



Laying the Path from Disposal Challenge to Opportunity

*Bioeconomy 2017: Domestic Resources for
a Vibrant Future*

July 11 & 12, 2017

Great Lakes Water Authority

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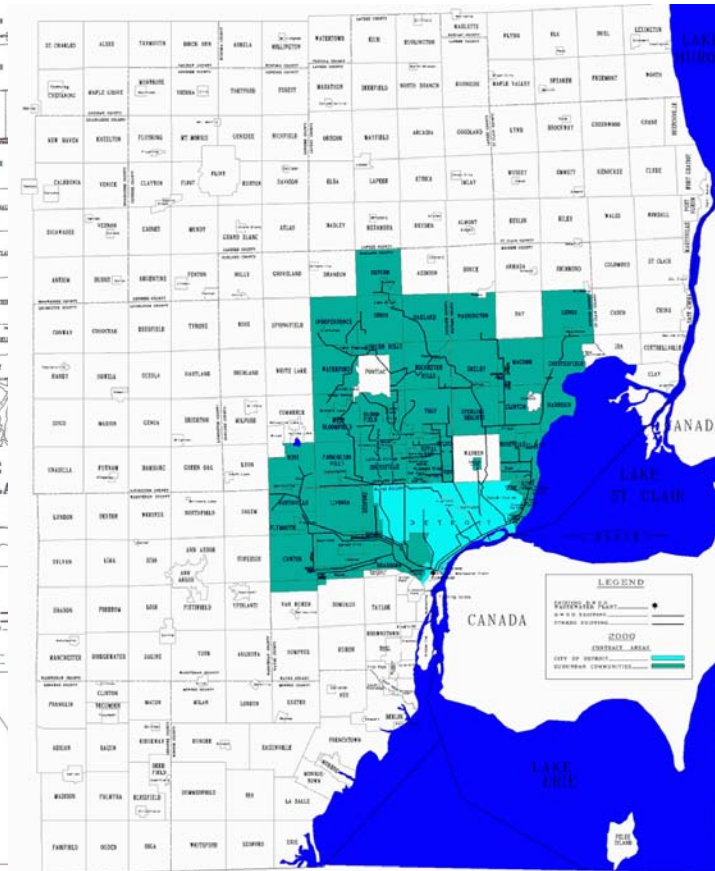
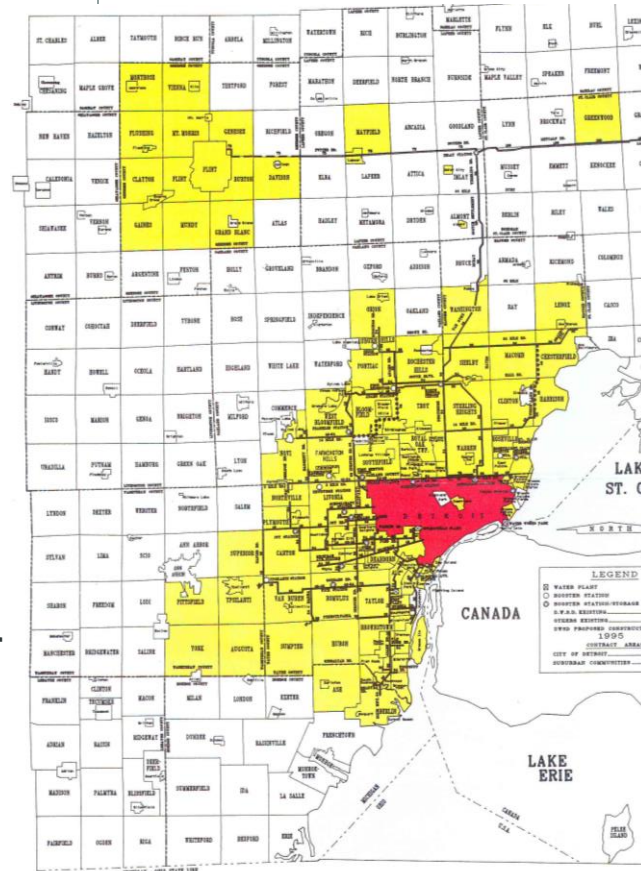


Great Lakes Water Authority

Began Operations January 1, 2016

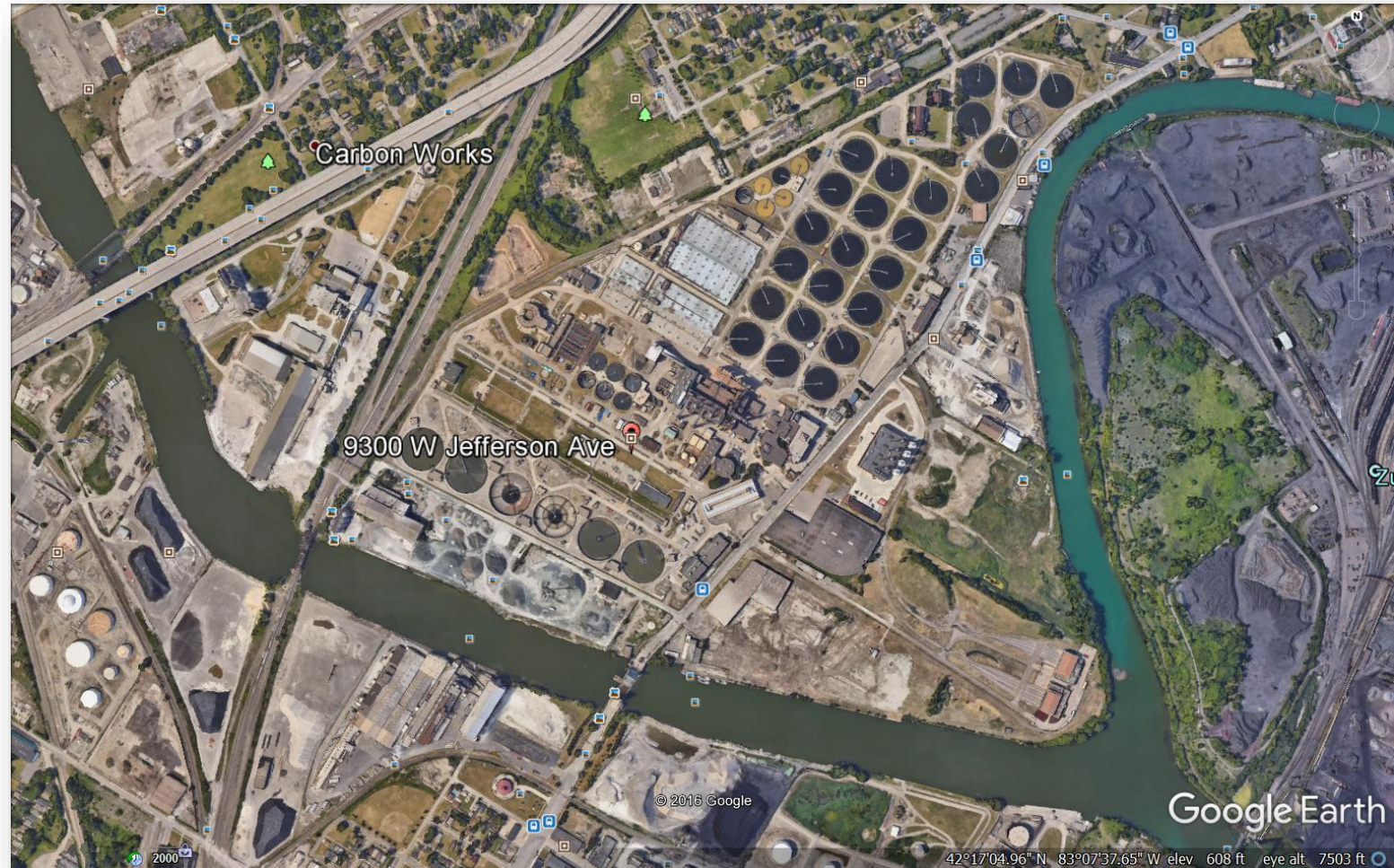
2017 Service Areas

- Resulted from mediation during the City of Detroit Bankruptcy
- Regional Authority formed to supply wholesale drinking water and wastewater treatment services
- Leases facilities (5 WTP, 1 WWTP and 8 CSO basins) from the City of Detroit for 40 Years for annual payment of \$50 Million (term extends as long as debt is outstanding)
- Detroit must use lease payment for City's water and wastewater capital investments
- Water Residential Assistance Program - 0.5% of revenues - \$4.5 M year one

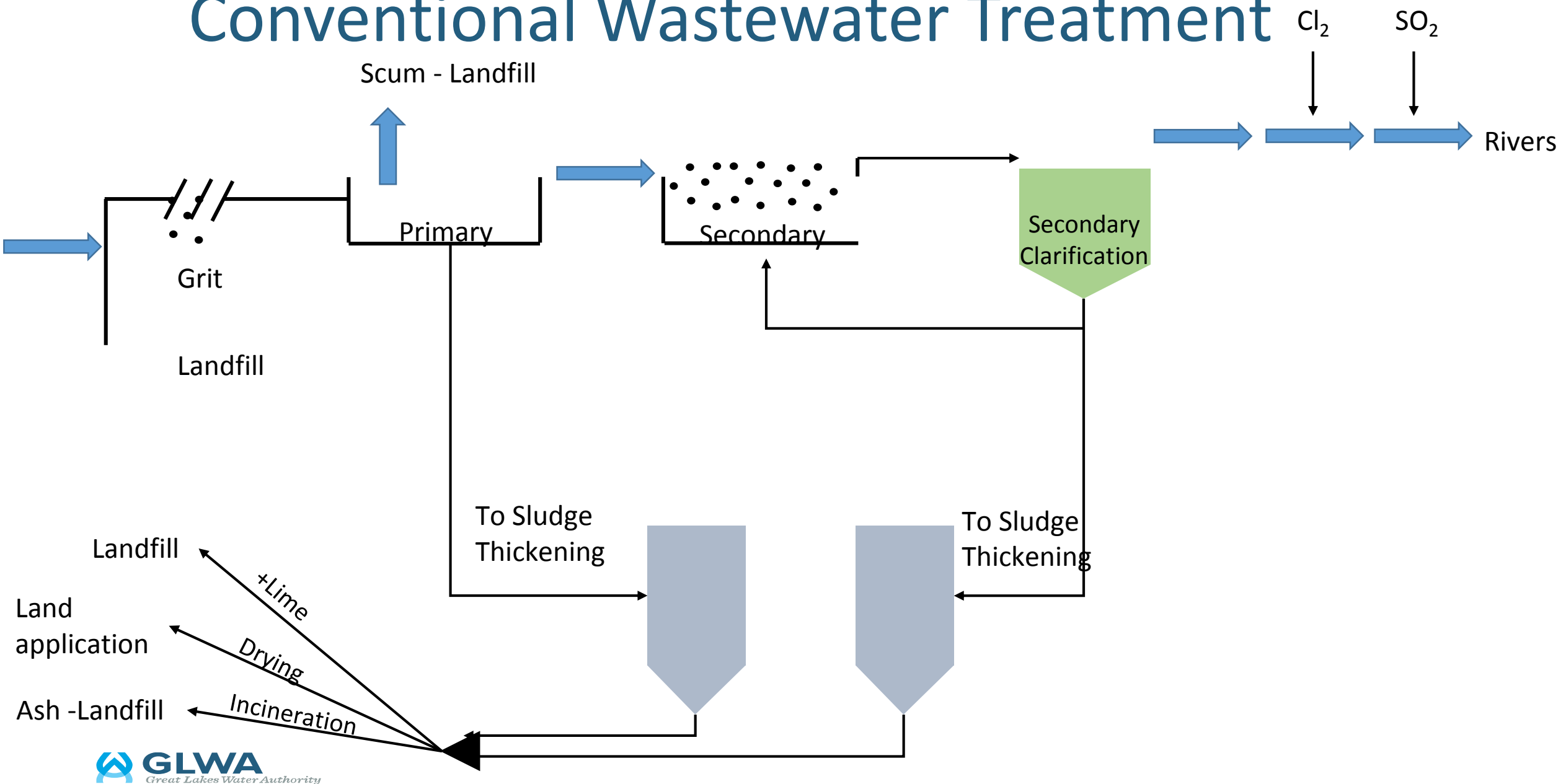


GLWA Water Resources Recovery Facility

- 675 MGD Avg – up to 930 MDG full primary and secondary capacity
- 1.7 Billion wet weather capacity
- 9 CSO facilities
- 450 Dry Tons per day Biosolids
 - 320-1100 dry tons per day wet weather
- Belt Filter Presses & Incineration
- Lime stabilization & Landfill
- Biosolids Drying Facility



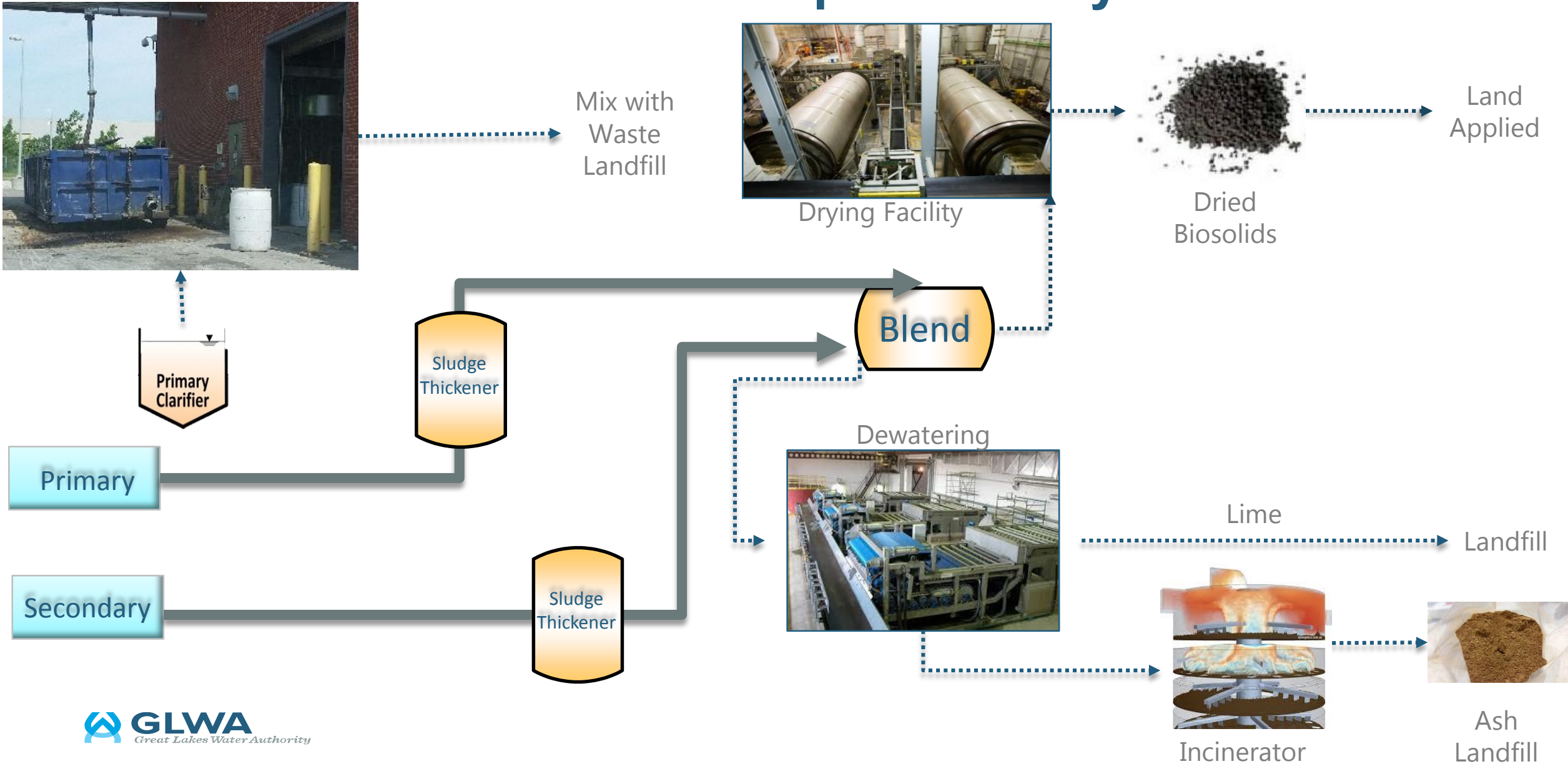
Conventional Wastewater Treatment



Feedstocks for Biofuels production

- Scum
 - 80 – 100 Tons per month
- Primary Sludge
 - 350 dry tons per day
 - 60-65% Volatile (wet weather 50-55%)
 - Thickened 5- 6%
- Secondary Sludge
 - 100 dry tons Secondary (Waste Activated)
 - 70-75% Volatile
 - Thickened 2 – 2.5%
- Daily Sludge flow requiring treatment 2.5 – 3 MGD

Biosolids Disposal Today



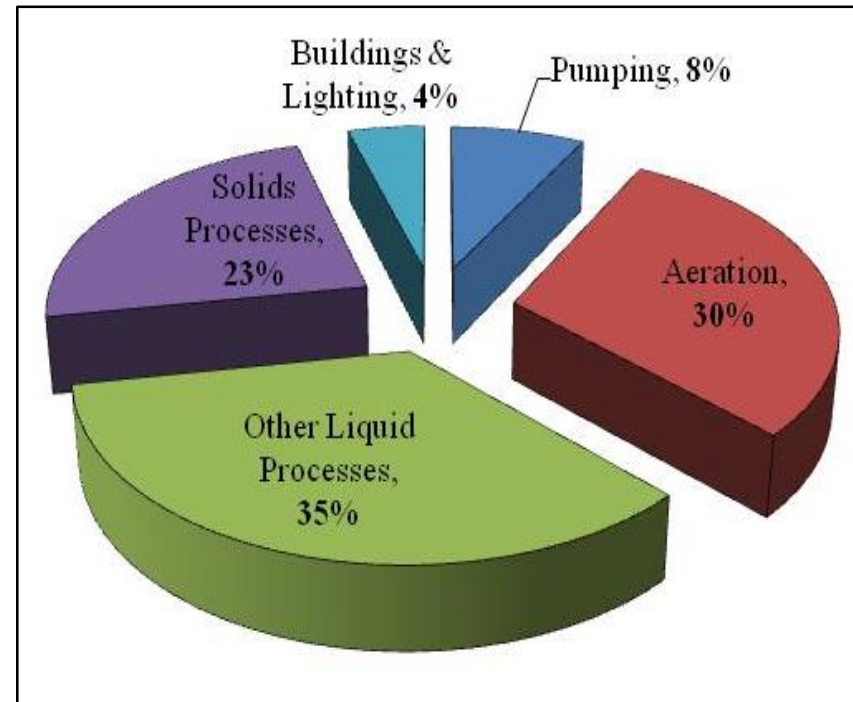
Biosolids Disposal Today

Disadvantages

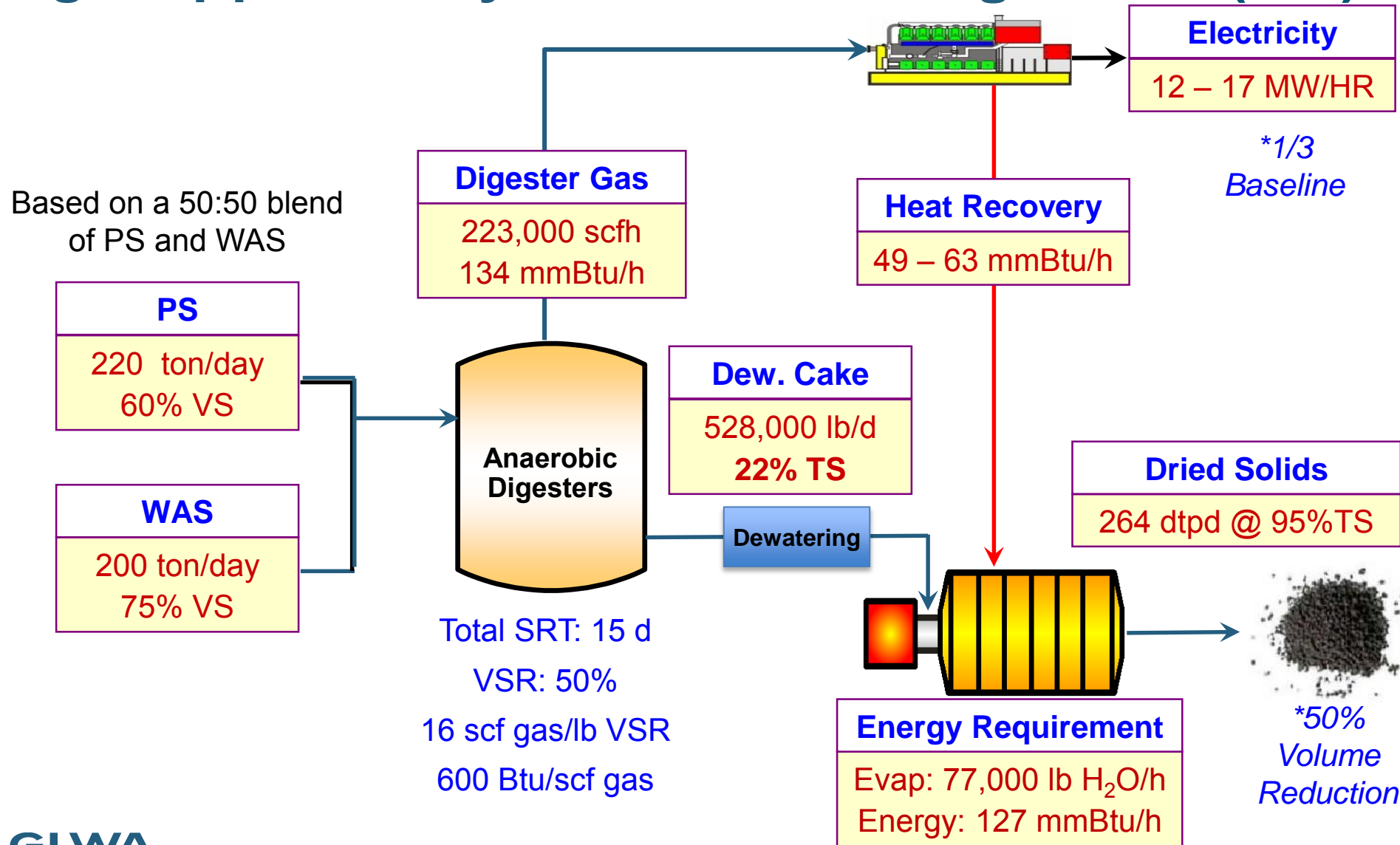
- Utility costs (whole plant)
 - Electricity \$12 Million annually
 - Natural Gas \$6 Million annually
- Biosolids Dryer
 - Roughly \$13 M (@ min)*
 - Land applied for nitrogen, phosphorous and root development
- Untapped Opportunities
 - heat recovery
 - anaerobic digestion
 - energy generation

*began operation in 2016 as initial phase of a biosolids disposal plan and Clean Air Act compliance strategy - with significant annual cost avoidance/savings

Average energy use WWTP national



Large Opportunity - Anaerobic Digestion (AD) w/ CHP



Investigation and Planning Underway

Steps

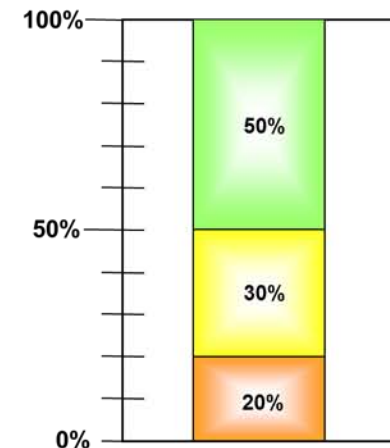
Minimize Energy use on liquid side

Investment Grade Audit launching shortly

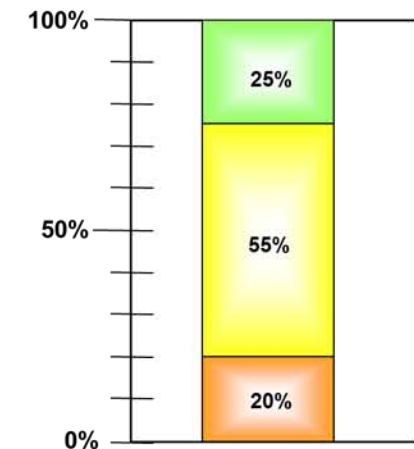
Maximize energy harvest from solids

- Solids have to be brought to the WWTP with minimum retention time in the collection system
- Carbon has to be conserved through liquid processes

Profile of Potential



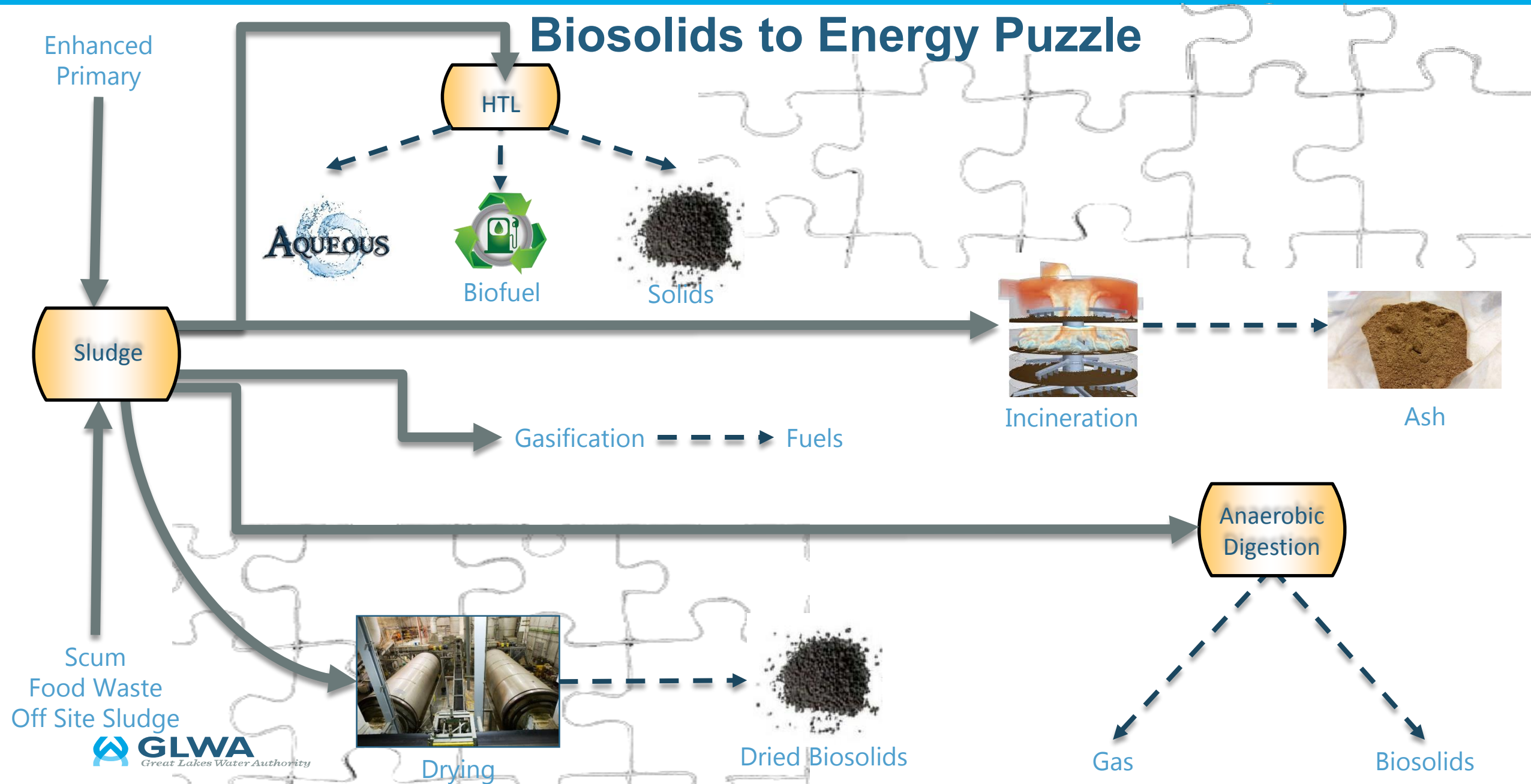
Primary Solids



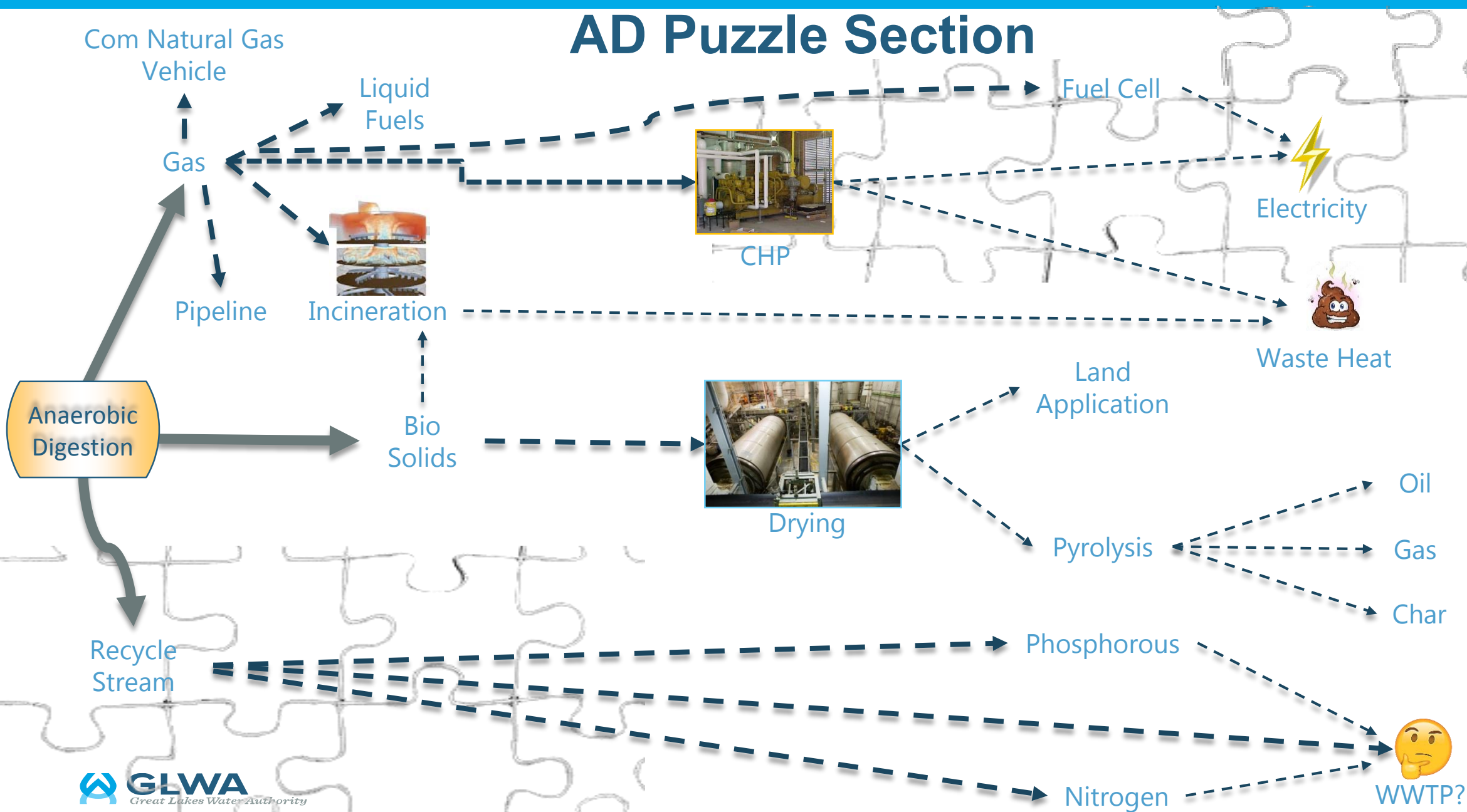
Waste Activated Sludge

 Inerts  Volatiles - Not Readily Biodegradable  Volatiles - Readily Biodegradable

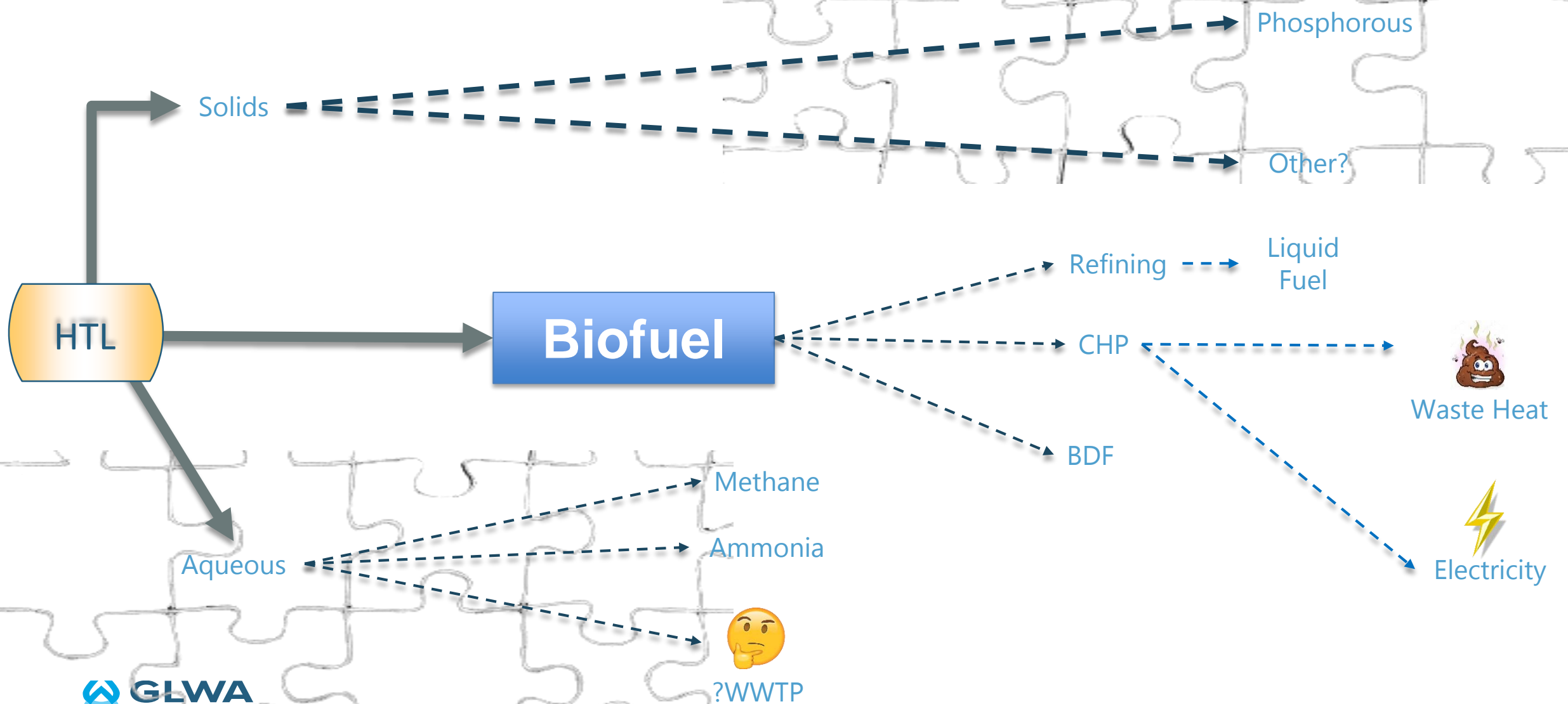
Biosolids to Energy Puzzle



AD Puzzle Section



HTL Puzzle Section



Known

The basics

- 450 Dry tons per day
- % Volatiles
- % inert
- Geographic locations
- Refinery
- Steel Mills
- Local WWTP biosolids
- Sources of food wastes

Some constraints

- Available space
- Newer Biosolids Drying Facility and 20 year operating contract
- Aging Incinerators
- Existing regulations
- Air permitting
- Sale of electricity
- Risk considerations

Opportunities

- New international bridge
- Utility of the future
- Carbon regulation is coming
- Migrating energy production
- Rapidly advancing technology

Unknown

Specifics

- Anaerobic Digestion, HTL, Pyrolysis w/wo co-processing materials
 - Energy production potential
 - Impact of recycle streams on secondary treatment
- Inventories of co-processing materials
- Availability of co-processing materials
- Regulatory requirements if co-processing
- Energy balances for different scenarios
- Markets for products

Economics

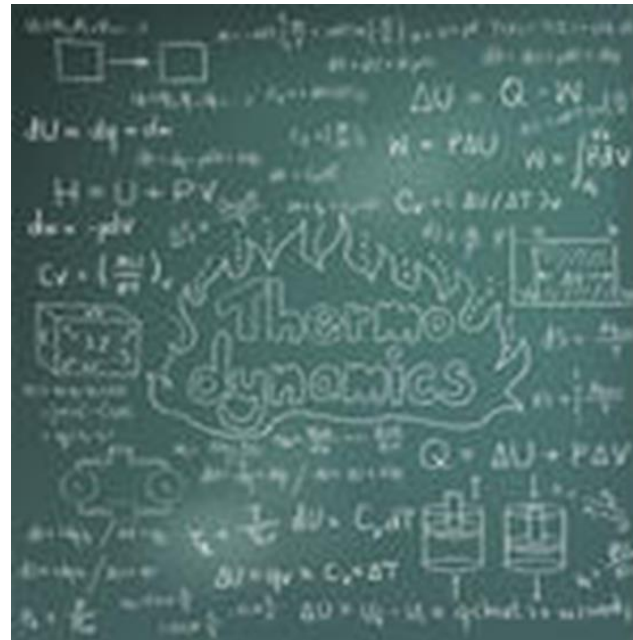
- Cost to construct
- Projected operation and maintenance costs
- Value of carbon credits
- Value of energy recovered
 - electricity, liquid fuels
- Value of other products
 - nitrogen
 - phosphorous
 - bioplastics
 - industrial chemicals
- Potential operational savings

The Path

Research

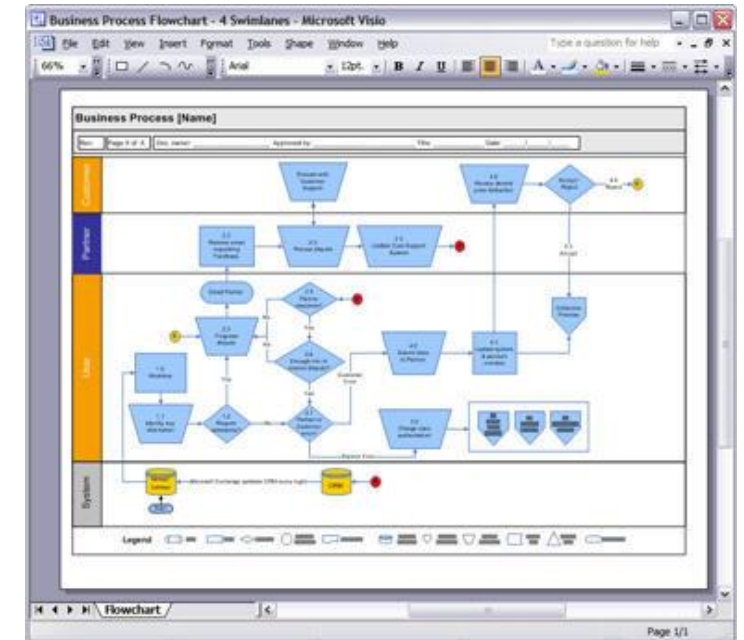


Elimination of scenarios



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Process modeling



As the funnel narrows

Master Planning



Pilot scale testing



Construction





GLWA

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