Iona Island Wastewater Treatment Plant
Project Definition Update

MV Project Team

May 19 & 21, 2020

Online Public Meeting

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Welcome

Thank you for joining us for an online meeting about the Iona Island Wastewater Treatment Plant Project.

The meeting will start shortly. To help things go smoothly:

When you are not speaking:
Please press the green microphone or telephone button at the top of your screen to mute your microphone

To ask a question or provide a comment:
Please press the raise hand button and the moderator will address you at the appropriate time

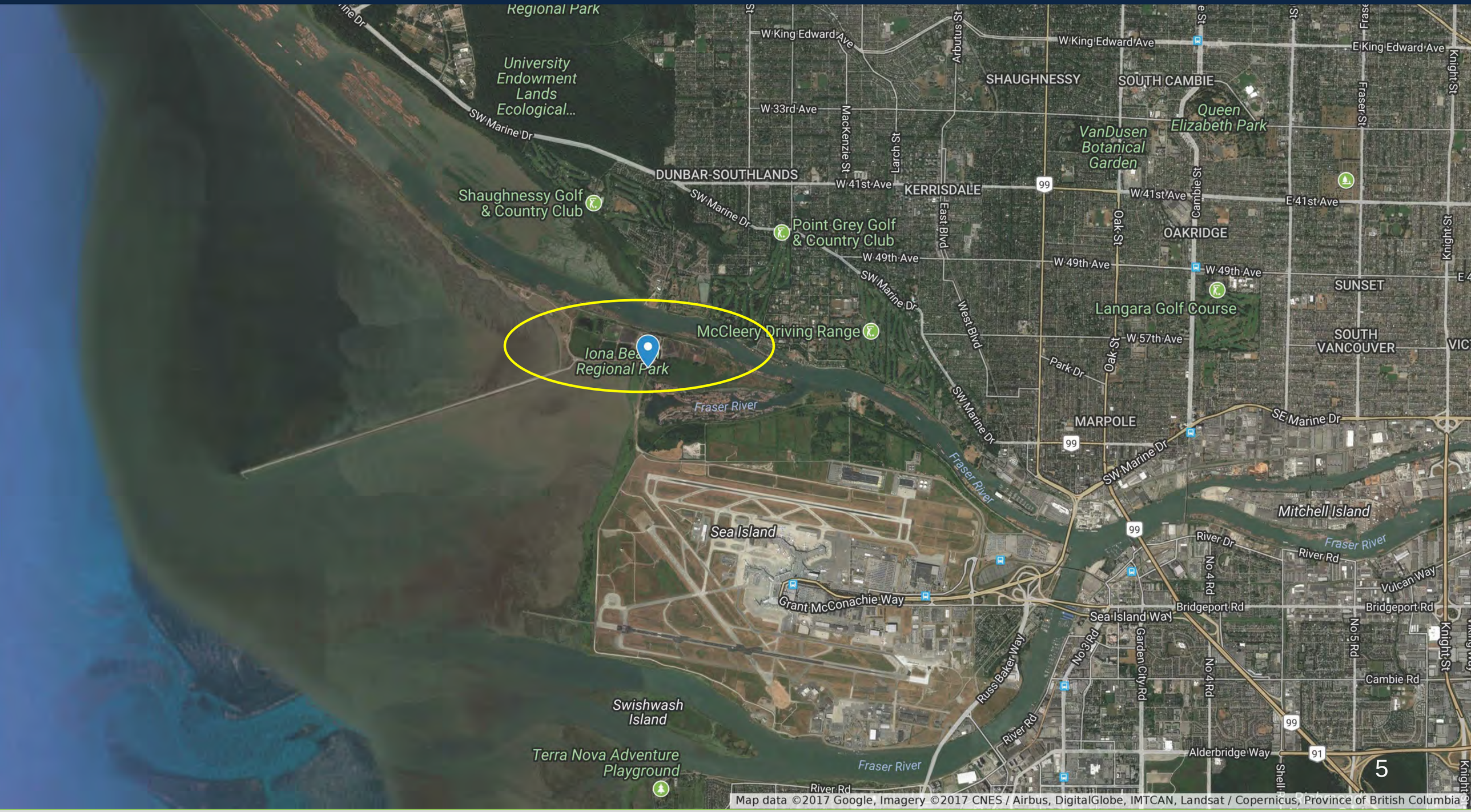
Presentations (discussion throughout)

1. Project definition overview & update
   Peter Navratil
2. Community engagement
   Tom Sadleir
3. Resource recovery and wastewater treatment options
   Peter Navratil
4. Iona Island context and ecological priorities
   Robyn Worcester
5. Preliminary design concepts for the Plant and island including habitat enhancement opportunities
   Jeff Cutler, Landscape Architect, Space2Place

1. PROJECT DEFINITION OVERVIEW

Overall project timeline

Plant Location



Iona Island

Existing Plant Layout

Existing Plant Layout

Existing Plant Layout

Existing Plant Layout

Project Definition Goals

- Wastewater Treatment
- Community and Park Integration
- Resource Recovery

Project Definition Design Considerations

CLIMATE CHANGE RESPONSE

EDUCATION

BIRDING

ADAPTABILITY + RESILIENCE

LEADERSHIP

COMMUNITY HEALTH

ARCHITECTURE

FACILITY INTEGRATION

STEWARDSHIP

DELIGHT

HISTORY + CULTURE

LIFE IN WATER

LIFE ON LAND

RECREATION

Evaluation Principles – Wastewater Treatment

- Effluent quality
- Flexibility for continuous improvement and innovation
- Ease of operation and maintenance
- Capital, operational and maintenance cost
- Adaptability and resiliency to climate change
- Staff safety and wellbeing

Evaluation Principles – Community and Park Integration

- Ecosystem health of Salish Sea, the region and Fraser River
- Improve habitat for fish, birds and other wildlife
- Footprint, visibility and esthetics
- Air quality and odour emissions
- Light and noise pollution
- Recreational opportunities and improved access
- Cultural and traditional values
- Education, outreach and collaborative partnerships

Evaluation Principles – Resource Recovery

- Recovery and beneficial use of resources
    - Energy, reclaimed water, nutrients
- Partnerships and collaboration
- Greenhouse gas emission reduction
- Energy recovery:
    - Biomethane
    - Bio-oil
    - Biomass
    - Effluent heat

Questions?

2. COMMUNITY ENGAGEMENT

- GVS&DD Board (LWC, Regional Parks)
- VSA members
- Residents and businesses
- Special interests
- Musqueam Indian Band

Technical Workshop 4, Musqueam Indian Band, July 24, 2019

What We've Heard

Community Workshop 1, January 9, 2019, Richmond

- Increase treatment level
- Reduce odour
- Reduce plant lighting
- Maintain access to park
- Replace and create new habitat
- Coordinate removal of existing lagoons with new habitat
- Maintain Musqueam views

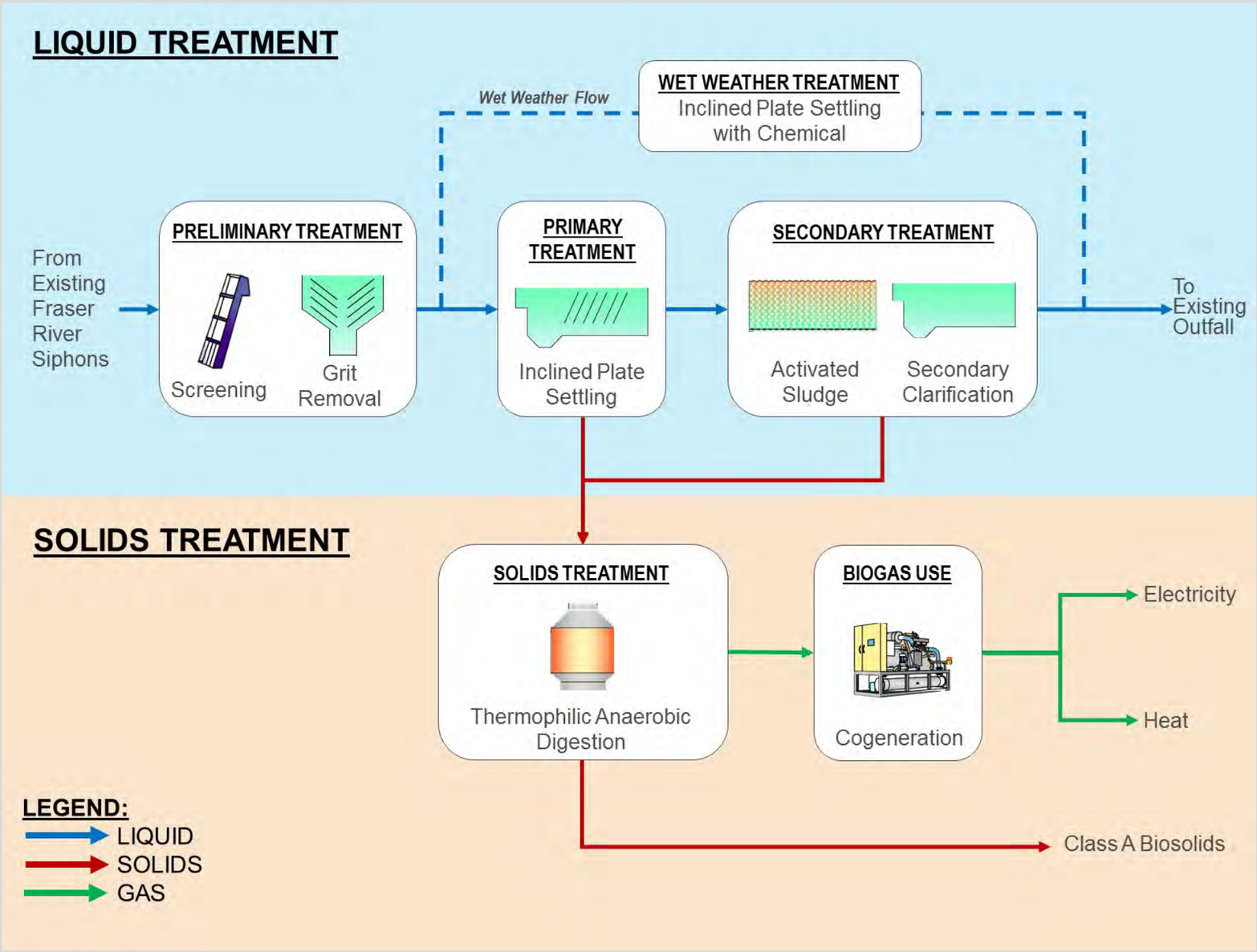
Committee & Engagement Overview (2020)

Timeline	Activity
February 7	Liquid Waste Committee Present design concepts. No decision sought.
February 22	Council of Councils Design concepts
March 11	Regional Parks Committee Park integration and habitat enhancement
May – June	Community Engagement Design concepts
July	Liquid Waste Committee and GVS&DD Board Recommend preferred concept, review input received. Seek approval.
January 2021	Liquid Waste Committee and GVS&DD Board Present Indicative Design and Project Definition Report. Seek approval.

Questions?

2. RESOURCE RECOVERY & WASTEWATER TREATMENT OPTIONS

Treatment Concept 1- Base Secondary



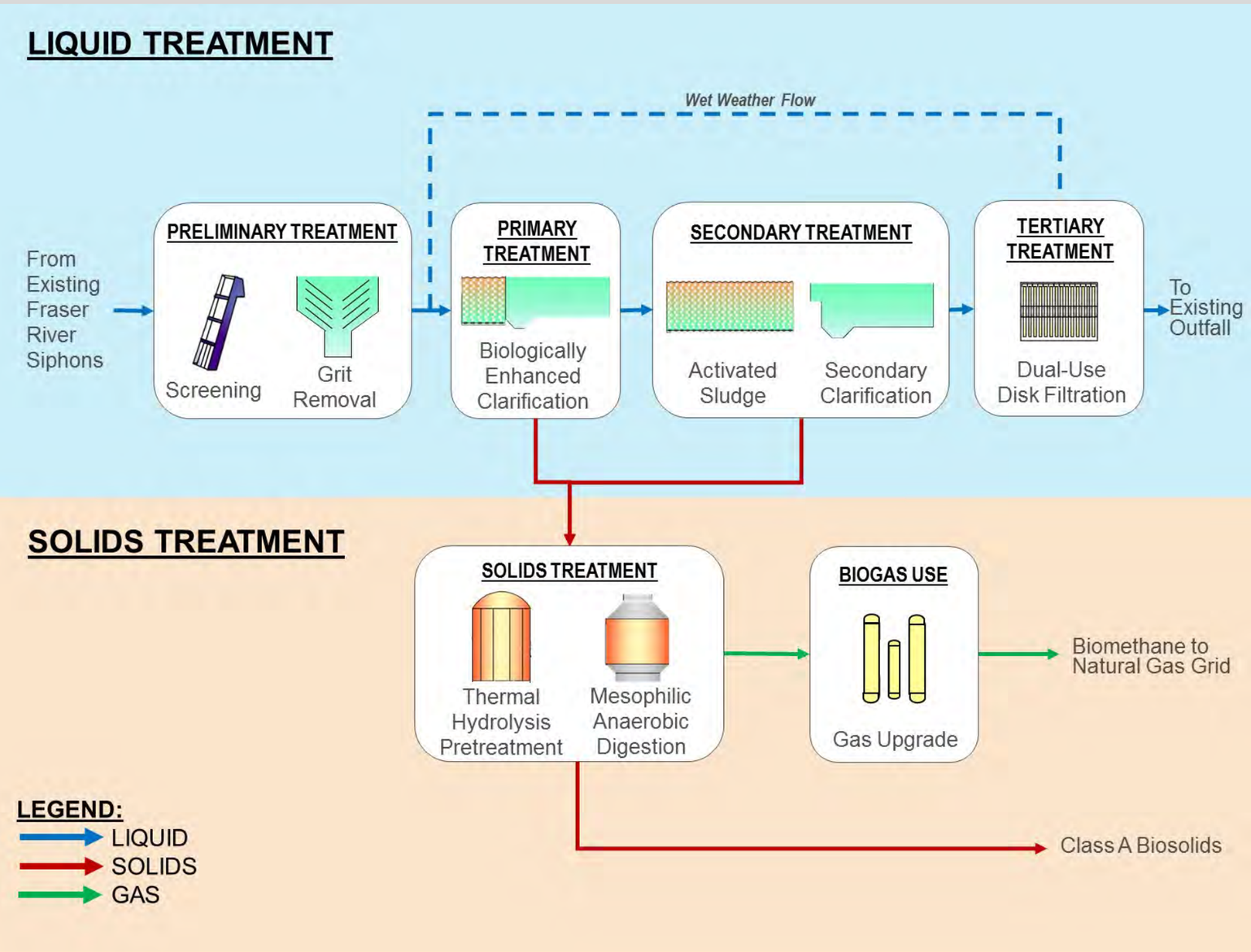
Key Features

- Secondary clarification and thermophilic digestion
- Secondary effluent that meets regulatory requirements
- Flexibility to adopt future technologies
- Low operational complexity

Resource Recovery Opportunities

- Reclaimed water
- Effluent heat recovery
- Biogas → Electricity and heat
- Class A biosolids

Treatment Concept 2 – Tertiary Disk Filtration



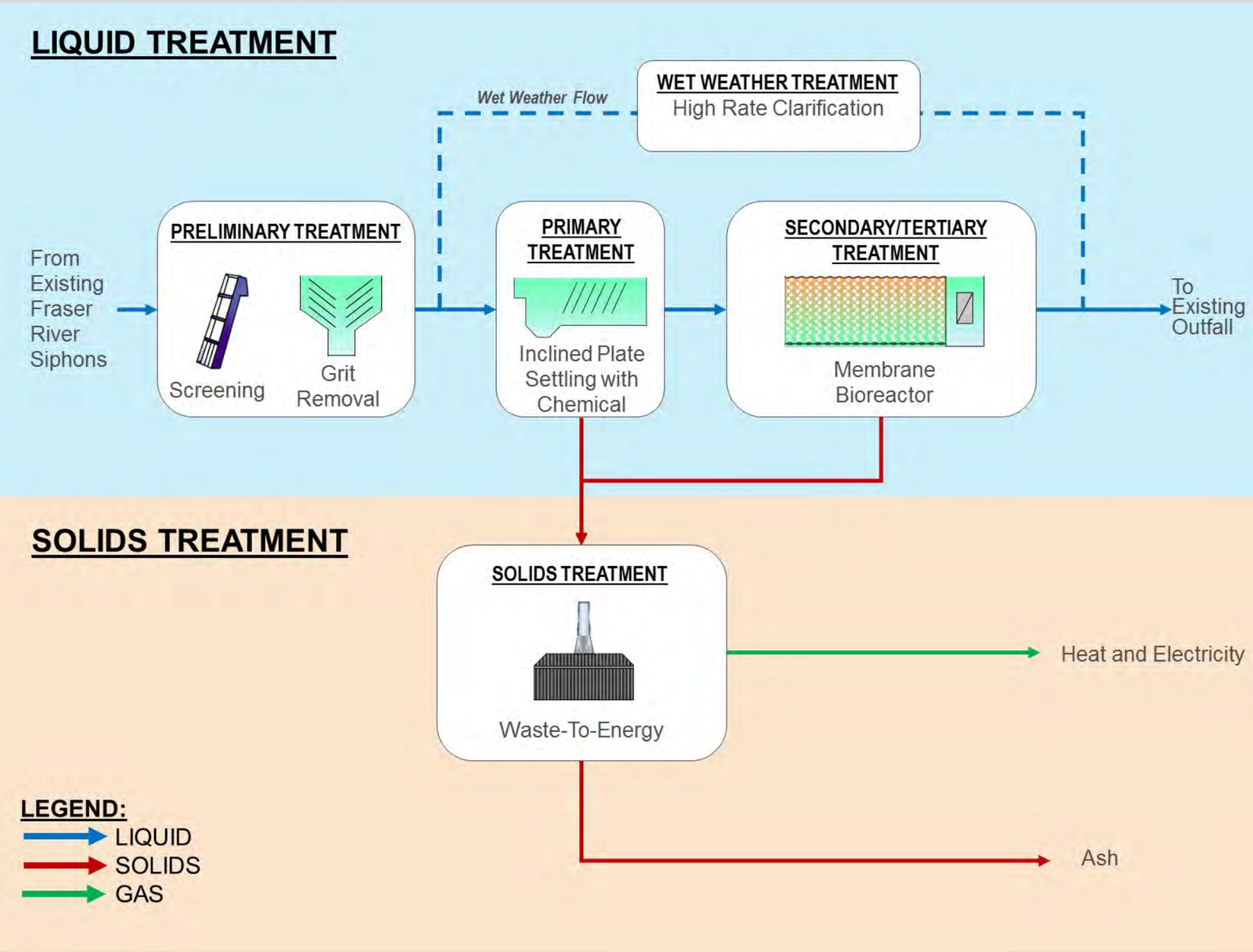
Key Features

- Enhanced primary followed by secondary clarification
- Tertiary effluent
- Opportunities for effluent reuse
- Biogas upgraded to biomethane
- Higher energy recovery
- Smaller activated sludge tanks
- Smaller digesters with THP
- More biogas

Resource Recovery Opportunities

- Reclaimed water
- Effluent heat recovery
- Biogas → biomethane
- Class A biosolids

Treatment Concept 3 – Tertiary Membrane Bioreactor (MBR)



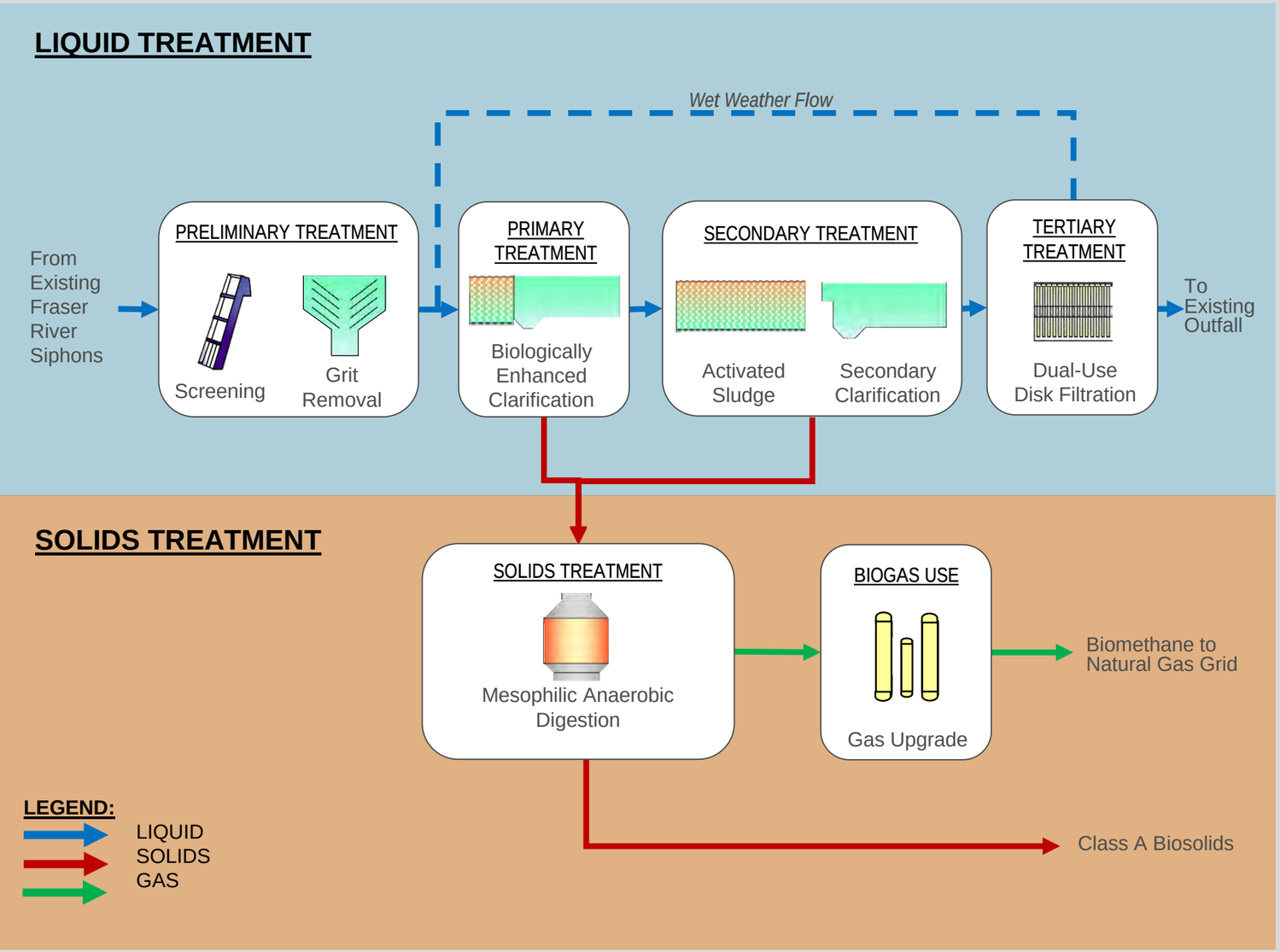
Key Features

- Tertiary level treatment achieved in one step
- Opportunities for effluent reuse
- Small footprint (MBR)
- Ash management in lieu of biosolids

Resource Recovery Opportunities

- Reclaimed water
- Effluent heat recovery
- Heat and electricity recovery
- Beneficial use of ash

Preferred Wastewater Treatment Plant Concept (#2)



Key Features

- Enhanced primary followed by secondary clarification
- Tertiary effluent
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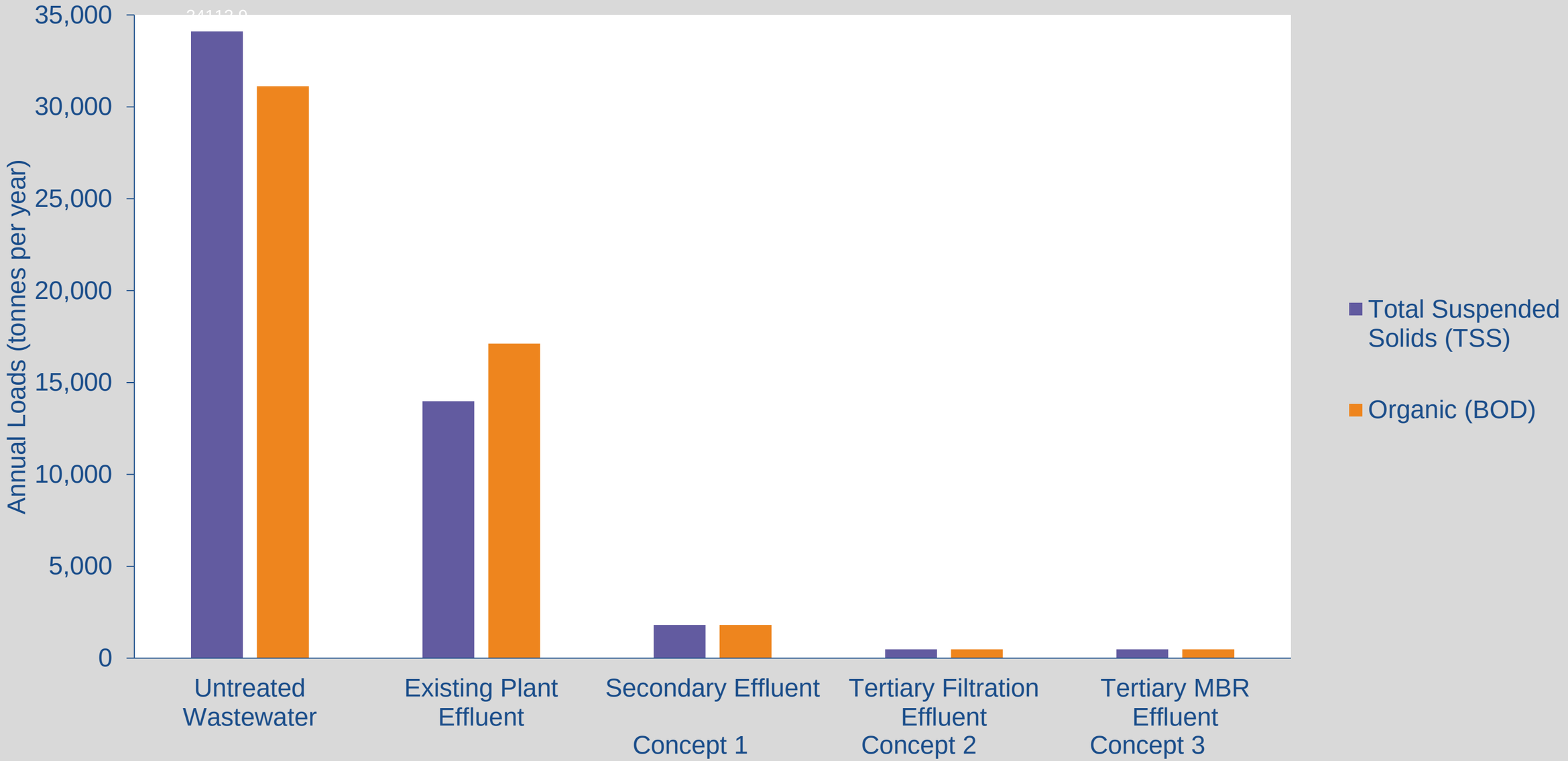
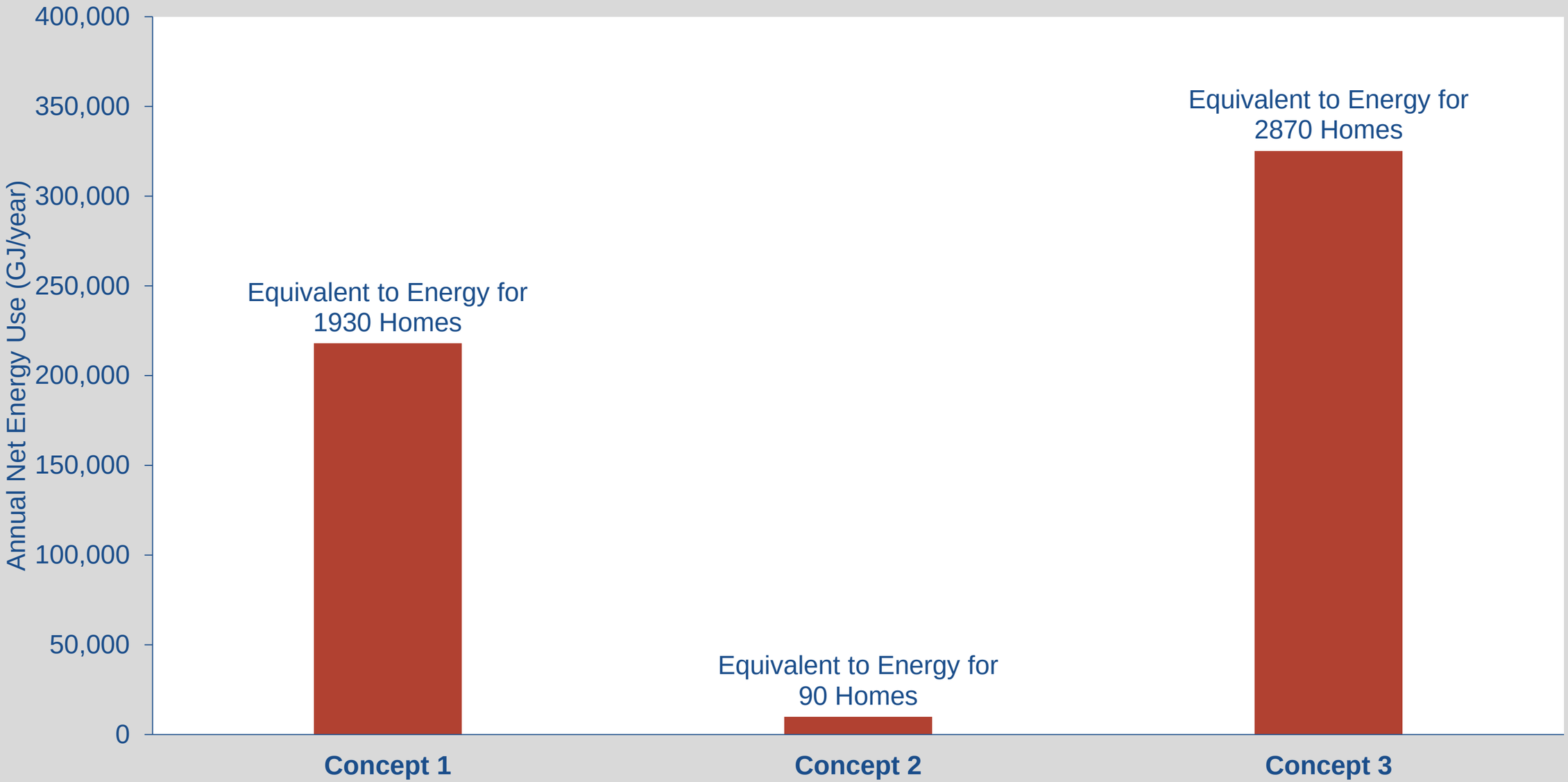
- Higher energy recovery
- Smaller secondary tanks

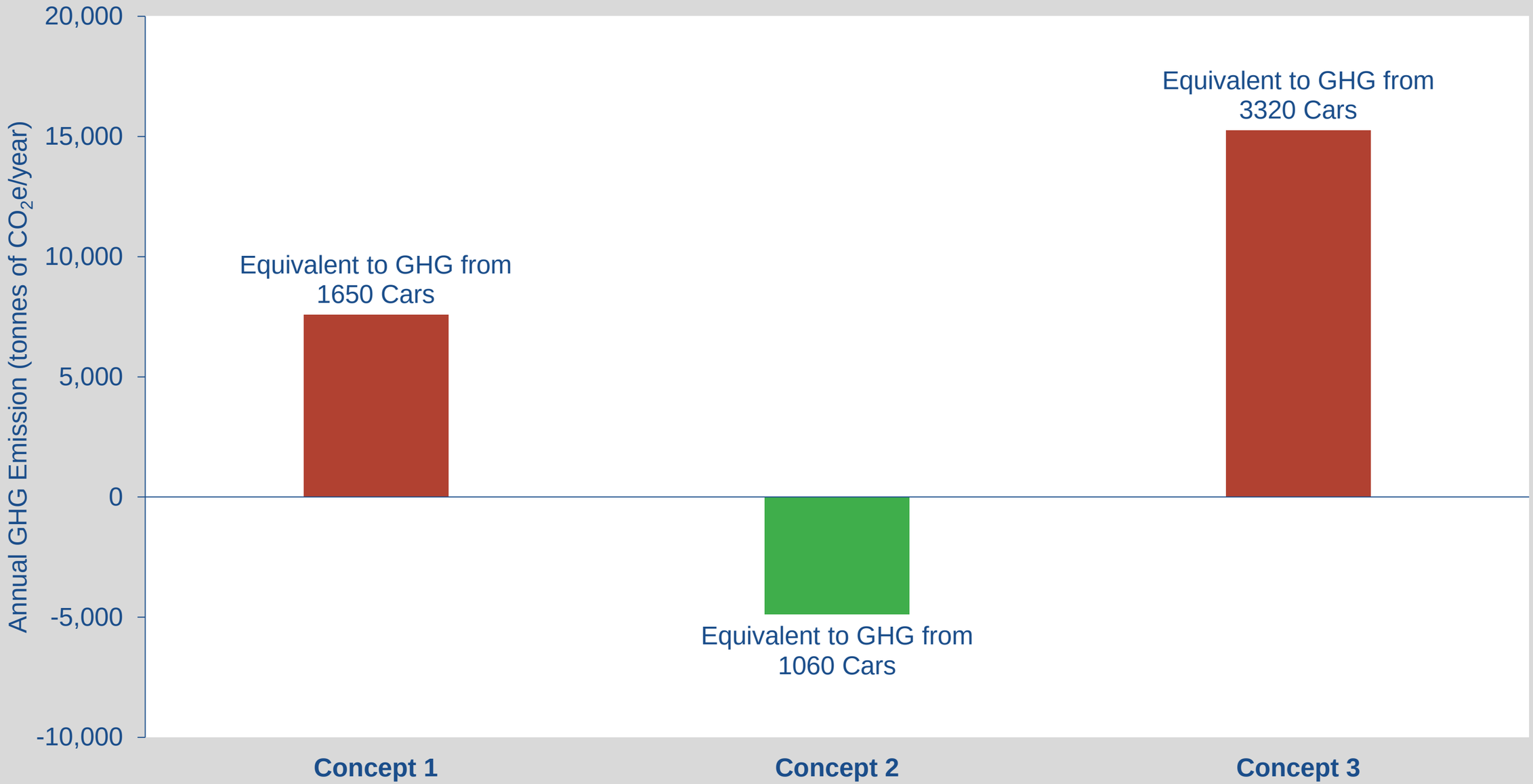
Comparing Annual Solids and Organics Discharge



Net Energy Use



Greenhouse Gas Emissions



Comparison of Options

Criteria	Concept 1 Base Secondary	Concept 2 Tertiary Filtration	Concept 3 Tertiary MBR
Operational Complexity	Medium	Low	High
Maintenance Requirements	High	Low	High
Health and Safety Risks	High	Low	High
Odour Release Risks	High	Medium	Low
Footprint	Large	Medium	Small
Ability to Adopt Future Technological Innovations	Medium	High	Low
Capital Cost (2020 Dollars)	Highest	Lowest	Medium
Annual Operating Cost	Medium	Lowest	Highest

Summary of Analysis

<u>Concept 2</u> provides:

- Tertiary filtered effluent that surpasses secondary treatment standards
- Lowest energy consumption
- Highest potential for energy production
- Lowest greenhouse gas emissions
- Simplest operation and maintenance
- Lowest health and safety risks
- Lowest capital and O&M costs
- Highest flexibility for future adaptation

STRATEGIES FOR NEW PLANT (STAGING)

Existing Plant

- 60 years old (built from 1959 to 1963)
- Additional stages added in 1973, 1978, 1981 and 1985
- Effluent pump station & deep outfall 32 years old (built 1988)

Recent Upgrades to Solids Treatment

Recent upgrades:

- Digester retrofits and mixing upgrades
- Biogas piping upgrades
- Solids handling building
- Biosolids dewatering facility (2021)

Staging Plant Implementation

Key considerations for construction of new plant:

- Useful life of existing assets
- Flexibility for future innovation
- Regional biosolids dryer potentially operational prior to 2030
- Reduce capital cost

Opportunity to stage implementation of Concept 2 by reusing solids treatment

Risk of Reusing Solids Treatment

- Not designed to seismic standards
- Maintaining operations while retrofitting is challenging
- Concrete surfaces require refurbishment
- Constructed below future flood levels

Staging Strategy

- New liquid treatment
- Upgrade existing solids treatment
- Utilize new solids handling and dewatering facilities
- Excess biosolids to new regional biosolids dryer
- Potential savings by deferring cost of new digesters
- Flexibility to adopt Hydrothermal Liquefaction technology in the future

Resource Recovery Opportunities

Inputs

Wastewater

Trucked Liquid Waste

Iona Island Wastewater Treatment Plant

Potential Products

- **Reclaimed Water**
- **Electricity**
- **Heat**
- **Biofuel**
- **Nutrients / Biosolids**

Reclaimed Water

- Potential for 500 ML/day of reclaimed water
- Equivalent to 40% of Metro Vancouver drinking water supply

- Onsite use
  - Tank cleaning and wash down
  - Grey water in O&M building

- Offsite use
  - Irrigation (e.g. golf courses, parks)
  - Toilet flushing
  - Vehicle washing
  - Construction activities
  - Industrial uses

Reclaimed Water – Potential Demand

UBC

Musqueam
Indian Band

Canada Post

UPS

YVR

Golf Courses

City of Vancouver

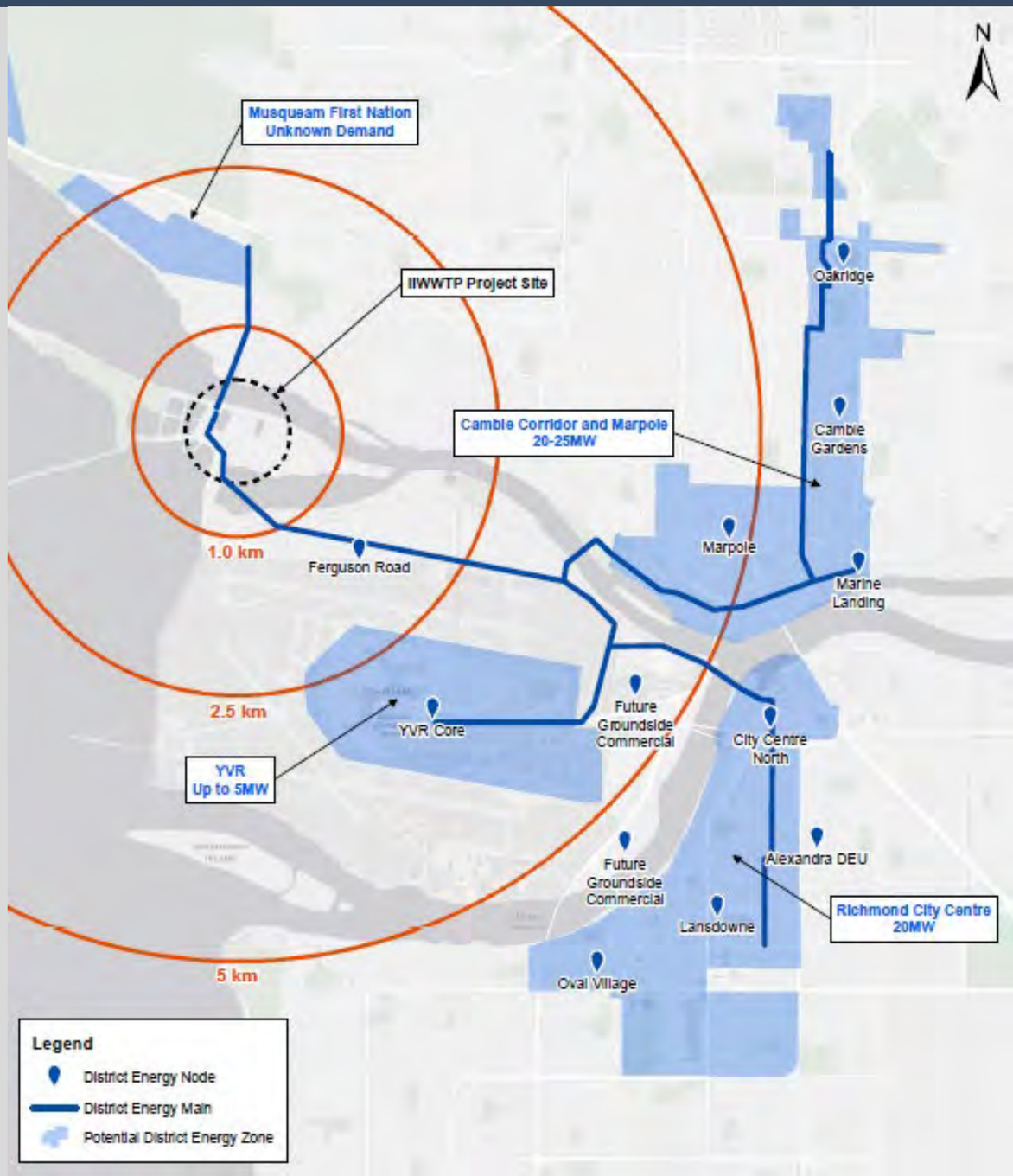
TransLink

City of Richmond

Effluent Heat Recovery

Heat recovery from plant effluent

- Onsite heating and cooling needs
- Export to district energy system
- Equivalent to heating energy use of 50,000 apartment units



Renewable Natural Gas

Biofuels

- Biogas upgrade to biomethane/renewable natural gas (RNG) with injection to natural gas grid
- Equivalent to 3,500 household served
- 2,800 cars taken off the road
- Offset 85% of Corporate GHG emissions

Biogas upgrade system at Surrey Biofuel Facility

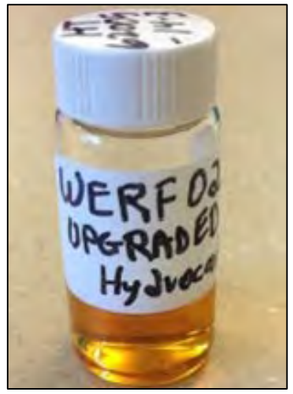
Biocrude

- Pilot testing hydrothermal liquefaction (HTL) technology at Annacis Island WWTP
- Lower capital and O&M costs
- Revenue potential
- Equivalent of taking 3,500 cars off the road annually
- Displace 1,400 truck loads of biosolids annually

Wastewater Biomass

Biocrude

Low Carbon Fuel



Nutrients

- Biosolids for land application
- Nutrient recovery opportunities through struvite crystallization

Questions?

5. IONA ISLAND AND ECOLOGICAL PRIORITIES

Iona Beach Regional Park

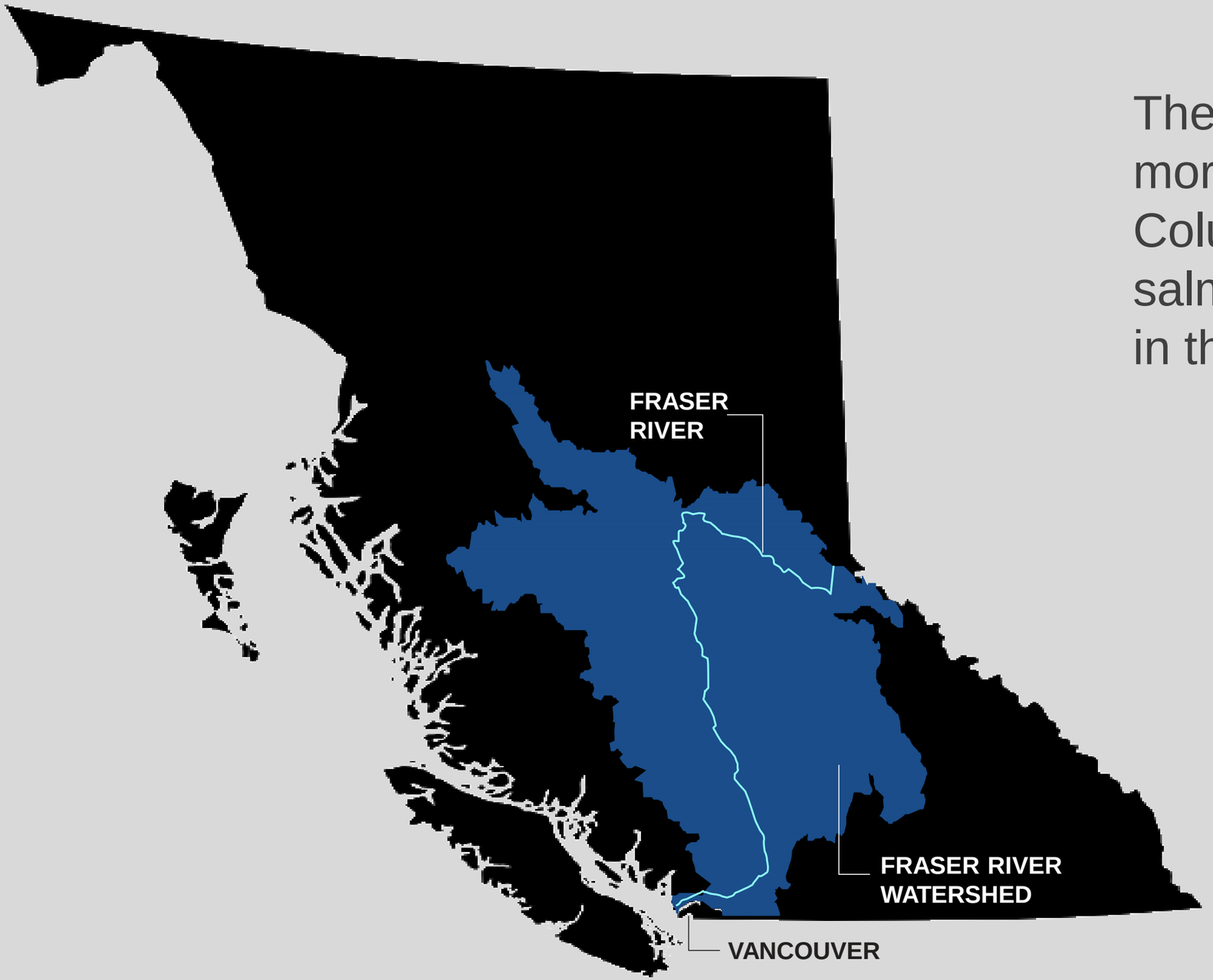
Iona Beach Regional Park


Iona South Outfall Jetty


Interpretive Programs


Coastal Sand Ecosystem

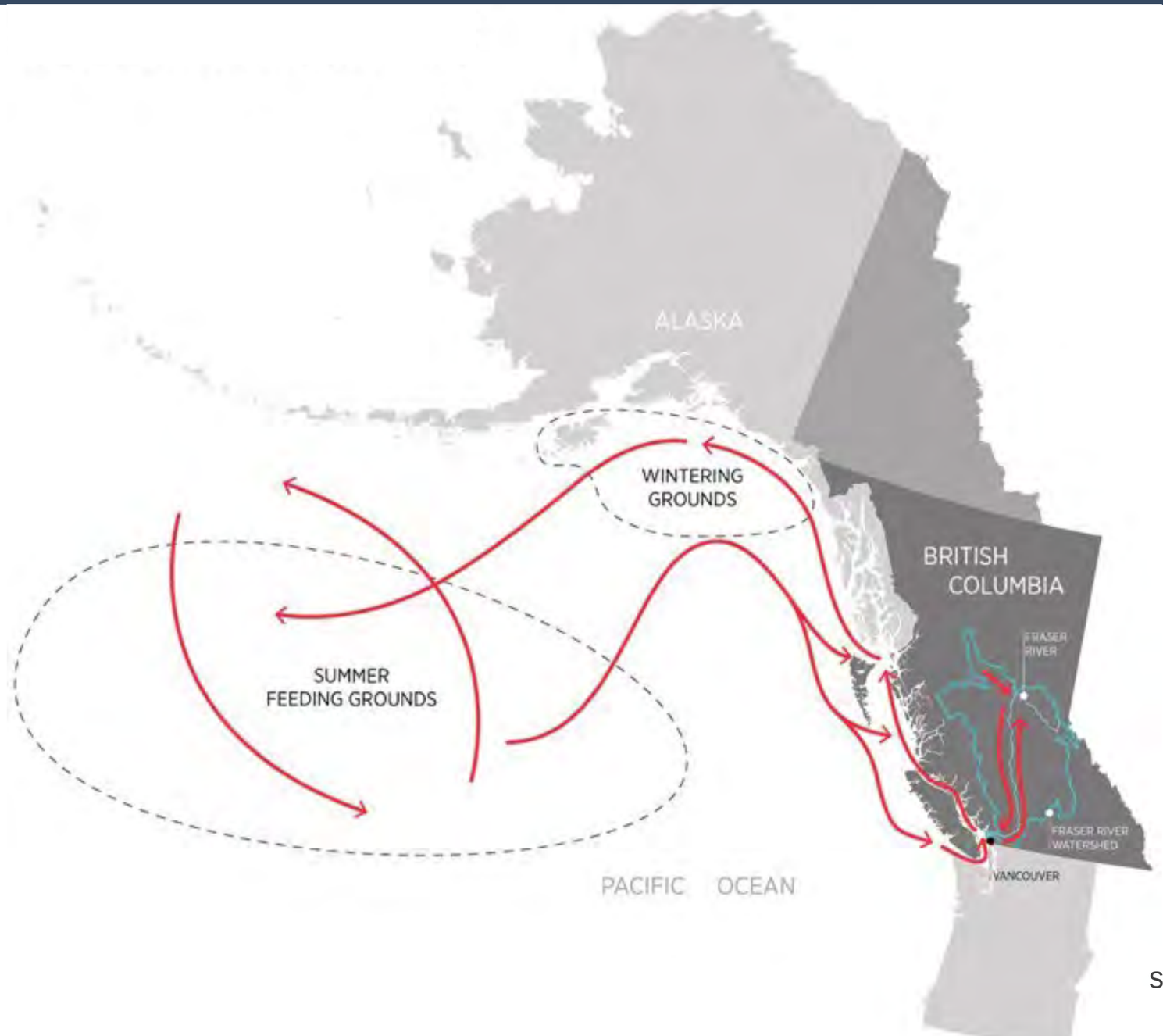
The Fraser River Basin



The Fraser River Basin drains more than a quarter of British Columbia, and supports more salmon runs than any other river in the world

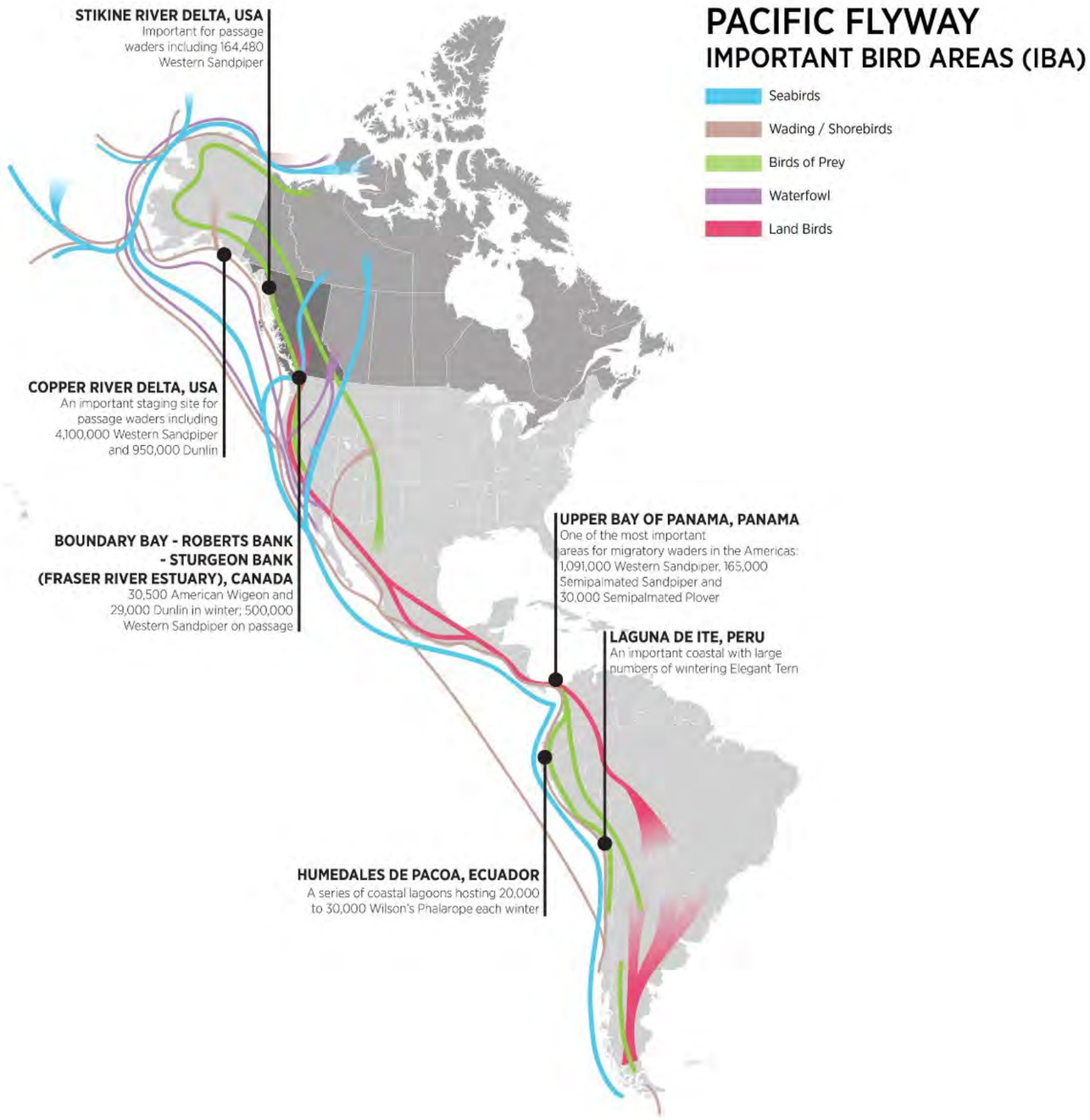
source: Rivershed Society

Salmon Migration Routes



source: Cohen Commission

Pacific Flyway



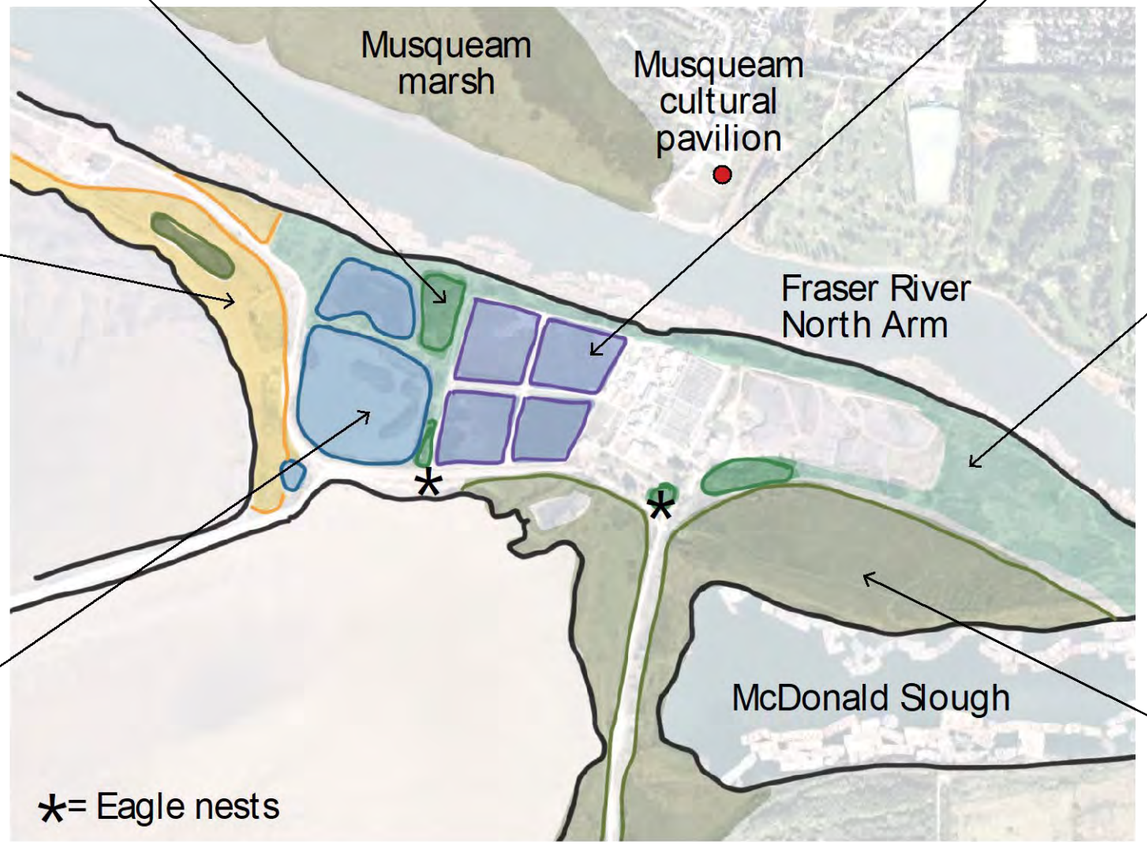
source: National Geographic

Ecosystems of Iona Island

Riparian forest / swamp

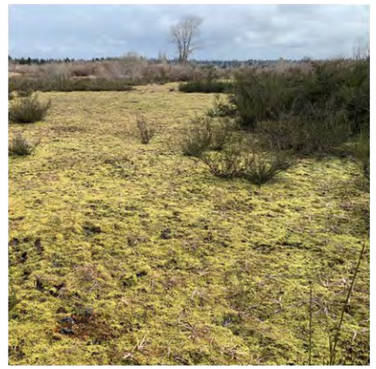
Coastal sand ecosystem

Freshwater wetlands



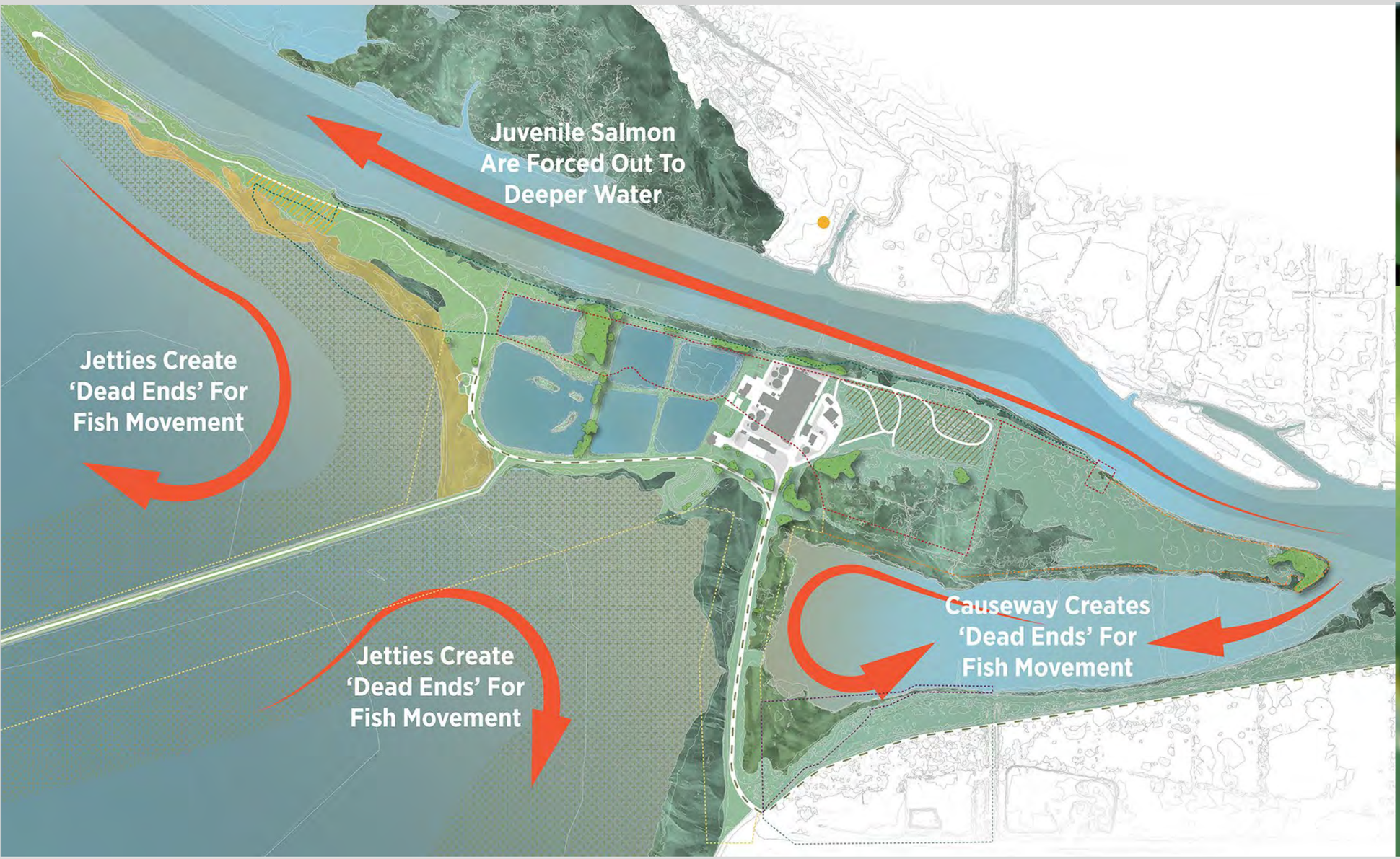
Sludge lagoons

Shrub grassland

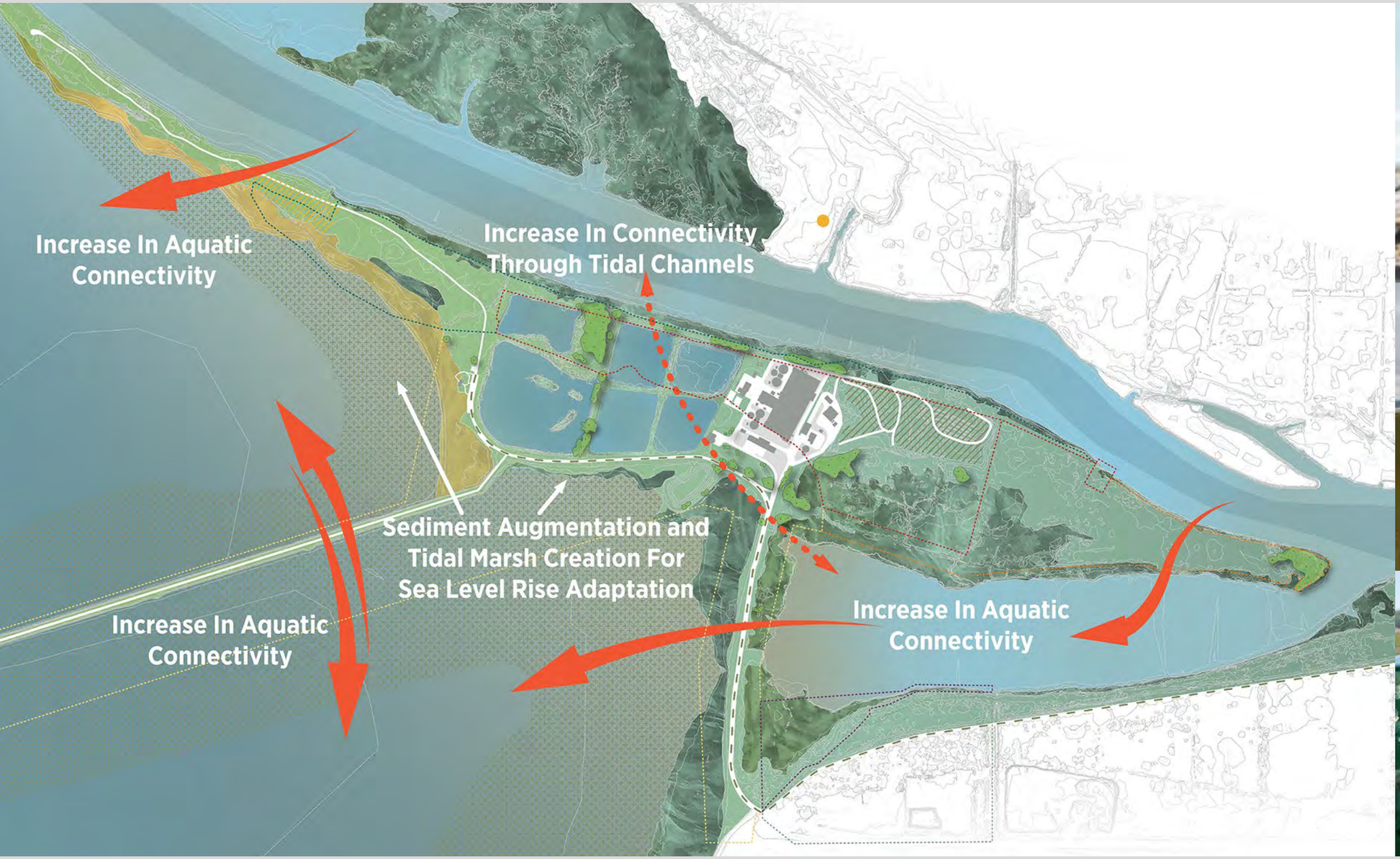


Tidal marsh

Disconnected Salmon Migration



Connected Salmon Migration



Ecological Priorities

Park Connection Opportunities

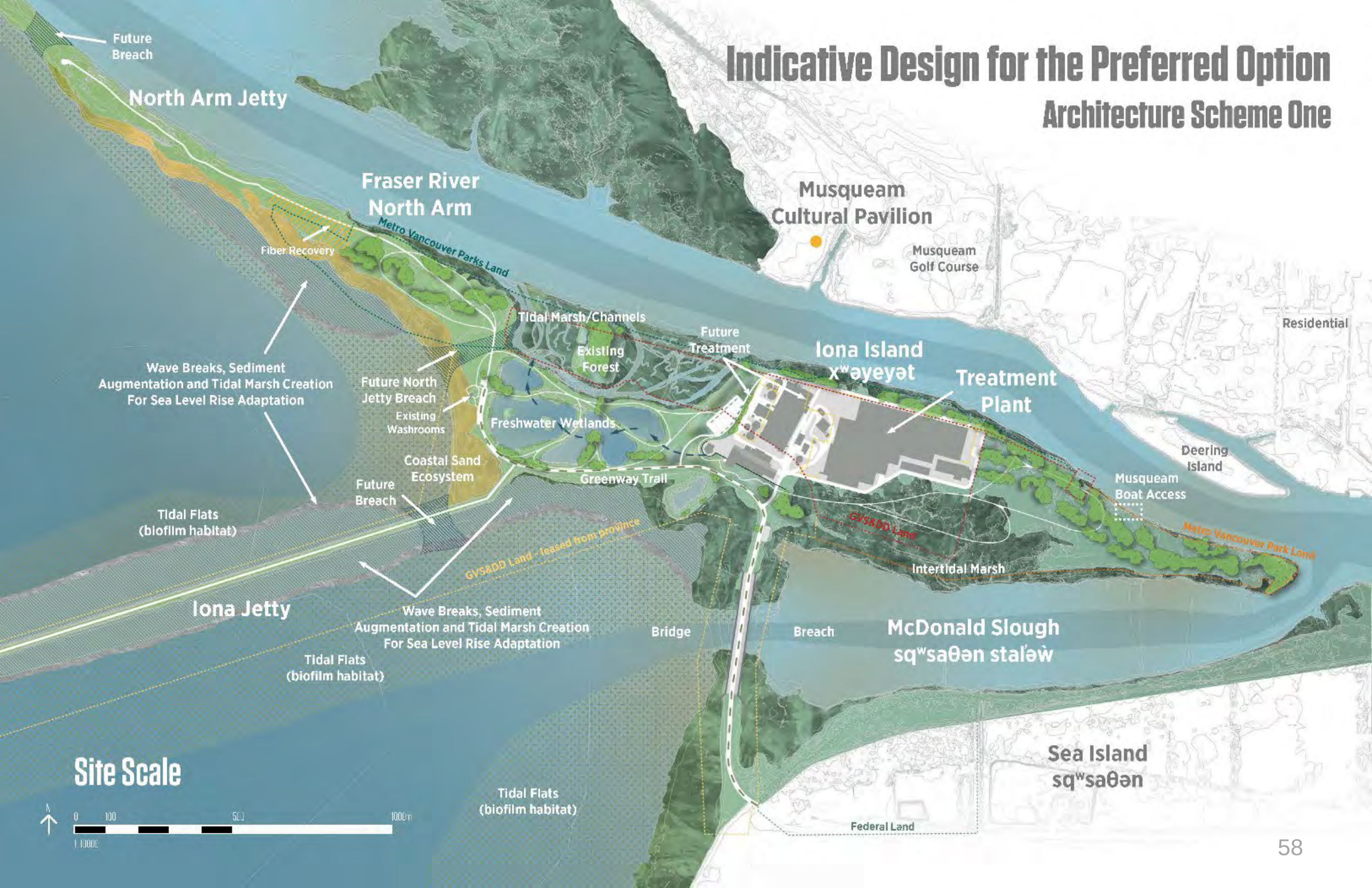
1. Enhance park ecology
2. Improve circulation, connections and visitor experience
3. Opportunities for education, recreation programming
4. Park expansion (access to more area)
5. Sea level rise and climate change mitigation
6. New partnerships and community connections

Questions?

6. PRELIMINARY DESIGN CONCEPTS FOR PLANT AND ISLAND INCLUDING HABITAT ENHANCEMENT OPPORTUNITIES

Indicative Design for the Preferred Option

Architecture Scheme One



Indicative Design for the Preferred Option

Architecture Scheme One

Fraser River
North Arm

Musqueam
Cultural Pavilion

Musqueam
Golf Course

Residential

Metro Vancouver Park Land

Tidal Marsh/Channels

Future North
Jetty Breach

Existing
Forest

Tidal Marsh/Channels

Future
Treatment

Iona Island
xʷəyeyət

Existing
Washrooms

Existing
Solids
Treatment

Biosolids
Dewatering

Existing
Primary
Treatment

B Stage Activated
Sludge Tanks

Primary
Clarifiers

Secondary
Clarifiers

A Stage Activated
Sludge Tanks

Blower Building

Secondary
Clarifiers

New Siphon South Shaft

Existing Effluent
Pump Station

Freshwater Wetlands

Existing
Parking

Greenway Trail

Operations and
Maintenance
Building

Eagle Nest

Odour Control

Preliminary Treatment and IPS
Electrical/Mechanical Room

Wave Breaks, Sediment
Augmentation and Tidal Marsh Creation
For Sea Level Rise Adaptation

Existing Gravity
Thickener

Existing Sludge
Screening

Electrical and Mechanical
Room with Substation

Dual Use Disk Filters
(Tertiary Treatment)

Future Breach

Tidal Flats
(biofilm habitat)

GVS&DD Land - leased from province

GVS&DD Land

Metro Vancouver Park Land

Intertidal Marsh

Parks Works Yard
and Maintenance
Building

Plant Scale

N

0 250m

1:5000

Bridge

Breach

McDonald Slough
sqʷsaθən staɬəw̓

ECOLOGICAL OPPORTUNITIES

- Plant Effluent Discharge
- Tidal Wetlands Habitat
- Wave Breaks
- Mudflat Habitat
- Riparian Habitat
- Freshwater Habitat
- Breaches

19. Offshore Wave Breaks

10. Foreshore Restoration

14. Outfall Jetty Breach

7. North Lagoons

16. Riparian Forest Restoration

2. North Jetty East Breach

5. South Pond

6. South Lagoons

18. Tidal Marsh Creation

9. Foreshore Restoration

15. North Channel Tie-In

4. North Pond

8. Foreshore Restoration

1. Causeway Breach

12. Upland Restoration

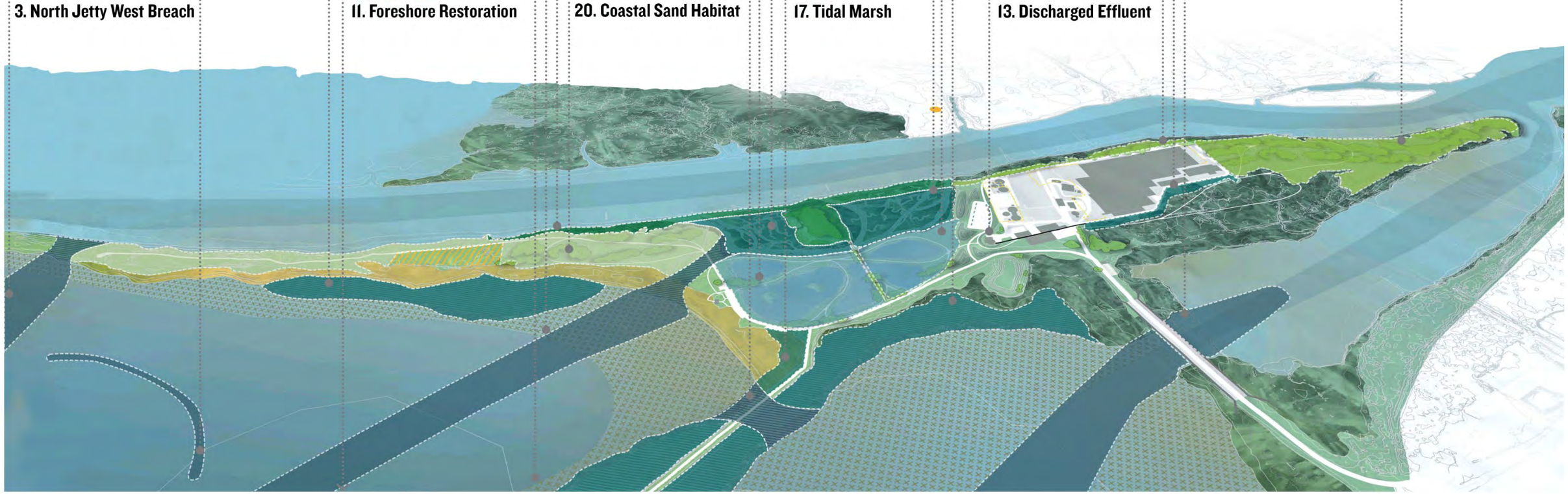
3. North Jetty West Breach

11. Foreshore Restoration

20. Coastal Sand Habitat

17. Tidal Marsh

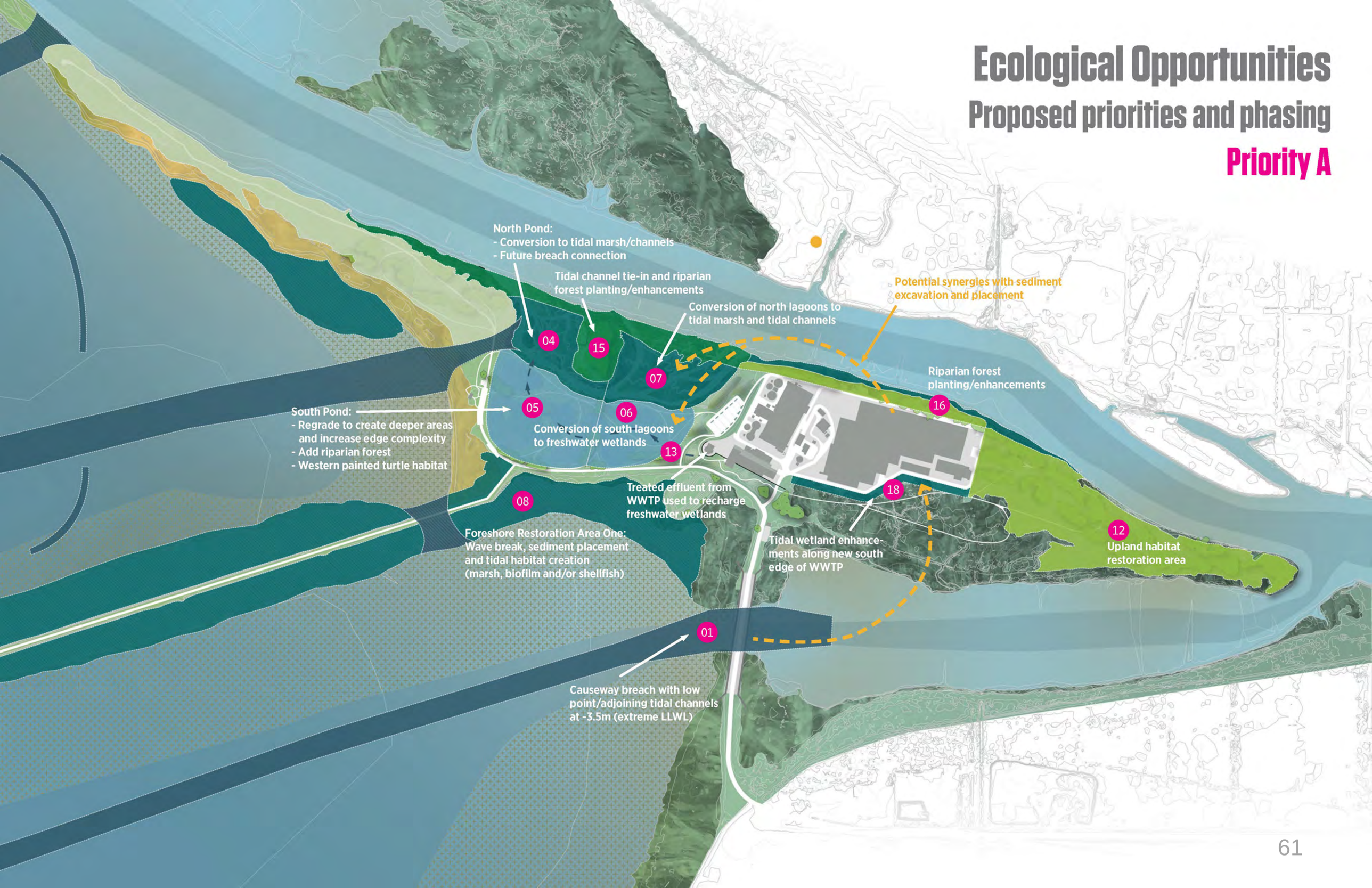
13. Discharged Effluent



Ecological Opportunities

Proposed priorities and phasing

Priority A



Need to add renderings of new Plant approx. 3-4 slides

SOUTHERN INTERTIDAL WETLANDS

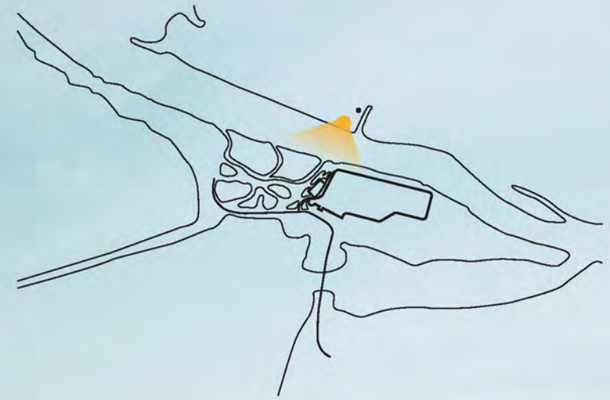
KNOLLS AND FRESHWATER WETLANDS

TIDAL CHANNELS, FRESHWATER WETLANDS AND THE PLANT

ARCHITECTURE SCHEME ONE

SOUTHERN VIEW FROM MUSQUEAM

ILLUSTRATION SHOWING PROPOSED VIEW WITH TREES REMOVED



Questions?

7. NEXT STEPS

- Submit input by Monday June 8 via **ionawwtp@metrovancouver.org**

- MV will consider and incorporate additional input, where possible
- Recommend preferred concept to LWC and GVS&DD Board (July 2020)
- Present Indicative Design and Project Definition Report to LWC & Board (January 2021)

Final thoughts?

COMMITTEE & ENGAGEMENT OVERVIEW (2020)

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November	Liquid Waste Committee and GVS&DD Board Present final Project Definition Report and Indicative Design. Seek approval.

Lagoon Cleaning

Excavate biosolids from lagoon

Timeline - Lagoon cleaning

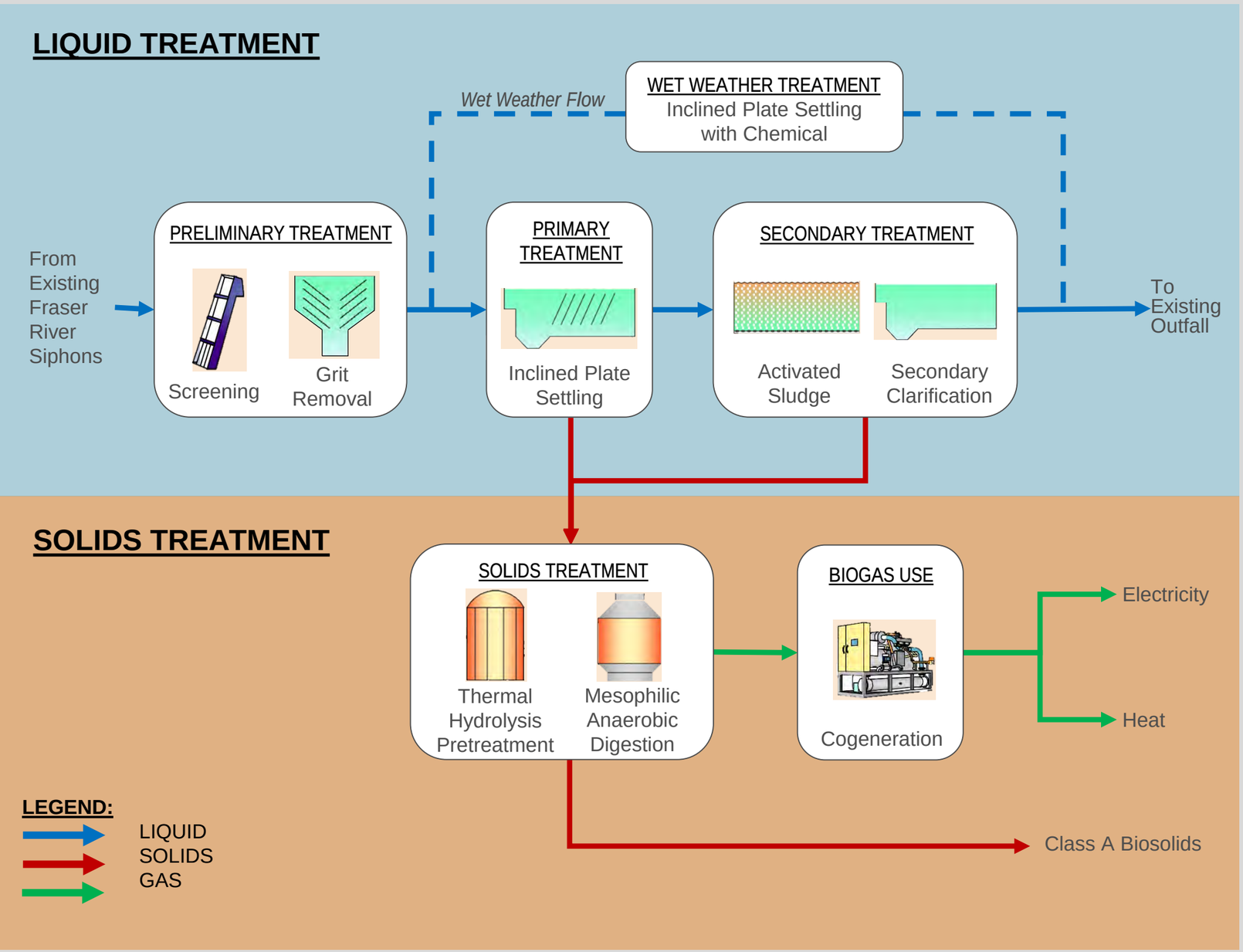
Lagoon Dredging

Period	Activity	Access Restrictions	Lagoon Status	
			Full	Empty
Summer 2020	SW Lagoon Cleaning	Intermittent closure of lagoon area	NE, NW, SE	SW
Winter 2020-2021	NE Lagoon Dredging	None	NE, NW, SE, SW?	SW?
Summer 2021	SE Lagoon Cleaning NE Lagoon Dredging	Partial closure of lagoon area	NE, NW, SW	SE
Summer 2022	SE Lagoon Cleaning NW Lagoon Dredging	Partial closure of lagoon area	NW, SW	SE, NE
Winter 2022-2023	NW Lagoon Dredging	None	NW, SW	SE, NE
Summer 2023	SW Lagoon Dredging	None	SW	SE, NE, NW

Overall Timeline

OVERVIEW OF NEW PLANT LAYOUTS

Concept 1- Secondary Treatment



Key Features

- Secondary clarification
- Smaller digesters with THP
- Secondary effluent that meets regulatory requirements

Resource Recovery Opportunities

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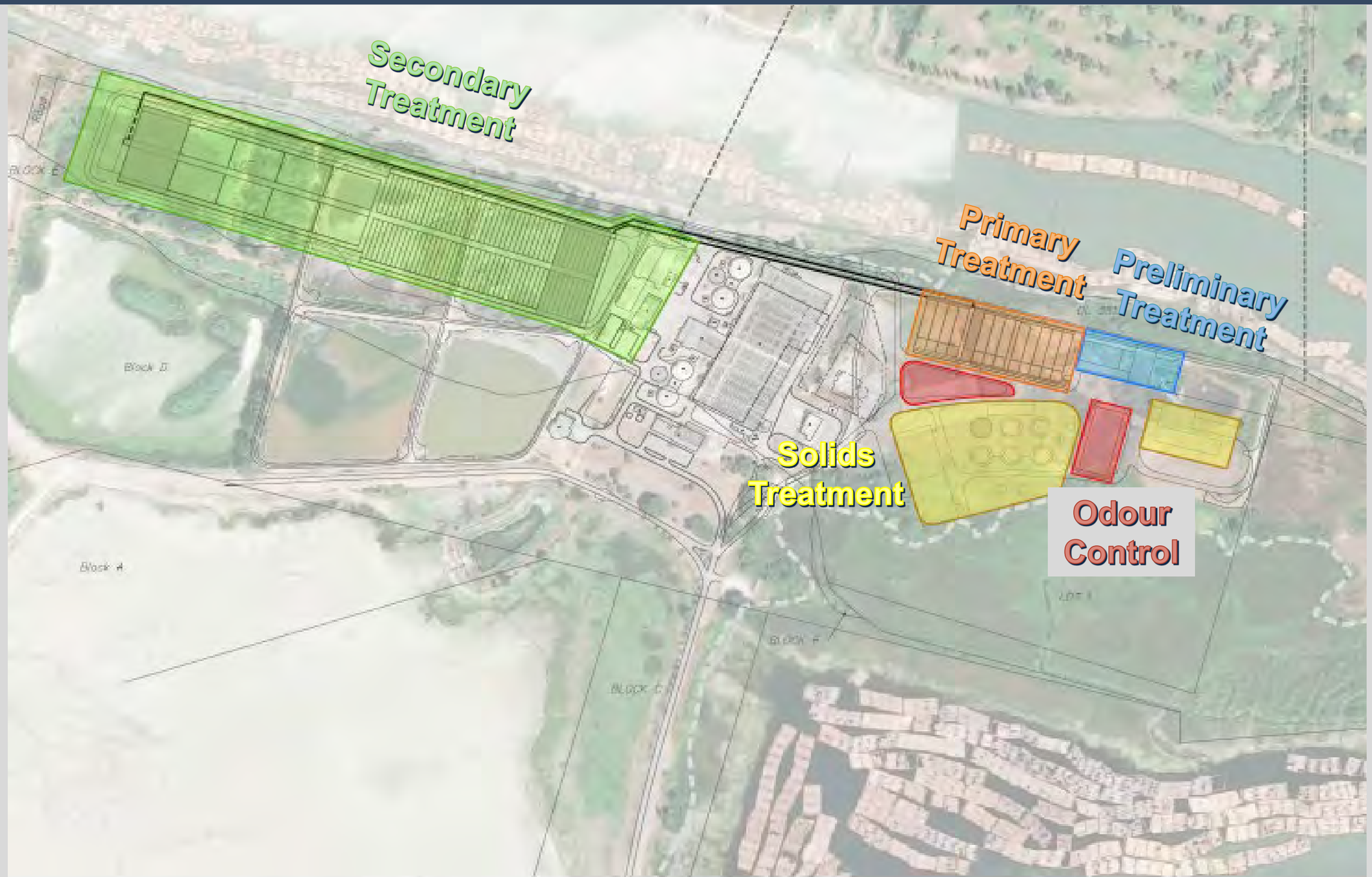
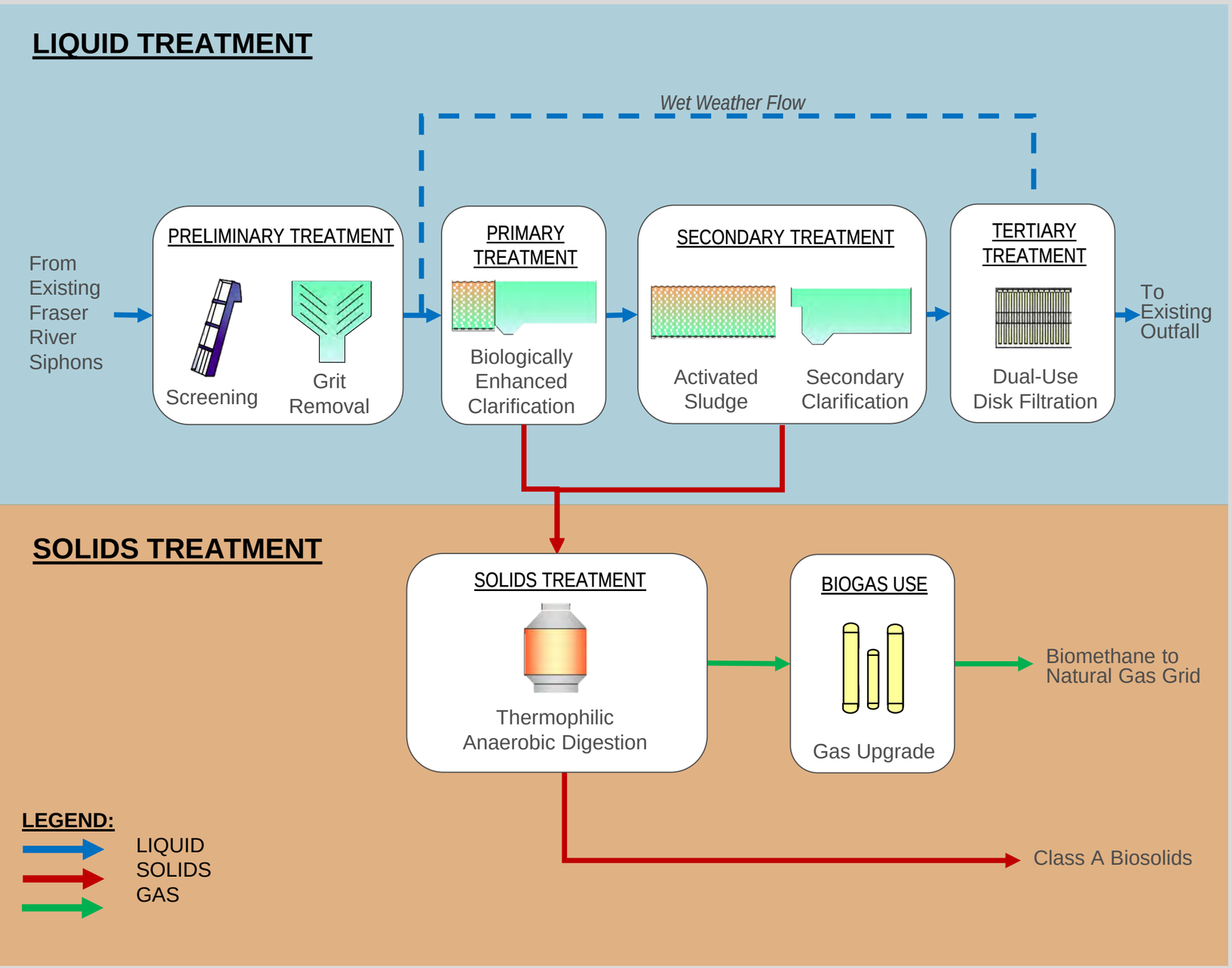
- Effluent heat recovery
- Biogas → Electricity and heat
- Class A biosolids

Concept 1 - Site Layout



Concept 2 – Tertiary Filtration



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Resource Recovery Opportunities

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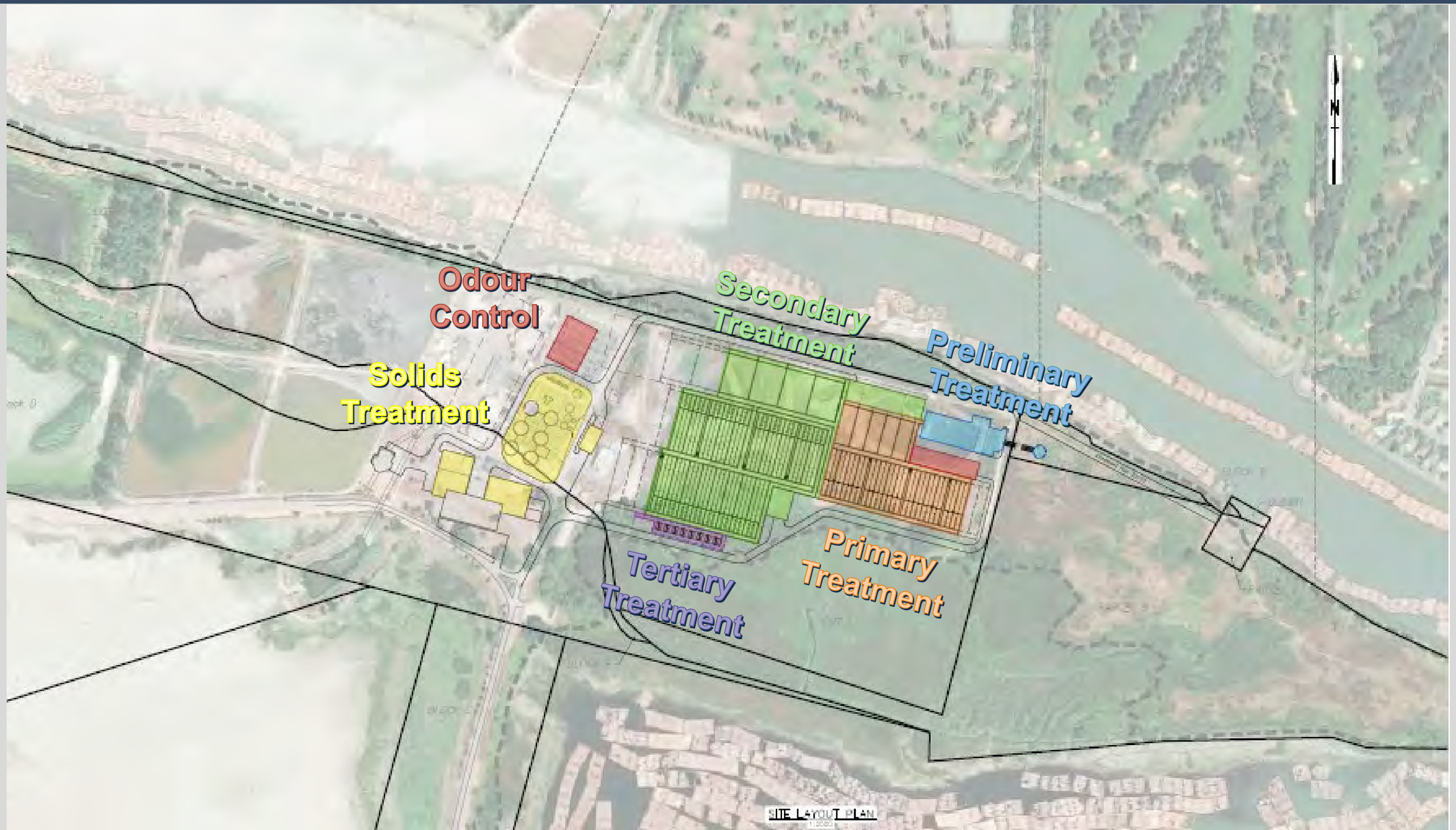
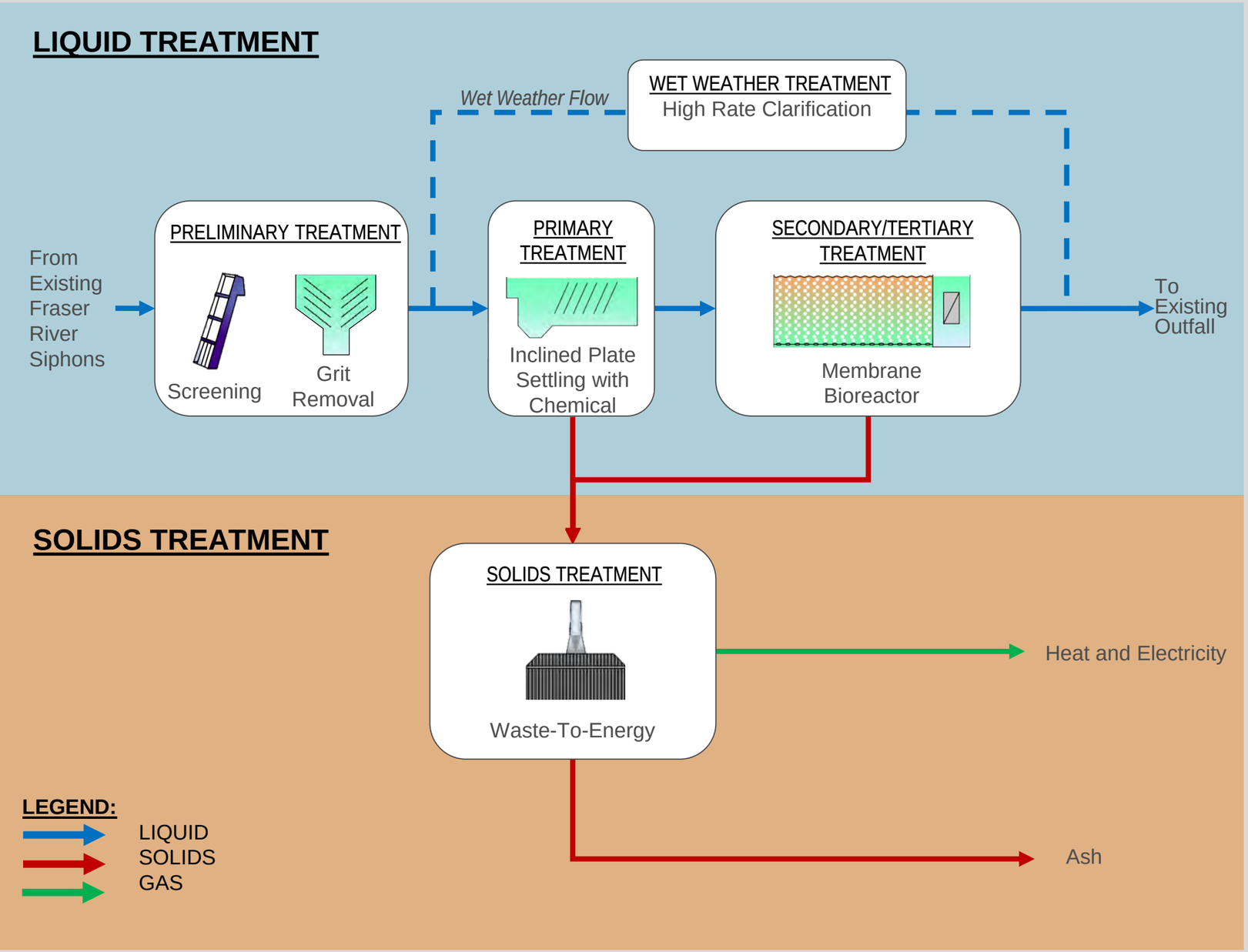
- Biogas → biomethane → grid
- Class A biosolids

Concept 2 - Site Layout



Concept 3 – Tertiary Membrane Bioreactor (MBR)



Key Features

- Secondary and Tertiary level treatment achieved within small footprint
- Opportunities for effluent reuse
- Ash management in lieu of biosolids

Resource Recovery Opportunities

- Reclaimed water
- Effluent heat recovery
- Heat and electricity recovery
- Beneficial use of ash

Concept 3 - Site Layout