Environmental Review of the Sandstone Development



Prepared For

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INTRODUCTION

EDI Environmental Dynamics Inc. (EDI) was retained to complete an environmental review to support conceptual layout planning within the identified future development areas of the Sandstone Development in the City of Nanaimo, BC. This environmental review was also needed to support the associated rezoning application and to address some of the City of Nanaimo's questions and comments regarding the Sandstone Master Plan (SMP) 2020, which are identified in their Comprehensive Letter (February 5, 2021).

Part of EDI's environmental scope included a review of several previous reports prepared by other consultants. In addition to background reviews, EDI conducted fieldwork in early 2021. The focus of our review was on identifying environmental regulatory constraints to development at a level of detail that was considered to be appropriate for the rezoning application (i.e., this review does not represent a complete bio-inventory of the area). Based on EDI's review of existing environmental information, watercourses and riparian areas were considered to be the most significant sensitivities and constraints to future planned development. As such, updating the watercourse mapping was the primary focus of EDI's field assessment in 2021. EDI also conducted fieldwork to review other key environmental features and potential sensitivities including terrestrial ecosystems and stick nests. This report includes a summary of EDI's recent assessment methods and results, discussion of the implications for the proposed development, and recommendations for future development planning.

2 METHODS

EDI completed a background information review followed by field surveys. Proposed future development areas were defined by conceptual layout drawings provided by McElhanney. EDI's assessment area included these future development areas and potential environmentally sensitive features within approximately 30 m of the proposed development areas, where accessible.

2.1 BACKGROUND INFORMATION

Background information reviewed prior to conducting the field assessment included:

- Previous reports related to environmental considerations:
 - o 2008 Ecological assessment report prepared by Madrone Environmental Services Ltd. (Madrone) for a previous owner.
 - o 2019 summary letter prepared by Cascadia Biological Services (Cascadia) for the current owner.
 - o 2020 preliminary tree management plan by Strathcona Forestry Consulting (Strathcona).
 - o 2021 preliminary stormwater management plan by Newcastle Engineering Ltd. (Newcastle).

- Existing watercourse mapping (Habitat Wizard / Freshwater Atlas, NanaimoMap, RDN Map, SHIM, and Newcastle's preliminary stormwater management plan).
- Fish distribution (Habitat Wizard and EDI fish sampling data referenced by Habitat Wizard from previous project work).
- Sensitive ecosystems (Sensitive Ecosystems Inventory, Terrestrial Ecosystem Mapping, Conservation Data Centre Publicly Available Occurrences)
- Species at risk (Conservation Data Centre Publicly Available Occurrences).
- Bald Eagle nests and heron colonies (Wildlife Tree Stewardship Atlas and BC Great Blue Heron Atlas).

2.2 FIELD MAP PREPARATION

Field maps were prepared in ArcGIS and QGIS using the City of Nanaimo LiDAR data. Potential streams to be assessed were mapped using the hydrology toolset in QGIS, based on a digital elevation model derived from the LiDAR data. Some of the LiDAR-generated streams were known to exist based on other mapping sources (NanaimoMap and Newcastle report), while many were potential drainages requiring field verification. Digital field maps included the LiDAR-generated streams, digital elevation model hillshade, the future development area, and City of Nanaimo orthophotos. Field maps were loaded into the Avenza PDF Maps app on each field team member's mobile device to support field navigation and data collection.

2.3 FIELD ASSESSMENT

Leo Chira, R.P.Bio. and Ian Wright, P.Ag., R.B.Tech. completed the stream and riparian assessments between March 3 and March 25 of 2021 with occasional on-site support from Adam Compton, R.P.Bio. Sensitive terrestrial ecosystem verification and the raptor nest survey was completed by Pablo Jost, R.P.Bio. on March 16 and 17, 2021.

2.3.1 STREAM VERIFICATION

Each of the LiDAR-generated stream locations were verified in the field. Streams to be assessed included any type of watercourse such as creeks, ditched streams, seepages, springs, wetlands and ponds. Confirmed streams were mapped using the Avenza PDF Maps app on handheld devices. This typically involved locating only the stream centerlines but where wide stream floodplains, ponds or wetlands occurred, the boundaries of these features were mapped. Field data collected for each stream included the type of watercourse, approximate average channel width, channel morphology, inferred flow regime (ephemeral or perennial), surface connection to fish habitat, and an estimate of the Streamside Protection and Enhancement Area (SPEA) width. Representative photos were taken of each of the assessed watercourses. Notes on additional characteristics of interest were also recorded, including whether a dry, ephemeral drainage's surface flow connection to downstream fish habitat was unclear, requiring follow up assessment during a wetter period.



The late winter timing of the fieldwork was appropriate for stream identification as site conditions were relatively moist and most plants had not yet leafed out (which can obscure some drainage features). During the fieldwork period there was relatively little rain, so watercourses were assessed during moist conditions, but not during high flow conditions that occur following significant periods of rainfall.

2.3.2 SENSITIVE TERRESTRIAL ECOSYSTEM VERIFICATION

Mature forest and terrestrial herbaceous sites identified in the 2008 Madrone report were briefly revisited to verify whether conditions had changed significantly since previous assessments. Vegetation was briefly characterized, disturbances were noted, and representative photos were taken.

2.3.3 RAPTOR NEST SURVEY

Previously mapped raptor nests were revisited to determine whether they are still present and if they appear to be active this year. Additionally, the study area was traversed to identify any new or previously unmapped stick nests within areas that have higher potential for such nests to occur (mature forest areas).

2.4 **POST-FIELD MAPPING**

Features mapped in the field were exported from Avenza PDF Maps in formats for viewing in Google Earth and ArcGIS. Using ArcGIS, the LiDAR-generated stream layer attributes were modified and updated based on the field data.

3 RESULTS

3.1 BACKGROUND INFORMATION REVIEW

3.1.1 MADRONE REPORT

The Madrone report provided substantial ecological information about the site. The report provided descriptions of key environmental sensitivities such as wetlands and riparian areas. It also identified areas where potential habitats for species of concern may be present. In the City of Nanaimo's Comprehensive Letter reviewing the SMP2020 document, findings from Madrone's report were referenced several times. EDI noted these specific questions and comments and planned field investigations to address them.

3.1.2 CASCADIA LETTER

The Cascadia letter was prepared with the intent of reviewing previous information collected by Madrone and determining if the site conditions were consistent with what was previously described. The letter indicated that eight types of assessment were conducted over a four-month period (March to June 2019) to verify



previous terrestrial and aquatic findings. The Cascadia letter summarized Madrone's previous findings and recommendations, then provided an opinion on whether Cascadia agreed or disagreed with them. As the Cascadia letter did not provide many details regarding assessment methods, assessment locations, level of effort or specific results/data, the report is simply an overview summary and it provides limited information regarding environmental features from which conclusions can be drawn. The report author was contacted by EDI to request information about whether any new features or development constraints were observed as a result of the assessments conducted (stick nests, rare plants and animals, or sensitive ecosystems). The author has not yet responded to EDI's requests. While Cascadia's letter provides some information and discussion, overall, it typically lacks the level detail needed to use as a reference in our assessment. The report does indicate that a Bald Eagle nest was identified at the lower end of Beck Creek and that information was used to plan a field review to verify the nest location and status.

3.1.3 MAPPED STREAMS AND FISH DISTRIBUTION

Of the publicly available sources, NanaimoMap provided the most accurate representation of watercourses on the property; however, it was not complete. Newcastle's compilation of mapped streams was the most complete representation of drainages on the property prior to EDI's 2021 assessment. The floodplain / estuary of the Nanaimo River overlaps with portions along the north end of the property. Beck Creek and Richard's Creek flow northward across the west portion of the property. These are the only named streams on the property.

No fish occurrences are mapped by Habitat Wizard directly within the property; however, mapped fish observations upstream and downstream of the property confirm fish presence in Nanaimo River, Beck Creek, and Richard's Creek. Additionally, one fish has been observed in a wetland complex that drains to the southeast across the property from the southeast corner of the regional landfill. Fish distribution is summarized below:

- Nanaimo River: provides regionally and culturally important salmonid habitat and is known to support chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, and kokanee salmon, as well as steelhead and rainbow trout, cutthroat trout, and Dolly Varden char.
- Beck Creek: coho salmon and chum salmon have been observed adjacent to the property. Upstream of the property, coho salmon, chum salmon, and cutthroat trout have been observed in Beck Lake, which was also historically stocked with rainbow trout.
- Richard's Creek: upstream of the property, coho salmon, rainbow trout, and cutthroat trout have been reported in Richard Lake.
- Wetland draining from the southeast corner of the landfill: one chinook parr was captured by EDI in 2017.



3.1.4 SENSITIVE ECOSYSTEMS

Six sensitive ecosystem polygons identified by the Sensitive Ecosystem Inventory (SEI) program intersect the study area, all of which are previously mapped wetlands.

Madrone's 2008 report identified terrestrial herbaceous plant communities in Polygons 8, 29, and 53. These were reported to be in poor condition as they were overrun by invasive plants and had signs of ongoing disturbance by human activities. In addition to the above three polygons identified in the report text, ecosystem maps provided in the report noted the presence of open shrub meadow in Polygons 10, 11, 15, 17, and 39. Madrone identified camas and chocolate lily in Polygons 29 and 53 as an indication of sensitive vegetation communities and potential for rare plants.

Older second growth forest (stands with an age class of 60 to 100 years) was identified in Polygons 2 and 6. These polygons are outside EDI's 2021 assessment area. In addition to the above two polygons identified in the report text, ecosystem maps provided in the report noted the presence of mature forest in Polygons 33, 35, and maturing forest in Polygons 7, 41, 51.

3.1.5 KNOWN AND HISTORIC OCCURRENCES OF SPECIES AT RISK

No known or historic occurrences of species at risk are documented on or immediately adjacent to the subject property. Several species at risk have some potential to occur on the property. The Madrone report describes the potential habitat suitability for several of these focal species.

3.1.6 WILDLIFE TREES (RAPTOR NESTS)

Two Bald Eagle nests were identified at the north end of the study area by the Wildlife Tree Stewardship Atlas. One is within the Agricultural Land Reserve portion of the property near Nanaimo River, and the other is within 25 m of the property boundary on an adjacent lot (1119 Trumpeter Terrace). Cascadia's letter identified an active Bald Eagle nest at the lower end of Beck Creek immediately north of the property and adjacent to Highway #1.

3.2 FIELD SURVEY RESULTS

3.2.1 WATERCOURSE DESCRIPTIONS

Beck Creek / Marsh, Richard's Creek / Marsh, and the Nanaimo River floodplain / estuary (and connected wetlands) provide the most valuable fish habitats on the property. These are the only streams on the property that flow year-round. The other perennially wetted aquatic habitat on the property appeared to be the wetlands with shallow, open water, including: (1) the larger marshes at the north end of Lot 1 that are mostly within the 200 year floodplain of Nanaimo River; (2) the marsh at the west end of Lot 3, immediately south of Duke Point Highway; (3) the upper marsh portion of the wetland system on Lot 2 near the southeast corner of the landfill; (4) the swamp at the northwest corner of Lot 2; (5) the marsh at the northeast corner of Lot 2; and



(6) the isolated swamp at the east edge of Lot 2. On Lot 6, the entire lengths of Beck Creek and Richard's Creek were classified as wetland, based on the abundance of marsh vegetation, sluggish flow, and lack of defined channel sections that are over 100 m in length.

Most of the remaining streams and wetlands appear to flow or have surface water on a seasonal basis as they were in the process of drying up at the time of assessment. Also, some of the streams appear to only have flow in response to significant or prolonged rainfall events. These were mostly dry at the time of assessment. Many of the seasonal or ephemeral streams were channelized or ditched, and some constructed drainage ditches connected directly to the stream network. Some of the streams appeared to have been historically constructed or deepened for the purpose of draining wetlands. Except where the seasonal or ephemeral streams were ditched, they were generally poorly defined, often with discontinuous scouring and alluvium. Apart from Beck Creek, the average channel widths of all stream reaches in the study area were less than 3.3 m (most less than 1.5 m), and would require a 10 m Streamside Protection and Enhancement Area (SPEA) under the Riparian Areas Protection Regulation (RAPR). A few previously unmapped streams were identified during the field assessment. As well, a couple of drainages previously classified as streams were found to not exist or to be constructed drainage ditches not associated with a natural headwater. Riparian setbacks were not applied to drainage ditches that were not associated with a natural headwater because these features do not require protection within the City of Nanaimo, they will be addressed by the stormwater management plan, and several are likely to be modified.

Forested seasonal springs and swamps were common throughout the property, often bordering ditched streams. These features were the most substantial additions to the previously mapped streams on the property. Several larger marshes with shallow, open water sections were also present on the property, as previously mapped. A few previously unmapped isolated wetlands were also found during EDI's field assessment. These wetlands were identified as being very unlikely to have surface water connectivity to other watercourses even during periods of significant rainfall.

3.2.2 STREAM MAPPING RESULTS

Mapped watercourses included stream and ditch centerlines, and the high water marks (stream boundaries) of wide floodplains, connected springs, and wetlands. In total, 6.9 km of stream length was mapped on the property. Of this, 2.8 km was represented by small and poorly defined stream sections. Approximately 29.3 hectares of wetland was mapped on the property, including 2.1 hectares of connected springs, and 0.2 hectares of isolated wetland.

Riparian setbacks applied to the mapped watercourses were based on the known watercourse leave strips that are required by Schedule C of the City of Nanaimo's Zoning Bylaw and, for watercourses that are not identified by Schedule C, some assumptions were made to map the watercourse leave strips that will likely be required when the schedule is updated. Watercourse leave strips were mapped as follows:

• 30 m buffer applied to the top of bank of Beck Creek and the edge of the active floodplain of Nanaimo River.



- 16 m buffer applied to stream centerlines where the stream was not within a ravine (to account for assumed 2 m average channel width).
- 15 m buffer applied to small and poorly defined stream centerlines that are not within a ravine, stream top of bank for streams within ravines, and the high water mark (stream boundary) of stream floodplains, connected springs, and wetlands.
- 7.5 m buffer assumed for isolated wetlands and drainages (this will need to be verified by City of Nanaimo prior to subdivision or other future development phases).

Spatial attributes and photos are stored by EDI and are readily available if/when needed. An overview map of watercourses, leave strips, and sensitive features within the study area is provided in Appendix A.

3.2.3 SENSITIVE TERRESTRIAL ECOSYSTEM VERIFICATION

Terrestrial herbaceous plant communities identified in the Madrone report text were visited and they were confirmed to be in a degraded state with an abundance of invasive plants and signs of ongoing human disturbance. Non-native grass species were noted in these areas along with Scotch broom, hairy cat's ear, English holly, and Himalayan blackberry. Polygon 8 identified in Madrone's report was severely disturbed, with compacted, deeper soils, and mainly vegetated with grasses and some native shrubs. Polygon 29 was also notably disturbed, with moss and lichen over thin soils and seepage areas, and was invaded by Scotch broom. Polygon 53 was disturbed but notably more intact than the other terrestrial herbaceous sites, with thin soils and invasive grasses and shrubs. Two less disturbed terrestrial herbaceous sites were noted by EDI in Polygon 39 (one observed in the field and one through orthophoto interpretation).

Polygon 4 also has some significant wildlife values as an open field adjacent to the Nanaimo River estuary. It is within the Agricultural Land Reserve and is outside the planned development area.

Polygons 2 and 6 contain mature forest outside the proposed development area. Mature forest in Polygon 33 is protected as it is within the riparian area of Beck Creek. Structurally, Polygons 35 and 41 appeared to be young forest, with the largest trees measured at 40 cm and 46 cm in diameter, respectively. Most of the trees were less than 35 cm in diameter.

The wildlife reserve area adjacent to Beck Creek / Marsh (recommended by Madrone in 2008) has a canopy of young and maturing bigleaf maple, and a few mature redcedar trees, with a dense understorey of osoberry, thimbleberry, salmonberry, and sword fern. Sloping moderately to steeply towards the stream, the site appeared productive with rich, moist soil. A sandstone ridge recommended as a wildlife reserve by Strathcona in 2020 is a thin strip of shrub and herbaceous plants over shallow bedrock. Other than a narrow foot trail the site is relatively intact and creates a natural woodland canopy opening between two riparian areas. A few standing dead trees are found along the ridge, adding to the wildlife habitat value. Both wildlife reserve areas are shown on the site plan in Appendix A.

A wildlife tree was identified on Lot 5 — a live 70 cm diameter western redcedar with nest cavities.



3.2.4 RAPTOR NEST SURVEY

Both Bald Eagle nests previously mapped by the Wildlife Tree Atlas were confirmed to be active this year. However, these are buffered by the Agricultural Land Reserve and are over 100 m from the proposed development area. The Bald Eagle nest identified in the Cascadia letter was visited and was found to be active. This nest is approximately 50 m north of the proposed development area and is immediately adjacent to a new subdivision along Roberta Road South. An active Red-tailed Hawk nest was found off the property, just north of the Highway 1 – Duke Point Highway intersection, also over 100 m from the proposed development area.

4 **DISCUSSION**

4.1 STREAM MAPPING AND RIPARIAN SETBACKS

As the watercourses were mapped using mobile devices, the accuracy of the mapped features can be expected to be approximately ± 5 m, with greater GPS error occurring beneath dense tree canopies and in ravines or adjacent to bedrock bluffs and cliffs. However, given that most of the stream features were generated from a LiDAR elevation model, and that GPS error is typically reduced on mobile devices in areas with cellular reception such as this, the level of accuracy achieved could be better than ± 5 m in many areas and is considered appropriate for preliminary development layout purposes.

As previously mentioned, the City of Nanaimo's watercourse leave strips are identified by Schedule C of the zoning bylaw. Where development activities are proposed within these leave strips, variances can be requested. When these works involve necessary stormwater outfalls, stream crossings for roads and services or routine works in and about a stream, the variance process may be straight forward and may also involve provincial or federal approvals. When proposed development does not involve necessary crossings or in-stream works, the variance process requires a clearly demonstrated need and rationale. Typically, at a minimum, the variance request must incorporate the principle of "no net loss" and ideally the request demonstrates a net gain and improvement of habitat (aquatic and/or riparian). When leave strip variances are requested, the requirements of the RAPR also need to be addressed. Under the RAPR, riparian setback known as Streamside Protection and Enhancement Areas (SPEAs) can be narrower than specified by the City's zoning bylaw, but this is not always the case. For small streams with average widths of less than 3.3 m, the SPEA can be a little as 10 m from the stream boundary (high water mark). For wetlands, lakes and ponds, the SPEA is 15 m from the high water mark, except on the south side where it is extended to 30 m due south to provide additional watercourse shading.

Note that ditched or channelized streams that are part of a natural drainage system are considered streams by the RAPR and the Zoning Bylaw. Whereas stormwater ditches are considered streams under RAPR if they are connected to a stream, these features are not part of a natural drainage system, they only convey surface runoff during rain events, and they are not considered by the City's Zoning Bylaw. No setbacks were assigned



to ditches, and it is understood that these features will be addressed and likely modified and managed appropriately as part of the stormwater management plans.

Apart from constructed drainage ditches, EDI mapped all surface water features that meet the definition of a stream under the RAPR or the BC Water Sustainability Act. It is unclear whether all the small and poorly defined streams would be considered as streams by the City of Nanaimo for incorporation into the Zoning Bylaw map (Schedule C), particularly ephemeral reaches that lack continuous scouring and alluvium. Isolated wetlands (those that have no surface flow connection to fish habitat) are not provided riparian protection under the RAPR, although the wetlands themselves are protected under the Water Sustainability Act. It is anticipated that the City will provide guidance on watercourse leave strips for small and poorly defined streams and isolated wetlands.

4.1.1 WINTER VERIFICATION OF POTENTIALLY ISOLATED STREAMS

For most of the small and poorly defined streams, their surface flow connection to downstream fish habitat was evident; however, some watercourses warrant verification of surface connectivity. The surface flow connection could not be confirmed for a wetland on Lot 5 that flows into the Highway 1 ditch. Sections of the ditch had little evidence of flowing water and it appeared that flows likely dissipate into coarse material beneath the highway, rather than connecting to Beck Creek to the north. To confirm whether the RAPR applies to this wetland it would need to be reviewed in winter during a significant period of sustained rainfall. It may also be worth revisiting the other ephemeral streams at such a time to confirm their connection and extent, although this may not be warranted until the detailed design and development permit phases within a given area.

4.1.2 STREAMS, WETLANDS, AND THE DEVELOPMENT STORMWATER DESIGN

Any planned development within wetlands and their riparian areas must be in accordance with all municipal, provincial and federal permitting requirements. The intent of any such planned development should be to minimize and avoid impacts to sensitive and important species and habitats and to mitigate or compensate for unavoidable impacts where this is necessary and warranted. Where any planned works that may affect streams, wetlands or their riparian areas are proposed, detailed, site-specific environmental assessment(s) should occur to support the permitting and development processes. These planned works may include but are not limited to:

- road crossings and approaches
- service crossings (water, sanitary)
- danger tree removal
- stormwater infrastructure (as per current conceptual plans and future detailed designs)
- invasive species removal
- water level gauges
- beaver dam removal



- relocation and enhancement of historically ditched streams
- riparian and/or aquatic restoration/enhancement

4.2 SENSITIVE ECOLOGICAL FEATURES AND WILDLIFE VALUES

Wetlands, streams, and adjacent riparian habitats likely provide the greatest value for wildlife and biodiversity in the project area. Overall habitat connectivity will be largely addressed through maintaining watercourse leave strips that will function as wildlife corridors. Other sensitive ecological features such as terrestrial herbaceous plant communities and patches of mature forest are also present on the property; however, these features are less consequential to the preliminary development layout.

Terrestrial herbaceous ecosystems are relatively rare features that account for a very small portion of the land base. They provide structural diversity and edge habitat in forested landscapes and niches important for rare plants and wildlife. Due to the poor condition of most of the terrestrial herbaceous plant communities identified on the property, these sites are not ideal candidates for protection. Retention of the highly degraded terrestrial herbaceous areas is not necessary, given that these ecosystems are difficult to restore, and there are no provincial, federal or local government requirements to retain them (they are not identified as DPA 2 Environmentally Sensitive Areas). Note that a few of the terrestrial herbaceous sites appeared more intact than most. EDI has not assessed these sites during the flowering season, so their plant communities have not been fully characterized, including the presence of rare plants. Additionally, these ecosystems have not been delineated at a detailed scale. Prior to subdivision and development permitting, terrestrial herbaceous areas should be mapped and surveyed for rare plants. More intact and biodiverse sites, particularly those with substantial occurrences of rare plants, may warrant protection as environmentally sensitive areas. Where retention of terrestrial herbaceous patches may be warranted, it is important to consider protective buffers and overall connectivity to other habitats. Where feasible, rare plants on highly degraded sites that will be developed should be salvaged and transplanted to nearby sites that will be retained.

There can be substantial ecological benefits to protection of larger, intact mature forest areas. Most of the property has been previously disturbed and lacks mature forest. For the most part, mature forest patches are located outside the planned development areas or are already located within watercourse leave strips. Polygons 2 and 6 are the most significant mature forest patches on the property. These are outside the proposed development area, located on 1200 Frew Road. Polygons 35 and 41, noted as mature and maturing by Madrone, lacked the structure of a mature forest, and had only a few trees over 35 cm in diameter. As these are upper slope sites with lower productivity shallow soils, it is possible these stands are over 80 years old (this would require tree coring to determine). However, based on the observed habitat characteristics, we consider these forest patches to be relatively young and not warranting protection. A wildlife reserve recommended by Madrone in 2008 covers bigleaf maple forest adjacent to Beck Creek / Marsh on Lot 6, which extends beyond the riparian setback and is mostly within a steep slope area. Although not a mature forest, it is a highly productive site linking aquatic and upland habitat, with an abundance of fruit-producing understory shrubs important for wildlife and pollinators. As the trees mature and decay, they will provide habitat for cavity nesters and will contribute to coarse woody debris habitat on the forest floor. Madrone deemed this site as suitable habitat for heron nesting, although there are currently no known nest sites there.



Currently known raptor nest locations are all outside of the proposed development areas, and far enough from planned development that they are not likely to be a constraint. Only one notable wildlife tree was observed. This and any others identified at a more detailed layout stage should be retained wherever possible. No other wildlife trees, significant trees, or heritage trees have been identified on the property; however, there is potential for some to exist so more detailed surveys will be required at the detailed design or development permitting phase. Such surveys would be done along with hazard tree assessments.

4.2.1 **OVERALL TREE RETENTION**

The City of Nanaimo's Management and Protection of Trees Bylaw, 2013 No. 7126 requires that 20% of trees be retained, excluding statutory park dedication. With the development of the Sandstone lands the City of Nanaimo will see an increase in parks and open spaces in the areas within and around the South Urban Node with approximately half of the 726 acres dedicated as a Wildlife Reserve, Nature, Community or City Parks. Due to the complex topography, including steep slope areas, significant wetlands and protected riparian areas, a substantial amount of the existing tree cover will remain. EDI completed a preliminary analysis of the forested area on the property that would be retained within the riparian leave strips, recommended wildlife reserve, Agricultural Land Reserve, and a parcel that will not be developed (1200 Frew Road) as it contains most of the mature forest on the property and is largely within the Nanaimo River floodplain. Approximately 85% of Sandstone is covered by trees and 29% of the existing forested area would be retained in these environmentally sensitive areas. Note that this analysis was preliminary and did not account for tree stem density. Larger non-forested areas were excluded, such as marshes and swamps with open water, terrestrial herbaceous areas, and roads; however, smaller features were not exhaustively delineated for this high-level analysis. While the approximate area of tree retention seems to be sufficient, further analysis will be necessary to verify that the 20% retention target will be met. It is preferrable to determine tree retention areas for the entire development rather than at the individual lot level to avoid unnecessary habitat fragmentation. Preserving and maintaining existing trees in areas where development is not achievable across the entire property will maintain larger patches of forest and broader habitat connectivity.

4.2.2 RARE BIRDS

In the Madrone report, it is recommended that surveys be completed for Western Meadowlark, Short-eared Owl, American Bittern, and Green Heron. EDI has reviewed the habitat requirements for these species and we consider these surveys to be unnecessary. The potential for disturbance to these species is limited as there is no planned development within major wetlands such as Richard's Marsh where some potentially suitable habitats occur for some of these species. Of these species both Western Meadowlark and Short-eared owl are not known to breed in Nanaimo and the other two are very rare and sporadic breeders in the region. A discussion of potential habitat for each species is provided below and references are provided in the References section of this report:

• American Bitterns breed in both freshwater habitats including sloughs, marshes, shallow portions of lakes and brackish wetlands, always with tall emergent vegetation. Potential breeding habitat, although low,



occurs at Richard's Marsh. The only recent recorded observations of American Bittern in Nanaimo were at Buttertubs Marsh and observations are rare and infrequent.

- Green Herons breed along riparian edges of slow-moving rivers, streams, ponds and sloughs, including in stands of Red Alder. It appears to be tolerant of at least some habitat degradation and disturbance. The Green Heron is not abundant anywhere in the province, and records of the species in Nanaimo are sparse and mainly from Buttertubs Marsh.
- Western Meadowlarks overwinter in Nanaimo in fields and estuaries that do not occur in the proposed development area (Polygon 4 from the Madrone Report contains potential habitat but is not proposed for development).
- Short-eared Owls breed in suitable habitat throughout BC, although it is absent as a breeder from much of the coast outside the Lower Mainland. Overwintering birds require open country, foraging in old pastures, hayfields, grasslands, bogs and marsh edges. In Nanaimo, records are common from the Nanaimo River estuary in winter. On the property, only Madrone's Polygon 4 may represent potential habitat for overwintering, and no development is proposed in this area.



5 **RECOMMENDATIONS**

Following our review of previous studies and our recent field assessments, several recommendations are provided for future development planning (at the subdivision or DP stage, after rezoning). The intent is for these recommendations to replace those made within previous environmental reports:

- A. Revisit potentially isolated wetlands and ephemeral streams in winter during a significant period of rainfall to verify surface connectivity and extents.
- B. Revisit representative small and poorly defined streams and isolated wetlands with City of Nanaimo staff (preferably in the rainy season) to determine the City's expectations for riparian protection around these features. Ultimately, the City of Nanaimo will determine how individual watercourses are incorporated into Schedule C of the Zoning Bylaw, such that watercourse leave strips can be applied.
- C. As much as possible, locate any planned development activity outside of watercourse leave strips that are associated with large wetlands, Richards Creek / Marsh, and Beck Creek / Marsh. It will be important to maintain adequately large riparian setbacks for these watercourses, as they provide significant aquatic habitat values.
- D. Minimize any planned development activity overlap with watercourse leave strips of small watercourses that provide limited aquatic habitat values. Where watercourses are minimally disturbed and riparian areas are naturally vegetated, there will be a higher priority to avoid them. Where watercourses have been disturbed and riparian areas are degraded, the preference is still avoidance; however, opportunities can be explored on a case-by-case basis to seek leave strip variances where it can be demonstrated that there will be net gains and improvements to aquatic and riparian ecosystems while accommodating development goals.
- E. During the detailed design and development permit stages, stream crossings and stormwater infrastructure should be designed to prioritize ecosystem health. Design elements should consider:
 - a. Appropriately sized crossing structures that accommodate fish and amphibian movement where applicable and that factor in climate change considerations (increased peak flows).
 - b. Where applicable, bioswales and ditches designed to capture and slow runoff, encourage infiltration, and minimize potential for sedimentation into watercourses.
 - c. Appropriately designed stormwater outfalls that minimize disturbance to watercourses and streamside vegetation that prevents scouring (energy dissipation features to be used where needed).
 - d. Where road crossings would occur along ditched streams, designs will consider stream relocation to improve channel and riparian habitats, prevent riparian encroachments and minimize the need for crossings.

- F. Minimize the number of road stream crossings and align road crossings to minimize overlap with the riparian leave strip (cross perpendicular to the stream orientation where possible).
- G. New public trails should be avoided within watercourse leave strips except as needed for stream crossings or approved access to watercourses. If any portions of new trails are to be considered within leave strips, seek variances/permitting as needed, minimize overlap with the leave strip and implement protective measures to prevent ecosystem damage (fencing, elevated boardwalks, signage etc.). Existing trails in the watercourse leave strips valuable for public recreation and access to nature (for example, along Richards Marsh) could likely be retained and improved (for safety and to prevent encroachment into specific sensitive locations).
- H. Consider developing outside of the approximate recommended wildlife reserve areas shown on the site plan in Appendix A and work with a Qualified Environmental Professional to accurately identify these boundaries during the future detailed planning phases. There are no legal requirements to conserve the portion of these areas that are outside of watercourse leave strips; however, we support the identification and delineation of wildlife reserves at these approximate locations. The reserve boundaries should be determined by balancing development layout needs with habitat conservation objectives.
- After rezoning and early in the development design and layout process, terrestrial herbaceous areas I. should be mapped and surveyed for rare plants. These surveys are warranted well in advance of any detailed designs being completed where terrestrial herbaceous ecosystems occur. As these sites can be readily identified through orthophoto interpretation, they should be delineated on a field map at a sufficiently detailed scale (such as 1:2,000) to identify areas to assess for rare plants. Rare plant surveys must be done during the appropriate time of year to adequately document flowering plants (typically mid-May to late June). More intact and biodiverse sites, particularly those with substantial occurrences of rare plants, may warrant protection as environmentally sensitive areas. Substantial occurrences could be where there are red-listed plants, a high number of blue-listed plants, or a healthy diversity of valued terrestrial herbaceous plant species, and where it is determined by a Qualified Environmental Professional, that transplanting may be problematic or inappropriate. Where retention of terrestrial herbaceous patches may be warranted, it is important to consider protective buffers and overall connectivity to other habitats. Terrestrial herbaceous areas that are selected for conservation will likely need protective measures to prevent encroachment and disturbance (fencing and signage) as these areas can be easily damaged by humans and pets when they are near developed areas and are easily accessible. Where feasible, rare plants on highly degraded sites that will be developed should be salvaged and transplanted to enhance nearby sites that will be retained.
- J. Complete the necessary environmental assessments and begin the permitting processes for stormwater management plans involving works within wetlands and riparian areas early in the development design and layout process. It will be important to better understand the site-specific habitats and the fish and wildlife values to determine the potential effects that changes to natural hydrological patterns and processes may have. The permitting processes for any planned stormwater storage within wetlands will be complex, as they will require demonstrating net gains to aquatic and/or riparian habitats in



accordance with the City of Nanaimo's policies and other regulatory requirements, and this may involve the preparation of detailed assessment reports, habitat balance calculations, habitat enhancement plans and habitat offsetting.

- K. Prior to each phase of development, complete detailed surveys for wildlife trees, significant trees, and heritage trees as needed to satisfy the City of Nanaimo's tree protection bylaw. Where required for construction or longer-term safety considerations, conduct hazard tree assessments in riparian areas or other areas designated for tree retention so that trees can be removed where necessary and so tree replacement requirements can be identified.
- L. Prior to each phase of development, complete detailed pre-development surveys to confirm the absence of new sensitivities or features such as but not limited to: heron/raptor nests or other nests protected by the Wildlife Act, listed plant species, substantial invasive species infestations, and changes to watercourse boundaries.
- M. Prior to each phase of development, a Qualified Environmental Professional shall accurately flag the boundary of wetlands and a BC Land Surveyor should accurately locate the top of bank of streams and the flagged wetland boundaries such that accurate leave strip boundaries can be applied.
- N. Qualified Environmental Professionals should prepare invasive plant management plans for each phase of future development. Invasive plants are sporadic throughout the project area and individual patches of concern have not been mapped. Without due care, development activities can cause or exacerbate the spread of invasive plants. Removal, monitoring, and restoration plans with specific recommendations should be developed on a case-by-case basis. Recommendations should be made to mitigate the spread of invasive species due to construction activities. Protection of naturally vegetated riparian areas will help limit the spread of invasive plants.
- O. Develop Construction Environmental Management Plans for each phase of construction to provide guidance and address any permitting criteria for items such as:
 - a. Erosion and sediment control.
 - b. Environmental protection measures for instream works.
 - c. Rare plant salvage and transplant plans from any terrestrial herbaceous sites that will be developed.
 - d. Bird nesting windows and pre-clearing nest survey requirements.
 - e. Raptor nest monitoring for any areas near sensitive nest sites.
 - f. Invasive plant management.
 - g. Enhancement planting.
 - h. Fuel management and spill response.



6 LIMITATIONS

This report was prepared exclusively for Seacliff Properties (Nanaimo) Ltd. by EDI Environmental Dynamics Inc. The quality of information, conclusions and estimates contained therein are consistent with the level of effort expended and is based on: i) information available at the time of preparation; ii) data collected by EDI Environmental Dynamics Inc. and/or supplied by outside sources; and iii) the assumptions, conditions and qualifications set forth in the report. The report is intended to be used by for Seacliff Properties (Nanaimo) Ltd. for the intended purpose as outlined by this report (City of Nanaimo review). Any other use or reliance on this report by any third party is at that party's sole risk.

The recommendations made in this report are not meant to satisfy any potential slope stability or flood hazard considerations as these aspects are outside our areas of expertise. It is understood that appropriately qualified professionals will be retained by the Proponent in the future to address aspects related to slope stability and flood construction levels.

It is expected that the conclusions made in this report could apply for up to five years from the date of the report; however, any material changes to site conditions may invalidate the conclusions and recommendations made herein.



LITERATURE CITED

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- Cascadia Biological Services. 2019. Sandstone Development Nanaimo, BC. Letter Prepared for Seacliff Properties (Sandstone) Ltd., Vancouver, BC.
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- Newcastle Engineering Ltd. 2021. Sandstone Development Storm Water Analysis. Draft Technical Memorandum Prepared for Keycorp Planning Ltd. Langford, BC.
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APPENDICES



APPENDIX A ENVIRONMENTAL REVIEW MAP



Environmental Review Sandstone Development, City of Nanaimo

- ✤ Wildlife Trees
- Subject Properties Assessed by EDI 1200 Frew Road Watercourse Leave Strip Boundaries Agricultural Land Reserve Wildlife Reserve Recommended by Madrone in 2008 Wildlife Reserve Recommended by Strathcona in 2020 Stream ----- Stream (Poorly Defined) Stream Boundary (High Water Mark) Stream Top of Bank Isolated Drainage Culvert Wetland Connected Spring
 - Isolated Wetland
 - Nanaimo River 200 Year Floodplain



City of Nanaimo Orthopl Feature locations approx	noto and LiDAR Hillshade simate based on handheld (GPS and interpretation of elevatior	n model and orth	ophotos.
0	200	400	600	800
		Meters		
	Map Scale =	1:10,000 (printed on 11 x 17)		
		UII. NAD 1985 UTM 2018 10N		
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