

2021 Biosolids Management Master Plan Update

Public Works Committee Meeting
Study Overview and Recommendations

October 8, 2024



Problem and Opportunity Statement

*The purpose of the Biosolids Management Master Plan Update is to develop a **holistic, long-term strategy for biosolids management in Niagara** in a manner that is transparent, sustainable, reliable, environmentally friendly, cost-effective and flexible.*

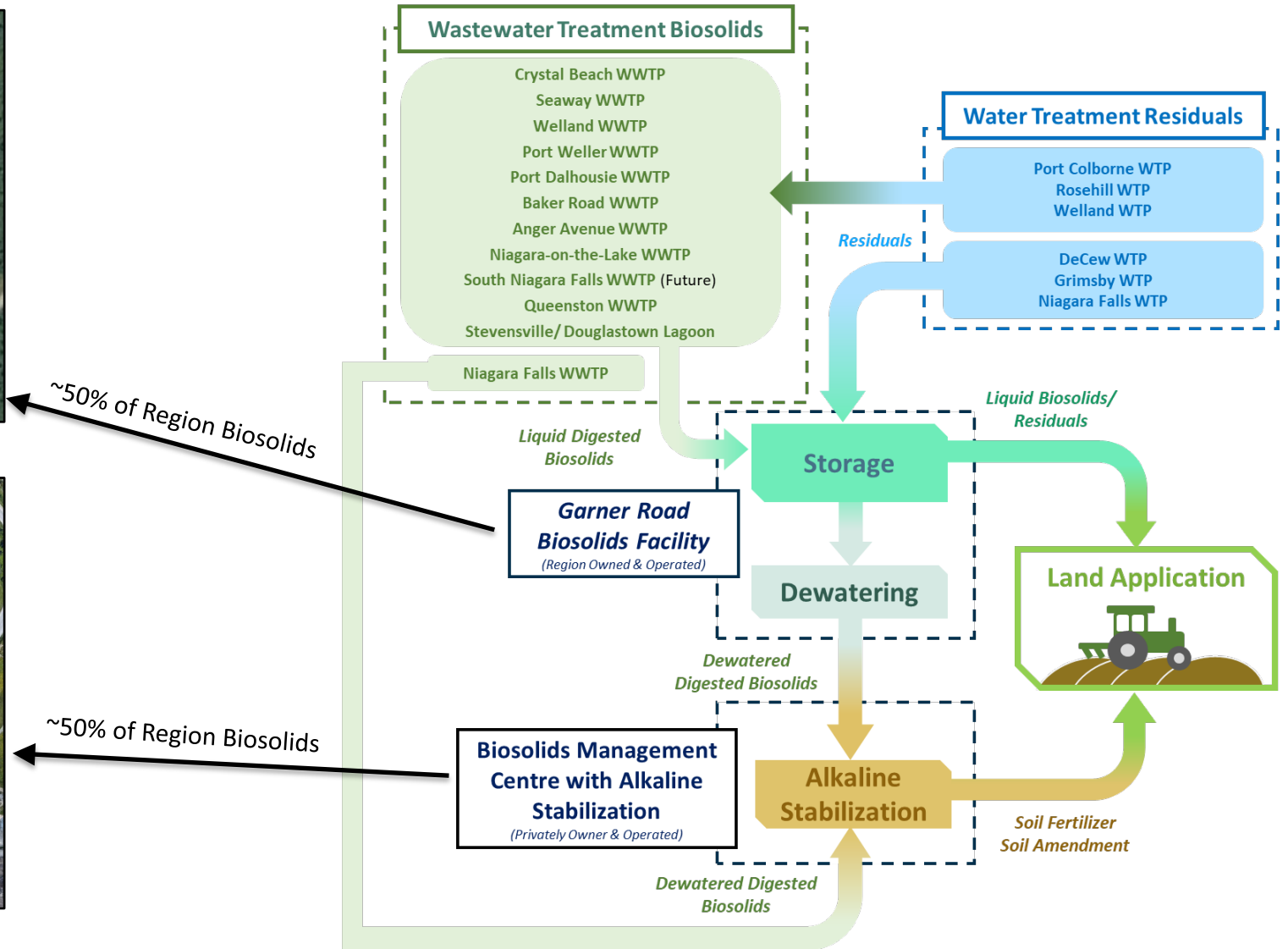


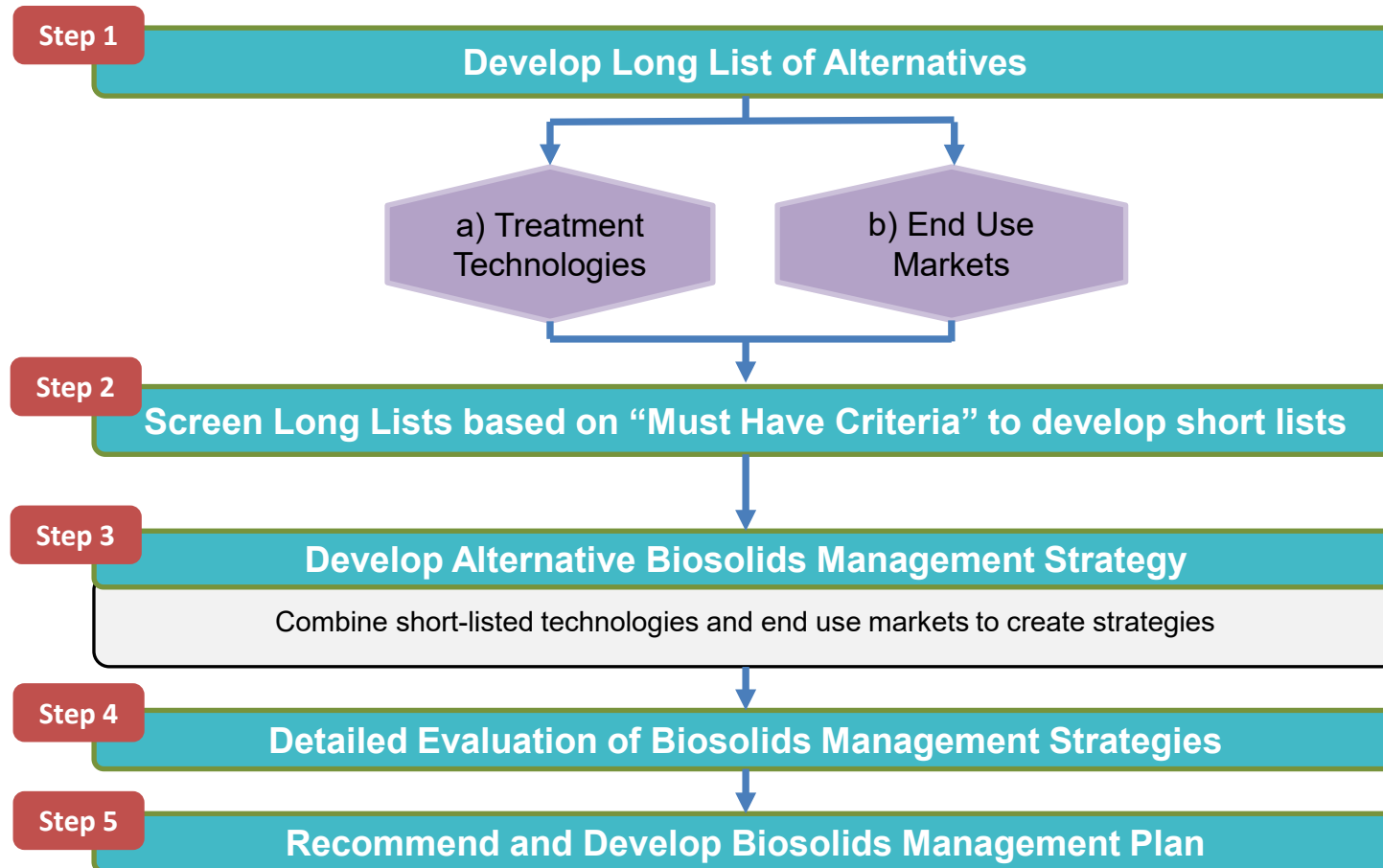
What are biosolids?

Biosolids are the organic materials resulting from the physical, chemical and biological treatment of sewage at wastewater treatment plants.

Biosolids have ***many potential beneficial uses*** including land application as a soil amendment or fertilizer, an approach currently used by the Region.

Overview of Existing System





Steps 1 & 2a – Screen Long List of Biosolids Treatment Technologies

		1. Maturity of Technology		2. Compatibility with Existing and Future Site Development and Biosolids End Use Markets		3. Proven Applicability at Similar Scale Facilities		4. Implementable		Consider for Detailed Evaluation
Biological Digestion Technologies	Thermal Hydrolysis Post-Treatment (THP)	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Thermal Drying Technologies	Direct Thermal Dryer (Drum Dryer, Belt Dryer)	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
	Fluidized Bed Dryer	✓	Pass	✓	Pass	✗	Fail	✗	Fail	Screened Out
	Indirect Thermal Dryer (Paddle Dryer, Disc Dryer)	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
	Solar Dryer	✓	Pass	✓	Pass	✗	Fail	✗	Fail	Screened Out
Chemical Stabilization Technologies	Alkaline Stabilization	✓	Pass	✓	Pass	✓	Pass	✗	Fail	Screened Out
	Alkaline Stabilization with Supplemental Heat or Acid	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
	Alkaline Stabilization with Supplemental Heat and High-Speed Mixing	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Composting Technologies	Composting (Open Technologies Aerated Static Pile and Windrow Composting)	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Thermal Conversion Technologies	Incineration	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
	Gasification	✗	Fail	✓	Pass	✗	Fail	✗	Fail	Screened Out
	Pyrolysis	✗	Fail	✓	Pass	✗	Fail	✗	Fail	Screened Out
	Wet Oxidation	✗	Fail	✓	Pass	✗	Fail	✗	Fail	Screened Out
	Hydrothermal Liquification	✗	Fail	✓	Pass	✗	Fail	✗	Fail	Screened Out

Steps 1 & 2b – Screen Long List of Biosolids End Use Markets

	Market Availability		Compatibility with Current Program		Long Term Reliability and Sustainability		Implementable		Considered for Detailed Evaluation
Agricultural, Silviculture and Horticulture	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Parks and Recreation Department	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Ontario Ministry of Transportation	✗	Fail	✓	Pass	✓	Pass	✓	Pass	Screened Out
Landscape Contractors	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Golf Courses	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Land Rehabilitation	✗	Fail	✓	Pass	✗	Fail	✓	Pass	Screened Out
Co-management with Source Separated Organics	✓	Pass	✓	Pass	✓	Pass	✓	Pass	Carried Forward
Fuel Additions (ie. Syngas)	?	Further Review	✓	Pass	✓	Pass	?	Further Review	Carried Forward
Landfill	✗	Fail	✓	Pass	✗	Fail	✓	Pass	Screened Out

Step 3 – Develop Alternative Biosolids Management Strategies

	Management Alternative	Technology	Product	End Use
Strategy 1	Beneficial Use on Land	AD	Stabilized Liquid biosolids	Land application with liquid biosolids
Strategy 2		AD + Dewatering	Stabilized Biosolids Cake	Land application with biosolids cake
Strategy 3		AD+ Advanced Digestion + Dewatering	Fertilizer quality Cake	Land application of cake / un-restricted use
Strategy 4		AD + Dewatering + Advanced Alkaline Stabilization	Fertilizer / soil amendment	Un-restricted use on land
Strategy 5		AD + Dewatering + Composting	Compost	Un-restricted use on land
Strategy 6		AD + Dewatering + Drying	Dried Product	Un-restricted use on land or fuel source
Strategy 7	Thermal Processing	AD + Dewatering + Incineration	Ash	Ash beneficial use + landfill

Strategy 0 – “Do Nothing” was screened out as it does not pass criteria for ‘Long Term Sustainability and Reliability’ due to capacity limitations in existing system to process future biosolids quantities.

AD = Anaerobic Digestion

Natural Environment



- Terrestrial Systems
- Aquatic Systems
- Surface Water Quality
- Groundwater Quality, Quantity and source water protection
- Soil Quality
- Air Quality/GHG

Socio-Cultural Environment



- Odour
- Noise/Vibrations during operation
- Visual/Aesthetics
- Truck Traffic
- Disruption during Construction
- Property Acquisition and Easements
- Recreational Use and Users
- Agricultural Land Users
- Human health and well being
- Existing and Future Adjacent Land Use Compatibility
- Archaeology / Cultural Heritage



Technical Considerations



- Performance
- Sustainability
- Ease of Operation
- Resiliency
- Ease of Implementation
- Compatibility with existing infrastructure
- Energy use and recovery
- Climate change adaptability
- Permits and Approvals
































































Economic Considerations

- Capital Cost
- Operating and Maintenance Cost
- Life Cycle Costs
- Best Use of Existing Investments






Approach: Equal weighting initially followed by sensitivity analysis prioritizing different criteria categories

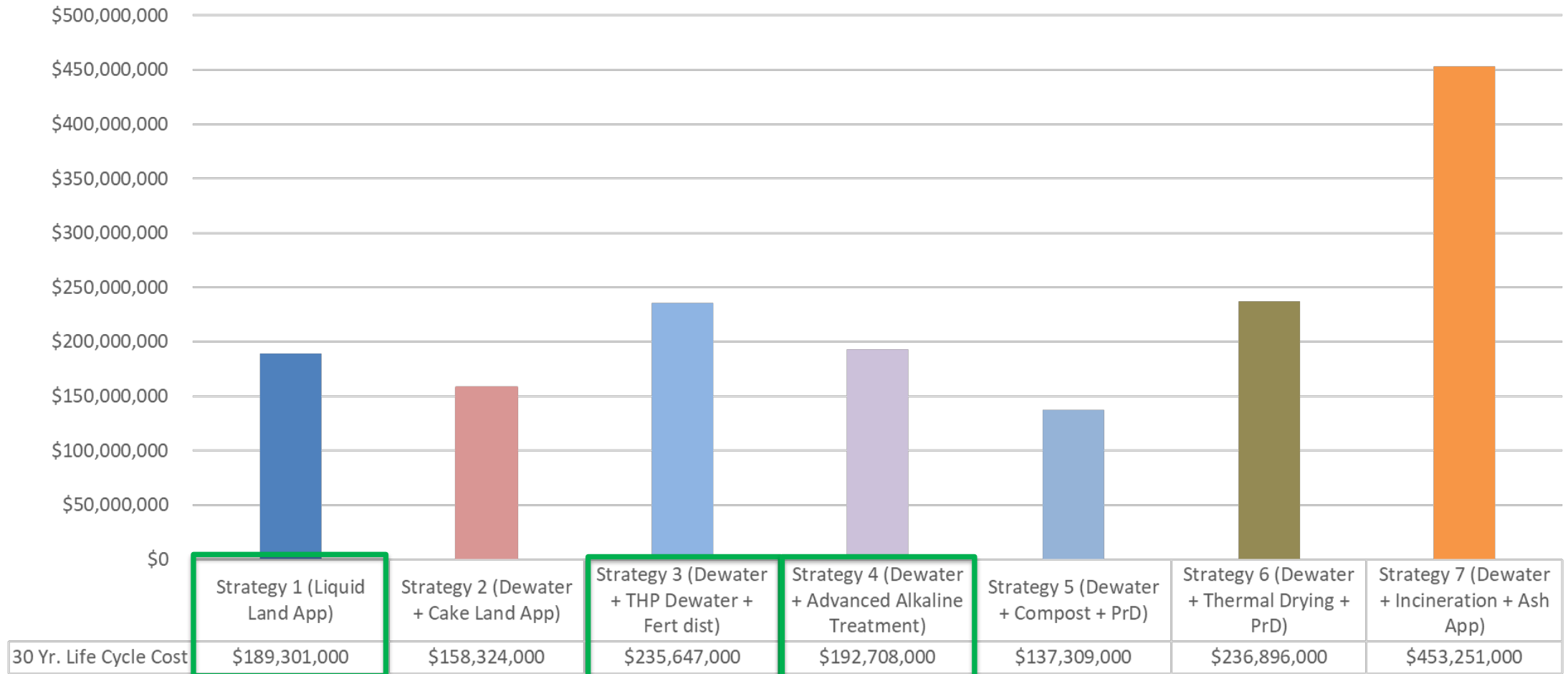
Step 4 - Detailed Evaluation - Results

Key Differentiating Criteria	Strategy 1: AD + Liquid Biosolids Land Application	Strategy 2: AD + Dewatering + Cake Land Application	Strategy 3: AD + Advanced Stabilization (THP) + Fertilizer Quality Product	Strategy 4: AD + Dewatering + Advanced Alkaline Treatment	Strategy 5: AD + Dewatering + Composting + Product Distribution	Strategy 6: AD + Dewatering + Thermal Drying + Product Distribution	Strategy 7: AD + Dewatering + Thermal Processing (Incineration)
Greenhouse Gas Emissions							
Nutrient Recovery and Potential for Beneficial Reuse by Agricultural Users							
Proven Performance							
Odour at Garner Road Facility							
Truck Traffic							
Long Term Sustainability							
Ease of Operation							
Resiliency							
Ease of Implementation							
Life Cycle Cost							
RANKING	3	2	5	1	6	4	7

LEGEND

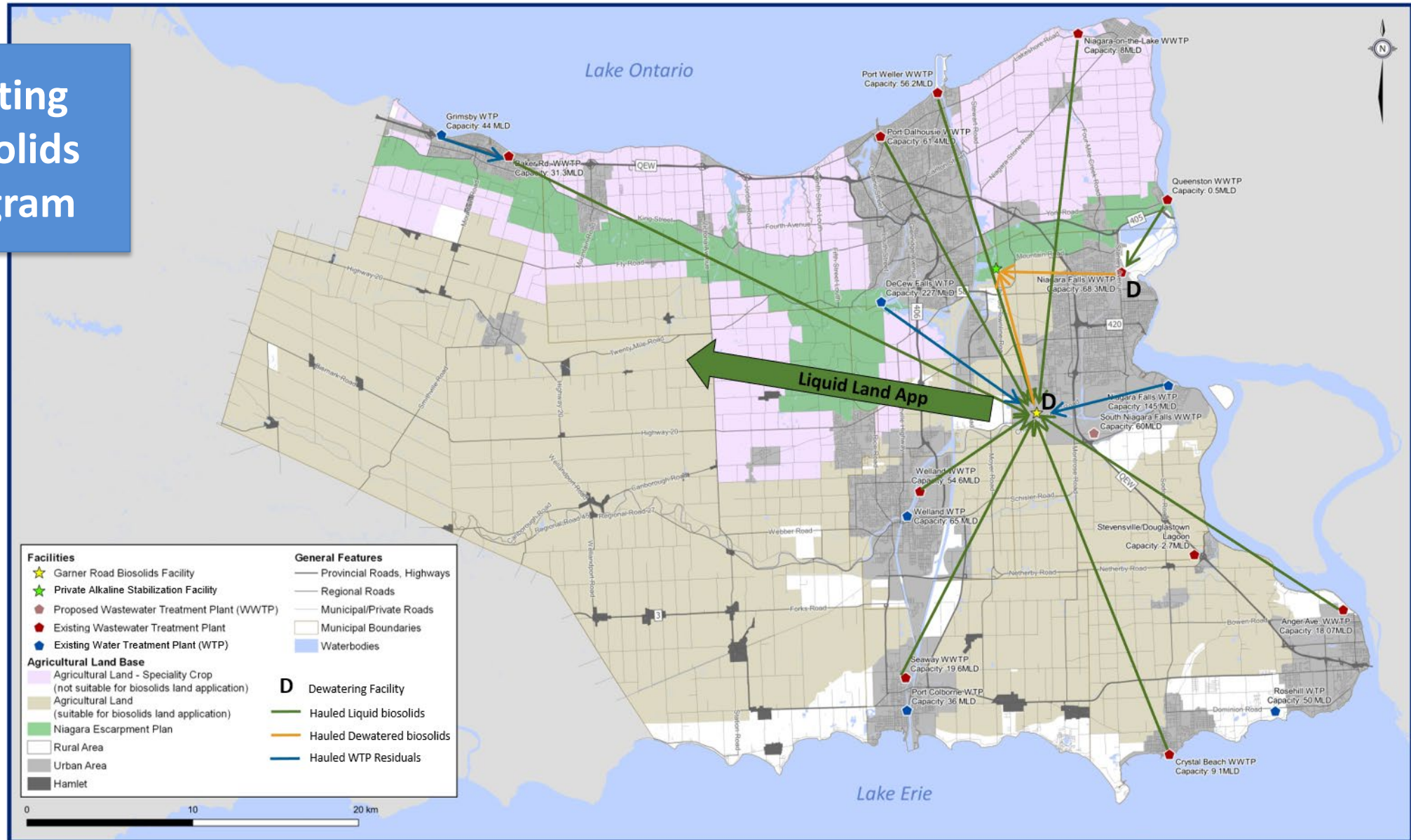
-  **Good**
Low Impact
-  **Neutral**
Moderate Impact
-  **Poor**
High Impact

30 Yr. Life Cycle Cost for Biosolids Management Strategies



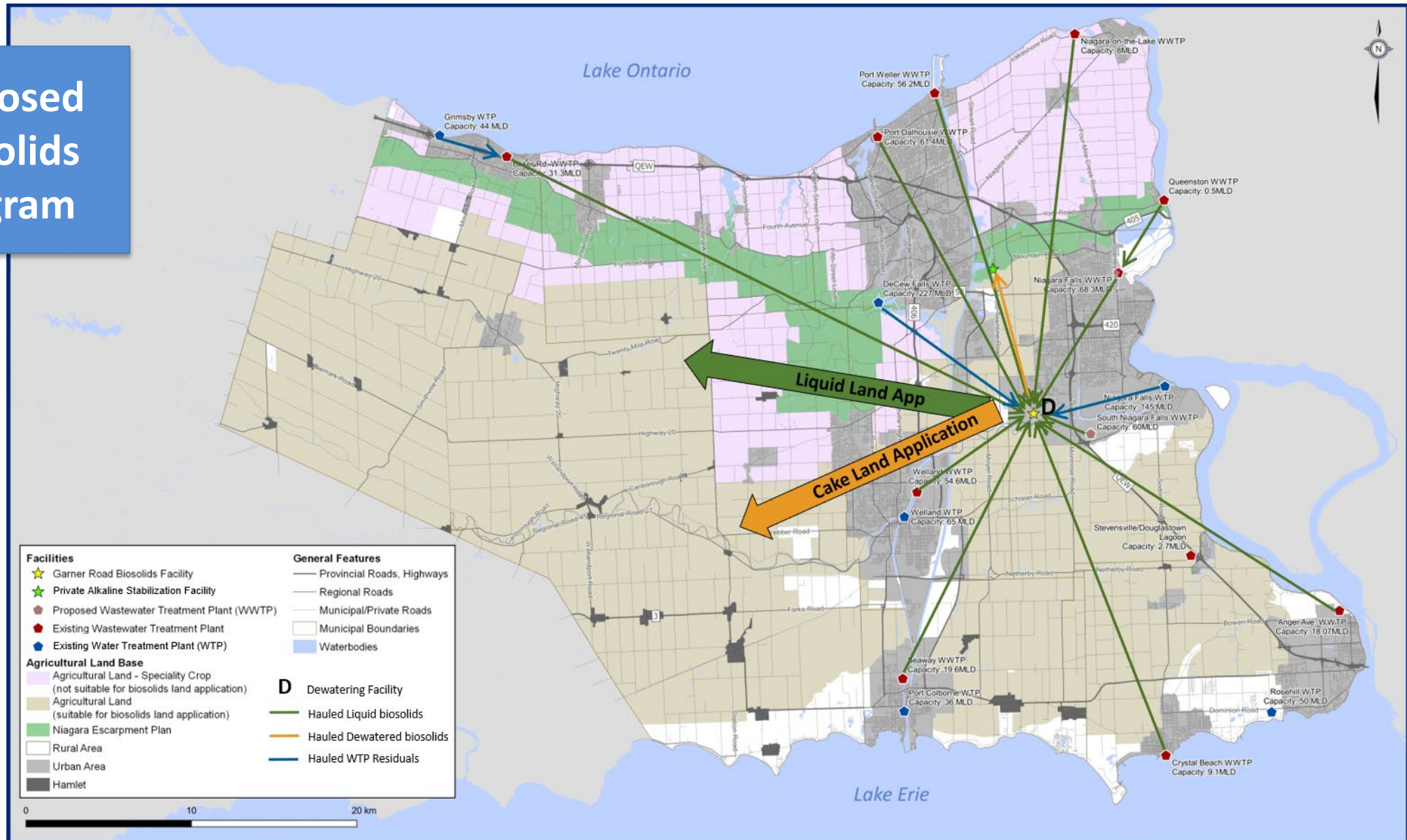
Step 5 – Recommendations Overview of Proposed Biosolids Program

Existing Biosolids Program



Step 5 – Recommendations Overview of Proposed Biosolids Program

Proposed Biosolids Program



Short Term (within 3 years)

- Optimize current operations (ie. increase centrifuge operation time, increase decanting of lagoons)
- **Develop a feasibility study of a Centralized Anaerobic Digestion (AD) at the Garner Road facility** to process the Region’s wastewater solids and source separated organics (SSO).




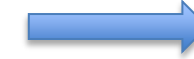

Mid Term (by 2031)

- Design and construct upgrades to Garner Road Biosolids Facility to provide **centralized storage and dewatering for all Region biosolids** to include:
 - New dewatering facility with cake storage
 - Decommission existing dewatering building
 - New Administration Building
 - Security upgrades and installation of weigh scale for monitoring biosolid quantities
- Decommission dewatering equipment at Niagara Falls WWTP at end of useful life

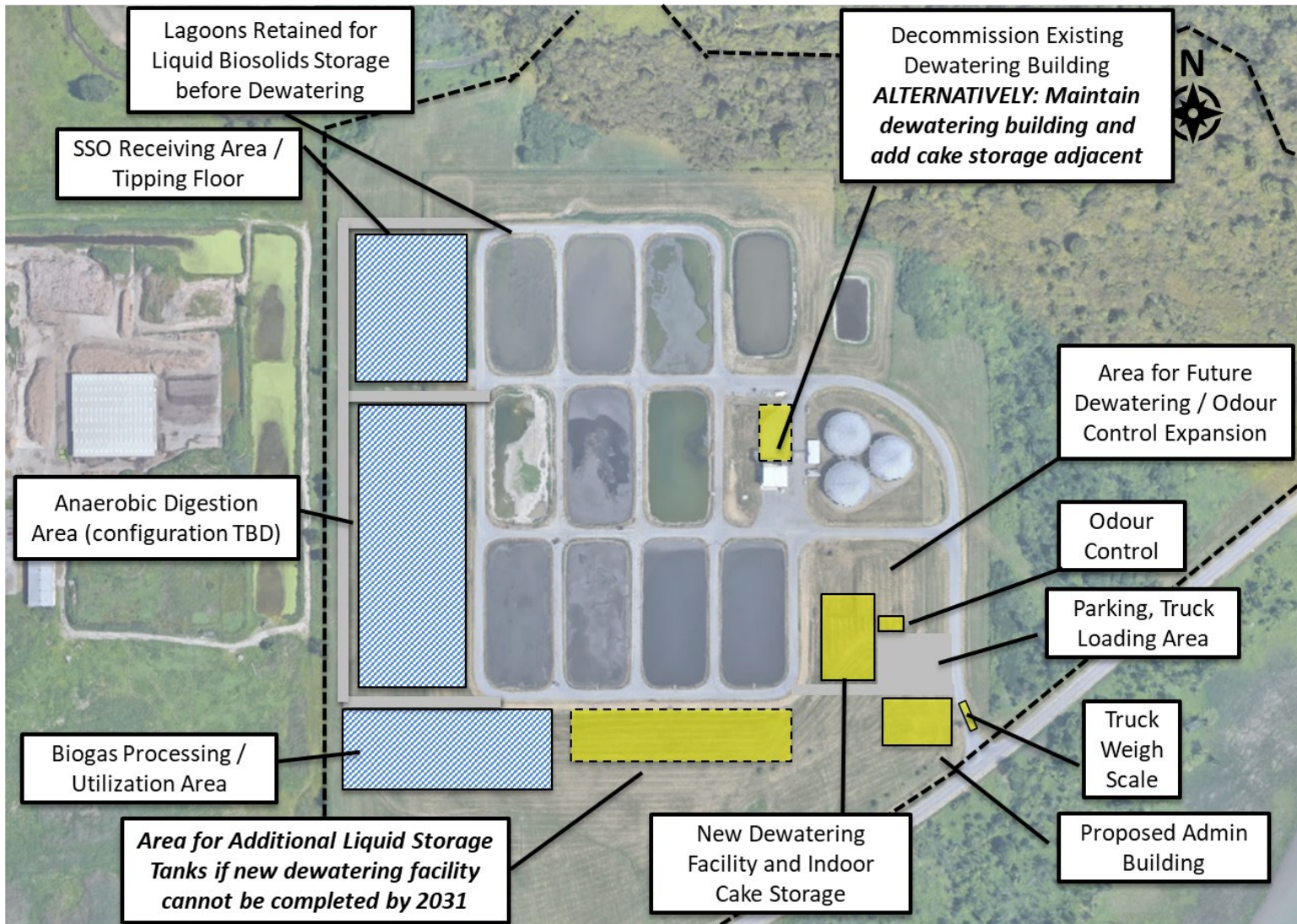
Long Term (by 2051)


- Design and construct WAS thickening at Port Dalhousie, Port Weller and Welland WWTPs
- Pending results of feasibility study, proceed with **design and construction of centralized anaerobic digestion facility for biosolids and SSO at Garner Road**, and decommission/re-purpose digesters at WWTPs


Key Drivers

-  Opportunity to generate renewable energy in line with the [Region’s Corporate Climate Action Plan](#).
-  Potential to avoid currently planned AD upgrade projects at WWTPs
-  Reduced transportation costs and GHG emissions
-  Better verification of material quantities, holding third party contractor accountable
-  Optimize digester performance and reduce transportation costs

Garner Road Biosolids Facility Upgrades



 Proposed Work to Complete by 2031

 Proposed Work to Complete by 2051
(pending recommendations of feasibility study)

 Property Line

Recommended Studies and Capital Projects	Budget (2024)	Timeline
1. Feasibility Study for Centralized Digestion Facility at Garner Road	\$0.3 Million	2025 - 2026
2. New Dewatering Facility at Garner Road, cake storage at Garner Road, weigh scale and increased security	\$38.9 Million	2027 – 2031
3. Decommission Dewatering Equipment at Niagara Falls WWTP	\$0.8 Million	2031 – 2033
4. Sludge Thickening at Port Dalhousie WWTP, Port Weller WWTP and Welland WWTP	\$18.7 Million	By 2051
5. Centralized Digester Facility at Garner Road, including decommissioning existing digesters at WWTPs	TBD pending results of feasibility study (item 2)	By 2051

Total Capital Biosolids Budget = \$58.7 Million

**excluding item 5*

Third-Party Contractors currently manage:

1. Transport of **liquid biosolids** and management of lagoons and site security at Garner Road (~50% of total Region-generated biosolids).
2. Transport of **dewatered cake** from Garner Road and Niagara Falls WWTP to an Alkaline Stabilization facility to make fertilizer. They also manage marketing and sale of final fertilizer product.



Key Recommendations

1. At end of current liquid biosolids contract, issue RFP for new contract to add transport and land application of cake, along with existing scope.
2. Implement sampling program to verify solids concentration of material leaving the Garner Road Facility
3. Amend contract with Alkaline Stabilization Contractor to:
 - a. Increase max. quantity of biosolids reserved for Niagara from 6,000 dt/yr to 8,000 dt/yr.
 - b. Maintain minimum of 4,700 dt/yr to allow for program flexibility

KEY BENEFITS OF RECOMMENDED PROGRAM

1. **Increase diversity** of biosolids program by incorporating **direct land application of cake**
2. **Reduce biosolids hauling** through increased dewatering, reducing transportation costs, GHG emissions and community impacts
3. **Increased resiliency during wet weather years** by reducing reliance on liquid storage



Questions?