**Exhibit 96.4**

# GIBSON SOUTH MINE
# SEC S-K 1300
# TECHNICAL REPORT SUMMARY

**PREPARED FOR**

Gibson County Coal, LLC
1146 Monarch Street
Suite 350
Lexington, Kentucky 40513

**FEBRUARY 2022**

RESPEC.COM

# GIBSON SOUTH MINE
# SEC S-K 1300
# TECHNICAL REPORT SUMMARY

**PREPARED BY**

RESPEC
146 East Third Street
Lexington, Kentucky 40508

**PREPARED FOR**

Gibson County Coal, LLC
1146 Monarch Street
Suite 350
Lexington, Kentucky 40513

**FEBRUARY 2022**

Project Number M0062.21001


RESPEC.COM

# TABLE OF CONTENTS


**1.0 EXECUTIVE SUMMARY 1**
1.1 PROPERTY DESCRIPTION 1
1.2 GEOLOGY AND MINERALIZATION 1
1.3 STATUS OF EXPLORATION 1
1.4 MINERAL RESOURCE AND RESERVE ESTIMATES 1
1.5 CAPITAL AND OPERATING COST ESTIMATES 2
1.6 PERMITTING REQUIREMENTS 2
1.7 QUALIFIED PERSON'S CONCLUSIONS AND RECOMMENDATIONS 2
**2.0 INTRODUCTION 3**
2.1 ISSUER OF REPORT 3
2.2 TERMS OF REFERENCE AND PURPOSE 3
2.3 SOURCES OF INFORMATION 3
2.4 PERSONAL INSPECTION 3
**3.0 PROPERTY DESCRIPTION 5**
3.1 PROPERTY DESCRIPTION AND LOCATION 5
3.2 MINERAL RIGHTS 7
3.3 SIGNIFICANT ENCUMBRANCES OR RISKS TO PERFORM WORK 7
**4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE 8**
4.1 TOPOGRAPHY AND VEGETATION 8
4.2 ACCESSIBILITY AND LOCAL RESOURCES 8
4.3 CLIMATE 8
4.4 INFRASTRUCTURE 9
**5.0 HISTORY 10**
5.1 PRIOR OWNERSHIP 10
5.2 EXPLORATION HISTORY 10
**6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT 11**
6.1 REGIONAL GEOLOGY 11
6.2 LOCAL GEOLOGY 12
6.3 PROPERTY GEOLOGY AND MINERALIZATION 14
6.4 STRATIGRAPHY 14
6.4. Mcleansboro Group 14
6.4. Carbondale Group 14
6.4. Raccoon Creek 14
**7.0 EXPLORATION 15**
7.1 DRILLING EXPLORATION 15
7.2 HYDROGEOLOGIC INVESTIGATIONS 16
7.3 GEOTECHNICAL INFORMATION 16

**8.0 SAMPLE PREPARATION, ANALYSES AND SECURITY** **18**
8.1 SAMPLE PREPARATION AND ANALYSIS 18
8.2 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC) 19
**9.0 DATA VERIFICATION** **20**
9.1 SOURCE MATERIAL 20
9.2 OPINION OF THE QUALIFIED PERSON ON DATA ADEQUACY 20
**10.0 MINERAL PROCESSING AND METALLURGICAL TESTING** **21**
10.1 ANALYTICAL PROCEDURES 21
10.2 REPRESENTATIVE SAMPLES 21
10.4 RESULTS 21
10.5 OPINION OF QUALIFIED PERSON ON DATA ADEQUACY 21
**11.0 MINERAL RESOURCE ESTIMATES** **22**
11.1 DEFINITIONS 22
11.2 LIMITING FACTORS IN RESOURCE DETERMINATION 22
11.3 CLASSIFICATION RESOURCES 24
11.4 ESTIMATION OF RESOURCES 24
11.5 OPINION OF QUALIFIED PERSON 25
**12.0 MINERAL RESERVES ESTIMATES** **26**
12.1 DEFINITIONS 26
12.2 KEY ASSUMPTIONS, PARAMETERS AND METHODS 26
12.2.1 Reserve Classification Criteria 26
12.2.2 Non-Contiguous Properties 26
12.2.3 Cut-Off Grade 27
12.2.4 Market Price 27
12.3 MINERAL RESERVES 27
12.3.1 Estimate of Mineral Reserves 27
12.4 OPINION OF QUALIFIED PERSON 28
**13.0 MINING METHODS** **29**
13.1 GEOTECHNICAL & HYDROLOGICAL MODELS 29
PERSONNEL MINING EQUIPMENT FLEET, MACHINERY &
13.4 PERSONNEL 30
13.5 MINE MAP 31
**14.0 PROCESSING AND RECOVERY METHODS** **32**
14.1 PLANT PROCESS 32
14.2 ENERGY, WATER, PROCESS MATERIALS & PERSONNEL 32
**15.0 INFRASTRUCTURE** **33**
**16.0 MARKET STUDIES** **36**
16.1 MARKETS 36
**17.0 ENVIRONMENTAL** **37**
17.1 ENVIRONMENTAL STUDIES 37

17.2 WASTE DISPOSAL & WATER MANAGEMENT 37
17.3 PERMITTING REQUIREMENTS 37
17.4 PLANS, NEGOTIATIONS OR AGREEMENTS 38
17.5 MINE CLOSURE 38
17.6 LOCAL PROCUREMENT & HIRING 39
17.7 OPINION OF THE QUALIFIED PERSON ON DATA ADEQUACY 39
**18.0 CAPITAL AND OPERATING COSTS 40**
18.1 CAPITAL COSTS 40
18.2 OPERATING COSTS 40
**19.0 ECONOMIC ANALYSIS 41**
19.1 KEY PARAMETERS AND ASSUMPTIONS 41
19.2 ECONOMIC VIABILITY 41
**20.0 ADJACENT PROPERTIES 43**
**21.0 OTHER RELEVANT DATA AND INFORMATION 44**
**22.0 INTERPRETATION AND CONCLUSION 45**
22.1 INTERPRETATIONS AND CONCLUSIONS 45
22.2 RISKS AND UNCERTAINTIES 45
**23.0 RECOMMENDATIONS 46**
**24.0 REFERENCES 47**
**25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT 48**
**APPENDIX A MINE MAP A-1**

# LIST OF TABLES


| TABLE | PAG |
|---|---|
| Table 1-1. Summary of Controlled Coal Reserve Estimates as of December 31, 2021 | 1 |
| Table 1-2. Capital and Operating Costs | 2 |
| Table 11-1. Qualities at 1.5 Specific Gravity – Dry Basis | 23 |
| Table 11-2. Coal-Resource Classification System | 24 |
| Table 12-1. Summary of Coal Reserves as of December 31, 2021 | 27 |
| Table 13-1. Life of Reserve Production Estimate | 29 |
| Table 16-1. Economic Analysis Coal Price | 36 |
| Table 17-1. Current State Permits | 38 |
| Table 18-1. Capital Cost Estimate | 40 |
| Table 18-2. Operating Cost Estimate | 40 |
| Table 19-1. Cash Flow Summary | 41 |
| Table 19-2. Sensitivity Analysis | 42 |
| Table 25-1. Summary of Information Provided by Registrant | 48 |

# LIST OF FIGURES


| FIGURE | PAG |
|---|---|
| Figure 3-1. General Location Map | 6 |
| Figure 6-1. Generalized Stratigraphic Column of Pennsylvanian Rocks in Indiana | 11 |
| Figure 6-2. Geological Cross-Section A-A’ | 13 |
| Figure 15-1. Infrastructure Layout Surface Facilities | 34 |
| Figure 15-2. Infrastructure Layout Rail Loading Facilities | 35 |

# 1.0 EXECUTIVE SUMMARY

## 1.1 PROPERTY DESCRIPTION

Gibson County Coal, LLC (GCC) owns and operates the Gibson South Mine (GSM). Gibson County Coal, LLC is a wholly owned subsidiary of Alliance Coal, LLC (Alliance). GSM is an underground coal mining operation located in Gibson County, Indiana and currently has approximately 23,350 acres permitted. The mine property is controlled through both fee ownership and leases of the coal. Surface facilities are controlled through ownership or lease.

## 1.2 GEOLOGY AND MINERALIZATION

The Springfield (Indiana No. 5) coal seam is mined through room and pillar methods. The Springfield seam is located in the Illinois Basin which is an interior cratonic basin that formed from numerous subsidence and uplift events. The primary coal-bearing strata is of Carboniferous age in the Pennsylvanian system.

## 1.3 STATUS OF EXPLORATION

GSM has extensively explored the Springfield seam through multiple drilling operations. Drilling records are the primary dataset used in the evaluation of the resource. Drill records have been compiled into a geologic database which includes location, elevation, detailed lithologic data and when available coal quality data.

## 1.4 MINERAL RESOURCE AND RESERVE ESTIMATES

This information is used to generate geologic models that identify potential adverse mining conditions, define areas of thinning or thickening coal and predict coal quality for marketing purposes. This information is used to create a resource model using Carlson's Geology module, part of an established software suite for the mining industry. In addition to coal thickness and quality data, seam recovery is modeled. Classification of the resources is based on distances from drill data. Carlson then estimates in-place tonnages, qualities, and average seam recovery within a set of polygons. These polygons are the result of the intersection of polygons outlining property boundaries, adverse mining conditions, mining method, mine plan boundaries, and resource classification boundaries. These results are exported to a database which then applies the appropriate percent ownership, mine recovery and seam recovery. Table 1-1 is a summary of the coal reserves based on the life-of-reserve plan. All resources were converted to reserves. There are no resources exclusive of reserves.

**Table 1-1. Summary of Controlled Coal Reserve Estimates as of December 31, 2021**

| Reserve Category | Controlled Recoverable (1,000 tons) |
|---|---|
| **Springfield Seam** | |
| Proven | 44,191 |
| Probable | 8,282 |
| **Total Proven and Probable** | **52,473** |

## 1.5 CAPITAL AND OPERATING COST ESTIMATES

GSM is an on-going operating coal mine; therefore, the capital and operating cost estimates were prepared with consideration of historical operating performance. Table 1-2 shows the estimated capital costs and operating costs for the life of reserve plan.

**Table 1-2. Capital and Operating Costs**

| Category | Life of Reserve Estimate 2022-2031 (US$ 000's) |
|---|---|
| Capital Costs | 223,554 |
| Mining and Processing Costs | 1,449,877 |
| **TOTAL** | **1,673,431** |

## 1.6 PERMITTING REQUIREMENTS

Indiana Department of Natural Resources, Division of Reclamation is responsible for oversight of active coal mining and reclamation activities. In addition to state mining and reclamation laws, operators must comply with various federal laws relevant to mining. All applicable permits for underground mining, coal preparation and related facilities and other incidental activities have been obtained and remain in good standing.

## 1.7 QUALIFIED PERSON'S CONCLUSIONS AND RECOMMENDATIONS

It is the Qualified Person's (QP) opinion the operating risks of the mine are low. The mining operation, processing facilities, and the site infrastructure are in place. Mining practices are well established. All required permits are issued and remain in good standing. Market risk is discussed in Section 16.1 and could materially impact reserve estimates.

# 2.0 INTRODUCTION

## 2.1 ISSUER OF REPORT

GCC has retained RESPEC Company, LLC (RESPEC) to prepare this Technical Report Summary (TRS). GSM is operated by GCC. GCC is a wholly owned subsidiary of Alliance.

## 2.2 TERMS OF REFERENCE AND PURPOSE

The purpose of this TRS is to support the disclosure in the annual report on Form 10-K of Alliance Resource Partners, L.P. (ARLP 10-K) of Mineral Resource and Mineral Reserve estimates for the GSM as of 12/31/2021. This report is intended to fulfill 17 Code of Federal Regulations (CFR) §229, "*Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975 – Regulation S-K*," subsection 1300, "Disclosure by Registrants Engaged in Mining Operations." The mineral resource and mineral reserve estimates presented herein are classified according to 17 CFR§229.133 – Item (1300) Definitions.

Unless otherwise stated, all measurements are reported in U.S. imperial units and currency in U.S. dollars ($).

This TRS was prepared by RESPEC. No prior TRS has been filed with respect to the GSM.

## 2.3 SOURCES OF INFORMATION

During the preparation of the TRS, discussions were had with several Alliance personnel.

The following information was provided by Alliance and GCC:

- Property history
- Property data
- Laboratory protocols
- Sampling protocols
- Topographic data
- Mining methods
- Processing and recovery methods
- Site infrastructure information
- Environmental permits and related data/information
- Historic and forecast capital and operating costs.

## 2.4 PERSONAL INSPECTION

A RESPEC QP and Alliance representative conducted a site visit on February 1, 2022. During the site visit, the RESPEC QP visited the preparation plant, the raw coal stockpile, the clean coal stockpile, the mine slope, the mine shaft, load-out structure, and the refuse impoundment. A portion of the product is

trucked to GCC's nearby Gibson North mine (GNM), where it is transported to a rail load-out facility. The GNM stockpiles and the rail load-out were visited.

Discussions were held with the mine engineer regarding several issues including current markets, coal quality and products, the ability to hire employees, and the life-of-mine plan for refuse disposal.

# 3.0 PROPERTY DESCRIPTION

## 3.1 PROPERTY DESCRIPTION AND LOCATION

The GSM (38°18’22” N, 87°42’30” W) is located in Gibson County, Indiana and currently has approximately 23,350 underground acres permitted.

Figure 3-1 shows the general location of the GSM property.

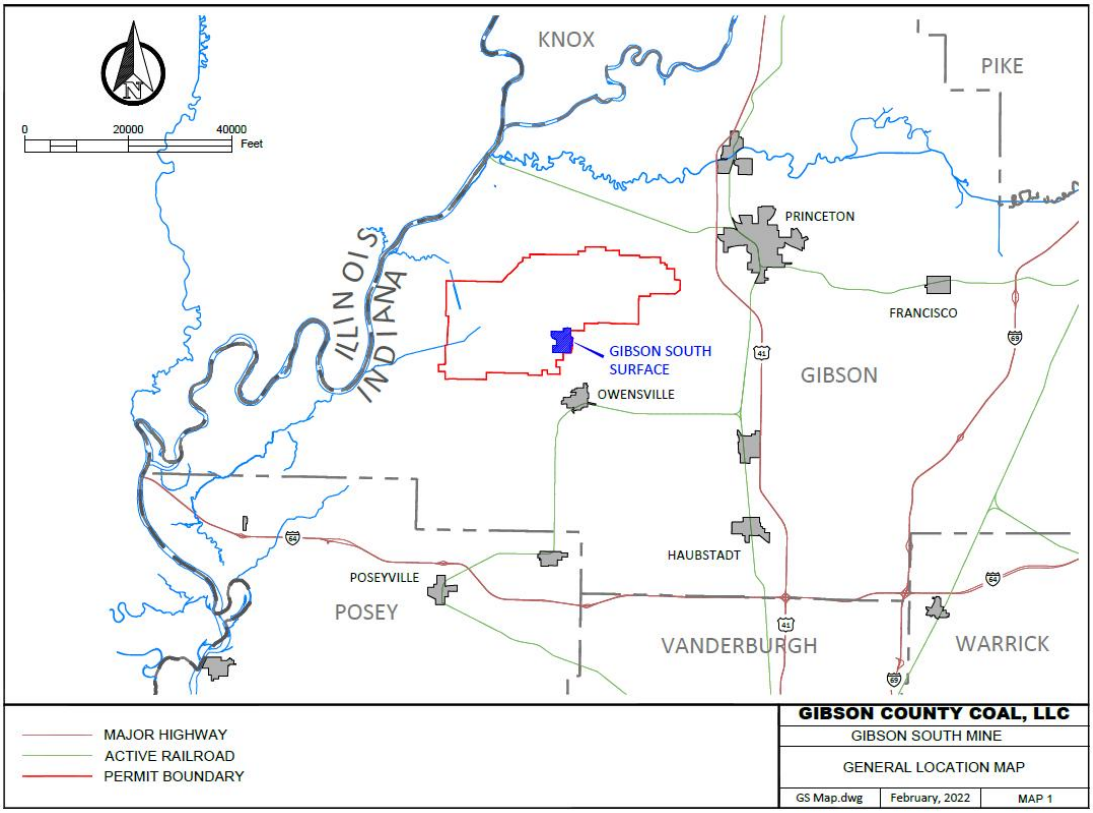



**Figure 3-1.** General Location Map

## 3.2 MINERAL RIGHTS

GCC holds rights to approximately 21,600 gross acres of coal within the boundaries of approximately 543 coal leases and coal deeds.

In November 1997, pursuant to (a) Assignment of Underground Coal Leases, (b) Partial Assignment of Underground Coal Leases and (c) Special Corporate Warranty Deed, Old Ben Coal Company conveyed to MAPCO Land & Development Corporation various coal leases and fee coal interests within a large property boundary located in Gibson County, Indiana. MAPCO Land & Development Corporation changed its name to MAPCO Coal Land & Development Corporation, and MAPCO Coal Land & Development Corporation merged into Alliance Properties, LLC (a wholly owned subsidiary of MAPCO Coal Inc.) effective August 4, 1999.

After the original Old Ben acquisition, Alliance Properties, LLC and GCC continued to acquire additional coal leases and fee coal interests in the area. Alliance Properties, LLC merged into GCC on February 19, 2018.

The coal leases are with private owners. The coal field description in the leases is generally described as an area within township 1 south range 11 west; township 1 south 12 west; township 1 south range 13 west; township 2 south range 11 west; township 2 south range 12 west; township 2 south range 13 west; township 3 south range 11 west; township 3 south range 12 west; township 3 south range 13 west; all in Gibson County, Indiana and Knox County, Illinois.

For some tracts, GCC has partial control of the mineral rights. The estimated saleable tonnage for each tract is reduced appropriately where control is less than 100%.

## 3.3 SIGNIFICANT ENCUMBRANCES OR RISKS TO PERFORM WORK ON PERMITS

ARLP's revolving credit facility is secured by, among other things, liens against certain Gibson County Coal surface properties, coal leases, and owned coal. Documentation of such liens is of record in the Office of the Recorder of Gibson County, Indiana. Please refer to “Item [8.] Financial Statements and Supplementary Data—Note 8 – Long-term Debt” of the ARLP 10-K for more information on the revolving credit facility.

Accounts receivable generated from the sale of coal mined from this property are collateral for ARLP's accounts receivable securitization facility, evidenced by financing statement of record in the Office of the Recorder of Gibson County, Indiana. Please refer to "Item [8.] Financial Statements and Supplementary Data—Note 8 – Long-term Debt" of the ARLP 10-K for more information on the accounts receivable securitization facility.

The Indiana Department of Natural Resources, Division of Reclamation is responsible for oversight of active coal mining and reclamation activities. In addition to state mining and reclamation laws, operators must comply with various federal laws relevant to mining. All applicable permits for underground mining, coal preparation, and related facilities and other incidental activities have been obtained and remain in good standing.

# 4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

## 4.1 TOPOGRAPHY AND VEGETATION

The GSM is located in the Southern Wabash Lowlands physiographic region of Indiana per USEPA. This region is unglaciated and glaciated (glacial till not extensive), consisting of undulating to rolling terrain, wide shallow valleys with low to medium gradient stream channels; paleo-dunes in west. The surface facilities and mine access are located to the southwest of Princeton, IN, and to the southeast of Duke Energy – Gibson Plant. The elevation ranges across the mine permit area between 380 and 560 feet above mean sea level. The vegetation across the mine permit area consists primarily of cropland, with some pastureland and deciduous forest.

## 4.2 ACCESSIBILITY AND LOCAL RESOURCES

The primary shaft access to GSM (38°18’22” N, 87°42’30” W) is located on County Road 350 S, Owensville, IN 47665. It is accessible from Princeton, IN, via IN-64 W to IN-65 S to County Road 350 S. Interstate 64 is a major transportation artery passing through the area, which lies about 9.8 miles due south of the mine. The city of Princeton, IN, lies about 8.4 miles to the northeast of the mine, the Duke Energy – Gibson Plant, lies about 5.6 miles to the northwest of the mine, and the Toyota Motor Manufacturing Indiana Plant lies about 8.1 miles to the west of the mine. The Wabash River lies about 5.9 miles to the northwest of the mine, passing next to the Duke Energy – Gibson Plant. Coal is transported by belt from the underground mine to the surface at the slope access (38°18’23” N, 87°41’57” W) located about 0.5 miles to the east of the primary shaft access. The coal is processed at the mine’s processing facilities located just to the northwest of the slope access. The mine has a truck loading facility located just to the south of the processing facility. The processed coal is transported by truck to either the GNM train loading facility, the Mount Vernon barge loading facility or directly to the client. The GNM truck unloading facility (38°22’27” N, 87°36’32” W) is located about 6.8 miles to the northeast of the GSM truck loading facility. From the truck unloading facility, the coal is transported by belt to the GNM train loading facility (38°22’11” N, 87°35’36” W) located 0.9 miles to the southwest. Rail service is provided by CSX Transportation (CSX) or Norfolk Southern Railway (NS). The CSX rail line is located east of the mine’s rail loop. The NS rail line is located south of the rail loop. The Mount Vernon barge loading facility (37°55’04” N, 87°52’04” W) is located on the Ohio River (mile marker 828) about 28 miles to the southwest of the mine. The barge loading facility has the capability to accept coal from either truck or rail at its unloading facilities located inside of a rail loop about 0.5 miles to the northeast of the barge loading facility. The nearest FAA-designated commercial service airport is Evansville Regional Airport (EVV) located about 21 miles to the southeast of the mine in Evansville, IN.

## 4.3 CLIMATE

The GSM and surrounding Princeton, IN, area has four distinct seasons with average annual precipitation of 48.9 inches according to U.S. Climate Data. The average annual high temperature is 66°F and the average annual low temperature is 44°F. The average annual snowfall is 10 inches. The climate of the area has little to no effect on underground and surface operations at the mine. The mine operates year-round with exceptions for holiday and vacation shutdowns.

## 4.4 INFRASTRUCTURE

The GSM gets its potable water from Gibson Water, Inc. Water used for underground operations and coal processing is provided by wells owned by the mine and sourced from the local alluvium. Electricity is provided by Western Indiana Energy REMC (WIN) through 69 kV transmission lines leading from Duke Energy's Gibson Generating Station, which has a capacity of 3,145 megawatts. Employment in the area is competitive. However, the mine has been able to attract a mixture of skilled and unskilled labor with its competitive pay package and benefits. Mine personnel primarily come from the Indiana counties of Gibson, Knox, Pike, Warrick, Vanderburgh, and Posey. The city of Evansville, IN, lies about 24 miles to the southeast of the mine. Its population is 117,298 according to the 2020 U.S. Census, making it the 3rd most populous city in Indiana. Evansville is the county seat of Vanderburgh County, IN, and it is a regional hub of commercial, medical, and cultural activity. Most supplies are trucked to the mine from regional vendors.

# 5.0 HISTORY

## 5.1 PRIOR OWNERSHIP

As described in Section 3.2, a significant portion of the GSM property was previously owned by Old Ben Coal Company (OBCC). OBCC after acquiring property rights commenced exploration activities.

## 5.2 EXPLORATION HISTORY

OBCC ran large exploration programs across multiple years to examine thickness, mineability, and quality. In general, holes are cased through the alluvium, rotary drilled to an interval above the coal, and then cored to collect roof, coal, and floor samples. Cores are typically 2⅛ to 3 inches in diameter. Sampling of coal was undertaken on the majority of holes with coal quality analysis completed. The GM series, drilled from about 1969 to 1971, contains 61 holes. The 600 series drilling was completed between 1982 and 1988 and contained 76 holes. Geophysical logs were acquired for a majority of the drilling. The T2 series drilling in the western area of the property is associated with the adjacent Wabash Mine under AMAX's ownership, where 73 holes similar in scope to the OBCC holes were drilled by AMAX.

See Appendix A for map showing all drill hole locations.

# 6.0 GEOLOGICAL SETTING, MINERALIZATION AND DEPOSIT

## 6.1 REGIONAL GEOLOGY

GCC extracts coal from the Springfield (Indiana No. 5) coal seam located in the Illinois Basin. The Illinois Basin is an interior cratonic basin that formed from numerous subsidence and uplift events. The Illinois Basin extends approximately 80,000 square miles, covering Illinois, southern Indiana, and western Kentucky.

Primary coal-bearing strata, including the Springfield coal, is of Carboniferous age in formations of Pennsylvanian aged rocks, which were deposited about 325 to 290 million years ago. Pennsylvanian sediments in Gibson County consist of shales, sandstones, siltstones, coals, and limestones. Pennsylvanian rocks are assigned in Indiana to the Raccoon Creek, Carbondale, and McLeansboro Groups. All three groups are present in Gibson County. The Springfield coal belongs to the Petersburg Formation within the Carbondale Group.

See Figure 6-1 for a stratigraphic column.

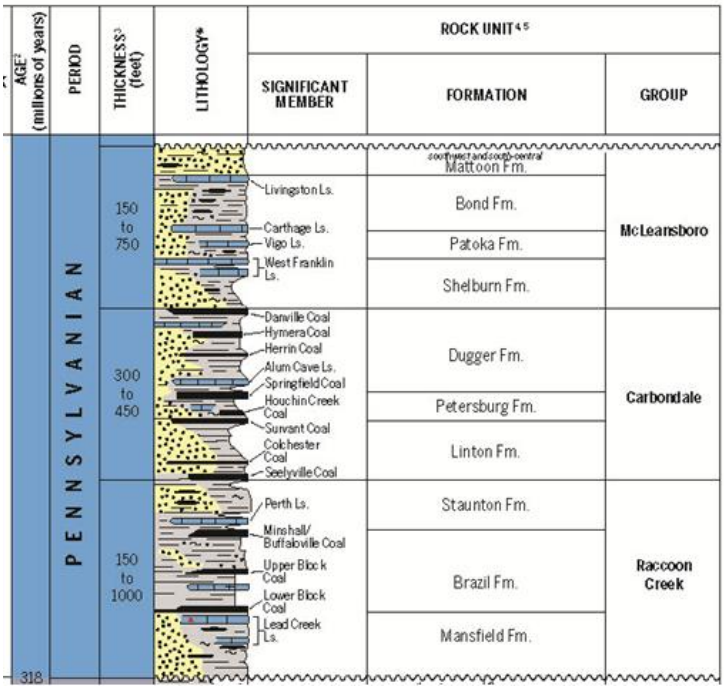



Figure 6-1. Generalized Stratigraphic Column of Pennsylvanian Rocks in Indiana

## 6.2 LOCAL GEOLOGY

The immediate roof over a vast majority of the reserve is a gray shale and/or silty shale known as the Dykersburg Shale. Below the Springfield coal seam, the lithology is variable but is generally a greenish-gray claystone or sandy claystone.

Locally, the GSM's geology can be divided into two distinct geologic settings. In the northern portion of the reserve the geology is highly variable due to the proximity of the Galatia paleochannel. The immediate roof geology in this area is a complex assemblage of thinly laminated shales and siltstones. Furthermore, this location also includes an abundance of fossilized plant debris, varying in size and often concentrated in areas of low topographic relief. The Springfield coal thickens to as much at nine feet near the Galatia paleochannel. Near the paleochannel there can be isolated areas of coal that contain clastic partings that develop quickly and can terminate abruptly.

The southern portion of the reserve is characterized by a thinning Dykersburg shale and an encroaching marine sequence containing the Saint David Limestone and the Turner Mine Shale.

A stratigraphic column (Figure 6-1) and a geologic cross section (Figure 6-2) representing the local geology found in the reserve are included in this report.

The reserve is bounded to the north by the Galatia paleochannel, to the west by workings from the abandoned Wabash mine and to the east by workings from the abandoned Kings Station mine. To the south/southeast the reserve is bounded by a thinning Dykersburg shale and the towns of Owensville and Johnson. The extreme southern reaches of the reserve are bounded by thinning coal, less than 4.0 feet in thickness.

See Figure 6-2 for a geological cross-section. Cross-section location is shown on the mine map in Appendix A.

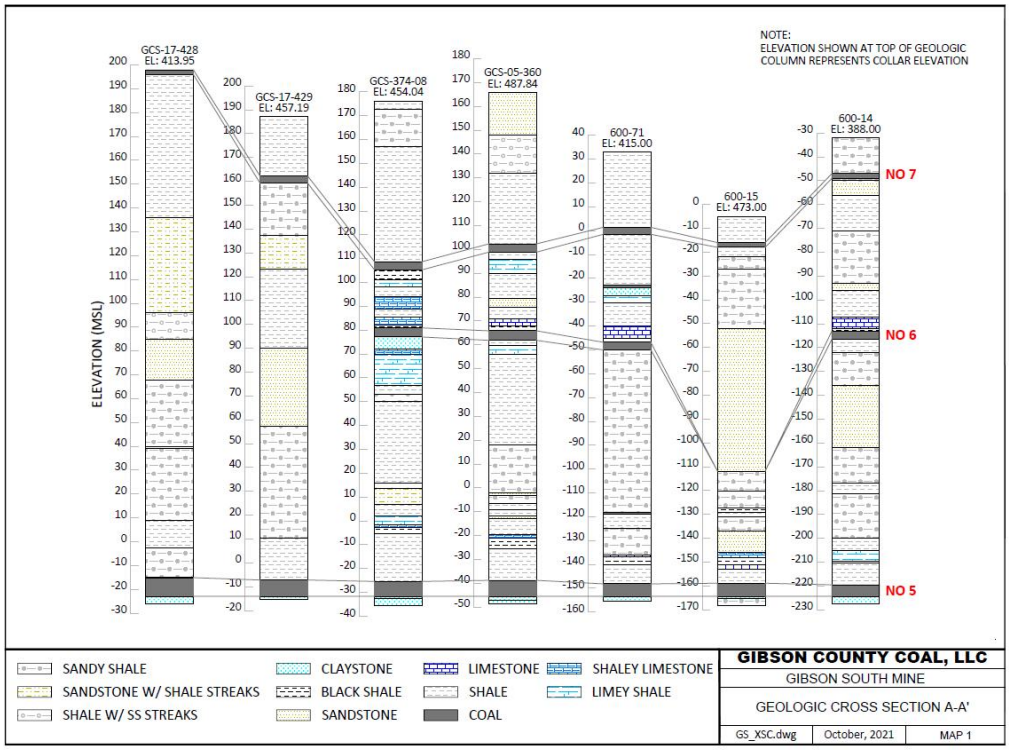



**Figure 6-2.** Geological Cross-Section A-A'

## 6.3 PROPERTY GEOLOGY AND MINERALIZATION

The GSM extracts coal from the Springfield, or Indiana No. 5 coal seam. The seam lies between 450 and 650 feet deep and dips gently (about 1%) to the west/southwest. The seam varies in thickness over the reserve area from over nine feet in the northern areas in close proximity to the Galatia paleochannel and thins to four feet in the south, distal to the channel. The average coal thickness within the GSM is about six feet.

On a 1.50 float, dry basis, the Springfield seam averages about 7.1% ash, 2.0% sulfur, and 13,500 btu/lb. The mineral deposit type (coal rank) mined by the GSM is a high volatile bituminous B/C coal.

The geologic model developed to characterize the resource/reserve is a bedded sedimentary deposit model. This is generally described as a continuous, non-complex, typical cyclothem sequence that follows a bedded sedimentary sequence. The geology, including coal thickness and extent has been and continues to be verified by an extensive drilling program.

## 6.4 STRATIGRAPHY

### 6.4.1 MCLEANSBORO GROUP

The McLeansboro group extends from the top of the Danville Coal Member of the Dugger Formation to the top of the Pennsylvanian sequence. Shale and sandstone make up over 90 percent of the rocks in this group, but minor amounts of limestone, fireclay, siltstone, and thin coals are present. This group includes the Shelburn, Patoka, Bond, and Mattoon Formations, in ascending order.

### 6.4.2 CARBONDALE GROUP

The Carbondale group is overlain by the Mcleansboro Group and underlain by the Raccoon Creek Group. The Carbondale Group extends from the base of the Seelyville Coal Member to the top of the Danville Coal Member. The Carbondale Group consists of laterally extensive limestone and five commercially important coals including the Springfield coal seam. The Group is dominantly comprised of shale, siltstone, and sandstone.

### 6.4.3 RACCOON CREEK

The Raccoon Creek Group is overlain by the Carbondale Group and underlain by rocks ranging from Middle Devonian to Late Mississippian age. The Raccoon Creek is composed of more than 95% sandstone and shale with the rest of the composition being limestone, coal, and fireclay.

# 7.0 EXPLORATION

## 7.1 DRILLING EXPLORATION

GCC has extensively explored the Springfield (Indiana No. 5) seam within the GSM area through drilling and collection of information from previous developers. Drilling records are the primary dataset used in the evaluation of the resource. Drill records have been compiled into a geologic database which includes location, elevation, detailed lithologic information and coal quality data. This information is used to generate geologic models that identify potential adverse mining conditions, define areas of thinning or thickening coal, and predict coal quality for marketing purposes. The drilling density on the controlled property is sufficient to identify and predict geological trends within the resource area.

The geologic database is also supplemented by the use of oil and gas well data from the petroleum industry. Oil and gas well geophysical logs are acquired from the Indiana Geological Survey. The most common geophysical log available is the induction log, which has the spontaneous potential curve and various resistivity and conductivity curves on it. These logs are beneficial in identifying sandstones, coals, and shales. Though less common, geophysical logs that have natural gamma, density and resistivity curves are available. These logs are identified in the geologic database as a “high quality” well. These logs provide much greater detail and can better differentiate between the various lithology. Oil and gas well data are used to verify thickness, identify faulting, and delineate areas with adverse mining conditions.

Exploration also includes the channel sampling of mine sections from underground surveys and underground geologic mapping conducted by geologists. Channel samples are samples collected from the coal seam within the coal mine. Once a suitable location is found within the mine, equal, representative portions of the coal seam are extracted using hand tools from the top of the seam to the bottom. The sample is placed within a heavy-duty plastic bag which is securely sealed with tape. The sample is then transported from the mine to the lab where the requested analyses are conducted.

Channel sample data and mine surveys are useful for thickness data and identifying any partings or anomalies within the coal seam. Underground geologic mapping is beneficial for identifying facies changes, poor roof trends, and supplementing hazards maps generated from drilling data.

The GSM resource has adequate drilling to define general geological trends within the resource area. Despite this, exploration continues to be undertaken and data added to the geologic database on an annual basis. This occurs when unexpected, adverse mining conditions arise or when it becomes necessary to better define the coal quality in areas that may lack sufficient information. Also, permit conditions require that a drill hole with geotechnical data be available within a 300-acre radius of a similar hole.

Drilling on the property targets the Springfield (Indiana No.5) coal and has been conducted using widely practiced industry methods by a third-party contractor employing qualified personnel. A geologist or other company representative oversees all drilling conducted on the property. Drilling methods include continuous diamond coring, mud rotary, air rotary and spot coring. Spot coring is a method that uses either mud or air rotary drilling to reach a specific depth, usually twenty or thirty feet above the target

seam. Once this depth is reached, the drill string is removed, and the rig sets up for core drilling. The core barrel is advanced to the bottom of the hole where coring commences. Core is advanced to about ten feet below the target seam. Once drilling is completed on a hole, a suite of geophysical parameters is collected for the entire borehole. Parameters such as naturally occurring gamma, resistivity, high resolution density and caliper data are collected. This information is used to verify the driller's log, geologist's log and verify the thickness of the coal and core recovery. Also, the geophysical log is helpful if core isn't collected, such as when only rotary drilling is conducted. The information from the geophysical log is used to determine coal thickness and identify critical strata in the boring.

Continuous coring on the property is generally limited to locations where shafts, fans or other critical infrastructure will be located. All core is described by a geologist, photographed for future reference, and stored until no longer needed.

Please see Appendix A for a plan view showing the locations of drill holes.

## 7.2 HYDROGEOLOGIC INVESTIGATIONS

Indiana Department of Natural Resources (IDNR): Division of Reclamation (DOR) requires a groundwater user survey in and within 1,000' of the permitted boundary. Issuance of permits needs IDNR to write a Cumulative Hydrologic Impact Assessment (CHIA). Both items were completed for this site and indicated groundwater issues would not be significant and require any sort of aquifer characterization. Groundwater inflow associated with mining has historically not been a significant issue and is dealt with as encountered.

## 7.3 GEOTECHNICAL INFORMATION

Rock mechanics data is collected from core drilling on an as needed basis. The GSM's permit issued by the IDNR DOR requires a corehole with geotechnical data on a minimum of every 300-acres of mining. Geotechnical data is derived from core sampling. Once the core is described and photographed by a geologist, the samples are prepared by a geologist or engineer and a representative from the lab transports the sample to the geotechnical lab for analysis. The following parameters are determined at a third-party laboratory:

- Compressive Strength using ASTM Standard D7012 method
- Indirect Tensile Strength using ASTM Standard D3967 method
- Swelling Strain using the (International Society for Rock Mechanics) ISRM method
- Slake Durability using ASTM Standard D4644 method
- Water Content using ASTM Standard D2216 method
- Atterberg Limits using ASTM Standard 4318 method

All rock mechanics data are analyzed by either SGS Laboratories or Standard Laboratories, Inc. No significant disruptions, issues or concerns have ever arisen as a result of processing or laboratory error. Therefore, it's reasonable to believe that the quality assurance actions employed by these laboratories are adequate to provide reliable results for the requested parameters.

The results from the geotechnical sampling program are adequate to satisfy the Indiana Department of Natural Resources, Division of Reclamation permit requirements and to provide guidance for the design of ground control methods.

See Appendix A for a map depicting the location of all drill holes.

# 8.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

## 8.1 SAMPLE PREPARATION AND ANALYSIS

Prior to sending samples to the laboratory for analysis, company representatives prepare them for transport. This includes a sample request form that has information such as sample ID, depths and requested analyses, that is placed securely inside the sample container. If the sample is rock core, the core remains sealed in plastic bags and in the box provided by the drilling contractor. The box is secured using heavy duty packing tape. If the sample is a channel sample, the sample is placed in a heavy-duty plastic bag. The bag is clearly labelled with the operation name, sample ID and location where the sample was collected. Within the sample bag, a smaller plastic bag contains a form that has the operation name, sample ID, date of sample collection, location where sample was collected and the requested analyses. Company representatives then arrange for sample pick up by a representative from the laboratory. Once the laboratory takes possession of the sample, rigorous quality control and quality assurance standards are strictly adhered to.

GSM contracts with two laboratories, Standard Laboratories and SGS, North America, Inc. Standard Laboratories has two facilities that analyze samples from the GSM. One lab is located in Evansville, Indiana and the other in Freeburg, Illinois. The laboratory in Freeburg, Illinois is an ISO/IEC 17025 accredited laboratory. The laboratory in Evansville, Indiana, while not accredited, according to a formal statement from its senior management “operates in compliance with International Standard ISO/IEC 17025 General Requirements for Competence and Testing and Calibration Laboratories.”

SGS North America, Inc. has an office in Henderson, Kentucky and is accredited by A2LA under ISO/IEC 17025. Their certification number is 3482.03

Both laboratories prepare, assay, and analyze samples in accordance with approved ASTM International standards.

Coal analysis typically includes some or all of the following:

- Ultimate Analysis using ASTM Method D5373 for percent nitrogen, carbon and hydrogen and ASTM D3176 for the determination of percent oxygen.
- Mineral Analysis of Ash using ASTM Method D4326 for measuring percent silicon dioxide, aluminum dioxide, ferric oxide, calcium oxide, magnesium oxide, potassium oxide, sodium oxide, titanium dioxide, phosphorus pentoxide, magnesium dioxide, barium oxide, strontium oxide, sulfur trioxide.
- Proximate Analysis using ASTM Method D5865 for the determination of thermal caloric value in BTU/LB. ASTM Method D3175 is used for the determination of percent ash. ASTM Method D4239 is used for measuring percent sulfur. Method M-V3175 is used to determine percent volatiles and ASTM D3175 is used to determine percentage of fixed carbon.
- Ash Fusion Temperatures are determined using ASTM Method D1857, Sulfur Forms are determined using ASTM Method D2492 and Water-Soluble Alkalis are determined using ASTM Method D8010.

- The Hardgrove Grindability Index (HGI) is measured using ASTM Method D409(M) and the percent Equilibrium Moisture is determined using ASTM Method D1412. The Mercury value, measured in parts per million is determined using ASTM Method D6722.
- Trace element analysis to include Antimony, Arsenic, Barium, Beryllium, Boron, Bromine, Cadmium, Chlorine, Chromium, Cobalt, Copper, Fluorine, Germanium, Lead, Lithium, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Vanadium, Zinc and Zirconium. ASTM Method D6357, D4208, D3761, or D6722 are typically used.

The GSM has sufficient drilling across the extent of the reserve to identify general trends in coal quality. The majority of the data comes from samples collected from core drilling. However, it periodically becomes necessary to collect additional channel samples in order to delineate local changes in coal quality. The procedure for collecting channel samples was described in a previous section.

## 8.2 QUALITY CONTROL/QUALITY ASSURANCE (QA/QC)

No significant disruptions, issues or concerns have ever arisen as a result of processing or laboratory error. Therefore, it's reasonable to assume that the quality assurance actions employed by these laboratories are adequate to provide reliable results for the requested parameters.

## 8.3 OPINION OF THE QUALIFIED PERSON ON ADEQUACY OF SAMPLE PREPARATION

No significant disruptions, issues or concerns have ever arisen as a result of sample preparation and analysis. Therefore, it's reasonable to assume that sample preparation, security and analytical procedures in place are adequate to provide a reliable sample in which requested parameters can be analyzed.

The qualified person is of the opinion that the sample preparation, security, and analytical procedures for the samples supporting the resource estimation work are adequate for the statement of mineral resources. Results from different laboratories show consistency and nothing in QA/QC demonstrates consistent bias in the results.

# 9.0 DATA VERIFICATION

## 9.1 SOURCE MATERIAL

The GSM maintains a detailed geologic database used to develop several types of maps used to predict the mineability and coal quality of the Springfield coal seam. Data verification of the accuracy of this database is conducted on a regular basis by company engineers and geologists. This includes a detailed review of drilling data, coal quality data and coal seam correlation of all exploration drill holes to what is found in the database. The verification process also entails underground geologic mapping by a geologist to field verify the accuracy of compiled geologic models from drill hole data. Furthermore, maps generated from coal quality data to predict the coal quality across the resource are checked for accuracy against actual output from the preparation plant.

Alliance contracted Weir International (Weir) to conduct an audit of Alliance's reserve estimates prepared under Industry Guide 7. Weir submitted its findings in a report dated July 23, 2015. Weir's review included methodologies, accuracy of Carlson gridding, and drill hole data. A similar review was conducted by Weir in 2010. During the 2015 audit, 10% to 20% of the new drill hole data was reviewed and confirmed.

RESPEC was provided with e-log data for all new holes or data obtained in 2016 or more recently. RESPEC compared 20% of those e-logs to the Carlson database. RESPEC also verified the thickness and quality grids. As part of the verification process, a new thickness grid was created from the database, and that resultant grid compared to GSM's model using Carlson grid file utilities.

## 9.2 OPINION OF THE QUALIFIED PERSON ON DATA ADEQUACY

Based on the verification of GSM data by the QP and review of prior database audits, the QP deems the adequacy of GSM data to be reasonable for the purposes of developing a resource model and estimating resources and subsequently reserves.

# 10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

## 10.1 ANALYTICAL PROCEDURES

The GSM has sufficient drilling across the extent of the reserve to identify general trends in coal quality. The majority of the data comes from samples collected from core drilling. However, on occasion it becomes necessary to collect channel samples in order to delineate local changes in coal quality. The procedure for collecting channel samples was described in a previous section.

## 10.2 REPRESENTATIVE SAMPLES

The parameters that the GSM analyzes are adequate to define the characteristics necessary to support the marketability of the coal.

## 10.3 TESTING LABORATORIES

GSM contracts with two laboratories, Standard Laboratories and SGS, North America, Inc.

Standard Laboratories has two facilities that analyze samples from the GSM. One lab is in Evansville, Indiana and the other in Freeburg, Illinois. The laboratory in Freeburg, Illinois is an ISO/IEC 17025 accredited laboratory. The laboratory in Evansville, Indiana, while not accredited, according to a formal statement from senior management “operates in compliance with International Standard ISO/IEC 17025 General Requirements for Competence and Testing and Calibration Laboratories.”

SGS North America, Inc. has an office in Henderson, Kentucky and is accredited by A2LA under ISO/IEC 17025. Their certification number is 3482.03. Both laboratories provide unbiased, third-party results and operate on a contractual basis.

No significant disruptions, issues or concerns have ever arisen as a result of processing or laboratory error. Therefore, it’s reasonable to assume that using one of these laboratories should provide assurance that the data processing and reporting procedures are reliable.

## 10.4 RESULTS

GCC performed a series of washability tests to develop washability curves. These curves predict coal qualities and recoveries at different specific gravities. The existing plant operates at a specific gravity of approximately 1.5 -1.6. The results from the coal quality sampling program are adequate to determine the specification requirements for customers located in both the domestic and export markets.

## 10.5 OPINION OF QUALIFIED PERSON ON DATA ADEQUACY

It is the opinion of the QP that the coal processing data collected from these analyses is adequate for modelling the resources and reserves for marketing purposes. All analyses are derived using standard industry practices by laboratories that are leaders in their industry.

# 11.0 MINERAL RESOURCE ESTIMATES

## 11.1 DEFINITIONS

A mineral resource is an estimate of mineralization, considering relevant factors such as cut-off grade, likely mining dimensions, location, or continuity, that, with the assumed and justifiable technical and economic conditions, is likely to, in whole or in part, become economically extractable.

Mineral resources are categorized based on the level of confidence in the geologic evidence. According to 17 CFR § 229.1301 (2021), the following definitions of mineral resource categories are included for reference:

An inferred mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. An inferred mineral resource has the lowest level of geological confidence of all mineral resources, which prevents the application of the modifying factors in a manner useful for evaluation of economic viability. An inferred mineral resource, therefore, may not be converted to a mineral reserve.

An indicated mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of adequate geological evidence and sampling. An indicated mineral resource has a lower level of confidence than the level of confidence of a measured mineral resource and may only be converted to a probable mineral reserve. As used in this subpart, the term adequate geological evidence means evidence that is sufficient to establish geological and grade or quality continuity with reasonable certainty.

A measured mineral resource is that part of a mineral resource for which quantity and grade or quality are estimated on the basis of conclusive geological evidence and sampling. As used in this subpart, the term conclusive geological evidence means evidence that is sufficient to test and confirm geological and grade or quality continuity.

## 11.2 LIMITING FACTORS IN RESOURCE DETERMINATION

Resources in the Springfield seam are delineated based on the following limitations:

- Mineable thickness
- Marketable quality
- Structural limits, such as faults or sandstone channels, existing mining, and subsidence protection zones
- Government and social approval

### 11.2.1 MINEABLE THICKNESS

Thicknesses are extracted from the database to create a geologic model. Grids are created using an inverse distance algorithm using a weighting factor of three. The minimum Springfield coal thickness in the database is 3.91 feet and the minimum thickness in the expected mining area is 4.21 feet. These

thicknesses are considered mineable using continuous miners. It is noted that 23 wells located in the Galatia Channel did not encounter the Springfield seam. This area is excluded from the resource area.

### 11.2.2 MARKETABLE QUALITY

The primary source quality data is from core holes drilled for the purpose of coal exploration. The qualities that are of primary interest are ash, sulfur, and BTU. These qualities have limitations which affect the value of the coal. The table below summarized the values and ranges of each in the geologic database. The range of critical qualities in the database indicates that all the coal in the Springfield seam is within marketable limits. The potential resource areas are considered to meet the quality standard and no further consideration or analyses of these parameters are made. All resource estimates include average anticipated values for ash, sulfur, and BTU.

**Table 11-1. Qualities at 1.5 Specific Gravity – Dry Basis**

| Quality | Number of samples | Average | Minimum | Maximum | Standard Deviation |
|---|---|---|---|---|---|
| Ash | 240 | 6.88 | 4.16 | 16.92 | 1.65 |
| Sulfur | 240 | 1.7 | 0.46 | 4.29 | 0.73 |
| BTU | 240 | 13,491 | 11,708 | 13,927 | 265.3 |

Values in Table 11-1 are dry basis qualities based on laboratory analysis of core or channel samples. Marketable qualities reflect moisture and adjustments for plant variability. GSM has the ability to blend raw saleable coal with the fully washed product to create a higher ash and lower BTU product. Typical as received quality specifications for the GSM product are approximately:

- BTU – 11,450 to 11,750
- Moisture – 13.0% to 15.0%
- Ash – 6.0% to 8.0%
- Sulfur – 1.5% to 2.0%
- Volatile Matter - 31.0% to 36.0%

### 11.2.3 STRUCTURAL LIMITS

The resource is limited to the north by the Galatia paleochannel. There are no known faults in the area to limit the resource.

An approximate 200’ buffer is maintained around existing underground mines in the Springfield seam in the area:  Kings Station Mine and the Wabash Mine.

An unmined block of the Springfield seam will be left under the mine structures located on the surface and is excluded from the resource estimation. Also, the resource is limited in the northwest as to not undermine a cooling pond associated with the adjacent power plant.

### 11.2.4 GOVERNMENT AND SOCIAL APPROVAL

There are no significant limitations to GCC obtaining the permits required. GCC holds the necessary permits to mine, process, and transport coal from this area. Historically, the company has been able to amend or revise permits as needed. The public is notified of significant permitting actions and may participate in the process.

## 11.3 CLASSIFICATION RESOURCES

### 11.3.1 CLASSIFICATION CRITERIA

The identified resources are divided into three categories of increasing confidence: inferred, indicated, and measured. The delineation of these categories is based on the distance from a known measurement point of the coal. The distances used are presented in USGS Bulletin 1450-B, "Coal Resource Classification System of the U.S. Bureau of Mines and U.S. Geological Survey." These distances are presented in Table 11-2.

**Table 11-2. Coal-Resource Classification System**

| Classification | Distance from measurement point |
|---|---|
| Measured | <1,320' |
| Indicated | 1,320' – 3,960' |
| Inferred | 3,960' – 15,840' |

These distances for classification division are not mandatory. However, these values have been used since 1976, have proven reliable in the estimation of coal resources, and are considered reasonable by the QP.

### 11.3.2 USE OF SUPPLEMENTAL DATA

Due to the continuity of coal seams in the Illinois Basin, mineability limits are the most important factor in resource assessment. Information from oil and gas well e-logs in the vicinity are used as supplemental data to confirm thickness trends, identify structural limits, and characterize adverse geologic conditions. Coal thickness grids are generated from drill hole information, mine measurements, channel samples, and a subset of high-quality oil and gas well e-logs. These are data points in which the company has a high degree of confidence in thickness measurement. These are the data used by the company to generate the model for its internal planning. The combined information increases the overall reliability of the resource estimate, and all data points are included within the classification system.

## 11.4 ESTIMATION OF RESOURCES

Resource estimates are based on a database of geologic information gathered from various sources. The sources of this data are presented in Section 7 of this report. Thickness and quality data are extracted from the database to create a model using Carlson's Geology module. The model consists of a set of grids, generated using an inverse distance algorithm with a weighting factor of three. In addition to the thickness and quality data, seam recovery is modeled. Quality data and recovery rates

are determined through a set of tests generating washability curves. The current operation washes the run-of-mine coal at a specific gravity of approximately1.5 – 1.6. The qualities and plant yield are based on this specific gravity.

Section 12 presents the modifying factors considered in determining whether resources qualify as reserves. There are no resources exclusive of reserves for the GSM. All resources were classified as either measured or indicated and were converted to reserves.

## 11.5 OPINION OF QUALIFIED PERSON

It is the QP's opinion that the risk of material impacts on the resource estimate is low. The mining operations, processing facility, and site infrastructure are in place. Mining practices are well established. The operation has a good track record of HSE compliance. The Energy Information Administration (EIA) predicts that global energy produced by coal will increase through 2050.

Please refer to Item 1A of the ARLP 10-K regarding the significant risks involved in investment in Alliance's operations including GSM, and the coal industry in general. It is the QP's opinion that the following technical and economic factors have the most potential to influence the economic extraction of the resource:

- Skilled labor – This site is located near a populated area, which has a history of coal mining.
- Environmental Matters
  - Greenhouse gas emission Federal or State regulations/legislation
  - Regulatory changes related to the Waters of the US.
  - Air quality standards
- Regional supply and demand – Although the US electric utility market has moved to natural gas and renewable forms of energy to provide a higher percentage of electricity production, it is the QP's opinion, coal will continue to serve as a baseload fuel source in the US and other global energy markets.

The potential for changes in the circumstances relating to these factors influencing the prospect of economic extraction exists and could materially adversely impact economic extraction of the resource.

# 12.0 MINERAL RESERVES ESTIMATES

## 12.1 DEFINITIONS

A mineral reserve is an estimate of tonnage and grade or quality of indicated and measured mineral resources that, in the opinion of the qualified person, can be the basis of an economically viable project. More specifically, it is the economically mineable part of a measured or indicated mineral resource, which includes diluting materials and allowances for losses that may occur when the material is mined or extracted. *Probable mineral reserves* comprise the economically mineable part of an indicated and, in some cases, a measured mineral resource. *Proven mineral reserves* represent the economically mineable part of a measured mineral resource and can only result from conversion of a measured mineral resource.

## 12.2 KEY ASSUMPTIONS, PARAMETERS AND METHODS

### 12.2.1 RESERVE CLASSIFICATION CRITERIA

The Springfield seam has historically been successfully mined at this location and throughout southern Indiana. Several other mines in the region are currently operating in this seam. Resources are identified as described in Section 11 of this report based on geologic conditions, mineability, and marketability of the coal seam. The two critical factors in converting indicated and measured mineral resources into the mineral reserves are inclusion in an economically feasible mine plan and government approval through the various environmental and operational permits.

Table 17-1 presents the various state and federal environmental permits currently held by the operation. These include the surface mining permit (required for surface operations), air quality permits, and water discharge permits. Approval has already been granted for the required surface disturbance, construction and operation of the preparation facilities, coal refuse disposal, and coal transport. It is noted that not all the anticipated underground mining areas are currently covered under the IDNR mining permit. Shadow areas (underground only areas) are extended using permit revisions. This is a common practice for underground operations in the Illinois Basin.

All the identified resource is converted into the reserve classification.

### 12.2.2 NON-CONTIGUOUS PROPERTIES

The operation currently has mineral rights to 356 properties yet to be mined. Some of these properties are non-contiguous. Securing additional mineral rights is a routine, ongoing activity with an emphasis on obtaining rights to tracts to fill any gaps in the mine plan. Should the operation encounter a tract for which mineral rights cannot be obtained, modifications can be made to the mine plan to access controlled tracts. Due to the nature of the resource and the flexibility of the mining operation, isolated tracts are considered eligible for conversion to the reserve classification. It is also noted that due to the large number of tracts which define the reserve, should a controlled non-contiguous tract become isolated, it will not have a significant effect on the total reserve.

### 12.2.3 CUT-OFF GRADE

The coal bed consistently exhibits qualities that make the product marketable. No reduction is made to the resources or reserves due to quality.

### 12.2.4 MARKET PRICE

The EIA reported the average weekly coal commodity spot price for Illinois Basin coal (the EIA price) on February 4, 2022, to be $75.50/ton (11,800 Btu, 5.0 lbs $SO_2$ basis). The reference price used in the economic analysis is $36.08 which is based on the simple average of the five-year actual GSM realization per ton and simple average of the EIA Price as reported for the first Friday of each month for calendar years 2020 and 2021 (the 2-year average). The revenue projection in the economic analysis is based on this estimate of coal price and is assumed to be real 2021 US dollars.

## 12.3 MINERAL RESERVES

### 12.3.1 ESTIMATE OF MINERAL RESERVES

The existing plant operates at a specific gravity of approximately 1.5 – 1.6. The qualities and recovery at a 1.5 specific gravity are added as attributes to the applicable drill holes from which samples were collected. Those values are then modeled using Carlson, gridding these attributes using the inverse distance algorithm with a weighting factor of three.

The operation uses a room and pillar layout. The approved ground control plan results in a 45% mining recovery of the in-place reserves. The mining recovery applied to the in-place coal estimates raw coal.

The coal testing included density calculations. The operation uses an average in-situ density of 82.6 lbs/cubic foot. This value is within the expected range of coal density.

All coal tonnages are reported as clean controlled coal. Carlson's Surface Mine Module is used to estimate in-place tonnages, qualities, and average seam recovery within a set of polygons. These polygons are the result of the intersection of polygons outlining property boundaries, adverse mining conditions, mining method, mine plan boundaries, and resource classification boundaries. The Carlson results are exported to a database, which then applies the appropriate percent ownership, mine recovery, and seam recovery. The basic calculation is:

Tons = Area * Thickness * Density * Mine Recovery * Seam Recovery * Percent Ownership

**Table 12-1. Summary of Coal Reserves as of December 31, 2021**

| Reserve Category | Controlled Recoverable (1,000 tons) | Sulfur (%) | Ash (%) | BTU |
|---|---|---|---|---|
| **Springfield** | | | | |
| Proven | 44,191 | 1.92 | 6.96 | 13,509 |
| Probable | 8,282 | 2.33 | 7.89 | 13,355 |
| **Total Proven and Probable** | 52,473 | 1.99 | 7.11 | 13,485 |

Values in Table 12-1 are based on a washed, dry basis.

## 12.4 OPINION OF QUALIFIED PERSON

It is the QP's opinion that the risk of material impacts on the reserve estimate is low. The mining operations, processing facility, and site infrastructure are in place. Mining practices are well established. The operation has a good track record of HSE compliance. The Energy Information Administration (EIA) predicts that global energy produced by coal will increase through 2050.

Please refer to Item 1A of the ARLP 10-K regarding the significant risks involved in investment in Alliance's operations including GSM, and the coal industry in general. It is the QP's opinion that the following technical and economic factors have the most potential to influence the economic extraction of the resource:

- Extension of permitted area – Not all the Reserves are currently permitted. Underground operations in Indiana have traditionally been able to extend the permitted shadow areas as needed. No change is anticipated in the issuance of these permit modifications. It is expected that the shadow area of the permit will be expanded as needed.
- Skilled labor – This site is located near a populated area, which has a history of coal mining. Although there is competition from other underground operators for skilled labor, GCC has been successful in attracting and retaining skilled staff and has programs for training less experienced miners. Should GCC not be able to maintain as skilled a labor pool as anticipated, this could impact productivity. However, economic evaluation indicates GSM remains economic with modest downturns in productivity.
- Environmental Matters
  - Greenhouse gas emission Federal or State regulations/legislation may impact the domestic electric utility market which is a major customer for GSM coal. While many proposed changes have been suggested, the horizon for these changes severely impacting the market is anticipated to be beyond the current planning horizon supporting the reserve estimate.
  - Regulatory changes related to the Waters of the US (WOTUS). The interpretation of the regulation and enforcement of the Clean Water Act with respect to the jurisdictional waters of the US has been modified multiple times through regulatory actions and court decisions. It is likely that further reinterpretation will occur. This could affect future modifications such as new or expanded stockpile areas, transportation areas, and refuse disposal areas.
  - Miscellaneous regulatory changes. The coal industry has been subjected to many changes in regulation and enforcement in the recent past. In addition to new regulations related to greenhouse gas emissions and WOTUS, it is expected that further change will occur.
- Regional supply and demand – Although the US electric utility market has moved to natural gas and renewable forms of energy to provide a higher percentage of electricity production, it is the QP's opinion, coal will continue to serve as a baseload fuel source in the US and other global energy markets.

The potential for changes in the circumstances relating to these factors influencing the prospect of economic extraction exists and could materially adversely impact economic extraction of the reserve.

# 13.0 MINING METHODS

## 13.1 GEOTECHNICAL & HYDROLOGICAL MODELS

Geotechnical models of the GSM Mineral Reserves have been assembled utilizing Carlson computer software. Geologic information from drillholes, underground channel samples, and past reserve studies is entered into the database and used to build stratigraphic grid models. Attributes including coal thickness, depth, recovery percentage, and quality are some of the features utilized to accurately model the GSM reserve.

The underground mining permit issued by the Indiana Department of Natural Resources, Division of Reclamation (IDNR) requires coreholes prior to mining, and their corresponding geotechnical sampling, to be performed at a density of not less than one hole per 300 acres of mined area within the reserve. The geotechnical data obtained from the coreholes is submitted to the IDNR as updates to an approved Subsidence Control Plan, prior to mining. However, corehole density is often much greater than the minimum required by IDNR in order to better define quality parameters of the coal seam. These holes are used to supplement the geologic model. Commonly analyzed quality parameters include moisture, ash, sulfur, and BTU.

Water inflow into the mine is managed as needed when encountered.

## 13.2 PRODUCTION RATES & EXPECTED MINE LIFE

GCC extracts coal from the Springfield seam utilizing the room and pillar method of underground mining. Mining takes place on dual-split ventilation Super Sections. The dual-split ventilation system allows two continuous mining machines to operate on each Super Section simultaneously. Infrastructure within the mine, including conveyors, ventilation, power, and freshwater capacity, is sized to support maximum production of five (5) Super Sections. Empirical data gathered from previous mining in the same coal seam while using similar equipment and mining practices as the GSM is compiled and considered when forecasting production rates. Predictable adverse geologic factors, such as mining in areas with a split coal seam, are also considered during production forecasting.

Planned production varies according to contracted sales volume and expectations of market conditions and on an annual basis ranged between 2.4 million and 7.0 million tons over the 2017 through 2021 period. The forecasted production contained in the economic analysis is shown in Table 13.1.

**Table 13-1. Life of Reserve Production Estimate**

| Life of Reserve Estimate 2022-2032 (US 000's) | | | | |
|---|---|---|---|---|
| Category | Annual Minimum | Annual Maximum | Annual Average | Total |
| RAW Tons | 6,966 | 7,541 | 7,352 | 73,522 |
| Saleable Tons | 4,900 | 5,459 | 5,247 | 52,473 |

Typical reserve recovery rates for the GSM range from 44%-48%. The recovery rate varies slightly based on the size of pillars left. Pillar size varies throughout the reserve typically ranging between 82' x

82’ (100’ centers) and 42’ x 42’ (60’ centers). Coal thickness throughout the GSM reserve averages 6.0’. The continuous miners cut a minimum six feet in height in entries and crosscuts. Where the coal thickness is less than the minimum, additional out-of-seam dilution is incurred which is removed by the Preparation Plant. Entries and cross-cuts driven by the continuous mining machines average a width of 18’.

There are approximately 52.4M clean tons remaining in the GSM reserve to be mined within the controlled properties. The current life of reserve plan anticipates exhausting the reserve in 2031. The lifespan of the mine is dependent on many factors and may vary materially from current projections. Please refer to Item 1A of the ARLP 10-K regarding the significant risks involved in investment in Alliance’s operations including GSM, and the coal industry in general.

## 13.3 UNDERGROUND DEVELOPMENT

The GSM currently operates within the specifications of the approved permits and certifications required by all local, state, and federal regulatory agencies. Some of these permits and certifications are as follows:

- Local: county road agreements, regulated drainage ditch permits
- State: IDNR shadow boundary permit, IDNR surface affects permit, IDEM wastewater treatment permits (NPDES), IDEM air permit
- Federal: US EPA class 5 injection well permit, Army Corps of Engineers section 404 (wetlands) permit, US NRC nuclear material license

In addition to the permits listed above, all applicable mining regulations found in Title 30 of the Code of Federal Regulations (CFR) must be followed. The Mine Safety and Health Administration (MSHA) is the federal regulatory agency who oversees compliance with the CFR. Also, plans uniquely specific to the GSM are required to be submitted, reviewed, and approved by MSHA prior to mining. Some of the approved MSHA required mine plans include:

- Roof Control Plan
- Ventilation Plan
- Emergency Response Plan
- Mine Emergency Evacuation and Fire Fighting Program Instruction Plan
- Oil Well Mine Through/Around Plan
- Slurry Injection Plan

## 13.4 PERSONNEL MINING EQUIPMENT FLEET, MACHINERY & PERSONNEL

Underground equipment required at the GSM includes, but is not limited to:

- Continuous miner
- Shuttle car
- Double boom roof bolter

- Truss bolter
- Battery scoop
- Fork trucks
- Personnel carrier (mantrip)
- Feeder breaker
- Road grader
- Belt conveyor
- Transformer/substation
- Refuge Alternative chamber
- Rock dusters
- Miscellaneous dewatering pumps

Surface equipment required at the GSM includes, but is not limited to:

- Dozers (various sizes)
- Miscellaneous preparation plant equipment
- End loader
- Man and material hoisting equipment
- Ventilation fan
- Substation
- Mobile crane
- Belt conveyor
- Tractor and dirt scraping pans
- Side by side personnel carriers
- Fresh water wells

Personnel required to operate and maintain the GSM are generally obtained through the hiring of both skilled and non-skilled workers from the immediate area. Salaried positions at the GSM are made up of production managers, business managers, engineers, information technology, preparation plant operators, maintenance foreman, purchasing agents, and safety specialists. Hourly positions include equipment operators on the surface and underground, general laborers, dust sampling technicians, mechanics, examiners, warehouse clerks, etc. Total headcount numbers can vary depending on the market and demand for coal. Typical headcount ranges from between 220 to 450 workers, depending on the number of super sections operating.

## 13.5 MINE MAP

Please see Appendix A for a plan view of the mine map.

# 14.0 PROCESSING AND RECOVERY METHODS

## 14.1 PLANT PROCESS

GSM utilizes a heavy media, float/sink style preparation plant to separate marketable coal from refuse. The plant has a design feed capacity of 1,800 tons per hour (TPH). The plant is divided into two independent 900 TPH circuits, fed by two independent plant feed conveyors. Once in the plant, the run of mine (ROM) material passes over vibratory screens to be separated by size. Approximately 80% of all of the ROM material reports to the heavy media circuit as coarse material. Through the introduction of magnetite, a ferromagnetic naturally occurring mineral, the gravity of the ROM material solution within the heavy media circuit is manipulated to precisely control the float/sink point. The ROM material in the heavy media circuit is then pumped into a heavy media cyclone. The cyclonic action aids in the magnification of gravity, which allows for a faster and more precise separation between coal and rock. The clean coal, or product, produced by the heavy media cyclone is rinsed, dried, and collected by the clean coal conveyor to be shipped. The rock, or coarse refuse, produced by the heavy media cyclone is rinsed and sent to the refuse disposal area.

The 20% of material that makes up the fine circuit within the plant is also separated by gravity, but in a different manner. The fine ROM material reports to a series of classifying cyclones, spirals, and vibratory stack sizers to separate the coal from the fine refuse. Clean coal produced by the stack sizers and spirals is passed through screen bowl driers to remove excess moisture prior to being collected on the clean coal conveyor. Fine refuse from the same process is pumped to a static thickener. Once the fine refuse material has had sufficient time to settle to the bottom of the thickener, it is pumped away to be disposed of within the refuse impoundment or underground in abandoned mine workings.

## 14.2 ENERGY, WATER, PROCESS MATERIALS & PERSONNEL

Energy for the underground mining and preparation plant operations is delivered in the form of a 69kV transmission line to the GSM with a 10MW substation located on site which is adequate of the requirements of the underground mine, preparation plant and ancillary surface operations. The transmission line and power are provided and maintained by WIN Energy.

Process water for underground mining and the preparation plant is supplied by three water supply wells owned by the GSM. The water supply wells are located approximately 2 miles from the mine site on property owned by Gibson County Coal. Potable water used in the bath houses and offices is supplied by Gibson Water, Inc., an Indiana Rural Water Association.

The preparation plant uses readily available reagents and supplies. These are typically able to be competitively sourced from multiple vendors and are generally delivered to the mine by truck.

The preparation plant operates a flexible work schedule responding to mine production and market demands. A typical shift crew includes five salaried and sixteen hourly personnel, with up to two crews to operate at full capacity.

# 15.0 INFRASTRUCTURE

The GSM is located at 3455 South 700 West, Owensville, IN, 47665. It is accessible from county road 350 South via state route 65 via US HWY 41 from the north or via state route 168 to the south through the town of Owensville (38°16’20” N, -87°41’21” W). Interstates 64 and 69 are major transportation arteries in and out of the area. Most supplies are trucked to the mine from regional vendors. All necessary utilities are in place and working. Electricity is sourced from a 69 kV line to a 10MW substation located on site through the WIN Energy electric cooperative. Water is provided by a combination of wells owned by the mine and sourced from the local alluvium with potable water provided by Gibson Water, Inc.

Coal is transported by truck to GCC’s GNM facility for loading on CSX or NS rail or trucked south to Alliance’s Mount Vernon Transfer Terminal (MVTT) on the Ohio River (mile marker 828). The GNM (38°22’35” N, -87°36’50” W) is approximately 6.7 direct miles northeast of the GSM. The rail loadout has an annual capacity of approximately 8 million tons and typically loads trains in four hours or less. MVTT (37°55’31” N, -87°51’46” W) is approximately 27.9 direct miles south southwest of the GSM. MVTT has the capabilities to transload 8 million tons per year via truck or rail (EVWR) to barge. Ground storage is about 200,000 tons. Coal is also transported directly to customers by truck, mainly in the surrounding Indiana power generation market.

A fine refuse impoundment is located on the mine’s property. At the final stages, the embankment style impoundment will cover approximately 280 acres. The impoundment embankments are constructed of coarse refuse, creating storage space for fine refuse within the impoundment.
Figures 15-1 and 15-2 show the layout of GSM and GNM surface facilities.

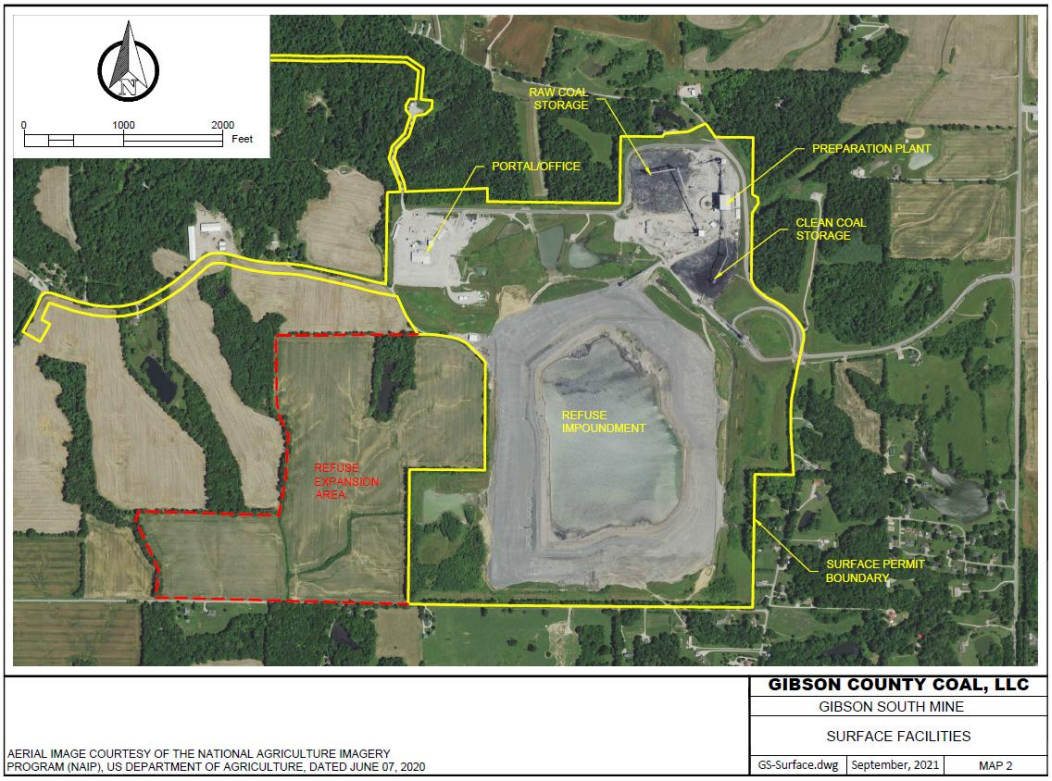



**Figure 15-1.** Infrastructure Layout Surface Facilities

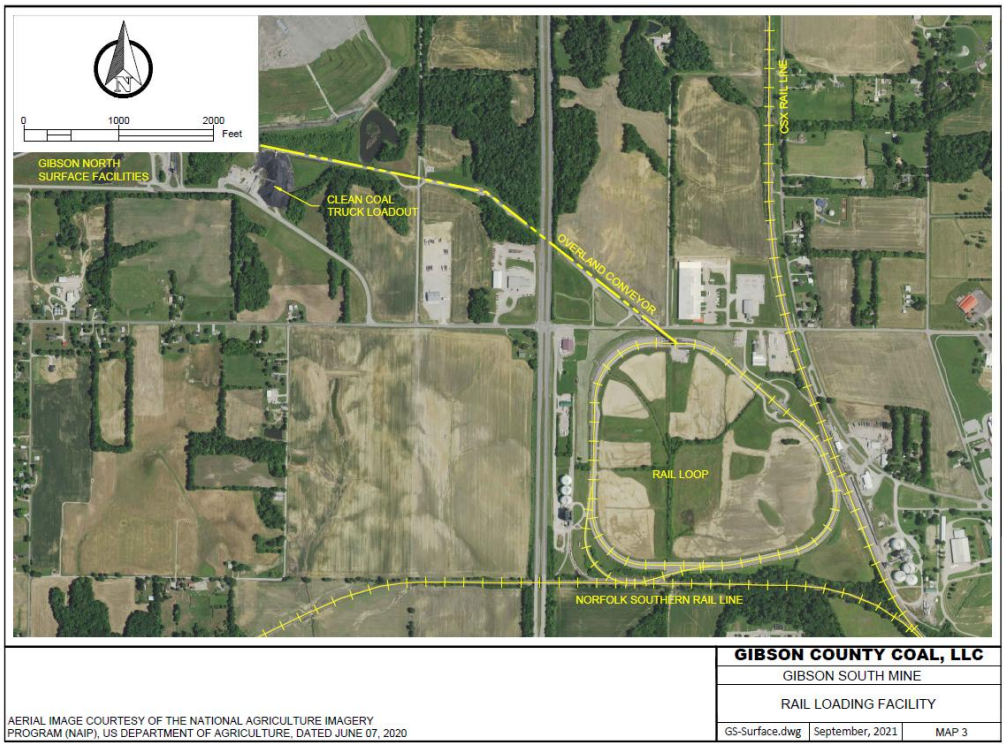



**Figure 15-2.** Infrastructure Layout Rail Loading Facilities

# 16.0 MARKET STUDIES

## 16.1 MARKETS

GSM produces a low/medium sulfur coal that is sold to the domestic and international thermal coal markets. Production from the GSM is shipped by truck or transported by rail on the CSX or NS railroads from the Gibson North rail loadout facility directly to customers or to various transloading facilities, including the Mt. Vernon Transfer Terminal, LLC (Mt. Vernon) transloading facility, for barge delivery.

GSM participates in the Illinois Basin coal market, selling coal to a diverse customer base of various domestic utilities, industrial facilities, and US East Coast and Gulf Coast exporters. While coal demand in the US is expected to decline over the coming years, the Eastern US thermal coal demand in 2021 was over 190 million tons. With its low-cost position, exceptional coal quality with regard to sulfur, and core domestic customer base, it is the QP's opinion, GSM should continue to have adequate market opportunities for its product.

**Table 16-1. Economic Analysis Coal Price**

| Operation | | 5-Year Average 2017-2021 | Third Party Price Forecasts[1] Minimum | Third Party Price Forecasts[1] Maximum | Economic Analysis Coal Price[2] | Reserve Tons |
|---|---|---|---|---|---|---|
| GSM | Tons Sold[3] | 4,800 | --- | --- | --- | 52,473 |
| | Price per ton[2] | --- | $38.89 | $59.67 | $36.08[4] | --- |

1. Proprietary third-party pricing forecast for 2022-2040 and 2022-2050, real 2021 dollars.
2. Price per ton is real 2021 dollars for the life of reserve economic analysis.
3. Tons reported in thousands.
4. The economic analysis coal price is based on the simple average of the GSM five-year average realization per ton and the simple average of the EIA Price as reported for the first Friday of each month for calendar years 2020 and 2021 (the 2-year average). See Section 12.2.4 for additional details.

The demand for the GSM coal is closely linked to the demand for electricity, and any changes in coal consumption by United States or international electric power generators would likely impact the GSM demand. The domestic electric utility industry accounts for approximately 91% of domestic coal consumption. The amount of coal consumed by the domestic electric utility industry is affected primarily by the overall demand for electricity, environmental and other governmental regulations, and the price and availability of competing fuels for power plants such as nuclear, natural gas, and fuel oil as well as alternative sources of energy.

Future environmental regulation of GHG emissions could also accelerate the use by utilities of fuels other than coal. In addition, federal and state mandates for increased use of electricity derived from renewable energy sources could affect demand for coal. Such mandates, combined with other incentives to use renewable energy sources such as tax credits, could make alternative fuel sources more competitive with coal. A decrease in coal consumption by the domestic electric utility industry could adversely affect the price of coal.

# 17.0 ENVIRONMENTAL

## 17.1 ENVIRONMENTAL STUDIES

No standalone environmental studies have been conducted for the properties. As part of the state and federal permitting process, various environmental assessments have been conducted. As disturbances are proposed for the operation, all relevant local, state, and federal agencies are contacted to review the proposed project. Each agency reviews the project for impacts to lands, water, and ecology.

## 17.2 WASTE DISPOSAL & WATER MANAGEMENT

The coarse refuse generated from the coal preparation process is used in the construction of the existing permitted, on-site slurry impoundment. Additional permitting will be required to expand the slurry impoundment. The expansion area is to be constructed on controlled land adjacent to the existing slurry impoundment. In conjunction with the expansion area, the slurry impoundment may be increased by employing upstream construction methods.

The fine refuse generated from the coal preparation process is disposed of by pumping it into the slurry impoundment or by injecting it into the GSM. The combination of pumping to the slurry impoundment and injecting into the GSM will provide life of reserve disposal of fine refuse.

All runoff from the slurry impoundment is managed by sediment control structures including diversions, sumps, and sediment basins. Prior to discharge from the permitted areas, water must meet compliance standards as defined in the NPDES permits. Water samples at discharge locations are collected in accordance with the approved permit and analyzed by an independent laboratory.

## 17.3 PERMITTING REQUIREMENTS

IDNR DOR is responsible for oversight of active coal mining and reclamation activities. The regulatory program is responsible for permitting and compliance verification, enforcement, and financial assurance of comprehensive environmental protection performance standards related to surface and underground coal mining operations.

In addition to the state mining and reclamation laws, operators must comply with various other federal laws relevant to mining. The federal laws include:

- Clean Air Act
- Clean Water Act
- Surface Mining Control and Reclamation Act
- Federal Coal Mine Safety and Health Act
- Endangered Species Act
- Fish and Wildlife Coordination Act
- National Historic Preservation Act
- Archaeological and Historic Preservation Act

In conjunction with the IDNR coal mining permit, the Clean Air Act and Clean Water Act laws and regulations are administered by the Indiana Department of Environmental Management (IDEM). IDEM is responsible for permit issuance and compliance monitoring for all activities which have the potential to impact air or water quality.

All applicable permits for underground mining, coal preparation and related facilities, and other incidental activities have been obtained and remain in good standing. A listing of all current state mining permits is provided in Table 17-1. Mining permits generally require that the permittee post a performance bond in an amount established by the agency to provide assurance that any disturbance or liability created by the mining operations is properly restored to an approved post-mining land use and that all regulations and requirements of the permit are satisfied before the bond is returned to the permittee.

**Table 17-1. Current State Permits**

| Regulatory Agency | Permit No. | Permitted Surface Area (Acres) | Permitted Underground Area (Acres) | Bond |
|---|---|---|---|---|
| IDNR | U-030 | 1408.43 | 22,346.58 | Yes |
| IDEM | NPDES-ING040253 | ---- | ---- | ---- |
| IDEM | NPDES-IN0064157 | ---- | ---- | ---- |
| IDEM | Air- S-051 0-26578-00052 | ---- | ---- | ---- |

## 17.4 PLANS, NEGOTIATIONS OR AGREEMENTS

New permits and certain permit amendments/revisions require public notification. The public is made aware of pending permits by advertisement in the local newspaper. Additionally, a copy of the application is retained at the county's public library for the public to review. A 30-day comment period follows the last advertisement date to allow the public to submit comments to the regulatory authority.

In certain instances, additional opportunities are provided to the public for comment. These instances include operations within 100 feet of a public road, operations within 300 feet of a dwelling, and operations within 300 feet of a public building, school, church, or community building. In those instances, approval must be granted by the regulatory authority as well as individuals or groups who own or provide oversight for a particular facility.

## 17.5 MINE CLOSURE

A detailed plan for reclamation activities upon completion of mining required at the properties has been prepared. Reclamation costs have been estimated based on internal project costs as well as publicly available heavy construction databases. Reclamation costs at the end of the year 2021 totaled approximately $5.5 million.

## 17.6 LOCAL PROCUREMENT & HIRING

There are no commitments for local procurement or hiring. However, efforts are made to source supplies and materials from regional vendors. The workforce is likewise located in the regional area.

## 17.7 OPINION OF THE QUALIFIED PERSON ON DATA ADEQUACY

The approved permits and certifications are adequate for continued operation of the facility. Waste disposal facilities are in place for current mining operations, with plans to expand the disposal facilities in order to provide life of reserve storage. Water control structures are in place and function as required by regulatory agencies. In the QP's opinion, the estimated reclamation liability is adequate to estimate mine closure and reclamation costs at the property.

# 18.0 CAPITAL AND OPERATING COSTS

RESPEC reviewed capital and operating costs required for the coal mining operations at the GSM. Historic capital and operating expenditures were supplied to RESPEC by GCC. The site is an operating coal mine; therefore, the capital and operating cost estimates were prepared with consideration of recent operating performance. The cost estimates are accurate to within +/-25%. RESPEC considers these cost estimates to be reasonable. All costs in this section are expressed in real 2021 US dollars.

## 18.1 CAPITAL COSTS

Capital costs were estimated with the costs classified as routine operating necessity (sustaining capital) and capital required for major infrastructure additions or replacement. As discussed in Item 12.3, the reserve for GSM is 52.4M tons. The current production schedule estimates approximately 52.4M tons will be mined by 2031. The estimated capital costs for the reserve tons are provided in Table 18-1.

**Table 18-1. Capital Cost Estimate**

| Life of Reserve Estimate 2022-2031 (US$ 000's) | | | | |
|---|---|---|---|---|
| **Category** | **Annual Minimum** | **Annual Maximum** | **Annual Average** | **Total** |
| Routine Operating Necessity | 15,675 | 27,417 | 18,973 | 189,733 |
| Major Infrastructure Investment | --- | 16,760 | 3,382 | 33,821 |

## 18.2 OPERATING COSTS

Operating cost inputs for the life of reserve economic analysis such as labor, benefits, consumables, maintenance, royalties, taxes, transportation, and general and administrative expenses were based on recent operating data. A summary of the estimated operating costs, including depreciation expense (the Mining and Processing Cost) for the life of the reserve are provided in Table 18-2.

**Table 18-2. Operating Cost Estimate**

| Life of Reserve Estimate 2022-2031 (US$ 000's) | | | | |
|---|---|---|---|---|
| **Category** | **Annual Minimum** | **Annual Maximum** | **Annual Average** | **Total** |
| Mining and Processing Costs | 136,494 | 148,629 | 144,988 | 1,449,877 |

# 19.0 ECONOMIC ANALYSIS

RESPEC completed an economic analysis based on the cash flow developed from the production plan and capital and operating costs previously discussed. The average per ton sold revenue estimate used for the life of reserve economic evaluation was $36.08.

## 19.1 KEY PARAMETERS AND ASSUMPTIONS

The economic analysis has been based on production, revenue, capital, and operating costs estimates. Other base economic analysis assumptions include:

- All revenue, costs, and cash flows are estimated using real 2021 U.S. dollars
- Taxes – Federal and State income tax are excluded from the economic analysis
- Royalties – reserve average of 3.47% of revenue
- Government levies – reserve average of 3.15% of revenue

Table 19-1 provides the range of cash flow of the life of reserve economic analysis for GSM based on the above assumptions.

**Table 19-1. Cash Flow Summary**

| Life of Reserve Cash Flow Summary 2022-2031 (US$ 000's) | | | | |
|---|---|---|---|---|
| **Category** | **Annual Minimum** | **Annual Maximum** | **Annual Average** | **Total** |
| Cash Flow | 34,384 | 65,720 | 52,464 | 524,637 |

## 19.2 ECONOMIC VIABILITY

The economic viability of the operation is reliable based on various factors. This is an on-going operation and has already established the economic benefits outweigh the economic costs. The economic analysis utilized the same parameters and assumptions used in past financial models. Therefore, it is reasonable to expect similar benefits and costs. Since this is an on-going operation with no major up front capital expenditures, there is no calculation of NPV, internal rate of return or payback period of capital.

We have tested the economic viability of the life of reserve economic analysis by conducting sensitivity analysis with respect to the revenue and operating and capital cost. In the independent sensitivity analysis, the revenue was reduced by 25% and the operating and capital cost were increase by 25%. This analysis shows the GSM reserves remain economically viable in both scenarios. The summary of the sensitivity analysis is shown in Table 19.2.

**Table 19-2. Sensitivity Analysis**

| Life of Reserve Estimate 2022-2031 (US$ 000's) | | | | |
|---|---|---|---|---|
| **Category** | **Annual Minimum** | **Annual Maximum** | **Annual Average** | **Total** |
| Revenue Reduced 25% - Cash Flow | (12,117) | 18,133 | 5,016 | 50,163 |
| Operating & Capital Costs increased 25% - Cash Flow | (3,832) | 31,746 | 17,495 | 174,953 |

# 20.0 ADJACENT PROPERTIES

The GSM is bounded to the east by old works of the abandoned King's Station Mine (KSM). Per the Indiana Geological Survey's Coal Mine Information System (CMIS), KSM operated from 1923 until closure in 1973. The mine map examined shows very successful room and pillar extraction with some irregularities as the mine approached the Galatia paleochannel to the north. From limited drilling, gas well interpretations, and correspondence with employees at the mine, conditions were very similar to GSM.

The GSM is bounded to the west by old works of the abandoned Wabash Mine. Per CMIS, Wabash operated from 1973 until closure in 1998. However, mine maps show small amounts of mining on and off until about 2003 in Illinois. From available MSHA records, production peaked at about 4.1 million clean tons in 1995. The mine operated in Indiana and Illinois, crossing a fault of the Wabash Valley System and mining extensively on both sides. As with the other mines in the area, Wabash had successful room and pillar extraction with some irregularities (partings, poor roof conditions) as the mine approached the Galatia paleochannel to the north. In general, conditions seem very similar to the GSM.

GSM's sister mine, Gibson North, lies across the Galatia paleochannel to the north. Gibson North produced coal from 2000 until 2019. At its peak, Gibson North's annual production exceeded 3.9 million tons.

# 21.0 OTHER RELEVANT DATA AND INFORMATION

All data relevant to the supporting studies and estimates of mineral resources and reserves have been included in the sections of this TRS. No additional information or explanation is necessary to make this TRS understandable and not misleading.

# 22.0 INTERPRETATION AND CONCLUSION

## 22.1 INTERPRETATIONS AND CONCLUSIONS

The QP has reached a conclusion concerning the GSM operation based on data and analysis summarized in this TRS that the operation is currently viable based on the reserves that remain, the economic benefits for GCC, and the market needs of this product. GSM contains an estimated 52.5 million clean tons of reserves.

## 22.2 RISKS AND UNCERTAINTIES

It is the QP's opinion that the mine operating risks are low. This is an on-going operation that has proven to be a viable and profitable business. The analysis of the reserves and resources used the same methodology the operation has used in the past. Given the reliability of past mining plans, it is a reasonable conclusion that future mining plans would continue to be reliable. However, market uncertainty associated with government regulations could result in earlier retirements of coal fired electric generating units. This could negatively affect the demand and pricing for the GCC product. Please refer to ARLP's Form 10-K, Item 1A, for a complete listing of risk factors that may affect this operation.

# 23.0 RECOMMENDATIONS

The recommendations for GSM are as follows:

- Continue acquiring mining rights in the extended mine plan to support future production
- Continued permitting efforts for expansion of waste disposal facility.
- Continue current exploration plan

# 24.0 REFERENCES

**Thompson, T.A. Sowder, K.H., Johnson, M.R. (2010, Revised 2016)**. Generalized Stratigraphic Column of Indiana Bedrock. Indiana Geological Survey, Indiana University.

**Nalley S., LaRose, A. (2021).** Annual Energy Outlook 2021 Press Release, U.S. Energy Information Administration (EIA). Accessed on February 4, 2022. Retrieved from https://www.eia.gov/outlooks/aeo/

**U.S. Energy Information Administration (EIA). (2021)**. Coal Markets. Accessed on February 4, 2022. Retrieved from https://www.eia.gov/coal/markets/

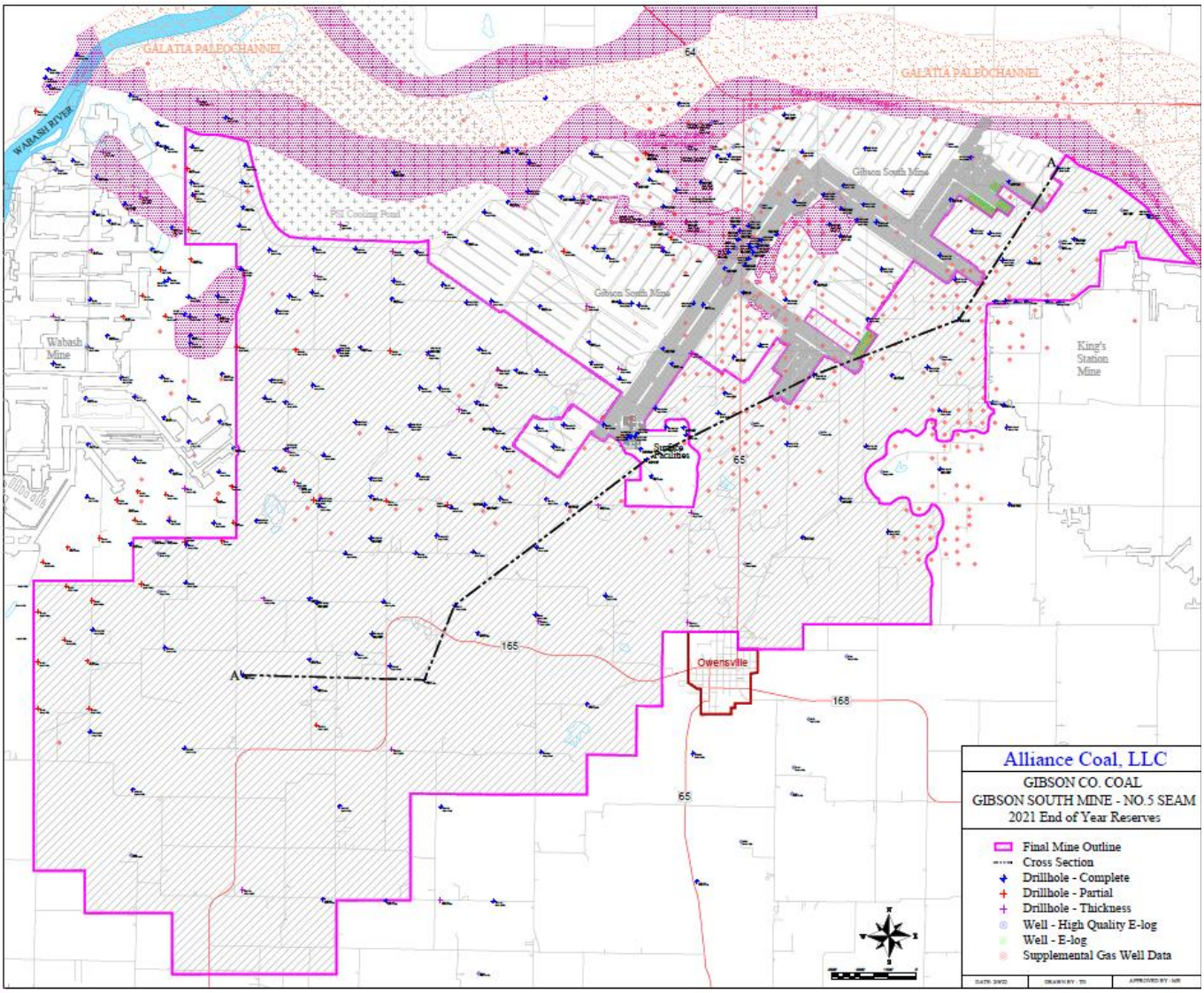
# 25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

Table 25-1 summarizes the information provided by the registrant for matters discussed in this report, as permitted under §229.1302(f) of the SEC S-K 1300 Final Rule.

**Table 25-1. Summary of Information Provided by Registrant**

| Category | Report Item/ Portion | Disclose why the Qualified Person considers it reasonable to rely upon the registrant |
|---|---|---|
| Macroeconomic trends | Section 19 | N/A |
| Marketing information | Section 16 | The market trends were provided by GCC personnel.<br>The QP's experience evaluating similar projects leads them to opine that the market trends are representative of the expected trends of an on-going coal mining operation in the United States |
| Legal matters | Section 17 | The legal matters involving statutory and regulatory interpretations affecting the mine plan were provided by GCC personnel.<br>The QP's experience with statutory and regulatory issues leads them to opine the mining plan meets all statutory and regulatory requirements of an on-going coal mining operation in the United States |
| Environmental matters | Section 17 | The environmental permits and matters were provided by GCC permitting group.<br>The QP's experience with permitting and environmental issues leads them to opine the information provided is representative of what is required of an on-going coal mining operation in the United States |
| Local area commitments | Section 17 | N/A |
| Governmental factors | N/A | N/A |

# APPENDIX A
## MINE MAP


GALATIA PALEOCHANNEL
WABASH RIVER
GALATIA PALEOCHANNEL
64
Gibson South Mine
Pit Cooling Pond
Gibson South Mine
Wabash Mine
King's Station Mine
Surface Facilities
65
165
Owensville
168
65
A
A'
Alliance Coal, LLC
GIBSON CO. COAL
GIBSON SOUTH MINE - NO.5 SEAM
2021 End of Year Reserves
Final Mine Outline
Cross Section
Drillhole - Complete
Drillhole - Partial
Drillhole - Thickness
Well - High Quality E-log
Well - E-log
Supplemental Gas Well Data