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June 26, 2025

Air Permits Initial Review Team (APIRT)
Texas Commission of Environmental Quality, MC 161
12100 Park 35 Circle, Building C, Third Floor
Austin, TX 78753

Submitted via STEERS

**Subject: Application for Authorization under Non-Rule Standard Permit
Ovintiv USA Inc.
Davidson F42L Tank Battery
Regulated Entity Number: RN111549937
Central Registry Number: CN601451149**

Air Permits Initial Review Team:

Ovintiv USA Inc. (Ovintiv) is submitting the attached application for the Davidson F42L Tank Battery to update the registration for the facility currently authorized under Standard Permit Registration No. 169903. The facility is authorized under Title 30 Texas Administrative Code (TAC) Chapter 116.602 Non-Rule Air Quality Standard Permit for Oil and Gas Handling and Production Facilities, effective date November 8, 2012 (NRSP). This application reflects equipment changes and updates to the emissions estimates based on the addition of new wells.

Ovintiv believes the information provided in this submittal satisfies the NRSP requirements. If you have any questions regarding the information contained herein, please contact me at (720) 876-3112 or by email at Emily.Knudsen@ovintiv.com. Thank you in advance for the efforts of your staff in reviewing this submittal.

Sincerely,

Emily Knudsen
Air Quality Specialist

Enclosures

cc: Mr. Ryan Slocum, Air Section Manager, TCEQ Region 7 – Midland (STEERS)
Ms. Nica Ulrich, Air Quality Manager, Ovintiv (electronically)
Ms. Amanda Zemaitis, Air Quality Engineer, Ovintiv (electronically)

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1.0 Introduction

Ovintiv USA Inc. (Ovintiv) owns and operates the Davidson F42L Tank Battery (Facility) located in Midland County, Texas. This oil and gas production facility receives gas and liquids from one or more production wells and prepares the gas for transfer via pipeline. This site consists of production wells, separators, heater treaters, oil and produced water storage tanks, compressor engines, flares, VRUs, and an oil LACT unit.

Ovintiv is submitting this standard permit application in order to update the registration for the facility currently authorized under Standard Permit Registration No. 169903. The facility is authorized under Title 30 Texas Administrative Code (TAC) Chapter 116.602 Non-Rule Air Quality Standard Permit for Oil and Gas Handling and Production Facilities, effective date November 8, 2012 (NRSP). This permitting action is not subject to public notice requirements. The applicable TCEQ forms are provided in Attachment A. The permit application and appropriate permitting fee were submitted online through STEERS.

1.1 Process Description

The Davidson F42L Tank Battery receives gas and liquids from multiple production wells. The gas and liquids enter multiple unheated separators where separation of oil, field gas, and produced water occurs. Separator gas is sent to the sales line, and oil from the separators is sent through four heated heater treaters. The gas from the heater treaters is captured by vapor recovery units (VRUs) which are run by a gas fired engine (EPN: ENG-1) and sent to the sales line. During times of AOS (such as when the line pressure is high or unavailable), produced gas from the separators or heater treaters may be routed to one of two flares (EPN: FLR-01 and FLR-03). A fraction of the gas stream leaving the facility is compressed by two reciprocating compressors driven by natural gas engines (EPN: ENG-4 and ENG-5) used to facilitate well production.

Oil from the Heater treaters is sent to one of two 750-bbl oil storage tanks (FIN: TK-6010 to TK-6020). Water from the separators is sent to one of two 750-bbl water tanks (FIN: TK-5010 to TK-5020). Emissions from the tanks are captured by the VRUs which are run by two gas fired engines (EPN: ENG-2 to ENG-3) and controlled by the flare (EPN: FLR-02) during VRU downtime. The oil is transported off site via a LACT unit and water is piped off site via transfer pumps. The LACT unit and the transfer pumps are expected to have a maximum of 3.0% downtime, during which the oil and water will be transported off site via truck (EPN: LOAD). Vapors from the oil loadout and water loadout when trucked are uncontrolled. The following additional sources are located at the facility: one 0.675, one 2.0 MMBtu/hr and two 1.0 MMBtu/hr heater treater heaters (EPN: H-1 to H-4); fugitive emissions from piping component leaks (EPN: FUG); and facility maintenance, startup, and shutdown activities (EPN: MSS).

The operation limits requested in this application are represented in the table below.

	Max Daily	Annual
Oil Throughput Limits	14,000 bbl/day	2,000,000 bbl/yr
PW Throughput Limits	68,073 bbl/day	10,015,025 bbl/yr
Associated Gas Flaring Limits	4.66 MMscf/day	290 MMscf/yr

A process flow diagram depicting the facility operation is included in Attachment B.

1.2 Area Map

The facility is located in Midland County approximately 11.9 miles northwest of Midkiff, Texas. The location map is included in Attachment B.

2.0 Regulatory Applicability

This section discusses the regulatory applicability of federal and state regulations.

2.1 PSD/ NNSR Applicability

Total potential emissions of any criteria pollutant from this facility are less than 250 tons per year (tpy), and the facility is not one of the 26 named PSD source categories. Therefore, the facility is not subject to PSD. In addition, the facility is located in Midland County, Texas, which is designated as an unclassified/attainment area for all criteria pollutants; therefore, Nonattainment New Source Review (NNSR) does not apply.

2.2 Title V Applicability

The facility has potential to emit less than one hundred tons per year of each regulated pollutant; therefore, it is a minor source under the Title V Program and requires no registration under the Title V program. Furthermore, the facility's HAP emissions are also below the major source threshold.

2.3 NESHAP & NSPS Applicability

2.3.1 New Source Performance Standards (NSPS) Subpart A

Subpart A, General Provisions, applies to any stationary source that contains an affected facility to which an NSPS standard is applicable. This subpart applies if at least one NSPS standard is applicable.

2.3.2 NSPS Subpart Dc

There are no heating units with a heat capacity of 10 MMBtu/hr or greater at the facility; therefore, this facility is not subject to 40 CFR 60.40c.

2.3.3 NSPS Subpart Kb

The tanks at this facility are pre-custody transfer. Pre-custody transfer tanks that are applicable to 40 CFR 60.110b are those that have a capacity greater than 10,000 bbl (1,589.874 m³). All of the tanks at this facility are less than or equal to this capacity threshold. Therefore, this facility is not subject to 40 CFR 60.110b.

2.3.4 NSPS Subpart GG

There are no turbines at this facility therefore this facility is not subject to 40 CFR 60.330.

2.3.5 NSPS Subpart KKK

This subpart applies to facilities involved in onshore natural gas processing plants. This facility is not a natural gas processing plant; therefore, this subpart does not apply.

2.3.6 NSPS Subpart LLL

This subpart applies to facilities that process natural gas, including sweetening units and sweetening units that are followed by a sulfur recovery unit. This facility does not process natural gas; therefore, this subpart does not apply.

2.3.7 NSPS Subpart IIII

This subpart applies to manufacturers, owners, and operators of stationary compression ignition internal combustion engines (ICE). There are no compression ignition internal combustion engines at this facility therefore it is not subject to 40 CFR 60.4200.

2.3.8 NSPS Subpart JJJJ

Subpart JJJJ applies to manufacturers, owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE). The stationary SI RICE at the facility commenced construction after June 12, 2006 and were manufactured on or after the regulatory applicability dates for engines of their type. Therefore, this subpart is applicable.

2.3.9 NSPS Subpart KKKK

This subpart establishes emission standards and compliance schedules for the control of emissions from stationary combustion turbines that commenced construction, modification, or reconstruction after February 18, 2005. There are no turbines at this facility; therefore, this subpart does not apply.

2.3.10 NSPS Subpart OOOO

This site was constructed after September 18, 2015; therefore, it is not subject to the requirements of this subpart.

2.3.11 NSPS Subpart OOOOa

This site was constructed after December 6, 2022; therefore, it is not subject to the requirements of this subpart.

2.3.12 NSPS Subpart OOOOb

This subpart applies to each well affected facility, each centrifugal and reciprocating compressor affected facility, each process controller affected facility, each storage vessel affected facility, each process unit affected facility, each sweetening unit affected facility, each pump affected facility, and each fugitive emissions components affected facility constructed, modified, or reconstructed after December 6, 2022.

The wells at this site were constructed, modified, or reconstructed after December 6, 2022; therefore, they are affected facilities under this subpart.

The centrifugal or reciprocating compressors at this site were not constructed, modified, or reconstructed after December 6, 2022 and are therefore not affected facilities under this subpart.

The collection air-driven process controllers at this are not part of an affected facility under this subpart.

The tank batteries at this site were constructed, modified, or reconstructed after December 6, 2022 and have the potential to emit either VOC emissions equal to or greater than 6 tpy or methane emissions equal to or greater than 20 tpy as defined by this subpart; therefore, they are affected facilities under this subpart.

This site is not an onshore natural gas processing plant; therefore, it does not contain any process unit equipment affected facilities under this subpart.

This site does not contain any sweetening units.

The collection of natural gas-driven pumps operated at this site for more than 90 days per calendar year was constructed, modified, or reconstructed after December 6, 2022 and is therefore an affected facility under this subpart.

The collection of fugitive emissions components at this site was constructed, modified, or reconstructed after December 6, 2022 and is therefore an affected facility under this subpart.

2.3.13 NESHAP Subpart HH

This subpart applies to emission points at oil and gas production facilities located at area sources and major sources of HAP emissions. The facility emissions are below major source thresholds for HAPs, and there are no triethylene glycol (TEG) dehydration units at this facility; therefore, this subpart does not apply.

2.3.14 NESHAP Subpart ZZZZ

This subpart establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emissions from stationary reciprocating internal combustion engines located at major

This facility is an area source of HAP emissions. Subpart ZZZZ applies to new or reconstructed engines at area sources of HAP emissions. Any engine at the facility will be a new stationary RICE located at an area source which commenced construction after June 12, 2006 [63.6590 (a)(2)(iii)]. New or reconstructed stationary RICE located at an area source must meet the requirements of NSPS Subpart JJJJ for SI. No further requirements apply for such engines under this subpart [63.6590(c)(1)].

2.4 State Regulatory Analysis

2.4.1 30 TAC 111.111

Ovintiv will not cause, suffer, allow, or permit visible emissions from any source except that no stationary vent will exceed 20% opacity over any six-minute period in accordance with 30 TAC 111.111(a)(1).

2.4.2 30 TAC 112

Ovintiv will not cause, suffer, allow, or permit emissions of hydrogen sulfide from a source or sources operated on a property or multiple sources operated on contiguous properties to exceed a net ground level concentration of 0.12 ppm averaged over any 30-minute period if the downwind concentration of hydrogen sulfide affects only property used for other than residential, recreational, business, or commercial purposes, such as industrial property and vacant tracts and range lands not normally occupied by people in accordance with 30 TAC 112.

2.4.3 30 TAC 115

This facility is not located in one of the enumerated counties for which additional volatile organic compound requirements apply as set forth in 30 TAC 115; therefore, the requirements of this regulation do not apply.

2.4.4 30 TAC 116

This facility is subject to the permitting requirements of TAC 30 116, as described in Section 3.5 of this application.

2.4.5 30 TAC 117

This facility is not located in the ozone nonattainment zone. Therefore, the requirements of 30 TAC 117 do not apply.

2.4.6 30 TAC 122

This facility is not a major source as demonstrated by the emissions summary table. Therefore, the requirements of 30 TAC 122 do not apply.

2.5 Standard Permit General Requirements and Applicability

The general requirements listed in 30 TAC §116.610 and §116.615 for issuance of a standard permit are satisfied as described below.

2.5.1 30 TAC 116.610

(a) Under the Texas Clean Air Act, §382.051, a project that meets the requirements for a standard permit listed in this subchapter or issued by the commission is hereby entitled to the standard permit, provided the following conditions listed in this section are met. For the purposes of this subchapter, project means the construction or modification of a facility or group of facilities submitted under the same registration.

(1) Any project that results in a net increase in emissions of air contaminants from the project other than carbon dioxide, water, nitrogen, methane, ethane, hydrogen, oxygen, or those for which a national ambient air quality standard has been established must meet the emission limitations of §106.261 of this title relating to Facilities (Emission Limitations), unless otherwise specified by a particular standard permit.

As specified in paragraph (h) of 30 TAC §116.602 – NRSP, total maximum estimated emissions meet the most stringent emission limitations outlined in this paragraph. See demonstration of compliance in Attachment C.

(2) Construction or operation of the project must be commenced prior to the effective date of a revision to this subchapter under which the project would no longer meet the requirements for a standard permit.

Ovintiv will operate equipment pursuant to the requirements of this subchapter. Ovintiv will ensure that subsequent revisions to this subchapter are met.

(3) The proposed project must comply with the applicable provisions of the Federal Clean Air Act (FCAA), §111 (concerning New Source Performance Standards) as listed under 40 Code of Federal Regulations (CFR) Part 60, promulgated by the United States Environmental Protection Agency (EPA).

Sources at the site will meet applicable provisions of 40 CFR Part 60. See discussion in Section 2.3 for more details.

(4) The proposed project must comply with the applicable provisions of FCAA, §112 (concerning Hazardous Air Pollutants) as listed under 40 CFR Part 61, promulgated by the EPA.

Operations at the site do not trigger any additional applicable provisions of 40 CFR Part 61 regarding hazardous air pollutants.

(5) The proposed project must comply with the applicable maximum achievable control technology standards as listed under 40 CFR Part 63, promulgated by the EPA under FCAA, §112 or as listed under Chapter 113, Subchapter C of this title (relating to National Emissions Standards for Hazardous Air Pollutants for Source Categories (FCAA, §112, 40 CFR Part 63)).

Sources at the site will meet all applicable provisions of 40 CFR Part 63. See discussion in Section 2.3 for more details.

(6) If subject to Chapter 101, Subchapter H, Division 3 of this title (relating to Mass Emissions Cap and Trade Program) the proposed facility, group of facilities or account must obtain allocations to operate.

Facilities in this County are not subject to the Mass Emissions Cap and Trade Program.

(b) Any project that constitutes a new major stationary source or major modification as defined in §116.12 of this title (relating to Nonattainment and Prevention of Significant Deterioration Review Definitions) is subject to the requirements of §116.110 of this title (relating to Applicability) rather than this subchapter.

The Facility is not located in a nonattainment area and potential emissions are less than PSD major source thresholds; therefore, nonattainment NSR and PSD reviews are not required.

(c) Persons may not circumvent by artificial limitations the requirements of §116.110 of this title.

Ovintiv is not circumventing by artificial limitations the requirements of §116.110 of this title.

(d) Any project involving a proposed affected source (as defined in §116.15(1) of this title (relating to Section 112(g) Definitions)) shall comply with all applicable requirements under Subchapter E of this chapter (relating to Hazardous Air Pollutants: Regulations Governing Constructed or Reconstructed Major Sources (FCAA, §112(g), 40 CFR Part 63)). Affected sources subject to Subchapter E of this chapter may use a standard permit under this subchapter only if the terms and conditions of the specific standard permit meet the requirements of Subchapter E of this chapter.

Operations at the site do not involve an affected source as defined in §116.15(1) of this title (relating to Section 112(g) Definitions); therefore, this paragraph does not apply.

2.5.2 30 TAC 116.615

The following general conditions are applicable to holders of standard permits but will not necessarily be specifically stated within the standard permit document.

(1) Protection of public health and welfare. The emissions from the facility, including dockside vessel emissions, must comply with all applicable rules and regulations of the commission adopted under Texas Health and Safety Code, Chapter 382, and with the intent of the Texas Clean Air Act (TCAA), including protection of health and property of the public.

The emissions from the facilities represented in this application comply with all applicable rules and regulations adopted under the Texas Health and Safety Code, Chapter 382, and with the intent of the TCAA including protection of the health and property of the public.

(2) Standard permit representations. All representations with regard to construction plans, operating procedures, and maximum emission rates in any registration for a standard permit become conditions upon which the facility or changes thereto, must be constructed and operated. It is unlawful for any person to vary from such representations if the change will affect that person's right to claim a standard permit under this section. Any change in condition such that a person is no longer eligible to claim a standard permit under this section requires proper authorization under §116.110 of this title (relating to Applicability). If the facility remains eligible for a standard permit, the owner or operator of the facility shall notify the executive director of any change in conditions which will result in a change in the method of control of emissions, a change in the character of the emissions, or an increase in the discharge of the various emissions as compared to the representations in the original registration or any previous notification of a change in representations. Notice of changes in representations must be received by the executive director no later than 30 days after the change.

Ovintiv understands that Standard Permit representations become conditions upon which the facility must be operated. Any changes to the representations in this application will be communicated to the TCEQ, as required in 30 TAC §116.615(2). As applicable, Ovintiv will submit a notice of change in representations to the executive director no later than 30 days after the change.

(3) Standard permit in lieu of permit amendment. All changes authorized by standard permit to a facility previously permitted under §116.110 of this title shall be administratively incorporated into that facility's permit at such time as the permit is amended or renewed.

This application is not being submitted in lieu of a permit amendment; therefore, this section does not apply.

(4) Construction progress. Start of construction, construction interruptions exceeding 45 days, and completion of construction shall be reported to the appropriate regional office not later than 15 working days after occurrence of the event, except where a different time period is specified for a particular standard permit.

The requirements in the Barnett Shale Standard Permit supersede these notification requirements per Section (g).

(5) Start-up notification.

(A) The appropriate air program regional office of the commission and any other air pollution control agency having jurisdiction shall be notified prior to the commencement of operations of the facilities authorized by a standard permit in such a manner that a representative of the executive director may be present.

(B) For phased construction, which may involve a series of units commencing operations at different times, the owner or operator of the facility shall provide separate notification for the commencement of operations for each unit.

(C) Prior to beginning operations of the facilities authorized by the permit, the permit holder shall identify to the Office of Permitting, Remediation, and Registration, the source or sources of allowances to be utilized for compliance with Chapter 101, Subchapter H, Division 3 of this title (relating to Mass Emissions Cap and Trade Program).

(D) A particular standard permit may modify start-up notification requirements.

The requirements in the Barnett Shale Standard Permit supersede these notification requirements per Section (g).

(6) Sampling requirements. If sampling of stacks or process vents is required, the standard permit holder shall contact the commission's appropriate regional office and any other air pollution control agency having jurisdiction prior to sampling to obtain the proper data forms and procedures. All sampling and testing procedures must be approved by the executive director and coordinated with the regional representatives of the commission. The standard permit holder is also responsible for providing sampling facilities and conducting the sampling operations or contracting with an independent sampling consultant.

If sampling is required, Ovintiv will contact the regional office prior to sampling to obtain the proper data forms and procedures.

(7) Equivalency of methods. The standard permit holder shall demonstrate or otherwise justify the equivalency of emission control methods, sampling or other emission testing methods, and monitoring methods proposed as alternatives to methods indicated in the conditions of the standard permit.

As Ovintiv has represented in this application, it does not intend to use alternative methods for emission control, sampling, or emissions testing.

(8) Recordkeeping. A copy of the standard permit along with information and data sufficient to demonstrate applicability of and compliance with the standard permit shall be maintained in a file at the plant site and made available at the request of representatives of the executive director, the United States Environmental Protection Agency, or any air pollution control agency having jurisdiction. For facilities that normally operate unattended, this information shall be maintained at the nearest staffed location within Texas specified by the standard permit holder in the standard permit registration. This information must include, but is not limited to, production records and operating hours. Additional recordkeeping requirements may be specified in the conditions of the standard permit. Information and data sufficient to demonstrate applicability of and compliance with the standard permit must be retained for at least two years following the date that the information or data is obtained. The copy of the standard permit must be maintained as a permanent record.

Ovintiv will maintain records, as required by the Standard Permit, and make them available to regulatory personnel upon request.

(9) Maintenance of emission control. The facilities covered by the standard permit may not be operated unless all air pollution emission capture and abatement equipment is maintained in good working order and operating properly during normal facility operations. Notification for emissions events and scheduled maintenance shall be made in accordance with §101.201 and §101.211 of this title (relating to Emissions Event Reporting and Recordkeeping Requirements; and Scheduled Maintenance, Startup, and Shutdown Reporting and Recordkeeping Requirements).

Emission controls at the site are maintained in good working order and operated properly during normal facility operations.

(10) Compliance with rules. Registration of a standard permit by a standard permit applicant constitutes an acknowledgment and agreement that the holder will comply with all rules, regulations, and orders of the commission issued in conformity with the TCAA and the conditions precedent to the claiming of the standard permit. If more than one state or federal rule or regulation or permit condition are applicable, the most stringent limit or condition shall govern. Acceptance includes consent to the entrance of commission employees and designated representatives of any air pollution control agency having jurisdiction into the permitted premises at reasonable times to investigate conditions relating to the emission or concentration of air contaminants, including compliance with the standard permit.

This standard permit application constitutes Ovintiv's acknowledgement and agreement of the terms stated in the paragraph above.

(11) Distance limitations, setbacks, and buffer zones. Notwithstanding any requirement in any standard permit, if a standard permit for a facility requires a distance, setback, or buffer from other property or structures as a condition of the permit, the determination of whether the distance, setback, or buffer is satisfied shall be made on the basis of conditions existing at the earlier of:

(A) The date new construction, expansion, or modification of a facility begins; or

(B) The date any application or notice of intent is first filed with the commission to obtain approval for the construction or operation of the facility.

Ovintiv will ensure on-going compliance with applicable distance requirements in place.

2.6 Specific Requirements of 30 TAC 116.602 – NRSP

(a) Applicability

The facility is an oil and gas site, which consists of stationary facilities, that produces and processes natural gas, crude oil, and produced water found in geologic formations and meets the conditions outlined in paragraph (a)(1) of this rule.

(b) Definitions and Scope

Ovintiv understands the definitions and will ensure all requirements outlined in the scope of this paragraph are met.

(c) Authorized Facilities, Changes and Activities

The facility is an oil and gas site (OGS) which meets the registration requirements of paragraph (c)(2). This site will meet the conditions outlined in this section.

(d) Facilities and Exclusions

Applicable facilities located at the site are permissible and are included in this application.

(e) Best Management Practices (BMP) and Best Available Control Technology (BACT) Requirements

(1) Facilities which have the potential to emit air contaminants are maintained in good working order and operated properly during facility operations. Ovintiv has established and will maintain a program to replace, repair, and/or maintain facilities to keep them in good working order.

(2) Applicable OGS facilities are operated at least 50 feet from any property line and receptor.

(3) If engines are located at this site, they will meet the emission and performance standards listed in Table 6 and shall meet all applicable requirements.

(4) There are no open-topped tanks or ponds located at the facility.

(5) Process equipment and storage facilities individually meet the requirements of BACT listed in Table 10 in paragraph (m). The uncontrolled combined emissions from process equipment and storage facilities have a PTE of > 25 tpy and are therefore subject to the combined control requirements of Table 10.

(6) The following shall apply to all fugitive components associated with this project:

(A) Seals and gaskets on components in VOC or H₂S service will be installed, checked, and properly maintained to prevent leaking. Applicable components will be physically inspected quarterly for leaks.

(B) Fugitive emissions have a PTE of greater than 10 tpy and are subject to the LDAR requirements specified in Table 9.

(C) Ovintiv will make every reasonable effort to repair fugitive components found to be leaking.

(D) Tank hatches will remain closed except for sampling, gauging, loading, unloading, or planned maintenance activities.

(E) New and reworked valves and piping connections will be located in a place that is reasonably accessible for leak checking during plant operation and underground process pipelines will contain no buried valves such that fugitive emission monitoring is rendered impractical (to the extent that good engineering practices will permit).

(7) Tanks and vessels will utilize a paint color that minimizes the effects of solar heating or utilize alternate control.

(8) Emission estimation methods have been used in a way that is consistent with protocols established by the commission.

(9) There are no process reboilers or heaters at the site used for control of waste gas streams.

(10) The VRUs at this site are used as control devices and will meet the appropriate design, monitoring, and recordkeeping in Table 7 and Table 8 of the NRSP.

(11) The flare(s) at this site are used for control of emissions from production with a destruction efficiency of 98% VOCs and H₂S and 99% for VOCs containing no more than three carbon atoms that contain no elements other than carbon and hydrogen. The flare(s) at this site meet the design and operating requirements outlined in this subsection.

(12) There are no thermal oxidation or vapor combustion control devices located at this site.

(f) Registration, Revision, and Renewal Requirements

(1) For all previous claims of this standard permit (or any previous version of this standard permit) existing authorized facilities, or group of facilities, are not required to meet the requirements of this standard permit, with the exception of planned MSS, until a renewal under the standard permit is submitted after December 31, 2015.

The existing facilities are authorized under the latest version of this Standard Permit, effective date November 8, 2012.

(2) If no other changes except for authorizing planned MSS occurs at an existing OGS under this standard permit, or any previous version of this standard permit, (b)(7) applies.

(A) Records demonstrating compliance with paragraph (i) must be kept;

(B) If the OGS must certify emissions to establish nonapplicability of prevention of significant deterioration (PSD), nonattainment new source review (NNSR), or the federal operating permit programs, this certification may be filed using Form APD-CERT. No fee is required for this certification.

(C) Planned MSS shall be incorporated at the next revision or update to a registration under this standard permit after January 5, 2012, and no later than any renewal submitted after December 31, 2015.

Planned MSS is included in this Standard Permit application. Standard Permits are considered federally enforceable and a separate certification form is not required.

(3) Facilities, groups of facilities or planned MSS from facilities registered under this standard permit cannot also be authorized by a permit under 30 TAC §116.111, General Application.

There are no MSS emissions at the facility that are authorized under a 116.111 permit.

(4) Prior to construction or implementation of changes for any project which meets this standard permit a notification shall be submitted through the e-Permits system. This notification shall include the following:

(A) Identifying information (Core Data) and a general description of the project must be submitted through e-Permits (or if not available, hard copy) using the "APD OGS New Project Notification."

(B) A fee of \$25 for small businesses as defined in 30 TAC §106.50, or \$50 for all others must be submitted through the commission's e-Pay system.

Ovintiv has submitted a new project notification for this registration along with a fee of \$50.00.

(5) For any registration which meets the emission limitations of this standard permit must meet the following:

(A) Within 90 days after start of operation or implemented changes (whichever occurs first), the facilities must be registered with a PI-1S Standard Permit Application.

(B) This registration shall include a detailed summary of maximum emissions estimates based on: site-specific or defined representative gas and liquid analysis; equipment design specifications and operations; material type and throughput; and other actual parameters essential for accuracy for determining emissions and compliance with all applicable requirements of this standard permit.

(C) The fee for this registration shall be \$475 for small businesses, or \$850 for all others.

(D) Construction may begin any time after receipt of written notification to the executive director. Operations may continue after receipt of registration if there are no objections or 45 days after receipt by the executive director of the registration, whichever occurs first.

This application serves as the registration required for the Standard Permit. The registration/revision includes a detailed summary of maximum emissions estimates. A fee of \$850 is also being submitted with this application.

(6) All registrations, registration revisions, and renewals shall be submitted to the commission through a PI-1S Standard Permit Registration Form. Fee requirements do not apply when there are changes in representations with no increase in emissions within 6- months after a standard permit registration has been issued.

This application serves as the registration required for the Standard Permit. The registration contains the required information and the fee payments have been made. The equivalent to the PI-1S Form is completed within the STEERS system.

(g) Any claim under this standard permit must comply with all applicable requirements of 30 TAC §116.610; §116.611, Registration to Use a Standard Permit; §116.614, Standard Permit Fees; and §116.615, General Conditions. This standard permit supersedes: the notification requirements of 30 TAC §116.615, General Conditions; and the emission limitations of 30 TAC §116.610(a)(1), Applicability.

Claims under this standard permit comply with the applicable requirements of this paragraph.

(h) Emission Limitations

Total maximum estimated registered emissions are based on representative worst-case operations and meet the limitations established in paragraph (k) of this standard permit. Compliance with emission limitations of this standard permit is demonstrated in Attachment C.

(i) Planned Maintenance, Start-ups, and Shutdowns (MSS)

Ovintiv has included planned maintenance, start-up, and shutdown (MSS) emissions in this application.

(j) Records, Sampling and Monitoring

Required records, sampling, and monitoring data will be maintained electronically or hard copy at the field office and will be readily available to the agency or local pollution control program with jurisdiction upon request.

(k) Emission Limits Based on Impacts Evaluation

Impacts evaluations have been completed in accordance with the specifications of this standard permit to demonstrate compliance with the NAAQS for NO₂ and SO₂, the state property line standard for H₂S, and with the hourly ESL for benzene.

(l) Existing, Unchanged Facilities and Projects Before Effective Date. The requirements in 30 TAC §116.620 are applicable to existing unchanged facilities and new or changing facilities as specified in paragraph (a)(1) of this standard permit.

Existing, new, and changing facilities will meet the requirements specified in this standard permit.

(m) The following Tables shall be used as required by this standard permit.

The applicable tables included in this section were used as required by this standard permit.

3.0 Impacts Evaluation

The NRSP requires an impacts evaluation for the nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) National Ambient Air Quality Standards (NAAQS), SO₂ and hydrogen sulfide (H₂S) State Property Line Standards, and benzene State Health Effects Review. As demonstrated in Attachment G, emissions of NO₂ and benzene are above the de-minimis thresholds specified in the Non-Rule Standard Permit Section (k)(3)(C). There are no receptors within one mile of this facility, so no further ESL review was performed for benzene. Further impacts evaluation using Screen3 to demonstrate NAAQS compliance was performed for NO₂. A summary of the impacts evaluation and supporting documentation are provided in Attachment G.

ATTACHMENT A

TCEQ Forms
Core Data Form
PI-1S
Table 1(a)
Table 29



TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided.)		
<input type="checkbox"/> New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)		
<input type="checkbox"/> Renewal (Core Data Form should be submitted with the renewal form)	<input checked="" type="checkbox"/> Other Update to NRSP	
2. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number (if issued)
CN 601451149		RN 111549937

SECTION II: Customer Information

4. General Customer Information		5. Effective Date for Customer Information Updates (mm/dd/yyyy)	
<input type="checkbox"/> New Customer		<input type="checkbox"/> Update to Customer Information	
<input type="checkbox"/> Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)		<input type="checkbox"/> Change in Regulated Entity Ownership	
The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).			
6. Customer Legal Name (If an individual, print last name first: eg: Doe, John)		If new Customer, enter previous Customer below:	
Ovintiv USA Inc.			
7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number (if applicable)
13214006	19800875585	980087558	253295612
11. Type of Customer:	<input type="checkbox"/> Corporation	<input type="checkbox"/> Individual	Partnership: <input type="checkbox"/> General <input type="checkbox"/> Limited
Government: <input type="checkbox"/> City <input type="checkbox"/> County <input type="checkbox"/> Federal <input type="checkbox"/> State <input type="checkbox"/> Other	<input type="checkbox"/> Sole Proprietorship	<input type="checkbox"/> Other:	
12. Number of Employees		13. Independently Owned and Operated?	
<input type="checkbox"/> 0-20 <input type="checkbox"/> 21-100 <input type="checkbox"/> 101-250 <input type="checkbox"/> 251-500 <input type="checkbox"/> 501 and higher		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14. Customer Role (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check one of the following			
<input type="checkbox"/> Owner		<input type="checkbox"/> Operator	
<input type="checkbox"/> Occupational Licensee		<input checked="" type="checkbox"/> Owner & Operator	
<input type="checkbox"/> Responsible Party		<input type="checkbox"/> Voluntary Cleanup Applicant	
<input type="checkbox"/> Other:			
15. Mailing Address:	370 17th Street, Suite 1700		
City	Denver	State	CO
ZIP	80202	ZIP + 4	
16. Country Mailing Information (if outside USA)		17. E-Mail Address (if applicable)	
		emily.knudsen@ovintiv.com	
18. Telephone Number		19. Extension or Code	
(720) 876-3112			
20. Fax Number (if applicable)			
() -			

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (If 'New Regulated Entity' is selected below this form should be accompanied by a permit application)	
<input type="checkbox"/> New Regulated Entity <input type="checkbox"/> Update to Regulated Entity Name <input type="checkbox"/> Update to Regulated Entity Information	
The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).	
22. Regulated Entity Name (Enter name of the site where the regulated action is taking place.)	
Davidson F42L Tank Battery	

23. Street Address of the Regulated Entity: <i>(No PO Boxes)</i>							
	City		State		ZIP		ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	HEAD SW ON YOUNGER RD TOWARD NORDEN DR TURN LEFT ONTO TX-349 TURN LEFT ONTO FM 1787 TURN RIGHT ONTO TX-349 TURN RIGHT ONTO COUNTY ROAD 330 CONTINUE TO N 31.654556 W 102.038130						
26. Nearest City	State				Nearest ZIP Code		
Midkiff	TX				79755		
27. Latitude (N) In Decimal:	31.654556			28. Longitude (W) In Decimal:	-102.038130		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds		
32	39	16.40	-102	2	17.27		
29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)		31. Primary NAICS Code (5 or 6 digits)		32. Secondary NAICS Code (5 or 6 digits)		
1311			21120				
33. What is the Primary Business of this entity? <i>(Do not repeat the SIC or NAICS description.)</i>							
Oil and Gas Exploration and Production							
34. Mailing Address:	370 17th Street, Suite 1700						
	City	Denver	State	CO	ZIP	80202	ZIP + 4
35. E-Mail Address:	emily.knudsen@ovintiv.com						
36. Telephone Number		37. Extension or Code			38. Fax Number <i>(if applicable)</i>		
(720) 876-3112		() -			() -		

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

<input type="checkbox"/> Dam Safety	<input type="checkbox"/> Districts	<input type="checkbox"/> Edwards Aquifer	<input type="checkbox"/> Emissions Inventory Air	<input type="checkbox"/> Industrial Hazardous Waste
<input type="checkbox"/> Municipal Solid Waste	<input type="checkbox"/> New Source Review Air	<input type="checkbox"/> OSSF	<input type="checkbox"/> Petroleum Storage Tank	<input type="checkbox"/> PWS
<input type="checkbox"/> Sludge	<input type="checkbox"/> Storm Water	<input type="checkbox"/> Title V Air	<input type="checkbox"/> Tires	<input type="checkbox"/> Used Oil
<input type="checkbox"/> Voluntary Cleanup	<input type="checkbox"/> Waste Water	<input type="checkbox"/> Wastewater Agriculture	<input type="checkbox"/> Water Rights	<input type="checkbox"/> Other:

SECTION IV: Preparer Information

40. Name:	Emily Knudsen		41. Title:	Air Quality Specialist	
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address		
(720) 876-3112		() -	emily.knudsen@ovintiv.com		

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Ovintiv USA Inc.	Job Title:	Air Quality Specialist		
Name <i>(In Print)</i> :	Emily Knudsen			Phone:	(720) 876- 3112

Signature:		Date:	
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Form PI-1S
Registrations for Air Standard Permit
(Page 1)
Texas Commission on Environmental Quality

I. Registrant Information	
A.	Company or Other Legal Customer Name:
B.	Company Official Contact Information: <input type="checkbox"/> Mr. <input type="checkbox"/> Mrs. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/> Other: _____
Name: Emily Knudsen	
Title: Air Quality Specialist	
Mailing Address: 370 17th Street, Suite 1700	
City: Denver	
State: CO	
ZIP Code: 80202	
Telephone Number: (720) 876-3112	
Fax Number:	
Email Address: Emily.Knudsen@ovintiv.com	
<i>All permit correspondence will be sent via email.</i>	
C.	Technical Contact Information <input type="checkbox"/> Mr. <input type="checkbox"/> Mrs. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/> Other: _____
Name: Emily Knudsen	
Title: Air Quality Specialist	
Company Name: Ovintiv USA Inc.	
Mailing Address: 370 17th Street, Suite 1700	
City: Denver	
State: CO	
ZIP Code: 80202	

Form PI-1S
Registrations for Air Standard Permit
(Page 2)
Texas Commission on Environmental Quality

I. Registrant Information (continued)
C. Technical Contact Information (continued)
Telephone Number: (720) 876-3112
Fax Number:
Email Address: Emily.Knudsen@ovintiv.com
II. Facility and Site Information
A. Name and Type of Facility
Facility Name: Davidson F42L Tank Battery
Type of Facility: <input checked="" type="checkbox"/> Permanent <input type="checkbox"/> Temporary
For portable units, please provide the serial number of the equipment being authorized below. Serial No(s):
B. Facility Location Information
Street Address:
If there is no street address, provide written driving directions to the site and provide the closest city or town, county, and ZIP code for the site (attach description if additional space is needed).
HEAD SW ON YOUNGER RD TOWARD NORDEN DR TURN LEFT ONTO TX-349 TURN LEFT ONTO FM
1787 TURN RIGHT ONTO TX-349 TURN RIGHT ONTO COUNTY ROAD 330 CONTINUE TO N 31.654556
W 102.038130
City: Midkiff
County: Midland
ZIP Code: 79755
C. Core Data Form (required for Standard Permits 6006, 6007, and 6013).
Is the Core Data Form (TCEQ Form 10400) attached? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Customer Reference Number (CN):
Regulated Entity Number (RN):
D. TCEQ Account Identification Number (if known):

Form PI-1S
Registrations for Air Standard Permit
(Page 3)
Texas Commission on Environmental Quality

II. Facility and Site Information (continued)
<p>E. Type of Action</p> <p><input type="checkbox"/> Initial Application</p> <p><input checked="" type="checkbox"/> Change to Registration</p> <p><input type="checkbox"/> Renewal</p> <p><input type="checkbox"/> Renewal Certification</p>
<p>For Change to Registration, Renewal, or Renewal Certification actions provide the following:</p>
<p>Registration Number: 169903</p>
<p>Expiration Date: 04/11/2035</p>
<p>F. Standard Permit Claimed:</p>
<p>G. Previous Standard Exemption or PBR Registration Number:</p>
<p>Is this authorization for a change to an existing facility previously authorized under a standard exemption or PBR?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>If "Yes," enter previous standard exemption number(s) and PBR registration number(s) and associated effective date in the spaces provided below.</p>
<p>Standard Exemption Number(s):</p>
<p>PBR Registration Number(s):</p>
<p>H. Other Facilities at this Site Authorized by Standard Exemption, PBR, or Standard Permit</p>
<p>Are there any other facilities at this site that are authorized by an Air Standard Exemption, PBR, or Standard Permit?</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>If "Yes," enter standard exemption number(s), PBR registration number(s), Standard Permit Registration Number(s), and associated effective date in the spaces provided below.</p>
<p>Standard Exemption Number(s):</p>
<p>PBR Registration Number(s):</p>
<p>Standard Permit Registration Number(s):</p>

Form PI-1S
Registrations for Air Standard Permit
(Page 4)
Texas Commission on Environmental Quality

II. Facility and Site Information (continued)
I. Other Air Preconstruction Permits
Are there any other air preconstruction permits at this site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If "Yes," enter permit number(s) in the spaces provided below.
J. Affected Air Preconstruction Permits
Does the standard permit directly affect any permitted facility? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
If "Yes," enter permit number(s) in the spaces provided below.
K. Federal Operating Permit (FOP) Requirements
Is this facility located at a site that is required to obtain a FOP pursuant to 30 TAC Chapter 122? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> To Be Determined
Check the requirements of 30 TAC Chapter 122 that will be triggered if this standard permit is approved (<i>check all that apply</i>). <input type="checkbox"/> Initial Application for a FOP <input type="checkbox"/> Significant Revision for a SOP <input type="checkbox"/> Minor Revision for a SOP <input type="checkbox"/> Operational Flexibility/Off Permit Notification for a SOP <input type="checkbox"/> Revision for a GOP <input type="checkbox"/> To be Determined <input checked="" type="checkbox"/> None
Identify the type(s) of FOP issued and/or FOP application(s) submitted/pending for the site. (<i>check all that apply</i>) <input type="checkbox"/> SOP <input type="checkbox"/> SOP application/revision (submitted or under APD review) <input type="checkbox"/> GOP <input type="checkbox"/> GOP application/revision (submitted or under APD review) <input checked="" type="checkbox"/> N/A

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III. Fee Information (go to www.tceq.texas.gov/epay to pay online)
A. Fee Amount: \$850
B. Voucher number from ePay:
IV. Public Notice (if applicable)
A. Responsible Person
<input type="checkbox"/> Mr.
<input type="checkbox"/> Mrs.
<input type="checkbox"/> Ms.
<input type="checkbox"/> Other: _____
Name:
Title:
Company:
Mailing Address:
City:
State:
ZIP Code:
Telephone No.:
Fax No.:
Email Address:
B. Technical Contact
<input type="checkbox"/> Mr.
<input type="checkbox"/> Mrs.
<input type="checkbox"/> Ms.
<input type="checkbox"/> Other: _____
Name:
Title:
Company:
Mailing Address:
City:
State:
ZIP Code:

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IV. Public Notice (if applicable)
B. Technical Contact
Telephone Number:
Fax Number:
Email Address:
C. Bilingual Notice
Is a bilingual program required by the Texas Education Code in the School District? <input type="checkbox"/> Yes <input type="checkbox"/> No
Are the children who attend either the elementary school or the middle school closest to your facility eligible to be enrolled in a bilingual program provided by the district? <input type="checkbox"/> Yes <input type="checkbox"/> No
If "Yes," list which language(s) are required by the bilingual program below? Language(s): _____ Language(s): _____
D. Small Business Classification and Alternate Public Notice
Does this company (including parent companies and subsidiary companies) have fewer than 100 employees or less than \$6 million in annual gross receipts? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is the site a major source under 30 TAC Chapter 122, Federal Operating Permit Program? <input type="checkbox"/> Yes <input type="checkbox"/> No
Are the site emissions of any individual regulated air contaminant equal to or greater than 50 tpy? <input type="checkbox"/> Yes <input type="checkbox"/> No
Are the site emissions of all regulated air contaminant combined equal to or greater than 75 tpy? <input type="checkbox"/> Yes <input type="checkbox"/> No

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Registrations for Air Standard Permit
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V. Renewal Certification Option	
A.	Does the permitted facility emit an air contaminant on the Air Pollutant Watch List, and is the permitted facility located in an area on the watch list? <input type="checkbox"/> Yes <input type="checkbox"/> No
B.	For facilities participating in the Houston/Galveston/Brazoria area (HGB) cap and trade program for highly reactive VOCs (HRVOCs), do the HRVOCs need to be specified on the maximum allowable emission rates table (MAERT)? <input type="checkbox"/> Yes <input type="checkbox"/> No
C.	Does the company and/or site have an unsatisfactory compliance history? <input type="checkbox"/> Yes <input type="checkbox"/> No
D.	Are there any applications currently under review for this standard permit registration? <input type="checkbox"/> Yes <input type="checkbox"/> No
E.	Are scheduled maintenance, startup, or shutdown emissions required to be included in the standard permit registration at this time? <input type="checkbox"/> Yes <input type="checkbox"/> No
F.	Are any of the following actions being requested at the time of renewal: <input type="checkbox"/> Yes <input type="checkbox"/> No
1.	Are there any facilities that have been permanently shut down that are proposed to be removed from the standard permit registration? <input type="checkbox"/> Yes <input type="checkbox"/> No
2.	Do changes need to be made to the standard permit registration in order to remain in compliance? <input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Are sources or facilities that have always been present and represented, but never identified in the standard permit registration, proposed to be included with this renewal? <input type="checkbox"/> Yes <input type="checkbox"/> No
4.	Are there any changes to the current emission rates table being proposed? <input type="checkbox"/> Yes <input type="checkbox"/> No
<p><i>Note: If answers to all of the questions in Section V. Renewal Certification Option are "No," use the certification option and skip to Section VII. of this form. If the answers to any of the questions in Section V. Renewal Certification Option are "Yes," the certification option cannot be used.</i></p>	
<p>*If notice is applicable and comments are received in response to the public notice, the application does not qualify for the renewal certification option.</p>	

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VI. Technical Information Including State and Federal Regulatory Requirements
<p>Place a check next to the appropriate box to indicate what you have included in your submittal. <i>Note: Any technical or essential information needed to confirm that facilities are meeting the requirements of the standard permit must be provided. Not providing key information could result in an automatic deficiency and voiding of the project.</i></p>
<p>A. Standard Permit requirements (Checklists are optional; however, your review will go faster if you provide applicable checklists.)</p>
<p>Did you demonstrate that the general requirements in 30 TAC §§116.610 and 116.615 are met? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>Did you demonstrate that the individual requirements of the specific standard permit are met? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>B. Confidential Information (All pages properly marked "CONFIDENTIAL"). <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>C. Process Flow Diagram. <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>D. Process Description. <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>E. Maximum Emissions Data and Calculations. <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>F. Plot Plan. <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
<p>G. Projected Start of Construction Date, Start of Operation Date, and Length of Time at Site: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>Projected Start of Construction (provide date): 2025 (TBD)</p>
<p>Projected Start of Operation (provide date): 2025 (TBD)</p>
<p>Length of Time at the Site:</p>

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VII. Delinquent Fees and Penalties

This form **will not be processed** until all delinquent fees and/or penalties owed to TCEQ or the Office of the Attorney General on behalf of TCEQ are paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ website at:
www.tceq.texas.gov/agency/financial/fees/delin/index.html

VIII. Signature Requirements

The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7; the Texas Health and Safety Code (THSC), Chapter 382, the Texas Clean Air Act (TCAA) the air quality rules of the Texas Commission on Environmental Quality; or any local governmental ordinance or resolution enacted pursuant to the TCAA. I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source of hazardous air pollutant permitting requirements. The signature further signifies awareness that intentionally or knowingly making or causing to be made false material statements or representations in the application is a criminal offense subject to criminal penalties.

Name (printed):

Signature (original signature required):

IX. Copies of the Registration

The Form PI-1S application must be submitted through ePermits. No additional copies need to be sent to the Regional Office or local Air Pollution Control Program(s). The link to ePermits can be found here:
www3.tceq.texas.gov/steers/.

Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data											
Manufacturer: GM			Model No. 5.7L			Serial No.			Manufacture Date:		
Rebuilds Date:			No. of Cylinders: 8			Compression Ratio: 9.4			EPN: ENG-1		
Application: <input checked="" type="checkbox"/> Gas Compression <input type="checkbox"/> Electric Generation <input type="checkbox"/> Refrigeration <input type="checkbox"/> Emergency/Stand by											
<input checked="" type="checkbox"/> 4 Stroke Cycle <input type="checkbox"/> 2 Stroke Cycle <input type="checkbox"/> Carbureted <input checked="" type="checkbox"/> Spark Ignited <input type="checkbox"/> Dual Fuel <input type="checkbox"/> Fuel Injected											
<input type="checkbox"/> Diesel <input type="checkbox"/> Naturally Aspirated <input type="checkbox"/> Blower /Pump Scavenged <input type="checkbox"/> Turbo Charged and I.C. <input checked="" type="checkbox"/> Turbo Charged											
<input type="checkbox"/> Intercooled <input type="checkbox"/> I.C. Water Temperature <input type="checkbox"/> Lean Burn <input checked="" type="checkbox"/> Rich Burn											
Ignition/Injection Timing: Fixed: _____ Variable: _____											
Manufacture Horsepower Rating: 92						Proposed Horsepower Rating: 92					
Discharge Parameters											
Stack Height (Feet)			Stack Diameter (Feet)			Stack Temperature (°F)			Exit Velocity (FPS)		
8			0.33			1,200			124.1		
II. Fuel Data											
Type of Fuel: <input checked="" type="checkbox"/> Field Gas <input type="checkbox"/> Landfill Gas <input type="checkbox"/> LP Gas <input type="checkbox"/> Natural Gas <input type="checkbox"/> Digester Gas <input type="checkbox"/> Diesel											
Fuel Consumption (BTU/bhp-hr): 9,500				Heating Value: 1177 Btu/scf				Lower Heating Value: 1177			
Sulfur Content (grains/100 scf - weight %): 0.9 grains/100 scf											
III. Emission Factors (Before Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
14		11		9.13E-3		0.788		8.8E-02		8.4E-02	
Source of Emission Factors: <input checked="" type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input checked="" type="checkbox"/> Other (specify): NSPS JJJJ											
IV. Emission Factors (Post Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
2.8		4.8		9.13E-3		0.788		8.8E-02		8.4E-02	
Method of Emission Control: <input checked="" type="checkbox"/> NSCR Catalyst <input type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment <input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input type="checkbox"/> Other (Specify): _____											
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>											
Is Formaldehyde included in the VOCs?										<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
V. Federal and State Standards (Check all that apply)											
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> Title 30 Chapter 117 - List County: _____											
VI. Additional Information											
1. Submit a copy of the engine manufacturer's site rating or general rating specification data. 2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents. 3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).											

Reset Form

Print Form

Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data											
Manufacturer: Cummins			Model No. G855			Serial No.			Manufacture Date:		
Rebuilds Date:			No. of Cylinders: 6			Compression Ratio: 10			EPN: ENG-2 to ENG-3		
Application: <input checked="" type="checkbox"/> Gas Compression <input type="checkbox"/> Electric Generation <input type="checkbox"/> Refrigeration <input type="checkbox"/> Emergency/Stand by											
<input checked="" type="checkbox"/> 4 Stroke Cycle <input type="checkbox"/> 2 Stroke Cycle <input type="checkbox"/> Carbureted <input checked="" type="checkbox"/> Spark Ignited <input type="checkbox"/> Dual Fuel <input type="checkbox"/> Fuel Injected											
<input type="checkbox"/> Diesel <input type="checkbox"/> Naturally Aspirated <input type="checkbox"/> Blower /Pump Scavenged <input type="checkbox"/> Turbo Charged and I.C. <input checked="" type="checkbox"/> Turbo Charged											
<input type="checkbox"/> Intercooled <input type="checkbox"/> I.C. Water Temperature <input type="checkbox"/> Lean Burn <input checked="" type="checkbox"/> Rich Burn											
Ignition/Injection Timing: Fixed: X						Variable:					
Manufacture Horsepower Rating: 188						Proposed Horsepower Rating: 188					
Discharge Parameters											
Stack Height (Feet)			Stack Diameter (Feet)			Stack Temperature (°F)			Exit Velocity (FPS)		
8			0.33			1,195			165.4		
II. Fuel Data											
Type of Fuel: <input type="checkbox"/> Field Gas <input type="checkbox"/> Landfill Gas <input type="checkbox"/> LP Gas <input checked="" type="checkbox"/> Natural Gas <input type="checkbox"/> Digester Gas <input type="checkbox"/> Diesel											
Fuel Consumption (BTU/bhp-hr): 8,605				Heating Value: 1177 Btu/scf				Lower Heating Value: 1177			
Sulfur Content (grains/100 scf - weight %): 0.9 grains/100 scf											
III. Emission Factors (Before Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
5.9		26.7		8.27E-3		1.98		8.0E-02		7.6E-02	
Source of Emission Factors: <input checked="" type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input checked="" type="checkbox"/> Other (specify): NRSP Table 6, NSPS JJJJ											
IV. Emission Factors (Post Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
0.5		2		8.27E-3		0.78		8.0E-02		7.6E-02	
Method of Emission Control: <input checked="" type="checkbox"/> NSCR Catalyst <input type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment											
<input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input type="checkbox"/> Other (Specify): _____											
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>											
Is Formaldehyde included in the VOCs?										<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
V. Federal and State Standards (Check all that apply)											
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> Title 30 Chapter 117 - List County: _____											
VI. Additional Information											
1. Submit a copy of the engine manufacturer's site rating or general rating specification data.											
2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.											
3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).											

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data											
Manufacturer: Caterpillar			Model No. G3516J			Serial No.			Manufacture Date:		
Rebuilds Date:			No. of Cylinders:			Compression Ratio: 8			EPN: ENG-4		
Application: <input checked="" type="checkbox"/> Gas Compression <input type="checkbox"/> Electric Generation <input type="checkbox"/> Refrigeration <input type="checkbox"/> Emergency/Stand by <input checked="" type="checkbox"/> 4 Stroke Cycle <input type="checkbox"/> 2 Stroke Cycle <input type="checkbox"/> Carbureted <input type="checkbox"/> Spark Ignited <input type="checkbox"/> Dual Fuel <input type="checkbox"/> Fuel Injected <input type="checkbox"/> Diesel <input type="checkbox"/> Naturally Aspirated <input type="checkbox"/> Blower /Pump Scavenged <input type="checkbox"/> Turbo Charged and I.C. <input type="checkbox"/> Turbo Charged <input type="checkbox"/> Intercooled <input type="checkbox"/> I.C. Water Temperature <input checked="" type="checkbox"/> Lean Burn <input type="checkbox"/> Rich Burn											
Ignition/Injection Timing: Fixed:						Variable:					
Manufacture Horsepower Rating: 1,380						Proposed Horsepower Rating: 1,380					
Discharge Parameters											
Stack Height (Feet)			Stack Diameter (Feet)			Stack Temperature (°F)			Exit Velocity (FPS)		
20			1.3			820			95.8		
II. Fuel Data											
Type of Fuel: <input checked="" type="checkbox"/> Field Gas <input type="checkbox"/> Landfill Gas <input type="checkbox"/> LP Gas <input type="checkbox"/> Natural Gas <input type="checkbox"/> Digester Gas <input type="checkbox"/> Diesel											
Fuel Consumption (BTU/bhp-hr): 7,301				Heating Value: 1177				Lower Heating Value: 1177			
Sulfur Content (grains/100 scf - weight %): 0.9 grains /100 scf											
III. Emission Factors (Before Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
1.0		2.37		7.02E-3		1.14		0.41		3.3E-02	
Source of Emission Factors: <input checked="" type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input checked="" type="checkbox"/> Other (specify): Subpart JJJJ											
IV. Emission Factors (Post Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
1.0		0.5		7.02E-3		1.11		0.41		3.3E-02	
Method of Emission Control: <input type="checkbox"/> NSCR Catalyst <input type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment <input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input checked="" type="checkbox"/> Other (Specify): Oxidation Catalyst											
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>											
Is Formaldehyde included in the VOCs?										<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
V. Federal and State Standards (Check all that apply)											
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> Title 30 Chapter 117 - List County: _____											
VI. Additional Information											
1. Submit a copy of the engine manufacturer's site rating or general rating specification data. 2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents. 3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).											

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Texas Commission on Environmental Quality
Table 29 Reciprocating Engines

I. Engine Data											
Manufacturer: Caterpillar			Model No. G3508			Serial No.			Manufacture Date:		
Rebuilds Date:			No. of Cylinders:			Compression Ratio:			EPN: ENG-5		
Application: <input checked="" type="checkbox"/> Gas Compression <input type="checkbox"/> Electric Generation <input type="checkbox"/> Refrigeration <input type="checkbox"/> Emergency/Stand by											
<input checked="" type="checkbox"/> 4 Stroke Cycle <input type="checkbox"/> 2 Stroke Cycle <input type="checkbox"/> Carbureted <input checked="" type="checkbox"/> Spark Ignited <input type="checkbox"/> Dual Fuel <input type="checkbox"/> Fuel Injected											
<input type="checkbox"/> Diesel <input checked="" type="checkbox"/> Naturally Aspirated <input type="checkbox"/> Blower /Pump Scavenged <input type="checkbox"/> Turbo Charged and I.C. <input type="checkbox"/> Turbo Charged											
<input type="checkbox"/> Intercooled <input type="checkbox"/> I.C. Water Temperature <input checked="" type="checkbox"/> Lean Burn <input type="checkbox"/> Rich Burn											
Ignition/Injection Timing: Fixed: _____ Variable: _____											
Manufacture Horsepower Rating: 690						Proposed Horsepower Rating: 690					
Discharge Parameters											
Stack Height (Feet)			Stack Diameter (Feet)			Stack Temperature (°F)			Exit Velocity (FPS)		
15			0.8			931			147.7		
II. Fuel Data											
Type of Fuel: <input checked="" type="checkbox"/> Field Gas <input type="checkbox"/> Landfill Gas <input type="checkbox"/> LP Gas <input type="checkbox"/> Natural Gas <input type="checkbox"/> Digester Gas <input type="checkbox"/> Diesel											
Fuel Consumption (BTU/bhp-hr): 7,395				Heating Value: 1177 Btu/scf				Lower Heating Value: 1177			
Sulfur Content (grains/100 scf - weight %): 0.9 grains/100 scf											
III. Emission Factors (Before Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
1.0		2.58		7.11E-3		1.12		0.18		2.6E-4	
Source of Emission Factors: <input checked="" type="checkbox"/> Manufacturer Data <input checked="" type="checkbox"/> AP-42 <input type="checkbox"/> Other (specify): Subpart JJJJ											
IV. Emission Factors (Post Control)											
NO _x		CO		SO ₂		VOC		Formaldehyde		PM ₁₀	
g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv	g/hp-hr	ppmv
1.0		0.5		7.11E-3		1.12		0.18		2.6E-4	
Method of Emission Control: <input type="checkbox"/> NSCR Catalyst <input type="checkbox"/> Lean Operation <input type="checkbox"/> Parameter Adjustment <input type="checkbox"/> Stratified Charge <input type="checkbox"/> JLCC Catalyst <input checked="" type="checkbox"/> Other (Specify): Oxidation Catalyst											
<i>Note: Must submit a copy of any manufacturer control information that demonstrates control efficiency.</i>											
Is Formaldehyde included in the VOCs?										<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
V. Federal and State Standards (Check all that apply)											
<input checked="" type="checkbox"/> NSPS JJJJ <input checked="" type="checkbox"/> MACT ZZZZ <input type="checkbox"/> NSPS IIII <input type="checkbox"/> Title 30 Chapter 117 - List County: _____											
VI. Additional Information											
1. Submit a copy of the engine manufacturer's site rating or general rating specification data. 2. Submit a typical fuel gas analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents. 3. Submit description of air/fuel ratio control system (manufacturer information is acceptable).											

Reset Form

Print Form



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:		Permit No.:		Regulated Entity No.:	RN111549937
Area Name:	Davidson F42L			Customer Reference No.:	CN601451149

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) NAME		(A) POUND	(B) TPY
FUG	FUG	Fugitives	VOC	1.84	8.08
			H2S	<0.01	<0.01
			HAPs	0.09	0.40
ENG-1	ENG-1	VRU Engine - GM 5.7L	VOC	0.16	0.70
			NOx	0.57	2.49
			CO	0.97	4.26
			PM/PM10/PM2.5	0.02	0.07
			SO2	<0.01	<0.01
			HAPs	0.02	0.11
ENG-2	ENG-2	VRU Engine - Cummins G855	VOC	0.32	1.42
			NOx	0.21	0.91
			CO	0.83	3.63
			PM/PM10/PM2.5	0.03	0.14
			SO2	<0.01	0.02
ENG-3	ENG-3	VRU Engine - Cummins G855	VOC	0.32	1.42
			NOx	0.21	0.91
			CO	0.83	3.63
			PM/PM10/PM2.5	0.03	0.14
			SO2	<0.01	0.02
ENG-4	ENG-4	Gas Lift Engine - Caterpillar G3516J	VOC	3.38	14.79
			NOx	3.04	13.33
			CO	1.52	6.66
			PM/PM10/PM2.5	0.10	0.44
			SO2	0.02	0.09
ENG-5	ENG-5	Gas Lift Engine - Caterpillar G3508J	VOC	1.70	7.46
			NOx	1.52	6.66
			CO	0.76	3.33
			PM/PM10/PM2.5	0.05	0.22
			SO2	0.01	0.05
			HAPs	0.73	3.21



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:		Permit No.:		Regulated Entity No.:	RN111549937
Area Name:	Davidson F42L			Customer Reference No.:	CN601451149

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) NAME		(A) POUND	(B) TPY
H-1	H-1	Heater Treater 1	VOC	<0.01	0.02
			NOx	0.07	0.29
			CO	0.06	0.24
			PM/PM10/PM2.5	<0.01	0.02
			SO2	<0.01	<0.01
			HAPs	<0.01	<0.01
H-2	H-2	Heater Treater 2	VOC	0.01	0.05
			NOx	0.20	0.86
			CO	0.16	0.72
			PM/PM10/PM2.5	0.01	0.07
			SO2	<0.01	0.02
			HAPs	<0.01	<0.01
H-3	H-3	Heater Treater 3	VOC	<0.01	0.02
			NOx	0.10	0.43
			CO	0.08	0.36
			PM/PM10/PM2.5	<0.01	0.03
			SO2	<0.01	<0.01
			HAPs	<0.01	<0.01
H-4	H-4	Heater Treater 4	VOC	<0.01	0.02
			NOx	0.10	0.43
			CO	0.08	0.36
			PM/PM10/PM2.5	<0.01	0.03
			SO2	<0.01	<0.01
			HAPs	<0.01	<0.01
LOAD	LOAD	Truck Loading	VOC	38.44	4.57
			H2S	<0.01	<0.01
			HAPs	1.39	0.17
FLR-01	FLR-01, PROD-GAS	Flare	VOC	46.92	35.13
			NOx	31.53	23.61
			CO	62.95	47.13
			SO2	0.48	0.36
			H2S	<0.01	<0.01
			HAPs	1.81	1.35
FLR-02	FLR-02, TK-6010, TK-6020, TK-5010, TK-5020	Flare	VOC	50.77	13.85
			NOx	12.05	3.29
			CO	24.05	6.57
			SO2	0.39	0.12
			H2S	<0.01	<0.01
			HAPs	2.37	0.65
FLR-03	FLR-03, PROD-GAS	Flare	VOC	15.82	8.92
			NOx	5.52	3.13
			CO	11.02	6.26
			SO2	0.06	0.04
			H2S	<0.01	<0.01
			HAPs	0.83	0.47
MSS	MSS	MSS	VOC	202.85	3.34
			H2S	0.01	<0.01
			HAPs	7.13	0.10

EPN = Emission Point Number
 FIN = Facility Identification Number



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:		Permit No.:		Regulated Entity No.:	RN111549937
Area Name:	Davidson F42L			Customer Reference No.:	CN601451149

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA			EMISSION POINT DISCHARGE PARAMETERS											
1. Emission Point			4. UTM Coordinates of Emission Point			Source								
EPN (A)	FIN (B)	Name (C)	Zone	East (Meters)	North (Meters)	5. Building Height (Ft.)	6. Height Above Ground (Ft.)	7. Stack Exit Data			8. Fugitives			
								Diameter (Ft.) (A)	Velocity (FPS) (B)	Temperature (°F) (C)	Length (Ft.) (A)	Width (Ft.) (B)	Axis Degrees (C)	
FUG	FUG	Fugitives										TBD	TBD	TBD
ENG-1	ENG-1	VRU Engine - GM 5.7L					8.0	0.33	124.1	1200				
ENG-2	ENG-2	VRU Engine - Cummins G855					8.0	0.33	165.4	1195				
ENG-3	ENG-3	VRU Engine - Cummins G855					8.0	0.33	165.4	1195				
ENG-4	ENG-4	Gas Lift Engine - Caterpillar G3516J					20.0	1.33	95.8	820				
ENG-5	ENG-5	Gas Lift Engine - Caterpillar G3508J					15.0	0.83	136.1	931				
H-1	H-1	Heater Treater 1					20.0	0.50	24.9	900				
H-2	H-2	Heater Treater 2					20.0	0.50	73.9	900				
H-3	H-3	Heater Treater 3					20.0	0.50	36.9	900				
H-4	H-4	Heater Treater 4					20.0	0.50	36.9	900				
LOAD	LOAD	Truck Loading					TBD	TBD	TBD	TBD				
FLR-01	FLR-01, PROD-GAS	Flare					80.0	0.67	20.0	1832				
FLR-02	FLR-02, TK-6010, TK-6020, TK-5010, TK-5020	Flare					50.0	0.50	20.0	1832				
FLR-03	FLR-03, PROD-GAS	Flare					50.0	0.50	20.0	1832				
MSS	MSS	MSS									TBD	TBD	TBD	

EPN = Emission Point Number

FIN = Facility Identification Number

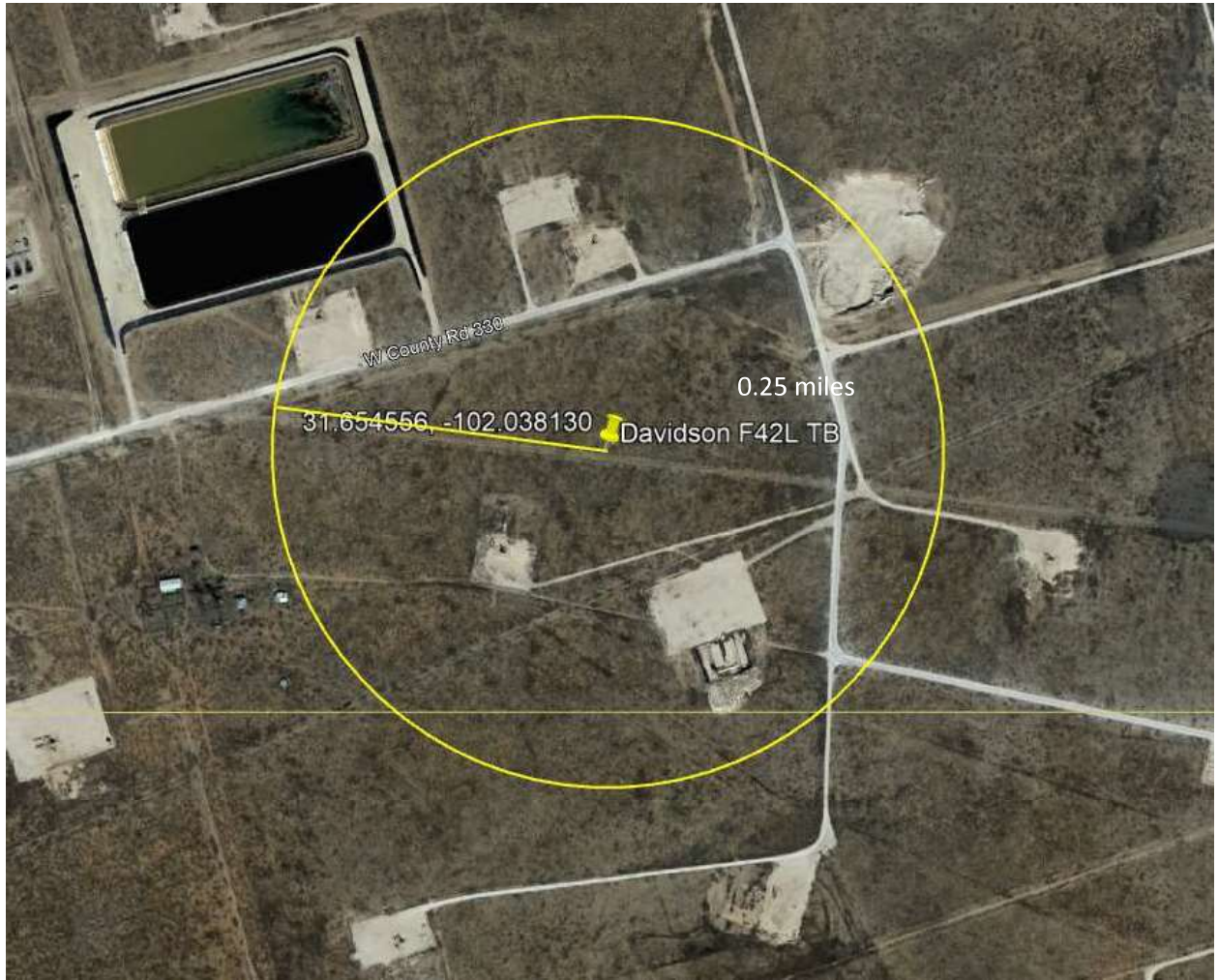
ATTACHMENT B

Site Location and Process Flow Diagram

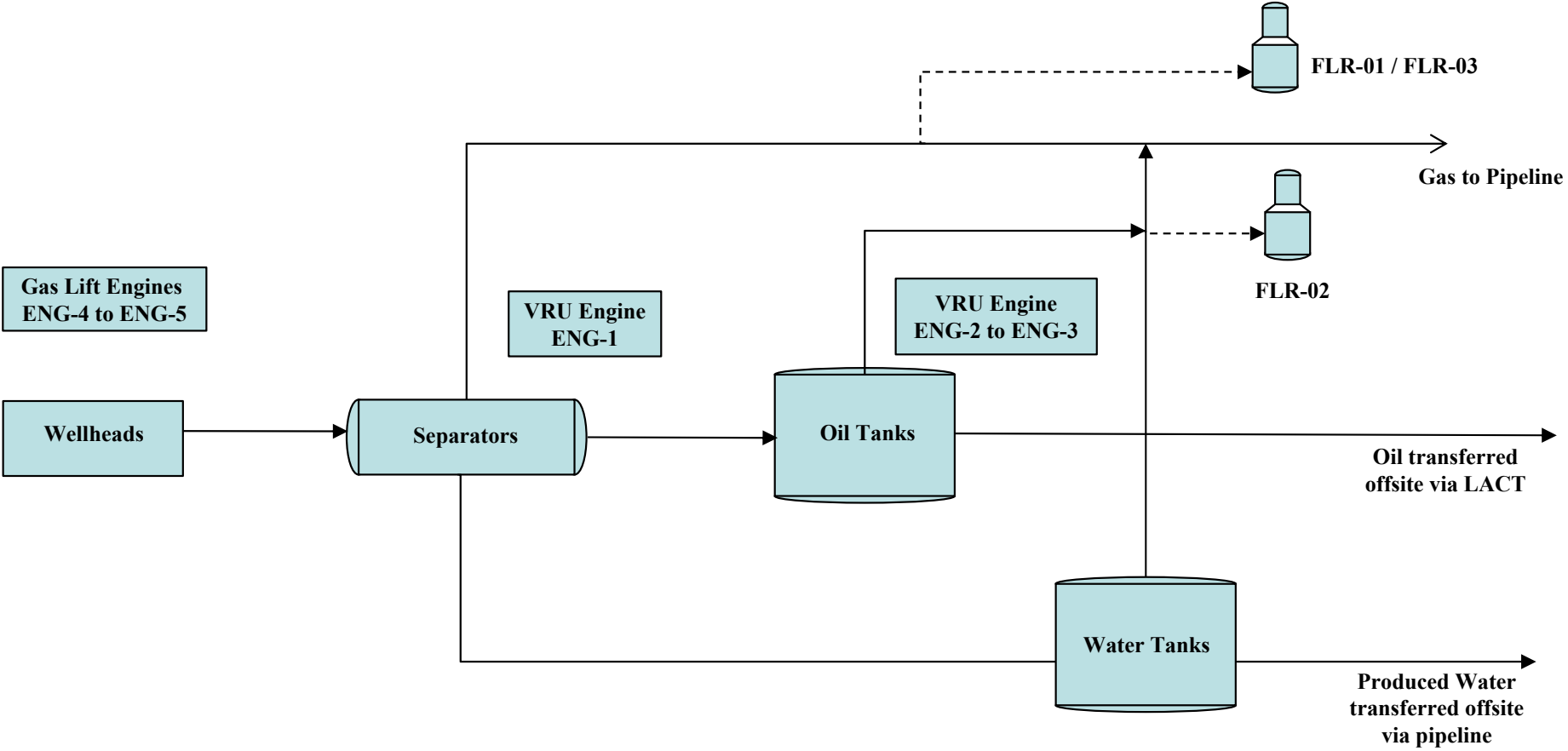
Davidson F42L Tank Battery

Midland County, Texas

31.654556°, -102.038130°



Process Flow Diagram



Gas Lift Engines
ENG-4 to ENG-5

Wellheads

VRU Engine
ENG-1

VRU Engine
ENG-2 to ENG-3

Separators

Oil Tanks

Water Tanks

FLR-01 / FLR-03

FLR-02

Gas to Pipeline

Oil transferred
offsite via LACT

Produced Water
transferred offsite
via pipeline

Davidson F42L



ATTACHMENT C

Facility Emissions Summary and Equipment Emission Calculations

Ovintiv USA Inc
Davidson F42L
Emissions Summary Table

EPN	FIN	Emission Source Name	ESTIMATED EMISSIONS																				Stream characterization							
			VOC ^[1]				NOx				CO		PM ₁₀		PM _{2.5}		SO ₂		Benzene		H ₂ S		Formaldehyde		Total HAPs ^[2]		Stream	Flow	Pressure	Hrs/yr
			lb/hr	lb/hr Natural Gas	lb/hr Condensate	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	Natural Gas OR Condensate	
FLG	FLG	Fugitives	1.845	1.066	0.779	8.090	--	--	--	--	--	--	--	--	--	--	0.007	0.032	9.0E-05	3.9E-04	--	--	0.092	0.404	N	S	--	--	8,760	
ENG-1	ENG-1	VRU Engine - GM 5.7L	0.160	0.160	--	0.700	0.568	2.487	0.974	4.264	0.017	0.074	0.017	0.074	0.002	0.008	0.001	0.006	--	--	0.018	0.078	0.025	0.108	N	S	--	--	8,760	
ENG-2	ENG-2	VRU Engine - Cummins G855	0.323	0.323	--	1.416	0.207	0.908	0.829	3.631	0.031	0.138	0.031	0.138	0.003	0.015	0.003	0.011	--	--	0.033	0.145	0.046	0.201	N	S	--	--	8,760	
ENG-3	ENG-3	VRU Engine - Cummins G855	0.323	0.323	--	1.416	0.207	0.908	0.829	3.631	0.031	0.138	0.031	0.138	0.003	0.015	0.003	0.011	--	--	0.033	0.145	0.046	0.201	N	S	--	--	8,760	
ENG-4	ENG-4	Gas Lift Engine - Caterpillar G3516J	3.377	3.377	--	14.792	3.042	13.326	1.521	6.663	0.101	0.441	0.101	0.441	0.021	0.093	0.004	0.019	--	--	1.247	5.464	1.435	6.286	N	S	--	--	8,760	
ENG-5	ENG-5	Gas Lift Engine - Caterpillar G3508J	1.704	1.704	--	7.462	1.521	6.663	0.761	3.331	0.051	0.223	0.051	0.223	0.011	0.047	0.002	0.010	--	--	0.639	2.798	0.734	3.215	N	S	--	--	8,760	
H-1	H-1	Heater Treater 1	0.004	0.004	--	0.016	0.066	0.290	0.056	0.244	0.005	0.022	0.005	0.022	0.001	0.006	1.4E-06	6.1E-06	--	--	5.0E-05	2.2E-04	5.3E-05	2.3E-04	N	S	--	--	8,760	
H-2	H-2	Heater Treater 2	0.011	0.011	--	0.047	0.196	0.858	0.165	0.722	0.015	0.065	0.015	0.065	0.004	0.019	4.1E-06	1.8E-05	--	--	1.5E-04	0.001	1.6E-04	0.001	N	S	--	--	8,760	
H-3	H-3	Heater Treater 3	0.005	0.005	--	0.024	0.098	0.429	0.082	0.361	0.007	0.033	0.007	0.033	0.002	0.009	2.1E-06	9.0E-06	--	--	7.4E-05	3.2E-04	7.9E-05	3.5E-04	N	S	--	--	8,760	
H-4	H-4	Heater Treater 4	0.005	0.005	--	0.024	0.098	0.429	0.082	0.361	0.007	0.033	0.007	0.033	0.002	0.009	2.1E-06	9.0E-06	--	--	7.4E-05	3.2E-04	7.9E-05	3.5E-04	N	S	--	--	8,760	
LOAD	LOAD	Truck Loading	38.445	--	38.445	4.565	--	--	--	--	--	--	--	--	--	0.094	0.011	0.002	0.001	--	--	1.390	0.001	0.001	0.165	C	S	--	--	8,760
FLR-01	FLR-01	Flare Pilot	0.017	0.017	--	0.011	0.023	--	--	--	--	--	--	1.7E-04	--	--	7.4E-05	--	--	1.9E-06	--	--	0.001	--	--	--	--	--	8,760	
		Combustion Products from Produced Gas	--	--	--	35.130	31.522	23.610	62.930	47.135	--	--	--	--	0.483	0.362	--	0.153	0.005	0.004	--	--	--	--	1.353	N	S	--	--	8,760
FLR-02	TK-6010, TK-6020, TK-5010, TK-5020	Produced Gas	46.903	46.903	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	S	--	--	8,760
		Flare Pilot	0.017	0.017	--	0.011	0.023	--	--	--	--	--	--	--	1.7E-04	--	--	7.4E-05	--	--	1.9E-06	--	--	0.001	--	--	--	--	8,760	
		Combustion Products from Controlled Tanks	--	--	--	13.845	12.037	3.292	24.030	6.572	--	--	--	--	0.393	0.125	0.063	0.001	--	--	--	--	--	0.001	0.647	C	S	--	--	1,686
FLR-03	FLR-03	Controlled Tanks	50.753	--	50.753	--	--	--	--	--	--	--	--	--	--	--	0.217	0.004	--	--	--	--	2.366	--	C	S	--	--	1,686	
		Flare Pilot	0.017	0.017	--	0.011	0.023	--	--	--	--	--	--	--	1.7E-04	--	--	7.4E-05	--	--	1.9E-06	--	--	0.001	--	N	S	--	--	8,760
MSS	MSS	Combustion Products from Produced Gas	--	--	--	8.921	5.509	3.135	10.998	6.259	--	--	--	--	0.062	0.036	--	0.046	--	--	--	--	--	0.469	N	S	--	--	8,760	
		Produced Gas	15.798	15.798	--	--	--	--	--	--	--	--	--	--	0.081	--	0.001	0.001	3.8E-04	--	--	--	--	--	0.104	N	S	--	--	8,760
MSS	MSS	Compressor Blowdowns/Startups	96.486	96.486	--	--	--	--	--	--	--	--	--	--	0.322	--	0.008	--	--	--	--	--	2.841	--	N	P	L	520		
		Equipment Degassing	87.939	87.939	--	--	--	--	--	--	--	--	--	--	0.353	--	0.003	--	--	--	--	--	3.622	--	N	P	H	80		
		Vacuum Trucks (Heater/Boiler Cleaning)	1.831	--	1.831	--	--	--	--	--	--	--	--	--	0.007	--	6.0E-05	--	--	--	--	--	0.075	--	C	P	L	4		
		Vacuum Trucks (Separator Cleaning)	0.149	--	0.149	3.343	--	--	--	--	--	--	--	--	--	--	5.0E-04	0.011	2.5E-04	--	--	--	0.004	0.104	C	P	L	26		
		Vacuum Trucks (Tanks Depressurization and Cleanout)	16.029	--	16.029	--	--	--	--	--	--	--	--	--	0.039	--	5.0E-04	--	--	--	--	--	0.579	--	C	P	L	48		
		Pipeline Degassing	0.007	0.007	--	--	--	--	--	--	--	--	--	--	2.4E-05	--	6.0E-07	--	--	--	--	--	2.1E-04	--	N	P	L	1		
		Filters/Strainers - Opened to Atmosphere	0.406	0.406	--	--	--	--	--	--	--	--	--	--	0.001	--	3.4E-05	--	--	--	--	--	0.012	--	N	P	L	1		
		Estimated Emissions	Total Emissions		362.55	254.57	107.99	99.78	55.11	56.34	103.33	83.17	0.27	1.17	0.27	1.17	0.99	0.74	1.34	0.37	0.02	0.01	1.97	8.63	15.91	13.16				
Steady-state			159.71	69.73	89.88	96.44	55.11	56.34	103.33	83.17	0.27	1.17	0.27	1.17	0.99	0.74	0.62	0.36	0.01	0.01	1.97	8.63	8.77	13.05						
< 30 psig periodic releases			114.91	96.90	18.01	3.34	--	--	--	--	--	--	--	--	--	--	0.37	0.01	0.01	<0.01	--	--	3.51	0.10						
Periodic ≥ 30 psig, up to 600hr/yr			87.94	87.94	--	--	--	--	--	--	--	--	--	--	--	--	0.35	--	<0.01	--	--	--	3.62	--						
Below permit limits?		--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
Non-Rule Standard Permit Emission Limits	Total emissions					250.0	250.0	250.0		15.0	15.0	15.0	15.0	250.0	10.2				47.0		10.0		25.0							
	Steady-state or < 30 psig periodic releases			750.0	145.0		121.0	104.0		28.0	28.0	28.0	28.0	93.2	7.0				10.8											
	Periodic ≥ 30 psig, up to 600hr/yr			1635.0	318.0										15.4				9.8											
Title V Applicability	Annual Emissions (excluding Fugitives VOC)					91.70	56.34	83.17		1.17		1.17		0.74		0.34			0.01		8.63		12.75							
	Below Limits?					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes						
MAXIMUM OPERATING SCHEDULE:			Hours/Day	24	Days/Week	7	Weeks/Year	52	Hours/Year	8760																				

[1] HAPs are included in Total VOC
[2] Specific HAPs included are listed on each source page

Fugitive Emission Calculations

EPN	FUG
LDAR Program	NRSP, Fugitives VOC PTE ≥ 25 tpy, H2S ≥ 5 tpy
Name	Fugitives

Description	Units	Gas Service	Control Efficiency	Liquid Service	Control Efficiency	Uncontrolled TOTAL		
						lb/hr	tpy	
Stream Composition	TOC	wt%	95.68%	NA	99.99%	NA		
	VOC	wt%	27.17%	NA	99.80%	NA		
	n-Hexane	wt%	0.61%	NA	2.94%	NA		
	2,2,4-Trimethylpentane	wt%	0.00%	NA	1.53%	NA		
	Benzene	wt%	0.09%	NA	0.48%	NA		
	Toluene	wt%	0.07%	NA	1.20%	NA		
	Ethylbenzene	wt%	0.01%	NA	0.68%	NA		
	Xylene	wt%	0.02%	NA	0.97%	NA		
	H ₂ S	wt%	0.00%	NA	0.00%	NA		
	CO ₂	wt%	1.64%	NA	0.00%	NA		
	CH ₄	wt%	53.20%	NA	0.01%	NA		
	Component Counts	Valve	-	1321	NA	263	NA	
Pump		-	0	NA	10	NA		
Connector		-	3774	NA	388	NA		
Flange		-	0	NA	486	NA		
Open-ended Line		-	134	NA	0	NA		
Pressure Relief Valve		-	57	NA	0	NA		
Other		-	0	NA	24	NA		
Emission Factor Source		-	Table 2-4	NA	Table 2-4	NA		
Components TOC Emissions	Valve	lb TOC/hr/component	9.92E-03	97%	5.51E-03	97%		
	Pump	lb TOC/hr/component	5.29E-03	85%	2.87E-02	85%		
	Connector	lb TOC/hr/component	4.41E-04	0%	4.63E-04	0%		
	Flange	lb TOC/hr/component	8.60E-04	0%	2.43E-04	0%		
	Open-ended Line	lb TOC/hr/component	4.41E-03	0%	3.09E-03	0%		
	Pressure Relief Valve	lb TOC/hr/component	1.94E-02	0%	1.65E-02	0%		
	Other	lb TOC/hr/component	1.94E-02	0%	1.65E-02	0%		
Uncontrolled Emission Calculations						lb/hr	tpy	
Emissions	TOC		16.47	72.12	2.43	10.64	18.90	82.76
	VOC		4.67	20.48	2.43	10.62	7.10	31.10
	n-Hexane		0.11	0.46	0.07	0.31	0.18	0.77
	2,2,4-Trimethylpentane		0	0	0.04	0.16	0.04	0.16
	Benzene		0.02	0.07	0.01	0.05	0.03	0.12
	Toluene		0.01	0.05	0.03	0.13	0.04	0.18
	Ethylbenzene		1.6E-03	0.01	0.02	0.07	0.02	0.08
	Xylene		3.3E-03	0.01	0.02	0.10	0.03	0.12
	H ₂ S		3.9E-04	1.7E-03	7.4E-07	3.2E-06	3.9E-04	1.7E-03
	CO ₂		0.28	1.24	9.6E-05	4.2E-04	0.28	1.24
	CH ₄		9.15	40.10	3.1E-04	1.4E-03	9.16	40.10
	CO ₂ e		229.16	1,003.71	0.01	0.03	229.17	1,003.75
Controlled Emission Calculations						lb/hr	tpy	
Emissions	TOC		3.75	16.44	0.78	3.42	4.53	19.86
	VOC		1.07	4.67	0.78	3.41	1.84	8.08
	n-Hexane		0.02	0.10	0.02	0.10	0.05	0.21
	2,2,4-Trimethylpentane		0	0	0.01	0.05	0.01	0.05
	Benzene		3.6E-03	0.02	3.7E-03	0.02	0.01	0.03
	Toluene		2.7E-03	0.01	0.01	0.04	0.01	0.05
	Ethylbenzene		3.7E-04	1.6E-03	0.01	0.02	0.01	0.03
	Xylene		7.4E-04	3.3E-03	0.01	0.03	0.01	0.04
	H ₂ S		8.9E-05	3.9E-04	2.4E-07	1.0E-06	9.0E-05	3.9E-04
	CO ₂		0.06	0.28	3.1E-05	1.3E-04	0.06	0.28
	CH ₄		2.09	9.14	1.0E-04	4.4E-04	2.09	9.14
	CO ₂ e		52.25	228.85	2.6E-03	0.01	52.25	228.86

Notes:

Component counts estimated based on 40 CFR 98 Subpart W, Table W-1B and W-1C counts for Western US Onshore oil production and estimated counts at Ovintiv sites. Engineering estimates used for component count of equipment types that are not listed in 40 CFR 98 Subpart W.
Emission factors from Protocol for Equipment Leak Emission Estimates, EPA-453/R95-017, November 1995

Ovintiv USA Inc
Davidson F42L

Internal Combustion Engine Emissions

Site Location		Discharge Parameters		Fuel Data	
County	Midland	Stack height (feet)	8.00	Fuel Type	Natural Gas
Region	TCEQ Region 7	Stack diameter (feet)	0.33	Fuel Consumption (BTU/bhp-hr)	9500
New to this registration?	Yes	Stage Temperature (°F)	1,200	Heat Value (Btu/scf)	1177
		Exhaust Flowrate (cfm)	650	Sulfur Content (grains/100scf)	0.9
		Exit Velocity (FPS)	124		
Engine Data		Method of Emission Control		Federal Standards	
EPN	ENG-1	Catalyst Type	NSCR		Yes/No
Name	VRU Engine	Parameter Adjustment	No	NSPS Subpart JJJJ	Yes
Manufacturer	GM	Stratified Charge	No	NSPS Subpart IIII	No
Model Number	5.7L	Other (Specify)		MACT Subpart ZZZZ	Yes
Serial Number	TBD				
Manufacture Date	TBD				
Last Rebuild Date					
Application	Vapor Recovery				
Horsepower:	92	Does the Total VOC (NMNEHC) emission factor being used below include formaldehyde?		Yes	
Fuel consumption (Btu/hp-hr):	9,500				
Hours of operation per year:	8,760				
Engine Type:	4 Stroke, Rich-Burn				

SO₂ Mass Balance calculation for sour gas fuel:

Fuel Heat Value (Btu/scf)	1,177
Fuel H ₂ S content (mol%)	0.002
SO ₂ produced (lb/hr) =	0.002
SO ₂ produced (tpy) =	0.008
SO ₂ EF (g/hp-hr) =	9.13E-03

MW SO₂ = 64.06 lb/lb-mole
Ideal Gas Law: 385.22 scf/lb-mole

Notes:

Hourly emission rate calculation:

- Hourly emission rate (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / 1,000,000 (Btu/MMBtu)
- Hourly emission rate (lb/hr) = EF (g/hp-hr) × Engine horsepower (hp) / 453.59 (g/lb)
- SO₂ mass balance hourly emission rate (lb/hr) = Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Molar volume (scf/lb-mole) × MW SO₂ (lb/lb-mole)

Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)

AP-42 Emission factor conversion: EF (g/hp-hr) = EF (lb/MMBtu) × 453.59 (g/lb) × Fuel consumption (Btu/hp-hr) / 1,000,000 (Btu/MMBtu)

Fuel H₂S content of 15 ppm is conservatively assumed.

To Determine Emissions for Air Permitting

	Manufacturer uncontrolled emission factor (g/hp-hr)	AP-42, Table 3.2-3 (lb/MMBtu)	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (tpy)	Manufacturer controlled emission factor (g/hp-hr)	NSPS JJJJ emission limit (g/hp-hr)	NRSP emission limit (g/hp-hr)	Emission factor used	units	Emissions	Emissions	Emission Factor Source
										(lb/hr)	(tpy)	
Total VOC (NMNEHC)			0.160	0.700				0.7883	g/hp-hr	0.160	0.700	VOC (NMNEHC, w/o HCHO) + Formaldehyde (HCHO)
VOC (NMNEHC w/o HCHO)	0.7		0.142	0.622	0.7			0.7	g/hp-hr	0.142	0.622	Manufacturer controlled
NOx	14.0		2.840	12.437	2.8		2.8	2.8	g/hp-hr	0.568	2.487	NSPS JJJJ
CO	11.0		2.231	9.772	4.8		4.8	4.8	g/hp-hr	0.974	4.264	NSPS JJJJ
PM (condensable)		0.00991	0.009	0.038				0.00991	lb/MMBtu	0.009	0.038	AP-42, Table 3.2-3
PM _{2.510} (filterable)		0.0095	0.008	0.036				0.0095	lb/MMBtu	0.008	0.036	AP-42, Table 3.2-3
PM _{TOTAL}		0.01941	0.017	0.074				0.01941	lb/MMBtu	0.017	0.074	AP-42, Table 3.2-3
SO ₂			0.002	0.008						0.002	0.008	Mass balance
Formaldehyde (HCHO)		0.0205	0.018	0.078				0.0883	g/hp-hr	0.018	0.078	AP-42, Table 3.2-3
Benzene		0.00158	0.001	0.006				0.00158	lb/MMBtu	0.001	0.006	AP-42, Table 3.2-3
Other HAPs*		0.00624	0.005	0.024				0.00624	lb/MMBtu	0.005	0.024	AP-42, Table 3.2-3
Total HAPs**		0.02832	0.025	0.108				0.122	g/hp-hr	0.025	0.108	Sum of listed HAPs

* Other HAPs AP-42 factor is the sum of AP-42 factors for all HAPs in the appropriate AP-42 table, with a rating C or better, excluding Formaldehyde and Benzene.

** Total HAPs = Formaldehyde + Benzene + Other HAPs, and Total HAPs are included in VOC

Ovintiv USA Inc
Davidson F42L

Internal Combustion Engine Emissions

Site Location		Discharge Parameters		Fuel Data	
County	Midland	Stack height (feet)	8.00	Fuel Type	Natural Gas
Region	TCEQ Region 7	Stack diameter (feet)	0.33	Fuel Consumption (BTU/bhp-hr)	8605
New to this registration?	Yes	Stage Temperature (°F)	1,195	Heat Value (Btu/scf)	1177
		Exhaust Flowrate (cfm)	866	Sulfur Content (grains/100scf)	0.9
		Exit Velocity (FPS)	166		
Engine Data		Method of Emission Control		Federal Standards	
EPN	ENG-2	Catalyst Type	NSCR	Yes/No	
Name	VRU Engine	Parameter Adjustment	No	NSPS Subpart JJJJ	Yes
Manufacturer	Cummins	Stratified Charge	No	NSPS Subpart IIII	No
Model Number	G855	Other (Specify)		MACT Subpart ZZZZ	Yes
Serial Number	TBD				
Manufacture Date	TBD				
Last Rebuild Date					
Application	Vapor Recovery				
Horsepower:	188	Does the Total VOC (NMNEHC) emission factor being used below include formaldehyde?		Yes	
Fuel consumption (Btu/hp-hr):	8,605				
Hours of operation per year:	8,760				
Engine Type:	4 Stroke, Rich-Burn				

SO₂ Mass Balance calculation for sour gas fuel:

Fuel Heat Value (Btu/scf)	1,177
Fuel H ₂ S content (mol%)	0.002
SO ₂ produced (lb/hr) =	0.003
SO ₂ produced (tpy) =	0.015
SO ₂ EF (g/hp-hr) =	8.27E-03

MW SO₂ = 64.06 lb/lb-mole
Ideal Gas Law: 385.22 scf/lb-mole

Notes:

Hourly emission rate calculation:

- Hourly emission rate (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / 1,000,000 (Btu/MMBtu)
- Hourly emission rate (lb/hr) = EF (g/hp-hr) × Engine horsepower (hp) / 453.59 (g/lb)
- SO₂ mass balance hourly emission rate (lb/hr) = Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Molar volume (scf/lb-mole) × MW SO₂ (lb/lb-mole)

Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)

AP-42 Emission factor conversion: EF (g/hp-hr) = EF (lb/MMBtu) × 453.59 (g/lb) × Fuel consumption (Btu/hp-hr) / 1,000,000 (Btu/MMBtu)

Fuel H₂S content of 15 ppm is conservatively assumed.

To Determine Emissions for Air Permitting

	Manufacturer uncontrolled emission factor	AP-42, Table 3.2-3	Uncontrolled Emissions	Uncontrolled Emissions	Manufacturer controlled emission factor	NSPS JJJJ emission limit	NRSP emission limit	Emission factor used	units	Emissions	Emissions	Emission Factor Source
										(lb/hr)	(tpy)	
Total VOC (NMNEHC)			0.821	3.594		Not Applicable		0.78	g/hp-hr	0.323	1.416	VOC (NMNEHC, w/o HCHO) + Formaldehyde (HCHO)
VOC (NMNEHC w/o HCHO)	1.9		0.787	3.449	0.7	0.7	1.0	0.7	g/hp-hr	0.290	1.271	NSPS JJJJ
NOx	5.9		2.445	10.711	0.5	1.0	0.5	0.5	g/hp-hr	0.207	0.908	NRSP
CO	26.7		11.066	48.471	2.0	2.0	3.0	2.0	g/hp-hr	0.829	3.631	NSPS JJJJ
PM (condensable)		0.00991	0.016	0.070				0.00991	lb/MMBtu	0.016	0.070	AP-42, Table 3.2-3
PM _{2.510} (filterable)		0.0095	0.015	0.067				0.0095	lb/MMBtu	0.015	0.067	AP-42, Table 3.2-3
PM _{TOTAL}		0.01941	0.031	0.138				0.01941	lb/MMBtu	0.031	0.138	AP-42, Table 3.2-3
SO ₂			0.003	0.015						0.003	0.015	Mass balance
Formaldehyde (HCHO)		0.0205	0.033	0.145				0.08	g/hp-hr	0.033	0.145	AP-42, Table 3.2-3
Benzene		0.00158	0.003	0.011				0.00158	lb/MMBtu	0.003	0.011	AP-42, Table 3.2-3
Other HAPs*		0.00624	0.010	0.044				0.00624	lb/MMBtu	0.010	0.044	AP-42, Table 3.2-3
Total HAPs**		0.02832	0.046	0.201				0.1105	g/hp-hr	0.046	0.201	Sum of listed HAPs

* Other HAPs AP-42 factor is the sum of AP-42 factors for all HAPs in the appropriate AP-42 table, with a rating C or better, excluding Formaldehyde and Benzene.

** Total HAPs = Formaldehyde + Benzene + Other HAPs, and Total HAPs are included in VOC

Ovintiv USA Inc
Davidson F42L

Internal Combustion Engine Emissions

Site Location		Discharge Parameters		Fuel Data	
County	Midland	Stack height (feet)	8.00	Fuel Type	Natural Gas
Region	TCEQ Region 7	Stack diameter (feet)	0.33	Fuel Consumption (BTU/bhp-hr)	8605
New to this registration?	Yes	Stage Temperature (°F)	1,195	Heat Value (Btu/scf)	1177
		Exhaust Flowrate (cfm)	866	Sulfur Content (grains/100scf)	0.9
		Exit Velocity (FPS)	166		
Engine Data		Method of Emission Control		Federal Standards	
EPN	ENG-3	Catalyst Type	NSCR		Yes/No
Name	VRU Engine	Parameter Adjustment	No	NSPS Subpart JJJJ	Yes
Manufacturer	Cummins	Stratified Charge	No	NSPS Subpart IIII	No
Model Number	G855	Other (Specify)		MACT Subpart ZZZZ	Yes
Serial Number	TBD				
Manufacture Date	TBD				
Last Rebuild Date					
Application	Vapor Recovery				
Horsepower:	188	Does the Total VOC (NMNEHC) emission factor being used below include formaldehyde?		Yes	
Fuel consumption (Btu/hp-hr):	8,605				
Hours of operation per year:	8,760				
Engine Type:	4 Stroke, Rich-Burn				

SO₂ Mass Balance calculation for sour gas fuel:

Fuel Heat Value (Btu/scf)	1,177
Fuel H ₂ S content (mol%)	0.0015
SO ₂ produced (lb/hr) =	0.003
SO ₂ produced (tpy) =	0.015
SO ₂ EF (g/hp-hr) =	8.27E-03

MW SO₂ = 64.06 lb/lb-mole
Ideal Gas Law: 385.22 scf/lb-mole

Notes:

Hourly emission rate calculation:

- Hourly emission rate (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / 1,000,000 (Btu/MMBtu)
- Hourly emission rate (lb/hr) = EF (g/hp-hr) × Engine horsepower (hp) / 453.59 (g/lb)
- SO₂ mass balance hourly emission rate (lb/hr) = Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Molar volume (scf/lb-mole) × MW SO₂ (lb/lb-mole)

Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)

AP-42 Emission factor conversion: EF (g/hp-hr) = EF (lb/MMBtu) × 453.59 (g/lb) × Fuel consumption (Btu/hp-hr) / 1,000,000 (Btu/MMBtu)

Fuel H₂S content of 15 ppm is conservatively assumed.

To Determine Emissions for Air Permitting

	Manufacturer uncontrolled emission factor (g/hp-hr)	AP-42, Table 3.2-3 (lb/MMBtu)	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (tpy)	Manufacturer controlled emission factor (g/hp-hr)	NSPS JJJJ emission limit (g/hp-hr)	NRSP emission limit (g/hp-hr)	Emission factor used	units	Emissions	Emissions	Emission Factor Source
										(lb/hr)	(tpy)	
Total VOC (NMNEHC)			0.821	3.594		Not Applicable		0.78	g/hp-hr	0.323	1.416	VOC (NMNEHC, w/o HCHO) + Formaldehyde (HCHO)
VOC (NMNEHC w/o HCHO)	1.9		0.787	3.449	0.7	0.7	1.0	0.7	g/hp-hr	0.290	1.271	NSPS JJJJ
NOx	5.9		2.445	10.711	0.5	1.0	0.5	0.5	g/hp-hr	0.207	0.908	NRSP
CO	26.7		11.066	48.471	2.0	2.0	3.0	2.0	g/hp-hr	0.829	3.631	NSPS JJJJ
PM (condensable)		0.00991	0.016	0.070				0.00991	lb/MMBtu	0.016	0.070	AP-42, Table 3.2-3
PM _{2.5/10} (filterable)		0.0095	0.015	0.067				0.0095	lb/MMBtu	0.015	0.067	AP-42, Table 3.2-3
PM _{TOTAL}		0.01941	0.031	0.138				0.01941	lb/MMBtu	0.031	0.138	AP-42, Table 3.2-3
SO ₂			0.003	0.015						0.003	0.015	Mass balance
Formaldehyde (HCHO)		0.0205	0.033	0.145				0.08	g/hp-hr	0.033	0.145	AP-42, Table 3.2-3
Benzene		0.00158	0.003	0.011				0.00158	lb/MMBtu	0.003	0.011	AP-42, Table 3.2-3
Other HAPs*		0.00624	0.010	0.044				0.00624	lb/MMBtu	0.010	0.044	AP-42, Table 3.2-3
Total HAPs**		0.02832	0.046	0.201				0.1105	g/hp-hr	0.046	0.201	Sum of listed HAPs

* Other HAPs AP-42 factor is the sum of AP-42 factors for all HAPs in the appropriate AP-42 table, with a rating C or better, excluding Formaldehyde and Benzene.

** Total HAPs = Formaldehyde + Benzene + Other HAPs, and Total HAPs are included in VOC

Ovintiv USA Inc
Davidson F42L

Internal Combustion Engine Emissions

Site Location		Discharge Parameters		Fuel Data	
County	Midland	Stack height (feet)	20.00	Fuel Type	Natural Gas
Region	TCEQ Region 7	Stack diameter (feet)	1.33	Fuel Consumption (BTU/bhp-hr)	7301
New to this registration?	Yes	Stage Temperature (°F)	820	Heat Value (Btu/scf)	1177
		Exhaust Flowrate (cfm)	8,028	Sulfur Content (grains/100scf)	0.9
		Exit Velocity (FPS)	96		
Engine Data		Method of Emission Control		Federal Standards	
EPN	ENG-4	Catalyst Type	SCO		Yes/No
Name	Gas Lift Engine	Parameter Adjustment	No	NSPS Subpart JJJJ	Yes
Manufacturer	Caterpillar	Stratified Charge	No	NSPS Subpart IIII	No
Model Number	G3516J	Other (Specify)		MACT Subpart ZZZZ	Yes
Serial Number	TBD				
Manufacture Date	TBD				
Last Rebuild Date					
Application	Gas Compression				
Horsepower:	1,380				
Fuel consumption (Btu/hp-hr):	7,301				
Hours of operation per year:	8,760				
Engine Type:	4 Stroke, Lean-Burn				
		Does the Total VOC (NMNEHC) emission factor being used below include formaldehyde?	Yes		

SO₂ Mass Balance calculation for sour gas fuel:

Fuel Heat Value (Btu/scf)	1,177
Fuel H ₂ S content (mol%)	0.002
SO ₂ produced (lb/hr) =	0.02135
SO ₂ produced (tpy) =	0.093
SO ₂ EF (g/hp-hr) =	7.02E-03

MW SO₂ = 64.06 lb/lb-mole
Ideal Gas Law: 385.22 scf/lb-mole

Notes:

Hourly emission rate calculation:

- Hourly emission rate (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / 1,000,000 (Btu/MMBtu)
- Hourly emission rate (lb/hr) = EF (g/hp-hr) × Engine horsepower (hp) / 453.59 (g/lb)
- SO₂ mass balance hourly emission rate (lb/hr) = Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Molar volume (scf/lb-mole) × MW SO₂ (lb/lb-mole)

Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)

AP-42 Emission factor conversion: EF (g/hp-hr) = EF (lb/MMBtu) × 453.59 (g/lb) × Fuel consumption (Btu/hp-hr) / 1,000,000 (Btu/MMBtu)

Fuel H₂S content of 15 ppm is conservatively assumed.

To Determine Emissions for Air Permitting

	Manufacturer uncontrolled emission factor	AP-42, Table 3.2-2	Uncontrolled Emissions	Uncontrolled Emissions	Manufacturer controlled emission factor	NSPS JJJJ emission limit	NRSP emission limit	Emission factor used	units	Emissions	Emissions	Emission Factor Source
	(g/hp-hr)	(lb/MMBtu)	(lb/hr)	(tpy)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)			(lb/hr)	(tpy)	
Total VOC (NMNEHC)	1.14		3.468	15.191	1.11	Not Applicable		1.11	g/hp-hr	3.377	14.792	VOC (NMNEHC, w/o HCHO) + Formaldehyde (HCHO)
VOC (NMNEHC w/o HCHO)	0.73		2.221	9.728	0.7	0.7	1.0	0.7	g/hp-hr	2.130	9.328	NSPS JJJJ
NOx	1.0		3.042	13.326	1.0	1.0	1.0	1.0	g/hp-hr	3.042	13.326	NRSP
CO	2.37		7.210	31.582	0.5	2.0	3.0	0.5	g/hp-hr	1.521	6.663	g/hp-hr
PM (condensable)		0.00991	0.100	0.437				0.00991	lb/MMBtu	0.100	0.437	AP-42, Table 3.2-2
PM _{2.510} (filterable)		0.000771	0.001	0.003				0.000771	lb/MMBtu	0.001	0.003	AP-42, Table 3.2-2
PM _{TOTAL}		0.00999	0.101	0.441				0.00999	lb/MMBtu	0.101	0.441	AP-42, Table 3.2-2
SO ₂			0.021	0.093						0.021	0.093	Mass balance
Formaldehyde (HCHO)	0.41		1.247	5.464	0.41			0.41	g/hp-hr	1.247	5.464	Manufacturer controlled
Benzene		0.000440	0.004	0.019				0.000440	lb/MMBtu	0.004	0.019	AP-42, Table 3.2-2
Other HAPs*		0.0182	0.183	0.803				0.0182	lb/MMBtu	0.183	0.803	AP-42, Table 3.2-2
Total HAPs**			1.435	6.286				0.4717	g/hp-hr	1.435	6.286	Sum of listed HAPs

* Other HAPs AP-42 factor is the sum of AP-42 factors for all HAPs in the appropriate AP-42 table, with a rating C or better, excluding Formaldehyde and Benzene.

** Total HAPs = Formaldehyde + Benzene + Other HAPs, and Total HAPs are included in VOC

Ovintiv USA Inc
Davidson F42L

Internal Combustion Engine Emissions

Site Location		Discharge Parameters		Fuel Data	
County	Midland	Stack height (feet)	15.00	Fuel Type	Natural Gas
Region	TCEQ Region 7	Stack diameter (feet)	0.83	Fuel Consumption (BTU/bhp-hr)	7395
New to this registration?	Yes	Stage Temperature (°F)	931	Heat Value (Btu/scf)	1177
		Exhaust Flowrate (cfm)	4,455	Sulfur Content (grains/100scf)	0.9
		Exit Velocity (FPS)	136		
Engine Data		Method of Emission Control		Federal Standards	
EPN	ENG-5	Catalyst Type	NSCR		Yes/No
Name	Gas Lift Engine	Parameter Adjustment	No	NSPS Subpart JJJJ	Yes
Manufacturer	Caterpillar	Stratified Charge	No	NSPS Subpart IIII	No
Model Number	G3508J	Other (Specify)		MACT Subpart ZZZZ	Yes
Serial Number	TBD				
Manufacture Date	TBD				
Last Rebuild Date					
Application	Gas Compression				
Horsepower:	690				
Fuel consumption (Btu/hp-hr):	7,395				
Hours of operation per year:	8,760				
Engine Type:	4 Stroke, Lean-Burn				
		Does the Total VOC (NMNEHC) emission factor being used below include formaldehyde?	Yes		

SO₂ Mass Balance calculation for sour gas fuel:

Fuel Heat Value (Btu/scf)	1,177
Fuel H ₂ S content (mol%)	0.002
SO ₂ produced (lb/hr) =	0.011
SO ₂ produced (tpy) =	0.047
SO ₂ EF (g/hp-hr) =	7.11E-03

MW SO₂ = 64.06 lb/lb-mole
Ideal Gas Law: 385.22 scf/lb-mole

Notes:

Hourly emission rate calculation:

- Hourly emission rate (lb/hr) = EF (lb/MMBtu) × Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / 1,000,000 (Btu/MMBtu)
- Hourly emission rate (lb/hr) = EF (g/hp-hr) × Engine horsepower (hp) / 453.59 (g/lb)
- SO₂ mass balance hourly emission rate (lb/hr) = Fuel Consumption (Btu/hp-hr) × Engine horsepower (hp) / Fuel Heat Value (Btu/scf) × Fuel H₂S content (mol%) / Molar volume (scf/lb-mole) × MW SO₂ (lb/lb-mole)

Annual emission rate (tpy) = Hourly Emission Rate (lb/hr) × Hours of operation per year (hrs/yr) / 2,000 (lb/ton)

AP-42 Emission factor conversion: EF (g/hp-hr) = EF (lb/MMBtu) × 453.59 (g/lb) × Fuel consumption (Btu/hp-hr) / 1,000,000 (Btu/MMBtu)

Fuel H₂S content of 15 ppm is conservatively assumed.

To Determine Emissions for Air Permitting

	Manufacturer uncontrolled emission factor	AP-42, Table 3.2-2	Uncontrolled Emissions	Uncontrolled Emissions	Manufacturer controlled emission factor	NSPS JJJJ emission limit	NRSP emission limit	Emission factor used	units	Emissions	Emissions	Emission Factor Source
	(g/hp-hr)	(lb/MMBtu)	(lb/hr)	(tpy)	(g/hp-hr)	(g/hp-hr)	(g/hp-hr)			(lb/hr)	(tpy)	
Total VOC (NMNEHC)	1.12		1.704	7.462	1.12	Not Applicable		1.12	g/hp-hr	1.704	7.462	VOC (NMNEHC, w/o HCHO) + Formaldehyde (HCHO)
VOC (NMNEHC w/o HCHO)	0.7		1.065	4.664	0.7	0.7	1.0	0.7	g/hp-hr	1.065	4.664	NSPS JJJJ
NOx	1.0		1.521	6.663	1.0	1.0	1.0	1.0	g/hp-hr	1.521	6.663	NRSP
CO	2.58		3.925	17.190	0.5	2.0	3.0	0.5	g/hp-hr	0.761	3.331	g/hp-hr
PM (condensable)		0.00991	0.051	0.221				0.00991	lb/MMBtu	0.051	0.221	AP-42, Table 3.2-2
PM _{2.510} (filterable)		0.000771	3.93E-04	0.002				0.000771	lb/MMBtu	3.93E-04	0.002	AP-42, Table 3.2-2
PM _{TOTAL}		0.00999	0.051	0.223				0.00999	lb/MMBtu	0.051	0.223	AP-42, Table 3.2-2
SO ₂			0.011	0.047						0.011	0.047	Mass balance
Formaldehyde (HCHO)	0.42		0.639	2.798	0.42			0.42	g/hp-hr	0.639	2.798	Manufacturer controlled
Benzene		0.000440	0.002	0.010				0.000440	lb/MMBtu	0.002	0.010	AP-42, Table 3.2-2
Other HAPs*		0.0182	0.093	0.407				0.0182	lb/MMBtu	0.093	0.407	AP-42, Table 3.2-2
Total HAPs**			0.734	3.215				0.4825	g/hp-hr	0.734	3.215	Sum of listed HAPs

* Other HAPs AP-42 factor is the sum of AP-42 factors for all HAPs in the appropriate AP-42 table, with a rating C or better, excluding Formaldehyde and Benzene.

** Total HAPs = Formaldehyde + Benzene + Other HAPs, and Total HAPs are included in VOC

Heaters-Boilers Emissions

Heater and Boiler Emission Calculations (fueled by natural gas)	
EPN	H-1
Name	Heater Treater 1
Heater/Boiler rating (MMBtu/hr):	0.675
Rating above is (select from list):	below 100 MMBtu/hr, uncontrolled (assume uncontrolled, unless specifically stated otherwise)
Operating hours/year:	8760
Fuel Heat Value (Btu/SCF):	1,177

Pollutant	Emission Factor (lb/MMBtu)	lb/hr	tpy
VOC	0.00539	0.004	0.016
NOx	0.098	0.066	0.290
CO	0.0824	0.056	0.244
PM total	0.00745	0.005	0.022
PM condensable	0.00559	0.004	0.017
PM filterable	0.00186	0.001	0.005
SO ₂	0.00212	0.001	0.006
Benzene	0.00000206	1.4E-06	6.1E-06
Formaldehyde	0.0000735	5.0E-05	2.2E-04
Other HAPs*	0.00000333	2.2E-06	9.8E-06
Total HAPs		5.3E-05	2.3E-04

* Other HAPs AP-42 factor is the sum of AP-42 factors from Table 1.4-3 with a rating C or better, excluding Formaldehyde and Benzene.

If the heater/boiler is fueled by Sour Gas, cannot use emission factors above to calculate SO₂ emissions, must use SO₂ mass balance:

SO ₂ Mass Balance calculation:		assumptions:	
Fuel H ₂ S content (mol %) =	0.0015	SO2 MW	64.06 lb/lb-mole
SO ₂ produced (lb/hr) =	0.0014	Ideal Gas Law	385.22 SCF/lb-mole
SO ₂ produced (tpy) =	0.0063		

Enter any notes here:	<p>Emission Factors from AP-42, Chapter 1, Tables 1.4-1, 1.4-2 and 1.4-3. Modified from lb/MMCF to lb/MMBtu by dividing by 1020 MMBtu/ MMCF (per AP-42 guidance).</p> <p>AP-42 emission factors for HAPs with a rating C or better were used for individual HAPs listed.</p> <p>Total HAPs = Benzene + Formaldehyde + Other HAPs</p> <p>HAPs are included in Total VOC.</p> <p>Fuel H₂S content of 15 ppm is conservatively assumed.</p>
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Heaters-Boilers Emissions

Heater and Boiler Emission Calculations (fueled by natural gas)			
EPN	H-2		
Name	Heater Treater 2		
Heater/Boiler rating (MMBtu/hr):	2.000		
Rating above is (select from list):	below 100 MMBtu/hr, uncontrolled	(assume uncontrolled, unless specifically stated otherwise)	
Operating hours/year:	8760		
Fuel Heat Value (Btu/SCF):	1,177		
Pollutant	Emission Factor (lb/MMBtu)	lb/hr	tpy
VOC	0.00539	0.011	0.047
NOx	0.098	0.196	0.858
CO	0.0824	0.165	0.722
PM total	0.00745	0.015	0.065
PM condensable	0.00559	0.011	0.049
PM filterable	0.00186	0.004	0.016
SO ₂	0.00212	0.004	0.019
Benzene	0.00000206	4.1E-06	1.8E-05
Formaldehyde	0.0000735	1.5E-04	0.001
Other HAPs*	0.00000333	6.7E-06	2.9E-05
Total HAPs		1.6E-04	0.001
* Other HAPs AP-42 factor is the sum of AP-42 factors from Table 1.4-3 with a rating C or better, excluding Formaldehyde and Benzene.			
If the heater/boiler is fueled by Sour Gas, <u>cannot</u> use emission factors above to calculate SO ₂ emissions, must use SO ₂ mass balance:			
SO ₂ Mass Balance calculation:			
Fuel H ₂ S content (mol %) =	0.0015	assumptions:	
SO ₂ produced (lb/hr) =	0.0042	SO2 MW	64.06 lb/lb-mole
SO ₂ produced (tpy) =	0.0186	Ideal Gas Law	385.22 SCF/lb-mole

Enter any notes here:	Emission Factors from AP-42, Chapter 1, Tables 1.4-1, 1.4-2 and 1.4-3. Modified from lb/MMCF to lb/MMBtu by dividing by 1020 MMBtu/ MMCF (per AP-42 guidance).
	AP-42 emission factors for HAPs with a rating C or better were used for individual HAPs listed.
	Total HAPs = Benzene + Formaldehyde + Other HAPs
	HAPs are included in Total VOC.
	Fuel H ₂ S content of 15 ppm is conservatively assumed.

Heaters-Boilers Emissions

Heater and Boiler Emission Calculations (fueled by natural gas)		
EPN	H-3	
Name	Heater Treater 3	
Heater/Boiler rating (MMBtu/hr):	1.000	
Rating above is (select from list):	below 100 MMBtu/hr, uncontrolled	(assume uncontrolled, unless specifically stated otherwise)
Operating hours/year:	8760	
Fuel Heat Value (Btu/SCF):	1,177	

Pollutant	Emission Factor (lb/MMBtu)	lb/hr	tpy
VOC	0.00539	0.005	0.024
NOx	0.098	0.098	0.429
CO	0.0824	0.082	0.361
PM total	0.00745	0.007	0.033
PM condensable	0.00559	0.006	0.024
PM filterable	0.00186	0.002	0.008
SO ₂	0.00212	0.002	0.009
Benzene	0.00000206	2.1E-06	9.0E-06
Formaldehyde	0.0000735	7.4E-05	3.2E-04
Other HAPs*	0.00000333	3.3E-06	1.5E-05
Total HAPs		7.9E-05	3.5E-04

* Other HAPs AP-42 factor is the sum of AP-42 factors from Table 1.4-3 with a rating C or better, excluding Formaldehyde and Benzene.

If the heater/boiler is fueled by Sour Gas, cannot use emission factors above to calculate SO₂ emissions, must use SO₂ mass balance:

SO ₂ Mass Balance calculation:		
Fuel H ₂ S content (mol %) =	0.0015	assumptions:
SO ₂ produced (lb/hr) =	0.0021	SO2 MW 64.06 lb/lb-mole
SO ₂ produced (tpy) =	0.0093	Ideal Gas Law 385.22 SCF/lb-mole

Enter any notes here:

Emission Factors from AP-42, Chapter 1, Tables 1.4-1, 1.4-2 and 1.4-3. Modified from lb/MMCF to lb/MMBtu by dividing by 1020 MMBtu/ MMCF (per AP-42 guidance).

AP-42 emission factors for HAPs with a rating C or better were used for individual HAPs listed.

Total HAPs = Benzene + Formaldehyde + Other HAPs

HAPs are included in Total VOC.

Fuel H₂S content of 15 ppm is conservatively assumed.

Heaters-Boilers Emissions

Heater and Boiler Emission Calculations (fueled by natural gas)	
EPN	H-4
Name	Heater Treater 4
Heater/Boiler rating (MMBtu/hr):	1.000
Rating above is (select from list):	below 100 MMBtu/hr, uncontrolled (assume uncontrolled, unless specifically stated otherwise)
Operating hours/year:	8760
Fuel Heat Value (Btu/SCF):	1,177

Pollutant	Emission Factor (lb/MMBtu)	lb/hr	tpy
VOC	0.00539	0.005	0.024
NOx	0.098	0.098	0.429
CO	0.0824	0.082	0.361
PM total	0.00745	0.007	0.033
PM condensable	0.00559	0.006	0.024
PM filterable	0.00186	0.002	0.008
SO ₂	0.00212	0.002	0.009
Benzene	0.00000206	2.1E-06	9.0E-06
Formaldehyde	0.0000735	7.4E-05	3.2E-04
Other HAPs*	0.00000333	3.3E-06	1.5E-05
Total HAPs		7.9E-05	3.5E-04

* Other HAPs AP-42 factor is the sum of AP-42 factors from Table 1.4-3 with a rating C or better, excluding Formaldehyde and Benzene.

If the heater/boiler is fueled by Sour Gas, cannot use emission factors above to calculate SO₂ emissions, must use SO₂ mass balance:

SO ₂ Mass Balance calculation:		assumptions:	
Fuel H ₂ S content (mol %) =	0.0015	SO2 MW	64.06 lb/lb-mole
SO ₂ produced (lb/hr) =	0.0021	Ideal Gas Law	385.22 SCF/lb-mole
SO ₂ produced (tpy) =	0.0093		

Enter any notes here:	<p>Emission Factors from AP-42, Chapter 1, Tables 1.4-1, 1.4-2 and 1.4-3. Modified from lb/MMCF to lb/MMBtu by dividing by 1020 MMBtu/ MMCF (per AP-42 guidance).</p> <p>AP-42 emission factors for HAPs with a rating C or better were used for individual HAPs listed.</p> <p>Total HAPs = Benzene + Formaldehyde + Other HAPs</p> <p>HAPs are included in Total VOC.</p> <p>Fuel H₂S content of 15 ppm is conservatively assumed.</p>
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Ovintiv USA Inc
Davidson F42L

Tank Emissions - AP-42

Breathing Working Losses From Storage Tanks

Parameter Name	AP-42 Variable		Units	Oil/Condensate Tank		Oil/Condensate Tank		Produced Water Tank		Produced Water Tank	
	Variable	Reference		TK-6010		TK-6020		TK-5010		TK-5020	
				Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual
FIN											
Tank contents				Oil/Condensate	Oil/Condensate	Produced Water	Produced Water				
Tank Type				VFR	VFR	VFR	VFR				
Roof Type				Cone	Cone	Cone	Cone				
Height (VFR) / Length (HFR)	H _g / L		ft	24	24	24	24				
Diameter	D		ft	15.5	15.5	15.5	15.5				
Average Liquid Height	H _L		ft	12	12.0	12	12				
Maximum Liquid Height	H _{LX}	Eq. 7.1-37	ft	23	23	23	23				
Tank Capacity	T _{CG}		bbl	750	750	750	750				
Throughput	Q		gal	12,250	42,000,000	12,250	42,000,000	59,564	210,315,534	59,564	210,315,534
Annual Liquid Level Increases	ΣH _{OI}	Eq. 7.1-37	ft/yr	-	29,752	-	29,752	-	148,985	-	148,985
Turnovers	N	Eq. 7.1-36		-	1352.37	-	1352.37	-	6772.02	-	6772.02
Tank Shell Radius	R _s		ft	7.75	7.75	7.75	7.75				
Cone Roof Height	H _R	Eq. 7.1-18	ft	0.48	0.48	0.48	0.48				
Cone Roof Outage	H _{RO}	Eq. 7.1-17	ft	0.16	0.16	0.16	0.16				
Vapor Space Outage	H _{VO}	Eq. 7.1-16	ft	12.16	12.16	12.16	12.16				
Breather Vent Vacuum Setting			psig	-0.03	-0.03	-0.03	-0.03				
Breather Vent Pressure Setting			psig	0.03	0.03	0.03	0.03				
Breather Vent Pressure Range	ΔP _B	Eq. 7.1-10	psi	0.06	0.06	0.06	0.06				
Surface Color-Shade				Tan	Tan	Tan	Tan				
Reflective Condition				New	New	New	New				
Paint Solar Absorbance	α	Tbl 7.1-6		0.43	0.43	0.43	0.43				
Meteorological data city*				Midland, TX	Midland, TX	Midland, TX	Midland, TX				
Daily Total Solar Insolation Factor	I	Tbl 7.1-7	Btu/ft ² -d	2,272	1,698	2,272	1,698	2,272	1,698	2,272	1,698
Atmospheric Pressure		Tbl 7.1-7	psia	13.26	13.26	13.26	13.26	13.26	13.26	13.26	13.26
Daily Maximum Ambient Temperature	T _{AX}	Tbl 7.1-7	*R	553.47	536.37	553.47	536.37	553.47	536.37	553.47	536.37
Daily Minimum Ambient Temperature	T _{AN}	Tbl 7.1-7	*R	530.67	511.07	530.67	511.07	530.67	511.07	530.67	511.07
Daily Ambient Temp. Change	ΔT _A	Eq. 7.1-11	*R	22.80	25.30	22.80	25.30	22.80	25.30	22.80	25.30
Daily Avg. Ambient Temperature	T _{AA}	Eq. 7.1-30	*R	542.07	523.72	542.07	523.72	542.07	523.72	542.07	523.72
Liquid Bulk Temperature	T _B	Eq. 7.1-31	*R	545.00	525.91	545.00	525.91	545.00	525.91	545.00	525.91
Daily Vapor Temperature Range	ΔT _V	Eq. 7.1-6	*R	34.51	32.80	34.51	32.80	34.51	32.80	34.51	32.80
Annual Average Vapor Temperature	T _V	Eq. 7.1-33	*R	551.74	530.95	551.74	530.95	551.74	530.95	551.74	530.95
Daily Avg. Liquid Surface Temperature	T _{LA}	Eq. 7.1-27	*R	547.54	527.81	547.54	527.81	547.54	527.81	547.54	527.81
Daily Max. Avg. Liq. Surf. Temp.	T _{LX}	Fig. 7.1-17	*R	556.17	536.01	556.17	536.01	556.17	536.01	556.17	536.01
Daily Min. Avg. Liq. Surf. Temp.	T _{LN}	Fig. 7.1-17	*R	538.92	519.61	538.92	519.61	538.92	519.61	538.92	519.61
Product Type				Crude	Crude	Crude	Crude				
RVP				9.90	9.90	9.90	9.90				
Constant A		Fig. 7.1-15,16		10.60	10.60	10.60	10.60				
Constant B		Fig. 7.1-15,16	*R	4473.28	4473.28	4473.28	4473.28				
Vapor Molecular Wt.	M _V		lb/lb-mole	39.98	39.98	39.98	39.98				
True Vapor Pressure @ T _{LA}	P _{VA}	Eq. 7.1-25	psia	11.39	8.39	11.39	8.39	11.39	8.39	11.39	8.39
True Vapor Pressure @ T _{LX}	P _{VX}	Eq. 7.1-25	psia	12.93	9.56	12.93	9.56	12.93	9.56	12.93	9.56
True Vapor Pressure @ T _{LN}	P _{VN}	Eq. 7.1-25	psia	10.00	7.34	10.00	7.34	10.00	7.34	10.00	7.34
Daily Vapor Pressure Range	ΔP _V	Eq. 7.1-9	psia	2.94	2.21	2.94	2.21	2.94	2.21	2.94	2.21
Vapor Space Expansion Factor	K _E	Eq. 7.1-5,12	/day	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
Vented Vapor Saturation Factor	K _S	Eq. 7.1-21		0.12	0.16	0.12	0.16	0.12	0.16	0.12	0.16
Working Loss Product Factor	K _P	Eq. 7.1-37		0.75	0.75	0.75	0.75				
Turnover Factor	K _N	Eq. 7.1-35		-	1.00	-	1.00	-	1.00	-	1.00
Net Working Loss Throughput	V _D	Eq. 7.1-39	ft ³	-	5,614,000	-	5,614,000	-	28,112,176	-	28,112,176
Vapor Space Volume	V _V	Eq. 7.1-3	ft ³	2294.77	2294.77	2294.77	2294.77				
Vapor Density	W _V	Eq. 7.1-22	lb/ft ³	0.08	0.06	0.08	0.06	0.08	0.06	0.08	0.06
Percent Water in the Tank (%)				0%		0%		99%		99%	
Emissions Calculations				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total HC Uncontrolled*	Breathing			0.882	1.942	0.882	1.942	0.882	1.942	0.882	1.942
	Working			141.863	123.998	141.863	123.998	689.787	620.923	689.787	620.923
	Total			141.863	125.940	141.863	125.940	689.787	622.864	689.787	622.864
Total Stream Uncontrolled	Breathing			0.909	2.002	0.909	2.002	0.909	2.002	0.909	2.002
	Working			146.235	127.819	146.235	127.819	711.044	640.057	711.044	640.057
	Total			146.235	129.821	146.235	129.821	711.044	642.059	711.044	642.059
Tank Vapor weight %s	THC			97.01%	97.01%	97.01%	97.01%	97.01%	97.01%	97.01%	97.01%
	VOC (C3)			29.68%	29.68%	29.68%	29.68%	29.68%	29.68%	29.68%	29.68%
	VOC (C4+)			40.60%	40.60%	40.60%	40.60%	40.60%	40.60%	40.60%	40.60%
	VOC			70.28%	70.28%	70.28%	70.28%	70.28%	70.28%	70.28%	70.28%
	Benzene			0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%
	H2S			0.0017%	0.0017%	0.0017%	0.0017%	0.0017%	0.0017%	0.0017%	0.0017%
	Total HAPs†			2.54%	2.54%	2.54%	2.54%	2.54%	2.54%	2.54%	2.54%
Uncontrolled Emissions	VOC (C3)			43.405	38.533	43.405	38.533	211.048	190.572	211.048	190.572
	VOC (C4+)			59.371	52.707	59.371	52.707	288.684	260.676	288.684	260.676
	Benzene			0.251	0.223	0.251	0.223	1.222	1.103	1.222	1.103
	H2S			0.002	0.002	0.002	0.002	0.012	0.011	0.012	0.011
	Total HAPs†			3.715	3.298	3.715	3.298	18.065	16.313	18.065	16.313

* Hourly emissions calculated per TCEQ guidance, APDG 6250, September 2014

† Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC

Ovintiv USA Inc
Davidson F42L

Tank Emissions

Flash Losses From Storage Tanks

Gas Oil Ratio (GOR) Method

Tank Identifier		Oil/Condensate Tank		Oil/Condensate Tank		Produced Water Tank		Produced Water Tank		
FIN		TK-6010		TK-6020		TK-5010		TK-5020		
Without VRT	Flash Gas MW (lb/lbmol)	41.99		41.99		41.99		41.99		
	GOR (scf of flash gas/bbl)	39.8		39.8		39.8		39.8		
	Production		bbl/hr	bbl/yr	bbl/hr	bbl/yr	bbl/hr	bbl/yr	bbl/hr	bbl/yr
	% Production without VRT		100%		100%		100%		100%	
	Amount of liquid flashed		291.7	1000000.0	291.7	1000000.0	1418.2	5007512.7	1418.2	5007512.7
	Percent Reduction for Produced Water Tank Calculation as Oil/Condensate		0%		0%		99%		99%	
	Emissions Calculations		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
	Total Uncontrolled Emissions (After % reduction for Produced Water)		1,265.685	2,169.746	1,265.685	2,169.746	61.542	108.650	61.542	108.650
	Flash Gas Composition (Wt.%)	VOC (C3)	31.71%		31.71%		31.71%		31.71%	
		VOC (C4+)	43.86%		43.86%		43.86%		43.86%	
		VOC	75.57%		75.57%		75.57%		75.57%	
		Benzene	0.30%		0.30%		0.30%		0.30%	
		H ₂ S	0.0012%		0.0012%		0.0012%		0.0012%	
	Total HAPs*		2.81%		2.81%		2.81%		2.81%	
	Uncontrolled Emissions	VOC (C3)	401.395	688.106	401.395	688.106	19.517	34.457	19.517	34.457
		VOC (C4+)	555.078	951.563	555.078	951.563	26.990	47.650	26.990	47.650
		VOC	956.474	1,639.669	956.474	1,639.669	46.507	82.107	46.507	82.107
		Benzene	3.767	6.458	3.767	6.458	0.183	0.323	0.183	0.323
		H ₂ S	0.015	0.026	0.015	0.026	0.075	0.132	0.075	0.132
	Total HAPs*		35.592	61.014	35.592	61.014	1.731	3.055	1.731	3.055

* Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC

Tank Emissions Summary

		Oil/Condensate Tank		Oil/Condensate Tank		Produced Water Tank		Produced Water Tank			
FIN		TK-6010		TK-6020		TK-5010		TK-5020			
EPN		FLR-02		FLR-02		FLR-02		FLR-02			
Tank Contents		Oil/Condensate		Oil/Condensate		Produced Water		Produced Water			
VRU (CIN: VRU)	Capture Efficiency %	95%		95%		95%		95%			
	% to Control Device during VRU uptime*	5%		5%		5%		5%			
	Downtime (hrs/year)	1314		1314		1314		1314			
Hours of VRU capture		7446		7446		7446		7446			
Combustion Control Device	Capture Efficiency %	100%		100%		100%		100%			
	Hours of capture by control device only (hrs/year)**	1314		1314		1314		1314			
	VOC (C3) Control Efficiency (%)	99%		99%		99%		99%			
	VOC (C4+) Control Efficiency (%)	98%		98%		98%		98%			
	H2S Control Efficiency (%)	98%		98%		98%		98%			
Total hours of combustion control		1686.3		1686.3		1686.3		1686.3			
Hours Uncontrolled		0		0		0		0			
Emissions Calculations											
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy		
Total Stream Uncontrolled Emissions (After any % reduction taken for produced water)	Breathing	0.909	2.002	0.909	2.002	0.909	2.002	0.909	2.002		
	Working	146.235	127.819	146.235	127.819	711.044	640.057	711.044	640.057		
	Flashing without VRT	1,265.685	2,169.746	1,265.685	2,169.746	61.542	108.650	61.542	108.650		
	Flashing	1,265.685	2,169.746	1,265.685	2,169.746	61.542	108.650	61.542	108.650		
	Worst case total †	1,411.920	2,299.567	1,411.920	2,299.567	772.586	750.709	772.586	750.709		
Is a VRU controlling this tank at any time?		Yes		Yes		Yes		Yes			
VRU (Captured and routed to sales, not emitted)	Breathing	0.909	1.616	0.909	1.616	0.909	1.616	0.909	1.616		
	Working	146.235	103.214	146.235	103.214	711.044	516.846	711.044	516.846		
	Flashing without VRT	1,265.685	1,752.070	1,265.685	1,752.070	61.542	87.735	61.542	87.735		
	Flashing	1,265.685	1,752.070	1,265.685	1,752.070	61.542	87.735	61.542	87.735		
	Worst case total †	1,411.920	1,856.900	1,411.920	1,856.900	772.586	606.198	772.586	606.198		
VRU (Captured and sent to Combustion Control Device)	Breathing	0.909	0.085	0.909	0.085	0.909	0.085	0.909	0.085		
	Working	146.235	5.432	146.235	5.432	711.044	27.202	711.044	27.202		
	Flashing without VRT	1,265.685	92.214	1,265.685	92.214	61.542	4.618	61.542	4.618		
	Flashing	1,265.685	92.214	1,265.685	92.214	61.542	4.618	61.542	4.618		
	Worst case total †	1,411.920	97.732	1,411.920	97.732	772.586	31.905	772.586	31.905		
Captured and sent to combustion control device	Breathing	0.909	0.300	0.909	0.300	0.909	0.300	0.909	0.300		
	Working	146.235	19.173	146.235	19.173	711.044	96.009	711.044	96.009		
	Flashing without VRT	1,265.685	325.462	1,265.685	325.462	61.542	16.298	61.542	16.298		
	Flashing	1,265.685	325.462	1,265.685	325.462	61.542	16.298	61.542	16.298		
	Worst case total †	1,411.920	344.935	1,411.920	344.935	772.586	112.606	772.586	112.606		
Stream Composition (Wt.%)	Breathing/Working	VOC (C3)	29.68%		29.68%		29.68%		29.68%		
		VOC (C4+)	40.60%		40.60%		40.60%		40.60%		
		VOC	70.28%		70.28%		70.28%		70.28%		
		Benzene	0.17%		0.17%		0.17%		0.17%		
		H ₂ S	0.0017%		0.0017%		0.0017%		0.0017%		
		Total HAPs ††	2.54%		2.54%		2.54%		2.54%		
	Flashing without VRT	VOC (C3)	31.71%		31.71%		31.71%		31.71%		
		VOC (C4+)	43.86%		43.86%		43.86%		43.86%		
		VOC	75.57%		75.57%		75.57%		75.57%		
		Benzene	0.30%		0.30%		0.30%		0.30%		
		H ₂ S	0.0012%		0.0012%		0.0012%		0.0012%		
		Total HAPs ††	2.81%		2.81%		2.81%		2.81%		
		Total Stream sent to Combustion Control (Worst case between VRU-to-CC or CC)	Breathing	0.909	0.385	0.909	0.385	0.909	0.385	0.909	0.385
			Working	146.235	24.605	146.235	24.605	711.044	123.211	711.044	123.211
Flashing without VRT	1,265.685		417.676	1,265.685	417.676	61.542	20.915	61.542	20.915		
Flashing	1,265.685		417.676	1,265.685	417.676	61.542	20.915	61.542	20.915		
Worst case total †	1,411.920		442.667	1,411.920	442.667	772.586	144.512	772.586	144.512		
Post-Combustion Control Device Emissions (FIN/EPN: Tank FIN/FL-1 or FL-2) ‡	VOC	16.737	5.265	16.737	5.265	8.619	1.620	8.619	1.620		
	Benzene	0.080	0.026	0.080	0.026	0.028	0.005	0.028	0.005		
	H ₂ S	3.56E-04	1.10E-04	3.56E-04	1.10E-04	0.002	0.001	0.002	0.001		
	Total HAPs ††	0.786	0.248	0.786	0.248	0.396	0.075	0.396	0.075		

Post-control Totals		
	lb/hr	tpy
VOC	50.753	13.771
Benzene	0.059	0.062
H ₂ S	0.001	0.001
Total HAPs*	0.873	0.644

Notes: * During the remainder of the time, VRU vapors are routed to sales.
 ** Does not include hours that the VRU vapors are routed to the combustion device.
 † Includes flash emissions and the maximum of breathing and working emissions.
 ‡ For total uncaptured losses, the total lb/hr is the sum of breathing losses from all tanks, plus working and flashing emissions from tanks TK-6010, TK-6020, TK-5010, TK-5020.
 †† Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC.

Loading Emissions

Source Name		Produced Water Loading		Oil/Condensate Loading			
FIN		LOAD		LOAD			
EPN		LOAD		LOAD			
Product		Produced Water		Oil/Condensate			
Number of loadouts per year		1670		334			
Vapor Balance Collection Efficiency		0.0%		0.0%			
Hours Uncontrolled		8,760		8,760			
Loading Loss Calculation		Hourly	Annual	Hourly	Annual		
Percent Reduction for Produced Water Calculation as Oil/Condensate		99%		0%			
S, Saturation Factor †	dimensionless	0.6		0.6			
M, Molecular Weight of Vapors ††	lb/lb-mole	39.98251597		39.98251597			
P, True vapor pressure of liquid loaded ††	psia	12.93	8.39	12.93	8.39		
T, Temperature of bulk liquid loaded ††	°R	556.17	527.81	556.17	527.81		
Loading Loss, L _L (lb _{HC} /1000 gal loaded) ‡	lb _{HC} /1000 gal loaded	0.069	0.048	6.950	4.754		
Loading Rate	gal	7,560	12,625,200	7,560	2,525,040		
Emission Calculations		lb/hr	tpy	lb/hr	tpy		
Total HC Uncontrolled Emissions (After % reduction taken for produced water)		0.525	0.300	52.540	6.001		
Total Stream Uncontrolled Emissions (After % reduction taken for produced water)		0.542	0.309	54.160	6.186		
Stream Composition (Wt.%)	VOC (C3)	29.68%		29.68%			
	VOC (C4+)	40.60%		40.60%			
	Benzene	0.17%		0.17%			
	H ₂ S	<0.01%		1.65055E-05			
	Total HAPs ††	2.54%		2.54%			
Emissions Summary		Produced Water Loading		Oil/Condensate Loading		Totals	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total Stream Uncaptured Emissions (FIN/EPN: LOAD/LOAD)	VOC	0.381	0.217	38.064	4.348	38.445	4.565
	Benzene	0.001	0.001	0.093	0.011	0.094	0.011
	H ₂ S	0.001	0.001	0.001	1.0E-04	0.002	0.001
	Total HAPs ††	0.014	0.008	1.376	0.157	1.390	0.165

† From AP-42, Table 5.2-1

†† From AP-42 Tanks Calculations (M_V , T_{LX} , T_{LA} , P_{VX} , P_{VA})

‡ From AP-42, Chapter 5, Section 5.2-4, $LL = 12.46 \times S \times P \times M / T$

†† Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC

Flare / Vapor Combustor Reference Page

Emissions Calculation Methods:

- [1] • Hourly Stream Flow (lb/hr) = (lb/lb-mol) * (P) * (scf/hr) * / (R) * (T)
 - Hourly Flow Rate (using GOR) (scf/hr) = GOR * Max throughput (bbl/hr)
 - Annual Stream Flow (tpy) = (lb/lb-mol) * (P) * (scf/yr) * / (R) * (T) * 2000
 - Annual Flow Rate (using GOR) (scf/yr) = GOR * Annual hourly throughput (bbl/hr) * Hrs/yr

- [2] • Hourly Flow Rate (scf/hr) = Total lb/hr * T * R / P * Stream MW
 - Annual Flow Rate (scf/yr) = Total tpy * T * R / P * Stream MW

 - NOx/CO (lb/hr) = (scf/hr)*EF (lb/MMBtu) * HV (Btu/scf) / 10⁶
 - SO₂ (lb/hr) = (H₂S lb/hr)*(64 lb SO₂/lb-mol)/(34.08 lb H₂S/lb-mol)

Flare Tip Velocity Calculation Method:

Actual Flare Tip Velocity (ft/sec) = (scf/hr)*(1 hr/3600 sec)/(flare tip area)

Heat Content Requirement Calculation Method:

For SO₂, Q = (0.53)*(10⁵)*(lb/hr SO₂)

TCEQ Flare Emission Factors

Flare Type	Waste Gas	NOx (lb/MMBTU)	CO (lb/MMBTU)
steam-assist	High BTU (>1000 BTU/scf)	0.0485	0.3503
	Low Btu (192-1000 BTU/scf)	0.068	0.3465
other	High Btu (>1000 BTU/scf)	0.138	0.2755
	Low Btu (192-1000 BTU/scf)	0.0641	0.5496

Technical Guidance for Chemical Sources: Flares & Vapor Oxidizers, October 2000.

EPN	FLR-01	FLR-02	FLR-03
Source Name	Utility Flare	Process Flare	Process Flare
Flare Information (If Controlled by Flare)			
Flare Steam Assisted (y or n)	NO	NO	NO
Pilot or Auto-ignitor?	Pilot	Pilot	Pilot
Pilot Flow (scf/hr):	70.00	70.00	70.00
Stack height (ft):	80	50	50
Flare Tip Diameter (in):	8	6	6
C1-C3 Destruction Efficiency (%):	99	99	99
C4+ Destruction Efficiency (%):	98	98	98
H ₂ S Conversion Efficiency (%):	98	98	98
Actual Flare Tip Velocity			
Total Gas Volume to Flare (scf/hr):	194,070.000	40,975.964	25,070.000
Flare Tip Diameter (ft)	0.67	0.50	0.50
Flare Tip Area (ft ²)	0.349	0.196	0.196
Flare Tip Velocity (ft/sec):	154.436	57.969	35.467
40 CFR 60.18(c)(4) - Max Flare Tip Velocity (ft/sec)			
Heating Value of Gas (Btu/scf)	1177	2127	1588
Low BTU Gas (<1,000 Btu/scf)	60	60	60
High BTU Gas (>1,000 Btu/scf)	400	400	400

Flare / Vapor Combustor Emissions

EPN:	FLR-01
Source Name:	Utility Flare

		[1]		[1]		Calculation Method				
		Flare Pilot		Separator Gas		Totals				
		Hourly	Annual	Hourly	Annual	Hourly	Annual			
FIN		FLR-01		PROD-GAS				FIN		
Routed to Flare?		Yes		Yes				Routed to Flare?		
Hours/year Routed to Flare		8,760		8,760				Hours/year Routed to Flare		
Analysis Used		Fuel Gas Analysis		Separator Flash				Analysis Used		
Stream Composition	VOC (C3)	wt%	12.80%	12.80%				wt%	VOC (C3)	
	VOC (C4+)	wt%	14.36%	14.36%				wt%	VOC (C4+)	
	Benzene	wt%	0.09%	0.09%				wt%	Benzene	
	H ₂ S	wt%	0.00%	0.00%				wt%	H ₂ S	
	Total HAPs	wt%	0.80%	0.80%				wt%	Total HAPs	
GOR		scf/bbl		1.0				scf/bbl	GOR	
Stream MW		lb/lb-mol	22.4	22.4				lb/lb-mol	Stream MW	
Heating Value		BTU/scf	1177.4		1,177		1,177	BTU/scf	Heating Value	
		MMBTU	0.082	722	228.421	341.455	228.50	342,177		
Flow Rate		scf	70.00	613,200	194,000.00	290,000,000	194,070.00	290,613,200	scf	
EMISSIONS										
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy			
Total Stream Flow (after any reduction taken for PW)		4.07	17.85	11,293.42	8,440.96	11,297.50	8,458.81	Total Stream Flow (after any reduction taken for PW)		
Uncontrolled Emissions	VOC (C3)	0.522	2.285	1,445.892	1,080.692	1,446.413	1,082.977	VOC (C3)	Uncontrolled Emissions	
	VOC (C4+)	0.585	2.564	1,622.179	1,212.454	1,622.765	1,215.017	VOC (C4+)		
	VOC	1.107	4.848	3,068.071	2,293.146	3,069.178	2,297.994	VOC		
	Benzene	0.004	0.016	10.228	7.644	10.231	7.660	Benzene		
	H ₂ S	9.29E-05	4.07E-04	0.257	0.192	0.258	0.193	H ₂ S		
	Total HAPs	0.033	0.143	90.324	67.510	90.356	67.653	Total HAPs		
Controlled Emissions	VOC (C3)	0.005	0.023	14.459	10.807	14.464	10.830	VOC (C3)	Controlled Emissions	
	VOC (C4+)	0.012	0.051	32.444	24.249	32.455	24.300	VOC (C4+)		
	VOC	0.017	0.074	46.903	35.056	46.919	35.130	VOC		
	Benzene	7.38E-05	3.23E-04	0.205	0.153	0.205	0.153	Benzene		
	H ₂ S	1.86E-06	8.14E-06	0.005	0.004	0.005	0.004	H ₂ S		
		Total HAPs	0.001	0.003	1.806	1.350	1.807	1.353		Total HAPs
		NOx	0.011	0.050	31.522	23.560	31.534	23.610		NOx
	CO	0.023	0.099	62.930	47.035	62.953	47.135	CO		
	SO ₂	1.74E-04	0.001	0.483	0.361	0.484	0.362	SO ₂		

Notes:

- See Flare / Vapor Combustor Reference Page for calculation methods and equipment details
- Flow rate assumptions for the following sources: PROD-GAS (Separator Gas) = Estimated hourly flow rates (scf/hr); PROD-GAS = Average hourly produced gas throughput at the site (scf/hr)
- Hourly and annual individual stream contributions represented in calculations are to determine a worst-case PTE emission rate at EPN: FLR-01 during normal operations. Actual individual stream flow rates will vary. Ovintiv will monitor total flow rate to the flare to ensure compliance with the authorization.

Constants

- 527.67 T (absolute temperature - Rankine)
- 10.73159 R (universal gas constant) - (psia*ft³)/(lbmolR)
- 14.7 P (Pressure (psia))

Flare / Vapor Combustor Emissions

EPN:	FLR-02
Source Name:	Process Flare

		[1]		[2]		[2]		[2]		[2]		Calculation Method			
		Flare Pilot		Tanks (B/W) - Produced Water		Tanks (B/W) - Oil/Condensate		Tanks (Flash) - Produced Water		Tanks (Flash) - Oil/Condensate		Totals			
		Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual	Hourly	Annual
FIN		FLR-02		Multiple Tanks		Multiple Tanks		Multiple Tanks		Multiple Tanks				FIN	
Routed to Flare?		Yes		Yes		Yes		Yes		Yes				Routed to Flare?	
Hours/year Routed to Flare		8,760		1,686		1,686		1,686		1,686				Hours/year Routed to Flare	
Analysis Used		Fuel Gas Analysis		Oil/Condensate BW Vapor		Oil/Condensate BW Vapor		Produced Water Flash		Oil/Condensate Flash without VRT				Analysis Used	
Stream Composition	VOC (C3)	wt%	12.80%	29.68%	29.68%	29.68%	31.71%	31.71%	31.71%	31.71%	31.71%	wt%	VOC (C3)	Stream Composition	
	VOC (C4+)	wt%	14.36%	40.60%	40.60%	40.60%	43.86%	43.86%	43.86%	43.86%	43.86%	wt%	VOC (C4+)		
	Benzene	wt%	0.09%	0.17%	0.17%	0.17%	0.30%	0.30%	0.30%	0.30%	0.30%	wt%	Benzene		
	H ₂ S	wt%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	wt%	H ₂ S		
	Total HAPs	wt%	0.80%	2.54%	2.54%	2.54%	2.81%	2.81%	2.81%	2.81%	2.81%	wt%	Total HAPs		
GOR	scf/bbl						39.8	39.8	39.8	39.8	39.8	scf/bbl	GOR		
Stream MW	lb/lb-mol	22.4	40.0	40.0	40.0	42.0	42.0	42.0	42.0	42.0	42.0	lb/lb-mol	Stream MW		
Heating Value	BTU/scf	1177.4	2043.4	2043.4	2043.4	2192.7	2192.7	2192.7	2192.7	2192.7	2192.7	2,131	2,127	BTU/scf	Heating Value
	MMBTU	0.082	722	28.033	9,733	5.794	1,968	2.476	1,683	50.920	33,607	87.31	47,713	MMBTU	
Flow Rate	scf	70.00	613,200	13,718.93	4,763,264	2,835.37	963,107	1,129.16	767,494	23,222.50	15,326,850	40,975.96	22,433,916	scf	Flow Rate
EMISSIONS															
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy		
Total Stream Flow (after any reduction taken for PW)		4.07	17.85	1,423.91	247.19	294.29	49.98	123.08	41.83	2,531.37	835.35	4,376.72	1,192.20	Total Stream Flow (after any reduction taken for PW)	
Uncontrolled Emissions	VOC (C3)	0.522	2.285	422.636	73.370	87.349	14.835	39.034	13.266	802.791	264.921	1,352.331	368.677	VOC (C3)	
	VOC (C4+)	0.585	2.564	578.106	100.360	119.481	20.292	53.980	18.345	1,110.157	366.352	1,862.308	507.913	VOC (C4+)	
	VOC	1.107	4.848	1,000.742	173.731	206.829	35.127	93.014	31.611	1,912.947	631.273	3,214.639	876.590	VOC	
	Benzene	0.004	0.016	2.447	0.425	0.506	0.086	0.366	0.124	7.534	2.486	10.857	3.138	Benzene	
	H ₂ S	9.29E-05	4.07E-04	0.024	0.004	0.005	0.001	0.150	0.051	0.031	0.010	0.209	0.066	H ₂ S	
Total HAPs	0.033	0.143	36.177	6.280	7.477	1.270	3.461	1.176	71.183	23.491	118.331	32.360	Total HAPs		
Controlled Emissions	VOC (C3)	0.005	0.023	4.226	0.734	0.873	0.148	0.390	0.133	8.028	2.649	13.523	3.687	VOC (C3)	
	VOC (C4+)	0.012	0.051	11.562	2.007	2.390	0.406	1.080	0.367	22.203	7.327	37.246	10.158	VOC (C4+)	
	VOC	0.017	0.074	15.788	2.741	3.263	0.554	1.470	0.500	30.231	9.976	50.769	13.845	VOC	
	Benzene	7.38E-05	3.23E-04	0.049	0.008	0.010	0.002	0.007	0.002	0.151	0.050	0.217	0.063	Benzene	
	H ₂ S	1.86E-06	8.14E-06	4.70E-04	8.16E-05	9.71E-05	1.65E-05	0.003	0.001	0.001	2.03E-04	0.004	0.001	H ₂ S	
	Total HAPs	0.001	0.003	0.724	0.126	0.150	0.025	0.069	0.024	1.424	0.470	2.367	0.647	Total HAPs	
	NOx	0.011	0.050	3.869	0.672	0.800	0.136	0.342	0.116	7.027	2.319	12.048	3.292	NOx	
	CO	0.023	0.099	7.723	1.341	1.596	0.271	0.682	0.232	14.028	4.629	24.053	6.572	CO	
SO ₂	1.74E-04	0.001	0.044	0.008	0.009	0.002	0.281	0.096	0.058	0.019	0.393	0.125	SO ₂		

Notes:

- See Flare / Vapor Combustor Reference Page for calculation methods and equipment details
- Flow rate assumptions for the following sources: PROD-GAS = Average hourly produced gas throughput at the site (scf/hr)
- Hourly and annual individual stream contributions represented in calculations are to determine a worst-case PTE emission rate at EPN: FLR-02 during normal operations. Actual individual stream flow rates will vary. Ovintiv will monitor total flow rate to the flare to ensure compliance with the authorization.

Constants

- 527.67 T (absolute temperature - Rankine)
- 10.73159 R (universal gas constant) - (psia*ft³)/(lbmolR)
- 14.7 P (Pressure (psia))

Ovintiv USA Inc
Davidson F42L

Flare / Vapor Combustor Emissions

EPN:	FLR-03
Source Name:	Process Flare

		[1]		[1]		Calculation Method			
		Flare Pilot		Heater Treaters Gas		Totals			
		Hourly	Annual	Hourly	Annual	Hourly	Annual		
FIN		FLR-03		PROD-GAS				FIN	
Routed to Flare?		Yes		Yes				Routed to Flare?	
Hours/year Routed to Flare		8,760		8,760				Hours/year Routed to Flare	
Analysis Used		Fuel Gas Analysis		Heater Treater Flash				Analysis Used	
Stream Composition	VOC (C3)	wt%	12.80%		22.53%			wt%	VOC (C3)
	VOC (C4+)	wt%	14.36%		29.12%			wt%	VOC (C4+)
	Benzene	wt%	0.09%		0.21%			wt%	Benzene
	H ₂ S	wt%	0.00%		0.00%			wt%	H ₂ S
	Total HAPs	wt%	0.80%		2.13%			wt%	Total HAPs
GOR	scf/bbl				1.0			scf/bbl	GOR
Stream MW	lb/lb-mol		22.4		30.1			lb/lb-mol	Stream MW
Heating Value	BTU/scf		1177.4		1596.9		1,596	1,588	BTU/scf
	MMBTU	0.082	722	39,922	44,713		40.00	45,435	MMBTU
Flow Rate	scf	70.00	613,200	25,000.00	28,000,000		25,070.00	28,613,200	scf
EMISSIONS									
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy		
Total Stream Flow (after any reduction taken for PW)		4.07	17.85	1,955.73	1,095.21	1,959.80	1,113.06	Total Stream Flow (after any reduction taken for PW)	
Uncontrolled Emissions	VOC (C3)	0.522	2.285	440.704	246.794	441.226	249.079	VOC (C3)	
	VOC (C4+)	0.585	2.564	569.559	318.953	570.145	321.517	VOC (C4+)	
	VOC	1.107	4.848	1,010.263	565.748	1,011.370	570.596	VOC	
	Benzene	0.004	0.016	4.055	2.271	4.059	2.287	Benzene	
	H ₂ S	9.29E-05	4.07E-04	0.033	0.019	0.033	0.019	H ₂ S	
	Total HAPs	0.033	0.143	41.613	23.303	41.645	23.446	Total HAPs	
Controlled Emissions	VOC (C3)	0.005	0.023	4.407	2.468	4.412	2.491	VOC (C3)	
	VOC (C4+)	0.012	0.051	11.391	6.379	11.403	6.430	VOC (C4+)	
	VOC	0.017	0.074	15.798	8.847	15.815	8.921	VOC	
	Benzene	7.38E-05	3.23E-04	0.081	0.045	0.081	0.046	Benzene	
	H ₂ S	1.86E-06	8.14E-06	0.001	3.72E-04	0.001	3.80E-04	H ₂ S	
	Total HAPs	0.001	0.003	0.832	0.466	0.833	0.469	Total HAPs	
	NOx	0.011	0.050	5.509	3.085	5.521	3.135	NOx	
	CO	0.023	0.099	10.998	6.159	11.021	6.259	CO	
SO ₂	1.74E-04	0.001	0.062	0.035	0.062	0.036	SO ₂		

Notes:

- See Flare / Vapor Combustor Reference Page for calculation methods and equipment details
 - Flow rate assumptions for the following sources: PROD-GAS (Heater Treaters Gas) = Estimated hourly flow rates (scf/hr); PROD-GAS = Average hourly produced gas throughput at the site (scf/hr)
 - Hourly and annual individual stream contributions represented in calculations are to determine a worst-case PTE emission rate at EPN: FLR-03 during normal operations. Actual individual stream flow rates will vary. Ovintiv will monitor total flow rate to the flare to ensure compliance with the authorization.

Constants

527.67 T (absolute temperature - Rankine)
 10.73159 R (universal gas constant) - (psia*ft³)/(lbmolR)
 14.7 P (Pressure (psia))

Planned MSS Emissions - VRU Comp. Blowdowns

FIN	MSS	EPN	MSS
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Identifier:	Compressor Blowdowns/Startups	
Total Hourly Vented Volume (scf/hr):	6,101	
Total Annual Vented Volume (scf/yr):	317,252	
Uncontrolled Emissions		
Total:	lb/hr	tpy
VOC (C3):	45.471	1.182
VOC (C4+):	51.015	1.326
VOC:	96.486	2.509
Benzene:	0.322	0.008
Total HAPs:	2.841	0.074
H ₂ S:	0.008	2.11E-04

Vent Gas Stream Composition (Weight %)	
From Vapor Recovery Tower Flash	
VOC (C3)	12.80%
VOC (C4+)	14.36%
Benzene	0.09%
HAPs	0.80%
H ₂ S	0.0023%
MW (lb/lb-mol)	22.43

Compressor Unit	Volume of Gas Vented (scf/event)	Annual Events (events/yr)	Annual Vented Volume (scf/yr)
Compressor 1	240	52	12,480
Compressor 2	325	52	16,900
Compressor 3	325	52	16,900
Compressor 4	3,896	52	202,592
Compressor 5	1,315	52	68,380
Compressor 6	0	52	0
Compressor 7	0	52	0
Compressor 8	0	52	0
Compressor 9	0	52	0
Compressor 10	0	52	0

Notes:	The basis of these emission calculations (i.e. volume, stream composition, frequency) are conditions used to establish a potential to emit and should not be interpreted as representations of a specific activity or condition under 30 TAC 116.116(a). Individual activities performed in this MSS category may have slight variations in procedure or equipment configuration.
	Compressor blowdown frequency and volumes are estimates. Ovintiv will not exceed the mass emission rate.
	Blowdown/Startups: Assume that blowdown/startup for a VRU compressor occurs in one hour.

Emission Calculation Method:

$$\begin{aligned} \text{Total Uncontrolled Emissions (lb/hr)} &= \\ &= (\text{Volume per hr}) \times \text{MW} / (\text{Constant scf/lb-mol}) \\ &= 6,101 \text{ scf/yr} \times 22.43 \text{ lb/lb-mol} / 385.22 \text{ scf/lb-mol} \end{aligned}$$

Planned MSS Emissions - Equipment Degassing

FIN	MSS	EPN	MSS
Identifier	Equipment Degassing		

Calculation Basis:

This Planned MSS Activity includes the depressurization and opening of various equipment to atmosphere. Emissions degassed and vented to atmosphere from opening the vessel are calculated using the Ideal Gas Law and are based on the entire equipment volume venting to the atmosphere at the opening concentration. It is assumed that only one equipment would be degassed at a time.

Constants and Variables:

Type of Equipment :	Heater Treater	Separator	Process Equipment
Equipment Volume (ft ³) :	565.49	169.65	49.09
Equipment Pressure (psia) :	74.70	114.70	44.70
Max Temperature (°F) :	100.00	100.00	100.00
Duration of depressurization (hr), per eqpt:	1	1	1
Duration of opening of vessel (hr), per eqpt:	1	1	1
Activities per year:	8	26	6
Composition Source:	Heater Treater Flash	Separator Flash	Fuel Gas Analysis
Vapor MW of Gas (lb/lbmol)	30.14	22.43	22.42
VOC Concentration (wt frac):	0.517	0.272	0.272
Benzene Concentration (wt frac):	0.002	0.001	0.001
Total HAPs concentration (wt frac):	0.021	0.008	0.008
H ₂ S Concentration (wt frac):	1.7E-05	2.3E-05	2.3E-05

Sample Calculation: Heater Treater

$$\begin{aligned} \text{Vessel Depressurizing - Total gas vented to atmosphere (lb)} &= (\text{Pressure Difference} \times \text{Volume}) / (\text{Gas Constant} \times \text{Temperature [°R]}) * \text{MW} \\ &= (74.70-14.70) \text{ (psia)} \times 565.49 \text{ (ft}^3\text{)} \times 30.14 \text{ (lb/lb-mol)} / 559.67 \text{ (R)} / 10.73 \text{ (ft}^3\text{-psi/R-lb-mol)} \end{aligned}$$

$$\begin{aligned} \text{Vessel Opening - Total gas vented to atmosphere (lb)} &= (\text{Pressure Difference} \times \text{Volume}) / (\text{Gas Constant} \times \text{Temperature [°R]}) * \text{MW} \\ &= 14.70 \text{ (psia)} \times 565.49 \text{ (ft}^3\text{)} \times 30.14 \text{ (lb/lb-mol)} / 559.67 \text{ (R)} / 10.73 \text{ (ft}^3\text{-psi/R-lb-mol)} \end{aligned}$$

		Heater Treater		Separator		Process Equipment			
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Depressurization	Total Emissions:	170.237	0.681	63.340	0.823	5.498	0.016		
	VOC:	87.939	0.352	17.208	0.224	1.494	0.004		
	Benzene:	0.353	0.001	0.057	0.001	0.005	1.5E-05		
	Total HAPs:	3.622	0.014	0.507	0.007	0.044	1.3E-04		
	H₂S:	0.003	1.2E-05	0.001	1.9E-05	1.3E-04	3.8E-07		
Opening	Total Emissions:	41.708	0.167	9.311	0.121	2.694	0.008		
	VOC:	21.545	0.086	2.530	0.033	0.732	0.002		
	Benzene:	0.086	3.5E-04	0.008	1.1E-04	0.002	7.3E-06		
	Total HAPs:	0.887	0.004	0.074	0.001	0.022	6.5E-05		
	H₂S:	0.001	2.8E-06	2.1E-04	2.8E-06	6.1E-05	1.8E-07		
Total*	Total Emissions:	170.237	0.848	63.340	0.944	5.498	0.025	170.237	1.817
	VOC:	87.939	0.438	17.208	0.257	1.494	0.007	87.939	0.701
	Benzene:	0.353	0.002	0.057	0.001	0.005	2.2E-05	0.353	0.003
	Total HAPs:	3.622	0.018	0.507	0.008	0.044	2.0E-04	3.622	0.026
	H₂S:	0.003	1.4E-05	0.001	2.2E-05	1.3E-04	5.6E-07	0.003	3.6E-05

Notes:	<p>* Depressurizing and opening a vessel are sequential activities; therefore, the total hourly emission rate is the higher of the two activities</p> <p>The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.</p> <p>Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC</p>
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Planned MSS Emissions - Vacuum Trucks (Heater Cleaning)

FIN	MSS	EPN	MSS
Identifier	Vacuum Trucks (Heater/Boiler Cleaning)		

Calculation Basis:

Emissions from vacuum trucks are estimated using the loading loss method of AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995. Calculations are performed based on the concentrations of the individual organic species since the wastes contain significant non-volatile content (i.e. water, solids). A truck can be loaded in one hour, therefore the emissions per loading activity reflect the lb/hr emission rate.

$$L_L = 12.46 \text{ SPM/T} * (\text{SF})$$

where:

L_L = loading loss, pounds VOC per 1000 gallons (lb/10³ gal) of liquid loaded

S = a saturation factor

P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)

M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole)

T = temperature of bulk liquid loaded, °R (°F+459.67)

SF = safety factor due to vacuum loading

Constants and Variables:

Heater/Boiler Contents Collected by Vacuum Truck	Oil/Condensate	
Heater/Boiler Volume (gal)	4,230	
Percent Volume of Oil/Condensate	100	
Liquid Heel (% volume of vessel)	3	
Amount Loaded (gal)	126.90	
S, Saturation Loss Factor	0.600	
P, Vapor Pressure (psi)	12.931	
M, Molecular Weight (lb/lb-mole)	39.983	
T, Bulk Loading Temp (°F)	100	
SF, Safety Factor	2	
L_L (lb/1000 gal)	13.813	
Total HC Loss (lbs/activity)	1.753	
Total Stream Loss (lbs/activity)	1.773	
Number of Vacuum Trucks per year:	2	(conservatively assumed)
Number of activities per hour:	2	
Number of Heater Treaters:	4	
THC Concentration (wt frac):	0.989	(from Heater Treater Flash composition)
VOC Concentration (wt frac):	0.517	(from Heater Treater Flash composition)
Benzene Concentration (wt frac):	0.002	(from Heater Treater Flash composition)
Total HAPs Concentration (wt frac):	0.021	(from Heater Treater Flash composition)
H ₂ S Concentration (wt frac):	1.7E-05	(from Heater Treater Flash composition)

Total Emissions	lb/hr	tpy
Total Emissions:	3.545	0.007
VOC:	1.831	0.004
Benzene:	0.007	1.5E-05
Total HAPs:	0.075	1.5E-04
H₂S:	6.0E-05	1.2E-07

Notes:	The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.
	Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC

Planned MSS Emissions - Vacuum Trucks (Separator Cleaning)

FIN	MSS	EPN	MSS
Identifier	Vacuum Trucks (Separator Cleaning)		

Calculation Basis:

Emissions from vacuum trucks are estimated using the loading loss method of AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995. Calculations are performed based on the concentrations of the individual organic species since the wastes contain significant non-volatile content (i.e. water, solids). A truck can be loaded in one hour, therefore the emissions per loading activity reflect the lb/hr emission rate.

$$L_L = 12.46 \text{ SPM/T} \cdot (\text{SF})$$

where:

L_L = loading loss, pounds VOC per 1000 gallons (lb/10³ gal) of liquid loaded

S = a saturation factor

P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)

M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole)

T = temperature of bulk liquid loaded, °R (°F+459.67)

SF = safety factor due to vacuum loading

Constants and Variables:

Separator Contents Collected by Vacuum Truck	Oil/Condensate	
Separator Volume (gal)	1,269	
Percent Volume of Oil/Condensate	100	
Liquid Heel (% volume of vessel)	3	
Amount Loaded (gal)	38.07	
S, Saturation Loss Factor	0.600	
P, Vapor Pressure (psi)	12.931	
M, Molecular Weight (lb/lb-mole)	39.983	
T, Bulk Loading Temp (°F)	100	
SF, Safety Factor	2	
L_L (lb/1000 gal)	13.813	
Total HC Loss (lbs/activity)	0.526	
Total Stream Loss (lbs/activity)	0.550	
Number of Vacuum Trucks per year:	2	(conservatively assumed)
Number of activities per hour:	1	
Number of separators:	13	
THC Concentration (wt frac):	0.957	(from Separator Flash composition)
VOC Concentration (wt frac):	0.272	(from Separator Flash composition)
Benzene Concentration (wt frac):	0.001	(from Separator Flash composition)
Total HAPs Concentration (wt frac):	0.008	(from Separator Flash composition)
H ₂ S Concentration (wt frac):	2.3E-05	(from Separator Flash composition)

Total Emissions	lb/hr	tpy
Total Emissions:	0.550	0.007
VOC:	0.149	0.002
Benzene:	5.0E-04	6.5E-06
Total HAPs:	0.004	5.7E-05
H₂S:	1.3E-05	1.6E-07

Notes:	<p>The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.</p> <p>Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC</p>
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Planned MSS Emissions - Tank Depressurization

FIN	MSS	EPN	MSS
Identifier	Tank Depressurization		

Calculation Basis:

Emissions vented to atmosphere from opening the emptied storage tank are calculated using the Ideal Gas Law and are based on the entire tank volume depressurized to the atmosphere at the opening concentration.

Constants and Variables:

Tank Volume (ft ³):	4,528.61	(Assume 24' x 15.5' tank = 800 bbl)
Tank Pressure (psia):	14.95	
Atm Pressure (psia):	14.70	
Max Tank Temperature (°F):	96.50	
Ideal Gas Constant (ft ³)(psi)/(lbmol)(°R):	10.73	
Duration of depressurization (hours):	1	(per tank)
Duration of opening of vessel (hours):	1	(per tank)
Number of activities per hour	4	
Number of activities per year, per tank:	12	
Number of Oil Tanks	2	
Number of Water Tanks	2	
Number of Tanks:	4	
Activities per year:	48	(conservatively assumed)
Vapor MW of Gas (lb/lbmol):	39.98	(from Oil/Condensate BW Vapor composition)
VOC Concentration (wt frac):	0.703	(from Oil/Condensate BW Vapor composition)
Benzene Concentration (wt frac):	0.002	(from Oil/Condensate BW Vapor composition)
Total HAPs concentration (wt frac):	0.025	(from Oil/Condensate BW Vapor composition)
H ₂ S Concentration (wt frac):	1.7E-05	(from Oil/Condensate BW Vapor composition)

Emission Calculation - From Depressurizing Tank:

$$\text{Total gas vented to atmosphere (lb)} = \frac{(\text{Pressure Difference} \times \text{Volume})}{(\text{Gas Constant} \times \text{Temperature [°R]})} \times \text{MW}$$

$$= \frac{0.25 \text{ psia} \times 4,528.61 \text{ ft}^3}{10.73 \text{ ft}^3 \cdot \text{psi} / \text{°R} \cdot \text{lb-mol}} \times \frac{39.98 \text{ lb}}{556.17 \text{ °R} \cdot \text{lb-mol}}$$

Total Emissions	lb/hr	tpy
Total Emissions:	15.320	0.092
VOC:	10.767	0.065
Benzene:	0.026	1.6E-04
Total HAPs:	0.389	0.002
H₂S:	2.5E-04	1.5E-06

Notes:	<p>The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.</p> <p>Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC</p>
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Planned MSS Emissions - Vacuum Trucks (Tank Cleaning)

FIN	MSS	EPN	MSS
Identifier	Vacuum Trucks (Oil/Condensate Tank Cleanout) & Vacuum Trucks (Produced Water Tank Cleanout)		

Calculation Basis:

Emissions from vacuum trucks are estimated using the loading loss method of AP-42, Chapter 5.2: Transportation and Marketing of Petroleum Liquids, 1995. Calculations are performed based on the concentrations of the individual organic species since the wastes contain significant non-volatile content (i.e. water, solids). A truck can be loaded in one hour, therefore the emissions per loading activity reflect the lb/hr emission rate.

$$L_L = 12.46 \text{ SPM/T} \cdot (\text{SF})$$

where:

L_L = loading loss, pounds VOC per 1000 gallons (lb/10³ gal) of liquid loaded
 S = a saturation factor
 P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)
 M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole)
 T = temperature of bulk liquid loaded, °R (°F+459.67)
 SF = safety factor due to vacuum loading

Constants and Variables:

Tank Contents Collected by Vacuum Truck	Produced Water	Oil/Condensate	
Tank Volume (gal)	31,500	31,500	
Percent Volume of Condensate/Oil	1	100	
Liquid Heel (% volume of tank)	3	3	
Amount Loaded (gal)	9.45	945.00	
S, Saturation Loss Factor	0.600	0.600	
P, Vapor Pressure (psi)	12.931	12.931	
M, Molecular Weight (lb/lb-mole)	39.983	39.983	
T, Bulk Loading Temp (°R)	556	556	
SF, Safety Factor	2	2	
L_L (lb/1000 gal)	7.610	7.610	
Total HC Loss (lbs/activity)	0.072	7.191	
Total Stream Loss (lbs/activity)	0.074	7.413	
Number of Tanks:	2	2	
Number of activities per year, per tank:	12		(conservatively assumed)
Number of activities per hour:	1		
THC Concentration (wt frac):	0.970		(from Oil/Condensate BW Vapor composition)
VOC Concentration (wt frac):	0.703		(from Oil/Condensate BW Vapor composition)
Benzene Concentration (wt frac):	0.002		(from Oil/Condensate BW Vapor composition)
Total HAPs Concentration (wt frac):	0.025		(from Oil/Condensate BW Vapor composition)
H ₂ S Concentration (wt frac):	1.7E-05		(from Oil/Condensate BW Vapor composition)

Total Emissions	Oil/Condensate Tanks		Produced Water Tanks		TOTAL	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Total Emissions:	7.413	0.089	0.074	0.001	7.487	0.090
VOC:	5.210	0.063	0.052	0.001	5.262	0.063
Benzene:	0.013	1.5E-04	1.3E-04	1.5E-06	0.013	1.5E-04
Total HAPs:	0.188	0.002	0.002	2.3E-05	0.190	0.002
H₂S:	1.2E-04	1.5E-06	1.2E-04	1.5E-06	2.4E-04	2.9E-06

Notes:	<p>The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.</p> <p>Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC</p>
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Planned MSS Emissions - Piping Opened to Atmosphere

FIN	MSS	EPN	MSS
Identifier	Pipeline Degassing		

Calculation Basis:

Emissions to the atmosphere after opening pipelines are calculated using the Ideal Gas Law and are based on the entire pipe volume venting to the atmosphere at pipeline pressure.

Constants and Variables:

Venting Pressure (psia) :	40.00	
Piping Length (ft) :	2.00	
Piping Diameter (ft) :	0.33	
Piping Volume (ft ³) :	0.17	
Process Temperature (°F) :	95.00	
Ideal Gas Constant (ft ³)(psi)/(lbmol)(°R) :	10.73	
Number of activities per hour :	1	
Activities per year :	1	
Molecular Weight (lb/lb mol) :	22.43	(from Gas Analysis composition)
VOC Concentration (wt frac):	0.272	(from Gas Analysis composition)
Benzene Concentration (wt frac):	0.001	(from Gas Analysis composition)
Total HAPs Concentration (wt frac):	0.008	(from Gas Analysis composition)
H ₂ S Concentration (wt frac):	2.3E-05	(from Gas Analysis composition)

Emission Calculation Method:

Total gas vented to atmosphere (lb/activity) = (Pressure x Volume) / (Gas Constant x Temperature [°R]) * MW

$$= \frac{40.00 \text{ psia} \times 0.17 \text{ ft}^3}{10.73 \text{ ft}^3 \cdot \text{psi} / \text{°R} \cdot \text{lb-mol}} \times \frac{22.43 \text{ lb}}{\text{lb-mol}}$$

Total Emissions	lb/hr	tpy
Total Emissions:	0.026	1.3E-05
VOC:	0.007	3.6E-06
Benzene:	2.4E-05	1.2E-08
Total HAPs:	2.1E-04	1.1E-07
H₂S:	6.0E-07	3.0E-10

Notes:	The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.
	Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC

Planned MSS Emissions - Filters/Strainers Opened to Atmosphere

FIN	MSS	EPN	MSS
Identifier	Filters/Strainers - Opened to Atmosphere		

Calculation Basis:

VOC emissions to the atmosphere after opening the filters/strainers are calculated using the Ideal Gas Law and are based on the entire filters/strainers volume venting to the atmosphere.

Constants and Variables:

Volume of Equipment (ft ³) :	20.00	
Process Temperature (F) :	100.00	
Ideal Gas Constant (ft ³)(psi)/(lbmol)(°R) :	10.73	
Opening Pressure (psia) :	20	
Molecular Weight (lb/lb mol) :	22.43	(from gas composition)
Number of activities per hour :	1	
Activities per year :	1	
VOC Concentration (wt frac):	0.272	(from Gas Analysis composition)
Benzene Concentration (wt frac):	0.001	(from Gas Analysis composition)
Total HAPs Concentration (wt frac):	0.008	(from Gas Analysis composition)
H ₂ S Concentration (wt frac):	2.3E-05	(from Gas Analysis composition)

Emission Calculation Method:

$$\text{Total gas vented to atmosphere (lb/activity)} = \frac{(\text{Pressure} \times \text{Volume})}{(\text{Gas Constant} \times \text{Temperature } [^{\circ}\text{R}]) \times \text{MW}}$$

$$= \frac{20.00 \text{ ft}^3}{10.73 \text{ ft}^3 \cdot \text{psi} / ^{\circ}\text{R} \cdot \text{lb-mol}} \times \frac{20 \text{ psi}}{560 ^{\circ}\text{R}} \times \frac{22.43 \text{ lb}}{\text{lb-mol}}$$

Total Emissions	lb/hr	tpy
Total Emissions:	1.493	0.001
VOC:	0.406	2.0E-04
Benzene:	0.001	6.8E-07
Total HAPs:	0.012	6.0E-06
H₂S:	3.4E-05	1.7E-08

Notes:	<p>The basis of the example emission calculation (such as volume, concentration, pressure) are example conditions and should not be interpreted as representations of a specific facility or activity condition under 116.116(a). Individual activities in this MSS category which are performed may have slight variations in procedure or equipment configuration.</p> <p>Total HAPs include 2,2,4-trimethylpentane, formaldehyde and BTEX and are included in VOC</p>
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ATTACHMENT D

Gas and Liquid Analyses and Laboratory Analytical Reports

July 2, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Ovintiv USA Inc.
P. O. Box 1449
Spring, Texas 77383-1449

Sample: Davidson 27 F27L
Inlet Separator V-102
Spot Gas Sample @ 110 psig & 103 °F

Date Sampled: 06/07/2022

Job Number: 222214.001

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	2.138	
Carbon Dioxide	0.838	
Methane	74.368	
Ethane	11.422	3.050
Propane	6.511	1.791
Isobutane	0.620	0.203
n-Butane	2.097	0.660
2-2 Dimethylpropane	0.003	0.001
Isopentane	0.474	0.173
n-Pentane	0.561	0.203
Hexanes	0.428	0.176
Heptanes Plus	<u>0.540</u>	<u>0.218</u>
Totals	100.000	6.474

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----- 3.312 (Air=1)
Molecular Weight ----- 95.56
Gross Heating Value ----- 5048 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----- 0.777 (Air=1)
Compressibility (Z) ----- 0.9960
Molecular Weight ----- 22.42
Gross Heating Value
Dry Basis ----- 1296 BTU/CF
Saturated Basis ----- 1274 BTU/CF

*Hydrogen Sulfide tested on location by: Stain Tube Method (GPA 2377)
Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.650 PSI & 60 Deg F

Sampled By: (16) RE
Analyst: KV
Processor: KV
Cylinder ID: T-3461

Certified: FESCO, Ltd. - Alice, Texas

Conan Pierce 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	2.138		2.672
Carbon Dioxide	0.838		1.645
Methane	74.368		53.222
Ethane	11.422	3.050	15.321
Propane	6.511	1.791	12.808
Isobutane	0.620	0.203	1.608
n-Butane	2.097	0.660	5.437
2,2 Dimethylpropane	0.003	0.001	0.010
Isopentane	0.474	0.173	1.526
n-Pentane	0.561	0.203	1.806
2,2 Dimethylbutane	0.003	0.001	0.012
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.057	0.023	0.219
2 Methylpentane	0.127	0.053	0.488
3 Methylpentane	0.082	0.033	0.315
n-Hexane	0.159	0.065	0.611
Methylcyclopentane	0.111	0.039	0.417
Benzene	0.026	0.007	0.091
Cyclohexane	0.064	0.022	0.240
2-Methylhexane	0.018	0.008	0.080
3-Methylhexane	0.024	0.011	0.107
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.092	0.040	0.407
n-Heptane	0.041	0.019	0.183
Methylcyclohexane	0.053	0.021	0.232
Toluene	0.017	0.006	0.070
Other C8's	0.061	0.028	0.300
n-Octane	0.012	0.006	0.061
Ethylbenzene	0.002	0.001	0.009
M & P Xylenes	0.003	0.001	0.014
O-Xylene	0.001	0.000	0.005
Other C9's	0.013	0.007	0.073
n-Nonane	0.002	0.001	0.011
Other C10's	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Undecanes (11)	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Totals	100.000	6.474	100.000

Computed Real Characteristics of Total Sample

Specific Gravity -----	0.777	(Air=1)
Compressibility (Z) -----	0.9960	
Molecular Weight -----	22.42	
Gross Heating Value		
Dry Basis -----	1296	BTU/CF
Saturated Basis -----	1274	BTU/CF

July 2, 2022

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

Sample: Davidson 27 F27L
Inlet Separator V-102
Spot Gas Sample @ 110 psig & 103 °F

Date Sampled: 06/07/2022

Job Number: 222214.001

GLYCALC FORMAT

COMPONENT	MOL%	GPM	Wt %
Carbon Dioxide	0.838		1.645
Hydrogen Sulfide	< 0.001		< 0.001
Nitrogen	2.138		2.672
Methane	74.368		53.222
Ethane	11.422	3.050	15.321
Propane	6.511	1.791	12.808
Isobutane	0.620	0.203	1.608
n-Butane	2.100	0.661	5.447
Isopentane	0.474	0.173	1.526
n-Pentane	0.561	0.203	1.806
Cyclopentane	0.000	0.000	0.000
n-Hexane	0.159	0.065	0.611
Cyclohexane	0.064	0.022	0.240
Other C6's	0.269	0.111	1.034
Heptanes	0.286	0.117	1.194
Methylcyclohexane	0.053	0.021	0.232
2,2,4 Trimethylpentane	0.000	0.000	0.000
Benzene	0.026	0.007	0.091
Toluene	0.017	0.006	0.070
Ethylbenzene	0.002	0.001	0.009
Xylenes	0.004	0.002	0.019
Octanes Plus	<u>0.088</u>	<u>0.042</u>	<u>0.445</u>
Totals	100.000	6.474	100.000

Real Characteristics Of Octanes Plus:

Specific Gravity ----- 3.936 (Air=1)
Molecular Weight ----- 113.54
Gross Heating Value ----- 5750 BTU/CF

Real Characteristics Of Total Sample:

Specific Gravity ----- 0.777 (Air=1)
Compressibility (Z) ----- 0.9960
Molecular Weight ----- 22.42
Gross Heating Value
Dry Basis ----- 1296 BTU/CF
Saturated Basis ----- 1274 BTU/CF

July 12, 2022

FESCO, Ltd.
1100 FESCO Avenue - Alice, Texas 78332

For: Ovintiv USA Inc.
P. O. Box 1449
Spring, Texas 77383-1449

Sample: Davidson 27 F27L
Inlet Separator V-102 Hydrocarbon Liquid
Sampled @ 116 psig & 103° F

Date Sampled: 06/07/2022

Job Number: 222214.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Hydrogen Sulfide	0.000	0.000	0.000
Nitrogen	0.000	0.000	0.000
Carbon Dioxide	0.065	0.019	0.020
Methane	2.841	0.824	0.316
Ethane	2.575	1.179	0.537
Propane	4.853	2.289	1.484
Isobutane	1.059	0.594	0.427
n-Butane	5.189	2.801	2.091
2,2 Dimethylpropane	0.053	0.035	0.027
Isopentane	2.815	1.763	1.408
n-Pentane	4.381	2.719	2.192
2,2 Dimethylbutane	0.029	0.021	0.018
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.682	0.479	0.408
2 Methylpentane	2.127	1.512	1.271
3 Methylpentane	1.455	1.017	0.870
n-Hexane	3.541	2.493	2.116
Heptanes Plus	<u>68.334</u>	<u>82.256</u>	<u>86.816</u>
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity ----- 0.8258 (Water=1)
°API Gravity ----- 39.85 @ 60°F
Molecular Weight ----- 183.2
Vapor Volume ----- 14.31 CF/Gal
Weight ----- 6.88 Lbs/Gal

Characteristics of Total Sample:

Specific Gravity ----- 0.7824 (Water=1)
°API Gravity ----- 49.35 @ 60°F
Molecular Weight ----- 144.2
Vapor Volume ----- 17.22 CF/Gal
Weight ----- 6.52 Lbs/Gal

Base Conditions: 14.650 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Sampled By: (16) J. Galicia
Analyst: JL
Processor: HHdjv
Cylinder ID: W-0096

Conan Pierce 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Hydrogen Sulfide	0.000	0.000	0.000
Carbon Dioxide	0.065	0.019	0.020
Nitrogen	0.000	0.000	0.000
Methane	2.841	0.824	0.316
Ethane	2.575	1.179	0.537
Propane	4.853	2.289	1.484
Isobutane	1.059	0.594	0.427
n-Butane	5.242	2.836	2.118
Isopentane	2.815	1.763	1.408
n-Pentane	4.381	2.719	2.192
Other C-6's	4.294	3.029	2.566
Heptanes	11.722	8.255	7.609
Octanes	12.119	9.462	9.023
Nonanes	5.555	5.049	4.879
Decanes Plus	34.015	56.151	61.855
Benzene	0.630	0.302	0.341
Toluene	1.325	0.760	0.846
E-Benzene	0.660	0.436	0.486
Xylenes	0.935	0.617	0.688
n-Hexane	3.541	2.493	2.116
2,2,4 Trimethylpentane	<u>1.373</u>	<u>1.223</u>	<u>1.088</u>
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity -----	0.7824 (Water=1)
°API Gravity -----	49.35 @ 60°F
Molecular Weight -----	144.2
Vapor Volume -----	17.22 CF/Gal
Weight -----	6.52 Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity -----	0.8619 (Water=1)
Molecular Weight -----	262.2

Characteristics of Atmospheric Sample:

°API Gravity -----	45.72 @ 60°F
Reid Vapor Pressure Equivalent (D-6377) -----	9.90 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	W-1852*	-----
Pressure, PSIG	120	115	-----
Probe Temperature, °F	78	78	-----

* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Hydrogen Sulfide	0.000	0.000	0.000
Nitrogen	0.000	0.000	0.000
Carbon Dioxide	0.065	0.019	0.020
Methane	2.841	0.824	0.316
Ethane	2.575	1.179	0.537
Propane	4.853	2.289	1.484
Isobutane	1.059	0.594	0.427
n-Butane	5.189	2.801	2.091
2,2 Dimethylpropane	0.053	0.035	0.027
Isopentane	2.815	1.763	1.408
n-Pentane	4.381	2.719	2.192
2,2 Dimethylbutane	0.029	0.021	0.018
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.682	0.479	0.408
2 Methylpentane	2.127	1.512	1.271
3 Methylpentane	1.455	1.017	0.870
n-Hexane	3.541	2.493	2.116
Methylcyclopentane	2.673	1.620	1.560
Benzene	0.630	0.302	0.341
Cyclohexane	2.013	1.173	1.175
2-Methylhexane	1.139	0.907	0.791
3-Methylhexane	1.149	0.903	0.799
2,2,4 Trimethylpentane	1.373	1.223	1.088
Other C-7's	2.166	1.613	1.490
n-Heptane	2.582	2.040	1.794
Methylcyclohexane	3.492	2.404	2.378
Toluene	1.325	0.760	0.846
Other C-8's	6.755	5.417	5.163
n-Octane	1.871	1.642	1.482
E-Benzene	0.660	0.436	0.486
M & P Xylenes	0.652	0.433	0.480
O-Xylene	0.283	0.184	0.208
Other C-9's	4.469	4.003	3.913
n-Nonane	1.086	1.046	0.966
Other C-10's	4.010	3.947	3.929
n-decane	0.874	0.919	0.862
Undecanes(11)	3.682	3.718	3.753
Dodecanes(12)	2.709	2.956	3.025
Tridecanes(13)	2.707	3.167	3.286
Tetradecanes(14)	2.191	2.745	2.886
Pentadecanes(15)	1.947	2.614	2.782
Hexadecanes(16)	1.443	2.069	2.221
Heptadecanes(17)	1.348	2.044	2.215
Octadecanes(18)	1.013	1.618	1.763
Nonadecanes(19)	1.375	2.286	2.507
Eicosanes(20)	0.933	1.614	1.780
Heneicosanes(21)	0.798	1.453	1.611
Docosanes(22)	0.730	1.384	1.544
Tricosanes(23)	0.659	1.295	1.452
Tetracosanes(24)	0.578	1.176	1.326
Pentacosanes(25)	0.584	1.234	1.397
Hexacosanes(26)	0.452	0.989	1.125
Heptacosanes(27)	0.472	1.070	1.223
Octacosanes(28)	0.474	1.113	1.276
Nonacosanes(29)	0.356	0.863	0.993
Triacotanes(30)	0.355	0.889	1.025
Hentriacontanes Plus(31+)	<u>4.325</u>	<u>14.990</u>	<u>17.873</u>
Total	100.000	100.000	100.000

July 12, 2022

FESCO, Ltd.
1100 FESCO Avenue - Alice, Texas 78332

For: Ovintiv USA Inc.
P. O. Box 1449
Spring, Texas 77383-1449

Sample: Davidson 27 F27L
Flash Liberation Hydrocarbon Liquid
Sampled @ psig & 72° F

Date Sampled: 06/07/2022

Job Number: 222214.012

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.000	0.000	0.000
Carbon Dioxide	0.000	0.000	0.000
Methane	0.000	0.000	0.000
Ethane	0.431	0.182	0.081
Propane	2.237	0.972	0.618
Isobutane	0.766	0.395	0.279
n-Butane	4.268	2.122	1.556
2,2 Dimethylpropane	0.004	0.003	0.002
Isopentane	2.760	1.592	1.249
n-Pentane	4.369	2.498	1.977
2,2 Dimethylbutane	0.028	0.019	0.015
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.694	0.448	0.375
2 Methylpentane	2.117	1.386	1.144
3 Methylpentane	1.490	0.959	0.805
n-Hexane	3.483	2.259	1.882
Heptanes Plus	<u>77.352</u>	<u>87.164</u>	<u>90.017</u>
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity ----- 0.8232 (Water=1)
°API Gravity ----- 40.39 @ 60°F
Molecular Weight ----- 185.6
Vapor Volume ----- 14.08 CF/Gal
Weight ----- 6.86 Lbs/Gal

Characteristics of Total Sample:

Specific Gravity ----- 0.7971 (Water=1)
°API Gravity ----- 46.02 @ 60°F
Molecular Weight ----- 159.5
Vapor Volume ----- 15.86 CF/Gal
Weight ----- 6.64 Lbs/Gal

Base Conditions: 14.650 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Sampled By: (16) E. Trujillo
Analyst: JL
Processor: HHdjv
Cylinder ID: Vial

Conan Pierce 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.000	0.000	0.000
Nitrogen	0.000	0.000	0.000
Methane	0.000	0.000	0.000
Ethane	0.431	0.182	0.081
Propane	2.237	0.972	0.618
Isobutane	0.766	0.395	0.279
n-Butane	4.272	2.125	1.557
Isopentane	2.760	1.592	1.249
n-Pentane	4.369	2.498	1.977
Other C-6's	4.329	2.812	2.339
Heptanes	13.196	8.566	7.740
Octanes	13.260	9.586	8.931
Nonanes	6.080	5.124	4.828
Decanes Plus	39.426	60.517	65.102
Benzene	0.700	0.309	0.343
Toluene	1.428	0.754	0.825
E-Benzene	0.719	0.437	0.478
Xylenes	1.020	0.621	0.679
n-Hexane	3.483	2.259	1.882
2,2,4 Trimethylpentane	<u>1.524</u>	<u>1.250</u>	<u>1.092</u>
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity -----	0.7971 (Water=1)
°API Gravity -----	46.02 @ 60°F
Molecular Weight -----	159.5
Vapor Volume -----	15.86 CF/Gal
Weight -----	6.64 Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity -----	0.8575 (Water=1)
Molecular Weight -----	263.3

Characteristics of Atmospheric Sample:

°API Gravity -----	50.45 @ 60°F
Reid Vapor Pressure Equivalent (D-6377) -----	9.78 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	W-1852*	-----
Pressure, PSIG	120	115	-----
Probe Temperature, °F	78	78	-----

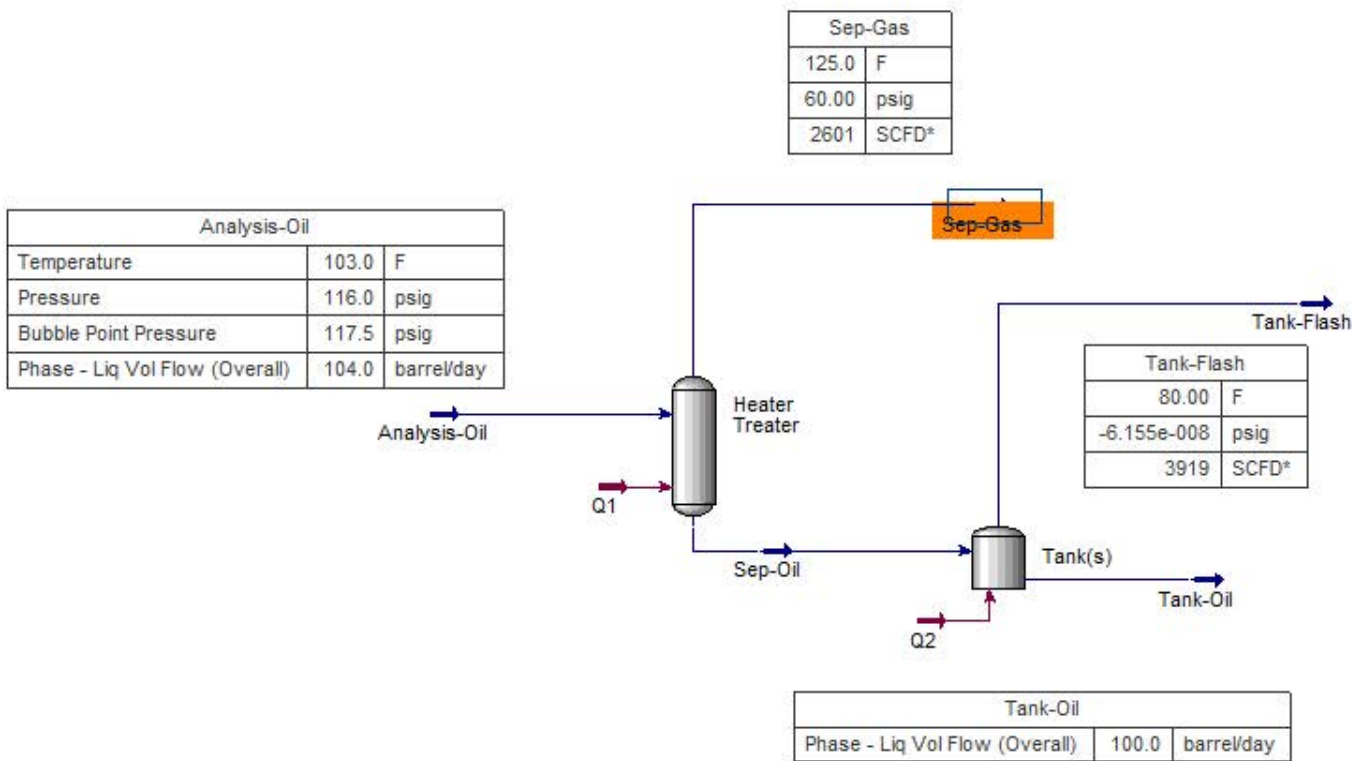
* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.000	0.000	0.000
Carbon Dioxide	0.000	0.000	0.000
Methane	0.000	0.000	0.000
Ethane	0.431	0.182	0.081
Propane	2.237	0.972	0.618
Isobutane	0.766	0.395	0.279
n-Butane	4.268	2.122	1.556
2,2 Dimethylpropane	0.004	0.003	0.002
Isopentane	2.760	1.592	1.249
n-Pentane	4.369	2.498	1.977
2,2 Dimethylbutane	0.028	0.019	0.015
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.694	0.448	0.375
2 Methylpentane	2.117	1.386	1.144
3 Methylpentane	1.490	0.959	0.805
n-Hexane	3.483	2.259	1.882
Methylcyclopentane	3.062	1.709	1.616
Benzene	0.700	0.309	0.343
Cyclohexane	2.262	1.215	1.194
2-Methylhexane	1.299	0.952	0.816
3-Methylhexane	1.280	0.927	0.804
2,2,4 Trimethylpentane	1.524	1.250	1.092
Other C-7's	2.437	1.685	1.516
n-Heptane	2.856	2.078	1.794
Methylcyclohexane	3.777	2.395	2.325
Toluene	1.428	0.754	0.825
Other C-8's	7.428	5.531	5.134
n-Octane	2.055	1.660	1.472
E-Benzene	0.719	0.437	0.478
M & P Xylenes	0.715	0.437	0.476
O-Xylene	0.306	0.183	0.203
Other C-9's	4.855	4.038	3.843
n-Nonane	1.224	1.087	0.985
Other C-10's	4.392	4.014	3.891
n-decane	0.957	0.926	0.854
Undecanes(11)	4.307	4.039	3.970
Dodecanes(12)	3.169	3.210	3.200
Tridecanes(13)	3.167	3.439	3.475
Tetradecanes(14)	2.563	2.981	3.053
Pentadecanes(15)	2.278	2.839	2.943
Hexadecanes(16)	1.688	2.247	2.349
Heptadecanes(17)	1.576	2.220	2.342
Octadecanes(18)	1.185	1.757	1.865
Nonadecanes(19)	1.608	2.483	2.652
Eicosanes(20)	1.092	1.753	1.883
Heneicosanes(21)	0.934	1.578	1.704
Docosanes(22)	0.854	1.504	1.634
Tricosanes(23)	0.770	1.406	1.536
Tetracosanes(24)	0.676	1.278	1.402
Pentacosanes(25)	0.683	1.340	1.478
Hexacosanes(26)	0.529	1.074	1.190
Heptacosanes(27)	0.552	1.163	1.293
Octacosanes(28)	0.555	1.209	1.349
Nonacosanes(29)	0.417	0.938	1.050
Triacotanes(30)	0.416	0.965	1.085
Hentriacotanes Plus(31+)	<u>5.059</u>	<u>16.153</u>	<u>18.904</u>
Total	100.000	100.000	100.000

ATTACHMENT E


Aspen HYSYS Analysis



BP Check	
1.148	%

Flash EF (lb/bbl)	
Tank-Flash EF (lb/bbl)	3.3268

Tank GOR	
GOR (scf/bbl)	39.81


1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Analysis-Oil

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	Act. Gas Flow (ACFM)	3.454e-003	3.454e-003	---	
13	Act. Liq. Flow (USGPM)	3.040	---	3.040	
14	Act. Volume Flow (barrel/day)	105.1	0.8859	104.2	
15	Avg. Liq. Density (lbmole/ft3)	0.3298	0.9803	0.3297	
16	CO2 Apparent Mole Conc. (lbmole/ft3)	2.120e-004	---	2.126e-004	
17	CO2 Apparent Wt. Conc. (lbmol/lb)	4.456e-006	---	4.431e-006	
18	CO2 Loading	---	---	---	
19	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
20	Cp/(Cp - R)	1.029	1.208	1.029	
21	Cp/Cv	1.027	1.250	1.029	
22	Cp/Cv (Ent. Method)	---	---	---	
23	Cv (Btu/lbmole-F)	68.48	9.231	68.36	
24	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
25	Cv (Semi-Ideal) (Btu/lbmole-F)	68.33	9.550	68.36	
26	Heat Capacity (Btu/lbmole-F)	70.31	11.54	70.35	
27	Heat of Vap. (Btu/lbmole)	6.596e+004	---	---	
28	HHV Mass Basis (Std) (Btu/lb)	---	2.238e+004	---	
29	HHV Molar Basis (Std) (Btu/SCF)	---	1373	---	
30	Kinematic Viscosity (cSt)	---	1.379	1.504	
31	LHV Mass Basis (Std) (Btu/lb)	---	2.050e+004	---	
32	LHV Molar Basis (Std) (Btu/SCF)	---	1257	---	
33	Liq. Mass Density (Std. Cond) (lb/ft3)	49.22	6.164e-002	49.23	
34	Liq. Vol. Flow (Std. Cond) (barrel/day)	101.6	7.508	101.6	
35	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	109.1	7.508	101.6	
36	Liquid Fraction	0.9994	0.0000	1.000	
37	Mass Cv (Btu/lb-F)	0.4694	0.3966	0.4684	
38	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
39	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4684	0.4104	0.4684	
40	Mass Density (lb/ft3)	47.59	0.5224	47.99	
41	Mass Enthalpy (Btu/lb)	-910.9	-1549	-910.8	
42	Mass Entropy (Btu/lb-F)	0.3989	1.765	0.3988	
43	Mass Exergy (Btu/lb)	1.421	---	---	
44	Mass Heat Capacity (Btu/lb-F)	0.4820	0.4957	0.4820	
45	Mass Heat of Vap. (Btu/lb)	452.2	---	---	
46	Molar Density (lbmole/ft3)	0.3262	2.245e-002	0.3288	
47	Molar Volume (ft3/lbmole)	3.066	44.55	3.042	
48	Molecular Weight	145.9	23.27	146.0	
49	Partial Pressure of CO2 (psig)	-13.88	---	---	
50	Partial Pressure of H2S (psig)	-14.70	---	---	
51	Phase Fraction [Act. Vol. Basis]	8.427e-003	8.427e-003	0.9916	
52	Phase Fraction [Mass Basis]	9.251e-005	9.251e-005	0.9999	
53	Phase Fraction [Molar Basis]	0.0006	0.0006	0.9994	
54	Phase Fraction [Vol. Basis]	1.951e-004	1.951e-004	0.9998	
55	Reid VP at 37.8 C (psig)	18.46	---	18.28	
56	Specific Heat (Btu/lbmole-F)	70.31	11.54	70.35	
57	Std. Gas Flow (SCFD*)	7.306e+004	42.37	7.302e+004	
58	Std. Ideal Liq. Mass Density (lb/ft3)	48.12	22.81	48.12	
59	Surface Tension (dyne/cm)	19.57	---	19.57	
60	Thermal Conductivity (Btu/hr-ft-F)	---	1.796e-002	6.453e-002	
61	True VP at 37.8 C (psig)	115.5	---	114.1	
62	User Property	---	---	---	

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Analysis-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase		
12	Viscosity (cP)	---	1.154e-002	1.156		
13	Viscosity Index	8.337	---	---		
14	Watson K	12.01	17.47	12.01		
15	Z Factor	---	0.9642	6.584e-002		
16	Ideal Gas Cp/Cv	1.036	1.216	1.036		
17	Ideal Gas Cp (Btu/lbmole-F)	56.92	11.18	56.95		
18	Mass Ideal Gas Cp (Btu/lb-F)	0.3902	0.4802	0.3902		
19	Bubble Point Pressure (psig)	117.5	---	---		


COMPOSITION

Overall Phase Vapour Fraction 0.0006

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
26	CO2	0.0052 *	0.0006 *	0.2295 *	0.0002 *	0.0190 *
27	Nitrogen	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 *
28	H2S	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 *
29	Methane	0.2279 *	0.0284 *	3.6562 *	0.0031 *	0.8362 *
30	Ethane	0.2066 *	0.0257 *	6.2113 *	0.0053 *	1.1957 *
31	Propane	0.3893 *	0.0485 *	17.1669 *	0.0147 *	2.3199 *
32	i-Butane	0.0850 *	0.0106 *	4.9377 *	0.0042 *	0.6016 *
33	n-Butane	0.4205 *	0.0524 *	24.4414 *	0.0209 *	2.8695 *
34	i-Pentane	0.2258 *	0.0282 *	16.2927 *	0.0139 *	1.7894 *
35	n-Pentane	0.3514 *	0.0438 *	25.3565 *	0.0217 *	2.7571 *
36	Cyclopentane	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 *
37	n-Hexane	0.2840 *	0.0354 *	24.4791 *	0.0209 *	2.5294 *
38	Cyclohexane	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 *
39	2-Mpentane	0.3445 *	0.0429 *	29.6846 *	0.0254 *	3.0960 *
40	n-Heptane	0.9403 *	0.1172 *	94.2246 *	0.0805 *	9.3937 *
41	Mycyclohexane	0.0000 *	0.0000 *	0.0000 *	0.0000 *	0.0000 *
42	224-Mpentane	0.1101 *	0.0137 *	12.5815 *	0.0108 *	1.2396 *
43	Benzene	0.0505 *	0.0063 *	3.9475 *	0.0034 *	0.3064 *
44	Toluene	0.1063 *	0.0132 *	9.7936 *	0.0084 *	0.7707 *
45	E-Benzene	0.0529 *	0.0066 *	5.6209 *	0.0048 *	0.4424 *
46	m-Xylene	0.0750 *	0.0094 *	7.9629 *	0.0068 *	0.6290 *
47	n-Octane	0.9722 *	0.1212 *	111.0523 *	0.0949 *	10.7800 *
48	n-Nonane	0.4456 *	0.0556 *	57.1538 *	0.0488 *	5.4335 *
49	C10+*	2.7286 *	0.3402 *	715.4448 *	0.6114 *	56.9518 *
50	Total	8.0217	1.0000	1170.2374	1.0000	103.9610

Vapour Phase Phase Fraction 5.799e-004

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
55	CO2	0.0000	0.0063	0.0013	0.0119	0.0001
56	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000
57	H2S	0.0000	0.0000	0.0000	0.0000	0.0000
58	Methane	0.0033	0.7199	0.0537	0.4963	0.0123
59	Ethane	0.0006	0.1375	0.0192	0.1777	0.0037
60	Propane	0.0004	0.0801	0.0164	0.1517	0.0022
61	i-Butane	0.0000	0.0073	0.0020	0.0183	0.0002
62	n-Butane	0.0001	0.0265	0.0072	0.0662	0.0008

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Analysis-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

COMPOSITION

Vapour Phase (continued)


Phase Fraction 5.799e-004

13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	i-Pentane	0.0000	0.0060	0.0020	0.0186	0.0002	0.0109
16	n-Pentane	0.0000	0.0072	0.0024	0.0223	0.0003	0.0129
17	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	n-Hexane	0.0000	0.0019	0.0008	0.0072	0.0001	0.0040
19	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	2-Mpentane	0.0000	0.0032	0.0013	0.0118	0.0001	0.0066
21	n-Heptane	0.0000	0.0022	0.0010	0.0096	0.0001	0.0051
22	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	224-Mpentane	0.0000	0.0003	0.0001	0.0013	0.0000	0.0007
24	Benzene	0.0000	0.0003	0.0001	0.0011	0.0000	0.0005
25	Toluene	0.0000	0.0002	0.0001	0.0009	0.0000	0.0004
26	E-Benzene	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001
27	m-Xylene	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001
28	n-Octane	0.0000	0.0008	0.0004	0.0040	0.0000	0.0021
29	n-Nonane	0.0000	0.0001	0.0001	0.0007	0.0000	0.0004
30	C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	Total	0.0047	1.0000	0.1083	1.0000	0.0203	1.0000

Liquid Phase

Phase Fraction 0.9994

34	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	CO2	0.0052	0.0006	0.2282	0.0002	0.0189	0.0002
37	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	Methane	0.2245	0.0280	3.6024	0.0031	0.8239	0.0079
40	Ethane	0.2059	0.0257	6.1921	0.0053	1.1920	0.0115
41	Propane	0.3889	0.0485	17.1505	0.0147	2.3177	0.0223
42	i-Butane	0.0849	0.0106	4.9357	0.0042	0.6014	0.0058
43	n-Butane	0.4204	0.0524	24.4342	0.0209	2.8686	0.0276
44	i-Pentane	0.2258	0.0282	16.2907	0.0139	1.7892	0.0172
45	n-Pentane	0.3514	0.0438	25.3540	0.0217	2.7568	0.0265
46	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	n-Hexane	0.2840	0.0354	24.4783	0.0209	2.5293	0.0243
48	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49	2-Mpentane	0.3444	0.0430	29.6833	0.0254	3.0959	0.0298
50	n-Heptane	0.9403	0.1173	94.2235	0.0805	9.3936	0.0904
51	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	224-Mpentane	0.1101	0.0137	12.5813	0.0108	1.2396	0.0119
53	Benzene	0.0505	0.0063	3.9474	0.0034	0.3064	0.0029
54	Toluene	0.1063	0.0133	9.7935	0.0084	0.7707	0.0074
55	E-Benzene	0.0529	0.0066	5.6208	0.0048	0.4424	0.0043
56	m-Xylene	0.0750	0.0094	7.9629	0.0068	0.6290	0.0061
57	n-Octane	0.9722	0.1213	111.0519	0.0949	10.7800	0.1037
58	n-Nonane	0.4456	0.0556	57.1537	0.0488	5.4335	0.0523
59	C10+	2.7286	0.3403	715.4448	0.6114	56.9518	0.5479
60	Total	8.0171	1.0000	1170.1292	1.0000	103.9408	1.0000


1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Sep-Gas

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	Molecular Weight	30.14	30.14	150.2	
13	Molar Density (lbmole/ft3)	1.228e-002	1.228e-002	0.3166	
14	Mass Density (lb/ft3)	0.3703	0.3703	47.54	
15	Act. Volume Flow (barrel/day)	99.38	99.38	0.0000	
16	Mass Enthalpy (Btu/lb)	-1297	-1297	-896.4	
17	Mass Entropy (Btu/lb-F)	1.416	1.416	0.4122	
18	Heat Capacity (Btu/lbmole-F)	14.24	14.24	74.15	
19	Mass Heat Capacity (Btu/lb-F)	0.4725	0.4725	0.4939	
20	LHV Molar Basis (Std) (Btu/SCF)	---	---	---	
21	HHV Molar Basis (Std) (Btu/SCF)	---	---	---	
22	HHV Mass Basis (Std) (Btu/lb)	---	---	---	
23	CO2 Loading	---	---	---	
24	CO2 Apparent Mole Conc. (lbmole/ft3)	---	---	---	
25	CO2 Apparent Wt. Conc. (lbmol/lb)	---	---	---	
26	LHV Mass Basis (Std) (Btu/lb)	---	---	---	
27	Phase Fraction [Vol. Basis]	1.000	1.000	---	
28	Phase Fraction [Mass Basis]	1.000	1.000	0.0000	
29	Phase Fraction [Act. Vol. Basis]	1.000	1.000	0.0000	
30	Partial Pressure of CO2 (psig)	-14.14	---	---	
31	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
32	Act. Gas Flow (ACFM)	0.3875	0.3875	---	
33	Avg. Liq. Density (lbmole/ft3)	0.8622	0.8622	0.3225	
34	Specific Heat (Btu/lbmole-F)	14.24	14.24	74.15	
35	Std. Gas Flow (SCFD*)	2601	2601	0.0000	
36	Std. Ideal Liq. Mass Density (lb/ft3)	25.99	25.99	48.42	
37	Act. Liq. Flow (USGPM)	---	---	---	
38	Z Factor	---	0.9693	3.760e-002	
39	Watson K	16.29	16.29	12.00	
40	User Property	---	---	---	
41	Partial Pressure of H2S (psig)	-14.70	---	---	
42	Cp/(Cp - R)	1.162	1.162	1.028	
43	Cp/Cv	1.187	1.187	1.028	
44	Heat of Vap. (Btu/lbmole)	9735	---	---	
45	Kinematic Viscosity (cSt)	1.891	1.891	1.333	
46	Liq. Mass Density (Std. Cond) (lb/ft3)	8.011e-002	8.011e-002	49.40	
47	Liq. Vol. Flow (Std. Cond) (barrel/day)	459.3	459.3	0.0000	
48	Liquid Fraction	0.0000	0.0000	1.000	
49	Molar Volume (ft3/lbmole)	81.42	81.42	3.159	
50	Mass Heat of Vap. (Btu/lb)	322.9	---	---	
51	Phase Fraction [Molar Basis]	1.0000	1.0000	0.0000	
52	Surface Tension (dyne/cm)	---	---	19.11	
53	Thermal Conductivity (Btu/hr-ft-F)	1.638e-002	1.638e-002	6.379e-002	
54	Viscosity (cP)	1.122e-002	1.122e-002	1.015	
55	Cv (Semi-Ideal) (Btu/lbmole-F)	12.26	12.26	72.17	
56	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4066	0.4066	0.4806	
57	Cv (Btu/lbmole-F)	12.00	12.00	72.17	
58	Mass Cv (Btu/lb-F)	0.3981	0.3981	0.4806	
59	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
60	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
61	Cp/Cv (Ent. Method)	---	---	---	
62	Reid VP at 37.8 C (psig)	1040	1040	7.568	

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
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Material Stream: Sep-Gas (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase		
12	True VP at 37.8 C (psig)	1555	1555	49.22		
13	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	459.3	459.3	0.0000		
14	Viscosity Index	-17.59	---	---		
15	Mass Exergy (Btu/lb)	57.31	---	---		
16	Ideal Gas Cp/Cv	1.166	1.166	1.034		
17	Ideal Gas Cp (Btu/lbmole-F)	13.95	13.95	60.50		
18	Mass Ideal Gas Cp (Btu/lb-F)	0.4628	0.4628	0.4029		
19	Bubble Point Pressure (psig)	---	---	---		

COMPOSITION

Overall Phase


Vapour Fraction 1.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
26	CO2	0.0022	0.0075	0.0946	0.0110	0.0079	0.0055
27	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	Methane	0.1446	0.5063	2.3196	0.2695	0.5305	0.3747
30	Ethane	0.0580	0.2032	1.7449	0.2027	0.3359	0.2373
31	Propane	0.0440	0.1540	1.9387	0.2252	0.2620	0.1851
32	i-Butane	0.0045	0.0156	0.2593	0.0301	0.0316	0.0223
33	n-Butane	0.0166	0.0583	0.9676	0.1124	0.1136	0.0802
34	i-Pentane	0.0040	0.0140	0.2883	0.0335	0.0317	0.0224
35	n-Pentane	0.0049	0.0171	0.3530	0.0410	0.0384	0.0271
36	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
37	n-Hexane	0.0014	0.0049	0.1214	0.0141	0.0125	0.0089
38	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	2-Mpentane	0.0023	0.0079	0.1949	0.0226	0.0203	0.0144
40	n-Heptane	0.0017	0.0060	0.1716	0.0199	0.0171	0.0121
41	Myclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	224-Mpentane	0.0002	0.0007	0.0231	0.0027	0.0023	0.0016
43	Benzene	0.0002	0.0008	0.0186	0.0022	0.0014	0.0010
44	Toluene	0.0002	0.0006	0.0158	0.0018	0.0012	0.0009
45	E-Benzene	0.0000	0.0001	0.0034	0.0004	0.0003	0.0002
46	m-Xylene	0.0000	0.0001	0.0041	0.0005	0.0003	0.0002
47	n-Octane	0.0007	0.0023	0.0745	0.0087	0.0072	0.0051
48	n-Nonane	0.0001	0.0004	0.0147	0.0017	0.0014	0.0010
49	C10+	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
50	Total	0.2856	1.0000	8.6081	1.0000	1.4156	1.0000

Vapour Phase

Phase Fraction 1.000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
55	CO2	0.0022	0.0075	0.0946	0.0110	0.0079	0.0055
56	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	Methane	0.1446	0.5063	2.3196	0.2695	0.5305	0.3747
59	Ethane	0.0580	0.2032	1.7449	0.2027	0.3359	0.2373
60	Propane	0.0440	0.1540	1.9387	0.2252	0.2620	0.1851
61	i-Butane	0.0045	0.0156	0.2593	0.0301	0.0316	0.0223
62	n-Butane	0.0166	0.0583	0.9676	0.1124	0.1136	0.0802

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
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Material Stream: Sep-Gas (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

COMPOSITION

Vapour Phase (continued)


Phase Fraction 1.000

13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	i-Pentane	0.0040	0.0140	0.2883	0.0335	0.0317	0.0224
16	n-Pentane	0.0049	0.0171	0.3530	0.0410	0.0384	0.0271
17	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	n-Hexane	0.0014	0.0049	0.1214	0.0141	0.0125	0.0089
19	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	2-Mpentane	0.0023	0.0079	0.1949	0.0226	0.0203	0.0144
21	n-Heptane	0.0017	0.0060	0.1716	0.0199	0.0171	0.0121
22	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	224-Mpentane	0.0002	0.0007	0.0231	0.0027	0.0023	0.0016
24	Benzene	0.0002	0.0008	0.0186	0.0022	0.0014	0.0010
25	Toluene	0.0002	0.0006	0.0158	0.0018	0.0012	0.0009
26	E-Benzene	0.0000	0.0001	0.0034	0.0004	0.0003	0.0002
27	m-Xylene	0.0000	0.0001	0.0041	0.0005	0.0003	0.0002
28	n-Octane	0.0007	0.0023	0.0745	0.0087	0.0072	0.0051
29	n-Nonane	0.0001	0.0004	0.0147	0.0017	0.0014	0.0010
30	C10+	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
31	Total	0.2856	1.0000	8.6081	1.0000	1.4156	1.0000

Liquid Phase

Phase Fraction 0.000

34	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	CO2	0.0000	0.0004	0.0000	0.0001	0.0000	0.0001
37	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	Methane	0.0000	0.0108	0.0000	0.0012	0.0000	0.0030
40	Ethane	0.0000	0.0192	0.0000	0.0038	0.0000	0.0084
41	Propane	0.0000	0.0446	0.0000	0.0131	0.0000	0.0201
42	i-Butane	0.0000	0.0104	0.0000	0.0040	0.0000	0.0056
43	n-Butane	0.0000	0.0522	0.0000	0.0202	0.0000	0.0269
44	i-Pentane	0.0000	0.0287	0.0000	0.0138	0.0000	0.0171
45	n-Pentane	0.0000	0.0448	0.0000	0.0215	0.0000	0.0285
46	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	n-Hexane	0.0000	0.0365	0.0000	0.0210	0.0000	0.0245
48	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49	2-Mpentane	0.0000	0.0442	0.0000	0.0254	0.0000	0.0300
50	n-Heptane	0.0000	0.1213	0.0000	0.0810	0.0000	0.0914
51	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	224-Mpentane	0.0000	0.0142	0.0000	0.0108	0.0000	0.0121
53	Benzene	0.0000	0.0065	0.0000	0.0034	0.0000	0.0030
54	Toluene	0.0000	0.0137	0.0000	0.0084	0.0000	0.0075
55	E-Benzene	0.0000	0.0068	0.0000	0.0048	0.0000	0.0043
56	m-Xylene	0.0000	0.0097	0.0000	0.0069	0.0000	0.0061
57	n-Octane	0.0000	0.1256	0.0000	0.0955	0.0000	0.1051
58	n-Nonane	0.0000	0.0576	0.0000	0.0492	0.0000	0.0530
59	C10+	0.0000	0.3527	0.0000	0.6159	0.0000	0.5554
60	Total	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000


1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Sep-Oil

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	Molecular Weight	150.2	30.14	150.2	
13	Molar Density (lbmole/ft3)	0.3166	1.228e-002	0.3166	
14	Mass Density (lb/ft3)	47.54	0.3703	47.54	
15	Act. Volume Flow (barrel/day)	104.4	0.0000	104.4	
16	Mass Enthalpy (Btu/lb)	-896.4	-1297	-896.4	
17	Mass Entropy (Btu/lb-F)	0.4122	1.416	0.4122	
18	Heat Capacity (Btu/lbmole-F)	74.15	14.24	74.15	
19	Mass Heat Capacity (Btu/lb-F)	0.4939	0.4725	0.4939	
20	LHV Molar Basis (Std) (Btu/SCF)	---	---	---	
21	HHV Molar Basis (Std) (Btu/SCF)	---	---	---	
22	HHV Mass Basis (Std) (Btu/lb)	---	---	---	
23	CO2 Loading	---	---	---	
24	CO2 Apparent Mole Conc. (lbmole/ft3)	1.254e-004	---	1.254e-004	
25	CO2 Apparent Wt. Conc. (lbmol/lb)	2.637e-006	---	2.637e-006	
26	LHV Mass Basis (Std) (Btu/lb)	---	---	---	
27	Phase Fraction [Vol. Basis]	---	---	1.000	
28	Phase Fraction [Mass Basis]	0.0000	0.0000	1.000	
29	Phase Fraction [Act. Vol. Basis]	0.0000	0.0000	1.000	
30	Partial Pressure of CO2 (psig)	-14.70	---	---	
31	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
32	Act. Gas Flow (ACFM)	---	---	---	
33	Avg. Liq. Density (lbmole/ft3)	0.3225	0.8622	0.3225	
34	Specific Heat (Btu/lbmole-F)	74.15	14.24	74.15	
35	Std. Gas Flow (SCFD*)	7.046e+004	0.0000	7.046e+004	
36	Std. Ideal Liq. Mass Density (lb/ft3)	48.42	25.99	48.42	
37	Act. Liq. Flow (USGPM)	3.046	---	3.046	
38	Z Factor	---	0.9693	3.760e-002	
39	Watson K	12.00	16.29	12.00	
40	User Property	---	---	---	
41	Partial Pressure of H2S (psig)	-14.70	---	---	
42	Cp/(Cp - R)	1.028	1.162	1.028	
43	Cp/Cv	1.028	1.187	1.028	
44	Heat of Vap. (Btu/lbmole)	6.179e+004	---	---	
45	Kinematic Viscosity (cSt)	1.333	1.891	1.333	
46	Liq. Mass Density (Std. Cond) (lb/ft3)	49.40	8.011e-002	49.40	
47	Liq. Vol. Flow (Std. Cond) (barrel/day)	100.5	0.0000	100.5	
48	Liquid Fraction	1.000	0.0000	1.000	
49	Molar Volume (ft3/lbmole)	3.159	81.42	3.159	
50	Mass Heat of Vap. (Btu/lb)	411.5	---	---	
51	Phase Fraction [Molar Basis]	0.0000	0.0000	1.0000	
52	Surface Tension (dyne/cm)	19.11	---	19.11	
53	Thermal Conductivity (Btu/hr-ft-F)	6.379e-002	1.638e-002	6.379e-002	
54	Viscosity (cP)	1.015	1.122e-002	1.015	
55	Cv (Semi-Ideal) (Btu/lbmole-F)	72.17	12.26	72.17	
56	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4806	0.4066	0.4806	
57	Cv (Btu/lbmole-F)	72.17	12.00	72.17	
58	Mass Cv (Btu/lb-F)	0.4806	0.3981	0.4806	
59	Cv (Ent. Method) (Btu/lbmole-F)	---	---	---	
60	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	---	
61	Cp/Cv (Ent. Method)	---	---	---	
62	Reid VP at 37.8 C (psig)	7.568	1040	7.568	

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Sep-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase		
12	True VP at 37.8 C (psig)	49.22	1555	49.22		
13	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	100.5	0.0000	100.5		
14	Viscosity Index	6.939	---	---		
15	Mass Exergy (Btu/lb)	1.425	---	---		
16	Ideal Gas Cp/Cv	1.034	1.166	1.034		
17	Ideal Gas Cp (Btu/lbmole-F)	60.50	13.95	60.50		
18	Mass Ideal Gas Cp (Btu/lb-F)	0.4029	0.4628	0.4029		
19	Bubble Point Pressure (psig)	60.00	---	---		

COMPOSITION

Overall Phase


Vapour Fraction 0.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
26	CO2	0.0031	0.0004	0.1348	0.0001	0.0112	0.0001
27	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	Methane	0.0833	0.0108	1.3366	0.0012	0.3057	0.0030
30	Ethane	0.1485	0.0192	4.4664	0.0038	0.8598	0.0084
31	Propane	0.3453	0.0446	15.2282	0.0131	2.0579	0.0201
32	i-Butane	0.0805	0.0104	4.6784	0.0040	0.5700	0.0056
33	n-Butane	0.4039	0.0522	23.4738	0.0202	2.7559	0.0269
34	i-Pentane	0.2218	0.0287	16.0045	0.0138	1.7578	0.0171
35	n-Pentane	0.3465	0.0448	25.0035	0.0215	2.7187	0.0265
36	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
37	n-Hexane	0.2826	0.0365	24.3577	0.0210	2.5168	0.0245
38	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	2-Mpentane	0.3422	0.0442	29.4897	0.0254	3.0757	0.0300
40	n-Heptane	0.9386	0.1213	94.0530	0.0810	9.3766	0.0914
41	Myclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	224-Mpentane	0.1099	0.0142	12.5584	0.0108	1.2373	0.0121
43	Benzene	0.0503	0.0065	3.9289	0.0034	0.3049	0.0030
44	Toluene	0.1061	0.0137	9.7777	0.0084	0.7695	0.0075
45	E-Benzene	0.0529	0.0068	5.6175	0.0048	0.4421	0.0043
46	m-Xylene	0.0750	0.0097	7.9588	0.0069	0.6286	0.0061
47	n-Octane	0.9715	0.1256	110.9778	0.0955	10.7728	0.1051
48	n-Nonane	0.4455	0.0576	57.1391	0.0492	5.4321	0.0530
49	C10+	2.7286	0.3527	715.4447	0.6159	56.9518	0.5554
50	Total	7.7362	1.0000	1161.6294	1.0000	102.5454	1.0000

Vapour Phase

Phase Fraction 0.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
55	CO2	0.0000	0.0075	0.0000	0.0110	0.0000	0.0055
56	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	Methane	0.0000	0.5063	0.0000	0.2695	0.0000	0.3747
59	Ethane	0.0000	0.2032	0.0000	0.2027	0.0000	0.2373
60	Propane	0.0000	0.1540	0.0000	0.2252	0.0000	0.1851
61	i-Butane	0.0000	0.0156	0.0000	0.0301	0.0000	0.0223
62	n-Butane	0.0000	0.0583	0.0000	0.1124	0.0000	0.0802

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Sep-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

COMPOSITION

Vapour Phase (continued)


Phase Fraction 0.0000

13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	i-Pentane	0.0000	0.0140	0.0000	0.0335	0.0000	0.0224
16	n-Pentane	0.0000	0.0171	0.0000	0.0410	0.0000	0.0271
17	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	n-Hexane	0.0000	0.0049	0.0000	0.0141	0.0000	0.0089
19	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	2-Mpentane	0.0000	0.0079	0.0000	0.0226	0.0000	0.0144
21	n-Heptane	0.0000	0.0060	0.0000	0.0199	0.0000	0.0121
22	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	224-Mpentane	0.0000	0.0007	0.0000	0.0027	0.0000	0.0016
24	Benzene	0.0000	0.0008	0.0000	0.0022	0.0000	0.0010
25	Toluene	0.0000	0.0006	0.0000	0.0018	0.0000	0.0009
26	E-Benzene	0.0000	0.0001	0.0000	0.0004	0.0000	0.0002
27	m-Xylene	0.0000	0.0001	0.0000	0.0005	0.0000	0.0002
28	n-Octane	0.0000	0.0023	0.0000	0.0087	0.0000	0.0051
29	n-Nonane	0.0000	0.0004	0.0000	0.0017	0.0000	0.0010
30	C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	Total	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000

Liquid Phase

Phase Fraction 1.000

34	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	CO2	0.0031	0.0004	0.1348	0.0001	0.0112	0.0001
37	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	Methane	0.0833	0.0108	1.3366	0.0012	0.3057	0.0030
40	Ethane	0.1485	0.0192	4.4664	0.0038	0.8598	0.0084
41	Propane	0.3453	0.0446	15.2282	0.0131	2.0579	0.0201
42	i-Butane	0.0805	0.0104	4.6784	0.0040	0.5700	0.0056
43	n-Butane	0.4039	0.0522	23.4738	0.0202	2.7559	0.0269
44	i-Pentane	0.2218	0.0287	16.0045	0.0138	1.7578	0.0171
45	n-Pentane	0.3465	0.0448	25.0035	0.0215	2.7187	0.0265
46	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	n-Hexane	0.2826	0.0365	24.3577	0.0210	2.5168	0.0245
48	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49	2-Mpentane	0.3422	0.0442	29.4897	0.0254	3.0757	0.0300
50	n-Heptane	0.9386	0.1213	94.0530	0.0810	9.3766	0.0914
51	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	224-Mpentane	0.1099	0.0142	12.5584	0.0108	1.2373	0.0121
53	Benzene	0.0503	0.0065	3.9289	0.0034	0.3049	0.0030
54	Toluene	0.1061	0.0137	9.7777	0.0084	0.7695	0.0075
55	E-Benzene	0.0529	0.0068	5.6175	0.0048	0.4421	0.0043
56	m-Xylene	0.0750	0.0097	7.9588	0.0069	0.6286	0.0061
57	n-Octane	0.9715	0.1256	110.9778	0.0955	10.7728	0.1051
58	n-Nonane	0.4455	0.0576	57.1391	0.0492	5.4321	0.0530
59	C10+	2.7286	0.3527	715.4447	0.6159	56.9518	0.5554
60	Total	7.7362	1.0000	1161.6294	1.0000	102.5454	1.0000


1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Tank-Flash

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	Molecular Weight	41.98	41.98	156.5	
13	Molar Density (lbmole/ft3)	2.576e-003	2.576e-003	0.3137	
14	Mass Density (lb/ft3)	0.1081	0.1081	49.11	
15	Act. Volume Flow (barrel/day)	714.0	714.0	0.0000	
16	Mass Enthalpy (Btu/lb)	-1079	-1079	-913.3	
17	Mass Entropy (Btu/lb-F)	1.026	1.026	0.3684	
18	Heat Capacity (Btu/lbmole-F)	17.48	17.48	72.80	
19	Mass Heat Capacity (Btu/lb-F)	0.4163	0.4163	0.4651	
20	LHV Molar Basis (Std) (Btu/SCF)	2193	2193	---	
21	HHV Molar Basis (Std) (Btu/SCF)	2370	2370	---	
22	HHV Mass Basis (Std) (Btu/lb)	2.142e+004	2.142e+004	---	
23	CO2 Loading	---	---	---	
24	CO2 Apparent Mole Conc. (lbmole/ft3)	---	---	---	
25	CO2 Apparent Wt. Conc. (lbmol/lb)	---	---	---	
26	LHV Mass Basis (Std) (Btu/lb)	1.982e+004	1.982e+004	---	
27	Phase Fraction [Vol. Basis]	1.000	1.000	---	
28	Phase Fraction [Mass Basis]	1.000	1.000	0.0000	
29	Phase Fraction [Act. Vol. Basis]	1.000	1.000	0.0000	
30	Partial Pressure of CO2 (psig)	-14.62	---	---	
31	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
32	Act. Gas Flow (ACFM)	2.784	2.784	---	
33	Avg. Liq. Density (lbmole/ft3)	0.7225	0.7225	0.3123	
34	Specific Heat (Btu/lbmole-F)	17.48	17.48	72.80	
35	Std. Gas Flow (SCFD*)	3919	3919	0.0000	
36	Std. Ideal Liq. Mass Density (lb/ft3)	30.33	30.33	48.88	
37	Act. Liq. Flow (USGPM)	---	---	---	
38	Z Factor	---	0.9854	8.090e-003	
39	Watson K	15.06	15.06	11.98	
40	User Property	---	---	---	
41	Partial Pressure of H2S (psig)	-14.70	---	---	
42	Cp/(Cp - R)	1.128	1.128	1.028	
43	Cp/Cv	1.136	1.136	1.028	
44	Heat of Vap. (Btu/lbmole)	1.271e+004	---	---	
45	Kinematic Viscosity (cSt)	5.126	5.126	2.095	
46	Liq. Mass Density (Std. Cond) (lb/ft3)	30.26	30.26	49.66	
47	Liq. Vol. Flow (Std. Cond) (barrel/day)	2.552	2.552	0.0000	
48	Liquid Fraction	0.0000	0.0000	1.000	
49	Molar Volume (ft3/lbmole)	388.2	388.2	3.187	
50	Mass Heat of Vap. (Btu/lb)	302.8	---	---	
51	Phase Fraction [Molar Basis]	1.0000	1.0000	0.0000	
52	Surface Tension (dyne/cm)	---	---	22.26	
53	Thermal Conductivity (Btu/hr-ft-F)	1.144e-002	1.144e-002	6.847e-002	
54	Viscosity (cP)	8.878e-003	8.878e-003	1.648	
55	Cv (Semi-Ideal) (Btu/lbmole-F)	15.49	15.49	70.82	
56	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.3690	0.3690	0.4524	
57	Cv (Btu/lbmole-F)	15.39	15.39	70.82	
58	Mass Cv (Btu/lb-F)	0.3666	0.3666	0.4524	
59	Cv (Ent. Method) (Btu/lbmole-F)	---	---	63.56	
60	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	0.4060	
61	Cp/Cv (Ent. Method)	---	---	1.146	
62	Reid VP at 37.8 C (psig)	381.2	381.2	-3.212	

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Tank-Flash (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	True VP at 37.8 C (psig)	716.7	716.7	3.625	
13	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	2.552	2.552	0.0000	
14	Viscosity Index	---	---	---	
15	Mass Exergy (Btu/lb)	1.037e-002	---	---	
16	Ideal Gas Cp/Cv	1.129	1.129	1.035	
17	Ideal Gas Cp (Btu/lbmole-F)	17.36	17.36	58.72	
18	Mass Ideal Gas Cp (Btu/lb-F)	0.4136	0.4136	0.3751	
19	Bubble Point Pressure (psig)	647.2	---	---	

COMPOSITION

Overall Phase


Vapour Fraction 1.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
26	CO2	0.0025	0.0057	0.1087	0.0060	0.0090	0.0035
27	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	Methane	0.0771	0.1792	1.2366	0.0685	0.2828	0.1111
30	Ethane	0.1022	0.2375	3.0730	0.1701	0.5916	0.2324
31	Propane	0.1299	0.3020	5.7291	0.3172	0.7742	0.3042
32	i-Butane	0.0151	0.0351	0.8778	0.0486	0.1070	0.0420
33	n-Butane	0.0568	0.1320	3.3017	0.1828	0.3876	0.1523
34	i-Pentane	0.0132	0.0307	0.9521	0.0527	0.1046	0.0411
35	n-Pentane	0.0156	0.0363	1.1262	0.0624	0.1225	0.0481
36	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
37	n-Hexane	0.0039	0.0091	0.3384	0.0187	0.0350	0.0137
38	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	2-Mpentane	0.0066	0.0153	0.5684	0.0315	0.0593	0.0233
40	n-Heptane	0.0041	0.0095	0.4095	0.0227	0.0408	0.0160
41	Myclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	224-Mpentane	0.0005	0.0012	0.0566	0.0031	0.0056	0.0022
43	Benzene	0.0007	0.0016	0.0537	0.0030	0.0042	0.0016
44	Toluene	0.0004	0.0010	0.0390	0.0022	0.0031	0.0012
45	E-Benzene	0.0001	0.0002	0.0071	0.0004	0.0006	0.0002
46	m-Xylene	0.0001	0.0002	0.0084	0.0005	0.0007	0.0003
47	n-Octane	0.0013	0.0031	0.1509	0.0084	0.0146	0.0058
48	n-Nonane	0.0002	0.0005	0.0254	0.0014	0.0024	0.0009
49	C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
50	Total	0.4303	1.0000	18.0624	1.0000	2.5454	1.0000

Vapour Phase

Phase Fraction 1.000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
55	CO2	0.0025	0.0057	0.1087	0.0060	0.0090	0.0035
56	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	Methane	0.0771	0.1792	1.2366	0.0685	0.2828	0.1111
59	Ethane	0.1022	0.2375	3.0730	0.1701	0.5916	0.2324
60	Propane	0.1299	0.3020	5.7291	0.3172	0.7742	0.3042
61	i-Butane	0.0151	0.0351	0.8778	0.0486	0.1070	0.0420
62	n-Butane	0.0568	0.1320	3.3017	0.1828	0.3876	0.1523

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
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Material Stream: Tank-Flash (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

COMPOSITION

Vapour Phase (continued)


Phase Fraction 1.000

13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	i-Pentane	0.0132	0.0307	0.9521	0.0527	0.1046	0.0411
16	n-Pentane	0.0156	0.0363	1.1262	0.0624	0.1225	0.0481
17	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	n-Hexane	0.0039	0.0091	0.3384	0.0187	0.0350	0.0137
19	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	2-Mpentane	0.0066	0.0153	0.5684	0.0315	0.0593	0.0233
21	n-Heptane	0.0041	0.0095	0.4095	0.0227	0.0408	0.0160
22	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	224-Mpentane	0.0005	0.0012	0.0566	0.0031	0.0056	0.0022
24	Benzene	0.0007	0.0016	0.0537	0.0030	0.0042	0.0016
25	Toluene	0.0004	0.0010	0.0390	0.0022	0.0031	0.0012
26	E-Benzene	0.0001	0.0002	0.0071	0.0004	0.0006	0.0002
27	m-Xylene	0.0001	0.0002	0.0084	0.0005	0.0007	0.0003
28	n-Octane	0.0013	0.0031	0.1509	0.0084	0.0146	0.0058
29	n-Nonane	0.0002	0.0005	0.0254	0.0014	0.0024	0.0009
30	C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	Total	0.4303	1.0000	18.0624	1.0000	2.5454	1.0000

Liquid Phase

Phase Fraction 0.000

34	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	CO2	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
37	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	Methane	0.0000	0.0009	0.0000	0.0001	0.0000	0.0002
40	Ethane	0.0000	0.0063	0.0000	0.0012	0.0000	0.0027
41	Propane	0.0000	0.0295	0.0000	0.0083	0.0000	0.0128
42	i-Butane	0.0000	0.0089	0.0000	0.0033	0.0000	0.0046
43	n-Butane	0.0000	0.0475	0.0000	0.0176	0.0000	0.0237
44	i-Pentane	0.0000	0.0286	0.0000	0.0132	0.0000	0.0165
45	n-Pentane	0.0000	0.0453	0.0000	0.0209	0.0000	0.0260
46	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	n-Hexane	0.0000	0.0381	0.0000	0.0210	0.0000	0.0248
48	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49	2-Mpentane	0.0000	0.0459	0.0000	0.0253	0.0000	0.0302
50	n-Heptane	0.0000	0.1279	0.0000	0.0819	0.0000	0.0934
51	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	224-Mpentane	0.0000	0.0150	0.0000	0.0109	0.0000	0.0123
53	Benzene	0.0000	0.0068	0.0000	0.0034	0.0000	0.0030
54	Toluene	0.0000	0.0145	0.0000	0.0085	0.0000	0.0077
55	E-Benzene	0.0000	0.0072	0.0000	0.0049	0.0000	0.0044
56	m-Xylene	0.0000	0.0102	0.0000	0.0070	0.0000	0.0063
57	n-Octane	0.0000	0.1328	0.0000	0.0969	0.0000	0.1076
58	n-Nonane	0.0000	0.0609	0.0000	0.0499	0.0000	0.0543
59	C10+	0.0000	0.3735	0.0000	0.6256	0.0000	0.5695
60	Total	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000


1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Tank-Oil

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	Molecular Weight	156.5	41.98	156.5	
13	Molar Density (lbmole/ft3)	0.3137	2.576e-003	0.3137	
14	Mass Density (lb/ft3)	49.11	0.1081	49.11	
15	Act. Volume Flow (barrel/day)	99.54	0.0000	99.54	
16	Mass Enthalpy (Btu/lb)	-913.3	-1079	-913.3	
17	Mass Entropy (Btu/lb-F)	0.3684	1.026	0.3684	
18	Heat Capacity (Btu/lbmole-F)	72.80	17.48	72.80	
19	Mass Heat Capacity (Btu/lb-F)	0.4651	0.4163	0.4651	
20	LHV Molar Basis (Std) (Btu/SCF)	---	2193	---	
21	HHV Molar Basis (Std) (Btu/SCF)	---	2370	---	
22	HHV Mass Basis (Std) (Btu/lb)	---	2.142e+004	---	
23	CO2 Loading	---	---	---	
24	CO2 Apparent Mole Conc. (lbmole/ft3)	2.545e-005	---	2.545e-005	
25	CO2 Apparent Wt. Conc. (lbmol/lb)	5.183e-007	---	5.183e-007	
26	LHV Mass Basis (Std) (Btu/lb)	---	1.982e+004	---	
27	Phase Fraction [Vol. Basis]	---	---	1.000	
28	Phase Fraction [Mass Basis]	0.0000	0.0000	1.000	
29	Phase Fraction [Act. Vol. Basis]	0.0000	0.0000	1.000	
30	Partial Pressure of CO2 (psig)	-14.70	---	---	
31	Cost Based on Flow (Cost/s)	0.0000	0.0000	0.0000	
32	Act. Gas Flow (ACFM)	---	---	---	
33	Avg. Liq. Density (lbmole/ft3)	0.3123	0.7225	0.3123	
34	Specific Heat (Btu/lbmole-F)	72.80	17.48	72.80	
35	Std. Gas Flow (SCFD*)	6.654e+004	0.0000	6.654e+004	
36	Std. Ideal Liq. Mass Density (lb/ft3)	48.88	30.33	48.88	
37	Act. Liq. Flow (USGPM)	2.903	---	2.903	
38	Z Factor	---	0.9854	8.090e-003	
39	Watson K	11.98	15.06	11.98	
40	User Property	---	---	---	
41	Partial Pressure of H2S (psig)	-14.70	---	---	
42	Cp/(Cp - R)	1.028	1.128	1.028	
43	Cp/Cv	1.028	1.136	1.028	
44	Heat of Vap. (Btu/lbmole)	5.574e+004	---	---	
45	Kinematic Viscosity (cSt)	2.095	5.126	2.095	
46	Liq. Mass Density (Std. Cond) (lb/ft3)	49.66	30.26	49.66	
47	Liq. Vol. Flow (Std. Cond) (barrel/day)	98.43	0.0000	98.43	
48	Liquid Fraction	1.000	0.0000	1.000	
49	Molar Volume (ft3/lbmole)	3.187	388.2	3.187	
50	Mass Heat of Vap. (Btu/lb)	356.1	---	---	
51	Phase Fraction [Molar Basis]	0.0000	0.0000	1.0000	
52	Surface Tension (dyne/cm)	22.26	---	22.26	
53	Thermal Conductivity (Btu/hr-ft-F)	6.847e-002	1.144e-002	6.847e-002	
54	Viscosity (cP)	1.648	8.878e-003	1.648	
55	Cv (Semi-Ideal) (Btu/lbmole-F)	70.82	15.49	70.82	
56	Mass Cv (Semi-Ideal) (Btu/lb-F)	0.4524	0.3690	0.4524	
57	Cv (Btu/lbmole-F)	70.82	15.39	70.82	
58	Mass Cv (Btu/lb-F)	0.4524	0.3666	0.4524	
59	Cv (Ent. Method) (Btu/lbmole-F)	---	---	63.56	
60	Mass Cv (Ent. Method) (Btu/lb-F)	---	---	0.4060	
61	Cp/Cv (Ent. Method)	---	---	1.146	
62	Reid VP at 37.8 C (psig)	-3.212	381.2	-3.212	

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Tank-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

PROPERTIES

		Overall	Vapour Phase	Liquid Phase	
12	True VP at 37.8 C (psig)	3.625	716.7	3.625	
13	Liq. Vol. Flow - Sum(Std. Cond) (barrel/day)	98.43	0.0000	98.43	
14	Viscosity Index	11.86	---	---	
15	Mass Exergy (Btu/lb)	3.897e-003	---	---	
16	Ideal Gas Cp/Cv	1.035	1.129	1.035	
17	Ideal Gas Cp (Btu/lbmole-F)	58.72	17.36	58.72	
18	Mass Ideal Gas Cp (Btu/lb-F)	0.3751	0.4136	0.3751	
19	Bubble Point Pressure (psig)	-7.893e-004	---	---	

COMPOSITION

Overall Phase


Vapour Fraction 0.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
26	CO2	0.0006	0.0001	0.0261	0.0000	0.0022	0.0000
27	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	Methane	0.0062	0.0009	0.1000	0.0001	0.0229	0.0002
30	Ethane	0.0463	0.0063	1.3934	0.0012	0.2682	0.0027
31	Propane	0.2154	0.0295	9.4991	0.0083	1.2837	0.0128
32	i-Butane	0.0654	0.0089	3.8006	0.0033	0.4631	0.0046
33	n-Butane	0.3470	0.0475	20.1721	0.0176	2.3683	0.0237
34	i-Pentane	0.2086	0.0286	15.0524	0.0132	1.6532	0.0165
35	n-Pentane	0.3309	0.0453	23.8773	0.0209	2.5962	0.0260
36	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
37	n-Hexane	0.2787	0.0381	24.0193	0.0210	2.4819	0.0248
38	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	2-Mpentane	0.3356	0.0459	28.9213	0.0253	3.0164	0.0302
40	n-Heptane	0.9345	0.1279	93.6435	0.0819	9.3358	0.0934
41	Myclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	224-Mpentane	0.1094	0.0150	12.5017	0.0109	1.2318	0.0123
43	Benzene	0.0496	0.0068	3.8752	0.0034	0.3008	0.0030
44	Toluene	0.1057	0.0145	9.7388	0.0085	0.7664	0.0077
45	E-Benzene	0.0528	0.0072	5.6104	0.0049	0.4415	0.0044
46	m-Xylene	0.0749	0.0102	7.9504	0.0070	0.6280	0.0063
47	n-Octane	0.9702	0.1328	110.8269	0.0969	10.7581	0.1076
48	n-Nonane	0.4453	0.0609	57.1137	0.0499	5.4297	0.0543
49	C10+	2.7286	0.3735	715.4447	0.6256	56.9518	0.5695
50	Total	7.3059	1.0000	1143.5670	1.0000	100.0000	1.0000

Vapour Phase

Phase Fraction 0.0000

COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION	
55	CO2	0.0000	0.0057	0.0000	0.0060	0.0000	0.0035
56	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
58	Methane	0.0000	0.1792	0.0000	0.0685	0.0000	0.1111
59	Ethane	0.0000	0.2375	0.0000	0.1701	0.0000	0.2324
60	Propane	0.0000	0.3020	0.0000	0.3172	0.0000	0.3042
61	i-Butane	0.0000	0.0351	0.0000	0.0486	0.0000	0.0420
62	n-Butane	0.0000	0.1320	0.0000	0.1828	0.0000	0.1523

1	 OVINTIV CANADA ULC Bedford, MA USA	Case Name:	Separator Oil HT Tank Model.hsc	
2		Unit Set:	bb/d-scf-d-psig	
3		Date/Time:	Fri May 31 09:55:51 2024	
4				
5				

Material Stream: Tank-Oil (continued)

Fluid Package: Peng-Robinson
 Property Package: Peng-Robinson

COMPOSITION

Vapour Phase (continued)

Phase Fraction 0.0000

13	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
15	i-Pentane	0.0000	0.0307	0.0000	0.0527	0.0000	0.0411
16	n-Pentane	0.0000	0.0363	0.0000	0.0624	0.0000	0.0481
17	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	n-Hexane	0.0000	0.0091	0.0000	0.0187	0.0000	0.0137
19	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	2-Mpentane	0.0000	0.0153	0.0000	0.0315	0.0000	0.0233
21	n-Heptane	0.0000	0.0095	0.0000	0.0227	0.0000	0.0160
22	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	224-Mpentane	0.0000	0.0012	0.0000	0.0031	0.0000	0.0022
24	Benzene	0.0000	0.0016	0.0000	0.0030	0.0000	0.0016
25	Toluene	0.0000	0.0010	0.0000	0.0022	0.0000	0.0012
26	E-Benzene	0.0000	0.0002	0.0000	0.0004	0.0000	0.0002
27	m-Xylene	0.0000	0.0002	0.0000	0.0005	0.0000	0.0003
28	n-Octane	0.0000	0.0031	0.0000	0.0084	0.0000	0.0058
29	n-Nonane	0.0000	0.0005	0.0000	0.0014	0.0000	0.0009
30	C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	Total	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000

Liquid Phase

Phase Fraction 1.000

34	COMPONENTS	MOLAR FLOW (lbmole/hr)	MOLE FRACTION	MASS FLOW (lb/hr)	MASS FRACTION	LIQUID VOLUME FLOW (barrel/day)	LIQUID VOLUME FRACTION
36	CO2	0.0006	0.0001	0.0261	0.0000	0.0022	0.0000
37	Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	Methane	0.0062	0.0009	0.1000	0.0001	0.0229	0.0002
40	Ethane	0.0463	0.0063	1.3934	0.0012	0.2682	0.0027
41	Propane	0.2154	0.0295	9.4991	0.0083	1.2837	0.0128
42	i-Butane	0.0654	0.0089	3.8006	0.0033	0.4631	0.0046
43	n-Butane	0.3470	0.0475	20.1721	0.0176	2.3683	0.0237
44	i-Pentane	0.2086	0.0286	15.0524	0.0132	1.6532	0.0165
45	n-Pentane	0.3309	0.0453	23.8773	0.0209	2.5962	0.0260
46	Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
47	n-Hexane	0.2787	0.0381	24.0193	0.0210	2.4819	0.0248
48	Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49	2-Mpentane	0.3356	0.0459	28.9213	0.0253	3.0164	0.0302
50	n-Heptane	0.9345	0.1279	93.6435	0.0819	9.3358	0.0934
51	Mycyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
52	224-Mpentane	0.1094	0.0150	12.5017	0.0109	1.2318	0.0123
53	Benzene	0.0496	0.0068	3.8752	0.0034	0.3008	0.0030
54	Toluene	0.1057	0.0145	9.7388	0.0085	0.7664	0.0077
55	E-Benzene	0.0528	0.0072	5.6104	0.0049	0.4415	0.0044
56	m-Xylene	0.0749	0.0102	7.9504	0.0070	0.6280	0.0063
57	n-Octane	0.9702	0.1328	110.8269	0.0969	10.7581	0.1076
58	n-Nonane	0.4453	0.0609	57.1137	0.0499	5.4297	0.0543
59	C10+	2.7286	0.3735	715.4447	0.6256	56.9518	0.5695
60	Total	7.3059	1.0000	1143.5670	1.0000	100.0000	1.0000

ATTACHMENT F

Equipment Manufacturer Specifications



Flare Design Report

Customer - Ovintiv

Job Location - Midland County

Date - 06/24/21

Flare Equipment - Hybrid AF-666 with 6" VOPT

Notes - 4 VOPT 50'

Total Flare Gas Flow Rate (MMscfd) - 24.25

Maximum Ground Radiation (Btu/Hr/Ft²) - 1500

HP Flare Gas Flow Rate (MMscfd) - 22.60

Maximum Radiation from base of Flare (Feet) - 35

Heating Value of the HP Flare Gas (Btu/Ft³) - 1400

Minimum Flare Height (Feet) - 68

HP Gas Exit Velocity/6VOPT (Ft/Sec) - 120

Actual Flare Height (Feet) - 50

Allowed HP Gas Exit Velocity (Ft/Sec) - 400

ΔP LP Gas Across the Flare Tip (Lbs/in²) - 0.0338

Number of 6" VOPT HP Tips - 4

Minimum required HP Gas Pressure (Lbs/in²) - 42

LP Flare Gas Flow Rate (MMscfd) - 1.65

Wind Speed (mph) - 20

Heating Value of the LP Flare Gas (Btu/Ft³) - 2200

Average Fraction Radiated (F Factor) - 0.13

LP Gas Exit Velocity (Ft/Sec) - 50

HP Flare Gas Temperature F° - 80

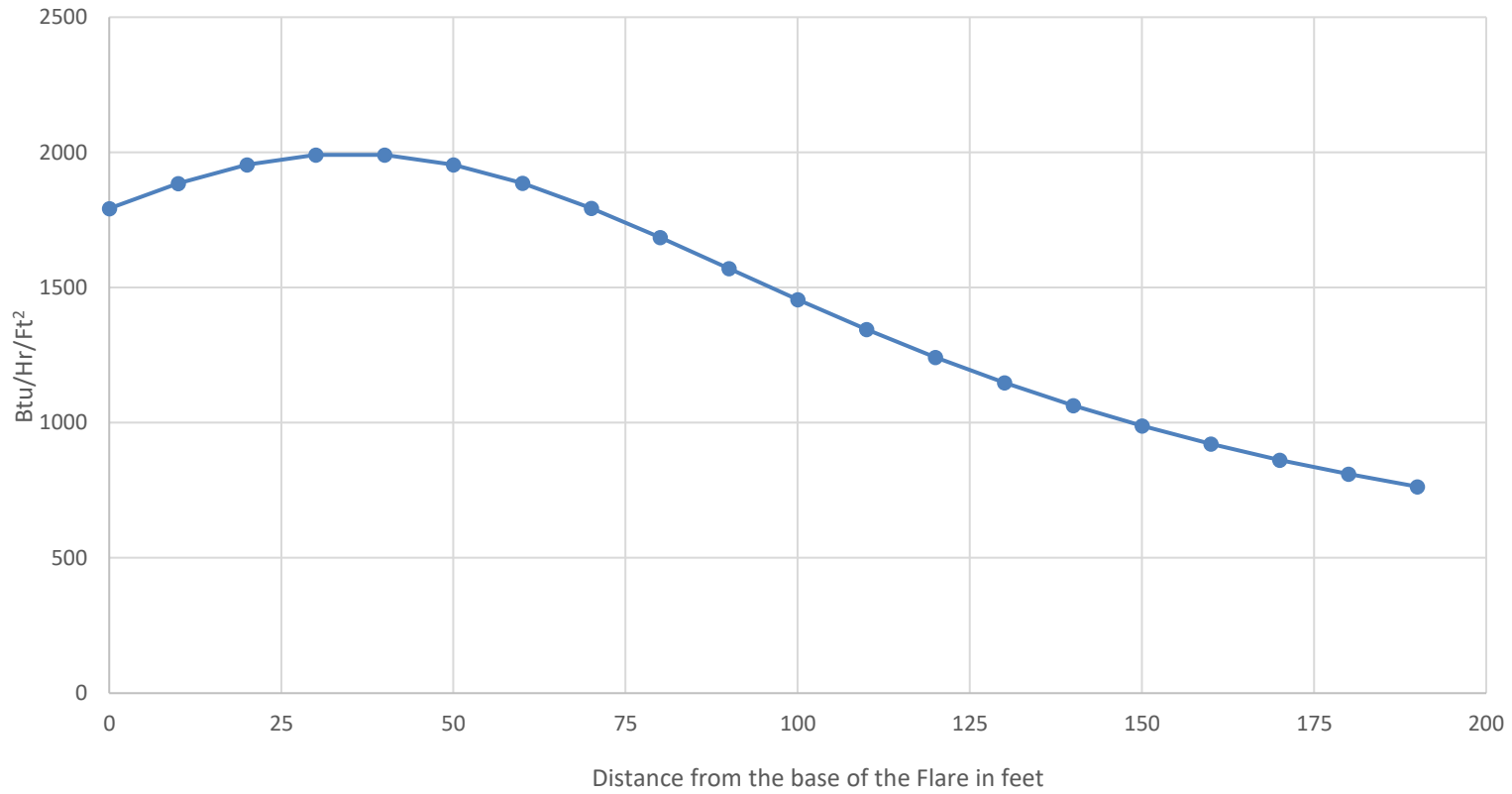
Allowed LP Gas Air Exit Velocity (Ft/Sec) - 220

LP Flare Gas Temperature F° - 80

This flare system will comply 40 CFR 63.11 & 60.18
and therefore carries a destruction efficiency of 98% or greater.

Solar Radiation is included
Solar Gain Btu/Hr/Ft² = 300

Ground Level Flare Radiation



Customer - Ovintiv
Job Location - Midland County
Notes - 4 VOPT 50'



POWERTRAIN Industrial Engines



GM Powertrain takes its expertise in designing outstanding Vortec truck and SUV engines and leverages it to make sophisticated yet extremely durable industrial engines.

Applications

**Industrial, Agriculture
Construction & Oilfield**

- **Pumps** – Irrigation, Industrial, Hydraulic, Sludge and Trash
- **Compressors** – Natural Gas and Air
- **Generators** – Prime Power, Standby and Co-Gen
- **Industrial Drives** – Forklifts, Manlifts, Street Sweepers, Wood Chippers, Chillers and Fans
- **Oil and Gas Production** – Gas Compressors, Pump Jacks, Vapor Recovery
- **Wind Machines**
- **Numerous Re-Power & Custom Applications**

Vortec™ 5.7L 8 Cylinder - 350 Cubic Inches



Available Factory Installed Options

- Natural Gas and LPG Fuel Systems
- Ignition Systems
- Belt and Pulley Accessory Drives
- Starters and Alternators
- Exhaust Headers and Manifolds
- Mufflers
- SAE 3 Flywheel Housing and Direct Drives
- PTOs: Side Load and In-Line
- Instrument Panel w/Gauges and Safety Shutdowns
- Governors: Electronic and Mechanical
- Engine Mounting Frames and Enclosures
- Three Way Catalyst

Features & Benefits

- Three way catalyst and closed loop fuel system for EPA/CARB emission certified engines
- Designed for propane and natural gas fuel
- Intake manifold is standard on the engine
- Hydraulic roller lifter camshaft is optimized for maximum performance
- Composite front cover for noise reduction
- Nodular iron crankshaft for increased strength and durability
- High Energy Ignition (HEI) distributor and coil are standard
- Induction-hardened inlet valve seats and sintered powder metal exhaust valve seat inserts for maximum durability
- World-class engine sealing system uses composite cylinder head gasket with steel cores, a one piece main crankshaft seal, a one piece oil pan seal and molded rocker cover seals
- Positive inlet valve stem seals to control oil consumption
- Common GM Powertrain industrial engine rear face for easy housing installation



Main Office:
20 N. McCormick
Oklahoma City, OK 73127
405-601-1000

515 North I-27
Lubbock, TX 79403
806-762-0455

4452 Canyon Dr.
Amarillo, TX 79109
806-355-8228

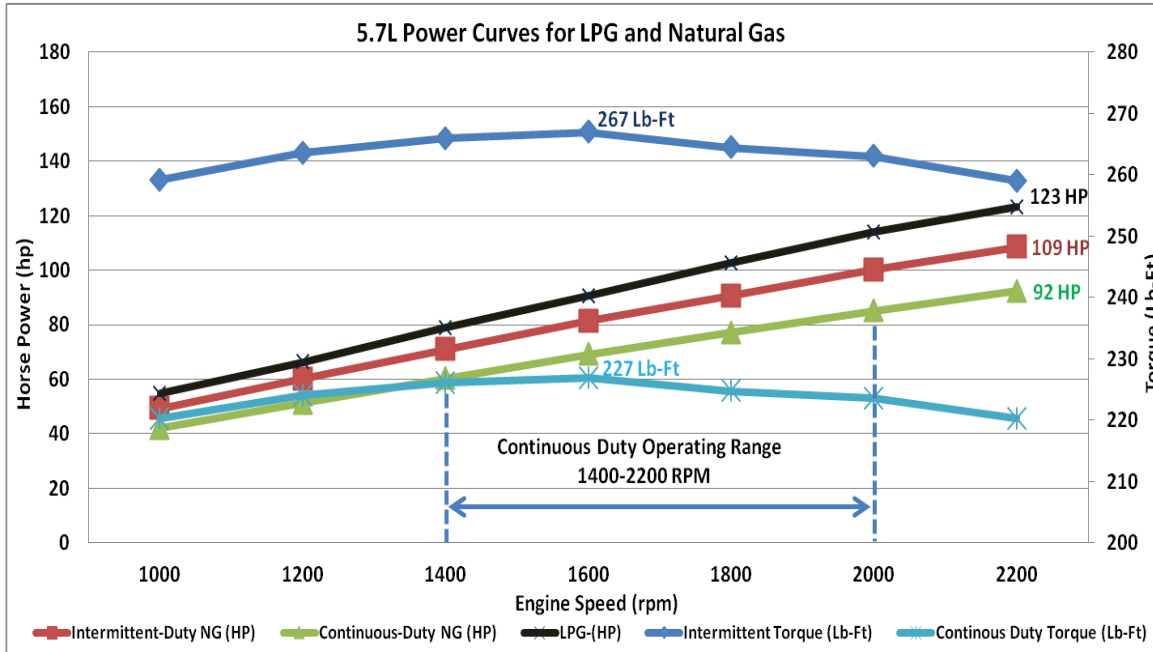
Buck's Engines combines over 50 years of engine application experience with General Motors' expertise in designing outstanding Vortec engines and utilizes this partnership to manufacture extremely durable industrial engines.



POWERTRAIN Industrial Engines



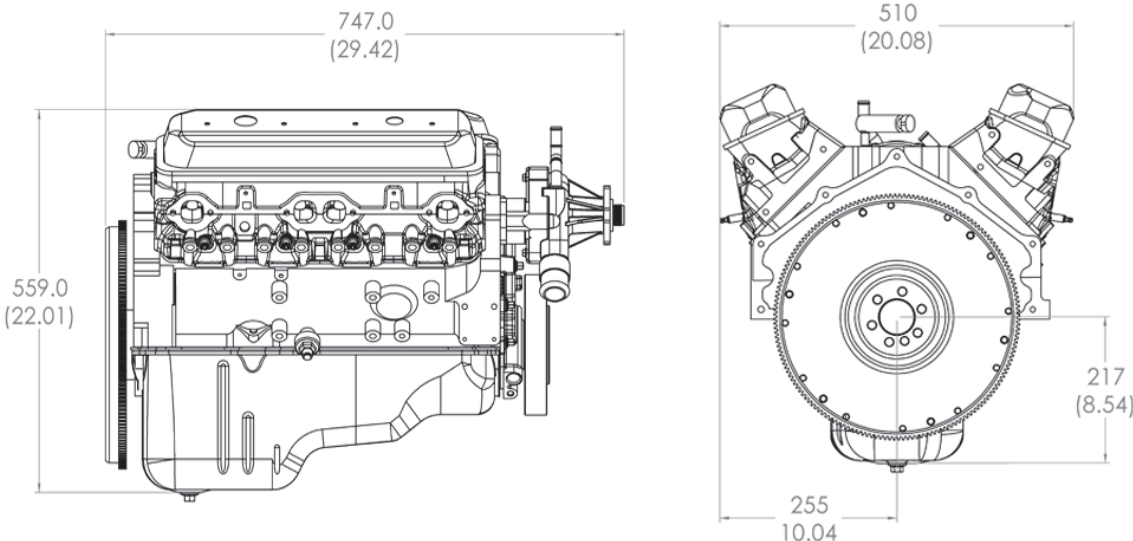
Vortec™ 5.7L 8 Cylinder – 350 Cubic Inches



Power and torque values provided by Buck's Engines per SAE1349. Actual power levels may vary depending on fuel selection and quality, calibration, application, altitude and ambient air temperatures.

CONTINUOUS BRAKE HORSEPOWER

GEARHEAD	1x1	6x5	5x4
ENGINE RPM	1760	2112	2200
BHP	73	87	92



Specifications and Materials

- **Type:** 90° 5.7L V8
- **Displacement:** 350 cld (5736 cc)
- **Compression Ratio:** 9.4:1
- **Valve Configuration:** Overhead/Pushrod Actuated
- **Valve Lifters:** Overhead/Pushrod Actuated
- **Bore x Stroke:** 4.00 x 3.48 in (101.60 x 88.39 mm)
- **Main Bearing Caps:** 2-Bolt
- **Balance Method:** External
- **Intake Manifold:** Four Barrel
- **Firing Order:** 1-8-4-3-6-5-7-2
- **Oil Pan Capacity:** 5 qt without oil filter
- **Fuel Type:** Propane or Natural Gas
- **Engine Rotation:** Clockwise (from the front)
- **Paint Protection:** Component Painted
- **Shipping Weight:** 434 lb (197 kg)
- **Block:** Cast Iron
- **Cylinder Head:** Cast Iron
- **Intake Manifold:** Cast Aluminum
- **Final Assembly:** Oklahoma City, OK USA

Information may vary by model and application. All specifications, options and product availability based upon the latest information available at time of publication. To ensure our customers have access to the highest quality products available we reserve the right to make product improvements and changes anytime without prior notice. GM and Vortec™ trademarks are property of General Motors Corporation. ©2010 10/10

Manufactured with US, North American and Global Sourced Content

MIRATECH Emissions Control Equipment Specification Summary

Proposal Number: TJ-12-2475

Engine Data

Number of Engines: 1
 Application: Gas Compression
 Engine Manufacturer: General Motors
 Model Number: Vortec 5.7L NA
 Power Output: 92 bhp
 Lubrication Oil: 0.6 wt% sulfated ash or less
 Type of Fuel: Natural Gas
 Exhaust Flow Rate: 650 acfm (cfm)
 Exhaust Temperature: 1,200°F

System Details

Housing Model Number: VXCI-1005-3.5-HSG
 Element Model Number: VX-RE-05XC
 Number of Catalyst Layers: 1
 Number of Spare Catalyst Layers: 1
 System Pressure Loss: 4.0 inches of WC (Fresh)
 Sound Attenuation: 28-32 dBA insertion loss
 Exhaust Temperature Limits: 750 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)

NSCR Housing & Catalyst Details

Model Number: VXCI-1005-3.5-XC1
 Material: Carbon Steel
 Inlet Pipe Size & Connection: 3.5 inch FF Flange, 150# ANSI standard bolt pattern
 Outlet Pipe Size & Connection: 3.5 inch FF Flange, 150# ANSI standard bolt pattern
 Overall Length: 43 inches
 Weight Without Catalyst: 98 lbs
 Weight Including Catalyst: 104 lbs
 Instrumentation Ports: 1 inlet/1 outlet (1/2" NPT)

Emission Requirements

Exhaust Gases	Engine Outputs (g/ bhp-hr)	Reduction (%)	Warranted Converter Outputs (g/ bhp-hr)	Requested Emissions Targets
NOx	14.00	93%	1.00	1 g/bhp-hr
CO	11.00	82%	2.00	2 g/bhp-hr
NMNEHC	0.40	0%	0.70	.7 g/bhp-hr
Oxygen	0.5%			

MIRATECH warrants the performance of the converter, as stated above, per the MIRATECH General Terms and Conditions of Sale.



EMIT Technologies, Inc
P.O. Box 6785
Sheridan, WY 82801
307-673-0883
307-673-0886 fax
cdosborn@emittechnologies.com

PREPARED FOR:

Fluid Compressor Partners

A. INFORMATION PROVIDED BY CUMMINS

Engine:	G855C188
DIM Sheet:	FR10523
Compression Ratio:	10.0:1
Load:	100%
RPM:	1800
Horsepower:	188
Fuel:	Natural Gas
Piping size:	5"
Annual Operating Hours:	8760
Exhaust Flow:	866 CFM
Exhaust Temperature:	1196 °F
Allowable Engine Backpressure:	27" WC

Emission Data

NO _x :	5.90	g/bhp-hr
CO:	26.70	g/bhp-hr
THC:	1.90	g/bhp-hr
Oxygen:	0.54	%

B. POST CATALYST EMISSIONS TO BE ACHIEVED BY EMISSION CONTROL EQUIPMENT

SINGLE ELEMENT PERFORMANCE

NO _x :	<1.0	g/bhp-hr
CO:	<1.0	g/bhp-hr
VOC:	<0.5	g/bhp-hr



Engine Performance Data

Cummins Inc

Columbus, Indiana 47202-3005
<http://www.cummins.com>

Industrial

G855

FR10523

188 BHP (140 kW) @ 1800 RPM
548 lb-ft (743 N-m) @ 1800 RPM

Configuration
D251006CX02

CPL Code
8749

Revision
15-Feb-2005

Compression Ratio: **10:1**

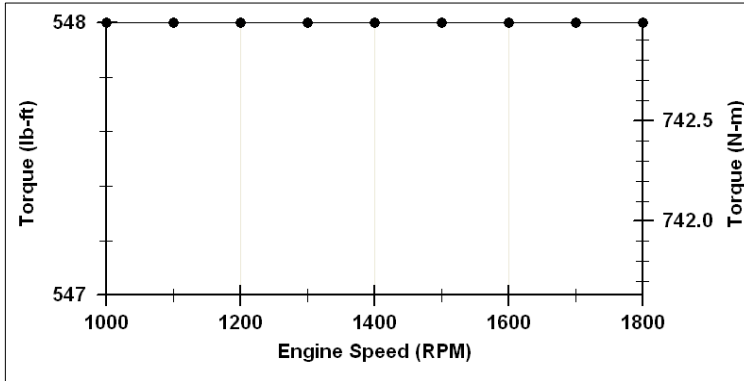
Displacement: **855 in3 (14.0 L)**

Fuel System: Catalyst or Standard, Dry Processed Gas and Field Gas Aspiration: **Naturally Aspirated**

Emission Certification: **Non-certified**

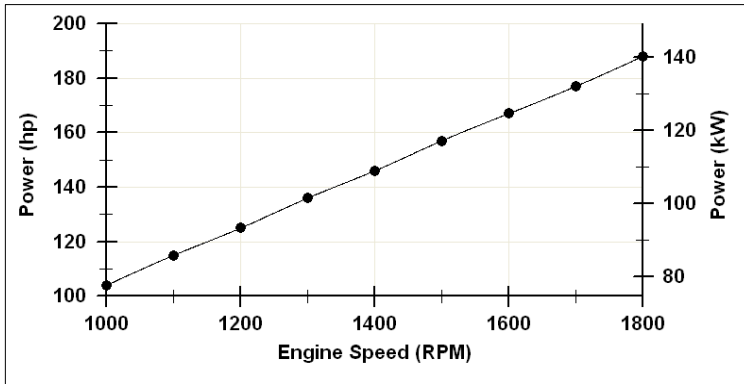
All data is based on the engine operating with fuel system, water pump, and 8 in H₂O (1.991 kPa) inlet air restriction with 5 in (127 mm) inner diameter, and with 1.1 in Hg (4 kPa) exhaust restriction with 4 in (102 mm) inner diameter; not included are alternator, fan, optional equipment and driven components. Coolant flows and heat rejection data based on coolants as 50% ethylene glycol/50% water. All data is subject to change without notice.

Rating Type: Continuous/WMR



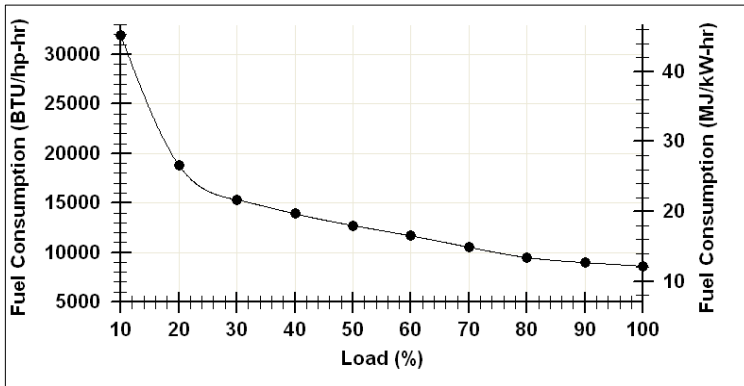
Torque Output

RPM	lb-ft	N-m
1,000	548	743
1,100	548	743
1,200	548	743
1,300	548	743
1,400	548	743
1,500	548	743
1,600	548	743
1,700	548	743
1,800	548	743



Power Output

RPM	hp	kW
1,000	104	78
1,100	115	86
1,200	125	93
1,300	136	101
1,400	146	109
1,500	157	117
1,600	167	125
1,700	177	132
1,800	188	140



Fuel Consumption @ 1,800 RPM

hp	kW	% Load	BTU/hp-hr	MJ/kW-hr
188	140	100	8,605	12.17
169	126	90	8,978	12.7
150	112	80	9,483	13.42
132	98	70	10,525	14.89
113	84	60	11,674	16.52
94	70	50	12,720	18
75	56	40	13,906	19.67
56	42	30	15,319	21.67
38	28	20	18,819	26.62
19	14	10	31,950	45.2

Data represents gross engine capabilities obtained and corrected in accordance with SAE J1995 and ISO 3046 conditions of 29.61 in Hg (100 kPa) barometric pressure [500 ft (152 m) altitude], 77 °F (25 °C) inlet air temperature and 0.30 in Hg (1 kPa) water vapor pressure using dry processed natural gas fuel with 930 BTU per standard cubic foot lower heating value. Deration may be required due to altitude, temperature and type of fuel. Consult Cummins Customer Engineering for operation above this altitude.

STATUS FOR CURVES AND DATA: Limited-(measured data)
TOLERANCE: Within +/- 5 %

CHIEF ENGINEER:
Alfred S Weber

Intake Air System

Maximum allowable air temperature rise over ambient at Intake Manifold
(Naturally Aspirated Engines) or Turbo Compressor inlet (Turbo-charged
Engines): (This parameter impacts emissions, LAT and/or altitude capability) 15 delta deg F 8.3 delta deg C

Exhaust System

Maximum exhaust back pressure: 2 in-Hg 6.8 kPa
Recommended exhaust piping size (inner diameter): 4 in 101.6 mm

Lubrication System

Nominal operating oil pressure
@ minimum low idle 15 psi 103 kPa
@ maximum rated speed 60 psi 414 kPa
Minimum engine oil pressure for engine protection devices
@ minimum low idle 15 psi 103 kPa

Fuel System

Maximum fuel inlet pressure: 20" H2O 5 kPa

Performance Data

Engine low idle speed: 900 RPM
Maximum low idle speed: 1,980 RPM
Minimum low idle speed: 850 RPM
Engine high idle speed 1,800 RPM
Governor break speed:
Maximum torque available at closed throttle low idle speed: 0 lb-ft 0 N-m

	100% Load		75% Load		50% Load	
Engine Speed	1,800 RPM		1,800 RPM		1,800 RPM	
Output Power	188 hp	140 kW	141 hp	105 kW	94 hp	70 kW
Torque	549 lb-ft	744 N-m	411 lb-ft	557 N-m	274 lb-ft	371 N-m
Intake Manifold Pressure	-1.5 in-Hg	-4.6 kPa	-4.2 in-Hg	-14 kPa	-6.7 in-Hg	-22 kPa
Turbo Comp. Outlet Pressure						
Turbo Comp. Outlet Temperature						
Inlet Air Flow	260 ft3/min	123 L/s	224 ft3/min	106 L/s	180 ft3/min	85 L/s
Charge Air Flow						
Exhaust Gas Flow	866 ft3/min	409 L/s	734 ft3/min	346 L/s	584 ft3/min	276 L/s
Exhaust Gas Temperature	1,196 deg F	647 deg C	1,154 deg F	623 deg C	1,115 deg F	602 deg C
Heat Rejection to Coolant	8,154 BTU/min	143.38 kW	7,412 BTU/min	130.33 kW	6,684 BTU/min	117.53 kW
Heat Rejection to Ambient	2,762 BTU/min	48.57 kW	3,135 BTU/min	55.13 kW	3,219 BTU/min	56.6 kW
Heat Rejection to Exhaust	5,674 BTU/min	99.77 kW	4,681 BTU/min	82.31 kW	3,627 BTU/min	63.78 kW
Fuel Consumption	8,605 BTU/hp-hr	12.174 MJ/kW-hr	9,870 BTU/hp-hr	13.964 MJ/kW-hr	12,720 BTU/hp-hr	17.996 MJ/kW-hr
Air Fuel Ratio (dry)	14.4 vol/vol		14.3 vol/vol		13.8 vol/vol	
Ignition timing (BTDC)	24 deg	24 deg	24 deg	24 deg	24 deg	24 deg
Total Hydrocarbons	1.9 g/hp-hr		2.5 g/hp-hr		3.4 g/hp-hr	
NonMethane Hydrocarbons						
NOx	5.9 g/hp-hr	7.91 g/kW-hr	2.9 g/hp-hr	3.89 g/kW-hr	1 g/hp-hr	1.34 g/kW-hr
CO	26.7 g/hp-hr	35.81 g/kW-hr	52.4 g/hp-hr	70.27 g/kW-hr	63.5 g/hp-hr	85.15 g/kW-hr
CO2	423 g/hp-hr	567 g/kW-hr	451 g/hp-hr	605 g/kW-hr	498 g/hp-hr	668 g/kW-hr
O2	0.54 %		0.47 %		0.49 %	

Cranking System (Cold Starting Capability)

Unaided Cold Start:
Minimum cranking speed: 150 RPM
Minimum ambient temperature
Cranking torque at minimum unaided cold start temperature: 375 lb-ft 508 N-m
Cold starting aids available None

ENGINE SPEED (rpm): 1400
 COMPRESSION RATIO: 8
 AFTERCOOLER TYPE: SCAC
 AFTERCOOLER - STAGE 2 INLET (°F): 130
 AFTERCOOLER - STAGE 1 INLET (°F): 201
 JACKET WATER OUTLET (°F): 210
 ASPIRATION: TA
 COOLING SYSTEM: JW+OC+1AC, 2AC
 CONTROL SYSTEM: ADEM3
 EXHAUST MANIFOLD: ASWC
 COMBUSTION: LOW EMISSION
 NOx EMISSION LEVEL (g/bhp-hr NOx): 0.5
 SET POINT TIMING: 29

RATING STRATEGY: STANDARD
 RATING LEVEL: CONTINUOUS
 FUEL SYSTEM: CAT WIDE RANGE
 WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:
 FUEL: Field Gas
 FUEL PRESSURE RANGE(psig): (See note 1) 7.0-40.0
 FUEL METHANE NUMBER: 62.1
 FUEL LHV (Btu/scf): 1027
 ALTITUDE(ft): 2800
 INLET AIR TEMPERATURE(°F): 105
 STANDARD RATED POWER: 1380 bhp@1400rpm

RATING	NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
			100%	100%	75%	50%
ENGINE POWER (WITHOUT FAN)	(2)	bhp	1380	1380	1035	690
INLET AIR TEMPERATURE		°F	105	105	105	105

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(3)	Btu/bhp-hr	7363	7363	7729	8308
FUEL CONSUMPTION (HHV)	(3)	Btu/bhp-hr	8136	8136	8540	9180
AIR FLOW (@inlet air temp, 14.7 psia)	(4)(5)	ft ³ /min	3297	3297	2519	1730
AIR FLOW (WET)	(4)(5)	lb/hr	13893	13893	10616	7290
FUEL FLOW (60°F, 14.7 psia)		scfm	165	165	130	93
INLET MANIFOLD PRESSURE	(6)	in Hg(abs)	88.8	88.8	70.6	48.6
EXHAUST TEMPERATURE - ENGINE OUTLET	(7)	°F	820	820	818	874
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(8)(5)	ft ³ /min	8028	8028	6136	4409
EXHAUST GAS MASS FLOW (WET)	(8)(5)	lb/hr	14381	14381	11001	7565

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(9)(10)	g/bhp-hr	0.50	0.50	0.50	0.50
CO	(9)(10)	g/bhp-hr	2.37	2.37	2.38	2.30
THC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	4.21	4.21	4.11	3.88
NMHC (mol. wt. of 15.84)	(9)(10)	g/bhp-hr	1.09	1.09	1.07	1.01
NMNEHC (VOCs) (mol. wt. of 15.84)	(9)(10)(11)	g/bhp-hr	0.73	0.73	0.72	0.68
HCHO (Formaldehyde)	(9)(10)	g/bhp-hr	0.41	0.41	0.39	0.38
CO2	(9)(10)	g/bhp-hr	475	475	497	537
EXHAUST OXYGEN	(9)(12)	% DRY	9.1	9.1	8.8	8.4

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(13)	Btu/min	36894	36894	31686	26397
HEAT REJ. TO ATMOSPHERE	(13)	Btu/min	5313	5313	4428	3543
HEAT REJ. TO LUBE OIL (OC)	(13)	Btu/min	4460	4460	3830	3191
HEAT REJ. TO A/C - STAGE 1 (1AC)	(13)(14)	Btu/min	11455	11455	8698	2354
HEAT REJ. TO A/C - STAGE 2 (2AC)	(13)(14)	Btu/min	5466	5466	4714	2893

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)	(14)(15)	Btu/min	57963
TOTAL AFTERCOOLER CIRCUIT (2AC)	(14)(15)	Btu/min	5739
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

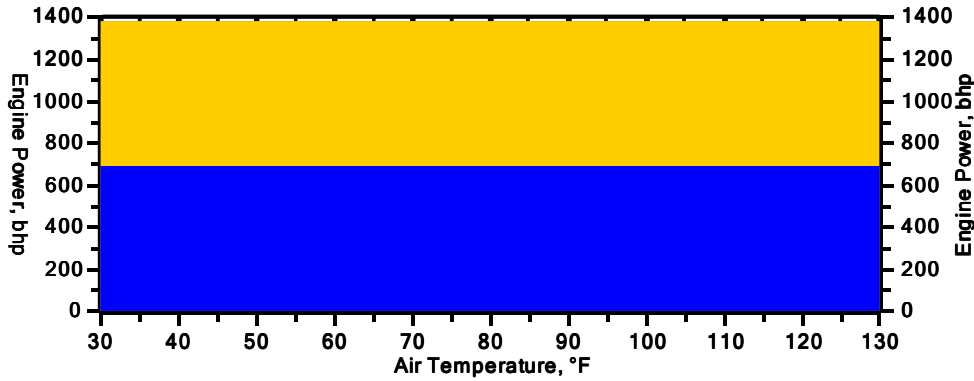
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.

Engine Power vs. Inlet Air Temperature

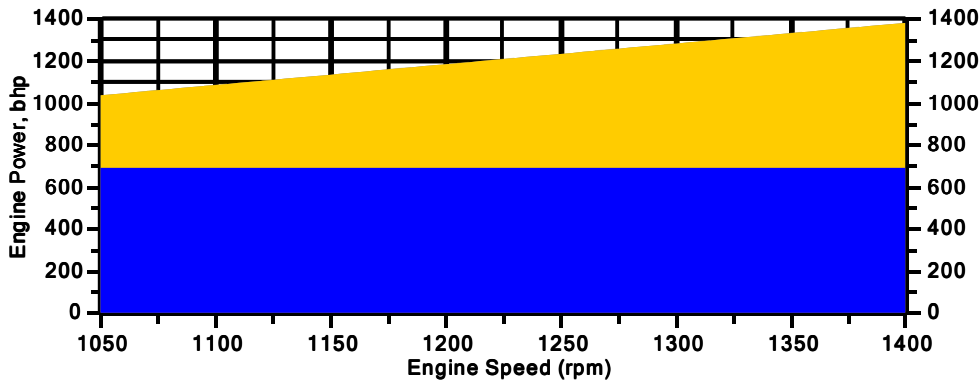
Data represents temperature sweep at 2800 ft and 1400 rpm



- No Rating Available Range for Site Conditions
- Continuous Operating Range for Site Conditions
- Low Load Intermittent Operating Range

Engine Power vs. Engine Speed

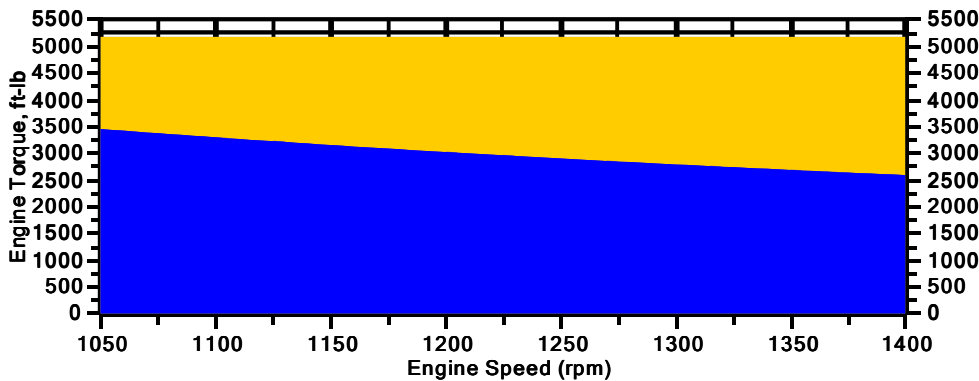
Data represents speed sweep at 2800 ft and 105 °F



- No Rating Available Range for Site Conditions
- Continuous Operating Range for Site Conditions
- Low Load Intermittent Operating Range

Engine Torque vs. Engine Speed

Data represents speed sweep at 2800 ft and 105 °F



- No Rating Available Range for Site Conditions
- Continuous Operating Range for Site Conditions
- Low Load Intermittent Operating Range

Note: At site conditions of 2800 ft and 105°F inlet air temp., constant torque can be maintained down to 1050 rpm. The minimum speed for loading at these conditions is 1050 rpm.

NOTES

1. Fuel pressure range specified is to the engine fuel pressure regulator. Additional fuel train components should be considered in pressure and flow calculations.
2. Engine rating is with two engine driven water pumps. Tolerance is $\pm 3\%$ of full load.
3. Fuel consumption tolerance is $\pm 3.0\%$ of full load data.
4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of $\pm 5\%$.
5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
6. Inlet manifold pressure is a nominal value with a tolerance of $\pm 5\%$.
7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of $\pm 6\%$.
9. Emissions data is at engine exhaust flange prior to any after treatment.
10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3 . THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5 .
13. Heat rejection values are nominal. Tolerances, based on treated water, are $\pm 10\%$ for jacket water circuit, $\pm 50\%$ for radiation, $\pm 20\%$ for lube oil circuit, and $\pm 5\%$ for aftercooler circuit.
14. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.
15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	2.5211	2.5211
Methane	CH4	86.6340	86.6340
Ethane	C2H6	4.9767	4.9767
Propane	C3H8	3.5670	3.5670
Isobutane	iso-C4H10	0.0000	0.0000
Norbutane	nor-C4H10	1.8211	1.8211
Isopentane	iso-C5H12	0.0000	0.0000
Norpentane	nor-C5H12	0.4802	0.4802
Hexane	C6H14	0.0000	0.0000
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	0.0000	0.0000
Carbon Dioxide	CO2	0.0000	0.0000
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup: Field Gas
Unit of Measure: English

Calculated Fuel Properties

Caterpillar Methane Number: 62.1
Lower Heating Value (Btu/scf): 1027
Higher Heating Value (Btu/scf): 1135
WOBBE Index (Btu/scf): 1274
THC: Free Inert Ratio: Not Applicable
Total % Inerts (% N2, CO2, He): 0%
RPC (%) (To 905 Btu/scf Fuel): 100%
Compressibility Factor: 0.997
Stoich A/F Ratio (Vol/Vol): 10.68
Stoich A/F Ratio (Mass/Mass): 16.43
Specific Gravity (Relative to Air): 0.650
Fuel Specific Heat Ratio (K): 1.297

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

ENGINE SPEED (rpm):	1400	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	APPLICATION:	GAS COMPRESSION
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	CONTINUOUS
AFTERCOOLER - STAGE 2 INLET (°F):	130	FUEL:	NAT GAS
AFTERCOOLER - STAGE 1 INLET (°F):	201	FUEL SYSTEM:	CAT WIDE RANGE
JACKET WATER OUTLET (°F):	203		WITH AIR FUEL RATIO CONTROL
ASPIRATION:	TA	FUEL PRESSURE RANGE(psig): (See note 1)	7.0-40.0
COOLING SYSTEM:	JW+OC+1AC, 2AC	FUEL METHANE NUMBER:	80
CONTROL SYSTEM:	ADEM3	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	DRY	ALTITUDE CAPABILITY AT 100°F INLET AIR TEMP. (ft):	5000
COMBUSTION:	LOW EMISSION		
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5		

RATING	NOTES	LOAD	100%	75%	50%
ENGINE POWER (WITHOUT FAN)	(2)	bhp	690	517	345
ENGINE EFFICIENCY (ISO 3046/1)	(3)	%	35.1	33.0	30.4
ENGINE EFFICIENCY (NOMINAL)	(3)	%	34.4	32.4	29.8

ENGINE DATA						
FUEL CONSUMPTION (ISO 3046/1)	(4)	Btu/bhp-hr	7254	7700	8373	
FUEL CONSUMPTION (NOMINAL)	(4)	Btu/bhp-hr	7395	7849	8535	
AIR FLOW (77°F, 14.7 psia) (WET)	(5) (6)	ft ³ /min	1595	1238	861	
AIR FLOW (WET)	(5) (6)	lb/hr	7073	5491	3817	
FUEL FLOW (60°F, 14.7 psia)		scfm	94	75	54	
COMPRESSOR OUT PRESSURE		in Hg(abs)	103.1	89.5	68.2	
COMPRESSOR OUT TEMPERATURE		°F	388	366	288	
AFTERCOOLER AIR OUT TEMPERATURE		°F	133	132	130	
INLET MAN. PRESSURE	(7)	in Hg(abs)	95.3	77.0	54.1	
INLET MAN. TEMPERATURE (MEASURED IN PLENUM)	(8)	°F	145	146	144	
TIMING	(9)	°BTDC	30	28	24	
EXHAUST TEMPERATURE - ENGINE OUTLET	(10)	°F	931	929	999	
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(11) (6)	ft ³ /min	4455	3458	2531	
EXHAUST GAS MASS FLOW (WET)	(11) (6)	lb/hr	7330	5695	3965	

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(12)(13)	g/bhp-hr	0.50	0.50	0.50	
CO	(12)(14)	g/bhp-hr	2.58	2.75	2.71	
THC (mol. wt. of 15.84)	(12)(14)	g/bhp-hr	5.49	5.81	5.59	
NMHC (mol. wt. of 15.84)	(12)(14)	g/bhp-hr	0.82	0.87	0.84	
NMNEHC (VOCs) (mol. wt. of 15.84)	(12)(14)(15)	g/bhp-hr	0.55	0.58	0.56	
HCHO (Formaldehyde)	(12)(14)	g/bhp-hr	0.42	0.46	0.48	
CO2	(12)(14)	g/bhp-hr	477	505	547	
EXHAUST OXYGEN	(12)(16)	% DRY	9.3	9.0	8.5	
LAMBDA	(12)(16)		1.72	1.68	1.61	

ENERGY BALANCE DATA						
LHV INPUT	(17)	Btu/min	85041	67697	49078	
HEAT REJECTION TO JACKET WATER (JW)	(18)(26)	Btu/min	10787	9234	8396	
HEAT REJECTION TO ATMOSPHERE	(19)	Btu/min	3498	2915	2332	
HEAT REJECTION TO LUBE OIL (OC)	(20)(26)	Btu/min	2650	2405	2103	
HEAT REJECTION TO EXHAUST (LHV TO 77°F)	(21)(22)	Btu/min	29952	23281	17446	
HEAT REJECTION TO EXHAUST (LHV TO 350°F)	(21)	Btu/min	19107	14809	11628	
HEAT REJECTION TO A/C - STAGE 1 (1AC)	(23)(26)	Btu/min	5012	4245	1561	
HEAT REJECTION TO A/C - STAGE 2 (2AC)	(24)(27)	Btu/min	3050	2840	1777	
PUMP POWER	(25)	Btu/min	833	833	833	

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	14	20	30	35	40	45	50	55	60	65	70	75	80	85
SET POINT TIMING	25	25	25	25	25	25	27	28	29	30	30	30	30	30
DERATION FACTOR	0.50	0.65	0.90	0.93	0.97	1	1	1	1	1	1	1	1	1

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °F	130	1	1	1	1	1	0.97	0.90	0.82	No Rating	No Rating	No Rating	No Rating	No Rating
	120	1	1	1	1	1	0.99	0.92	0.86	0.79	No Rating	No Rating	No Rating	No Rating
	110	1	1	1	1	1	0.99	0.94	0.88	0.83	0.77	No Rating	No Rating	No Rating
	100	1	1	1	1	1	1	0.95	0.90	0.85	0.80	0.75	No Rating	No Rating
	90	1	1	1	1	1	1	0.96	0.91	0.87	0.83	0.78	No Rating	No Rating
	80	1	1	1	1	1	1	0.99	0.94	0.90	0.85	0.81	0.76	No Rating
	70	1	1	1	1	1	1	1	0.95	0.91	0.86	0.82	0.77	No Rating
	60	1	1	1	1	1	1	1	0.95	0.91	0.86	0.82	0.77	No Rating
	50	1	1	1	1	1	1	1	0.95	0.91	0.86	0.82	0.77	No Rating
			0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °F	130	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.60	No Rating	No Rating	No Rating	No Rating	No Rating
	120	1.24	1.29	1.34	1.38	1.43	1.48	1.53	1.53	1.53	No Rating	No Rating	No Rating	No Rating
	110	1.18	1.23	1.27	1.32	1.37	1.42	1.47	1.47	1.47	1.47	No Rating	No Rating	No Rating
	100	1.12	1.16	1.21	1.26	1.30	1.35	1.40	1.40	1.40	1.40	1.40	No Rating	No Rating
	90	1.06	1.10	1.15	1.19	1.24	1.28	1.33	1.33	1.33	1.33	1.33	No Rating	No Rating
	80	1	1.04	1.08	1.13	1.17	1.22	1.27	1.27	1.27	1.27	1.27	1.27	No Rating
	70	1	1	1.02	1.06	1.11	1.15	1.20	1.20	1.20	1.20	1.20	1.20	No Rating
	60	1	1	1	1	1.04	1.09	1.13	1.13	1.13	1.13	1.13	1.13	No Rating
	50	1	1	1	1	1	1.02	1.07	1.07	1.07	1.07	1.07	1.07	No Rating
			0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000

ALTITUDE (FEET ABOVE SEA LEVEL)

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM)

INLET AIR TEMP °F	130	900	900	900	900	900	900	1020	1050	No Rating	No Rating	No Rating	No Rating	No Rating
	120	900	900	900	900	900	900	940	1000	1040	No Rating	No Rating	No Rating	No Rating
	110	900	900	900	900	900	900	910	970	1010	1050	No Rating	No Rating	No Rating
	100	900	900	900	900	900	900	900	950	990	1020	1050	No Rating	No Rating
	90	900	900	900	900	900	900	900	940	970	1000	1030	No Rating	No Rating
	80	900	900	900	900	900	900	900	930	960	990	1020	1050	No Rating
	70	900	900	900	900	900	900	900	930	960	990	1020	1040	No Rating
	60	900	900	900	900	900	900	900	930	960	990	1020	1040	No Rating
	50	900	900	900	900	900	900	900	930	960	990	1020	1040	No Rating
			0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor and full load set point timing required for a given fuel. Note that deration and set point timing adjustment may be required as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar methane number calculation.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site. The derate factors shown do not take into account external cooling system capacity. The derate factors provided assume the external cooling system can maintain the specified cooling water temperatures, at site conditions.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2).

- 1) Fuel Usage Guide Deration
- 2) $1 - ((1 - \text{Altitude/Temperature Deration}) + (1 - \text{RPC}))$

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for inlet air temp and altitude conditions. See notes 26 and 27 for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM):

This table shows the minimum allowable engine turndown speed where the engine will maintain the Rated Speed's Torque for the given ambient conditions. For some ambient conditions, the engine is not capable of being loaded continuously from idle to the max site torque at the indicated speed.

NOTES:

1. Fuel pressure range specified is to the engine fuel pressure regulator. Additional fuel train components should be considered in pressure and flow calculations.
2. Engine rating is with two engine driven water pumps. Tolerance is $\pm 3\%$ of full load.
3. ISO 3046/1 engine efficiency tolerance is $(+0, -)5\%$ of full load % efficiency value. Nominal engine efficiency tolerance is $\pm 3.0\%$ of full load % efficiency value.
4. ISO 3046/1 fuel consumption tolerance is $(+5, -)0\%$ of full load data. Nominal fuel consumption tolerance is $\pm 3.0\%$ of full load data.
5. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of $\pm 5\%$.
6. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
7. Inlet manifold pressure is a nominal value with a tolerance of $\pm 5\%$.
8. Inlet manifold temperature is a nominal value with a tolerance of $\pm 9^\circ\text{F}$.
9. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
10. Exhaust temperature is a nominal value with a tolerance of $(+63^\circ\text{F}, -)54^\circ\text{F}$.
11. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of $\pm 6\%$.
12. Emissions data is at engine exhaust flange prior to any after treatment.
13. NOx values are the maximum values expected under steady state conditions.
14. CO, CO₂, THC, NMHC, NMNEHC, and HCHO are the maximum values expected under steady state conditions. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
15. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
16. Exhaust Oxygen tolerance is ± 0.5 ; Lambda tolerance is ± 0.05 . Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
17. LHV rate tolerance is $\pm 3.0\%$.
18. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is $\pm 10\%$ of full load data.
19. Heat rejection to atmosphere based on treated water. Tolerance is $\pm 50\%$ of full load data.
20. Lube oil heat rate based on treated water. Tolerance is $\pm 20\%$ of full load data.
21. Exhaust heat rate based on treated water. Tolerance is $\pm 10\%$ of full load data.
22. Heat rejection to exhaust (LHV to 77°F) value shown includes unburned fuel and is not intended to be used for sizing or recovery calculations.
23. Heat rejection to A/C - Stage 1 based on treated water. Tolerance is $\pm 5\%$ of full load data.
24. Heat rejection to A/C - Stage 2 based on treated water. Tolerance is $\pm 5\%$ of full load data.
25. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
26. Total Jacket Water Circuit heat rejection is calculated as: $(\text{JW} \times 1.1) + (\text{OC} \times 1.2) + (1\text{AC} \times 1.05) + [0.85 \times (1\text{AC} + 2\text{AC}) \times (\text{ACHRF} - 1) \times 1.05]$. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
27. Total Second Stage Aftercooler Circuit heat rejection is calculated as: $(2\text{AC} \times 1.05) + [(1\text{AC} + 2\text{AC}) \times 0.15 \times (\text{ACHRF} - 1) \times 1.05]$. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

FREE FIELD MECHANICAL & EXHAUST NOISE

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	690	111.8	74.5	73.8	78.6	82.9	87.5	91.1	92.9	96.3	98.4	101.4
75	517	111.6	73.1	73.4	77.6	79.7	85.6	89.0	91.7	95.6	97.1	100.4
50	345	109.4	69.9	70.5	74.0	78.0	80.6	85.4	89.2	93.9	96.3	98.3

MECHANICAL: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	690	104.1	103.6	103.3	103.9	100.4	97.2	93.8	90.9	90.2	91.7	99.7
75	517	102.8	102.2	101.4	102.7	99.9	97.0	97.3	94.8	99.1	99.6	101.2
50	345	101.3	100.1	98.9	100.5	98.2	95.5	95.9	93.0	98.0	95.6	93.9

EXHAUST: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	Overall	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	690	120.1	88.8	93.5	98.8	97.9	100.3	98.7	100.8	103.6	108.4	114.5
75	517	115.5	86.5	89.9	94.6	94.9	97.9	98.6	99.1	100.7	107.9	107.9
50	345	111.3	86.4	91.2	95.3	94.9	98.7	97.9	99.2	98.0	100.6	103.3

EXHAUST: Sound Power (1/3 Octave Frequencies)

Percent Load	Engine Power	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
%	bhp	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
100	690	110.0	107.9	107.6	111.1	111.5	107.7	107.0	103.9	98.5	93.6	99.5
75	517	104.5	100.4	100.0	105.5	107.3	99.9	101.0	98.0	96.9	97.5	98.2
50	345	100.1	96.7	96.8	100.0	101.7	97.3	98.8	95.9	94.4	92.2	88.4

SOUND PARAMETER DEFINITION:

Sound Power Level Data - DM8702-03

Sound power is defined as the total sound energy emanating from a source irrespective of direction or distance. Sound power level data is presented under two index headings:

Sound power level -- Mechanical
Sound power level -- Exhaust

Mechanical: Sound power level data is calculated in accordance with ISO 3747. The data is recorded with the exhaust sound source isolated.

Exhaust: Sound power level data is calculated in accordance with ISO 6798 Annex A. Exhaust data is post-catalyst on gas engine ratings labeled as "Integrated Catalyst".

Measurements made in accordance with ISO 3747 and ISO 6798 for mechanical and exhaust sound level only. Frequency bands outside the displayed ranges are not measured, due to physical test, and environmental conditions that affect the accuracy of the measurement. No cooling system noise is included unless specifically indicated. Sound level data is indicative of noise levels recorded on one engine sample in a survey grade 3 environment.

How an engine is packaged, installed and the site acoustical environment will affect the site specific sound levels. For site specific sound level guarantees, sound data collection needs to be done on-site or under similar conditions.

ATTACHMENT G

Impacts Evaluation and Supporting Documentation

Ovintiv USA Inc
Davidson F42L

Impacts Analysis

Initial Screening

Air Contaminants	Screening Emission Rate (lb/hr)	Total Emission Rate (lb/hr)	Further Demonstration Required?	Nearest receptor (miles)	Nearest receptor (ft)	Screening Distance (miles)	Further Demonstration Required?
Benzene	0.039	1.34	Yes	>1	>5280	1.00	No
Hydrogen Sulfide	0.0250	0.0235	No	N/A	N/A	N/A	N/A
Sulfur Dioxide	2.0	0.99	No	N/A	N/A	N/A	N/A
Nitrogen Oxide	4.0	55.11	Yes	N/A	N/A	N/A	N/A

Ovintiv USA Inc
Davidson F42L
Impacts Analysis
SCREEN3 Modeling

EPN	FIN	Emission Source Name	Emission rates			Screen3 Input					Stack parameters					SCREEN3 Results [3]			
			NOx	NO ₂ /NOx ratio [1]	NO ₂	Heat Release	Stack Height	Stack Diameter	Stack Gas Exit		Heat Release	Stack Height	Stack Diameter	Stack Gas Exit		Distance to max	SCREEN3 Ghourly	NO ₂	
									Velocity (m/s)	Temp (K)				Flow [2] (cfm)	Temp (F)			μg/m ³	
lb/hr	lb/hr	lb/hr	cal/s	m	m	mm	mm	MMBtu/hr	ft	ft	mm	mm	m	(μg/m ³) / (lb/hr)	Normal				
ENG-1	ENG-1	VRU Engine - GM 5.7L	0.568	0.2	0.114		2.438	0.102	37.8	922.0		8.00	0.33	650	1,200	37	121	13.766	
ENG-2	ENG-2	VRU Engine - Cummins G855	0.207	0.2	0.041		2.438	0.102	50.4	919.0		8.00	0.33	866	1,195	41	99.60	4.128	
ENG-3	ENG-3	VRU Engine - Cummins G855	0.207	0.2	0.041		2.438	0.102	50.4	919.0		8.00	0.33	866	1,195	41	99.60	4.128	
ENG-4	ENG-4	Gas Lift Engine - Caterpillar G3516J	3.042	0.2	0.608		6.096	0.406	29.2	710.9		20.00	1.33	8,028	820	147	7.53	4.582	
ENG-5	ENG-5	Gas Lift Engine - Caterpillar G3508J	1.521	0.2	0.304		4.572	0.254	41.5	772.6		15.00	0.83	4,455	931	98	15.98	4.862	
H-1	H-1	Heater Treater 1	0.066	0.8	0.053		6.096	0.152	7.6	755.4	0.68	20.00	0.50	294	900	105	93.83	4.965	
H-2	H-2	Heater Treater 2	0.196	0.8	0.157		6.096	0.152	22.5	755.4	2.00	20.00	0.50	870	900	111	42.09	6.600	
H-3	H-3	Heater Treater 3	0.098	0.8	0.078		6.096	0.152	11.3	755.4	1.00	20.00	0.50	435	900	120	72.13	5.655	
H-4	H-4	Heater Treater 4	0.098	0.8	0.078		6.096	0.152	11.3	755.4	1.00	20.00	0.50	435	900	120	72.13	5.655	
FLR-01	FLR-01	Flare Pilot	0.011	0.8	0.009	16,005,673	24.384					228.504	80.00				1,157	0.14	0.001
		Combustion Products from Produced Gas	31.522	0.8	25.218														3.452
		PROD-GAS Produced Gas	--	--	--														--
FLR-02	FLR-02	Flare Pilot	0.011	0.8	0.009	6,115,342	15.240					87.305	50.00				944	0.28	0.003
		Combustion Products from Controlled Tanks	12.037	0.8	9.629														2.665
		TK-6010, TK-6020, TK-5010, TK-5020 Controlled Tanks	--	--	--														--
FLR-03	FLR-03	Flare Pilot	0.011	0.8	0.009	2,802,125	15.240					40.00432	50.00				851	0.57	0.001
		Combustion Products from Produced Gas	5.509	0.8	4.407														0.603
		PROD-GAS Produced Gas	--	--	--														--
																	Project Impacts (μg/m³)	61.068	
																	Background (μg/m³)	70	
																	Total Impacts (μg/m³)	131.068	
																	Applicable Standard (μg/m³)	188	
																	Pass?	Yes	

Notes:

[1] NO₂ to NOx conversion factors determined in accordance with the TCEQ APDG 6232v2 Air Quality Modeling Guidelines (04/2015), and with paragraph (k)(4)(A) of 30 TAC §(k)(4)(A) of 30 TAC §116.602 – NON RULE 2012-NOV-08 for engines.

[2] Stack Gas Flow Rate was determined using the following formula: $Q = F_d \cdot [20.9 / (20.9 - \%O_2)] \cdot H_{in} / 60$, where F_d = Fuel factor, dry basis (from EPA Method 19) in dscf/MMBtu; $\%O_2$ = Measured oxygen concentration, dry basis expressed as a percentage; and H_{in} = Heat input rate in MMBtu/hr (Preferred and Alternative Methods for Estimating Air Emissions from Boilers, EPA, January 2001, Volume II, Chapter 2).

[3] Each EPN was modeled in SCREEN3 using a unit emission rate of 1 lb/hr (0.126 g/s). The Screen3 generic impact, Ghourly (μg/m³) / (lb/hr) was determined for each EPN. Emission rate from each source was multiplied by Ghourly. All maximum impacts were summed for each pollutant and evaluated against the appropriate NAAQS.

NO	500.	45.36	4	1.0	1.0	320.0	13.82	36.21	18.43
NO	600.	35.64	4	1.0	1.0	320.0	13.82	42.77	21.33
NO	700.	28.64	4	1.0	1.0	320.0	13.82	49.24	24.14
NO	800.	26.28	6	1.0	1.0	10000.0	21.77	28.00	12.79
NO	900.	26.72	6	1.0	1.0	10000.0	21.77	31.10	13.73
NO	1000.	26.55	6	1.0	1.0	10000.0	21.77	34.18	14.65

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 105. 93.83 3 1.5 1.5 480.0 11.25 13.23 7.99

NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 93.83	----- 105.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

07/21/23

11:55:08

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

HTR 2.0 MMBtu/hr

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.126000
STACK HEIGHT (M)	=	6.1000
STK INSIDE DIAM (M)	=	0.1520
STK EXIT VELOCITY (M/S)	=	22.5000
STK GAS EXIT TEMP (K)	=	755.4000
AMBIENT AIR TEMP (K)	=	308.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.755 M**4/S**3; MOM. FLUX = 1.192 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
1.	0.000	1	1.0	1.0	320.0	23.45	0.93	0.86
100.	41.57	3	3.5	3.5	1120.0	11.06	12.54	7.58
200.	38.47	4	3.0	3.0	960.0	11.88	15.65	8.66
300.	34.89	4	2.0	2.0	640.0	14.77	22.75	12.34
400.	30.47	4	1.5	1.5	480.0	17.67	29.64	15.62

NO

NO	500.	26.98	4	1.0	1.0	320.0	23.45	36.48	18.96
NO	600.	23.99	4	1.0	1.0	320.0	23.45	43.00	21.78
NO	700.	20.94	4	1.0	1.0	320.0	23.45	49.44	24.54
NO	800.	18.22	4	1.0	1.0	320.0	23.45	55.79	27.24
NO	900.	15.89	4	1.0	1.0	320.0	23.45	62.08	29.88
NO	1000.	13.93	4	1.0	1.0	320.0	23.45	68.31	32.47

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 111. 42.09 3 3.0 3.0 960.0 11.88 13.94 8.42

NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 42.09	----- 111.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

04/12/23

10:18:22

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

1.0 MMBtu/hr HTR

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.126000
STACK HEIGHT (M)	=	6.1000
STK INSIDE DIAM (M)	=	0.1500
STK EXIT VELOCITY (M/S)	=	11.2600
STK GAS EXIT TEMP (K)	=	755.3700
AMBIENT AIR TEMP (K)	=	308.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.368 M**4/S**3; MOM. FLUX = 0.291 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

	DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
DWASH									
NO	1.	0.000	1	1.0	1.0	320.0	16.22	0.64	0.52
NO	100.	71.35	3	2.0	2.0	640.0	11.16	12.55	7.58
NO	200.	66.01	4	1.5	1.5	480.0	12.85	15.68	8.72
NO	300.	60.43	4	1.0	1.0	320.0	16.22	22.79	12.43
NO	400.	50.58	4	1.0	1.0	320.0	16.22	29.60	15.54

4000.	7.997	6	1.0	1.0	10000.0	24.07	119.28	31.26
NO								
4500.	7.028	6	1.0	1.0	10000.0	24.07	132.60	32.97
NO								
5000.	6.244	6	1.0	1.0	10000.0	24.07	145.76	34.59
NO								

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 120. 72.13 3 1.5 1.5 480.0 12.85 14.99 9.07
 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 72.13	----- 120.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

4000.	8.026	6	1.0	1.0	10000.0	23.81	119.33	31.44
NO								
4500.	7.048	6	1.0	1.0	10000.0	23.81	132.64	33.14
NO								
5000.	6.260	6	1.0	1.0	10000.0	23.81	145.80	34.75
NO								

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 37. 121.2 3 8.0 8.0 2560.0 4.31 5.11 3.12

NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 121.2	----- 37.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	500.	31.47	4	1.0	1.0	320.0	20.96	36.53	19.05
NO	600.	26.92	4	1.0	1.0	320.0	20.96	43.04	21.86
NO	700.	22.92	4	1.0	1.0	320.0	20.96	49.47	24.61
NO	800.	19.60	4	1.0	1.0	320.0	20.96	55.82	27.30
NO	900.	18.03	6	1.0	1.0	10000.0	25.94	31.50	14.62
NO	1000.	18.42	6	1.0	1.0	10000.0	25.94	34.54	15.48
NO	1100.	18.40	6	1.0	1.0	10000.0	25.94	37.57	16.27
NO	1200.	18.20	6	1.0	1.0	10000.0	25.94	40.57	17.04
NO	1300.	17.87	6	1.0	1.0	10000.0	25.94	43.56	17.79
NO	1400.	17.45	6	1.0	1.0	10000.0	25.94	46.53	18.52
NO	1500.	16.97	6	1.0	1.0	10000.0	25.94	49.49	19.24
NO	1600.	16.46	6	1.0	1.0	10000.0	25.94	52.43	19.95
NO	1700.	15.93	6	1.0	1.0	10000.0	25.94	55.35	20.64
NO	1800.	15.40	6	1.0	1.0	10000.0	25.94	58.26	21.32
NO	1900.	14.87	6	1.0	1.0	10000.0	25.94	61.15	21.99
NO	2000.	14.35	6	1.0	1.0	10000.0	25.94	64.03	22.65
NO	2100.	13.83	6	1.0	1.0	10000.0	25.94	66.89	23.20
NO	2200.	13.33	6	1.0	1.0	10000.0	25.94	69.75	23.75
NO	2300.	12.86	6	1.0	1.0	10000.0	25.94	72.59	24.29
NO	2400.	12.41	6	1.0	1.0	10000.0	25.94	75.42	24.81
NO	2500.	11.98	6	1.0	1.0	10000.0	25.94	78.24	25.33
NO	2600.	11.57	6	1.0	1.0	10000.0	25.94	81.04	25.84
NO	2700.	11.18	6	1.0	1.0	10000.0	25.94	83.84	26.34
NO	2800.	10.81	6	1.0	1.0	10000.0	25.94	86.63	26.83
NO	2900.	10.46	6	1.0	1.0	10000.0	25.94	89.40	27.32
NO	3000.	10.13	6	1.0	1.0	10000.0	25.94	92.17	27.80
NO	3500.	8.706	6	1.0	1.0	10000.0	25.94	105.87	29.75

	4000.	7.594	6	1.0	1.0	10000.0	25.94	119.36	31.56
NO									
	4500.	6.705	6	1.0	1.0	10000.0	25.94	132.67	33.26
NO									
	5000.	5.981	6	1.0	1.0	10000.0	25.94	145.83	34.86
NO									

	MAXIMUM 1-HR CONCENTRATION AT OR BEYOND					1. M:			
	41.	99.60	3	8.0	8.0	2560.0	4.75	5.62	3.43

NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
-----	-----	-----	-----
SIMPLE TERRAIN	99.60	41.	0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	500.	4.975	4	5.0	5.0	1600.0	24.70	36.53	19.05
NO	600.	4.503	4	5.0	5.0	1600.0	24.70	43.05	21.87
NO	700.	4.053	4	4.0	4.0	1280.0	29.35	49.63	24.94
NO	800.	3.688	4	4.0	4.0	1280.0	29.35	55.97	27.59
NO	900.	3.395	4	3.5	3.5	1120.0	32.67	62.35	30.43
NO	1000.	3.142	4	3.0	3.0	960.0	37.09	68.70	33.29

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 147. 7.531 3 10.0 10.0 3200.0 15.40 18.07 10.93
 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 7.531	----- 147.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	500.	8.593	4	3.5	3.5	1120.0	21.72	36.48	18.94
NO	600.	7.551	4	3.0	3.0	960.0	24.58	43.10	21.97
NO	700.	6.721	4	2.5	2.5	800.0	28.58	49.66	24.99
NO	800.	6.073	4	2.5	2.5	800.0	28.58	56.00	27.65
NO	900.	5.543	4	2.0	2.0	640.0	34.59	62.47	30.69
NO	1000.	5.113	4	2.0	2.0	640.0	34.59	68.66	33.22

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 98. 15.98 3 10.0 10.0 3200.0 10.57 12.44 7.53
 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 15.98	----- 98.	----- 0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	600.	0.4094E-01	1	3.0	3.3	960.0	372.17	147.29	166.54
NO	700.	0.8204E-01	1	3.0	3.3	960.0	372.17	167.81	224.66
NO	800.	0.9895E-01	1	3.0	3.3	960.0	372.17	187.90	293.29
NO	900.	0.1106	1	2.0	2.2	640.0	539.74	227.54	384.02
NO	1000.	0.1273	1	2.0	2.2	640.0	539.74	248.03	473.22
NO	1100.	0.1359	1	1.5	1.6	708.3	707.30	296.28	587.03
NO	1200.	0.1364	1	1.5	1.6	708.3	707.30	311.01	694.51
NO	1300.	0.1323	1	1.5	1.6	708.3	707.30	325.28	813.69
NO	1400.	0.1270	1	1.5	1.6	708.3	707.30	339.74	944.75
NO	1500.	0.1218	1	1.5	1.6	708.3	707.30	354.35	1087.59
NO	1600.	0.1170	1	1.5	1.6	708.3	707.30	369.09	1242.16
NO	1700.	0.1124	1	1.5	1.6	708.3	707.30	383.91	1408.42
NO	1800.	0.1082	1	1.5	1.6	708.3	707.30	398.81	1586.39
NO	1900.	0.1043	1	1.5	1.6	708.3	707.30	413.77	1776.08
NO	2000.	0.1007	1	1.5	1.6	708.3	707.30	428.76	1977.51
NO	2100.	0.9727E-01	1	1.5	1.6	708.3	707.30	443.78	2190.72
NO	2200.	0.9408E-01	1	1.5	1.6	708.3	707.30	458.82	2415.76
NO	2300.	0.9110E-01	1	1.5	1.6	708.3	707.30	473.86	2652.65
NO	2400.	0.8829E-01	1	1.5	1.6	708.3	707.30	488.91	2901.45
NO	2500.	0.8566E-01	1	1.5	1.6	708.3	707.30	503.95	3162.20
NO	2600.	0.8318E-01	1	1.5	1.6	708.3	707.30	518.99	3434.95
NO	2700.	0.8084E-01	1	1.5	1.6	708.3	707.30	534.01	3719.75
NO	2800.	0.7863E-01	1	1.5	1.6	708.3	707.30	549.01	4016.62
NO	2900.	0.7654E-01	1	1.5	1.6	708.3	707.30	563.99	4325.64
NO	3000.	0.7456E-01	1	1.5	1.6	708.3	707.30	578.96	4646.83

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 1157. 0.1369 1 1.5 1.6 708.3 707.30 304.81 645.88
 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, $X < 3 \cdot LB$

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 0.1369	----- 1157.	----- 0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	600.	0.2226	1	3.0	3.2	960.0	217.63	141.16	161.14
NO	700.	0.2388	3	10.0	10.9	3200.0	80.10	76.08	46.75
NO	800.	0.2555	3	10.0	10.9	3200.0	80.10	85.70	52.43
NO	900.	0.2742	1	1.5	1.6	480.0	412.02	220.25	379.74
NO	1000.	0.2737	1	1.5	1.6	480.0	412.02	236.43	467.25
NO	1100.	0.2709	1	1.0	1.1	607.4	606.41	281.58	579.76
NO	1200.	0.2623	1	1.0	1.1	607.4	606.41	296.34	688.07
NO	1300.	0.2505	1	1.0	1.1	607.4	606.41	311.28	808.20
NO	1400.	0.2390	1	1.0	1.1	607.4	606.41	326.37	940.02
NO	1500.	0.2284	1	1.0	1.1	607.4	606.41	341.55	1083.49
NO	1600.	0.2186	1	1.0	1.1	607.4	606.41	356.81	1238.56
NO	1700.	0.2096	1	1.0	1.1	607.4	606.41	372.13	1405.25
NO	1800.	0.2013	1	1.0	1.1	607.4	606.41	387.48	1583.58
NO	1900.	0.1936	1	1.0	1.1	607.4	606.41	402.86	1773.57
NO	2000.	0.1866	4	15.0	17.0	4800.0	58.51	128.36	51.22
NO	2100.	0.1800	4	15.0	17.0	4800.0	58.51	134.13	52.78
NO	2200.	0.1737	1	1.0	1.1	607.4	606.41	449.00	2413.91
NO	2300.	0.1680	1	1.0	1.1	607.4	606.41	464.37	2650.97
NO	2400.	0.1647	4	10.0	11.3	3200.0	77.75	151.71	58.51
NO	2500.	0.1616	4	10.0	11.3	3200.0	77.75	157.36	59.96
NO	2600.	0.1584	4	10.0	11.3	3200.0	77.75	162.99	61.39
NO	2700.	0.1551	4	10.0	11.3	3200.0	77.75	168.60	62.81
NO	2800.	0.1518	4	10.0	11.3	3200.0	77.75	174.18	64.20
NO	2900.	0.1485	4	10.0	11.3	3200.0	77.75	179.75	65.59
NO	3000.	0.1452	4	10.0	11.3	3200.0	77.75	185.29	66.95

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
944. 0.2768 1 1.5 1.6 480.0 412.02 227.51 417.68
NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, $X < 3 \cdot LB$

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 0.2768	----- 944.	----- 0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

NO	600.	0.5258	3	10.0	10.8	3200.0	56.19	65.50	39.63
NO	700.	0.5071	3	10.0	10.8	3200.0	56.19	75.18	45.27
NO	800.	0.5617	1	1.0	1.1	384.0	383.03	200.23	301.34
NO	900.	0.5647	1	1.0	1.1	384.0	383.03	216.53	377.59
NO	1000.	0.5331	1	1.0	1.1	384.0	383.03	232.96	465.50
NO	1100.	0.4985	1	1.0	1.1	384.0	383.03	249.48	564.86
NO	1200.	0.4675	1	1.0	1.1	384.0	383.03	266.03	675.56
NO	1300.	0.4401	1	1.0	1.1	384.0	383.03	282.58	797.58
NO	1400.	0.4158	1	1.0	1.1	384.0	383.03	299.11	930.91
NO	1500.	0.3941	1	1.0	1.1	384.0	383.03	315.61	1075.59
NO	1600.	0.3745	1	1.0	1.1	384.0	383.03	332.06	1231.66
NO	1700.	0.3569	1	1.0	1.1	384.0	383.03	348.47	1399.18
NO	1800.	0.3409	1	1.0	1.1	384.0	383.03	364.82	1578.19
NO	1900.	0.3273	4	8.0	8.9	2560.0	63.46	122.74	50.03
NO	2000.	0.3181	4	8.0	8.9	2560.0	63.46	128.52	51.62
NO	2100.	0.3220	2	1.0	1.1	384.0	383.03	315.88	267.51
NO	2200.	0.3239	2	1.0	1.1	384.0	383.03	327.78	279.47
NO	2300.	0.3236	2	1.0	1.1	384.0	383.03	339.66	291.56
NO	2400.	0.3216	2	1.0	1.1	384.0	383.03	351.52	303.77
NO	2500.	0.3181	2	1.0	1.1	384.0	383.03	363.35	316.10
NO	2600.	0.3136	2	1.0	1.1	384.0	383.03	375.16	328.54
NO	2700.	0.3083	2	1.0	1.1	384.0	383.03	386.94	341.08
NO	2800.	0.3025	2	1.0	1.1	384.0	383.03	398.69	353.70
NO	2900.	0.2963	2	1.0	1.1	384.0	383.03	410.41	366.42
NO	3000.	0.2899	2	1.0	1.1	384.0	383.03	422.11	379.21

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

NO	851.	0.5708	1	1.0	1.1	384.0	383.03	208.68	339.52
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DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, $X < 3 \cdot LB$

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	----- 0.5708	----- 851.	----- 0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
