Sewer Extension South Liquid Waste Management Plan Addendum
Joint Technical and Public Advisory Committee

Meeting #2 – November 23, 2022

Comox Valley
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Welcome

The CVRD respectfully acknowledges that the proposed Sewer Extension South Project will be constructed and operated on the unceded traditional territory of the K'ómoks First Nation, the traditional keepers of the lands and waters this project strives to protect.

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Today's Goals

Details on:

- Sewer Extension South Project
  - Proposed project phasing
  - Forcemain alignment
  - Collection system options
  - Pump station design
- Decision Making Process
- Meeting #3

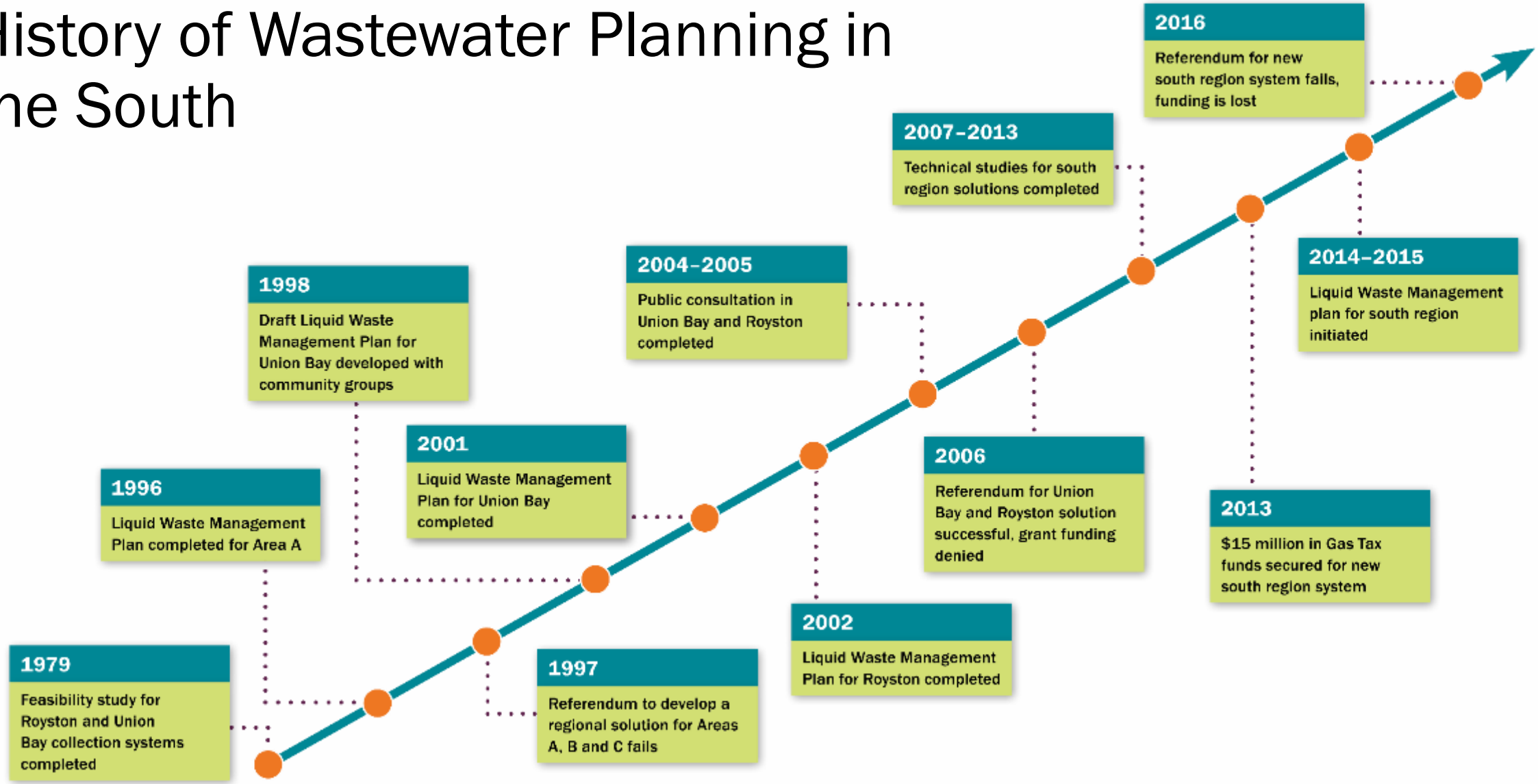
Abbreviations

CVRD	→	Comox Valley Regional District
CVSC	→	Comox Valley Sewage Commission
EASC	→	Electoral Areas Services Committee
CVSS	→	Comox Valley Sewage Service
CVWPCC	→	Comox Valley Water Pollution Control Center
EIS	→	Environmental Impact Study
LWMP	→	Liquid Waste Management Plan
SES	→	Sewer Extension South
PAC	→	Public Advisory Committee
TAC	→	Technical Advisory Committee
MoECCS	→	Ministry of Environment and Climate Change Strategy

Meeting #1 recap

- Minutes
  - Past LWMP work & options analysis
  - LWMP addendum process/scope
  - Current project concept
- Follow up questions?

History of Wastewater Planning in the South



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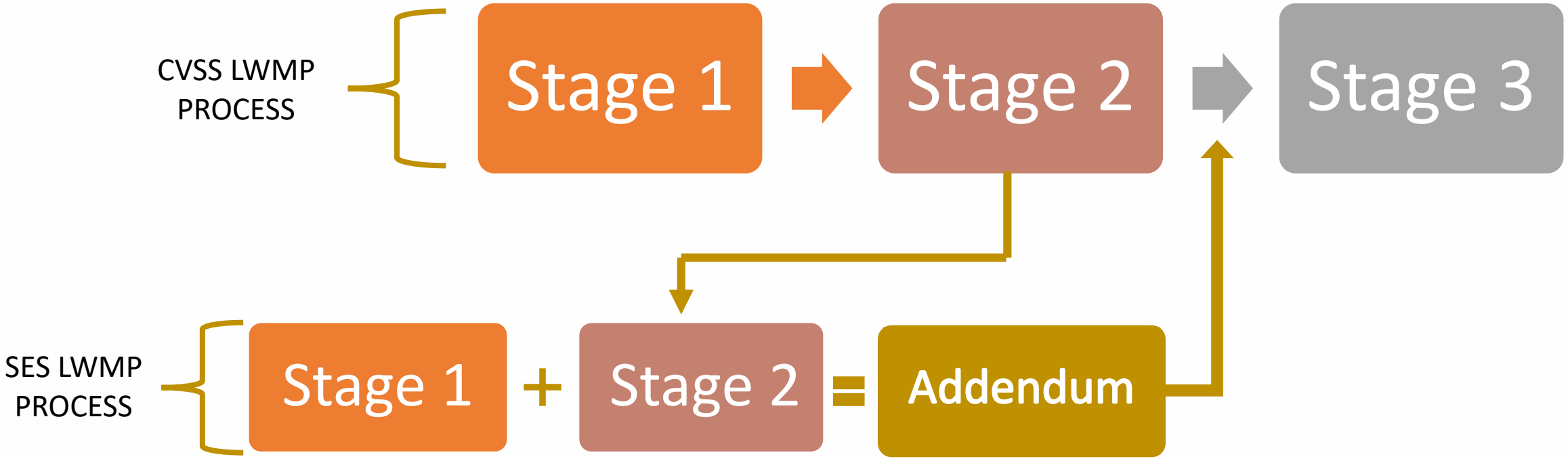
LWMP 3-Stage Process



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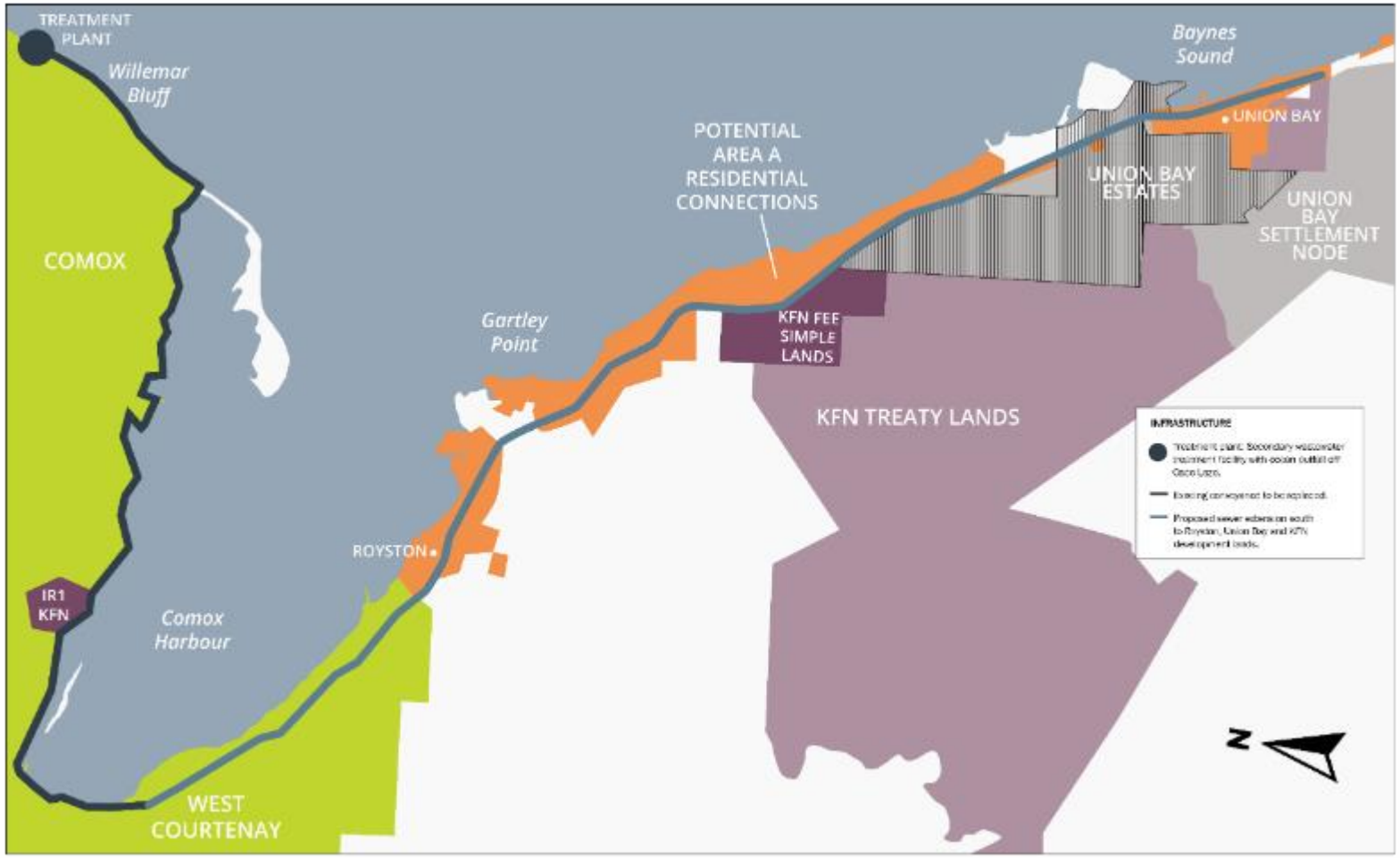
Sewer Extension South – Project Overview

- 13km sewer forcemain
  - Union Bay to Courtenay
- Local collection systems
- Pump stations
- Several phases
- Expansion for future development



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Sewer Extension South - Project Concept

Questions:

- Does the committee have any questions/concerns about the project concept?
- Additional information needed on past options analysis or investigations?

Island Health

Environmental Health Protection Services

Rory Beise
Land Use/Drinking Water Consultant
Nov 23, 2022

Excellent health and care for everyone, everywhere, every time.

Island Health & Sewerage Information

- Septic systems are an important wastewater treatment option for homeowners where sewers are unavailable .
- Properly working systems provide environmentally friendly and economical solutions to domestic wastewater treatment.
- Non-functioning/failing sewerage systems pose significant environmental and public health hazards.
- Such hazards include the discharge of microbial (bacteria, viruses, and parasites) pathogens into the environment.
- Improperly disposed (or treated) chemical pollutants as well.

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Island Health & Sewerage Information

- The typical lifespan of a septic system is 15 to 40 years
- All systems will eventually fail and will require replacement and repairs
- Proper maintenance can extend the lifespan
- Complexity (Type) of system requires increased maintenance
  - Type 1 (Septic Tank and Gravity Dispersal)
  - Type 2 (Engineered Treatment Systems): 45 ppm BOD & TSS
  - Type 3 (Enhanced Treatment Systems): 10 ppm BOD & TSS
- Complexity of system depends on property constraints including:
  - Setbacks to wells, water bodies, property lines, and other legal boundaries
  - Onsite Soil Conditions
  - Lot Size - Island Health recommends 1 Ha (Well Water) or 0.2 Ha (City Water)

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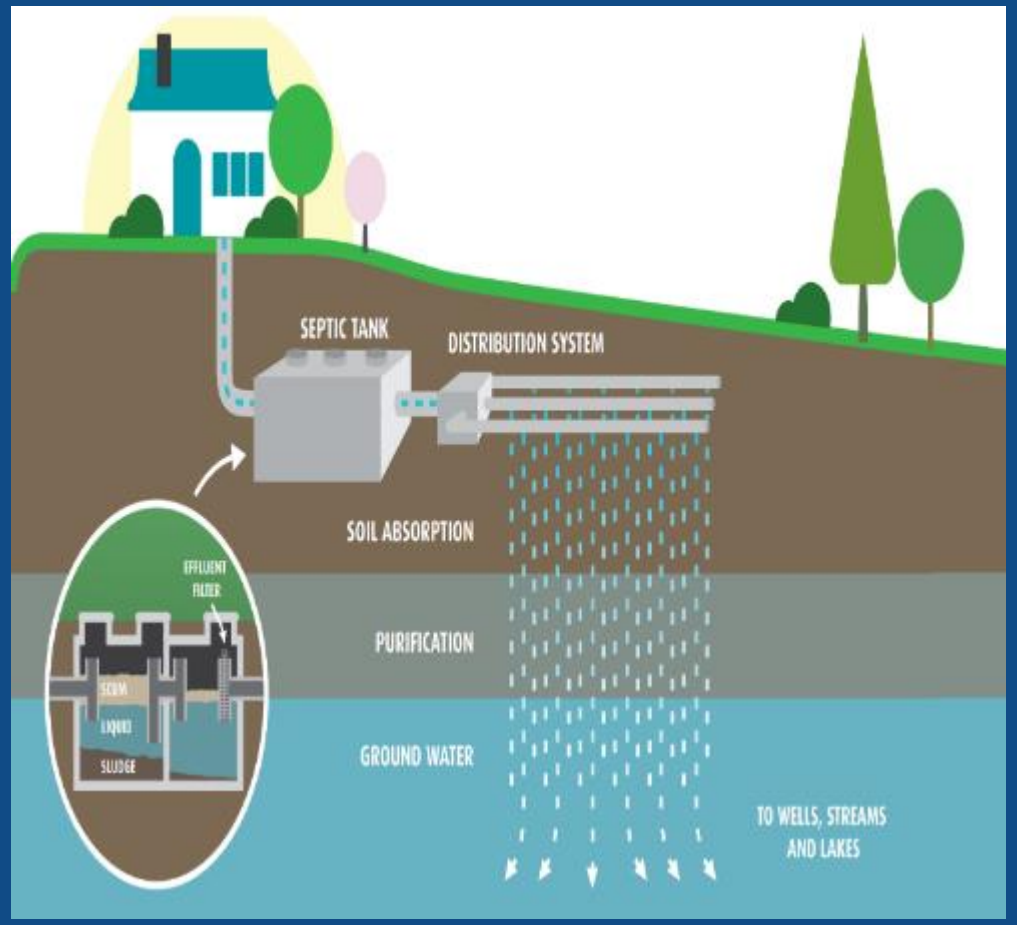
Island Health & Sewerage Information



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Island Health & Sewerage Information

- Maintenance is critical to the proper functioning of a sewerage system.
- Effective maintenance becomes increasingly critical as system complexity increases: Type 1 < Type 2 < Type 3
- In BC the provincial legislation places the requirement for sewerage system maintenance on the homeowner in accordance with the maintenance plan provided and keep records of maintenance.
- In BC maintenance (and construction) must be done by an AP or supervised by AP (Authorized Person)
- AP's: Registered Onsite Wastewater Practitioners (ROWP's) or P. Engineers
- Only P. Eng can construct or maintain Type 3 (or >9,100 L/Day) Systems
- Some local governments have enacted bylaws (CRD Bylaw 3479) which requires homeowners to maintain their sewerage systems.

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Island Health & Sewerage Information

- CRD Bylaw Requires:
  - Type 1 Systems to pump out tank every 5 years
  - Type 2& 3 Systems to have an AP to conduct a maintenance inspection and complete any required maintenance annually

The current (2020) industry costs on Vancouver Island are estimated to be as follows:

Pumping a septic tank:	$400 - $1200 (600 – 1000 gallon tank)
Inspection:	$600 - $1200
Maintenance, cleaning or repairs:	$90-110 per hour

- Estimated Septic System Replacement Costs

» Type I: $10,000 to $20,000
» Type II: $20,000 to $30,000
» Type III: $30,000 to $50,000

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Island Health & Sewerage Information

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Island Health/CVRD Sewage Statistics

- Town (Properties Onsite Septic){% of Lots smaller than 0.2 Ha}
- **Union Bay** (249){95%}
  - 46% (113)have no records of sewerage systems
  - Lots (136) with records:
    - 20% ~40+ years old
    - 20% ~30 years old
    - 15% ~20 years old
    - 26% ~15 years old
    - 15% <10 years old
  - Type 1 (62%), Type 2 (27%), Type 3 (9%), Holding Tank (1.4%)
  - Repair/Replacement (30%), New Construction (60%), Alterations (10%)

Island Health/CVRD Sewage Statistics

- **Kilmarnock** (231){72%}
  - 10% (21) have no records of sewerage systems
  - Lots (210) with records:
    - 40% ~40+ years old
    - 25% ~30 years old
    - 12% ~20 years old
    - 12% ~15 years old
    - 12% <10 years old
  - Type 1 (81%), Type 2 (14%), Type 3 (5%)
  - Repair/Replacement (13%), New Construction (83%), Alterations (4%)

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Island Health/CVRD Sewage Statistics

- **Royston** (459){71%}
  - 30% (139) have no records of sewerage systems
  - Lots (320) with records:
    - 26% ~40+ years old
    - 20% ~30 years old
    - 15% ~20 years old
    - 18% ~15 years old
    - 21% <10 years old
  - Type 1 (78%), Type 2 (20%), Type 3 (3%), Holding Tank (<1%)
  - Repair/Replacement (54%), New Construction (35%), Alterations (10%)

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Island Health/CVRD Sewage Statistics

Overall Observations of Data:

- 30% of all lots (939 Total) have no records of sewerage systems
- 30% of all lots with records are ~40+ years old
- 22% of all lots with records are ~30 years old
- 14% of all lots with records are ~20 years old
- 18% of all lots with records are ~15 years old
- 18% of all lots with records are <10years old
- 70% Type 1 Systems, 24% Type 2 Systems, 6% Type 3 Systems
- 90-95% of construction is identified as repairs or replacement

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Island Health/CVRD Sewage Statistics

Overall Observations of Data:

- 70-95% of lots are under Island Health recommended size of 0.2 Ha
  - Indicates replacement/repairs will likely require complex and expensive options
- 64% of all lots with records indicate that systems are 20 to 40+ years old
  - Indicates these systems are likely at end of life and require repair/replacement
- 30% of all lots have no records indicating unknown age or standard (if any) to how these systems were constructed
  - No construction standard available would require upgrade to today's standards for repairs
- 30% of all lots with records indicate complex sewerage systems (Type 2/3)
  - Complex systems require maintenance by AP (supervised), which adds costs to lifespan
- There are no sewerage maintenance bylaws in these areas
  - Without regular maintenance Type1 system lifespan is estimated to be ~10-15 years

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Island Health/CVRD Sewage Statistics

Estimated Replacement & Maintenance Costs (25 years)

- Type 1: $15,000 + $10,000 = $25,000
- Type 2: $25,000 + $35,000 = $60,000
- Type 3: $40,000 + $40,000 = $80,000

- When systems fail and need replacement/repair, funds need to be readily available or through approved lending by the homeowner.
- Some parts of connection fees to municipal services can be amortized through property tax payments
- Connection to municipal services can free up septic maintenance and repair costs and increase useable space on property

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Questions for Island Health

Rory Beise

Land Use/Drinking Water Consultant

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Email: rory.beise@islandhealth.ca

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References

- Capital Regional District, Protecting Your Septic System (https://www.crd.bc.ca/education/stormwater-wastewater-septic/at-home/protecting-septic-system)
- Capital Regional District, Bylaw No. 3479 (https://www.crd.bc.ca/docs/default-source/crd-document-library/bylaws/liquidwasteseptagesewersourcecontrolandstormwater/3479---onsite-sewage-system-maintenance-bylaw-2007B.pdf?sfvrsn=3cc83e72_0)
- Cowichan Valley Regional District, Septic Savvy (https://www.cvrd.ca/2300/Septic-Savvy)
- Fraser Valley Regional District, Sewer & Septic (https://www.fvrd.ca/EN/main/services/sewer-septic/faq.html)
- Island Health, Subdivision Standards (2020) (https://www.islandhealth.ca/sites/default/files/environment/documents/subdivision-standards.pd)
- Sewerage System Practice Manual, Version 3 (2014), Health Protection Branch, Ministry of Health (https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/spmv3-24september2014.pdf)
- Sewerage System Regulation, B.C. Reg. 326/2004, King's Printer (https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/326_2004)

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CVRD Updates

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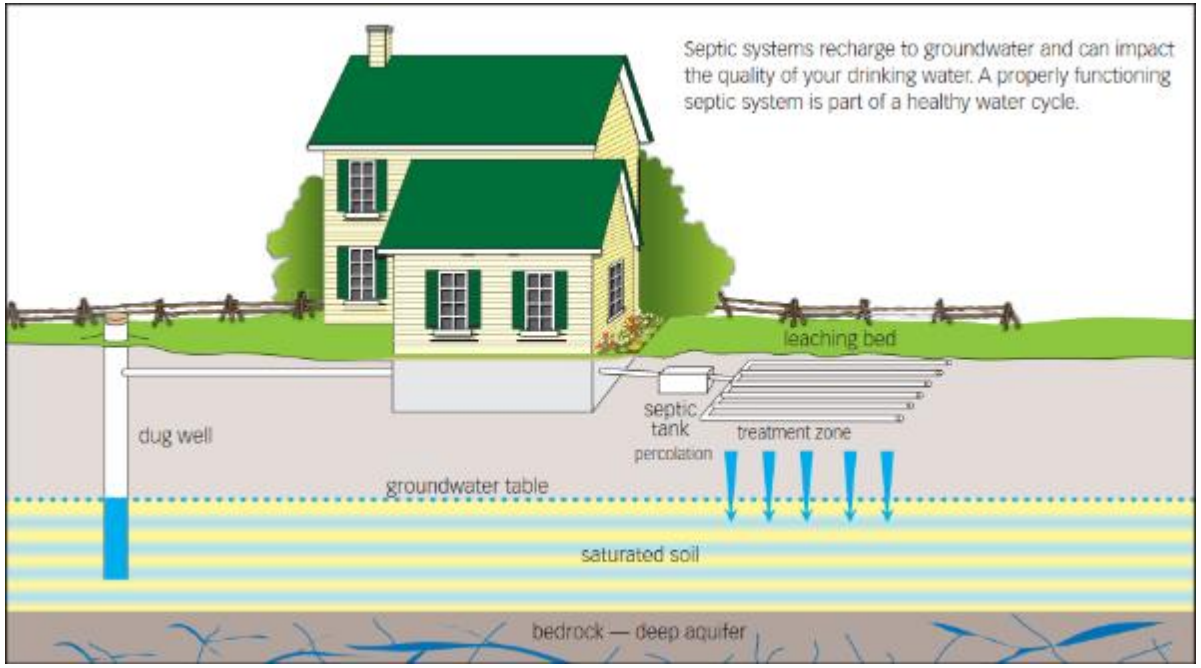
Septic System Regulatory Options - Background

- Approximately 9,000 septic systems in electoral areas
- Sewerage System Regulation – owner responsible for system maintenance
- 2016 staff research into other RD practices
- 2018 launch of CVRD's septic education program
  - www.comoxvalleyrd.ca/septic



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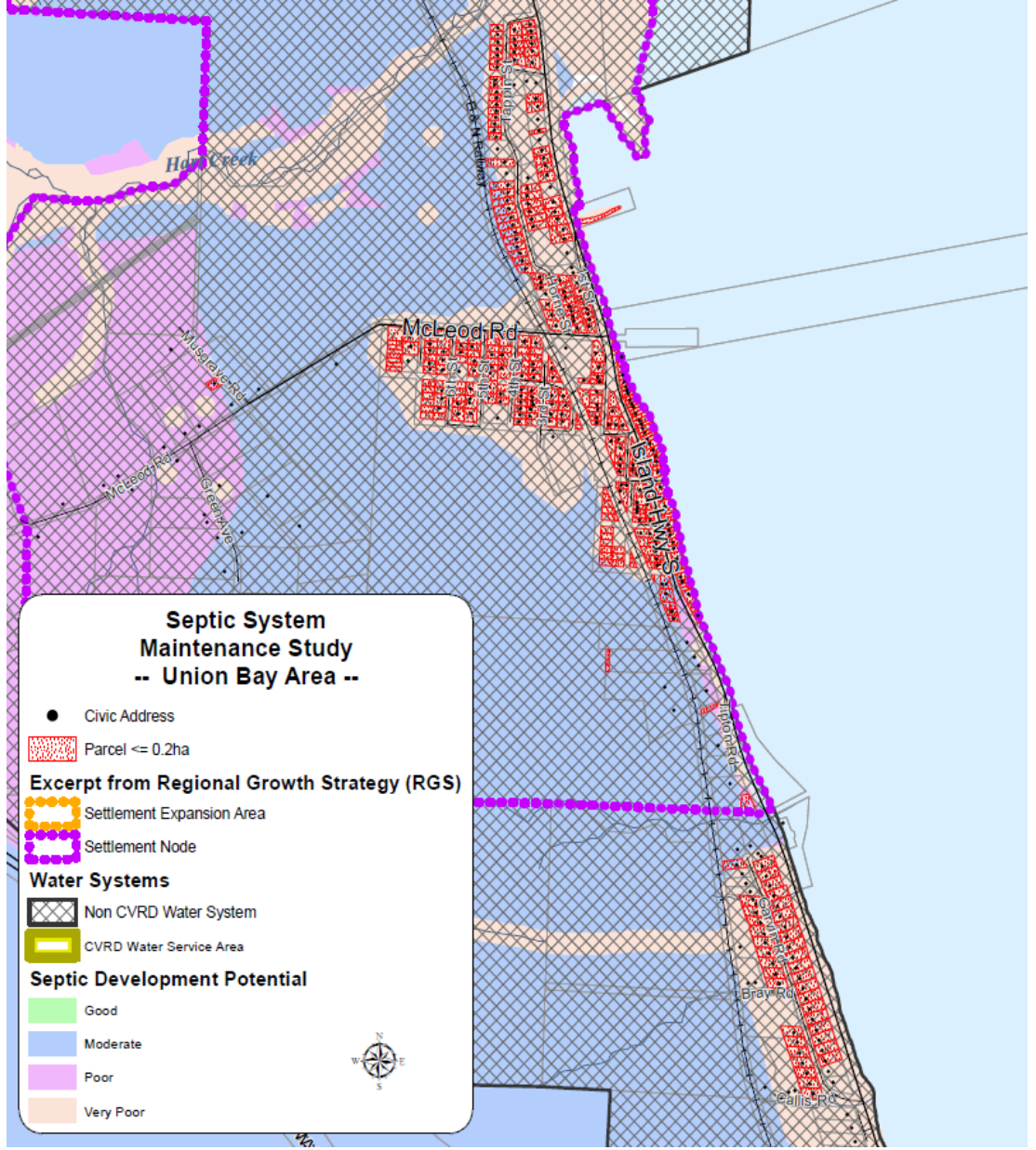
2020 Maintenance Program Options study

- Septic maintenance program options
- Septic failure risk assessment
  - Mapping areas of concern
  - Seven priority areas (including Royston & Union Bay)



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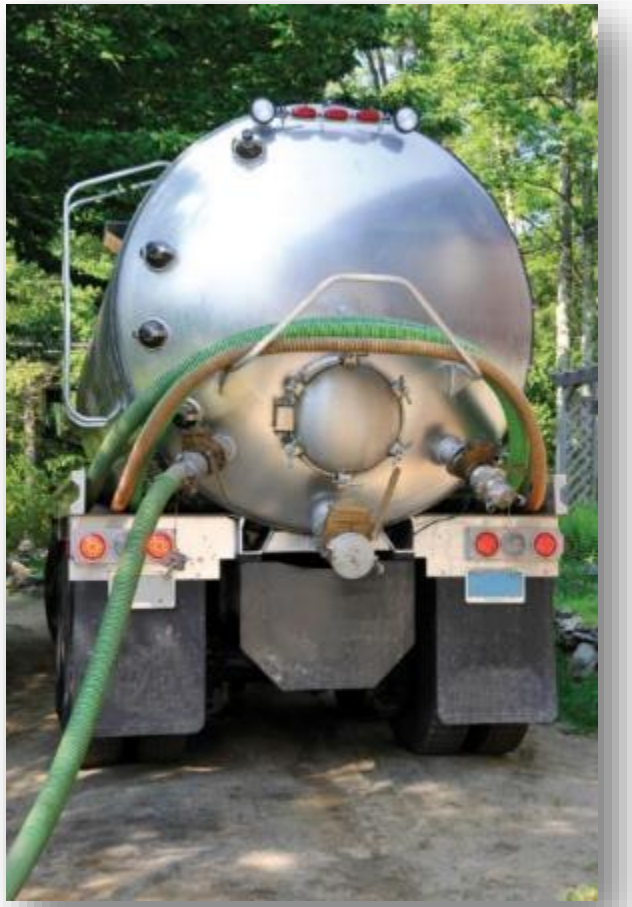
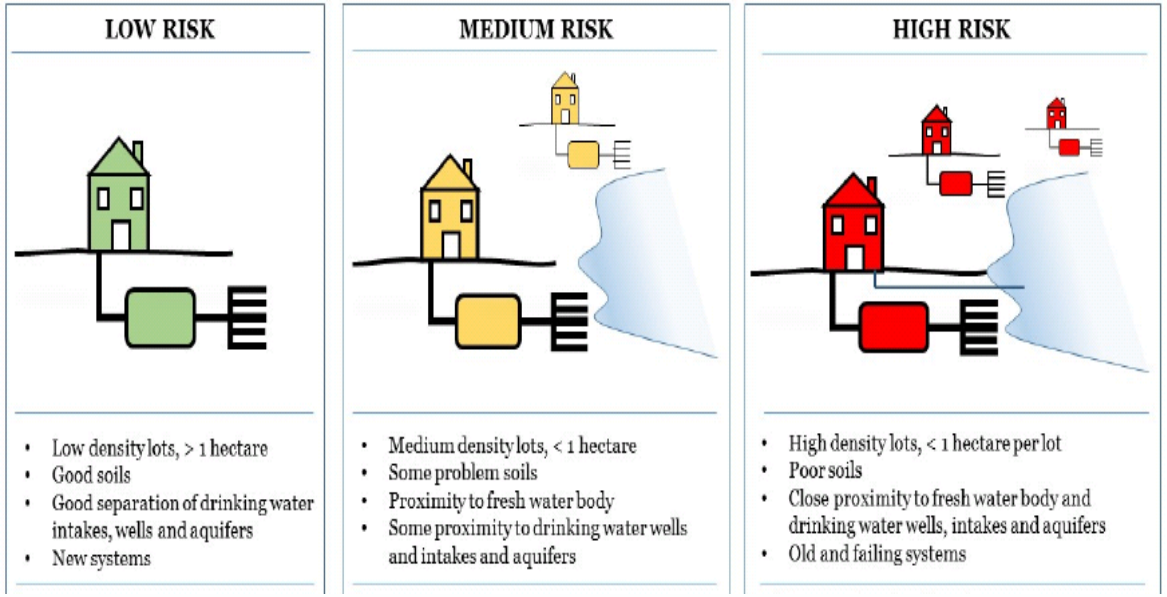
Maintenance Program Options



- Program options to encourage proper maintenance
  1. Mandatory pump-out
  2. Mandatory inspection
  3. Mandatory inspection and maintenance
- Program cost estimated between $330k & $1.8million
  - Dependent on program type & areas included
  - Not including repair/replacement costs

Regulatory Program Considerations

- Limited effectiveness:
  - High dwelling density
  - Poor ground conditions
  - High winter water table
- Septic System Repair/Replacement Costs
  - $15,000 - $50,000+
- Prior consideration during 2015 LWMP
- Only one RD septic regulatory program in BC – CRD



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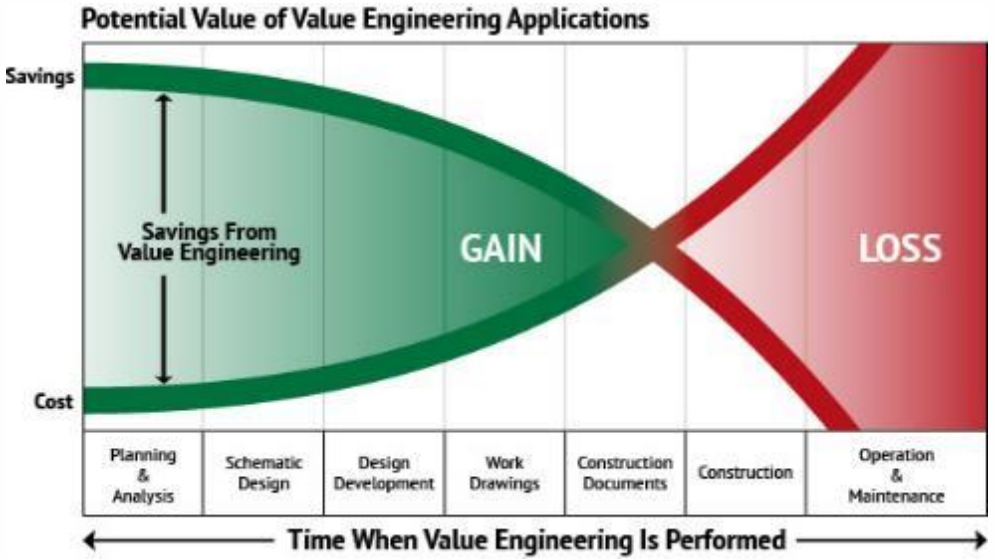
Land Use Considerations

- Zoning bylaw permits secondary dwellings on most residential properties
- Concerns with cumulative impact due to soil conditions and lot densities
- Proposed amendments to restrict secondary dwellings in parts of Electoral Area A until sewer servicing in place
  - Electoral Areas Services Committee, early 2023

Value Planning Workshop

- November 14 – 18
- Third-party review by team of subject matter experts
- Consider project through a function vs resources lens
- Preliminary outcomes



$$Value \sim \frac{Function}{Resources}$$

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Questions

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Discussion Paper #1

Conveyance Piping Design & Project Phasing

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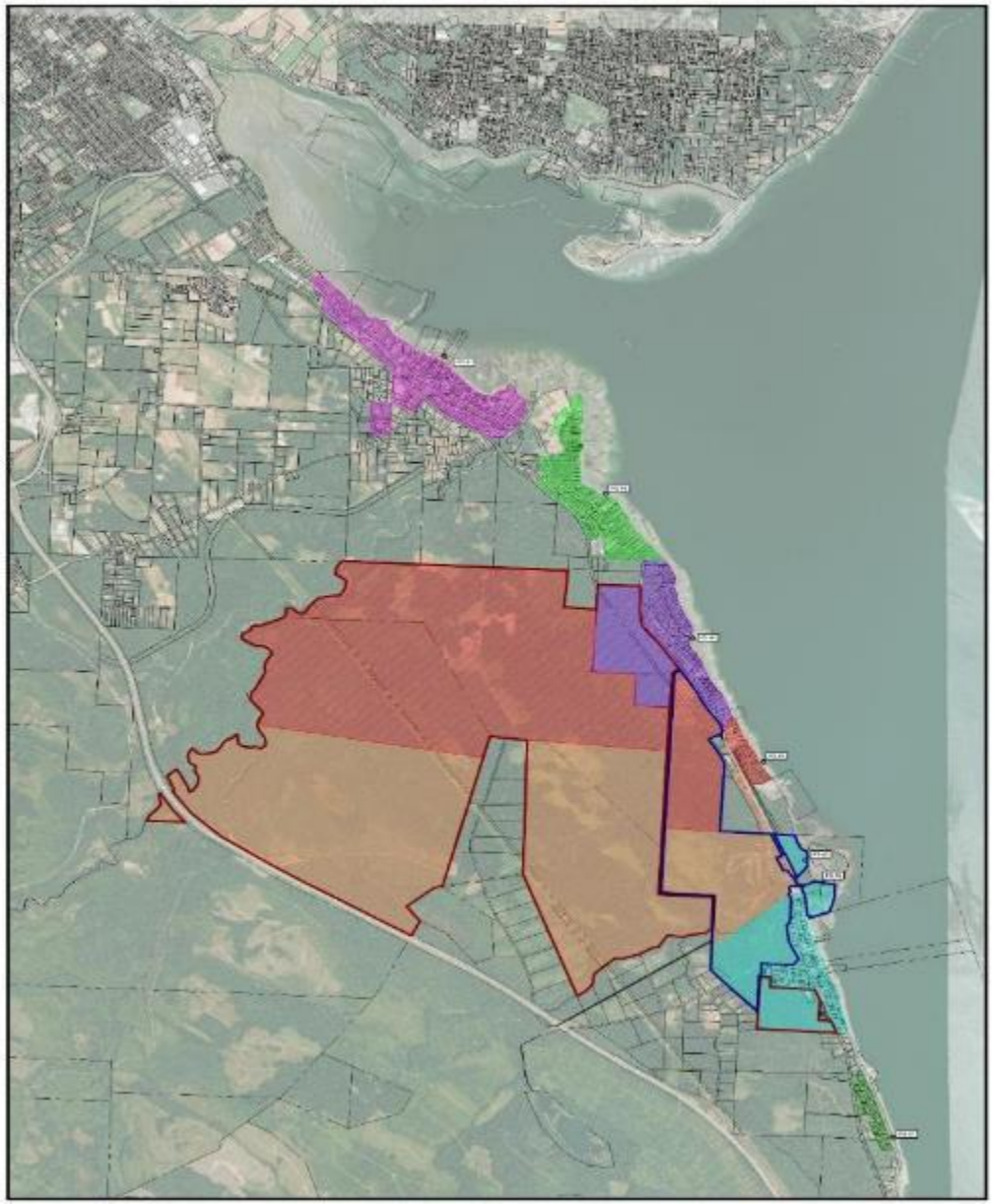
Population Projections

- Development projections are varied and uncertain
- High, medium and low growth scenarios were developed over the course of 50 years (2020 – 2070)

YEAR	ROYSTON	GARTLEY	KILMARNOCK	UNION BAY	NEW DEVELOPMENT AREAS	TOTAL
2020	986	372	593	819	0	2,770
2025	1,011	381	608	839	258	3,098
2040	1,090	411	655	905	3,428	6,489
2070	1,266	477	761	1,051	10,688	14,243

Catchment Areas



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Catchment Flows

		PS#1 Catchment	PS#2 Catchment	PS#3 Catchment	PS#4 Catchment	PS#5 Catchment	PS#6 Catchment	PS#7 Catchment	Total
2025	Population	1011	381	547	155	120	776	108	
	Area (ha)	133	81	72	115	151	128	15	
	Peaking Factor	3.2	3.2	-	-	-	-	3.2	
	ADWF (L/s)	2.8	1.1	3.5	0.4	0.3	2.2	0.3	10.6
	PDWF (L/s)	9.0	3.4	11.2	1.4	1.1	6.9	1.0	
	I&I (L/s)	8.0	4.9	4.3	6.9	9.1	7.7	0.9	
	PWWF (L/s)	17.0	8.2	15.5	8.3	10.1	14.6	1.8	75.5
2070	Population	1266	477	2943	3111	4085	3615	135	
	Area (ha)	133	81	145	169	206	163	15	
	Peaking Factor	3.2	3.2	-	-	-	-	3.2	
	ADWF (L/s)	3.5	1.3	20.9	8.6	11.3	11.8	0.4	57.8
	PDWF (L/s)	11.3	4.2	62.7	25.6	33.3	36.6	1.2	
	I&I (L/s)	8.0	4.9	8.7	10.2	12.3	9.8	0.9	
	PWWF (L/s)	19.2	9.1	71.4	35.8	45.6	46.4	2.1	229.6

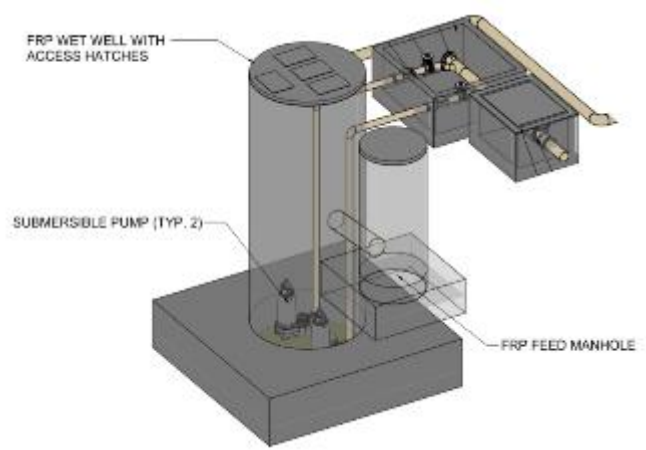
Design Constraints

The design considerations and engineering principles accounted for during the system configuration include:

- Minimum flushing velocity
  - Minimum velocity to reduce the settlement of solids
  - 0.75 m/s

PIPE SIZE (NOMINAL, MM)	PIPE SIZE (ID, MM)	MINIMUM FLOW TO ACHIEVE 0.75 M/S FLUSHING VELOCITY (L/S)
200	192	21.7
250	239	33.7
300	283	47.3

- Wet Well Sizing
  - Incoming flows contained in wet well until sufficient volume has accumulated to facilitate pumping at required higher flow.



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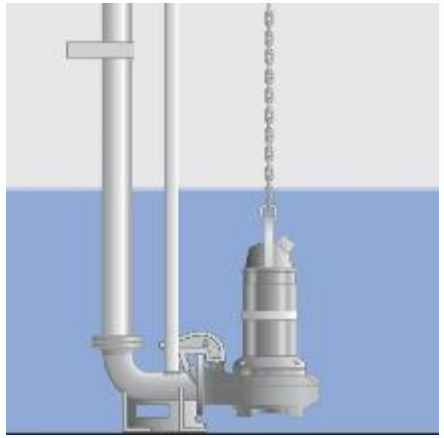
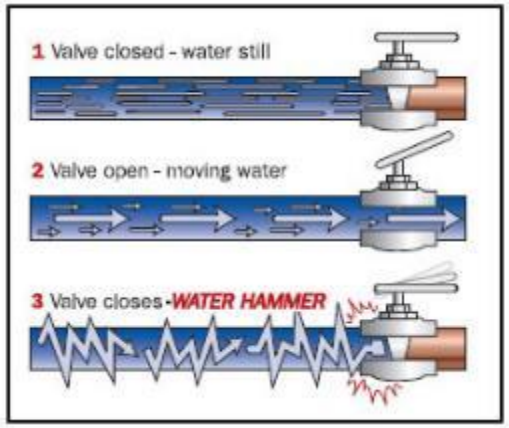
Design Constraints

- Pump Capacity
  - Centrifugal pump type required for handling solids and abrasive grit
  - Submersible pumps



Source: Flygt N-Technology N 3202 Pump| xylem - Official Website

- Transient Pressure
  - Changes in the flow result in pressure surges which propagate along the pipe from the source.



Source: Water Hammer| The Process Piping - Official Website

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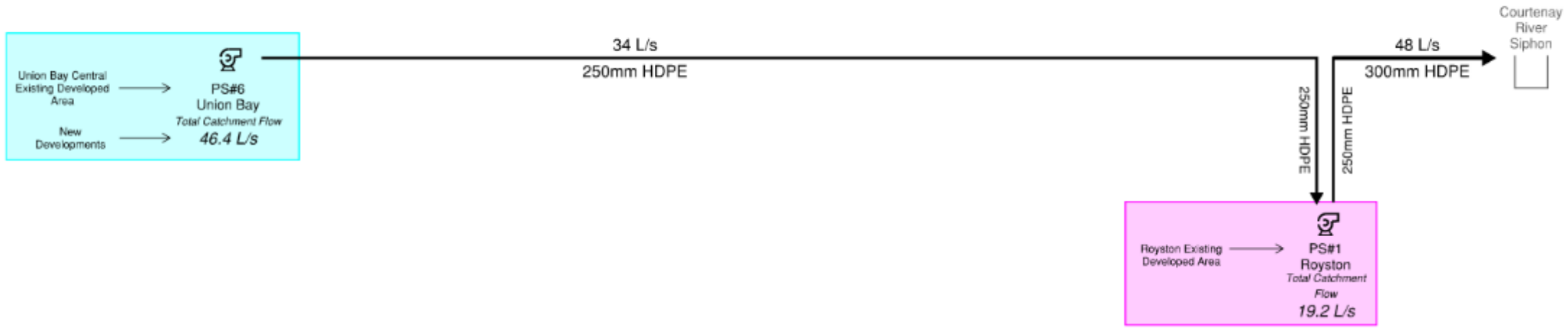
Process Flow Diagram: Phase 1A

Propsed Sewer Extension South Project to be funded in partnership by provincial/federal grants, CVRD Electoral Area A residents, K'ómoks, and Union Bay Estates



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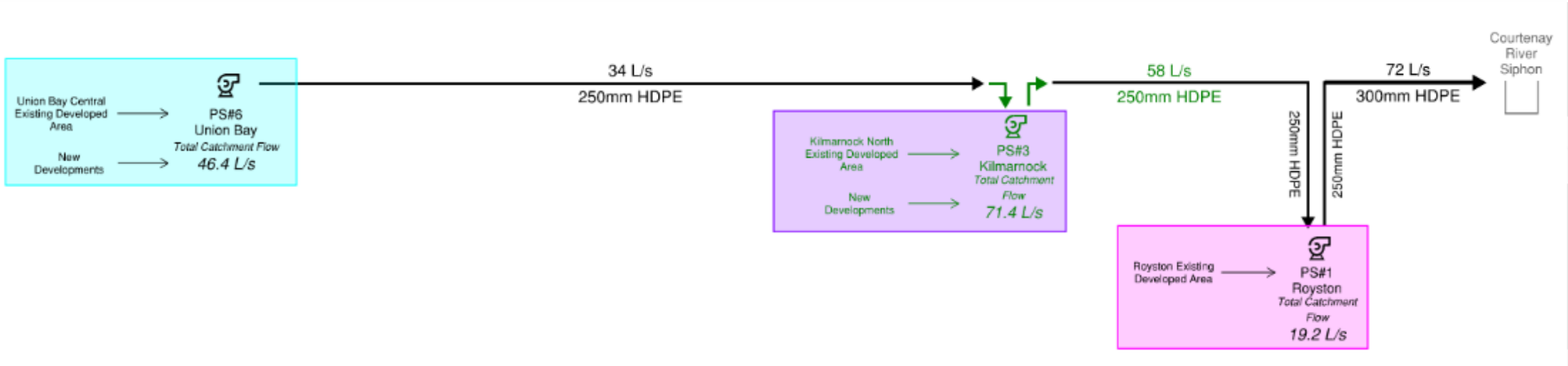
Process Flow Diagram: Phase 1B

Addition of PS#3 is required for Kilmarnock neighbourhood and K’ómoks First Nation lands



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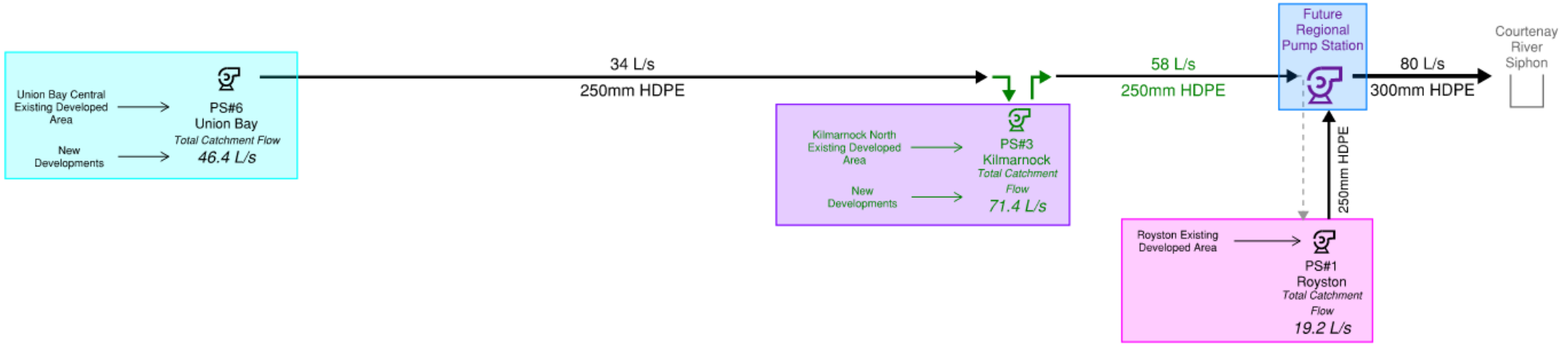
Process Flow Diagram: Long Term



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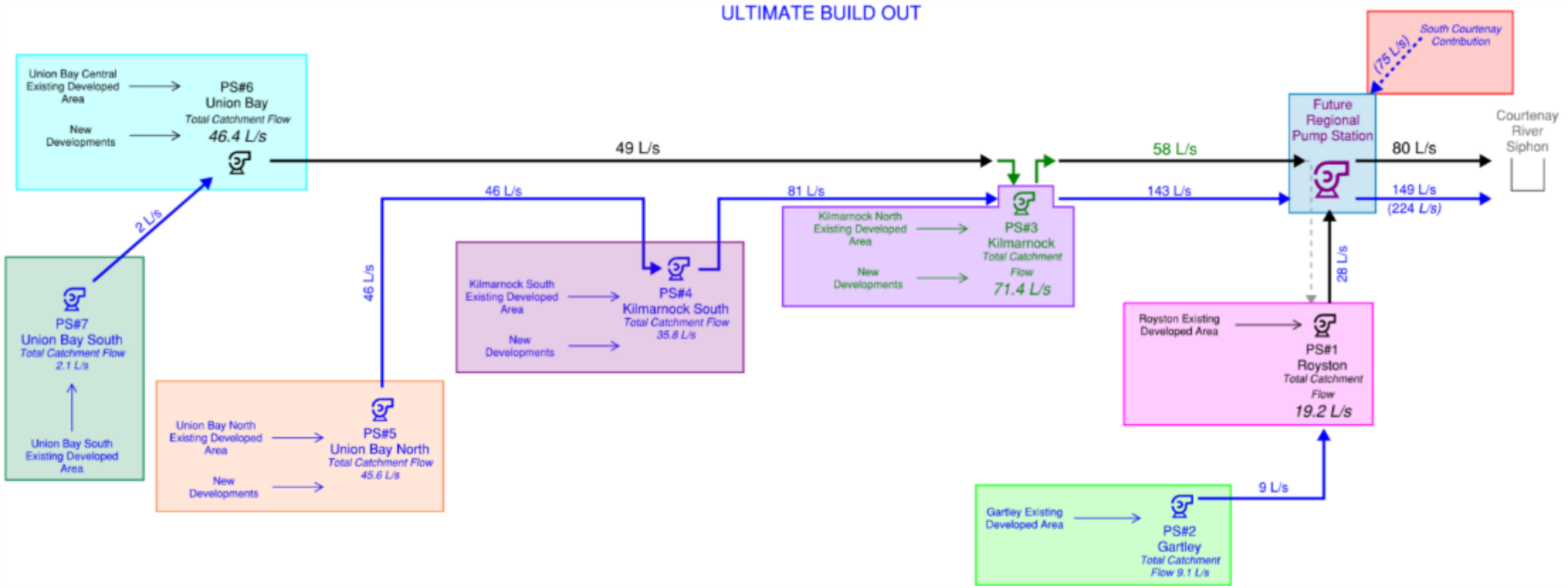
Process Flow Diagram: Ultimate Build Out



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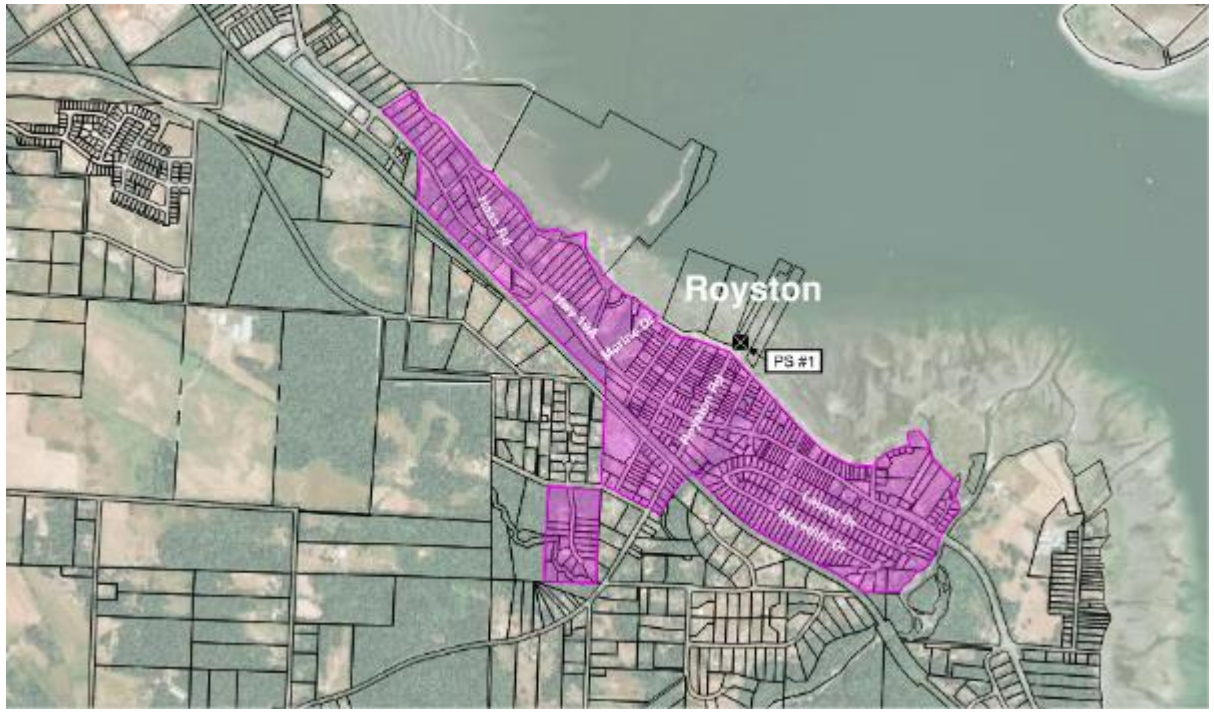
Phase 1A Catchment Selection

PS#1



PS#6

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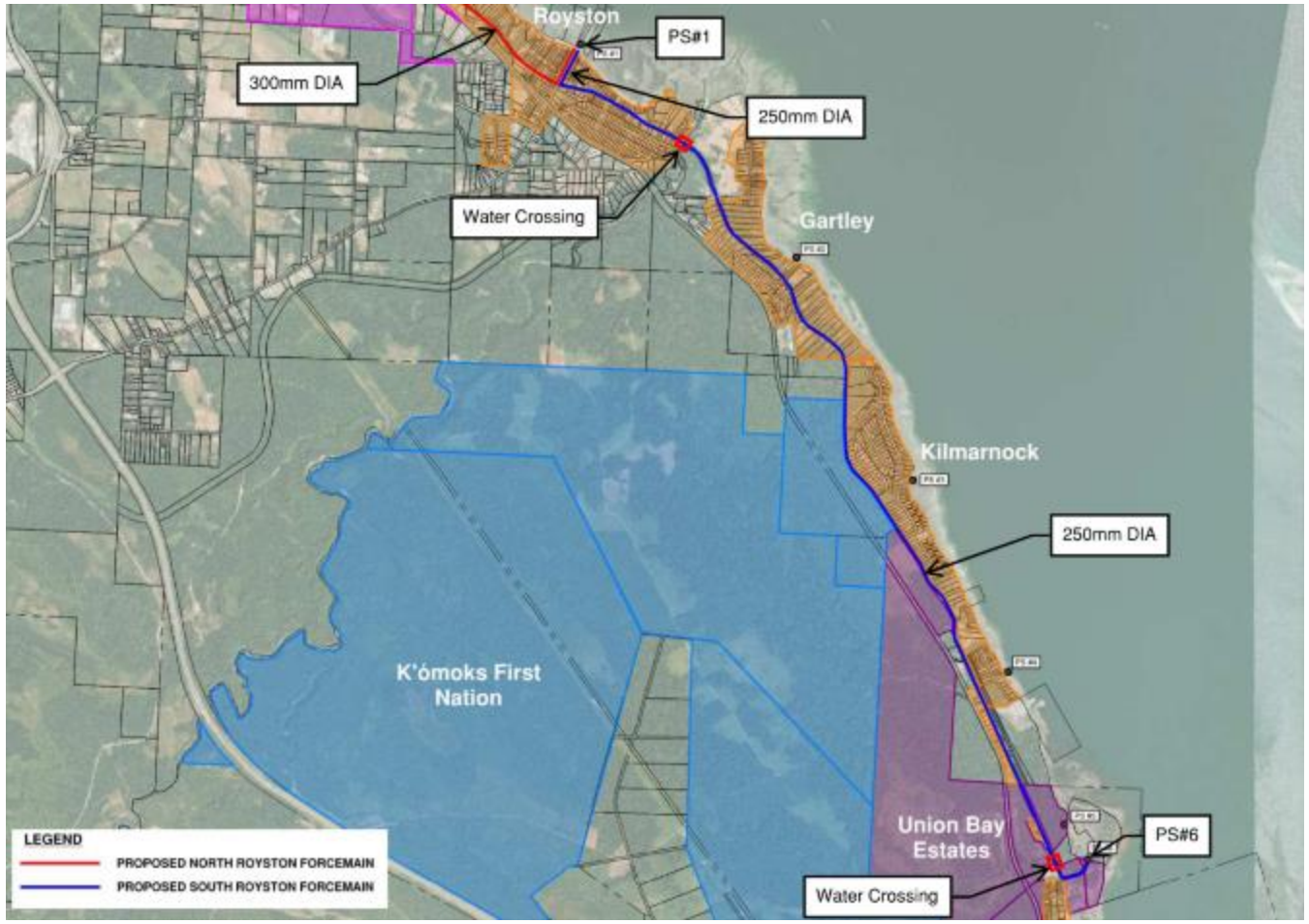
South Royston Forcemain



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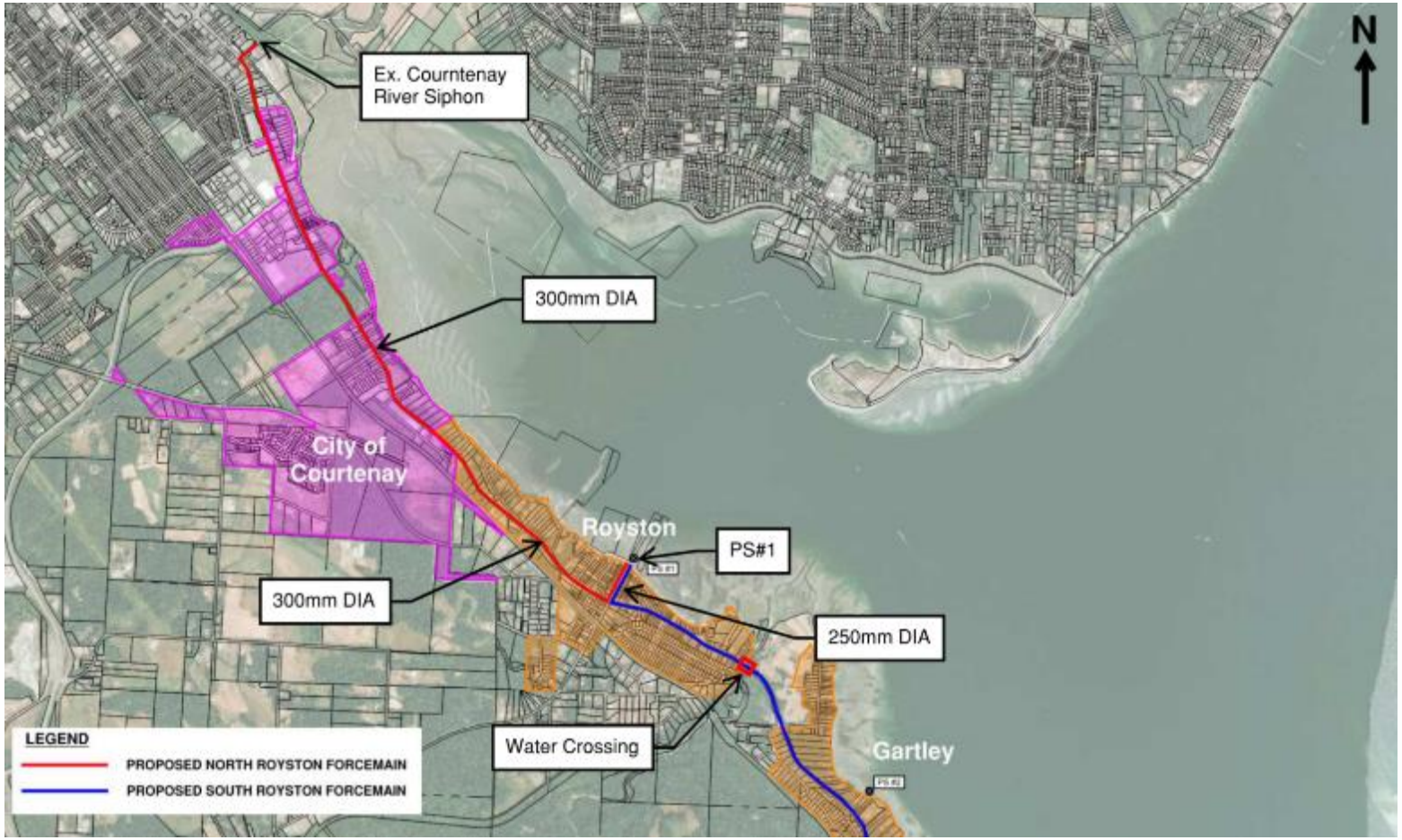
North Royston Forcemain



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Forcemain Cost Estimate

-Class C estimate
-2022 dollars

DESCRIPTION	COST
Highway 19A Forcemain	$ 19,053,000
General	$ 3,023,000
Subtotal All Items	**$ 22,076,000**
Contingency (30% of Subtotal)	$ 6,623,000
Engineering (10% of Subtotal + Contingency)	$ 2,870,000
Total	**$ 31,569,000**

Questions

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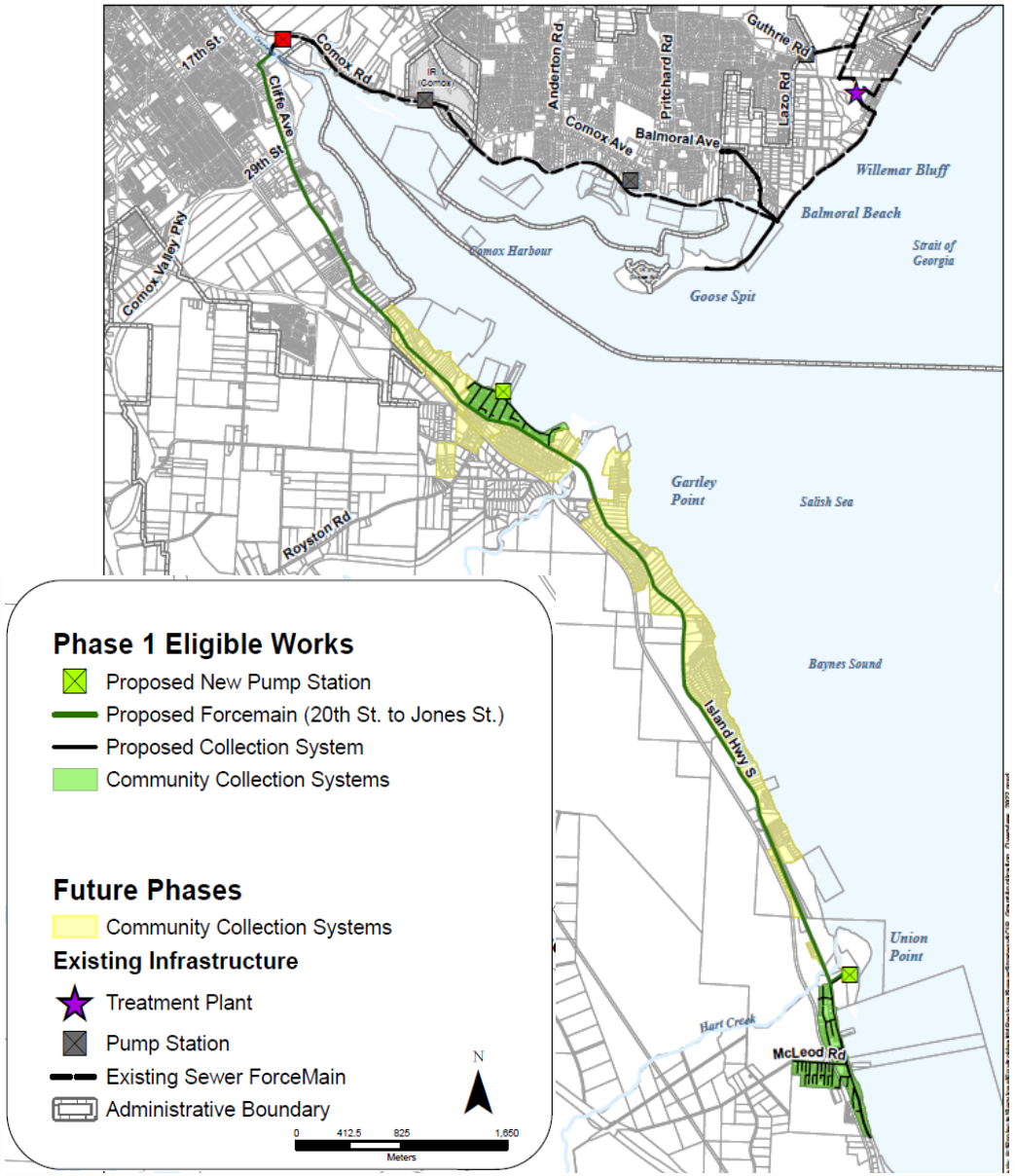
Initial Phase – Overview & Rationale

- Historic core of Union Bay & part of Royston
- Technical considerations
- Environmental need
  - Oldest septic systems
  - Smallest lots
- Funding program limits



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Committee Process – Forcemain Design & Project Phasing

- Support current initial phase?
- Criteria for future phasing?
  - Grant funding
  - Environmental need
  - Property owner petition
  - Partnership opportunities
  - Other?
- Value Engineering workshop – refine forcemain alignment

Discussion Paper #2

Collection System Options

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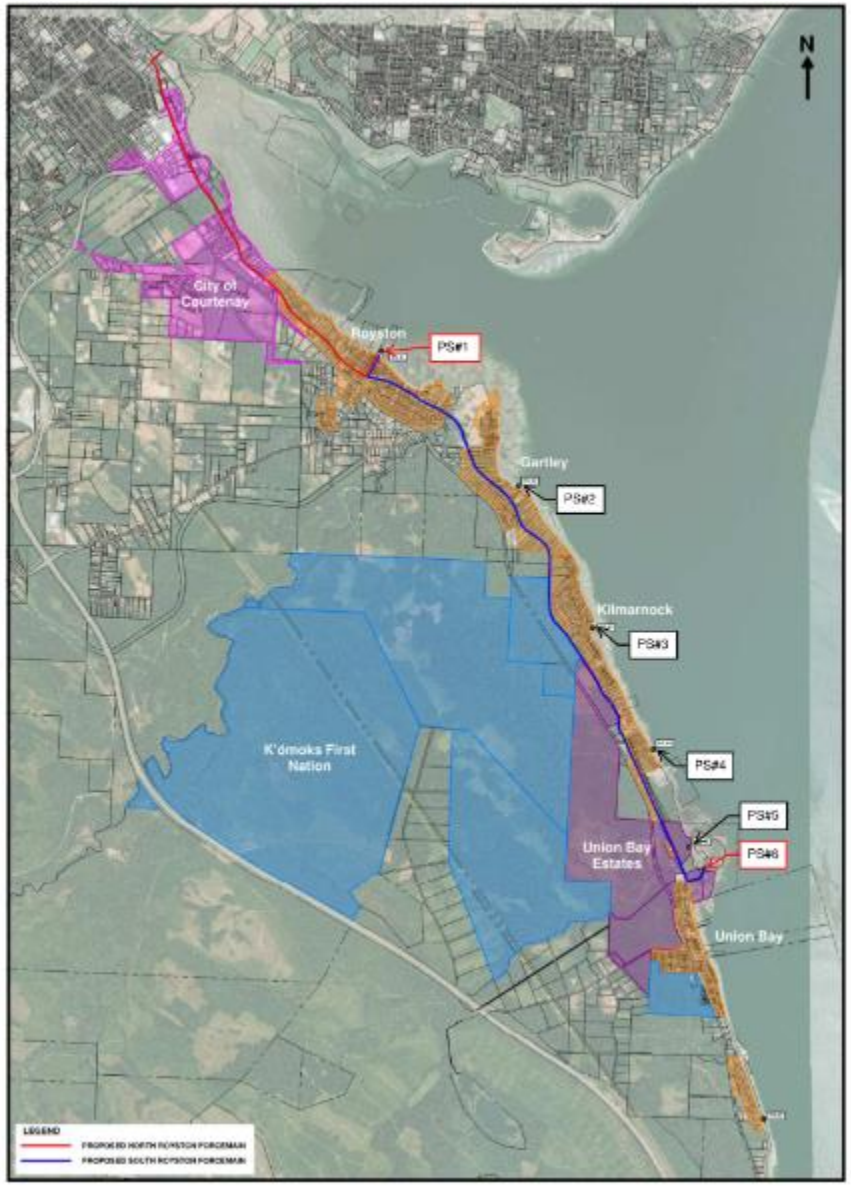
Background

- Wastewater Collection System Options Overview & Evaluation
- Wastewater Collection System Conceptual Design
- PS#1 and PS#6 Short-Term Design Considerations and Class “D” Cost Estimate



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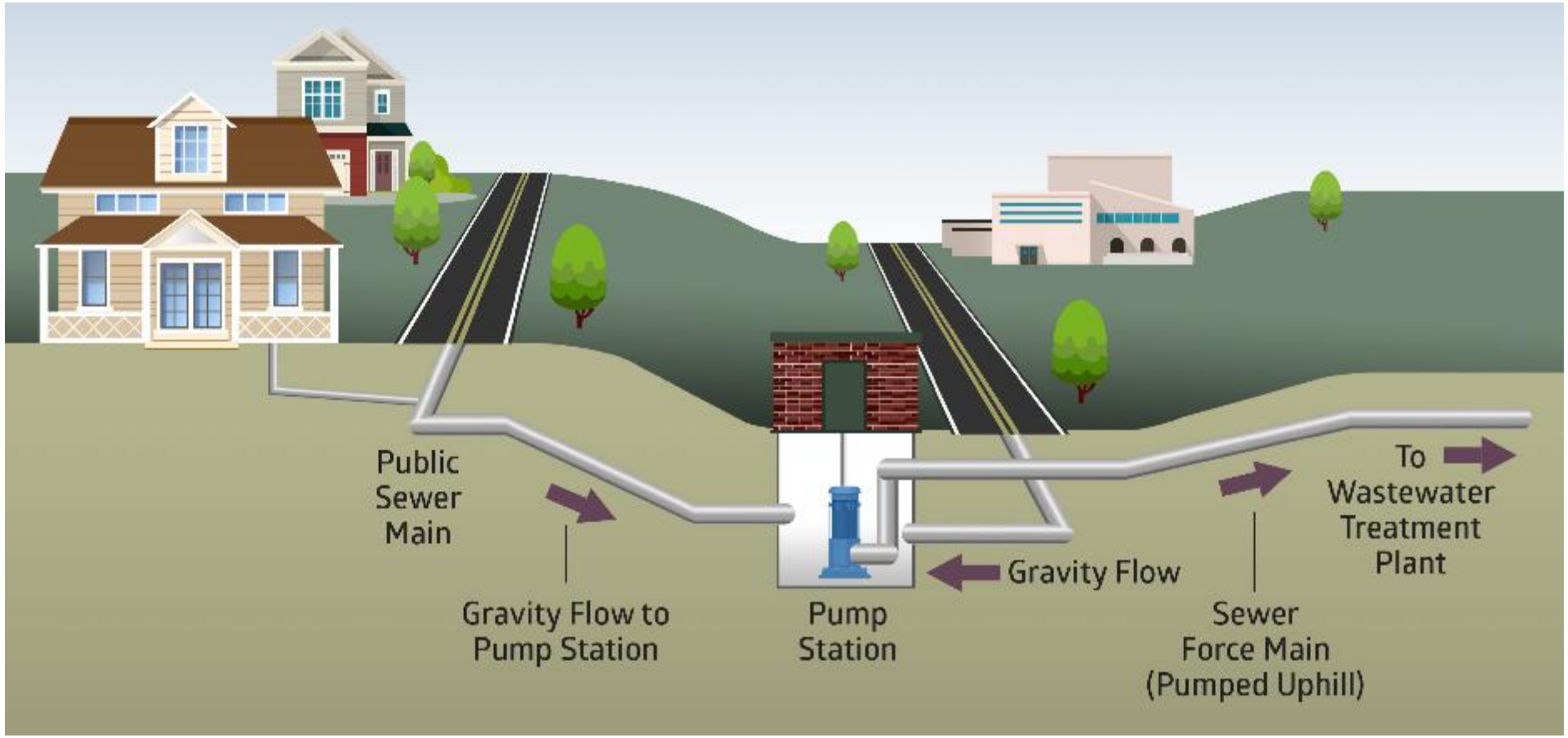
Options and Alternatives

- In total, seven (7) different collection system alternatives were evaluated:
  1. Gravity Sewer System
  2. Low Pressure Sewer (LPS) System
  3. Vacuum Sewer (VS) System
  4. Septic Tank Effluent Gravity/Pump (STEG/STEP)
  5. Gravity/LPS Hybrid
  6. Gravity/VS Hybrid
  7. LPS/VS Hybrid

ALTERNATIVE	FINAL SCORE
GS/LPS	**74.9**
STEG/STEP	73.8
GS/VS	69.8
GS	67.4
LPS	59.0
LPS/VS	50.8

Gravity Sewer System



Source: Sudbury Massachusetts CWMP Updates| Sudbury, MA - Official Website

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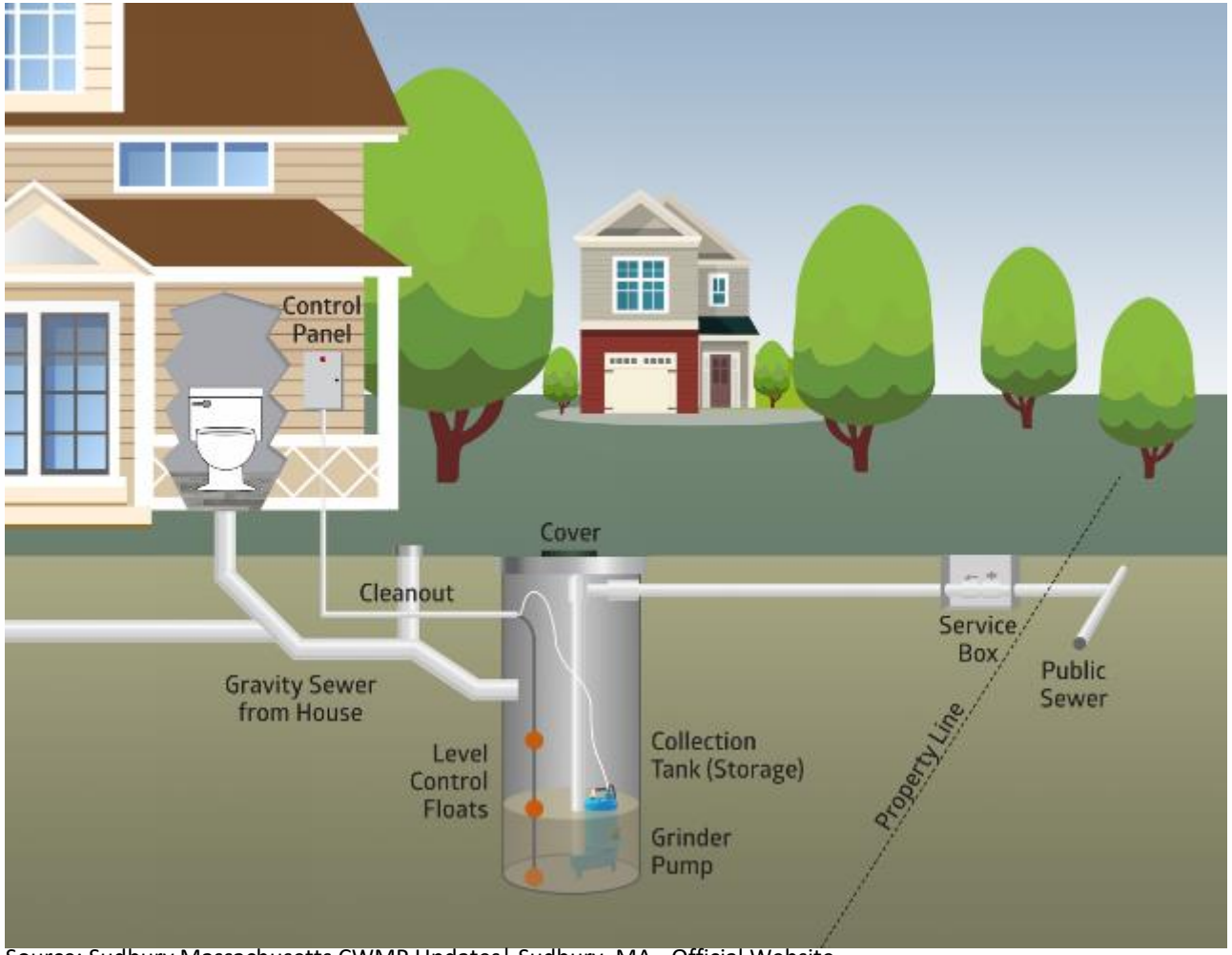
Low Pressure Sewer System



Source: Sudbury Massachusetts CWMP Updates| Sudbury, MA - Official Website

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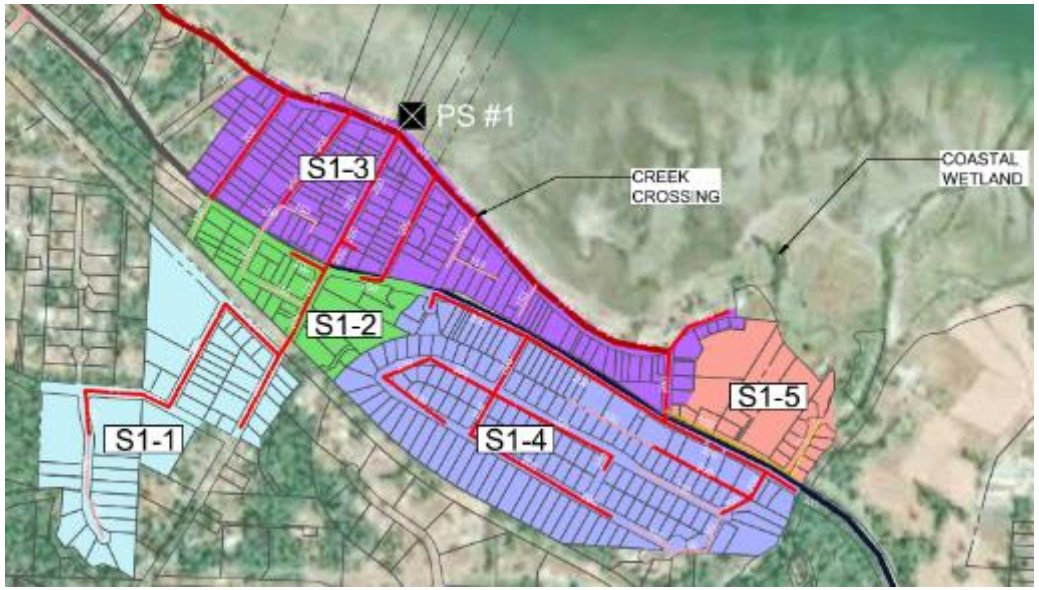
Short Term Conceptual Design

- 18 highway crossings (assumed via HDD)
- Foreshore installation review to replace gravity system in foreshore with LPS
- Phased approach to buildout, with focus on PS#1 and PS#6



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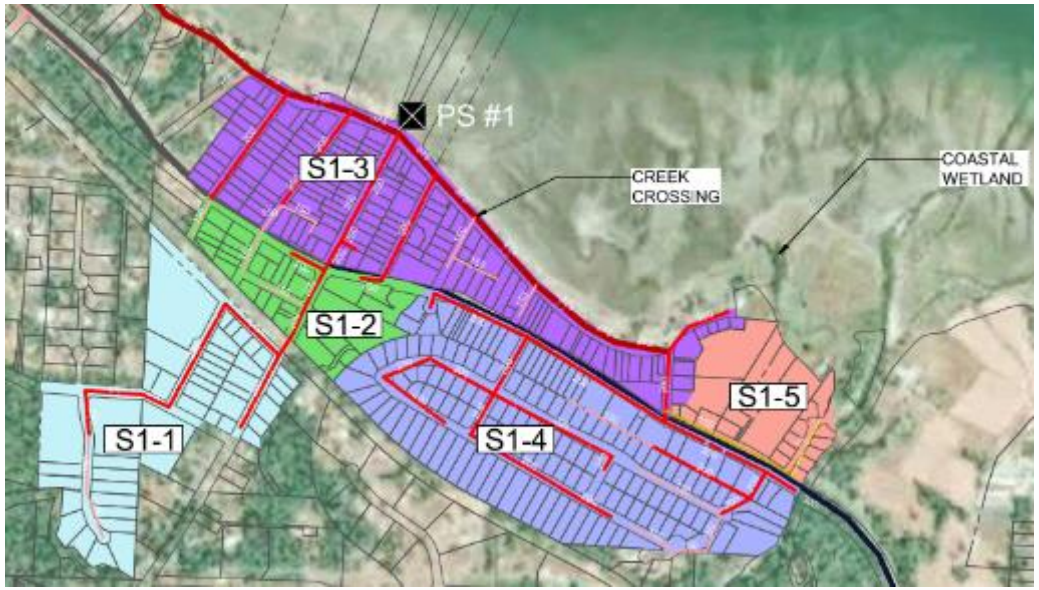
Cost Estimate

- PS#1 Catchment capital Cost Estimate



ITEM	DESCRIPTION	PRICE
1	**Collection system**	
1.1	Gravity – PVC SDR35	$ 3,541,000
1.2	Forcemain-HDPE DR17	$ 110,000
1.3	Appurtenances and Tie-Ins	$ 1,180,000
1.4	Service Connection to prop. Line	$ 1,267,000
	Subtotal 1 Collection System	**$6,098,000**
	Contingency (40% of Subtotal)	$2,439,000
	Engineering (15% of Subtotal All + Contingency)	$1,281,000
	Contractor Overhead and Pricing (15% of Subtotal All + Contingency)	$1,281,000
	Total	**$11,099,000**

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Cost Estimate

– PS#6 Catchment capital Cost Estimate

ITEM	DESCRIPTION	PRICE
1	**Collection system**	
1.1	Gravity – PVC SDR35	$ 3,031,000
1.2	Forcemain-HDPE DR17	$ 222,000
1.3	Appurtenances and Tie-Ins	$ 1,059,000
1.4	Service Connection to prop. Line	$ 1,520,000
	Subtotal 1 Collection System	**$5,832,000**
	Contingency (40% of Subtotal)	$2,333,000
	Engineering (15% of Subtotal All + Contingency)	$1,225,000
	Contractor Overhead and Pricing (15% of Subtotal All + Contingency)	$1,225,000
	Total	**$10,615,000**

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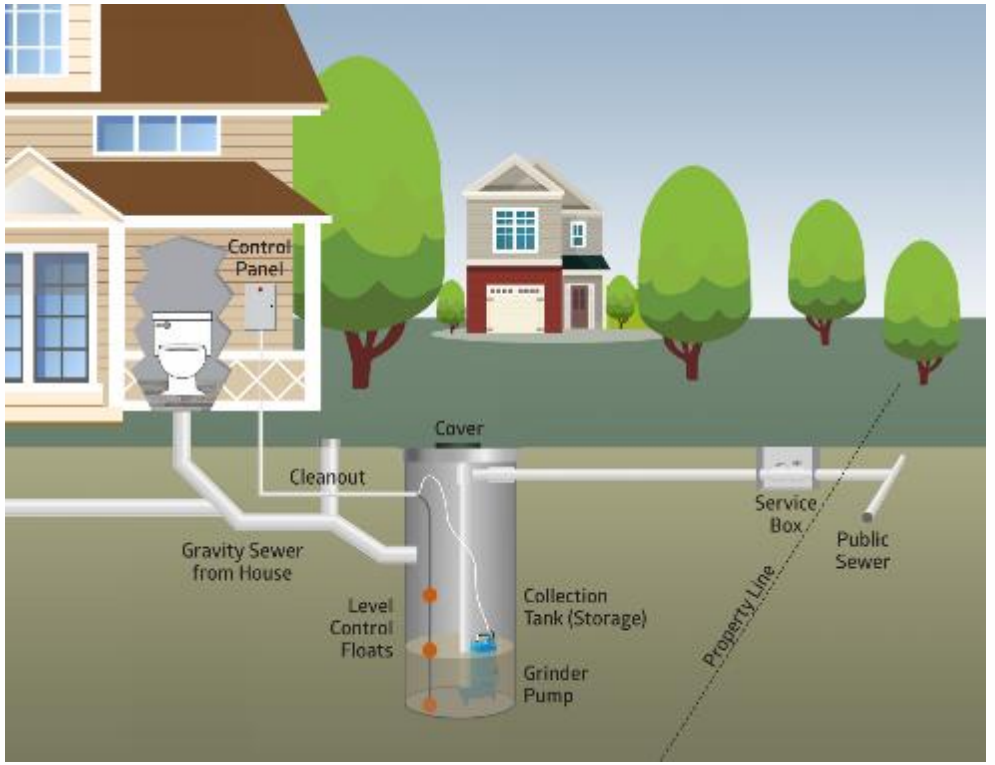
Property Owner Cost Estimate

CONNECTION TO SYSTEM	CONNECTION LENGTH	CONNECTION[1]	MEDIAN COST
Gravity	0-10m	$1,500	$5,250
	11-30m	$6,500	
Low Pressure	0-10m	$1,500	$5,250
	11-30m	$6,500	

Notes:

[1] Cost provided correspond to the higher length in the range



Source: Sudbury Massachusetts CWMP Updates| Sudbury, MA - Official Website

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Questions

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Committee Process – Collection System

- Support proposed configuration?
- Consideration for broader application of Low Pressure Sewer (LPS) vs. Gravity?
  - Waterfront – no sewer infrastructure on foreshore
  - Limit disruption of private property
  - Limit excavation depths for gravity mains
  - High water table
  - Dwelling density
  - Archaeology potential
  - Others?
- Value Engineering workshop – broader application of LPS

Discussion paper #3

Pump Station Design

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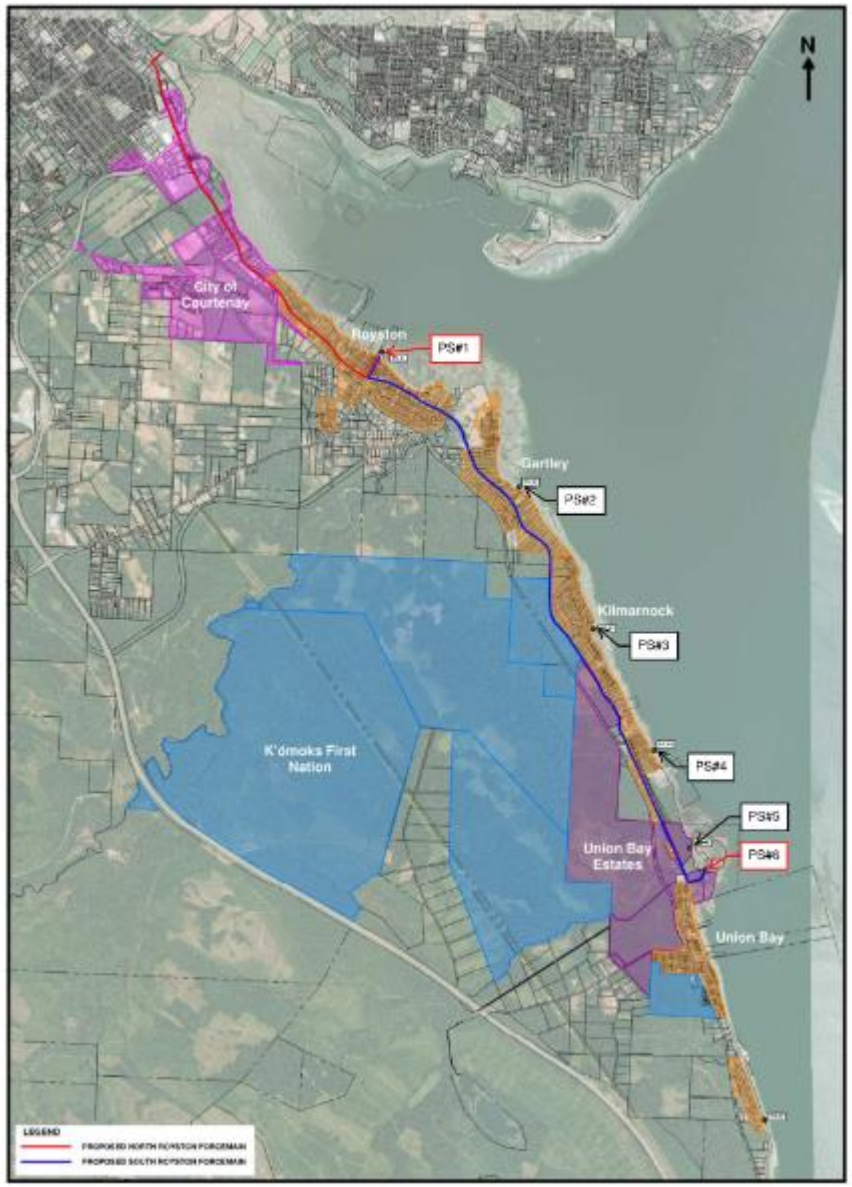
Background

PS#1 and PS#6:

- Summary of pump station design.
- Summary of pump station siting options.
- Summary of pump station cost estimate.



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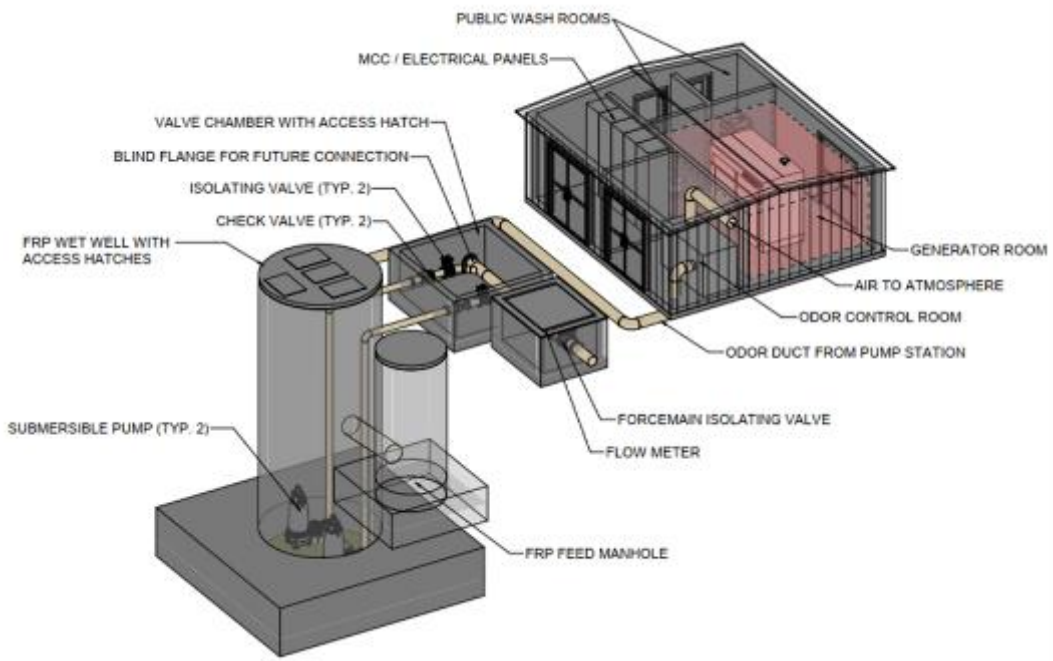
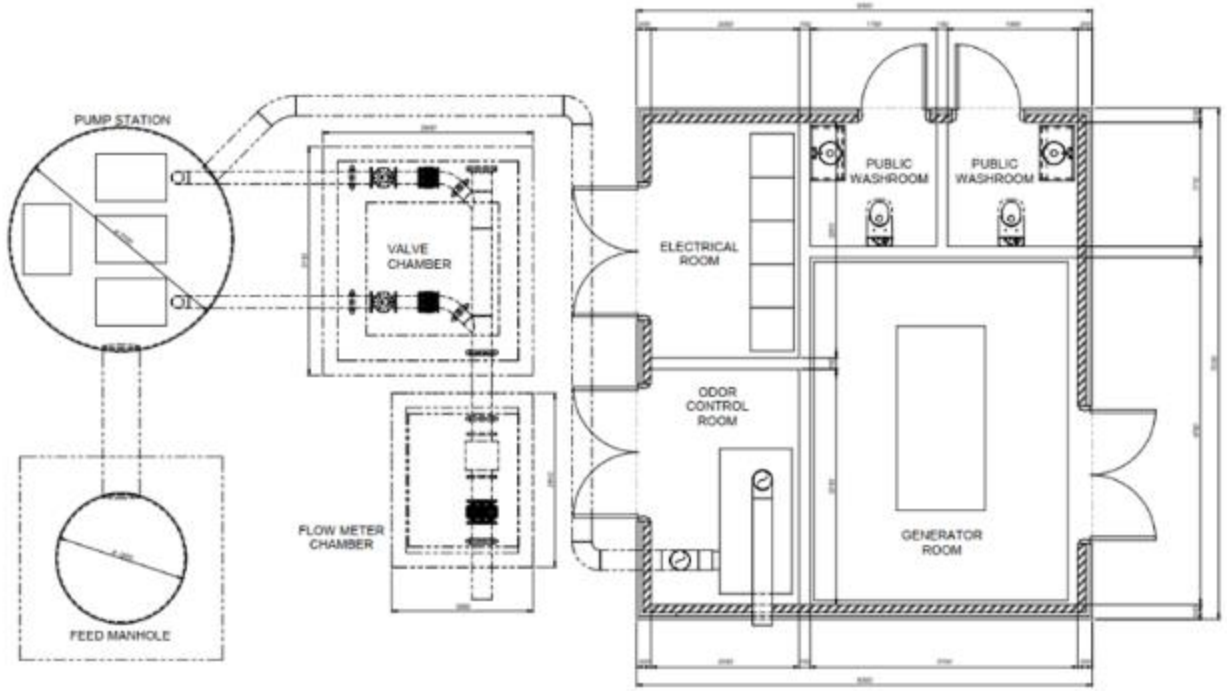
Pump Station #1

Option A





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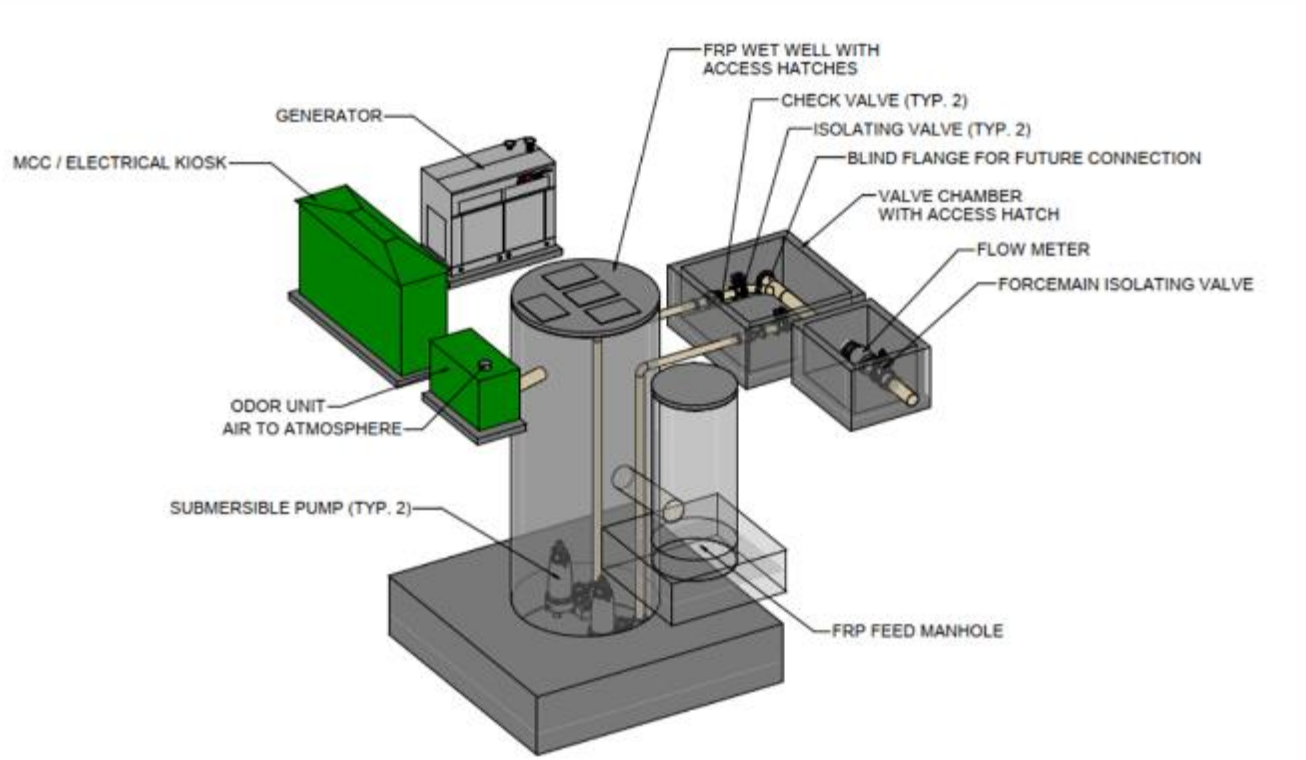
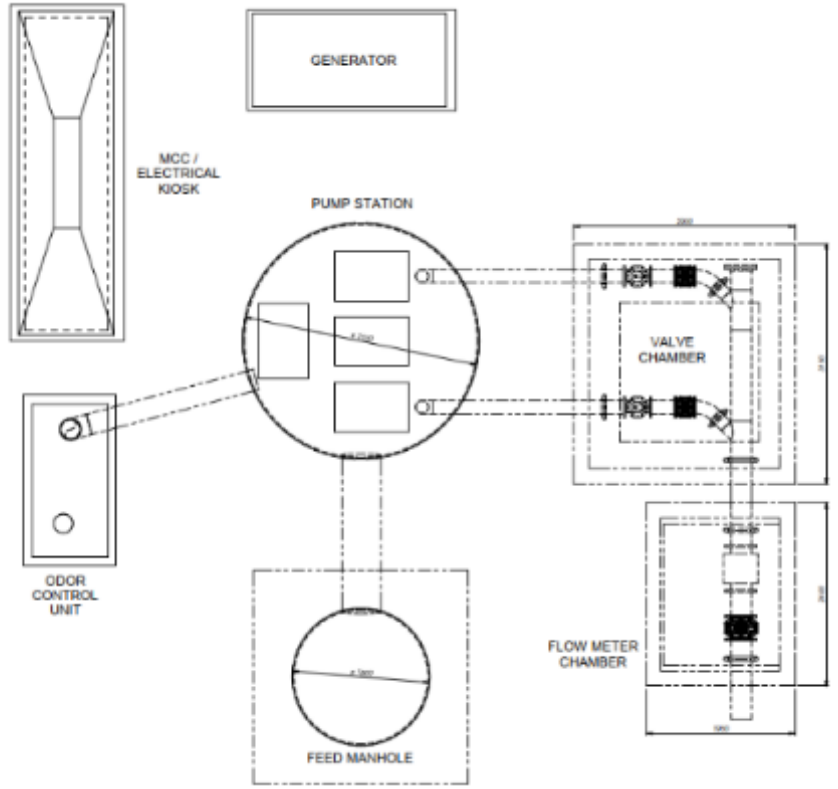
Pump Station #1

Option B





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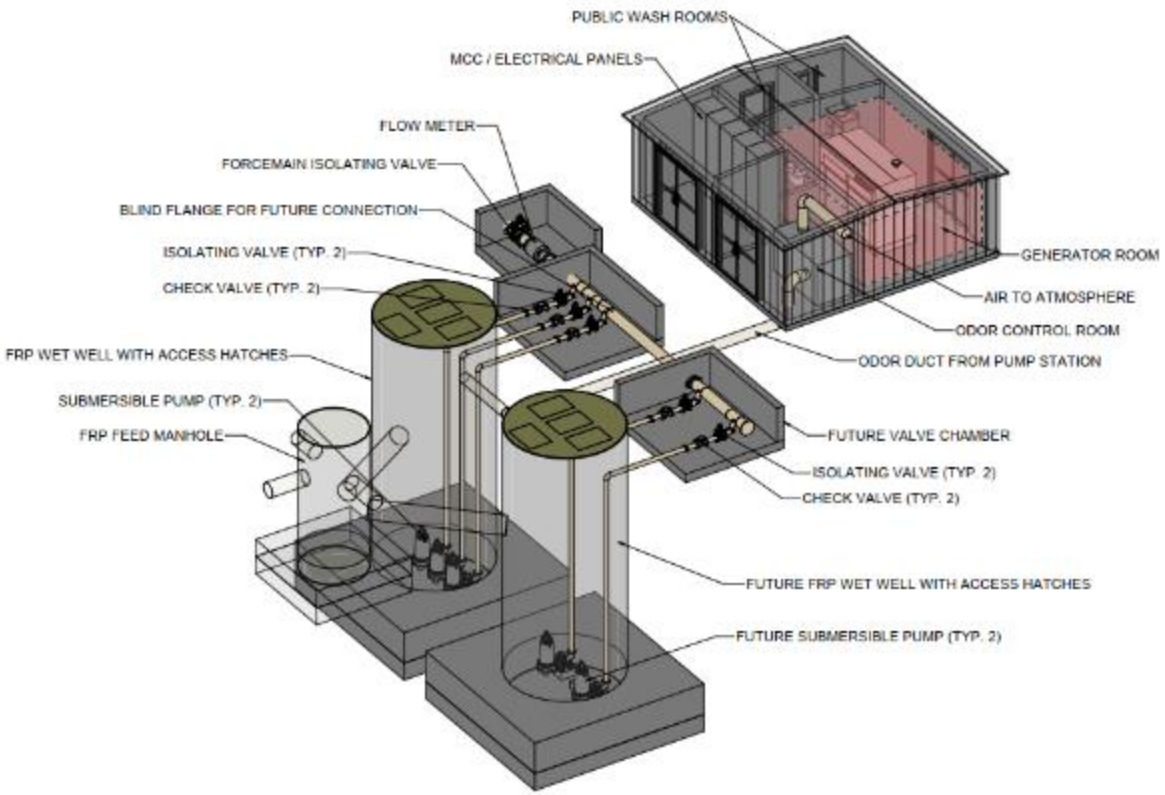
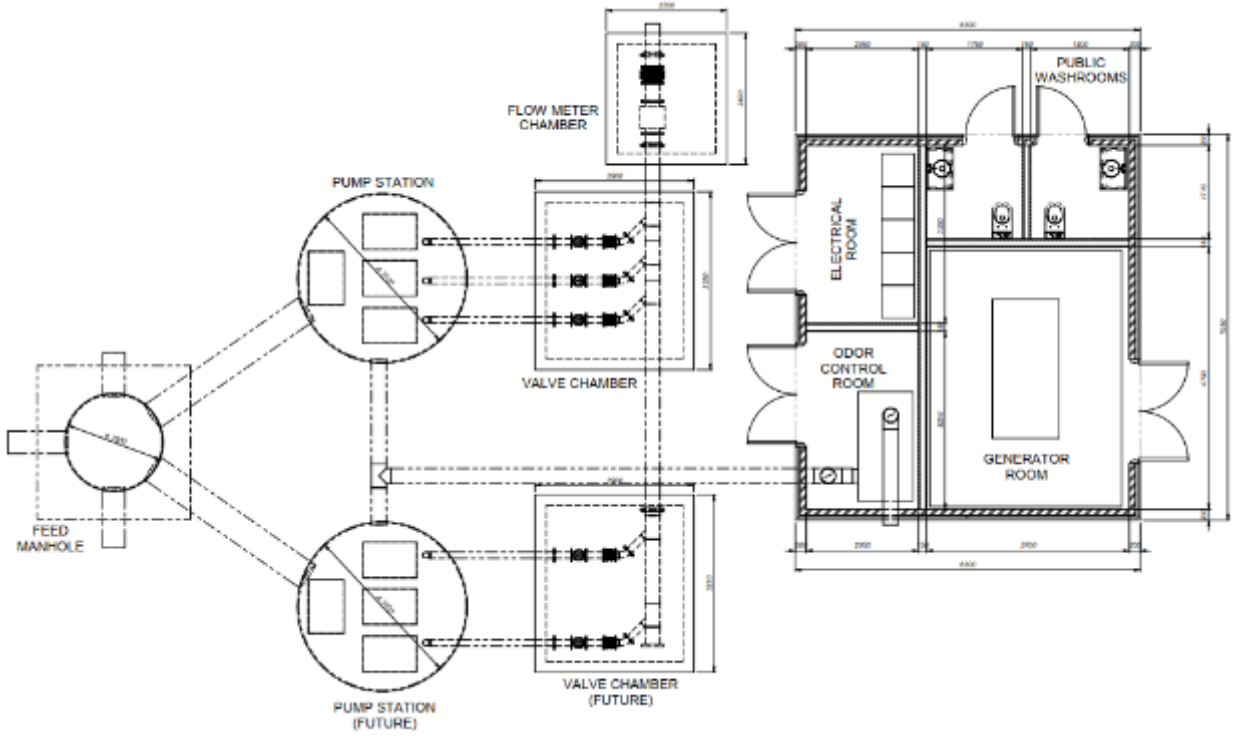
Pump Station #6

Option A





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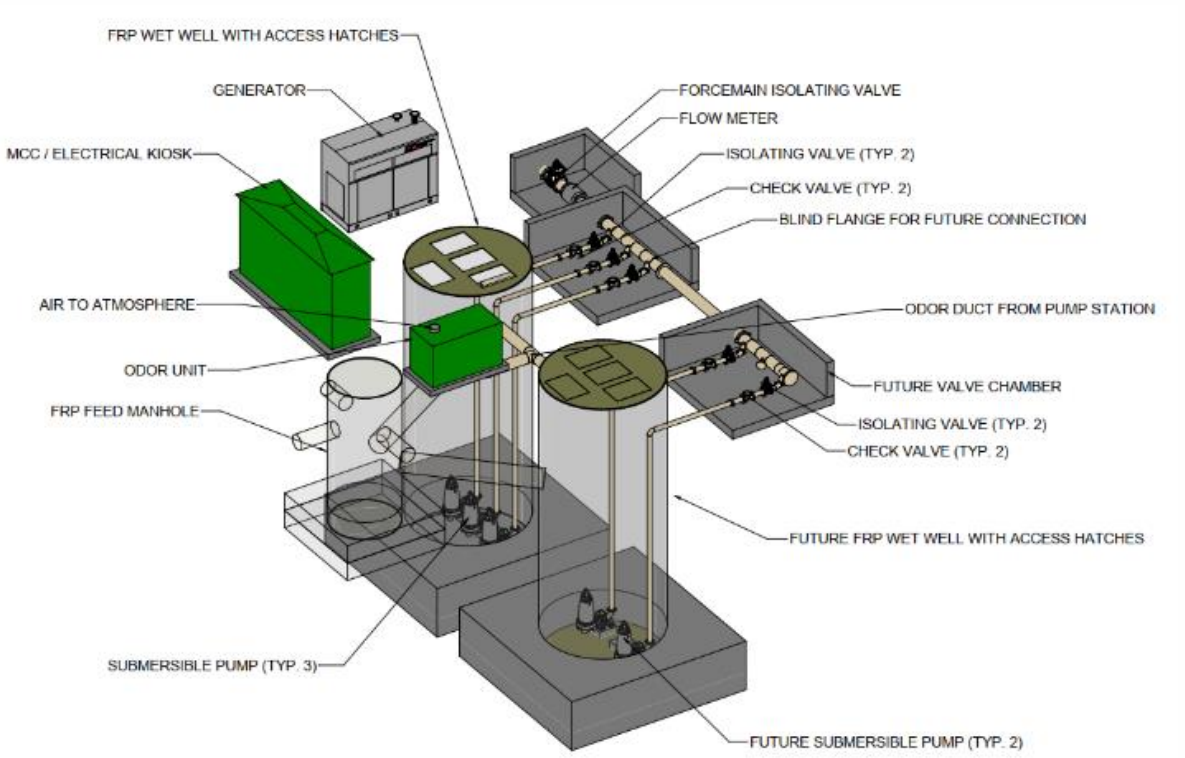
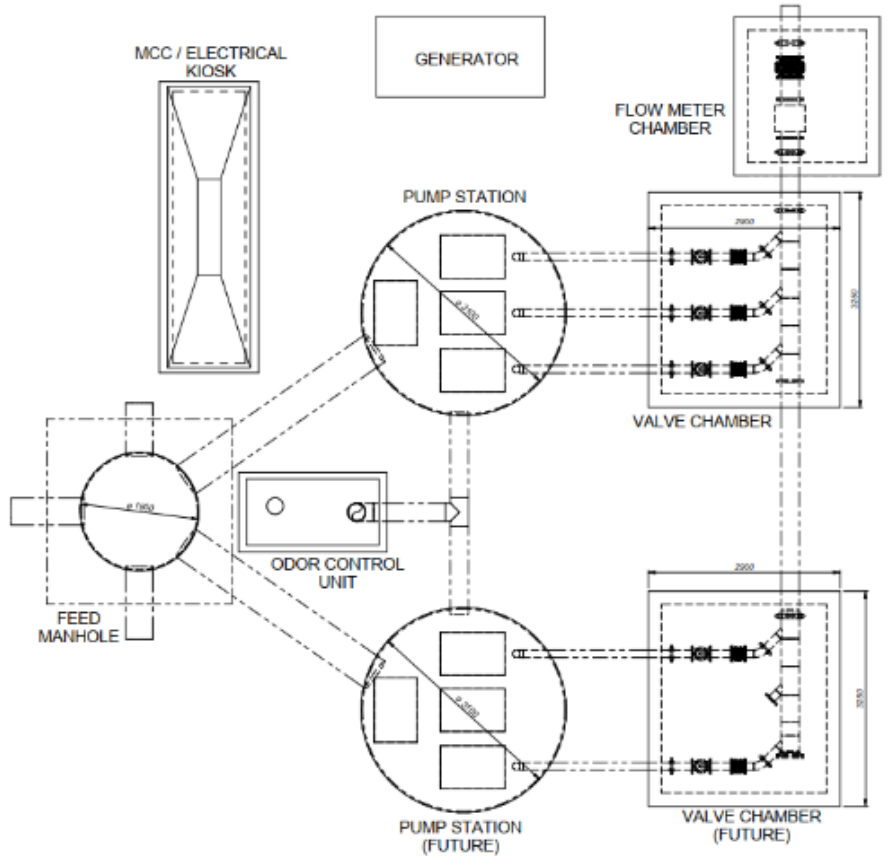
Pump Station #6

Option B





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Pump Station Layout Comparison

	OPTION A (BUILDING)	OPTION B (KIOSKS)
Advantages	• Opportunity for public facilities provided (washrooms)	• Reduces visual impact of the pump station • Lower cost associated with kiosks
Disadvantages	• Visual impact of the pump station building • Higher costs for construction of building	• Does not provide opportunity for any public facilities • Risk of vandalism • Increased noise, in particular if the genset is operating

Siting Consideration – PS#1

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Siting Consideration – PS#1 Location 1

Option A

Option B

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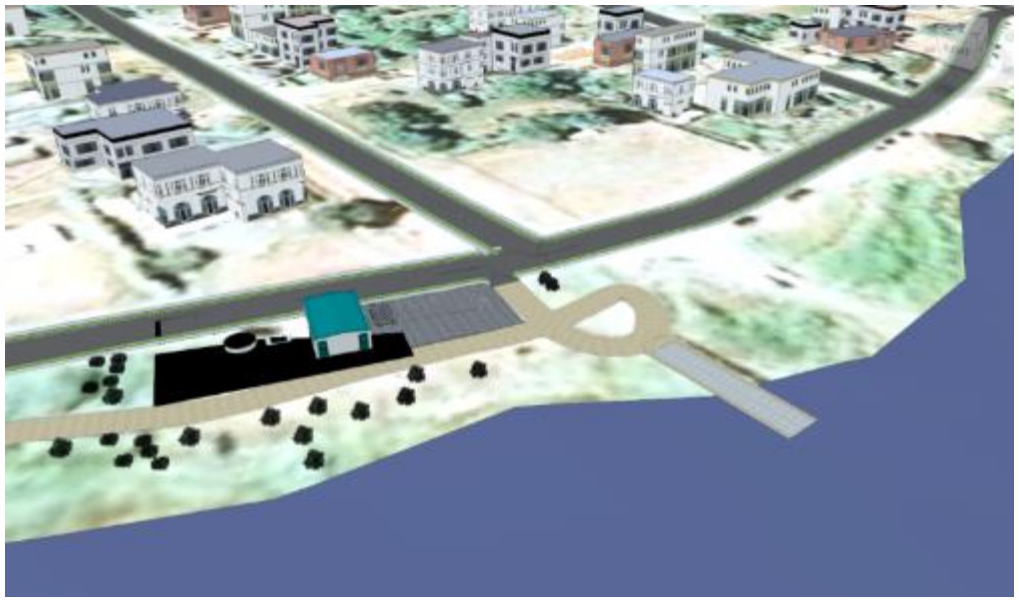
Siting Consideration – PS#1 Location 2

Option A



Option B

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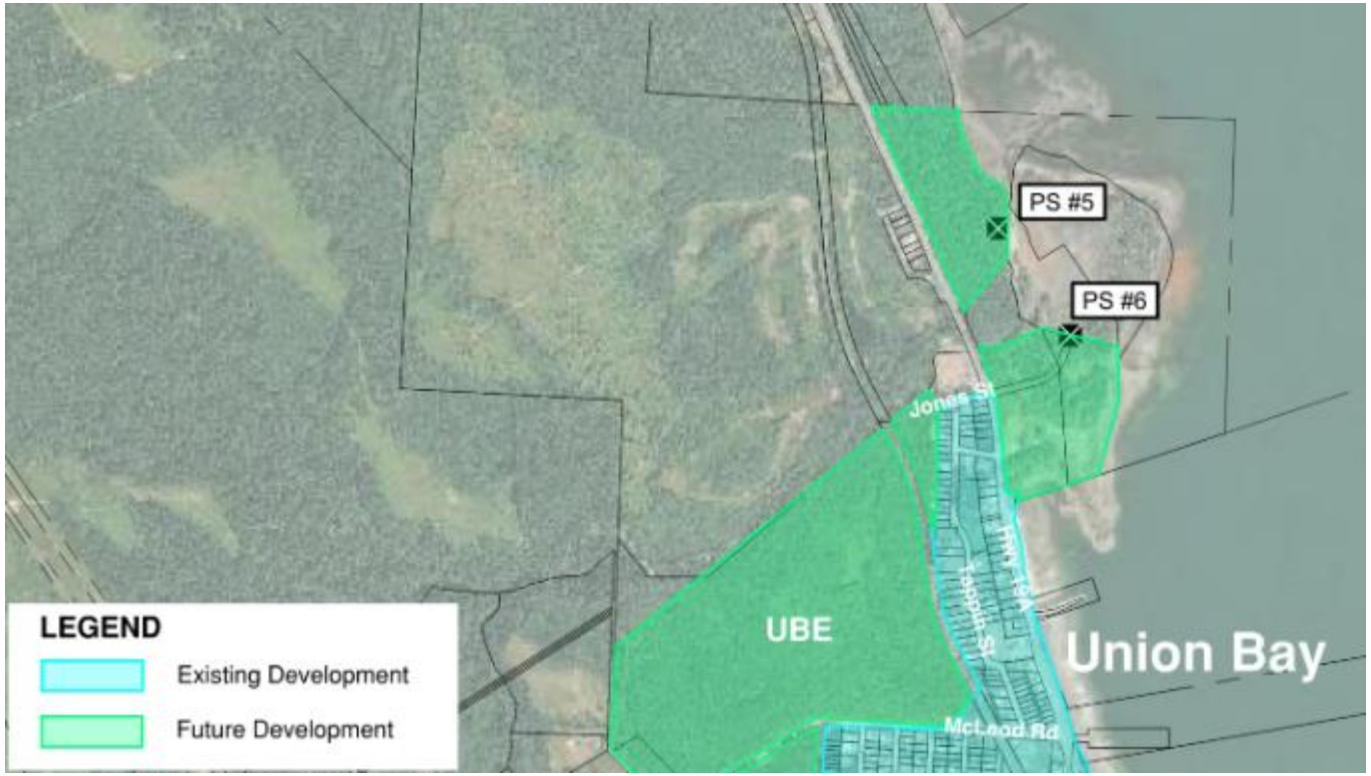
Siting Consideration – PS#6

- Previous LWMP process recommended site opposite the parking lot of the Highwayman Pub
- An alternate location north of the Highway 19A road allowance site is preferred



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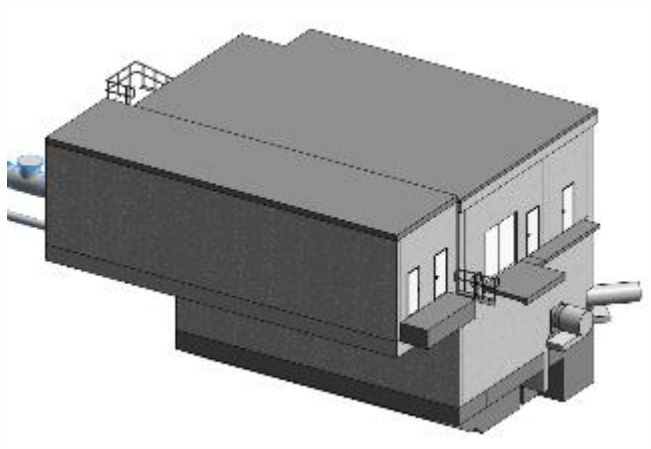
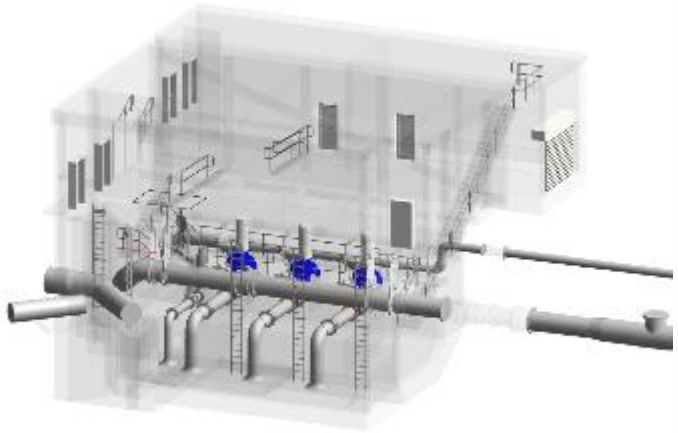
Future Regional Pump Station

- The Future Regional Pump Station will be constructed when additional capacity is required.
- It will convey flow from all seven pump stations to the Courtenay River Siphon.
- Should be located in close proximity to the forcemain.





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Mitigation

- Visual
- Climate Change
- Odour

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Pump Station Capital Cost Estimate

DESCRIPTION	OPTION A	OPTION B
Pump Station 1	$ 1,436,000	$ 1,133,000
Pump Station 6	$ 1,308,000	$ 1,053,000
General (Pump Stations)	$ 500,000	$ 460,000
Subtotal All Items	**$ 3,244,000**	**$ 2,646,000**
Contingency (30% of Subtotal)	$ 974,000	$ 794,000
Engineering (10% of Subtotal + Contingency)	$ 422,000	$ 344,000
Total	**$ 4,640,000**	**$ 3,784,000**

Pump Station O&M Cost Estimate

PS#1

O&M COST ITEM	PS#1 (OPTION A)	PS#1 (OPTION B)
Annual Operating Cost	$91,000	$91,000
Annual Energy/Fuel Cost	$49,732	$19,734
Annual Maintenance and Repair Cost	$23,890	$18,420
Total Annual O&M Costs	**$164,622**	**$129,154**
Non-annual Replacement or Upgrade Cost	$748,000	$664,000
LCC		
Total Net Present Value (NPV)	**$15,177,689**	**$10,538,323**

PS#6

O&M COST ITEM	PS#6 (OPTION A)	PS#6 (OPTION B)
Annual Operating Cost	$91,000	$91,000
Annual Energy/Fuel Cost	$42,374	$12,376
Annual Maintenance and Repair Cost	$23,010	$17,650
Total Annual O&M Costs	**$156,384**	**$121,026**
Non-annual Replacement or Upgrade Cost	$745,250	$655,250
LCC		
Total Net Present Value (NPV)	**$13,988,260**	**$9,712,446**

Questions

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Committee Process – Pump Stations

- Building or kiosk option
  - Resilience
  - Affordability
  - Environmental impact
  - Public amenities
  - Neighborhood impact
- PS #1 Location
- Value Engineering workshop – pump station location

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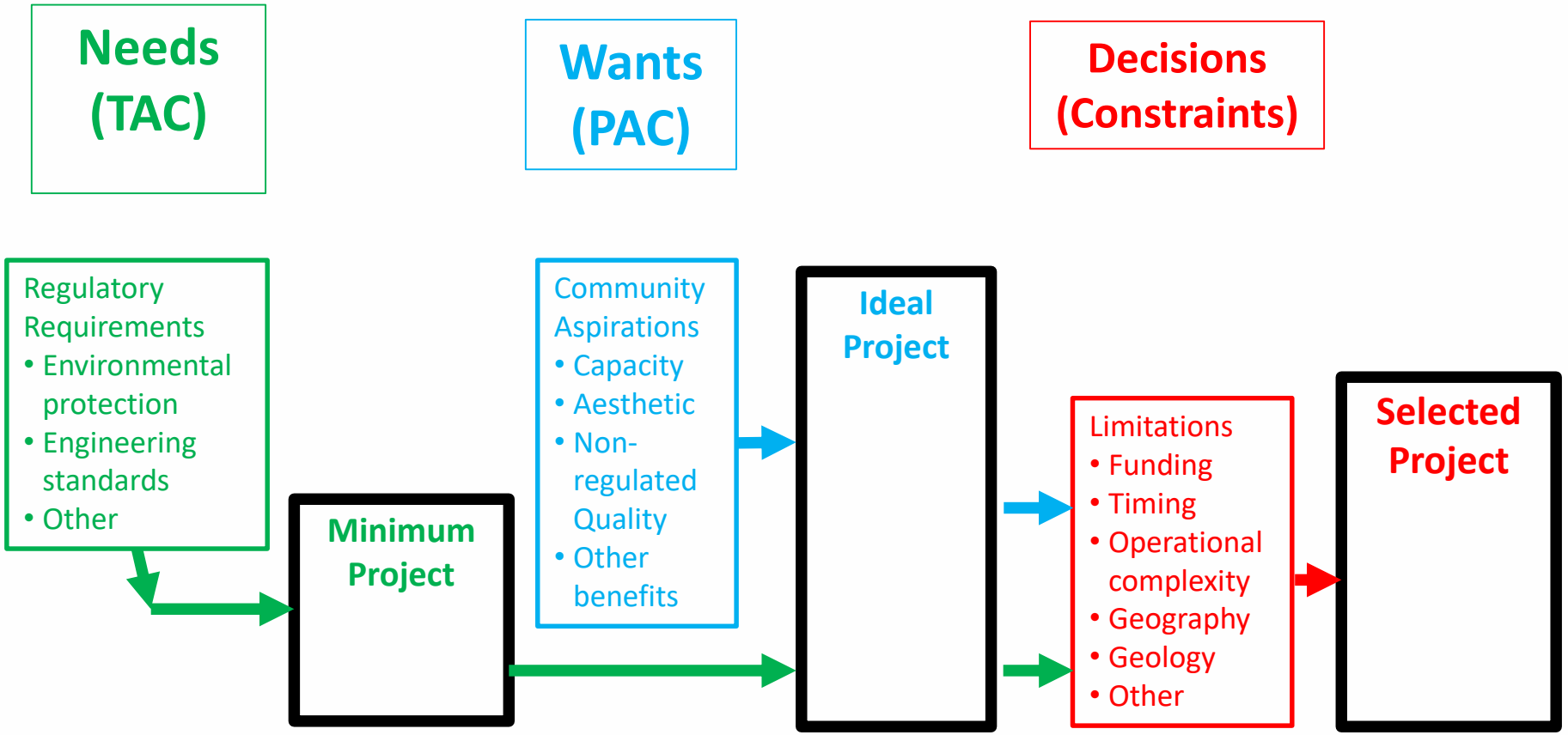
TAC/PAC Committee Process

- Work according to the Terms of Reference
- TAC and PAC will operate as a joint committee
  - Unless there is a specific need to do otherwise
- Decisions to be made by consensus
  - Balance project “needs” and community “wants”

Reconciling Needs, Wants and Reality



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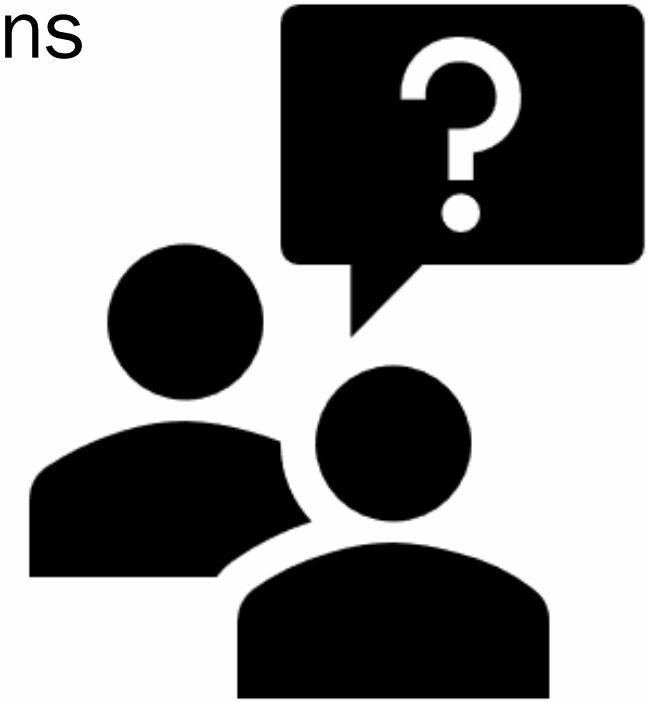
Next Meeting – December 12

- Draft Stage 1 Environmental Impact Study
- Sewer Service Structure
- Resident Costs
- Committee Decision Making

Round Table

Discussion / Questions



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