IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. EQUISTAR CHEMICALS, LP; LYONDELLBASELL ACETYLS, LLC; AND LYONDELL CHEMICAL COMPANY, Defendants.	Civil Action No. Judge

CONSENT DECREE

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Table 1:

Table 2:

Concurrently with the lodging of this Consent Decree, Plaintiff, the United States of America ("United States"), on behalf of the United States Environmental Protection Agency ("EPA"), has filed a Complaint in this action seeking injunctive relief and civil penalties from the Defendants: Equistar Chemicals, LP; LyondellBasell Acetyls, LLC; and Lyondell Chemical Company, for alleged violations of the Clean Air Act (the "CAA" or "Act"), 42 U.S.C. §§ 7401 *et seq.*, with respect to emissions of volatile organic compounds ("VOCs"), hazardous air pollutants ("HAPs"), and other pollutants at the chemical manufacturing facilities located in or near: Channelview, Texas (the "Channelview North Plant" and the "Channelview South Plant," collectively the "Channelview Plants"); Clinton, Iowa (the "Clinton Plant"); Corpus Christi, Texas (the "Corpus Christi Plant"); and La Porte, Texas (the "La Porte LyondellBasell Acetyls Plant" and the "La Porte Equistar Plant," collectively the "La Porte Plants"). These six plants are collectively referred to as the "Covered Plants";

WHEREAS, the Defendant Equistar Chemicals, LP owns and operates the Channelview North Plant, the Corpus Christi Plant, the La Porte Equistar Plant, and the Clinton Plant, including the Steam-Assisted Flares and Unassisted Flare used at the plants as safety devices and to control emissions of air pollutants generated by the manufacturing processes;

WHEREAS, the Defendant LyondellBasell Acetyls, LLC owns and operates the La Porte LyondellBasell Acetyls Plant, including the Steam-Assisted Flares used at the plant as safety devices and to control emissions of air pollutants generated by the manufacturing processes;

WHEREAS, the Defendant Lyondell Chemical Company owns and operates the Channelview South Plant, including the Steam-Assisted and Unassisted Flares used at the plant as safety devices and to control emissions of air pollutants generated by the manufacturing processes;

WHEREAS, the Complaint alleges that the Defendants violated one or more of the following federal Clean Air Act and/or Iowa or Texas state air pollution requirements:

a. The Prevention of Significant Deterioration ("PSD") requirements found in 42 U.S.C. § 7475 and 40 C.F.R. §§ 52.21(a)(2)(iii) and 52.21(i) – 52.21(r)(5);

b. The Non-Attainment New Source Review ("NNSR") requirements found in 42 U.S.C. §§ 7502(c)(5), 7503(a)-(c) and 40 C.F.R. Part 51, Appendix S, Part IV, Conditions 1-4;

c. The New Source Performance Standards ("NSPS") promulgated at 40 C.F.R. Part 60, Subparts A and DDD, pursuant to Section 111 of the CAA, 42 U.S.C. § 7411;

d. The National Emission Standards for Hazardous Air Pollutants ("NESHAPs") promulgated at 40 C.F.R. Part 61, Subparts A and FF and 40 C.F.R. Part 63, Subparts A, F, G, H, SS, YY, and FFFF, pursuant to Section 112 of the CAA, 42 U.S.C. § 7412;

e. The Title V requirements of the CAA found at 42 U.S.C. §§ 7661a(a), 7661b(c), 7661c(a); and 40 C.F.R. §§ 70.1(b), 70.5(a) and (b), 70.6(a) and (c), and 70.7(b);

f. The federally enforceable Iowa and Texas state implementation plan (SIP) provisions that incorporate, adopt, and/or implement the federal requirements listed in a–e; and

g. The portions of the Title V permits for the Covered Plants that adopt, incorporate, or implement the provisions cited in a–f.

WHEREAS, the Applicable Defendants have installed systems and equipment to recover Waste Gas generated by process units at the Clinton Plant and the Corpus Christi Plant, both of which are subject to federally enforceable CAA operating permits. The Waste Gas is recovered by these "In-Process Waste Gas Recovery Systems" before it reaches these two Covered Plants' Flare headers. These In-Process Waste Gas Recovery Systems include:

- At the Clinton Plant, a Vent Stream Recovery System (known as a "Dephlegmator"), a Tank Farm Ethylene Vent Recovery System, and Flare

Minimization Regeneration Procedures that have a combined Design Capacity to recover 2.4 mscf of Waste Gas per Day; and

- At the Corpus Christi Plant, a Vent Recovery System, Pyrolosis Gasoline Stripper Vent Recovery, and Flare Minimization Regeneration Procedures which have a combined Design Capacity to recover 2 mscf of Waste Gas per Day.

WHEREAS, the Applicable Defendants have installed flare gas recovery systems ("FGRSs") to recover Waste Gas generated by the Olefins Plant 1 (OP-1) and Olefins Plant 2 (OP-2) process units at the Channelview North Plant, which is subject to a federally enforceable CAA operating permit. These FGRSs include:

- One steam Eductor for each of the OP-1 and OP-2 process units to return and recover Waste Gas from the Flare header to the process at the Channelview North Plant. Each Eductor has a Design Capacity 1,000 scfm of Waste Gas.

WHEREAS, the Defendants have, prior to entry of this Consent Decree, implemented Flare flow reduction and Combustion Efficiency improvements at some of the Covered Flares;

WHEREAS, by entering into this Consent Decree, the Defendants commit to undertake further projects at the Covered Plants intended to reduce emissions of air pollutants from the Covered Plants;

WHEREAS, as more specifically described in Section V (Compliance Requirements), the Defendants have agreed to operate monitoring equipment and control technology, as well as undertake additional measures, at the Covered Plants that will recover and minimize Waste Gas flows to the twenty-one Flares covered by this Consent Decree ("Covered Flares") and ensure proper Combustion Efficiency at the Covered Flares;

WHEREAS, implementing the Consent Decree's compliance requirements are estimated to cost approximately $50 million;

WHEREAS, between January 1, 2017 and full implementation of the Consent Decree's compliance requirements, EPA estimates that emissions from the Covered Flares will be reduced by approximately the following amounts (in tons per year or "TPY"):

Pollutant	Amount in TPY (2017 – through implementation)
VOCs	2,677
Carbon Dioxide Equivalents ("CO_2e")	91,946
HAPs	371
Nitrogen Oxides ("NOx")	11

WHEREAS, implementing the Consent Decree's compliance requirements will also reduce carbon monoxide ("CO") from the Covered Flares;

WHEREAS, the United States anticipates that the specific and comprehensive compliance measures set forth in this Consent Decree, which are subject to a reasonable timetable for implementation, will result in the cessation of the violations alleged in the Complaint and those resolved through Section XIII (Effect of Settlement);

WHEREAS, the Defendants deny they have violated or continue to violate any of the statutory and regulatory requirements set forth in the preceding "whereas" clauses and deny any liability to the United States arising out of the occurrences alleged in the Complaint; and

WHEREAS, the Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and will avoid litigation between the Parties and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, before the taking of any testimony, without the adjudication or admission of any issue of fact or law except as provided in Section I, and with the consent of the Parties, IT IS HEREBY ADJUDGED, ORDERED, AND DECREED as follows:

I. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action, pursuant to 28 U.S.C. §§ 1331, 1345, and 1355, and Section 113(b) of the Clean Air Act, 42 U.S.C. § 7413(b). This Court has personal jurisdiction over the Parties. Venue lies in this District pursuant to Section 113(b) of the Clean Air Act, 42 U.S.C. § 7413(b), and 28 U.S.C. §§ 1391(b) and (c) and 1395(a), because the Defendants reside and are located in this judicial district, some of the violations alleged in the Complaint are alleged to have occurred in this judicial district, and the Defendants conduct business in this judicial district. The Defendants consent to this Court's jurisdiction over the Parties and this Consent Decree, over any action to enforce this Consent Decree, and to venue in this judicial district.

2. For purposes of this Consent Decree, the Defendants do not contest that the Complaint states claims upon which relief may be granted.

3. Notice of the commencement of this action has been given to the Iowa Department of Natural Resources ("IDNR") and the Texas Commission on Environmental Quality ("TCEQ") in accordance with Section 113(b) of the Clean Air Act, 42 U.S.C. § 7413(b).

II. APPLICABILITY

4. The obligations of this Consent Decree apply to and are binding upon the United States, and upon the Defendants and any successors, assigns, or other entities or persons otherwise bound by law.

5. At least 60 Days before a transfer of the ownership or operation of any of the Covered Plants or Covered Flares, the Applicable Defendant must provide a copy of this Consent Decree to the proposed transferee(s). At least 30 Days before any such transfer, the Applicable Defendant must provide written notice of the prospective transfer to the EPA and the United

States, in accordance with Section XVI (Notices). Any attempt to transfer ownership or operation of any of the Covered Plants or Covered Flares without complying with this Paragraph constitutes a violation of this Decree.

6. If an Applicable Defendant intends to request that the United States agree to a transferee's assumption of any obligations of the Consent Decree, the Applicable Defendant must condition the transfer of the Covered Plant or Covered Flare upon the transferee's written agreement to execute a modification to the Consent Decree that makes the terms and conditions of the Consent Decree applicable to, binding upon, and enforceable against the transferee.

7. As soon as possible before the transfer, the Applicable Defendant must: (i) notify the United States of the proposed transfer and of the specific Consent Decree provisions that the Applicable Defendant proposes the transferee assume; (ii) certify that the transferee is contractually bound to assume the ongoing compliance requirements and obligations of this Consent Decree; and (iii) require the transferee to submit to the United States both a certification that the transferee has the financial and technical ability to assume the ongoing compliance requirements and obligations of this Consent Decree and a certification that the transferee is contractually bound to assume the ongoing compliance requirements and obligations of this Consent Decree.

8. After submitting the notice and certifications required by the previous Paragraph to the United States, either: (i) the United States must notify the Applicable Defendant that the United States does not agree to modify the Consent Decree to make the transferee responsible for complying with the terms and conditions of the Consent Decree; or (ii) the United States, the Applicable Defendant, and the transferee must file with the Court a joint motion requesting the Court approve a modification substituting the transferee for the Applicable Defendant as the

defendant responsible for complying with the terms and conditions of the Consent Decree that the Applicable Defendant intends the transferee to assume.

9. If the Applicable Defendant does not secure the agreement of the United States to a joint motion to modify the Consent Decree within a reasonable period of time, then the Applicable Defendant and the transferee may file, without the agreement of the United States, a motion requesting the Court to approve a modification substituting the transferee for the Applicable Defendant as the defendant responsible for complying with the terms and conditions of the Consent Decree that the transferee intends to assume. The United States may file an opposition to the motion. The motion to modify must be granted unless the Applicable Defendant and the transferee: (i) fail to show that the transferee has the financial and technical ability to assume the ongoing compliance requirements and obligations of the Consent Decree; (ii) fail to show that the modification language effectively transfers the ongoing compliance requirements and obligations to the transferee; or (iii) the Court finds other good cause for denying the motion.

10. The Defendants must provide a copy of this Consent Decree to all officers whose duties might reasonably include compliance with any provision of this Decree. For all employees whose duties might reasonably include compliance with any provision of this Decree, as well as for any contractor retained to perform work required under this Consent Decree, the Applicable Defendant must provide a copy of the portions of this Consent Decree that are applicable to the employee's duties or to the contractor's work. The Applicable Defendants must condition any such contract upon performance of the work in conformity with the terms of this Consent Decree.

11. In any action to enforce this Consent Decree, the Defendants will not raise as a defense the failure by any of their officers, directors, employees, agents, or contractors to take any actions necessary to comply with the provisions of this Consent Decree.

III. DEFINITIONS

12. Terms used in this Consent Decree that are defined in the CAA or in federal or state regulations promulgated pursuant to the CAA will have the meanings assigned to them in the CAA or such regulations, unless otherwise provided in this Decree. Whenever the terms set forth below are used in this Consent Decree, the following definitions apply:

a. "Applicable Defendant" means: (i) with respect to the Channelview South Plant, the Lyondell Chemical Company; (ii) with respect to the Channelview North Plant, the Clinton Plant, the Corpus Christi Plant, and the La Porte Equistar Plant, Equistar Chemicals, LP; and (iii) with respect to the La Porte LyondellBasell Acetyls Plant, LyondellBasell Acetyls, LLC.

b. "Assist Air" or "Air_{asst}" means all air that is intentionally introduced before or at a Flare tip through nozzles or other hardware conveyance for the purposes of, including, but not limited to, protecting the design of the Flare tip, promoting turbulence for mixing, or inducing air into the flame. Assist Air includes premix assist air and perimeter assist air. Assist Air does not include surrounding ambient air. Flares that use Assist Air are referred to in this Consent Decree as "Air-Assisted Flares."

c. "Assist Steam" means all steam that is intentionally introduced before or at a Flare tip through nozzles or other hardware conveyance for the purposes of, including, but not limited to, protecting the design of the Flare tip, promoting turbulence for mixing, or inducing air into the flame. Assist Steam includes, but is not necessarily limited to, center steam, lower steam, and upper steam.

d. "Available for Operation" means, with respect to an Eductor within a FGRS, that the Eductor is capable of commencing the recovery of Potentially Recoverable Gas as soon as practicable but not more than one hour after the Need for an Eductor to Operate arises. The period of time, not to exceed one hour, allowed by this definition for the startup of an Eductor will be included in the amount of time that an Eductor is Available for Operation.

e. "Baseload Waste Gas Flow Rate" means, for a Covered Flare, the daily average flow rate, in standard cubic feet per Day ("scfd"), to that Flare, excluding all flows during periods of startup, shutdown, and Malfunction. The flow rate data period

that must be used to determine Baseload Waste Gas Flow Rate is set forth in sub-Paragraph 28(a)(ii).

f. "BTU/scf" means British Thermal Unit per standard cubic foot.

g. "Calendar Quarter" means a three-month period ending on March 31, June 30, September 30, or December 31.

h. "Capable of Receiving Sweep, Supplemental, and/or Waste Gas" means, for a Flare, that the flow of Sweep Gas, Supplemental Gas, and/or Waste Gas is not prevented from being directed to the Flare by means of an isolation device such as closed valves, blinds, or stopples.

i. "Channelview North Plant" means the petrochemical manufacturing plant owned and operated by Equistar Chemicals, LP, located at 8280 Sheldon Road in Channelview, Texas.

j. "Channelview North Flares" means the following five Flares located at the Channelview North Plant:

- East Plant (Steam-Assisted);
- IPOH (Steam-Assisted);
- Methanol Continuous Flare (Unassisted);
- OP1 Flare (Steam-Assisted); and
- OP2 Flare (Steam-Assisted).

k. "Channelview South Plant" means the petrochemical manufacturing plant owned and operated by Lyondell Chemical Company, located at 2502 Sheldon Road in Channelview, Texas.

l. "Channelview South Flares" means the following six Flares located at the Channelview South Plant:

- BDO Flare (Unassisted);
- Deepwell Flare (Unassisted);
- MTBE Continuous Flare (Steam-Assisted);
- MTBE Emergency Flare (Steam-Assisted);
- POSM 1 Continuous Flare (Steam-Assisted); and
- POSM 2 Continuous Flare (Steam-Assisted).

m. "Clinton Plant" means the petrochemical manufacturing plant owned and operated by Equistar Chemicals, LP, located at 3400 Anamosa Road in Clinton, Iowa.

n. "Clinton Flare" means the Steam-Assisted Flare located at the Clinton Plant.

o. "Combustion Efficiency" or "CE" means a Flare's efficiency in converting the organic carbon compounds found in Combustion Zone Gas to carbon dioxide. Combustion Efficiency must be determined in accordance with the NHV_{cz} calculations in Appendix 1.2.

p. "Combustion Zone" means the area of the Flare flame where the Combustion Zone Gas combines for combustion.

q. "Combustion Zone Gas" means all gases and vapors found after the Flare tip. This gas includes all Vent Gas, Pilot Gas, Total Steam, and Assist Air.

r. "Complaint" means the complaint filed by the United States in this action.

s. "Consent Decree" or "Decree" means this Consent Decree, including any and all tables and attached appendices.

t. "Corpus Christi Plant" means the petrochemical manufacturing plant owned and operated by Equistar Chemicals, LP, located at 1501 McKinzie Road in Corpus Christi, Texas.

u. "Corpus Christi Flares" means the following three Steam-Assisted Flares located at the Corpus Christi Plant:

- BDU Flare;
- Cold Olefins Flare; and
- Hot Olefins Flare.

v. "Covered Flare" or "Covered Flares" means each of the following Flares, as well as any Newly Installed Covered Flare or Portable Flare in use at a Covered Plant, provided however that once a Covered Flare is permanently taken out of service after the Effective Date and that change is reported in the subsequent Semi-Annual Report, that Flare is no longer a Covered Flare:

- the Channelview North Flares;
- the Channelview South Flares;
- the Clinton Flare;
- the Corpus Christi Flares;
- the La Porte Equistar Flares; and
- the La Porte LyondellBasell Acetyls Flares.

w. "Covered Plant" or "Covered Plants" means:

- the Channelview North Plant;
- the Channelview South Plant;
- the Clinton Plant;
- the Corpus Christi Plant;

- the La Porte LyondellBasell Acetyls Plant; and
- the La Porte Equistar Plant.

x. "Date of Lodging" means the date this Consent Decree is filed for lodging with the Clerk of the Court for the United States District Court for the Southern District of Texas.

y. "Day" means a calendar day unless expressly stated to be a business day. In computing any period of time for a compliance deadline under this Consent Decree (*e.g.*, a deadline for installing a FGRS or submitting a Waste Gas Management Plan (WGMP)), where the last day would fall on a Saturday, Sunday, or federal or state holiday, the period will run until the close of business of the next business day.

z. "Defendants" means Equistar Chemicals, LP; LyondellBasell Acetyls, LLC; and the Lyondell Chemical Company.

aa. "Design Capacity" means, with respect to an FGRS, the capacity, in mscf per Day, of the installed flare gas recovery Eductor.

bb. "Eductor" means a mechanical device for compressing and conveying gases. An Eductor utilizes the pressure energy found within a high pressure motive gas (*e.g.*, steam) to entrain and compress a secondary low pressure gas (*e.g.*, Vent Gas). The Eductor utilizes a specially shaped nozzle to create a "venturi effect" which increases the fluid velocity and decreases the fluid pressure, thereby resulting in a mixture of high pressure and low pressure gases on the discharge side.

cc. "Effective Date" shall have the definition provided in Section XVII.

dd. "EPA" means the United States Environmental Protection Agency and any of its successor departments or agencies.

ee. "External Utility Loss" means a loss in the supply of electrical power or other third-party utility to a Covered Plant that is caused by actions occurring outside the boundaries of a Covered Plant, excluding utility losses due to an interruptible utility service agreement.

ff. "Flare" means a combustion device lacking an enclosed combustion chamber that uses an uncontrolled volume of ambient air to burn gases.

gg. "Flare Gas Recovery System" or "FGRS" means a system of one or more Eductors, piping, and associated water seal, rupture disk, or other equipment used to divert gas from a Flare and direct the gas to a fuel gas system, to a combustion device other than the Flare, or to a product, co-product, by-product, or raw material recovery system.

hh. "Flare Tip Velocity" or "Vtip" means the velocity of gases exiting the Flare tip as defined in Paragraph 39.

ii. "In Operation," with respect to a Flare, means all times that Sweep, Supplemental, or Waste Gas is or may be vented to a Flare. A Flare that is In Operation is Capable of Receiving Sweep, Supplemental, and/or Waste Gas unless all Sweep, Supplemental, and Waste Gas flow is prevented by means of an isolation device such as closed valves, blinds, and/or stopples.

jj. "KSCFH" or "kscfh" means thousand standard cubic feet per hour.

kk. "La Porte Equistar Plant" means the petrochemical plant owned and operated by Equistar Chemicals, located at 1515 Miller Cut-off Road in La Porte, Texas.

ll. "La Porte Equistar Flares" means the following four Steam-Assisted Flares located at the La Porte Equistar Plant:

- AB3 Flare;
- ARU Flare;
- Hyperzone – Q1 Flare; and
- Olefins QE1 Flare.

mm. "La Porte LyondellBasell Acetyls Flares" means the following two Steam-Assisted Flares at the La Porte LyondellBasell Acetyls Plant:

- AA Flare; and
- VAM Flare.

nn. "La Porte LyondellBasell Acetyls Plant" means the petrochemical plant owned and operated by LyondellBasell Acetyls, LLC, located at 1350 Miller Cut-off Road in La Porte, Texas.

oo. "Malfunction" means, as specified in 40 C.F.R. § 60.2, any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not Malfunctions. In any dispute under this Consent Decree involving this definition, the Defendants have the burden of proving all of the following:

(1) The excess emissions were caused by a sudden, unavoidable breakdown of technology, beyond the control of the owner or operator;

(2) The excess emissions: (a) did not stem from any activity or event that could have been foreseen and avoided, or planned for, and (b)

could not have been avoided by better operation and maintenance practices;

(3) To the maximum extent practicable the air pollution control equipment or processes were maintained and operated in a manner consistent with good practice for minimizing emissions;

(4) Repairs were made in an expeditious fashion when the operator knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been used, to the extent practicable, to ensure that such repairs were made as expeditiously as practicable;

(5) The amount and duration of the excess emissions (including any bypass) were minimized to the maximum extent practicable during periods of such emissions;

(6) All possible steps were taken to minimize the impact of the excess emissions on ambient air quality;

(7) All emission monitoring systems were kept in operation if at all possible;

(8) The owner or operator's actions during the period of excess emissions were documented by properly signed, contemporaneous operating logs, or other relevant evidence;

(9) The excess emissions were not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and

(10) The owner or operator properly and promptly notified the appropriate regulatory authority.

pp. "Monitoring System Malfunction" means any sudden, infrequent, and not reasonably preventable failure of instrumentation or a monitoring system to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not Monitoring System Malfunctions. In any dispute under this Consent Decree involving this definition, the Defendants have the burden of proving all of the following:

(1) The instrument or monitoring system downtime was caused by a sudden, unavoidable breakdown of technology, beyond the control of the owner or operator;

(2) The instrument or monitoring system downtime: (a) did not stem from any activity or event that could have been foreseen and

avoided, or planned for, and (b) could not have been avoided by better operation and maintenance practices;

(3) To the maximum extent practicable, the instrument or monitoring system were maintained and operated in a manner consistent with good practice for minimizing emissions;

(4) Repairs were made in an expeditious fashion when the operator knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been used, to the extent practicable, to ensure that such repairs were made as expeditiously as practicable;

(5) The amount and duration of the instrument or monitoring system downtime was minimized to the maximum extent practicable;

(6) The owner or operator's actions during the period of instrument or monitoring system downtime were documented by properly signed, contemporaneous operating logs, or other relevant evidence; and

(7) The instrument or monitoring system downtime was not part of a recurring pattern indicative of inadequate design, operation, or maintenance.

qq. "mscf" means million standard cubic feet.

rr. "Need for an Eductor to Operate" means any time when there is a Potentially Recoverable Gas flow (determined on a fifteen-minute block average) to the Covered Flare(s) serviced by the FGRS.

ss. "Net Heating Value" means the theoretical total quantity of heat liberated by the complete combustion of a unit volume or weight of a fuel initially at 25 degrees Centigrade and 760 mmHg, assuming that the produced water is vaporized and all combustion products remain at, or are returned to, 25 degrees Centigrade; however, the standard for determining the volume corresponding to one mole is 20 degrees Centigrade.

tt. "Net Heating Value Analyzer" or "NHV Analyzer" means an instrument capable of measuring the Net Heating Value of Vent Gas in BTU/scf. The sample extraction point of a Net Heating Value Analyzer may be located upstream of the introduction of Supplemental Gas and/or Sweep Gas and/or Purge Gas if the composition and flow rate of any such Supplemental Gas and/or Sweep Gas and/or Purge Gas is known and if this known value then is used in the calculation of the Net Heating Value of the Vent Gas.

uu. "Net Heating Value of Combustion Zone Gas" or "NHV_{cz}" means the Net Heating Value, in BTU/scf, of the Combustion Zone Gas in a Flare. NHV_{cz} must be calculated in accordance with Step 3 of Appendix 1.2.

vv. "Net Heating Value of Dilution" or "NHV_{dil}" means the Net Heating Value, in BTU/ft^2, of dilution zone gas in a Flare. NHV_{dil} must be calculated in accordance with Step 4 of Appendix 1.2.

ww. "Net Heating Value of Vent Gas" or "NHV_{vg}" means the Net Heating Value, in BTU/scf, of the Vent Gas directed to a Flare. NHV_{vg} must be calculated in accordance with Step 1 of Appendix 1.2.

xx. "New Source Review" or "NSR" means the PSD and NNSR provisions in Part C and D of Subchapter I of the Clean Air Act, 42 U.S.C. §§ 7470-7492, 7501-7515, the Minor NSR provisions in 42 U.S.C. § 7410(a), applicable federal regulations implementing such provisions of the CAA, and the corresponding provisions of the federally enforceable SIPs for the State of Iowa and the State of Texas.

yy. "Newly Installed Covered Flare(s)" means any Air-Assisted Flare or Steam-Assisted Flare that is permanently installed, receives Waste Gas that has been redirected to it from an existing Covered Flare (existing as of the Effective Date), and commences operation at a Covered Plant after the Effective Date.

zz. "Paragraph" means a portion of this Decree identified by an arabic numeral.

aaa. "Parties" means the United States and the Defendants.

bbb. "Pilot Gas" means gas introduced into a Flare tip that provides a flame to ignite the Vent Gas.

ccc. "Portable Flare" means a Steam-Assisted Flare or Air-Assisted Flare that is not permanently installed and that receives Waste Gas that has been redirected to it from a Covered Flare.

ddd. "Potentially Recoverable Gas" means the Sweep Gas, Supplemental Gas, and/or Waste Gas (including hydrogen, nitrogen, oxygen, carbon dioxide, carbon monoxide, and/or water) directed to a Covered Flare's or group of Covered Flares' FGRS, except that Regeneration Waste Gas Streams are not included in the definition of "Potentially Recoverable Gas."

eee. "Prevention Measure" means an instrument, device, piece of equipment, system, process change, physical change to process equipment, procedure, or program to minimize or eliminate flaring.

fff. "Purge Gas" means the gas introduced between a Flare header's water seal and the Flare tip to prevent oxygen infiltration (backflow) into the Flare tip. For a Flare

with no water seal, the function of Purge Gas is performed by Sweep Gas, and therefore, by definition, such a Flare has no Purge Gas.

ggg. "Regeneration Waste Gas Streams" means Waste Gas streams produced during the regeneration and subsequent clearing of the dryers, reactors, and other vessels at the Covered Plants. Regeneration Waste Gas Streams are high in nitrogen (typically approximately 90%) and thus cannot be returned to the process.

hhh. "Reportable Flaring Incident" means when Waste Gas equal to or greater than 500,000 scf is flared within a 24-hour period at any Covered Plant from its Covered Flare(s). For purposes of calculating whether the triggering level of Waste Gas flow has been met, the following flows may be excluded: i) the pro-rated Baseload Waste Gas Flow Rate (pro-rated on the basis of the duration of the Reportable Flaring Incident); and ii) if a Covered Plant has instrumentation capable of measuring the concentrations of hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam) in the Waste Gas, the contribution of the calculated flow of the above compounds for which a concentration is measured may be excluded. A flaring event or events that have the same root cause(s) and that last(s) more than 24 hours will be considered a single Reportable Flaring Incident. When flaring occurs at more than one Covered Flare, the volume of non-excluded Waste Gas flow at each Covered Flare must be added together unless the root cause(s) of the flaring at each Covered Flare is(are) not related to each other.

iii. "SCFD" or "scfd" means standard cubic feet per Day.

jjj. "SCFH" or "scfh" means standard cubic feet per hour.

kkk. "SCFM" or "scfm" means standard cubic feet per minute.

lll. "Section" means a portion of this Decree identified by a roman numeral.

mmm. "Semi-Annual Period" means a six-month period ending on June 30 or December 31.

nnn. "Smoke Emissions" shall have the definition set forth in Section 3.5 of Method 22 of 40 C.F.R. Part 60, Appendix A. For purposes of this Consent Decree, Smoke Emissions may be either documented by a video camera or determined by an observer knowledgeable with respect to the general procedures for determining the presence of Smoke Emissions per Method 22.

ooo. "Standard Conditions" means a temperature of 68 degrees Fahrenheit and a pressure of 1 atmosphere. Unless otherwise expressly set forth in this Consent Decree or an Appendix, Standard Conditions apply.

ppp. "Steam-Assisted Flare" means a Flare that uses steam piped to a Flare tip to assist in combustion.

qqq. "Supplemental Gas" means all gas introduced to a Flare in order to improve the combustible characteristics of the Combustion Zone Gas.

rrr. "Sweep Gas" means:

(1) For a Flare with an FGRS: Gas intentionally introduced into a Flare header system to prevent oxygen buildup in the Flare header. Sweep Gas in these Flares is introduced prior to and recovered by the FGRS; and

(2) For a Flare without an FGRS: Gas intentionally introduced into a Flare header system to maintain a constant flow of gas through the Flare header and out the Flare tip in order to prevent oxygen building in the Flare header and to prevent infiltration (backflow) into the Flare tip.

sss. "Total Steam" means the total of all steam that is supplied to a Flare and includes, but is not limited to, lower steam, center steam, and upper steam.

ttt. "Turnaround" means a complete shutdown of any emission unit to: (1) perform necessary cleaning and repairs; (2) perform required tests and internal inspections; and/or (3) install any modifications or additions, or make preparations necessary for a future modification or addition.

uuu. "United States" means the United States of America, acting on behalf of EPA.

vvv. "Unassisted Flare" means a Flare that does not use Assist Steam or Assist Air.

www. "Unobstructed Cross Sectional Area of the Flare Tip" or "$A_{tip\text{-}unob}$" means the open, unobstructed area of a Flare tip through which Vent Gas and center steam pass. Diagrams of four common Flare types are set forth in Appendix 1.3 together with the equations for calculating the $A_{tip\text{-}unob}$ of these four types.

xxx. "Vent Gas" means all gas found just before the Flare tip. This gas includes all Waste Gas, that portion of Sweep Gas that is not recovered, Purge Gas, and Supplemental Gas, but does not include Pilot Gas, Total Steam, or Assist Air.

yyy. "Visible Emissions" means five minutes or more of Smoke Emissions during any two consecutive hours.

zzz. "VOC" or "Volatile Organic Compounds" shall have the definition set forth in 40 C.F.R. § 51.100(s).

aaaa. "Waste Gas" means the mixture of all gases from plant operations that is directed to a Flare for the purpose of disposing of the gas. "Waste Gas" does not include gas introduced to a Flare exclusively to make it operate safely and as intended;

therefore, "Waste Gas" does not include Pilot Gas, Total Steam, Assist Air, or the minimum amount of Sweep Gas and Purge Gas that is necessary to perform the functions of Sweep Gas and Purge Gas. "Waste Gas" also does not include the minimum amount of gas introduced to a Flare to comply with regulatory and/or enforceable permit requirements regarding the combustible characteristics of Combustion Zone Gas; therefore, "Waste Gas" does not include Supplemental Gas. Depending upon the instrumentation that monitors Waste Gas, certain compounds (hydrogen, nitrogen, oxygen, carbon dioxide, carbon monoxide, and/or water (steam)) that are directed to a Flare for the purpose of disposing of these compounds may be excluded from calculations relating to Waste Gas flow. The circumstances in which such exclusions are permitted are specifically identified in Section V (Compliance Requirements). Appendix 1.4 to this Consent Decree depicts the meaning of "Waste Gas," together with its relation to other gases associated with Flares.

bbbb. "Waste Gas Minimizing Equipment" means the equipment identified in Appendix 1.6 to the Consent Decree.

cccc. "Waste Gas Minimizing Procedures" means the operating procedures and practices identified in Appendix 1.6 to the Consent Decree.

IV. CIVIL PENALTY

13. By no later than 30 Days after the Effective Date, the Defendants, jointly and severally, must pay $3,400,000 as a civil penalty.

14. The Defendants must pay the civil penalty due to the United States by FedWire Electronic Funds Transfer (EFT) to the U.S. Department of Justice account, in accordance with instructions provided to the Defendants by the Financial Litigation Unit ("FLU") of the United States Attorney's Office for the Southern District of Texas after the Effective Date. The payment instructions provided by the FLU will include a Consolidated Debt Collection System ("CDCS") number, which the Defendants must use to identify all payments required to be made in accordance with this Consent Decree. The FLU will provide the payment instructions to:

Julie Solmer Stine, Esq.
Associate General Counsel – Operations and HSE
LyondellBasell
1221 McKinney Street, Suite 300
Houston, Texas 77010

1221 McKinney Street, Suite 300
Houston, Texas 77010

and, electronically to:
julie.solmerstine@lyb.com

on behalf of the Defendants. The Defendants may change the individual to receive payment instructions on its behalf by providing written notice of such change to the United States and EPA in accordance with Section XVI (Notices).

15. At the time of payment, the Defendants must send notice that payment has been made: (i) to the United States via email and regular mail in accordance with Section XVI (Notices) and (ii) to EPA via email at: cinwd_acctsreceivable@epa.gov and regular mail at: EPA Cincinnati Finance Office, 26 W. Martin Luther King Drive, Cincinnati, Ohio 45268. This notice must state that the payment is for the civil penalty owed pursuant to the Consent Decree in *United States v. Equistar Chemicals, LP, et al.* and must reference the civil action number, CDCS Number, and DOJ case number 90-5-2-1-11593.

16. The Defendants must not deduct any penalties paid under this Decree pursuant to this Section or Section IX (Stipulated Penalties) in calculating their federal, state, or local income tax.

V. COMPLIANCE REQUIREMENTS

A. Instrumentation and Monitoring Systems

17. Flare Data and Monitoring Systems and Protocol Report. For each Covered Flare, by no later than the dates set forth in Appendix 1.1, the Applicable Defendant must submit a report, consistent with the requirements in Appendix 1.5, to EPA that includes the following:

a. The information, diagrams, and drawings specified in Paragraphs 1–7 of Appendix 1.5;

b. A detailed description of each instrument and piece of monitoring equipment, including the specific model and manufacturer, that the Applicable Defendant has installed or will install in compliance with Paragraphs 19–23 of this Consent Decree (Paragraphs 8–9 of Appendix 1.5); and

c. A narrative description of the monitoring methods and calculations that the Applicable Defendant will use to comply with the requirements of Paragraph 42 (Paragraph 10 of Appendix 1.5).

18. Installation and Operation of Monitoring and Control Systems on Covered Flares.

a. Except for the compliance schedules for the Interim Measures described in Appendix 2.1, by no later than the compliance dates set forth in Appendix 1.1, the Applicable Defendant must install and commence operation of the instrumentation, controls, and monitoring systems set forth in Paragraphs 19–22 at each Covered Flare except the following Flares: i) Newly Installed Covered Flares, ii) Portable Flares, iii) the Flares that will be removed from service as specified in Paragraph 18.c and iv) the Unassisted Flares (the BDO Flare, Deepwell Flare, and Methanol Continuous Flare).

b. By no later than the date that any Newly Installed Covered Flare or Portable Flare is In Operation and Capable of Receiving Waste, Supplemental, and/or Sweep Gas at a Covered Plant, the Applicable Defendant must complete installation and commence operation of the instrumentation, controls, and monitoring systems set forth in Paragraphs 19–22. The Applicable Defendant must operate the instrumentation, controls, and monitoring systems for each Newly Installed Covered Flare and Portable Flare in accordance with Paragraphs 19–22.

c. Flares that must be removed from service. Instead of complying with the requirements of Paragraphs 17 and 19–22, the IPOH Flare at the Channelview North Plant must be permanently removed from service by no later than June 30, 2021 and the BDU Flare at the Corpus Christi Plant must be permanently removed from service by no later than the Effective

Date.

19. Vent Gas and Assist Steam Monitoring Systems.

a. For each Covered Flare, the Applicable Defendant must install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of Vent Gas in the header or headers feeding that Covered Flare. This system must also be able to continuously analyze pressure and temperature at each point of Vent Gas flow measurement. Different flow monitoring methods may be used to measure different gaseous streams that make up the Vent Gas provided that the flow rates of all gas streams that contribute to the Vent Gas are determined. Flow must be calculated in scfm and pounds per hour.

b. For each Covered Flare that is Steam-Assisted, the Applicable Defendant must install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the volumetric flow rate of Assist Steam used with each Covered Flare. This system must also be able to continuously analyze the pressure and temperature of Assist Steam at a representative point of steam flow measurement. Flow must be calculated in scfm and pounds per hour.

c. Each flow rate monitoring system must be able to correct for the temperature and pressure of the system and output parameters in Standard Conditions.

d. In lieu of a monitoring system that directly measures volumetric flow rate, the Applicable Defendant may choose from the following additional options for monitoring any gas stream:

i. Mass flow monitors may be used for determining the volumetric flow rate of Assist Steam provided that the Applicable Defendant converts

the mass flow rates to volumetric flow rates pursuant to the methodology in Step 2 of Appendix 1.2;

ii. Mass flow monitors may be used for determining the volumetric flow rate of Vent Gas, provided the Applicable Defendant determines the molecular weight of such Vent Gas using compositional analysis data collected pursuant to the monitoring method specified in Paragraph 22.a and provided that the Applicable Defendant converts the mass flow rates to volumetric flow rates pursuant to the methodology in Step 2 of Appendix 1.2; and

iii. Continuous pressure/temperature monitoring system(s) and appropriate engineering calculations may be used in lieu of a continuous volumetric flow monitoring system provided the molecular weight of the gas is known and provided the Applicable Defendant complies with the methodology in Step 2 of Appendix 1.2 for calculating volumetric flow rates. For Vent Gas, the Applicable Defendant must determine molecular weight using compositional analysis data collected pursuant to the monitoring method specified in Paragraph 22.a.

20. Assist Steam Control Equipment. The Applicable Defendant must install and commence operation of equipment, including, as necessary, main and trim control valves and piping which enables the Applicable Defendant to control Assist Steam flow to each Covered Flare that is Steam-Assisted in a manner sufficient to ensure compliance with this Decree.

21. Video Camera. The Applicable Defendant must install and commence operation of a video camera that is capable of monitoring and recording, in digital format, the flame of and any Smoke Emissions from each Covered Flare by the Effective Date. It is not a violation of the Consent Decree, however, if Flare video equipment cannot discern the Flare combustion zone and/or any smoke emissions at a Covered Flare subject to these provisions due to weather conditions such as fog or snow, provided that recordings are created and retained in accordance with the Consent Decree.

22. Vent Gas Compositional Monitoring or Direct Monitoring of Net Heating Value of Vent Gas. For each Covered Flare, the Applicable Defendant must either determine the concentration of individual components in the Vent Gas or directly monitor the Net Heating Value of the Vent Gas (NHV_{vg}) in compliance with one of the methods specified in this Paragraph. The Applicable Defendant may elect to use different monitoring methods (of the methods provided in this Paragraph) for different gaseous streams that make up the Vent Gas, provided the composition or Net Heating Value of all gas streams that contribute to the Vent Gas are determined. The Applicable Defendant must:

a. Install, operate, calibrate, and maintain a monitoring system capable of continuously measuring (*i.e.*, at least once every 15 minutes), calculating, and recording the individual component concentrations present in the Vent Gas; or

b. Install, operate, calibrate, and maintain a calorimeter capable of continuously measuring (*i.e.*, at least once every 15 minutes), calculating, and recording the NHV_{vg} at Standard Conditions. If the Applicable Defendant elects this method, the Applicable Defendant may install, operate, calibrate, and maintain a monitoring system capable of continuously measuring, calculating, and recording the hydrogen concentration in the Vent Gas. The sample extraction point of the calorimeter may be located upstream of the introduction of Supplemental Gas or Sweep Gas or Purge Gas if the composition and flow rate of such gas is known, and if this known value then is used in the calculation of the Net Heating Value of the Vent Gas.

c. If the Applicable Defendant elects the method in Paragraph 22.b, and the Net Heating Value of the Vent Gas exceeds the upper calibrated span of the calorimeter on the Covered Flare, then the Applicable Defendant must use the value of the upper calibrated span of that calorimeter for calculating the NHV_{vg} at Standard Conditions until the Net Heating Value of the Vent Gas returns to within the measured calibrated span. Use of this method will not constitute instrument system downtime for the period of time that the Net Heating Value of the Vent Gas exceeds the upper calibrated span of the calorimeter.

Direct compositional or Net Heating Value monitoring is not required for purchased ("pipeline quality") natural gas streams. The Net Heating Value of purchased natural gas streams may be determined using annual or more frequent grab sampling at any one representative location.

Alternatively, the Net Heating Value of any purchased natural gas stream can be assumed to be 920 BTU/scf.

23. Instrumentation and Monitoring Systems: Optional Equipment for any Covered Flare. To continuously measure and calculate flow of all Pilot Gas to a Covered Flare in scfm and pounds per hour, an Applicable Defendant, at its option, may either: a) install (if not already installed) an instrument, or b) use a restriction orifice and pressure measurements. The Applicable Defendant may use the data generated by this instrument or restriction orifice as part of calculating the Net Heating Value of the Combustion Zone Gas.

24. Instrumentation and Monitoring Systems: Specifications, Calibration, Quality Control, and Maintenance.

a. The instrumentation and monitoring systems identified in Paragraphs 19 and 22 must:

i. Meet or exceed all applicable minimum accuracy, calibration, and quality control requirements specified in Table 13 of 40 C.F.R. Part 63, Subpart CC;

ii. Have an associated readout (*i.e.*, a visual display or record) or other indication of the monitored operating parameter that is readily accessible onsite for operational control or inspection by the Applicable Defendant;

iii. Be capable of measuring the appropriate parameter over the range of values expected for that measurement location; and

iv. Have an associated data recording system with a resolution that is equal to or better than the required instrumentation/system accuracy.

b. The Applicable Defendant must operate, maintain, and calibrate each instrument and monitoring system identified in Paragraphs 19 and 22 according to a monitoring plan that contains the information listed in 40 C.F.R. § 63.671(b)(1)-(5). However, if an Applicable Defendant is determining NHV_{vg} using a process mass spectrometer, the Applicable Defendant

must use the methods established for determining NHV_{vg} as outlined in the February 5, 2018 letter to representatives of Extrel CMS, LLC and AMETEK, Energy and Process Division from Steffan M. Johnson, Group Leader, Measurement Technology Group, Office of Air Quality Planning and Standards (the "Johnson Letter," attached as Appendix 1.8) in lieu of complying with 40 C.F.R. § 63.671(b)(1)-(5)'s requirements for determining NHV_{vg} using a Gas Chromatograph.

c. All Gas Chromatograph monitoring systems used to comply with Paragraph 22.a must also meet the requirements of 40 C.F.R. § 63.671(e)(1) through (3) (Additional Requirements for Gas Chromatographs). All process mass spectrometers used to estimate Waste Gas composition in order to calculate NHV_{vg} must comply with: i) 40 C.F.R. § 63.671(e)(1) and (2) and ii) 40 C.F.R. § 63.671(e)(3) as specified and modified by the Johnson Letter contained in Appendix 1.8

d. For each instrumentation and monitoring system required by Paragraphs 19 and 22 (or installed pursuant to Paragraph 23), the Applicable Defendant must comply with the out-of-control procedures described in 40 C.F.R. § 63.671(c)(1) and (2), and with the data reduction requirements specified in 40 C.F.R. § 63.671(d)(1) through (3).

e. The language in 40 C.F.R. § 63.671, Table 13 of 40 C.F.R. Part 63, Subpart CC, or in any regulatory provision cross-referenced in 40 C.F.R. § 63.671 or Table 13 of 40 C.F.R. Part 63, Subpart CC, that limits the applicability of these regulatory requirements to periods when "regulated material" (as defined in 40 C.F.R. § 63.641) is routed to a Flare, is not applicable for purposes of this Consent Decree. In addition, for purposes of this Decree, the language in 40 C.F.R. § 63.671, Table 13 of 40 C.F.R. Part 63, Subpart CC, or in any regulatory

provision cross-referenced in 40 C.F.R. § 63.671 or Table 13 of 40 C.F.R. Part 63, Subpart CC, that refers to a continuous parametric monitoring system will instead be read to refer to the instrumentation and monitoring systems required by Paragraphs 19 and 22.

f. The Applicable Defendant may elect to utilize the exceptions set forth in 40 C.F.R. § 63.1103(e)(4)(i)-(ix) when complying with this Paragraph.

25. Instrumentation and Monitoring Systems: Recording and Averaging Times. The instrumentation and monitoring systems identified in Paragraphs 19 and 21-23 must be able to produce and record data measurements and calculations for each parameter at the following time intervals:

Instrumentation and Monitoring System	**Recording and Averaging Times**
Vent Gas, Assist Steam Flow Monitoring Systems, and (if installed) Pilot Gas Flow	Measure continuously and record 15-minute block averages
Vent Gas Compositional Monitoring (if using the methodology in Paragraph 22.a.)	Measure no less than once every 15 minutes and record that value
Vent Gas Net Heating Value Analyzer (if using the methodology in Paragraph 22.b.)	Measure continuously and record 15-minute block averages
Video Camera	Record at a rate of no less than 4 frames per minute

The term "continuously" in this Paragraph means to make a measurement as often as the manufacturer's stated design capabilities of the flow monitors (for Vent Gas, Assist Steam, Assist Air, and if installed, Pilot Gas) and the Vent Gas Net Heating Value analyzers during each fifteen (15) minute block period, but in no case shall the flow monitors or the Vent Gas Net Heating Value analyzers make less than one measurement in each fifteen (15) minute block period. The measurement results are then averaged and recorded to represent each fifteen (15) minute block period. Nothing in this Paragraph prohibits the Defendants from setting up process

control logic that uses different averaging times from those in this table, provided that the recording and averaging times in this table are available and used for determining compliance with this Consent Decree.

26. Instrumentation and Monitoring Systems: Operation. The Applicable Defendant must operate each of the instruments and monitoring systems required by Paragraphs 19 and 21-22 and collect data on a continuous basis when the Covered Flare that the instrument and/or monitoring system is associated with is In Operation and Capable of Receiving Sweep, Supplemental, and/or Waste Gas, except for the periods of Instrument Downtime specified in sub-Paragraphs 44(a)-(d).

B. Determining Whether a Covered Flare that has a Water Seal is Not Receiving Potentially Recoverable Gas Flow

27. For each Covered Flare that has a water seal, if all of the following conditions are met, then the Covered Flare is not receiving Potentially Recoverable Gas flow:

a. For the water seal drum associated with the respective Covered Flare, the pressure difference between the inlet pressure and the outlet pressure is less than the water seal pressure as set by the static head of water between the opening of the dip tube in the drum and the water level in the drum;

b. For the water seal drum associated with the respective Covered Flare, the water level in the drum is: (i) at the level of the weir or (ii) if the water level in the drum is measured, the measurement indicates that the water seal is present; and

c. Downstream of the seal drum, there is no flow of Supplemental Gas directed to the Covered Flare.

C. Waste Gas Minimization

28. Initial Waste Gas Minimization Plans ("Initial WGMP"). By no later than the compliance dates set forth in Appendix 1.1, for each Covered Flare except the BDO Flare, Deepwell Flare, and Methanol Continuous Flare, the Applicable Defendant must submit to EPA

an Initial Waste Gas Minimization Plan that discusses and evaluates flaring Prevention Measures on both a plant-wide and Covered Flare-specific basis for each Covered Plant. The Initial WGMP must include, but not be limited to:

a. Waste Gas Characterization and Mapping. The Applicable Defendant must characterize the Waste Gas being disposed of at each Covered Flare and determine its source as follows:

> i. Volumetric (in scfm) and mass (in pounds) flow rate. The Applicable Defendant must identify the volumetric flow of Waste Gas, in scfm on a 30-Day rolling average, and the mass flow rate, in pounds per hour on a 30-Day rolling average, vented to each Covered Flare for the one-year period of time ending 180 Days before the submission of the Initial WGMP. To the extent that, for any particular Covered Flare, the Applicable Defendant has instrumentation capable of measuring and/or calculating the volumetric and mass flow rate of hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam) in the Waste Gas, the Applicable Defendant may calculate the volumetric and mass flow of: (i) all Waste Gas flows excluding hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam); and (ii) hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam) flows in the Waste Gas. The Defendants may use either an engineering evaluation or measurements from monitoring or a combination to determine flow rate. In determining flow rate, except as provided in the next sentence, flows during all periods must be included (including but not limited to normal operations and periods of startup, shutdown, Malfunction, process upsets, relief valve leakages, utility losses due to an interruptible utility service agreement, and emergencies arising from events within the boundaries of the Covered Plants). Flows that could not be prevented through reasonable planning and are in anticipation of or caused by a natural disaster, act of war or terrorism, or External Utility Loss are the only flows that may be excluded from the calculation of flow rate. The Applicable Defendant must provide the date, time, and nature of the event that results in the exclusion of any flows from the calculation.
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> ii. Baseload Waste Gas Flow Rates. The Applicable Defendant must use flow rate data for the one-year period ending 180 Days before the submission of the Initial WGMP to determine the Baseload Waste Gas Flow Rate, in scfd, to each Covered Flare.

iii. Identification of Constituent Gases. The Applicable Defendant must use best efforts to identify the constituent gases within each Covered Flare's Waste Gas and the percentage contribution of each such constituent during baseload conditions. The Applicable Defendant may use an engineering evaluation, measurements from monitoring, or a combination of both to determine Waste Gas constituents.

iv. Waste Gas Mapping. Using all available information including, but not limited to, instrumentation, isotopic tracing, and/or engineering calculations, the Applicable Defendant must identify and estimate the flow from each process unit header (sometimes referred to as a "sub-header") to the main header(s) servicing each Covered Flare. Using that information, the Applicable Defendant must complete an identification of each Waste Gas tie-in to the main header(s) and process unit header(s), as applicable, consistent with Appendix 1.7. Temporary connections to the main header(s) of a Covered Flare and/or process unit header(s) are not required to be included in the mapping.

b. Reductions Previously Realized. The Applicable Defendant must describe the equipment, processes, and procedures installed or implemented to reduce flaring at the Covered Flares for the period between the Effective Date and 60 Days prior to the submission of the Initial WGMP. The description must specify the date of installation or implementation and the amount of reductions (in both flow and mass of pollutants) realized.

c. Planned Reductions. The Applicable Defendant must describe any equipment, processes, or procedures the Applicable Defendant plans to install or implement to eliminate or reduce flaring from the Covered Flares. The description must specify a schedule for expeditiously installing and commencing operation of any equipment, process, or procedures the Applicable Defendant plans to install, add, or implement to minimize flaring. The description must also include a projection of the amount of reductions to be realized. After submitting the Initial WGMP, the Applicable Defendant may revise the installation and operation dates provided the Applicable Defendant: i) does so in writing to EPA before the First Updated Waste Gas Minimization Plan is due, and ii) provides a reasonable explanation for the revised date. In

formulating this plan, the Defendants must review and evaluate the results of the Waste Gas Mapping required by sub-Paragraph 28.a.iv. Any schedule revision accompanied by a reasonable explanation and made before the First Updated Waste Gas Minimization Plan is due shall be considered part of the Initial Waste Gas Minimization Plan.

d. Taking a Covered Flare Permanently Out of Service or Converting a Covered Flare to an Unassisted Flare. The Applicable Defendant must identify any Covered Flare it intends to take permanently out of service or convert to an Unassisted Flare, including the date the Covered Flare is taken permanently out of service or converted into an Unassisted Flare. Taking a Covered Flare "permanently out of service" means physically removing piping in the Flare header or physically isolating the piping with a welded blind so as to eliminate direct piping to the Covered Flare, and surrendering any permit to operate such Covered Flare. Converting a Covered Flare into an Unassisted Flare means physically removing piping used to provide Assist Steam or Assist Air or physically isolating such piping with a welded blind so as to eliminate direct piping of Assist Steam or Assist Air to the Covered Flare.

e. Prevention Measures. The Applicable Defendant must describe and evaluate all Prevention Measures, including a schedule for expeditiously implementing and commencing operation of all Prevention Measures, to address the following:

> i. Flaring that has occurred or may reasonably be expected to occur during planned maintenance activities, including startup and shutdown. The evaluation must include a review of flaring from the Covered Flares that has occurred during these activities in the three years prior to the compliance dates set forth in Appendix 1.1 and must consider the feasibility of performing these activities without flaring; and
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> ii. Flaring caused by the recurrent failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. The evaluation of flaring from the Covered Flares must consider the adequacy of existing maintenance schedules and protocols for such

equipment. A failure is "recurrent" if it occurs more than twice during any five-year period as a result of the same cause.

29. First Updated Waste Gas Minimization Plans ("First Updated WGMP"). By no later than the compliance dates set forth in Appendix 1.1, the Applicable Defendant must submit to EPA a First Updated WGMP that updates, if and as necessary based on any changes, the information, diagrams, and drawings required in the Flare Data and Monitoring Systems and Protocol Report required by Paragraph 17 and the information required in sub-Paragraphs 28.a–28.e for the 12-month period after the period covered by the Initial Waste Gas Minimization Plans. The First Updated WGMP must also include:

a. Updated Waste Gas Mapping. The Applicable Defendant must update the Waste Gas mapping from each process unit header (sometimes referred to as a "sub-header") to the main header(s) servicing each Covered Flare, if more information relevant to Waste Gas Mapping becomes available. The Applicable Defendant must use this updated mapping to plan any reductions in Waste Gas flow;

b. Reductions Based on Root Cause Analysis. The Applicable Defendant must review all of the root cause analysis reports submitted under Paragraph 33 to determine if reductions in addition to the reductions achieved through any required corrective action under Paragraph 34 can be realized; and

c. Revised Schedule. To the extent the Applicable Defendant proposes to extend any schedule set forth in the Initial WGMP or subsequent WGMP, the Applicable Defendant may do so only with good cause, the determination of which is subject to Section XI (Dispute Resolution).

30. Subsequent Updates to WGMPs ("Subsequently Updated WGMP"). On an annual basis after submitting the First Updated WGMP and continuing until an Applicable Defendant has achieved compliance with all provisions of this Section V (Compliance Requirements) applicable to a Covered Plant other than the requirements of this Paragraph, the Applicable Defendant must submit an updated WGMP for a Covered Plant as part of the Semi-Annual Report required by Section VIII (Reporting Requirements) if, at that Covered Plant, the Applicable Defendant: a) commences operation of a Newly Installed Covered Flare or permanently removes a Covered Flare from service, b) connects a new Waste Gas stream to a Covered Flare, c) intentionally modifies the Baseload Waste Gas Flow Rate to a Covered Flare, d) installs additional FGRS, or e) changes the design of a Covered Flare (including, but not limited to, converting a Covered Flare to an Unassisted Flare). Each update must update, if and as necessary, the information required in sub-Paragraphs 28.a.i - 28.a.iii. and sub-Paragraphs 29.a and 29.b, as applicable. To the extent the Applicable Defendant proposes to extend any schedule set forth in a previous WGMP (excepting schedule changes made to the Initial Waste Gas Management Plan prior to the First Updated Waste Gas Management Plan as described in Paragraph 28.c) for any of the Covered Facilities, the Applicable Defendant may do so only with good cause, the determination of which is subject to Section XI (Dispute Resolution).

31. Waste Gas Minimization Plan: Implementation. By no later than the dates specified in a WGMP, the Applicable Defendant must implement the actions described therein.

32. Enforceability of WGMPs. The terms of each WGMP (including Initial, First Updated, and Subsequently Updated WGMPs) submitted under this Consent Decree are specifically enforceable.

33. Root Cause Analysis for Reportable Flaring Incidents.

a. Internal Reporting and Recordkeeping. Commencing no later than the compliance dates set forth in Appendix 1.1, except as provided in Paragraph 35, the Applicable Defendant must conduct an investigation into the root cause(s) of each Reportable Flaring Incident at any of the Covered Plants and prepare and keep as a record an internal report that contains the information listed below. The Applicable Defendant must conduct the investigation into the root cause(s) of each Reportable Flaring Incident and prepare the internal report by no later than 45 Days following the end of a Reportable Flaring Incident. The internal report must include, at a minimum, the following information:

i. The date and time that the Reportable Flaring Incident started and ended;

ii. The measured volume of Waste Gas flared and an estimate of the individual quantities of VOCs and HAPs that were emitted during the Reportable Flaring Incident and the calculations that were used to determine the quantities;

iii. The steps, if any, the Applicable Defendant took to limit the duration of the Reportable Flaring Incident, and to limit the quantity of VOC and HAP emissions associated with the Reportable Flaring Incident;

iv. A detailed analysis that sets forth the root cause and all contributing causes of the Reportable Flaring Incident, to the extent determinable;

v. An analysis of the measures, if any, that are available to reduce the likelihood of a recurrence of a Reportable Flaring Incident resulting from the same root cause or contributing causes. The analysis must discuss the alternatives, if any, that are available, the probable effectiveness and the cost of the alternatives, if an alternative is eliminated based on cost. Possible design, operation, and maintenance changes must be evaluated. If the Applicable Defendant concludes that corrective action(s) is (are) required under Paragraph 34, the report must include a description of the action(s) and, if not already completed, a schedule for its (their) implementation, including proposed commencement and completion dates. If the Applicable Defendant concludes that corrective action is not required under Paragraph 34, the report must explain the basis for that conclusion; and

vi. To the extent that investigations of the causes or possible corrective

actions are still underway 45 Days after the Reportable Flaring Incident ended, a statement of the anticipated date by which a follow-up report fully conforming to the requirements of this Paragraph will be completed.

b. Submitting Summary of Internal Flaring Incident Reports. In each Semi-Annual Report due under Section VIII (Reporting Requirements), the Applicable Defendant must include a summary of the following items for each Reportable Flaring Incident that occurred during the six-month period that the Semi-Annual Report covers:

i. Date;

ii. Duration;

iii. Amount of VOCs and HAPs emitted;

iv. Root cause(s);

v. Corrective action(s) completed;

vi. Corrective action(s) still outstanding; and

vii. An analysis of any trends identified by the Applicable Defendant in the number of Reportable Flaring Incidents, the root causes, or the types of corrective action(s).

34. Corrective Action Implementation. In response to any Reportable Flaring Incident, the Applicable Defendant must take, as expeditiously as practicable, such interim and long-term corrective actions, if any, as are consistent with good engineering practice to minimize the likelihood of a recurrence of the root cause and all contributing causes of that Reportable Flaring Incident.

35. In lieu of preparing a new report under Paragraph 33 and analyzing and implementing corrective action under Paragraph 34 for a Reportable Flaring Incident that has as its root cause the same root cause as a previously reported Reportable Flaring Incident, the

Applicable Defendant may cross-reference and use the prior report and analysis when preparing the report required by Paragraph 33.

D. Flare Gas Recovery Systems, Other Waste Gas Minimization Equipment and Operational Procedures

36. Plant-Specific Requirements.

a. Channelview FGRS. Prior to the Date of Lodging, Defendant Equistar Chemicals, LP completed installation and commenced operation of: (i) an Eductor system with a Design Capacity of 1,000 scfm on the Channelview North Plant's OP1 Flare header and (ii) an Eductor system with a Design Capacity of 1,000 scfm on the Channelview North Plant's OP2 Flare header (collectively, the "Channelview FGRS"). Defendant Equistar Chemicals, LP must continue to assure that the Channelview FGRS is in good working order and must comply with the Operation and Availability Requirements of Paragraph 37.

b. La Porte FGRS. By no later than the compliance date set forth in Appendix 1.1, Defendant Equistar Chemicals, LP must complete installation and commence operation of an Eductor system with a Design Capacity of 1,000 scfm on the La Porte Plant's QE-1 Flare header (the "La Porte FGRS"). By no later than the compliance date set forth in Appendix 1.1, Defendant Equistar Chemicals, LP must assure that the La Porte FGRS is in good working order and must comply with the Operation and Availability Requirements of Paragraph 37.

c. Clinton Plant Waste Gas Minimizing Equipment and Operational Procedures. Prior to the Date of Lodging, Defendant Equistar Chemicals, LP completed installation and commenced operation of the "Clinton Plant Waste Gas Minimizing Equipment and Operational Procedures" required by Appendix 1.6 of this Consent Decree. The Clinton Plant Waste Gas Minimizing Equipment and Operational Procedures include equipment designed to collect

certain Waste Gas streams and return them to process and operational practices to collect certain Waste Gas streams and return them to process. Defendant Equistar Chemicals, LP must continue the Clinton Plant Waste Gas Minimizing Procedures, and must continue to assure that the Clinton Plant Waste Gas Minimizing Equipment is in good working order and can comply with the Operation and Availability Requirements of Paragraph 37.

d. Corpus Christi Plant Waste Gas Minimizing Equipment and Operational Procedures. Prior to the Date of Lodging, Defendant Equistar Chemicals, LP completed installation and commenced operation of the "Corpus Christi Plant Waste Gas Minimizing Equipment and Operational Procedures" required by Appendix 1.6 of this Consent Decree. The Corpus Christi Plant Waste Gas Minimizing Equipment and Operational Procedures include equipment designed to collect certain Waste Gas streams and return them to process and operational practices to collect certain Waste Gas streams and return them to process. Defendant Equistar Chemicals, LP must continue the Corpus Christi Plant Waste Gas Minimizing Procedures, and must assure that the Corpus Christi Waste Gas Minimizing Equipment is in good working order and is capable of complying with the Operation and Availability Requirements of Paragraph 37.

37. FGRS and Waste Gas Minimizing Equipment: Operation and Availability Requirements.

a. General. After the applicable compliance deadlines set forth in Appendix 1.1, the Defendant Equistar Chemicals, LP must operate each FGRS and each set of Waste Gas Minimizing Equipment required in Appendix 1.6 in a manner to minimize Waste Gas to the applicable Covered Flares while ensuring safe chemical plant operations. Defendant Equistar Chemicals, LP also must operate each FGRS and each set of Waste Gas Minimizing Equipment

required in Appendix 1.6 consistent with good engineering and maintenance practices and in accordance with its design and the manufacturer's specifications. Nothing in this Paragraph 37 will require the Applicable Defendants to recover Regeneration Waste Streams in an FGRS.

b. Requirements Related to FGRS and Waste Gas Minimizing Equipment Operating Time. By no later than the applicable compliance dates set forth in Appendix 1.1, the Applicable Defendant must comply with the following requirements for each FGRS and each set of Waste Gas Minimizing Equipment required in Appendix 1.6 when Potentially Recoverable Gas is being generated:

i. Channelview Plant FGRS Operation and Availability. The Channelview North Plant OP1 FGRS must have an Eductor Available for Operation or in operation 98% of the time. The Channelview North Plant OP2 FGRS must have an Eductor Available for Operation or in operation 98% of the time. The periods provided for in sub-Paragraphs 37.c. and 37.d. below may be included in the amount of time that an Eductor is Available for Operation when determining compliance with the requirement to have an Eductor Available for Operation or in operation.

ii. La Porte Plant FGRS Operation and Availability. The La Porte Equistar Plant FGRS must have an Eductor Available for Operation or in operation 98% of the time. The periods provided for in sub-Paragraphs 37.c. and 37.d. below may be included in the amount of time that an Eductor is Available for Operation when determining compliance with the requirement to have an Eductor Available for Operation or in operation.

iii. Clinton Plant Waste Gas Minimizing Equipment and Operational Procedures: Availability. The Clinton Plant Waste Gas Minimizing Equipment, as described in and required by Appendix 1.6 (the Vent Stream Recovery System (the "Dephlegmator") and the Tank Farm Ethylene Vent Recovery System), must be in operation 98% of the time. The Clinton Waste Gas Minimizing Procedures, as described and required by Appendix 1.6 (Flare Minimization Regeneration Procedures) must be implemented during regeneration in 98% of the hours during which regeneration is occurring in each 8,760 hour-period, rolled hourly.

iv. Corpus Christi Plant Waste Gas Minimizing Equipment and Operational Procedures: Availability. The Corpus Christi Plant Waste Gas Minimizing Equipment, as described in and required by Appendix 1.6 (Vent Recovery System and Pyrolysis Stripper Vent Recovery System), must be in operation 98% of the time. The Corpus Christi Waste Minimizing Operational Procedures, as described and required by Appendix 1.6 (Flare Minimization Regeneration Procedures), must be implemented during regeneration in 98% of the hours during which regeneration is occurring in each 8,760 hour-period, rolled hourly.

c. Maintenance of FGRS. Periods of maintenance on and subsequent restart of the Eductor(s) may be included in the amount of time that an Eductor is Available for Operation when determining compliance with the requirement to have an Eductor Available for Operation or in operation; provided however, these periods of maintenance and subsequent restart must not exceed 1,344 hours per Eductor in a five-year rolling sum period, rolled daily. Defendant Equistar Chemicals, LP must use best efforts to schedule maintenance activities during a Turnaround of the process units venting to the Covered Flare(s) served by the applicable FGRS.

To the extent it is not practicable to undertake these maintenance activities during a Turnaround of these units, Defendant Equistar Chemicals, LP must use best efforts to minimize the generation of Waste Gas during such periods.

d. Averaging Periods.

i. For purposes of calculating compliance with the period of time that an Eductor must be Available for Operation and/or in operation, as required by sub-Paragraphs 37.b.i and b.ii, the period to be used must be an 8,760-hour rolling sum, rolled hourly, using only hours when Potentially Recoverable Gas was generated during all or part of the hour but excluding hours for flows that could not have been prevented through reasonable planning and were in anticipation of or caused by a natural disaster, act of war or terrorism, or External Utility Loss. When no Potentially Recoverable Gas was generated during an entire hour, then that hour must not be used in computing the 8,760-hour rolling sum. The rolling sum must include only the previous 8,760 1-hour periods when Potentially Recoverable Gas was generated during all or part of the hour, provided that the Potentially Recoverable Gas was not generated by flows that could not have been prevented through reasonable planning and were in anticipation of or caused by a natural disaster, act of war or terrorism, or External Utility Loss.

ii. For the purposes of calculating compliance with the period of time that the Waste Gas Minimizing Equipment must be in operation, as required by Paragraphs 37.b.iii and b.iv, the period of time to be used must be an 8,760-hour period rolling sum, rolled hourly, but this sum may exclude hours occurring during a Turnaround of the emissions units that normally vent to or receive Waste Gas from the Waste Gas Minimizing Equipment.

E. Flare Combustion Efficiency

38. General Emission Standards Applicable to Covered Flares. By no later than the Effective Date, the Applicable Defendant must comply with the requirements set forth in this Paragraph at each Covered Flare at all times when that Covered Flare is In Operation.

a. Operation During Emissions Venting. The Applicable Defendant must operate each Covered Flare at all times when emissions may be vented to it.

b. No Visible Emissions. The Applicable Defendant must specify the smokeless design capacity of each Covered Flare and operate with no Visible Emissions, except for periods not to exceed a total of 5 minutes during any 2 consecutive hours, when the Covered Flare is In Operation and the Vent Gas flow is less than the smokeless design capacity of the Covered Flare. For purposes of this Consent Decree, Visible Emissions may be determined by a person trained in accordance with Section 2.3 of Method 22 or documented by a video camera. By no later than the Effective Date, the Applicable Defendant must monitor for Visible Emissions from each Covered Flare while it is In Operation as specified below in sub-Paragraphs 38.b.i or ii. An initial Visible Emissions demonstration must be conducted using an observation period of 2 hours using Method 22 at 40 C.F.R. Part 60, Appendix A–7. Subsequent Visible Emissions observations must be conducted using either method listed in sub-Paragraphs 38.b.i or ii. The Applicable Defendant must record and report any instances where Visible Emissions are observed for more than 5 minutes during any 2 consecutive hours as specified in 40 C.F.R. § 63.655(g)(11)(ii).

i. At least once per Day, the Applicable Defendant must conduct Visible Emissions observations using an observation period of 5 minutes using Method 22 at 40 C.F.R. Part 60, Appendix A–7. If at any time a Defendant

sees Visible Emissions, even if the minimum required daily Visible Emission monitoring has already been performed, the Applicable Defendant must immediately begin an observation period of 5 minutes using Method 22 at 40 C.F.R. Part 60, Appendix A–7. If Visible Emissions are observed for more than one continuous minute during any 5-minute observation period, the observation period using Method 22 at 40 C.F.R. Part 60, Appendix A–7 must be extended to 2 hours or until 5 minutes of Visible Emissions are observed.

ii. Alternatively, the Applicable Defendant may use a video surveillance camera to continuously record (at least one frame every 15 seconds with time and date stamps) images of the Flare flame at a reasonable distance above the Flare flame, and at an angle suitable for Visible Emissions observations. The Applicable Defendant must provide real-time video surveillance camera output to the control room or other continuously staffed location where the camera images may be viewed at any time.

c. Pilot Flame Presence. The Applicable Defendant must operate each Covered Flare with a pilot flame present at all times. The Applicable Defendant must continuously monitor the presence of the pilot flame(s) using a device (including, but not limited to, a thermocouple, ultraviolet beam sensor, or infrared sensor) capable of detecting that the pilot flame is present.

d. Monitoring According to Applicable Provisions. The Applicable Defendant must comply with all applicable Subparts of 40 C.F.R. Parts 60, 61, or 63 that state how a particular Covered Flare must be monitored.

e. Good Air Pollution Control Practices. At all times, including during periods of startup, shutdown, and/or Malfunction, the Applicable Defendant must implement good air pollution control practices to minimize emissions from each Covered Flare. Nothing in this sub-Paragraph 38.e requires the Defendants to install or maintain Flare monitoring equipment in addition to or different from the equipment required by this Consent Decree.

39. Flare Tip Velocity or V_{tip}. By no later than the Effective Date, the Applicable Defendant must operate each Covered Flare in compliance with either sub-Paragraph 39.a. or

39.b. below, provided that the appropriate monitoring systems are in place, whenever the Vent Gas flow rate is less than the smokeless design capacity of the Covered Flare.

a. The actual Flare Tip Velocity (Vtip) must be less than 60 feet per second. The Defendants must monitor Vtip using the procedures specified in Appendix 1.2, or

b. Vtip must be less than 400 feet per second and also less than the maximum allowed Flare Tip Velocity (Vmax) as calculated according to Equation 11 in Appendix 1.2. The Defendants must monitor Vtip and gas composition, and must determine NHV_{vg} using the procedures specified in Appendix 1.2. The Unobstructed Cross Sectional Area of the Flare Tip must be calculated consistent with Appendix 1.3.

40. Revisions to 40 C.F.R. §§ 60.18(b)–(f) and/or 63.11(b). From the Effective Date until termination of this Consent Decree, if revisions are made to 40 C.F.R. §§ 60.18(b)–(f) and/or 63.11(b) that become final and effective, but are inconsistent with any of the requirements in Paragraphs 38.a–d, 39, or 42.a, the Defendants must comply with the final, effective regulations and any requirements in Paragraphs 38.a–d, 39, or 42.a, that are not inconsistent with the final, effective regulations. Notwithstanding the preceding sentence, if EPA determines by Alternative Means of Emissions Limitation (AMEL) or applicable regulation that compliance with the 270 NHV_{cz} can be used in lieu of the NHV_{vg} requirements, the Applicable Defendant shall be in compliance with this Consent Decree by complying with the approved AMEL or applicable regulation and the Applicable Defendant will no longer need to comply with the Consent Decree's NHV_{vg} requirement in Paragraph 42.a.

41. Operation According to Design. By no later than the Effective Date, the Applicable Defendant must operate and maintain each Covered Flare in accordance with its design and the requirements of this Consent Decree.

42. Net Heating Value Standards. The Defendants must comply with the following Net Heating Value standards, except as provided in Paragraph 44 (Standard During Instrument Downtime).

a. Net Heating Value of Vent Gas (NHV_{vg}).

i. Net Heating Value of Vent Gas (NHV_{vg}) for all Covered Flares except Unassisted Flares. Beginning on the Effective Date and continuing until the earlier of: (i) termination of this Consent Decree; or (ii) the requirements in 40 C.F.R. §§ 60.18(c)(3)(ii) and 63.11(b)(6)(ii) related to the NHV_{vg} are modified (whether in those regulations, in any applicable NESHAP/NSPS regulation, or by applicable AMEL), the Applicable Defendant must operate each Covered Flare, except Unassisted Flares, with an NHV_{vg} of greater than or equal to 300 BTU/scf determined on a 15-minute block period basis when Waste Gas is routed to the Covered Flare for at least 15 minutes. The Applicable Defendant must monitor and calculate NHV_{vg} at each Covered Flare in accordance with Appendix 1.2.

ii. Net Heating Value of Vent Gas (NHV_{vg}) for Unassisted Flares. Beginning on the Effective Date, the Applicable Defendant must operate each Unassisted Flare with an NHV_{vg} of greater than or equal to 200 BTU/scf determined on a 15-minute block period basis when Waste Gas is

routed to the Unassisted Flares for at least 15 minutes. The Applicable Defendant must calculate NHV_{vg} for the BDO Flare, Deepwell Flare, and Methanol Continuous Flare in accordance with Appendix 2.3.

b. Net Heating Value of Combustion Zone Gas (NHV_{cz}) for all Covered Flares except Unassisted Flares. By no later than the compliance dates set forth in Appendix 1.1, at any time a Covered Flare, other than an Unassisted Flare, is In Operation, the Applicable Defendant must operate that Flare so as to maintain the NHV_{cz} at or above 270 BTU/scf determined on a 15-minute block period basis when Waste Gas is routed to the Covered Flare for at least 15 minutes. The Applicable Defendant must monitor and calculate NHV_{cz} at each Covered Flare in accordance with Appendix 1.2.

43. 98% Combustion Efficiency. By no later than the applicable date set forth in Appendix 1.1, the Applicable Defendant must operate each Covered Flare with a minimum of a 98% Combustion Efficiency at all times when Waste Gas is vented to it. To demonstrate continuous compliance with the 98% Combustion Efficiency, the Applicable Defendant must operate each Covered Flare in compliance with the applicable requirements in Paragraph 42.b (for Covered Flares except Unassisted Flares) or Paragraph 42.a.ii (for Unassisted Flares).

44. Standard During Instrument Downtime. If one or more of the following conditions (collectively referred to as "Instrument Downtime") is present and renders an Applicable Defendant incapable of operating a Covered Flare in accordance with the applicable NHV standards in Paragraph 42, the Applicable Defendant must operate that Covered Flare in accordance with good air pollution control practices so as to minimize emissions and ensure good Combustion Efficiency at that Covered Flare:

a. Malfunction of an instrument needed to meet the requirement(s);

b. Repairs following Malfunction of an instrument needed to meet the requirement(s);

c. Recommended scheduled maintenance of an instrument in accordance with the manufacturer's recommended schedule, for an instrument needed to meet the requirement(s); and/or

d. Quality Assurance/Quality Control activities on an instrument needed to meet the requirement(s).

Instrument Downtime must be calculated in accordance with 40 C.F.R. § 60.13(h)(2). In no event shall Instrument Downtime exceed 5% of the time in each Semi-Annual Period that the Covered Flare affected by the Instrument Downtime is In Operation. For purposes of calculating the percentage of Instrument Downtime allowed by this Paragraph, the time used for NHV Analyzer, mass spectrometer, or gas chromatograph calibration and validation activities may be excluded. Nothing in this Paragraph is intended to prevent an Applicable Defendant from asserting Force Majeure as provided in Section X as the cause of any period of Instrument Downtime.

45. Recordkeeping for All Covered Flares: Timing and Substance. The Applicable Defendant must comply with the following recordkeeping requirements:

a. By no later than the compliance date set forth in Appendix 1.1 for each Covered Flare, the Applicable Defendant must calculate and record each of the following parameters:

i. Volumetric flow rates of all gas streams that contribute to the Vent Gas volumetric flow rate (in scfm) (in 15-minute block averages and in accordance with any calculation requirements of Paragraphs 19, 25, and and Step 2 of Appendix 1.2 (for Covered Flares except Unassisted Flares) or in accordance with Appendix 2.3 (for Unassisted Flares));

ii. Assist Steam volumetric flow rate (in scfm) (in 15-minute block averages and in accordance with any calculation requirements of Paragraphs 19, 25, and Step 2 of Appendix 1.2) (for Steam-Assisted Flares);

iii. NHV_{vg} (in BTU/scf) (in 15-minute block averages in accordance with Step 1 of Appendix 1.2 (for Covered Flares except Unassisted Flares) or in accordance with Appendix 2.3 (for Unassisted Flares)); and

iv. NHV_{cz} (in BTU/scf) (in 15-minute block averages in accordance with Step 3 of Appendix 1.2 (for Covered Flares except Unassisted Flares).

b. By no later than the compliance date set forth in Appendix 1.1 for each Covered Flare, the Applicable Defendant must record the duration of all periods of Instrument Downtime for each Covered Flare that exceed 5% of the time in a Semi-Annual Period that the Covered Flare is In Operation. The Applicable Defendant must record which instrument(s) experienced the downtime, which Covered Flare was affected by the downtime, an explanation of the cause(s) of the deviation, and a description of the corrective action(s) that the Applicable Defendant took.

c. By no later than the compliance dates set forth in Appendix 1.1, the Applicable Defendant must record the dates and times of any periods that the Applicable Defendant deviates from the standards in Paragraph 37.b. The Applicable Defendant must also record the duration of the deviation, an explanation of the cause(s) of the deviation, and a description of the corrective action(s) that the Applicable Defendant took.

d. By no later than the compliance dates set forth in Appendix 1.1, at any time that the Applicable Defendant deviates from the emissions standards in Paragraphs 42-44 at any Covered Flare, the Applicable Defendant must record the duration of the deviation, an explanation of the cause(s) of the deviation, and a description of the corrective action(s) that the Applicable Defendant took.

F. Fenceline Monitoring Project Requirements

46. The Applicable Defendant must maintain and operate at each Covered Plant a Fenceline Monitoring Project in accordance with Appendix 2.2.

VI. PERMITS

47. Permits Needed for Compliance Obligations. The Defendants must obtain all federal, state, and local permits necessary for performing any compliance obligation under this Consent Decree including, without limitation, permits for the construction of pollution control technology and the installation of equipment at each Covered Plant. The Defendants may seek relief under the provisions of Section X (Force Majeure) for any delay in performing any such obligation resulting from a failure to obtain, or a delay in obtaining, any permit or approval required to fulfill such obligation, provided that the Defendants have submitted timely and complete applications and have taken all other actions necessary to obtain all such permits or approvals.

48. Permits to Ensure Survival of Consent Decree Limits and Standards after Termination of Consent Decree.

a. For the Clinton Plant.

i. By no later than one year after the Effective Date or one year after the applicable Appendix 1.1 deadlines for each compliance requirement listed in Paragraph 48.c, whichever is later, the Applicable Defendant must complete and submit to the necessary permitting authorities in the State of Iowa appropriate applications to incorporate the requirements listed in sub-Paragraph 48.c, as applicable, into a non-Title V federally enforceable permit for the Clinton Plant, such that the requirements listed in sub-Paragraph 48.c: (i) become and remain "applicable requirements" as that term is defined in 40 C.F.R. § 70.2 and (ii) survive the termination of this Consent Decree.

ii. By no later than three years after the Effective Date or one year after the applicable Appendix 1.1 deadline for each compliance requirement listed in Paragraph 48.c, whichever is later, the Applicable Defendant must complete and submit to the necessary permitting authorities in the State of Iowa appropriate applications to modify, amend, or revise the Title V permit for the Clinton Plant

to incorporate the requirements listed in sub-Paragraph 48.c into that plant's federally enforceable Title V permit.

b. For the Channelview, Corpus Christi, and La Porte Plants.

i. By no later than one year after the Effective Date or one year after the applicable Appendix 1.1 deadline for each compliance requirement listed in Paragraph 48.c, whichever is later, the Applicable Defendant must complete and submit to the necessary permitting authorities in the State of Texas appropriate applications to incorporate the requirements listed in sub-Paragraph 48.c, as applicable, into non-Title V, federally enforceable permits for the Channelview Plants, the Corpus Christi Plant, and the La Porte Plant, such that the requirements listed in sub-Paragraph 48.c: (i) become and remain "applicable requirements" as that term is defined in 40 C.F.R. § 70.2 and (ii) survive the termination of this Consent Decree.

ii. By no later than three years after the Effective Date or one year after the applicable Appendix 1.1 deadline for each compliance requirement listed in Paragraph 48.c, whichever is later, the Applicable Defendant must complete and submit to the necessary permitting authorities in the State of Texas appropriate applications to modify, amend, or revise the Title V permit for each of the Channelview Plants, the Corpus Christi Plant, and the La Porte Plant to incorporate the requirements listed in sub-Paragraph 48.c into each plant's federally enforceable Title V permit.

c. The following requirements of the Consent Decree shall survive termination: Paragraphs 18–22 (Instrumentation and Monitoring Systems), Paragraphs 24–26 (Specifications, Calibration, Quality Control, and Maintenance/Recording and Averaging Times/Operation), Paragraph 27 (Determining whether Flare has Potentially Recoverable Gas), Paragraph 37 (FGRS and Waste Gas Minimizing Equipment: Operation and Availability Requirements), Paragraphs 38–39 (Flaring Efficiency Standards), Paragraph 41 (Operation According to Design), Paragraph 42.a.ii (NHV_{vg} Standard for Unassisted Flares), Paragraph 42.b (NHV_{cz} Standards), Paragraph 43 (98% CE), Paragraph 44 (Standard During Instrument Downtime), Paragraph 45 (Recordkeeping), and Paragraph 46 (Fenceline Monitoring Project Requirements). Nothing in this Paragraph shall prohibit the Defendants from seeking to

incorporate Paragraph 23 (Optional Equipment) in a permit that survives termination of this Decree.

49. The permit applications and process of incorporating the requirements of this Consent Decree into Title V Permits must be in accordance with applicable state or local Title V rules, including applicable administrative amendment provisions of such rules. The Parties agree that the incorporation may be by "amendment" under 40 C.F.R. § 70.7(d) and analogous state Title V rules, where allowed by state law.

50. Following submission of the complete permit applications, the Defendants must cooperate with IDNR and TCEQ by promptly submitting all available information that either state agency seeks following its receipt of the permit materials.

VII. EMISSION CREDIT GENERATION

51. Prohibitions.

a. Definition. "CD Emissions Reductions" means any NOx, VOC, PM, PM_{TOTAL}, PM_{10}, $PM_{2.5}$, HAP, or CO emissions reductions that result from any projects conducted or controls used to comply with this Consent Decree.

b. The Defendants must not apply for, obtain, trade, sell, generate, or use CD Emissions Reductions:

i. As netting reductions,

ii. As emissions offsets, or

iii. For the purpose of determining whether a project would result in a significant emissions increase or significant net emissions increase in any major or minor NSR permit or permit proceeding, or for the purpose of obtaining offsets in any non-attainment NSR permit or permit proceeding. Baseline actual emissions during any 24-month period selected by the Defendants must be adjusted downward to exclude any portion of the baseline emissions that would have been eliminated as CD Emissions

Reductions (including the Waste Gas Minimization Requirements of Section C) had the Defendants been complying with this Consent Decree during that 24-month period.

52. Outside the Scope of the Prohibition. Nothing in this Section is intended to prohibit the Defendants from using or generating:

a. Emission reductions, netting credits, or emission offsets from process units at a Covered Plant that are not subject to an emission limitation pursuant to this Consent Decree;

b. CD Emissions Reductions for a Covered Plant's compliance with any rules or regulations designed to address regional haze or the non-attainment status of any area (excluding NSR rules, but including, for example, Reasonably Available Control Technology rules) that apply to a Covered Plant; provided, however, that the Defendants must not trade or sell any CD Emissions Reductions; and

c. CD Emissions Reductions for purposes of the State of Iowa or State of Texas air toxics modeling programs.

VIII. REPORTING REQUIREMENTS

53. Semi-Annual Reports. By no later than February 28th and August 31st of each year after the Effective Date, until termination of this Decree pursuant to Section XX, the Applicable Defendant must submit a "Semi-Annual Report" to EPA, except that the first Semi-Annual Report shall be due 60 Days after the first full half year after the Effective Date of this Consent Decree (a "half year" runs between January 1 and June 30 and between July 1 and December 31). Each Semi-Annual Report must contain the following information for the preceding six months (the "Semi-Annual Period") (*i.e.*, January through June will be addressed in the report to be submitted by August 31, and July through December will be addressed in the report submitted by February 28), except that the first Semi-Annual Report will cover the period between the Effective Date through the end of the first full half year:

a. A description of the status of work performed and progress made

toward implementing all requirements of Section V (Compliance Requirements) at the Covered Plants. This topic should describe any major milestones completed and remaining to be completed;

b. A description of any problems encountered or anticipated in meeting the requirements in Section V (Compliance Requirements) at the Covered Plants, together with implemented or proposed solutions;

c. A description of the status of any permit applications, including a summary of all permitting activity, pertaining to compliance with this Consent Decree;

d. Any updated WGMP for the Covered Plants that is required to be submitted by Paragraph 30;

e. Any summary of internal flaring incident reports as required by Paragraph 33;

f. A summary of the following, per Semi-Annual Period (hours shall be rounded to the nearest tenth):

(1) The total number of hours of Instrument Downtime claimed pursuant to Paragraph 44, expressed as both an absolute number and a percentage of time the Covered Flare that the instrument/equipment monitors is In Operation and Capable of Receiving Sweep, Supplemental, and/or Waste Gas;

(2) If the total number of hours of Instrument Downtime claimed pursuant to Paragraph 44 exceeds 5% of the time in a Semi-Annual Period the Covered Flare affected by the downtime is In Operation, an identification of the periods of downtime by date, time, cause (including Malfunction or maintenance), and, if the cause is asserted to be a Malfunction, the corrective action taken;

(3) The total number of hours, expressed as both an absolute number of hours and a percentage of time that the Covered Flare was In Operation, in

which the requirements of Paragraphs 42-43 were not applicable because the only gas or gases being vented were Pilot Gas or Purge Gas;

(4) Exceedances of Combustion Efficiency Standards.

i. The total number of hours, expressed as both an absolute number of hours and a percentage of time the Covered Flare was In Operation, of exceedances of the emissions standards in Paragraphs 42-43; provided however, that if the exceedance of these standards was less than 5% of the time in a Semi-Annual Period and was due to one or more of the exceptions set forth in Paragraph 44, the report shall so note; and

ii. If the exceedance of the emissions standards in Paragraphs 42-43 was not due to one of the exceptions in Paragraph 44 (Instrument Downtime), or if the exceedance was due to one or more of the exceptions in Paragraph 44 and the total number of hours caused by the exceptions exceeds 5% of the time in a Semi-Annual Period that the Covered Flare affected by the Instrument Downtime was In Operation, an identification of each block period that exceeded the standard, by time and date; the cause of the exceedance (including startup, shutdown, maintenance, or Malfunction), and if the cause is asserted to be a Malfunction, an explanation and any corrective actions taken; and

(5) Compliance with FGRS and Waste Gas Minimizing Equipment Availability Requirements. Sufficient information to document compliance with the requirements of sub-Paragraph 37.b. For any period of non-compliance, the Applicable Defendant must identify the date, cause, and corrective action taken.

g. Any additional matters that the Applicable Defendant believes should be brought to the attention of EPA.

54. Fenceline Air Monitoring Reports. Each Applicable Defendant must submit Fenceline Air Monitoring Reports as part of each Semi-Annual Report for its Covered Plant(s). The Fenceline Air Monitoring Reports must contain the following information:

a. In spreadsheet format, the individual sample results for each monitor comprising the Fenceline Monitoring System, each bi-weekly annual average benzene concentration difference value (*i.e.*, the annual average Δc based on the average of the 26 most recent 14-Day sampling periods once the data from 26 sampling periods are available (*see* Appendix 2.2, Paragraph 3.g)), and the corresponding meteorological data for the relevant monitoring periods. The first two columns of each spreadsheet

will list respectively the date and time for each sample taken; and

b. A detailed description of the findings of any root cause analysis and corrective action(s) undertaken pursuant to Paragraph 3(h) of Appendix 2.2, including the known results of the corrective action(s) and the anticipated emissions reductions (in TPY per pollutant).

c. For the purpose of determining the cause of an Action Level exceedance, the Applicable Defendant may submit and discuss additional data collected by it or by third parties in the reports required pursuant to Paragraph 3.h of Appendix 2.2 and/or this Paragraph. If the Applicable Defendant concludes that an exceedance of the Action Level described in Paragraph 3.g of Appendix 2.2 of this Consent Decree was caused by an offsite source(s), such a conclusion does not relieve the Applicable Defendant of its obligation to perform the Root Cause investigation described in Paragraph 3.h of Appendix 2.2.

55. Annual Emissions Data. In the Semi-Annual Report that is submitted on February 28 of each year, the Applicable Defendant must provide, for each Covered Flare, for the prior calendar year, the amount of emissions of the following compounds (in tons per year): VOCs, HAPs, NOx, CO_2, methane, and ethane.

56. Each Semi-Annual Report must also include a description of any non-compliance with the requirements of this Consent Decree not otherwise identified by Paragraph 53 along with an explanation of the violation's likely cause and of the remedial steps taken, or to be taken, to prevent or minimize such violation. If the cause of a violation cannot be fully explained at the time the report is due, the Applicable Defendant must so state in the report. In such a case, the Applicable Defendant must investigate the cause of the violation and then submit an amendment to the report, including a full explanation of the cause of the violation, within 30 Days of the Day the Defendants become aware of the cause of the violation. Nothing in this Paragraph or the following Paragraph relieves the Applicable Defendant of its obligation to provide the notice required by Section X (Force Majeure).

57. All reports required under this Section must be submitted to the persons and in the manner designated in Section XVI (Notices).

58. Each report submitted by the Defendants under this Section must be signed by an official of each Covered Plant and include the following certification:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

59. The reporting requirements of this Consent Decree do not relieve the Defendants of any reporting obligations required by the Clean Air Act, or its implementing regulations, or by any other federal, state, or local law, regulation, permit, or other requirement.

60. Any information provided pursuant to this Consent Decree may be used by the United States in any proceeding to enforce the provisions of this Consent Decree and as otherwise permitted by law.

IX. STIPULATED PENALTIES

61. Except where stipulated penalties reference "Defendants" (in which case, the Defendants are jointly and severally liable), the Applicable Defendant is liable for stipulated penalties to the United States for violations of this Consent Decree as specified below, unless excused under Section X (Force Majeure). A violation includes failing to perform any obligation required by the terms of this Decree, including any work plan or schedule approved under this Decree, according to all applicable requirements of this Decree and within the specified time schedules established by or approved under this Decree.

62. Late Payment of Civil Penalty. If the Defendants fail to pay the civil penalty required to be paid under Section IV (Civil Penalty) when due, the Defendants must pay a stipulated penalty of $2,500 per Day for each Day that the payment is late.

63. Failure to Meet Compliance Requirements. For the following violations by the Applicable Defendant of Section V (Compliance Requirements):

Violation	**Stipulated Penalty**	
63.a. Violations of Paragraph 17. Failure to timely submit a Flare Data and Monitoring Systems and Protocol Report in accordance with the requirements of Paragraph 17.	Period of Delay or Noncompliance Days 1–30 Days 31–60 Days 61 and later	Penalty per Day per Violation $ 300 $ 400 $ 500
63.b. Violations of Paragraphs 18-22. Failure to install the equipment and monitoring systems in accordance with Paragraphs 18-22 by the compliance date and maintain them in accordance with the respective, applicable technical specifications in those Paragraphs and Paragraphs 24–25 (except for the QA/QC requirements referenced in sub-Paragraph 24.a.i., which are covered in sub-Paragraph 63.c below).	Period of Delay or Noncompliance per Monitoring System/ Control Instrument Days 1–30 Days 31–60 Days 61 and later	Penalty per Day per Monitoring System/Control Instrument $ 750 $ 1,250 $ 2,000 or an amount equal to 1.2 times the economic benefit of delayed compliance, whichever is greater
63.c. Violations of the QA/QC requirements in Paragraph 24.a.i. Failure to perform the QA/QC requirements in accordance with Paragraph 24.a.i.	Violation of a: Daily requirement Quarterly requirement Annual requirement	Penalty per Violation $ 100 $ 200 per Day late $ 500 per Day late

63.d Violations of Paragraph 26. Except for 5% of the time per Semi-Annual Period, failure to operate each monitoring system required by Paragraphs 19 and 21-22 in accordance with Paragraph 26; provided however, that the Defendants will not be liable for a stipulated penalty for violation of Paragraph 26 if, during the period of downtime, the only gas(es) being sent to the Covered Flare in question is/are Purge Gas and/or Pilot Gas. For any monitoring system that serves a dual purpose, this stipulated penalty applies per instrument only.	Per Monitoring System/ Control Instrument Number of Hours per Semi-Annual Period 0.25–100.0 100.25–200.0 Over 200.0	Penalty per Hour per Monitoring System/ Control Instrument $ 250 $ 500 $ 1,000
63.e. Violations of Paragraphs 28, 29, or 30. Failure to timely submit a WGMP in accordance with the requirements of the applicable Paragraph.	Period of Delay or Noncompliance Days 1–30 Days 31–60 Days 61 and later	Penalty per Day per Violation $ 500 $ 750 $ 1,000
63.f. Violations of Paragraph 33. Failure to timely develop a root cause flaring investigation report in accordance with the requirements in sub-Paragraph 33.a; or failure to keep it as an internal record; or failure to timely submit a summary of the flaring incident reports in accordance with the requirements in sub-Paragraph 33.b.	Period of Delay or Noncompliance Days 1 – 30 Days 31 – 60 Days 61 and later	Penalty per Day per Violation $ 800 $ 1,600 $ 3,000
63.g. Violations of Paragraph 34. Failure to complete any corrective action in accordance with the requirements of Paragraph 34.	Period of Delay or Noncompliance Days 1 – 30 Days 31 – 60 Days 61 and later	Penalty per Day per Violation $ 1,000 $ 2,000 $ 5,000

<table>
<tr>
<td>63.h. Violations of Paragraph 36. For failing to timely install any equipment listed in Paragraph 36 and Appendix 1.6 in accordance with the requirements of Paragraph 36 and Appendix 1.6.</td>
<td>
<table>
<tr><th>Period of Delay or Noncompliance per FGRS or Waste Gas Minimizing Equipment Unit</th><th>Penalty per Day per FGRS or Waste Gas Minimizing Equipment Unit</th></tr>
<tr><td>Days 1–30</td><td>$ 1,250</td></tr>
<tr><td>Days 31–60</td><td>$ 3,000</td></tr>
<tr><td>Days 61 and later</td><td>$ 5,000 or an amount equal to 1.2 times the economic benefit of delayed compliance, whichever is greater</td></tr>
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<tr>
<td>63.i. Violations of Sub-Paragraphs 37.b.i. and 37.b.ii. For each failure to have the requisite number of FGRS Eductors Available for Operation or in operation in accordance with sub-Paragraphs 37.b.i. and 37.b.ii.</td>
<td>Per FGRS, $750 per hour or fraction thereof below the required percentage in a rolling 8,760-hour period that an Eductor required to be Available for Operation is not Available for Operation; provided however, that stipulated penalties will not apply for any hour in which an Eductor’s unavailability did not result in flaring.</td>
</tr>
<tr>
<td>63.j. Violations of Sub-Paragraphs 37.b.iii. and 37.b.iv. For each failure to operate Waste Gas Minimizing Equipment in accordance with sub-Paragraphs 37.b.iii. and 37.b.iv.</td>
<td>Per Waste Gas Minimizing Equipment unit, $750 per hour or fraction thereof below the required percentage in a rolling 8,760-hour period that a Waste Gas Minimizing Equipment unit was required to be operating.</td>
</tr>
<tr>
<td>63.k. Violations of Paragraphs 42.a.ii, 42.b, and 44. For each Covered Flare, each failure to operate the Covered Flare in accordance with the Net Heating Value of Vent Gas (for Unassisted Flares only) in Paragraph 42.a.ii, the Combustion Zone Net Heating Value standard in Paragraph 42.b, or the Standard During Instrument Downtime in Paragraph 44.</td>
<td>
<table>
<tr><th>On a per Covered Flare basis, Hours per Semi-Annual Period In Non-Compliance</th><th>Penalty per Hour Per Covered Flare</th></tr>
<tr><td>Hours 0.25–100.0</td><td>$ 50</td></tr>
<tr><td>Hours 100.25–200.0</td><td>$ 100</td></tr>
<tr><td>Hours over 200.0</td><td>$ 300</td></tr>
</table>
For purposes of calculating the number of hours of noncompliance with the NHV_{vg} or NHV_{cz} standard, all 15-minute periods of violation must be added together to determine the total.
</td>
</tr>
</table>

63.l. Violations of Paragraph 45. Failure to record any information required to be recorded pursuant to Paragraph 45.	$100 per Day
63.m. Violations of Paragraph 46 (Fenceline Monitoring Requirements). For each failure to operate the Fenceline Monitoring System in accordance with any requirement of Paragraph 46 or Appendix 2.2.	Period of Delay or Noncompliance / Penalty per Day Days 1–30 / $ 500 Days 31–60 / $ 1,500 Days 61 and later / $ 3,000

64. Failure to Meet Reporting Requirements. For each failure by an Applicable Defendant to submit a Semi-Annual Report in accordance with the requirements of Section VIII:

Period of Delay or Noncompliance per Semi-Annual Report		Penalty per Day per Semi-Annual Report
Days	1–30	$ 300
Days	31–60	$ 1,000
Days	61 and later	$ 2,000

65. Incorporation of Consent Decree Requirements into Federally Enforceable Permits. For each failure by an Applicable Defendant to timely submit a complete permit application to incorporate the Consent Decree requirements required by Paragraph 48 to the State of Texas or State of Iowa:

Period of Delay or Non-Compliance		Penalty per Violation per Day
Days	1–30	$500
Days	31–60	$1,500
Day	61 and later	$3,000

66. Stipulated penalties under this Section begin to accrue on the Day after performance is due or on the Day a violation occurs, whichever is applicable, and, except as provided in Paragraph 69, will continue to accrue until performance is satisfactorily completed or

until the violation ceases. Stipulated penalties will accrue simultaneously for separate violations of this Consent Decree.

67. The Applicable Defendant must pay stipulated penalties to the United States within 60 Days of a written demand by the United States unless the demand is disputed through compliance with the requirements of the Dispute Resolution provisions in Section XI of this Consent Decree.

68. The United States may, in the unreviewable exercise of its discretion, reduce or waive stipulated penalties otherwise due to it under this Consent Decree.

69. By no later than 60 Days after receiving a demand for stipulated penalties, the Applicable Defendant may dispute liability for any or all stipulated penalties demanded by invoking the dispute resolution procedures of Section XI of this Decree (Dispute Resolution). In the event of a dispute over stipulated penalties, stipulated penalties shall not accrue commencing on the later of either: (i) the date that, during dispute resolution under Section XI, the Plaintiffs and the Applicable Defendant agree upon; or (ii) the date that the Applicable Defendant files a motion with the Court under Paragraph 83; provided however, that in order for stipulated penalties to cease accruing pursuant to either (i) or (ii), the Applicable Defendant must place the disputed amount in an interest-bearing commercial escrow account. The interest rate must be determined in accordance with 28 U.S.C. § 1961. If the dispute is resolved in the Applicable Defendant's favor, the escrowed amount plus accrued interest will be returned to the Applicable Defendant; otherwise, the United States will be entitled to the amount determined by the Court to be due, plus interest that has accrued on such amount in the escrow account.

70. The Applicable Defendant must pay stipulated penalties owing to the United States in the manner set forth in Paragraph 14 and with the confirmation notices required by

Paragraph 15, except that the transmittal letter must state that the payment is for stipulated penalties and must state for which violation(s) the penalties are being paid.

71. If the Applicable Defendant fails to pay stipulated penalties according to the terms of this Consent Decree, the Applicable Defendant is liable for interest on such penalties, as provided for in 28 U.S.C. § 1961, accruing as of the date payment became due. Nothing in this Paragraph will be construed to limit the United States from seeking any remedy otherwise provided by law for the Applicable Defendant's failure to pay any stipulated penalties.

72. The payment of penalties and interest, if any, do not alter in any way the Applicable Defendant's obligation to complete the performance of the requirements of this Consent Decree.

73. Non-Exclusivity of Remedy. Stipulated penalties are not the United States' exclusive remedy for violations of this Consent Decree. Subject to the provisions of Section XIII (Effect of Settlement/Reservation of Rights), the United States expressly reserves the right to seek any other relief it deems appropriate for the Applicable Defendant's violation of this Decree or applicable law, including but not limited to an action against any Applicable Defendant for statutory penalties, additional injunctive relief, mitigation or offset measures, and/or contempt. However, the amount of any statutory penalty assessed for a violation of this Consent Decree must be reduced by an amount equal to the amount of any stipulated penalty assessed and paid pursuant to this Consent Decree.

X. FORCE MAJEURE

74. "Force Majeure," for purposes of this Consent Decree, is defined as any event beyond the control of the Applicable Defendant, of any entity controlled by the Applicable Defendants, or of the Applicable Defendant's contractors, which delays or prevents the performance of any obligation under this Consent Decree despite the Applicable Defendant's

best efforts to fulfill the obligation. The requirement that the Applicable Defendant exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential Force Majeure and best efforts to address the effects of any potential Force Majeure: (a) as it is occurring and (b) following the potential Force Majeure, such that the delay and any adverse effects of the delay are minimized. "Force Majeure" does not include the Applicable Defendant's financial inability to perform any obligation under this Consent Decree.

75. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a Force Majeure, the Applicable Defendant must provide written notice to EPA in accordance with Section XVI no later than 15 Days after the date the Applicable Defendant first knew, or by the exercise of due diligence should have known, that the event might cause a delay. This notice must specifically reference this Paragraph of the Consent Decree and must provide an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementing any measures to be taken to prevent or mitigate the delay or the effect of the delay; the Applicable Defendant's rationale for attributing such delay to a Force Majeure if it intends to assert such a claim; and a statement as to whether, in the opinion of the Applicable Defendant, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Applicable Defendant must include with any notice all documentation then available supporting the claim that the delay was attributable to a Force Majeure. Failure to comply with the above requirements will preclude the Applicable Defendant from asserting any claim of Force Majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. The Applicable Defendant will be deemed to know of any circumstance of which any Applicable

Defendant, any entity controlled by a Applicable Defendant, or an Applicable Defendant's contractors knew or should have known.

76. If EPA agrees that the delay or anticipated delay is attributable to a Force Majeure, the time for performance of the obligations under this Consent Decree that are affected by the Force Majeure will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the Force Majeure will not, by itself, extend the time for performance of any other obligation. EPA will notify the Applicable Defendant in writing of the length of the extension, if any, for performing the obligations affected by the Force Majeure.

77. If EPA does not agree that the delay or anticipated delay has been or will be caused by a Force Majeure, EPA will notify the Applicable Defendant in writing of its decision.

78. If the Applicable Defendant elects to invoke the dispute resolution procedures set forth in Section XI (Dispute Resolution), it must do so no later than 45 Days after receiving EPA's notice of decision. In any such dispute resolution proceeding, the Applicable Defendant has the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a Force Majeure, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that the Applicable Defendant complied with the requirements of Paragraphs 74 and 75. If the Applicable Defendant carries this burden, the delay at issue will be deemed to not be a violation by the Applicable Defendant of the affected obligation of this Consent Decree identified to EPA and the Court.

XI. DISPUTE RESOLUTION

79. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section are the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree.

80. Informal Dispute Resolution. Any dispute subject to Dispute Resolution under this Consent Decree will first be the subject of informal negotiations. The dispute will be considered to have arisen when an Applicable Defendant sends the United States a written Notice of Dispute. Such Notice of Dispute must clearly state the matter in dispute. The period of informal negotiations must not exceed 60 Days from the date the dispute arises, unless that period is modified by written agreement. If the Parties cannot resolve a dispute by informal negotiations, then the position advanced by the United States will be considered binding unless, within 45 Days after the conclusion of the informal negotiation period, the Applicable Defendant invokes formal dispute resolution procedures as set forth below.

81. Formal Dispute Resolution. The Applicable Defendant must invoke formal dispute resolution procedures, within the time period provided in the preceding Paragraph, by serving on the United States a written Statement of Position regarding the matter in dispute. The Statement of Position must include, but need not be limited to, any factual data, analysis, or opinion supporting the Applicable Defendant's position and any supporting documentation relied upon by the Applicable Defendant.

82. The United States must serve its Statement of Position within 45 Days of receiving the Applicable Defendant's Statement of Position. The United States' Statement of Position must include, but need not be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States. The United States' Statement of Position will be binding on the Applicable Defendant, unless the

Applicable Defendant files a motion for judicial review of the dispute in accordance with the following Paragraph.

83. The Applicable Defendant may seek judicial review of the dispute by filing with the Court and serving on the United States, in accordance with Section XVI (Notices), a motion requesting judicial resolution of the dispute. The motion must be filed within 45 Days of receiving the United States' Statement of Position pursuant to the preceding Paragraph. The motion must contain a written statement of the Applicable Defendant's position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and must set forth the relief requested and any schedule within which the dispute must be resolved for orderly implementation of the Consent Decree.

84. The United States must respond to the Applicable Defendant's motion within the time period allowed by the Local Rules of this Court. The Applicable Defendant may file a reply memorandum, to the extent permitted by the Local Rules.

85. Standard of Review. In a formal dispute resolution proceeding under this Section, the Applicable Defendant bears the burden of demonstrating that their position complies with this Consent Decree and the CAA and that it is entitled to relief under applicable principles of law. The United States reserves the right to argue that its position is reviewable only on the administrative record and must be upheld unless arbitrary and capricious or otherwise not in accordance with law, and the Defendants reserve the right to argue to the contrary.

86. The invocation of dispute resolution procedures under this Section will not, by itself, extend, postpone, or affect in any way any obligation of the Applicable Defendant under this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated penalties with respect to the disputed matter will continue to accrue from the first Day of

noncompliance, but payment will be stayed pending resolution of the dispute as provided in Paragraph 69. If the Defendants do not prevail on the disputed issue, stipulated penalties will be assessed and paid as provided in Section IX (Stipulated Penalties).

XII. INFORMATION COLLECTION AND RETENTION

87. The United States and their representatives, contractors, and consultants, have the right of entry into any Covered Plant, at all reasonable times, upon presentation of credentials, to:

a. Monitor the progress of activities required under this Consent Decree;

b. Verify any data or information submitted to the United States in accordance with the terms of this Consent Decree;

c. Obtain samples and, upon request, splits of any samples taken by the Defendants or their representatives, contractors, or consultants;

d. Obtain documentary evidence, including photographs and similar data; and

e. Assess the Applicable Defendant's compliance with this Consent Decree.

88. Upon request, the Applicable Defendant must provide EPA, or their authorized representatives, splits of any samples taken by the Applicable Defendant. Upon request, EPA must provide the Applicable Defendant splits of any samples taken by EPA.

89. Notwithstanding Section XX (Termination), and except for data recorded by any video camera required pursuant to Paragraph 21, until three years after the termination of this Consent Decree, the Applicable Defendant must retain, and must instruct its contractors and agents to preserve, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or their contractors' or agents' possession or control, or that come into their or their contractors' or agents' possession or control, and that relates to the Applicable Defendant's performance of its obligations under

this Consent Decree. This information-retention requirement applies regardless of any contrary corporate or institutional policies or procedures. At any time during this information-retention period, upon request by the United States the Applicable Defendant must provide copies of any documents, records, or other information required to be maintained under this Paragraph. The Applicable Defendant must retain the data recorded by the video cameras required pursuant to Paragraph 21 for one year from the date of recording.

90. In addition to the requirements of Paragraph 89, the Applicable Defendant must notify the United States at least 90 Days before the destruction of any documents, records, or other information subject to the requirements of the preceding Paragraph ("Discard Notice"). Within 90 Days after the date of the Discard Notice, the United States may provide the Applicable Defendant with a written request for production that (a) identifies specific documents, records, or other information and/or (b) provides a general description of categories of documents, records, or other information, and the Applicable Defendant shall produce the requested documents, records, or information to the United States. The Applicable Defendant is no longer required to retain any documents, records, or other information not requested for production by the United States at any time after 90 Days from the date of the Discard Notice. The Defendants may assert that certain documents, records, or other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Applicable Defendant asserts such a privilege, it must provide the following: (a) the title of the document, record, or information; (b) the date of the document, record, or information; (c) the name and title of each author of the document, record, or information; (d) the name and title of each addressee and recipient; (e) a description of the subject of the document, record, or information; and (f) the privilege asserted by the Applicable Defendant. However, no documents,

records, or other information created or generated pursuant to the requirements of this Consent Decree may be withheld on grounds of privilege.

91. Except for emissions data, the Applicable Defendant may also assert that information required to be provided under this Section is protected as Confidential Business Information ("CBI") under 40 C.F.R. Part 2. As to any information that the Applicable Defendant seeks to protect as CBI, the Applicable Defendant must follow the procedures set forth in 40 C.F.R. Part 2.

92. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of the Applicable Defendant to maintain documents, records, or other information imposed by applicable federal or state laws, regulations, or permits.

XIII. EFFECT OF SETTLEMENT/RESERVATION OF RIGHTS

93. Definitions. For purposes of this Section XIII, the following definitions apply:

a. "BTU/scf Flared Gas Requirements" shall mean the requirements found in the following regulations:

i. 40 C.F.R. § 60.18(c)(3)(ii);

ii. 40 C.F.R. § 63.11(b)(6)(ii); and

iii. The provisions of 40 C.F.R. Part 60, 61, and 63 that require compliance with 40 C.F.R. § 60.18(c)(3)(ii) (for example 40 C.F.R. § 61.349(a)(2)(iii)) or 40 C.F.R. § 63.11(b)(6)(ii) (for example 40 C.F.R. § 63.113(a)(1)(i)) and are applicable requirements in a federally enforceable permit for a Covered Plant as of the Date of Lodging.

b. "General Flare Requirements" shall mean the requirements found in the following regulations:

i. 40 C.F.R. § 60.18(c)(1) and 40 C.F.R. § 63.11(b)(4) (both relate to a prohibition on Visible Emissions);

ii. 40 C.F.R. § 60.18(c)(2) and 40 C.F.R. § 63.11(b)(5) (both relate to flame presence);

iii. 40 C.F.R. § 60.18(c)(4) and 40 C.F.R. § 63.11(b)(7) (both relate to exit velocity requirements for Steam-Assisted Flares);

and

iv. 40 C.F.R. § 60.18(e) and 40 C.F.R. § 63.11(b)(3) (both relate to operation during emissions venting).

c. "Good Air Pollution Control Practice Requirements" shall mean the requirements found in the following regulations:

i. 40 C.F.R. § 60.11(d);

ii. 40 C.F.R. § 61.12(c); and

iii. 40 C.F.R. § 63.6(e)(1)(i).

d. "PSD/NNSR Requirements" shall mean the Prevention of Significant Deterioration and Non-Attainment New Source Review requirements found in the following:

i. 42 U.S.C. § 7475;

ii. 40 C.F.R. §§ 52.21(a)(2)(iii) and 52.21(j)–52.21(r)(5);

iii. 42 U.S.C. §§ 7502(c)(5) and 7503(a)–(c);

iv. 40 C.F.R. Part 51, Appendix S, Part IV, Conditions 1–4;

v. any applicable, federally enforceable state or local regulation that implements, adopts, or incorporates the federal provisions cited in sub-Paragraphs 93.d.i–iv; and

vi. any applicable Title V permit requirement that implements, adopts, or incorporates the federal provisions or federally enforceable state provisions cited in sub-Paragraphs 93.d.i–v.

e. "Requirements Related to Monitoring, Operation, and Maintenance According to Flare Design" shall mean the requirements found in the following regulations:

i. 40 C.F.R. § 60.18(d);

ii. 40 C.F.R. § 63.11(b)(1); and

iii. The provisions of 40 C.F.R. Part 60, 61, and 63 that require compliance with 40 C.F.R. § 60.18(d) (for example 40 C.F.R. § 61.349(a)(2)(iii)) or 40 C.F.R. § 63.11(b)(1) (for example 40 C.F.R. § 63.113(a)(1)(i)) and are applicable requirements in a federally enforceable permit for a Covered Plant as of the Date of Lodging.

94. Entry of this Consent Decree resolves the civil claims of the United States for the violations alleged in the Complaint filed in this action and occurring through the Date of Lodging, and as noted below.

95. Resolution of Claims for Violating PSD/NNSR Requirements at the Covered Flares. With respect to emissions of VOCs, NOx, and CO from all Covered Flares, entry of this Consent Decree resolves the civil claims of the United States against the Applicable Defendant for violations of the PSD/NNSR Requirements resulting from construction or modification from the date of the pre-Lodging construction or modification through: a) the compliance dates with Paragraph 42.b as set forth in Appendix 1.1 for each Covered Flare, except for the La Porte Equistar Olefins QE1 Flare and the Unassisted Flares, b) the compliance date with Paragraph 36.b as set forth in Appendix 1.1 for the La Porte Equistar Olefins QE1 Flare, and c) the Date of Lodging for the Unassisted Flares. This Paragraph does not apply to and does not resolve any violations for Newly Installed Covered Flares.

96. Resolution of Pre-Lodging Claims at the Covered Flares for Failing to Comply with (a) BTU/scf Flared Gas Requirements and (b) General Flare Requirements.

With respect to emissions of VOCs and HAPs from the Covered Flares, entry of this Consent Decree resolves the civil claims of the United States against the Defendants for violations of the following requirements from the date those claims accrued until the Date of Lodging: a) BTU/scf Flared Gas Requirements; and b) General Flare Requirements.

97. Resolution of Claims for Failing to Comply with (a) Good Air Pollution Control Practice Requirements, and (b) Requirements Related to Monitoring, Operation, and Maintenance According to Flare Design for all Covered Flares. With respect to emissions of VOCs and HAPs from the Covered Flares, entry of this Consent Decree resolves the civil claims of the United States against the Defendants for violations of Good Air Pollution Control Practice Requirements and Requirements Related to Monitoring, Operation, and Maintenance According to Flare Design, but only to the extent that the claims are based on the Defendants' use of too much steam in relation to Vent Gas flow. The resolution in this Paragraph extends through the Effective Date for the Covered Flares, except for the following Covered Flares:

a. Hot Olefins Flare (at the Corpus Christi Plant);

b. Cold Olefins Flare (at the Corpus Christi Plant);

c. East Flare (at the Channelview North Plant);

d. POSM1-C Flare (at the Channelview South Plant);

e. Q1 Hyperzone (at the La Porte Equistar Plant); and

f. QE1 Flare (at the La Porte Equistar Plant).

For these six Covered Flares, the resolution in this Paragraph extends until the applicable compliance dates with Paragraph 42.b as set forth in Appendix 1.1. This Paragraph does not apply to and does not resolve any violations for Newly Installed Covered Flares.

98. Resolution of Title V Violations. Entry of this Consent Decree resolves the civil claims of the United States against the Applicable Defendants for the violations of Sections 502(a), 503(c), and 504(a) of the CAA, 42 U.S.C. §§ 7661a(a), 7661b(c), 7661c(a), and of 40 C.F.R. §§ 70.1(b), 70.5(a) and (b), 70.6(a) and (c), and 70.7(b), that are based upon the violations resolved by Paragraphs 95–97 for the time frames set forth in those Paragraphs.

99. Reservation of Rights — Resolution of Liability in Paragraphs 95 and 97-98 can be Rendered Void. Notwithstanding the resolution of liability in Paragraphs 95 and 97-98, for the period of time between the Date of Lodging and the post-lodging dates specified in Paragraphs 95 and 97-98, those resolutions of liability will be rendered void if the Applicable Defendant materially fails to comply with any of the obligations and requirements of Section V (Compliance Requirements) and Section VII (Emission Credit Generation). To the extent that a material failure involves a particular Covered Plant, the resolution of liability will be rendered void only with respect to claims involving that particular Covered Plant. The resolutions of liability in Paragraphs 95 and 97-98, will not be rendered void if the Defendants, as expeditiously as practicable, remedy such material failure and pay all stipulated penalties due as a result of such material failure.

100. The United States reserves all legal and equitable remedies available to enforce the provisions of this Consent Decree. This Consent Decree will not be construed to limit the rights of the United States to obtain penalties or injunctive relief under the Clean Air Act, or

implementing regulations, or under other federal or state laws, regulations, or permit conditions, except as specified in Paragraphs 94-98. The United States further reserves all legal and equitable remedies to address any imminent and substantial endangerment to the public health or welfare or the environment arising at, or posed by, the Covered Plants, whether related to the violations addressed in this Consent Decree or otherwise.

101. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, civil penalties, other appropriate relief relating to a Covered Plant or the Applicable Defendant's violations, the Applicable Defendant must not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case, except with respect to claims that have been specifically resolved pursuant to Paragraphs 94-98.

102. This Consent Decree is not a permit, or a modification of any permit, under any federal, state, or local laws or regulations. The Defendants are responsible for maintaining compliance with all applicable federal, state, and local laws, regulations, and permits; and the Defendants' compliance with this Consent Decree is no defense to any action commenced pursuant to any such laws, regulations, or permits, except as set forth herein. The United States does not, by its consent to the entry of this Consent Decree, warrant or aver in any manner that the Defendants' compliance with any aspect of this Consent Decree will result in compliance with provisions of the Clean Air Act, 42 U.S.C. § 7401 *et seq.* or with any other provisions of federal, state, or local laws, regulations, or permits.

103. This Consent Decree does not limit or affect the rights of the Defendants or of the United States against any third parties, not party to this Consent Decree, nor does it limit the rights of third parties, not party to this Consent Decree, against the Defendants, except as otherwise provided by law.

104. This Consent Decree must not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

XIV. COSTS

105. The Parties must bear their own costs of this action, including attorneys' fees, except that the United States is entitled to collect the costs (including attorneys' fees) incurred in any action necessary to collect any portion of the civil penalty or any stipulated penalties due but not paid by the Defendants.

XV. 26 U.S.C. § 162(F)(2)(A)(II) IDENTIFICATION

106. For purposes of the identification requirement of Section 162(f)(2)(A)(ii) of the Internal Revenue Code, 26 U.S.C. § 162(f)(2)(A)(ii), performance of Section II (Applicability), Paragraph 10; Section V (Compliance Requirements), Paragraphs 17-31 and 33-46; Section VI (Permits), Paragraphs 47–48; Section VIII (Reporting Requirements), Paragraphs 53-58; Section XII (Information Collection and Retention), Paragraphs 87-90; and related Appendices 1.1-1.8 and 2.1-2.3 is restitution or required to come into compliance with law.

XVI. NOTICES

107. Unless otherwise specified in this Decree, whenever notifications, submissions, or communications are required by this Consent Decree, they must be made in writing and addressed as follows. Submission by U.S. mail or courier is required and shall be sufficient to comply with the notice requirements of this Consent Decree; however, for the submission of

technical information or data, the Defendants must submit the data in electronic form (*e.g.*, a disk or hard drive). The email addresses listed below are to permit the submission of additional electronic courtesy copies.

As to the United States by email:	eescdcopy.enrd@usdoj.gov **Re: DJ # 90-5-2-1-11593** and as to EPA as set forth below.
As to the United States by mail:	EES Case Management Unit Environment and Natural Resources Division U.S. Department of Justice P.O. Box 7611 Washington, D.C. 20044-7611 **Re: DJ # 90-5-2-1-11593** and as to EPA as set forth below.
As to the United States Attorney for the Southern District of Texas by mail:	United States Attorney Southern District of Texas 1000 Louisiana St., Suite 2300 Houston, TX 77002
As to EPA by mail:	Director, Air Enforcement Division Office of Civil Enforcement U.S. Environmental Protection Agency Mail Code 2242-A Regular Mail: 1200 Pennsylvania Ave, N.W. William Jefferson Clinton Building Room 1119 Washington, DC 20460-0001 Express Mail: Use same address but use 20004 as the zip code

and

Associate Director
Air, Toxics, and Inspections Coordination Branch
(6 EN-A)
U.S. EPA, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270-210

As to EPA by email:

parrish.robert@epa.gov
foley.patrick@epa.gov
stucky.maria@epa.gov

As to the Defendants:

Julie Solmer Stine, Esq.
Associate General Counsel – Operations and HSE
LyondellBasell
1221 McKinney Street, Suite 300
Houston, Texas 77010

As to the Defendants by email:

julie.solmerstine@lyb.com

108. Any Party may, by written notice to the other Parties, change its designated notice recipient or notice address provided above.

109. Notices submitted pursuant to this Section will be deemed submitted upon mailing, unless otherwise provided in this Consent Decree or by mutual agreement of the Parties in writing.

XVII. EFFECTIVE DATE

110. The Effective Date of this Consent Decree is the date upon which this Consent Decree is entered by the Court or a motion to enter the Consent Decree is granted, whichever occurs first, as recorded on the Court's docket.

XVIII. RETENTION OF JURISDICTION

111. The Court retains jurisdiction over this case until termination of this Consent Decree, for the purpose of: a) resolving disputes arising under this Decree pursuant to Section

XI, b) entering orders modifying this Decree pursuant to Section XIX, and c) effectuating or enforcing compliance with the terms of this Decree.

XIX. MODIFICATION

112. Except as otherwise allowed in Paragraphs 14 and 108 (notice recipients and addresses), the terms of this Consent Decree, including any attached appendices, may be modified only by a subsequent written agreement signed by all the Parties. Where the modification constitutes a material change to this Decree, it will be effective only upon approval by the Court.

113. Any disputes concerning modification of this Decree must be resolved pursuant to Section XI (Dispute Resolution), provided, however, that, instead of the burden of proof provided by Paragraph 85, the Party seeking the modification bears the burden of demonstrating that it is entitled to the requested modification in accordance with Federal Rule of Civil Procedure 60(b).

XX. TERMINATION

114. Before seeking termination of the entire Consent Decree or the set of requirements applicable to one or more Covered Plants, the Applicable Defendant must:

a. Pay the civil penalty and any accrued stipulated penalties as required by this Consent Decree;

b. Satisfactorily comply with all provisions of Section V (Compliance Requirements) applicable to the Covered Plant that is subject to the termination request;

c. Operate for at least one year in satisfactory compliance with the limitations and standards set forth in Paragraphs 37.b (FGRS and Waste Gas Minimizing Equipment: Operation and Availability Requirements), 42.a.ii (NHV_{vg} for Unassisted Flares), 42.b (NHV_{cz}), and 43 (98% Combustion Efficiency) for all of the Covered Flares at the Covered Plant that is subject to the termination request;

d. Receive all non-Title V air permits in accordance with Paragraph 48.a and

b. that contain the Consent Decree limits and standards specified in Paragraph 48.c for all of the Covered Flares at the Covered Plant that is subject to the termination request; and

e. Apply for a modification or amendment to the applicable Title V air permits necessary to ensure that the Consent Decree limits and standards specified in Paragraph 48.c survive termination of this Consent Decree for all of the Covered Flares at the Covered Plant that is subject to the termination request.

115. After an Applicable Defendant believes it has satisfied the conditions for termination set forth in the preceding Paragraph for either the entire Consent Decree or for one or more of the Covered Plants, the Applicable Defendant may submit a request for termination to the United States by certifying such compliance in accordance with the certification language in Paragraph 58 ("Request for Termination"). In the Request for Termination, the Applicable Defendant must demonstrate that it has satisfied the conditions for termination set forth in the preceding Paragraph, as well as submit all necessary supporting documentation.

116. Following receipt by the United States of the Applicable Defendant's Request for Termination, the Parties will confer informally concerning the request. If the United States agrees that the Decree may be terminated entirely, or as to the Applicable Defendant(s) and/or Covered Plant(s), the Parties will submit, for the Court's approval, a joint stipulation for Termination.

117. If the United States does not agree that the Decree may be terminated entirely, or as to the Applicable Defendant(s) and/or Covered Plant(s), or if the Defendants do not receive a written response from the United States within 90 Days of the Defendant's submission of the Request for Termination the Applicable Defendant(s) may invoke Dispute Resolution under Section XI.

XXI. PUBLIC PARTICIPATION

118. This Consent Decree must be lodged with the Court for a period of not less than 30 Days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations indicating that the Consent Decree is inappropriate, improper, or inadequate. The Defendants consent to entry of this Consent Decree without further notice and agree not to withdraw from or oppose entry of this Consent Decree by the Court or to challenge any provision of the Decree, unless the United States has notified the Defendants in writing that it no longer supports entry of the Decree.

XXII. SIGNATORIES/SERVICE

119. Each undersigned representative of the Defendants and the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind the Party or Parties he or she represents to this document.

120. This Consent Decree may be signed in counterparts, and its validity cannot be challenged on that basis. The Defendants agree to accept service of process by mail with respect to all matters arising under or relating to this Consent Decree and to waive the formal service requirements set forth in Rules 4 and 5 of the Federal Rules of Civil Procedure and any applicable Local Rules of this Court including, but not limited to, service of a summons.

XXIII. INTEGRATION

121. This Consent Decree constitutes the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Decree and supersedes all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than deliverables that are subsequently submitted and

approved pursuant to this Decree, the Parties acknowledge there are no representations, agreements, or understandings relating to the settlement other than those expressly contained in this Consent Decree.

XXIV. FINAL JUDGMENT

122. Upon approval and entry of this Consent Decree by the Court, this Consent Decree constitutes a final judgment of the Court as to the United States and the Defendants.

XXV. APPENDICES

123. The Appendices listed in the Tables of Appendices are attached to and part of this Consent Decree.

Dated and entered this _____ Day of _____, 202_____

_____
UNITED STATES DISTRICT JUDGE
SOUTHERN DISTRICT OF TEXAS

Subject to the notice and comment requirements of 28 C.F.R. § 50.7, THE UNDERSIGNED PARTIES enter into this Consent Decree entered in the matter of the *United States v. Equistar Chemicals, LP et al.* (S.D. Tex.).

FOR THE UNITED STATES OF AMERICA

TODD KIM
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice

Attorney-in-Charge:

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Southern District of Texas

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Assistant United States Attorney
SDTX Id No. 7959
Texas Bar No. 10131415
1000 Louisiana St., Suite 2300
Houston, TX 77002
Telephone: (713) 567-9000

Subject to the notice and comment requirements of 28 C.F.R. § 50.7, THE UNDERSIGNED PARTIES enter into this Consent Decree entered in the matter of the *United States v. Equistar Chemicals, LP et al.* (S.D. Tex.).

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

LAWRENCE STARFIELD

Digitally signed by LAWRENCE STARFIELD
Date: 2021.10.08 18:57:45 -04'00'

LAWRENCE E. STARFIELD
Acting Assistant Administrator
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue
Washington, D.C. 20460

Subject to the notice and comment requirements of 28 C.F.R. § 50.7, THE UNDERSIGNED PARTIES enter into this Consent Decree entered in the matter of the *United States v. Equistar Chemicals, LP et al.* (S.D. Tex.).

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION 6

Digitally signed by CHERYL SEAGER
DN: c=US, o=U.S. Government, ou=Environmental Protection Agency, cn=CHERYL SEAGER, 0.9.2342.19200300.100.1.1=68001003651793
Date: 2021.09.30 15:50:56 -05'00'

CHERYL SEAGER
Director - Compliance Assurance and Enforcement Division
U.S. Environmental Protection Agency, Region 6
1201 Elm Street
Dallas, TX 75270

Subject to the notice and comment requirements of 28 C.F.R. § 50.7, THE UNDERSIGNED PARTIES enter into this Consent Decree entered in the matter of the *United States v. Equistar Chemicals, LP et al.* (S.D. Tex.).

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION 7

JODI BRUNO

Digitally signed by JODI BRUNO
Date: 2021.09.16 11:24:56 -05'00'

JODI BRUNO on behalf of
DIANE HUFFMAN

Acting Director, Enforcement and Compliance Assurance Division
U.S. Environmental Protection Agency, Region 7
11201 Renner Blvd
Lenexa, KS 66219

THE UNDERSIGNED PARTIES enter into this Consent Decree entered in the matter of the *United States v. Equistar Chemicals, LP et al.* (S.D. Tex.).

FOR EQUISTAR CHEMICALS, LP;
LYONDELLBASELL ACETYLS, LLC;
AND LYONDELL CHEMICAL COMPANY

JEFFREY KAPLAN
Executive Vice-President and Chief Legal Officer

United States
v.
Equistar Chemicals, LP; LyondellBasell Acetyls, LLC; and Lyondell Chemical Company

APPENDICES TO CONSENT DECREE

Appendix 1.1 Compliance Schedule

Flare*	Flare Data and Monitoring Systems Protocol Report	Installation & Operation of Monitoring & Control Systems	Initial Waste Gas Minimization Plan	First Updated Waste Gas Minimization Plan	Root Cause Analysis	Flare Gas Recovery (FGR) Installation & Commence Operation	FGR & Waste Gas Minimizing Equipment Operation & Availability	Net Heating Value of Combustion Zone/ Net Heating Value of Vent Gas for Unassisted Flares	Record-keeping
A	B	C	D	E	F	G	H	I	J
Referenced Paragraphs of the Consent Decree									
	17	18	28	29	33	36.b	37	42.a.ii (for Unassisted Flares) 42.b (for all other Covered Flares)	47
CCO Hot Olefins Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	ED	ED	ED
CCO Cold Olefins Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	ED	ED	ED
CCO BDU Flare	Steam assisted flare to be removed from service by Effective Date								
CVO-N East Flare	ED + 365 Days	06/30/23 (see Note 1) GC PS 9 mods, Steam Meter accuracy, P&T compensation	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CVO-N Methanol-C Flare	ED + 365 Days	N/A	N/A	N/A	ED + 365 Days	NA	NA	ED (42.a.ii. only)	ED
CVO-N OP1 Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	ED	ED	ED
CVO-N OP2 Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	ED	ED	ED

Appendix 1.1 Compliance Schedule

Flare*	Flare Data and Monitoring Systems Protocol Report	Installation & Operation of Monitoring & Control Systems	Initial Waste Gas Minimization Plan	First Updated Waste Gas Minimization Plan	Root Cause Analysis	Flare Gas Recovery (FGR) Installation & Commence Operation	FGR & Waste Gas Minimizing Equipment Operation & Availability	Net Heating Value of Combustion Zone/ Net Heating Value of Vent Gas for Unassisted Flares	Record-keeping
A	B	C	D	E	F	G	H	I	J
CVO-N IPOH Flare	Steam assisted flare to be removed from service by 6/30/21								
CVO-S MTBE-C Flare	ED + 365 Days	6/30/23 (see Note 1) GC PS 9 mods, Steam Meter accuracy, P&T compensation	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CVO-S MTBE-E Flare	ED + 365 Days	6/30/23 (see Note 1) GC PS 9 mods, Steam Meter accuracy, P&T compensation, Flow meter required for BDO emergency flow (water seal currently in place, flow is estimated)	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CVO-S POSM1-C Flare	ED + 365 Days	6/30/23 (see Note 1) GC PS 9 mods, Steam meter P&T compensation	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CVO-S POSM2-C Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CVO-S BDO Flare	ED + 365 Days	N/A	N/A	N/A	ED + 365 Days	NA	NA	ED (42.a.ii. only)	ED
CVO-S Deepwell Flare	ED + 365 Days	N/A	N/A	N/A	ED + 365 Days	NA	NA	ED (42.a.ii. only)	ED
LPO AB3 Flare	ED + 365 Days	6/30/21 (see Note 1) GC PS 9 mods, Steam Meter accuracy, P&T compensation	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED

Appendix 1.1 Compliance Schedule									
Flare*	**Flare Data and Monitoring Systems Protocol Report**	**Installation & Operation of Monitoring & Control Systems**	**Initial Waste Gas Minimization Plan**	**First Updated Waste Gas Minimization Plan**	**Root Cause Analysis**	**Flare Gas Recovery (FGR) Installation & Commence Operation**	**FGR & Waste Gas Minimizing Equipment Operation & Availability**	**Net Heating Value of Combustion Zone/ Net Heating Value of Vent Gas for Unassisted Flares**	**Record-keeping**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
LPO ARU Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
LPO Q1 Hyperzone	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	The earlier of 90 days after issuance of the Title V permit to increase the NOx limit at this flare or ED + 365 Days	ED
LPO QE1 Flare	ED + 365 Days	6/30/22 (see Note 1) GC PS 9 mods, Steam Meter accuracy	ED + 365 Days	ED + 730 Days	ED + 365 Days	6/30/22	9/30/22	The earlier of 90 days after issuance of the Title V permit to increase the NOx limit at this flare or ED + 365 Days	ED
LPO AA Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
LPO VAM Flare (see note 2)	ED + 365 Days	6/30/21 (see Note 1) GC PS 9 mods	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	NA	ED	ED
CLO Clinton Flare	ED + 365 Days	ED	ED + 365 Days	ED + 730 Days	ED + 365 Days	NA	ED	ED	ED

Note 1:

GC PS 9 mods – Texas HRVOC monitoring allows certain exceptions to Performance Specification 9, therefore the following modifications are needed:

- Heated probe and heated sample line and the ability to inject calibration gas at the probe.
- Steam Meter accuracy – Steam meter does not meet accuracy requirement.
- P&T compensation – Steam pressure and temperature taps need to be added.

Note 2: VAM Flare refers to both the former and current VAM flare.

***Abbreviations**:

ED: Effective Date
NA: Not Applicable
CCO: Corpus Christi
CVO-N: Channelview North
CVO-S: Channelview South
LPO: La Porte
CLO: Clinton

United States

v.

Equistar Chemicals, LP, et al.

APPENDICES TO CONSENT DECREE

APPENDIX 1.2

Calculating Combustion Efficiency, Net Heating Value of the Combustion Zone Gas (NHV_{cz}), the Net Heating Value Dilution Parameter (NHV_{dil}), and Flare Tip Velocity

APPENDIX 1.2

All abbreviations, constants, and variables are defined in the Key on Page 7 of this Appendix.

Combustion Efficiency Equation:

$$CE = [CO_2]/([CO_2] + [CO] + [OC])$$

where:

$[CO_2]$ = Concentration in volume percent or ppm-meters of carbon dioxide in the combusted gas immediately above the Combustion Zone

$[CO]$ = Concentration in volume percent or ppm-meters of carbon monoxide in the combusted gas immediately above the Combustion Zone

$[OC]$ = Concentration in volume percent or ppm-meters of the sum of all organic carbon compounds in the combusted gas immediately above the Combustion Zone, counting each carbon molecule separately where the concentration of each individual compound is multiplied by the number of carbon atoms it contains before summing (*e.g.*, 0.1 volume percent ethane shall count as 0.2 percent OC because ethane has two carbon atoms)

For purposes of using the *CE* equation, the unit of measurement for CO_2, CO, and OC must be the same; that is, if "volume percent" is used for one compound, it must be used for all compounds. "Volume percent" cannot be used for one or more compounds and "ppm-meters" for the remainder.

Step 1: Determine the Net Heating Value of the Vent Gas (NHV_{vg})

The Applicable Defendants shall determine the Net Heating Value of the Vent Gas (NHV_{vg}) based on composition monitoring data on a 15-minute block average basis according to the following requirements. If the Applicable Defendants monitor separate gas streams that combine to comprise the total vent gas flow to a Covered Flare, the 15-minute block average Net Heating Value shall be determined separately for each measurement location according to the following requirements and a flow-weighted average of the gas stream Net Heating Values shall be used to determine the 15-minute block average Net Heating Value of the cumulative Vent Gas. The NHV_{vg} 15-minute block averages shall be calculated for set 15-minute time periods starting at 12 midnight to 12:15 AM, 12:15 AM to 12:30 AM and so on, concluding at 11:45 PM to midnight.

Step 1a: Equation or Output to be Used to Determine NHV_{vg} at a Measurement Location

For any gas stream for which the Applicable Defendants comply with Paragraph 22 by collecting compositional analysis data in accordance with the method set forth in 22.a: Equation 1 shall be used to determine the NHV_{vg} of a specific sample by summing the Net Heating

APPENDIX 1.2

Value for each individual component by individual component volume fractions. Individual component Net Heating Values are listed in Table 1 of this Appendix.

$$NHV_{vg} = \sum_{i=1}^{n} (x_i \cdot NHV_i) \qquad \textit{Equation 1}$$

For any gas stream for which the Applicable Defendants comply with Paragraph 22 by collecting direct Net Heating Value monitoring data in accordance with the method set forth in 22.b but for which a Hydrogen Concentration Monitor is not used: Use the direct output (measured value) of the monitoring system(s) (in BTU/scf) to determine the NHV_{vg} for the sample.

For any gas stream for which the Applicable Defendants comply with Paragraph 22 by collecting direct Net Heating Value monitoring data in accordance with the method set forth in 22.b and for which a Hydrogen Concentration Monitor is also used: Equation 2 shall be used to determine the NHV_{vg} for each sample measured via the Net Heating Value monitoring system. Where hydrogen concentration data is collected, Equation 2 performs a net correction for the measured heating value of hydrogen since the theoretical Net Heating Value for hydrogen is 274 Btu/scf, but for the purposes of this Consent Decree, a Net Heating Value of 1,212 Btu/scf may be used (1,212 – 274 = 938 BTU/scf).

$$NHV_{vg} = NHV_{measured} + 938x_{H2} \qquad \textit{Equation 2}$$

Step 1b: Calculation Method to be Used in Applying Equation/Output to Determine NHV_{vg}

For any Covered Flare for which the Applicable Defendants comply with Paragraph 22 by using a continuous monitoring system in accordance with the method set forth in 22.a or 22.b: The Applicable Defendants may elect to determine the 15-minute block average NHV_{vg} using either the Feed-Forward Calculation Method or the Direct Calculation Method (both described below). The Applicable Defendants need not elect to use the same methodology at all Covered Flares with a continuous monitoring system; however, for each such Covered Flare, the Applicable Defendants must elect one calculation method that will apply at all times, and use that method for all continuously monitored flare vent streams associated with that Covered Flare. If the Applicable Defendants intend to change the calculation method that applies to a Covered Flare, the Applicable Defendants must notify the EPA 30 days in advance of such a change.

Feed-Forward Calculation Method. When calculating NHV_{vg} for a specific 15-minute block:

1. Use the results from the first sample collected during an event (for periodic Vent Gas flow events) for the first 15-minute block associated with that event.
2. If the results from the first sample collected during an event (for periodic Vent Gas flow events) are not available until after the second 15-minute block starts, use the results from the first sample collected during an event for the second 15-minute block associated with that event.

APPENDIX 1.2

3. For all other cases, use the results that are available from the most recent sample prior to the 15-minute block period for that 15-minute block period for all Vent Gas streams. For the purpose of this requirement, use the time that the results become available rather than the time the sample was collected. For example, if a sample is collected at 12:25 AM and the analysis is completed at 12:38 AM, the results are available at 12:38 AM and these results would be used to determine compliance during the 15-minute block period from 12:45 AM to 1:00 AM.

Direct Calculation Method. When calculating NHV_{vg} for a specific 15-minute block:

1. If the results from the first sample collected during an event (for periodic Vent Gas flow events) are not available until after the second 15-minute block starts, use the results from the first sample collected during an event for the first 15-minute block associated with that event.
2. For all other cases, use the arithmetic average of all NHV_{vg} measurement data results that become available during a 15-minute block to calculate the 15-minute block average for that period. For the purpose of this requirement, use the time that the results become available rather than the time the sample was collected. For example, if a sample is collected at 12:25 AM and the analysis is completed at 12:38 AM, the results are available at 12:38 AM and these results would be used to determine compliance during the 15-minute block period from 12:30 AM to 12:45 AM.

Step 2: Determine Volumetric Flow Rates of Gas Streams

The Applicable Defendants shall determine the volumetric flow rate in standard cubic feet (scf) of Vent Gas, along with the volumetric flow rates (in scf) of any Supplemental Gas, Assist Steam, and Premix Assist Air, over a 15-minute block average basis. The 15-minute block average volumetric flow rates shall be calculated for set 15-minute time periods starting at 12 midnight to 12:15 AM, 12:15 AM to 12:30 AM and so on, concluding at 11:45 PM to midnight.

For any gas streams for which the Applicable Defendants comply with Paragraph 19 by using a monitoring system that directly records volumetric flow rate: Use the direct output (measured value) of the monitoring system(s) (in scf), as corrected for the temperature and pressure of the system to standard conditions (i.e., a temperature of 20 °C (68 °F) and a pressure of 1 atmosphere) to then calculate the average volumetric flow rate of that gas stream for the 15-minute block period.

For Vent Gas, Assist Steam, or Premix Assist Air gas streams for which the Applicable Defendants comply with Paragraph 19 by using a mass flow monitor to determine volumetric flow rate: Equation 3 shall be used to determine the volumetric flow rate of Vent Gas, Assist Air, or Assist Steam by converting mass flow rate to volumetric flow at standard conditions (i.e., a temperature of 20 °C (68 °F) and a pressure of 1 atmosphere). Equation 3 uses the molecular weight of the gas stream as an input to the equation; therefore, if the Applicable Defendants elect to use a mass flow monitor to determine volumetric flow rate of Vent Gas, the Applicable Defendants must collect compositional analysis data for such Vent Gas in accordance

APPENDIX 1.2

with the method set forth in 22.a. For Assist Steam, use a molecular weight of 18 pounds per pound-mole. For Assist Air, use a molecular weight of 29 pounds per pound-mole. The converted volumetric flow rates at standard conditions from Equation 3 shall then be used to calculate the average volumetric flow rate of that gas stream for the 15-minute block period.

$$Q_{vol} = \frac{Q_{mass} * 385.3}{MWt} \qquad \textit{Equation 3}$$

For gas streams for which the molecular weight of the gas is known and for which the Applicable Defendants comply with Paragraph 19 by using continuous pressure/temperature monitoring system(s): Use appropriate engineering calculations to determine the average volumetric flow rate of that gas stream for the 15-minute block period. For Assist Steam, use a molecular weight of 18 pounds per pound-mole. For Assist Air, use a molecular weight of 29 pounds per pound-mole. For Vent Gas, molecular weight must be determined by collecting compositional analysis data for such Vent Gas in accordance with the method set forth in 22.a.

Step 3: Calculate the Net Heating Value of the Combustion Zone Gas (NHV_{cz})

For any Covered Flare at which: 1) the Feed-Forward Calculation Method is used; 2) gas composition or Net Heating Value monitoring is performed in a location representative of the cumulative vent gas stream; and 3) Supplemental Gas flow additions to the flare are directly monitored: Equation 4 shall be used to determine the 15-minute block average NHV_{cz} based on the 15-minute block average Vent Gas, Supplemental Gas, and assist gas flow rates.

$$NHV_{cz} = \frac{(Q_{vg} - Q_{NG2} + Q_{NG1}) * NHV_{vg} + (Q_{NG2} - Q_{NG1}) * NHV_{NG}}{Q_{vg} + Q_s + Q_{a,premix}} \qquad \textit{Equation 4}$$

For the first 15-minute block period of an event, Q_{NG1} shall use the volumetric flow value for the current 15-minute block period (i.e. $Q_{NG1} = Q_{NG2}$). NHV_{NG} shall be determined using one of the following methods: 1) direct compositional or Net Heating Value monitoring of the natural gas stream in accordance with Step 1; or 2) for purchased ("pipeline quality") natural gas streams, the Applicable Defendants may elect to either: a) use annual or more frequent grab sampling at any one representative location, or b) assume a Net Heating Value of 920 BTU/scf.

For all other Covered Flares: Equation 5 shall be used to determine the 15-minute block average NHV_{cz} based on the 15-minute block average Vent Gas and assist gas flow rates. For periods when there is no Assist Steam flow or Premix Assist Air flow, $NHV_{cz} = NHV_{vg}$.

$$NHV_{cz} = \frac{Q_{vg} * NHV_{vg}}{Q_{vg} + Q_s + Q_{a,premix}} \qquad \textit{Equation 5}$$

APPENDIX 1.2

Step 4: Calculate the Net Heating Value Dilution Parameter (NHV_{dil})

For any Covered Flare at which: 1) the Feed-Forward Calculation Method is used; 2) gas composition or Net Heating Value monitoring is performed in a location representative of the cumulative vent gas stream; and 3) Supplemental Gas flow additions to the flare are directly monitored: Equation 6 shall be used to determine the 15-minute block average NHV_{dil} only during periods when Perimeter Assist Air is used. For 15-minute block periods when there is no cumulative volumetric flow of Perimeter Assist Air, the 15-minute block average NHV_{dil} parameter does not need to be calculated.

$$NHV_{dil} = \frac{\left[(Q_{vg} - Q_{NG2} + Q_{NG1}) * NHV_{vg} + (Q_{NG2} - Q_{NG1}) * NHV_{NG}\right] * Diam}{(Q_{vg} + Q_s + Q_{a,premix} + Q_{a,perimeter})} \qquad \textit{Equation 6}$$

For the first 15-minute block period of an event, Q_{NG1} shall use the volumetric flow value for the current 15-minute block period (i.e. $Q_{NG1} = Q_{NG2}$). NHV_{NG} shall be determined using one of the following methods: 1) direct compositional or Net Heating Value monitoring of the natural gas stream in accordance with Step 1; or 2) for purchased ("pipeline quality") natural gas streams, the Applicable Defendants may elect to either: a) use annual or more frequent grab sampling at any one representative location, or b) assume a Net Heating Value of 920 BTU/scf.

For all other Covered Flares: Equation 7 shall be used to determine the 15-minute block average NHV_{dil} based on the 15-minute block average Vent Gas and Perimeter Assist Air flow rates, only during periods when Perimeter Assist Air is used. For 15-minute block periods when there is no cumulative volumetric flow of Perimeter Assist Air, the 15-minute block average NHV_{dil} parameter does not need to be calculated.

$$NHV_{dil} = \frac{Q_{vg} * Diam * NHV_{vg}}{(Q_{vg} + Q_s + Q_{a,premix} + Q_{a,perimeter})} \qquad \textit{Equation 7}$$

Step 5: Ensure that during flare operation, $NHV_{cz} \geq 270$ BTU/scf

The flare must be operated to ensure that NHV_{cz} is equal to or above 270 BTU/scf, as determined for each 15-minute block period when Supplemental, Sweep, and/or Waste Gas is routed to a Covered Flare for at least 15-minutes. Equation 8 shows this relationship.

$$NHV_{cz} \geq 270\ BTU/scf \qquad \textit{Equation 8}$$

Step 6: Ensure that during flare operation, $NHV_{dil} \geq 22$ BTU/ft^2

A flare actively receiving Perimeter Assist Air must be operated to ensure that NHV_{dil} is equal to or above 22 BTU/ft^2, as determined for each 15-minute block period when Supplemental, Sweep, and/or Waste Gas is routed to a Covered Flare for at least 15-minutes. Equation 9 shows this relationship.

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$$NHV_{dil} \geq 22\ BTU/ft^2 \qquad \textit{Equation 9}$$

Calculation Method for Determining Compliance with V_{tip} Operating Limits.

The Applicable Defendants shall determine V_{tip} on a 15-minute block average basis according to the following requirements:

(a) Applicable Defendants shall use design and engineering principles and the guidance in Appendix 1.3 to determine the Unobstructed Cross Sectional Area of the Flare Tip. The Unobstructed Cross Sectional Area of the Flare Tip is the total tip area that Vent Gas can pass through. This area does not include any stability tabs, stability rings, and Upper Steam or air tubes because Vent Gas does not exit through them.

(b) Applicable Defendants shall determine the cumulative volumetric flow of Vent Gas for each 15-minute block average period using the data from the continuous flow monitoring system required in Paragraph 19 according to the requirements in Step 2 above.

(c) The 15-minute block average V_{tip} shall be calculated using Equation 10.

$$Vtip = \frac{Q_{cum}}{Areax900} \qquad \textit{Equation 10}$$

(d) If the Applicable Defendants choose to comply with Paragraph 39.b, Applicable Defendants shall also determine the NHVvg using Step 1 above and calculate V_{max} using Equation 11 in order to compare V_{tip} to V_{max} on a 15-minute Block average basis.

$$log_{10}(V_{max}) = \frac{NHV_{vg} + 1{,}212}{850} \qquad \textit{Equation 11}$$

APPENDIX 1.2

Key to the Abbreviations:

$385.3 = conversion\ factor\ (scf/lb\text{-}mol)$
850 = Constant
900 = Conversion factor, (seconds / 15-minute block average)
1,212 = Constant
Area = The unobstructed cross sectional area of the flare tip is the total tip area that vent gas can pass through, in ft². This area does not include any stability tabs, stability rings, and upper steam or air tubes because Vent Gas does not exit through them. Use design and engineering principles to determine the unobstructed cross sectional area of the flare tip.
Diam = Effective diameter of the unobstructed area of the flare tip for Vent Gas flow, in ft. Determine the diameter as $Diam = 2 * \sqrt{Area \div \pi}$
$i = individual\ component\ in\ Vent\ Gas\ (unitless)$
$MWt = molecular\ weight\ of\ the\ gas\ at\ the\ flow\ monitoring\ location\ (lb/lb\text{–}mol)$
$n = number\ of\ components\ in\ Vent\ Gas\ (unitless)$
$NHV_{cz} = Net\ Heating\ Value\ of\ Combustion\ Zone\ Gas\ (BTU/scf)$
$NHV_i = Net\ Heating\ Value\ of\ component\ i\ according\ to\ Table\ 1\ of\ this\ Appendix\ (BTU/scf)$
$NHV_{measured} = Net\ Heating\ Value\ of\ Vent\ Gas\ stream\ as\ measured\ by\ monitoring\ system\ (BTU/scf)$
$NHV_{NG} = Net\ Heating\ Value\ of\ Supplemental\ Gas\ to\ flare\ during\ the\ 15-minute\ block\ period\ (BTU/scf)$
$NHV_{vg} = Net\ Heating\ Value\ of\ Vent\ Gas\ (BTU/scf)$
$Q_{a,perimeter} = cumulative\ vol\ flow\ of\ perimeter\ assist\ air\ during\ the\ 15-minute\ block\ period\ (scf)$
$Q_{a,premix} = cumulative\ vol\ flow\ of\ premix\ assist\ air\ during\ the\ 15-minute\ block\ period\ (scf)$
Qcum = cumulative volumetric flow over 15-minute block average period (scf)
$Q_{mass} = massflow\ rate\ (pounds\ per\ second)$
$Q_{NG1} = cumulative\ vol\ flow\ of\ Supplemental\ Gas\ to\ flare\ during\ previous\ 15-minute\ block\ period\ (scf)$
$Q_{NG2} = cumulative\ vol\ flow\ of\ Supplemental\ Gas\ to\ flare\ during\ the\ 15-minute\ block\ period\ (scf)$
$Q_s = cumulative\ vol\ flow\ of\ Total\ Steam\ during\ the\ 15-minute\ block\ period\ (scf)$
$Q_{vg} = cumulative\ vol\ flow\ of\ Vent\ Gas\ during\ the\ 15-minute\ block\ period\ (scf)$
$Q_{vol} = volumetric\ flow\ rate\ (scf\ per\ second)$
Vmax = Maximum allowed flare tip velocity (feet per second)
Vtip = Flare tip velocity (feet per second)
$x_i = concentration\ of\ component\ i\ in\ Vent\ Gas\ (vol\ fraction)$
$x_{H2} = concentration\ of\ H2\ in\ Vent\ Gas\ at\ time\ sample\ was\ input\ into\ NHV\ monitoring\ system\ (vol\ fraction)$

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Table 1
Individual Component Properties

Component	Molecular Formula	MW_i (pounds per pound-mole)	CMN_i (mole per mole)	NHV_i (British thermal units per standard cubic foot)	LFL_i (volume %)
Acetylene	C_2H_2	26.04	2	1,404	2.5
Benzene	C_6H_6	78.11	6	3,591	1.3
1,2-Butadiene	C_4H_6	54.09	4	2,794	2.0
1,3-Butadiene	C_4H_6	54.09	4	2,690	2.0
iso-Butane	C_4H_{10}	58.12	4	2,957	1.8
n-Butane	C_4H_{10}	58.12	4	2,968	1.8
cis-Butene	C_4H_8	56.11	4	2,830	1.6
iso-Butene	C_4H_8	56.11	4	2,928	1.8
trans-Butene	C_4H_8	56.11	4	2,826	1.7
Carbon Dioxide	CO_2	44.01	1	0	∞
Carbon Monoxide	CO	28.01	1	316	12.5
Cyclopropane	C_3H_6	42.08	3	2,185	2.4
Ethane	C_2H_6	30.07	2	1,595	3.0
Ethylene	C_2H_4	28.05	2	1,477	2.7
Hydrogen	H_2	2.02	0	1,212[A]	4.0
Hydrogen Sulfide	H_2S	34.08	0	587	4.0
Methane	CH_4	16.04	1	896	5.0
Methyl-Acetylene	C_3H_4	40.06	3	2,088	1.7
Nitrogen	N_2	28.01	0	0	∞
Oxygen	O_2	32.00	0	0	∞
Pentane+ (C5+)	C_5H_{12}	72.15	5	3,655	1.4
Propadiene	C_3H_4	40.06	3	2,066	2.16
Propane	C_3H_8	44.10	3	2,281	2.1
Propylene	C_3H_6	42.08	3	2,150	2.4
Water	H_2O	18.02	0	0	∞

[A] The theoretical Net Heating Value for hydrogen is 274 Btu/scf, but for the purposes of this Consent Decree, a Net Heating Value of 1,212 Btu/scf shall be used.

Note: If a component is not specified in this Table 1, the heats of combustion may be determined using any published values where the net enthalpy per mole of offgas is based on combustion at 25 °C and 1 atmosphere (or constant pressure) with offgas water in the gaseous state, but the standard temperature for determining the volume corresponding to one mole of vent gas is 20 °C.

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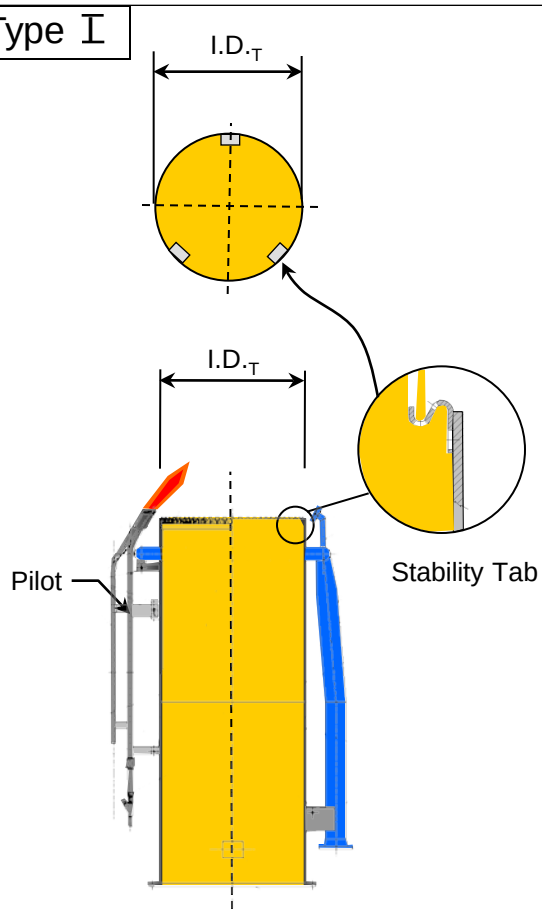
APPENDICES TO CONSENT DECREE

APPENDIX 1.3

Calculating the Unobstructed Cross Sectional Area of Various Types of Flare Tips

APPENDIX 1.0

Type I



$A_{tip\text{-}unob} = \pi(I.D._T)^2/4 - (X_T * A_{ST})$

Where:

- $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip
- $I.D._T$ = Inside Diameter Flare Tip
- X_T = Number of Stability Tabs
- A_{ST} = Area of a Stability Tab

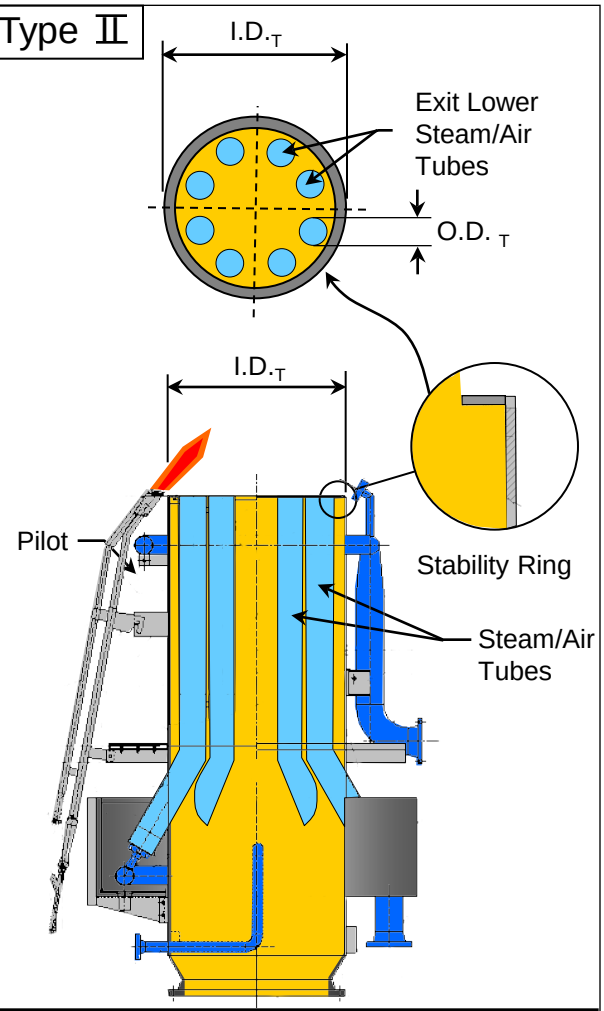
Example:

- $I.D._T$ = 41.5 inches
- X_T = 3
- A_{ST} = 3 Sq. inches

$A_{tip\text{-}unob} = \pi(41.5)^2/4 - (3 * 3)$

$A_{tip\text{-}unob}$ = 1344 Sq. inches

Type II



$A_{tip\text{-}unob} = \pi(I.D._T)^2/4 - A_{ST} - N_T * \pi * (O.D._T)^2/4$

Where:

- $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip
- $I.D._T$ = Inside Diameter Flare Tip
- A_{ST} = Area of Stability Ring
- $O.D._T$ = Outside Diameter of Steam/Air Tubes
- N_T = Number of Steam/Air Tubes

Example:

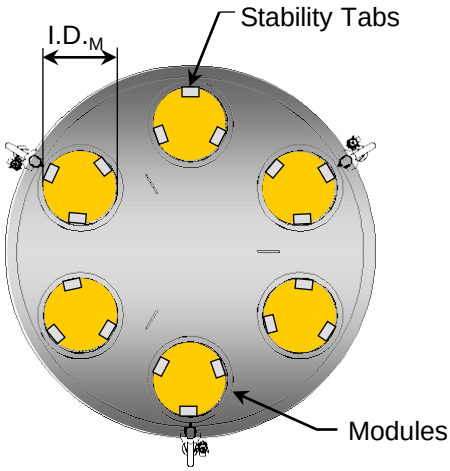
- $I.D._T$ = 47.5 inches
- A_{ST} = 100 Sq. inches
- $O.D._T$ = 6.5 inches
- N_T = 8

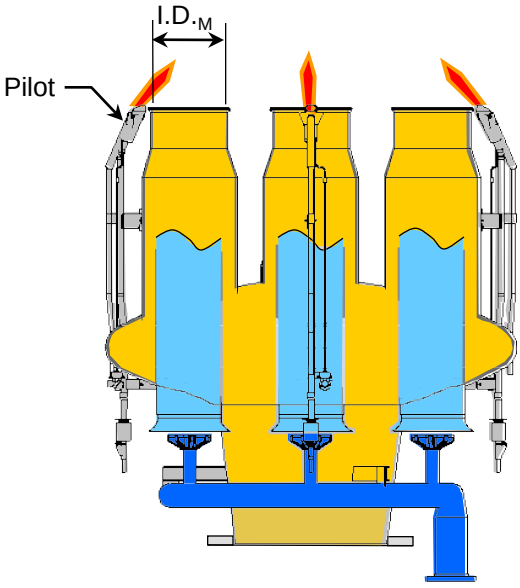
$A_{tip\text{-}unob} = \pi\ (47.5)^2/4 - 100 - 8 * \pi * (6.5)^2/4$

$A_{tip\text{-}unob}$ = 1322 Sq. inches

APPENDIX 1.0

Type III





$$A_{tip\text{-}unob} = N_M * (\pi * (I.D._M)^2/4 - X_T * A_{ST})$$

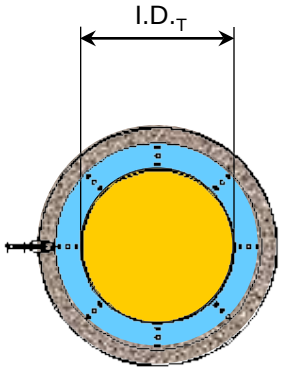
Where:
- $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip
- $I.D._M$ = Inside Diameter of One Tip Module
- N_M = Number of Modules
- X_T = Number of Stability Tabs per Module
- A_{ST} = Area of a Stability Tab

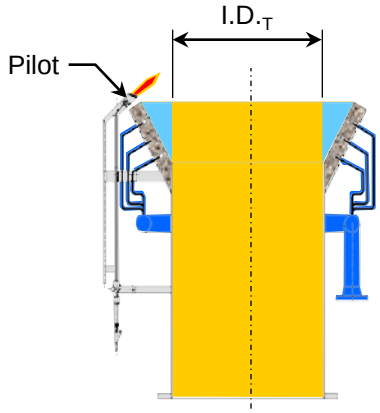
Example:
- $I.D._M$ = 17 inches
- N_M = 6
- X_T = 3
- A_{ST} = 3 Sq. inches

$$A_{tip\text{-}unob} = 6 * (\pi * (17)^2/4 - 3 * 3)$$

$$A_{tip\text{-}unob} = 1308 \text{ Sq. inches}$$

Type IV





$$A_{tip\text{-}unob} = \pi (I.D._T)^2/4$$

Where:
- $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip
- $I.D._T$ = Inside Diameter of Flare Tip

Example:
- $I.D._T$ = 41.5 inches

$$A_{tip\text{-}unob} = \pi (41.5)^2/4$$

$$A_{tip\text{-}unob} = 1353 \text{ Sq. inches}$$

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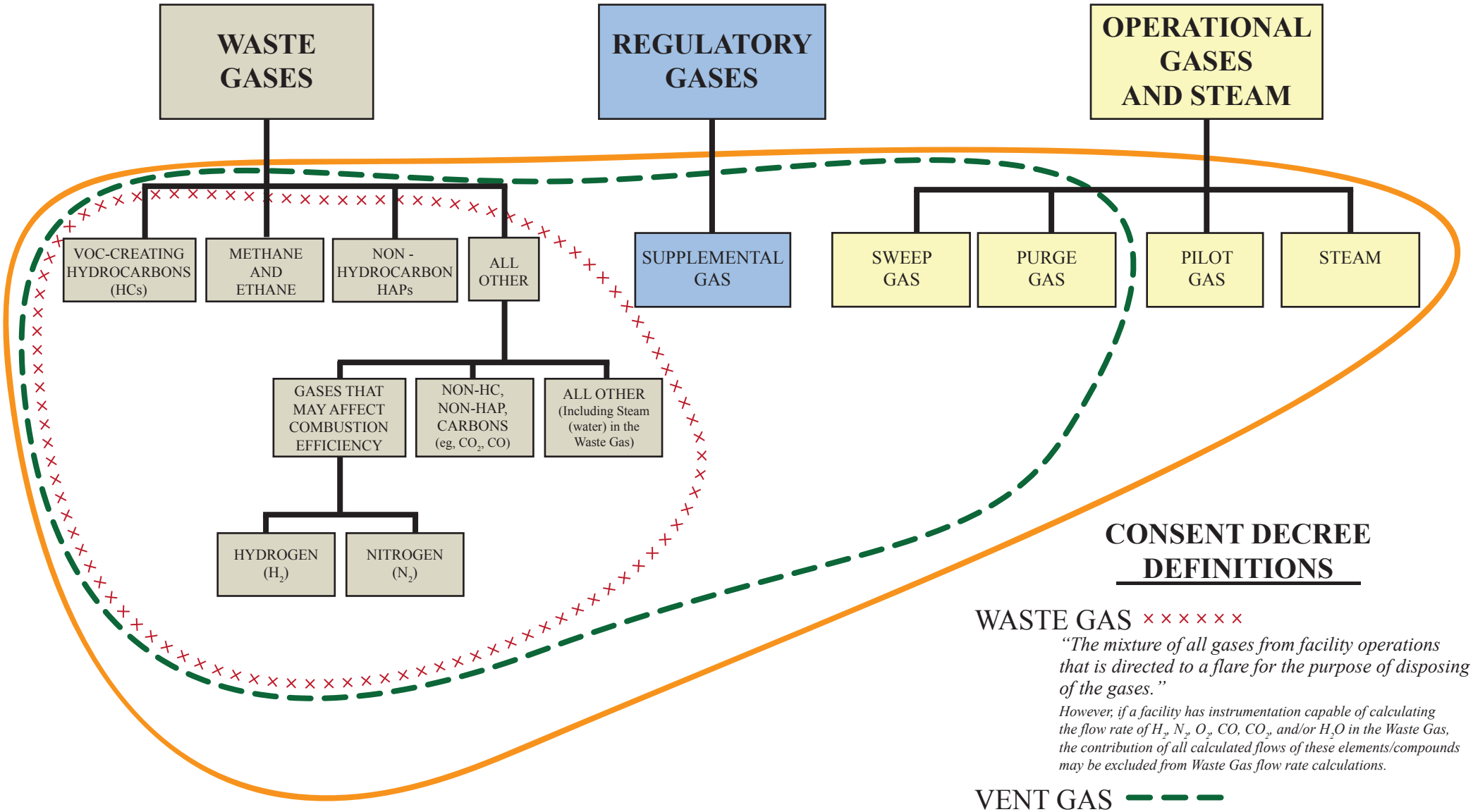
APPENDIX 1.4

Depiction of Gases Associated with Steam-Assisted Flares

DEPICTION OF GASES ASSOCIATED WITH STEAM-ASSISTED FLARES



CONSENT DECREE DEFINITIONS

WASTE GAS ××××××

"The mixture of all gases from facility operations that is directed to a flare for the purpose of disposing of the gases."

However, if a facility has instrumentation capable of calculating the flow rate of H_2, N_2, O_2, CO, CO_2, and/or H_2O in the Waste Gas, the contribution of all calculated flows of these elements/compounds may be excluded from Waste Gas flow rate calculations.

VENT GAS – – –

"The mixture of all gases found prior to the flare tip. This includes all Waste Gas, Supplemental Gas, Sweep Gas, and Purge Gas."

COMBUSTION ZONE GAS ———

"The mixture of all gases and steam found just after the flare tip. This includes all Vent Gas, Pilot Gas, and Total Steam."

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APPENDICES TO CONSENT DECREE

APPENDIX 1.5

Outline of Requirements for the Flare Data and Monitoring Systems Report

APPENDIX 1.5

OUTLINE OF REQUIREMENTS FOR THE FLARE DATA AND MONITORING SYSTEMS REPORT

1. Facility-Wide

    1.1 Facility plot plan showing the location of each Flare in relation to the general plant layout

2. General Description of Flare

    2.1 Ground or elevated
    2.2 Type of assist system
    2.3 Simple or integrated (*e.g.*, sequential, staged)
    2.4 Date first installed
    2.5 History of any physical changes to the Flare
    2.6 Whether the Flare is a Temporary-Use Flare, and if so, the duration and time periods of use
    2.7 Flare Gas Recovery System ("FGRS"), if any, and date first installed

3. Flare Components: Complete description of each major component of the Flare, except the Flare Gas Recovery System (*see* Paragraph 5), including but not limited to:

    3.1 Flare stack (for elevated flares)
    3.2 Flare tip
        3.2.1 Date installed
        3.2.2 Manufacturer
        3.2.3 Tip Size
        3.2.4 Tip Drawing
    3.3 Knockout or surge drum(s) or pot(s), including dimensions and design capacities
    3.4 Water seal(s), including dimensions and design parameters
    3.5 Flare header(s)
    3.6 Sweep Gas system
    3.7 Purge gas system
    3.8 Pilot gas system
    3.9 Supplemental gas system
    3.10 Assist system
    3.11 Ignition system

4. Simplified process diagram(s) showing the configuration of the components listed in Paragraph 3

APPENDIX 1.5

5. Channelview and La Porte Flare Gas Recovery Systems ("FGRSs")

5.1 Complete description of each major component, including but not limited to:
- 5.1.1 Compressor(s), including design capacities
- 5.1.2 Water seal(s), rupture disk, or similar device to divert the flow

5.2 Maximum actual past flow on a scfm basis and the annual average flow in scfm for the five years preceding Date of Lodging

5.3 Simplified schematic showing the FGRS

5.4 Process Flow Diagram that adds the FGRS to the PDF(s) of the process flow diagrams required in Paragraph 4

6. Flare Design Parameters

6.1 Maximum Vent Gas Flow Rate and/or Mass Rate

6.2 Maximum Sweep Gas Flow Rate and/or Mass Rate

6.3 Maximum Purge Gas Flow and/or Mass Rate, if applicable

6.4 Maximum Pilot Gas Flow and/or Mass Rate

6.5 Maximum Supplemental Gas Flow Rate and/or Mass Rate

6.6 If steam-assisted, Minimum Total Steam Rate, including all available information on how that rate was derived

7. Gases Venting to Flare

7.1. Sweep Gas
- 7.1.1 Type of gas used
- 7.1.2 Actual set operating flow rate (in scfm)
- 7.1.3 Average lower heating value expected for each type of gas used

7.2 Purge Gas, if applicable
- 7.2.1 Type of gas used
- 7.2.2 Actual set operating flow rate (in scfm)
- 7.2.3 Average lower heating value expected for each type of gas used

7.3 Pilot Gas
- 7.3.1 Type of gas used
- 7.3.2 Actual set operating flow rate (in scfm)
- 7.3.3 Average lower heating value expected for each type of gas used

7.4 Supplemental Gas
- 7.4.1 Type of gas used
- 7.4.2 Average lower heating value expected for each type of gas used

7.5 Steam (if applicable)
- 7.5.1 Drawing showing points of introduction of Lower, Center, Upper, and any other steam

7.6 Simplified flow diagram that depicts the points of introduction of all gases, including Waste Gases, at the Flare (in this diagram, the detailed drawings of 7.5.1 may be simplified; in addition, detailed Waste Gas mapping is not required; a simple identification of the header(s) that carries(y) the Waste Gas to the Flare

APPENDIX 1.5

and show(s) its(their) location in relation to the location of the introduction of the other gases is all that is required)

8. Existing Monitoring Systems

8.1 A brief narrative description, including manufacturer and date of installation, of all existing monitoring systems, including but not limited to:

8.1.1 Waste Gas and/or Vent Gas flow monitoring
8.1.2 Waste Gas and/or Vent Gas heat content analyzer
8.1.3 Sweep Gas flow monitoring
8.1.4 Purge Gas flow monitoring
8.1.5 Supplemental Gas flow monitoring
8.1.6 Steam flow monitoring
8.1.7 Waste Gas or Vent Gas molecular weight analyzer
8.1.8 Gas Chromatograph
8.1.9 Sulfur analyzer(s)
8.1.10 Video camera
8.1.11 Thermocouple

8.2 Drawing(s) showing locations of all existing monitoring systems

9. Monitoring Equipment to be Installed to Comply with Consent Decree

10. Narrative Description of the Monitoring Methods and Calculations that will be used to comply with the NHV_{CZ} Requirements in the Consent Decree

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APPENDICES TO CONSENT DECREE

APPENDIX 1.6

Waste Gas Minimizing Equipment and Operational Procedures

Clinton Plant Waste Gas Minimizing Equipment and Operational Procedures

At the Clinton Plant the Applicable Defendant must operate the following equipment and perform the following operational procedures to minimize flaring.

Vent Stream Recovery System – Dephlegmator

The Dephlegmator Vent Recovery System collects continuous vent streams from the Topping Still Reflux Drum, Main C2 Splitter Reflux Drum, 2nd Ethylene Refrigerant Compressor Receiver Drum, and the C3 Splitter Reflux Drum in the separation section of the plant and condenses out heavier liquids, which are returned to the process. The remaining gas stream is routed to the Process Gas Compressor for recovery in the separation section, or to the fuel gas system. The estimated gas recovery for the Dephlegmator is approximately 1.4 mscf per Day under normal conditions. During the 98% operating time required by Paragraph 37.b.iii of the Consent Decree, the gas streams described above must not be routed to a Flare.

Tank Farm Ethylene Vent Recovery System

The Clinton Plant employs a cryogenic tank for ethylene surge storage. This cryogenic tank is located in the onsite tank farm. The Tank Farm Ethylene Vent Recovery System compresses vapors generated by ambient heat gain in the cryogenic Ethylene Storage Tank and routes them to the product recovery system in the separation section of the ethylene unit. The estimated gas recovery for the tank farm ethylene vent recovery system is approximately 0.6 mscf per Day under normal conditions. During the 98% operating time required by Paragraph 37.b.iii of the Consent Decree, the gas streams described above must not be routed to a Flare.

Flare Minimization Regeneration Procedures

Molecular sieve desiccant dryers are used in the olefins process to remove moisture and other contaminants from process streams. These dryers require periodic regeneration via temperature swing adsorption, using hot regeneration gases, to desorb the moisture and contaminants. Flare Minimization Regeneration Procedures are employed to optimize the recovery of process fluids to (i) the Process Gas Compressor system for recovery in the separation section, and (ii) recovery of regeneration gases to the fuel system. These procedures are employed during the regeneration of the Process Gas Dryers and C2 Splitter Guard Dryers. The estimated average gas recovery for the flare minimization regeneration procedures is 0.4 mscf per Day for normal regeneration cycles. During the 98% operating time required by Paragraph 37.b.iii of the Consent Decree, the gas streams described above must not be routed to a Flare.

Corpus Christi Plant Waste Gas Minimizing Equipment and Operational Procedures

At the Corpus Christi Plant the Applicable Defendant must operate the following equipment and perform the following operational procedures to minimize flaring.

Vent Recovery System

The Vent Recovery System collects continuous vent streams from the C2 Splitter Reflux Drum and the Secondary Deethanizer Reflux Drum in the separation section of the plant. Ethylene in the vent from the C2 splitter is condensed and recycled to the separation section of the process. The remaining gas stream is routed to the Process Gas Compressor for product recovery in the separation section. The estimated gas recovery for the Vent Recovery System is 0.6 mscf per

Day under normal conditions. During the 98% operating time required by Paragraph 37.b.iv of the Consent Decree, the gas streams described above must not be routed to a Flare.

Pyrolysis Gasoline Stripper Vent Recovery

Pyrolysis gasoline is produced in the olefins process. The pyrolysis gasoline has light compounds that need to be removed to meet vapor pressure limitations on downstream tankage. The light compounds are removed in the Pyrolysis Gasoline Stripper and are routed to the Process Gas Compressor for product recovery. The estimated gas recovery for the Pyrolysis Gasoline Stripper Vent Recovery is 1.0 mscf per Day under normal conditions. During the 98% operating time required by Paragraph 37.b.iv of the Consent Decree, the gas streams described above must not be routed to a Flare.

Flare Minimization Regeneration Procedures

Molecular sieve desiccant dryers are used in the olefins process to remove moisture and other contaminants from process streams. These dryers require periodic regeneration via temperature swing adsorption, using hot regeneration gases, to desorb the moisture and contaminants. Flare Minimization Regeneration Procedures are employed to optimize the recovery of process fluids to (i) the Process Gas Compressor system for further recovery in the separation section, and (ii) recovery of regeneration gases to the fuel system. These procedures are employed during the regeneration of the Process Gas Dryers, C2 Splitter Guard Dryers, and Propylene Dryers. The estimated average gas recovery for the flare minimization regeneration procedures is 0.4 mscf per Day for normal regeneration cycles. During the 98% operating time required by Paragraph 37.b.iv of the Consent Decree, the gas streams described above must not be routed to a Flare.

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APPENDICES TO CONSENT DECREE

APPENDIX 1.7

Waste Gas Mapping: Level of Detail Needed to Show Main Headers and Process Unit Headers

APPENDIX 1.7

WASTE GAS MAPPING:
LEVEL OF DETAIL NEEDED TO SHOW MAIN HEADERS AND PROCESS UNIT HEADERS

Purpose:

Waste Gas Mapping is required in order to identify the source(s) of Waste Gas entering each Covered Flare. Waste Gas Mapping can be done using instrumentation, isotopic tracing, acoustic monitoring, and/or engineering estimates for all sources entering a flare header (e.g. pump seal purges, sample station purges, compressor seal nitrogen purges, relief valve leakage, and other sources under normal operations). This Appendix outlines what needs to be included as the Waste Gas Mapping section within the Initial Waste Gas Minimization Plan ("Initial WGMP") and, as needed, later updated.

Waste Gas Mapping Criteria:

For purposes of Waste Gas mapping, a main header is defined as the last pipe segment prior to the flare knock out drum. Process unit headers are defined as pipes from inside the battery limits of each process unit that connect to the main header. For process unit headers that are greater than or equal to six (6) inches in diameter, flow ("Q") must be identified and quantified if it is technically feasible to do so. In addition, all sources feeding each process unit header must be identified and listed in a table, but not necessarily individually quantified. For process unit headers that are less than six (6) inches in diameter, sources must be identified, but they do not need to be quantified.

Waste Gas Mapping Submission Requirements:

For each Covered Flare, the following shall be included within the Waste Gas Mapping section of the Initial WGMP:

1. A simplified schematic consistent with the example schematic included on the second page of this Appendix.

2. A table of all sources connected to each flare main header and process unit header consistent with the Table included on the third page of this Appendix.

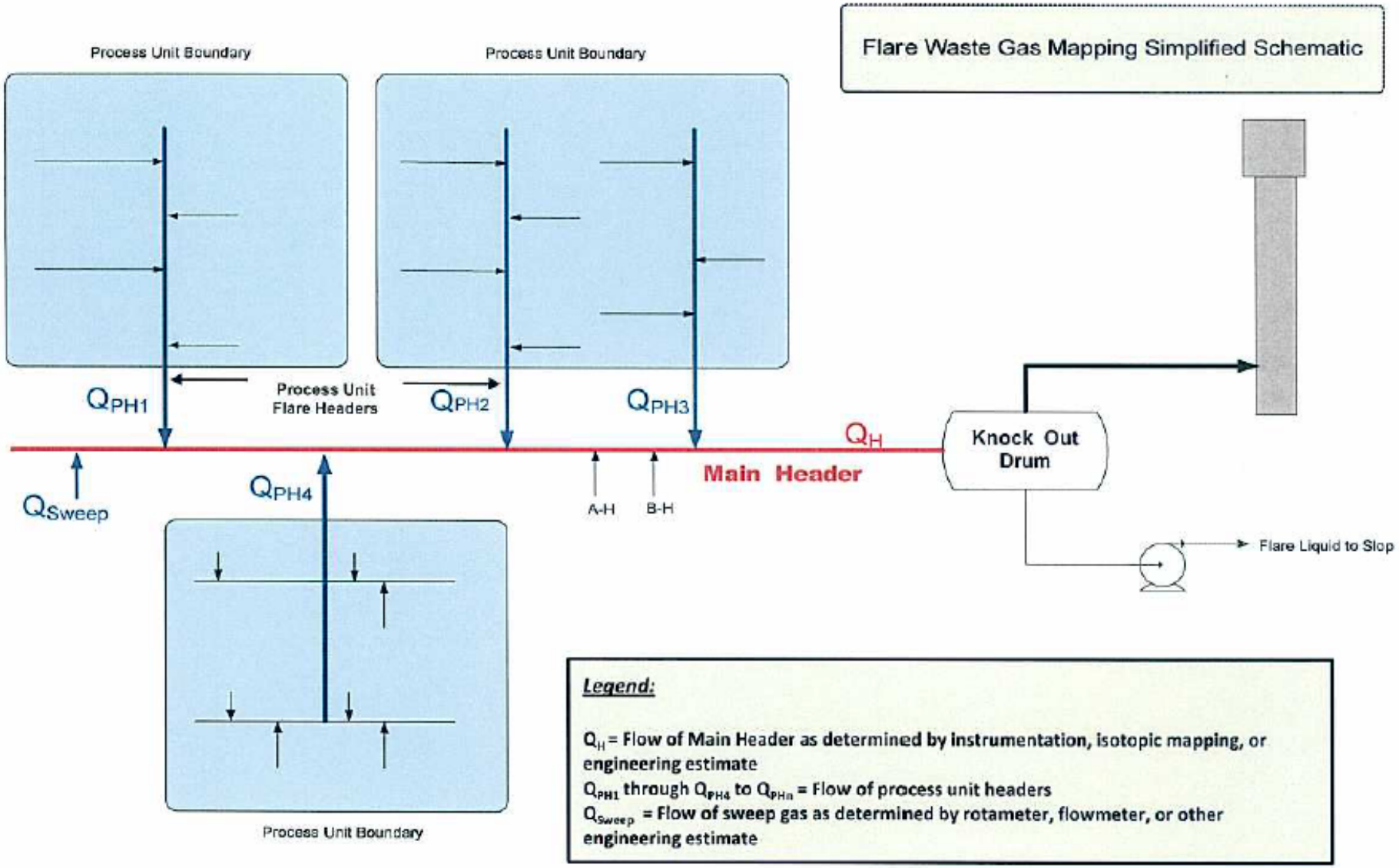
Flare Waste Gas Mapping Simplified Schematic
Process Unit Boundary
Process Unit Boundary
Process Unit Flare Headers
QPH1
QPH2
QPH3
QH
Main Header
Knock Out Drum
QSweep
QPH4
A-H
B-H
Flare Liquid to Slop
Process Unit Boundary
Legend:
QH = Flow of Main Header as determined by instrumentation, isotopic mapping, or engineering estimate
QPH1 through QPH4 to QPHn = Flow of process unit headers
QSweep = Flow of sweep gas as determined by rotameter, flowmeter, or other engineering estimate

Table 1: Example of Flare Source Description Table

Process Unit Header	Sources	Detailed Source Description
Q_{PH1} (Ex: FCCU Gas Con Unit)	3 PSVs	PSV-14 on 110-D-5 Gas Con Absorber PSV-12 on 110-D-1 Amine Scrubber PSV-7 on 110-F-1 Batch Caustic Vessel
	2 Pump Seal Purges	110-G-1 LPG Pump 110-G-2 Rich Amine Pump
	1 Sample Station	110-S-1 LPG
	1 PSV	PSV 17 on 112-D-1 Main Column
	1 Pressure Control Valve	PCV 21 – Emergency Wet Gas Compressor
	1 PSV	PSV-21 on Flush Oil Drum
	1 Pump Seal Purge	110-G-23 Slurry Oil Pump
Q_{PH2} (Ex: Gas Oil Treater)	Continue same as PH1	Continue same as PH1
Q_{PH3}	Continue same as PH1	Continue same as PH1
Q_{PH4}	Continue same as PH1	Continue same as PH1
A-H	1 PSVs	PSV-17 on 109-E-42 Slurry Heat Exchanger
B-H	2 Pump Seal Purges	110-G-3 Gas Oil Feed 110-G-4 Main Column Reflux

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APPENDIX 1.8

Johnson Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

Mr. Chuck DeCarlo
Marketing Manager
Extrel CMS, LLC
575 Epsilon Drive, Suite 2
Pittsburg, PA 15238-2838

FEB 05 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. Tony Slapikas
Product Manager for Mass Spectrometry
AMETEK, Energy & Process Division
150 Freeport Road
Pittsburgh, PA 15238

Dear Mr. DeCarlo and Mr. Slapikas,

I am writing in response to your letter dated August 18, 2017, requesting approval for use of process mass spectrometers as part of an alternative to testing procedures utilizing calorimeters or gas chromatographs to measure Net Heating Value (NHV_{VG}) in flare vent gas as required under 40 CFR Part 63, Subpart CC – National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries. The owner or operator of facilities subject to Subpart CC must measure flare vent gas composition to determine NHV_{VG} in units of British Thermal Units per standard cubic foot (BTU/SCF). This BTU/SCF determination may be performed using a calorimeter capable of continuously measuring, calculating, and recording NHV_{VG} at standard conditions (40 CFR 63.670 (j)(3)) or equipment that determines the concentration of individual components in the flare vent gas (40 CFR 63.670 (j)(1)), such as a gas chromatograph, and, if desired, may directly measure the hydrogen concentration in the flare vent gas following the methods provided in 40 CFR 63.670 (j)(4). All monitoring equipment must meet the applicable minimum accuracy, calibration and quality control requirements specified in Table 13 and §63.671 of Subpart CC.

In your letter, you propose to use a process mass spectrometer analyzer and the following measurement approach as an alternative to measure NHV_{VG}:

1) The owner or operator of the affected facility will perform a pre-survey to determine the list and concentration of components that are present in flare vent gas feed. This pre-survey will be used in part to:
   a) Determine an appropriate analysis method for the site-specific refinery flare vent gas;
   b) Create a list of vent gas components to be included in calibration gas cylinders to be used to evaluate the quality of the measurement procedure used to determine NHV_{VG};
   c) Define calibration standards to be prepared by a vendor at a certified accuracy of 2 percent and traceable to NIST; and
   d) Perform an initial calibration to identify mass fragment overlap and response factors for the target compounds.

2) The process mass spectrometer will be calibrated using calibration gas standards consisting of a mix of the compounds identified in the site specific flare gas pre-survey.
3) During flare gas analysis, compounds that are not identified during the pre-survey and that have mass fragments identical to the compounds found during the pre-survey will be included in the calculation of NHV_{VG}.
4) Calibration error (CE) for each component in the calibration blend will be calculated using the following equation:

$$CE = \frac{C_m - C_a}{C_a} \, x \, 100$$

Where :

C_m = Average instrument response, (ppm)
C_a = Cylinder gas value or tag value, (ppm)

5) The average instrument CE for each calibration compound at any calibration concentration must not differ by more than 10 percent from the cylinder gas value or tag value.
6) For each set of triplicate injections at each calibration concentration for each calibration compound, any one introduction shall not deviate more than 5 percent from the average concentration measured at that level.

Your supporting information included Method 301 calculations that showed acceptable bias and precision when you measured a mixture of gases from a vendor certified gas cylinder. Your request also includes reference to facilities needing to monitor flare gas composition continuously to effectively maintain flare efficiency while compensating for changes in the flare gas composition.

With this letter, we are approving your request to substitute continuous process mass spectrometry for continuous gas chromatography as allowed in 40 CFR 63.670 and 63.671 predicated on both your proposed use of these process mass spectrometers as described above and the additional provisos listed below:

1) You must meet the requirements in 40 CFR 63.671 (e)(1) and (2) including Table 13 requirements for Net Heating Value by Gas Chromatograph.
2) You may use the alternative sampling line temperature allowed in 40 CFR 63, Subpart CC, Table 13, under Net Heating Value by Gas Chromatograph.
3) You must meet applicable Performance Specification 9 (40 CFR part 60, appendix B) requirements for initial continuous monitoring system acceptance including, but not limited to:
    - Performing a multi-point calibration check at three concentrations following the procedure in Section 10.1; and
    - Performing periodic process mass spectrometer calibrations as directed for gas chromatographs in 40 CFR 63, Subpart CC, Table 13.
4) You may augment the minimum list of calibration gas components found in 40 CFR 63.671(e) with compounds found during the pre-survey as needed to develop a site-specific analysis method.

5) For unknown gas components that have similar analytical mass fragments to calibration compounds, you may report the unknowns as an increase in the overlapped calibration gas compound.
6) For unknown compounds that do not produce mass fragments that overlap calibration compounds, you may use the response factor for the nearest molecular weight hydrocarbon in the calibration mix to quantify the unknown component's NHV_{VG}. This requirement parallels the requirements in 40 CFR Part 63.671 (e)(3) for gas chromatographs.
7) You may use the response factor for n-pentane to quantify any unknown components detected with a higher molecular weight than n-pentane.
8) You must meet all other applicable generic requirements of §§63.670 and 63.671 for measurement of NHV_{VG} (i.e., measurement requirements not specifically targeted to gas chromatographs).
9) A copy of this approval letter must be included in the report for each testing program where these alternative testing procedures are applied.

Since this alternative test method approval under 40 CFR 63.7 (f) is appropriate for use at all facilities subject to 40 CFR 63, Subpart CC, we will announce on EPA's Web site (*https://www.epa.gov/emc/broadly-applicable-approved-alternative-test-methods*) that the alternative method is broadly applicable to determination of NHV_{VG} under this subpart.

If you have any questions regarding this approval or need further assistance, please contact Ray Merrill at (919) 541-5225 or *merrill.raymond@epa.gov*, or Robin Segall at (919) 541-0893 or *segall.robin@epa.gov*.

Sincerely,

Robin R. Segall for SMJ

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc.

Gerri Garwood, EPA/OAQPS/SPPD
Maria Malave, EPA/OECA/OC
Brenda Shine, EPA/OAQPS/SPPD
EPA Regional Testing Contacts

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APPENDICES TO CONSENT DECREE

APPENDIX 2.1

Interim Measures

1. Channelview North – East Plant Flare: Assist Steam Monitoring Requirements.

   By no later than the Effective Date through June 30, 2023, at the Channelview North – East Plant Flare, the Applicable Defendant must:

   a. Measure Assist Steam flow as required by Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree; or

   b. Measure Assist Steam flow using the existing (as of the Effective Date) Assist Steam meters and comply with the following:

      i. When using Equation 3 in Appendix 1.2 to calculate Q_s, steam flow (secondary and backup) will be adjusted from the measured value using the equations[1] below:

         Secondary Steam Flow:

$$Q_{mass,a} = Q_{mass} + \frac{472486 * (Q_{mass}{}^{-1.9226}) - 0.05}{1.05} * Q_{mass}$$

         Backup Steam Flow:

$$Q_{mass,a} = Q_{mass} + \frac{1246631 * (Q_{mass}{}^{-1.9509}) - 0.05}{1.05} * Q_{mass}$$

         Where:

         Q_{mass} = measured steam flow rate
         $Q_{mass,\ a}$ = adjusted steam flow rate; and

      ii. Calculate Assist Steam flows using a fixed temperature of 406 °F and a fixed pressure of 250 psig, for primary and secondary steam flow; and

      iii. Calculate Assist Steam flow using a fixed temperature of 489 °F and a fixed pressure of 600 psig, for backup steam flow.

   Failure to comply with the requirements of either Paragraph 1.a or 1.b.i-iii above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2023, the Applicable Defendant must comply with Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree at the Channelview North – East Plant Flare.

2. Channelview North – IPOH Flare: Assist Steam Monitoring Requirements.

   By no later than the Effective Date through June 30, 2021, at the Channelview North – IPOH Flare, the Applicable Defendant must:

[1]Equations determined based on a correlation relating the expected potential inaccuracy of the steam flow meter to the measured steam flow. Expected potential steam flow inaccuracy determined using the methods in API Manual of Petroleum Measurement Standards Chapter 14.3.1.

a. Measure Assist Steam flow as required by Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree; or

b. Measure Assist Steam flow using the existing (as of the Effective Date) steam calculation[2] as follows:

i. Primary Steam Flow:

$$Q_{mass} = 0.004{x_a}^3 - 0.2357{x_a}^2 + 11.634x_a + 9.5115 + Q_{orifice}$$

Secondary Steam Flow:

$$Q_{mass} = 0.0353{x_b}^3 - 2.2502{x_b}^2 + 104.33x_b$$

Where:

Q_{mass} = calculated steam flow rate, lb/hr
x_a = primary valve controller output, % (expressed 0-100)
x_b = secondary valve controller output, % (expressed 0-100)
$Q_{orifice}$ = constant bypass steam flow through orifice, 200 lb/hr; and

ii. Calculate volumetric steam flow using a fixed temperature of 400 °F and a fixed pressure of 200 psig.

Failure to comply with the requirements of either Paragraph 2.a or 2.b.i-ii above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2021, the Applicable Defendant must comply with Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree at the Channelview North – IPOH Flare.

3. Channelview South – MTBE-C Flare: Assist Steam Monitoring Requirements.

By no later than the Effective Date through June 30, 2023, at the Channelview South – MTBE-C Flare, the Applicable Defendant must:

a. Measure Assist Steam flow as required by Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree; or

b. Measure Assist Steam flow using the existing (as of the Effective Date) steam meters and comply with the following:

[2] Equations determined based on a correlation relating the expected steam flow to the steam controller output. Expected steam flow determined via a universal control valve sizing equation using the known flow characteristics of the valves.

i. When using Equation 3 in Appendix 1.2 to calculate Q_s, steam flow will be adjusted from the measured value using the equation[1] below:

$$Q_{mass,a} = Q_{mass} + \frac{192710 * (Q_{mass}{}^{-2.022}) - 0.05}{1.05} * Q_{mass}$$

Where:

Q_{mass} = measured steam flow rate
$Q_{mass,\ a}$ = adjusted steam flow rate; and

ii. Calculate volumetric steam flow using a fixed temperature of 338 °F and a fixed pressure of 100 psig.

Failure to comply with the requirements of either Paragraph 3.a or 3.b.i-ii above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2023, the Applicable Defendant must comply with Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree at the Channelview South – MTBE-C Flare.

4. Channelview South – MTBE-E Flare: Vent Gas and Assist Steam Monitoring Requirements.

By no later than the Effective Date through June 30, 2023, at the Channelview South – MTBE-E Flare, the Applicable Defendant must:

a. Monitor Assist Steam Flow. To monitor Assist Steam Flow, the Applicable Defendants must either:

i. Measure Assist Steam flow as required by Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree; or

ii. Measure Assist Steam flow using the existing (as of the Effective Date) steam meters and comply with the following:

1. When using Equation 3 in Appendix 1.2 to calculate Q_s, steam flow will be adjusted from the measured value using the equations[1] below:

Ring Steam Flow:

$$Q_{mass,a} = Q_{mass} + \frac{258758 * (Q_{mass}{}^{-1.906}) - 0.05}{1.05} * Q_{mass}$$

Center Steam Flow:

$$Q_{mass,a} = Q_{mass} + \frac{4055.5 * (Q_{mass}{}^{-1.9113}) - 0.05}{1.05} * Q_{mass}$$

Where:

Q_{mass} = measured steam flow rate
$Q_{mass,\ a}$ = adjusted steam flow rate; and

2. Calculate volumetric Steam flow using a fixed temperature of 338 °F and a fixed pressure of 100 psig.

b. Monitor Vent Gas flow. To monitor Vent Gas Flow, the Applicable Defendant must either:

i. Measure Vent Gas flow as required by Paragraphs 19, 22, 24 and Appendix 1.2 of this Consent Decree; or

ii. Calculate the BDO unit emergency Vent Gas flow rate using material balance calculations and standard engineering estimations, including relief valve flow calculations, control valve flow calculations, and orifice calculations, as detailed in Crane Technical Paper 410.

Failure to comply with the requirements of either Paragraph 4.a.i or 4.a.ii.1-2 and Paragraph 4.b.i or 4.b.ii above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2023, the Applicable Defendant must comply with Paragraphs 19, 22, 24 and Appendix 1.2 of this Consent Decree at the Channelview South – MTBE-E Flare.

5. Channelview South – POSM1-C Flare: Assist Steam Monitoring Requirements.

By no later than the Effective Date through June 30, 2023, at the Channelview South – POSM1-C Flare, the Applicable Defendant must:

a. Measure Assist Steam pressure and temperature as required by Paragraph 19.b of this Consent Decree; or

b. Calculate Assist Steam flow using a fixed temperature of 356 °F and a fixed pressure of 130 psig.

Failure to comply with the requirements of either Paragraph 5.a or 5.b above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2023, the Applicable Defendant must comply with Paragraph 19.b of this Consent Decree at the Channelview South – POSM1-C Flare.

6. La Porte AB3 Flare: Equipment Uptime Requirements.

a. On or before December 31, 2020, the Applicable Defendant will complete installation of all Consent Decree-required Vent Gas and Assist Steam monitoring equipment at the La Porte AB3 Flare.

b. After January 1, 2021 and until June 30, 2021, the Applicable Defendant shall make best efforts to operate the Consent Decree required Vent Gas and Assist Steam monitoring equipment as often as possible, but shall not be required to comply with the equipment uptime requirement in Paragraph 44 of the Consent Decree at the La Porte AB3 Flare.

7. La Porte QE1 Flare: Assist Steam Monitoring Requirements.

By no later than the Effective Date through June 30, 2022, at the La Porte QE1 Flare, the Applicable Defendant must:

a. Measure Assist Steam flow as required by Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree; or

b. Measure volumetric steam flow using the existing (as of the Effective Date) steam meters. When using Equation 3 in Appendix 1.2 to calculate Q_s, steam flow will be adjusted from the measured value using the equation[1] below:

$$Q_{mass,a} = Q_{mass} + \frac{376883 * (Q_{mass}{}^{-1.734}) - 0.05}{1.05} * Q_{mass}$$

Where:

Q_{mass} = measured steam flow rate
$Q_{mass,\ a}$ = adjusted steam flow rate

Failure to comply with the requirements of either Paragraph 7.a or 7.b above is a violation of this Consent Decree and therefore subject to stipulated penalties pursuant to Paragraph 63.b and/or 63.c of this Consent Decree. After June 30, 2023, the Applicable Defendant must comply with Paragraphs 19 and 24 and Appendix 1.2 of this Consent Decree at the La Porte QE1 Flare.

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APPENDICES TO CONSENT DECREE

APPENDIX 2.2

Scope of Work for the Fenceline Monitoring Project

APPENDIX 2.2

SCOPE OF WORK FOR THE FENCELINE MONITORING PROJECT

1. **Applicability.** The requirements of this Fenceline Monitoring Project apply to the following Covered Plants that are owned and/or operated by the Applicable Defendant: Channelview North Plant; Channelview South Plant; Clinton Plant; Corpus Christi Plant; and La Porte LyondellBasell Acetyls Plant; and La Porte Equistar Plant.

2. **Timing and Public Transparency**. No later than 270 Days after the Effective Date, the Applicable Defendant must submit in writing to EPA a report: a) showing the location of all monitors at each Covered Plant that will be utilized to comply with the Monitoring Requirements of Paragraph 3 below; b) providing an active/live/not password protected URL to a mockup of the publicly available website to be used to report monitoring data pursuant to this Fenceline Monitoring Project; and c) a statement indicating that the website is properly indexed (including, but not limited to the following search terms, "benzene," "fenceline monitoring," and the Covered Plant name and location) with the major search engines (*e.g.*, Google, Bing, Yahoo) to allow the public to easily find the website.

   The Fenceline Monitoring System described in Paragraph 3 below must commence collecting data 365 Days after the Effective Date (Effective Date is defined at Section XVII of the Consent Decree) unless a different time is provided pursuant Paragraph 3(i) below.

   The Applicable Defendant must post to a publicly available website each individual sample result for each monitor, each biweekly annual average concentration difference value (once annual averages are available), and any corrective action plan submitted to EPA pursuant to Paragraph 3(h)(corrective action plans posted to the website may be redacted to protect confidential business information). The Applicable Defendant must post each individual sample result for each monitor within 30 Days of the end of the biweekly sampling period or within 30 Days of sampling collected pursuant to the "alternative sampling frequency for burden reduction" requirements set forth in Paragraph 3(f)(3) below. The Applicable Defendant must post each annual average difference value within 45 Days of the sampling period that allows the creation of a new annual average difference value. The data must be presented in a tabular format.

3. **Monitoring Requirements**.

a. The Applicable Defendant must commence sampling along the property boundary of each of the Covered Plants. The Applicable Defendant must collect and analyze the samples in accordance with Methods 325A and 325B of Appendix A to 40 C.F.R. Part 63 (Test Methods – Pollutant Measurement Methods From Various Waste Media) (hereafter "Rule Appendix A"), and subparagraphs 3(b) through 3(g).

b. The target analyte for the Fenceline Monitoring System is benzene.

c. The Applicable Defendant may submit and discuss additional data collected by it or by third parties in the reports required pursuant to Paragraph 3.h of this Appendix and/or Paragraph 54 of this Consent Decree. If the Applicable Defendant concludes that an exceedance of the action level described in Paragraph 3.g is caused by an offsite source(s), such a conclusion does not relieve the Applicable Defendant of its obligation to perform the Root Cause investigation described in Paragraph 3.h.

d. Siting of monitors. The Applicable Defendant must determine the passive monitor locations comprising each Fenceline Monitoring System in accordance with Section 8.2 of Method 325A of Rule Appendix A, with the exception of the number of duplicates and blanks, which will be determined pursuant to 40 C.F.R. § 63.658(c)(3).

(1) As it pertains to this Fenceline Monitoring Project, known sources of VOCs, as used in Section 8.2.1.3 in Method 325A of Rule Appendix A for siting passive monitors, means a wastewater treatment unit, process unit, or any emission source requiring HAP control according to the requirements of any state or federal air permit applicable to the Covered Plants, including marine vessel loading operations. For marine loading operations that are located offshore, one passive monitor should be sited on the shoreline adjacent to the dock. For purposes of this Appendix, an additional monitor is not required if the only emission sources within 50 meters of the monitoring boundary are equipment leak sources satisfying all of the requirements in 40 CFR § 63.658(c)(1)(i) through (iv).

(2) If there are 19 or fewer monitoring locations, the Applicable Defendant shall collect at least one co-located duplicate sample per sampling period and at least one field blank per sampling period. If there are 20 or more monitoring locations, the Applicable Defendant shall collect at least two co-located duplicate samples per sampling period and at least one field blank per sampling period, as described in 40 C.F.R. § 63.658(c)(3). The co-located duplicates may be collected at any one of the perimeter sampling locations.

(3) The Applicable Defendant must follow the procedure in Section 9.6 of Method 325B of Rule Appendix A to determine the detection limit of benzene for each sampler used to collect samples and co-located samples and blanks. Each monitor used to conduct sampling in accordance with this Appendix must have a detection limit that is at least an order of magnitude lower than the benzene action level.

(4) The Applicable Defendant may install additional monitors and may submit and discuss additional data collected by it or by third parties in the reports required pursuant to Paragraph 3.h of this Appendix and/or Paragraph 54 of this Consent Decree. If the Applicable Defendant concludes that an exceedance of the Action Level described in Paragraph 3.g is

caused by an offsite source(s), such a conclusion does not relieve the Applicable Defendant of its obligation to perform the Root Cause investigation described in Paragraph 3.h.

e. Collection of meteorological data. The Applicable Defendant must collect and record meteorological data according to the applicable requirements in sub-Paragraphs 3(e)(1) and 3(e)(2).

(1) The Applicable Defendant must collect and record the average temperature and barometric pressure during each sampling period using either an on-site meteorological station in accordance with Section 8.3 of Method 325A of Rule Appendix A or, alternatively, using data from a United States Weather Service (USWS) meteorological station provided the USWS meteorological station is within 40 kilometers (25 miles) of the applicable Covered Plant.

(2) If an on-site meteorological station is used, the Applicable Defendant must follow the calibration and standardization procedures for meteorological measurements in EPA-454/B-08-002. http://www3.epa.gov/ttnamti1/files/ambient/met/Volume_IV_Meteorological_Measurements.pdf.

f. Sampling Frequency. The Applicable Defendant must use a sampling period and sampling frequency as specified in this sub-Paragraph 3(f).

(1) *Sampling period*. A 14-Day sampling period must be used, unless a shorter sampling period is determined to be necessary under Paragraph 3(h). A sampling period is defined as the period during which a sampling tube is deployed at a specific sampling location with the diffusive sampling end cap in-place. The sampling period does not include the time required to analyze the sample. For the purpose of this sub-Paragraph, a 14-Day sampling period may be no shorter than 13 calendar days and no longer than 15 calendar days, but the routine sampling period must be 14 calendar days.

(2) *Base sampling frequency*. Except as provided in Paragraph 3(f)(3), the frequency of sample collection must be once each contiguous 14-Day sampling period, such that the next 14-Day sampling period begins immediately upon the completion of the previous 14-Day sampling period.

(3) *Alternative sampling frequency for burden reduction*. When an individual monitor consistently, as defined in sub-Paragraph 3(f)(3)(i) through (v), yields results at or below 0.9 $\mu g/m^3$, the Applicable Defendant may elect to use the applicable minimum sampling frequency specified in Paragraph 3(f)(3)(i) through (v) for that individual monitoring site. When calculating Δc (as defined in Paragraph 3(g)) for the monitoring period when using

this alternative for burden reduction, zero must be substituted for the sample result for the monitoring site for any period where a sample is not taken.

(i) If every sample at an individual monitoring site is at or below 0.9 µg/m^3 for 2 years (52 consecutive samples), every other sampling period can be skipped for that individual monitoring site, *i.e.*, sampling can occur approximately once per month.

(ii) If every sample at an individual monitoring site that is monitored at the frequency specified in Paragraph 3(f)(3)(i) is at or below 0.9 µg/m^3 for 2 years (*i.e.*, 26 consecutive "monthly" samples), five 14-Day sampling periods can be skipped for that individual monitoring site following each period of sampling, *i.e.*, sampling will occur approximately once per quarter.

(iii) If every sample at an individual monitoring site that is monitored at the frequency specified in Paragraph 3(f)(3)(ii) is at or below 0.9 µg/m^3 for 2 years (*i.e.*, 8 consecutive quarterly samples), twelve 14-Day sampling periods can be skipped for that individual monitoring site following each period of sampling, *i.e.*, sampling will occur twice a year.

(iv) If every sample at an individual monitoring site that is monitored at the frequency specified in Paragraph 3(f)(3)(iii) is at or below 0.9 µg/m^3 for 2 years (*i.e.*, 4 consecutive semi-annual samples), only one sample per year is required for that individual monitoring site. For yearly sampling, samples must occur at least 10 months but no more than 14 months apart.

(v) If at any time a sample for an individual monitoring site that is monitored at the frequency specified in Paragraphs 3(f)(3)(i) through (iv) returns a result that is above 0.9 µg/m^3, that sampling site must return to the original sampling requirements of contiguous 14-Day sampling periods with no skip periods for one quarter (six 14-Day sampling periods). If every sample collected during this quarter is at or below 0.9 µg/m^3, the Applicable Defendant may revert back to the reduced monitoring frequency applicable for that individual monitoring site immediately prior to the sample reading exceeding 0.9 µg/m^3. If any sample collected during this quarter is above 0.9 µg/m^3, that individual monitoring site must return to the original sampling requirements of contiguous 14-Day sampling periods with no skip periods for a minimum of two years. The burden reduction requirements can be used again for that monitoring site once the requirements of Paragraph 3(f)(3)(i) are met again, *i.e.*, after 52 contiguous 14-Day samples with no results above 0.9 µg/m^3.

g. Action Level. Within 45 Days of completion of each sampling period, the Applicable Defendant must determine whether the results are above or below the action level as follows:

(1) Calculation of the Δc. The Applicable Defendant must determine the benzene difference concentration (Δc) for each 14-Day sampling period by determining the highest and lowest sample results for benzene concentrations from the sample pool and calculating the Δc as the difference in these concentrations. The Applicable Defendant must adhere to the following

procedures when one or more samples for the sampling period are below the method detection limit for benzene:

(i) If the lowest detected value of benzene is below detection, the Applicable Defendant must use zero as the lowest sample result when calculating Δc.

(ii) If all sample results are below the method detection limit, the Applicable Defendant must use the method detection limit as the highest sample result.

(2) The Applicable Defendant must calculate the annual average Δc based on the average of the 26 most recent 14-Day sampling periods. The Applicable Defendant must update this annual average value after receiving the results of each subsequent 14-Day sampling period (*i.e.*, on a "rolling" basis).

(3) The action level for benzene is 9 micrograms per cubic meter (μg/m^3) on an annual average basis. If the annual average Δc value for benzene is less than or equal to 9 μg/m^3, the concentration is below the action level. If the annual average Δc value for benzene is greater than 9 μg/m^3, the concentration is above the action level, and the Applicable Defendant must conduct a root cause analysis and corrective action in accordance with Paragraph 3(h).

h. Root Cause Analysis and Corrective Action. Within 5 Days of determining that the action level has been exceeded for any annual average Δc and no longer than 50 Days after completion of the sampling period, the Applicable Defendant must initiate a root cause analysis to determine the cause of such exceedance and to determine appropriate corrective action, such as those described in Paragraphs 3(h)(1) through (4). The root cause analysis and initial corrective action analysis must be completed and initial corrective actions taken no later than 45 Days after determining there is an exceedance. Root cause analysis and corrective action may include, but is not limited to:

(1) Leak inspection using Method 21 of 40 C.F.R. Part 60, Appendix A-7 and repairing any leaks found.

(2) Leak inspection using optical gas imaging and repairing any leaks found.

(3) Visual inspection to determine the cause of the high benzene emissions and implementing repairs to reduce the level of emissions.

(4) Employing progressively more frequent sampling, analysis and meteorology (*e.g.*, using shorter sampling periods for Methods 325A and 325B of Appendix A of 40 C.F.R. Part 63, or using active sampling techniques).

If, after completing the corrective action analysis and corrective actions such as those described in Paragraph 3(h), the Δc value for the next 14-Day sampling period for which the sampling start time begins after the completion of the corrective actions is greater than 9 μg/m^3 or if all corrective action measures identified require more than 45 Days to implement, the Applicable Defendant must develop a corrective action plan that describes the corrective action(s) completed

to date, additional measures that the Applicable Defendant proposes to employ to reduce benzene concentrations at the fenceline location in question below the action level, and a schedule for completion of these measures. The Applicable Defendant must submit the corrective action plan to EPA within 60 Days after receiving the analytical results indicating that the Δc value for the 14-Day sampling period following the completion of the initial corrective action is greater than 9 $\mu g/m^3$ or, if no initial corrective actions were identified, no later than 60 Days following the completion of the corrective action analysis required in Paragraph 3(h).

i. Alternative Test Method. The Applicable Defendant may submit for review and approval pursuant to this Consent Decree a request to use an alternative test method as provided in 40 C.F.R. § 63.658(k).

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Equistar Chemicals, LP, et al.

APPENDICES TO CONSENT DECREE

APPENDIX 2.3

BDO Flare, Deepwell Flare, and Methanol Continuous Flare

Net Heating Value of Vent Gas (NHV_{vg}) Calculations to Determine Compliance with Paragraph 42.a.ii of the Consent Decree

Pursuant to Paragraph 42.a.ii. of the Consent Decree, the BDO Flare, Deepwell Flare, and Methanol Continuous Flare must be operated with an NHV_{vg} of greater than or equal to 200 BTU/scf, determined on a 15-minute block period basis, when Waste Gas is routed to them for at least 15 minutes.

Compliance with Paragraph 42.a.ii of the Consent Decree shall be determined as follows:

BDO Flare NHV_{vg} Compliance Calculation:

The NHV_{vg} for the BDO Flare must be calculated using constants for the Net Heating Value of the two gas streams flowing to the BDO Flare. The two streams going to the BDO Flare are the combined process Vent Gas stream and the Supplemental Gas (natural gas) stream. The combined process Vent Gas stream consists of the combined flows from all the Vent Gas streams from the process equipment in the BDO unit to the BDO Flare. Although these process Vent Gas streams contain hydrogen and hydrocarbons, the combined process Vent Gas stream may also contain significant levels of nitrogen. A constant of zero (0) BTU/scf must be used for the NHV of the combined process Vent Gas.

BDO Flare Vent Gas NHV Calculation:

$$NHVvg = \frac{\left[Vent\ Gas\ Flow - \frac{Nat\ Gas\ Mass\ Flow * Molar\ Volume}{Nat\ Gas\ MW}\right] * Vent\ Gas\ NHV + \frac{Nat\ Gas\ Mass\ Flow * Molar\ Volume}{Nat\ Gas\ MW} * Nat\ Gas\ NHV}{Vent\ Gas\ Flow}$$

Where:

NHV_{vg} = *Net Heating Value of the Vent Gas*
Vent Gas Flow = Vent Gas flow, in scfh (measured using the existing flow meter)
Vent Gas NHV = 0 BTU/scf *(a constant in the equation)*
Nat Gas Mass Flow = Natural gas flow meter output, in pounds per hour
Nat Gas NHV = 920 BTU/scf *(a constant in the equation)*
Nat Gas MW = 17 lb./lb.mol
Molar Volume = 385.33 scf/lb.mol

Deepwell Flare NHVvg Compliance Calculation:

The NHV_{vg} for the Deepwell Flare must be calculated using constants for the NHV of the two gas streams flowing to the Deepwell Flare. The two streams going to the Deepwell Flare are the combined nitrogen vent stream and the Supplemental Gas (natural gas) stream. The combined

nitrogen vent stream consists of the combined flows from all the nitrogen streams from the process equipment in the Deepwell area routed to the Deepwell Flare. Although these Vent Gases contain hydrocarbons, the combined nitrogen vent stream is mostly nitrogen, and therefore, a constant of zero (0) BTU/scf must be applied for the NHV of the combined nitrogen vent stream.

Deepwell Flare Vent Gas NHV Calculation:

$$NHV_{vg} = \frac{N_2\ Flow\ (scfm) * N_2\ NHV\ \left(\frac{BTU}{scf}\right) + Nat\ Gas\ Flow\ (scfm) * Nat\ Gas\ NHV\ (\frac{BTU}{scf})}{N_2\ Flow\ (scfm) + Nat\ Gas\ Flow\ (scfm)}$$

Where:

NHV_{vg} = Net Heating Value of the Vent Gas
N_2 Flow = Sum of nitrogen flows, in scfm (as recorded by the Distributed Control System).
N_2 NHV = 0 BTU/scf *(a constant in the equation)*
Nat Gas Flow = Natural Gas flow meter output, in scfm
Nat Gas NHV = 920 BTU/scf *(a constant in the equation)*

Methanol Continuous Flare NHV_{vg} Compliance Calculation:

The NHV_{vg} for the Methanol Continuous Flare must be calculated using the composition of the Vent Gas routed to the Flare. The Vent Gas composition must be determined using an online gas chromatograph which operates continuously.

Methanol Continuous Flare Vent Gas NHV Calculation:

$$NHV_{vg} = \sum_{i=1}^{n} (x_i * NHV_i)$$

Where:

NHV_{vg} = Net Heating Value of the Vent Gas
x_i = concentration of component i in the Vent Gas
NHV_i = Net Heating Value of component i