Project Independence Final Technical Report

October 31, 2012

Final Technical Report

Project Title: Project Independence: Construction of an Integrated Biorefinery for Production of Renewable Biofuels at an Existing Pulp and Paper Mill
Award Number: DE-PS36-08GO18049; Amendment No. M009

Recipient: NewPage Wisconsin System, Inc.

Project Location(s): Wisconsin Rapids Mill

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Cost-Sharing Partners: None

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Note: This report has been closely reviewed and does not contain any protected personal information (Protected PII).

Executive Summary:

Project Independence proposed to construct a demonstration biomass-to-liquids (BTL) biorefinery in Wisconsin Rapids, Wisconsin. The biorefinery was to be co-located at the existing pulp and paper mill, NewPage Wisconsin System Incorporated's Wisconsin Rapids Mill, and when in full operation would both generate renewable energy for Wisconsin Rapids Mill and produce liquid fuels from abundant and renewable lignocellulosic biomass. The biorefinery would serve to validate the thermochemical pathway and economic models for BTL production using forest residuals and wood waste, providing a basis for proliferating BTL conversion technologies throughout the United States. It was a project goal to create a compelling new business model for the pulp and paper industry, and support the nation's goal for increasing renewable fuels production and reducing its dependence on foreign oil. NewPage Corporation planned to replicate this facility at other NewPage Corporation mills after this first demonstration scale plant was operational and had proven technical and economic feasibility.

An overview of the process begins with biomass being harvested, sized, conditioned and fed into a ThermoChem Recovery International (TRI) steam reformer where it is converted to high quality synthetic gas (syngas). The syngas is then cleaned, compressed, scrubbed, polished and fed into the Fischer-Tropsch (F-T) catalytic reactors where the gas is converted into two, sulfur-free, clean crude products which will be marketed as revenue generating streams. Additionally, the Fischer-Tropsch products could be upgraded for use in automotive, aviation and chemical industries as valuable products, if desired.

As the Project Independence project set out to prove forest products could be used to commercially produce biofuels, they planned to address and mitigate issues as they arose. In the early days of the Project Independence project, the plant was sized to process 500 dry tons of biomass per day but would generate a blend of synthesis gas for the lime kiln and a minimum of Fischer-Tropsch liquids for sale. This was to be done using a single stage of Fischer-Tropsch reaction at roughly a 70% yield. The capability of the Wisconsin Rapids Mill lime kiln to run on the relatively low heating value of the product synthesis gas was problematic. The design was then changed to maximize Fischer-Tropsch liquids production using a two stage Fischer-Tropsch process.

Project Independence progressed with the design of the mill as ThermoChem Recovery International worked on the technical details of the project as well as develop information from their pilot plant. The pilot plant work uncovered several problems with the synthesis gas clean-up that solutions. ThermoChem Recovery International found these solutions and developed a very good path forward on the technical side. The technical solutions were demonstrated in the pilot plant to everyone's satisfaction.

In July 2010, NewPage Corporation had been severely affected by the downturn in the economy and actively went to find a strategic partner. By April 2011 the Abell Foundation entered the picture as this strategic partner. The Abell Foundation would join forces as Project Independence Inc. to build the 500 dry ton per day Project Independence plant.

The design of this facility progress even after NewPage Corporation declared Chapter 11 Bankruptcy protection in September, 2011. This continued until April 2012 when NewPage Corporation determined that continued work on Project Independence Inc. presented too much risk with little reward for NewPage Corporation. The project was terminated at this point.

Investigations Conducted to Better Understand the Process

Over the course of the project, xxx major investigations were undertaken to increase the project's understanding of the process and are discussed below:

1. The first investigation was conducted by the NewPage Wisconsin System Incorporated's Wood Supply group. This investigation addressed biomass availability and procurement opportunities. The result of this investigation was that there was sufficient biomass in the region around Wisconsin Rapids Mill to supply Project Independence.

2. The second investigation was done in conjunction with AMEC to determine the design, location and cost of Project Independence. This work has been submitted to the DOE and a public version is available. (AMEC Project Number 161934, Project Independence Study – Liquid Fuels from Biomass Feasibility Study, January 26, 2010)

3. As the third investigation, the pilot plant began operations. The pilot plant efforts were shared with Flambeau River BioFuels LLC as both projects were very similar and by pooling the results, each party gained more information than would be possible going alone.

   The results are summarized in the Project Independence BioFuels- Biomass to Fischer-Tropsch Liquids Integrated Pilot Plant Trial Report, April 2011 (Flambeau River IP Trial Report). The Flambeau River IP Trial Report is considered Business Confidential and has been previously submitted to DOE. The report has the Flambeau River BioFuels LLC name on it as a convenience, but the results were shared between both projects.

4. During the integrated pilot plant operations, unforeseen impurities began impacting the process and a fourth investigation was conducted to identify the source of the problems and is described in the Flambeau River IP Trial Report.

5. In addition to impurities, the mechanism feeding the reformer the biomass feedstock was found to not be performing well and the fifth investigation/ engineering study to find a better feed system was conducted and again, is described in the aforementioned Flambeau River IP Trial Report.

6. Once the pilot work was completed, the market for Fischer-Tropsch products came into question. Research into the market was then done by Nexant who looked into existing and potential products that could be generated from Fischer-Tropsch liquids. This work revealed that there were numerous opportunities in for Fischer-Tropsch liquids and

these opportunities presented some very good economic returns. The Nexant report is available.

7. The seventh investigation was by AMEC to update their feasibility study with additional information from the pilot plant work. The results of this investigation are in an updated report from AMEC.

Technical Effectiveness and Economic Feasibility of the Project

Technically, the project was a success and succeeded in proving that biomass can produce second generation fuels outside of the food chain. The project's Achilles heel was that the economic feasibility of the first of a kind plant was too onerous to proceed without a large amount of economic support. This was compounded with the bankruptcy of NewPage Corporation.

Benefit the Public

Economically, the project would have benefited the residents in central Wisconsin by securing jobs for the lumberjack and lumber industry. There would have been an increase in the construction trades and engineering work during construction of the facility, thereby increasing the bottom line of any support business. Additional staff would have been hired to operate the facility. Renewable energy to the Wisconsin Rapids Mill operations would have been an added benefit that would have contributed to the long term viability of the facility. By utilizing undesirable species and tree parts in the process and removing them from forests, forests would be healthier and the danger from forest fires would decrease.

Most significantly, the facility would have generated second generation fuels outside of the food chain from a renewable, sustainable resource.

Comparison of the Actual Accomplishments with the Goals and Objectives of the Project:

The primary project goal was to generate a renewable energy from biomass in an economically feasible way. The second goal was to then replicate the facility in other similar situations across the United States. To support these goals, the following efforts were made to address the DOE barriers thought to be problematic if not addressed.

The first investigation conducted by the Project Independence Papers' foresters was to insure the required supply of biomass was readily and affordably available. Without adequate and affordable biomass, the process would be stalled. Their investigation addressed the concerns listed in the DOE Barrier IM-A: Inadequate Supply Chain Infrastructure description.

Another DOE Barrier Im-E: Lack of Industry Standards and Regulations was not found to be an issue for the project. The collection of the biomass supply would follow standard forestry regulations, transportation requirements would be covered under Department of Transportation, construction and operation of the plant would be covered under city, state and

national permits, and the desired F-T product characteristics would be regulated by their customers.

The next barrier addressed by the project was DOE's It-C: Risk of First-of-a-kind-Technology. The operation of the pilot plant allowed the project to addressed and mitigate each issue found. The operation of the pilot plant also allowed the project to address the DOE milestones M.6.11, M.6.11.5 and M.6.11.6. Each mitigation step ultimately added to the capital costs of the project but was viewed as less expensive than the down time would cost the project overall. The project utilized experts in their fields to address impurities found in the feed stream, with the mechanical feed system and thoroughly understand and guard against the deactivation of the process catalysts. The Fischer-Tropsch product investigation addressed issues for DOE milestones M.15 and M.15.1.

The project milestones to have signed off-take agreements for the F-T products; have approved permits; and tasks surrounding financial close were worked on throughout the project and never reached 100%. The milestones of having the integrated pilot plant run for 1000 continuous hours work was reached as was the completion of all engineering design documents. The biggest barrier the project encountered was a barrier not found in the lists of the DOE Barriers and Milestones. The biggest barrier to the project was inadequate DOE first of a kind plant financial support and the bankruptcy of a key player in Project Independence due to financial situations that had no connection to the project.

Summarize the Project Activities for the Entire Period of Funding:

In August 2007, Project Independence was submitted to the DOE as a project to receive funding for a demonstration plant to for a 500 dry ton per day plant using the TRI steam reformer and the EFT F-T process to deliver heat and synthesis gas to the NewPage Wisconsin System Incorporated's Wisconsin Rapids Mill and produce income generating Fischer-Tropsch products.

Project Independence was approved for DOE funding to the level of $30 MM in January 2008. After negotiating the award, a Class 30 Cost Estimate System Design was developed by AMEC and completed by September, 2008.

Project Independence entered into a design period where AMEC was again chosen to develop a Class 10 design and cost estimate. At the same time, TRI and EFT were designing their portions of the plant. From the efforts of TRI and EFT, it became apparent that a pilot plant demonstration system was going to be needed to prove the project out. Most of 2009 was spent constructing the pilot plant and getting it ready for operation. In November 2009, the pilot plant made its first Fischer-Tropsch liquids.

At the same time, AMEC was completing their Class 10 design an issued a report in January 2010. The project was stalled until the integrated pilot plant completed their work and defined engineering changes that would be required to the design.

During the course of 2010, TRI and EFT worked to address to problem areas that were discovered during the pilot plant work. The first had to do with low levels of contaminants in the system that poisoned the Fischer-Tropsch catalyst. The second was related to problems with the feed system. Substantial effort was put into identifying and finding solutions to these problems. TRI did a great job of using well thought out methods to find a solution to these problems.

TRI overcame their obstacles and completed the 1000 hours of demonstration required and provided their report Flambeau River BioFuels IP Trial Report in April 2011.

With the Flambeau River BioFuels IP Trial Report, AMEC was able to assess the impact of the additional required equipment and conducted a value engineering exercise in order to lower the overall project cost. Their final FEL 3 Engineering Report and Cost Estimate was provided to DOE in xxxx 2012.

NewPage Corporation determined that Project Independence was going to be too much of a burden on the company in the July 2010. However, they did allow Project Independence to continue to search for strategic partners, investors and funding sources along with other approaches to make the plant economics viable. In April, 2011, Abell Foundation proposed partnering with NewPage Corporation and formed Project Independence Inc. With the backing of The Abell Foundation, Project Independence Inc. completed the AMEC feasibility study, worked with Avenor on a parallel feasibility study, and worked with Nexant to identify the potential of Fischer-Tropsch liquids and likely markets to pursue. This work was substantially complete in March, 2012.

Due to economics reasons separate from Project Independence or Wisconsin Rapids Mill, NewPage Corporation declared bankruptcy in September 2011. This cast a long shadow over Project Independence and has a major hindrance moving forward with the project and attracting additional DOE funding.

In April 2012, it became apparent to NewPage Corporation that there was not enough financial incentive for the company to continue to pursue Project Independence and requested a termination of the project.

Identification of Products Developed Under the Award and Technology Transfers

Project Independence did not publish or release any documents other than those provided to DOE for review previously.

Project Independence is mentioned on websites outside of our control. There was no Project Independence website.

Project Independence Inc. and TRI-Inc. had negotiated a licensing agreement for the TRI-Inc technology but the agreement was never executed.

Any technologies/techniques developed by the project are described in the Flambeau River BioFuels - Biomass to Fischer-Tropsch Liquids Integrated Pilot Plant Trial Report, April 2011. This report reflects information that was developed in the collaborative effort of Project Independence and Flambeau River BioFuels LLC.

Computer Modeling Development:

The Project Independence did not develop computer modeling as part of their project.

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Project Independence Inc.
Wisconsin Rapids, WI

Liquid Fuels from Biomass
Feasibility Study
Scope and Estimate

Project Number 168890
March, 2012

This report was prepared exclusively for Project Independence Inc. by AMEC. The quality of information, analysis, estimates, and Discussion contained herein are consistent with the level of AMEC's services and is based on: i) information available at the time of preparation, ii) data supplied by outside sources, iii) the conditions and qualification set forth in this document. This report is intended for the specific project application as defined herein and is subject to the terms and conditions of the contract with AMEC. No guarantee of ultimate project cost, financial or product performance is intended or implied. Any use of, or reliance on, or decisions based on this report by any third party does so at its sole risk and discretion.

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APPENDICES

1. SUMMARY

Project Independence scope consists of the installation of a biomass to liquids fuels facility at the existing NewPage Pulp and Paper Mill in Wisconsin Rapids, Wisconsin. The new facility includes the process technologies and equipment for biomass handling, reforming and gasification system, syngas clean-up and heat recovery/steam generation equipment, syngas to liquids conversion system, liquid fuel storage and loading equipment, and energy and utilities integration with the existing mill. This new system is designed to produce [redacted] of clean, zero sulfur, renewable Fischer-Tropsch hydrocarbon biofuels. The feedstock will be [redacted] of woody biomass comprised of mill residues and unmerchantable forest biomass.

The proposed equipment is located in the area east of 5th Avenue and adjacent to Brown Street. Several energy integration and utility services are interconnected to the existing NewPage pulp and paper mill. The gasification equipment, including the steam reformer, cyclone separators, steam generation equipment, and syngas clean up equipment are located in a new Reformer building as illustrated in the site plan drawings in Appendix D. All other new process systems, including syngas to liquids, are located adjacent to the gasification facility.

The entire biogas to liquids system will be operated with a new PLC in a control room located in the Reformer Building.

A new electric power system ties into the mill's 46 kV power system via a new 46-13.8kV, 20/26.6 MVA unit substation.

AMEC developed a capital cost estimate for the supply and installation of this system which is TBD, and has an accuracy range of ±10%. The details of the estimate are shown in Section 8.0 and Appendix A of the report. The estimate accuracy presumes that the process scope definition established by the major vendors, TRI and EFT are appropriate for the project objectives and performance. Pilot plant testing has been conducted, and final results and analysis were submitted to D.O.E.

2. INTRODUCTION

The New Page Wisconsin Rapids Fiber and Energy (F&E) pulp and paper mill, located in central Wisconsin, USA, recently received a Department of Energy (D.O.E.) grant to evaluate the construction/operations of an integrated Biorefinery for production of renewable biofuels. This system will produce clean, zero sulfur, renewable hydrocarbon biofuels from forest residuals biomass.

The biorefinery will gasify biomass into synthesis gas (syngas), which contains the desired hydrogen (H_2) and carbon monoxide (CO), with some methane and other hydrocarbons. The syngas produced can be used to produce biofuels that can either be blended into typical diesel or chemical feed stocks.

AMEC was engaged by Project Independence, Inc. to develop a ±10 percent total project cost estimate for the installation of the biorefinery at the Wisconsin Rapids Mill (WRM). The process technology modules selections were determined by Project Independence, Inc.

The study and cost estimate has been divided into six (6) main process areas:

1. Area 155-01 – Biomass Receiving and Handling
2. Area 155-02 – Biomass Dryer and Dry Storage
3. Area 155-03 – Reformer/Gasifier
4. Area 155-04 – Gas to Liquids
5. Area 155-05 – Product Storage
6. Area 155-06 – Balance of Plant

3. DESCRIPTION OF EXISTING FACILITIES

New Page's Wisconsin Rapids pulp and paper mill, located in Wisconsin Rapids, Wisconsin, has been operating for over 100 years at this site. The mill is the second largest hardwood Kraft mill in the U.S. and fourth largest hardwood mill in North America.

F&E generally consists of two fiberlines that process both log and wood chip receipts into fully bleached pulp. Kraft liquor used to cook the wood chips is recovered with three sets of evaporator and recovery boilers, and regenerated at the recausticizing and lime kiln areas. Supplemental steam is generated in three power boilers using bark, coal, and gas. Three turbine generators provide F&E's power requirements. Other process facilities include chemical handling systems, raw water filtration, and waste water treatment.

4. DESIGN BASIS

4.1. Site Conditions

• Site Location	Wisconsin Rapids, WI
• Site elevation	+/-1000 ft. AMSL
• Snow Load (IBC 2006) (ASCE 7-05)	
o Building Occupancy Category	II
o Importance Factor (Iw)	1.0
o Thermal Factor (C_t)	1.0
o Exposure Factor (C_e)	1.0
o Slope Factor (C_s)	1.0
o Ground Snow Load (P_g)	50 psf
• Wind Loads (IBC 2006) (ASCE 7-05)	
o Building Occupancy Category	II
o Importance Factor (Iw)	1.00
o Basic Wind Speed (3 second gust at 33 feet above ground)	90 mph
o Wind Exposure Category	"C"
o K_{zt} Topographic Factor	1.0
• Seismic Loads (IBC 2006) (ASCE 7-05)	
o Building Occupancy Category	II
o Importance Factor (Ie)	1.0
o Site Class	"D" (Stiff Soil n= 15 to 50)
o Seismic Design Category	B
o 0.2 Second Design Spectral Acceleration, S_{DS}	0.069g (Site Class D)
1.0 Second Design Spectral Acceleration, D_1	0.051g (Site Class D)

4.2. Utilities

• Oxygen	
o Oxygen Capacity	2378 scfm
o Oxygen Pressure	95 psig
o Oxygen Purity	92.5%
• Nitrogen	
o Nitrogen Capacity	482 scfm

- Nitrogen Pressure — 100 psig
- Nitrogen Purity — 99.98%

- Natural Gas — 17.0 mubtu/hr
  (See App. C for additional Information)

- Electric Power — 15.3MW
  (Estimated Operating Load

4.3. Fuel Analysis

4.3.1. Biomass Bark and Wood Waste (Based on the TRI Proposal)

- Average Elemental Analysis (percent by weight)
  - Carbon 49.00%
  - Hydrogen 5.70%
  - Oxygen 39.1%
  - Sulfur 0.03%
  - Nitrogen 0.70%
  - Inerts and Ash 5.26%

    TOTAL 100.00
  - Water 43.01%

- Higher Heating Value — 8,855 Btu/lb dry (MAF)

4.3.2. Natural Gas (From the 2008 FEL2 Study)

- Elemental Analysis (percent by volume)
  - Nitrogen 2.7
  - Carbon Dioxide 0.0
  - Methane 89.0
  - Ethane 5.2
  - Propane 1.9
  - Butane 0.7
  - Pentane 0.4
  - C6+ 0.02
  - Helium 0.06

    TOTAL 100.00

- Pressure 50.0 psig
- Temperature Ambient
- Higher Heating Value 1051 Btu/scf

4.3.3. Tail Gas

A tertiary supplemental fuel for any needed burners is biorefinery tail gas fuel with an approximate HHV of 295 Btu/scf. Natural gas shall be limited to only backup or startup situations. An estimated composition of tail gas fuel is:

- Pressure 26 psig
- Temperature 200deg. F
- CH_4 [redacted]
- C_2H_6 [redacted]
- C_2H_4 [redacted]
- C_3H_6 [redacted]
- C_3H_8 [redacted]
- H_2 [redacted]
- H_2O [redacted]r
- CO [redacted]
- CO_2 [redacted]
- O_2 [redacted]r
- N_2 [redacted]
- C4 [redacted]
- C5 [redacted]
- C6 [redacted]
- C7 [redacted]
- C8 [redacted]
- C9 [redacted]
- C10 [redacted]
- Total Mass Flow [redacted]
- Estimated HHV [redacted]

4.4. Predicted Emissions for the Biomass Dryer Stack

The primary heat source for the biomass dryer will be the flue gas from the pulse combustors with supplemental heat provided by a tail gas fired heater (see section 5.3.3). The predicted emissions (provided by TSI) are as follows:

- VOC [redacted]
- CO [redacted]
- Particulates [redacted]
- NOx [redacted]

4.5. SynGas Product Fuels

- The process is designed for approximately [redacted] gallons/day of a heavy fraction liquids HFTL, consisting of paraffinic hydrocarbons (C18+).
- The process is designed for approximately [redacted] gallons/day of a medium fraction liquids MFTL, consisting of paraffinic hydrocarbons (C9–C18).
- The process is designed for approximately [redacted] gallons/day of a light fraction liquid LFTL, consisting of light paraffins (C5-C8).

5. DESCRIPTION OF PROPOSED NEW FACILITIES

5.1. Introduction

This project is based on two technology modules: the reforming and gasification process developed by ThermoChem Recovery International (TRI) and the generic Gas-to-Liquids (GTL) process using the Fischer-Tropsch process, also provided by TRI through their supplier. Gasification is the sub-stoichiometric oxidation of a biomass to produce a gaseous mixture containing carbon monoxide, carbon dioxide, methane, hydrogen, hydrogen sulfide and other hydrocarbons. Steam reformation is a more specific chemical reaction whereby steam reacts with organic carbon to yield carbon monoxide and hydrogen. The Fischer-Tropsch catalyst based GTL process converts the syngas into various multi-carbon fraction liquid hydrocarbon fuels. The study basis for the Fischer-Tropsch unit operations is a generic fixed bed catalyst system

Biomass drying and heating and pyrolysis occurs within the steam reformer. The pyrolysis releases volatile components in the form of methane, hydrogen, carbon monoxide, carbon dioxide, and other hydrocarbons. Char reforming and partial oxidation then occurs, creating a medium Btu hydrogen rich syngas that can be used to offset fossil fuels, generate clean power or produce biofuels and biochemicals. In this project, the syngas is cleaned, compressed, and processed in a typical Fischer-Tropsch reactor to produce liquid fuels. Fixed-bed, Fischer-Tropsch Gas to Liquid processing is a mature technology.

The proposed process is shown in more detail on the preliminary P&ID's included in Appendix B, along with the original TRI process flow diagrams. The project mass balance diagram (developed by TRI) is included in Appendix C.

The syngas produced by the steam reformer is first cooled in a heat recovery steam generator (HRSG), where the heat is recovered in the form of high pressure steam. The cooled syngas then goes through a cold syngas clean-up train comprised of a venturi scrubber to remove any condensable tar or particulate carry-over, a solvent scrubber, then a Triazine scrubber to remove H_2S.

The clean syngas is then compressed and sent to a [redacted] an ammonia scrubber and sulfur guards to remove residuals that could poison the catalyst in the gas-to-liquids FT reactor. The product stream from the FT reactor is separated in three different cuts according to their boiling point: HFTL, MFTL and LFTL. The condensed liquid fuel streams produced can be used in a conventional refinery. A fourth stream is the residual tail gas which is distributed to the biomass dryer air heater burner and the PC heaters, providing the indirect bed heating for the

volatilizing of the biomass and the endothermic steam reforming reaction. Any remaining tail gas is then fired in an auxiliary boiler to generate 1250 psig steam

TRI has commercialized indirectly heated biomass steam reforming at one commercial installation using black liquor as the biomass feed. The TRI steam reforming system proposed for this application employs both steam reforming and partial oxidation gasification of biomass. TRI has tested and demonstrated its gasification technology in pilot plants, a new Process Demonstration Unit and a commercial scale black liquor gasifier. The FT technology chosen for the project is the 40 year old shell and tube fixed bed design which is well understood.

5.2. Area 155-01 – Biomass Receiving and Wet Storage

5.2.1. Area Summary

The biomass feed specifications for the commercial scale units are: top size of 1-inch max across any face or axis and moisture content of 10% by weight or less.

This area encompasses equipment and systems to receive loose biomass by truck, unloading by hydraulic truck dumper, outside storage and reclaiming and hog processing of material to a nominal size of 1" minus.

5.2.2. Description of Existing Site

The biomass storage and processing system is located east of Fifth Avenue and south of Wilson Street. The site is currently unoccupied except for use as a temporary storage area for excess bark and other boiler fuel. The site is flat and is clear with the exception of some undergrowth and security fencing which will be removed.

5.2.3. Design Basis

- Biomass Usage:
  - 555 T/D @ 10% Moisture
  - 1000 T/D @ 50%M; 41.6 T/Hr. Avg.
- Bulk Density:
  - 20 Lbs./Cu.Ft. Avg. Wet
  - 10 Lbs./Cu.Ft. Avg. Dry
- Truck Unloading:
  - 5 Days/Wk., 16 Hrs./Day = 4 Trucks/Hr. Avg.
- Biomass Receipts Storage:
  - 20 Days

- 20,000 Tons (as received basis)
- Sq.ft storage available

- Bio-Size Processing:
  - 7 Days/Wk., 24 Hrs./Day
  - 877 T/D, 24 Hrs/Day = 36.5 T/Hr. Avg. or 60 T/Hr. Design

5.2.4. **Truck Traffic**

Two inbound scales will be installed on Brown Street, one new and one relocated from the north end of the log yard. The existing outbound scale located on Wilson Street will be left in place. All scales will be above grade, pitless type, 100 ton capacity. All log and biomass trucks will turn off the highway on Wilson Street as they do now, turn right on Fifth Avenue and proceed to the inbound scales. In a counter clockwise pattern traffic will go north, with log trucks going to the log decks or the storage yard, and biomass trucks to the truck dumper. After unloading all trucks will leave via the outbound scale.

Drivers will enter identification information by using a keypad or identification card which they will use at the scale stations to weigh the truck in and out, record all necessary data, and receive a printed receipt/scale ticket at the exit scale. A scale house will be located between the two inbound scales to house all electronic equipment but will be unmanned. The two scale areas will be linked for data transmission, and will be under surveillance by CCTV from the central control room. A telephone or intercom connection will be provided at the scale house.

5.2.5. **Biomass Unloading and Storage**

Biomass material will arrive at the plant site in closed or covered semi-trailers. The material will be preprocessed off-site by various types of equipment, with a target size of 4” minus but containing occasional small branches and slivers up to 15” long.

A single truck dumper will be installed at the northeast corner of the project site, with space allowed for adding a second dumper in the future. The dumper will be the back-on type with a 70 foot platform length and extended arms with special chute attachment to gain additional elevation. A 7% inclined ramp will add more discharge height so that two trailer loads of material can be dumped before the area has to be cleared. The hydraulic power units will be housed in a weather proof, unheated building.

Truck drivers will operate the truck dumper. With push button panel in an operator cabin next to the dumper platform that will allow the driver to control all necessary functions for unloading. A

telephone or intercom connection to the main control room will be provided. A CCTV system will survey the dumper area.

A wheel loader, Caterpillar Model 980H or equal (by owner), will be used to move material from the dumper to the biomass reclaimer and to put excess material into storage. The storage area will hold approximately 20,000 tons of material when piled 20 feet high on average, or a 20 day supply. The reclaimer is a hydraulic stoker type with a live storage capacity of about 80 tons or two hours of running time. Hydraulic power units will be housed in a weather proof, unheated building.

5.2.6. **Biomass Processing**

Conveyor C-1, a 48" wide belt conveyor, will move reclaimed material to the biomass processing building. The conveyor will contain a tramp iron magnet, a weigh scale and a metal detector, Conveyor C-1 will discharge to enter C-2A or C-2B by a diverter gate. C2A and C2B are parallel screening and hog lines. Conveyor C-2and C2B are, a 60" wide vibrating conveyor, will spread out and feed material to the primary hog. These conveyor contain a screen section with openings to remove 1" particles which will bypass the hogs.

The objective of processing the raw biomass is to reduce the material to a particle size to 1" minus as required by the gasification process.

Primary hog 1 and 2 will be a set up to produce 1" minus material. The biomass will then be combined from the hog lines and conveyed to the primary screen which will segregate oversize and 1" minus fractions. The overs will be conveyed to the infeed of primary hog No. 1 or primary hog No. 2. It should be recognized that under wet and freezing conditions small screen openings may blind over, reducing the effectiveness of the screen.

Acceptable material passing the primary screen will go on to the dryer metering bin (by dryer supplier). Material which is still oversize will be recirculated and reprocessed until all material meets size specifications.

5.2.7. **Building and Services**

All processing equipment will be housed in a pre-engineered steel building with sound insulated siding and roof. Building services will include mill air, instrument air and dry type fire protection. The building will cover an area about 100 ft. long by 35 ft. wide. A electric MCC room and a conveyor support structure adjoin the process building. Equipment is normally unattended and will be controlled and surveyed via CCTV from the central control room.

5.3. Area 155-02 – Biomass Dryer and Dry Storage

5.3.1. Area Summary

This area includes a biomass dryer system and a dry storage silo.

5.3.2. Design Basis

Dryer Operation	7 days/wk, 24 hrs/day
Dryer Design Capacity	[redacted]T/day@10%moisture
Wet Biomass	
Dryer Feed Rate:	[redacted]lb/hr
Moisture:	50 %
Temperature:	102 deg F
Bulk Density:	20 lb/ft3
Specific Heat:	0.35 Btu/lb F
Flue Gas	
PC Heater Flue Gas Flow:	87,507 lb/hr
PC Heater Flue Gas Temp.:	842 deg F
PC Heater Heat Input:	[redacted]mmbtu/hr
Tail Gas	
Aux. Tail Gas Fuel Heat Input:	[redacted] @ biomass 50%moisture
Dry Biomass	
Dryer Discharge Flow:	[redacted] lb/hr
Moisture:	10 %
Evaporation:	[redacted]b/hr
Temperature:	212 deg F
Bulk Density:	10 lb/ft3

5.3.3. Dryer

Several dryer systems were evaluated. A TSI rotary dryer system was selected as the basis of estimate, based on price, performance and experience.

The TSI dryer system is equipped with a cone-bottom Metering Bin that contains a discharge metering device that is driven by a Variable Frequency Drive. The Metering Bin meters material into the Infeed Airlock based on Dryer System water evaporation load. The Metering Bin will have a capacity of 30 minutes retention.

The dryer drum is a 13' diameter by 60 foot long cylindrical structure made of rolled mild carbon steel plate. It is reinforced with structural section channel, tee and angle ribs and external bands. The Drum's interior is a network of lifting flights and baffles, designed to shower material across the

Drum's cross-section as to rotates, and to regulate the forward movement of material through the Drum. Around the circumference of the Drum are mounted segmented chain teeth sets, on which heavy duty roller chain rides. Drum rotation is effected by an electric motor and gear reducer and the Drum's tires are supported on four trunnion wheels, arranged in opposed pairs. A Kevlar type air seal at either end of the Drum is designed to limit ambient air infiltration. The Drum is clad with a corrugated skin held in place with stainless steel bands. This creates an air gap which acts as insulation. The Dryer System comes equipped with structural steel, working platforms and access ladder.

As dried material exits the Dryer Drum it is immediately discharged out of the Dryer System via a Hopper and Airlock. Most of the dried material is heavier dried particles which drop out of the hopper to a collection conveyor. Entrained particulate is conveyed through a duct from the Hopper to a high efficiency Multi-Clone, where the particulate is separated from the spent gas. This particulate exits the Dryer System via the Multi-Clone Airlock and is combined with the other, heavier dried material. The dried material is conveyed pneumatically to a Dry Storage Silo. Spent gas exits out of the top of the multi-clone into the Gas Duct which leads to an ID Fan flow is controlled by an Inlet Damper. The ID Fan Inlet Damper control is governed by the pressure differential reading across the Multi-Clone. Spent gas is forced by the ID Fan either to the Exhaust Stack or back to the Dryer System as gas recycle. The recycle improves the overall system efficiency and reduces emissions.

Dryer exhaust gas is transported to a Regenerative Thermal Oxidizer (RTO) for pollution control. There is an abort stack between the dryer and the RTO so that when the dryer is heating up, or cooling down, or in fault, exhaust can be diverted to atmosphere.

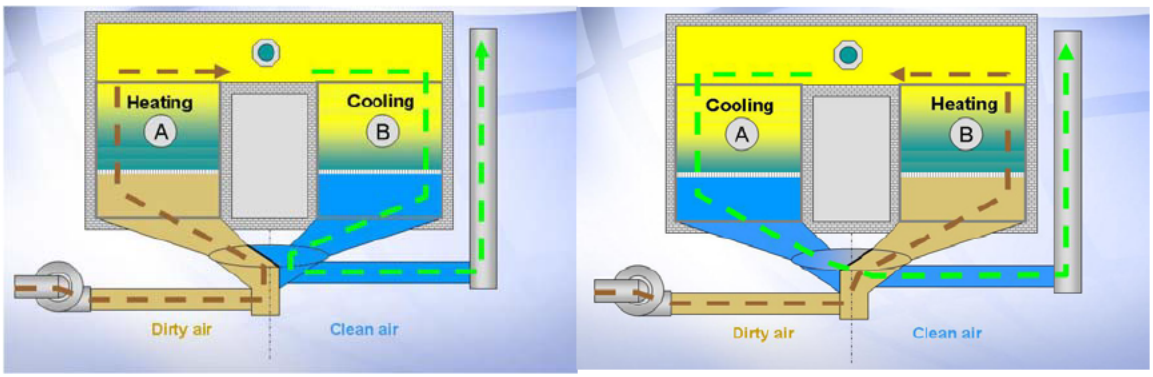
The burner is sized for 50 million BTU/hr and shall be of "ultra low-NOx" design. The multi-fuel burner is designed to accommodate process biogas, recycle and natural gas. Fuel mixing takes place in the single-walled horizontal mixing chamber fabricated from carbon steel. The dryer comes equipped with an Allen-Bradley burner management/safeguard system. The fuel train and BMS controls will be sheltered within a simple shed-like enclosure.

The proposed Dryer System is (programmable logic control) PLC controlled and has an operator (Human Machine Interface) to provide a graphic feedback and control interface for the HMI. System control devices are supplied , including a "Firefly" Fire Detection and deluge-type suppression System.

RTO

During normal operation, dryer exhaust gases will be treated in a Regenerative Thermal Oxidizer (RTO). The technology selected as the basis of design is Megtec's "CLEANSWITCH" technology. Megtec's proprietary custom design of the heat transfer media in other similar commercial installations has eliminated the need to install Wet ESP technology for particulate control.

The "CLEANSWITCH" Regenerative Thermal Oxidizer System provides destruction of Volatile Organic Compounds (VOC's) and odor control. It combines high temperature thermal oxidation with a regenerative heat exchange to efficiently convert VOC's and other odor causing organic compounds to carbon dioxide and water vapor. The "CLEANSWITCH" consists of (2) energy recovery columns connected by a high temperature combustion chamber. The unit is internally lined with ceramic fiber insulation. Flow is directed through the unit by a single valve such where one column is in a gas-heating (inlet) mode and the other column is in a gas-cooling (outlet) mode. The single switch valve incorporates a sealing system to ensure no bypass or leakage of process gas to clean exhaust gas. VOC-laden air enters the oxidizer through the inlet manifold and is fed into the base column A, where it passes vertically up through ceramic heat exchange media and is preheated almost to the combustion chamber temperature. The burner in the combustion chamber raises the air temperature to the operating set point where the oxidation process, which started in the ceramic media, is completed. Hot purified air then enters column B and passes vertically down through the ceramic media and is cooled before being exhausted to atmosphere.



The system includes a low pressure and re-cleanable bed designs that are unique to MEGTEC Systems. This bed design is based upon extensive testing of multiple media types and combinations in the bio-mass drying processes. The bed will minimize requirements for breakout or wash down. To provide particulate tolerance, the bed size has been significantly increased to nearly double the normal bed area for this type of structured media. In addition, over 4 inches of

additional static pressure is provided in the fan to maintain dryer flow in the event of particulate accumulation in the bed.

The burner will be “ultra-low NOx” multi-fuel design to accommodate process biogas and natural gas. High temperature protection device is included, along with a flame safeguard with Self-checking Ultra-Violent Scanner. The design will be Factory Mutual compatible with the necessary interlocks to achieve safe starts and fail-safe operation.

Megtec’s RTO package also includes Allen-Bradley Logix PLC and a power distribution panel. The equipment is “skid mounted”, assembled and matchmarked in Megtec’s shop, then broken down, shipped and re-integrated on site.

5.3.4. Dry Storage and Transfer

Dried biomass material will be conveyed by chain conveyor and pneumatic system. An online moisture meter will be installed at the dryer discharge. The dryer silo is sized for approximately 12 hours of dry material (appr [redacted] cu. Ft). the dry silo will be a bolted steel construction and have a flat bottom. A center pivot screw reclaimer with variable speed drive will extract material that will then be conveyed with two (2) pneumatic system . Each pneumatic system will feed a biomass storage bin at the reformer.

5.4. Area 155-03 – Reformer

5.4.1. Area Summary

This area includes the steam reformer system and carbon trim cell, and the gas clean-up systems including all necessary auxiliaries. The equipment will be supported in a steel framed structure which is partially enclosed. This structure will also include an electrical room, control room, laboratory, conference room, unisex restroom. Workshop, locker rooms, spare parts storage and warehouse are excluded.

5.4.2. Design Basis

Reformer

Biomass Flow:	[redacted]
Biomass Moisture:	10 %
Biomass Size:	1 inch minus
Syngas Flow:	[redacted]
Syngas Pressure:	
Syngas Temperature:	

Pulse Combustors
- Tail Gas Heat Input:
- N.G. Heat Input:
- Flue Gas Flow:
- Flue Gas Exit Temp:

HRSG 1
- Steam Flow:
- Steam Pressure:
- Steam Temperature:

HRSG 2
- Steam Flow:
- Steam Pressure:
- Steam Temperature:

Syngas Clean-up
- Venturi Scrubber Inlet Flow:
- Venturi Scrubber Inlet Temp:
- H2S Scrubber Inlet Flow:
- H2S Scrubber Inlet Temp:
- H2S Scrubber Outlet Flow:
- H2S Scrubber Outlet Temp:

Ash Handling
- Ash Flow:
- Ash Temperature:
- Ash Storage Volume:
- Ash Storage Retention:

5.4.3. Steam Reformer

The steam reformer will be fed from two, parallel live-bottom storage bins within the reformer building. The bins, transport and weigh screws and high speed augers are standard industrial equipment that are currently used in the wood products industry. Multiple feeders will be employed in the commercial systems to distribute biomass injection and to provide redundancy. The steam reformer has been sized to handle [redacted] of biomass feed, at a moisture content of 10% at 125 ^{o}F. The endothermic energy required for the steam reforming reaction will be provided indirectly through 4 pulse combustor (PC) heaters. The reformer will be a carbon steel refractory lined rectangular vessel. The alumina oxide bed will be fluidized with superheated steam using a fluidizing grid installed in the bottom of the reformer vessel. 150 psig saturated steam is superheated utilizing the hot flue gas discharge from the PC heaters in a dedicated fluidizing steam superheater. A set of Internal Ash Cyclones will be suspended inside of the reformer to capture bed material from the syngas, and return the bed material to the bed through dip-legs. Three sets

of lock hoppers will be provided for discharging bed material during shutdown. The vessel will be fitted with level, temperature and pressure measurement instrumentation.

An external dual cyclone system will be installed in the syngas duct immediately after the exit from the steam reformer. The cyclones will capture the fine ash/char that has not been captured in the internal cyclones, and the material will be collected in a common dust hopper for injection into the carbon trim cell.

5.4.4. Pulse Combustor (PC) Heater

The four PC Heaters that provide the endothermic energy for the steam reforming reaction will be fully submerged in the fluid bed. The heaters will be the standard TRI design configuration. Each heater will have [redacted] pilot flames for start-up, fired with natural gas. The main flame will be typically fired with tail gas from the gas to liquid process. Natural gas will be required for start-up until the reformer produces syngas.

5.4.5. Flue Gas Heat Recovery

The flue gas from the PC heaters will be partially cooled by passing through a superheater for the reformer fluidizing steam. Following the fluidizing heaters, the flue gas will pass through an economizer to heat the feedwater for HRSG 1 and 2. The flue gas will then be routed to the biomass dryer.

5.4.6. Carbon Trim Cell

Unreacted char will flow out of the reformer with the ash and is captured in the external cyclones and collected in the dust hopper. The ash/char will be discharged from the dust hopper and re-injected into the carbon trim cell. The carbon trim cell is a refractory-lined carbon steel vessel that is fluidized with steam to which sub-stoichiometric quantities of oxygen are added. The char will react with the oxygen to produce CO, liberate heat and increase the overall carbon conversion rate. The syngas from the carbon trim cell is combined with the syngas from the reformer and sent to gas clean-up. A set of cyclones (Internal Ash Cyclones) will be suspended inside of the carbon trim cell to capture fine bed material from the syngas, and return the fines to the bed through dip-legs.

An external cyclone system will be installed in the syngas duct immediately after the exit of the carbon trim cell. The cyclones will capture the fine ash that has not been captured in the internal cyclones, and the material is discharged to the ash collection system via lock hoppers.

5.4.7. **HRSG 1**

Prior to the gas clean-up system, the syngas from the reformer will be cooled in a heat recovery steam generator (HRSG). HRSG 1 will include a superheater, generator section and steam drum. Feedwater will be supplied from the Mill's No. 3 Power Boiler deaerator, via the existing boiler feed pumps. The high pressure, high temperature steam generated in HRSG 1 will be sent to the mill for use in the turbine generator.

[redacted]

5.4.8. **HRSG 2**

A second heat recovery steam generator will be furnished to collect heat from the PC heater cooling water and the carbon trim cell cooling water. This system will consist of a steam drum to collect and separate the steam and a set of pumps to circulate the feed water through the PC heaters and the carbon trim cell. HRSG 2 will generate medium pressure (300psig) saturated steam for use in the new biorefinery process. The excess steam will be reduced in pressure and sent to the 160 psig steam system. Excess 160 psig steam will be routed to the mill.

5.4.9. **Gas Clean-up**

Primary particulate removal from the syngas is done in four sets of Ash Cyclones, one set installed in the reformer, one set immediately after the syngas discharge from the reformer, one set installed in the carbon trim cell and one set immediately after the syngas discharge from the carbon trim cell. The hot syngas will then be routed through HRSG 1, where a portion of the heat will be used to generate high pressure steam.

The cooled syngas is then routed through the venturi scrubber to remove any remaining particulate material in the high ΔP venturi throat. From the venturi, the syngas passes to a scrubber where the gases are further cooled [redacted]

[redacted] The captured heat from the syngas is discharged through a heat exchanger in the re-circulated fluid loop. The excess water condensed from the syngas is blown down to the mill's waste water plant after flashing/degassing in a flash tank separator.

[redacted], [redacted] After the H_2S scrubber, the syngas is sent to the Gas to Liquids (GTL) plant.

The data generated from TRI's pilot plant will be used in conjunction with process simulation software to design the commercial gas clean-up system to minimize scale-up risk.

5.4.10. **Ash Handling**

The syngas from the carbon trim cell will pass through the quaternary cyclone to remove the final biomass ash and unreacted carbon from the gas. The ash discharges through double lock hoppers to a water cooled chain conveyor to cool the ash and transport it to a storage silo. The silo is sized for four days storage. From the silo, the ash is discharged through a rotary valve to a paddle mixer where water is added before loading into trucks for transporting to the land fill.

5.4.11. **Bed Media**

The bed media will be alumina oxide. This material will be delivered by truck and will be pneumatically unloaded into a storage silo. This silo is sized to accommodate full bed inventory from the reformer and CTC. A denseveyor system will be furnished to convey the alumina oxide to the reformer and the carbon trim cell.

There will be two portable denseveyors furnished to load and unload the reformer and the carbon trim cell. The first unit is 30 tph system designed to load the media from the storage silo to the reformer. This unit can be moved via fork truck to also unload the reformer. The second unit will be a 4 tph unit designed to load the carbon trim cell, unload the carbon trim cell, feed carbon to the carbon trim cell, and to make-up lost bed material to the reformer or carbon trim cell during operation.

5.4.12. **Oxygen and Nitrogen Supply**

Oxygen and nitrogen supply will be purchased from the third party supplier who will build, own and operate a cryogenic oxygen plant on site to produce oxidation reactions to adjust the hydrogen to CO ratio in the syngas as required by the downstream gas to the liquids process.

The plant will also produce 99.98% pure nitrogen for start-up purging, and for use as the pneumatic instrumentation control.

5.5. Area 155-04 – Gas to Liquids

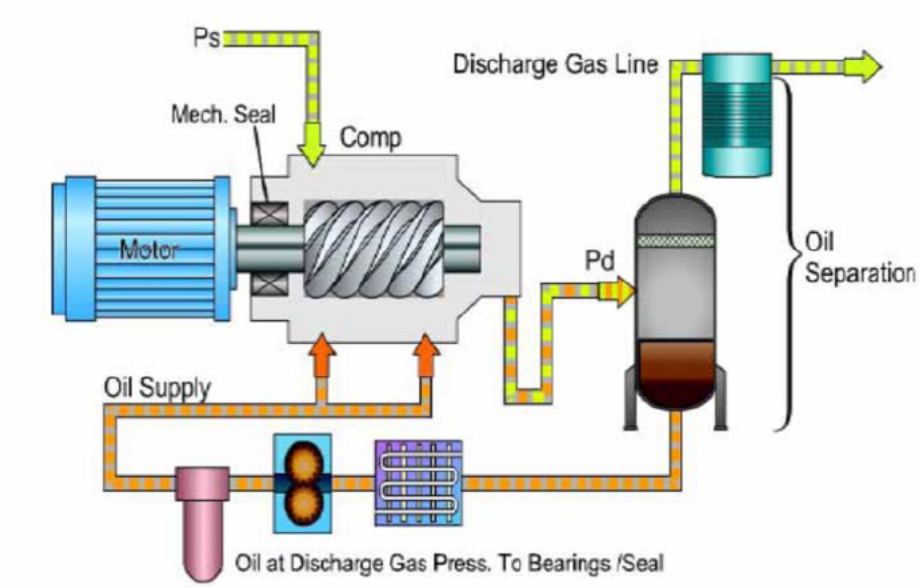
5.5.1. Area Summary

This Area includes the syngas compression system and F-T reaction to ultimately produce the desired hydrocarbon products.

5.5.2. Syngas Compression

The syngas, [redacted], must be compressed to 440 psig. The Fischer-Tropsch Reactor is more efficient at higher pressures since F-T product selectivity and catalyst performance are influenced by pressure, so the syngas must be compressed following the H2S Scrubber. Compression upstream of the Secondary Syngas Clean-up system keeps the sizing of this equipment to a minimum.

The syngas compressor system must raise the syngas pressure from approximately 25 psi to the target F-T Reactor feed pressure of ≥400 psi. Therefore, the compressor discharge pressure should be designed for ≥450 psi to account for equipment and line losses upstream of the F-T reactor inlet. Oil injected screw compressor technology was selected as the basis of estimate. This technology operates with two rotors that pull in and compress the gas within the casing that contact each other at lobe surface via an oil film. The oil acts as a lubricant, coolant and seal. The oil and gas mixture is discharged through the compressor discharge nozzle into an oil separation system downstream of the compressor. Oil that is separated is circulated in the compressor lube system.



[redacted]. Kobelco offers a wide variety of lube oils and has experience with a broad range of process gases. With Kobelco's basic oil removal system, 0.5 ppmw carryover is expected. With enhanced filtration, Kobelco can achieve a 10.0 ppbw oil carryover rate. Due to the lube oil, reduced mechanical wear is expected.

Turndown range for each screw compressor is 20%-100%, compared to 85%-100% for the centrifugal compressor. The screw compressor offers better ability to handle fluctuations in feed pressure, molecular weight and flow, and is less susceptible to vibration issues than the centrifugal compressor. Skid-mounted units greatly simplify installation.

Kobelco's bare shaft compressors are manufactured in Takasago, Japan and shipped to the USA. Total Package design and assembly are carried out in Corona, California, from where they are shipped as skid-mounted units. Kobelco operates a local service facility in Illinois.

Heat of compression is removed by intercoolers and moisture removed in knock-out pots in between stages.

5.5.3. [redacted]

[redacted]

5.5.4. [redacted]

[redacted]

5.5.5. **Fischer-Tropsch Reaction**

The FT reaction is an exothermic catalytic reaction where the syngas is converted to hydrocarbon liquids of various chain lengths in catalyst-packed tubes. This step is carried out in two stages: Each Stage consists of two parallel FT reactor vessels. CO conversion in each stage is a minimum of 65%. Heat of reaction is removed from each stage by generating steam in a dedicated HRSG.

[redacted]. The feed composition as defined by the H_2/CO syngas ratio affects both the rate of CO conversion and the product selectivity. When the desired hydrocarbon products involve diesel range and heavier

hydrocarbons, the preferred ratio corresponds to the H2/C ratio of the products. With this feed one can readily convert all of the synthesis gas.

The product output from each of the FT Reactors is a mixture of liquid and vapor hydrocarbons and unreacted syngas and steam. This mixture is separated into the desired hydrocarbon chain length products, namely HFTL (wax), MFTL (diesel), and LFTL (naptha) in a series of condensers and separators.

The total products composition and production rate from the FT Reaction is:

- [redacted]
- [redacted]
- [redacted]

Water collected in the separators is sent to the wastewater treatment plant after flash vapor is collected. Unreacted syngas from the first reactor is reheated in a steam preheater prior to entering the second stage FT reactors. [redacted]

5.6. Area 155-05 – Product Storage

5.6.1. Area Summary

The Product Storage Area includes a total of three (3) storage tanks, one for each type of end product. The tank for the heavy fraction liquids (HFTL) will be [redacted] capacity and the medium fraction liquids (MFTL) will be [redacted] in size, designed for a minimum 5 days of storage. The third tank for the light fraction liquids (LFTL) is [redacted] in size.

5.6.2. Liquid Hydrocarbons Storage

Production of liquid hydrocarbons is collected in three storage tanks located in a common diked area.

For the heavy fraction liquids, a [redacted] tank will hold a designed production of approximately [redacted] of HFTL. The tank is 22 feet in diameter and 30 feet tall. To prevent solidification of the HFTL product, its storage tank is insulated and provided with a steam coil, heat tracing jackets, and a recirculation bypass to maintain the storage tank contents in the liquid state.

For medium fraction liquids, a [redacted] tank will hold a designed production of approximately [redacted] of MFTL. The tank is 19 feet in diameter and 29 feet tall. The MFTL product storage tank is insulated and provided with heat tracing jackets, and a recirculation bypass.

For light fraction liquids, a 15,000 gallon tank will hold a design production of approximately [redacted] of LFTL. The tank is 12.5 feet in diameter and 16.5 feet tall. The LFTL product storage tank is provided only with insulation and a recirculation bypass.

Each product can be shipped either by truck or railcar through dedicated loading racks and loading arms. To minimize emissions vents from the truck/railcar are recycled back to the respective product tank vapor phase. The vents from the storage tanks will be collected and incinerated in the auxiliary boiler, or the flare.

5.7. Area 155-06 – Balance of Plant

5.7.1. Area Summary

This area includes those items that are not directly related to the biomass conversion process. Included are the cooling tower, flare and the auxiliary boiler.

5.7.2. Raw Water (35°F winter - 85°F Summer)

A new Raw Water Booster Pump will be included to supply make-up to the cooling tower cooling water loop and to supply water to the HFTL and MFTL coolers.

A cross flow mechanical draft cooling tower designed for 109 mmbtu/hr will supply 85°F cooling water in summer time at a circulation rate of 6000 gpm. In the winter when flow is shutdown, the blowdown will be controlled to maintain the 85°F temperature and the warm blowdown will be returned to the mill to help heat mill water.

The raw water used to cool the HFTL and MFTL coolers will be returned to the mill at 280°F

5.7.3. Filtered Water (35°F Winter - 85°F Summer)

Filtered Water will be pumped from the mill filtered water header for use as direct contact water for the solvent scrubber, H2S scrubber, and the ammonia scrubber.

5.7.4. Service Water (125°F)

Service water for the biorefinery will be supplied frpm a new pump which will take suction from the cooling water return loop.

The 70 ºF water servicing the LFTL Condensers is recycled back to the cooling tower water loop.

5.7.5. Flare System

During start-up, syngas will be produced in reduced quantities as the Reformer operation ramps up. During this period, syngas must be sent to a flare to burn off so that it is not released into the atmosphere. It is anticipated that this will occur for a period of six hours. Once the syngas production reaches [redacted] of the design flow rate, it can be routed through the process. For the start-up condition, an enclosed flare is desired because it is designed to reduce noise and flame visibility to the public. Burning of the waste gases takes place "invisible" to ground level observers with only combustion products being discharged to the atmosphere. Air for combustion is by natural draft. The combustion chamber is a vertical refractory lined unit with the burner systems located at the base.

Unexpected outages or equipment failures warrant the need for an emergency flare, with natural gas pilot, sized to handle the full syngas flow.

A "knock-out" pot is included to reduce velocity of the incoming gas and to remove any moisture prior to the flare burner.

The basis of this estimate includes a single enclosed flare to support *both* start-up and emergency conditions. This would handle flaring up to and including [redacted] lb/hr of Syngas waste stream.

5.8. Electrical Distribution

See Appendix F for the Electrical design drawings for the project.

5.8.1. Power Distribution

Electrical power for Project Independence will be supplied from a new 20/26.6 MVA utility tie transformer located at the existing Kraft Mill Substation. The secondary of this new transformer will be cable connected to a new 15 kV switchgear line-up located in the new Reformer Building electrical room (ER#1). (See one line diagram, Dwg. No. 6E-11883-0001.) The new 15kV feeder will consist of three (3) parallel runs of 3/C 500 kcmil, shielded, Type MC copper cables installed in cable tray between the substation and ER#1. The new 15 kV metal-clad switchgear consists of 2 highdraw-out, vacuum circuit breakers. Each circuit breaker has been furnished with redundant protective relays and a Rockwell Automation Powermonitor 3000 Model-M505A-ENT- M5 version. The switchgear line-up has also been furnished with bus differential relaying to aid in minimizing arc flash incident energy levels.

Two (2) new 6000/7500 kVA transformer will be provided to step-down the 13.8 kV to 4160 volts. Two (2) new 2500/3125 kVA transformers will be provided to step-down the 13.8 kV to 480 volts. The transformers will be specified as outdoor liquid immersed units, and will be furnished with a vegetable oil based, less-flammable fluid, such as FR3 (a Cooper Power product). Both the 13.8 kV and the 4160 volt systems will each be low resistance grounded through a 400 ampere, 10 second resistor, while the 480 volt system will be grounded through a high resistance grounding system (limiting ground fault current to 5 amperes or less). See DWG No. 6E-11883-0001 for details of the 4160 volt distribution system.

New 480 volt switchgear will consist of metal-enclosed, draw-out, power circuit breaker style equipment located in ER#1. A main-tie-main breaker configuration has been specified. The outdoor transformer secondary air terminal chambers will be cable connected to the indoor 480V switchgear with multiple parallel runs of 3/C 500 kcmil Type MC copper cable routed in cable trays with no spacing between cables. The high resistance ground detection system will be housed in the 480V switchgear incoming line section compartment. See DWG No. 6E-11883-0002 for details of the 480V distribution system.

The Oxygen Plant will be fed from two different power sources. A 4160V feeder will originate from a fused switch in the MV MCC in ER#1 to feed the approximate 3500HP, 4160V load, while a 480V feeder will originate from a 800A, breaker in the 480V switchgear located in ER#1 to feed a 300kva 480V load.

The present total connected load for the plant is approximately 24,099 hp. The estimated running load is approximately 15.3 MW.

5.8.2. **Utility Tie Substation**

The existing Kraft Mill Substation will be expanded to create space for the new 20/26.6 MVA, 46 kV to 13.8Y/7.97 kV substation transformer. This expansion will be to the north-east of the existing substation outline. New concrete foundations and structural steel members will be installed to extend the existing design. A new 1200A, 46 kV rated SF_6 gas circuit breaker (GCB) will be installed, for primary protection of the new transformer. New CT's will wire to new protective relays for transformer protection. These new relays will be located in the existing substation control building. Six (6) new vertically mounted, 46 kV, 1200A rated copper, hook-stick operated disconnect switches with insulators will be included for maintenance isolation of the 46 kV GCB. The transformer primary bushings will be connected to the 46 kV bus work via a 46 kV, 1200A 3-pole, gang-operated vertical break switch, with manual operator.

5.8.3. Electrical Rooms

Two new electrical equipment rooms will be provided. The main electrical room for the project will be located in the Reformer Building on the ground floor and will be identified as ER#1. See Dwg. No. 6E-11883-0003 for the ER#1 Room layout. The second electrical room will be located just outside of the northeast corner of the Biomass Fuel Preparation Building and will be identified as ER#2. The new substation transformers mentioned in paragraph 2 above will all be located outdoors directly east of ER#1. See Dwg. No. 6E-11883-0004 for the transformer area layout. The new electrical rooms will be air-conditioned and heated.

5.8.4. Motors

All motors will be high efficiency design. Motors rated 250 hp and larger will be rated 4000V for operation on the 4160V system. Motors rated above 2500 hp will be rated 13.2kV for operation on a 13.8kV system. All motors 200 hp through ½ hp will be rated 460 volts for operation on the 480V system. Motors used with variable frequency drives (VFD's) will also be inverter duty rated. There are over 200 motors on the project: two motors are rated 13.2 kV; not containing the Linde Oxygen Plant 4000V Motors, there are 13 additional 4,000v motors; the remaining are rated at 460V.

5.8.5. Motor Control Centers

Grouped 480V motor control centers will be furnished with 1200 ampere main buses. The 480V MCC's will be furnished with a main incoming line fusible switch, per the owner's request. Starter disconnect devices will be fusible switches. Each starter door will be furnished with a Grace Engineered Products R-3W thru-door voltage indicator. The conveyor motor starters will be furnished with Load Controls, Inc. current transducers, for monitoring motor current via the DCS. 480V VFD's will be incorporated into the MCC lineups.

New 4160V motor controllers will be grouped in a lineup with a 1200 ampere main bus, and a 5 kV draw-out, vacuum circuit breaker for the incoming line section. This line-up will be located in ER#1. A 1200 ampere, fused load-break switch in this 4160V controller line-up will be used to feed the remote 4160V motor controller line-up located in ER#2.

5.8.6. Diesel Generator Set

A 250 kW diesel-engine generator set with sound attenuated, weatherproof enclosure and a UL listed sub-base 400 gallon fuel tank will be furnished for providing standby power in accordance with NEC Article 702. The genset will be connected to the 480V power distribution system via a 400A automatic transfer switch (ATS). When normal power to the ATS is lost, the ATS control circuitry will signal the diesel-generator to start. When the generator voltage and frequency are

within specified limits, the ATS will transfer to the generator voltage source. A standby power 480V MCC will be connected downstream of the ATS. Standby power loads such as the two PC Heater BFW Circ. Pumps, the two FT Reactor 1 BFW Circ. Pumps, the two FT Reactor 2 BFW Circ. Pumps, the electric heat tracing systems, building heating loads, and the DCS UPS will be connected to this 480V MCC. The DCS will be programmed to sequentially load the generator after initial start-up to keep starting impact manageable. The 400 gallon fuel tank will provide about 20.6 hours of operation at 100% load.

5.8.7. **15kV Soft Starter**

Two (2) 15 kV soft starter swill be furnished staring the 4250 HP 1st Stage Syngas Compressor and the 3550 HP 2nd stage Syngas compressor to avoid large voltage dips on starting. The use of soft starter has been implemented.

A synchronous motor option for the syngas compressor was investigated but it was deemed too expensive for the desired benefits of power factor correction. AMEC believes that the induction motor option for the syngas compressor with dedicated power factor correction equipment is a more economical solution. At this point in the estimate, no power factor correction equipment has been included. During the design phase of the project, a detailed power factor analysis study will be performed to size the required PF correction equipment.

5.8.8. **Control Circuits**

Each motor starter circuit will have 120V, 60 Hz power supplied from its own grounded control power transformer (located in the starter compartment). Each motor starter will have a Test-Off-Normal selector switch mounted on the MCC starter door. The motors will be controlled from the DCS system; using one DO and three DI points, per motor. Only a select number of motors will have a local Emergency Stop pushbutton located near the motor. Emergency Stop pushbuttons and pull cord switches will be hard-wired to the respective motor starter. Each E-Stop button or pull cord switch will also have a second contact wired to the DCS, so that the operator can see which E-Stop was initiated.

Local non-fused disconnect switches with locking provisions will be furnished for all roof mounted motors, air conditioning equipment, unit heaters, bridge cranes, and electric hoists.

5.8.9. **Lighting**

Lighting will be designed to produce average maintained illumination levels recommended by the IES and AMEC's design standards. Fluorescent fixtures with energy saving ballasts and lamps will be used in the electrical rooms, control room, rack room, laboratory, conference room, and

restrooms. High pressure sodium lamps in industrial HID fixtures will be used in the balance of the plant. Emergency lighting (to provide required illumination for egress pathways) will be supplied from strategically located normal lighting fixtures that are wired to the emergency lighting UPS system.

5.8.10. **Conduit, Cable Tray and Wire**

Exposed conduit shall be rigid aluminum. Cable trays shall also be aluminum with nominal 4 inch high side rails and 9 inch rung spacing. Drop outs from the cable tray will be furnished via either rigid conduit or 4 inch wide aluminum channels where the larger cable size warrants. All penetrations through fire rated walls will be sealed after installation of cables with an equal or greater fire rating seal. The following areas of the project will be treated as Class I, Division 2 classified areas regarding the electrical installation: SynGas compressor, Gas-to-Liquids, product storage and loadout.

5.8.11. **Uninterruptible Power Supply**

A 30 kVA, 3-phase UPS, with 208Y/120V, 3-phase, 4-wire power distribution panelboard will be supplied to furnish an uninterruptible power source for at least sixty minutes after the failure of the normal mill power source for the safe shutdown of the critical systems DCS processors. This UPS power panel will also feed the fire alarm system, any emergency shutdown systems, the security system, and the communications system. This UPS system (with battery cabinet) and panelboard will be located in the Rack Room, which is adjacent to the Control Room.

5.9. PCS and Controls

In order to keep initial costs down, a new PLC based Process Control System (PCS), not a Distributed Control System (DCS), is being installed for Project Independence. A Rockwell ControlLogix control system has been quoted for the project. The PCS operates on a non-redundant Ethernet TCP/IP network. There are four, quad monitor operator work stations in the control room. One engineering workstation is also included.

I/O cabinets are to be installed in the main electrical room. I/O quantities included in the PCS are shown below. The I/O count was obtained by review of the study P&IDs. 20% additional, configured I/O was added to provide design flexibility. 25% spare I/O are also included for future use. High density temperature measurements are multiplexed into the PCS.

I/O Distribution	AI (4-20 ma)	AO (4-20 ma)	DI (120 VAC)	DO (120 VAC)	AI Profibus
Area 1	3	0	72	2	0
Area 2	25	9	18	4	17
Area 3	437	48	263	170	320
Area 4	105	53	53	10	1240
Area 5	10	0	0	0	0
Area 6	25	7	24	19	0
TOTAL Assigned Points	**605**	**117**	**430**	**205**	**1577**
25% SPARES	152	30	108	52	NA
TOTAL points including spares	**757**	**147**	**538**	**257**	**1577**

Except for specific areas, all control resides in the PCS. Three PLCs are included for control of packaged systems. The PLCs communicated to the PCS using EtherNetIP Ethernet protocol. The PLCs are:

- Biomass Burner Management System
- Combustors Burner Management System
- Dryer Burner Burner Management System

Motor control is via ControlNet networks to the MCCs. Motor Management Relays are monitored in the PCS via a RS485 network. There is no connection to any plant wide or business network.

Each of the two reactors will have multiple temperature sensors for monitoring the gas to liquid conversion. The number of temperature sensors will be 1000 (500 for each stage). Generally, 1-3% of the reformer tubes are instrumented with a temperature sensor every two feet. During the study, it was assumed that 100 tubes in each reformer will be instrumented. Each tube will have five sensors, for a total of 500 temperature sensors for each reformer. For the estimate the number of sensors was set to 128 tubes with 5 sensors, a total of 640 sensors for each reformer. To accommodate the high number of measurements, ProfiBus temperature modules are being used. Modules are 32 thermocouple input units, so sensors for six reactor tubes are wired to each module. Twenty-one modules are included for each reactor. Modules are divided into multiple ProfiBus networks for communications redundancy. Other high density temperature measurements will also use multiplexors. The PCS will have six ProfiBus communication gateways.

PCS pricing includes hardware, software, system design, system configuration, and Factory Acceptance Test. Three CCTV systems are included in the project. Four cameras are included for the Biomass Receiving Area CCTV system. Four cameras are included for the Biomass Drying

Area CCTV system. Four cameras are included for the Reformer Area CCTV system. Each system will have its own monitor, recorder, and controller. Systems will be installed in the control room.

Basic furniture for mounting of PCS operator stations is included. ImageVision AgileVIEW consoles have been included. Pricing includes four 48-inch, double tier consoles for the four operator stations, one 48-inch 2-tier console for the CCTV monitors, two tables for printers and work area and one 48 inch single tier console for the engineering workstation.

Field instruments, where possible, will be HART compatible. Analog signals will be 4-20 mADC. Discrete signals (switches and solenoids) will be 24 VDC. Vendor furnished instruments are included only where indicated. Field instruments are generally wired to the PCS I/O. Multiplexed thermocouples will use a ProfiBus network. Only instruments included in the Instrument List are included in the project.

5.10. Mechanical

Appendix D contains the site plan and design layout drawings.

Appendix E contains the Piping Specification, Piping Service Index and Tie-In List.

5.10.1. **Piping**

Piping take-offs were derived from equipment layout drawings and 3-D model developed during this study. The take-offs utilized line sizing shown on the P&ID's. The Piping Service index indicates the piping type and material needed for the various services.

5.10.2. **Heating, Ventilation and Air Conditioning**

Air conditioning in the form of roof-top DX systems will be provided for the rooms designated as temperature sensitive areas. These areas include the Reformer Building MCC Electrical Room, Fuel Prep Building MCC Room, Reformer Control Room, Reformer Lab and Conference Rooms.

The buildings that are fully enclosed in the scope will be ventilated with sidewall fans and heated with steam unit heaters at multiple locations throughout each building. These buildings include the Reformer Building and Compressor Building.

5.10.3. **Fire Protection**

The fire protection plan is consistant with the recommendations from the Factory Mutual Global requirements outlined in the report (see Appendix K for the FM Global Report) with the exception of the Fischer-Tropsch Island which requires further discussion with FM Global in the next phase of the project.

Fire protection water will be supplied from tie-ins to the existing fire loop.

The Fuel Prep Building bolt conveyors will have automatic sprinkler systems.

The Biomass Dryer will include a spark detection and water deluge system, provided by the vendor.

MCC's will be provided with smoke detection and alarm systems.

5.11. Structural

The following is a structural scope for project independence in terms of the structural steel, concrete, foundations and architectural components of the project. See Appendix H for structural design documents related to the project.

5.11.1. **Area 155-01 Biomass Receiving**

Two Truck Scales are required for the area – one new track scale and one existing truck scale relocated adjacent to the new truck scale. The truck scales along with a modular scale house will be founded on silo bearing mat foundations. It is assumed that the new and relocated existing truck scales are similar in type.

One new Truck Dumper along with space allocated for a future Truck Dumper (but not provided with this phase) is included. The truck dumper foundation will be soil bearing concrete mat approximately 18 feet x 100 feet with an additional mat for the enclosure of the hydraulic unit – approximately 18 feet x 18 feet. A retaining head wall and tail wall is required at each and for the elevated truck dumper. The head wall is approximately 80 feet long by 12 feet high and the tail wall is approximately 50 feet long by 16 feet high.

The reclaim area consists of a Reclaimer foundation with retaining wall and tunnel for the reclaim conveyor. The reclaimer foundation approximately 25 feet x 55 feet will partially be founded on a soil bearing concrete mat and spanning partially above the reclaim tunnel. The reclaim tunnel with the inside clear dimensions of 13 feet wide by 9 feet high will be located just below grade level at the reclamier and slope upward to grade over distance of approximately 110 feet. A retaining wall approximately 110 feet long by 22 feet high above grade for retaining material is required at the reclaimer. Soil bearing foundations will be required for support of the reclaim belt conveyor that spans approximately 150 feet from the exit of the tunnel to the transfer tower adjacent to the Biomass Process Building. A structural steel framed enclosure with metal siding and roofing and a monorail is required for the reclaimer hydraulic equipment. This structure is approximately 22 feet by 22 feet with a 12 feet eave height.

The Biomass Process Building along with the reclaim conveyor transfer tower, combined with this structure, houses equipment for processing the raw material. Two hogs and a screen along with two vibrating conveyors and several other conveyors with related chutework are included with in the building. A dust collection system is required with the dust collector and fan located adjacent to the building. The building portion for the hogs and screen area is approximately 120 feet by 35 feet by 50 feet eave height with one 5 ton monorail spanning the length of the building. There is an elevated stepped platform for access around the hogs, screen, and transfer conveyors for this part of the building. The transfer tower with stairs to each platform level is approximately 41 feet by 25 feet by 72 feet eave height and has five levels of platforms and support framing for the reclaim conveyor head shaft, diverter gates, vibrating conveyors, and related chutework. Sections of these levels extend over into the hogs area. This structure is a conventional steel braced frame structure enclosed with grits for metal siding and purlins for a metal roof. An electrical room approximately 28 feet by 25 feet with a ceiling height of 12 feet is located within this building. The electrical room is encloused with concrete masonry walls and has a concrete roof on an steel supported metal deck. All structures and equipment will be founded on soil bearing spread footings or mat foundations. Both hogs and the screen will be supported on isolated concrete pedestals with dynamic analysis preformed on these structures. Conveyors near floor level with in the building will be supported from isolated spread footing or thickened slabs at the ground floor level.

5.11.2. **Area 155-02 Biomass Dryer**

The Dryer Feed Bin located adjacent to the Dryer is a steel bin approximately 20 feet in diameter by 30 feet high that stores material for the biomass process building. Bottom of the bin is assumed to be above grade level for an inclined conveyor to feed the Dryer. Material is transported to the bin by a belt conveyor approximately 285 feet long from the process building. The bin and conveyor support bents (provided by conveyor vendor) are supported on either a soil bearing mat foundation or isolated spread footings.

The Biomass Dryer is a rotary drum dryer system consisting of several major pieces of equipment requiring foundations. All foundations are soil bearing mat foundations. This equipment is located outside except for the Burner which requires an enclosure. This enclosure is a single level structural steel braced frame structure approximately 28 feet long by 29 feet wide by 15 feet high with metal siding and roofing. All other structural steel required for support of equipment and access platforms is provided by the equipment supplier. The enclosure as well as the Burner and related equipment are supported on a concrete mat with a footprint approximately 30 feet by 64 feet. The Rotary Drum is supported on a concrete mat foundation with one 22 feet high concrete pedestal and another 25 feet high for support of the drum trunnions. The mat footprint is

approximately 33 feet by 65 feet. Another concrete mat will provide support for the Hopper, Multi-clones and ID Fan combined for a footprint approximately 24 feet by 96 feet. The ID Fan with a 700 HP motor is supported on a concrete pier approximately five feet high from the top of the mat at grade. Smaller individual concrete piers are provided for support of the equipment support steel near grade level. The RTO unit is supported from a concrete mat foundation with top of mat near grade level. The mat footprint is approximately 36 feet by 59 feet and has a concrete pedestal approximately five feet high for the fan with a 1000 HP motor. Dynamic analysis will be performed on each of the fan foundations.

A Fire Dump containment area is provided approximately 11 feet by 11 feet on a concrete mat with concrete walls approximately nine feet high on three sides. Recycle gas duct supports will be founded on isolated spread footing foundations in this area.

The Dry Silo is an elevated steel silo approximately 35 feet in diameter by 72 feet high that stores material from the dryer. Bottom of the silo is elevated approximately 11 feet above grade. Material is transported to the silo from the dryer by a pneumatic system (system No. 1). The material is reclaimed and transported to the reformer building by another pneumatic system (system No. 2). The silo is supported on a soil bearing mat foundation along with the pneumatic systems for this area. A load bearing masonry wall structure with membrane roof approximately 16 feet by 10 feet by 14 feet high is required for the blower for pneumatic system No. 1. This structure is supported on a soil bearing foundation and slab. Pneumatic system No. 2 blower is assumed to be housed under the dry silo. Pneumatic piping (approximately 200 feet) for both systems in this area will be supported on isolated foundations. Also located in the area is the dust collection system for the dry material. Vendor supplied bag house support steel (approximate footprint 7 feet by 7 feet) and blower skid (approximate footprint 5 feet by 4 feet) will be founded on soil bearing foundations

5.11.3. **Reformer**

The Reformer Building is a combination of an enclosed and open structure with a two level masonry wall structure located within the building structural steel perimeter. The structure is a structural steel braced frame with steel girts and purlins for metal siding and roofing for the enclosed area. The enclosed area geometry is [redacted] with an equipment penthouse for the Reformer and other equipment approximately [redacted]. Two other penthouses are required for stair access to the roof level. On the east side of the enclosed building the structure is extended for [redacted]. The area is open but has either a steel or concrete roof at the [redacted] with equipment supported at this level.

On the northeast corner of the enclosed building the structure is extended for [redacted] The area is enclosed. On the northwest corner of the enclosed building the structure is extended for [redacted]. On the south side of the enclosed building the structure is extended for [redacted] which includes the electrical room at the ground floor level and control room and conference room at the elevated level. Overall, there are seven process levels serviced by two stairwells enclosed with fireproof metal panels. This building houses the reformer and related equipment. Foundations for the building columns are soil bearing combined or isolated spread footing as well as some equipment foundations. However, the reformer and carbon trim cell located in the enclosed area are isolated from all other foundations and are supported on caissons. A dynamic analysis will be performed on each of these caisson supported foundations. Miscellaneous equipment foundations may be founded on thickened slabs at the ground floor level. The concrete ground floor consists of approximately 260 lineal feet of u-drains routed to a sump. The foundation footprint for the structure is roughly 140 feet by 105 feet. Additional isolated soil bearing equipment foundations are located around the perimeter of the structure for support of one package boiler (approximately 24 feet by 20 feet), the diesel generator (approximately 20 feet by 11 feet) and for the four curbed transformers (two locations with approximate area 30 feet by 20 feet each).

The Oxygen Plant located near the Reformer building is an area of equipment operated by a third party supplier. All structures and enclosures including electrical rooms required for this equipment support will be furnished by the equipment supplier. Foundations for this equipment and structures are assumed to be a soil bearing concrete mat. This area is approximately 90 feet by 180 feet with approximately 290 lineal feet of u-drains routed to a sump.

5.11.4. **Gas to Liquids**

The Gas to Liquids (GTL) is a completely open structural steel braced frame structure. The building footprint is approximately 45 feet by 53 feet. A stair tower attaches to the southeast corner of the structure for access to all floor levels. The structure built around four reactors and an ammonia scrubber supported at ground level houses equipment related to the reactors and scrubber. There are two main grated process levels above ground floor level with the upper level stepped at elevations approximately 30 feet and 34 feet above ground floor. The lower level is approximately 20 feet above ground floor. One 11 feet by 13 feet bay adjacent to the stair tower extends up to an elevation approximately 54 feet high above ground floor for access requirements for the ammonia scrubber. The building column foundations as well as the reactor and scrubber

foundations will be supported from isolated soil bearing footing. The ground floor slab with a thickened slab may be used for support of miscellaneous equipment.

[redacted]

The Syngas Compressor Building located in the GTL area is a pre-engineered metal building that houses the syngas compressor and related equipment. The building (approximately 60 feet by 60 feet by 25 feet eave height) will be vendor supplied with removable roof sections along the ridge line of the building. Building column foundations will be supported from soil bearing isolated footings as well as the syngas compressor equipment and pumps where required. The syngas compressor foundation will require a dynamic analysis for the 3550 HP motor required for the syngas compressor. The ground floor slab with a thickened slab will be used for support of miscellaneous equipment. The concrete ground floor contains approximately 165 lineal feet of u-drain. A steel frame from the ground floor level is required for equipment support within the building. This frame is approximately 19 feet by 5 feet by 18 feet high for support of three intercoolers / aftercoolers with approximately 200 square feet of miscellaneous platforms with access by ladders.

5.11.5. **Product Storage**

The Product Storage Area consists of three vertical storage tanks, [redacted]

Containment walls will be a maximum 3 feet in height and bear on continuous soil-bearing foundations. Three pumps and a sump will be located within the containment area inside an enclosed structural steel structure. The enclosure will be approximately 18 feet by 13 feet around the pumps with an extension approximately 17 feet by 11 feet around the sump. The enclosure will be approximately 10 feet high which will support a monorail over the pumps. Stationary stairs on each side of the wall with a landing located at the top of the wall will provide access into and out of the containment area. The three storage tanks will be founded on soil-bearing mat foundations.

The Truck Loading and the Rail Car Loading stations will be provided with soil bearing foundations for the loading arm equipment and platforms. This area is approximately 22 feet by 8 feet for each

station. The truck loading station will also be provided with a concrete loading area approximately 82 feet by 13 feet.

5.11.6. **Balance of Plant**

A field erected one cell Cooling Tower will be supported from a soil bearing concrete basin. The footprint of the basin is approximately 34 feet by 40 feet with 2 feet high walls. Two pumps founded on a soil bearing foundation will be located adjacent to the cooling tower basin.

Utility Bridges will be provided to route piping and electrical tray and cables between major areas including routing to and thru existing structures as noted below. These structures are steel braced frames approximately 10 feet wide by high elevation noted below:

- One level 17 feet above grade approximately 370 lineal feet
- Two levels 21 feet above grade approximately 230 lineal feet
- Three levels 24 feet above grade approximately 225 lineal feet
- Three levels 27 feet above grade approximately 350 lineal feet
- Two levels 27 feet above grade approximately 560 lineal feet
- One level approximately 100 lineal feet inside the existing Power Boiler building.

Structural steel towers and bents for the utility bridges will be founded on soil bearing foundations.

5.12. Civil Work

See Appendix I for Civil Drawings related to the project.

5.12.1. **Traffic, Paving and Fencing**

The traffic flow on existing roads will be changed to the following:

- Brown Street will be one way to the east between 5th Avenue and 4th Avenue;
- 4th Avenue will be one way to the north between Brown Street and Wilson Street;
- Wilson Street will be one way to the west between 4th Avenue and 5th Avenue.

Brown Street will be widened on both sides to allow three lanes of traffic:

- One lane for the scale relocated from the existing scale area to the north of the site;
- One lane for the new scale;
- One lane for a bypass.

The paving along 4th Avenue and Wilson Street will remain unchanged. A concrete paved entrance and concrete ramp to the new truck dumper will be installed at the northwest corner of the project site. Room is designated for a future truck dumper adjacent to the new truck dumper. A new concrete road will provide access for biomass delivery trucks to access the biomass storage area, for product tanker truck loadout and for maintenance vehicles to access the project site. This road will access the site from 4th Avenue. The existing fence which crosses the site will be relocated, and new fence will be installed to secure the project site.

5.12.2. **Railroad Work**

A section of existing rail spur will be removed at the entrance to the new truck dumper. The balance of the existing spur shall be left in place to provide loadout station for the product into rail tanker cars. The existing rail bumping post at the north end of the spur shall be relocated to this section of existing spur. Containment will be provided at the product loadout station. A new rail grade crossing will be installed at the new site access road. The existing grade crossing at Brown Street will be lengthened to accommodate the road widening.

5.12.3. **Erosion Control**

Existing ditches and all areas where storm water can exit site by sheet flow will be protected from fugitive silt by means of silt fence. Inlet control shall be installed at existing storm culverts inlets to prevent silt from entering pipes. Check dams will be installed in existing and new ditches as necessary to prevent erosion from increased velocities. Temporary and permanent seeding will be done as required by law. Erosion and sedimentation control measures will be implemented in accordance with local, state and federal regulations, as appropriate.

5.12.4. **Grading and Drainage**

The storm water drainage in open equipment areas will be routed to a sump by sheet flow. If the water is contaminated, it will be disposed of in accordance with government regulations or recycled. If the water is clean, it will be routed to a drainage ditch. Where storm water is not being contained, the drainage will be routed to swales and ditches by overland sheet flow or new storm sewer.

5.12.5. **Underground Fire Protection**

A new fire loop will be installed around the new biomass facility, which will be fed from the existing Fiber and Energy fire system. Hydrants with shutoff valves, sectional valves and post indicator sectional valves shall be provided. The hydrant spacing shall be approximately 300 feet. Post indicator valves will also be provided at each sprinkler feed line. Underground piping and

appurtenances will be installed per FM Global Datasheet 3-10, Installation/Maintenance of Private Fire Service Mains and Their Appurtenances.

5.12.6. **Other Underground Utilities**

A sanitary sewer shall be installed to collect the sanitary effluent. A sanitary lift station and force main will be installed. The force main will tie into an existing force main in 5th Avenue, south of the project site. A storm sewer will be installed to drain the interior areas of the new facility. A short section of an existing gas line near the proposed scales may need relocation. Process sewer will be routed to the treatment facility.

6. MISCELLANEOUS DESIGN ITEMS

The following items were part of the design basis for the study.

6.1. Process Hazard Analysis

A preliminary process hazard analysis (PPHA) was conducted on August 17 h through August 19th 2009 at NewPage for the Biomass Gasification and Gas to Liquids Process Systems. See Appendix L for the issued preliminary report.

The purpose of this PPHA was to identify potential incidents and process hazards by following the guidelines in the Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) regulation 29 CFR 1910.119 sections (e) and Appendix C (4) for Hazard Analysis. Wisconsin Rapids F&E Operations, Engineering and Management personnel and NewPage's insurance underwriter participated in the review, held at the Wisconsin Rapids Mill.

A subsequent PPHA was held at FM Global's offices in December 2012 to review the TSI Dryer and BTEX removal system

6.2. Air Emissions Control

AECOM was retained by Project Independence to apply for an air permit for the new processes associated with Project Independence

Emission controls will be designed to meet probable BACT requirements (Best Available Control Technology) which may be required by the Wisconsin Department of Natural Resources. BACT controls take into account technologies that have been successfully used for similar sources, and will consider capital and operating costs. An economic analysis was not done as part of this study.

Another permitting goal is to stay below the PSD (Prevention of Significant Deterioration) thresholds to avoid lengthy permitting. The pollutants of interest and thresholds for avoiding PSD are:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

Vents for the biomass bins, dry silo, media silo, flue gas stack and ash silo will have baghouses for particulate control. The HFTL, MFTL and LFTL storage tank vents will be routed to the auxiliary boiler or the flare for control of VOC emissions, with 98% removal. The flare will also be sized to burn syngas during startup conditions.

The biomass preparation (screening, shredding, and metal removal) will be in an enclosed building and incorporate a dust collector baghouse. Ash will be wet before loading into trucks to eliminate emissions from loadout. The emergency power generator will be specified to meet EPA Tier 3 emission levels.

7. PROJECT SCHEDULE

See Schedule Attached Appendix O.

The project schedule is based on a limited notice to proceed on June 1, 2012, estimated delivery lead times given by vendors for the larger equipment, engineering man-hour estimate and estimated construction durations.

8. ESTIMATE

8.1. Basis of Estimate

The cost estimate is based on the scope details, general arrangements and layouts, P&ID's, bills of material, specifications and quantity takeoffs utilizing historical "in-house" information, vendor and supplier information, and information from reliable published sources. All pricing is current as of the date of estimate issue.

AMEC has included equipment and contractor procurement services

The cost estimate details are presented in the Appendix A.

Assumptions. In developing the estimate, AMEC assumes that the project will be constructed by multiple contractors familiar with the specific crafts involved. Contracts will be awarded on a lump sum basis. Each contractor will be responsible for his own field engineering, material procurement, and construction. Labor rates are based on current schedules in the area, and built up including the payroll burdens, fringe benefits, overtime and per diems, as well as the field indirects and overhead and profit. We have assumed the project will be constructed on a 50 hour/week schedule with additional allowance for spot overtime.

8.2. Direct Costs

Prices for the main process systems and equipment are from vendor proposals prepared from written specifications and /or inquires. Other equipment prices are based on budget quotations and current in-house price information.

Pricing for the steam reformer package is based on a firm quotation from TRI. Components of the TRI supplied system are marked in the equipment list.

Building costs are based on the preliminary general arrangement drawings and the building material descriptions and schedule of quantities included in the estimate.

Civil costs are based on the site plan, AMEC construction specifications, and schedule of quantities included in the estimate.

Piping metallurgy for all process systems follows accepted industry standards. Piping costs are based on quantities derived from representative pipe routing for diameter 3" and above, and from the general arrangement and P&ID's. Major pipe and valve quantities are listed in the estimate. An allowance is included for piping specialty items such as traps, vents, special hangers, etc.

Instrumentation costs are based on vendor quotations and in-house information. The scope of work was defined by the instrument list included in the report and which was developed by P&ID's.

Electrical costs are based on the description of the electrical power supply and distribution facilities and the single line diagram. Electrical motor control center and wiring costs are related to the individual motors identified in the equipment lists. The prefabricated control room and associated electrical equipment is based on a vendor quotation.

Manufacturer's Assistance. Funds are included as part of the equipment cost for having specialist erection supervision on site to oversee the installation of specific equipment. This cost includes labor costs, living expenses, and travel.

Freight. Freight is included with the equipment costs.

8.3. Indirect Costs

Taxes and Duties. Sales tax of 6.5% are included on materials. No sales tax is included on equipment.

Engineering costs. Design Engineering costs are based on a man-hour estimate to complete the detailed engineering. Project management, purchasing and document control are included.

Construction Management Construction Management will have responsibility for the entire project delivery. They will develop, plan, and execute the schedule, Work Package Scopes (WPS), engineering deliverables, the procurement process, the commissioning, the training and the Project closeout.

The Construction management costs are derived from a man loaded schedule to completely manage the project from Notice To Proceed (NTP) to end of Commissioning, ready for verification. Functions included are site management, schedule development and compliance, engineering management, equipment procurement, equipment expediting/receiving, contractor procurement, Project cost control, assist the owner with Department of Energy (DOE) documentation, commissioning, training of Owner's employees, and document turnover at completion.

Contingency. A contingency allowance of is added to the estimate based upon experience, judgment, and the extent of engineering work and equipment pricing employed in the preparation of this estimate. This sum is added to cover additional cost which may develop during detailed engineering and construction, such as:

- Local conditions, but not extended strikes
- Minor changes in equipment specifications and pricing

- Minor changes in construction that are agreed to be within the scope of the estimate
- Items of work unaccounted for or not determinable at the time of the estimate.
- Consideration has been given to the TRI firm price quotation.

Normally, contingency funds are expected to be used. Contingency does not pertain to escalation or major unanticipated costs. It does not cover significant increases in project costs due to changes in scope.

Escalation. The estimated annual escalation rate is estimated to be 3.0% applied at the mean spending month as calculated from the project schedule included in this report. The source used is the Chemical Engineering Plant Cost Index.

8.4. Items Not Included

To further define the scope of the estimate, the items not included are listed below:

- Financing costs or capitalized interest costs
- Land purchase
- Legal costs
- Working capital and pre-operating expenses
- Financial instruments or derivatives for exchange rate hedging
- Utility lines beyond the property line
- Bonding or other specific insurances, except as specified
- Governmental changes in statutory conditions after estimate submittal
- Offsite disposal of waste chemicals, oils or hazardous material
- Additional pilot plant fees
- Spare Parts
- Commissioning and startup plant operators
- Owner's personnel salary and living expenses

Spreadsheet Level	Labor Amount (USD)	Material Amount (USD)	Sub Amount (USD)	Process Equipment Amount (USD)	Total Amount (USD)
01-Biomass Receiving and Wet Storage	3,497,066	3,206,440	225,197	3,273,818	10,202,521
02-Biomass Dryer & Dry Storage	4,114,576	2,734,555	11,431	7,116,497	13,977,059
03-Reformer	[redacted]				
04-Gas to Liquids					
05-Product Storage	678,878	476,655	36,660	573,901	1,766,094
06-Balance of Plant	7,010,241	7,695,234	2,452,319	6,836,156	23,993,951

Estimate Totals

Description	Amount	Totals	Hours
Labor	28,628,483		301,811 hrs
Material	27,733,967		
Subcontract	3,217,158		
Equipment	[redacted]		
SALES TAX - MATERIALS	1,135,644		
ENGINEERING	8,000,000		
ENGINEERING-VENDOR	969,900		
CONSTRUCTION MGMT	9,000,000		
MARKUP-CONSTR CONTRACTS	5,470,587		
MARKUP - EQUIPMENT PROCUREMENT	7,260,910		
CONTINGENCY [redacted]			
ESCALATION			
Total	[redacted]		

Project name	Project Independence FEL3
Labor rate table	Project Independence
Report format	Sorted by 'Area/Structure/Breakdown/Activity' 'Detail' summary Allocate addons

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
01-Biomass Receiving and Wet Storage												
010-Equipment												
01005												
unassigned												
BIOMASS HANDLING SYSTEM" Updated 1/3/12	1.00 ea							-	-	-	-	
Truck scale, biomass and log trucks, incl. accessories	1.00 ea	230.000	230.00	102.09	23,481			-	-	62,000.00	62,000	85,481
Truck scale, log trucks	1.00 ea	180.000	180.00	102.09	18,377			-	-	-	-	18,377
Truck scale, log trucks	1.00 ea							-	-	-	-	
Truck dumper, hydraulic, back-on type, c/w. discharge chute	1.00 ea	450.000	450.00	102.09	45,941			-	-	298,000.00	298,000	343,941
Motor No.1, hydr. Unit	1.00 ea							-	-	-	-	
Motor No.2, hydr. Unit	1.00 ea							-	-	-	-	
Motor, hydraulic unit cooling fan	1.00 ea							-	-	-	-	
Mobile loader	1.00 ea							-	-	-	-	
Biomass reclaimer, hydraulic stoker type	1.00 ea	540.000	540.00	102.09	55,130			-	-	311,000.00	311,000	366,130
Motor No.1, hydr.system	1.00 ea							-	-	-	-	
Motor No.2, hydr.system	1.00 ea							-	-	-	-	
Motor No.3, hydr.system	1.00 ea							-	-	-	-	
Motor No.4, hydr.system	1.00 ea							-	-	-	-	
Motor, hydraulic unit cooling fan No.1	1.00 ea							-	-	-	-	
Motor, hydraulic unit cooling fan No.2	1.00 ea							-	-	-	-	
Spiked roll	1.00 ea	35.000	35.00	102.09	3,573			-	-	23,500.00	23,500	27,073
Motor, spiked roll	1.00 ea							-	-	-	-	
Concrete floor, retaining wall and reclaim pit, hydraulic room	1.00 ea							-	-	-	-	
Conveyor C-1 to hog	1.00 ea	560.000	560.00	102.09	57,172			-	-	300,000.00	300,000	357,172
Motor, conveyor C-1 to hog	1.00 ea							-	-	-	-	
Tramp iron magnet, self-cleaning, conveyor C-1	1.00 ea	100.000	100.00	102.09	10,209			-	-	75,000.00	75,000	85,209
Motor, tramp iron magnet	1.00 ea							-	-	-	-	
Belt scale, conveyor C-1, incl. instrumentation	1.00 ea	30.000	30.00	102.09	3,063			-	-	15,000.00	15,000	18,063
Metal detector, conveyor C-1	1.00 ea	20.000	20.00	102.09	2,042			-	-	25,000.00	25,000	27,042
Bypass/Splitter gate	1.00 ea	20.000	20.00	102.09	2,042			-	-	25,000.00	25,000	27,042
Motor, bypass gate	1.00 ea							-	-	-	-	
Feed chute to conveyor C-2A and C-2B	1.00 ea	20.000	20.00	102.09	2,042			-	-	25,000.00	25,000	27,042
Conveyor C-2A, vibrating, with screen section	1.00 ea	100.000	100.00	102.09	10,209			-	-	102,950.00	102,950	113,159
Motor, Conveyor C-2A to prim. hog	1.00 ea							-	-	-	-	
Conveyor C-2B, vibrating, with screen section	1.00 ea	100.000	100.00	102.09	10,209			-	-	102,950.00	102,950	113,159
Motor, Conveyor C-2B to prim. hog	1.00 ea							-	-	-	-	
Primary Hog No. 1	1.00 ea	190.000	190.00	102.09	19,398	49,643.72	49,644	-	-	263,750.00	263,750	332,791
Motor No.1, primary hog No. 1	1.00 ea							-	-	-	-	
Motor No.2, primary hog No. 1	1.00 ea							-	-	-	-	
Motor, hydraulic system No. 1	1.00 ea							-	-	-	-	
Belt drive incl. guard No. 1	1.00 ea							-	-	-	-	
Motor base No. 1	1.00 ea							-	-	-	-	
Hog feed chute No. 1	1.00 ea	20.000	20.00	102.09	2,042			-	-	15,000.00	15,000	17,042
Primary Hog No. 2	1.00 ea	190.000	190.00	102.09	19,397			-	-	263,750.00	263,750	283,147
Motor No.1, primary hog No. 2	1.00 ea							-	-	-	-	
Motor No.2, primary hog No. 2	1.00 ea							-	-	-	-	
Motor, hydraulic system No. 2	1.00 ea							-	-	-	-	
Belt drive incl. guard No. 2	1.00 ea							-	-	-	-	
Motor base No. 2	1.00 ea							-	-	-	-	
Hog feed chute No. 2	1.00 ea	20.000	20.00	102.09	2,042			-	-	15,000.00	15,000	17,042

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Conveyor C-3, to primary screen	1.00 ea	325.000	325.00	102.09	33,180			-	-	190,000.00	190,000	223,180
Motor, Conveyor C-3 to screen	1.00 ea							-	-	-	-	
Primary screen	1.00 ea	365.000	365.00	102.09	37,264			-	-	181,500.00	181,500	218,764
Motor, primary screen	1.00 ea							-	-	-	-	
Conveyor C-5, overs to C-6	1.00 ea	32.000	32.00	102.09	3,267			-	-	50,000.00	50,000	53,267
Motor, Conveyor C-5	1.00 ea							-	-	-	-	
Conveyor C-6	1.00 ea	310.000	310.00	102.09	31,649			-	-	160,000.00	160,000	191,649
Motor, conveyor C-6	1.00 ea							-	-	-	-	
Conveyor C-6A, to Primary hogs	1.00 ea	150.000	150.00	102.09	15,314			-	-	73,000.00	73,000	88,314
Motor, conveyor C-6A	1.00 ea							-	-	-	-	
Slide Gate	1.00 ea							-	-	-	-	
Motor - Slide Gate Actuator	1.00 ea							-	-	-	-	
Dust collection system, biomass processing building	1.00 ea	200.000	200.00	102.09	20,418			-	-	95,000.00	95,000	115,418
Blower	1.00 ea							-	-	-	-	
Motor, pull blower	1.00 ea							-	-	-	-	
Airlock Feeder	1.00 ea							-	-	-	-	
Motor, airlock feeder	1.00 ea							-	-	-	-	
Conveyor C-10, to Dryer Feed Bin	1.00 ea	540.000	540.00	102.09	55,130			-	-	285,000.00	285,000	340,130
Motor, conveyor C-10	1.00 ea							-	-	-	-	
Magnet - Permanent	1.00 ea	30.000	30.00	102.09	3,063			-	-	20,000.00	20,000	23,063
10-ton Roof Top Air Conditioning Unit for Fuel Prep. MCC Room, RTU-1	1.00 ea					-	-	-	-	10,000.00	10,000	10,000
Motor, RTU-1	1.00 ea							-	-	1,100.00	1,100	1,100
Fuel Prep. Building - Sidewall Ventilation Fan, F-1	1.00 ea	10.000	10.00	102.09	1,021			-	-	5,500.00	5,500	6,521
Motor, F-1	1.00 ea							-	-	0.00	0	
Fuel Prep. Building - Sidewall Ventilation Fan, F-2	1.00 ea	10.000	10.00	102.09	1,021			-	-	5,500.00	5,500	6,521
Motor, F-2	1.00 ea							-	-	0.00	0	
Fuel Prep. Building - Sidewall Ventilation Fan, F-3	1.00 ea	10.000	10.00	102.09	1,021			-	-	5,500.00	5,500	6,521
Motor, F-3	1.00 ea							-	-	0.00	0	
Fuel Prep. Building - Sidewall Ventilation Fan, F-4	1.00 ea	10.000	10.00	102.09	1,021			-	-	5,500.00	5,500	6,521
Motor, F-4	1.00 ea							-	-	0.00	0	
Fuel Prep. Building - Steam Unit Heater, UH-1	1.00 ea	16.000	16.00	102.09	1,633			-	-	2,000.00	2,000	3,633
Motor, UH-1	1.00 ea							-	-	-	-	
Fuel Prep. Building - Steam Unit Heater, UH-2	1.00 ea	16.000	16.00	102.09	1,633			-	-	2,000.00	2,000	3,633
Motor, UH-2	1.00 ea							-	-	-	-	
Fuel Prep. Building - Steam Unit Heater, UH-3	1.00 ea	16.000	16.00	102.09	1,633			-	-	2,000.00	2,000	3,633
Motor, UH-3	1.00 ea							-	-	-	-	
Fuel Prep. Building - Steam Unit Heater, UH-4	1.00 ea	16.000	16.00	102.09	1,633			-	-	2,000.00	2,000	3,633
Motor, UH-4	1.00 ea							-	-	-	-	
** unassigned **			*4,861.00*		*496,269*		*49,644*				*3,018,500*	*3,564,413*
01005			*4,861.00*		*496,269*		*49,644*				*3,018,500*	*3,564,413*
010-Equipment			**4,861.00**		**496,269**		**49,644**				**3,018,500**	**3,564,413**
020-Structural												
Buildings												
Fuel Prep Bldg												
Structural Steel - Heavy (60 to 100 #/lf)	3.20 tn	14.000	44.80	125.37	5,616	4,335.77	13,874	-	-	-	-	19,491
Structural Steel - Average (41 to 60 #/lf)	41.30 tn	20.000	826.00	125.37	103,553	4,967.60	205,162	-	-	-	-	308,715
Structural Steel - Light (21 to 40 #/lf)	41.00 tn	24.000	984.00	125.37	123,361	4,967.60	203,672	-	-	-	-	327,032
Structural Steel-Extra Light (0 to 20 #/lf)	29.20 tn	40.000	1,168.00	125.37	146,428	6,302.18	184,024			-	-	330,452

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Fuel Prep Bldg												
Structural Steel-Extra Light (0 to 20 #/lf)	57.80 tn	40.000	2,312.00	125.37	289,848	6,302.18	364,266			-	-	654,113
Concrete Building Foundations & Columns	127.00 CY	7.080	899.16	103.67	93,217	1,070.24	135,921	-	-	-	-	229,138
Grade Slab W/Turndown	262.80 CY	2.700	709.56	103.67	73,561	415.85	109,285	-	-	-	-	182,846
Stair Pads	1.32 CY	8.200	10.82	103.67	1,122	715.64	945	-	-	-	-	2,067
Handrails - Stairs	219.16 LF	0.200	43.83	103.67	4,544	88.65	19,428	-	-	-	-	23,972
Stairs w/Treads	58.83 VF	4.000	235.31	103.67	24,395	564.13	33,187	-	-	-	-	57,582
Ladders	53.00 LF	0.500	26.50	103.67	2,747	299.80	15,889	-	-	-	-	18,637
S12X35 (Monorail)	0.32 TN	18.000	5.76	103.67	597	6,302.25	2,017	-	-	-	-	2,614
Lighting and Building Services	8,550.00 SF	0.250	2,137.50	95.74	204,647	8.06	68,905	-	-	-	-	273,552
Fire Protection (Allowance)	8,550.00 SF							7.50	64,125	-	-	64,125
Handrail - Alum	721.00 lf	0.250	180.25	125.37	22,597	48.35	34,863	-	-	-	-	57,461
Grating - Galv	9,507.00 sf	0.170	1,616.19	125.37	202,616	22.57	214,529	-	-	-	-	417,145
Stair Treads - Galv	136.00 ea	0.300	40.80	125.37	5,115	96.71	13,152	-	-	-	-	18,267
1.5" Metal Form Deck	700.00 sf	0.050	35.00	125.37	4,388	2.98	2,296	-	-	-	-	6,684
Preformed Metal Siding	21,020.00 sf		-	-	-	-	-	5.20	109,304	-	-	109,304
Preformed Metal Roofing	5,760.00 sf		-	-	-	-	-	4.30	24,768	-	-	24,768
Fuel Prep Bldg			***11,275.49***		***1,308,354***		***1,621,413***		***198,197***			***3,127,964***
Hydraulic Bldg												
Footing	1.96 CY	7.400	14.47	103.67	1,500	465.81	911	-	-	-	-	2,411
Pier	2.31 CY	14.850	34.28	103.67	3,554	573.81	1,325	-	-	-	-	4,879
Wall	8.13 CY	9.150	74.38	103.67	7,711	1,070.25	8,700	-	-	-	-	16,410
Hydraulic Bldg			***123.13***		***12,765***		***10,935***					***23,700***
MCC Architectural												
Elev Slab On Metal Deck	10.10 cy	14.000	141.40	103.67	14,659	265.95	2,686	-	-	-	-	17,345
12" Load Bearing CMU (#5 Bars @ 32" O.G. in Grouted Cell, Foam Insulation, All Non-reiforced Cells)	1,248.00 SF	0.130	162.24	103.67	16,820	4.98	6,216	-	-	-	-	23,035
Paint (Primer and 2 Finish Coats) Each Face	2,496.00 SF					2.11	5,270	-	-	-	-	5,270
1 1/2" Metal Deck (20 ga)	700.00 SF	0.007	4.90	103.67	508	2.10	1,467	-	-	-	-	1,975
Doors/Frame (3' x 7' H.M.)	1.00 EA	12.000	12.00	103.67	1,244	2,417.71	2,418	-	-	-	-	3,662
Pair Doors/Frame (3' x 7' H.M.) w/2' x 6' Removable Transom	1.00 PR	16.000	16.00	103.67	1,659	2,740.08	2,740	-	-	-	-	4,399
Door Hardware	2.00 EA	6.000	12.00	103.67	1,244	644.72	1,289	-	-	-	-	2,534
Lighting/Receptacles (Allowance)	700.00 SF	0.250	175.00	95.74	16,755	8.06	5,641	-	-	-	-	22,396
MCC Architectural			***523.54***		***52,888***		***27,727***					***80,616***
MCC Structural												
W12x26	1.79 TN	18.000	32.18	125.37	4,034	4,967.60	8,880	-	-	-	-	12,913
W8x15	0.87 TN	18.000	15.59	125.37	1,955	6,302.18	5,459	-	-	-	-	7,414
L4x4x5/16	0.19 TN	18.000	3.49	125.37	438	6,302.20	1,222	-	-	-	-	1,660
Grade Slab W/Turndown	75.20 CY	2.700	203.04	103.67	21,049	415.85	31,272	-	-	-	-	52,321
MCC Structural			***254.30***		***27,476***		***46,833***					***74,308***
Buildings			***12,176.46***		***1,401,483***		***1,706,909***		***198,197***			***3,306,589***
Equipment Foundation												
Hog/Shredder grindr												
Foundations	186.01 CY	7.080	1,316.95	103.67	136,530	988.04	183,785	-	-	-	-	320,316
Slab	65.19 CY	2.700	176.00	103.67	18,246	407.79	26,582	-	-	-	-	44,828
Hog/Shredder grindr			***1,492.95***		***154,777***		***210,367***					***365,144***
Primary Screen												
Foundations	64.80 CY	7.080	458.78	103.67	47,563	988.04	64,025	-	-	-	-	111,588
Slab	20.37 CY	2.700	55.00	103.67	5,702	407.79	8,307	-	-	-	-	14,009
Primary Screen:	1.00 ea	12.000	12.00	103.67	1,244	265.94	266	-	-	-	-	1,510

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Primary Screen			*525.78*		*54,509*		*72,598*					*127,107*
Reclaimer												
Mat Foundation	217.67 CY	3.800	827.13	103.67	85,750	352.99	76,833	-	-	-	-	162,584
Turndown	11.89 CY	4.300	51.13	103.67	5,300	407.79	4,849	-	-	-	-	10,149
Reclaimer			*878.26*		*91,051*		*81,682*					*172,733*
Truck Dumper Hydr Un												
Mat Foundation	62.38 CY	3.800	237.06	103.67	24,576	352.99	22,021	-	-	-	-	46,597
Pad	3.30 CY	8.200	27.06	103.67	2,805	1,097.65	3,622	-	-	-	-	6,428
Piers	0.37 CY	14.850	5.45	103.67	564	573.79	210	-	-	-	-	775
Curb	7.09 CY	13.230	93.79	103.67	9,723	528.67	3,748	-	-	-	-	13,471
Door Pad	3.06 CY	8.200	25.06	103.67	2,598	715.65	2,187	-	-	-	-	4,784
Truck Dumper Hydr Un			*388.41*		*40,267*		*31,788*					*72,055*
Equipment Foundation			*3,285.40*		*340,603*		*396,435*					*737,038*
Structures												
Containment-Rock/met												
Slab	20.53 CY	2.700	55.44	103.67	5,748	415.85	8,539	-	-	-	-	14,286
Walls	10.27 CY	9.150	93.94	103.67	9,739	1,070.24	10,988	-	-	-	-	20,727
Containment-Rock/met			*149.38*		*15,486*		*19,527*					*35,013*
Truck Dumper												
Mat Foundation	263.12 CY	3.800	999.86	103.67	103,657	352.99	92,878	-	-	-	-	196,534
Equipment Pedestals (12)	25.74 CY	8.450	217.50	103.67	22,549	1,097.64	28,253	-	-	-	-	50,802
Walls	103.18 CY	9.150	944.10	103.67	97,876	1,070.24	110,428	-	-	-	-	208,304
Containment Curb	4.98 CY	13.230	65.89	103.67	6,831	528.67	2,633	-	-	-	-	9,464
Truck Dumper			*2,227.34*		*230,912*		*234,192*					*465,104*
Truck Scale												
Mat Foundation	300.47 CY	3.800	1,141.79	103.67	118,371	352.99	106,062	-	-	-	-	224,433
Approach Slab	125.69 CY	0.060	7.54	103.67	782	153.36	19,276	-	-	-	-	20,057
Truck Scale			*1,149.33*		*119,153*		*125,338*					*244,491*
Tunnel & Ret Wall												
Mat	269.89 CY	3.800	1,025.58	103.67	106,324	352.99	95,267	-	-	-	-	201,591
Retaining Wall	185.62 CY	8.900	1,652.02	103.67	171,267	941.30	174,724	-	-	-	-	345,991
Tunnel Roof	100.09 CY	5.730	573.52	103.67	59,457	520.61	52,108	-	-	-	-	111,566
Pier	0.65 CY	14.850	9.65	103.67	1,001	573.80	373	-	-	-	-	1,374
Walls	1.96 CY	9.150	17.93	103.67	1,859	1,070.24	2,098	-	-	-	-	3,957
Tunnel & Ret Wall			*3,278.70*		*339,908*		*324,570*					*664,478*
Structures			*6,804.76*		*705,460*		*703,626*					*1,409,086*
020-Structural			**22,266.62**		**2,447,546**		**2,806,969**		**198,197**			**5,452,713**
030-Piping												
Process Piping												
Miscellaneous Small Bore Pipe												
CSSmall bore allowance	1.00 AL	215.000	215.00	107.59	23,131	25,950.15	25,950	-	-	-	-	49,082
Miscellaneous Small Bore Pipe			*215.00*		*23,131*		*25,950*					*49,082*
Process Piping			*215.00*		*23,131*		*25,950*					*49,082*
030-Piping			**215.00**		**23,131**		**25,950**					**49,082**
040-Instrumentation												
DCS/PLC												
** unassigned **												
Project Control System (Proportioned Cost)	1.00 LOT	20.000	20.00	95.74	1,915	0.00	0	-	-	19,131.00	19,131	21,046

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **			*20.00*		*1,915*						*19,131*	*21,046*
DCS/PLC			*20.00*		*1,915*						*19,131*	*21,046*
Instruments												
** unassigned **												
Field Instruments (not vendor supplied)	1.00 LOT	104.000	104.00	95.74	9,957	9,670.88	9,671	-	-	61,183.00	61,183	80,811
** unassigned **			*104.00*		*9,957*		*9,671*				*61,183*	*80,811*
Instruments			*104.00*		*9,957*		*9,671*				*61,183*	*80,811*
Instrument Tubing &												
** unassigned **												
Motor Control-37 ea	1.00 LS	110.450	110.45	95.74	10,575	4,598.50	4,599	-	-	-	-	15,173
120V Power-4 ea	1.00 LS	59.000	59.00	95.74	5,649	3,549.21	3,549	-	-	-	-	9,198
Air Supply, Tubing from Header-1ea	1.00 LS	14.000	14.00	95.74	1,340	1,120.21	1,120	-	-	-	-	2,461
Analog I/O-2 ea	1.00 LS	47.000	47.00	95.74	4,500	2,321.00	2,321	-	-	-	-	6,821
Digital I/O-59 ea	1.00 LS	701.000	701.00	95.74	67,115	36,418.86	36,419	-	-	-	-	103,534
** unassigned **			*931.45*		*89,178*		*48,008*					*137,186*
Instrument Tubing &			*931.45*		*89,178*		*48,008*					*137,186*
040-Instrumentation			**1,055.45**		**101,050**		**57,679**				**80,314**	**239,043**
050-Electrical												
Grounding												
** unassigned **												
1/C #4/0 bare copper grounding conductor - Class B stranding	2,710.00 Lf	0.053	144.44	95.74	13,829	5.83	15,812	-	-	-	-	29,641
Compression Type connection, Copper wire to Copper wire connector	50.00 Ea	1.333	66.65	95.74	6,381	35.43	1,771	-	-	-	-	8,153
Compression type connection, Heavy Duty with single bolt hole for connection to serviit post or Equipment Grounding Bus Bar	20.00 Ea	1.333	26.66	95.74	2,552	35.43	709	-	-	-	-	3,261
Copperclad Steel Ground Rod 3/4" dia. X 10'L., including a compression type connector for grounding conductor.	10.00 Ea	2.190	21.90	95.74	2,097	91.28	913	-	-	-	-	3,010
Compression type connection for grounding conductor to structural reinforcement bar in concrete	13.00 Ea	1.333	17.33	95.74	1,659	35.43	461	-	-	-	-	2,120
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	25.00 Ea	1.120	28.00	95.74	2,681	35.43	886	-	-	-	-	3,566
** unassigned **			*304.98*		*29,199*		*20,551*					*49,751*
Grounding			*304.98*		*29,199*		*20,551*					*49,751*
Heat Tracing												
** unassigned **												
Electric heat tracing	1,000.00 Lf							27.00	27,000	-	-	27,000
** unassigned **									*27,000*			*27,000*
Heat Tracing									*27,000*			*27,000*
Control Equipment												
** unassigned **												
MCC-1	1.00 EA	100.000	100.00	95.74	9,574	8,059.06	8,059	-	-	131,184.00	131,184	148,817
MCC-6	1.00 EA	100.000	100.00	95.74	9,574	8,059.05	8,059	-	-	43,820.00	43,820	61,453
** unassigned **			*200.00*		*19,148*		*16,118*				*175,004*	*210,270*
Control Equipment			*200.00*		*19,148*		*16,118*				*175,004*	*210,270*
Power Wiring												
** unassigned **												
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	600.00 Lf	0.296	177.60	95.74	17,004	23.21	13,926	-	-	-	-	30,930

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
24" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	250.00 Lf	0.276	69.00	95.74	6,606	22.11	5,529	-	-	-	-	12,135
Power Wiring to Equipment	1.00 ls	3,140.000	3,140.00	95.74	300,628	111,214.89	111,215	-	-	-	-	411,843
3/C 500 kcmil copper, 5 kV shielded	6.40 CLF	14.000	89.60	95.74	8,578	6,840.52	43,779	-	-	-	-	52,358
** unassigned **			*3,476.20*		*332,817*		*174,449*					*507,265*
Power Wiring			*3,476.20*		*332,817*		*174,449*					*507,265*
050-Electrical			**3,981.18**		**381,164**		**211,118**		**27,000**		**175,004**	**794,286**
060-Sitework												
Outdoor Lighting												
** unassigned **												
150W HPS structure mounted fixture (Petrolux2)	20.00 EA	8.000	160.00	95.74	15,319	1,071.85	21,437	-	-	-	-	36,756
150W HPS structure mounted fixture (Wallpack)	12.00 EA	6.000	72.00	95.74	6,893	572.19	6,866	-	-	-	-	13,760
400W HPS Mongoose lignt fixture- mounted on wooden pole	2.00 EA	25.500	51.00	95.74	4,883	2,917.38	5,835	-	-	-	-	10,718
UG Conduit/wire	1,610.00 LF	0.135	217.35	95.74	20,809	13.01	20,942	-	-	-	-	41,751
** unassigned **			*500.35*		*47,904*		*55,080*					*102,984*
Outdoor Lighting			*500.35*		*47,904*		*55,080*					*102,984*
060-Sitework			**500.35**		**47,904**		**55,080**					**102,984**
01-Biomass Receiving and Wet Storage			***32,879.60***		***3,497,066***		***3,206,440***		***225,197***		***3,273,818***	***10,202,521***
02-Biomass Dryer & Dry Storage												
010-Equipment												
01005												
** unassigned **												
BIOMASS DRYER SYSTEM	1.00 ea							-	-	-	-	
Dryer, Rotary Drum Biomass" 555 tpd @ 10% moisture	1.00 ea	3,100.000	3,100.00	102.09	316,485	66,084.20	66,084	-	-	3,328,000.00	3,328,000	3,710,570
SNCR Option per Email 2/10/12 from ZO	1.00 ea					-	-	-	-	250,000.00	250,000	250,000
Gear Reducer, Rotary Drum Biomass Dryer	1.00 ea					-	-	-	-	-	-	
Motor, Rotary Drum Biomass Dryer	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency	1.00 ea					-	-	-	-	-	-	
Bin, Inlet Metering Bin" 30 minutes storage	1.00 ea					-	-	-	-	-	-	
Feeder, Metering Bin Screw	1.00 ea					-	-	-	-	-	-	
Motor, Metering Bin Screw Feeder	1.00 ea					-	-	-	-	-	-	
Conveyor, Dryer Feed Conveyor	1.00 ea					-	-	-	-	-	-	
Motor, Dryer Feed Conveyor	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, Dryer Infeed	1.00 ea					-	-	-	-	-	-	
Motor, Dryer Infeed Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Hopper, Dryer Discharge	1.00 ea					-	-	-	-	-	-	
Auger, Discharge Hopper	1.00 ea					-	-	-	-	-	-	
Motor, Discharge Hopper Auger	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, Dryer Discharge	1.00 ea					-	-	-	-	-	-	
Motor, Dryer Discharge Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 1 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 1 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 1 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 2 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 2 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 2 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 3 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 3 Cyclone	1.00 ea					-	-	-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* unassigned *												
Motor, No. 3 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 4 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 4 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 4 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 5 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 5 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 5 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 6 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 6 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 6 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 7 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 7 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 7 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 8 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 8 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 8 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 9 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 9 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 9 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Cyclone, No. 10 High Efficiency	1.00 ea					-	-	-	-	-	-	
Rotary Airlock, No. 10 Cyclone	1.00 ea					-	-	-	-	-	-	
Motor, No. 10 Cyclone Rotary Airlock	1.00 ea					-	-	-	-	-	-	
Fan, Induced Draft	1.00 ea					-	-	-	-	-	-	
Motor, ID Fan	1.00 ea					-	-	-	-	-	-	
Damper, ID Fan Inlet	1.00 ea					-	-	-	-	-	-	
Burner, Tailgas 50 mmbtu/hr	1.00 ea					-	-	-	-	-	-	
Burner, Natural Gas 50 mmbtu/hr	1.00 ea					-	-	-	-	-	-	
Fan, Forced Draft	1.00 ea					-	-	-	-	-	-	
Motor, FD Fan	1.00 ea					-	-	-	-	-	-	
Damper, FD Fan Inlet	1.00 ea					-	-	-	-	-	-	
Damper, Dryer Recycle	1.00 ea					-	-	-	-	-	-	
Damper, Stack	1.00 ea					-	-	-	-	-	-	
Damper, Burner Dilutiion	1.00 ea					-	-	-	-	-	-	
RTO SYSTEM	1.00 ea					-	-	-	-	1,209,600.00	1,209,600	1,209,600
Installatiion Supervisor	1.00 ea					-	-	-	-	35,700.00	35,700	35,700
Mechanical & Electrical Installation	1.00 ea	3,250.000	3,250.00	102.09	331,799	-	-	-	-	0.00	0	331,799
Damper, Isolation	1.00 ea					-	-	-	-	-	-	
Damper, Fresh Air	1.00 ea					-	-	-	-	-	-	
Media Chamber 1A	1.00 ea					-	-	-	-	-	-	
Media Chamber 1B	1.00 ea					-	-	-	-	-	-	
Combustion Chamber, No 1	1.00 ea					-	-	-	-	-	-	
Burner, No. 1 Natural Gas / Tail Gas	1.00 ea					-	-	-	-	-	-	
Fan, No. 1 Combustion Air	1.00 ea					-	-	-	-	-	-	
Motor, No. 1 Combustion Air Fan	1.00 ea					-	-	-	-	-	-	
Switch Valve, No. 1	1.00 ea					-	-	-	-	-	-	
Motor, No. 1 Switch valve Custom Gear Motor	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency No. 1 Combustion Fan	1.00 ea	20.000	20.00	102.09	2,042	-	-	-	-	-	-	2,042
Media Chamber 2A	1.00 ea					-	-	-	-	-	-	
Media Chamber 2B	1.00 ea					-	-	-	-	-	-	
Combustion Chamber, No 2	1.00 ea					-	-	-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* *unassigned* *												
Burner, No. 2 " Natural Gas / Tail Gas"	1.00 ea					-	-	-	-	-	-	
Fan, No. 2 Combustion Air	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency No. 2 Combustion Fan	1.00 ea	20.000	20.00	102.09	2,042	-	-	-	-	-	-	2,042
Motor, No. 2 Combustion Air Fan	1.00 ea					-	-	-	-	-	-	
Switch Valve, No. 2	1.00 ea					-	-	-	-	-	-	
Motor, No. 2 Switch valve" Custom Gear Motor	1.00 ea					-	-	-	-	-	-	
Fan, Induced Draft	1.00 ea					-	-	-	-	-	-	
Motor, ID Fan	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency ID Fan	1.00 ea					-	-	-	-	-	-	
Stack 113 Ft	1.00 ea					-	-	-	-	130,755.00	130,755	130,755
DRY BIOMASS STORAGE" Updated 1/3/12	1.00 ea					-	-	-	-	-	-	
Conveyor C-16, from Dryer Cyclones	1.00 ea	100.000	100.00	102.09	10,209	-	-	-	-	75,000.00	75,000	85,209
Motor, conveyor C-16	1.00 ea					-	-	-	-	-	-	
Conveyor C-17, from Dryer Cyclones	1.00 ea	120.000	120.00	102.09	12,251	-	-	-	-	150,000.00	150,000	162,251
Motor, conveyor C-17	1.00 ea					-	-	-	-	-	-	
Conveyor C-18, from Dryer Outlet and Cyclones	1.00 ea	140.000	140.00	102.09	14,293	-	-	-	-	185,000.00	185,000	199,293
Motor, conveyor C-18	1.00 ea					-	-	-	-	-	-	
Dump Diverter, Dryer Dump to grade	1.00 ea	40.000	40.00	102.09	4,084	-	-	-	-	25,000.00	25,000	29,084
Motor, diverter	1.00 ea					-	-	-	-	-	-	
Moisture sensor	1.00 ea	20.000	20.00	102.09	2,042	-	-	-	-	25,000.00	25,000	27,042
Pneumatic system No. 1 to dry biomass silo	1.00 ea	80.000	80.00	102.09	8,167	-	-	-	-	115,000.00	115,000	123,167
Blower B-1	1.00 ea					-	-	-	-	-	-	
Motor, blower B-1	1.00 ea					-	-	-	-	-	-	
Airlock Feeder F-1	1.00 ea					-	-	-	-	-	-	
Motor, airlock feeder F-1	1.00 ea					-	-	-	-	-	-	
Ductwork, elbows, fittings and cyclone target box	1.00 ea	100.000	100.00	102.09	10,209	-	-	-	-	60,000.00	60,000	70,209
Dry biomass silo	1.00 ea					-	-	-	-	804,550.00	804,550	804,550
Reclaimer Screw	1.00 ea					-	-	-	-	-	-	
Silo erection	1.00 ea	2,600.000	2,600.00	102.09	265,439	-	-	-	-	-	-	265,439
Mech. and electr. Installation	1.00 ea	3,200.000	3,200.00	102.09	326,695	-	-	-	-	-	-	326,695
Motor, screw drive	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency	1.00 ea					-	-	-	-	-	-	
Motor, travel advance drive	1.00 ea					-	-	-	-	-	-	
Drive, hydraulic motor	1.00 ea					-	-	-	-	-	-	
Conveyor No.1, Discharge	1.00 ea					-	-	-	-	-	-	
Motor, discharge conveyor No1	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency No1	1.00 ea					-	-	-	-	-	-	
Conveyor, Discharge No 2	1.00 ea					-	-	-	-	-	-	
Motor, discharge conveyor No2	1.00 ea					-	-	-	-	-	-	
Drive, Variable Frequency No 2	1.00 ea					-	-	-	-	-	-	
Dry Silo Bin Vent	1.00 ea	20.000	20.00	102.09	2,042	-	-	-	-	25,000.00	25,000	27,042
Motor, Bin Vent	1.00 ea					-	-	-	-	-	-	
Pneumatic system No. 2 to TRI fuel bin	1.00 ea	80.000	80.00	102.09	8,167	-	-	-	-	110,000.00	110,000	118,167
Blower B-2	1.00 ea					-	-	-	-	-	-	
Motor, blower B-2	1.00 ea					-	-	-	-	-	-	
Airlock Feeder F-2	1.00 ea					-	-	-	-	-	-	
Motor, airlock feeder F-2	1.00 ea					-	-	-	-	-	-	
Pneumatic system No. 3 to TRI fuel bin	1.00 ea	80.000	80.00	102.09	8,167	-	-	-	-	110,000.00	110,000	118,167
Blower B-3	1.00 ea					-	-	-	-	-	-	
Motor, blower B-3	1.00 ea					-	-	-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Airlock Feeder F-3	1.00 ea					-	-	-	-	-	-	
Motor, airlock feeder F-3	1.00 ea					-	-	-	-	-	-	
** unassigned **			*12,970.00*		*1,324,134*		*66,084*				*6,638,605*	*8,028,823*
01005			*12,970.00*		*1,324,134*		*66,084*				*6,638,605*	*8,028,823*
010-Equipment			12,970.00		1,324,134		66,084				6,638,605	8,028,823
020-Structural												
Buildings												
Monorail Beams												
S12x35	0.43 tn	18.000	7.80	125.37	977	4,967.60	2,152	-	-	-	-	3,129
Monorail Beams			*7.80*		*977*		*2,152*					*3,129*
Blower bldg slab												
Grade Slab W/Turndown	41.00 CY	2.700	110.70	103.67	11,476	415.85	17,050	-	-	-	-	28,526
Blower bldg slab			*110.70*		*11,476*		*17,050*					*28,526*
Dryer Burner Encl												
Doors/Frame (3' x 7' H.M.)	2.00 EA	12.000	24.00	51.58	1,238	1,934.17	3,868	-	-	-	-	5,106
Structural Steel - Light (21 to 40 #/lf)	7.10 tn	24.000	170.40	125.37	21,362	4,967.60	35,270	-	-	-	-	56,632
Lighting	432.00 SF	0.250	108.00	95.74	10,340	4.03	1,741	-	-	-	-	12,081
Fire Protection (Allowance)	432.00 SF							7.50	3,240	-	-	3,240
Preformed Metal Siding	1,218.00 sf		-	-	-	-	-	5.20	6,334	-	-	6,334
Preformed Metal Roofing	432.00 sf		-	-	-	-	-	4.30	1,858	-	-	1,858
Dryer Burner Encl			*302.40*		*32,940*		*40,879*		*11,431*			*85,251*
Fire Dump Walls												
Wall	9.00 CY	9.150	82.35	103.67	8,537	1,070.24	9,632	-	-	-	-	18,170
Fire Dump Walls			*82.35*		*8,537*		*9,632*					*18,170*
Buildings			*503.25*		*53,932*		*69,713*		*11,431*			*135,075*
Equipment Foundation												
C10/Dryer Feed Fdn												
Foundations	30.00 CY	7.080	212.40	103.67	22,020	988.04	29,641	-	-	-	-	51,661
C10/Dryer Feed Fdn			*212.40*		*22,020*		*29,641*					*51,661*
C10/Dryer Feed Piers												
Piers	8.00 CY	14.850	118.80	103.67	12,316	573.80	4,590	-	-	-	-	16,907
C10/Dryer Feed Piers			*118.80*		*12,316*		*4,590*					*16,907*
C10/Dryer Feed pads												
Pad	19.00 CY	8.200	155.80	103.67	16,152	1,097.64	20,855	-	-	-	-	37,007
C10/Dryer Feed pads			*155.80*		*16,152*		*20,855*					*37,007*
C15 Conveyor/Tower												
Foundations	45.00 CY	7.080	318.60	103.67	33,030	988.04	44,462	-	-	-	-	77,492
C15 Conveyor/Tower			*318.60*		*33,030*		*44,462*					*77,492*
Dry Silo												
Foundations	330.00 CY	7.080	2,336.40	103.67	242,218	988.04	326,053	-	-	-	-	568,271
Dry Silo			*2,336.40*		*242,218*		*326,053*					*568,271*
Dryer Burner												
Foundations	269.00 CY	7.080	1,904.52	103.67	197,445	988.04	265,783	-	-	-	-	463,227
Dryer Burner			*1,904.52*		*197,445*		*265,783*					*463,227*
Dryer Drum												
Foundations	347.00 CY	7.080	2,456.76	103.67	254,696	988.04	342,850	-	-	-	-	597,546
Dryer Drum			*2,456.76*		*254,696*		*342,850*					*597,546*
Dryer Drum Piers												
Piers	367.00 CY	14.850	5,449.95	103.67	565,005	573.80	210,586	-	-	-	-	775,591

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Dryer Drum Piers			*5,449.95*		*565,005*		*210,586*					*775,591*
Dryer Feed Bin												
Foundations	111.00 CY	7.080	785.88	103.67	81,473	988.04	109,672	-	-	-	-	191,146
Dryer Feed Bin			*785.88*		*81,473*		*109,672*					*191,146*
Dust Coll Baghouse												
Foundations	43.00 CY	7.080	304.44	103.67	31,562	988.04	42,486	-	-	-	-	74,047
Dust Coll Baghouse			*304.44*		*31,562*		*42,486*					*74,047*
Fire Dump Slab												
Foundations	12.00 CY	7.080	84.96	103.67	8,808	988.04	11,856	-	-	-	-	20,664
Fire Dump Slab			*84.96*		*8,808*		*11,856*					*20,664*
Misc pads												
Pad	40.00 CY	8.200	328.00	103.67	34,004	1,097.64	43,906	-	-	-	-	77,910
Misc pads			*328.00*		*34,004*		*43,906*					*77,910*
Multi-clone/Hopper												
Foundations	376.00 CY	7.080	2,662.08	103.67	275,982	988.04	371,503	-	-	-	-	647,485
Multi-clone/Hopper			*2,662.08*		*275,982*		*371,503*					*647,485*
Pipe supports												
Foundations	11.00 CY	7.080	77.88	103.67	8,074	988.04	10,868	-	-	-	-	18,942
Pipe supports			*77.88*		*8,074*		*10,868*					*18,942*
RTO & Stack												
Foundations	347.00 CY	7.080	2,456.76	103.67	254,696	988.04	342,850	-	-	-	-	597,546
RTO & Stack			*2,456.76*		*254,696*		*342,850*					*597,546*
Equipment Foundation			*19,653.23*		*2,037,482*		*2,177,961*					*4,215,444*
Structures												
C15 Transf twr platf												
Structural steel	5.00 TN	18.000	90.00	125.37	11,283	4,967.60	24,838	-	-	-	-	36,121
Grating	130.00 SF	0.220	28.60	125.37	3,585	19.34	2,514	-	-	-	-	6,100
Handrails	41.00 LF	0.200	8.20	125.37	1,028	88.65	3,635	-	-	-	-	4,663
Ladders	10.00 LF	0.500	5.00	125.37	627	299.80	2,998	-	-	-	-	3,625
C15 Transf twr platf			*131.80*		*16,523*		*33,985*					*50,508*
Structures			*131.80*		*16,523*		*33,985*					*50,508*
020-Structural			**20,288.28**		**2,107,937**		**2,281,659**		**11,431**			**4,401,027**
030-Piping												
Process Piping												
Pipe C2F												
A106 Grade B Std Wt-3" (allow)	500.00 LF	0.990	495.00	107.59	53,256	67.70	33,848	-	-	-	-	87,104
A106 Grade B Std Wt-Small bore/specialties	1.00 AL	148.000	148.00	107.59	15,923	5,077.21	5,077	-	-	-	-	21,000
Pipe C2F			*643.00*		*69,179*		*38,925*					*108,105*
Valve 54AF												
3"-Plug	2.00 ea	7.500	15.00	107.59	1,614	514.17	1,028	-	-	-	-	2,642
8"-Plug	1.00 ea	15.000	15.00	107.59	1,614	2,954.45	2,954	-	-	-	-	4,568
Valve 54AF			*30.00*		*3,228*		*3,983*					*7,210*
Valve 54AT												
1"-Plug	1.00 ea	5.000	5.00	107.59	538	256.27	256	-	-	-	-	794
Valve 54AT			*5.00*		*538*		*256*					*794*
Valve 64BS												
.75"-Ball	3.00 ea	7.500	22.50	107.59	2,421	114.44	343	-	-	-	-	2,764
Valve 64BS			*22.50*		*2,421*		*343*					*2,764*
Valve VEND												
-Ball	4.00 ea	15.000	60.00	107.59	6,455	19.83	79	-	-	-	-	6,535

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve VEND												
-Check	1.00 ea	15.000	15.00	107.59	1,614	19.82	20	-	-	-	-	1,634
-Gate	8.00 ea	15.000	120.00	107.59	12,911	19.82	159	-	-	-	-	13,069
-Plug	8.00 ea	15.000	120.00	107.59	12,911	19.83	159	-	-	-	-	13,069
Valve VEND			*315.00*		*33,890*		*416*					*34,307*
Process Piping			*1,015.50*		*109,256*		*43,924*					*153,180*
030-Piping			**1,015.50**		**109,256**		**43,924**					**153,180**
040-Instrumentation												
DCS/PLC Equipment												
** unassigned **												
Project Control System (Proportioned Cost)	1.00 LT	20.000	20.00	95.74	1,915	805.93	806	-	-	12,754.00	12,754	15,475
** unassigned **			*20.00*		*1,915*		*806*				*12,754*	*15,475*
DCS/PLC Equipment			*20.00*		*1,915*		*806*				*12,754*	*15,475*
Instruments (field)												
** unassigned **												
Field Instruments (not vendor supplied)	1.00 LT	156.000	156.00	95.74	14,936	12,894.48	12,894	-	-	82,371.00	82,371	110,201
** unassigned **			*156.00*		*14,936*		*12,894*				*82,371*	*110,201*
Instruments (field)			*156.00*		*14,936*		*12,894*				*82,371*	*110,201*
Instr. Tubing & Wiri												
** unassigned **												
Biomass BMS PLC Digital I/O-39	1.00 LS	400.830	400.83	95.74	38,376	20,115.38	20,115	-	-	-	-	58,491
Analog I/O-40	1.00 LS	921.000	921.00	95.74	88,178	49,982.24	49,982	-	-	-	-	138,160
Digital I/O-17	1.00 LS	214.000	214.00	95.74	20,489	12,377.12	12,377	-	-	-	-	32,866
Motor Control-30	1.00 LS	88.040	88.04	95.74	8,429	3,631.39	3,631	-	-	-	-	12,060
120V Power-3	1.00 LS	35.000	35.00	95.74	3,351	2,001.88	2,002	-	-	-	-	5,353
Air Supply, Tubing from Header-4	1.00 LS	54.000	54.00	95.74	5,170	4,476.00	4,476	-	-	-	-	9,646
** unassigned **			*1,712.87*		*163,993*		*92,584*					*256,577*
Instr. Tubing & Wiri			*1,712.87*		*163,993*		*92,584*					*256,577*
040-Instrumentation			**1,888.87**		**180,843**		**106,284**				**95,125**	**382,253**
050-Electrical												
Grounding												
** unassigned **												
1/C #4/0 bare copper grounding conductor - Class B stranding	1,450.00 Lf	0.053	77.29	95.74	7,399	5.83	8,460	-	-	-	-	15,860
Compression Type connection, Copper wire to Copper wire connector	26.00 Ea	1.333	34.66	95.74	3,318	35.43	921	-	-	-	-	4,239
Compression type connection, Heavy Duty with single bolt hole for connection to serviit post or Equipment Grounding Bus Bar	13.00 Ea	1.333	17.33	95.74	1,659	35.43	461	-	-	-	-	2,120
Copperclad Steel Ground Rod 3/4" dia. X 10'L., including a compression type connector for grounding conductor.	6.00 Ea	2.190	13.14	95.74	1,258	91.28	548	-	-	-	-	1,806
Compression type connection for grounding conductor to structural reinforcement bar in concrete	5.00 Ea	1.333	6.67	95.74	638	35.43	177	-	-	-	-	815
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	10.00 Ea	1.120	11.20	95.74	1,072	35.43	354	-	-	-	-	1,427
** unassigned **			*160.28*		*15,345*		*10,921*					*26,266*
Grounding			*160.28*		*15,345*		*10,921*					*26,266*
Control Equipment												
** unassigned **												
1000 HP VFD-5KV	1.00 EA	60.000	60.00	95.74	5,744	16,118.12	16,118	-	-	225,000.00	225,000	246,863

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** unassigned **												
MCC-2	1.00 EA	100.000	100.00	95.74	9,574	8,059.05	8,059	-	-	157,767.00	157,767	175,400
** unassigned **			*160.00*		*15,319*		*24,177*				*382,767*	*422,263*
Control Equipment			*160.00*		*15,319*		*24,177*				*382,767*	*422,263*
Power Wiring												
** unassigned **												
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	650.00 Lf	0.296	192.40	95.74	18,421	23.21	15,087	-	-	-	-	33,507
24" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	320.00 Lf	0.276	88.32	95.74	8,456	22.11	7,077	-	-	-	-	15,532
Power Wiring to Equipment	1.00 ls	3,220.000	3,220.00	95.74	308,288	114,438.50	114,439	-	-	-	-	422,726
3/C 500 kcmil copper, 5 kV shielded	6.40 CLF	14.000	89.60	95.74	8,578	6,840.52	43,779	-	-	-	-	52,358
** unassigned **			*3,590.32*		*343,743*		*180,381*					*524,124*
Power Wiring			*3,590.32*		*343,743*		*180,381*					*524,124*
050-Electrical			**3,910.60**		**374,407**		**215,479**				**382,767**	**972,653**
060-Sitework												
Outdoor Lighting												
** unassigned **												
150W HPS structure mounted fixture (Petrolux2)	10.00 EA	8.000	80.00	95.74	7,659	1,071.86	10,719	-	-	-	-	18,378
UG Conduit/wire	800.00 LF	0.135	108.00	95.74	10,340	13.01	10,406	-	-	-	-	20,746
** unassigned **			*188.00*		*17,999*		*21,124*					*39,124*
Outdoor Lighting			*188.00*		*17,999*		*21,124*					*39,124*
060-Sitework			**188.00**		**17,999**		**21,124**					**39,124**
02-Biomass Dryer & Dry Storage			***40,261.24***		***4,114,576***		***2,734,555***		***11,431***		***7,116,497***	***13,977,059***
03-Reformer												
010-Equipment												
01005												
** unassigned **												
Biomass Feed System	1.00 ea							-	-			
Bin, Dry Biomass Splitting	1.00 ea	6,500.000	6,500.00	102.09	663,598	111,214.88	111,215	-	-			
Bin No. 1, Dry Biomass Surge	1.00 ea							-	-	-	-	
Screw No. 1, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 1	1.00 ea							-	-	-	-	
VFD, Surge Bin No. 1 Discharge Screw No. 1	1.00 ea							-	-	-	-	
Screw No. 2, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 2	1.00 ea							-	-	-	-	
VFD, Surge Bin No. 1 Discharge Screw No. 2	1.00 ea							-	-	-	-	
Screw No. 3, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 3	1.00 ea							-	-	-	-	
VFD, Surge Bin No. 1 Discharge Screw No. 3	1.00 ea							-	-	-	-	
Bin No. 2, Dry Biomass Surge	1.00 ea							-	-	-	-	
Screw No. 4, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 4	1.00 ea							-	-	-	-	
VFD, Surge Bin No. 1 Discharge Screw No. 4	1.00 ea							-	-	-	-	
Screw No. 5, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 5	1.00 ea							-	-	-	-	
VFD, Surge Bin No. 1 Discharge Screw No. 5	1.00 ea							-	-	-	-	
Screw No. 6, Surge Bin No. 1 Discharge	1.00 ea							-	-	-	-	
Motor, Surge Bin No. 1 Discharge Screw No. 6	1.00 ea							-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* *unassigned* *												
VFD, Surge Bin No. 1 Discharge Screw No. 6	1.00 ea							-	-	-	-	
Screw No. 1, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 1	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 1	1.00 ea							-	-	-	-	
Screw No. 2, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 2	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 2	1.00 ea							-	-	-	-	
Screw No. 3, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 3	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 3	1.00 ea							-	-	-	-	
Screw No. 4, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 4	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 4	1.00 ea							-	-	-	-	
Screw No. 5, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 5	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 5	1.00 ea							-	-	-	-	
Screw No. 6, Weigh	1.00 ea							-	-	-	-	
Motor, Weigh Screw No. 6	1.00 ea							-	-	-	-	
VFD, Weigh Screw No. 6	1.00 ea							-	-	-	-	
Feeder #1, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #1	1.00 ea							-	-	-	-	
Motor, Feeder #1 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2, Feeder #1	1.00 ea							-	-	-	-	
Motor, Feeder #1 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Feeder #2, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #2	1.00 ea							-	-	-	-	
Motor, Feeder #2 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2, Feeder #2	1.00 ea							-	-	-	-	
Motor, Feeder #2 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Feeder #3, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #3	1.00 ea							-	-	-	-	
Motor, Feeder #3 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2 , Feeder #3	1.00 ea							-	-	-	-	
Motor, Feeder #3 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Feeder #4, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #4	1.00 ea							-	-	-	-	
Motor, Feeder #4 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2, Feeder #4	1.00 ea							-	-	-	-	
Motor, Feeder #4 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Feeder #5, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #5	1.00 ea							-	-	-	-	
Motor, Feeder #5 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2, Feeder #5	1.00 ea							-	-	-	-	
Motor, Feeder #5 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Feeder #6, Three Stage Plug	1.00 ea							-	-	-	-	
Hydraulic Pack 1, Feeder #6	1.00 ea							-	-	-	-	
Motor, Feeder #6 Hydraulic Pack 1	1.00 ea							-	-	-	-	
Hydraulic Pack 2, Feeder #6	1.00 ea							-	-	-	-	
Motor, Feeder #6 Hydraulic Pack 2	1.00 ea							-	-	-	-	
Plug Breaker #1	1.00 ea							-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* unassigned *												
Motor, Plug Breaker #1	1.00 ea							-	-	-	-	
Plug Breaker #2	1.00 ea							-	-	-	-	
Motor, Plug Breaker #2	1.00 ea							-	-	-	-	
Plug Breaker #3	1.00 ea							-	-	-	-	
Motor, Plug Breaker #3	1.00 ea							-	-	-	-	
Plug Breaker #4	1.00 ea							-	-	-	-	
Motor, Plug Breaker #4	1.00 ea							-	-	-	-	
Plug Breaker #5	1.00 ea							-	-	-	-	
Motor, Plug Breaker #5	1.00 ea							-	-	-	-	
Plug Breaker #6	1.00 ea							-	-	-	-	
Motor, Plug Breaker #6	1.00 ea							-	-	-	-	
Auger #1, High Speed Injection " [Biomass Feed Screw #1]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #1	1.00 ea							-	-	-	-	
Auger #2, High Speed Injection " [Biomass Feed Screw #2]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #2	1.00 ea							-	-	-	-	
Auger #3, High Speed Injection " [Biomass Feed Screw #3]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #3	1.00 ea							-	-	-	-	
Auger #4, High Speed Injection " [Biomass Feed Screw #4]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #4	1.00 ea							-	-	-	-	
Auger #5, High Speed Injection " [Biomass Feed Screw #4]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #5	1.00 ea							-	-	-	-	
Auger #6, High Speed Injection " [Biomass Feed Screw #4]	1.00 ea							-	-	-	-	
Motor, High Speed Injection Auger #6	1.00 ea							-	-	-	-	
Steam Reformer (Erected by Vendor)	1.00 ea							-	-	-	-	
Internal Cyclones" [Ash Cyclone #1]	1.00 ea							-	-	-	-	
Fluidization Grid	1.00 ea							-	-	-	-	
Denseveyor, Reformer Unloading" 30 TPH	1.00 ea	100.000	100.00	102.09	10,209			-	-	68,950.00	68,950	79,159
Receiver, Bed Media Conveying Air" 620 Gallons	1.00 ea	20.000	20.00	102.09	2,042			-	-	5,255.00	5,255	7,297
Secondary Quad Cyclone" [redacted]	1.00 ea							-	-	-	-	
1st Fill Bed Materia [redacted]	1.00 ea							-	-	-	-	
Carbon Trim Cell [redacted]	1.00 ea							-	-	-	-	
Internal Cyclones" [redacted]	1.00 ea							-	-	-	-	
Fluidization Grid	1.00 ea							-	-	-	-	
Denseveyor, [redacted] Unload" (Pot [redacted]	1.00 ea	100.000	100.00	102.09	10,209			-	-	105,700.00	105,700	115,909
Quaternary Quad Cyclone" [redacted]	1.00 ea							-	-	-	-	
1st Fill Bed Material" [redacted]	1.00 ea							-	-	-	-	
Tank, Bed Media Storage [redacted]	1.00 ea							-	-	[redacted]		
Baghouse, Bed Media Tank Vent" 6000 cfm" Auto Pulse Cleaning	1.00 ea	60.000	60.00	102.09	6,126			-	-			
Fan, Centrifugal" [redacted]	1.00 ea							-	-			
Motor, Fan	1.00 ea							-	-			
Receiver, Bed Media Conveying Ai [redacted]	1.00 ea	20.000	20.00	102.09	2,042			-	-			
PC Heater No 1	1.00 ea							-	-			
Fan 1 , Combustion Air	1.00 ea	250.000	250.00	102.09	25,523			-	-			
Silencer, Combustion Air Fan 1 Inlet	1.00 ea							-	-			
Motor, Combustion Air Fan 1	1.00 ea							-	-			
Fuel Rack, Pulse Combustor No. 1	1.00 ea							-	-			
PC Heater No 2	1.00 ea							-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* unassigned *												
Fuel Rack, Pulse Combustor No. 2	1.00 ea							-	-	-	-	
PC Heater No 3	1.00 ea							-	-	-	-	
Fuel Rack, Pulse Combustor No. 3	1.00 ea							-	-	-	-	
PC Heater No 4	1.00 ea							-	-	-	-	
Fuel Rack, Pulse Combustor No. 4	1.00 ea							-	-	-	-	
LP Steam Superheater	1.00 ea							-	-	-	-	
MP Economizer	1.00 ea							-	-			
Ductwork	1.00 ea	1,200.000	1,200.00	102.09	122,510			-	-	[redacted]		
Expansion Joints	1.00 ea	400.000	400.00	102.09	40,837			-	-			
OXYGEN SYSTEM	1.00 ea							-	-	-	-	
All equipment to be supplied by Vendor." 143.2 stpdc, 90 psig, 90% purity, 95% availability"	1.00 ea							-	-	-	-	
Motor	1.00 ea							-	-	-	-	
Motor	1.00 ea							-	-	-	-	
Pump, Oxygen Plant Process Sump" 100 gpm, 225 ft TDH	1.00 ea	60.000	60.00	102.09	6,126			-	-	8,523.00	8,523	14,649
Motor, Oxygen Plant Process Sump Pump	1.00 ea							-	-	-	-	
NITROGEN SYSTEM	1.00 ea							-	-	-	-	
All equipment to be supplied by Vendor" 3.7 mmscf/month" 11,000 gal Tank	1.00 ea							-	-	-	-	
ASH HANDLING SYSTEM	1.00 ea							-	-			
Conveyor, Water Jacketed Chain" 2000 lb/hr @ 1800 F" 150 F Discharge	1.00 ea	400.000	400.00	102.09	40,837			-	-	[redacted]		
Motor, Water Jacketed Chain Conveyor	1.00 ea							-	-	-	-	
Silo, Ash Storage" 5500 Cu Ft" 14 ft Dia x 45 ft OH	1.00 ea							-	-	-	-	
Rotary Valve, Ash Discharge	1.00 ea							-	-	-	-	
Motor, Ash Discharge Rotary Valve	1.00 ea							-	-			
Ash Unloading Mixer" 30 TPH	1.00 ea							-	-	-	-	
Motor, Ash Unloading Mixer	1.00 ea							-	-			
Dumpster A, Reformer" 1 1/2 cu yd Self Dumping" To be refractory lined in field	1.00 ea							-	-	965.00	965	965
Dumpster B, Reformer" 1 1/2 cu yd Self Dumping" To be refractory lined in field	1.00 ea							-	-	965.00	965	965
Dumpster C, Reformer" 1 1/2 cu yd Self Dumping" To be refractory lined in field	1.00 ea							-	-	965.00	965	965
Dumpster A, Carbon Trim Cell" 1 1/2 cu yd Self Dumping" To be refractory lined in field	1.00 ea							-	-	965.00	965	965
Dumpster B, Carbon Trim Cell" 1 1/2 cu yd Self Dumping" To be refractory lined in field	1.00 ea							-	-	965.00	965	965
HRSG 1	1.00 ea							-	-			
Drum, HRSG 1	1.00 ea	5,000.000	5,000.00	102.09	510,460			-	-	[redacted]		
Generating Bank, HRSG 1	1.00 ea							-	-			
Superheater, HRSG 1	1.00 ea							-	-			
Pump No. 1, HRSG 1 BFW Circulation " 2600 gpm, 70 ft TDH	1.00 ea	60.000	60.00	102.09	6,126			-	-	95,000.00	95,000	101,126
Motor, HRSG 1 BFW Circulation Pump No. 1	1.00 ea							-	-			
Pump No. 2, HRSG 1 BFW Circulation " 2600 gpm, 70 ft TDH	1.00 ea	60.000	60.00	102.09	6,126			-	-	95,000.00	95,000	101,126
Motor, HRSG 1 BFW Circulation Pump No. 2	1.00 ea							-	-	-	-	
HRSG 2	1.00 ea							-	-	-	-	
Drum, HRSG#2 Steam	1.00 ea							-	-			

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* unassigned *												
Pump 1, PC Heater BFW Circulation" 1022 gpm, 82 ft TDH	1.00 ea	75.000	75.00	102.09	7,657			-	-	25,000.00	25,000	32,657
Motor, PC Heater BFW Circulation Pump 1	1.00 ea							-	-			
Pump 2, PC Heater BFW Circulation " 1022 gpm, 82 ft TDH	1.00 ea	75.000	75.00	102.09	7,657			-	-	25,000.00	25,000	32,657
Motor, PC Heater BFW Circulation Pump 2	1.00 ea							-	-			
Blowdown Tank, Reformer Area"	1.00 ea	40.000	40.00	102.09	4,084			-	-	15,000.00	15,000	19,084
Pump 1, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 1	1.00 ea							-	-	-	-	
Pump 2, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 2	1.00 ea							-	-	-	-	
Pump 3, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 3	1.00 ea							-	-	-	-	
Phosphate Tote" HRSG 1 & 2	1.00 ea							-	-	-	-	
Coolers" Including Analyzers	1.00 ea							-	-	-	-	
VENTURI SCRUBBER	1.00 ea							-	-			
Venturi Scrubber	1.00 ea	1,000.000	1,000.00	102.09	102,092			-	-	[redacted]		
[redacted]												
Motor, Decanter Water Pump 1	1.00 ea							-	-			
Pump 2, Decanter Water	1.00 ea	75.000	75.00	102.09	7,657			-	-	33,211.00	33,211	40,868
Motor, Decanter Water Pump 2	1.00 ea							-	-			
Filter, Solvent Particulate	1.00 ea							-	-	280,000.00	280,000	280,000
[redacted]												
HVAC	1.00 ea							-	-	-	-	
15-ton Roof Top Air Conditioning Unit for Reformer MCC Room, RTU-2	1.00 ea	37.000	37.00	102.09	3,777			-	-	15,000.00	15,000	18,777

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Motor, RTU-2	1.00 ea							-	-	-	-	
15-ton Roof Top Air Conditioning Unit for Reformer MCC Room, RTU-3	1.00 ea	37.000	37.00	102.09	3,777			-	-	15,000.00	15,000	18,777
Motor, RTU-3	1.00 ea							-	-	-	-	
5-ton Roof Top Air Conditioning Unit for Reformer Control Room, RTU-4	1.00 ea	22.000	22.00	102.09	2,246			-	-	5,000.00	5,000	7,246
Motor, RTU-4	1.00 ea							-	-	-	-	
5-ton Roof Top Air Conditioning Unit for Reformer Conference Room, RTU-5	1.00 ea	22.000	22.00	102.09	2,246			-	-	5,000.00	5,000	7,246
Motor, RTU-5	1.00 ea							-	-	-	-	
Reformer Building - Sidewall Ventilation Fan, F-9	1.00 ea	4.000	4.00	102.10	408			-	-	5,800.00	5,800	6,208
Motor, F-9	1.00 ea							-	-	-	-	
Reformer Building - Sidewall Ventilation Fan, F-10	1.00 ea	4.000	4.00	102.09	408			-	-	5,800.00	5,800	6,208
Motor, F-10	1.00 ea							-	-	-	-	
Reformer Building - Sidewall Ventilation Fan, F-11	1.00 ea	4.000	4.00	102.10	408			-	-	5,800.00	5,800	6,208
Motor, F-11	1.00 ea							-	-	-	-	
Reformer Building - Sidewall Ventilation Fan, F-12	1.00 ea	4.000	4.00	102.09	408			-	-	5,800.00	5,800	6,208
Motor, F-12	1.00 ea							-	-	-	-	
** unassigned **			***16,134.00***		***1,647,153***		***111,215***				***34,848,163***	***36,606,531***
01005			***16,134.00***		***1,647,153***		***111,215***				***34,848,163***	***36,606,531***
010-Equipment			**16,134.00**		**1,647,153**		**111,215**				**34,848,163**	**36,606,531**
020-Structural												
Buildings												
Oxygen												
Foundations	189.07 CY	14.000	2,647.04	103.67	274,423	1,070.24	202,355	-	-	-	-	476,778
Grade Slab W/Turndown	1,006.75 CY	2.700	2,718.23	103.67	281,803	407.79	410,541	-	-	-	-	692,343
Sump	5.56 CY	9.930	55.17	103.67	5,719	959.03	5,328	-	-	-	-	11,047
12" U-Drain	287.00 LF	0.693	198.78	103.67	20,607	117.66	33,769	-	-	-	-	54,376
Oxygen			***5,619.20***		***582,552***		***651,992***					***1,234,545***
Ref/Elect/Conf/Contr												
Concrete-	1.00 EA	12.000	12.00	51.58	619	265.94	266	-	-	-	-	885
Foundations	718.50 CY	14.000	10,059.00	51.58	518,822	1,070.24	768,969	-	-	-	-	1,287,791
Pier	51.40 CY	14.850	763.29	51.58	39,369	573.80	29,494	-	-	-	-	68,862
Grade Slab W/Turndown	209.40 CY	2.700	565.38	51.58	29,161	407.79	85,391	-	-	-	-	114,552
Truck Slab Reinforced	14.67 CY	3.800	55.73	51.58	2,875	407.79	5,981	-	-	-	-	8,856
Building Wall	44.60 CY	14.000	624.40	51.58	32,205	1,070.24	47,733	-	-	-	-	79,938
Curb, 8"	1.83 CY	13.230	24.24	51.58	1,250	528.67	968	-	-	-	-	2,218
Elevated Slabs	77.70 CY	5.730	445.22	51.58	22,964	520.61	40,452	-	-	-	-	63,415
12" U-Drain	283.80 LF	0.693	196.56	51.58	10,138	117.66	33,393	-	-	-	-	43,531
Electrical Room:	1.00 EA	12.000	12.00	51.58	619	265.95	266	-	-	-	-	885
Grade Slab	85.90 CY	2.700	231.93	51.58	11,962	407.79	35,029	-	-	-	-	46,991
Wall Footing	18.80 CY	7.400	139.12	51.58	7,176	341.70	6,424	-	-	-	-	13,600
Building Wall	45.30 CY	14.000	634.20	51.58	32,711	1,070.24	48,482	-	-	-	-	81,193
Architectural:	1.00 EA	12.000	12.00	51.58	619	265.94	266	-	-	-	-	885
12" CMU (Exterior)	7,400.00 SF	0.130	962.00	51.58	49,618	4.98	36,856	-	-	-	-	86,474
12" CMU (Interior)	1,240.00 SF	0.119	147.56	51.58	7,611	4.45	5,516	-	-	-	-	13,127
Paint (Primer and 2 Finish Coats) Each Face	17,280.00 SF					2.11	36,486	-	-	-	-	36,486
Exterior Uninsulated Metal Siding:	1.00 EA	12.000	12.00	51.58	619	265.94	266	-	-	-	-	885
East Elevation	5,660.00 SF					7.25	41,053	-	-	-	-	41,053

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Ref/Elect/Conf/Contr												
South Elevation	3,710.00 SF					7.25	26,909	-	-	-	-	26,909
West Elevation	5,500.00 SF					7.25	39,892	-	-	-	-	39,892
North Elevation	6,530.00 SF					7.25	47,363	-	-	-	-	47,363
Penthouse:	1.00 EA	12.000	12.00	51.58	619	265.95	266	-	-	-	-	885
East and West	1,090.00 SF					7.25	7,906	-	-	-	-	7,906
North and South	1,090.00 SF					7.25	7,906	-	-	-	-	7,906
Roof Membrane (60 mil-fully adhered)	8,610.00 SF	0.016	137.76	51.58	7,105	1.55	13,323	-	-	-	-	20,428
1 1/2" Metal Deck-Floor and Roof (20 ga)	10,790.00 SF	0.007	75.53	51.58	3,896	2.10	22,609	-	-	-	-	26,505
Flashing	1,080.00 SF					6.64	7,172	-	-	-	-	7,172
Stair Enclosure (Sim to "Insulrock" Fire Rated Wall Panels, 5" thick, by Advanced Insulation Concepts):	1.00 EA	12.000	12.00	51.58	619	265.95	266	-	-	-	-	885
East Elevation	1,960.00 SF					16.12	31,591	-	-	-	-	31,591
South Elevation	3,690.00 SF					16.12	59,476	-	-	-	-	59,476
West Elevation	1,960.00 SF					16.12	31,592	-	-	-	-	31,592
North Elevation	4,460.00 SF					16.12	71,887	-	-	-	-	71,887
Doors/Frame (3' x 7' H.M.)	9.00 EA	12.000	108.00	51.58	5,570	2,417.71	21,759	-	-	-	-	27,330
Doors/Frame (3' x 7' 4" Head, H.M.)	8.00 EA	12.000	96.00	51.58	4,951	2,417.71	19,342	-	-	-	-	24,293
Pair Doors/Frame (3' x 7' 2" Head, H.M.) w/2' x 6' Removable Transom	1.00 PR	22.000	22.00	51.58	1,135	4,513.08	4,513	-	-	-	-	5,648
Doors/Frame (3' x 7' "B" Label, H.M.)	16.00 EA	12.000	192.00	51.58	9,903	2,417.71	38,683	-	-	-	-	48,586
Door Hardware	18.00 EA	6.000	108.00	51.58	5,570	644.72	11,605	-	-	-	-	17,175
Aluminum Threshold, 3'-0"	33.00 EA	1.090	35.97	51.58	1,855	38.68	1,277	-	-	-	-	3,132
Aluminum Threshold, 6'-0"	1.00 EA	1.300	1.30	51.58	67	72.52	73	-	-	-	-	140
Toilet Room:	1.00 LT	88.000	88.00	51.58	4,539	11,282.68	11,283	-	-	-	-	15,822
Toilet Room Hardware	1.00 EA	20.000	20.00	51.58	1,032	3,223.62	3,224	-	-	-	-	4,255
Lighting and Building Services	14,400.00 SF	0.040	576.00	51.58	29,709	8.06	116,050	-	-	-	-	145,759
Steel-	1.00 EA	20.000	20.00	56.41	1,128	4,940.17	4,940	-	-	-	-	6,068
W14X82	129.28 TN	18.000	2,327.03	56.41	131,276	4,335.77	560,527	-	-	-	-	691,803
W12X40	100.39 TN	18.000	1,807.07	56.41	101,943	4,967.60	498,710	-	-	-	-	600,653
W12X30	78.52 TN	18.000	1,413.34	56.41	79,731	4,967.60	390,051	-	-	-	-	469,783
W18X40	17.28 TN	18.000	311.09	56.41	17,549	4,967.60	85,853	-	-	-	-	103,403
W14X48	14.83 TN	18.000	266.96	56.41	15,060	4,967.60	73,676	-	-	-	-	88,736
W14X38	4.60 TN	18.000	82.84	56.41	4,673	4,967.60	22,863	-	-	-	-	27,536
W14X34	3.18 TN	18.000	57.15	56.41	3,224	4,967.60	15,773	-	-	-	-	18,997
W8X18	10.48 TN	18.000	188.69	56.41	10,645	6,302.18	66,066	-	-	-	-	76,711
W12X26	8.76 TN	18.000	157.75	56.41	8,899	4,967.60	43,535	-	-	-	-	52,434
W10X22	18.21 TN	18.000	327.73	56.41	18,488	4,967.60	90,446	-	-	-	-	108,934
W10X30	5.91 TN	18.000	106.40	56.41	6,002	4,967.60	29,363	-	-	-	-	35,365
W8X18	3.25 TN	18.000	58.48	56.41	3,299	6,302.18	20,475	-	-	-	-	23,774
W10X22	15.39 TN	18.000	277.00	56.41	15,627	4,967.60	76,446	-	-	-	-	92,073
W14X61	3.51 TN	18.000	63.25	56.41	3,568	4,967.60	17,456	-	-	-	-	21,024
W12X16	0.70 TN	18.000	12.67	56.41	715	6,302.17	4,437	-	-	-	-	5,152
W18X50	9.34 TN	18.000	168.03	56.41	9,479	4,967.60	46,373	-	-	-	-	55,853
W12X35	0.77 TN	18.000	13.85	56.41	781	4,967.59	3,822	-	-	-	-	4,604
W24X76	3.35 TN	18.000	60.25	56.41	3,399	4,335.77	14,513	-	-	-	-	17,912
W24X94	5.17 TN	22.100	114.34	56.41	6,450	4,335.77	22,433	-	-	-	-	28,883
W24X68	3.00 TN	18.000	54.06	56.41	3,050	4,335.77	13,023	-	-	-	-	16,073
W14X43	21.61 TN	18.000	388.95	56.41	21,942	4,967.60	107,342	-	-	-	-	129,284
W10X30	1.42 TN	18.000	25.47	56.41	1,437	4,967.62	7,030	-	-	-	-	8,467
W8X21	0.92 TN	18.000	16.57	56.41	935	4,967.61	4,574	-	-	-	-	5,509

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Ref/Elect/Conf/Contr												
W14X34	3.34 TN	18.000	60.03	56.41	3,387	4,967.60	16,568	-	-	-	-	19,955
W10X39	5.41 TN	18.000	97.36	56.41	5,492	4,967.60	26,868	-	-	-	-	32,360
W14X43	6.31 TN	18.000	113.66	56.41	6,412	4,967.60	31,368	-	-	-	-	37,780
W14X30	1.32 TN	18.000	23.80	56.41	1,343	4,967.61	6,568	-	-	-	-	7,911
C10X15	4.71 TN	18.000	84.71	56.41	4,779	6,302.18	29,660	-	-	-	-	34,439
W10X33	0.18 TN	18.000	3.27	56.41	184	4,967.66	902	-	-	-	-	1,086
Floor Decking	4,191.00 SF	0.015	62.87	56.41	3,546	2.42	10,133	-	-	-	-	13,679
Girts & Sag Rods	78.50 TN	28.450	2,233.33	56.41	125,989	4,303.53	337,827	-	-	-	-	463,817
Stair Treads	385.53 EA	2.890	1,114.18	56.41	62,855	90.02	34,705	-	-	-	-	97,560
Grating 1 1/4" x 3/16"	25,730.00 SF	0.220	5,660.60	56.41	319,333	19.34	497,662	-	-	-	-	816,996
Grating 1 1/4" x 3/16" (Stairs)	120.00 SF	0.220	26.40	56.41	1,489	19.34	2,321	-	-	-	-	3,810
Handrails	4,076.60 LF	0.200	815.32	56.41	45,995	88.65	361,389	-	-	-	-	407,384
Checker Plate 3/8"	1,617.00 sf	0.320	517.44	125.37	64,870	21.76	35,185	-	-	-	-	100,055
Ref/Elect/Conf/Contr			***35,513.15***		***1,959,885***		***5,430,137***					***7,390,022***
Buildings			***41,132.36***		***2,542,437***		***6,082,130***					***8,624,567***
Equipment Foundation												
Carbon Trim Cell												
Mat Foundation	[redacted]							-	-	-	-	49,244
Caissons								-	-	-	-	27,813
Carbon Trim Cell			***618.20***		***31,886***		***45,171***					***77,057***
Reformer												
Mat Foundation	[redacted]							-	-	-	-	67,904
Caissons								-	-	-	-	44,498
Reformer												***112,401***
Equipment Foundation												***189,458***
Structures												
Sump												
Walls	7.33 CY	14.000	102.62	51.58	5,293	1,070.24	7,845	-	-	-	-	13,138
Bottom Reinforced	1.73 CY	3.800	6.57	51.58	339	415.86	719	-	-	-	-	1,059
Sump			***109.19***		***5,632***		***8,564***					***14,196***
Sodium												
Pad	5.21 CY	8.200	42.76	51.58	2,206	988.04	5,152	-	-	-	-	7,358
Reinforced Slab	4.48 CY	3.800	17.02	51.58	878	407.79	1,826	-	-	-	-	2,704
Curb, 8"	1.59 CY	13.230	21.03	51.58	1,085	528.66	841	-	-	-	-	1,925
Sodium			***80.81***		***4,168***		***7,819***					***11,987***
Concrete Bunker												
Pad	2.44 CY	8.200	20.04	51.58	1,034	1,097.64	2,683	-	-	-	-	3,717
Reinforced Slab	4.19 CY	3.800	15.91	51.58	821	407.79	1,708	-	-	-	-	2,529
Walls	13.04 CY	14.000	182.52	51.58	9,414	1,070.24	13,953	-	-	-	-	23,367
Roof	4.89 CY	5.730	28.01	51.58	1,445	520.61	2,545	-	-	-	-	3,990
Concrete Bunker			***246.49***		***12,713***		***20,889***					***33,602***
Boiler												
Foundations	95.40 CY	7.080	675.43	51.58	34,837	746.27	71,194	-	-	-	-	106,031
Boiler			***675.43***		***34,837***		***71,194***					***106,031***
[redacted]												
								-	-	-	-	108,699
												108,699
Diesel Generator												
Foundations	40.70 CY	7.080	288.16	51.58	14,862	746.27	30,373	-	-	-	-	45,236

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Diesel Generator			*288.16*		*14,862*		*30,373*					*45,236*
Transformer												
Foundations	269.40 CY	7.080	1,907.35	51.58	98,377	746.27	201,045	-	-	-	-	299,422
Transformer			*1,907.35*		*98,377*		*201,045*					*299,422*
Transformer curbs												
Curb, 8"	14.60 CY	13.230	193.16	51.58	9,963	528.67	7,719	-	-	-	-	17,681
Transformer curbs			*193.16*		*9,963*		*7,719*					*17,681*
Structures			*4,193.02*		*216,267*		*420,588*					*636,855*
020-Structural			**46,857.32**		**2,837,719**		**6,613,161**					**9,450,880**
030-Piping												
Insulation												
Cal Sil w/alum												
3.0" Dia 1.5" Calsil w/Alum Jacket	6.00 lf		-	-	-	-	-	15.03	90	-	-	90
4.0" Dia 1.5" Calsil w/Alum Jacket	111.00 lf		-	-	-	-	-	16.88	1,874	-	-	1,874
6.0" Dia 1.5" Calsil w/Alum Jacket	65.00 lf		-	-	-	-	-	19.48	1,266	-	-	1,266
8.0" Dia 1.5" Calsil w/Alum Jacket	45.00 lf		-	-	-	-	-	23.64	1,064	-	-	1,064
12.0" Dia 1.5" Calsil w/Alum Jacket	132.00 lf		-	-	-	-	-	32.89	4,341	-	-	4,341
2.0" Dia 2" Calsil w/Alum Jacket	111.00 lf		-	-	-	-	-	17.62	1,956	-	-	1,956
3.0" Dia 2" Calsil w/Alum Jacket	414.00 lf		-	-	-	-	-	19.48	8,065	-	-	8,065
4.0" Dia 2" Calsil w/Alum Jacket	28.00 lf		-	-	-	-	-	21.83	611	-	-	611
6.0" Dia 2" Calsil w/Alum Jacket	165.00 lf		-	-	-	-	-	26.29	4,338	-	-	4,338
8.0" Dia 2" Calsil w/Alum Jacket	10.00 lf		-	-	-	-	-	30.65	307	-	-	307
10.0" Dia 2" Calsil w/Alum Jacket	157.00 lf		-	-	-	-	-	36.61	5,748	-	-	5,748
12.0" Dia 2" Calsil w/Alum Jacket	119.00 lf		-	-	-	-	-	40.37	4,804	-	-	4,804
14.0" Dia 2" Calsil w/Alum Jacket	13.00 lf		-	-	-	-	-	47.94	623	-	-	623
18.0" Dia 2" Calsil w/Alum Jacket	2.00 lf		-	-	-	-	-	57.36	115	-	-	115
28.0" Dia 2" Calsil w/Alum Jacket	8.00 lf		-	-	-	-	-	86.26	690	-	-	690
2.0" Dia 2.5" Calsil w/Alum Jacket	5.00 lf		-	-	-	-	-	19.57	98	-	-	98
3.0" Dia 2.5" Calsil w/Alum Jacket	130.00 lf		-	-	-	-	-	22.26	2,894	-	-	2,894
4.0" Dia 2.5" Calsil w/Alum Jacket	296.00 lf		-	-	-	-	-	25.95	7,681	-	-	7,681
6.0" Dia 2.5" Calsil w/Alum Jacket	187.00 lf		-	-	-	-	-	31.98	5,980	-	-	5,980
8.0" Dia 2.5" Calsil w/Alum Jacket	558.00 lf		-	-	-	-	-	36.58	20,412	-	-	20,412
24.0" Dia 2.5" Calsil w/Alum Jacket	4.00 lf		-	-	-	-	-	87.43	350	-	-	350
2.0" Dia 6" Calsil w/Alum Jacket	33.00 lf		-	-	-	-	-	43.30	1,429	-	-	1,429
3.0" Dia 3" Calsil w/Alum Jacket	285.00 lf		-	-	-	-	-	27.26	7,769	-	-	7,769
3.0" Dia 5.5" Calsil w/Alum Jacket	42.00 lf		-	-	-	-	-	44.52	1,870	-	-	1,870
3.0" Dia 6" Calsil w/Alum Jacket	217.00 lf		-	-	-	-	-	48.51	10,527	-	-	10,527
4.0" Dia 3" Calsil w/Alum Jacket	230.00 lf		-	-	-	-	-	31.12	7,158	-	-	7,158
4.0" Dia 5.5" Calsil w/Alum Jacket	60.00 lf		-	-	-	-	-	51.90	3,114	-	-	3,114
4.0" Dia 6" Calsil w/Alum Jacket	35.00 lf		-	-	-	-	-	56.91	1,992	-	-	1,992
6.0" Dia 3" Calsil w/Alum Jacket	22.00 lf		-	-	-	-	-	35.81	788	-	-	788
6.0" Dia 5.5" Calsil w/Alum Jacket	75.00 lf		-	-	-	-	-	63.96	4,797	-	-	4,797
6.0" Dia 6" Calsil w/Alum Jacket	5.00 lf		-	-	-	-	-	68.85	344	-	-	344
8.0" Dia 3" Calsil w/Alum Jacket	580.00 lf		-	-	-	-	-	47.28	27,422	-	-	27,422
8.0" Dia 5.5" Calsil w/Alum Jacket	14.00 lf		-	-	-	-	-	73.16	1,024	-	-	1,024
8.0" Dia 6" Calsil w/Alum Jacket	159.00 lf		-	-	-	-	-	79.28	12,606	-	-	12,606
8.0" Dia 3.5" Calsil w/Alum Jacket	96.00 lf		-	-	-	-	-	47.28	4,539	-	-	4,539
10.0" Dia 6" Calsil w/Alum Jacket	150.00 lf		-	-	-	-	-	93.03	13,955	-	-	13,955
12.0" Dia 5" Calsil w/Alum Jacket	10.00 lf		-	-	-	-	-	88.03	880	-	-	880
12.0" Dia 6" Calsil w/Alum Jacket	17.00 lf		-	-	-	-	-	102.74	1,747	-	-	1,747

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Cal Sil w/alum												
14.0" Dia 3" Calsil w/Alum Jacket	35.00 lf		-	-	-	-	-	80.86	2,830	-	-	2,830
14.0" Dia 3.5" Calsil w/Alum Jacket	116.00 lf		-	-	-	-	-	80.86	9,380	-	-	9,380
16.0" Dia 5" Calsil w/Alum Jacket	15.00 lf		-	-	-	-	-	117.45	1,762	-	-	1,762
16.0" Dia 6" Calsil w/Alum Jacket	168.00 lf		-	-	-	-	-	136.93	23,004	-	-	23,004
16.0" Dia 4" Calsil w/Alum Jacket	95.00 lf		-	-	-	-	-	97.31	9,244	-	-	9,244
18.0" Dia 6" Calsil w/Alum Jacket	5.00 lf		-	-	-	-	-	147.53	738	-	-	738
30.0" Dia 5" Calsil w/Alum Jacket	6.00 lf		-	-	-	-	-	202.24	1,213	-	-	1,213
Cal Sil w/alum									***223,437***			***223,437***
Insulation									***223,437***			***223,437***
Process Piping												
Pipe C2F												
A106 Grade B Std Wt-16"	261.00 LF	3.780	986.58	107.59	106,144	253.05	66,047	-	-	-	-	172,192
A106 Grade B Std Wt-12"	180.00 LF	2.700	486.00	107.59	52,288	140.23	25,241	-	-	-	-	77,529
A106 Grade B Std Wt-8"	252.00 LF	1.770	446.04	107.59	47,989	117.66	29,651	-	-	-	-	77,640
A106 Grade B Std Wt-6"	595.00 LF	1.320	785.40	107.59	84,500	78.98	46,992	-	-	-	-	131,492
A106 Grade B Std Wt-4"	404.00 LF	1.060	428.24	107.59	46,074	59.64	24,093	-	-	-	-	70,167
A106 Grade B Std Wt-3"	6.00 LF	0.990	5.94	107.59	639	67.69	406	-	-	-	-	1,045
A106 Grade B Std Wt-Small bore/specialties	1.00 AL	942.697	942.70	107.59	101,423	28,851.41	28,851	-	-	-	-	130,275
Pipe C2F			***4,080.90***		***439,057***		***221,282***					***660,339***
Pipe C2G												
A53 Grade B Std Wt-12"	264.00 LF	2.700	712.80	107.59	76,689	122.50	32,339	-	-	-	-	109,028
A53 Grade B Std Wt-10"	115.00 LF	2.320	266.80	107.59	28,705	145.06	16,682	-	-	-	-	45,387
A53 Grade B Std Wt-8"	45.00 LF	1.770	79.65	107.59	8,569	107.99	4,860	-	-	-	-	13,429
A53 Grade B Std Wt-6"	210.00 LF	1.320	277.20	107.59	29,823	78.98	16,586	-	-	-	-	46,409
A53 Grade B Std Wt-4"	373.00 LF	1.060	395.38	107.59	42,538	56.41	21,042	-	-	-	-	63,580
A53 Grade B Std Wt-3"	70.00 LF	0.990	69.30	107.59	7,456	66.08	4,626	-	-	-	-	12,082
A53 Grade B Std Wt-Small bore/specialties	1.00 AL	541.573	541.57	107.59	58,267	14,345.10	14,345	-	-	-	-	72,612
Pipe C2G			***2,342.70***		***252,048***		***110,480***					***362,527***
Pipe C3A												
A106 Grade B Sch 40-28"	8.00 LF	7.790	62.32	107.59	6,705	747.88	5,983	-	-	-	-	12,688
A106 Grade B Sch 40-24"	4.00 LF	6.180	24.72	107.59	2,660	723.70	2,895	-	-	-	-	5,554
A106 Grade B Sch 40-18"	2.00 LF	4.470	8.94	107.59	962	436.80	874	-	-	-	-	1,835
A106 Grade B Sch 40-16"	11.00 LF	3.796	41.76	107.59	4,493	235.32	2,589	-	-	-	-	7,081
A106 Grade B Sch 40-14"	13.00 LF	3.420	44.46	107.59	4,783	282.07	3,667	-	-	-	-	8,450
A106 Grade B Sch 40-12"	89.00 LF	2.690	239.41	107.59	25,758	256.28	22,809	-	-	-	-	48,566
A106 Grade B Sch 40-10"	165.00 LF	2.320	382.80	107.59	41,185	162.79	26,861	-	-	-	-	68,046
A106 Grade B Sch 40-8"	206.00 LF	1.760	362.56	107.59	39,007	132.17	27,227	-	-	-	-	66,234
A106 Grade B Sch 40-6"	205.00 LF	1.310	268.55	107.59	28,893	111.22	22,799	-	-	-	-	51,692
A106 Grade B Sch 40-4"	226.00 LF	1.050	237.30	107.59	25,531	75.76	17,121	-	-	-	-	42,651
A106 Grade B Sch 40-Small bore/specialties	1.00 AL	503.371	503.37	107.59	54,157	19,986.44	19,986	-	-	-	-	74,143
Pipe C3A			***2,176.19***		***234,133***		***152,809***					***386,942***
Pipe C3B												
SA106 Grade B Sch 40-14"	116.00 LF	2.320	269.12	107.59	28,954	282.07	32,720	-	-	-	-	61,674
SA106 Grade B Sch 40-8"	96.00 LF	1.760	168.96	107.59	18,178	132.17	12,688	-	-	-	-	30,866
SA106 Grade B Sch 40-4"	108.00 LF	1.050	113.40	107.59	12,201	75.76	8,182	-	-	-	-	20,382
SA106 Grade B Sch 40-3"	50.00 LF	0.990	49.50	107.59	5,326	69.31	3,465	-	-	-	-	8,791
SA106 Grade B Sch 40-Small bore/specialties	1.00 AL	180.899	180.90	107.59	19,463	8,703.78	8,704	-	-	-	-	28,166
Pipe C3B			***781.88***		***84,121***		***65,759***					***149,880***
Pipe C8B												
SA106 Grade C Sch 80/100-16"	95.00 LF	3.770	358.15	107.59	38,533	852.65	81,002	-	-	-	-	119,534

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Pipe C8B												
SA106 Grade C Sch 80/100-14"	35.00 LF	3.340	116.90	107.59	12,577	1,313.62	45,977	-	-	-	-	58,554
SA106 Grade C Sch 80/100-3"	259.00 LF	0.980	253.82	107.59	27,308	80.59	20,873	-	-	-	-	48,181
SA106 Grade C Sch 80/100-Small bore/specialties	1.00 AL	220.225	220.22	107.59	23,694	22,242.98	22,243	-	-	-	-	45,937
Pipe C8B			***949.09***		***102,112***		***170,094***					***272,206***
Pipe M8B												
A335 Grade P22 Sch 120/100-8"	222.00 LF	2.310	512.82	107.59	55,173	581.86	129,174	-	-	-	-	184,347
A335 Grade P22 Sch 120/100-6"	75.00 LF	1.980	148.50	107.59	15,977	668.90	50,168	-	-	-	-	66,144
A335 Grade P22 Sch 120/100-3"	250.00 LF	1.320	330.00	107.59	35,504	246.61	61,652	-	-	-	-	97,156
A335 Grade P22 Sch 120/100-Small bore/specialties	1.00 AL	298.877	298.88	107.59	32,156	36,104.55	36,105	-	-	-	-	68,260
Pipe M8B			***1,290.20***		***138,810***		***277,098***					***415,908***
Pipe N3H												
B407 Nickel Alloy Sch 120-6"	5.00 LF	3.796	18.98	107.59	2,042			-	-	-	-	2,042
Pipe N3H			***18.98***		***2,042***							***2,042***
Pipe S4E												
A312 TP304H Sch 80S/40S-30"	6.00 LF	24.200	145.20	107.59	15,622	5,351.21	32,107	-	-	-	-	47,729
A312 TP304H Sch 80S/40S-18"	5.00 LF	14.200	71.00	107.59	7,639	9,508.06	47,540	-	-	-	-	55,179
A312 TP304H Sch 80S/40S-16"	47.00 LF	7.430	349.21	107.59	37,571	2,564.39	120,526	-	-	-	-	158,097
A312 TP304H Sch 80S/40S-12"	10.00 LF	18.200	182.00	107.59	19,581	5,096.54	50,965	-	-	-	-	70,546
A312 TP304H Sch 80S/40S-10"	150.00 LF	5.530	829.50	107.59	89,245	1,363.59	204,539	-	-	-	-	293,783
A312 TP304H Sch 80S/40S-8"	170.00 LF	3.920	666.40	107.59	71,697	710.81	120,837	-	-	-	-	192,534
A312 TP304H Sch 80S/40S-4"	95.00 LF	1.810	171.95	107.59	18,500	203.09	19,293	-	-	-	-	37,793
A312 TP304H Sch 80S/40S-3"	42.00 LF	2.100	88.20	107.59	9,489	169.24	7,108	-	-	-	-	16,597
A312 TP304H Sch 80S/40S-Small bore/specialties	1.00 AL	750.563	750.56	107.59	80,752	90,906.10	90,906	-	-	-	-	171,658
Pipe S4E			***3,254.02***		***350,095***		***693,823***					***1,043,918***
Pipe S6K												
A312 TP316/316L Sch 10S-8"	438.00 LF	2.320	1,016.16	107.59	109,327	172.46	75,539	-	-	-	-	184,866
A312 TP316/316L Sch 10S-6"	22.00 LF	1.800	39.60	107.59	4,261	148.29	3,262	-	-	-	-	7,523
A312 TP316/316L Sch 10S-4"	30.00 LF	1.030	30.90	107.59	3,325	77.37	2,321	-	-	-	-	5,645
A312 TP316/316L Sch 10S-Small bore/specialties	1.00 AL	326.966	326.97	107.59	35,178	12,088.57	12,089	-	-	-	-	47,266
Pipe S6K			***1,413.63***		***152,090***		***93,211***					***245,301***
Valve 14AF												
3"-Gate	3.00 ea	7.500	22.50	107.59	2,421	375.55	1,127	-	-	-	-	3,547
4"-Gate	3.00 ea	10.500	31.50	107.59	3,389	481.93	1,446	-	-	-	-	4,835
Valve 14AF			***54.00***		***5,810***		***2,572***					***8,382***
Valve 14BF												
10"-Gate	2.00 ea	21.000	42.00	107.59	4,519	4,189.10	8,378	-	-	-	-	12,897
3"-Gate	7.00 ea	10.500	73.50	107.59	7,908	610.87	4,276	-	-	-	-	12,184
4"-Gate	1.00 ea	12.000	12.00	107.59	1,291	744.65	745	-	-	-	-	2,036
6"-Gate	4.00 ea	15.000	60.00	107.59	6,455	1,255.60	5,022	-	-	-	-	11,478
Valve 14BF			***187.50***		***20,173***		***18,421***					***38,594***
Valve 14BW												
14"-Gate	2.00 ea	27.000	54.00	107.59	5,810	5,467.26	10,935	-	-	-	-	16,744
4"-Gate	4.00 ea	12.000	48.00	107.59	5,164	622.16	2,489	-	-	-	-	7,653
6"-Gate	3.00 ea	15.000	45.00	107.59	4,841	1,021.89	3,066	-	-	-	-	7,907
8"-Gate	3.00 ea	18.000	54.00	107.59	5,810	3,123.69	9,371	-	-	-	-	15,181
Valve 14BW			***201.00***		***21,625***		***25,860***					***47,485***
Valve 14CS												
2"-Gate	4.00 ea	7.500	30.00	107.59	3,228	159.57	638	-	-	-	-	3,866
2"-Gate	4.00 ea	7.500	30.00	107.59	3,228	159.57	638	-	-	-	-	3,866
3"-Gate	2.00 ea	7.500	15.00	107.59	1,614	240.17	480	-	-	-	-	2,094

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Valve 14CS			***75.00***		***8,069***		***1,757***					***9,826***
Valve 14DP												
3"-Gate	3.00 ea	10.500	31.50	107.59	3,389	5,098.15	15,294	-	-	-	-	18,684
4"-Gate	1.00 ea	13.500	13.50	107.59	1,452	5,913.75	5,914	-	-	-	-	7,366
Valve 14DP			***45.00***		***4,841***		***21,208***					***26,050***
Valve 14ES												
2"-Gate	4.00 ea	7.500	30.00	107.59	3,228	209.54	838	-	-	-	-	4,066
Valve 14ES			***30.00***		***3,228***		***838***					***4,066***
Valve 14HF												
3"-Gate	2.00 ea	10.500	21.00	107.59	2,259	554.46	1,109	-	-	-	-	3,368
Valve 14HF			***21.00***		***2,259***		***1,109***					***3,368***
Valve 14KP												
14"-Gate	2.00 ea	30.000	60.00	107.59	6,455	78,619.26	157,239	-	-	-	-	163,694
24"-Gate	2.00 ea	51.000	102.00	107.59	10,974	112,020.80	224,042	-	-	-	-	235,016
Valve 14KP			***162.00***		***17,429***		***381,280***					***398,709***
Valve 17AF												
6"-Gate	1.00 ea	13.500	13.50	107.59	1,452	3,726.49	3,726	-	-	-	-	5,179
Valve 17AF			***13.50***		***1,452***		***3,726***					***5,179***
Valve 17HF												
3"-Gate	3.00 ea	10.500	31.50	107.59	3,389	5,125.55	15,377	-	-	-	-	18,766
4"-Gate	4.00 ea	12.000	48.00	107.59	5,164	9,667.64	38,671	-	-	-	-	43,835
8"-Gate	4.00 ea	15.000	60.00	107.59	6,455	18,659.93	74,640	-	-	-	-	81,095
Valve 17HF			***139.50***		***15,009***		***128,687***					***143,695***
Valve 17HS												
3"-Gate	1.00 ea	10.500	10.50	107.59	1,130	5,125.56	5,126	-	-	-	-	6,255
Valve 17HS			***10.50***		***1,130***		***5,126***					***6,255***
Valve 24DP												
3"-Globe	1.00 ea	10.500	10.50	107.59	1,130	7,897.85	7,898	-	-	-	-	9,028
Valve 24DP			***10.50***		***1,130***		***7,898***					***9,028***
Valve 24KP												
3"-Globe	2.00 ea	10.500	21.00	107.59	2,259	7,897.87	15,796	-	-	-	-	18,055
Valve 24KP			***21.00***		***2,259***		***15,796***					***18,055***
Valve 24LS												
2"-Globe	1.00 ea	7.500	7.50	107.59	807	1,956.73	1,957	-	-	-	-	2,764
Valve 24LS			***7.50***		***807***		***1,957***					***2,764***
Valve 25UP												
3"-Globe	2.00 ea	10.500	21.00	107.59	2,259	7,789.88	15,580	-	-	-	-	17,839
Valve 25UP			***21.00***		***2,259***		***15,580***					***17,839***
Valve 34AF												
3"-Check	3.00 ea	7.500	22.50	107.59	2,421	219.21	658	-	-	-	-	3,078
4"-Check	2.00 ea	10.500	21.00	107.59	2,259	328.81	658	-	-	-	-	2,917
6"-Check	1.00 ea	13.500	13.50	107.59	1,452	757.54	758	-	-	-	-	2,210
8"-Check	2.00 ea	15.000	30.00	107.59	3,228	1,063.80	2,128	-	-	-	-	5,355
Valve 34AF			***87.00***		***9,360***		***4,200***					***13,561***
Valve 34BF												
12"-Check	2.00 ea	24.000	48.00	107.59	5,164	3,342.89	6,686	-	-	-	-	11,850
6"-Check	3.00 ea	15.000	45.00	107.59	4,841	1,286.23	3,859	-	-	-	-	8,700
Valve 34BF			***93.00***		***10,006***		***10,544***					***20,550***
Valve 34BW												
6"-Check	1.00 ea	15.000	15.00	107.59	1,614	833.31	833	-	-	-	-	2,447

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 34BW												
8"-Check	1.00 ea	18.000	18.00	107.59	1,937	1,112.15	1,112	-	-	-	-	3,049
Valve 34BW			***33.00***		***3,550***		***1,945***					***5,496***
Valve 34CS												
2"-Check	2.00 ea	7.500	15.00	107.59	1,614	122.49	245	-	-	-	-	1,859
Valve 34CS			***15.00***		***1,614***		***245***					***1,859***
Valve 34KP												
3"-Check	1.00 ea	7.500	7.50	107.59	807	4,687.15	4,687	-	-	-	-	5,494
Valve 34KP			***7.50***		***807***		***4,687***					***5,494***
Valve 37HF												
4"-Check	2.00 ea	12.000	24.00	107.59	2,582	6,935.62	13,871	-	-	-	-	16,453
6"-Check	1.00 ea	15.000	15.00	107.59	1,614	12,352.91	12,353	-	-	-	-	13,967
8"-Check	1.00 ea	18.000	18.00	107.59	1,937	20,626.33	20,626	-	-	-	-	22,563
Valve 37HF			***57.00***		***6,133***		***46,850***					***52,983***
Valve 37XF												
8"-Check	1.00 ea	18.000	18.00	107.59	1,937	4,353.50	4,354	-	-	-	-	6,290
Valve 37XF			***18.00***		***1,937***		***4,354***					***6,290***
Valve 54AF												
3"-Plug	2.00 ea	7.500	15.00	107.59	1,614	514.16	1,028	-	-	-	-	2,642
4"-Plug	6.00 ea	10.500	63.00	107.59	6,778	883.28	5,300	-	-	-	-	12,078
6"-Plug	1.00 ea	13.500	13.50	107.59	1,452	1,594.09	1,594	-	-	-	-	3,047
8"-Plug	3.00 ea	15.000	45.00	107.59	4,841	2,954.45	8,863	-	-	-	-	13,705
Valve 54AF			***136.50***		***14,686***		***16,785***					***31,471***
Valve 54AT												
2"-Plug	2.00 ea	5.000	10.00	107.59	1,076	256.28	513	-	-	-	-	1,588
Valve 54AT			***10.00***		***1,076***		***513***					***1,588***
Valve 64AF												
3"-Ball	2.00 ea	10.500	21.00	107.59	2,259	19.83	40	-	-	-	-	2,299
Valve 64AF			***21.00***		***2,259***		***40***					***2,299***
Valve 64BS												
2"-Ball	32.00 ea	7.500	240.00	107.59	25,821	322.36	10,316	-	-	-	-	36,137
3"-Ball	1.00 ea	10.500	10.50	107.59	1,130	443.25	443	-	-	-	-	1,573
1.5"-Ball	2.00 ea	1.780	3.56	107.58	383	322.36	645	-	-	-	-	1,028
1"-Ball	1.00 ea	1.780	1.78	107.60	192	322.36	322	-	-	-	-	514
Valve 64BS			***255.84***		***27,525***		***11,726***					***39,251***
Valve 64GF												
10"-Ball	1.00 ea	21.000	21.00	107.59	2,259	16,098.75	16,099	-	-	-	-	18,358
4"-Ball	4.00 ea	12.000	48.00	107.59	5,164	3,384.80	13,539	-	-	-	-	18,703
8"-Ball	3.00 ea	18.000	54.00	107.59	5,810	10,154.40	30,463	-	-	-	-	36,273
Valve 64GF			***123.00***		***13,233***		***60,101***					***73,335***
Valve 64TS												
2"-Ball	28.00 ea	7.500	210.00	107.59	22,594	2,219.46	62,145	-	-	-	-	84,739
Valve 64TS			***210.00***		***22,594***		***62,145***					***84,739***
Valve 67AF												
3"-Ball	8.00 ea	7.500	60.00	107.59	6,455	481.93	3,855	-	-	-	-	10,311
Valve 67AF			***60.00***		***6,455***		***3,855***					***10,311***
Valve 67XF												
4"-Ball	2.00 ea	10.500	21.00	107.59	2,259	2,274.26	4,549	-	-	-	-	6,808
6"-Ball	2.00 ea	13.500	27.00	107.59	2,905	3,151.09	6,302	-	-	-	-	9,207
8"-Ball	1.00 ea	15.000	15.00	107.59	1,614	4,202.01	4,202	-	-	-	-	5,816

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 67XF			*63.00*		*6,778*		*15,053*					*21,831*
Valve 71AA												
8"-B'fly	2.00 ea	15.000	30.00	107.59	3,228	1,402.27	2,805	-	-	-	-	6,032
Valve 71AA			*30.00*		*3,228*		*2,805*					*6,032*
Valve 74AA												
4"-B'fly	3.00 ea	10.500	31.50	107.59	3,389	688.24	2,065	-	-	-	-	5,454
Valve 74AA			*31.50*		*3,389*		*2,065*					*5,454*
Valve 74SF												
10"-B'fly	2.00 ea	21.000	42.00	107.59	4,519	6,444.02	12,888	-	-	-	-	17,407
12"-B'fly	5.00 ea	24.000	120.00	107.59	12,911	7,183.84	35,919	-	-	-	-	48,830
18"-B'fly	2.00 ea	36.000	72.00	107.59	7,746	15,740.95	31,482	-	-	-	-	39,228
4"-B'fly	1.00 ea	12.000	12.00	107.59	1,291	2,572.42	2,572	-	-	-	-	3,863
6"-B'fly	3.00 ea	15.000	45.00	107.59	4,841	3,437.99	10,314	-	-	-	-	15,155
8"-B'fly	1.00 ea	18.000	18.00	107.59	1,937	4,353.50	4,354	-	-	-	-	6,290
Valve 74SF			*309.00*		*33,245*		*97,529*					*130,774*
Valve HOLD												
10"-Ball	1.00 ea	18.000	18.00	107.59	1,937	19.82	20	-	-	-	-	1,956
12"-Ball	1.00 ea	21.000	21.00	107.59	2,259	19.81	20	-	-	-	-	2,279
3"-Stop Check	1.00 ea	7.500	7.50	107.59	807	19.81	20	-	-	-	-	827
4"-Ball	2.00 ea	10.500	21.00	107.59	2,259	19.84	40	-	-	-	-	2,299
8"-Ball	1.00 ea	15.000	15.00	107.59	1,614	19.83	20	-	-	-	-	1,634
Valve HOLD			*82.50*		*8,876*		*119*					*8,995*
Valve SPECIAL												
.75"-Angle	3.00 ea	7.500	22.50	107.59	2,421	19.83	59	-	-	-	-	2,480
1"-Angle	1.00 ea	7.500	7.50	107.59	807	19.83	20	-	-	-	-	827
3"-Gate	1.00 ea	10.500	10.50	107.59	1,130	19.83	20	-	-	-	-	1,150
Valve SPECIAL			*40.50*		*4,357*		*99*					*4,456*
Valve VEND												
.5"-Ball	1.00 ea	7.500	7.50	107.59	807	19.82	20	-	-	-	-	827
.5"-Plug	56.00 ea	7.500	420.00	107.59	45,187	19.83	1,110	-	-	-	-	46,297
.75"-Ball	2.00 ea	7.500	15.00	107.59	1,614	19.82	40	-	-	-	-	1,653
.75"-Check	1.00 ea	7.500	7.50	107.59	807	19.81	20	-	-	-	-	827
.75"-Gate	24.00 ea	7.500	180.00	107.59	19,366	19.83	476	-	-	-	-	19,842
.75"-Globe	20.00 ea	7.500	150.00	107.59	16,138	19.83	397	-	-	-	-	16,535
1"-Ball	1.00 ea	7.500	7.50	107.59	807	19.83	20	-	-	-	-	827
1"-Gate	2.00 ea	7.500	15.00	107.59	1,614	19.83	40	-	-	-	-	1,653
1"-Globe	2.00 ea	7.500	15.00	107.59	1,614	19.83	40	-	-	-	-	1,653
3"-Gate	1.00 ea	10.500	10.50	107.59	1,130	19.82	20	-	-	-	-	1,150
3"-Stop Check	1.00 ea	10.500	10.50	107.59	1,130	19.81	20	-	-	-	-	1,150
-Ball	2.00 ea	15.000	30.00	107.59	3,228	19.82	40	-	-	-	-	3,267
-Check	6.00 ea	15.000	90.00	107.59	9,683	19.83	119	-	-	-	-	9,802
-Gate	3.00 ea	15.000	45.00	107.59	4,841	19.82	59	-	-	-	-	4,901
-Globe	2.00 ea	15.000	30.00	107.59	3,228	19.82	40	-	-	-	-	3,267
Valve VEND			*1,033.50*		*111,193*		*2,458*					*113,651*
Process Piping			*20,023.43*		*2,154,287*		*2,764,489*					*4,918,777*
030-Piping			**20,023.43**		**2,154,287**		**2,764,489**		**223,437**			**5,142,214**
040-Instrumentation												
DCS/PLC Equipment												
** unassigned **												
Project Control System (Proportioned Cost)	1.00 LT	120.000	120.00	95.74	11,489	0.00	0	-	-	267,839.00	267,839	279,328

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **			*120.00*		*11,489*						*267,839*	*279,328*
DCS/PLC Equipment			*120.00*		*11,489*						*267,839*	*279,328*
Instruments (field)												
** unassigned **												
Field Instruments (not vendor supplied)	1.00 LT	698.000	698.00	95.74	66,828	38,683.44	38,683	-	-	1,275,265.00	1,275,265	1,380,776
** unassigned **			*698.00*		*66,828*		*38,683*				*1,275,265*	*1,380,776*
Instruments (field)			*698.00*		*66,828*		*38,683*				*1,275,265*	*1,380,776*
Instr. Tubing & Wiri												
** unassigned **												
Analog I/O-643	1.00 LS	13,218.000	13,218.00	95.74	1,265,511	718,096.80	718,097	-	-	-	-	1,983,608
Digital I/O-346	1.00 LS	4,089.000	4,089.00	95.74	391,487	233,291.76	233,292	-	-	-	-	624,779
Motor Control-23	1.00 LS	69.000	69.00	95.74	6,606	3,151.09	3,151	-	-	-	-	9,757
120V Power-45	1.00 LS	495.000	495.00	95.74	47,392	28,051.94	28,052	-	-	-	-	75,444
Air Supply, Tubing from Header-18	1.00 LS	243.000	243.00	95.74	23,265	20,139.58	20,140	-	-	-	-	43,405
** unassigned **			*18,114.00*		*1,734,262*		*1,002,731*					*2,736,993*
Instr. Tubing & Wiri			*18,114.00*		*1,734,262*		*1,002,731*					*2,736,993*
040-Instrumentation			**18,932.00**		**1,812,578**		**1,041,415**				**1,543,104**	**4,397,097**
050-Electrical												
Grounding												
** unassigned **												
1/C #4/0 bare copper grounding conductor - Class B stranding	3,200.00 Lf	0.053	170.56	95.74	16,330	5.83	18,671	-	-	-	-	35,001
Compression Type connection, Copper wire to Copper wire connector	86.00 Ea	1.333	114.64	95.74	10,976	35.43	3,047	-	-	-	-	14,022
Compression type connection, Heavy Duty with single bolt hole for connection to serviit post or Equipment Grounding Bus Bar	81.00 Ea	1.333	107.97	95.74	10,338	35.43	2,870	-	-	-	-	13,207
Copperclad Steel Ground Rod 3/4" dia. X 10'L., including a compression type connector for grounding conductor.	11.00 Ea	2.190	24.09	95.74	2,306	91.28	1,004	-	-	-	-	3,310
Compression type connection for grounding conductor to structural reinforcement bar in concrete	21.00 Ea	1.333	27.99	95.74	2,680	35.43	744	-	-	-	-	3,424
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	28.00 Ea	1.120	31.36	95.74	3,002	35.43	992	-	-	-	-	3,994
** unassigned **			*476.61*		*45,632*		*27,328*					*72,959*
Grounding			*476.61*		*45,632*		*27,328*					*72,959*
Heat Tracing												
** unassigned **												
Electric heat tracing	1,664.00 Lf							27.00	44,928	-	-	44,928
** unassigned **									*44,928*			*44,928*
Heat Tracing									*44,928*			*44,928*
Control Equipment												
** unassigned **												
MCC-3	1.00 LS	100.000	100.00	95.74	9,574	8,059.05	8,059	-	-	414,386.00	414,386	432,019
MCC-4	1.00 EA	100.000	100.00	95.74	9,574	8,059.03	8,059	-	-	90,703.00	90,703	108,336
** unassigned **			*200.00*		*19,148*		*16,118*				*505,089*	*540,355*
Control Equipment			*200.00*		*19,148*		*16,118*				*505,089*	*540,355*
Power Wiring												
** unassigned **												
Elect Heat Trace	3,745.00 lf		-	-	-	-	-	27.00	101,115	-	-	101,115

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	1,805.00 Lf	0.296	534.28	95.74	51,153	23.21	41,894	-	-	-	-	93,047
Power Wiring to Equipment	1.00 ls	6,530.000	6,530.00	95.74	625,192	230,488.82	230,489	-	-	-	-	855,681
** unassigned **			*7,064.28*		*676,345*		*272,383*		*101,115*			*1,049,843*
Power Wiring			*7,064.28*		*676,345*		*272,383*		*101,115*			*1,049,843*
050-Electrical			**7,740.89**		**741,125**		**315,829**		**146,043**		**505,089**	**1,708,086**
060-Sitework												
Outdoor Lighting												
** unassigned **												
150W HPS structure mounted fixture (Wallpack)	3.00 EA	6.000	18.00	95.74	1,723	572.19	1,717	-	-	-	-	3,440
UG Conduit/wire	500.00 LF	0.135	67.50	95.74	6,463	13.01	6,504	-	-	-	-	12,966
** unassigned **			*85.50*		*8,186*		*8,220*					*16,406*
Outdoor Lighting			*85.50*		*8,186*		*8,220*					*16,406*
060-Sitework			**85.50**		**8,186**		**8,220**					**16,406**
03-Reformer			***109,773.15***		***9,201,048***		***10,854,329***		***369,480***		***36,896,356***	***57,321,213***
04-Gas to Liquids												
010-Equipment												
01005												
** unassigned **												
SYNGAS COMPRESSOR	1.00 ea							-	-	-	-	
Compressor, 1st Stage Syngas " 67,300 lb/hr, 440 psig discharge	1.00 ea	3,000.000	3,000.00	102.09	306,276	92,195.52	92,196	-	-	3,300,000.00	3,300,000	3,698,472
Motor, 1st Stage Syngas Compressor	1.00 ea							-	-	-	-	
Compressor, 2nd Stage Syngas " 67,300 lb/hr, 440 psig discharge	1.00 ea							-	-	-	-	
Motor, 2nd Stage Syngas Compressor	1.00 ea							-	-	-	-	
Cooler, Syngas Compressor Inlet	1.00 ea							-	-	-	-	
Knock-out Pot, Syngas Compressor Inlet	1.00 ea							-	-	-	-	
Reservoir, 1st Stage Oil	1.00 ea							-	-	-	-	
Cooler, 1st Stage Oil	1.00 ea							-	-	-	-	
Pump, 1st Stage Oil	1.00 ea							-	-	-	-	
Motor, 1st Stage Oil Pump	1.00 ea							-	-	-	-	
Filter, 1st Stage Dual Oil	1.00 ea							-	-	-	-	
Separator, 1st Stage Oil Coalescing	1.00 ea							-	-	-	-	
Reservoir, 2nd Stage Oil	1.00 ea							-	-	-	-	
Cooler, 2nd Stage Oil	1.00 ea							-	-	-	-	
Pump, 2nd Stage Oil	1.00 ea							-	-	-	-	
Motor, 2nd Stage Oil Pump	1.00 ea							-	-	-	-	
Filter, 2nd Stage Dual Oil	1.00 ea							-	-	-	-	
Separator, 2nd Stage Oil Coalescing	1.00 ea							-	-	-	-	
[redacted]												
Absorber No. 1	1.00 ea							-	-	-	-	
Absorber No. 2	1.00 ea							-	-	-	-	
Absorber No. 3	1.00 ea							-	-	-	-	
Absorber No. 4	1.00 ea							-	-	-	-	
Microwave Chamber	1.00 ea							-	-	-	-	

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* unassigned *												
[redacted]								-	-	-	-	
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								-	-	-	-	
PSIG, 400¦F, Savannah Tank,, Savannah, Georgia								-	-	21,328.00	21,328	21,328
AMMONIA SCRUBBER SYSTEM	1.00 ea							-	-	-	-	
Vessel, Ammonia Scrubber (Vessel Only) ˝ Design P & T = 475 600 psig & 240 350¦F˝ Carbon Steel. 42" diam x 32'-0" 50'-6" High˝ ˝	1.00 ea	150.000	150.00	102.09	15,314							
Packing System for Amminia Scrubber	1.00 ea	60.000	60.00	102.09	6,126							
Pump, Ammonia Scrubber Water˝ 133 gpm, TDH = 887 ft˝	1.00 ea	80.000	80.00	102.09	8,167							
Motor, Scrubber Water Pump	1.00 ea											
Exchanger, Shell & Tube, Syngas Preheater ITT Standard, Buffalo, New York	1.00 ea											
Vessel, Sulfur Guard Bed˝ 96" Dia x 34' Vertical on Skirt, ˝ 600 PSIA, 480¦F	1.00 ea											
Sulfur Guard Catalyst, Zinc-Oxide Bed for 155-2278 Haldor Topsoe, Houston, Texas	1.00 ea											
Vessel, Sulfur Guard Bed˝ 96" Dia x 34' Vertical on Skirt, ˝ 600 PSIA, 480¦F	1.00 ea											
Sulfur Guard Catalyst, Zinc-Oxide Bed for 155-2278 Haldor Topsoe, Houston, Texas	1.00 ea											
Filter, Polishing Filter Vessel Fourinox, Inc. , Green Bay Wisconsin	1.00 ea							-	-	-	-	
Polishing Filter Media for 155-2268 Haldor Topsoe, Houston, Texas	1.00 ea							-	-	-	-	
Filter, Polishing Filter Vessel Fourinox, Inc. , Green Bay Wisconsin	1.00 ea							-	-	-	-	
Polishing Filter Media for 155-2269 Haldor Topsoe, Houston, Texas	1.00 ea							-	-	-	-	
Pump 1, GTL Area Process Sump˝ 100 gpm, 225 ft TDH	1.00 ea	40.000	40.00	102.09	4,084			-				
Motor, GTL Area Sump Pump 1	1.00 ea							-				
FISCHER-TROPSCH SYSTEM	1.00 ea							-				
Exchanger, Fisher-Tropsch Reactor #1A	1.00 ea	400.000	400.00	102.09	40,837			-				
Exchanger, Fisher-Tropsch Reactor #1B	1.00 ea	400.000	400.00	102.09	40,837			-				

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
* *unassigned* *												
Catalyst,for Fisher-Tropsch Reactor #1, 155-2281	1.00 ea							-	-	-	-	
Catalyst Retention Screen Plugs, Total Number, 5500	1.00 ea							-	-	-	-	
Exchanger, Fisher-Tropsch Reactor #2A	1.00 ea	300.000	300.00	102.09	30,628			-	-	[redacted]		
Exchanger, Fisher-Tropsch Reactor #2B	1.00 ea	300.000	300.00	102.09	30,628			-	-			
Catalyst,for Fisher-Tropsch Reactor #2, 155-2257	1.00 ea							-	-			
Catalyst Retention Screen Plugs, Total Number, 2700	1.00 ea							-	-			
Exchanger, Reactor #1 MFTL Condenser, 36-120 BEM, Vertical 1,492 Sq Ft	1.00 ea	150.000	150.00	102.09	15,314			-	-	22,576.00	22,576	37,890
Exchanger, Reactor #2 MFTL Condenser, 24-120 BEM, Vertical 785 Sq Ft	1.00 ea	150.000	150.00	102.09	15,314			-	-	18,031.00	18,031	33,345
Vessel, MFTL Separator #1 " 72" Dia x 6 ft L , 600 PSIG, FV, " 480F w/ 18" x 18" Boot	1.00 ea	100.000	100.00	102.09	10,209			-	-	50,394.00	50,394	60,603
Vessel, MFTL Separator #2 " 72" Dia x 6 ft L , 600 PSIG, FV, " 480F w/ 18" x 18" Boot	1.00 ea	100.000	100.00	102.09	10,209			-	-	50,394.00	50,394	60,603
Vessel, Hot Separator" 72" Dia x 6 ft L, Vertical on Legs" 600 PSIG / FV, 480F	1.00 ea	100.000	100.00	102.09	10,209			-	-	53,804.00	53,804	64,013
Vessel, Hot Separator" 72" Dia x 6 ft L, Vertical on Legs" 600 PSIG / FV, 480F	1.00 ea	100.000	100.00	102.09	10,209			-	-	62,695.00	62,695	72,904
Filter, HFTL Product Filter #1, Cartridge Type, Dual Unit w/ Switching Valves. Rosedale Model D4120-2RFWN-1-600-CFLEXSOE1NPTFC	1.00 ea	60.000	60.00	102.09	6,126			-	-	22,815.00	22,815	28,941
Filter, HFTL Product Filter #2, Cartridge Type, Dual Unit w/ Switching Valves. Rosedale Model D4120-2RFWN-1-600-CFLEXSOE1NPTFC	1.00 ea	60.000	60.00	102.09	6,126			-	-	22,815.00	22,815	28,941
Exchanger, HFTL Transfer Cooler #1, 8-48 BEM Vertical	1.00 ea	150.000	150.00	102.09	15,314			-	-	13,287.00	13,287	28,601
Exchanger, HFTL Transfer Cooler #2, 8-48 BEM Vertical	1.00 ea	150.000	150.00	102.09	15,314			-	-	6,959.00	6,959	22,273
Exchanger, Tail Gas Heater, ITT Standard, Buffalo, New York (For estimate assumed same size as Syngas Pre-Heater 155-2277)	1.00 ea	150.000	150.00	102.09	15,314			-	-	6,959.00	6,959	22,273
Exchanger, LFTL Condenser #1, 24-120 BEM, Vertical 712 Sq Ft	1.00 ea	150.000	150.00	102.09	15,314			-	-	18,031.00	18,031	33,345
Exchanger, LFTL Condenser #2, 18-120 BEM, Vertical 385 Sq Ft	1.00 ea	150.000	150.00	102.09	15,314			-	-	11,976.00	11,976	27,290
Vessel, LFTL Separator #1 Horizontal" 72" diam x 6'-0" T-T 600 PSIG, 480¦F " Boot 18" diam x 18" L	1.00 ea	100.000	100.00	102.09	10,209			-	-	50,394.00	50,394	60,603
Vessel, LFTL Separator #2 Horizontal" 72" diam x 6'-0" T-T 600 PSIG, 480¦F " Boot 18" diam x 18" L	1.00 ea	100.000	100.00	102.09	10,209			-	-	50,394.00	50,394	60,603
HRSG 3	1.00 ea							-	-	-	-	
Drum, FT Reactor 1 Steam	1.00 ea	250.000	250.00	102.09	25,523			-	-	-	-	25,523
Pump 1A, FT Reactor 1A BFW Circulation " 908 gpm, 139 ft TDH	1.00 ea	50.000	50.00	102.09	5,105			-	-	12,834.00	12,834	17,939
Motor, FT Reactor 1A BFW Circulation Pump 1A	1.00 ea							-	-	2,566.00	2,566	2,566
Pump 2A, FT Reactor 1A BFW Circulation " 908 gpm, 139 ft TDH	1.00 ea	50.000	50.00	102.09	5,105			-	-	12,834.00	12,834	17,939
Motor, FT Reactor 1A BFW Circulation Pump 2A	1.00 ea							-	-	2,566.00	2,566	2,566
Pump 1B, FT Reactor 1B BFW Circulation " 908 gpm, 139 ft TDH	1.00 ea	50.000	50.00	102.09	5,105			-	-	12,834.00	12,834	17,939
Motor, FT Reactor 1B BFW Circulation Pump 1B	1.00 ea							-	-	2,566.00	2,566	2,566
Pump 2B, FT Reactor 1B BFW Circulation " 908 gpm, 139 ft TDH	1.00 ea	50.000	50.00	102.09	5,105			-	-	12,834.00	12,834	17,939

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Motor, FT Reactor 1B BFW Circulation Pump 2B	1.00 ea							-	-	2,566.00	2,566	2,566
Pump 1, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 1	1.00 ea							-	-	-	-	
Pump 2, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 2	1.00 ea							-	-	-	-	
Pump 3, Phosphate Injection	1.00 ea							-	-	-	-	
Motor, Phosphate Injection Pump 3	1.00 ea							-	-	-	-	
Phosphate Tote" HRSG 3 & 4	1.00 ea							-	-	-	-	
Blowdown Tank, GTL Area"	1.00 ea	50.000	50.00	102.09	5,105			-	-	15,000.00	15,000	20,105
HRSG 4	1.00 ea							-	-	-	-	
Drum, FT Reactor 2 Steam	1.00 ea	250.000	250.00	102.09	25,523			-	-	-	-	25,523
Pump 1A, FT Reactor 2A BFW Circulation " 361 gpm, 139 ft TDH	1.00 ea	40.000	40.00	102.09	4,084			-	-	11,048.00	11,048	15,132
Motor, FT Reactor 2A BFW Circulation Pump 1A	1.00 ea							-	-	1,496.00	1,496	1,496
Pump 2A, FT Reactor 2A BFW Circulation " 361 gpm, 139 ft TDH	1.00 ea	40.000	40.00	102.09	4,084			-	-	11,048.00	11,048	15,132
Motor, FT Reactor 2A BFW Circulation Pump 2A	1.00 ea							-	-	1,496.00	1,496	1,496
Pump 1B, FT Reactor 2B BFW Circulation " 361 gpm, 139 ft TDH	1.00 ea	40.000	40.00	102.09	4,084			-	-	11,048.00	11,048	15,132
Motor, FT Reactor 2B BFW Circulation Pump 1B	1.00 ea							-	-	1,496.00	1,496	1,496
Pump 2B, FT Reactor 2B BFW Circulation " 361 gpm, 139 ft TDH	1.00 ea	40.000	40.00	102.09	4,084			-	-	11,048.00	11,048	15,132
Motor, FT Reactor 2B BFW Circulation Pump 2B	1.00 ea							-	-	1,496.00	1,496	1,496
Flash Tank 1, Degassing, 4' diax8' CS	1.00 ea	20.000	20.00	102.09	2,042			-	-	10,000.00	10,000	12,042
Blower #1, Degassing Vent, 5 acfm, 20"wc, 85 degF	1.00 ea	20.000	20.00	102.09	2,042			-	-	2,859.00	2,859	4,901
Motor, Degassing Vent Blower 1	1.00 ea							-	-	-	-	
Flash Tank 2, Degassing, 4' diax10' CS	1.00 ea	20.000	20.00	102.09	2,042			-	-	11,000.00	11,000	13,042
Blower #2, Degassing Vent, 80 acfm, 20"wc, 91 degF	1.00 ea	20.000	20.00	102.09	2,042			-	-	2,859.00	2,859	4,901
Motor, Degassing Vent Blower 2	1.00 ea							-	-			
** unassigned **			***7,890.00***		***805,506***		***92,196***					
01005			***7,890.00***		***805,506***		***92,196***					
010-Equipment			**7,890.00**		**805,506**		**92,196**					
020-Structural												
Buildings												
Compressor Building												
Compressor Building - Pre-engineered (Ideal Building Construction, LLC)	1.00 LS	458.000	458.00	51.58	23,623	204,627.34	204,627	-	-	-	-	228,250
Foundations	46.80 CY	14.000	655.20	51.58	33,794	1,070.24	50,087	-	-	-	-	83,881
Piers	10.10 CY	14.850	149.99	51.58	7,736	573.80	5,795	-	-	-	-	13,531
Grade Slab W/Turndown	174.80 CY	2.700	471.96	51.58	24,343	407.79	71,281	-	-	-	-	95,624
Building Wall	25.11 CY	14.000	351.56	51.58	18,132	1,070.24	26,875	-	-	-	-	45,007
12" U-Drain	165.00 LF	0.693	114.28	51.58	5,894	117.66	19,414	-	-	-	-	25,309
12" U-Drain (Between Compressor and GTL Buildings)	35.00 LF	0.693	24.24	51.58	1,250	117.66	4,118	-	-	-	-	5,368
Lighting and Building Services	4,150.00 SF	0.040	166.00	51.58	8,562	8.06	33,445	-	-	-	-	42,007
Metal Siding Fascia (1 1/2" Deep Profile Non-insulated)	830.00 SF					11.44	9,498	-	-	-	-	9,498
Metal Roofing (1 1/2" Deep Profile Non-insulated)	2,990.00 SF					10.88	32,530	-	-	-	-	32,530
Flashing	420.00 SF					6.64	2,789	-	-	-	-	2,789
HVAC	1.00 ea							-	-	-	-	
Compressor Building - Sidewall Ventilation Fan, F-17	1.00 ea	4.000	4.00	102.10	408			-	-	5,200.00	5,200	5,608

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Compressor Building												
Motor, F-17	1.00 ea							-	-	-	-	
Compressor Building - Sidewall Ventilation Fan, F-18	1.00 ea	4.000	4.00	102.08	408			-	-	5,200.00	5,200	5,608
Motor, F-18	1.00 ea							-	-	-	-	
Compressor Building - Steam Unit Heater, UH-17	1.00 ea	5.000	5.00	102.10	510			-	-	4,700.00	4,700	5,210
Motor, UH-17	1.00 ea							-	-	-	-	
Compressor Building			***2,404.22***		***124,661***		***460,462***				***15,100***	***600,223***
Buildings			***2,404.22***		***124,661***		***460,462***				***15,100***	***600,223***
Structures												
GTL Tower												
Foundations	163.06 CY	14.000	2,282.84	51.58	117,744	1,070.24	174,514	-	-	-	-	292,258
Grade Slab W/Turndown	241.59 CY	2.700	652.29	51.58	33,644	407.79	98,517	-	-	-	-	132,161
Curb	10.96 CY	13.230	145.04	51.58	7,481	528.68	5,796	-	-	-	-	13,277
W12X53	21.93 TN	18.000	394.73	56.41	22,268	4,967.60	108,937	-	-	-	-	131,205
W12X26	14.14 TN	18.000	254.48	56.41	14,356	4,967.60	70,232	-	-	-	-	84,588
W12X19	7.60 TN	18.000	136.82	56.41	7,718	6,302.18	47,903	-	-	-	-	55,621
W16X36	1.08 TN	18.000	19.44	56.41	1,097	4,967.59	5,365	-	-	-	-	6,462
W10X33	5.20 TN	18.000	93.61	56.41	5,281	4,967.60	25,834	-	-	-	-	31,115
W8X24	8.01 TN	18.000	144.22	56.41	8,136	4,967.60	39,800	-	-	-	-	47,936
W8X15	5.85 TN	18.000	105.30	56.41	5,940	6,302.18	36,868	-	-	-	-	42,808
WT7X19	0.97 TN	18.000	17.54	56.41	990	6,302.18	6,141	-	-	-	-	7,131
L3x3x1/2	2.87 TN	18.000	51.65	56.41	2,914	6,302.17	18,084	-	-	-	-	20,998
Stair Platforms	1.10 TN	18.000	19.80	56.41	1,117	6,302.19	6,932	-	-	-	-	8,049
Stringers	1.44 TN	18.000	25.91	56.41	1,461	6,302.17	9,070	-	-	-	-	10,532
Roof Steel:	1.00 EA	20.000	20.00	56.41	1,128	4,940.21	4,940	-	-	-	-	6,068
W12X19 Beams	2.91 TN	18.000	52.33	56.41	2,952	6,302.18	18,320	-	-	-	-	21,272
W12X26 Girders	1.04 TN	18.000	18.72	56.41	1,056	6,302.15	6,554	-	-	-	-	7,610
W8X15 Short Beams	1.20 TN	18.000	21.60	56.41	1,219	6,302.18	7,563	-	-	-	-	8,781
L3x3x1/2 Diagonals	0.84 TN	18.000	15.19	56.41	857	6,302.18	5,317	-	-	-	-	6,174
W10X33 Columns	2.23 TN	18.000	40.10	56.41	2,262	4,967.61	11,065	-	-	-	-	13,327
W10X33 Braces	0.48 TN	18.000	8.66	56.41	488	4,967.61	2,389	-	-	-	-	2,877
Grating 1 1/4" x 3/16"	3,303.65 SF	0.220	726.80	56.41	41,001	19.34	63,898	-	-	-	-	104,900
Handrails	857.13 LF	0.200	171.43	56.41	9,671	88.65	75,984	-	-	-	-	85,655
Treads	87.00 EA	2.890	251.43	56.41	14,184	90.02	7,832	-	-	-	-	22,016
Ladders	12.00 LF	0.500	6.00	56.41	338	299.80	3,598	-	-	-	-	3,936
GTL Tower			***5,675.91***		***305,303***		***861,454***					***1,166,758***
Heat Exch Support Pl												
C10x15.3 Beams	0.57 TN	18.000	10.19	56.41	575	6,302.17	3,568	-	-	-	-	4,143
L3x3x1/2 Horizontals	0.32 TN	18.000	5.76	56.41	325	6,302.20	2,017	-	-	-	-	2,342
W8x18 Columns	0.55 TN	18.000	9.90	56.41	558	6,302.18	3,466	-	-	-	-	4,025
WT5x11 Braces	0.25 TN	18.000	4.50	56.42	254	6,302.10	1,576	-	-	-	-	1,829
C10x15.3 Walkway	0.46 TN	18.000	8.26	56.41	466	6,302.16	2,893	-	-	-	-	3,359
C8x11.5 Walkway	0.13 TN	18.000	2.33	56.42	131	6,302.14	815	-	-	-	-	947
Grating 1 1/4" x 3/16"	206.25 SF	0.220	45.38	56.41	2,560	19.34	3,989	-	-	-	-	6,549
Handrails	94.00 LF	0.200	18.80	56.41	1,061	88.65	8,333	-	-	-	-	9,394
Ladders	21.00 LF	0.500	10.50	56.41	592	299.80	6,296	-	-	-	-	6,888
Heat Exch Support Pl			***115.62***		***6,522***		***32,952***					***39,474***
Heat Exchanger Suppo												
W10x22 Beams	1.63 TN	18.000	29.30	56.41	1,653	6,302.19	10,260	-	-	-	-	11,913
W8x18 Beams	0.36 TN	18.000	6.48	56.41	366	6,302.17	2,269	-	-	-	-	2,634
W8x31 Beams	0.62 TN	18.000	11.16	56.41	630	4,967.58	3,080	-	-	-	-	3,709

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Heat Exchanger Suppo												
L3x3x1/2 Horizontals	0.26 TN	18.000	4.73	56.41	267	6,302.22	1,658	-	-	-	-	1,925
W10x33 Columns	1.16 TN	18.000	20.79	56.41	1,173	4,967.60	5,738	-	-	-	-	6,910
WT5x11 Braces	0.54 TN	18.000	9.80	56.41	553	6,302.18	3,431	-	-	-	-	3,984
Heat Exchanger Suppo			***82.27***		***4,641***		***26,435***					***31,076***
Structures			***5,873.80***		***316,467***		***920,842***					***1,237,309***
020-Structural			**8,278.02**		**441,128**		**1,381,304**				**15,100**	**1,837,532**
030-Piping												
Insulation												
Cal Sil w/alum												
3.0" Dia 2" Calsil w/Alum Jacket	225.00 lf		-	-	-	-	-	19.48	4,383	-	-	4,383
4.0" Dia 2" Calsil w/Alum Jacket	10.00 lf		-	-	-	-	-	21.83	218	-	-	218
6.0" Dia 2" Calsil w/Alum Jacket	144.00 lf		-	-	-	-	-	26.29	3,786	-	-	3,786
8.0" Dia 2" Calsil w/Alum Jacket	25.00 lf		-	-	-	-	-	30.65	766	-	-	766
3.0" Dia 2.5" Calsil w/Alum Jacket	280.00 lf		-	-	-	-	-	22.26	6,233	-	-	6,233
4.0" Dia 2.5" Calsil w/Alum Jacket	165.00 lf		-	-	-	-	-	25.95	4,282	-	-	4,282
6.0" Dia 2.5" Calsil w/Alum Jacket	312.00 lf		-	-	-	-	-	31.98	9,978	-	-	9,978
10.0" Dia 2.5" Calsil w/Alum Jacket	103.00 lf		-	-	-	-	-	42.98	4,427	-	-	4,427
4.0" Dia 3" Calsil w/Alum Jacket	322.00 lf		-	-	-	-	-	30.96	9,969	-	-	9,969
Cal Sil w/alum									***44,042***			***44,042***
Insulation									***44,042***			***44,042***
Process Piping												
Pipe C2F												
A106 Grade B Std Wt-6"	9.00 LF	1.320	11.88	107.59	1,278	78.98	711	-	-	-	-	1,989
Pipe C2F			***11.88***		***1,278***		***711***					***1,989***
Pipe C2G												
A53 Grade B Std Wt-8"	25.00 LF	1.770	44.25	107.59	4,761	107.99	2,700	-	-	-	-	7,461
A53 Grade B Std Wt-6"	290.00 LF	1.320	382.80	107.59	41,185	78.98	22,904	-	-	-	-	64,089
A53 Grade B Std Wt-4"	175.00 LF	1.060	185.50	107.59	19,958	56.41	9,872	-	-	-	-	29,830
A53 Grade B Std Wt-3"	667.00 LF	0.990	660.33	107.59	71,044	66.08	44,078	-	-	-	-	115,122
A53 Grade B Std Wt-Small bore/specialties	1.00 AL	383.146	383.15	107.59	41,222	11,927.39	11,927	-	-	-	-	53,149
Pipe C2G			***1,656.03***		***178,169***		***91,482***					***269,651***
Pipe C3A												
A106 Grade B Sch 40-10"	182.00 LF	2.320	422.24	107.59	45,428	162.79	29,628	-	-	-	-	75,056
A106 Grade B Sch 40-8"	610.00 LF	1.760	1,073.60	107.59	115,507	132.17	80,623	-	-	-	-	196,130
A106 Grade B Sch 40-6"	338.00 LF	1.310	442.78	107.59	47,638	111.21	37,591	-	-	-	-	85,229
A106 Grade B Sch 40-3"	65.00 LF	0.990	64.35	107.59	6,923	69.31	4,505	-	-	-	-	11,428
A106 Grade B Sch 40-Small bore/specialties	1.00 AL	602.247	602.25	107.59	64,795	22,887.71	22,888	-	-	-	-	87,682
Pipe C3A			***2,605.22***		***280,291***		***175,234***					***455,525***
Pipe C3B												
SA106 Grade B Sch 40-14"	116.00 LF	3.420	396.72	107.59	42,682	282.07	32,720	-	-	-	-	75,402
SA106 Grade B Sch 40-8"	96.00 LF	1.760	168.96	107.59	18,178	132.17	12,688	-	-	-	-	30,866
SA106 Grade B Sch 40-4"	108.00 LF	1.050	113.40	107.59	12,201	75.75	8,182	-	-	-	-	20,382
SA106 Grade B Sch 40-3"	50.00 LF	0.990	49.50	107.59	5,326	69.31	3,465	-	-	-	-	8,791
SA106 Grade B Sch 40-Small bore/specialties	1.00 AL	219.101	219.10	107.59	23,573	8,542.58	8,543	-	-	-	-	32,115
Pipe C3B			***947.68***		***101,959***		***65,597***					***167,557***
Pipe S6K												
A312 TP316/316L Sch 10S-8"	16.00 LF	2.320	37.12	107.59	3,994	75.47	1,207	-	-	-	-	5,201
A312 TP316/316L Sch 10S-6"	4,286.00 LF	1.800	7,714.80	107.59	830,022	75.46	323,443	-	-	-	-	1,153,465
A312 TP316/316L Sch 10S-Small bore/specialties	1.00 AL	2,325.843	2,325.84	107.59	250,234	48,676.65	48,677	-	-	-	-	298,910

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Pipe S6K			*10,077.76*		*1,084,250*		*373,327*					*1,457,576*
Valve 14AF												
4"-Gate	9.00 ea	1.780	16.02	107.59	1,724	594.76	5,353	-	-	-	-	7,076
Valve 14AF			*16.02*		*1,724*		*5,353*					*7,076*
Valve 14BF												
8"-Gate	2.00 ea	18.000	36.00	107.59	3,873	2,080.85	4,162	-	-	-	-	8,035
Valve 14BF			*36.00*		*3,873*		*4,162*					*8,035*
Valve 14BW												
2.5"-Gate	2.00 ea	9.000	18.00	107.59	1,937	396.51	793	-	-	-	-	2,730
3"-Gate	8.00 ea	10.500	84.00	107.59	9,037	431.97	3,456	-	-	-	-	12,493
6"-Gate	12.00 ea	15.000	180.00	107.59	19,366	1,021.89	12,263	-	-	-	-	31,629
8"-Gate	18.00 ea	18.000	324.00	107.59	34,859	3,123.69	56,226	-	-	-	-	91,085
4"-Gate	5.00 ea	1.780	8.90	107.59	958	431.96	2,160	-	-	-	-	3,117
Valve 14BW			*614.90*		*66,156*		*74,898*					*141,054*
Valve 14CS												
.5"-Gate	40.00 ea	7.500	300.00	107.59	32,276	49.97	1,999	-	-	-	-	34,275
0.75"-Gate	31.00 ea	7.500	232.50	107.59	25,014	62.86	1,949	-	-	-	-	26,963
1"-Gate	61.00 ea	7.500	457.50	107.59	49,222	67.70	4,129	-	-	-	-	53,351
1.5"-Gate	42.00 ea	7.500	315.00	107.59	33,890	130.56	5,483	-	-	-	-	39,374
2"-Gate	10.00 ea	7.500	75.00	107.59	8,069	159.57	1,596	-	-	-	-	9,665
Valve 14CS			*1,380.00*		*148,472*		*15,156*					*163,628*
Valve 14HW												
6"-Gate	5.00 ea	18.000	90.00	107.59	9,683	1,468.36	7,342	-	-	-	-	17,025
3"-Gate	8.00 ea	1.780	14.24	107.59	1,532	19.83	159	-	-	-	-	1,691
Valve 14HW			*104.24*		*11,215*		*7,500*					*18,715*
Valve 14TS												
0.75"-Gate	2.00 ea	7.500	15.00	107.59	1,614	282.08	564	-	-	-	-	2,178
1"-Gate	12.00 ea	7.500	90.00	107.59	9,683	443.25	5,319	-	-	-	-	15,002
2"-Gate	4.00 ea	7.500	30.00	107.59	3,228	685.02	2,740	-	-	-	-	5,968
Valve 14TS			*135.00*		*14,524*		*8,623*					*23,148*
Valve 24BW												
3"-Gate	6.00 ea	10.500	63.00	107.59	6,778	859.10	5,155	-	-	-	-	11,933
4"-Gate	3.00 ea	12.000	36.00	107.59	3,873	1,165.34	3,496	-	-	-	-	7,369
6"-Gate	2.00 ea	15.000	30.00	107.59	3,228	1,816.52	3,633	-	-	-	-	6,861
8"-Gate	2.00 ea	18.000	36.00	107.59	3,873	2,380.64	4,761	-	-	-	-	8,634
Valve 24BW			*165.00*		*17,752*		*17,045*					*34,797*
Valve 24TS												
1.5"-Globe	2.00 ea	7.500	15.00	107.59	1,614	319.15	638	-	-	-	-	2,252
Valve 24TS			*15.00*		*1,614*		*638*					*2,252*
Valve 34AF												
3"-Check	2.00 ea	10.500	21.00	107.59	2,259	219.21	438	-	-	-	-	2,698
6"-Check	1.00 ea	13.500	13.50	107.59	1,452	757.56	758	-	-	-	-	2,210
Valve 34AF			*34.50*		*3,712*		*1,196*					*4,908*
Valve 34BF												
8"-Check	1.00 ea	18.000	18.00	107.59	1,937	1,063.81	1,064	-	-	-	-	3,000
Valve 34BF			*18.00*		*1,937*		*1,064*					*3,000*
Valve 34CS												
0.75"-Check	1.00 ea	7.500	7.50	107.59	807	37.07	37	-	-	-	-	844
Valve 34CS			*7.50*		*807*		*37*					*844*
Valve 34TS												

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 34TS												
2"-Check	2.00 ea	7.500	15.00	107.59	1,614	253.06	506	-	-	-	-	2,120
Valve 34TS			***15.00***		***1,614***		***506***					***2,120***
Valve 37ER												
0.75"-Check	1.00 ea	7.500	7.50	107.59	807	312.69	313	-	-	-	-	1,120
Valve 37ER			***7.50***		***807***		***313***					***1,120***
Valve 54BS												
1"-Plug	2.00 ea	5.000	10.00	107.59	1,076	304.63	609	-	-	-	-	1,685
1.5"-Plug	4.00 ea	5.000	20.00	107.59	2,152	428.74	1,715	-	-	-	-	3,867
Valve 54BS			***30.00***		***3,228***		***2,324***					***5,552***
Valve 64BS												
.5"-Ball	2.00 ea	5.000	10.00	107.59	1,076	85.43	171	-	-	-	-	1,247
0.75"-Ball	6.00 ea	5.000	30.00	107.59	3,228	114.44	687	-	-	-	-	3,914
1"-Ball	3.00 ea	5.000	15.00	107.59	1,614	133.78	401	-	-	-	-	2,015
1.5"-Ball	10.00 ea	5.000	50.00	107.59	5,379	248.22	2,482	-	-	-	-	7,862
2"-Ball	11.00 ea	5.000	55.00	107.59	5,917	322.36	3,546	-	-	-	-	9,463
Valve 64BS			***160.00***		***17,214***		***7,287***					***24,501***
Valve 71AA												
10"-B'fly	4.00 ea	18.000	72.00	107.59	7,746	1,629.55	6,518	-	-	-	-	14,265
3"-B'fly	4.00 ea	7.500	30.00	107.59	3,228	480.32	1,921	-	-	-	-	5,149
4"-B'fly	1.00 ea	10.500	10.50	107.59	1,130	633.43	633	-	-	-	-	1,763
Valve 71AA			***112.50***		***12,104***		***9,073***					***21,177***
Valve 74AA												
3"-B'fly	6.00 ea	7.500	45.00	107.59	4,841	610.88	3,665	-	-	-	-	8,507
4"-B'fly	3.00 ea	10.500	31.50	107.59	3,389	688.24	2,065	-	-	-	-	5,454
6"-B'fly	10.00 ea	13.500	135.00	107.59	14,524	965.47	9,655	-	-	-	-	24,179
Valve 74AA			***211.50***		***22,755***		***15,385***					***38,140***
Valve HOLD												
8"-3-way	2.00 ea	27.000	54.00	107.59	5,810	19.82	40	-	-	-	-	5,849
Valve HOLD			***54.00***		***5,810***		***40***					***5,849***
Valve VEND												
.5"-Gate	7.00 ea	7.500	52.50	107.59	5,648	19.82	139	-	-	-	-	5,787
0.75"-Gate	39.00 ea	7.500	292.50	107.59	31,470	19.83	773	-	-	-	-	32,243
1"-Gate	7.00 ea	7.500	52.50	107.59	5,648	19.82	139	-	-	-	-	5,787
1.5"-3-way	4.00 ea	7.500	30.00	107.59	3,228	19.83	79	-	-	-	-	3,307
2"-Gate	6.00 ea	7.500	45.00	107.59	4,841	19.83	119	-	-	-	-	4,960
4"-B'fly	1.00 ea	13.500	13.50	107.59	1,452	19.84	20	-	-	-	-	1,472
6"-Gate	1.00 ea	18.000	18.00	107.59	1,937	19.84	20	-	-	-	-	1,956
6"-Stop Check	1.00 ea	18.000	18.00	107.59	1,937	19.85	20	-	-	-	-	1,956
8"-Gate	1.00 ea	21.000	21.00	107.59	2,259	19.83	20	-	-	-	-	2,279
8"-Stop Check	1.00 ea	21.000	21.00	107.59	2,259	19.82	20	-	-	-	-	2,279
-Check	5.00 ea	21.000	105.00	107.59	11,297	19.82	99	-	-	-	-	11,396
-Gate	13.00 ea	21.000	273.00	107.59	29,372	19.83	258	-	-	-	-	29,629
Valve VEND			***942.00***		***101,348***		***1,705***					***103,053***
Process Piping			***19,357.23***		***2,082,612***		***878,655***					***2,961,266***
030-Piping			**19,357.23**		**2,082,612**		**878,655**		**44,042**			**3,005,308**
040-Instrumentation												
DCS/PLC Equipment												
**** unassigned ****												
Project Control System (Proportioned Cost)	1.00 LT	120.000	120.00	95.74	11,489	0.00	0	-	-	312,478.00	312,478	323,967

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **			*120.00*		*11,489*						*312,478*	*323,967*
DCS/PLC Equipment			*120.00*		*11,489*						*312,478*	*323,967*
Instruments (field)												
** unassigned **												
Field Instruments (not vendor supplied)	1.00 LT	734.000	734.00	95.74	70,274	21,275.89	21,276	-	-	661,184.00	661,184	752,734
** unassigned **			*734.00*		*70,274*		*21,276*				*661,184*	*752,734*
Instruments (field)			*734.00*		*70,274*		*21,276*				*661,184*	*752,734*
Instr. Tubing & Wiri												
** unassigned **												
Analog I/O-126	1.00 LS	2,846.000	2,846.00	95.74	272,480	154,492.01	154,492	-	-	-	-	426,972
Digital I/O-50	1.00 LS	639.000	639.00	95.74	61,179	37,065.18	37,065	-	-	-	-	98,244
Motor Control-28	1.00 LS	83.400	83.40	95.74	7,985	3,468.61	3,469	-	-	-	-	11,453
120V Power-6	1.00 LS	76.000	76.00	95.74	7,276	4,446.99	4,447	-	-	-	-	11,723
Air Supply, Tubing from Header-13	1.00 LS	176.000	176.00	95.74	16,851	14,548.20	14,548	-	-	-	-	31,399
** unassigned **			*3,820.40*		*365,771*		*214,021*					*579,792*
Instr. Tubing & Wiri			*3,820.40*		*365,771*		*214,021*					*579,792*
040-Instrumentation			**4,674.40**		**447,534**		**235,297**				**973,662**	**1,656,493**
050-Electrical												
Grounding												
** unassigned **												
1/C #4/0 bare copper grounding conductor - Class B stranding	1,575.00 Lf	0.053	83.95	95.74	8,037	5.83	9,190	-	-	-	-	17,227
Compression Type connection, Copper wire to Copper wire connector	48.00 Ea	1.333	63.98	95.74	6,126	35.43	1,701	-	-	-	-	7,826
Compression type connection, Heavy Duty with single bolt hole for connection to serviit post or Equipment Grounding Bus Bar	39.00 Ea	1.333	51.99	95.74	4,977	35.43	1,382	-	-	-	-	6,359
Copperclad Steel Ground Rod 3/4" dia. X 10'L., including a compression type connector for grounding conductor.	10.00 Ea	2.190	21.90	95.74	2,097	91.28	913	-	-	-	-	3,010
Compression type connection for grounding conductor to structural reinforcement bar in concrete	14.00 Ea	1.333	18.66	95.74	1,787	35.43	496	-	-	-	-	2,283
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	19.00 Ea	1.120	21.28	95.74	2,037	35.43	673	-	-	-	-	2,711
** unassigned **			*261.76*		*25,061*		*14,354*					*39,415*
Grounding			*261.76*		*25,061*		*14,354*					*39,415*
Heat Tracing												
** unassigned **												
Electric heat tracing	1,445.00 Lf							27.00	39,015	-	-	39,015
** unassigned **									*39,015*			*39,015*
Heat Tracing									*39,015*			*39,015*
Control Equipment												
** unassigned **												
4250 HP Soft Starter- 13.8 KV	1.00 LS	120.000	120.00	95.74	11,489	16,118.09	16,118	-	-	160,450.00	160,450	188,057
3550 HP Soft Starter- 13.8 KV	1.00 EA	120.000	120.00	95.74	11,489	16,118.09	16,118	-	-	160,450.00	160,450	188,057
** unassigned **			*240.00*		*22,978*		*32,236*				*320,900*	*376,114*
Control Equipment			*240.00*		*22,978*		*32,236*				*320,900*	*376,114*
Power Wiring												
** unassigned **												
Elect Heat Trace	1,445.00 lf		-	-	-	-	-	27.00	39,015	-	-	39,015

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	1,050.00 Lf	0.296	310.80	95.74	29,756	23.21	24,371	-	-	-	-	54,127
Power Wiring to Equipment	1.00 ls	2,740.000	2,740.00	95.74	262,332	96,708.59	96,709	-	-	-	-	359,040
** unassigned **			*3,050.80*		*292,088*		*121,079*		*39,015*			*452,182*
Power Wiring			*3,050.80*		*292,088*		*121,079*		*39,015*			*452,182*
050-Electrical			**3,552.56**		**340,128**		**167,669**		**78,030**		**320,900**	**906,727**
060-Sitework												
Outdoor Lighting												
** unassigned **												
150W HPS structure mounted fixture (Petrolux2)	6.00 EA	8.000	48.00	95.74	4,596	1,071.85	6,431	-	-	-	-	11,027
UG Conduit/wire	400.00 LF	0.135	54.00	95.74	5,170	13.01	5,203	-	-	-	-	10,373
** unassigned **			*102.00*		*9,766*		*11,634*					*21,400*
Outdoor Lighting			*102.00*		*9,766*		*11,634*					*21,400*
060-Sitework			102.00		9,766		11,634					21,400
04-Gas to Liquids			***43,854.20***		***4,126,673***		***2,766,754***		***122,072***		***17,912,375***	***24,927,874***
05-Product Storage												
010-Equipment												
01005												
** unassigned **												
Tank, HFTL Product Storage Tank, " Field Fabricated." [redacted]	1.00 ea					0.00	0	-	-	[redacted]		
Heater, External Steam Plate	1.00 ea							-	-	11,000.00	11,000	11,000
Pressure/vacuum Relief Valve	1.00 ea							-	-	19,000.00	19,000	19,000
Tank, MFTL Product Storage Tank, " Shop Fabricated." [redacted]	1.00 ea	80.000	80.00	102.09	8,167			-	-	[redacted]		
Freight for 155-2295	1.00 ea							-	-	12,000.00	12,000	12,000
Heater, External Steam Plate	1.00 ea							-	-	11,000.00	11,000	11,000
Pressure/vacuum Relief Valve	1.00 ea	80.000	80.00	102.09	8,167			-	-	19,000.00	19,000	27,167
Tank, LFTL Product Storage Tank, " Shop Fabricated." [redacted]	1.00 ea	40.000	40.00	102.09	4,084			-	-	[redacted]		
Freight for 155-2248	1.00 ea							-	-	10,000.00	10,000	10,000
Pressure/vacuum Relief Valve	1.00 ea							-	-	19,000.00	19,000	19,000
Blower, Tank Vent Gas, 24 acfm, 20" wc, 163 DegF	1.00 ea	20.000	20.00	102.09	2,042			-	-	3,154.00	3,154	5,196
Motor, Tank Vent Gas Blower	1.00 ea							-	-	-	-	
Pump, HFTL Product Loading Pump, Goulds 3196 Mti, Size 2 x 3-10. Goulds Pumps, Senneca Falls, New York	1.00 ea	30.000	30.00	102.09	3,063			-	-	4,987.00	4,987	8,050
Motor, HFTL Product Loading Pump	1.00 ea							-	-	-	-	
Pump, MFTL Product Loading Pump, Goulds 3196 Mti, Size 2 x 3-10. Goulds Pumps, Senneca Falls, New York	1.00 ea	30.000	30.00	102.09	3,063			-	-	4,987.00	4,987	8,050
Motor, MFTL Product Loading Pump	1.00 ea							-	-	-	-	
Pump, LFTL Product Loading Pump, Goulds 3196 Mti, Size 2 x 3-10. Goulds Pumps, Senneca Falls, New York	1.00 ea	30.000	30.00	102.09	3,063			-	-	4,987.00	4,987	8,050
Motor, LFTL Product Loading Pump	1.00 ea							-	-	-	-	
Misc, HFTL Product Truck Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, MFTL Product Truck Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042

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** unassigned **												
Misc, LFTL Product Truck Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, HFTL Rail Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, MFTL Rail Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, LFTL Rail Loading Arm	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, Rail Rack	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
Misc, Truck Rack	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
** unassigned **			***470.00***		***47,983***						***499,215***	***547,198***
01005			***470.00***		***47,983***						***499,215***	***547,198***
010-Equipment			**470.00**		**47,983**						**499,215**	**547,198**
020-Structural												
Buildings												
Pump Building												
W10x22 Columns	1.21 TN	18.000	21.78	125.37	2,731	4,967.59	6,011	-	-	-	-	8,741
W10x22 Main Beams	0.69 TN	18.000	12.42	125.37	1,557	4,967.58	3,428	-	-	-	-	4,985
W8x15 Beams	0.98 TN	18.000	17.64	125.37	2,211	6,302.17	6,176	-	-	-	-	8,388
L4x4x3/8 Roof Diaganals	0.45 TN	18.000	8.10	125.37	1,015	6,302.10	2,836	-	-	-	-	3,851
WT5x11 Braces	0.30 TN	18.000	5.40	125.37	677	6,302.23	1,891	-	-	-	-	2,568
Girts & Sag Rods	2.45 TN	27.700	67.87	125.37	8,508	6,302.17	15,440	-	-	-	-	23,948
C10x15.3 Stringers	0.27 TN	22.000	6.03	125.37	757	6,302.20	1,729	-	-	-	-	2,485
C10x15.3 Beams	0.22 TN	18.000	3.96	125.37	496	6,302.20	1,386	-	-	-	-	1,883
L3x3x1/4 Diagonals, Knee Brace, Post	0.05 TN	18.000	0.90	125.38	113	6,302.00	315	-	-	-	-	428
Grating 1 1/4" x 3/16"	50.50 SF	0.220	11.11	125.37	1,393	19.34	977	-	-	-	-	2,370
Handrails	49.60 LF	0.200	9.92	125.37	1,244	88.65	4,397	-	-	-	-	5,641
Stair Treads	12.00 EA	2.890	34.68	125.37	4,348	90.02	1,080	-	-	-	-	5,428
Metal Siding	610.00 SF					14.91	9,095	-	-	-	-	9,095
Roof Membrane (60 mil-fully adhered)	226.00 SF	0.016	3.62	125.37	453	1.55	350	-	-	-	-	803
Roof Rigid Insulation (2 layers-1 1/2" poly)	453.00 SF	0.006	2.72	125.37	341	1.00	453	-	-	-	-	793
1 1/2" Metal Deck (20 ga)	226.00 SF	0.007	1.58	125.35	198	2.10	474	-	-	-	-	672
Flashing	45.00 SF					6.64	299	-	-	-	-	299
Pair Doors/Frame (3' x 7' H.M.) w/2' x 6' Removable Transom	1.00 PR	22.000	22.00	125.37	2,758	4,513.07	4,513	-	-	-	-	7,271
Door Hardware	2.00 EA	6.000	12.00	125.37	1,504	644.72	1,289	-	-	-	-	2,794
Aluminum Threshold, 6'-0"	1.00 EA	1.300	1.30	125.37	163	72.53	73	-	-	-	-	236
Pump Building			***243.03***		***30,467***		***62,210***					***92,678***
Buildings			***243.03***		***30,467***		***62,210***					***92,678***
Structures												
Sump												
Sump	5.89 CY	9.930	58.49	103.67	6,064	959.03	5,649	-	-	-	-	11,712
Stair Pads	0.87 CY	8.200	7.13	103.67	740	715.64	623	-	-	-	-	1,362
Sump			***65.62***		***6,803***		***6,271***					***13,074***
Storage & Loading												
Grade Slab W/Turndown	281.72 CY	2.700	760.64	103.67	78,857	407.79	114,882	-	-	-	-	193,739
Column Piers	0.46 CY	14.850	6.81	103.67	706	573.82	263	-	-	-	-	969
Wall	32.02 CY	14.000	448.31	103.67	46,477	1,070.24	34,272	-	-	-	-	80,749
Storage & Loading			***1,215.76***		***126,040***		***149,417***					***275,456***
Truck & Rail Loading												
Containment Area	131.96 CY	13.230	1,745.82	103.67	180,992	528.67	69,763	-	-	-	-	250,755
Loading Platform Foundation	71.70 CY	14.000	1,003.85	103.67	104,071	1,070.24	76,740	-	-	-	-	180,811

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Truck & Rail Loading			*2,749.67*		*285,063*		*146,504*					*431,567*
Structures			*4,031.06*		*417,906*		*302,192*					*720,098*
020-Structural			**4,274.08**		**448,373**		**364,402**					**812,775**
030-Piping												
Insulation												
** unassigned **												
Pipe Painting	1.00 EA					1,611.83	1,612	-	-	-	-	1,612
** unassigned **							*1,612*					*1,612*
Insulation							*1,612*					*1,612*
Insulation												
Cal Sil w/alum												
3.0" Dia 2.5" Calsil w/Alum Jacket	32.00 lf		-	-	-	-	-	22.26	712	-	-	712
4.0" Dia 2.5" Calsil w/Alum Jacket	108.00 lf		-	-	-	-	-	25.95	2,803	-	-	2,803
3.0" Dia 3" Calsil w/Alum Jacket	28.00 lf		-	-	-	-	-	26.25	735	-	-	735
4.0" Dia 3" Calsil w/Alum Jacket	115.00 lf		-	-	-	-	-	30.96	3,560	-	-	3,560
10.0" Dia 3" Calsil w/Alum Jacket	24.00 lf		-	-	-	-	-	50.05	1,201	-	-	1,201
Cal Sil w/alum									*9,012*			*9,012*
Insulation									*9,012*			*9,012*
Process Piping												
Pipe C2F												
A106 Grade B Std Wt-10"	24.00 LF	2.320	55.68	107.59	5,991	157.96	3,791	-	-	-	-	9,781
A106 Grade B Std Wt-4"	105.00 LF	1.060	111.30	107.59	11,975	59.64	6,262	-	-	-	-	18,236
A106 Grade B Std Wt-3"	28.00 LF	0.990	27.72	107.59	2,982	67.70	1,895	-	-	-	-	4,878
A106 Grade B Std Wt-Small bore/specialties	1.00 AL	59.551	59.55	107.59	6,407	1,773.00	1,773	-	-	-	-	8,180
Pipe C2F			*254.25*		*27,354*		*13,721*					*41,076*
Pipe C3A												
A106 Grade B Sch 40-4"	118.00 LF	1.050	123.90	107.59	13,330	75.76	8,939	-	-	-	-	22,269
A106 Grade B Sch 40-3"	32.00 LF	0.990	31.68	107.59	3,408	69.31	2,218	-	-	-	-	5,626
A106 Grade B Sch 40-Small bore/specialties	1.00 AL	48.314	48.31	107.59	5,198	1,611.80	1,612	-	-	-	-	6,810
Pipe C3A			*203.89*		*21,937*		*12,769*					*34,705*
Valve 14AF												
3"-Gate	2.00 ea	10.500	21.00	107.59	2,259	375.55	751	-	-	-	-	3,010
4"-Gate	5.00 ea	12.000	60.00	107.59	6,455	481.93	2,410	-	-	-	-	8,865
Valve 14AF			*81.00*		*8,715*		*3,161*					*11,875*
Valve 14BW												
4"-Gate	3.00 ea	12.000	36.00	107.59	3,873	622.15	1,866	-	-	-	-	5,740
Valve 14BW			*36.00*		*3,873*		*1,866*					*5,740*
Valve 14CS												
1 1/2"-Gate	18.00 ea	7.500	135.00	107.59	14,524	130.56	2,350	-	-	-	-	16,874
1"-Gate	17.00 ea	7.500	127.50	107.59	13,718	67.70	1,151	-	-	-	-	14,868
Valve 14CS			*262.50*		*28,242*		*3,501*					*31,743*
Valve 34AF												
3"-Check	1.00 ea	7.500	7.50	107.59	807	219.22	219	-	-	-	-	1,026
4"-Check	1.00 ea	10.500	10.50	107.59	1,130	328.81	329	-	-	-	-	1,458
Valve 34AF			*18.00*		*1,937*		*548*					*2,485*
Valve 34BF												
4"-Check	1.00 ea	12.000	12.00	107.59	1,291	641.52	642	-	-	-	-	1,933
Valve 34BF			*12.00*		*1,291*		*642*					*1,933*
Valve 46CA												
3"-Gate	3.00 ea	1.780	5.34	107.59	575	1,324.91	3,975	-	-	-	-	4,549

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 46CA			*5.34*		*575*		*3,975*					*4,549*
Process Piping			*872.99*		*93,923*		*40,182*					*134,105*
030-Piping			**872.99**		**93,923**		**41,794**		**9,012**			**144,729**
040-Instrumentation												
DCS/PLC Equipment												
** unassigned **												
Project Control System (Proportioned Cost)	1.00 LT	20.000	20.00	95.74	1,915			-	-	6,377.00	6,377	8,292
** unassigned **			*20.00*		*1,915*						*6,377*	*8,292*
DCS/PLC Equipment			*20.00*		*1,915*						*6,377*	*8,292*
Instruments (field)												
** unassigned **												
Field Instruments (not vendor supplied)	1.00 LT	76.000	76.00	95.74	7,276	9,670.85	9,671	-	-	68,309.00	68,309	85,256
** unassigned **			*76.00*		*7,276*		*9,671*				*68,309*	*85,256*
Instruments (field)			*76.00*		*7,276*		*9,671*				*68,309*	*85,256*
Instr. Tubing & Wiri												
** unassigned **												
Analog I/O-8	1.00 LS	180.000	180.00	95.74	17,233	9,812.72	9,813	-	-	-	-	27,046
120V Power-2	1.00 LS	26.000	26.00	95.74	2,489	1,482.86	1,483	-	-	-	-	3,972
** unassigned **			*206.00*		*19,723*		*11,296*					*31,018*
Instr. Tubing & Wiri			*206.00*		*19,723*		*11,296*					*31,018*
040-Instrumentation			**302.00**		**28,914**		**20,966**				**74,686**	**124,566**
050-Electrical												
Grounding												
** unassigned **												
1/C #4/0 bare copper grounding conductor - Class B stranding	620.00 Lf	0.053	33.05	95.74	3,164	5.83	3,618	-	-	-	-	6,781
Compression Type connection, Copper wire to Copper wire connector	14.00 EA	1.333	18.66	95.74	1,787	35.43	496	-	-	-	-	2,283
Compression type connection, Heavy Duty with single bolt hole for connection to serviit post or Equipment Grounding Bus Bar	6.00 EA	1.333	8.00	95.74	766	35.43	213	-	-	-	-	978
Copperclad Steel Ground Rod 3/4" dia. X 10'L., including a compression type connector for grounding conductor.	4.00 EA	2.190	8.76	95.74	839	91.27	365	-	-	-	-	1,204
Compression type connection for grounding conductor to structural reinforcement bar in concrete	5.00 EA	1.333	6.67	95.74	638	35.43	177	-	-	-	-	815
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	3.00 EA	1.120	3.36	95.74	322	35.43	106	-	-	-	-	428
** unassigned **			*78.49*		*7,515*		*4,975*					*12,489*
Grounding			*78.49*		*7,515*		*4,975*					*12,489*
Heat Tracing												
** unassigned **												
Electric heat tracing	307.00 Lf					0.00	0	27.00	8,289	-	-	8,289
** unassigned **									*8,289*			*8,289*
Heat Tracing									*8,289*			*8,289*
Power Wiring												
** unassigned **												
Elect Heat Trace	717.00 lf		-	-	-	-	-	27.00	19,359	-	-	19,359
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	400.00 Lf	0.296	118.40	95.74	11,336	23.21	9,284	-	-	-	-	20,620

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Power Wiring to Equipment	1.00 ls	170.000	170.00	95.74	16,276	6,447.22	6,447	-	-	-	-	22,723
**** unassigned ****			***288.40***		***27,612***		***15,731***		***19,359***			***62,702***
Power Wiring			***288.40***		***27,612***		***15,731***		***19,359***			***62,702***
050-Electrical			**366.89**		**35,127**		**20,706**		**27,648**			**83,481**
060-Sitework												
Outdoor Lighting												
** unassigned **												
150W HPS structure mounted fixture (Petrolux2)	12.00 EA	8.000	96.00	95.74	9,191	1,071.86	12,862	-	-	-	-	22,053
400W HPS Mongoose lignt fixture- mounted on wooden pole	1.00 EA	25.500	25.50	95.74	2,441	2,917.38	2,917	-	-	-	-	5,359
UG Conduit/wire	1,000.00 LF	0.135	135.00	95.74	12,925	13.01	13,007	-	-	-	-	25,932
**** unassigned ****			***256.50***		***24,558***		***28,787***					***53,345***
Outdoor Lighting			***256.50***		***24,558***		***28,787***					***53,345***
060-Sitework			**256.50**		**24,558**		**28,787**					**53,345**
05-Product Storage			***6,542.46***		***678,878***		***476,655***		***36,660***		***573,901***	***1,766,094***
06-Balance of Plant												
010-Equipment												
01005												
** unassigned **												
COOLING TOWER	1.00 ea	1.000	1.00	102.09	102	31,107.93	31,108	-	-	-	-	31,210
Cooling Tower" 74 F wet bulb" Water Inlet 124o F, Outlet 84o F" 5450 gpm	1.00 ea							-	-	230,202.00	230,202	230,202
Fan, Cooling Tower	1.00 ea	1.000	1.00	102.09	102			-	-	-	-	102
Motor, Cooling Tower Fan	1.00 ea							-	-	-	-	
Pump No.1 , Cooling Water Circulation " 6000 gpm, 75 ft TDH	1.00 ea	80.000	80.00	102.09	8,167			-	-	90,746.00	90,746	98,913
Motor, Cooling Water Circulation Pump No.1	1.00 ea							-	-	18,300.00	18,300	18,300
Pump No.2 , Cooling Water Circulation " 6000 gpm, 75 ft TDH	1.00 ea	80.000	80.00	102.09	8,167			-	-	90,746.00	90,746	98,913
Motor, Cooling Water Circulation Pump No. 2	1.00 ea							-	-	18,300.00	18,300	18,300
Pump No. 1, Raw Water	1.00 ea	70.000	70.00	102.09	7,146			-	-	14,414.00	14,414	21,560
Motor, Raw Water Pump No. 1	1.00 ea							-	-	4,487.00	4,487	4,487
Pump No. 2, Raw Water	1.00 ea	70.000	70.00	102.09	7,146			-	-	14,414.00	14,414	21,560
Motor, Raw Water Pump No. 2	1.00 ea							-	-	4,487.00	4,487	4,487
Pump No. 1, Filtered Water	1.00 ea	30.000	30.00	102.09	3,063			-	-	4,864.00	4,864	7,927
Motor, Filtered Water Pump No. 1	1.00 ea							-	-	675.00	675	675
Pump No. 2, Filtered Water	1.00 ea	30.000	30.00	102.09	3,063			-	-	4,864.00	4,864	7,927
Motor, Filtered Water Pump No. 2	1.00 ea							-	-	675.00	675	675
Pump, Cooling Water Return	1.00 ea	80.000	80.00	102.09	8,167			-	-	15,225.00	15,225	23,392
Motor, Cooling Water Return Pump	1.00 ea							-	-	6,835.00	6,835	6,835
Pump No. 1, MFTL Recirc	1.00 ea	35.000	35.00	102.09	3,573			-	-	5,801.00	5,801	9,374
Motor, MFTL Recirc Pump No. 1	1.00 ea							-	-	1,030.00	1,030	1,030
Pump No. 2, MFTL Recirc	1.00 ea	35.000	35.00	102.09	3,573			-	-	5,801.00	5,801	9,374
Motor, MFTL Recirc Pump No. 2	1.00 ea							-	-	1,030.00	1,030	1,030
Pump No. 1, HFTL Recirc	1.00 ea	30.000	30.00	102.09	3,063			-	-	7,489.00	7,489	10,552
Motor, HFTL Recirc Pump No. 1	1.00 ea							-	-	535.00	535	535
Pump No. 2, HFTL Recirc	1.00 ea	30.000	30.00	102.09	3,063			-	-	7,489.00	7,489	10,552
Motor, HFTL Recirc Pump No. 2	1.00 ea							-	-	535.00	535	535
Pump No. 1, Service Water	1.00 ea	35.000	35.00	102.09	3,573			-	-	5,775.00	5,775	9,348

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
Motor, Service Water Pump No. 1	1.00 ea							-	-	1,030.00	1,030	1,030
Pump No. 2, Service Water	1.00 ea	35.000	35.00	102.09	3,573			-	-	5,775.00	5,775	9,348
Motor, Service Water Pump No. 2	1.00 ea							-	-	1,030.00	1,030	1,030
Chemical Treatment Package, Cooling Water, Nalco supplied Unit and Chemicals. Will include injection pump	1.00 ea	20.000	20.00	102.09	2,042			-	-	-	-	2,042
AUXILARY BOILER	1.00 ea							-	-	-	-	
Boiler, Package" 60,000 lb/hr, 1250 psig, 900F" Nat. gas / Tail gas	1.00 ea	2,400.000	2,400.00	102.09	245,021			-	-	2,600,000.00	2,600,000	2,845,021
Drum, Steam	1.00 ea							-	-	-	-	
Drum, Mud	1.00 ea							-	-	-	-	
Fan, FD	1.00 ea							-	-	-	-	
Motor, FD Fan	1.00 ea							-	-	-	-	
Burner" 90 mmbtu/hr" Nat Gas or Tail Gas"	1.00 ea							-	-	-	-	
FLARE	1.00 ea							-	-	-	-	
Flare, Enclosed, John Zink Co. LLC, Tulsa, Oklahoma	1.00 ea	1,000.000	1,000.00	102.09	102,092			-	-	1,280,000.00	1,280,000	1,382,092
Vessel, Flare KO Drum" 144" Dia x 16' lg, Vertical on Skirt" 15 PSIG, 430¦F	1.00 ea	160.000	160.00	102.09	16,335			-	-	71,084.00	71,084	87,419
**** unassigned ****			***4,222.00***		***431,033***		***31,108***				***4,513,638***	***4,975,779***
01005			***4,222.00***		***431,033***		***31,108***				***4,513,638***	***4,975,779***
010-Equipment			**4,222.00**		**431,033**		**31,108**				**4,513,638**	**4,975,779**
020-Structural												
Foundations												
Transformers												
Foundations	151.59 CY	7.080	1,073.25	103.67	111,266	988.04	149,776	-	-	-	-	261,042
Curbs	11.00 CY	13.230	145.53	103.67	15,087	528.67	5,815	-	-	-	-	20,903
Transformers			***1,218.78***		***126,353***		***155,592***					***281,945***
Diesel Generator												
Foundations	44.81 CY	7.080	317.29	103.67	32,894	988.04	44,279	-	-	-	-	77,173
Diesel Generator			***317.29***		***32,894***		***44,279***					***77,173***
Substation Expansion												
Column Foundation	17.11 CY	7.080	121.15	103.67	12,559	988.04	16,906	-	-	-	-	29,466
Column Pier	3.91 CY	14.850	58.08	103.67	6,021	573.80	2,244	-	-	-	-	8,265
Breaker	3.85 CY	7.080	27.26	103.67	2,826	988.04	3,804	-	-	-	-	6,630
Transformer	43.63 CY	7.080	308.92	103.67	32,027	988.04	43,111	-	-	-	-	75,138
Transformer Curb	0.98 CY	13.230	12.94	103.67	1,341	528.67	517	-	-	-	-	1,858
Substation Expansion			***528.34***		***54,774***		***66,583***					***121,357***
Foundations			***2,064.42***		***214,021***		***266,454***					***480,475***
Structures:												
T Poles												
Foundations	10.00 CY	7.080	70.80	103.67	7,340	573.81	5,738	-	-	-	-	13,078
Steel	6.00 TN	13.000	78.00	103.67	8,086	3,626.57	21,759	-	-	-	-	29,846
T Poles			***148.80***		***15,426***		***27,497***					***42,924***
Cooling Tower:												
Mat Foundations	29.63 CY	3.800	112.59	103.67	11,673	352.99	10,459	-	-	-	-	22,132
Pedestal	10.11 CY	8.450	85.44	103.67	8,858	622.16	6,291	-	-	-	-	15,148
Grade Slab W/Turndown	44.24 CY	2.700	119.44	103.67	12,382	407.79	18,039	-	-	-	-	30,421
Cooling Tower:			***317.47***		***32,913***		***34,789***					***67,701***
Structures:			***466.27***		***48,339***		***62,286***					***110,625***
Pipe Bridges:												

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Steel-												
East Pipe Bridge	208.60 TN	14.800	3,087.22	103.67	320,057	3,384.80	706,056	-	-	-	-	1,026,114
West Pipe Bridge	58.89 TN	14.800	871.62	103.67	90,363	3,384.80	199,343	-	-	-	-	289,705
Compressor Building Pipe Bridge, 65'	8.36 TN	14.800	123.73	103.67	12,827	3,384.80	28,297	-	-	-	-	41,124
Reformer Building Pipe Bridge, 120'	15.46 TN	14.800	228.73	103.67	23,713	3,384.80	52,312	-	-	-	-	76,025
Steel-			***4,311.31***		***446,960***		***986,008***					***1,432,968***
Concrete-												
Tower Foundations	633.60 CY	7.080	4,485.89	103.67	465,059	317.53	201,185	-	-	-	-	666,244
Tower Piers	26.20 CY	14.850	389.01	103.67	40,329	573.80	15,031	-	-	-	-	55,360
Bent Foundations	328.53 CY	7.080	2,326.02	103.67	241,142	317.53	104,318	-	-	-	-	345,460
Bent Piers	52.39 CY	14.850	778.02	103.67	80,658	573.80	30,063	-	-	-	-	110,721
Concrete-			***7,978.93***		***827,188***		***350,597***					***1,177,785***
Pipe Bridges:			***12,290.24***		***1,274,149***		***1,336,605***					***2,610,753***
020-Structural			**14,820.92**		**1,536,509**		**1,665,344**					**3,201,853**
030-Piping												
Painting												
****unassigned****												
Gate 4"	1.00 Al	1.780	1.78	107.60	192	19.82	20	11,250.00	11,250	-	-	11,461
****unassigned****			***1.78***		***192***		***20***		***11,250***			***11,461***
Painting			***1.78***		***192***		***20***		***11,250***			***11,461***
Insulation												
Cal Sil w/alum												
2.5" Dia 1.5" Calsil w/Alum Jacket	184.00 lf		-	-	-	-	-	15.03	2,766	-	-	2,766
3.0" Dia 1.5" Calsil w/Alum Jacket	126.00 lf		-	-	-	-	-	15.03	1,894	-	-	1,894
4.0" Dia 1.5" Calsil w/Alum Jacket	1,232.00 lf		-	-	-	-	-	16.88	20,796	-	-	20,796
6.0" Dia 1.5" Calsil w/Alum Jacket	162.00 lf		-	-	-	-	-	19.48	3,156	-	-	3,156
4.0" Dia 2.5" Calsil w/Alum Jacket	3,423.00 lf		-	-	-	-	-	25.95	88,827	-	-	88,827
8.0" Dia 2.5" Calsil w/Alum Jacket	1,510.00 lf		-	-	-	-	-	36.58	55,236	-	-	55,236
6.0" Dia 3" Calsil w/Alum Jacket	132.00 lf		-	-	-	-	-	36.87	4,867	-	-	4,867
8.0" Dia 5.5" Calsil w/Alum Jacket	1,345.00 lf		-	-	-	-	-	79.29	106,645	-	-	106,645
10.0" Dia 4" Calsil w/Alum Jacket	38.00 lf		-	-	-	-	-	65.32	2,482	-	-	2,482
12.0" Dia 4.5" Calsil w/Alum Jacket	178.00 lf		-	-	-	-	-	80.74	14,372	-	-	14,372
14.0" Dia 3" Calsil w/Alum Jacket	2,135.00 lf		-	-	-	-	-	65.34	139,501	-	-	139,501
18.0" Dia 3 Calsil w/Alum Jacket	197.00 lf		-	-	-	-	-	72.25	14,233	-	-	14,233
20.0" Dia 3" Calsil w/Alum Jacket	740.00 lf		-	-	-	-	-	88.04	65,150	-	-	65,150
24.0" Dia 3" Calsil w/Alum Jacket	30.00 lf		-	-	-	-	-	67.43	2,023	-	-	2,023
Cal Sil w/alum									***521,946***			***521,946***
Insulation									***521,946***			***521,946***
Process Piping												
Pipe C2F												
A106 Grade B Std Wt-16"	62.00 LF	3.780	234.36	107.59	25,214	253.05	15,689	-	-	-	-	40,904
A106 Grade B Std Wt-12"	178.00 LF	2.700	480.60	107.59	51,707	140.23	24,960	-	-	-	-	76,667
A106 Grade B Std Wt-8"	1,566.00 LF	1.770	2,771.82	107.59	298,215	117.66	184,259	-	-	-	-	482,474
A106 Grade B Std Wt-6"	938.00 LF	1.320	1,238.16	107.59	133,212	78.98	74,082	-	-	-	-	207,294
A106 Grade B Std Wt-Small bore/specialties	1.00 AL	708.749	708.75	107.59	76,253	35,878.88	35,879	-	-	-	-	112,132
Pipe C2F			***5,433.69***		***584,601***		***334,870***					***919,471***
Pipe C2G												
A53 Grade B Std Wt-24"	30.00 LF	6.180	185.40	107.59	19,947	562.52	16,876	-	-	-	-	36,823
A53 Grade B Std Wt-20"	740.00 LF	4.680	3,463.20	107.59	372,600	441.64	326,811	-	-	-	-	699,410
A53 Grade B Std Wt-18"	197.00 LF	4.470	880.59	107.59	94,741	351.37	69,221	-	-	-	-	163,962

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Pipe C2G												
A53 Grade B Std Wt-14"	2,135.00 LF	3.420	7,301.70	107.59	785,578	145.06	309,709	-	-	-	-	1,095,287
A53 Grade B Std Wt-10"	16.00 LF	2.840	45.44	107.59	4,889	112.83	1,805	-	-	-	-	6,694
A53 Grade B Std Wt-8"	322.00 LF	2.470	795.34	107.59	85,569	95.10	30,621	-	-	-	-	116,190
A53 Grade B Std Wt-6"	162.00 LF	1.660	268.92	107.59	28,933	145.06	23,500	-	-	-	-	52,433
A53 Grade B Std Wt-4"	2,033.00 LF	1.060	2,154.98	107.59	231,851	170.85	347,342	-	-	-	-	579,192
A53 Grade B Std Wt-3"	126.00 LF	0.980	123.48	107.59	13,285	132.17	16,653	-	-	-	-	29,938
A53 Grade B Std Wt-Small bore/specialties	1.00 AL	2,082.397	2,082.40	107.59	224,042	126,365.92	126,366	-	-	-	-	350,407
Pipe C2G			***17,301.45***		***1,861,434***		***1,268,904***					***3,130,337***
Pipe C3A												
A106 Grade B Sch 40-16"	267.00 LF	3.800	1,014.60	107.59	109,159	235.32	62,832	-	-	-	-	171,991
A106 Grade B Sch 40-12"	85.00 LF	2.690	228.65	107.59	24,600	256.28	21,784	-	-	-	-	46,384
A106 Grade B Sch 40-10"	220.00 LF	2.320	510.40	107.59	54,913	162.79	35,814	-	-	-	-	90,728
A106 Grade B Sch 40-6"	402.00 LF	1.310	526.62	107.59	56,658	111.21	44,708	-	-	-	-	101,367
A106 Grade B Sch 40-4"	1,488.00 LF	1.050	1,562.40	107.59	168,096	78.98	117,520	-	-	-	-	285,616
A106 Grade B Sch 40-3"	310.00 LF	0.990	306.90	107.59	33,019	69.31	21,485	-	-	-	-	54,504
A106 Grade B Sch 40-Small bore/specialties	1.00 AL	715.805	715.81	107.59	77,012	36,497.83	36,498	-	-	-	-	113,510
Pipe C3A			***4,865.38***		***523,458***		***340,642***					***864,099***
Pipe C8B												
SA106 Grade C Sch 80/100-4"	1,134.00 LF	1.060	1,202.04	107.59	129,325	77.37	87,734	-	-	-	-	217,059
SA106 Grade C Sch 80/100-Small bore/specialties	1.00 AL	179.776	179.78	107.59	19,342	10,476.76	10,477	-	-	-	-	29,818
Pipe C8B			***1,381.82***		***148,667***		***98,211***					***246,878***
Pipe M8B												
A335 Grade P22 Sch 120/100-8"	1,345.00 LF	2.310	3,106.95	107.59	334,272	581.86	782,606	-	-	-	-	1,116,878
Pipe M8B			***3,106.95***		***334,272***		***782,606***					***1,116,878***
Tie-ins												
TI01 1250 steam-A335 Grade P22 Sch 120/100-8"	1.00 EA	40.000	40.00	107.59	4,304	0.00	0	-	-	-	-	4,304
TI02 160 steam-A106 Grade B Sch 40-4"	1.00 EA	9.000	9.00	107.59	968	0.00	0	-	-	-	-	968
TI07 filtered water-A53 Grade B Std Wt-4"	1.00 EA	9.000	9.00	107.59	968	0.00	0	-	-	-	-	968
TI08 raw water-A53 Grade B Std Wt-14"	1.00 EA	30.000	30.00	107.59	3,228	0.00	0	-	-	-	-	3,228
TI09 BFW-SA106 Grade C Sch 80/100-14"	1.00 EA	54.000	54.00	107.59	5,810	0.00	0	-	-	-	-	5,810
TI warm water return-A53 Grade B Std Wt-14"	1.00 EA	30.000	30.00	107.59	3,228	0.00	0	-	-	-	-	3,228
TI16 180 water-A53 Grade B Std Wt-6"	1.00 EA	12.000	12.00	107.59	1,291	0.00	0	-	-	-	-	1,291
Tie-ins			***184.00***		***19,796***							***19,796***
Valve 14AF												
04"-Gate	1.00 ea	10.500	10.50	107.59	1,130	481.92	482	-	-	-	-	1,612
06"-Gate	1.00 ea	13.500	13.50	107.59	1,452	984.83	985	-	-	-	-	2,437
14"-Gate	2.00 ea	24.000	48.00	107.59	5,164	2,527.32	5,055	-	-	-	-	10,219
03"-Gate	2.00 ea	1.780	3.56	107.59	383	354.60	709	-	-	-	-	1,092
Valve 14AF			***75.56***		***8,129***		***7,231***					***15,360***
Valve 14BW												
08"-Gate	3.00 ea	18.000	54.00	107.59	5,810	3,123.69	9,371	-	-	-	-	15,181
10"-Gate	1.00 ea	21.000	21.00	107.59	2,259	3,905.40	3,905	-	-	-	-	6,165
2.5"-Gate	1.00 ea	9.000	9.00	107.59	968	396.53	397	-	-	-	-	1,365
04"-Gate	5.00 ea	12.000	60.00	107.59	6,455	622.16	3,111	-	-	-	-	9,566
06"-Gate	3.00 ea	15.000	45.00	107.59	4,841	1,021.89	3,066	-	-	-	-	7,907
Valve 14BW			***189.00***		***20,334***		***19,849***					***40,184***
Valve 14CS												
.5"-Gate	19.00 ea	7.500	142.50	107.59	15,331	49.97	949	-	-	-	-	16,281
.75"-Gate	6.00 ea	7.500	45.00	107.59	4,841	62.86	377	-	-	-	-	5,219
01"-Gate	4.00 ea	7.500	30.00	107.59	3,228	67.69	271	-	-	-	-	3,498

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 14CS												
01.5"-Gate	2.00 ea	7.500	15.00	107.59	1,614	130.56	261	-	-	-	-	1,875
02"-Gate	9.00 ea	7.500	67.50	107.59	7,262	159.57	1,436	-	-	-	-	8,698
03"-Gate	1.00 ea	7.500	7.50	107.59	807	240.15	240	-	-	-	-	1,047
Valve 14CS			***307.50***		***33,083***		***3,535***					***36,618***
Valve 14LS												
.75"-Gate	3.00 ea	7.500	22.50	107.59	2,421	275.62	827	-	-	-	-	3,248
02"-Gate	2.00 ea	7.500	15.00	107.59	1,614	607.65	1,215	-	-	-	-	2,829
Valve 14LS			***37.50***		***4,035***		***2,042***					***6,077***
Valve 14TS												
03"-Gate	1.00 ea	10.500	10.50	107.59	1,130	894.55	895	-	-	-	-	2,024
Valve 14TS			***10.50***		***1,130***		***895***					***2,024***
Valve 15LP												
08"-Gate	1.00 ea	21.000	21.00	107.59	2,259	27,599.02	27,599	-	-	-	-	29,858
Valve 15LP			***21.00***		***2,259***		***27,599***					***29,858***
Valve 15LS												
.75"-Gate	3.00 ea	7.500	22.50	107.59	2,421	686.63	2,060	-	-	-	-	4,481
Valve 15LS			***22.50***		***2,421***		***2,060***					***4,481***
Valve 24BW												
03"-Gate	2.00 ea	10.500	21.00	107.59	2,259	859.09	1,718	-	-	-	-	3,978
Valve 24BW			***21.00***		***2,259***		***1,718***					***3,978***
Valve 24LS												
02"-Globe	1.00 ea	7.500	7.50	107.59	807	1,956.75	1,957	-	-	-	-	2,764
Valve 24LS			***7.50***		***807***		***1,957***					***2,764***
Valve 24TS												
02"-Globe	1.00 ea	7.500	7.50	107.59	807	357.81	358	-	-	-	-	1,165
Valve 24TS			***7.50***		***807***		***358***					***1,165***
Valve 34AF												
03"-Check	1.00 ea	7.500	7.50	107.59	807	219.19	219	-	-	-	-	1,026
04"-Check	1.00 ea	10.500	10.50	107.59	1,130	328.82	329	-	-	-	-	1,459
14"-Check	2.00 ea	24.000	48.00	107.59	5,164	3,101.12	6,202	-	-	-	-	11,366
18"-Check	2.00 ea	33.000	66.00	107.59	7,101	4,110.12	8,220	-	-	-	-	15,321
Valve 34AF			***132.00***		***14,202***		***14,970***					***29,172***
Valve 37ER												
.75"-Check	1.00 ea	7.500	7.50	107.59	807	312.71	313	-	-	-	-	1,120
Valve 37ER			***7.50***		***807***		***313***					***1,120***
Valve 54AT												
1.5"-Plug	2.00 ea	1.780	3.56	107.58	383	19.83	40	-	-	-	-	423
2"-Plug	1.00 ea	1.780	1.78	107.60	192	19.80	20	-	-	-	-	211
Valve 54AT			***5.34***		***575***		***59***					***634***
Valve 64BS												
.75"-Ball	9.00 ea	7.500	67.50	107.59	7,262	114.44	1,030	-	-	-	-	8,292
01"-Ball	7.00 ea	7.500	52.50	107.59	5,648	133.78	936	-	-	-	-	6,585
02"-Ball	2.00 ea	7.500	15.00	107.59	1,614	322.36	645	-	-	-	-	2,259
Valve 64BS			***135.00***		***14,524***		***2,611***					***17,136***
Valve 71AA												
04"-B'fly	2.00 ea	10.500	21.00	107.59	2,259	633.44	1,267	-	-	-	-	3,526
14"-B'fly	2.00 ea	24.000	48.00	107.59	5,164	2,113.09	4,226	-	-	-	-	9,390
18"-B'fly	4.00 ea	33.000	132.00	107.59	14,202	2,627.25	10,509	-	-	-	-	24,711
24"-B'fly	2.00 ea	42.000	84.00	107.59	9,037	5,175.53	10,351	-	-	-	-	19,388

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Valve 71AA			***285.00***		***30,663***		***26,353***					***57,016***
Valve 74AA												
03"-B'fly	2.00 ea	7.500	15.00	107.59	1,614	610.88	1,222	-	-	-	-	2,836
14"-B'fly	3.00 ea	24.000	72.00	107.59	7,746	3,929.59	11,789	-	-	-	-	19,535
Valve 74AA			***87.00***		***9,360***		***13,011***					***22,371***
Valve VEND												
.5"-Gate	3.00 ea	7.500	22.50	107.59	2,421	19.83	59	-	-	-	-	2,480
.75"-Gate	17.00 ea	7.500	127.50	107.59	13,718	19.83	337	-	-	-	-	14,055
01"-Gate	4.00 ea	7.500	30.00	107.59	3,228	19.82	79	-	-	-	-	3,307
01.5"-Gate	4.00 ea	7.500	30.00	107.59	3,228	19.83	79	-	-	-	-	3,307
03"-Check	1.00 ea	10.500	10.50	107.59	1,130	19.82	20	-	-	-	-	1,150
03"-Gate	1.00 ea	10.500	10.50	107.59	1,130	19.81	20	-	-	-	-	1,150
08"-Gate	1.00 ea	18.000	18.00	107.59	1,937	19.84	20	-	-	-	-	1,956
08"-Stop Check	1.00 ea	18.000	18.00	107.59	1,937	19.83	20	-	-	-	-	1,956
-Gate	6.00 ea	15.000	90.00	107.59	9,683	19.83	119	-	-	-	-	9,802
-Plug	10.00 ea	15.000	150.00	107.59	16,138	19.83	198	-	-	-	-	16,337
Valve VEND			***507.00***		***54,547***		***952***					***55,499***
Process Piping			***34,131.68***		***3,672,170***		***2,950,744***					***6,622,914***
030-Piping			**34,133.46**		**3,672,361**		**2,950,764**		**533,196**			**7,156,322**
040-Instrumentation												
DCS/PLC Equipment:-												
****unassigned****												
Project Control System (Proportioned Cost)	1.00 LOT	20.000	20.00	95.74	1,915	0.00	0	-	-	19,131.00	19,131	21,046
****unassigned****			***20.00***		***1,915***						***19,131***	***21,046***
DCS/PLC Equipment:-			***20.00***		***1,915***						***19,131***	***21,046***
Instr. Tubing & Wiri												
****unassigned****												
Analog I/O-25	1.00 LS	563.000	563.00	95.74	53,902	30,664.70	30,665	-	-	-	-	84,567
Digital I/O-34	1.00 LS	442.000	442.00	95.74	42,318	25,208.71	25,209	-	-	-	-	67,526
120V Power-4	1.00 LS	52.000	52.00	95.74	4,979	2,965.74	2,966	-	-	-	-	7,944
Air Supply, Tubing from Header-4	1.00 LS	56.000	56.00	95.74	5,362	4,480.84	4,481	-	-	-	-	9,842
****unassigned****			***1,113.00***		***106,560***		***63,320***					***169,880***
Instr. Tubing & Wiri			***1,113.00***		***106,560***		***63,320***					***169,880***
Instruments (field):												
****unassigned****												
Field Instruments (not vendor supplied)	1.00 LOT	54.000	54.00	95.74	5,170	11,282.69	11,283	-	-	69,919.00	69,919	86,372
****unassigned****			***54.00***		***5,170***		***11,283***				***69,919***	***86,372***
Instruments (field):			***54.00***		***5,170***		***11,283***				***69,919***	***86,372***
040-Instrumentation			**1,187.00**		**113,645**		**74,603**				**89,050**	**277,298**
050-Electrical												
Grounding:												
****unassigned****												
1/C #4/0 bare copper grounding conductor - Class B stranding	750.00 Lf	0.053	39.98	95.74	3,827	5.83	4,376	-	-	-	-	8,203
Compression Type connection, Copper wire to Copper wire connector	2.00 Ea	1.333	2.67	95.75	255	35.42	71	-	-	-	-	326
Compression type connection for grounding conductor to structural reinforcement bar in concrete	18.00 Ea	1.333	23.99	95.74	2,297	35.43	638	-	-	-	-	2,935
Exothermic Type grounding connection for Copper wire to Structural Steel - Cadweld Type VS or equivalent	18.00 Ea	1.120	20.16	95.74	1,930	35.43	638	-	-	-	-	2,568

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** unassigned **			*86.80*		*8,310*		*5,722*					*14,032*
Grounding:			*86.80*		*8,310*		*5,722*					*14,032*
Heat Tracing												
** unassigned **												
Electric heat tracing	18,680.00 Lf							27.00	504,360	-	-	504,360
** unassigned **									*504,360*			*504,360*
Heat Tracing									*504,360*			*504,360*
Control Equipment												
** unassigned **												
5 KV MCC's-MCC1	1.00 EA	100.000	100.00	95.74	9,574	16,118.10	16,118	-	-	179,000.00	179,000	204,692
5 KV MCC's-MCC2	1.00 EA	120.000	120.00	95.74	11,489	16,118.11	16,118	-	-	179,000.00	179,000	206,607
New Additional MCC 3- 5KV	1.00 EA	80.000	80.00	95.74	7,659	16,118.11	16,118	-	-	115,000.00	115,000	138,777
MCC-5	1.00 EA	100.000	100.00	95.74	9,574	8,059.06	8,059	-	-	128,861.00	128,861	146,494
** unassigned **			*400.00*		*38,297*		*56,413*				*601,861*	*696,571*
Control Equipment			*400.00*		*38,297*		*56,413*				*601,861*	*696,571*
Power Wiring												
Cable Tray												
30" Aluminum cable tray, ladder type 9" rung spacing, 4" side rail	150.00 Lf	0.296	44.40	95.74	4,251	23.21	3,482	-	-	-	-	7,732
Cable Tray			*44.40*		*4,251*		*3,482*					*7,732*
15 kV												
1/C #4/0 AWG, copper, 600V	3.00 CLF	10.000	30.00	95.74	2,872	1,004.16	3,012	-	-	-	-	5,885
3/C 500 kcmil copper, 15 kV shielded	45.80 CLF	17.000	778.60	95.74	74,544	7,159.66	327,912	-	-	-	-	402,457
3/C #2/0 AWG copper, 15 kV shielded	3.00 CLF	38.000	114.00	95.74	10,915	5,641.33	16,924	-	-	-	-	27,839
3/C #4/0 AWG copper, 15 kV shielded	3.00 CLF	24.000	72.00	95.74	6,893	5,091.71	15,275	-	-	-	-	22,169
15 kV			*994.60*		*95,225*		*363,124*					*458,349*
5 kV												
3/C #2 AWG copper, 5 kV shielded	4.00 CLF	14.000	56.00	95.74	5,362	2,251.70	9,007	-	-	-	-	14,368
1/C #4/0 AWG, copper, 600V	2.00 CLF	10.000	20.00	95.74	1,915	660.85	1,322	-	-	-	-	3,237
3/C 500 kcmil copper, 5 kV shielded	18.50 CLF	14.000	259.00	95.74	24,797	6,840.52	126,550	-	-	-	-	151,347
3/C 350 kcmil copper, 5 kV shielded	10.00 CLF	14.000	140.00	95.74	13,404	5,344.76	53,448	-	-	-	-	66,851
3/C #6 AWG copper, 5 kV shielded	10.00 CLF	4.400	44.00	95.74	4,213	988.04	9,880	-	-	-	-	14,093
3/C #4 AWG copper, 5 kV shielded	40.00 CLF	11.000	440.00	95.74	42,126	1,368.43	54,737	-	-	-	-	96,863
3/C #1/0 AWG copper, 5 kV shielded	4.00 CLF	18.000	72.00	95.74	6,893	2,891.59	11,566	-	-	-	-	18,460
5 kV			*1,031.00*		*98,710*		*266,510*					*365,219*
600 V												
1/C #4/0 AWG, copper, 600V, Type XHHW-2 (grounding conductor)	17.55 CLF	10.000	175.50	95.74	16,803	1,004.16	17,623	-	-	-	-	34,426
3/C #350 kcmil copper conductor, Type TC Cable, 600 Volt, Type XHHW	35.00 CLF	18.000	630.00	95.74	60,317	4,363.17	152,711	-	-	-	-	213,028
3/C #500 kcmil copper conductor, Type MC Cable, 600 Volt, Type XHHW	69.35 CLF	18.000	1,248.30	95.74	119,514	6,005.60	416,489	-	-	-	-	536,003
600 V			*2,053.80*		*196,634*		*586,823*					*783,456*
** unassigned **												
Elect Heat Trace	7,456.00 lf		-	-	-	-	-	27.00	201,312	-	-	201,312
Power Wiring to Equipment	1.00 ls	1,890.000	1,890.00	95.74	180,951	66,084.22	66,084	-	-	-	-	247,036
** unassigned **			*1,890.00*		*180,951*		*66,084*		*201,312*			*448,348*
Power Wiring			*6,013.80*		*575,770*		*1,286,022*		*201,312*			*2,063,104*
Utility Tie Substati												
** unassigned **												

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **												
48 KV Disconnect switch	1.00 EA	50.000	50.00	95.74	4,787	1,611.81	1,612	-	-	7,137.00	7,137	13,536
Hook Switch	5.00 EA	40.000	200.00	95.74	19,148			-	-	848.00	4,240	23,388
48KV SF6 Breaker	1.00 EA	60.000	60.00	95.74	5,744	4,029.53	4,030	-	-	40,250.00	40,250	50,024
PT's, KWH, MW,MVAR,Ammeters	1.00 EA							-	-	0.00	0	
Protection and Control13.8KV section in main sub.	1.00 EA							-	-	20,960.00	20,960	20,960
20/26.6 MVA 48KV/13.8 KV Transformer	1.00 EA	350.000	350.00	95.74	33,510	40,295.23	40,295	50,000.00	50,000	407,000.00	407,000	530,805
13.8KV Switchgear Line up with 125 DC system	1.00 EA	160.000	160.00	95.74	15,319	403,274.87	403,275	-	-	375,000.00	375,000	793,594
New additional section	1.00 EA							-	-	46,875.00	46,875	46,875
6000 KVA 13.8KV/4.16KV Transformer	2.00 EA	190.000	380.00	95.74	36,382	16,118.10	32,236	-	-	101,379.00	202,758	271,376
2500 KVA 13.8KVA/480V transformer	1.00 EA	100.000	100.00	95.74	9,574	8,059.04	8,059	-	-	59,799.00	59,799	77,432
2500 KVA 13.8KVA/480V transformer	1.00 EA	100.000	100.00	95.74	9,574	8,059.04	8,059	-	-	59,799.00	59,799	77,432
480V Switchgear	1.00 EA	120.000	120.00	95.74	11,489	16,118.08	16,118	-	-	239,445.00	239,445	267,052
Spare parts	1.00 EA							-	-	2,594.00	2,594	2,594
30 KVA UPS	1.00 EA	30.000	30.00	95.74	2,872			-	-	36,106.00	36,106	38,978
BATTERY BANK WITH ENCLOSURE	1.00 LS	30.000	30.00	95.74	2,872	4,029.54	4,030	-	-	19,197.00	19,197	26,099
SPARE PARTS	1.00 EA							-	-	2,222.00	2,222	2,222
250KW/313 KVA Diesel Generator Set with Enclosure	1.00 LS	130.000	130.00	95.74	12,446	16,118.10	16,118	-	-	69,825.00	69,825	98,389
Automatic transfer switch for item 19	1.00 EA	18.000	18.00	95.74	1,723			-	-	3,400.00	3,400	5,123
30 KVA UPS sytem	1.00 EA	30.000	30.00	95.74	2,872			-	-	35,000.00	35,000	37,872
**** unassigned ****			***1,758.00***		***168,314***		***533,831***		***50,000***		***1,631,607***	***2,383,752***
Utility Tie Substati			***1,758.00***		***168,314***		***533,831***		***50,000***		***1,631,607***	***2,383,752***
050-Electrical			**8,258.60**		**790,690**		**1,881,989**		**755,672**		**2,233,468**	**5,661,819**
060-Sitework												
Earthwork												
** unassigned **												
Adjusted Fill (10% Shrinkage)	8,425.00 CY							3.66	30,836	-	-	30,836
Excess loose material	31,542.00 CY							1.68	52,991	-	-	52,991
Dewatering	1.00 AL	500.000	500.00	73.35	36,677	80,590.49	80,590			-	-	117,267
Cut-Bank Measure (Balnce of plant)	5,246.00 CY							13.15	68,985	-	-	68,985
Structural Fill Placement (Remove and replace uncontrolled fill in plant area)	34,721.00 CY							15.00	520,815	-	-	520,815
Fill (Balance of plant)	7,372.00 CY							3.66	26,982	-	-	26,982
Cut (Remove and replace uncontrolled fill in plant area)	34,721.00 CY							13.15	456,581	-	-	456,581
**** unassigned ****			***500.00***		***36,677***		***80,590***		***1,157,189***			***1,274,456***
Earthwork			***500.00***		***36,677***		***80,590***		***1,157,189***			***1,274,456***
Demolition:												
Railroad												
Remove Existing Railroad Track	160.00 LF	1.000	160.00	73.35	11,737			22.89	3,662	-	-	15,399
Bumper Posts	1.00 EA	1.000	1.00	73.36	73			2,600.00	2,600	-	-	2,673
Railroad			***161.00***		***11,810***				***6,262***			***18,072***
Demolition:			***161.00***		***11,810***				***6,262***			***18,072***
Erosion Control												
** unassigned **												
Silt Fence	1,000.00 LF	0.010	10.00	73.35	734	0.63	629			-	-	1,362
Slope Protection	1.00 AL	40.000	40.00	73.35	2,934	12,894.49	12,894			-	-	15,829
Ditch Check Dams	1.00 AL	80.000	80.00	73.35	5,868	19,341.72	19,342			-	-	25,210
Erosion/Sediment Control-Construction Exit (50'X20'X6" - #57 stone)	20.00 CY	0.320	6.40	73.35	469	49.90	998			-	-	1,468

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
** unassigned **			*136.40*		*10,005*		*33,863*					*43,868*
Erosion Control			*136.40*		*10,005*		*33,863*					*43,868*
Roads & Paving:												
Asphalt												
18" Crushed Limestone Base	930.00 CY	0.060	55.80	73.35	4,093	86.55	80,495	-	-	-	-	84,589
Asphalt			*55.80*		*4,093*		*80,495*					*84,589*
Concrete												
6" Aggregate Base	750.00 CY	0.040	30.00	73.35	2,201	32.08	24,056	-	-	-	-	26,257
Concrete			*30.00*		*2,201*		*24,056*					*26,257*
Coal Railroad												
Crossing	110.00 LF	1.000	110.00	73.35	8,069	83.01	9,131	-	-	-	-	17,200
Bumper Posts	1.00 EA	1.000	1.00	73.35	73	7,091.97	7,092	-	-	-	-	7,165
Guard Posts	20.00 EA	2.100	42.00	73.35	3,081	282.07	5,641	-	-	-	-	8,722
Coal Railroad			*153.00*		*11,223*		*21,864*					*33,087*
Truck Dumper:												
9" Concrete Roadway	500.00 CY	0.060	30.00	73.35	2,201	153.36	76,682	-	-	-	-	78,882
6" Aggregate Base	340.00 CY	0.040	13.60	73.35	998	32.08	10,906	-	-	-	-	11,903
Truck Dumper:			*43.60*		*3,198*		*87,587*					*90,786*
Asphalt Road Paving												
7" Asphalt	1,900.00 SF	0.046	87.40	73.35	6,411	87.42	166,107	-	-	-	-	172,518
Asphalt Road Paving			*87.40*		*6,411*		*166,107*					*172,518*
Concrete Road Paving												
9" Concrete Roadway	1,099.00 CY	0.060	65.94	73.35	4,837	153.36	168,547	-	-	-	-	173,384
Concrete Road Paving			*65.94*		*4,837*		*168,547*					*173,384*
Miscellaneous Sidewa												
Concrete 4"	162.00 SF	0.040	6.48	73.35	475	5.61	909	-	-	-	-	1,384
Curb and Gutter	170.00 LF	0.053	9.01	73.35	661	11.59	1,970	-	-	-	-	2,631
Miscellaneous Sidewa			*15.49*		*1,136*		*2,879*					*4,015*
Roads & Paving:			*451.23*		*33,099*		*551,535*					*584,635*
Storm Drainage Pipe												
** unassigned **												
Catch Basin Precast Concrete, 7' deep	5.00 ea	10.000	50.00	103.67	5,184			-	-	-	-	5,184
18" CMP CL V	630.00 LF	0.253	159.39	73.35	11,692	44.32	27,925			-	-	39,616
24" CMP CL V	320.00 LF	0.300	96.00	73.35	7,042	54.00	17,279			-	-	24,321
Manholes- 10' deep	1.00 EA	12.000	12.00	73.35	880	1,974.49	1,974			-	-	2,855
** unassigned **			*317.39*		*24,798*		*47,178*					*71,975*
Storm Drainage Pipe			*317.39*		*24,798*		*47,178*					*71,975*
Storm Drainage Struc												
** unassigned **												
Flat Bottom Ditch -Average Depth 3'	1,500.00 LF	0.440	660.00	73.35	48,413					-	-	48,413
Chain Link Fence	1,200.00 LF	0.100	120.00	73.35	8,802	40.04	48,045			-	-	56,847
** unassigned **			*780.00*		*57,216*		*48,045*					*105,261*
Storm Drainage Struc			*780.00*		*57,216*		*48,045*					*105,261*
Underground Utilitie												
Ductbank												
UG Ductbank-Excavation/Backfill	560.00 CY	0.100	56.00	73.35	4,108	4.61	2,581	-	-	-	-	6,689
UG Ductbank-Concrete	66.00 CY	7.300	481.80	73.35	35,342	451.31	29,786	-	-	-	-	65,128
UG Ductbank-Conduits	4,300.00 LF	0.140	602.00	73.35	44,159	21.49	92,387	-	-	-	-	136,546
Manhole	2.00 EA	30.000	60.00	73.35	4,401	16,118.10	32,236	-	-	-	-	36,637

Spreadsheet Level	Takeoff Quantity/Unit	Labor Hours/Unit	Labor Quantity (Hours)	Labor Rate (USD)	Labor Amount (USD)	Material Price (USD)	Material Amount (USD)	Sub Price (USD)	Sub Amount (USD)	Process Equipment (USD)	Process Equipment Amount (USD)	Total Amount (USD)
Ductbank			***1,199.80***		***88,010***		***156,991***					***245,001***
Gas Main												
6" Pipe-4' cover (Relocate Existing)	134.00 LF	0.690	92.46	73.35	6,782	40.94	5,486	-	-	-	-	12,268
Trenching/Backfill	145.00 LF	0.063	9.14	73.35	670	0.68	98	-	-	-	-	768
Trenching/Backfill	220.00 LF	0.063	13.86	73.35	1,017	0.68	149	-	-	-	-	1,166
4" Pipe from Metering Station	220.00 LF	1.450	319.00	107.59	34,321	11.44	2,518	-	-	-	-	36,838
Clean/test	220.00 LF	1.000	220.00	107.59	23,669	4.03	886	-	-	-	-	24,556
Gas Main			***654.46***		***66,459***		***9,137***					***75,596***
Sanitary												
Sanitary Lift Station, xxGPM/xxHP Duplex Complete Station	1.00 EA	66.000	66.00	73.35	4,841	12,088.60	12,089	-	-	-	-	16,930
Sanitary Sewer 4" PVC - 8' Cover	300.00 LF	0.064	19.20	73.35	1,408	6.19	1,857	-	-	-	-	3,265
Sanitary Sewer Manhole - 10' deep, 4' Dia Pre-cast	1.00 EA	12.000	12.00	73.35	880	1,974.46	1,974	-	-	-	-	2,855
Force Main 4" PVC	170.00 LF	0.064	10.88	73.35	798	6.19	1,052	-	-	-	-	1,850
Force Main tie-in 28" X 4" PVC	1.00 EA	12.500	12.50	73.35	917	1,611.82	1,612	-	-	-	-	2,529
Trenching/Backfill	320.00 LF	0.070	22.40	73.35	1,643	0.84	268	-	-	-	-	1,911
Sanitary			***142.98***		***10,488***		***18,852***					***29,340***
Fire Protection												
8" Pipe-6' cover	2,000.00 LF	0.300	600.00	73.35	44,012	35.70	71,403	-	-	-	-	115,415
6" Pipe-6' cover	700.00 LF	0.250	175.00	73.35	12,837	28.69	20,083	-	-	-	-	32,920
Fire Hydrant	6.00 EA	2.800	16.80	73.35	1,232	2,538.60	15,232	-	-	-	-	16,464
8" PIV	5.00 EA	7.000	35.00	73.35	2,567	2,458.01	12,290	-	-	-	-	14,857
6" PIV	3.00 EA	6.550	19.65	73.35	1,441	2,088.90	6,267	-	-	-	-	7,708
6" Stub Up	3.00 EA	5.200	15.60	73.36	1,144	1,611.81	4,835	-	-	-	-	5,980
8" Fittings-Allowance	1.00 EA	2.990	2.99	73.35	219	846.18	846	-	-	-	-	1,066
6" Fittings-Allowance	1.00 EA	2.990	2.99	73.35	219	805.91	806	-	-	-	-	1,025
Tie Into Existing 8" Pipe	2.00 EA	17.500	35.00	73.35	2,567	3,868.35	7,737	-	-	-	-	10,304
Trenching/Backfill	2,800.00 LF	0.066	184.80	73.35	13,556	0.74	2,076	-	-	-	-	15,632
Fire Protection			***1,087.83***		***79,796***		***141,575***					***221,371***
Potable Water												
Trenching/Backfill	220.00 LF	0.063	13.86	73.35	1,017	0.68	149	-	-	-	-	1,166
2" Pipe from Metering Station	220.00 lf	0.970	213.40	107.59	22,959	11.93	2,624	-	-	-	-	25,583
Clean/test	220.00 LF	1.000	220.00	107.59	23,669	4.03	887	-	-	-	-	24,556
Potable Water			***447.26***		***47,645***		***3,659***					***51,305***
Underground Utilitie			***3,532.33***		***292,398***		***330,215***					***622,613***
060-Sitework			**5,878.35**		**466,003**		**1,091,426**		**1,163,451**			**2,720,880**
06-Balance of Plant			***68,500.32***		***7,010,241***		***7,695,234***		***2,452,319***		***6,836,156***	***23,993,951***

Estimate Totals

Description	Amount	Totals	Hours
Labor	28,628,483		301,811 hrs
Material	27,733,967		
Subcontract	3,217,158		
Equipment	[redacted]		
SALES TAX - MATERIALS	1,135,644		
ENGINEERING	8,000,000		
ENGINEERING-VENDOR	969,900		
CONSTRUCTION MGMT	9,000,000		
MARKUP-CONSTR CONTRACTS	5,470,587		
MARKUP - EQUIPMENT PROCUREMENT	7,260,910		
[redacted]			
CONTINGENCY (Exclude TRI)	8,479,472		
ESCALATION	4,651,649		
Total		[redacted]