Received
June 3, 2022
WV DEP/Div of Air Quality

Minor Source Construction Permit Application

Thunder Mountain Environmental Services LLC (TMES)

Icon Project 22-200-05

MWF - Medical Waste Derived Fuel

Waste-To-Energy

May 2022

Icon Construction Inc.

42 Pinehurst Place,

Springboro, Ohio 45458

Ph: 937-885-2299

Cell: 937-545-4872

Email: npatel@iconconstructioninc.com

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Thunder Mountain Environmental Services, LLC

(TMES)

West Virginia Plant

Renaissance Environmental Services LLC

Waste-To-Energy

Manufacturing Facility

Solid Medical Waste – Thermal Gasification

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

X CONSTRUCTION ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** **X MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
Thunder Mountain Environmental Services LLC

2. Federal Employer ID No. ***(FEIN):***
88-1632364

3. Name of facility *(if different from above):*
Thunder Mountain Environmental Services LLC West Virginia Plant (TMES)

4. The applicant is the:
x **OWNER** ☐**OPERATOR** ☐ **BOTH**

5A. Applicant's mailing address: Att: N.R. Patel
Icon Construction
42 Pinehurst Place
Springboro, Ohio 45066
217 Barfoot Beach Blvd.
Bonita Springs, Florida

5B. Facility's present physical address:
Thunder Mountain Environmental Services LLC
5334B Point Pleasant Rd.
Ravenswood, WV 26164 Jackson County

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? X **YES** ☐ **NO**

- If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
- If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation: Renaissance Environmental Services LLC (Subsidiary) 1800 Diagonal Rd. Suite 600 Alexandria, WV 22314

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* X **YES** ☐ **NO**

- If **YES,** please explain: Thunder Mountain Environmental Services LLC
  5334B Point Pleasant Rd. Ravenswood, WV 26164 Jackson County
- If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): 'Solid Medical Waste Gasification' – Waste-To-Energy Facility	10. North American Industry Classification System **(NAICS)** code for the facility: 56221
11A. DAQ Plant ID No. (for existing facilities only): –	11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): See section four (4) application - submittal

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B.**

See Annex-1 Drawing – 22-200-05G1 and 22-200-05G2
Direction to WV Plant Interstate – US 33 – Ravenswood Bridge HS on Highway 33
Location – 5334B Point Pleasant Rd. Ravenswood, WV 26164

12.B. New site address (if applicable): 5334B Point Pleasant Rd. Ravenswood, WV 26164	12C. Nearest city or town: Ravenswood	12D. County: Jackson
12.E. UTM Northing (KM): 4311296.92423971	12F. UTM Easting (KM): N-434058.654337772/E174266.55	12G. UTM Zone: 17 S

13. Briefly describe the proposed change(s) at the facility:
Existing facility was used by Belt Wade House (Aluminum Fabricating)
New Facility: Solid Medical Waste Gasification (Waste-To-Energy)

14A. Provide the date of anticipated installation or change: 08/24/22 – If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: Plant is brown field	14B. Date of anticipated Start-Up if a permit is granted: 12/08/22

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved). See Schedule with Application

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day 24 Days Per Week 7 Weeks Per Year 50

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** x **NO**

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known)*. A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known)*. Provide this information as **Attachment D.** Section 4.0 (included in application)

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) . See Dwg 20-200-05G1 & 05G2

– Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.** See Annex - 1 - 22-200-05G1 & G2

23. Provide a **Process Description** as **Attachment G.** See Application – Section 1,2,3, 5 and 9

– Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☐ Bulk Liquid Transfer Operations	X Haul Road Emissions	☐ Quarry
☐ Chemical Processes	☐ Hot Mix Asphalt Plant	X Solid Materials Sizing, Handling and Storage Facilities
☐ Concrete Batch Plant	☐ Incinerator	
☐ Grey Iron and Steel Foundry	☐ Indirect Heat Exchanger	☐ Storage Tanks
☐ General Emission Unit, specify		

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

x Absorption Systems	x Baghouse	☐ Flare
x Adsorption Systems	☐ Condenser	x Mechanical Collector
x Afterburner	☐ Electrostatic Precipitator	☐ Wet Collecting System

x Other Collectors, specify cyclone, dry sorbent scrubber – "TMES" Solid Medical Waste Gasification "Waste-To-Energy" facility

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in See Section 9.0

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

X YES ☐ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

X Authority of Corporation or Other Business Entity ☐ Authority of Partnership

☐ Authority of Governmental Agency ☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned **X Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE Bryan J Fennell *(Please use blue ink)* DATE: April 15, 2022 *(Please use blue ink)*

35B. Printed name of signee: Mr. Bryan J. Fennell		35C. Title: President
35D. E-mail: bryanf@resllc.net	36E. Phone: 561-310-2482	36F. FAX:
36A. Printed name of contact person (if different from above): Naren Patel		36B. Title: Technical Director
36C. E-mail: npatel@iconconstructioninc.com	36D. Phone: 937-545-4872	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

X Attachment A: Business Certificate
X Attachment B: Map(s)
X Attachment C: Installation and Start Up Schedule
X Attachment D: Regulatory Discussion
X Attachment E: Plot Plan
X Attachment F: Detailed Process Flow Diagram(s)
X Attachment G: Process Description
X Attachment H: Material Safety Data Sheets (MSDS)
X Attachment I: Emission Units Table
X Attachment J: Emission Points Data Summary Sheet
X Attachment K: Fugitive Emissions Data Summary Sheet
X Attachment L: Emissions Unit Data Sheet(s)
X Attachment M: Air Pollution Control Device Sheet(s)
X Attachment N: Supporting Emissions Calculations
X Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans
☐ Attachment P: Public Notice
☐ Attachment Q: Business Confidential Claims
X Attachment R: Authority Forms
☐ Attachment S: Title V Permit Revision Information
X Application Fee

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ *Forward 1 copy of the application to the Title V Permitting Group and:*
- ☐ *For Title V Administrative Amendments:*
  - ☐ *NSR permit writer should notify Title V permit writer of draft permit,*
- ☐ *For Title V Minor Modifications:*
  - ☐ *Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,*
  - ☐ *NSR permit writer should notify Title V permit writer of draft permit.*
- ☐ *For Title V Significant Modifications processed in parallel with NSR Permit revision:*
  - ☐ *NSR permit writer should notify a Title V permit writer of draft permit,*
  - ☐ *Public notice should reference both 45CSR13 and Title V permits,*
  - ☐ *EPA has 45 day review period of a draft permit.*

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

Section 7.0

WVDAQ Attachments

1. Attachment A: Business Certificate
2. Attachment B: Map(s)
3. Attachment C: Installation and Start Up Schedule
4. Attachment D: Regulatory Discussion
5. Attachment E: Plot Plan
6. Attachment F: Detailed Process Flow Diagram(s)
7. Attachment G: Process Description
8. Attachment H: Material Safety Data Sheets (MSDS)
9. Attachment I: Emission Units Table
10. Attachment J: Emission Points Data Summary Sheet
11. Attachment K: Fugitive Emissions Data Summary Sheet
12. Attachment L: Emissions Unit Data Sheet(s)
13. Attachment M: Air Pollution Control Device Sheet(s)
14. Attachment N: Supporting Emissions Calculations
15. Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans
16. Attachment P: Public Notice
17. Attachment Q: Business Confidentiality Claims
18. Attachment R: Authority of Corporation or Other Business Entity (Domestic or Foreign)

Attachment A

Business Certificate

Thunder Mountain Environmental Services LLC

Solid Medical Waste – Thermal Gasification

Waste-To-Energy Facility

Business Certificate

State of West Virginia

Certificate

I, Mac Warner, Secretary of State,
of the State of West Virginia, hereby certify that

THUNDER MOUNTAIN ENVIRONMENTAL SERVICES LLC

has filed the appropriate registration documents in my office according to the provisions of the West Virginia Code and hereby declare the organization listed above as duly registered with the Secretary of State's Office.

Given under my hand and
the Great Seal of West Virginia
on this day of
April 12, 2022

Mac Warner

Secretary of State

IRS DEPARTMENT OF THE TREASURY
INTERNAL REVENUE SERVICE
CINCINNATI OH 45999-0023

Date of this notice: 04-06-2022

Employer Identification Number:
88-1632364

Form: SS-4

Number of this notice: CP 575 A

THUNDER MOUNTAIN ENVIRONMENTAL
SERVICES
BRYAN FENNELL GEN PTR
1800 DIAGONAL RD STE 600
ALEXANDRIA, VA 22314

For assistance you may call us at:
1-800-829-4933

IF YOU WRITE, ATTACH THE
STUB AT THE END OF THIS NOTICE.

WE ASSIGNED YOU AN EMPLOYER IDENTIFICATION NUMBER

Thank you for applying for an Employer Identification Number (EIN). We assigned you EIN 88-1632364. This EIN will identify you, your business accounts, tax returns, and documents, even if you have no employees. Please keep this notice in your permanent records.

Taxpayers request an EIN for their business. Some taxpayers receive CP575 notices when another person has stolen their identity and are opening a business using their information. If you did not apply for this EIN, please contact us at the phone number or address listed on the top of this notice.

When filing tax documents, making payments, or replying to any related correspondence, it is very important that you use your EIN and complete name and address exactly as shown above. Any variation may cause a delay in processing, result in incorrect information in your account, or even cause you to be assigned more than one EIN. If the information is not correct as shown above, please make the correction using the attached tear-off stub and return it to us.

Based on the information received from you or your representative, you must file the following forms by the dates shown.

Form 940	01/31/2024
Form 1065	03/15/2023
Form 944	01/31/2024

If you have questions about the forms or the due dates shown, you can call us at the phone number or write to us at the address shown at the top of this notice. If you need help in determining your annual accounting period (tax year), see Publication 538, *Accounting Periods and Methods*.

We assigned you a tax classification (corporation, partnership, etc.) based on information obtained from you or your representative. It is not a legal determination of your tax classification, and is not binding on the IRS. If you want a legal determination of your tax classification, you may request a private letter ruling from the IRS under the guidelines in Revenue Procedure 2020-1, 2020-1 I.R.B. 1 (or superseding Revenue Procedure for the year at issue). Note: Certain tax classification elections can be requested by filing Form 8832, *Entity Classification Election*. See Form 8832 and its instructions for additional information.

IMPORTANT INFORMATION FOR S CORPORATION ELECTION:
If you intend to elect to file your return as a small business corporation, an election to file a Form 1120-S, U.S. Income Tax Return for an S Corporation, must be made within certain timeframes and the corporation must meet certain tests. All of this information is included in the instructions for Form 2553, Election by a Small Business Corporation.

A limited liability company (LLC) may file Form 8832, *Entity Classification Election*, and elect to be classified as an association taxable as a corporation. If the LLC is eligible to be treated as a corporation that meets certain tests and it will be electing S corporation status, it must timely file Form 2553, *Election by a Small Business Corporation*. The LLC will be treated as a corporation as of the effective date of the S corporation election and does not need to file Form 8832.

If you are required to deposit for employment taxes (Forms 941, 943, 940, 944, 945, CT-1, or 1042), excise taxes (Form 720), or income taxes (Form 1120), you will receive a Welcome Package shortly, which includes instructions for making your deposits electronically through the Electronic Federal Tax Payment System (EFTPS). A Personal Identification Number (PIN) for EFTPS will also be sent to you under separate cover. Please activate the PIN once you receive it, even if you have requested the services of a tax professional or representative. For more information about EFTPS, refer to Publication 966, *Electronic Choices to Pay All Your Federal Taxes*. If you need to make a deposit immediately, you will need to make arrangements with your Financial Institution to complete a wire transfer.

The IRS is committed to helping all taxpayers comply with their tax filing obligations. If you need help completing your returns or meeting your tax obligations, Authorized e-file Providers, such as Reporting Agents or other payroll service providers, are available to assist you. Visit www.irs.gov/mefbusproviders for a list of companies that offer IRS e-file for business products and services.

IMPORTANT REMINDERS:

* Keep a copy of this notice in your permanent records. This notice is issued only one time and the IRS will not be able to generate a duplicate copy for you. You may give a copy of this document to anyone asking for proof of your EIN.

* Use this EIN and your name exactly as they appear at the top of this notice on all your federal tax forms.

* Refer to this EIN on your tax-related correspondence and documents.

* Provide future officers of your organization with a copy of this notice.

Your name control associated with this EIN is THUN. You will need to provide this information along with your EIN, if you file your returns electronically.

Safeguard your EIN by referring to Publication 4557, Safeguarding Taxpayer Data: A Guide for Your Business.

You can get any of the forms or publications mentioned in this letter by visiting our website at www.irs.gov/forms-pubs or by calling 800-TAX-FORM (800-829-3676).

If you have questions about your EIN, you can contact us at the phone number or address listed at the top of this notice. If you write, please tear off the stub at the bottom of this notice and include it with your letter.

Thank you for your cooperation.

(IRS USE ONLY) 575A 04-06-2022 THUN B 9999999999 SS-4

Keep this part for your records. CP 575 A (Rev. 7-2007)

Return this part with any correspondence so we may identify your account. Please correct any errors in your name or address.

CP 575 A

9999999999

Your Telephone Number ( ) -

Best Time to Call

DATE OF THIS NOTICE: 04-06-2022
EMPLOYER IDENTIFICATION NUMBER: 88-1632364
FORM: SS-4 NOBOD

INTERNAL REVENUE SERVICE
CINCINNATI OH 45999-0023

THUNDER MOUNTAIN ENVIRONMENTAL SERVICES
BRYAN FENNELL GEN PTR
1800 DIAGONAL RD STE 600
ALEXANDRIA, VA 22314

Attachment B

Existing Site

- Site map - See Attachment E
- Nearest highway - US Route 33
- Interstate Highway - I-64
- See attached - Annex 1

LEGEND

- POST
- SIGN
- VERTICAL PIPE
- SPOT ELEVATION
- GATE
- STRUCTURE

0' 20' 40' 60'

PROJECT INFORMATION	REVISIONS:
	1.
	2.
	3.
DATE: 4/7/2022	4.

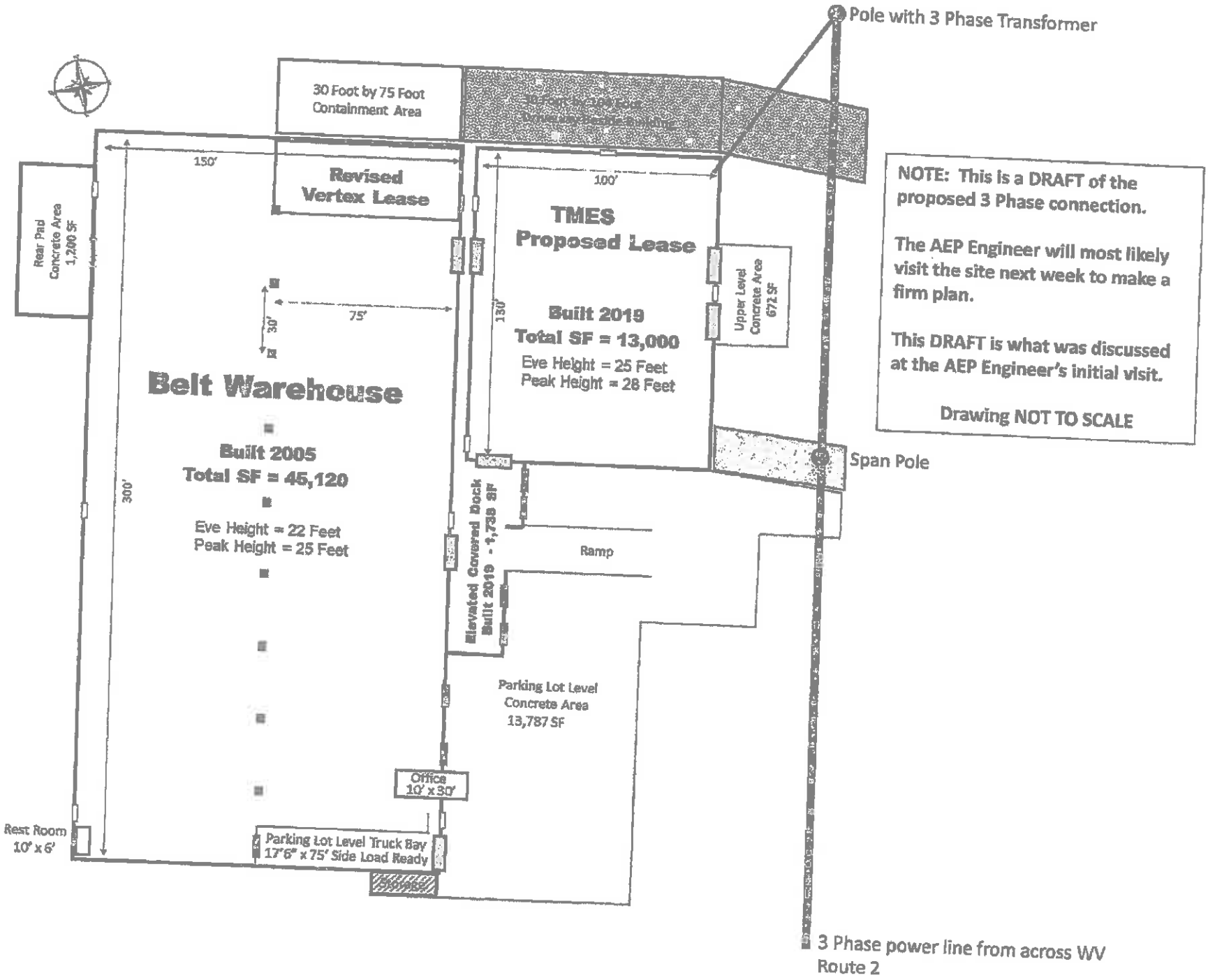
PICKERING ASSOCIATES
Architects • Engineers • Surveyors

JACKSON COUNTY, WV

TOPOGRAPHIC SURVEY
PREPARED FOR
RENAISSANCE ENVIRONMENTAL SERVICES

SHEETS 01

PROJECT #


Pole with 3 Phase Transformer
30 Foot by 75 Foot Containment Area
Revised Vertex Lease
150'
100'
TMES Proposed Lease
Built 2019
Total SF = 13,000
Eve Height = 25 Feet
Peak Height = 28 Feet
Rear Pad Concrete Area 1,200 SF
Upper Level Concrete Area 672 SF
130'
30'
75'
Belt Warehouse
Built 2005
Total SF = 45,120
Eve Height = 22 Feet
Peak Height = 25 Feet
300'
Elevated Covered Dock Built 2019 - 1,738 SF
Ramp
Span Pole
Parking Lot Level Concrete Area 13,787 SF
Office 10' x 30'
Rest Room 10' x 6'
Parking Lot Level Truck Bay 17'6" x 75' Side Load Ready
NOTE: This is a DRAFT of the proposed 3 Phase connection.
The AEP Engineer will most likely visit the site next week to make a firm plan.
This DRAFT is what was discussed at the AEP Engineer's initial visit.
Drawing NOT TO SCALE
3 Phase power line from across WV Route 2

Attachment C

Installation and Start-Up Schedule

Icon Construction Inc.

42 Pinehurst Place

Springboro, OH 45066

Thunder Mountain Environmental Services LLC WV Plant (TME)

Solid Medical Waste – Thermal Gasification Waste-To-Energy

5334 Point Pleasant Rd., Ravenswood, WV 26164

Facility Installation and Commissioning Schedule

Acct. No.	Starts 06-06-22, Ends 1/8/23	Description	Estimated Date	
	Property Selection	Property Leased	3/7/2022	10 year
101-03	EPA Permit	preparation and process system	1/3/2022	4/12/2022
	EPA Permit	Preliminary review with WV DAQ	4/20/2022	4/28/2022
	EPA Permit	EPA permit submittal to WVDAQ	5/2/2022	
	EPA Permit	EPA permit received	6/24/2022	
2001	Process engineering	process design-product-capacity	5/2/2022	cont'd
	process equipment	preliminary design specifications	5/2/2022	22-Jul
	process equipment	process equipment specifications	5/2/2022	22-Jul
	process equipment	process preliminary proposal	5/2/2022	22-Jul
	process equipment	plant layout-egress points	5/2/2022	cont'd
2002	process procurement	procurement assistance	6/24/2022	cont'd
2001	process procurement	detail engineering in existing structure	22-Apr	cont'd
2001-400	process fountain	equipment foundation	22-Sep	cont'd
2001-500	process structure	equipment-structural support	22-Sep	cont'd
2001-800	process electrical	equipment-electrical distribution	22-Sep	cont'd

2001-900	process piping duct design	equipment-piping, affluent, egress points	19-Sep	cont'd
2001-1000	process instrumental/control	equipment-functional instruments	22-Sep	cont'd
2014	process PLC control	equipment-individual PLC control	22-Sep	cont'd
2003	plant construction	equipment-installation assistance	22-Nov	cont'd
2011-2012	process equipment	process and equipment-validation test	22-Dec	as needed
700-723	process equipment	procurements, design, approval	22-Jan	22-Dec
	supporting accounts 100-105, 200-225, 400-424, 500-540, 700-723	transportation-installation and commissioning	22-Jan	22-Dec
701-704	800-806, 900-918, 1000-1020	receiving-storage-structure with emission equipment	22-Nov	22-Dec
705-708	supporting accounts	Medical waste thermal gasification startup & testing	22-Dec	22-Dec
716-722	supporting accounts	West process equipment with emission control system	22-Dec	22-Dec

Section 4.0
Attachment "D"
Regulatory Discussion

4.0 Federal Regulations

4.1 Prevention of Signification

4.1.1 Prevention of Significant Deterioration (40 CFR Part 51)
4.1.2 Nonattainment New Source Review (40 CFR Part 51)

4.2 New Source Performance Standards (40 CFR Part 60)

4.2.1 40 CFR Part 60 – Subpart EC - Hospital Medical Waste Incineration CFR-2015 Title 40 Volume 17
4.2.2 NSPS – 40 CFR Part 60 – Subpart JJJ
4.2.3 40 CFR 60 - Subpart Db - Standard of Performance for Industrial Commercial Institutional Steam Generating Units.
4.2.3.1 40 CFR 60 - Subpart 60.52C Emission Limits

4.3 National Emission Standards for Hazardous Air Pollutants (40 CFR 63)

4.3.1 NESHAP – 40 CFR Part 63 – Subpart ZZZZ

4.4 Compliance Assurance Monitoring (CAM)

4.4.1 Compliance Assurance Monitoring (CAM) – 40 CFR Part 64 Title V, Part 70 Program
4.4.2 40 CFR 60 - Subpart 60.53C
4.4.3 40 CFR 60 - Subpart 60.56

4.5 Chemical Accident Prevention (40 CFR 68)

4.6 State Operating Permit Program (40 CFR 70)

4.7 Mandatory Greenhouse Gas Reporting (40 CFR 98)

4.8 Maximum Achievable Control Technology Standard

4.8.1 MACT applicability

4.9 Risk Management Plan

4.10 Other requirements

4.11 Stack height

5.0 West Virginia State Regulations

5.1 45CSR6 – To Prevent and Control Air Pollution from Combustion Refuse
5.2 45CSR10 – To Prevent and Control Air Pollution from Emission of Sulfur Oxides
https://dep.wv.gov
5.3 45CSR13 – Permits for Construction
5.4 45CSR27 – To Prevent and Control the Emissions of Toxic and Pollutants
5.5 45CSR25 – Hazardous Air Pollutant

6.0 Insignificant Activities.

4.0 Federal Regulation

The Code of Federal Regulations (CFR) are regulations adopted by the US EPA and published in the Federal Register pursuant to the authority of the grant by Congress in the Clean Air Act. The CFR addresses multiple aspects, including but not limited to, permitting requirements, performance standards, testing methods, and monitoring requirements. The (CFR's) may be viewed online.

4.1 Prevention of Significant Deterioration Determination

The Prevention of Significant Deterioration (PSD) permitting program is a Clean Air Act permitting program for new and modified major stationary source of air pollution. Implementation of the federal PSD regulations is delegated to the state of West Virginia by U.S. EPA and these regulations are contained at 40 CFR Part 52.21. Therefore, BAPC implements the federal PSD regulations directly. These regulations specify federally required permitting procedures for each "major stationary source." The PSD regulations define a "stationary source" as "any buildings, structure, facility or installation which emits or may emit any air pollutant subject to regulation under the Act." A building structure facility or installation" is defined as "all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of ant vessel. Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same 'Major Group' (i.e., which have the same first two-digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement."

"Major" is defined as the potential to emit of a stationary source, which equal or exceeds a specified threshold (in tons per year) or any air pollutants regulated under the Clean Air Act (40 CFR 52.21(b)(1)). The first threshold is for a stationary source that emits or has the potential to emit 100 tons per year or more of any regulated NSR pollutants and is defined as one of 28 specific categories of sources (see 40 CFR 52.21(b)(1)(i)(a)). The other applicability threshold is for any other stationary source thar emits or has the potential to emit 250 tons per year of any regulated NSR pollutant (see 40 CFR 52.21(b)(1)(i)9b)). TME is not a major source as defined by PSD.

4.1.1 Prevention of Significant Deterioration (40 CFR 51)

Prevention of Significant Deterioration (PSD) applies to all criteria pollutants in an area that has been designated as attainment, such as the city of Ravenswood, WV. The PSD program is set forth in 40 CFR 51 and is part of the federal New Source Review (NSR) permitting program for pollutants in an attainment area. Potential emissions of each PSD pollutant are below the program threshold; therefore, federal PSD review does not apply.

4.1.2 Nonattainment New Source Review (40 CFR Part 51)

Nonattainment New Source Review (NNSR) applies to major stationary sources located in nonattainment areas. The proposed plant will be located in Jackson County, which is currently in attainment for all pollutants. Therefore, NNSR does not apply.

4.2 New Source Performance Standards (40 CFR Part 60)

Section 111 of the Clean Air Act, Standards of performance for New Stationary Sources," (NSPS) requires US EPA to establish federal emission standards for source categories which cause or contribute significantly to air pollution. Each NSPS defines the facilities subject to these requirements and prescribes emission limits for specific pollutants, compliance requirements monitoring requirements and test methods and procedures. These standards are intended to promote use of best air pollution control technologies, taking into account the cost of such technology and any other non-air quality, health, and environmental impact and energy requirements. These standards apply to sources which have been constructed or modified since the proposal of the standard. These standards can be found in the CFR at Title 40 (Protection of Environment), Part 60 (Standards of Performance for New Stationary Sources).

Generally, state and local air pollution control agencies are responsible for implementation, compliance assistance, and enforcement of the NSPS. US EPA retains concurrent enforcement authority and is also available to provide technical assistance when a state of local agency seeks help. US EPA also retains a few of the NSPS responsibilities such as the ability to approve alternative monitoring methods to maintain a minimum level of national consistency.

There are several federal and state regulations that apply to new source constructed and operating in an attainment area such as "Medical Waste Treatment Facility (MWTF). Brief overviews of these requirements are listed in subsections that follows. The Clean Air Act of 1970 directed US EPA to establish new source performance standards for specific industrial categories. There are few NSPS applicable to this project.

4.2.1 40 CFR 60, Subpart EC – Hospital/Medical/Infectious Waste Incineration 2015 Volume 17

Standard performance for New Stationary Sources:
Hospital/Medical/Infectious Waste (Incineration) Gasification (HMIWG) – The gasification of medical waste feedstock in first stage (conveyor #1) combustion chamber initially assisted by natural gas burner up to feedstock ignited then burner is turned off the line.
In the first stage, heat used to induce thermal decomposition of solid carbon-based waste fuel material to produce a producer fuel gas (syngas) which is consists primarily of CO and hydrogen in oxygen starved environment (to prevent combustion of the producer gas). In the second stage (conveyor #2) addition air (although still at sub-stoichiometric conditions) is used to fully oxidize the remaining carbon char to generate the heat required to sustain the reaction in the first stage.
In the "TME" thermal gasification process the producer gas is directly combusted. The producer gases (1000-1200 degrees F.) allow for more efficient combustion in the gas stream. The long chain carbon by products (i.e., tar liquids) are totally combusted in the high temperature (2000 degrees F. plus). In the third stage conveyor and combustion zone will NOx control oxidizer.

This gasification of Hospital Waste and /or Medical/Infectious Waste are not using external energy (40 CFR Part 60.51c). According to 40 CFR Part 60.50c(f) any pyrolysis in (40 CFR Part 60.51) is not subject to this subpart. So, the strict provisions of subpart EC does not apply, subsequently, the BPAC also does not apply.

4.2.1 Medical Waste Incinerators CFR-2015 Title 40–Vol17–Part60–Subpart EC

Stationary Source of Air Pollution

Hospital, Medical, and Infectious Waste Incinerators (HMIWI)

Rules: Section 129 of Clear Air Act (CAA) title "Solid Waste Combustion", requires developing and adopt standards for solid waste incineration unit pursuant to "CAA" Section 111 and 129.

This suite of actions promulgates EPA's New Source Performance Standard (NSPS) emission guideline and Federal Implementation Plan (FIP) for Hospital/Medical/Infectious Waste Incineration Unit (HMIWI).

This final rule set limits for 9 pollutants under Section 129:

- Cadmium
- Carbon Monoxide
- Hydrogen Chloride
- Lead
- Mercury
- Nitrogen Oxides
- Particulate Matter
- Polychlorinated dibenzo, -P-dioxins and dibenzofurans
- Sulfur Dioxide

This thermal combustor (Thermal Gasification Unit) operates in two distinct phases.

First Stage: The first stage of combustion involves the gasification of all gaseous components in the fuel from the solid matrix.

Second Stage: The second stage in the combustion process takes these gaseous fuels and extracts all the available energy through a controlled oxidation. This energy will be used for production of steam/power. TME also called this "Waste-To-Energy" gasification unit.

TME process will meet the EPA standards. Also, TME stationary source emission will meet this requirement.

- 40CFR Ch (7-1-15 Edition)
  Subpart EC – Standards of Performance of New Stationary Sources:
  Hospital/Medical/Infections waste Incineration (or combustion – gasification)

  See Attached Section 5.0;
  45CSR13 – Table 45-13A Page 21

45CSR27 – Table 'A'

4.13 Insignificant Activities.
See Section 5.0 45CSR13 Table 45-BB, DE Minimis Sources Pages 22-25

4.2.2 NSPS – 40 CFR Part 60 Subpart JJJJ – Standard of Performance for Stationary Spark Ignition Internal Combustion Engines

Cummins Power Generation is subject to the provisions of Subpart JJJJ since it will be an emergency stational spark ignition internal combustion engine manufactured after January 1, 2009 and has a maximum engine power greater than 25 horsepower as described under 40 CFR Part 60.4230(a)(4)(iv). Emission unit 5-EG5

4.2.3 40 CFR Subpart Db – Standard of Performance for Industrial-Commercial-Institutional Steam Generating Units

Subpart Db §60.40b – Applicability
This subpart applies to each generating unit which has a heat input capacity from fuel combusted in steam generating unit of greater than 29 MW (100 million Btu/hr). "TME" facility heat input from solid medical waste is less than that (25 million Btu/hr) so it does not apply.

4.2.2 40 CFR 60 Subpart EC -- Standards of Performance for Medical Waste Processing Plants

Subpart EC of 40 CFR 60 requires medical waste treatment facilities to comply with certain particulate standards. Activities regulated by this NSPS include standard performance for new stationary sources; Hospital/Medical/Infectious waste incineration. Emission points are subject to opacity limitation of 20%. There will be crushing, conveying, transfer, and storage of prepared medical waste that will be subject to this subpart.

Also, this regulation limits the amounts of PM, NO_x, CO, and SO_2 emitted by the facility. It also limits toxic pollutants: Dioxin/Furans, Lead, Cadmium, and Mercury.

"TME" will comply with the opacity and particulate matter requirements of WVDEP standards and apply EPA 40 CFR 60.254(a) and (b). Performance tests and/or monitoring will be conducted in accordance with 40 CFR 60.255. Reporting and record keeping will be conducted in accordance with 40CFR 60.258. Also, the subpart EC of Part 60 operating parameter to be monitored which includes data measurement and recording (see Table 4.4.2).

4.2.3.1 40 CFR 60 Subpart 60.52C Emission Limit

The requirements of 40 CFR 60 subpart 60.52C applies to all rated capacities greater than feed rate of HM1W is more than 500 lbs/hr. The Table 1A emission limit applies. This standard also applies to steam generating boilers. This design is based on the following emissions as applied under Table 1A.

See Section 7.0 40 CFR 60 subpart 60.58C. Page 311-312, Page 313 thru 316.
Table 1A, 1B and Table 3. This should be used as a reference.

The proposed burning of HWIW in thermal gasifier byproducts/waste gas in afterburner with subsequent steam production via the waste heat recovery boiler/steam generator classifies this equipment as a "steam generating unit" for the purposes of NSPS applicability evaluation. Based on the total heat input capacity of 10.5 MMBtu/hr of the fuels (TG by-product/waste gas – 10.0 MMBtu/hr - and natural gas - 1.5 MMBtu/hr) being combusted in the afterburner and based on the applicability criteria outlined under 40 CFR §60.40b(a), 40 CFR Part 60, Subpart Db - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units - will apply. Because the affected facility combusts by-product/waste as defined by 40 CFR §60.41 b and the annual capacity factor of natural gas co-fired with the by-product/waste is ten percent or less, see 40 CFR §60.44b(e), the affected facility is subject only to an emission standard or limitation for SO_2. (The percentages of CO and CO_2 in the afterburner inlet flue gas are lower than the standards set forth in Section 60.41 b, and the facility is classified as a "chemical manufacturing plant" under NASIC code 325180). The proposed project will be required to comply with an SO_2 standard or emission limit of 0.20 lb/MMBtu heat input or 8% (0.08) of the potential SO_2 emission rate (i.e., 92% reduction) and 1.2 lb/MMBtu heat input (40 CFR §60.42b(k)(1)). The limit and percent reduction requirement will apply at all times, including periods of startup, shutdown, and malfunction (40 CFR §60.42b(g)). CAWP requests that the State include a Federally enforceable permit condition limiting the annual capacity factor of natural gas co-fired with the by-product/waste to ten percent or less.

An affected source is required to install, calibrate, maintain, and operate a Continuous Emission Monitoring System (CEMS) system for measuring SO_2 concentrations and either O_2 or CO_2 concentrations, and to record the CEMS output (40 CFR §60.47b(a)). For compliance with the percent reduction standard, the SO_2 and either O_2 or CO2 concentrations must be monitored at the inlet and the outlet of the SO_2 control device. The CEMS output must be used to demonstrate compliance with the SO_2 standard(s), subsequent to the initial performance test required under 40 CFR §60.8. Compliance with the standard(s) must be determined on a 30-day rolling average basis (40 CFR §60.42b(e)).

"TME" will comply with the requirements of 40 CFR 60 Subpart 60.52.C Emission Limits. "TME" will comply with applicable limit. Also comply with the HMIW large size emission limits. (Ref 40 CFR 40 subpart 60.50c (a)(1) and (2)).

4.3 National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 63)

The NESHAPs contained in 40 CFR 63 have been adopted by the USEPA to regulate hazardous air pollutants via industrial controls. There are no sources at the proposed facility which will be subject to these standards.

4.3.1 National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 63) Subpart ZZZZ

4.4 40 CFR 60 Subpart 60.57C - Compliance Assurance Monitoring (CAM). 40 CFR 60 Subpart 60.50C (a)(1) and (2) 40 CFR Part 64

The Federal Compliance Assurance Monitoring (CAM) Regulation is applicable to those pollutant-specific emission units that use a control device to achieve compliance with applicable (non-exempt) emission limits or standards. This regulation defines minimum applicable monitoring, operation and maintenance requirements to ensure compliance with emission limits.

The CAM rule applies to an emission unit at a new source required to obtain a Part 70 Operating Permit that meets the following criteria:

- The emission unit's pre-controlled emissions of a regulated pollutant are greater than or equal to the respective major source emission threshold (§64.2(a)(1) through (3)), and
- The emission unit has a federally enforceable emissions limitation or standard for the pollutant being regulated, and
- The emissions unit is equipped with an add-on control device to achieve compliance with the applicable emissions standard or limitation.

4.4.1 Compliance Assurance Monitoring (CAM) – 40CFR Part 64 Title V, Part 70 Program

"TME" will comply with applicable limits.

4.4.2 40 CFR 60 Subpart 60.53C – Operator Trainings and Qualification Requirements

"TME" will comply with applicable limits.

4.4.3 40 CFR 60 Subpart 60.56 – Compliance and Performance Testing

"TME" will comply with applicable limits.

Note that exempted emission limitations or standards include those relating to post-November 15, 1990, NSPS or NESHAP, and those for which a Part 70 permit specifies a continuous compliance determination method that does not use an assumed control factor, to name a few (§64.2(b)(1)).

Under §64.4, the owner or operator subject to CAM must submit a CAM monitoring approach (or CAM Plan) to the regulatory authority that satisfies the monitoring design requirements in §64.3. The submittal must include: 1) the indicators to be monitored; 2) the ranges or designated conditions for such indicators; and 3) performance criteria for the monitoring.

With regard to emissions from the production facility with Thermal Gasification Combustion, the recently revised NSPS Subpart Db stipulates an emission limit for S02 emissions. Subpart Db requires that compliance with this limit be demonstrated with criteria pollutants SO2, NOx, CO, VOC, Pb, Hg, Cd, Hcl, Dioxin, and PM/PM10 and applicable threshold (100 tpy) pollutant emitted by this "TME" WV Plant.

Therefore, the CAM rule does not apply to these pollutant emissions. However, because the proposed Project will be subject to permit emission limits based on the use of control devices for PM/PM_{10}, CO and VOC, and applicable threshold, CAM applies for these pollutants emitted by the TGC.

A review of PM emissions for each material handling operation dust collector also was

conducted. A summary table of CAM applicability findings for these emission sources and the CAM Plans for the affected sources and pollutants are provided in Table 9.2.1 to this application. Only the main stack EP-001 is subject to CAM.
All table number starting with are Attachment 'N' – Emission Calculation.

4.5 Chemical Accident Prevention (40 CFR Part 68)

The facility does not have more than a threshold quantity of the chemicals listed in this subpart; therefore, this regulation does not apply.

4.6 State Operating Permit Programs (40 CFR 70)

West Virginia's Operating Permit Program applies to major sources of criteria pollutants or hazardous air pollutants. The proposed facility is below both of these thresholds and is not subject to this regulation.

4.7 Mandatory Greenhouse Gas Reporting (40 CFR 98)

The proposed facility is subject to greenhouse gas reporting in accordance with 40 CFR 98.2(a)(3). Specifically, all three of the conditions in this section have been met:

- The facility will meet the requirements of either 40 CFR 98.2(a)(1) or (a)(2).
- The aggregate maximum rated heat input capacity of the stationary fuel combustion units at the facility is 30 MMBTU/hr or greater.
- The facility emits 25,000 metric tons CO_2e or more per year in combined emissions from all stationary fuel combustion sources.

The facility will not require CO_2e emissions because fossil fuel greenhouse gases are not generated by "TME". Even though "TME" provided as reference.

4.8 Maximum Achievable Control Technology Standards

Maximum Achievable Control Technology (MACT) Standards were established under Section 112 of Clean Air Act for control of hazardous air pollutants ("HAPs"). These MACT standards are specified bases on the category and subcategory list applicable to the major source. A minor source of HAPs is a source with total predicted HAP emissions of 25 TPY or greater or any single HAP emissions equal to 10 TPY or greater.

4.8.1 MACT Applicability

Predicated HAP emission from TME Plant are less than 25 tons per year total and less than 10 tons per year of any single HAP, hence "TME" is not defined as a major source of HAPs. See tables 9.4.1 & 9.4.2.

4.9 Risk Management Plan

40 CFR 68 requires that Risk Management Plan (RMP) be developed for any regulated substance in excess of the threshold quantity as defined in subpart F. The TME Plant does not have any regulated substance in excess of threshold limit.

4.10 Stack Height

The stack height regulations promulgated by U.S. EPA on July 8, 1985 (50 FE27892), established a stack height limitation to assure that stack height increases, and other plume dispersion techniques would not be used in lieu of constant emission controls. These regulations apply to facilities that commenced construction after December 31, 1970, and to dispersion techniques implemented after that date. These federal requirements have been included in the regulations for Good Engineering Practice Stack Height. The regulations specify that Good Engineering Practice (GEP) stack height is the maximum creditable stack height a source may use in establishing its applicable State Implementation Plan (SIP) emission limitation. A GEP stack height means the greater of one of the following two options:

1. 65 meters, measured from ground-level elevation at the base of the stack (de-minims stack height); or

2. For stacks uninfluenced by terrain features, the determination of GEP stack height for a source is based on the following empirical equation:

   $$Hg = H + 1.5Lb$$

   Where: Hg = GEP stack height;
   H = Height of the structure on which the source is located, or nearby structure; and
   Lb = Lesser dimension (height or width) of the structure on which the source is located, or nearby structure.

Both the height and width of the structure are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. The area where a nearby structure can have significant influence on the source is limited to 5 times the lesser dimension (height or width) of that structure or within 0.5 mile (0.8 km) of the proposed stack, whichever is less. The methods for determining GEP stack height for various building configurations have been described in U.S. EPA's technical support document (U.S. EPA, 1985).

All stacks at TME Plant are less than 65 meters in height.

5.0 State Regulations

In addition to the federal air permitting requirements, the WVDEP applicable air quality regulations are summarized in this section.

The West Virginia Air Quality Standards and Regulations (DAQ) contains all state regulations applicable to the proposed site. All new or modified emission sources that are not specifically exempt from permitting requirements must obtain a construction and operating permit from the State of West Virginia Department of Environmental Protection Division of Air Quality prior to commencing construction and/or operation. This application and attached forms fulfill the information requirements needed to obtain a construction and operating permit required by regulation. Applicable sections include:

5.1 45CSR R-6 – Control of Air Pollution from Combustion of Refuse

This section requires particulate matter emission for new source to be limited as provided to emission standards for incinerators and incineration (Refuse-Combustion) using formula provided by:

Emissions(lb/hr) = F x Incinerator capacity (tons/hr)

Were factor F, as per Table 1: Determining maximum allowable particular emission.

Incinerator Capacity	Factor-'F'
a) less than 15000 lb/hr	5.43
b) 15000 lb/hr or greater	2.72

Emissions(lb/hr) = 5.43 x 0.825 tons/hr = 4.479 ≈ 4.50lb/hr

Since the lb/hr emission from the thermal combustor (thermal gasification unit) is less that this rate, the facility complies with the limit.

The calculated valve: Uncontrolled – 3.86 lb/hr 16.9 tpy Controlled - 2.21 lb/hr 9.70 tpy
Reference Tables 9.4, 9.4.1, 9.4.1A, 9.4.2, & 9.4.2A

5.2 45CSR10: Emission of Sulfur Dioxide

"TME" Solid Medical Waste Thermal Gasification Unit will burn the waste. The unit will generate SO2 calculated valve of Sulfur Dioxide SO2:
Uncontrolled – 1.789 lb/hr 7.875 tpy Controlled – 1.725E-02 lb/hr 5.45E-02 tpy
Reference Tables 9.4.1, 9.4.1A, 9.4.2 & 9.4.2A

5.3 45CSR13: "Minor New Source" Permit for Construction

Review permitting West Virginia's is divided into three categories:

1. NSR (45CSR13) Preconstruction Permit – See Table 9.4 for pollutant
   NSR (45CSR13) Preconstruction – Requirements
   This is an existing infrastructure used for Aluminum Fabrication.
   "TME" Solid Medical Waste Treatment Facility will meet all requirements as per NSR (45CSR13) See WVDEP 45CSR 13 Table 13A Revised and Table 13B as well as Table 9.4.

All potential TAP and HAP emissions as listed in table 45-13A are calculated and included with this application. See permit application and attachments as listed under NSR (CSR13)

Respective Air Pollution for HAPs and TAPs See tables 9.4.1, 9.4.1A, 9.4.2 & 9.4.2A

2. 45CSR13 – Hazardous Air Pollution (HAP)
3. 45CSR13 – Toxic Air Pollution (TAP)

West Virginia Minor Source Air Permitting Program is enacted through 45CSR13 in which air toxic are addressed in 45CSR 13. Any source that proposes to have the potential to emit before control at or above 2 lb/hr od 5 tpy of TAPs considered on aggregated basis for new facility. "TME" will meet the necessary requirements. The EPA has determined that the following units do not require stringent regulations under Part 266, Subpart H.

1.0 Units burning gas recovered from hazardous or solid waste.
2.0 Units burning hazardous waste exempt from regulation 216.6(a)(s))iii)-v and maybe from 261.5
3.0 Applicability and exemptions, there are two classes of units covered under the Part 266, Subpart H. Regulation – Boilers and Industrial Furnaces. EPA defines a boiler as an enclosed device that uses controlled flame combustion to recover and export energy in the form of steam. Boilers have a combustion chamber and energy recovery efficiency od 60 percent. Reference RCRA, 40 CFR Part 266H – Boilers and Industrial Furnaces

5.4 45CSR27: To Prevent and Control of Toxic Air Pollutants (TAP)

As CSR27 "To prevent and control the emission of Toxic Air Pollutants", addresses 14 compounds Reference Table 45CSR Table A also included in EPA list of HAPs.
"TME" Solid Medical Waste Treatment Facility will be below the listed Table 45CSR Table A List of Toxic Air Pollutants (TAPs) – See Table 45CSR27.

TME will comply with the applicable requirements.
See 45CSR27: To prevent and Control the Emissions of Toxic Air Pollutants.
TME will comply with the applicable requirement. See Table 'A" attached – Section 5.0

5.5 45CSR25 – (See pages 14 thru 22.) To prevent and control hazardous air emissions

Sub-Section 5.5 State Regulation and Facility Description, Summary with 45 CSR25 Hazardous Waste Permit, Application 40CFR 266 Sub-Part "H".

1.0 Facility Location

2.0 "TME" Minor Source Permit Application

3.0 Thermal Gasifier

4.0 Hazardous Waste

Feedstock Specifications

Medical Waste

5.0 Basic Operation

5.1.1 Operating Temperature Profile

6.0 Process Description

7.0 Emissions from "TME" Medical Waste-To-Energy Operation – Attachments 'N' for all tables starting with No. 9.

(a) Table 9.4 – Emission Factors/Emission Calculations Note 1 Attachment N page 23 of 36

(b) Tables 9.4.1, 9.4.1A, 9.4.2 & 9.4.2A – Emission Summary (Section 9.0) Pages 24, 25 of 36

(c) Table 9.4.3 – Metals and Other Emission Factors/Emission (Section 9.0) Page 26 of 36

(d) TAP & HAP Emission Summary (Section 9.0) Page 29 of 36

Organic HAPs Emission Summary (Section 9.0) Page 29-32 of 36

(e) Table 9.4.5 - Hazardous Air Pollutants Summary (Section 9.0) Page 36

Including Metallic HAPs Summary

8.0 Emergency Generator (Section 9.0) Subsection 9.6.2 Pages 33 to 36

Cummins Power Generator - Information

9.0 45 CSR27 Table A – Fugitive Emission Air Toxic

10.0 45 CSR13 Table 13A – Hazardous Air Pollutants

1.0 Facility Location

The "TME" Facility will be located at 5334 Point Pleasant Road, Ravenswood, Jackson County, West Virginia 26164 where it will operate a Medical Waste Thermal Gasification Waste-To-Energy Plant. The facility is not subject to 40 CFR Part 60 EC "Standards for performance for new stationary sources: Hospital/Medical/Infection Waste Incinerator (HMIWI) but has used the guidelines for emissions. "TME" plant is designed Waste-To-Energy Generation so is classified waste management and remediation services under NAICS code 562219, additional information section 1.0 subsection 1.7 and 1.10.

2.0 "TME" Minor Source Construction Permit Application

"TME" is proposing to construct and operate a Medical-Waste-To-Energy Plant. Currant operations include Medical Waste Collection and Transportation to an approved third-party disposal facility with operations throughout the mid-west region including W.V. "TME" contractors collect pre-approved and properly sealed bags or bins of medical waste from a variety of facilities including, but to limed to, hospitals, doctors offices, dentists, veterinarians' offices and pharmacies. "TME" proposed facility will allow them to offer full Medical-Waste-To-Energy Generation Services from collection, transportation, and final conversion of Waste-To-Energy via Thermal Gasification System.

3.0 Thermal Gasifier

The M8 Thermal Gasifier equipment package consists of the Thermal Gasifier plus a control system which displays and controls the various input of the Thermal Gasifier. This system allows for precise control of temperature, pressure, and air flow in the gasification chamber and fire tube. This degree of control allows the user to customize the gasification reaction to fit the given feedstock. The system also has automated settings for commonly used functions such as loading the hoppers, initial startup, and safe shutdown, which create easier operation for the unit.

4.0 Hazardous Waste

Medical Waste feedstock as gasified in thermal gasifier.

Feedstock Specifications

Medical Waste (MWF) Driven Fuel

Heterogeneous material is mixed properly to maintain uniform BTU values.

Any Hydrocarbon-based material from 4,500 BTU/lb to over 15,000 BTU/lb

Moisture content up to 45%

Preferable to have rock/dirt/glass removed from waste stream

Preferable to have feedstock size at 1-2" particle size

Feed rate is 8.0 million to 10 million BTU/hr

Feed rate is 1,650 lb/hr at the "TME" – Gasification System

Medical Waste

Red Bag Waste: used medical gloves, paper towels, gauzes, bandages, etc. This may include some human tissue (i.e. Teeth, cultures, etc.);

Sharp Containers: container that contain sharp objects (i.e. needles, syringes, etc.);

Chemotherapy: tubing, gauzes, gloves, and other supplies used in the administration of chemotherapy medications. This does not include the actual chemotherapy medication other than what trace amounts may be on the aforementioned supplies;

Pharmaceutical: expired or tainted pharmaceuticals; and

Pathology: human or animal tissue or fluids generated during surgery, medical procedures, or autopsies.

These waste streams are considered biohazardous as they potentially can be contaminated with infectious agents that maybe a threat to public health if not handled and disposed properly.

Medical waste additional information – See Attachment 'G' (section 1.0 & 2.0) of the detailed submittal specific page numbers are attached in this submittal.

5.0 Basic Operations

The feedstock will be fed into the Vista Thermal Gasifier system using a screw-feed auger mechanism. Once in the gasifier, the feedstock will pass through the various parts of the gasification chamber on conveying belts. The speed of the belts is monitored and controlled to optimize the thermal decomposition reaction. The residence time in the chamber is dependent on a number of factors, including feedstock composition, density, and moisture content. As the feedstock temperature reaches approximately 1,600 – 1,800 degrees F., the reaction has completed, and the initial feedstock has been converted into two products: a usable syngas and an ash residue. A water bath is used to remove the ash residue from the bottom of the gasifier, while the syngas exits the top of the gasifier and passes through the fire tube, where it is combusted. The effluent gas from this process is used to heat the boiler, for steam electric generation.

5.1.1 Operating Temperature Profile

Note that residence times for the conveyor belts listed below are controlled by the system and are based on energy content of the feedstock and moisture present. Total residence time in the gasification chamber is generally 30-60 minutes.

Feedstock at room temperature is loaded into the feed hopper.

Feedstock drops into onto the initial conveyor belt in the gasification chamber, where the temperature is approximately 400-600 degrees F. The feedstock is dried and heated as it is conveyed along this belt. Feedstock is roughly 900-1100 degrees F. when it reaches the end of this belt. The heat content of medical waste is sufficient to maintain the temperature needed for the thermal destruction of the waste. As such, an outside energy source (i.e. natural gas combustion) would not typically be needed in normal operating conditions. The first conveyor in the gasification chamber is equipped with 2 MMBTU/hr natural gas burners. The burners are required to bring the initial feedstock up to combustion temperature upon cold start-ups, once the feedstock is ignited it will shut off.

Feedstock drops onto the second belt. The temperature climbs as the feedstock progresses along this belt, reaching 1600-1800 degrees F. toward the end of the belt. On this belt the majority of the syngas is released and is diverted to the firetube.

The syngas is combusted in the firetube (using as injection of turbulent air) to boost the effluent gas temperature to between 2200 and 2700 degrees F. The effluent is used to fire the waste heat boiler.

The remaining solids fall onto the final belt and complete thermochemical decomposition, leaving the belt at roughly 900-1100 degrees F. These solids fall into a water bath and are conveyed out of the system by means of a drag chain conveyor into a closed container (or sump). The sludge pump will pump the slurry to the cone bottom double walled storage tank equipped with carbon filter vented to the main APGV controlled device.

6.0 Process Description

"TME" currant operations include Medical Waste Collection and Transportation to an approved third-party disposal facility with operations throughout the mid-west region including W.V. "TME" receives pre-approved feedstock in properly sealed bags or bins of medical waste from a variety of facilities including, but to limed to, hospitals, doctors offices, dentists, veterinarians' offices, and pharmacies. "TME" proposed facility will allow them to offer full Medical-Waste-To-Energy Generation Services from collection, transportation, and final disposal via Thermal Gasification destruction.

The medical waste will arrive on the site via semi-trailer trucks and small box trucks. The medical waste inside the trucks will be stored in either gaylord boxes or sealed plastic containers (28 or 30 gallon capacity). The waste will be directly unloaded into the facility

building from the trucks at the loading docks and will be processed within 24 hours. At no time are the gaylord boxes or plastic container exposed to or stored outdoors.

Once inside, the contents of the gaylord boxes and plastic containers are unpacked into a (cart) feed hooper at the shredder. The shredder will make approximate (2" x 2") size and transferred to the gasifier 24-hour feed hoppers. The hopper is designed to dry the contents by using the recirculated flue gas as required. The shredding system in air

The medical waste (0.825 tons/hour limit) will first be introduced to the gasifier fuel surge hopper. It is converted into combustible gas and ash through a gasification process using direct heat of the feedstock combustible materials (contains 5,000 to 15,000 BTU/lb), the thermal gasifier uses thermochemical reaction to break down the recycling residue into two products: a producer gas (syngas) stream and an ash residue. The syngas stream is converted to steam/electric energy. Note that the gasifier is the main component in the waste-to-energy processing system.

The ash residue if it merits and roughly 10% of the original value (0.0825 tons/hr), can be landfilled or industrial use. At present "TME" will transfer to EPA approved landfill.

This final (firetube) combustion section essentially serves as a thermal oxidizer and carries out the near combustion of organics, carbon, and other combustion gases with an efficiency of approximately 99.99%. Temperatures achieved during the thermal process ranges from 2000 to 3000 degrees F. The exhaust is then routed to the heat recovery boiler for cogeneration purposes. The boiler generates steam from the waste heat and then the steam is used to turn a turbine and create electricity, approximately 0.5 MW to 1.0 MW.

Medical waste gasification involves converting waste to energy. Wastes are produced by hospitals, veterinary facilities, and medical research facilities, etc. The waste includes both infectious ("red bag") medical waste as well as noninfectious general housekeeping wastes.

Waste Composition

Waste Composition wt%	Percentage Range (varies) %
Carbon-C	25-60
Hydrogen-H	4-10
Oxygen O	0-30
Nitrogen-N2	0-5
Sulfer (S, SO2, H2So4)	0-5
Chlorine (Cl, HCL)	0-15
Voc (THC)	
Oxides	(0-40)
Metals	(1-5)
H2O	1-20

HHV (Btu(lb))	4,500-15,000

Medical Solid Waste/Medical Waste (MSW/MW)

a. MSW Sorting, Transport, and Shredding

Sorting and separation is performed by the generator; certified transporter will transfer the initial prepared waste to TME. TME will perform shredding at the site, will reduce the size of large homogenous items. (one to two inches in size), thereby making them suitable for further handling and feeding system.

Shredding is used for fragmenting inhomogeneous waste into small normally homogeneous parts. In the shredding process, temperature of shredded items may reach several hundred degrees. Shredding will cause emissions to air depending on the system. The exhaust will be directed to APCD system - Egress Point EP-001

b. Treatment-Units

The Gasification unit is designed to operate on a continuous basis which consists of feed stock and surge hopper, feeder, (MFG8) thermal gasifier -with three feed conveyor, firetube waste heat boiler and air pollution control system.

The gasifier is designed for processing multiple forms of hydrocarbon-based fuel such as RDF, TDF and HMSW, with energy content 5000-15000 btu/lb. Feed stock input 7-20 tons per day (TPD) through various temperature zones in the gasification chamber. Rated capacity of gasifier is 8.4 mm btu/hr, (Ref DWG 22-200-0514).

The HMSW passes through several zones of the gasifier which include drying zone, oxidation zone, combustion zones, via conveyor NO1, NO2 and No3, and finally the producer gas passes through the fire tube section - waste to energy conversion.

- Zones

Zones	Function	Temperature Range
Drying Zones	Heating -Removal of water (air less than the stoichiometric) Combustion air-primary air 1800 CFM@70°F 30" WG Air enters the First conveyor (or chamber) from beneath (below the burning bed of waste) This air is called primary or	400° to 600° F

	under fire air. This low air waste ratio dries and volatilization of water and most of the residual carbon in ash burns.	
Oxidation Zones	The second conveyor receives waste from first conveyor. The secondary air (4800 CFM) is added to the volatile gases formed in first and second conveyor to complete combustion. Temperature is higher than first conveyor.	1500° to 1800° F
Combustion Zone	The Third Conveyor receives waste from second conveyor. In this stage all residual carbon in the waste is burned. Combustion of volatiles is completed due to turbulent motion of the waste in the chambers. From First, the ash underneath of the conveyors will be removed by drag chain conveyor. (Conveyor will be washed with water. Ash will be collected in tanks)	1800° to 2000°F

The medical waste (0.825 tons/hr limit) will first be introduced to the gasifier fuel surge hopper, it is converted into combustible gas and ash through a gasification process using direct heat of the feed stock combustible materials that contains 500 to 15000 Btu/lb. The thermal gasifier uses thermochemical reaction to break down the recycling residue into two products – a producer gas (syngas) stream and ash residue. The syngas stream is converted to steam/electric energy. Note that the gasifier is main component in thew waste-to-energy processing system. The ash residue if it's inert and roughly 10% of the original value (0.0825 tons/hour), can be landfilled or industrial use. At present "TME" will transfer to an EPA approved landfill. This final (fire tube) combustion section essentially serves as a thermal oxidizer and carries out the nearly complete combustion of organics, carbons and other combustion gases with an efficiency of approximately 99.999%. temperature achieved during the thermal process ranges from 2000 to 3000 degrees F. The exhaust is then routed to the heat recovery boiler for cogeneration purposes. The boiler generates steam from the waste heat and then the steam is used to turn a turbine and create electricity, approximately 0.5 to 1.0 Mw. The heat recovery boiler and turbine operate in a closed loop system with no potential to emit air pollutants. The heat content of medical waste is sufficient to maintain the temperature needed for thermal destruction of the waste. As such, an

outside energy source (i.e. natural gas combustion) would not typically be needed for normal operating conditions.
The first conveyor in the gasification chamber is equipped with two MMBtu/hr natural gas burners. The burner is required to bring the initial feed stock up to combustion temperature upon cold start-ups, once the feed stock are ignited it will shut off.

7.0 Emissions:

Emission from the following emission units

Emission Unit I.D.	Description	Points
1-S-1	Feedstock Unloading, conveying, Shredding – Feeding	EP-001
1-S	Thermal Gasifier/Accessories Cyclone, Gasifier – Thermal Oxidizer Dry Scrubber – NaHCO3 Injection PAC – Activated Carbon Injection Baghouse (Filtering Unit)	EP-001

Emissions from all these units will be routed through serval air pollution control device (APCD).

APCD Unit 10	Description
C1-1	Thermal Oxidizer
C1-2	Cyclone
C1-3	Dry Scrubber – NaHCO3 Injection
C1-4	PAC – Activated Carbon Injection
C1-5	Baghouse – (Filtering Unit)

These air pollution components have been selected and arranged to provide targeted and redundant levels of removal for the "nine pollutants" of concern specified the Table 1B of 40 CFR part EC, for which "TME" is not subject to, but are using for reference. These controls include Thermal Oxidizer (NOx control), Cyclone, NaHCO3 dry scrubber to control SO2, HCL and other acids and dioxins, PAC Injection System to control lead (Pb), mercury (hg) and partially cadmium (Cd) etc. The bicarbonate (NaHCO3) and PAC – powder activated carbon are pneumatically loaded into each reactor form sealed hopper. The loading will occur at a rate of 150 lb/hr. This transfer of material is completely enclosed and therefore the potential for any fugitive emissions is negligible. Following the dry scrubber is the baghouse which provides a control mechanism for particles and metals with an estimated of 90 to 99.99% removal efficiency (0.05 gr/dsfm) The baghouse filter bags are coated with residual bicarbonate (NaHCO3), which provides an additional mechanism of acid removal additionally the filter bags are manufactured by Remedia, which are known to absorb any remaining dioxins. The transfer of

spent bicarbonate, PAC and residue waste ash/particulates removal from the baghouse to waste collection bins via screw conveyors will be entirely sealed and enclosed, therefore the potential for any fugitive emissions is negligible.

Dry Scrubber emission from thermal gasifier all sections and shredder will be routed through the several air pollution control devises that are ducted in one series. These air pollutants control components have been selected and arranged to provide targeted and redundant levels of removal for nine pollutants of concern specified in table 1B of 40 CFR part subpart EC. "TME" facility is not subject to but used as reference. These controls include cyclone, dry sodium by carbonate scrubber, AC injection system and baghouse. This NaHCO3 dry scrubber is designed to remove most of acids HCl. H2SO4 (cl2, SO2 & So3) and some dioxins. Following the dry scrubber is the baghouse which provides a control mechanism for particles and metals with estimated 90 to 99 plus percent removal efficiency. The transfer of spent sodium by carbonate, activated carbon and residue waste ash particulate removal from the baghouse to the waste collection bins. All components of air pollution system will operate at all times of the thermal gasifier is in operation. All components of air emissions (post control) will exhaust through one common stack (egress Point EP-001). Thermal gasifier emission treatment system is equipped with an emergency bypass stack (pre-controls) that will be only utilized in emergency situations, as defined under WVDEP and EPA regulations. Some emergency situations whereas the bypass stack will open incudes:

Low boiler water level

High boiler steam pressure

High levels of hydrocarbon or VOC 120 seconds continuously

High baghouse temperature maintained for 60 seconds continuously

Induced fan failure or fault

The event above would otherwise lead to damage and danger to facility equipment and personnel. If the boiler were to continue to operate with high steam or low water, this would present imminent danger to the facility. Should the emergency bypass stack open at all, the following interlock procedures would occur immediately:

The gasifier immediately ceases operation with all air inputs positively closed

The feed cycle is locked out so no further inputs to the system can be made

The start-up burner are locked out

The IF fan ceases operation immediately

The boiler outlet damper closes to positively stop gas flow to the boiler and the air pollution control (APC) system

The oxidizer combustion air remains active (secondary combustion chamber)

The oxidizer combustion remains active (secondary combustion chamber)

Since the gasifier inputs will be closed during an emergency event, the potential to generate gasified waste products ids reduced 95 to 99%. For all practical purposes, the gas generation ceases. The minor gas volume generated from residual smoldering in the first conveyor during the emergency event is oxidized in the secondary conveyor at 1800 degrees F. or higher, and under excess air conditions, prior to release to the atmosphere. If the bypass stack is opened, all gasifier inputs are positively closed, which leads to a 95 to 99% reduction of gasifier outputs. Due to the shutdown of the gasifier inputs and 99% reduction in gasifier outputs, the effective residence time in the oxidizing chamber (secondary combustion chamber) is increased to approximately 4 seconds. The gas flow volume is reduced to 1500 standard cubic feet per minute (scfm) and a nominal 19 feet per second (fps). The emergency bypass stack has a 18 inch actual inner diameter. In the event of an emergency bypass stack even, an alarm sound, a red strobe flashes and an onscreen written warning flashes in red. Anytime an emergency bypass event occurs, the event will be logged with the event time, date, and duration.

A process flow diagram of the facility that displays in detail the emission units proposed to be permitted can be found in Attachment 'F'.

5-EG5 – Emergency Natural Gas Generator Unit (ID 5-EG5)

Emergency generator will be a 15 MMBTU/hr natural gas generator and provide power during emergency events. The generator will be permitted for 100 hours per year for non-emergency uses including maintenance and upkeep activities.

6.0 Insignificant Activities Exempt from Permitting

Certain sources, operations, and activities are considered to be insignificant based on following categories.

A. Size or emission rate
B. Type of activity
C. Type of pollutant

The insignificant activities for the proposed project are listed in Table

Table List of Insignificant Activities

Insignificant Activity	Insignificant Activity Subcategory Class
- Two 0.2-MMBtu/hr gas-fired HVAC furnaces - Six 0.05-MMBtu/hr space heaters	A-5
Laboratory equipment/vents	A-5
Process sample points and gas analyzers	A-5
- Four 12,000-gal inorganic salt solution storage tanks (see A-4)	A-5
- Storage of miscellaneous water treatment chemical (inhibitors and membrane-cleaning chemicals in 200-gal totes)	A-5
Maintenance of grounds and buildings	B-1
Surface coating of equipment during construction/maintenance	B-2

Insignificant Activity	Insignificant Activity Subcategory Class
Misc. equipment maintenance or construction	B-3
Vehicle refueling exhaust emissions	B-4
Office activities	B-5
Emissions from storage or use of water-treating chemicals	B-8 and B-40
Misc. additions or upgrades of instrumentation/control systems	B-9
Emissions from air contaminant detectors and combustion controllers	B-11
Buildings. cabinets and facilities used for chemical storage	B-12
Use of products for maintaining facility motor vehicles	B-13
Stacks for vents to prevent escape of sanitary sewer gases	B-15
Emissions from equipment lubricating systems	B-16
Air conditioning systems not regulated under CAA Title VI	B-17
Instrument air systems, excluding fuel-fired compressors	B-22
Paved parking lots	B-23
Air vents from air compressors	B-24
Periodic use of air for cleanup	B-25
Solid waste dumpsters	B-26
Emissions of $NaHCO_3$ or wet lime mud from lime mud mix/slurry tanks	B-27
Emissions from natural gas odoring activities	B-29
Emissions from engine crankcase vents	B-30
Emissions from firefighting training	B-41
Portable petroleum/diesel fuel storage tanks used on a temporary basis	B-44

Also see attached Table 9.4.

Attachment D

Regulatory Requirements and Applicability

WV Office of Air Quality
45CSR25
Part "B" Hazardous Permit Application
40CFR 266 Subpart H
Table 9.4.1 Emissions

Compliance Assurance Monitoring (CAM) – 40 CFR Part 64 & 45CSR 25

Compliance assurance monitoring (CAM) plans are required for major source required to obtain Title v (Part 70 of 71) permits. The CAM rule was signed on October 3, 1997 and came into effect on November 21, 1997. The U.S. EPA developed the CAM rule to focus on monitoring of certain operating parameter to ensure compliance limitations in-between scheduled source tests. CAM requirements apply to stationary sources that: (1) are equipped with post-process pollutant control devices; (2) have pre-control device emission equal to or greater than 100% of the major source threshold for pollutants; and (3) are subject to the Title V permit program.
"TME" does not have units that trigger CAM applicability. (See attached table 9.4.0 Emission Factors) displays the systems' CAM applicability determination parameters. (See attached tables 9.4.1, 9.4.1A, 9.4.2 & 9.4.2A plus other attached tables for proposed emissions.

Title V, Part 70 Program

Title V of the Clean Air Act requires major sources of air pollutants, and certain other sources, to obtain and operate in compliance with an air quality operating permit. These requirements are further detailed I federal regulations 40 CFR Part 70 – STATE OPERATING PERMIT PROGRAMS. States that receive the delegated authority from EPA to administer a Title V program must establish a comprehensive set of state regulations that incorporate the minimum elements required by the Clean Air Act and CFR 40 Part 70 for state operating permit programs. The West Virginia Division of Environmental Protection's (WVDEP).

Proposed Emissions:
The facility wide emissions inventory for the "TME" facility as shown in tables 9.4.1, 9.4.1A, 9.4.2 and 9.4.2A emissions of each criteria pollutant are BAPC's WVDAP construction permit/operating permit threshold of 100 tons per year including insignificant activities. NESHP-New Source Facility emitting or potential to emit 10 tons per year or more of one hazardous air pollutant or 25 tons per year or more multiple HAP's. (TME is well below) so it is considered a minor source.
Table 9.4 – Emission Factor/Calculation
Table - 9.4.1 – Facility Wide Emission – Controlled
Table – 9.-4.1A – Facility Wide Emissions – Uncontrolled
Table – 9.4.2 – Facility Wide Emissions – Metal – Controlled
Table - 9.4.2A – Facility Wide Emissions – Metal – Uncontrolled
These emissions are based on EPA – "Emission Factors" – real efficiency improvements are not included. The emission should not increase "Minor Source Permit Application".
In order to display compliance with this limits, initial performance testing will be performed in 60 days after startup.

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.1 and 9.4.1A

Table 9.4.1 - Facility Wide Emissions - Controlled

Unit I.D.	Emission "Controlled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CDD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	0.75	0.75	0.75	0.243	0.88	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.24E-02	8.00E-03	2.93	4.26E-05	1.07E-05	2.93E-04	-	8760	Thermal Gasifier - WVDEF 1-S (From - I)
Fugitive Emissions	0.24	0.24	0.24	Round Numbers Ref Table 9.3.1 Fugitive (FG), Ref Table 9.3.1 - Average and Ref Table 9.2.1 - Material Handling (MH)															Fugitive Emission
Material Handling	0.101	0.0739	-																Material Handling
5-EGS	-	0.1501	-	0.418	0.0885	-	-	-	-	-	0.008	-	0.633	-	-	-	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	1.09	1.214	0.99	0.661	0.9685	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.25E-02	8.00E-03	3.563	4.26E-05	1.07E-05	2.93E-04	0.168		Sub-Total LB/HR
Sub-Total TPY	8.322	5.3173	4.3362	2.8951	4.242	2.01E-07	2.97E-09	3.42E-07	3.64E-08	3.40E-01	5.45E-02	3.50E-02	15.6	1.86E-04	4.69E-05	1.28E-03	0.7358		Sub-Total TPY

Table 9.4.1A - Facility Wide Emissions - Uncontrolled

Unit I.D.	Emission "Uncontrolled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CDD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	3.85	1.125	1.125	2.43	2.00	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.79	8.00E-03	2.93	6.00E-02	1.40E-01	2.93E-04	-	8760	Thermal Gasifier - WVDEF 1-S (From - I)
Fugitive Emissions	0.32	0.32	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Fugitive Emission
Material Handling	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Material Handling
5-EGS	-	0.1501	-	2.71	0.1725	-	-	-	-	-	0.008	-	3.81	-	-	-	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	4.32	1.7451	1.595	5.14	2.1725	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.798	-	6.74	6.00E-02	1.40E-01	0.381	0.168		Sub-Total LB/HR
Sub-Total TPY	18.92	7.643	5.55	22.51	9.515	6.65E-05	3.59E-05	2.967E-05	2.579E-04	12.13	7.875	-	29.52	2.63E-01	6.123E-01	1.28E-03	1.668		Sub-Total TPY

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.2 and 9.4.2A

Table 9.4.2 - Facility Wide Metal Emissions - Controlled										
Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Controlled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-		Sub-Total LB/HR
Sub-Total TPY	5.45E-04	5.27E-05	2.67E-04	1.38E-05	6.93E-04	2.41E-04	3.94E-03	-		Sub-Total TPY

Table 9.4.2A - Facility Wide Metal Emissions - Uncontrolled										
Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Uncontrolled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-		Sub-Total LB/HR

Reference Items 9.0 & 10.0

45CSR - 13 and Hazardous Air Pollutants (HAPs)

See Reference - Emission Summary Table 9.4.1
9.0 - 45CSR 27 -Table A Fugitve Emissions of Toxic Air Pollutants

10.0 - 45CSR13 - Table 45-13A - Hazardous Air Pollutants

Pollutant		lb/hr	lb/XAR	Potential Emission Rate (pounds/year)
Acrylonitrile	TAP			500
Allyl Chloride	TAP			10,000
Arsenic Compounds (Inorganic)	TAP	0.000012	0.10512	200
Asbestos	TAP	0	0	14
Benzene	TAP	0.00013	1.1388	1,000
Beryllium	TAP	0.000003166	0.02768	0.8
1,3 Butadiene	TAP			500
Carbon Tetrachloride	TAP	0	0	1,000
Chloroform	TAP	0.0000486	0.425	1,000
Ethylene Dichloride	TAP			1,000
Ethylene Oxide	TAP			500
Formaldehyde	TAP	0.000198	1.7348	1,000
Lead or lead compounds	TAP	0.00000426	0.3731	1,200
Mercury	TAP	0.000293	2.5668	200
Methylene Chloride	TAP		3.833	5,000
Propylene Oxide	TAP			5,000
Trichloroethylene	TAP	0	0	10,000
Vinyl Chloride	TAP	0	0	1,000
Vinylidene Chloride	TAP			2,000
Solenium	TAP	0.0000082	0.007183	2,000

Further detail please See Table 9.4.3 thur 9.4.6 in Attachment 'N'

POPULATION HEALTH DIVISION
SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

ATTACHMENT "D"

FactSheet

Guidelines for Handling and Storing Medical Waste

Many types of facilities can generate medical waste: hospitals, clinics, physicians' offices, dental practices, laboratories, blood banks, veterinary hospitals/clinic, and medical research facilities. Medical Waste may be either non-infectious or infectious.

Non-Infectious Waste

Non-Infectious waste is waste at a hospital or health care facility that has not been contaminated with blood or other human body fluids. This includes commonly occurring waste such as IV bags, tubing, non-bloody gloves, packaging and urine-soaked pads.

Disposal of Non- Infectious Waste

Non-infectious waste does not need to be disinfected and can be discarded in the regular trash can with other solid waste. Staff who may come in contact with both infectious and non-infectious waste should receive training on an annual basis to ensure that they are able to successfully identify both.

Infectious Waste (Medical Waste)

This is waste that may be contaminated by blood, body fluid or other potentially infectious materials (OPIM). Medical Waste is divided into two categories: biohazardous or sharps.

How do you know if an item is contaminated?
If the item is soaked with blood, body fluid or OPIM (dripping with blood/body fluid when squeezed)

UNIVERSAL PRECAUTIONS

The Bloodborne Pathogen Standard states that universal precautions should be taken when people are exposed to blood/body fluids. Implementing Universal precautions is an approach to infection control where all human blood/body fluids are treated as infectious. In other words treat all blood/body fluid as if infected whether you think it is or not.

How are workers exposed to Medical Waste?

- Needle sticks or cuts from used needles or sharps
- Blood or OPIM coming in contact with your eyes, nose, mouth or broken skin
- Splashes or punctures

How can you protect yourself?

- Get the hepatitis B vaccine
- Read and understand your employer's Exposure Control Plan.
- Use Best Management Practices (BMP) whenever practical. Common BMP include:
  - Hand washing is one of the most important practices and easiest ways to prevent exposure.
  - Dispose of used sharps promptly into an appropriate sharps disposal container.
  - Use personal protective equipment (PPE), such as gloves and face shields, every time there is a potential for exposure to blood or body fluids.
  - Clean work surfaces with germicidal products.

STORAGE & HANDLING

Storage Containers should be:

- Closable
- Equipped with a tightfitting cover
- Puncture resistant
- Leak proof on sides and bottom
- In good condition, cleaned and decontaminated on a regular schedule

Biohazardous Waste
Place all biohazardous waste in a red biohazardous waste bag. The biohazardous waste bag must then be put in a rigid container for storage until it is picked up for proper disposal.

Sharps Waste
Place all sharps in a sharps container. Sharps containers must be sealed prior to being discarded or replaced.

Labels
Medical Waste Containers should be labeled with:

- Water-resistant labels
- The words □Biohazardous Waste□ for biohazardous waste
- The words □Sharps Waste□or the international symbol

All labels should be affixed to or printed on the outside of the container.

During use, containers for medical waste shall be:

- Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found (e.g., laundries);
- Maintained upright throughout use; and
- Replaced routinely and not be allowed to overfill.

When moving containers of medical waste from the area of use, the container shall be: Closed immediately prior to removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping

Medical Waste Accumulation Times

All medical waste must be disposed of in timely manner

Facilities generating more than 20 pounds of biohazardous or sharps waste per month may store the waste onsite at or above 32 degrees Fahrenheit for up to **seven days** without obtaining prior written approval from the enforcement agency.

Facilities generating less than 20 pounds of biohazardous waste per month may store the waste onsite at or above 32 degrees Fahrenheit for up to **thirty days.**

Biohazardous or sharps waste may be stored onsite at or below 32 degrees Fahrenheit for up to **ninety days** without obtaining prior written approval from the enforcement agency.

The enforcement agency may require more frequent removal if odors from biohazardous or sharps waste poses a nuisance.

What you should do if you're exposed?

- Wash needle sticks and cuts with soap and water
- Flush splashes to nose, mouth, or skin with water.
- Irrigate eyes with clean water, saline, or sterile wash
- Report all exposures promptly to ensure that you receive appropriate follow up care

How can facilities improve safety and health for workers?
You can improve safety by participating in the following activities:

- Identify and evaluate hazards and adopt interventions to prevent work-related injuries
- Identify employees with occupational exposure
- Provide training
- Develop Minimum Standards

For more information

U. S. Department of Labor Occupational Safety and Health Administration
https://www.osha.gov/OshDoc/data_BloodborneFacts/bbfact04.pdf

California Department of Public Health
http://www.cdph.ca.gov/certlic/medicalwaste/Documents/MedicalWaste/2013/MWMAfinal2013.pdf

San Francisco Department of Public Health
Hazardous Materials and Waste Program
Environmental Health Branch
Population Health Division
1390 Market Street, Suite 210
San Francisco, California 94102
415.252.3900
www.sfdph.org/dph/eh

POPULATION HEALTH DIVISION
SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

ATTACHMENT - "D"

Attachment E - Site Plots

Plot Plan
Solid Medical Waste Gasification
Waste-To-Energy Facility

5334 Point Pleasant Rd, Ravenswood, WV 26164
Brown Field - Old Belt Wale House Plant - Aluminum fabricating shop

See Annex-1
22-200-05G1 - See Attachment B&E scale: 1"=50'

Reference Coordinates

- UTM - Easting – 431161.06
- UTM - Northing – 4308549.80
- UTM Zone - 17 S
- Longitude: 38.923164
- Latitude: -81.79419

Total Building Area: 13,200 sq ft

Plant from sea level EL 182.79 - 599.57 feet above sea level

Plant floor EL - 599.57' ± ft

Transportation

- Nearest highway: US Route 33
- Distance to major highway - 0.9 miles
- Nearest interstate: I-64
- Distance to interstate: 5.5 miles exit 48
- Occupied structure

LEGEND

PROJECT INFORMATION	REVISIONS
	1.
	2.
	3.
	4.
DATED: 4/9/2020	

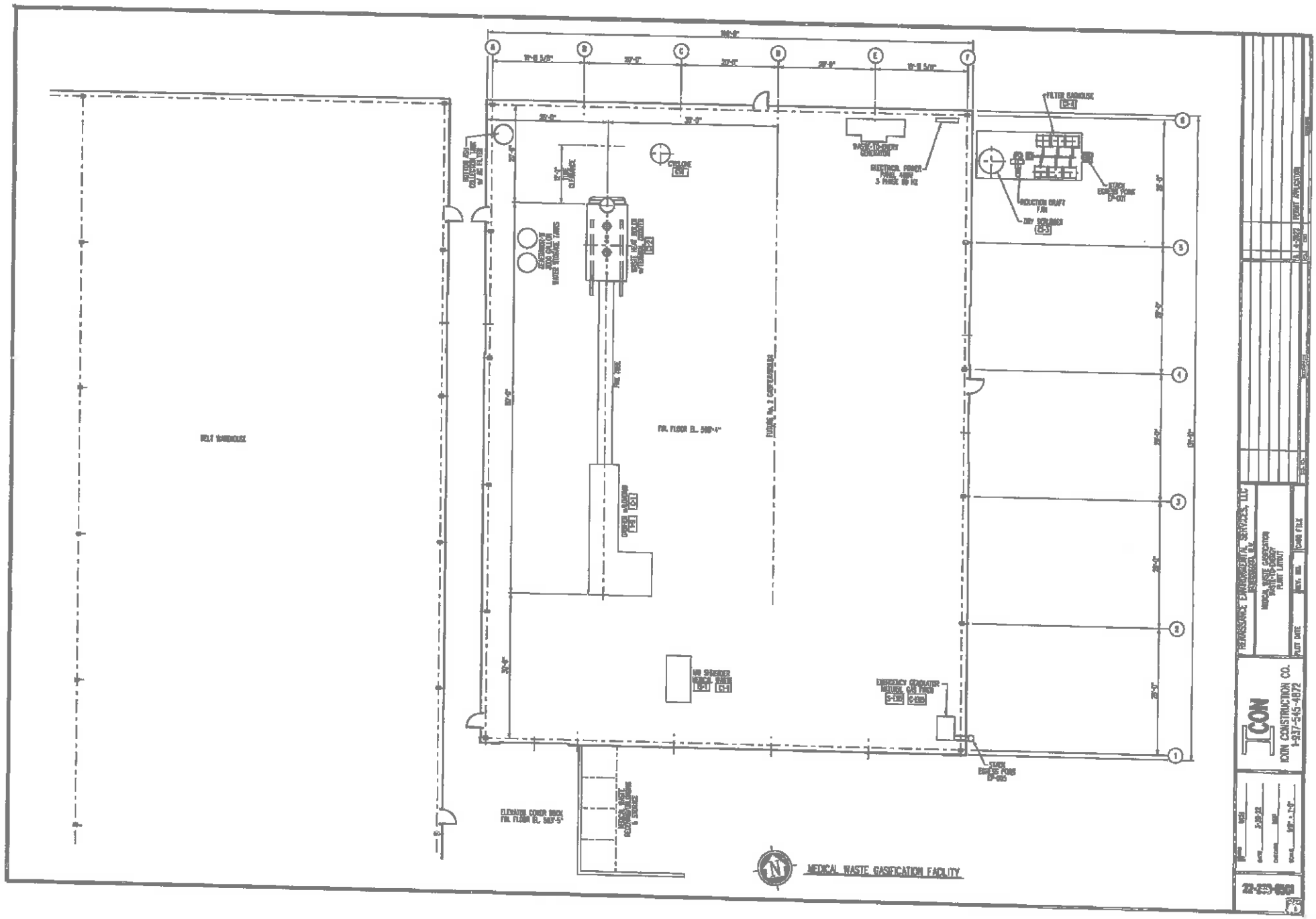
PICKERING ASSOCIATES
Architects • Engineers • Surveyors
1500 WARREN AVENUE, PARKERSBURG, WV 26101
(304) 464-5700 PICKERING USA.COM

JACKSON COUNTY, WV

TOPOGRAPHIC SURVEY
PREPARED FOR
REMAINANCE ENVIRONMENTAL SERVICES

SHEET# 01

PROJECT # 2020097



ICON CONSTRUCTION CO.
1-937-545-4072

Attachment F

Detail - Process Flow Diagram(s)

Flow Diagram - See Annex-1

*Please note following drawings are prepared for (Renaissance Environmental Services, LLC) TME West Virginia Plant

22-200-05G1 – Medical Waste-To-Energy Plant Layout

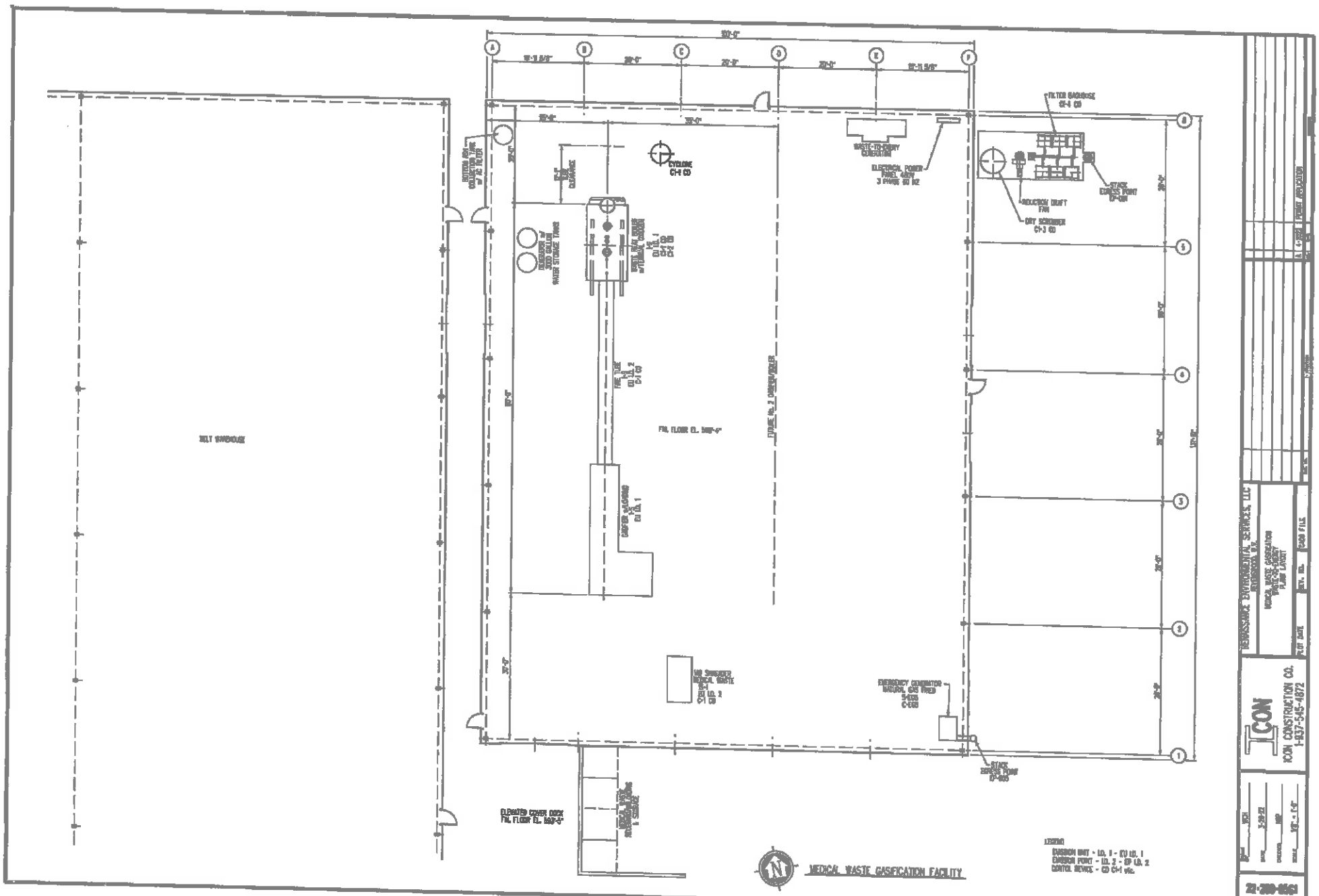
22-200-05G2 – Site Map

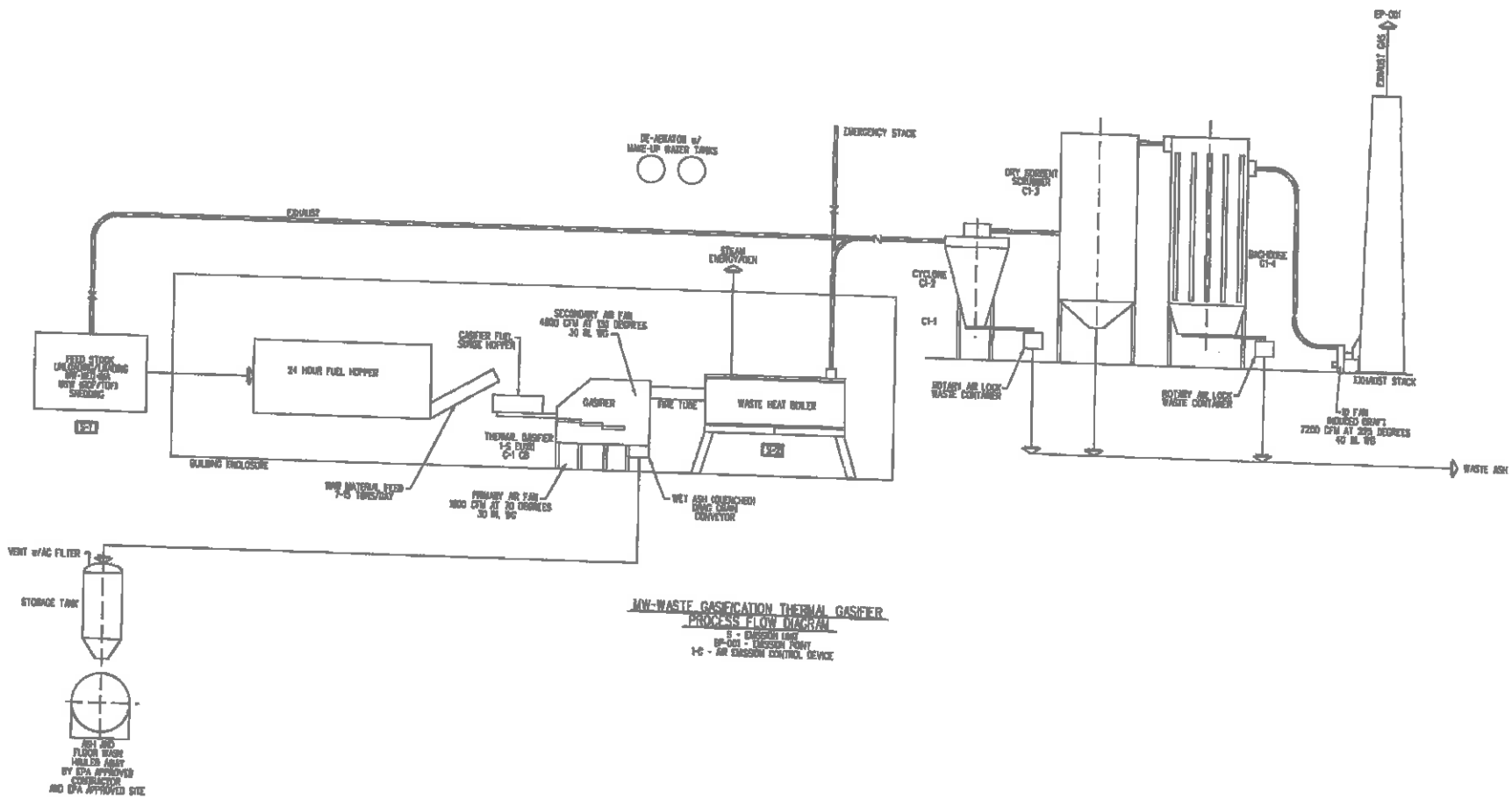
22-200-05M1 – Medical Waste-To-Energy Process Flow Diagram

22-200-05M2 – Medical Waste-To-Energy Flow Diagram - Power Generation

22-200-05M3 – Medical Waste-To-Energy Flow Diagram - DSI/AC-Injection

22-200-05M4 – Medical Waste-To-Energy Air Pollution Control - APCD Diagram


SALT WAREHOUSE
CYCLONE CY-1 CD
FIN. FLOOR EL. 949'-0"
CYCLONE No. 2 UNDER WATER
WASTE-TO-ENERGY GENERATOR
ELECTRICAL POWER PANEL 480V 3 PHASE 60 HZ
FILTER BAGHOUSE CY-1 CD
INDUCTION DRAFT FAN
DRY SCRUBBER CY-3 CD
STACK EXHAUST POINT CP-1 CD
AIR SPARGED MEDICAL WASTE SY-1
EMERGENCY GENERATOR NATURAL GAS FIRED
STACK EXHAUST POINT CP-2 CD
ELEVATED COVER DOCK FIN. FLOOR EL. 950'-0"
MEDICAL WASTE GASIFICATION FACILITY
LEGEND
EMISSION UNIT - I.D. 1 - EU I.D. 1
EMISSION POINT - I.D. 2 - EP I.D. 2
CONTROL DEVICE - CD CY-1 etc.
ICON CONSTRUCTION CO.
1-937-545-4872
21-200-052

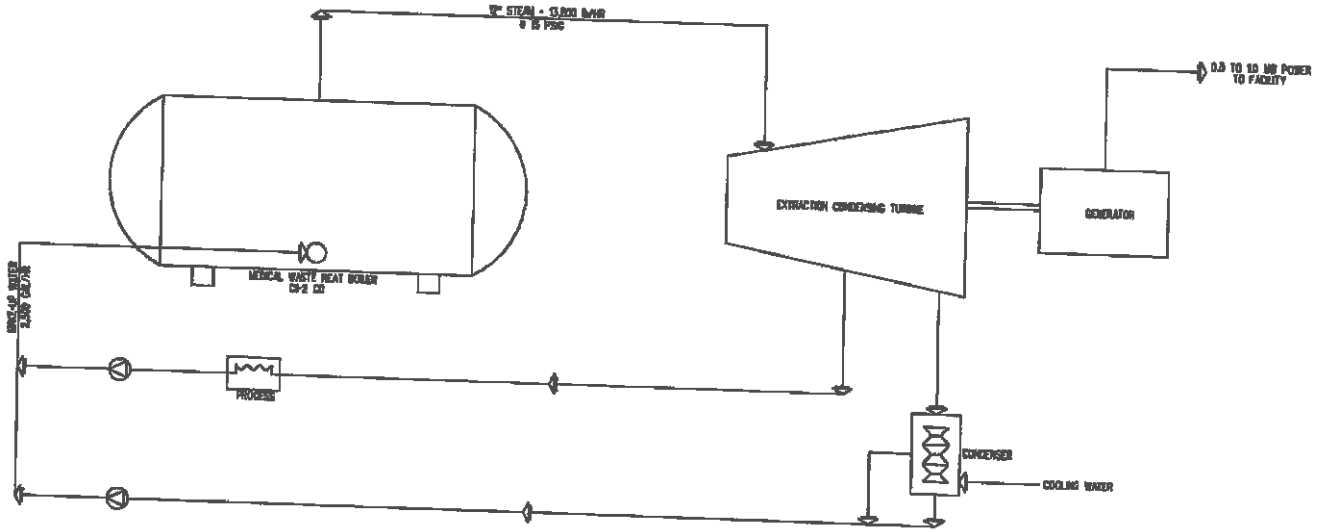


MW-WASTE GASIFICATION THERMAL GASIFER
PROCESS FLOW DIAGRAM

S - EMISSION UNIT
EP-001 - EMISSION POINT
1-C - AIR EMISSION CONTROL DEVICE

NEWSOURCE ENVIRONMENTAL SERVICES, LLC
ICON CONSTRUCTION CO.
1-937-545-4972

22-200-05M



FLOW DIAGRAM WASTE TO ENERGY

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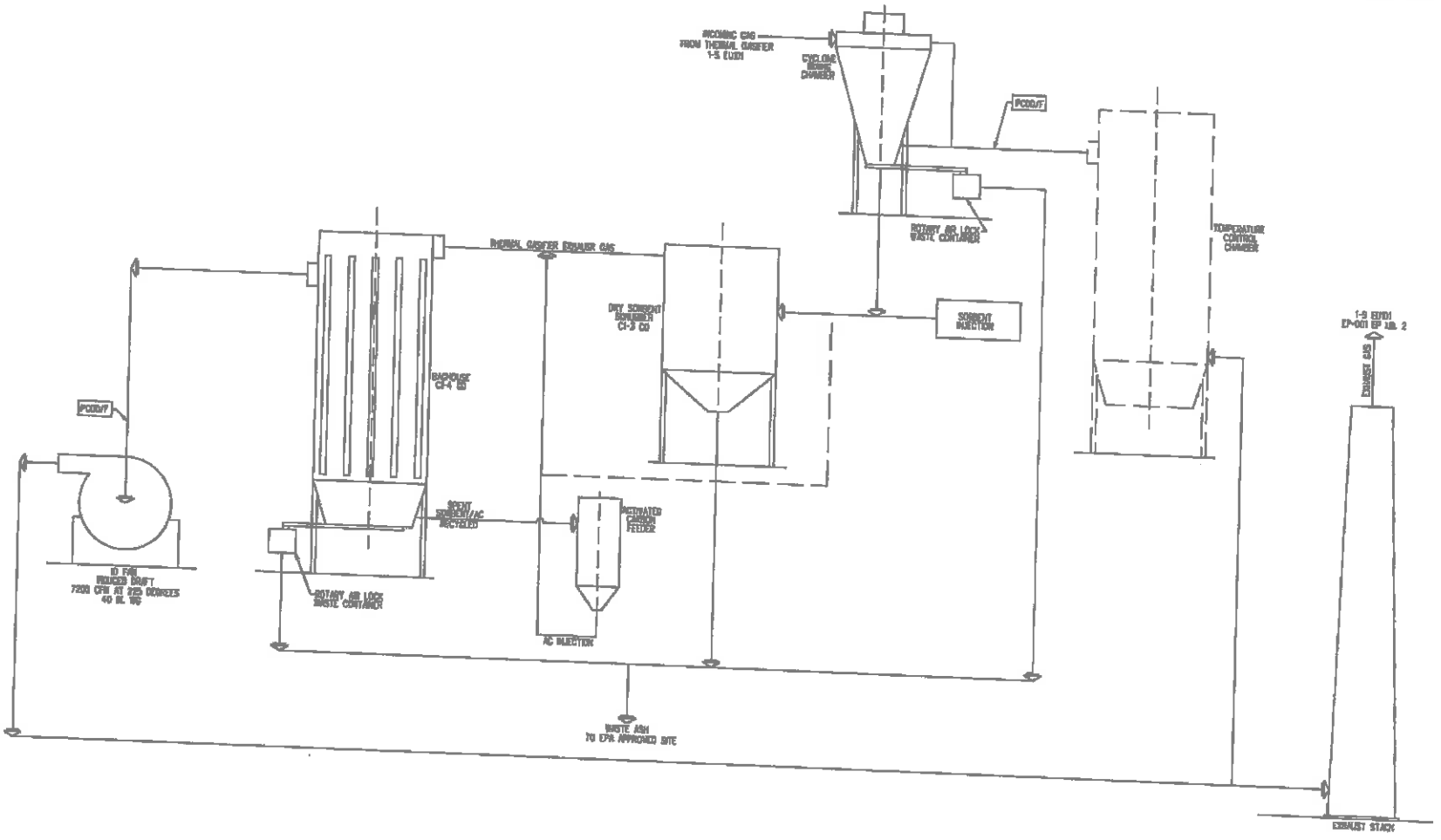
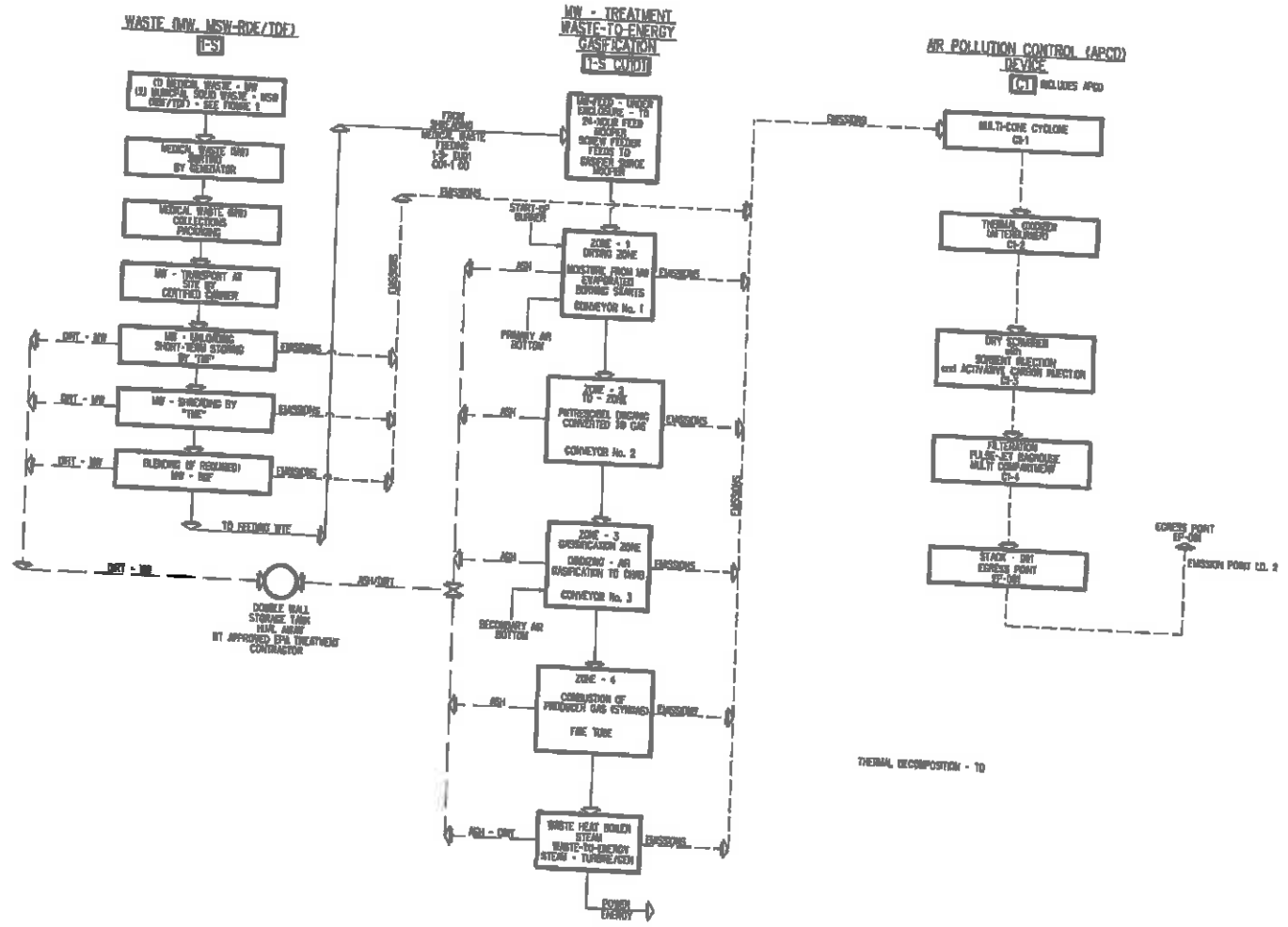
1-937-545-4972



FLOW DIAGRAM OF DRY SOLVENT/ACTIVATIVE CARBON
INJECTION TO CONTROL PCDD/F
AIR POLLUTION CONTROL SYSTEM (APC)

ICON CONSTRUCTION CO.
1-937-548-4872



PROCESS BLOCK DIAGRAM

ICON
ICON CONSTRUCTION CO.
1-937-845-4972

Attachment G – Process Description
Table of Contents
Section 1.0
Introduction

Executive Summary

Thunder Mountain Environmental Services LLC (TME) a West Virginia company is submitting an application to West Virginia Department of Environmental Protection (WVDP) for minor source air permit for Hospital Solid Medical Waste Gasification unit.

The gasifier unit will receive pre-processed medical hospital waste and convert the waste to energy. The Medical Waste (MW) may be combined with Refuse Derived Fuel (RDF) and to maintain energy vale for continuous operation. The feedstock input = 10-20 tons per day, Energy content 5000-15000 Btu/lb.

The solid waste gasifier will convert to producer(gas) at high and low pressure. The producer gas will be burned at waste heat boiler to generate steam/power.

The exhaust gas leveling the gasifier unit will consist of thermal oxidizer, cyclone, dry sodium scrubber, and baghouse to remove particulate matter. See Attachment "F".

Section 1.0 - Introduction

1.1 Introduction

The need for solid medical waste (SMW) treatment has been growing in recent years. According to the concept of sustainable waste disposal a successful treatment of MW should be safe, effective, and environmentally friendly.

Existing waste disposal methods have problems achieving this goal. For example, medical waste incineration can generate many hazardous air pollutants (HAPs) including lead, cadmium, dioxins and furans. The incineration ash by product may also cause major environmental problems. There are several alternatives for 'MW' treatment including microwave or autoclave. However, these technologies are not suitable for all type of medical waste (MW). Another key challenge for MW disposal is the ability to cope with heterogeneous properties of medical waste. So far there has not been a commercially available solution to overcome all these challenges, creating need for new technology with a comprehensive solution. Prevailing alternatives are either cost prohibitive or lack of proven track record.

In order to provide a cost effective and environmentally friendly solution a gasification has been developed. The technology called "thermal gasification" has been developed to satisfy the need for MW treatment by transforming it into producer (synthesis) gas and byproducts ash suitable for construction materials.

This thermal gasification (TG) process which has higher energy efficiency conversation of energy embedded in the waste to a high yield producer gas. The producer gas will be used waste-to-energy conversion.

1.2 Project Description

This TME medical waste (MW) treatment plant will use the thermal gasification technology to convert medical waste into producer gas and benign reside (ASH). Both system output materials may be considered as a secondary material since they have commercial use in other processes.

The thermal combustor (thermal gasification unit) operates in two distinct phases. The first stage of combustion involves the gasification of all the gaseous components in the (waste) fuel from the solid matrix. The second stage in the combustion process takes these gaseous fuels and extracts all the available energy through a controlled oxidation. This system can operate using variety of fuel including "MW" and other fuel type (RDF, TDF, etc). "TME" is not using other fuels.

Once producer gas is produced in the second stage, it is transferred to the thermal residence chamber to assure destruction of dioxin and other hazardous materials due to high calorific value of gas, minimum amount of possible fuel (such as LPG or NG) are sequined to safely assure the ignition of the producer gas. The producer gas (PG) will be blown into firetube heat recovery steam generator.

The gas is fed into heat recovery steam generator (HRSG) to produce superheated steam for use as heat or electricity generation using steam generator. The exhaust gas leaving the HRSG will enter Air Pollution Control (APCD) System. The APCD will consists of thermal oxidize cyclone, dry alkali injection scrubber, emergency stack, dust collector filter (bag house), induced draft fan, stack – Egress Point EP-001.

These technologies are combined to create an economically viable and environmentally friendly solution for converting medical waste (MW) into energy.

This gasification process which has high energy efficiency and over 90% plus conversation of energy embedded in the waste to a high yield producer gas with benefits of producing benign reside of ash.

Medical waste gasification involves converting waste to energy. Wastes are produced by hospitals, veterinary facilities, and medical research facilities, etc. The waste includes both infectious ("red bag") medical waste as well as noninfectious general housekeeping wastes.

Waste Composition

Waste Composition wt%	Percentage Range (varies) %
Carbon-C	25-60
Hydrogen-H	4-10
Oxygen O	0-30
Nitrogen-N2	0-5
Sulfer (S, SO2, H2So4)	0-5
Chlorine (Cl, HCL)	0-15
Voc (THC)	
Oxides	(0-40)

Metals	(1-5)
H2O	1-20
HHV (Btu(16))	4,500-15,000

Medical Solid Waste/Medical Waste (MSW/MW)

a. MSW Sorting, Transport, and Shredding

Sorting and separation is performed by the generator; certified transporter will transfer the initial prepared waste to TME. TME will perform shredding at the site, will reduce the size of large homogenous items. (one to two inches in size), thereby making them suitable for further handling and feeding system.

Shredding is used for fragmenting inhomogeneous waste into small normally homogeneous parts. In the shredding process, temperature of shredded items may reach several hundred degrees. Shredding will cause emissions to air depending on the system. The exhaust will be directed to APCD system - Egress Point EP-001

b. Treatment-Units

The Gasification unit is designed to operate on a continuous basis which consists of feed stock and surge hopper, feeder, (MFG8) thermal gasifier -with three feed conveyor, firetube waste heat boiler and air pollution control system.

The gasifier is designed for processing multiple forms of hydrocarbon-based fuel such as RDF, TDF and HMSW, with energy content 5000-15000 btu/lb. Feed stock input 7-20 tons per day (TPD) through various temperature zones in the gasification chamber. Rated capacity of gasifier is 8.4 mm btu/hr, (Ref DWG 22-200-05M1). "TME is only medical waste.

The HMSW passes through several zones of the gasifier which include drying zone, oxidation zone, combustion zones, via conveyor NO1, NO2 and No3, and finally the producer gas passes through the fire tube boiler - waste to energy conversion.

- Zones

Zones	Function	Temperature Range
Drying Zones	Heating -Removal of water (air less than the stoichiometric) Combustion air-primary air 1800 CFM@70°F 30" WG Air enters the First conveyor (or chamber) from beneath (below the burning bed of waste) This air is called primary	400° to 600° F

	or under fire air. This low air waste ratio dries and volatilization of water and most of the residual carbon in ash burns.	
Oxidation Zones	The second conveyor receives waste from first conveyor. The secondary air (4800 CFM) is added to the volatile gases formed in first and second conveyor to complete combustion. Temperature is higher than first conveyor.	1500° to 1800° F
Combustion Zone	The Third Conveyor receives waste from second conveyor. In this stage all residual carbon in the waste is burned. Combustion of volatiles is completed due to turbulent motion of the waste in the chambers. From First, the ash underneath of the conveyors will be removed by drag chain conveyor. (Conveyor will be washed with water. Ash will be collected in tanks)	1800° to 2000°F

1.3 General

The Thunder Mountain Environmental Services LLC (TME) is a West Virginia based company. The company will treat the prepared medical waste. It will treat 15 to 20 tons of medical waste. The proposed TME treatment facility will be located at 5334 Point Pleasant, Ravenswood, WV 26164.

At this time, TME is submitting this application for an air permit. The air permit application addresses the West Virginia Department of Environment Protection and Division of Air Quality (WVDEP-DAQ) and United States Environmental Protection Agency's (USEPA or EPA) air

quality permit requirements and requests issuance of an appropriate construction and operating permit. This permit will allow the installation and operation of the following.

- Feedstock feeding preparation
- Medical Waste Gasification
- Waste-to-Energy generation

1.4 Expected Design Parameters

Several of the key design parameters of the new facility are summarized in Table 1.5.

Table 1.4 Expected Design Parameters

Description	Quantities		Units
	Input	Output	
Product:			
Producer gas	16738	13390	MBH
Steam@15 psig		13800	lb/hr
Water for waste heat boiler	1700		GPM
Feed Materials:			
Medical Waste MW	7300		Tons/yr
Sorbent - $NaHCO_3$ or $CaOH_2$	400	Varies	Tons/yr
Ash & Spent Sorbent (Waste) - BIOCHAR	200	Varies	Tons/yr

1.5 Thunder Mountain Environmental Service, LLC Site Location and Contact Information

Plant Location 5334 Point Pleasant Rd Ravenswood, WV 26164	
UTM Zone: 17	Easting: 431161.06 Northing: 4308549.80 Latitude: 38.923164 Longitude: -81.794119 Zone – 17S Total Building Area: Approx. 13,000 sq. ft. Floor Elevation: 598.6 feet
Applicant	Thunder Mountain Environmental Service, LLC
Project Technical Information And Development Contact	Mr. Naren R. Patel 42 Pinehurst Place Springboro, OH 45066
Air Permitting Consultant	Icon Construction, Inc.
Air Permit Application Contact	Mr. Naren R. Patel Springboro, OH Phone: (937) 748-4196 Cell: (937) 545-4872 Email: npatel@iconconstructioninc.com

1.6 Operation

The prepared medical waste will be delivered to the TME site by certified transport contractor. TME will shred and grind the feedstock to the feed system of the gasifier.

The TME project involved the construction of a next generation waste-to-energy facility. The source was a custom-built gasification unit, Vista's Thermal Gasifier. The system utilized efficient gasification, followed by standard steam boiler with low-NOx burner and oxidizer with flue gas recirculation, and effluent gas treatment through a standard 60" diameter cyclone, semi-dry absorber, spray dry absorber, or dry scrubber, and (IAC Systems - Model 120BHI-A3-144:60S) baghouse – fabric filter (FF).

The source was capable of processing multiple forms of hydrocarbon-based fuel (HSMW, RDF, TDF), and was operated using various feedstocks with energy content values of 5000 – 15000 BTU/lb. The unit was designed to operated on a continuous basis, using chambers moving fuel belts to convey the feedstock (7-20 tons per day) through various temperature zones in the gasification chamber. The rated capacity of the MFG-8 Thermal Gasifier is 8.4 MMBTU/hr. A block diagram of the process flow included is included in Attachment 'F'.

This Waste-to-Energy system will generate power by using steam boiler/turbine and generator. The power will be used to operate the facility.

1.7 Emissions Summary

The project is expected to include the following sources of air pollutant emissions.

- By-product/waste gas from Medical Waste (MW), gasification units, reheat boiler, cyclones, thermal oxidizer, equipped with semi DSI system, and a baghouse.
- Material handling operations, controlled primarily by dust collectors (bin vents and filters).
- Truck traffic-generated (haul road) fugitive dust.

The Emission includes:

- HCL - Hydrochloric Acid
- HF – Hydrofluoric Acid
- HBR – Hydrobromic Acid
- PM – Particulate Matter
- SO_2 – Sulfur Dioxide
- CO – Carbon Monoxide
- Dioxins/Furnas
- VOC – Volatile Organic Compounds
- NOx – Nitrogen Oxide
- Pb – Lead

- Cd – Cadmium
- Hg - Mercury

1.8 Land Use Information

The site is currently an unincorporated area in the city of Ravenswood, WV. No zoning certificate, building permit, or inspection is required.

- Cd – Cadmium
- Hg - Mercury

1.8 Land Use Information

The site is currently an unincorporated area in the city of Ravenswood, WV. No zoning certificate, building permit, or inspection is required.

Attachment "G"
Table of Contents
Section 2.0
Project Overview

2.1 General Facility Information

TME is proposing to construct a Brownfield facility dedicated to the treatment of "Medical Waste" to enable industry to meet their impending emission control requirements. The facility will use prepared "Medical Waste" along with RDF and TDF fuel for the treatment of medical waste. This is Waste-To-Energy generating process for medical waste.

In terms of standard classification (SIC) code, this facility is categorized under Industrial 49539904 with NAICS code 562219, Landfill 562211, and OSHA compliance.

This facility will be located at:

5334 Point Pleasant Road
Ravenswood, WV 26164

2.2 Feedstock

There are several different kinds of medical waste.
Hospital solid medical waste consists of the flowing,
See Annex-2, The categories of Waste for further details

1. Infectious
2. Hazardous
3. Radioactive – not used by "TME" (except embedded insignificant quantities)
4. Sharps
5. General

1) Infectious Medical Waste

Infection medical waste (IMW) is any sort of waste that is capable of producing or spreading infection. This type of waste should be handled with extreme caution and only by those specifically trained.

Example of infectious waste include:

- Personal Protective Equipment
- IV Tubing
- Sharps
- Body Tissue or Organs
- Wound Pressings

Separating: Red container and bags

2) Hazardous Medical Waste

Hazardous medical waste has a characteristic that makes them too dangerous to be mixed with other type of waste. Exposure to hazardous materials can cause difficulty breathing, skin & eye irritation, and other ailments.

Example of hazardous waste include:

- Metal that can rust
- Corrosive
- Pesticides and Herbicides
- Chemical and Paints
- Fluorescent light bulbs
- Batteries with mercury
- Poisons
- Medications

Separating: Black Containers

3) Radioactive Medical Waste – (not used by "TME" thermal gasification process)

Radioactive is one of the most dangerous types of medical waste if handled improperly. Exposure to it can lead to many severe long-term ailments. Much of radioactive waste produced in healthcare field comes from radiation therapy. "TME" will not use any radioactive medical waste except for undetectable embedded with other waste.

Example of radioactive waste include:

- Sharps used for radiation
- Clothing and utensils used for radiation
- Any disposable materials that come in contact with radioactive rays

Separating: Shielded containers with **radioactive symbol – not used by "TME" plant**

4) Sharps

Sharps are defined as any medical utensil that can puncture human or animal skin. Sharps are used frequently in healthcare settings, especially for vaccinations, drawing blood, and inserting an IV. They have their own containers specially made for disposal.

Example of Sharps include:

- Needles
- Lancets
- Syringes
- Scalpels
- Autoinjectors

Separating: Puncture resistant containers with **Biohazard symbol**

4) General Medical Waste

General medical waste is really no different than waste generated from households. General waste is typically the bulk of waste in a medical facility.

Example of general medical waste include:

- Paper
- Plastic

5) General Office Waste

Separating: Shredding and trash bins

2.3 Medical Waste Collection and Preparation

Segregation and Packing:

Segregation should always be the responsibility of the waste procedure. It should take place as close as possible to where the waste is generated and should be maintained in storage areas as well as during transport.

The most appropriate way of identifying the categories of healthcare waste is by sorting the waste into color coded plastic bags or containers.

Shredding:

Hazardous, medical, pharmaceutical, and hospital waste will be shredded in class 1 Div 1&2 environments, oxygen starved processing chambers, double airlock systems, fire detection and suppression, deflagration vents, pressing and shipping to "TME" by outside contractors in bulk.

Recommended Color Coding for Healthcare Waste (REF)

Type of Waste	Color of Container and Marking	Type of Container
Highly infectious Waste	Yellow Marked "Highly Infectious"	Strong leak proof plastic bag or container capable of being autoclaved
Other infectious waste Pathological and anatomical Waste	Yellow	Leak proof plastic bag or container
Chemical and Pharmaceutical Waste	Brown	Plastic bag or container
Sharps	Yellow Marked "Sharps"	Puncture proof container
Radioactive Waste (Only major hospitals)	Gray or other noy used by "TME"	Lead box labeled with Radioactive symbol
General Healthcare Waste	Black	Plastic bags

Handling Storage and Transportation of Healthcare Waste

Collection:

Waste shall be collected daily or as frequently as required and transported to the designed central storage area.

Storage:

72 hours in winter
48 hours in summer

Cytotoxic waste is stored separately. (If and Only insignificant embedded with other waste)

The storage area shall have an impermeable hard standing floor with good drainage.

- It shall be easy to clean and disinfect
- Water supply
- Easy access for waste collection vehicles
- Protected from the sun
- Inaccessible to animals, insects, and birds
- Good lighting and passive ventilation

Transportation:

1. Onsite Transport of Waste

- Wheeled trolleys
- Easy to load and unload
- No sharp edges during loading and unloading
- East to clean
- Vehicles shall be cleaned and disinfected daily with appropriate disinfectant

2. Offsite Transport of Waste

The healthcare waste producer is responsible for safe packaging and adequate labeling of waste to be transported offsite and for authorization of it destination.

Packaging and labeling should comply with national regulation governing the transport of hazardous waste.

- Consignment form
- Route of transport carrier
- Transporters have license from state of WV Heath and Safety code
- Tracking documents
- Vehicles should be kept locked at all times except during loading and unloading
- Trucks shall be disinfected

General Guidelines for Shredding of Medical Waste

The waste is processed by shredding in a closed system to prevent release of the waste into the environment. Medical Sharps processed by grinding shall be done in a way that renders the waste incapable of creating a stick hazard.

The transporter will transport this waste and deliver to Thunder Mountain Environment LLC for treatment to meet EPA emission requirements.

The feedstock is "Heterogeneous". It's BTU and moisture value varies so it will be mixed to maintain consistent value per pound. This total waste will be shredded and fed to the thermal gasifier.

- **Hospital Solid Medical Waste Composition (HSMW)**

Medical waste also known as biomedical waste includes:

  - Infectious
  - Pathological
  - Chemical

- Pharmaceutical
- Cytotoxic
- Non-Hazardous
- General

Medical waste is divided into two main categories

- Non- Hazardous: Includes disposable masks and gloves, office material, food, etc
- Hazardous: Includes chemical, toxic, explosive, pathogenic

Medical waste is regulated by State Environmental and Health Department.

Waste Composition:

- Liquid: .6%
- Plastic: 14%
- Glass: 3%
- Food: 17%
- Metal: 3%
- Wood: 5%
- Biomedical: 5%
- Misc: 3%
- Paper: 45%

Hazardous Biomedical Waste:

- Pathological Waste: 1.7%
- Infectious Waste: (Including sharp objects) 80.3%
- Sharps Waste: 7.8%
- Pharmaceutical Waste: 2%
- Cytotoxic Waste: 2.8%
- Chemical Waste: 5.4%

Mixing the Waste

The Medical Waste will be mixed to maintain proper sizes and thermal value so that the thermal gasifier will have constant operation and emissions value.

Medical Waste Gasification

Gasification is a process that uses medical waste as a feedstock for a thermal-chemical conversion of the waste into high BTU synthetic gas. This is done in low oxygen and high temperature environment and causes material breakdown at the molecular level to carbon monoxide, hydrogen, and carbon dioxide. After treatment combustion gases are further treated and syngas is collected.

Producer gas will be used to generate steam/electricity in much the same way that natural gas can. Creating syngas or producer gas through gasification is creating "closed loop" when it comes to medical waste life cycle. The inherent energy in the waste itself can be used to generate steam/power that in turn will generate electricity.

With gasification, the medical waste produced by healthcare facilities are disposed of safely while also producing a renewable source of energy.

Paired with the proper feedstock preparation equipment, medical waste will be mixed, shredded, and fed into gasification system. The medical waste is broken down into producer gas.

Gasification offers low emission medical waste disposal. The amount of plastics mixed into medical waste is a concern for most waste disposal method. Common methods include sterilization, shredding, and either incineration or land disposal. Incineration is a "dirty" disposal method which creates harmful dioxins and other emissions while landfills keep filling up.

Converting medical waste into heat and electricity with minimum emission through gasification process breaks down any organic matter (matter containing carbon) into gas called producer gas or syngas.

Proper operating conditions becomes even more important when potentially dangerous pathogens are being destroyed. There are several factors which are critical to the proper function of any combustion system. Maintaining a somewhat steady temperature is important for consistent complete combustion. This can be difficult because of the heterogeneity of composition in medical waste streams where heat contents can be anywhere from 1000 Btu/lb to over 10000 Btu/lb. To safeguard against this happening 'RES' and 'VISTA' will properly mixed medical waste, so the gasifier temperature always maintains 1232 F (800 C). This gasifier makes enough turbulence by moving and transferring feedstock for reacting gases to promote complete combustion as required.

Process Description

Gasification is a process that converts organic matter (biomass and other organic waste) to a gas comprised primarily of carbon monoxide (CO), hydrogen(H2) called producer gas. The efficiency of the system is to do with the residency temp of the feedstock in the 4 "Zones"; Drying, pyrolysis, combustion, and reduction, it passes through as it breaks down into a gaseous form.

See Typical Analysis in Figure

Description	Zone	Temperature Range
Drying Zone	Heating - Removal of Moisture volatile gases	400 to 600 F
Oxidation Zone	Secondary air is added to the volatile gas combustion	1500 to 1800 F
Combustion Zone	Fire tube Boiler with Nox control	1800 to 2000 F

In summary, gasification has inherent advantage over combustion for emission control. Emission control is simpler in gasification than in combustion because the produced syngas in gasification is higher in temperature and pressure than exhaust gases produced in combustion.
These higher temperature and pressure allow for easier removal of sulfur and nitrous oxide and volatile trace contaminants such as mercury, arsenic, selenium, cadmium, etc. Gasification systems can achieve almost an order of magnitude lower criteria emission levels than typical current US permit levels.

Waste-To-Energy

Waste-To-Energy differ form traditional incineration of medical waste (MW) and municipal solid waste (MSW) in that thermal energy produced by the combustion of waste is used to generate steam which is directed to an electric generating turbine. The US EPA quotes a value of 22 Btu/ or higher for MW with high plastic content. Also, the US EPA describes Waste-To-Energy as a "Clean", reliable, and renewable source of energy.

Combustion Residues

In addition to emissions, combustion residue are another concern with WTE. There are primarily two categories of ash resulting from feedstock combustion; bottom ash and fly ash from baghouse.

Bottom Ash:

Consists of unburned proportions of waste from main combustion chamber. It typically has high metal oxide content and is not found to be toxic according to EPA leaching procedures. It is quenched and disposed at an EPA approved site.

Fly Ash:

Fly ash on the other hand comprise flue gases and filter dust from the APC's and usually have high level of toxic heavy metal including Cd and Pb (see TCLP results and VITINC test results)

In the US fly and bottom ashes are mixed, if the combined ash does not meet the WVDEP and EPA approval, it will be taken to an approved EPA site otherwise it will haul to regular sanitary dump.

2.4 Process Equipment

Thermal Gasifier

Thermal gasifier consists of series of conveyers placed one above the other in an enclosed horizontal lined. Waste is fed to the top of the first conveyor and passes it to a horizontal path on each zone. Waste is transferred from first to second, second to third conveyor. Generated gases flow concurrently to heat the waste to reaction temperature and to carry on designer reaction.

Gasifier area which heats transfer and mass transfer between the solids (waste) and gas phases depends, is provided in the most economical form with good complete combustion practice. The processing solids in a thin layer improves gas-solid contact, while temperature difference between the top and the bottom of the material is minimized.

Mixing and turning the moving material by gentle rabbling ensures uniformity, supports mass transfer, and contributes to even temperatures throughout the bed. The residence time can be accurately controlled because of the mechanical movement of material through the gasifier. Waste can be kept for any specified time at each temperature level and in each conveyor(zone) of the gasifier.

The proposed process is continuous and confers on waste is dried and completely combusted. Concurrently, the gases and water vapor emitted from the waste moves horizontally the same way mixing with the gases from one zone to others and passes to the firetube boiler and exits top of the gasifier. An emergency vent on the top of the gasifier is used to vent gasifier byproduct waste gas during upset conditions pas through the emergency stack.

Waste feed to the gasifier would be stopped immediately, the emergency vent will open, and movement of the conveyors will be reduced, slowing the generation of air pollution. Because the feed is stopped immediately, the quantity of potential emission is limited to what is generated by the process volume of the gasifier. In addition, as a result of process "ramp down", the temperature decreases and the rate at which emission generated is reduced. As such emission in excess of the proposed average mass rate from an upset condition are not anticipated. For shutdown the same procedure will be followed.

The hospital solid waste gasification facility is equipped with modern air pollution control to reduce emissions to the atmosphere. These controls are discussed in the following sections.

2.5 Gasifier- Air Pollution Control Device (APCD)

The emission from the shredding (DM) will pass through cyclones and merge with "Gasifier streams". It will now be referred to as "Gasifier emission".

Emissions associated with proposed Gasifier are Nitrogen Oxide (NOx), Caron Monoxide (CO), Volatile Organic Compounds (VOC), Hazardous Air Pollutants (HAPs) and Particulate Matters ($PM_{2.5}$ and PM_{10}). The gasifier will be equipped with thermal oxidizer/afterburner to assist in destruction of CO, VOC and HAPs. The reducing atmosphere within the gasifier will reduce NOx emissions along with the installation of Low NOx burners, addition of steam and Flue Gas Recirculation (FGR). A dry alkali-based sorbent injection and "AC" injection will control SO_2 and assist with NOx control and other emissions. The PM emissions will be controlled by baghouses. Calculated emissions are listed in Attachment 'D' and Attachment 'N' under Table 9.4.1 ang 9.4.2

- Cyclones

The by-product/waste gases exiting the top of the gasifier are ducted through cyclone type dust collectors designed to remove approximately 85-90% of the entrained solids in the gas. The particulate matter collected by these cyclones is pneumatically conveyed to the waste solids silo, where it is loaded into trucks for disposal. The cyclone shall be designed for the subject service. The flue gas exiting the cyclone passes to the thermal oxidizer/after burner.

- Thermal Oxidizers

Afterburner with FGR/Low-NOx Burner
After exiting the cyclones, the by-product/waste gases from the gasifier are routed to a thermal oxidizer/afterburner, where air and a small amount of natural gas (less than 10% of the design heat input) are introduced. This natural gas is used as a supplemental fuel to the by-product/waste gas in the afterburner to provide a pilot flame and maintain adequate flame temperature for efficient oxidation of organic compounds. From here on the thermal oxidizer is referred to as afterburner. The afterburner is designed for an approximate residence time of 1.0 to 1.5 seconds.

The hot temperature (expected to range from 1600· to 1800·F) in the afterburner reduces VOC (including organic hazardous air pollutants) and CO emissions. Approximately 10% of the waste heat recovery boiler exhaust gases are recirculated to the afterburner (i.e., FGR) to lower the flue gas temperature and reduce NO_x formation.

NO_X Evaluation
The formation of thermal NO_X is affected by three furnace-zone factors.

(1) Oxygen concentration

(2) Peak temperature
(3) Time of exposure at peak temperature

As these factors increases, NOx emissions increases.

The thermal NO_X formation is controlled by the following.

- Preheating combustion air
- Steam injection
- Use of dry sorbent injection
- Low NO_X burner coupled with high temperature with reducing gas conditions during the startup process.
- At high temperatures, reducing conditions and in presence of carbon, NO_X is readily reduced to N_2.

Furthermore, the thermal oxidizer operates with preheating and moisture injection, air injection into the thermal oxidizer combustion zone coupled with low NO_X burners to further prevent or reduce NO_X formation ensuring that the DOE-cited NO_X emission rate for similar processes remain conservative.

Due to the inherently nominal NO_X derived from the (HSMW) gasifier, methods for additional system of NO_X control focuses primarily on the prevention of NO_X formation in the thermal oxidizer rather than on destruction of NO_X from the thermal oxidizer.

The exhaust temperature, along with oxygen content levels, will be monitored to ensure proper operation of the afterburner. Afterburner is a self-supported vertical cylindrical chamber with a lined inside refractory. The design incorporates a mixing zone, choke ring, and a minimum residence time of greater than one second. It is equipped with two low NO_x burners with Flue gas recirculation (FGR) also, utilizing heated combustion air. Afterburner chamber is fitted with necessary hot air injection and steam nozzles which are placed to provide combustion air and turbulence to facilitate the oxidation of organic material in flue gas. The afterburner chamber design temperature, residence time and mixing are such that the VOC and CO destruction efficiency are 99%. Oxygen is monitored to ensure that good combustion is maintained.

- **Waste Heat Recovery System with Steam Generator**

The flue gas exiting afterburner and combustion zones passes through an unfired waste heat recovery boiler and economizer to make steam. As a whole, the gasification process is exothermic, producing more heat than it consumes. The waste heat from the process will be used to generate steam. The balance of this steam is used to dry the feedstock, heat the combustion air and other processes at the gasifier. The steam loop will generate no air pollutant emissions.

Exhaust gas from afterburner shall pass through a modular construction straight in header connection heat recovery steam generator. Exhaust gas @ 1600 °F to 1800°F will generate steam. Discharge gas shall be at 300° to 350°F. System shall consist of steam drum, economizer, and feed water and condensation collection system.

- **AC Injection**

The flue gas exiting the waste heat recovery boiler is treated with a mercury adsorption system using AC produced on site. The AC is pneumatically conveyed to the injection system located just upstream of the Semi Dry Absorber (SDA) scrubber or in between the SDA and fabric filter baghouse. The system is designed to achieve at least an 80% reduction in mercury emission to atmosphere.

After treatment for mercury removal, the exhaust gas stream is treated for SO_2 (and H_2SO_4 - Acid) removal by injecting Dry Sorbent Absorption (Scrubber), which uses dry sodium carbonate.

- **Dry Sorbent Injection System**

Dry sorbent injection system involves the injection of pulverized sodium bicarbonate upstream of semi-dry scrubbing system. Sodium bicarbonate thermally decomposes to sodium carbonate. This sodium carbonate reacts with SO_x (SO_2, SO_3 and other acids) and NO_x to form sodium sulfite and sodium nitrate which are oxidized into sodium sulfate and sodium nitrate.

Sorbent injection equipment is designed to automatically meter and deliver bicarbonate into the ductwork. The system consists of storage silos, pulverizes, and volumetric feeders with pneumatic conveying, equipment and injection nozzles. Injection nozzles are custom designed to evenly distribute the ground particles throughout the gas stream.
Sodium bicarbonate used in SDA is delivered by truck and pneumatically transferred from truck to sodium bicarbonate storage silo. From the silo it is injected at controlled rate to the SDA.

Flue gas desulfurization (FGD) and other pollutants using sodium bicarbonate or sodium carbonate was identified long ago as a highly efficient process due to low level of sulfur in waste.

- Dry Scrubbing

Dry scrubbing uses the same chemical principals as wet scrubbing but does not saturate the flue gas stream with moisture. Dry scrubbers do not have a stack steam plume or wastewater handling requirements. They are typically combined with a particulate matter control device (baghouse) to remove reaction products and excess sorbent material. Dry scrubbing systems can be categorized as dry sorbent injectors or spray dryer absorbers. Dry sorbent injection involves the addition of an alkaline material into the gas stream, forming salts that is removed by the PM control device (baghouse). Spray dryer absorbers, also called semi-dry scrubbing, route the flue gas into an absorbing tower where the gases are contacted with finely atomized alkaline slurry. Again, the reaction forms solid salts which are removed via a PM control device (baghouse).

The SDA is a dry scrubber system, which minimizes water use and wastewater generation. Acid gases in the flue gas react with sorbent ($NaHCO_3$ or $Na2CO_3$), resulting in non-hazardous inorganic compounds. The water in the slurry evaporates, and a portion of the solids remaining after evaporation drops out of the SDA. Some of this material is recycled back to the SDA, as described below. The balance of the solid matter is exhausted with the flue gases through a baghouse before exiting to the atmosphere through the main stack. This baghouse is designed to have a PM emission level of 0.005 gr/dscf.

The material captured by the baghouse consists of fly ash, spent activated carbon (AC) and sodium sulfate/sulfite, generated through the use of sorbent ($NaHCO_3$ or $Na2CO_3$) in the SDA. Also, the spent sorbent with ash will be recycled to dry sorbent injection system. Most of this material and the material that drops out in the SDA, along with the solid material captured in the gasifier cyclones, is pneumatically conveyed to a waste solids silo. This silo will be elevated to allow for unloading into trucks. Note that a portion of the solids (containing unreacted sorbent) from the SDA and baghouse is recycled and mixed with the fresh sorbent to reduce sorbent usage in the SDA. Ultimately, the waste solid material will be transported off-site to be beneficially used or disposed of in an approved landfill. AC product will be impregnated as required by chemical treatment to improve mercury capture by AC sorbent for certain applications. Normally this impregnation is aqueous inorganic salt solution. This will be shipped in bulk chemical tanker truck or shipped as material and mixed on site to create aqueous solution. The treatment solution has very low vapor pressure at ambient temperature, and it is thermally stable. Emissions associated with this material are very negligible. Also, it is not classified as HAP or TAP by the U.S. EPA. Dry Sodium Injection is cost effective alternative to spray in a dry or wet scrubbing system for the removal of SO_2, SO_3, HCL / HF, Hg and part of NOx (98% SO_2, SO_3, HCL / HF, Hg and 90% of Hg removal). This process requires no slurry equipment or reactor vessel because the sorbent is stored and injected dry into the flue gas duct where it reacts with the acid gas. The spent sorbent is collected dry, either through a baghouse or electrostatic precipitators.

The dry fine (10 to 20 micron or less) most effective sorbent for acid gas removal, where gases are neutralized together or independently. The dry sodium bicarbonate ($NaHCO_3$) "duct injection" for the removal of acid gases from the flue gases across a fabric filter (baghouse). This process is parallel reaction Kinetics and assumes that the sodium bicarbonate injection process can be separated into two (2) stages.

- Transport Duct Section where $NaHCO_3$ fine particles are injected into the Acid Gas laden flue gas stream
- Second Stage is Fabric Filter section where sodium sorbent is collected and behave as a variable depth fixed bed reactor.
- The Sodium Bicarbonate rapid calcination to sodium carbonate at a temperature of 275°F, the "popcorn like" decomposition creates a large and reactive surface by bringing unreacted sodium carbonate to the particle surface for HCL/HF and SO_2/SO_3 neutralization. The byproducts of the reactors are sodium chloride, fluoride, and sodium sulfate.
- The major factors for the process are flue gas temperature, SO_2 and acid gas concentration, sodium bicarbonate particle sizes, residence time, normalized stoichiometric ratio etc.

In the duct section small portion of SOx and NOx are removed. Major removal of acid gas occurs across the filter cake, which accumulates the sorbent particles on the fabric filter. These particles are periodically disposed as filter is cleaned. This filter cake may be recycled for further use or disposed.

Nitrous Oxide (NOx) removal also occurs during SO_2 abatement in Dry Sorbent Injection (DSI). The actual amount of NOx removed is directly related to the amount of SO_2 removal.

The most important variables for high removal efficiency are Injection Temperature (325 - 601°F), H_2O concentration (~5%), fine particle size (~20μms) and retention time where acid gas is in contact with the sorbent.

In Sodium Scrubbing, a Sodium Hydroxide, Sodium Carbonate or Sodium Bicarbonate absorbs the (Acid gases SO_3, HCL, HF, H_2SO_4 etc) from the Flue Gas. The SO_2 reacts to form Sodium Sulfate. Sodium scrubbing differs from lime or limestone-based system, because high reactivity of Sodium Alkali, sorbent compared to the Lime or Limestone sorbent, these systems are characterized by low sorbent to gas ratio.
Advantages.

- Relatively Simple Design
- Scaling and Plugging are minimized
- Lower Corrosion and Erosion
- Lower Power Consumption due to Low Sorbent / Gas ratio
- Commercially Proven

- Regeneration System (Option for future)

Regeneration system recovers sodium bicarbonate scrubber reagent and produces ammonium sulfate/nitrate for fertilizer production from spent scrubber slurry. The system involves a reactor and equipment for drying, crystallizing, separating, and converting various compounds in the spent reagent as it is regenerated to produce a fresh reagent stream to scrubber and a chemical stream to the fertilizer production system where it becomes high grade granular fertilizer.

- **Baghouse**

The solid matter is exhausted with the flue gases through a baghouse before exiting to the atmosphere through main stack (Stack - 001). The material captured by the baghouse consist of fly ash, spent sorbent, sodium sulfate/sulfite, generated through the use of dry sorbent - $NaHCO_3$ injection system in the SDA. This baghouse is designed to have a PM emission level of no greater than 0.005 gr/dscf. The material captured by the baghouse consists of fly ash generated at "TG" along with solid material captured in the gasifier cyclones. It is pneumatically conveyed to a waste solids silo. This silo will be elevated to allow for unloading into trucks. Ultimately, the waste solid material will be transported to EPA approved site.

The flue gas discharge from baghouse via to dry sorbent injection system to induced draft blower and Stack - 001, Egress Point EP-001.

- **Induced Draft Blower**

Variable speed induced draft fan is provided to exhaust combustion gases from gasifier, afterburner, steam generator, and through air pollution control system. Exhaust gas stream will pass through above system and clean gas exhausted to atmosphere via 60 ft high stack with inside diameter of 1'-4". Design information and layout drawings are included in Attachment 'E & F'.

2.6 Material Handling - Emission

The proposed project is designed to address the control of potential PM emissions associated with Material (includes all material hospital solid medical waste, AC - Product, Ash, Spent Sorbent, Sorbent, additives & any other materials) handling operations. All material conveyors are fully enclosed, with dust collection/dust suppression system at all transfer points to control emissions caused from air displacement from waste, AC product, ash, spent sorbent, sorbent and additives handling. Each of these dust collection systems are designed to have an emission level no greater than 0.005 grains per dry standard cubic feet (gr/dscf). In short, the emissions from material handling operations will be handled by main "ACPD" system.

2.7 Fugitive Emissions - On Site Haul Roads

PM emissions from fugitive road dust caused by truck traffic at site is based upon AP-42, section 13.2.1 - Emission factors for paved roads. This calculation is based upon road particulate size, weight percent slit content, mean vehicle weight and number of days with at least 0.01 inches of precipitation. Maximum ten (10) delivery trucks (total for waste, AC - Product, Ash, Spent Sorbent, Sorbent and additives) per day will travel - vehicle miles, 20 on paved roadways (or wet roadways). Emissions are calculated under Section 9.3.1 and summarized on table 9.3.2 (Fugitive Emissions Summary)

2.8 Ancillary Facility Operations

2.8.1 Emergency Generator

The Emergency generator powered by a 15 MMBtu natural gas fueled engine will be installed as part of the proposed project. The engine will be operated only during emergencies and once a month testing - a maximum 100 hours per year. The engine will be certified by manufacturer to comply with applicable U.S. EPA and Wyoming DEQ standards. RCL will route the emergency generator exhaust to a separate and dedicated zinc-oxide bed catalyst and oxidation catalyst system.

The emissions have been calculated on operating every hour of the year (8760 hours per year). The emissions associated with the generator are based on AP-42, Natural gas emission factors and presented in table 9.6.2.1 and 9.6.2.2.

Attachment H

Material Safety Data Sheets (MSDS)

See Attached Annex-3 Reference to MSDS Sheet

1. Material Process - Solid Medical Waste Thermal Gasification

    1.1 Annex-2 - Solid Medical Waste Composition/Categories

    1.2 Managing Solid Waste Contaminated with a Category A Infectious substance
    Ref www.phmsa.dot.gov

    Hazardous Material and Waste Management
    University of California San Francisco
    UCSF Health Environment Care Safety

2. Material Used

    2.1 Activated Carbon - GAC / PAC - Pollution Abatement Injection- Adsorption

    2.2 Sodium Bicarbonate - Pollution Abatement Scrubbing- Absorption

3. The component emitted to air

    Particulate - matter - PM, PM10, and PM2.5 - see application section 9.0

    CO - Carbon monoxide - see application section 9.0

    Dioxins/Furans - see application section 9.0

    HAPs - 9.4.2 - see application section 9.0

    NOx - nitrogen oxide - see application section 9.0

    SO2 - sulfur dioxide - see application section 9.0

    Hydrogen Chloride (HCl) - see application section 9.0

Lead (Pb) - see application section 9.0

Cadmium (Cd) - see application section 9.0

Mercury (Hg) - see application section 9.0

VOC - volatile organic compound - see application section 9.0

Annex 3

Thunder Mountain Environmental LLC

MSDS Data Sheet

See Attachment H

2.2 "CLEANING THE WORLD WITH ACTIVATED CARBON"

GENERAL CARBON CORP.

SAFETY DATA SHEET

Section 1 - Identity

Identity (As Used on Label and List): GC Activated Carbon (Including, but not limited to GC C-40, GC 4 x 8B, GC 4 x 8S, GC 6 x 12, GC 6 x 12S, GC 8 x 30, GC 8 x 30AW, GC 8 x 30S, GC 8 x 30SAW, GC 12 x 40, GC 12 x 40AW, GC 12x40SAW, GC 20 x 50, GC 20 x 50S, GC Powdered, GC WDC activated carbons)

Manufacturers Name: General Carbon Corporation
33 Paterson Street
Paterson, NJ 07501
Tel: (973)523-2223
www.generalcarbon.com
Date Prepared: February 16, 2017

Section 2 - Hazardous Identification

2.1 GHS-US Classification

Eye Irritation	2B H320
STOT	SE 3 H335

Hazards not otherwise classified: Combustible dust. May form combustible dust concentrations in air. All powdered activated carbons are classified as weakly explosive (Dust explosion class St1): Given the necessary conditions of a strong ignition source, right concentrations of airborne carbon dust, adequate oxygen levels, and confinement, the potential for a deflagration event exists. A combustible dust hazard assessment and employee training should be carried out. See sections 7 and 9 for further information on combustible dust precautions.

2.2 Label Elements

Hazard Pictograms

Signal word (GHS-US) : Warning
Hazard Statements : H320- Causes eye irritation
: H335- May cause respiratory irritation
Precautionary statements (GHS-US) : P261- Avoid breathing dust
: P264- Wash thoroughly after handling
: P271- Use in well-ventilated area
: P280- Wear protective gloves/clothing/eye & face protect
: P304&340: IF INHALED: Remove person to fresh air

: P305&351&P338: If in eyes, Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing.
: P312- Call Poison Control Center/Doctor if you feel sick
: P403& P233- Store in well-ventilated place. Keep container tightly closed
: P405- Store locked up
: P501- Dispose of container to appropriate receptacle

2.3 Other Hazards
No additional information available
2.4 Unknown acute toxicity (GHS-US)
No data available

Section 3: Composition/Information on Ingredients

3.1 Substances
Not applicable
3.2 Mixture

Name	CAS #	%	GHS US classification
Carbon	7440-44-0	100	Not classified

Section 4 – First Aid Measures

4.1 Description of first aid measures

First aid after inhalation: Remove person to fresh air. If not breathing, administer CPR or artificial respiration. Get immediate medical attention.
First aid after skin contact: If skin reddening or irritation develops, seek medical attention
First aid after eye contact: Immediately flush eyes with plenty of water for at least 15 minutes. If irritation persists, get medical attention.
First aid after ingestion: If the material is swallowed, get immediate medical attention or advice. DO NOT induce vomiting unless directed to do so by medical personnel.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation: May cause respiratory irritation
Symptoms/injuries after skin contact: May cause skin irritation
Symptoms/injuries after eye contact: Causes serious eye damage
Symptoms/injuries after ingestion: May be harmful is swallowed

4.3 Indication of any immediate medical attention and special treatment needed
No additional information available.

Section 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media: If involved with fire, flood with plenty of water
Unsuitable extinguishing media: None

5.2 Special hazards arising from substance or mixture
Fire hazard: None known
Explosion hazard: None known
Reactivity: Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, etc. may result in fire.

5.3 Advice for firefighters
Protection during firefighting: Firefighters should wear full protective gear

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

General measures — Avoid contact with the skin and eyes

6.1.1 For non-emergency personnel

No additional information available

6.1.2 For emergency responders

No additional information available

6.2 Environmental precautions

None

6.3 Methods and material for containment and cleaning up

For containment — If possible, stop flow of product

Methods for cleaning up — Shovel or sweep up and put in closed container for disposal

6.4 Reference to other sections

No additional information available

Section 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling — Avoid contact with eyes. Wet activated carbon removes oxygen from air causing severe hazard to workers inside carbon vessels or confined spaces

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions — Protect containers from physical damage. Store in dry, cool, well-ventilated area. Store away from strong oxidizers, strong acids, ignition sources, combustible materials, and heat. An adequate air gap between packages is recommended to reduce propagation in the case of fire .

Handling: A hazard assessment should be carried out. As with all finely divided materials, ground all transfer, blending, and dust collecting equipment to prevent static discharge. Remove all strong ignition sources from material handling, transfer, and processing areas where dust may be present or accumulate. Practice good housekeeping. Excessive accumulations of dust or dusty conditions can create the potential of secondary explosions. Inspection of hidden surfaces for dust accumulation should be made routinely. If possible, eliminate the pathways for dust to accumulate in hidden areas. Fine carbon dust may penetrate electrical equipment and cause electrical shorts. Where dusting is unavoidable, dust-proof boxes and regular electrical line maintenance are recommended. Refer to NFPA standards 654 for guidance.

Caution employees-no smoking in carbon storage and handling areas. Carbon is difficult to ignite, however, cutting and welding operations should be carried out using hot work permit systems where precautions are taken not to ignite carbon, which may smolder undetected.

7.3 Specific end use(s)

No additional information available

Section 8: Exposure controls/ personal protection

8.1 Control parameters

No additional information available

8.2 Exposure controls

Appropriate engineering controls	: Local exhaust and general ventilation must be adequate to meet exposure standards
Hand Protection	: None required under normal product handling conditions
Eye Protection	: safety glasses
Skin and body protection	: Wear suitable working clothes
Respiratory protection	: If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	: Solid
Appearance	: Particulate
Color	: Black
Odor	: No data available
Odor threshold	: No data available
Ph	: No data available
Relative evaporation rate	: No data available
Melting point	: No data available
Freezing point	: No data available
Boiling point	: No data available
Flash point	: No data available
Self ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor Pressure	: No data available
Relative Vapor density @ 20 deg C	: No data available
Relative Density	: 28-33 lb/ cubic foot
Solubility	: No data available
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Explosive limits	: No data available

Combustible dust- These products may contain combustible dusts. May form combustible dust concentrations in air. All powdered activated carbons are weakly explosive. No specific information on these carbons are available.
Typical combustible dust data for a variety of activated carbons:
K_{St} values reported between 43-113 (various sources).
Dust explosion class St1 (K_{St} values < 200 are Class St1-weakly explosive).
MEC (minimum explosible concentration) in air 50 and 60 g/m^3 (two reports)
Volatile content (by weight): < 8% ASTM D3175-11 (Watercarb)
MIT (minimum ignition temperature) values reported between 400-680°C (752-1256°F) (four reports)
Maximum Absolute Explosion pressure values reported between 6.0-8.6 bar (four reports)

9.2 Other information
No additional information available

Section 10: Stability and reactivity

10.1 Reactivity
Contact with strong oxidizers such as ozone, liquid oxygen, chlorine, etc. may result in fire

10.2 Chemical stability
Stable under normal conditions

10.3 Possibility of hazardous reactions
Will not occur

10.4 Conditions to avoid
None

10.5 Incompatible materials
Strong oxidizing and reducing agents such as ozone, liquid oxygen or chlorine.

10.6 Hazardous decomposition products
Carbon monoxide may be generated in the event of a fire.

Section 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity	: Not classified
Carbon (7440-44-0)	
LD50 oral rat	: >10000 mg/kg
Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Causes eye irritation
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity	: May cause respiratory irritation (single exposure)
Specific target organ toxicity	: Not classified (repeated exposure)
Aspiration hazard	: Not classified

Section 12: Ecological information

12.1 Toxicity
No additional information available

12.2 Persistence and degradability
No additional information available

12.3 Bioaccumulative potential
No additional information available

12.4 Mobility in soil
No additional information available

12.5 Other adverse effects

No additional information available

Section 13: Disposal concerns

13.1 Waste treatment methods

Waste Disposal recommendations : Dispose of contents/container in accordance with local/ regional/ international regulations

Section 14: Transportation information

In accordance with DOT/ADR/RID/ADNR/IMDG/ICAO/IATA

14.1 UN Number

Not applicable. See Note 1 below.

14.2 UN proper shipping name

Not applicable

Note 1: Under the UN classification for activated carbon, all activated carbons have been identified as a class 4.2 product. However, This product has been tested according to the United Nations Transport of Dangerous Goods test protocol for a "self-heating substance" (United Nations Transportation of Dangerous Goods, Manual of Tests and Criteria, Part III, Section 33.3.1.6 - Test N.4 - Test Method for Self Heating Substances) and it has been specifically determined that this product does not meet the definition of a self heating substance (class 4.2) or any other hazard class, and therefore should not be listed as a hazardous material. This information is applicable only for the Activated Carbon Product identified in this document.

Section 15: Regulatory information

15.1 US Federal regulations

Carbon (7440-44-0)

Listed on the United States TSCA inventory

15.3 US State regulations

No additional information available

Section 16: Other information

Full text of H-phrases:

Eye Irrit. 2B	Serious eye damage/eye irritation Category 2B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H335	May cause respiratory irritation

NFPA®

NFPA health hazard : 1-Exposure could cause irritation but only minor residual injury even if no treatment is given

NFPA fire hazard : 1- Materials that require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur (e.g. mineral oil). Includes some finely divided suspended solids that do not require heating before ignition can occur. Flash point at or above 93.3 °C (200 °F)

NFPA reactivity : 0- Normally stable, even under fire exposure conditions, and are not reactive with water

The information contained herein is accurate to the best of our knowledge. General Carbon Corporation makes no warranty with respect hereto said information and disclaims all liability from reliance there in.

SAFETY DATA SHEET
North American Version

SODIUM BICARBONATE

1. PRODUCT AND COMPANY IDENTIFICATION

1.1. Identification of the substance or preparation

Product name	:	SODIUM BICARBONATE
Product grade(s)	:	USP Grade 1 USP Grade 1 TFF Animal Feed Technical Grade 1 Technical Grade 5 Coarse Industrial Grade USP Grade 2 USP Grade 5 BICAR® Z / TEC
Chemical Name	:	Sodium hydrogencarbonate
Synonyms	:	Bicar, Sodium bicarb
Molecular formula	:	$NaHCO_3$
Molecular Weight	:	84.02 g/mol

1.2. Use of the Substance/Preparation

Recommended use :

- Food/feedstuff additives
- Detergent
- Chemical industry
- Glass industry
- Foaming agents
- Water treatment
- Environmental protection
- Purifying flue gas
- Animal feed

1.3. Company/Undertaking Identification

Address : SOLVAY CHEMICALS, INC.
3333 RICHMOND AVENUE
HOUSTON TX 77098-3099
United States

1.4. Emergency and contact telephone numbers

Emergency telephone : **1 (800) 424-9300 CHEMTREC ® (USA & Canada)**
01-800-00-214-00 (MEX. REPUBLIC)

Contact telephone number (product information) : **US: +1-800-765-8292 (Product Information)**
US: +1-713-525-6500 (Product Information)

2. HAZARDS IDENTIFICATION

SOLVAY Chemicals

SOLVAY

2.1. Emergency Overview:

NFPA	:	H= 0 F= 0 I= 0 S= None
HMIS	:	H= 0 F= 0 R= 0 PPE = Supplied by User; dependent on local conditions

General information

Appearance	:	crystalline, powder
Colour	:	white
Odour	:	odourless

2.2. Potential Health Effects:

Inhalation
- Mechanical irritation from the particulates generated by the product.

Eye contact
- Mechanical irritation from the particulates generated by the product.

Skin contact
- Mechanical irritation from the particulates generated by the product.

Ingestion
- Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Other toxicity effects
- See section 11: Toxicological Information

2.3. Environmental Effects:
- See section 12: Ecological Information

3. COMPOSITION/INFORMATION ON INGREDIENTS

Sodium bicarbonate

CAS-No.	:	144-55-8
Concentration	:	>= 99.0 %

4. FIRST AID MEASURES

4.1. Inhalation
- Remove the subject from dusty environment and let him blow his nose.

4.2. Eye contact
- Rinse thoroughly with plenty of water, also under the eyelids.
- If eye irritation persists, consult a specialist.

4.3. Skin contact
- Wash off with plenty of water.

4.4. Ingestion
- If a large amount is swallowed, get medical attention.

If victim is conscious:
- If swallowed, rinse mouth with water (only if the person is conscious).

If victim is unconscious but breathing:
- not applicable

5. FIRE-FIGHTING MEASURES

- SAEL (Solvay Acceptable Exposure Limit) 2007
  TWA = 10 mg/m3
- US. ACGIH Threshold Limit Values
  Remarks: none established

Sodium bicarbonate

- SAEL (Solvay Acceptable Exposure Limit) 2007
  TWA = 10 mg/m3
- US. ACGIH Threshold Limit Values
  Remarks: none established

Particles not otherwise specified (PNOS)

- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 5 mg/m3
  Remarks: respirable dust fraction, All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 15 mg/m3
  Remarks: Total dust, All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Table Z-3.
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 15 millions of particles per cubic foot of air
  Remarks: respirable dust fraction
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 50 millions of particles per cubic foot of air
  Remarks: Total dust
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-3 (29 CFR 1910.1000) 2000
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. ACGIH Threshold Limit Values 2008
  time weighted average = 10 mg/m3
  Remarks: Inhalable particles.

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.
SAEL = Solvay Acceptable Exposure Limit, Time Weighted Average for 8 hour workdays. No Specific TLV STEL (Short Term Exposure Level) has been set. Excursions in exposure level may exceed 3 times the TLV TWA for no more than a total of 30 minutes during a workday and under no circumstances should they exceed 5 times the TLV TWA.

8.2. Engineering controls

- Ensure adequate ventilation.
- Provide appropriate exhaust ventilation at places where dust is formed.
- Refer to protective measures listed in sections 7 and 8.
- Apply technical measures to comply with the occupational exposure limits.

5.1. Suitable extinguishing media
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Extinguishing media which shall not be used for safety reasons
- None.

5.3. Special exposure hazards in a fire
- Not combustible.

5.4. Hazardous decomposition products
- none

5.5. Special protective equipment for fire-fighters
- No special precautions required.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions
- Refer to protective measures listed in sections 7 and 8.

6.2. Environmental precautions
- Do not flush into surface water or sanitary sewer system.
- Prevent any mixture with an acid into the sewer/drain (gas formations).

6.3. Methods for cleaning up
- Sweep up and shovel into suitable containers for disposal.
- Avoid dust formation.
- Keep in properly labelled containers.
- Keep in suitable, closed containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".

7. HANDLING AND STORAGE

7.1. Handling
- Keep away from incompatible products.

7.2. Storage
- Keep in a dry place.
- Store in original container.
- Keep container closed.
- Keep away from incompatible products.

7.3. Packaging material
- Paper + PE.
- Polyethylene
- Polypropylene
- Woven plastic material + PE.

7.4. Other information
- Avoid dust formation.
- Refer to protective measures listed in sections 7 and 8.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Exposure Limit Values

Sodium bicarbonate

8.3. Personal protective equipment

8.3.1. Respiratory protection

- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.

8.3.2. Hand protection

- Wear suitable gloves.

8.3.3. Eye protection

- Dust proof goggles, if dusty.

8.3.4. Skin and body protection

- None.

8.3.5. Hygiene measures

- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General information

Appearance	:	crystalline, powder
Colour	:	white
Odour	:	odourless

9.2. Important health safety and environmental information

pH	:	8.6 *Concentration*: 52 g/l
Boiling point/boiling range	:	*Remarks*: not applicable, Thermal decomposition
Flash point	:	*Remarks*: not applicable
Flammability	:	*Lower explosion limit*: *Remarks*: The product is not flammable.
Explosive properties	:	*Explosion danger*: *Remarks*: Not explosive
Oxidizing properties	:	*Remarks*: Non oxidizer
Vapour pressure	:	*Remarks*: not applicable
Relative density / Density	:	2.22
Bulk density	:	from 0.5 - 1.2 kg/dm3 from 31 - 75 lb/ft3
Solubility	:	Water 96 g/l *Temperature*: 20 °C (68 °F) Other slightly soluble Alcohol
Partition coefficient: n-octanol/water	:	*Remarks*: not applicable

Viscosity	:	1.2 mPa.s
Vapour density	:	*Remarks*: not applicable

9.3. Other data

Melting point/range	:	*Remarks*: not applicable, Decomposition
Auto-flammability	:	*Remarks*: The product is not flammable.
Decomposition temperature	:	> 60 °C (140 °F)

10. STABILITY AND REACTIVITY

10.1. Stability
- Stable under recommended storage conditions.

10.2. Conditions to avoid
- none
- Keep at temperature not exceeding: 60 °C (140 °F)

10.3. Materials to avoid
- Acids

10.4. Hazardous decomposition products
- none

11. TOXICOLOGICAL INFORMATION

Toxicological data

Acute oral toxicity
- LD50, rat, > 4,000 mg/kg

Acute inhalation toxicity
- LC50, rat, > 4.74 mg/l

Acute dermal irritation/corrosion
- LD50, Remarks: no data available

Skin irritation
- rabbit, Mild skin irritation

Eye irritation
- rabbit, Mild eye irritation

Sensitisation
- no data available

Chronic toxicity
- no observed effect

Genetic toxicity in vitro
- Genotoxicity in vitro, Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

Teratogenicity
- Oral route (gavage), 10 days, Various species, 330 mg/kg, Did not show teratogenic effects in animal experiments.

Remarks
- Health injuries are not known or expected under normal use.

12. ECOLOGICAL INFORMATION

12.1. Ecotoxicity effects

Acute toxicity

- Fishes, Oncorhynchus mykiss, LC50, 96 h, 7,700 mg/l
- Fishes, Oncorhynchus mykiss, NOEC, 96 h, 2,300 mg/l
- Fishes, Lepomis macrochirus, LC50, 96 h, 7,100 mg/l
- Fishes, Lepomis macrochirus, NOEC, 96 h, 5,200 mg/l
- Crustaceans, Daphnia magna, EC50, 48 h, 4,100 mg/l
- Crustaceans, Daphnia magna, NOEC, 48 h, 3,100 mg/l

12.2. Mobility

- Water, Soil/sediments
  Remarks: Solubility
- Water, Soil/sediments
  Remarks: Mobility

12.3. Persistence and degradability

Abiotic degradation

- Water, hydrolyses
  Result: acid/base equilibrium as a function of pH
  Degradation products: carbonic acid/bicarbonate/carbonate

Biodegradation

- Remarks: The methods for determining the biological degradability are not applicable to inorganic substances.

12.4. Bioaccumulative potential

- Result: not applicable

12.5. Other adverse effects

- no data available

12.6. Remarks

- Ecological injuries are not known or expected under normal use.

13. DISPOSAL CONSIDERATIONS

13.1. Waste from residues / unused products

- Contact waste disposal services.
- If recycling is not practicable, dispose of in compliance with local regulations.
- or
- Dilute with plenty of water.
- Neutralise with acid.
- In accordance with local and national regulations.

13.2. Packaging treatment

- To avoid treatments, as far as possible, use dedicated containers.
- or
- Clean container with water.
- Dispose of rinse water in accordance with local and national regulations.
- The empty and clean containers are to be reused in conformity with regulations.
- or
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.

14. TRANSPORT INFORMATION

- Sea (IMO/IMDG)
- not regulated
- Air (ICAO/IATA)
- not regulated
- U.S. Dept of Transportation
- not regulated
- It is recommended that ERG Guide number 111 be used for all non-regulated material.
- Canadian Transportation of Dangerous Goods
- not regulated

15. REGULATORY INFORMATION

15.1. Inventory Information

Australian Inventory of Chemical Substances (AICS)	: -	In compliance with inventory.
Canadian Domestic Substances List (DSL)	: -	In compliance with inventory.
Korean Existing Chemicals List (ECL)	: -	In compliance with inventory.
EU list of existing chemical substances (EINECS)	: -	In compliance with inventory.
Japanese Existing and New Chemical Substances (MITI List) (ENCS)	: -	In compliance with inventory.
Inventory of Existing Chemical Substances (China) (IECS)	: -	In compliance with inventory.
Philippine Inventory of Chemicals and Chemical Substances (PICCS)	: -	In compliance with inventory.
Toxic Substance Control Act list (TSCA)	: -	In compliance with inventory.
New Zealand Inventory (in preparation) (NZ)	: -	All components on composite list considered for transfer.

15.2. Other regulations

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)

- not regulated.

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

- not regulated.

US. EPA CERCLA Hazardous Substances (40 CFR 302)

- not regulated.

US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)
- not regulated.

US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)
- not regulated.

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
- This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects..

15.3. Classification and labelling

Canada. Canadian Environmental Protection Act (CEPA). WHMIS Ingredient Disclosure List (Can. Gaz., Part II, Vol. 122, No. 2)
- Not listed

Remarks: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

EC Label
- Not classified according to Directive 67/548/EEC.

16. OTHER INFORMATION

Ratings :

NFPA (National Fire Protection Association)
Health = 0 Flammability = 0 Instability = 0 Special =None

HMIS (Hazardous Material Information System)
Health = 0 Fire = 0 Reactivity = 0 PPE : Supplied by User; dependent on local conditions

Further information
- System maintenance
- Distribute new edition to clients

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of the company mentioned in section 1 in North America. If you are located in a country other than Canada, Mexico or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location. The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product). To our actual knowledge, the information contained herein is accurate as of the date of this document. However, neither the company mentioned in section 1 nor any of its affiliates makes any warranty, express or implied, including merchantability or fitness for use, or accepts any liability in connection with this information or its use. This information is for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right. The user alone must finally determine suitability of any information or material for any contemplated use, the manner of use and whether any patents are infringed. This information gives typical properties only and is not to be used for

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Attachment H
Material Safety Data Sheets (MSDS)
See Attachment Annex - 2
MSDS - Data Sheets

1. Material Process
   2.1 Activated Carbon - GAC/PAC

General Carbon Corporation (page 1-7)
33 Paterson Street
T-973-523-2223
Home>Activated Carbon>SDS Sheet (Safety Data Sheet)

Section 1.0 Product and Company Identification
Section 2.0 Hazards Identification
Section 3.0 Composition and Information on Ingredients
Section 4.0 First-Aid Measures
Section 5.0 Fire-Fighting Measures
Section 6.0 Accidental Release Measures
Section 7.0 Handling and Storage
Section 8.0 Exposure Controls/Personal Protection
Section 9.0 Physical and Chemical Properties
Section 10.0 Stability and Reactivity
Section 11.0 Toxicological Information
Section 12.0 Ecological Information
Section 13.0 Disposal Consideration
Section 14.0 Transportation Information
Section 15.0 Regulatory Information
Section 16.0 Other Information
-NEPA

Attachment I

Emission Unit Table

Attachment I

Emission Unit Table

(Includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID1	Emission Point ID2	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type3 and Date of Change	Control Device4
	EP-001	Feed Stock – MW, MSW (RDF 1 TDF)				
1-S-1		Feedstock Unloading	2022	40 TPD	New	C1-1
1S-1	EP-001	Unloading Shredding Feeding	2022	40 TPD	New	C1-1
1-S	EP-001	Waste Treating Unit – Thermal Gasifier	2022	20 TPD	New	C1
1-S	EP-001	Cyclone 1 Thermal Oxidizer Waste Heat Boiler	2022	6000 ACFM	New	C1-1 and C1-2
1-S	EP-001	Dry Scrubber – NaHCO3 AC Injection	2022	6000 ACFM	New	C1-3
1-S	EP-001	Baghouse	2022	6000 ACFM	Existing - Modified	C1-4
S-EGS	EP-005	Emergency Generator – natural Gas Fired	2022	15.0 MM BTU/Hr.	New	C-EGS
S-EGS	PE-005	Cummins Power Generator – Model #QS491-PACK	2022	15.0 MM BTU/Hr.	New	C-EGS
S-EGS	EP-005	Emergency Generator – natural Gas Fired	2022	15.0 MM BTU/Hr.	New	C-EGS
S-EGS	EP-005	Cummins Power Generator – Model #QS491-PACK	2022	15.0 MM BTU/Hr.	New	C-EGS

1. For emission units (or sources) use the following numbering system: 1S, 2S, 3S…or other appropriate designation
2. For emission points use the following numbering system: 1E, 2E, 3E…or other appropriate designation
3. New, modification, removal
4. For control devices use the following numbering system: 1C, 2C, 3C…or other appropriate designation

Attachment J

Emission Points Data Summary Sheet

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions[4]		Maximum Potential Controlled Emissions[5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used[6]	Emission Concentration[7] (ppmv or mg/m^3)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
EP-001	Vertical	S-1	MWG	C1 C-1-1 C-1-2 C-1-3	Thermal Gasifier Cyclone Oxidizer DD1-FF	"C"	8760	Particulates PM PM10 CO Dioxin/Furans TCDD TCDF TEQ SO2 S03,(H2S04) NOx Lead-Pb Cadmium-cd Mercury-Hg	See Table 9.4.1A and 9.4.2A for all Metal Emissions	See Table 9.4.1A and 9.4.2A for all Metal Emissions	See Tables 9.4.1 and 9.4.2 for all Metal Emissions	See Tables 9.4.1 and 9.4.2 for all Metal Emissions	Flue Gas	Calculated	
EP-005	Vertical	S-EG5	Nat. gas fired emergency generator	C=EG5	SCR – catalyst system supplied by Mfg.		100	CO (630-08-0) NOx (10102-44-0) CH4 (74-88-8) HAP (formaldehyde)			2.71 3.81 3.81 0.381	0.135 0.19 0.19 0.019	Flue Gas		4ppm (dry Guaranteed by supplier

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

[3] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

[4] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[6] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

[7] Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data

Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
EP -001	1'-4"	200-250	6,000	74	640.0	60'	Lat. - 38.9231	Long. - 81.7961
EP-005	1'-6"	95	3,000	50	640.0	40'	Lat. – 38.9231	Long. – 81.7961

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.

Attachment K

Fugitive Emission Data Sheet

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? x Yes ☐ No ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes x No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☐ Yes x No ☐ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes x No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☐ Yes x No ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes x No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes x No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions PM 2.5, PM 10 Paved Haul Roads PM 30 on haul road – paved section 9.3.1.9.3.2						
Unpaved Haul Roads						
Storage Pile Emissions						
Loading/Unloading Operations						
Wastewater Treatment Evaporation & Operations						
Equipment Leaks		Does not apply		Does not apply		
General Clean-up VOC Emissions						
Other						

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.

[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Table 9.2.1									
Emission Summary - Material Handling (Non-fugitive)									
Particulate Emission		9.2.2	9.2.3	9.2.4	9.2.5	9.1	9.2	avg. lb/hr	
PM	lb/hr	0.0012	0.088	0.0002	0.0008	calculated		0.1	0.438
	tpy	0.0053	0.385	0.0009	0.004	calculated			
PM10	lb/hr	0.0271	0.0463	0.00009	0.0005	calculated		0.0739	0.324
	tpy	0.1186	0.2027	0.0004	0.0022	calculated			

Attachment L

Medical Waste - Gasifier Processing

- Equipment information - Gasifier
- Storage activity - None
- Conveying and transfer – Flexible spiral conveyor or conveyor
- Crushing and screening - Shredding
- Fugitive emission paved haul roads

Thermal gasification treatment is a viable alternative for the treatment of highly toxic waste, such as incinerator residues, radioactive wastes and medical wastes.

1.) Gasification offers low emission medical waste disbursement, along with its converting waste-to energy. The amount of plastic mixed into medical waste is a concern for existing deposit methods. Existing systems includes incineration or landfill disposal, it creates harmful dioxins and emissions. Gasification is not a new system it is used to convert "coal" to production of gas (or syngas) due to market conditions industries abandon in late 2019.
"TME" – Thermal Gasification is one of the several types of gasification – system for medical waste gasification:
    - Down Draft – Gasification – Bio Hearth
    - Mags – Mikro Auto Gasification System
    - Waste Gasification Technology – Shell CO
    - Veolia-Siemens Medical Waste Gasification Technology
    - Plasmai Gasification

Advantages with Thermal Gasification systems are:

- Self-Cleaning
- Small Footprints
- Low Maintenance
- 24/7 Operations
- Medical Waste up to 12 to 22% Plastic (TME – Less than 12%)
  High Moister Content

The entire process, from loading, though shredding, gasification treatment (through gasifier) and collecting of ash is fully automated, reducing the exposure of works to materials. This also allows safer, faster, and more efficient waste processing.

The Thermal Gasification is process that uses a medical waste (of feedstock) for a thermal-chemical conversion of that waste in high BTU producer (syngas) gases. This is done in low oxygen and high temperature environments and causes material breakdown at molecular level to:

- Carbon Monoxide (CO)
- Hydrogen (H2)
- Carbon Dioxide CO2)

These gases will be combusted in the gasifier combustion zone to generate steam for electric production.

2.) Thermal Gasification – Process Equipment
The process equipment located within its own enclosure in the building.
Gasifier enclosure size: 80'-0" long x 20'-0" wide x 18'-0" high
Air pollution control device (APCD) will be located outside of the enclosure, along with primary and secondary air fans.
The enclosure will enclose the following:
Feedstock – shredding and feeding system
Surge hopper
Gasifier with conveying system and combustion zone
Fire tube
Waste heat boiler
Ash handling system

Please review attached pages or perspective section for additional information.

Section 1.0, Subsection 1.3 Process Description, Pages 5, 6 and 7 of 11

Section 2.0, Subsection 2.4 Medical Waste Disposal Methods, Pages 10-14 of 22

Section 2.0, Subsection 2.5 Process Equipment, Pages 14, 15, 17 and 18 of 22

Section 9.0, Subsection 9.4 Thermal Gasification Emissions, Pages 17-31 of 35

Attachment L
Emission Unit Data Sheet
(NONMETALLIC MINERALS PROCESSING)

Control Device ID No. (must match List Form): C-1

Equipment Information

1. Plant Type:
   - ☐ Hot-mix asphalt facility that reduces the size of nonmetallic minerals embedded in recycled asphalt pavement
   - ☐ Plant without crushers or grinding mills and containing a stand-alone screening operation
   - ☐ Sand and gravel plant ☐ Common clay plant
   - ☐ Crushed stone plant ☐ Pumice plant
   - ☒ Other, specify Pre-Processed Medical Waste (MW)

2. Plant Style: ☒ Fixed Plant ☐ Portable Plant

3. Plant Capacity: tons/hr

4. Underground mine: ☐ Yes ☒ No

5. Storage: ☐ Open ☒ Enclosed

6. Emission Facility Type	Equipment Type Used	ID Number of Emission Unit	Manufacturer	Model Number/ Serial Number	Date of Manufacture
Conveyors					2022
Crusher					2022
Secondary Crushers					
Tertiary Crushers					
Grinder					
Hoppers					
Rock Drills					
Screens					
Enclosed Storage	Yes		n/a	n/a	2022
Other					
Other					
Other					

Emission Facility Type	Operation Rate Design Ton/hr	Design Ton/hr	Annual Production Tons/year	Number of Units	Air Pollution Control Device Used
Conveyors	3.0		7,500		C1-4
Crusher		3.0			C1-4
Secondary Crushers					
Tertiary Crushers					
Grinder					
Hoppers					
Rock Drills					
Screens					
Enclosed Storage					
Other					
Other					
Other					

7. Provide a diagram and/or schematic that shows the proposed process of the operation or plant. The diagram and/or schematic is to show all sources, components and facets of the operation or plant in an understandable line sequence of the operation. The diagram should include all the equipment involved in the operation; such as conveyors, transfer points, stockpiles, crushers, facilities, vents, screens, truck dump bins, truck, barge and railcar loading and unloading, etc. Appropriate sizing and specifications of equipment should be included in the diagram. The diagram shall logical follow the entire process load-in to load-out.

8. Roads

	Paved Miles of Road	Unpaved Miles of Road	Watered		Other Control (Specify)
			Miles	Frequency	
Plant Yard	2.0	0	2.0	Daily as Required	Dust Supression
Access Roads					

9. Vehicle Type

Vehicle Type	Mean Vehicle Speed in mph	Mean Vehicle Weight in Tons		Number of Wheels	Distance Traveled per Round Trip	
		Empty	Full		Paved Feet or Miles	Unpaved Feet or Miles
Raw Aggregate	(MW) 5.0 to 10.	2.5	27.5	4-6	2	0
Loaders	less than 2 inside	<1.0	1.1	4	less than 6 to 10 ft	0
Product Trucks	5 to 10	2.5	27.5	4-6	2	0
Other	5 to 10	2.5	27.5	4-6	2	0
Other						
Other						
Other						

10. Describe all proposed materials storage facilities associated with the **Emission Units** listed.
Feed stock material will be delivered by truck inside the building under enclosed structure with hood negative pressure
Product will transport in enclosed tankers or closed trucks
See attached drawings and attachment E and F

Storage Activity

ID of Emission Unit	C1-4				
Type Storage	B - Bin or Storag				
Material Stored	silos or delivery trucks				
Typical Moisture Content (%)	MW - 25% Other - 2%				
Avg % of material passing through 200 mesh sieve					
Maximum Total Yearly Throughput in storage (tons)					
Maximum Stockpile Base Area (ft^2)	daily 1 truck				
Maximum Stockpile height (ft)	1.5 to 2 ft				
Dust control method applied to storage					
Method of material load-in to bin or stockpile					
Dust control method applied during load-in					
Method of material load-out to bin or stockpile					
Dust control method applied during load-out					

Storagepiles	**Estimated Annual Tons**	**Turnover Rate (Ton/Month)**	**Wetted as Piled**	**Number of Sides Enclosed**	**Other Dust Control**	**Loading Method** (Loader, Conveyor) **IN/OUT**
Coarse: over 1"						
Fine: 1" to ¼"						
¼" and less						
MFG. Sand						
Other, specify						

Conveying and Transfer

Describe the conveying system including transfer points associated with proposed Emission Units (crushers, etc...).

Dust control method applied to storage (for above table): truck unloading negative pressure baghouse. The Medical Waste will arrive on site via semi-trailer trucks and smaller box trucks. The Medical Waste inside the trucks will be stored in either Gatlord boxes or sealed plastic containers (28 to 38 gallon capacity). The waste will be directly unloaded into the facility building from the trucks at the unloading docks and will be processed within 24 hours. At no time are the Gaylord boxes or plastic containers exposed to or stored outdoors. Containers are emptied into an dnclosed crusher's hopper then from the crusher to the thermal gasifier. Approximately 10% of the waste gasified is converted to ash and will be collected via a completely sealed ash removal conveyor, where it is transported to a sealed ash container. The wet ash will be shipped offsite to an EPA approved site.

Other process material feedstock - activated carbon (AC), spent sorbent, sorbent, etc. transferred to respective process units into closed air tight conveying systems.

See Attachment F - Detailed Process Flow Diagrams

See Attachment G - Process Description

Describe any methods of emission control to be used with these proposed conveying systems:

Each conveyor drop point is covered and also under negative prssure with dust collection system.

See reference flow diagrams for details.

See Attachment F - Baghouse C1-4

ID of Emission Unit	Type Conveyor or Transfer Point	Material Handled [Note nominal size of material transferred (e.g. ¾" × 0)]	Material Conveying or Transfer Rate		Dust Control Measures Applied	Approximate Material Moisture Content (%)
			Max. TPH	Maximum TPY		
1S-1	OTH - Other (specify in fo	MW 2" x 2"	0.825	7,500		MW - 25%
1S-1		Waste Crushing	3.0	60,000		<5%
Process Flow						
Diagram - See						
Attachment "F"						

Crushing and Screening

ID of Emission Unit	1S-1 MW					
Type Crusher or Screen						
Material Sized	2" x 2"					
Material Sized Throughput:						
Tons/hr	3.0					
Tons/yr	7,500					
Material sized from/to	2" to 4"					
Typical moisture content as crushed or screened (%)	MW - 25%					
Dust control methods applied	EB - Enclosed					
Stack Parameters:						
Height (ft)	70'					
Diameter (ft)	1'-4"					
Volume (ACFM)	6000 to 7000					
Temp (°F)	200 to 250					
Maximum operating schedule:						
Hour/day	24					
Day/year	365					
Hour/year	8760					
Approximate Percentage of Operation from:						
Jan – Mar	25%					
April – June	25%					
July – Sept	25%					
Oct – Dec	25%					
Maximum Particulate Emissions:						
LB/HR	2.25					
Ton/Year	9.855					

List emission sources with request information:

ID of Emission Unit	Type of Emission Unit and Use	Operating Schedule		Max. Amount of Stone Input to Emission (lb/hr)	Crushed or Screened From/To (size)	Date of Emission Unit was Manufacture
		Actual (hrs/yr)	Design (hrs/yr)			
1-S	Baghouse	8760	8760	MW - 1650		

List emission sources with request information:

ID of Emission Unit	Maximum expected emissions from Emission Unit without Air Pollution Control Equipment				
	PM_{10} (lbs/hr)	SO_2 (lbs/hr)	CO (lbs/hr)	NO_x (lbs/hr)	VOC (lbs/hr)
1-S Baghouse	0.75	n/a/	n/a	n/a	n/a

ID of Emission Unit	Maximum expected emissions from Emission Unit without Air Pollution Control Equipment				
	PM_{10} (tons/yr)	SO_2 (tons/yr)	CO (tons/yr)	NO_x (tons/yr)	VOC (tons/yr)
1-S Baghouse	3.285				

Please fill out a separate Air Pollution Control Device Sheet for each Emission Unit equipped with an air pollution control system.

What type of stone will be quarried at this site?

See attached MW receiving and processing - C1

How will it be quarried?

- ☐ Sawing
- ☐ Blasting
- ☐ Other, Specify:

If blasting is checked, complete the following:

- ☐ Frequency of blasting:
- ☐ What method of air pollution control will be employed during drilling and blasting?

Table 9.2.1									
Emission Summary - Material Handling (Non-fugitive)									
Particulate Emission		9.2.2	9.2.3	9.2.4	9.2.5	9.1	9.2	avg. lb/hr	
PM	lb/hr	0.0012	0.088	0.0002	0.0008	calculated		0.1	0.438
	tpy	0.0053	0.385	0.0009	0.004	calculated			
PM10	lb/hr	0.0271	0.0463	0.00009	0.0005	calculated		0.0739	0.324
	tpy	0.1186	0.2027	0.0004	0.0022	calculated			

Table 9.3.1

Particulate material (PM) (particle size)	Uncontrolled Emission		Controlled Emission	
	lb/hr	tons/yr	lb/hr	tons/yr
1. PM2.5	0.0369	0.1349	0.0154	0.0674
2. PM10	0.1229	0.5384	0.0614	0.2690
Subtotal:	0.1592	0.6733	0.0768	0.3364
3. PM15	0.1512	0.6622	0.3220	1.4105
4. PM30	0.6441	2.8212	0.3976	1.7416
Subtotal:	0.7953	3.4834	0.7196	3.1521

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)		
p =	Number of days per year with precipitation >0.01 in.		

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1									
2									
3									
4									
5									
6									
7									
8									

Source: *AP-42 Fifth Edition – 13.2.2 Unpaved Roads*

$E = k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365) =$ lb/Vehicle Mile Traveled (VMT)

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)		
S =	Mean vehicle speed (mph)		
W =	Mean vehicle weight (tons)		
w =	Mean number of wheels per vehicle		
p =	Number of days per year with precipitation >0.01 in.		

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1								
2								
3								
4								
5								
6								
7								
8								
TOTALS								

FUGITIVE EMISSIONS FROM PAVED HAULROADS

INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Feedstock MW Transport	27.5	1.88	11.28	4118.0	water spray	50%
2	AC Injection & NaHCO3	27.5	1.88	3.76	1372.0	water spray	50%
3	ash/waste transport	27.5	2.0	2.0	730.0	water spray	50%
4	misc. transport	27.5	1.6	1.6	584.0	water spray	50%
5							
6							
7							
8							

Source: *AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads*

$E = 0.077 \times I \times (4 \div n) \times (s \div 10) \times (L \div 1000) \times (W \div 3)^{0.7} =$ lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	Two
s =	Surface meterial silt content (%)	12.0 g/m squared
L =	Surface dust loading (lb/mile)	0.011 lb/VMT (PM30)
W =	Average vehicle weight (tons)	27.5

For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1	MW - 0.32	1.41	0.24	1.0512
2	AC injection - .16	0.70	0.12	0.5256
3	Ssorbent injection - .16	0.70	0.12	0.5256
4	misc. - .32	1.401	0.24	1.0512
5				
6				
7				
8				
TOTALS	0.96	4.204	0.72	3.1536

Attachment L
Emission Unit Data Sheet
(INCINERATOR)

Control Device ID No. (must match List Form): 1-S Thermal Gasifier

Equipment Information

1. Manufacturer: Vista International Technology	2. Model No. MFG-8
3. On a separate sheet sketch or draw the proposed incinerator showing the location and dimensions (inside and out) of (1) the primary combustion chamber, (2) the secondary combustion chamber, (3) the flame port, (4) auxiliary burners, and (5) dampers **with special emphasis on dimensions of the flame port and secondary combustion chambers (inside). Also,** sketch in the minimum distance the gas travels through the secondary combustion chamber.	
4. Rated capacity of the incinerator for the type of waste to be burned: Maximum: 1700 to 2000 lb/hr Typical: 1650 lb/hr Annual: 7500 tons/yr	
5. By what means is waste charged? ☐ Batch ☒ Continuous ☐ Periodically	
6. Type: ☐ Multiple Chamber ☒ Single Chamber ☐ Other, specify:	
7. Projected operating schedule: 24 hr/day 365 day/yr	

Primary Combustion Chamber

8. Volume: NA ft^3	9. Effective grate area: NA ft^2
10. Maximum temperature: 2200 TO 2700 °F	11. Burning rate: 1650 $lb/ft^2/hr$
12. Heat release in primary chamber: NA BTU/hr/ft^3	13. Total heat release in incinerator: 1375 TO 4125 BTU/hr/ft^3

Secondary Combustion Chamber

14. Volume: NA ft^3	15. Cross sectional area: NA ft^2
16. Volume of gas through secondary combustion chamber: NA ACFM @ °F	17. Gas velocity through secondary combustion chamber: NA ft/sec
18. Minimum gas temperature: 1600 °F	19. Minimum retention time of gas: 3 TO 4 sec
20. Minimum distance of gas travel through secondary combustion chamber: ft	21. Location of air admission: TWO PORTS - Preimary and Secondary

Flame Port

22. Flame port area: NA ft^2	23. Velocity through flame port: NA ft/sec

Dampers

24. Type: NA	25. Number NA
26. Diameter: NA inches	27. Capacity: NA ACFM @ °F

Combustion Air

28. Type of draft:
☐ Natural
☐ Sliding damper
☐ Forced
☐ Barametric damper
☒ Induced
Windshielding? ☒ Yes ☐ No

29. If draft is forced or induced, describe ID fans or blowers:

Number		
HP rating	75 to 100	HP
Rated flow	6000 to 7000	ft^3/min
Rated speed	1800 (Variable)	RPM
Fan rated draft	10 to 15	in. H_2O
Volume	@	°F

30. Theoretical air/refuse ratio: lb air/lb refuse

31. Percent of total air applied as:
overfire air
underfire air

Auxiliary Burners

32. Proposed type and fuel:

33. **Primary Burner**
Capacity: 2 MMBTU/hr
Number: 2
Manufacture:
Model:
Estimated capacity: BTU/hr
Fuel:
How controlled?
Is there a temperature indicator? ☐ Yes ☐ No

34. **Secondary Burner**
Capacity: Not Required MMBTU/hr
Number:
Manufacture:
Model:
Estimated capacity: BTU/hr
Fuel:
How controlled?
Is there a temperature indicator? ☐ Yes ☐ No

Miscellaneous Devices and Controls

35. Automatic loading device. ☒ Yes ☐ No
If yes, describe.

36. Self closing doors. ☒ Yes ☐ No

37. Sparks arrestor ☒ Yes ☐ No

38. Flame failure protection equipment ☐ Yes ☐ No

39. Method of creating turbulence for combustion gases.
Describe.
Conveyors

40. Method of cleaning secondary or settling chamber.
Describe.
Washing and Disinfication

41. Other interlocking devices or controls. If yes, describe. ☒ Yes ☐ No

Installation

42. Indoor Installation: ☒ Yes ☐ No
If yes, describe method of supplying combustion air.

43. Outdoor Installation: ☐ Yes ☐ No

Stack or Vent Data

44. Inside diameter or dimensions: 1.4 ft	45. Gas exit temperature: 250 °F
46. Height: 70 ft	47. Stack serves: ☒ This equipment only ☐ Other equipment also (submit type and rating of all other equipment exhausted through this stack or vent)
48. Gas flow rate: 600 to 7000 ft/min	
49. Estimated percent of moisture: - %	

Waste

50. Source of waste: ☒ Hospital ☐ Restaurant ☐ Store ☐ Industry ☐ Apartment ☐ Crematory ☐ Warehouse ☐ Public Institution ☐ Other, specify:

51. Describe fully, in detail, the composition of waste feed to the incinerator:

Gasifier - Attached following pages Section 1.0 page 5 of 11
Section 2.0 pages 3 thru 9 of 22

52. Expected BTU/lb as fired: BTU/lb	53. Daily amount: 40,000 lb
54. Does incinerator have a charge hopper ☒ Yes ☐ No	55. What is the volume of the charge hopper? 6000 cu ft +/- ft^3
56. Does the charge hopper have automatic control? ☐ Yes ☒ No	57. Is the waste charged to the incinerator weighed? ☒ Yes ☐ No
58. Is the secondary chamber preheated prior to charging waste? ☐ Yes ☒ No	59. At what secondary temperature does waste charging begin? °F
60. Is the ash waste quenched? ☒ Yes ☐ No	61. Is all the waste burned generated on site? ☒ Yes ☐ No

62. For hospital waste, is the ash inspected for recognizable combustible components? ☒ Yes ☐ No

63. For hospital waste, are recognizable combustible components of the ash reburned? ☐ Yes ☒ No

64. Is any waste received from outside the local government boundary? ☐ Yes ☒ No

65. Are hazardous or special waste burned? ☒ Yes ☐ No If yes, please describe:	66. Are potential infectious waste burned? ☒ Yes ☐ No

67. How will the waste material from process and control equipment be disposed of?

Transfer to EPA Approved Site

68. Method of charging waste solids: ☐ Manual ☐ Manual charge hopper ☒ Automatic charge hopper ☐ Other, specify:	69. Method of feeding liquids: ☐ Lab pack ☐ Injection as a primary burner fuel ☐ Injection as a secondary burner fuel ☐ Other, specify:
70. Rated steam flow – heat recovery boiler: 18,800 lbs/hr	71. Rated pressure – recovery boiler: 15 PSIG

Emissions Stream

72. Emission rates:

Pollutant	Pounds per Hour lb/hr	grain/ACF	@ °F	PSIA	Tons per Year Tons/yr	Parts per Million ppm
CO	0.661				2.8951	
Hydrocarbons						
NO_x	3.563				15.60	
Pb	4.26E-05				1.086E-4	
PM_{10}	1.214				5.3362	
SO_2	1.248E-02				5.45E-02	
VOCs	0.9685				4.2420	
Other (specify)	see attachement D & J Tables 9.4.1, 9.4.1A 9.4.2 &					

73. If an *Air Pollution Control Device* is not submitted, the emission rates should be the same as those reported home "Maximum Potential and Maximum Actual Emissions" on the *Emission Points Data Summary Sheet.*

74. Emissions rates should be substantiated by submitting *stack test data* and/or *calculations.*

Fuel Usage Data

75. Estimated annual fuel cost: $

76. Firing rate: Maximum: 3.0 mmBTU/hr
Typical: 1.2 mmBTU/hr
Design: 300 mmBTU/hr

77. Fuel type: ☒ Natural Gas ☐ Coal ☐ Fuel Oil, No. ☐ Other, specify:

78. Typical heating content of fuel: 1000 BTU/Cu Ft

79. Typical fuel sulfur content: wt. %

80. Typical fuel ash content: 10 wt. %

81. Annual fuel usage:

82. Please complete an *Air Pollution Control Device Sheet(s)* for the control(s) used on this Emission Unit, if applicable.

83. Have you included the ***air pollution rates*** on the Emissions Points Data Summary Sheet? See Attachment D & I

84. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING PLAN: Please list (1) describe the process parameters and how they were chosen (2) the ranges and how they were established for monitoring to demonstrate compliance with the operation of this process equipment operation or air pollution control device.
See Attachment "O"

TESTING PLAN: Please describe any proposed emissions testing for this process equipment or air pollution control device.
Sixty (60) days after startup - Stack Test

RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.
See Attachment "O"

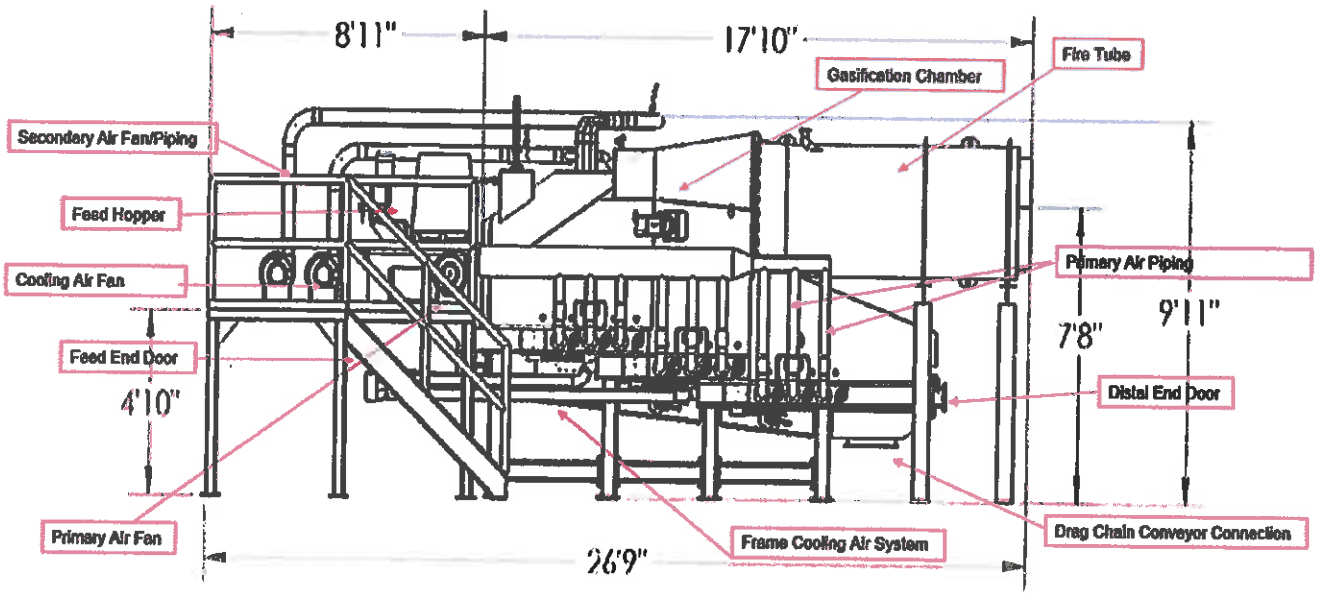
REPORTING: Please describe the proposed frequency of reporting of the recordkeeping.
As Rquired by WVDEP

85. Please describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
"TME" will submit after process equipment are purchased. See attached basic information.

Basic System Components

1-S THERMAL GASIFIER

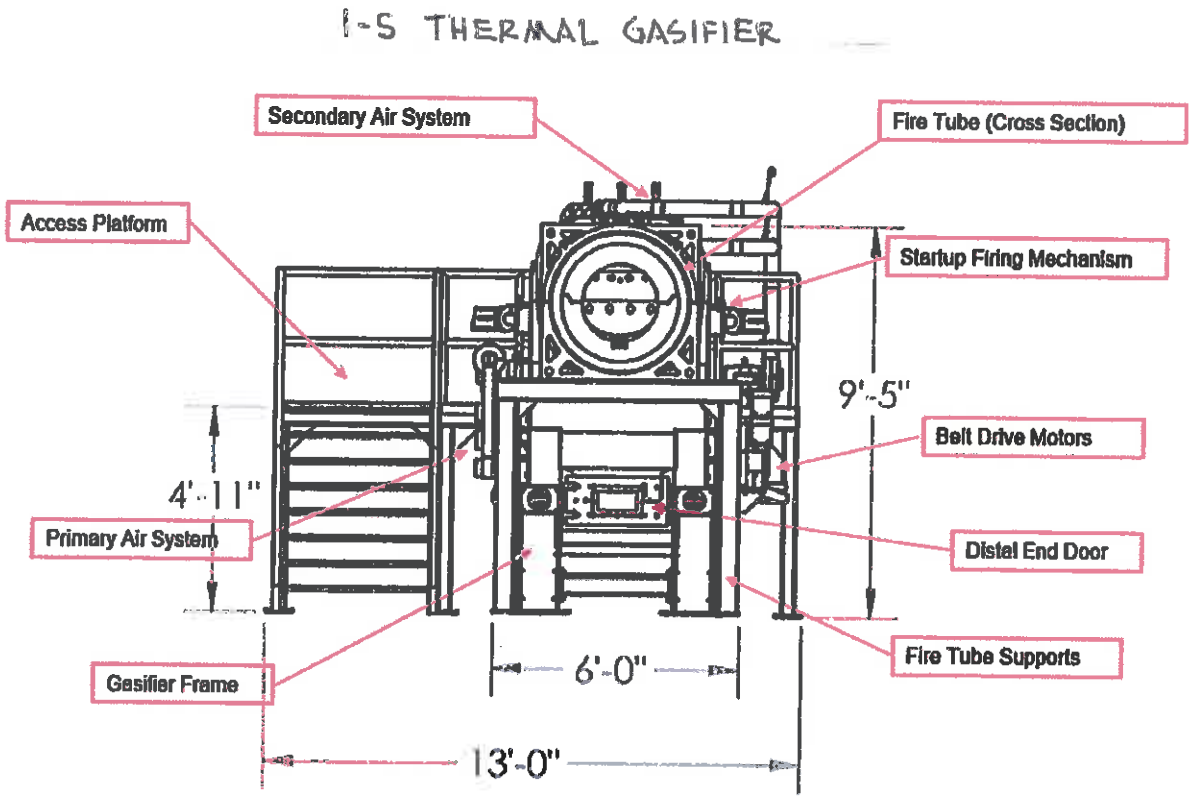
Side View with Stainless Steel Cover Removed



Components Seen In This View:

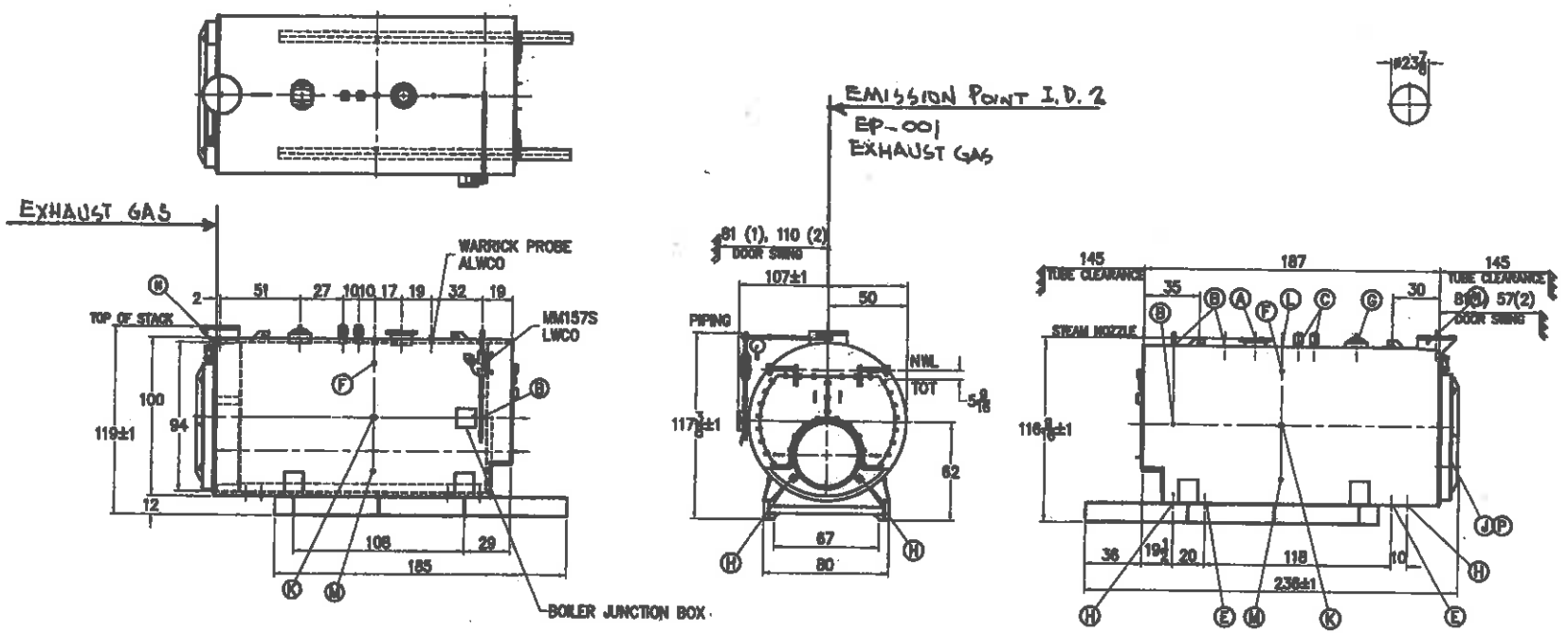
- Gasification Chamber – where drying, gasification and oxidation reactions take place
- Fire Tube – where heated effluent gas exits the system
- Primary Air Piping – supplies a minimal amount of ambient air to the system to aid the gasification process
- Distal End Door – sealed door through which gasification reaction can be viewed. Also used for maintenance access when unit is not in operation
- Drag Chain Conveyor Connection – drag chain conveyor is attached here and used to empty the inert ash residual from the reaction
- Frame Cooling Air System – circulates cooling air through the frame to keep bearings from overheating
- Primary Air Fan – controls ambient air injection into the system
- Feed End Door – sealed door used for maintenance access to unit/belt changes when unit is not in operation
- Cooling Air Fan – controls cooling air injection into the frame
- Feed Hopper – controls feedstock entry into the system
- Secondary Air Fan Piping – controls secondary air injection into the system. This air is mixed with the syngas produced to create a combustion reaction

Distal End View with Stainless Steel Cover Removed



Components Seen In This View Only:

- Access Platform – used to access feed hopper and fans
- Startup Firing Mechanism – used to start gasification reaction
- Belt Drive Motors – move feedstock through the gasification chamber
- Fire Tube Supports – support fire tube section between Thermal Gasifier and boiler
- Gasifier Frame – supports weight of Thermal Gasifier



ATTACHMENT "L" BOILER EUDS PART OF THERMAL GASIFIER

BOILER CONNECTIONS	
A.(1) STEAM OUTLET	12"-150# FLANGE
B.(4) LWCO	1" NPT
C.(2) SAFETY VALVE	3" NPT
D.( ) SAFETY VALVE	
E.(2) BOILER BLOWDOWN	2" NPT
F.(2) SURFACE BLOWDOWN	1" NPT
G.(1) MANWAY	12" x 16"
H.(4) HANDHOLE	3" x 4"
J.(1) CLEANOUT PORT	17" ID
K.(2) FEEDWATER	2" NPT
L.(1) AUXILIARY/VENT	2" NPT
M.(2) LOW FIRE HOLD	1" NPT
N.(2) STACK TEMP	1/2" NPT
P.(1) SIGHTPORT	1" PIPE
Q.( )	
R.( )	
S.( )	

RATINGS & CAPACITIES	
HORSEPOWER	400*
DESIGN PRESSURE	15 PSIG STEAM
GROSS OUTPUT	13390 MBH*
STEAM (FROM & AT 212°F)	13800 LB/HR*
HEAT RELEASE: (FURNACE ONLY)	136398 BTU/CuFt*
RATED INPUT	16738 MBH*
HEATING SURFACE (ASME)	2022 SqFt
FURNACE HEATING SURFACE	140.16 SqFt
FURNACE VOLUME:	
FURNACE ONLY	120.94 CuFt
STEAMING VOLUME	60.89 CuFt
STEAM RELEASE AREA	73.32 SqFt
WATER CAPACITY:	
(FULL) 2.984 Gal	24,852 Lbs
(NWL) 2.509 Gal	20,864 Lbs
SHIPPING WEIGHT:	29,700 Lbs

LTR	DATE	REVISION	BY
		EMISSION UNIT DATA SHEET EUDS 1-S	

NOTES

1. ALL CONTROLS MOUNTED AS PER SPECIFICATION SHEET.
2. SPECIFICATION SHEET TAKES PRIORITY OVER R & D SHEET.
3. REAR DOOR SWING:
   (1) MIN SIDE, MAX REAR
   (2) MAX SIDE, MIN REAR
4. BOILER DESIGN CODE ASME SECTION IV.
5. BOILER INSULATED WITH 2"-8# DENSITY MINERAL FIBER INSULATION WITH 22 GAUGE STEEL JACKET.
6. ALL DIMENSIONS ARE ±1/2" UNLESS OTHERWISE NOTED.
*7. HORSEPOWER & RELATED INFO BASED ON 5 SqFt FIRING.

SUPERIOR BOILER WORKS, INC. HUTCHINSON, KANSAS

CHECKED BY

DRAWN BY ?

DATE

DATE

MOHAWK BOILER MODEL 4-5-2007-S15-

SCALE 1/70

DRAWING No ?

REPRESENTATIVE ?

PROJECT ?

Table 9.6.2.3

EMISSION UNIT 5:EGS - EMRGENCY GENERATOR

QSV 81G - 1200 rpm - 12 :1, 203 deg.F HT Outlet - 500 mg/Nm3 NOx - Engine Driven Pumps Fitted

GENERAL DATA - BASED ON HV FRAME 8 4 POLE ALTERNATOR	
Bore	7.09 in
Stroke	7.87 in
Cylinders configuration	16 V
Cylinder displacement	310.6 cu.in
Rated speed	1200 rpm
Mean effective pressure	203 psi

Genset Weight With Fluids	42336 lbs
Genset Overall Length	18.6 ft
Genset Overall Height	8.14 ft
Genset Overall Width	5.64 ft
Engine HT Water Volume	92 U.S.gal
Engine LT Water Volume	62 U.S.gal
Engine Lub Oil Volume	141 U.S.gal

Cummins Power Generation

TECHNICAL DATA - AT CONDITIONS REFERENCED BELOW						
Frequency / Engine RPM		60Hz / 1200	3 of 23	Version Date		20th September 2001
	See Note	Units	100%	90%	75%	50%
General Data						
Effective mechanical output with engine driven pumps	1	kW	1140	1025	855	N/A
Effective mechanical output with engine driven pumps	1	bhp	1529	1375	1147	N/A
Generator electrical output		kWe	1100	989	825	N/A
Energy input (LHV)	2,3	mmBTU/h	9.83	9.00	7.71	N/A
Electrical efficiency		%	38.2%	37.5%	36.5%	N/A
Mechanical efficiency		%	39.6%	38.9%	37.8%	N/A
Heat Rate	4	BTU/kWhe	8937	9100	9346	N/A
Heat dissipated in lube oil cooler	4	mmBTU/h	0.51	0.49	0.44	N/A
Heat dissipated in L.T. charge air cooler	4	mmBTU/h	0.30	0.26	0.21	N/A
Heat dissipated in H.T. charge air cooler	4	mmBTU/h	0.38	0.30	0.15	N/A
Heat dissipated in block	4	mmBTU/h	1.55	1.50	1.55	N/A
Total heat rejected to LT. Circuit	4	mmBTU/h	0.95	0.89	0.77	N/A
Total heat rejected to H.T Circuit	4	mmBTU/h	1.78	1.66	1.57	N/A
Unburnt	4	mmBTU/h	0.28	0.26	0.24	N/A
Heat radiated to ambient + unaccounted	4	mmBTU/h	0.47	0.43	0.37	N/A
Available Exhaust Heat To 250 deg.F	4	mmBTU/h	2.41	2.26	1.89	N/A
Fluid Flows						
Intake air flow	4	lb/h	13336	12304	10161	N/A
Intake air flow	4	scfm	2918	2692	2223	N/A
Exhaust gas flow rate	4	lb/h	13812	12780	10478	N/A
Exhaust gas flow rate	4	scfm	2973	2751	2256	N/A
LT. Circuit water flow rate		USgpm	132	132	132	132
HT Circuit water flow rate		USgpm	141	141	141	141
Maximum pressure drop in each external cooling circuit		psi	14.5	14.5	14.5	14.5
Maximum exhaust system back pressure		inchWG	20	20	20	20
Temperatures						
Lube Oil engine inlet temperature	6,9	°F	205	205	205	205
Lube Oil engine outlet temperature	5,9	°F	217	217	217	217
Maximum LT. engine water inlet temperature	5,9	°F	122	122	122	122
LT. engine water outlet temperature	6,9	°F	140	140	140	140
HT engine water inlet temperature	6,9	°F	180	180	180	180
HT engine water outlet temperature	5,9	°F	203	203	203	203
Exhaust gas temperature after turbine	7	°F	932	943	955	N/A
Emissions						
NOx emissions (dry)	4	ppm	175	164	177	N/A
NOx Emission Rate at exhaust condition	4	g/bhp hr	1.18	1.14	1.22	N/A
CH4 emissions (dry) (affected by gas composition)	4	ppm	1856	1908	2075	N/A
CH4 Emission Rate (affected by gas composition)	4	g/bhp hr	4.36	4.59	4.95	N/A
CO emissions (dry)	4	ppm	647	655	678	N/A
CO Emission Rate at exhaust condition	4	g/bhp hr	2.6	2.7	2.8	N/A
O2 emissions (dry)	4	%	9.4	9.4	9.2	N/A
Miscellaneous						
Gas supply pressure range		psi	3.5 to 43.5	3.5 to 43.5	3.5 to 43.5	3.5 to 43.5
Minimum Methane Index			70	70	70	70
Minimum static head on LT & HT water cooling circuits		psi	7.3	7.3	7.3	7.3
HT Circuit maximum pressure @ engine		psi	65.3	65.3	65.3	65.3
LT. Circuit maximum pressure @ engine		psi	65.3	65.3	65.3	65.3
Lubricating oil consumption	8	g/kWe.h	< 0.5	< 0.5	< 0.5	< 0.5
Starting air bottle recommended pressure		psi	435 to 580	435 to 580	435 to 580	435 to 580
Electric starter voltage		V	24	24	24	24
Minimum battery capacity @ 104 deg.F		Ah	4 x 180 =720	4 x 180 =720	4 x 180 =720	4 x 180 =720

Engine data subject to change without prior notice and are not contract values.

1) Service conditions according to ISO 8528/1 and reference conditions according to ISO 3046/1:
   COP : Continuous output without time limitation between the stated maintenance intervals - no overload allowed, parallel operation with the grid.
   Reference conditions : altitude 3280 feet, suction air temperature 95°F, LT. cooling water inlet temperature 122°F, methane index as stated above.
   Derating :
   If service conditions differ from the reference conditions, the engine is derated according to ISO 3046/1 (Third edition, Tab. 1 - Ref. D).
   In first approach, the rules below can be used:
   - For each additional degree of suction air temperature above 95°F (max. : 122°F) : 0.2 % of the mechanical output.
   - For each additional 328 feet of altitude above 3280 feet, (max. : 8200 feet) : 1.0 % of the mechanical output.
   - Gas specific consumption increase : 1/5 of derating (for example: a 10% derating will increase the specific consumption by 2%).
   - For a LT. cooling water inlet temperature above 122°F, or a methane index below that stated above, or off the grid installation, consult CPG
2) Low voltage alternator terminals at power factor = 1.0 according to IEC 34.1.
3) According to ISO 3046/I with a tolerance of +5% - Natural gas LHV 980 BTU/scf.
4) Tolerance ±5%.
5) Outlet : maximum temperature allowed. Inlet : for information, with 30% of glycol and with outlet T° at max allowed.
6) Inlet : maximum temperature allowed. Outlet : for information, with 30% of glycol and with max allowed inlet T°.
7) With air intake at 95°F. Tolerance ± 20°F.
8) At full load (l/h for information, with lubricating oil Specific Gravity = 0.83).
9) LT. water cooling circuit and lube oil cooling circuit are on same loop as standard, separated on request for specific cogeneration requirement.

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Ramsgate, Kent CT12 5BF
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Attachment M

Air Pollution Control Device Sheets

Attachment M
Air Pollution Control Device Sheet
(MECHANICAL COLLECTOR-CYCLONE)

Control Device ID No. (must match Emission Units Table): C1 (subsetion C1-1)

Equipment Information

1. Manufacturer: IFCO or BSP -Filter technology Ltd. This equipment is part of Process Equipment Guarantee

   Model No.

2. Method: ☐ Wet ☐ Dry
   ☒ Single-stage
   ☐ Multiple: number
   ☐ In series: number

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Provide a diagram of the proposed simple cyclone or multicyclone system with examples of the parameters identified below:

5. Simple cyclone system (show units):

Major cylinder diameter:	60.0	in.
Major cylinder length:		in.
Cone length:		in.
Gas outlet diameter:	20	in.
Gas outlet length:		in.
Gas inlet height:		in.
Gas inlet weight:		in.
Dust outlet diameter:	6	in.
Pressure drop across the cyclone:		in. H_2O

Describe the collected dust discharge valves and system: Automatic valve discharge into closed container/airlock

6. Multicyclone system (show units):

Major cylinder diameter:		in.
Major cylinder length:		in.
Cone length:		in.
Gas outlet diameter:		in.
Gas outlet length:		in.
Gas inlet height:		in.
Gas inlet weight:		in.
Dust outlet diameter:		in.
Pressure drop across the system:	4.0	in. H_2O
Number of tubes:	100	
Tube diameter:	10	in.
Tube length:	84	in.

Describe the collected dust discharge valves and system:

7. More than one cyclone:
   Number of cyclones: 1
   Arrangement: ☐ Parallel ☐ Series
   Pressure drop across the system: in. H_2O

8. On a separate sheet answer the following questions for each cyclone and attach:

Major cylinder diameter:	60	in.	Gas inlet weight:	6 to 8	in.
Major cylinder length:	72	in.	Dust outlet diameter:	4	in.
Cone length:	98	in.	Pressure drop across the system:	10	in. H_2O
Gas outlet diameter:	20	in.	Number of tubes:	6	
Gas outlet length:	96	in.	Tube diameter:		in.
Gas inlet height:	12	in.	Tube length:		in

Describe the collected dust discharge valves and systems:
Airlock with blow through system, gate valve

9. Guaranteed collection efficiency:
   Minimum: 70 %

10. Efficiency of cyclone:
    At design maximum: 97 %
    At average Operation: 90.5%

11. Method of handling material removed:
    Closed collection to silos - for disposal to EPA approved site - ash and inerts

Gas Stream Characteristics

12. Particle characteristics (for particulate matter):
    Type of material:
    Particle density:
    Emission rate at collector outlet: 1.5 to 2.5 lb/hr
    grains/ACF
    Particulate matter inlet rate to device: 3,704 lb/hr
    grains/ACF

13. Total flow rate:
    Design maximum: 7,000 acfm
    Average expected: acfm

14. Gas Stream Temperature:
    Inlet: 500 °F
    Outlet: 500 °F

15. Gas flow rate into collector: 6,000 to 7,200 acfm at 500 °F and Negative PSIA

16. Viscosity of gas stream at the above temperature and pressure: lb/sec-ft

17. Inlet gas velocity: ft/sec

18. Particulate Grain Loading in grains/scf:
    Inlet:
    Outlet:

19. Supply a curve showing particulate collection efficiency versus gas volume from 25 to 100 percent of design rating of collector.

Particulate Distribution

20. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10	10 micron plus	10 micron plus
10 – 12		70 to 90%
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

21. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
Inlet - Medical Waste - Thermal "Gasifier" System Outlet -Thermal Oxidizer, Reheat Boiler/Cyclone/Dry Scrubber and Baghouse

22. Describe the collection material disposal system:
The ash will be disposed to EPA approved site in closed container with EPA approved methods.

23. Have you included ***Mechanical Collector (Cyclone) Control Device*** in the Emissions Points Data Summary Sheet? Is part of C1 (C1-1) but supplied by equipment supplier

24. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
Attachment "O"	Attachment "O"
REPORTING:	TESTING:
Attachment "O"	Attachment "O"

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

25. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
99%

26. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
97%

27. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The equipment purchased will be submitted.

Attachment M
Air Pollution Control Device Sheet
(BAGHOUSE)

Control Device ID No. (must match Emission Units Table): C1 (C1-4 Baghouse)

Equipment Information and Filter Characteristics

1. Manufacturer: IAC Industrial ACC Co.
   Model No. 120 BHI-A3-144.60S
2. Total number of compartments: 3 to 4
3. Number of compartment online for normal operation:
4. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.
5. Baghouse Configuration: (check one)
   - ☐ Open Pressure
   - ☐ Closed Pressure
   - x Closed Suction
   - ☐ Electrostatically Enhanced Fabric
   - ☐ Other, Specify
6. Filter Fabric Bag Material:
   - ☐ Nomex nylon
   - ☐ Wool
   - ☐ Polyester
   - ☐ Polypropylene
   - ☐ Acrylics
   - ☐ Ceramics
   - x Fiber Glass
   - ☐ Cotton Weight oz./sq.yd
   - ☐ Teflon Thickness in
   - ☐ Others, specify
7. Bag Dimension:
   Diameter 6 in.
   Length 10 ft.
8. Total cloth area: 2,500 ft²
9. Number of bags: 144
10. Operating air to cloth ratio: 3 to 1 ft/min
11. Baghouse Operation: x Continuous ☐ Automatic ☐ Intermittent
12. Method used to clean bags:
    - ☐ Mechanical Shaker
    - ☐ Pneumatic Shaker
    - ☐ Bag Collapse
    - ☐ Manual Cleaning
    - ☐ Sonic Cleaning
    - ☐ Reverse Air Flow
    - x Pulse Jet
    - ☐ Reverse Jet
    - ☐ Reverse Air Jet
    - ☐ Other:
13. Cleaning initiated by:
    - x Timer
    - ☐ Expected pressure drop range 6.0in. of water
    - ☐ Frequency if timer actuated
    - ☐ Other
14. Operation Hours: Max. per day: 24 Max. per yr: 8760
15. Collection efficiency: Rating: 100 % Guaranteed minimum: %

Gas Stream Characteristics

16. Gas flow rate into the collector: 6000 to 7000 ACFM at 500 °F and -25 WC PSIA
    ACFM: Design: PSIA Maximum: PSIA Average Expected: Negative PSIA
17. Water Vapor Content of Effluent Stream: lb. Water/lb. Dry Air
18. Gas Stream Temperature: 500 °F
19. Fan Requirements: 75 to 100 hp OR 7000 ft³/min
20. Stabilized static pressure loss across baghouse. Pressure Drop: High 15 in. H_2O Low -25 in. H_2O
21. Particulate Loading: Inlet: 1.1212 grain/scf Outlet: 0.003 grain/scf

22. Type of Pollutant(s) to be collected (if particulate give specific type):

PM (FIL) PM Condensable

PM 2.5 (FIL)

PM 10 (FIL)

23. Is there any SO_3 in the emission stream? x No ☐ Yes SO_3 content: ppmv

24. Emission rate of pollutant (specify) into and out of collector at maximum design operating conditions:

	IN		OUT	
Pollutant	**lb/hr**	**grains/acf**	**lb/hr**	**grains/acf**
Particulate – Ash - Inlet	6 to 8	1.1212	2.21	0.005
Spent Sorbent – ANCL plus spent activated carbon				

25. Complete the table:

	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2	Varies – 66.5	Based on 0.005 - 90
2 – 4		
4 – 6	43	95
6 – 8	52	99.9
8 – 10		
10 – 12	65	99.9
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

26. How is filter monitored for indications of deterioration (e.g., broken bags)?
- ☐ Continuous Opacity
- ☐ Pressure Drop
- x Alarms-Audible to Process Operator
- x Visual opacity readings, Frequency:
- ☐ Other, specify:

27. Describe any recording device and frequency of log entries:

PLC Control and operational system function
1.0 Bag cleaning – recording
2.0 Alarm and set points
3.0 Auto fan damper positioning
4.0 Modulating bleed in dilution air damper setting
5.0 Bag leak detection monitor, lift pressure transmitter and control
6.0 Exhaust Gas in/out temperature

28. Describe any filter seeding being performed:

Filter will precoat is chemical inert light density powder that is injected into the baghouse to establish a uniform porous dust cake on filter bags for maximum even air flow with enhanced operational efficiency and unequal bag protection from moisture, particulate bleed through hydrocarbon carry over, bag blinding, oil and tacky, ok visciods containment. Pre precoat 1 lb. per 20 s.f.

29. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

Waste Heat Recovery Boiler: the "WHRB" will transfer heat to produce low pressure steam-to energy

30. Describe the collection material disposal system:

The sent sorbent, spent AC and ash will be transferred in closed container to the EPA (WVDEP) approved disposal site.

31. Have you included ***Baghouse Control Device*** in the Emissions Points Data Summary Sheet? C1 (C1-4)

32. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:
1. Stack – Particulate Testing
2. Criteria Pollutants as required by EPA (WVDEP) Testing and Monitoring

RECORDKEEPING: See Attachment "O"

REPORTING: See Attachment "O"

TESTING: See Attachment "O"

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

33. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
C1 – Air Pollution Control Device (APCD)
C1-1 – Cyclone
C1.-2 – Thermal Oxidizer – 0.1 to 0.12 lbs/mmbtu
C1-3 – Dry Scrubber >95%
C1-4 – Baghouse – Particulate – 0.005 grain/dscfm Hydrocarbon distribution efficiency (DRE) – 99.9%

34. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
C1 – Air Pollution Control Device (APCD)
C1-1 – Cyclone
C1.-2 – Thermal Oxidizer – 0.1 to 0.12 lbs/mmbtu
C1-3 – Dry Scrubber >95%
C1-4 – Baghouse – Particulate – 0.005 grain/dscfm Hydrocarbon distribution efficiency (DRE) – 99.9%

35. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
'TME' will supply procedure of manufacturer information as order is placed.

Attachment M
Air Pollution Control Device Sheet
(AFTERBURNER SYSTEM)

Control Device ID No. (must match Emission Units Table): C-1/C1-1

Equipment Information

1. Manufacturer: John Zink Model No. Not Ordered	2. ☒ Thermal Energy Recovery ☐ Recuperative (Conventional) ☐ Catalytic
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. Combustion chamber dimensions: Length: 2 to 3 ft Diameter: 2'-0" +/- ft Cross-sectional area: 10 ft²	5. Stack Dimensions: Height: 40 ft Diameter: 1'-4" ft
6. Combustion (destruction) efficiency: Estimated: 99.6 (CO) % Minimum guaranteed: 99.8 (CO) 99.6 (VOC) %	7. Retention or residence time of materials in combustion chamber: Maximum: 1.5 sec Minimum: 0.15 sec
8. Throat diameter: 2'-0" +/- ft	9. Combustion Chamber Volume: 100.0 +/- ft³
10. Fuel used in burners: ☒ Natural Gas ☐ Fuel Oil, Number: ☐ Other, specify:	11. Burners per afterburner: Number of burners: Two (2) Staged Combustor -1 Turn Down 20.1 BTU/hr for burner: 20. MM BTU/hr
12. Fuel heating value of natural gas: 19,000 to 22,500 BTU/lb	13. Flow rate of natural gas: 0.25 - 1.0 ft³/min
14. Is a catalyst material used?: ☐ Yes ☒ No If yes, catalyst material used:	15. Expected frequency of catalyst replacement: N/A yr(s) 16. Date catalyst was last replaced: Month/Year: N/A
17. Space Velocity of the catalyst material used: 1/hour	18. Catalyst area: N/A ft² 19. Volume of catalyst bed: N/A ft³
20. Minimum loading: N/A Maximum loading: N/A	21. Temperature catalyst bed inlet: °F Temperature catalyst bed outlet: °F
22. Explain degradation or performance indicator criteria determining catalyst replacement:	
23. Heat exchanger used? ☒ Yes ☐ No Describe heat exchanger:	24. Heat exchanger surface area? N/A ft² 25. Average thermal efficiency: 80 %
26. Temperature of gases: After preheat: 1,550 TO 1,800 °F	Before preheat: 1,200 TO 1,400 °F
27. Dilution air flow rate: 1,800 Startup Cap ft³/minute	
28. Describe method of gas mixing used: Appoximately 10.1 of flue exhaust gas from heat recovery boiler. Gases are recirculated to thermal oxidizer < steam assisted if required.	

Waste Gas (Emission Stream) to be Burned

29.

Name	Quantity Grains of H_2S/100 ft^2	Quantity-Density (LB/hr, ft^3/hr, etc)	Source of Material
CO	Oxidized to CO2	0.06 each	SMW - Thermal
NOx		0.08 each	SMW - Gasifier
Producer Gas		0.12	SMW - Gasifier

30. Estimate total combustibles to afterburner 11,000 lb/hr or ACF/hr

31. Estimated total flow rate to afterburner or catalyst including materials to be burned, carrier gases, auxiliary fuel, etc.: 6,000 to 7,000 ACFM each system lb/hr, ACF/hr, or scfm
Total flow rate = Flue gas flow rate

32. Afterburner operating parameters:

	During maximum operation of feeding unit(s)	During typical operation of feeding unit(s)	During minimum operation of feeding unit(s)
Combustion chamber temperature in °F	1,600	1,600	1,400
Emission stream gas temperature in	1,800	1,800	250 - 500
Combined gas stream entering catalyst bed in	N/A	N/A	N/A
Flue stream leaving the catalyst bed	N/A	N/A	N/A
Emission stream flow rate (scfm)	6,000	4,000	2,000
Efficiency (VOC Reduction)	99.5 %	99.9 %	99.8 %
Efficiency (Other; specify contaminant)	99.9 %	99.65 %	99.0 %

33. Inlet Emission stream parameters:

	Maximum	Typical
Pressure (mmHg):	Negative	Negative
Heat Content (BTU/scf):	800	600
Oxygen Content (%):	3 to 15	3 to 8
Moisture Content (%):	25	12 to 15

Are halogenated organics present? ☐ Yes ☐ No
Are particulates present? ☒ Yes ☐ No
Are metals present? ☐ Yes ☒ No

34. For thermal afterburners, is the combustion chamber temperature continuously monitored and recorded?
☒ Yes ☐ No

35. For catalytic afterburners, is the temperature rise across the catalyst bed continuously monitored and recorded? ☐ Yes ☒ No

36. Is the VOC concentration of exhaust monitored and recorded? ☐ Yes ☒ No

37. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):
Inlet (1) Fire Tube - Boiler, Outlet (1) Waste Heat Boiler (2) APDC - Cyclone, Dry Scrubber, AC Injection, Filter Baghouse.

38. Describe the collection material disposal system:
The Spent Material with Fly Ash will be disposed of at an EPA (WVDEP) apporved site.

39. Have you included ***Afterburner Control Device*** in the Emissions Points Data Summary Sheet? C-1 / C1-1

40. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
Attachment "O" - Section 7.0 Inlet - Outlet, Flue Gas Temperature, Flue Gas Flow	Attachment "O" - Section 7.0
REPORTING:	**TESTING:**
Attachment "O" - Section 7.0 Stack Test within 60 days after installation	Performance testing - (stack test resaults) after 60 days after installation and testing. To meet WVDAQ and EPA.

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

41. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

CO - 99.9% @ 10 ppmv

NOx - 99.5% @ 60 to 70 ppmv (0.1 to +0.012 (bimmbtu)

PM - 99.5%

Hydrocarbon Destruction Efficiency - 99.51 to 99.9%

42. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

Hydrocarbon Destruction Efficiency - 99.9% as above

43. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

After process equipment ordered warraty will br submitted to meet EPA (WVDEP) requirements.

Stage Combustor - Inlet gas flue gas temperature

Temperature thermal oxidizion chamber of burner turn down

Designated time 1.0 seconds

Attachment M
Air Pollution Control Device Sheet
(ADSORPTION SYSTEM)

Control Device ID No. (must match Emission Units Table): C1 (C1-3 Dry Scrubber)

Equipment Information

1. Name of Control Device: Dry Scrubber	2. Manufacturer: IAC - Industrial ACC Co. Model No. Not Order
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	

Gas Stream Characteristics

4. Gas Flow Rate into the Collector:
ACFM 7000 @ 180 to 200 °F
Relative Humidity PSIA

5. Emission Rate of each Pollutant (Specify) into and out of Collector:

Pollutant	IN lb/hr	IN grains/acf	IN ppm (volume)	OUT lb/hr	OUT grains/acf	OUT ppm (volume)
A TCDD	5.98E-05			7.87E-10		
B TCDF	-			7.48E-03		
C Pb	6.00E-02			1.87E-03		
D Cd	4.52E-03			1.07E-05		
E Hg	8.83E-02			2.93E-04		

6. LEL (lower explosive limit) for most volatile pollutant: Pollutant PPM

7. List vapor pressure (mmHg) at the operating temperature for each pollutant in inlet stream:

	Pollutant	Temp	MmHg
A			
B			
C			
D			
E			

Adsorbent Characteristics

8. Adsorbent: Type: Manufacturer: IAC Grade No.: Specifications:	9. Maximum adsorbate loading: 1to2 lb/ 4 to 8 lb pollutant/lb of adsorbent
10. Pressure drop across unit: 1 to 2 (in inches of water)	11. Number of beds per unit:
12. Weight of adsorbent material per bed: 50 to 60 lb	13. Adsorbent media average particle size: PAC - Powdered AC microns
14. Adsorber geometry: Length: ft; Diameter: ft; Bed Depth: ft; Bed Surface Area: ft^2	15. Temperature Range Adsorption: Min. Temp. 180 °F; Max. Temp. 200 °F; Average Temp. 180 °F
16. Cycle time for adsorption: hr	17. Frequency of adsorbent replacement: Control yr
18. Cycle time for drying before adsorbing: 1 to 2 seconds hr	
19. Saturation Capacity of Pollutant on adsorbent (supply units): Supplier will provide	
20. Length of mass transfer zone: Supplier in	

Regenerative Systems

21. Type of regeneration: ☒ Replacement ☐ Stream ☐ Other, specify:

22. Method of Regeneration:

☒ Alternate use of entire units ☐ Source shut down

☐ Alternate use of beds in a single unit ☐ Other (describe):

23. Cycle time for regeneration: NA hr

24. Emission steam velocity through bed:
Negative ft/min

25. Steam flow rate: lb/min
Steam temp.: °F
Steam pressure: PSIA

26. Disposition of vapors during regeneration:

NA

27. Guaranteed minimum efficiency per pollutant captured:

	Captured Pollutant	Minimum Efficiency
A	98 to 99	%
B	98 to 99	%
C	98 to 99	%
D	98 to 99	%
E	98 to 99	%

28. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

Inlet - Flue Gas
- Flue Gas - WHB outlet @ 500 Degrees F (Normal 375 degrees F)
- Flue Gas Exhaust - Appox. Flow SCFH - 6,000 to 7,000 Flow ACFM
Quanity will be verified with emission abatement equipment supplier
- Sorbent - NAHCO3 - SO2 (
- Activated Carbon (AC) injection for lead (Pb) and mercury (Hb) pollution absorption
Outlet - Flue Gas

29. Describe the collection material disposal system:

The spent activted carbon and ash will be recycled (up to exhaust) then it will be disposed to EPA (WVDEP) approved site.

30. Have you included ***Adsorption Control Device*** in the Emissions Points Data Summary Sheet?

31. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
Attachment "O" Sorbent injection - Activated Carbon (AC)	Sorbent injection rate AC injection rate
REPORTING:	**TESTING:**
Attachment "O"	Attachment "O"

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

32. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.

99.9%

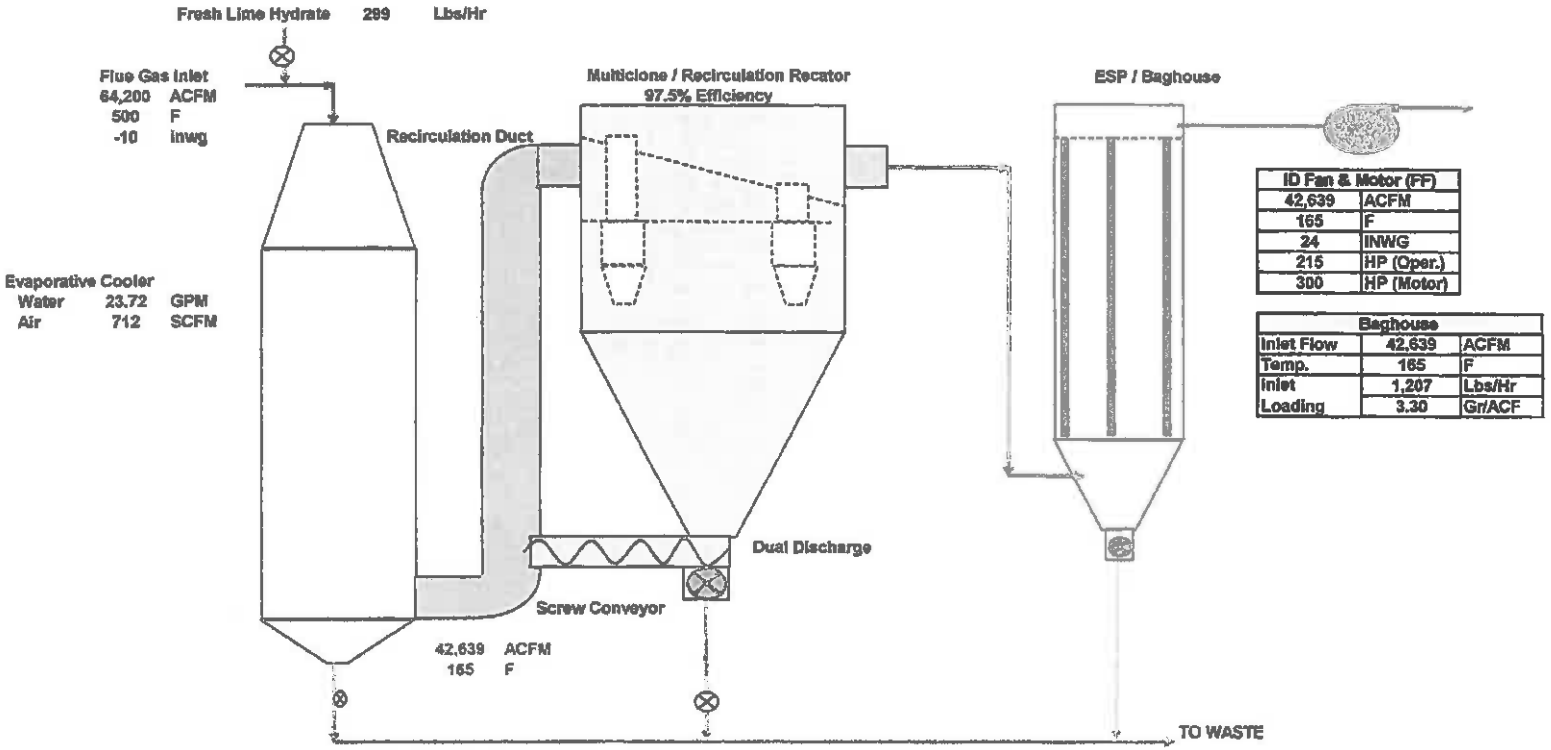
33. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

95 to 99.5%

34. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

When equipment purchase it will be submitted.

IAC RECIRCULATION SCRUBBER
SORBENT - HYDRATED LIME
ATTACHMENT-M-(APCD)



ID Fan & Motor (FF)	
42,639	ACFM
165	F
24	INWG
215	HP (Oper.)
300	HP (Motor)

Baghouse		
Inlet Flow	42,639	ACFM
Temp.	165	F
Inlet	1,207	Lbs/Hr
Loading	3.30	Gr/ACF

Lime Hydrate Injection Upstream of Cooler		
Flow from Kiln	64,200	ACFM
Temperature	500	F
Flow to/From Multiclone	42,639	ACFM
Temperature	165	F
Multiclone Inlet		
SO2; SO3; HCL; HF	143	Lbs/Hr
Flyash	800	Lbs/Hr
Fresh Hydrate	299	Lbs/Hr
Recirculation	47,043	Lbs/Hr
Total	48,285	Lbs/Hr
MC Outlet to ESP/Baghouse	1,207	Lbs/Hr
Multiclone to Waste	34	Lbs/Hr

NOTE:	Lime Hydrate injection before Flue Gas Cooling.
	Waste Silo and Convey system not illustrated

		DSI	Recirculation A	Recirculation B
Sorbent		Trona	Trona	Hydrated Lime
Feed Rate	lbs/hr	948	346	299
Capital Cost	$	Base	$135,000	$250,000
Sorbent Cost:	$	$852,959	$311,337	$179,150
1 Yr Eval. Cost:	Rank	$852,959	$446,337	$429,150

Note:		
Trona:	$225	Per Ton
Lime Hydrate:	$150	Per Ton
Oper. Hours/Year:	8,000	

ATTACHMENT-M-(APDC)

CALCIUM SORBENT REACTIONS

- $Ca(OH)_2 + SO_2 \rightarrow CaSO_3 + H_2O$
- $Ca(OH)_2 + SO_3 \rightarrow CaSO_4 + H_2O$
- $Ca(OH)_2 + 2HCL \rightarrow CaCl_2 + 2H_2O$
- $Ca(OH)_2 + 2HF \rightarrow CaF_2 + 2H_2O$

$CaSO_3$, $CaSO_4$, $CaCl_2$ and CaF_2 are collected in fly ash.

IAC

5

SODIUM BICARBONATE / TRONA REACTIONS

- $2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$
- $2(Na_2CO_3.NaHCO_3.2H_2O) \rightarrow 3Na_2CO_3 + 5H_2O + CO_2$
- $Na_2CO_3 + SO_2 + 1/2O_2 \rightarrow Na_2SO_4 + CO_2$
- $Na_2CO_3 + SO_3 \rightarrow Na_2SO_4 + CO_2$
- $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$
- $Na_2CO_3 + 2HF \rightarrow 2NaF + H_2O + CO_2$
- $Na_2CO_3 + NO_x \rightarrow NaNO_3 + CO_2$

Na_2SO_4, NaCl, NaF and $NaNO_3$ are collected in fly ash.

IAC

6

Attachment "N"
Emission Calculations
"TME" Waste-To-Energy

9.1 Material Handling – Operation and Source Emission Calculations

9.2 Fugitive Emission - Calculations

Point Source Emission – Calculation

9.4 Thermal Gasification (TG) (9.4.0) EP-001

- Emission Calculation
- Emission Unit I.D.1 – 1-S1, 1-S
- Emission Point I.D. 2 – EP-001

9.6.2 Emergency Generator

- Emission Unit I.D.1 – 5ECS
- Emission Point I.D. 2 – EP-005

General Information

9.1 Emissions

9.1.1 Operating Data

9.1.2 Air Emission Sources

9.1.3 Material Handling Operation and Sources

9.3 Fugitive Emissions – On-Site Haul Roads

9.4 Thermal Gasification of Medical Waste (SMW) Emission Calculations

Thermal Mountain Environment Services LLC (TME) WV facility is designed using the State-of-the-Art Technology for treatment and pollution control system for solid medical waste gasification from the thermal gasifier.

9.1 Emission

This Section provides Emission Rates for pollutants expected to be emitted from the Medical Waste Gasification Facility. These emission predictions are based on the following data and assumptions.

The Assumptions and emission calculations methodologies are described in detail in this section. Also, material handling is summarized in tables and presented in this section. The project annual emission rates are listed by individual emission units on the WVDAQ permit applications forms. HAP/TAP emission rates for the proposed project are also shown on this section.

This proposed facility will be dedicated to the Treatment of Medical Waste (MW) with treatment capacity of approximately 15 million pounds per year. The feedstock will be fed into the Vista Thermal Gasifier system using a screw-feed auger mechanism. Once in the gasifier, the feedstock will pass through the various parts of the gasification chamber on moving belts (see flow diagram Annex-1 DWG 22-200-05 MI). The speed of these belts are monitored and controlled to optimize the thermal decomposition reaction. The residence time in the chambers is dependent on a number of factors, including feedstock composition, density, and moisture content. As the temperature reaches approximately 1500-1800 °F, the reaction has completed, and the fuel has been converted into two products: a usable producer gas and an ash residue.

A chain belt conveyor and washing is used to remove the ash residue from the bottom of the gasifier, while the producer gas exits the top of the gasifier and passes through combustion zone at the fire tube, where it is combusted to heat the boiler. From this point, the system functions as a standard waste heat boiler system. It is anticipated that the unit will utilize a make-up water tank and may also add a condenser (see DWG ANNEX-1 22-200-5M2). To minimize water usage by the system. The Small amount of exhaust gases that are produced in this process pass through the pollution control system before exiting the stack. A cyclone will be used to remove large particulate matter and will be followed by a baghouse which will remove the smaller particulate. Effluent gas monitoring will be used at dry scrubber, sorbent injection and various points to provide testing date on the various feedstocks.

The air pollution control device (APCD) consists of cyclone, thermal oxidizer/afterburner, heat recovery unit, sorbent, AC injection system (for dioxins/furans, mercury), dry scrubbing, and baghouse.

The project also includes infrastructures such as medical waste handling, crushing, small amount of storage, ash, spent sorbent, waste product and additive handling & storage, transfer and utilities, etc. Emissions generated by this auxiliary facility is include with main APCD system.

9.1.1 Operating Data

- Feedstock (SMW) Input = 1,650 lb/hr = 7,227 TPY ≈ 7500 TPY
- Feedstock size – 1-to-2-inch Particle size
- Operating Hours Per Year = 8,760
- Heating Value of SMW = 4,500 to 15,000 Btu/lb
- Natural Gas heat Input = 15 MMBtu/hr @ 1000 BTU/cu ft, 100 hrs/yr
- Annual Emissions are based on 8760 hours of operation per year unless stated differently
- Pollution Emissions are based on 100% capacity unless stated differently
- Rated heat content for Synthetic Natural Gas is 1000 to 1020 Btu/scf . Rated heat capacity of producer is less.
- Pollutant Emissions are based on commonly accepted factors as noted in calculations
- All sulfur in the feedstock is assumed to convert to SO2, with 1% of the SO_2 assumed to convert to SO_3, and all of the SO_3 assumed to convert to H_2SO_4
- Maximum design sulfur content of feedstock is used to calculate 0.6% (actual 0.5%) for SO_2 and H_2SO_4 emission rates (lb/hr) and annual emission rates (typ).
- Pollution Emission abatement system control efficiency for sulfur emission is 95% (Conservative). Emission limit 8.1 PPM by volume.
- Steam generation – 13,800 lb/hr at 15 PSI 212F
- Ash is generally 10-15% of feedstock volume
  Ash composition depends on incoming feedstock composition. Emission meet all US and EU standard.
- NO_x concentration in flue gas: 140 ppmv or 0.07 lb/hr per MMbtu or max 0.13 lb/her MMbtu
- The dust collection system baghouse grain loading: (outlet) 0.005 gr/dscf
- PM_{10} Emissions are composed of 18mg dscf (0.00080 gr/dscf)
  - Filterable PM (Outlet grain loading) and
  - Condensable PM fractions
- CO concentration in flue gas: 11 ppmv
- VOC concentration in flue gas: 100 ppmv
- Dioxin/Furans -9.3 Nanogram per standard CUFT (4.1 grains per Standard cubic foot)
- Hydrogen Chloride (HCL) pollution emission limit for hydrogen chloride 5.1 PPM by volume
- Lead-Emission limit 0.00069 mg/dscm or 0.00030 grains per 1000dscf
- Cadium -Emission Limit 0.00013 mg/dscm or 0.000057 grains per 1000 dscf
- Mercury emission limit 0.00013 mg/dscm or 0.000057 grains per 1000 dscf

9.1.2 Air Emission Sources

Pollutant emissions from the Medical Waste Gasification facility are the product of the Waste-to Energy conversion.

This facility is expected to generate the following sources of air pollutant emissions including both point source and fugitive sources. A summary of the predicated criteria pollutant emissions is presented in the application forms.

Point sources:

- Emission Unit I.D. 1S, Emission Point I.D. – EP-001, Medical Waste -Thermal Gasification - flue gas controlled by thermal oxidizer -afterburner with low NOx burners and FGR, heat recovery exchanger, baghouse, dry injection of NaHCO3, semi-dry scrubber, and exhaust Stack -001 (Egress Point EP-001).

- Emergency Generator:

Emission Unit I.D. 5EGS, Emission Point I.D. EP-005, Emergency generator powered by a 15 MMBtu, natural gas fired engine will be used for fire water pump and emergency equipment control the exhaust gas will egress Stack -005 (EP-005). Exhaust gas will pass through a post combustion emission control -catalyst and oxidation catalyst control.

- Material Handling
    - Sorbent, Ash, Additive, etc.
    - Truck unloading
    - Crushing processing
    - Conveying
    - Storing inside gasifier for daily operation
    - Fugitive sources:
    - Vehicular traffic
    - Medical Waste-Waste to Energy Conversion
    - Ash transport from the facility

- Miscellaneous transport to and from the facility

- PM emissions from fugitive road dust caused by truck traffic are based on AP-42 emissions factors for paved roads. Calculation is based on particle size, silt loading, mean vehicle weight and number of days with at least 0.01 in of precipitation.

9.1.3 Material Handling Operations and Sources

- All material transfer pint will be fully enclosed:

- Emissions from the dust collector will be at ambient temperature.
- Control efficiency for the dust collectors is assumed to be 99.9%.
- Specific moisture contents of the various materials; and
- Filterable PMPM10 Material Handling emission estimates are based on emission factors as follows:

  Batch or continuous drop equation: AP42, fifth edition, Compilation of air pollutant.

  Emission factors from U.S. EPA's compilation of air Pollutant

  Emission Factors, Volume I: Stationary Point and area sources, fifth Ed. (AP42),

  Sections 13.2.4 (aggregate handling and storage piles) and 11.12 (for pneumatic material conveying activities); and U.S. EPA WebFIRE database (coal crushing activities under SCC 30501010).

  Emission factor 0.0060 lb/ton; WebFIRE SCC 30501010: Industrial processes, cleaning and material handling, crushing, PM10, filterable, uncontrolled; and

  Emission factor 0.00099 lb/ton; AP-42, Fifth Edition, Compilation of Air Pollutant

  Emission Factors, Volume 1: Stationary Point and Area Sources, Section 11, Table 11.12-2 (dated 6/06); controlled cement unloading to elevated storage silo

  (pneumatic) Total PM.

  Various emission sources operations (e.g., material transfers, crushing and truck loading/loading, etc.) are assigned to (i.e., being vented by) point sources identified (in the process flow diagrams).

To estimate hourly and annual emissions, several process operational assumptions are used in the calculations. Each item listed should be considered in context of plant operation within an hour timeframe (except some annual emission assumptions are changed when annual operating time is considered as noted):

- All dust collectors, including baghouses, have a 99.9% capture efficiency.
- Any un-vented transfers are 100% enclosed (i.e., there are no fugitive emission sources other than haul road travel);
- Moisture contents of various materials:

  Medical Waste 45% (as received 20%)

  Fly ash = 2%

  NaHCO3 or lime =0.7%

Spent Sorbent =2%

AC Injection =2%

Bromine = 0.7%

Additive = 0.7%

Ash =100%

- Crushers operate only eight hours / per day. However, on an annual basis, the total throughout is that of the maximum crushed product; 24 TPD annual 7500 TPY

If emission factors for PM and not PM10 are conservatively estimated from EPA data system. See Table 9.2.1 – Summary of Particulate Matter (PM) Non-Fugitive Emission.

9.1.4 Waste Storage - Indoor

There are no active feedstock storage piles. The only storage pile is covered indoor storage gasification hopper for normal daily operation.

Waste Handling -Ash is wet

Reference: The batch or continuous drop. AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Section 13.2.r, Aggregate Handling and Storage Pile.

$$EF = k \times 0.0032 \times \left(\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right)$$

where:
EF = emission factor (lb/ton)
k = particle size multiplier (PM = 0.74), (PM_{10} = 0.35) , ($PM_{2.5}$ = 0.053)
U = mean wind speed (MPH) = 3.0 (Assumed reduced wind speed for locally enclosed material drop climatological mean wind speed to be used for emission factor calculation for EP-326)
M = material moisture content (%) = 15%

and emissions are then calculated using:

$$E = EF \times F \times \left(\frac{ton}{2000\ lb} \right) \times (1 - C)$$

where:

E = emission (lb/hr)
EF = emission factor (lb/ton)
F = throughput (lb/hr) or (ton/yr)
C = control efficiency = 90%

A sample calculation for coal unloading, storage, and transfer.

EF for PM:

$$EF = 0.74 \times 0.0032 \times \left(\frac{\left(\frac{3.0}{5}\right)^{1.3}}{\left(\frac{15}{2}\right)^{1.4}}\right)$$

$$= 0.74 \times 0.0032 \times 0.0306 = 7.2 \times 10^{-5} \text{ lb/ton}$$

EF for PM_{10}:

$$EF = 0.35 \times 0.0032 \times \left(\frac{\left(\frac{3.0}{5}\right)^{1.3}}{\left(\frac{15}{2}\right)^{1.4}}\right)$$

$$= 0.35 \times 0.0032 \times 0.0306 = 3.42 \times 10^{-5} \text{ lb/ton}$$

EF for $PM_{2.5}$:

$$EF = 0.053 \times 0.0032 \times \left(\frac{\left(\frac{3.0}{5}\right)^{1.3}}{\left(\frac{15}{2}\right)^{1.4}}\right)$$

$$= 0.053 \times 0.0032 \times 0.0306 = 5.2 \times 10^{-6} \text{ lb/ton}$$

These PM, PM_{10} and $PM_{2.5}$ emission factors used for following emission points for emission calculation.

9.2 Material Handling – Operation and Source Emission

Process material handling – transfer and drops – emission factors as referenced in AP-42, Fifth addition compilation of air pollutant emission factors, Volume 1 stationary point and area sources Section 13.2.4 aggregate handling and storage.

The following process materials used at the TME medical waste gasification facility will be prepackaged in sealed containers. The non-fugitive emission of PM and PM10 will be controlled

by a main air pollution control device (APCD) system. The particulate matter emission for transport and drops will be very small quantities.

The following materials will be handled:

- Solid Medical Waste (SMW) – Ref. 9.2.2 Moisture 25%
- Refuse Derived Fuel (RDF) Ref. 9.2.2 Moisture 15%
- Activated Carbon (AC) – Ref. 9.2.3 Moisture 2%
- Ash and Spent Sorbent – Ref. 9.2.4 Moisture 2%
- Sorbent and Additive including Activated Carbon Ref. 9.2.5 Moisture 2%
- Conveying Moisture 2%

Crushing and screening in closed system are included in main Air Pollution Control Device (APCD) Egress Point, EP-001.

The summary is given in Table 9.2.1

Table 9.2.1

Emission Summary - Material Handling (Non-fugitive)

Particulate Emission		9.2.2	9.2.3	9.2.4	9.2.5	9.1	9.2	avg. lb/hr	
PM	lb/hr	0.0012	0.088	0.0002	0.0008	calculated		0.1	0.438
	tpy	0.0053	0.385	0.0009	0.004	calculated			
PM10	lb/hr	0.0271	0.0463	0.00009	0.0005	calculated		0.0739	0.324
	tpy	0.1186	0.2027	0.0004	0.0022	calculated			

The above calculation are prepared by using the following 9.4.1 waste indoor storage emission factors.

9.3 Fugitive Emission - On-site Haul Roads (Truck Traffic)

9.3.1 Fugitive Emission Calculation

The truck traffic along the haul road at site will result in fugitive PM emissions. All haul road in the immediate proximity of the plant is assumed to be paved as well as being well-maintained and cleaned. Emissions from haul roads are presented with summary of emissions in Table 9.3.2. The emissions were estimated using the following equations taken from AP-42, Section 13.2.1 Paved Roads (Jan 2011).

- Fugitive dust will be generated by trucks used to transport
  - Solid Medical Waste (SMW)
  - Ash,
  - Backing Soda ($NaHCO_3$) or Caustic Soda (NaOH) or Lime,
  - Impregnation compound (inorganic salt) and

  - Activated Carbon injection.
- The prepared medical solid waste, ash, $NaHCO_3$, activated carbon and miscellaneous trucks will operate six (6) days a week, 52 weeks a year on 12 hours per day basis.
- All trucks travelling on site will use paved road or wet road.
- Filterable PM/PM_{10} emission factors from AP-42, Section 13.2.1

Paved Roads

Total emissions = E * VMT

Where: E = size specific emission factor (lb/VMT)
VMT = Vehicle Mile Traveled

Size-specific emissions were calculated from the following equation (Daily Basis):

$$E_{ext} = [\, k\,(sL)^{0.91}\,(W)^{1.02}]\,(1 - P / 4N)$$

Where: E_{ext} = Particulate emission factor (g/m^2)
K = Particulate size multiplier for size range = $PM_{2.5}$ – 0.25 g/VMT
PM_{10} – 1.00 g/VMT
PM_{15} – 1.23 g/VMT
PM_{30} – 5.24 g/VMT
sL = Road surface silt loading = 12 g/m^2
W = Average vehicle weight = 27.5 ton
P = Wet days with 0.254 mm (0.01 in) of precipitation = 115 days (ref. figure 13.2.1.2)
N = Number of days in averaging period = 365 days

Vehicle Miles Traveled

VMT is calculated as follows:

$$VMT = \frac{2 \times [\text{Length of Haul Road (miles)}] \times [\text{Max Hourly Amount Hauled (ton/hr)}]}{\text{Capacity of Vehicle (tons)}}$$

(See Tables 9.3.1 in "Emission Summary Tables" at the end of this section)

PAVED ROADS EQUATION:

Reference AP-42, Section 13.2.1 Paved Roads (Jan 2011), Equation (2) - Daily Basis.

$$E_{ext} = [\, k\,(sL)^{0.91}\,(W)^{1.02}\,]\,(1 - P / 4N)$$

E = Particulate emission factor (units of k)
sL = road surface silt loading (grams per square meter)(g/m2) - Ref. AP-42, Section 13.2.1, Table 13.2.1-2 & 13.2.1-3
W = average weight (tons) of the vehicle travelling the road = 27.5 tons
k = particle size multiplier for particle size range - Ref. AP-42, Section 13.2.1, Table 13.2.1-1
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period from Figure 13.2.1-2 of AP42 = 115 days
N = number of days in the averaging period = 365 days

(I) - PM 2.5 INPUTS

sL = 12.0g/m2 (Very Conservative)
k = 0.25 g/VMT (0.0054 lb/VMT)
W = 27.5 tons
P = 115 Days
N = 365 Days

$$E_{ext\ (PM\ 2.5)} = [0.25\ (12.0)^{0.91}\ (27.5)^{1.02}]\ (1 - 115 / 4 \times 365)$$
$$E_{ext\ (PM\ 2.5)} = 70.43855 \times 0.9213$$
$$= 64.099 \text{ grams/VMT}$$

(II) - PM 10 INPUTS

sL = 12.0g/m2 (Very Conservative)
k = 1.0 g/VMT (0.0022 lb/VMT)
W = 27.5 tons
P = 115 Days
N = 365 Days

$$E_{ext\ (PM\ 10)} = [1.0\ (12.0)^{0.91}\ (27.5)^{1.02}]\ (1 - 115 / 4 \times 365)$$
$$E_{ext\ (PM\ 10)} = 281.75 \times 0.9213$$
$$= 319.24 \text{ grams/VMT}$$

(III) - PM 15 INPUTS

sL = 12.0g/m2 (Very Conservative)
k = 1.23 g/VMT (0.0027 lb/VMT)
W = 27.5 tons
P = 115 Days
N = 365 Days

$$E_{ext\ (PM\ 15)} = [1.23\ (12.0)^{0.91}\ (27.5)^{1.02}]\ (1 - 115 / 4 \times 365)$$
$$E_{ext\ (PM\ 15)} = 346.55 \times 0.9213$$
$$= 319.24 \text{ grams/VMT}$$

(IV) - PM 30 INPUTS

sL = 12.0g/m2 (Very Conservative)
k = 5.24 g/VMT (0.011 lb/VMT)
W = 27.5 tons
P = 115 Days
N = 365 Days

$$E_{ext\ (PM\ 30)} = [5.24\ (12.0)^{0.91}\ (27.5)^{1.02}]\ (1 - 115 / 4 \times 365)$$
$$E_{ext\ (PM\ 30)} = 1476.39 \times 0.9213$$
$$= 1360.00 \text{ grams/VMT}$$

See Table 9.3.1 - Fugitive Emission Summary

Thunder Mountain Environment LLC (TME)

TME Medical Solid Waste Gasification Facility

Table 9.3.1 Fugitive Dust Emission Summary

"Summary of Paved (or Wet) Haul Road Emission"

Table 9.3.1

Particulate material (PM) (particle size)	Uncontrolled Emission		Controlled Emission	
	lb/hr	tons/yr	lb/hr	tons/yr
1. PM2.5	0.0369	0.1349	0.0154	0.0674
2. PM10	0.1229	0.5384	0.0614	0.2690
Subtotal:	0.1592	0.6733	0.0768	0.3364
3. PM15	0.1512	0.6622	0.3220	1.4105
4. PM30	0.6441	2.8212	0.3976	1.7416
Subtotal:	0.7953	3.4834	0.7196	3.1521

9.4 Thermal Gasification of Solid Medical Waste (SMW) – Emission Unit I.D. 1-S1, Emission Point I.D. EP-001

The primary purpose for thermal gasifier for solid waste gasification are as follows:

1. Reduce the hazard associated with waste
2. Reduce the volume and mass of the waste
3. Waste-to –Energy

Waste-to Energy (WTE) is an obvious replacement for medical waste incinerators whose numbers are likely to decline due to more stringent emission standards. The high plastic content of medical waste is looked at as potential for gasification.

WTE should be considered as a more environmentally friendly treatment for the growing volumes of disinfected medical waste.

The National Environmental Engineering research institute quoted that US estimates are 9/ kg/bed/day and 22 million tons a year.

If medical waste is determined to be hazardous then it is subject to tracking and handling regulations under subtitle C, subpart 264 & 265 of the same act. In addition, transportation of hazardous waste is regulated under the "RCRA" by the department of transportation.

A publication of compliance guidelines claims that many items are currently assumed to be regulated waste simply because they looked "Medical" as opposed to being hazardous or infections wasted. Analysis of Medical Waste – See Annex-2.

These objectives are accomplished by exposing the waste to high temperatures over a sufficiently long period of time to destroy threatening organisms and burn combustible portion of the waste to produce product: Producer Gas.

Please see Annex-1; TME – Propose Process Drawings.
Also see Annex-2; Solid Medical Waste – Generation, Composition, Categories.

First waste is fed into the gasifier surge hopper, the charging door is closed, it is ignited to bring the first conveyor to target temperature. The waste is dried and burned then transferred to second conveyor. Moisture and volatile components in waste are vaporized and pass (along with combustion gases) to second conveyor. Secondary air is added and is mixed with volatile components at the second conveyor. Gases exiting second conveyor to the third conveyor where the adequate temperature is maintained to convert waste to producer gas. Conveyors provides necessary turbulent motion to gases for complete combustion.

Medical waste gasification can emit significant quantities of pollutant to the exhaust gases. These pollutants include:

- PM
- Metal
- Acid gases – SO2, H2SO4, Cl, HCL
- Carbon monoxides (CO)
- Organics
    - Dioxins/Furans (CDD/CDF)
    - Nitrogen Chloride – Nox
    - Lead – Pb
    - Cadmium – Cd
    - Mercury - Hg
- Other materials and pathogens

Emissions

- Particulate matter (PM)

Particulate Matter is emitted as results of incomplete combustion of organic (i.e. soot) and by the entrapment of noncombustible in the flue gas stream. PM may exit as a solid or an aerosol and in addition to fly ash, it may contain heavy metals, acids, and trace organics. Inorganic matter is not destroyed during combustion, most of this material leaves as bottom ash. However, some does become entrained in the FLUE gas as PM.

The "TME" FIRE Tube combustion (waste heat boiled) gives proper residence time, temperature and turbulence (good air/fuel mixing) to minimize PM Emission. Also, system provides increase residence time, higher temperature, increase oxidation to gaseous products. This will make up to 80% of the fine particulate particles.

- Metal

Orango-Metal compounds and inorganic waste present in the waste stream may be volatilized and oxidized under high temperatures and oxidizing conditions in gasification. The type and amount of trace of (heavy)metals in the flue gas are directly related to the metals contains in the waste. Some trace metal sources in the waste include surgical blades, batteries, measuring devices, foil wrappers and plastics. Plastic objects made of "PVC" contain cadmium (cd) heat – stabilizing compounds; additionally, "cd" may be found in paints/dyes. The volatilized organo-metallic compounds condense uniformly on available particulate surface area. Some submicron particles contribute most of the available surface area, these particles have a higher concentration of volatile metals per unit of mass.

Control of metal Emissions to the atmosphere involves minimizing vaporization of metals in the waste feed and maximizing small particles collection in the air pollution control device (bag house). Fabric filters achieve low metal particulates emissions; this is believed to be because of their efficient control of small particles (0.000g mg/dscm).

"APC" system is a surrogate for metal control; except for Hg; Hg in flue gas is largely in the vapor form.

- Acid gases

Combustion of medical wastes will produce acid gas emissions in the form of hydrochloric acid (Hcl) and sulfur dioxide (SO2, H2SO4) as lesser quantities of other compounds. "TME" will control by neutralization of the acid gas and or collection of the acid constituent in dry sorbents solutions.

Hydrochloric acid is formed in the flue gas by the conversion found in the waste (e.g. in plastic PVC) uncontrolled 'HCL' emissions are estimated to be on the order of 1000 PPM or less.

Sulfur is present both in the material making up medical waste and in the auxiliary fuels. Medical waste like municipal waste, typically contain 0.2 percent sulfur. The rate of SO2

emissions is directly proportional to the sulfur content of the waste and auxiliary fuels. Uncontrolled SO2 emissions are estimated to be on the order of 1000PPM or less.

- Nox: Oxides of Nitrogen

Nitrogen Oxides (NOx) represents a mixture mainly of nitric oxide (NO) and nitrogen dioxide (NO2). In combustion system 'NO" predominates due to kinetic limitation in the oxidation of NO to NO2. Nitrogen oxides are formed by one of two general mechanisms. "Thermal NOx" is the results of the high-temperature reaction between molecular nitrogen and molecular oxygen, both of which enters the combustion zone in the combustion air. "Fuel NOx" results from the oxidation of nitrogen that is chemically bound within the fuel structure.

Thermal NOx formation is extremely sensitive to temperature, where as fuel NOx is not. At the lower and adiabatic temperatures which characterize medical waste incinerations (combustion) fuel NOx account for most NOx. Omissions, while thermal NOx generally contributes less than 10 PPM. Medical waste combustion data indicates the NOx level are on the order of 200 PPM. TME will control thermal NOx by using auxiliary "After (Oxidizing) Burners".

- CO: Carbon Monoxide

Carbon monoxide (CO) is also product of "PIC". Carbon Monoxide emissions are related to shorter residence times, lower temperatures, and poorer mixing conditions that are optimal. When combustion has not proceeded to completion, CO is formed in lieu of (CO2). The FIRE tube combustion zone will control temperature and residence time to avoid formation of "CO". Small amount of (CO) is formed under these conditions.

- Organics: CCD/CDF

Products of incomplete combustion (PIC's) creates emission. Includes compounds ranging from low molecular weight hydrocarbons to high molecular weight chlorinated compounds such as dibenzo-p-dioxins and dibenzofurans (CDD/CDF).

Many factors are believed to be involved in the formation of 'CDD' and 'CDF' compounds

1. Gasification (Incineration) of 'MW'- CDD and CDF may be produced by pyrolysis of chlorinated plastics in the waste at the oxygen-standard zones.
2. CDD/CDF are synthesized from a variety of organics and chlorine donor.
3. Possible mechanisms involve catalytic reactions on fly ash particles at temperatures in range of 230° to 350°C (450° to 650°F) of specific relevance to wet scrubbing systems is potential for formation of CDD/CDF from precursor materials, such as chlorobenzene and chlorophenols that are present in recirculated scrubber solution.

4. Unburned CCDs and CDFs present in feed. The "TME" goal is to minimize formation of "CDD/CDF" using good combustion practice (GCP) in the gasification system. The Elements of GCP include

    a. Uniform medical waste feed

    b. Adequate supply and good distribution of air in the ALL Zones of gasifier

    c. High gasifier exhaust gas temperatures ((>985°c (1800°F))

    d. Secondary conveyor residence time

    e. Good mixing of combustion gases and primary and secondary air

    f. Minimization of PM entrainment in the flue gas leaving the FIRE tube combustion (combustion zones) to control of the gas temperature entering the air pollution control device (230 ° to 250°C) (450°F to 482°F) or less. Low Molecular weight organic compound (LMWC) are PICs of the volatiles evolved from waste. The Same control mechanisms described above for CDDs and CDFs are also applicable to LMWC. When Residence time, temperature, and turbulence in the combustion zone are high, LMWC emission will be low.

    g. Other pollution (Emissions)

    Other pollution specific to medical waste is cytotoxic chemicals used in chemotherapy are toxic to cell growth, are capable of impairing, injuring, or killing cells. Temperature Greater than 1095°c (2000°F) are necessary for > 99 percent destruction of cytotoxic chemicals. Examples of cytotoxins are nitrosourea, cyclophosphamide, and anthracycline antibiotics.

    h. Radioactive Waste

    "TME" is very selective and will not accept radioactive waste except negligible quantities embedded within the waste, the waste preparation contractor will make sure the material does not contain radioactive materials. Radioactive species used in vitro diagnostic studies may also be present in medical waste. The level of radioactivity is to be low (<100 Ci/g) but are difficult to estimate. Medical waste incineration is considered to by the Nuclear Regulatory Commission (NRC) to be an excellent means of low-level radioactive waste disposal. 'TME' will control high enough temperature of radioactive waste destruction requirements.

    i. Infectious waste

    Infectious material is contributed to medical waste from animal and human blood, other body fluid and parts, and instruments or bedding material that have come into contact with infectious materials. Pathogens are generally thermally sensitive and easy to destroy when exposed to typical gas temperatures in first and second conveyors (or zones). Residence times of one to two seconds. In general,

conditions that maximize the destruction of organics (i.e. time temperature and turbulence) will promote proper destruction of pathogens and bacteria. If mainly pathological waste is charged, gasifier (FIRE) need to operate at all times at conveyor NO1 and NO2 area to maintain adequate temperature levels.

9.4.0 Criteria Air Pollutant - Emission Calculation

Emission Estimate Solid Medical Waste Gasification (SMW)

This section provides sample calculations for the pollutants expected to be emitted from the TME SMW Stack-001 (Egress Point, EP-001). These emission predictions are based on the following data and assumptions.

Operating Data

- Maximum "SMW" input = 1,650 lb/hr = 7,227 TPY ≈ 7,500 TPY

Operating hours = 8,760

- Natural gas heat input at Emergency Generator = 15.0 MMBtu/hr @ 1,000 Btu/cu ft
- Heating value of "SMW" variers = 4,500 to 15,000 Btu/lb
- Steam Production Waste-To-Energy = 13,800 lb/hr
- Power Generation Waste-To-Energy = 0.5 to 1.0 MW
- Non-Fugitive Material Handling is calculated at 7,500 TPY which is conservative.

Emission

The Solid Medical Waste Gasification WV Plant production facility is expected to generate air pollutant emissions from the Medical Waste.

(See Tables 9.4.1 - Criteria Air Pollutants Emission, 9.5 - TAPs and HAPs Pollutants Emission, and 9.4.10 - Greenhouse Gas Emissions Summary, in "Emission Summary Tables" at the end of this section) calculation for reference only

9.4.1 Filterable PM_{10} Emissions (based on fabric filter control)[45]

- Outlet grain loading = 0.005 gr/dscfm (baghouse spec)
- Exhaust mol wt = 30.33 lb/lb mol dry = 385.4 scf/lb mole
- Exhaust flow = 33,128 lb/hr (dry)

$$\text{Exhaust volume} = \frac{33128X\ 385.4}{30.33\ X\ 60} = 7016 \text{ dcfm (exhaust)*}$$

* As a conservative figure, use 7016 dcfm

$PM_{10} = \frac{0.005\ X\ 7016\ X\ 60}{7000} = 0.383$ lb/hr
Annual TPY = 0.383 x 8760 x 0.0005 = 1.67 TPY

9.4.2 CO Emission

CO comes from Medical Waster Thermal Gasifier (Incineration Combustion) when combustion of the waste is not complete and small amount from thermal oxidizer natural gas burner. TME will control the thermal gasifier combustion and temperature, also thermal oxidizer to maintain CO control efficiency of 99.85% will convert CO to CO_2.

Assume CO concentration from TME as 60 ppmv.
Given dscfm from TME = 7000
Molecular weight = 28.01 lb/lb mol

Therefore, short term emission =
(7000 dscfm/385.4 SCF/lb/lb mol) x (60 part CO/1,000,000 parts) x 28.01 lb/lb mol x 60 min/hr = 1.83 lb/hr (uncontrolled)
= controlled 1.83 x (efficiency 1.998) = 0.0036

Annual emission = 0.0036 lb/hr x 8760 x 0.0005 = 0.016 TPY

9.4.3 Dioxin/Furnas

The combustion (incineration) of Solid Medical Waste (SMW) and Municipal Waste (MSW) feedstock containing about 8 to 12% of plastic as it burns, releasing toxic gases like "Dioxins/Furans" (CDD/CCF), Mercury (hg) and Polychlorinated Poiphenyis into the pollution control system.
All combustion process can result in formation of PCDD/F at temperatures ranging of 200 to 600 degrees C./ 392 to 1112 degrees F. In case of organic carbon, oxygen and chloride becomes accessible.
The formations of Dioxin/Furnas will be effectively reduced the thermal gasifier temperature control in the range of 1000 degrees C. (1832 degrees F.) and stack cooling of gases combined with absence of oxygen.
Emission estimates range from non-detect to less than 5.74 x 10^6 1mg/m3 (5.58 x 10^8) range without activated carbon injection control.
normal coal combustion system. CO and VOC control will be accomplished by the use of oxidizer/afterburner unit.

See detail calculation based on EPA emission factors reference 7.4.3 no documentation for AP-42, Section 2.6 Medical Waste Classification Codes 5-01-005-05 and 5-02-005-05.

Table 9.4 – EPA Emission Factors
Table 9.4.1 – Facility Wide Emissions – Controlled
Table 9.4.1A – Facility Wide Emissions – Uncontrolled
Table 9.4.2 – Facility Wide Metal Emissions – Controlled
Table 9.4.2A – Facility Wide Metal Emissions – Uncontrolled

We have not used any efficiency percentage as mandated in this submittal.
It is straight calculated by using this formula:
lb/hr = emission factor lb/ton x feedstock tons/hr.

9.4.4 Acid Gases – SO2, HCL, H2SO4, Etc.

Acid gases are controlled by using Alkaline Solvent Dry Scrubbing System and feedstock combination they are effectively control as described previously see table 9.4.1 for SO2, HCL, H2SO4, HBL, HF calculated without control with control are shown in the EPA requirement.

9.4.5 NO_x Emission

Reference Table 9.4 for emission calculations.

9.4.6 Lead Emissions – Pb

This is hazardous emissions. Low level of lead exposure results in neurological damage or infection. When inhale high levels of lead to abdominal cramps, headaches, loss of appetite and motor-nerve paralysis. TME will control lead emissions by using activated carbon injection in the exhaust flue. Which controls 99% of lead emissions.

9.4.7 Cadmium Emissions – Cd

Acute exposure to Cadmium can occur through inhalation or ingestion, when inhaled at high levels, Cadmium can cause severe pulmonary irritation and when ingested at high level the metal can irritate the gastrointestinal track.

A process for reducing toxic emission of mercury, cadmium, and thallium in medical waste exhaust gases are in chloride form and HCl with a (a) substantially dry finely divided alkaline material ($NaHCO_3$) and (b) substantially dry, finely divided sorbent material for removal of toxic metal chloride (AC carbon injection).

The uncontrolled emission of cadmium shows substantial variability with cadmium emission factors ranging from 0.12 to 22 g/mg of waste changed ($2.4x10^{-4}$ to $4.4x10^{-2}$ lb/ton). This range of emission factors represents a variety of waste types (mixed medical, red bag infectious waste,

pathological waste) and variety of incinerator types. Variability is related to differences in the cadmium content in the feedstock.

9.4.8 Mercury Emissions – Pb

Mercury exposure can be associated with neurological, kidney and immune system damage fatal exposure at high level. These hazardous emissions will be controlled by using dry scrubber with Alkali injection and activated carbon injection which will control 99% of these pollutants.

Mercury emission from medical solid waste combustion (MSWC) is removed by adjusting operating parameters. The results indicates that 99% of the mercury in the solid waste ended in fly ash and flue gas, of which 3.3 – 66.3% is emitted to air through stack gas. Mercury in the stack gas is mainly in the form of oxidized mercury (Hg^{2+}) the proportion 65.4 - 89% far higher than originally estimated.

Mercury removal efficiencies (MRE) is 33.6 – 95.2% by using activated carbon (AC) injection.

MRE is significantly linearly correlated to the ration of AC injection and fly ash yield (correlation coefficient = 0.98 signification < 0.01). AC injection value is determined based on the control of dioxins emissions without considering mercury emissions.

Injection rate 100 $mgNM^{-3}$ to 135 $mgNM^{-3}$ to reach removal efficiency 90%.

9.4.9 Greenhouse Gas Emissions (GHG) and Global Warming Potential (GWP)

According to research by the American Public Health Association, the US health care system contributes 9-10% of all national greenhouse emissions. 'TME' Thermal Gasification Facility for Solid Medical Waste may generate the following greenhouse emissions:
CO, CO2, NOx, CH4 and VOC
Gases produced from incineration (combustion) of Solid Medical Waste at 'TME' Thermal Gasifier Facility. Solid Medical Waste input – 1,650 lb/hr (SMW)
SMW – heating values Btu/lb = 500 to 15,000
Natural Gas input at oxidizer SCF = 3,000
Natural Gas heating value Btu/SCF = 1,000

1. CO – Carbon Monoxide –
2. CO_2 Emission

The incineration of 1.0 Mg (2.201 lb.) of municipal or solid medical waste will release 0.7 to 1.2 Mg of carbon dioxide CO2. This carbon dioxide is directly release to the atmosphere and thus makes real contribution to the greenhouse effect only the climate-revealed CO2 emissions.
The 'TME' Thermal Gasification process uses Solid Medical Waste as a feedstock fuel (SMW) and natural gas as a fuel at the after burner. CO2 produced from the combustion of natural gas and gasification oxidation process:

Feedstock (SMW) input = 1,650 lb/hr
Feed Stock Btu/lb = 500 to 15,000
Natural Gas (to) SCFH = 4,000 to 4,500
Natural Gas heating value Btu/SCF = 1,000

According to research by the American Public Health Association, the US health care system contributes 9-10% of all natural greenhouse gas emissions. The 'TME' Thermal Gasification of Solid Medical Waste (SMW) waste generates greenhouse emissions:

CO2 – Carbon Dioxide
NOx – Nitrous Oxide
CH4 – Methane
CO2 according to EPA CO2 considered greenhouse gas if it generated by fossil fuels, but 'TME' has provide this information.

Total Btu input calculation:
(1) Heat Input

Solid Medical Waste Feed stock - 1,650 lb/hr x 15,000 Btu/lb = 24.75 x 10^6 Btu/hr
(Varies – 5,000 to 15,000)
'TME' is using default high heat values for 40 CFR 98 Table C-1 Subpart C
Solid Medical Waste = 9,950 Btu/lb
Solid Medical Waste CO2 emission factor – 90.7 KgCO2/MMBtu
Feed stock input = 0.825 TPH
Feed stock heat input – 9,950 Btu/lb x 0.825 TPH = 8,208 Btu/hr

(2) Natural Gas Heat Input

Heat input 4,500 SCF/hr natural gas x 1,000 Btu/hr = 4.5 MMBtu/hr
Total heat input – 4.508208 MMBtu/hr

(3) CO_{2e} Emission
Fuel heat input in MMBtu/hr x EF (emission factor)
= 4.508208 MMBtu/hr x 90.7 Kg/CO2/MMBtu/hr
= 408.89 Kg/hr
= (901.2 lb/hr)
Annual emissions = 901.2 x 8760 x .0005 tons/lb = 3947.2 TPY

NO_2 Emissions:
NO_2 emission for natural gas = heat input in MMBtu/hr x EF
NO_2 emission factor for natural gas = 0.0001 Kg/MMBtu (40 CFR 98, Table C-1)
NO_2 emission heat input in MMBtu/hr x emission factor
NO_2 emission = 4.508208 MMBtu/hr x 0.0001 Kg/MMBtu, 0.00045 Kg/hr = 0.010 lb/hr
Annual emissions = 0.010 lb/hr x 8760 hr x .0005 t/lb = 0.0468 TPY

GHG Emission in terms of CO_2e (Carbon Dioxide Equivalent) in TPY

Pollutant	GHG Mass Emission Rates		CO_2e Emission (TPY)
	Annual (TPY)	GWP	
CO_2	3,950	1	3,950
CH_4	N/A	N/A	N/A
N_2O	0.0468	298	13.94
Total CO_2e			3,963.94 ~ 4000

(4) N_2O Emission
Nitrous oxide are compounds of NO and N_2O, Nitrous oxide N_2O is of relevance form climate perspective. Emission levels have been determined in individual measurements at SMW (MSW) incineration combustion plants to be on average of 1 to 12 mg/m3. Emission levels have been determined in individual measurements from hazardous waste incineration plants are 30 to 32 mg/m3.
N_2O emission levels (individual measurements) are markedly higher in the incineration of sewage sludge in fluidized bed plants. An average of 100 mg N_2O/m3 was used for calculations.

(5) CH_4 Emission (Methane)

It can be assumed that under the oxidative combustion prevailing in waste gasifier (incineration) in SMW and MSW combustors, methane is not present in the waste gas and consequently is not emitted. Although methane emissions may form in waste storage containments TME has no storage piles.

(6) VOC (non-methane volatile organic NMVOC)
Organic compounds (Organic-C) in waste gas of (MSW) – SMW plants are measured continuously as part of parameters total carbon. This parameter constitutes an indicator of the level of combustion achieved in the gasifier and firetube boiler process. The emissions are subject to limit of 10mg/m3, normal emission levels are always below 10 mg/m3. So, it is always total organic carbon (TOC) is below the limits.

Thunder Mountain Environmental LLC
Solid Medical Waste - Thermal Gasification
Emission Summary Table 9.4/Calculation
Emission - EPA Emission Factors - Reference (7-43)
Emission Factor Documentation for AP-42 Section 2.6
Source Classification Codes: 5-01-005-05, 5-02-005-05

Section No.	Pollutant	Uncontrolled			Controlled		
	Description	Emission Factor	Emissions		Emission Factor	Emissions	
Source Classification			lb/ton	kg/mg		lb/ton	kg/mg
	PM	B	4.67	2.33	E	2.68	1.34
	CO (C)	A	2.95	1.48	EFF	Thermal Oxidizer	
	Dioxins/Furns (C)	B	2.13E-05	1.07E-05	E	5.58E-08	2.60E-08
	TCDD	B	1.00E-06	7.70E-05	E	8.23E-10	4.11E-10
	CDF	B	7.15E-05	3.58E-05	E	9.47E-08	4.74E-08
	TCDF	B	7.21E-06	3.61E-06	E	1.01E-08	5.07E-09
	HCL (C)	B	3.35E+01	1.68E+01	C	9.43E-02	4.71E-02
	SO2 (C)	B	2.17	1.09	E	1.51E-02	7.57E-03
	SO3, H2SO4				E	9.70E-03	4.53E-03
	NOx (C)	A	3.56E+00	1.78	EFF	Thermal Oxidizer	
	Pb (C)	B	7.28E-02	3.64E-02	E	5.17E-05	2.58E-05
	Cd (C)	B	5.48E-03	2.74E-03	E	1.30E-05	6.48E-06
	Hg (C)	C	1.70E-01	5.37E-02	E	3.56E-04	1.78E-04
	Antimony (C)	D	1.28E-02	6.39E-03	E	1.51E-04	7.53E-05
	Arsenic (C)	B	2.42E-04	1.21E-04	E	1.46E-05	7.32E-06
	Barium	D	3.24E-03	1.62E-03	E	7.39E-05	3.69E-05
	Berylium (C)	D	6.26E-06	3.12E-06	E	3.84E-06	1.92E-06
	Chromium (C)	B	7.75E-04	3.88E-04	E	1.92E-04	9.58E-05
	Silver	D	2.26E-04	1.13E-04	E	6.65E-05	3.32E-05
	Thalium	D	1.10E-03	5.51E-04			
	Chorine	E	1.05E-01	5.23E-02			

Emission Factors Documentation for AP-42 Section 2.6 Medical Waste Incineration and Thermal Gasifier test for (RDF,TDF)
C - Hazardous Waste
U = Used
N - Not Used

Thunder Mountain Environmental LLC
Solid Medical Waste - Thermal Gasification
Emission Summary (Reference for Others) Table 9.4.3

Description	Uncontrolled			Controlled			HAP's Regulated	
	Emission Factor	Emissions		Emission Factor	Emissions		CAL	
	lb/ton	lb/hr	TPY	lb/ton	lb/hr	TPY	Title III S112(b	WVDEP
TOC	2.99E-01	2.46E-01	1.077	4.71E-02	3.88E-02	0.17	5.01.005.05 5.02.005.05	
PCB's	4.65E-05	3.83E-05	1.68E-04				5.01.005.05 5.02.005.05	
Aluninum (C)	1.05E-05	8.66E-06	3.79E-05	2.99E-03	2.46E-03	1.08E-02	5.01.005.05 5.02.005.05	
Antimuny (C)	1.28E-05	1.05E-05	4.60E-05	1.51E-04	1.24E-04	5.45E-04	5.01.005.05 5.02.005.05	
Arsanic (C)	2.42E-04	1.99E-04	8.70E-05	1.19E-05	9.80E-06	4.30E-05	5.01.005.05 5.02.005.05	
Barium	3.24E-04	2.60E-04	1.17E-03	7.39E-05	6.09E-05	2.60E-04	5.01.005.05 5.02.005.05	
Berlium (C)	6.25E-06	5.15E-04	2.25E-03	3.84E-06	3.16E-06	1.38E-05	5.01.005.05 5.02.005.05	
Cadmium (C)	5.84E-03	4.80E-03	2.11E-02	1.30E-05	1.07E-05	4.39E-05	5.01.005.05 5.02.005.05	
Chromium (C)	7.75E-04	6.39E-04	2.80E-02	3.96E-05	3.26E-05	1.43E-04	5.01.005.05 5.02.005.05	
Copper	1.25E-02	1.05E-02	4.60E-02	2.75E-04	2.26E-04	9.87E-04	5.01.005.05 5.02.005.05	
Iron	1.44E-02	1.18E-02	5.20E-02	9.47E-03	7.81E-03	3.42E-02	5.01.005.05 5.02.005.05	
Mangance (C)	5.76E-04	4.75E-04	2.08E-03	6.12E-04	5.05E-04	2.21E-03	5.01.005.05 5.02.005.05	
Nickle (C)	5.90E-04	4.86E-04	2.13E-03	2.84E-04	2.34E-04	1.02E-03	5.01.005.05 5.02.005.05	
Silver	2.26E-04	1.80E-04	8.16E-04	6.65E-05	5.48E-05	2.40E-04	5.01.005.05 5.02.005.05	
Thalium	1.10E-03	9.00E-04	3.97E-04				5.01.005.05 5.02.005.05	
SO3				9.07E-03	7.48E-03	3.27E-02	5.01.005.05 5.02.005.05	
HBR	4.33E-02	3.57E-02	1.56E-01	4.42E-03	3.64E-03	1.59E-02	5.01.005.05 5.02.005.05	
Hydrogen Fluoride 'HF'	1.49E-01	1.23E-01	5.38E-01	1.33E-02	1.09E-02	4.80E-02	5.01.005.05 5.02.005.05	

C - Hazardous Waste

Controlled Emission Docs not include APCD Control Efficiency.

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.1 and 9.4.1A

Table 9.4.1 - Facility Wide Emissions - Controlled

Unit I.D.	Emission "Controlled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CCD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	0.75	0.75	0.75	0.243	0.88	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.24E-02	8.00E-03	2.93	4.26E-05	1.07E-05	2.93E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Fugitive Emissions	0.24	0.24	0.24	Round Numbers Ref Table 9.3.1 Fugitive (FG), Ref Table 9.3.1 - Average and Ref Table 9.2.1 - Material Handling (MH)															Fugitive Emission
Material Handling	0.101	0.0739	-																Materail Handling
5-EGS	-	0.1501	-	0.418	0.0885	-	-	-	-	-	0.008	-	0.633	-	-	-	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	1.09	1.214	0.99	0.661	0.9685	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.25E-02	8.00E-03	3.563	4.26E-05	1.07E-05	2.93E-04	0.168		Sub-Total LB/HR
Sub-Total TPY	8.322	5.3173	4.3362	2.8951	4.242	2.01E-07	2.97E-09	3.42E-07	3.64E-08	3.40E-01	5.45E-02	3.50E-02	15.6	1.86E-04	4.69E-08	1.28E-03	0.7358		Sub-Total TPY

Table 9.4.1A - Facility Wide Emissions - Uncontrolled

Unit I.D.	Emission "Uuncontrolled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CCD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	3.85	1.125	1.125	2.43	2.00	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.79	8.00E-03	2.93	6.00E-02	1.40E-01	2.93E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Fugitive Emissions	0.32	0.32	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Fugitive Emission
Material Handling	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Materail Handling
5-EGS	-	0.1501	-	2.71	0.1725	-	-	-	-	-	0.008	-	3.81	-	-	0.381	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	4.32	1.7451	1.595	5.14	2.1725	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.798	-	6.74	6.00E-02	1.40E-01	0.381	0.168		Sub-Total LB/HR
Sub-Total TPY	18.92	7.643	5.55	22.51	9.515	6.65E-05	3.59E-05	2.067E-06	2.579E-04	12.13	7.875	-	29.52	2.63E-01	6.123E-01	1.28E-03	1.668		Sub-Total TPY

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.2 and 9.4.2A

Table 9.4.2 - Facility Wide Metal Emissions - Controlled

Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Controlled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-		Sub-Total LB/HR
Sub-Total TPY	5.45E-04	5.27E-05	2.67E-04	1.38E-05	6.93E-04	2.41E-04	3.94E-03	-		Sub-Total TPY

Table 9.4.2A - Facility Wide Metal Emissions - Uncontrolled

Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Uncontrolled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-		Sub-Total LB/HR

9.5 Hazardous/Toxic Air Pollutants (TAP/HAP) – Emission

- Details of all organic metallic HAPs:
  Emission factor for each 'TAP' is the average factor (excluding non-detects) from table.
  From: US DOE Report
  Table A-3 - Barium
  Table A-8 - Chromium
  Table A-15 - Manganese
  Table A-14 - Mercury
  Table A-18 - Nickel
  From the US DOE Report: A comprehensive assessment of toxic emission from Solid Medical Waste Gasification (Incinerator): phase-1 results from the US Department of Energy Study, September 1996
- Emission factor for 'HCL' and 'HF' are the average factors (excluding non-detects) from EPA ICR Databases for 'stack'.
  - General 1650 lb/hr (≈ 7,500 TPY)
  - Operating time: 8,760 hr/year at 5,000 to 15,000 Btu per pound
  - Heating value of SMW input: 24.75 mm Btu/hr (Maximum) and 8.25 mm Btu/hr (Minimum)

- **Facility-wide TAP/HAP Emissions**

Emission factor for each TAP is average factor (Excluding non-detects) from the DOE report: A Comprehensive Assessment of Toxic Emissions from Medical Waste (Incineration) combustion.

Emission factors for HCl and HF are the average factors (excluding non-detects) from EPA ICR database for stack test concluded on ADCFR PART60 2010 and Part II EPA Standard Performance for New Stationary Sources and Emission Guidelines.
For existing sources: Sewage Sludge Incineration units: Proposal Rule Oct-14-2010

Notes:

1. HAP emission factors are from AP-42 Section 1.1 – Solid Medical Waste Incineration Combustion, OAQPS, OAR, US EPA, Research Triangle Park, NC, September 1998.

2. The POM/PAH compounds are listed separately in Clean Air Act, Section 112(b).
   POM - Polycyclic Organic Matter.
   PAH - Polynuclear Aromatic Hydrocarbon

3. No AP-42 emission factor is available for dibenzofurans. Assume AP-42 emission factor for total TCDF (Table 1.1-12).

4. No AP-42 emission factor is available for 2, 3, 7, 8 TCDD (For FGD-SDA with FF). Assume AP-42 emission factor for total TCDF (Table 1.1-12).

5. Total PAH is also a regulated class of HAP's under CAA Title III, §112(b).

6. Emission based on mass balance calculation using the constituent content of Feedstock (SMW) lead emissions based on design feedstock content of 2 ppm (Actual 1.37 ppm) = 6,000 lb/hr coal x 2 ppm / 10^6 = 0.012 lb/hr.
Reference annual TPY = 0.012 lb/hr x 8760 x 0.0005 = 0.05256 TPY.

7. Hazardous air pollutants (HAP's) and toxic air pollutants as listed under WVDEP 45CSR13 Table 45-13-A and toxics air pollutants (TAP's) as listed under WVDEP 45CSR27 Table A.
"TME" application is well below any others are covered under section 9.0.

E_{unc} = 0.007 lb/hr (uncontrolled)
$E_{cont} = E_{unc}$ (1-C) = 0.007 x 0.01 = 0.00007 lb/hr (controlled)
= 0.00007 x 8760 x 0.0005 TPY = .0003066 TPY = 3.07E-04 TPY

Organic HAPs (POM/PAH compounds)[6]:

Table 9.4.4

Description	CAS No.	Emission Factor lb/ton	Emissions		HAPs regulated under	
			lb/hr	TPY	CAA Title III, §112(b)	West Virginia
Naphthalene[2]	91-20-3	1.30E-05	1.30E-06	5.69E-06	5.69E-06	5.69E-06
Acenaphthene	83-32-9	5.10E-07	5.10E-08	2.23E-07	2.23E-07	2.23E-07
Dibenzofurans[2,3]	132-64-9	2.49E-09	2.49E-10	1.09E-09	1.09E-09	1.09E-09
2,4-Dinitrotoluene[2]	121-14-2	2.80E-07	2.80E-08	1.23E-07	1.23E-07	1.23E-07
Fluorene	86-73-7	9.10E-07	9.10E-08	3.99E-07	3.99E-07	3.99E-07
Hexachlorobenzene[2]	118-74-1					
Phenanthrene	85-01-8	2.70E-06	2.70E-07	1.18E-06	1.18E-06	1.18E-06
Anthracene	120-12-7	2.10E-07	2.10E-08	9.20E-08	9.20E-08	9.20E-08
Fluoranthene	206-44-0	7.10E-07	7.10E-08	3.11E-07	3.11E-07	3.11E-07
Pyrene	129-00-0	3.30E-07	3.30E-08	1.45E-07	1.45E-07	1.45E-07
Benzo(a)anthracene	56-55-3	8.00E-08	8.00E-09	3.50E-08	3.50E-08	3.50E-08
Chyrsene	218-01-9	1.00E-07	1.00E-08	4.38E-08	4.38E-08	4.38E-08
Benzo(b,k)fluoranthene	205-99-2	1.10E-07	1.10E-08	4.82E-08	4.82E-08	4.82E-08
Benzo(a)pyrene	50-32-8	3.80E-08	3.80E-09	1.66E-08	1.66E-08	1.66E-08
Indeno(1,2,3-c,d)pyrene	193-39-5	6.10E-08	6.10E-09	2.67E-08	2.67E-08	2.67E-08
Benzo(g,h,i)perylene	191-24-2	2.70E-08	2.70E-09	1.18E-08	1.18E-08	1.18E-08
	92-52-4	1.70E-06	1.70E-07	7.45E-07	7.45E-07	7.45E-07
Acenaphthylene	208-96-8	2.50E-07	2.50E-08	1.10E-07	1.10E-07	1.10E-07
2,3,7,8-TCDD[2,4]	1746-01-6	3.93E-10	3.93E-11	1.72E-10	1.72E-10	1.72E-10
Total POM/PAH[5]			2.10E-06	9.21E-06	9.21E-06	9.21E-06

Other Organic HAPs*

Table 9.4.4

Description	CAS No.	Emission Factor lb/ton	Emissions		HAPs regulated under	
			lb/hr	TPY	CAA Title III, §112(b)	West Virginia
Acetophenone	98-86-2	1.50E-05	1.50E-06	6.57E-06	6.57E-06	6.57E-06
Benzyl Chloride	100-44-7	7.00E-04	7.00E-05	3.07E-04	3.07E-04	3.07E-04
Cyanide	74-90-8	2.50E-03	2.50E-04	1.10E-03	1.10E-03	1.10E-03
Methyl Chloride	74-87-3	5.30E-04	5.30E-05	2.32E-04	2.32E-04	2.32E-04
Methyl Bromide	74-83-9	1.60E-04	1.60E-05	7.01E-05	7.01E-05	7.01E-05
Vinyl Chloride	75-01-4		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethyl Chloride	75-00-3	4.20E-05	4.20E-06	1.84E-05	1.84E-05	1.84E-05
Carbon Disulfide	75-15-0	1.30E-04	1.30E-05	5.69E-05	5.69E-05	5.69E-05
1,1-Dichloroethane	75-34-3		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroform	67-66-3	5.90E-05	5.90E-06	2.58E-05	2.58E-05	2.58E-05
1,2-Dichloroethane	107-06-2		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl Ethyl Ketone	78-93-3	3.90E-04	3.90E-05	1.71E-04	1.71E-04	1.71E-04
Carbon Tetrachloride	56-23-5		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vinyl Acetate	108-05-4	7.60E-06	7.60E-07	3.33E-06	3.33E-06	3.33E-06
Propylene Dichloride	78-87-5		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethene	79-01-6		0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethane	79-00-5		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	71-43-2	1.30E-03	1.30E-04	5.69E-04	5.69E-04	5.69E-04
1,3-Dichloropropylene	542-75-6		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromoform	75-25-2	3.90E-05	3.90E-06	1.71E-05	1.71E-05	1.71E-05
Tetrachloroethene	127-18-4		0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,2,2-Tetrachloroethane	79-34-5		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	108-88-3	2.40E-04	2.40E-05	1.05E-04	1.05E-04	1.05E-04
Chlorobenzene	108-90-7	2.20E-05	2.20E-06	9.64E-06	9.64E-06	9.64E-06
Ethylbenzene	100-41-4	9.40E-05	9.40E-06	4.12E-05	4.12E-05	4.12E-05
Styrene	100-42-5	2.50E-05	2.50E-06	1.10E-05	1.10E-05	1.10E-05
Xylenes	1330-20-7	3.70E-05	3.70E-06	1.62E-05	1.62E-05	1.62E-05
Formaldehyde	50-00-0	2.40E-04	2.40E-05	1.05E-04	1.05E-04	1.05E-04
Acetaldehyde	75-07-0	5.70E-04	5.70E-05	2.50E-04	2.50E-04	2.50E-04
Acrolein	107-02-8	2.90E-04	2.90E-05	1.27E-04	1.27E-04	1.27E-04
Propionaldehyde	123-38-6	3.80E-04	3.80E-05	1.66E-04	1.66E-04	1.66E-04
Total Organic HAPs			7.77E-04	3.40E-03	3.40E-03	3.40E-03

9.5.1 Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants Table

- After burner destruction efficiency - 99.0% (for organic compound)
- Dust collector baghouse efficiency - 99% (assumed)
- HG with activated carbon (AC injection) - 80%
- Assume 99.9% of H2S oxidizes to SO2 in the after burner

	Efficiency Standard Table 9.4.5					
Pollutants	Pre-controlled potential emission (tons/year)	Potential to emit (PTE)	Units	Potential to emit (lb/hr)	Potential to emit (tons/year)	Basis for determination
1. Barium	N/A	0.000025	lb/mm Btu	0.00405	0.01774	other
2. Chromium	N/A	0.000016	lb/mm Btu	0.00259	0.01064	other
3. Manganese	N/A	0.000015	lb/mm Btu	0.00243	0.01064	other
4. Mercury	N/A	0.000006	lb/mm Btu	0.00097	0.00424	other
5. Nickel	N/A	0.000011	lb/mm Btu	0.00178	0.00779	other
6. Hydrochloric Acid	N/A	0.000108	lb/mm Btu	0.01749	0.0766	other
7. Hydrogen Fluoride (HF)	N/A	0.000089	lb/mm Btu	0.01441	0.06311	other
8. Sulfuric Acid (H2SO4)	N/A	0.000005	lb/mm Btu	0.00081	0.00354	other

- After burner destruction efficiency - 99.0% (for organic compound)
- Dust collector baghouse efficiency - 99% (assumed)
- HG with activated carbon (AC injection) - 80%
- Assume 99.9% of H2S oxidizes to SO2 in the after burner

Metallic HAPs:

Table 9.4.5

Description	CAS No.	Emission Factor lb/ton	Emissions		HAPs regulated under	
			lb/hr	TPY	CAA Title III, §112(b)	West Virginia
Antimony	7440-36-0		1.59E-06	6.96E-06	6.96E-06	6.96E-06
Arsenic	7440-38-2		1.34E-05	5.87E-05	5.87E-05	5.87E-05
Barium	7440-39-3		4.19E-03	1.84E-02	1.84E-02	1.84E-02
Beryllium	7440-41-7		3.10E-06	1.36E-05	1.36E-05	1.36E-05
Cadmium	7440-43-9		7.17E-07	3.14E-06	3.14E-06	3.14E-06
Chromium	7440-47-3		3.98E-05	1.74E-04	1.74E-04	1.74E-04
Copper	7440-50-8		1.63E-04	7.14E-04	7.14E-04	7.14E-04
Lead	7439-92-1		1.88E-05	8.23E-05	8.23E-05	8.23E-05
Manganese	7439-96-5		1.39E-04	6.09E-04	6.09E-04	6.09E-04
Mercury	7439-97-6		1.75E-04	7.67E-04	7.67E-04	7.67E-04
Nickel	7440-02-0		3.98E-05	1.74E-04	1.74E-04	1.74E-04
Selenium	7782-49-2		8.20E-06	3.59E-05	3.59E-05	3.59E-05
Zinc	7440-66-6		9.90E-05	4.34E-04	4.34E-04	4.34E-04
Total Metallic HAPs			4.89E-03	2.14E-02	2.14E-02	2.14E-02
Other Inorganic HAPs						
Ammonia	7664-41-7					
Hydrogen Chloride	7647-01-0		9.18E-03	4.02E-02	4.02E-02	4.02E-02
Hydrogen Fluoride	7664-39-3		6.04E-02	2.65E-01	2.65E-01	2.65E-01
Sulfuric Acid	7664-93-9					
Hydrogen Sulfide	7783-06-4					
Total (Other inorganic HAPs)			6.96E-02	3.05E-01	3.05E-01	3.05E-01
Grand Total (HAPs)			7.53E-02	3.30E-01	3.30E-01	3.30E-01

Notes:

Annual emissions are based on 8,760 hrs/yr of operation

1. These POM/PAH compounds are listed separately.
2. These POM/PAH compounds are listed separately in Clean Air Act, Section 112(b).
3. Total PAH is also a regulated class of HAPs; total POM is a regulated class of HAPs under CAA Title III, §112(b).
4. TCDD - Emission factor from Ref. #45 - Table 1.1-12, Emission Factors for Bituminous and Subbituminous Coal Combustion.
5. Assumes 99.9% of H_2S oxidizes to SO_2 in the afterbumer.
6. Emission Factors for Polynuclear Aromatic Hydrocarbons (PAH) from Control Coal Combustion, Ref. #45, Table 1.1-13.

9.6 Ancillary Equipment

Emissions from the ancillary equipment for the TME-RES are calculated based on similar methods demonstrated in the previous subsections. This equipment includes egress point EP-005 from TME-TG and emergency generator. The emissions for each of these pieces of equipment are contained in the following tables.

9.6.1 Emergency Vent from Thermal Gasifier (TG)

The TME facility is equipped with one emergency vent system. This emergency vent is to control pollutant emissions from TG. During start-up, shutdown, or upset events the controlled flow is transferred to the scrubber and baghouse prior to venting to atmosphere to meet environmental standards.

Also, this emergency vent is used to vent TG by-product waste gas during power failure. Under this condition, feed to TG would be stopped immediately, vent opened, and the rotation rate of the rake arm reduced slowing the activation reaction and generation of air pollutant emissions. Because of stopping feed immediately, quantity of potential emissions is limited to what can be generated by the process volume of the TG. In addition, as a result of the process ramp down temperature decreases and rate at which emissions would be generated is reduced. As such, emissions in excess of the proposed average mass rates from a power failure (an upset condition) are not anticipated. Normally it will be less than normal operating conditions. So the emission from emergency vent will not be discussed further in the calculation sections.

9.6.2 Emergency Generator – Emission Unit I.D. 5EGS, Emission Point I.D. EP-005

- Natural gas fired.
- Engine will operate no more than 100 hours per year.
- Emission Factor AP-42 Section 3.3 and criteria pollutant from manufacture

Use of these emission factors will yield conservative emission rates, given that NO_x, CO, and PM emissions for new emergency generator engines will be certified to more restrictive levels under 40 CFR 60, Subpart IIII by the manufacturer. The specific levels will depend on the actual model year of the engine installed.

The "TME" facility will have a 15 MMBtu/hr natural gas fired emergency generator. While it is not anticipated that the generator will be used more than 100 hours per year, the pollutant emissions have been calculated based on operating every hour of the year (8,760 hr/yr). The emissions associated with the generator are based on AP-42, natural gas combustion emission factors, and are presented in Table 9.6.2 Emergency Generator (15 MMBtu/hr) Stack No. 0005 (Egress Point EP-005) and manufacturer's emission data - from Cummins power generation - Cummins Model No. QS491 are presented in Table 9.6.2.2 and engine information to drive the generator (pump) is presented in Table 9.6.2.3.

The emergency generator powered by a 15 MMBtu natural gas-fired engine will be installed as part of the proposed project. The engine will be operated only during emergencies and once a month testing amounting to a maximum of 100 hours per year. The engine will be certified by manufacturer to comply with applicable US EPA and West Virginia DEQ Standards. Post system, the emergency generator exhaust routed through a dedicated zinc oxide bed catalyst and oxidation catalyst system by equipment supplier.

The emissions have been calculated based on operating every hour of the year (8760 hours). The criteria and HAPS emission generated by the 15 MMBtu natural gas-fired engine is presented in detail under Table 9.6.2.1 based on AP-42, Section 3.2 (4-stroke engine @ 95% efficiency) and manufacturer's (Cummins) information post system emission data are presented under Table 9.6.2.2 and 9.6.2.3.

Emission Source Information	Emergency Generator (15 MMBtu/hr) Emissions											
	NO_x[1]		CO		VOC		HAPs		SO_2		PM_{10}	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
15 MMBtu Engine (AP-42) Section 3.2, 4-stroke engine, Ref. Table 9.6.2.1	0.633	2.782	0.418	1.83	0.0885	0.3876	0.168	0.737	0.008	0.0385	0.1501	0.6583
Manufacturer (Cummins), Ref. Tables 9.6.2.2 & 9.6.2.3	0.32	1.40	0.99	4.33	NA	NA	NA	NA	NA	NA	NA	NA
Value used by TME for emission (most conservative)	See calculation based on manufacture data											

The emission shown above under Table 9.6.2.2 - Emergency Generator based on manufacturer's "Post system emission outlet data" information which reflects a 4-stroke lean-burn engine. TME proposes that the emergency generator will be used at 90% load. Please not those emissions are based on 8,760 hours per year (maximum operation is 100 hours/yr), so this is most conservative.

Criteria Air Pollutant - Emission Calculation
Emission Estimate - Emergency Generator, based on BACT WV DAQ emission factors for Natural Gas fired lean burnt engine - BACT guideline varies with fuel and region.

1. Operating Data

- Operating hours = 100
- Maximum Natural gas input = 14,706 SCF @ 1,020 Btu/cu ft
- Maximum Btu input = 15,000,000 Btu/hr
- Power Output = 2463 bhp
- Design Exhaust Flow = 22,097 lb/hr ± 2%
- Design Exhaust Temp = 941 ± 20°F
-

2. Emission

2.1 NO_x Emission

- Emission factor = 0.7 g/hp-hr
- Total BHP = 2463

NO_x Emission (in Kg/hr) = $\frac{Emission\ Factor\ in\ g/hp-hr\ x\ HP}{1000\ g/kg}$

= (0.7 x 2463) / 1000

= 1.7241 kg/hr

= 1.7241 kg/hr x 2.204 lb/kg = 3.81 lb/hr

= (3.81 lb/hr x 100 hr/yr) / 2000 = 0.19 tpy

2.2 CO Emission

- Emission Factor = 0.5 g/hp-hr
- Total BHP = 2463

CO Emission (in Kg/hr) = $\frac{Emission\ Factor\ in\ g/hp-hr\ x\ HP}{1000\ g/kg}$

= (0.5 x 2463) / 1000

= 1.2315 kg/hr

= 1.2315 kg/hr x 2.204 lb/kg = 2.71 lb/hr

= (2.71 lb/hr x 100 hr/yr) / 2000 = 0.135 tpy

2.3 VOC Emission

- Emission Factor = 0.07 g/hp-hr
- Total BHP = 2463

VOC Emission (in Kg/hr) = $\frac{Emission\ Factor\ in\ g/hp-hr\ x\ HP}{1000\ g/kg}$

= (0.07 x 2463) / 1000

= .17241 kg/hr

= .17241 kg/hr x 2.204 lb/kg = .381 lb/hr

= (.381 lb/hr x 100 hr/yr) / 2000 = 0.19 tpy

2.4 Formaldehyde (HAP) Emission

- Emission Factor = 0.07 g/hp-hr
- Total BHP = 2463

HAP Emission (in Kg/hr) = $\frac{Emission\ Factor\ in\ g/hp-hr\ x\ HP}{1000\ g/kg}$

= (0.07 x 2463) / 1000

= .17241 kg/hr

= .17241 kg/hr x 2.204 lb/kg = .381 lb/hr

= (.381 lb/hr x 100 hr/yr) / 2000 = 0.19 tpy

9.7 Waste-To-Energy – Steam Boiler/Turbine Generator

Medical waste thermal gasifier is considered "Waste-To-Energy" – because it will generate energy. The combustion gases chemically converted to combustible gases (Typically known as syngas or producer gas). In the combustion zones these gases will generate steam in the fire tube boiler. This will be used at the steam turbine to generate power; this power will be used in the process equipment drives. The minimum power that will be produces is 0.5 MW and the maximum power produced will be 1.0 MW. The conversation efficiency of waste heat is more than 60 to 70%. This system will not generate any air pollutants.

Attachment O

Monitoring / Recordkeeping / Testing Plans

This TME WV Plant application for minor source EPA Permit, the plant will need the following emission requirements:

The plant will implement good operating practice for coal unloading from trucks, coal loading to hopper, product loading, storing, conveying, crushing, screening, and general maintenance dust generation and atmospheric entrainments, operations and maintenance of emission control equipment.

4.2.7.1 Standards and Limitations

The TME will meet all applicable standards as described under sections 4.0 and any additional standards as required by the US EPA / WVDAQ.

Limitations:

Emissions as per table 3.1 and 3.2, criteria pollutants as per table 9.4.1, TAPs and HAPs emission per table 9.4.2

4.2.7.2 Testing Requirements

The plant will conduct test(s) - stack-001 (EP-001) and stack-005 (EP-005) to compliance with emission limitations set forth in this application. The TME WV Plant will provide all necessary sampling connections and sampling ports on stack along with excess platform and stairs. Stack test initial performance documents will be submitted to WVDAQ and US EPA as required for egress point EP-001 (stack-001) and EP-005 (stack-005)

4.2.7.3 Operation Data

TME WV Plant will maintain operational records. TME WV Plant will maintain certifiable records of the following:

a) MSW delivered to facility - daily/monthly
b) additive – none
c) sodium bicarbonate - NaHCO3 - sorbent - daily/monthly
d) the amount of activated carbon produced - daily/monthly
e) the spent sorbent/ash produced - daily/monthly
f) the amount of water/dust suppressions etc. - daily/monthly
g) liquid flow rate (water) gasifier ash removal

h) pressure drop across baghouses and operating range - daily
i) natural gas in MCF - per year
j) cause of the malfunctions and duration - steps taken to correct the malfunction or any modification to equipment or procedure
k) record of maintenance of air pollution control equipment
l) opacity exceeding if any

Attachment P

Public Notice

Class 1 Legal Advisement

45CSR 13.8.3 and 45CSR 13.8.5

Example of Legal Advertisement for Details

Affidavit of Publication on Attachment P

Thunder Mountain Environmental Servicers LLC

W.V. Plant - Legal

Plant Location:

5334 Point Pleasant Rd, Ravenswood, WV 26164
Jackson County

Reference Coordinates:

- UTM - Easting – 431161.06
- UTM - Northing – 4308549.80
- UTM Zone - 17 S
- Longitude: 38.923164
- Latitude: -81.79419

Total Building Area: 13,200 sq ft

Plant from sea level EL 182.79 - 599.57 feet above sea level

Plant floor EL - 599.57' ± ft

Applicant: Thunder Mountain Environmental Services, LLC

Type of Permit: Minor Source – "Construction Permit"

Operations: Medical Solid Waste Gasification

Startup Date: 22-Nov-22 (Final – 3-Jan-23)

Type of Pollutant: Criteria Pollutant – Each Criteria Pollutant allowance by EPA & WV DAQ is 100 tons per year – See Emission Table 9.4

A) Criteria Pollutant	Tons Per Year	Round Numbers
a. Particulate Matter	9.6842	10
b. CO – Carbon Dioxide	1.066	1.2
c. Dioxin/Furans	1.24E-06	
i. TCDF	1.34E-05	
ii. TEQ	1.34E-05	
d. HCL	0.34	0.4
e. SO2 – Sulfur Dioxide	5.20E-02	5.20E-02
f. NOx – Nitrogen Oxide	1.257	1.3
g. Lead – Pb	1.87E-05	1.9E-05

h. Cadmium – Cd	4.60E-05	4.60E-05
i. Mercury – Hg	1.29E-04	1.3E-05
j. Fugitive Emissions – Table 9.3.1	3.1521	3.2
k. Material Handling – Table 9.2.1	0.761	0.8
l. HAPS (Total)		

B) Source and Contact – For more Information:

Mr. Naren Patel
42 Pine hurst Place
Dayton, Ohio 45066
Tel: (937)545-4872

C) Written Comments:

1.) All questions regarding this permit application should be directed to the DAQ at telephone number – (304)926-0499 Ext 1250.
2.) Written comments should be sent to:
The West Virginia Department of Environmental Protection
Division of Air Quality (DEQ)
601 57th Street SE
Charleston, WV 25304
From 30 day from the date of publication of this notice.

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.1 and 9.4.1A

Table 9.4.1 - Facility Wide Emissions - Controlled

Unit I.D.	Emission "Controlled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CCD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	0.75	0.75	0.75	0.243	0.88	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.24E-02	8.00E-03	2.93	4.26E-05	1.07E-05	2.93E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Fugitive Emissions	0.24	0.24	0.24	Round Numbers Ref Table 9.3.1 Fugitive (FG), Ref Table 9.3.1 - Average and Ref Table 9.2.1 - Material Handling (MH)															Fugitive Emission
Material Handling	0.101	0.0739	-																Material Handling
5-EGS	-	0.1501	-	0.418	0.0885	-	-	-	-	-	0.008	-	0.633	-	-	-	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	1.09	1.214	0.99	0.661	0.9685	4.60E-08	6.78E-10	7.81E-08	8.30E-09	7.77E-02	1.25E-02	8.00E-03	3.563	4.26E-05	1.07E-05	2.93E-04	0.168		Sub-Total LB/HR
Sub-Total TPY	8.322	5.3173	4.3362	2.8951	4.242	2.01E-07	2.97E-09	3.42E-07	3.64E-08	3.40E-01	5.45E-02	3.50E-02	15.6	1.86E-04	4.69E-08	1.28E-03	0.7358		Sub-Total TPY

Table 9.4.1A - Facility Wide Emissions - Uncontrolled

Unit I.D.	Emission "Uuncontrolled" - lb/hr																	ITYY	EUDS Emission Unit Data Sheet
	PM	PM10	PM2.5	CO	VOC	Total CCD	Total TCDD	Total CDF	Total TCDF	HCL	SO2	SO3	NoX	Pb	Cd	Hg	HAP's	Operating Hours	
1-S	3.85	1.125	1.125	2.43	2.00	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.79	8.00E-03	2.93	6.00E-02	1.40E-01	2.93E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Fugitive Emissions	0.32	0.32	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Fugitive Emission
Material Handling	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Material Handling
5-EGS	-	0.1501	-	2.71	0.1725	-	-	-	-	-	0.008	-	3.81	-	-	0.381	0.168	100	Emergency Generator - Calculates 8760 Hours
Sub-Total LB/HR	4.32	1.7451	1.595	5.14	2.1725	1.75E-05	8.20E-07	5.94E-06	5.89E-05	2.77	1.798	-	6.74	6.00E-02	1.40E-01	0.381	0.168		Sub-Total LB/HR
Sub-Total TPY	18.92	7.643	5.55	22.51	9.515	6.65E-05	3.59E-05	2.067E-06	2.579E-04	12.13	7.875	-	29.52	2.63E-01	6.123E-01	1.28E-03	1.668		Sub-Total TPY

Thunder Mountain Environmental LLC
Minor Source Air Permit Application
Ref. WV Office of Air Quality - 40CFR 266 Sub-Part H
Table 9.4.2 and 9.4.2A

Table 9.4.2 - Facility Wide Metal Emissions - Controlled

Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Controlled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.24E-04	1.20 E-05	6.09E-05	3.16E-06	1.58E-04	5.40E-05	9.00E-04	-		Sub-Total LB/HR
Sub-Total TPY	5.45E-04	5.27E-05	2.67E-04	1.38E-05	6.93E-04	2.41E-04	3.94E-03	-		Sub-Total TPY

Table 9.4.2A - Facility Wide Metal Emissions - Uncontrolled

Unit I.D.	Emission of "Metal" from Medical Waste Thermal Gasification "Uncontrolled" - lb/hr								ITYY	EUDS Emission Unit Data Sheet
	Antimony - Sb	Arsanic - AS	Barium - Ba	Balium - Be	Chromium - Cr	Silver - Ag	Thalium Ti	Selenium - Se	Operating Hours	
1-S	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-	8760	Thermal Gasifier - WVDEP 1-S (From - I)
Sub-Total LB/HR	1.056E-02	1.996E-04	2.67E-03	5.15E-06	6.39E-04	1.86E-04	9.00E-04	-		Sub-Total LB/HR

Attachment Q

Business Confidentiality Claims

No Confidential material in this application

Attachment R

Authority of Corporation or

Other Business Entity (Domestic or Foreign)

Attachment R
AUTHORITY OF CORPORATION
OR OTHER BUSINESS ENTITY (DOMESTIC OR FOREIGN)

TO: The West Virginia Department of Environmental Protection, Division of Air Quality

DATE: April 18, 2022

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 88-1632364

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) Bryan J. Fennell (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.

Bryan J Fennell President

President or Other Authorized Officer
(Vice President, Secretary, Treasurer or other official in charge of a principal business function of the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

Secretary

Name of Corporation or business entity

Annex 2 - Medical Waste Information

Dental Information – for Reference Only

Medical Waste- Information

	Medical Waste Information
Figure 1	How Much Medical Waste is Produced
Figure 2	Regulated Medical Waste: 10-25% Unregulated Medical Waste: 75-90% Six different packing Five Ways of Treating 1. Incineration 2. Thermal Autoclaving Non- Incineration System 3. Irradiative (microwave) 4. Chemical 5. Biological (Enzymes)
Figure 3	Schematic Diagram of Medical Waste Categories
Figure 4	Schematic Diagram of Energy /Fuels /Material
Figure 5	Schematic Diagram Co-processing of other Waste (MSW) (ALB) (FLB)
Figure 6	Medical Waste Fraction Percentage
Table 7	Regulated Medical Waste/Chemotherapeutic/ Non-hazardous Pathological Medical Waste - Weight/volume

FIGURE -1
ANNEX-2 CREF ICON 22-200-05

How Much Medical Waste Is Produced?

33 lbs.
of medical waste per day per staffed bed

Florida alone has approximately
38,000 facilities
that generate biomedical waste

Regulated Medical Waste
Unregulated Medical Waste

SHARPS Red Sharps Container	BIOHAZARD Red Container or Red Liner in Container	TRACE CHEMO Yellow Container
√ Needles √ Ampules	√ Infectious Waste √ Blood Products (albumin etc)	√ Empty vials, ampules √ Empty Syringes, Needles

FIGURE -1 (REF ICON 22-200-05

FIGURE-2
ANNEX-2 (REF. ICON 22-200-05

SHARPS
Red Sharps Container

- ✓ Needles
- ✓ Ampules
- ✓ Broken Glass
- ✓ Blades
- ✓ Razors
- ✓ Staples
- ✓ Trocars
- ✓ Guide Wires
- ✓ Other Sharps

BIOHAZARD
Red Container or Red Liner in Container

- ✓ Infectious Waste
- ✓ Blood Products (albuminate)
- ✓ Contaminated Personal Protective Equipment (PPE)
- ✓ IV Tubing
- ✓ Cultures, Stacks

TRACE CHEMO
Yellow Container

- ✓ Empty vials, ampules
- ✓ Empty Syringes, Needles
- ✓ Empty IVs
- ✓ Gowns
- ✓ Gloves
- ✓ Tubing
- ✓ Aprons
- ✓ Wipes
- ✓ Packaging

RCRA HAZARD
Black Container

- ✓ Hazardous meds (RCRA)
- ✓ Half/Partial doses (RCRA)
- ✓ Hazardous bulk meds
- ✓ P-listed drugs, packaging
- ✓ Bulk chemo
- ✓ Pathological Waste (Incineration Only)

PHARMACEUTICAL
Blue Container

- ✓ Pills
- ✓ Injectables
- ✓ Antibiotics

RADIOACTIVE
Shielded Containers with Radioactive Symbol

- ✓ Fluorine-18 (F-18). 110 minutes half-life
- ✓ Technetium-99 (T-99m). 6 hour half-life
- ✓ Iodine-131 (I-131). 8 days half-life.
- ✓ Strontium-89 (Sr-89). 52 days half-life
- ✓ Iridium-192 (Ir-192). 74 days half-life
- ✓ Cobalt-60 (Co-60). 53 years half-life

5 Ways of Treating Medical Waste

Incineration

Typically for pathological waste and pharmaceutical waste Never for plastics.

Non-Incineration Systems

Thermal
(Autoclaving)

Typically for sharps waste and infectious waste.Never for pathological waste.

Irradiative
(Microwave)

Typically for sharps waste and infectious waste.Never for pathological waste.

Chemical

Typically for chemical waste and liquid waste (e.g. generated from laboratory cleaning)

Biological
(Enzymes)

Undeveloped and rarely used technology for medical waste disposal

Properly Disposing Of Your Medical Waste Prevents Infections and Diseases From Spreading, And

Keeps Our Earth Clean.

FIGURE-2 (REF ICON 22-200-05)

FIGURE-3-MEDICAL WASTE CATEGORIES/TYPES
ANNEX-2 (REF. ICON 22-200-05)

Figure 1
A schematic diagram on medical waste categories/types.

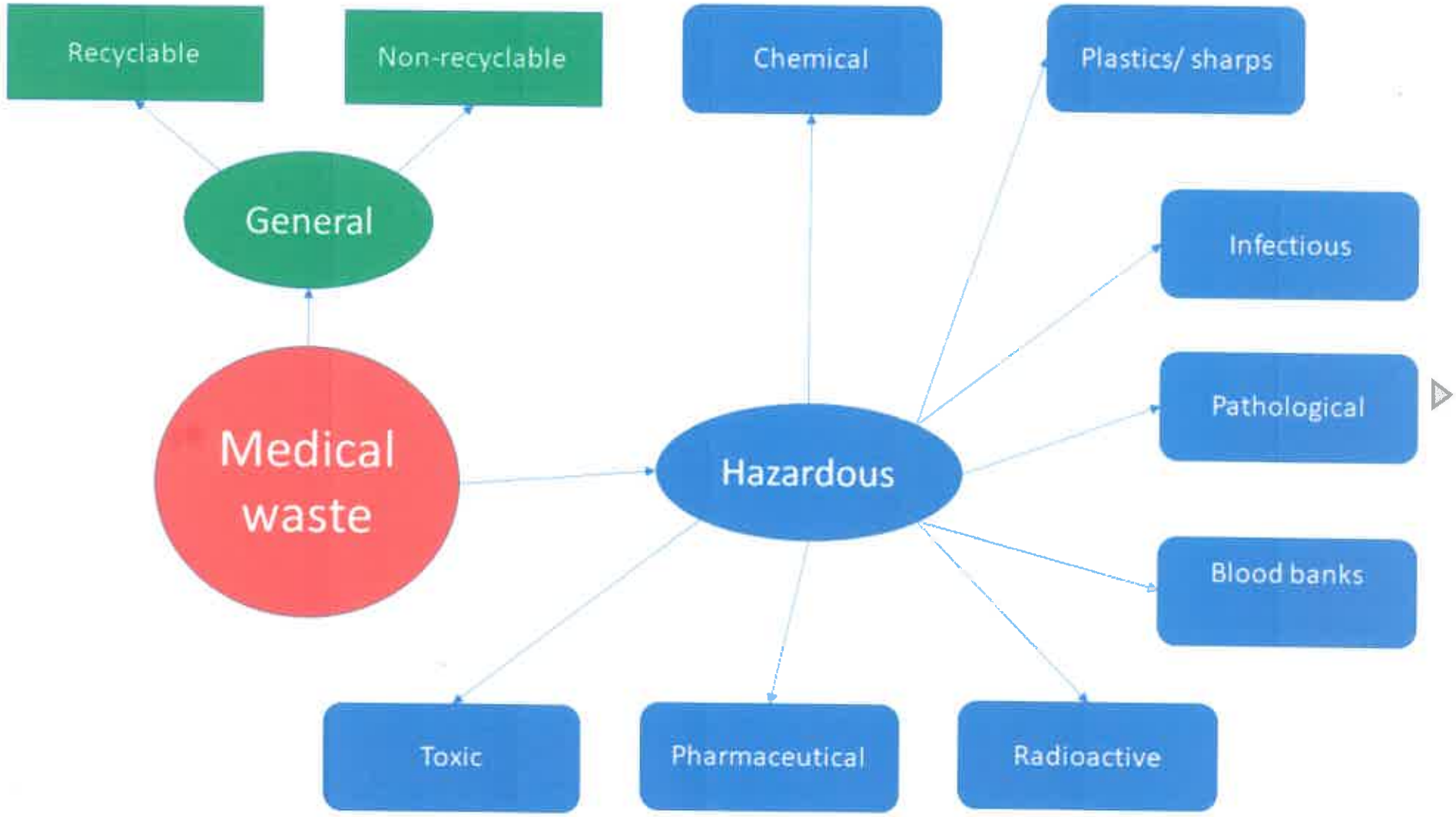


FIGURE-3-(REF ICON 22-200-05

FIGURE - 3 MEDICAL WASTE-ENERGY/FUELS/MATER.
ANNEX-2 (REF ICON 22-200-05)

Figure 3
A schematic diagram on energy/fuels/materials production from medical waste and medical waste fractions via various treatment technologies.

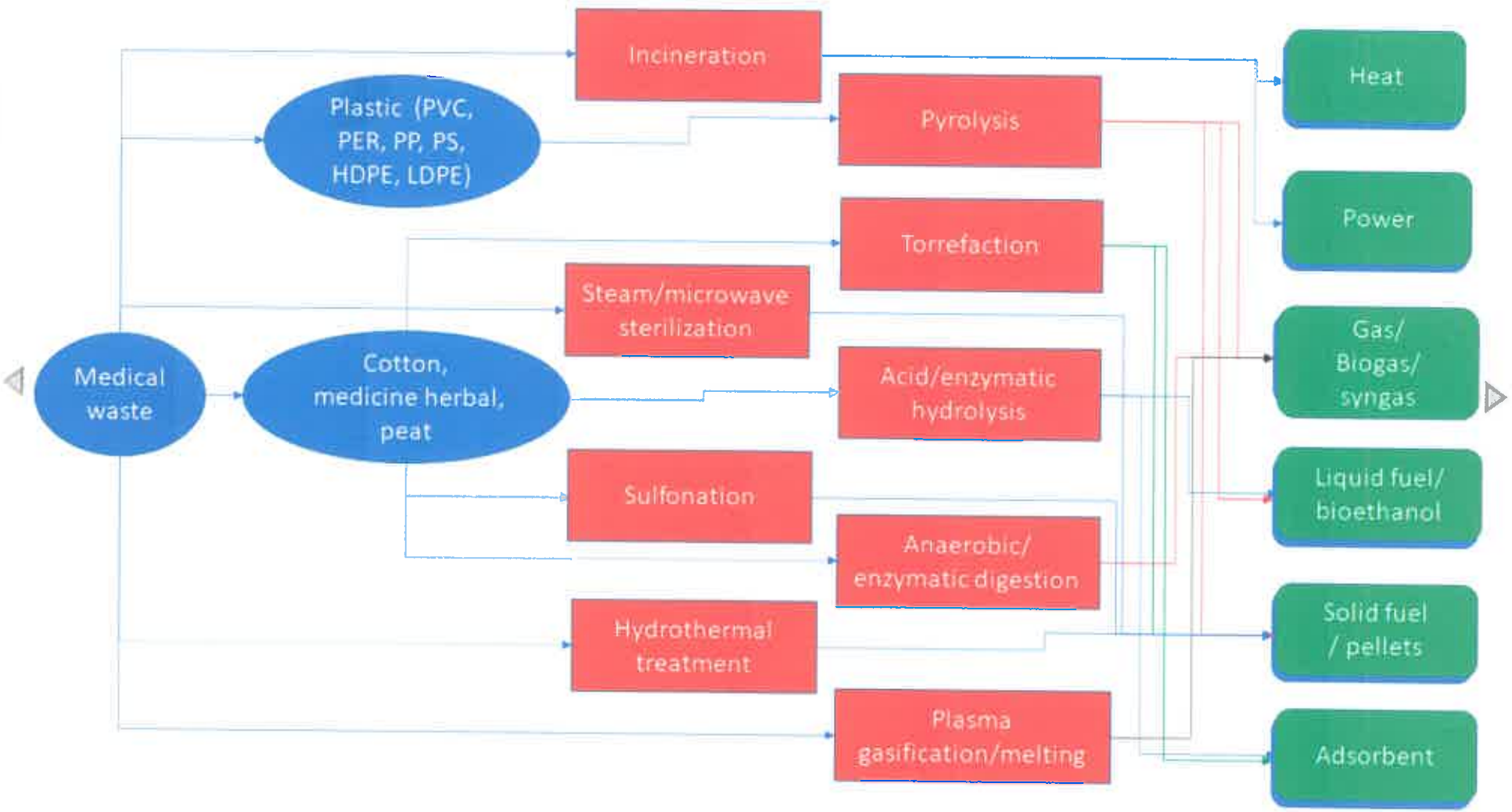


FIGURE - 4 (REF ICON 22-200-05)

FIGURE-5-CO-PROCESSING OF OTHER WASTE
ANNEX-2 (REF ICON 22-200-05)

Figure 4
A schematic diagram on co-processing of the plastic/lignocellulosic fraction of medical waste with municipal/industrial solid waste fractions and/or agricultural/forest lignocellulosic biomass for fuels/materials.

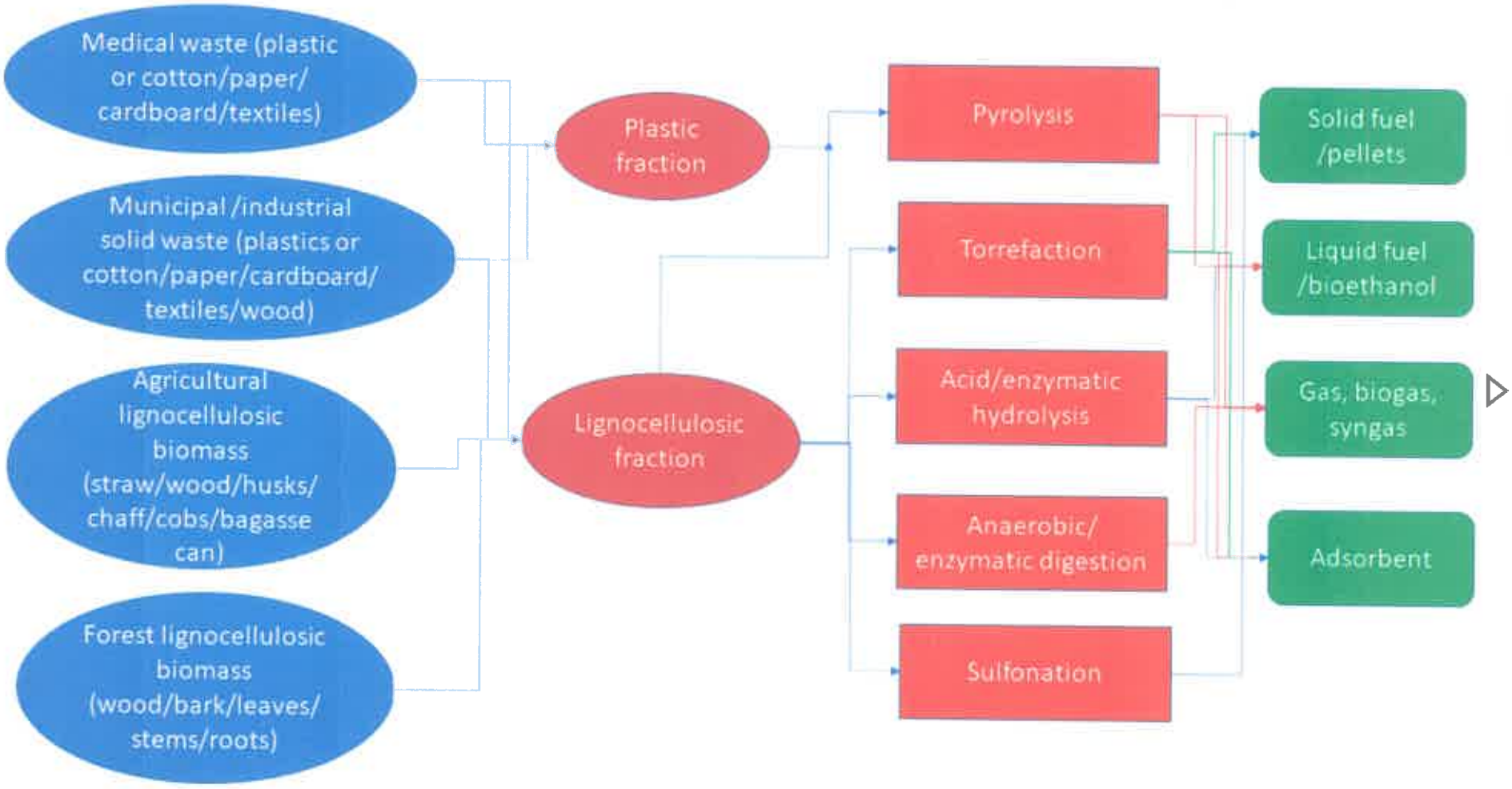


FIGURE-5 CREF ICON 22-200-05

FIGURE-6 MEDICAL WASTE FRACTION %
ANNEX-2 (REF ICON 22-200-05

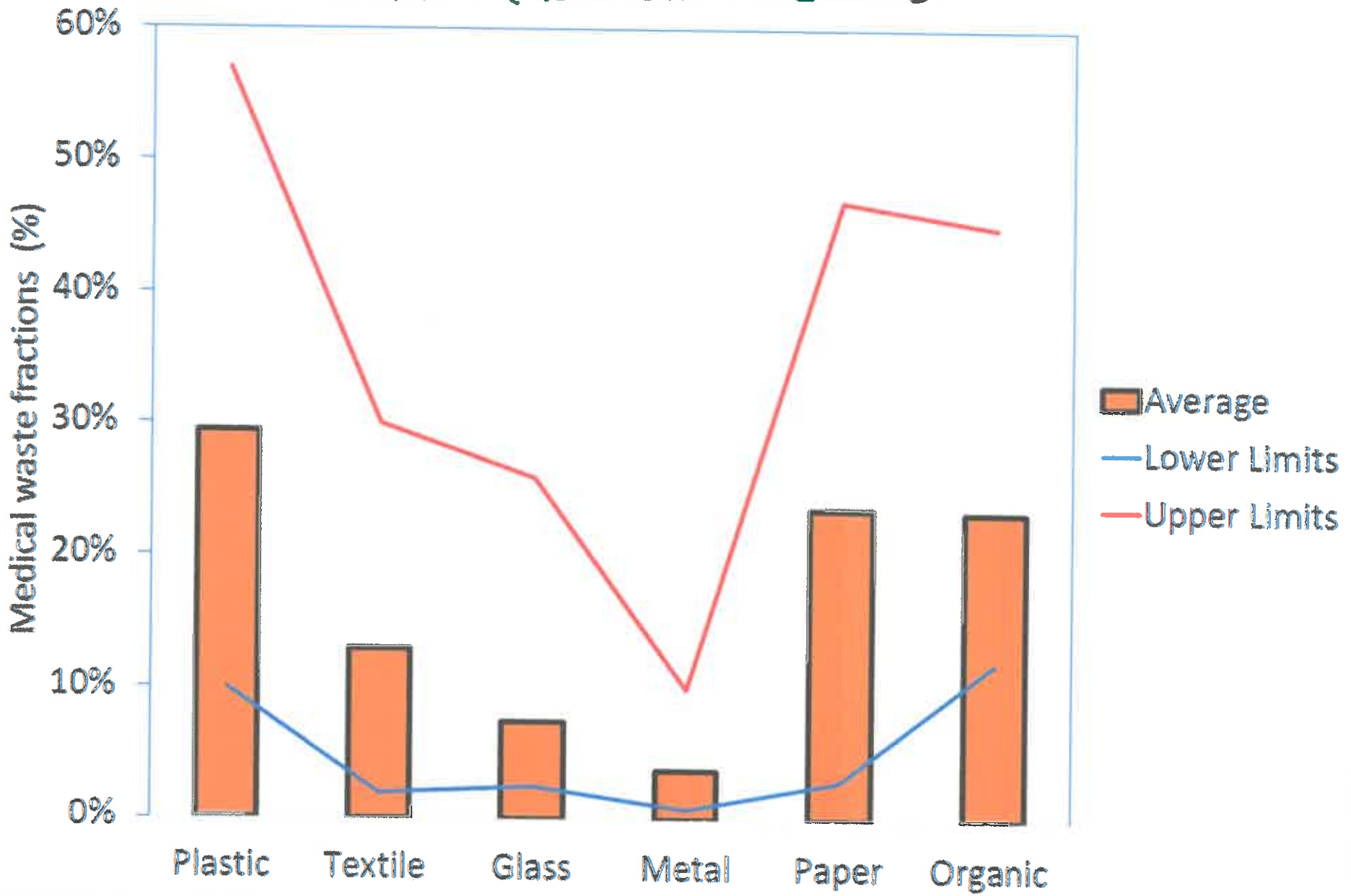


FIGURE-6 (REF ICON 22-200-05)

TABLE-7(REF ICON 22-200-05

Regulated Medical Waste Breakdown

waste contaminated with blood and other bodily fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections (e.g. swabs, bandages and disposable medical devices);

Using the standard 30 gallon container the following average weight of each container is:

Weight by volume	21.5 lbs	
Liquid (Water, Blood, Other)		3.225
Solid (plastic, other)		13.975
Solid (paper cardboard)		4.3
Packaging by volume	21.5 lbs	
Liquid (Water, Blood, Other)		15%
Solid (plastic, other)		65%
Solid (paper cardboard)		20%

Trace Chemotherapeudic Waste Breakdown

waste containing substances with cytotoxic properties (i.e. trace substances that are, mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites

Using the standard 30 gallon container the following average weight of each container is:

Weight by volume	18.4 lbs	
Liquid (Water, Blood, Other)		5.52
Solid (plastic, other)		11.04
Solid (paper cardboard)		1.84
Packaging by volume	18.4 lbs	
Liquid (Water, Blood, Other)		30%
Solid (plastic, other)		60%
Solid (paper cardboard)		10%

Non-Hazardous Pharmaceutical Waste Breakdown

expired, unused and contaminated drugs and vaccines, non-listed

Using the standard 30 gallon container the following average weight of each container is:

Weight by volume	26.2 lbs	
Liquid (Water, Blood, Other)		7.86
Solid (plastic, other)		14.41
Solid (paper cardboard)		3.93
Packaging by volume	26.2 lbs	
Liquid (Water, Blood, Other)		30%
Solid (plastic, other)		55%
Solid (paper cardboard)		15%

Pathological Medical Waste Breakdown

human tissues, organs or fluids, body parts and contaminated animal carcasses

Using the standard 30 gallon container the following average weight of each container is:

Weight by volume	24.2 lbs	
Liquid (Water, Blood, Other)		10.89
Solid (plastic, other)		8.47
Solid (paper cardboard)		4.84
Packaging by volume	24.2 lbs	
Liquid (Water, Blood, Other)		45%
Solid (plastic, other)		35%
Solid (paper cardboard)		20%

TABLE-7 MEDICAL WASTE WEIGHT - VOLUME

POPULATION HEALTH DIVISION

ATTACHMENT "D"

FactSheet

Guidelines for Handling and Storing Medical Waste

Many types of facilities can generate medical waste: hospitals, clinics, physicians offices, dental practices, laboratories, blood banks, veterinary hospitals/clinic, and medical research facilities. Medical Waste may be either non-infectious or infectious.

Non-Infectious Waste

Non-Infectious waste is waste at a hospital or health care facility that has not been contaminated with blood or other human body fluids. This includes commonly occurring waste such as IV bags, tubing, non-bloody gloves, packaging and urine-soaked pads.

Disposal of Non- Infectious Waste

Non-infectious waste does not need to be disinfected and can be discarded in the regular trash can with other solid waste. Staff who may come in contact with both infectious and non-infectious waste should receive training on an annual basis to ensure that they are able to successfully identify both.

Infectious Waste (Medical Waste)

This is waste that may be contaminated by blood, body fluid or other potentially infectious materials (OPIM). Medical Waste is divided into two categories: biohazardous or sharps.

How do you know if an item is contaminated?
If the item is soaked with blood, body fluid or OPIM (dripping with blood/body fluid when squeezed)

UNIVERSAL PRECAUTIONS

The Bloodborne Pathogen Standard states that universal precautions should be taken when people are exposed to blood/body fluids. Implementing Universal precautions is an approach to infection control where all human blood/body fluids are treated as infectious. In other words treat all blood/body fluid as if infected whether you think it is or not.

How are workers exposed to Medical Waste?

- Needle sticks or cuts from used needles or sharps
- Blood or OPIM coming in contact with your eyes, nose, mouth or broken skin
- Splashes or punctures

How can you protect yourself?

- Get the hepatitis B vaccine
- Read and understand your employer's Exposure Control Plan.
- Use Best Management Practices (BMP) whenever practical. Common BMP include:
  - Hand washing is one of the most important practices and easiest ways to prevent exposure.
  - Dispose of used sharps promptly into an appropriate sharps disposal container.
  - Use personal protective equipment (PPE), such as gloves and face shields, every time there is a potential for exposure to blood or body fluids.
  - Clean work surfaces with germicidal products.

STORAGE & HANDLING

Storage Containers should be:

- Closable
- Equipped with a tightfitting cover
- Puncture resistant
- Leak proof on sides and bottom
- In good condition, cleaned and decontaminated on a regular schedule

Biohazardous Waste
Place all biohazardous waste in a red biohazardous waste bag. The biohazardous waste bag must then be put in a rigid container for storage until it is picked up for proper disposal.

Sharps Waste
Place all sharps in a sharps container. Sharps containers must be sealed prior to being discarded or replaced.

Labels
Medical Waste Containers should be labeled with:

- Water-resistant labels
- The words "Biohazardous Waste" for biohazardous waste
- The words "Sharps Waste" or the international symbol

All labels should be affixed to or printed on the outside of the container.

During use, containers for medical waste shall be:

- Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found (e.g., laundries);
- Maintained upright throughout use; and
- Replaced routinely and not be allowed to overfill.

When moving containers of medical waste from the area of use, the container shall be: Closed immediately prior to removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping

Medical Waste Accumulation Times

All medical waste must be disposed of in timely manner

Facilities generating more than 20 pounds of biohazardous or sharps waste per month may store the waste onsite at or above 32 degrees Fahrenheit for up to **seven days** without obtaining prior written approval from the enforcement agency.

Facilities generating less than 20 pounds of biohazardous waste per month may store the waste onsite at or above 32 degrees Fahrenheit for up to **thirty days**.

Biohazardous or sharps waste may be stored onsite at or below 32 degrees Fahrenheit for up to **ninety days** without obtaining prior written approval from the enforcement agency.

The enforcement agency may require more frequent removal if odors from biohazardous or sharps waste poses a nuisance.

What you should do if you're exposed?

- Wash needle sticks and cuts with soap and water
- Flush splashes to nose, mouth, or skin with water.
- Irrigate eyes with clean water, saline, or sterile wash.
- Report all exposures promptly to ensure that you receive appropriate follow up care

How can facilities improve safety and health for workers?
You can improve safety by participating in the following activities:

- Identify and evaluate hazards and adopt interventions to prevent work-related injuries
- Identify employees with occupational exposure
- Provide training
- Develop Minimum Standards

For more information

U. S. Department of Labor Occupational Safety and Health Administration
https://www.osha.gov/OshDoc/data_BloodborneFacts/bbfact04.pdf

California Department of Public Health
http://www.cdph.ca.gov/certlic/medicalwaste/Documents/MedicalWaste/2013/MWMAfinal2013.pdf

San Francisco Department of Public Health
Hazardous Materials and Waste Program
Environmental Health Branch
Population Health Division
1390 Market Street, Suite 210
San Francisco, California 94102
415.252.3900
www.sfdph.org/dph/eh

POPULATION HEALTH DIVISION

ATTACHMENT - "D"