



Developing a Circular Economy using Biosolids via a Community Based Public-Private Partnership to Fund Green Infrastructure

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EARTHCARE TECHNOLOGY

- INTRODUCTIONS
- BOROUGH BACKGROUND INFORMATION
- EMERGING CONTAMINENTS OF CONCERN
- INTEGRATED WATER STRATEGY
- BIOCHAR SOLUTIONS
- THE EARTHCARE PROCESS
- QUESTIONS



Community Based Public-Private Partnership





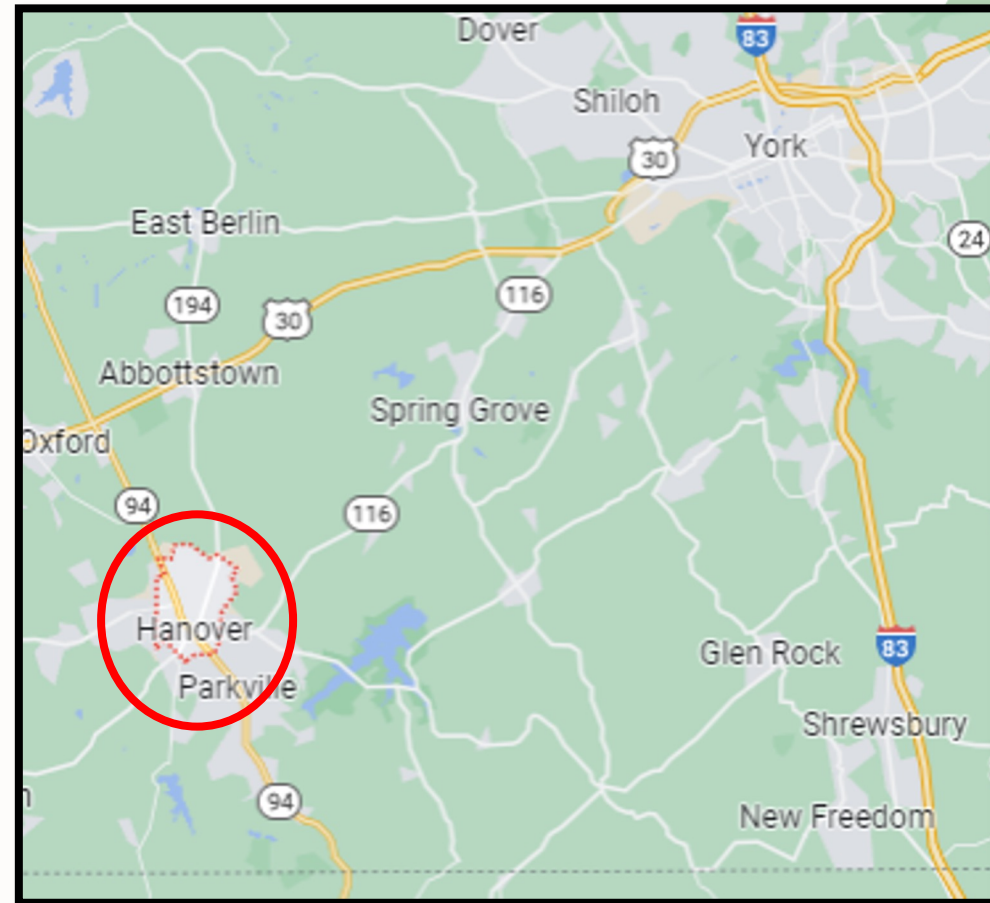
Borough of Hanover, PA CBP3

Turning Poo Green – Solution Provider, Not Solution Seekers



Community Background:

- South Central, PA
- Incorporated in 1815
- Nearly Built Out Community
- Population ~16,500
- Median Household Income \$52,094
- Poverty level 12%
- Environmental Justice Community





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Stormwater Challenges:

- 58% Impervious Area
- Little to no Storm Drain Network
- Aging & Crumbling Infrastructure
- MS4/CBw TMDL requirements
- Community has Stormwater Management Authority
- Generates only \$1.4M/year
- Not Enough \$\$ to fix problem





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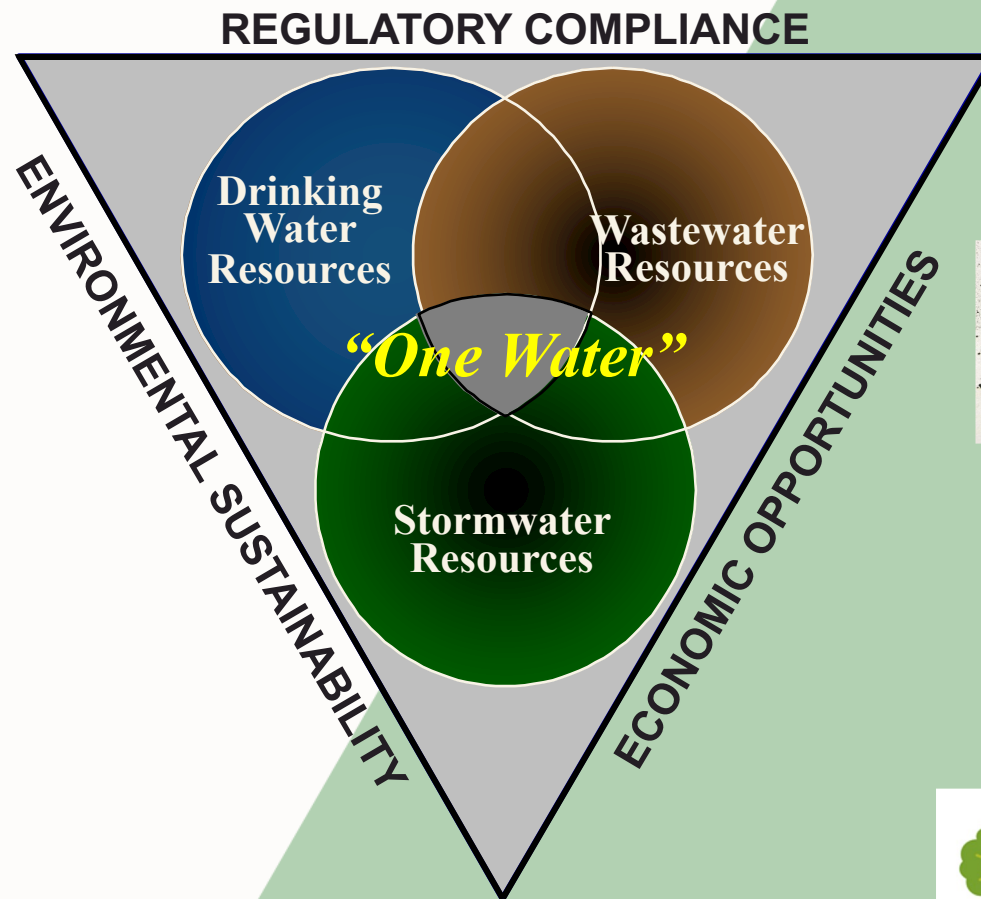
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Community Background:

- Shifted to an Integrated “One Water” Strategy
- Creation of a new municipal water resources division
- Transition WWTP to Modern Resource Recover Facility (RR)
- EPA Emerging Contaminants of Concern (ECC)
 - PFAS/PFOS, endocrines, pharmaceuticals, microplastics
- Opportunity to be a solution provider while generating non-tax revenue.

“ONE WATER” STRATEGY





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Point Sources

- Industrial sites that used or manufactured PFAS
- Military fire training areas, fire suppression, and storage areas
- Civilian fire training areas, fire suppression, and storage areas
- Wastewater treatment plant effluent**
- Landfills

Nonpoint Sources

- Biosolids land application**
- Stormwater runoff**
- Septic systems
- Atmospheric deposition

Federal and academia responses only.

A large green arrow points downwards from the Point Sources section towards the news article below.

LOCAL NEWS | JAN 31

Advocates seek ban on Bloom fertilizer over forever chemicals concerns

Jacob Fenston

► LISTEN

RELATED STORIES

- NPR, NOV 2, 2021: More activists who have had abortions are saying so out loud. Here's why
- 16, APR 9, 2022: 1A: Remaking America: The fight for abortion access
- NPR, MAR 18, 2022: While red states restrict abortion, blue states are voting to protect access
- THE DIANE BERRY SHOW, JAN 22, 2014: Access To Abortion 41 Years After

Bags of Bloom for sale at a D.C. hardware store. ©Dale / WASH. POST



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GENERATED CP3 PROFITS TO BE DEDICATED TO STORMWATER PROGRAM & WATERSHED/ RESERVOIR MANAGEMENT.



STORMWATER RUNOFF (I&I)

+/-1 BILLION GALLONS PROCESSED BY WWTP

WASTEWATER TREATMENT FACILITY

BOROUGH BIOSOLIDS & GREEN WASTE PROCESSING

NEW CP3 RESOURCE RECOVERY FACILITY (RRF)

SELF CONTAINED GASIFICATION FACILITY

POSSIBLE ECC EFFLUENT RELEASES TO DOWNSTREAM COMMUNITIES

POSSIBLE ECC LAND CONTAMINATION AT DISPOSAL FIELDS

REGIONAL BIOSOLIDS, FOOD PROCESS WASTE & GREEN WASTE PROCESSING SERVICES



- Watershed Management
- Natural Resources Restoration & Enhancement
- Public Use Development & Amenities

- CP3 REVENUE GENERATION**
- Biosolids Tipping Fees
 - Biosolids Biochar Revenue Share
 - Wood Biochar Revenue Share
 - Voluntary Carbon Credit Market

- OPERATIONAL SAVINGS/BENEFITS**
- Natural Gas – Facility, AD System, BNR
 - Biosolids Disposal & Hauling Costs
 - Nutrient Reduction
 - Electricity (TBD)
 - Liability & Risk
 - Price Containment
 - Biochar for Borough GSI
 - Additional Effluent Treatment for Release or Indirect Recycling





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•Project Assumptions:

- 2 module facility expanding to 4 modules within 2yrs (60,000 – 120,000 wet TPY)
- Located at the existing municipal wastewater treatment facility
- Project financing through SRF & Private Equity Funds
- Solutions Provider – O&M, Feedstock & End-Product Contracts
- Municipal government – Site, Oversight, Offtake Agreements, Public Education





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•Project Revenue Sharing:

- Revenue Stream: - tipping fees, biochar sales, carbon credits, energy production, operational offsets (natural gas, electricity (being evaluated))
- Base Annual Revenue to the Authority: ~\$500,000+ initially scaling to > \$1.2+M/yr
- Based on 2.25% interest for 20 years = SRF value of \$8m to \$20m depending on profits
- Revenues to Municipal Government will be dedicated to Stormwater Authority to fund projects



Private Sector Support

Research and Development

- Exploring innovative methods for using biochar to solve for environmental challenges
- Developing new applications for biochar

Advisory Services

- Project design services
- Quantifying the benefits of biochar

Project Delivery & Implementation

- Integrating biochar into nature-based applications
- Matchmaking between biochar sources and projects



Municipal Biosolids

Emerging contaminants (PFAS, pharma, micro plastics) make land application and landfilling problematic

Residual Wastes

Agricultural industry & food processing create residuals wastes and the amount of manure is surpassing the capacity of available land for application.



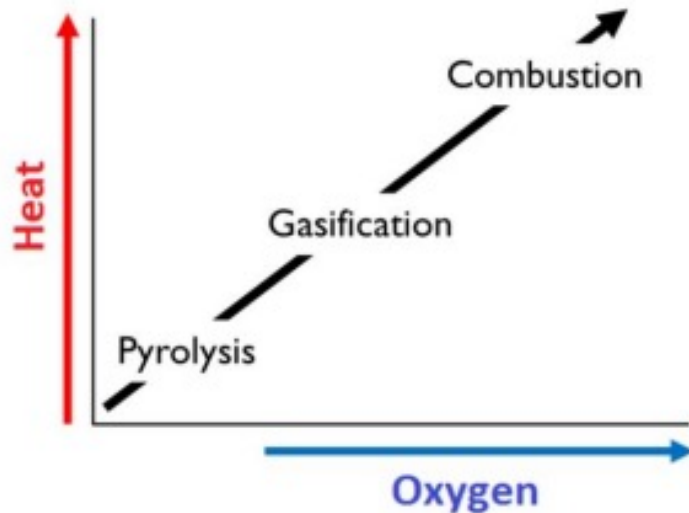
Organics Management

The pursuit of zero waste can only be achieved through the adoption of alternative methods for managing organic materials

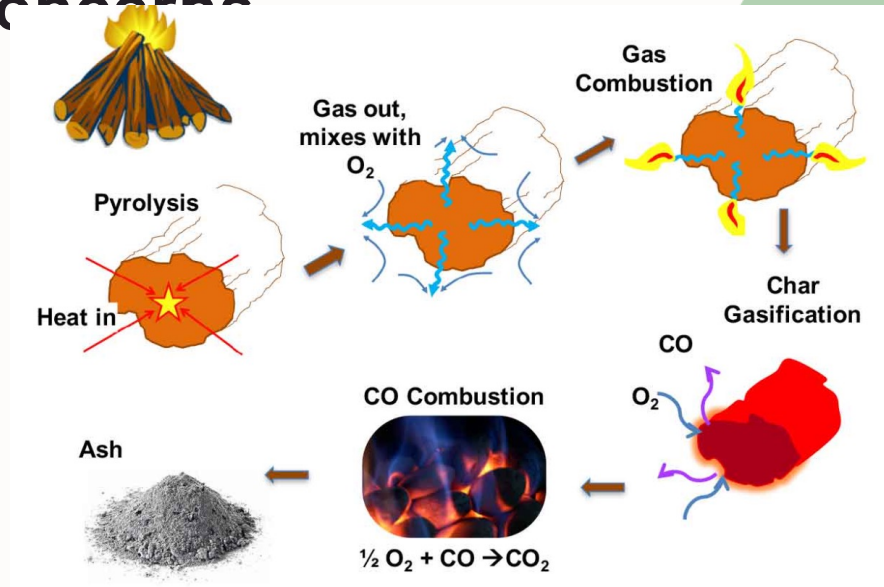


Biochar Solution

- ONE SOLUTION for Organics Management – High Temperature Thermal Processing
- NOT COMBUSTION!
- Organics management through pyrolysis/gasification (thermal processing) and biochar production is one way to manage organics and address volatile contaminant concerns



[An Introduction to Bioenergy, another step towards smarter energy \(oregonstate.edu\)](https://oregonstate.edu)



[Basic Principles of Biochar Production - Biochar for Sustainable Soils](#)

What is Biochar?

- Biochar is a solid material obtained from the carbonization thermochemical conversion of biomass in an oxygen-limited environment. (IBI)
- Biochar is a carbon rich solid with durable double bonded carbon with beneficial properties.
- Not All Chars Are Equal –
 - The chars from manures and biosolids/spent microbial cake have unique characteristics that provide opportunities in different markets.
 - The various minerals contained in the feedstocks & chars can provide unique benefits and each variation can provide different end uses.
 - EcoChar Environmental Solutions and others have been utilizing these variations to “design” chars for specific remediation and filtration applications

Biochar Solution

Materials to be Accepted

- Municipal spent microbial cake
- Ag & forest product materials
- Food waste and other organics

Multiple Biochar End Product Uses

- Agronomic (NRCS CP 336)
- Remediation (ex. Brownfields heavy metals capture)
- Filtration (ex. stormwater)
- Carbon Sequestration
 - biochar is considered “durable”
 - Carbon may be the driving factor in next 2 yrs



Animal Manure



Organic Waste



Bio-Solids



Biomass



Equine Waste



Distillers' Byproduct

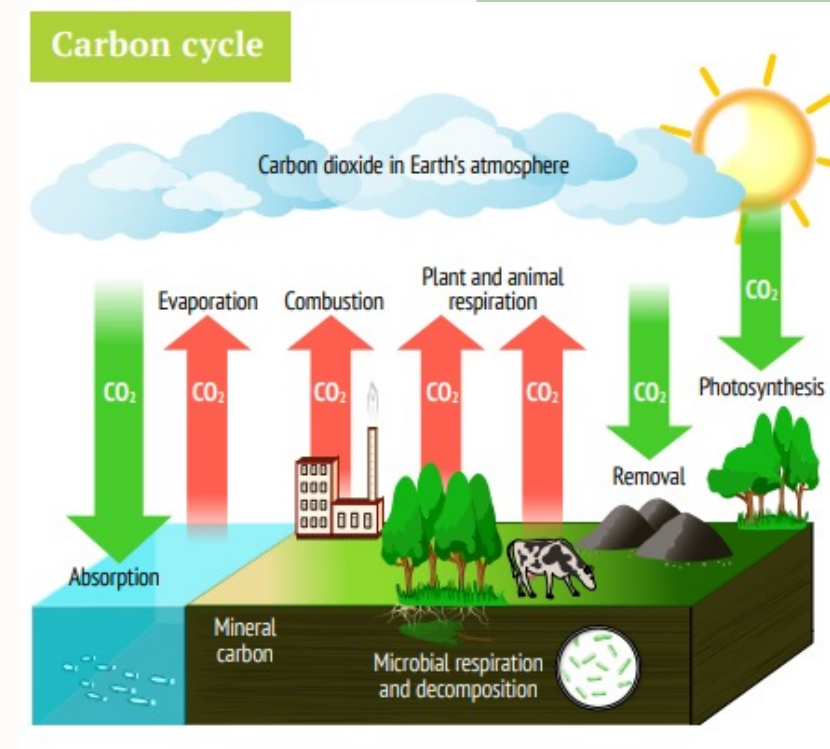
Biochar Solution – Synergies & Co-Benefits

- Synergies

- Organics Management solutions
- Stormwater – incorporate for bioretention designs for first flush treatment (metals, N, P, PCBs, VOCs)
- Remediation –
 - pump and treat systems (PFAS, metals, VOCs, etc);
 - in-situ treatment of brownfields, ex. Hugo Neu redevelopments.
- Climate Action – carbon sequestration, voluntary carbon credits/offsets

- Co-benefits

- Landscape nutrient removal (TMDLs, watershed protection, Chesapeake Bay Plan)
- Carbon sequestration – voluntary carbon market
- Renewable energy options if excess heat (ORC, steam turbines, RICE for “clean” syngas applications)



Green Streets are “Greener” with EcoChar-E Added to Swales & Bioretention



FILTER POLLUTANTS WITH BIOCHAR

Cleaner water
at less cost

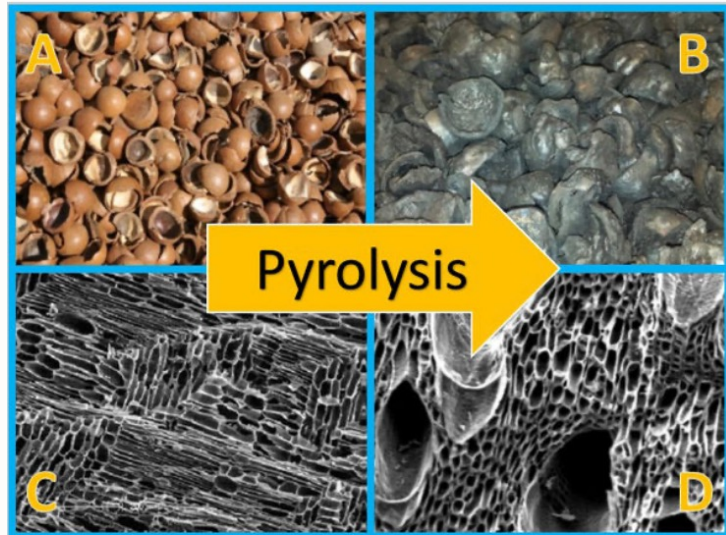


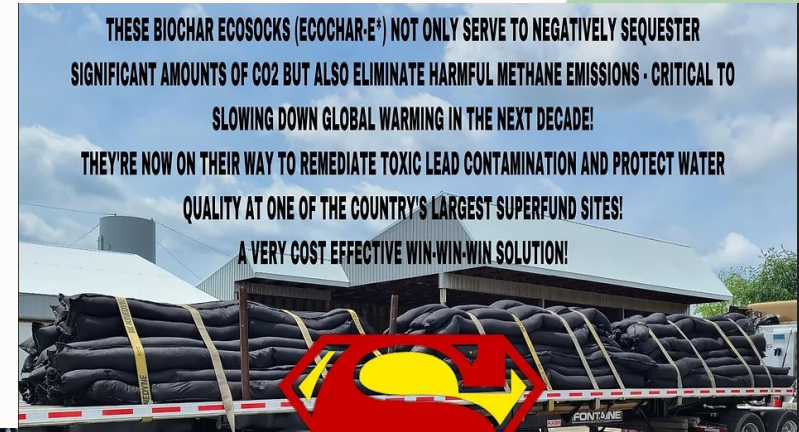
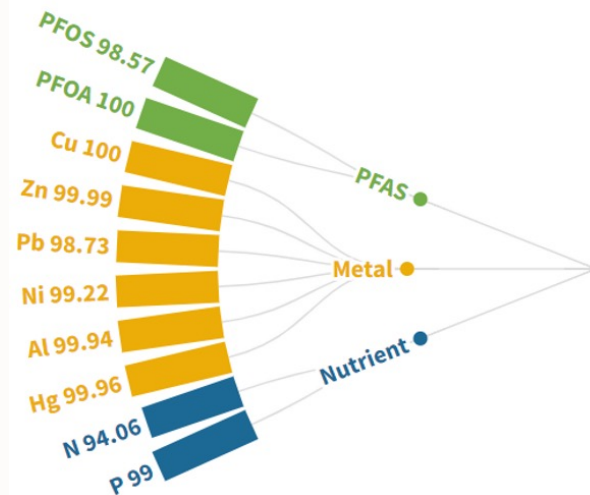
Image source: Illinois Sustainable
Technology Center

Biochar Solution - Stormwater

- Carbon filtration media such as activated carbon has a growing market. Biochar feeds into this market but in an alternative way.
 - Biochar works by surface area (less than GAC) but also adsorption due to particle charge
 - GAC is not a “green/renewable” product as it’s made from coal or coconut. Both require high levels of processing and impact
 - Biochar can be made from waste feedstocks that address environmental concerns while addressing stormwater treatment needs
 - CI score is far superior for biochar products that serve the same filtration purposes as GAC
 - Biochar can be 2-3x lower cost

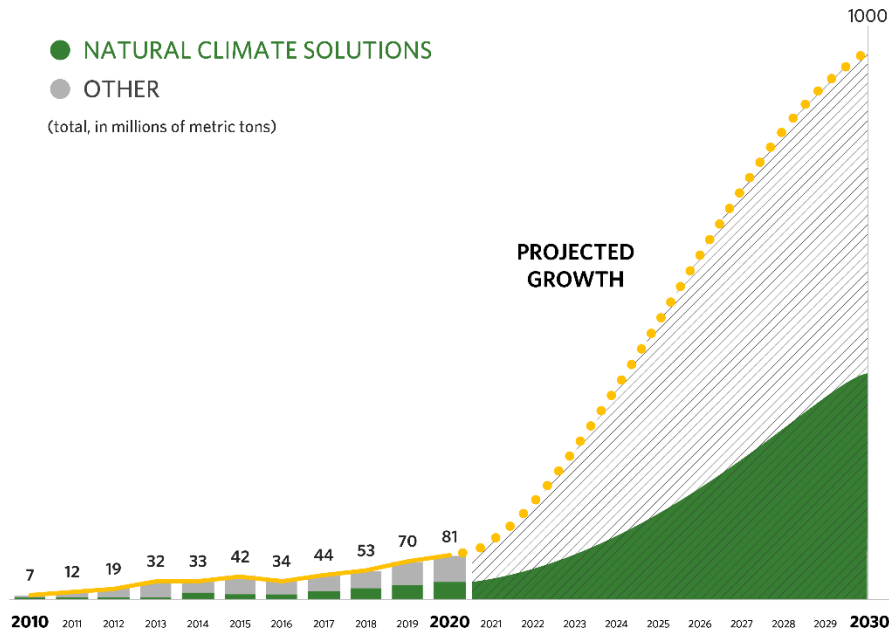
Biochar Solution - Remediation

- Filtration media –
 - Metals & VOC capture/filtration
 - PFAS capture (evolving) – allows for circular treatment system as thermal process breaks significantly reduces PFAS in the solid material
 - Brownfields site remediation – sequester metals
 - <https://www.ecocharenvironmentalsolutions.net>



Biochar Solution - Climate Action

● NATURAL CLIMATE SOLUTIONS
 ● OTHER
 (total, in millions of metric tons)



The depicted projection assumes NCS market share remains at 2020 levels through 2030. NCS data: WEF, 'Consultation: Net and Net Zero;' Overall market growth: IIF, 'Taskforce on Scaling Voluntary Carbon Markets. Source: TNC

- Corporate ESG goals are driving supply chain decarbonization. This is projected to only accelerate over next 10 years.
- This is creating demand for carbon retirement opportunities to decarbonize organizations and processes.
- Products that can sequester carbon through long term soil storage

Biochar application is an accepted and verified carbon



Earthcare System

Organics Processing Facility

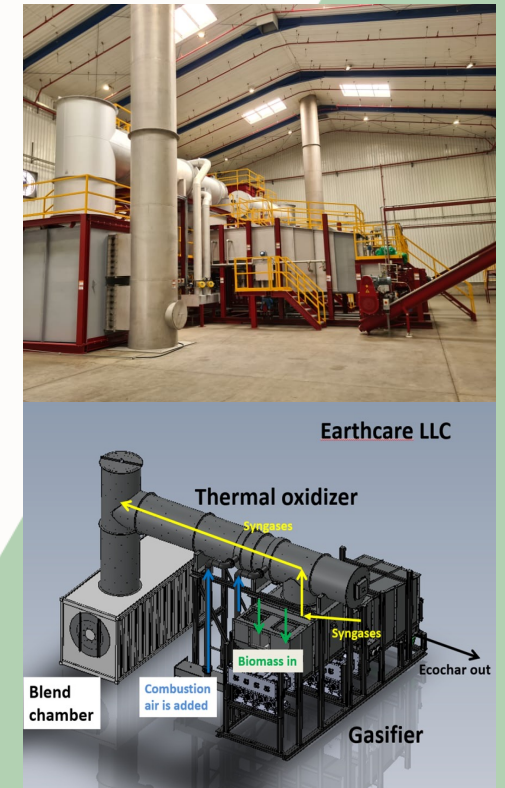
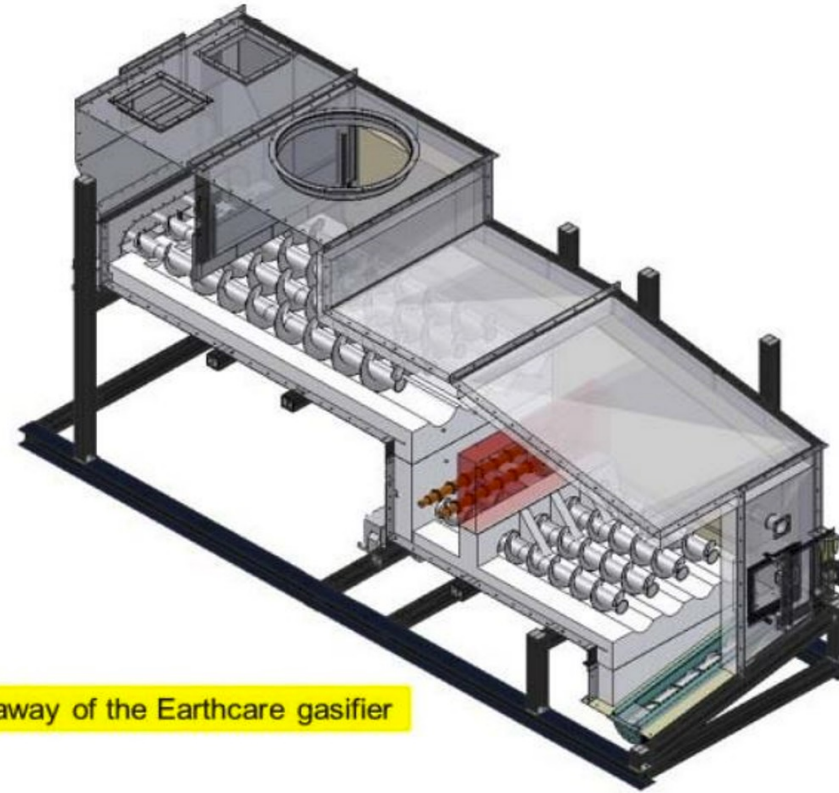
Earthcare, LLC an organics solutions provider in the organics management space

- Leader in biochar production technology related to non-wood feedstocks (ex. ag manure, etc)
- (4) facilities in the US; (10) operational facilities (at scale 30,000 -70,000 wet TPY) worldwide

Sister companies to market end product (Ecochar™)

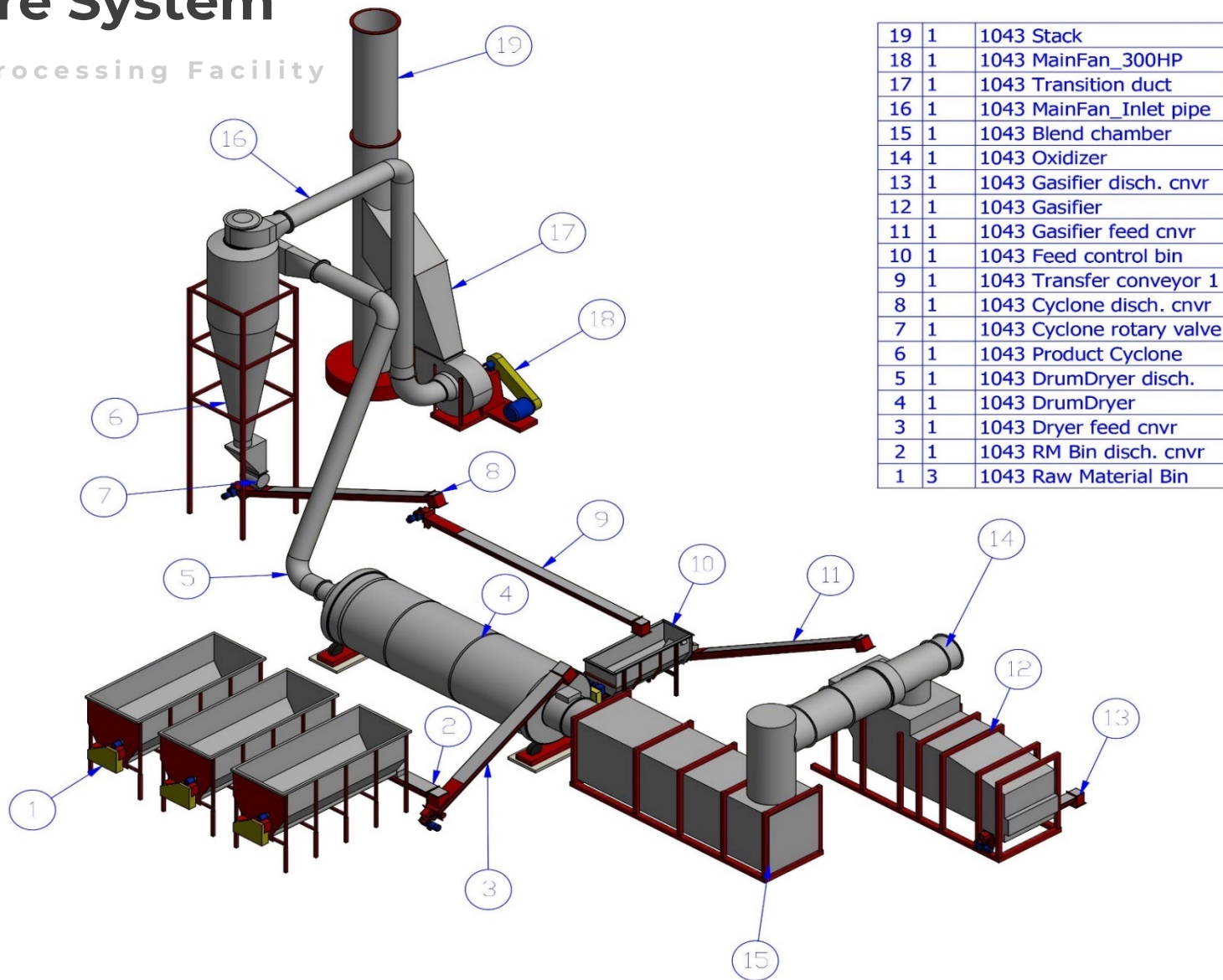
- Ecochar Environmental Solutions
- Vital Force
- Ecochar

[Walkthroughs | Earthcare \(earthcarellc.com\)](https://earthcarellc.com)



Earthcare System

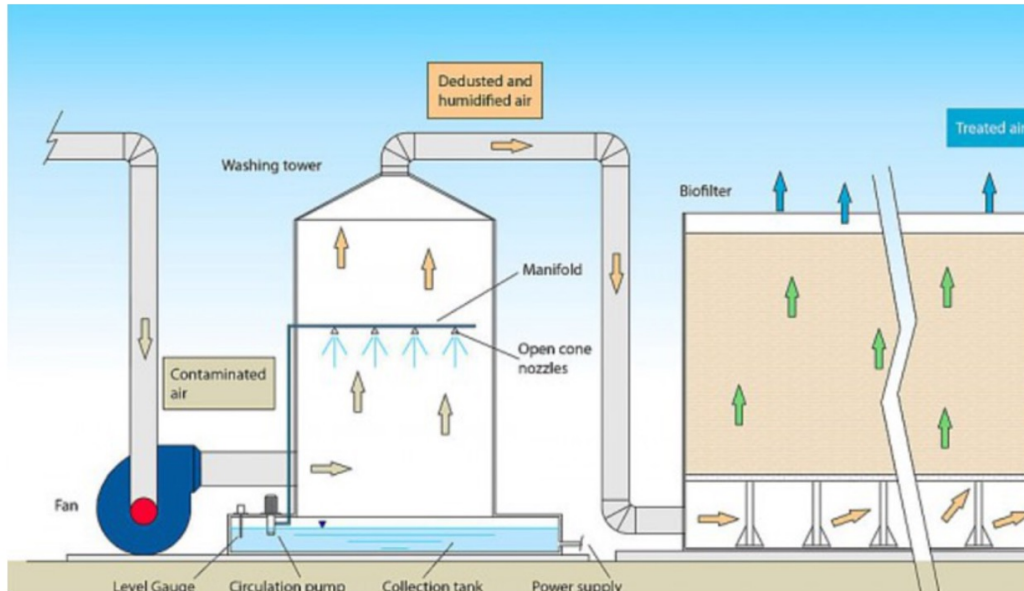
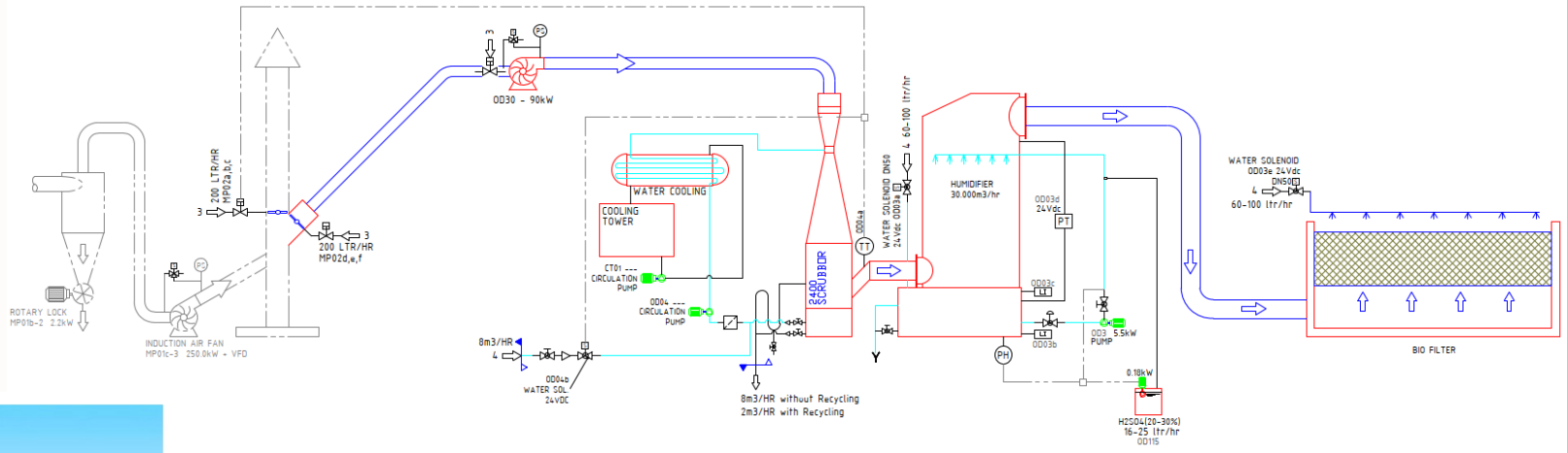
Organics Processing Facility

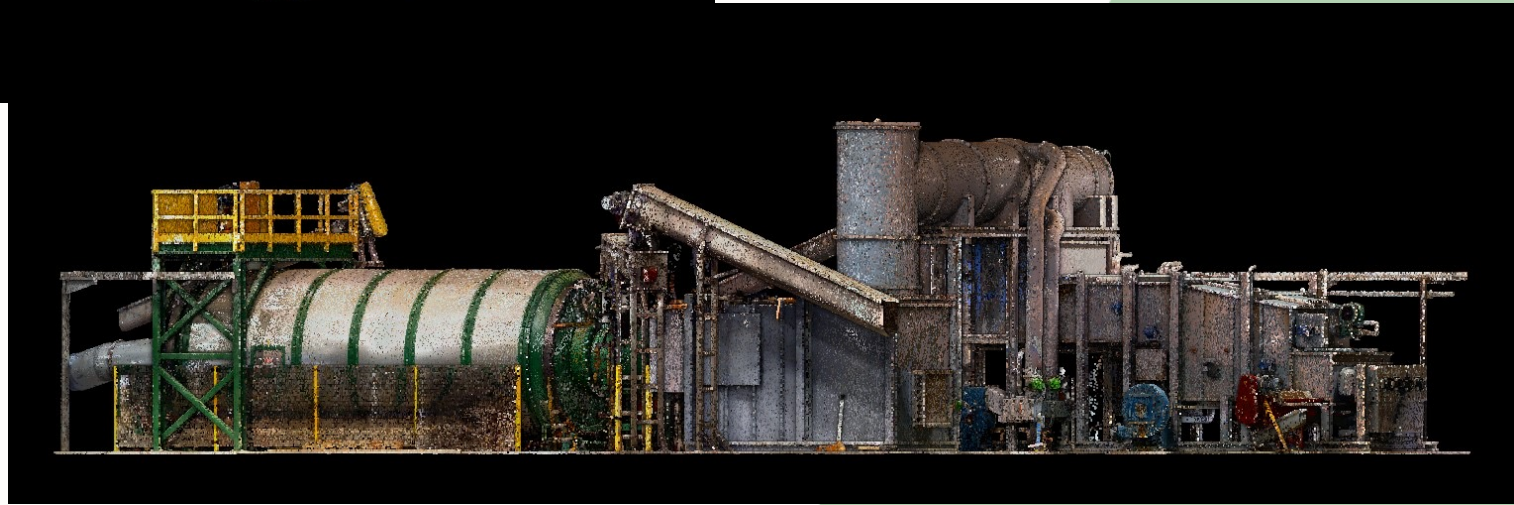
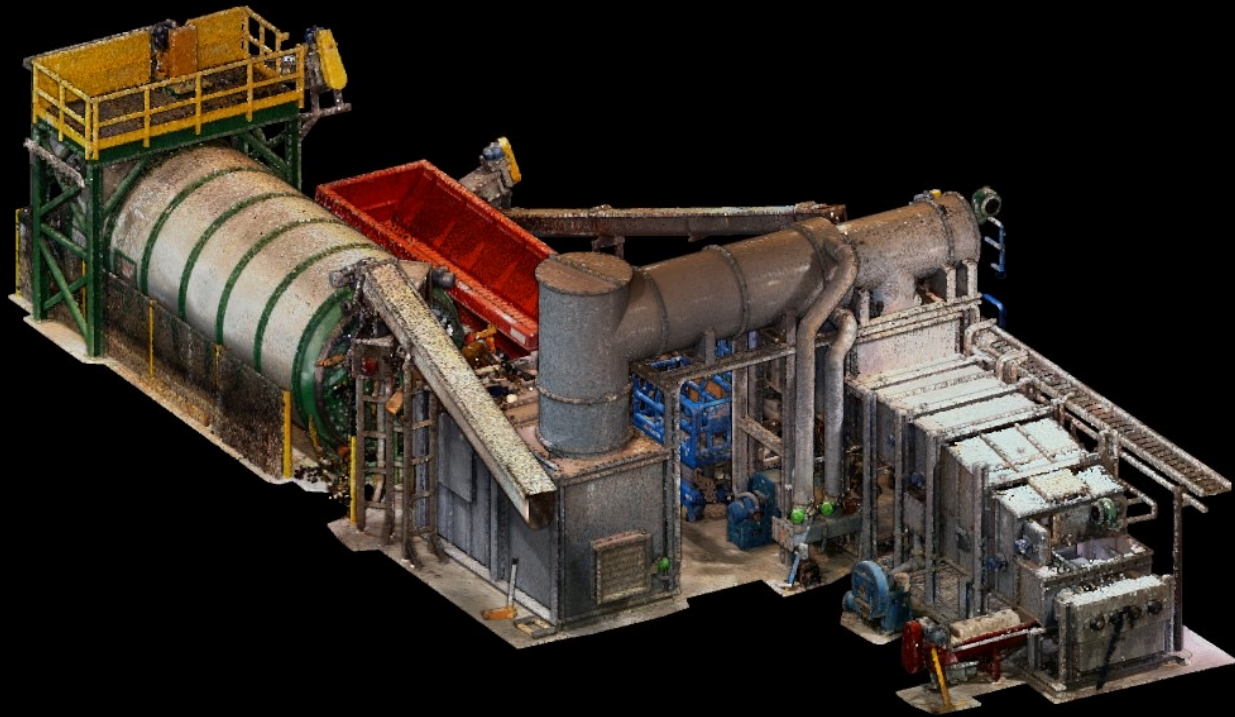


Earthcare System

Organics Processing Facility

Biofilter Odor Control

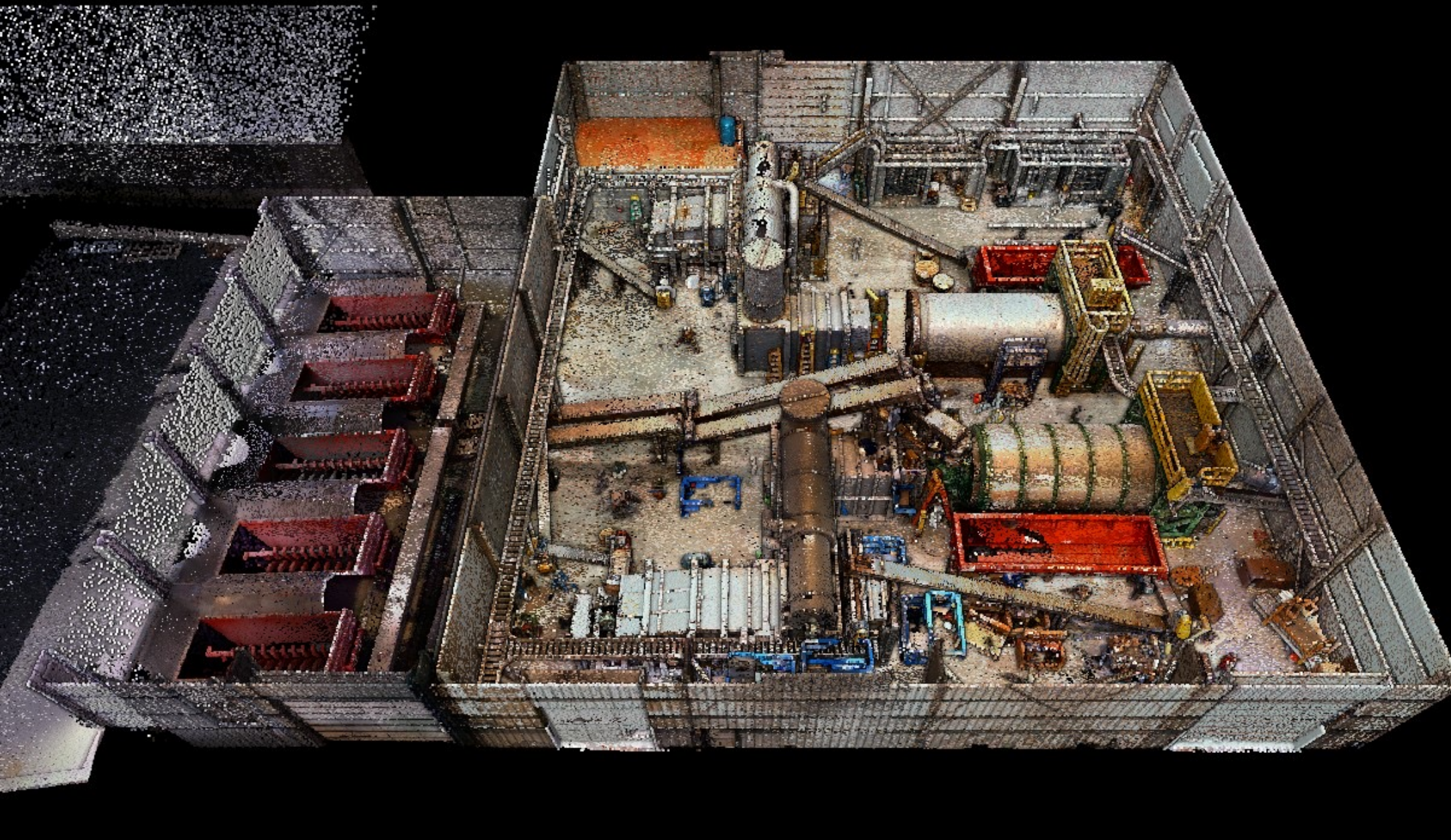




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USBI • [BIOCHARCONFERENCE.COM](https://www.biocharconference.com) • FEB. 12-15, 2024



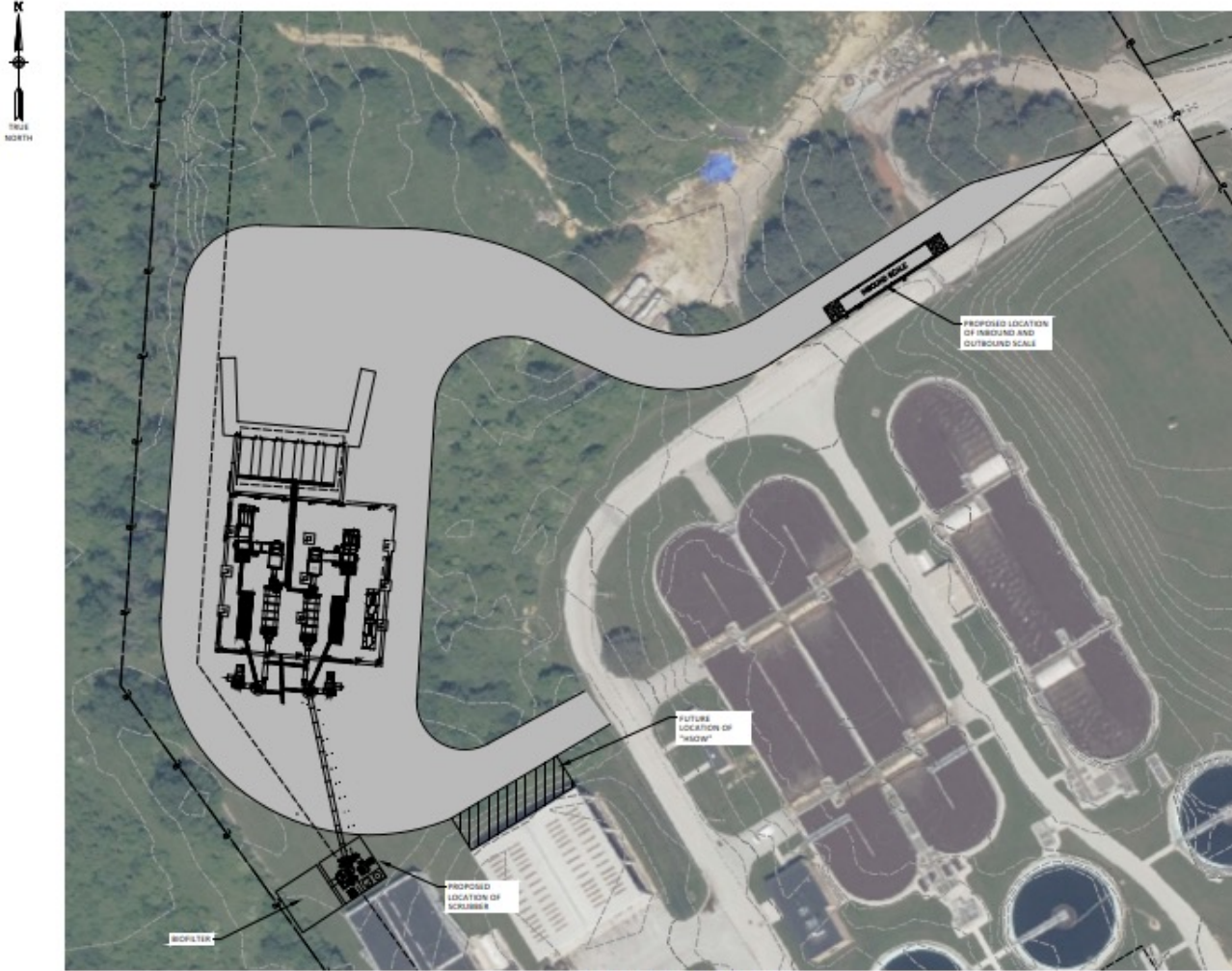


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Hanover Biochar Facility (Concept)



DETAILED PLAN VIEW

SCALE: 1" = 40'-0"



OVERALL PLAN VIEW

SCALE: 1" = 200'-0"



Questions?

Speakers



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