LWMP Wastewater Advisory Committee
Meeting #13

PREPARED BY: Paul Nash
DATE: November 2 2017

Review of 2017 Field Work and Presentation of Discharge and Treatment Options

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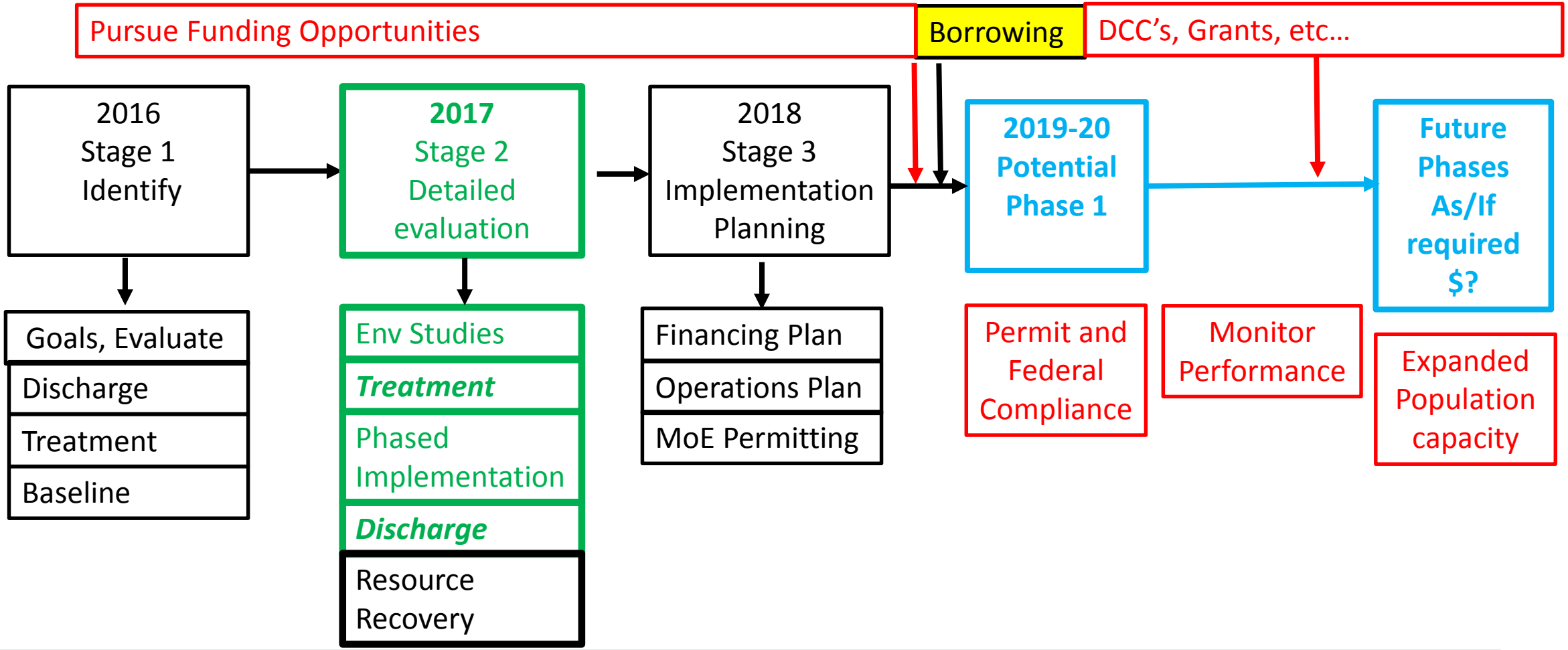
Original Mandate

"to develop an environmentally sustainable method to treat the liquid waste that is produced by the Village"

WAC expanded mandate

"to develop an environmentally sustainable method to **treat the liquid waste** that is produced by the Village, that is ***affordable***, and, ideally, economically *productive*, environmentally *enhancing* and socially *beneficial*"

Cumberland LWMP Road Map (Nov 2017)



Today's Objectives

- Review the information in the Technical Memo's
- Select a Preferred Discharge Option
- Select a Preferred Treatment Option

And that's it!

The Goals and Evaluation System

- A quantitative system for evaluating and choosing the Preferred Options according to a pre-agreed set of goals
- The goals are intended to capture the needs and wants of the community
- Developed by the WAC in June 2016
- "**Decision Gates"**, to pass/fail on mandatory needs
- "**Goals**" -19 different goals in Economic, Environmental and Social
- 18 of them are referenced within the OCP, Comox Valley Sustainabilty Plan or other documents

The Goals and Evaluation System

- It is not only how we evaluate options, but we also develop the options to achieve as many of the goals as possible
- Are the goals still relevant
- Is there a conflict between achieving goals and cost?
- Do we want to consider any changes?

Technical Memos for today...

5. Receiving Environment

1. Regulatory Framework

2. Financial Framework

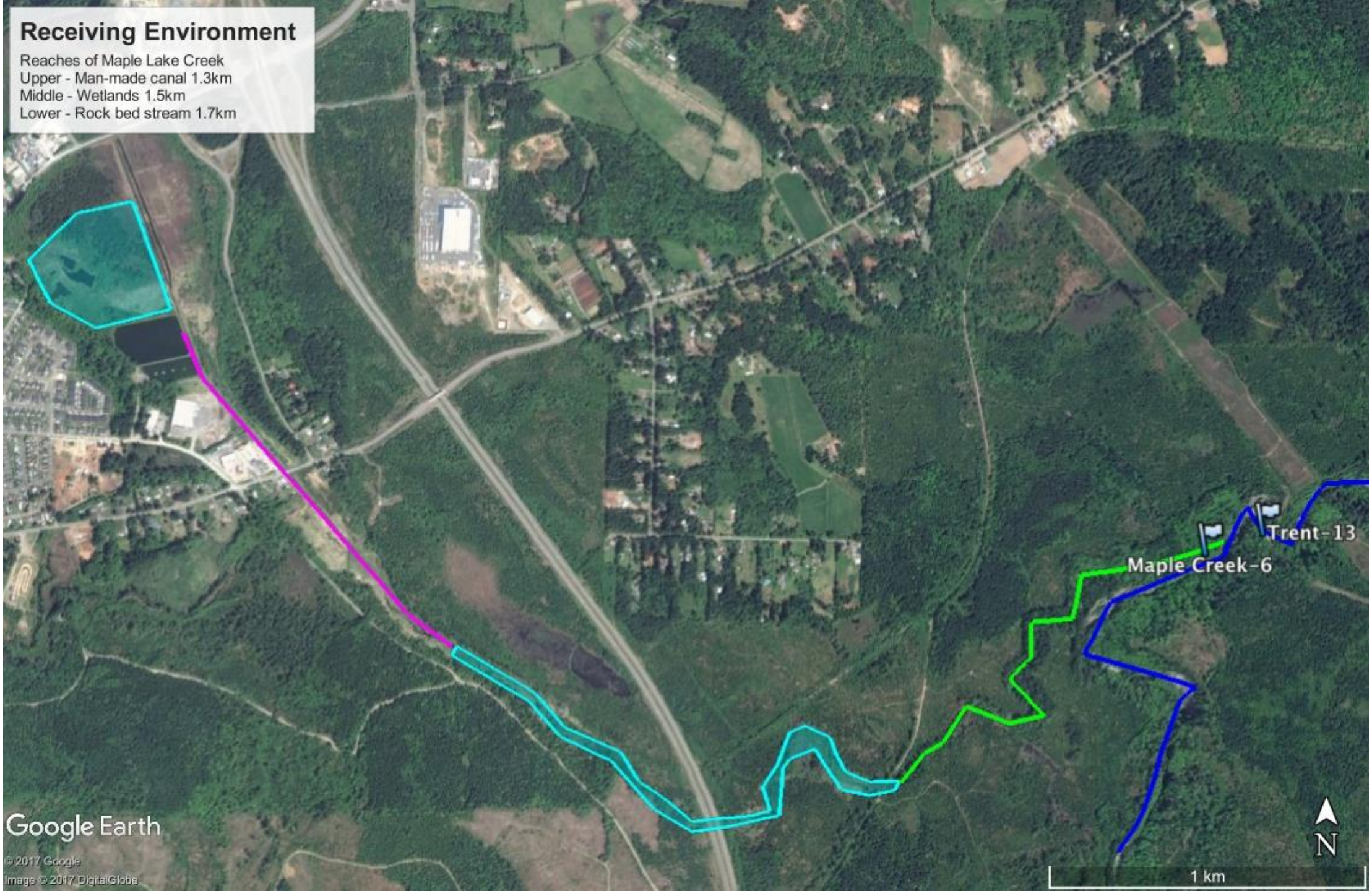
3. Historical and Projected flows and loads

4. Lagoon System Performance

6. Discharge Options

7A Treatment Options

7B Comparison of Treatment Options


Receiving Environment
Reaches of Maple Lake Creek
Upper - Man-made canal 1.3km
Middle - Wetlands 1.5km
Lower - Rock bed stream 1.7km
Trent-13
Maple Creek-6
Google Earth
© 2017 Google
Image © 2017 DigitalGlobe
N
1 km

DISCHARGE PERMIT TO MLC

- $BOD_5 \leq 30$ mg/L; TSS $\leq$ 30 mg/L; FC $\leq$ 200 MPN/100 mL; Total-P < 1.0 mg-P/L

DISCHARGE PERMIT + FEDERAL REGULATION TO MLC

- **$BOD_5 \leq 25$ mg/L**; **TSS $\leq$ 25 mg/L**; FC $\leq$ 200 MPN/100 mL; Total-P < 1.0 mg-P/L; **$NH_3 < 1.25$ mg/L**;

MWR MEP – INDIRECT DISCHARGE TO MLC THROUGH WETLANDS

- $BOD_5 \leq 25$ mg/L; TSS $\leq$ 25 mg/L; **FC < 100 MPN/100 mL**; Total-P < 1.0 mg-P/L; $NH_3 < 1.25$ mg/L

MWR GEP – DIRECT DISCHARGE TO MLC

- **$BOD_5 \leq 10$ mg/L**; **TSS $\leq$ 10 mg/L**; **FC < 1 /100 mL**; Total-P < 1.0 mg-P/L; $NH_3 < 1.25$ mg/L

Financial Framework

1. Cumberland has $650k in Reserves
2. $500k of this is committed to projects
3. DCC is set at $9.4k per house, collected as houses are approved
4. Cumberland has a maximum borrowing capacity of $7.1M
5. There are regular grant funding opportunities
6. There are ***no guarantees*** of receiving grant funding
7. But Cumberland ***must*** make upgrades to meet Permit and Federal requirements by 2021

Financial Options

1. Cumberland can say “yes” to a project of less than $7M
2. Any project greater than $7m must wait until reserves have built up and/or grant funding is received

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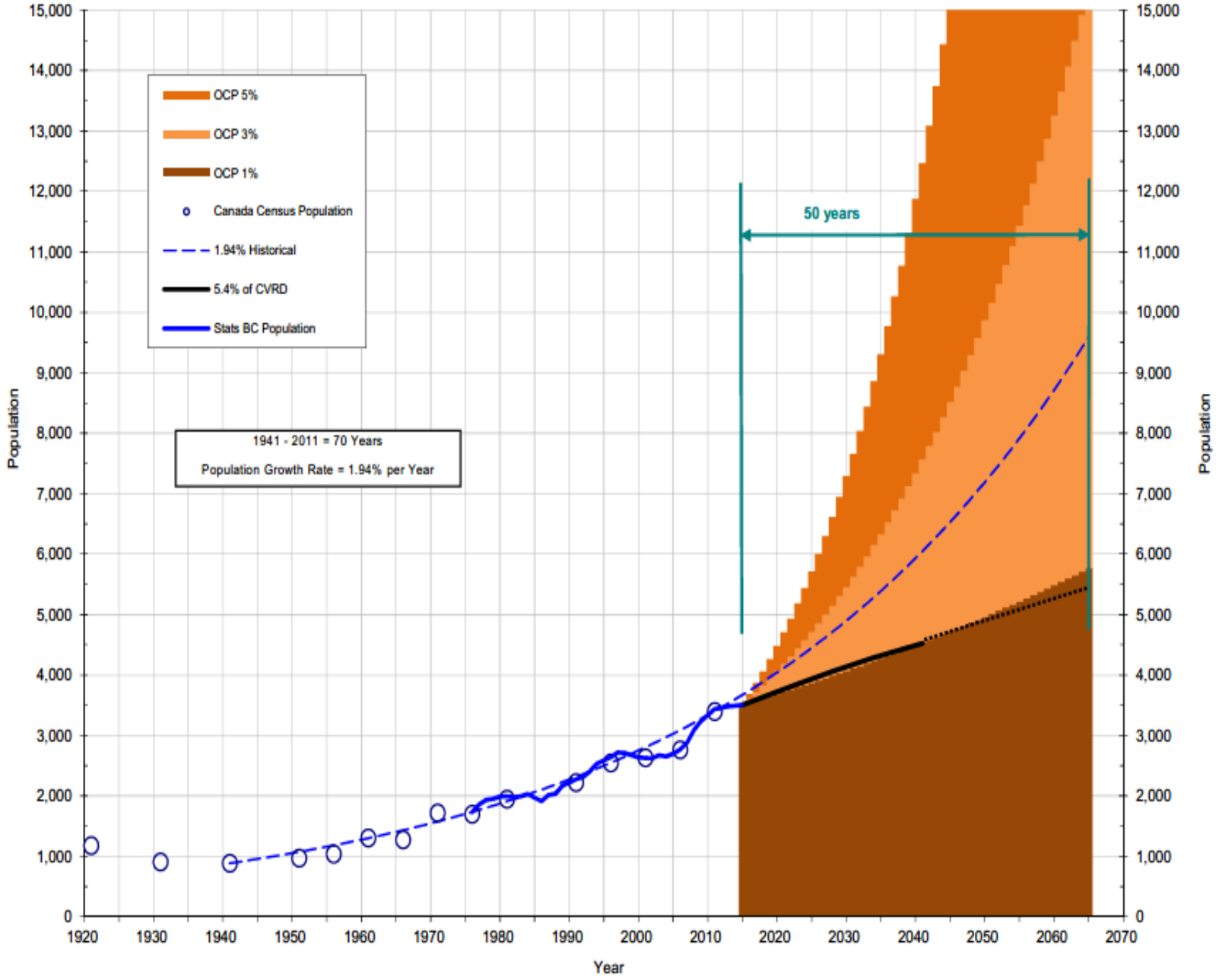
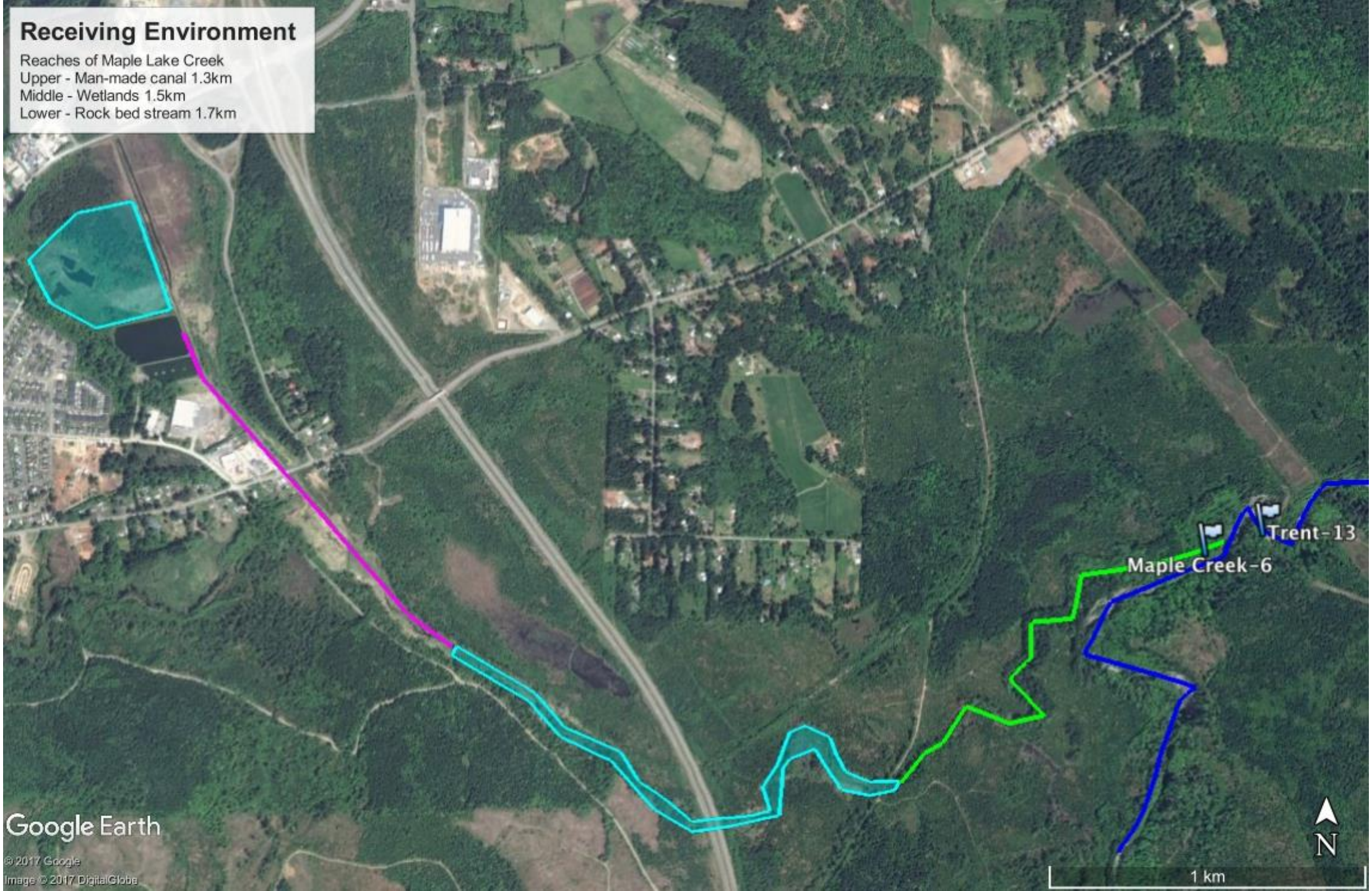
Population Growth



Flow and Load Model

Year	Population	ADWF	PWWF	Peaking Factor	Comments
	3% growth	cu.m/day	cu.m/day		
2016	3650	820	14,100	17	Baseline year
2017	3760	846	14400	17	
2018	3872	871	14400	16	
2019	3988	897	14400	16	Commissioning Year
2020	4108	924	13900	15	Permit ADWF (910 cu.m/day) exceeded
2023	4489	1010	12400	12	Permit +10% (1001 cu.m/day) exceeded
2025	4762	1071	11400	11	
2030	5521	1242	8900	7	
2035	6400	1440	6400	4	Minimum Peaking factor reached
2038	6994	1800	7200	4.0	End of 20 year Design Horizon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Reaches of Maple Lake Creek
Upper - Man-made canal 1.3km
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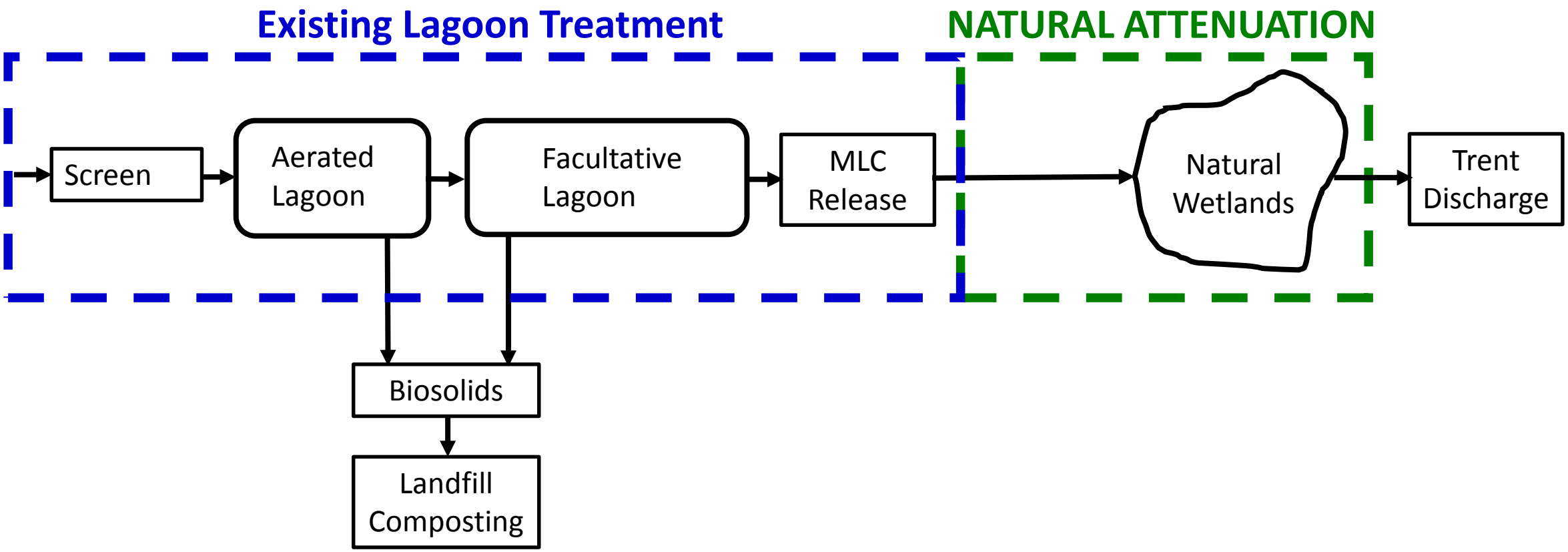
© 2017 Google
Image © 2017 DigitalGlobe
N
1 km


Existing Lagoon Treatment
NATURAL ATTENUATION
Screen
Aerated Lagoon
Facultative Lagoon
MLC Release
Natural Wetlands
Trent Discharge
Biosolids
Landfill Composting

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Lagoon Performance

cumberland.ca

LOCATION	Total BOD (mg/L)	Soluble BOD (mg/L)	TSS (mg/L)	TP (mg-P/L)	Ortho-P (mg-P/L)	$NH4^+$ (mg-N/L)	E. coli CFU/100mL	Fecal Colif. CFU/100mL
Influent	292	175	282	6.8	4.08	41.4	1,350,000	2,176,750
Aerated Lagoon	38	8	100	6.4	4.46	43.2	16,100	115,500
Facultative Lagoon	17	< 6	49	4.7	3.50	24.6	2,692	12,618
Wetland Treatment	< 6	< 6	< 4	0.2	0.231	0.366	48	398
Trent 200 m U/S	< 6	< 6	<4	< 0.005	< 0.005	0.235	3	34
Trent 100 m D/S	< 6	< 6	< 4	0.035	0.024	0.132	10	55

Maple Lake Creek Flow Study

Location	Flow (m^3/d)	Measurement
MLC upstream of lagoons	Effectively zero	Visual observation
Lagoon discharge	800	Lagoon Measuring weir
End of MLC wetland reach (1 km upstream of Trent)	660	Temporary measuring weir
Trent River at Hwy 19 (1 km upstream of MLC)	660	Temporary measuring weir
Estimated flow in Trent at MLC confluence	1,320	Visual observation

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Flow Measurement at end of Maple Lake Creek Wetlands (site 6A)

Maple Lake Creek Phosphorus

Location	Avg. Total P (mg-P/L)	TP Load (kg-P/day)	Reduction from Effluent
MLC upstream of lagoons		0	
Lagoon discharge	5.6	4.5	Effluent
End of MLC	0.2	0.16	97%
Trent River 100m upstream of MLC)	< 0.005	< 0.004	Trent Baseline
Trent 100m downstream of MLC	0.035	0.063	99%

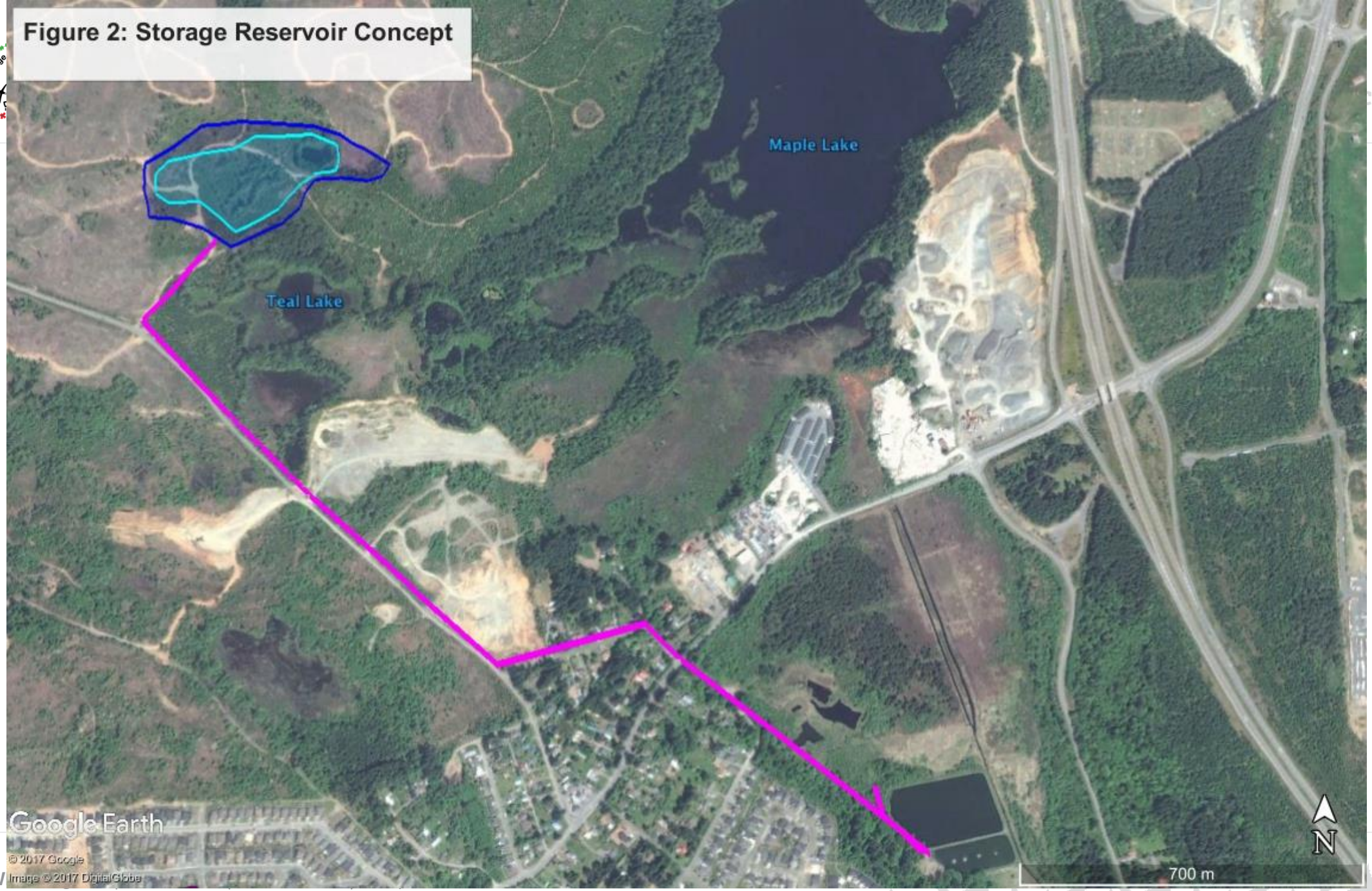
What does the water look like? (Aug 2, 2017)

TM# 6 Conceptual Discharge Options

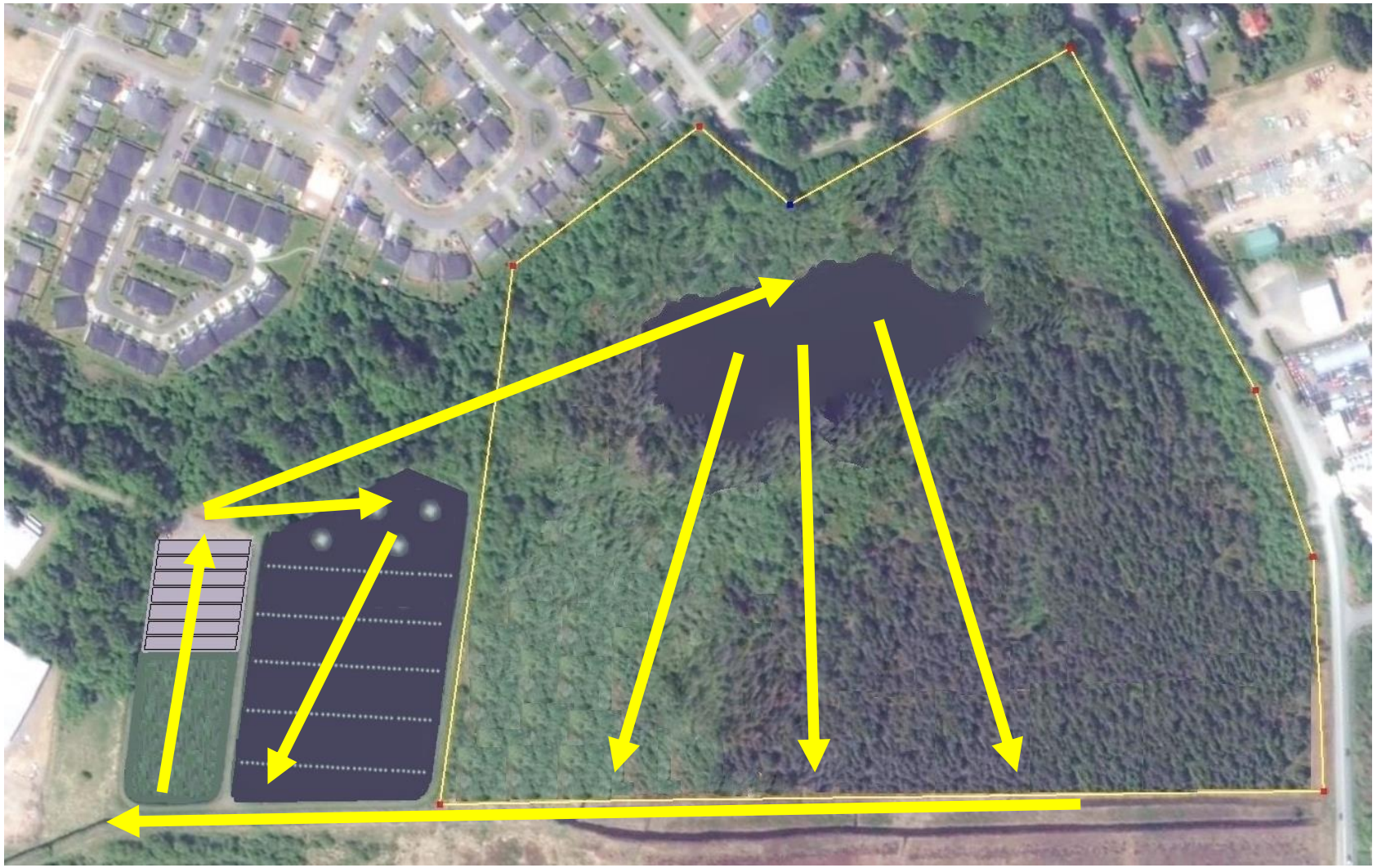
Season	Location	Result
Winter	Maple Lake Creek	Selected
Summer	1 Maple Lake Creek	Viable Option
	2. Storage Wetland	Ruled Out
	3 Storage Reservoir	Ruled Out
	4 Wetlands Distribution	Viable Option

Figure 1: Storage Wetland Concept

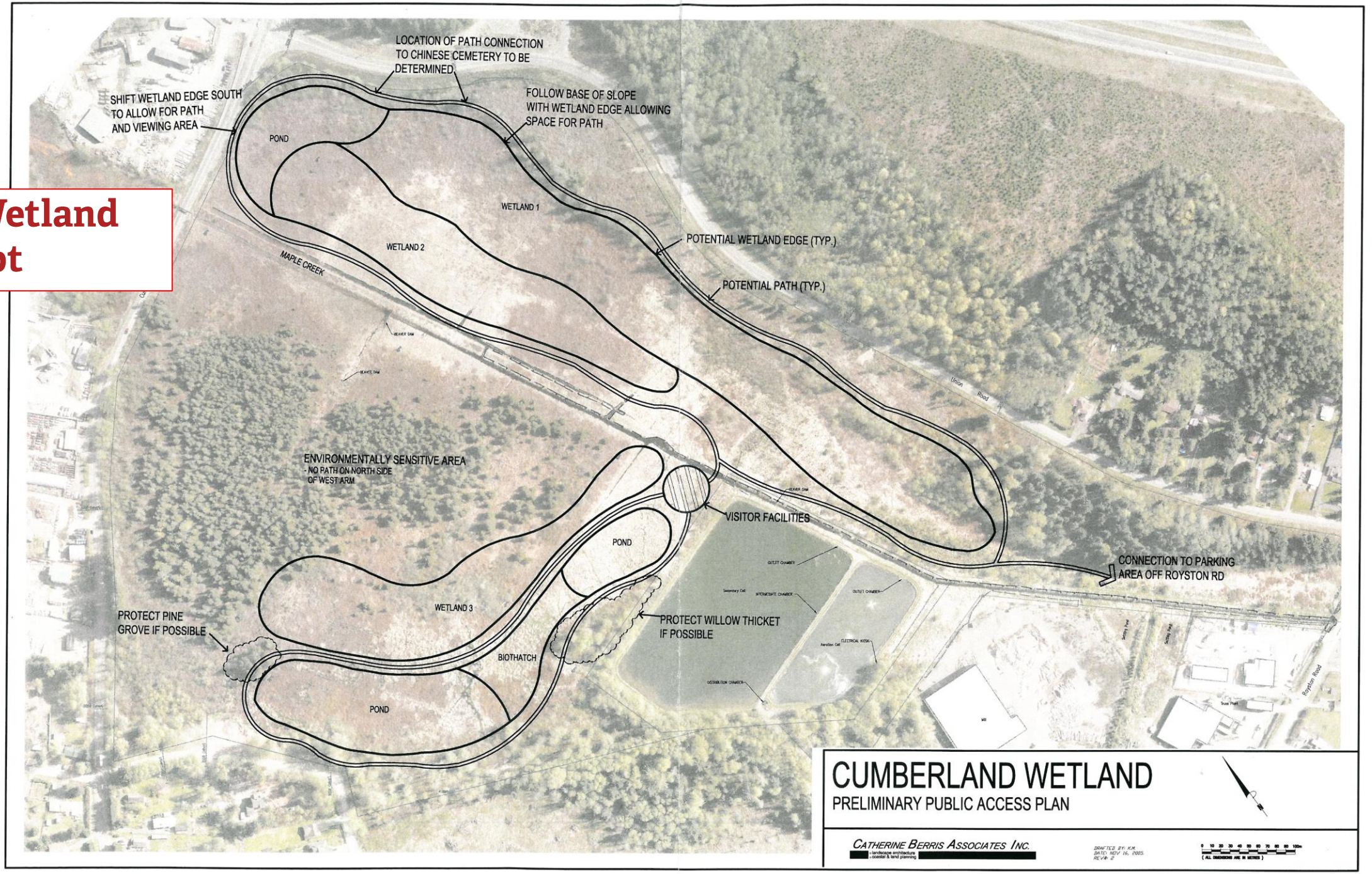
Figure 2: Storage Reservoir Concept



Conceptual Layout of enhanced lagoon and wetland application



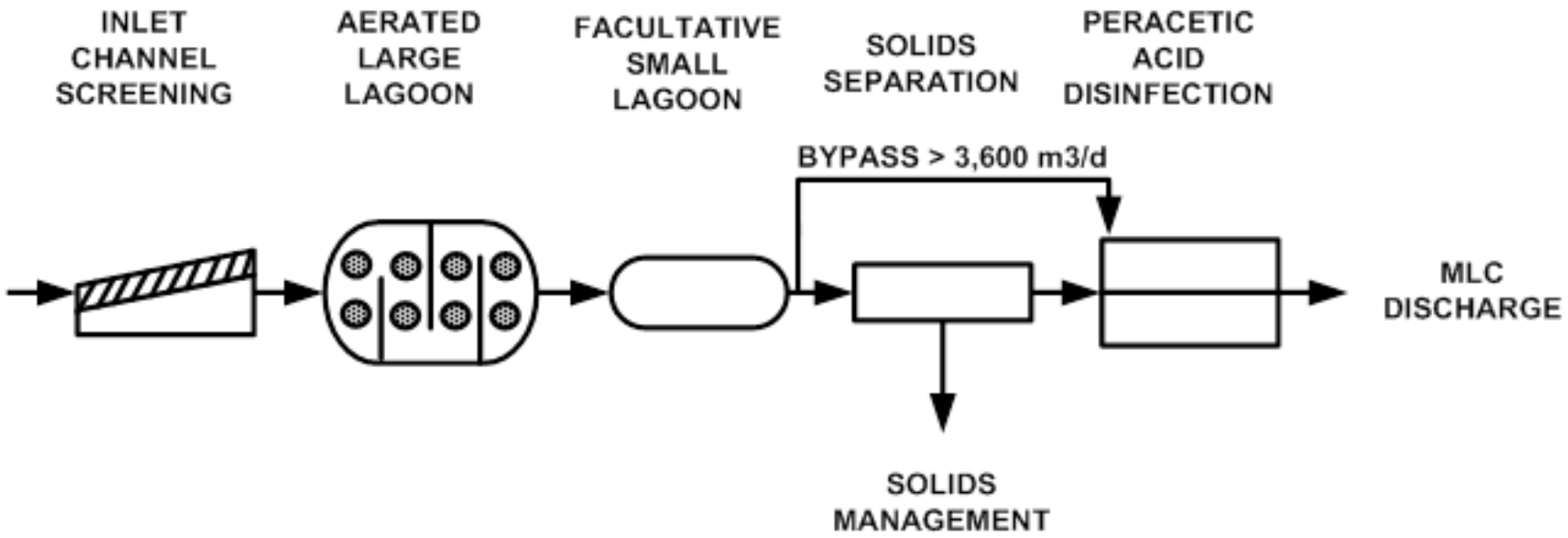
2005 Wetland Concept



Conceptual Treatment Options

All options include Chemical Disinfection, for all Flows

- **Option 1** Upgraded Lagoon to Meet Permit
- **Option 1A** Upgraded Lagoon to meet MWR MEP
- **Option 1B** Upgraded Lagoon to meet MWR GEP
- **Option 2** “Base Flow” mechanical (up to 2x ADWF, 3600 cu.m/day), excess to lagoons
- **Option 3** “Full Flow” mechanical, (up to 8xADWF, 14,400 cu.m/day) lagoons decommissioned



LAGOON OPTION 1

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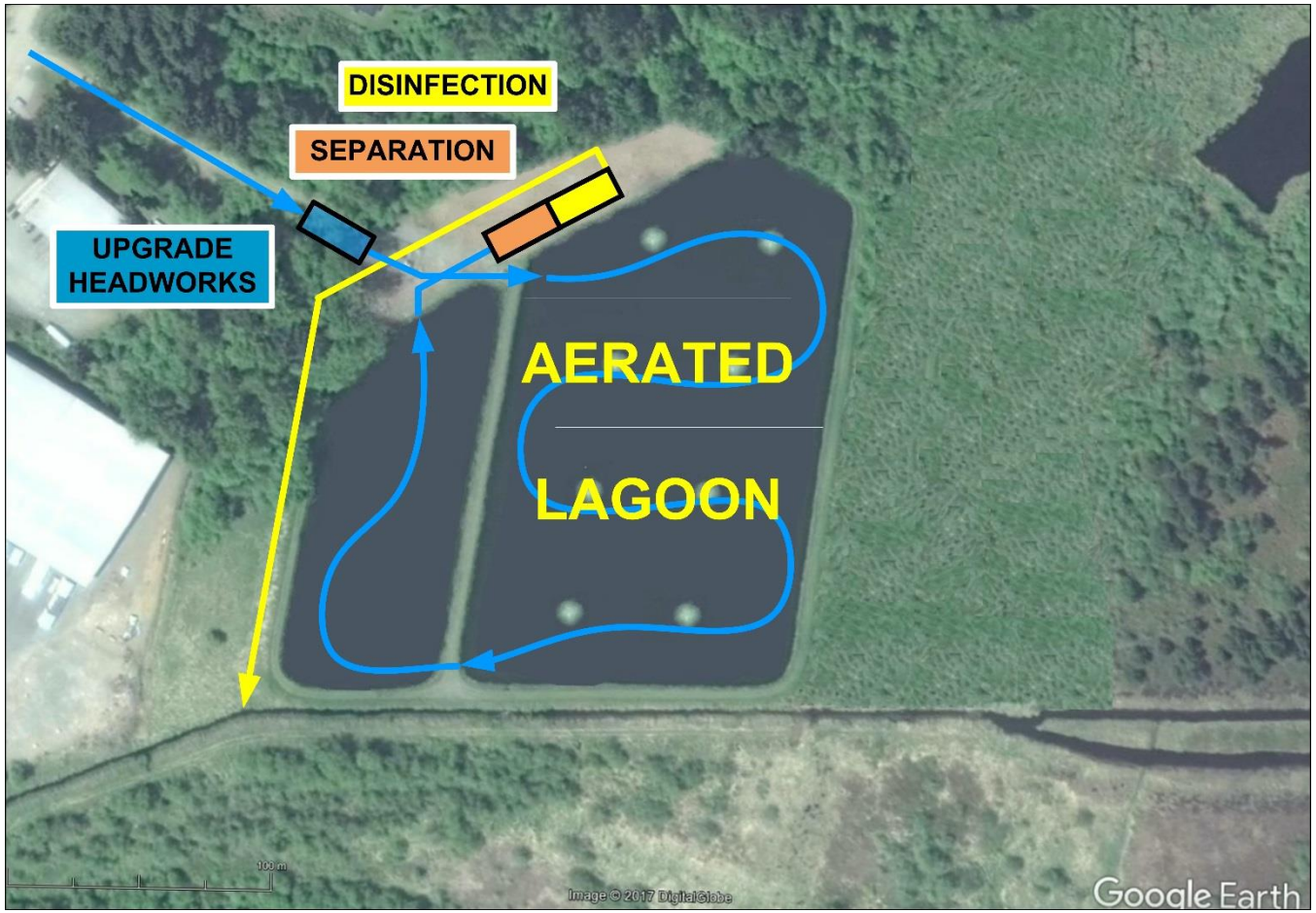

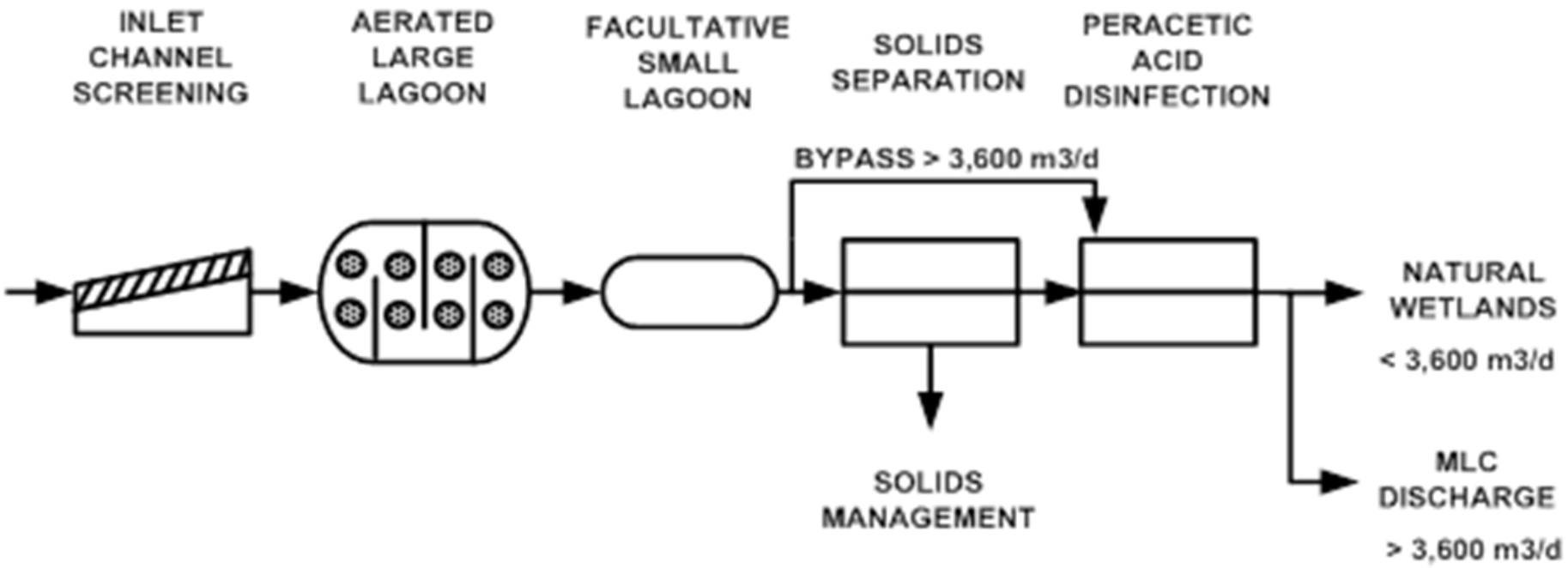

LAGOON OPTION 1A

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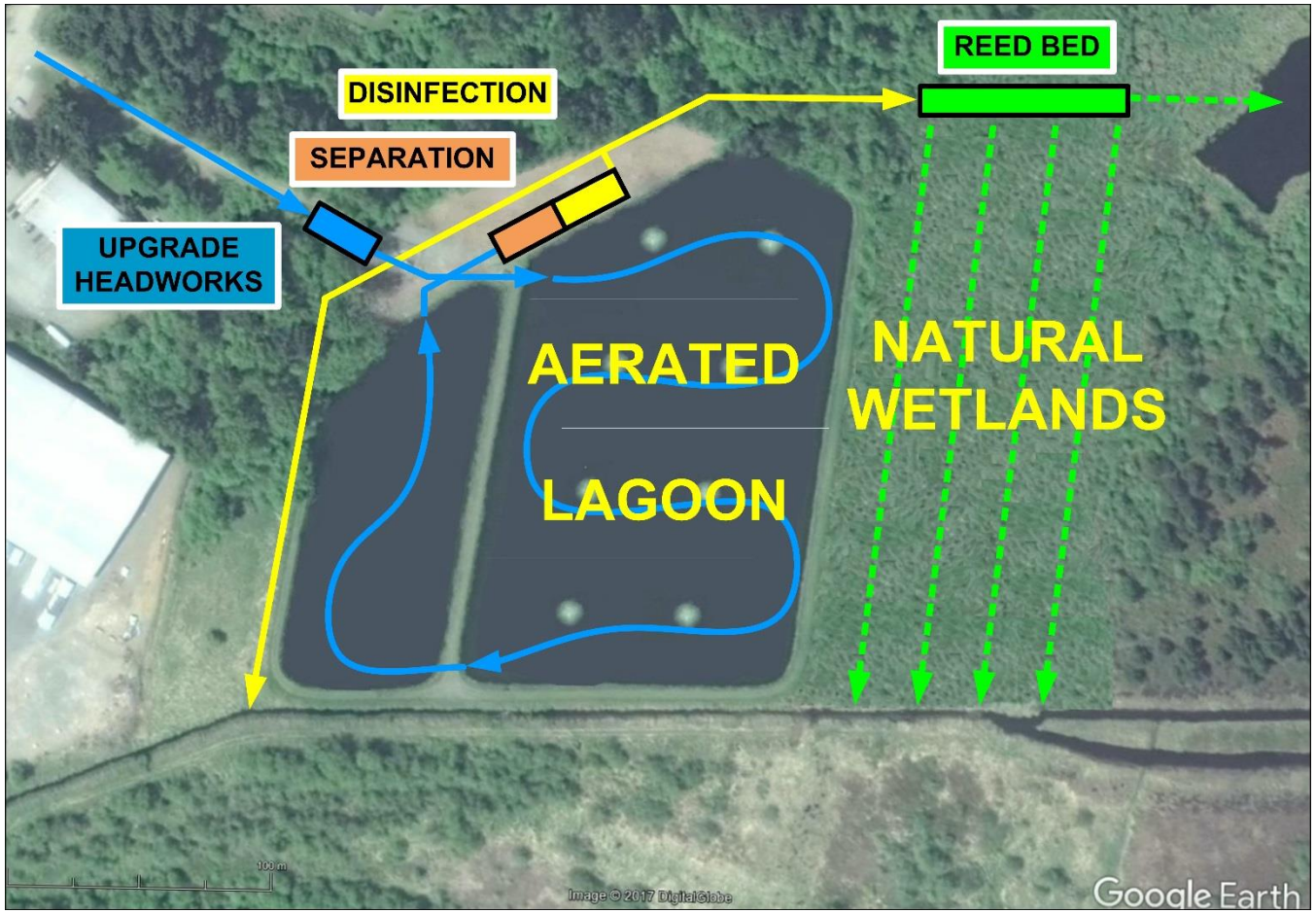
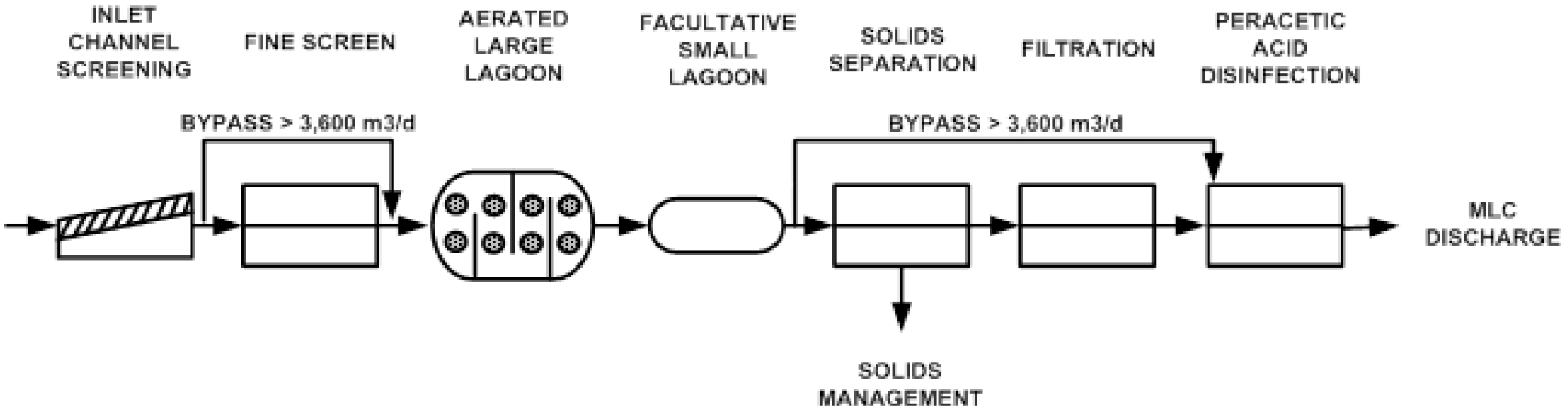
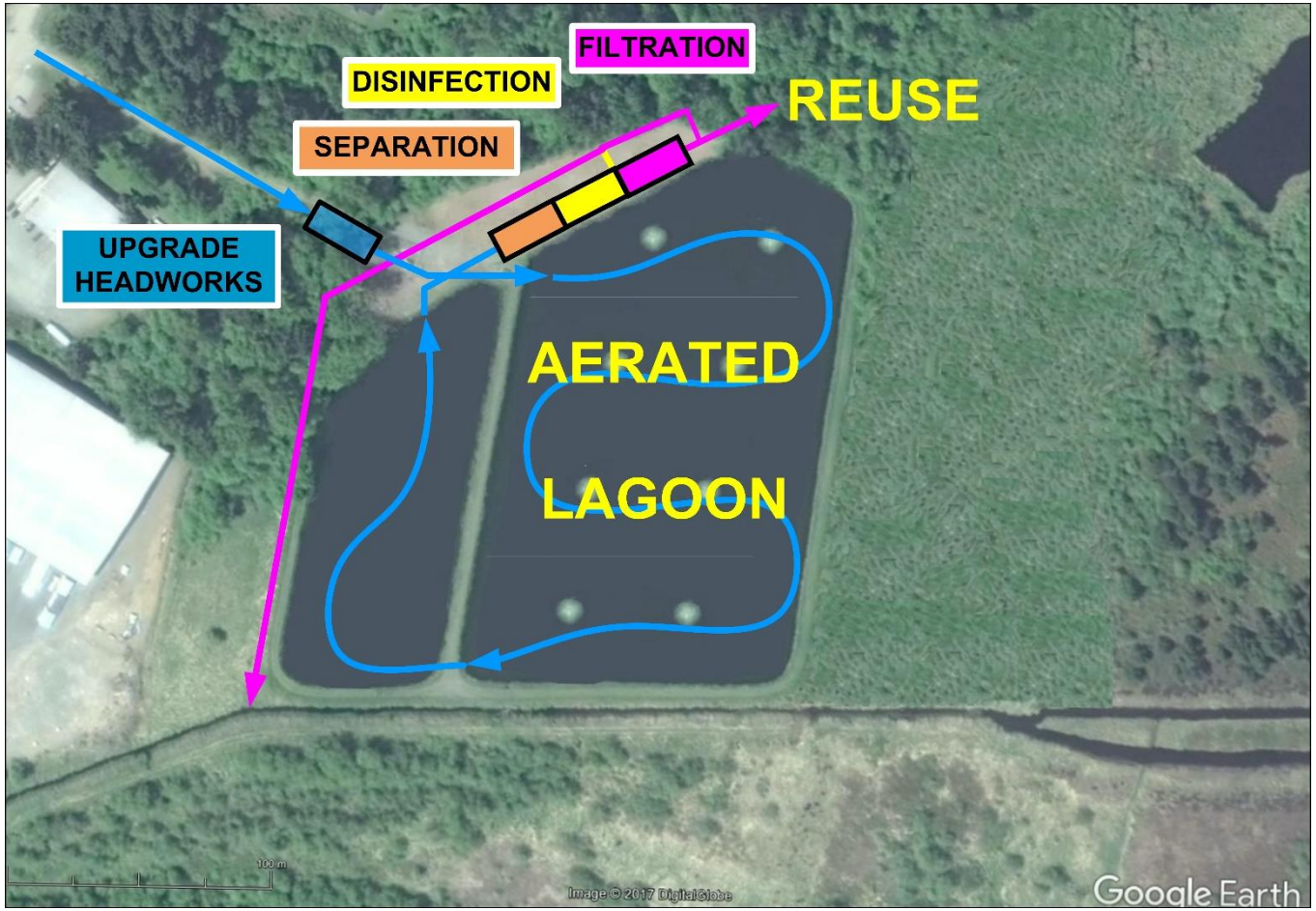
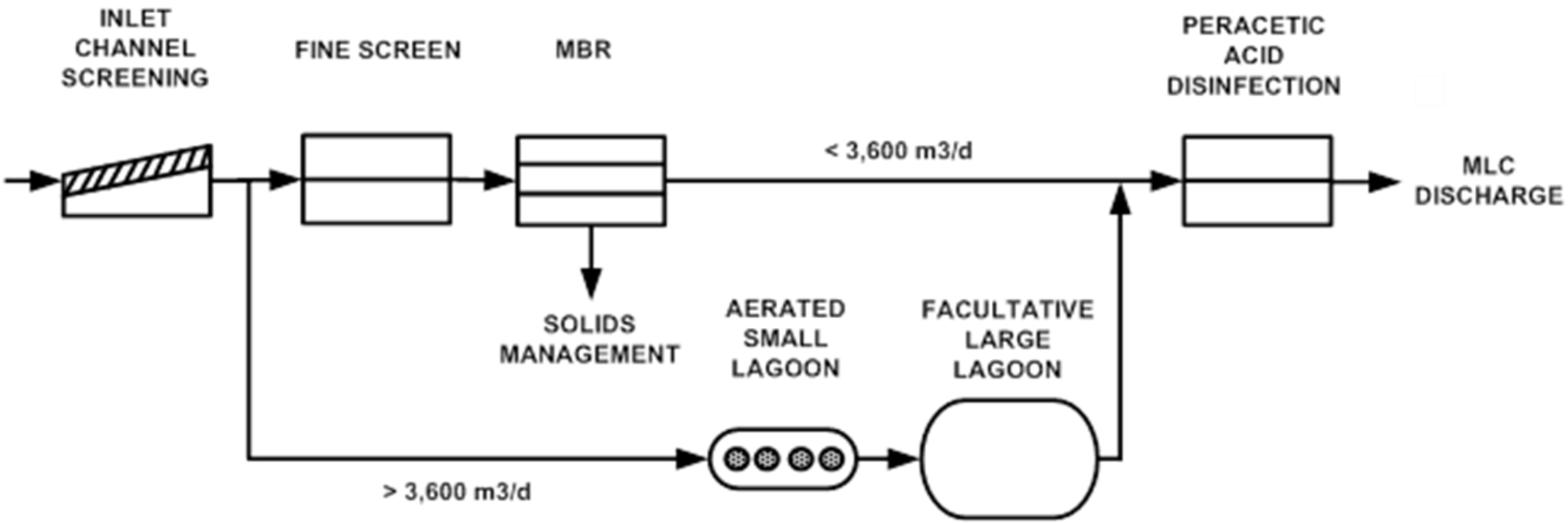




LAGOON
OPTION 1B

LAGOON OPTION 1B




INLET CHANNEL SCREENING
FINE SCREEN
MBR
PERACETIC ACID DISINFECTION
< 3,600 m3/d
MLC DISCHARGE
SOLIDS MANAGEMENT
AERATED SMALL LAGOON
FACULTATIVE LARGE LAGOON
> 3,600 m3/d

OPTION 2

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

TETRA TECH DOCUMENT CONTROL NUMBER 735-1671900100-GAD-J0007

DWG. NO.	REFERENCE DRAWINGS	DWG. NO.	REFERENCE DRAWINGS

REV. No.	REVISION DESCRIPTION	BY	DESIGN	CHECK	APPROVED	DATE
0	ISSUED FOR COST ESTIMATE	AO	LS	VB	LS	2016/11/25

SCALE: NONE		DATE
DESIGNED BY:	L.SAWCHYN	2016/11/08
DRAWN BY:	A.OZTURK	2016/11/08
CHECKED BY:	V.BENJAMIN	2016/11/08
APPROVED BY:	L.SAWCHYN	2016/11/08
COST APPROVAL		

VILLAGE OF CUMBERLAND

LIQUID WASTE MANAGEMENT PLAN
GENERAL ARRANGEMENT DRAWING
PROPOSED SITE PLAN
BASED ON OPTION 3.1

DRAWING NUMBER: 735-1671900100-GAD-J0007 REV. 0

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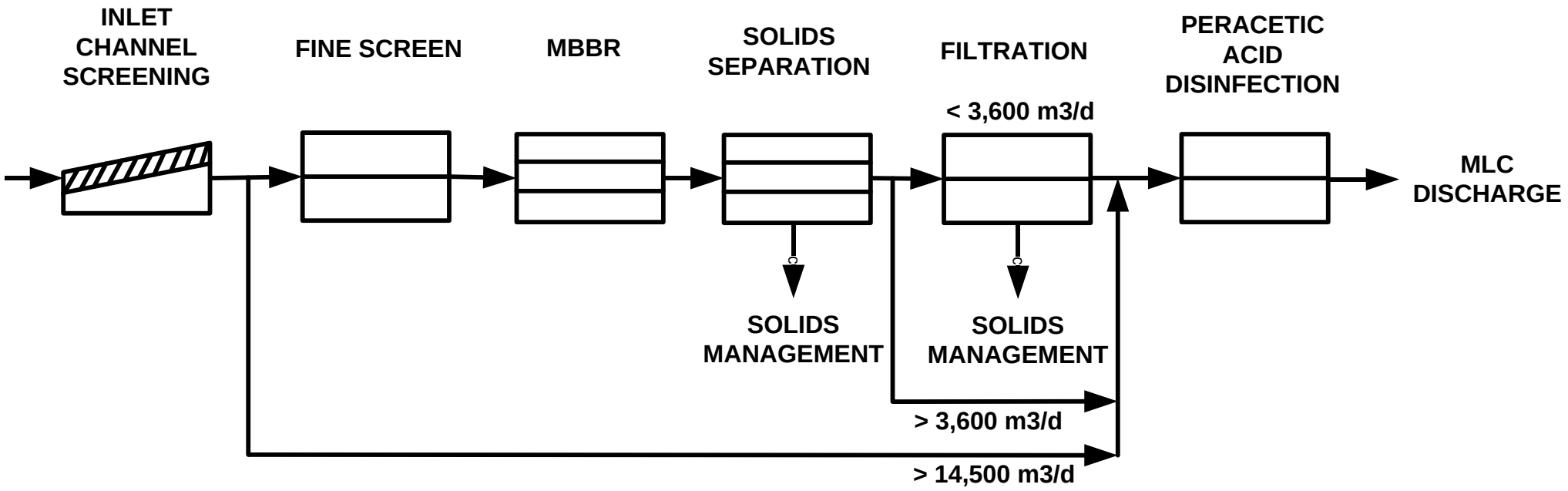
INLET CHANNEL SCREENING
FINE SCREEN
MBBR
SOLIDS SEPARATION
FILTRATION
< 3,600 m3/d
PERACETIC ACID DISINFECTION
MLC DISCHARGE
SOLIDS MANAGEMENT
SOLIDS MANAGEMENT
> 3,600 m3/d
> 14,500 m3/d

OPTION 3

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

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DWG. NO.	REFERENCE DRAWINGS	DWG. NO.	REFERENCE DRAWINGS

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VILLAGE OF CUMBERLAND

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Option Comparison

	Option				
	1	1+1A	1+1A+ 1B	2	3
Description	Upgraded Lagoon to Permit Standard	Upgraded Lagoon to MEP Reuse standard, Wetland Distribution	Upgraded Lagoon to GEP Reuse standard	Base flow mechanical to GEP reuse standard	Full flow mechanical to GEP reuse standard
Biosolids Withdrawal	Periodic dredging + partial volume from solids separation	Periodic dredging + partial volume from solids separation	Periodic dredging + partial volume from solids separation	Full sludge treatment	Full sludge treatment
Long Term Biosolids Production	Low	Low	Moderate	High	Highest
Operational Class	2-3	2-3	3	4	4
Energy use	Moderate	Moderate	Moderate	High	Highest
Carbon Footprint	Low	Low	Moderate	High	Highest

Option Cost Summary

Item	Option 1	Option 1A	Option 1B	Option 2	Option3
Construction Subtotal	$ 3.7 M	$ 2.4 M	$ 2.0 M	$ 5.4 M	$8.0
Engineering & Project Management	$ 0.4 M	$ 0.3 M	$ 0.3 M	$ 0.8 M	$0.8
Other Owners Costs	$ 0.2 M	$ 0.2 M	$ 0.2 M	$ 0.6 M	$1.2
Material Contingency	$ 0.3 M	$ 0.3 M	$ 0.1 M	$ 0.7 M	$0.8
Project Contingency (25%)	$ 1.0 M	$ 0.7 M	$ 0.6 M	$ 1.8 M	$2.7
Option Increment	$ 5.6 M	$ 3.9 M	$ 3.2 M		
Option Total	**$ 5.6 M**	**$ 9.5 M**	**$ 12.7 M**	**$ 9.3 M**	**$13.5 M**

Preliminary Tax Burden Calculation

Notes

- Tax calculations are for comparison purposes only, and have not been reviewed by Cumberland financial staff
- Borrowing costs are based on the financing and borrowing parameters used for the Nov 2016 Grant Application.
- The Tax Burden calculation assumes 100% of the cost is borrowed, for 20 years, at 4% interest, this cost is distributed among the existing 1350 houses and other properties.
- Option1 is an intermediate option only, to a population 4500 people, and is not directly comparable to the other options, which are all for growth to 7000 people.

Preliminary Tax Burden Calculation

	Option 1 (intermediate phase)	1+1A	1+1A+1B	Option 2	Option 3
Capital Cost	$ 5.6 M	$9.5M	12.7M	$ 9.3 M	$14.8 M
Tax burden per house ($55 per $1M)	**$310**	**$525**	**$700**	**$520**	**$800**
Annual operating cost (including biosolids)	$350 k	$375k	$425k	$450 k	$500 k
Operating cost per house (1350 houses)	**$260**	**$280**	**$315**	**$335**	**$370**
Total annual cost per house	**$570**	**$805**	**$1015**	**$855**	**$1170**

Evaluation…

- Select a preferred discharge Option
- Select a preferred treatment Option
- Are the resource recovery concepts (reclaimed water, heat recovery) worth pursuing in the near, or long term?
- ***At the end of 2017, the preferred direction is set, completing LWMP Stage 2***

Fall 2017 meeting schedule

- Nov 23 public Open House (evening)
- Nov 30 (1-4) review feedback, formal Evaluations, finalise Recommendations.
- Dec 11 – present recommendations to Council

2018 Stage 3

- Refine Implementation Plan
- Financing Plan
  - Grants
  - User fees
  - DCC's
  - Borrowing
- Documentation
- Public Consultation
- Submit Final Report to MoE

Thank You!