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Moving Targets

Infrastructure Asset Management and Climate Change

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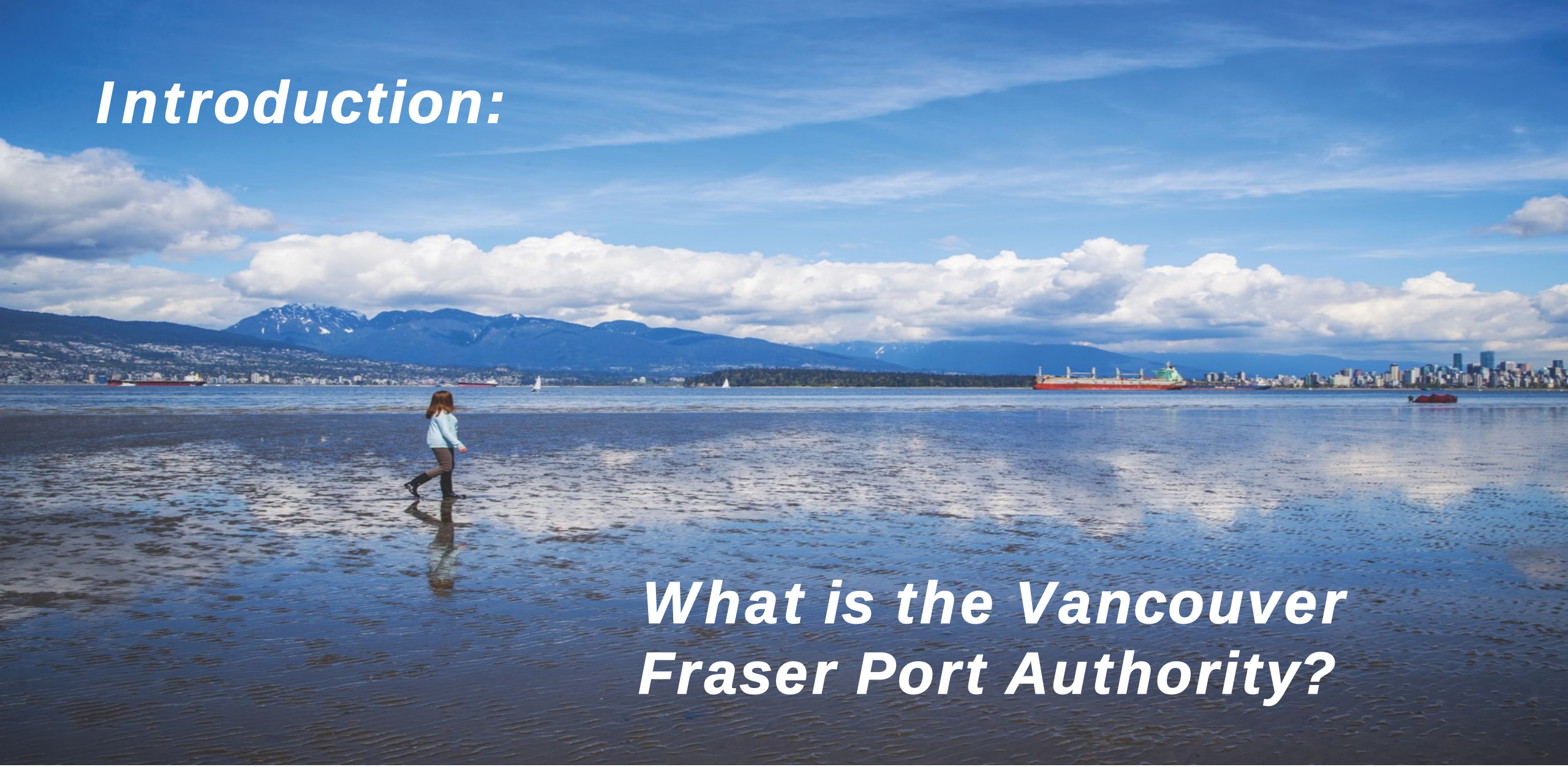
Introduction:



What is the Vancouver Fraser Port Authority?

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Who we are

- Canada’s largest port.
- Home to 27 major terminals.
- Diversified: Containers, dry and liquid bulk, breakbulk, autos, cruise ship terminals.
- Enables trade of approximately $200 billion in goods.
- Manages shipping activity on local waters along 350 km of shoreline, and over 1000 hectares of federal land.

Who we are

- Financially self-sufficient corporation, governed by Board of Directors representing government and industry across Canada.
- Authority derives from the Canada Marine Act.
- Accountable to the Federal Minister of Transport.
- Our mandate is to facilitate Canada’s trade objectives, ensuring goods are moved safely, while protecting the environment and considering local communities.

What we do

- Safety and security
- Permitting of projects on port lands
- Environmental reviews of projects
- Planning - land use and economic forecasting
- Real estate management – tenant leases, purchase & sale of lands
- Transportation operations – ensure efficient movement of goods by rail and road
- Customer services and international trade development
- Infrastructure development and maintenance

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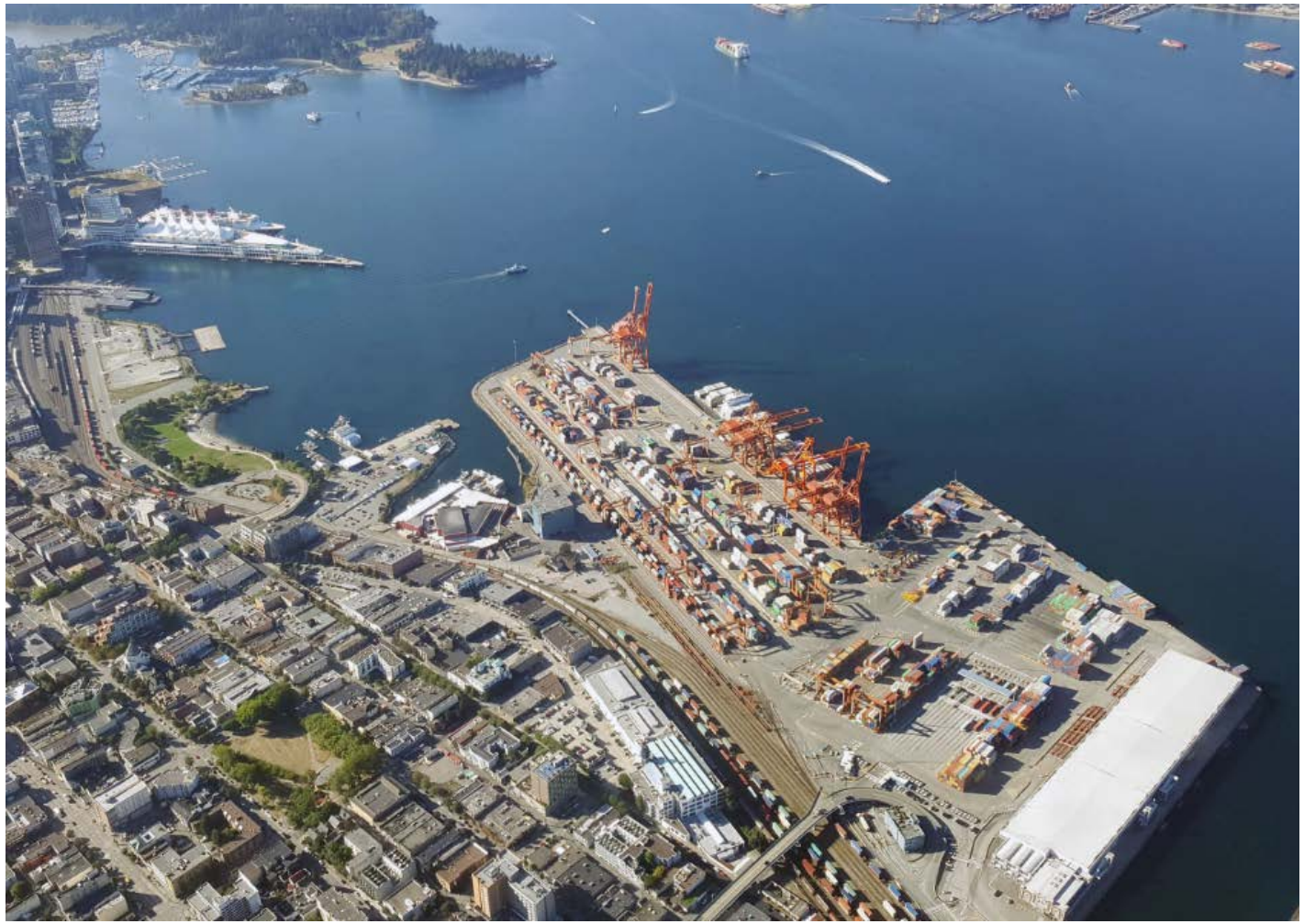
Infrastructure – What we own and manage

Over 800 Infrastructure Assets, including:

- 13 km of dock faces
- 30 km of slope protection (rip-rap)
- 100+ buildings, 200,000 m² footprint area.
- 9 overpasses.
- 25 centreline km of roadways.
- 2.8 million m² of paved surface (parking, storage areas).
- 270 km of underground pipe utilities. (water, storm, sanitary)



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Infrastructure – What we own and manage

But generally, just from the pavement down – above ground structures are typically built, owned and operated by tenants.

Good Asset Management Practices

- What is it?
- Where is it?
- What condition is it in?
- When should it be repaired or replaced?
- By what method and cost?

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Geographic Information System (GIS)

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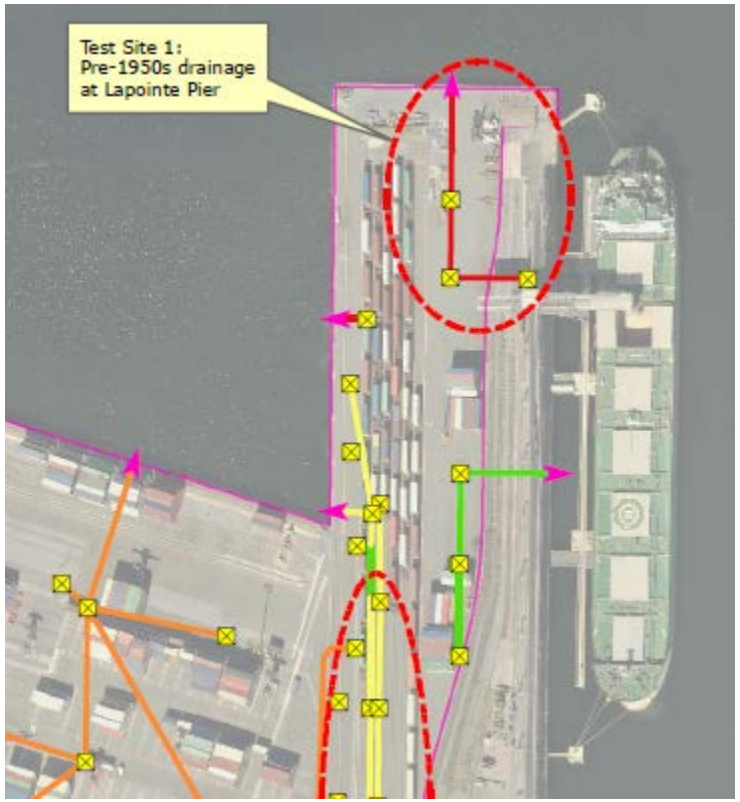

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Good Asset Management Practices

Life Cycle Cost Analysis (LCCA)

- What is it?
- Where is it?
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Geographic Information System (GIS)

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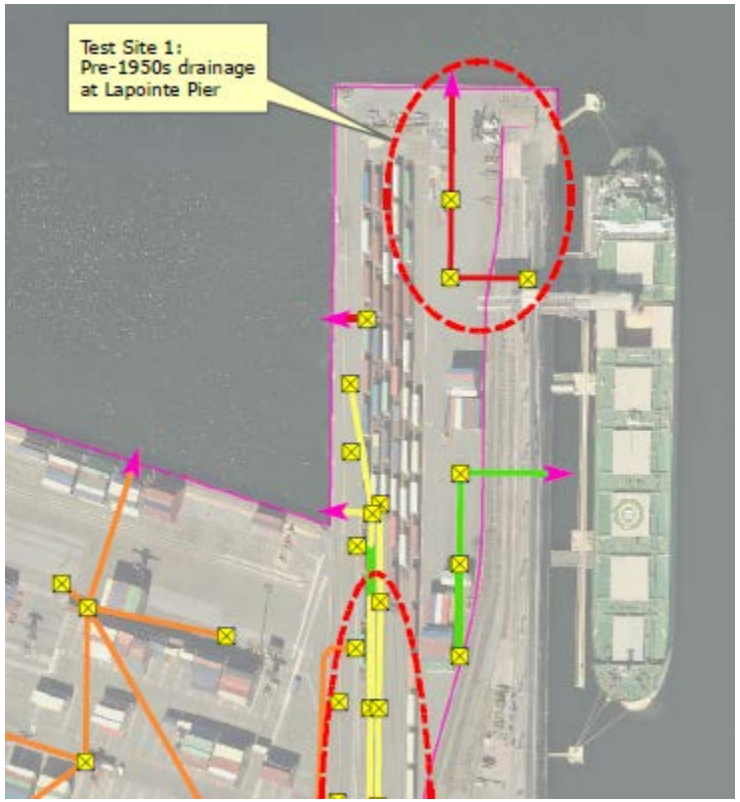

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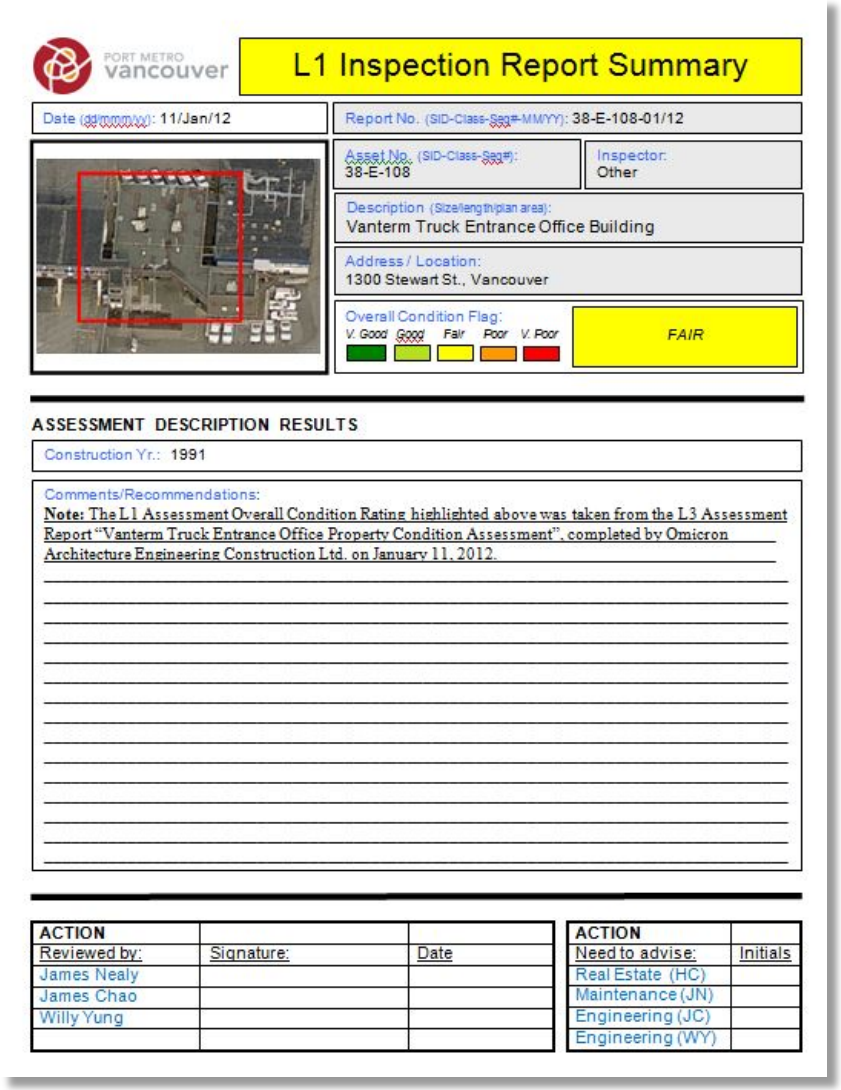
Condition Assessments – Level 1

- Level 1 (L1) - basic assessments performed by maintenance staff.
- Simple rating system – Very Good to Very Poor.
- Poor condition, or downward trend, can trigger a more detailed assessment by a professional consultant (L2, L3 inspection)



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L1 Inspection Report Summary

Date (dd/mmm/yy): 11/Jan/12

Report No. (SID-Class-Seq#-MM/YY): 38-E-108-01/12

Asset No. (SID-Class-Seq#): 38-E-108

Inspector: Other

Description (Size/length/plan area): Vanterm Truck Entrance Office Building

Address / Location: 1300 Stewart St., Vancouver

Overall Condition Flag: V. Good | Good | Fair | Poor | V. Poor — FAIR

ASSESSMENT DESCRIPTION RESULTS

Construction Yr.: 1991

Comments/Recommendations:

Note: The L1 Assessment Overall Condition Rating highlighted above was taken from the L3 Assessment Report "Vanterm Truck Entrance Office Property Condition Assessment", completed by Omicron Architecture Engineering Construction Ltd. on January 11, 2012.

ACTION		
Reviewed by:	Signature:	Date
James Nealy		
James Chao		
Willy Yung		

ACTION	
Need to advise:	Initials
Real Estate (HC)	
Maintenance (JN)	
Engineering (JC)	
Engineering (WY)	

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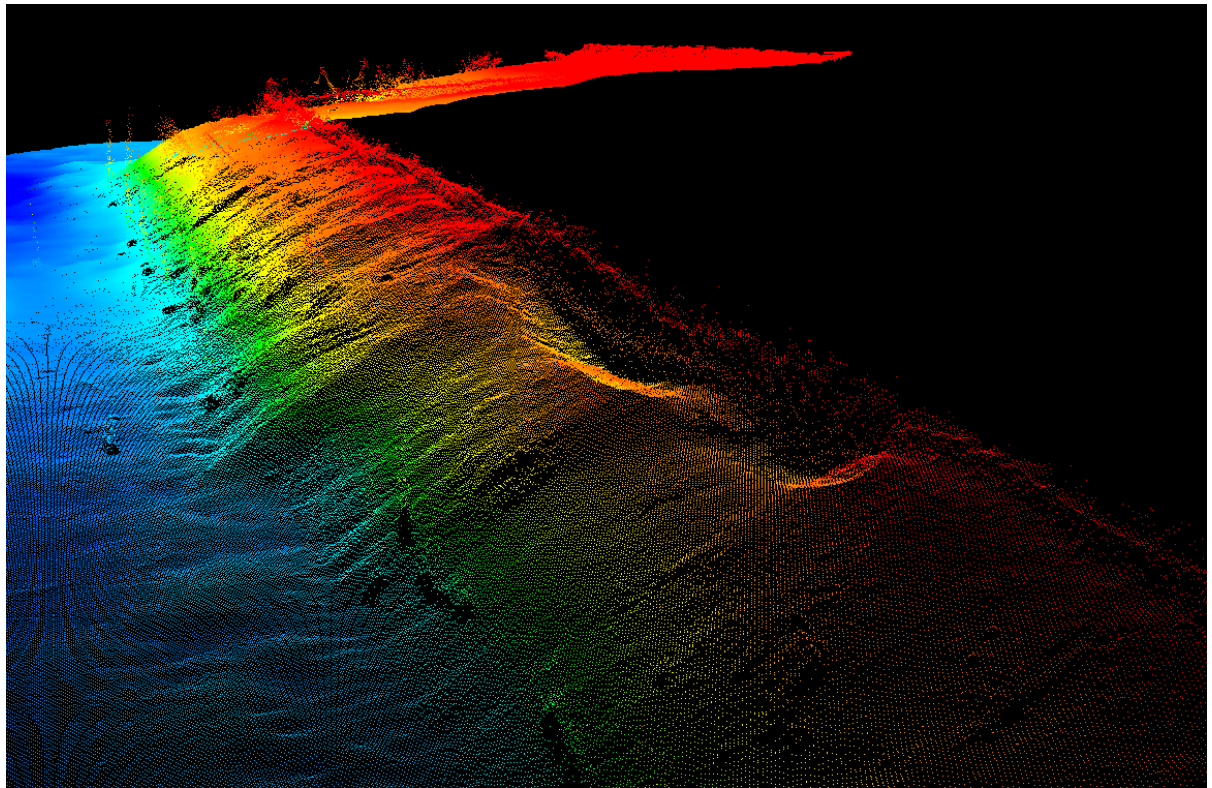
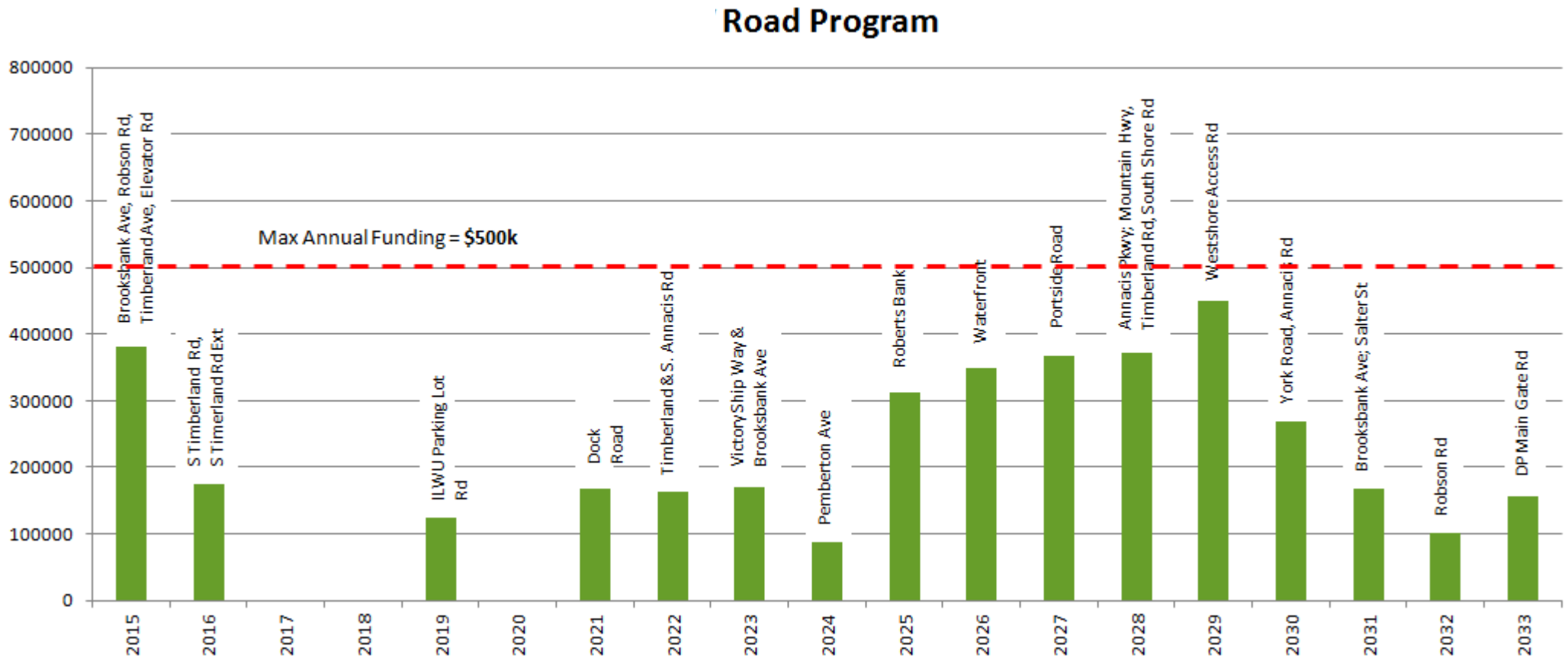
Condition Assessments – Level 2, 3

- Roadway surveys
- Bridge surveys
- Dock Structure surveys
- Pipe inspections



- Ultrasonic Thickness (UT) measurements
- Diving surveys
- Bathymetric data surveys
- Core sample lab testing

Asset Management Plans



Road Paving Forecast – Uses known costs and estimated quantities

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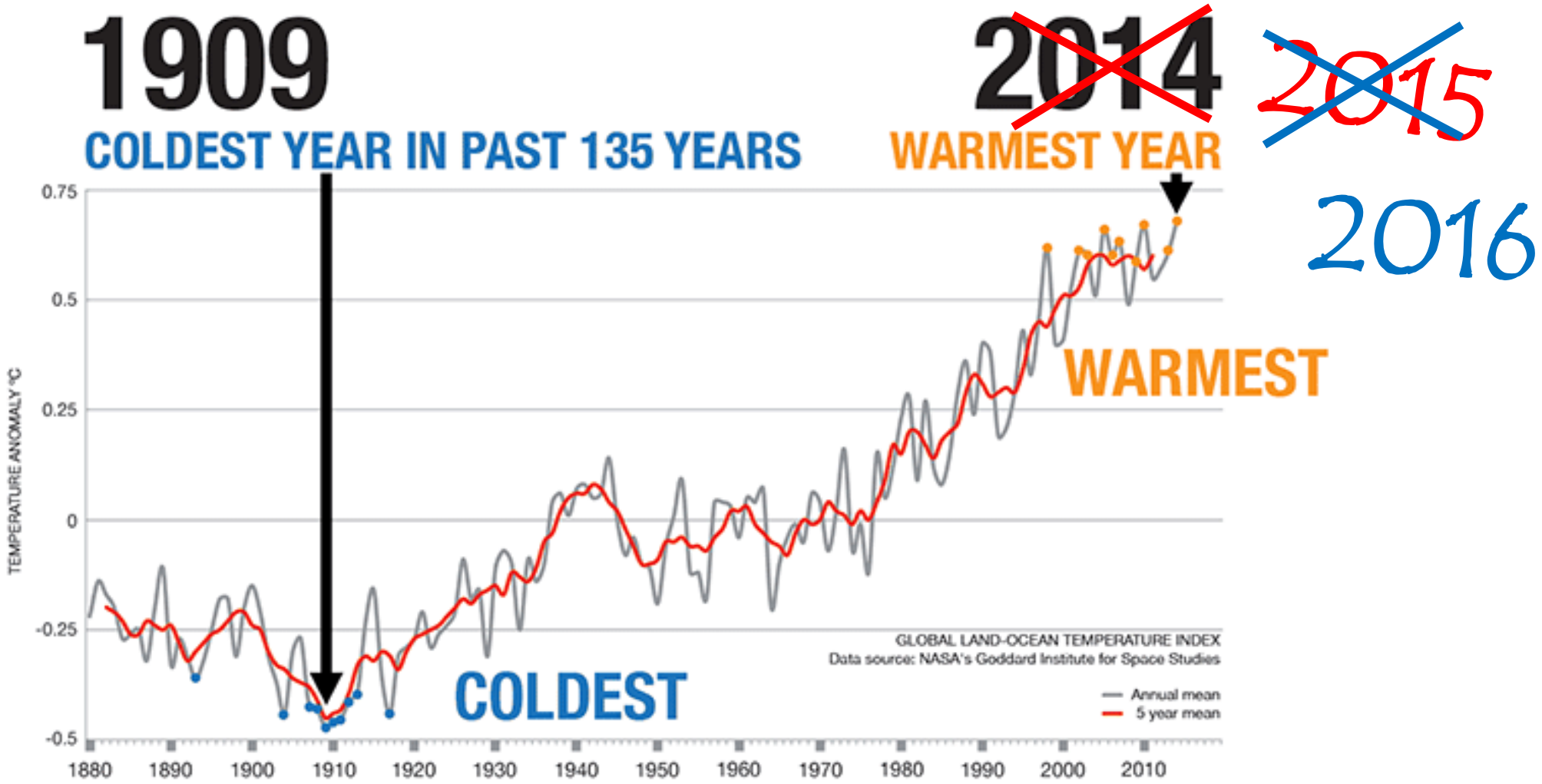
Enter CLIMATE CHANGE...



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Source: NASA

What does Climate Change mean for Ports?

Hints of things to come?

King Tides

Record water levels

Heavy Rainfall Events

Overloaded storm sewers

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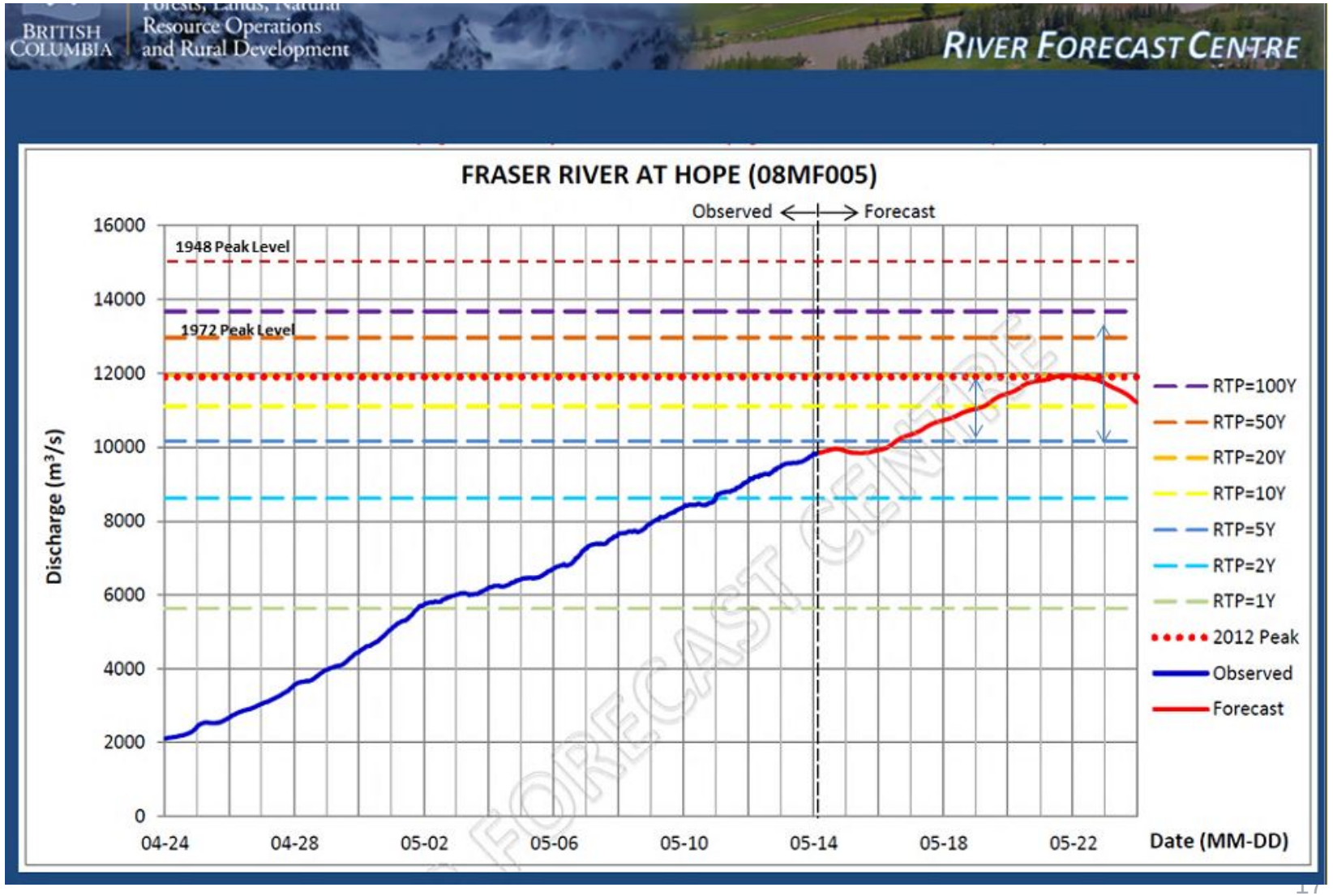
Hints of things to come?

Rapid snow-melt caused higher than normal freshet flow on the Fraser River (May 2018)

Will 1 in 100 year floods become 1 in 20 year occurrences?



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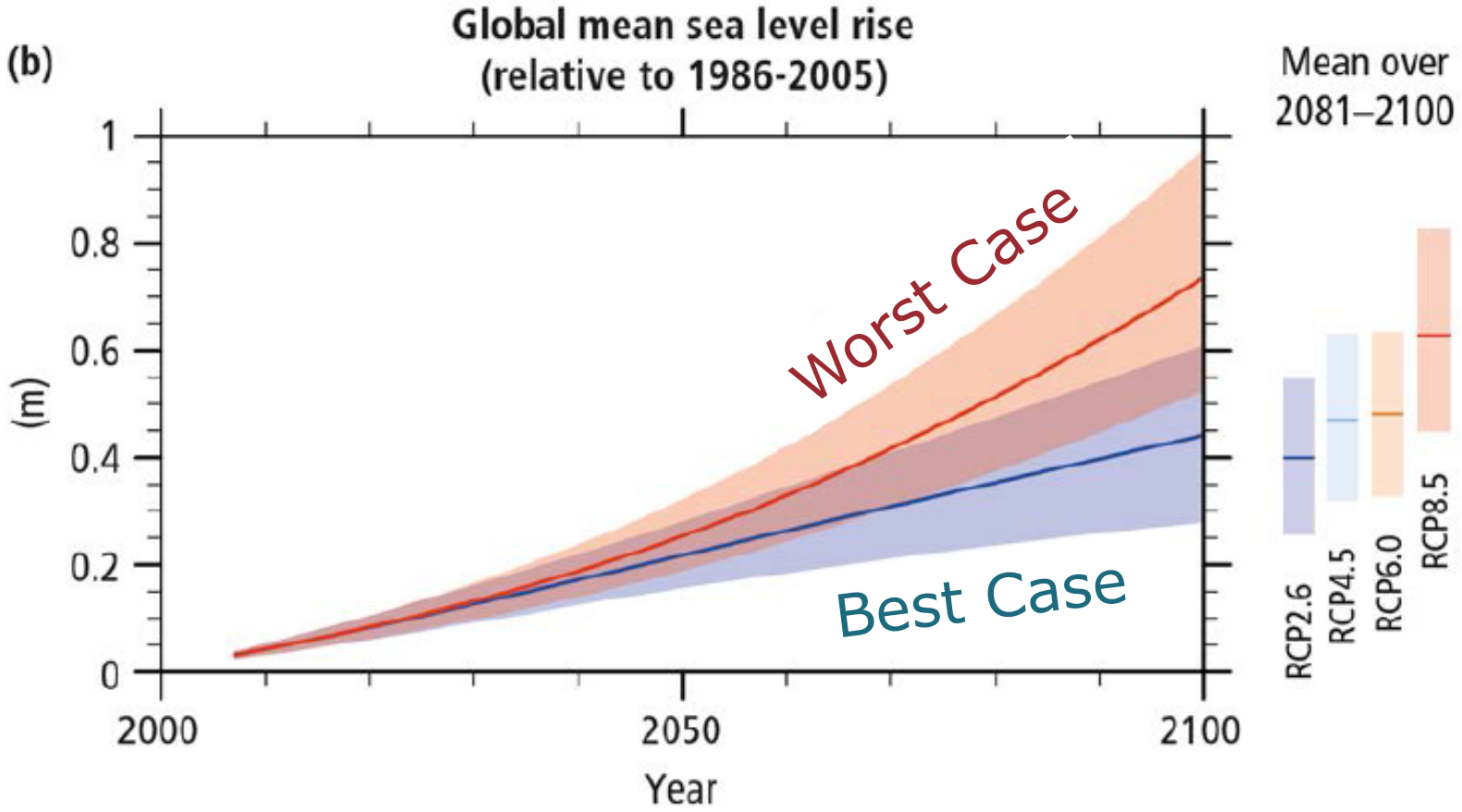
How soon?



Province of BC adopted prediction of 1.0 m SLR by year 2100

Intergovernmental Panel on Climate Change (IPCC) Scenarios (2013)

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The Problem with Ports

- Built on low-lying land, near water bodies.
- Dock structures and working areas built “just high enough” by standards of the day.
- Impractical to build dikes around terminals.
- Impractical to raise / rebuild very large dock structures at working terminals.

Possible Consequences

Terminal operations and cargo:

- Temporary shut-downs and staff evacuations.
- Lost revenues and wages during shut-downs.
- Possible contaminant release (fuels, chemical products, sanitary overflow, etc.)
- Damage to stored goods (containers, bulk products, etc.)

Infrastructure:

- Damage to buildings
- Damage to electrical transformers, motors, controllers, etc.
- Wave-effect damage to unprotected shorelines.

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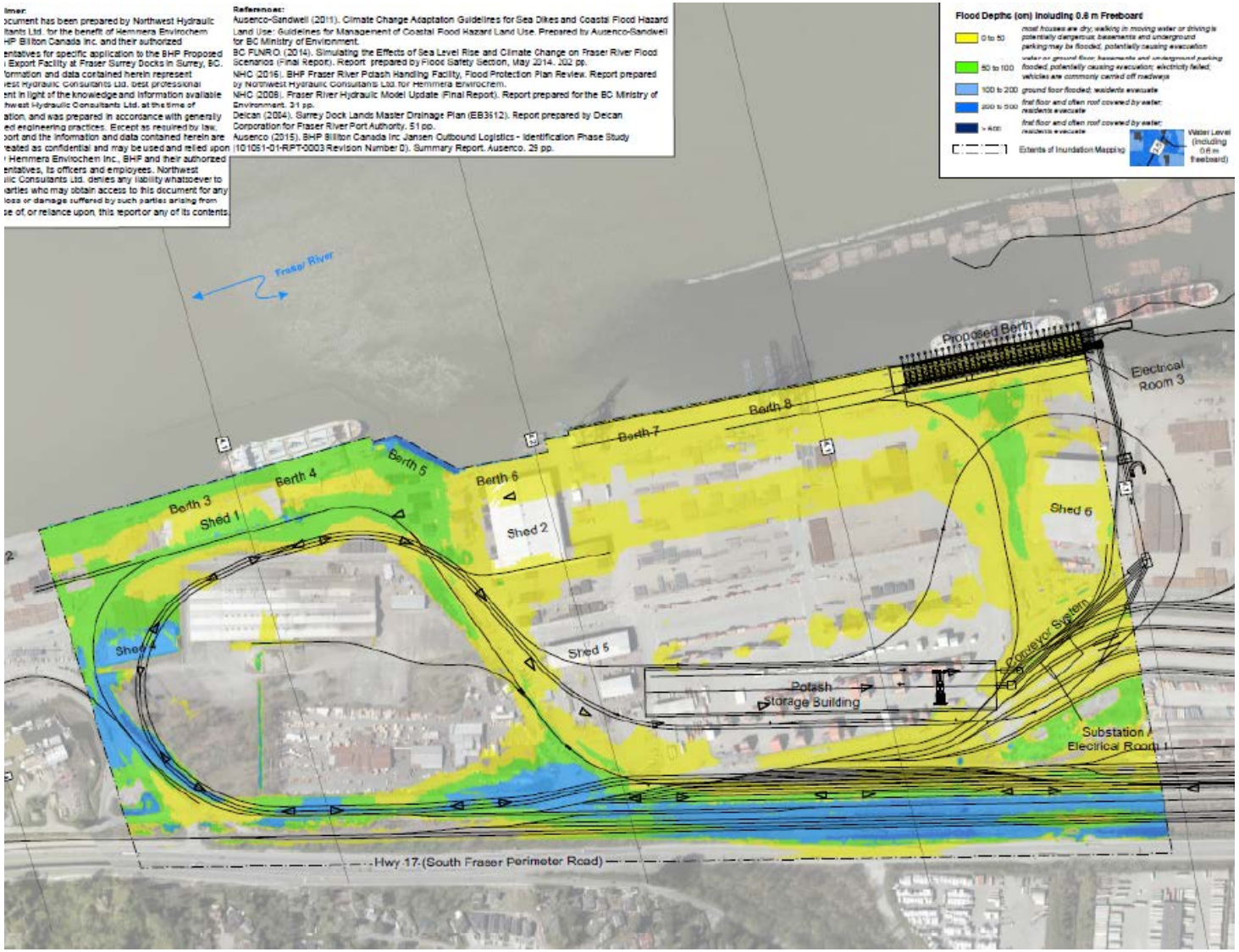
Understanding Risk

Flood Hazard Assessments now requested for any development applications

- Overlay proposed developments over elevation data (LiDAR)
- Develop flood scenarios applicable to end of project/infrastructure lifespan
- Findings inform both proponent and Port of any risks.
- Proponent must propose mitigation measures.



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Options

- Protect:
  - Dikes or flood walls (OK for warehousing uses, but not too practical at working terminals)
  - Use fill to raise elevations of entire site (aka “Super-dike”)
- Adapt:
  - Avoid use of below-grade chambers for electrical systems
  - Put electrical transformers & equipment on elevated pedestals
  - Office buildings on stilts
  - Flood-proofed storage buildings

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Adaptation Options

Flood doors and barriers

Tolerant of occasional minor flooding.

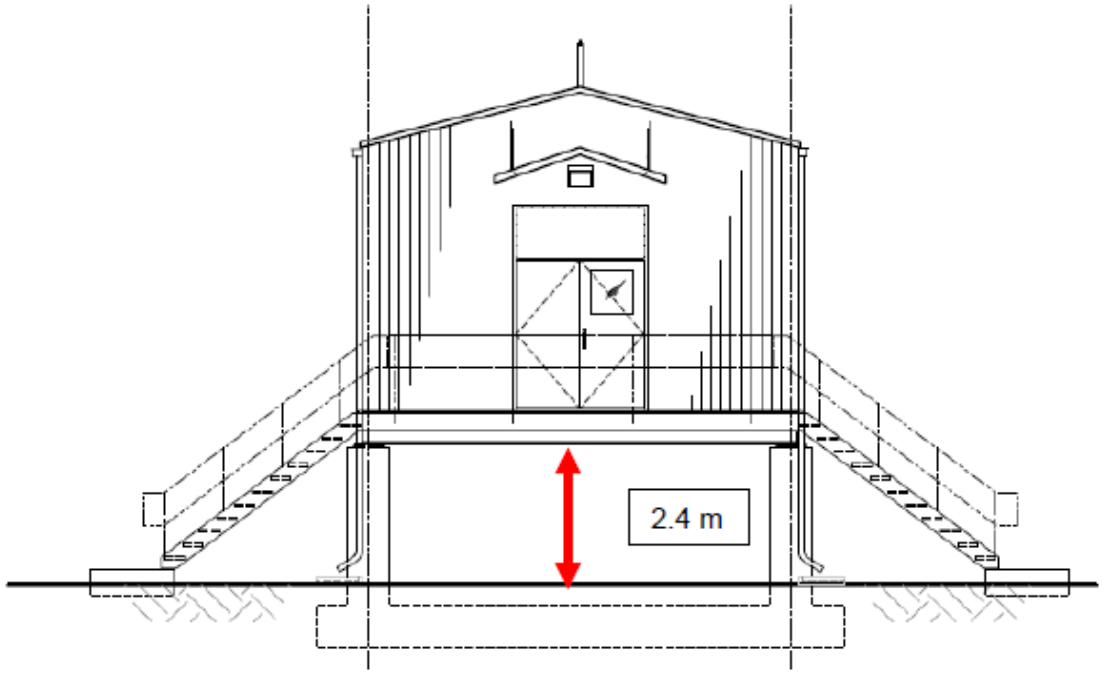

Figure 5 – Electrical Room Elevation

Elevated structures

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Adaptation Options – New Seaspan Office, North Vancouver

Concept illustration

Tolerant of occasional minor flooding at parking lot level.

Under construction
(opened April 2018)

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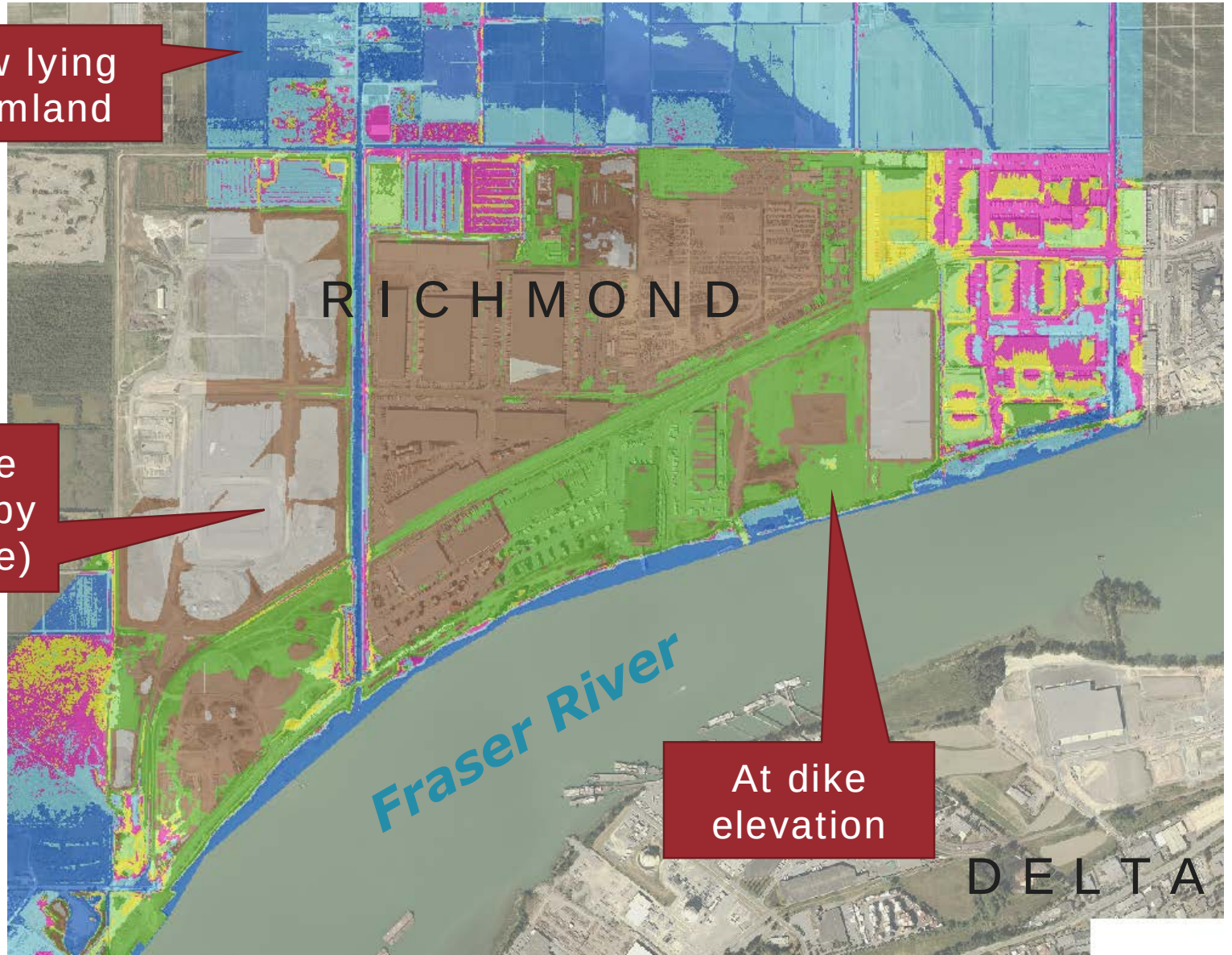
Super-dike

Richmond Properties:

- Former landfill (1970s).
- Capped and built up with dredged river sand.
- At or above existing dike crest elevations.

Some of the highest land in Richmond.



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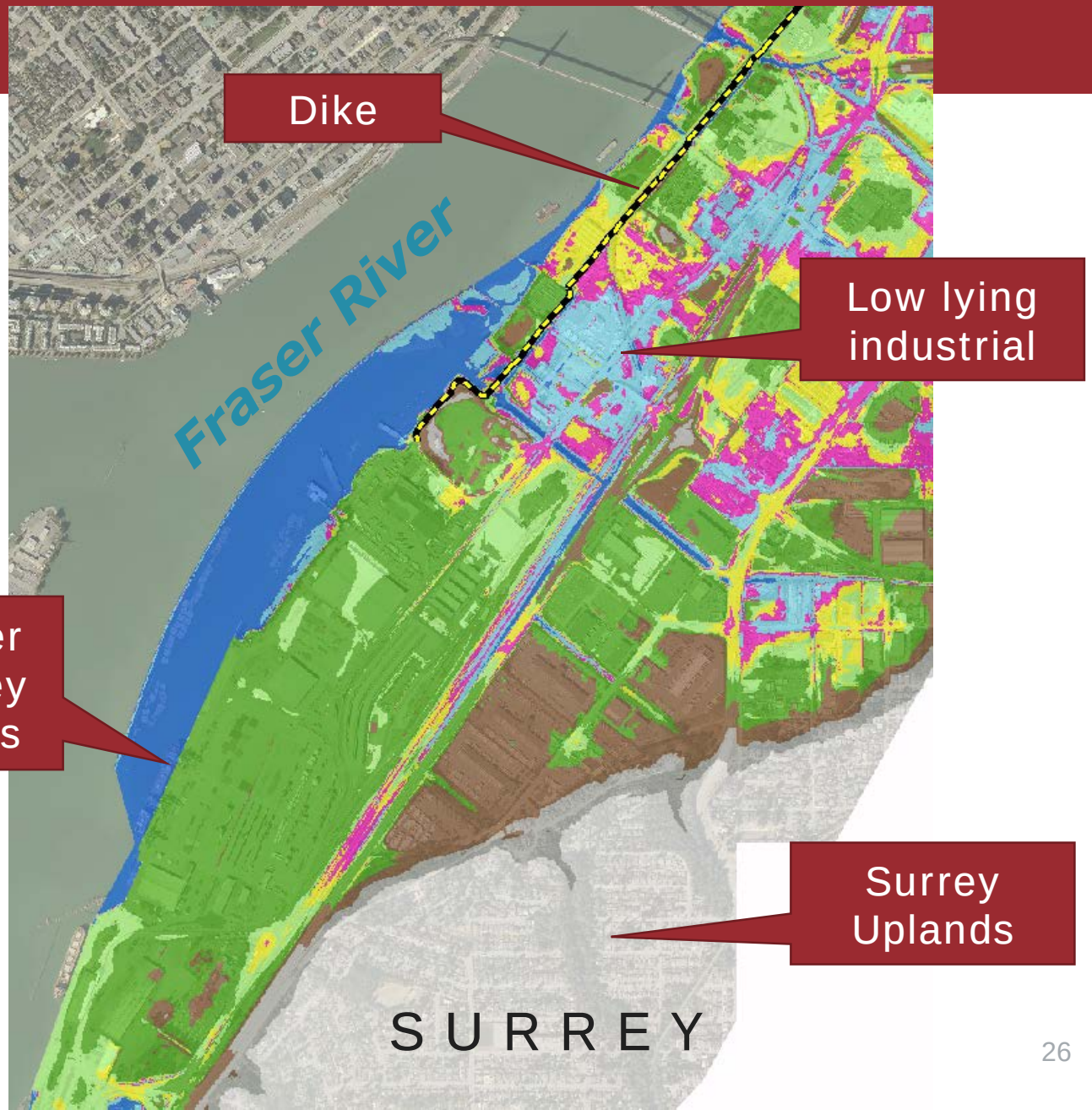
Super-dike

Fraser Surrey Properties:

- Floodplain area built up with dredged river sand in stages. (1970s)
- At same elevation as existing dike crest to the north.
- Terminal berths are a mix of sheet-pile retaining walls, and pile & deck dock structures.
- Oldest structures date from late 1960s.

Best suited for "greenfield" sites.



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Infrastructure Renewal

- Leases rarely more than 30 years.
- Business use may change.
- Sites may be reconfigured during lease tenure (roads/rail mainly).
- Lifespan of concrete & steel structures generally 50-70 years.
- Same for storm sewer pipes: opportunity to upsize.

These are opportunities to build new infrastructure to updated standards.

Ongoing Research

These are early days for Climate Change research. The Port actively participates in liaison and studies with other partners, such as:

- Fraser Basin Council
- City of Vancouver
- City of Surrey
- City of Delta
- North Shore Partners
- In-house Climate Change Adaptation Project

Workshop at Port office

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