



**PERMIT-TO-INSTALL APPLICATION  
OHIO RIVER CLEAN FUELS FACILITY  
VILLAGE OF WELLSVILLE, COLUMBIANA AND JEFFERSON COUNTIES, OHIO**

**SUBMITTED TO:**

**OHIO ENVIRONMENTAL PROTECTION AGENCY**

**SUBMITTED BY:**

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**CEC PROJECT 061-933.0002**

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## INTRODUCTION

### 1.0 Site Location

On behalf of Ohio River Clean Fuels, LLC (ORCF), Civil & Environmental Consultants, Inc. (CEC) has prepared this Permit-to-Install (PTI) application for a proposed coal-to-liquid fuels facility. ORCF has selected a site located west of Route 7 and the Ohio River near Wellsville, Columbiana and Jefferson Counties, Ohio. The proposed project site boundary is shown on Figure 1 – Site Location Map.

### 2.0 Project Team

ORCF enlisted the support of various consulting firms to carry the project from the design to the permitting stage. ORCF and the Project Team have presented portions of the information within this application to the Ohio EPA during pre-application meetings and teleconference calls during 2007. These discussions have provided insight into state and federal permitting requirements and the level of technical information appropriate and necessary for this application package. Consequently, this application has been compiled as a non-confidential document with the understanding that it will be made publicly available through the Ohio EPA's internet web site.

### 3.0 Project Description

The purpose of this project is to produce ultra-clean high-quality liquid transportation fuels from coal and biomass. The proposed facility will encompass an area of approximately 275 acres within a property boundary of more than 600 acres. Figure 2 is a proposed plot plan of the entire facility illustrating both the elements of the facility that are the subject of this PTI application as well as other key site elements.

Figure 3 is a block flow diagram of the entire manufacturing process. To simplify the presentation and organization of this application, the facility has been divided into twelve discrete but interrelated modules. Each module is illustrated in Figure 3. The following brief descriptions summarize the air quality permit modules of the facility. Detailed process descriptions and module-specific flow diagrams are provided in the module-specific permit application sections.

#### 3.1 Feedstock Storage

Bituminous coal (e.g., Pittsburgh #8) and biomass (e.g., saw dust, wood chips, or dry chicken litter) will be stored in six piles: four for coal, one for biomass, and one for either coal or biomass. The total storage pile area will be approximately 19 acres. Air emission sources include material handling equipment and wind erosion of storage piles which will produce airborne particulate matter.



### 3.2 *Feedstock Processing*

Coal and biomass will be delivered to the facility by either conveyor or truck. Conveyor transfers will originate from a river-side coal terminal operated by a separate legal entity. ORCF will operate a transfer tower located at the coal terminal. From there, coal and biomass will be delivered via enclosed conveyor to the storage piles. Coal and biomass will also be delivered by truck to an enclosed hopper building. Fugitive particulate matter emissions will be generated from stacker/reclaimers used to manage the coal pile, and from conveyors used to transfer coal and biomass from the hopper building to the storage piles. Point source particulate emissions will be associated with various transfer towers, silos, crushers, and filling vessels. Products of combustion will be generated when fuel is burned to dry the feedstock prior to delivery to the gasifiers.

### 3.3 *Gasification*

Six gasifiers will be used to manufacture synthetic gas (syngas) consisting primarily of carbon monoxide and hydrogen from the feedstock. Gasification involves exposure of feedstock to sub-stoichiometric quantities of oxygen at elevated temperature (about 2,800 °F) and pressure. By-products of the gasification process include slag and ash. Slag and ash will be removed as described in Module 4. Syngas generated in the gasifiers is then cleaned in Module 5 – Syngas Cleanup. The gasification process will not be a source of atmospheric emissions under normal operating conditions. During startup and shutdown of the gasifiers and during emergencies or process upsets, it will be necessary to direct gasifier products to the high pressure flare.

### 3.4 *Material Handling*

Fly ash is collected and transferred to one of six storage silos prior to being shipped off-site. Point sources of particulate emissions include intermediate storage vents and storage silo vents. Fly ash will be pneumatically conveyed from the silos to trucks. Passive bin vent filters will control particulate emissions associated with the transfer of the fly ash from silos.

Dewatered slag from each of the six gasifiers will be conveyed to on-site storage via enclosed conveyors. The slag storage area will be surrounded on three sides by low barriers to contain material and provide partial wind barriers. The slag storage pile area is estimated at about one acre and will be a source of fugitive particulate emissions.

### 3.5 *Syngas Cleanup*

In this part of the plant, sulfur, mercury, and other impurities that would adversely impact the Fischer-Tropsch and Product Upgrade processes are removed from the syngas generated in the gasifiers. Syngas processing steps include:

- filtration (particulate removal);



- wet scrubbing (residual particulate, soluble alkali salts, hydrochloric acid, and hydrofluoric acid);
- activated carbon adsorption (mercury);
- Rectisol<sup>®</sup> (or equivalent) acid gas removal (hydrogen sulfide [H<sub>2</sub>S], carbonyl sulfide [COS], CO<sub>2</sub>, and other trace components such as cyanide, ammonia, mercury, and metal carbonyls); and
- Zinc oxide sorption (residual sulfur species)

Also included within this module are sulfur recovery systems that will be used to convert sulfur compounds removed from syngas in the acid gas removal process into elemental sulfur. The sulfur recovery system includes thermal oxidization for control of reduced sulfur species.

### *3.6 Fischer-Tropsch and Product Upgrade*

In the Fischer-Tropsch process, syngas (essentially carbon monoxide and hydrogen), undergoes conversion to hydrocarbons and water in the presence of cobalt catalyst particles. Hydrocarbons formed in the Fischer-Tropsch reactors will be fractionated into various product streams. Emission sources associated with this process are process heaters; various equipment flanges, valves and seals that may be sources of fugitive volatile organic compounds; and catalyst regeneration gases sent to a low-pressure flare.

In the Product Upgrade process, middle distillates are hydrotreated and then refined via distillation into F-T-diesel, F-T-naphtha, and liquefied petroleum gas. Air emission sources include process heaters and various equipment flanges, valves and seals that may be sources of fugitive volatile organic compounds.

### *3.7 Tank Farm*

Products from the Fischer-Tropsch and Product Upgrade processes will be stored in above-ground storage tanks or pressure vessels prior to being shipped offsite. The tank farm will include eight (three-million gallon) fixed-roof tanks to store middle distillates and four internal floating-roof tanks to store F-T naphtha and off-specification product. Liquefied petroleum gas (LPG) will be stored in ten nominal 30,000-gallon LPG bullets.

### *3.8 Product Loading*

Tanker truck loading of product will occur at the loading rack adjacent to the tank farm. The design of the loading rack will provide capacity for four to eight tanker trucks to load F-T diesel and/or F-T naphtha simultaneously. A pipeline connection for product delivery is also anticipated. The F-T naphtha product loading rack will be equipped with a vapor recovery system.



### *3.9 Combined Cycle Plant*

The power block will be constructed in three phases. The first phase will be a 1,200 MMBtu/hr boiler (Phase 1 Boiler) that will be constructed along with a steam turbine. A transitional stage where one combustion turbine generator (CTG) will be brought on line will begin roughly 18 months after the initial startup. The full operational phase where the second CTG will be brought on line will begin about 36 months after initial startup.

The Combined Cycle block will consist of two CTGs, each exhausting to its own Heat Recovery Steam Generator (HRSG) and a process steam turbine generator (PTG). Two 230 MW (nominal) CTGs will burn tailgas produced within the facility. Emissions from the HRSGs will be controlled by selective catalytic reduction and catalytic oxidation.

### *3.10 Cooling Towers*

The waste heat from condensers at the facility will be rejected by two hyperbolic wet cooling towers. Each tower will be 580 feet tall and 239 feet in diameter at the top. Ohio River water will be used for the cooling tower makeup with pre-treatment prior to use. The cooling towers will also provide cooling required for the coal-to-liquids processes.

### *3.11 Emergency Generator and Fire Pumps*

Emergency power generation for the site will be provided by a single 16-cylinder diesel-powered 2-MW emergency generator. Two nominal 300 bhp diesel-driven fire pump engines will be used to provide fire protection at the facility.

### *3.12 Roadways and Parking*

Plant roads at the Ohio River Clean Fuels facility will allow for delivery of raw materials (coal and biomass), export of products (F-T diesel, F-T naphtha, and LPG), shipping of by-products (sulfur, fly ash, and slag), and employee vehicle traffic and parking. Due to the high volume of traffic, all plant roads will be paved. Haul trucks will be covered and roadways will be watered and swept in accordance with a dust control plan.

## **4.0 Primary Emission Units and Air Pollution Control Equipment**

Table 1 is a list of the primary emission units proposed for the ORCF facility. As detailed in the attached application, ORCF will employ multiple air pollution control technologies and strategies to reduce air emissions from the plant. Specifically, ORCF will limit the emission of particulate matter (total, PM<sub>10</sub>, and PM<sub>2.5</sub>), sulfur dioxide, nitrogen dioxide, carbon monoxide, volatile organic compounds, organic compounds, hazardous air pollutants, and air toxics through the use of the following methods:



- Full and partial enclosures as well as wind barriers
- Dust suppressants
- Baghouses, fabric filters, and pneumatic conveyance
- Enclosed conveyors
- Low-sulfur, clean fuels
- Good design and combustion practices
- Thermal oxidation
- Ultra Low-NOx and low-NOx burners
- Selective Catalytic Reduction
- Catalytic Oxidation
- Leakless/sealless or low-emission components
- Leak Detection and Repair Program
- Internal Floating Roof Tanks
- Vapor Recovery System
- Drift Eliminators
- Dust Control Program

Specific pollution control technologies associated with the primary emission units are identified in Table 1.

#### 5.0 Emission Inventory Summary

Detailed information about the air emissions profile for the various processes proposed for the ORCF facility are provided in the individual Emission Inventory sections of the Permit Application. Table 2 summarizes the actual annual emissions from ORCF. ORCF has the potential to emit non-criteria air pollutants that are regulated as hazardous air pollutants (HAP) under Clean Air Act Section 112. Table 3 summarizes the HAP emissions from the facility. In addition to criteria pollutants and hazardous air pollutants, the facility has the potential to emit other air contaminants that may have an adverse impact on human health. These air toxics are defined by Ohio EPA as substances for which a health-based threshold limit value (TLV) has been established by the American Conference of Governmental Industrial Hygienists (ACGIH). Table 3 summarizes short-term and annual estimated emissions of air toxics from ORCF.

#### 6.0 Regulatory Summary

Regulations applicable to the entire facility are discussed below. Module-specific applicable regulations are presented in the respective application modules. The matrix shown in Table 4 summarizes applicable regulations identified for each process module.

##### *6.1 Air Pollution Nuisances Prohibited (3745-15-07)*

The emission into the open air of smoke, ashes, dust, grime, acids, fumes, gases, vapors, odors, or any other substances or combinations of substances, in such a manner as to endanger the



health, safety or welfare of the public, or cause unreasonable injury or damage to property, is a public nuisance. It is unlawful for any person to cause, permit or maintain any such public nuisance.

## 6.2 Stack Height Requirements (3745-16)

Good engineering practice stack height requirements are established by this rule. According to 3745-16-02, the requirements of the rule apply to all new air contaminant sources, with certain exemptions that do not apply to ORCF. Good engineering practice (GEP) stack height is defined in 3745-16-01 as the greater of either:

- 65 meters measured from the ground-level elevation at the stack base (or building from which the stack arises);
- the height of the nearby structure (i.e., within 5 times the building height or up to 0.8 km) plus the lesser of the height or projected width times 1.5; or
- the height demonstrated by a fluid model or field study approved by the director which ensures that the emissions from the stack do not result in excessive concentrations.

Stack heights for ORCF sources will be evaluated relative to these criteria. Final stack heights will be selected on the basis of director-approved modeling evaluations and engineering considerations.

## 7.0 BACT Analysis Summary

The proposed ORCF coal-to-liquid fuels plant will be a chemical process plant (SIC Code 2869 and NAICS Code 325199). As a Chemical Process Plant, the facility is one of the 28 named source categories listed in Section 169 of the Clean Air Act. Therefore, the facility will be considered a major source if the potential to emit for any single pollutant regulated by the Act, including fugitive emissions, exceeds 100 tons per year.

As shown in Section 4, facility-wide potential emissions of all criteria pollutants exceed the 100-ton per year threshold, therefore the facility is a major stationary source as defined under OAC 3745-31-01(KKK). As such, the facility is subject to New Source Review.

Because Columbiana County, Ohio is in attainment (or is unclassified) for all regulated pollutants, Prevention of Significant Deterioration (PSD) review applies. While a portion of the facility property is within the adjacent Jefferson County, and Jefferson County has been designated a non-attainment area for fine particulate (PM<sub>2.5</sub>) air emission sources will not be located in Jefferson County. Non-attainment permitting requirements have therefore not been addressed in this application.

In accordance with OAC 3745-21-15(C) a new major stationary source shall apply best available control technology (BACT) for each regulated New Source Review pollutant that the major stationary source has the potential to emit in significant amounts. The significant emission rates, per OAC 3745-21-01(KKKKK) are:



Carbon Monoxide:	100 tpy
Nitrogen Oxide:	40 tpy
Sulfur Dioxide:	40 tpy
Total Suspended Particulate:	25 tpy
PM10:	15 tpy
Ozone (VOC):	40 tpy
Lead:	0.6 tpy
Fluorides:	3 tpy
Sulfuric Acid Mist:	7 tpy
Hydrogen Sulfide:	10 tpy
Total Reduced Sulfur:	10 tpy
Reduced Sulfur Compounds:	10 tpy
NMOC from landfills:	50 tpy

The Table 1 summarizes the emission units and pollutants that are considered in this BACT analysis.

### 7.1 Top-Down BACT Methodology

Best available control technology (BACT) is defined in OAC 3745-31-01(S) as:

“... an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the director, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such major stationary source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such air pollutant.”

In a memorandum dated December 1, 1987, the U.S. Environmental Protection Agency (EPA) Assistant Administrator for Air and Radiation implemented the “top-down” method for determining BACT. As described in EPA’s *Draft New Source Review Workshop Manual* (October 1990), the five steps of a top-down BACT analysis are:



Table 1  
Summary of BACT Applicability by Permit Module

Module	BACT Analysis Required?					
	PE/PM10	CO	NO <sub>x</sub>	VOC	SO <sub>2</sub>	H <sub>2</sub> S
1. Feedstock Storage	YES	NO	NO	NO	NO	NO
2. Feedstock Processing	YES	YES	YES	YES	YES	NO
3. Gasification	YES	YES	YES	YES	YES	NO
4. Material Handling	YES	NO	NO	NO	NO	NO
5. Syngas Cleanup	NO	YES	NO	NO	NO	YES
6. Fischer-Tropsch and Product Upgrade	YES	YES	YES	YES	YES	NO
7. Tank Farm	NO	NO	NO	YES	NO	NO
8. Product Loading	NO	NO	NO	YES	NO	NO
9. Combined Cycle Plant	YES	YES	YES	YES	YES	NO
10. Cooling Towers	YES	NO	NO	NO	NO	NO
11. Emergency Generator & Pumps	YES	YES	YES	YES	YES	NO
12. Roadways and Parking	YES	NO	NO	NO	NO	NO

1. **Identify all available control technologies applicable to the proposed source, including Lowest Achievable Emission Rate (LAER) technologies.** Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. Techniques must be commercially available to be considered. Per page B-11 of the *Draft New Source Review Workshop Manual*, "Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered available; an applicant should be able to purchase or construct a process or control device that has already been demonstrated in practice." On page B.18 of the *Draft New Source Review Workshop Manual*, EPA again specifies that a technology must be commercially available to be considered: "A control technique is considered available, within the context presented above, if it has reached the licensing and commercial sales stage of development. A source would not be required to experience extended time delays or resource penalties to allow research to be conducted on a new technique."
2. **Eliminate technically infeasible options.** The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific factors. This demonstration should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emission unit under review. Technically infeasible control options then are eliminated from further consideration in the BACT analysis.



3. **Rank remaining control technologies by control effectiveness.** This ranking should include control efficiencies, expected emission rate, expected emissions reduction, energy impacts, environmental impacts, and economic impacts. If the top control alternative is chosen, then cost and other detailed information about other control options need not be provided.
4. **Evaluate the most effective controls and document results, including a case-by-case consideration of energy, environmental, and economic impacts.** If the top control alternative is selected, impacts of unregulated air pollutants or impacts in other media are considered to determine if the selection of an alternative control option can be justified. If the top control option is not selected as BACT, evaluate the next most effective control option.
5. **Select BACT,** which will be the most effective option not rejected in Step 4. Steps 1 through 5 have been completed for PM/PM10, NO<sub>x</sub>, CO, VOC, and SO<sub>2</sub> emissions from each emission source that is subject to the BACT requirements. The details of each BACT analysis are included within the respective application Modules.

#### 7.2 *BACT Determinations*

Table 2 summarizes the BACT determinations and applicable emission limits contained within the module-specific BACT analyses.

#### 8.0 Air Quality Impacts Summary

A dispersion modeling analysis was performed for this project in accordance with an Ohio EPA-approved modeling protocol. The modeling evaluation demonstrates that the facility will not have an adverse impact on the National Ambient Air Quality Standards. In addition, the Prevention of Significant Deterioration (PSD) evaluation concludes that modeled impacts are below the Class II PSD increment for each of the criteria contaminants, as well as the Ohio acceptable increments. Further detail concerning the modeling results is provided in Appendix A.

#### 9.0 PTI Application Organization

This PTI application is organized into twelve process groups which comprise the total operations with significant facility air emissions. Based on pre-application meetings with representatives of the Ohio Environmental Protection Agency, Northeast District Office as well as Central Office, it was agreed that organization of this application in separate modules would be beneficial to the review process. The twelve modules in the order presented are:



Module - Description

- 1 - Feedstock Storage
- 2 - Feedstock Processing
- 3 - Gasification
- 4 - Material Handling
- 5 - Syngas Cleanup
- 6 - Fischer-Tropsch & Product Upgrade
- 7 - Tank Farm
- 8 - Product Load-Out
- 9 - Combined Cycle Plant
- 10 - Cooling Towers
- 11 - Emergency Generator and Fire Pumps
- 12 - Roadways and Parking

Each module consists of four sections and four attachments:

- Section 1 - Process Description
- Section 2 - Air Emission Inventory
- Section 3 - Source-Specific Applicable Regulations
- Section 4 - BACT Analysis
- Attachment A - Figures
- Attachment B - Supporting Calculations
- Attachment C - Documentation
- Attachment D - OEPA Application Forms

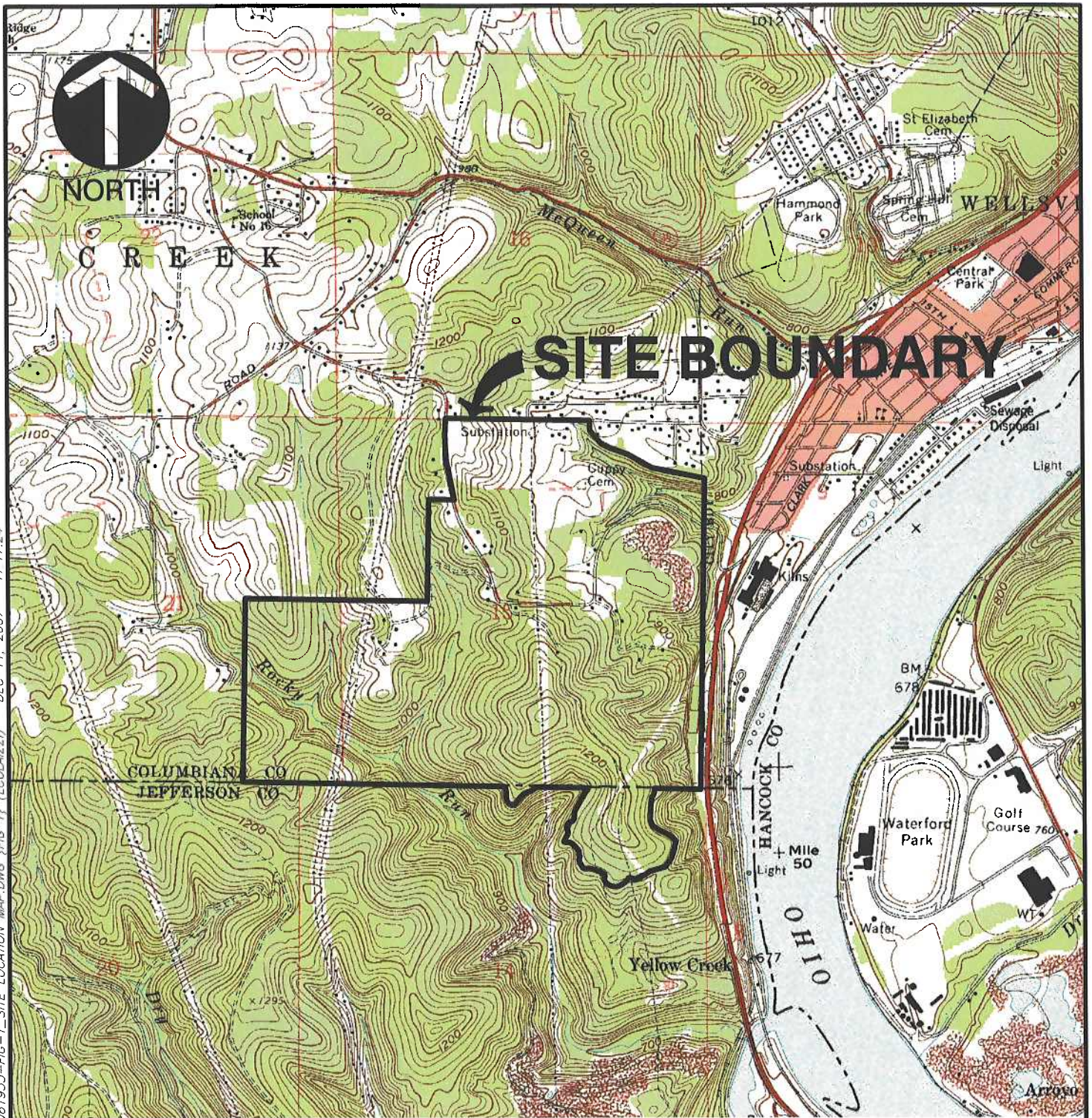
Process descriptions provide module-specific information related to the unique emission sources for the identified process. Block flow diagrams for each module are included as figures in Attachment A for each module. Section 2, the air emissions inventory, describes the module-specific emission sources, pollutants, and techniques used to estimate actual and potential emissions. Detailed supporting calculations are presented in Attachment B for each module. Source-specific applicable regulations are listed and discussed in Section 3 for each module and Section 4 presents the BACT analyses for each affected process. References, RBLC database summary tables, and other unique sources of documentation are provided in Attachment C. The Ohio EPA permit application forms unique to each module are provided in Attachment D. Finally, Appendix A contains the dispersion modeling evaluation for the proposed facility.

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**ATTACHMENT A**

**FIGURES**

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I:\SIR-PITT\CADD\PROJECTS\2006\061-933\DWG\061933-FIG-1\_SITE\_LOCATION\_MAP.DWG (FIG 1) (LOCALIZZI) - DEC 11, 2007 - 17:17:24



**REFERENCE:**  
 USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLE, WELLSVILLE,  
 OHIO - WEST VIRGINIA, DATED 1960. PHOTOREVISED 1992.

THIS DRAWING SUPERSEDES CEC DWG NO.: 061933.0002  
 SITE LOCATION.DWG, DATED 06/20/07.

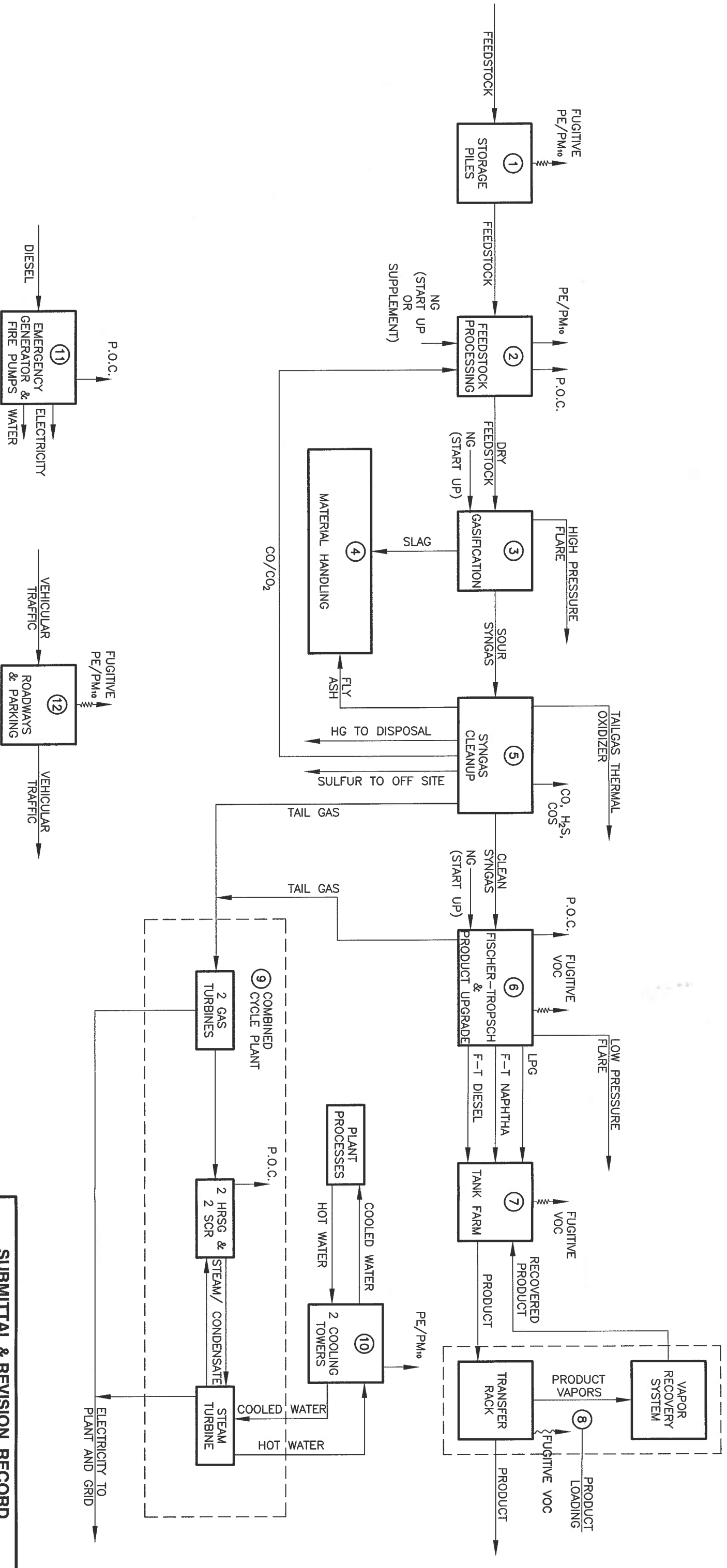


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 PROPOSED COAL TO LIQUID FUEL PLANT  
 COLUMBIANA AND JEFFERSON COUNTY  
 WELLSVILLE, OHIO**

**SITE LOCATION MAP**

APPROVED: <i>Kem</i>	PROJECT NO: 061-933	FIGURE NO: 1
DRAWN BY: DWD/LKC	CHKD BY: DJL	DWG SCALE: 1"=2,000'
	DATE: 12/17/07	



**LEGEND**

CO = CARBON MONOXIDE	PE = PARTICULATE EMISSIONS
COS = CARBONYL SULFIDE	P.O.C. = PRODUCTS OF COMBUSTION
HRSG = HEAT RECOVERY STEAM GENERATOR	PMIO = RESPIRABLE PARTICULATE
H <sub>2</sub> S = HYDROGEN SULFIDE	SCR = SELECTIVE-CATALYTIC REDUCTION
NG = NATURAL GAS	VOC = VOLATILE ORGANIC COMPOUNDS



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APPROVED:	<i>[Signature]</i>
DRAWN BY:	RLS/ILKC
CHKD BY:	DJL
DWG SCALE:	N.T.S.

**SUBMITTAL & REVISION RECORD**

NO	DATE	DESCRIPTION
A	08/25/07	OHIO EPA DRAFT SUBMISSION, DRAWING: 061-933-SPT.DWG
B	12/17/07	AIR PERMIT APPLICATION

**OHIO RIVER CLEAN FUELS, LLC**  
 PROPOSED COAL TO LIQUID FUEL PLANT  
 COLUMBIANA AND JEFFERSON COUNTY  
 WELLSVILLE, OHIO

**BLOCK FLOW DIAGRAM**  
 AIR PERMITTING MODULES

PROJECT NO: 061-933.0002  
 DATE: 12/11/07  
 FIGURE NO: **3**

