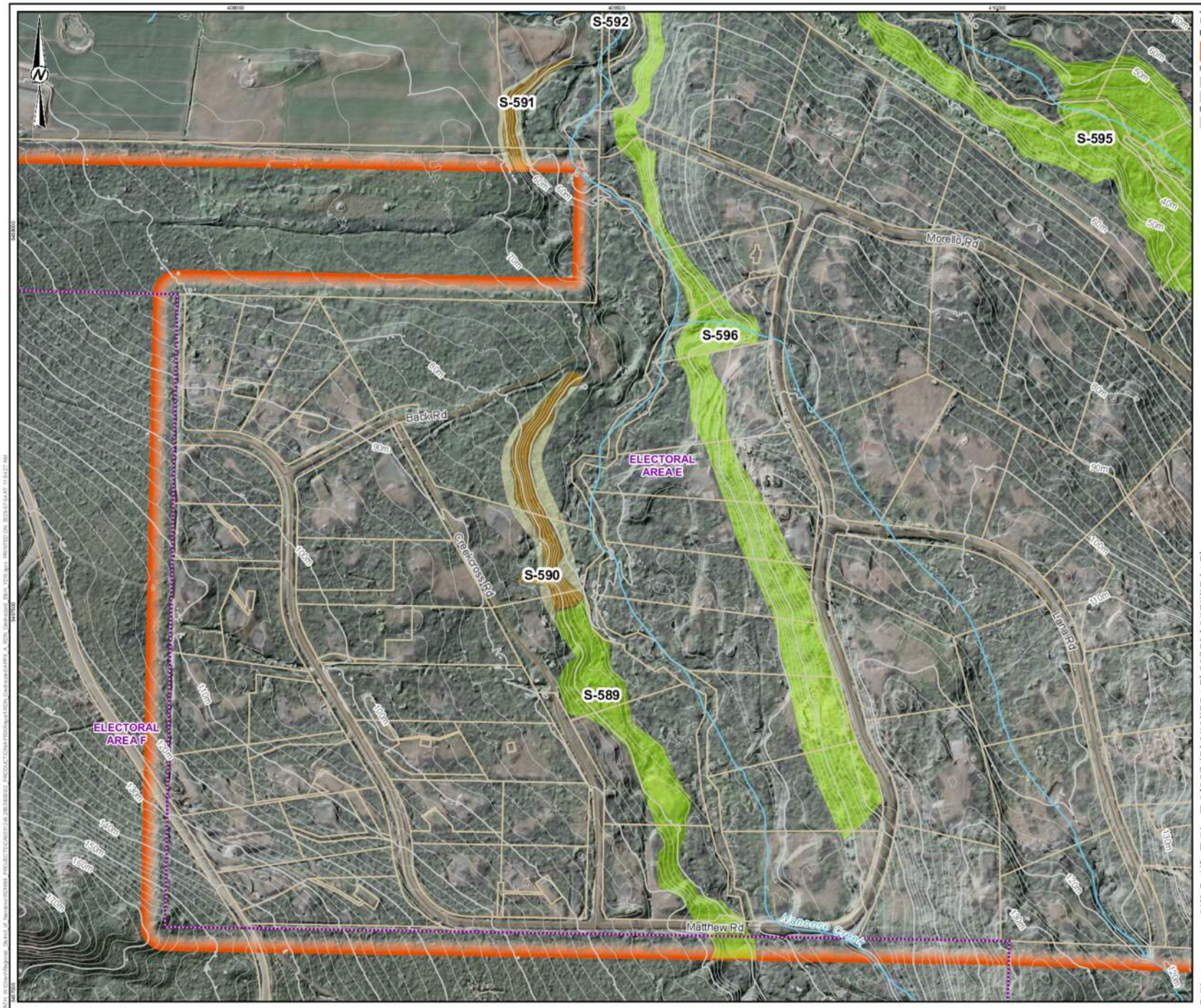
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F23



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOI)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
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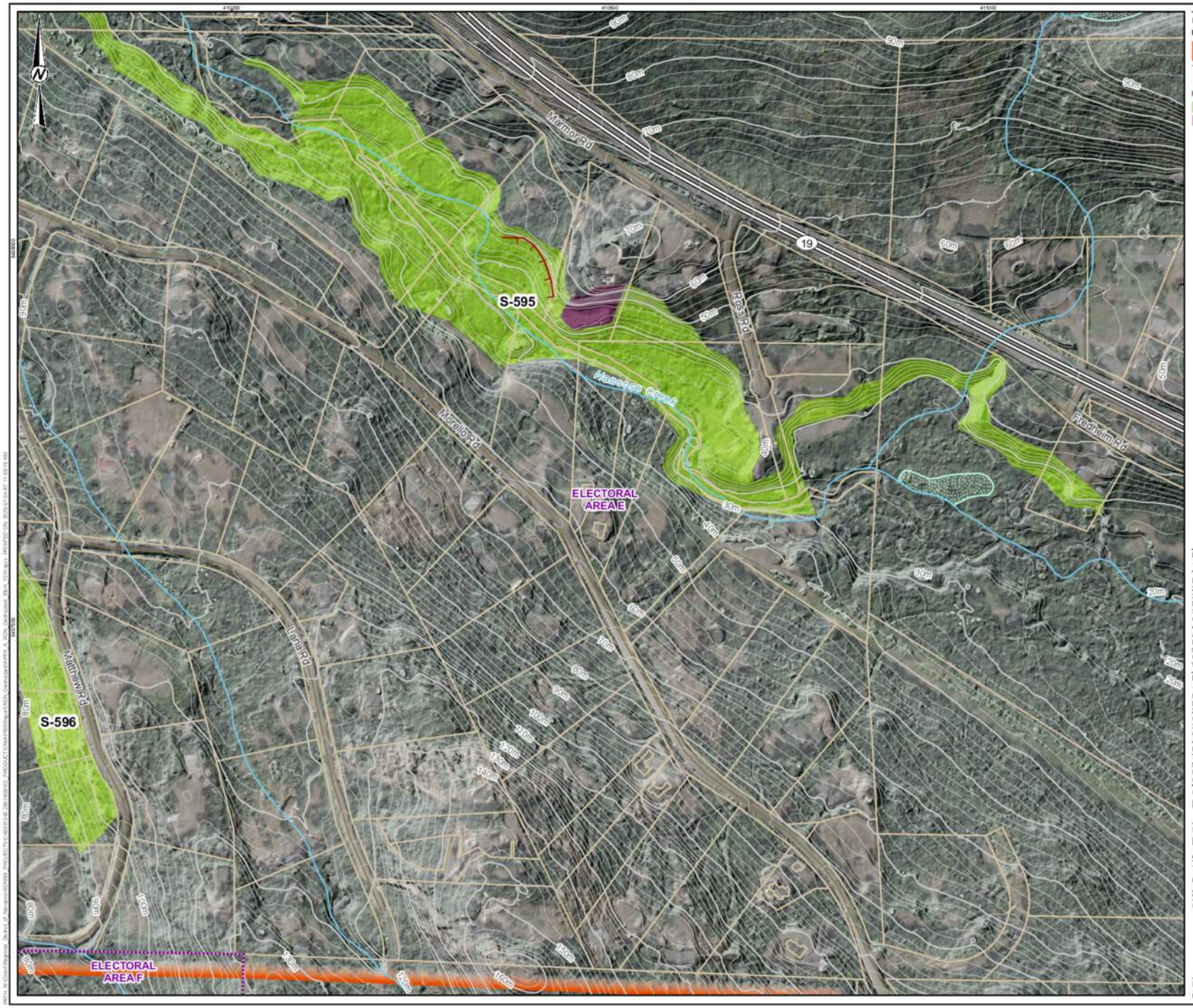
APPROVED	DC

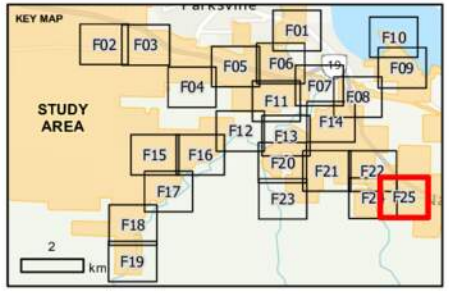
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F24



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
  - SCARP
- HAZARD AREA (AOP)
  - LOW
  - UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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4. AREAS MARKED AS "UNCLASSIFIED" ARE LIKELY TO CONTAIN STEEP-SLOPE HAZARDS BUT WERE NOT ASSESSED AS PART OF THIS STUDY. BUFFER ZONES MAY ALSO CONTAIN UNCLASSIFIED STEEP SLOPE HAZARDS.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION F - ENGLISHMAN RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	F25

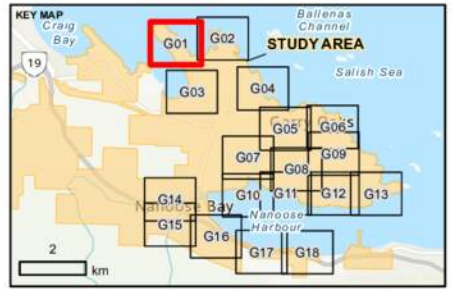
LEGEND

PROJECT DATA

- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

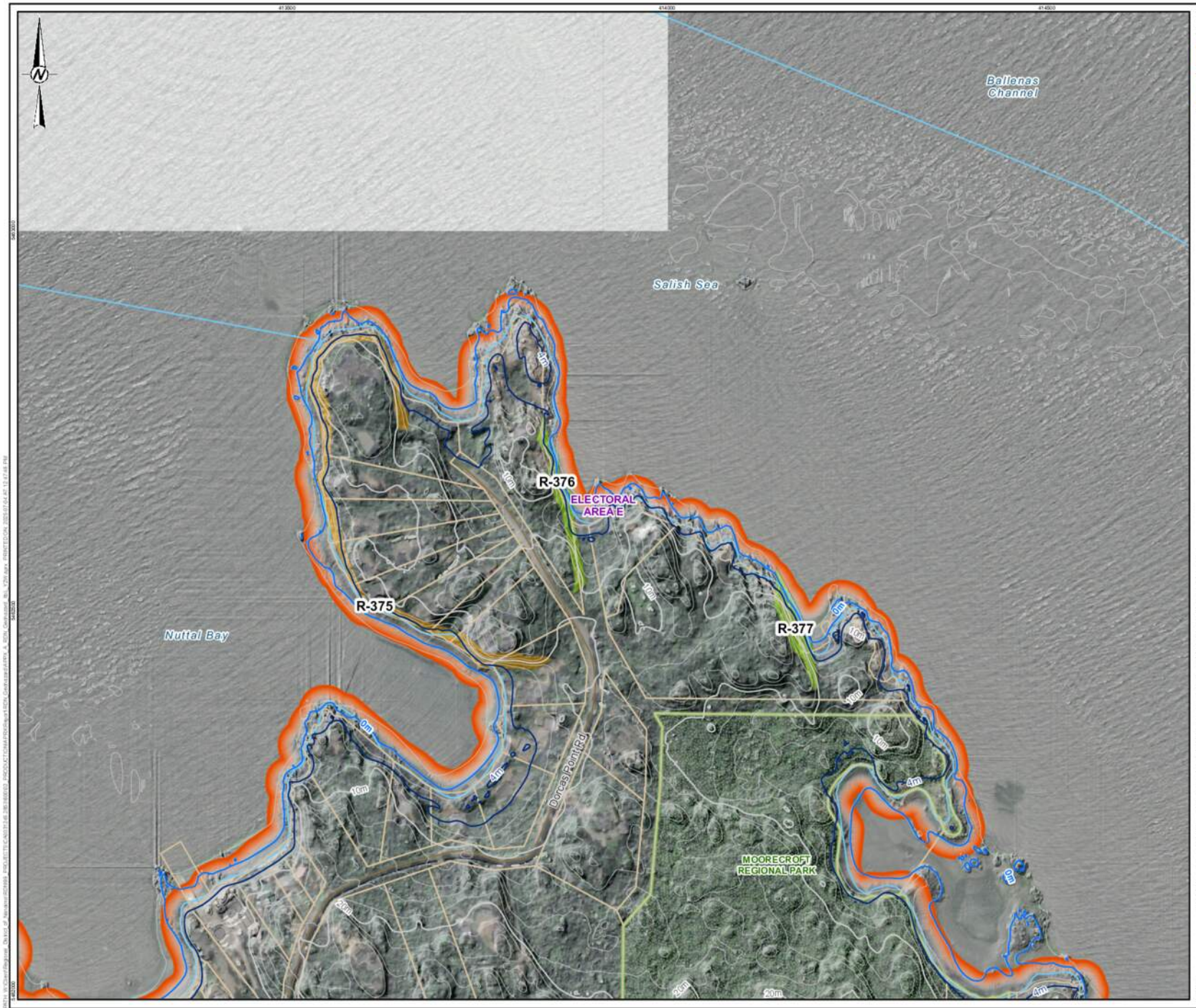
CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G01

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
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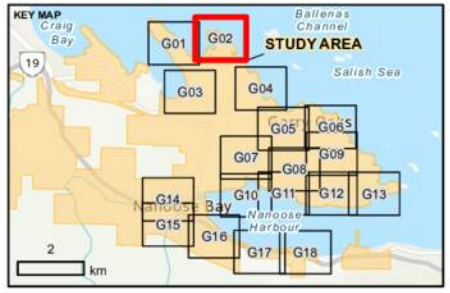
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N.

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

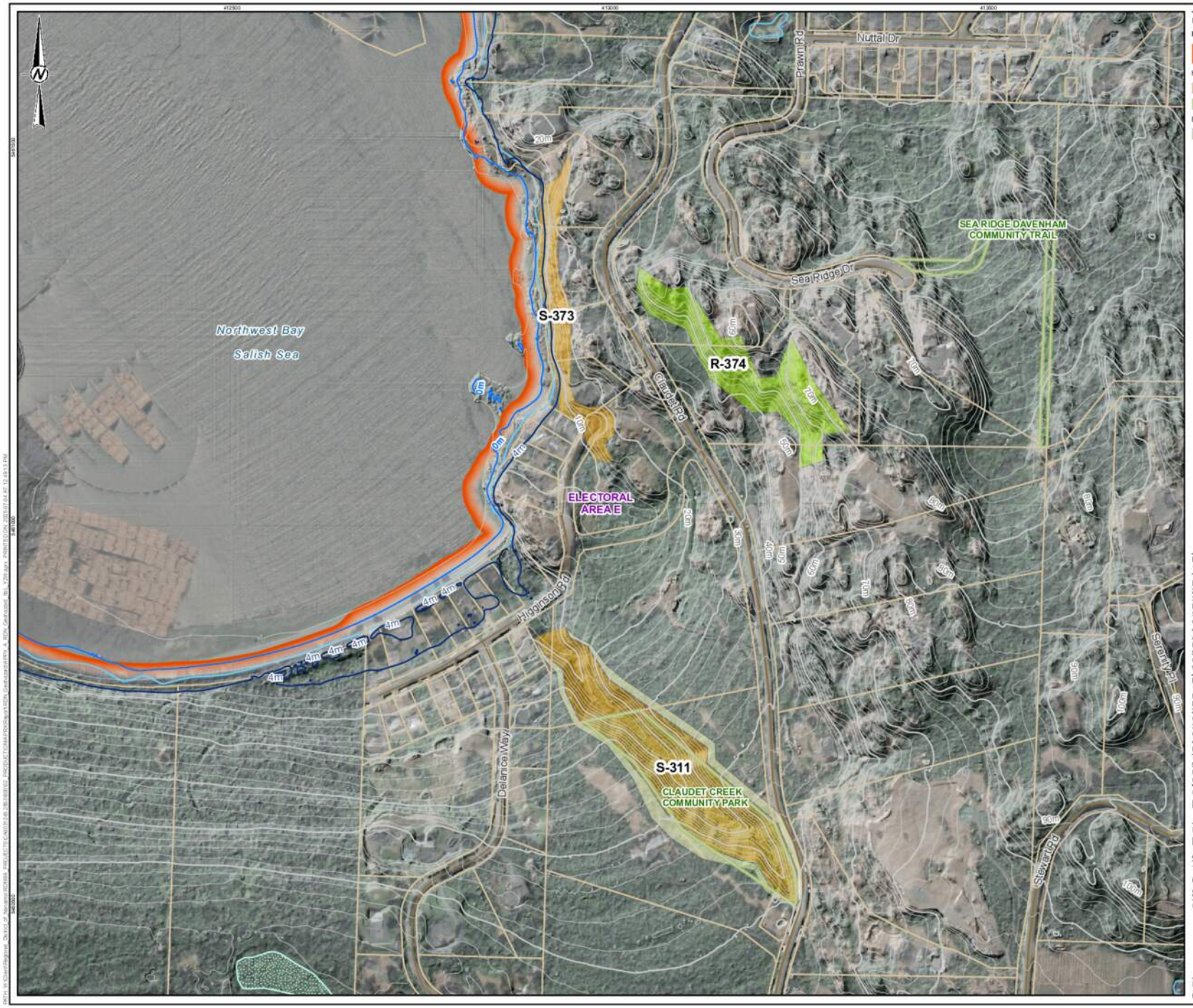
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G02



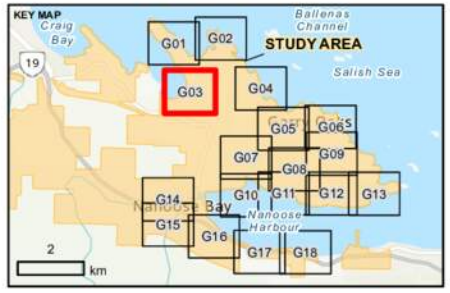
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G03

LEGEND

PROJECT DATA

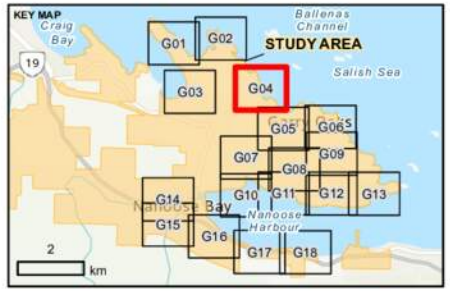
- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G04

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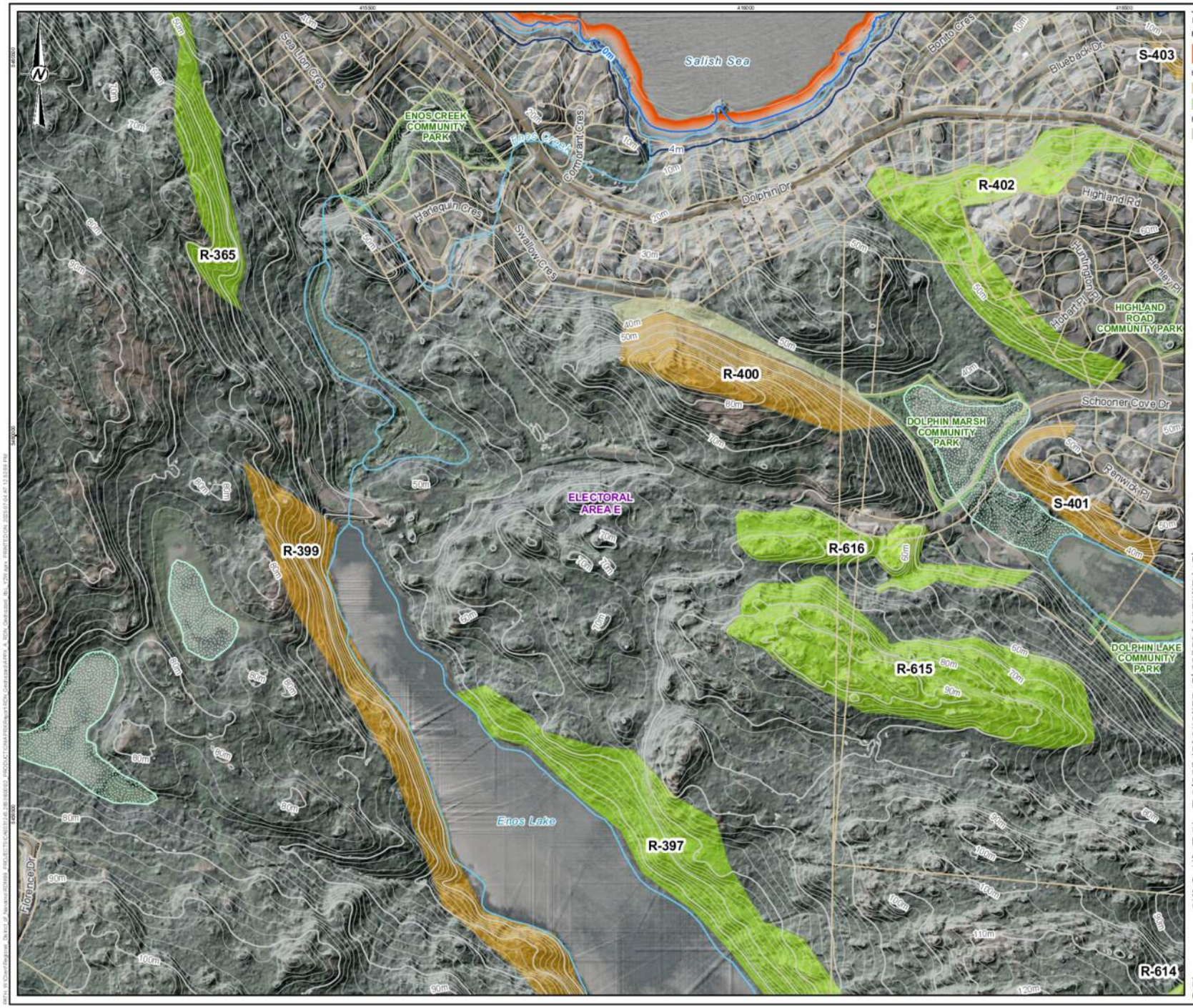

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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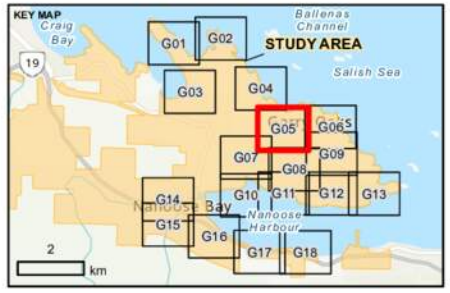

0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G05

THE INCORPORATION OF DOES NOT IMPLY THAT THE SUBJECT HAS BEEN MODIFIED FROM ITS

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA

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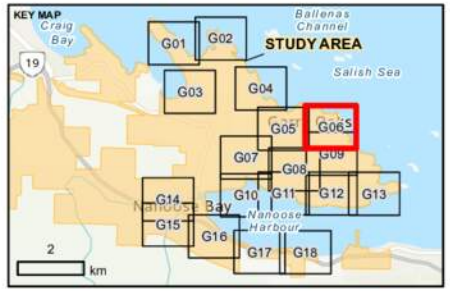

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
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PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G06

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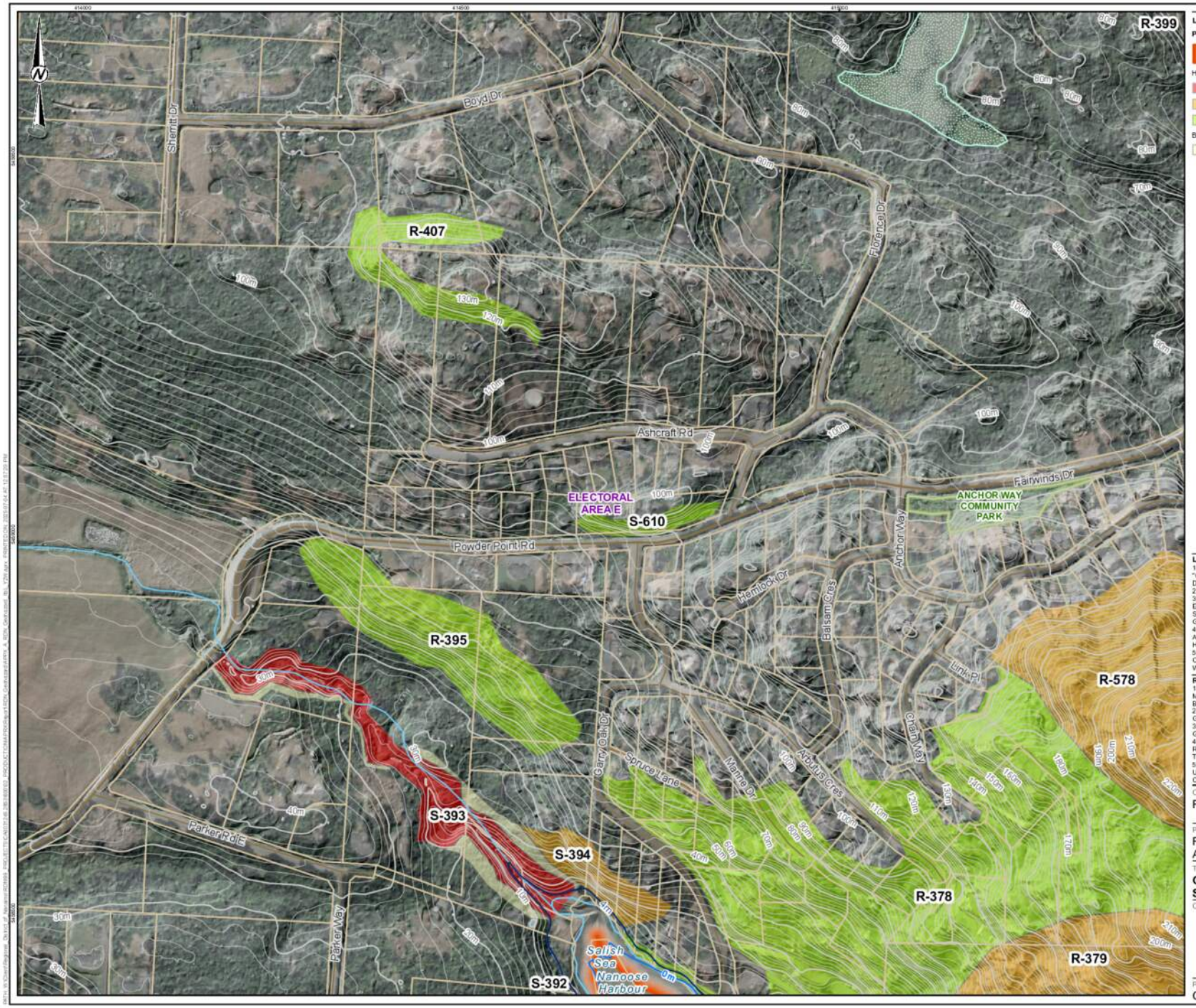

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
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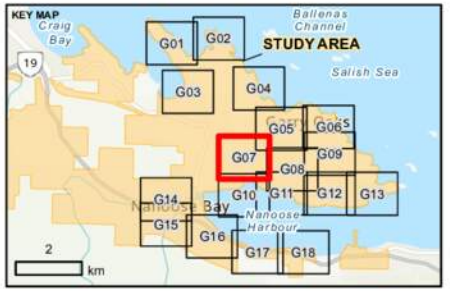
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N.

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

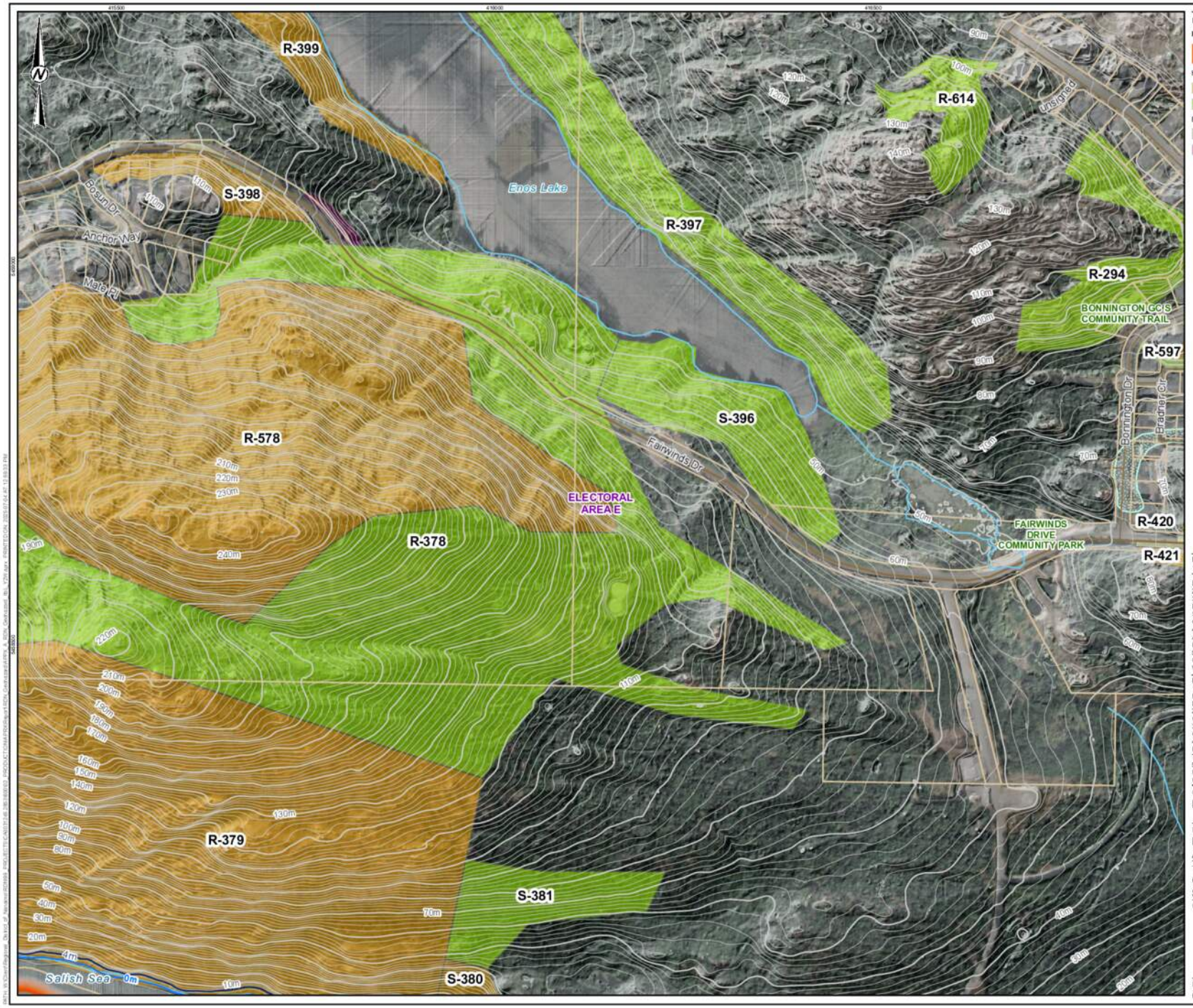
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G07



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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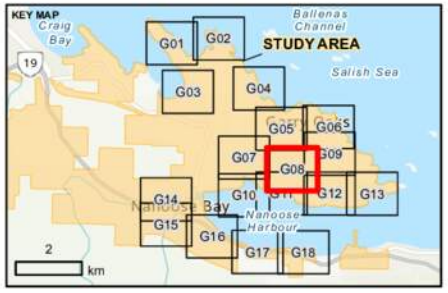
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G08

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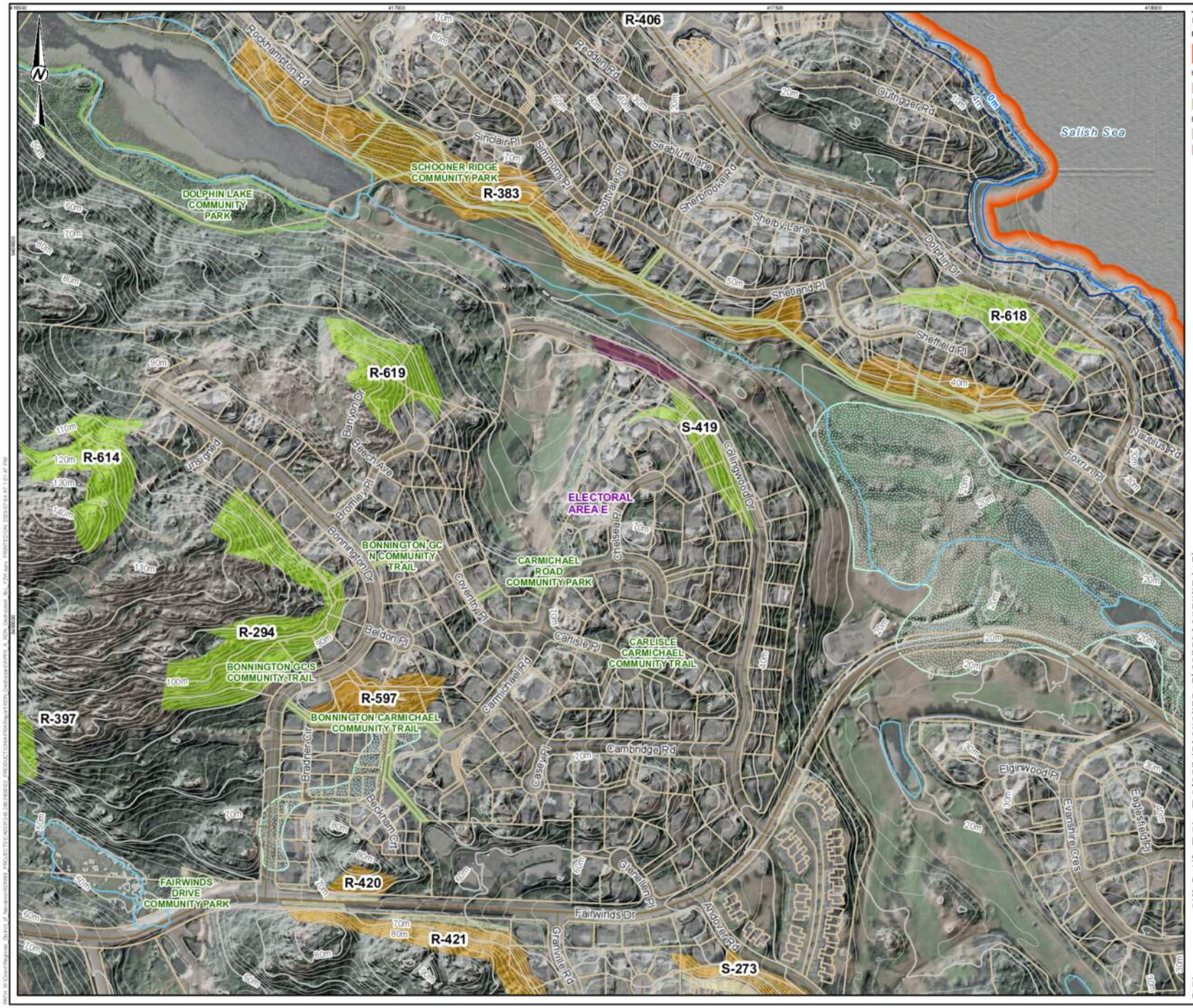

LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
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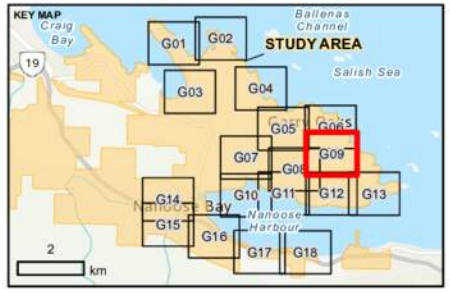

0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N.

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

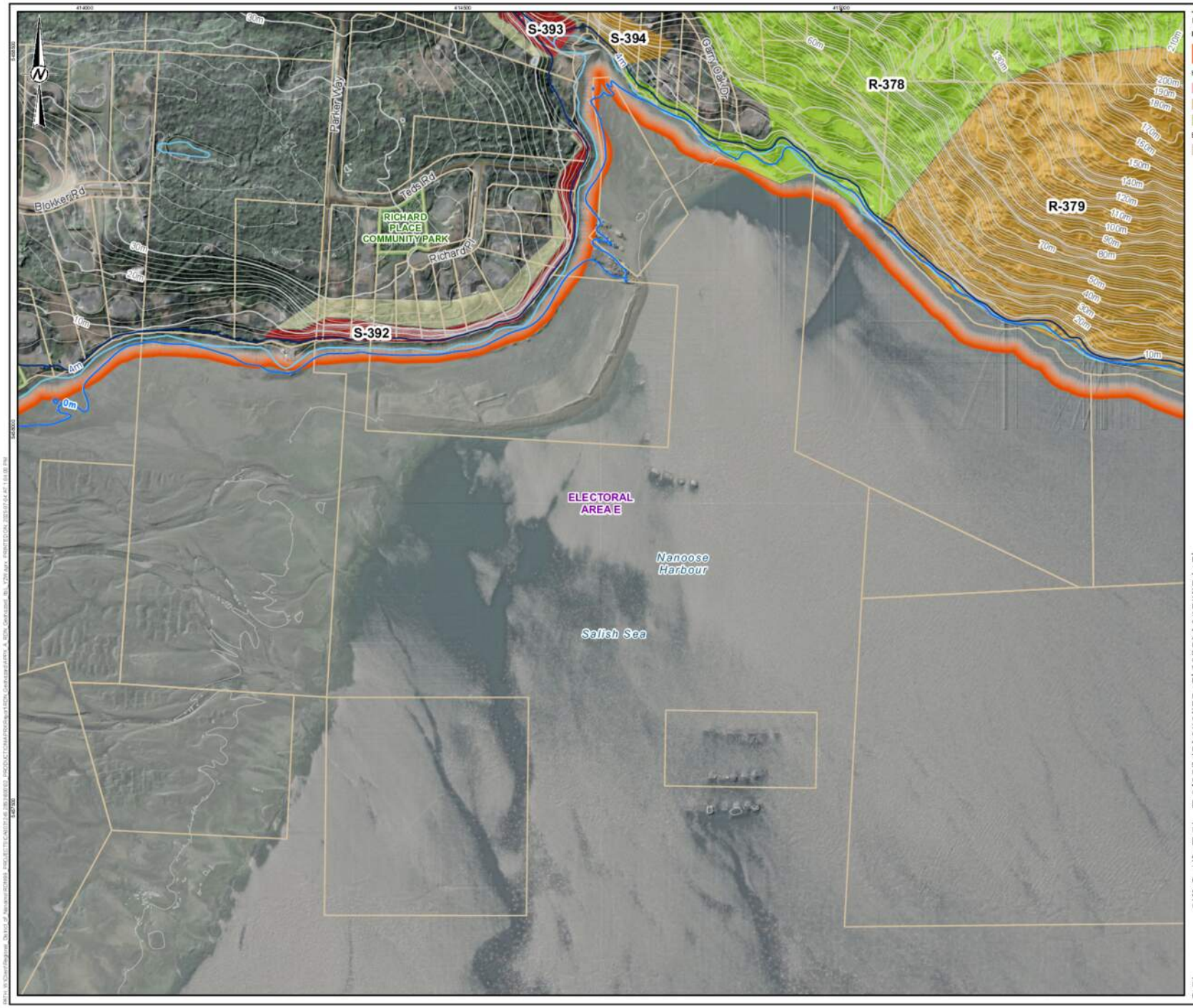
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G09



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
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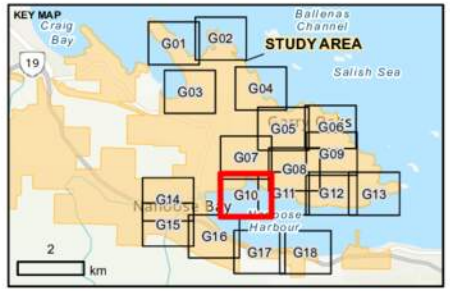

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G10

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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- ROAD - ARTERIAL / COLLECTOR
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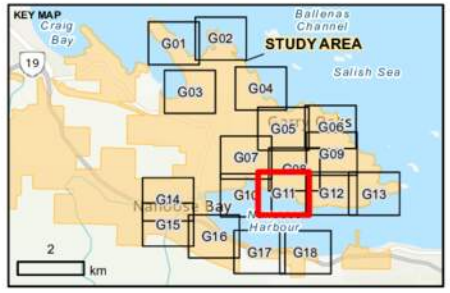

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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
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PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G11

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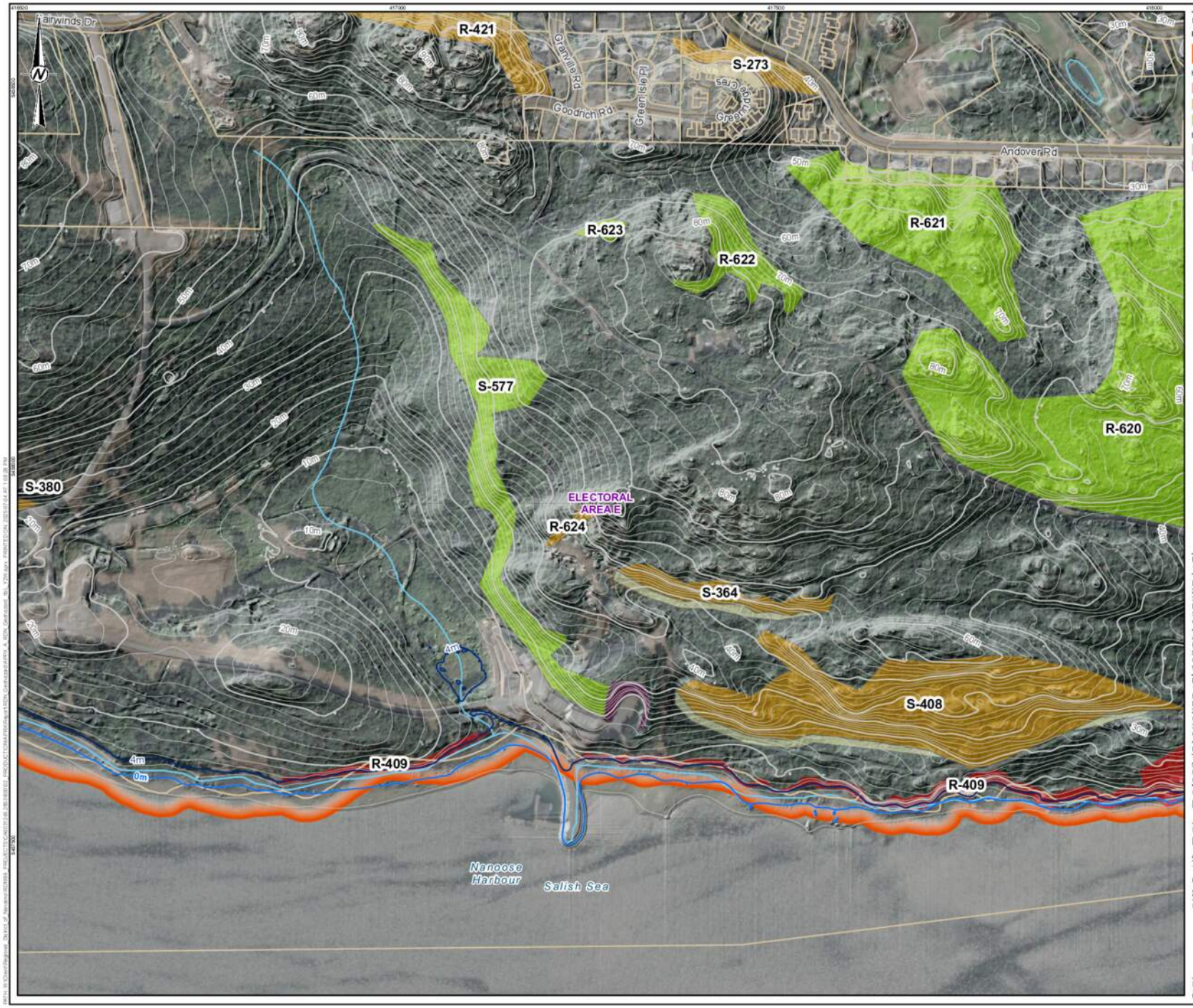

LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
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BASE DATA
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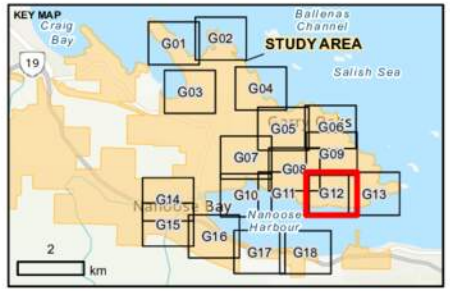

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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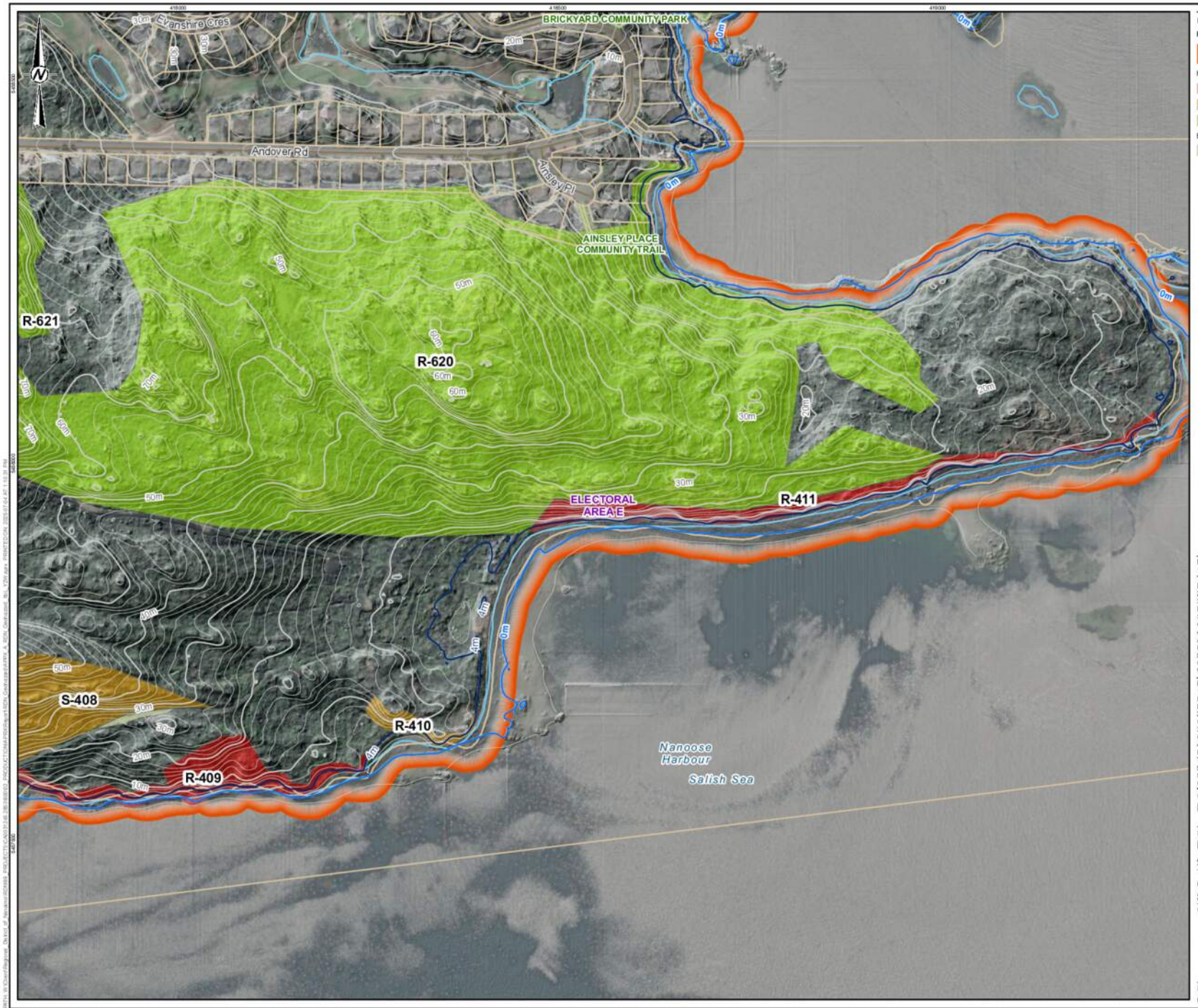
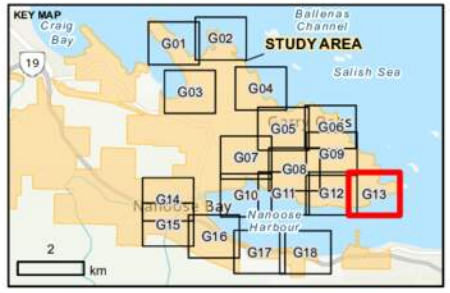
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G12





0 100 200

METRES

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

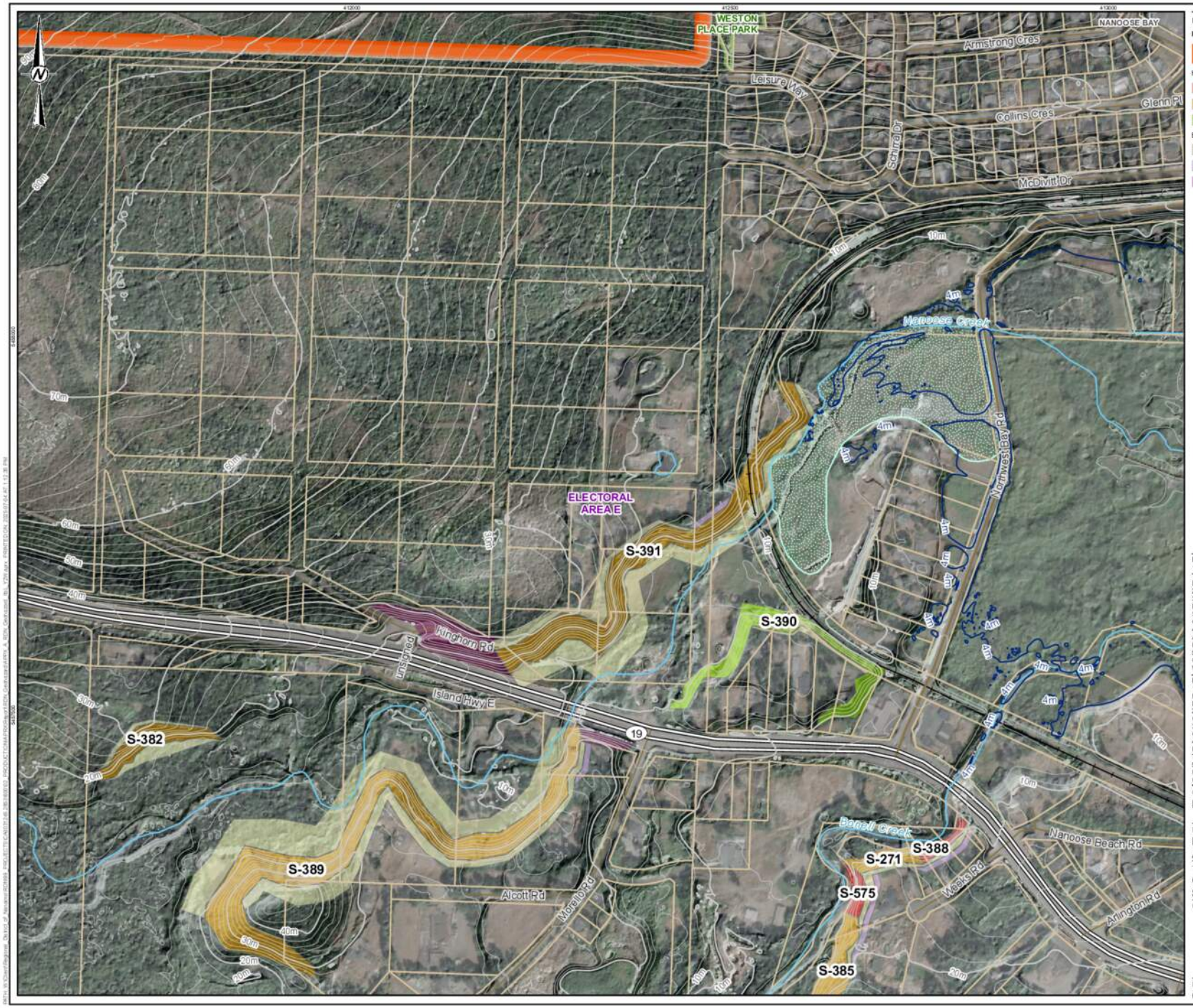
CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA

0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G14

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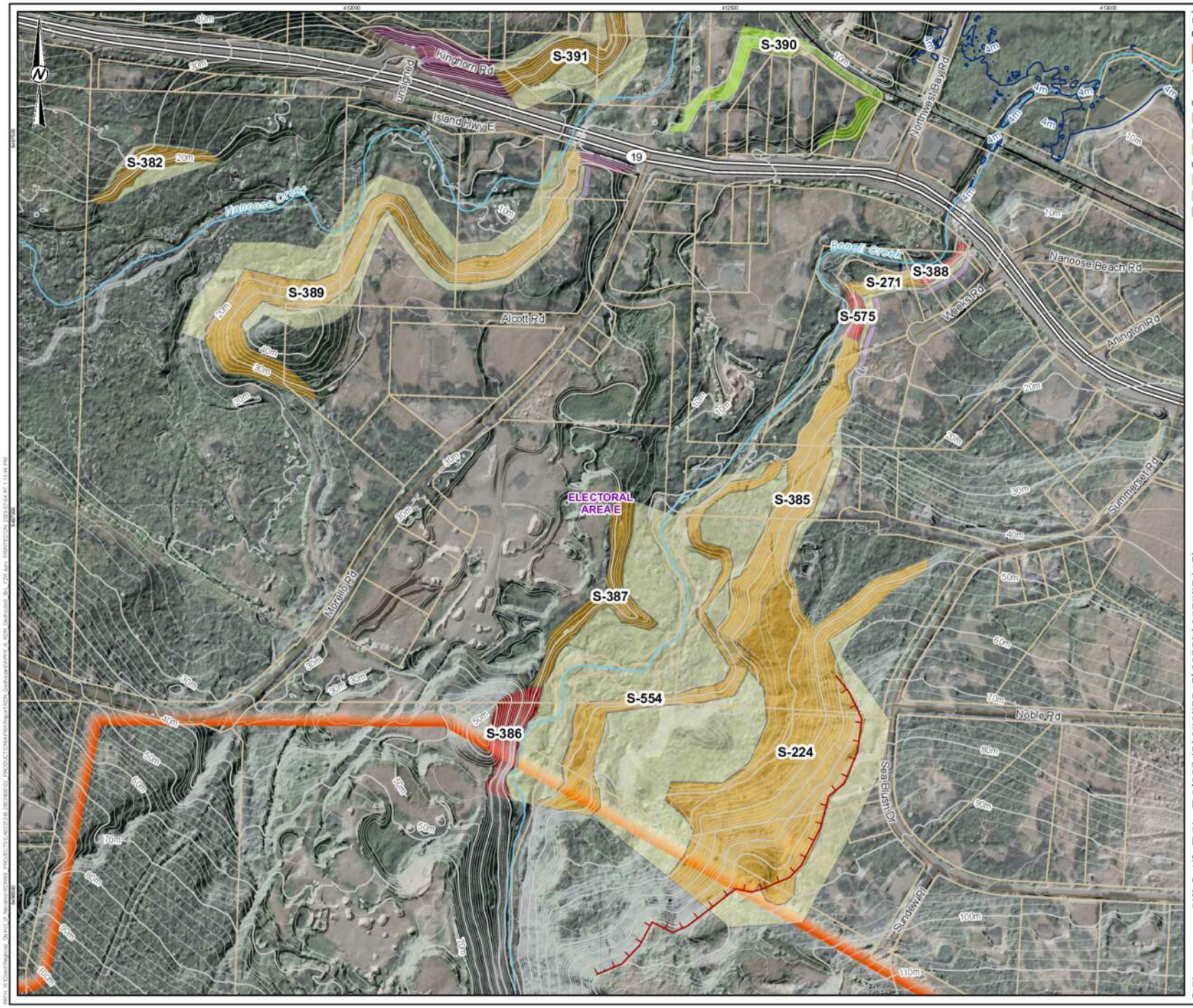


LEGEND

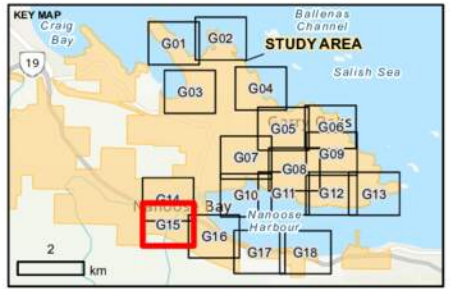
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

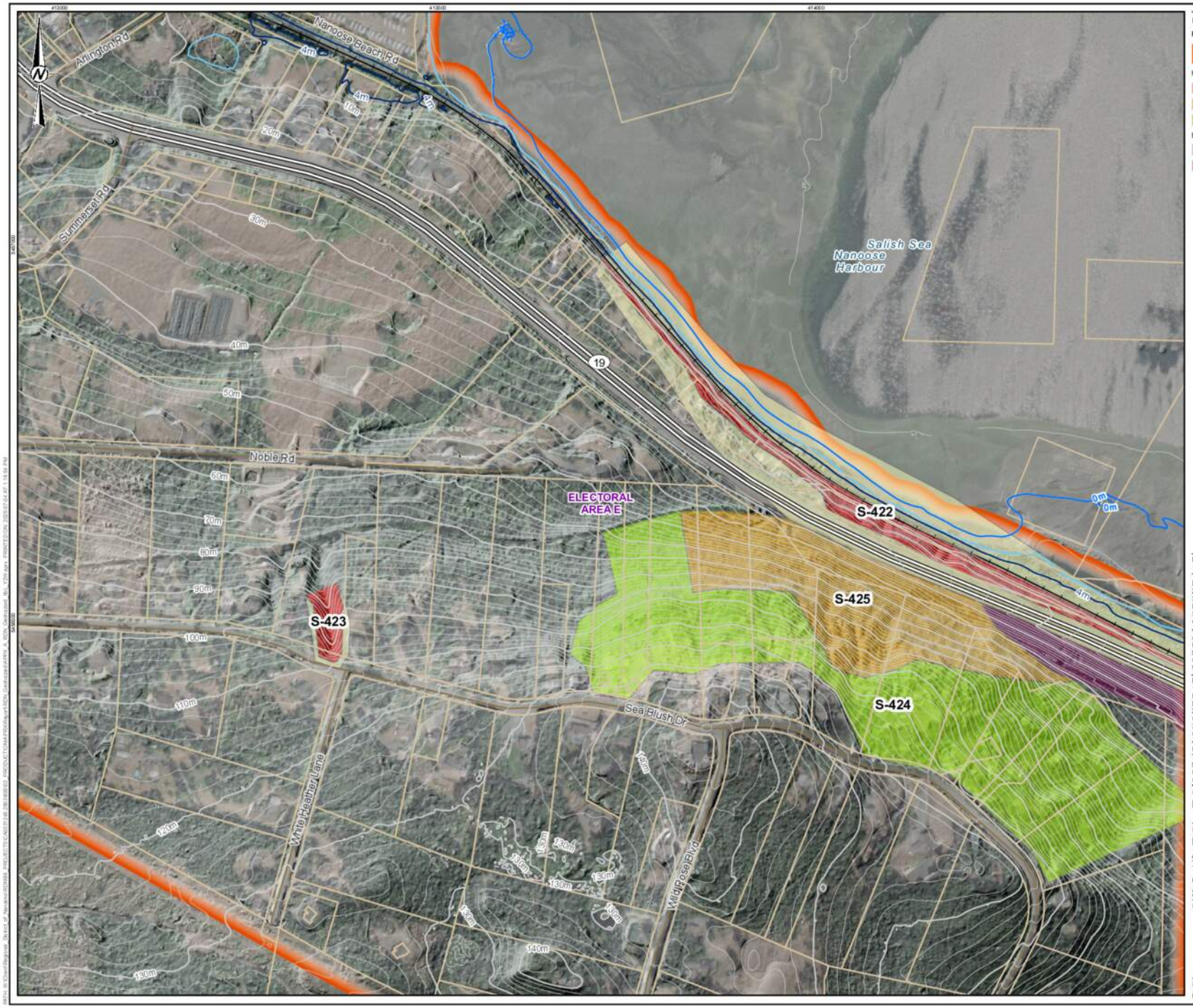
TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

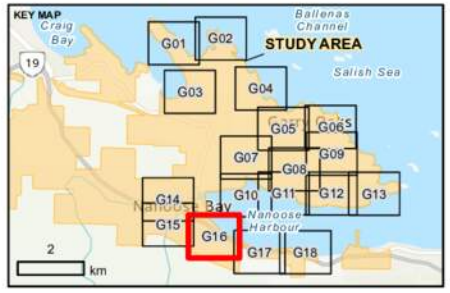
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

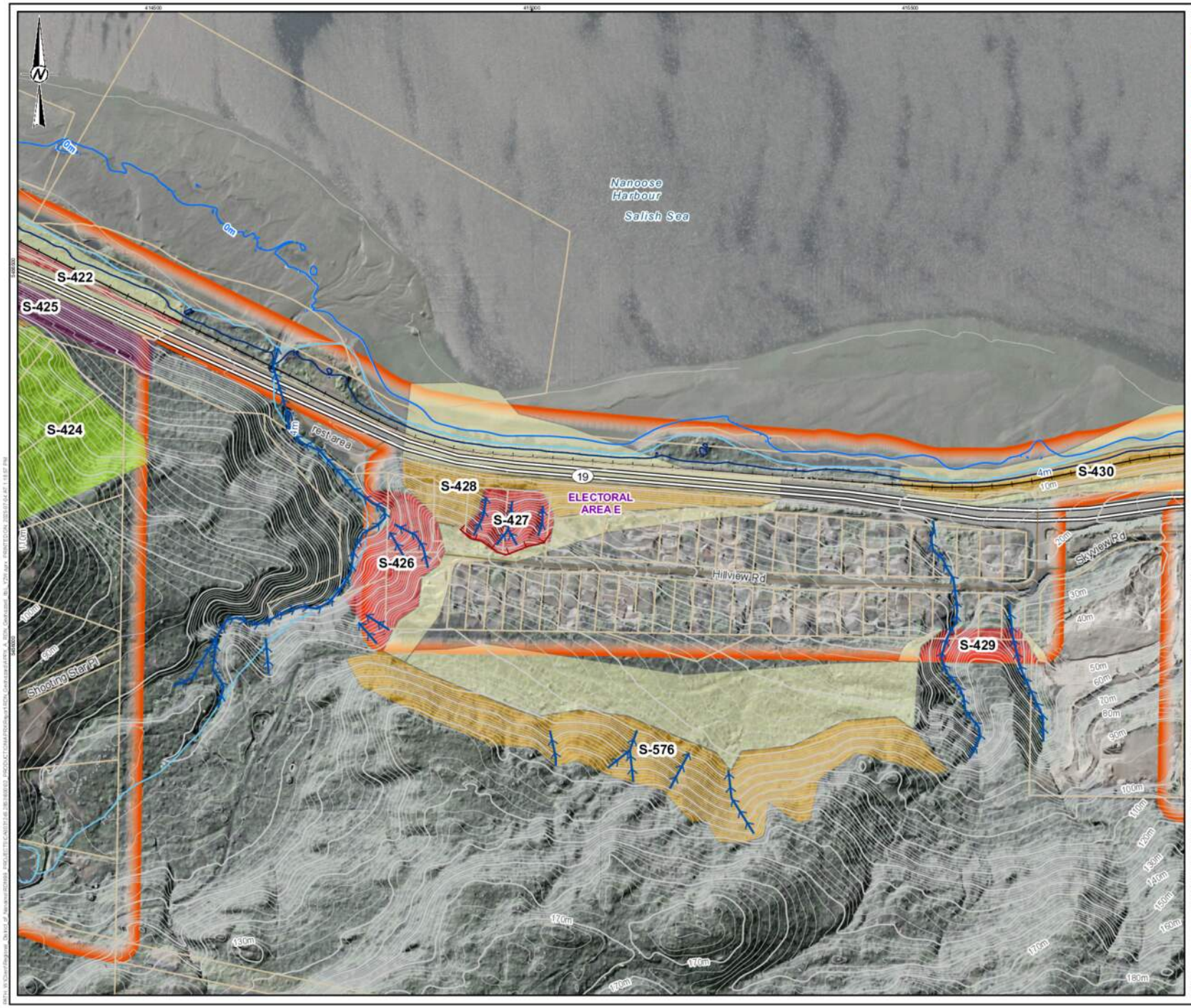
TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G16



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
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- CONTOUR (2 m INTERVAL)
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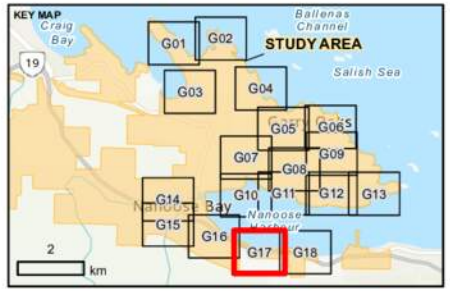

0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G17

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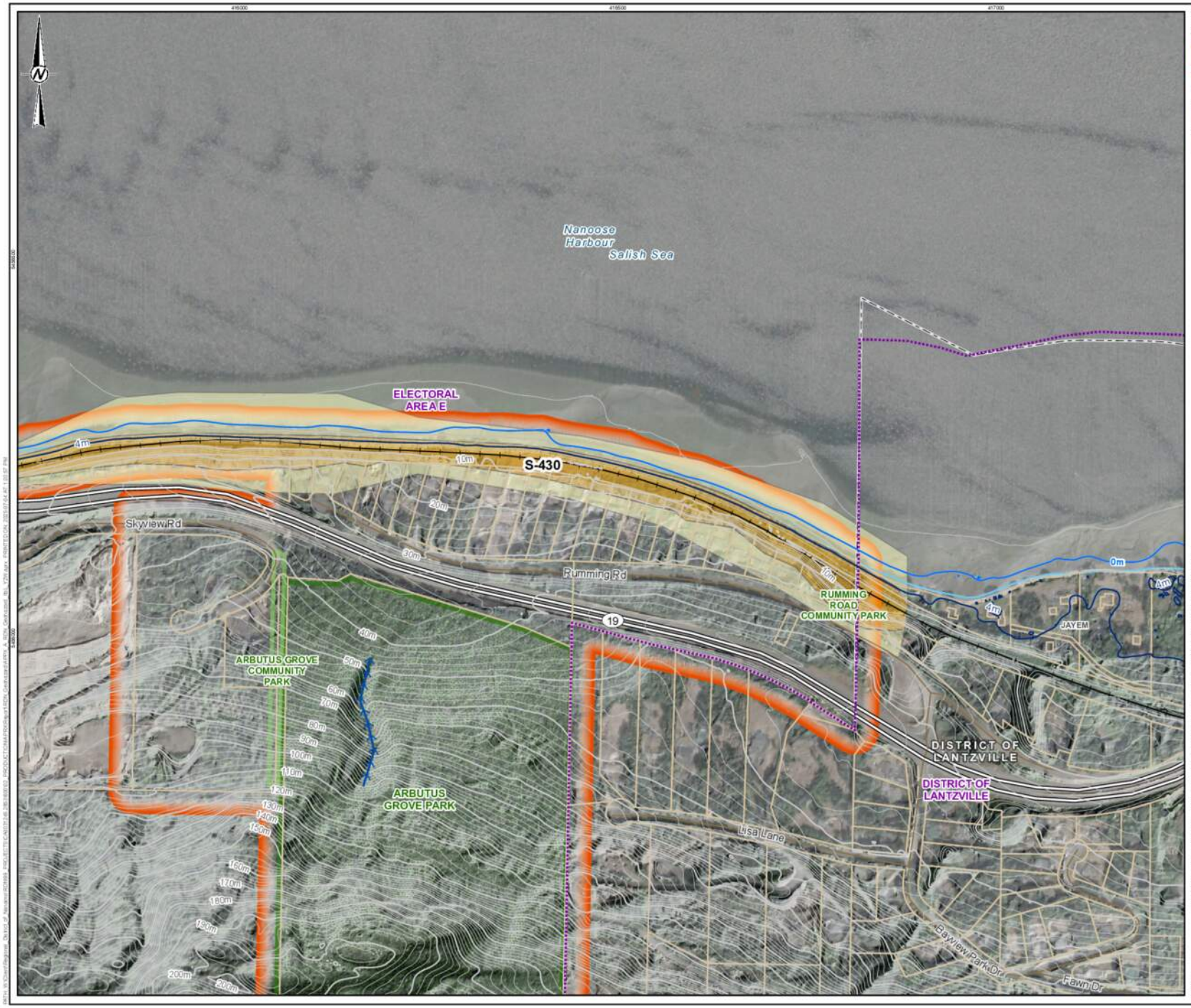

LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)

- MEDIUM

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

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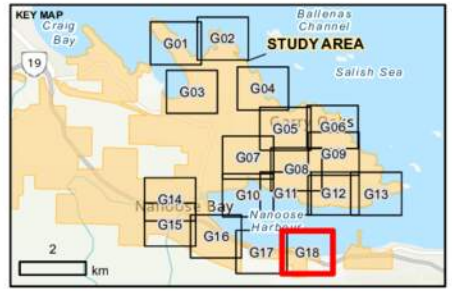

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

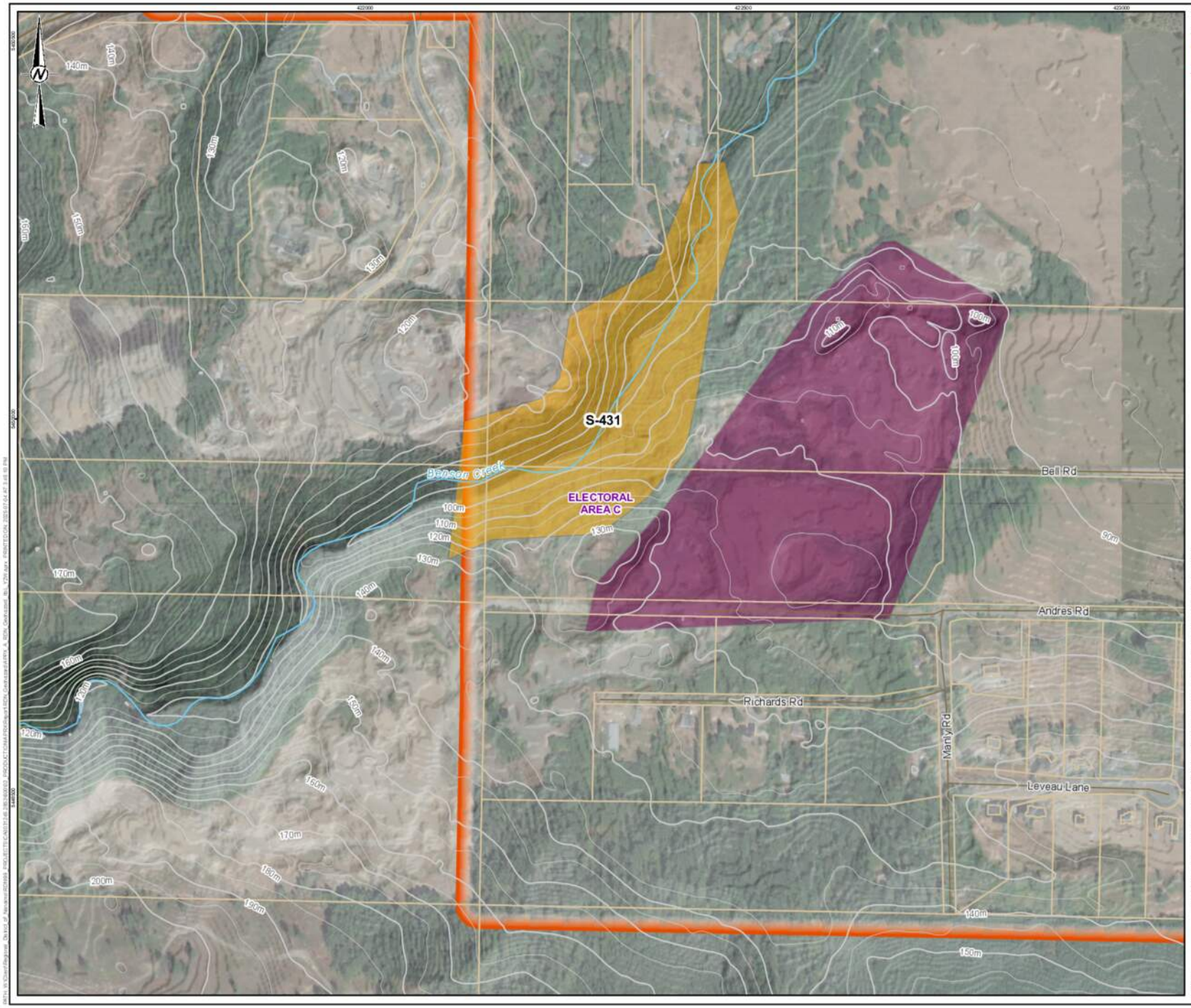
TITLE
GEOHAZARD MAPPING
SECTION G - NANOOSE HARBOUR AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	G18



LEGEND

PROJECT DATA

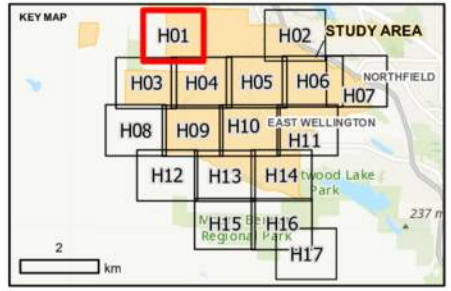
- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

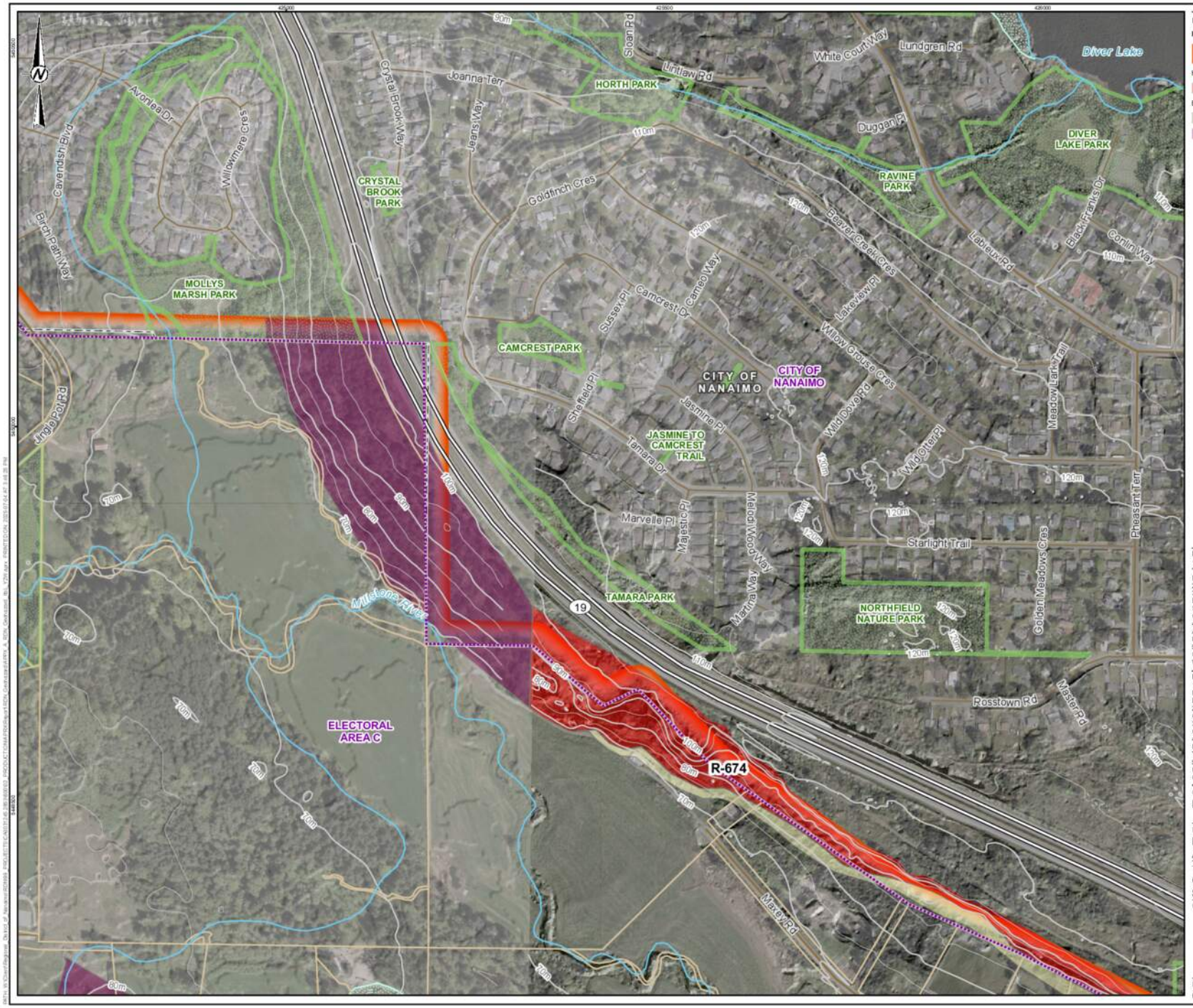
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H01



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

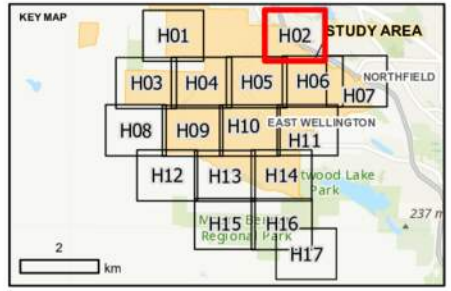
- HIGH

BUFFER ZONE

- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

1. THESE MAP SHEETS SHOULD BE REVIEWED TOGETHER WITH THE ACCOMPANYING REPORT TITLED "GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY, REGIONAL DISTRICT OF NANAIMO" (REV. 1 DATED JULY 2025).
2. ONLY STEEP-SLOPE RELATED GEOHAZARDS WERE IDENTIFIED AS PART OF THIS STUDY.
3. HAZARD MAPPING WAS LIMITED BY SCALE AND IS NOT COMPREHENSIVE. LOCAL GEOHAZRDS MAY EXIST WHERE NO HAZARDS HAVE BEEN IDENTIFIED. FEATURES WITH RELIEF OF LESS THAN 5 M AND/OR SLOPES LESS THAN 15 DEGREES STEEP WERE BELOW THE ESTABLISHED LEVEL OF DETAIL AND WERE GENERALLY NOT MAPPED.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
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SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

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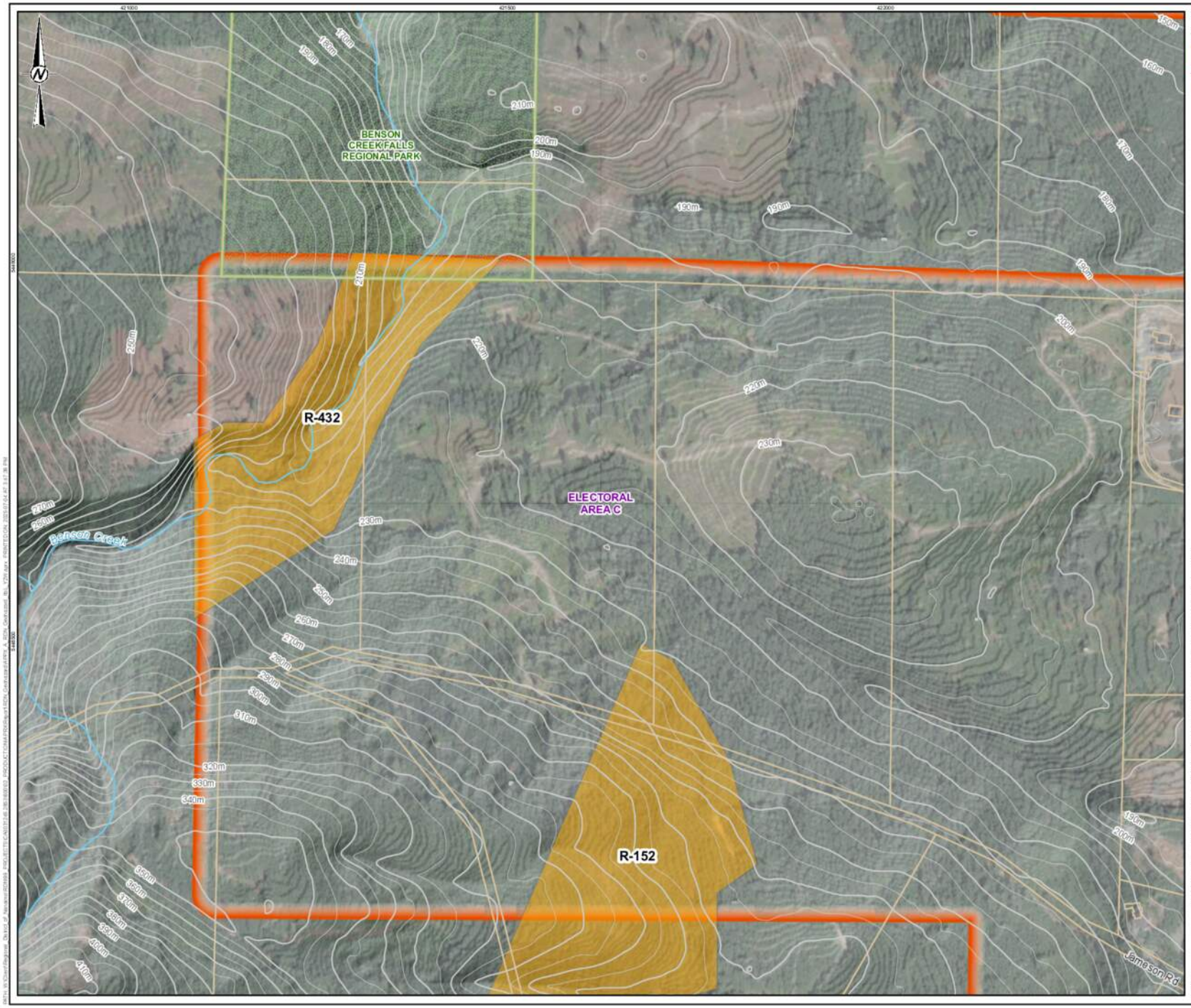
APPROVED	DC

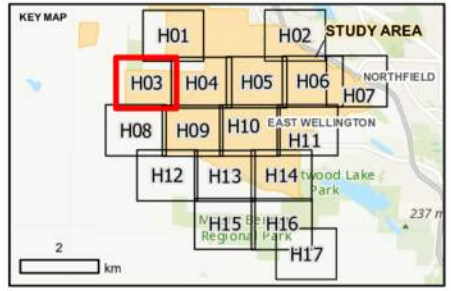
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H02



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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PREPARED	LH
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APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H03

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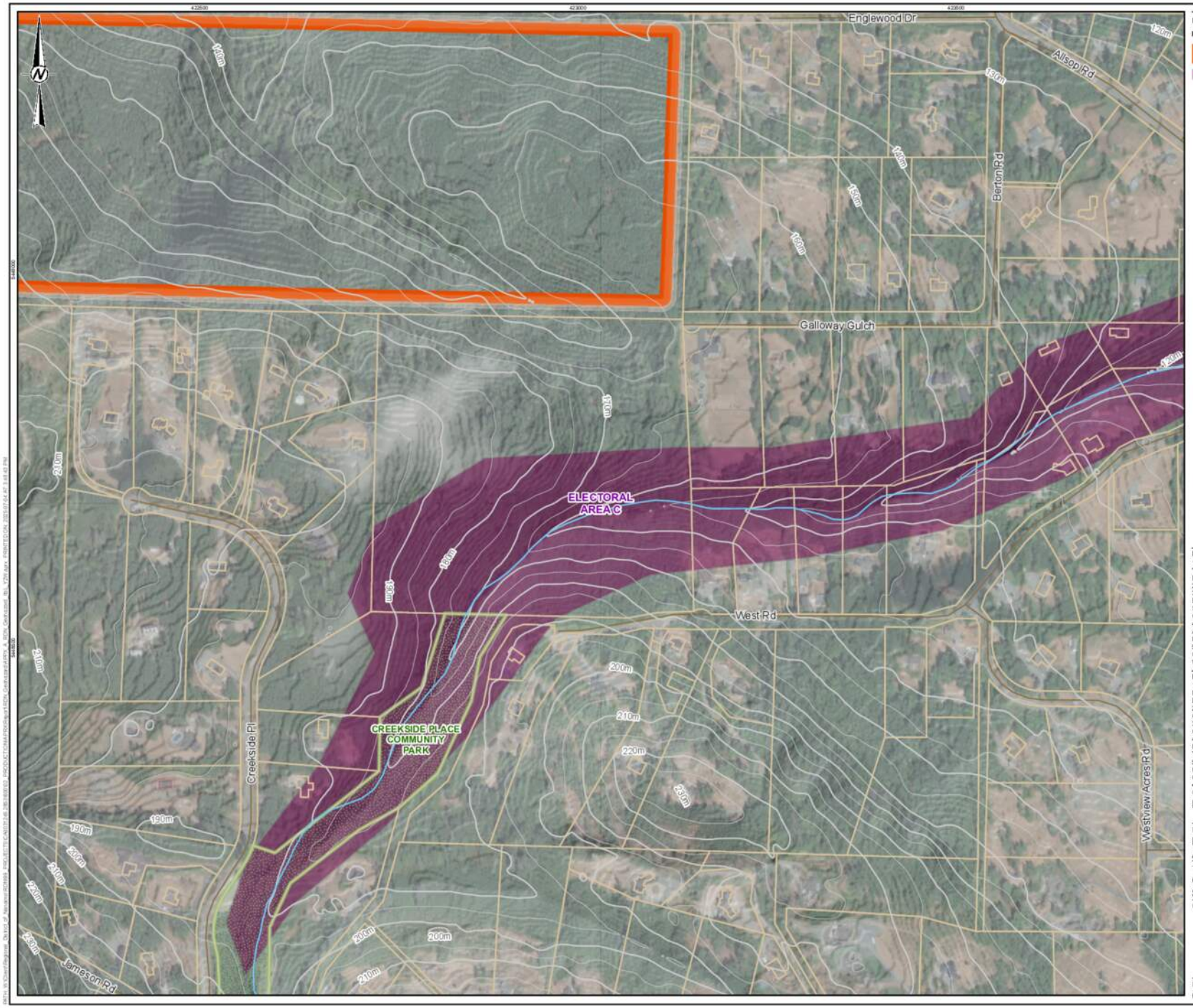
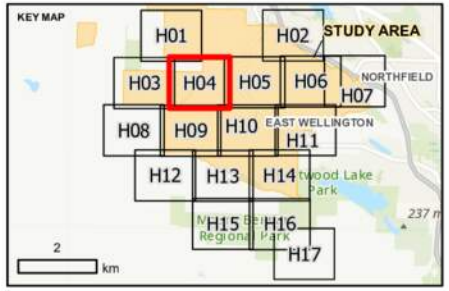


LEGEND

PROJECT DATA
- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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METRES

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H04

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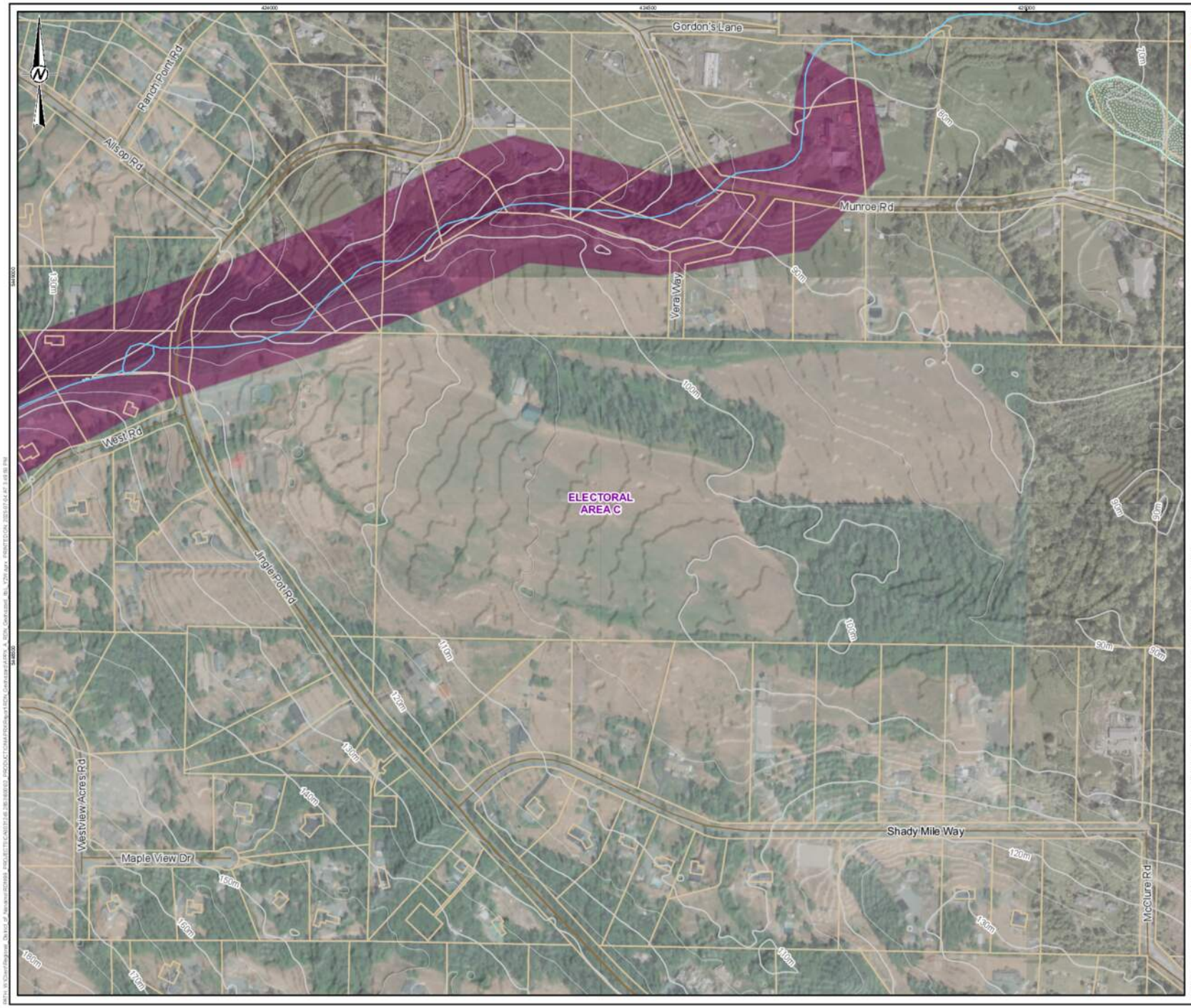


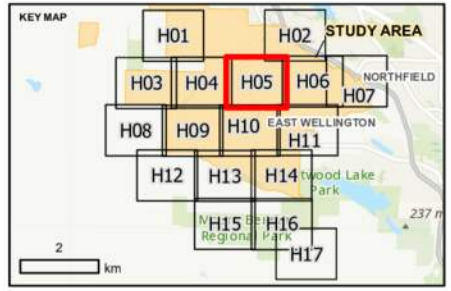
LEGEND

PROJECT DATA

- STUDY AREA
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
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APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H05

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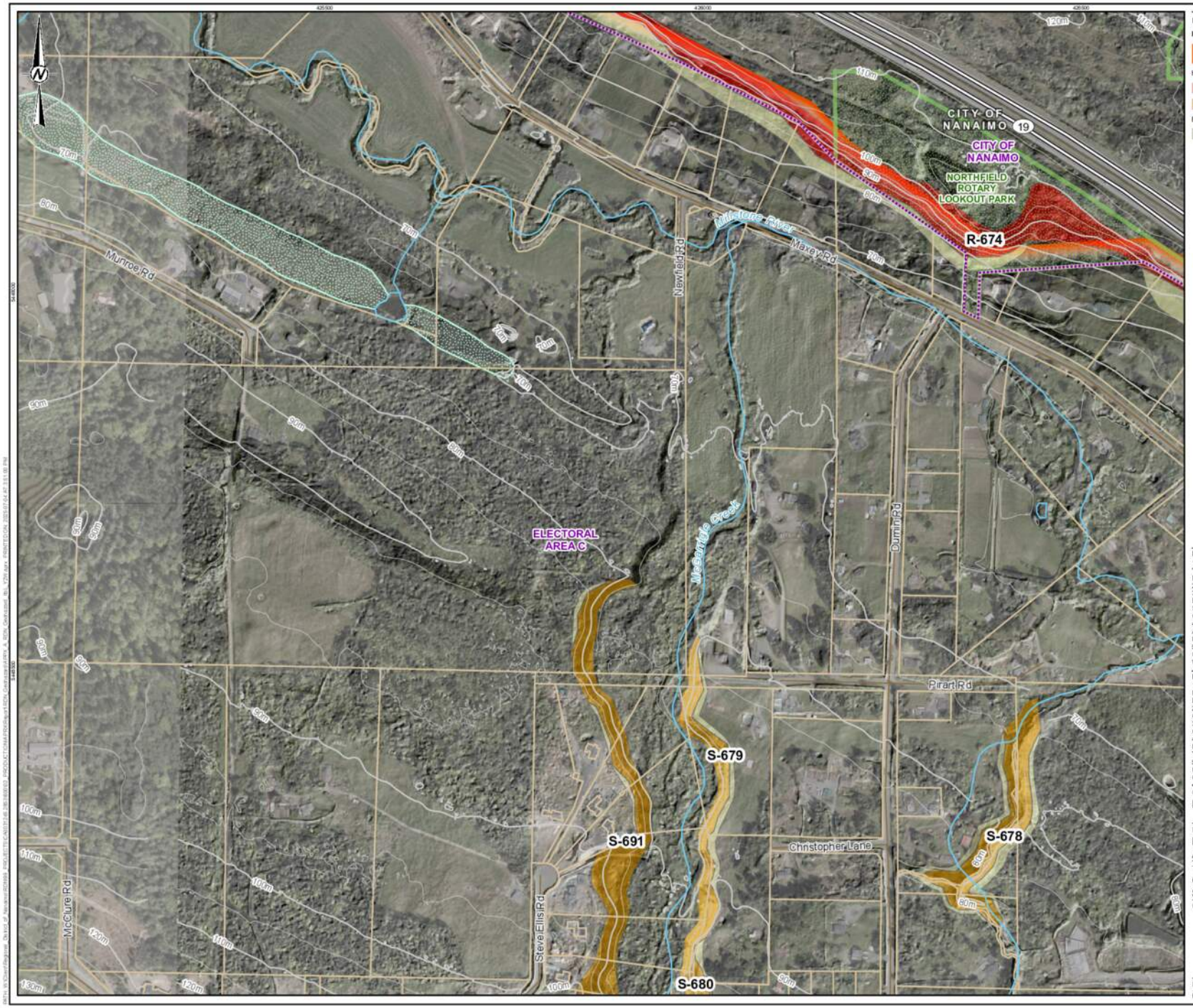

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
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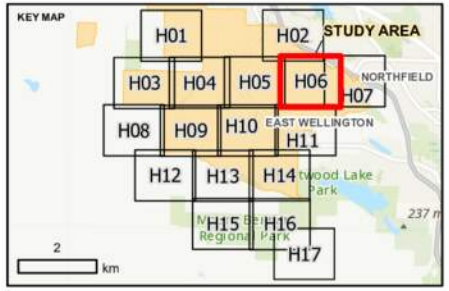

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TITLE

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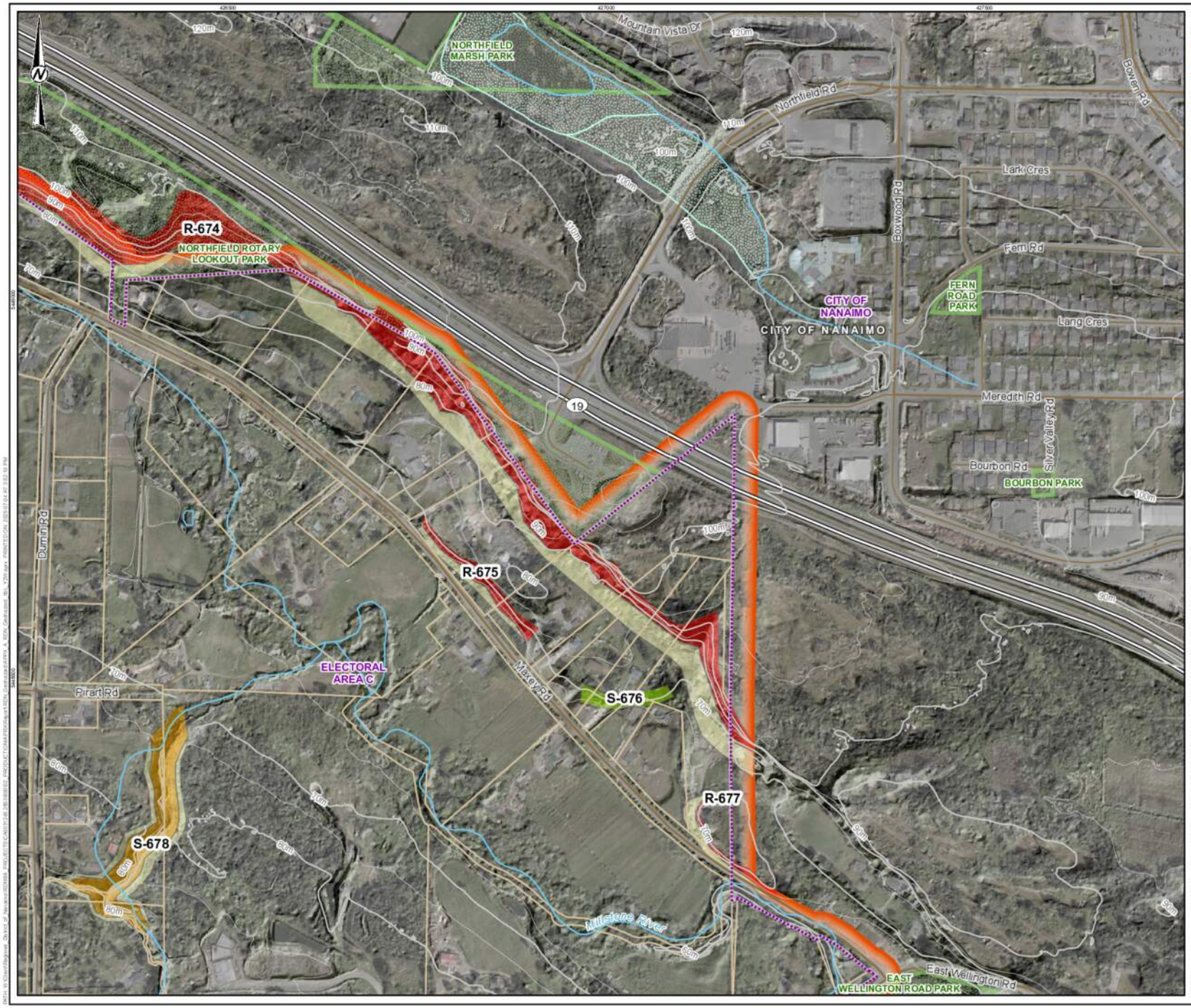
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H06



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
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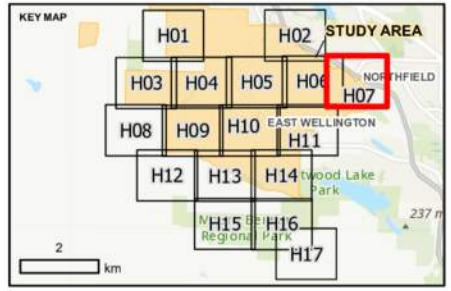

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TITLE
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SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

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PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H07

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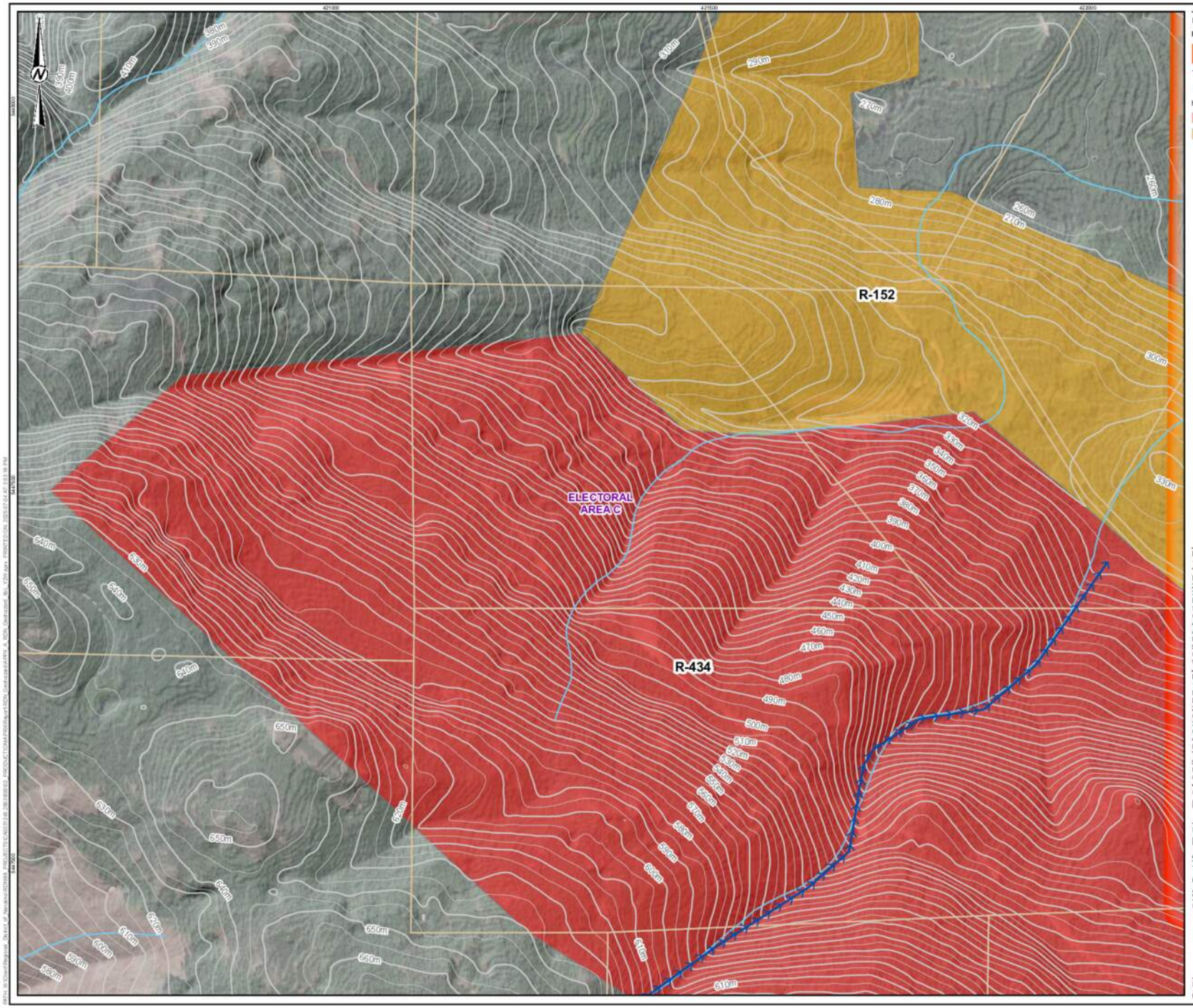

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
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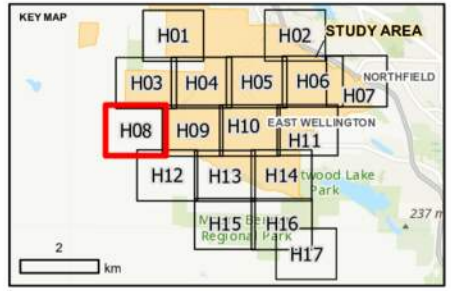

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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

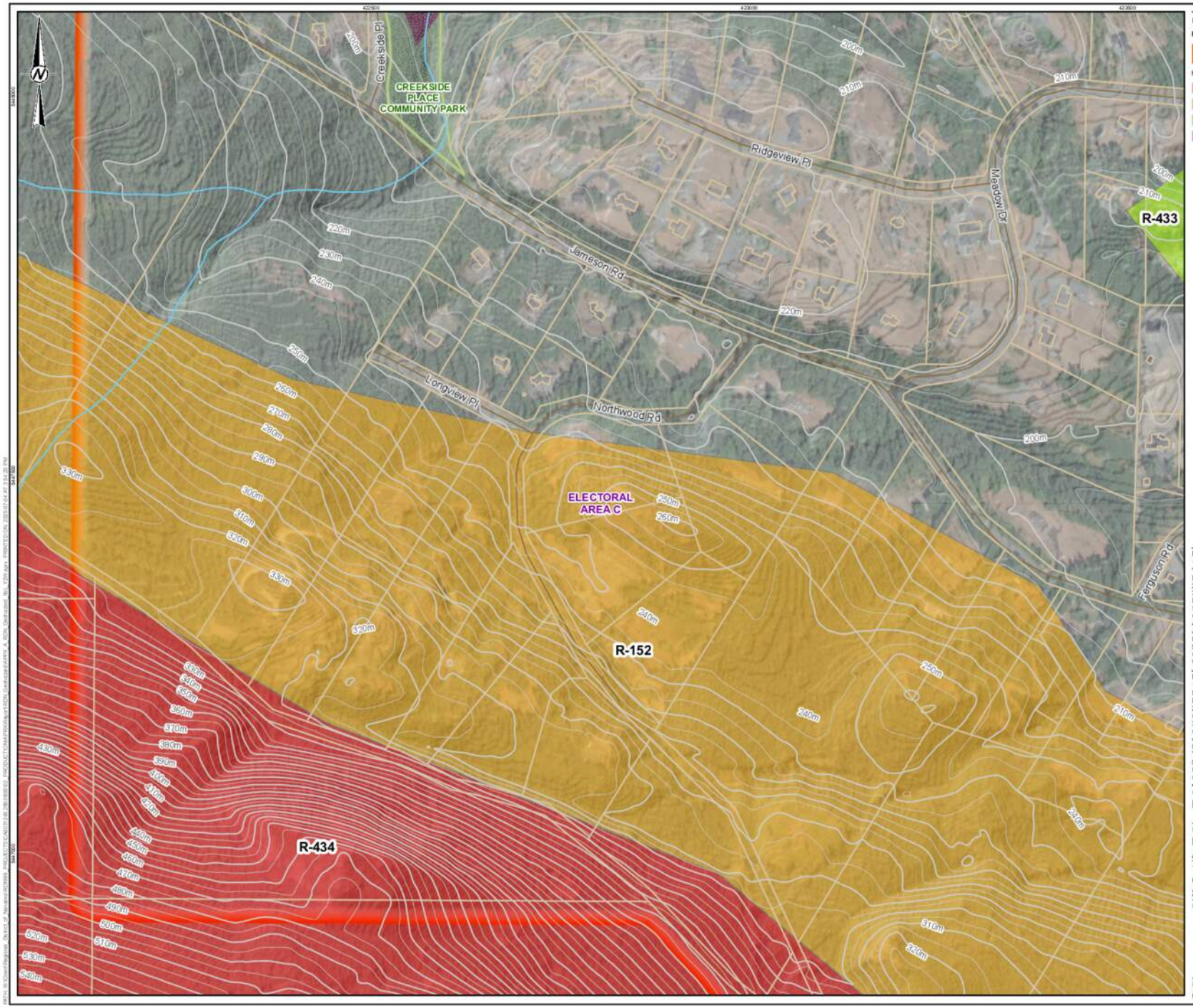
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H08



LEGEND

PROJECT DATA

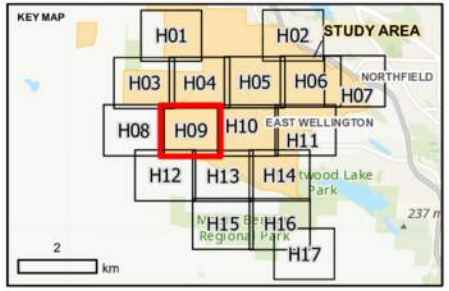
- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

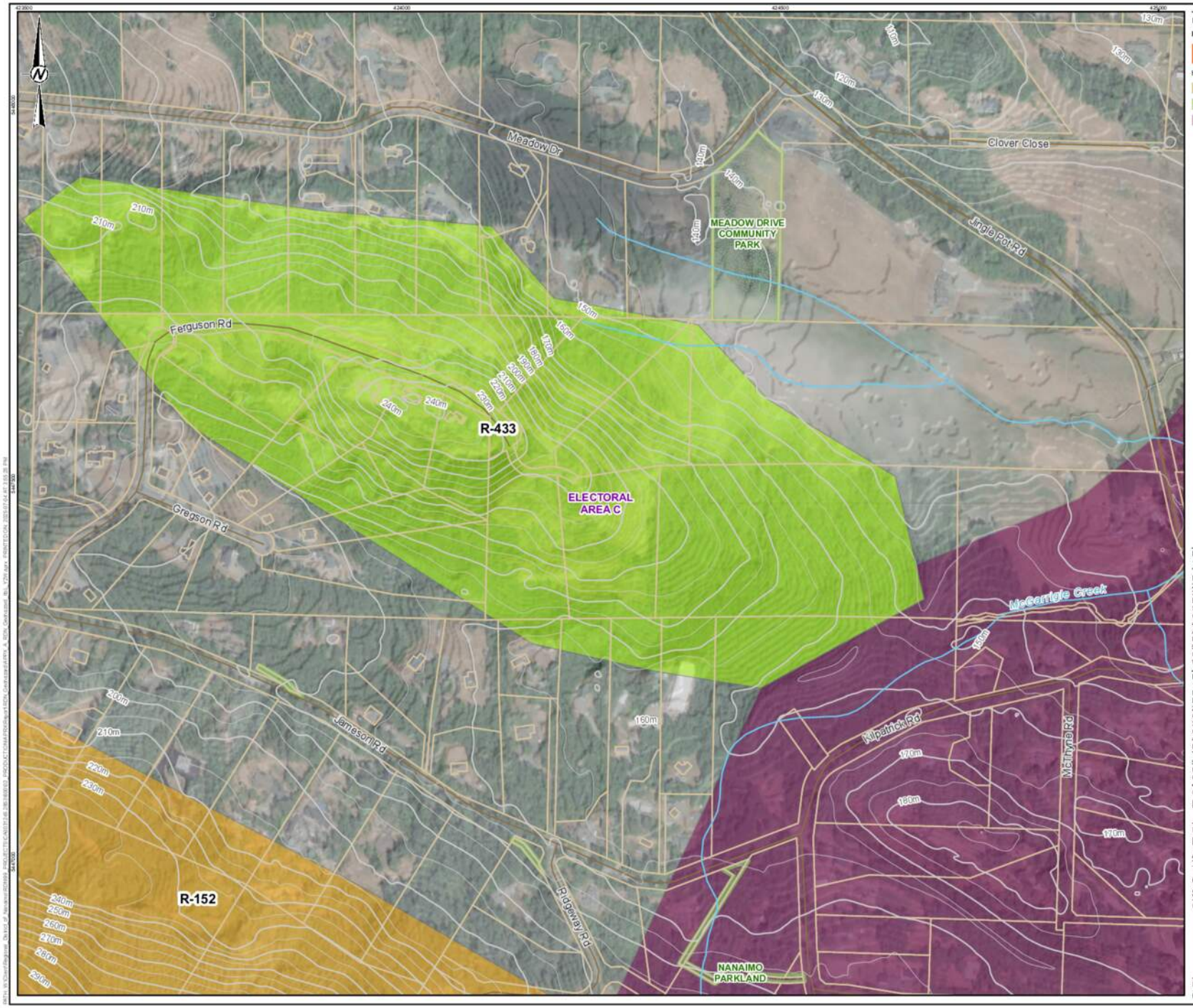
TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

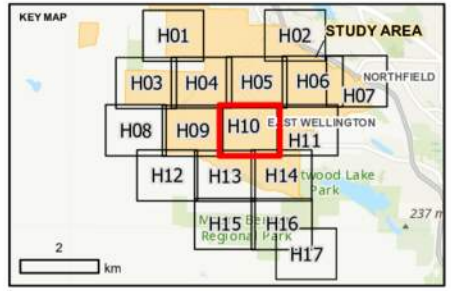
CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H09





LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA

0 100 200
METRES

LIMITATION(S)

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

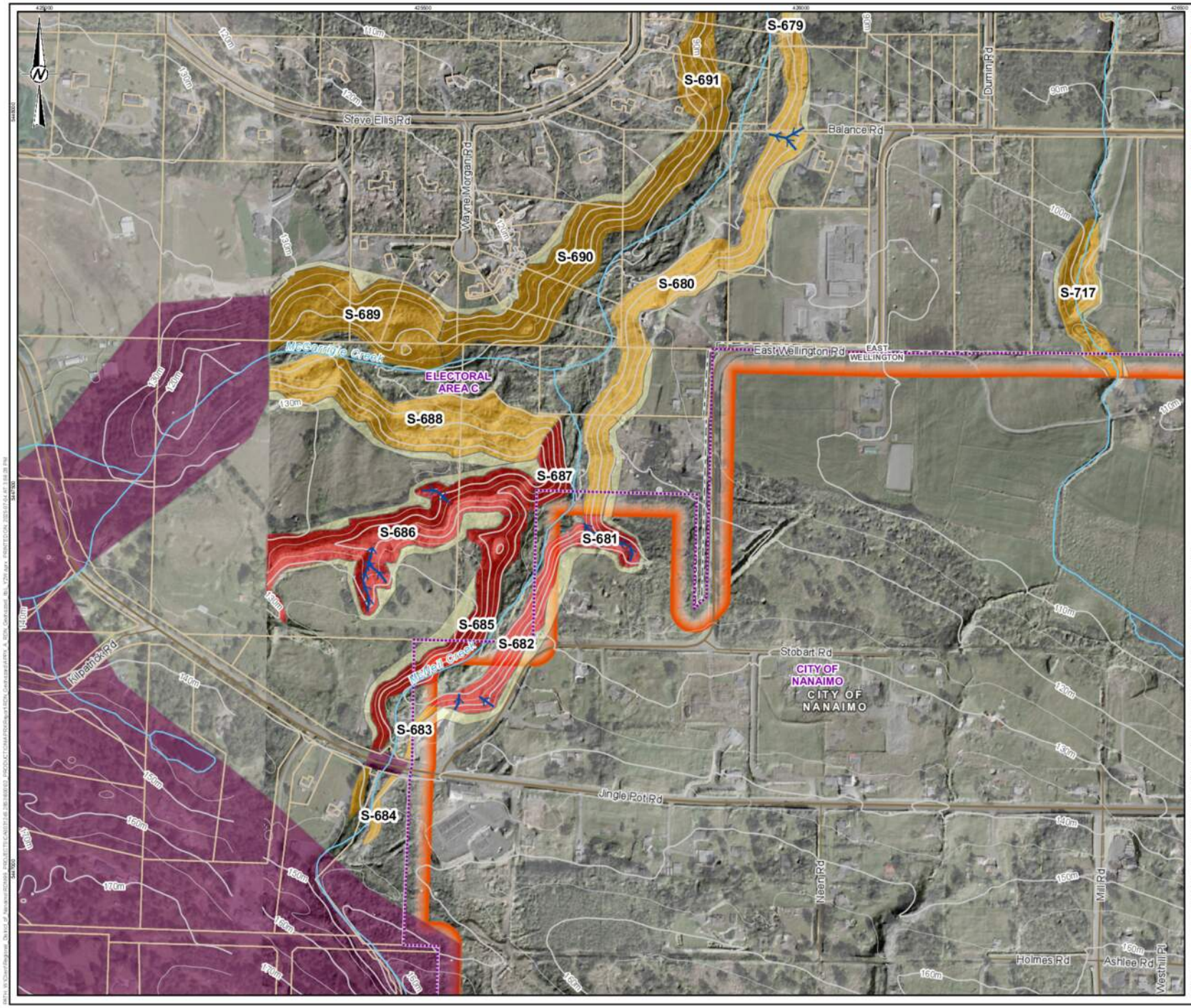
TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H10



LEGEND

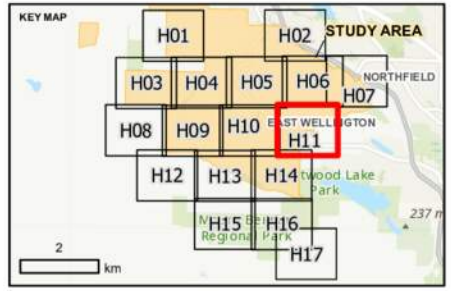
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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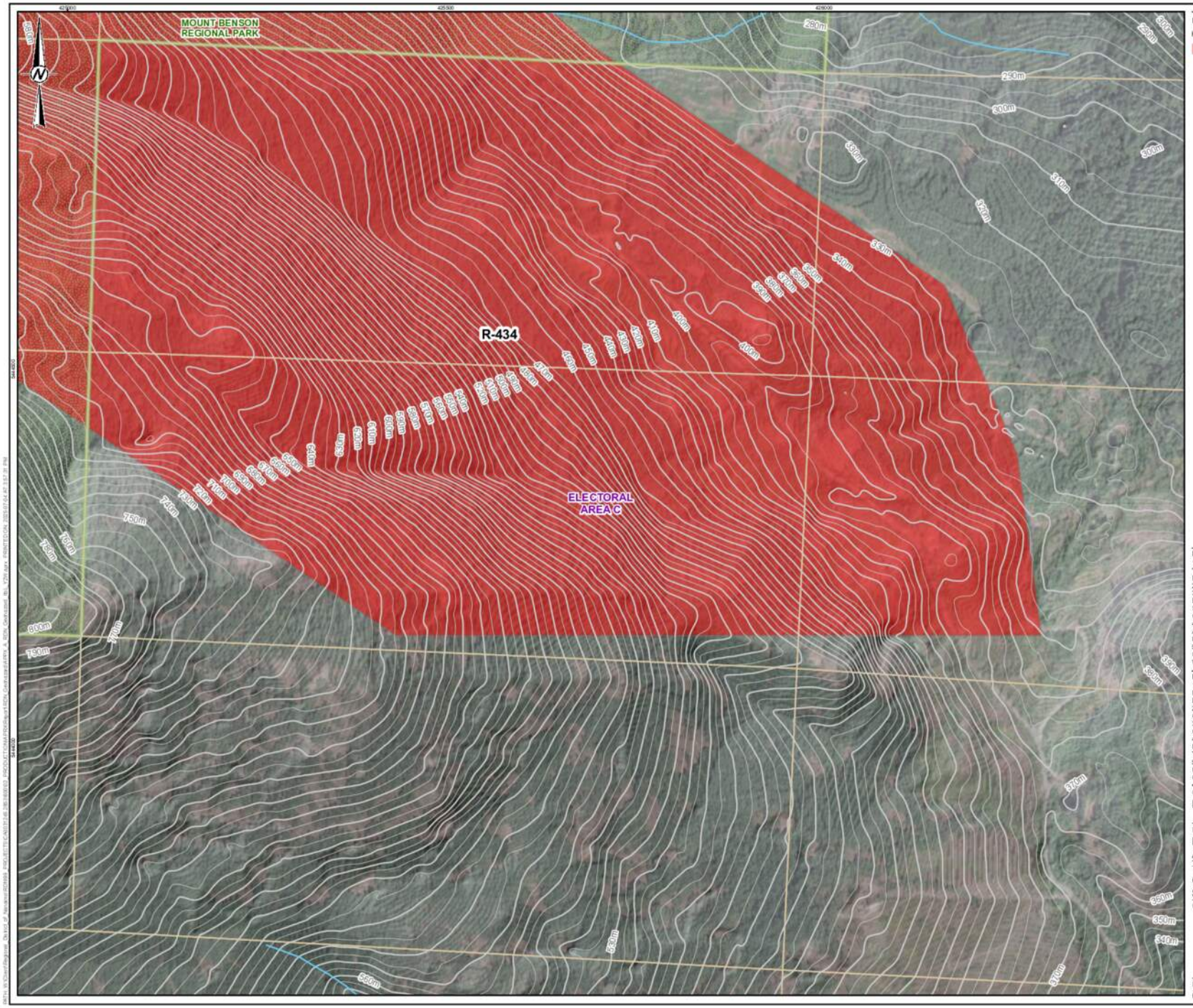
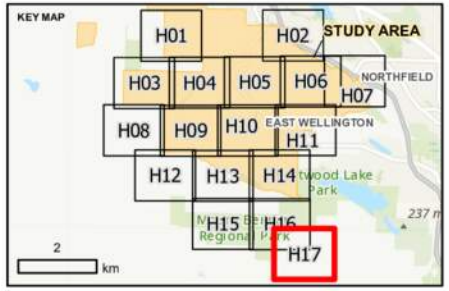
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H11



LEGEND

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H17

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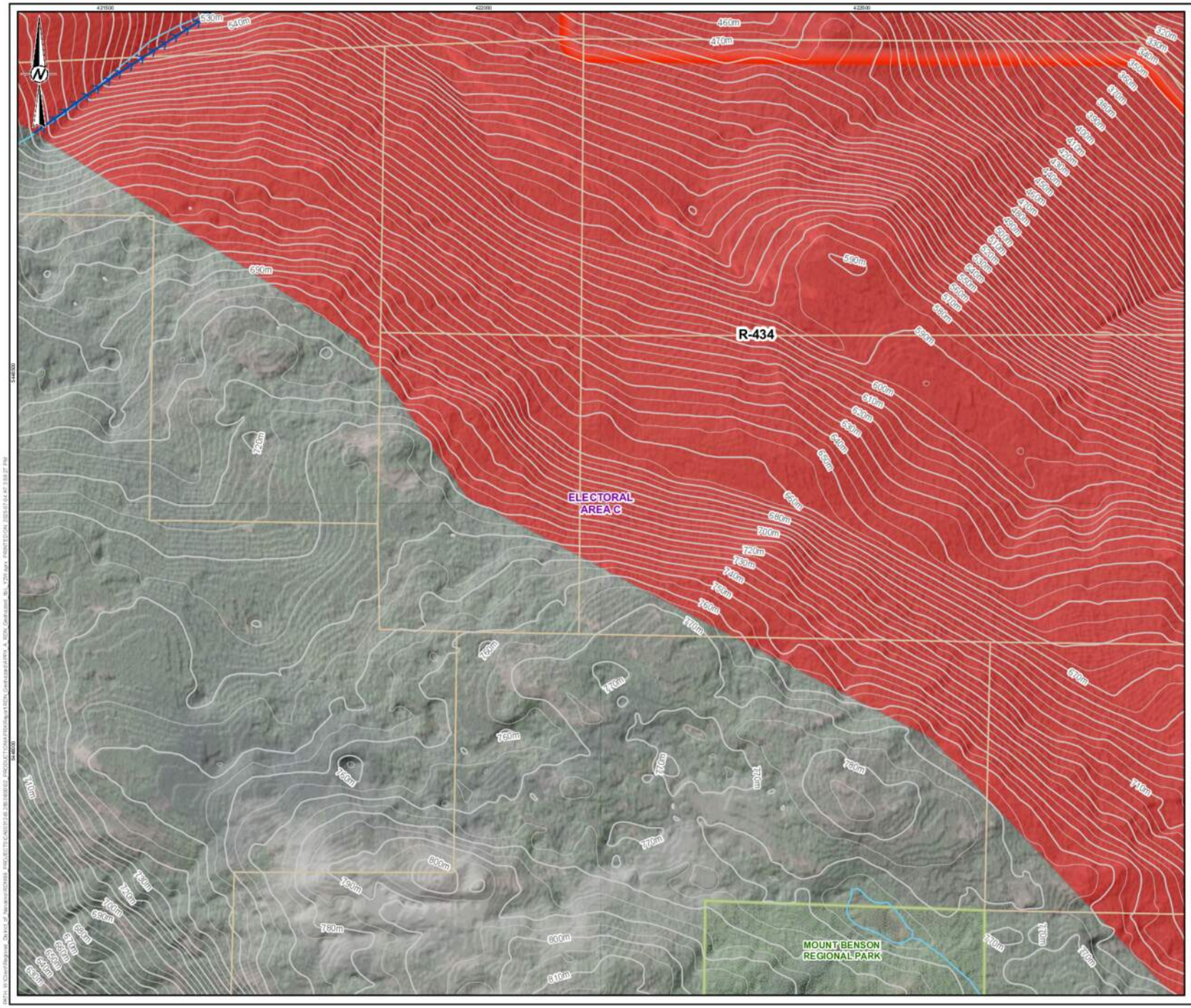

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
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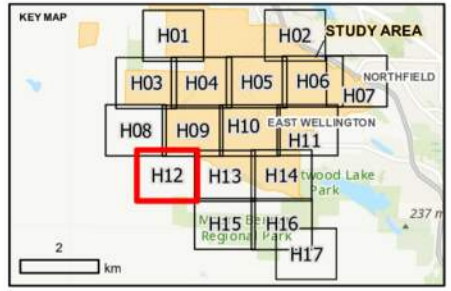

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

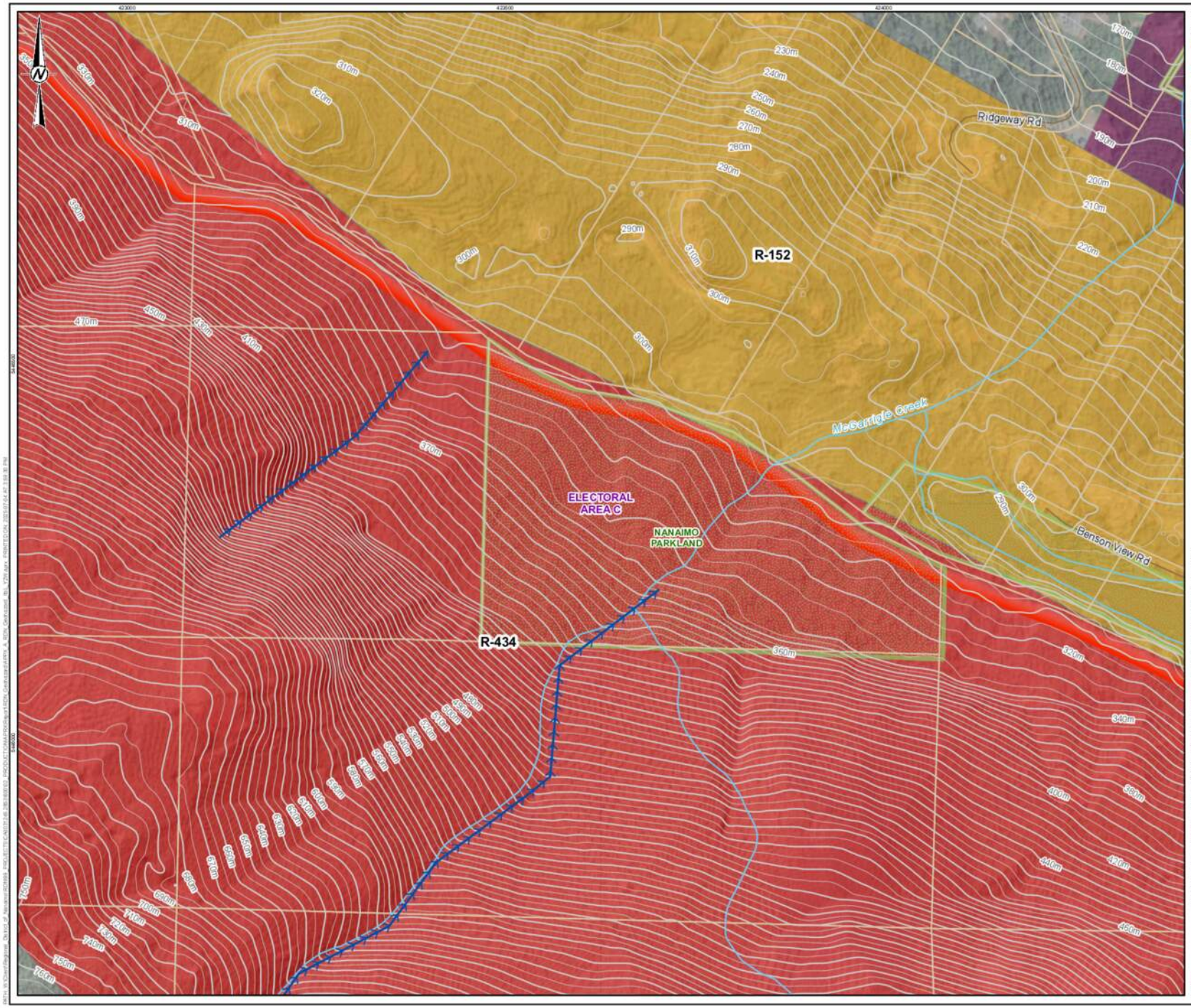
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H12



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
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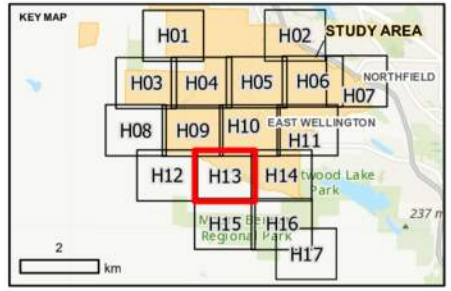
KEY MAP



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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

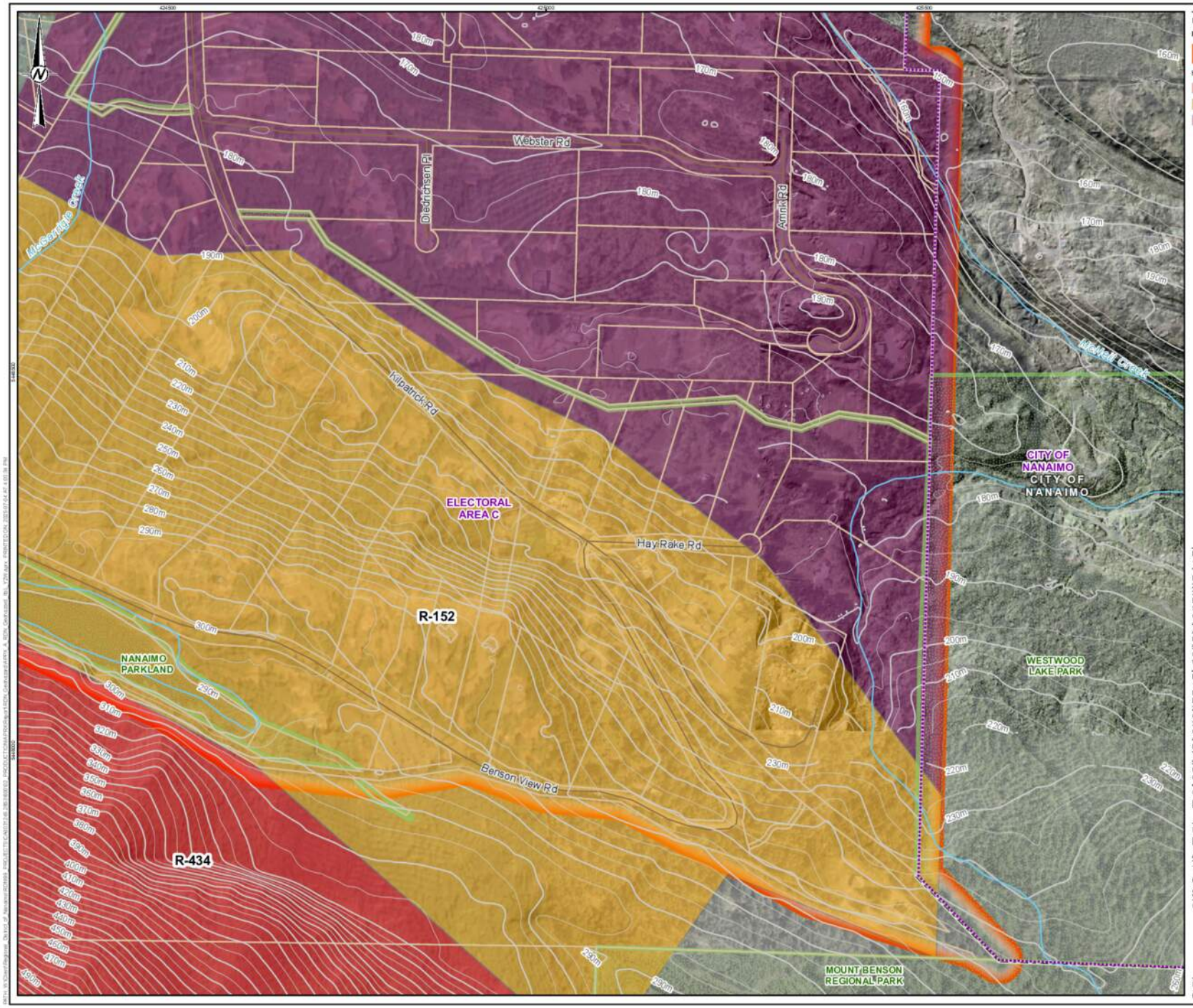
CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

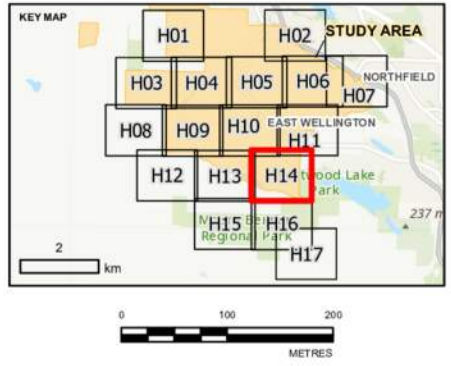
- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

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REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
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SECTION H - WESTWOOD LAKE AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
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REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
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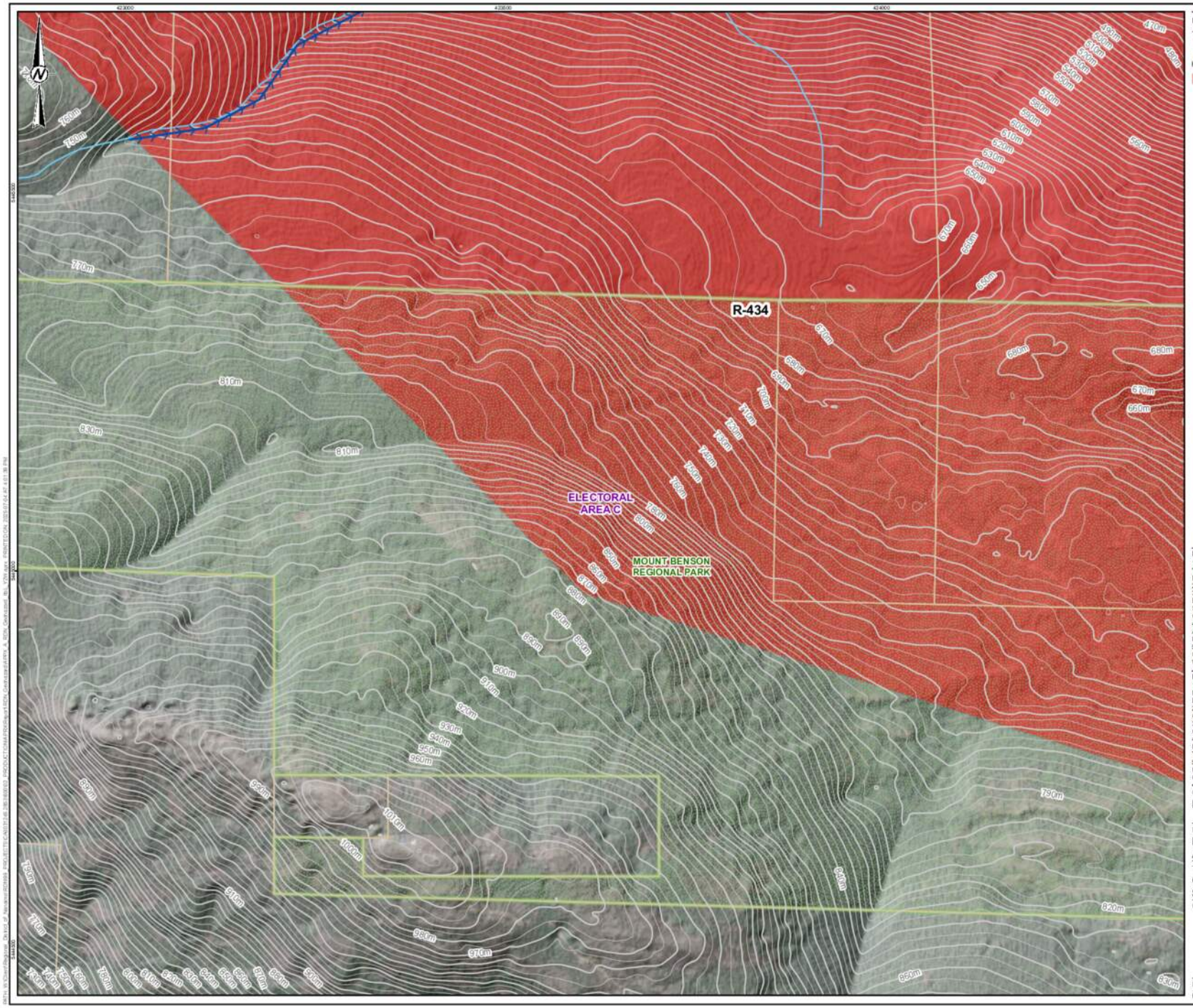
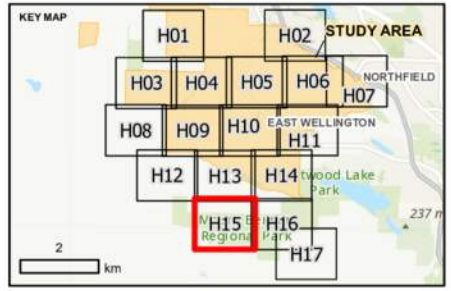


LEGEND

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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TITLE
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SECTION H - WESTWOOD LAKE AREA

CONSULTANT

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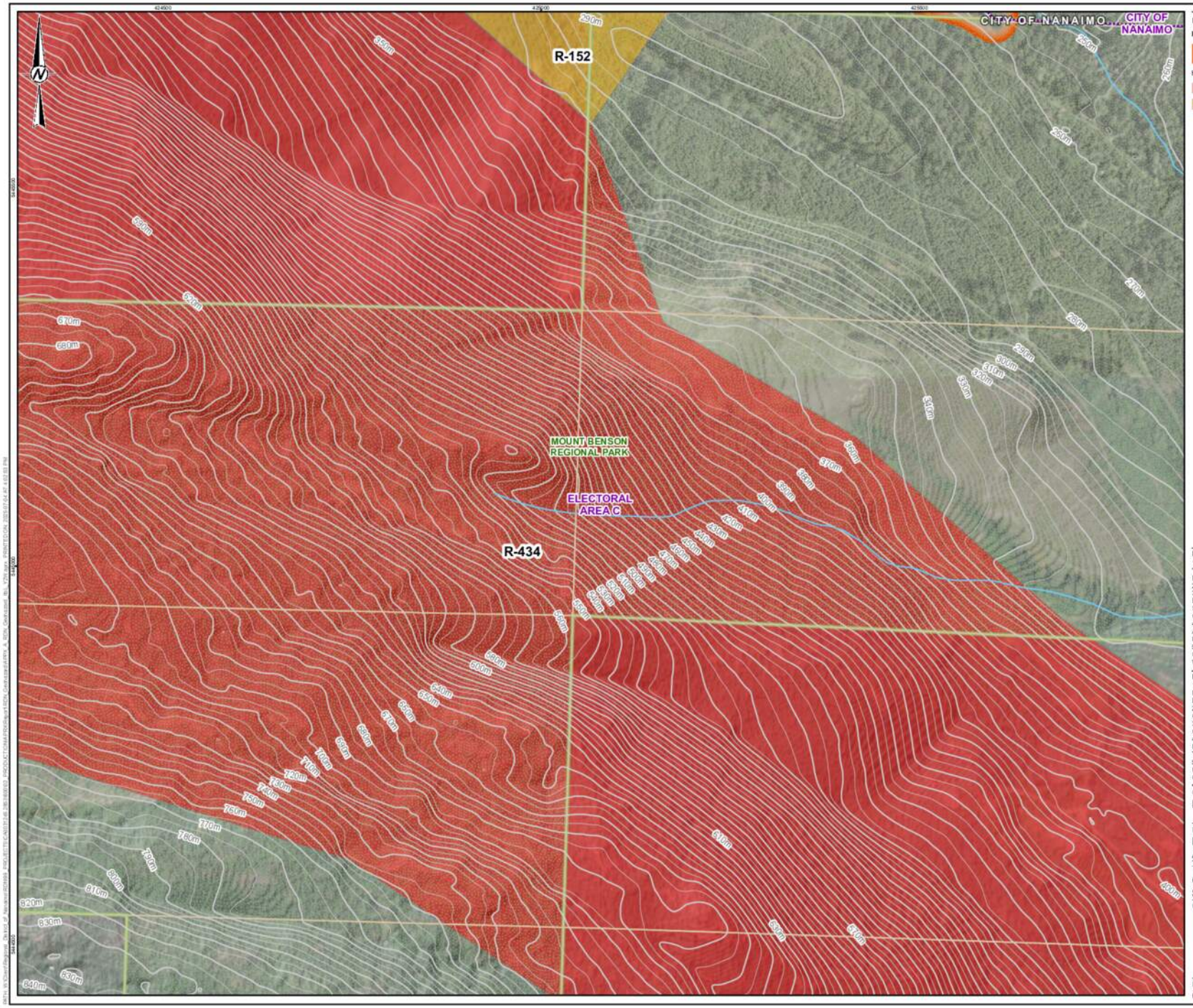
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H15

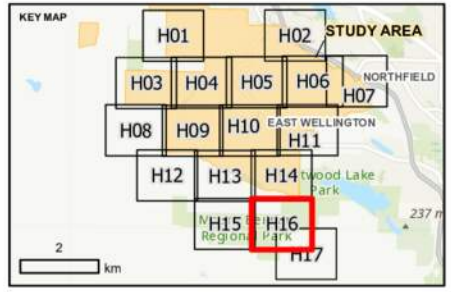


LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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TITLE
GEOHAZARD MAPPING
SECTION H - WESTWOOD LAKE AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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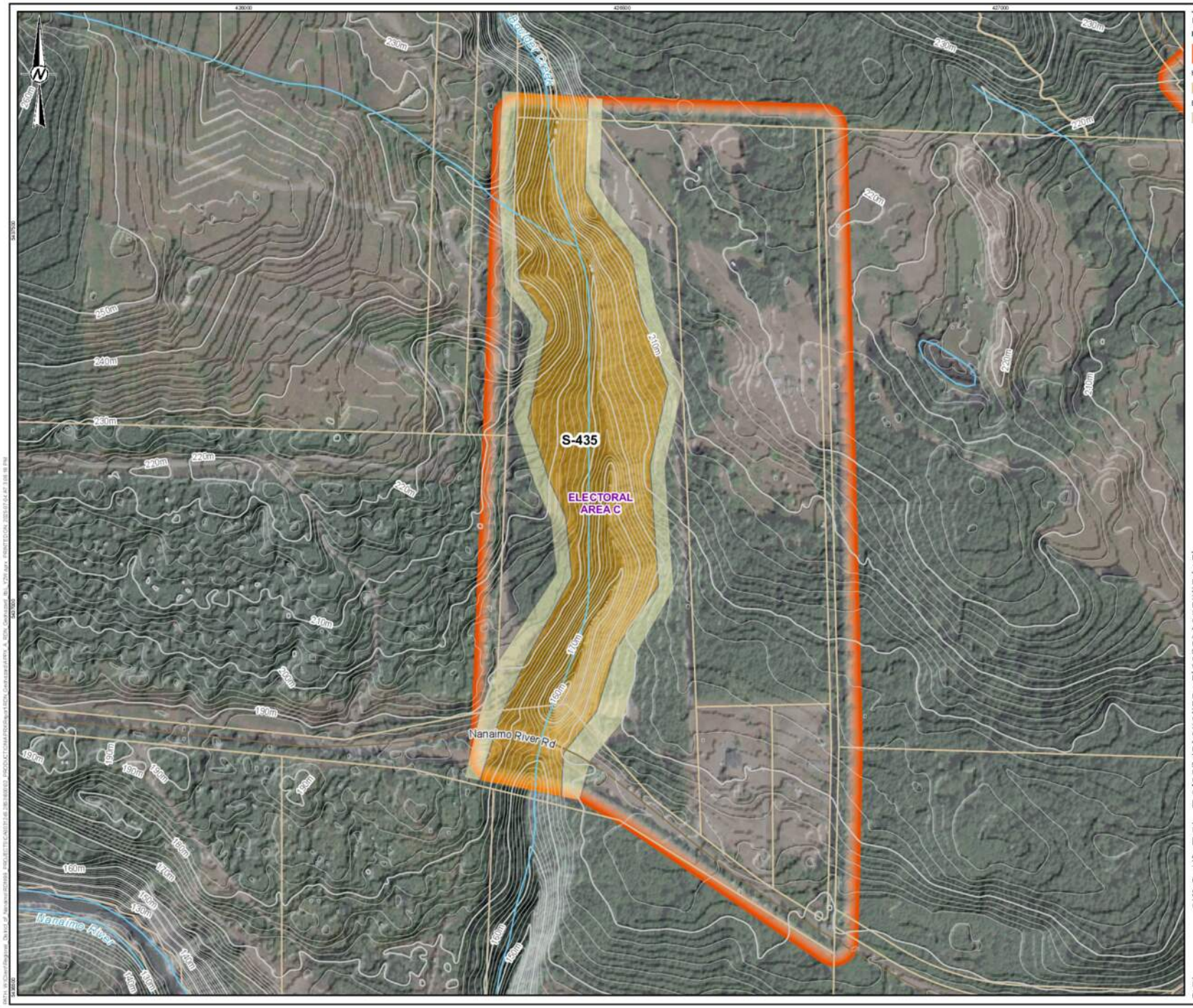
APPROVED	DC

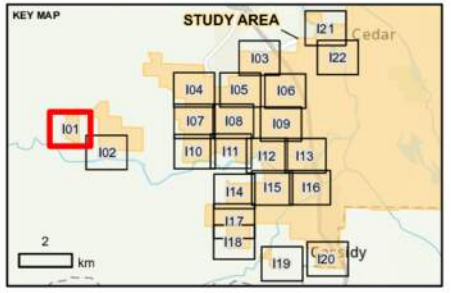
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	H16



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

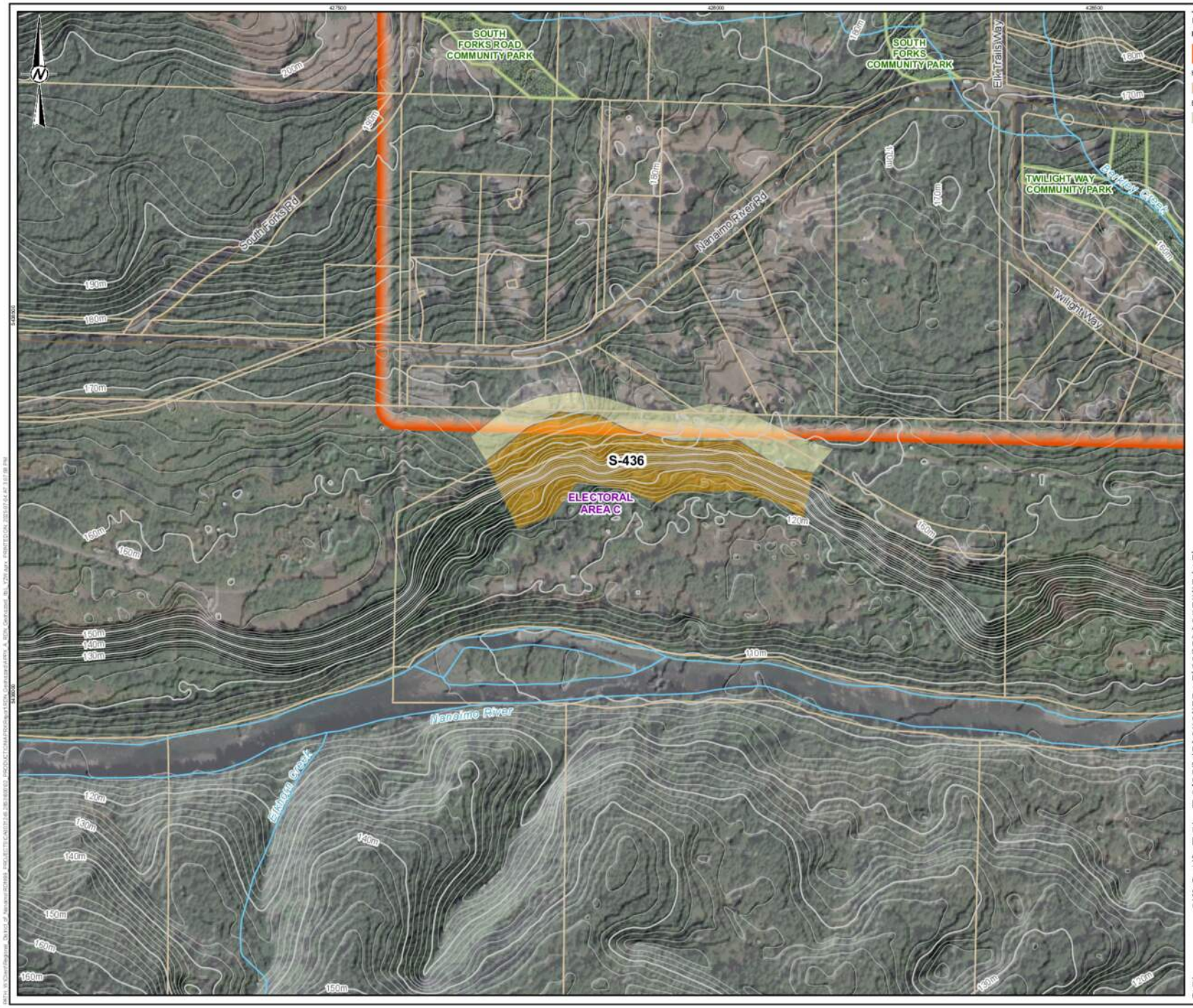
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I01



LEGEND

PROJECT DATA

- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
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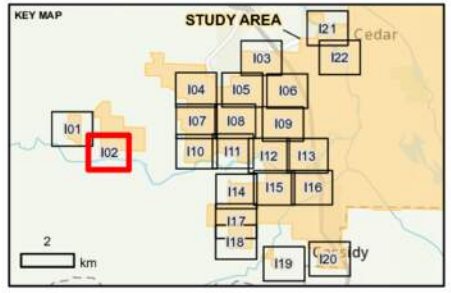

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TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
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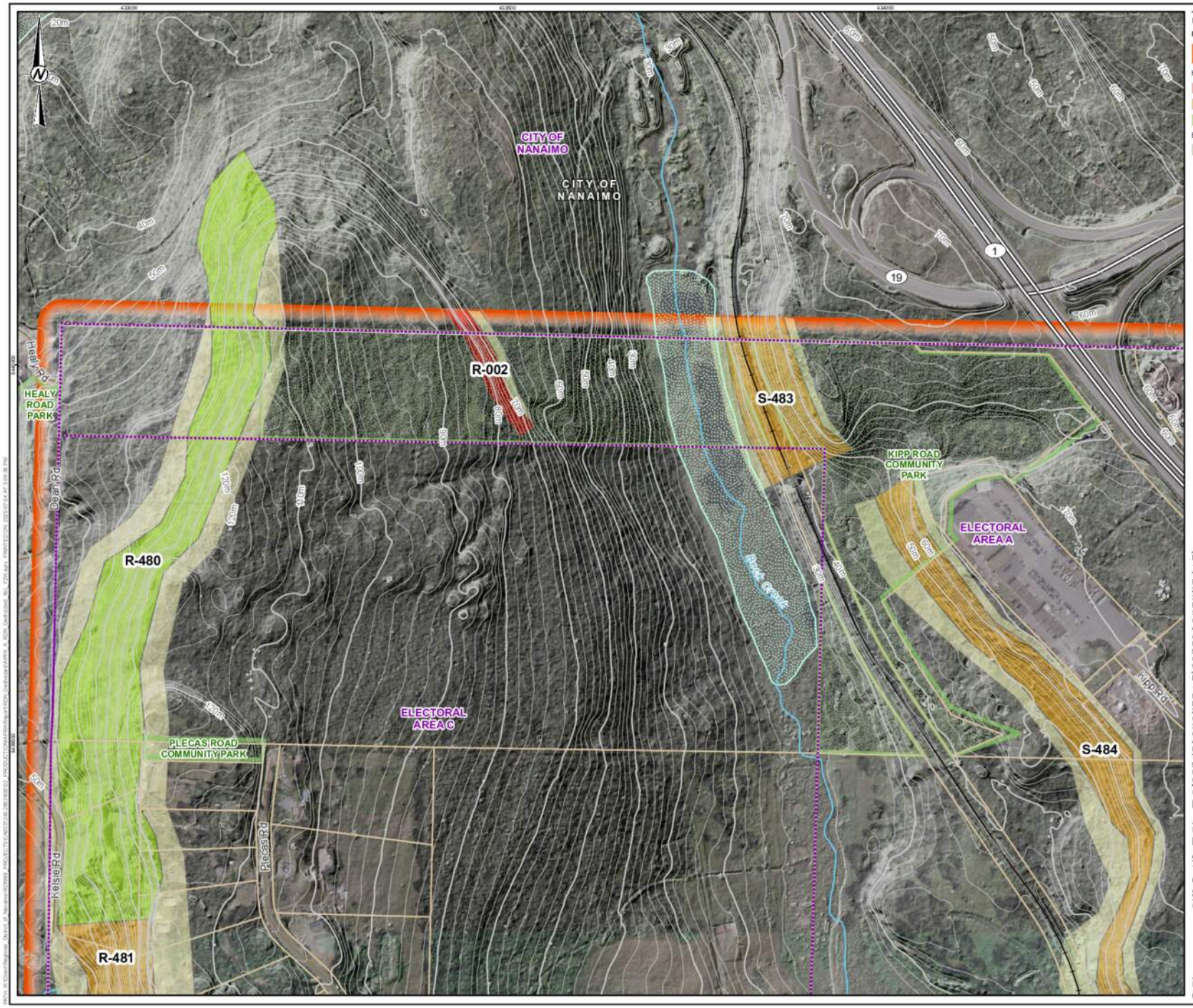
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I02



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- MUNICIPALITY
- RAILROAD
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
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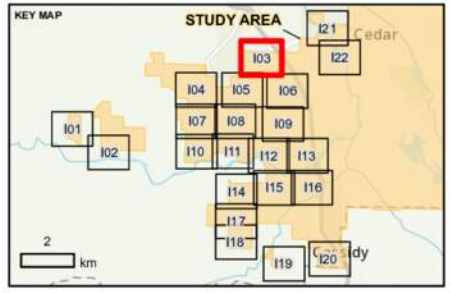

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TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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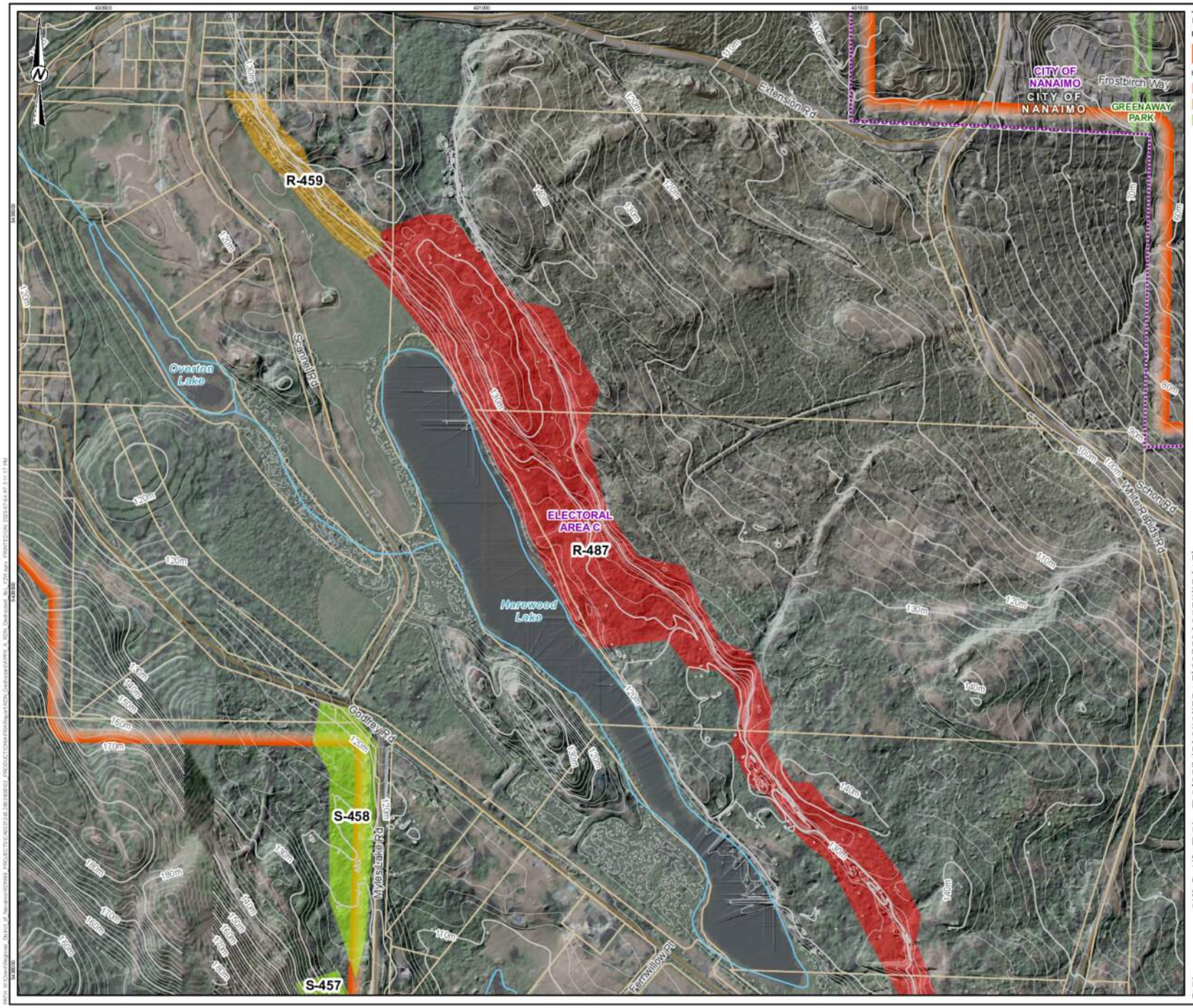
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I03



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- MUNICIPALITY
- WATERCOURSE
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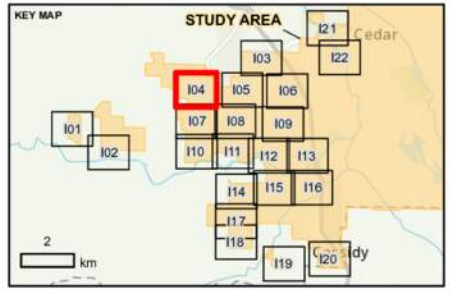

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

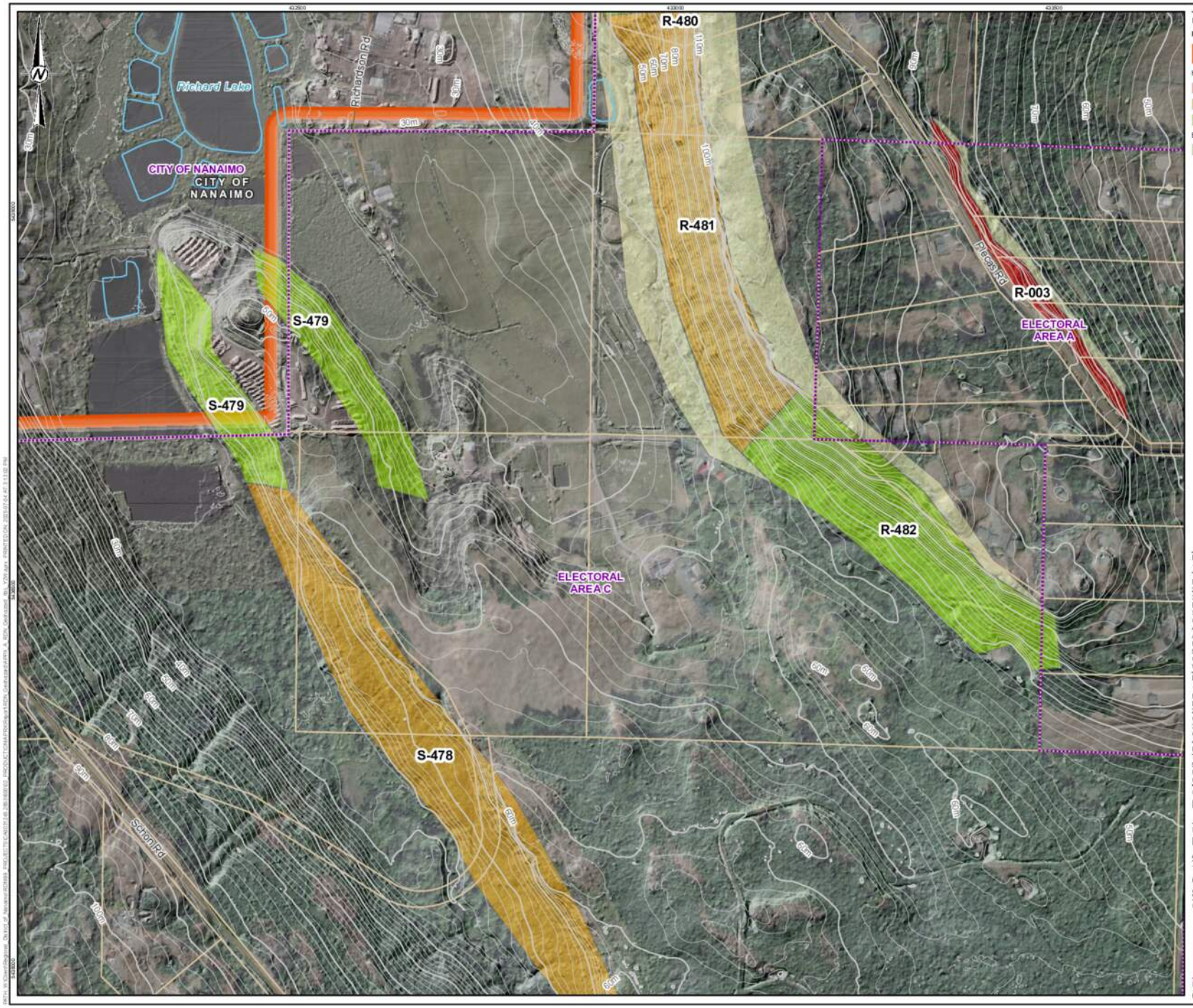
TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I04



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

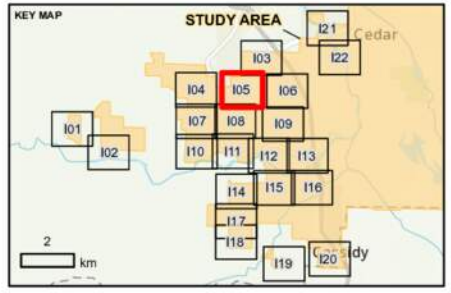
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- MUNICIPALITY
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
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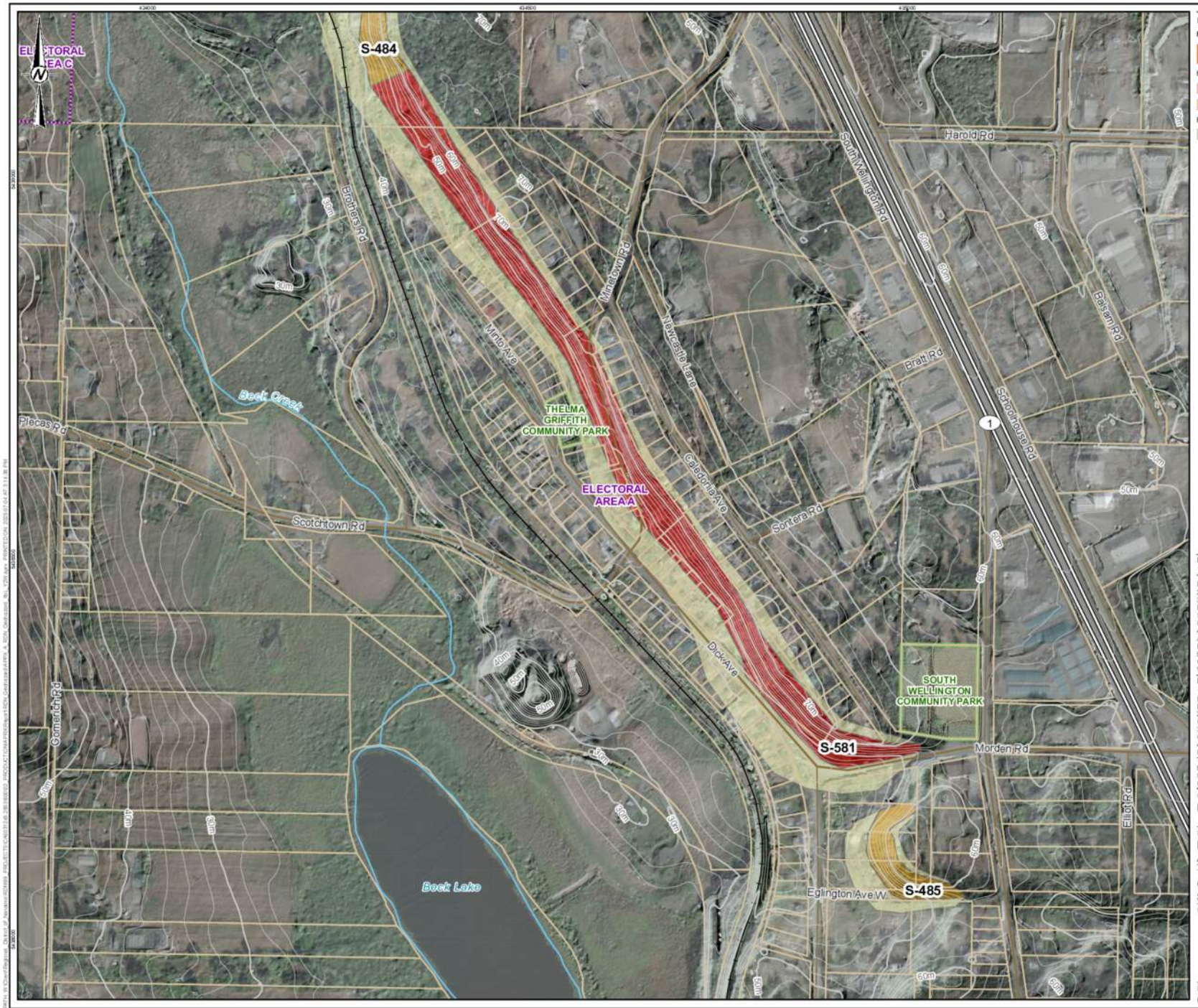
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I05



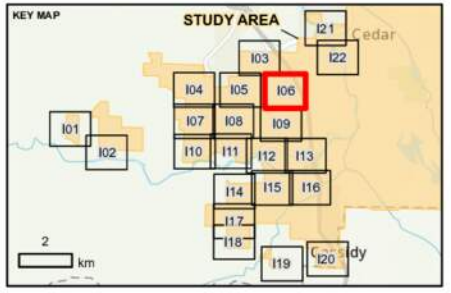
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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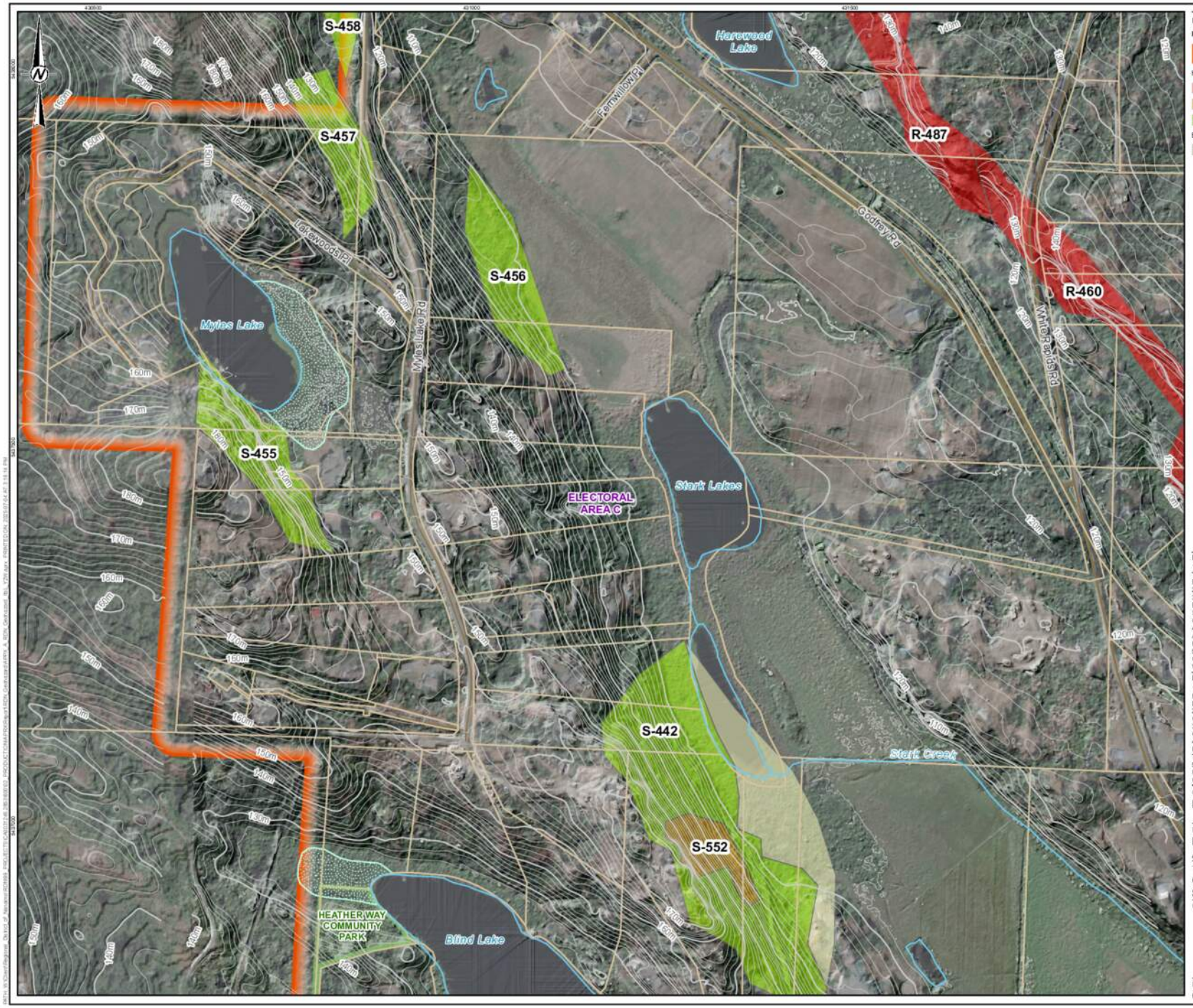
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I06



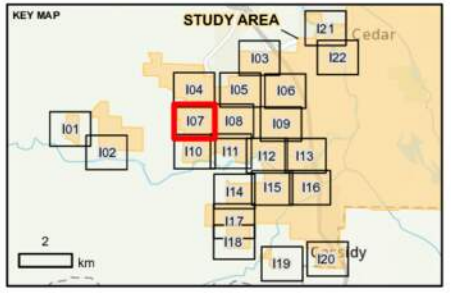
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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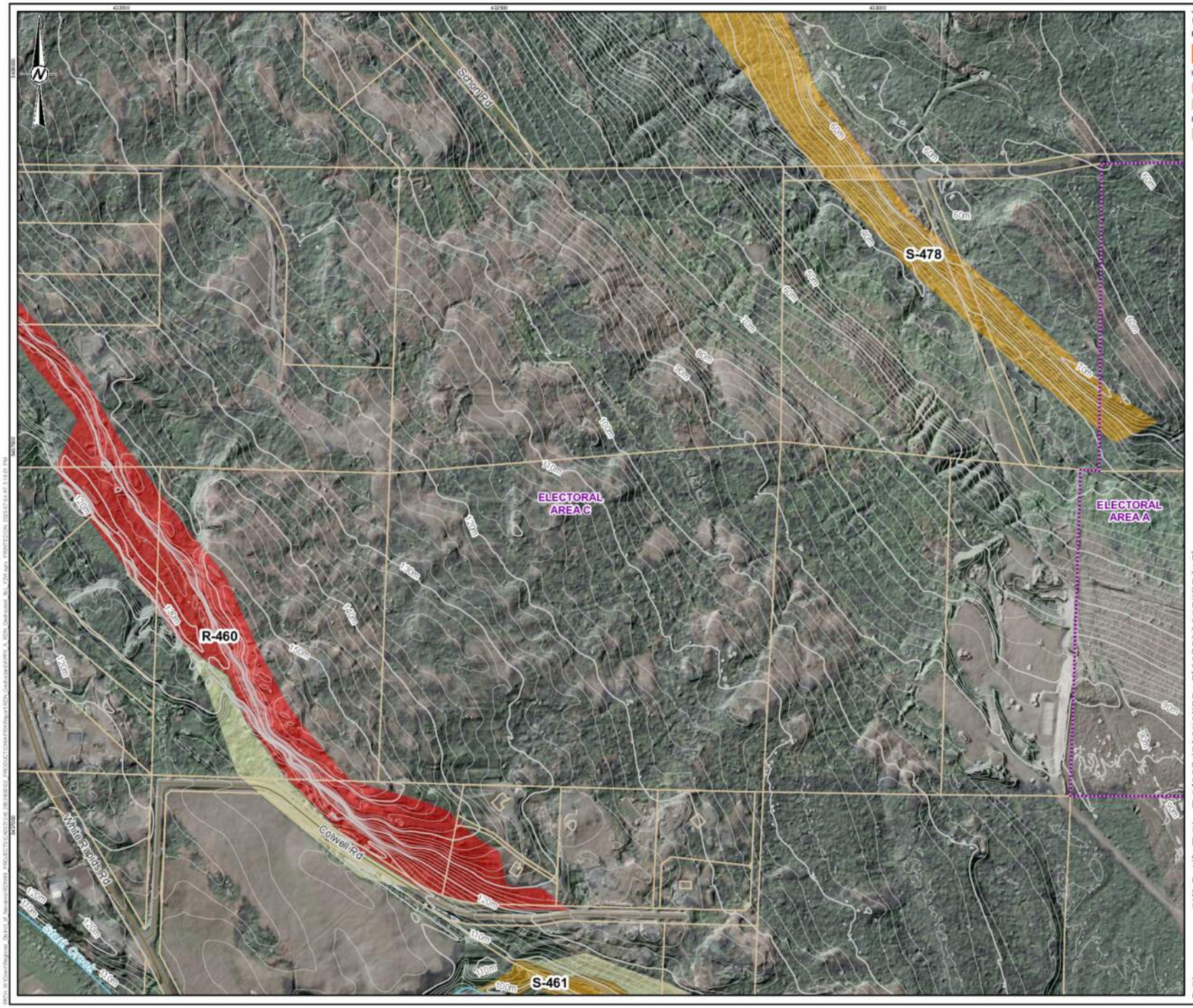
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I07



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
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- WATERCOURSE
- PARCEL
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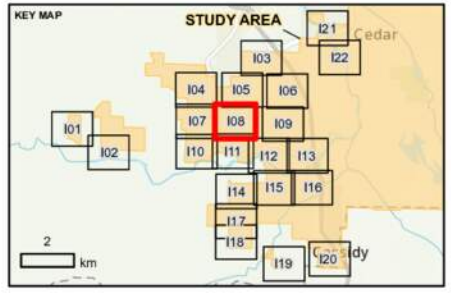

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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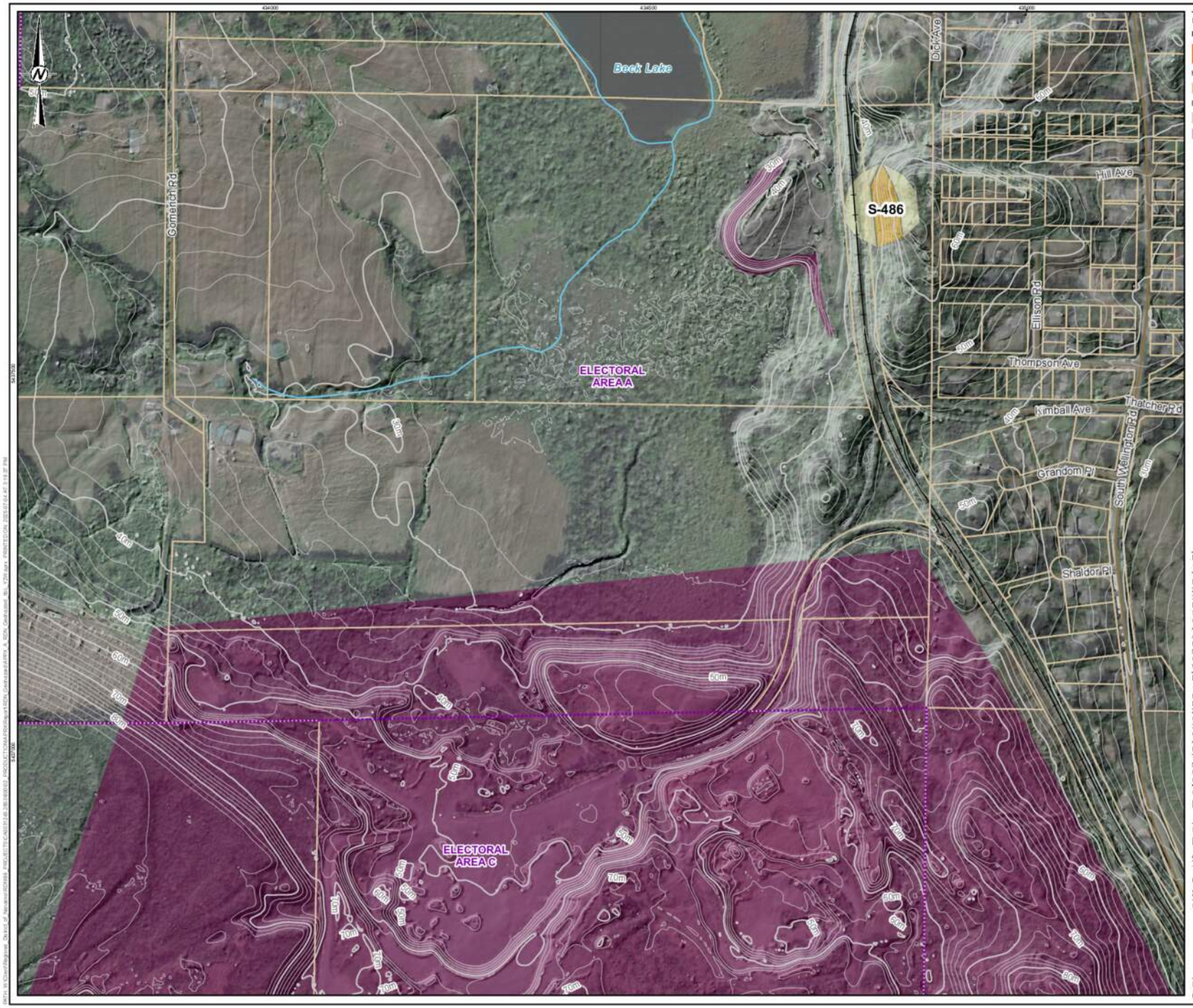
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I08



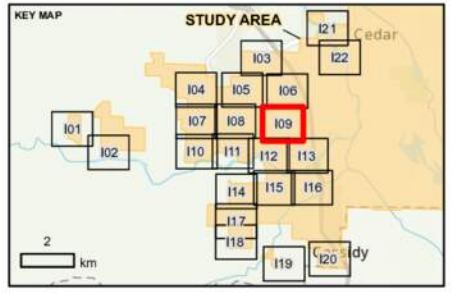
LEGEND

PROJECT DATA

- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)
  - UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
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APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I09

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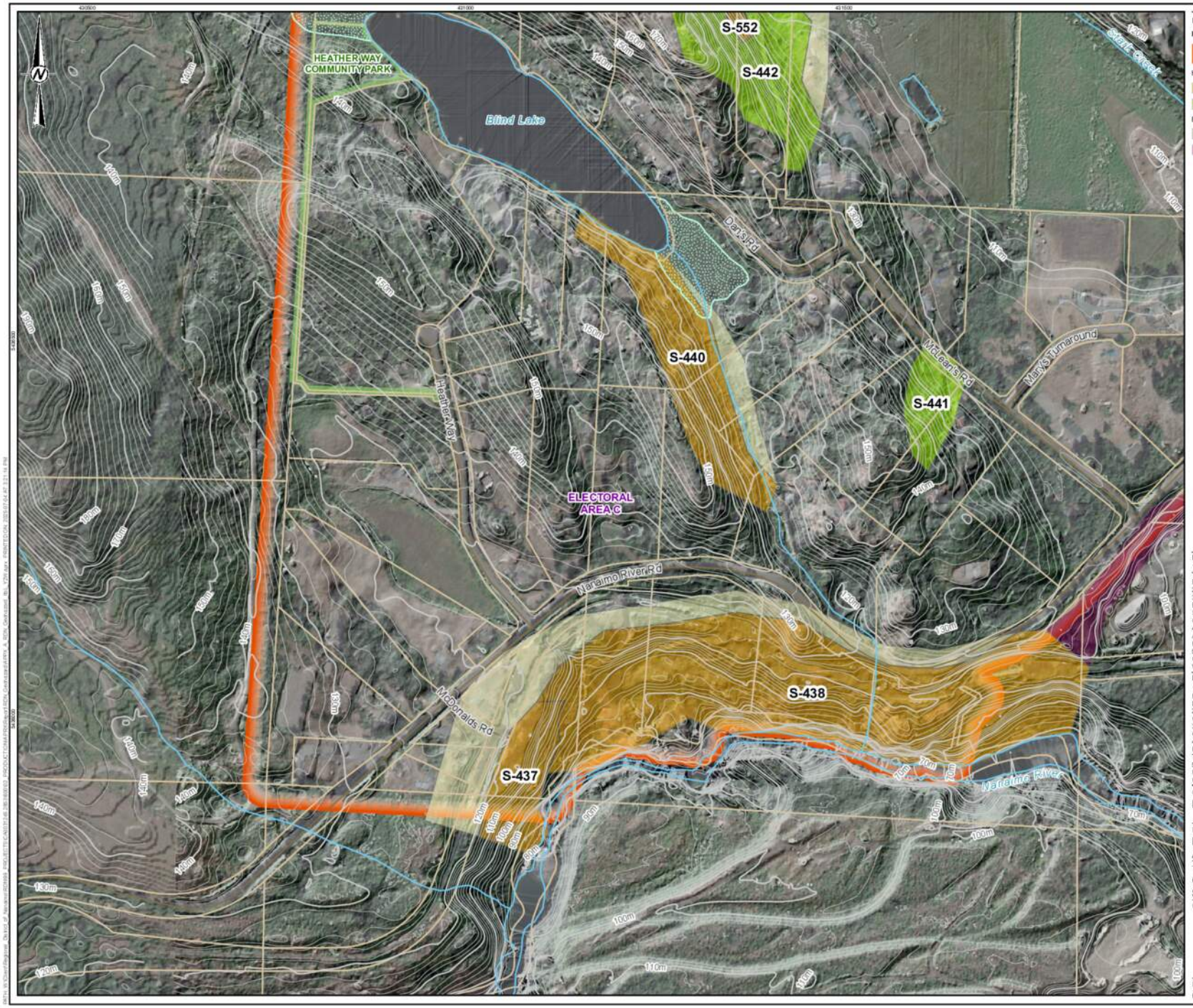

LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
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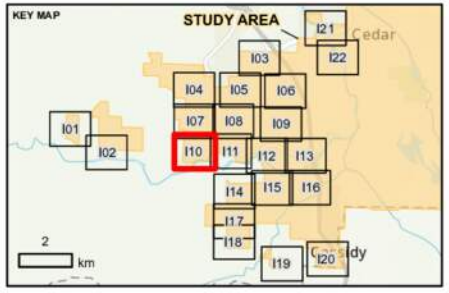

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
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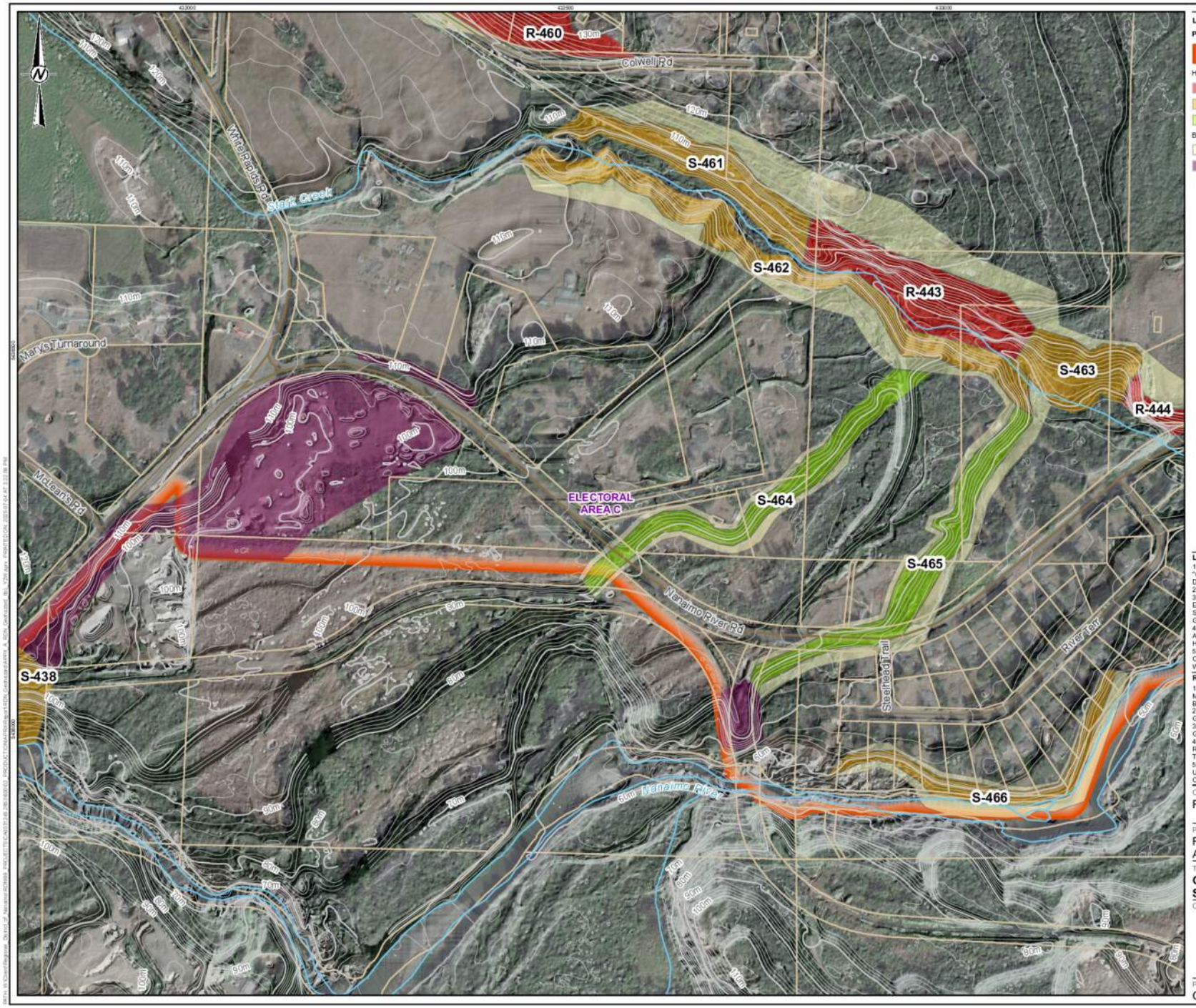


LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

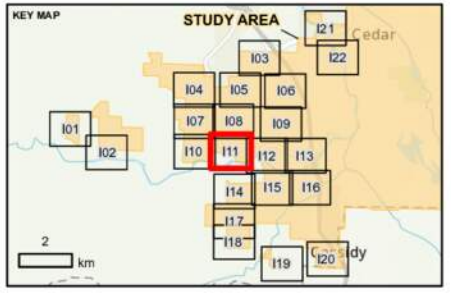
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



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METRES

LIMITATION(S)

1. THESE MAP SHEETS SHOULD BE REVIEWED TOGETHER WITH THE ACCOMPANYING REPORT TITLED "GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY: REGIONAL DISTRICT OF NANAIMO" (REV. 1 DATED JULY 2025).
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

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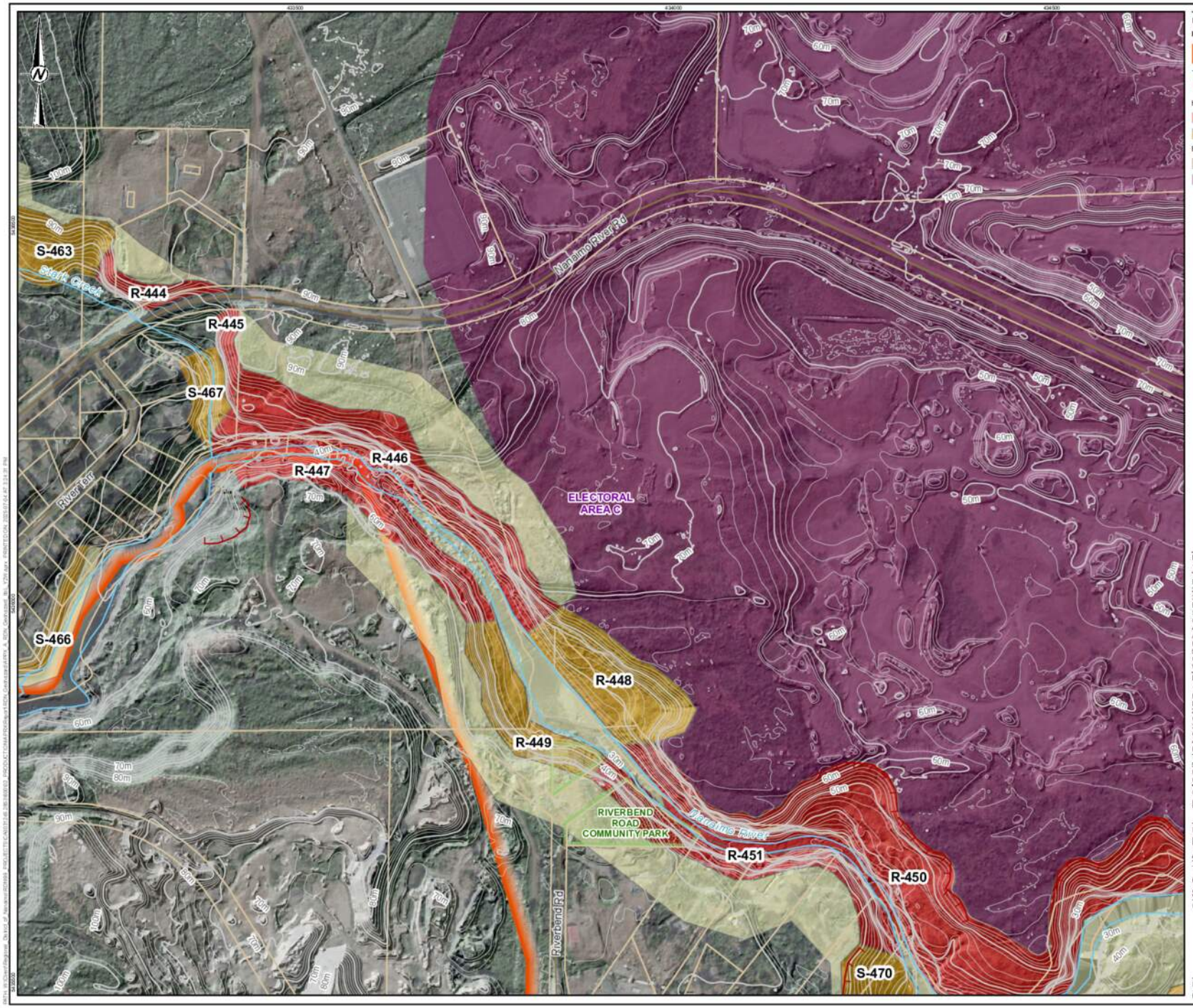

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
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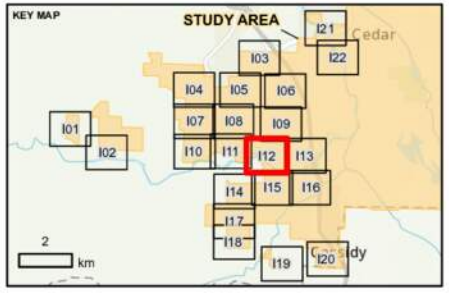
- ELECTORAL AREA



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TITLE
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SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

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PROJECT NO.	CONTROL	REV.	FIGURE
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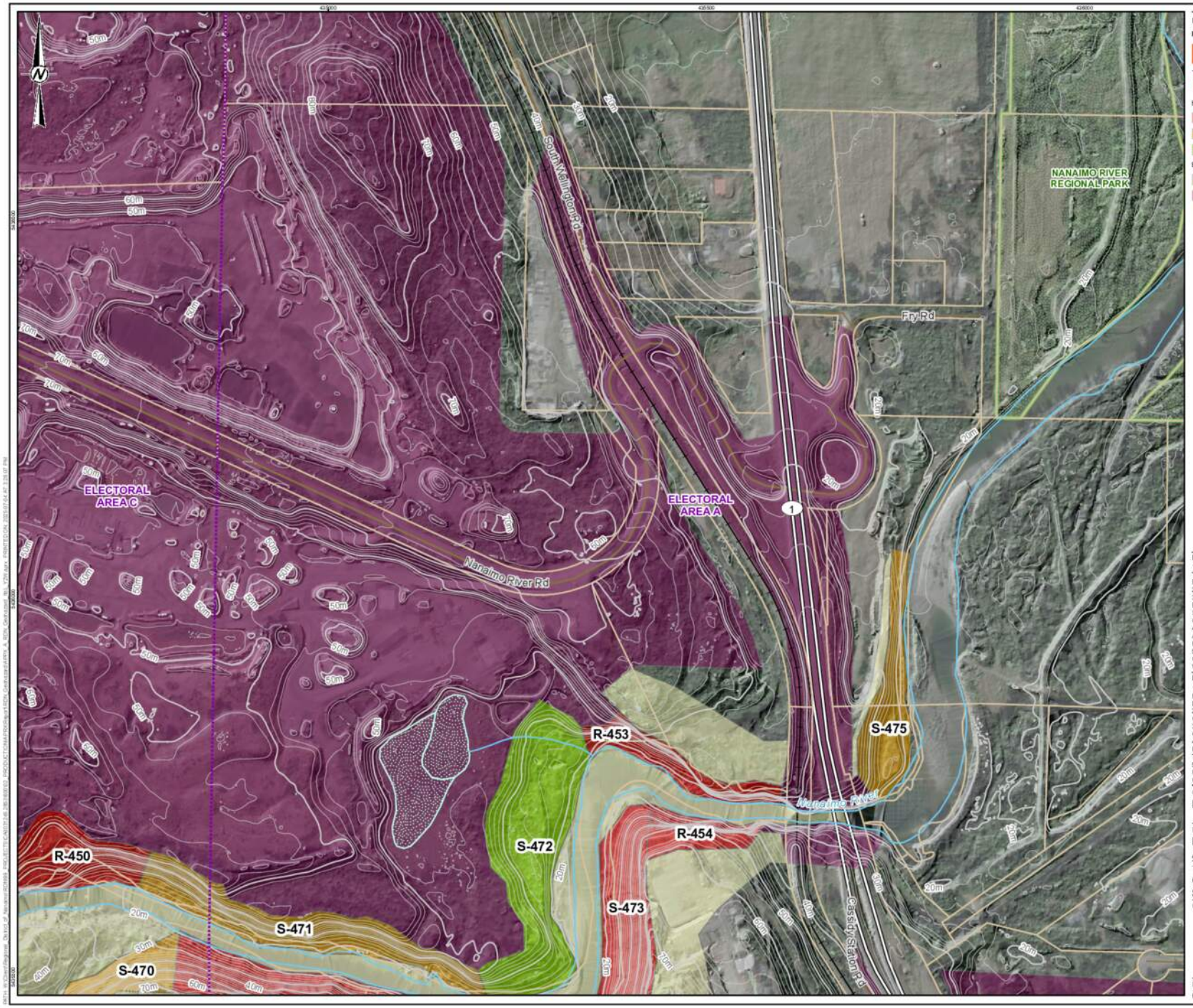

LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
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BUFFER ZONE
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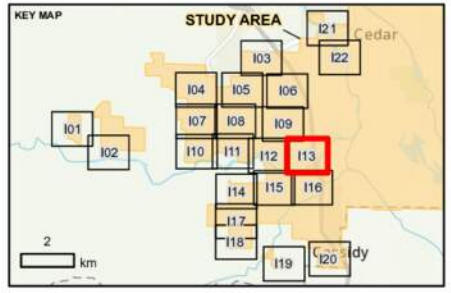

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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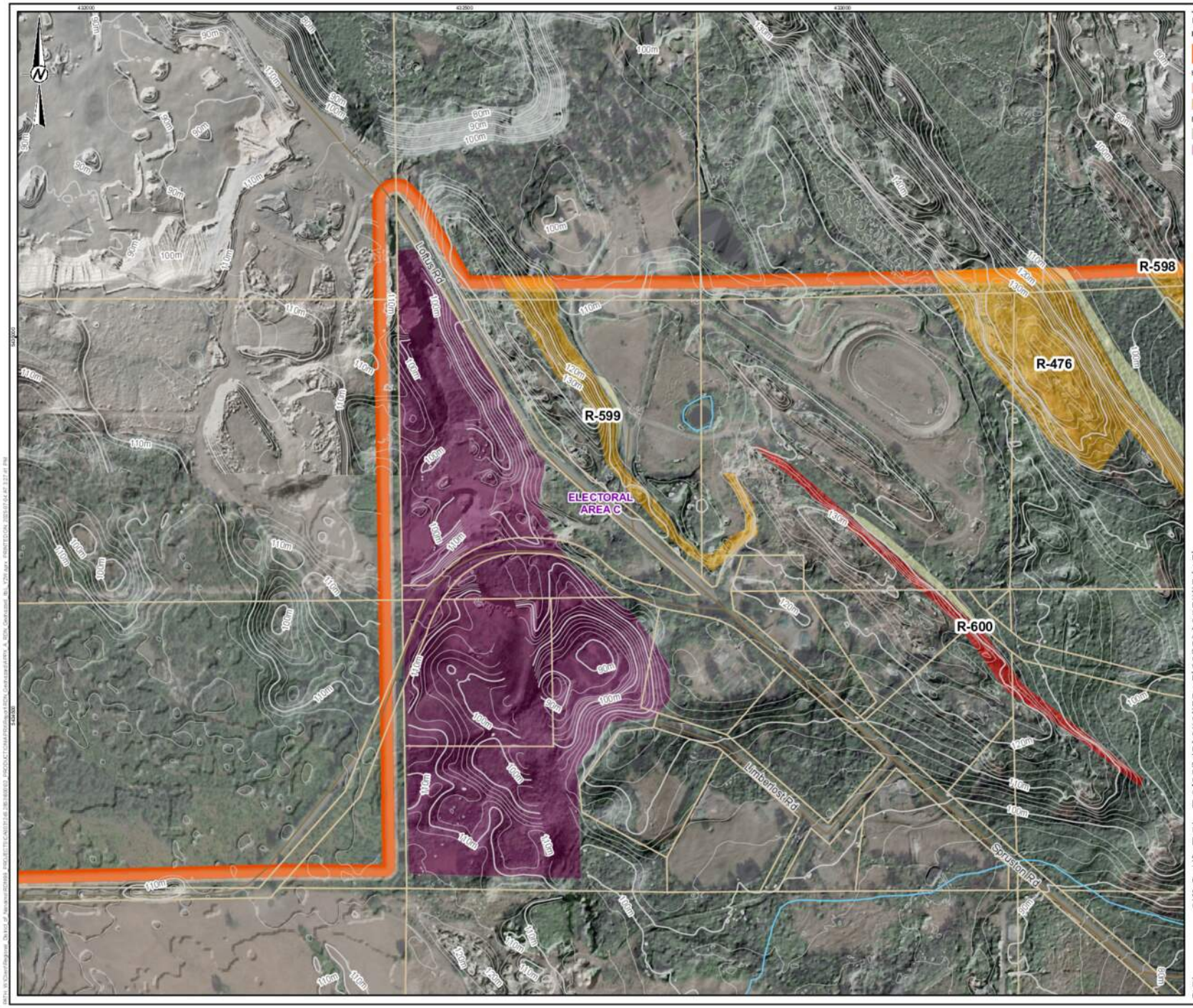
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I13



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - HIGH
  - MEDIUM
- BUFFER ZONE
  - BUFFER (CREST / TOE)
  - UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
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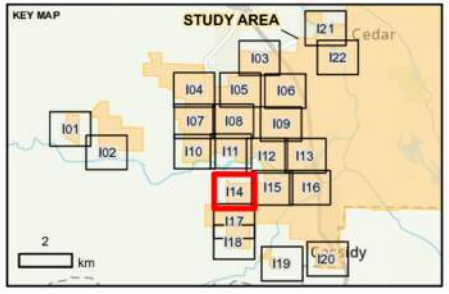
KEY MAP



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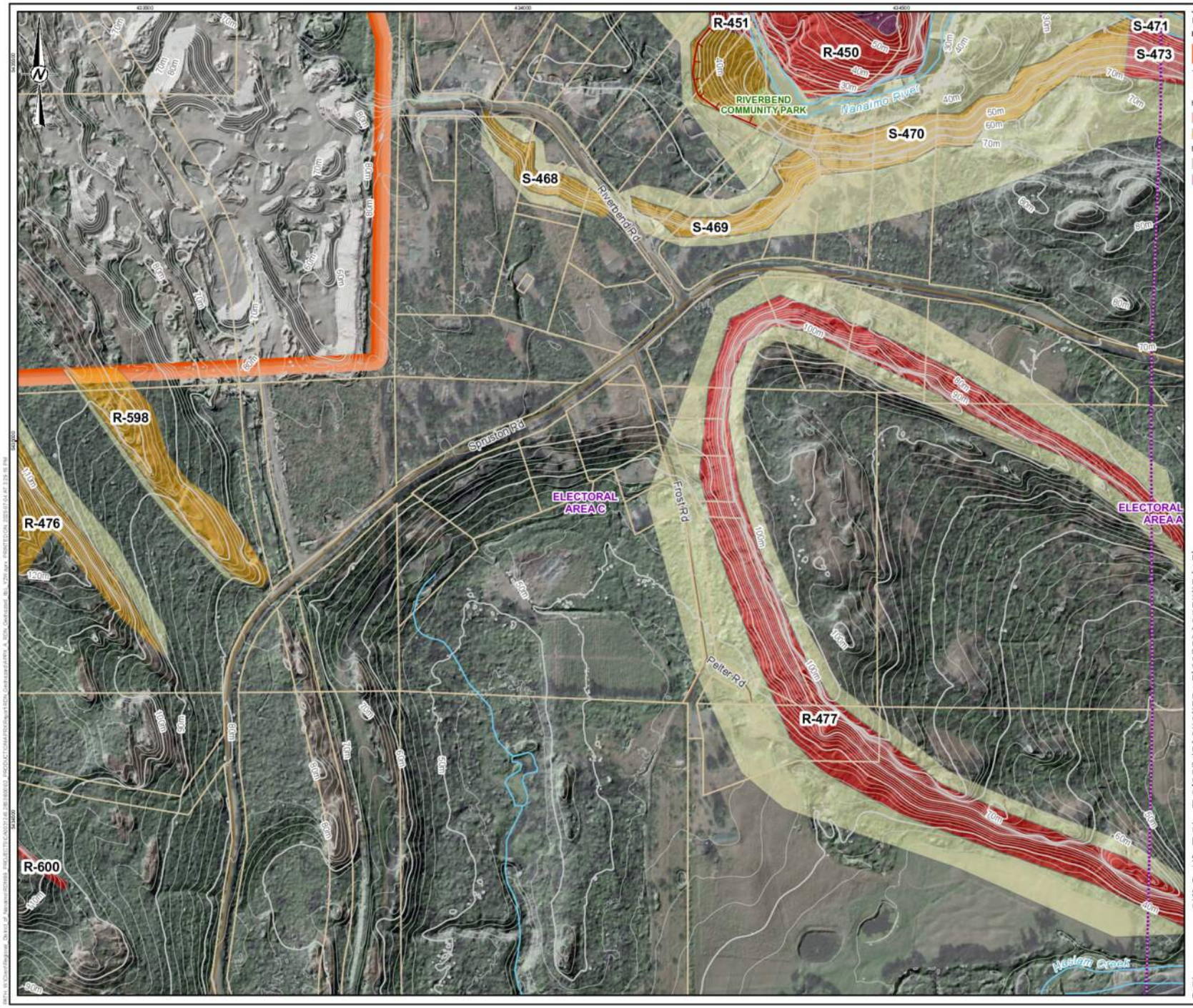
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I14



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PROJECT DATA
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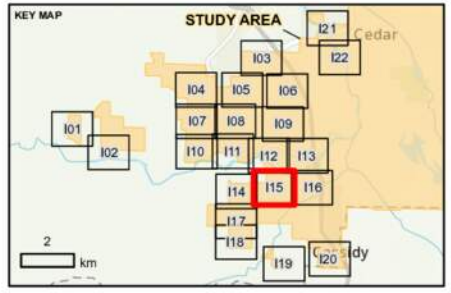

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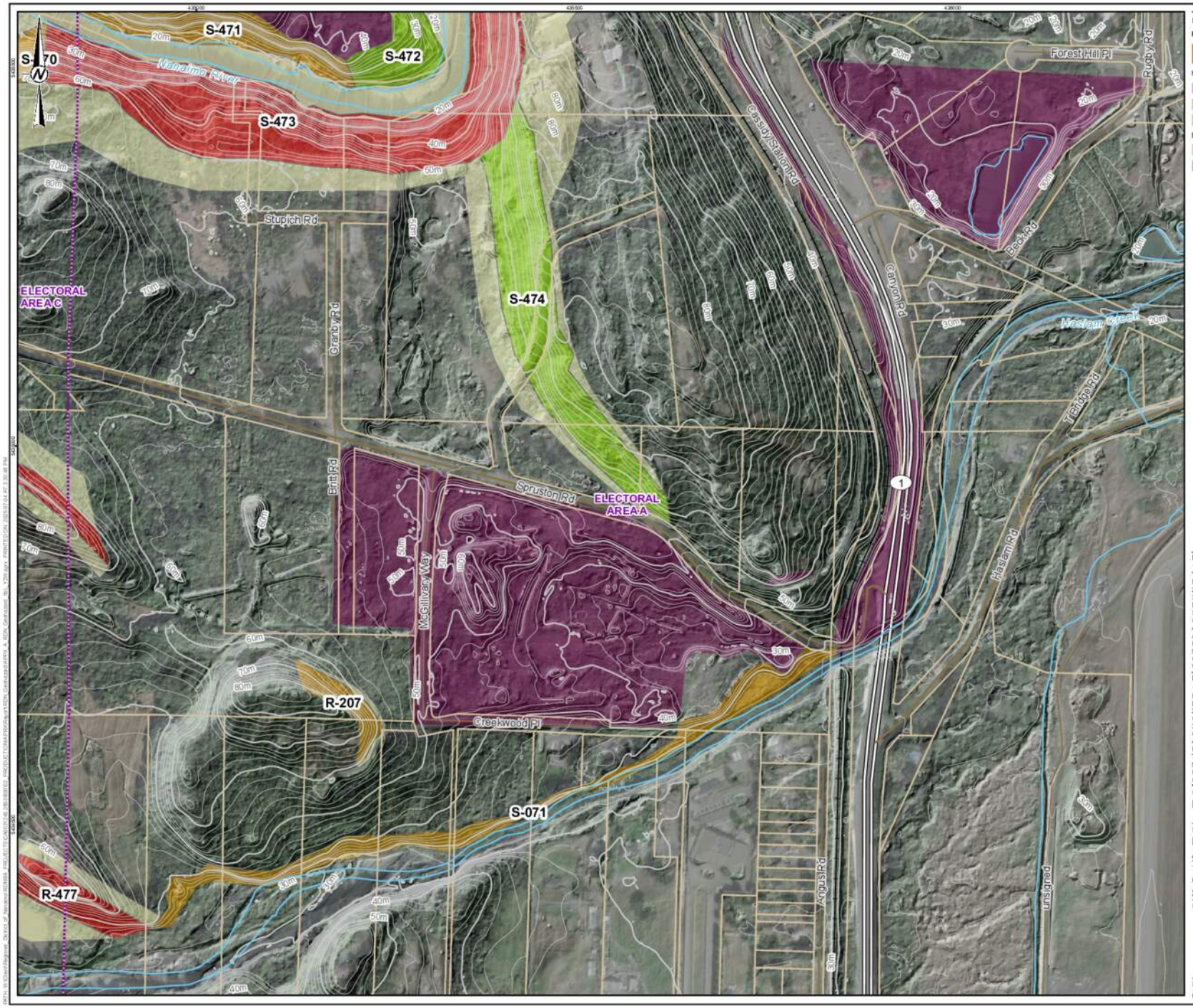
CA0031245.2853	600	1	I15



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
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BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
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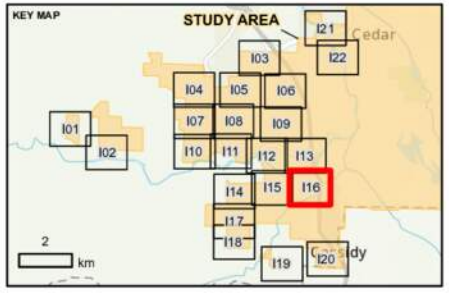

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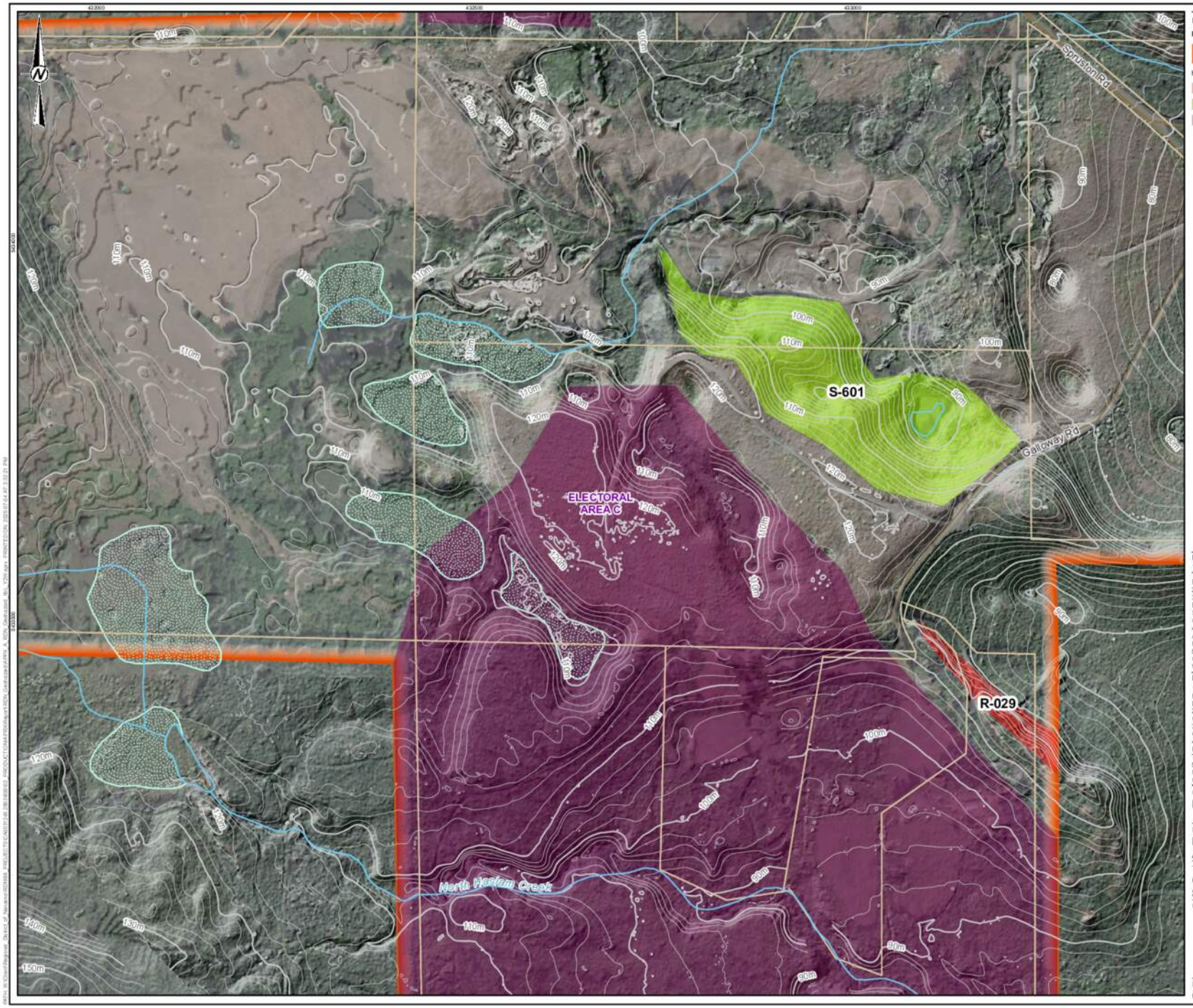

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- LOW
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
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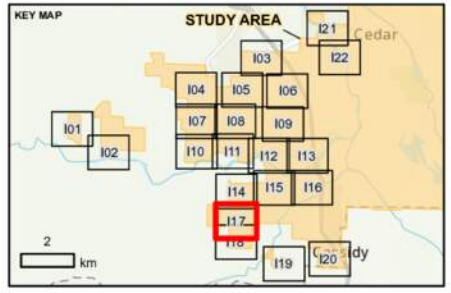

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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

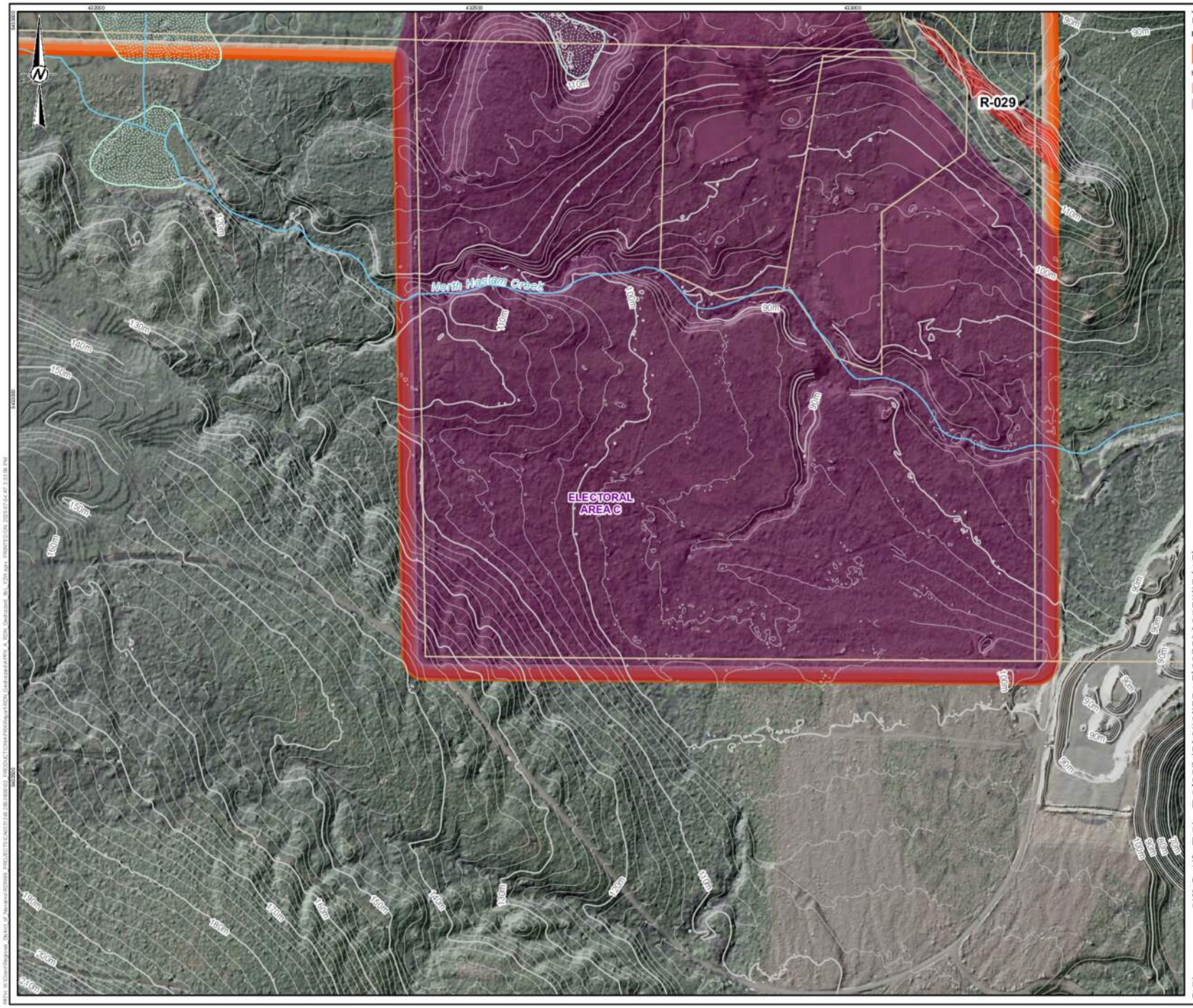
TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I17

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA

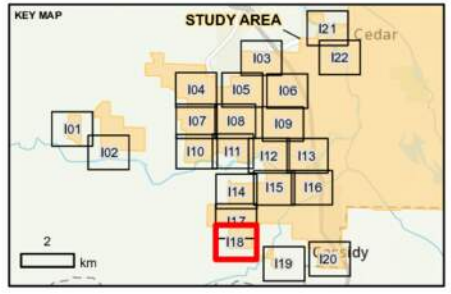
- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I18

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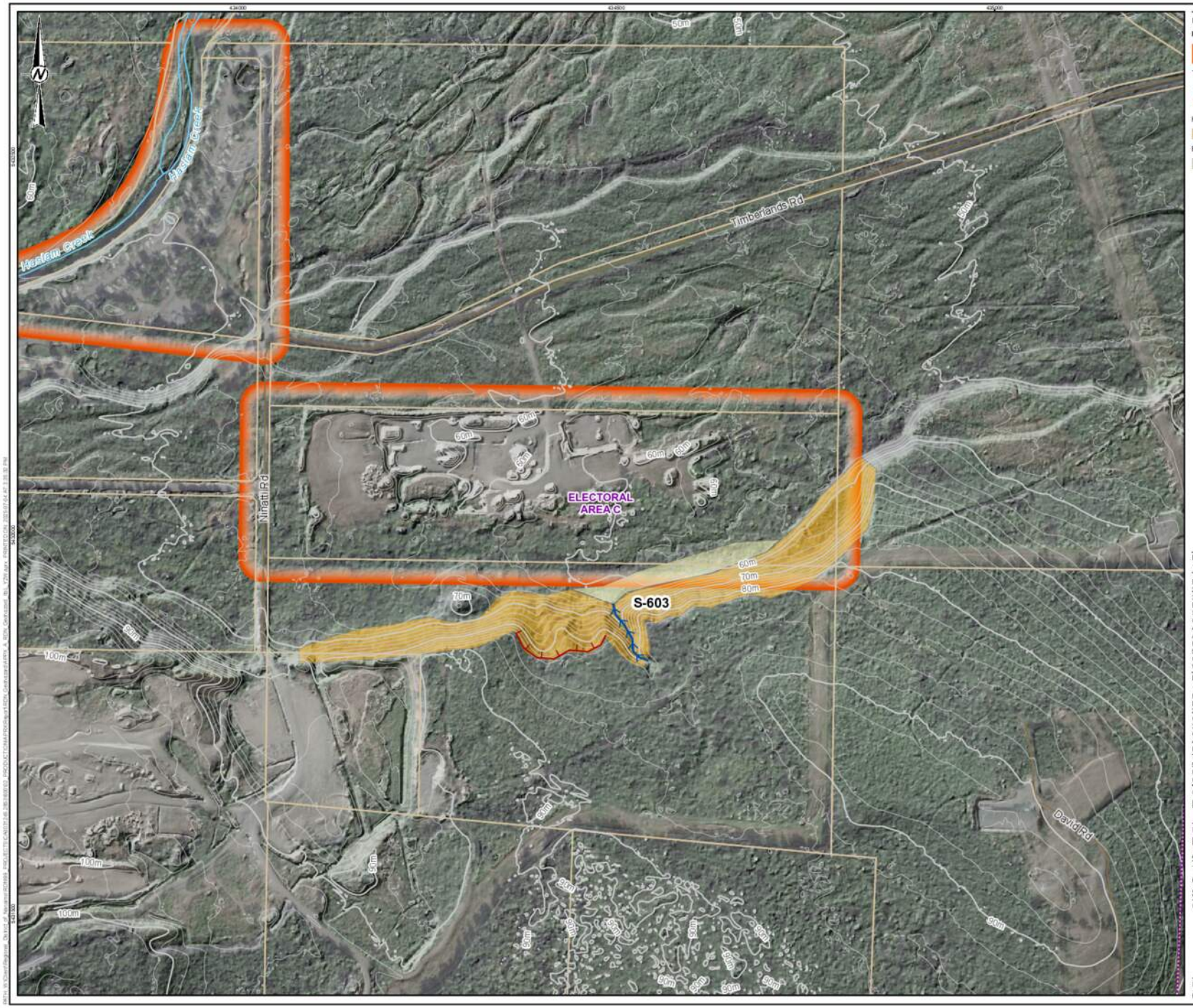


LEGEND

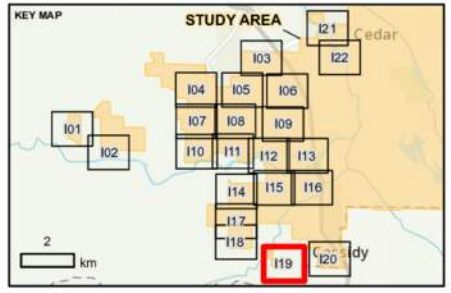
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

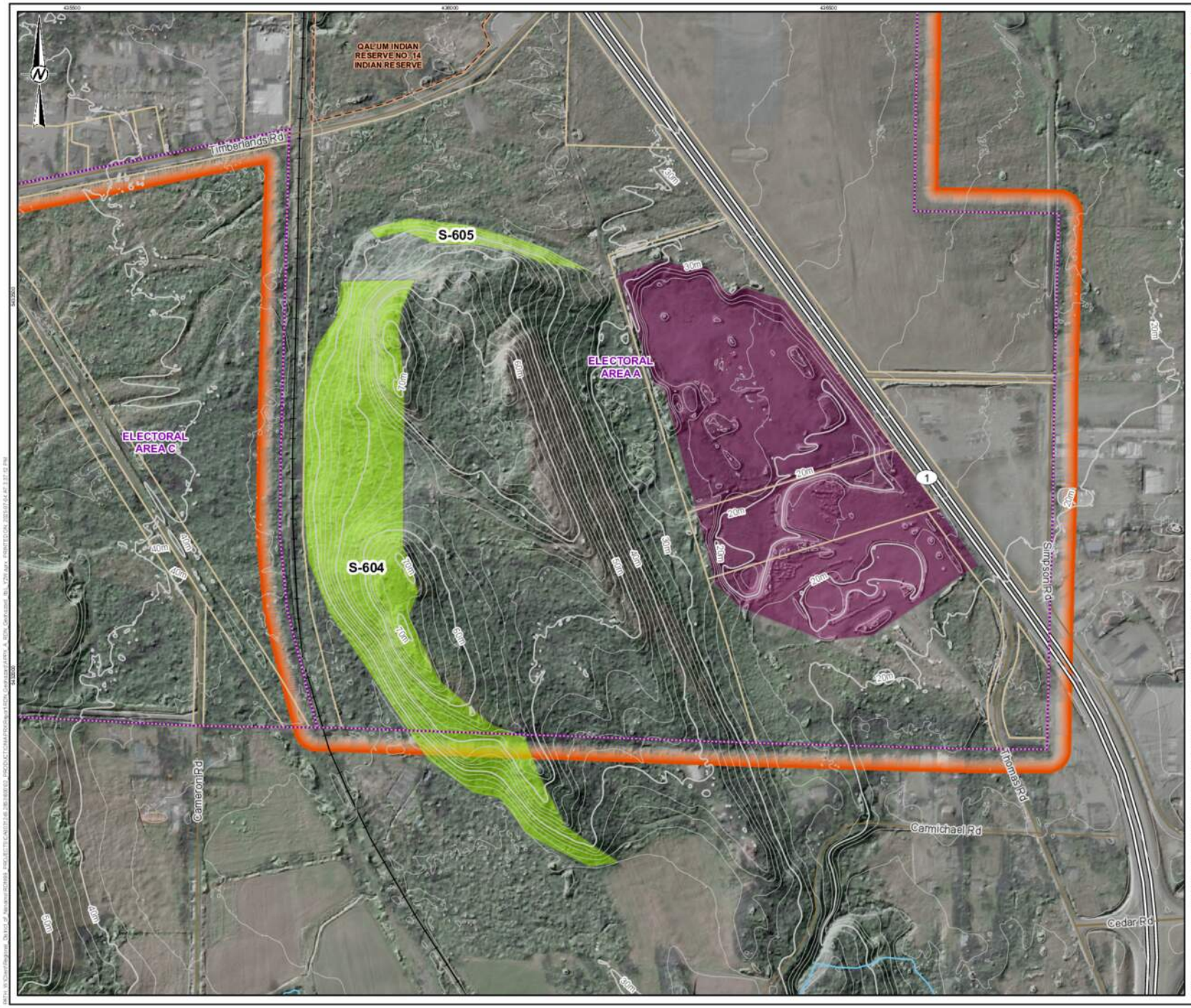
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I19



LEGEND

PROJECT DATA

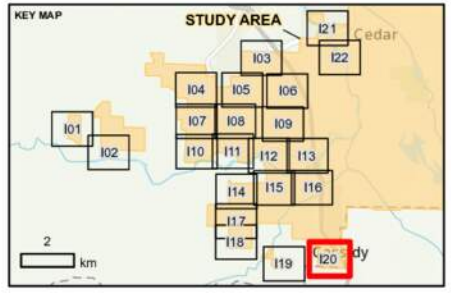
- STUDY AREA

HAZARD AREA (AOP)

- LOW
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- INDIAN RESERVE
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I20

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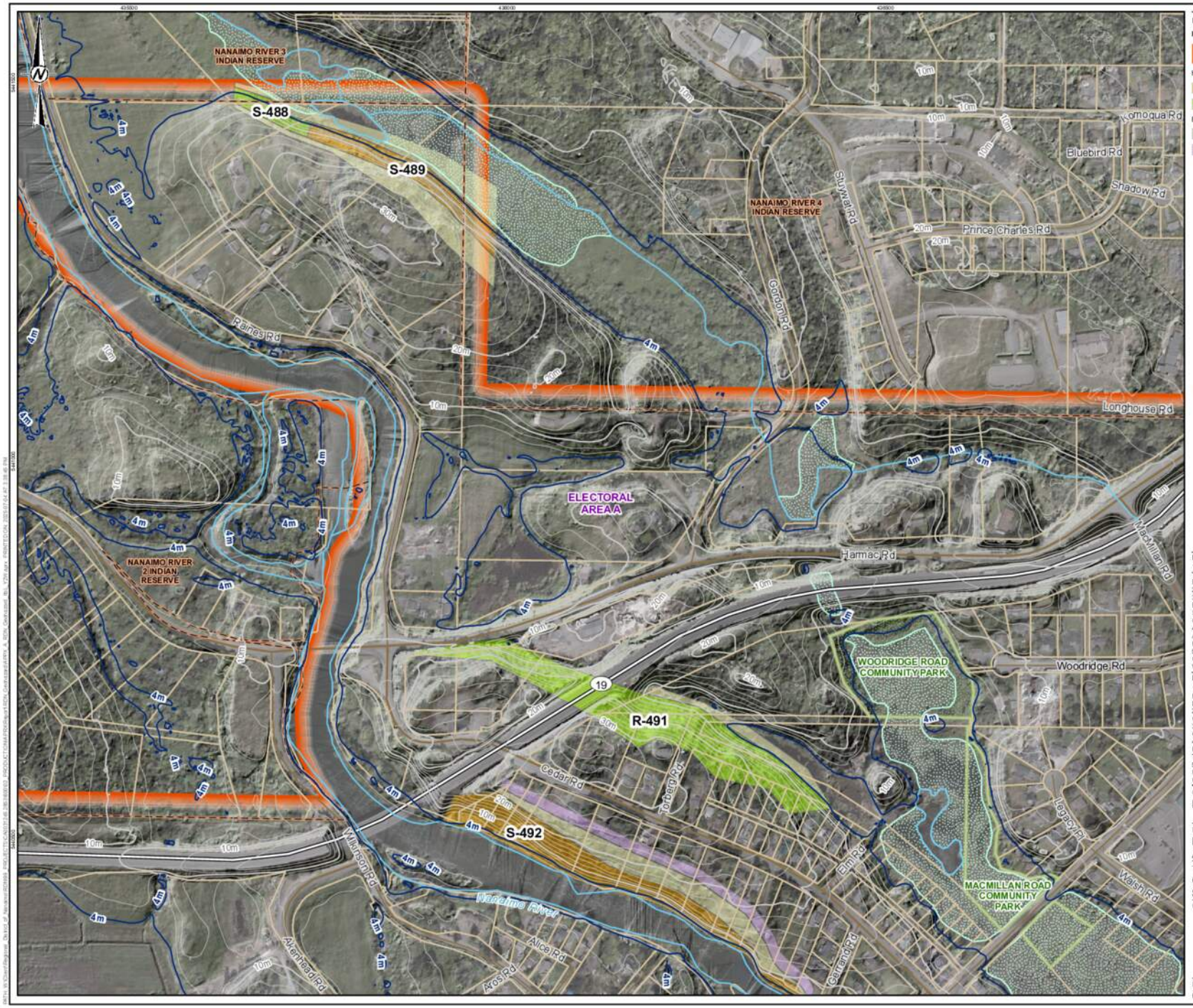

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- INDIAN RESERVE
- HIGHWAY
- ROAD - ARTERIAL / COLLECTOR
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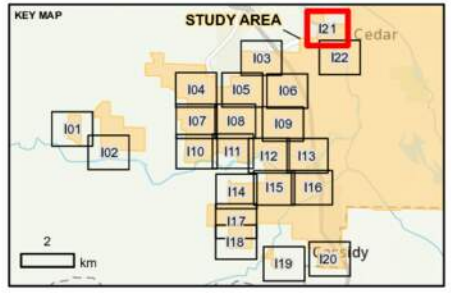

0 100 200

METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I21

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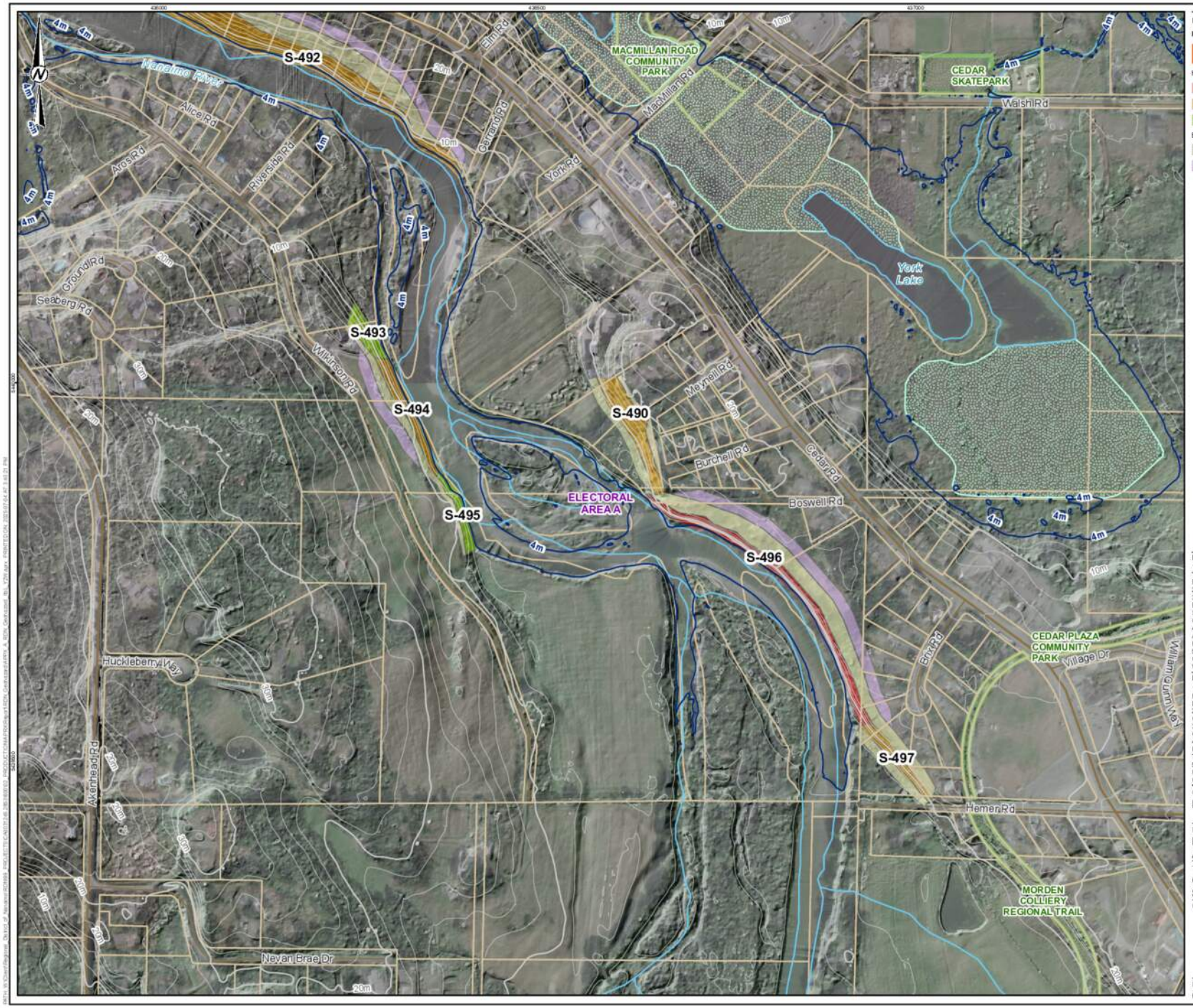

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
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- LOCAL AND REGIONAL GREENSPACE
- PARCEL
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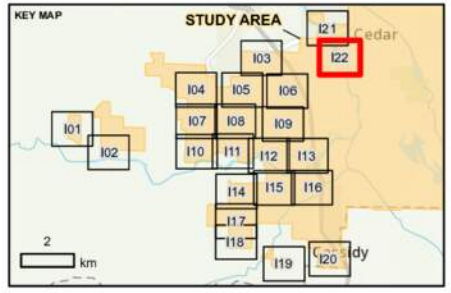
KEY MAP



0 100 200
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

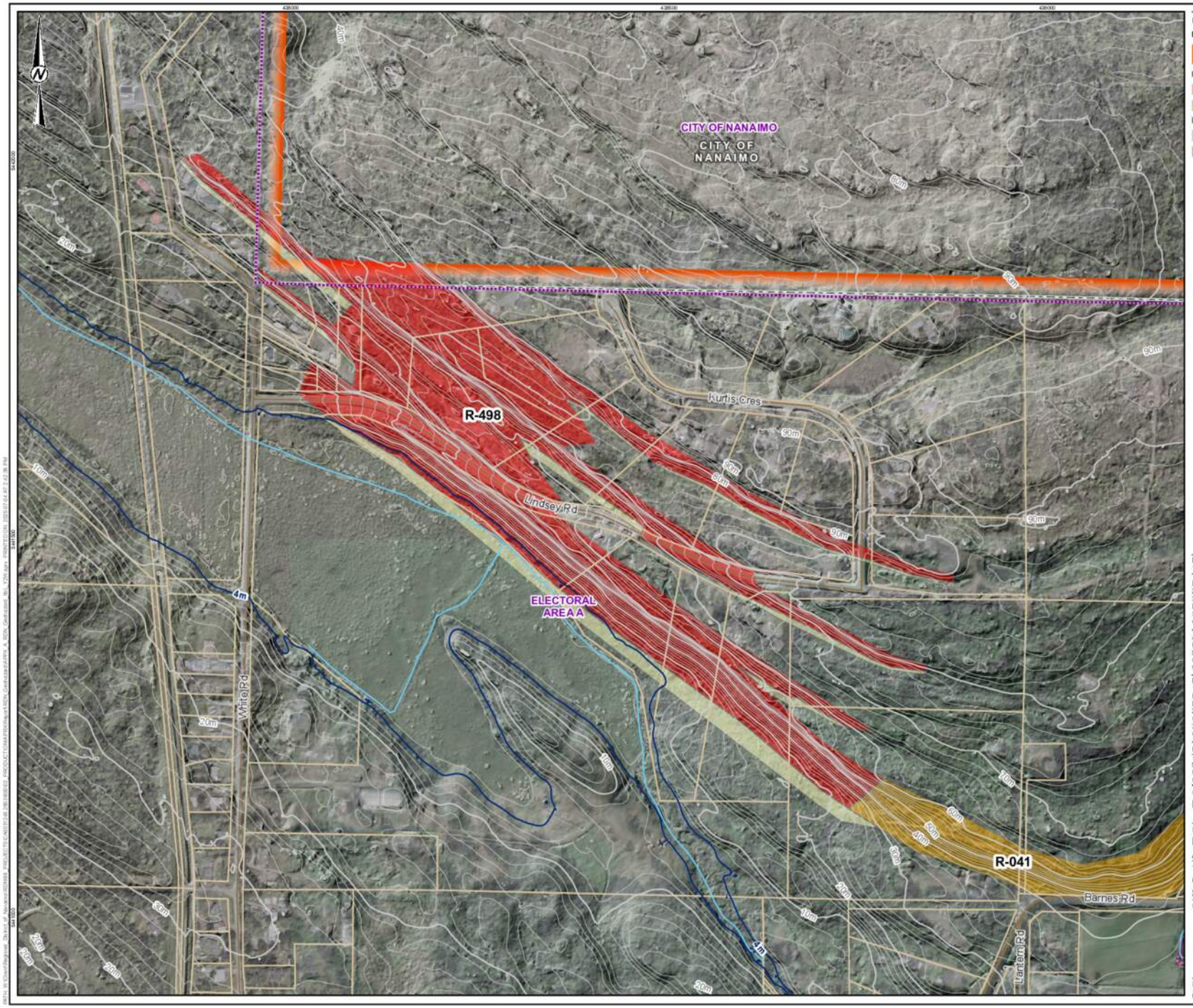
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION I - NANAIMO RIVER AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	I22



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
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- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
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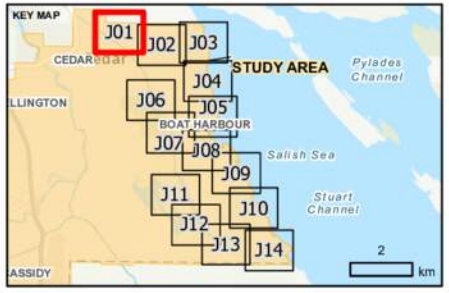

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

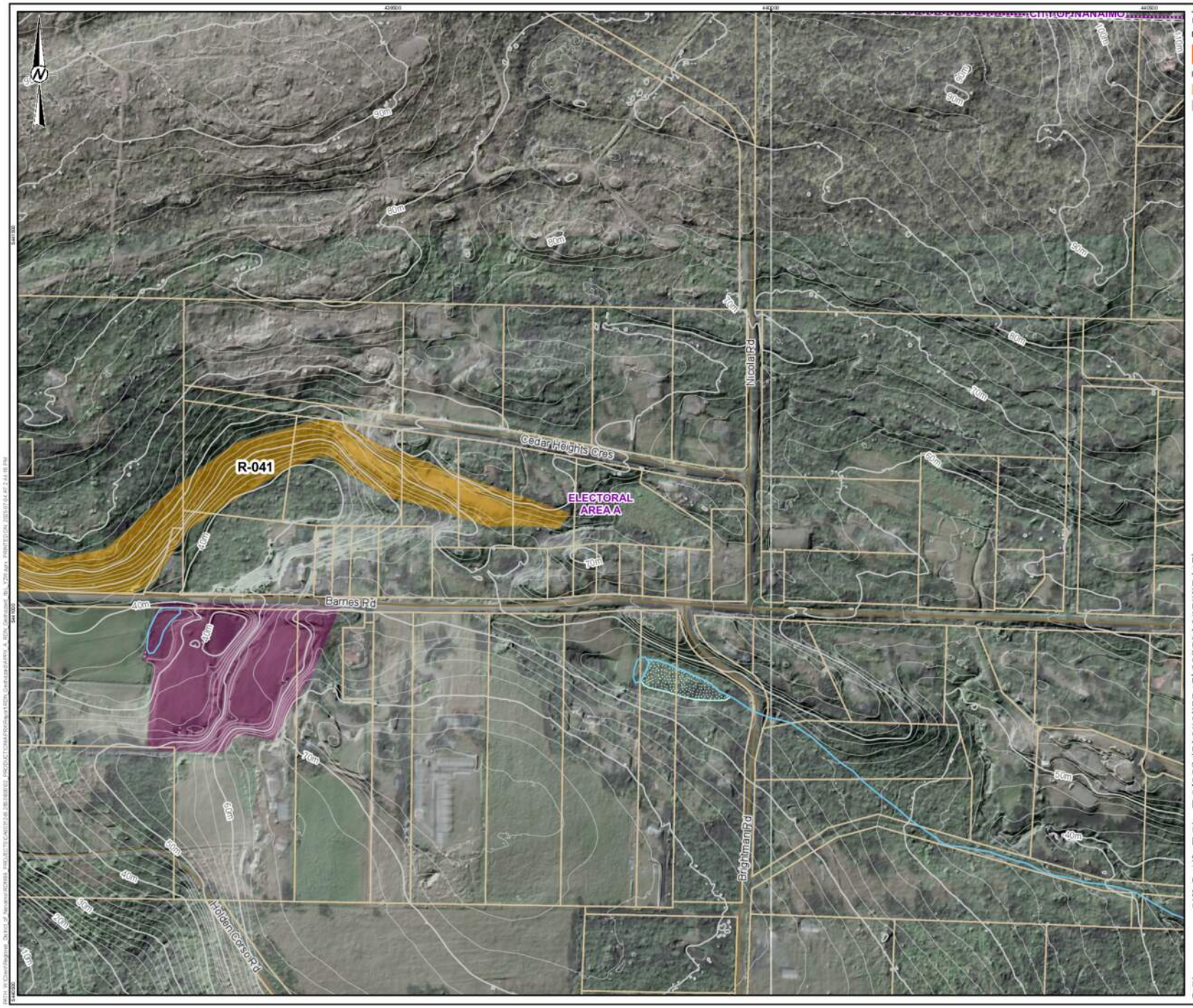
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J01



LEGEND

PROJECT DATA

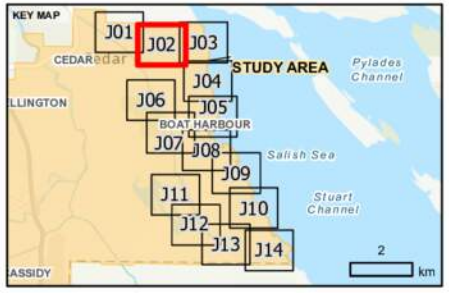
- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
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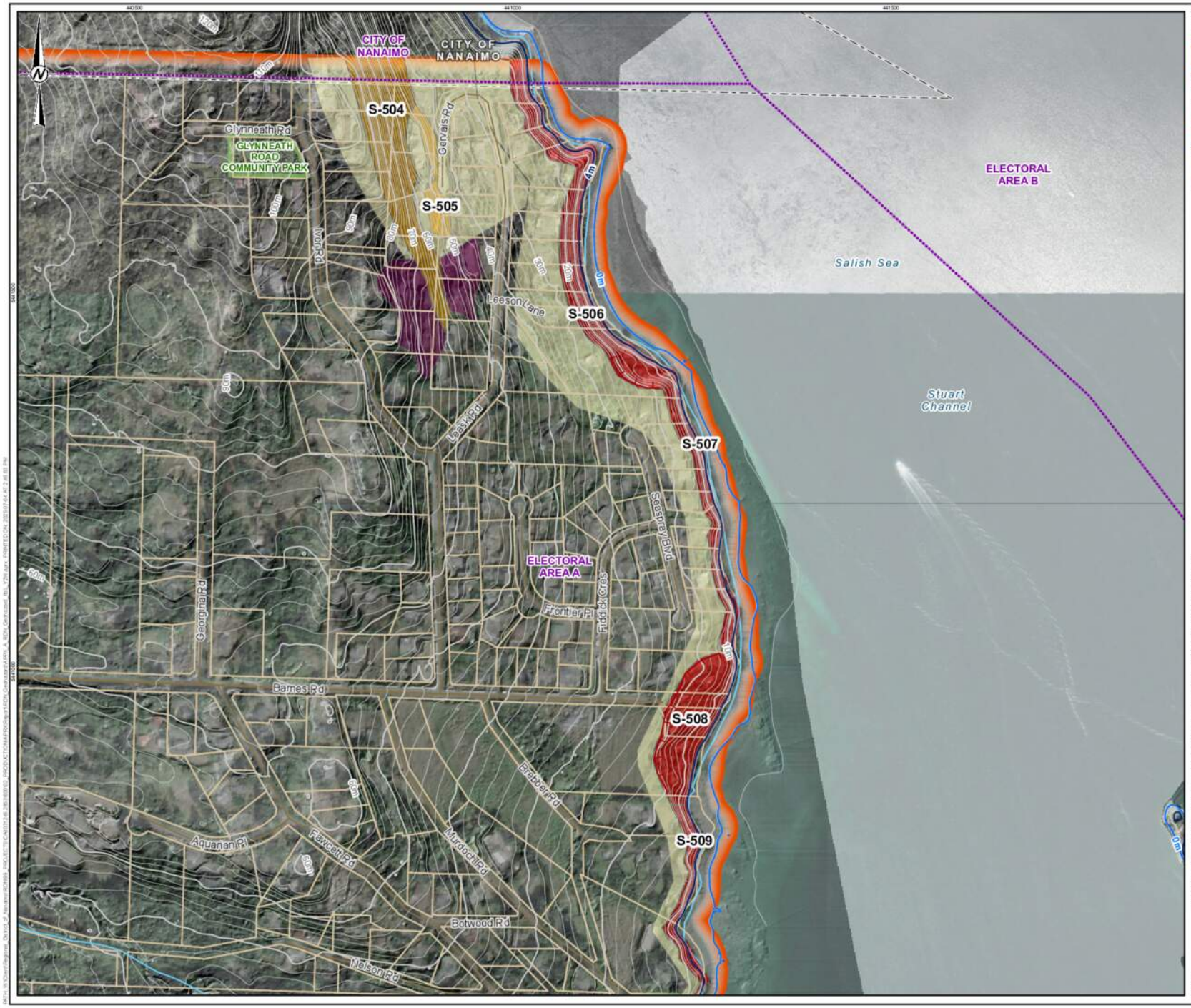
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J02



LEGEND

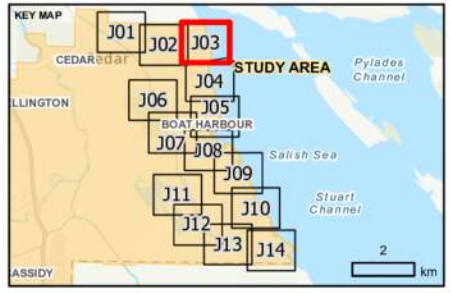
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- MUNICIPALITY
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

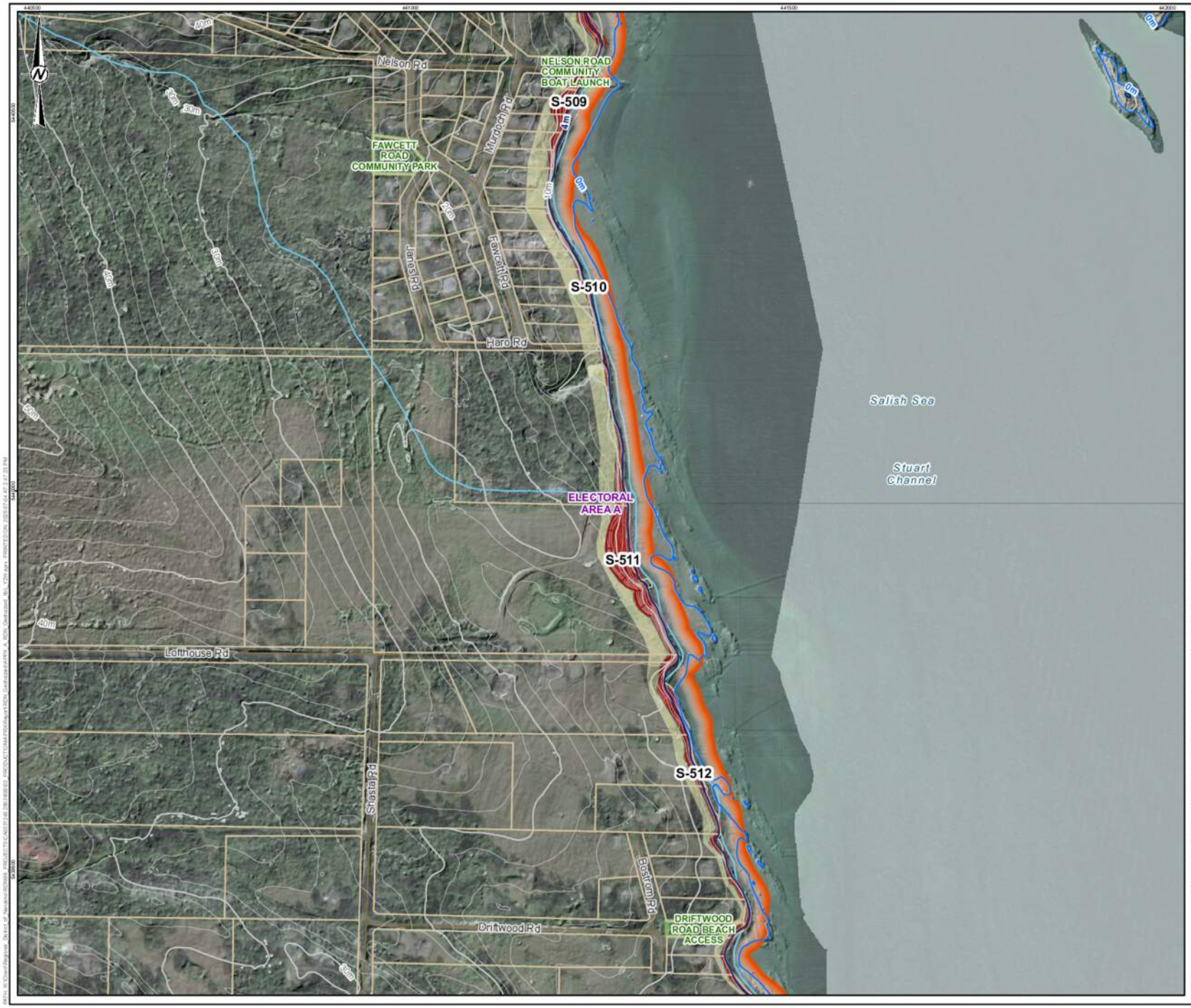
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J03



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- SCARP

HAZARD AREA (AOP)

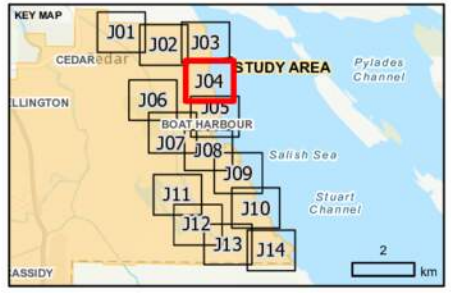
- HIGH

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - LOCAL
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

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REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
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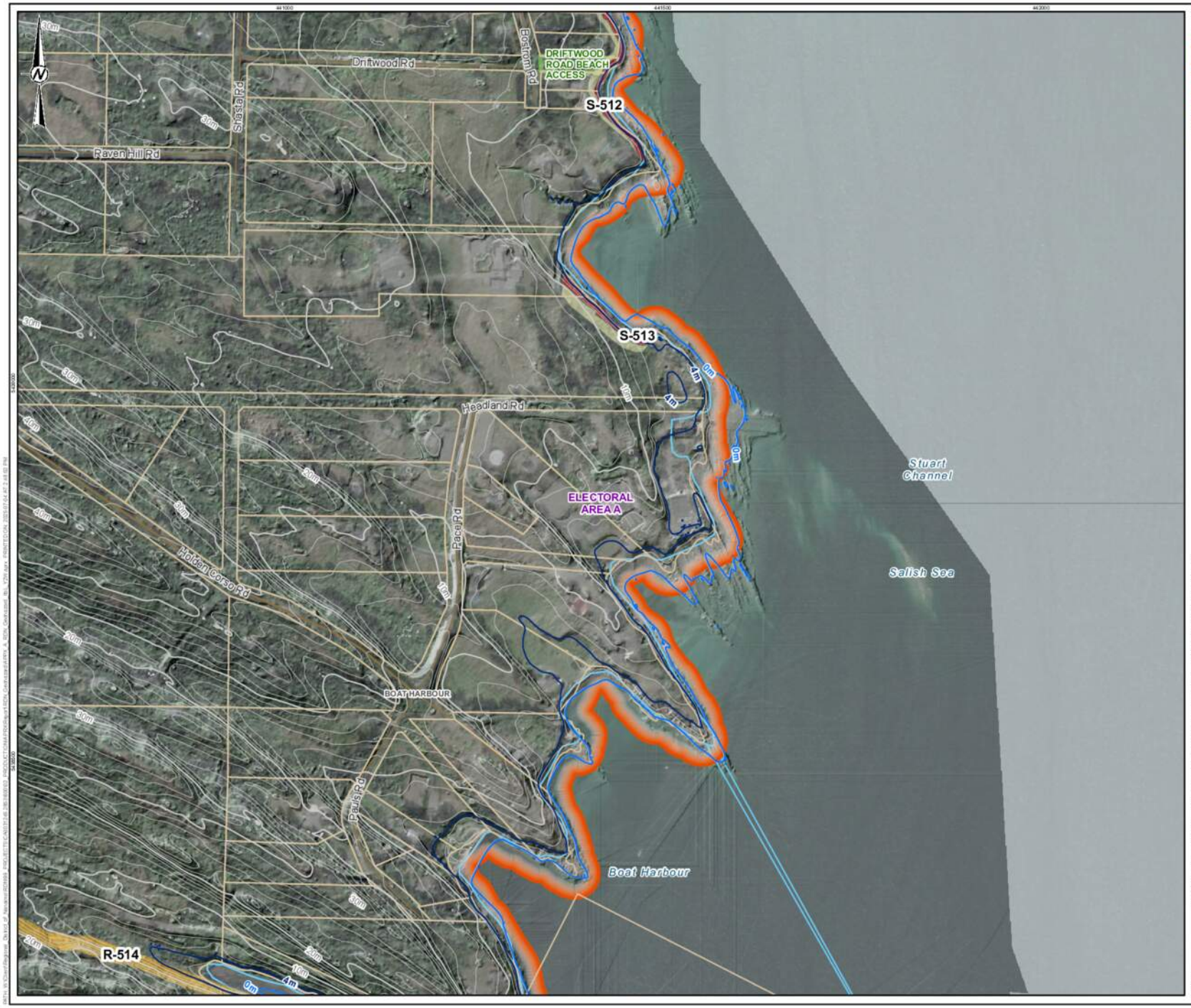
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J04



LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
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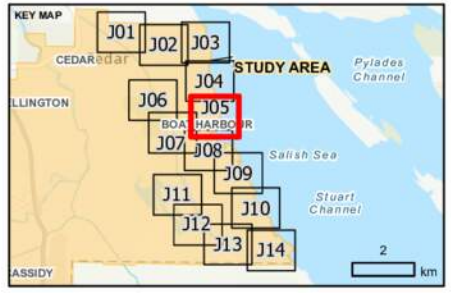

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REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
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PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J05

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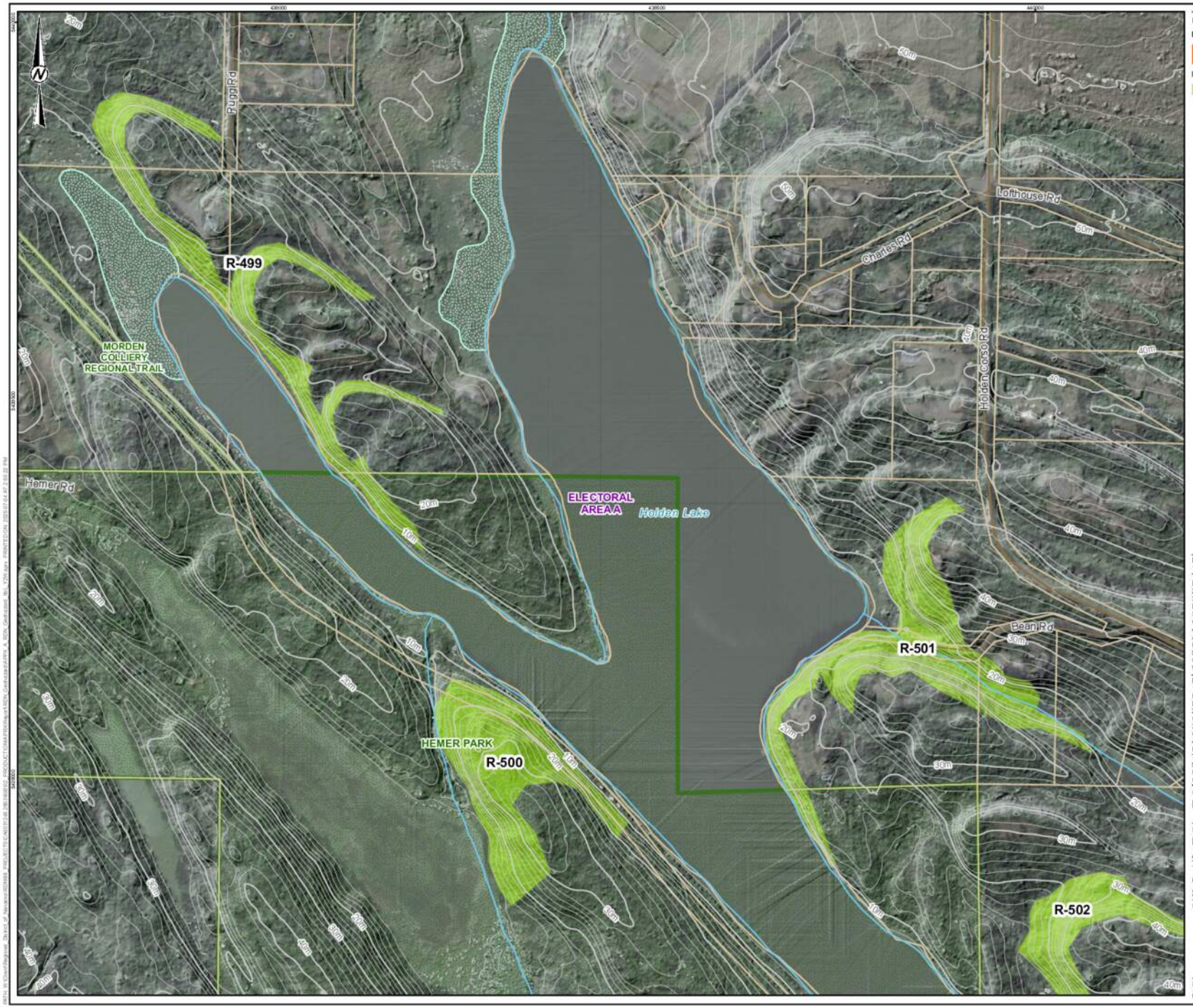

LEGEND

PROJECT DATA

- STUDY AREA
- HAZARD AREA (AOP)
  - LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
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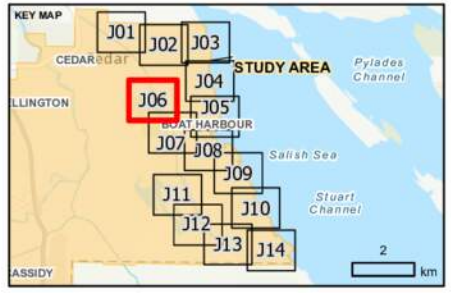

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SECTION J - QUENNELL AND HOLDEN LAKES AREA

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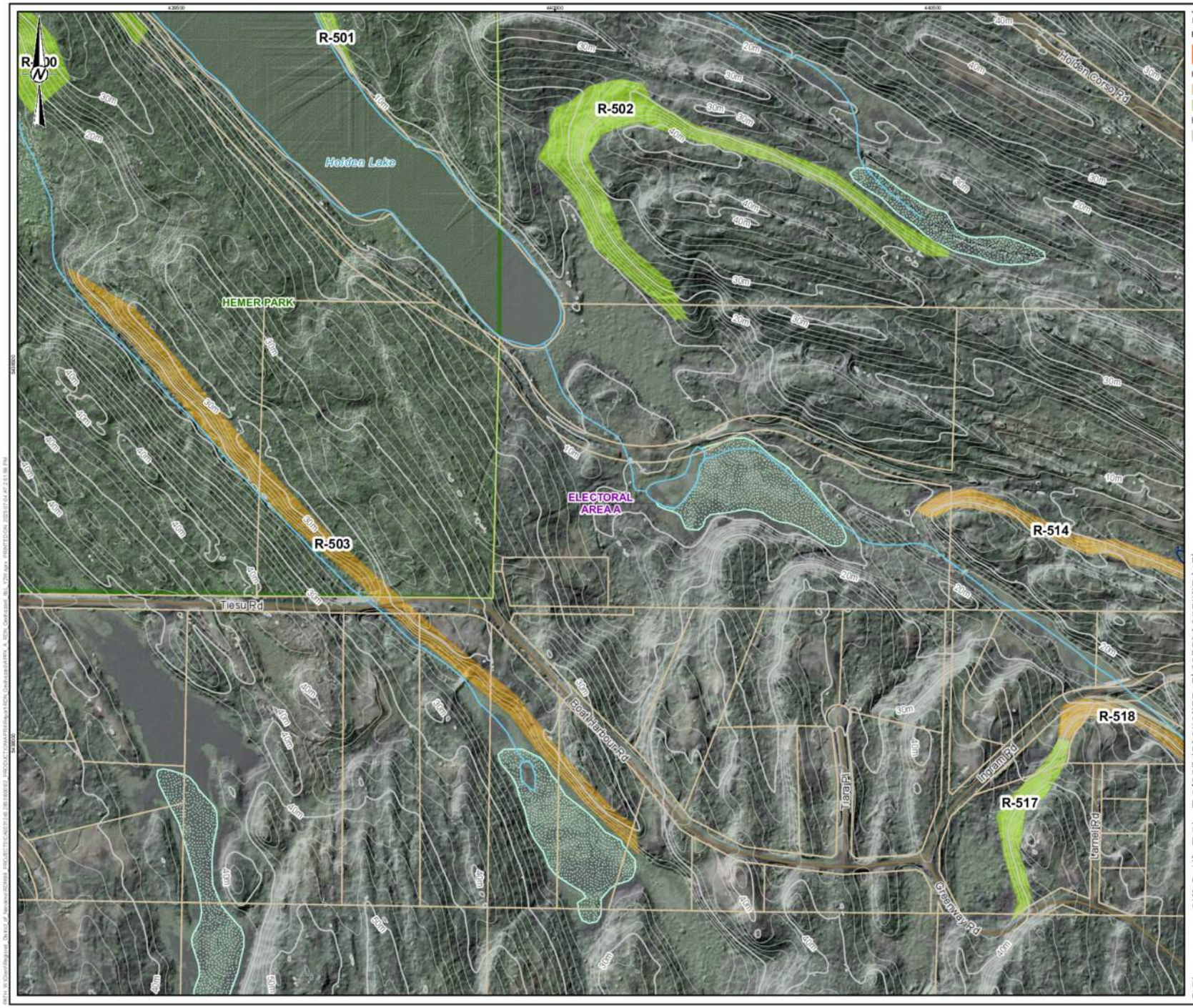
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J06



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)

BASE DATA

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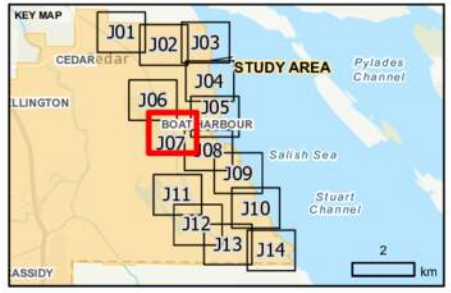

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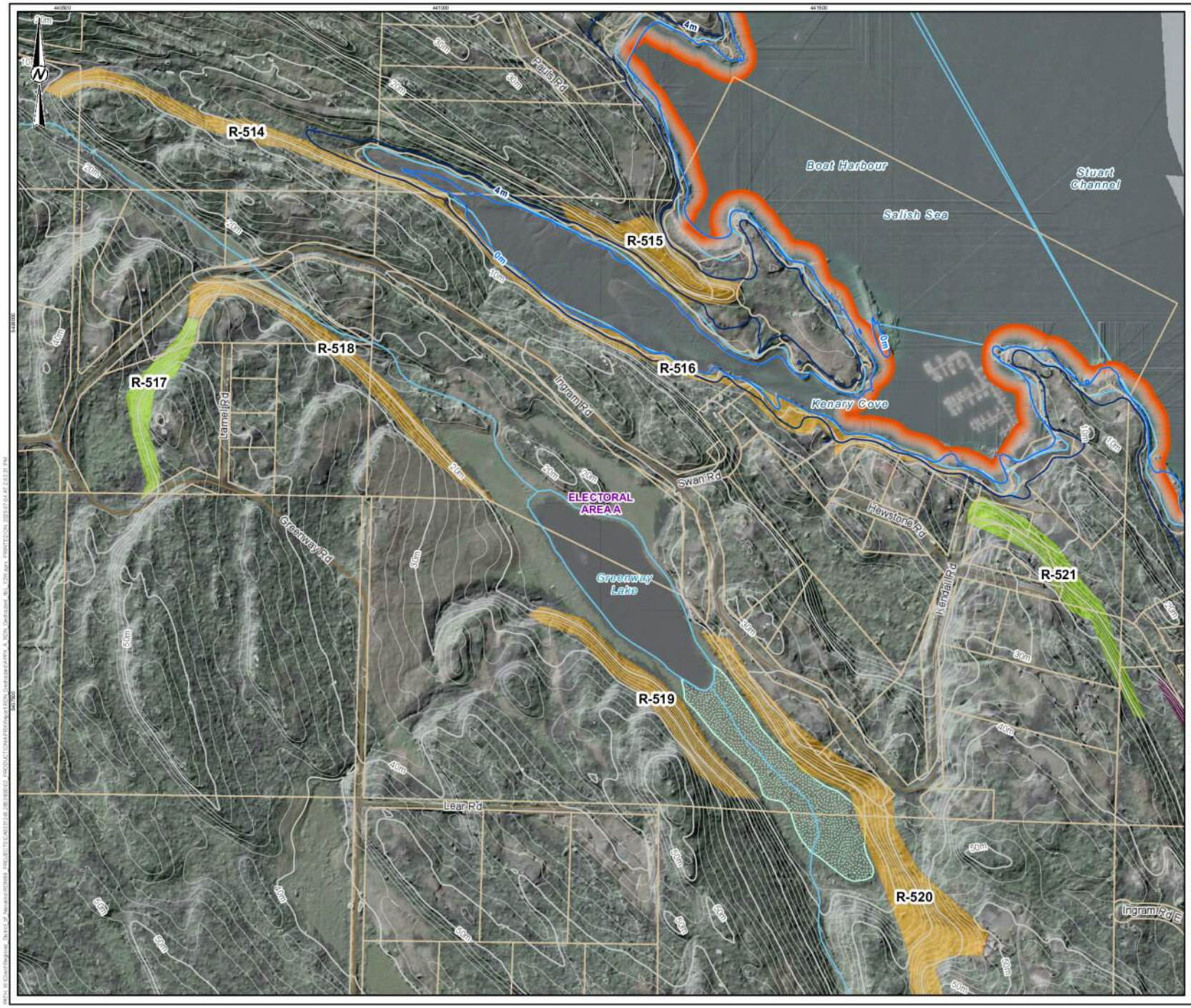
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J07



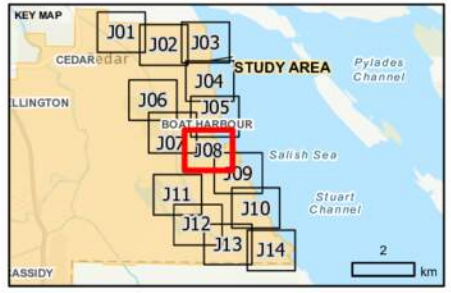
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
- HIGH SEA LEVEL (EL. 4 m)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J08

LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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- ROAD - LOCAL
- WATERCOURSE
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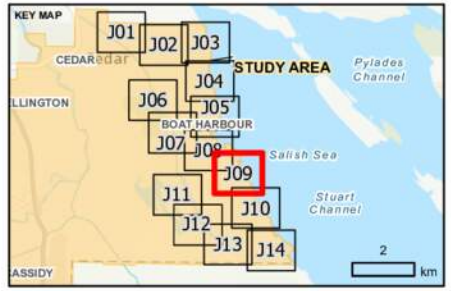
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

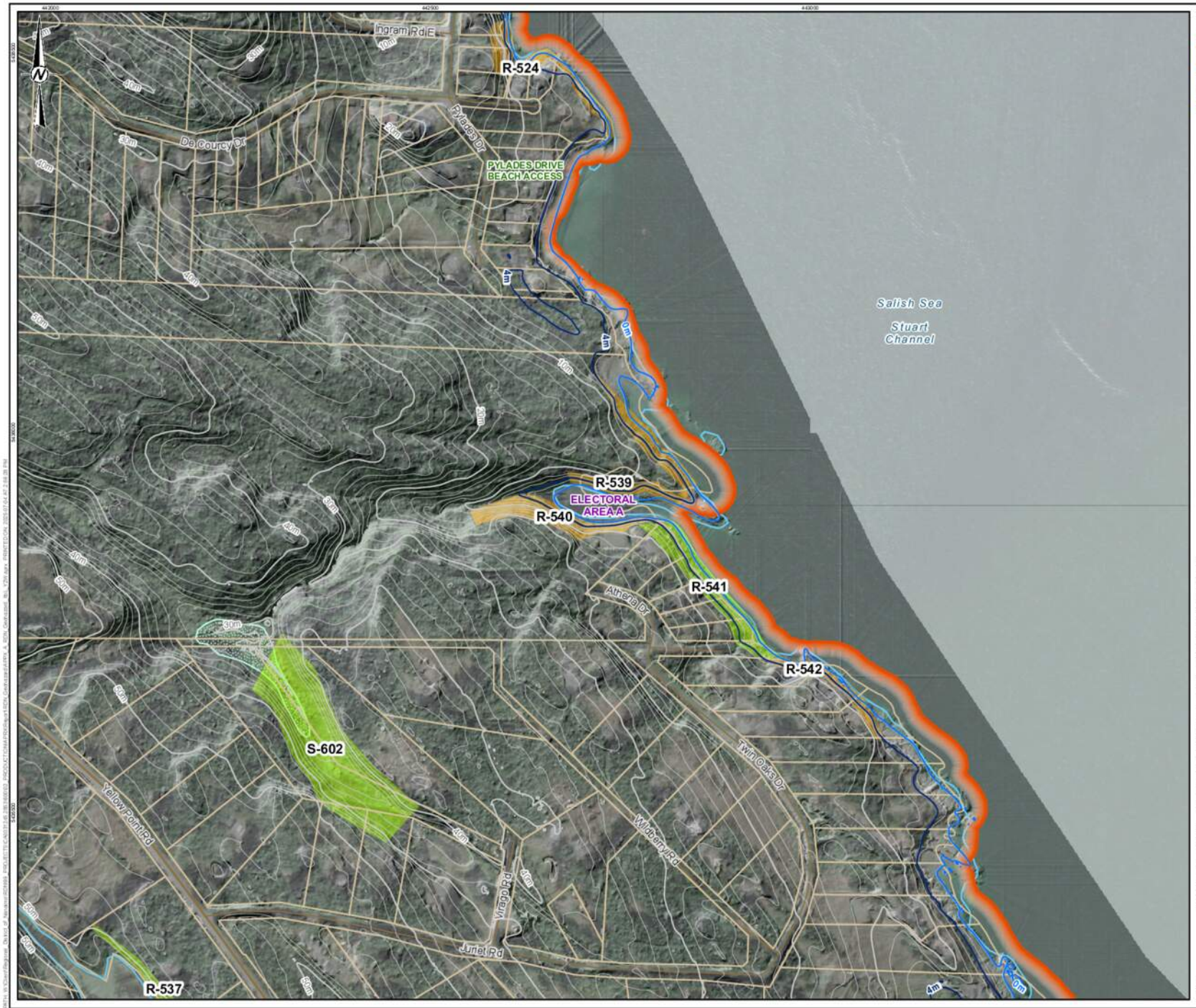
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J09



LEGEND

PROJECT DATA

- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
  - LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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- ROAD - ARTERIAL / COLLECTOR
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- PARCEL
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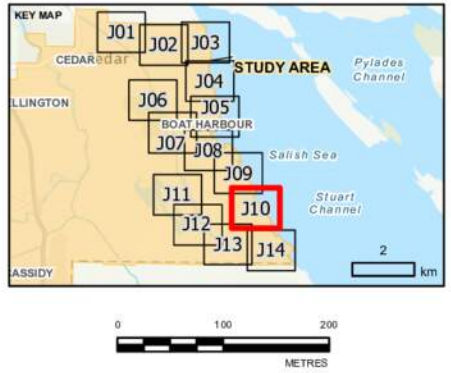

0 100 200

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

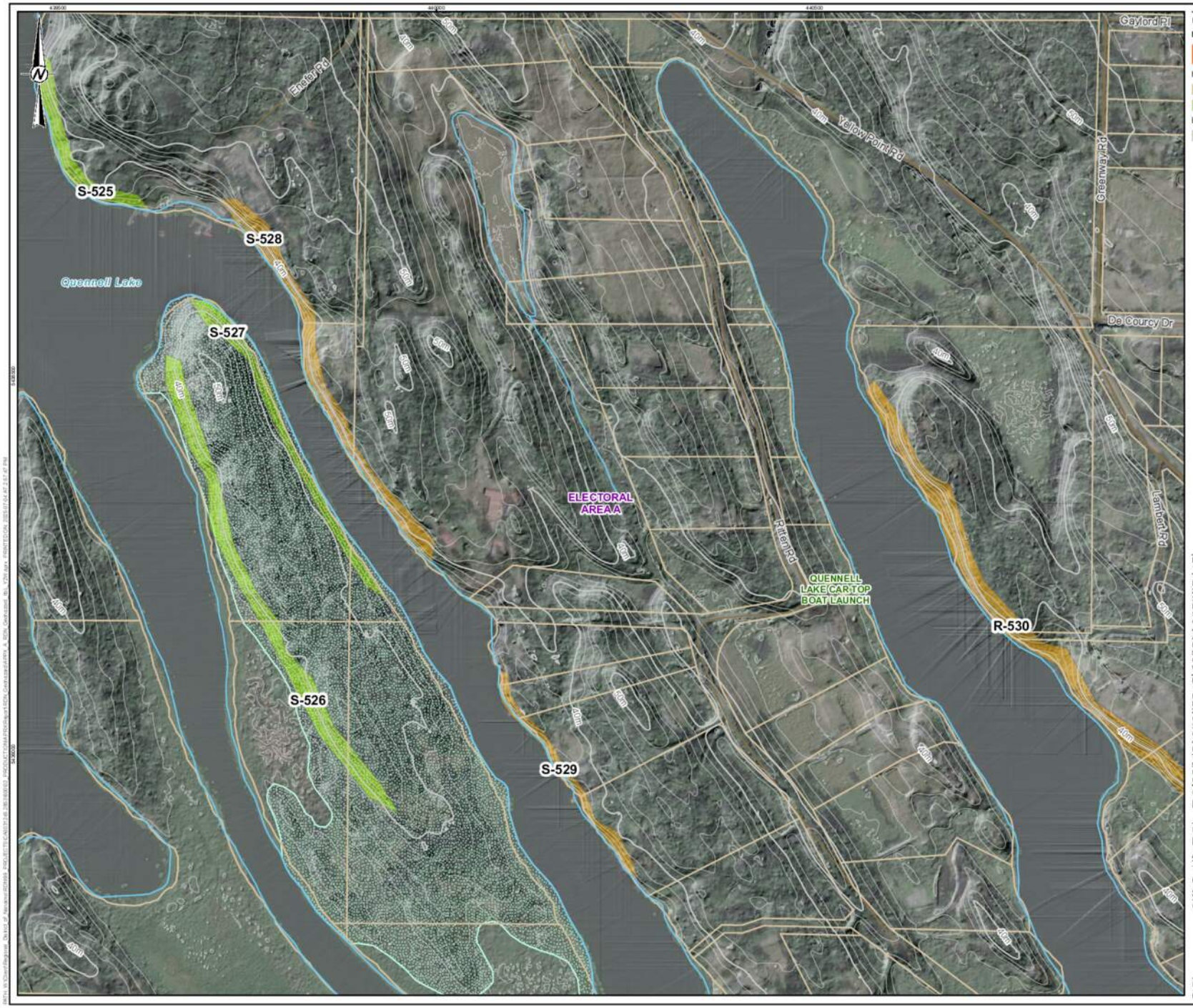
TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J10



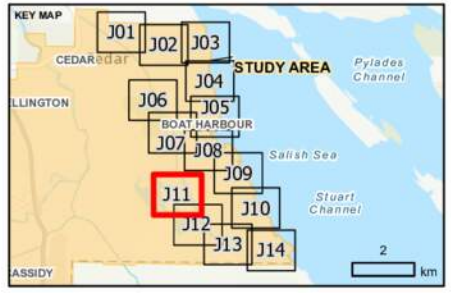
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J11

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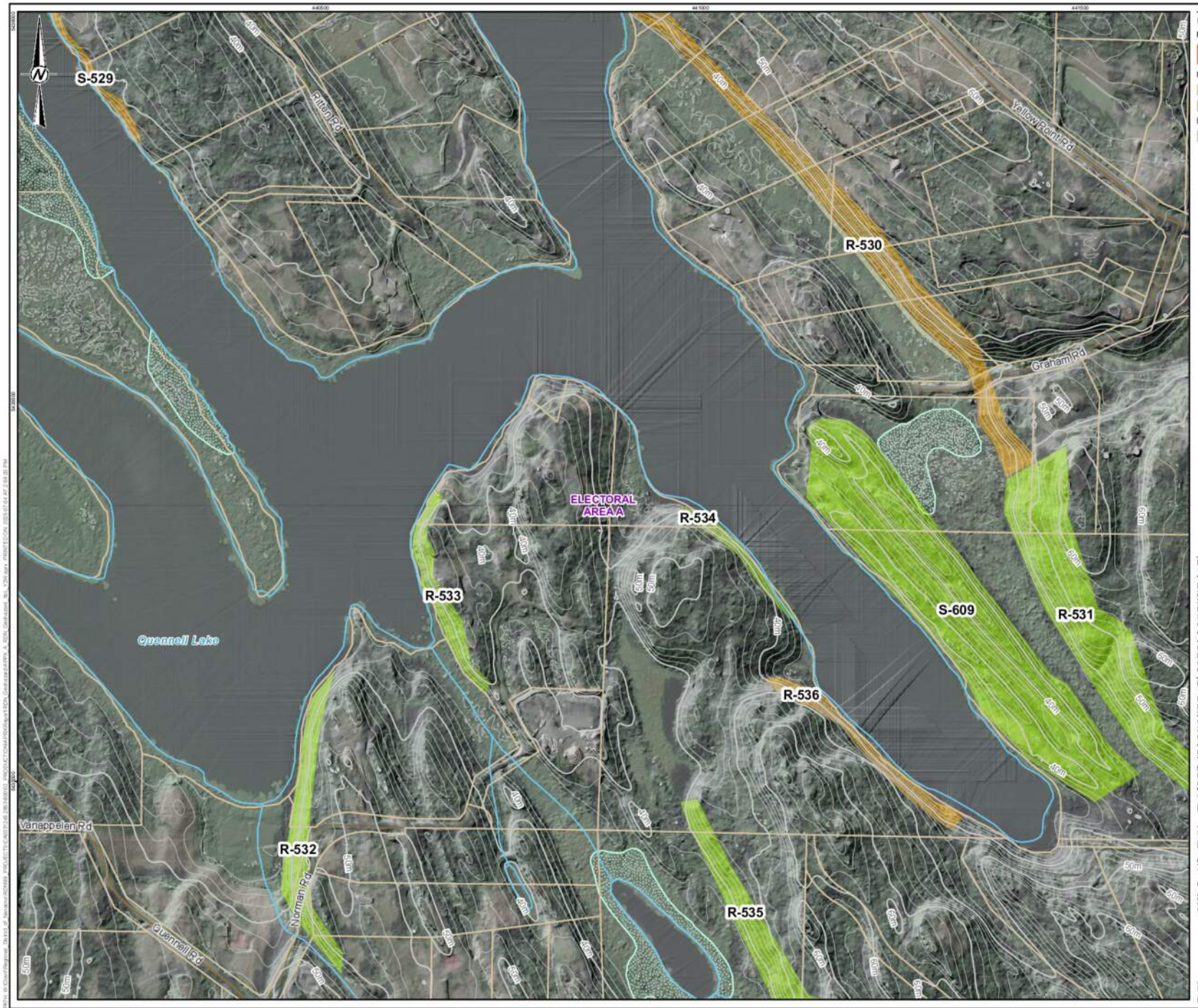

LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
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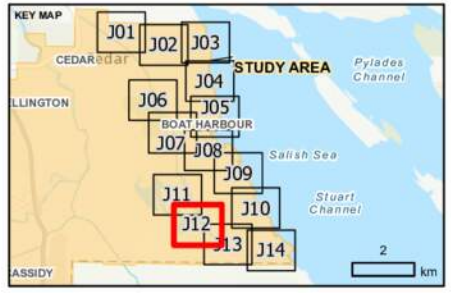

0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

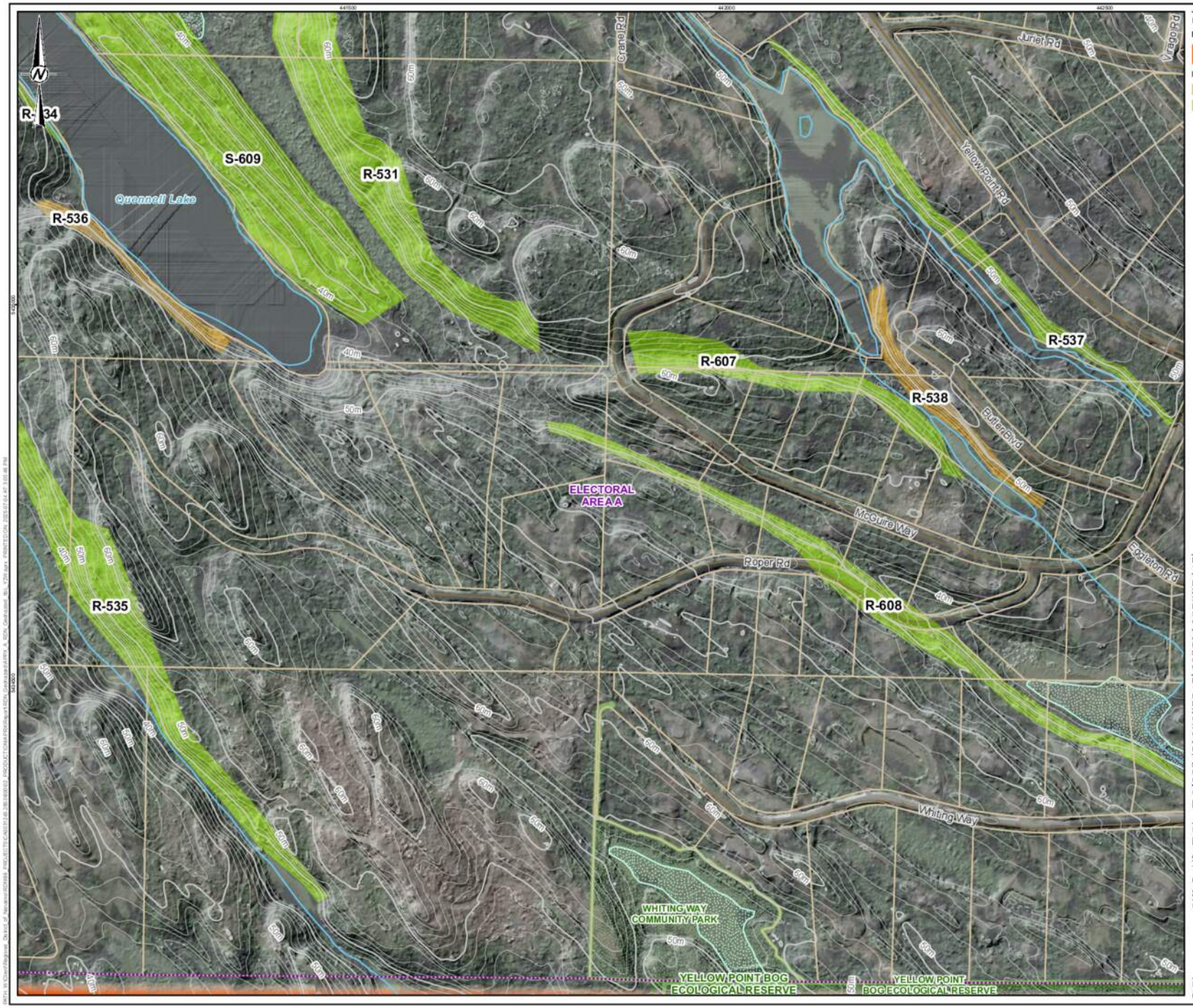
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J12



LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
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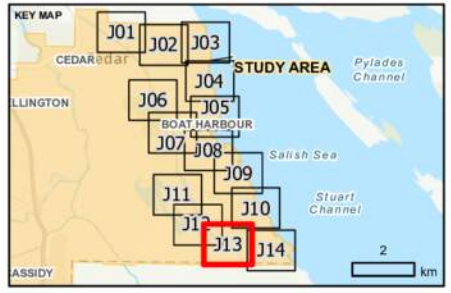

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CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J13

LEGEND

PROJECT DATA

- STUDY AREA

HAZARD AREA (AOP)

- MEDIUM
- LOW

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (2 m INTERVAL)
- MEAN SEA LEVEL (EL. 0 m)
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- ROAD - ARTERIAL / COLLECTOR
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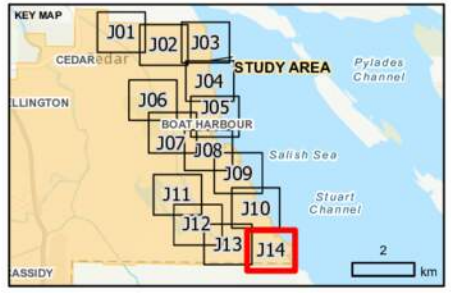

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

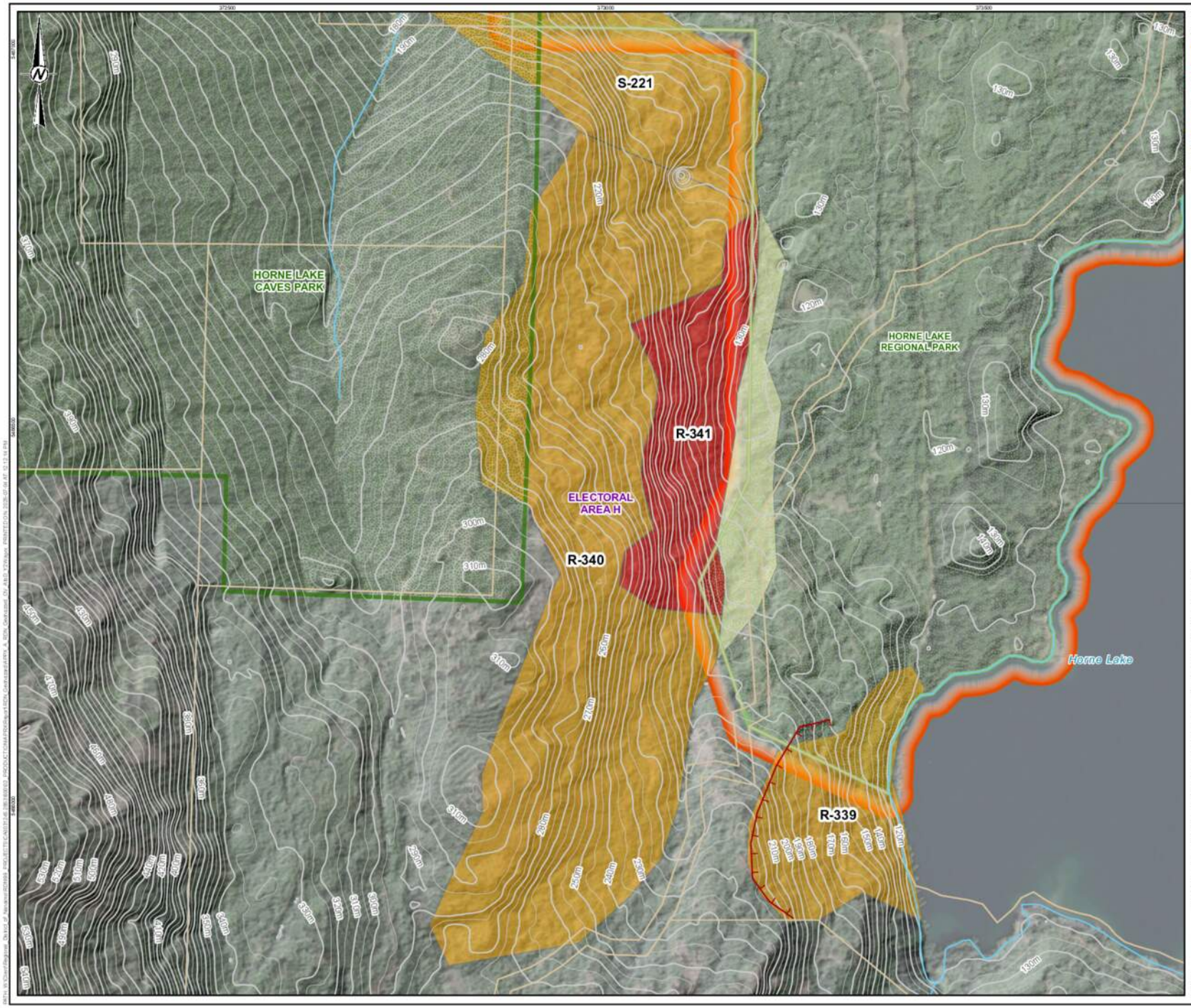
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION J - QUENNELL AND HOLDEN LAKES AREA

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

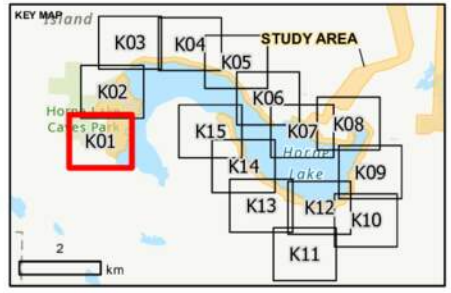
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	J14



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
- SCARP
- HAZARD AREA (AOP)
- HIGH
- MEDIUM
- BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

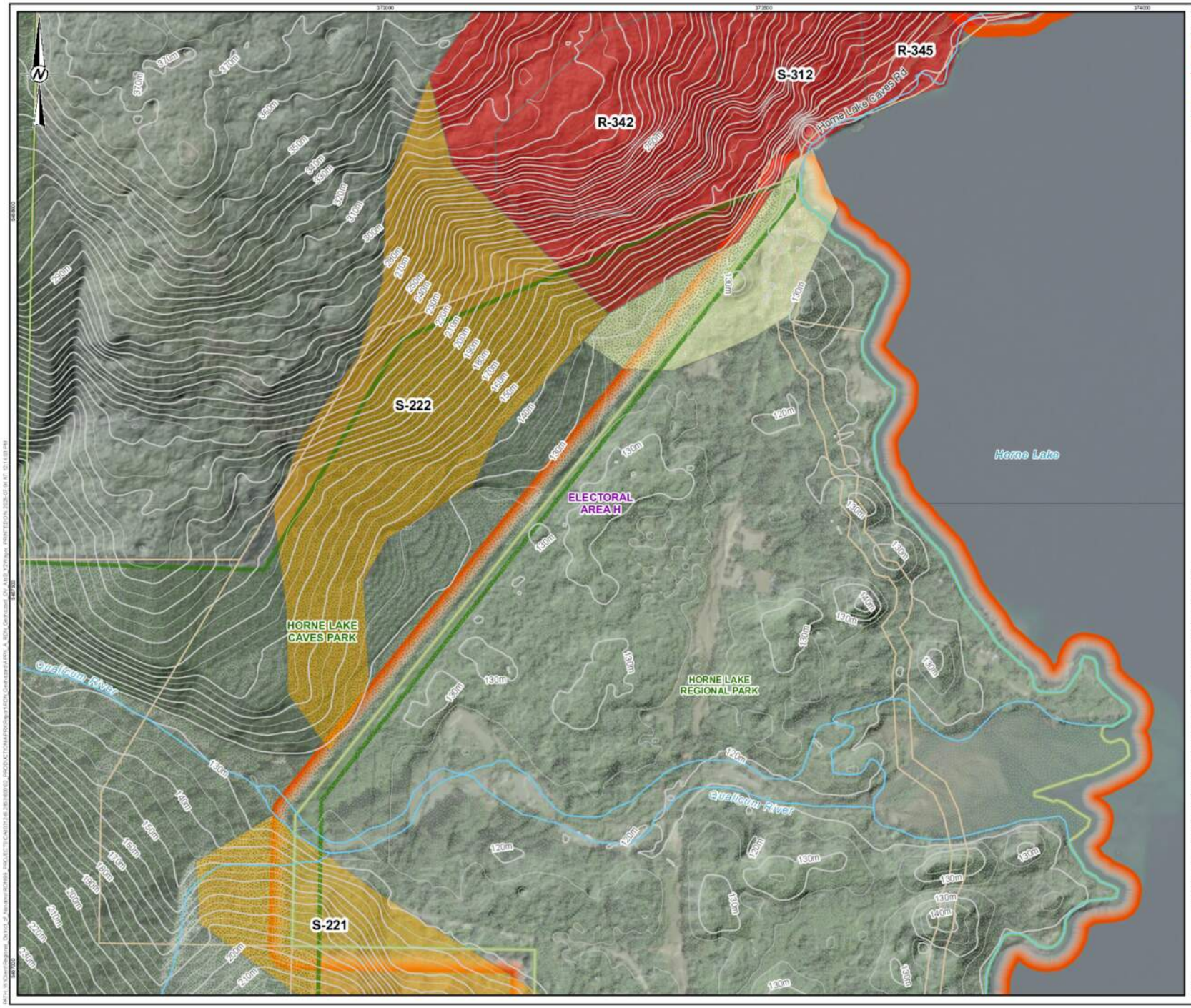
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K01



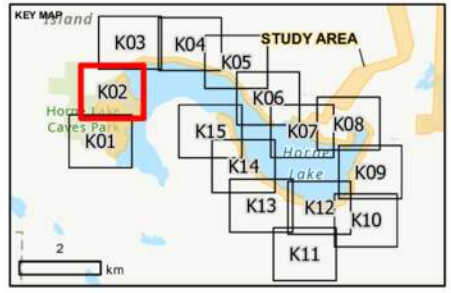
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WATERBODY
- LOCAL AND REGIONAL GREENSPACE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

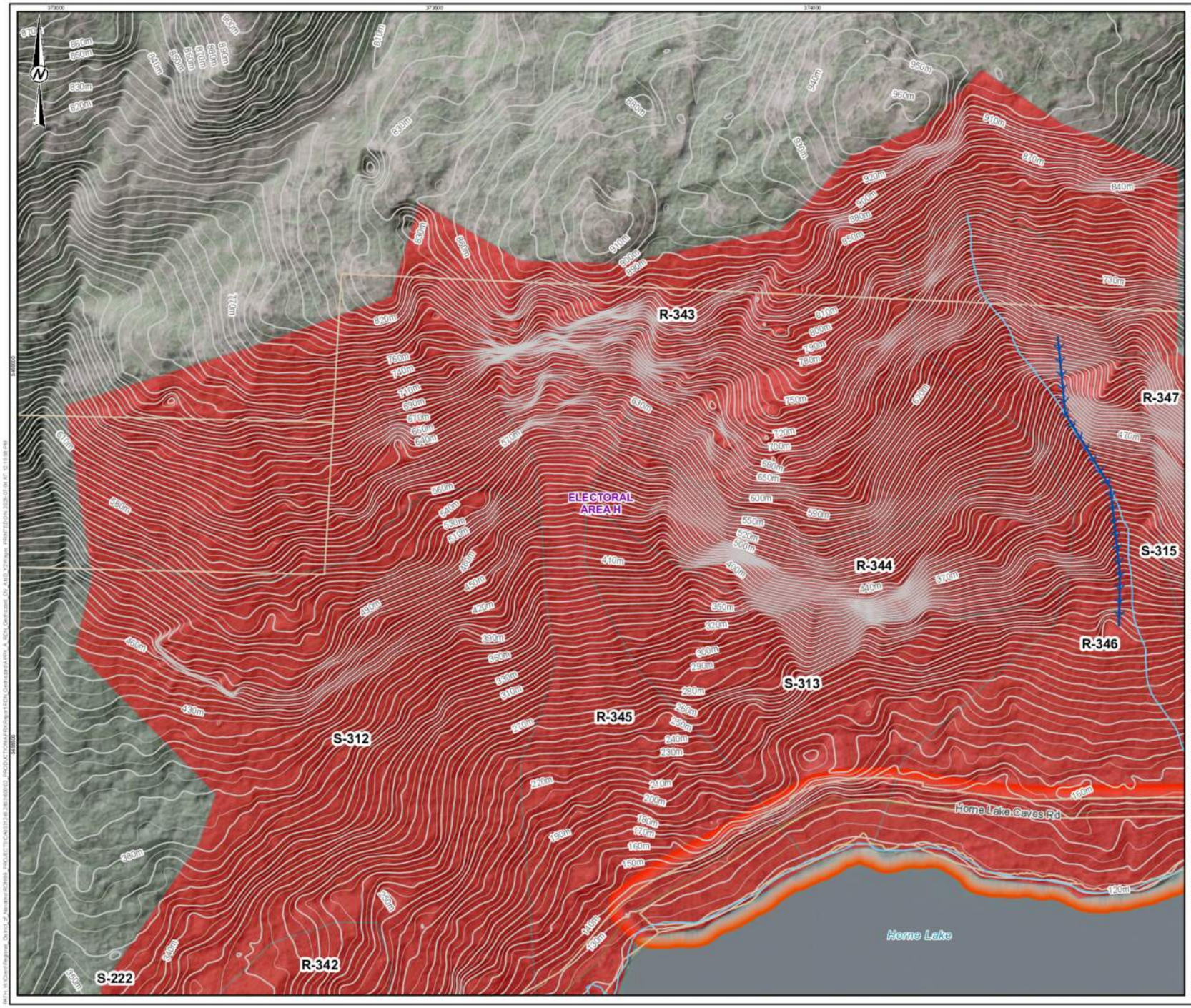
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K02



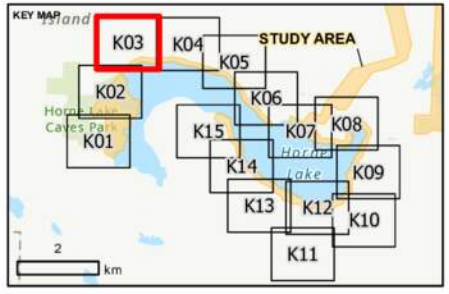
LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

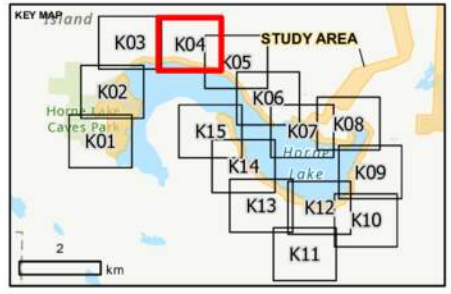
YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K03

LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

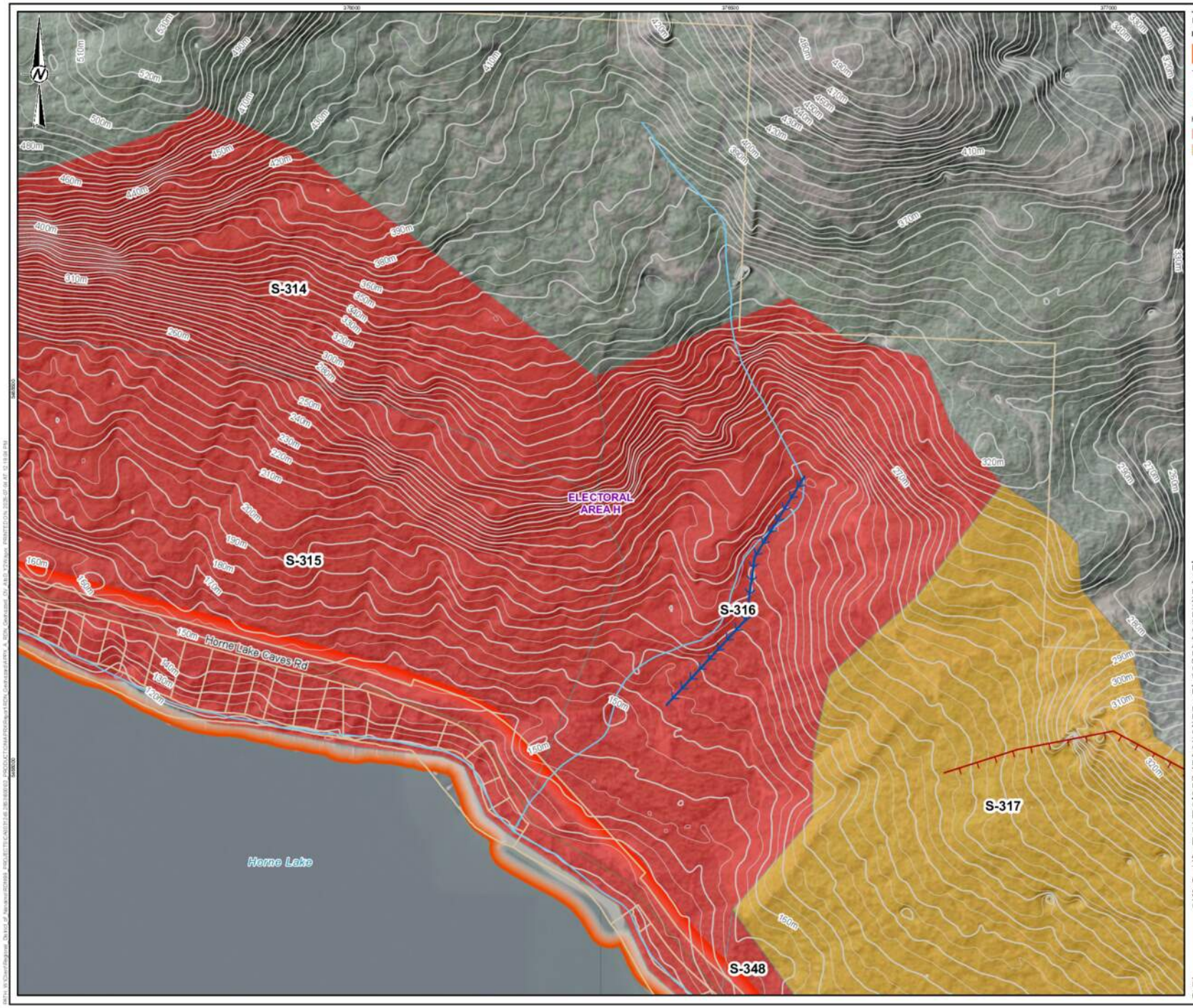
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K04



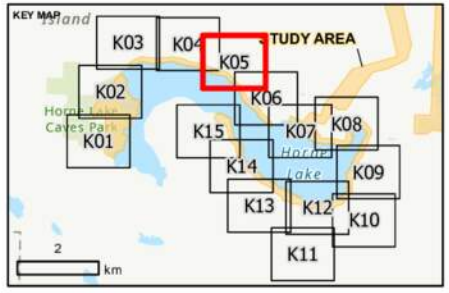
LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

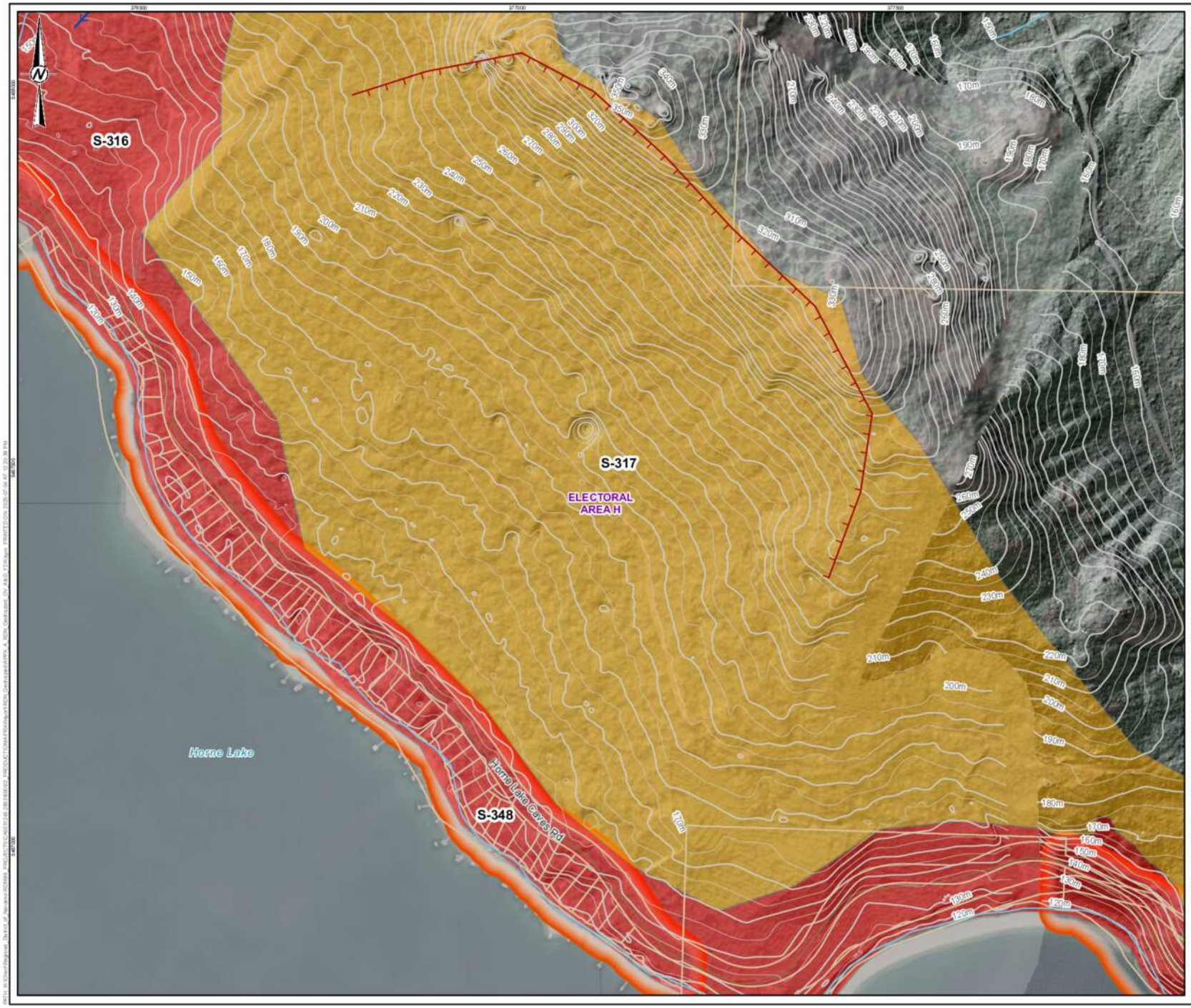
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K05



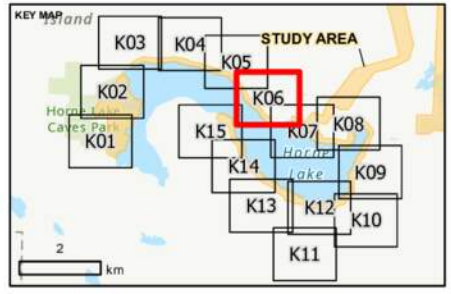
LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K06

LEGEND

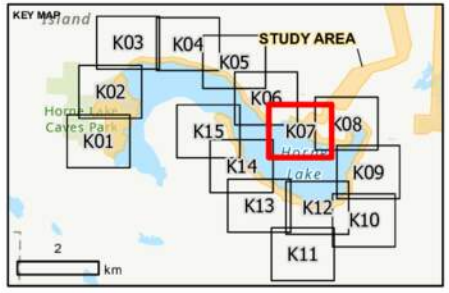
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

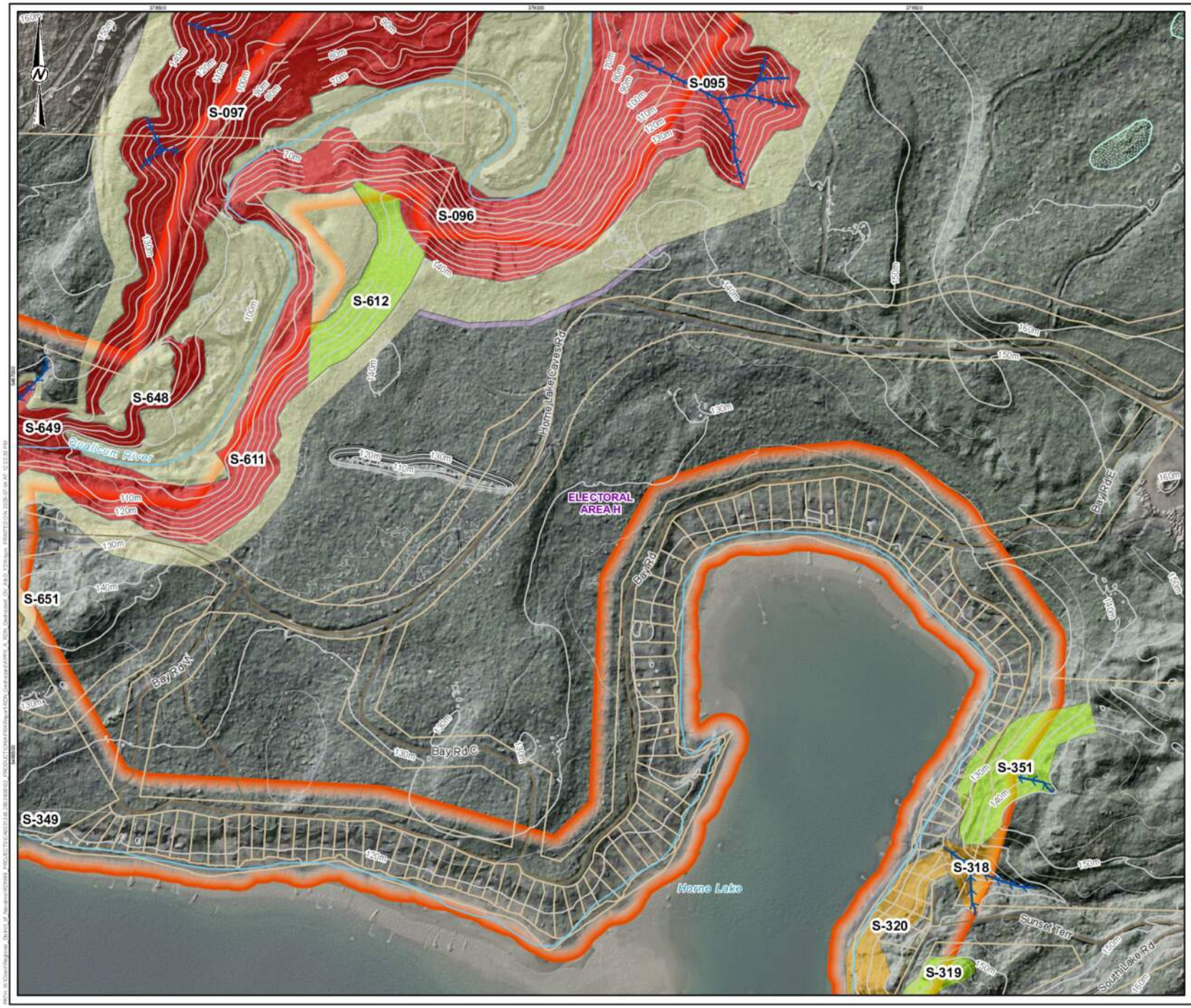
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K07



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)

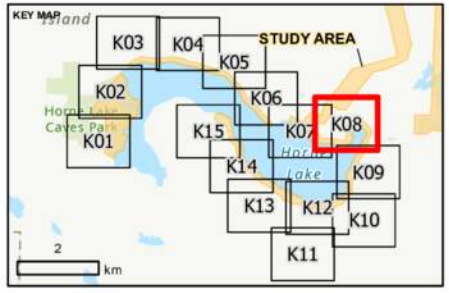
- HIGH
- MEDIUM
- LOW

BUFFER ZONE

- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

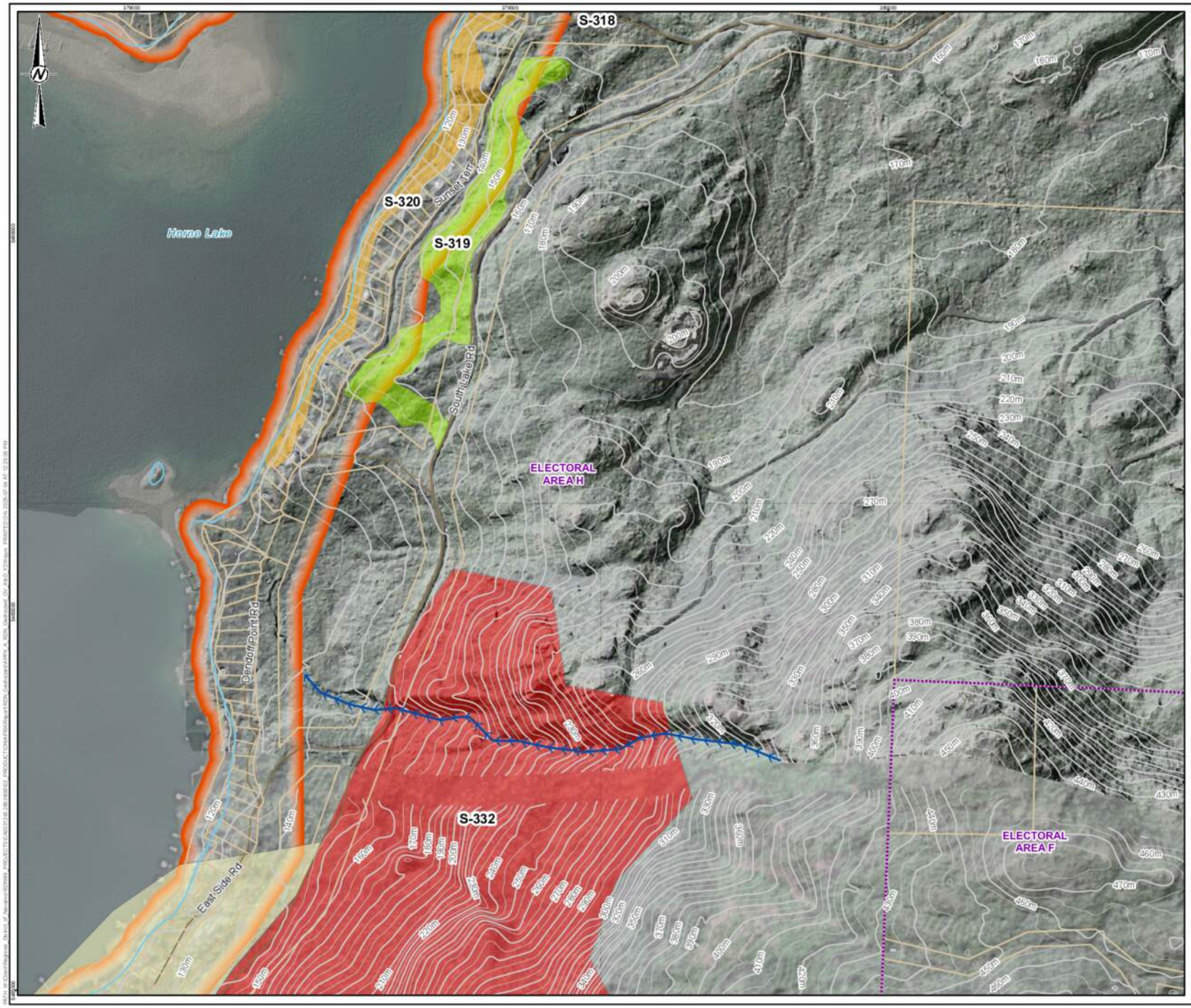
TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K08



LEGEND

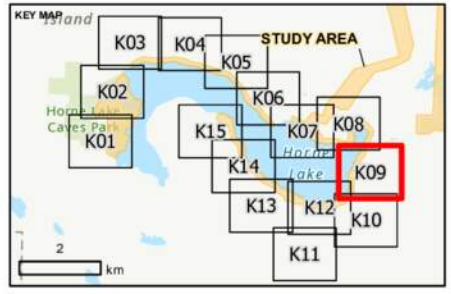
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- PARCEL
- ELECTORAL AREA



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METRES

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

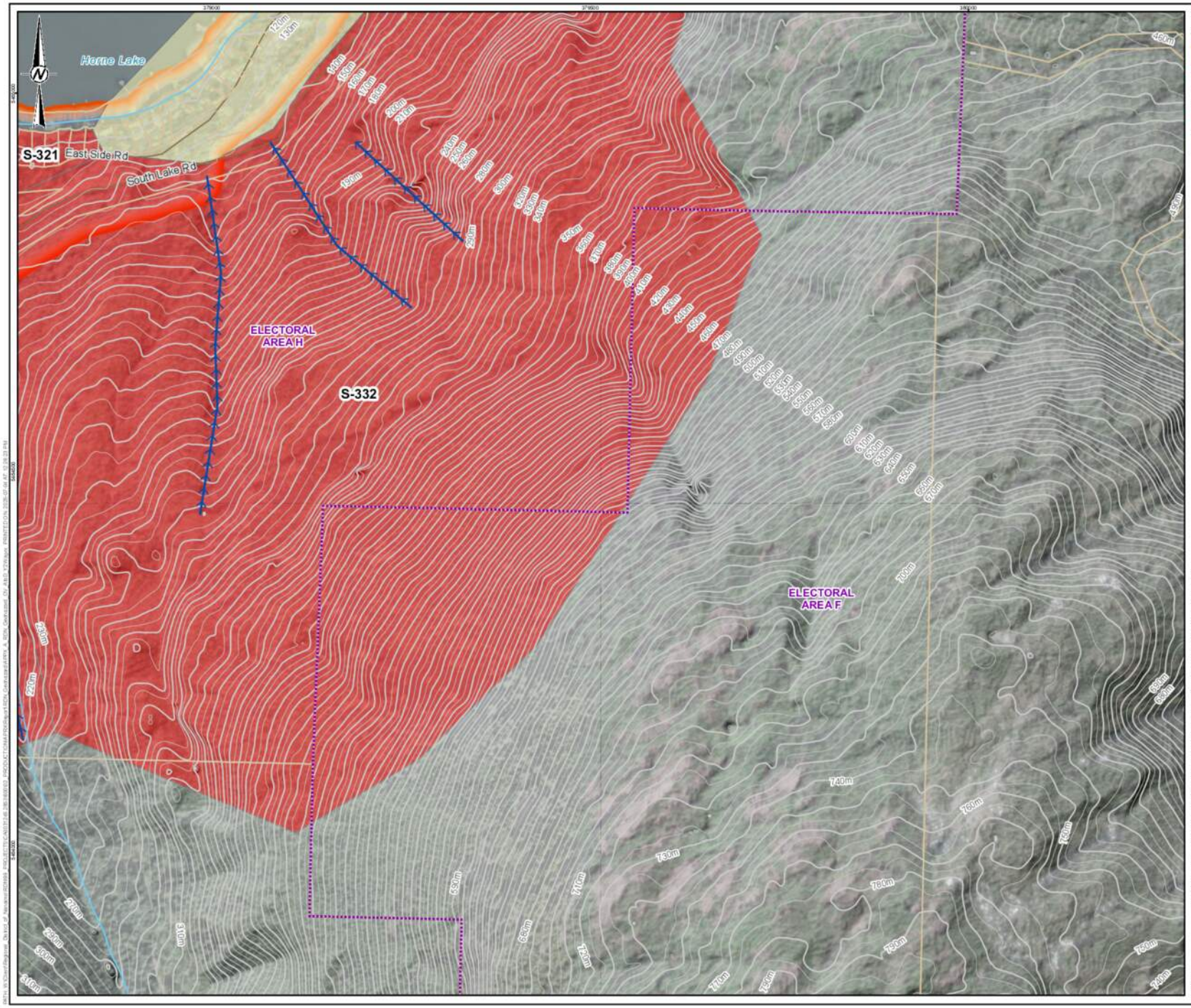
TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K09

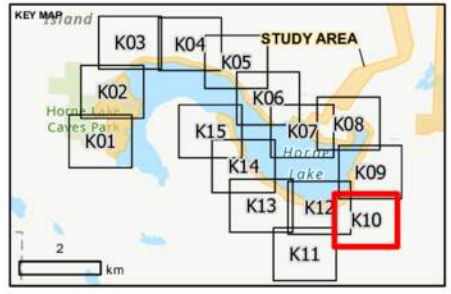
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- HAZARD AREA (AOP)
- HIGH
- BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
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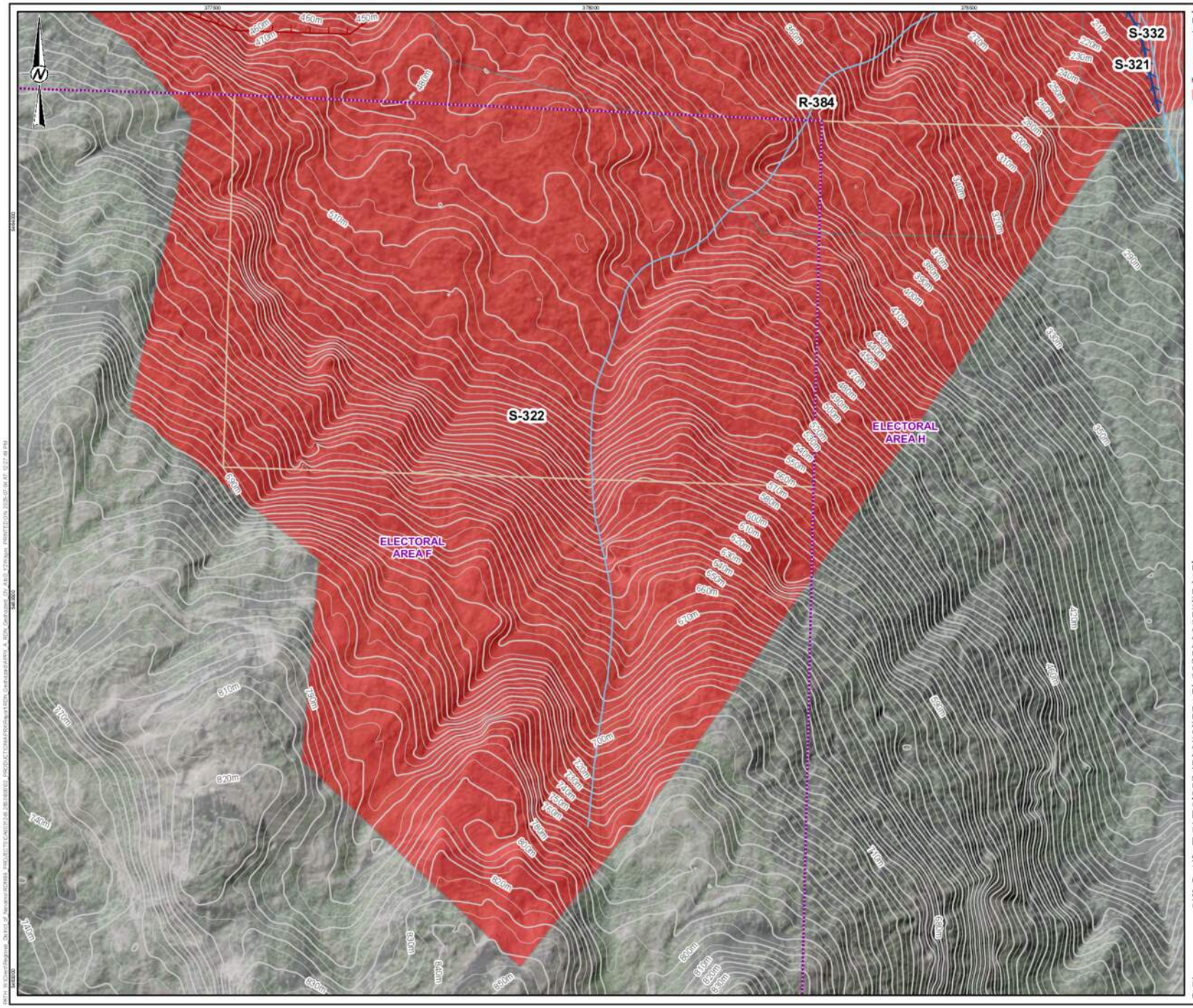
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K10



LEGEND

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
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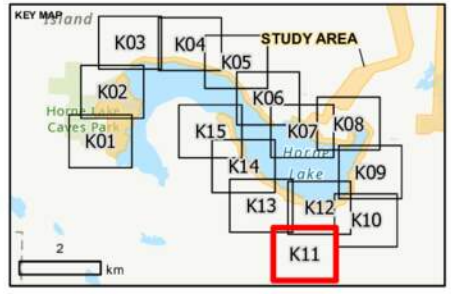

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CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K11

LEGEND

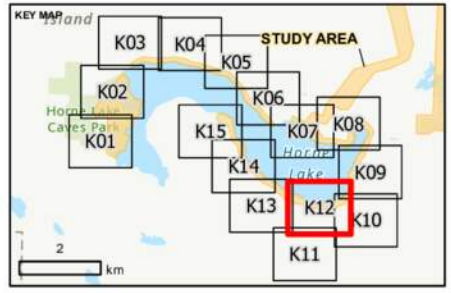
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

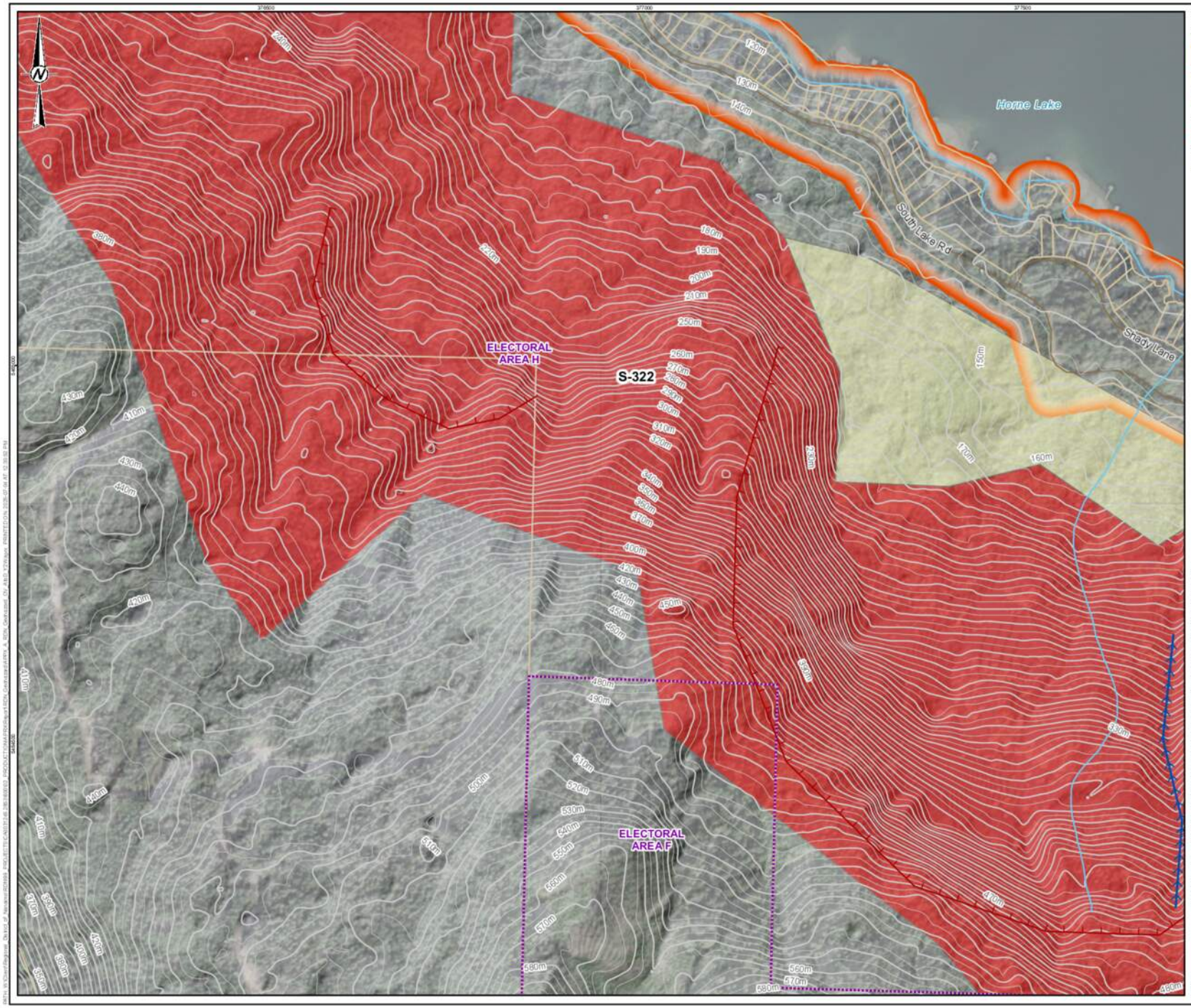
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K12



LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
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BASE DATA
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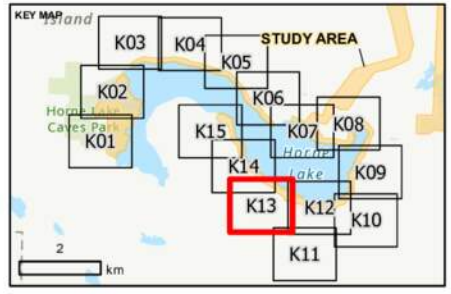

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REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

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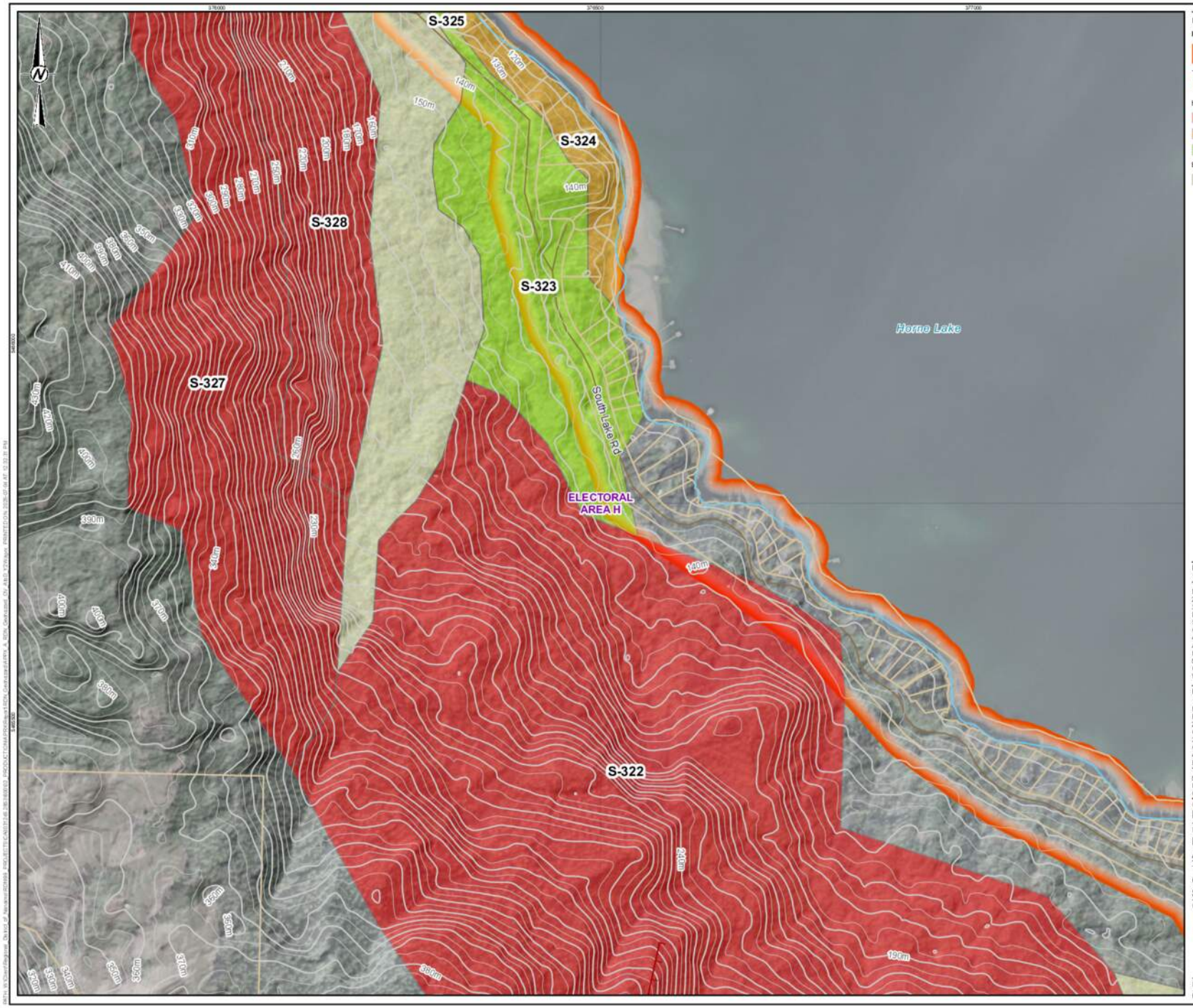
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K13



LEGEND

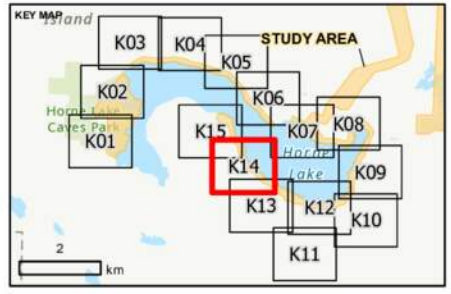
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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4. AREAS MARKED AS "UNCLASSIFIED" ARE LIKELY TO CONTAIN STEEP-SLOPE HAZARDS BUT WERE NOT ASSESSED AS PART OF THIS STUDY. BUFFER ZONES MAY ALSO CONTAIN UNCLASSIFIED STEEP SLOPE HAZARDS.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

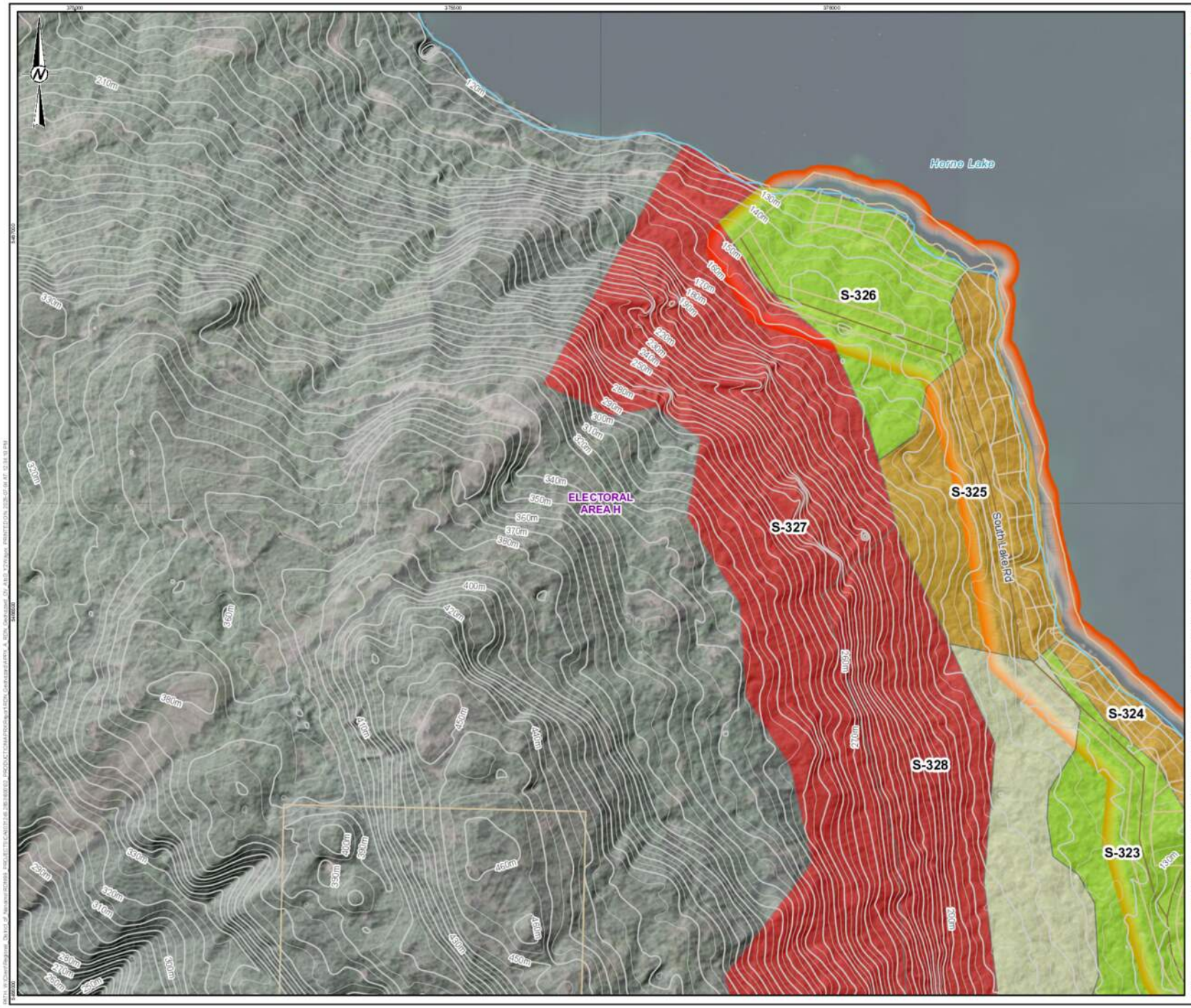
TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K14

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



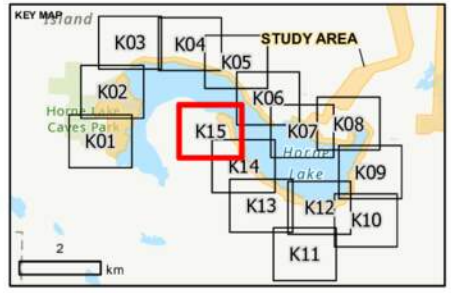
LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

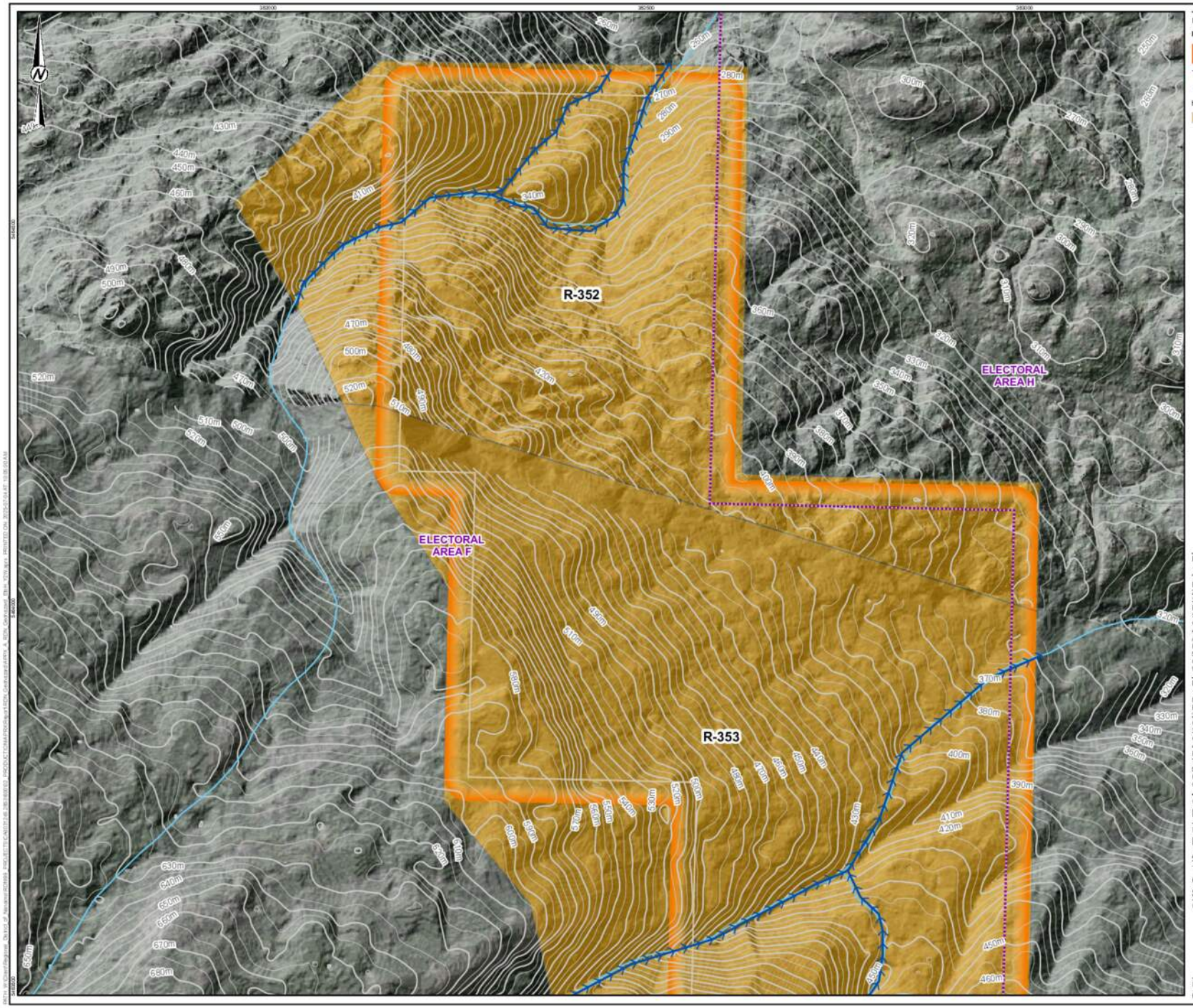
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION K - HORNE LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	K15



LEGEND

PROJECT DATA

- STUDY AREA

TERRAIN FEATURE

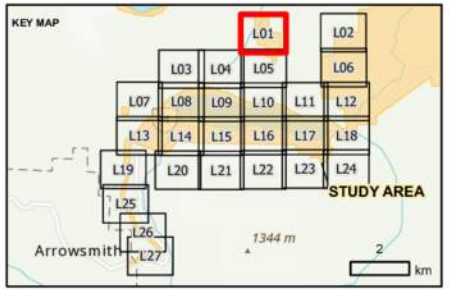
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)

- MEDIUM

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT

REGIONAL DISTRICT OF NANAIMO, BC

PROJECT

REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE

GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

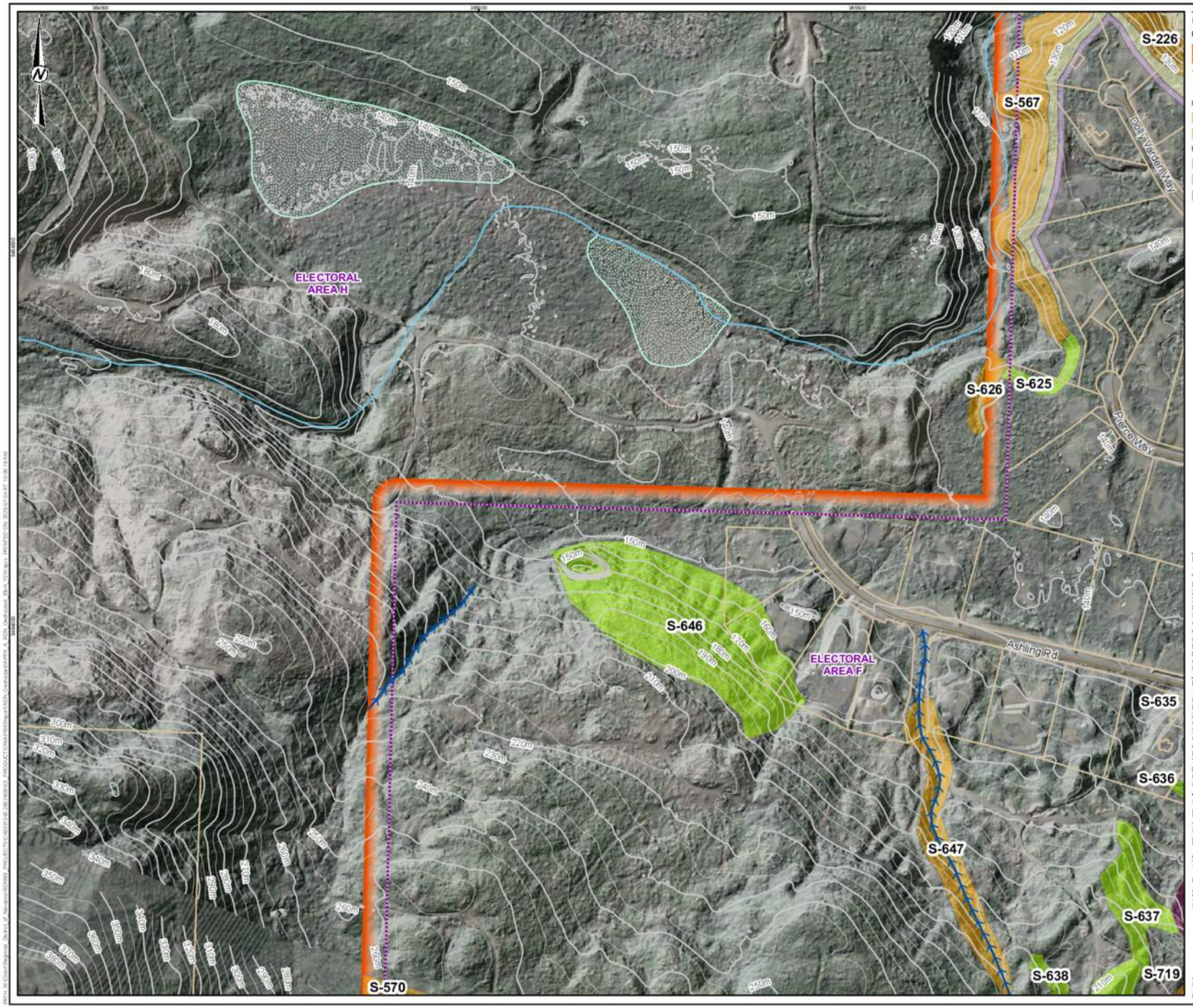
CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L01

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



LEGEND

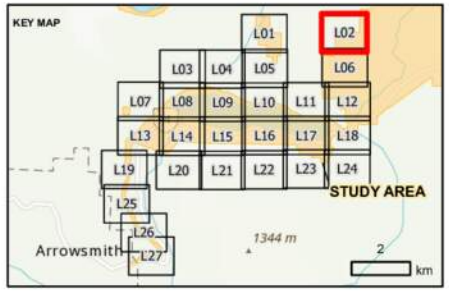
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- MEDIUM
- LOW

BUFFER ZONE
- BUFFER (CREST / TOE)
- BUFFER (LATERAL EROSION)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - LOCAL
- WATERCOURSE
- WETLAND
- LOCAL AND REGIONAL GREENSPACE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

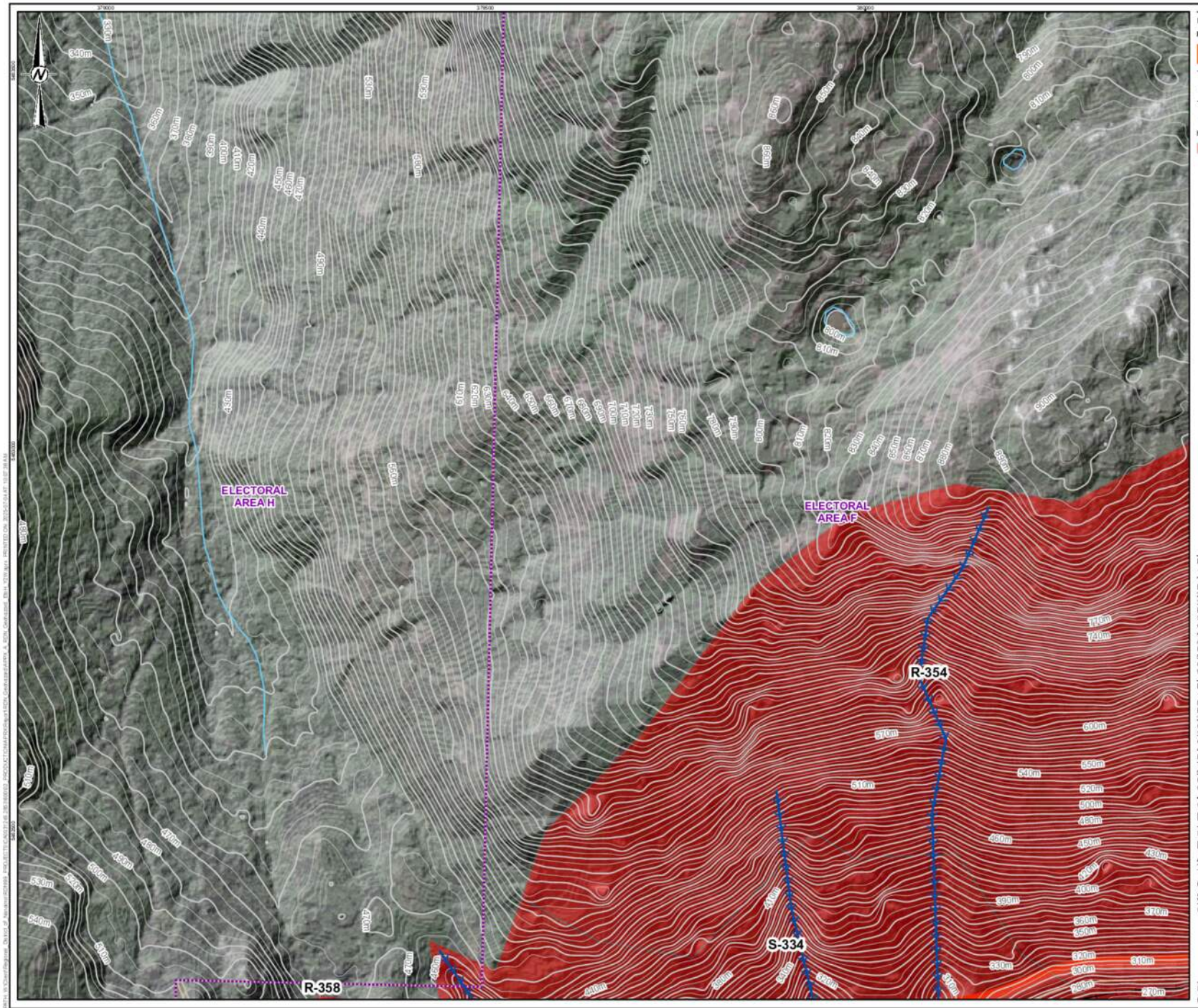
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L02



LEGEND

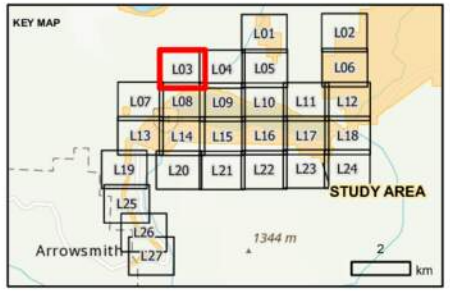
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

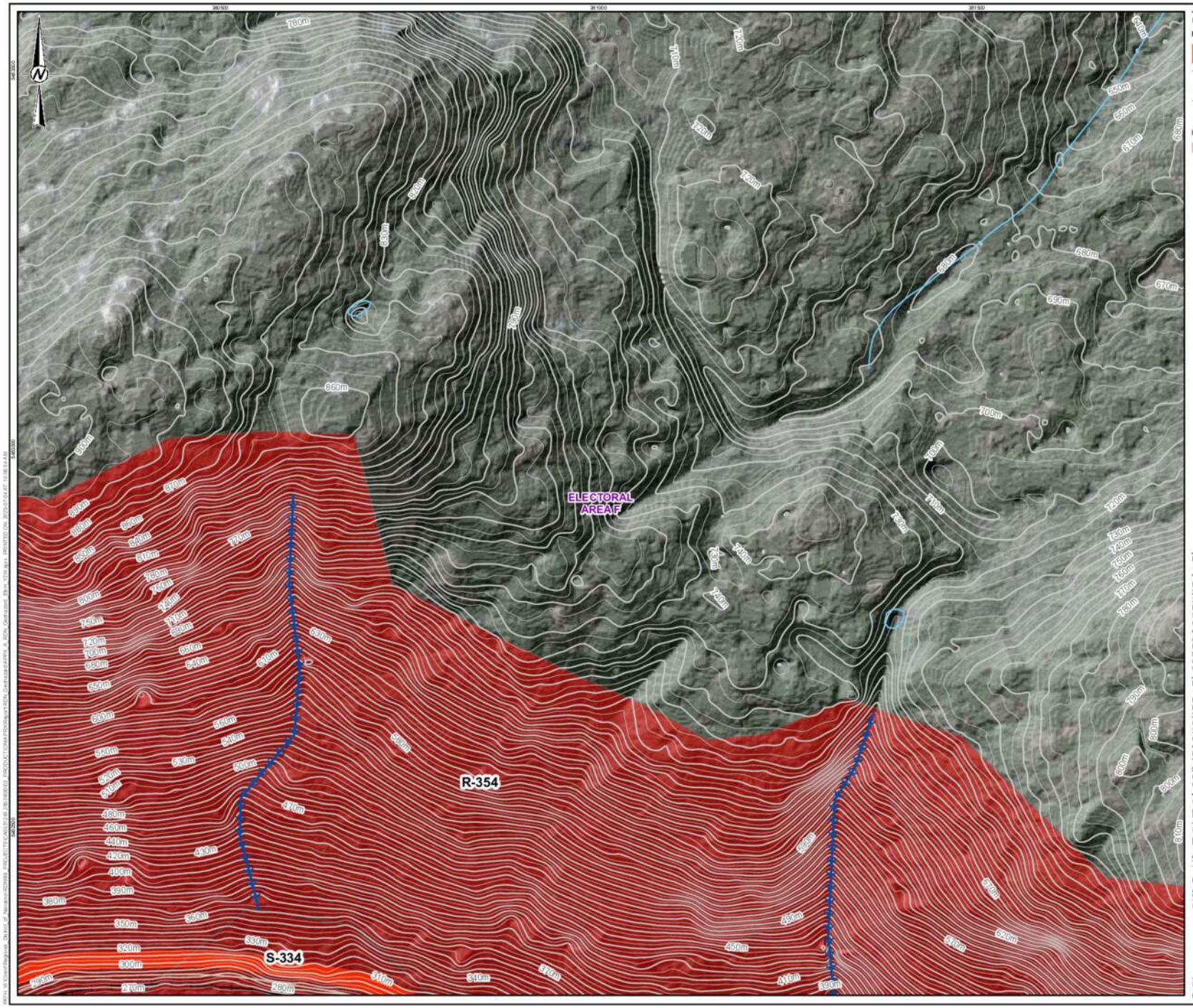
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L03



LEGEND

PROJECT DATA

- STUDY AREA

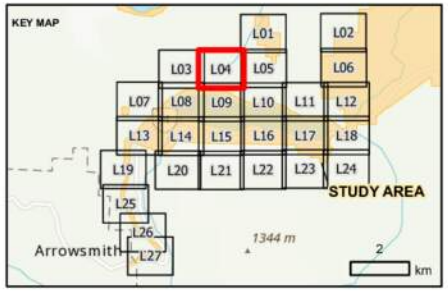
TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

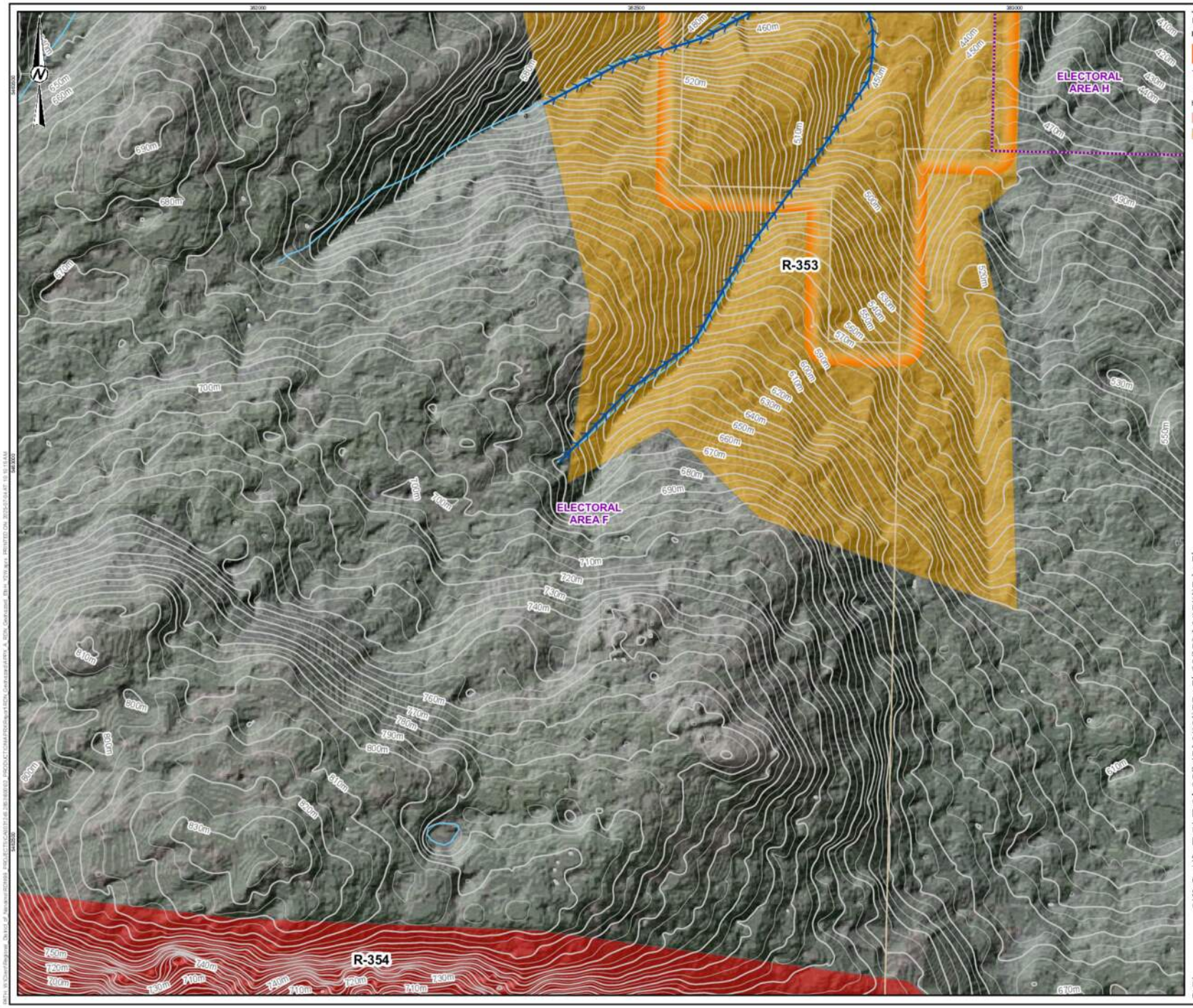
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L04



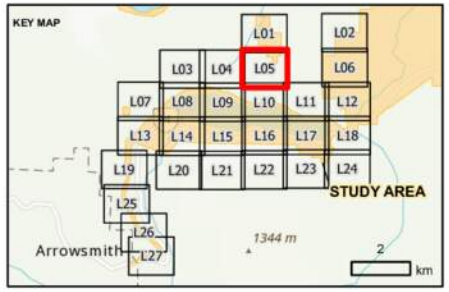
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

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5. SOME HAZARD POLYGONS ARE MAPPED OUTSIDE OF THE STUDY AREA FOR CONTINUITY AND CONTEXT. HOWEVER, ANY HAZARD MAPPING OUTSIDE THE STUDY AREA SHOULD NOT BE RELIED UPON WITHOUT REVIEW BY WSP.

REFERENCE(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

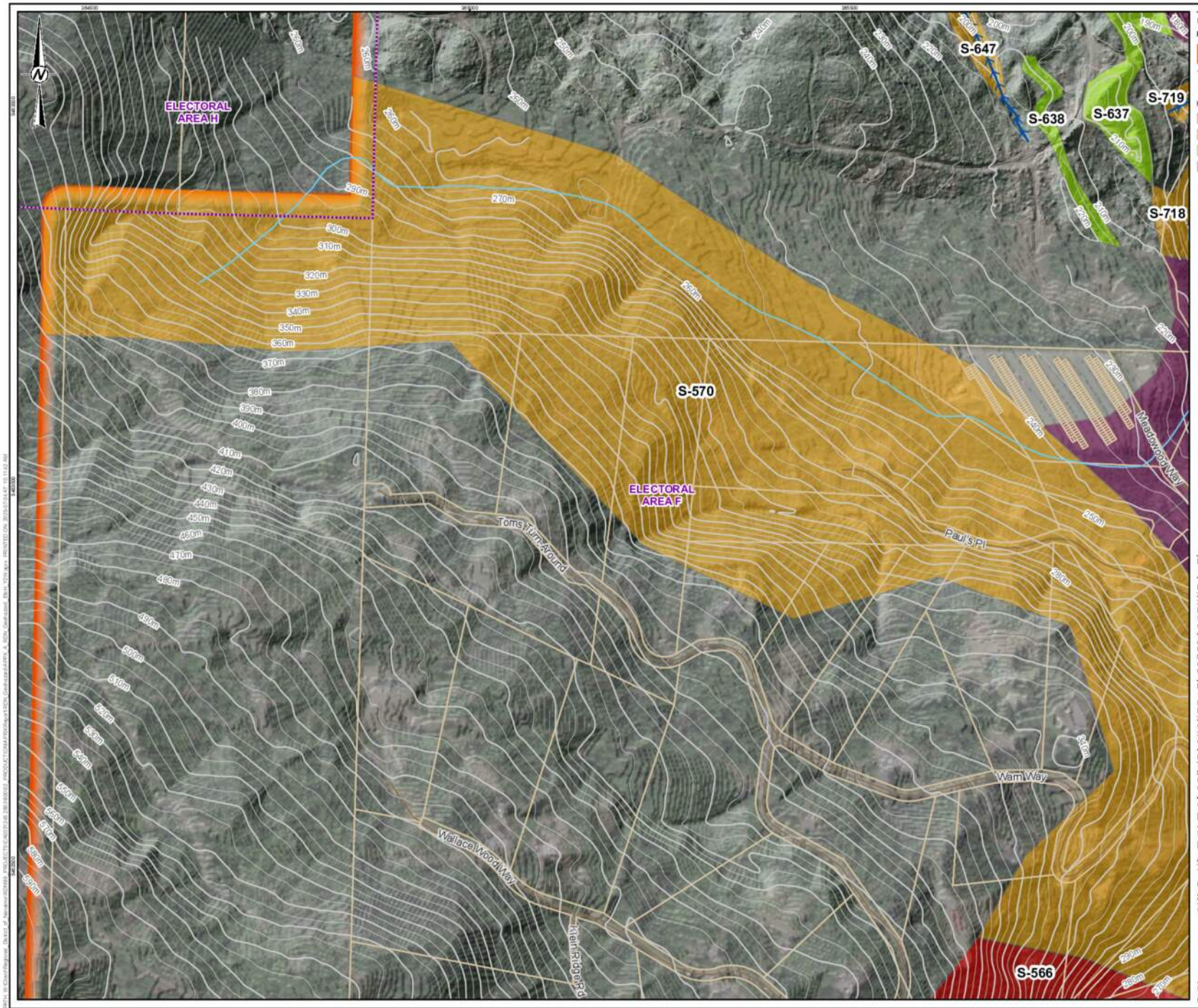
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L05



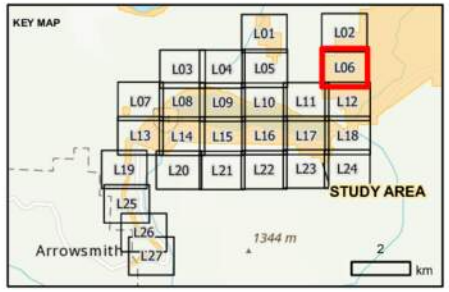
LEGEND

PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- LOW
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- ROAD - ARTERIAL / COLLECTOR
- ROAD - LOCAL
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

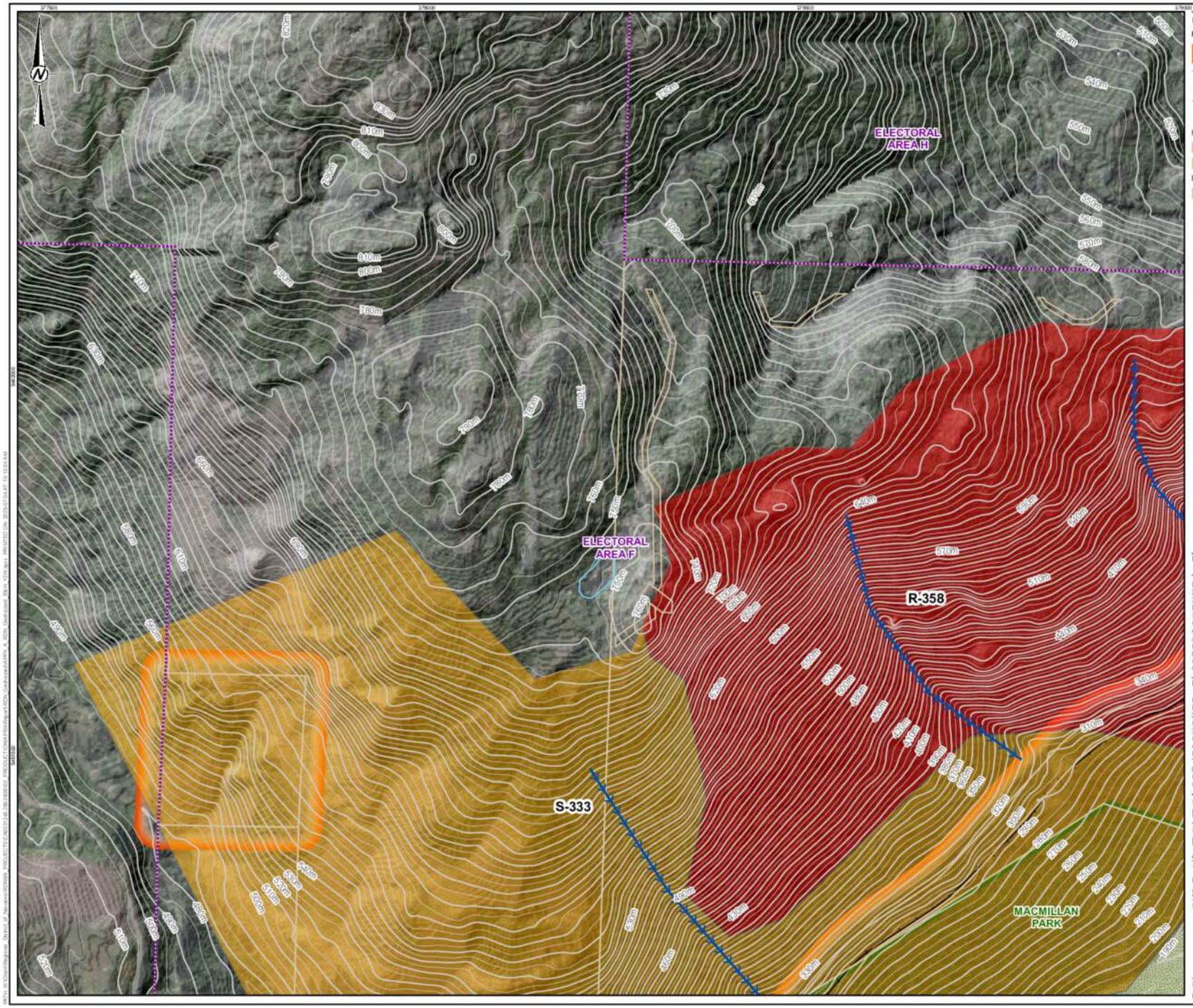
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L06



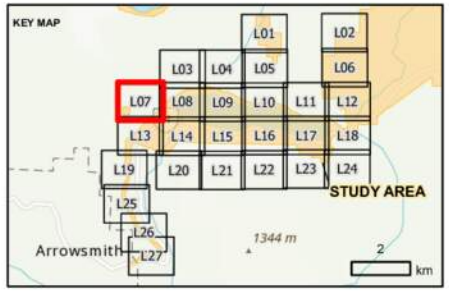
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): HIGH
- HAZARD AREA (AOP): MEDIUM
- BUFFER ZONE: BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L07

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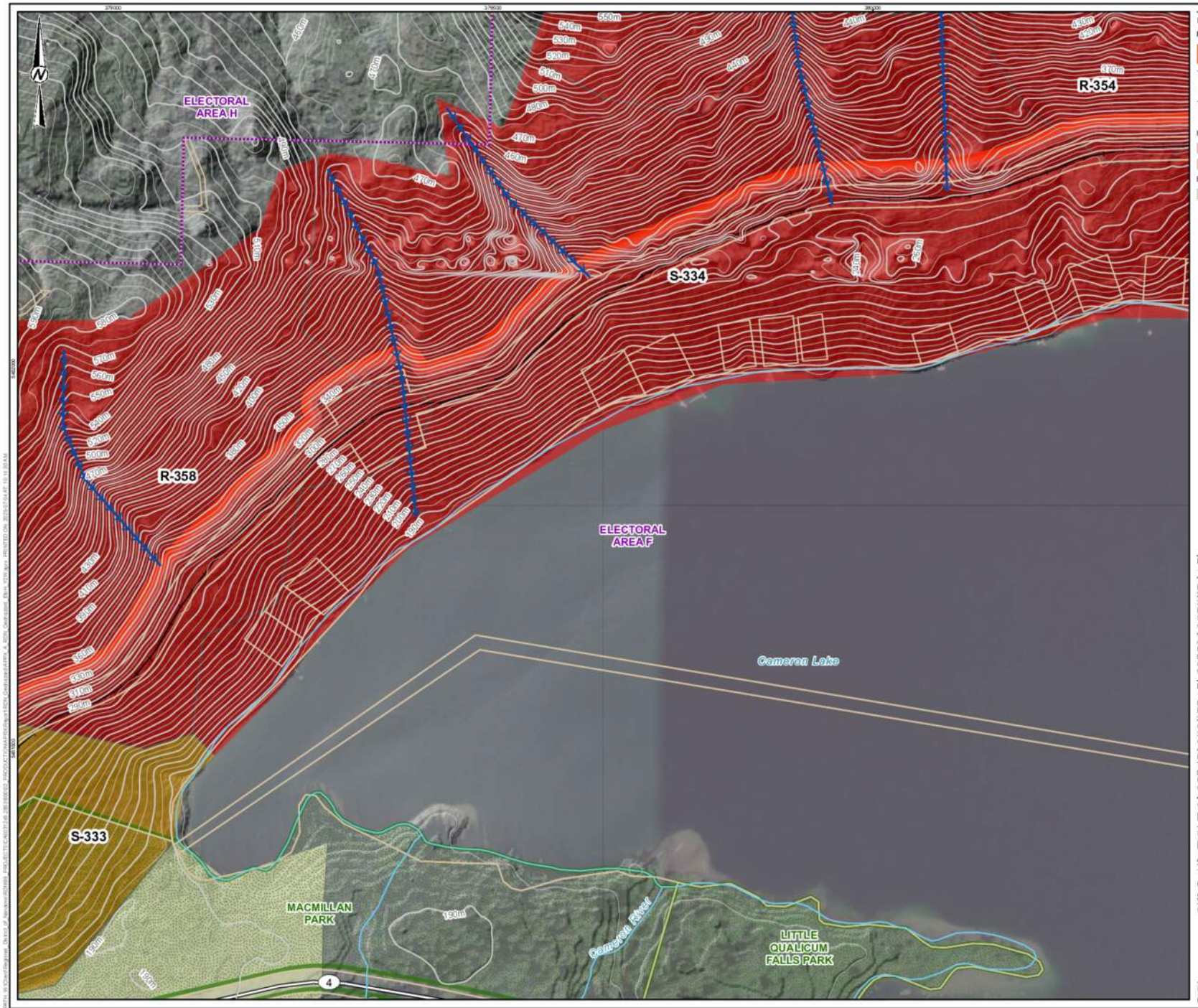


LEGEND

PROJECT DATA
- STUDY AREA

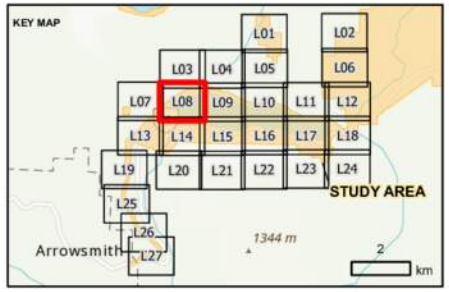
TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

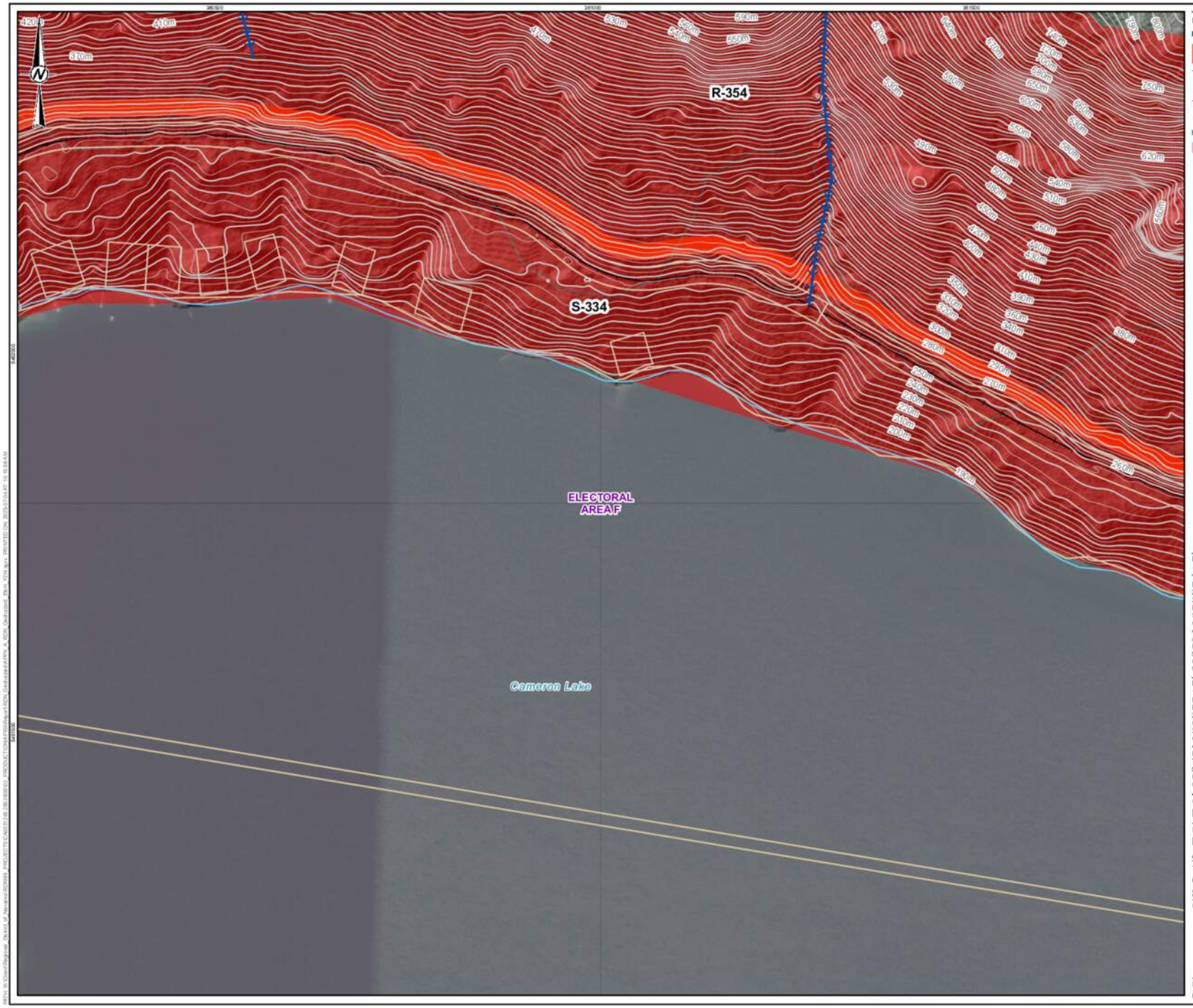
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L08



LEGEND

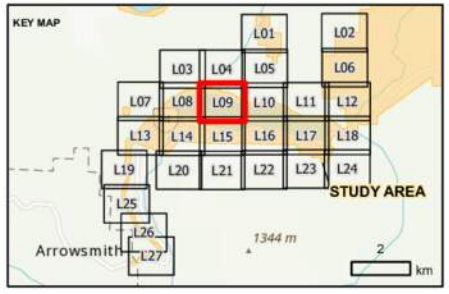
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

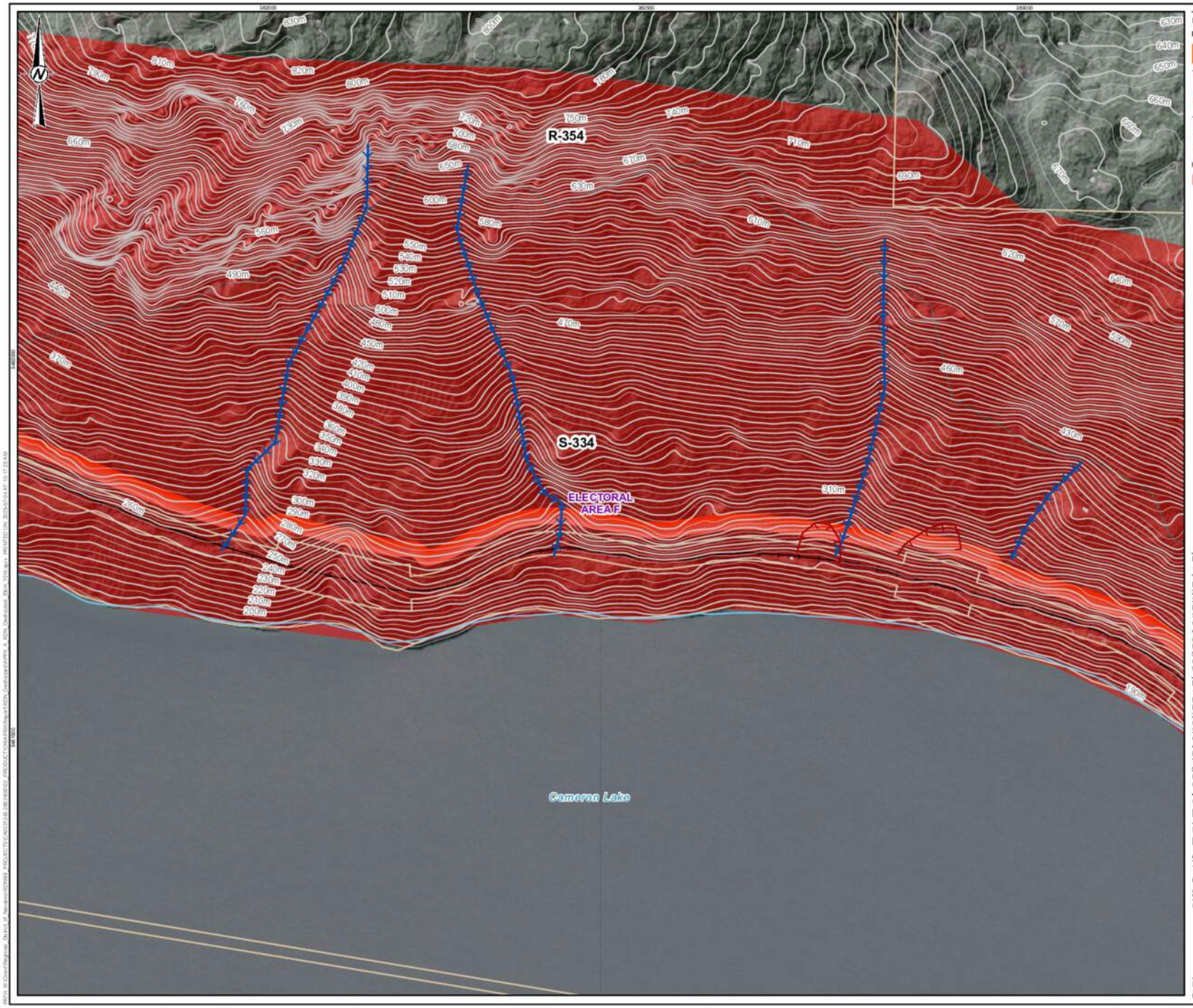
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L09



LEGEND

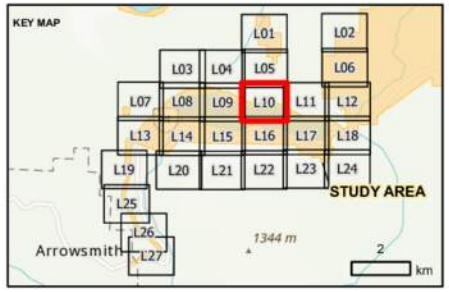
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

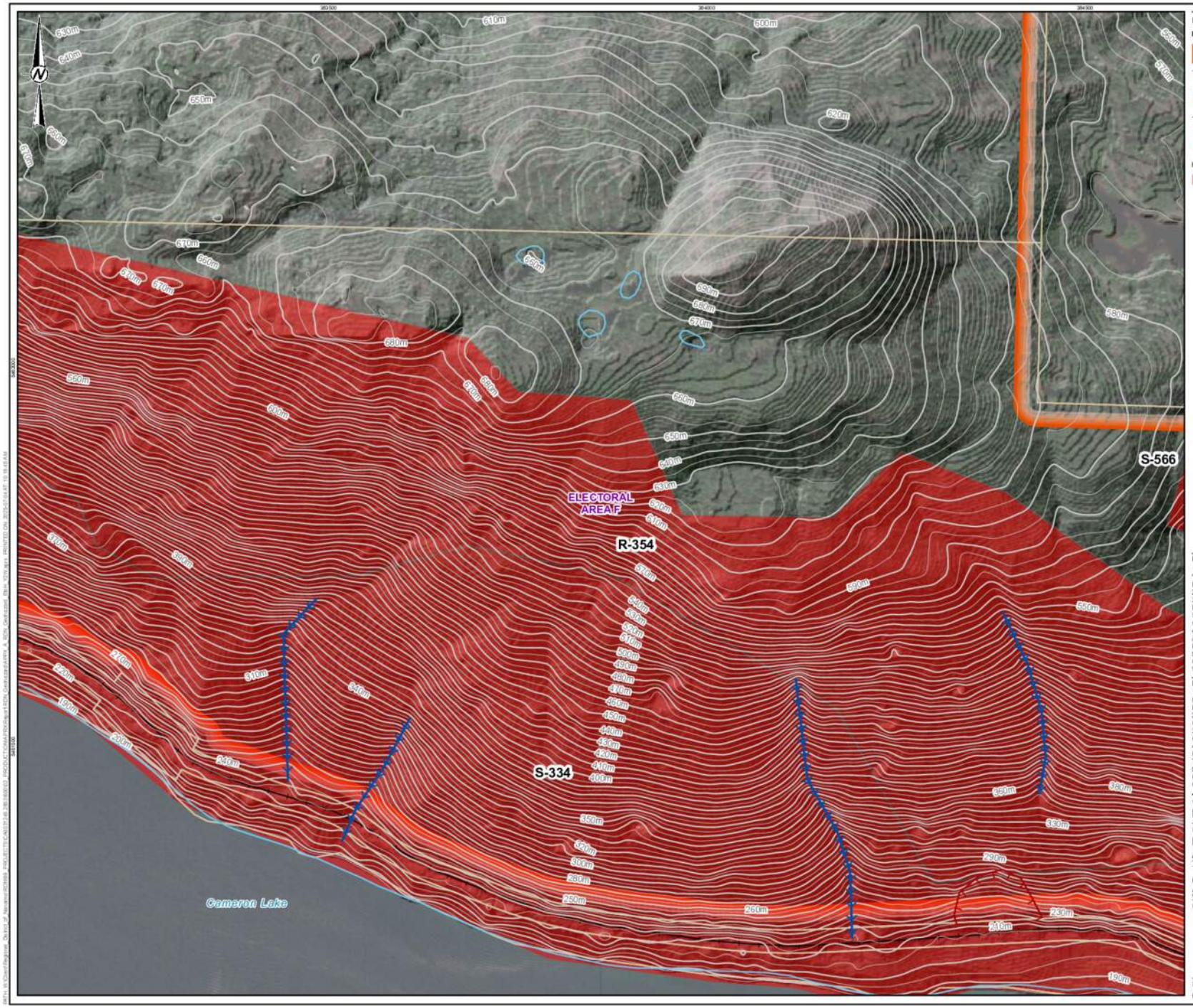
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L10



LEGEND

PROJECT DATA

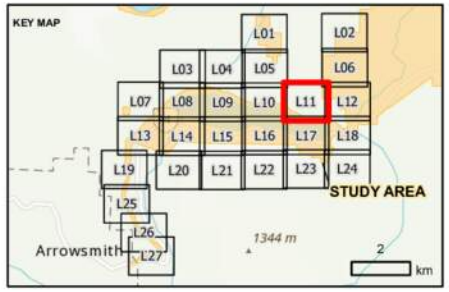
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- RAILROAD
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

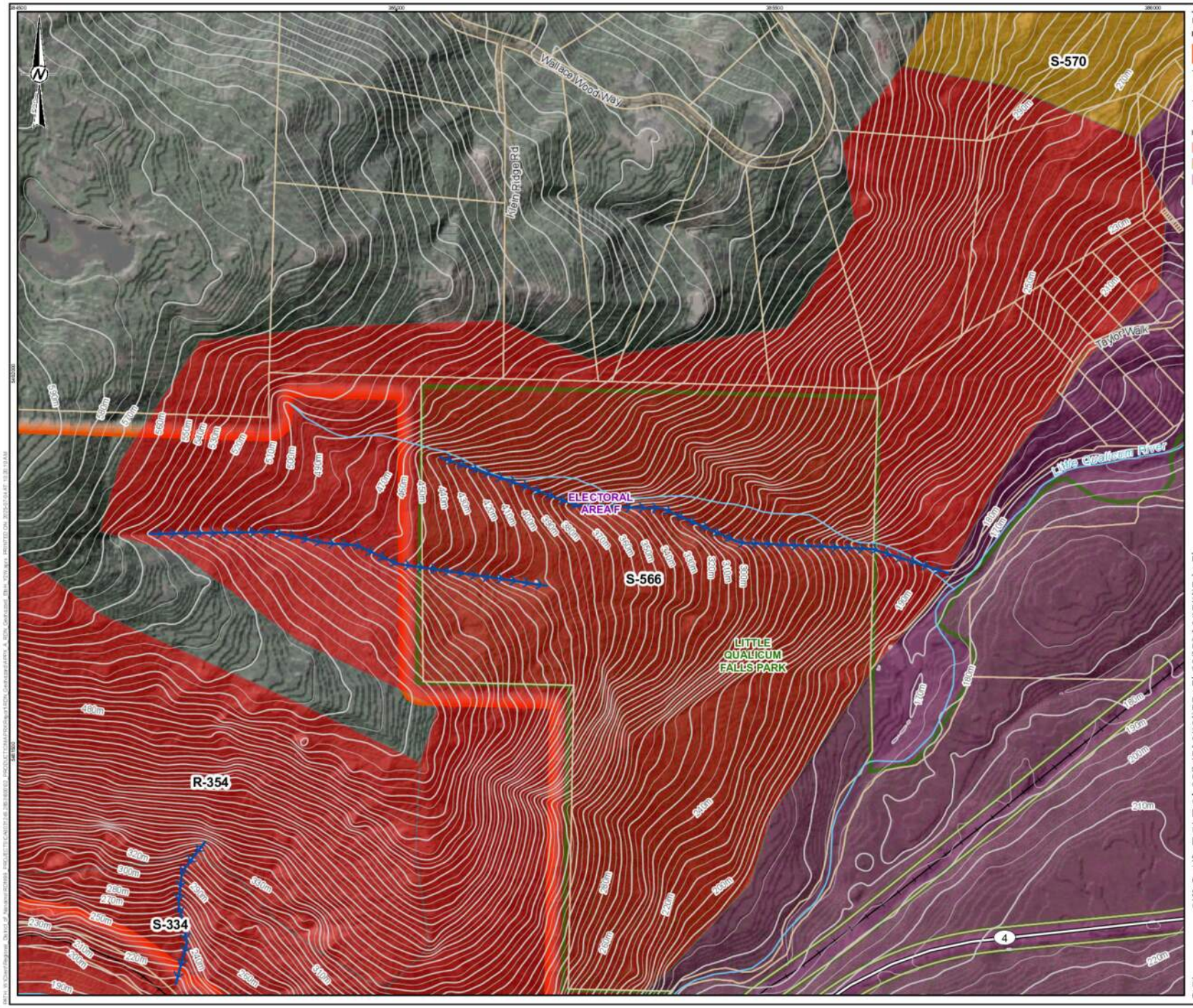
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L11



LEGEND

PROJECT DATA

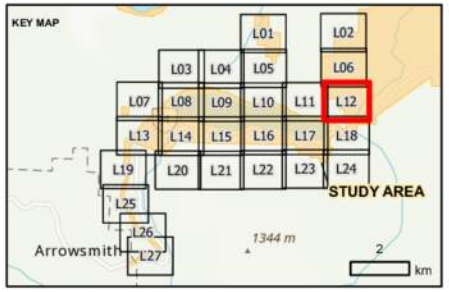
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L12

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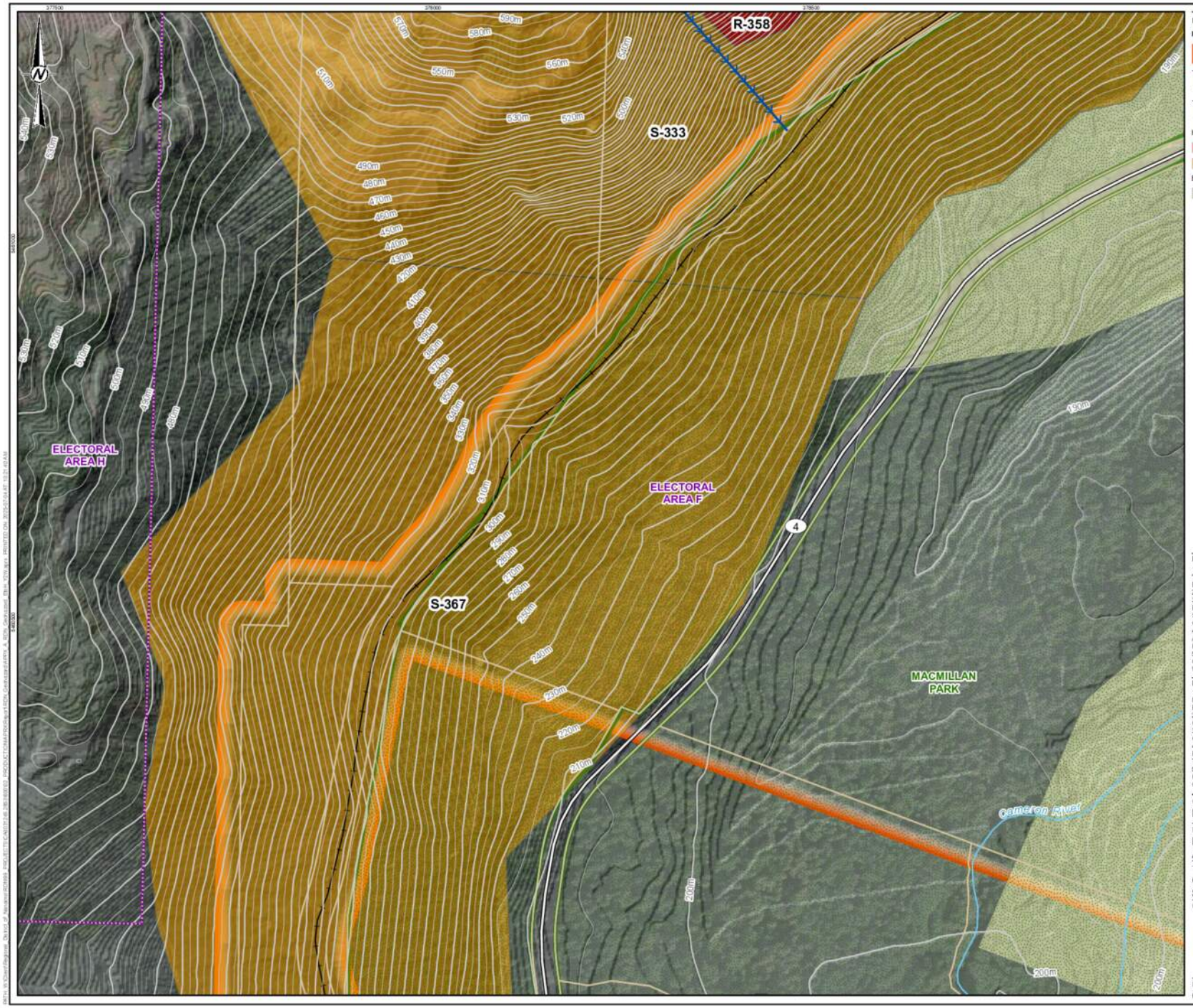


LEGEND

PROJECT DATA
- STUDY AREA

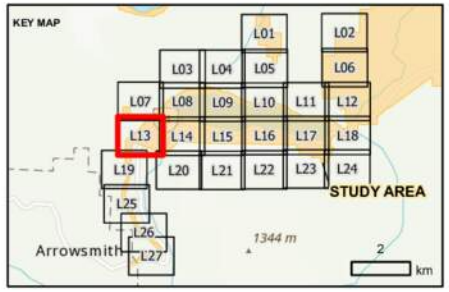
TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

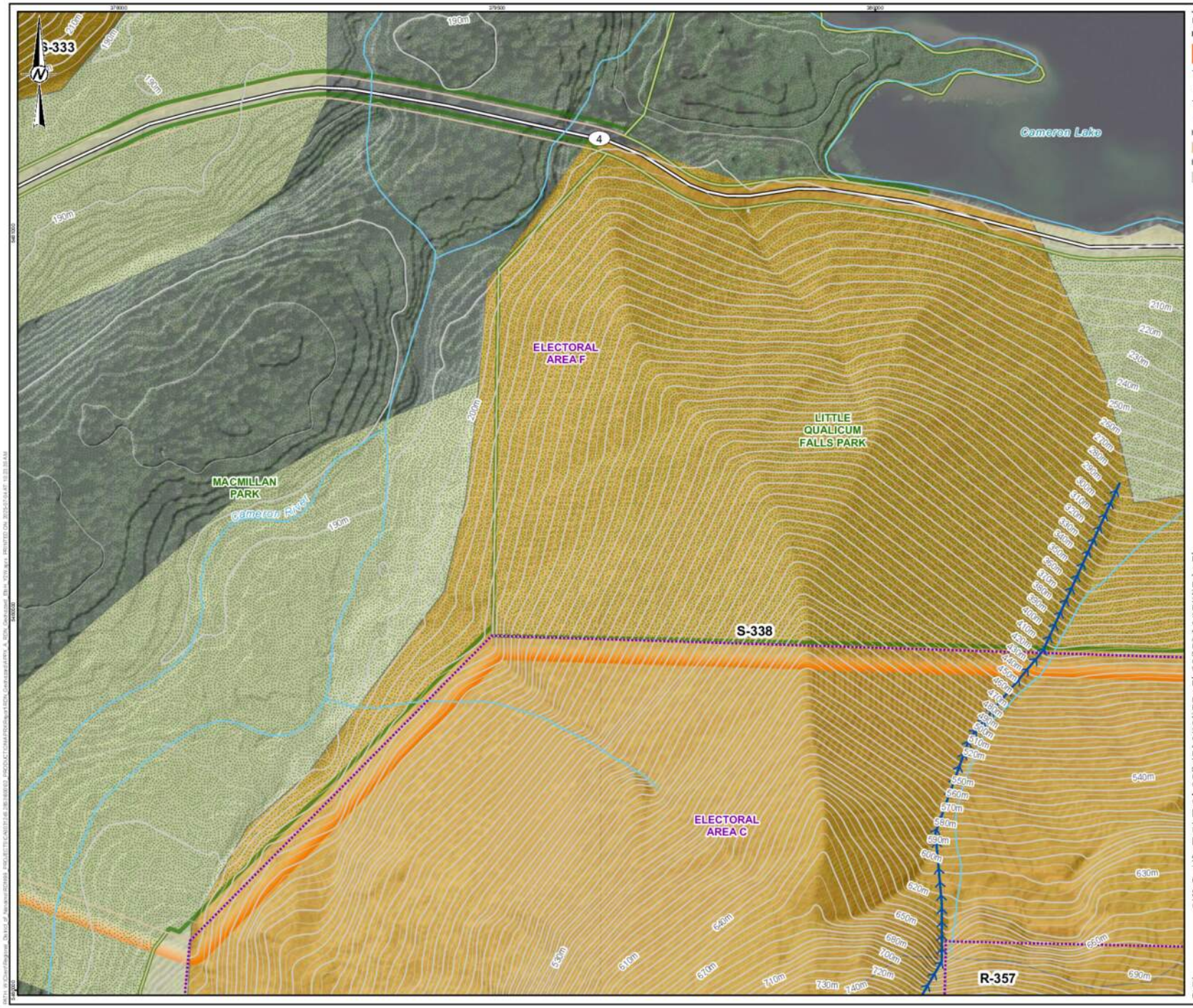
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L13



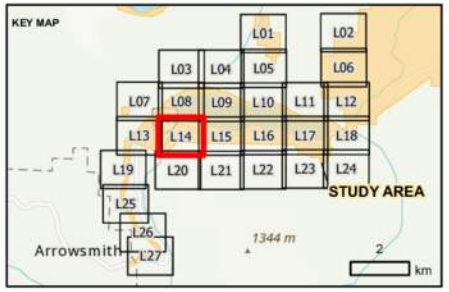
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): MEDIUM
- BUFFER ZONE: BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L14

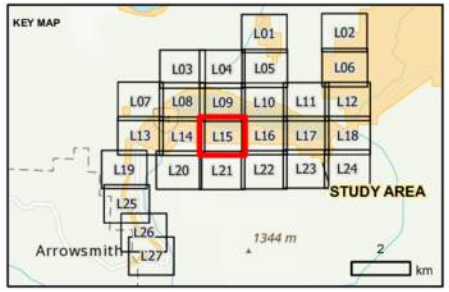
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): MEDIUM
- BUFFER ZONE: BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200

METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

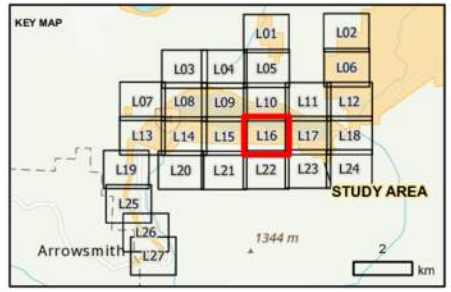
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): HIGH
- HAZARD AREA (AOP): MEDIUM
- BUFFER ZONE: BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L16

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

LEGEND

PROJECT DATA
- STUDY AREA

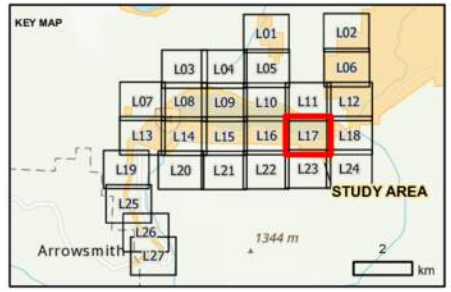
TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

TERRAIN FEATURE
- GULLY / DRAINAGE PATH
- SCARP

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BUFFER ZONE
- BUFFER (CREST / TOE)
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

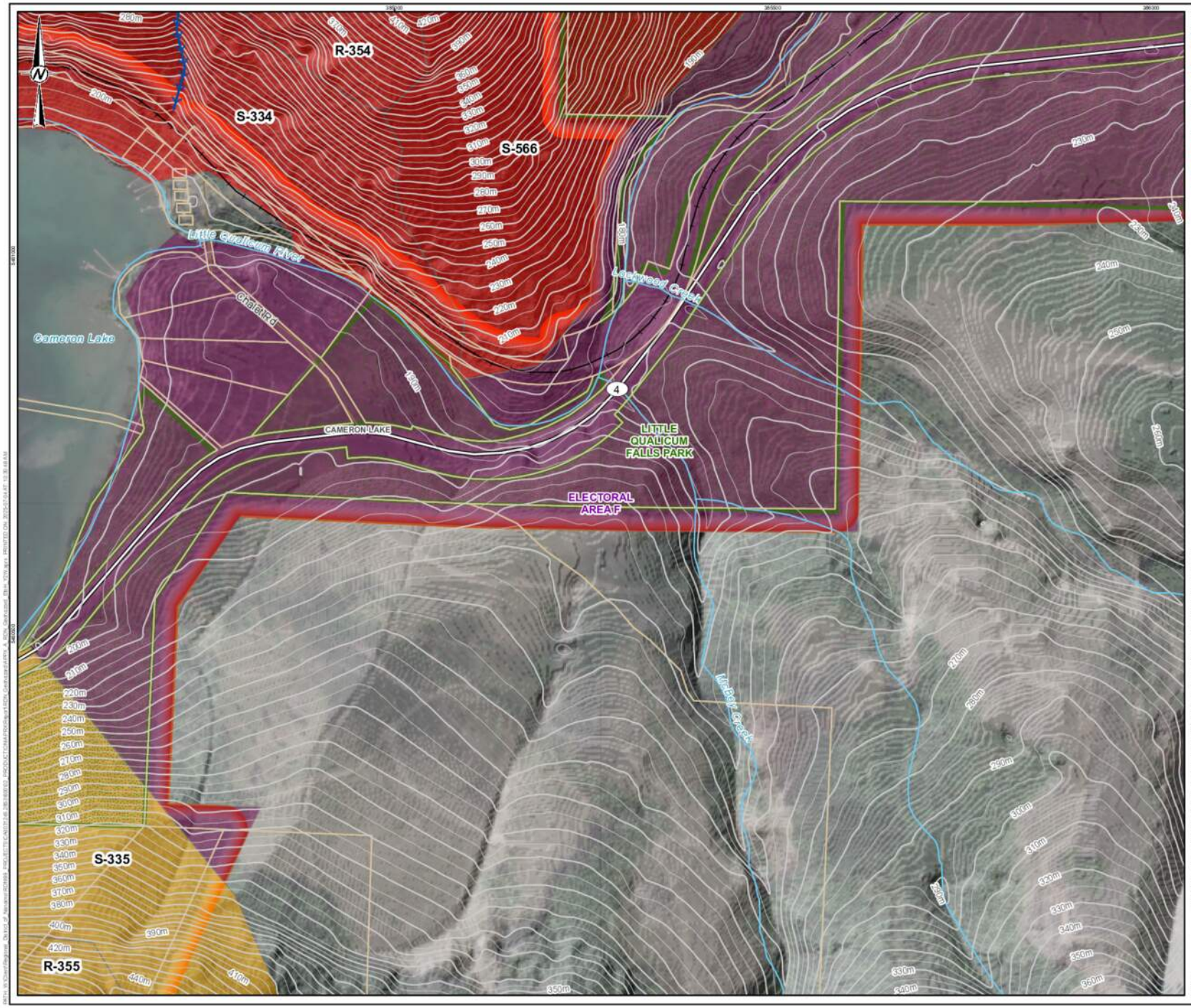
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L17



LEGEND

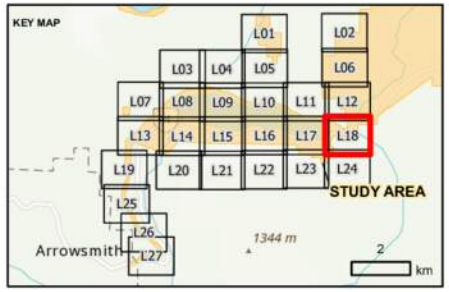
PROJECT DATA
- STUDY AREA

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- ROAD - LOCAL
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



LIMITATION(S)

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4. AREAS MARKED AS "UNCLASSIFIED" ARE LIKELY TO CONTAIN STEEP-SLOPE HAZARDS BUT WERE NOT ASSESSED AS PART OF THIS STUDY. BUFFER ZONES MAY ALSO CONTAIN UNCLASSIFIED STEEP SLOPE HAZARDS.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

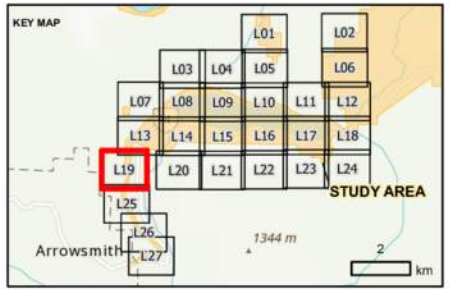
YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L18

LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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METRES

LIMITATION(S)

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

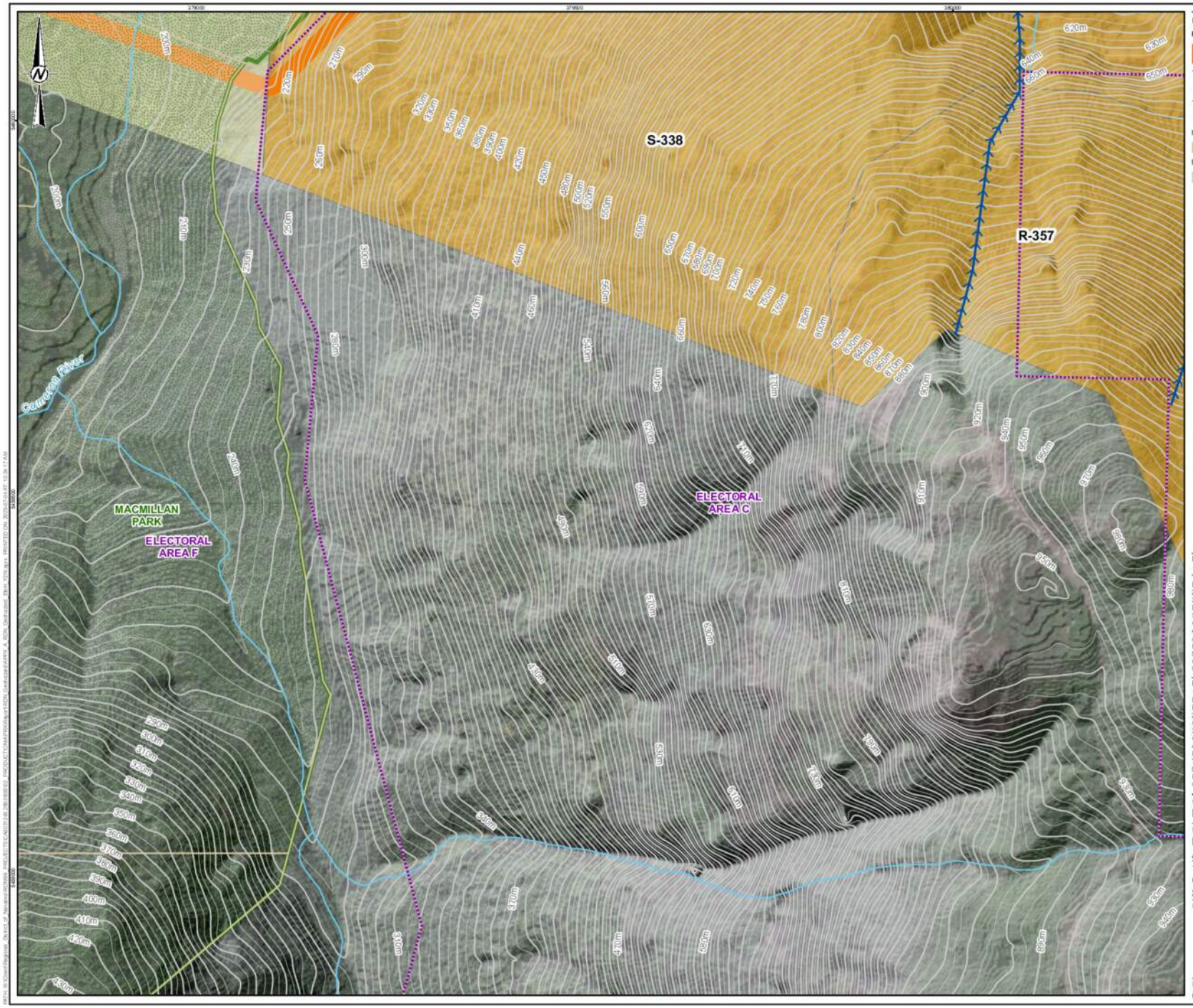
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L19



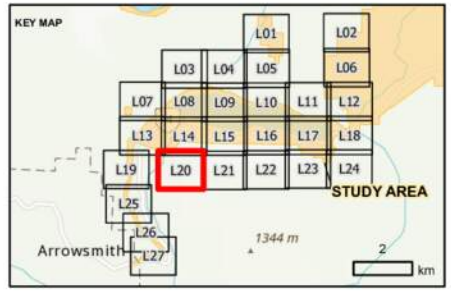
LEGEND

PROJECT DATA

- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): MEDIUM
- BUFFER ZONE: BUFFER (CREST / TOE)

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

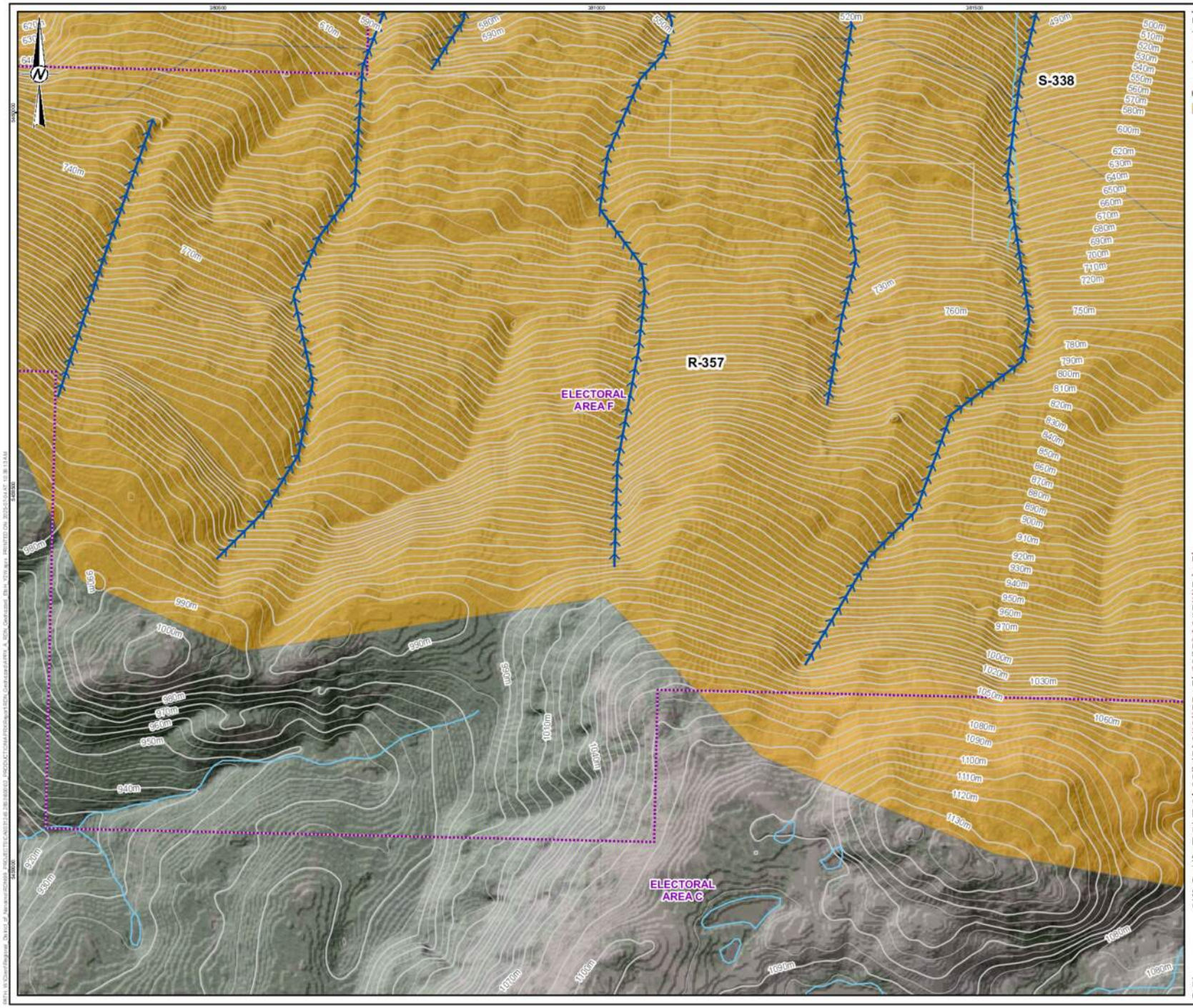
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L20



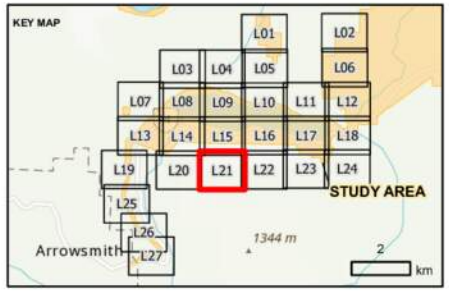
LEGEND

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

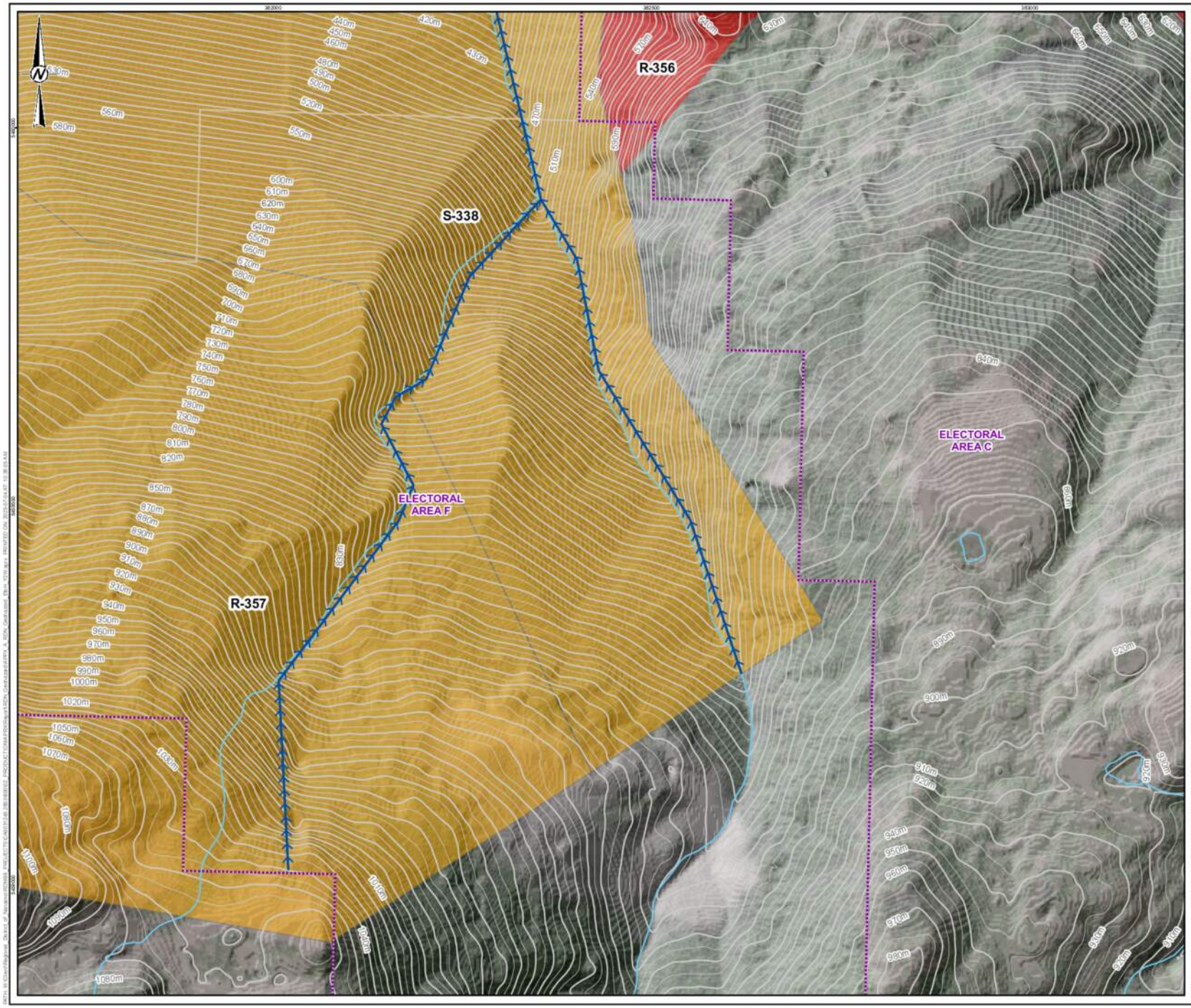
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L21



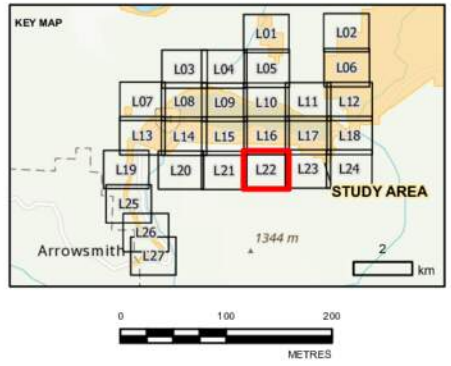
LEGEND

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

TERRAIN FEATURE
- GULLY / DRAINAGE PATH

HAZARD AREA (AOP)
- HIGH
- MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

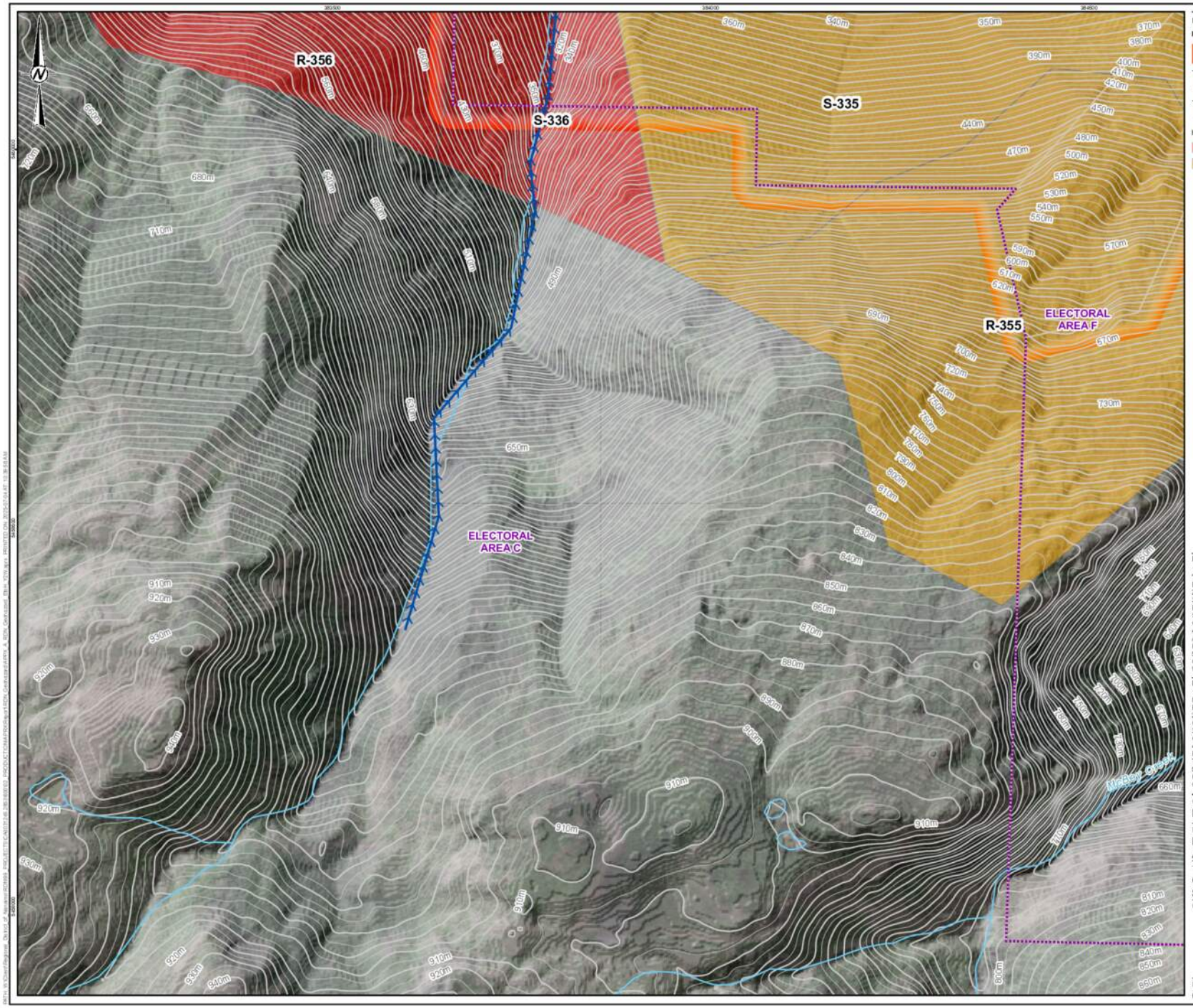
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

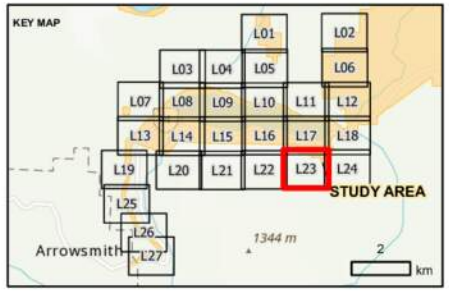
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L22



LEGEND

PROJECT DATA
- STUDY AREA
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- TERRAIN FEATURE: GULLY / DRAINAGE PATH
- HAZARD AREA (AOP): HIGH
- HAZARD AREA (AOP): MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

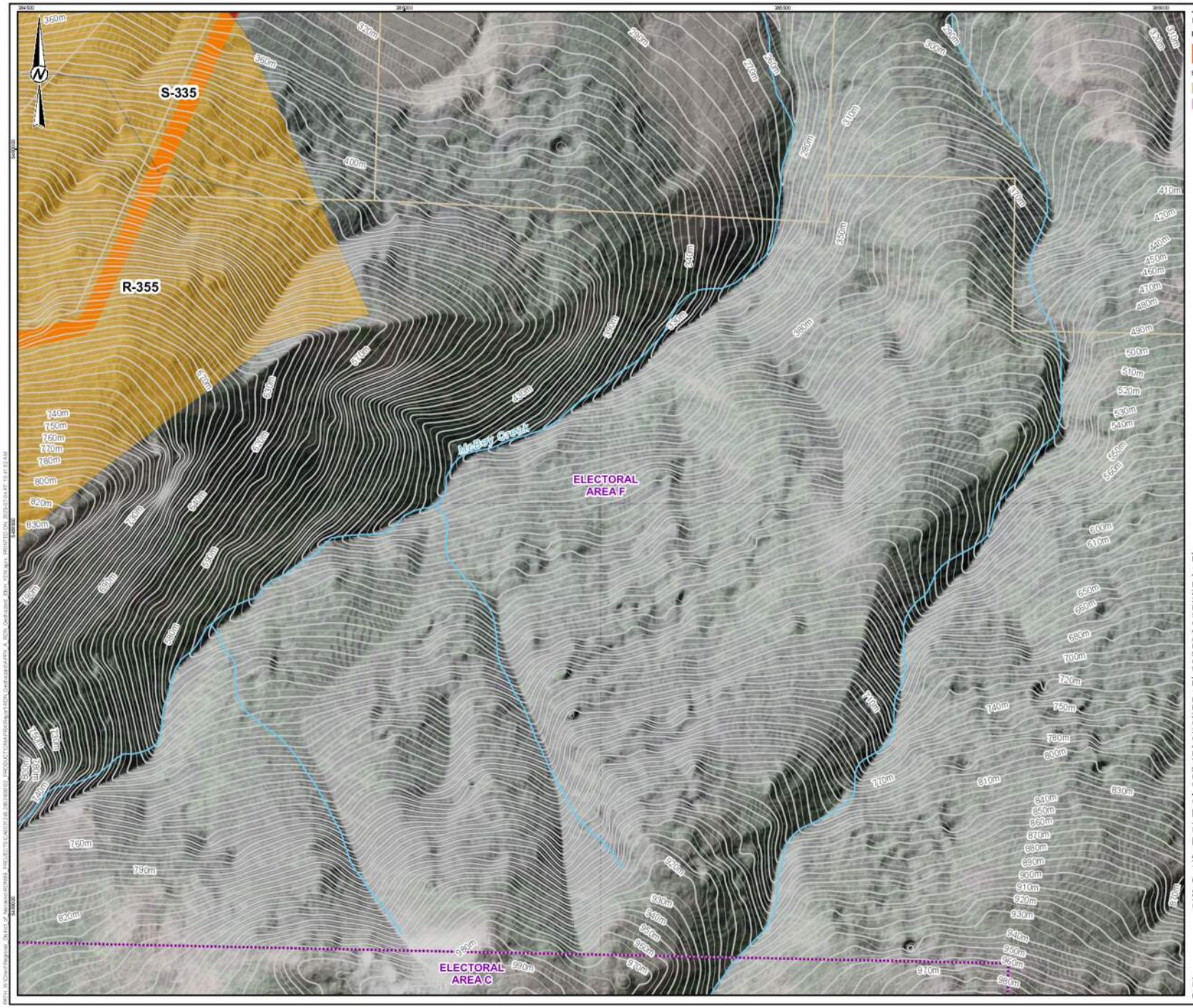
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L23



LEGEND

PROJECT DATA

- STUDY AREA

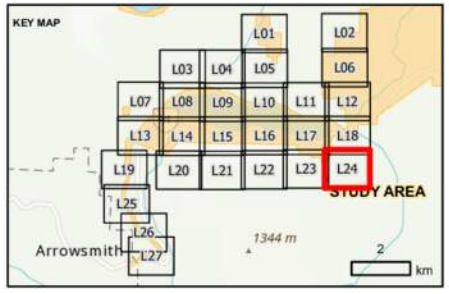
HAZARD AREA (AOP)

- MEDIUM
- UNCLASSIFIED HAZARD AREA

BASE DATA

- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- PARCEL
- ELECTORAL AREA

KEY MAP



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

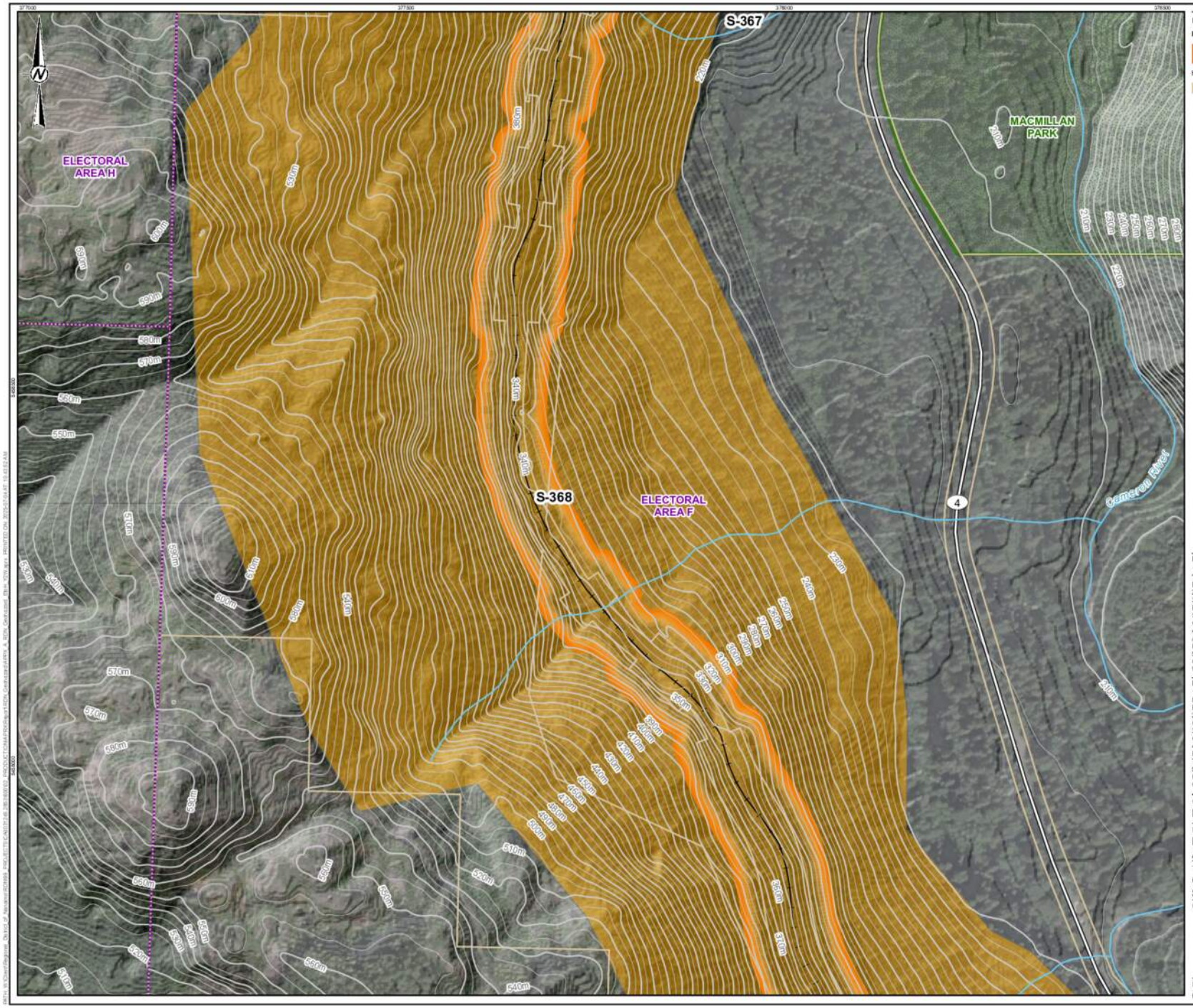
TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

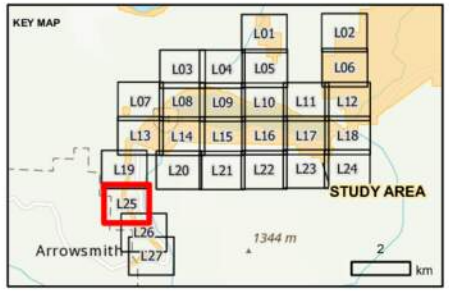
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L24



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

LIMITATION(S)

1. THESE MAP SHEETS SHOULD BE REVIEWED TOGETHER WITH THE ACCOMPANYING REPORT TITLED "GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY, REGIONAL DISTRICT OF NANAIMO" (REV. 1 DATED JULY 2025).
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3. HAZARD MAPPING WAS LIMITED BY SCALE AND IS NOT COMPREHENSIVE. LOCAL GEOHAZRDS MAY EXIST WHERE NO HAZARDS HAVE BEEN IDENTIFIED. FEATURES WITH RELIEF OF LESS THAN 5 M AND/OR SLOPES LESS THAN 15 DEGREES STEEP WERE BELOW THE ESTABLISHED LEVEL OF DETAIL AND WERE GENERALLY NOT MAPPED.
4. AREAS MARKED AS "UNCLASSIFIED" ARE LIKELY TO CONTAIN STEEP-SLOPE HAZARDS BUT WERE NOT ASSESSED AS PART OF THIS STUDY. BUFFER ZONES MAY ALSO CONTAIN UNCLASSIFIED STEEP SLOPE HAZARDS.
5. SOME HAZARD POLYGONS ARE MAPPED OUTSIDE OF THE STUDY AREA FOR CONTINUITY AND CONTEXT. HOWEVER, ANY HAZARD MAPPING OUTSIDE THE STUDY AREA SHOULD NOT BE RELIED UPON WITHOUT REVIEW BY WSP.

REFERENCE(S)

1. WATERCOURSE, WATERBODY, WETLAND, PARK/PROTECTED AREA, GREENSPACE, ROAD AND MUNICIPALITY DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – BRITISH COLUMBIA.
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3. PARCELAND ELECTORAL AREA DATA CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – REGIONAL DISTRICT OF NANAIMO.
4. CONTOUR, SEA LEVELAND HILLSHADE DATA DERIVED FROM LIDAR BC, HRDEM (1m RESOLUTION) AND REGIONAL DISTRICT OF NANAIMO (2m RESOLUTION) ELEVATION DATA. INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – BRITISH COLUMBIA AND CANADA.
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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

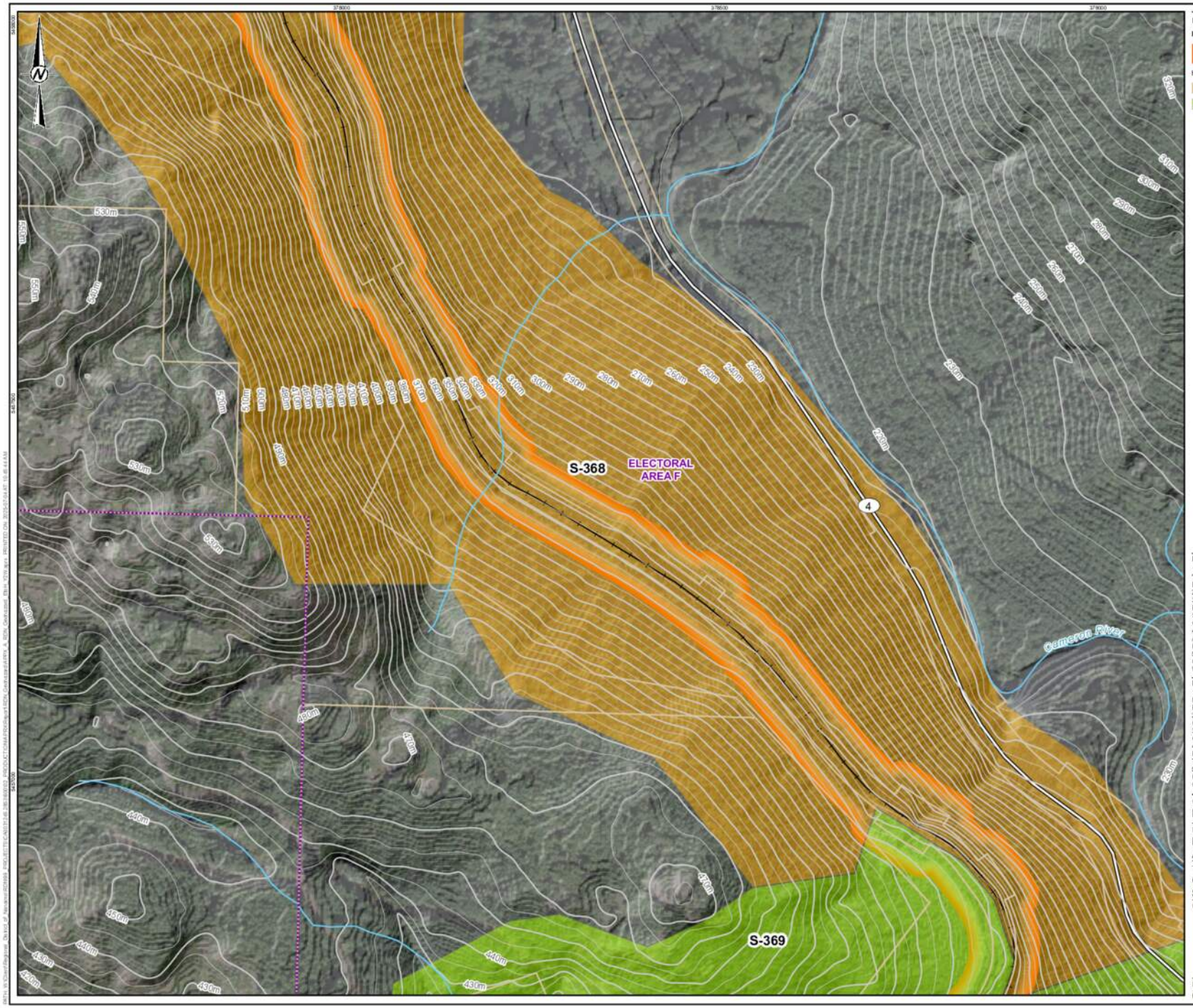
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L25

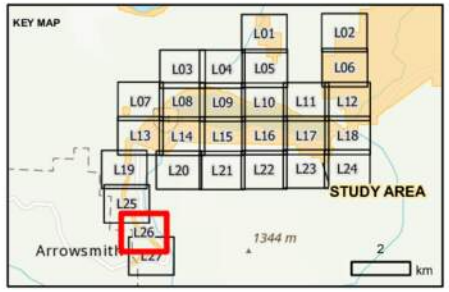


LEGEND

PROJECT DATA
- STUDY AREA

HAZARD AREA (AOP)
- MEDIUM
- LOW

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

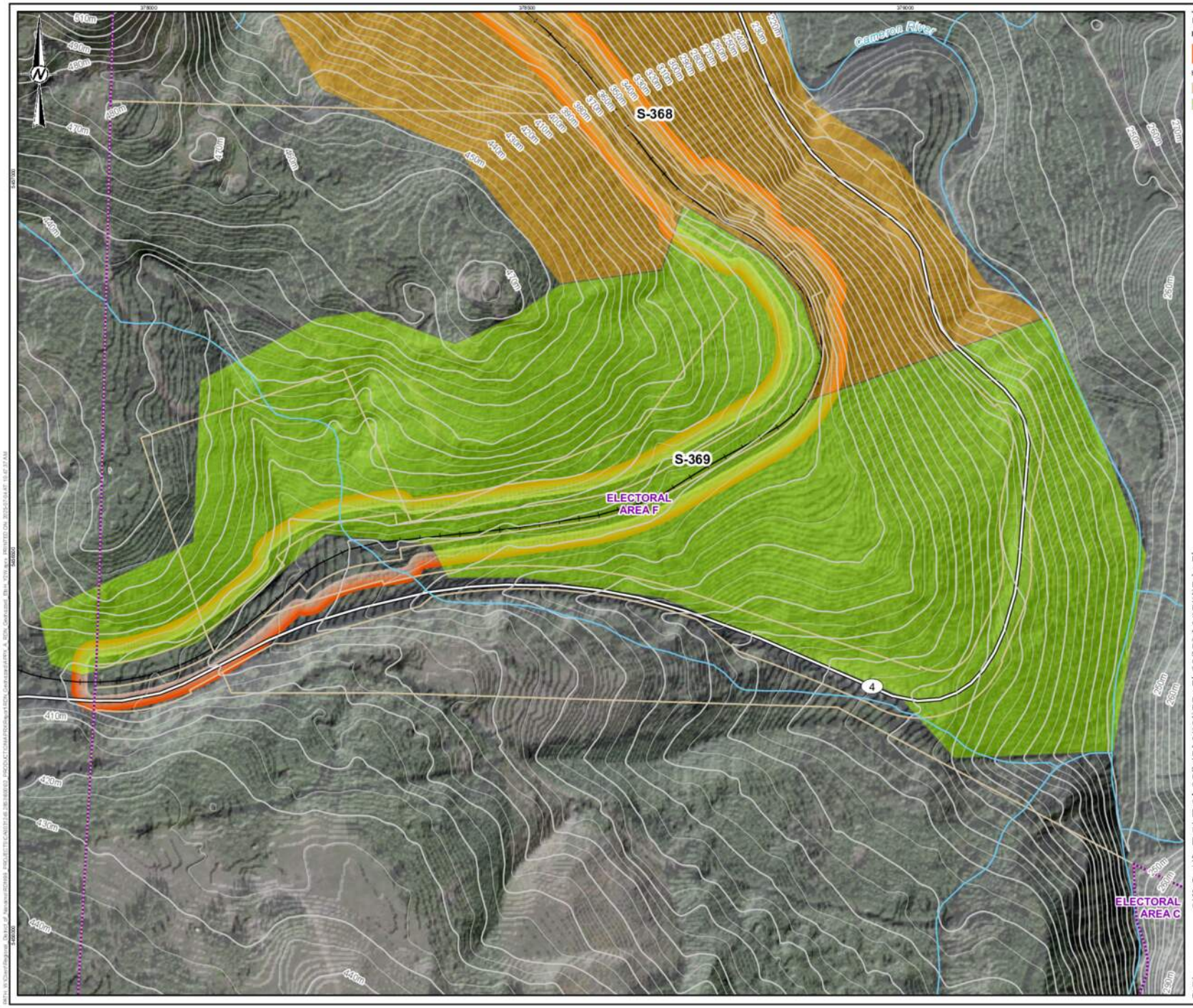
PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

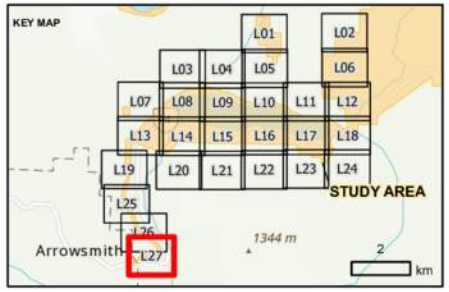
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L26



LEGEND

PROJECT DATA
- STUDY AREA
- HAZARD AREA (AOP)
  - MEDIUM
  - LOW

BASE DATA
- CONTOUR (10 m INTERVAL)
- CONTOUR (5 m INTERVAL)
- HIGHWAY
- RAILROAD
- WATERCOURSE
- PARCEL
- ELECTORAL AREA



0 100 200
METRES

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COORDINATE SYSTEM: NAD 1983 UTM Zone 10N

CLIENT
REGIONAL DISTRICT OF NANAIMO, BC

PROJECT
REGIONAL DISTRICT OF NANAIMO GEOHAZARD ASSESSMENT AND RISK PRIORITIZATION STUDY

TITLE
GEOHAZARD MAPPING
SECTION L - CAMERON LAKE

CONSULTANT

YYYY-MM-DD	2025-07-04
DESIGNED	MP
PREPARED	LH
REVIEWED	DC
APPROVED	DC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031245.2853	600	1	L27

APPENDIX

B GEOHAZARD DATA TABLE

Explanation of Terms in Geohazard Map Data Table

Data Headings:

Hazard Likelihood **–** 1 = High, 2 = Medium, 3 = Low. Refer to the Report for further explanation.

Polygon ID **–** unique identifier of polygon as shown on the map sheets.

Primary Hazard **–** primary geohazard within polygon (refer to Report for explanation of the identified hazards). Where multiple hazards are listed, the first one is the "primary" hazard. Additional information may be provided in the Description column.

Key (natural) trigger – refer to Report for explanation of Triggers. Within the data table, triggering by erosional processes was separated into "toe erosion" (undercutting of slope toe by a stream or coastal wave action), as well as "active erosion", referring to general erosion-related transport of material (such as from overland flow), leading to soil transport, retrogression of slope crests, development of erosional gullies, etc.

Type **–** brief description of the nature of the slope (e.g. coastal, river valley, etc.)

Description **–** provides brief information about the polygon including visible indications of historic instabilities, signs of surface or toe erosion, and other relevant details.

Height, Steepness **–** provide approximate height (m) and steepness (°) of the identified slope within the polygon.

Reliability **–** indicates polygons assessed based on the higher resolution LidarBC or HRDEM datasets (Reliability 1), or the lower resolution DEM provided by the RDN (Reliability 2). The lower resolution of the RDN's DEM hinders the ability to assess the surface features, height, and steepness of slopes. In some cases, slope steepness can be underreported by more than 50% using this dataset.

Terms used in Polygon Descriptions:

"Future" / "long-term" **–** Generally indicates a period of roughly 100 years into the future.

E.g. Where the description includes phrases such as "possibility of future (long-term) toe erosion", that means the slope is not currently subjected to toe erosion, but could reasonably become subjected within a 100 year period (and, as such, the triggering mechanism may change). In coastal areas, the threshold for this was determined by a contour set at a level of 4 m amsl (refer to the report for more information). Along rivers and streams, this description may apply to any old valley slopes not actively undercut by the stream, but deemed to be conceivably reached by a meandering channel within a 100 year period.

Surficial Erosion **–** indicates visible development of drainage/erosion channels (also called "rills") on the slope face (as identified on the digital elevation model).

Overburden **–** in this context, used to describe a thin veneer of loose soils overlying a dense, competent material like glacial till or bedrock.

Gully **–** used to describe erosional ravine like features of relatively short length and high channel grade (e.g. more than about 4-5%).

Ravine **–** used to describe small stream valleys with channel grades typically less than about 4%.

Geohazard Map Data Table

Regional District of Nanaimo

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-001	Soil Slide	High Precipitation	Natural slope along creek	Tributary creek to Big Qualicum River.	20	30-40	1
3	S-004	Soil Slide	High Precipitation	Natural coastal slope	No signs of instability. Known seismically induced liquefaction slides in area.	7	25-30	1
2	S-005	Soil Slide	High Precipitation	Natural coastal slope	No signs of instability. Known seismically induced liquefaction slides in area.	10-15	25-30	1
2	S-006	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Some drainage gully formation throughout slope. Likely historic debris flows/slides. Landslide in area reported in 1991. Known seismically induced liquefaction slides in area.	20-25	30-35	1
2	S-007	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Drainage gully and possible old landslide within polygon. Known seismically induced liquefaction slides in area.	25	30	1
2	S-008	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	No signs of instability. Known seismically induced liquefaction slides in area.	20	30	1
1	S-009	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Drainage gully formations.	15-20	35-45	1
2	S-010	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of surface erosion on slope / slight gully formations	25	35	1
2	S-011	Soil Slide	Active erosion	Natural draiange gully		10-20	35-45	1
2	S-012	Soil Slide	Active erosion	Natural drainage gully		15-25	35-45	1
2	S-013	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of gullying and soil slides/flows.	40	35	1
1	S-014	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of gullying and soil slides/flows. Landslide in area reported in 2011.	40-45	35-45	1
1	S-015	Soil Slide	Active erosion	Natural gully	Major drainage gully. Signs of bank instability.	20-25	30	1
1	S-016	Debris Flow	High Precipitation	Natural coastal slope	Signs of extensive gullying and debris flows/slides. Possible coastal toe erosion (long term).	40	25-35	1
1	S-017	Soil Slide	Active erosion	Natural gully	Major drainage gully. Signs of bank instability.	20-25	40	1
1	S-018	Debris Flow	High Precipitation	Natural coastal slope	Signs of extensive gullying and blow-off failures / debris flows. Possible coastal toe erosion (long term).	35-40	30-35	1
2	S-019	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Appears generally stable. Slight signs of old debris flows. Possible coastal toe erosion (long term).	20	30-35	1
2	S-020	Soil Slide, Debris Flow	Active erosion	Natural ravine		5-10	30-45	1
2	S-021	Debris Flow	High Precipitation	Natural coastal slope	Slight indications of erosion channel formation and/or old debris flows. Possible coastal toe erosion (long term).	15-20	30-35	1
2	S-022	Block Slide	High Precipitation	Natural coastal slope	Part of inferred landslide area. Possible coastal toe erosion (long term).	20	25	1
2	S-023	Soil Slide	High Precipitation	Natural ravine	Ravine flows out into inferred landslide area.	5-10	40-45	1
2	S-024	Soil Slide, possible Block S	High Precipitation	Natural coastal slope	Part of inferred landslide area.	15-20	20	1
2	S-025	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Slight indications of erosion channel formation and/or old debris flows.	25	25-30	1
3	S-026	Soil Slide, possible Block S	High Precipitation	Natural coastal slope	Contains suspected old landslide area. Possible coastal toe erosion (long term).	15	20-25	1
2	S-027	Soil Slide	High Precipitation	Natural ravine	Minor ravine.	5	30	1
2	S-028	Debris Flow	High Precipitation	Natural coastal slope with some cut/fill activity	No signs of instability.	7	30	1

Geohazard Map Data Table

Regional District of Nanaimo

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-030	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Variable slope inclination. Higher potential for instability in steeper sections.	5-10	30-45	1
2	S-031	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity		7	30	1
2	S-032	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Variable slope inclination. Higher potential for instability in steeper sections.	10	30-35	1
1	S-033	Soil Slide, Debris Flow	Active erosion	Natural gully	Very steep banks.	5-10	40-50	1
2	S-034	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Possible local coastal toe erosion (future).	12	25-35	1
3	S-035	Soil Slide	High Precipitation	Natural coastal slope	No signs of instability.	5-8	20-26	1
2	S-036	Soil Slide	Toe erosion	Natural slope along creek floodplain		10-15	27-37	1
2	S-037	Soil Slide	Toe erosion	Natural slope along creek floodplain	Somes indication of old soil slides.	10-13	30-35	1
2	S-038	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible old liquefaction slide.	10-15	20-25	1
2	S-039	Soil Slide	Toe erosion	Natural slope along creek floodplain		10	25-35	1
2	S-040	Soil Slide	Toe erosion	Natural slope along creek floodplain	Variable slope inclination. Higher potential for instability in steeper sections.	12-15	20-40	1
1	S-042	Soil Slide	High Precipitation	Natural slope along creek floodplain	Some signs of old or recent debris or earth slides.	15-25	30-40	1
3	S-043	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future toe erosion.	5-10	30	1
1	S-044	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Possible recent or active instability.	12	40-45	1
2	S-045	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible recent or active instabilites present within polygon. Possibility for future toe erosion.	10	30-45	1
1	S-046	Soil Slide	Toe erosion	Natural slope along creek floodplain	Possible recent or active instabilites present within polygon. Local toe erosion.	10	30	1
3	S-047	Soil Slide	High Precipitation	Natural slope along creek floodplain	No signs of any recent instability	10	30	1
1	S-048	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	13	50	1
3	S-049	Soil Slide	High Precipitation	Natural slope along creek floodplain	No signs of any recent instability.	12	30	1
3	S-050	Soil Slide	High Precipitation	Natural slope along creek floodplain including relict terraces	No signs of any recent instability. Possibility for future (long-term) toe erosion.	15	25-30	1
2	S-051	Soil Slide, Debris Flow	Active erosion	Natural gully		10	30	1
2	S-052	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future (long-term) toe erosion.	10	20-30	1
1	S-053	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	5	40	1
3	S-054	Soil Slide	High Precipitation	Natural slope along creek terrace	No signs of any recent instability.	20-25	25	1
2	S-055	Soil Slide, Debris Flow	Active erosion	Natural gully		10	25	1
3	S-056	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible old landslide activity. Possibility for future (long-term) toe erosion.	30	20	1
2	S-057	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	30	20	1
3	S-058	Soil Slide	High Precipitation	Natural slope along creek floodplain	No signs of instability.	10	20	1
2	S-059	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Variable slope inclination. Higher potential for instability in steeper sections.	10	30-40	1
2	S-060	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future toe erosion. No signs of any recent instability. Some gullies present within polygon.	15-20	30	1
2	S-061	Soil Slide	High Precipitation	Natural slope along creek floodplain	No signs of any recent instability.	15	25-30	1
2	S-062	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain	Possibility for future toe erosion. Some signs of gully formation and/or debris flows along slope.	25	25-35	1
1	S-063	Debris Flow	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Drainage gully present within polygon.	27	30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-064	Debris Flow	High Precipitation	Natural slope along creek floodplain	Some signs of gullying.	25	25-30	1
1	S-065	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Active or recent slide present within polygon.	30	30	1
2	S-066	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	No signs of any recent instability. Possibility for future (long-term) toe erosion.	15-30	30	1
3	S-067	Soil Slide	High Precipitation	Natural slope along creek floodplain including relict terraces	No signs of any recent instability.	25-30	15-25	1
2	S-068	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity		25-30	30-40	1
2	S-069	Soil Slide	High Precipitation	Natural slope along creek floodplain	Signs of old landsliding (possible block slides).	50	25	1
1	S-070	Debris Flow	Active erosion	Natural slope along creek floodplain and gullies	Extensive gullying and possibility of gully retrogression. Numerous blow-offs, debris flows, and possibly other slides.	60-80	15-30	1
2	S-072	Soil Slide	High Precipitation	Natural slope with some cut/fill activity		11-13	30 - 45	1
2	S-073	Soil Slide	High Precipitation	Natural slope along river floodplain		15	25	1
3	S-074	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability.	15	25	1
3	S-075	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability.	10	20	1
3	S-076	Soil Slide	High Precipitation	Natural slope along river terrace		7	20	1
1	S-077	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	35	30	1
2	S-078	Soil Slide, Debris Flow	Active erosion	Natural gully		20	30	1
2	S-079	Soil Slide	Toe erosion	Natural slope along creek	Tributary creek to Big Qualicum River. Some signs of instability.	17	25	1
1	S-080	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Possible recent or active slide within polygon.	25	35	1
2	S-081	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	No sign of any recent instability.	30	30	1
1	S-082	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Signs of gully formation and/or debris flows.	40	20-25	1
2	S-083	Soil Slide	High Precipitation	Natural slope along river floodplain	Local toe erosion. Possibility for future (long term) toe erosion. Inferred old landslide within polgyon. Slight signs of gully formation.	40	25	1
1	S-084	Debris Flow	Active erosion	Natural slope along river floodplain and gullies	Extensive gullying and possibility for gully retrogression. Numerous blow-offs and debris flows. Local toe erosion.	70	25-30	1
1	S-085	Debris Flow	Active erosion	Natural gully	Extensive gullying and possibility for gully retrogression. Numerous blow-offs and debris flows.	40	20-35	1
1	S-086	Debris Flow	High Precipitation	Natural slope along river terrace	Some signs of gullying and debris flows.	35	30	1
1	S-087	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Sings of active or recent landsliding.	35	35-40	1
1	S-088	Debris Flow	Active erosion	Natural gully	Extensive gullying and possibility for gully retrogression. Numerous blow-offs and debris flows.	45-50	30	1
2	S-089	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability.	37	35	1
1	S-090	Debris Flow	Active erosion	Natural gully	Signs of gullying and debris flows.	25-30	25-35	1
2	S-091	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability. Possibility for future (long term) toe erosion.	35-40	30-35	1
1	S-092	Debris Flow	High Precipitation	Natural slope along river floodplain	Signs of gullying and several debris flows/slides and possible blow-off failures. Possibility for gully retrogression.	60-70	30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-093	Soil Slide	High Precipitation	Natural slope along river floodplain	Slope appears generally stable with no indication of recent instability. Possibility for future toe erosion.	75-100	20-30	1
1	S-094	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion.	30-50	30-35	1
1	S-095	Debris Flow	High Precipitation	Natural slope along river floodplain and gullies	Signs of gullying and several debris flows/slides and possible blow-off failures. Possibility for gully retrogression. Local toe erosion along river channel	80-90	20-25	1
1	S-096	Soil Slide	Toe erosion	Natural slope along river floodplain	Likely recent or active instability along oversteepend portions of the slope.	70-80	35-40	1
1	S-097	Debris Flow	High Precipitation	Natural slope along river floodplain	Extensive gullying and possibility for gully retrogression. Numerous blow-offs and debris flows. Local areas of toe erosion.	85-90	30	1
2	S-098	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability. Possibility for future toe erosion.	35-85	30-35	1
1	S-099	Soil Slide	Toe erosion	Natural slope along river floodplain with some cut/fill activity	Slope subjeted to toe erosion.	20-25	25-35	1
3	S-100	Soil Slide	High Precipitation	Natural slopes and relict river terraces.	Area of relict terraces and old slopes. No signs of instability.	45-65	45	1
1	S-101	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future toe erosion.	15-20	32	1
3	S-102	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion.	30	35	1
2	S-103	Soil Slide	High Precipitation	Natural slope along river floodplain	Variable slope inclination. Higher potential for instability in steeper sections.	10	40	1
2	S-104	Debris Flow	High Precipitation	Natural slope along relict river terrace.	Inferred old debris flows within polygon.	20	25-30	1
2	S-105	Soil Slide	High Precipitation	Natural coastal slope	Possible coastal toe erosion (long term).	20	30	1
1	S-106	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of gullying and several debris flows/slides and possible blow-off failures. Possibility for gully retrogression. Possible coastal toe erosion (long term).	40	35-45	1
2	S-107	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	No signs of instability. Possible coastal toe erosion (long term).	47	40	1
1	S-108	Soil Slide, Debris Flow	Active erosion	Natural gully	Major gully. Some sign of erosion channel formation on slopes.	30-40	30-40	1
2	S-109	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	No signs of instability. Possible coastal toe erosion (long term).	50-60	40	1
2	S-110	Soil Slide, Debris Flow	High Precipitation	Natural ravine with some cut/fill activity	Some signs of past landslide activity.	20	25-30	1
2	S-111	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Some signs of erosion channel formation and a few past debris flows within polygon.	40-45	30-35	1
1	S-112	Debris Flow	High Precipitation	Natural coastal slope	Signs of extensive gullying and blow-off failures / debris flows. Possible coastal toe erosion (long term).	65-70	30	1
1	S-113	Debris Flow	High Precipitation	Natural coastal slope	Signs of extensive gullying and blow-off failures / debris flows. Possible coastal toe erosion (long term).	70	30-35	1
1	S-114	Soil Slide, Debris Flow	Active erosion	Natural gully	Major drainage gully. Some sign of past slope instability.	25-35	30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-115	Soil Slide, possible Block S	High Precipitation	Natural coastal slope with some cut/fill activity	Two adjacent historic landslides within polygon - possibly liquefaction-related, block slides. Possible coastal toe erosion (long term).	45-60	25-30	1
2	S-116	Debris Flow	High Precipitation	Natural coastal slope	Some sign of past debris flow activity. Possible coastal toe erosion (long term).	48	35	1
2	S-117	Soil Slide, Debris Flow, pos	High Precipitation	Natural coastal slope	Possible old block-slide within polygon and indication of past debris flow activity. Possible coastal toe erosion (long term).	55	30	1
1	S-118	Debris Flow	Active erosion	Natural gully	Major drainage gully. Some sign of past slope instability.	35-45	35	1
1	S-119	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of extensive surficial erosion of slope and/or several past debris flows/slides. Possible coastal toe erosion (long term).	50-55	30-40	1
1	S-120	Soil Slide, Debris Flow	Active erosion	Natural gully	Major drainage gully. Some signs of slope instability.	30	30-40	1
2	S-121	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Possible coastal toe erosion (long term).	20-30	30	1
3	S-122	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Possible coastal toe erosion (long term).	10	25	1
2	S-123	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local toe erosion. Possibility for future (long term) toe erosion.	15	30	1
1	S-124	Soil Slide	High Precipitation	Natural slope along creek floodplain	Signs of slope instability throughout polygon. Local toe erosion. Possibility for future (long term) toe erosion.	30	30-40	1
1	S-125	Soil Slide	Active erosion	Natural ravine	Minor tributary ravine.	15	20-30	1
1	S-126	Soil Slide	Active erosion	Natural ravine	Minor tributary ravine.	10	30	1
2	S-127	Soil Slide	High Precipitation	Natural coastal/river slope	Possible future coastal or river toe erosion (long term).	12	35	1
1	S-128	Soil Slide	Toe erosion	Natural coastal/river slope	Slope subjected to toe erosion. Possible exposure to long-term coastal toe erosion.	15	50	1
2	S-129	Debris Flow	High Precipitation	Natural slope along river floodplain	Signs of past debris flows throughout polygon.	30-40	25-35	1
2	S-130	Debris Flow	High Precipitation	Natural slope along river floodplain	Site of possible ancient liquefaction slide. Some indication of past debris flows.	25	20	1
3	S-131	Soil Slide	High Precipitation	Natural slope along river terrace	No sign of any recent instability.	17	25	1
1	S-132	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion.	20	50	1
1	S-133	Soil Slide	Toe erosion	Natural slope along river terrace	Local areas subjected to active toe erosion. Some indication of past slope instability.	20-25	30-60	1
3	S-134	Soil Slide	High Precipitation	Natural slope along river terrace	Area of relict terraces and old slopes. No signs of instability.	10	20-25	1
2	S-135	Soil Slide	High Precipitation	Natural slope along river floodplain	Possible local toe erosion.	15	45	1
3	S-136	Soil Slide	High Precipitation	Natural slope along river terrace	Area of relict terraces and old slopes. No signs of instability.	15-25	20	1
2	S-137	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future (long-term) toe erosion.	20	28	1
1	S-138	Soil Slide	Toe erosion	Natural slope along river floodplain	Recent or active landslide within polygon. Slope subjected to toe erosion.	35	25-30	1
2	S-139	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future (long-term) toe erosion.	40	20-30	1
3	S-140	Soil Slide	High Precipitation	Natural slope along river terrace	Old slope along relict river terrace. No signs of instability.	10-15	25-30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-141	Soil Slide	High Precipitation	Natural slope along river floodplain including relict terraces	Old slopes and relict river terraces. Possibility for future (long-term) toe erosion.	30	15-25	1
1	S-142	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Possible active or recent instability.	35	35-60	1
2	S-143	Debris Flow	High Precipitation	Natural slope along river floodplain including relict terraces	Some signs of past debris flows.	35	25	1
3	S-144	Soil Slide	High Precipitation	Natural slope along river terrace	Old slopes and relict river terraces. No signs of instability.	15	25	1
2	S-145	Soil Slide, Debris Flow	Active erosion	Natural gully		15-20	30	1
2	S-146	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Possible local toe erosion. Possibility for future (long term) toe erosion. Several inferred debris flows / blow-offs within polygon.	40-45	25-35	1
2	S-147	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Possible old slide area. Possbility for future (long term) toe erosion.	38	25-30	1
2	S-148	Soil Slide, Debris Flow	Active erosion	Natural gully		20-25	30-35	1
2	S-149	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of recent instability but signs of past landslide activity - possibly liquefaction related. Possibility for future (long term) toe erosion.	30-40	20	1
1	S-150	Soil Slide	Toe erosion	Natural slope along river floodplain	Possibility for toe erosion during floods (and long term). Local areas of possible instability.	30-35	35	1
1	S-151	Soil Slide	Toe erosion	Natural slope along river floodplain	Inferred landlside within polygon - possible block slide. Slope subjected to toe erosion.	45	30-50	1
2	R-152	Rock Fall, Soil Slide	Time-dependent strength loss	Foothill area	Possibility of localized steep areas with rock fall or soil slide hazards.	75	20-25	2
2	S-153	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Some signs of past instability including inferred old soil slides and flows. Signs of surficial erosion on slope. Possibility for future (long term) toe erosion.	45-50	25	1
3	S-154	Soil Slide	High Precipitation	Natural slope along river terrace	No signs of recent instability but some indication of historic landsliding.	25-40	20	1
1	S-155	Soil Slide, possible Block S	Toe erosion	Natural slope along river floodplain	Signs of large active or recent slide - possibly a block slide. Slope subjected to toe erosion.	25	25-30	1
3	S-156	Soil Slide	High Precipitation	Natural slope along river terrace	No signs of instability.	20-25	25-30	1
2	S-157	Debris Flow	High Precipitation	Natural slope along river floodplain with some cut/fill activity	Part of slope along relict floodplain. Possibility for future (long term) toe erosion in some areas. Some signs of debris flows or blow-off failures in upper part of slope.	65	35	1
1	S-158	Soil Slide, Debris Flow	Toe erosion	Natural slope along creek floodplain	Inferred active landslide within polygon. Signs of past debris flows or blow-off failures within upper part of slope.	45-50	25-30	1
2	S-159	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future (long term) toe erosion. No sign of recent instability.	35-45	20-30	1
2	S-160	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future (long term) toe erosion. No sign of instability.	55	30-35	1
1	S-161	Soil Slide	Toe erosion	Natural slope along river floodplain	Active slide near toe of slope. Slope subjected to toe erosion.	57	40	1
2	S-162	Soil Slide	Toe erosion	Natural slope along river floodplain	Some signs of past instability. Slope subjected to toe erosion.	55-65	30-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
3	S-163	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No signs of instability.	60-80	30-35	1
3	S-164	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No signs of instability.	30-40	30-35	1
1	S-165	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Signs of surficial erosion and likely instability.	40-45	45-50	1
3	S-166	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No sign of instability.	32	30	1
2	S-167	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion. No sign of recent instability.	10-15	25-30	1
1	S-168	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Active or recent slide present within polygon.	14	42	1
2	S-169	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion. Possible old slide within polygon.	15	30	1
2	S-170	Soil Slide, Debris Flow	Active erosion	Natural ravine		10	30-35	1
2	S-171	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local areas subjected to active toe erosion. Some indication of past slope instability.	15-20	25-40	1
3	S-172	Soil Slide	High Precipitation	Abandoned creek channel and floodplain		10	15-20	1
2	S-173	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local areas subjected to active toe erosion. Some indication of past slope instability.	20	25-30	1
2	S-174	Soil Slide	Active erosion	Natural gully slope		15	35	1
2	S-175	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity		15-20	20-25	1
2	S-176	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Local areas subjected to active toe erosion with higher likelihood of instability. Some indication of past slope instability including flow or blow-off failures. Possibility for future (long term) toe erosion.	25	20-25	1
2	S-177	Soil Slide, Flow	Active erosion	Natural gullies	Several natural gullies. No signs of widespread instability. Possibility for long term gully retrogression.	15-20	25-30	1
2	S-178	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion. Signs of surficial erosion. Old slope instability visible within polygon, apparently caused by historic toe erosion. Possibility of flow or blow-off type instability.	25-35	25-35	1
1	S-179	Soil Slide, Flow	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Potential instability. Signs of surficial erosion and on slope.	40	35	1
2	S-180	Debris Flow	High Precipitation	Natural slope along creek terrace	Signs of possible old debris flows.	25-30	20	1
2	S-181	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible local toe erosion.	15	35	1
1	S-182	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	15	30	1
2	S-183	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local areas subjected to toe erosion. Some indication of past slope instability.	15	30	1
1	S-184	Soil Slide	Toe erosion	Natural slope along creek floodplain with some cut/fill activity	Slope subjected to toe erosion.	17	30	1
2	S-185	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Possible local toe erosion.	15-20	30	1
1	S-186	Soil Slide, Flow	Toe erosion	Natural slope along creek floodplain	Possible toe erosion.	25	30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-187	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possible local toe erosion. Possibility for future (long term) toe erosion. Signs of several past flows or blow-off failures throughout polygon.	25	30	1
3	S-188	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain		15	15-20	1
2	S-189	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion.	20	35	1
2	S-190	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion.	15	30	1
2	S-191	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possible local toe erosion. Possibility for future (long term) toe erosion.	20	35	1
2	S-192	Soil Slide, Flow	Active erosion	Natural ravine	Likely toe erosion. Some signs of slope instability.	20	30	1
2	S-193	Soil Slide, Flow	Active erosion	Natural ravine		20	30	1
2	S-194	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion.	15-20	30-35	1
2	S-195	Soil Slide, Flow	Active erosion	Natural ravine		15	25-30	1
2	S-196	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain & gully	Some signs of past instability and surficial erosion on slope. Possibility for future (long term) toe erosion.	15-20	25-40	1
2	S-197	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Slope locally subjected to toe erosion. Inferred past earth slide within polygon.	15-25	20-35	1
2	S-198	Soil Slide, Flow	Active erosion	Natural ravines	Tributary ravines to Kinkade creek.	15-25	30-35	1
3	S-199	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain, or cut slope	Inferred man-made (cut) slope	10	25	1
1	S-200	Flow	Toe erosion	Natural slope along creek floodplain	Slope locally subjected to toe erosion. Inferred past blow-off failure or flow within polygon. Possibility for future (long term) toe erosion.	20-30	30-35	1
2	S-201	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain	Locally subjected to toe erosion. Possibility of future (long term) toe erosion. Some signs of gully formation or possible old debris flow.	20-30	20-30	1
1	S-202	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion and locally oversteepened. Some signs of instability.	8	45	1
2	S-203	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity		5-10	25-30	1
1	S-204	Soil Slide	Toe erosion	Natural slope along river floodplain	Locally subjected to toe erosion. Possibility of future (long term) toe erosion. Some signs of surficial erosion and possible instability.	20-25	45-55	1
1	S-205	Soil Slide, Debris Flow	Toe erosion	Natural slope along creek floodplain	Local areas subjected to toe erosion. Several slides noted throughout, possibly some debris flows. Some surficial erosion. Higher likelihood of slope failures where undercut by the creek.	25-30	25-40	1
1	S-206	Debris Flow	Toe erosion	Natural slope along creek floodplain	Slopes subjected to toe erosion. Some signs of instability. Higher likelihood of slope failures where undercut by the creek.	30	25-45	1
2	R-207	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge with some cut/fill activity		15-20	30-40	1
2	S-208	Debris Flow	Active erosion	Natural ravine	Some signs of instability.	10-20	25-35	1
1	S-209	Soil Slide, Debris Flow	Toe erosion	Natural slope along creek floodplain	Local areas subjected to toe erosion. Several slides noted throughout, possibly some debris flows. Some surficial erosion. Higher likelihood of slope failures where undercut by the creek.	25-30	25-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-210	Soil Slide	Active erosion	Natural ravines / gullies	Several natural ravines/gullies. Possibility for long term gully retrogression.	10-15	25-50	1
1	S-211	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slopes partially subjected to toe erosion. Some signs of instability. Higher likelihood of slope failures where undercut by the creek.	15-20	15-30	1
2	S-212	Soil Slide, Flow	High Precipitation	Natural slope along creek terrace	Suspected old landslide area. Possible liquefaction-related slides. No sign of recent instability.	15-20	25-30	1
1	S-213	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	10-17	20-30	1
1	S-214	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slopes partially subjected to toe erosion. Some signs of instability. Higher likelihood of slope failures where undercut by the creek.	10-15	20-30	1
2	S-215	Soil Slide, Flow	Active erosion	Natural gully	Possiblity of gully retrogression.	7-12	35-40	1
1	S-216	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope possibly subjected to toe erosion. Some signs of instability.	15	40-60	1
2	S-217	Soil Slide	Active erosion	Natural ravine		5-15	25-45	1
1	S-218	Soil Slide	High Precipitation	Natural slopes along creek floodplain	Local areas subjected to toe erosion. Several slides noted throughout. Higher likelihood of slope failures where undercut by the creek.	5-15	20-50	1
1	S-219	Soil Slide	High Precipitation	Natural slopes along creek floodplain	Local areas subjected to toe erosion. Several slides noted throughout. Higher likelihood of slope failures where undercut by the creek.	5-10	20-40	1
3	S-220	Soil Slide	High Precipitation	Natural slope along creek terrace	No signs of recent instability.	10-15	20-30	1
2	S-221	Soil Slide	High Precipitation	Natural mountain slope	Possible soil slides in steeper sections of slope.	50-100	20-50	2
2	S-222	Soil Slide	High Precipitation	Natural mountain slope	Possible soil slides in steeper sections of slope.	55-140	15-35	2
2	S-224	Soil Slide	High Precipitation	Natural slope along creek terrace	Signs of large old landslide within polygon, possibly liquefaction related. Quadra sand deposits present.	15-40	25-35	1
1	S-225	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Inferred active or recent insatbility within polygon.	25-40	25-40	1
2	S-226	Soil Slide	Toe erosion	Natural slope along creek floodplain	Some signs of surficial erosion and instability where subjected to toe erosion, particularly along the west bank.	20-45	30-40	1
1	S-227	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope partially subjected to toe erosion. Signs of likely instability where undercut by toe erosion.	15-25	35-45	1
2	S-228	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility for future (long term) toe erosion. No signs of recent instability.	5-20	30-50	1
1	S-229	Soil Slide	Toe erosion	Natural slope along river floodplain	Higher likelihood of instability where locally subjected to toe erosion. Possibility for future (long term) toe erosion.	5-25	35-60	1
2	S-230	Soil Slide	High Precipitation	Natural slope along river terrace	No sign of any recent instability.	40	15-35	1
1	S-231	Soil Slide	Toe erosion	Natural slope along creek	No visible signs of instability. Possibility of toe erosion.	20-40	20-35	2
1	S-232	Soil Slide	Toe erosion	Natural slope along creek with some cut/fill activity	No visible signs of instability. Possibility of toe erosion.	50-60	35-40	1
2	S-233	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity		10-20	25-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-234	Soil Slide	High Precipitation	Natural slope along creek floodplain	Slope subjected to toe erosion. Likely instability within oversteepened areas. Possibility of retrogression.	20-25	40-55	1
2	S-235	Debris Flow	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Some signs of past instability. Possibility for future (long term) toe erosion.	20	25-35	1
2	S-236	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible old slide or relict terrace area.	25-30	15-20	1
2	S-237	Soil Slide	High Precipitation	Natural slope along creek floodplain	No sign of any recent instability. Possibility for future (long term) toe erosion.	25-30	25-35	1
1	S-238	Soil Slide	Toe erosion	Natural slope along creek floodplain	Inferred soil slide within polygon - likely recent or active. Slope subjected to toe erosion.	25-35	30-35	1
2	S-239	Soil Slide	High Precipitation	Natural slope along creek floodplain	No sign of any recent instability. Possibility for future (long term) toe erosion.	28-32	30-35	1
1	S-240	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain	Signs of surficial erosion / gullying on slope face. Possibility of crest retrogression. Possibility of future toe erosion.	35-45	20-30	1
2	S-241	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain including relict terraces	Area includes several terraces inferred to be relict river terraces, but in some cases may be old slide areas. Some indication of recent gully formations. Possibility for future (long term) toe erosion.	30-40	25-35	1
2	S-242	Debris Flow	Toe erosion	Natural slope along creek floodplain including relict terraces; some cut/fill activity	Area includes several terraces inferred to be relict river terraces. Possibility for future (long term) toe erosion. Suspected old landslide within polygon.	30-40	15-35	1
2	S-243	Soil Slide	High Precipitation	Natural slope along creek floodplain including relict terraces; some cut/fill activity	Area includes several terraces inferred to be relict river terraces. No sign of instability. Possibility for future (long term) toe erosion.	30-40	15-25	1
1	S-244	Soil Slide	Active erosion	Natural gully/ravine		5-10	15-40	1
2	S-245	Soil Slide	High Precipitation	Natural slope along creek floodplain including relict terraces; some cut/fill activity	Area includes several relict river terraces. No sign of instability. Possibility for future (long term) toe erosion.	20-35	20-35	1
1	S-246	Soil Slide	High Precipitation	Natural slope along creek floodplain	Slide noted in west side of polygon. Possibility for future (long term) toe erosion.	20-30	20-35	1
1	S-247	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Debris sliding likely.	20-25	35-50	1
2	S-248	Soil Slide	High Precipitation	Natural slope along creek terrace	No signs of any recent instability.	15-30	15-30	1
1	S-249	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope partially subjected to toe erosion. Likely toe experience instability where undercut by toe erosion.	20-25	30-50	1
1	S-250	Soil Slide	Active erosion	Natural ravine		5-20	30-55	1
2	S-251	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future toe erosion.	10-20	25-35	1
3	S-252	Soil Slide	High Precipitation	Natural slope along relict creek terrace	No signs of instability.	10-25	20-30	1
1	S-253	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope partially subjected to toe erosion. Highly oversteepened slopes in some areas. Likely toe experience instability where undercut by toe erosion.	25-35	40-60	1
2	S-254	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion.	25-30	30-40	1
1	S-255	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Highly oversteepened and likely to experience instability.	37	60-70	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-256	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Some signs of surficial erosion or debris flows. Possibility for future (long term) toe erosion.	30-35	25-40	1
1	S-257	Soil Slide	High Precipitation	Natural slope along creek floodplain	Slope partially subjected to toe erosion. Signs of landslide activity.	35-45	30-40	1
2	S-258	Soil Slide, Debris Flow	Active erosion	Natural slope along creek floodplain	Signs of past landslide activity. Some signs of surficial erosion on slope.	35-45	25-40	1
1	S-259	Soil Slide, Debris Flow	High Precipitation	Natural gully		5-20	25-35	1
2	S-260	Soil Slide	High Precipitation	Natural slope along creek floodplain	Inferred old slides within polygon, possible block slide. Possibility for future (long term) toe erosion.	35-45	25-40	1
1	S-261	Debris Flow	Toe erosion	Natural slope along creek floodplain	Slope partially subjected to toe erosion. Signs of surficial erosion and possible debris flows / blow-off failures.	35-45	35-40	1
2	S-262	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain	Signs of surficial erosion and possible debris flows / blow-off failures. Possibility of future (long term) toe erosion.	35-45	25-40	1
1	S-263	Soil Slide, Debris Flow	Active erosion	Natural gully	Possibility of gully retrogression. Possible impact from surface water runoff.	20-30	30-45	1
1	S-264	Soil Slide, Debris Flow	High Precipitation	Natural slope along creek floodplain	Slope partially subjected to toe erosion, with possibility of future (long term) toe erosion in unaffected areas. Signs of several debris flows or blow-off failures, as well as gully formations and posible recent landslide.	30-45	25-40	1
1	S-265	Soil Slide	Toe erosion	Natural slope along creek floodplain	Most of slope subjected to toe erosion and some areas significantly oversteepend and vulnerable to instability.	15-30	20-65	1
2	S-267	Soil Slide	High Precipitation	Natural slope along creek floodplain including relict terraces	Some indication of old landslide activity. Possibility for some areas to experience future (long term) toe erosion.	20-35	15-40	1
2	S-268	Soil Slide	High Precipitation	Natural slope along creek floodplain	Some indication of old landslide activity.	10-25	20-40	1
2	S-269	Soil Slide	High Precipitation	Natural slope along river floodplain		20-30	32	1
2	S-270	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity		7-10	20-30	1
2	S-271	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Possibility for future (long term) toe erosion.	12	30	1
3	S-272	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity		10-20	20-35	1
2	S-273	Soil Slide	High Precipitation	Natural hill slope		20	40	1
2	S-274	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility for future (long term) toe erosion. No signs of instability.	10-15	20-40	1
1	S-275	Soil Slide	High Precipitation	Natural slope along creek floodplain	Slopes locally subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek. Some signs of possible local instabilities.	5-15	15-35	1
2	S-276	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity	Some signs of local surficial erosion. Possible coastal toe erosion (long term).	10-15	25-45	1
2	S-277	Soil Slide	High Precipitation	Natural slopes along creek floodplain	Local areas may be subjected to toe erosion. Generally no signs of any widespread instability.	10-20	20-35	1
1	S-278	Soil Slide	Toe erosion	Natural ravine		5-15	20-40	1
1	S-279	Soil Slide	Toe erosion	Natural ravine		10-20	25-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-280	Soil Slide	Toe erosion	Natural ravine		5-10	25-60	1
3	S-281	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of instability.	5-15	20-35	1
3	S-282	Soil Slide	High Precipitation	Natural slope along river terrace	No signs of instability.	5-10	15-20	1
2	S-283	Soil Slide	High Precipitation	Natural slope along river floodplain	Locally very steep. Possibility of future (long term) toe erosion.	5-10	40-50	1
1	S-284	Soil Slide, possible rock sli	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Locally very steep. Suspected shallow bedrock.	10-15	35-55	1
2	S-285	Soil Slide	High Precipitation	Natural slope along river floodplain, including some relict terraces.	No sign of instability.	10-20	25-40	1
2	S-286	Soil Slide	High Precipitation	Natural slope along river floodplain	Some signs of local surficial erosion and possible local instabilities.	5-10	30-40	1
2	S-287	Soil Slide	High Precipitation	Natural slope along river floodplain	Signs of local surficial erosion.	20-30	30-45	1
2	S-288	Soil Slide, possible Block S	High Precipitation	Natural slope along river floodplain	Signs of past landslide activity including possible block slides and debris flow or blow-off failures in upper slope. Sigsn of local surficial erosion. Local areas may be subjected to toe erosion.	25-35	20-35	1
2	S-289	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Signs of past localized soil slides/flows. Possibility of future (long term) toe erosion.	30-40	30-70	1
2	S-290	Soil Slide	High Precipitation	Natural slope along river floodplain and small ravine	Ravine running parallel to river slope. No sign of recent instability.	25-35	25-35	1
2	S-291	Soil Slide	High Precipitation	Natural slope along river floodplain including relict terraces	Locally subjected to toe erosion. Possibility for future (long term) toe erosion. Sone signs of past soil slide activity.	25-40	30-40	1
1	S-292	Soil Slide	Active erosion	Natural ravine		5-20	25-35	1
1	S-293	Soil Slide	High Precipitation	Natural slope along and creek terrace	Locally subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek.	25-30	20-40	1
1	S-295	Soil Slide	High Precipitation	Natural slope along creek terrace	Locally subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek. Some signs of past landslide activity.	15-30	25-40	1
1	S-296	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Highly oversteepened toe (suspected bedrock exposures).	20-35	60-70	1
1	S-297	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion.	5-15	25-60	1
2	S-298	Soil Slide	High Precipitation	Natural slope along river floodplain and relict terrace with some cut/fill activity	No sign of recent instability. Possibility of future (long term) toe erosion.	10-15	30-40	1
3	S-299	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity		10-15	25-40	1
1	S-300	Soil Slide, possible rock sli	Toe erosion	Natural slope along river floodplain	Slope subjected to toe erosion. Highly oversteepened toe (inferred bedrock).	15-25	50-80	1
2	S-301	Soil Slide	High Precipitation	Natural slope along river floodplain	No signs of recent instability. Possible old slump in eastern part of polygon. Possibility for future (long term) toe erosion.	30-35	35-50	1
1	S-302	Soil Slide	Toe erosion	Natural slope along river floodplain	Slope partially subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek. Some signs of past landslide activity.	30-40	50-70	1
2	S-303	Soil Slide	High Precipitation	Natural slope along river floodplain and relict terrace	Inferred blow-off slide in southern part of polygon. Possiblity for future (long term) toe erosion.	35-55	30-45	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-304	Soil Slide	High Precipitation	Natural slope along river floodplain	Signs of past landslide activity. Some signs of surficial erosion on slope. Possiblity for future (long term) toe erosion.	35-40	25-30	1
2	S-305	Soil Slide	High Precipitation	Natural slope along river floodplain	Some signs of past landsliding. Possiblity for future (long term) toe erosion.	25-35	25-40	1
1	S-306	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Crest likely to retrogress.	35-40	55-75	1
2	S-307	Soil Slide	High Precipitation	Natural slope along creek terrace	Some signs of past landsliding. Possiblity for future (long term) toe erosion.	15-30	20-40	1
1	S-308	Debris Flow	High Precipitation	Natural slope along creek floodplain	Signs of surficial erosion and instability including possible debris flows and blow-off failures. Possiblity for future (long term) toe erosion.	30-40	30-35	1
1	S-309	Soil Slide	High Precipitation	Natural slope along creek floodplain	Some signs of past instabilty. Locally subjected to toe erosion. Possibility for future (long term) toe erosion.	25-30	30-40	1
2	S-310	Debris Flow	High Precipitation	Natural slope along creek terrace	Some signs of past instabilty. Possibility for future (long term) toe erosion.	20-30	25-40	1
2	S-311	Soil Slide	High Precipitation	Natural ravine	No signs of any widespread instability.	10-20	25-40	1
1	S-312	Soil Slide	High Precipitation	Natural mountain slope		250-450	25-35	2
1	S-313	Soil Slide	High Precipitation	Natural mountain slope	soil slides may be induced by rock fall / rock slide from bedrock exposures above. Possible runout of rock falls into this polygon from above.	255-290	15-60	2
1	S-314	Soil Slide	High Precipitation	Natural mountain slope	Local bedrock exposures and rock fall hazards likely.	120-275	30-60	2
1	S-315	Soil Slide, Debris Flow	High Precipitation	Natural mountain slope	Soil slides may be induced by rock fall / rock slide from bedrock exposures above. Possible runout of rock falls into this polygon from above.	105-155	15-50	2
1	S-316	Soil Slide, Debris Flow	High Precipitation	Natural mountain slope	Possible ancient rock slide/landslide area. Some possibility of channelised debris flows.	195-205	30-40	2
2	S-317	Soil Slide	High Precipitation	Natural mountain slope	Possibility of soil slides in local steeper areas. Possibility of local bedrock exposures and rockfall hazards.	105-205	20-35	2
2	S-318	Soil Slide	High Precipitation	Natural gullies		15	30-35	1
3	S-319	Soil Slide	High Precipitation	Foothill area	Low possibility of soil slides in local steeper areas.	15-25	15-25	1
2	S-320	Soil Slide	High Precipitation	Natural hill slope along lake	Low possibility of soil slides in local steeper areas.	10-15	25-30	1
1	S-321	Debris Flow	High Precipitation	Natural gully	Some possibility of channelized debris flows.	15-30	25-35	2
1	S-322	Soil Slide, Rock Fall, Rock S	High Precipitation	Natural mountain slope	Possible ancient rock slide/landslide area within polygon. Possibility of soil slides in steeper areas. Possibility of rock falls from localized bedrock exposures.	200-400	30-50	2
3	S-323	Soil Slide	High Precipitation	Natural mountain slope	Low possibility of debris sliding in local steeper areas. Possible runout of debris flows into polygon from slope to the west.	25-40	20-25	2
2	S-324	Soil Slide	High Precipitation	Natural mountain slope	Local steeper areas may be prone to debris sliding.	10-20	20-50	2
2	S-325	Soil Slide	High Precipitation	Natural mountain slope	Local steeper areas may be prone to debris sliding.	40-70	20-50	2
3	S-326	Soil Slide	High Precipitation	Natural mountain slope	Low possibility of debris sliding in local steeper areas.	30-45	25-30	2

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-327	Soil Slide, Rock Fall	High Precipitation	Natural mountain slope	Local steeper areas may be prone to debris sliding, particularly in southern area of polygon. Possibility of local rock fall/rock slide areas where bedrock exposed.	85-160	30-55	2
1	S-328	Soil Slide, Rock Fall	High Precipitation	Natural mountain slope	Local steeper areas may be prone to debris sliding. Local bedrock exposures may pose rockfall risk.	80-110	45-55	2
1	S-329	Soil Slide, Debris Flow	High Precipitation	Natural slope along river floodplain	Slope subjected to toe erosion. Inferred unstable area and blow-off slide within polygon.	45	47	1
2	S-330	Debris Flow	High Precipitation	Natural slope along river floodplain	Signs of past debris flows and or blow-off failures throughout polygon. Possibility for future (long term) toe erosion.	30-45	30-45	1
2	S-331	Soil Slide	High Precipitation			5-10	20-25	1
1	S-332	Soil Slide, Rock Fall	High Precipitation	Natural mountain slope	Possibility of channelized debris flows through gullies. Local steeper areas may be prone to debris sliding. Possibility of local bedrock exposures and rock fall hazards.	175-405	25-55	2
2	S-333	Soil Slide	High Precipitation	Natural mountain slope	Steeper areas may be prone to soil sliding.	315-365	35-50	2
1	S-334	Debris Flow	High Precipitation	Natural mountain slope	Possibility of rock fall/rock slide runout from rock slopes above. soil slides may be induced by rock falls/rock slides from above. Possibility of channelized flows through gullies. Several soil slides / flows observed near the lake elevation, including recent instabilities.	195-515	30-50	2
2	S-335	Soil Slide	High Precipitation	Natural mountain slope	Steeper areas may be prone to debris sliding. Possible runout area for rock slides from slope above.	245-405	30-40	2
1	S-336	Debris Flow	High Precipitation	Natural mountain slope	Possibility of channelized debris flows through gullies. Local steeper areas may be prone to debris sliding. Possible runout area for rock slides from slope above.	150-370	35-45	2
1	S-337	Debris Flow	High Precipitation	Natural mountain slope	Steeper areas may be prone to debris sliding. Possible runout area for rock slides from slope above.	155-205	35-50	2
2	S-338	Debris Flow	High Precipitation	Natural mountain slope	Possibility of channelized debris flows through gullies. Local steeper areas may be prone to debris sliding. Possibility of rock fall/rock slide runout from rock slopes above.	360-570	30-40	2
2	R-339	Rock Slide, Soil Slide	Time-dependent strength loss	Natural mountain slope	Possible ancient rock slide area. Possibility of rock or soil slides in local steeper areas.	55-115	35-45	2
2	R-340	Rock Slide, Soil Slide	Time-dependent strength loss	Natural mountain slope	Low possibility of debris sliding in local steeper areas.	60-125	30-40	2
1	R-341	Rock Slide, Soil Slide	Time-dependent strength loss	Natural mountain slope	Possibility of rock slides, and soil slides within soil overburden.	70-90	30-60	2
1	R-342	Rock Slide, Soil Slide	Time-dependent strength loss	Natural mountain slope	Possibility of rock slides, and soil slides within soil overburden.	125	45-50	2
1	R-343	Rock Fall, Rock Slide	Time-dependent strength loss	Natural mountain slope		205-365	40-70	2

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	R-344	Rock Fall	Time-dependent strength loss	Natural mountain slope	Sedimentary rock exposures with high likelihood of rock fall occurrence.	200-230	60-70	2
1	R-345	Rock Slide, Rock Fall	Time-dependent strength loss	Natural mountain slope	Colluvial fan with recent rock fall occurrence. High likelihood of future rock fall/rock slide occurrence.	700	30-75	2
1	R-346	Rock Slide	Time-dependent strength loss	Natural mountain slope	Colluvial fan with old rock falls/rock slides, but no signs of recent activity.	665	25-50	2
1	R-347	Rock Fall	Time-dependent strength loss	Natural mountain slope	Local sedimentary rock exposures with high likelihood of rock fall occurrence.	285-375	55-70	2
1	S-348	Soil Slide	High Precipitation	Natural mountain slope	Steeper areas may be prone to debris sliding. Some signs of past debris slides in area.	15-35	25-60	2
3	S-349	Soil Slide	High Precipitation	Natural hill slope along lake		10	15-20	1
1	R-350	Rock Fall, Rock Slide	Time-dependent strength loss	Natural mountain slope	Inferred steep bedrock exposures.	20-35	35-60	1
3	S-351	Soil Slide	High Precipitation	Natural hill slope (glacial topography)		20-30	20-30	1
2	S-352	Rock Slide, Rock Fall	Time-dependent strength loss	Natural mountain slope	Steeper areas, particularly within gullies, may be prone to rock or debris sliding. Some possibility of channelized debris flows.	115-225	20-45	1
2	R-353	Rock Slide, Rock Fall	Time-dependent strength loss	Natural mountain slope	Steeper areas, particularly within gullies, may be prone to rock or debris sliding. Some possibility of channelized debris flows.	160-200	35-45	2
1	R-354	Rock Fall	Time-dependent strength loss	Natural mountain slope	High potential for rock falls and rock slides. Recent rock slide occurred in 2021-2022. Possibility of channelized debris flows through gullies.	155-630	40-70	2
2	R-355	Rock Slide	Time-dependent strength loss	Natural mountain slope	Possibility of rock slides, and soil slides within soil overburden.	175-370	40-45	2
1	R-356	Rock Fall, Rock Slide	Time-dependent strength loss	Natural mountain slope	Local areas prone to rock falls. Possibility of channelized debris flows through gullies.	205-365	40-60	2
2	R-357	Rock Slide, Soil Slide	Time-dependent strength loss	Natural mountain slope	Several gullies throughout polygon. Possibility of channelized debris flows through gullies. Possibility of rock slides or rock falls where bedrock exposures present.	365-535	30-45	2
1	R-358	Rock Slide, Rock Fall	Time-dependent strength loss	Natural mountain slope	Possibility of channelized debris flows through gullies.	355-395	40-45	2
3	R-359	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope	Low likelihood of instability.	35-50	15-30	2
2	R-360	Rock Fall	Time-dependent strength loss	Natural hill slope	Possibility of rock slides, and soil slides within soil overburden. Possible local rock falls, especially in steeper upper parts of slope.	70-90	30-45	2
2	R-361	Rock Fall	Time-dependent strength loss	Natural hill slope	Possibility of rock slides, and soil slides within soil overburden. Possible local rock falls, especially in steeper upper parts of slope.	80-115	25-50	2
3	R-362	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope	Low likelihood of instability.	50-75	20-30	2
3	R-363	Rock Slide	Time-dependent strength loss	Natural hill slope		20-30	20-35	1
2	S-364	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridge	Possibility of soil slides in steeper areas. Possibilty of rock falls where bedrock exposures are present.	40-55	20-30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
3	R-365	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope	Low likelihood of instability. Inferred as shallow bedrock area.	10-25	35-55	1
2	R-366	Rock Fall	Time-dependent strength loss	Natural coastal slope	Subjected to coastal toe erosion. Rock bluffs may be locally prone to rock falls or rock slides.	15-25	40-75	1
2	S-367	Soil Slide	High Precipitation	Natural slope along river floodplain	Steeper areas may be prone to soil sliding.	240-375	25-35	2
2	S-368	Soil Slide	High Precipitation	Natural slope along river floodplain	Steeper areas may be prone to soil sliding. Some signs of possible instability. Possibility of future (long-term) toe erosion.	240-370	25-50	2
3	S-369	Soil Slide	High Precipitation	Natural slope along river floodplain	Steeper areas may be prone to soil sliding.	70-200	15-30	2
2	R-370	Rock Fall	Time-dependent strength loss	Natural coastal slope	Subjected to coastal toe erosion. Rock bluffs may be locally prone to rock falls or rock slides. Soil slides could locally occur in upper part of slope.	10-20	35-65	1
2	R-371	Rock Fall	Time-dependent strength loss	Natural coastal slope	Subjected to coastal toe erosion. Rock bluffs may be locally prone to rock falls or rock slides.	5-10	25-70	1
2	R-372	Rock Fall	Time-dependent strength loss	Natural coastal slope	Subjected to coastal toe erosion. Rock bluffs may be locally prone to rock falls or rock slides.	5-15	20-45	1
2	S-373	Soil Slide	High Precipitation	Natural coastal slope	Possibility of coastal toe erosion. Possibility of soil slides within soil overburden. Possibility of rock falls within local, steeper zones of exposed bedrock inferred in lower part of slope.	10-20	35-75	1
3	R-374	Rock Slide	Time-dependent strength loss	Natural hill slope	Possibility of rock falls within local, steeper zones. Possibility of soil slides within soil overburden, where present.	25-75	25-40	1
2	R-375	Rock Fall	Time-dependent strength loss	Natural coastal slope	Possibility of future (long term) coastal toe erosion. Rock bluffs may be locally prone to rock falls or rock slides.	5-10	30-70	1
3	R-376	Rock Fall	Time-dependent strength loss	Natural coastal slope	Slope may be locally subjected to coastal toe erosion.	5-20	20-65	1
3	R-377	Rock Fall	Time-dependent strength loss	Natural coastal slope	Slope may be locally subjected to coastal toe erosion.	5-20	35-75	1
3	R-378	Rock Fall, Soil Slide	High Precipitation	Natural hill slope	Generally low likelihood of instabilities. Local steep areas may contain rock fall hazards or soil slide hazards within soil overburden zones.	115-235	30-50	1
2	R-379	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope	No indications of any recent instabilities.	150-210	30-40	1
2	S-380	Soil Slide	High Precipitation	Natural coastal slope	Steeper areas may be prone to soil sliding.	20-45	20-35	1
3	S-381	Soil Slide	High Precipitation	Natural hill slope	No signs of instability.	25-55	20-25	1
2	R-383	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Possibility of rock falls within local, steeper zones. Possibility of soil slides within soil overburden, where present.	10-35	40-60	1
1	R-384	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridge	Possibility of rock falls or rock slides within local, steeper zones, particularly within lower parts of the slope. Possibility of soil slides within soil overburden, where present.	250-310	20-25	2
2	S-385	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible future (long term) toe erosion in some areas. Some signs of localized old instabilities.	25-55	18-30	1
1	S-386	Soil Slide, Flow	High Precipitation	Natural slope along creek floodplain	Possible future (long term) toe erosion	25-30	30-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-387	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local areas may be subjected to toe erosion. Possible future (long term) toe erosion.	8-10	20	1
1	S-388	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion. Oversteepened areas more likely to experience instability.	5-10	30-35	1
2	S-389	Soil Slide	High Precipitation	Natural slope along creek floodplain	No signs of recent instability. Local area may be subjected to toe erosion. Possible future (long term) toe erosion in other areas.	10-20	20-35	1
3	S-390	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	No signs of instability. Possible future (long term) toe erosion. Part of slope inferred to be cut adjacent to railway.	8-10	20-30	1
2	S-391	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Local areas may be subjected to toe erosion. Possible future (long term) toe erosion in other areas.	10-20	20-30	1
1	S-392	Soil Slide	High Precipitation	Natural coastal slope	Possibility of soil slides within soil overburden. Possibility of rock falls within bedrock exposures, if present.	5-20	20-50	1
1	S-393	Soil Slide	Active erosion	Natural ravine	Some signs of instability.	10-15	25-40	1
2	S-394	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of soil slides especially within steeper areas. Possible bedrock exposures in lower part of slope.	25-30	25-30	1
3	S-396	Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instability.	25-30	15-20	1
2	S-398	Soil Slide	High Precipitation	Natural hill slope / ridge	Some indication of possible past soil slides within polygon.	20-30	20	1
2	R-400	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of shallow soil slides within steeper areas. Bedrock exposures possible.	20-40	30-40	1
2	S-401	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of soil slides within local steeper areas of slope.	10-15	15-30	1
2	S-403	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of soil slides within local steeper areas of slope.	20-25	25-30	1
2	S-404	Soil Slide	High Precipitation	Natural hill slope / ridge with some cut/fill activity	Possibility of soil slides within local steeper areas of slope. Eastern part of polygon may be subjected to coastal toe erosion and future (long term) toe erosion.	12-15	30-32	1
2	S-405	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of soil slides within local steeper areas of slope.	15-20	20-25	1
2	R-406	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge with some cut/fill activity	Local areas may be prone to rock falls. Possibility of soil sliding within overburden, where present.	10-15	35-40	1
3	R-407	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge	Possibility of local bedrock exposures where rock fall hazards may be present. Possibility of soil slides in steeper areas.	15-20	20-40	1
2	S-408	Soil Slide	High Precipitation	Natural hill slope / ridge	Possibility of soil slides in steeper areas. Possibility of local bedrock exposures where rock fall hazards may be present.	35-45	30-40	1
1	R-409	Rock Fall	Toe Erosion	Natural coastal slope	Slope likely subjected to toe erosion. Steep rock bluffs may be prone to rock fall and rock slide hazards.	5-15	40-60	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	R-410	Rock Fall, Soil SLide	Time-dependent strength loss	Natural coastal slope	Slope may be locally subjected to toe erosion. Locals teep rock bluffs may be prone to rock fall hazards. Possibility of shallow slides within soil overburden.	5-15	20-45	1
1	R-411	Rock Fall	Time-dependent strength loss	Natural coastal slope	Steep rock bluffs may be prone to rock fall and rock slide hazards. Slope likely subjected to toe erosion.	10-25	50-80	1
1	R-412	Rock Fall	Time-dependent strength loss	Natural coastal slope	Steep rock bluffs may be prone to rock fall and rock slide hazards. Possibility of local soil slides within soil overburden. Slope may be subjected to toe erosion.	5-12	35-40	1
2	S-413	Soil Slide	High Precipitation, possible toe erosion	Natural coastal/creek slope	Possible coastal erosion. Possibility of future (long term) toe erosion by creek. Some indication of past soil sliding.	5-10	25-30	1
1	S-414	Soil Slide	Toe erosion	Natural slope along creek floodplain	Locally subjected to toe erosion.	5-12	20-25	1
2	S-415	Soil Slide	High Precipitation	Natural hill slope	No signs of instability.	5-10	20-30	1
1	S-416	Soil Slide	High Precipitation	Natural coastal slope	Slope may be subjected to coastal toe erosion. Possibility of soil slides within local steeper areas of the slope.	5-10	30-40	1
2	S-417	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	Some signs of surficial erosion on slope.	10-25	20-30	1
3	S-418	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No signs of instability.	20-30	15-30	1
3	S-419	Soil Slide, Soil Slide	High Precipitation	Natural hill slope with some cut/fill activity		5-10	25-30	1
2	R-420	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge	Possible rock fall hazards within local bedrock exposures. Possibility of local soil slides within soil overburden.	5-15	30-50	1
2	R-421	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge	Possible rock fall hazards within local bedrock exposures. Possibility of local soil slides within soil overburden.	15-20	30-50	1
1	S-422	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope with some cut/fill activity	Some signs of past debris flows or blow-off failures.	15-20	30-45	1
1	S-423	Soil Slide	Active erosion	Natural gully	No signs of instability.	10	30-50	1
3	S-424	Soil Slide	High Precipitation	Natural hill slope	Low hazard area. Possibility of local bedrock outcrops.	40-80	20-25	1
2	S-425	Soil Slide, Rock Slide, Rock	High Precipitation	Natural coastal slope with some cut/fill activity	Some signs of surficial erosion. Possibility of local bedrock outcrops and rock fall hazards.	50-70	25-35	1
1	S-426	Soil Slide, Debris Flow	High Precipitation	Natural ravine slope	Signs of surficial erosion and formation of erosional gullies.	45-48	27-30	1
1	S-427	Debris Flow	High Precipitation	Natural hill slope	Signs of surficial erosion and suspected past debris flows or blow-off failures within polygon.	45	30	1
2	S-428	Soil Slide, Debris Flow	High Precipitation	Natural hill slope with some cut/fill activity	No signs of instability.	25-45	30-32	1
1	S-429	Soil Slide, Debris Flow	High Precipitation	Natural drainage gullies	Some signs of slope instability upstream of polygon. Possibility of channelized debris flows through gullies.	20	30-35	1
2	S-430	Soil Slide	High Precipitation	Natural coastal slope	Slope may be subjected to coastal toe erosion. Possibility of soil slides within local steeper areas of the slope.	20-25	20-40	1
2	S-431	Soil Slide	Active erosion	Natural ravine		15-30	20-35	2

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	R-432	Rock Fall, Soil Slide	Toe erosion	Natural slope along creek	Possible toe erosion. Possibility of local rock fall or rock slide hazards and soil slides within soil overburden.	20-30	20-45	2
3	R-433	Rock Fall, Soil Slide	Time-dependent strength loss	Foothill area	Possibility of local rock fall or rock slide hazards and soil slides within soil overburden.	75-90	20-30	2
1	R-434	Rock Slide, Debris Flow	Time-dependent strength loss	Natural mountain slope	Possibility of rock fall and rock slide hazards where bedrock exposed. Possibility of soil slides within soil overburden, where present. Some possibility of channelised debris flows.	290-570	25-45	2
2	S-435	Soil Slide	High Precipitation	Natural ravine		30	30	2
2	S-436	Soil Slide	High Precipitation	Natural slope along river terrace		35-40	20-30	2
2	S-437	Soil Slide	High Precipitation	Natural slope along river channel	Inferred bedrock outcrops along river channel (toe erosion may be limited). Possibility of soil slides in steeper areas within upper part of slope.	35-45	25-35	2
2	S-438	Soil Slide	High Precipitation	Natural slope along river channel	Inferred bedrock outcrops along river channel (toe erosion may be limited). Possibility of soil slides in steeper areas within upper part of slope.	40-50	15-25	2
2	S-439	Soil Slide	Toe Erosion	Natural slope along creek		10-15	20-30	1
2	S-440	Soil Slide, Rock Slide	High Precipitation	Foothill area	Local steep areas may contain soil slide hazards. Local exposures of bedrock may present rock fall or rock slide hazards.	15-30	30-40	2
3	S-441	Soil Slide	High Precipitation	Foothill area		30	15-20	2
3	S-442	Soil Slide	High Precipitation	Foothill area	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	40-60	15-20	2
1	R-443	Rock Fall, Soil Slide	Time-dependent strength loss	Natural slope along river channel	Inferred steep bedrock slope along river channel (toe erosion may be limited). Possibility of soil slides where soil overburden is present. Possibility of rock falls and rock slides in steep bedrock areas.	30-35	35-70	1
1	R-444	Rock Fall	Time-dependent strength loss	Natural slope along river channel with some cut/fill activity	Inferred steep rock slopes along river channel (toe erosion may be limited). Possibility of soil slides where soil overburden is present. Possibility of rock falls and rock slides in steep bedrock areas.	10-30	40-70	1
1	R-445	Rock Fall	Time-dependent strength loss	Natural ravine	Near vertical rock bluffs with high potential for rock fall hazards.	10-15	60-75	1
1	R-446	Rock Fall, Rock Slide	Time-dependent strength loss	Natural slope along river channel	Near vertical rock cliffs along river channel (toe erosion may be limited). Possibilty of rock fall and rock slide hazards. Possibility of soil slides in upper part of slope, where soil overburden is present.	20-45	60-90	1
1	R-447	Rock Fall, Rock Slide	Time-dependent strength loss	Natural slope along river channel	Inferred steep rock slopes along river channel (toe erosion may be limited). Possibilty of rock fall and rock slide hazards. Possibility of soil slides where soil overburden is present.	15-30	45-70	1
2	R-448	Rock Fall, Soil Slide	Time-dependent strength loss	Natural slope along river channel	Local exposures of bedrock may present rock fall or rock slide hazards. Possibility of soil slides where soil overburden is present.	35-40	25-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	R-449	Rock Fall, Soil Slide	Time-dependent strength loss	Natural slope along river channel	Inferred steep rock slopes along river channel. Possibilty of rock fall and rock slide hazards. Possibility of soil slides where soil overburden is present. Possible toe erosion.	20-30	40-50	1
1	R-450	Rock Fall, Rock Slide	Time-dependent strength loss	Natural slope along river channel	Near vertical rock cliffs along river channel (toe erosion may be limited). Possibilty of rock fall and rock slide hazards. Possibility of soil slides in upper part of slope, where soil overburden is present. Several infereed slides throughout; possible block slides.	35-40	50-90	1
1	R-451	Rock Fall, Rock Slide, poss	Time-dependent strength loss	Natural slope along river channel	Near vertical rock cliffs along river channel (toe erosion may be limited). Possibilty of rock fall and rock slide hazards. Possibility of soil slides where soil overburden is present.	30-40	45-90	1
3	S-452	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridge with some cut/fill activity		15-25	20-30	1
1	R-453	Rock Fall	Time-dependent strength loss	Natural slope along river channel (no floodplain)	Inferred near-vertical bedrock cliffs along river channel (toe erosion may be limited).	20-25	60-90	1
1	R-454	Rock Fall	Time-dependent strength loss	Natural slope along river channel (no floodplain)	Inferred near-vertical bedrock cliffs along river channel (toe erosion may be limited).	30	80-90	1
3	S-455	Soil Slide	High Precipitation	Natural hill slope	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	25-36	25-30	2
3	S-456	Soil Slide	High Precipitation	Natural hill slope	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	20-30	20-25	2
3	S-457	Soil Slide	High Precipitation	Natural hill slope	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	30-35	30-35	2
3	S-458	Soil Slide	High Precipitation	Natural hill slope	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	15-25	15-20	2
2	R-459	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge along lake	Possibility of local rock fall hazards. Possibility of soil sliding within overburden, where present.	15-20	30-40	2
1	R-460	Rock Fall	High Precipitation	Natural hill slope / ridge	Likely rock fall hazards. Possibility of soil slides within overburden, where present.	10-30	50-80	1
2	S-461	Soil Slide	High Precipitation	Natural slope along creek with some cut/fill activity	No signs of instability. Slope may be locally subjected to toe erosion.	10-25	20-25	1
2	S-462	Soil Slide	High Precipitation	Natural slope along creek	Some signs of past instability. Slope may be locally subjected to toe erosion.	10-20	25-35	1
2	S-463	Soil Slide	High Precipitation	Natural slope along creek	Slope may be locally subjected to toe erosion. Possible old slide area.	15-25	20-25	1
3	S-464	Soil Slide	High Precipitation	Natural slope along river terrace		9-12	20-30	1
3	S-465	Soil Slide	High Precipitation	Natural slope along river terrace		10	25-35	1
2	S-466	Soil Slide	High Precipitation	Natural slope along creek	Slope may be locally subjected to toe erosion.	10	30-50	1
2	S-467	Soil Slide	High Precipitation	Natural ravine	Slope may be subjected to toe erosion. Interpreted rock bluffs on west bank of ravine, with possibility of rock fall hazards.	10	35-50	1
2	S-468	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No signs of instability.	10-15	30	1
2	S-469	Soil Slide	High Precipitation	Natural slope along river terrace with some cut/fill activity	No signs of instability.	15	30-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-470	Soil Slide, possible Block S	High Precipitation	Natural slope along river channel (no floodplain)	Slope may be subjected to toe erosion. No signs of instability except inferred large old slide in west part of polygon.	30-20	20-45	1
2	S-471	Soil Slide	Toe erosion	Natural slope along river channel (no floodplain)	Slope may be subjected to toe erosion.	25-30	40-45	1
3	S-472	Soil Slide	High Precipitation	Natural slope along river terrace	Interpreted as a relict river terrace, but may also be an ancient slide area.	15-20	25-40	1
1	S-473	Soil Slide	Toe erosion	Natural slope along river channel (no floodplain)	Slope subjected to toe erosion. Signs of likely past instability and possible recent instability. Signs of local surficial erosion.	30-45	30-40	1
3	S-474	Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instabilty. Interpreted shallow bedrock. Possibility of soil slides within overburden.	15-30	20-30	1
2	S-475	Soil Slide	High Precipitation	Natural slope along river channel (no floodplain)	Slope may be locally subjected to toe erosion. No sign of instability.	10-15	25-35	1
2	R-476	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridge	Possibility of local rock fall or rock slide hazards. Possibility of soil sliding within overburden, where present.	25-30	30-40	1
1	R-477	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridge	Possible rock fall and rock slide hazards, especially in steeper upper parts of slope. Possibility of soil slides within soil overburden.	40-50	40-75	1
2	R-477	Soil Slide, Rock Fall	High Precipitaiton	Natural hill slope / ridge	Possibility of rock bluffs in upper part of slope with rock fall hazard.	15-25	20-60	1
3	S-479	Soil Slide, Rock Fall	High Precipitaiton	Natural hill slope / ridge	Possibility of localized rock bluffs with rock fall hazard.	15-30	15-25	1
3	R-480	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge with some cut/fill activity	Possibility of localized rock bluffs with rock fall hazard.	21-51	15-30	1
2	R-481	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Interpreted shallow bedrock near crest of slope and possible rock fall hazard. Possibility of soil slides below.	50-70	35-40	1
3	R-482	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Interpreted shallow bedrock near crest of slope and possible rock fall hazard. Possibility of soil slides below.	35-45	25-30	1
2	S-483	Soil Slide	High Precipitation	Natural hill slope / ridge	Possible local bedrock exposures near crest of slope with a rock fall hazard.	20-40	20-25	1
2	S-484	Soil Slide	High Precipitation	Natural hill slope	Possible local bedrock exposures near crest of slope with a rock fall hazard.	15-30	30-45	1
2	S-485	Soil Slide	High Precipitation	Natural hill slope / ridge		20	30	1
2	S-486	Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instability.	20	25-30	1
1	R-487	Rock Fall	High Precipitation	Natural hill slope / ridge	Interpreted same as R-460. Likely rock fall hazards. Possibility of soil slides within overburden, where present.	10-30	50-80	2
3	S-488	Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instabilty.	10	20-30	1
2	S-489	Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instabilty. Possibility of bedrock outcrops and localized rock fall hazard, particularly within southern part of polygon.	10-20	40-45	1
2	S-490	Soil Slide	High Precipitation	Natural slope along reriver terrace		8-12	25-30	1
3	R-491	Rock Fall, Soil Slide	High Precipitation	Natural hill slope / ridge	No signs of instabilty. Possibility of bedrock outcrops and localized rock fall hazards.	10-20	25-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-492	Soil Slide	High Precipitation	Natural slope along river channel	Slope subjected to toe erosion. Some signs of a slide (likely old) within northern part of polygon.	15-25	25-40	1
3	S-493	Soil Slide	High Precipitation	Natural slope along river floodplain	Possible future (long term) toe erosion.	10	30	1
2	S-494	Soil Slide	High Precipitation	Natural slope along river floodplain	Slope subjected to toe erosion.	10	30-40	1
3	S-495	Soil Slide	High Precipitation	Natural slope along river floodplain	Possible toe erosion.	6-7	33-45	1
1	S-496	Soil Slide	High Precipitation	Natural slope along creek	Slope subjected to toe erosion. Very steep slope. Crest likely to retrogress.	10-15	40-60	1
2	S-497	Soil Slide	High Precipitation	Natural slope along creek	Possibility for future (long term) toe erosion.	8-10	35-40	1
1	R-498	Rock Slide, Rock Fall, Soil S	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards likely within steep bedrock bluffs.	50-60	30-75	1
3	R-499	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	10-15	30-35	1
3	R-500	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	10-20	25-30	1
3	R-501	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	10-30	25-40	1
3	R-502	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	15-20	30-40	1
2	R-503	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	12-15	30-60	1
2	S-504	Soil Slide	High Precipitation	Natural coastal slope		35-55	30-40	1
2	S-505	Soil Slide	High Precipitation	Natural coastal slope with some cut/fill activity		11-13	30-40	1
1	S-506	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Slope subjected to coastal toe erosion. Possibility of shallow soil slides within overburden. Possibility of block slides.	23-25	35-55	1
1	S-507	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Slope subjected to coastal toe erosion. Possibility of shallow soil slides within overburden. Possibility of block slides.	15-20	45-60	1
1	S-508	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Possible old or recent landslide area. Slope subjected to coastal toe erosion. Future (long term) toe erosion likely.	20-25	50-60	1
1	S-509	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Slope subjected to toe erosion. Possibility of shallow soil slides within overburden. Possibility of block slides.	12	30-50	1
1	S-510	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Slope subjected to toe erosion. Locally very steep, near-vertical sections. Possibility of shallow soil slides within overburden. Possibility of block slides.	8-12	60-80	1
1	S-511	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Polygon contains possible old or recent landslide area. Slope subjected to coastal toe erosion.	10-20	40-50	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-512	Soil Slide, Block Slide	Toe erosion	Natural coastal slope	Slope subjected to toe erosion. Possibility of shallow soil slides within overburden. Possibility of block slides.	5-12	30-75	1
1	S-513	Soil Slide	Toe erosion	Natural coastal slope	Slope subjected to toe erosion. Possibility of shallow soil slides within overburden. Possibility of block slides.	5-10	35-50	1
2	R-514	Rock Fall, Rock Slide	High Precipitation	Natural hill slope / ridges	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible.	10-15	35-40	1
2	R-515	Rock Fall, Rock Slide	High Precipitation	Natural coastal slope	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards possible. Locally may be subjected to coastal toe erosion.	10-20	35-40	1
2	R-516	Rock Fall, Rock Slide	High Precipitation	Natural coastal slope	Possibility of shallow soil slides within overburden. Localized rock falls or rock slide hazards likely. Locally may be subjected to coastal toe erosion (in southern part of polygon).	5-20	30-65	1
3	R-517	Soil Slide	High Precipitation	Natural hill slope / ridges	No signs of instability. Possibility of shallow soil slides within soil overburden.	10-15	30	1
2	R-518	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges	Possibility of shallow soil slides within soil overburden. Localized rock falls or rock slide hazards possible within bedrock exposures.	10-15	30-40	1
2	R-519	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges	Possibility of shallow soil slides within soil overburden. Localized rock falls or rock slide hazards possible within bedrock exposures.	15-35	30-40	1
2	R-520	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges	Possibility of shallow soil slides within soil overburden. Localized rock falls or rock slide hazards possible within bedrock exposures, particularly near slope crest.	15-25	30-65	1
3	R-521	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges	Possibility of shallow soil slides within soil overburden. Localized rock falls or rock slide hazards possible within bedrock exposures, particularly near slope crest.	15-20	30-45	1
2	R-522	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges	Local areas of coastal toe erosion, and possibility of future (long-term) toe erosion. Possibility of shallow soil slides within soil overburden. Localized rock falls or rock slide hazards possible within bedrock exposures, particularly near slope crest.	10	25-70	1
2	R-523	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Localized rock falls or rock slide hazards possible within bedrock exposures, particularly near slope crest. Possibility of shallow soil slides within soil overburden.	9-18	45-55	1
2	R-524	Rock Fall, Soil Slide	Toe erosion	Natural coastal slope	Slope subjeted to coastal toe erosion. Localized rock falls or rock slide hazards may be present bedrock exposures, particularly near slope crest. Possibility of shallow soil slides within soil overburden.	5-15	24-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
3	S-525	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden.	6-11	25-55	1
3	S-526	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden.	6-11	25-30	1
3	S-527	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden.	5-11	20-35	1
2	S-528	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Possible local rock exposures with rock fall hazard.	10-15	30-50	1
2	S-529	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Possible local rock exposures with rock fall hazard.	5	30-45	1
2	R-530	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridges along lake	Rock falls or rock slide hazards possible within bedrock exposures, particularly near slope crest. Possibility of shallow soil slides within soil overburden.	10-20	35-50	1
3	R-531	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Likely bedrock outcrops.	20-30	20-30	1
3	R-532	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Likely bedrock outcrops.	10-15	35-40	1
3	R-533	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Likely bedrock outcrops.	10-15	35-55	1
3	R-534	Soil Slide, Rock Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Likely bedrock outcrops.	8-13	45-55	1
3	R-535	Soil Slide	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Likely bedrock outcrops.	10-20	20-35	1
2	R-536	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridges along lake	Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	15-20	50-65	1
3	R-537	Soil Slide, Rock Fall	High Precipitation	Natural hill slope / ridges along lake	Possibility of shallow soil slides within soil overburden. Possible local rock exposures with rock fall hazard.	5-12	25-50	1
2	R-538	Rock Fall, Rock Slide	Time-dependent strength loss	Natural hill slope / ridges along lake	Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	10-15	35-60	1
2	R-539	Rock Fall, Soil Slide	Time-dependent strength loss	Natural coastal slope	Slope may be locally subjected to coastal toe erosion. Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	11-13	35-40	1
2	R-540	Rock Fall, Rock Slide	Time-dependent strength loss	Natural coastal slope	Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	15-20	40-50	1
3	R-541	Rock Fall, Rock Slide	Toe erosion	Natural coastal slope	Slope may be subjected to coastal toe erosion.	8-12	30-40	1
2	R-542	Rock Fall, Rock Slide	Toe erosion	Natural coastal slope	Slope may be subjected to coastal toe erosion. Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	6-11	35-65	1
2	R-543	Rock Fall	Time-dependent strength loss	Natural hill slope / ridges	Possible local rockfall hazards in bedrock exposures.	4-10	30-60	1
3	R-544	Rock Fall	Time-dependent strength loss	Natural hill slope / ridges	Possible local rockfall hazards in bedrock exposures.	5-10	20-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	R-545	Rock Slide, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges	Possible rock fall or rock slide hazards. Possibility of shallow soil slides within soil overburden.	11-17	30-65	1
2	R-546	Rock Fall	Toe erosion	Natural coastal slope	Subjected to coastal toe erosion. Steep coastal rock bluffs may be locally prone to rock falls or rock slides.	3-7	45-75	1
2	R-547	Rock Fall	Time-dependent strength loss	Natural coastal slope	Possibility of rock falls in steep bedrock exposures.	10-15	55-65	1
2	R-548	Rock Fall, Rock Slide	Time-dependent strength loss	Natural coastal slope	Possibility of rock falls or rock slides in steep bedrock exposures. Locally may be subjected to coastal toe erosion.	10-11	50-65	1
3	R-549	Soil Slide	Time-dependent strength loss	Natural coastal slope		7-8	30-45	1
2	R-550	Rock Fall, Rock Slide	Time-dependent strength loss	Natural coastal slope	Possibility of rock falls or rock slides in steep bedrock exposures. Locally may be subjected to coastal toe erosion.	10-20	50-65	1
1	S-551	Soil Slide	Toe erosion	Natural slope along river channel	Slope subjected to toe erosion.	10-20	33-37	1
2	S-552	Soil Slide	High Precipitation	Natural hill slope	Local steep areas may contain soil slide hazards. Local exposures of bedrock may be present.	15-50	25-35	2
1	S-553	Soil Slide	Toe erosion	Natural slope along creek floodplain	Higher likelihood of slope failure where locally subjected to toe erosion. Some signs of past instability.	13-23	35-40	1
2	S-554	Soil Slide	High Precipitation	Natural slope along creek floodplain	Local areas may be subjected to toe erosion. Possible future (long term) toe erosion. Likely recent or active instability along oversteepend portions of the slope.	5-13	20-50	1
2	S-555	Debris Flow	High Precipitation	Natural coastal slope	Slope subjected to coastal toe erosion. Some signs of past instability. Possibility of shallow soil slides within overburden. Known seismically induced liquefaction slides in area.	10-22	30-55	1
1	S-556	Debris Flow, Soil Slide	Active erosion	Natural gully / ravine		5-7	25-35	1
3	S-557	Soil Slide	High Precipitation	Ancient slide area	Ancient liquefaction slide area, likely seismically induced (inferred pre-1946)	7-17	25-35	1
1	S-558	Debris Flow, Soil Slide	Active erosion	Natural gully		5-10	35-40	1
1	S-559	Debris Flow, Soil Slide	Active erosion	Natural gully		9-15	25-50	1
1	S-560	Soil Slide	Toe erosion	Natural slope along creek floodplain	Variable slope inclination. Higher potential for instability in steeper sections.	5-9	20-40	1
1	S-561	Soil Slide	Toe erosion	Natural slope along creek floodplain	Some signs of old or recent debris or earth slides.	5-15	25-45	1
1	S-562	Soil Slide	Toe erosion	Natural slope along creek floodplain	Some signs of old or recent debris or earth slides. Variable slope inclination. Higher potential for instability in steeper sections.	5-10	20-50	1
1	S-563	Debris Flow	Active erosion	Natural gully		3-10	25-45	1
1	S-564	Soil Slide	Toe erosion	Natural slope along creek floodplain	Some signs of old or recent debris or earth slides.	9-22	25-35	1
2	S-565	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible old liquefaction slide.	8-13	20-30	1
1	S-566	Soil Slide, Debris Flow	High Precipitation	Natural mountain slope	Possibility of channelized flows through gullies.	200-400	30-50	2
2	S-567	Soil Slide	Toe erosion	Natural slope along creek floodplain	Higher likelihood of instability in areas subjected to toe erosion.	15-30	30-40	1
2	S-568	Soil Slide	High Precipitation	Natural slope along creek terrace	Some signs of past instability and surficial erosion on slope.	20-25	20-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-569	Debris Flow, Soil Slide	High Precipitation	Natural slope along creek terrace	Some signs of past instability and surficial erosion on slope. May be vulneable to gully formation.	15-25	25-40	1
2	S-570	Soil Slide	High Precipitation	Natural mountain slope		60-120	25-40	2
3	S-571	Debris Flow, Soil Slide	High Precipitation	Natural slope along creek terrace	Signs of erosion channel formation.	15	30-40	1
1	R-572	Rock Fall, Rock Slide	Time-dependent strength loss	Natural slope along creek floodplain	Possibility of soil slides within soil overburden. Some indication of past instability. Possible future (long term) toe erosion.	30-55	35-70	1
2	S-573	Soil Slide, Debris Flow	High Precipitation	Natural coastal slope	Signs of surface erosion on slope / slight gully formations	27-34	35-40	1
2	S-574	Soil Slide	High Precipitation	Natural slope along abandoned (ancient) channel, with many areas of cut/fill activity	No signs of instability. May be locally vulnerable to surficial erosion / gully formation.	10-25	20-30	1
1	S-575	Soil Slide	Toe erosion	Natural slope along creek floodplain	Slope subjected to toe erosion.	13	40	1
2	S-576	Soil Slide, Debris Flow	High Precipitation	Nautral coastal slope	Possibility of channelized debris flows through drainage gullies.	30-60	30-45	1
3	S-577	Soil Slide	High Precipitation	Natural hill slope	No signs of instability.	15-40	15-35	1
2	R-578	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope	Possibility of localized rockfall hazards and soil slides within soil overburden, where present.	120-160	25-40	1
2	S-579	Soil Slide	High Precipitation	Natural ravine system	May be subjected to toe erosion.	5-12	15-30	1
2	S-580	Soil Slide	High Precipitation	Natural ravine	May be locally subjected to toe erosion.	20-25	25-35	1
1	S-581	Soil Slide, Rock Fall	High Precipitation	Natural hill slope	No signs of instability. In northern part of polygon, possible local bedrock exposures near crest of slope with a rock fall hazard.	20-25	30-40	1
3	S-582	Soil Slide	Seismic		1946 earthquake-induced Mapleguard Spit Landslide (location is notional - slide mass submerged)			1
3	S-583	Soil Slide	High Precipitation	Natural hills (glacial kame and kettle topography)	Low hazard area of glacial landforms including kames and kettle lakes (numerous small slopes not subdivided into separate polygons). Low potential for localized slope instabilities. Some potential for erosion channel formation.	0-25	15-30	1
3	S-584	Soil Slide	High Precipitation	Natural hills (glacial kame and kettle topography)	Low hazard area of glacial landforms including kames and kettle lakes (numerous small slopes not subdivided into separate polygons). Low potential for localized slope instabilities. Some potential for erosion channel formation.	0-15	15-30	1
2	S-585	Soil Slide	High Precipitation	Natural slope along creek floodplain	Locally may be subjected to toe erosion. Some signs of past instabilities.	10-20	20-38	1
2	S-586	Soil Slide	High Precipitation	Natural slope along creek floodplain	Locally may be subjected to toe erosion.	15-20	30	1
2	S-587	Soil Slide	High Precipitation	Natural slope along creek floodplain	Locally may be subjected to toe erosion. Some signs of past instabilities.	10-15	20-40	1
2	S-588	Soil Slide	High Precipitation	Natural slope along creek floodplain	Locally may be subjected to toe erosion. Some signs of past instabilities.	5-8	20-35	1
3	S-589	Soil Slide	High Precipitation	Natural slope along creek floodplain and terraces		5-15	17-25	1
2	S-590	Soil Slide	High Precipitation	Natural slope along creek floodplain		10-15	25-30	1
2	S-591	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possibility of future (long term) toe erosion.	5-10	30-35	1
2	S-592	Soil Slide	High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Locally may be subjected to toe erosion. Possibility of future (long term) toe erosion.	5-10	20-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
3	S-593	Soil Slide	High Precipitation	Natural slope along creek floodplain		15-30	15-20	1
2	S-594	Soil Slide	High Precipitation	Natural slope along creek floodplain		20-30	30	1
3	S-595	Soil Slide	High Precipitation	Natural slope along creek floodplain	Generally low likelihood of instabilities. However, local steep areas may soil slide hazards. Local areas may be subjeted to toe erosion. Possibility of future (long-term) toe erosion.	5-20	15-25	1
3	S-596	Soil Slide	High Precipitation	Natural slope along creek floodplain	Generally low likelihood of instabilities. However, local steep areas may soil slide hazards or rock fall hazards. Local areas may be subjeted to toe erosion. Possibility of future (long-term) toe erosion.	10-30	15-30	1
2	R-597	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge	Possible local steep bedrock exposures with rock fall hazards.	10-15	40-60	1
2	R-598	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge		5-10	40-50	1
2	R-599	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge		5-20	30-40	1
1	R-600	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Steep rock bluffs, likely local rock fall hazards.	5-10	40-75	1
3	S-601	Soil Slide	High Precipitation	Natural hill slope / ridge, possible old quarry area		25-30	20-30	1
3	S-602	Soil Slide	High Precipitation	Natural hill slopes / ridges		10	25-35	1
2	S-603	Soil Slide, Debris Flow	High Precipitation	Natural slope along abandoned (ancient) channel	Signs of past debris flows/slides, erosion channel formation.	20-25	25-30	1
3	S-604	Soil Slide, Rock Fall	High Precipitation	Natural hill slopes / ridges	Possibility of bedrock exposures and rock fall hazards, particularly near slope crests.	30	25-35	1
3	S-605	Soil Slide, Rock Fall	High Precipitation	Natural hill slopes / ridges		10-20	30-40	1
2	R-606	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridge with some cut/fill activity	Localized rock falls possible within bedrock exposures, particularly near slope crest. Possibility of shallow soil slides within soil overburden.	15	25-35	1
3	R-607	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges along lake	Possible rock fall hazards in local steep bedrock exposures. Possibility of shallow soil slides within soil overburden.	5-10	30	1
3	R-608	Rock Fall, Soil Slide	Time-dependent strength loss	Natural hill slope / ridges along lake	Possible rock fall hazards in local steep bedrock exposures. Possibility of shallow soil slides within soil overburden.	7-10	30	1
3	S-609	Soil Slide	High precipitation	Natural hill / eskers (glacial)	Low hazard area of glacial landforms. Low potential for localized slope instabilities.	10	30	
3	S-610	Soil Slide	High Precipitaiton	Natural hill slope / ridge with cut		10-15	25-30	1
1	S-611	Soil Slide	Toe erosion, High Precipitation	Natural slope along river	Inferred high-likelihood of occurence hazard area. Topographic data insufficient to assess in detail. Polygon area is approximate and no buffer zones determined.	10-40	25-40	1
3	S-612	Soil Slide	High Precipitation	Natural slope along creek terrace		35	32	1
1	S-613	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel	Slope locally subjected to toe erosion. Locally very steep where previously undercut by stream.	10-15	30-60	1
3	R-614	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
3	R-615	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-616	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-617	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-618	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-619	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-620	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-621	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-622	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
3	R-623	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Bedrock outcrops with possibility of local rock fall hazards.	Varies	Varies	1
2	R-624	Rock Fall	Time-dependent strength loss	Natural hill slope / ridge	Steep bedrock bluffs.	5-10	45-80	1
3	S-625	Soil Slide	High Precipitation	Natural slope along creek floodplain		5-8	20-22	1
2	S-626	Soil Slide	High Precipitation	Natural gully / ravine		5	25-30	1
2	S-627	Soil Slide	High Precipitation, possible toe erosion	Natural slope along creek	Some signs of surficial erosion and instability where subjected to toe erosion, particularly along the west bank.	5-10	30-45	1
3	S-628	Soil Slide	High Precipitation	Natural slopes along river terraces	No signs of instability.	10-25	25-30	1
1	R-629	Rock Fall, Soil Slide	Time-dependent strength loss	Natural slope along river channel	Steep bedrock slope along river channel (toe erosion may be limited). Possibility of soil slides where soil overburden is present above rock. Possibility of rock falls and rock slides in steep bedrock areas.	15-25	40-50	1
1	R-630	Rock Fall, Soil Slide	Time-dependent strength loss	Natural slope along river channel	Inferred bedrock cliffs along river channel.	15-20	45-90	1
1	S-631	Soil Slide	Toe erosion	Natural slope along river channel	Slope subjected to toe erosion. Possibly exposed bedrock near toe of slope.	10-15	30-40	1
2	S-632	Soil Slide	High Precipitation	Natural slope along river floodplain	Possibility of future (long term) toe erosion.	10-20	25-30	1
3	S-633	Soil Slide	High Precipitation	Natural hill (glacial topography)	Low potential for localized slope instabilities.	5-10	20-30	1
3	S-634	Soil Slide	High Precipitation	Natural hill (glacial topography), with some cut/fill activity	Low potential for localized slope instabilities.	10-15	22-35	1
3	S-635	Soil Slide	High Precipitation	Natural hill (glacial topography), with some cut/fill activity	Low potential for localized slope instabilities.	10-15	20-30	1
3	S-636	Soil Slide	High Precipitation	Natural hill (glacial topography)	Low potential for localized slope instabilities.	10	25	1
3	S-637	Soil Slide	High Precipitation	Natural hill (glacial topography)	Low potential for localized slope instabilities.	5-20	20-25	1
3	S-638	Soil Slide	High Precipitation	Natural hill (glacial topography)	Low potential for localized slope instabilities.	5-10	20-25	1
3	S-639	Soil Slide	High Precipitation	Natural hill (glacial topography)	Low potential for localized slope instabilities.	5-10	25-30	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	R-640	Rock Fall, Soil Slide	Toe Erosion	Natural slope along river channel	Steep bedrock slope along river channel (toe erosion may be limited). Possibility of soil slides where soil overburden is present above rock. Possibility of rock falls and rock slides in steep bedrock areas.	20-45	30-80	1
2	S-641	Soil Slide	High Precipitation	Natural slope along river terrace		25-30	22-26	1
3	S-642	Soil Slide	High Precipitation	Natural slope along river terrace		10-15	15-20	1
1	S-643	Soil Slide	Toe Erosion	Natural slope along river channel	Slope subjected to toe erosion. Possibly exposed bedrock near toe of slope.	5	25-45	1
2	S-644	Soil Slide	Toe Erosion	Natural slope along river channel	Slope subjected to toe erosion. No signs of any instability.	15	25-30	1
3	S-645	Soil Slide	High Precipitation	Natural slope along river floodplain with some cut/fill activity	No signs of instability	15	25-30	1
3	S-646	Soil Slide	High Precipitation	Natural hill (glacial topography)	Some signs of erosion channel formation.	20-50	20-25	1
2	S-647	Soil Slide	High Precipitation	Natural ravine/gully		5-10	25-30	1
1	S-648	Soil Slide	High Precipitation	Natural slope along river floodplain with some cut/fill activity	Local steeper areas may be vulnerable to soil slides.	10-20	20-45	1
1	S-649	Soil Slide	Toe Erosion		Slope subjected to toe erosion. Likely bedrock exposures near toe of slope.	10-15	25-30	1
1	R-650	Rock Fall	Toe Erosion, Time-dependent strength loss	Natural slopes along river channel	Inferred narrow channel with bedrock slopes.	10	40-60	1
2	S-651	Soil Slide	High Precipitation	Natural slopes along river floodplain		10-15	30-35	1
1	S-652	Soil Slide	High Precipitation	Natural Ravine	Minor ravine.	5-8	20-25	1
2	S-653	Soil Slide	High Precipitation, Toe Erosion	Natural slopes along creek	Minor ravine.	5-10	20-35	1
2	S-654	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion.	10	30-45	1
1	S-655	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion. Signs of past instability and possible recent instability. Signs of local surficial erosion.	25	25-60	1
1	S-656	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion.	5-15	25-55	1
2	S-657	Soil Slide	High Precipitation	Natural slopes along creek terraces		5-10	20-30	1
2	S-658	Soil Slide	Toe Erosion, High Precipitaiton	Natural slopes along creek channel, terraces	Lower slope along river channel subjected to toe erosion and likely to experience instabilities. Upper slope along is separated from the lower slope by a terrace, with a lower likelihood of instability.	10-15	20-35	1
1	S-659	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion.	15	45-55	1
3	S-660	Soil Slide	High Precipitation	Natural slope along creek terraces		10-15	10-20	1
1	S-661	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion.	20-25	45-55	1
2	S-662	Soil Slide	High Precipitation	Natural slope along creek terraces	Possibility of future (long term) toe erosion.	25	15	1
1	S-663	Soil Slide, Debris Flow	Toe Erosion	Natural slope along creek chanel	Locally subjected to toe erosion. Slight indications of erosion channel formation and/or old debris flows	25	25-60	1
1	S-664	Soil Slide, Debris Flow	Toe Erosion	Natural slope along creek chanel	Locally subjected to toe erosion. Slight indications of erosion channel formation and/or old debris flows. Some surficial erosion. Higher likelihood of slope failures where undercut by the creek.	25-30	30-50	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
2	S-665	Soil Slide	Toe Erosion, High Precipitaiton	Natural slopes along creek channel, terraces	Lower slope along river channel subjected to toe erosion and likely to experience instabilities. Upper slope along is separated from the lower slope by a terrace, with a lower likelihood of instability.	30	20-40	1
1	S-666	Soil Slide, Debris Flow	Toe Erosion	Natural slope along creek chanel	Locally subjected to toe erosion. Slight indications of erosion channel formation and/or old debris flows. Some surficial erosion. Higher likelihood of slope failures where undercut by the creek.	25-30	35-50	1
2	S-667	Soil Slide	Toe Erosion, High Precipitaiton	Natural slopes along creek channel, terraces	Lower slope along river channel subjected to toe erosion and likely to experience instabilities. Upper slope along is separated from the lower slope by a terrace, with a lower likelihood of instability.	30	35-60	1
1	S-668	Soil Slide, Debris Flow	Toe Erosion	Natural slope along creek chanel	Locally subjected to toe erosion. Signs of erosion channel/gully formation and/or old debris flows.	30	20-40	1
1	S-669	Soil Slide, Debris Flow	Toe Erosion	Natural slope along creek chanel	Subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek.	15-25	30-40	1
1	S-670	Soil Slide, Rock Fall	Toe Erosion	Natural slope along creek chanel	Inferred bedrock cliffs along river channel. Possibilty of rock fall and rock slide hazards. Possibility of soil slides in upper part of slope, where soil overburden is present.	20	70-90	1
2	S-671	Soil Slide, Rock Fall	High Precipitation	Natural slope along creek floodplain and terraces	Possibility of future (long term) toe erosion. Possible local bedrock exposures and rock fall hazards.	10-30	30-50	1
2	S-672	Soil Slide	High Precipitation	Natural slope along creek terrace	Some indication of past (ancient) soil slides.	15-20	20-35	1
1	S-673	Soil Slide	Toe Erosion	Natural slope along creek chanel	Slope subjected to toe erosion	35	50	1
1	R-674	Rock Fall	Time-dependent strength loss	Natural rock ridge	Inferred bedrock bluffs with rock fall hazard. Possibility of soil slides within soil overburden, where present.	20-30	30-70	1
1	R-675	Rock Fall	Time-dependent strength loss	Natural rock ridge	Inferred bedrock bluffs with rock fall hazard.	5-8	50-70	1
3	S-676	Soil Slide	High Precipitation	Natural hill slope / ridge	Possible areas of exposed bedrock.	7-10	20-30	1
1	R-677	Rock Fall	Time-dependent strength loss	Natural rock ridge	Inferred bedrock bluffs with rock fall hazard.	5-8	50-70	1
2	S-678	Soil Slide	Toe Erosion, High Precipitation	Natural ravine		5-8	35-40	1
2	S-679	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Local areas may be subjected to toe erosion. Possibility of future (long-term) toe erosion.	10	35-45	1
2	S-680	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Local areas may be subjected to toe erosion. Possibility of future (long-term) toe erosion.	10-20	25-35	1
1	S-681	Soil Slide	Active erosion	Natural ravine		5-15	35-40	1
1	S-682	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain with some cut/fill activity	Locally subjected to toe erosion. Higher likelihood of slope failures where undercut by the creek.	20	35-40	1
2	S-683	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain with some cut/fill activity	No sign of instability.	5	30-35	1
2	S-684	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain	Local areas may be subjected to toe erosion.	5	30-35	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-685	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain	Local areas may be subjected to toe erosion.	15-25	30-40	1
2	S-686	Soil Slide	Active erosion	Natural ravine system		5-15	30-35	1
1	S-687	Soil Slide	Toe Erosion	Natural slope along creek floodplain	Locally may be subjected to toe erosion.	25	35	1
2	S-688	Soil Slide	High Precipitation	Natural slope along creek terraces	Locally may be subjected to toe erosion.	25-30	20-30	1
2	S-689	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek terraces	Locally may be subjected to toe erosion.	20	20-30	1
2	S-690	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain	Locally may be subjected to toe erosion.	20-25	20-30	1
2	S-691	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek floodplain and terraces	Locally subjected to toe erosion.	10	20-30	1
1	S-692	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel	Slope locally subjected to toe erosion. Oversteepened areas undercut by the creek more likely to experience slope failures.	10-20	40-50	1
2	S-693	Soil Slide	High Precipitation	Natural slope along creek terrace with some cut/fill activity		10	24	1
1	S-694	Soil Slide	Toe Erosion	Natural slope along creek channel	Slope locally subjected to toe erosion. Very steep slopes where undercut by the creek with signs of instability. Bedrock exposures likely near toe of slope.	20	35-70	1
2	S-695	Soil Slide	Active erosion	Natural drainage gully		5	20-25	1
1	S-696	Soil Slide	Toe Erosion	Natural slope along creek channel	Slope locally subjected to toe erosion. Bedrock exposures likely near toe of slope.	10-15	30-45	1
2	S-697	Soil Slide	High Precipitation	Natural slope along creek terrace with some cut/fill activity		10-15	30	1
1	S-698	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel and floodplain	Slope locally subjected to toe erosion. Very steep slopes where undercut by the creek with signs of instability. Bedrock exposures likely near toe of slope.	10-20	35-70	1
1	S-699	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel and floodplain	Slope locally subjected to toe erosion. Very steep slopes where undercut by the creek with signs of instability. Bedrock exposures likely near toe of slope.	15-20	40-50	1
2	S-700	Soil Slide	High Precipitation	Natural slope along creek terrace		5-10	25-30	1
1	S-701	Soil Slide	Toe Erosion	Natural slope along creek channel	Very steep slopes where undercut by the creek. Bedrock exposures likely near toe of slope.	10-15	50-70	1
1	S-702	Soil Slide	Toe Erosion	Natural slope along creek channel	Slope locally subjected to toe erosion. Very steep slopes where undercut by the creek with signs of instability. Bedrock exposures likely near toe of slope.	8-15	45-50	1
3	S-703	Soil Slide	High Precipitation	Natural slope along creek terrace		5-10	25-30	1
3	S-704	Soil Slide	High Precipitation	Natural slope along creek floodplain (abandoned)		8-10	25-30	1
3	S-705	Soil Slide	High Precipitation	Natural slope along creek floodplain (abandoned)		10	30	1
3	S-706	Soil Slide	High Precipitation	Natural slope along creek floodplain (abandoned)		10	30-40	1

Hazard Likelihood	Polygon ID	Primary Hazard	Key (Natural) Trigger	Type	Description	Height (m)	Steepness (°)	Reliability
1	S-707	Soil Slide	Toe Erosion	Natural slope along creek channel	Slope subjected to toe erosion. Very steep slopes where undercut by the creek. Bedrock exposures possible near toe of slope.	10-20	35-55	1
1	S-708	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel	Slope partly subjected to toe erosion. Very steep slopes where undercut by the creek. Bedrock exposures possible near toe of slope.	20	40-60	1
3	S-709	Soil Slide	High Precipitation	Natural slope along creek floodplain (abandoned)		10	30	1
2	S-710	Soil Slide	High Precipitation	Natural slope along creek terrace		10-15	30-35	1
1	S-711	Soil Slide	Toe Erosion	Natural slope along creek channel	Slope subjected to toe erosion. Very steep slopes with signs of instability. Bedrock exposures possible near toe of slope.	20-25	55-65	1
1	S-712	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel and terrace	Slope may be subjected to toe erosion.Terrace reduces risk of instabilty in upper part of slope. Bedrock exposures possible near toe of slope.	20	30-35	1
1	S-713	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel and terrace	Slope may be subjected to toe erosion. Bedrock exposures possible near toe of slope.	5-10	35-50	1
3	S-714	Soil Slide	High Precipitation	Natural slope along abandoned creek channel		5-10	25-35	1
2	S-715	Soil Slide	High Precipitation	Natural slope along creek floodplain	Possible future (long term) toe erosion.	8-15	30-38	1
1	S-716	Soil Slide	Active Erosion	Natural ravine / gully		5-10	25-35	1
2	S-717	Soil Slide	Toe Erosion, High Precipitation	Natural ravine		5	25-40	1
2	S-718	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel		10-20	25	1
2	S-719	Soil Slide	Toe Erosion, High Precipitation	Drainage gully		10-15	25-30	1
2	S-720	Soil Slide	Toe Erosion, High Precipitation	Natural slope along creek channel		15-20	30-45	1