Liquid Waste Management Plan - Stages 1 & 2

Wastewater 101

November 23rd, 2018

What’s in wastewater?

- ✓ Water
- ✓ Organic material
- ✓ Bacteria
- ✓ Viruses
- ✓ Nutrients

Where does it come from?

Mainly residential

Can include industrial, commercial and institutional sources

Collection

Central systems: sewer collection system, central treatment facility, outfall or ground discharge

Satellite systems: collection & treatment systems for small communities or specific areas within larger communities

What are BOD and TSS?

This is how we measure how much poop is in the water.

BOD: Biochemical Oxygen Demand

TSS: Total Suspended Solids

Effluent Discharge Regulations

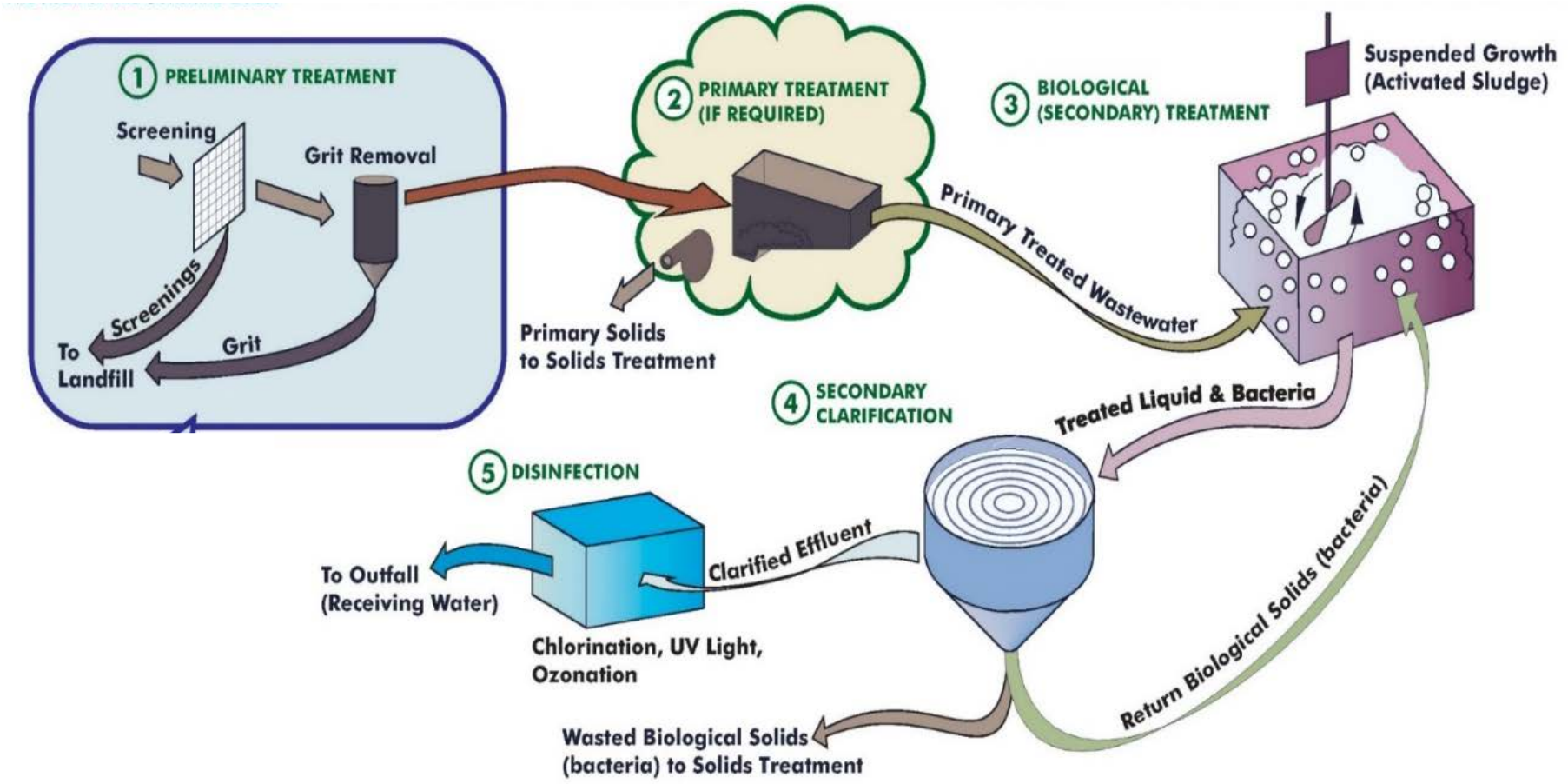
	Provincial Regulations for Discharges to a **Marine** Environment	Provincial Regulations for Discharges to a **Freshwater** Environment	Federal Regulations
Total Suspended Solids (TSS)	Maximum 45 mg/L	Maximum 45 mg/L	Average 25 mg/L
5-Day Biochemical Oxygen Demand (BOD_5)	Maximum 45 mg/L	Maximum 45 mg/L	Average 25 mg/L
Disinfection	Shellfish: 14 Fecal Coliforms/100 mL Recreation: 200 Fecal Coliforms/100 mL		
Ammonia Toxicity	Chronic: non-toxic outside Initial Dilution Zone Acute: non-toxic in undiluted effluent		
Advanced or Tertiary Treatment	Additional requirements may be imposed depending on results of an EIS	Total Phosphorus < 1 mg/L Phosphate <0.5 mg/L	N/A

Reclaimed Water Regulations

	Indirect Potable Reuse	Greater Exposure	Moderate Exposure	Lower Exposure
Uses	Replenishing a potable water source, like an aquifer	Public might be directly exposed Eg. irrigating a golf course	Public probably won't be exposed Eg. irrigating a silviculture operation	Industrial uses, public not at risk of exposure Eg. use at treatment plant
Total Suspended Solids, TSS (mg/L)	5	10	25	45
5-Day Biochemical Oxygen Demand, BOD_5 (mg/L)	5	10	25	45
Turbidity (NTU)	<1	2	n/a	n/a
Disinfection	Fecal coliforms <1 100 mL Chlorine residual required	Fecal coliforms <1 /100 mL Chlorine residual required	Fecal coliforms <100 /100mL Chlorine residual required	Fecal coliforms <200 / 100mL Chlorine residual required


RAW
ASTEWATER
ECONDARY
FFLUENT
TERTIARY
EFFLUENT
TAP
WATER
DEWATERED
BIOSOLIDS

How does liquid wastewater treatment work?



Typical Treatment Facilities

1. **Preliminary Treatment**
   - Includes screening and grit removal
   - Removes trash, debris, plastics, sand, coffee grounds, seeds etc.

2. **Primary Treatment**
   - Removes solids by gravity settling

3. **Secondary (Biological) Treatment**
   - Removes organic substances by using bacteria to convert degradable organic matter into bacterial cells

4. **Secondary Clarification**
   - Gravity settling separates process bacteria from treated liquid

Typical Treatment Facilities

5 Disinfection

Chlorine, ultraviolet (UV) light or ozone kills or inactivates pathogens such as bacteria and viruses

6 Advanced (Tertiary) Treatment

Biological nutrient removal removes nitrogen and phosphorus with bacteria

Chemical addition removes dissolved substances such as phosphorus

Filtration removes residual suspended solids not captured by secondary treatment

Screening

1 Preliminary Treatment

Typical influent values:
BOD ~200 mg/L
TSS ~200 mg/L

2 Primary Treatment

Typical values after Primary Treatment:
BOD ~140 mg/L
TSS ~100 mg/L

Activated Sludge Aeration Basins

3

Secondary (Biological) Treatment

Suspended Growth Systems

Moving Bed Biofilm Reactor (MBBR)

Trickling Filter

3

Secondary (Biological) Treatment

Fixed Growth Systems

Gravity Settling

Dissolved Air Flotation

4

Secondary Clarification

Separation of Biological Solids from Treated Water

Typical values after Secondary Treatment & Clarification:
BOD < 25 mg/L
TSS < 25 mg/L

UV Disinfection

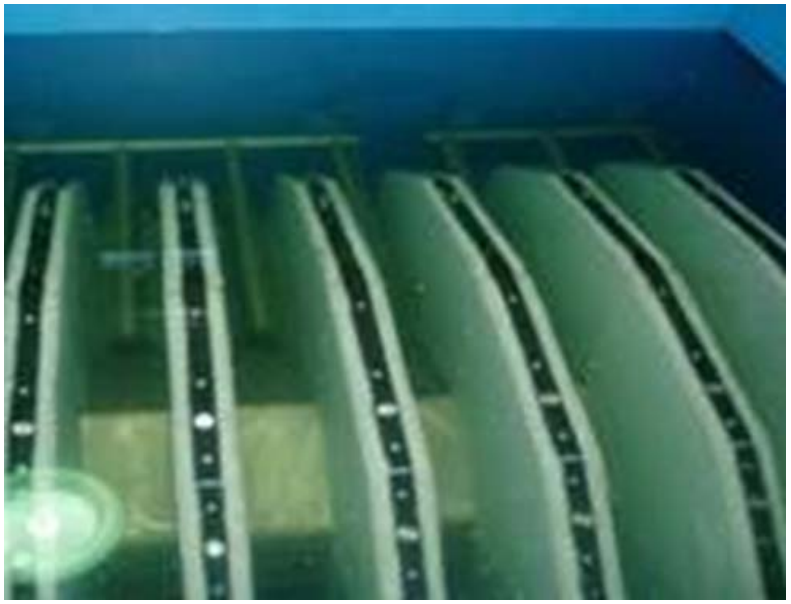
Chlorine Disinfection

5

Disinfection

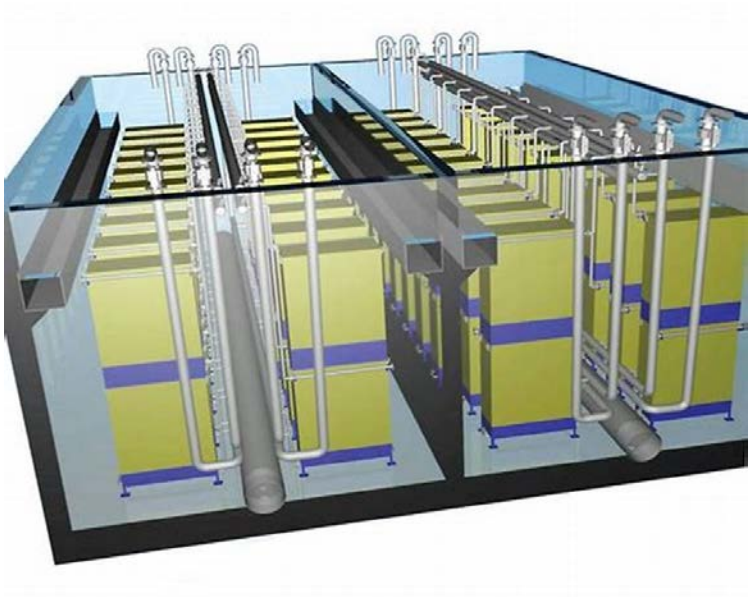
Kills or inactivates pathogens

Nitrogen and Phosphorus Removal



Effluent Filtration with Disk Filters

6 Advanced (Tertiary) Treatment



Membrane Filtration

Campbell River

Nanaimo Five Fingers

Marine Outfalls

Discharge of Treated Effluent

Brightwater (Seattle)

Solids Handling and Treatment

Wastewater solids must be dealt with promptly or they will quickly begin to generate odours and attract insects.

The objective of solids handling and treatment is to reduce biodegradable content to reduce solids mass, disease risk, odours and insect attraction.

Solutions:

- Screenings are sent to landfill or incineration
- Grit is sent to landfill
- Primary waste solids are sent to solids treatment
- Biological (secondary) waste solids are sent to solids treatment
- Septage is sent to solids treatment

Solids Handling and Treatment

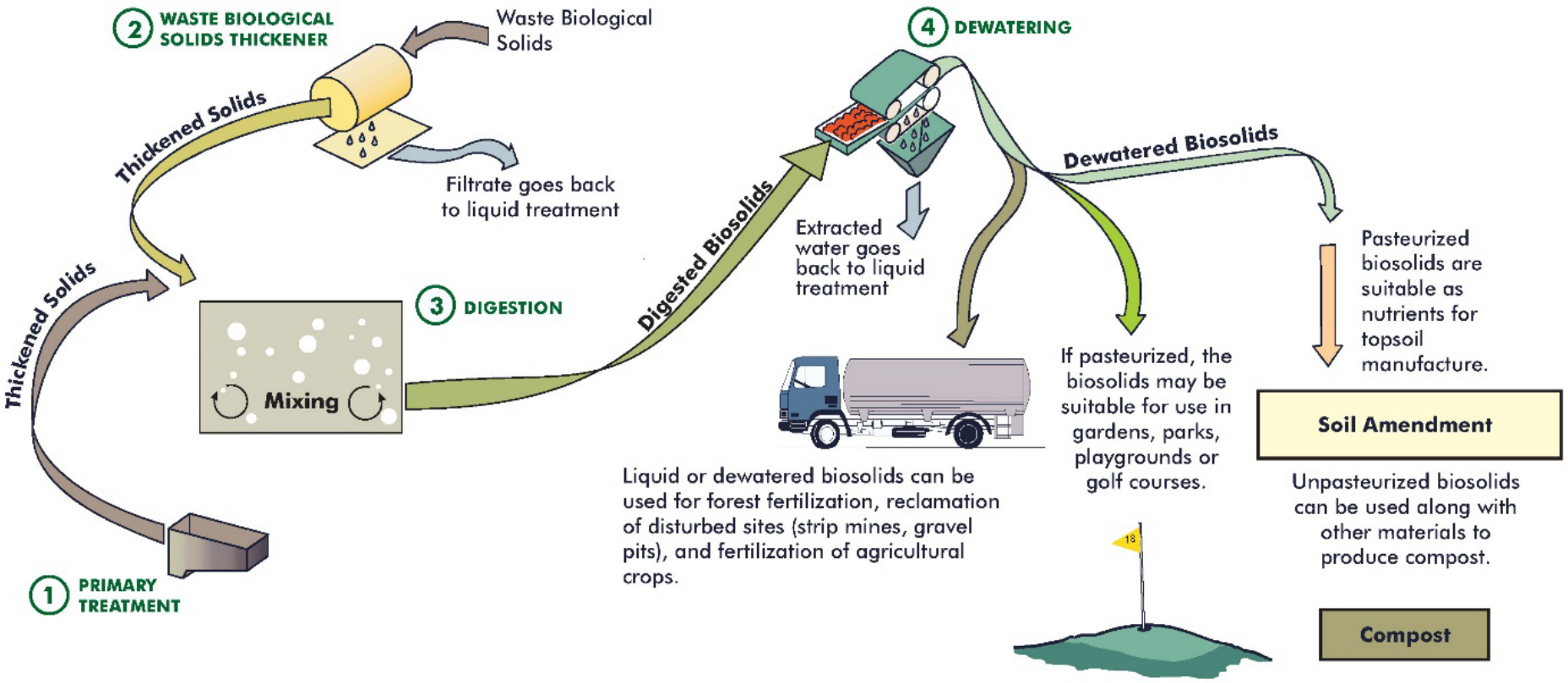
Compost and biosolids are products that can be beneficially reused

Compost is generally a more marketable product than biosolids.

Compost and biosolids use in B.C. is regulated by the *Organic Matter Recycling Regulation (OMRR)*

Products must meet the standards set out in the OMRR before they can be applied to soil

How does solids treatment work?



Anaerobic Digesters with Biogas Production

3

Solids Digestion

Mix liquid waste solids in a tank under aerated or unaerated conditions (solid product of digestion is called *biosolids)*

Centrifuges

4

Solids Dewatering

Remove water from biosolids/sludge

4

Composting

Mix dewatered waste solids with wood chips, mix and aerate until biologically stabilized

Reclaimed Effluent Storage for Irrigation

Reclaimed Effluent for In-Plant Use

Resource Recovery
Reclaimed Water

Effluent Heat Recovery for District Energy Systems

Effluent Heat Recovery for In-Plant Use

Resource Recovery

Heat Recovery

Anaerobic Digestion and Gas Recovery

Nutrient Recovery as Compost & Biosolids

Phosphorus and Nitrogen Recovery as Struvite Fertilizer Pellets

Resource Recovery
Nutrients and Gas Recovery

Odour Control

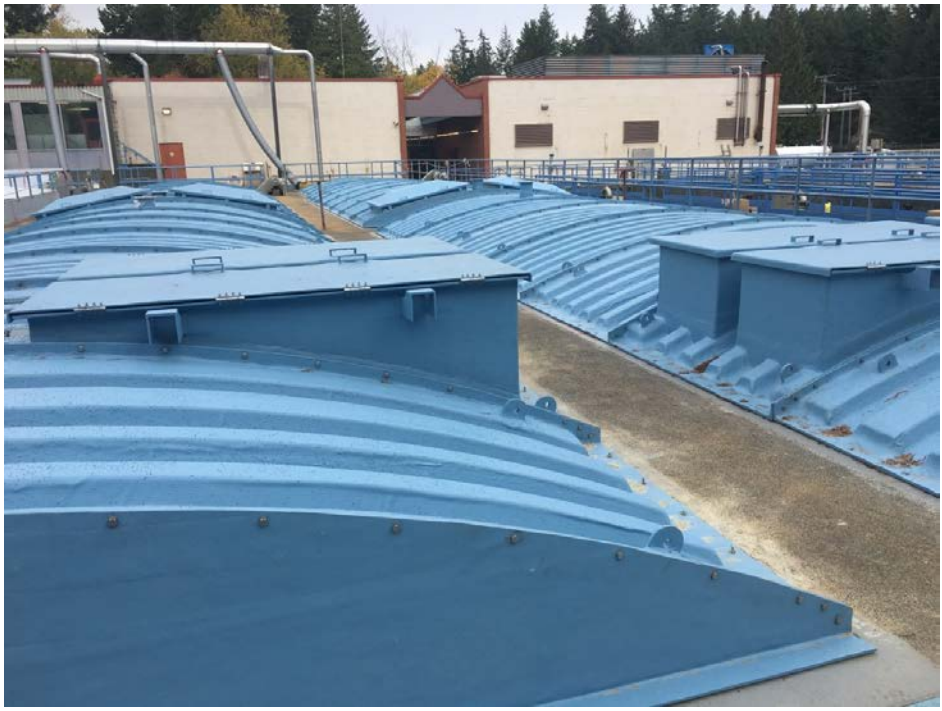
Important from aesthetic standpoint

Need depends on processes used and location of wastewater treatment facility

Solutions include:

- Enclose treatment processes, collect and treat foul air before release
- treatment methods include chemicals (e.g., chlorine, ozone), incineration, biological oxidation by bacteria, filtration using activated carbon media

Fully Enclosed Facilities



Covered Tanks

Containment of Foul Air

Chemical or Biological Scrubbers

Compost Biofilter

Foul Air Treatment

Planning Horizons

- Important to preserve space for key sewerage infrastructure into the future
- Integrate sewerage infrastructure planning with OCPs
- LWMPs typically have a 10 to 20 year horizon and should be updated on a 5 year cycle
- Wastewater Treatment Plants
  - Site plant for 50 to 100 year buildout if possible
  - Room to double capacity of the plant is ideal
  - Facility upgrades in 10 to 20 year increments
- Pipelines
  - Protect utility corridors for 50 to 100 year buildout
  - Design for 20 to 40 year capacity
  - Outfall capacity for ~40 years

Future 101 topics: Understanding cost estimates

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Engineer, Wastewater Treatment
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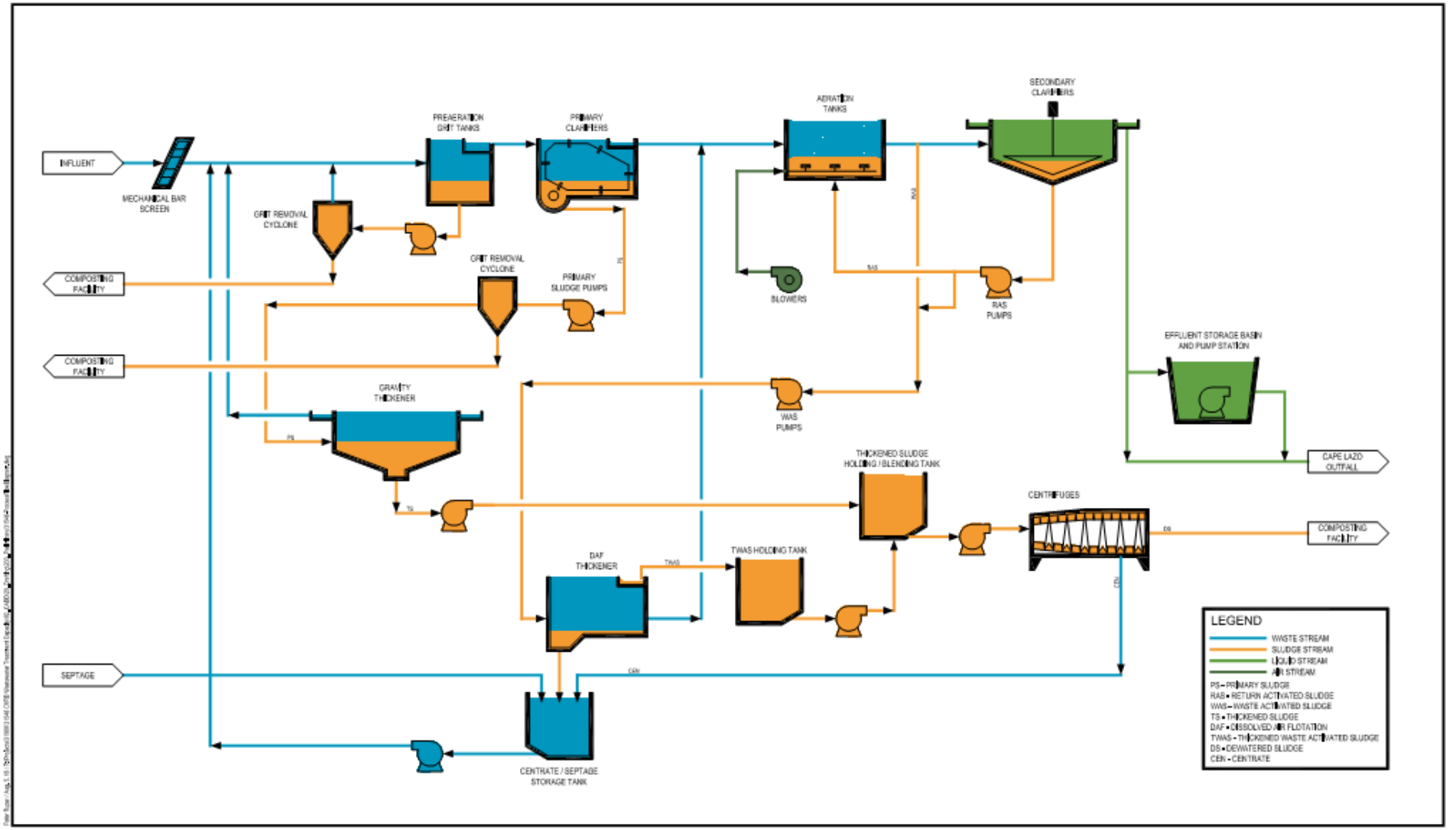


ISL Engineering and Land Services

COMOX WWTP

COMOX VALLEY WATER POLLUTION CONTROL CENTER
PROCESS FLOW DIAGRAM

Figure 2.1

PROJECT : 31548

LIQUID WASTE MANAGEMENT PLAN (LWMP) for the COMOX VALLEY SEWERAGE SYSTEM (CVSS)

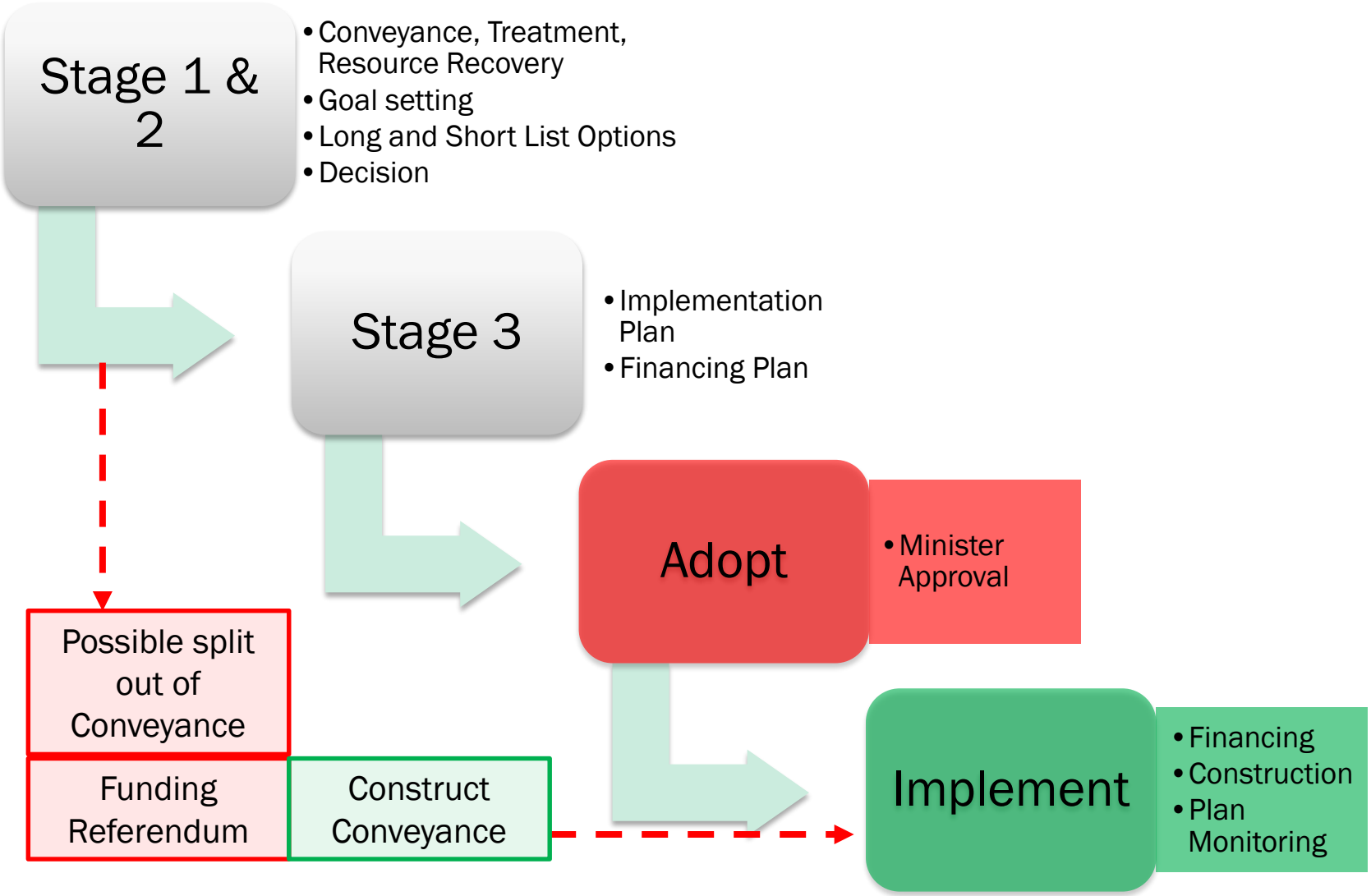
Joint Technical Advisory Committee and Public Advisory Committee (TACPAC)

Meeting #2

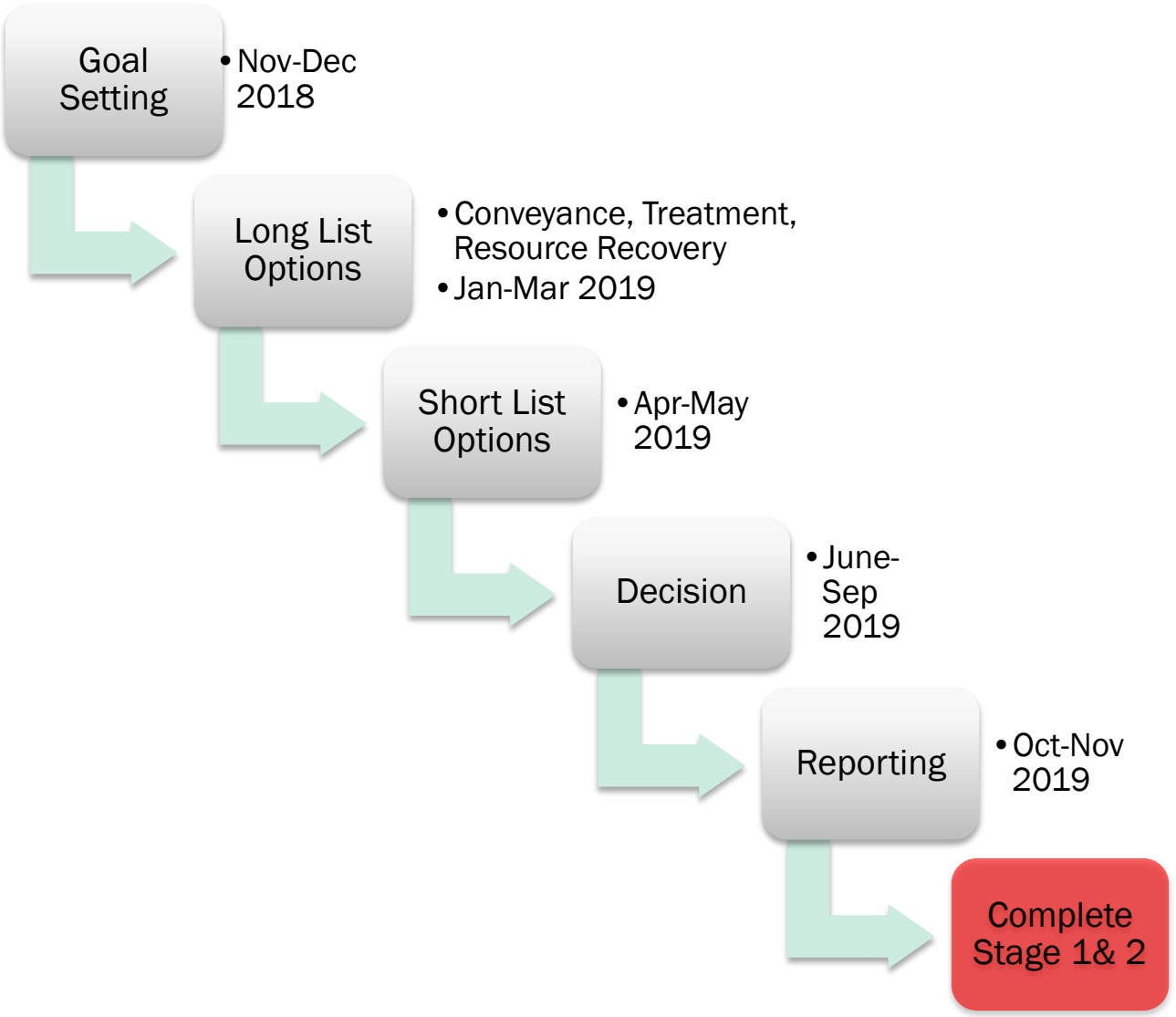
November 23, 2018

Comox Valley REGIONAL DISTRICT

LWMP Road Map – CVSS



LWMP Road Map – CVSS Stage 1 & 2



Wastewater 101

[Aline]

What Are Goals, and how de we use them?

[Paul]

Terminology

- Components
- Objectives
- Options
- Goals
- Actions
- Evaluation

LWMP Components

The three study areas of this LWMP

1. ***Conveyance*** – getting the waste water to the CVWPCC
2. ***Treatment*** – the process to remove the waste from the water
3. ***Resource Recovery*** – turning the waste or water into a useable product

Objectives

- Objectives are the things we ***must*** achieve for each Component
- The project Component might have more than one Objective

Component Objectives

Component	Primary Objective	Secondary Objective
Conveyance	Decommissioning of Willemar Bluffs	Capacity for growth
Treatment	Meet current and near future regulatory requirements	Capacity for growth
Resource Recovery	Study the possibilities	

Options

- An Option is project by which we can achieve the Objectives for a Component
- Example – Comox #2 Pump Station & Forcemain is a Conveyance Option
- ***If a proposed Option can't achieve the Objective(s), it is not a viable Option***
- Ultimately, we want to select the best Option for each Component

Goals

- These are things we ***want*** to achieve, also called ”Aspirational” goals
- Some Goals are common to all Components
- Some Goals are specific to individual Components
- The best Option is the one that achieves the most Goals
- Goals are grouped into five categories

Goal Categories

Category	Meaning	Example	By
Technical	Functional/Operational desires, separate from cost		TAC
Affordability	Ability of community to pay – the tax burden		PAC
Economic Benefit	increased local economic production		PAC
Environmental Benefit	Protection (avoiding damage), Improvements		PAC
Social Benefit	Improvement for people		PAC

Goal Categories

Category	Meaning	Example	By
Technical	Functional/Operational desires, separate from cost	Increased reliability	TAC
Affordability	Ability of community to pay – the tax burden	Reduce capital cost	PAC
Economic Benefit	increased local economic production	Increased Agriculture	PAC
Environmental Benefit	Protection (avoiding damage), Improvements	-Reduce GHG's -Habitat restoration	PAC
Social Benefit	Improvement for people	Increase recreational trails	PAC

Actions

- Most Goals will require some specific Action(s) to achieve them
- Some Actions can achieve multiple Goals An Option may inherently Action certain goals
- We might add additional Actions to an Option achieve more goals

Goals and Actions

Category	Example Goal	Potential Action
Technical	Increased reliability	Avoid a new pump station
Affordability	Reduce capital cost	Attract grant funding
Economic Benefit	Increased Agriculture	Provide reclaimed water for irrigation
Environmental Benefit	-Reduce GHG's -Habitat restoration	-Use renewable energy -Use reclaimed water to keep a wetland "wet"
Social Benefit	Increase recreational trails	Make pipeline ROW into a bike trail

Difference between Goals and Actions?

- In theory, develop the Goals first, then identify Actions to achieve them
- But sometimes we think of an Action first
- For today, when developing “Goals” they can be either a Goal or an Action
- We will sort/group them later.

How do we use the Goals?

- Weight the Goals according to importance
- Create an evaluation system based on the Goals
- Knowing what the Goals are, tweak the Options to try and achieve more Goals
- Evaluate each Option to see what Goals it achieves

Evaluation Matrix

Category	Value	Goals	Goal Weight	Score for Option X
Technical				
Affordability				
Economic				
Environment				
Social				

Evaluation Matrix

Category	Value	Goals	Goal Weight	Score for Option X
Technical		**Increased reliability**		
		All other		
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Economic		**Increased Agriculture**		
		All other		
Environment		**-Reduce GHG's** **-Habitat restoration**		
		All other		
Social		**Increase recreational trails**		
		All Other		
		Total		

Evaluation Matrix

Category	Value	Goals	Goal Weight	Score for Option X
Technical	20	**Increased reliability**	**5**	
		All other	15	
Affordability	20	**Reduce capital cost**	**10**	
		All other	10	
Economic	20	**Increased Agriculture**	**5**	
		All other	15	
Environment	20	**-Reduce GHG's** **-Habitat restoration**	**5** **3**	
		All other	12	
Social	20	**Increase recreational trails**	**5**	
		All Other	15	
		Total	**100**	

Hypothetical Scoring Example
(illustrative only - not an actual evaluation of Comox #2)

Category	Value	Goals	Goal Weight	Score for Comox #2
Technical	20	**Increased reliability**	**5**	**0**
		All other	15	5
Affordability	20	**Reduce capital cost**	**10**	**5**
		All other	10	5
Economic	20	**Increased Agriculture**	**5**	**0**
		All other	15	0
Environment	20	**-Reduce GHG's** **-Habitat restoration**	**5** **3**	**1** **0**
		All other	12	6
Social	20	**Increase recreational trails**	**5**	**5**
		All Other	15	5
		Total	**100**	**32**

End Result

- The highest ranked Option is the one that achieves the most Goals!
- But the system is not perfect…
- So, use the ranking as a ***guide*** to selecting the Preferred Option

Initial Public Consultation in the LWMP

[Christianne]

Liquid Waste Management Plan

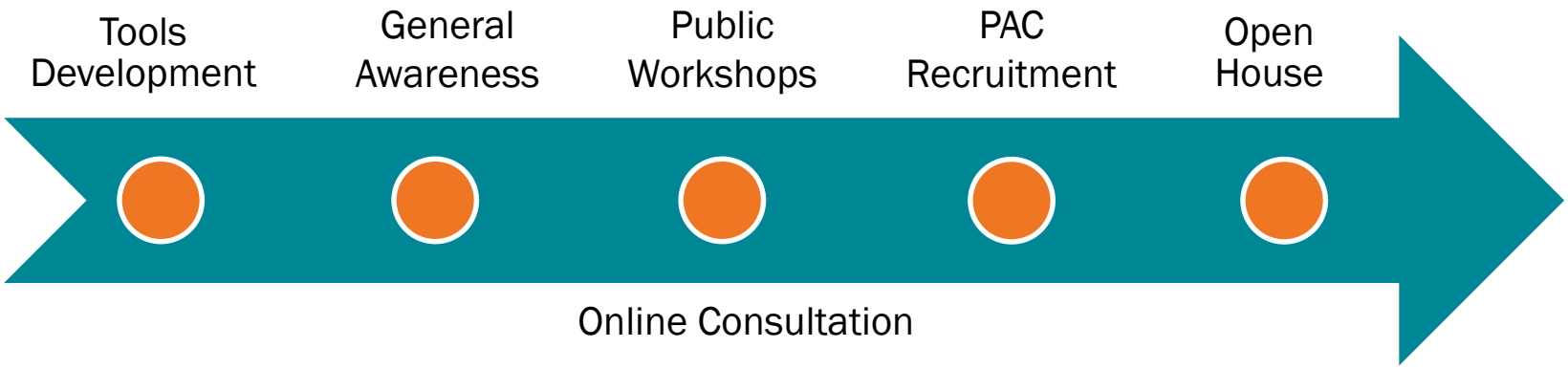
PHASE 1 PUBLIC CONSULTATION

Comox Valley
REGIONAL DISTRICT

Phase 1 Goals

INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
Educate about the LWMP and the Sewer System	Understand community values for sewer system planning			

Phase 1 Activities



Inform – Open House

Comox Valley Pollution Control Centre

November 6 and 8

110 attendees

Open House Themes

- Odour management
- Impact of natural disasters
- Education for residents
- Level of treatment
- LWMP process
- Future growth and impact

Consult - Public Workshops

Courtenay (June 18)

3 - Courtenay

1 – Comox

1 – Fanny Bay

Comox (June 19)

5 – Comox

1 - Courtenay

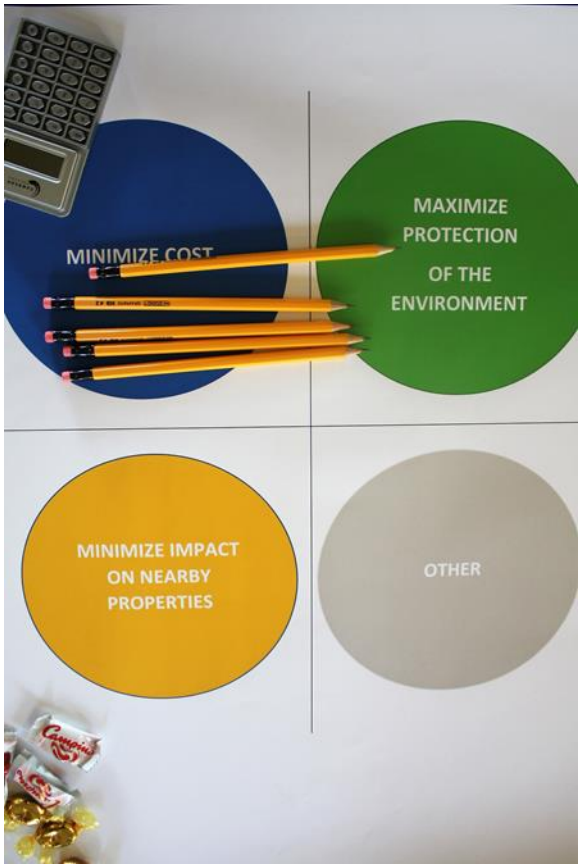
9 – Area B

2 – Union Bay

89% of attendees satisfied or very satisfied with workshop

Scenarios

- Construction of pipes in an environmentally sensitive area
- Construction of pipes in a commercial/business area
- Construction of pipes in a residential area
- Upgrade at the sewage treatment plant



Public Workshops - Themes

Concerns about the environment.

- ✓ Ranked most often as the highest value to consider when making sewer system decisions.

Interest in long-term planning.

- ✓ Long-term infrastructure planning should be done in coordination with community development and land use planning.

Consult – Online Feedback

104 Responses to online survey

49 Courtenay

28 Comox

12 Area B

15 Area A, C, Cumberland

1 Unknown

Online Feedback - Themes

Interest in long-term planning.

- ✓ Ensuring we are thinking long term and not making decisions that will need to be corrected later.
- ✓ Opportunities and plans for service outside of the existing areas.

Importance of moving forward.

- ✓ Quickly make decisions and move forward with improvements, given the risks posed by aging/overstretched infrastructure

Online Feedback - Themes

Concerns about the environment.

- ✓ Ensuring the environment is not overlooked or negatively impacted as a result of eagerness to reduce costs.

Next Steps

November 27

Workshop

Comox Golf Club

5:00 – 7:00 pm

November 28

Workshop

Westerly Hotel

5:00 – 7:00 pm

LWMP Public Consultation Plan

QUESTIONS?

Examples of Goal-Driven Projects

[Paul]

Conveyance Project – Marwayne, AB

[Video Link]

Process

1. Conveyance project was required
2. Sustainability Plan for guidance
3. Urban revitalisation was the aspirational goal

Treatment Project– Sechelt Water Resource Centre, BC

[Video Link]

OCP Goals:

- Promote and use **best practices** and **innovative approaches** to infrastructure and public utilities that achieve the **environmental** and **energy conservation** goals of this Plan, while providing the necessary services to residents
- Reduced water rates and use of biosolids for agriculture

Sechelt Sustainability Plan Goals – Liquid Waste

- Treat effluent to the highest standards
- Reduce noise and odour to the greatest extent possible
- Identify and pursue opportunities to recover energy and other resources from treated effluent.

Sechelt Sustainability Plan Goals – Other

- Act as a model for others by designing and operating Sechelt facilities to be energy and water efficient and have low greenhouse gas emissions
- Base decisions on full life-cycle costs
- Give equal weighting to social, cultural, environmental and economic factors
- Promote and use renewable energy and low impact infrastructure
- Reduce [potable] water use in parks and public facilities
- Incorporate public amenities in all new development
- Build positive relationships with other levels of government

Resource Recovery Project, Cranbrook, BC

[Video Link]

Primary Objective:

- Eliminate direct discharge to Kootenay River

Goals achieved:

- Maximise ***economically productive*** use of water - $1.2M value per year
- Habitat enhancement

Methodology

- “Rather than looking for leading-edge technologies, the city focused on using proven, off-the-shelf products in innovative ways.”

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Brainstorming the Goals

Instructions: Brainstorming the goals

1. We will generate goals for each component:
    - Conveyance
    - Treatment &
    - Resource Recovery
2. PAC will generate goals for:
    - Cost/Affordability
    - Economic benefit
    - Environmental benefit
    - Social benefit
3. TAC will generate goals for:
    - Technical/functional
4. We will spend 3-5 minutes on each component (Conveyance, Treatment & Resource Recovery)
5. Staff will sort the goals as we go & place goals on flip charts for each component in groups of similar goals
6. We will display the groupings and provide an opportunity for tac pac to view

Instructions: prioritizing the goals

- TAC to rank functional technical goals
- PAC to rank other goals: Cost/Affordability, Economic benefit, Environmental benefit, & Social benefit
- Rank the goals for each component for using the coloured dots
- Green – highest ranking (value 5)
- Red/pink – medium ranking (value 3)
- Yellow – lower ranking (value 1)

OCP, RGS and CVSS Plans

Category	Goal	
Technical	• Alternate Trunk Sewer Networks • Treatment to tertiary or reuse level • Waste to resources	
Affordability	• Reduce capital cost • Low Operating Costs • Funding Through DCC's	

OCP, RGS and CVSS Plans

Category	Goal	
Economic Benefit	• Vibrant Local Economy • Increased Agriculture	
Environmental Benefit	• Reduce GHG's • Renewable Energy • Energy Conservation • Protect, conserve and restore Ecosystems • Green Buildings	
Social Benefit	• Public Health Needs	

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After meeting # 2…

The goals we develop will be taken to public sessions on;

- Nov 27 - Courtenay
- Wed Nov 28 Comox
- Feedback to be reviewed at TACPAC 3 on Dec 11.

For meeting # 3…

- Review feedback of public sessions
- Review of evaluation system
- Adjust goals and weightings
- Recommend finalized Goals and Evaluation system

Round Table

[Allison]