ARLINGTON RE-GEN

Arlington County Water Pollution Control Plant

Solids Master Plan

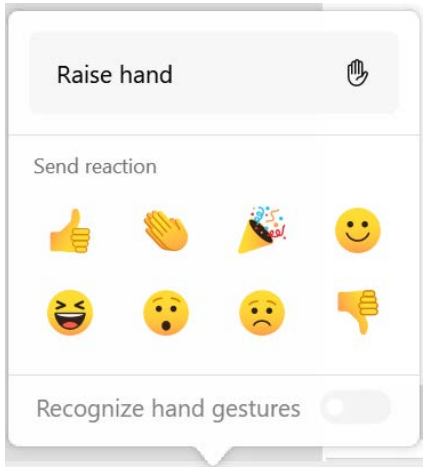
Biosolids Advisory Panel

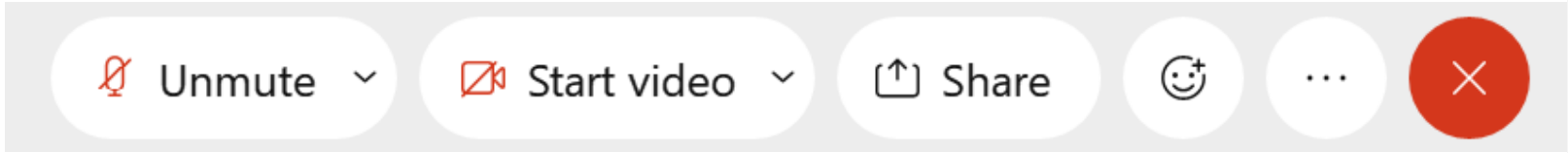
June 30, 2022

ARLINGTON VIRGINIA

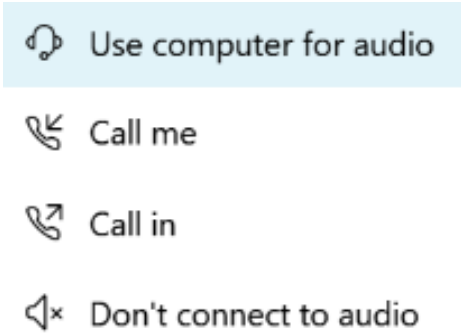
Meeting Logistics

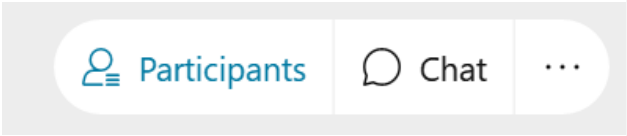
WEBEX CONTROLS





MEETING PREVIEW AUDIO SELECTION





TO BE UNMUTED

*Click the "**Raise Hand**" button pressing ***3 on your phone***

*You can also ask to be unmuted in the "**Chat**" box*

ISSUES HEARING AUDIO?

Re-join using "Call me" Audio Selection

Agenda

01	6:00 – 6:05	**Introductions**
02	6:05 – 6:15	**Program Updates**
03	6:15 – 6:25	**WPCP Tour Recap**
04	6:25 – 6:35	**Brand/Website Preview**
05	6:35 – 6:50	**Confirmation of Biogas Utilization**
06	6:50 – 7:05	**Greenhouse Gas Emissions**
07	7:05 – 7:20	**Air Quality and Public Health**
08	7:20 – 7:25	**Renderings and Site Layout**
09	7:25 – 7:30	**Next Steps**

Introductions

Mary Strawn	Peter Golkin	Lisa Racey	Wilbur Brown	Fasil Haile
Arlington County Water Pollution Control Bureau	Arlington County DES Communications	Arlington County Water Pollution Control Bureau	Arlington County Water Pollution Control Bureau	Arlington County Water Pollution Control Bureau

Brian Balchunas	Miranda Mair	Rahkia Nance	Jessica Host
HDR	HDR	HDR	HDR

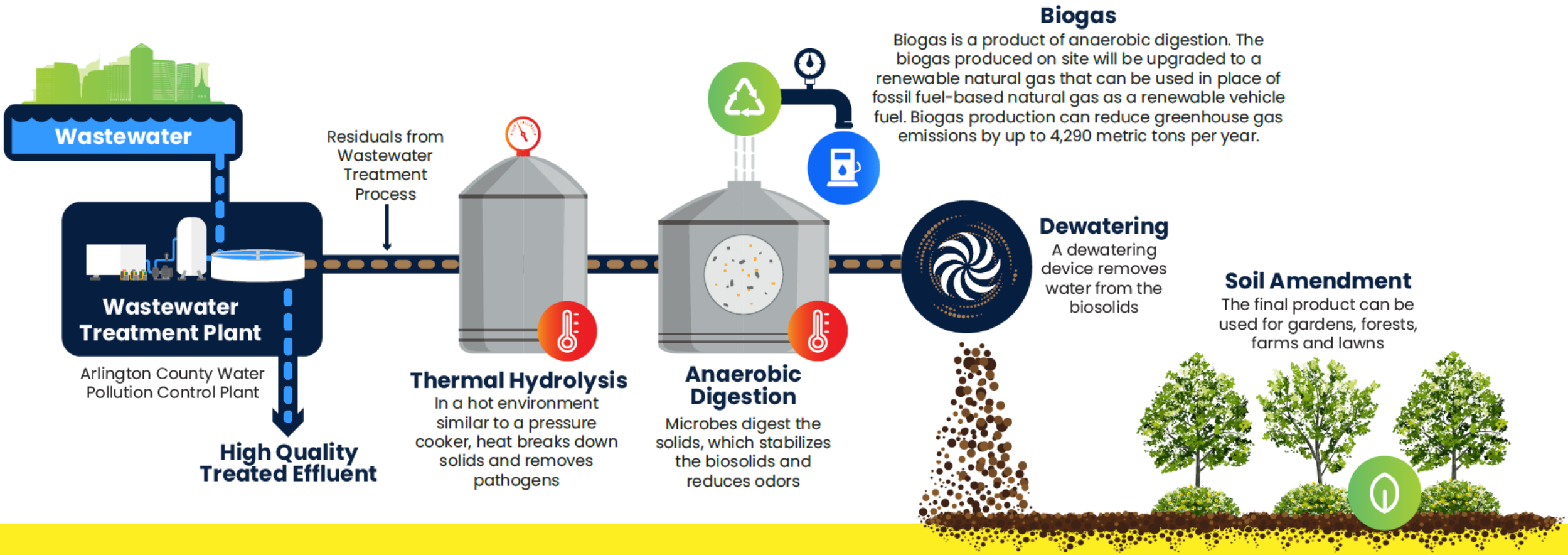
Biosolids Advisory Panel

- Purpose: to serve as a focus group that examines and gives feedback as the program develops

- Expectations: to provide thoughtful input and perspective from the groups and people represented

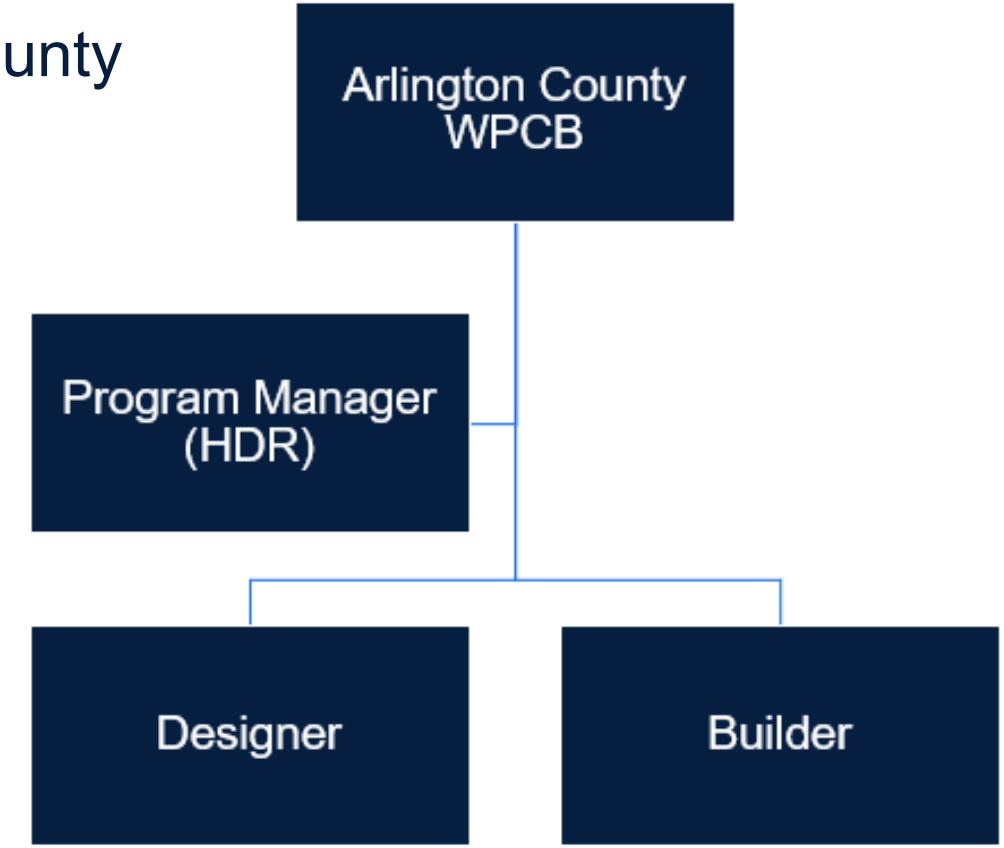
Program Overview

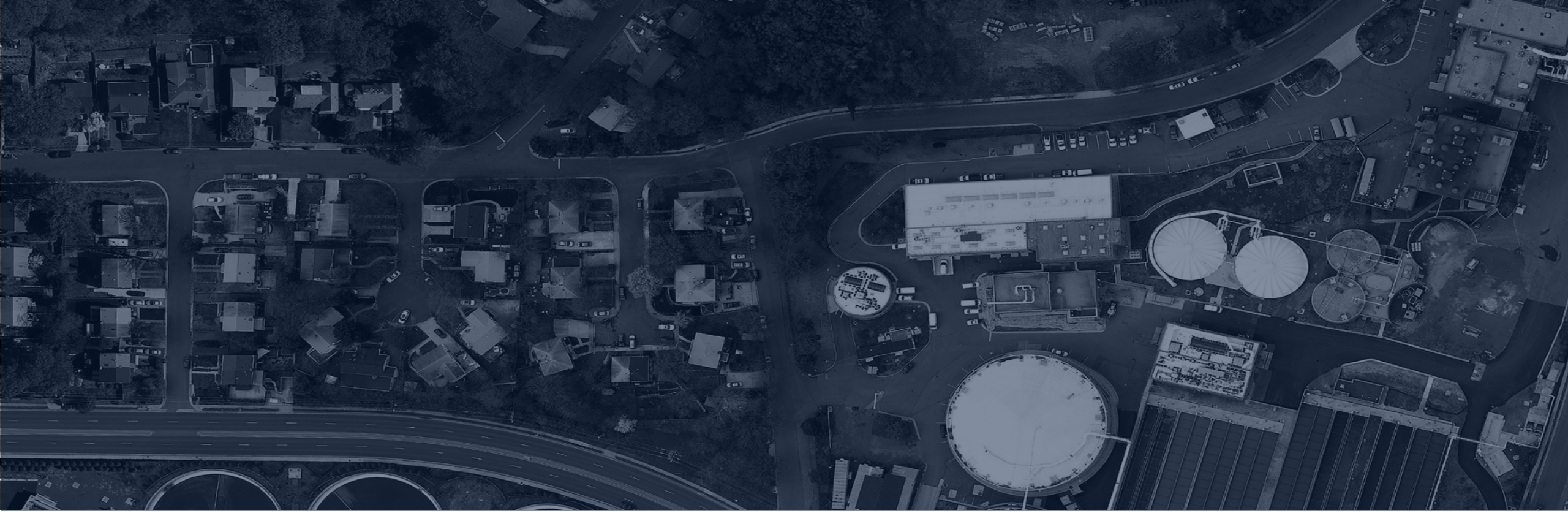
Recovering renewable resources from wastewater



Roles and Responsibilities

- HDR serves as an advisor to Arlington County
- Current phase:
  - Define program scope
  - Define program delivery
- Future phases:
  - Oversee design and construction
  - Assist with start-up and commissioning
- HDR is prohibited from participating in any design and construction

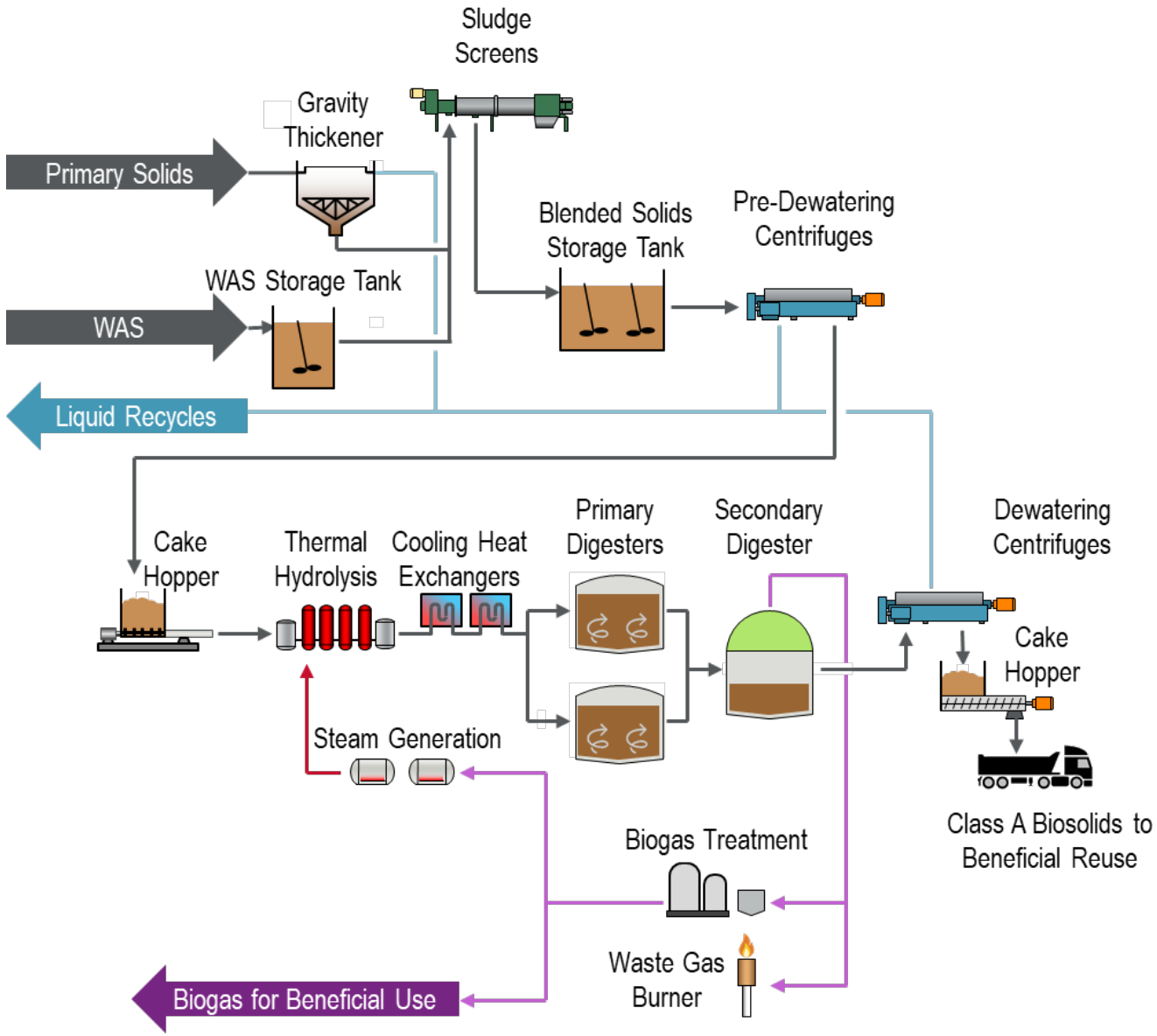




02

Program Updates

New Solids Handling Process



Program Components

Program Management

- Assistance with program development and oversight

Gravity Thickeners

- Rehabilitate existing gravity thickeners

Early Work Package

- Demolition
- Utility relocation
- Site Preparation

Main Work Package

- New processes and facilities

Tentative Program Timeline

Program Management	Facilities Plan Biogas Utilization	**Procurement Design Oversight**	Design and Construction Oversight	Design and Construction Oversight	Construction Oversight	Construction Oversight	Construction Oversight	Start-up Assistance	Start-up Assistance
Gravity Thickeners	--	**Design**	Design and Construction	Construction and Start-up					
Early Work	--	--	Design	Design and Construction	Construction				
Main Work Package	--	--	Design	Design	Construction	Construction	Construction	Commission	Start-up

Technical Updates

"What"

- Data Analysis
- Condition Assessment
- Technology Review
- Process Evaluations
- Biogas Utilization
- Air Emissions Analysis
- Site Development
- Facilities Plan

Completed since last Meeting

- Draft Facilities Plan
- Continued Discussion on Biogas Utilization
- CIP Updates

Upcoming

- Final Facilities Plan
- Early Work Definition

Delivery Updates

"How"

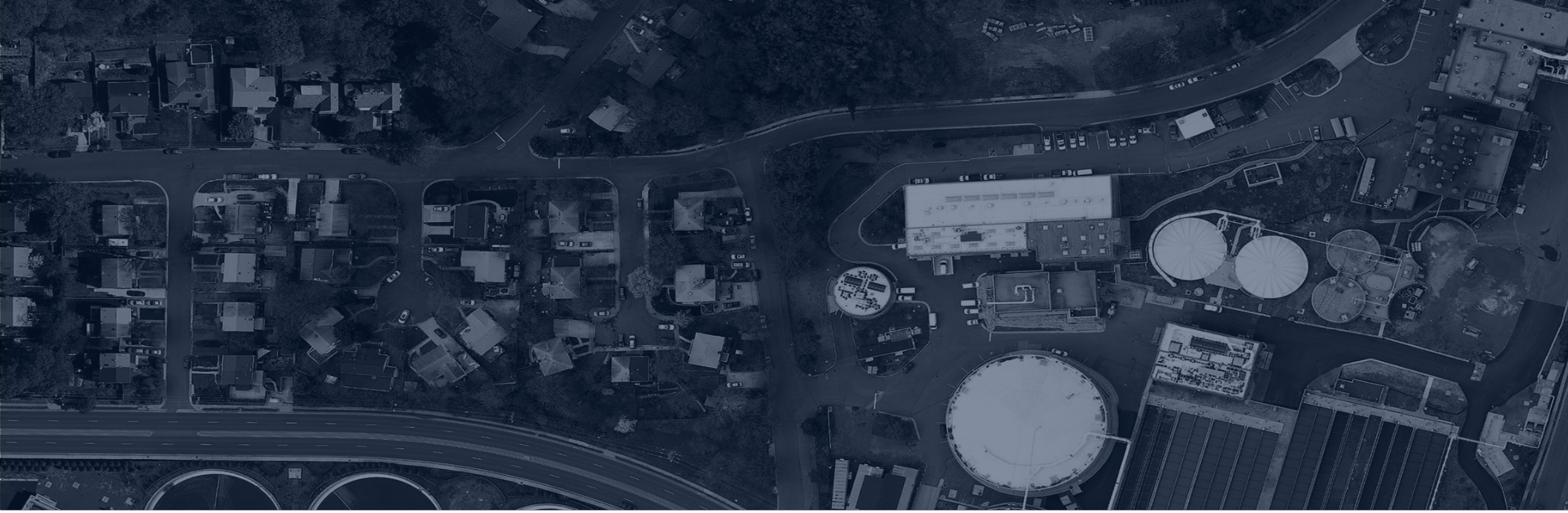
- Risk Analysis
- Project Packaging
- Delivery Evaluation
- Procurement of Delivery Teams

Completed since last meeting

- Gravity thickeners – solicitation for design services
- Remainder of work – RFQ issued for design-build services

Upcoming

- Begin design of gravity thickeners
- Continue with solicitation process for remainder of work



03

WPCP Tour Recap

WPCP Tour– April 23, 2022

Tour included:

- Primary, secondary and tertiary liquid treatment processes
- Overview of current solids handling processes and challenges, including visit to Dewatering Building
- Follow-up Q&A with more detailed responses to questions

Review of Questions Received on Tour

- Distributed summary of questions received on tour
- Further discussion?

04

Brand/Website Preview

ARLINGTON
RE-GEN

Mission

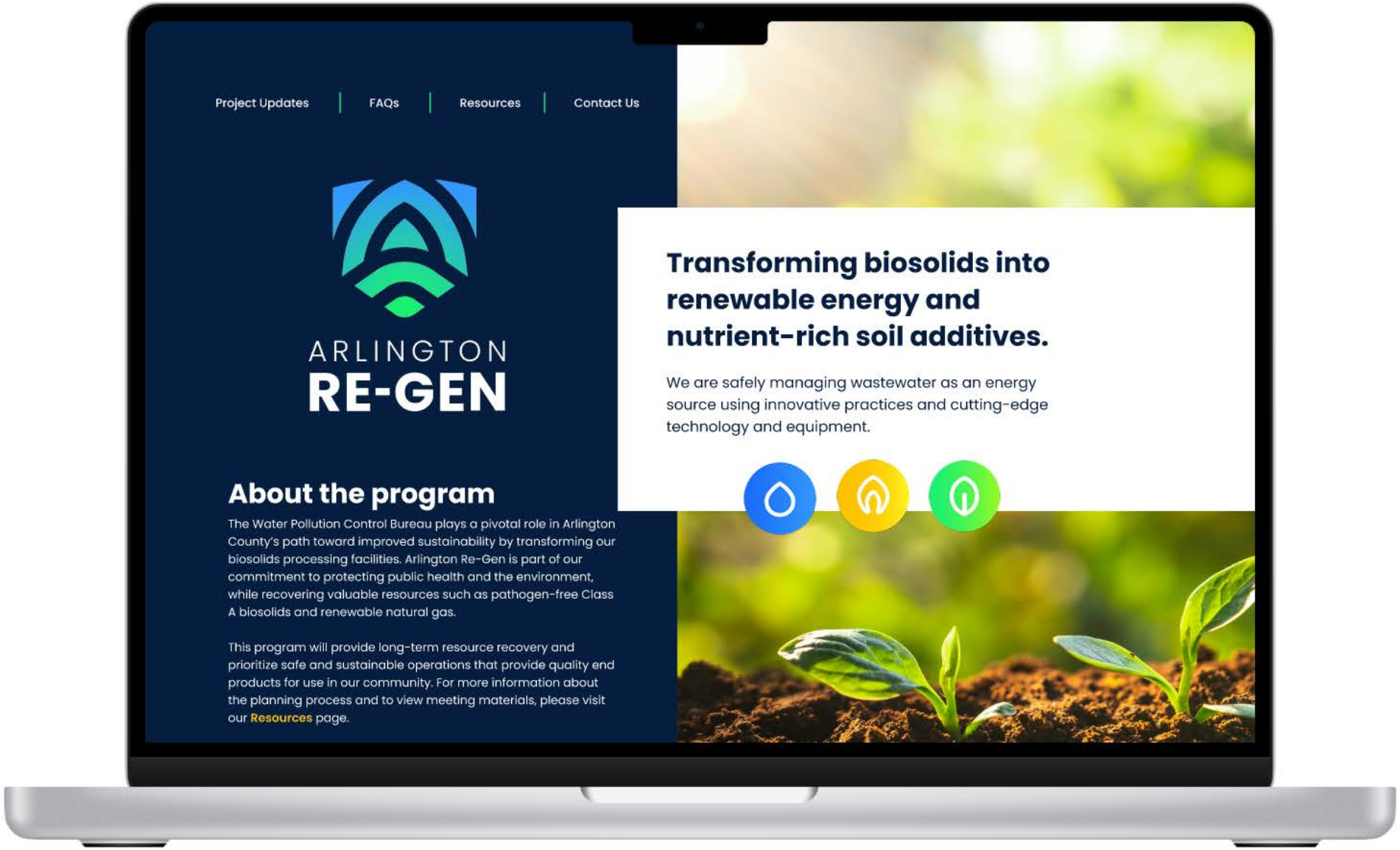
To create renewable energy and a soil-enhancing product using a safe and reliable transformation process.

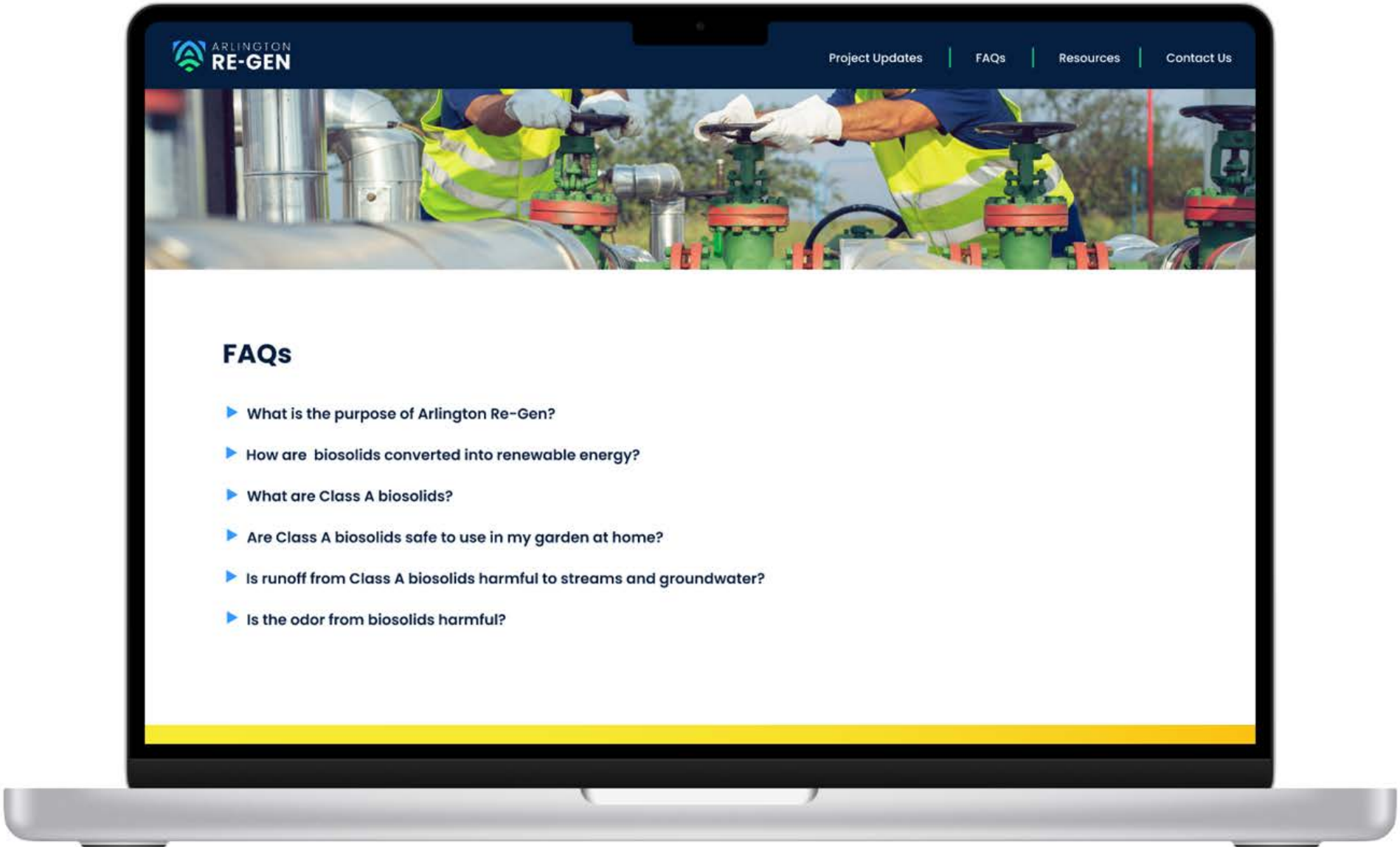
Vision

To be a good neighbor within our community, a leader in efficiency in our industry, and a beacon of sustainability in Arlington County.

Purpose

To replace infrastructure in a manner that helps Arlington County meet its energy and carbon reduction goals.


Project Updates
FAQs
Resources
Contact Us
ARLINGTON
RE-GEN
About the program
The Water Pollution Control Bureau plays a pivotal role in Arlington County's path toward improved sustainability by transforming our biosolids processing facilities. Arlington Re-Gen is part of our commitment to protecting public health and the environment, while recovering valuable resources such as pathogen-free Class A biosolids and renewable natural gas.
This program will provide long-term resource recovery and prioritize safe and sustainable operations that provide quality end products for use in our community. For more information about the planning process and to view meeting materials, please visit our Resources page.
Transforming biosolids into renewable energy and nutrient-rich soil additives.
We are safely managing wastewater as an energy source using innovative practices and cutting-edge technology and equipment.


ARLINGTON
RE-GEN
Project Updates
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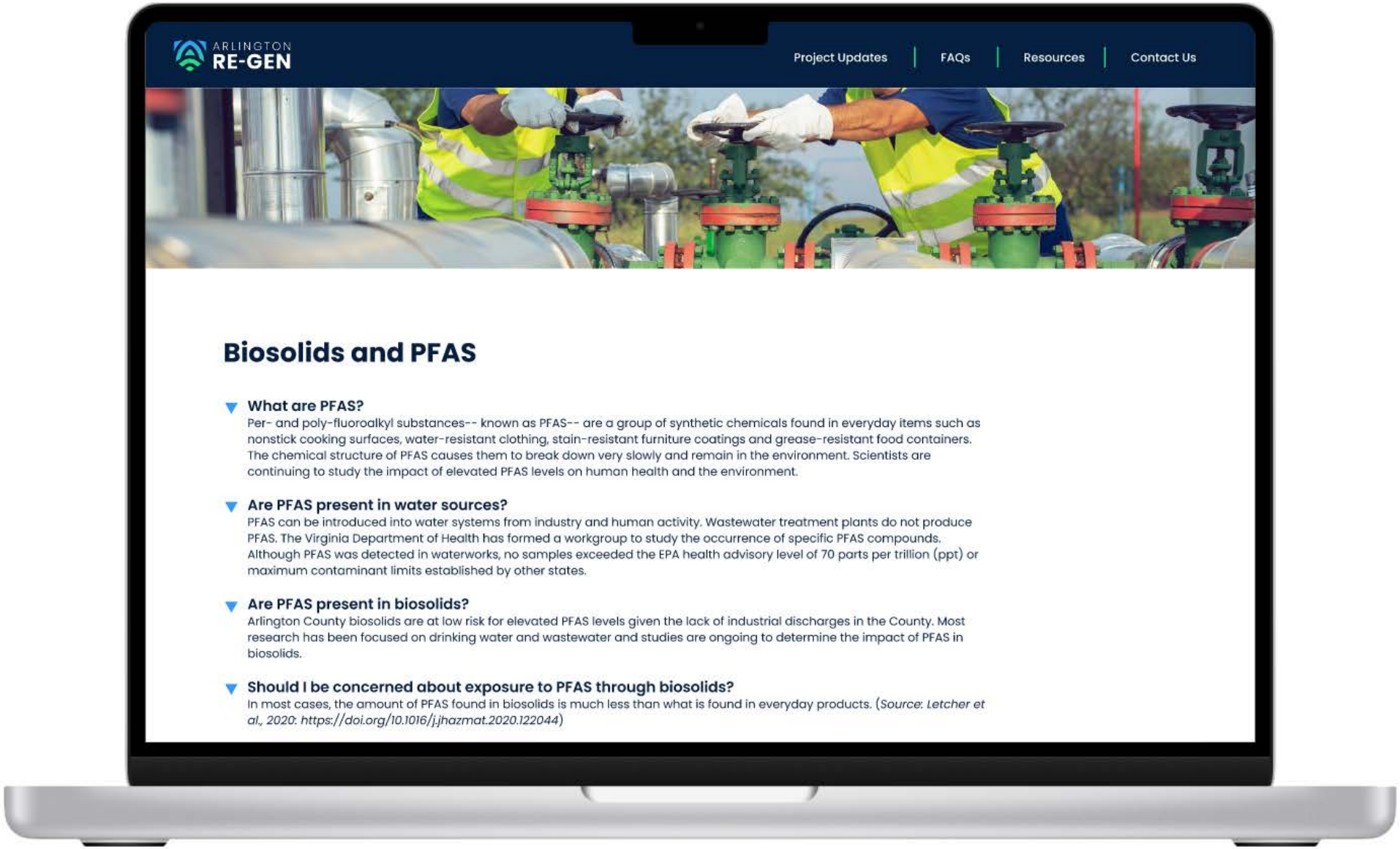
FAQs
What is the purpose of Arlington Re-Gen?
How are biosolids converted into renewable energy?
What are Class A biosolids?
Are Class A biosolids safe to use in my garden at home?
Is runoff from Class A biosolids harmful to streams and groundwater?
Is the odor from biosolids harmful?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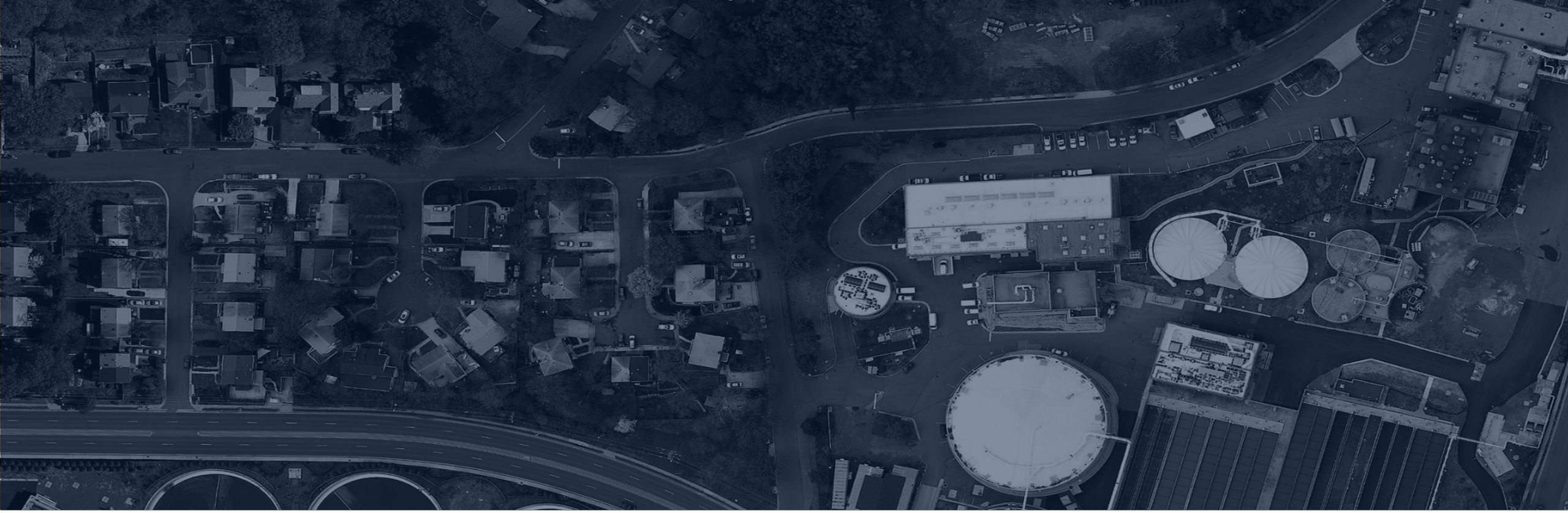
Biosolids and PFAS
What are PFAS?
Per- and poly-fluoroalkyl substances-- known as PFAS-- are a group of synthetic chemicals found in everyday items such as nonstick cooking surfaces, water-resistant clothing, stain-resistant furniture coatings and grease-resistant food containers. The chemical structure of PFAS causes them to break down very slowly and remain in the environment. Scientists are continuing to study the impact of elevated PFAS levels on human health and the environment.
Are PFAS present in water sources?
PFAS can be introduced into water systems from industry and human activity. Wastewater treatment plants do not produce PFAS. The Virginia Department of Health has formed a workgroup to study the occurrence of specific PFAS compounds. Although PFAS was detected in waterworks, no samples exceeded the EPA health advisory level of 70 parts per trillion (ppt) or maximum contaminant limits established by other states.
Are PFAS present in biosolids?
Arlington County biosolids are at low risk for elevated PFAS levels given the lack of industrial discharges in the County. Most research has been focused on drinking water and wastewater and studies are ongoing to determine the impact of PFAS in biosolids.
Should I be concerned about exposure to PFAS through biosolids?
In most cases, the amount of PFAS found in biosolids is much less than what is found in everyday products. (Source: Letcher et al., 2020: https://doi.org/10.1016/j.jhazmat.2020.122044)

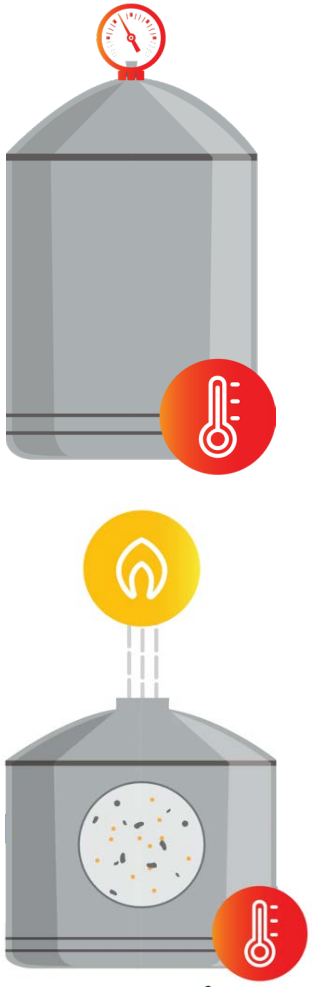


05

Confirmation of Biogas Utilization

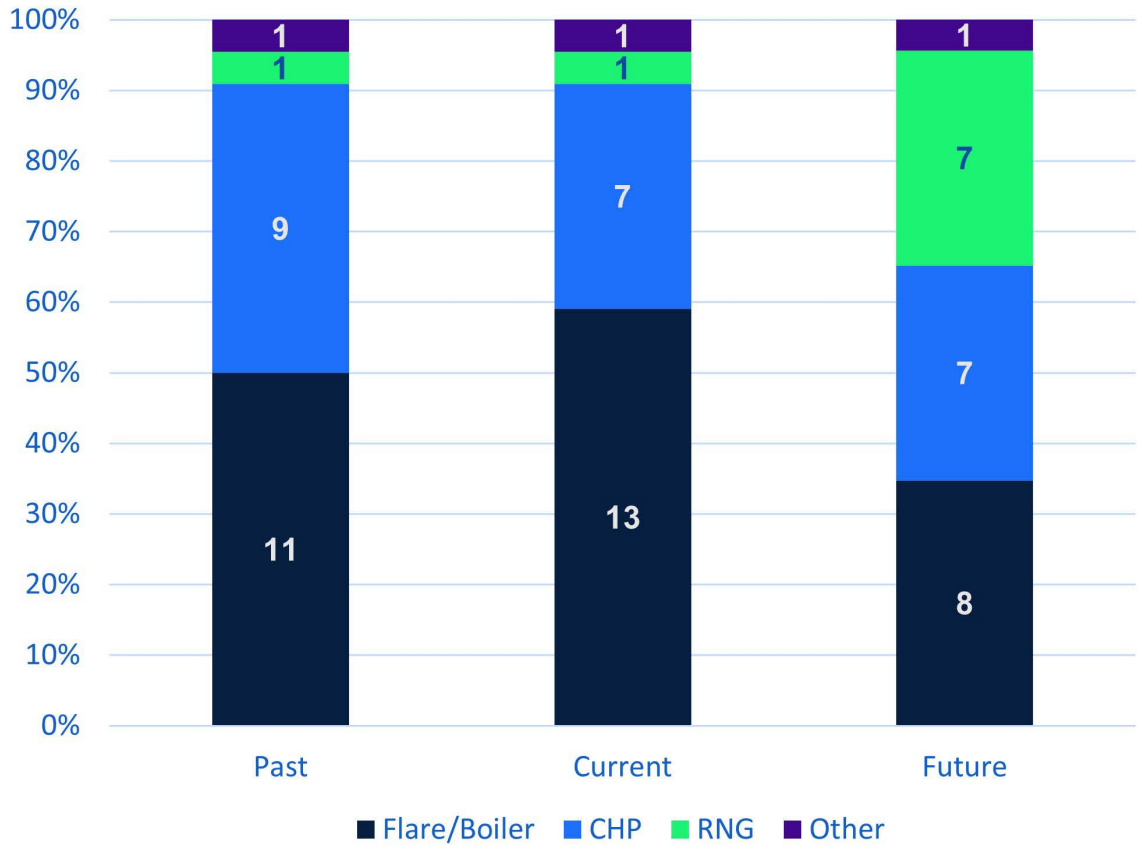
Key Questions for Biogas Utilization

- Steam is required for thermal hydrolysis
- Biogas is a by-product from anaerobic digestion that can be sustainably used



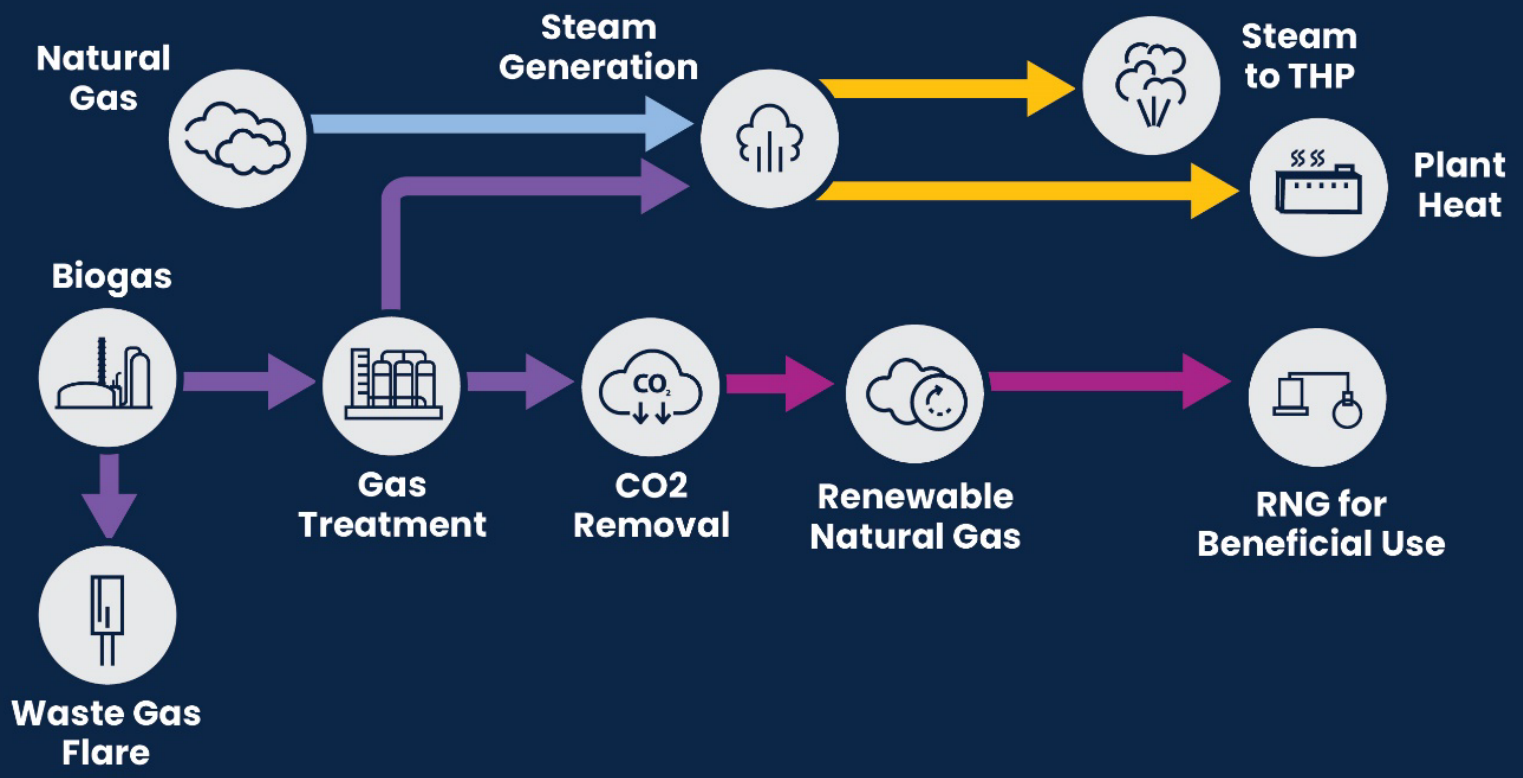
How do we use the biogas in the most sustainable way while generating the necessary steam for the process most effectively?

Wastewater Biogas Usage in Maryland, Virginia, and DC



- 22 facilities total (majority of wastewater treatment plants with anaerobic digesters in region)
- Four of seven facilities with CHP/engines report intermittent use (difficult to keep online)
- Six facilities are planning for conversion to RNG

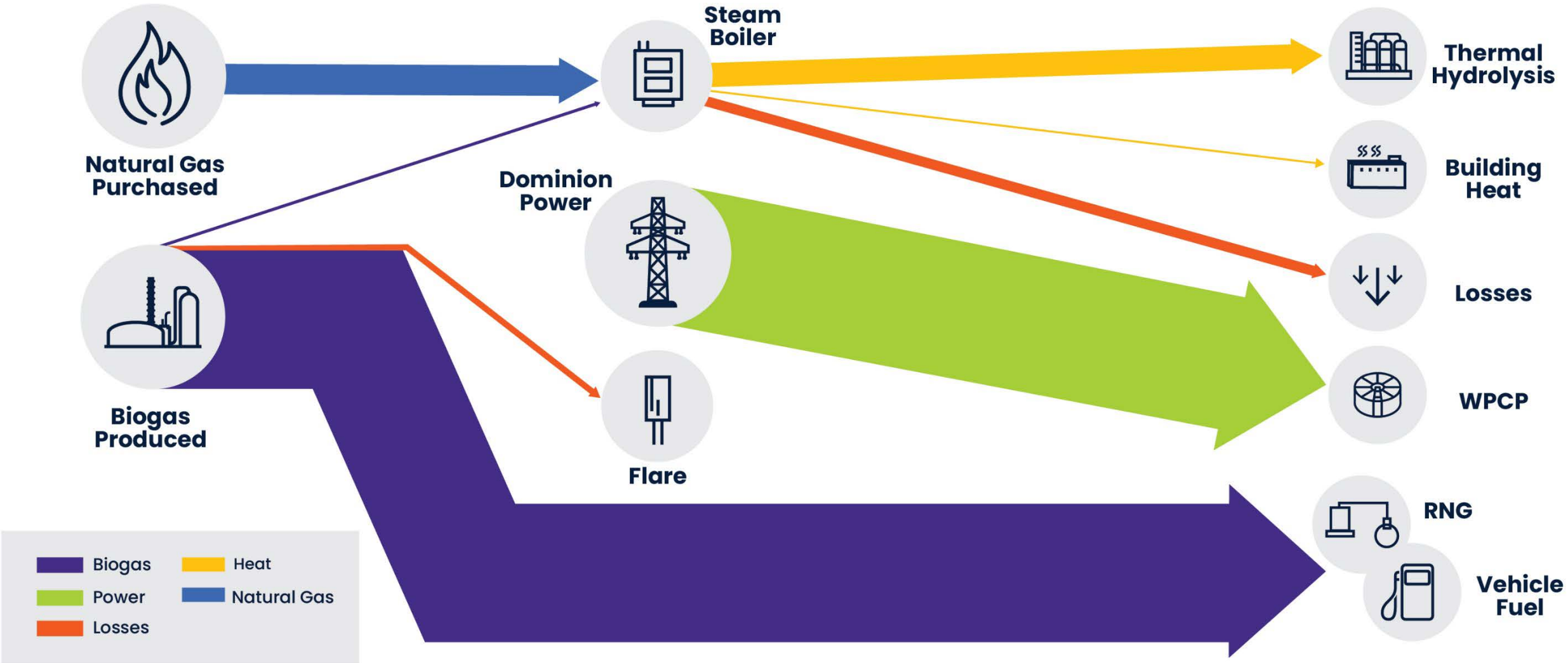
Alternative 3
Renewable Natural Gas



Four Alternatives Considered

1. Process and Building Heat
2. Combined Heat and Power
3. Renewable Natural Gas
4. Renewable Natural Gas and Combined Heat and Power

Alternative 3 – Renewable Natural Gas



Biogas Recommendations

- **County staff recommended proceeding with Alternative 3 – Renewable Natural Gas**
- **Distributed Biogas Utilization Report** - final report has been revised based on comments from the Advisory Panel and other updates, with no change to the recommendation. Final report will be posted on Re-Gen website.
- **Preference for Alternative 3A** (RNG into pipeline) over Alternative 3B (RNG as CNG) due to uncertainty of local RNG transportation use. However, final decision will be made in the future.
- Recommendation was noted in County Board CIP Work Session on June 28.

Advisory Panel Views

We would like feedback from the groups you represent on the renewable natural gas approach County staff recommends.

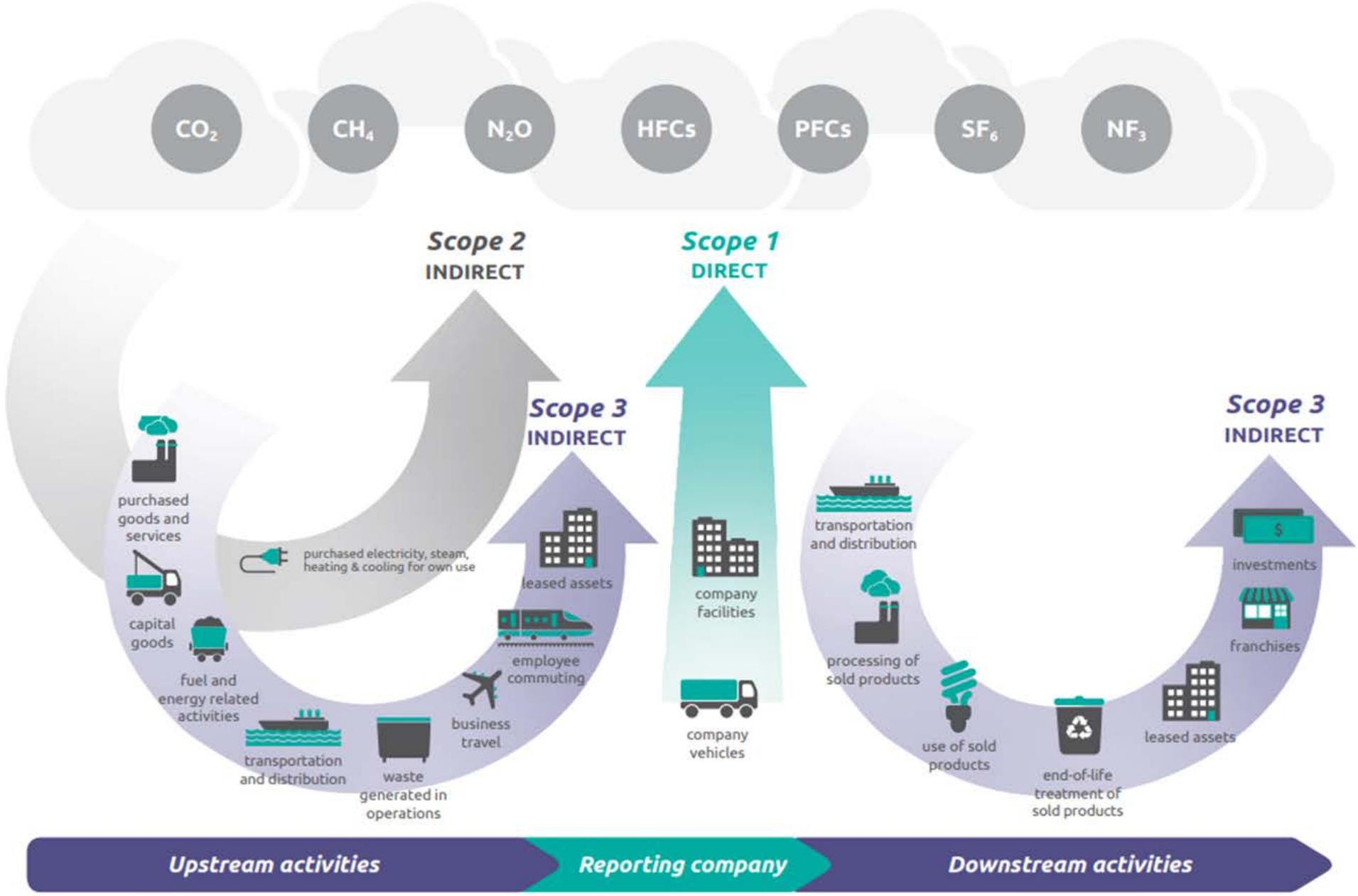
Please send brief written comments to Samantha Villegas at svillegas@raftelis.com by Friday, July 8.

Biogas Utilization: Next Steps

- Technology evaluations and site visits
- Coordination with natural gas utility and other utility stakeholders
- Confirmation of commercial arrangement

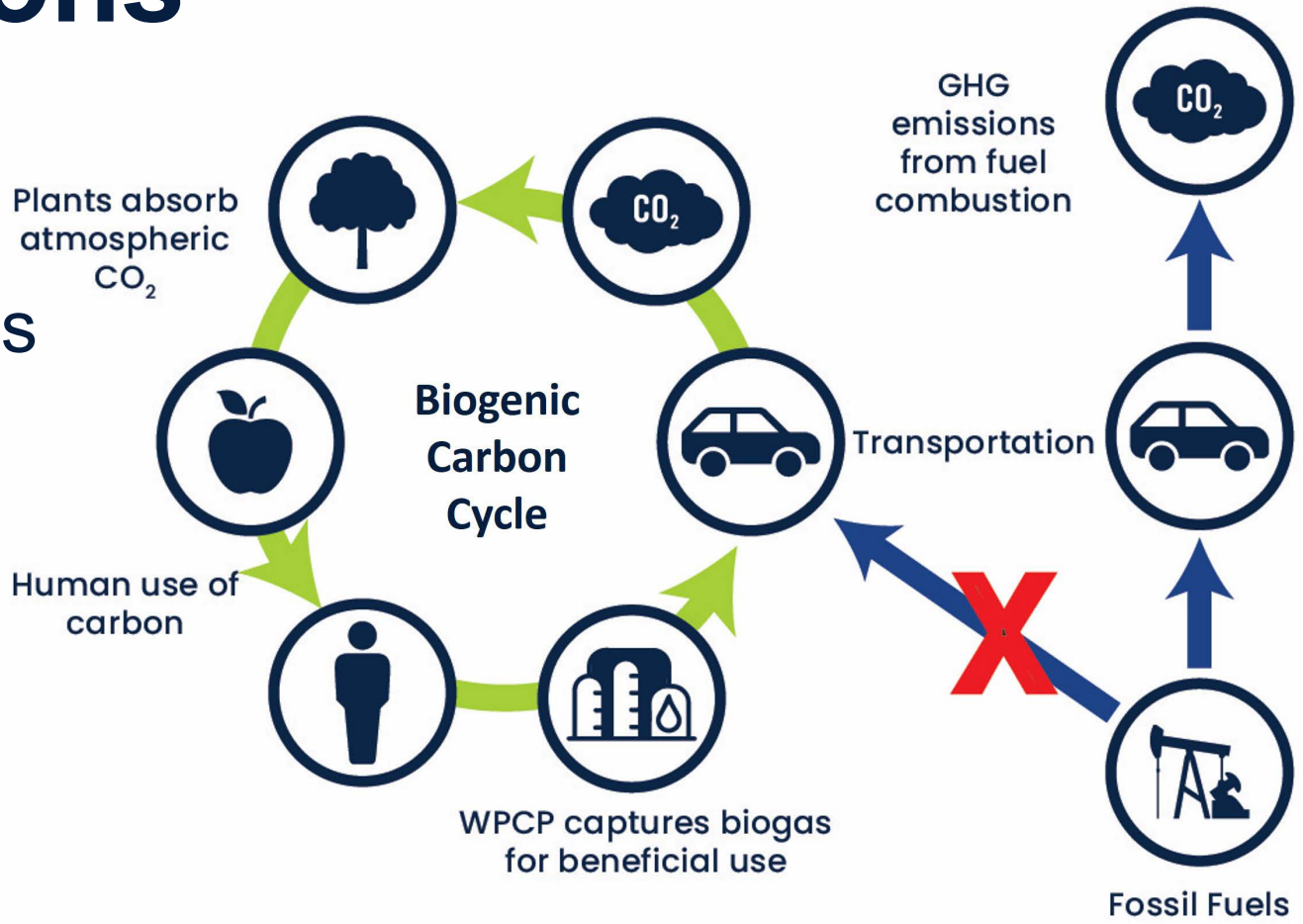
06

Greenhouse Gas Emissions


CO_2
CH_4
N_2O
HFCs
PFCs
SF_6
NF_3
Scope 2
INDIRECT
Scope 1
DIRECT
Scope 3
INDIRECT
Scope 3
INDIRECT
purchased goods and services
capital goods
fuel and energy related activities
transportation and distribution
waste generated in operations
business travel
employee commuting
leased assets
purchased electricity, steam, heating & cooling for own use
company facilities
company vehicles
transportation and distribution
processing of sold products
use of sold products
end-of-life treatment of sold products
leased assets
franchises
investments
Upstream activities
Reporting company
Downstream activities

Biogenic Emissions

- Carbon present in wastewater is **biogenic**
- **Short-term** carbon cycle vs **long-term** carbon cycle
- Capturing energy from **carbon that would be emitted naturally** vs **extracting deep storage carbon** from fossil fuels



Greenhouse Gas Fundamentals

- Tiers of GHG calculation methods
- Based on level of detail and complexity
- Tier 3 becomes more challenging as you extend further upstream and downstream of your project/site (Scope 3)

Intergovernmental Panel on Climate Change Tier	Description
3	Direct measurements, local data
2	Combination of some direct measurements, local data, and regional default values
1	National or regional default values

Calculation Methodology

Biosolids Facility (Project)

- Electricity use for solids handling processes
- Transportation and production of chemicals
- Transportation of biosolids for land application
- Fuel combustion for steam generation
- Production of biogas

Other Water Pollution Control Plant Facilities

- Electricity use not for solids handling processes
- Wastewater treatment
- Transportation and production of chemicals/materials
- Fuel combustion in various equipment
- **Not affected by this project**

Project Carbon Footprint with Current Dominion Energy Profile (2037)

MT CO_2e/year

Category	Lime Stabilization	THP, Anaerobic Digestion, RNG	Comment
Scope 1 – Direct (Natural Gas)	50	1,970	Fuel combustion (natural gas) for steam generation
Scope 2 – Indirect (Electricity)	1,420	3,300	Electricity for solids processing
Scope 3 – Indirect (Other)	3,860	1,940	Reduced truck traffic and chemicals
Total	**5,340**	**7,210**	
RNG Production	--	(6,150)	RNG displacing fossil fuel
Adjusted Total	***5,340***	***1,050***	***Net difference of 4,290 metric tons/year***

Project Carbon Footprint with 100% Renewable Energy (2037)

MT CO_2e/year

Category	Lime Stabilization	THP, Anaerobic Digestion, RNG	Comment
Scope 1 – Direct (Natural Gas)	50	1,970	Fuel combustion (natural gas) for steam generation
Scope 2 – Indirect (Electricity)	0	0	Electricity is renewable
Scope 3 – Indirect (Other)	3,860	1,940	Reduced truck traffic and chemicals
Total	**3,910**	**3,910**	
RNG Production	--	(6,150)	RNG displacing fossil fuel
Adjusted Total	***3,910***	***(2,240)***	***Net difference of 6,150 metric tons/year***

CURRENT

CLASS B
BIOSOLIDS PRODUCT

BIOSOLIDS TRUCKS
4/day

LIME USED
5 tons/day

ENERGY USED
2.1 MMBtu/hr

ENERGY GENERATED
0 MMBtu/hr

NET ENERGY USAGE
2.1 MMBtu/hr

FUTURE SOLIDS PROCESSING

CLASS A
BIOSOLIDS PRODUCT

BIOSOLIDS TRUCKS
2/day

LIME USED
0 tons/day

ENERGY USED
8.7 MMBtu/hr

ENERGY GENERATED
13.4 MMBtu/hr

NET ENERGY USAGE
-4.7 MMBtu/hr

Upgrade Benefits

- Fewer chemicals
- Less energy
- More opportunities to use biosolids

CO_2 EMISSION REDUCTION

4,290 MT/YEAR CO2 =

- 480,000 gallons of gas or
- 420,000 gallons of diesel or
- 760 vehicles or
- 835 homes' electricity per year or
- 540 homes' energy per year

07

Air Quality and Public Health

Criteria Air Pollutants

- Permissible levels set by the Clean Air Act through the National Ambient Air Quality Standards (NAAQS)
- Regulated through the air permitting process
- Impacts are evaluated with:
  - AQ dispersion modeling
  - Ambient AQ monitoring

Pollutant	Description
PM	Particulate Matter
PM10	Inhalable Particulate Matter less than 10 microns
PM2.5	Fine Inhalable Particulate Matter less than 2.5 microns
NOx	Nitrous oxides (ozone precursor)
SO2	Sulfur dioxide
CO	Carbon monoxide (ozone precursor)
VOC	Volatile Organic Carbon (ozone precursor)

Criteria Air Pollutants

- Potential to Emit (PTE) is calculated for regulatory permitting
  - assumes all “emitting units” are emitting at their maximum capacities, 100% of the time without operational limits

A manufacturing facility has plans to install a process with a rated maximum capacity of 10 tons per hour feed input and an emission factor of 2 lb PM_{10} per ton feed input. The facility has requested 4000 hours per year limit on process operation.

PTE for PM_{10} of unpermitted unit:

10 tn/hr x 2 lb PM_{10}/tn x 8760 hr/yr x tn/2000lb = 87.6 tn/yr

PTE for PM_{10} of unit after permit issued with limit on hours of operation:

10 tn/hr x 2lb PM_{10}/tn x 4000 hr/yr x tn/2000 = 40 tn/yr

Post-Project Facility – Potential to Emit (tons per year)

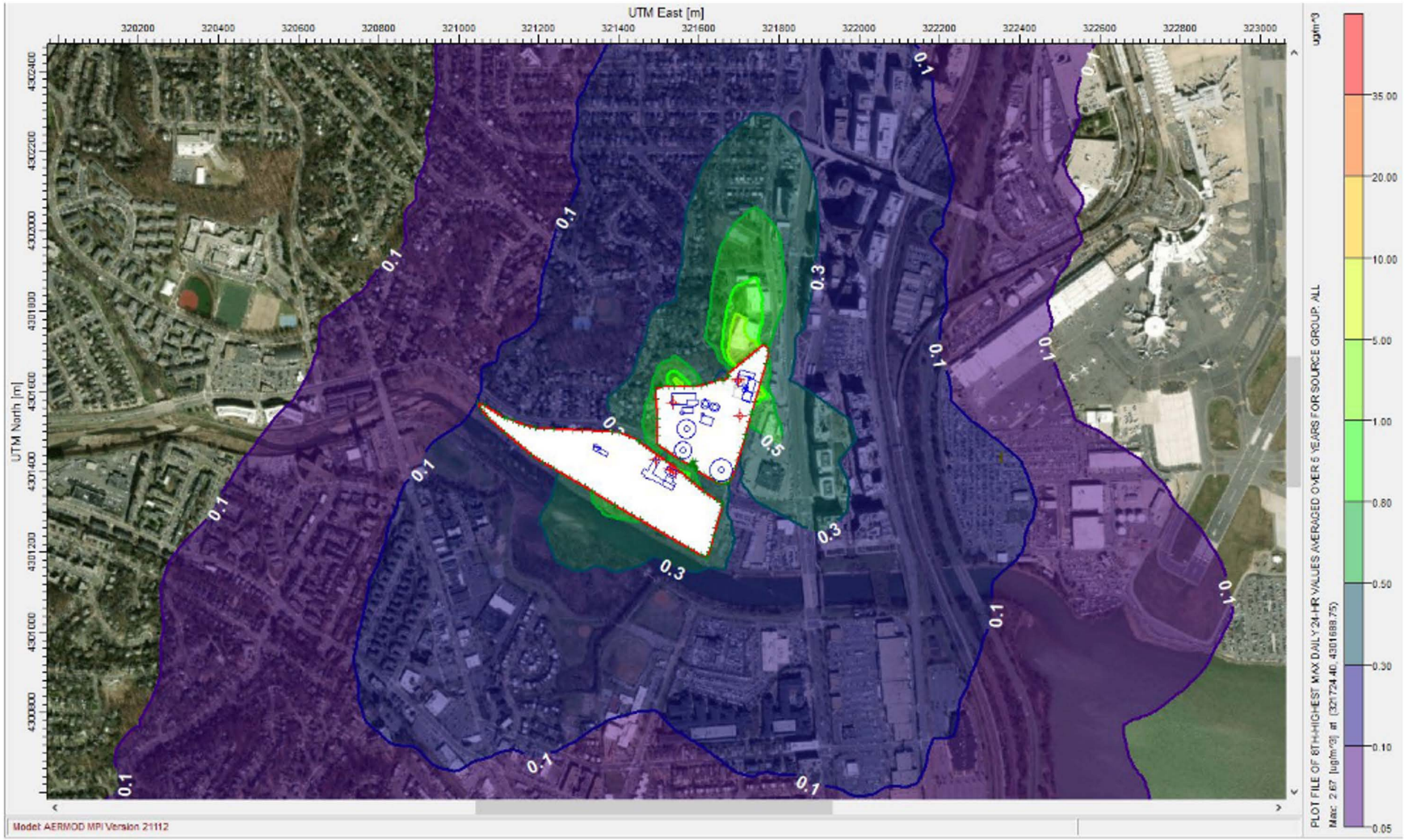
Pollutant	Existing Facility	Project Emissions	Post Project Total	Title V Major Source Threshold
$PM/PM_{10}/PM_{2.5}$	7.8	2.2	10.0	100
NO_x	24.3	17.8	42.1	100
SO_2	6.1	3.4	9.5	100
CO	31.7	33.5	65.2	100
VOC	4.0	2.3	6.3	50

Post-project emissions will not trigger Title V permitting requirements based on current VDEQ rule language.

Air Emissions Modeling

- Project does not require modeling, but County has elected to do so to show impacts to community
- Completed on entire WPCP including existing emitting units
- Two scenarios:
  - Short-term emissions based on maximum operation of all WPCP combustion units running simultaneously. Similar to PTE, this is not operationally feasible.
  - Long-term analysis based on predicted actual operations.
- Completed for two site layouts
- Compared to National Ambient Air Quality Standards (NAAQS)

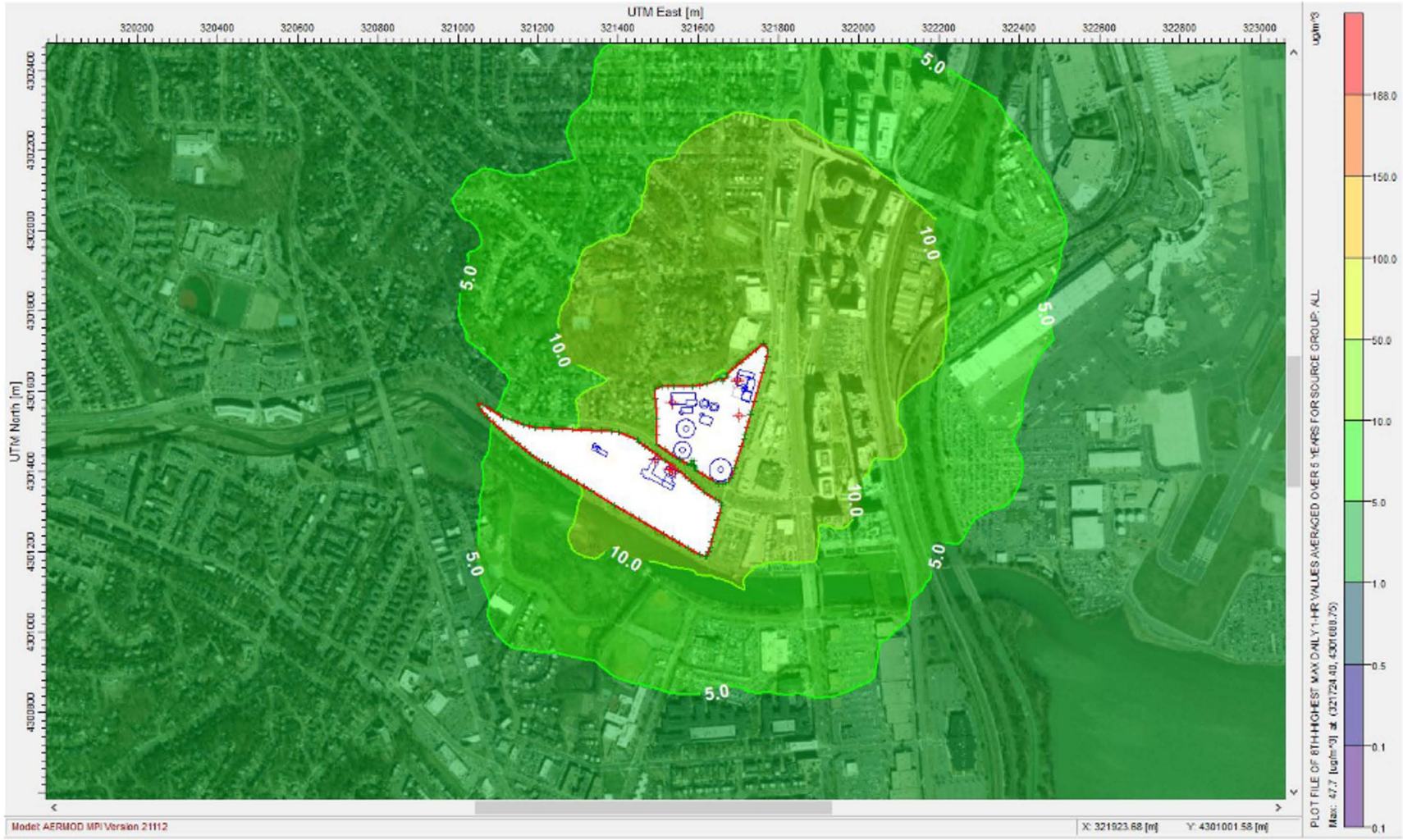
Example Impact Maps – $PM_{2.5}$, 24-hr



NAAQS Standard

Background
18 µg/m^3

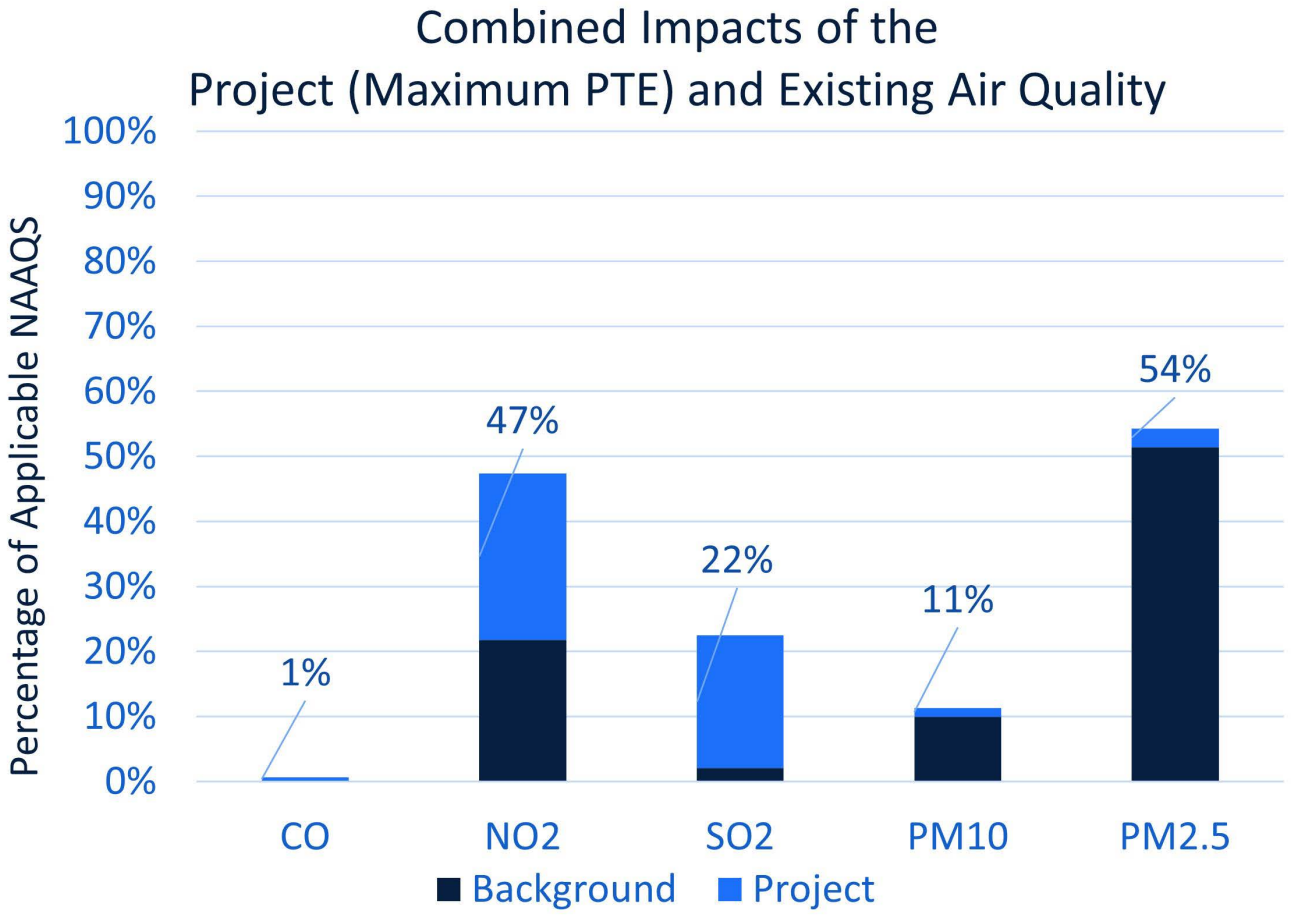
Example Impact Maps – NO_2, 1-hr



NAAQS Standard

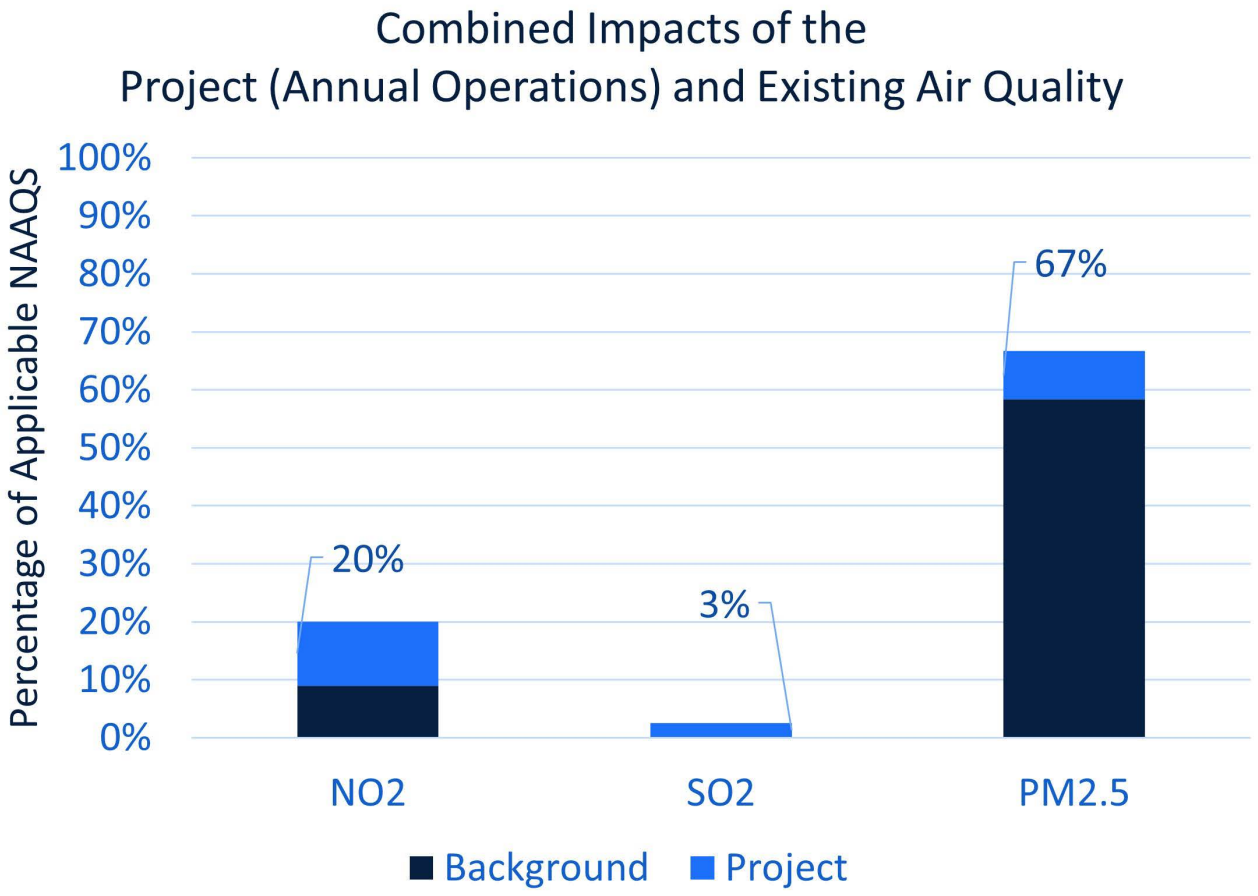
Background
41 µg/m^3

Short-Term Air Emission Results



- Highest values between two site layout options presented
- Ambient air quality monitor data were sourced from EPA monitor sites within the surrounding 8 miles of the facility

Annual Air Emission Results



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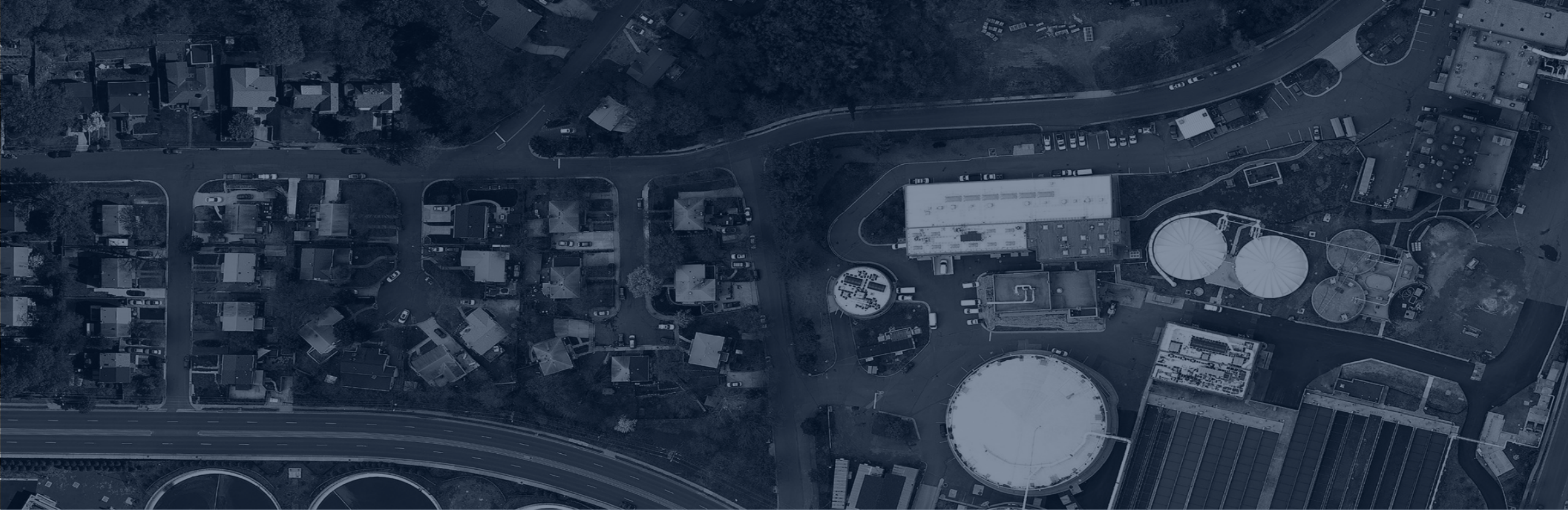
- Ambient air quality monitor data were sourced from EPA monitor sites within the surrounding 8 miles of the facility



08

Renderings and Site Layouts

Renovate Dewatering Building

Renovate Dewatering Building

Renovate Dewatering Building

Decommission Dewatering Building

Decommission Dewatering Building

Decommission Dewatering Building

09

Next Steps

Next Steps

- Next meeting in Fall 2022
  - Agenda topics TBD
  - Panel preference?
  - Preferred meeting format—virtual or hybrid
- Will notify panel of website launch and additional outreach opportunities

Project Contact

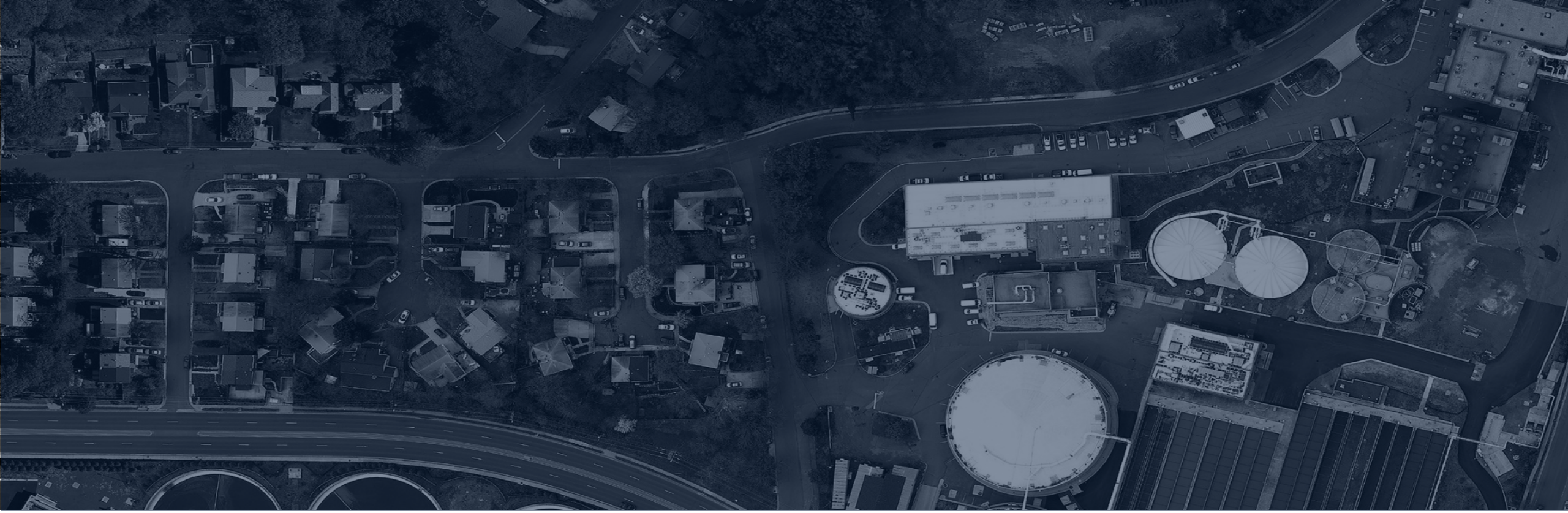
Mary Strawn
Chief Engineer
Arlington County Water Pollution Control Bureau
(703) 228-6829
MStrawn@arlingtonva.us

Advisory Panel Views

We would like feedback from the groups you represent on the renewable natural gas approach County staff recommends.

Please send brief written comments to Samantha Villegas at svillegas@raftelis.com by Friday, July 8.

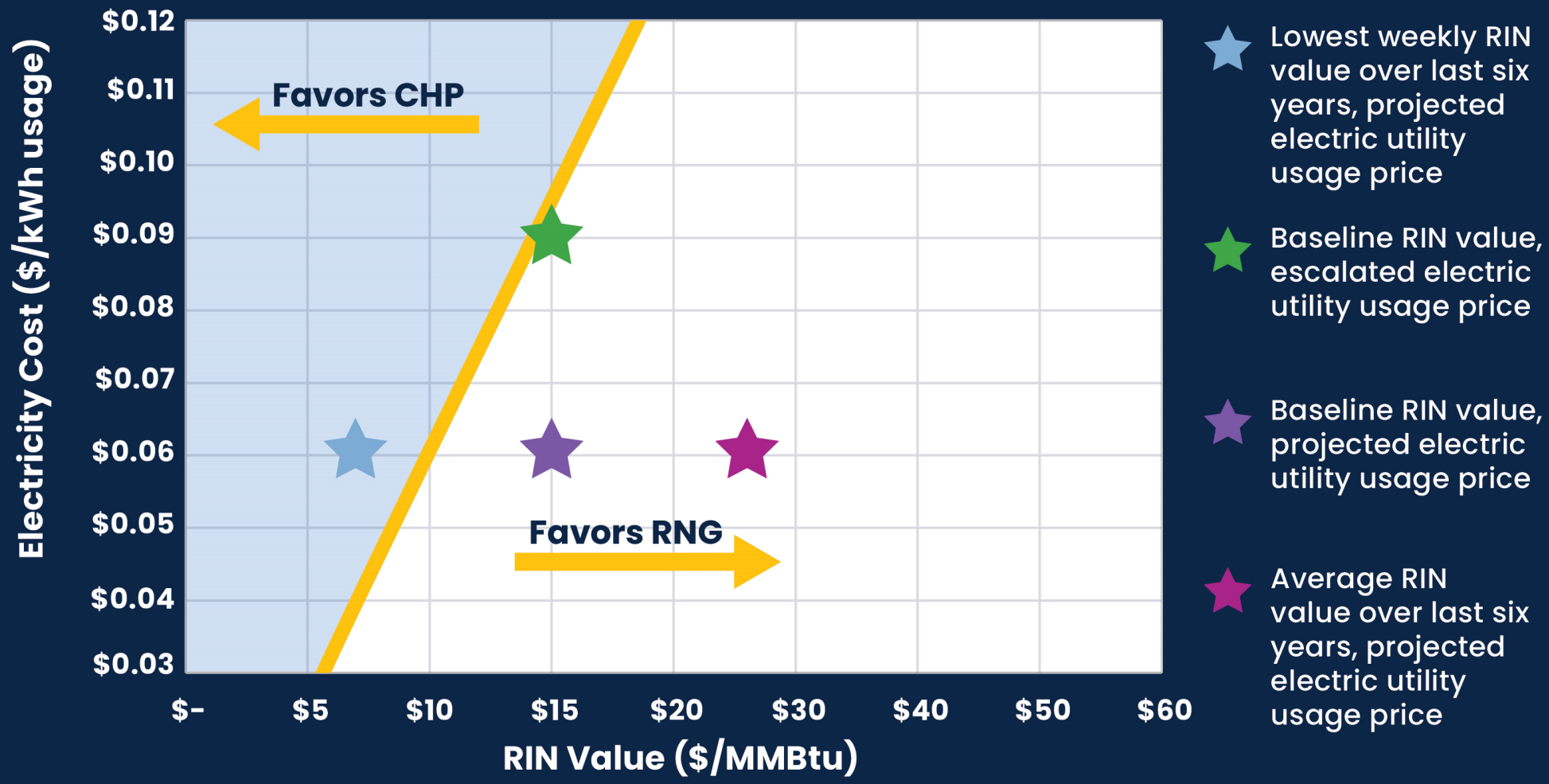
Thank you!



Background Materials

Sensitivity Analysis

RIN Value vs. Electricity Cost



Planned Improvements – Potential to Emit (tons per year)

Pollutant	Boilers	Waste Gas Flare	Project Total	Major NSR Threshold	Minor NSR Threshold
$PM/PM_{10}/PM_{2.5}$	1.0	1.2	2.2	250	25/10/6
NO_x	12.6	5.2	17.8	100	10
SO_2	0.1	3.3	3.4	250	10
CO	10.6	22.9	33.5	250	100
VOC	0.7	1.6	2.3	50	10

Project will trigger minor New Source Review (NSR) permitting requirements for modifications to existing source.

Short-Term Emission Results

Pollutant	Duration	Modeled Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	NAAQS (ug/m3)	% of NAAQS
CO	1-hr	253	2	255	40,000	0.6%
	8-hr	58	0	58	10,000	0.6%
NO2	1-hr	48	41	89	188	48%
SO2	1-hr	40	4	44	196	22%
	24-hr	4	2	6	366	2%
PM10	24-hr	2	15	17	150	11%
PM2.5	24-hr	1	18	19	35	54%

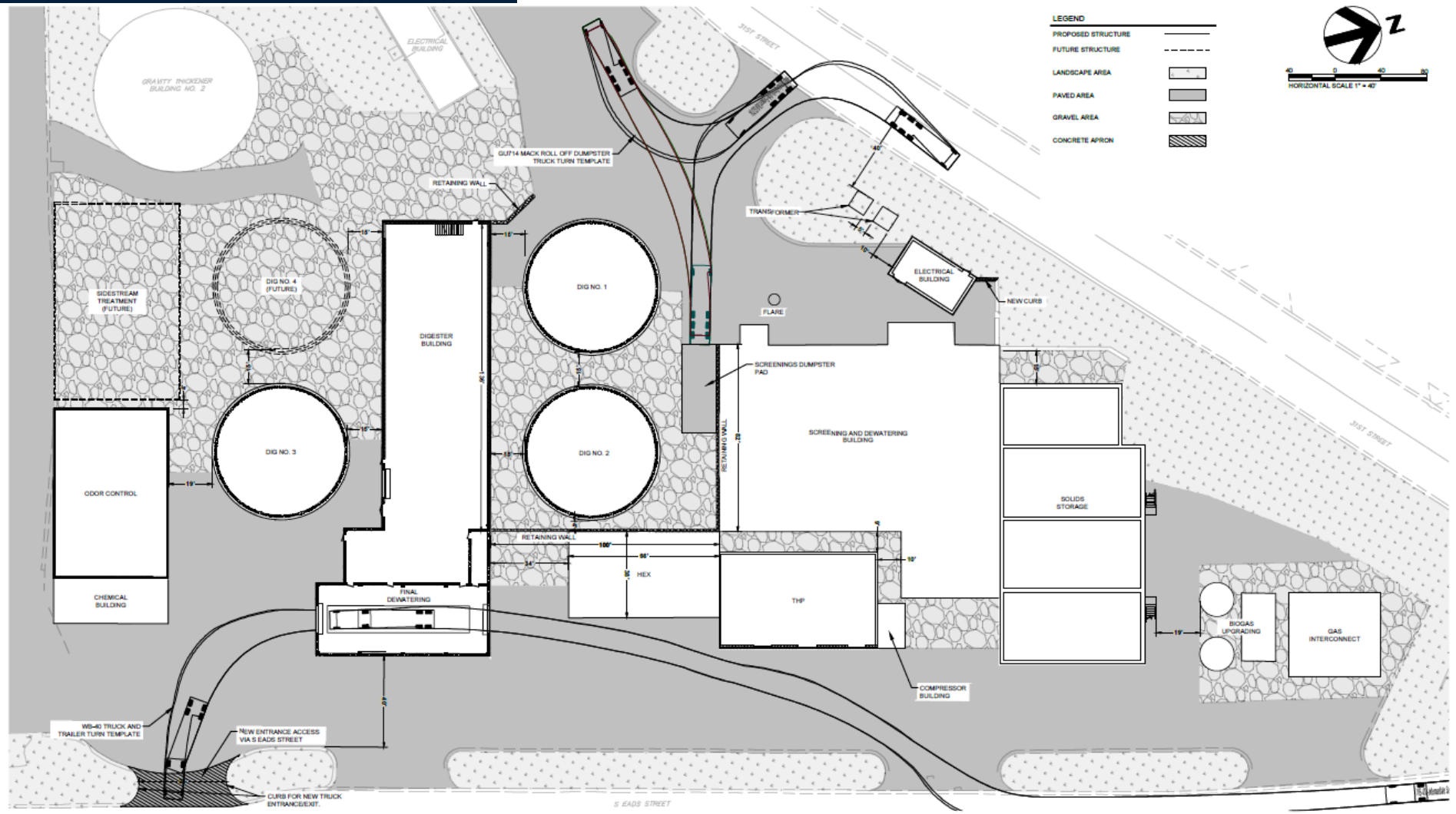
Highest values between two site layout options presented.

Annual Emission Results

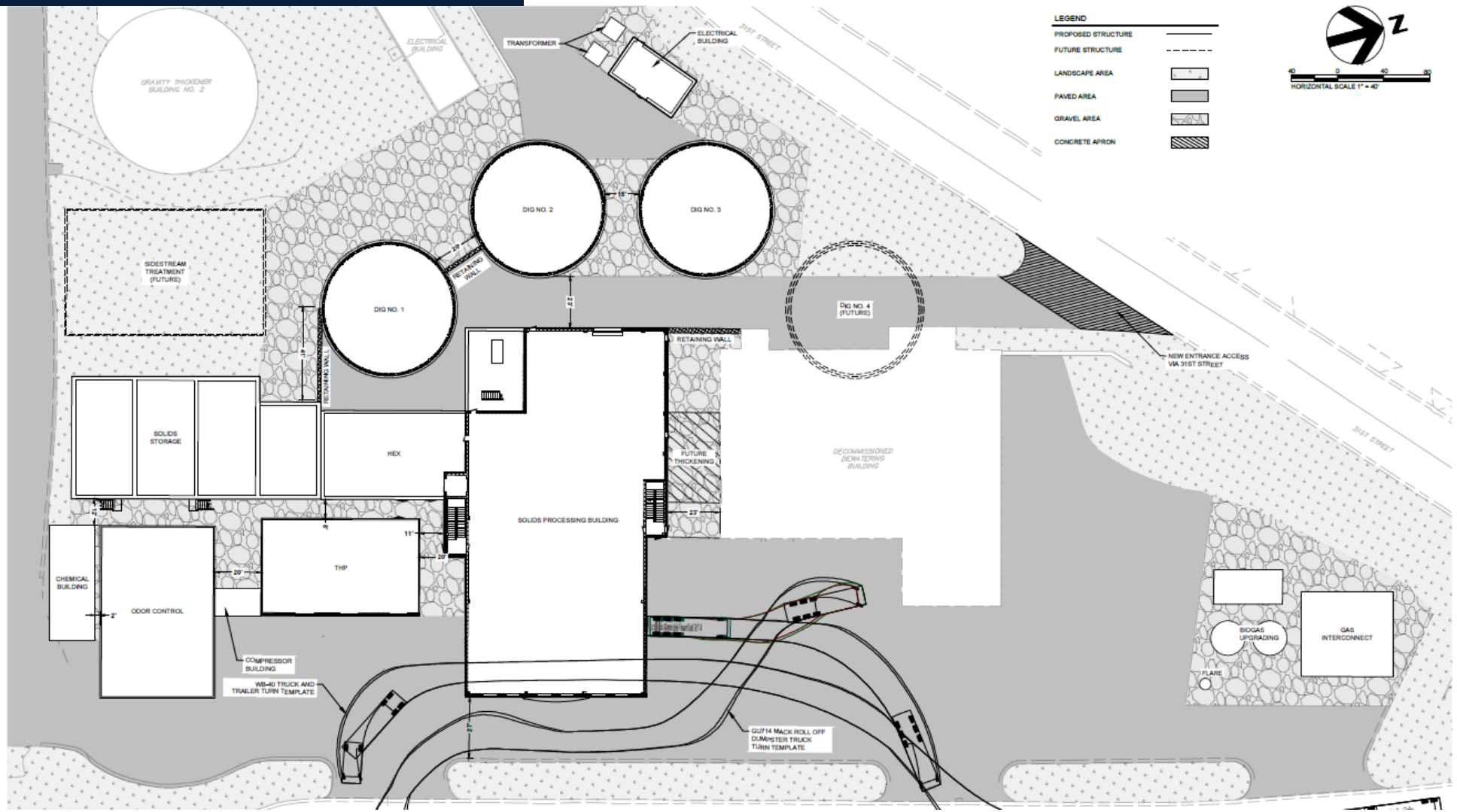
Pollutant	Duration	Modeled Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	NAAQS (ug/m3)	% of NAAQS
NO2	Annual	11	9	20	100	20%
SO2	Annual	2	0	2	78	2%
PM2.5	Annual	1	7	8	12	67%

Highest values between two site layout options presented.

Renovate Dewatering Building

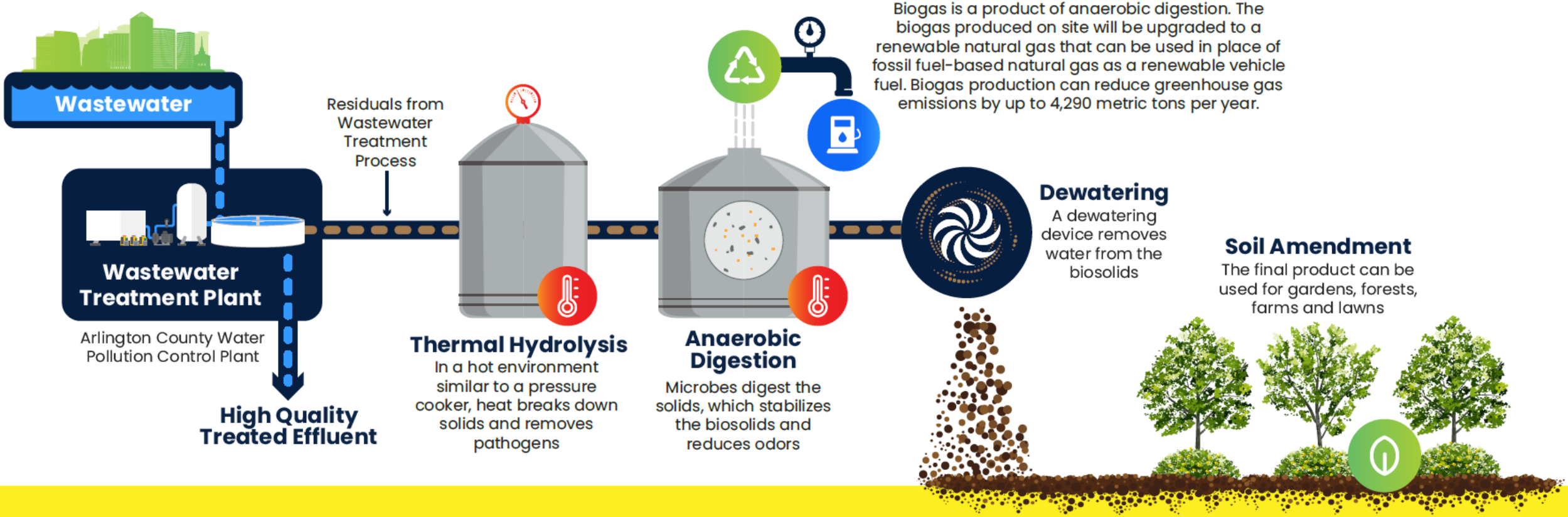


Decommission Dewatering Building



Program Overview

Recovering renewable resources from wastewater



What are biosolids?

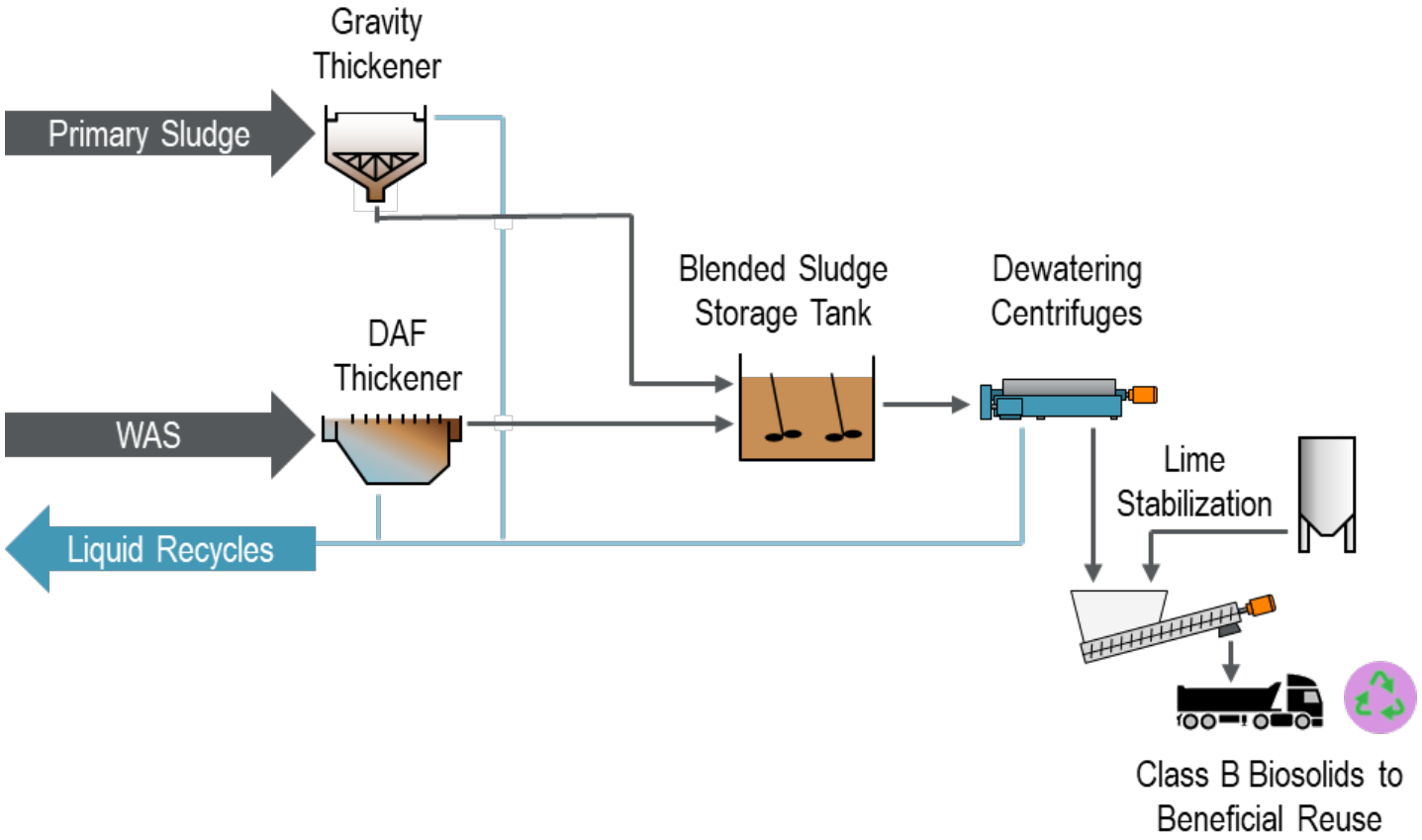
- Product of the wastewater treatment process
- Liquids are separated from the solids
- These solids are physically and chemically treated to produce a semisolid, nutrient-rich product - “biosolids”
- Beneficially used biosolids must meet federal and state requirements for treatment

All wastewater treatment plants must handle and dispose of solids.
Biosolids are a natural and renewable resource that conserves and protects our environment.
Using biosolids reduces waste and recovers natural resources.

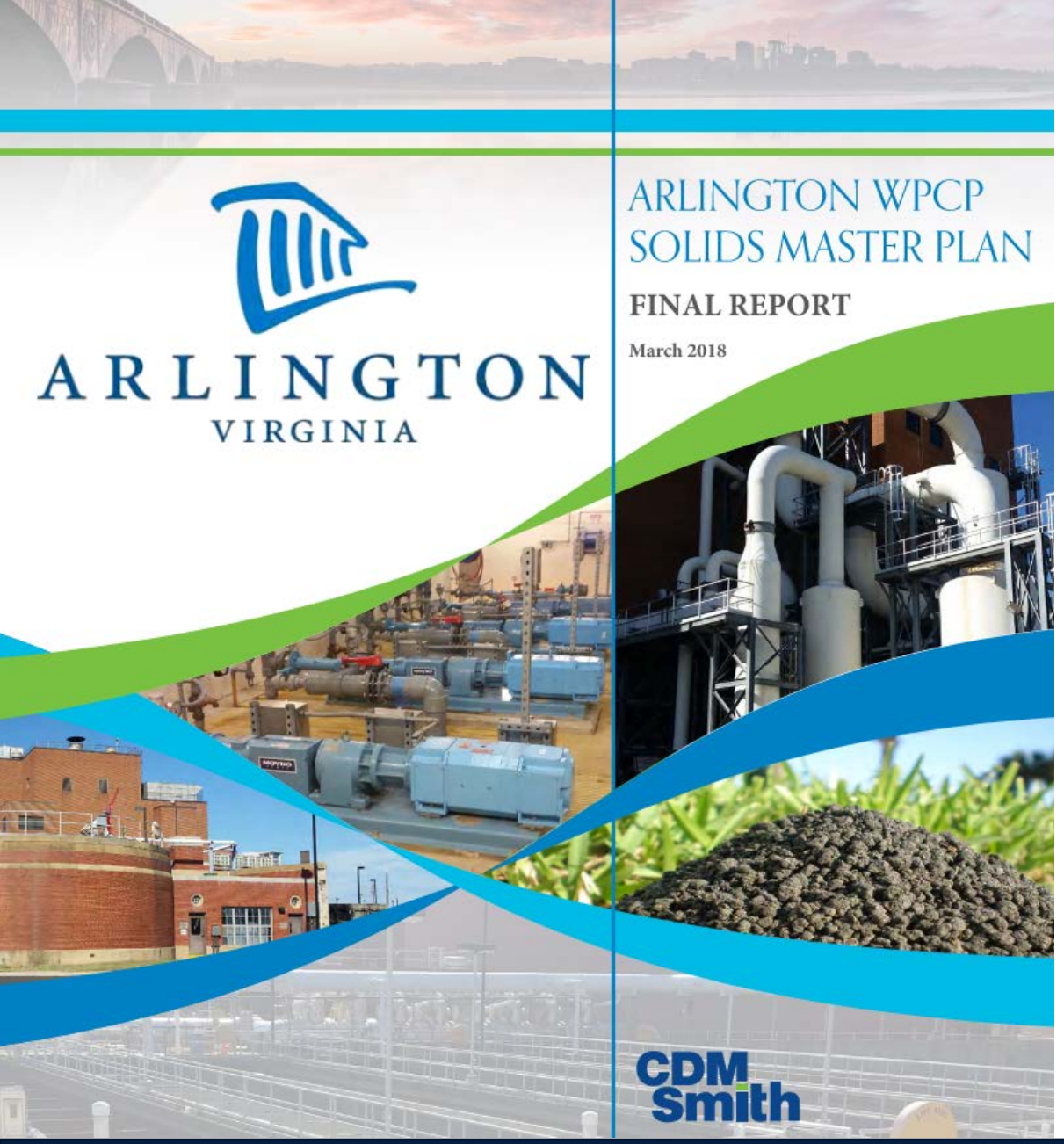
Land Application of Biosolids

- Biosolids are rich in key nutrients and are a proven and effective natural alternative to chemical fertilizers
- Class of biosolids depends on level of pathogen removal
- Class A biosolids
  - Treatment processes proven to eliminate pathogens and viruses
  - No restrictions on use
- Class B biosolids
  - Treatment process to reduce, but not necessarily eliminate, pathogens and viruses
  - Site restrictions on use to allow time for additional pathogen degradation

Existing Solids Handling at the WPCP



- Existing solids process was implemented in the 1990s as incineration was phased out
- Equipment is nearing end of useful life
- New processes that look to more beneficially use resources have been developed since the solids processes were last upgraded



Solids Master Plan

- Development of the Solids Master Plan began in 2015 and was completed in 2018
- Master planning goals:
  - Replacing failing and end of life equipment
  - Mitigating the risk of potential future regulatory changes to the current practice of recycling Class B biosolids through application to agricultural land
  - Providing a solution that reduces the energy and greenhouse gas footprint of the WPCP
  - Achieving additional County-wide sustainability goals
  - Developing a solids management strategy that offers long-term reliability
  - Establishing an implementation plan compatible with County CIP funding

Master Planning Process

- Initially screened over 50 technologies
- From these technologies, developed 12 viable alternatives
- Further screened the 12 alternatives to 4 for detailed evaluation

1. **Lime Stabilization** *(similar to existing)*
   Class B
2. **Anaerobic digestion**
   Class B
3. **Thermal hydrolysis + anaerobic digestion**
   Class A
4. **Anaerobic digestion + heat drying**
   Class A

Selected Thermal Hydrolysis + Anaerobic Digestion for Implementation

Lime Stabilization

- Class B product
- Lime – 5 tons/day
- Polymer – 0.2 tons/day
- Biosolids trucks – 4/day
- Power use – 570 kW
- Natural gas use – 0.1 MMBtu/hr
- Biogas generated – 0 MMBtu/hr
- Net energy usage – 2.1 MMBtu/hr

Thermal Hydrolysis + Anaerobic Digestion

- Class A product
- Lime – 0 tons/day
- Polymer – 0.3 tons/day
- Biosolids trucks – 2/day
- Power use – 1,300 kW
- Natural gas use – 4.2 MMBtu/hr
- Biogas generated – 13.4 MMBtu/hr
- Net energy usage – (4.7) MMBtu/hr

KEY Better Neutral Worse

SELECTED THERMAL HYDROLYSIS + ANAEROBIC DIGESTION FOR IMPLEMENTATION

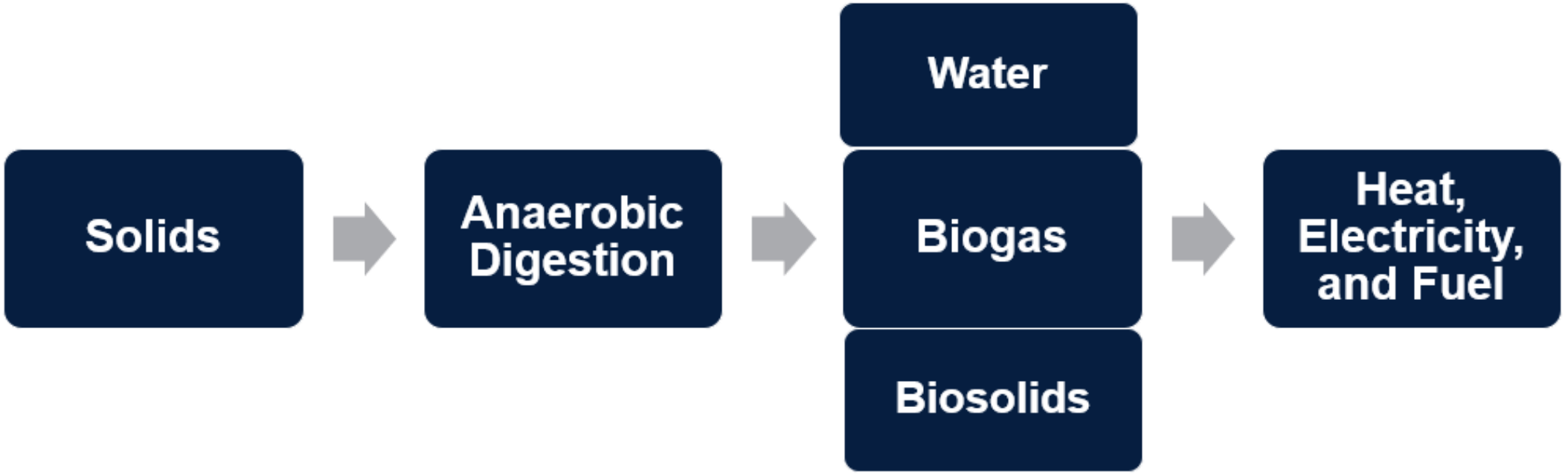
	LIME STABILIZATION	THERMAL HYDROLYSIS + ANAEROBIC DIGESTION
	CLASS B PRODUCT	**CLASS A** PRODUCT
BIOSOLIDS TRUCKS	4/DAY	2/DAY
LIME	5 tons/day	0 tons/day
POLYMER	0.2 tons/day	0.3 tons/day
NATURAL GAS USE	0.1 MMBtu/hr	4.2 MMBtu/hr
POWER USE	2.0 MMBtu/hr	4.5 MMBtu/hr
BIOGAS GENERATED	0 MMBtu/hr	13.4 MMBtu/hr
NET ENERGY USAGE	2.1 MMBtu/hr	-4.7 MMBtu/hr

What is Thermal Hydrolysis?

- A high-temperature process– similar to a pressure-cooker– that sterilizes biosolids.
- The high-temperature process removes pathogens, resulting in a Class A Exceptional Quality biosolids product

What is Anaerobic Digestion?

- Process to break down biodegradable material to produce biogas, water and stabilized biosolids



What is Biogas Utilization?

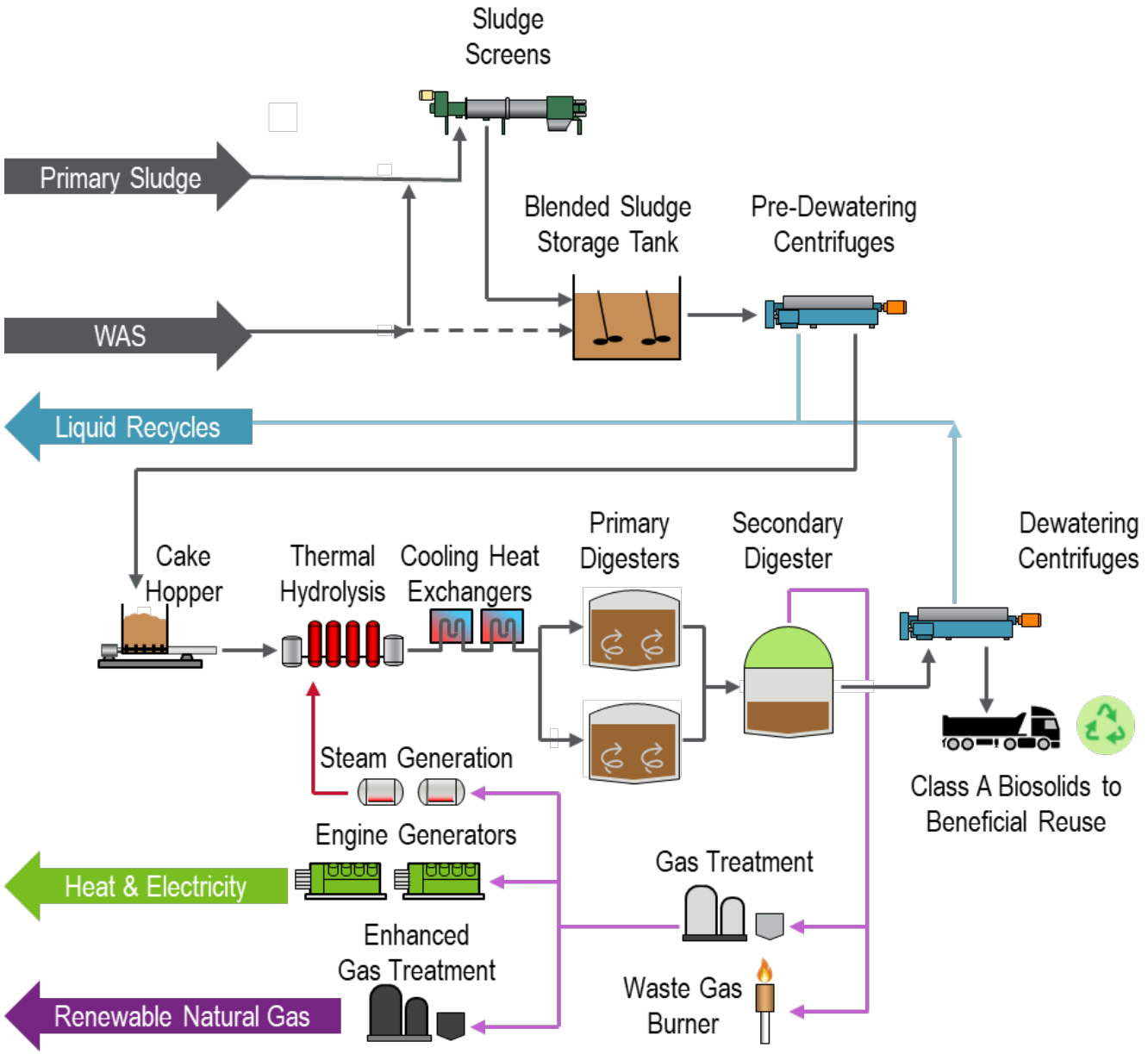
- Biogas generated in the digesters is cleaned through a treatment process.
- The cleaned biogas can be used to generate electricity, fuel natural gas buses or injected into the Washington Gas Pipeline
- Biogas contains biogenic carbon – combustion of biogas does not result in new CO_2 emissions

What are Class A Exceptional Quality Biosolids?

- Highly treated biosolids that do not have detectable levels of pathogens. Class A Exceptional Quality (EQ) biosolids can be used as fertilizer on areas such as lawns, parks, gardens, etc.

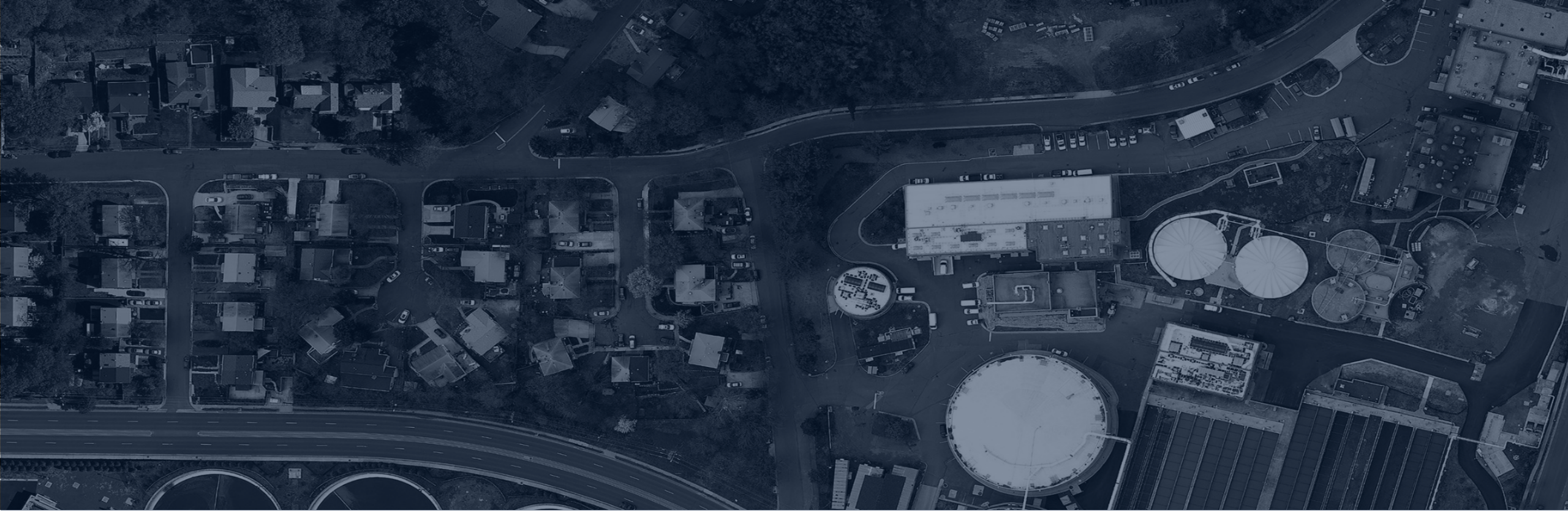
Benefits of Upgrades

New Solids Handling Process



Program Funding

- All projects in the WPCB are funded through the Utilities Fund
- The Utilities Fund is an Enterprise Fund
  - Enterprise funds are self-sufficient
  - Revenues generated within the fund must sustain all activities with appropriate reserves
  - Water-sewer rate set at level which will fully fund activities
- Projects in the WPCB can impact water-sewer rates but not the General Fund



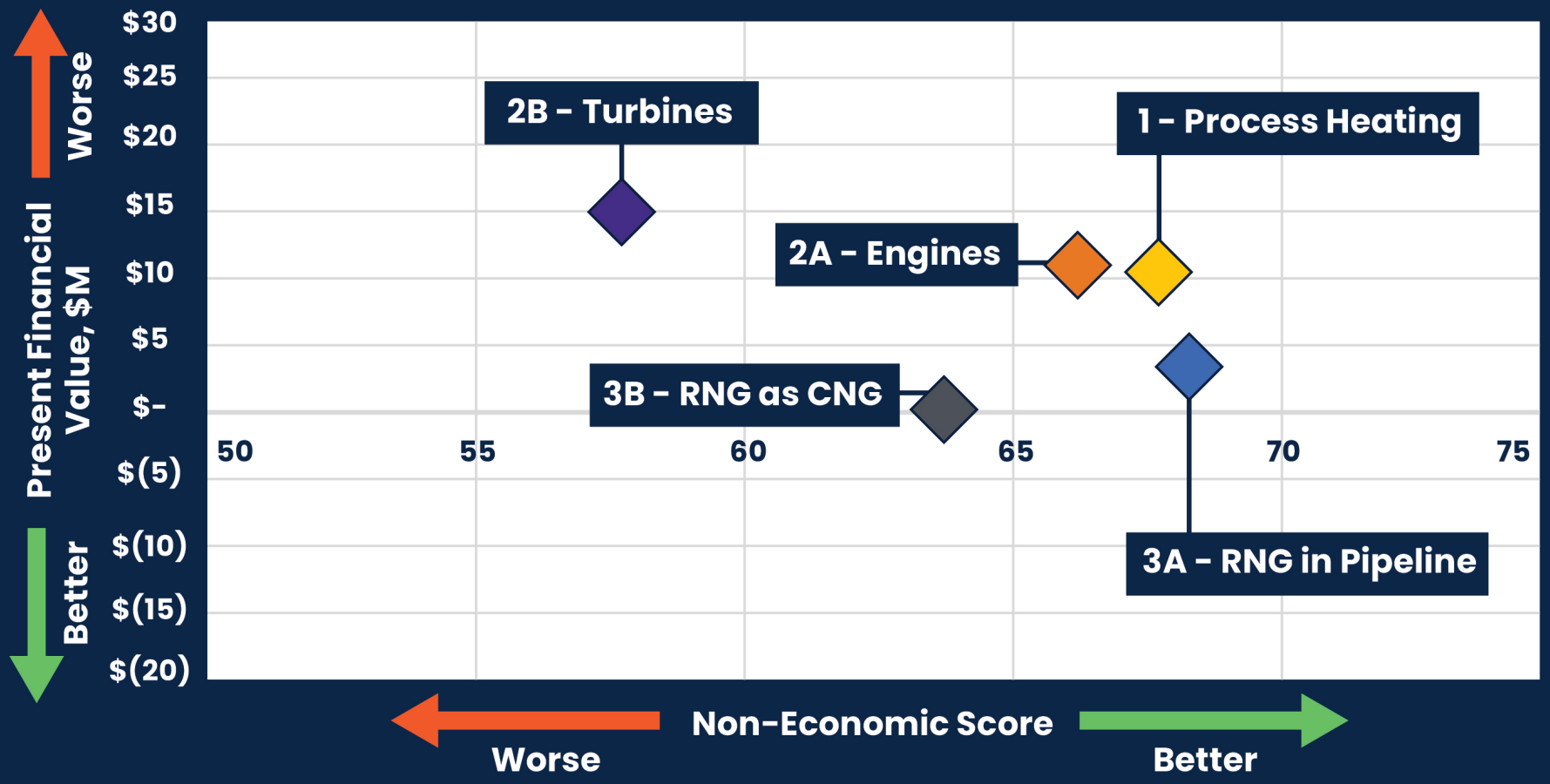
Details of Financial and Non-Economic Scenario Results

Non-Economic Scoring

Criterion	1 – Process	2A – Engines	2B – Turbine	3A – RNG	3B – CNG
Localized emissions	2	3	3	4	4
Noise	5	3	3	4	4
Visual aesthetics	4	4	4	4	4
Footprint	5	4	4	4	4
Potential for flaring	1	3	2	4	3
Operational complexity	4	3	2	2	3
Maintenance complexity and reliability	4	2	2	4	4
Safety	4	4	3	2	2
Resilience	2	4	4	4	2
Future opportunities	2	3	3	5	4

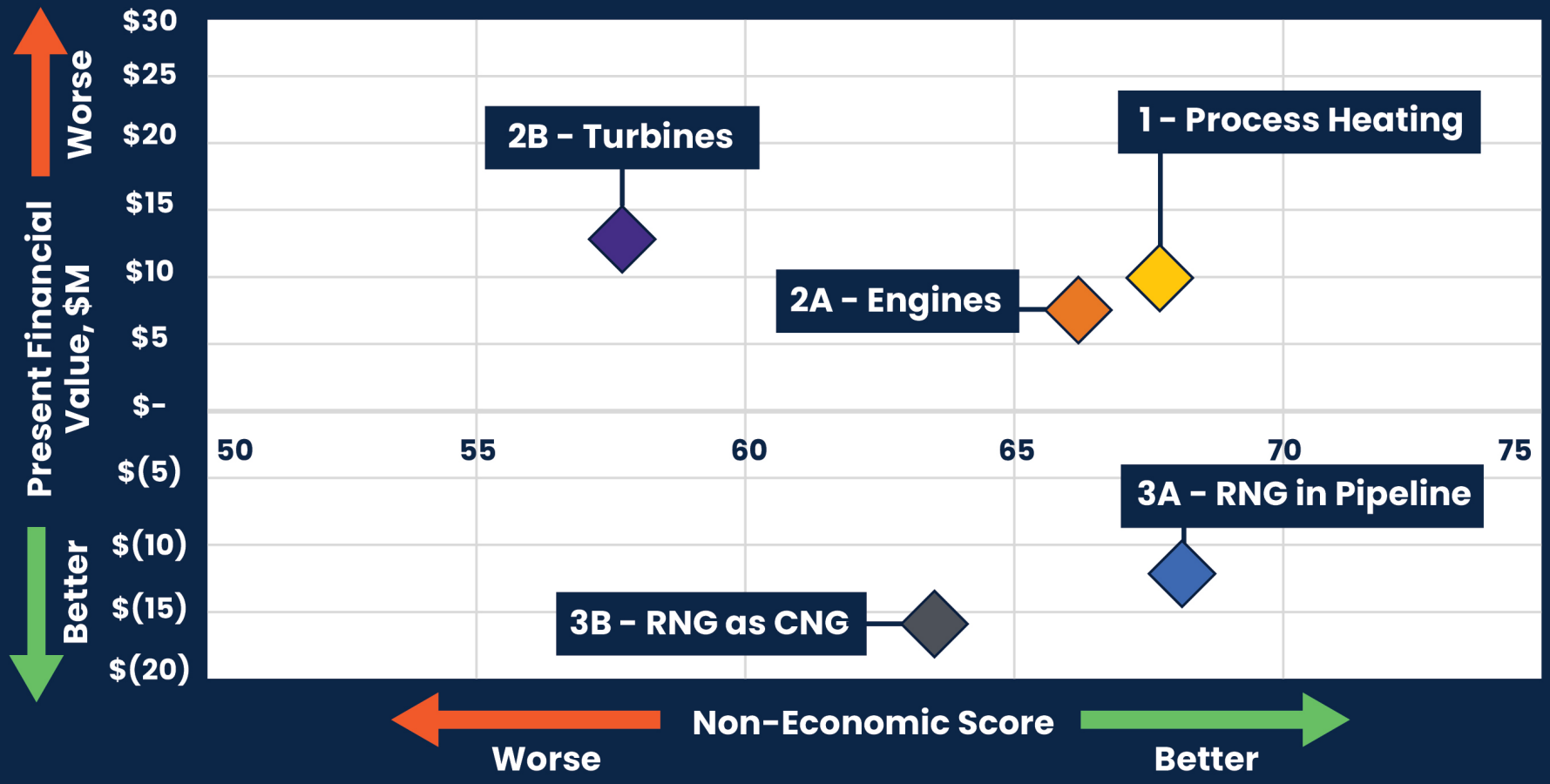
Base Scenario

($0.06/kWh, No social cost of GHG, RIN = $15/MMBtu)



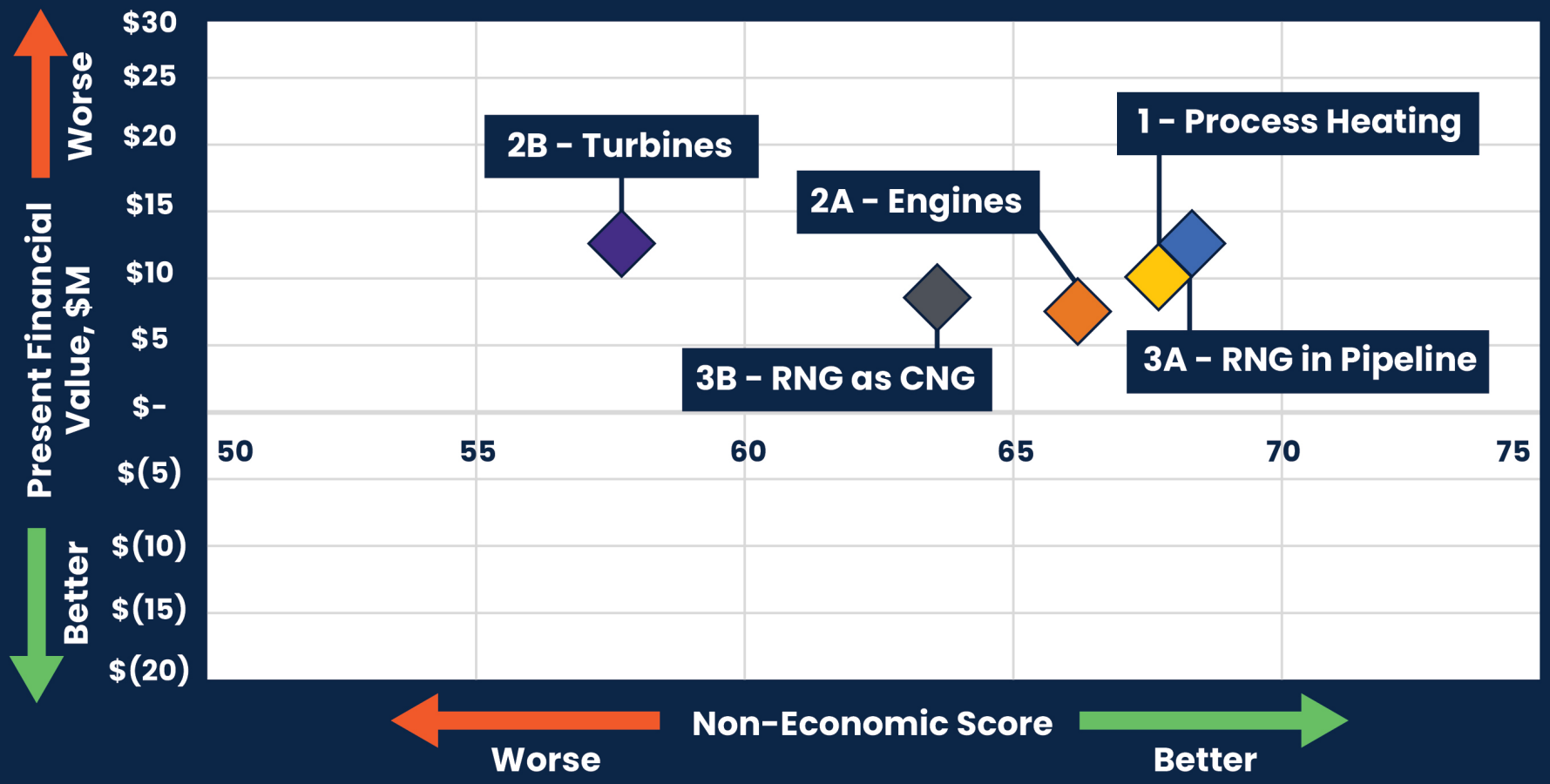
Average RIN Scenario

($0.06/kWh, Includes social cost of GHG, RIN = $23.35/MMBtu)



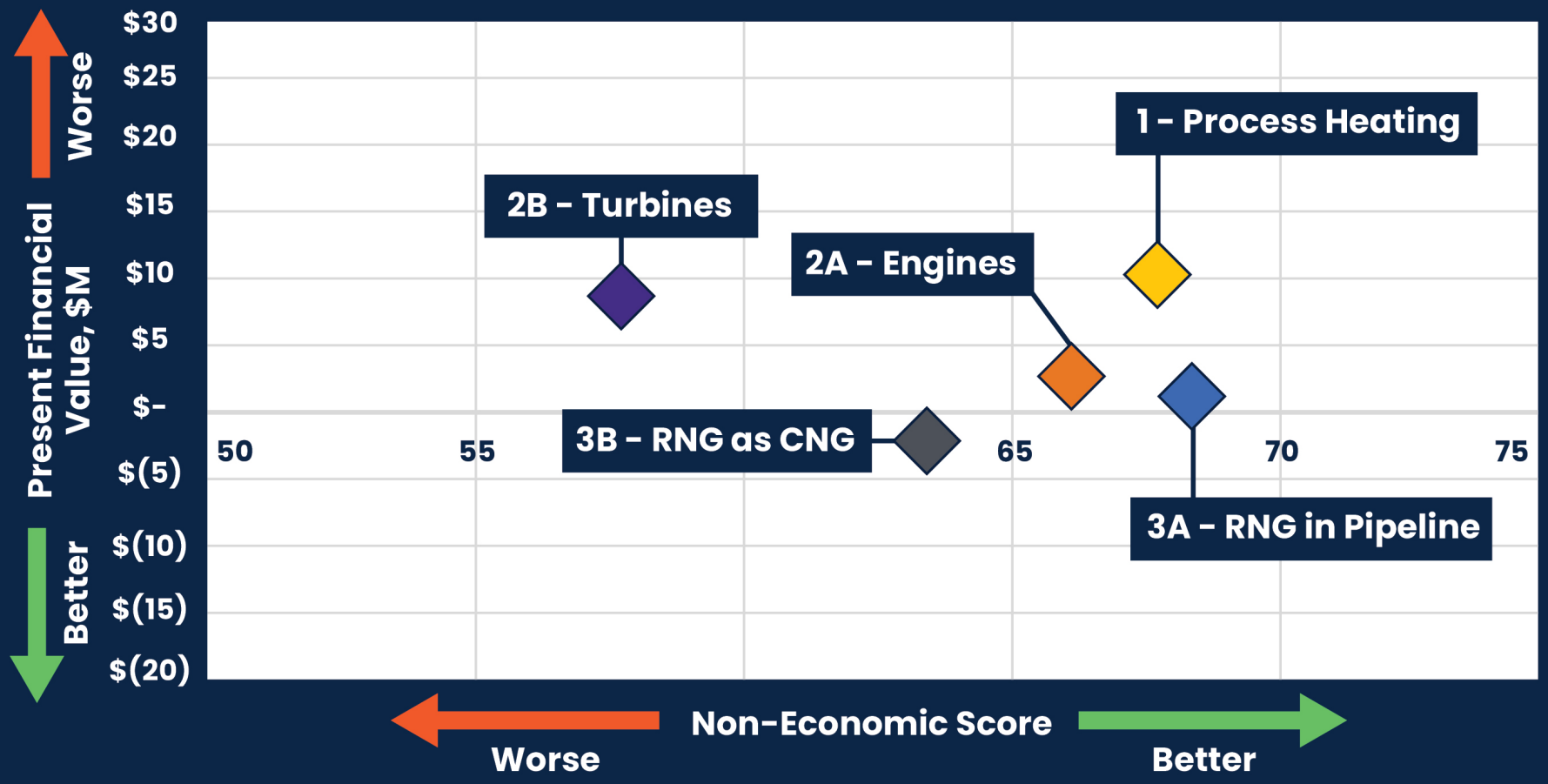
Lowest RIN Scenario

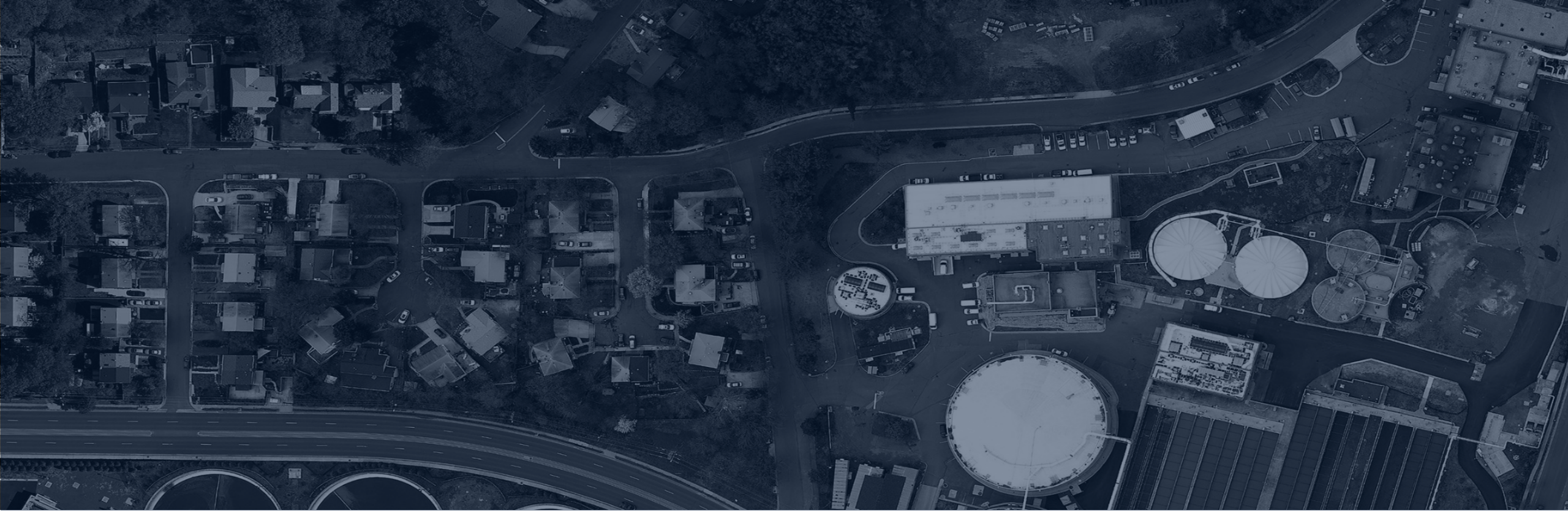
($0.06/kWh, Includes social cost of GHG, RIN = $6.38/MMBtu)



High Electrical Cost Scenario

($0.09/kWh, Includes social cost of GHG, RIN = $15/MMBtu)





Questions from Advisory Panel and County Commissions

Q

It appears the proposal is both to sell the "GHG reduction benefits" and "count" the GHG benefits in the financial calculations using the current value of social cost of carbon used by the federal government. This appears to be a form of double-counting.

A

- See previous discussion on RNG pathways and reference p. 7-9 of the Biogas Utilization Executive Summary.
- The GHG reduction benefit would remain in Arlington County if the gas is used within the County.
- Social cost of carbon is not a true financial value, rather a monetization of the social impacts of the GHG emissions based on economic loss over time.
- Social cost of carbon impacted Alternatives 2A and 3A similarly (similar base GHG reductions). Excluding this would not have impacted the recommendations.

Q **Is there a sense in which the availability of the County's RNG might compete with, and tempt Arlington and WMATA to delay, the needed transition to electric buses? If so, is this an optimal use of the gas?**

A

- The recommendation of RNG is not dependent on use of the RNG in ART or WMATA bus fleets.
- The Transit Bureau is currently completing a study for the bus fleets, including electrification and resiliency alternatives.

Q **Is there a sense of what kind of terms and prices WGL might offer for the RNG and how that compares to transportation use?**

A

- Prices have not yet been discussed.
- The expectation is that the value for the physical gas (without the environmental attributes) would be comparable to the commodity value of natural gas independent of the buyer.

Q **If the “transportation market” loses its viability due to electrification or regulatory changes, will WGL likely be our only practical buyer? If so, how would we be guaranteed a competitive price?**

A No, WGL would not be the only buyer available to the County. There are national and international voluntary markets that operate on a book and claim basis* that would still offer a competitive value for the RNG. This could be other customers within or outside of Arlington County.

*sustainability claim separated from the physical pathway

Q **How would it affect the calculations if Arlington decided to sell the gas without claiming it as "RNG" – i.e. to "retire the environmental credits so that we can claim them ourselves rather than selling them? Would WGL be a willing buyer if we did not sell the gas as "RNG"?**

A

- See previous discussion about RNG pathways and RIN values and reference p. 7-9 of the Biogas Utilization Executive Summary.
- The GHG reduction benefit would remain in Arlington County if the gas is used within the County.
- WGL would be a willing buyer of the physical gas regardless of credits or environmental attributes. However, if no dollar value was received for RINs, the financial benefit would be less, and the financial analysis would favor CHP over RNG. The non-monetary analysis still favors RNG.

Q **What would the approximate cost per kWh of the electricity generated in Option 2?**

A $0.06/kWh which equates for both current County usage and demand charges.

Q **Have there been significant discussions of possible emergency uses for the electricity generating capacity under Option 2? Do resilience concerns justify a higher value for the electricity?**

A There have been such discussions. The WPCP is currently fully protected by two independent Dominion feeds and three generators onsite. New generation would provide some resiliency as it would be on the north side of the campus, but generation would only be approximately 35% of total WPCP power consumption.

Q **What are the “Base Assumptions” made in generating the estimates of capital costs and O&M costs?**

A The analysis was completed over a 25-year time frame with conservative metrics. Additional details on assumptions are provided in the Biogas Utilization Report.

Q **Can we have more information about how the “non-economic criteria” were calculated?**

A Additional details were provided with the Executive Summary and in the Biogas Utilization Report.

Q **Can the anaerobic process be designed for both option 2 and 3 to rely solely on the produced biogas onsite and eliminate the need to purchase natural gas?**

A Although we will not be able to fully disconnect the facility from natural gas, the system will be designed to allow for biogas to be used onsite to the greatest extent desired by the County (i.e., to fire boilers in lieu of natural gas). Please note, with the RNG options, the economics favor selling all of the biogas as RNG and utilizing purchased natural gas onsite. The net natural gas usage would be the same (RNG produced minus either biogas or natural gas used onsite).

Q **Can staff provide more details on the assessment of the localized emissions? How does the expected emission compare with state and federal emissions and air quality requirements and with the present process? What will be the impact on air quality for the surrounding residents?**

A The emissions models are being revised to include all air emitting units onsite (initial model runs were done just for the new facilities). Preliminary results indicate that plant emissions will not result in the local neighborhood air quality exceeding National Ambient Air Quality Standards (NAAQS) for the recommended RNG alternative. Should a CHP alternative be selected, additional air pollution mitigation measures may be required to ensure that the NAAQS are not exceeded.

Q **For full comparison of the emission impact, what are the emissions from use of RNG when used for ART buses and what impact will they have on air quality within the County as well as resulting health impacts?**

A These factors were not considered in the WPCP analysis. It is assumed that the RNG will displace fossil-fuel-based natural gas. There is no marked difference between the emissions from combusting RNG or fossil fuel-based natural gas, so the emission impacts are expected to be neutral to current practices.

Heating and Cooling of Process Areas

- Ventilation of process areas is governed by national standards
- Process areas not cooled in summer, 55° F in winter
- Evaluate heat type during design
- Occupied spaces and electrical rooms cooled with energy efficient DC split-system heat pumps

THP Pressure, Temperature and Safety

- Operating pressure: 87 psi (6x atmospheric pressure)
- Operating temperature: 340° F
- Each pressure vessel will be certified per the ASME Boiler and Pressure Vessel Code
- Regular inspections per Virginia Boiler and Pressure Vessel Safety Act
- More than 70 THP installations currently in operation – the first was installed in 1996

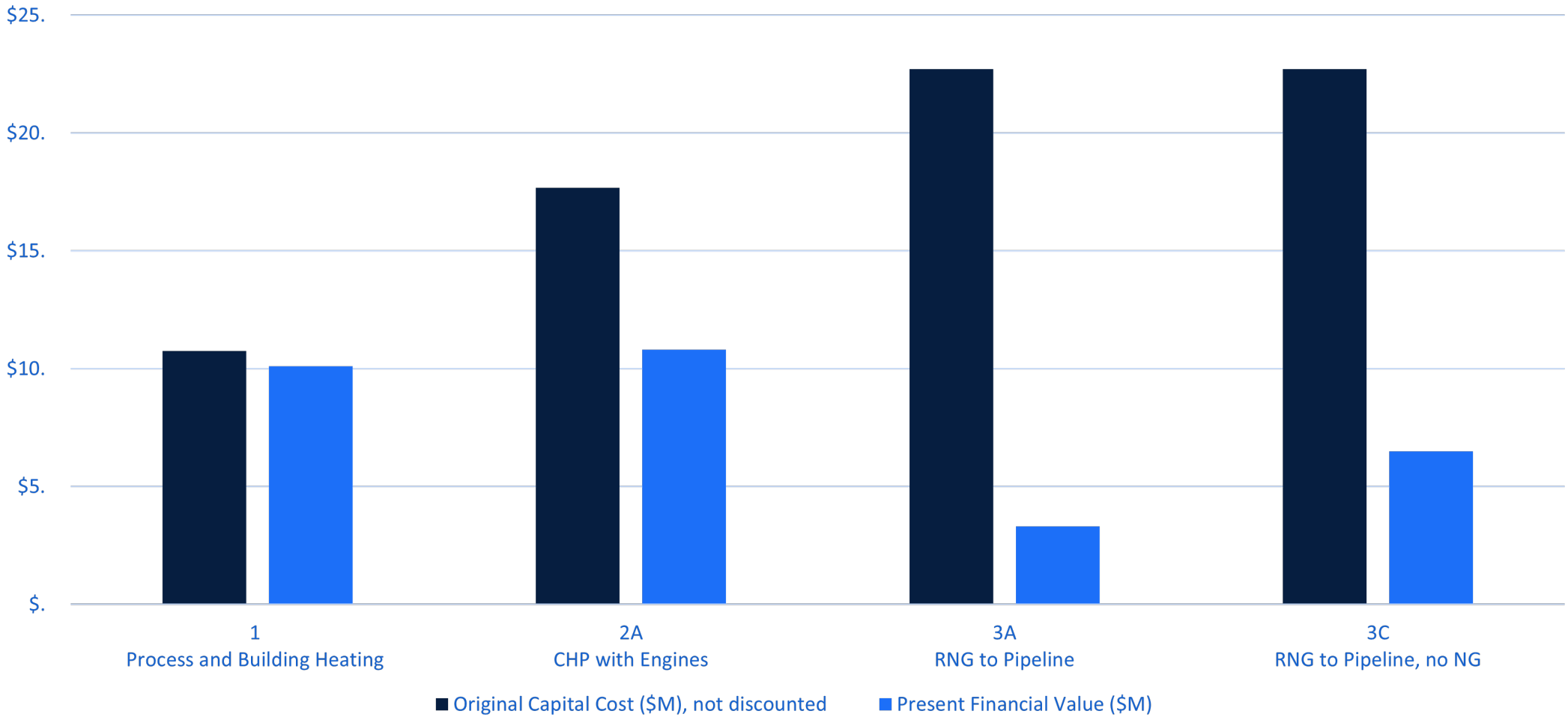
Impact of Construction and Operation Vibration on Neighborhood

- Community impacts will be discussed extensively with delivery teams during design
- Conduct noise and vibration studies after final site configuration is chosen, focusing on both construction activities and future operations
- Will make efforts to reduce impact on community (i.e., auger-cast piles instead of driven H-piles)
- Regular community updates throughout the process

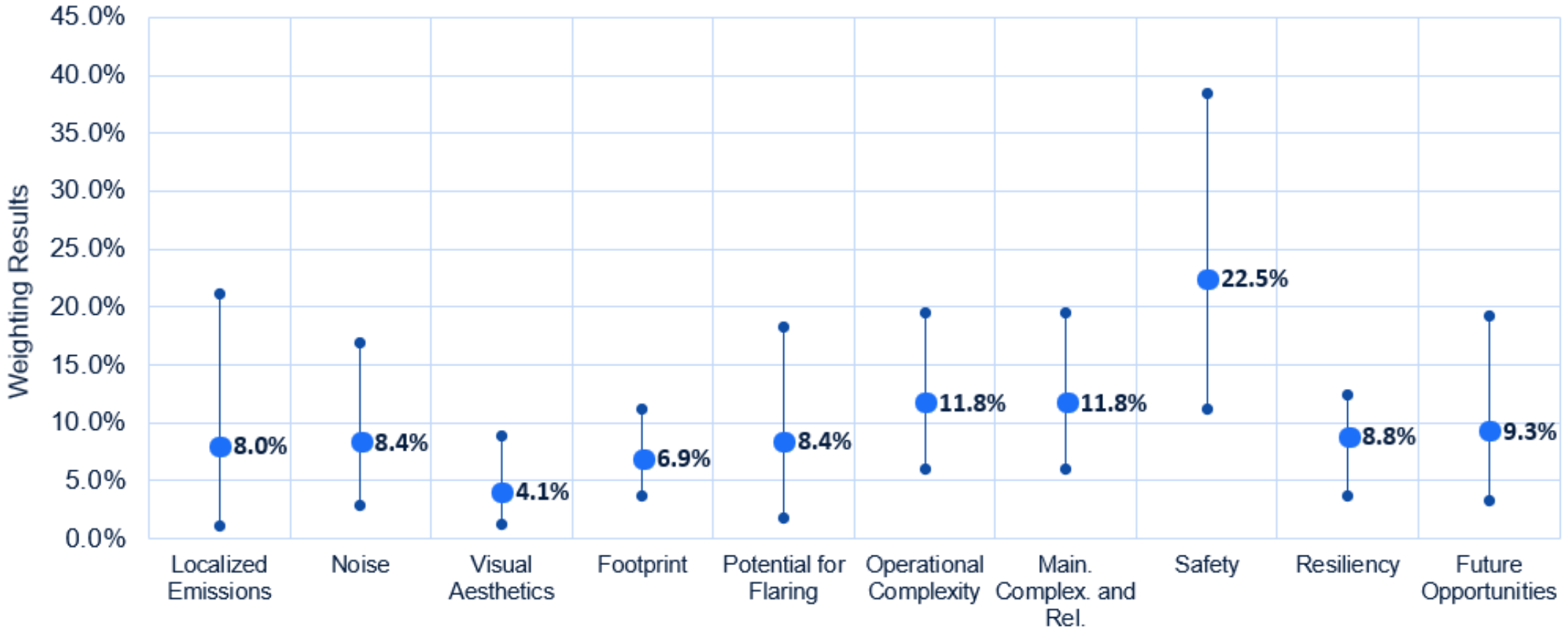
Alternative 3 with Biogas in Boiler

Alternative	1 Process and Building Heating	2A CHP with Engines	3A RNG into the NG Pipeline	3C RNG into the Pipeline, no NG
Conceptual construction cost, $M	$10.75	$17.68	$22.72	$22.72
	Present Financial Value ($M)			
Capital cost	$9.3	$15.3	$19.6	$19.6
Equipment O&M	$0.8	$5.9	$4.9	$3.6
NG cost	$0.0	$0.0	$4.2	$0.0
Electrical offset	$0.0	($10.4)	$0.0	$0.0
RNG revenue	$0.0	$0.0	($25.5)	($16.8)
Total present value	$10.10	$10.81	$3.31	$6.50

Alternative 3 with Biogas in Boiler



County Weighting of Non-Economic Criteria



Scenarios and Probability Models

- Modeled for different electricity and value of environmental attributes (Renewable Identification Numbers)
- Performed statistical analysis for sensitivity analysis
  - Alternative 3 had lower financial and environmental cost for 97% of scenarios
  - In 80% of scenarios, there was a negative cost (revenue generation) to Arlington County