

Regional District of Nanaimo Coastal Flood Hazard Map Atlas (Revision 1) Flood Construction Level Maps for 1.0 m RSLR



7 October, 2021

ebbwater
CONSULTING



CASCADIA COAST
RESEARCH LTD.

Cover Photo: King Tide in Parksville. © Photo by Ebbwater Consulting

Index

| | |
|---|---|
| Introduction | 2 |
| Overview of Maps | 2 |
| Notes to Map User | 2 |
| Print Instructions..... | 3 |
| References | 4 |
| Flood Construction Level Map for 1.0 m RSLR - Map Tile Index..... | 5 |

Introduction

The map atlas accompanies a floodplain mapping study by Ebbwater Consulting Inc. and its partner Cascadia Coast Research Ltd. for the Regional District of Nanaimo (RDN). It contains a collection of maps which show the impacts of coastal flood hazards affecting the RDN. This information may be used by the RDN in planning and engineering projects with the goal of reducing risk from flood hazards. Note that the results of this work are not sufficiently resolved to be appropriate for specifying FCL at the property level, however, they can be a guide for resilience policy and planning activities.

This work generally followed the approach set out in the Professional Practice Guidelines for Flood Mapping in BC (APEGBC 2017). It also references the Provincial Coastal Floodplain Mapping – Guidelines and Specifications (Kerr Wood Leidal 2011) as well as various provincial documents developed to provide guidance on sea level rise (Ausenco Sandwell, 2011a, 2011b, 2011c).

This map atlas is designed to accompany a Floodplain Mapping Report (Ebbwater Consulting Inc. and Cascadia Coast Research Ltd. 2021) and is intended for the purposes set out in that report only. See the main report for further details on the methodology, results and limitations.

Overview of Maps

We assessed and mapped the coastal storm-induced flood hazard for the 0.5% Annual Exceedance Probability (AEP) (200-year indicative return period) along the coastline of the RDN. We considered this AEP scenario for one relative sea level rise scenario (RSLR 1.0 m). Due to the large geographical area of the RDN, the map has been divided into 19 map tiles.

Notes to Map User

1. This map is designed to accompany a Coastal Floodplain Mapping Report (Ebbwater Consulting Inc. and Cascadia Coast Research Ltd, 2021) and is intended for the purposes set out in that report only. See the main report for further details on the methodology, results and limitations. Maps from this series REPLACE previous mapping from Phase I and II Coastal Floodplain Mapping Report (Cascadia Coast Research Ltd, 2019) for the Regional District of Nanaimo (RDN).
2. Flood water levels were developed using a 0.5% Annual Exceedance Probability (AEP) flood and 1.0 m Relative Sea Level Rise (RSLR).
3. The adopted values for sea level rise are based on guidelines from Ausenco Sandwell (2011). These are subject to change and RSLR values may need to be reassessed in future.

4. A 0.6 m freeboard allowance has been included in water levels in accordance with Ausenco Sandwell (2011).
5. This map was produced following the Coastal Floodplain Mapping Guidelines (KWL, 2011) and Professional Practice Guidelines (APEGBC, 2017). Maps did not include contours after RDN's request.
6. The Regional District of Nanaimo (RDN) does not represent that flooding will not occur outside of the indicated FCL Reach and will not exceed the FCLs indicated on the map.
7. Application of the FCLs presented in this map should be done in accordance with relevant policy and regulations by a suitably qualified professional.

Limitations

1. The accuracy of the presented FCLs is limited by available data and modelling approaches. The FCLs are based on 1D cross-shore transects. Please refer to report (Ebbwater Consulting Inc and Cascadia Coast Research Ltd., 2021) for a detailed discussion of limitations.
2. The accuracy of the floodplain extent is limited by the accuracy of the base mapping data and surveys. The floodplain limits were not established on the ground by legal survey.
3. This map was produced by Ebbwater Consulting Inc. using generally accepted best practice and guidelines for the Province of British Columbia. However, flooding may still occur outside the defined floodplain boundary, and Ebbwater Consulting Inc. and Cascadia Coast Research Ltd. do not assume any liability by reason of the failure to delineate flood areas on this map.
4. The outlines and levels shown on this map are to provide an assessment of current and future flood levels to help inform decisions on future land use policy. Under the provisions of the Local Government Act 2004, these levels only take effect when adopted by bylaw or implemented via another planning tool (such as a development permit area). The required setback from the FCL Reach area is defined in RDN Floodplain Management Bylaw No.1469, 2006.

Print Instructions

All maps are designed and scaled to be printed at ANSI D.

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6. Base map and parcel layers were provided by different data owners and are subject to differences.

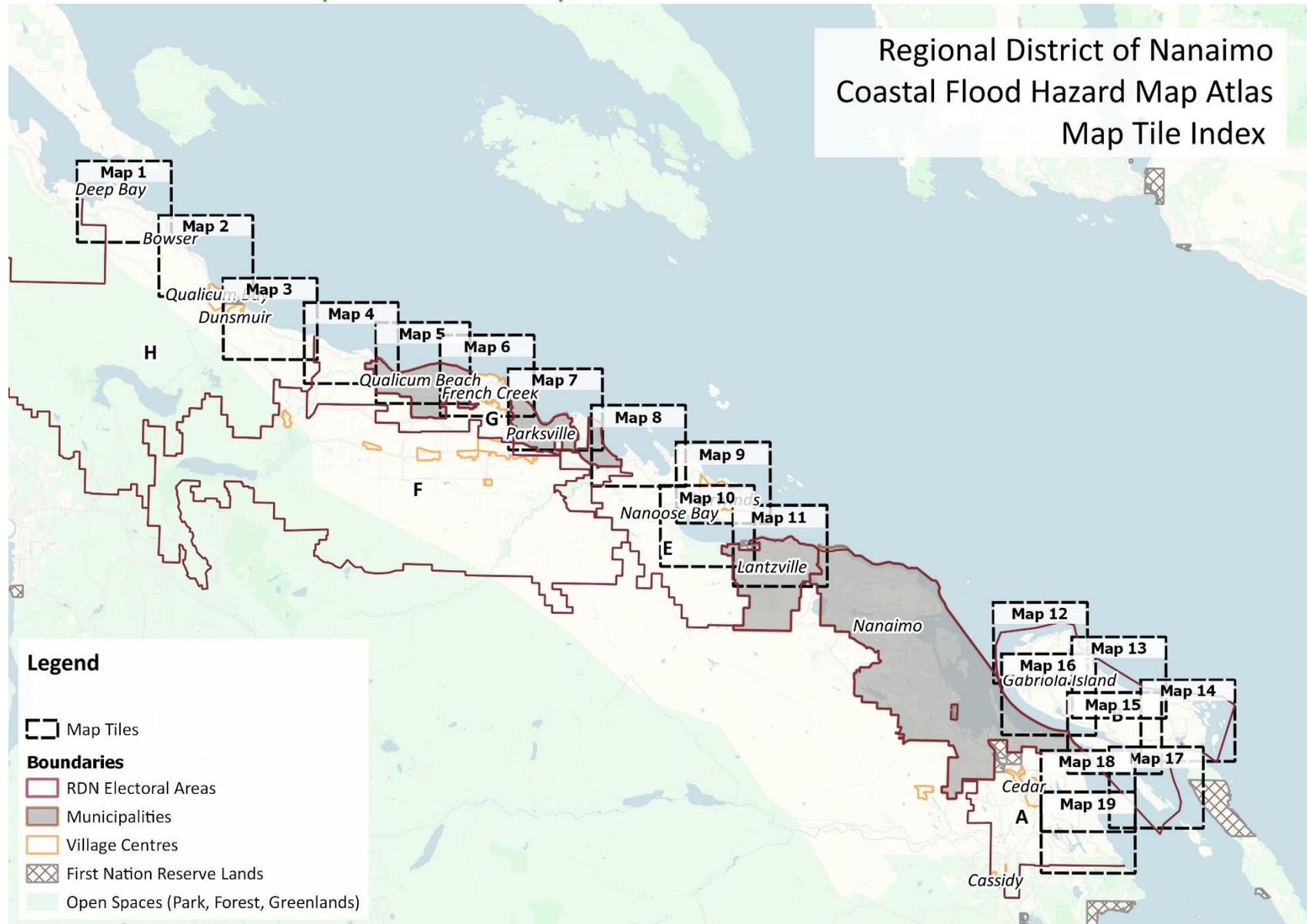
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References

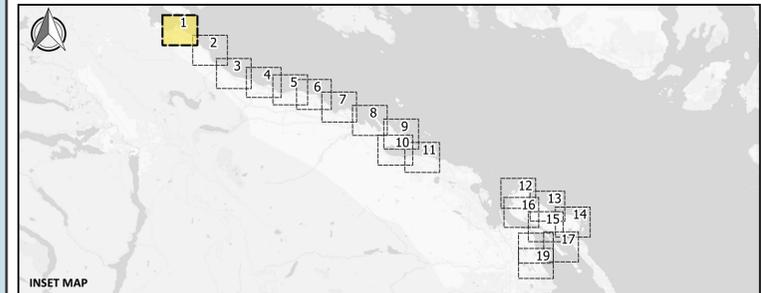
- APEGBC. 2017. "Flood Mapping in BC - APEGBC Professional Practice Guidelines - V1.0." Prepared For British Columbia Ministry of Forests, Lands and Natural Resource Operations.
- Ausenco Sandwell. 2011a. "Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use - Draft Policy Discussion Paper." Prepared for BC Ministry of Environment.
- . 2011b. "Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use - Guidelines for Management of Coastal Flood Hazard Land Use." Prepared for BC Ministry of Environment.
- . 2011c. "Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use - Sea Dike Guidelines." Prepared for BC Ministry of Environment.
- Ebbwater Consulting Inc., and Cascadia Coast Research Ltd. 2021. "Regional District of Nanaimo Coastal Floodplain Mapping Final Report." Prepared for Regional District of Nanaimo.
- Kerr Wood Leidal. 2011. "Coastal Floodplain Mapping – Guidelines and Specifications." Prepared for Ministry of Forests Lands & Natural Resource Operations.

Flood Construction Level Map for 1.0 m RSLR - Map Tile Index





- Legend**
- RDN Electoral Area
 - RDN Village Centres
 - Land Parcels
 - Municipalities
 - First Nation Reserve Lands
 - Building Footprints
 - Open Spaces (Park, Forest, Grasslands)
 - Transects
 - FCL Reaches (metres, CGVD 2013)
 - Reach Labels



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Date Created: 07 Oct 2021
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 Vertical Datum: CGVD 2013
 Paper Size: ANSI D

Prepared By: NS
 Reviewed By: TL
 Checked By: TL

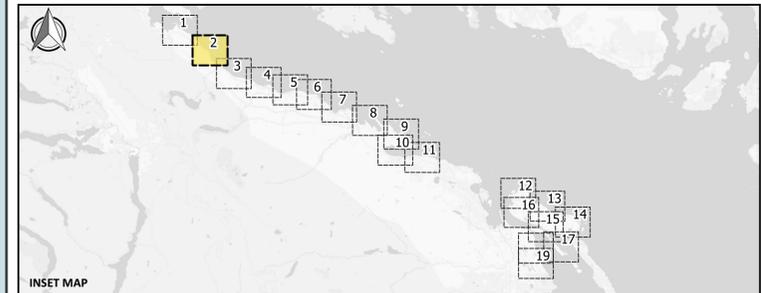
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Legend

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- Transects
- FCL Reaches (metres, CGVD 2013)
- Reach No. 10
FCL = 5.2 m



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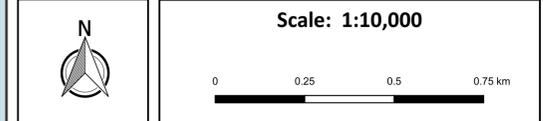
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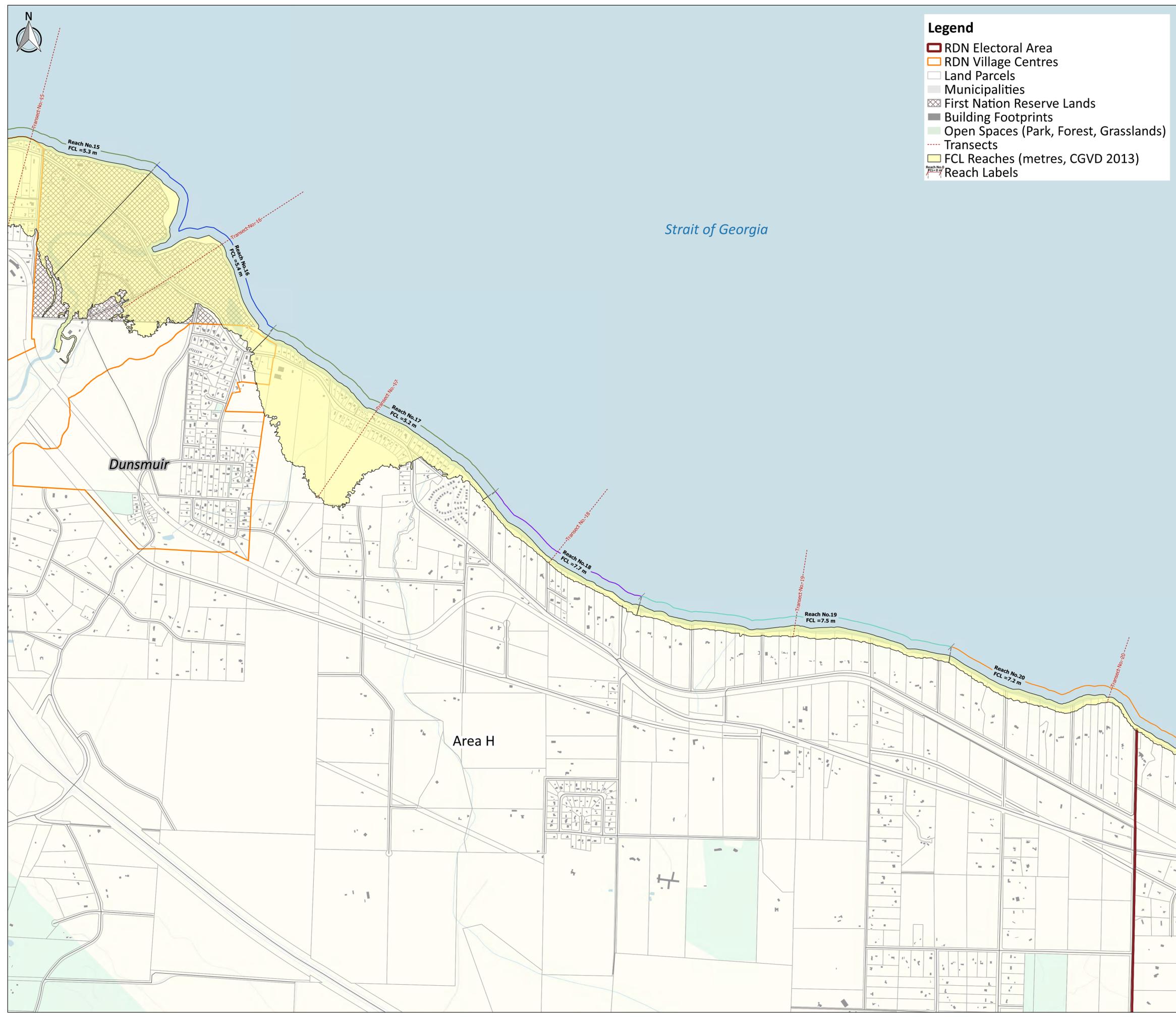
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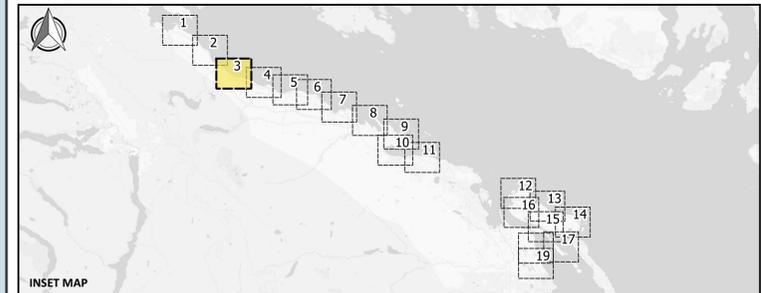
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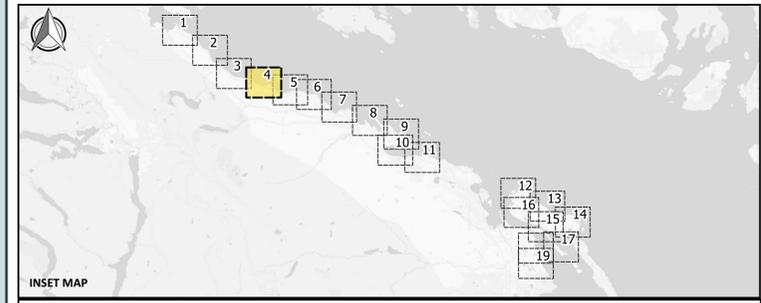
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0 0.25 0.5 0.75 km

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Strait of Georgia

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Area H

Qualicum Beach (Town)

Little Qualicum River

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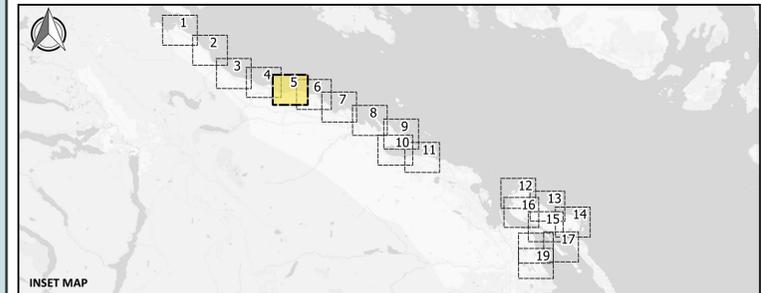
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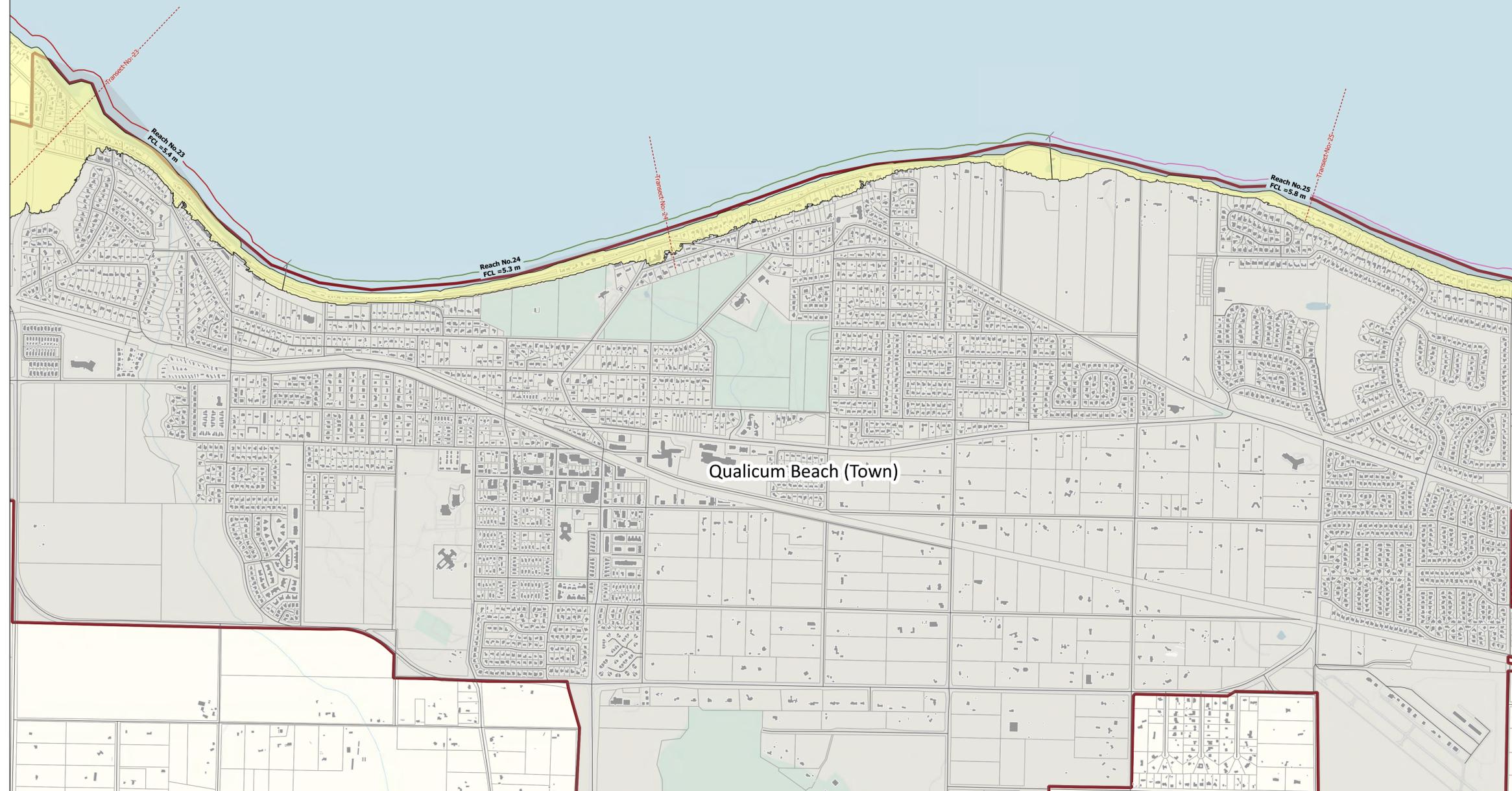
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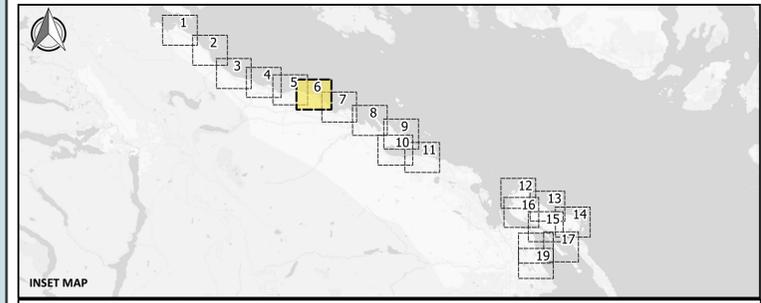
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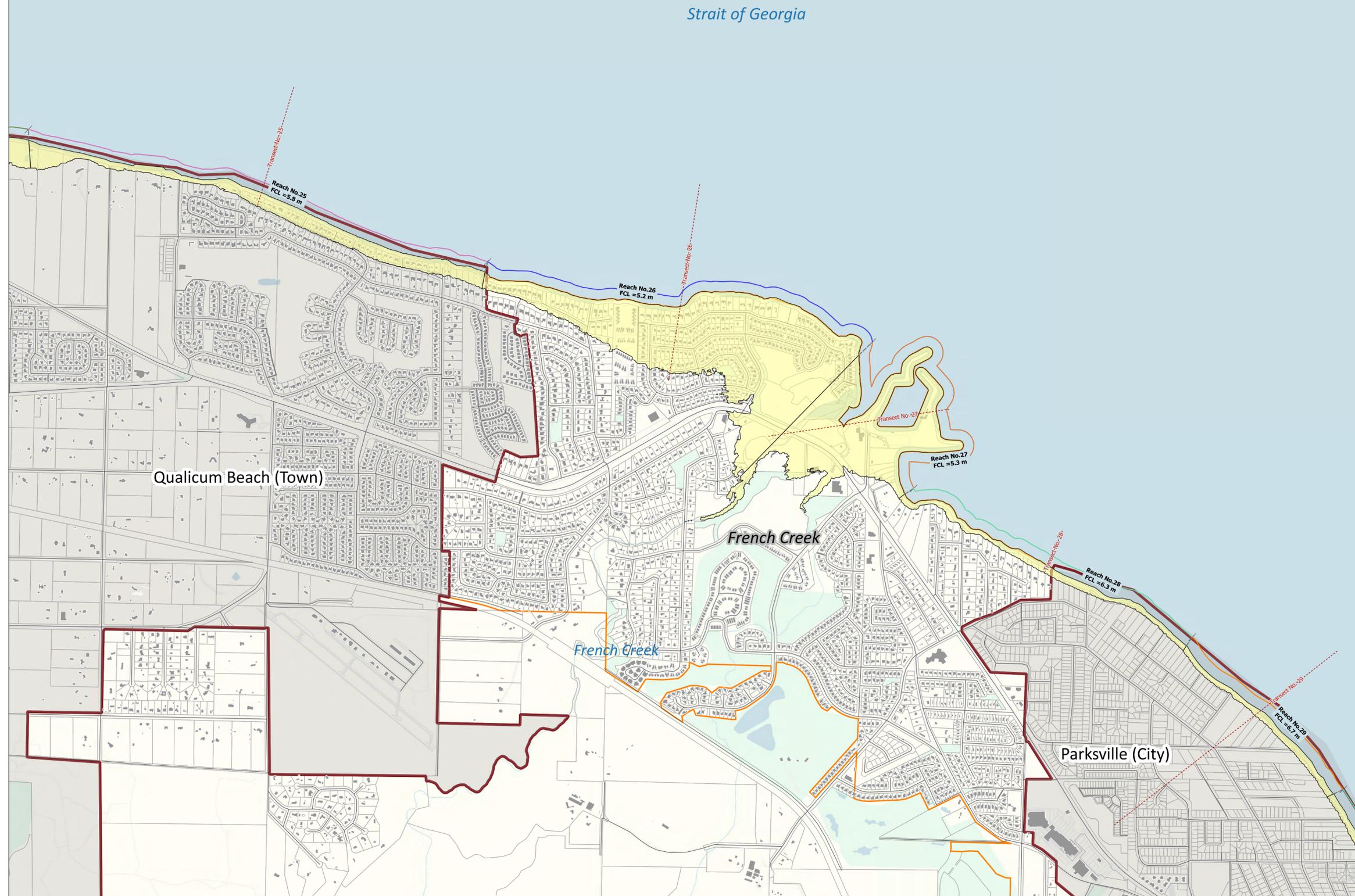
References:

1. Ebbwater Consulting Inc. and Cascadia Coast Research Ltd. (2021). Regional District of Nanaimo Coastal Floodplain Mapping. Prepared for the Regional District of Nanaimo.

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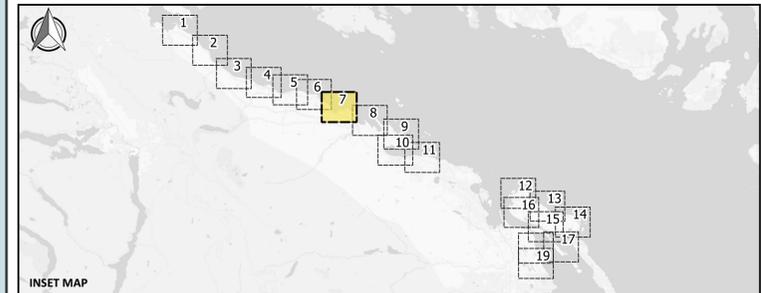
Prepared By: NS
 Reviewed By: TL
 Checked By: TL

Scale: 1:10,000

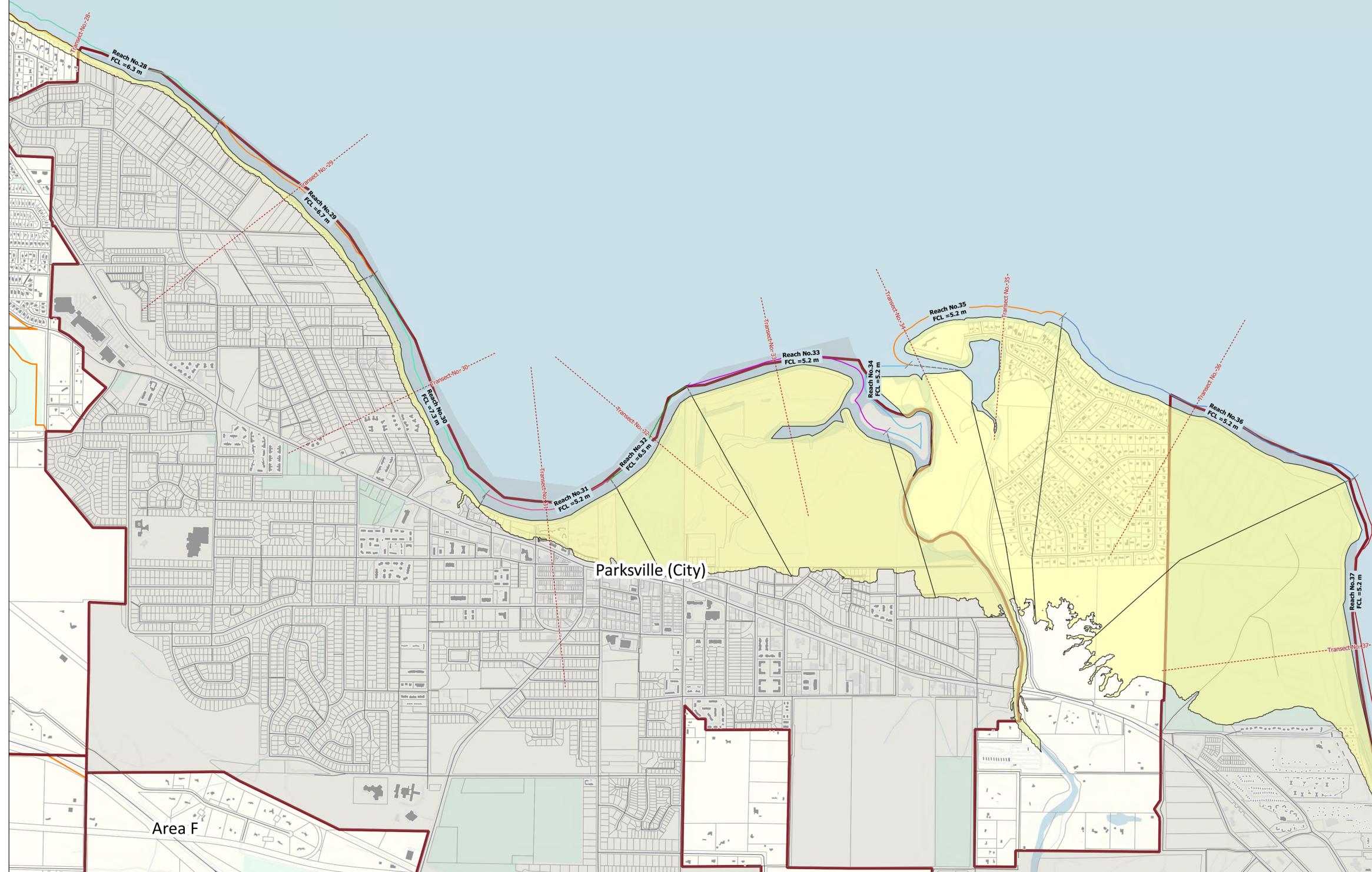




- Legend**
- RDN Electoral Area
 - RDN Village Centres
 - Land Parcels
 - Municipalities
 - First Nation Reserve Lands
 - Building Footprints
 - Open Spaces (Park, Forest, Grasslands)
 - Transects
 - FCL Reaches (metres, CGVD 2013)
 - Reach Labels



Strait of Georgia



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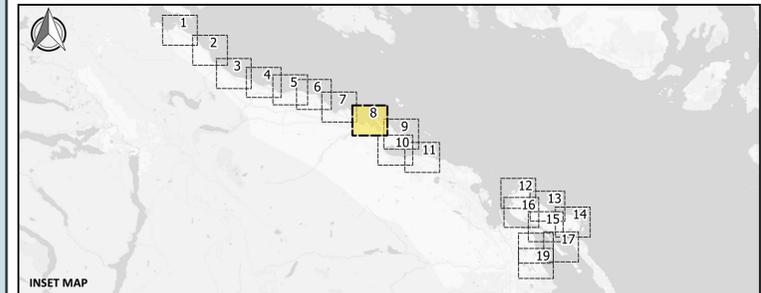
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| Vertical Datum: | CGVD 2013 |
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| Prepared By: | NS |
| Reviewed By: | TL |
| Checked By: | TL |

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| | <p>Scale: 1:10,000</p> | |
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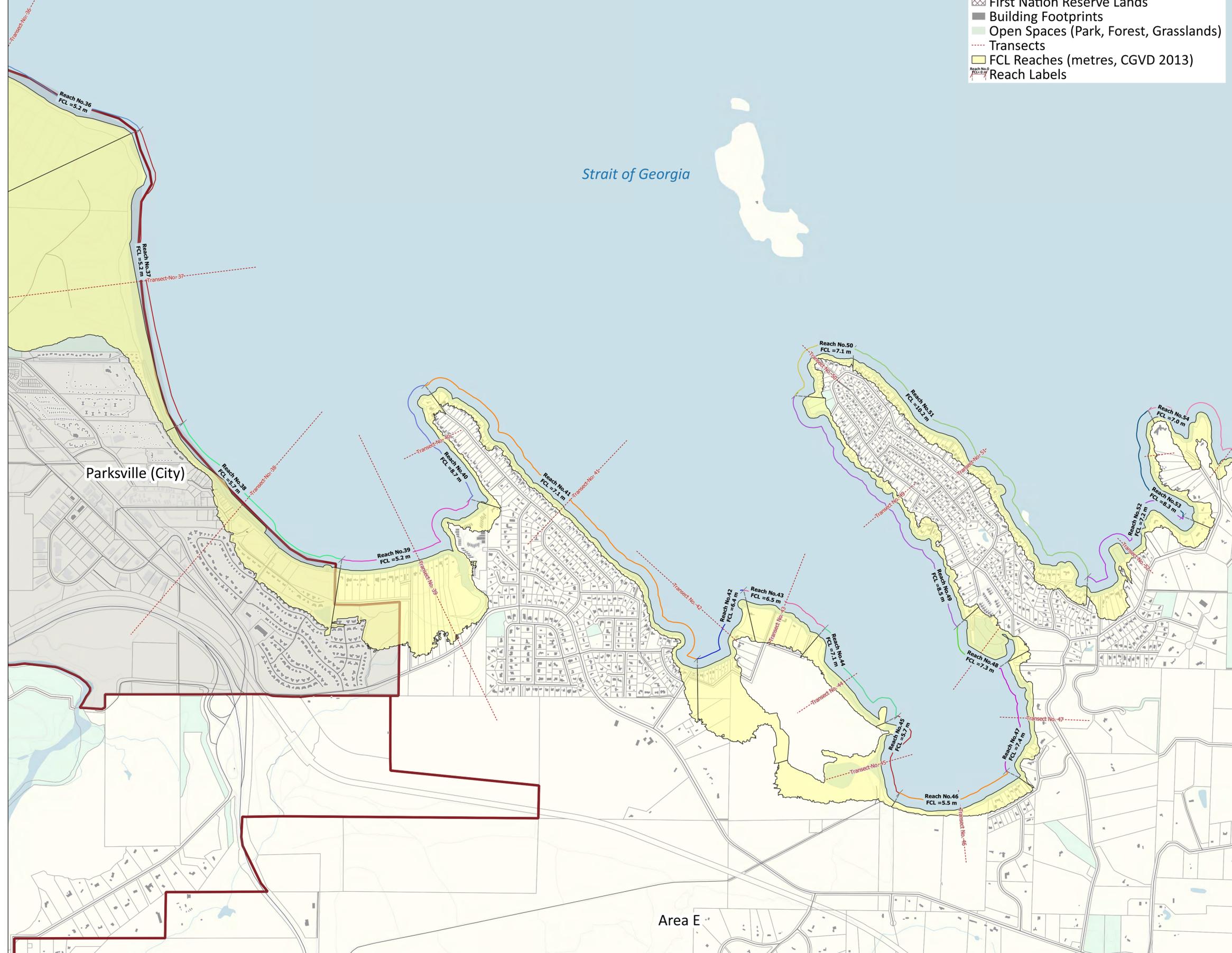
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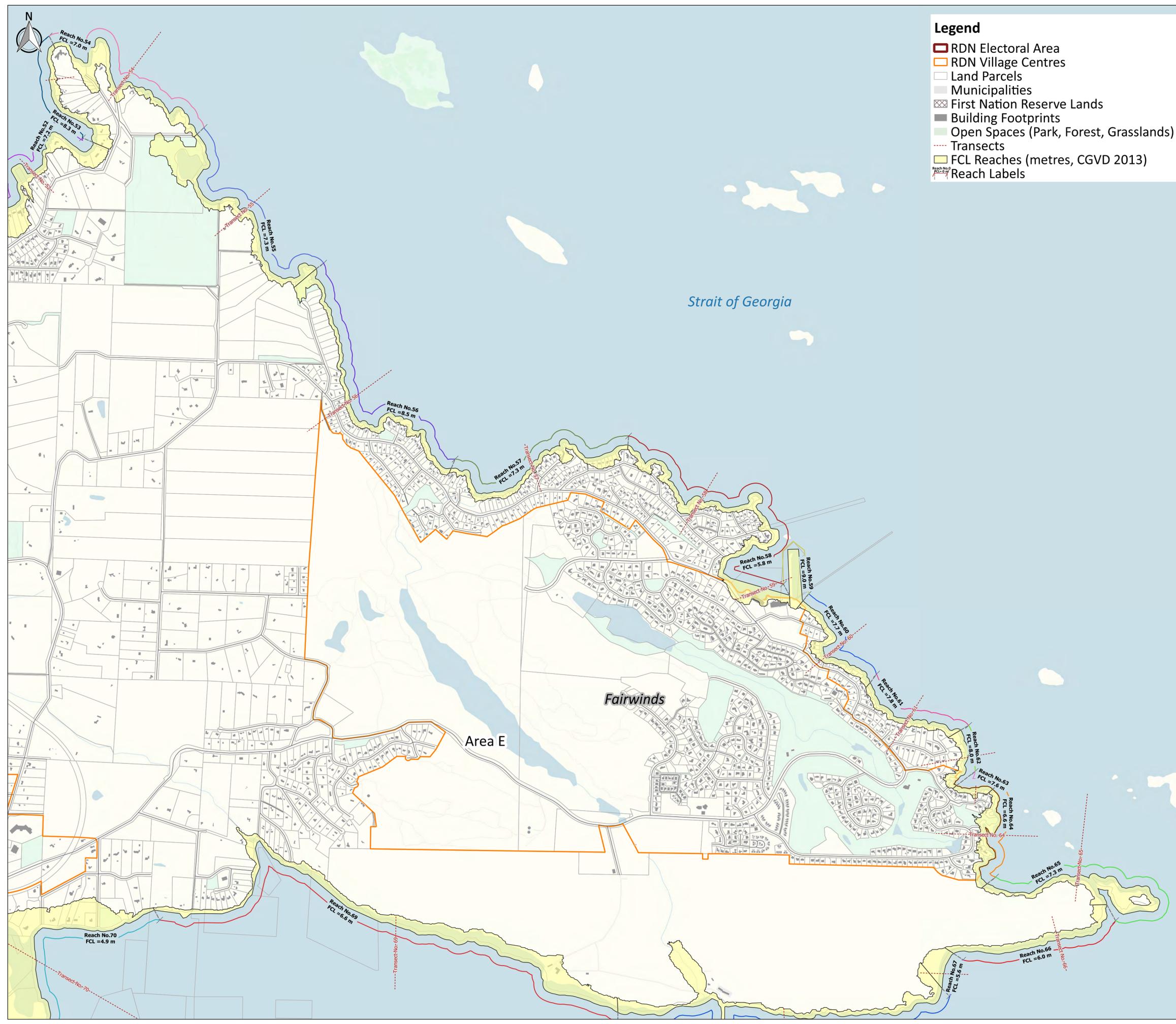
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Strait of Georgia

Parksville (City)

Area E

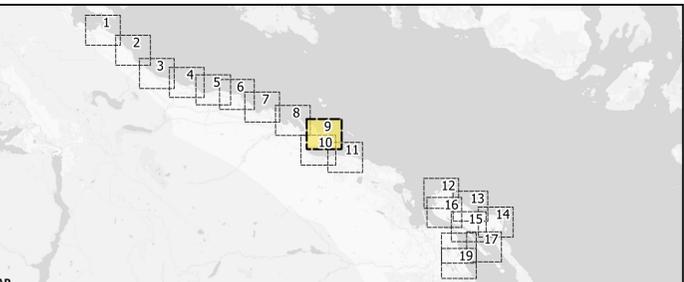


Legend

- RDN Electoral Area
- RDN Village Centres
- Land Parcels
- Municipalities
- First Nation Reserve Lands
- Building Footprints
- Open Spaces (Park, Forest, Grasslands)
- Transects
- FCL Reaches (metres, CGVD 2013)
- Reach No. 67
FCL = 5.6 m



ELECTORAL AREA E (2 OF 3)
REGULATORY COASTAL FLOODPLAIN MAP
0.5% AEP & 1 m RSLR plus 0.6 m freeboard
Map 9 of 19



INSET MAP

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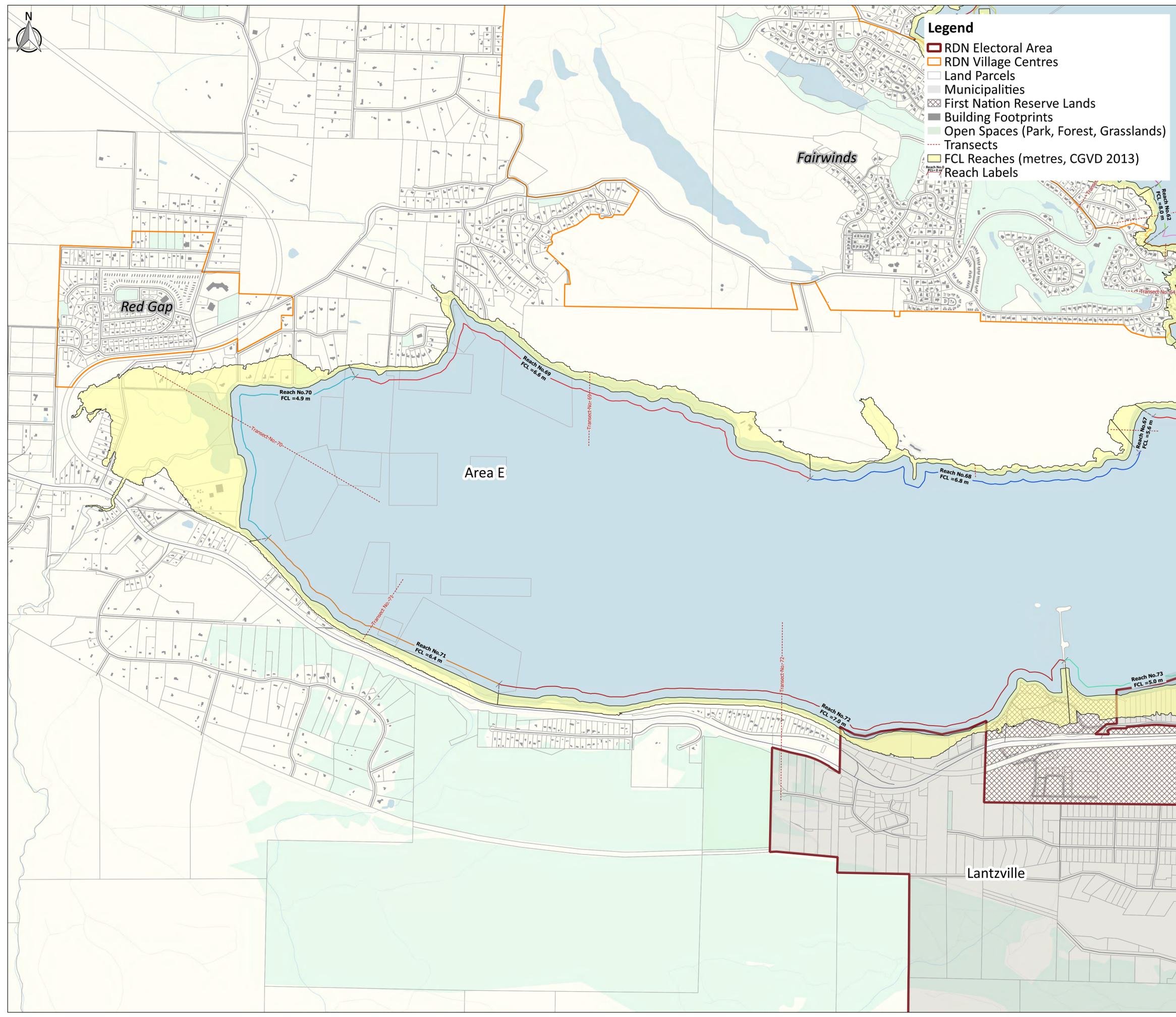
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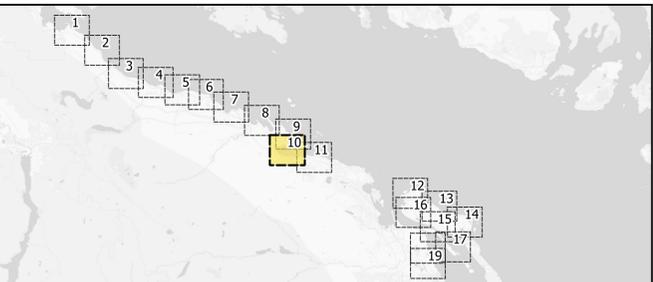
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| Prepared By: | NS |
| Reviewed By: | TL |
| Checked By: | TL |

Scale: 1:10,000



Legend

- █ RDN Electoral Area
- █ RDN Village Centres
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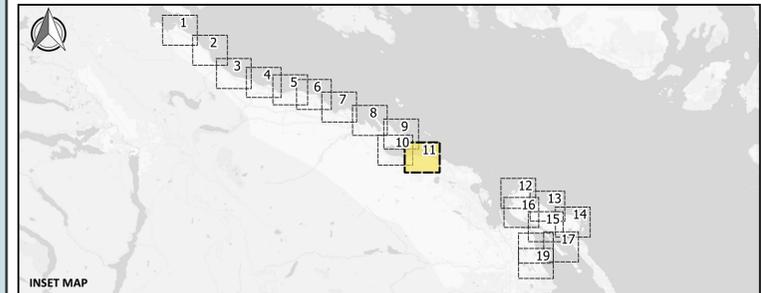
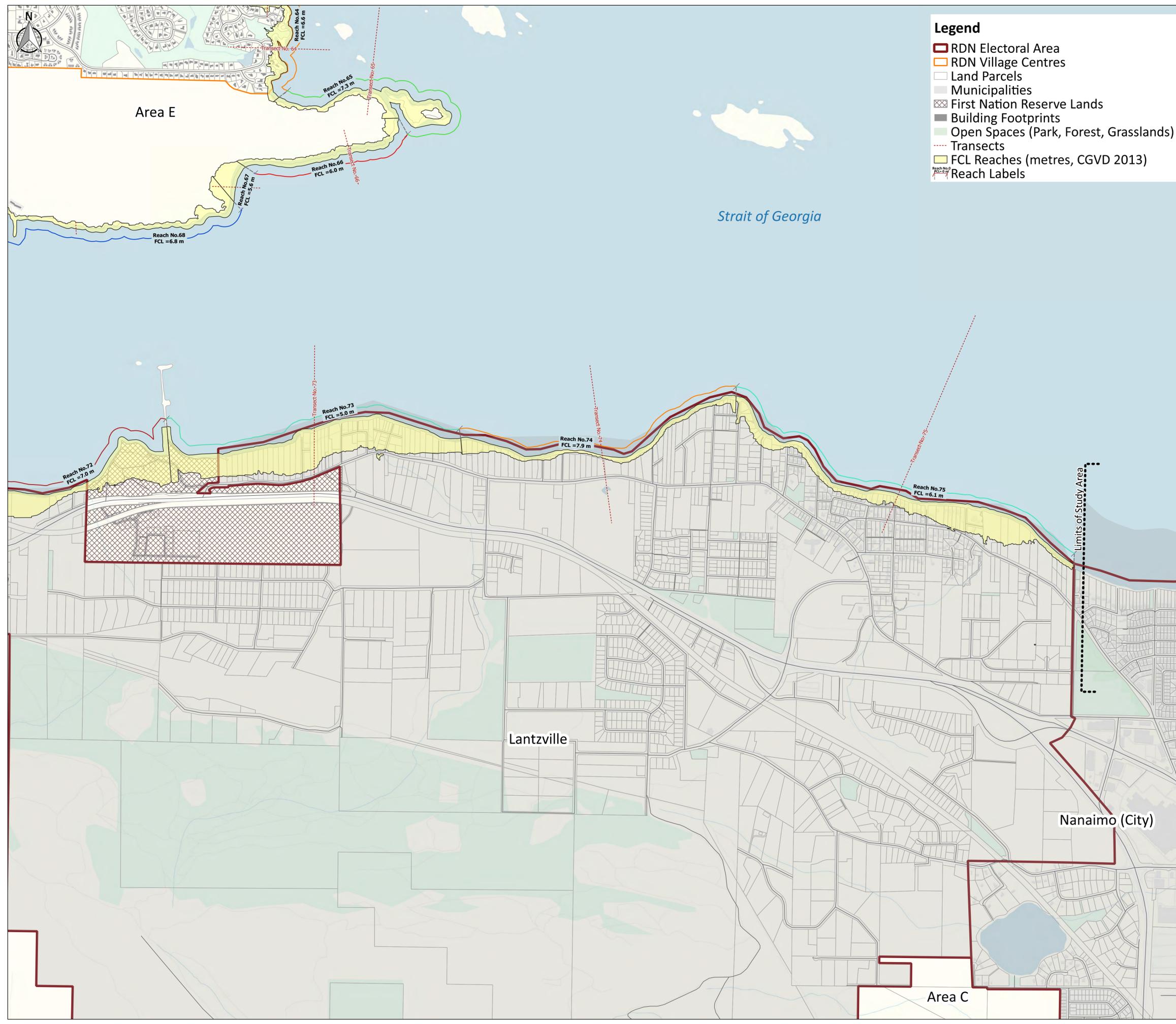
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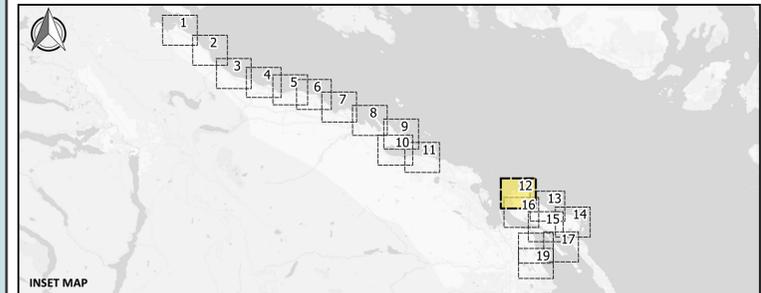

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Strait of Georgia



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6. Base map and parcel layers were provided by different data owners and are subject to differences.

Data Sources:

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4. OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA).

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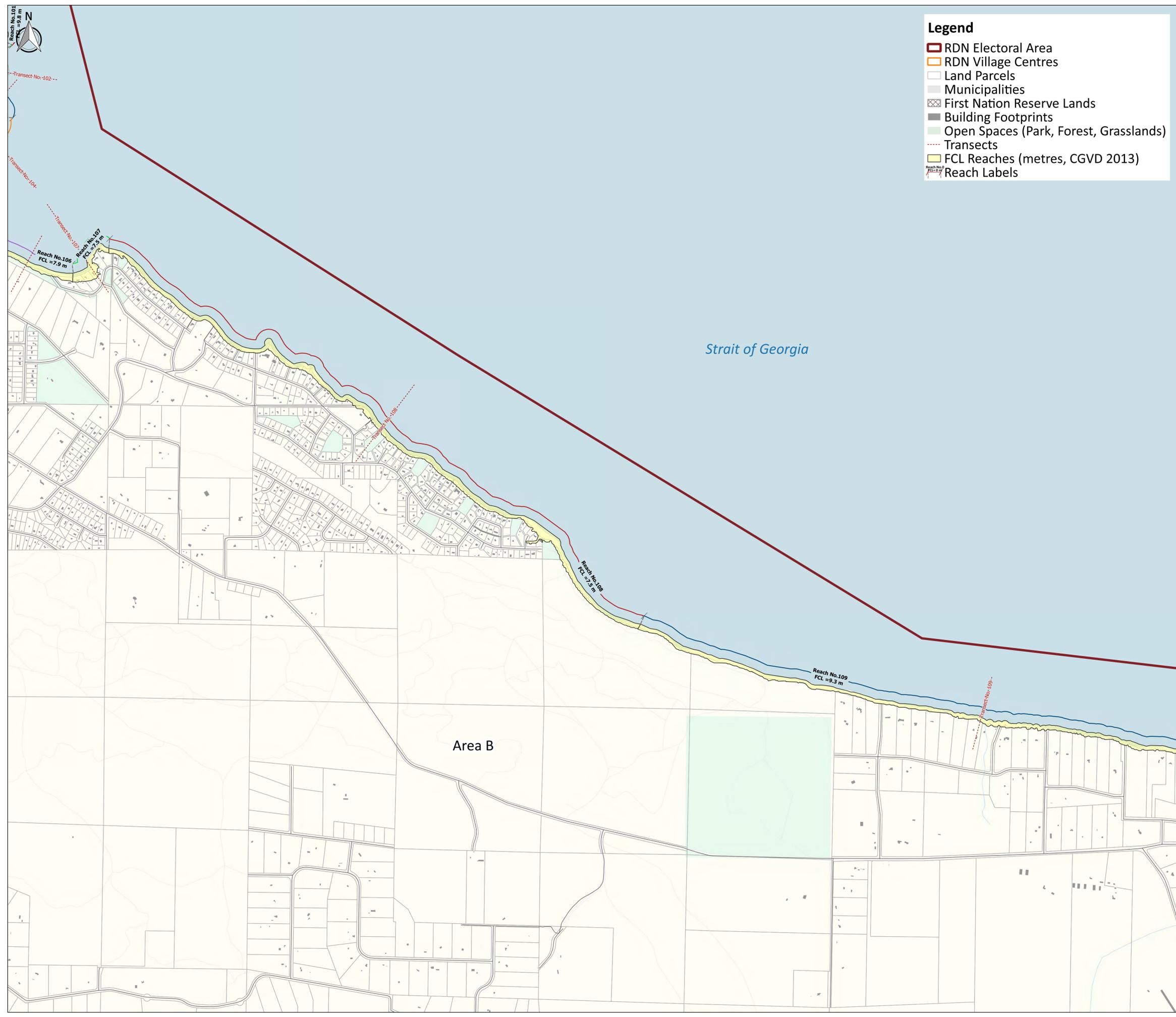
Area B

Gabriola Island

Date Created: 07 Oct 2021
 Coordinate System: NAD83, UTM 10N
 Vertical Datum: CGVD 2013
 Paper Size: ANSI D

Prepared By: NS
 Reviewed By: TL
 Checked By: TL

Scale: 1:10,000



Legend

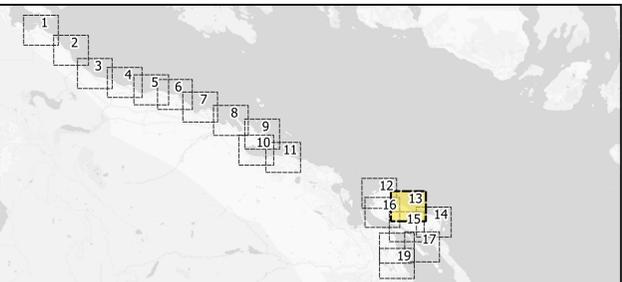
- RDN Electoral Area
- RDN Village Centres
- Land Parcels
- Municipalities
- First Nation Reserve Lands
- Building Footprints
- Open Spaces (Park, Forest, Grasslands)
- Transects
- FCL Reaches (metres, CGVD 2013)
- Reach Labels



ELECTORAL AREA B (2 OF 6)
REGULATORY COASTAL FLOODPLAIN MAP

0.5% AEP & 1 m RSLR plus 0.6 m freeboard

Map 13 of 19



INSET MAP

Notes to User:

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4. A 0.6 m freeboard allowance has been included in water levels in accordance with Ausenco Sandwell (2011).
5. This map was produced following the Coastal Floodplain Mapping Guidelines (KWL, 2011) and Professional Practice Guidelines (APEGBC, 2017). Maps did not include contours after RDN's request.
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7. Application of the FCLs presented in this map should be done in accordance with relevant policy and regulations by a suitably qualified professional.

Limitations:

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Data Sources:

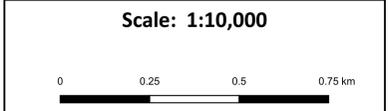
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| Date Created: | 07 Oct 2021 |
| Coordinate System: | NAD83, UTM 10N |
| Vertical Datum: | CGVD 2013 |
| Paper Size: | ANSI D |

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| Prepared By: | NS |
| Reviewed By: | TL |
| Checked By: | TL |





Legend

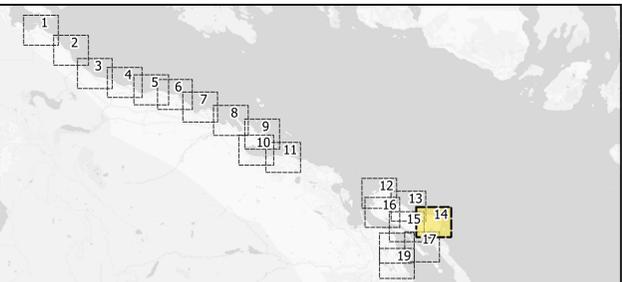
- ▭ RDN Electoral Area
- ▭ RDN Village Centres
- ▭ Land Parcels
- ▭ Municipalities
- ▭ First Nation Reserve Lands
- ▭ Building Footprints
- ▭ Open Spaces (Park, Forest, Grasslands)
- Transects
- ▭ FCL Reaches (metres, CGVD 2013)
- Reach Labels



ELECTORAL AREA B (3 OF 6) REGULATORY COASTAL FLOODPLAIN MAP

0.5% AEP & 1 m RSLR plus 0.6 m freeboard

Map 14 of 19



INSET MAP

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Data Sources:

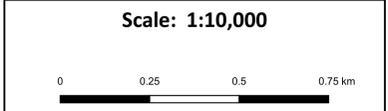
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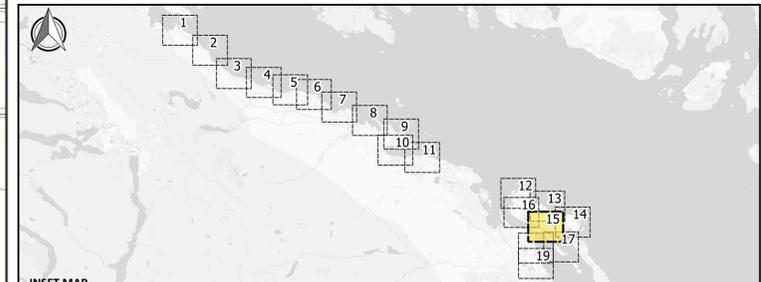
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| Coordinate System: | NAD83, UTM 10N |
| Vertical Datum: | CGVD 2013 |
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| Prepared By: | NS |
| Reviewed By: | TL |
| Checked By: | TL |





- Legend**
- RDN Electoral Area
 - RDN Village Centres
 - Land Parcels
 - Municipalities
 - First Nation Reserve Lands
 - Building Footprints
 - Open Spaces (Park, Forest, Grasslands)
 - Transects
 - FCL Reaches (metres, CGVD 2013)
 - Reach Labels



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Limitations:

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Date Created: 07 Oct 2021
 Coordinate System: NAD83, UTM 10N
 Vertical Datum: CGVD 2013
 Paper Size: ANSI D

Prepared By: NS
 Reviewed By: TL
 Checked By: TL

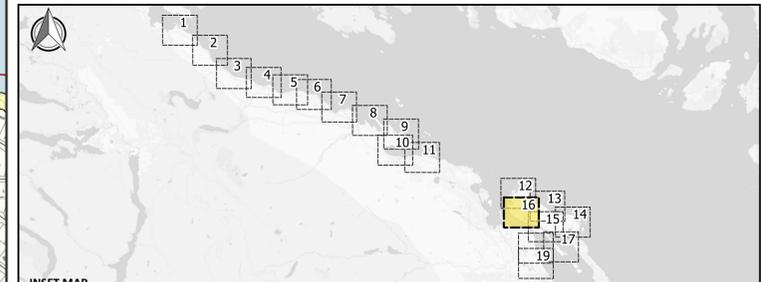
Scale: 1:10,000





ELECTORAL AREA B (5 OF 6)
REGULATORY COASTAL FLOODPLAIN MAP
0.5% AEP & 1 m RSLR plus 0.6 m freeboard
 Map 16 of 19

- Legend**
- RDN Electoral Area
 - RDN Village Centres
 - Land Parcels
 - Municipalities
 - First Nation Reserve Lands
 - Building Footprints
 - Open Spaces (Park, Forest, Grasslands)
 - Transects
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INSET MAP

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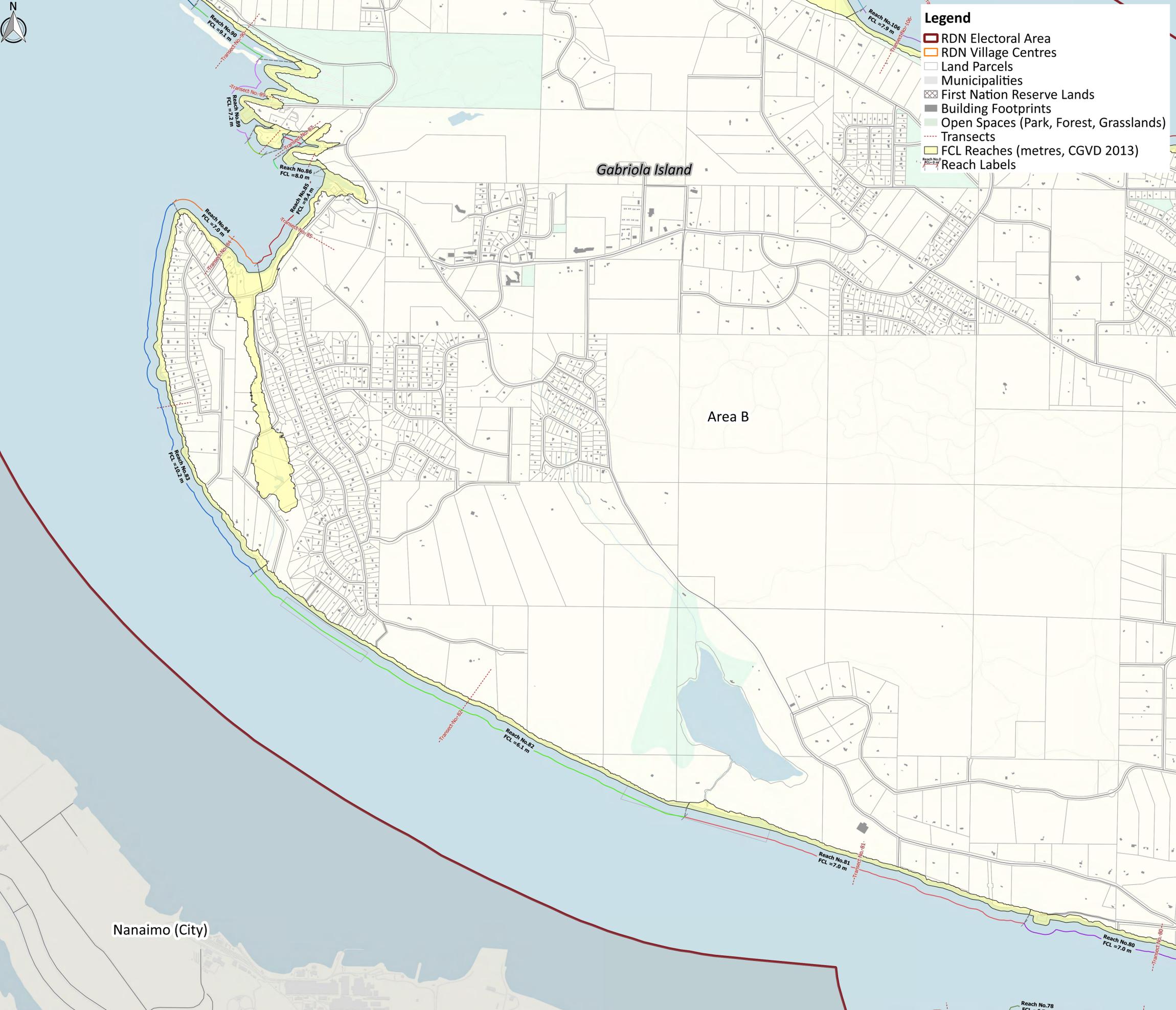
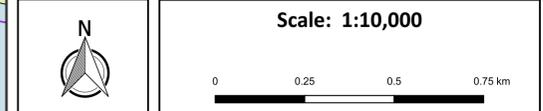
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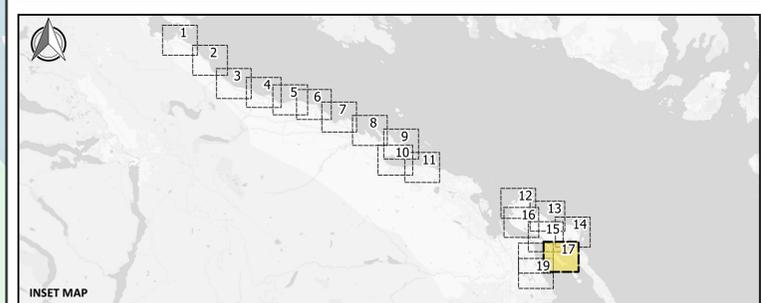
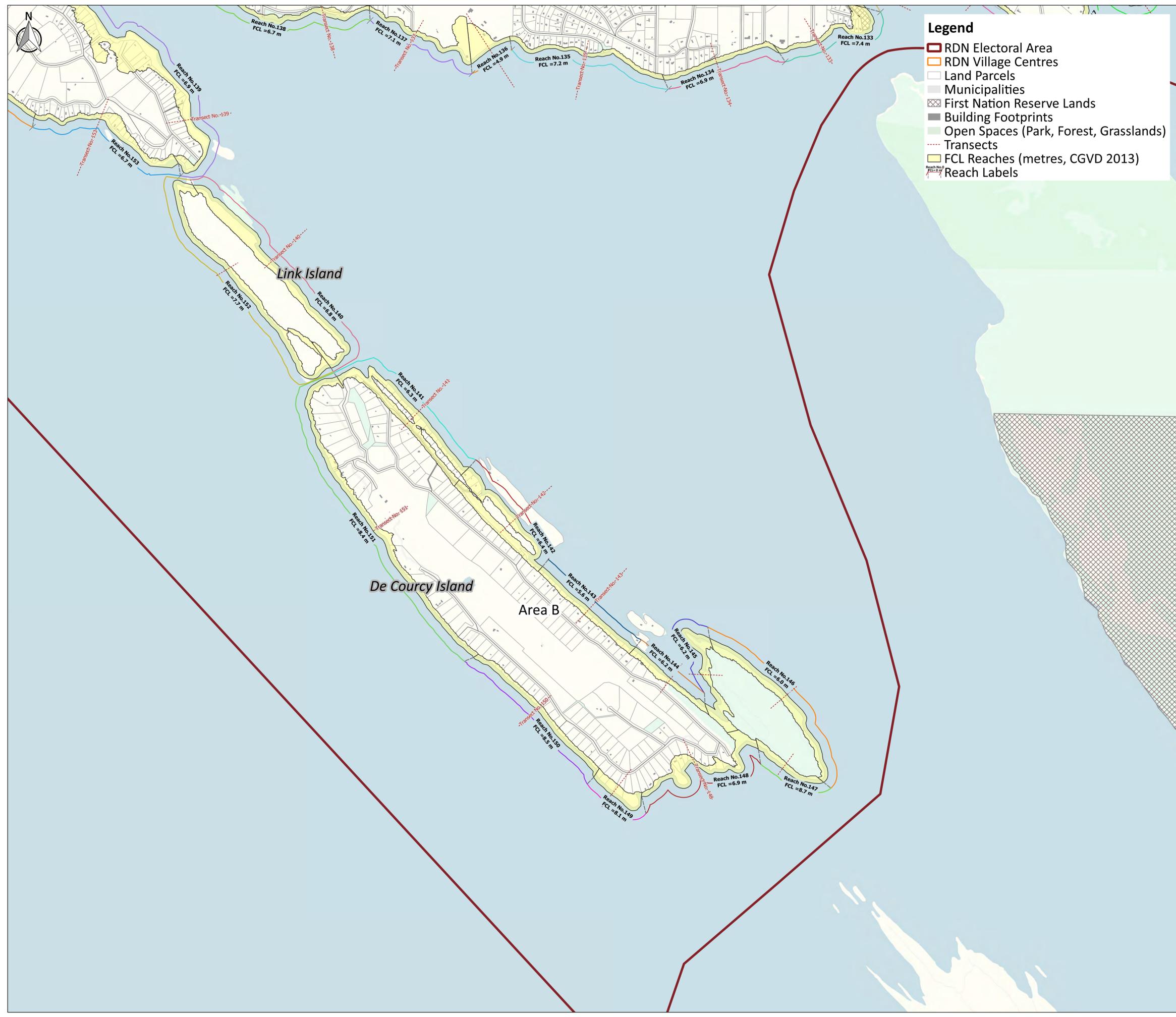
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Limitations:

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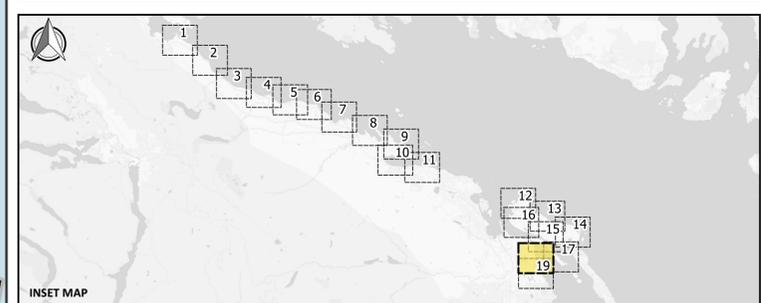
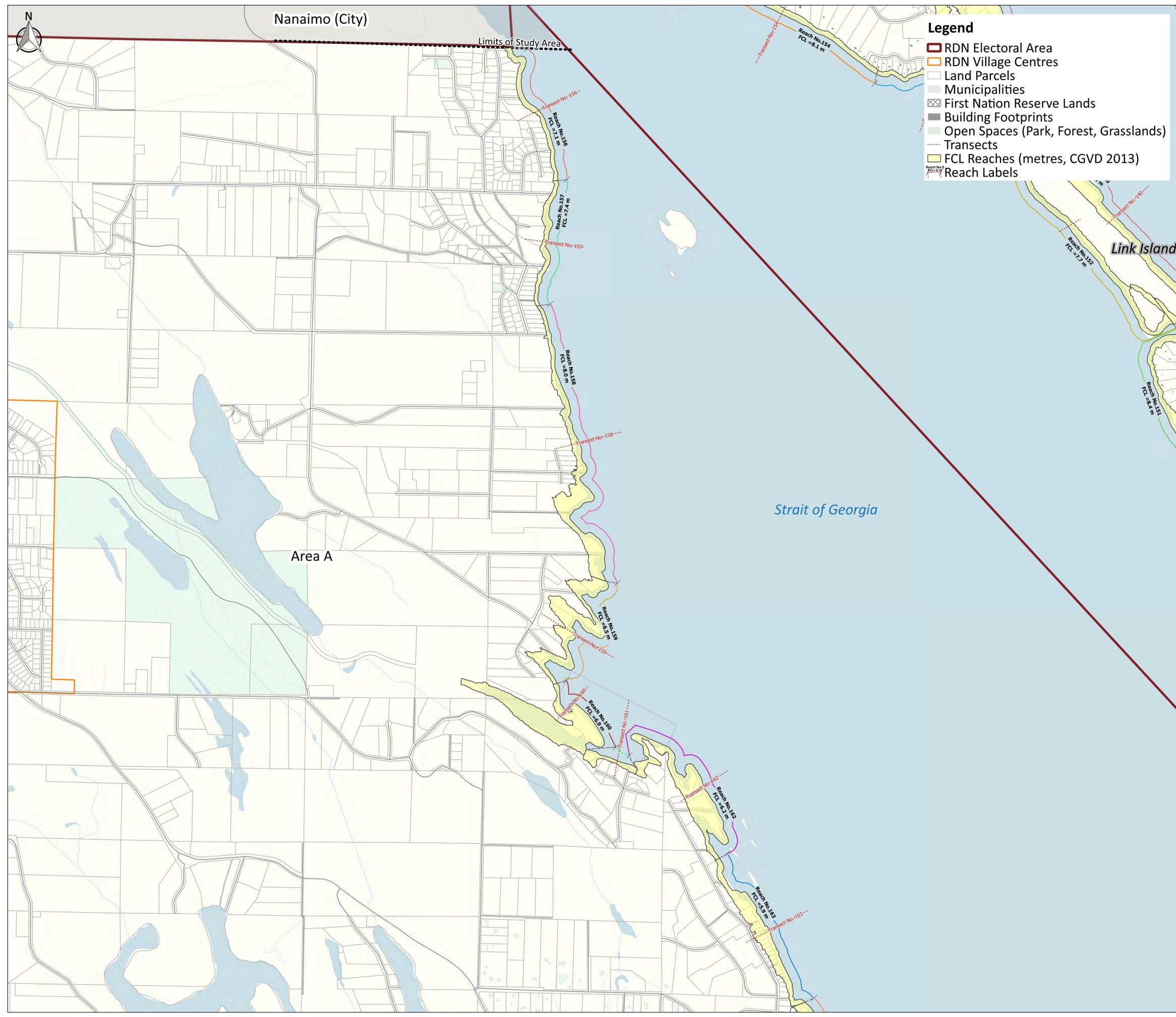
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Prepared By: NS
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Scale: 1:10,000



Legend

- █ RDN Electoral Area
- █ RDN Village Centres
- Land Parcels
- Municipalities
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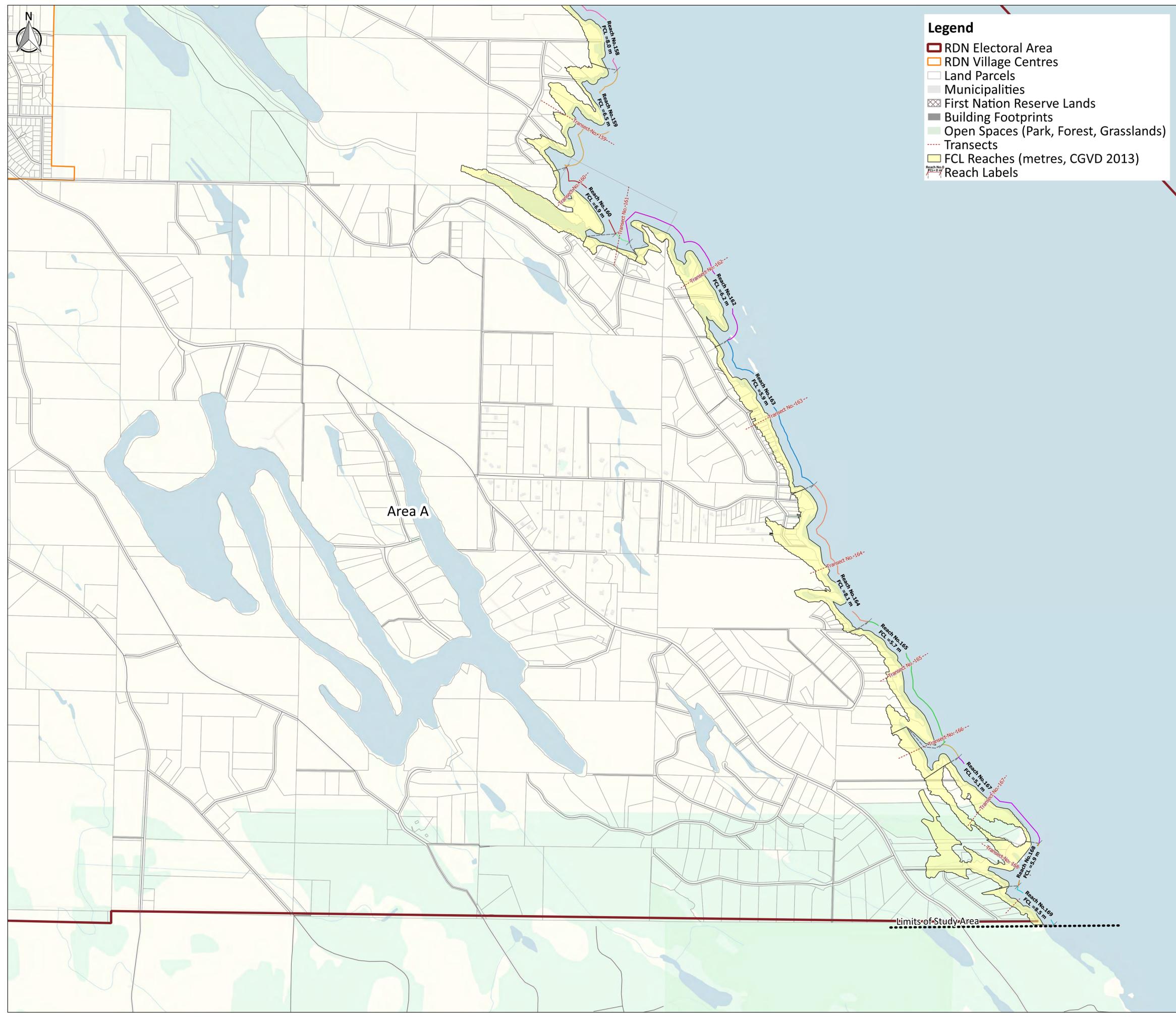
References:

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Date Created: 07 Oct 2021
 Coordinate System: NAD83, UTM 10N
 Vertical Datum: CGVD 2013
 Paper Size: ANSI D

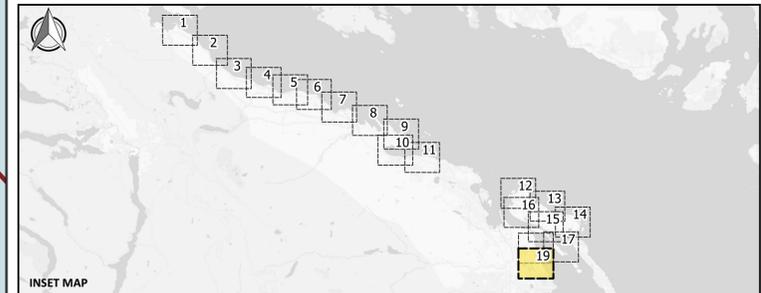
Prepared By: NS
 Reviewed By: TL
 Checked By: TL

Scale: 1:10,000



Legend

- RDN Electoral Area
- RDN Village Centres
- Land Parcels
- Municipalities
- First Nation Reserve Lands
- Building Footprints
- Open Spaces (Park, Forest, Grasslands)
- Transects
- FCL Reaches (metres, CGVD 2013)
- Reach Labels



Notes to User:

1. This map is designed to accompany a Coastal Floodplain Mapping Report (Ebbwater Consulting Inc. and Cascadia Coast Research Ltd., 2021) and is intended for the purposes set out in that report only. See the main report for further details on the methodology, results and limitations. Maps from this series REPLACE previous mapping from Phase I and II Coastal Floodplain Mapping Report (Cascadia Coast Research Ltd, 2019) for the Regional District of Nanaimo (RDN).
2. Flood water levels were developed using a 0.5% Annual Exceedance Probability (AEP) flood and 1.0 m Relative Sea Level Rise (RSLR).
3. The adopted values for sea level rise are based on guidelines from Ausenco Sandwell (2011). These are subject to change and RSLR values may need to be reassessed in future.
4. A 0.6 m freeboard allowance has been included in water levels in accordance with Ausenco Sandwell (2011).
5. This map was produced following the Coastal Floodplain Mapping Guidelines (KWL, 2011) and Professional Practice Guidelines (APEGBC, 2017). Maps did not include contours after RDN's request.
6. The Regional District of Nanaimo (RDN) does not represent that flooding will not occur outside of the indicated FCL Reach and will not exceed the FCLs indicated on the map.
7. Application of the FCLs presented in this map should be done in accordance with relevant policy and regulations by a suitably qualified professional.

Limitations:

1. The accuracy of the presented FCLs is limited by available data and modelling approaches. The FCLs are based on 10 cross-shore transects. Please refer to report (Ebbwater Consulting Inc and Cascadia Coast Research Ltd., 2021) for a detailed discussion of limitations.
2. The accuracy of the floodplain extent is limited by the accuracy of the base mapping data and surveys. The floodplain limits were not established on the ground by legal survey.
3. This map was produced by Ebbwater Consulting Inc. using generally accepted best practice and guidelines for the Province of British Columbia. However, flooding may still occur outside the defined floodplain boundary, and Ebbwater Consulting Inc. and Cascadia Coast Research Ltd. do not assume any liability by reason of the failure to delineate flood areas on this map.
4. The outlines and levels shown on this map are to provide an assessment of current and future flood levels to help inform decisions on future land use policy. Under the provisions of the Local Government Act 2004, these levels only take effect when adopted by bylaw or implemented via another planning tool (such as a development permit area). The required setback from the FCL Reach area is defined in RDN Floodplain Management Bylaw No.1469, 2006.
5. The presented FCLs are limited to estimates of the effects of a coastal storm flood hazard and they do not include effects of riverine flooding. FCLs in estuarine areas should be based both on the coastal conditions and river levels.
6. Base map and parcel layers were provided by different data owners and are subject to differences.

Data Sources:

1. Flood Construction Reference Plane (FCRP) values provided by Cascadia Coast Research Ltd.
2. First Nation Reserve Lands (also known as Indian Reserve Lands) layer was downloaded from DataBC, Province of British Columbia. The other civic boundary layers were provided by the Regional District of Nanaimo.
3. LiDAR data surveyed in 2016 was used to create the contours. Contours are 1.0 m CGVD and greater.
4. OSM Humanitarian Data Model and CARTO's Positron, created using derivatives of OpenStreetMap data - openstreetmap.org (© OpenStreetMap contributors; cartography license CC BY-SA).

References:

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