WRB Refining LP
Borger Refinery
P. O. Box 271
Spur 119 North
Borger, Texas 79008

November 10, 2015

CERTIFIED MAIL/RETURN RECEIPT REQUESTED

Eddy Vance
TCEQ Region 1
3918 Canyon Drive
Amarillo, Texas 79109-4933

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Sector Policies and Programs Division
Attention: Refinery Sector Lead
U.S. EPA Mailroom (E143–01)
109 T.W. Alexander Drive
Research Triangle Park, NC 27711

Dear Sir or Madam:

40 CFR Part 60 Subpart Ja (NSPS Ja) – Flare Management Plan
Phillips 66 Company – Borger Refinery, Borger, Texas

As required by 40 CFR 60.103a(b)(3), enclosed please find the Phillips 66 Company Borger Refinery flare management plan (FMP), including the information detailed in 40 CFR 60.103a(a).

Per E-mail correspondence dated October 28, 2015, between an industry representative and the designated NSPS Ja rule agency contact, EPA has indicated that Confidential Business Information (CBI) should not be included in the FMP. As such, the Borger Refinery is not submitting manufacturer flare tip drawings or process and instrumentation drawings (P&IDs), which are considered to be CBI, with this FMP. This information will continue to be maintained onsite for EPA review.

If you have any questions concerning this report or require additional information, please contact Scott Hartman at (806) 275-1350.

Sincerely,

Sandy D. Keys
Environmental Team Leader

Enclosure

Phillips 66
WRB Refining, LLC
Borger, Texas

NSPS Subpart Ja Flare Management Plan

P.O. BOX 271
SPUR 119 NORTH
BORGER, TEXAS 79008

November 2015

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*Per email correspondence on October 28, 2015 between an industry representative and the designated Ja Rule Contact, EPA has indicated that Confidential Business Information should not be included in Flare Management Plans. Consequently, Borger Refinery is not submitting the confidential flare tip schematic and P&IDs with this flare management plan. The flare tip schematic and P&IDs are available on site for EPA review. The make and model number of the flare tips are identified on Table 2 (page 10) of this submitted report.

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SECTION 1 INTRODUCTION

1.1 Facility Description

WRB Refining, LLC owns and Phillips 66 Company operates the Borger Refinery. The refinery processes on average 146,000 barrels per day (bpd) of crude oil and an average of 30,000 bpd of Natural Gas Liquids (NGLs).

1.2 NSPS Ja Applicability

The most recent promulgation of the petroleum refinery New Source Performance Standard (NSPS) is contained within 40 CFR 60 Subpart Ja. NSPS Ja (hereafter referred to as "the rule") applies to fluid catalytic cracking units (FCCU), fluid coking units (FCU), delayed coking units, fuel gas combustion devices, flares, and sulfur recovery plants. This Flare Management Plan (FMP) is created per section 40 CFR 60.103a within NSPS Ja which contains provisions that are applicable to refinery flares.

These work practice standards, as well as the applicability triggers for flares, were proposed to be changed in the Federal Register dated December 22, 2008[1]. On September 12, 2012, the revised NSPS Ja standards were published in the Federal Register. The Borger Refinery must develop, implement, and submit to the EPA an FMP by no later than the startup date for the flare, per §60.103a(b). The Borger Refinery is required to maintain a copy of the initial FMP until regulatory re-submittal is required (see Section 1.3). If an update is made, the Borger Refinery will comply with the version of this FMP that is considered to be the most up-to-date, regardless of whether the change was re-submitted to the EPA.

An affected flare under NSPS Ja is one for which construction, modification or reconstruction commenced after June 24, 2008. Construction is the fabrication, erection, or installation of a flare, and begins at the time that the refinery undertakes or contracts to undertake a continuous program of construction.

The Borger Refinery has four (4) flares that fall under the rule. They are

- 95-FE38 – GOHDS Flare
- 95-FE43 – CAT Flare
- 95-0VY1 – West Refinery Flare
- 95-0VY2 – East Refinery Flare

[1] 73 FR78522 (Dec. 22, 2008)

The Derrick Flare is also located at the Refinery and has not triggered the requirements of the rule.

1.3 Revisions to the Flare Management Plan

Pursuant to §60.103a(b)(2), the Borger Refinery will periodically update this FMP to account for changes in the operation of the flare. However, this FMP will only require re-submittal to the Administrators if any of the following changes occur:

- Addition of an alternative baseline flow rate;
- Revision of an existing baseline;
- Installation of a flare gas recovery system; or
- Change of flare designations and monitoring methods described in §60.107a(g).

A Flare Management Plan Revision History log is included in Appendix A.

1.4 Flare Management Plan Contents

This FMP fulfills the requirements of §60.103a(a) regarding the development of a written FMP and has been prepared pursuant to the requirements and provisions of the rule. A regulatory cross-reference table is presented as Appendix B which includes a table that indicates the requirements of NSPS Ja and the applicable narrative within this FMP.

SECTION 2 DESCRIPTION OF FLARE SYSTEM

2.1 General Description of Flares

As stated in Section 1.2, the rule applies to four flares.

GOHDS Flare

The GOHDS flare system is connected by two main flare headers, the Common Relief Header (CRH) and the ARDS Relief Header (ARH). The main units that feed these headers are the Coker, Vacuum Distillation Unit, Gas Oil Hydrotreater (GOHDS), one Sulfur Plant (SRU), two Steam Methane Reformers, two Amine Contactors, and a Methyl Mercaptan (MeSH) unit.

CAT Flare

The CAT flare receives gas from Units 29 and 40, the Fluid Catalytic Cracking (FCC) units. These units convert heavy oil into lighter gas or liquid fractions and include equipment for the removal of H2S from the refinery sour water.

East Refinery Flare

The East Refinery flare receives gas from many different processes, including but not limited to: the Crude units (Unit 9, Unit 10, Unit 32) and units that have recovery processes for sulfur compounds (Unit 19, Unit 36). A detailed list of process units that send flows to this flare in provided in Appendix E.

West Refinery Flare

The West Refinery flare receives gas from many different processes, including but not limited to: the HF Alkylation unit (Unit 22), separation units (Unit 23, Unit 26), and units that have recovery processes for sulfur compounds (Unit 25, Unit 35). A detailed list of process units that send flows to this flare in provided in Appendix E.

The flare system contains a flare gas recovery unit (FGRU) with liquid seal drums directing the flow. All flares are part of a single cascaded system, meaning flow is preferentially directed to one flare based on the set liquid level of the seal drums. The GOHDS flare seal drum is set lower than all the others and therefore it will first get all of the flow not captured by the FGRU. The lower the liquid level on the seal drum, the less pressure it creates on the header system. In Table 1, the GOHDS flare has been labeled the primary flare while the three others have been labeled secondary. As seen in Appendix C, the GOHDS and the CAT flares have a crossover between their headers and the East Refinery and West Refinery flares have a crossover between their headers. It is

possible for any flare to be isolated while the other (of the pair) takes the flow and acts as a backup. If either the East or West Refinery flare goes down, the other is able to take all of the load. Therefore, in Table 1, they have both been labeled backups since they can act as backups to each other. Because the GOHDS flare is designed to take all of the load, the GOHDS flare is not considered a backup to the CAT. In contrast, because the CAT flare is sized to handle the same load as the GOHDS flare but is not the primary flare of the cascaded system, it is labeled a backup. Per the definition referenced in NSPS Ja, the four flares are considered "non-emergency flares", meaning that, although they have a water seal, they receive flow more than four times in a 365-day rolling period.

The values used as maximum design flow and smokeless capacity were determined from the flare tip documentation.

All four applicable flares are elevated flares. An elevated flare consists of a tip that is mounted on a flare stack, which is raised high above-grade, and supports combustion at the upper end of a vertical riser. The combustion zone is elevated in order to separate the heat from people, equipment, or structures at grade level and to aid in air dispersion.

The following table provides a description of flare configuration and design parameters:

Table 1 Flare Configuration and Design Parameters

Description	GOHDS	CAT	West Refinery	East Refinery
Flare Type	Elevated	Elevated	Elevated	Elevated
Height (ft.)	187' - 4 1/2"	198'-0"	140'-0"	140'-0"
Elevation Above Main Sea Level (ft.)	2978'	2982'	2974'	2982'
Type of Assist System	Steam	Steam	Steam	Steam
Flare Tip Type	Simple	Simple	Simple	Simple
Flare System Type	Cascaded	Cascaded	Cascaded	Cascaded
Primary or Secondary (In Cascaded System)	Primary	Secondary	Secondary	Secondary
Emergency or Non-Emergency Status	Non-Emergency	Non-Emergency	Non-Emergency	Non-Emergency
Backup Flare	No	Yes	Yes	Yes
Equipped with Flare Gas Recovery	Yes	Yes	Yes	Yes
Maximum Design Capacity of Hydrocarbon Flow (Lbs/Hr)	1,200,000 @ MW = 30 1,800,000 @ MW = 70		414,500 @ MW = 30 640,000 @ MW = 70	270,000 @ MW = 21 250,000 @ MW = 58
Smokeless Capacity of Hydrocarbon Flow (Lbs/Hr)	414,500 @ MW = 30 316,456 @ MW = 70			190,000 @ MW = 58

2.2 Simplified Flare System Diagram and Component Design Information

Simplified process flow diagrams of the flare/flare system described in this plan are provided in Appendix C. There are two drawing types in the appendix:

1. Simple PFDs of the header system split into two drawings grouped by the flares that have crossovers between them (that serve as backups to each other). These

drawings are labeled FMP_PFD_01, FMP_PFD-02, and FMP-PFD_03 and are 8.5" x 11".

2. A larger PFD of the entire system including all four flares in one 11" x 17" drawing which is labeled FMP_PFD_04. The purpose of including this drawing is to see all of the flares and headers on one page.

Additional technical information for each flare subject to Subpart Ja is provided below:

2.3 Flare System Design Specifications

2.3.1 Flare Tip

The function of the flare tip is to mix the flare gas and assist gas at velocities, turbulence, and concentration required to establish and maintain proper ignition and stable combustion for the maximum specified relief gas flow rates at the system-allowable pressure drop. Although the flare normally has a low flow of flare gas during normal operations, the largest concern with respect to the flare system is its ability to handle the large, emergency flaring events. The design of the flare tip is an integral part of the flare system because it enables the refinery to handle large variances in the volume, pressure drop, concentration, and temperature of the flare gas streams.

Based on a review of the flare tip drawings, the flare tips appear to be obstructed by the center steam injection and will have an effective diameter as seen in the following table. An effective diameter of the flare tip considers the location of steam injection by subtracting the obstructed exit area of the flare tip (i.e., area of any stability tabs, stability rings, and steam tubes) from the total exit area of the flare tip.

All four flares contain velocity seals designed to reduce the amount of purge gas needed. Per MOC M-12-0474, the velocity seal was removed from the extension spool piece and included in the flare tip for the West Refinery Flare. Engineering drawings of the flare tip are included in Confidential Appendix CA, which are being maintained on-site at the Refinery.

Table 2 Flare Tip Description

Description	GOHDS	CAT	West Refinery	East Refinery
Date Installed	2011	2007	2011	1998
Manufacturer	Zeeco	Zeeco	Zeeco	Callidus Technologies
Flare Tip Model No.	QFSC-48	QFSC-48	QFSC-30	BTZ-US-30C
Nominal Tip Diameter (inches)	48"	48"	30"	30"
Effective Tip Diameter (inches)	47.22"	46.69"	29.01"	29.01"

2.3.2 Assist System

Assist gas is added to the flare tip to encourage additional flame zone turbulence, improved air entrainment, and thus, improved combustion efficiency and the reduction of smoke formation. Care must be taken to ensure the combustible mixture of the combined gases is not diluted by excess use of assist gas.

All four flares are steam-assisted flares. Steam assist can be supplied radially using an upper external steam ring, as well as in the center of the flare stack, just above the velocity seal. Upper steam is supplied to a steam ring with star-shaped steam diffusers on the outside of the flare stack circumference. Upper steam is used to draw air into the perimeter of the flame bundle, in order to keep the vent gas inside the combustion zone and assist in smoke control. Center steam prevents burn back at low gas flows and aids in flame stability.

The flow of steam is monitored on each flare by a flow meter on each flare. There are also cameras pointing to the flare so that the flame and smoke can be constantly visually monitored. Procedure *CPX-NP-5080: Monitoring the Flares by Operation Shift Team* provides guidance for monitoring (via visual expectations) the flares to ensure hydrocarbon combustion efficiency, or destruction efficiency (DRE) of 98%. The procedure calls the operator to adjust the steam rate during flaring events and to increase the lifting steam if the flame appears to be blowing over onto the tip due to wind. The tables below outlines the details of the steam assist system.

Table 3 GOHDS & CAT Flare Steam Assist Details

	GOHDS		CAT	
Flow Controller	90FC003		90FC005	
	Upper Steam	Center Steam	Upper Steam	Center Steam
Size	6"	2"	6"	3"
Minimum Steam Flow Rate (lbs/hr)	3,069	1,154	586	586
Total Steam Min Flow Rate (lbs/hr)	4,223		1,172	
Max Steam Flow Rate (lbs/hr)	155,775	6,925	146,600	4,692
Total Steam Max Flow Rate (lbs/hr)	162,700		151,292	

Table 4 West Refinery & East Refinery Flare Steam Assist Details

	West Refinery		East Refinery	
Flow Controller	92FC004		92FC002	
	Upper Steam	Center Steam	Upper Steam	Center Steam
Size	6"	2"	6"	3"
Minimum Steam Flow Rate (lbs/hr)	650	500	450	250
Total Steam Min Flow Rate (lbs/hr)	2,654		700	
Max Steam Flow Rate (lbs/hr)	45,000	2,000	54,813	2,236
Total Steam Max Flow Rate (lbs/hr)	108,465		57,049	

2.3.3 Ignition & Pilot System

Pilot gas is introduced through the pilot tip of a flare in order to provide a flame to reliably ignite the flare. These pilot systems contain bypass lines to increase gas flow to the flare tip in order to increase Btu's. The GOHDS flare has two bypass lines.

The pilot lights are fueled by purchased natural gas or fuel gas. The rule explicitly allows all pilot gas lines to be exempted from sulfur content monitoring that is required for all other gas lines to demonstrate compliance with the 162

parts per million by volume (ppmv) H_2S limit. The pilot gas flow is not required by the rule, but is normally monitored by a rotameter.

Table 5 Ignition System Description

	GOHDS	CAT	East Refinery	West Refinery
Manufacturer	Stackmatch			
Model	12 ft. Spit-Fire	9 ft. Spit-Fire	9 ft. Spit-Fire	9 ft. Spit-Fire
Ignition Type	Flame Front			Air-Assist
Electrical Requirement	110V / 50-60 Hz			
No. of Pilot Lights	4	3	3	3
Pilot Light Spacing	90°	120°	120°	120°
Thermocouple	Type "K"			
No. of By-Pass	2	1	1	1
Pilot Gas Flow per Pilot (scfh) @ 25 psig	25.4	25.4	25.4	25.4
Pilot Gas Flow per Flare (scfh) @ 25 psig	101.6	76.2	76.2	76.2
Maximum Pilot Gas Flow per Pilot (scfh) @ 30 psig with bypass	365	198	198	198
Maximum Pilot Gas Flow per Flare (scfh) @ 30 psig with bypass	1460	594	594	594

2.3.4 Purge Gas

All flare systems have the propensity for flashback, in-line detonation, and potential explosion in the flare stack if oxygen enters through the flare burner and travels down the flare stack. A continuous purge is therefore necessary to prevent atmospheric oxygen from entering down through the flare burners. The purge is an injected gas designed to provide a minimum continuous flow upward through the flare tip ensuring no reversal of flow so that no intrusion of air can create an ignitable mixture.

Because the four flares are equipped with a water seal, purge gas is distinctly different from sweep gas. Purge gas is injected downstream of the water seal to condition the velocity seal and to prevent air intrusion into the flare stack. Sweep gas is injected upstream of each water seal into the flare header to reduce the

likelihood of stratification of gases in the header and also to maintain a positive pressure in the flare header. See Section 2.3.5 for further information on sweep gas.

The GOHDS, CAT, and East Refinery flares contain velocity seals in order to reduce the amount of purge gas required. API 521 6.4.3.6.2 recommends 0.04 ft/sec purge velocity with a velocity seal. Per MOC M-12-0474, the West Refinery flare purge is set at a higher velocity (0.1 ft/sec) than the others and so the purge rate is greater than the East Refinery flare even though they are the same size. The manufacturer has set this velocity. As described in section 2.3.2, the purge gas is increased upon turning off the center steam during freezing weather. The following table contains details about the required purge rates during non-freezing conditions.

All four flares use purchased natural gas or fuel gas for purge gas. The systems are designed so that the purge gas goes through both flow and sulfur monitors.

Table 6 Purge Gas Details

	GOHDS	CAT	West Refinery	East Refinery
Flow Meter (Rotameter)	90FI-F1/2 90FI-F1/4	90FI-F1/1 90FI-F1/3	92FI-F1/2 92FI-F1/4	92FI-F1/1 92FI-F1/3
Type of Gas Used	Natural Gas or Fuel Gas	Natural Gas or Fuel Gas	Natural Gas or Fuel Gas	Natural Gas or Fuel Gas
Minimum Velocity into Flare (ft/sec)	0.04	0.04	0.1	0.04
Minimum Purge Rate (scfh)	1,770	1,770	1,770	683
Minimum Purge Rate (scfm) as seen in Rotameters	29.5	29.5	29.5	11.4

2.3.5 Sweep Gas

Because the flare is equipped with a water seal, purge gas is distinctly different from sweep gas. Purge gas is injected downstream of each water seal primarily to condition the velocity seal and to assist in the backflow prevention. See Section 2.3.4 for further information on purge gas. Sweep gas is injected upstream of the water seal into the flare header to reduce the likelihood of stratification of gases and localized corrosion in the header. Sweep gas provides a positive gauge pressure so that ambient oxygen does not have the opportunity to leak into the header. Per the EPA, sweep gas is the minimum amount of gas introduced into a Flare header in order to:

1. Prevent oxygen buildup, corrosion, and/or freezing in the Flare header
2. Maintain a safe flow of gas through the Flare header

Sweep gas is typically injected at the furthest point upstream of a long header run, in order to sweep the highest percentage of the header pipe. While API 521 describes a calculation for the purge flow rate downstream of the seal drum to the flare, it does not offer a calculation for the header. The following information was considered when determining the minimum sweep gas flow rate.

1. API 521 and the flare manufacturers recommend a flow of 0.1 ft/sec of purge gas through the flare stack when the flare tip does not have a velocity seal.
2. The seal drums impart 1 psi – 2 psi back pressure on the header system.
3. The liquid-ring compressors in the FGRU are equipped with a spillback valve. As the pressure in the flare gas header decreases below the set pressure, PV-001 opens to allow more recycle gas back to the compressor suction. This keeps the needed pressure on the FGRU.

Based on these considerations, the Borger Refinery determined 0.1 ft/sec to be a conservative design basis for sweep gas velocity through the header. To calculate the minimum required sweep gas flow rate, the following equation was used for each injection location in the header system

$Q = VA$

Where V = velocity is ≥ 0.1 ft/sec and
A = pipe cross-section in ft^2.

The area A was calculated based on the largest diameter section of the flare subheader before intersecting another header with sweep gas. The following tables identify each injection point and its associated minimum flow rate for each of the flares.

Table 7 GOHDS Sweep Gas

Unit	Description	P&ID Number	Header Diameter (in)	Minimum Purge (scfh)
Unit 41	Hydrogen Plant	G0041_mf_134	24	1,131
Unit 41	Hydrogen Plant	G0041_mf_135	24	1,131
Unit 41	Hydrogen Plant	G0041_mf_138	24	1,131
Unit 42	GOHDS Unit	G0042_mf_146	10	196
Unit 42	GOHDS Unit	G0042_mf_147	24	1,131
Unit 44	PSA Relief Header	G0044_mf_1	8	126
Unit 45	Methyl Mercaptan	G0045_mf_26	18 | 36	2,545
Unit 45	Methyl Mercaptan	G0045_mf_26	10	
Unit 98	Hydrogen Unit	G0098_mf_34	12	283
Unit 50	Coker	G0050_mf_168	24	1,131
Unit 51	Vacuum Unit	G0051_mf_57	30	1,767
Unit 34	NGL Sulfur Unit	G0034_mf_71	14	385
Total				**10,957**

Table 8 CAT Sweep Gas

Unit	Description	P&ID Number	Header Diameter (in)	Minimum Purge (scfh)
G0029	FCCU	G0029_mf_75	48	4,524
G0040	HGO CFFU	G0040_mf_113	48	4,524
Total				**9,048**

Table 9 West Refinery Sweep Gas

Unit	Description	P&ID Number	Header Diameter (in)		Minimum Purge (scfh)
G0022	HF Alkylation	G0022_MF_73	24		1,131
G0022	HF Alkylation	G0022_MF_73	8		126
G0022	HF Alkylation	G0022_MF_63	14		385
G0025	Low Sulfur Gas	G0025_MF_104	8	24	1,131
G0025	Low Sulfur Gas	G0025_MF_104	10		
G0026	UNIT 26	G0035_MF_23	10		196
G0029	FCCU	G0029_MF_118	8		126
G0052	Oily Solids Unit	G0052_MF_14	4		31
Total					**3,126**

Table 10 East Refinery Sweep Gas

Unit	Description	P&ID Number	Header Diameter (in)	Minimum Purge (scfh)
G0032	Crude Clean Up And Desalting Unit	G0032_MF_22	24	1,131
G0019	Distillate, HDS, Naphtha Reforming	G0019_MF_71	8	126
G0019	Distillate, HDS, Naphtha Reforming	G0019_MF_86	18	636
Total				**1,893**

The sum of all the individual sweep gas flow rates is 25,024 scfh, which is the minimum required sweep gas flow rate. The capacity of one compressor is 1,103 acfm or an estimated 1000 scfm. The total flare gas recovery compressor capacity is 120,000 scfh (with two compressors running defined as the maximum capacity). As such, the sweep gas represents approximately 21% of the flare gas recovery system capacity. The maximum capacity will increase to 180,000 scfh when the service liquid pressure drop issue is resolved and all three compressors can run at once (See Section 3.1.2 for a description of the problem). This will make the sweep gas about 14% of the total FGRU capacity. The flow rates of the sweep gas are regulated with rotameters on a given set point.

Because the sweep gas is injected upstream of the water seal, it is incorporated into the combined flare gas being monitored to comply with the 162 ppmv H_2S

limit. The contribution of the sweep gas to the gas stream that is monitored is anticipated to occur only during flaring events. During periods of time when flaring is not occurring, the sweep gas is recovered by the flare gas recovery system.

2.3.6 Supplemental Gas

Supplemental gas is gas that is introduced to the flare in order to comply with the net heating value requirements of 40 CFR §60.18(b) and 40 CFR 63.11(b), which is 300 Btu/scf. Supplemental gas is used as a caloric boost to the vented gas to ensure adequate combustion.

The Borger Refinery has a process in place in which supplemental fuel gas is added to the flares when nitrogen is being purged in order to maintain a heating value over 300 Btu/scf. Currently a spreadsheet is used to calculate the heating value, however after the Btu monitors are installed, these will be used. In order to get the fuel gas to the flare, the Borger Refinery utilizes the purge gas lines at each seal drum, the sweep gas injection points when the seal is dropped, and the fuel gas pressure control valve at the GOHDS flare.

During periods of high winds, the facility adds supplemental fuel gas to the flares to reduce the chance that the flare flame blows out. Supplemental gas is sent to the flare until the flame is visible. Approximately 50 MSCFH is estimated as the maximum amount of supplemental gas sent to a flare.

In these scenarios, a combination of fuel gas and purchased natural gas would be used for supplemental gas. Because natural gas, according to the rule, is inherently low in sulfur concentration, NSPS Ja offers provisions that allow gas lines that are exclusively natural gas to be exempted from sulfur content monitoring. The fuel gas used goes through both flow and sulfur monitors.

2.4 Refinery Process Units, Ancillary Equipment and Fuel Gas Systems Connected to Subpart Ja Flares

Appendix E contains a list of all refinery process units and ancillary equipment associated with each flare.

2.4.1 Knockout Drum

The knockout drums remove any potential liquid from the flare gas prior to combustion. Each of the flares has at least one knockout drum before the water seal and then one after the water seal before the flare.

Table 11 Knockout Drums

GOHDS				
	95-FE35	**95-KC08**	**95-FE36**	**95-KC72**
Description	Secondary ARH Knockout Drum	Primary ARH Knockout Drum	Secondary CRH Knockout Drum	Primary CRH Knockout Drum
P&ID Number	712_MF_20	G0041_MF_159	712_MF_20	G0041_MF_159
Size (D x L) (ft)	10' x 40'	7.5' x 30'	10' x 40'	9.5' x 38'
Volume (ft³)	3403	1436	3403	2918
MAWP @ MAWT	134 psig @ 450°F	403 psig @ 450°F	50 psig @ 650°F	108 psig @ 650°F

CAT			
	95-FE39	**95-ND42**	**95-NH69**
Description	Secondary Knockout Drum	Unit 29 Vent Stack	Unit 40 Knockout Drum
P&ID Number	G0500_MF_1	G0029_MF_118	G0040_MF_113
Size (D x L) (ft)	12' x 48'	12' x 33'	10' x 40'
Volume (ft³)	5881	4185	3403
MAWP @ MAWT	15 psig @ 448°F	30 psig @ 450°F	6 psig @ 609°F

West Refinery			
	95-VD92	**95-VD88**	**95-VD87**
Description	Secondary Drip Tank	Unit 22 Header Drip Tank	Low Pressure Header Drip Tank
P&ID Number	G0502_MF_2	G0303_MF_1	G0303_MF_1
Size (D x L) (ft)	13' x 40'	13' x 50'	13' x 50'
Volume (ft³)	5884	7212	7212
MAWP @ MAWT	50 psig @ 650°F	50 psig @ 650°F	50 psig @ 650°F

East Refinery			
	95-VD91	**95-VD90**	**95-VD89**
Description	Secondary Drip Tank	High Pressure Header Drip Tank	Unit 19 Header Drip Tank
P&ID Number	G0502_MF_1	G0303_MF_2	G0303_MF_2
Size (D x L) (ft)	13' x 40'	13' x 50'	13' x 50'
Volume (ft³)	5884	7212	7212
MAWP @ MAWT	50 psig @ 650°F	50 psig @ 650°F	50 psig @ 650°F

2.5 Seal Drums

Each flare is accompanied with a seal drum to route flow to the flare gas recovery unit instead of to the flare. Per API 521, the purpose of a liquid seal in a flare system includes the following:

1. To prevent any flashback originating from the flare tip from propagating back through the flare system
2. To maintain a positive system pressure to ensure no air leakage into the flare system and permit use of a flare gas recovery system
3. To provide a method of flare staging between an enclosed flare and a full size emergency flare
4. To prevent an ingress of air into the flare system during sudden temperature changes or condensation of flare gas, such as can occur following a major release of flare gas or following a steaming operation

Image 1 at the end of this section shows a typical seal drum configuration at the Borger Refinery. Based on the water level, a pressure is imparted onto the flare gas system ranging from around one to two pounds per square inch (1 psi – 2 psi). The Borger Refinery uses varying liquid levels between the four seal drums in order to divert flow to certain flares. The GOHDS seal drum liquid level is set lower than all the other flares so that all flow will go to the GOHDS flare during an event. Each seal drum has two level bridles which are connected to the Distributed Control System (DCS) for monitoring. Water continuously flows in and out maintaining a constant level. The flow of water into the seal drum will vary depending on the liquid level reading from the level gauge.

During normal operation, the pressure of the flare gas in the header will not be enough to overcome the water seal and the flare gas is directed to the flare gas recovery unit. However, during an upset condition, the pressure will increase such that it overcomes the water seal causing the water to exit out the top along with the flare gas. The water should settle out in the secondary knockout tank. If the pressure at the flare gas inlet indicates a flaring event, the makeup water will not fill the drum to prevent from unnecessarily entering the vessel and being carried out the top, filling the secondary knockouts. Once the pressure drops back to normal, the makeup water or other liquid will be used to fill the seal drum.

Purge gas is introduced to the seal drum and immediately exits out the top in order to keep a positive pressure on the flare stack. For more information on purge gas, see Section 2.3.4.

The seal drum is electrically heat-traced to prevent liquid water from freezing during the winter months. Light hydrocarbons enter the seal drum during flaring events and if these hydrocarbons vaporize, the temperature could drop causing the water in the seal drum to freeze.

A steam line has been run to the seal drum, but is not used during normal operation. The steam line is used to assist in clearing the seal drum when it must be removed from service.

Image 1 Typical Seal Drum Configuration at the Borger Refinery

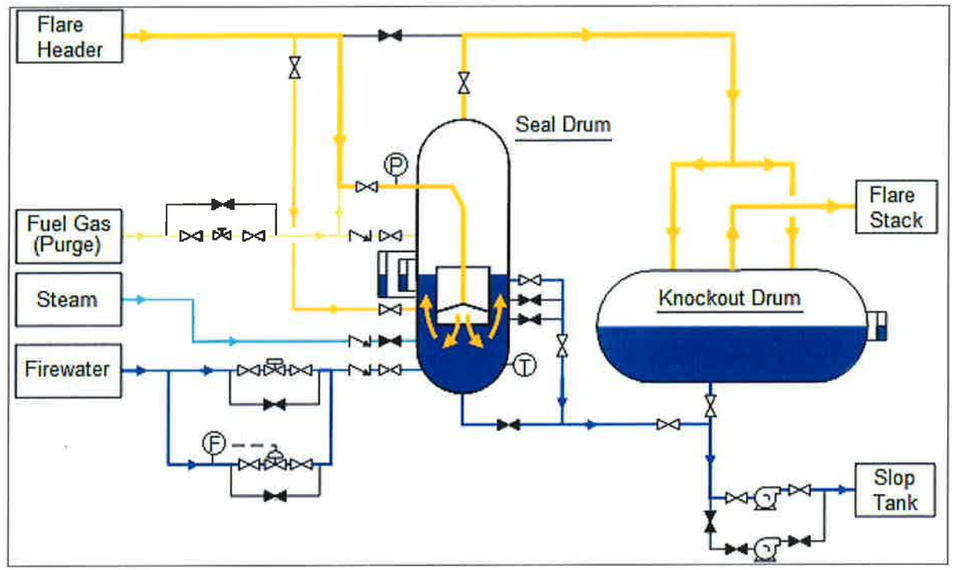


Table 12 Seal Drums

	95-FE57	95-FE55	95-VD67	95-VD65
Description	GOHDS Flare Seal Drum	CAT Flare Seal Drum	West Refinery Flare Seal Drum	East Refinery Flare Seal Drum
P&ID Number	G0500_MF_209	G0500_MF_5	G0502_MF_7	G0502_MF_8
Size (D x H) (ft)	10' x 20.75'	10' x 20.75'	9' x 17.83'	9' x 17.83'
Liquid Level Operating Range	25% - 80%	25% - 80%	25% - 80%	25% - 80%
Capacity (GPM)	235	170	203	203

2.6 Flare Gas Recovery Unit

The Borger flare gas recovery unit (FGRU) was installed to meet the Consent Decree (Civil Action No. H-05-0258) requirements designed to reduce overall flaring by

December 31, 2011. As stated earlier, the FGRU covers the four Subpart Ja applicable flares: East Refinery Flare, West Refinery Flare, CAT Flare and the GOHDS Flare. Each flare is separated from the flare gas recovery unit by a seal drum as described in Section 2.5.

The FGRU has three liquid ring compressors in parallel, each with a capacity of 1,103 acfm (or about 1,000 scfm). The compressors are dual stage – containing two casings with one impeller. Each compressor can be individually started or not as chosen by the equipment operator. The flare gas recovery unit was designed to operate with only a single compressor to as many as three compressors running simultaneously. When starting more than one compressor, at least a ten second delay [60.103a(a)(3)(vii)(C)] should be used before starting another compressor. This will minimize the draw on the refinery electrical system during FGRU startup. When a compressor has been started, it will run for a minimum of thirty minutes (even if it is no longer needed) assuming there are no shutdowns present. An unused compressor may function as a backup.

A recycle valve PV-001 maintains the flare gas inlet pressure set point. As the pressure in the flare gas header increases above the set pressure, PV-001 closes to allow less recycle gas back to the compressor suction. As the pressure in the flare gas header decreases below the set pressure, PV-001 opens to allow more recycle gas back to the compressor suction.

A flow element 63FI003 is located at the inlet of the knockout drum and indicates what is being recovered.

The recovered gas is routed to Unit 82 amine treater and the refinery fuel system.

2.7 Monitoring Instrumentation

NSPS Ja identifies two monitoring schemes that can be used to demonstrate compliance with the rule. The primary monitoring scheme involves both flare gas flow and sulfur monitoring. The alternative monitoring scheme involves flare header pressure and water seal liquid level monitoring. The alternative monitoring scheme may only be used by the following flares with water seals:

1. Emergency flares (e.g., flares that receive flow no more than four times per 365 day period);
2. Secondary flares (e.g., flares that are not identified as the primary flare in a cascaded flare system); and
3. Flares equipped with a flare gas recovery system that is designed and operated to recover all flows except those during startup, shutdown, and malfunctions.

Since all flares are equipped with a flare gas recovery system, they all satisfy the third condition above; however, the Borger Refinery has chosen to implement the monitoring requirements of the rule and not utilize the alternative monitoring provision. The details of the monitoring systems are described in the following sub-sections.

2.7.1 Vent Gas Flow

NSPS Ja requires the refinery to operate a flow meter that provides a representative measurement of the total flow rate discharged to each flare. The flow rate data that is collected will be used to determine if flaring events occur that exceed the RCA threshold of 500,000 scf in a 24-hour period above the established baseline. The following standards for the flow meter are required pursuant to 40 CFR 60.107a(f) of the rule:

- Must be located in a position that is representative of the total gas flow rate;
- Must have a flow sensitivity of no more than 5% of the flow rate or 10 scfm, whichever is greater;
- Must be maintainable online; and
- Must continually correct for pressure and temperature and record flow in standard conditions.
- At least quarterly, perform a visual inspection of all components of the monitor for physical and operational integrity and all electrical connections for oxidation and galvanic corrosion if the flow monitor is not equipped with a redundant flow sensor.
- Recalibrate the flow monitor in accordance with the manufacturer's procedures and specifications which is annually.

Each flare uses a GE Panametrics GF868 flow meter system with dual channel ultrasonic flow transducers to continuously measure the flow rate to the flare. Each of the flow meters is installed after the seal drum and right before the flare to ensure that all the flow going to the flare is measured by the meters. The following table lists the tag number and serial numbers for each of the flow meters. The meter on the GOHDS flare is set up with two channels to measure the CRH and ARH flow. The flow meters are currently installed and working.

Table 13 Flow Meter Tag Numbers

Flare	Flow Meter	Serial Number
GOHDS CRH	90FT002	508 Ch. 2
GOHDS ARH	90FT001	508 Ch. 1
CAT (FCC)	90FT004	513
East Refinery	92FT001	775
West Refinery	92FT003	749

The flow meters are manufactured according to the specifications in the rule. The following table summarizes the specifications of the flow meters.

Table 14 Flow Meter Specifications

Item	Monitor Specification
Make	General Electric
Model	DigitalFlow™ GF868
Type	Panametrics Ultrasonic Flare Gas Mass Flow Meter
Range	0.1 ft/sec to 328 ft/sec
Precision	Repeatability = ±1%
Accuracy (Velocity – as tested for all meters)	±1.25%
Calibration Factor	
GOHDS CRH	0.927
GOHDS ARH	0.933
CAT (FCC)	0.924
East Refinery	0.914
West Refinery	0.914

The meter configuration is a dual-channel bias-90 configuration with temperature and pressure corrected readings. The pressure and temperature readings are used to automatically correct the raw flow meter readings to standard condition flow rates and are reported to the DCS and viewed in the control room.

The facility brings in a third party annually to verify proper operation of the flare flow meters. The reports are known as the Certification and Acceptance Reports and are filed in Livelink, the facility's information management system.

A regulatory PM is done quarterly on the flare meters. During the PM a visual inspection is done on all components of the monitor (for physical and operational

integrity) and all electrical connections (for oxidation and galvanic corrosion) of each flow monitor.

The facility has had good reliability with the flare meters. Should a problem develop with a meter's readings, a technician will be contacted to review and repair the meter.

2.7.2 Sulfur Content

NSPS Ja requires the refinery to operate a monitor to measure the sulfur content of the gases combusted in each flare. The rule allows the refinery to select one of three options that involve direct analysis of the gas that is directed to the flare in order to comply with the sulfur monitoring requirements:

- SO_2 (or total sulfur) monitoring;
- Total Reduced Sulfur (TRS) monitoring; or
- H_2S Monitoring.

The refinery has chosen to monitor both H_2S and total sulfur as well as Btu in each of the four flares, in compliance with the H_2S and total sulfur monitoring requirements found in NSPS Ja. The installation of the analyzers is scheduled before the deadline of November 2015. FMP_PFD_01 and FMP_PFD_02 in Appendix C show the location for planned installation of the analyzers (clouded).

NSPS Ja requires that the H_2S analyzer must provide accurate readings at 20 ppmv – 300 ppmv. The total sulfur analyzer must have a high-scale span of roughly 1.1 to 1.3 times the maximum anticipated sulfur concentration in the flare gas header, but no less than 5,000 ppmv. The analyzers are manufactured according to the specifications in the rule. Each of the analyzers is designed to be installed after the seal drum and right before the flare to ensure that all the flow going to the flare is measured by the meters.

The compliance state of the flare with respect to the 162 ppmv H_2S limit is based on a 3-hour rolling average, which is the arithmetic mean of three, continuous 1-hour averages calculated using the results from the continuous monitoring system.

A procedure was written to satisfy the requirement to have a QAQC procedure on flare CEMS. The procedure is located in Livelink with other ECPs (Environmental Compliance Procedures). The procedure number is ECP 2.0 Flare CEMS QAQC.

The procedure includes the make, model, serial number, parameter, and range of the analyzer.

SECTION 3 FLARE MINIMIZATION

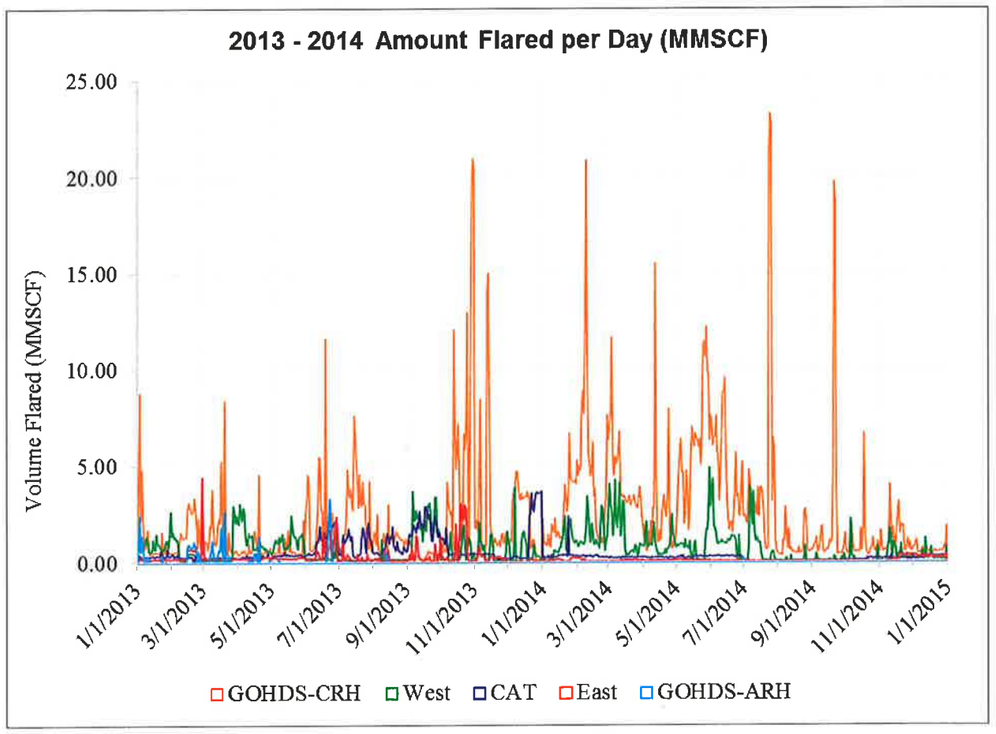
3.1 2013 – 2014 Flare Flow

The following table and graph shows the total flare flow to the four flares in 2013 and 2014. This information was used in the minimization and baseline assessments.

Table 15 Total Flare Flow per Year (MMscf)

	GOHDS-CRH	GOHDS-ARH	CAT	East	West	Total
2013	703.9	42.1	268.5	117.2	255.5	**1,387.3**
2014	1,100.9	0.3	74.9	34.3	266.5	**1,476.9**
Total	**1,804.8**	**42.4**	**343.4**	**151.6**	**522.0**	**2,864.2**

Graph 1 All Flares Total Flare Flow per Day (MMscf)



3.2 Minimization Assessment

According to the Rule, the Borger Refinery must conduct an assessment of whether discharges to the flares from process units, associated equipment, and the fuel gas system can be minimized. The assessment must include the following items:

- Elimination of process gas discharge to the flare through process operating changes or gas recovery at the source;
- Reduction of the volume of process gas to the flare through process operating changes;
- Installation of a flare gas recovery system*; and,
- Minimization of sweep and purge gas flow rates, if applicable.

* If a facility is fuel rich, a flare gas recovery system and a co-generation unit or combined heat and power unit would also need to be considered. Because the Borger Refinery is short on fuel gas, the refinery does not have to consider a co-generation unit as part of the minimization assessment.

For each of the items above, the minimization assessment must provide rationale in terms of the following considerations:

- Costs, including capital and annual operating;
- Natural gas offset credits, if applicable;
- Technical feasibility;
- Secondary environmental impacts; and
- Safety considerations.

If a reduction in flow cannot be achieved, a statement must be made justifying why the minimization could not occur.

3.2.1 Minimization Assessment Regarding Continuous and Non-Continuous Streams

The facility installed a flare gas recovery unit (FGRU) to meet requirements of the Consent Decree and NSPS Ja. The cost estimate was approximately $50,000,000 for the installation of flare gas recovery compressors and associated piping. Some of the operating cost is offset by reducing the amount of natural gas purchased. A FGRU is technically feasible and was recently installed. There were no additional secondary environmental impacts. There were no significant safety considerations.

3.2.1.1 Process Gas

Process gas has been minimized through the installation of the FGRU. Gas from relief valves, pump seals, routine maintenance, and sample points all occur upstream of the water seals and will be recovered by the FGRU during normal operating conditions and routed to plant fuel gas. Each of these sources is considered minimized because the normal flow of gas is not expected to exceed the FGRU. The amount of process gas impacted the size and cost of the FGRU. Natural gas credits are not a factor when determining to minimize flaring due to process gas discharge. Normal operation without upsets is technically feasible. There are no additional secondary environmental impacts and there were no significant safety considerations.

There are some operating conditions where the FGRU is shut down or bypassed and the flow is sent to flare. These conditions are related to Units 41, 22, 98, and 45. Procedure *PSSTL-NP-4140: FGRU Operation during Abnormal Flaring Events* describes how the FGRU is shut down or bypassed due to upsets in these units.

- PSSTL-NP-4140: FGRU Operation during abnormal flaring events.
    - This procedure provides work direction for shutting down the Flare Gas Recovery Unit during abnormal plant operating conditions. Certain materials recovered by the FGRU can negatively impact the plant fuel system via the Amine Absorbers at the Boiler House. The Amine from the Absorbers then is processed at Unit 11/34 impacting the downstream SRUs. Therefore it is more environmentally responsible to shut down the FGRU during these events than to continue to operate it under certain plant operating conditions.

The scenarios that cause the FGRU to be shut down and procedures on how flow to the flare is minimized are described below

Unit 41 and Unit 98 PSA (SMR Tail Gas)

Both Units 41 and 98 produce nearly pure hydrogen from natural gas and steam. Hydrogen is produced from fuel gas by steam-methane reforming. The process consists of desulfurization, reforming, carbon monoxide conversion, and hydrogen purification. If the source of flaring is from either Unit 98 PSA (SMR Tail Gas) or Unit 41 PSA (SMR Tail Gas), the FGRU is shut down until the flaring is stopped. One hour is allowed for material to clear the flare systems.

Unit 22

There is an isolation valve (22HS415) for the HF Alkylation Unit (Unit 22) that is closed when the unit is venting material that may contain HF acid. The use of the isolation valve insures that HF acid is kept out of process furnaces and heaters and is done because of safety concerns. This valve keeps HF acid out of the fuel gas system by closing off the Unit 22 header from the FGRU. If a flaring event is suspected to come from Unit 22, an operator will close the isolation valve to see if the total flare flow at the GOHDS flare decreases and the East and West Refinery flare flows increase. Unit 22 flaring has been evaluated as an alternate baseline case as described in Section 4. The use of this operating scenario will be used only on an as-needed basis to insure that flare flows are minimized.

Unit 45 Methyl Mercaptan

Unit 45 Methyl Mercaptan production unit produces MESH (methyl mercaptan) and DMS (dimethyl sulfide). The Unit 35 and 82 amine contactors will not absorb significant quantities of these two highly toxic compounds. If the FGRU recovered these compounds during a flaring event, it could create a potential exposure of toxics if personnel are exposed to fuel gas and it could also result in the possible production of significant quantities of SO2 from stack flue gas of equipment firing refinery fuel gas.

To prevent the risks as outlined above, the FGRU will be shut down immediately in the event of an unplanned flare event at Unit 45 per procedure *FGR-EP-1550: Shut Down FGRU during Unit 45 Flaring Event*. Before restarting the FGRU, the GOHDS unit operators will increase the CRH flare line purges in Unit 41 and Unit 45 to a total of 150 scfm (9,000 scfh) and purge to the GOHDS flare stack (the liquid seal can be left in as the flare flow will bubble through) for five hours.

Procedures Currently in Practice to Minimize Flaring

The Borger Refinery has generated three procedures to minimize the flaring during the conditions listed above. The bullets under the title of the procedure are copied directly from the procedure to describe the purpose and general contents.

Procedures –cont.

- CPX-EP-1010: Refinery Gas Shedding
    - This guideline provides multiple unit direction for the safe shedding of Refinery Gas flows due to the loss of Unit 93 (Gas Recovery), Unit 12 (Gas Recovery), and or the loss of Units 29/40 (FCCUs). Proper shedding of the Refinery Gas is necessary to ensure environmental compliance during planned maintenance, unit upsets, unit startups and unit shutdowns. It was also written to minimize an Environmental event if we were to lose the ability to compress the refinery gas stream.
    - This procedure strongly emphasizes moving refinery gas to the units that can process refinery gas, reducing refinery gas production, and/or flaring gases that do not have high enough concentrations of H2S that would cause a reportable quantity of SO2 to be emitted to the atmosphere via the flares.
- CPX-EP-1200: Acid Gas Shedding
    - This guideline provides multiple unit direction for the safe shedding of acid gas flows and sour gas flows due to loss of a H2S producer or consumer. Proper shedding of the acid gas is necessary to ensure environmental compliance during planned maintenance, unit upsets, unit startups and unit shutdowns.
    - This procedure strongly emphasizes getting in compliance quickly in the event of a SRU/MeSH unit upset or shutdown, loss of HP Water Wash pump in Unit 42, and loss of 34 SRU Acid Gas Compressor.
    - Bypassing either TGTU to the Incinerators for 20 -30 minutes will result in a RQ. Additional emissions above the RQ need to be minimized by continuing to reduce H2S production if the RQ is exceeded.
    - We must have the mindset that we will prevent RQs by taking aggressive action to reduce acid gas production and move it to units that are running in compliance, and stop emitting above our permit quickly in the event of an upset or unit trip.

- STL-EP-1020: Steam Shedding Plan
    - This procedure was written to provide direction for immediate actions required during short and long term steam upsets. After assuring their own safety and the safety of their co-workers, it is important that employees know the proper action to take. They should follow coordinated actions based on this procedure. Response to a steam system upset will be coordinated by the North Refinery STL for steam production and pressure control issues and by the Shift Superintendent for steam distribution issues. The final responsibility for assessing unit specific operational emergencies rests with the Unit Stillman. He has the authority to revise the procedures as necessary for each situation to ensure a safe and orderly response.

3.2.1.2 Sweep Gas and Purge Gas

The facility evaluated flare sweep and purge rates. Natural gas credits are not a factor when determining the amount of sweep or purge gas rates. Minimizing sweep and purge gas rates are technically feasible. There are no additional secondary environmental impacts. There are no significant safety considerations.

Like the process gas in Section 3.2.1.1, sweep gas is injected upstream of the seal drums and will be recovered by the FGRU during normal operating conditions. The minimum required amount of sweep gas given the current design and injection points was calculated in Section 2.3.5. The minimum required amount was determined to be 25,024 scfh, which is approximately 21% of the current FGRU capacity and will drop down to 14% when all three compressors are able to run at once. The flow rates of the sweep gas are regulated with rotameters on a given set point.

Upon field verification, many flow meters were reading higher than the minimum calculated value. The Borger Refinery will look into reducing the flow at each injection point to the minimum calculated value.

The design purge gas flow rate is a necessary component of the flare system and ensures that the velocity seal is properly conditioned to prevent the backflow of oxygen through the flare stack. The minimum required purge gas rates are listed in Table 6 in Section 3.1. Upon field verifying the flow by looking at the local rotameters, it was determined that the purge rates are set higher than the minimum required. The Borger Refinery will look into reducing the flow at each rotameter to the minimum calculated value.

3.2.2 Minimization Assessment Regarding Expansion or Redesign of the Existing Flare Gas Recovery System

Per Table 17 there were 174 days in 2013 and 2014 where the FGRU was down either for planned maintenance or unplanned shutdown. This led to a large quantity of gas being vented directly to the flare. For the majority of 2014, the middle compressor was down and only two compressors were able to run at once. At the end of 2014, the middle compressor was back online but there is a service liquid issue where not all three compressors can get enough service liquid to run at once. This is due to a pressure drop issue across the airfins. There have been multiple projects to improve the reliability of the FGRU.

The cost of including the capital and annual operating cost were considered when evaluating each project. Natural gas offset credits were not considered in the project justification. Only projects that were technically feasible were considered. There were no secondary environmental impacts associated with the projects.

1. Wiring changes were made to the three FGRU compressors which moved the emergency stop button to a different location in the circuit to insure there is a direct way to stop the motor in the event it fails to stop on command.

2. Winterizing the service liquid airfins which includes the following items. In December 2013 and again in January 2014, the FGRU had to shut down due to the airfins freezing and bursting. The FGRU was down for a total of 47 days. The winterization items include the following.

    a. Installing a steam supply line to the airfins. This will turn on when the temperatures get near freezing.

    b. Adding a nitrogen line and a permanent drain line to quickly drain the airfins into the inlet KO drum. If the compressors shut down, the airfins need to be able to drain before the pipe freezes and bursts.

    c. Adding a low temperature alarm at the outlet of the airfins.

d. Modifying SIS Logic on FGRU to incorporate airfin shutdown so if the compressor trips, the airfin fan will quit blowing over the service liquid. This will slow down the time it will take for the pipe to freeze.

e. Documenting winterization procedures

3. The Service Liquid circuit in the FGRU was experiencing accelerated corrosion due to oxygen entering the unit with flare gases. An oxygen scavenger is now injected into the Service Liquid circuit to help minimize the corrosion.

4. To address the pressure drop issue across the airfin, a new airfin was designed and installed (3rd quarter 2015) so that it can provide enough liquid to keep all three compressors running at once.

The FGRU has three compressors each with a capacity of 1,103 acfm for a total 3,309 acfm (or about 3,000 scfm). There are currently no plans to install a fourth compressor to handle a greater capacity. During the 2013-2014 baseline study two machines could continually run and the third machine was a backup. During the 3rd quarter of 2015 the FGRU was upgraded (by installing the new airfin) to allow the operation of all three machines at the same time.

3.3 Minimization Procedures

3.3.1 Procedures to Minimize or Flaring During Planned Startup and Shutdown

- CPX-NP-3025: Venting or Purging of Equipment to Flare System
    - This procedure provides work direction for operation and maintenance that require venting or purging of equipment into the flare system.
    - An update was made to add verbiage stating this procedure now supersedes all other individual unit procedures when purging equipment to the flare. This procedure does not allow for shutting down the FGRU if the Btu in the fuel gas system gets too low. Instead, it calls for the purging to be reduced or stopped.

The Borger Refinery reviewed the procedures that detail its planned shutdowns and startups. The operational philosophy at the refinery encourages the minimization of flaring through implementation of these procedures as flaring represents lost raw materials and products. The procedures elaborate upon the specific steps taken by operators to perform a shutdown and startup in a planned, step-wise manner, while taking both operational requirements and safety precautions into consideration. The refinery maintains procedures for minimizing flaring during planned shutdown and startup of individual process units.

3.3.2 Procedures to Reduce Flaring in case of Fuel Gas Imbalance

Fuel gas imbalance is a situation that results in excess fuel gas in the fuel gas system and the refinery must vent the excess to flare. When the Borger Refinery's fuel gas system pressure becomes too high, control valve 90FC017 is opened and fuel gas is directly relieved to the GOHDS flare downstream of the seal drum. There is also an option to vent fuel gas from 19PC157 to the East and West Refinery flare upstream of the seal drum. Since the tie in is upstream of the seal drum, the liquid level must be dropped to vent directly to flare. The maximum flow rate is 417 Mscfh per Environmental Compliance Procedure *ECP 2.13: Borger Flare Gas Recovery System.*

During a period of fuel gas imbalance (fuel gas is pressured up or venting to the flare) the procedure requires the following items be reviewed to minimize flaring:

- Sour fuel gas is treated at Unit 35 and the Boiler House. Shift sour gas to Unit 35 or to the Boiler House depending on which header is pressured up.
- If neither header is pressured there is no need to shift the gas.

The addition of purchased gas (El Paso or Rock Creek) and enrichment streams should be minimized during fuel gas imbalance. Review the following areas and remove the additions if possible:

- Remove any unnecessary El Paso gas from the header.
- If the NGL mix tank is pressured up, hard block the west Rock Creek valve.
- Make sure enrichment streams, C2C3 and U22 C3, are blocked.

The third party Cogen facility can burn refinery fuel gas and purchased natural gas. During fuel gas imbalance request that Cogen Duct burners run on mix tank gas (fuel gas) instead of purchased gas.

Dilution gas (purchased gas) is sometimes added to the fuel to Cogen to meet the applicable regulatory H2S limit. Dilution gas should be shut in or minimized during periods of fuel gas imbalance.

Hydrogen to fuel should be minimized. Ensure H2 to fuel gas make (excess H2) is minimized at the SRI and U19.1. If Air Liquide PSA is down, minimize excess H2 at U19.3.

Check the process vents to U12 in the NGL area and see if there is a way to minimize their flows.

- At U11 board
  - Column 44 fd tank
  - C3 surge tank
  - Raw feed tanks
  - Dec2 feed tank
  - Y2 feed tank
  - C3 Treater feed tank
- At 2.2,4,SRI,7 board
  - HDS stabilizer OH
  - H2 fractionator OH
  - H2 Scrubber

- Columns area
  - 29 accumulator
  - 31 accumulator
  - 35 accumulator
  - 36 feed tank and accumulator
  - 37 vent
  - 38 OH

During periods of excessive flaring the facility may consider making production changes to reduce flaring. These include:

- Cutting Coker charge
- Reducing the riser temps at the FCCU
- FCCU feed rate reduction can also be considered for more extreme conditions

3.3.3 Procedures to Minimize Flare Gas Recovery Outage and Partial Outage

Two procedures have been developed to aid in the winterization of the FGRU.

- FGR-NP-4025: Winterize Service Liquid Air Fins
  - This procedure provides work direction for Winterizing the service liquid air fins during an FGRU Shutdown in cold / freezing weather.
- FGR-NP-4030: External Steam Heaters FGRU Airfins
  - This procedure provides work direction for putting the steam heaters under the FGRU air fins (when the temperature is below 40°F or has the potential to drop below 32°F).

During baseline evaluation, the refinery continuously ran two compressors in the FGRU. If one compressor goes down, there was a third that acts as a backup. By running two compressors continuously, the refinery is limiting the cycling of the compressors off and on which will mitigate some of the opportunity for failure. Since both compressors operate continuously, flaring events will not occur as a result of compressor staging during normal operation. In the event that one of the compressors must be shut down, the other compressor will continue to operate at close to full capacity until the compressor is brought back online or the backup compressor starts.

During an outage, procedures call for the following to be considered to reduce flaring:

- Cease all unnecessary venting/purging of equipment in the North Refinery.
- Review areas including Units 9, 10, 19, 22, 26, 28, 32, 35, 36, BH, OSHU, CNU, and some individual equipment in Units 29 and 40 and equipment in the ILB area.

3.3.4 Procedure for Minimizing Flaring during Unit 22 Isolation

Unit 22 isolation (from the FGRU) is done during periods where there is a potential to release HF acid into the flare system. Isolation is done as a safety precaution as it is safer to have a release through a dedicated flare (West Refinery Flare) than numerous fired sources throughout the plant.

During normal operation, the West Refinery Flare receives little flare flow since it is all directed towards the GOHDS. But when the Unit 22 isolation valve is closed, the flow from the West Refinery header is all directed towards the West Refinery Flare without going to the FGRU – the other headers still go to the FGRU.

During Unit 22 Isolation the following should be considered to reduce flaring:

- Cease all unnecessary venting/purging of equipment in the North Refinery.
- Review areas including Units 9, 10, 19, 22, 26, 28, 32, 35, 36, BH, OSHU, CNU, and individual equipment in Units 29 and 40 and equipment in the ILB area.

3.3.5 Procedure for Minimizing Flaring during Flare Down

As mentioned in Section 2.1, the East and the West Refinery Flares have a crossover line between them and can act as backups to each other if one is shut down. The same goes for the CAT and the GOHDS Flares.

Flares must be periodically out of service for maintenance. The following should be considered to reduce flaring:

- Define the period of time the flare will be out of service and develop a schedule to get the work completed.
- Update the schedule as required.

- Cease all unnecessary venting/purging of equipment in the North Refinery.
- Review areas including Units 9, 10, 19, 22, 26, 28, 32, 35, 36, BH, OSHU, CNU, and individual equipment in Units 29 and 40 and equipment in the ILB area.

SECTION 4 BASELINE GENERATION

4.1 Baseline Flow Evaluation

NSPS Ja specifies that a baseline flow evaluation must be conducted after the minimization assessment has been completed. The numeric value of the baseline flow is the sum of all flows that the minimization assessment determined could not be further minimized. See Section 3 for further information on the Minimization Assessment.

Alternative baseline flow rates can be established for different operating conditions provided that the following information is included with the development of separate baseline flow rates:

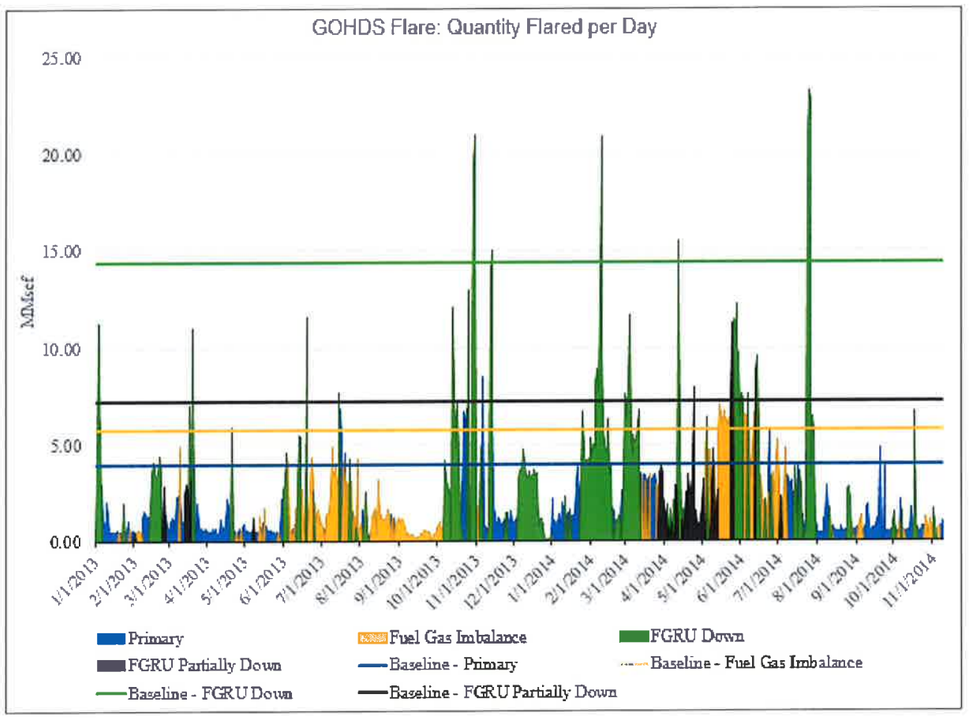
- Identification of a primary baseline that will be used as the default baseline;
- Description of each operating condition for which a separate baseline is established; and,
- Procedures to minimize discharges to the flare during each operating condition for which a separate baseline is established (see Section 3.2).

To determine baseline flows, historical flare flow data was utilized and was based upon data after the installation of the Flare Gas Recovery (FGR). To get the historical flare data, a report was pulled from the DCS that showed the flow rate for every minute over nearly two years (January 1, 2013 through November 9, 2014). To get the total amount of flow each day in standard cubic feet (scf), the flow rate for every minute was assumed to have been constant for that entire minute and every minute was summed up for the day. The total flow for the day was then compared to historical flaring reports generated every day by the shift team. The flare reports identify the causes of flaring for the day. For example, a flare report for one day might list out that a specific vessel was being purged and the FGRU was shut down. Since we know that the FGRU was shut down during that day, it was assumed that was the cause of flare flow for the day. Therefore that day would have been labeled as an alternate baseline scenario of the FGRU being down. Each day was assessed to see if it fell into an alternate baseline case. If it did not, it was assigned to the primary (default) baseline.

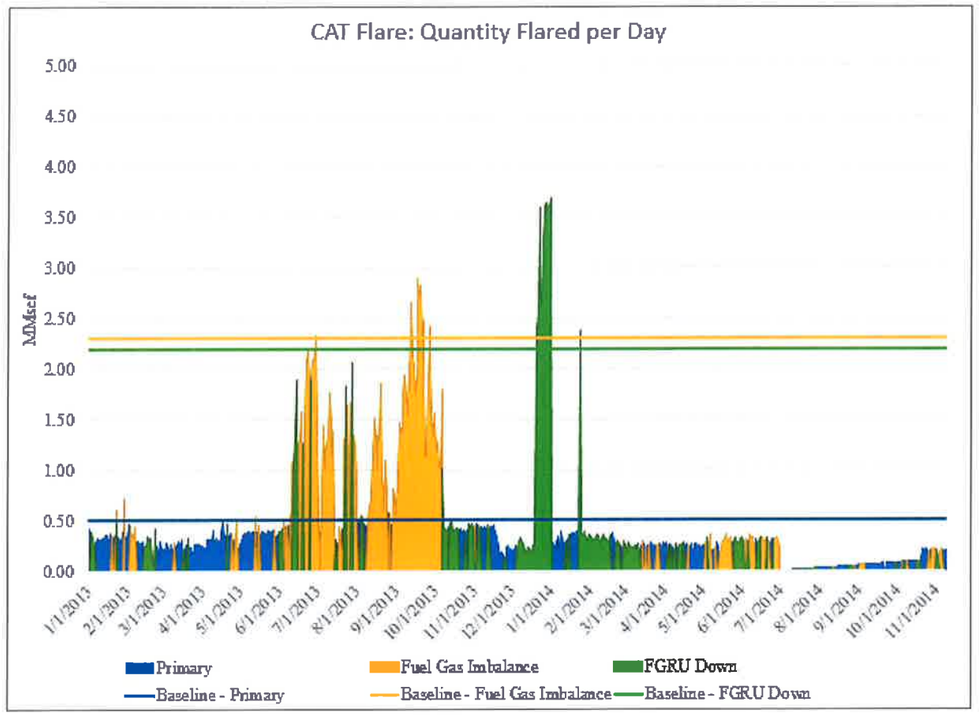
Two sets of days were not included in this evaluation due to extremely high flaring and not enough information in the flare logs to demonstrate the reason for the flaring. For the GOHDS and CAT flares, September 21–22, 2014 were not included and for the West Refinery and East Refinery flares, October 20–24, 2013 were not included. Normally, when no information indicated that an alternate case was present, the day was assigned to the primary (default) baseline. However, the flare flows indicated the refinery was not in normal operation.

After each day was assigned and the flare flow totaled, the baseline flow was determined. Due to high variability in the data, the baselines were set at the average plus two standard deviations. The chosen alternate baselines are different per flare. Graphs 2 – 5 show the flare flow data that was evaluated (between January 1, 2013 and November 9, 2014).

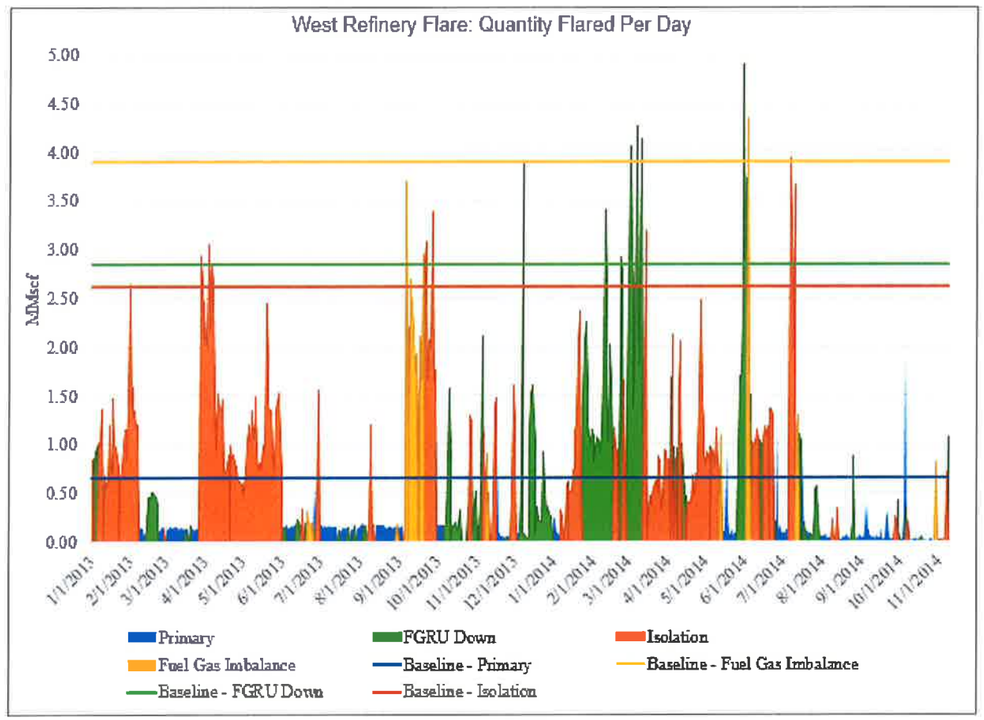
Graph 2 GOHDS Flare Total Flare Flow per Day with Baselines



Graph 3 CAT Flare Total Flare Flow per Day with Baselines



Graph 4 West Refinery Flare Total Flare Flow per Day with Baselines



Graph 5 East Refinery Flare Total Flare Flow per Day with Baselines

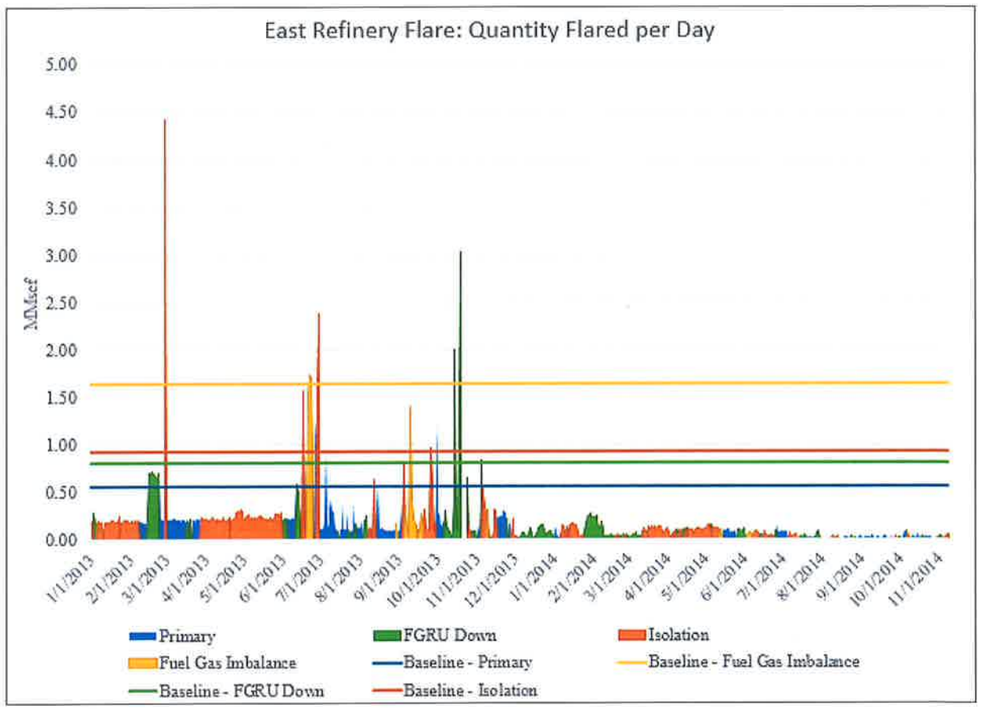


Table 16 shows which baselines were chosen for each flare and the daily flow for each baseline (MMscf).

Table 16 Alternate Baselines per Flare

	GOHDS	CAT	West Refinery	East Refinery
	Daily Flare Flow (MMSCF)			
FGRU Down	14.421	2.191	2.851	0.809
Unit 22 Isolation	N/A	N/A	2.622	0.926
Fuel Gas Imbalance	5.750	2.304	3.902	1.637
FGRU Partially Down	7.229	N/A	N/A	N/A
Primary (Default) Baseline	3.935	0.507	0.649	0.558

Table 17 Count of Days where Baseline Applied

	GOHDS	CAT	West Refinery	East Refinery
	Days (between 1/1/2013 – 11/9/2014)			
FGRU Down	174	174	174	174
Unit 22 Isolation	N/A	N/A	227	227
Fuel Gas Imbalance	177	177	24	24
FGRU Partially Down	43	N/A	N/A	N/A
Primary (Default) Baseline	282	325	248	248

During the primary (default) baseline, the FGRU is running two compressors, there is no fuel gas imbalance, and the Unit 22 isolation valve is not closed (for West and East Refinery flares). A change in this configuration identifies an alternate baseline. In 2013 and 2014, the system ran with two compressors and one backup.

Evaluating each day aided in understanding options for minimization. In looking at the top 50 flaring days, the following list shows which units were mentioned the most often and in what context. These units were researched during the minimization Section 3 of this document.

Table 18 Flaring Analysis

Unit	Mentions in the Top 50 Flaring Days	Mentions in All Days
Unit 22 purging	66%	54%
Unit 41		11%
venting H2	24%	
purging N2	16%	
Unit 29 steaming	38%	21%
Unit 11 venting C3 Surge Tank	20%	15%
Unit 5 SRI purging N2	20%	3%

4.1.1 Flare Gas Recovery Unit Down

The first alternate baseline case is when the FGRU is down. This could be due to a problem with the equipment in the FGRU or due to flaring in an area that should not be recovered by the FGRU. In either case, all flow will go to the flares. The expectation of the refinery is that the FGRU will be running in order to capture all of the flare gas before it goes to the flare. This scenario was chosen as an alternate baseline because it is a distinct operational change from that expectation. In this scenario, no flow is recovered and all is flared. Addressing the issue of the FGRU being down was described in the minimization section of this document.

The facility minimizes the duration of an FGR outage. Most are only a few hours, but during a period of FGR upgrade an outage can be several days. The normal flow rate (alternate baselines) for each flare during an outage is listed in Table 16. The worst case number of days is shown in Table 17.

4.1.2 Fuel Gas Imbalance

The next alternate baseline evaluated is when there is a fuel gas imbalance and fuel gas is vented straight to the flare. This is done when the pressure in the fuel gas system becomes too high. While this alternate case applies to both the GOHDS and CAT flares as well as the West and East flares, the trigger for the scenario is based on which control valve is venting the sweet fuel gas. To vent to the GOHDS and CAT flares, control valve 90FC017 is opened and to vent to the West and East Refinery flares, control valve 19PC157 is opened. The average length of this alternate baseline case is 12.4 hours per day. The average length was determined by pulling data from the DCS of flow through the fuel gas vent control valve (90FC017) for every minute and counting the minutes per day that had flow.

4.1.3 Unit 22 Isolation

The third alternate baseline case evaluated applies only to the West and East Refinery flares. In this scenario, the Unit 22 isolation valve 22HS415 is closed and flare flow to the FGRU is cut off and directed towards the West and East flares. This scenario was chosen as an alternate case because it causes a drastic difference in flare flow to the West and East Refinery flares. Since the GOHDS flare usually sees the upset condition flare flow, this alternate case causes very high spikes specifically in the West Refinery flare. The spikes are much higher than the normal baseline. In 2013 and 2014, the average length of time the valve remained closed after it was initially closed was over six days. This included four large turnarounds in which the valve was closed over 270 days combined. Removing these outliers, we get an average of two days. This time was calculating by pulling the valve position from the DCS which shows the time the valve changed position. The amount of time the valve was closed before opened was summed and then averaged with the total number of times the valve was closed. Therefore two days is the expected length of the alternate baseline.

The facility minimizes the duration of Unit 22 Isolation. Most are only a few hours, but can last several days. The normal flow rate (alternate baseline) for each flare during an outage is listed in Table 16. The worst case number of days is shown in Table 17.

4.1.4 Flare Gas Recovery Unit Partially Down

The FGRU being partially down is defined when two compressors are down so that only one can recover gas. In this case, the FGRU is not able to recover as much flow as when two are running and the GOHDS flare will see a higher flare flow (the GOHDS seal drum is set the lowest so that the flow is primarily directed to it). There was no higher flare flow during for the other three flares the days in which two compressors were down and so the alternate baseline was only applied to the GOHDS flare. The expected duration of this alternate baseline once triggered is also a full day.

The facility minimizes the duration of an FGR partially down. Most are only a few hours, but during a period of FGR upgrade an outage can last several days. The normal flow rate (alternate baselines) for each flare during an outage is listed in Table 16. The worst case number of days is shown in Table 17.

4.1.5 Flare Down

The final alternate baseline case evaluated is when any one of the four flares is down. As mentioned in Section 3.3.5, the East and the West Refinery Flares have a crossover line between them and can act as backups to each other if one is shut down. The same goes for the CAT and the GOHDS Flares. A flare can be taken offline during any one of the other baseline cases and so a completely new set of baseline flow rates applies. This new set of baseline flow rates is a combination of the two flares that can backup each other. For example if the East Flare is shut down, the West Flare alternate baseline flow is the sum of the East and the West Flare baseline flows. The table below shows the flow rates.

The facility does maintenance on flares. Maintenance of a flare does not result in excess emissions as emissions are moved from the flare that is down to remaining flares. Flare downtime and the refinery's use of the Flare Down alternate baseline may be several months in duration.

Table 19 Alternate Baselines when One Flare is Down

	GOHDS and CAT	East and West
	Daily Flare Flow (MMSCF)	
FGRU Down	16.612	3.66
Unit 22 Isolation	N/A	3.548
Fuel Gas Imbalance	8.054	5.539
FGRU Partially Down	7.229	N/A
Primary (Default) Baseline	4.442	1.207

A glossary of regulatory terms used throughout this Flare Management Plan is presented as Appendix F.

APPENDIX A DOCUMENT REVISION LOG

Revision Log

This Flare Management Plan (FMP) fulfills the requirements for NSPS Ja for the No. 1 Flare. Any changes to the original plan should be documented in the table below.

Revision No.	***Revision Date***	***Revision Author (name, company)***	***Reason for Revision***	***Requires Submission to the USEPA? (see Section 1.3 of the FMP)***
0	*11/09/15*	*P66 Company*	*Initial issue*	*No*

APPENDIX B NSPS JA CROSS-REFERENCE TABLE

Regulatory Section	Regulatory Section Description	FMP Section	Comments
60.103a(a)(1)	**Listings per flare**		
	Process units	2.4, Appendix E	
	Ancillary equipment	2.4, Appendix E	
	Fuel gas systems	2.3.2 – 2.3.6	
60.103a(a)(2)	**Minimization assessment**		
60.103a(a)(2)(i)	Elimination of process gas discharge to the flare through process operating changes or gas recovery at the source	3.2.1.1	
60.103a(a)(2)(ii)	Reduction of the volume of process gas to the flare through process operating changes	3.2.1.1	
60.103a(a)(2)(iii)	Installation of a flare gas recovery system or, for facilities that are fuel gas rich, a flare gas recovery system and a co-generation unit or combined heat and power unit (if applicable)	3.2.2	
60.103a(a)(2)(iv)	Minimization of sweep gas flow rates and, for flares with water seals, purge gas flow rates	3.2.1.2	
60.103a(a)(3)(i)	**General description including**		
	Flare type (ground or elevated)	2.1	
	Assist system	2.1	
	Flare tip	2.1	
	Cascaded flare system	2.1	
	Flare backup	2.1	
	Emergency or non-emergency flare	2.1	
	Flare Gas Recovery System	2.1	
60.103a(a)(3)(ii)	**Description and simple PFD showing the interconnection of the following**		
	Flare tip (including design information and tip drawing)	2.3.1, Appendix C	

Regulatory Section	Regulatory Section Description	FMP Section	Comments
	KO drum (including design information)	2.4.1, Appendix C	
	Flare header & subheader	2.1, Appendix C	
	Assist system	2.3.2, Appendix C	
	Ignition system	2.3.3, Appendix C	
60.103a(a)(3)(iii)	**Design parameters**		
	Maximum vent gas flow rate	2.1	
	Minimum sweep gas flow rate	2.3.5	
	Minimum purge gas flow rate	2.3.4	
	Maximum supplemental gas flow rate	2.3.6	
	Maximum pilot gas flow rate	2.3.4	
	Minimum total steam flow rate	2.3.2	
60.103a(a)(3)(iv)	**Description and simple PFD of all gas lines and monitors**		
	Designate which lines are exempt from sulfur, H2S or flow monitoring and why	2.3.3, 2.3.4, 2.3.5, 2.3.6	
	Designate which lines are monitored	2.3.3, 2.3.4, 2.3.5, 2.3.6	
	Identify on the process flow diagram the location and type of each monitor	Appendix C	
	Vent gas	Appendix C	
	Purge gas	2.3.4	
	Sweep gas	2.3.5	
	Supplemental gas	2.3.6	
	Pilot gas	2.3.3	
60.103a(a)(3)(v)	**Manufacturer's specifications for each monitor/analyzer identified in 60.103a(a)(3)(iv)**		
	Make	ECP 2.0 Flare CEMS QAQC	
	Model	same	

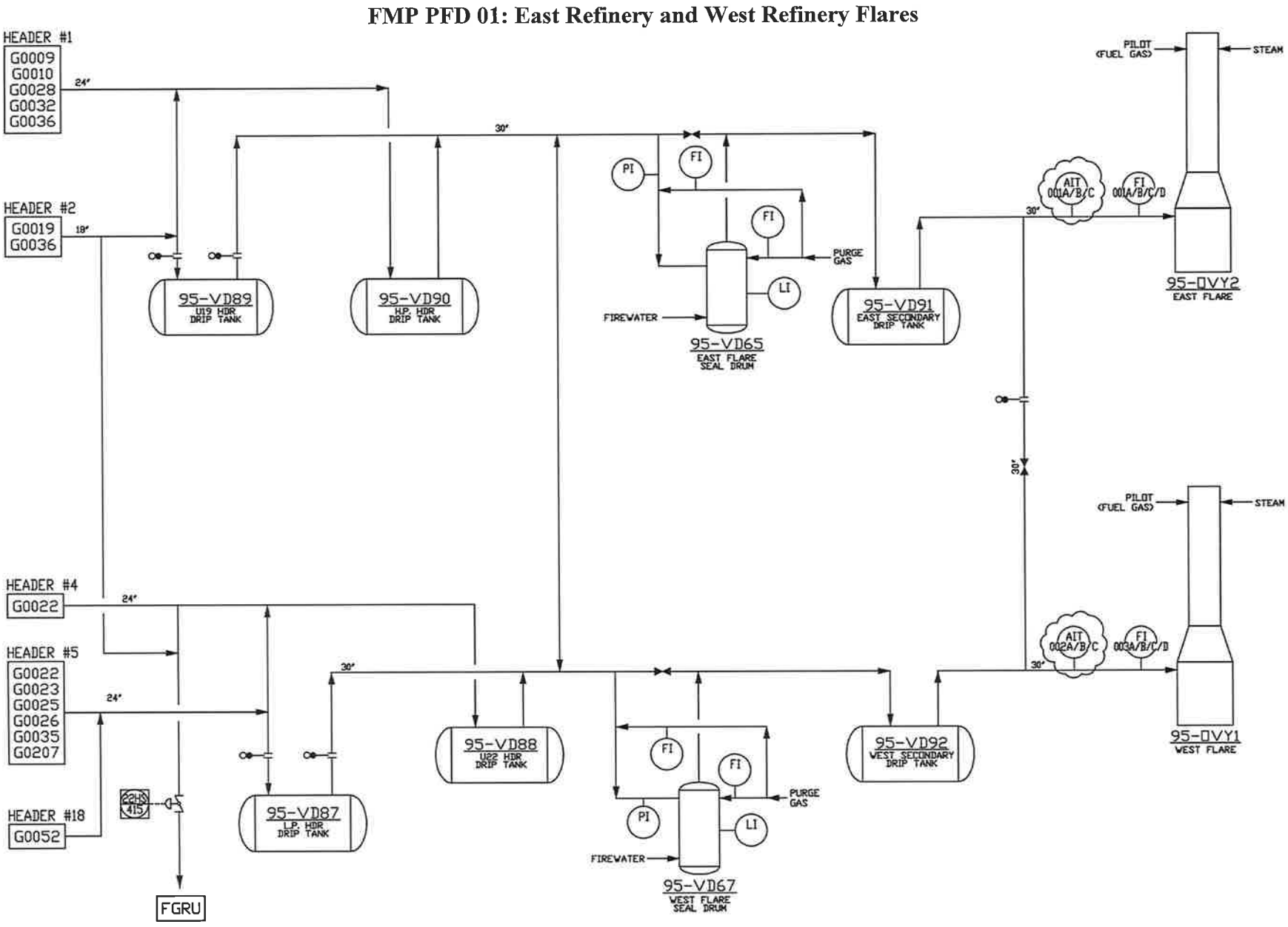
Regulatory Section	Regulatory Section Description	~~FMP~~ Section	Comments
	Type	ECP 2.0 Flare CEMS QAQC	
	Range	same	
	Precision	same	
	Accuracy	same	
	Calibration	same	
	Maintenance procedures	same	
	Instrument quality assurance procedures	same	
60.103a(a)(3)(vi)	**For emergency flares, secondary flares, and flares with FGRUs that are designed to capture all normal flows**		
	Description of water seal	2.5	
	Designation of monitoring option	2.7	
60.103a(a)(3)(vii)	Description of FGRU	2.6	
	FGRU monitoring parameters to quantify gas recovered	2.6	
	FGRU Compressor system logistics for staged compressors	2.6	
60.103a(a)(4)	**Baseline flow evaluation**		
60.103a(a)(4)(i)	Primary baseline	4.1	
60.103a(a)(4)(ii)	Alternate baseline(s)	4.1.1, 4.1.2, 4.1.3, 4.1.4	
	…Rationale	4.1.1, 4.1.2, 4.1.3, 4.1.4	
	…Daily Flow	4.1	
	…Expected duration	4.1.1, 4.1.2, 4.1.3, 4.1.4	
60.103a(a)(4)(iii)	Minimization procedures for alternate baseline(s) in 60.103a(a)(4)(ii) unless developed for 60.103a(a)(5)-(8)	3.3, Appendix D	

Regulatory Section	Regulatory Section Description	FMP Section	Comments
60.103a(a)(5)	Procedures to minimize or eliminate discharges during planned shutdown and startup	3.3.1, Appendix D	
	A schedule for the prompt implementation of any procedures that cannot reasonably be implemented as of the date of the submission of the flare management plan	N/A – All were included	
60.103a(a)(6)	Procedures to reduce flaring in cases of fuel gas imbalance	3.3.2	
	A schedule for the prompt implementation of any procedures that cannot reasonably be implemented as of the date of the submission of the flare management plan	N/A – All were included	
60.103a(a)(7)	Procedures to minimize frequency and duration of FGRU outages and to minimize flaring during FGRU outages	3.3.3, Appendix D	
	A schedule for the prompt implementation of any procedures that cannot reasonably be implemented as of the date of the submission of the flare management plan	N/A – All were included	
60.103a(c)-(e)	Root Cause Analysis	Follow 60.103a(c)-(e)	An RCFA must be completed within 45 days as per requirements listed in 60.103a(c)-(e)

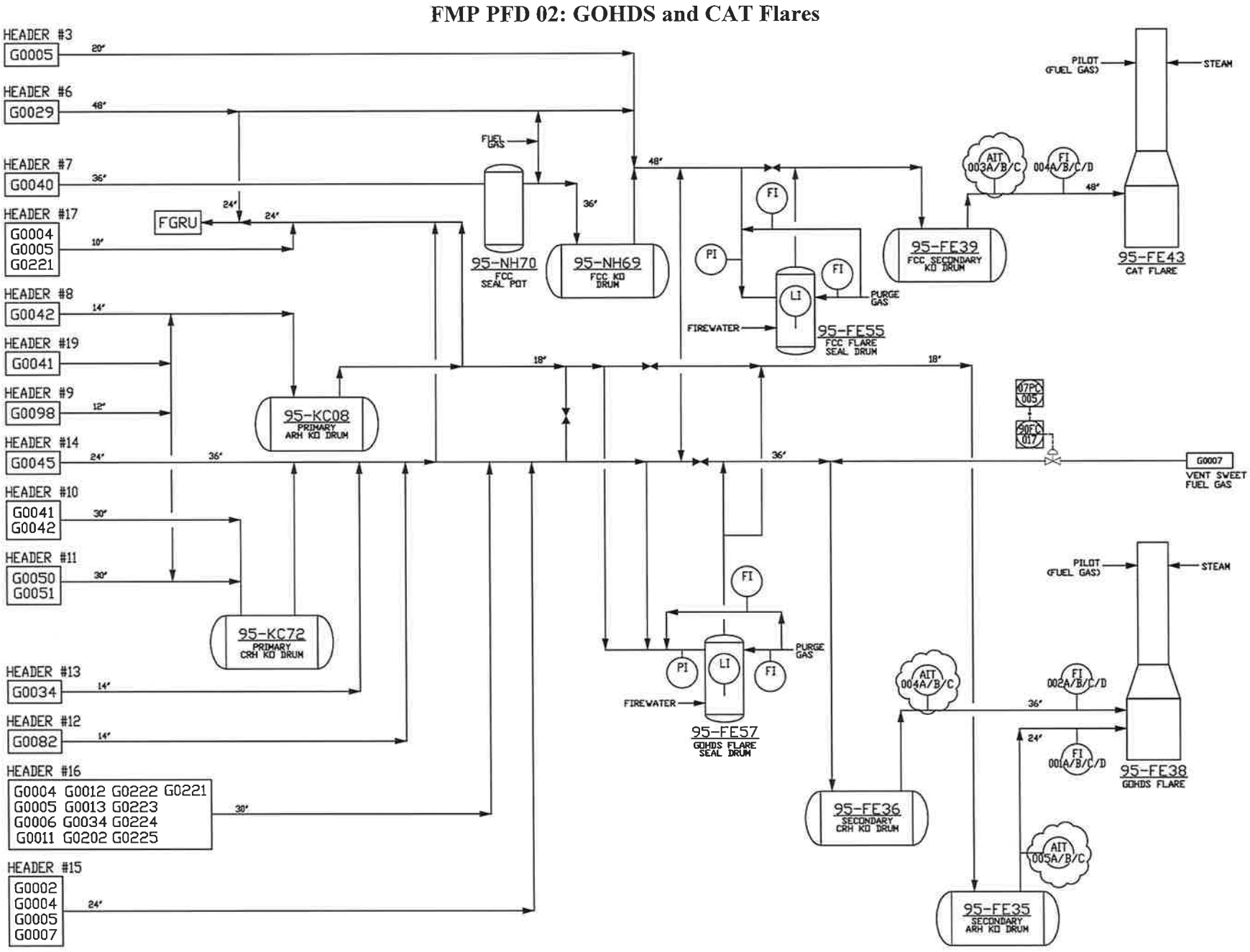
APPENDIX C PROCESS FLOW DIAGRAMS

- FMP_PFD_01: East and West Refinery Flares
- FMP_PFD_02: GOHDS and CAT Flares
- FMP_PFD_03: Flare Gas Recovery Unit
- FMP_PFD_04: All Flares

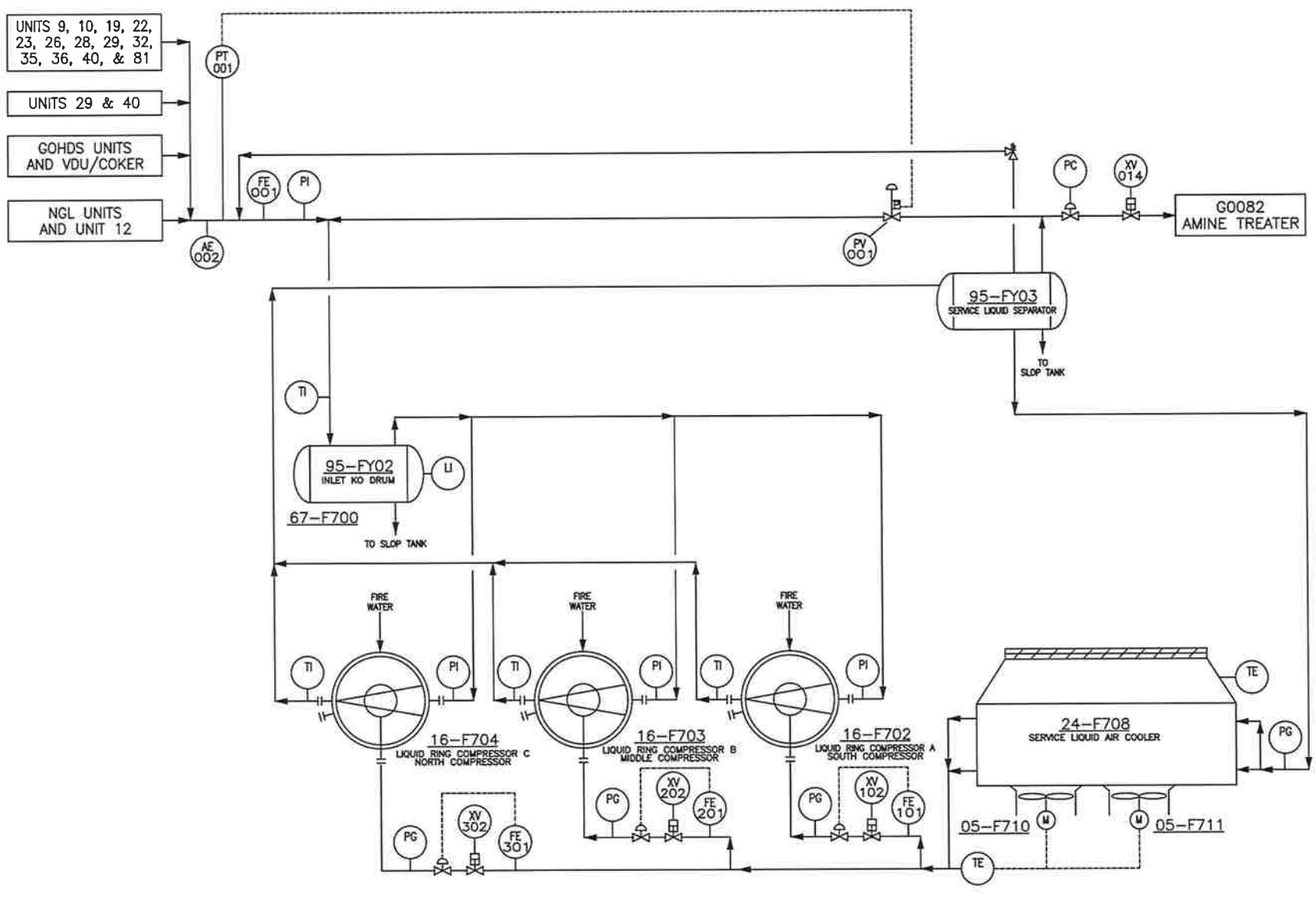
FMP PFD 01: East Refinery and West Refinery Flares



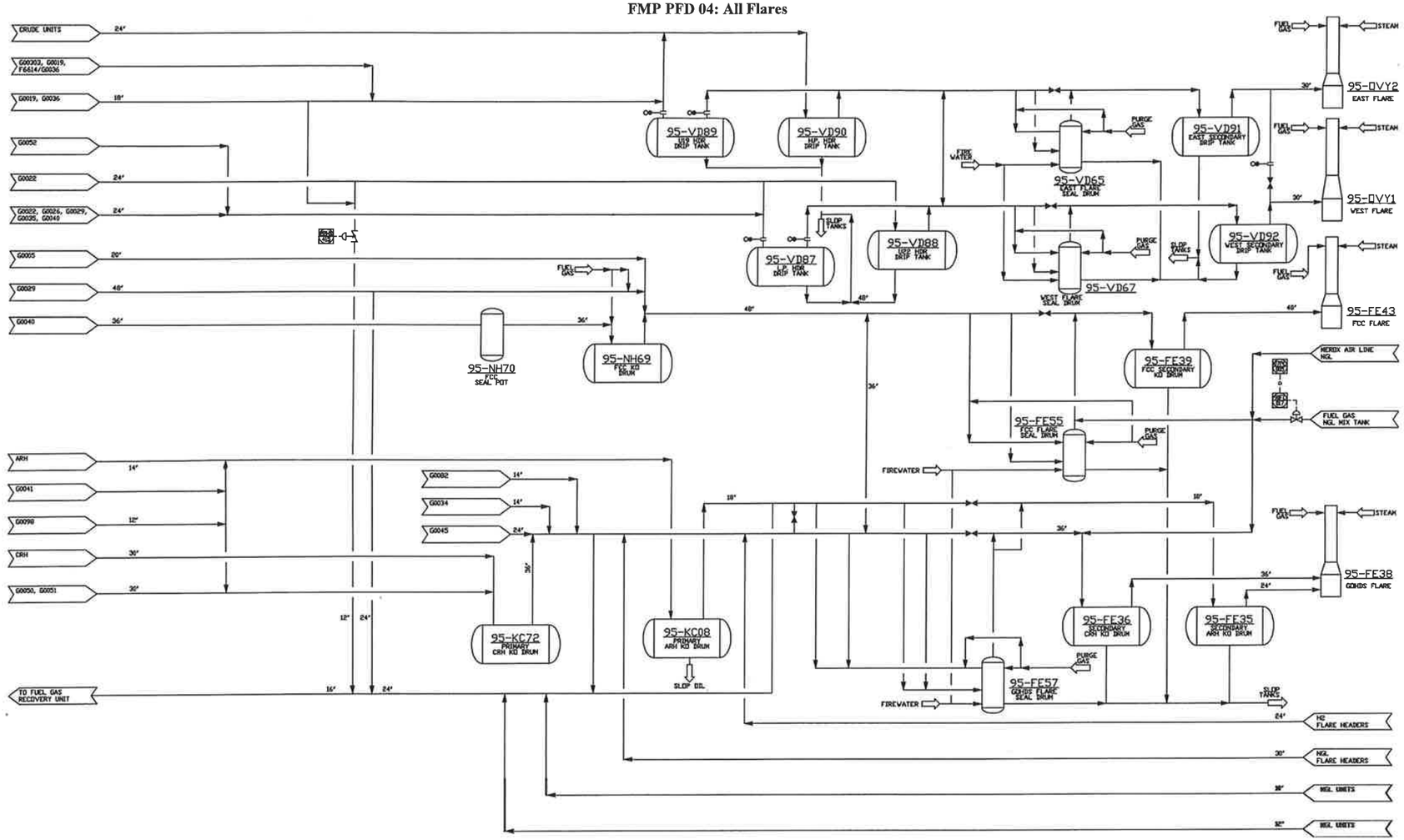
FMP PFD 02: GOHDS and CAT Flares



FMP PFD 03: Flare Gas Recovery Unit



FMP PFD 04: All Flares



APPENDIX D MINIMIZATION PROCEDURES

The following procedures are locating in Livelink under Downstream > Refining > Borger Refinery > [*folder location listed in the bullet points below*]

- **CPX-EP-1010: Refinery Gas Shedding**
  - http://livelink.phillips66.net/Livelink.exe/properties/182298322
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Operations > Emergency Operating Procedures

- **CPX-EP-1200: Acid Gas Shedding**
  - http://livelink.phillips66.net/Livelink.exe/properties/154532965
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Operations > Emergency Operating Procedures

- **CPX-NP-3025: Venting or Purging of Equipment to Flare System**
  - http://livelink.phillips66.net/Livelink.exe/properties/159726705
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Operations > Normal Operating Procedures

- **CPX-NP-5080: Monitoring the Flares by Operation Shift Team**
  - http://livelink.phillips66.net/Livelink.exe/properties/168454382
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Operations > Normal Operating Procedures

- **ECP 2.13: Borger Flare Gas Recovery System**
  - http://livelink.phillips66.net/Livelink.exe/properties/163190168
  - Environmental > Environmental Compliance Procedures > Air

- **FGR-EP-1500: Managing Abnormal Flaring Conditions**
  - http://livelink.phillips66.net/Livelink.exe/properties/159762898
  - Employee Development Team > Standard Operating Procedures > Area D > Process (North) > FGRU, Butamer & C5/C6 Isom > Normal Operating Procedures > Emergency Operating Procedures

- **FGR-EP-1550: Shut Down FGRU during Unit 45 Flaring Event**
  - http://livelink.phillips66.net/Livelink.exe/properties/159762899
  - Employee Development Team > Standard Operating Procedures > Area D > Process (North) > FGRU, Butamer & C5/C6 Isom

- **FGR-NP-4025: Winterize Service Liquid Air Fins**
  - http://livelink.phillips66.net/Livelink.exe/properties/160526623
  - Employee Development Team > Standard Operating Procedures > Area D > Process (North) > FGRU, Butamer & C5/C6 Isom > Normal Operating Procedures > FGRU

- **FGR-NP-4030: External Steam Heaters FGRU Airfins**
  - http://livelink.phillips66.net/Livelink.exe/properties/183257454
  - Employee Development Team > Standard Operating Procedures > Area D > Process (North) > FGRU, Butamer & C5/C6 Isom > Normal Operating Procedures > FGRU

- **ILB-NP-4148: Block in Lift Steam to Flare Tip during Freezing Weather**
  - http://livelink.phillips66.net/Livelink.exe/properties/160628608
  - Employee Development Team > Standard Operating Procedures > Area E (Plant Systems) > Refinery In-Line Blending > Normal Operating Procedures > Flare and KO Drums

- **PSSTL-NP-4140: FGRU Operation during Abnormal Flaring Events**
  - http://livelink.phillips66.net/Livelink.exe/properties/176038269
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Shift Team Leaders > Normal Operating Procedures

- **STL-EP-1020: Steam Shedding Plan**
  - http://livelink.phillips66.net/Livelink.exe/properties/132342037
  - Employee Development Team > Standard Operating Procedures > Complex Wide Procedures > Shift Team Leaders > Emergency Operating Procedures

APPENDIX E REFINERY PROCESS UNITS, ANCILLARY EQUIPMENT AND FUEL GAS SYSTEMS CONNECTED TO SUBPART JA FLARES

Note: The header numbers below apply to the PFDs in Appendix C.

Header 1 Ancillary Equipment – East Flare

G0009 (Crude Unit)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0009_MF_11	36-U135	UNIT 9 CHARGE FURNACE
PCD_G0009_MF_2	93-U103	41-U125A (S), 41-U125B (S), 41-U125C (S)
PCD_G0009_MF_3	93-U104	41-U126A (S), 41-U126B (S), 41-U126C (S)
PCD_G0009_MF_9	93-U115	24-U134 A, 24-U134 B, 24-U136 A, 24-U136 B, 41-U129A (S), 41-U129B (S), 41-U134 (T), 41-U135A (S), 41-U135B (S), 41-U136 (T), 41-U137 (S), 41-U138 (S), 95-UB15
PCD_G0009_MF_51	93-U137	24-U128 (East), 24-U128 (West), 41-U132 (S), 41-U133A (S), 41-U133B (S), 41-U133C (S), 41-U133D (S), 95-UB28
PCD_G0009_MF_47	93-U140	41-U134 (S)
PCD_G0009_MF_48	93-U141	41-U136 (S)
PCD_G0009_MF_27	95-UB07	FOUL/SULFIDE WATER SURGE TANK

G0010 (Crude Unit)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0010_MF_24	35-UA10	FUEL GAS FILTER WEST
PCD_G0010_MF_11	36-U117	CHARGE FURNACE
PCD_G0010_MF_42	67-U039	10B ACCCUMULATOR REFLUX & TRANSFER SOUTH
PCD_G0010_MF_42	67-U040	10B ACCUMULATOR REFLUX & TRANSFER NORTH
PCD_G0010_MF_42	67-U047	S. #1A TANK TRANSFER/REFLUX PUMP
PCD_G0010_MF_42	67-U048	N. #1A TANK TRANSFER/REFLUX PUMP
PCD_G0010_MF_19	67-U095	NORTH HEAVY NAPHTHA PUMP
PCD_G0010_MF_19	67-U096	SOUTH HEAVY NAPHTHA PUMP
PCD_G0010_MF_15	93-U222	24-U102A, 24-U102B, 41-U103 (S), 41-U204 (S), 95-UA11

MF #	Equipment Number	Description/Eq. Protected
PCD_G0010_MF_19	93-U224	95-UA12
PCD_G0010_MF_34	93-U239	41-U201 (T), 41-U202 (S), 41-U205A (T), 41-U205B (T), 41-U210 (S)
PCD_G0010_MF_36	93-U248	95-UA19
PCD_G0010_MF_37	93-U249	95-UA18
PCD_G0010_MF_34	93-U250	41-U201 (S)
PCD_G0010_MF_20	95-UA20	SEAL OIL POT FOR 67-U544
PCD_G0010_MF_20	95-UA21	SEAL OIL POT FOR 67-U045

G0019 (HDS & Reformer)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_9	95-TF26	DISTILLATE REFLUX ACCUMULATOR

G0028 (Crude Unit)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0028_MF_59	35-U601	CRUDE FRACTIONATOR COKE TRAP
PCD_G0028_MF_59	35-U602	SPARE CRUDE FRACT. COKE TRAP
PCD_G0028_MF_3	36-U626	CHARGE FURNACE
PCD_G0028_MF_64	67-U603	DIESEL PUMPAROUND
PCD_G0028_MF_64	67-U604	DIESEL PUMPAROUND/JET PUMPAROUND
PCD_G0028_MF_64	67-U605	WEST HEAVY DIESEL PUMP
PCD_G0028_MF_64	67-U606	EAST HEAVY DIESEL PUMP
PCD_G0028_MF_64	67-U607	JET PUMPAROUND PUMP
PCD_G0028_MF_59	67-U608	EAST TOPPED CRUDE #2 TOWER
PCD_G0028_MF_59	67-U611	WEST TOPPED CRUDE #2 TOWER
PCD_G0028_MF_63	67-U616	WEST #2 TWR REFLUX AND TRANSFER
PCD_G0028_MF_63	67-U617	EAST #2 TWR REFLUX AND TRANSFER
PCD_G0028_MF_27	93-U563	IP005-15CL276-NS0-24
PCD_G0028_MF_27	93-U564	24-U629 A, 24-U629 B, 41-U127 (S), 41-U130 (T), 41-U131 (T), 41-U205 A (S), 41-U205 B (S), 41-U621 (S), 41-U622 (S), 41-U633 (S), 41-U634 (S), 41-U635

MF #	Equipment Number	Description/Eq. Protected
		(S), 95-UB12, 95-UG18, 95-UG40, 95-UG42
PCD_G0028_MF_36	93-U568	41-U631 A (S), 41-U631 B (S)
PCD_G0028_MF_59	93-U569	41-U632 (S)
PCD_G0028_MF_63	93-U571	24-U629 A, 24-U629 B, 41-U621 (S), 41-U622 (S), 41-U633 (S), 95-UB12, 95-UG18
PCD_G0028_MF_7	93-U586	24-U602 A, 24-U602 B, 24-U602 C, 24-U628 A, 24-U628 B, 24-U628 C, 24-U628 D, 41-U601 A (S) , 41-U601 C (S) , 41-U629 (S), 41-U630 (S), 95-UG10, 95-UG19
PCD_G0028_MF_32	93-U588	41-U612 A (S), 41-U612 B (S), 41-U613 B (T), 41-U613 C (T), 41-U613 D (T), 41-U613 F (S), 41-U613 G (S), 41-U631 A (T), 41-U631 B (T), L018-30CSTL-HC1-6
PCD_G0028_MF_26	93-U589	41-U607 A (S), 41-U607 B (S), 41-U609 (S), 41-U611 A (S), 41-U611 B (S), 41-U613 A (T), 41-U615 (T), L024-30CSTL-HC1-6
PCD_G0028_MF_7	93-U593	95-UG11
PCD_G0028_MF_24	93-U603	95-UG09
PCD_G0028_MF_6	93-U608	24-U602 A, 24-U602 B, 24-U602 C, 24-U628 A, 24-U628 B, 24-U628 C, 24-U628 D, 41-U611 A (T), 41-U611 B (T), 41-U612 A (S), 41-U612 A (T), 41-U612 B (T), 41-U613 A (S), 41-U613 B (S), 41-U613 C (S) , 41-U613 D (S), 41-U613 F (T), 41-U613 G (T), 95-UG10, 95-
PCD_G0028_MF_6	93-U610	95-UG10
PCD_G0028_MF_24	93-U611	95-UG09
PCD_G0028_MF_7	95-UG11	BENZENE STRIPPER OVHD KO TANK
PCD_G0028_MF_7	95-UG19	#1 TOWER ACCUMULATOR

G0032 (Benzene Stripper)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0032_MF_26	67-U573	BENZENE STRIPPER A&B NEUTRALIZER INJ
PCD_G0032_MF_21	67-U638	RAW WTR BOOSTER
PCD_G0032_MF_5	67-U641	BIG CRUDE BOOSTER PUMP
PCD_G0032_MF_4	93-U618	95-UF07, 95-UF23
PCD_G0032_MF_1	93-U619	95-UF12
PCD_G0032_MF_3	93-U620	95-UF07, 95-UF11
PCD_G0032_MF_7	93-UF17	95-UF17
PCD_G0032_MF_14	93-UF19	95-UF19
PCD_G0032_MF_15	93-UF20	95-UF20
PCD_G0032_MF_7	95-UF17	BENZENE WATER FLASH DRUM
PCD_G0032_MF_14	95-UF19	BENZENE STRIPPER A
PCD_G0032_MF_15	95-UF20	BENZENE STRIPPER B

G0036 (HDS)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0036_MF_20	16-U802	STABILIZER OH COMP EAST
PCD_G0036_MF_21	16-U803	STABILIZER OH COMP WEST
PCD_G0036_MF_13	93-U703	16-U802 W disch, 95-UH09
PCD_G0036_MF_17	93-U710	95-UH04, 95-UH20
PCD_G0036_MF_10	93-U713	24-U909, 41-U907 (S), 95-UH02, 95-UH06, 95-UH10, 95-UH11, 95-UH11A, 95-UH19
PCD_G0036_MF_9	93-U716	24-U909, 36-U910 (#2), 41-U903A (S), 41-U903B (S), 41-U903C (S), 41-U903D (S), 41-U907 (S), 95-UH02, 95-UH06
PCD_G0036_MF_6	93-U717	24-U905, 41-U904 (S), 41-U906A (S), 41-U906B (S), 41-U906C (S), 41-U911A (S), 41-U911B (S), 95-UH22
PCD_G0036_MF_6	93-U718	36-U910 (#1), 41-U906A (T), 41-U906B (T), 41-U906C (T), 41-U911A (T), 41-U911B (T)
PCD_G0036_MF_12	93-U721	95-UH67
PCD_G0036_MF_2	93-U725	95-UH21
PCD_G0036_MF_12	93-U727	95-UH10, 95-UH11, 95-UH11A, 95-UH19
PCD_G0036_MF_33	93-U728	41-U915 (T), 95-UH16, 95-UH23, 95-UH25

MF #	Equipment Number	Description/Eq. Protected
PCD_G0036_MF_33	93-U729	35-UH24
PCD_G0036_MF_34	93-U730	95-UH26
PCD_G0036_MF_10	95-UH02	REFLUX ACCUMULATOR
PCD_G0036_MF_13	95-UH08	EAST MU HYD COMP DISCHARGE BOTTLE
PCD_G0036_MF_13	95-UH09	EAST OH GAS COMP DISCHARGE BOTTLE
PCD_G0036_MF_20	95-UH27	E DIST PIECE VENT/DRAIN POT COMP 16-U802
PCD_G0036_MF_20	95-UH28	E PACKING VENT/DRAIN POT COMP 16-U802
PCD_G0036_MF_21	95-UH29	W DIST PIECE VENT/DRAIN POT COMP 16-U803
PCD_G0036_MF_21	95-UH30	W PACKING VENT/DRAIN POT COMP 16-U803
PCD_G0036_MF_12	95-UH67	BLOWDOWN LIQUIDS ACCUMULATOR
PCD_G0036_MF_31	95-UH69	ANALYZER SAMPLE RECOVERY TANK

G0053

MF #	Equipment Number	Description/Eq. Protected
PCD_G0053_MF_33	93-U532	95-VG51
PCD_G0053_MF_33	93-U533	95-VG52

G0209

MF #	Equipment Number	Description/Eq. Protected
PCD_G0209_MF_12	93-0VN1	L227-15CSTL-HC1
PCD_G0209_MF_12	93-0VN2	35-VN2
PCD_G0209_MF_12	93-0VN3	35-VN3

Header 2 Ancillary Equipment – East Flare

G0019 (Fuel Gas, HDS, & Reformer)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_15	35-TF49A	FUEL GAS FILTER EAST
PCD_G0019_MF_15	35-TF49B	FUEL GAS FILTER WEST
PCD_G0019_MF_142	41-T793C	TRAIN A FEED/EFFLUENT

MF #	Equipment Number	Description/Eq. Protected
		BOTTOM
PCD_G0019_MF_22	67-T523	#2 NAPHTHA FRACT REBLR & TRANSFER EAST
PCD_G0019_MF_22	67-T524	#2 NAPHTHA FRACT REBLR & TRANSFER WEST
PCD_G0019_MF_40	67-T549	STABILIZER REFLUX EAST
PCD_G0019_MF_40	67-T550	STABILIZER REFLUX WEST
PCD_G0019_MF_79	67-T762	PENDING TRAIN 1 CHARGE PUMP
PCD_G0019_MF_40	93-OTF1	95-TF02
PCD_G0019_MF_13	93-T605	41-T653A (S), 41-T653B (S), 41-T655 (S)
PCD_G0019_MF_7	93-T609	24-T604A, 24-T604B, 24-T604C, 24-T604D, 41-T601 (S), 41-T603A (S), 41-T603B (S) , 41-T605A (S), 41-T605B (S) , 41-T605C (S) , 41-T606 (S), 41-T650A (S), 41-T650B (S) , 41-T650C (S) , 41-T650D (S) , 41-T652 (S), 41-T668 (S), 41-T669 (S), 41-T670 (S), 95-TF
PCD_G0019_MF_27	93-T615	95-TF22
PCD_G0019_MF_35	93-T623	41-T791(S), 41-T792 (S), 41-T868 (S), 41-T869(S), 95-TF24
PCD_G0019_MF_9	93-T624	24-T604A, 95-TF26
PCD_G0019_MF_2	93-T626	41-T650A (T), 41-T650B (T) , 41-T650C (T) , 41-T650D (T)
PCD_G0019_MF_2	93-T627	41-T650B (T) , 41-T650C (T) , 41-T650D (T)
PCD_G0019_MF_49	93-T632	95-TF72, 95-TG63
PCD_G0019_MF_2	93-T683	41-T668 (T)
PCD_G0019_MF_2	93-T684	41-T650A (S), 41-T650B (S) , 41-T650C (S) , 41-T650D (S) , 41-T668 (S)
PCD_G0019_MF_5	93-T685	41-T605A (S), 41-T605B (S) , 41-T605C (S) , 41-T606 (S), 41-T669 (S)
PCD_G0019_MF_5	93-T686	41-T669 (T)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_7	93-T687	24-T604A, 24-T604B, 24-T604C, 24-T604D, 41-T601 (S), 41-T602A (S), 41-T602B (S) , 41-T602C (S) , 41-T603A (S), 41-T603B (S) , 41-T605A (S), 41-T605B (S) , 41-T605C (S) , 41-T606 (S), 41-T650A (S), 41-T650B (S) , 41-T650C (S) , 41-T650D (S) , 41-T652 (S),
PCD_G0019_MF_69	93-T688	41-T668 (T), 41-T669 (T), 41-T670 (T), 41-T679 (T)
PCD_G0019_MF_69	93-T689	41-T670 (S)
PCD_G0019_MF_69	93-T690	41-T602A (T), 41-T602B (T) , 41-T602C (T)
PCD_G0019_MF_5	93-T691	41-T605A (T), 41-T605B (T) , 41-T605C (T)
PCD_G0019_MF_2	93-T692	41-T650A (T), 41-T650B (T) , 41-T650C (T) , 41-T650D (T)
PCD_G0019_MF_3	93-T693	41-T607A (T), 41-T607B (T), 41-T607C (T), 41-T607D (T), 41-T607E (T), 41-T607F (T), 41-T607G (T), 41-T607H (T), 41-T607J (T), 41-T607K (T), 41-T607L (T), 41-T607M (T), 41-T607N (T), 41-T607P (T), 41-T607Q (T), 41-T607R (T)
PCD_G0019_MF_127	93-T699	67-T556
PCD_G0019_MF_30	93-T701	41-T799A (S)
PCD_G0019_MF_20	93-T704	36-T633, 95-TF15
PCD_G0019_MF_20	93-T705	36-T633, 95-TF15
PCD_G0019_MF_26	93-T708	41-T629A (S), 41-T629B (S), 41-T629C (S), 41-T629D (S), 41-T630A (S), 41-T630B (S), 41-T630C (S), 41-T630D (S)
PCD_G0019_MF_26	93-T709	24-T620A , 24-T620B, 41-T619 (S)
PCD_G0019_MF_21	93-T710	24-T763A, 24-T763B, 24-T763C, 41-T790(S) , 41-T791(T), 41-T868(T), 41-T869(T), 95-TF102, 95-TF11, 95-TF12

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_36	93-T713	36-T634 (Coil II), 41-T626A (S), 41-T627 (S), 41-T627 (T), 41-T628 (S), 95-TF02, 95-TF04
PCD_G0019_MF_81	93-T719	95-TF09
PCD_G0019_MF_51	93-T720	24-T624A, 24-T624B, 24-T624C, 24-T624D, 24-T624E, 24-T624F, 24-T624G, 24-T624H, 24-T624J, 24-T624K, 41-T625A (T), 41-T625B (T), 41-T629A (T), 41-T629B (T), 41-T629C (T), 41-T629D (T), 41-T630A (T), 41-T630B (T), 41-T630C (T), 41-T630D (T), 95-TF09
PCD_G0019_MF_148	93-T731	35-TF79
PCD_G0019_MF_26	93-T804	41-T612A(S), 41-T612B(S), 95-TF21
PCD_G0019_MF_30	93-T809	67-T528
PCD_G0019_MF_4	93-T811	95-TF39
PCD_G0019_MF_131	93-T843	35-TG59
PCD_G0019_MF_131	93-T844	95-TG43, 95-TG44
PCD_G0019_MF_132	93-T845	41-T683 (S), 95-TG45, 95-TG49, 95-TG51
PCD_G0019_MF_132	93-T846	16-T570, 95-TG50, 95-TG52
PCD_G0019_MF_12	93-T848	L043-30STL-HYI-6
PCD_G0019_MF_12	93-T849	L246-30CSTL-HY1-4
PCD_G0019_MF_12	93-T850	36-T661 RX Coil, 41-T681 (T), 95-TF54
PCD_G0019_MF_12	93-T851	36-T661 RX Coil, 41-T681 (T), 95-TF54
PCD_G0019_MF_140	93-T852	95-TG47, 95-TG48
PCD_G0019_MF_13	93-T853	07-T663 (T), 35-TG59, 41-T653A (T), 41-T653B (T), 41-T654 (S), 41-T655 (T), 41-T679 (S), 41-T680 (S), 41-T681 (S), 95-TF32, 95-TF33, 95-TF56
PCD_G0019_MF_20	93-T870	41-T793A(T), 41-T793B(T), 41-T793C(T), 95-TF90
PCD_G0019_MF_20	93-T871	36-T660
PCD_G0019_MF_30	93-T874	67-T762
PCD_G0019_MF_148	93-T878	35-TF107

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_143	93-T904	41-T793C (S)
PCD_G0019_MF_142	93-T905	41-T796C (S)
PCD_G0019_MF_16	93-T906	41-T600A (S)
PCD_G0019_MF_51	95-TF09	PRODUCT SEPARATOR
PCD_G0019_MF_127	95-TF25	INBOARD SEAL BUFFER POT 67-T566
PCD_G0019_MF_9	95-TF26	DISTILLATE REFLUX ACCUMULATOR
PCD_G0019_MF_18	95-TF32	DISTILLATE LOW TEMPERATURE SEPARATOR
PCD_G0019_MF_16	95-TF34	FUEL GAS SCRUBBER
PCD_G0019_MF_127	95-TF36	OUTBOARD SEAL BUFFER POT 67-T566
PCD_G0019_MF_12	95-TF54	DISTILLATE HDS REACTOR
PCD_G0019_MF_49	95-TG20	SOUR GAS TRAP NORTH
PCD_G0019_MF_49	95-TG21	SOUR GAS TRAP OUTBOARD
PCD_G0019_MF_57	95-TG29	N BUFFER POT PLAT CHG 67-T525
PCD_G0019_MF_57	95-TG30	S BUFFER POT PLAT CHG 67-T525
PCD_G0019_MF_128	95-TG31	BUFFER POT #2 STAB E RFLX & TRFR 67-T523
PCD_G0019_MF_128	95-TG32	BUFFER POT #2 STAB W RFLX & TRFR 67-T524
PCD_G0019_MF_137	95-TG55	OUTBOARD DISTANCE PIECE DRAIN TANK
PCD_G0019_MF_137	95-TG56	INBOARD DISTANCE PIECE DRAIN TANK
PCD_G0019_MF_140	95-TG57	67-T758 SEAL POT
PCD_G0019_MF_142	97-T585	97-T585 SAMPLING SYSTEM

G0036 (HDS)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0036_MF_22	93-U704	95-UH01
PCD_G0036_MF_13	93-U705	16-U802 E disch, 95-UH08
PCD_G0036_MF_8	93-U706	16-U801, 95-UH17
PCD_G0036_MF_7	93-U711	24-U905, 35-UH24, 41-U904 (S), 41-U906A (S), 41-U906B (S), 41-U906C (S), 41-U911A (S), 41-U911B

MF #	Equipment Number	Description/Eq. Protected
		(S), 95-UH05
PCD_G0036_MF_22	93-U719	36-U910 (#3)
PCD_G0036_MF_13	93-U723	95-UH11

G0303

MF #	Equipment Number	Description/Eq. Protected
PCD_G0303_MF_16	93-V448	95-VD48

Header 3 Ancillary Equipment – CAT Flare

G0005

MF #	Equipment Number	Description/Eq. Protected
PCD_G0005_MF_7	93-F534	41-F203A (S), 41-F203B (S), 41-F203C (S), 41-F203D (S), 41-F203D (T), 41-F203E (S), 41-F203E (T), 41-F203F (S), 41-F203F (T), 95-FB33
PCD_G0005_MF_7	93-F535	41-F203A (T), 41-F203C (T), 95-FB34
PCD_G0005_MF_46	93-F537	41-F204A (S), 41-F204B (S), 41-F204C (S), 41-F204C (T), 41-F204D (S), 41-F204D (T), 41-F240 (S), 95-FB35

Header 4 Ancillary Equipment – West Flare

G0022

MF #	Equipment Number	Description/Eq. Protected
PCD_G0022_MF_46	41-R704B	#2 DEC4 OVERHEAD CONDENSER BTM NORTH
PCD_G0022_MF_46	41-R704D	#2 DEC4 OVERHEAD CONDENSER BTM SOUTH
PCD_G0022_MF_47	67-R619	DEC4 TOWER REFLUX OVERHEAD MAKE-UP NORTH
PCD_G0022_MF_47	67-R620	DEC4 TOWER REFLUX OVERHEAD MAKE-UP SOUTH
PCD_G0022_MF_18	67-R626	S. DEHYDRATOR CHARGE
PCD_G0022_MF_29	93-R103	41-R104A (S), 41-R104B (S), 41-R104C (S), 41-R104D (S), 41-R105 (S), 41-R111A (S), 41-R111A (T),

MF #	Equipment Number	Description/Eq. Protected
		41-R111B (S), 41-R111B (T), 41-R117A (S), 41-R117B (S), 95-RA07
PCD_G0022_MF_29	93-R104	41-R104A (S), 41-R104B (S), 41-R104C (S), 41-R104D (S), 41-R105 (S), 41-R111A (S), 41-R111A (T), 41-R111B (S), 41-R111B (T), 41-R117A (S), 41-R117B (S), 95-RA07
PCD_G0022_MF_32	93-R106	41-R107 (S), 41-R720A (S), 41-R720B (S), 41-R720C (S), 95-RA09
PCD_G0022_MF_60	93-R108	95-RA12
PCD_G0022_MF_60	93-R109	95-RA13
PCD_G0022_MF_142	93-R140	95-TK0801
PCD_G0022_MF_142	93-R141	95-TK0802
PCD_G0022_MF_13	93-R201	95-RF20
PCD_G0022_MF_13	93-R202	95-RF01
PCD_G0022_MF_16	93-R203	95-RF03
PCD_G0022_MF_16	93-R204	95-RF02
PCD_G0022_MF_18	93-R205	41-R702A (S), 41-R702B (S), 95-RF05
PCD_G0022_MF_50	93-R208	41-R703A (S), 41-R703B (S), 41-R713 (S), 95-RF07, 95-RF09
PCD_G0022_MF_53	93-R209	41-R703A (S), 41-R703B (S), 41-R713 (S), 95-RF07, 95-RF09
PCD_G0022_MF_48	93-R210	41-R708 (S), 95-RF13
PCD_G0022_MF_48	93-R211	41-R707 (S)
PCD_G0022_MF_45	93-R212	41-R707 (S), 41-R708 (S), 95-RF13
PCD_G0022_MF_33	93-R213	41-R711 (S), 41-R712A (S), 41-R712B (S), 41-R712D (S), 41-R712E (S), 41-R712F (S), 41-R712G (S), 41-R712H (S), 41-R712J (S), 41-R712K (S), 41-R712L (S), 41-R712M (S), 41-R712N (S), 41-R712P (S), 41-R712Q (S), 41-R712R (S), 41-R712S (S), 41-R713 (T), 95-RF
PCD_G0022_MF_33	93-R215	41-R711 (S), 41-R712A (S), 41-R712B (S), 41-R712D (S), 41-R712E (S), 41-R712F (S), 41-R712G (S), 41-R712H (S), 41-R712J (S), 41-R712K (S), 41-R712L (S), 41-R712M (S), 41-R712N (S), 41-R712P (S), 41-R712Q (S), 41-R712R (S), 41-R712S (S), 41-R713 (T), 95-RF
PCD_G0022_MF_33	93-R216	41-R711 (S), 41-R712A (S), 41-

MF #	Equipment Number	Description/Eq. Protected
		R712B (S), 41-R712D (S), 41-R712E (S), 41-R712F (S), 41-R712G (S), 41-R712H (S), 41-R712J (S), 41-R712K (S), 41-R712L (S), 41-R712M (S), 41-R712N (S), 41-R712P (S), 41-R712Q (S), 41-R712R (S), 41-R712S (S), 41-R713 (T), 95-RF
PCD_G0022_MF_39	93-R217	41-R716 (S), 41-R717A (S), 41-R717B (S), 41-R717C (S), 41-R717D (S), 41-R717E (S), 41-R717F (S), 41-R717G (S), 41-R717H (S), 41-R717I (S), 41-R717J (S), 41-R717K (S), 41-R717L (S), 41-R717M (S), 41-R717N (S), 41-R717P (S), 41-R717Q (S), 41-R717R (S), 41-R
PCD_G0022_MF_39	93-R219	41-R716 (S), 41-R717A (S), 41-R717B (S), 41-R717C (S), 41-R717D (S), 41-R717E (S), 41-R717F (S), 41-R717G (S), 41-R717H (S), 41-R717I (S), 41-R717J (S), 41-R717K (S), 41-R717L (S), 41-R717M (S), 41-R717N (S), 41-R717P (S), 41-R717Q (S), 41-R717R (S), 41-R
PCD_G0022_MF_39	93-R220	41-R716 (S), 41-R717A (S), 41-R717B (S), 41-R717C (S), 41-R717D (S), 41-R717E (S), 41-R717F (S), 41-R717G (S), 41-R717H (S), 41-R717I (S), 41-R717J (S), 41-R717K (S), 41-R717L (S), 41-R717M (S), 41-R717N (S), 41-R717P (S), 41-R717Q (S), 41-R717R (S), 41-R
PCD_G0022_MF_47	93-R223	95-RF10
PCD_G0022_MF_17	93-R229	41-R721 (T)
PCD_G0022_MF_141	93-R303	95-RA40
PCD_G0022_MF_141	93-R304	95-RA41
PCD_G0022_MF_141	93-R305	41-R160 (T), 41-R162 (T)
PCD_G0022_MF_141	93-R306	41-R160 (S), 41-R161 (S)
PCD_G0022_MF_33	93-R327	41-R711 (S), 41-R712A (S), 41-R712B (S), 41-R712D (S), 41-R712E (S), 41-R712F (S), 41-R712G (S), 41-R712H (S), 41-R712J (S), 41-R712K (S), 41-R712L (S), 41-R712M (S), 41-

MF #	Equipment Number	Description/Eq. Protected
		R712N (S), 41-R712P (S), 41-R712Q (S), 41-R712R (S), 41-R712S (S), 41-R713 (T), 95-RF
PCD_G0022_MF_39	93-R328	41-R716 (S), 41-R717A (S), 41-R717B (S), 41-R717C (S), 41-R717D (S), 41-R717E (S), 41-R717F (S), 41-R717G (S), 41-R717H (S), 41-R717I (S), 41-R717J (S), 41-R717K (S), 41-R717L (S), 41-R717M (S), 41-R717N (S), 41-R717P (S), 41-R717Q (S), 41-R717R (S), 41-R
PCD_G0022_MF_29	93-R329	41-R104A (S), 41-R104B (S), 41-R104C (S), 41-R104D (S), 41-R105 (S), 41-R111A (S), 41-R111A (T), 41-R111B (S), 41-R111B (T), 41-R117A (S), 41-R117B (S), 95-RA07
PCD_G0022_MF_127	93-R422	95-TK0800
PCD_G0022_MF_44	93-R423	95-RF22
PCD_G0022_MF_44	93-R424	95-RF21
PCD_G0022_MF_44	93-R425	95-RF23
PCD_G0022_MF_127	93-R426	41-R412 (S)
PCD_G0022_MF_50	93-R725	95-RF07
PCD_G0022_MF_65	95-RA11	EAST RELIEF NEUTRALIZER
PCD_G0022_MF_133	95-RA52	BUFFER POT DEC3 STRIP W REFLUX
PCD_G0022_MF_44	95-RF23	N2 GUARD CHAMBER
PCD_G0022_MF_63	SD-1006	95-RA14
PCD_G0022_MF_63	SD-1007	95-RA14

Header 5 Ancillary Equipment – West Flare

G0006

MF #	Equipment Number	Description/Eq. Protected
PCD_G0006_MF_8	95-ED47	LOW TEMPERATURE SEPARATOR

G0007

MF #	Equipment Number	Description/Eq. Protected
PCD_G0007_MF_19	95-EH07	COMPRESSOR PULSATION POT

G0009

MF #	Equipment Number	Description/Eq. Protected
PCD_G0009_MF_51	95-UB28	#1 TOWER RUN TANK

G0010

MF #	Equipment Number	Description/Eq. Protected
PCD_G0010_MF_37	95_UA18	10-1A ACCUMULATOR 95-UA18
PCD_G0010_MF_36	95-UA19	#1B TOWER ACCUMULATOR

G0019 (HDS & Reformer)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0019_MF_51	95-TF09	PRODUCT SEPARATOR
PCD_G0019_MF_27	95-TF22	L.E.P. ACCUMULATOR
PCD_G0019_MF_18	95-TF32	DISTILLATE LOW TEMPERATURE SEPARATOR

G0022 (Alky)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0022_MF_15	67-R601	ALKY C4 TRANSFER
PCD_G0022_MF_15	67-R602	ALKY SPARE OLEFIN TRANSFER
PCD_G0022_MF_11	67-R603	ALKY BLIMP TRANSFER WEST
PCD_G0022_MF_11	67-R623	ALKY BLIMP TRANSFER EAST
PCD_G0022_MF_14	93-R302	95-TK832
PCD_G0022_MF_10	93-R307	95-TK0571
PCD_G0022_MF_12	93-R323	L065-15CSTL-HC1-8
PCD_G0022_MF_10	93-R324	L148-15CSTL-CC1-6
PCD_G0022_MF_61	93-T207	95-TA35
PCD_G0022_MF_61	93-T210	95-TA34
PCD_G0022_MF_131	95-VD11	REFINERY GAS KNOCKOUT DRUM

G0023 (Fractionation)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0023_MF_16	41-R401B	#2 TOWER OVHD CONDENSER BTM NORTH
PCD_G0023_MF_16	41-R401D	#2 TOWER OVHD CONDENSER BTM MID

MF #	Equipment Number	Description/Eq. Protected
PCD_G0023_MF_17	41-R401F	#2 TOWER OVHD CONDENSER BTM SOUTH
PCD_G0023_MF_7	41-R402C	#1 TOWER OVHD CONDENSER BTM NORTH
PCD_G0023_MF_8	41-R402F	#1 TOWER OVHD CONDENSER BTM MID
PCD_G0023_MF_9	41-R402J	#1 TOWER OVHD CONDENSER BTM SOUTH
PCD_G0023_MF_19	67-R301	#2 TOWER REFLUX & TRANSFER NORTH
PCD_G0023_MF_19	67-R302	#2 TOWER REFLUX & TRANSFER SOUTH
PCD_G0023_MF_11	67-R303	#1 TOWER REFLUX NORTH
PCD_G0023_MF_11	67-R304	#1 TOWER REFLUX SOUTH
PCD_G0023_MF_12	67-R305	#1 TOWER OVERHEAD TRANSFER NORTH
PCD_G0023_MF_12	67-R306	#1 TOWER OVERHEAD TRANSFER SOUTH
PCD_G0023_MF_6	67-R307	#1 TOWER BOTTOMS EAST
PCD_G0023_MF_6	67-R308	#1 TOWER BOTTOMS WEST
PCD_G0023_MF_15	67-R309	WEST NO. 2 TOWER BOTTOMS PUMP
PCD_G0023_MF_15	67-R310	EAST NO. 2 TOWER BOTTOMS PUMP
PCD_G0023_MF_28	67-RD03	#2 TOWER REFLUX
PCD_G0023_MF_18	93-R501	41-R401A (S), 41-R401B (S), 41-R401C (S), 41-R401D (S), 41-R401E (S), 41-R401F (S), 41-R409 (S), 95-RD01, 95-RD03, 95-RD06
PCD_G0023_MF_10	93-R502	41-R402A (S), 41-R402B (S), 41-R402C (S), 41-R402D (S), 41-R402E (S), 41-R402F (S), 95-RD02, 95-RD04
PCD_G0023_MF_4	93-R503	41-R402A (S), 41-R402B (S), 41-R402C (S), 41-R402D (S), 41-R402E (S), 41-R402F (S), 41-R408 (S), 41-R410A (S), 41-R410B (S), 41-R410C (S) , 41-R411A (S), 41-R411B (S), 95-RD02, 95-RD05
PCD_G0023_MF_4	93-R504	41-R402A (S), 41-R402B (S), 41-R402C (S), 41-R402D (S), 41-R402E (S), 41-R402F (S), 41-R408 (S), 41-R410A (S), 41-R410B (S), 41-R410C (S) , 41-R411A (S), 41-R411B (S), 95-RD02, 95-RD05
PCD_G0023_MF_13	93-R505	41-R401A (S), 41-R401B (S), 41-R401C (S), 41-R401D (S), 41-R401E

MF #	Equipment Number	Description/Eq. Protected
		(S), 41-R401F (S), 41-R409 (S), 95-RD01, 95-RD03, 95-RD06
PCD_G0023_MF_13	93-R506	41-R401A (S), 41-R401B (S), 41-R401C (S), 41-R401D (S), 41-R401E (S), 41-R401F (S), 41-R409 (S), 95-RD01, 95-RD03, 95-RD06

G0025 (Gasoline Desulfurization)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0025_MF_35	16-LS02	RECYCLE GAS COMPRESSOR
PCD_G0025_MF_11	35-LS01	FEED FILTER
PCD_G0025_MF_20	35-LS02	BLOWBACK GAS COMP COALESCING FILTER
PCD_G0025_MF_21	41-LS10	LIFT GAS HEATER
PCD_G0025_MF_34	67-LS01	REACTOR CHARGE PUMP
PCD_G0025_MF_34	67-LS04	STABILIZER REFLUX PUMP
PCD_G0025_MF_34	67-LS06	STABILIZER BOTTOMS PUMP
PCD_G0025_MF_102	93-LS12	95-LS30
PCD_G0025_MF_11	93-LS13	95-LS20
PCD_G0025_MF_14	93-LS16	95-LS03
PCD_G0025_MF_20	93-LS17	95-LS17
PCD_G0025_MF_16	93-LS18	95-LS22
PCD_G0025_MF_17	93-LS19	24-LS02, 41-LS09 (S), 95-LS06
PCD_G0025_MF_18	93-LS21	41-LS17 (T)
PCD_G0025_MF_19	93-LS22	95-LS02
PCD_G0025_MF_20	93-LS23	16-LS03
PCD_G0025_MF_22	93-LS24	95-LS11
PCD_G0025_MF_22	93-LS25	95-LS10
PCD_G0025_MF_25	93-LS27	95-LS13
PCD_G0025_MF_26	93-LS28	95-LS14
PCD_G0025_MF_16	93-LS35	95-LS05
PCD_G0025_MF_31	93-LS37	41-LS03 (S), 41-LS04 (S), 95-LS08, 95-LS32
PCD_G0025_MF_32	93-LS38	41-LS08 (S), 95-LS09
PCD_G0025_MF_32	93-LS40	95-LS06, 95-LS09
PCD_G0025_MF_17	95-LS06	PENDING-PRODUCT SEPARATOR
PCD_G0025_MF_25	95-LS13	REGENERATOR LOCKHOPPER
PCD_G0025_MF_18	95-LS21	RECYCLE GAS COMPRESSOR

MF #	Equipment Number	Description/Eq. Protected
		DAMPENER
PCD_G0025_MF_18	95-LS24	RECYCLE COMPRESSOR DISCHARGE BOTTLE
PCD_G0025_MF_102	95-LS30	FUEL GAS KNOCKOUT DRUM

G0026 (FCCU Fractionation)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0026_MF_23	36-T116	DEC4 REBLR FURNACE
PCD_G0026_MF_27	41-T101A	DEC3 BTMS COOLER TOP EAST
PCD_G0026_MF_34	41-T102B	GASOLINE COOLER BTM EAST
PCD_G0026_MF_34	41-T102D	GASOLINE COOLER BTM WEST
PCD_G0026_MF_9	41-T103B	LEAN OIL COOLER BTM
PCD_G0026_MF_3	41-T104A	DEC2 COOLER TOP EAST
PCD_G0026_MF_3	41-T104B	DEC2 COOLER BTM EAST
PCD_G0026_MF_2	41-T104C	DEC2 COOLER TOP MID
PCD_G0026_MF_2	41-T104D	DEC2 COOLER BTM MID
PCD_G0026_MF_1	41-T104E	DEC2 COOLER TOP WEST
PCD_G0026_MF_1	41-T104F	DEC2 COOLER BTM WEST
PCD_G0026_MF_26	41-T107	DEC3 FEED HEATER
PCD_G0026_MF_6	41-T112	DEC2 TRIMMER STEAM REBOILER
PCD_G0026_MF_65	41-T114A	DEC4 COND EAST
PCD_G0026_MF_9	67-T003	LEAN OIL NORTH
PCD_G0026_MF_9	67-T004	LEAN OIL SOUTH
PCD_G0026_MF_26	67-T007	PB TREATER FEED NORTH
PCD_G0026_MF_26	67-T008	PB TREATER FEED SOUTH
PCD_G0026_MF_22	67-T009	DEBUTANIZER REBOILER NORTH
PCD_G0026_MF_22	67-T010	DEBUTANIZER REBOILER MID
PCD_G0026_MF_18	67-T013	SOUTH DEBUTANIZER REFLUX & TRANSFER
PCD_G0026_MF_7	67-T014	RICH OIL WEST
PCD_G0026_MF_7	67-T015	RICH OIL EAST
PCD_G0026_MF_3	67-T016	DEETHANIZER INTERCOOLER WEST
PCD_G0026_MF_2	67-T017	DEETHANIZER INTERCOOLER MID
PCD_G0026_MF_1	67-T018	DEETHANIZER INTERCOOLER EAST
PCD_G0026_MF_22	67-T023	DEBUTANIZER REBOILER SOUTH

MF #	Equipment Number	Description/Eq. Protected
PCD_G0026_MF_18	67-T027	DEBUTANIZER REFLUX PUMP SPARE
PCD_G0026_MF_26	67-T028	PB TREATER FEED SPARE
PCD_G0026_MF_5	93-T104	41-T104A (S), 41-T104B (S), 41-T104C (S), 41-T104D (S), 41-T104E (S), 41-T104F (S), 41-T105 (S), 41-T112 (S), 41-T113 (S), 61-TA56, 61-TA57, 61-TA58, 95-TA09, 95-TA10, 95-TA11, 95-TA12, 95-TA15
PCD_G0026_MF_16	93-T107	95-TA18
PCD_G0026_MF_17	93-T109	95-TA14, 95-TA24
PCD_G0026_MF_25	93-T110	95-TA17, 95-TA23
PCD_G0026_MF_12	93-T111	95-TA04
PCD_G0026_MF_15	93-T112	95-TA03, 95-TA54
PCD_G0026_MF_11	93-T113	95-TA02
PCD_G0026_MF_27	93-TA09	G0022-L148-15CSTL
PCD_G0026_MF_12	95-TA04	RESIDUE GAS SCRUBBER DRUM
PCD_G0026_MF_4	95-TA10	BOTTOM INTERCOOLER WATER KNOCKOUT
PCD_G0026_MF_5	95-TA15	DEETHANIZER TOWER
PCD_G0026_MF_25	95-TA17	DEPROPANIZER FEED DRUM
PCD_G0026_MF_25	95-TA23	DEPROPANIZER FEED WATER KNOCKOUT
PCD_G0026_MF_17	95-TA24	DE- BUT OH ACCUM WATER KNOCKOUT
PCD_G0026_MF_18	95-TA38	67-T027 SEAL POT
PCD_G0026_MF_15	95-TA54	HYDROGEN ABSORBER KO POT

G0028 (Crude Unit)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0028_MF_63	95-UB12	E. Tube / TK Exchanger
PCD_G0028_MF_7	95-UG11	BENZENE STRIPPER OVHD KO TANK
PCD_G0028_MF_7	95-UG19	#1 TOWER ACCUMULATOR

G0029 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0029_MF_259	93-N090	95-NA05
PCD_G0029_MF_118	95-ND42	VENT STACK

G0032 (Desalter)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0032_MF_4	95-UF07	CRUDE SURGE TANK

G0035 (Amine)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0035_MF_16	16-T310	OOS H2S GAS COMPRESSOR
PCD_G0035_MF_17	24-T409	REGENERATOR GAS AIRFIN
PCD_G0035_MF_9	93-T216	24-T401 A, 24-T401 B, 24-T401 C, 41-T402 (S), 41-T403 A (S), 41-T403 A (T), 41-T403 B (S), 41-T404 (S), 95-TD15, 95-TD17
PCD_G0035_MF_5	93-T218	95-TD19
PCD_G0035_MF_35	93-T226	95-TD36, 95-TD40
PCD_G0035_MF_14	93-T302	24-T409, 95-TD25
PCD_G0035_MF_14	93-T303	24-T409, 95-TD26
PCD_G0035_MF_14	93-T304	24-T409, 95-TD27
PCD_G0035_MF_14	93-T305	16-T310, 95-TD29, 95-TD30
PCD_G0035_MF_12	95-TD15	REFLUX ACCUMULATOR
PCD_G0035_MF_5	95-TD19	AMINE SURGE TANK
PCD_G0035_MF_14	95-TD25	EAST H2S DRYER
PCD_G0035_MF_14	95-TD26	MIDDLE H2S DRYER
PCD_G0035_MF_14	95-TD27	WEST H2S DRYER
PCD_G0035_MF_16	95-TD30	OOS 2ND STAGE DISCHARGE BOTTLE
PCD_G0035_MF_35	95-TD41	RICH AMINE RETURN PUMP SEAL POT 67-T321

G0040 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0040_MF_26	95-NH09	FRACTIONATOR OVERHEAD ACCUMULATOR
PCD_G0040_MF_144	95-NH17	OOS VENT STK
PCD_G0040_MF_113	95-NH69	FLARE LINE KNOCKOUT DRUM

G0041 (Hydrogen)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_62	35-KC30	HYDROGEN PROD FILTER

G0207

MF #	Equipment Number	Description/Eq. Protected
PCD_G0207_MF_1	67-0VF1	U23 CHARGE EAST
PCD_G0207_MF_1	67-0VF2	U23 CHARGE WEST
PCD_G0207_MF_50	93-T307	95-VD10
PCD_G0207_MF_1	93-V313	95-TK570, 95-VF01
PCD_G0207_MF_20	93-V315	95-VD06
PCD_G0207_MF_19	93-V697	95-VF03
PCD_G0207_MF_17	93-V699	95-VF02
PCD_G0207_MF_18	93-V700	95-VF04

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G0029 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0029_MF_55	16-N075	WET GAS COMPRESSOR
PCD_G0029_MF_178	35-ONA6	SEAL OIL PURIFIER (RECLAIMER) ON WET GAS
PCD_G0029_MF_63	41-N403A	DEC2 ABS INTERCOOLERS TOP
PCD_G0029_MF_64	41-N403B	DEC2 ABS INTERCOOLERS MID
PCD_G0029_MF_65	41-N403C	DEC2 ABS INTERCOOLERS BTM
PCD_G0029_MF_69	41-N410A	DEC4 CONDENSER TOP NORTH
PCD_G0029_MF_70	41-N410B	DEC4 CONDENSER BTM NORTH
PCD_G0029_MF_69	41-N410C	DEC4 CONDENSER TOP SOUTH
PCD_G0029_MF_70	41-N410D	DEC4 CONDENSER BTM SOUTH
PCD_G0029_MF_58	41-N412B	COMPRESSOR AFTERCOOLER BTM NORTH
PCD_G0029_MF_58	41-N412D	COMPRESSOR AFTERCOOLER BTM SOUTH
PCD_G0029_MF_67	67-N047	DEBUTANIZER FEED EAST

MF #	Equipment Number	Description/Eq. Protected
PCD_G0029_MF_67	67-N048	DEBUTANIZER FEED WEST
PCD_G0029_MF_72	67-N131	DEC4 RFLX & TRFR PUMP WEST
PCD_G0029_MF_72	67-N132	DEC4 RFLX & TRFR PUMP EAST
PCD_G0029_MF_63	67-N318	INTERCOOLER TOP
PCD_G0029_MF_65	67-N319	INTERCOOLER BTM
PCD_G0029_MF_64	67-N320	INTERCOOLER MID
PCD_G0029_MF_28	67-N321	RAW GASO WEST
PCD_G0029_MF_28	67-N322	RAW GASO EAST
PCD_G0029_MF_81	67-N323	LIGHT GASO REFLUX & TRANSFER WEST
PCD_G0029_MF_81	67-N324	LIGHT GASO REFLUX & TRANSFER EAST
PCD_G0029_MF_203	67-N336	TOP REFLUX WEST
PCD_G0029_MF_203	67-N337	TOP REFLUX EAST
PCD_G0029_MF_259	93-N090	95-NA05
PCD_G0029_MF_20	93-N114	24-N432A, 24-N432B, 24-N432C, 24-N432D, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20,
PCD_G0029_MF_20	93-N115	24-N432A, 24-N432B, 24-N432C, 24-N432D, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20,
PCD_G0029_MF_21	93-N201	24-N432A, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20, 95-ND21, 95-ND32, 95-

MF #	Equipment Number	Description/Eq. Protected
		ND35, 95
PCD_G0029_MF_21	93-N202	24-N432A, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20, 95-ND21, 95-ND32, 95-ND35, 95
PCD_G0029_MF_21	93-N203	24-N432A, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20, 95-ND21, 95-ND32, 95-ND35, 95
PCD_G0029_MF_22	93-N204	24-N432A, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20, 95-ND21, 95-ND32, 95-ND35, 95
PCD_G0029_MF_22	93-N205	24-N432A, 24-N432B, 24-N432C, 24-N432D, 41-N411A (SHELL), 41-N411B (SHELL), 41-N411C (SHELL), 41-N411D (SHELL), 41-N413A (SHELL), 41-N413B (SHELL), 41-N413C (SHELL), 41-N413D (SHELL), 41-N413E (SHELL), 41-N413F (SHELL), 95-NA16, 95-NA25, 95-ND14, 95-ND20,
PCD_G0029_MF_71	93-N211	41-N410A (SHELL), 41-N410B (SHELL), 41-N410C (SHELL), 41-N410D (SHELL), 95-ND19, 95-ND64
PCD_G0029_MF_59	93-N221	41-N412A (SHELL), 41-N412B (SHELL), 41-N412C (SHELL), 41-N412D (SHELL), 41-N412E

MF #	Equipment Number	Description/Eq. Protected
		(SHELL), 41-N412F (SHELL), 95-ND18
PCD_G0029_MF_65	93-N411	95-ND15
PCD_G0029_MF_116	93-N412	95-ND16
PCD_G0029_MF_98	93-N415	95-NA07 OOS, 95-NA10 OOS
PCD_G0029_MF_60	93-N417	41-N109 (SHELL), 41-N110 (SHELL), 41-N403A (SHELL), 41-N403B (SHELL), 41-N403C (SHELL), 95-NA01, 95-NA02, 95-NA03, 95-ND61, 95-ND65
PCD_G0029_MF_97	93-N502	41-N106 (T), 95-NA08
PCD_G0029_MF_54	93-N577	95-NA16
PCD_G0029_MF_56	93-N592	41-N121 (SHELL), 95-NA47
PCD_G0029_MF_25	93-N594	95-ND14, 95-ND20, 95-ND21, 95-ND38
PCD_G0029_MF_178	95-NA57	SEAL OIL OVERHEAD TANK
PCD_G0029_MF_59	95-ND18	V-10 WATER KNOCKOUT DRUM
PCD_G0029_MF_71	95-ND19	DEC4 ACCUMULATOR
PCD_G0029_MF_26	95-ND20	MAIN FRACTIONATOR ACCUMULATOR (NORTH)
PCD_G0029_MF_18	95-ND42	VENT STACK
PCD_G0029_MF_18	95-ND49	FLARE HEADER SEAL POT

G0040 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0040_MF_27	67-N620	FRACTIONATOR OVERHEAD MAKE NORTH
PCD_G0040_MF_27	67-N621	H FRACTIONATOR OVERHEAD MAKE SOUTH
PCD_G0040_MF_34	67-NG44	AFTER COOLER MAKE HIGH STAGE PUMP (SPARE)
PCD_G0040_MF_34	67-NG82	AFTER COOLER MAKE PUMP

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G0040 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0040_MF_42	93-N620	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03
PCD_G0040_MF_42	93-N621	95-NH01A, 95-NH01B
PCD_G0040_MF_42	93-N655	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH02, 95-NH03
PCD_G0040_MF_38	93-N656	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH01B, 95-NH02, 95-NH03
PCD_G0040_MF_21	93-N703	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_21	93-N704	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-

MF #	Equipment Number	Description/Eq. Protected
		NH04A
PCD_G0040_MF_21	93-N705	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_21	93-N706	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_21	93-N707	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_21	93-N713	07-N716A (T), 07-N716B (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_26	93-N808	41-N718A (S), 41-N718B (S), 41-N718C (S), 95-NH09, 95-NH59
PCD_G0040_MF_26	93-N809	41-N718A (S), 41-N718B (S), 41-N718C (S), 95-NH09, 95-NH59
PCD_G0040_MF_6	93-NH08	07-N716A (T), 24-N709A, 24-N709B, 24-N709C, 24-N709D, 24-N709E, 24-N709F, 24-N709G, 24-N709H, 24-N709J, 24-N709K, 24-N709L, 24-N709M, 24-N709N, 24-N709P, 24-N709Q, 24-N709R, 24-N709S, 24-N709T, 95-NH01A, 95-

MF #	Equipment Number	Description/Eq. Protected
		NH02, 95-NH03, 95-NH04A
PCD_G0040_MF_26	95-NH09	FRACTIONATOR OVERHEAD ACCUMULATOR
PCD_G0040_MF_34	95-NH11	GAS COMP AFTER SEPARATOR
PCD_G0040_MF_41	41-N710	LCO COOLER
PCD_G0040_MF_43	41-N711	HCO COOLER

Header 8 Ancillary Equipment – GOHDS Flare

G0040 (FCCU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0042_MF_75	93-L108	16-K041, 24-K129 A, 24-K129 B, 24-K129 C, 24-K129 D, 35-K114A, 36-K101, 36-K102, 41-K104A (S), 41-K104A (T), 41-K104B (S), 41-K104B (T), 41-K105A (S), 41-K105A (T), 41-K105B (S), 41-K105B (T), 41-K106A (S), 41-K106A (T), 41-K106B (S), 41-K106B (T), 41-K10
PCD_G0042_MF_24	93-L219	16-K036 (Stage III), 95-KA88
PCD_G0042_MF_28	93-L220	16-K037 (Stage III), 95-KA89
PCD_G0042_MF_32	93-L221	16-K038 (Stage III), 95-KA90
PCD_G0042_MF_22	93-L308	16-K036 (Stage II), 24-K136A, 95-KA32, 95-KA79, 95-KA85
PCD_G0042_MF_26	93-L309	16-K037 (Stage II), 24-K136B, 95-KA33, 95-KA80, 95-KA86
PCD_G0042_MF_30	93-L423	16-K038 (Stage II), 24-K136C, 95-KA34, 95-KA81, 95-KA87
PCD_G0042_MF_75	95-KA23	RECYCLE GAS COMPRESSOR SUCTION DRUM

Header 9 Ancillary Equipment – GOHDS Flare

G0098 (Hydrogen)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0098_MF_22	35-KP31	W FUEL GAS FILTER
PCD_G0098_MF_22	35-KP32	E FUEL GAS FILTER
PCD_G0098_MF_12	41-K208	#1 PROCESS STEAM GENERATOR

MF #	Equipment Number	Description/Eq. Protected
PCD_G0098_MF_30	41-K226	FEED GAS SAMPLE COOLER
PCD_G0098_MF_30	41-K227	DESULFURIZED FEED GAS FR. 95-KP02 SAMPLE COOLER
PCD_G0098_MF_30	41-K228	DESULFURIZED FEED GAS FR. 95-KP03 SAMPLE COOLER
PCD_G0098_MF_30	41-K229	REFORMER OUTLET SAMPLE COOLER
PCD_G0098_MF_30	41-K230	SHIFT OUTLET GAS SAMPLE COOLER
PCD_G0098_MF_7	93-K901	95-KP02
PCD_G0098_MF_7	93-K902	95-KP03
PCD_G0098_MF_13	93-K906	36-K210, 41-K208 (T), 41-K211 , 95-KP04
PCD_G0098_MF_22	93-K907	35-KP31, 35-KP32, 95-KP10
PCD_G0098_MF_16	93-K908	24-K206A, 24-K206B, 41-K200 (T), 41-K201A (T), 41-K201B (T), 41-K202A (T), 41-K202B (T), 41-K204 (S), 95-KP06
PCD_G0098_MF_5	93-K912	95-KP09
PCD_G0098_MF_33	93-K913	95-KP11
PCD_G0098_MF_33	93-K914	95-KP12
PCD_G0098_MF_33	93-K915	95-KP13
PCD_G0098_MF_34	93-K916	95-KP14
PCD_G0098_MF_34	93-K917	95-KP15
PCD_G0098_MF_33	93-K918	95-KP16
PCD_G0098_MF_33	93-K919	95-KP17
PCD_G0098_MF_33	93-K920	95-KP18
PCD_G0098_MF_34	93-K921	95-KP19
PCD_G0098_MF_34	93-K922	95-KP20
PCD_G0098_MF_21	93-K923	95-KP22
PCD_G0098_MF_56	93-K925	16-K150 1ST STAGE, 16-K150 2ND STAGE, 24-K215, 95-KP43, 95-KP44, 95-KP45
PCD_G0098_MF_57	93-K926	16-K150 2ND STAGE, 24-K216, 95-KP46, 95-KP47, 95-KP48
PCD_G0098_MF_58	93-K927	16-K150 3RD STAGE, 24-K217, 95-KP49, 95-KP51
PCD_G0098_MF_54	93-K928	16-K150 4TH STAGE, 95-KP52
PCD_G0098_MF_57	93-K945	H2 Line from 16-K150
PCD_G0098_MF_54	93-K946	24-K218, 95-KP41, 95-KP42
PCD_G0098_MF_7	95-KP02	DESULFURIZER
PCD_G0098_MF_7	95-KP03	DESULFURIZER
PCD_G0098_MF_14	95-KP05	HOT CONDENSATE SEPARATOR

MF #	Equipment Number	Description/Eq. Protected
PCD_G0098_MF_16	95-KP06	PROCESS CONDENSATE SEPARATOR
PCD_G0098_MF_5	95-KP09	FEED GAS KO DRUM
PCD_G0098_MF_22	95-KP10	FUEL GAS KO DRUM
PCD_G0098_MF_33	95-KP11	PSA ADSORBER (SOUTH - WEST SIDE)
PCD_G0098_MF_33	95-KP12	PSA ADSORBER (4TH FM NORTH - WEST SIDE)
PCD_G0098_MF_33	95-KP13	PSA ADSORBER (3RD FM NORTH - WEST SIDE)
PCD_G0098_MF_34	95-KP14	PSA ADSORBER (2ND FM NORTH - WEST SIDE)
PCD_G0098_MF_34	95-KP15	PSA ADSORBER (NORTH - WEST SIDE)
PCD_G0098_MF_33	95-KP16	PSA ADSORBER (SOUTH - EAST SIDE)
PCD_G0098_MF_33	95-KP17	PSA ADSORBER (4TH FM NORTH - EAST SIDE)
PCD_G0098_MF_33	95-KP18	PSA ADSORBER (3RD FM NORTH - EAST SIDE)
PCD_G0098_MF_34	95-KP19	PSA ADSORBER (2ND FM NORTH - EAST SIDE)
PCD_G0098_MF_34	95-KP20	PSA ADSORBER (NORTH - EAST SIDE)
PCD_G0098_MF_3	95-KP21	PROCESS KO DRUM
PCD_G0098_MF_21	95-KP22	PSA TAILGAS DRUM
PCD_G0098_MF_54	95-KP41	MAKEUP COMPRESSOR SUCTION DRUM
PCD_G0098_MF_56	95-KP44	HYDROGEN MKUP COMP 1ST INTERSTG DRUM
PCD_G0098_MF_57	95-KP47	HYDROGEN MKUP COMP 2ND INTERSTG DRUM
PCD_G0098_MF_58	95-KP50	HYDROGEN MKUP COMP 3RD INTERSTG DRUM
PCD_G0098_MF_63	95-KP54	CYLINDER PACKING VENT/DRAIN TANK
PCD_G0098_MF_63	95-KP55	OUTBOARD DISTANCE PIECE DRAIN TANK
PCD_G0098_MF_63	95-KP56	INBOARD DISTANCE PIECE DRAIN TANK

Header 10 Ancillary Equipment – GOHDS Flare

G0041 (Hydrogen)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_29	07-K307	REFORMER FURNACE WHB STEAM DRUM
PCD_G0041_MF_5	16-K227 (1st Stage)	FLASH GAS COMP
PCD_G0041_MF_4	16-K227 (2nd Stage)	FLASH GAS COMP
PCD_G0041_MF_62	35-KC30	HYDROGEN PROD FILTER
PCD_G0041_MF_54	35-KC31	PRESS SWING ABSORBER
PCD_G0041_MF_4	35-KD07	FLASH GAS FILTER 2ND STAGE
PCD_G0041_MF_29	41-K307	REFORMER FURNACE WHB EXCHANGER
PCD_G0041_MF_20	41-K348	COLBALT-MOLY SAMPLE COOLER
PCD_G0041_MF_138	93-K330	1/4 tubing (AE-0304)
PCD_G0041_MF_138	93-K331	1/4 tubing (AE-0312)
PCD_G0041_MF_138	93-K332	1/4 Tubing (AE-303A)
PCD_G0041_MF_136	93-K333	1/4 tubing (AE-0302)
PCD_G0041_MF_136	93-K334	1/4 TUBING
PCD_G0041_MF_136	93-K335	1/4 tubing (95-KC65)
PCD_G0041_MF_136	93-K336	1/4 tubing (AE-011)
PCD_G0041_MF_1	93-M401	95-KC42
PCD_G0041_MF_10	93-M402	41-K302 (S), 95-KC65
PCD_G0041_MF_33	93-M406	24-K323
PCD_G0041_MF_37	93-M408	35-KC31, 41-K306 A (T), 41-K306 B (T), 41-K306 C (T), 41-K306 D (T), 41-K313 (S), 95-KC40, 95-KC41
PCD_G0041_MF_62	93-M411	35-KC30
PCD_G0041_MF_58	93-M412	95-KC47
PCD_G0041_MF_58	93-M413	95-KC48
PCD_G0041_MF_58	93-M414	95-KC49
PCD_G0041_MF_56	93-M415	95-KC50
PCD_G0041_MF_50	93-M416	95-KC54
PCD_G0041_MF_50	93-M417	95-KC55
PCD_G0041_MF_55	93-M418	95-KC51
PCD_G0041_MF_52	93-M419	95-KC53
PCD_G0041_MF_53	93-M420	95-KC52
PCD_G0041_MF_20	93-M502	95-KC38

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_21	93-M503	95-KC36
PCD_G0041_MF_21	93-M504	95-KC37
PCD_G0041_MF_6	93-M507	16-K227 (2nd Stage), 24-K321, 24-K324, 35-KD07, 95-KC43
PCD_G0041_MF_8	93-M508	41-K301 A (S), 41-K301 B (S), 95-KC44
PCD_G0041_MF_19	93-M510	41-K304 A (T), 41-K304 B (T)
PCD_G0041_MF_31	93-M511	95-KC34
PCD_G0041_MF_32	93-M512	41-K303 (T), 41-K306 A (T), 41-K306 B (T), 41-K306 C (T), 41-K306 D (T), 41-K314 (S), 95-KC35
PCD_G0041_MF_35	93-M513	95-KC40
PCD_G0041_MF_2	93-M515	67-K211
PCD_G0041_MF_50	93-M525	95-KC56
PCD_G0041_MF_60	93-M604	95-KC58
PCD_G0041_MF_61	93-M605	95-KC58, 95-KC59
PCD_G0041_MF_31	93-M615	41-K303 (T), 41-K306 A (T), 41-K306 B (T), 41-K306 C (T), 41-K306 D (T), 95-KC34
PCD_G0041_MF_60	93-M616	95-KC58
PCD_G0041_MF_1	93-M829	L014-15CSTL-HY1-2
PCD_G0041_MF_95	93-M831	95-KC19, L148-30CSTL-HC1-2
PCD_G0041_MF_158	93-M832	L144-30CSTL-HY1-4
PCD_G0041_MF_17	93-M833	95-KC33
PCD_G0041_MF_73	93-OKC4	41-KC01
PCD_G0041_MF_92	95-KC10	FLASH GAS DEGASSING TANK
PCD_G0041_MF_17	95-KC33	MEA CONTACTOR OVHD KNOCKOUT DRUM
PCD_G0041_MF_37	95-KC41	2ND CONDENSATE KNOCKOUT DRUM
PCD_G0041_MF_1	95-KC42	FLASH GAS 1ST STG SUC. SCRUBBER
PCD_G0041_MF_6	95-KC43	FLASH GAS 2ND STG SUC. SCRUBBER
PCD_G0041_MF_8	95-KC44	FLASH GAS HIGH PRESS KNOCKOUT DRUM
PCD_G0041_MF_2	95-KC46	FUEL GAS KNOCKOUT DRUM
PCD_G0041_MF_53	95-KC52	NORTH PSA (B TRAIN)
PCD_G0041_MF_52	95-KC53	2ND FROM NORTH PSA (B TRAIN)
PCD_G0041_MF_50	95-KC54	3RD FROM NORTH PSA (B TRAIN)
PCD_G0041_MF_50	95-KC55	4TH FROM NORTH (B TRAIN)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_50	95-KC56	SOUTH PSA (B TRAIN)
PCD_G0041_MF_60	95-KC58	SURGE TANK
PCD_G0041_MF_61	95-KC59	MIXING TANK
PCD_G0041_MF_10	95-KC65	FLASH GAS MEA CONTACTOR
PCD_G0041_MF_158	PSA unit	

G0042 (GOHDS)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0042_MF_100	16-K039	OFF GAS COMPRESSOR NORTH
PCD_G0042_MF_101	16-K040	OFF GAS COMPRESSOR SOUTH
PCD_G0042_MF_72	16-K041	RECYCLE GAS COMPRESSOR
PCD_G0042_MF_72	35-K114A	STRAINER TO 16-K041
PCD_G0042_MF_160	35-KA61	LUBE OIL FILTER FOR RECYCLE COMP NORTH
PCD_G0042_MF_160	35-KA62	LUBE OIL FILTER FOR RECYCLE COMP SOUTH
PCD_G0042_MF_237	67-K858	FRACTIONATOR REFLUX PUMP A
PCD_G0042_MF_237	67-K859	FRACTIONATOR REFLUX PUMP B
PCD_G0042_MF_104	93-KA09	35-KA10, 35-KA11, 95-KA104
PCD_G0042_MF_218	93-KA18	35-KA100
PCD_G0042_MF_218	93-KA19	35-KA101
PCD_G0042_MF_219	93-KA20	95-KA92
PCD_G0042_MF_218	93-KA21	35-KA102, 95-KA91
PCD_G0042_MF_93	93-L113	35-KB14, 35-KB15, 95-KA35
PCD_G0042_MF_52	93-L121	24-K127, 41-K116 A (T), 41-K116 B (T), 95-KA25
PCD_G0042_MF_64	93-L201	41-K116 A (S), 41-K116 B (S), 41-K117 (S), 84-K018 outlet side, 95-KA24
PCD_G0042_MF_29	93-L202	16-K038 (Stage I), 24-K135C, 95-KA31, 95-KA78, 95-KA84
PCD_G0042_MF_21	93-L203	16-K036 (Stage I dis, 24-K135A, 95-KA29, 95-KA76, 95-KA82
PCD_G0042_MF_25	93-L204	16-K037 (Stage I), 24-K135B, 95-KA30, 95-KA77, 95-KA83
PCD_G0042_MF_78	93-L205	95-KA46
PCD_G0042_MF_78	93-L210	24-K128, 24-K130 A-D, 36-202-ETC, 36-K103, 41-K110 (S), 41-K116 A (S), 41-K116 B (S), 41-K123 (T), 41-K162 (S), 41-K165 (S), 95-KA46, 95-KA47, 95-KA48,

MF #	Equipment Number	Description/Eq. Protected
		95-KB18
PCD_G0042_MF_78	93-L211	24-K128, 24-K130 A-D, 36-202-ETC, 36-K103, 41-K110 (S), 41-K116 A (S), 41-K116 B (S), 41-K123 (T), 41-K162 (S), 41-K165 (S), 95-KA46, 95-KA47, 95-KA48, 95-KB18
PCD_G0042_MF_54	93-L214	41-K109 (S), 95-KA39
PCD_G0042_MF_98	93-L217	95-KA37
PCD_G0042_MF_14	93-L218	95-KA18
PCD_G0042_MF_97	93-L223	16-K039 (Stg I suct), 16-K040 (Stg I suct), 24-K130 A-D, 41-K162 (S), 41-K165 (S), 95-KA36, 95-KA46, 95-KA47, 95-KA48, 95-KA65, 95-KA66, 95-KB18
PCD_G0042_MF_100	93-L224	16-K039 (Stg II dis), 95-KA38, 95-KA71
PCD_G0042_MF_101	93-L225	16-K040 (Stg I disc), 95-KA70
PCD_G0042_MF_101	93-L301	16-K040 (Stg II dis), 95-KA38, 95-KA72
PCD_G0042_MF_14	93-L306	95-KA18
PCD_G0042_MF_19	93-L307	24-K134 , 95-KA28, 95-KA73, 95-KA74, 95-KA75
PCD_G0042_MF_64	93-L312	95-KA24
PCD_G0042_MF_64	93-L313	95-KA24
PCD_G0042_MF_90	93-L315	24-K132, 41-K125 (T), 41-K126 (S)
PCD_G0042_MF_100	93-L317	16-K039 (Stg I dish), 95-KA69
PCD_G0042_MF_149	93-L318	41-K121 A (S), 41-K121 B (S), 95-KA50
PCD_G0042_MF_14	93-L322	95-KA18
PCD_G0042_MF_69	93-L424	84-K857, 95-KA26
PCD_G0042_MF_71	93-L425	24-K127, 95-KA27
PCD_G0042_MF_99	93-L501	41-K118 A&B (S), 41-K118 C&D (S), 95-KA38
PCD_G0042_MF_52	93-L614	24-K127, 41-K116 A (T), 41-K116 B (T), 95-KA25
PCD_G0042_MF_91	93-L626	41-K113A (S), 07-K115 (T)
PCD_G0042_MF_91	93-L627	41-K110 (S), 41-K123 (T)
PCD_G0042_MF_153	93-OKA4	35-OKA1
PCD_G0042_MF_153	93-OKA5	35-OKA2
PCD_G0042_MF_103	93-OKA6	95-KA103
PCD_G0042_MF_34	95-KA19	REACTOR EFFLUENT FLASH DRUM TRAIN A

MF #	Equipment Number	Description/Eq. Protected
PCD_G0042_MF_42	95-KA20	REACTOR EFFLUENT FLASH DRUM TRAIN B
PCD_G0042_MF_51	95-KA21	HP HOT FLASH DRUM
PCD_G0042_MF_75	95-KA23	RECYCLE GAS COMPRESSOR SUCTION DRUM
PCD_G0042_MF_64	95-KA24	NAPHTHA FLASH DRUM
PCD_G0042_MF_69	95-KA26	RICH AMINE FLASH DRUM
PCD_G0042_MF_71	95-KA27	LP COLD FLASH DRUM
PCD_G0042_MF_19	95-KA28	MAKEUP GAS COMPRESSOR SUCTION DRUM
PCD_G0042_MF_21	95-KA29	NORTH MAKEUP GAS COMPRESSOR 1ST IN. DR
PCD_G0042_MF_25	95-KA30	CENTER MAKEUP GAS COMPRESSOR 1ST IN. DR
PCD_G0042_MF_29	95-KA31	SOUTH MAKEUP GAS COMPRESSOR 1ST INTERSTAGE DRUM
PCD_G0042_MF_22	95-KA32	NORTH MAKEUP GAS COMPRESSOR 2ND IN. DR
PCD_G0042_MF_26	95-KA33	CENTER MAKEUP GAS COMPRESSOR 2ND IN. DR
PCD_G0042_MF_30	95-KA34	SOUTH MAKEUP GAS COMPRESSOR 2ND IN. DR
PCD_G0042_MF_99	95-KA38	COMPRESSOR OFF GAS KNOCKOUT DRUM
PCD_G0042_MF_59	95-KA44	HP NAPHTHA CONTACTOR
PCD_G0042_MF_66	95-KA45	HP AMINE CONTACTOR
PCD_G0042_MF_149	95-KA50	GYLCOL SURGE DRUM
PCD_G0042_MF_157	95-KA58	DEGASSING TANK
PCD_G0042_MF_24	95-KA88	MAKEUP GAS 3RD STAGE DISCH SNUB NORTH
PCD_G0042_MF_28	95-KA89	MAKEUP GAS 3RD STAGE DISCH SNUB MID
PCD_G0042_MF_32	95-KA90	MAKEUP GAS 3RD STAGE DISCH SNUB SOUTH
PCD_G0042_MF_236	95-KB18	FRACTIONATOR REFLUX DRUM
PCD_G0042_MF_237	95-KB19	SEAL BUFFER POT FOR 67-K858
PCD_G0042_MF_237	95-KB20	SEAL BUFFER POT FOR 67-K859
PCD_G0042_MF_147	PRV-3094	1/4 TUBING (AE-0320)
PCD_G0042_MF_147	PRV-3095	1/4 TUBING (AE-0013)
PCD_G0042_MF_147	PRV-3096	1/4 TUBING (AE-1301B)
PCD_G0042_MF_147	PRV-3097	1/4 TUBING (STEAM 2)

G0044 (Sour Water)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0044_MF_1	93-L811	95-KE04
PCD_G0044_MF_17	95-KE18	SLOP OIL DRUM

Header 11 Ancillary Equipment – GOHDS Flare

G0050 (Coker)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0050_MF_82	16-Q050 (1st Stage)	WET GAS COMPRESSOR
PCD_G0050_MF_84	16-Q050 (2nd Stage)	WET GAS COMPRESSOR
PCD_G0050_MF_95	24-Q084	DEBUTANIZER BOTTOMS AIR COOLER
PCD_G0050_MF_34	35-QA87	FUEL GAS STRAINER
PCD_G0050_MF_34	35-QA92	FUEL GAS STRAINER
PCD_G0050_MF_88	41-Q109	STRIPPER SIDE REBOILER
PCD_G0050_MF_87	41-Q110	STRIPPER REBOILER
PCD_G0050_MF_95	41-Q116	NAPHTHA PRODUCT TRIM COOLER
PCD_G0050_MF_69	67-Q206	HCGO PRODUCT PUMP WEST
PCD_G0050_MF_69	67-Q207	HCGO PRODUCT PUMP EAST
PCD_G0050_MF_62	67-Q208	LCGO PUMPAROUND PUMP SOUTH
PCD_G0050_MF_62	67-Q209	LCGO PUMPAROUND PUMP NORTH
PCD_G0050_MF_87	67-Q212	LEAN SPONGE OIL PUMP SOUTH
PCD_G0050_MF_87	67-Q213	LEAN SPONGE OIL PUMP NORTH
PCD_G0050_MF_74	67-Q214	FRACTIONATOR REFLUX PUMP SOUTH
PCD_G0050_MF_74	67-Q215	FRACTIONATOR REFLUX PUMP NORTH
PCD_G0050_MF_70	67-Q216	NAPHTHA RECYCLE PUMP SOUTH
PCD_G0050_MF_70	67-Q217	NAPHTHA RECYCLE PUMP NORTH
PCD_G0050_MF_73	67-Q218	FRACTIONATOR OVHD WATER PUMP SOUTH
PCD_G0050_MF_73	67-Q219	FRACTIONATOR OVHD WATER PUMP NORTH

MF #	Equipment Number	Description/Eq. Protected
PCD_G0050_MF_83	67-Q220	INTERSTAGE DRUM NAPHTHA PUMP SOUTH
PCD_G0050_MF_83	67-Q221	INTERSTAGE DRUM NAPHTHA PUMP NORTH
PCD_G0050_MF_128	67-Q226	CONDENSED BLOWDOWN WATER PUMP WEST
PCD_G0050_MF_128	67-Q227	CONDENSED BLOWDOWN WATER PUMP EAST
PCD_G0050_MF_127	67-Q228	LIGHT SLOP OIL PUMP WEST
PCD_G0050_MF_127	67-Q229	LIGHT SLOP OIL PUMP EAST
PCD_G0050_MF_86	67-Q236	STRIPPER FEED PUMP SOUTH
PCD_G0050_MF_86	67-Q237	STRIPPER FEED PUMP NORTH
PCD_G0050_MF_90	67-Q240	PRESATURATOR LIQUID PUMP SOUTH
PCD_G0050_MF_90	67-Q241	PRESATURATOR LIQUID PUMP NORTH
PCD_G0050_MF_93	67-Q242	DEBUTANIZER REFLUX PUMP SOUTH
PCD_G0050_MF_93	67-Q243	DEBUTANIZER REFLUX PUMP NORTH
PCD_G0050_MF_94	67-Q244	DEBUTANIZER BOTTOMS PUMP SOUTH
PCD_G0050_MF_94	67-Q245	DEBUTANIZER BOTTOMS PUMP NORTH
PCD_G0050_MF_13	67-Q255	FLARE KNOCK OUT DRUM PUMP SOUTH
PCD_G0050_MF_13	67-Q256	FLARE KNOCK OUT DRUM PUMP NORTH
PCD_G0050_MF_34	93-Q200	95-QA50
PCD_G0050_MF_70	93-Q215	41-Q103A (S), 41-Q103B (S)
PCD_G0050_MF_70	93-Q216	41-Q103B
PCD_G0050_MF_64	93-Q218	07-Q021 (tube), 41-Q603A (Tube), 41-Q603B (tube), 41-Q603C (tube), 41-Q603D (tube)
PCD_G0050_MF_74	93-Q220	24-Q082A, 24-Q082B, 24-Q082C, 24-Q082D, 41-Q104 (shell), 95-QA03, 95-QA04, 95-QA06, 95-QA07
PCD_G0050_MF_74	93-Q221	95-QA03, 95-QA06
PCD_G0050_MF_83	93-Q225	41-Q105 (shell), 95-QA08
PCD_G0050_MF_84	93-Q226	16-Q050, 95-QA15
PCD_G0050_MF_87	93-Q228	24-Q080, 41-Q110 (tube)
PCD_G0050_MF_89	93-Q229	35-COALESCER PEND, 41-Q107 (shell), 41-Q108 (shell), 41-Q109 (shell), 41-Q110 (shell), 41-Q111

MF #	Equipment Number	Description/Eq. Protected
		(shell), 95-QA12, 95-QA13, 95-QA14, 95-QA15, 95-QA16
PCD_G0050_MF_91	93-Q231	35-QA64, 41-Q112 (tube), 41-Q113 (shell)
PCD_G0050_MF_92	93-Q233	41-Q114 (shell), 41-Q115A (shell), 95-QA17, 95-QA18
PCD_G0050_MF_95	93-Q237	24-Q084, 41-Q109 (tube), 41-Q116 (shell)
PCD_G0050_MF_123	93-Q239	24-Q083A, 24-Q083B, 24-Q083C, 24-Q083D, 24-Q083E, 24-Q083F, 24-Q083G, 24-Q083H, 41-Q106 (tube), 95-QA09
PCD_G0050_MF_123	93-Q240	24-Q083A, 24-Q083B, 24-Q083C, 24-Q083D, 24-Q083E, 24-Q083F, 24-Q083G, 24-Q083H, 41-Q106 (tube), 95-QA09
PCD_G0050_MF_127	93-Q241	95-QA10
PCD_G0050_MF_127	93-Q242	95-QA10
PCD_G0050_MF_183	93-Q274	L564001-15CSTL
PCD_G0050_MF_81	93-Q277	95-QA59
PCD_G0050_MF_74	95-QA06	FRACTIONATOR OVERHEAD RECEIVER
PCD_G0050_MF_81	95-QA07	FIRST STAGE SUCTION DRUM
PCD_G0050_MF_127	95-QA10	BLOWDOWN SETTLING DRUM
PCD_G0050_MF_88	95-QA13	ABSORBER/STRIPPER
PCD_G0050_MF_89	95-QA15	SPONGE OIL ABSORBER/PRESATURATOR
PCD_G0050_MF_93	95-QA18	DEBUTANIZER REFLUX DRUM
PCD_G0050_MF_170	95-QA31	FLARE KNOCK OUT DRUM
PCD_G0050_MF_34	95-QA50	FUEL GAS KNOCK OUT DRUM

G0051 (VDU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0051_MF_42	41-Q615	OFF GAS AFTER CONDENSER
PCD_G0051_MF_4	67-Q712	FLASH DISTILLATE PUMP SOUTH
PCD_G0051_MF_4	67-Q713	FLASH DISTILLATE PUMP NORTH
PCD_G0051_MF_4	67-Q714	SOUR WATER PUMP SOUTH
PCD_G0051_MF_4	67-Q715	SOUR WATER PUMP NORTH
PCD_G0051_MF_15	93-Q701	41-Q602A (shell), 41-Q602A (tube), 41-Q602B (shell), 41-Q602B (tube), 41-Q602C (shell), 41-Q602C (tube),

MF #	Equipment Number	Description/Eq. Protected
		41-Q602D (shell), 41-Q602D (tube), 41-Q602E (shell), 41-Q602E (tube), 41-Q602F (shell), 41-Q602F (tube), 41-Q602G (shell), 41-Q602G (tube), 41-Q602H (
PCD_G0051_MF_34	93-Q702	07-Q520 (tube), 07-Q524 (tube), 41-Q602A (tube), 41-Q602B (tube), 41-Q602C (tube), 41-Q602D (tube), 41-Q602E (tube), 41-Q602F (tube), 41-Q602G (tube), 41-Q602H (tube)
PCD_G0051_MF_29	93-Q709	36-Q530 Proc.Coil 1, 41-Q611A (S), 41-Q611B (S), 41-Q611C (S), 41-Q612 (S), 41-Q613 (S), 71-Q551, 71-Q552 , 71-Q553 , 71-Q554 , 71-Q555 , 71-Q556 , 71-Q557 , 71-Q558 , 71-Q559 , 71-Q560 2, 95-QM01, 95-QM02
PCD_G0051_MF_29	93-Q710	36-Q530 Proc.Coil 1, 41-Q611A (S), 41-Q611B (S), 41-Q611C (S), 41-Q612 (S), 41-Q613 (S), 71-Q551, 71-Q552 , 71-Q553 , 71-Q554 , 71-Q555 , 71-Q556 , 71-Q557 , 71-Q558 , 71-Q559 , 71-Q560 2, 95-QM01, 95-QM02
PCD_G0051_MF_16	93-Q713	07-Q521 (Shell), 41-Q604A (shell), 41-Q604B (shell)
PCD_G0051_MF_41	93-Q719	41-Q611A (S), 41-Q611B (S), 41-Q611C (S), 41-Q612 (S), 41-Q613 (S), 41-Q615 (S), 71-Q551, 71-Q552 , 71-Q553 , 71-Q554 , 71-Q555 , 71-Q556 , 71-Q557 , 71-Q558 , 71-Q559 , 71-Q560 2, 95-QM01, 95-QM02
PCD_G0051_MF_41	95-QM02	HOTWELL

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G0082 (Gas Collection)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0082_MF_2	93-H903	24-H410, 95-CH54
PCD_G0082_MF_2	93-H904	24-H410, 95-CH53
PCD_G0082_MF_2	93-H908	95-CH55
PCD_G0082_MF_3	93-H926	95-CH52
PCD_G0082_MF_3	93-H927	95-CH51

Header 13 Ancillary Equipment – GOHDS Flare

G0034 (SRU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0034_MF_50	16-C716	EAST H2S COMPRESSOR
PCD_G0034_MF_61	16-C717	WEST H2S COMPRESSOR
PCD_G0034_MF_49	24-C818	H2S COMPRESSOR AIRFIN WEST
PCD_G0034_MF_49	24-C836	H2S COMPRESSOR AIRFIN EAST
PCD_G0034_MF_66	67-OCE4	MAIN LUBE OIL PUMP ON ACID GAS COMPRESSOR
PCD_G0034_MF_46	93-C438	95-CH72
PCD_G0034_MF_41	93-C906	95-CE24
PCD_G0034_MF_49	93-C928	95-CH20
PCD_G0034_MF_48	95-CE49	WEST H2S COMPRESSOR DISCHARGE BOTTLE
PCD_G0034_MF_49	95-CE51	EAST H2S COMPRESSOR DISCHARGE BOTTLE

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G0045 (MeSH)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0045_MF_47	16-MM01	H2S COMPRESSOR
PCD_G0045_MF_6	41-MM10	MESH REACTOR EFFLUENT COOLER BTM
PCD_G0045_MF_11	41-MM13	HYDROGEN STRIPPER OVERHEAD CONDENSER
PCD_G0045_MF_12	41-MM23	H2S STRIPPER REBOILER
PCD_G0045_MF_41	41-MM33	FLARE HEATER
PCD_G0045_MF_40	67-MM05	WATER STRIPPER BOTTOMS PUMP NORTH
PCD_G0045_MF_40	67-MM06	WATER STRIPPER BOTTOMS PUMP SOUTH
PCD_G0045_MF_11	67-MM09	H2 STRIPPER BOTTOMS PUMP EAST
PCD_G0045_MF_11	67-MM10	H2 STRIPPER BOTTOMS PUMP

MF #	Equipment Number	Description/Eq. Protected
		WEST
PCD_G0045_MF_13	67-MM11	H2S STRIPPER OH ACCUM PUMP NORTH
PCD_G0045_MF_13	67-MM12	H2S STRIPPER OH ACCUM PUMP SOUTH
PCD_G0045_MF_35	67-MM27	N PRODUCT RECOVERY DRUM PUMP
PCD_G0045_MF_35	67-MM52	HIGH VOL PROD RECOVERY DRUM PUMP
PCD_G0045_MF_20	95-MM02	DMS OVERHEAD ACCUMULATOR
PCD_G0045_MF_11	95-MM04	Hydrogen Stripper
PCD_G0045_MF_15	95-MM07	AZEO COLUMN
PCD_G0045_MF_17	95-MM08	MESH COLUMN
PCD_G0045_MF_1	95-MM11	1ST STAGE COMPRESSOR SUCTION KO DRUM
PCD_G0045_MF_3	95-MM12	2ND STAGE COMPRESSOR SUCTION KO DRUM
PCD_G0045_MF_3	95-MM13	3RD STAGE COMPRESSOR SUCTION KO DRUM
PCD_G0045_MF_6	95-MM17	MESH REACTOR EFFLUENT SEPARATOR
PCD_G0045_MF_10	95-MM18	LP ABSORBER DRUM
PCD_G0045_MF_13	95-MM19	H2S STRIPPER ACCUMULATOR
PCD_G0045_MF_16	95-MM20	AZEO COLUMN OVERHEAD ACCUMULATOR
PCD_G0045_MF_18	95-MM21	MESH COLUMN OVERHEAD ACCUMULATOR
PCD_G0045_MF_35	95-MM29	PRODUCT RECOVERY DRUM
PCD_G0045_MF_35	95-MM30	WASH WATER DRUM
PCD_G0045_MF_41	95-MM31	FLARE KNOCKOUT DRUM
PCD_G0045_MF_47	95-MM35	PRIMARY SOUR GAS K.O. POT
PCD_G0045_MF_47	95-MM36	SECONDARY SOUR GAS K.O. POT
PCD_G0045_MF_47	95-MM38	H2S COMPRESSOR 1ST STG DISCHARGE BOTTLE
PCD_G0045_MF_47	95-MM40	H2S COMPRESSOR 2ND STG DISCHARGE BOTTLE
PCD_G0045_MF_47	95-MM42	H2S COMPRESSOR 3RD STE DISCHARGE BOTTLE
PCD_G0045_MF_1	93-MM01	95-MM11
PCD_G0045_MF_2	93-MM05	16-MM01 (Stage III), 95-MM42
PCD_G0045_MF_3	93-MM06	16-MM01 (Stage I), 95-MM12, 95-MM38
PCD_G0045_MF_3	93-MM07	16-MM01 (Stage II), 41-MM03 (S),

MF #	Equipment Number	Description/Eq. Protected
		95-MM13, 95-MM40
PCD_G0045_MF_6	93-MM10	95-MM17
PCD_G0045_MF_7	93-MM12	95-MM15
PCD_G0045_MF_7	93-MM13	41-MM11 (T), 41-MM14 (S), 95-MM03, 95-MM09
PCD_G0045_MF_10	93-MM17	41-MM15 (S), 95-MM18
PCD_G0045_MF_11	93-MM18	95-MM04
PCD_G0045_MF_35	93-MM19	67-MM27
PCD_G0045_MF_12	93-MM26	41-MM23 (S), 41-MM25 (S), 41-MM26 (S), 41-MM27 (S), 41-MM28 (S), 41-MM31 (S), 41-MM32 (S), 95-MM05, 95-MM19
PCD_G0045_MF_14	93-MM30	41-MM17 (S), 95-MM06
PCD_G0045_MF_21	93-MM31	41-MM22 (S), 95-MM14
PCD_G0045_MF_15	93-MM35	41-MM16 (S), 41-MM30 (S), 95-MM07, 95-MM20
PCD_G0045_MF_17	93-MM37	24-MM04, 41-MM19 (T), 95-MM08, 95-MM21
PCD_G0045_MF_19	93-MM39	95-MM02, 95-MM10
PCD_G0045_MF_35	93-MM45	41-MM20 (S), 95-MM29
PCD_G0045_MF_35	93-MM46	35-MM03, 41-MM24 (S), 95-MM30
PCD_G0045_MF_5	93-MM48	41-MM06 (S), 41-MM06 (T), 41-MM07 (S), 41-MM07 (T), 41-MM08 (T), 41-MM09 (S), 41-MM10 (S), 95-MM01
PCD_G0045_MF_2	93-MM50	16-MM01 (Stage I), 95-MM12, 95-MM38
PCD_G0045_MF_2	93-MM51	16-MM01 (Stage II), 41-MM03 (S), 95-MM13, 95-MM40
PCD_G0045_MF_11	93-MM52	Line 15CSTL-MM1-2
PCD_G0045_MF_30	93-MM56	95-MM43
PCD_G0045_MF_49	93-MM57	95-MM44
PCD_G0045_MF_49	93-MM58	41-MM41 (S)
PCD_G0045_MF_49	93-MM59	41-MM40 (S)
PCD_G0045_MF_49	93-MM60	41-MM42 (T), 95-MM45
PCD_G0045_MF_49	93-MM61	41-MM42 (S), 95-MM49
PCD_G0045_MF_49	93-MM62	95-MM46

G0046 (Heavy M)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0046_MF_2	41-HM01	HEAVY M COLUMN OVHD CONDENSER
PCD_G0046_MF_1	93-HM01	41-HM01 (S), 41-HM02 (S), 95-HM01
PCD_G0046_MF_3	93-HM03	95-HM02
PCD_G0046_MF_3	93-HM04	95-HM03

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G0002 (Columns)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0002_MF_4	93-E901	41-E821A (T), 41-E821B (T), 41-E821C (T), 41-E821D (T), 41-E821E (T), 41-E821F (T), 95-EH39
PCD_G0002_MF_4	93-E902	41-E821A (T), 41-E821B (T), 41-E821C (T), 41-E821D (T), 41-E821E (T), 41-E821F (T), 95-EH39
PCD_G0002_MF_17	93-E903	95-EH38
PCD_G0002_MF_14	93-E904	24-E819A, 24-E819B, 41-E826 (T), 41-E827A (S), 41-E827B (S), 41-E828A (S), 41-E828B (S), 95-EH37
PCD_G0002_MF_7	93-E905	24-E820A, 24-E820B , 24-E820C, 24-E820D, 41-E829 A (S), 41-E829 B (S), 95-EH34, 95-EH35, 95-EH53
PCD_G0002_MF_10	93-E906	95-EH34
PCD_G0002_MF_10	93-E907	95-EH33
PCD_G0002_MF_7	93-E912	41-E829A (T), 41-E829B (T)
PCD_G0002_MF_2	93-E914	35-E839, 35-E840, 95-EH32, 95-EH56
PCD_G0002_MF_4	93-E920	36-E818, 41-E821A (S), 41-E821B (S), 41-E821C (S), 41-E821D (S), 41-E821E (S), 41-E821F (S)
PCD_G0002_MF_4	93-E921	95-EH39, 36-RB18
PCD_G0002_MF_30	93-EH46	95-EH93
PCD_G0002_MF_30	93-EH47	95-EH94
PCD_G0002_MF_29	95-EH64	PENDING UNIT 2 FLARE KNOCKOUT DRUM

G0004

MF #	Equipment Number	Description/Eq. Protected
PCD_G0004_MF_13	16-F400	BUTAMER HYDROGEN COMPRESSOR WEST
PCD_G0004_MF_13	16-F401	BUTAMER HYDROGEN COMPRESSOR EAST
PCD_G0004_MF_15	67-F419	BUTAMER N. STABLIZER E. REFLUX
PCD_G0004_MF_13	93-F404	16-F401 , 95-FE06
PCD_G0004_MF_13	93-F405	95-FE04
PCD_G0004_MF_12	93-F410	24-F512, 24-F516, 41-F511A (T), 41-F511B (T), 41-F513A (S), 41-F513B (S), 41-F513C (S), 95-FE08
PCD_G0004_MF_12	93-F411	24-F512, 24-F516, 41-F511A (T), 41-F511B (T), 41-F513A (S), 41-F513B (S), 41-F513C (S), 95-FE08
PCD_G0004_MF_5	93-F416	95-FE12
PCD_G0004_MF_5	93-F417	95-FE13
PCD_G0004_MF_1	93-F422	95-FE40
PCD_G0004_MF_17	93-F508	41-F506 (S), 95-FE32
PCD_G0004_MF_15	93-F512	41-F501A (S), 41-F501B (S), 95-FE26, 95-FE28
PCD_G0004_MF_15	93-F513	95-FE25
PCD_G0004_MF_11	93-F516	36-F508, 41-F511A (S), 41-F511B (S)
PCD_G0004_MF_11	93-F517	95-FE33
PCD_G0004_MF_11	93-F518	95-FE34
PCD_G0004_MF_11	95-FE34	#1 REACTOR BUTAMER WEST
PCD_G0004_MF_27	95-FE53	BUFFER POT N STAB E RFLX 67-F419

G0005

MF #	Equipment Number	Description/Eq. Protected
PCD_G0005_MF_28	16-F116	PENTANE ISOM H2 MAKEUP COMPRESSOR SOUTH
PCD_G0005_MF_28	16-F117	PENTANE ISOM H2 MAKEUP COMPRESSOR NORTH
PCD_G0005_MF_10	16-F118	PENTANE ISOM H2 RECYCLE COMPRESSOR
PCD_G0005_MF_52	41-F203B	#1 & #2 REACTOR FD/EFFLUENT NORTH BTM
PCD_G0005_MF_53	41-F204B	#3 REACTOR FEED/EFFLUENT BTM NORTH
PCD_G0005_MF_38	67-F109	PENTANE ISOM CHARGE

MF #	Equipment Number	Description/Eq. Protected
		NORTH
PCD_G0005_MF_38	67-F110	PENTANE ISOM FEED MID
PCD_G0005_MF_38	67-F111	PENTANE ISOM CHARGE SOUTH
PCD_G0005_MF_9	93-F121	24-F201A, 24-F201B, 24-F201C, 24-F201D, 24-F201E, 24-F201F, 41-F202A (S), 41-F202B (S), 41-F202C (S), 41-F202D (S), 95-FB32
PCD_G0005_MF_8	93-F122	24-F201D, 24-F201E, 24-F201F, 41-F202C (S), 41-F202D (S)
PCD_G0005_MF_8	93-F123	24-F201A, 24-F201B, 24-F201C, 41-F204A (T)
PCD_G0005_MF_16	93-F214	95-FB29
PCD_G0005_MF_21	93-F215	41-F209A (S), 41-F209B (S), 41-F209C (S), 41-F209D (S), 95-FB30
PCD_G0005_MF_21	93-F302	95-FB16
PCD_G0005_MF_22	93-F307	95-FB11
PCD_G0005_MF_22	93-F308	95-FB12
PCD_G0005_MF_17	93-F524	16-F116 1st Stage, 41-F209C (S), 41-F209D (S), 95-FB25A, 95-FB25B
PCD_G0005_MF_18	93-F526	16-F117 2nd, 41-F212C (S), 41-F212D (S), 95-FB20A, 95-FB20B
PCD_G0005_MF_19	93-F527	16-F117 1st, 41-F209A (S), 41-F209B (S), 95-FB28A, 95-FB28B
PCD_G0005_MF_20	93-F528	95-FB17A
PCD_G0005_MF_47	93-F540	35-F143, 61-0FB17, 67-F140, 95-FB61
PCD_G0005_MF_7	95-FB64	PENDING TR B #2 ISOM RX
PCD_G0005_MF_27	95-FB74	NORTH OIL RECLAIMER RESEVOIR
PCD_G0005_MF_27	95-FB75	SOUTH OIL RECLAIMER RESEVOIR

G0006

MF #	Equipment Number	Description/Eq. Protected
PCD_G0006_MF_54	95-EA02	SWEET FUEL GAS SCRUBBER
PCD_G0006_MF_31	95-ED35	H2 REGEN GAS SCRUBBER
PCD_G0006_MF_8	95-ED47	LOW TEMPERATURE SEPARATOR

G0007 (Platformer)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0007_MF_35	67-G036	PLATFORMER ALCOHOL INJECTION SOUTH
PCD_G0007_MF_35	67-G037	PLATFORMER ALCOHOL INJECTION MID
PCD_G0007_MF_19	93-E721	16-E701, 95-EH07
PCD_G0007_MF_20	93-E722	16-E702, 95-EH09
PCD_G0007_MF_21	93-E723	16-E703, 95-EH11
PCD_G0007_MF_24	93-E724	16-E704, 95-EH13
PCD_G0007_MF_22	93-E802	16-E706, 95-EH17, 95-EH82
PCD_G0007_MF_14	93-E803	24-E803A, 24-E803B , 24-E803C , 24-E803D , 41-E806(T), 41-E807 (S) , 41-E808 (S), 41-E811A (S), 41-E811B (S), 95-EH18
PCD_G0007_MF_17	93-E821	41-E804 (S), 41-E836 (S), 95-EH19

G0041

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_169	95-KC104	METHANATOR KO DRUM

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G0004

MF #	Equipment Number	Description/Eq. Protected
PCD_G0004_MF_7	67-F406	BUTAMER MOL SIEVE REGENERATION
PCD_G0004_MF_8	67-F407	BUTAMER CHARGE WEST
PCD_G0004_MF_8	67-F408	BUTAMER CHARGE EAST
PCD_G0004_MF_2	67-F413	BUTAMER BUTANE DEHY REGENERATION
PCD_G0004_MF_8	93-F412	95-FE09
PCD_G0004_MF_3	93-F415	36-F507, 41-F509 (T)
PCD_G0004_MF_3	93-F418	95-FE10
PCD_G0004_MF_3	93-F419	95-FE11
PCD_G0004_MF_7	93-F420	95-FE16
PCD_G0004_MF_7	93-F421	95-FE15
PCD_G0004_MF_1	93-F423	41-F514 (S), 95-FE14

MF #	Equipment Number	Description/Eq. Protected
PCD_G0004_MF_2	93-F502	41-F515A (T), 41-F515B (T)
PCD_G0004_MF_2	93-F503	95-FE17
PCD_G0004_MF_2	93-F504	95-FE18
PCD_G0004_MF_2	93-F505	95-FE19
PCD_G0004_MF_4	93-F506	95-FE20
PCD_G0004_MF_4	93-F507	95-FE21
PCD_G0004_MF_4	95-FE20	COLUMN 41 SCRUBBER
PCD_G0004_MF_4	95-FE21	COLUMN 41 UNIT 41

G0005

MF #	Equipment Number	Description/Eq. Protected
PCD_G0005_MF_5	67-F106	PENTANE ISOM STABLIZER REFLUX SOUTH
PCD_G0005_MF_5	67-F107	PENTANE ISOM STABLIZER REFLUX NORTH
PCD_G0005_MF_5	67-F147	PENDING C5/C6 ISOM REGEN LIQUID PUMP
PCD_G0005_MF_5	67-F148	PENDING C5/C6 ISOM REGEN LIQ PMP SPARE
PCD_G0005_MF_2	93-F113	41-F218A(S), 41-F218B (S), 41-F219A (T), 41-F219A(S), 41-F219B (T), 41-F231, 95-FB02, 95-FB03
PCD_G0005_MF_2	93-F114	95-FB04
PCD_G0005_MF_1	93-F311	95-FB07
PCD_G0005_MF_1	93-F312	95-FB08
PCD_G0005_MF_1	93-F313	41-F221 (S), 95-FB09
PCD_G0005_MF_7	93-F534	41-F203A (S), 41-F203B (S), 41-F203C (S), 41-F203D (S), 41-F203D (T), 41-F203E (S), 41-F203E (T), 41-F203F (S), 41-F203F (T), 95-FB33
PCD_G0005_MF_7	93-F535	41-F203A (T), 41-F203C (T), 95-FB34
PCD_G0005_MF_7	93-F536	41-F203B (T), 95-FB64
PCD_G0005_MF_46	93-F537	41-F204A (S), 41-F204B (S), 41-F204C (S), 41-F204C (T), 41-F204D (S), 41-F204D (T), 41-F240 (S), 95-FB35
PCD_G0005_MF_46	93-F538	41-F204B (T), 41-F240 (T), 95-FB62
PCD_G0005_MF_46	93-F539	41-F204A (T), 95-FB63
PCD_G0005_MF_47	93-F541	95-FB65 , 95-FB68
PCD_G0005_MF_1	93-F542	36-F207-Pr

MF #	Equipment Number	Description/Eq. Protected
PCD_G0005_MF_22	93-F544	36-F207, 67-F147, 67-F148
PCD_G0005_MF_22	93-F545	95-FB11, 95-FB12
PCD_G0005_MF_14	95-FB03	PENTANE STABILIZER OVERHEAD ACCUMULATOR
PCD_G0005_MF_2	95-FB04	FEED SURGE DRUM

G0006

MF #	Equipment Number	Description/Eq. Protected
PCD_G0006_MF_100	16-E318	HAT HYDROGEN RECYCLE COMPRESSOR WEST
PCD_G0006_MF_57	16-E319	HAT HYDROGEN RECYCLE COMP 2ND FR WEST
PCD_G0006_MF_16	16-E320	U2.2 HYDROGEN RECYCLE COMPRESSOR
PCD_G0006_MF_16	16-E321	U2.2 HYDROGEN RECYCLE COMPRESSOR
PCD_G0006_MF_63	24-E101A	COLUMN 130 OVERHEAD AIRFIN COIL EAST
PCD_G0006_MF_63	24-E101B	COLUMN 130 OVERHEAD AIRFIN COIL MIDDLE
PCD_G0006_MF_63	24-E101C	COLUMN 130 OVERHEAD AIRFIN COIL WEST
PCD_G0006_MF_69	24-E102A	COL 131 OH EAST SET AIRFIN COILS EAST
PCD_G0006_MF_69	24-E102B	COL 131 OH EAST SET AIRFIN COILS 2ND E
PCD_G0006_MF_69	24-E102C	COL 131 OH EAST SET AIRFIN COILS 3RD E
PCD_G0006_MF_69	24-E102D	COL 131 OH EAST SET AIRFIN COILS 4TH E
PCD_G0006_MF_69	24-E102E	COL 131 OH EAST SET AIRFIN COILS 5TH E
PCD_G0006_MF_69	24-E102F	COL 131 OH EAST SET AIRFIN COILS WEST
PCD_G0006_MF_76	24-E103A	COL132 OVERHEAD AIRFIN COILS EAST
PCD_G0006_MF_76	24-E103B	COL132 OVERHEAD AIRFIN COILS 2ND FR EAST
PCD_G0006_MF_76	24-E103C	COL132 OVERHEAD AIRFIN COILS 3RD FR EAST
PCD_G0006_MF_76	24-E103D	COL132 OVERHEAD AIRFIN COILS 3RD FR WEST
PCD_G0006_MF_76	24-E103E	COL132 OVERHEAD AIRFIN COILS 2ND FR WEST
PCD_G0006_MF_76	24-E103F	COL132 OVERHEAD AIRFIN

MF #	Equipment Number	Description/Eq. Protected
		COILS WEST
PCD_G0006_MF_83	24-E104A	COL133 OVERHEAD AIRFIN COILS EAST
PCD_G0006_MF_83	24-E104B	COL133 OVERHEAD AIRFIN COILS 2ND FR EAST
PCD_G0006_MF_83	24-E104C	COL133 OVERHEAD AIRFIN COILS 3RD FR EAST
PCD_G0006_MF_83	24-E104D	COL133 OVERHEAD AIRFIN COILS 4TH FR EAST
PCD_G0006_MF_83	24-E104E	COL133 OVERHEAD AIRFIN COILS 5TH FR EAST
PCD_G0006_MF_83	24-E104F	COL133 OVERHEAD AIRFIN COILS WEST
PCD_G0006_MF_87	24-E105	COLUMN 134 OVERHEAD AIRFIN COILS (3)
PCD_G0006_MF_77	67-E022	COLUMN 132 REFLUX
PCD_G0006_MF_77	67-E023	COLUMN 132-133 REFLUX
PCD_G0006_MF_75	67-E026	COLUMN 132-133 INTERMEDIATE REFLUX
PCD_G0006_MF_158	67-E042	COLUMN 130 REFLUX SOUTH
PCD_G0006_MF_158	67-E043	COLUMN 130 REFLUX NORTH
PCD_G0006_MF_158	67-E044	COLUMN 133 KETTLE PRODUCT WEST
PCD_G0006_MF_158	67-E045	COLUMN 130 KETTLE PRODUCT
PCD_G0006_MF_158	67-E046	COLUMN 130 INTERMEDIATE REFLUX EAST
PCD_G0006_MF_158	67-E047	COLUMN 130 INTERMEDIATE REFLUX
PCD_G0006_MF_157	67-E322	BENZENE HYDRO FEED EAST
PCD_G0006_MF_158	67-E323	BENZENE HYDRO FEED WEST
PCD_G0006_MF_144	67-E326	HEX HYDROGEN FRACTIONATOR REFLUX WEST
PCD_G0006_MF_64	93-E113	95-EA09
PCD_G0006_MF_70	93-E115	95-EA10
PCD_G0006_MF_77	93-E117	95-EA11
PCD_G0006_MF_84	93-E119	95-EA12
PCD_G0006_MF_60	93-E126	41-E130A (T), 41-E130B (T)
PCD_G0006_MF_60	93-E132	41-E440A
PCD_G0006_MF_85	93-E211	41-E125A (S), 41-E125B (S), 41-E125C (S), 41-E125D (S), 67-E036, 67-E037, 95-EA24
PCD_G0006_MF_88	93-E213	95-EA23

MF #	Equipment Number	Description/Eq. Protected
PCD_G0006_MF_78	93-E215	41-E133A (T), 67-E033, 67-E050, 95-EA22
PCD_G0006_MF_71	93-E217	95-EA21
PCD_G0006_MF_1	93-E301	95-ED41, 95-EE01
PCD_G0006_MF_2	93-E302	95-ED42, 95-EE02
PCD_G0006_MF_9	93-E303	95-ED40
PCD_G0006_MF_22	93-E305	41-E412 (S), 41-E413 (T), 41-E437 (S), 95-ED45
PCD_G0006_MF_5	93-E306	95-ED43
PCD_G0006_MF_5	93-E307	95-ED44
PCD_G0006_MF_7	93-E308	41-E411A (S), 41-E411B (S), 41-E414 (S), 95-ED46, 95-ED47
PCD_G0006_MF_8	93-E309	95-ED47
PCD_G0006_MF_15	93-E311	16-E321 S, 95-ED60, 95-ED61
PCD_G0006_MF_16	93-E312	95-ED67
PCD_G0006_MF_57	93-E313	16-E319, 95-ED70, 95-ED71
PCD_G0006_MF_100	93-E314	16-E318, 95-ED74, 95-ED75
PCD_G0006_MF_15	93-E315	16-E321 N, 95-ED48, 95-ED49
PCD_G0006_MF_16	93-E316	16-E320 N, 95-ED54, 95-ED55
PCD_G0006_MF_10	93-E317	95-ED56
PCD_G0006_MF_24	93-E318	95-ED36
PCD_G0006_MF_97	93-E320	95-ED57
PCD_G0006_MF_26	93-E321	95-ED37
PCD_G0006_MF_129	93-E324	95-ED32
PCD_G0006_MF_30	93-E326	41-E417
PCD_G0006_MF_4	93-E360	36-E403
PCD_G0006_MF_31	93-E400	95-ED35
PCD_G0006_MF_31	93-E401	95-ED34
PCD_G0006_MF_45	93-E417	36-E401
PCD_G0006_MF_41	93-E421	95-ED27, 95-EE05
PCD_G0006_MF_44	93-E424	41-E406A (S), 41-E406B (S), 95-ED26
PCD_G0006_MF_95	93-E602	41-E424 (S), 95-ED80
PCD_G0006_MF_97	93-E603	41-E425 (S), 95-ED81
PCD_G0006_MF_98	93-E610	95-ED90
PCD_G0006_MF_99	93-E611	24-E428, 41-E429 (S), 41-E430 (S), 95-ED88, 95-ED90
PCD_G0006_MF_92	93-E613	95-ED87
PCD_G0006_MF_92	93-E614	41-E424 (T), 41-ED01 (T) , 95-ED86
PCD_G0006_MF_49	93-E620	95-ED98

MF #	Equipment Number	Description/Eq. Protected
PCD_G0006_MF_64	93-E621	95-EA28
PCD_G0006_MF_94	93-E623	L237-15CSTL
PCD_G0006_MF_126	93-ED05	35-ED01, 41-0ED6 (S)
PCD_G0006_MF_27	93-ED10	95-EH28
PCD_G0006_MF_28	93-ED11	95-EH29
PCD_G0006_MF_10	93-ED18	95-FB11, 95-FB12
PCD_G0006_MF_128	93-ED20	41-0ED4A (S) , 41-0ED4B (S) , 41-0ED4C (S)
PCD_G0006_MF_32	93-ED21	41-E438 (S)
PCD_G0006_MF_3	93-ED28	41-E411A (T), 41-E411B (T)
PCD_G0006_MF_60	93-ED30	41-E130A (S), 41-E130B (S), 41-E155 (S)
PCD_G0006_MF_64	93-ED31	41-E108 (S), 41-E110 (S)
PCD_G0006_MF_62	95-EA05	COLUMN 130-B
PCD_G0006_MF_68	95-EA08	COLUMN 131-B
PCD_G0006_MF_75	95-EA15	COLUMN 132-B
PCD_G0006_MF_86	95-EA20	COLUMN 134
PCD_G0006_MF_26	95-ED37	H2 FRACTIONATOR ACCUMULATOR
PCD_G0006_MF_7	95-ED46	HIGH TEMPERATURE SEPARATOR
PCD_G0006_MF_97	95-ED57	HAT LOW TEMPERATURE SEPARATOR
PCD_G0006_MF_56	95-ED58	COMPRESSOR BLOWCASE
PCD_G0006_MF_15	95-ED60	H2 PULSATION POT - EAST
PCD_G0006_MF_16	95-ED67	H2 PULSATION POT - 8TH FR EAST
PCD_G0006_MF_57	95-ED70	H2 PULSATION POT - 8TH FR WEST
PCD_G0006_MF_100	95-ED74	H2 PULSATION POT - 4TH FR WEST
PCD_G0006_MF_97	95-ED81	HAT HIGH TEMPERATURE SEPARATOR
PCD_G0006_MF_99	95-ED88	HAT STABILIZER ACCUMULATOR
PCD_G0006_MF_13	95-ED95	RECYC H2 DISCHG PUL BOTTLE FOR 16-E317
PCD_G0006_MF_137	95-EE06	SEAL BUFFER POT FOR 67-ED07
PCD_G0006_MF_131	95-EE07	SEAL BUFFER POT FOR 67-ED04
PCD_G0006_MF_131	95-EE08	SEAL BUFFER POT FOR 67-ED05
PCD_G0006_MF_144	95-EE16	BUFFER POT HEX H2 FRACT W

MF #	Equipment Number	Description/Eq. Protected
		REFLX 67-E326
PCD_G0006_MF_27	95-EH28	C6 FEED DRYER SOUTH
PCD_G0006_MF_28	95-EH29	C6 FEED DRYER
PCD_G0006_MF_49	RD-1015	67-E370, 67-E369

G0011 (C2C3)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0011_MF_5	41-C300	SOUR FEED HEATER
PCD_G0011_MF_5	41-C309	WEST SOUR FEED HEATER
PCD_G0011_MF_57	41-C334	DEC2 FEED TO BOTTOMS
PCD_G0011_MF_6	67-C201	SOUR FEED Y1 FEED - NORTH
PCD_G0011_MF_6	67-C202	SOUR FEED Y1 FEED - MID
PCD_G0011_MF_6	67-C203	SOUR FEED Y1 FEED - SOUTH
PCD_G0011_MF_25	67-C210	WEST DEETHANIZER REGENERATOR GAS
PCD_G0011_MF_25	67-C211	EAST DEETHANIZER REGENERATOR GAS
PCD_G0011_MF_27	67-C247	W. DEETHANIZER REFLUX
PCD_G0011_MF_27	67-C248	E. DEETHANIZER REFLUX
PCD_G0011_MF_58	67-C252	W. MDEA SCRUBBER CONDENSATE
PCD_G0011_MF_58	67-C253	E. MDEA SCRUBBER CONDENSATE
PCD_G0011_MF_41	67-C254	W. COL 44 FEED
PCD_G0011_MF_41	67-C255	E. COL 44 FEED
PCD_G0011_MF_40	67-C256	W. ETHANE TRANSFER
PCD_G0011_MF_40	67-C257	E. ETHANE TRANSFER
PCD_G0011_MF_50	67-C262	PROPANE TO STORAGE
PCD_G0011_MF_47	67-C280	PROPANE PUMP-OUT
PCD_G0011_MF_56	67-C283	EAST ETHANE/PROPANE PHASE SEPARATOR
PCD_G0011_MF_56	67-C284	ETHANE/PROPANE PHASE SEPARATOR - CTR
PCD_G0011_MF_56	67-C285	WEST ETHANE/PROPANE PHASE SEPARATOR
PCD_G0011_MF_2	67-CC05	COL 29/30 FEED PUMP SOUTH
PCD_G0011_MF_2	67-CC06	COL 29/30 FEED PUMP NORTH
PCD_G0011_MF_2	67-CC07	CAV 11 DEC2 TRANSFER PUMP
PCD_G0011_MF_3	67-CC08	N COL 31 FEED PUMP
PCD_G0011_MF_3	67-CC09	S COL 31 FEED PUMP
PCD_G0011_MF_166	67-CC10	PENDING - PIPELINE PURGE

MF #	Equipment Number	Description/Eq. Protected
		PUMP #1
PCD_G0011_MF_166	67-CC11	PENDING - PIPELINE PURGE PUMP #2
PCD_G0011_MF_7	93-C505	95-CC23
PCD_G0011_MF_7	93-C506	95-CC23
PCD_G0011_MF_8	93-C507	95-CC24
PCD_G0011_MF_8	93-C508	95-CC24
PCD_G0011_MF_9	93-C509	41-C300 (T)
PCD_G0011_MF_10	93-C511	95-CC16
PCD_G0011_MF_13	93-C513	95-CC18
PCD_G0011_MF_12	93-C514	95-CC15
PCD_G0011_MF_11	93-C515	95-CC13
PCD_G0011_MF_11	93-C517	95-CC12
PCD_G0011_MF_18	93-C518	95-CC10
PCD_G0011_MF_21	93-C523	41-C303A (S), 41-C303B (S), 41-C304A (S), 41-C304B (S), 41-C305 (S), 41-C306 (S), 41-C307A (S), 41-C307B (S), 95-CC06, 95-CC07
PCD_G0011_MF_21	93-C524	41-C305 (S), 95-CC06, 95-CC07
PCD_G0011_MF_21	93-C525	41-C306 (S), 95-CC06, 95-CC07
PCD_G0011_MF_20	93-C603	95-CC06
PCD_G0011_MF_24	93-C607	41-C301 (S), 95-CC21, 95-CC22, 95-CC29
PCD_G0011_MF_26	93-C608	41-C302 (T)
PCD_G0011_MF_22	93-C610	95-CC03, 95-CC03 (C3), 95-CC03 (EP), 95-CC03 (iC4), 95-CC03 (nC4), 95-CC03 (RGP)
PCD_G0011_MF_23	93-C611	95-CC04, 95-CC04 (C3), 95-CC04 (EP), 95-CC04 (iC4), 95-CC04 (nC4), 95-CC04 (RGP)
PCD_G0011_MF_35	93-C612	95-CC01
PCD_G0011_MF_34	93-C613	95-CC02
PCD_G0011_MF_37	93-C614	95-CC75
PCD_G0011_MF_32	93-C616	95-CC72
PCD_G0011_MF_58	93-C620	41-C337 (T)
PCD_G0011_MF_41	93-C621	41-C338 (T), 95-CC64
PCD_G0011_MF_50	93-C622	41-C338 (S), 95-CC57
PCD_G0011_MF_48	93-C623	95-CC58
PCD_G0011_MF_46	93-C624	41-C350A (S), 41-C350B (S), 41-C350C (S), 95-CC56
PCD_G0011_MF_53	93-C625	95-CC27, 95-CC28, 95-CC30
PCD_G0011_MF_4	93-C702	95-CC77

MF #	Equipment Number	Description/Eq. Protected
PCD_G0011_MF_4	93-C704	95-CC78
PCD_G0011_MF_3	93-C706	95-CC79
PCD_G0011_MF_3	93-C707	95-CC79
PCD_G0011_MF_3	93-C708	95-CC80
PCD_G0011_MF_3	93-C709	95-CC80
PCD_G0011_MF_44	93-C715	16-C274 (1st stage), 16-C274 (2 nd stage)
PCD_G0011_MF_44	93-C716	16-C274 (1st stage), 16-C274 (2 nd stage)
PCD_G0011_MF_52	93-C717	16-C273
PCD_G0011_MF_47	93-C724	41-C342 (S), 41-C343 (S), 95-CC53
PCD_G0011_MF_43	93-C725	95-CC59
PCD_G0011_MF_42	93-C801	95-CC62
PCD_G0011_MF_55	93-C802	41-C340 (S), 95-CC60
PCD_G0011_MF_59	93-C806	41-C339 (T), 95-CC61
PCD_G0011_MF_27	93-C811	95-CC67
PCD_G0011_MF_28	93-C828	41-C331 (T), 41-C334 (S), 95-CC68
PCD_G0011_MF_28	93-C829	41-C332 (T), 95-CC68
PCD_G0011_MF_28	93-C830	41-C333 (T), 41-C334 (S), 95-CC68
PCD_G0011_MF_16	93-C841	95-CC11
PCD_G0011_MF_57	93-CC05	41-C334 (T), 41-C353 (S)
PCD_G0011_MF_163	93-CC06	95-CE33, 95-CE33 (C3), 95-CE33 (EP), 95-CE33 (iC4), 95-CE33 (nC4), 95-CE33 (Regen), 95-CE33 (RGP)
PCD_G0011_MF_163	93-CC07	95-CE34, 95-CE34 (C3), 95-CE34 (EP), 95-CE34 (iC4), 95-CE34 (nC4), 95-CE34 (Regen), 95-CE34 (RGP)
PCD_G0011_MF_162	93-CC08	95-CE35, 95-CE35 (C3), 95-CE35 (EP), 95-CE35 (iC4), 95-CE35 (nC4), 95-CE35 (RGP)
PCD_G0011_MF_165	93-CC09	95-CD09, 95-CD09 (C3), 95-CD09 (EP), 95-CD09 (iC4), 95-CD09 (nC4), 95-CD09 (RGP)
PCD_G0011_MF_24	95-CC21	REGENERATION LIQUID SEPARATOR EAST
PCD_G0011_MF_24	95-CC22	REGENERATION LIQUID SEPARATOR WEST
PCD_G0011_MF_7	95-CC23	SOUR FEED SURGE DRUM NORTH
PCD_G0011_MF_8	95-CC24	SOUR FEED SURGE DRUM SOUTH
PCD_G0011_MF_53	95-CC27	ETHANE KOH TREATER
PCD_G0011_MF_53	95-CC28	KOH ETHANE SCRUBBER

MF #	Equipment Number	Description/Eq. Protected
PCD_G0011_MF_144	95-CC38	BUFFER POT OB N SOUR Y1 FEED 67-C201
PCD_G0011_MF_144	95-CC39	BUFFER POT IB N SOUR Y1 FEED 67-C201
PCD_G0011_MF_145	95-CC40	BUFFER POT OB MID SOUR Y1 FEED 67-C202
PCD_G0011_MF_145	95-CC41	BUFFER POT IB MID SOUR Y1 FEED 67-C202
PCD_G0011_MF_146	95-CC42	BUFFER POT OB S SOUR Y1 FEED 67-C203
PCD_G0011_MF_146	95-CC43	BUFFER POT IB S SOUR Y1 FEED 67-C203
PCD_G0011_MF_42	95-CC62	COLUMN 44 ACCUMULATOR
PCD_G0011_MF_32	95-CC73	OOS CAUSTIC TANK WEST
PCD_G0011_MF_166	95-CD10	Purge Pump Seal Pot
PCD_G0011_MF_166	95-CD11	Purge Pump Seal Pot
PCD_G0011_MF_5	RD-C732	UT003-15CSTL-ST1
PCD_G0011_MF_28	RD-C734	L170-15CSTL-HC1
PCD_G0011_MF_28	RD-C735	UT005-15CSTL-ST1
PCD_G0011_MF_28	RD-C736	UT005-15CSTL-ST1
PCD_G0011_MF_58	SD-C737	UT003-15CSTL-ST1

G0012 (Gas Collection)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0012_MF_46	16-H537	37 VACUUM FIELD GAS ENGINE/COMPRESSOR
PCD_G0012_MF_47	16-H538	38 VACUUM FIELD GAS ENGINE/COMPRESSOR
PCD_G0012_MF_48	16-H539	39 VACUUM FIELD GAS ENGINE/COMPRESSOR
PCD_G0012_MF_55	16-H620	FEED GAS COMPRESSOR #41 WEST
PCD_G0012_MF_56	16-H621	FEED GAS COMPRESSOR #42 2ND FR WEST
PCD_G0012_MF_57	16-H622	FEED GAS COMPRESSOR #43 3RD FR WEST
PCD_G0012_MF_58	16-H623	FEED GAS COMPRESSOR #44 4TH FR WEST
PCD_G0012_MF_59	16-H624	FEED GAS COMPRESSOR #45 EAST
PCD_G0012_MF_60	16-H625	PROPANE REFRIGERATION #46 WEST
PCD_G0012_MF_61	16-H626	PROPANE REFRIGERATION #47 EAST

MF #	Equipment Number	Description/Eq. Protected
PCD_G0012_MF_25	35-H1026	TREATED GAS DUST FILTER NORTH
PCD_G0012_MF_30	41-H672	HOT GAS
PCD_G0012_MF_20	67-H628	STABILIZER BOTTOMS FEED EAST
PCD_G0012_MF_20	67-H629	STABILIZER BOTTOMS FEED WEST
PCD_G0012_MF_36	67-H638	LOW PRESS MAKE TANK NORTH
PCD_G0012_MF_36	67-H639	LOW PRESS MAKE TANK SOUTH
PCD_G0012_MF_104	93-HG86	95-HG86
PCD_G0012_MF_1	93-K105	16-H537 Stage 2, 95-HF24, 95-HF77
PCD_G0012_MF_1	93-K106	16-H537 Stage 1, 95-HF23
PCD_G0012_MF_3	93-K107	16-H538 Stage 2, 95-HF22, 95-HF82
PCD_G0012_MF_3	93-K108	16-H538 Stage 1, 95-HF21, 95-HF79
PCD_G0012_MF_4	93-K109	16-H539 Stage 2, 95-HF20, 95-HF85
PCD_G0012_MF_4	93-K110	16-H539 Stage 1, 95-HF19, 95-HF60
PCD_G0012_MF_1	93-K111	95-HF26, 95-HF28
PCD_G0012_MF_1	93-K112	41-H669 A (S), 41-H669 B (S), 95-HF25, 95-HF27
PCD_G0012_MF_7	93-K402	95-HG24, 95-HG25, 95-HG87
PCD_G0012_MF_7	93-K403	95-HG24, 95-HG25
PCD_G0012_MF_8	93-K404	95-HG26
PCD_G0012_MF_8	93-K405	95-HG09
PCD_G0012_MF_20	93-K408	95-HG08, 95-HG46, 95-HG55, 95-HG64, 95-HG73, 95-HG82
PCD_G0012_MF_21	93-K411	41-H670 BM N (S), 41-H670 BM S (S), 41-H670 TP N (S), 41-H670 TP S (S), 95-HG27
PCD_G0012_MF_25	93-K418	95-HG28
PCD_G0012_MF_25	93-K419	95-HG29
PCD_G0012_MF_26	93-K420	24-H677, 95-HG31
PCD_G0012_MF_25	93-K422	35-H1026
PCD_G0012_MF_26	93-K423	95-HG30
PCD_G0012_MF_33	93-K426	41-H678 (S)
PCD_G0012_MF_30	93-K502	16-H632 (Compressor), 95-HG14
PCD_G0012_MF_31	93-K503	41-H664 (S)
PCD_G0012_MF_31	93-K504	41-H665 (S)
PCD_G0012_MF_32	93-K505	95-HG12
PCD_G0012_MF_35	93-K509	95-HG19
PCD_G0012_MF_36	93-K510	95-HG103, 95-HG18
PCD_G0012_MF_65	93-K512	95-HG22
PCD_G0012_MF_37	93-K513	95-HG05

MF #	Equipment Number	Description/Eq. Protected
PCD_G0012_MF_37	93-K514	95-HG06
PCD_G0012_MF_42	93-K515	41-H663 A (S), 41-H663 B (S), 95-HG11, 95-HG125
PCD_G0012_MF_42	93-K516	95-HG11
PCD_G0012_MF_43	93-K517	95-HG07
PCD_G0012_MF_64	93-K519	41-H667 (T), 41-H668 (T), 41-H669 A (T), 41-H669 B (T), 95-HG21
PCD_G0012_MF_42	93-K521	41-H663 A (S), 41-H663 B (S), 95-HG125
PCD_G0012_MF_38	93-K524	95-HG108
PCD_G0012_MF_9	93-K613	16-H620 Stage 1, 24-H1020A, 24-H1020B, 95-HG40, 95-HG41, 95-HG43, 95-HG45
PCD_G0012_MF_9	93-K614	16-H620 Stage 2, 24-H1020A, 24-H1020B, 95-HG44
PCD_G0012_MF_10	93-K615	16-H620 Stage 3, 95-HG47
PCD_G0012_MF_11	93-K616	16-H621 Stage 1, 24-H1021A, 24-H1021B, 95-HG49, 95-HG50, 95-HG52, 95-HG54
PCD_G0012_MF_11	93-K617	16-H621 Stage 2, 24-H1021A, 24-H1021B, 95-HG53
PCD_G0012_MF_12	93-K618	16-H621 Stage 3, 95-HG56
PCD_G0012_MF_13	93-K619	16-H622 Stage 1, 24-H1022A, 24-H1022B, 95-HG58, 95-HG59, 95-HG61, 95-HG63
PCD_G0012_MF_13	93-K620	16-H622 Stage 2, 24-H1022A, 24-H1022B, 95-HG62
PCD_G0012_MF_14	93-K621	16-H622 Stage 3, 95-HG65
PCD_G0012_MF_15	93-K622	16-H623 Stage 1, 24-H1023A, 24-H1023B, 95-HG67, 95-HG68, 95-HG70, 95-HG72
PCD_G0012_MF_15	93-K623	16-H623 Stage 2, 24-H1023A, 24-H1023B, 95-HG71
PCD_G0012_MF_17	93-K701	16-H624 Stage 1, 24-H1024A, 24-H1024B, 95-HG76, 95-HG77, 95-HG79, 95-HG81
PCD_G0012_MF_17	93-K702	16-H624 Stage 2, 24-H1024A, 24-H1024B, 95-HG80
PCD_G0012_MF_37	93-K709	95-HG106, 95-HG107
PCD_G0012_MF_39	93-K710	16-H625 Stage 2, 95-HG105, 95-HG110, 95-HG112
PCD_G0012_MF_39	93-K711	16-H625 Stage 3, 95-HG111
PCD_G0012_MF_41	93-K712	16-H626 Stage 1, 95-HG114, 95-HG115
PCD_G0012_MF_40	93-K713	16-H626 Stage 2, 95-HG116, 95-HG122, 95-HG123

MF #	Equipment Number	Description/Eq. Protected
PCD_G0012_MF_41	93-K714	16-H626 Stage 3, 95-HG124
PCD_G0012_MF_81	93-K810	95-HH06
PCD_G0012_MF_37	95-HG06	HIGH STAGE C3 SUCTION SCRUBBER
PCD_G0012_MF_38	95-HG105	46 ENGINE 2ND STAGE PULSATION POT NORTH
PCD_G0012_MF_39	95-HG111	46 ENGINE 3RD STAGE PULSATION POT NORTH
PCD_G0012_MF_40	95-HG116	47 ENGINE 2ND STAGE PULSATION POT NORTH
PCD_G0012_MF_41	95-HG124	47 ENGINE 3RD STAGE PULSATION POT NORTH
PCD_G0012_MF_35	95-HG19	HIGH PRESSURE MAKE TANK
PCD_G0012_MF_65	95-HG20	LOW TEMPERATURE VENT WEATHERING TANK
PCD_G0012_MF_25	95-HG28	NORTH DEHYDRATOR
PCD_G0012_MF_25	95-HG29	SOUTH DEHYDRATOR
PCD_G0012_MF_9	95-HG44	41 ENGINE 2ND STAGE PULSATION POT NORTH
PCD_G0012_MF_10	95-HG47	41 ENGINE 3RD STAGE PULSATION POT NORTH
PCD_G0012_MF_11	95-HG53	42 ENGINE 2ND STAGE PULSATION POT NORTH
PCD_G0012_MF_12	95-HG56	42 ENGINE 3RD STAGE PULSATION POT NORTH
PCD_G0012_MF_13	95-HG62	43 ENGINE 2ND STAGE PULSATION POT NORTH
PCD_G0012_MF_14	95-HG65	43 ENGINE 3RD STAGE PULSATION POT NORTH
PCD_G0012_MF_104	95-HG86	INLET GAS COMP PUL POT WTR SURGE DRUM

G0013

MF #	Equipment Number	Description/Eq. Protected
PCD_G0013_MF_9	41-C956	OOS REFLUX ACCUMULATOR VENT COOLER
PCD_G0013_MF_1	93-C301	95-CB07
PCD_G0013_MF_2	93-C302	95-CB08
PCD_G0013_MF_3	93-C303	95-CB09
PCD_G0013_MF_4	93-C304	95-CB02
PCD_G0013_MF_7	93-C305	95-CB12
PCD_G0013_MF_8	93-C309	41-C954 (S)
PCD_G0013_MF_9	93-C310	41-C956 (S), 95-CB04

PCD_G0013_MF_12	93-C315	95-CB14
PCD_G0013_MF_12	93-C316	95-CB15
PCD_G0013_MF_4	95-CB02	WATER FILTER SURGE TANK
PCD_G0013_MF_1	95-CB07	Y1 NGL PRECIPITATOR NORTH
PCD_G0013_MF_12	95-CB14	FLARE DRIP LEG BLOWCASE
PCD_G0013_MF_12	95-CB15	H2S FLARE BLOWCASE

G0034 (SRU)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0034_MF_45	41-C564A	CENTRAL STILL MDEA REFLUX EAST
PCD_G0034_MF_45	41-C564B	CENTRAL STILL MDEA REFLUX WEST
PCD_G0034_MF_48	93-C408	24-C818, 95-CE49
PCD_G0034_MF_49	93-C414	24-C836, 95-CE51
PCD_G0034_MF_5	93-C742	95-CH31
PCD_G0034_MF_19	93-C746	07-C700 (T), 36-C700, 36-C701, 95-CH21, 95-CH27
PCD_G0034_MF_23	93-C752	95-CH22
PCD_G0034_MF_28	93-C756	24-C737, 95-CH24
PCD_G0034_MF_45	93-C907	95-CE26
PCD_G0034_MF_38	93-C910	41-C561A (T), 41-C561B (T), 41-C561C (T), 95-CE27
PCD_G0034_MF_3	93-C915	95-CH06
PCD_G0034_MF_1	93-C916	41-C753 (S), 95-CH05
PCD_G0034_MF_41	93-C926	41-C562 (S)
PCD_G0034_MF_41	93-C927	41-C563 (S)
PCD_G0034_MF_83	93-C938	L121-30CSTL-HCI
PCD_G0034_MF_45	95-CE26	DEA STILL ACCUMULATOR
PCD_G0034_MF_28	95-CH24	STRIPPER TOWER REFLUX DRUM-TGTU
PCD_G0034_MF_47	95-CH63	OOS EAST H2S DRYER
PCD_G0034_MF_47	95-CH64	OOS MIDDLE H2S DRYER
PCD_G0034_MF_47	95-CH65	OOS WEST H2S DRYER

G0082

MF #	Equipment Number	Description/Eq. Protected
PCD_G0082_MF_1	93-H902	35-CH60, 95-CH56, 95-CH57

G0085

MF #	Equipment Number	Description/Eq. Protected
PCD_G0085_MF_5	67-H455	VACUUM GAS LINE DRIP

G0202

MF #	Equipment Number	Description/Eq. Protected
PCD_G0202_MF_243	41-C130	SUPER HEATER COLD FLARE SUP
PCD_G0202_MF_244	93-C001	L711-60CSTL-HC1-10
PCD_G0202_MF_242	93-C114	41-C130 (T), 41-C131 (S)
PCD_G0202_MF_218	95-AG03	NO. 2 CAUSTIC DISPOSAL TANK
PCD_G0202_MF_219	95-AG05	COLUMN 104-105 OVERHEAD SCRUBBER
PCD_G0202_MF_227	95-AG18	NO. 2 VENT LINE SCRUBBER

G0220

MF #	Equipment Number	Description/Eq. Protected
PCD_G0220_MF_24	93-G255	41-G169 (S)
PCD_G0220_MF_29	93-G263	41-G138(S), 41-G172 (S)
PCD_G0220_MF_33	93-G264	41-G171 (S)

G0221 (Columns)

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_87	67-G048	COLUMN 35 K/P PUMP
PCD_G0221_MF_87	67-G148	COLUMN 35 K/P PUMP
PCD_G0221_MF_87	67-G503	COLUMN 35 FEED WEST
PCD_G0221_MF_87	67-G504	OOS COLUMN 35 FEED EAST
PCD_G0221_MF_87	67-G505	COLUMN 35 REFLUX WEST
PCD_G0221_MF_87	67-G506	COLUMN 35 REFLUX EAST
PCD_G0221_MF_19	67-G526	COLUMN 38 INTERMEDIATE REFLUX SOUTH
PCD_G0221_MF_19	67-G527	COLUMN 38 INTERMEDIATE REFLUX NORTH
PCD_G0221_MF_87	67-G528	COLUMN 37 REFLUX WEST
PCD_G0221_MF_87	67-G529	COLUMN 37 REFLUX EAST
PCD_G0221_MF_87	67-G530	COLUMN 38 REFLUX WEST
PCD_G0221_MF_87	67-G531	COLUMN 38 REFLUX EAST
PCD_G0221_MF_87	67-G534	COLUMN 38 FEED WEST
PCD_G0221_MF_87	67-G535	COLUMN 38 FEED EAST

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_24	67-G560	COLUMN 39-40 FEED WEST
PCD_G0221_MF_24	67-G561	COLUMN 39-40 FEED EAST
PCD_G0221_MF_87	67-G562	COLUMN 39 REFLUX
PCD_G0221_MF_34	67-G566	COLUMN 39-40 INTERMEDIATE REFLUX MID
PCD_G0221_MF_34	67-G567	COLUMN 40 INTERMEDIATE REFLUX EAST
PCD_G0221_MF_87	67-G568	COLUMN 40 REFLUX & OVHD PRODUCT WEST
PCD_G0221_MF_37	67-G569	COLUMN 40 REFLUX & OVHD PRODUCT EAST
PCD_G0221_MF_87	67-G570	PENDING COLUMN 39 INTERMEDIATE REFLUX
PCD_G0221_MF_87	67-G571	PENDING COLUMN 39 INTERMEDIATE REFLUX
PCD_G0221_MF_44	67-G586	COLUMN 41 REFLUX WEST
PCD_G0221_MF_44	67-G587	COLUMN 41 REFLUX MID
PCD_G0221_MF_39	67-G590	COLUMN 41 FEED MID
PCD_G0221_MF_39	67-G591	COLUMN 41 FEED EAST
PCD_G0221_MF_41	67-G592	COLUMN 41 INTERMEDIATE REFLUX WEST
PCD_G0221_MF_41	67-G593	COLUMN 41 INTERMEDIATE REFLUX MID
PCD_G0221_MF_41	67-G594	COLUMN 41 INTERMEDIATE REFLUX EAST
PCD_G0221_MF_48	67-G596	COLUMN 42 INTERMEDIATE REFLUX SOUTH
PCD_G0221_MF_48	67-G597	COLUMN 42 INTERMEDIATE REFLUX NORTH
PCD_G0221_MF_10	67-G608	COL 36 EAST REFLUX PUMP
PCD_G0221_MF_10	67-G609	COL 36 WEST REFLUX PUMP
PCD_G0221_MF_7	67-G615	COL 36 EAST FEED PUMP
PCD_G0221_MF_87	67-G802	DEOILER REBOILER COLUMN 45 WEST
PCD_G0221_MF_87	67-G803	DEOILER REBOILER COLUMN 45 EAST
PCD_G0221_MF_87	67-GF03	COLUMN 38 EAST KETTLE PRODUCT PUMP
PCD_G0221_MF_87	67-GF04	COLUMN 38 WEST KETTLE PRODUCT PUMP
PCD_G0221_MF_1	93-G519	95-GF22
PCD_G0221_MF_10	93-G521	95-GF23, 95-GF92
PCD_G0221_MF_101	93-G523	95-GF24, 95-GF81
PCD_G0221_MF_7	93-G524	95-GF25, 95-GF82

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_15	93-G601	95-GF26
PCD_G0221_MF_22	93-G602	95-GF27
PCD_G0221_MF_16	93-G604	95-GF28, 95-GF93
PCD_G0221_MF_16	93-G623	95-GF29
PCD_G0221_MF_30	93-G625	95-GF30
PCD_G0221_MF_37	93-G702	95-GF31
PCD_G0221_MF_43	93-G705	95-GF11, 95-GF12, 95-GF32
PCD_G0221_MF_50	93-G717	95-GF14, 95-GF34, 95-GF52
PCD_G0221_MF_25	93-G718	41-G868 (T), 41-G962 B side
PCD_G0221_MF_1	93-G762	41-G165 (S), 41-G705A(S), 41-G705A(T), 41-G705B(S), 41-G705B(T)
PCD_G0221_MF_17	93-G765	41-G167A (S)
PCD_G0221_MF_25	93-G767	41-G868 (S), 41-G962 A side
PCD_G0221_MF_57	93-G903	95-GJ02, 95-GJ03
PCD_G0221_MF_51	93-G915	41-G168(S)
PCD_G0221_MF_6	93-G920	41-G705A(S), 41-G705A(T), 41-G705B(S), 41-G705B(T), 41-G707
PCD_G0221_MF_51	93-G921	41-G746 (S)
PCD_G0221_MF_50	95-GF34	COLUMN 42 ACCUMULATOR
PCD_G0221_MF_80	95-GF83	67-G615 SEAL BUFFER POT
PCD_G0221_MF_80	95-GF84	67-G616 SEAL BUFFER POT
PCD_G0221_MF_80	95-GF85	67-G608 OB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF86	67-G608 IB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF87	67-G609 OB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF88	67-G609 IB SEAL BUFFER POT
PCD_G0221_MF_81	95-GH01	PENDING SEAL BUFFER POT FOR 67-G526
PCD_G0221_MF_81	95-GH02	PENDING SEAL BUFFER POT FOR 67-G527
PCD_G0221_MF_81	95-GH05	PENDING BUFFER POT COL 40 E INTERM RFLX 67-G567
PCD_G0221_MF_82	95-GH07	PENDING BUFFER POT COL 41 W REFLUX 67-G588
PCD_G0221_MF_82	95-GH09	PENDING BUFFER POT IB COL 41 E INTM RFLX 67-G594
PCD_G0221_MF_101	95-GH11	PENDING BUFFER POT IB COL 42 INTR RFLX 67-G618
PCD_G0221_MF_83	95-GH14	BUFFER POT COL39/40 W FEED 67-G560
PCD_G0221_MF_53	95-GJ03	COLUMN 45 DEOILER

G0222

MF #	Equipment Number	Description/Eq. Protected
PCD_G0222_MF_17	35-D601	HYDROGEN FILTER
PCD_G0222_MF_40	67-D091	EAST #6 VENT SCRUBBER PUMP
PCD_G0222_MF_40	67-D092	WEST #6 VENT SCRUBBER PUMP
PCD_G0222_MF_1	67-D611	PROPANE TRTR #2 2ND FROM E. FEED
PCD_G0222_MF_10	67-D614	C3 TREATER C3 BOOSTER PUMP
PCD_G0222_MF_10	67-D615	PROPANE TRTR E. REGENERATION CIRC
PCD_G0222_MF_10	67-D616	PROPANE TRTR W. REGENERATION CIRC
PCD_G0222_MF_36	67-D645	NON-CORROSIVE VENT SCRUBBER
PCD_G0222_MF_16	93-D701	95-DG38
PCD_G0222_MF_18	93-D704	41-D712(S)
PCD_G0222_MF_13	93-D705	41-D711A(S), 41-D711B(S)
PCD_G0222_MF_13	93-D706	41-D711C(S), 41-D711D(S)
PCD_G0222_MF_17	93-D707	35-D601, 95-DG18 Liquid, 95-DG18 Vapor
PCD_G0222_MF_9	93-D708	41-D717A(S), 41-D717B(S), 95-DG17
PCD_G0222_MF_9	93-D709	41-D717A(S), 41-D717B(S), 95-DG16
PCD_G0222_MF_9	93-D710	95-DG15
PCD_G0222_MF_9	93-D711	95-DG14
PCD_G0222_MF_10	93-D712	41-D718(S), 95-DG30
PCD_G0222_MF_11	93-D713	95-DG25
PCD_G0222_MF_11	93-D715	95-DG26
PCD_G0222_MF_12	93-D717	95-DG22
PCD_G0222_MF_12	93-D718	95-DG24
PCD_G0222_MF_12	93-D719	95-DG23
PCD_G0222_MF_11	93-D720	95-DG27
PCD_G0222_MF_9	93-D721	95-DG13
PCD_G0222_MF_9	93-D722	95-DG12
PCD_G0222_MF_9	93-D723	95-DG11
PCD_G0222_MF_9	93-D724	95-DG10
PCD_G0222_MF_18	93-D725	L001-30CSTL-HC1-4
PCD_G0222_MF_17	93-D726	95-DG19
PCD_G0222_MF_16	93-D727	95-DG37
PCD_G0222_MF_16	93-D728	41-D703A(S), 41-D703B(S), 95-DG36
PCD_G0222_MF_1	93-D802	95-DG41
PCD_G0222_MF_1	93-D804	95-DG43

MF #	Equipment Number	Description/Eq. Protected
PCD_G0222_MF_8	93-D805	95-DG44
PCD_G0222_MF_8	93-D806	95-DG09, 95-DG45, 95-DG64
PCD_G0222_MF_7	93-D807	95-DG46
PCD_G0222_MF_7	93-D808	95-DG47
PCD_G0222_MF_6	93-D809	95-DG48
PCD_G0222_MF_6	93-D810	95-DG49
PCD_G0222_MF_5	93-D811	95-DG50
PCD_G0222_MF_5	93-D812	95-DG51
PCD_G0222_MF_3	93-D813	95-DG59, 95-DG60, 95-DG61
PCD_G0222_MF_3	93-D814	95-DG56, 95-DG57, 95-DG58
PCD_G0222_MF_2	93-D815	95-DG52, 95-DG53, 95-DG55
PCD_G0222_MF_3	93-D816	95-DG56, 95-DG57, 95-DG58
PCD_G0222_MF_3	93-D817	95-DG59, 95-DG60, 95-DG61
PCD_G0222_MF_18	93-D819	35-DG35
PCD_G0222_MF_35	93-D821	95-DG31
PCD_G0222_MF_2	93-D822	95-DG52, 95-DG53, 95-DG55
PCD_G0222_MF_2	93-D823	95-DG52, 95-DG53, 95-DG55
PCD_G0222_MF_3	93-D825	95-DG59, 95-DG60, 95-DG61
PCD_G0222_MF_1	93-D831	95-DG42
PCD_G0222_MF_17	93-D833	67-D618, 67-D617
PCD_G0222_MF_8	93-D834	95-DG98
PCD_G0222_MF_40	95-DA28	#6 VENT SCRUBBER
PCD_G0222_MF_25	95-DG02	CAUSTIC DISPOSAL TANK
PCD_G0222_MF_36	95-DG03	OOS #3 CORROSIVE VENT SCRUBBER
PCD_G0222_MF_36	95-DG04	FLARE LINE SCRUBBER
PCD_G0222_MF_17	95-DG19	SOUR SCRUBBER
PCD_G0222_MF_17	95-DG34	AMINE SOLUTION SURGE TANK
PCD_G0222_MF_16	95-DG36	DEA TOWER ACCUMULATOR
PCD_G0222_MF_1	95-DG41	#1 PROPANE FEED DRUM EAST
PCD_G0222_MF_1	95-DG42	#2 PROPANE FEED DRUM (MID)
PCD_G0222_MF_9	95-DG62	SAND TOWER BLOWDOWN DEGAS DRUM
PCD_G0222_MF_1	95-DG81	SEAL BUFFER POT FOR 67-D611
PCD_G0222_MF_1	95-DG87	C3 Trtr feed pump 67-D610 buffer pot
PCD_G0222_MF_8	95-DG98	PENDING MEROX VENT GAS KO POT

G0223

MF #	Equipment Number	Description/Eq. Protected
PCD_G0223_MF_3	93-D104	95-DA02
PCD_G0223_MF_3	93-D105	95-DA03
PCD_G0223_MF_3	93-D106	95-DA04
PCD_G0223_MF_4	93-D109	95-DA10
PCD_G0223_MF_4	93-D110	95-DA09
PCD_G0223_MF_4	93-D111	95-DA08
PCD_G0223_MF_6	93-D114	41-D106(S), 41-D110A(S), 41-D110B(S), 41-D110C(S), 41-D110D(S), 41-D110E(S), 41-D110F(S), 41-D111A(S), 41-D111B(S), 41-D111C(S), 41-D111C(T), 41-D111D(S), 41-D112 (S), 95-DA21, 95-DA22, 95-DA25
PCD_G0223_MF_8	93-D118	41-D106(S), 41-D110A(S), 41-D110B(S), 41-D110C(S), 41-D110D(S), 41-D110E(S), 41-D110F(S), 41-D111A(S), 41-D111B(S), 41-D111C(S), 41-D111D(S), 41-D112 (S), 95-DA21, 95-DA22, 95-DA25
PCD_G0223_MF_8	95-DA14	OOS NORTH RSH MAKE TANK
PCD_G0223_MF_1	95-DA20	OOS NO. 1 FEED TANK
PCD_G0223_MF_7	95-DA21	#2 STILL TOWER ACCUMULATOR
PCD_G0223_MF_8	95-DA25	RSH MAKE TANK SOUTH

G0224

MF #	Equipment Number	Description/Eq. Protected
PCD_G0224_MF_20	93-D321	95-DD19
PCD_G0224_MF_19	93-D322	95-DD20
PCD_G0224_MF_19	93-D417	95-DD30
PCD_G0224_MF_20	93-D419	95-DD31
PCD_G0224_MF_1	93-DD21	95-DD21
PCD_G0224_MF_1	95-DD21	NGL WASTE WATER SURGE DRUM

G0225

MF #	Equipment Number	Description/Eq. Protected
PCD_G0225_MF_24	67-C405	COL 105 INTERNAL REFLUX
PCD_G0225_MF_22	67-C406	COL 105 REFLUX
PCD_G0225_MF_3	93-C105	95-CA11
PCD_G0225_MF_12	93-C110	41-C117(S) , 95-CA09
PCD_G0225_MF_12	93-C113	41-C121(S) , 95-CA10
PCD_G0225_MF_22	93-C216	95-CE08
PCD_G0225_MF_22	93-C217	95-CE03 , 95-CE07
PCD_G0225_MF_1	93-C362	41-C124(S)
PCD_G0225_MF_27	95-0R24	OOS LIGHT PLATFORMATE SURGE TANK
PCD_G0225_MF_29	95-0R47	SOUR WATER TANK 107
PCD_G0225_MF_22	95-CA26	BUFFER POT COL 105 INTERM RFLX 67-C405
PCD_G0225_MF_22	95-CA27	BUFFER POT COL 105 REFLUX 67-C406

Header 17 Ancillary Equipment – GOHDS Flare

G0004

MF #	Equipment Number	Description/Eq. Protected
PCD_G0004_MF_6	36-F507	NO. 16 REGENERATOR FURNACE
PCD_G0004_MF_7	67-F406	BUTAMER MOL SIEVE REGENERATION
PCD_G0004_MF_8	67-F407	BUTAMER CHARGE WEST
PCD_G0004_MF_8	67-F408	BUTAMER CHARGE EAST
PCD_G0004_MF_8	93-F412	95-FE09
PCD_G0004_MF_3	93-F415	36-F507, 41-F509 (T)
PCD_G0004_MF_3	93-F418	95-FE10
PCD_G0004_MF_3	93-F419	95-FE11
PCD_G0004_MF_7	93-F420	95-FE16
PCD_G0004_MF_7	93-F421	95-FE15
PCD_G0004_MF_1	93-F423	41-F514 (S), 95-FE14
PCD_G0004_MF_2	93-F502	41-F515A (T), 41-F515B (T)
PCD_G0004_MF_2	93-F503	95-FE17
PCD_G0004_MF_2	93-F504	95-FE18
PCD_G0004_MF_2	93-F505	95-FE19
PCD_G0004_MF_4	93-F506	95-FE20
PCD_G0004_MF_4	93-F507	95-FE21

G0005

MF #	Equipment Number	Description/Eq. Protected
PCD_G0005_MF_62	67-F106	PENTANE ISOM STABLIZER REFLUX SOUTH
PCD_G0005_MF_62	67-F107	PENTANE ISOM STABLIZER REFLUX NORTH
PCD_G0005_MF_62	67-F147	PENDING C5/C6 ISOM REGEN LIQUID PUMP
PCD_G0005_MF_62	67-F148	PENDING C5/C6 ISOM REGEN LIQ PMP SPARE
PCD_G0005_MF_14	93-F113	41-F218A(S), 41-F218B (S), 41-F219A (T), 41-F219A(S), 41-F219B (T), 41-F231, 95-FB02, 95-FB03
PCD_G0005_MF_2	93-F114	95-FB04
PCD_G0005_MF_1	93-F311	95-FB07
PCD_G0005_MF_1	93-F312	95-FB08
PCD_G0005_MF_1	93-F313	41-F221 (S), 95-FB09
PCD_G0005_MF_7	93-F536	41-F203B (T), 95-FB64
PCD_G0005_MF_46	93-F538	41-F204B (T), 41-F240 (T), 95-FB62
PCD_G0005_MF_46	93-F539	41-F204A (T), 95-FB63
PCD_G0005_MF_47	93-F541	95-FB65 , 95-FB68
PCD_G0005_MF_1	93-F542	36-F207-Pr
PCD_G0005_MF_22	93-F544	36-F207, 67-F147, 67-F148
PCD_G0005_MF_22	93-F545	95-FB11, 95-FB12
PCD_G0005_MF_1	95-FB07	FEED DRYER NORTH
PCD_G0005_MF_22	95-FB12	H2 DRYER SOUTH

G0221

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_101	41-G959	SEAL FLUSH COOLER FOR 67-G596
PCD_G0221_MF_101	41-G960	SEAL FLUSH COOLER FOR 67-G597
PCD_G0221_MF_6	67-G048	COLUMN 35 K/P PUMP
PCD_G0221_MF_6	67-G148	COLUMN 35 K/P PUMP
PCD_G0221_MF_72	67-G503	COLUMN 35 FEED WEST
PCD_G0221_MF_72	67-G504	OOS COLUMN 35 FEED EAST
PCD_G0221_MF_72	67-G505	COLUMN 35 REFLUX WEST
PCD_G0221_MF_72	67-G506	COLUMN 35 REFLUX EAST
PCD_G0221_MF_19	67-G526	COLUMN 38 INTERMEDIATE REFLUX SOUTH

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_19	67-G527	COLUMN 38 INTERMEDIATE REFLUX NORTH
PCD_G0221_MF_72	67-G528	COLUMN 37 REFLUX WEST
PCD_G0221_MF_72	67-G529	COLUMN 37 REFLUX EAST
PCD_G0221_MF_72	67-G530	COLUMN 38 REFLUX WEST
PCD_G0221_MF_72	67-G531	COLUMN 38 REFLUX EAST
PCD_G0221_MF_72	67-G534	COLUMN 38 FEED WEST
PCD_G0221_MF_72	67-G535	COLUMN 38 FEED EAST
PCD_G0221_MF_24	67-G561	COLUMN 39-40 FEED EAST
PCD_G0221_MF_72	67-G562	COLUMN 39 REFLUX
PCD_G0221_MF_34	67-G566	COLUMN 39-40 INTERMEDIATE REFLUX MID
PCD_G0221_MF_34	67-G567	COLUMN 40 INTERMEDIATE REFLUX EAST
PCD_G0221_MF_72	67-G568	COLUMN 40 REFLUX & OVHD PRODUCT WEST
PCD_G0221_MF_37	67-G569	COLUMN 40 REFLUX & OVHD PRODUCT EAST
PCD_G0221_MF_25	67-G570	PENDING COLUMN 39 INTERMEDIATE REFLUX
PCD_G0221_MF_25	67-G571	PENDING COLUMN 39 INTERMEDIATE REFLUX
PCD_G0221_MF_44	67-G586	COLUMN 41 REFLUX WEST
PCD_G0221_MF_44	67-G587	COLUMN 41 REFLUX MID
PCD_G0221_MF_44	67-G588	COLUMN 41 REFLUX EAST
PCD_G0221_MF_39	67-G591	COLUMN 41 FEED EAST
PCD_G0221_MF_41	67-G592	COLUMN 41 INTERMEDIATE REFLUX WEST
PCD_G0221_MF_41	67-G593	COLUMN 41 INTERMEDIATE REFLUX MID
PCD_G0221_MF_41	67-G594	COLUMN 41 INTERMEDIATE REFLUX EAST
PCD_G0221_MF_48	67-G596	COLUMN 42 INTERMEDIATE REFLUX SOUTH
PCD_G0221_MF_48	67-G597	COLUMN 42 INTERMEDIATE REFLUX NORTH
PCD_G0221_MF_10	67-G608	COL 36 EAST REFLUX PUMP
PCD_G0221_MF_10	67-G609	COL 36 WEST REFLUX PUMP
PCD_G0221_MF_7	67-G615	COL 36 EAST FEED PUMP
PCD_G0221_MF_72	67-G802	DEOILER REBOILER COLUMN 45 WEST
PCD_G0221_MF_72	67-G803	DEOILER REBOILER COLUMN 45 EAST
PCD_G0221_MF_72	67-GF03	COLUMN 38 EAST KETTLE

MF #	Equipment Number	Description/Eq. Protected
		PRODUCT PUMP
PCD_G0221_MF_72	67-GF04	COLUMN 38 WEST KETTLE PRODUCT PUMP
PCD_G0221_MF_1	93-G519	95-GF22
PCD_G0221_MF_5	93-G521	95-GF23, 95-GF92
PCD_G0221_MF_10	93-G523	95-GF24, 95-GF81
PCD_G0221_MF_7	93-G524	95-GF25, 95-GF82
PCD_G0221_MF_15	93-G601	95-GF26
PCD_G0221_MF_22	93-G602	95-GF27
PCD_G0221_MF_16	93-G604	95-GF28, 95-GF93
PCD_G0221_MF_24	93-G623	95-GF29
PCD_G0221_MF_30	93-G625	95-GF30
PCD_G0221_MF_37	93-G702	95-GF31
PCD_G0221_MF_39	93-G704	95-GF33
PCD_G0221_MF_43	93-G705	95-GF11, 95-GF12, 95-GF32
PCD_G0221_MF_50	93-G717	95-GF14, 95-GF34, 95-GF52
PCD_G0221_MF_25	93-G718	41-G868 (T), 41-G962 B side
PCD_G0221_MF_1	93-G762	41-G165 (S), 41-G705A(S), 41-G705A(T), 41-G705B(S), 41-G705B(T)
PCD_G0221_MF_17	93-G765	41-G167A (S)
PCD_G0221_MF_25	93-G767	41-G868 (S), 41-G962 A side
PCD_G0221_MF_57	93-G903	95-GJ02, 95-GJ03
PCD_G0221_MF_51	93-G915	41-G168(S)
PCD_G0221_MF_6	93-G920	41-G705A(S), 41-G705A(T), 41-G705B(S), 41-G705B(T), 41-G707
PCD_G0221_MF_51	93-G921	41-G746 (S)
PCD_G0221_MF_26	95-GF07	COLUMN 39-A PENTANE SPLITTER
PCD_G0221_MF_41	95-GF12	COLUMMN 41-B DEISOBUTANIZER
PCD_G0221_MF_43	95-GF32	COLUMN 41 ACCUMULATOR
PCD_G0221_MF_101	95-GF79	PENDING BUFFER POT FOR 67-G596
PCD_G0221_MF_80	95-GF83	67-G615 SEAL BUFFER POT
PCD_G0221_MF_80	95-GF84	67-G616 SEAL BUFFER POT
PCD_G0221_MF_80	95-GF85	67-G608 OB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF86	67-G608 IB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF87	67-G609 OB SEAL BUFFER POT
PCD_G0221_MF_80	95-GF88	67-G609 IB SEAL BUFFER POT
PCD_G0221_MF_81	95-GH01	PENDING SEAL BUFFER POT FOR 67-G526

MF #	Equipment Number	Description/Eq. Protected
PCD_G0221_MF_81	95-GH02	PENDING SEAL BUFFER POT FOR 67-G527
PCD_G0221_MF_81	95-GH05	PENDING BUFFER POT COL 40 E INTERM RFLX 67-G567
PCD_G0221_MF_82	95-GH09	PENDING BUFFER POT IB COL 41 E INTM RFLX 67-G594
PCD_G0221_MF_101	95-GH11	PENDING BUFFER POT IB COL 42 INTR RFLX 67-G618
PCD_G0221_MF_83	95-GH14	BUFFER POT COL39/40 W FEED 67-G560
PCD_G0221_MF_82	95-GH17	PENDING BUFFER POT COL 41 E FEED 67-G591

Header 18 Ancillary Equipment – West Flare

G0052

MF #	Equipment Number	Description/Eq. Protected
PCD_G0052_MF_13	95-TK572	SLOP OIL
PCD_G0052_MF_14	95-TK573	SLOP OIL

Header 19 Ancillary Equipment – GOHDS Flare

G0041

MF #	Equipment Number	Description/Eq. Protected
PCD_G0041_MF_168	93-M835	95-KC105
PCD_G0041_MF_169	93-M836	41-K379 (S), 95-KC104
PCD_G0041_MF_167	93-M837	41-K377 (S), 41-K378 (T)
PCD_G0041_MF_169	93-M841	41-K379 (T)
PCD_G0041_MF_169	95-KC104	METHANATOR KO DRUM

APPENDIX F GLOSSARY OF TERMS

Ancillary Equipment (per Subpart Ja): Equipment used in conjunction with or that serve a refinery process unit. Ancillary equipment includes, but is not limited to, storage tanks, product loading operations, wastewater treatment systems, steam- or electricity-producing units (including coke gasification units), pressure relief valves, pumps, sampling vents and continuous analyzer vents.

Cascaded Flare System (per Subpart Ja): A series of flares connected to one flare gas header system arranged with increasing pressure set points so that discharges will be initially directed to the first flare in the series (i.e., the primary flare). If the discharge pressure exceeds a set point at which the flow to the primary flare would exceed the primary flare's capacity, flow will be diverted to the second flare in the series. Similarly, flow would be diverted to a third (or fourth) flare if the pressure in the flare gas header system exceeds a threshold where the flow to the first two (or three) flares would exceed their capacities.

Emergency Flare (per Subpart Ja): A flare that combusts gas exclusively released as a result of malfunctions (and not startup, shutdown, routine operations or any other cause) on four or fewer occasions in a rolling 365-day period. For purposes of this rule, a flare cannot be categorized as an emergency flare unless it maintains a water seal.

Emergency Gas: Gas, typically nitrogen, introduced after a flaring event to prevent blowback into the riser.

EPA: The United States Environmental Protection Agency

Flare (per Subpart Ja): A combustion device that uses an uncontrolled volume of air to burn gases. The flare includes the foundation, flare tip, structural support, burner, igniter, flare controls, including air injection or steam injection systems, flame arrestors and the flare gas header system. In the case of an interconnected flare gas header system, the flare includes each individual flare serviced by the interconnected flare gas header system and the interconnected flare gas header system.

Flare Gas Header System (per Subpart Ja): All piping and knockout pots, including those in a subheader system, used to collect and transport gas to a flare either from a process unit or a pressure relief valve from the fuel gas system, regardless of whether or not a flare gas recovery system draws gas from the flare gas header system. The flare gas header system includes piping inside the battery limit of a process unit if the purpose of the piping is to transport gas to a flare or knockout pot that is part of the flare.

Flare Gas Recovery System (per Subpart Ja): A system of one or more compressors, piping and the associated water seal, rupture disk or similar device used to divert gas from the flare and direct the gas to the fuel gas system or to a fuel gas combustion device.

Fuel Gas (per Subpart Ja): Any gas which is generated at a petroleum refinery and which is combusted. Fuel gas includes natural gas when the natural gas is combined and combusted in any proportion with a gas generated at a refinery. Fuel gas does not include gases generated by catalytic cracking unit catalyst regenerators, coke calciners (used to make premium grade coke) and fluid coking burners, but does include gases from flexicoking unit gasifiers and other gasifiers. Fuel gas does not include vapors that are collected and combusted in a thermal oxidizer or flare installed to control emissions from wastewater treatment units other than those processing sour water, marine tank vessel loading operations or asphalt processing units (i.e., asphalt blowing stills).

Fuel Gas Combustion Device (per Subpart Ja): Any equipment, such as process heaters and boilers, used to combust fuel gas. For the purposes of this subpart, fuel gas combustion device does not include flares or facilities in which gases are combusted to produce sulfur or sulfuric acid.

Fuel Gas System (per Subpart Ja): A system of compressors, piping, knock-out pots, mix drums, and units used to remove sulfur contaminants from the fuel gas (e.g., amine scrubbers) that collects refinery fuel gas from one or more sources for treatment as necessary prior to combusting in process heaters or boilers. A fuel gas system may have an overpressure vent to a flare but the primary purpose for a fuel gas system is to provide fuel to the refinery.

lb/hr: Pounds per hour.

MSCFD: Thousands of standard cubic feet per day.

MMSCFD: Millions of standard cubic feet per day.

Non-Emergency Flare (per Subpart Ja): Any flare that is not an emergency flare as defined in this subpart.

Petroleum Refinery (per Subpart Ja): Any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, asphalt (bitumen) or other products through distillation of petroleum or through redistillation, cracking or reforming of unfinished petroleum derivatives. A facility that produces only oil shale or tar sands-derived crude oil for further processing at a petroleum refinery using only solvent extraction and/or distillation to recover diluent is not a petroleum refinery.

Primary Flare (per Subpart Ja): The first flare in a cascaded flare system.

Process Upset Gas (per Subpart Ja): Any gas generated by a petroleum refinery process unit or by ancillary equipment as a result of startup, shutdown, upset or malfunction.

Purge Gas (per Subpart Ja): Gas introduced between a flare's water seal and a flare's tip to prevent oxygen infiltration (backflow) into the flare tip. For flares with no water seals, the function of purge gas is performed by sweep gas (i.e., flares without water seals do not use purge gas).

Reduced Sulfur Compounds (per Subpart Ja): Hydrogen sulfide (H_2S), carbonyl sulfide, and carbon disulfide.

Refinery Process Unit (per Subpart Ja): Any segment of the petroleum refinery in which a specific processing operation is conducted.

Root Cause Analysis (per Subpart Ja): An assessment conducted through a process of investigation to determine the primary cause, and any other contributing cause(s), of a discharge of gases in excess of specified thresholds.

Secondary Flare (per Subpart Ja): A flare in a cascaded flare system that provides additional flare capacity and pressure relief to a flare gas system when the flare gas flow exceeds the capacity of the primary flare. For purposes of this subpart, a secondary flare is characterized by infrequent use and must maintain a water seal.

Sweep Gas (per Subpart Ja): The gas introduced in a flare gas header system to maintain a constant flow of gas to prevent oxygen buildup in the flare header. For flares with no water seals, sweep gas also performs the function of preventing oxygen infiltration (backflow) into the flare tip.

NSPS Ja Flare
Continuous Emission Monitoring System
40 CFR 60
Quality Assurance Plan

Phillips 66
Borger Refinery
Spur 119 North
Borger, Texas 79008

October 2015
Revision 1

CONTENTS

1.0 INTRODUCTION

In accordance with the Federal Code of Regulations 40 CFR, Part 60, Appendix F requirements, the Borger Refinery has developed this Quality Assurance/Quality Control (QA/QC) Plan regarding the operation and maintenance of the continuous emissions monitoring system (CEMS).

This document describes the quality assurance program for the CEMS. The written quality control procedures for the CEMS contained in this document are based on the Federal Code of Regulations 40 CFR, Part 60, Appendix F, Procedure 1: "Quality Assurance Requirement for Gaseous Continuous Emission Monitoring Systems (CEM) Used for Compliance Determination", known hereafter in this document as "Appendix F". Quality Assurance (QA) and Quality Control (QC) procedures outlined in this document are site-specific for the Borger Refinery NSPS Ja Flares. These are the GOHDS Flare, Cat Flare, East Refinery Flare, and West Refinery Flare.

The following procedure reflects site specific assessment and control of the CEMS. These forms are to be used by the site operation and maintenance personnel to assess and control the quality of all the CEMS data and indicate when the quality is inadequate and corrective action must take place.

1.1 Regulatory Requirements

The CEMS used are subject to NSPS Ja. This regulation requires a CEMS QA/QC procedure as defined by 40 CFR, Part 60, Appendix F.

Under the criteria of 40 CFR, Part 60, Appendix F, the owner or operator of an affected unit must operate, calibrate, and maintain the CEMS according to the QA/QC procedures outlined in Appendix F. It specifies that the facility must develop and implement a quality control program for the CEMS and its components. At a minimum, the plan must describe step-by-step procedures and operations for each of the following activities:

Quality Control Requirements

- Calibration of CEMS
- Calibration drift (CD) determination and adjustment of CEMS
- Preventive maintenance of CEMS (including a spare parts inventory)
- Data recording, calculations, and reporting
- Accuracy audit procedures including sampling and analysis methods
- Program of corrective action for malfunctioning CEMS

CD Assessment (Quality Assurance)

- Daily Assessments
- Quarterly Assessments
- Annual Assessments

Recordkeeping provisions for QA/QC activities under Appendix F are contained in 40 CFR §60.7(d). The facility permit also includes recordkeeping requirements. These provisions require the owner or operator to record the applicable information for each certified analyzer or certified monitoring system measuring and recording emissions. All records must be maintained for 5 years. Records must be kept for the following areas:

- Daily Calibration Drift
- Quarterly Cylinder Gas Audits
- Annual Relative Accuracy Tests

1.2 Objective of the Quality Assurance/Quality Control Plan

Phillips recognizes that the reliability and acceptability of emission monitoring data depends upon the rigorous completion of all activities stipulated in a well-defined QA/QC Plan. The objective of this QA/QC plan is to delineate the activities necessary to ensure that emission monitoring data is complete, representative, and of known precision and accuracy. The QA/QC plan also provides the framework for implementing quality assurance and quality control activities by addressing items such as responsible individuals, data integrity, documentation, training programs, and corrective actions.

1.3 Definition of Quality Assurance and Quality Control

Quality assurance and quality control have been defined and used in many ways. For the purposes of this document, Quality Control (QC) will be defined as: "The system of activities to provide a quality product". Quality Assurance (QA) will be defined as: "The system of activities to provide assurance that the quality control system is adequate".

Quality control will characterize the facility's internal activities (i.e., daily calibrations, preventive maintenance, and routine status checks). Quality assurance will characterize external activities conducted by a third party contractor, corporate personnel, or regulatory or agency personnel (i.e., quarterly audits, inspections and regulatory overview). The QA/QC plan will include both quality control and quality assurance activities.

1.4 Scope of the Quality Assurance/Quality Control Plan

This QA/QC Plan covers the operation and maintenance of the CEMS installed on NSPS Ja Flares.

1.5 Document Control

This document has been set up in a revision control format to aid with future additions, deletions, and modifications to the QA/QC Plan. Revisions will be necessary in the event of instrument type changes, preventive maintenance schedule changes, reporting updates, and modification of audit procedures.

1.6 Organization and Responsibilities

General oversight of the quality assurance program will be the responsibility of Environmental. They will:

- Receive calibration data on the CEMS;
- Be notified of CEMS and process malfunctions;
- Be notified of potential and/or actual non-compliance with emissions or monitoring standards as well as excessive CEMS drift and inaccuracy;
- Receive and review quality assurance checks, audits, and corrective action data; and
- Prepare required regulatory test notifications and report submissions.

Environmental will consult on quality assurance issues with the production teams who will also provide guidance in the implementation of the quality assurance program. They will keep abreast of unit compliance status, CEMS data quality and availability, safety problems, operations problems, maintenance problems, and the status of general quality assurance program activities. In the event of a CEMS malfunction, Operations will request a Technician to address the required task to ensure prompt repairs.

Environmental will compile reports required by State and Federal agencies and will submit reports at the specified intervals. Environmental will interface with agency personnel, and will respond to inquiries from agency personnel concerning emissions monitoring and compliance.

Technicians will conduct or oversee the performance of all quality assurance program maintenance and inspection activities. Specifically, they will evaluate the daily automatic calibration error or drift data, and conduct daily status checks and will also conduct periodic checks, routine maintenance and corrective actions, and quarterly audits. These personnel will consult with Environmental routinely to identify and resolve possible CEMS malfunctions.

Operations personnel will provide notifications to Environmental of CEMS alarms, potential non-compliance, missing or erroneous data, and process problems. The Environmental will provide guidance to the Technician in the performance of quality assurance program activities and in ensuring compliance with emissions and monitoring requirements. Environmental will maintain files of quality assurance program data, the quarterly CGA audit results, the yearly RATA results, and quality assurance summary reports.

A Technician will monitor CEMS fault warning systems and alarms indicated in the Unit 29 Computer Room.

Environmental, Technician, and a member of the Operating Team will meet to discuss the quality assurance program performance and to discuss potential revisions to the program.

- Ensure continued compliance with State and Federal regulations;
- Update the quality assurance program to reflect current equipment, personnel, regulations and procedures;
- Evaluate the frequencies of preventive maintenance activities and determine whether individual procedures should be conducted more or less frequently; and
- Determine whether specific preventive maintenance activities are necessary and sufficient for the current scope of the quality assurance program. This annual review will ensure that the quality assurance program is responsive to the current needs and requirements, while minimizing extraneous activities and resource requirements.

2.0 NSPS JA FLARES

The applicable Borger Refinery NSPS Ja Flares are:

1. East Refinery Flare
2. West Refinery Flare
3. Cat Flare
4. GOHDS Flare (24" and 36" Flare Headers)

These flares are tied to a Flare Gas Recovery (FGR) system that recovers gas and sends it back to process units. During a period of process upset more gas may be relieved than sent to the FGR.

Emissions are calculated based upon a flare flow rate and the TRS (total reduced sulfur) content of the stream.

3.0 CEMS Description

The continuous emission monitoring system is a dedicated, extractive CEM system, which transports sample gas from the sample probes via heated lines and a sample conditioning system to the analyzer for continuous monitoring. Effluent concentrations of H2S, TRS, and BTU are measured by a flare CEMS.

The gas sample is routed from the probe, which consists of a stainless steel sample pipe and filter, through a heated sample line to the sample conditioning enclosure. The sample conditioning enclosure removes water and particulate matter from the gas sample. This sampling system incorporates a probe, heated sample line, and a sample conditioning panel.

The Maxum II Syscon 2 cabinet is used to gather the signals from analyzers. The signals are recorded on a Yokogawa DX2000 (paperless recorder) and serve as the backup for the plant data historian. The cabinet controls the calibration that is done daily on each pollutant. It controls routine sampling, calibration, and blowback operations. Calibration drift checks can be performed manually in addition to automatic calibration.

The calibration records are sent by email to Environmental. Calibration is also available on PHD. A record includes the date, time, component, zero value, zero gas, span value, and span gas. Calibration records are reviewed by plant personnel on normal work days on a routine basis as a spot check to insure that zero, span, and calibration is being done correctly.

Tables 3-1 through Table 3-5 provide the specifics for the CEMS on each flare:

Table 3 -1
East Refinery CEMS Analyzers

Parameter	Analyzer or Component	Analytical Technique	Instrument Range	Serial Number
TRS	Maxum II	GC	0 – 460,000 ppm	001060
H2S	Maxum II	GC	0 – 300 ppm	001410
BTU	Cosa 9610	Wobbe-index	NA	

Table 3 -2
West Refinery CEMS Analyzers

Parameter	Analyzer or Component	Analytical Technique	Instrument Range	Serial Number
TRS	Maxum II	GC	0 – 460,000 ppm	001510
H2S	Maxum II	GC	0 – 300 ppm	001610
BTU	Maxum II	GC	NA	001710

Table 3 -3
Cat Flare CEMS Analyzers

Parameter	Analyzer or Component	Analytical Technique	Instrument Range	Serial Number
TRS	Maxum II	GC	0 – 460,000 ppm	001810
H2S	Maxum II	GC	0 – 300 ppm	001910
BTU	Cosa 9610	Wobbe-index	NA	2080

Table 3 -4
GOHDS 24" Flare Header CEMS Analyzers

Parameter	Analyzer or Component	Analytical Technique	Instrument Range	Serial Number
TRS	Maxum II	GC	0 – 460,000 ppm	002010
H2S	Maxum II	GC	0 – 300 ppm	002110
BTU	Cosa 9610	Wobbe-index	NA	2078

Table 3 -5
GOHDS 36" Flare Header CEMS Analyzers

Parameter	Analyzer or Component	Analytical Technique	Instrument Range	Serial Number
TRS	Maxum II	GC	0 – 460,000 ppm	002210
H2S	Maxum II	GC	0 – 300 ppm	002310
BTU	Cosa 9610	Wobbe-index	NA	2081

The following functions are fulfilled by each Maxum II Syscon 2 cabinet:

- Automatically controls the extraction of a gaseous sample for analysis
- Performs zero and span calibration drift checks of the analyzer
- Shows system status and gas concentration levels
- Enunciates the status of alarms and warnings
- Displays values in concentration, analyzer status
- Displays and alarms and warnings

The following functions are done by the Plant Historian (PHD):

- CEMS data is stored (typically a one-minute interval)
- Data confidence is available to define the quality of the data

The following functions are done by the Analyzer Technician:

- Performs quarterly cylinder gas audits of the CEMS
- Reviews the data from the daily calibration
- Maintains the analyzer installation and repairs it as needed
- Reviews the data for out of control periods (OOC) and notifies the Environmental Contact

The following functions are performed by Environmental:

- Prints historical data on demand
- Drafts periodic reports
- Provides facilities for system file maintenance and data file backup
- Generates semiannual reports
- Makes applicable notifications for OOC periods and CGA failures

Table 3-6
Operating Parameters, Permit Standards, and Equation Usage

Standard	Reference
The maximum SO_2 concentration shall be less than 162 ppm_v	NSPS Ja – New Source
Complete an RCFA when SO2 >500 lbs. per rolling day	NSPS Ja – New Source

4.0 QUALITY CONTROL ACTIVITIES

Quality Control (QC) activities are defined as internal activities conducted by Borger personnel. The principal QC activities for the CEMS are required by 40 CFR, Part 60, Appendix F.

1. The zero, span, and calibration records are normally reviewed on normal work days (excluding weekends and holidays). Zero, span, and calibration are automatically done daily but the records are not manually reviewed on weekends and holidays.

2. CEMS Daily Inspections and Preventative maintenance (daily, weekly, annually).

3. CEMS Logbook entries

The preventative maintenance procedures are discussed in detail in Section 6 of this document.

4.1 Daily Calibration Assessment Procedures

The daily calibration assessment and sequencing (checks) of the calibration gases is controlled by a Maxum II Syscon 2 cabinet. The calibration gases travel down the tubing to the probe assembly and travel down through the entire sample conditioning system. The calibration drift checks are conducted daily. In the event of a calibration drift failure, the Instrument Technician can initiate the "Auto Cal" sequence to recalibrate the system.

The calibration gas cylinders (zero and span) are connected by tubing to bulkhead fittings at the bottom of each calibration gas solenoid valve. The calibration gases are then drawn down the sample tube into the sample pump. The sample pump then feeds the calibration gas into the sample conditioning system and out to the analyzer through a rotometer.

As a requirement of 40 CFR, Part 60, Appendix F and § 60.13(d) all gaseous CEM systems are required to conduct a daily calibration drift check at two points within their operating range. The two calibration points are defined as a low-level value, typically 0-20% of the span and a high-level value, typically 80-100% of the span. An analyzer will follow the Quality Assurance requirements under 40 CFR, Part 60, Appendix F, and will be calibrated at two points within its operating range.

The initial performance specification calibration drift limits specified in 40 CFR, Part 60, Appendix B, Performance Specification 2, 3, and 4 set the criteria for all daily calibration drift checks. The daily calibration drift limits after the initial certification are twice the applicable performance specification limits. Refer to section 5.0 of this document for more specifics and definitions of "Out-Of-Control" (OOC) periods. For additional information on "Out-Of-Control" (OOC) periods consult 40 CFR, Part 60, Appendix F.

4.2 Calibration Gases

Gases utilized for the quarterly cylinder audits are all prepared as certified EPA Protocol 1 standards. The gas bottles have tags that indicate the components and expiration dates.

Gases used for daily calibration need to be high quality but do not need to be certified EPA Protocol 1 standards.

4.3 Daily CEMS Inspection

As part of the QA/QC Plan, plant personnel will conduct a CEMS inspection on normal workdays, excluding weekends and holidays.

1. An Analyzer Technician will review and assess the Calibration Drift (CD) data. The analyzer automatically zero, spans, and calibrates daily.

2. The technician will make a CEMS logbook entry when corrective action, routine adjustments, operational status of the CEMS, and preventative maintenance is performed.

4.4 Weekly CEMS Inspections and Preventative Maintenance

Prior to a weekend or holiday the following inspection and maintenance are completed:

1. An Analyzer Technician will review the pressure of the calibration gas bottles.

2. If a bottle needs replacement it should be replaced prior to the weekend or holiday.

3. Assigned personnel will complete all required paper work and record his activities in the CEMS logbook.

4. The daily calibration sheets should be sent to the Environmental Contact.

4.5 Annual CEMS Inspections and Preventative Maintenance

Annual routine analyzer and stack mounted equipment inspections will be conducted along with preventative maintenance activities.

4.6 CEMS Logbook

A logbook must be maintained that is to be made available for inspection by TCEQ personnel. The logbook, or log, is mentioned frequently in this document, since it is not only a requirement, but a very good preventative maintenance tool. The information that is to be entered into the logbook is addressed in this document. For clarification purposes, the following is a list of items which should be recorded in the logbook.

- Date and Time
- Routine maintenance performed (include starting and ending date and time)
- Manual calibration routines (include starting and ending date and time)
- Routine sample flow and pressure adjustments
- System status (alarms and warnings)
- Repairs made on individual components, analyzer, and CEMS peripherals (include starting and ending date and time)
- Calibration gas cylinder change-outs (include starting and ending date and time)
- Analyzer out-of-control periods (include starting and ending date and time)
- Date and quarterly cylinder gas audits

5.0 QUALITY ASSURANCE ACTIVITIES

Quality Assurance (QA) activities are mostly conducted by external contractors and begin with the completion of the initial certification program. The requirements for initial certification are described in this section in the event recertification is required. Recertification is triggered by the replacement of an analytical method, including the analyzer; change in the location or orientation of the sampling probe or site; rebuilding of an analyzer or all monitoring system equipment; replacement of an existing CEMS; and if a CEMS is idle for more than two calendar years the owner/operator may be required to recertify the CEMS.

The initial and recertification program is comprised of two test components: a seven day calibration drift test and a relative accuracy test audit (RATA). Annual RATAs, after the initial certification program, do not require the seven-day drift test.

There are three methods for conducting quarterly audits on CEMS; Relative Accuracy Test Audit (RATA), Cylinder Gas Audit (CGA), and Relative Accuracy Audit (RAA).

A CGA may be conducted in three of four calendar quarters, but in no more than three quarters in succession. A CGA is performed following the procedures set forth in 40 CFR, Part 60, Appendix F and section 5.2 of this document. Prior to conducting a quarterly CGA, the following steps should be taken to ensure that the results obtained will represent the actual system performance and that sampling system integrity is intact:

- Determine that the procedures listed under the preventative maintenance section of this document have been completed.
- Review the performance of the system since the last audit and conduct any indicated preventative maintenance routines.
- Determine that the CEMS has successfully passed the daily calibration error check.

During a CGA, each monitor is challenged with audit gases at predetermined concentrations and at two points within its range shown Table 3.1 through Table 3.5.

Quality Assurance (QA) activities involve periodic external auditing of the CEMS, after the initial certification program. Table 5-1 summarizes the QA activities for the analyzer and the required frequency. The following sections describe each audit type in detail.

Table 5-1
Flare CEMS
QA Activity Summary

Analyzer Type	Audit Type/CFR Reference	Frequency/Reference
TRS & H2S	Calibration Drift (CD), 40 CFR 60, §60.13(d) (1) and Appendix F, section 4.0.	Daily, Reference section 5.1 of this document.
TRS & H2S	Cylinder Gas Audit (CGA), 40 CFR 60, Appendix F, section 5.0.	Quarterly (Based on calendar quarters), Reference section 5.2 of this document.
TRS & H2S	Relative Accuracy Test Audit (RATA), 40 CFR 60, Appendix F, section 5.0.	Annual (Typically based on date of initial certification testing)

Abbreviations:
CD = Calibration Drift
CFR = Code of Federal Regulations
CGA = Cylinder Gas Audit
RATA = Relative Accuracy Test Audit

5.1 Daily Assessments

5.1 Calibration Drift Assessments

The analyzer's calibration response and logs the of daily calibration drift checks results are recorded on the computer printout. The printout is in the 29 Computer Room.

The daily calibration drift (CD) limit after initial certification as specified in 40 CFR, Part 60, Appendix F, section 4.3.1. The applicable drift limits are twice the performance specification limit for an individual pollutant: The applicable drift limits are listed Table 5-2:

Table 5-2
Drift Limits

Pollutant	Limits	Applicable Drift Limits
TRS	(2)(Performance Spec. 5)	± 6%
H2S	(2)(Performance Spec. 7)	± 30 ppm
BTU	NA	NA

The analyzer is required to be recalibrated if this limit is exceeded.

The rule also discusses a condition when the "Applicable Drift Limit" is exceeded for five consecutive days. The instrument is deemed "Out-Of-Control" (OOC). Having a period of OOC is unlikely because the analyzers are configured to automatically calibrate each day. However; should the auto-calibrate be disabled or if the cal gas bottle is empty during calibration, there may be a possibility to have an "Out-Of-Control" period. The OOC period begins at the completion of the fifth consecutive calibration and ends at the time corresponding to completion of a valid calibration check after completion of corrective action. The instrument is also deemed OOC if the drift exceeds four times the Performance Specification limit. The out of control period begins with the hour of the failed calibration drift test and ends with the hour of completion following an effective recalibration. In the event there are any logged episodes of excess pollutant emissions, personnel should immediately perform a calibration drift check to discount the analyzer as the probable cause. When a CEM system passes a daily assessment (i.e., daily calibration drift test), data from the CEM system is prospectively validated.

5.2 Data Invalidation with Respect to Daily Assessments, Daily Calibration Cycles, and Calibration Standards

The following rules apply to the invalidation of data with respect to daily assessments:

1. During the period the CEMS is out of control, the CEMS data is considered invalid and may not be used in calculating emission compliance nor be counted toward meeting the minimum data availability as required.

2. Emissions data obtained during an out of control period may not be included or used in the calculation of reported emission data for the quarterly reporting period.

3. If during any hourly averaging period, the time required to complete the calibration cycle exceeds fifteen minutes, then that hourly period shall be included in the downtime calculation for that parameter.

4. Only one calibration period of less then fifteen minutes may be excluded from the downtime requirement for any 24 hour period.

5. The quality of the daily calibration gas is considered an integral part of the CEMS. Therefore the quality of the calibration gases utilized for the daily CEMS calibration drift checks during the certification (PST) test program shall be the minimum quality acceptable until the next annual RATA.

5.2 Quarterly Assessments

The following quarterly assessments are required, as defined in 40 CFR, Part 60, Appendix F.

5.2.1 Cylinder Gas Audits

Cylinder Gas Audits (CGA) will be performed in each calendar quarter. Successive CGA's will be two months apart (60 days) at a minimum. A CGA is not required during the calendar quarter in which the annual RATA is performed. CGA testing may be conducted in three of the four calendar quarters, but in no more then three quarters in succession.

The CGA utilizes two audit points only, which are specified in 40 CFR, Part 60, Appendix F. The average of each analyzer response is used to determine the analyzer's CGA result. All test gases will be prepared according to EPA Protocol 1 standards. The gases must be routed up through the entire sampling system (introduced at the probe) for the tests to be valid. Cylinder Gas Audits shall not commence if the CEM system is operating "Out-of-Control" with respect to any of the daily or annual quality assurance assessments required by 40 CFR, Part 60, Appendix F, sections 4.0 and 5.0. Once a CGA has begun there shall be no adjustment of the CEM system during the test.

Table 5- 3
Flare Cylinder Gas Audit – Gas Concentration Tolerances

		Analyzer Range			CGA Audit Gas Tolerances			
CEMS	Component	Zero	Span	Units	20% Min	30% Max	50% Min	60% Max
Flare	TRS	0	460,000	ppm	92000	138,000	230,000	276,000
Flare	H2S	0	300	ppm	60	90	150	180
Flare	BTU	NA	NA	NA	NA	NA	NA	NA

5.2.1.1 Cylinder Gas Audit Procedure

To conduct a CGA of the analyzer, challenge the CEM system with EPA Protocol 1 standards at two points in a range of 20 to 30% of span and 50 to 60% of span. Challenge the analyzer three times at each audit point alternating between the two points. The analyzer should be challenged at each audit point for a sufficient period of time to assure adsorption-desorption of the CEMS sample conditioning and transport systems. The time should be sufficient to allow complete stabilization of the system prior to recording the analyzer results. Average the three responses to determine the accuracy. The difference between the certified concentration and the average of the analyzer response is used to calculate the accuracy of the analyzer as follows:

CGA Accuracy will be calculated as follows:

- $$A = \frac{C_m - C_a}{C_a} x100$$

Where: *A = Accuracy of the CEMS in %*

C_m = Average CEMS response in ppm

C_a = Reference gas value in ppm

5.2.2 Data Validation for Cylinder Gas Audits

An out-of-control (OOC) period occurs when a CGA has failed (i.e., when the error exceeds or deviates from the reference value by more than ±15% or ±5 ppm, whichever is less restrictive) or when a CGA is aborted due to a problem with the analyzer or CEM system. The out-of-control period begins with the hour of the failed or aborted CGA check and ends with the hour of completion of a satisfactory CGA check following corrective action and/or monitor repair. A CEM system shall not be considered out-of-control when a CGA is aborted for a reason unrelated to the CEMS performance. Successive quarterly CGA's shall occur no closer then 2

months or 60 days apart. Note that CGA attempts which are aborted or invalidated due to problems with the reference calibration gases or due to operational problems with the affected unit need not be reported. Such partial tests do not affect the validation status of emission data recorded by the CEM system. A record of all CGA attempts (whether reported or not) must be kept on-site as part of the official test log for each monitoring system.

5.3 Annual Assessments

After initial certification, the required frequency of RATAs is typically determined based on the date of initial certification testing. See Table 5-1 of this document for RATA frequency determination. The following sections discuss the requirements of 40 CFR, Part 60, Appendix B.

5.3.1 Seven-Day Calibration Drift Tests

The seven-day calibration drift tests are required to be performed during the initial certification and/or re-certification tests. The initial certification test procedures are defined in 40 CFR, Part 60, Appendix B.

A calibration drift tests is over a period of 8 days. No adjustments to the instruments will be made during each of the 8 days except for recalibration of the analyzer after each day's calibration drift check. At the beginning of the calibration drift test (day zero), the analyzer will be calibrated to the zero and span gas reference points. After a 24-hour period has elapsed, the zero and span gas reference points will be checked (day 1). The resulting readings will be recorded on the computer printout and the calibration drift determined.

The calibration drift test procedure will be repeated every 24 hours for seven days. If the limits are exceeded for any of the days, the seven-day drift test is invalid and must be repeated from day zero.

Determination of the calibration drift for the analyzer must be done once each day for 7 consecutive operating days according to the following procedures. The calibration drift test procedures in this section and in 40 CFR, Part 60, Appendix B, Performance Specification 2 (section 6.0) and 8 shall also be used to perform the daily assessments. Do not make manual or automatic calibration adjustments to the analyzer until after taking measurements at both zero and span concentration levels for that day during the 7-day test. Record and report test results for each day using the unadjusted concentration measured in the calibration drift test prior to making any manual or automatic adjustments (i.e., resetting the calibration). The calibration drift tests should be approximately 24 hours apart. Perform calibration drift tests at both the zero-level concentration and high-level concentration. Use only calibration gas, as specified in section 4.2 of this document. Operate the CEMS in its normal Automatic Calibration mode allowing the calibration gas to pass through all filters, scrubbers, conditioners, and other monitor components used during normal sampling and through as much of the sampling probe as is practical. Challenge the analyzer once with each calibration gas standard. Record the analyzer response from the data acquisition and handling system (DAHS). The results of a 7-day calibration drift test are acceptable for each analyzer or monitoring system certification, recertification or diagnostic testing if none of these daily calibration error test results exceed the applicable performance specifications in 40 CFR, Part 60, Appendix B, Performance

Specifications 3 and 4. The status of emission data from a gas monitor prior to and during a 7-day calibration drift test period shall be determined as follows:

For initial certification and recertification testing, data from the analyzer(s) are considered invalid until all certification tests, including the 7-day calibration drift test, have been successfully completed.

Calibration Drift (CD) is calculated for the analyzer using the following equation.

- $$CD = \frac{|A - R|}{S} x\ 100$$

Where: *CD = Calibration drift, %*

A = Concentration measured, ppm or %

R = Actual calibration gas standard

S = Span of the instrument.

5.3.2 Relative Accuracy Test Audit

Relative Accuracy Test Audits must be conducted at least once every four calendar quarters. This requirement applies as of the calendar quarter following the calendar quarter in which the CEM system is provisionally certified. Table 5-1 showing the frequency with which a relative accuracy test audit must be performed.

During the RATA, emission values derived from the reference method (RM) testing performed by an outside contractor are compared to concurrent CEMS values. A value of relative accuracy is calculated statistically using the mean difference between the RM and CEMS values, and a confidence coefficient derived from the standard deviation of the readings. The facility's source of emission must be operating at a minimum of 50 percent of their maximum rated capacity during the RATA for the gas analyzer.
During the RATA conducted for the gas analyzer, an RM sample is extracted from a point as close to the CEMS probe inlet as possible, conforming to 40 CFR, Part 60, Appendix A, Method 1.

A RATA consists of a series of test runs; typically a minimum of nine 21 minute test runs. The testing company or contractor may choose to perform more than nine sets of RM tests. The tester may then, at his discretion, reject a maximum of three sets of the test results so long as the total number of test results used to determine the relative accuracy is greater than or equal to nine. Comparisons made during the RATA must be in the units of the emission standard.

The complete procedures for determining CEMS relative accuracy are specified in the following Performance Specifications in 40 CFR, Part 60, Appendix B:

40 CFR, Part 60, Appendix B, Performance Specification 5: Specifications and test procedures for TRS continuous emission monitoring systems in stationary sources

40 CFR, Part 60, Appendix B, Performance Specification 7: Specifications and test procedures for hydrogen sulfide continuous emission monitoring systems in stationary sources

As indicated above, Performance Specifications 5 and 7 are used to determine the performance of the analyzer. These specifications are included by reference.

The following USEPA Reference Method is used to determine RM values during the RATA. This method is referred to as Method 25A. These documents are also listed below. These reference methods are incorporated by reference in section 9.0 of this document.

40 CFR, Part 60, Appendix A, Method 1 - Sample and Velocity Traverses for Stationary Sources

40 CFR, Part 60, Appendix A, Method 25A - Determination of Total Gaseous Organic Concentrations using a Flame Ionization Analyzer.

5.3.3 Relative Accuracy Calculations

Relative Accuracy will be calculated as follows:

a. Arithmetic Mean. The arithmetic mean of the differences, d, will be calculated as follows:

- $$\overline{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$$

Where: *n = number of data points n and*:

- $\sum_{i=1}^{n} d_i$ = *algebraic sum of the individual differences* d_i

b. Standard Deviation. The standard deviation "S_d" will be calculated as follows:

- $$S_d = \sqrt{\frac{\sum_{i=1}^{n} d_i^{\,2} - \left[\frac{\left(\sum_{i=1}^{n} d_i\right)^2}{n}\right]}{n-1}}$$

c. Confidence Coefficient. The 2.5% error confidence coefficient (one-tailed), CC, will be calculated as follows:

- $$CC = t_{0.025}\frac{S_d}{\sqrt{n}}$$

Where: $t_{0.025}$ = *t-value*

n-1	*t-value*	*n-1*	*t-value*	*n-1*	*t-value*
1	*12.706*	*12*	*2.179*	*23*	*2.069*
2	*4.303*	*13*	*2.160*	*24*	*2.064*
3	*3.182*	*14*	*1.145*	*25*	*2.060*
4	*2.776*	*15*	*1.131*	*26*	*2.056*
5	*2.571*	*16*	*2.120*	*27*	*2.052*
6	*2.447*	*17*	*2.110*	*28*	*2.048*
7	*2.447*	*18*	*1.101*	*29*	*2.045*
8	*2.365*	*19*	*1.093*	*30*	*2.042*
9	*2.306*	*20*	*2.086*	*40*	*2.021*
10	*2.228*	*21*	*2.080*	*60*	*2.000*
11	*2.201*	*22*	*2.074*	*>60*	*1.960*

d. Relative Accuracy. The calculation of the relative accuracy (RA) will be done as follows:

- The mean of PTM (Performance Test Method) values for each run will be calculated.
- The mean, standard deviation and confidence coefficient for the differences between PTM values and CEMS values for the runs used for the final calculations.

The relative accuracy will be calculated using the following equation:

- $$RA = \frac{|\bar{d}| + |CC|}{PTM} \times 100$$

Where: *RA = Relative Accuracy*

d = absolute value of the arithmetic mean of differences

CC = absolute value of the confidence coefficient

PTM = average Performance Test Method value or applicable standard

6.0 PREVENTATIVE MAINTENANCE

The following sections have been compiled to provide guidelines for an effective preventative maintenance program. By identifying preventative maintenance functions and their frequency, the personnel involved in the daily operations and maintenance of the CEMS are furnished with an effective list of items which prevent the overlooking of prescribed maintenance functions. The preventative maintenance functions have been broken down by maintenance frequency. As with the rest of this document, the preventative maintenance schedule should be flexible enough to introduce modified or improved functions. The following are recommended maintenance intervals based on American CEM Service Corporation and the component manufacturer's recommendations. The intervals have been established only to form guidelines. The frequency of preventative maintenance functions should be increased or decreased as experience is gained on each component and in conjunction with a complete working knowledge in the use of the parameters recorded on the CEM System Weekly Quality Control Check List to predict when preventative maintenance is needed.

The requirements specified in the Federal Code of Regulations require an effective preventative maintenance and corrective action program. Data must be routinely reviewed in order to apprise appropriate personnel of the system's status and alert responsible parties of equipment malfunctions so that corrective action can be taken.

Operation and Maintenance Manuals supplied by the manufacturer come equipped with troubleshooting and maintenance sections which can assist in troubleshooting, preventative maintenance, re-calibration, and correcting most system malfunctions. In order to avoid out-of-control periods, technicians should become familiar with the daily performance of each CEMS component. Noisy or erratic signals may be signs of electronic problems, weak sensors, moisture condensation, or particulate matter contamination. Excessively slow responses may be an indication of leaks or poor cell performance.

6.1 Daily Inspections

The daily routine inspection functions are designed to provide a quick evaluation of the operating status of the CEMS, calibration results, and collected data. Daily inspection procedures can be made part of the overall daily operational procedure, as daily inspection involves mostly checking of critical parameters to ensure that the system is working properly. In an effort to be responsive to the data integrity requirements specified in the regulations, daily system inspections must be performed. These daily routine observations and checks are designed to efficiently evaluate the operational status of the CEMS by assessing calibration results and reviewing collected data.

At a minimum, daily inspections should include the following:

- Observation and the recording of operational parameters to include flow rates, status indicators, and pollutant levels
- Inspect the calibration drift reports. The data should be assessed for completeness and the determination of analyzer drift
- Review to see if the air conditioner is working
- Replace the calibration gas bottles when the pressure drops below 500 psig

In the event of a component malfunction, the following corrective action procedures should be initiated:

- If an "Out-Of-Control" period is in effect, the actual CEMS time when the period began must be documented in the CEMS logbook. An out-of-control period should be reported to Environmental Contact
- If the repair requires parts that are not in stock, steps should be taken to expedite the delivery of the parts from the analyzer manufacturer or a local supplier
- All steps involved in the repair must be documented in the CEMS logbook
- As soon as the repair is made, and the CEMS is put back into the operational mode, calibrations should be performed as necessary to take the CEMS out of the Out-Of-Control status. As soon as this status is reached, the CEMS time must be documented in the logbook. The total time that the CEMS was out-of-control should then be evaluated and documented in the logbook

6.2 Weekly Preventative Maintenance Inspections

There are no manufacturer recommended maintenance functions to be performed on a weekly basis, however, the following functions must be performed on a weekly basis to ensure continued operation and reduce down time.

- Replace any low calibration gas bottles prior to the weekend
- If a routine preventative maintenance procedure requires parts, the type of parts used and the quantity used needs to be recorded in the CEMS logbook

6.3 Monthly Preventative Maintenance

There are no manufacturer recommended maintenance functions to be performed on a monthly basis, however, the following functions should be performed monthly or on an as needed basis to ensure continued operation and reduce down time. As soon as the preventative maintenance is complete, and the CEMS is put back into the operational mode, calibrations should be performed as necessary prior to taking the CEMS out of "Maintenance" mode. As soon as this status is reached, the CEMS time must be documented in the logbook. The total time that the CEMS was in "Maintenance" mode should then be evaluated and documented in the logbook.

- If a routine preventative maintenance procedure requires parts, the type of parts used and the quantity needs to be recorded in the CEMS logbook
- Check exhaust and moisture manifolds for obstructions
- Check for sample leaks inside the analyzer enclosure
- Change sample polishing filters as needed
- Check the sample chiller moisture traps
- Check for loose or damaged tube fittings
- Check and adjust sample and calibration gas flow
- Test sample flow switches, moisture detectors, and rotometers
- Check all sample tubing for sign of moisture. Clean as needed
- Inspect all cables and sample tubing runs from stack mounted CEMS components to the analyzer shelter. Look for frayed damaged insulation and loose or missing wire ties or supports
- Inspect the reference gas cylinder stock, both in-use and reserve stock, to ensure that the proper numbers of cylinders are available, and that certifications and other pertinent information have been properly filed. Check expiration dates to ensure that all cylinders are in compliance
- Inspect the CEM shelter for corrosion and water leaks

6.4 Annual Preventative Maintenance

The analyzer and sample handling system manufacturers recommends that the following components be replaced on an annual basis. This Preventative Maintenance is to be performed in conjunction with the annual RATA when possible. Refer to the manufacturer's Operation and Maintenance manual for procedures.

6.5 Spare Parts

Phillips will ensure a spare parts inventory adequate to meet normal operating requirements of the CEMS. Key parts kept on site for the analyzers include:

Maxuum II Spare Parts
- Sample valve
- EPC Module
- Syscon
- DPM
- Sample system filters

Cosa 9610 Spare Parts
- Ametek Cell
- Ametek thermocouple
- Orifice Tube, Gas
- Orifice Tube, Air
- Sample inlet filter

Sample system spare parts include:

- Ring Heater
- Sample Valves
- Inline Gas Filters
- Fuses
- Probe Filter Housing

7.0 MISSING DATA PROCEDURE

Data from the Applied Automation EC cabinet is automatically stored on PHD (plant data historian).

8.0 RECORDKEEPING AND REPORTING REQUIREMENTS

Phillips' Borger Refinery is subject to the Recordkeeping and Reporting Requirements of the Federal Code of Regulations:

- 40 CFR §60.7, - Notification and Recordkeeping
- 40 CFR, Part 60, Appendix F - Recordkeeping, Data Recording and Reporting Requirements.

8.1 Record keeping Requirements - Gaseous CEMS

Various data must be kept to satisfy the record keeping requirements. The following is a summary of the requirement and where it is kept:

- Monitoring data shall be reduced to hourly and rolling daily average emissions – This is done on a separate spreadsheet.
- Records of CGAs are maintained in Livelink.

8.2 Reporting Requirements - Gaseous CEMS

Phillips' Borger Refinery is required to report CEMS emissions information and operating data to the TCEQ in Reports.

All CGA exeedances of + 15% accuracy and any CEMS downtime shall be reported to the TCEQ Regional Director.

8.3 Manual Recordkeeping and Reporting

The Environment Contact and Analyzer Group First-Line Supervisor are responsible for maintaining files of all CEMS QA/QC records. The areas of responsibility are as follows:

- CEMS Logbooks
- Daily, Weekly and Annual P.M. CEMS Check Sheets
- P.M. and Corrective Action forms
- CEMS O & M Manuals
- Calibration Gas Bottle Logs
- CEMS Calibration Gas Concentration Certificates
- Quarterly CGA Reports
- Annual Relative Accuracy Test Audit Reports
- An up-to-date copy of this QA/QC Plan

These files, logs, and documents should be readily available for review by, TCEQ personnel, and/or EPA personnel.

9.0 Reference Documents

The following documents are incorporated by reference in this QA/QC Plan:

40 CFR, Part 60, Appendix A, Method 1, "Sample, and Velocity Traverses for Stationary Sources".

40 CFR, Part 60, Appendix A, Method 25A, "Determination of total Gaseous Organic Concentrations Using a Flame Ionization Analyzer".

40 CFR, Part 60, Appendix B, Performance Specification 5: Specifications and test procedures for TRS continuous emission monitoring systems in stationary sources

40 CFR, Part 60, Appendix B, Performance Specification 7: Specifications and test procedures for hydrogen sulfide continuous emission monitoring systems in stationary sources

40 CFR, Part 60, Appendix F, Quality Assurance Procedures.

QA/QC Plan - Review Record

☐ Annual Review ☑ Periodic Review ☐

Date: _____

Revision Number: ____

Attendees:

_____ _____ _____

_____ _____ _____

Actions Taken:

_____

_____

_____

_____

Use additional pages as needed.

Revision Summary

Action	Date	Rev	Originator	Approver	Description
Created	9/01/15	0	Scott Hartman	Sandy Keys	Developed
Revision	10/06/15	1	Scott Hartman	Sandy Keys	Changed TRS Span to 46% due to span gas availability