Comparative Quantitative Risk Assessment
For Transportation of Crude Oil

Associated with the

SENTINEL PEAK RESOURCES

Lompoc Facility Loading Rack Installation Project

Prepared For
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1.0 Introduction

The Project includes construction of a new truck loading rack and associated infrastructure on a Lompoc Oil Field existing production pad located immediately adjacent to the Lompoc Oil and Gas Production Facility on Harris Grade Road. The proposed truck loading rack would connect to the existing Sentinel Peak Resources 4" Oil Shipping Line. The production shipped through the proposed truck rack would be under the ownership of Sentinel Peak Resources. The Applicant does not anticipate any increase in the throughput of oil, water, and gas following the installation of the truck loading rack.

The oil will be shipped from the Lompoc Oil Field truck rack to the Coalinga Station at 37509 Oil City Road, Coalinga CA where it will be unloaded and shipped via existing pipeline systems. The proposed truck route includes the following sections:

- The Lompoc Oil Field to Harris Grade Road,
- Harris Grade Road to Hwy 1,
- Hwy 1 to Hwy 135,
- Hwy 135 to Betteravia Road,
- Betteravia Road to Hwy 101.
- Hwy 101 to Hwy 46,
- Hwy 46 to Hwy 41,
- Hwy 41 to Hwy 33,
- Hwy 33 to Coalinga,

The trucking route is shown in the Project Description section. The approximate distance of the truck route would be 165 miles. The Applicant proposes to ship up to 2,000 truckloads per year (an average of about 5 to 6 trucks per day).

Historical operation has included production and shipping of the crude oil via the pipeline 300 system, which connects the LOGP to the Santa Maria Refinery (SMR). The SMR stopped processing crude oil in January 2023, and the Lompoc Oil Field and adjacent LOGP has been shut in since that time. The Applicant is proposing to ship crude oil via truck instead of the historical method of pipeline, since the pipeline is no longer available.

The pipeline 300 system follows the approximate route listed below:

- From the LOGP, due north over the hills to the Hwy 135,
- Follows the Hwy 135 to the Orcutt Pump Station,
- Continues north along Broadway Street/California Blvd to under the Airport,
- Continues north along Depot Road to the Suey Junction at Battle Road (where a pipeline connects from the Santa Maria Pump Station),
- It the continues north paralleling Depot Road and Railroad Ave to the Santa Maria River,
- It crosses the Santa Maria River and travels to the north side of the 101 Freeway,

- It continues in a northeasterly direction along Thompson Ave when it crosses under the 101 Freeway at Thompson Ave,
- It then connects to the Summit Pump Station along Los Berros Road and Dale Ave,
- It then leaves the Summit Pump Station and heads west to Applegate Way,
- South on Applegate way to past Chesapeake, when it angles to Guadalupe Road,
- It the heads south on Guadalupe Road and crosses under Highway 1, and
- It then heads west and connects to the SMR.

Figure 1 shows the pipeline route. Total pipeline length is about 32 miles. The pipeline is 12 inches in diameter to Highway 135, 8 inches to Suey Junction, 12 inches to Summit Pump Station and then 10 inches to the SMR. The LOGP to Orcutt section was built in 1986 (37 years old), the Orcutt to Suey Junction was built in 1953 (70 years old), the Suey to Summit Pump Station was built in sections between 1941 and 1993 (30-82 year old), and the Summit to SMR section was built in 1977 (46 years old).

Attachment 1 includes the tables used to estimate the pipeline risk. Attachment 2 includes tables used to estimate the trucking risk. Attachment 3 includes the results of the Canary© modeling for spills and subsequent impacts.

2.0 Methodology

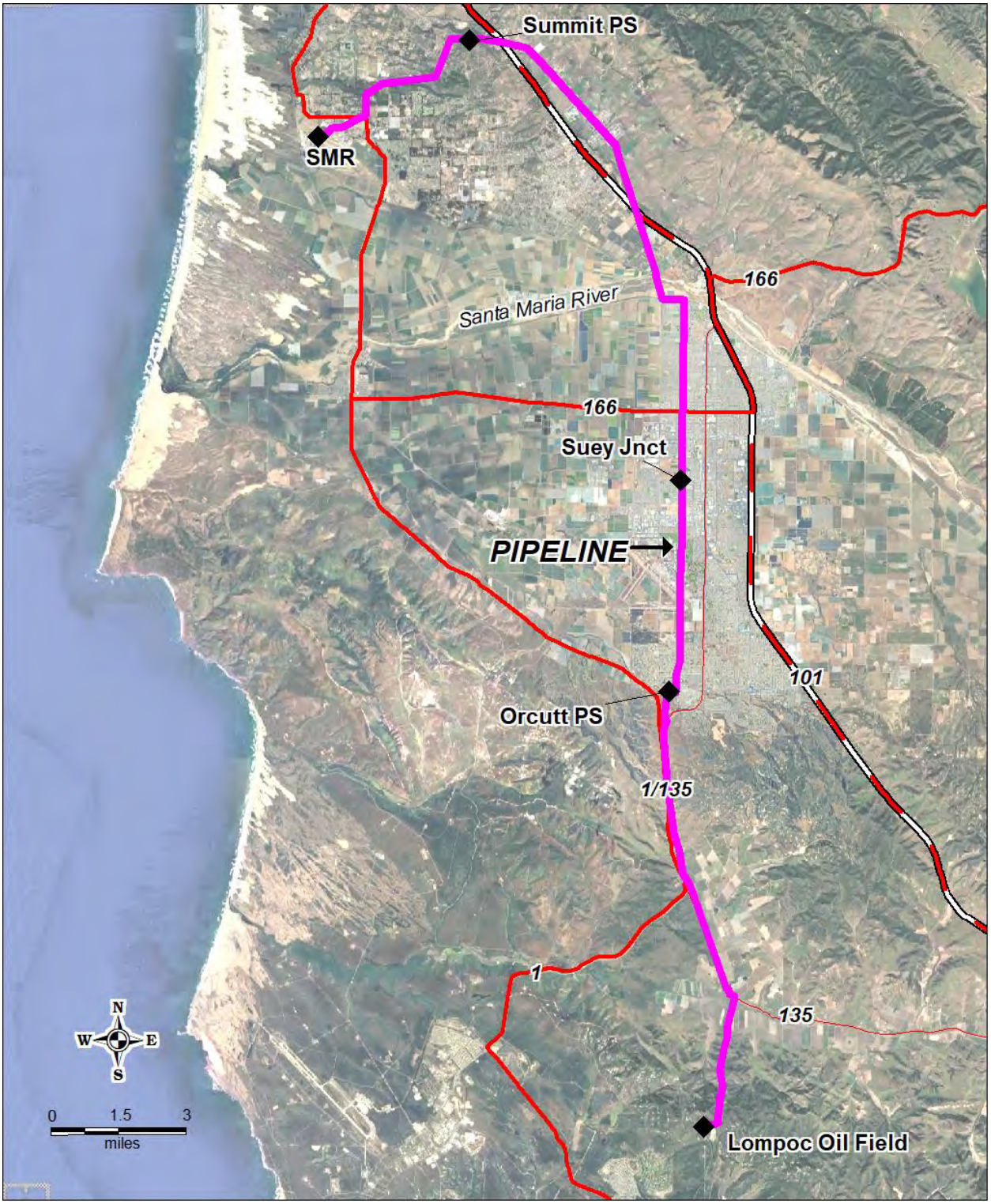
The proposed Project would contribute to potentially hazardous activities in the area (transportation of crude oil by truck). The analysis evaluates the potential changes in risk associated with the proposed activities over the historical baseline pipeline operations. The baseline operations are assumed to include the operating pipeline, which also presented risks to people and the environment.

As the baseline includes the operation of the pipeline 300 system used to transport the crude oil to the SMR, this baseline risk level was evaluated and then compared with the proposed trucking operations. The baseline pipeline risk and the proposed trucking risk were evaluated following the methodology used for past pipeline projects in Santa Barbara County. This approach was used to allow for the direct comparison of FN curves between the two modes of transportation.

Data from past analysis, such as the ExxonMobil Trucking Project EIR (SBC 2021) risk assessment and the East Cat Canyon Oil Field Development Project (Aera 2017) for trucking, and United States Pipeline and Hazardous Materials Safety Administration (PHMSA) data and historical operations for the pipeline, were utilized in estimating the risk levels from the proposed trucking and historical pipeline activities.

The risk analysis looked at both public safety risk as well as environmental risk. Each of these is discussed below.

Figure 1 Pipeline Route



Source: Google Earth Pro 2023

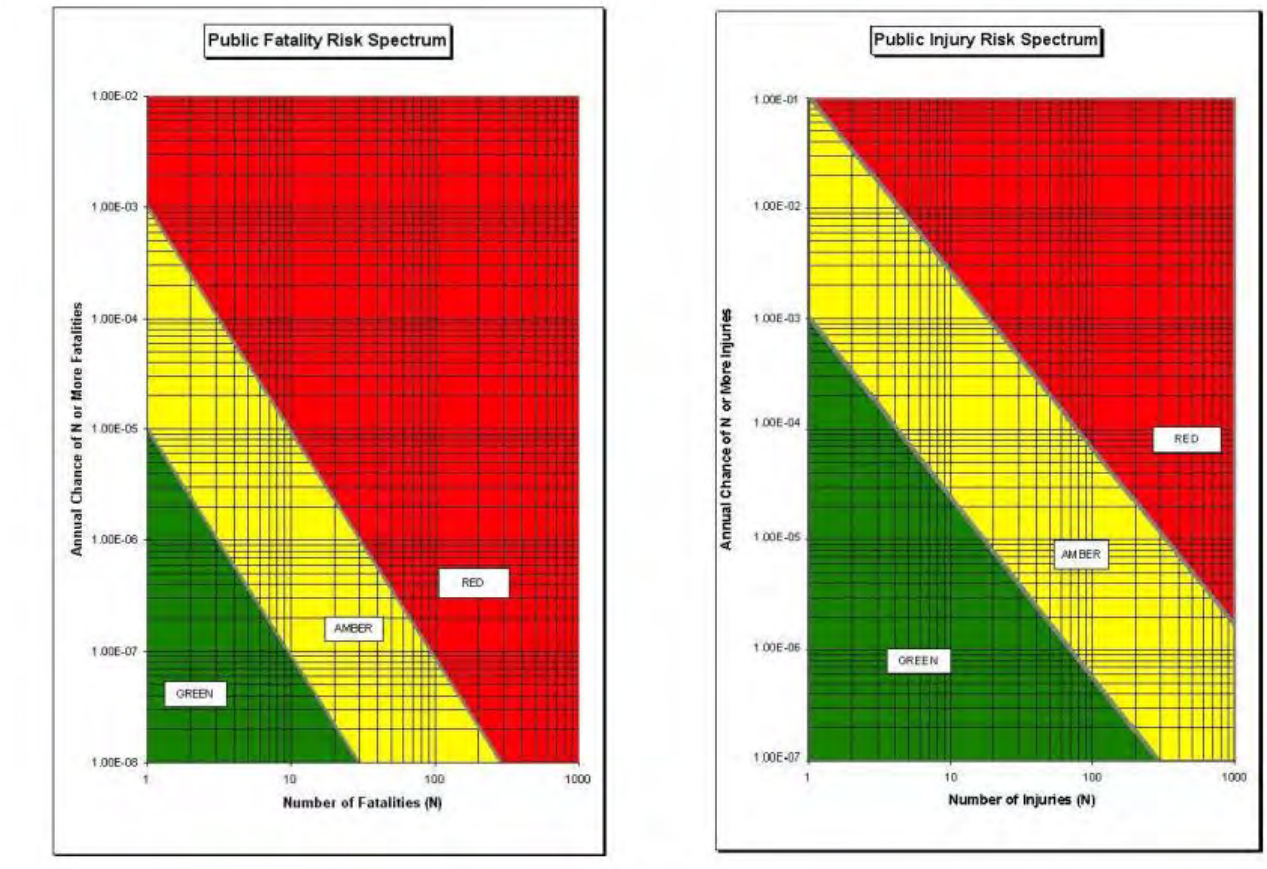
2.1 Public Safety Risk

The Santa Barbara County CEQA safety thresholds require the use of a quantitively risk assessment (QRA) when evaluating public safety risk associated with oil and gas operations. A QRA is a technique used to estimate the risk levels associated with transportation and fixed facilities. Potential incidents associated with the operations are examined and their associated consequences and frequency are estimated based on industry historical databases and estimates. The results of the QRA are compared against the existing Santa Barbara County thresholds.

The public health risk is defined by the County's CEQA thresholds, which evaluates the frequency and level of public health impacts (number of fatalities or injuries) on an FN chart. The County Threshold FN curves for public health risk are shown in Figure 2. An FN chart plots the cumulative frequency of public health impacts against the level of the public health impact. The thresholds define what areas on the chart are acceptable and unacceptable.

The public risk analysis utilized established County risk guidelines to evaluate the risk associated with the baseline pipeline operations and the proposed trucking operations. Impact hazards were assessed and the potential impacts to nearby receptors associated fires and flammable gases from crude oil spills were evaluated.

Figure 2 Santa Barbara County Project Specific Fatality and Injury Risk Thresholds



Source: Santa Barbara County Environmental Thresholds and Guidelines Manual, Revised 2018.

Public safety risks associated with the proposed trucking operations were considered significant if they were greater than the baseline pipeline risk and were in the amber or red zone of the thresholds shown above.

The public safety risk for trucking is based on the entire route in order to address the potential cumulative societal risks associated with spills along the entire truck route, as opposed to examining the peak segment risk along the truck route. This was done to allow for a direct comparison to the pipeline risk. This is also considered conservative as the trucking risk would be lower on the FN curves if the peak segment approach was used.

2.2 Environmental Risk

The County generally has established thresholds for environmental risks associated with an oil spill as any increase in spill frequency or volume over the historical operations would be considered potentially significant. Therefore, the significance of environmental risks are evaluated based on the change in spill volume and or frequency compared to the baseline. For this project the spill volumes and frequencies are plotted on an FS chart (similar to an FN chart), which plots the cumulative frequency of spills against the respective size of the spills. This allows for comparing two operational scenarios (pipeline verses trucking) against each other in terms of environmental risk. Environmental risk was considered significant if the proposed trucking spill risk is greater than the baseline pipeline spill risk.

3.0 Public Safety Risk

This section of the document discusses the approach and results for the public safety QRA for both the baseline pipeline operations and the proposed trucking operations. Estimating the risk, or frequency and consequences, of potential accident/incident scenarios from a pipeline or trucking involves several different steps. These include the following:

1. Identification of release scenarios;
2. Identification of release scenarios spill volumes;
3. Identification of release scenario spill frequencies;
4. Identification of release scenario spill consequences; and
5. Development of risk estimates.

Each of these steps is discussed below for baseline pipeline operations and the proposed trucking operations.

3.1 Baseline Pipeline Risk

The following sections discuss the development of the release scenarios, the spill volumes, the consequences, and the resulting risk estimates for the pipeline historical operations.

3.1.1 Identification of Release Scenarios

The release scenarios involve a potential release from the crude oil pipeline due to several causes, such as internal or external corrosion, third-party impact, earthquake, etc. Releases could occur in a range of different sizes, depending on the characteristics of the break and the location of the break. Releases are defined by two different groups in this analysis: ruptures and leaks. Ruptures are defined as releases that occur rapidly and involve a release hole similar in size to the pipeline diameter, with relatively large volumes. Leaks are releases from smaller holes, producing a spill an estimated 10% of the volume of a rupture.

3.1.2 Identification of Release Scenarios Spill Volumes

The spill size from a crude oil pipeline is a function of several parameters including the location of the spill relative to the terrain, the location of valve stations and check valves, the pipeline diameter, and the pipeline throughput rate. The crude oil that would spill out of a leak or rupture would be composed of the pumping rate of the crude oil through the pipeline plus the drain down volume. The drain down volume is the volume of crude oil that would drain from a hole in the pipeline. For a rupture or leak located at a low point on the pipeline, the drain down volume could be substantial. For a rupture or leak located at a high point on the pipeline, the drain down volume could be much smaller.

The rupture diameter is a function of the location of the release, depending on whether the release occurs in the 8 inch, 10 inch or 12 inch section of the pipeline system.

In the event of a pipeline spill, the leak detection system should detect and shut down the pipeline by stopping pumps and closing valves. Leak detection systems operate by monitoring the flow rates into and out of the pipeline system (called volume balancing) as well as monitoring the pressures along the pipeline to identify any operating parameters that might indicate a potential release, such as sudden drops in pressure or imbalances in flow levels. Temperatures are also monitored to estimate "line pack," which accounts for the compressibility of the fluids.

Given a spill, once the pipeline is shut down, the oil would continue to be released from the spill site until it drains from the associated segments of the pipeline between the closed valves as defined by the terrain "valleys" (the draindown volume). Many leak detection systems are designed to shut down the pipeline in 5-15 minutes. However, as there have been multiple spills in the area, including the 2015 Refugio spill and 2021 Huntington Beach spill, where the operators did not shut down the system even when the detections system alerted them of a leak, a longer-duration of 60 minutes is assumed for the system to continue pumping until the system is shut down.

Crude oil pipeline leaks are similar to ruptures, except that the leaks involve smaller-sized releases from a pipeline. This distinction between leaks and ruptures accounts for the different failure frequencies that exist between them. Pipeline leaks occur more frequently than pipeline ruptures and are most commonly a result of corrosion and erosion of the steel in the pipeline. Although a leak generally occurs more frequently than a rupture, it has a smaller impact area. Ruptures have been examined in regards to public health risks as generally spills are small enough volumes and act slowly enough that public health risks would be low. However, both leaks and ruptures are identified as possible release scenarios to address a range of spill risk levels.

The spill volumes from the crude pipeline were calculated based on the pipeline sizes and the associated terrain for different segments of the pipeline. A spill profile model is used to estimate the spill volumes by dividing the pipeline into 1,000 segments and assigning a spill volume to each segment based on pipeline size, the location of MOVs and check valves and the associated terrain. Pumping time is also included. Figure 3 shows the estimated spill volumes along the pipeline route for each segment as a worst case for that segment. Note that in some areas, the spills are almost entirely related to continued pumping as the terrain and valve systems are such that the draindown volumes are almost zero.

Spill volumes along the pipeline range from 9,592 gallons to 104,883 gallons, depending on the segment location and characteristics, for the individual model segments.

3.1.3 Identification of Release Scenarios Spill Frequencies

Spill frequencies from a crude oil pipeline are based on the PHMSA failure rates from the California, onshore, crude oil pipeline portion of the database. The PHMSA database on liquid pipeline incidents indicates a total of 273 incidents on all crude pipelines in onshore areas of California since 2003 (PHMSA 2023). There was an average total milage of crude oil pipelines in California onshore of 3,708 operating miles during that period. This resulted in a base rate of 3.68 incidents per 1,000 mile years. There were no fatalities or injuries in California resulting from pipeline releases of crude oil during the PHMSA data period.

As many segments of the pipeline are old, ranging up to 82 years, and the PHMSA data above is an average for all age pipelines, an adjustment factor was included. Although the information on specific pipelines is dated, the California State Fire Marshall (CSFM) report (CSFM 1993) provides detailed information on the age and failure rate of crude oil pipelines in California as well as provides age-based comparisons to the average. The CSFM data indicates that older pipelines have a higher failure rate by a factor of 2.76 times as high as the average failure rate of California liquid pipelines. This correction was included in the analysis for the older pipeline segments.

3.1.4 Identification of Release Scenarios Spill Consequences

In the event of a crude oil spill and subsequent ignition resulting in a pool fire, the heat (i.e., thermal radiation) from the fire could result in a serious injury or fatality. The spilled crude oil, if it does not immediately ignite, could also produce a flammable vapor cloud that could cause impacts. Modeling runs were performed to estimate the extent of impacts of the different releases. The Canary© model was used and incorporated a range of assumptions about the temperature, releases, meteorological parameters, and release duration. These assumptions are listed in Table 1 along with modeling results and probability assumptions. The Canary© model files are provided in Attachment 3.

In the event of crude oil spill, an elongated, elliptical flammable vapor cloud could also form from crude oil vapors that, if ignited, would result in a flash fire. Ignition of a flammable vapor cloud could be caused by vehicles on a nearby road or an ignition source adjacent to the pipeline right-of-way. A flash fire could result in injury or fatality to people in the vicinity of the vapor cloud if they are not able to evacuate the area before the vapor cloud ignites.

Figure 3 Spill Volume by Segment Milepost for Crude Pipeline Segments

Source: Spill Profile Mode, MRS Environmental, 2023.

Table 1 Pipeline Release Modeling and Probability Parameters

Parameter	Value
Rupture Diameter	8", 10" or 12" diameters depending on location
Normal Flow Rate	5481 BPD based on 2022 average
Release Volumes	Between 13,789 gallons to 73,774 gallons as an average of all Spill Profile segments within the census tract area
Canary Model Assumptions	Wind speed: 2 m/s, Class F for LFL, 5 m/s and D stab for thermal, Spill onto concrete, 10 minute release, unconfined impoundment forming a pool
Canary model: Thermal	Thermal 10 kw/m2 distance – up to 152 feet depending on spill volume Thermal 5 kW/m2 distance – up to 206 feet depending on spill volume
Canary model: Flammable gas	½ LFL – up to 208 feet, depending on spill volume LFL – up to 195 feet, depending on spill volume
Fatality Exposures	Thermal: 10% fatality at exposures ≥ 10 kW/m^2 Flammable gases: ½ LFL 10%
Injury Exposure Levels	Thermal: 90% injury at exposures ≥ 10 kW/m^2 10% injury at exposures between 5 kW/m^2 and 10 kW/m^2 Flammable gases: ½ LFL 50%
Spill Size Distribution	20% large spills, 80% small spills
Ignition Probabilities	Ignition probability: 1.9% based on PHMSA data all states onshore since 2010 for crude oil pipelines

Source: MRS 2023
kW/m2 = kilowatt per square meter thermal energy; LFL = lower flammability limit

The pool fire hazard areas are generally larger than the vapor cloud hazards and would be a greater threat to nearby populations. Energy from a pool fire radiates 360 degrees and has the potential to impact a larger area, whereas the flammable vapor cloud dimensions are generally narrower and only occur in the direction of the wind. However, both hazards were considered.

3.1.5 Development of Risk Estimates

The development of risk estimates involves examining the population densities along the pipeline route. The population densities along the route are based on 2020 U.S. Census Tracts along the pipeline route. The pipeline route crosses over 21 different Census Tracts where pipeline lengths within those Tracts ranges from ½ mile up to 6 miles in length. The average density along the pipeline route is 1,841 persons per square mile. Each segment represents a different scenario in developing the FN curves which define the risk levels.

The consequence zones were laid over the population densities in order to estimate the population exposed to thermal effects at different levels or flammable vapor clouds. As per Table 1, the resulting fatality and injury percentages were then applied in order to estimate the consequences of the releases.

The results of the risk analysis are FN curves showing the potential impacts associated with the operating pipeline. Figure 4 shows the FN curves for the pipeline along with the Santa Barbara County FN public safety thresholds. The risks are generally high as the pipelines are older, resulting in higher failure frequencies than newer pipelines. The inputs and calculations used for the QRA are provided in Attachment 1.

The estimates of risk are conservative in that they do not account for variation in conditions between night and day, or variables in meteorological conditions, and assume that all areas exposed could experience fatalities or injuries independent of infrastructure (such as walls or buildings) that could shield areas from thermal impacts.

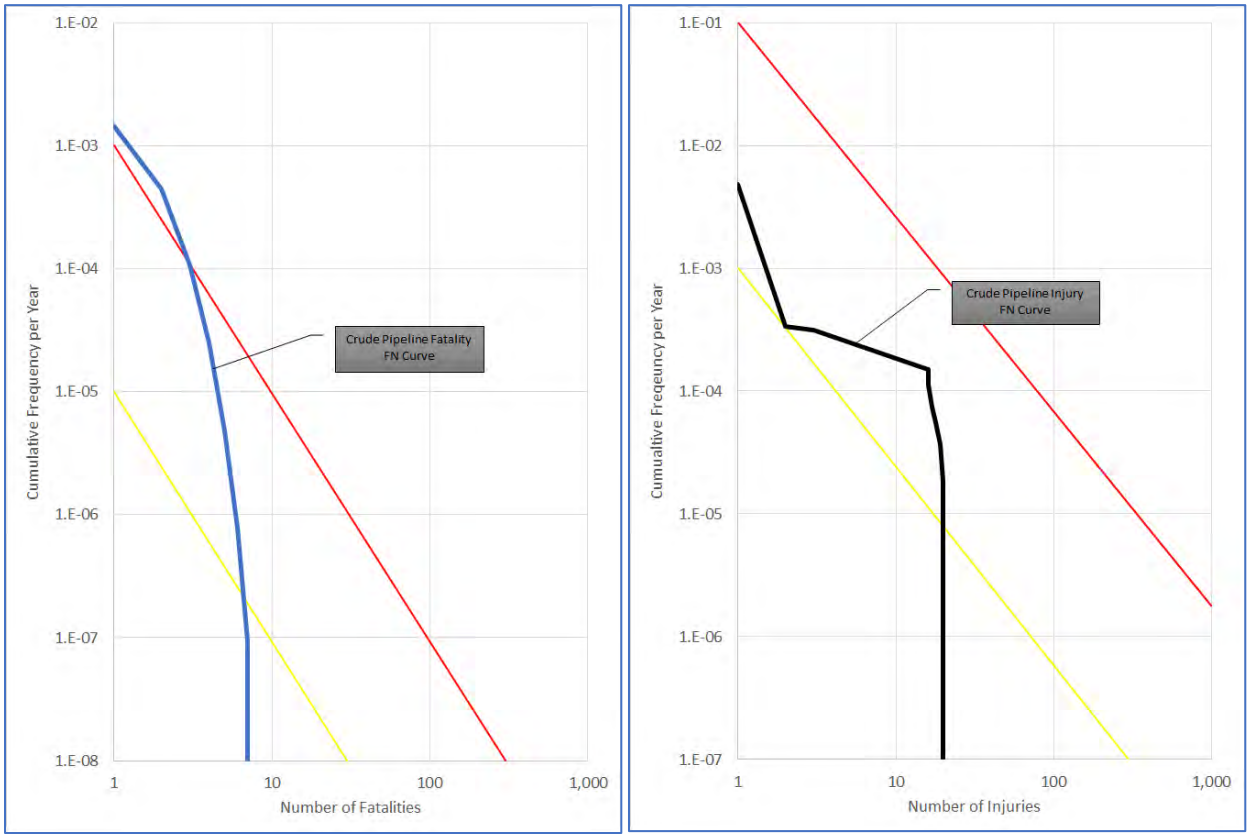
3.2 Proposed Trucking Risk

As the Project loading rack is located farther from receptors than the potential impact zones from a crude spill at the rack or from a truck, the risks from the loading rack area have not been included in the analysis.

3.2.1 Identification of Release Scenarios and Spill Volumes

The release scenarios involve a release from a truck due to several causes, primarily accidents or from mechanical failure on the truck allowing a release of contents. Crude oil is normally transported by selected contract carriers that are required to meet all regulatory requirements and safety standards. Crude oil would be transported by cargo trucks designed to comply with US Department of Transport (DOT) 406 or DOT 407 specifications in 160 barrel (6,720 gallons) loads. These trucks are designed according to construction requirements for cargo tank motor vehicles specifications in the Code of Federal Regulations (CFR), 49 CFR 178.346 and 178.347. These regulations prescribe the requirements for packaging and containers used in the transportation of hazardous materials. DOT 406/407 tank trucks are constructed of stainless steel or aluminum steel with thin shells capable of pressure up to 40 psia.

Figure 4 Crude Pipeline Risk of Public Health Impacts



Source: MRS Environmental 2023

Releases given an accident and subsequent spill are based on either the entire truck contents of 6,720 gallons or an estimated 10% of the truck contents for a more frequent spill scenario.

3.2.2 Identification of Release Scenario Spill Frequencies

The release frequencies are based on the ExxonMobil Trucking EIR Transportation Risk Analysis, (SBC 2021) and Aera 2017 which examined trucking accident frequencies based on California Highway Patrol data. Accident frequencies are based on freeways or 2-lane highways.

Additional information on the probabilities of spills given and accidents, fires, fatalities, etc. are listed in Table 2 below.

Table 2 Trucking Release Modeling and Probability Parameters

Parameter	Value
Highway Hazardous Materials Truck Accident Rate	0.28 accidents per million miles
Freeway Hazardous Materials Truck Accident Rate	0.34 accidents per million miles 0.72 within Santa Maria
Spill probability given an accident	5.4 %
Probability of a large spill	40%
Probability of a small spill	60%
Ignition and fire with a large spill	20% of spills
Ignition and fire with a small spill	2% of spills
On-road probability of fatality given a fire, large/small fire	5%/2%

Table 2 Trucking Release Modeling and Probability Parameters

Parameter	Value
On-road probability of injury given a fire, large/small fire	10%/5%
Off-road exposure thermal fire injury fraction	5 kw/m2 – 10% 10 kW/m2 – 90%
Off-road exposure thermal fire fatality fraction	10 kW/m2 – 10%
Off-road exposure flammable vapor injury/fatality	½ LFL : 50%/50% LFL: 50%/10%
Fatality distribution on-road vehicles exposed to fires	1 fatality/injury – 60%, 2 fatality/injury – 20%, 3 fatality/injury – 10%, 4 fatality/injury – 6%, 5 fatality/injury – 4%

Source: MRS 2023, ExxonMobil Trucking EIR 2020
Key: Units: psig = pounds per square inch, ^{0}F – degrees Fahrenheit, mph= miles per hour
kW/m^2 = kilowatt per square meter thermal energy

3.2.3 Identification of Release Scenario Spill Consequences

In the event of a crude oil spill and subsequent ignition resulting in a pool fire, the heat (i.e., thermal radiation) from the fire could result in a serious injury or fatality, as with the pipeline discussion above. The spilled crude oil, if it does not ignite, could also produce a flammable vapor cloud that could cause impacts. Modeling runs were performed to estimate the extent of impacts of the different releases. The Canary© model used and incorporated a range of assumptions about the temperature, releases, meteorological parameters, and release duration. The results indicate that thermal impacts would range from 70 to 93 feet for 5kW and 10kW exposures, and that flammable gasses could impact areas are far as 53 feet at the ½ LFL. The Canary© model files are provided in Attachment 3.

Impacts are examined for both on-road and off-road receptors. On-road receptors are other vehicles on the roadway which could be impacted by a crude oil fire, utilizing historical impacts of fatalities and injuries from tanker truck fires. Off-road impacts are impacts to residential areas located along the roadway route for a crude oil fire or flammable gas. As the truck accident would be on a roadway, there is an estimated area of 50 feet from the accident site that is assumed to not include any off-road impacts, such as residences or other sensitive receptors that are generally set back from the roadway edge.

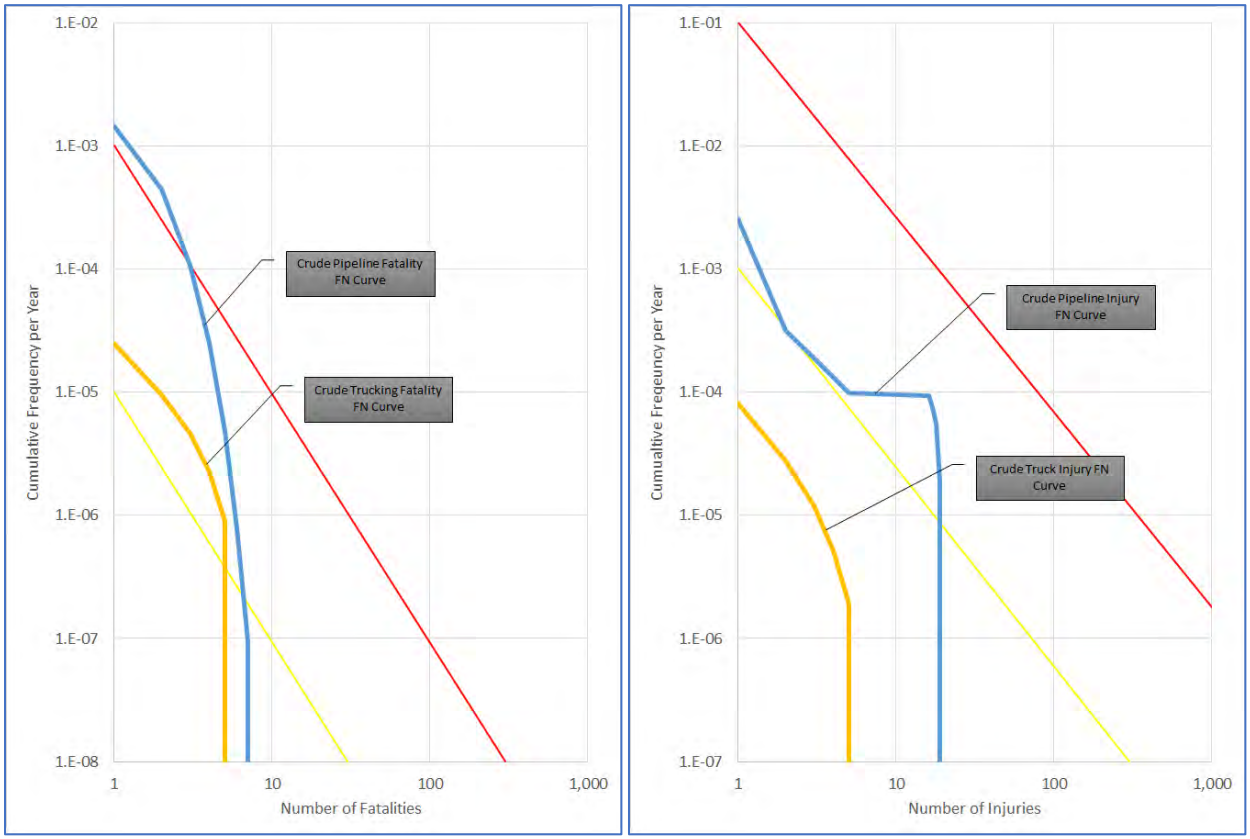
3.2.4 Development and Comparison of Risk Estimates

The development of risk estimates involves examining the population densities along the trucking route. The population densities along the route are based on 2020 U.S. Census Tracts along the trucking route. The trucking route passes through 48 different Census Tracts where roadway segments lengths ranged from 0.2 miles up to 26.8 miles in length. The average density along the trucking route is 962 persons per square mile.

The consequence zones were laid over the population densities to estimate the population exposed to thermal effects at different levels or flammable vapor clouds. As per Table 3, the resulting fatality and injury percentages were then applied to estimate the consequences of the releases.

The results of the risk analysis are FN curves showing the potential impacts associated with the proposed trucking activity. These are shown in Figure 5 with the pipeline FN curves also included. The inputs and calculations used for the QRA are provided in Attachment 2.

Figure 5 Crude Trucking and Pipeline Risk of Public Health Impacts



Source: MRS Environmental 2023

As with the pipeline risk analysis, the estimates of risk are conservative in that they do not account for variation in conditions between night and day, or variables in meteorological conditions, and assume that all areas exposed could experience fatalities or injuries independent of infrastructure (such as walls or buildings) that could shield areas from thermal impacts.

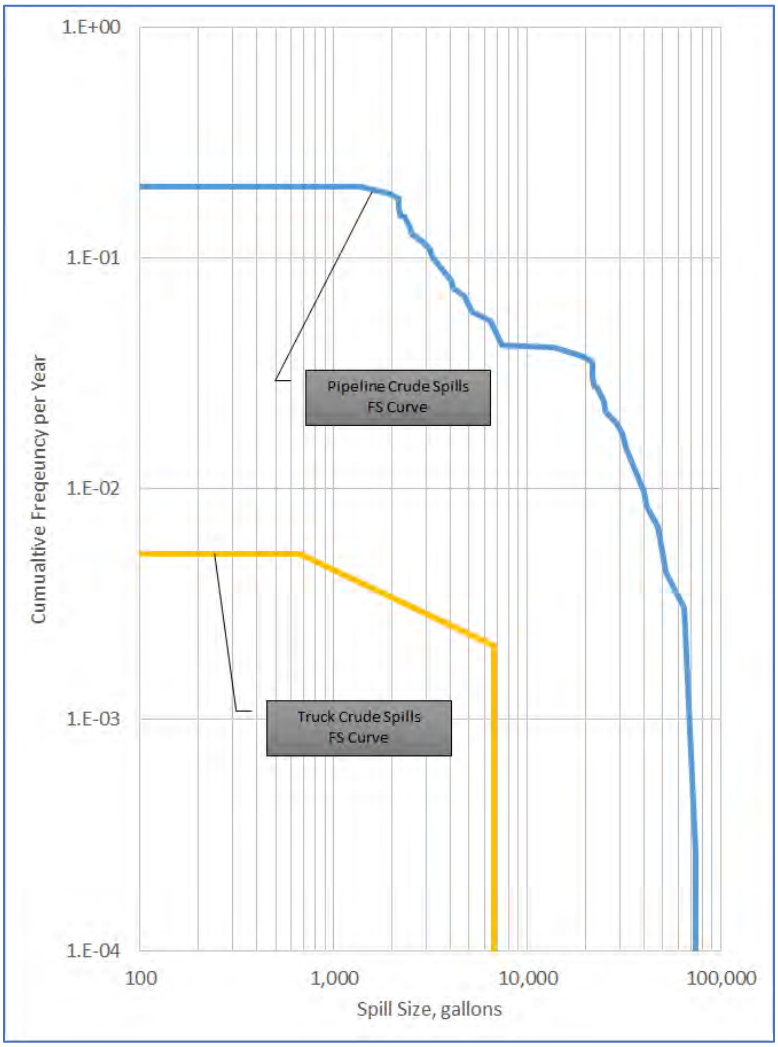
The FN curves show that for both injury and fatality the risk from trucking is less than that for the baseline pipeline operations. This is due to the lower spill volumes and as such smaller hazard zones associated with a truck spill, and the age and associated high spill frequency of the pipeline. The limited number of truck trips per year, and the fact that most of the truck route miles are in areas with very low population densities, also contribute substantially to the lower trucking risks.

4.0 Environmental Risk

Spill risks are defined by the combination of the different scenarios for trucking and pipeline release scenarios, with each segment representing a different spill frequency and spill volume. For trucks, the spills are generally of two sizes: a complete loss of the entire truck contents or a leak spill that is estimated at 10% of the truck contents. For the pipeline, there are more spill size scenarios as each segment of the pipeline has a different associated spill volume and frequency based on segment length, terrain, and pipeline size. Generally, pipelines have larger spill volumes than trucks. The spill volumes and spill frequencies are provided above in Section 3.1 for the baseline pipeline and in Section 3.2 for the proposed trucking operations.

Figure 6 shows the spill FS curves based on the spill volumes and corresponding spill frequencies for both the proposed trucking operations and the baseline pipeline operations.

Figure 6 Spill Risk Chart



Source: MRS Environmental, 2023

As the chart shows, the spill risk for the proposed trucking operation is less than for the baseline pipeline operations. This is due to the larger spill volumes associated with the pipeline, the age of some of the pipeline segments which contributes to the spill frequencies from the pipeline, and primarily the low number of annual truck trips, which reduces the spill frequency associated with the trucks.

5.0 References

AERA 2017, East Cat Canyon Oil Field Development Project, Transportation Quantitative Risk Assessment, Prepared for Aera Energy by Dixon Consulting, January 2017.

CSFM 1993, California State Fire Marshal (CSFM). 1993. Hazardous Liquid Pipeline Risk Assessment Report.

PHMSA 2023, Pipeline and Hazardous Materials Safety Administration, Data Portal page, accessed December 2023, https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=All%20Reported

SBC 2021, Revised Final Supplemental Environmental Impact Report, ExxonMobil Interim Trucking for Santa Ynez Unit (SYU) Phased Restart Project, County EIR No. 19EIR-00000-00001, County Case No. 17RVP-00000-00081, State Clearinghouse No. 2018061035, August 2021

Attachment 1
Pipeline Risk Tables

SPR Pipeline 300 Risk Calculations

from LOGP to SMR

Segment	Description	Segment Length, miles	Cumulative Length at End of Segment	Spill Profile Model Segment, At Start	Census Tract Exposed	Population Density, ppsm	Valves
1	LOGP to Hwy 135	3.02	3.02	1.00	Census Tract 28.09	61	MOV at LOGP
2	Hwy 135 to Hwy 135 undercrossing/Frasciosa Rd	6.44	9.45	95.20	Census Tract 20.06	13	
3	Hwy 135 undercrossing to Orcutt PS	0.61	10.06	298.44	Census Tract 20.12	2383	MOV at Orcutt PS
4	Orcutt PS to Foster Rd	1.64	11.70	317.54	Census Tract 20.12	2383	MOV at Orcutt PS
5	Foster Rd to Betteravia	2.55	14.25	369.30	Census Tract 20.11	743	
6	Betteravia Rd to Suey Jnctn	0.78	15.02	449.74	Census Tract 24.02	1809	MOV at Suey
7	Surey Jnctn to Stowell Rd	0.48	15.50	474.24	Census Tract 24.04	15355	MOV at Suey
8	Stowell to RailRoad	0.50	16.01	489.45	Census Tract 24.04	15355	
9	RailRoad to Main Street	0.50	16.51	505.37	Census Tract 24.03	13331	
10	Main St to Alvin Ave	0.50	17.01	521.29	Census Tract 23.04	13278	
11	Alvin to Donovan Rd	0.50	17.51	537.03	Census Tract 23.03	13328	
12	Donovan Rd to Taylor St	0.50	18.02	552.95	Census Tract 23.05	14952	
13	Taylor St to Atlantic Place (river)	0.92	18.94	568.76	Census Tract 23.06	955	
14	Atlantic Place (river) to North Side River Valve	1.09	20.03	597.89	Census Tract 123.04	132	Check North Side River
15	North Side River valve to Cherry Blossom Pl	1.23	21.27	632.45	Census Tract 123.04	132	Check North Side River
16	Cherry Blossum Pl to unname road	0.63	21.90	671.39	Census Tract 124.01	1415	
17	unnamed rd to unnamed rd (524 Thompson)	0.76	22.66	691.39	Census Tract 123.04	132	
18	Unnamed rd (524 Thompson) to Summit Rd	2.70	25.36	715.47	Census Tract 124.01	1415	
19	Summit Rd to Hwy 101	1.14	26.50	800.58	Census Tract 123.02	14	
20	Hwy 101 to Summit PS	0.40	26.90	836.51	Census Tract 123.04	132	MOV at Summit PS
21	Summit PS to SMR	4.78	31.67	849.21	Census Tract 123.04	132	MOV at Summit/SMR

Impact distances based on CANARY modeling for 100-100,000 gallon spill sizes
Spill volume is the average of the spill sizes within each segment using the spill profile model
The segements from LOGP to Orcutt (segments 1-3) and the last segment (21) use the 30 yr rate. All other segements use the 50 year rate.
Spill profile model segment is based on the starting point along the pipeline of the segment. Pipeline is divided into 1000 segments in the spill profile model

Total Length, miles	*31.67*	
Weighted population density, ppsm	*1841*	
Spill Profile Model Segment size, ft	*167.24*	*assumes 1000 segments*
Spill Ignition Prob	*0.019*	*based on PHMSA incident data since 2010*
PL base failure rate (>50 years old)	*1.02E-02*	*see below, PHMSA data since 2003, with CSFM age correction*
PL base failure rate (30-40 years old)	*2.17E-03*	*see below, PHMSA data since 2003, with CSFM age correction*
Rupure fraction	*0.20*	*CSFM 1993 fraction size GT 99 bbls*
1/2 LFL Injury fraction	*0.50*	*Assumes LFL=50% of 1/2 LFL area, 50% injury within LFL, 50% injury within 1/2LFL*
1/2 LFL Fatality fraction	*0.30*	*Assumes LFL=50% of 1/2 LFL area, 50% fatality within LFL, 10% fatality within 1/2LFL*
5 kW thermal injury fraction	*0.20*	*EOM 2021*
10 kW thermal injury fraction	*0.90*	*EOM 2021*
10 kW thermal fatality fraction	*0.10*	*EOM 2021*

Assumes LFL zone width is 10% of length

SPR Pipeline 300 Risk Calculations

from LOGP to SMR

Segment	Description	Segment Length, miles	Pipeline Dia, in	Pipeline Age > 50 Years	Pipeline Name	Spill Profile Model Volume Average Spill Size, gal	Pool Radius, ft	1/2 LFL, ft	5kW, ft	10kW, ft
1	LOGP to Hwy 135	3.02	12	N	CC-30-10	40,362	51.0	149.9	154.3	114.0
2	Hwy 135 to Hwy 135 undercrossing/Frasciosa Rd	6.44	12	N	CC-30-10	64,206	60.8	186.0	173.1	126.7
3	Hwy 135 undercrossing to Orcutt PS	0.61	12	N	CC-30-10	73,774	64.1	198.4	179.2	130.8
4	Orcutt PS to Foster Rd	1.64	8	Y	CC-30-30	13,789	33.9	91.0	118.2	89.1
5	Foster Rd to Betteravia	2.55	8	Y	CC-30-30	21,618	40.2	112.1	132.1	98.8
6	Betteravia Rd to Suey Jnctn	0.78	8	Y	CC-30-30	26,147	43.2	122.5	138.5	103.2
7	Surey Jnctn to Stowell Rd	0.48	12	Y	CC-32-30	21,762	40.3	112.5	132.3	98.9
8	Stowell to RailRoad	0.50	12	Y	CC-32-30	20,398	39.3	109.1	130.2	97.5
9	RailRoad to Main Street	0.50	12	Y	CC-32-30	19,547	38.7	107.0	128.9	96.5
10	Main St to Alvin Ave	0.50	12	Y	CC-32-30	22,035	40.5	113.1	132.8	99.2
11	Alvin to Donovan Rd	0.50	12	Y	CC-32-30	24,131	41.9	118.0	135.8	101.3
12	Donovan Rd to Taylor St	0.50	12	Y	CC-32-30	25,099	42.6	120.2	137.1	102.2
13	Taylor St to Atlantic Place (river)	0.92	12	Y	CC-32-30	28,889	44.9	128.3	142.0	105.6
14	Atlantic Place (river) to North Side River Valve	1.09	12	Y	CC-32-30	24,848	42.4	119.6	136.8	102.0
15	North Side River valve to Cherry Blossom Pl	1.23	12	Y	CC-32-30	47,026	54.0	160.9	160.2	118.0
16	Cherry Blossum Pl to unname road	0.63	12	Y	CC-32-30	51,782	56.0	168.3	164.1	120.6
17	unnamed rd to unnamed rd (524 Thompson)	0.76	12	Y	CC-32-30	40,985	51.3	151.0	154.9	114.4
18	Unnamed rd (524 Thompson) to Summit Rd	2.70	12	Y	CC-32-30	32,292	46.8	135.1	146.0	108.3
19	Summit Rd to Hwy 101	1.14	12	Y	CC-32-30	23,064	41.2	115.5	134.3	100.3
20	Hwy 101 to Summit PS	0.40	12	Y	CC-32-30	22,035	40.5	113.1	132.8	99.2
21	Summit PS to SMR	4.78	10	N	CC-32-50	31,126	46.2	132.8	144.6	107.4

SPR Pipeline 300 Risk Calculations

from LOGP to SMR

Segment	Description	Segment Length, miles	Base Large Release Frequency / yr	1/2 LFL Frequency /yr	Thermal Frequency /yr	1/2 LFL Area, ft2	5kW Thermal Area, ft2	10kW Thermal Area, ft2
1	LOGP to Hwy 135	3.02	1.31E-03	1.28E-03	2.49E-05	1,764	74,771	40,793
2	Hwy 135 to Hwy 135 undercrossing/Frasciosa Rd	6.44	2.80E-03	2.74E-03	5.31E-05	2,717	94,147	50,443
3	Hwy 135 undercrossing to Orcutt PS	0.61	2.63E-04	2.58E-04	4.99E-06	3,092	100,868	53,752
4	Orcutt PS to Foster Rd	1.64	3.33E-03	3.27E-03	6.33E-05	650	43,872	24,959
5	Foster Rd to Betteravia	2.55	5.18E-03	5.08E-03	9.84E-05	987	54,844	30,659
6	Betteravia Rd to Suey Jnctn	0.78	1.58E-03	1.55E-03	3.00E-05	1,178	60,274	33,446
7	Surey Jnctn to Stowell Rd	0.48	9.79E-04	9.60E-04	1.86E-05	993	55,025	30,752
8	Stowell to RailRoad	0.50	1.02E-03	1.01E-03	1.95E-05	935	53,285	29,855
9	RailRoad to Main Street	0.50	1.02E-03	1.00E-03	1.95E-05	899	52,169	29,278
10	Main St to Alvin Ave	0.50	1.01E-03	9.94E-04	1.92E-05	1,005	55,367	30,928
11	Alvin to Donovan Rd	0.50	1.03E-03	1.01E-03	1.95E-05	1,094	57,921	32,241
12	Donovan Rd to Taylor St	0.50	1.02E-03	9.98E-04	1.93E-05	1,134	59,063	32,826
13	Taylor St to Atlantic Place (river)	0.92	1.87E-03	1.84E-03	3.56E-05	1,293	63,333	35,006
14	Atlantic Place (river) to North Side River Valve	1.09	2.22E-03	2.18E-03	4.23E-05	1,124	58,769	32,675
15	North Side River valve to Cherry Blossom Pl	1.23	2.51E-03	2.46E-03	4.76E-05	2,034	80,663	43,746
16	Cherry Blossum Pl to unname road	0.63	1.29E-03	1.26E-03	2.45E-05	2,225	84,615	45,717
17	unnamed rd to unnamed rd (524 Thompson)	0.76	1.55E-03	1.52E-03	2.94E-05	1,790	75,342	41,080
18	Unnamed rd (524 Thompson) to Summit Rd	2.70	5.48E-03	5.37E-03	1.04E-04	1,434	66,933	36,836
19	Summit Rd to Hwy 101	1.14	2.31E-03	2.27E-03	4.39E-05	1,049	56,636	31,581
20	Hwy 101 to Summit PS	0.40	8.18E-04	8.02E-04	1.55E-05	1,005	55,367	30,928
21	Summit PS to SMR	4.78	2.07E-03	2.04E-03	3.94E-05	1,386	65,723	36,222

SPR Pipeline 300 Risk Calculations

from LOGP to SMR

Segment	Description	Segment Length, miles	1/2 LFL Exposed	5 kW Thermal Exposed	10 kW Thermal Exposed	1/2 LFL Fatality	1/2 LFL Injury	Thermal Fatality	Thermal Injury
1	LOGP to Hwy 135	3.02	0.004	0.164	0.090	0.0012	0.0019	0.0090	0.0956
2	Hwy 135 to Hwy 135 undercrossing/Frasciosa Rd	6.44	0.001	0.045	0.024	0.0004	0.0006	0.0024	0.0258
3	Hwy 135 undercrossing to Orcutt PS	0.61	0.264	8.623	4.595	0.0793	0.1322	0.4595	4.9412
4	Orcutt PS to Foster Rd	1.64	0.056	3.751	2.134	0.0167	0.0278	0.2134	2.2437
5	Foster Rd to Betteravia	2.55	0.026	1.462	0.817	0.0079	0.0132	0.0817	0.8646
6	Betteravia Rd to Suey Jnctn	0.78	0.076	3.910	2.170	0.0229	0.0382	0.2170	2.3008
7	Surey Jnctn to Stowell Rd	0.48	0.547	30.308	16.938	0.1642	0.2736	1.6938	17.9185
8	Stowell to RailRoad	0.50	0.515	29.349	16.444	0.1546	0.2576	1.6444	17.3808
9	RailRoad to Main Street	0.50	0.430	24.946	14.000	0.1290	0.2149	1.4000	14.7894
10	Main St to Alvin Ave	0.50	0.479	26.370	14.731	0.1436	0.2393	1.4731	15.5854
11	Alvin to Donovan Rd	0.50	0.523	27.691	15.414	0.1568	0.2614	1.5414	16.3278
12	Donovan Rd to Taylor St	0.50	0.608	31.677	17.605	0.1825	0.3042	1.7605	18.6592
13	Taylor St to Atlantic Place (river)	0.92	0.044	2.169	1.199	0.0133	0.0221	0.1199	1.2732
14	Atlantic Place (river) to North Side River Valve	1.09	0.005	0.278	0.154	0.0016	0.0027	0.0154	0.1636
15	North Side River valve to Cherry Blossom Pl	1.23	0.010	0.381	0.207	0.0029	0.0048	0.0207	0.2209
16	Cherry Blossum Pl to unname road	0.63	0.113	4.294	2.320	0.0339	0.0564	0.2320	2.4828
17	unnamed rd to unnamed rd (524 Thompson)	0.76	0.008	0.356	0.194	0.0025	0.0042	0.0194	0.2071
18	Unnamed rd (524 Thompson) to Summit Rd	2.70	0.073	3.397	1.869	0.0218	0.0364	0.1869	1.9878
19	Summit Rd to Hwy 101	1.14	0.001	0.029	0.016	0.0002	0.0003	0.0016	0.0169
20	Hwy 101 to Summit PS	0.40	0.005	0.262	0.146	0.0014	0.0024	0.0146	0.1546
21	Summit PS to SMR	4.78	0.007	0.311	0.171	0.0020	0.0033	0.0171	0.1819

Pipeline Base Failure Rate Calcs, most recent PHMSA database online

Number of incidents	*273.00*	*PHMSA, total 2003-2022*
Years of incidents	*20.00*	
Total Miles	*3708.00*	*average 2010-2022*
PHMSA Data, incidents per mile-year	*3.68E-03*	*PHMSA database, 2003-2022, Crude Oil , CA only, onshore*
Age factor >50 years	*2.76*	*CSFM 1993 average vs 50 year old*
Age factor 30-40 years	*0.59*	*CSFM 1993 average vs 30 year old*
Base rate, > 50 years, incidents per mile-year	*1.02E-02*	
Base rate, 30-40 years, incidents per mile-year	*2.17E-03*	

No Fatalities or injuries in CA

https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=All%20Reported

PHMSA Database

Crude Oil Miles

Year	Interstate miles	Intrastate miles	Total miles
2022	121.0	3129	3250
2021	97.4	3159	3256
2020	97.4	3417	3514
2019	97.5	3517	3615
2018	97.4	3544	3641
2017	235.6	3232	3468
2016	234.8	3330	3564
2015	227.3	4024	4251
2014	227.4	3664	3891
2013	232.2	3702	3934
2012	241.7	3770	4011
2011	241.7	3679	3921
2010	255.5	3639	3894
Average			3708

https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FPublic%20Reports&Page=Infrastructure

PHMSA Database

Fire Incidents

All States, pipelines, crude oil, onshore, 2010-2022

Total incidents	2614
Incidents with ignition	50
Fraction ignitiioin	0.019

Note: none in CA

https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data

FN/FS Curve Data

FATALITY

Frequency Total	Fatalities	Freq Sum
	7	1.00E-08
9.42E-08	7	9.42E-08
6.86E-07	6	7.81E-07
4.04E-06	5	4.82E-06
2.02E-05	4	2.50E-05
8.21E-05	3	1.07E-04
3.39E-04	2	4.46E-04
9.97E-04	1	1.44E-03

INJURY

Frequency Total	Injury	Freq Sum
	19	1.00E-07
1.90E-05	19	1.90E-05
3.73E-05	18	5.63E-05
1.87E-05	17	7.50E-05
1.87E-05	16	9.38E-05
4.93E-06	5	9.87E-05
9.06E-05	3	1.89E-04
1.26E-04	2	3.15E-04
2.26E-03	1	2.58E-03

Spill Chart

Row#	Spill Freq	Spill gal	Size	Cum Freq	
			73,774	1.00E-04	
1	2.63E-04		73,774	2.63E-04	Rupture
2	2.80E-03		64,206	3.06E-03	Rupture
3	1.29E-03		51,782	4.35E-03	Rupture
4	2.51E-03		47,026	6.85E-03	Rupture
5	1.55E-03		40,985	8.40E-03	Rupture
6	1.31E-03		40,362	9.71E-03	Rupture
7	5.48E-03		32,292	1.52E-02	Rupture
8	2.07E-03		31,126	1.73E-02	Rupture
9	1.87E-03		28,889	1.91E-02	Rupture
10	1.58E-03		26,147	2.07E-02	Rupture
11	1.02E-03		25,099	2.17E-02	Rupture
12	2.22E-03		24,848	2.40E-02	Rupture
13	1.03E-03		24,131	2.50E-02	Rupture
14	2.31E-03		23,064	2.73E-02	Rupture
15	8.18E-04		22,035	2.81E-02	Rupture
16	1.01E-03		22,035	2.91E-02	Rupture
17	9.79E-04		21,762	3.01E-02	Rupture
18	5.18E-03		21,618	3.53E-02	Rupture
19	1.02E-03		20,398	3.63E-02	Rupture
20	1.02E-03		19,547	3.73E-02	Rupture
21	3.33E-03		13,789	4.07E-02	Rupture
	1.05E-03		7,377	4.17E-02	Leak
	1.12E-02		6,421	5.29E-02	Leak
	5.15E-03		5,178	5.81E-02	Leak
	1.00E-02		4,703	6.81E-02	Leak
	6.20E-03		4,099	7.43E-02	Leak
	5.24E-03		4,036	7.95E-02	Leak
	2.19E-02		3,229	1.01E-01	Leak
	8.30E-03		3,113	1.10E-01	Leak
	7.50E-03		2,889	1.17E-01	Leak
	6.31E-03		2,615	1.24E-01	Leak
	4.07E-03		2,510	1.28E-01	Leak
	8.90E-03		2,485	1.37E-01	Leak
	4.10E-03		2,413	1.41E-01	Leak
	9.25E-03		2,306	1.50E-01	Leak
	3.27E-03		2,204	1.53E-01	Leak
	4.05E-03		2,204	1.57E-01	Leak
	3.92E-03		2,176	1.61E-01	Leak
	2.07E-02		2,162	1.82E-01	Leak
	4.10E-03		2,040	1.86E-01	Leak
	4.10E-03		1,955	1.90E-01	Leak
	1.33E-02		1,379	2.03E-01	Leak
			100	2.03E-01	

Attachment 2
Trucking Risk Tables

Truck Frequency and FN Calculations

Annual Trips total -->	2000	Max indicated in Project Desription
Average Trucks per day	5.5	Average rate based on annual trips
Average BPD production	876.7	assumes 160 bbl per truck

On-Road Risks

Segment	On Route Segment	Description	Distance, miles	Base Accident Rate, per million miles	Accident Frequency, per year	Large Spill Frequency, per year	Small Spill Frequency, per year	Large Fire Frequency	Small Fire Frequency	Large Fire Fatalities Frequency	Small Fire Fatalities Frequency	Large Fire Injuries Frequency	Small Fire Injuries Frequency
1	Harris Grade	Harris Grade to Hwy 1	3.5	0.27	1.86E-03	4.01E-05	6.01E-05	8.02E-06	1.20E-06	4.01E-07	2.40E-08	8.02E-07	6.01E-08
2	Hwy 1	Hwy 1 to Hwy 135	12.9	0.27	6.84E-03	1.48E-04	2.22E-04	2.95E-05	4.43E-06	1.48E-06	8.86E-08	2.95E-06	2.22E-07
3	Hwy 135	Hwy 135 to Betteravia	8.9	0.27	4.72E-03	1.02E-04	1.53E-04	2.04E-05	3.06E-06	1.02E-06	6.11E-08	2.04E-06	1.53E-07
4	Betteravia	Betteravia to Hwy 101	1.1	0.27	5.83E-04	1.26E-05	1.89E-05	2.52E-06	3.78E-07	1.26E-07	7.56E-09	2.52E-07	1.89E-08
5	Hwy 101	Betteravia to Hwy 46	62.3	0.34	4.21E-02	9.10E-04	1.37E-03	1.82E-04	2.73E-05	9.10E-06	5.46E-07	1.82E-05	1.37E-06
6	Hwy 46	Hwy 46 to Hwy 41	25.4	0.27	1.35E-02	2.91E-04	4.36E-04	5.82E-05	8.72E-06	2.91E-06	1.74E-07	5.82E-06	4.36E-07
7	Hwy 41	Hwy 41 to Hwy 33	19.6	0.27	1.04E-02	2.24E-04	3.37E-04	4.49E-05	6.73E-06	2.24E-06	1.35E-07	4.49E-06	3.37E-07
8	Hwy 33	Hwy 33 to Coalinga	31.1	0.27	1.65E-02	3.56E-04	5.34E-04	7.12E-05	1.07E-05	3.56E-06	2.14E-07	7.12E-06	5.34E-07

Input Values:

Base Accident Rate: Freeways	*0.34*
Base Accident Rate: Highways	*0.27*
Base Accident Rate: Freeway SM 101	*0.72*
Spill Probability	*0.054*
Spill: large probability	*0.40*
Spill : small probability	*0.60*
Ignition: large spill probability	*0.20*
Ignition: small spill probability	*0.02*
Fatality: large spill probability	*0.05*
Fatality: small spill probability	*0.02*
Injury: large spill probability	*0.10*
Injury: small spill probability	*0.05*

Notes:

Only thermal effects analyzed for large spills. Vehicles not assumed not affected by a flammable gas cloud.
Total Distance, miles *164.8*
Segments based on Highway type
On-road risks are risks to other vehicles on the road. Off-road risks are tabulated below
Spill risk, every x years *192*
Spill risk, every x years, mitigated *239*
mitigated assumes 12% reduction in collisions and 50% reduction in non-collision risk, SBC 2021 section 6.4

Truck Frequency and FN Calculations

Annual Trips total -->	2000	Max indicated in Project Desription
Average Trucks per day	5.5	Average rate based on annual trips
Average BPD production	876.7	assumes 160 bbl per truck

On-Road Risks

Segment	On Route Segment	Description	Distance, miles	Base Accident Rate, per million miles	Accident Frequency, per year	One Fatality	Two Fatalities	Three Fatalities	Four Fatalities	Five Fatalities	One Injury	Two Injuries	Three Injuries	Four Injuries	Five Injuries
1	Harris Grade	Harris Grade to Hwy 1	3.5	0.27	1.86E-03	2.55E-07	8.50E-08	4.25E-08	2.55E-08	1.70E-08	5.17E-07	1.72E-07	8.62E-08	5.17E-08	3.45E-08
2	Hwy 1	Hwy 1 to Hwy 135	12.9	0.27	6.84E-03	9.39E-07	3.13E-07	1.57E-07	9.39E-08	6.26E-08	1.91E-06	6.35E-07	3.18E-07	1.91E-07	1.27E-07
3	Hwy 135	Hwy 135 to Betteravia	8.9	0.27	4.72E-03	6.48E-07	2.16E-07	1.08E-07	6.48E-08	4.32E-08	1.31E-06	4.38E-07	2.19E-07	1.31E-07	8.76E-08
4	Betteravia	Betteravia to Hwy 101	1.1	0.27	5.83E-04	8.01E-08	2.67E-08	1.34E-08	8.01E-09	5.34E-09	1.62E-07	5.42E-08	2.71E-08	1.62E-08	1.08E-08
5	Hwy 101	Betteravia to Hwy 46	62.3	0.34	4.21E-02	5.79E-06	1.93E-06	9.65E-07	5.79E-07	3.86E-07	1.17E-05	3.91E-06	1.96E-06	1.17E-06	7.83E-07
6	Hwy 46	Hwy 46 to Hwy 41	25.4	0.27	1.35E-02	1.85E-06	6.17E-07	3.08E-07	1.85E-07	1.23E-07	3.75E-06	1.25E-06	6.25E-07	3.75E-07	2.50E-07
7	Hwy 41	Hwy 41 to Hwy 33	19.6	0.27	1.04E-02	1.43E-06	4.76E-07	2.38E-07	1.43E-07	9.52E-08	2.90E-06	9.65E-07	4.83E-07	2.90E-07	1.93E-07
8	Hwy 33	Hwy 33 to Coalinga	31.1	0.27	1.65E-02	2.26E-06	7.55E-07	3.77E-07	2.26E-07	1.51E-07	4.59E-06	1.53E-06	7.66E-07	4.59E-07	3.06E-07

Off-Road Risks

Segment	Length, miles	Description	Population Density, ppsm	Base Accident Rate	Accident Frequency, per year	Large Spill Frequency, per year	Small Spill Frequency, per year	LFL and 1/2 LFL Frequency	Large Fire Frequency	1/2 LFL Exposed Persons	LFL Exposed Persons	5kW Fire Persons Exposed	10kW Fire Persons Exposed	LFL and 1/2 LFL Fatalities	Thermal Fatalities	LFL and 1/2 LFL Injuries	Thermal Injuries
1	0.2	Onsite area	61	0.27	1.11E-04	2.39E-06	3.58E-06	1.91E-06	4.78E-07	0.00000	0.00000	0.010	0.003	0.0000	0.0003	0.0000	0.0041
2	6.4	Hwy 1: Facility to Constellation Rd	632	0.27	3.41E-03	7.37E-05	1.10E-04	5.89E-05	1.47E-05	0.00004	0.00000	0.108	0.031	0.0000	0.0031	0.0000	0.0430
3	3.5	Hwy 1: Constellation Rd to Vand	37	0.27	1.87E-03	4.04E-05	6.06E-05	3.23E-05	8.08E-06	0.00000	0.00000	0.006	0.002	0.0000	0.0002	0.0000	0.0025
4	6.2	Hwy 1: Vand - Hwy 135	0	0.27	3.27E-03	7.05E-05	1.06E-04	5.64E-05	1.41E-05	0.00000	0.00000	0.000	0.000	0.0000	0.0000	0.0000	0.0000
5	4.8	Hwy 135: Hwy 1 to Rice Rd	17	0.27	2.56E-03	5.54E-05	8.31E-05	4.43E-05	1.11E-05	0.00000	0.00000	0.003	0.001	0.0000	0.0001	0.0000	0.0011
6	0.4	Hwy 135: Rice Rd to Clark	2211	0.27	2.29E-04	4.94E-06	7.41E-06	3.95E-06	9.89E-07	0.00014	0.00000	0.377	0.107	0.0000	0.0107	0.0001	0.1503
7	1.0	Hwy 135: Clark to RR	4238	0.27	5.31E-04	1.15E-05	1.72E-05	9.17E-06	2.29E-06	0.00027	0.00000	0.723	0.205	0.0000	0.0205	0.0001	0.2881
8	1.0	Hwy 135: RR to Lakeview	5089	0.27	5.47E-04	1.18E-05	1.77E-05	9.45E-06	2.36E-06	0.00032	0.00000	0.868	0.246	0.0000	0.0246	0.0002	0.3460
9	1.2	Hwy 135: Lakeview to SM Way	4575	0.27	6.62E-04	1.43E-05	2.14E-05	1.14E-05	2.86E-06	0.00029	0.00000	0.780	0.221	0.0000	0.0221	0.0001	0.3111
10	1.6	Hwy 135/Betteravia: SM Way to Hwy 101	5607	0.27	8.29E-04	1.79E-05	2.69E-05	1.43E-05	3.58E-06	0.00036	0.00000	0.956	0.271	0.0000	0.0271	0.0002	0.3812
11	1.0	Frwy 101: Betteravia to Stowell	4573	0.72	1.47E-03	3.17E-05	4.75E-05	2.53E-05	6.33E-06	0.00029	0.00000	0.780	0.221	0.0000	0.0221	0.0001	0.3109
12	0.5	Frwy 101: Stowell to Jones St	4671	0.72	7.33E-04	1.58E-05	2.38E-05	1.27E-05	3.17E-06	0.00030	0.00000	0.797	0.226	0.0000	0.0226	0.0001	0.3176
13	0.5	Frwy 101: Jones to Main	8884	0.72	7.30E-04	1.58E-05	2.36E-05	1.26E-05	3.15E-06	0.00056	0.00000	1.515	0.430	0.0001	0.0430	0.0003	0.6040
14	0.5	Frwy 101: Main to Alvin	10353	0.72	7.47E-04	1.61E-05	2.42E-05	1.29E-05	3.23E-06	0.00066	0.00000	1.766	0.501	0.0001	0.0501	0.0003	0.7039
14a	0.6	Frwy 101: Alvin to Donovan	12528	0.72	8.11E-04	1.75E-05	2.63E-05	1.40E-05	3.50E-06	0.00079	0.00000	2.137	0.606	0.0001	0.0606	0.0004	0.8517
15	1.0	Frwy 101: Donovan to Hwy 135	8596	0.72	1.48E-03	3.21E-05	4.81E-05	2.57E-05	6.41E-06	0.00055	0.00000	1.466	0.416	0.0001	0.0416	0.0003	0.5844
16	0.3	Frwy 101: Hwy 135 to SMR Bridge	6823	0.72	4.61E-04	9.96E-06	1.49E-05	7.97E-06	1.99E-06	0.00043	0.00000	1.164	0.330	0.0000	0.0330	0.0002	0.4639
17	2.8	Frwy 101: SMR Bridge to Cherry Blossom Rd	90	0.34	1.87E-03	4.03E-05	6.05E-05	3.23E-05	8.06E-06	0.00001	0.00000	0.015	0.004	0.0000	0.0004	0.0000	0.0061
18	1.4	Frwy 101: Cherry to Division	1850	0.34	9.66E-04	2.09E-05	3.13E-05	1.67E-05	4.17E-06	0.00012	0.00000	0.316	0.090	0.0000	0.0090	0.0001	0.1258
19	2.0	Frwy 101: Division to Cherokee	1908	0.34	1.35E-03	2.91E-05	4.36E-05	2.32E-05	5.81E-06	0.00012	0.00000	0.325	0.092	0.0000	0.0092	0.0001	0.1297
20	5.4	Frwy 101: Cherokee to Old Summit	433	0.34	3.68E-03	7.95E-05	1.19E-04	6.36E-05	1.59E-05	0.00003	0.00000	0.074	0.021	0.0000	0.0021	0.0000	0.0295
21	1.8	Frwy 101: Old Summit to Halycon	1367	0.34	1.23E-03	2.67E-05	4.00E-05	2.13E-05	5.33E-06	0.00009	0.00000	0.233	0.066	0.0000	0.0066	0.0000	0.0929
22	1.0	Frwy 101: Halcyon to Old Park Pl	3851	0.34	6.56E-04	1.42E-05	2.13E-05	1.13E-05	2.84E-06	0.00024	0.00000	0.657	0.186	0.0000	0.0186	0.0001	0.2618
23	1.8	Frwy 101: Old Park Pl to Ocean View	2175	0.34	1.23E-03	2.65E-05	3.97E-05	2.12E-05	5.30E-06	0.00014	0.00000	0.371	0.105	0.0000	0.0105	0.0001	0.1479
24	4.5	Frwy 101: Ocean View to Cave Landing	2940	0.34	3.01E-03	6.50E-05	9.75E-05	5.20E-05	1.30E-05	0.00019	0.00000	0.501	0.142	0.0000	0.0142	0.0001	0.1999
25	4.4	Frwy 101: Cave Landing to Higuera	67	0.34	2.95E-03	6.36E-05	9.54E-05	5.09E-05	1.27E-05	0.00000	0.00000	0.011	0.003	0.0000	0.0003	0.0000	0.0045
26	1.7	Frwy 101: Higuera to Prado	1871	0.34	1.13E-03	2.43E-05	3.65E-05	1.94E-05	4.86E-06	0.00012	0.00000	0.319	0.091	0.0000	0.0091	0.0001	0.1272
27	2.2	Frwy 101: Prado to Hwy 1	1221	0.34	1.46E-03	3.16E-05	4.74E-05	2.53E-05	6.32E-06	0.00008	0.00000	0.208	0.059	0.0000	0.0059	0.0000	0.0830
28	1.3	Frwy 101: Hwy 1 to Loomis	7727	0.34	8.74E-04	1.89E-05	2.83E-05	1.51E-05	3.78E-06	0.00049	0.00000	1.318	0.374	0.0000	0.0374	0.0002	0.5253
29	2.4	Frwy 101: Loomis to Stage Coach	519	0.34	1.62E-03	3.50E-05	5.25E-05	2.80E-05	7.01E-06	0.00003	0.00000	0.089	0.025	0.0000	0.0025	0.0000	0.0353
30	2.2	Frwy 101: Stagfe Coach to State Coach N	41	0.34	1.48E-03	3.20E-05	4.81E-05	2.56E-05	6.41E-06	0.00000	0.00000	0.007	0.002	0.0000	0.0002	0.0000	0.0028
31	7.2	Frwy 101: Stage Coach N to SB Rd	62	0.34	4.89E-03	1.06E-04	1.59E-04	8.46E-05	2.11E-05	0.00000	0.00000	0.011	0.003	0.0000	0.0003	0.0000	0.0042
32	2.6	Frwy 101: SB Rd to Curbaril	3619	0.34	1.75E-03	3.77E-05	5.66E-05	3.02E-05	7.55E-06	0.00023	0.00000	0.617	0.175	0.0000	0.0175	0.0001	0.2460
33	1.2	Frwy 101: Curbaril to Traffic Wy	2699	0.34	7.81E-04	1.69E-05	2.53E-05	1.35E-05	3.38E-06	0.00017	0.00000	0.460	0.131	0.0000	0.0131	0.0001	0.1835
34	3.4	Frwy 101: Traffic Wy to San Ramon	1582	0.34	2.31E-03	4.99E-05	7.48E-05	3.99E-05	9.98E-06	0.00010	0.00000	0.270	0.077	0.0000	0.0077	0.0001	0.1075
35	2.9	Frwy 101: San Ramon to Main	63	0.34	1.98E-03	4.28E-05	6.43E-05	3.43E-05	8.57E-06	0.00000	0.00000	0.011	0.003	0.0000	0.0003	0.0000	0.0043
36	3.1	Frwy 101: Main to Vine	93	0.34	2.12E-03	4.59E-05	6.88E-05	3.67E-05	9.17E-06	0.00001	0.00000	0.016	0.005	0.0000	0.0005	0.0000	0.0063
37	2.3	Frwy 101: Vine to Hwy 46	2508	0.34	1.56E-03	3.37E-05	5.06E-05	2.70E-05	6.74E-06	0.00016	0.00000	0.428	0.121	0.0000	0.0121	0.0001	0.1705
38	1.5	Hwy 46: Frwy 101 to Golden Hills Rd	2363	0.27	7.75E-04	1.67E-05	2.51E-05	1.34E-05	3.35E-06	0.00015	0.00000	0.403	0.114	0.0000	0.0114	0.0001	0.1606
39	3.3	Hwy 46: Golden Hills to Dry Creek	283	0.27	1.73E-03	3.75E-05	5.62E-05	3.00E-05	7.49E-06	0.00002	0.00000	0.048	0.014	0.0000	0.0014	0.0000	0.0193
40	26.8	Hwy 46: Dry Creekk to Kern Co	16	0.27	1.42E-02	3.07E-04	4.61E-04	2.46E-04	6.15E-05	0.00000	0.00000	0.003	0.001	0.0000	0.0001	0.0000	0.0011
41	5.0	Hwy 46/41: Kern Co to Kings Co	4	0.27	2.63E-03	5.68E-05	8.52E-05	4.54E-05	1.14E-05	0.00000	0.00000	0.001	0.000	0.0000	0.0000	0.0000	0.0003
42	16.0	Hwy 41/33: Kings Co to Tehama Rd	15	0.27	8.49E-03	1.83E-04	2.75E-04	1.47E-04	3.67E-05	0.00000	0.00000	0.003	0.001	0.0000	0.0001	0.0000	0.0010
43	1.2	Hwy 33: Tehama to 7th	4859	0.27	6.10E-04	1.32E-05	1.98E-05	1.05E-05	2.64E-06	0.00031	0.00000	0.829	0.235	0.0000	0.0235	0.0002	0.3304
44	2.3	Hwy 33: 7th to Laneva	682	0.27	1.20E-03	2.60E-05	3.89E-05	2.08E-05	5.19E-06	0.00004	0.00000	0.116	0.033	0.0000	0.0033	0.0000	0.0464
45	2.8	Hwy 33: Laneva to Sutter	22	0.27	1.48E-03	3.20E-05	4.79E-05	2.56E-05	6.39E-06	0.00000	0.00000	0.004	0.001	0.0000	0.0001	0.0000	0.0015

Off-Road Risks

Segment	Length, miles	Description	Population Density, ppsm	Base Accident Rate	Accident Frequency, per year	Large Spill Frequency, per year	Small Spill Frequency, per year	LFL and 1/2 LFL Frequency	Large Fire Frequency	1/2 LFL Exposed Persons	LFL Exposed Persons	5kW Fire Persons Exposed	10kW Fire Persons Exposed	LFL and 1/2 LFL Fatalities	Thermal Fatalities	LFL and 1/2 LFL Injuries	Thermal Injuries
46	13.6	Hwy 33: Sutter to Merced, Gale to PS	10	0.27	7.19E-03	1.55E-04	2.33E-04	1.24E-04	3.11E-05	0.00000	0.00000	0.002	0.000	0.0000	0.0000	0.0000	0.0007
47	3.1	Hwy 33: Merced to Gale	2192	0.27	1.62E-03	3.50E-05	5.25E-05	2.80E-05	6.99E-06	0.00014	0.00000	0.374	0.106	0.0000	0.0106	0.0001	0.1490

Input Values:

Base Accident Rate: Freeways	*0.34*
Base Accident Rate: Highways	*0.27*
Base Accident Rate: Freeway SM 101	*0.72*
Spill Probability	*0.054*
Spill: large probability	*0.40*
Spill : small probability	*0.60*
Ignition: large spill probability	*0.20*
Exclusion Distance, ft	*50.0*
Thermal 5kW/m2 distance, ft	*93.0*
Thermal 10kW/m2 distance, ft	*70.0*
Fraction thermal outside roadway , 5kW	*0.18*
Fraction thermal outside roadway , 10kW	*0.09*
1/2 LFL Distance	*53.0*
Fraction 1/2 LFL outside roadway	*0.01*
Fraction LFL outside roadway	*0.00*
Thermal 10kW fatalities fraction exposed	*0.10*
Thermal 5kW injuries fraction exposed	*0.20*
Thermal 10kW injuries fraction exposed	*0.90*
LFL fatalities fraction exposed	*0.50*
LFL injuries fraction exposed	*0.50*
1/2 LFL injuries fraction exposed	*0.50*
1/2 LFL fatalities fraction exposed	*0.10*

Notes:

Assumes 50% of 1/2 LFL area is within LFL
Thermal and LFL distances based on Canary model with 160 bbls release
Average population density, ppsm 962
Segments based on Census Tracts 2020
Off-road risks are risks to residences located near the roadway
Off-road risks only for larger spill fires and large spill LFL
Small spill calcs only used for spill chart
Fraction outside roadway is the arc segment outside the exclusion distance on one side of the roadway

Accident Frequency Calculations and Event Probabilities

Spill and Ignition Probabilities

Type	Probability
Spill	0.054
Large spill	0.40
Small Spill	0.60
Ignition large spill	0.20
Ignition small spill	0.02

Source: ExxonMobil Interim Trucking for SYU Phase Restart Project, TQRA, February 2020

Off-Road Injury/Fatality Probabilites

Type	Probability
Thermal 5kw injury	0.20
Thermal 10kW injury	0.90
Thermal 10kW fat	0.10
LFL fatality	0.50
LFL Injury	0.50
1/2 LFL injury	0.50
1/2 LFL fatality	0.10

Source: ExxonMobil Interim Trucking for SYU Phase Restart Project, TQRA, February 2020 for Thermal Estimates for LFL and 1/2 LFL

On-Road Injury/Fatality Probabilities

Type	Fatality	Injury
Large fire probability	0.05	0.10
Small fire probability	0.02	0.05

Source: ExxonMobil Interim Trucking for SYU Phase Restart Project, TQRA, February 2020 for Thermal

Fatality/Injury Distribution

Number	Onroad: Fatality/ Injury Fraction	Offroad: Poissons Equation
1	0.6	0.741
2	0.2	0.18
3	0.1	0.061
4	0.06	0.015
5	0.04	0.003
6	0	5.10E-04
7	0	7.00E-05

Source: ExxonMobil Interim Trucking for SYU Phase Restart Project, TQRA, February 2020 for Onroad

Highway 101/46/41/33 Calculated Accident Rate, per million miles

Route Section ID	Hwy	Distance, miles	HM Class 3 Accident Rate per Million Miles	Segment Description
B1	101	5.2	0.72	Betteravia-Rte166
B2	101	4.1	0.27	Rte166-Nipomo
B3	101	1.7	0.17	Nipomo
B4	101	6.2	0.14	Nipmo-AG
B5	101	7.4	0.37	AG-Shell Beach
B6	101	5.9	0.19	Shell Beach -SLO
B7	101	4	0.41	SLO
B8	101	2.4	0.42	SLO-Los Padres Hills
B9	101	3.3	0.78	LPH
B10	101	6.7	0.31	LPH-Atas
B11	101	6.9	0.21	Atas
B12	101	2	0.29	Atas-Temp
B13	101	6.8	0.29	Temp-SR46
B14	46	2.5	0.63	Hwy101-Paso
B15	46	14.7	0.22	Rural
B16	46	4.1	0.19	2 lane hwy
B17	46	1.9	0.07	4 lane
B18	46	2.2	0.23	2lane - hwy 41
B19	46	6.1	0.22	Hwy 41
B20	46	20.4	0.33	Hwy 41 - Hwy 33
B21	33	12.1	0.22	Hwy 33

Source: AERA East Cat Canyon Oil Field Redevelopment Plan, TRQA, January 2017

Accident Rates by Road Type

Freeways	62.6	0.34	per million miles
Freeway in Santa Maria	5.20	0.72	per million miles
Highways	64	0.27	per million miles

FN/FS Chart Inputs

FATALITY (onroad +offroad)

Frequency Onroad	Frequency Offroad	Frequency Total	Fatalities	Freq Sum
1.00E-08	0.00E+00	1.00E-08	5	1.00E-08
8.83E-07	7.96E-09	8.91E-07	5	8.91E-07
1.33E-06	3.98E-08	1.37E-06	4	2.26E-06
2.21E-06	1.62E-07	2.37E-06	3	4.63E-06
4.42E-06	4.88E-07	4.91E-06	2	9.53E-06
1.33E-05	1.97E-06	1.52E-05	1	2.48E-05

INJURY (onroad + offroad)

Frequency Onroad	Frequency Offroad	Frequency Total	Injuries	Freq Sum
1.00E-08	0	1.00E-08	5	1.00E-08
1.79E-06	1.1145E-07	1.90E-06	5	1.90E-06
2.69E-06	5.5725E-07	3.25E-06	4	5.15E-06
4.48E-06	2.2661E-06	6.75E-06	3	1.19E-05
8.96E-06	6.8356E-06	1.58E-05	2	2.77E-05
2.69E-05	2.7528E-05	5.44E-05	1	8.21E-05

Spills

Frequency	Gallons	Freq Sum
1.00E-04	6720	1.00E-04
2.08E-03	6720	2.08E-03
3.13E-03	672	5.21E-03
3.13E-03	100	5.21E-03

Attachment 3
Canary© Modeling Files

Case Inputs

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Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL100
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                             80 lb/cu.ft
  Substrate heat Capacity                     0.22 Btu/lb-F
  Substrate delay time                           0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
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RELEASE MENU
Type of release:   Regulated
Release duration                                  10 min
Regulated flow rate                             0.97 lb/sec
Pipe inner diameter                             7.98 inches
Equivalent release diameter                     8.00 inches
Height of release point                          1.0 feet
Angle of release from horizontal                 0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                        LFL mol%
  Concentration endpoint 2                        LFL mol%
  Concentration endpoint 3                    1/2 LFL mol%
Dispersion coefficient averaging time              1 min


  NOTES:
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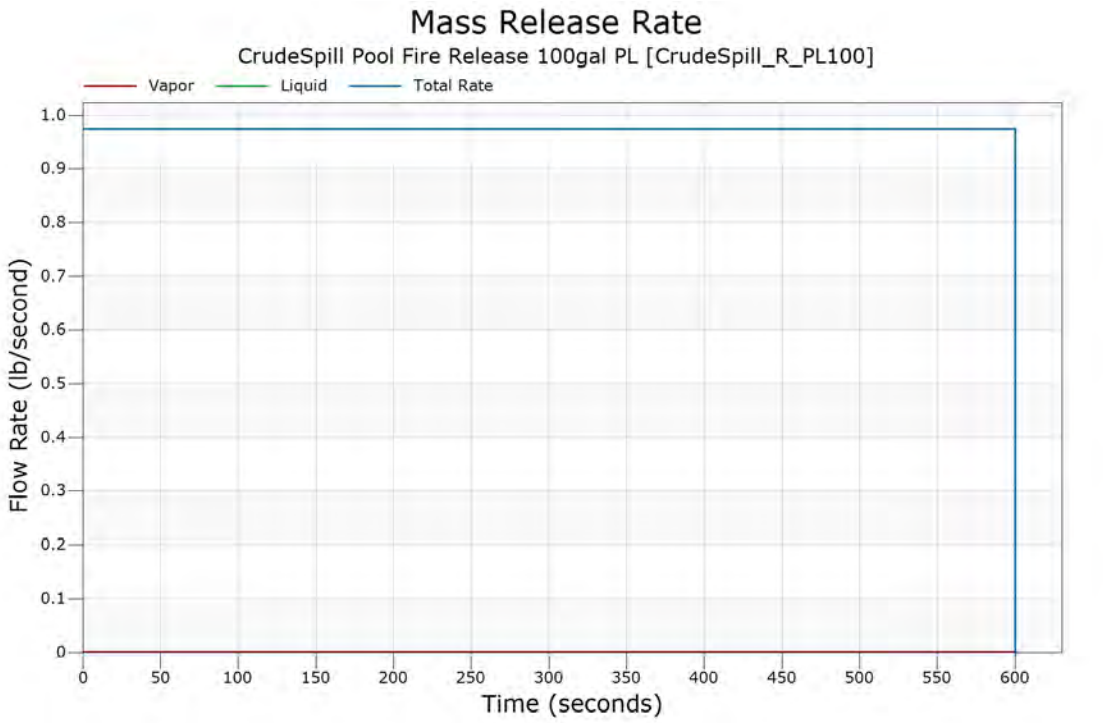
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.7361798E-03	0.000000	.9736638	.9744000
0.1000000	.7361798E-03	0.000000	.9736638	.9744000
0.3000000	.7361798E-03	0.000000	.9736638	.9744000
0.5000000	.7361798E-03	0.000000	.9736638	.9744000
0.7000000	.7361798E-03	0.000000	.9736638	.9744000
1.000000	.7361798E-03	0.000000	.9736638	.9744000
3.000000	.7361798E-03	0.000000	.9736638	.9744000
5.000000	.7361798E-03	0.000000	.9736638	.9744000
7.000000	.7361798E-03	0.000000	.9736638	.9744000
10.00000	.7361798E-03	0.000000	.9736638	.9744000
20.00000	.7361798E-03	0.000000	.9736638	.9744000
30.00000	.7361798E-03	0.000000	.9736638	.9744000
40.00000	.7361798E-03	0.000000	.9736638	.9744000
50.00000	.7361798E-03	0.000000	.9736638	.9744000
60.00000	.7361798E-03	0.000000	.9736638	.9744000
70.00000	.7361798E-03	0.000000	.9736638	.9744000
85.00000	.7361798E-03	0.000000	.9736638	.9744000
100.0000	.7361798E-03	0.000000	.9736638	.9744000
200.0000	.7361798E-03	0.000000	.9736638	.9744000
300.0000	.7361798E-03	0.000000	.9736638	.9744000
400.0000	.7361798E-03	0.000000	.9736638	.9744000
500.0000	.7361798E-03	0.000000	.9736638	.9744000
600.0000	.7361798E-03	0.000000	.9736638	.9744000
Totals (lb)	.4417079	0.000000	584.1983	584.6400

Flowrate for Jet Fire [1st minute] = 0.7361798E-03 lb/sec.
Jet Fire [2-3 minutes] = 0.7361798E-03 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

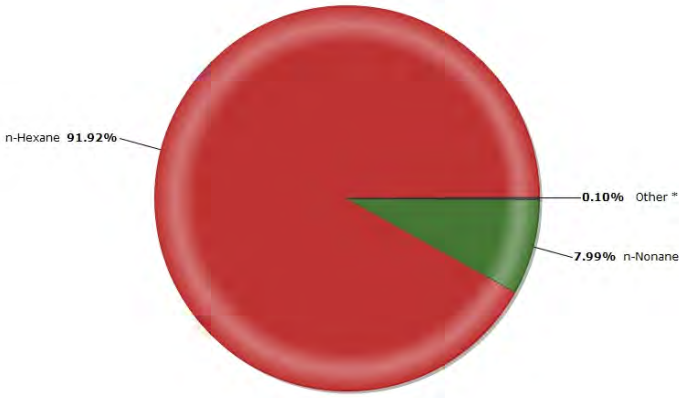
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

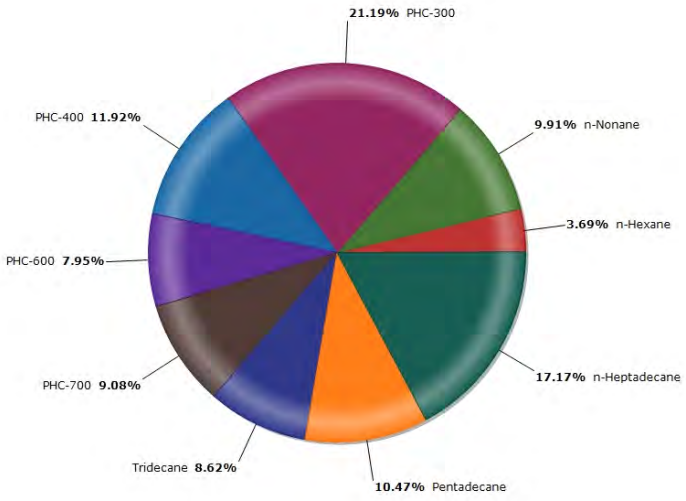
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

Liquid Pool Stream
CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



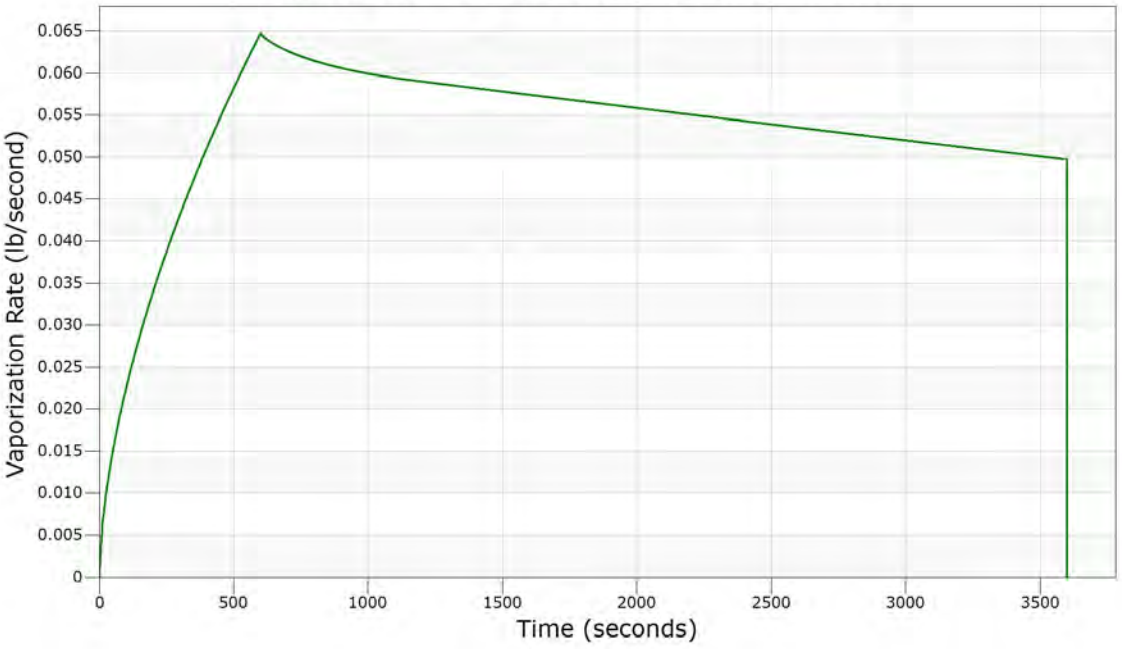
Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	0.883255	2.28917	0.130478E-01
80.0000	1.75856	2.88022	0.197184E-01
120.000	2.62840	3.29298	0.250930E-01
160.000	3.49368	3.62073	0.297602E-01
200.000	4.35500	3.89633	0.339622E-01
240.000	5.21244	4.13681	0.378225E-01
280.000	6.06671	4.35138	0.414227E-01
320.000	6.91744	4.54593	0.448112E-01
360.000	7.76534	4.72441	0.480233E-01
400.000	8.61042	4.88944	0.510877E-01
440.000	9.45303	5.04396	0.540221E-01
480.000	10.2925	5.18898	0.568462E-01
520.000	11.1298	5.32579	0.595711E-01
560.000	11.9646	5.45571	0.622056E-01
600.000	12.7966	5.57940	0.647608E-01
640.000	12.7380	5.57054	0.636849E-01
680.000	12.6801	5.56234	0.629684E-01
720.000	12.6229	5.55381	0.623886E-01
760.000	12.5660	5.54560	0.618970E-01
800.000	12.5095	5.53707	0.614715E-01
840.000	12.4537	5.52887	0.610945E-01
880.000	12.3979	5.52067	0.607616E-01
1130.00	12.0554	5.46949	0.592977E-01
1380.00	11.7192	5.41831	0.583012E-01
1630.00	11.3886	5.36680	0.573114E-01
1880.00	11.0641	5.31529	0.563281E-01
2130.00	10.7448	5.26378	0.553470E-01
2380.00	10.4312	5.21227	0.543770E-01
2630.00	10.1233	5.16043	0.534092E-01
2880.00	9.82066	5.10860	0.524502E-01
3130.00	9.52366	5.05643	0.514956E-01
3380.00	9.23231	5.00459	0.505454E-01
3600.00	8.98017	4.95866	0.497142E-01

Ending Message: Normal Ending

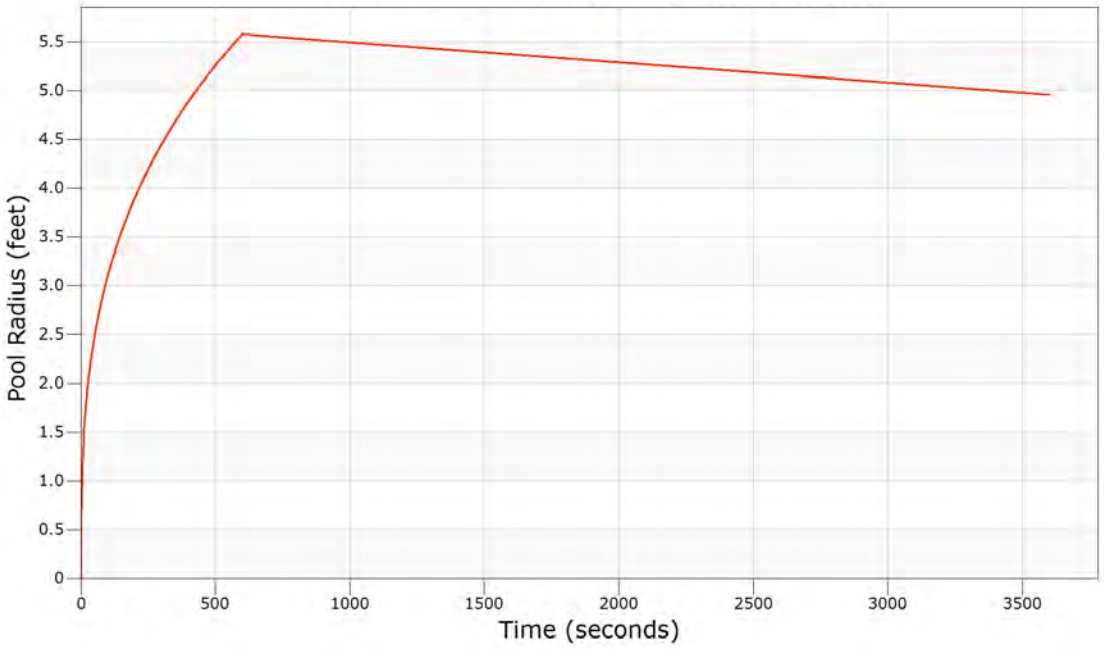
Pool Vaporization Rate

CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



Pool Radius

CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



Momentum Jet Dispersion

concentration limits

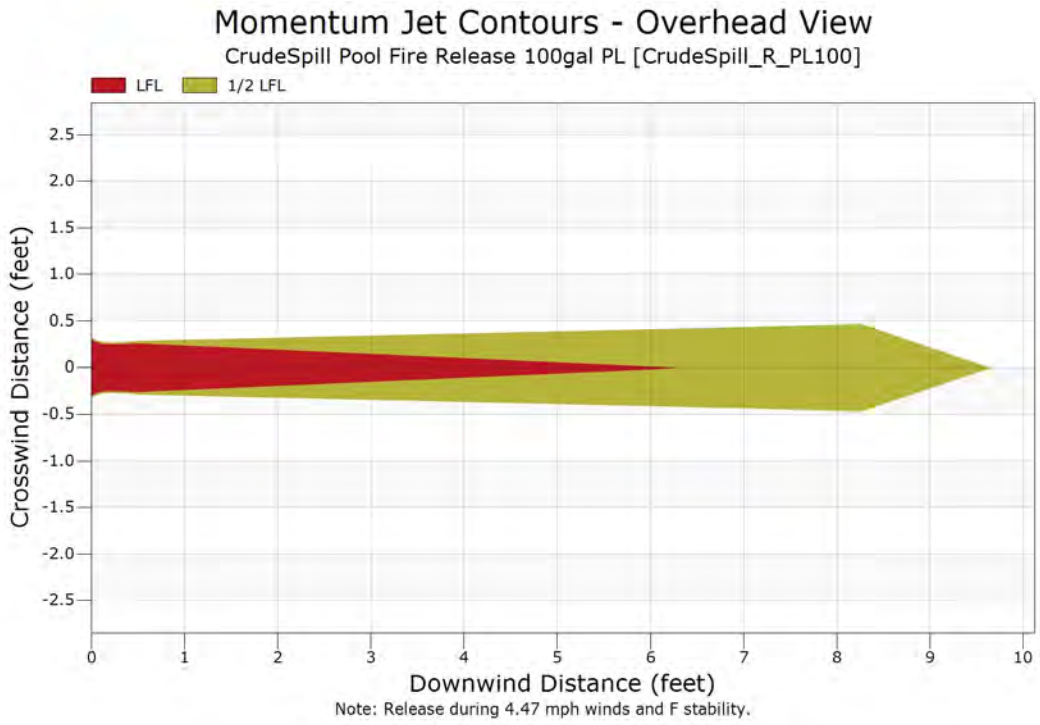
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.3	0.3	0.3	1.0
0.2	0.715254	0.000000	0.3	0.3	0.3	0.9
0.4	0.534872	0.000000	0.3	0.3	0.3	0.8
0.6	0.355870	0.355870	0.3	0.3	0.3	0.0
0.8	0.231668	0.231668	0.3	0.3	0.3	0.0
1.0	0.166059	0.166059	0.3	0.2	0.2	0.0
1.2	0.126506	0.126506	0.3	0.2	0.2	0.0
1.4	0.100512	0.100512	0.3	0.2	0.2	0.0
1.6	0.082354	0.082354	0.3	0.2	0.2	0.0
1.8	0.069081	0.069081	0.3	0.2	0.2	0.0
2.0	0.059031	0.059031	0.3	0.2	0.2	0.0
2.2	0.051206	0.051206	0.3	0.2	0.2	0.0
2.4	0.044971	0.044971	0.3	0.2	0.2	0.0
2.6	0.039908	0.039908	0.3	0.2	0.2	0.0
2.8	0.035731	0.035731	0.3	0.2	0.2	0.0
3.0	0.032235	0.032235	0.3	0.2	0.2	0.0
3.2	0.029276	0.029276	0.4	0.1	0.1	0.0
3.4	0.026744	0.026744	0.4	0.1	0.1	0.0
3.6	0.024557	0.024557	0.4	0.1	0.1	0.0
3.8	0.022654	0.022654	0.4	0.1	0.1	0.0
4.0	0.020985	0.020985	0.4	0.1	0.1	0.0
4.2	0.019511	0.019511	0.4	0.1	0.1	0.0
4.4	0.018203	0.018203	0.4	0.1	0.1	0.0
4.6	0.017035	0.017035	0.4	0.1	0.1	0.0
4.8	0.015987	0.015987	0.4	0.1	0.1	0.0
5.0	0.015042	0.015042	0.4	0.1	0.1	0.0
5.2	0.014187	0.014187	0.4	0.1	0.1	0.0
5.4	0.013410	0.013410	0.4	0.0	0.0	0.0
5.6	0.012702	0.012702	0.4	0.0	0.0	0.0
5.8	0.012054	0.012054	0.4	0.0	0.0	0.0
6.0	0.011459	0.011459	0.4	0.0	0.0	0.0
6.2	0.010912	0.010912	0.4	0.0	0.0	0.0
6.4	0.010407	0.010407	0.4	0.0	0.0	0.0
6.6	0.009940	0.009940	0.4	0.0	0.0	0.0
6.8	0.009507	0.009507	0.4	0.0	0.0	0.0

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
7.0	0.009105	0.009105	0.4	0.0	0.0	0.0
7.2	0.008730	0.008730	0.4	0.0	0.0	0.0
7.4	0.008380	0.008380	0.4	0.0	0.0	0.0
7.6	0.008053	0.008053	0.5	0.0	0.0	0.0
7.8	0.007747	0.007747	0.5	0.0	0.0	0.0
8.0	0.007460	0.007460	0.5	0.0	0.0	0.0
8.2	0.007190	0.007190	0.5	0.0	0.0	0.0
8.4	0.006894	0.006894	0.4	0.0	0.0	0.0
8.6	0.006598	0.006598	0.4	0.0	0.0	0.0
8.8	0.006321	0.006321	0.3	0.0	0.0	0.0
9.0	0.006061	0.006061	0.2	0.0	0.0	0.0
9.2	0.005817	0.005817	0.1	0.0	0.0	0.0
9.4	0.005589	0.005589	0.1	0.0	0.0	0.0
9.6	0.005373	0.005373	0.0	0.0	0.0	0.0
9.8	0.005171	0.005171	0.0	0.0	0.0	0.0

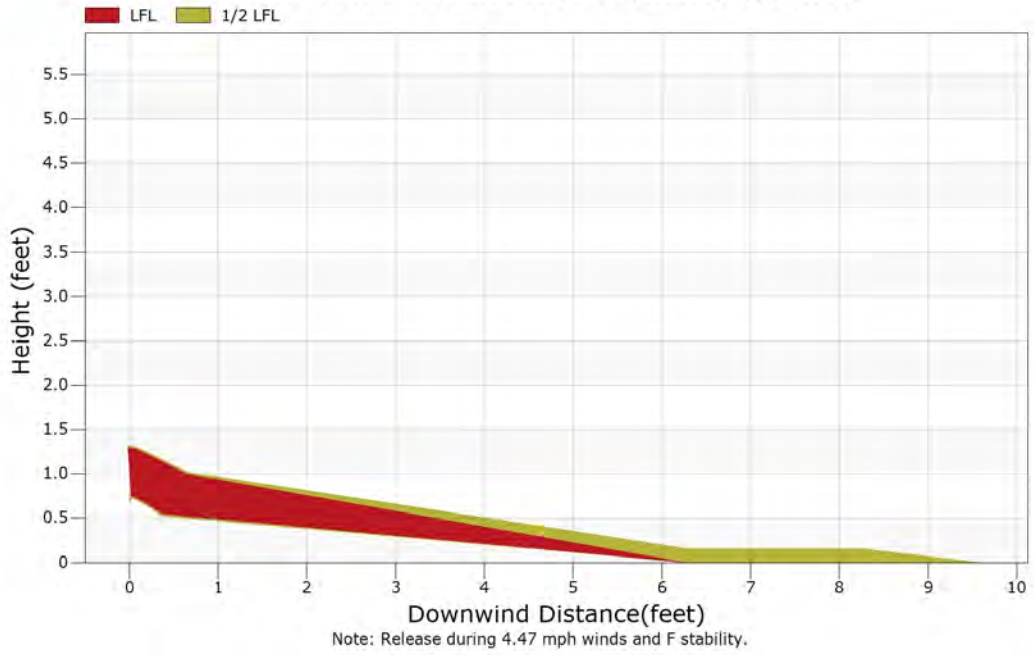
The momentum jet model coupled to the heavy gas model at 0.50 ft in 0 sec.

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.010670 (LFL)	6.3	2
2	0.010670 (LFL)	6.3	2
3	0.005335 (1/2 LFL)	9.6	3



Momentum Jet Contours - Side View

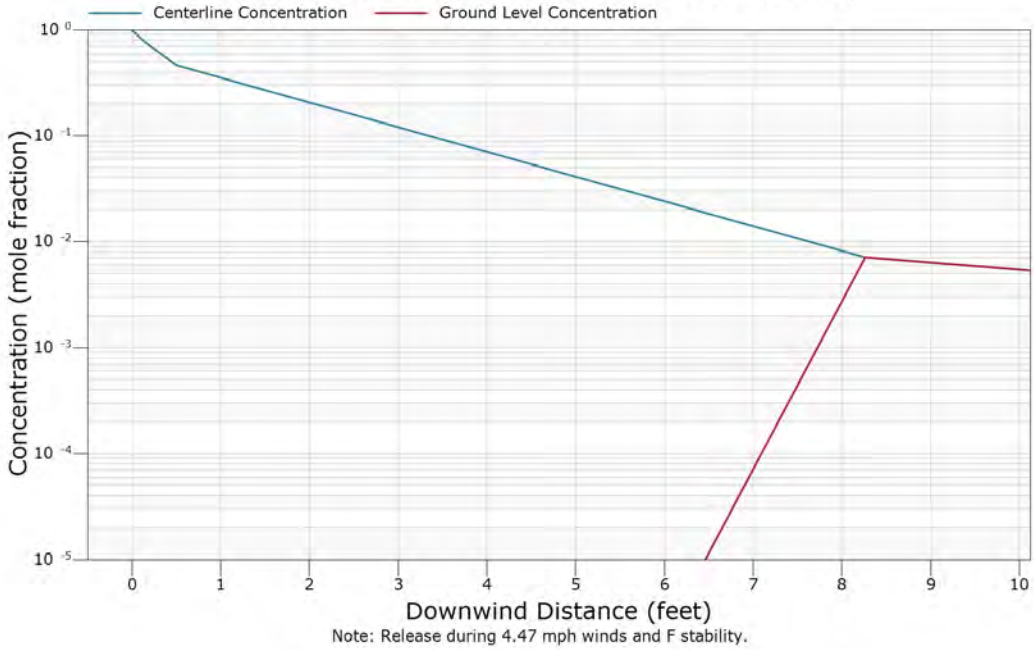
CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



Note: Release during 4.47 mph winds and F stability.

Momentum Jet Concentration

CrudeSpill Pool Fire Release 100gal PL [CrudeSpill_R_PL100]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

```
  concentration limits

  Endpoint 1 (highest) =    0.004529 mole fraction
  Endpoint 2 (middle)  =    0.004529 mole fraction
  Endpoint 3 (lowest)  =    0.002265 mole fraction

downwind   centerline      Endpoint3  Endpoint2  Endpoint1
distance      conc.        1/2 width  1/2 width  1/2 width
  (ft)    (mole frac.)      (ft)       (ft)       (ft)

* Vapor cloud does not leave source.
```

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_100PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              11.2 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

Pool Fire Radiation

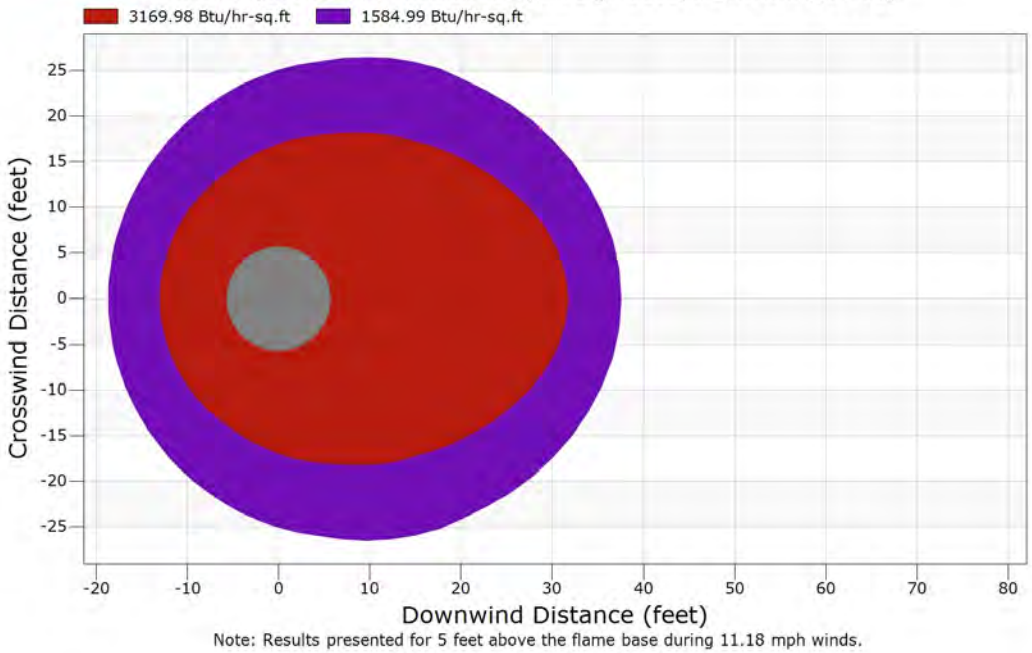
Length of Flame	:	20.1	feet
Flame Tilt from Vertical	:	52.9	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
18.0	17923	21466	24968
18.8	15832	17827	23842
19.6	14225	14786	20518
20.5	12700	11506	17137
21.4	10780	8941	14005
22.3	9052	7301	11630
23.2	7730	6169	9890
24.2	6736	5251	8540
25.3	5957	4409	7411
26.4	5317	3608	6426
27.5	4746	2858	5540
28.7	4183	2188	4721
29.9	3634	1628	3982
31.2	3119	1189	3338
32.6	2655	859	2791
34.0	2253	621	2337
35.5	1913	451	1965
37.0	1627	330	1660
38.6	1389	244	1410
40.3	1191	183	1205
42.0	1026	139	1036
43.8	888	106	895
45.7	772	82	776
47.7	673	64	676
49.7	589	50	591
51.9	518	40	519
54.1	456	32	457
56.4	403	26	404
58.9	357	21	357
61.4	317	17	317

Downwind Distances to Endpoints:

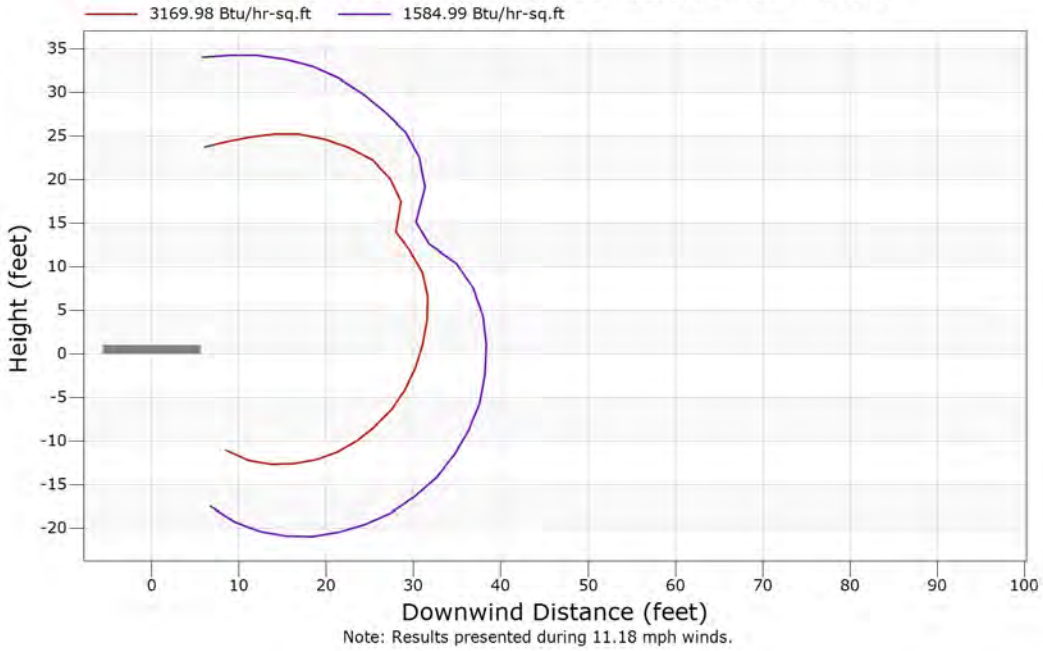
Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
31.7	3170
37.5	1585
37.5	1585

Pool Fire Radiant Heat Contours - Overhead View



Note: Results presented for 5 feet above the flame base during 11.18 mph winds.

Pool Fire Radiant Heat Contours - Side View



Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL500
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                             80 lb/cu.ft
  Substrate heat Capacity                     0.22 Btu/lb-F
  Substrate delay time                           0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
```

```
RELEASE MENU
Type of release:   Regulated
Release duration                                  10 min
Regulated flow rate                             4.87 lb/sec
Pipe inner diameter                             7.98 inches
Equivalent release diameter                     8.00 inches
Height of release point                          1.0 feet
Angle of release from horizontal                 0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                        LFL mol%
  Concentration endpoint 2                        LFL mol%
  Concentration endpoint 3                    1/2 LFL mol%
Dispersion coefficient averaging time              1 min


  NOTES:
```

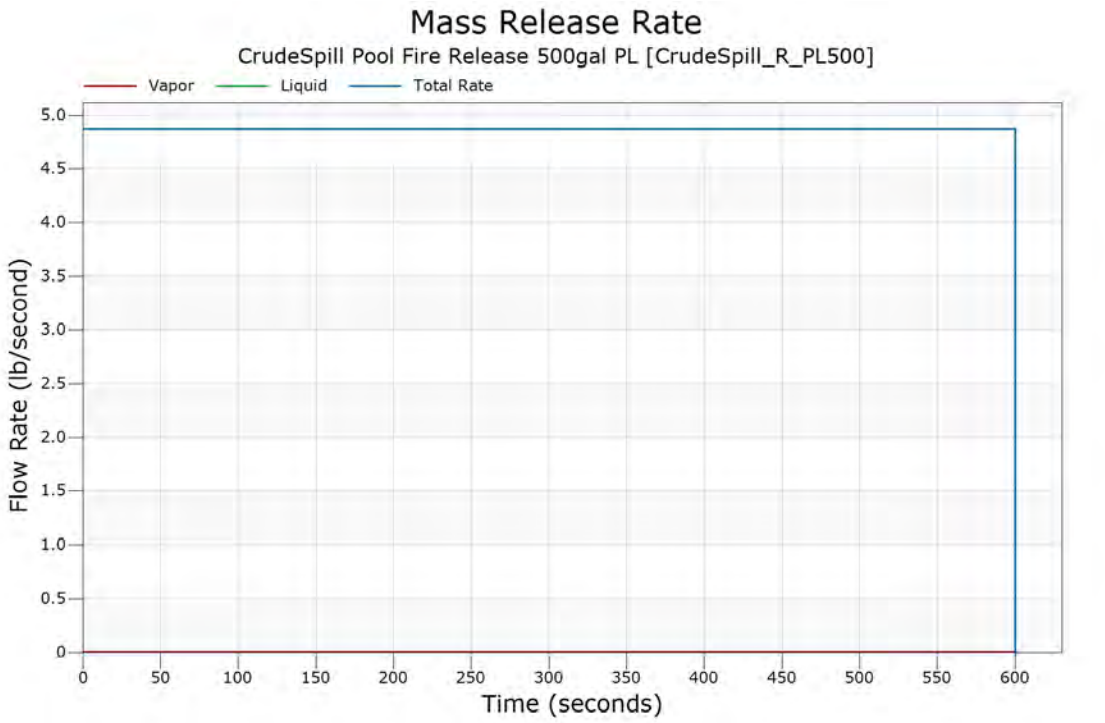
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.3680899E-02	0.000000	4.868319	4.872000
0.1000000	.3680899E-02	0.000000	4.868319	4.872000
0.3000000	.3680899E-02	0.000000	4.868319	4.872000
0.5000000	.3680899E-02	0.000000	4.868319	4.872000
0.7000000	.3680899E-02	0.000000	4.868319	4.872000
1.000000	.3680899E-02	0.000000	4.868319	4.872000
3.000000	.3680899E-02	0.000000	4.868319	4.872000
5.000000	.3680899E-02	0.000000	4.868319	4.872000
7.000000	.3680899E-02	0.000000	4.868319	4.872000
10.00000	.3680899E-02	0.000000	4.868319	4.872000
20.00000	.3680899E-02	0.000000	4.868319	4.872000
30.00000	.3680899E-02	0.000000	4.868319	4.872000
40.00000	.3680899E-02	0.000000	4.868319	4.872000
50.00000	.3680899E-02	0.000000	4.868319	4.872000
60.00000	.3680899E-02	0.000000	4.868319	4.872000
70.00000	.3680899E-02	0.000000	4.868319	4.872000
85.00000	.3680899E-02	0.000000	4.868319	4.872000
100.0000	.3680899E-02	0.000000	4.868319	4.872000
200.0000	.3680899E-02	0.000000	4.868319	4.872000
300.0000	.3680899E-02	0.000000	4.868319	4.872000
400.0000	.3680899E-02	0.000000	4.868319	4.872000
500.0000	.3680899E-02	0.000000	4.868319	4.872000
600.0000	.3680899E-02	0.000000	4.868319	4.872000
Totals (lb)	2.208539	0.000000	2920.991	2923.200

Flowrate for Jet Fire [1st minute] = 0.3680899E-02 lb/sec.
Jet Fire [2-3 minutes] = 0.3680899E-02 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

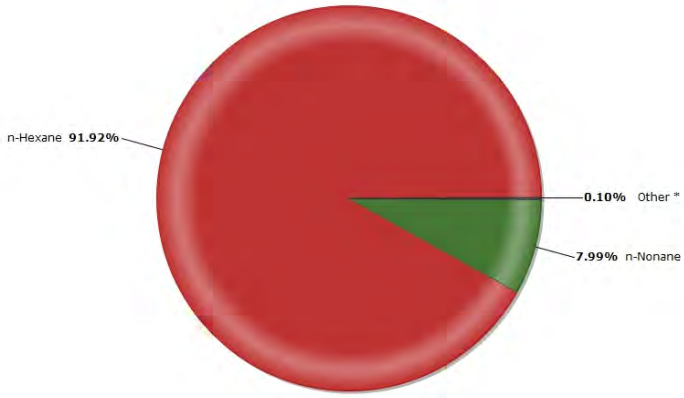
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

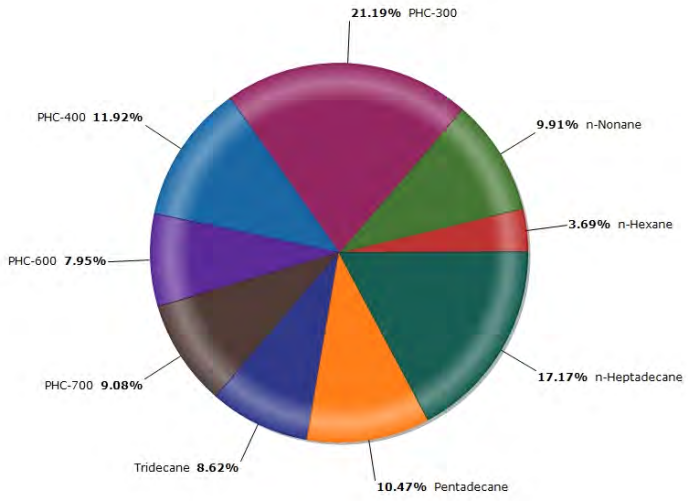
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

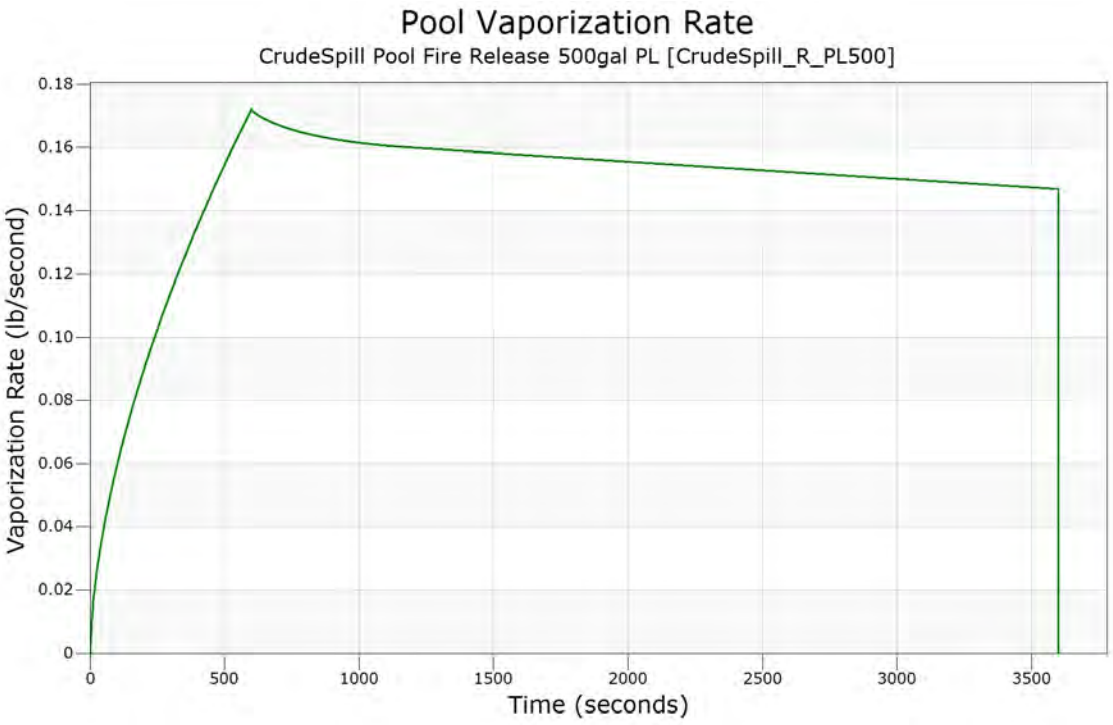
Liquid Pool Stream
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]

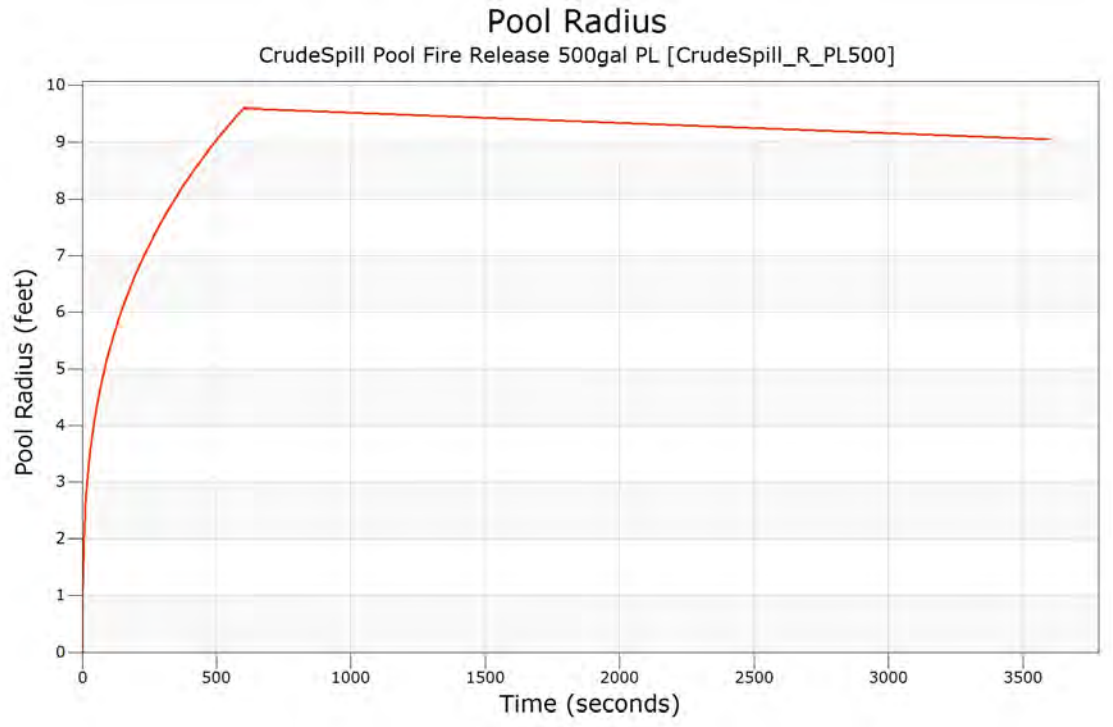


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	4.43305	3.91699	0.343127E-01
80.0000	8.84527	4.93209	0.519321E-01
120.000	13.2430	5.64239	0.661585E-01
160.000	17.6287	6.20669	0.785397E-01
200.000	22.0035	6.68241	0.897061E-01
240.000	26.3688	7.09777	0.999862E-01
280.000	30.7248	7.46850	0.109579
320.000	35.0721	7.80545	0.118629
360.000	39.4112	8.11417	0.127211
400.000	43.7443	8.40125	0.135412
440.000	48.0668	8.66896	0.143274
480.000	52.3858	8.92093	0.150853
520.000	56.6942	9.15879	0.158171
560.000	60.9990	9.38484	0.165252
600.000	65.2968	9.60007	0.172128
640.000	65.1414	9.59219	0.169522
680.000	64.9860	9.58465	0.167853
720.000	64.8342	9.57710	0.166535
760.000	64.6823	9.56988	0.165448
800.000	64.5305	9.56234	0.164527
840.000	64.3822	9.55479	0.163733
880.000	64.2303	9.54757	0.163047
1130.00	63.3086	9.50164	0.160369
1380.00	62.3975	9.45571	0.158951
1630.00	61.4934	9.40978	0.157567
1880.00	60.5964	9.36417	0.156191
2130.00	59.7065	9.31824	0.154815
2380.00	58.8272	9.27198	0.153444
2630.00	57.9514	9.22605	0.152077
2880.00	57.0862	9.18012	0.150712
3130.00	56.2280	9.13386	0.149354
3380.00	55.3805	9.08760	0.147994
3600.00	54.6389	9.04692	0.146806

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]
Vaporization Rate (lb/second)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]
Pool Radius (feet)
10
9
8
7
6
5
4
3
2
1
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

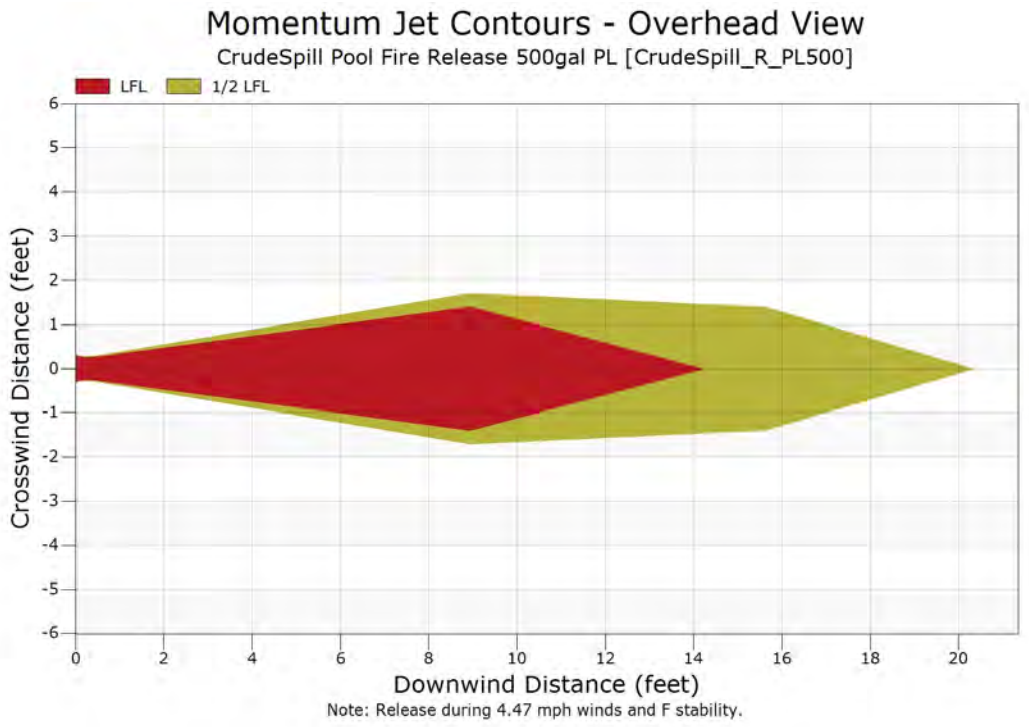
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.3	0.3	0.3	1.0
0.5	0.485758	0.000000	0.3	0.3	0.3	0.8
1.0	0.239008	0.239008	0.4	0.3	0.3	0.0
1.5	0.157692	0.157692	0.5	0.4	0.4	0.0
2.0	0.117401	0.117401	0.5	0.5	0.5	0.0
2.5	0.093385	0.093385	0.6	0.5	0.5	0.0
3.0	0.077458	0.077458	0.7	0.6	0.6	0.0
3.5	0.066131	0.066131	0.8	0.7	0.7	0.0
4.0	0.057667	0.057667	0.9	0.7	0.7	0.0
4.5	0.051105	0.051105	1.0	0.8	0.8	0.0
5.0	0.045871	0.045871	1.1	0.9	0.9	0.0
5.5	0.041599	0.041599	1.1	0.9	0.9	0.0
6.0	0.038048	0.038048	1.2	1.0	1.0	0.0
6.5	0.035049	0.035049	1.3	1.1	1.1	0.0
7.0	0.032484	0.032484	1.4	1.1	1.1	0.0
7.5	0.030265	0.030265	1.5	1.2	1.2	0.0
8.0	0.028326	0.028326	1.6	1.3	1.3	0.0
8.5	0.026619	0.026619	1.6	1.3	1.3	0.0
9.0	0.024955	0.024955	1.7	1.4	1.4	0.0
9.5	0.022568	0.022568	1.7	1.3	1.3	0.0
10.0	0.020515	0.020515	1.7	1.1	1.1	0.0
10.5	0.018736	0.018736	1.6	1.0	1.0	0.0
11.0	0.017184	0.017184	1.6	0.9	0.9	0.0
11.5	0.015820	0.015820	1.6	0.7	0.7	0.0
12.0	0.014617	0.014617	1.6	0.6	0.6	0.0
12.5	0.013548	0.013548	1.6	0.5	0.5	0.0
13.0	0.012595	0.012595	1.5	0.3	0.3	0.0
13.5	0.011742	0.011742	1.5	0.2	0.2	0.0
14.0	0.010974	0.010974	1.5	0.1	0.1	0.0
14.5	0.010281	0.010281	1.5	0.0	0.0	0.0
15.0	0.009653	0.009653	1.4	0.0	0.0	0.0
15.5	0.009082	0.009082	1.4	0.0	0.0	0.0
16.0	0.008540	0.008540	1.3	0.0	0.0	0.0
16.5	0.008038	0.008038	1.1	0.0	0.0	0.0
17.0	0.007580	0.007580	1.0	0.0	0.0	0.0

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
17.5	0.007161	0.007161	0.8	0.0	0.0	0.0
18.0	0.006775	0.006775	0.7	0.0	0.0	0.0
18.5	0.006420	0.006420	0.5	0.0	0.0	0.0
19.0	0.006092	0.006092	0.4	0.0	0.0	0.0
19.5	0.005789	0.005789	0.2	0.0	0.0	0.0
20.0	0.005508	0.005508	0.1	0.0	0.0	0.0
20.5	0.005247	0.005247	0.0	0.0	0.0	0.0

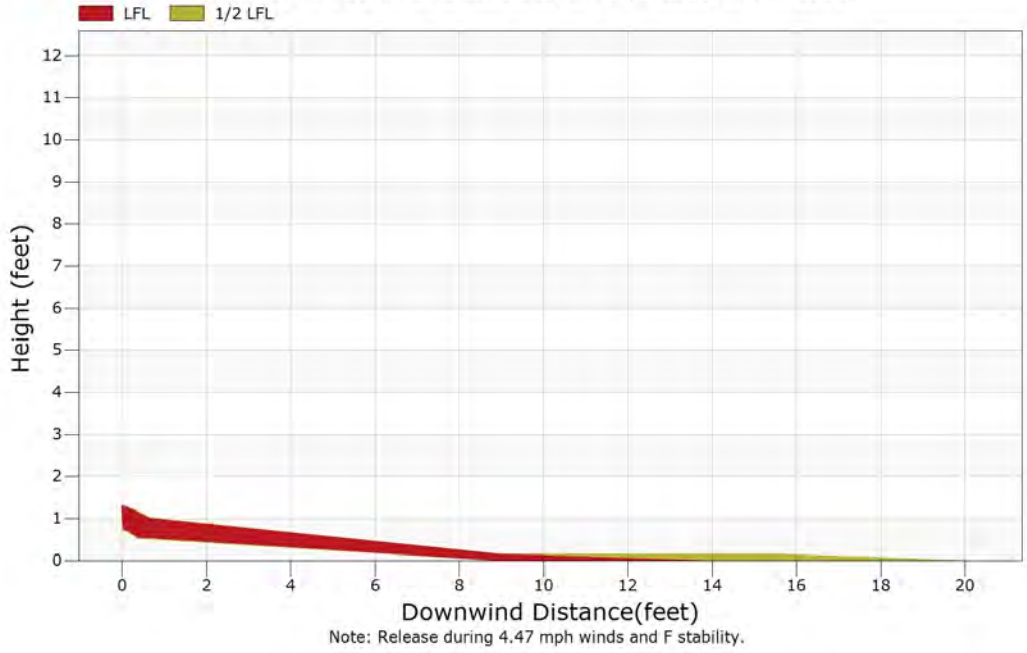
The momentum jet model coupled to the heavy gas model at 0.50 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	14.2	4
2 0.010670 (LFL)	14.2	4
3 0.005335 (1/2 LFL)	20.3	6



Momentum Jet Contours - Side View

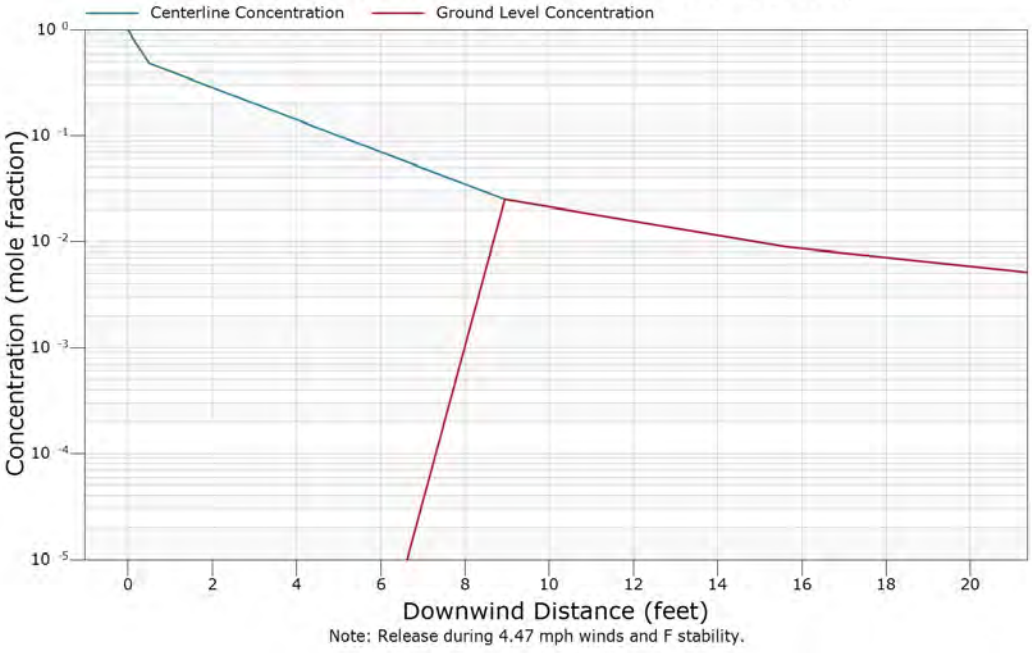
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]



Note: Release during 4.47 mph winds and F stability.

Momentum Jet Concentration

CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

concentration limits

Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

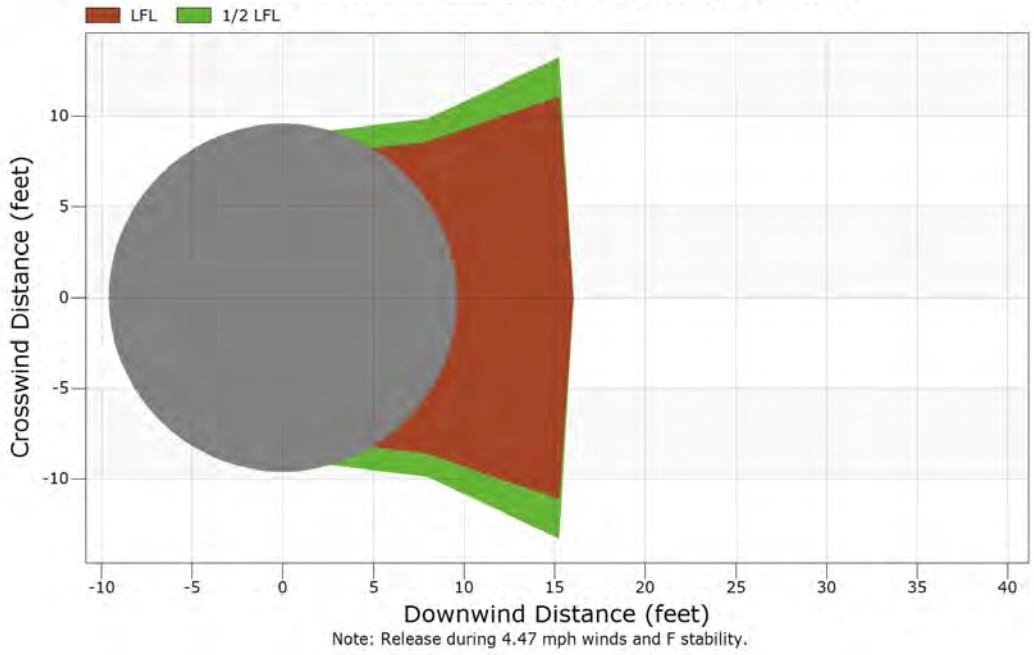
downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
2.00	0.002319	10.17	0.00	0.00
2.25	0.002419	10.17	0.00	0.00
2.50	0.002460	10.17	0.00	0.00
2.75	0.002479	10.18	0.00	0.00
3.00	0.002497	10.18	0.00	0.00
3.25	0.002513	10.18	0.00	0.00
3.50	0.002529	10.18	0.00	0.00
3.75	0.002543	10.19	0.00	0.00
4.00	0.002556	10.19	0.00	0.00
4.25	0.002569	10.19	0.00	0.00
4.50	0.002581	10.20	0.00	0.00
4.75	0.002592	10.20	0.00	0.00
5.00	0.002603	10.20	0.00	0.00
5.25	0.002614	10.21	0.00	0.00
5.50	0.002624	10.21	0.00	0.00
5.75	0.002633	10.21	0.00	0.00
6.00	0.002642	10.21	0.00	0.00
6.25	0.002651	10.22	0.00	0.00
6.50	0.002660	10.22	0.00	0.00
6.75	0.002668	10.22	0.00	0.00
7.00	0.002676	10.23	0.00	0.00
7.25	0.002683	10.23	0.00	0.00
7.50	0.002691	10.23	0.00	0.00
7.75	0.002698	10.24	0.00	0.00
8.00	0.002696	10.24	0.00	0.00
8.25	0.002677	10.24	0.00	0.00
8.50	0.002659	10.24	0.00	0.00
8.75	0.002641	10.25	0.00	0.00
9.00	0.002624	10.37	0.00	0.00
9.25	0.002608	10.48	0.00	0.00
9.50	0.002592	10.60	0.00	0.00
9.75	0.002577	10.72	0.00	0.00
10.00	0.002562	10.83	0.00	0.00
10.25	0.002547	10.95	0.00	0.00
10.50	0.002533	11.07	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
10.75	0.002520	11.19	0.00	0.00
11.00	0.002507	11.30	0.00	0.00
11.25	0.002494	11.42	0.00	0.00
11.50	0.002481	11.54	0.00	0.00
11.75	0.002469	11.66	0.00	0.00
12.00	0.002457	11.77	0.00	0.00
12.25	0.002446	11.89	0.00	0.00
12.50	0.002434	12.01	0.00	0.00
12.75	0.002423	12.13	0.00	0.00
13.00	0.002413	12.24	0.00	0.00
13.25	0.002402	12.36	0.00	0.00
13.50	0.002392	12.48	0.00	0.00
13.75	0.002382	12.60	0.00	0.00
14.00	0.002372	12.71	0.00	0.00
14.25	0.002362	12.83	0.00	0.00
14.50	0.002353	12.95	0.00	0.00
14.75	0.002344	13.07	0.00	0.00
15.00	0.002335	13.18	0.00	0.00
15.25	0.002326	13.30	0.00	0.00
15.50	0.002306	13.30	0.00	0.00
15.75	0.002287	13.30	0.00	0.00
16.00	0.002269	13.30	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	16.1	10

Heavier-than-Air Contours - Overhead View

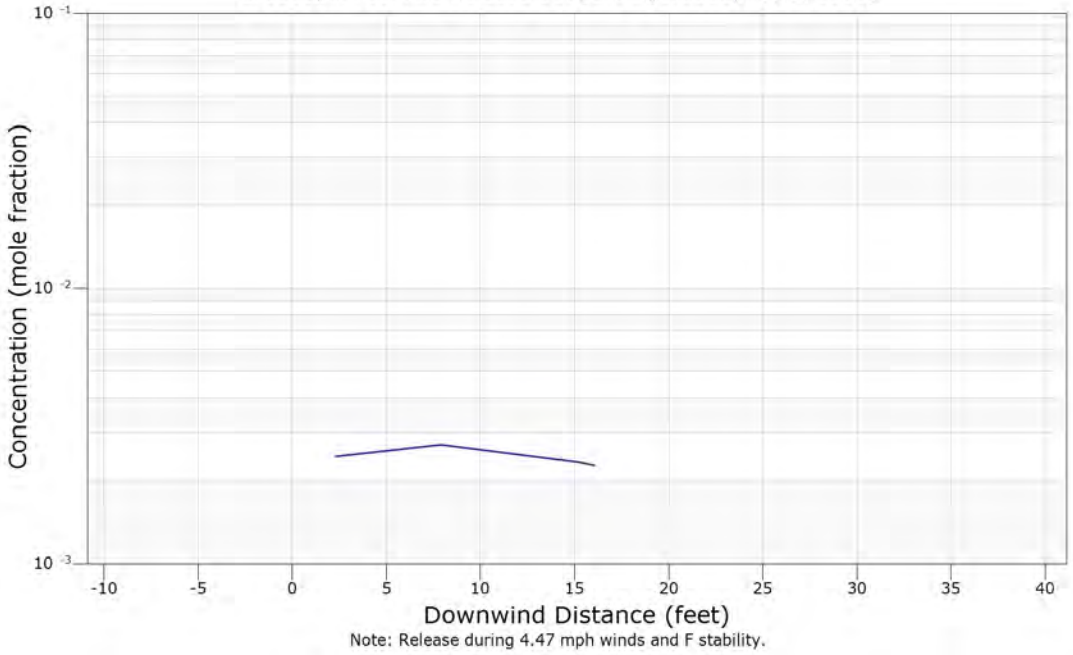
CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Centerline Concentration

CrudeSpill Pool Fire Release 500gal PL [CrudeSpill_R_PL500]



Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_500PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              19.2 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

Pool Fire Radiation

Length of Flame	:	29.2	feet
Flame Tilt from Vertical	:	46.9	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

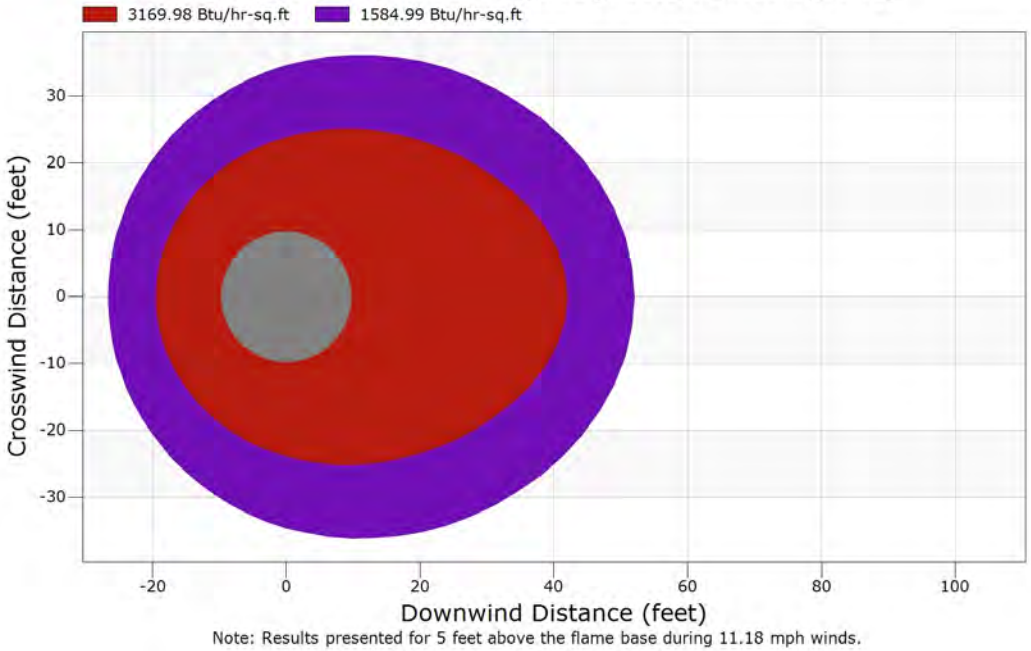
Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
23.9	16082	8903	18382
25.0	10973	6688	12850
26.1	8894	5922	10685
27.3	7586	5367	9292
28.5	6624	4892	8235
29.8	5866	4460	7369
31.2	5242	4053	6626
32.6	4717	3658	5969
34.1	4272	3271	5381
35.6	3885	2887	4840
37.2	3545	2507	4342
38.9	3237	2136	3878
40.7	2944	1783	3442
42.5	2653	1457	3027
44.4	2371	1168	2643
46.4	2099	922	2292
48.5	1843	719	1978
50.7	1609	556	1703
53.0	1400	429	1464
55.4	1215	330	1259
58.0	1053	255	1084
60.6	914	197	935
63.3	795	154	809
66.2	692	120	702
69.2	604	95	611
72.3	528	75	533
75.6	462	59	466
79.0	406	48	409
82.6	357	38	359
86.4	315	31	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
41.9	3170
51.9	1585
51.9	1585

Pool Fire Radiant Heat Contours - Overhead View

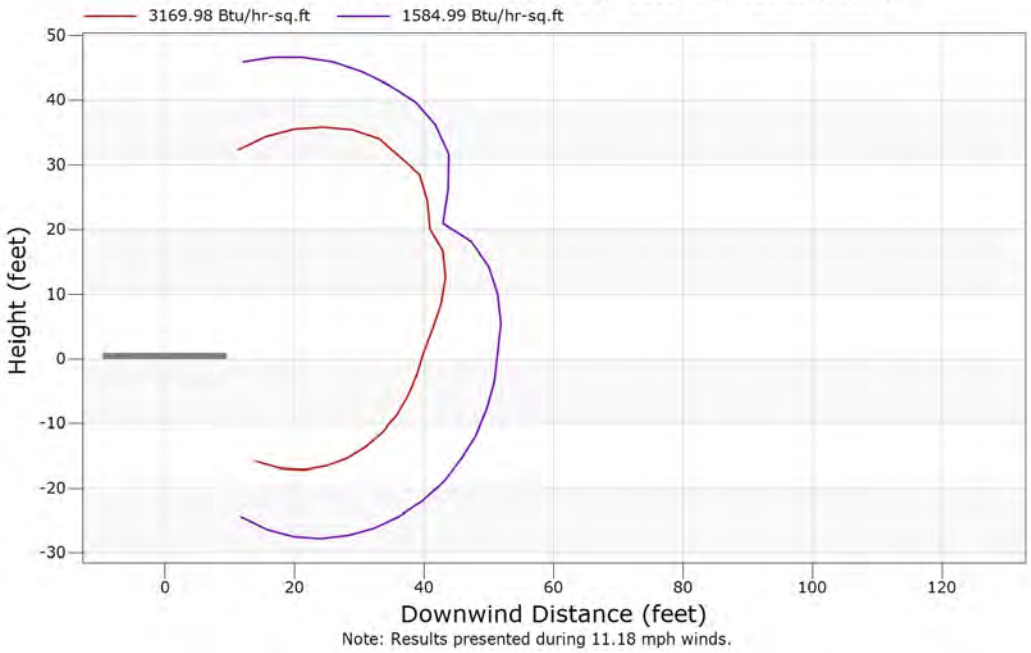
CrudeSpill Pool Fire Thermal 500gal PL [CrudeSpill_Thermal_500PL]



Note: Results presented for 5 feet above the flame base during 11.18 mph winds.

Pool Fire Radiant Heat Contours - Side View

CrudeSpill Pool Fire Thermal 500gal PL [CrudeSpill_Thermal_500PL]



Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL1000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                            Medium density concrete
  Substrate thermal conductivity              0.2698 Btu/hr-ft-F
  Substrate density                              80 lb/cu.ft
  Substrate heat Capacity                      0.22 Btu/lb-F
  Substrate delay time                            0 sec
Surrounding terrain                       Long grass or crops > 15 cm (6 in)

  NOTES:
```

```
RELEASE MENU
Type of release:   Regulated
Release duration                                    10 min
Regulated flow rate                               9.74 lb/sec
Pipe inner diameter                               7.98 inches
Equivalent release diameter                       8.00 inches
Height of release point                            1.0 feet
Angle of release from horizontal                   0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                          LFL mol%
  Concentration endpoint 2                          LFL mol%
  Concentration endpoint 3                      1/2 LFL mol%
Dispersion coefficient averaging time                1 min


  NOTES:
```

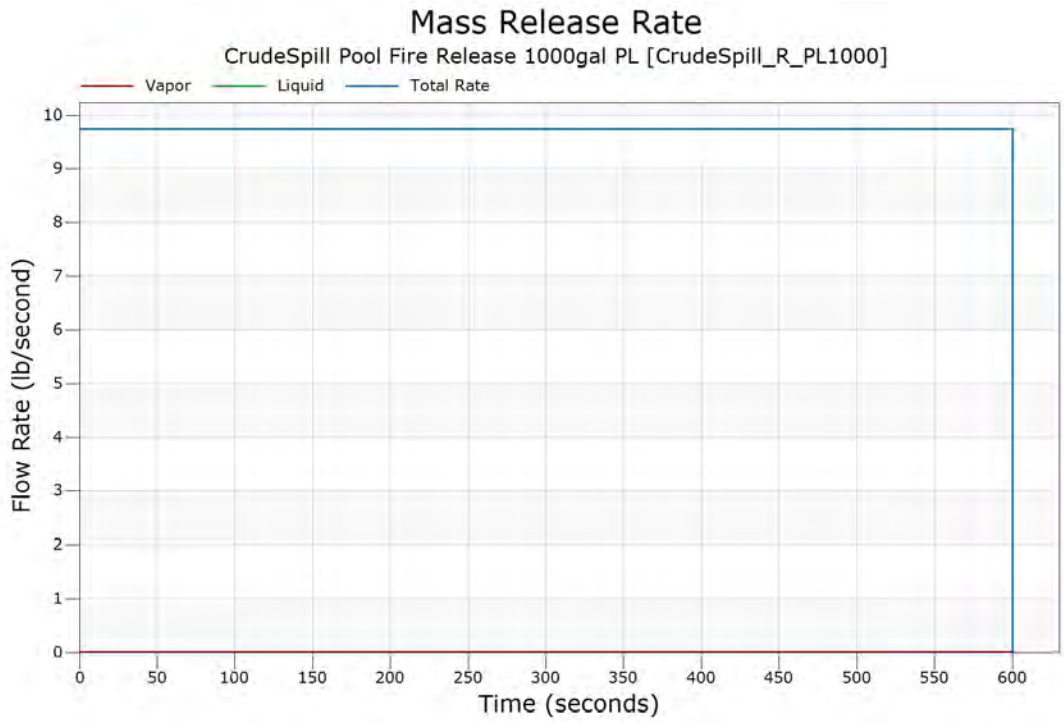
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.7361798E-02	0.000000	9.736638	9.744000
0.1000000	.7361798E-02	0.000000	9.736638	9.744000
0.3000000	.7361798E-02	0.000000	9.736638	9.744000
0.5000000	.7361798E-02	0.000000	9.736638	9.744000
0.7000000	.7361798E-02	0.000000	9.736638	9.744000
1.000000	.7361798E-02	0.000000	9.736638	9.744000
3.000000	.7361798E-02	0.000000	9.736638	9.744000
5.000000	.7361798E-02	0.000000	9.736638	9.744000
7.000000	.7361798E-02	0.000000	9.736638	9.744000
10.00000	.7361798E-02	0.000000	9.736638	9.744000
20.00000	.7361798E-02	0.000000	9.736638	9.744000
30.00000	.7361798E-02	0.000000	9.736638	9.744000
40.00000	.7361798E-02	0.000000	9.736638	9.744000
50.00000	.7361798E-02	0.000000	9.736638	9.744000
60.00000	.7361798E-02	0.000000	9.736638	9.744000
70.00000	.7361798E-02	0.000000	9.736638	9.744000
85.00000	.7361798E-02	0.000000	9.736638	9.744000
100.0000	.7361798E-02	0.000000	9.736638	9.744000
200.0000	.7361798E-02	0.000000	9.736638	9.744000
300.0000	.7361798E-02	0.000000	9.736638	9.744000
400.0000	.7361798E-02	0.000000	9.736638	9.744000
500.0000	.7361798E-02	0.000000	9.736638	9.744000
600.0000	.7361798E-02	0.000000	9.736638	9.744000
Totals (lb)	4.417079	0.000000	5841.983	5846.400

Flowrate for Jet Fire [1st minute] = 0.7361798E-02 lb/sec.
Jet Fire [2-3 minutes] = 0.7361798E-02 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
Time (seconds)
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450
500
550
600

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

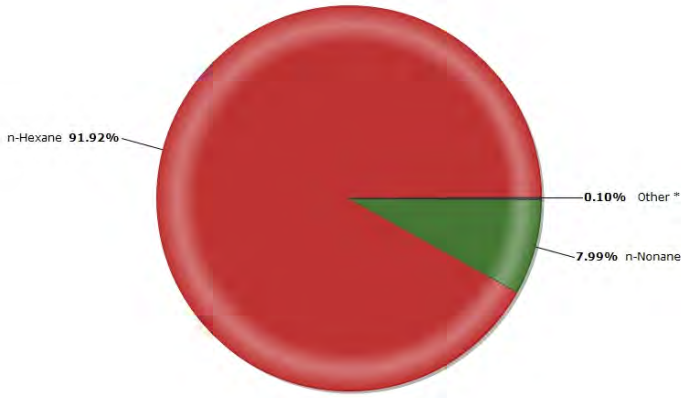
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

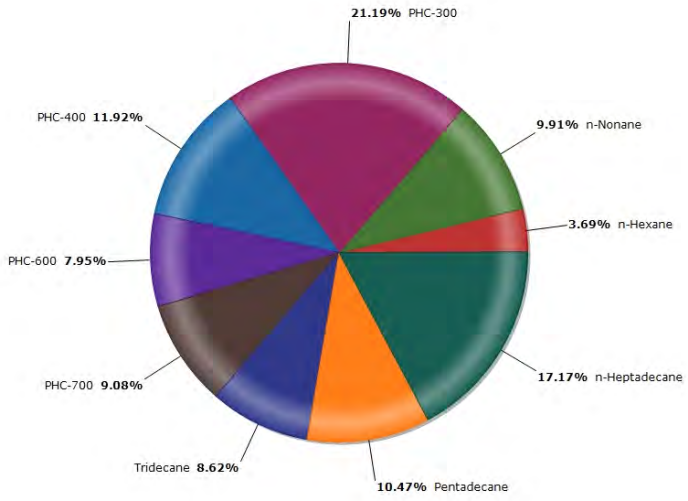
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

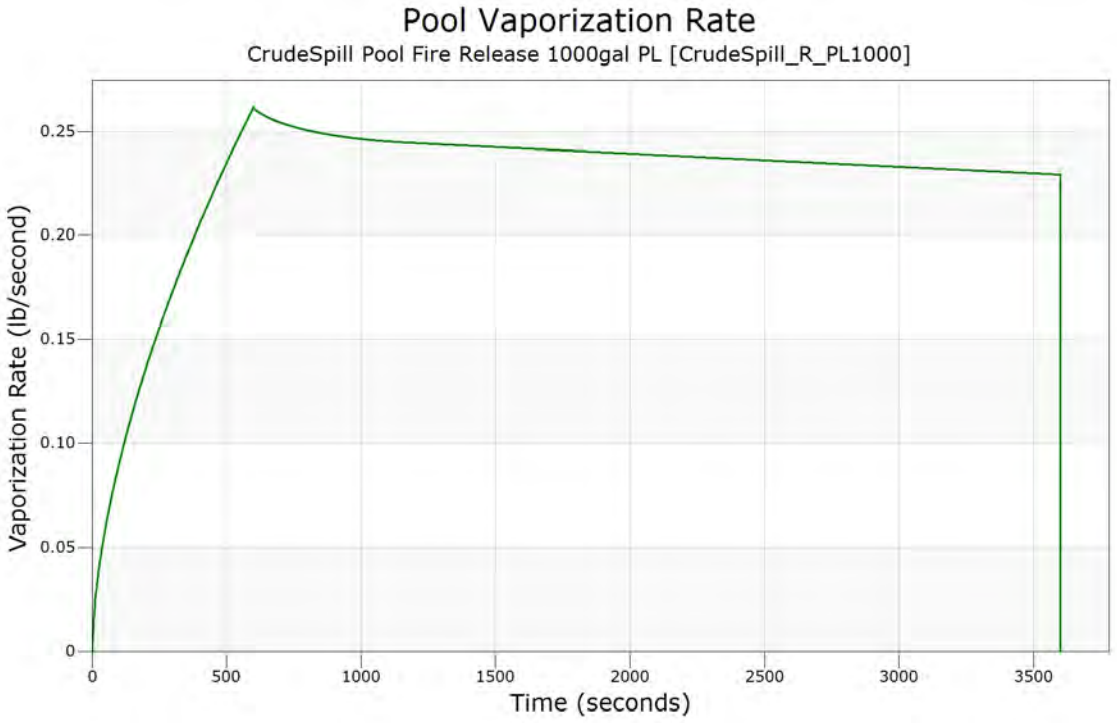
Liquid Pool Stream
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]

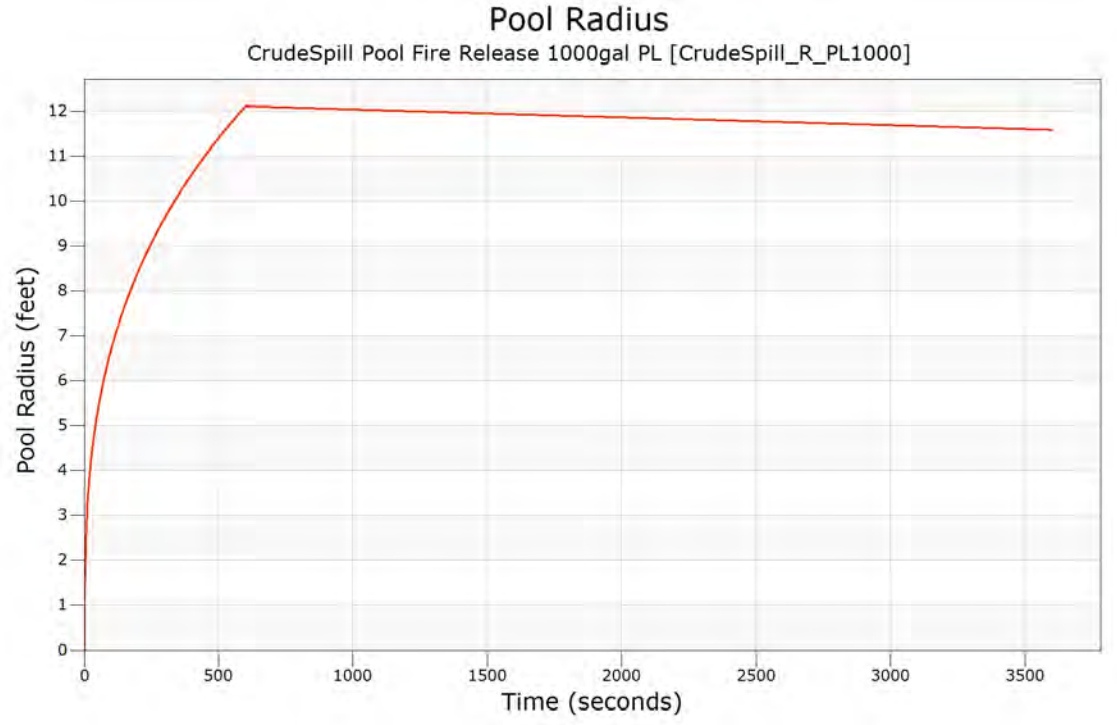


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	8.87528	4.93570	0.520181E-01
80.0000	17.7188	6.21588	0.787579E-01
120.000	26.5404	7.11220	0.100361
160.000	35.3429	7.82448	0.119175
200.000	44.1292	8.42552	0.136155
240.000	52.9014	8.95013	0.151790
280.000	61.6594	9.41864	0.166385
320.000	70.4069	9.84383	0.180149
360.000	79.1402	10.2346	0.193215
400.000	87.8594	10.5971	0.205707
440.000	96.5715	10.9360	0.217691
480.000	105.269	11.2546	0.229237
520.000	113.957	11.5561	0.240392
560.000	122.637	11.8422	0.251195
600.000	131.307	12.1142	0.261689
640.000	131.070	12.1070	0.257831
680.000	130.834	12.0997	0.255383
720.000	130.601	12.0925	0.253465
760.000	130.371	12.0856	0.251900
800.000	130.142	12.0784	0.250577
840.000	129.912	12.0715	0.249475
880.000	129.686	12.0643	0.248505
1130.00	128.277	12.0207	0.244934
1380.00	126.882	11.9767	0.243280
1630.00	125.494	11.9331	0.241671
1880.00	124.117	11.8894	0.240083
2130.00	122.750	11.8458	0.238518
2380.00	121.391	11.8018	0.236909
2630.00	120.042	11.7579	0.235343
2880.00	118.703	11.7139	0.233756
3130.00	117.372	11.6699	0.232191
3380.00	116.048	11.6260	0.230604
3600.00	114.893	11.5876	0.229237

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
Vaporization Rate (lb/second)
0.25
0.20
0.15
0.10
0.05
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
Pool Radius (feet)
12
11
10
9
8
7
6
5
4
3
2
1
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

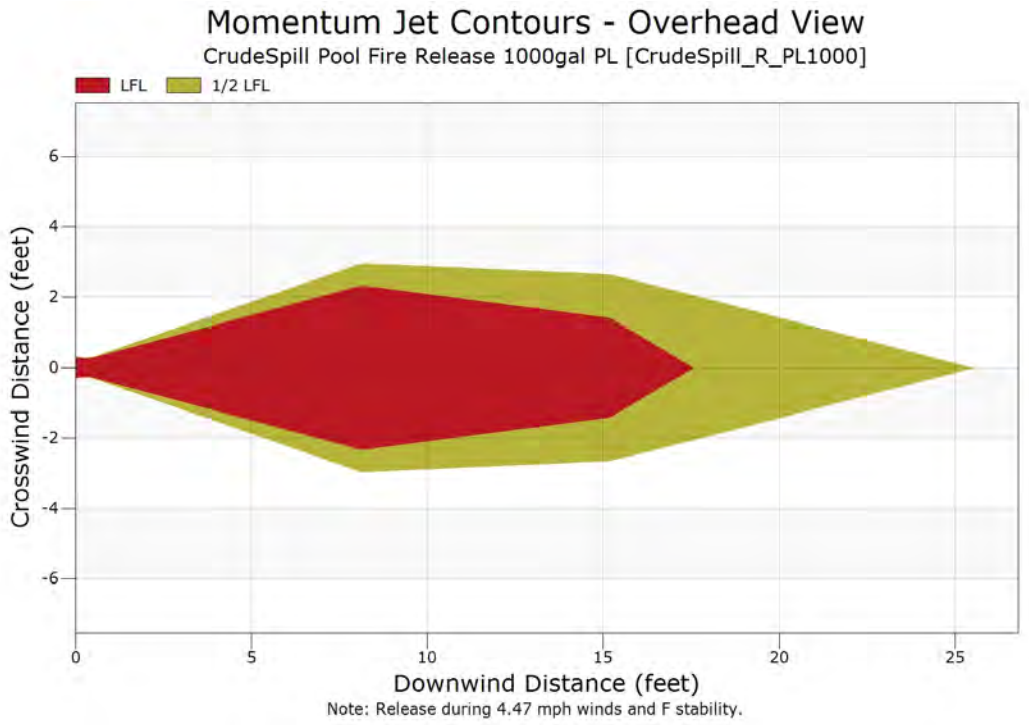
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

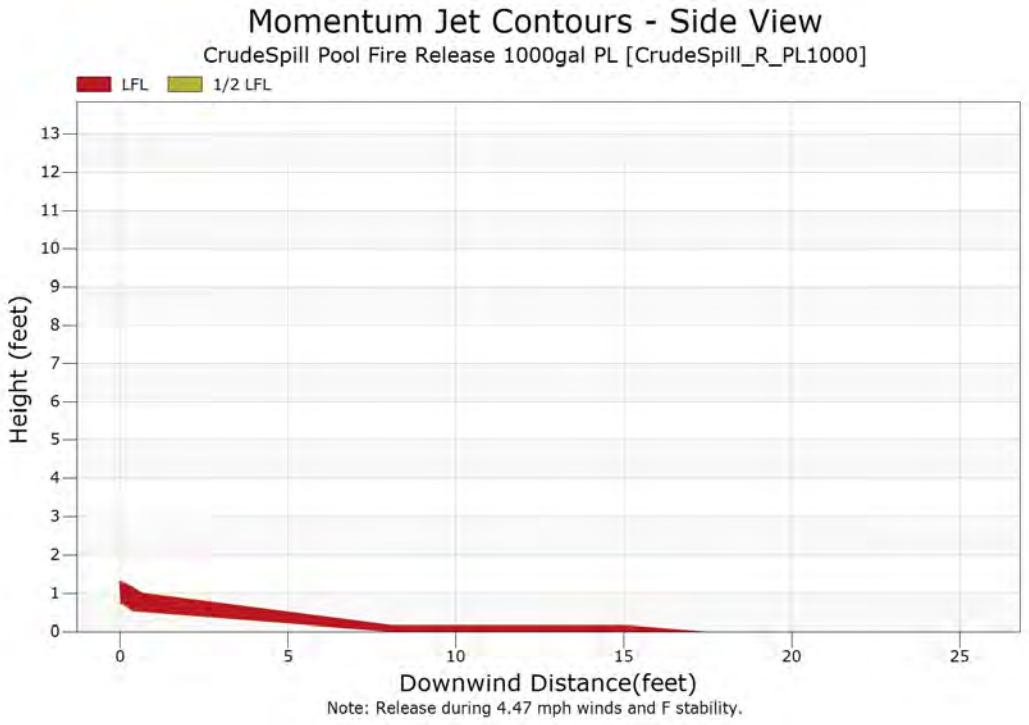
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.3	0.3	0.3	1.0
0.5	0.510802	0.000000	0.3	0.3	0.3	0.8
1.0	0.275186	0.275186	0.5	0.4	0.4	0.0
1.5	0.191491	0.191491	0.7	0.5	0.5	0.0
2.0	0.148053	0.148053	0.8	0.7	0.7	0.0
2.5	0.121269	0.121269	1.0	0.8	0.8	0.0
3.0	0.103024	0.103024	1.2	1.0	1.0	0.0
3.5	0.089757	0.089757	1.4	1.1	1.1	0.0
4.0	0.079654	0.079654	1.5	1.2	1.2	0.0
4.5	0.071691	0.071691	1.7	1.4	1.4	0.0
5.0	0.065244	0.065244	1.9	1.5	1.5	0.0
5.5	0.059913	0.059913	2.1	1.6	1.6	0.0
6.0	0.055428	0.055428	2.2	1.8	1.8	0.0
6.5	0.051599	0.051599	2.4	1.9	1.9	0.0
7.0	0.048290	0.048290	2.6	2.0	2.0	0.0
7.5	0.045401	0.045401	2.8	2.2	2.2	0.0
8.0	0.042855	0.042855	2.9	2.3	2.3	0.0
8.5	0.039017	0.039017	3.0	2.3	2.3	0.0
9.0	0.035265	0.035265	2.9	2.2	2.2	0.0
9.5	0.032048	0.032048	2.9	2.2	2.2	0.0
10.0	0.029268	0.029268	2.9	2.1	2.1	0.0
10.5	0.026848	0.026848	2.9	2.0	2.0	0.0
11.0	0.024727	0.024727	2.8	2.0	2.0	0.0
11.5	0.022858	0.022858	2.8	1.9	1.9	0.0
12.0	0.021200	0.021200	2.8	1.8	1.8	0.0
12.5	0.019723	0.019723	2.8	1.8	1.8	0.0
13.0	0.018401	0.018401	2.8	1.7	1.7	0.0
13.5	0.017213	0.017213	2.7	1.6	1.6	0.0
14.0	0.016140	0.016140	2.7	1.6	1.6	0.0
14.5	0.015169	0.015169	2.7	1.5	1.5	0.0
15.0	0.014286	0.014286	2.7	1.4	1.4	0.0
15.5	0.013456	0.013456	2.6	1.2	1.2	0.0
16.0	0.012686	0.012686	2.4	0.9	0.9	0.0
16.5	0.011981	0.011981	2.3	0.6	0.6	0.0
17.0	0.011335	0.011335	2.2	0.3	0.3	0.0

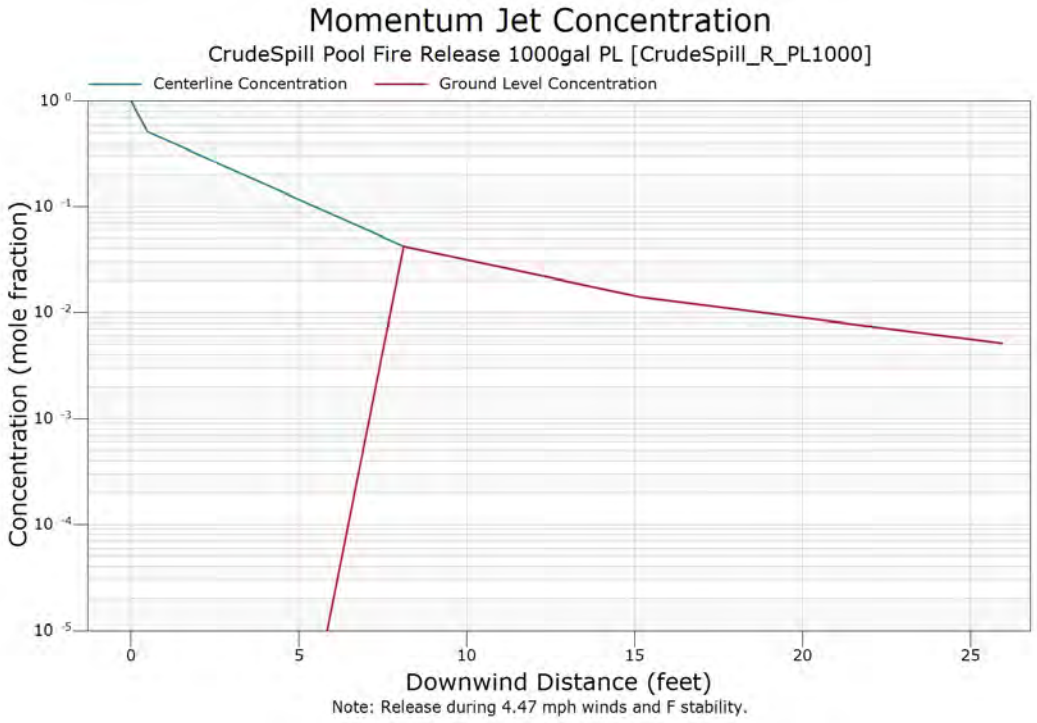
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
17.5	0.010741	0.010741	2.1	0.0	0.0	0.0
18.0	0.010193	0.010193	1.9	0.0	0.0	0.0
18.5	0.009687	0.009687	1.8	0.0	0.0	0.0
19.0	0.009219	0.009219	1.7	0.0	0.0	0.0
19.5	0.008785	0.008785	1.5	0.0	0.0	0.0
20.0	0.008381	0.008381	1.4	0.0	0.0	0.0
20.5	0.008006	0.008006	1.3	0.0	0.0	0.0
21.0	0.007655	0.007655	1.2	0.0	0.0	0.0
21.5	0.007328	0.007328	1.0	0.0	0.0	0.0
22.0	0.007021	0.007021	0.9	0.0	0.0	0.0
22.5	0.006734	0.006734	0.8	0.0	0.0	0.0
23.0	0.006465	0.006465	0.6	0.0	0.0	0.0
23.5	0.006212	0.006212	0.5	0.0	0.0	0.0
24.0	0.005974	0.005974	0.4	0.0	0.0	0.0
24.5	0.005749	0.005749	0.3	0.0	0.0	0.0
25.0	0.005537	0.005537	0.1	0.0	0.0	0.0
25.5	0.005337	0.005337	0.0	0.0	0.0	0.0
26.0	0.000000	0.000000	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 0.50 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	17.6	5
2 0.010670 (LFL)	17.6	5
3 0.005335 (1/2 LFL)	25.5	8


Momentum Jet Contours - Overhead View
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
LFL
1/2 LFL
Crosswind Distance (feet)
6
4
2
0
-2
-4
-6
0
5
10
15
20
25
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Contours - Side View
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
LFL
1/2 LFL
Height (feet)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
5
10
15
20
25
Downwind Distance(feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
10 0
10 -1
10 -2
10 -3
10 -4
10 -5
0
5
10
15
20
25
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

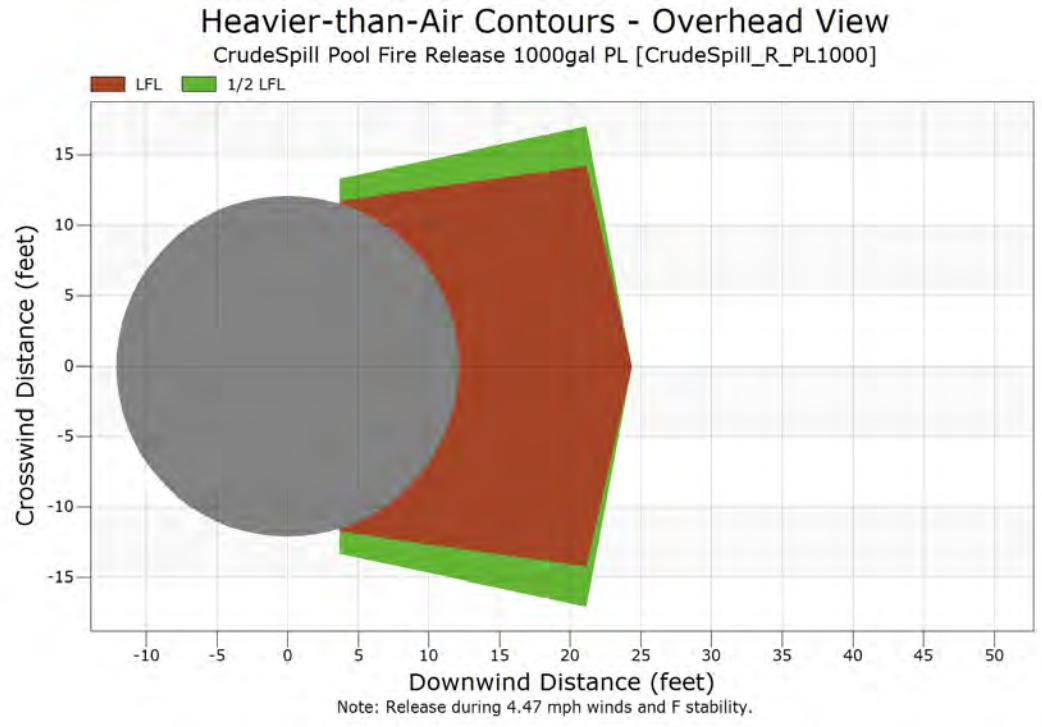
concentration limits

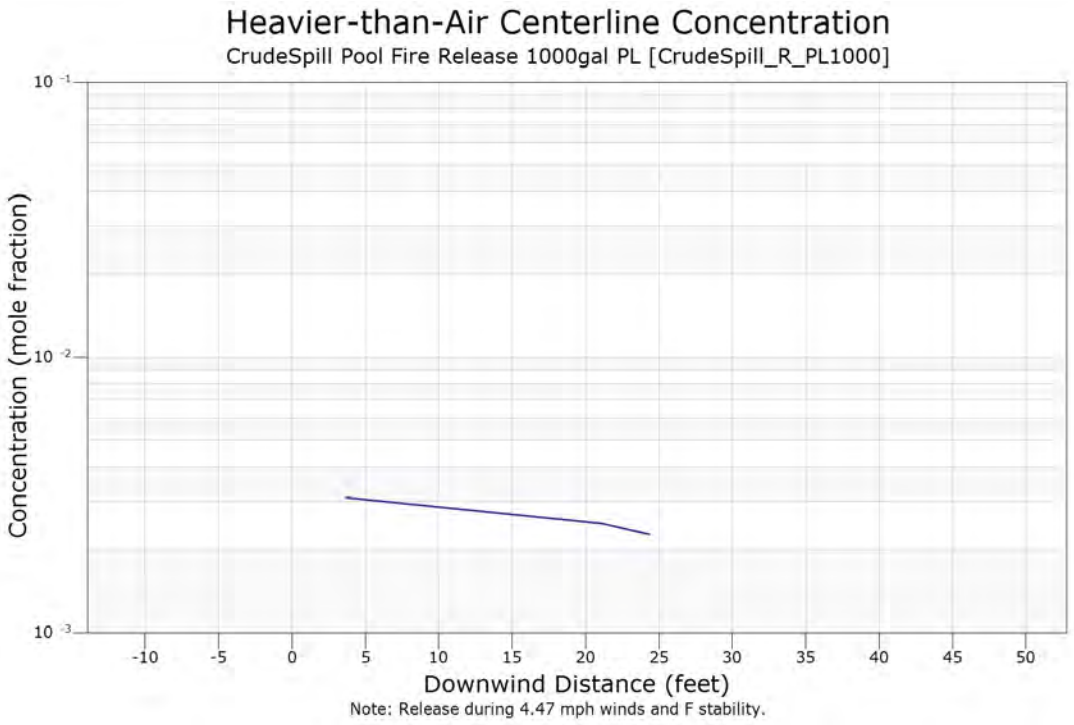
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
1.00	0.002341	10.22	0.00	0.00
1.50	0.002555	10.79	0.00	0.00
2.00	0.002718	11.37	0.00	0.00
2.50	0.002852	11.94	0.00	0.00
3.00	0.002966	12.51	0.00	0.00
3.50	0.003066	13.09	0.00	0.00
4.00	0.003061	13.27	0.00	0.00
4.50	0.003007	13.27	0.00	0.00
5.00	0.002960	13.28	0.00	0.00
5.50	0.002917	13.28	0.00	0.00
6.00	0.002879	13.28	0.00	0.00
6.50	0.002845	13.29	0.00	0.00
7.00	0.002813	13.29	0.00	0.00
7.50	0.002784	13.29	0.00	0.00
8.00	0.002757	13.30	0.00	0.00
8.50	0.002731	13.30	0.00	0.00
9.00	0.002708	13.30	0.00	0.00
9.50	0.002686	13.31	0.00	0.00
10.00	0.002665	13.31	0.00	0.00
10.50	0.002646	13.31	0.00	0.00
11.00	0.002627	13.31	0.00	0.00
11.50	0.002609	13.32	0.00	0.00
12.00	0.002593	13.32	0.00	0.00
12.50	0.002577	13.32	0.00	0.00
13.00	0.002561	13.33	0.00	0.00
13.50	0.002547	13.33	0.00	0.00
14.00	0.002533	13.33	0.00	0.00
14.50	0.002520	13.34	0.00	0.00
15.00	0.002507	13.34	0.00	0.00
15.50	0.002499	13.34	0.00	0.00
16.00	0.002498	13.34	0.00	0.00
16.50	0.002496	13.35	0.00	0.00
17.00	0.002495	13.75	0.00	0.00
17.50	0.002493	14.15	0.00	0.00
18.00	0.002492	14.55	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
18.50	0.002491	14.95	0.00	0.00
19.00	0.002489	15.35	0.00	0.00
19.50	0.002488	15.75	0.00	0.00
20.00	0.002487	16.15	0.00	0.00
20.50	0.002486	16.55	0.00	0.00
21.00	0.002484	16.95	0.00	0.00
21.50	0.002456	17.09	0.00	0.00
22.00	0.002420	17.14	0.00	0.00
22.50	0.002385	17.19	0.00	0.00
23.00	0.002351	17.23	0.00	0.00
23.50	0.002318	17.28	0.00	0.00
24.00	0.002286	17.33	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	24.4	8




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 1000gal PL [CrudeSpill_R_PL1000]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-10
-5
0
5
10
15
20
25
30
35
40
45
50
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_1000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              24.0 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

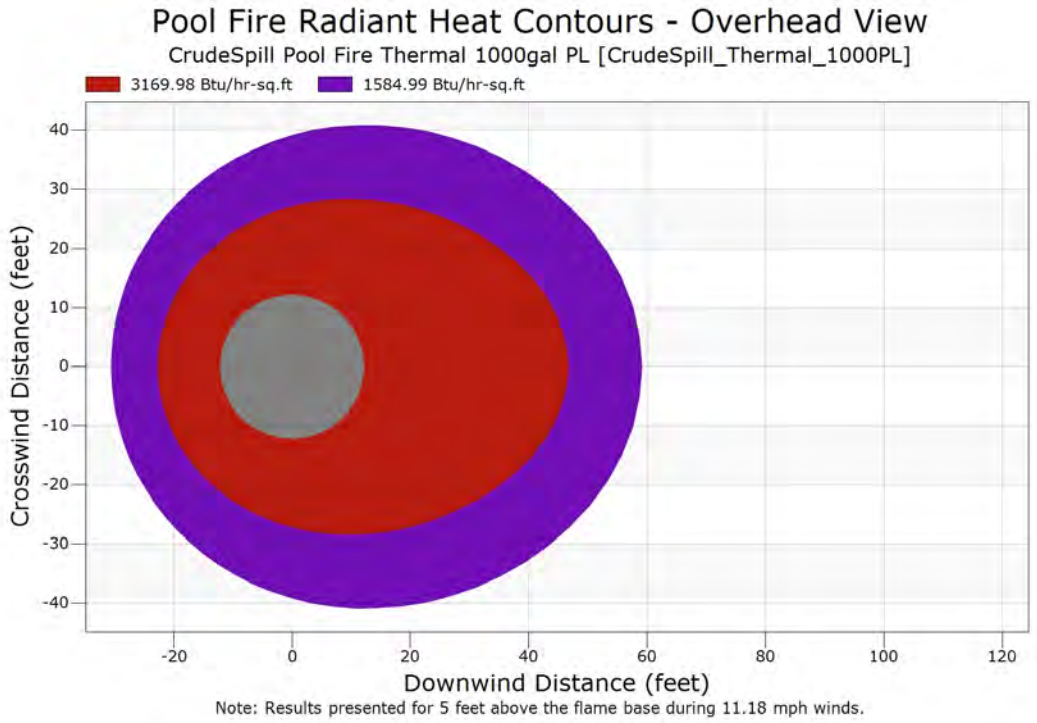
Pool Fire Radiation

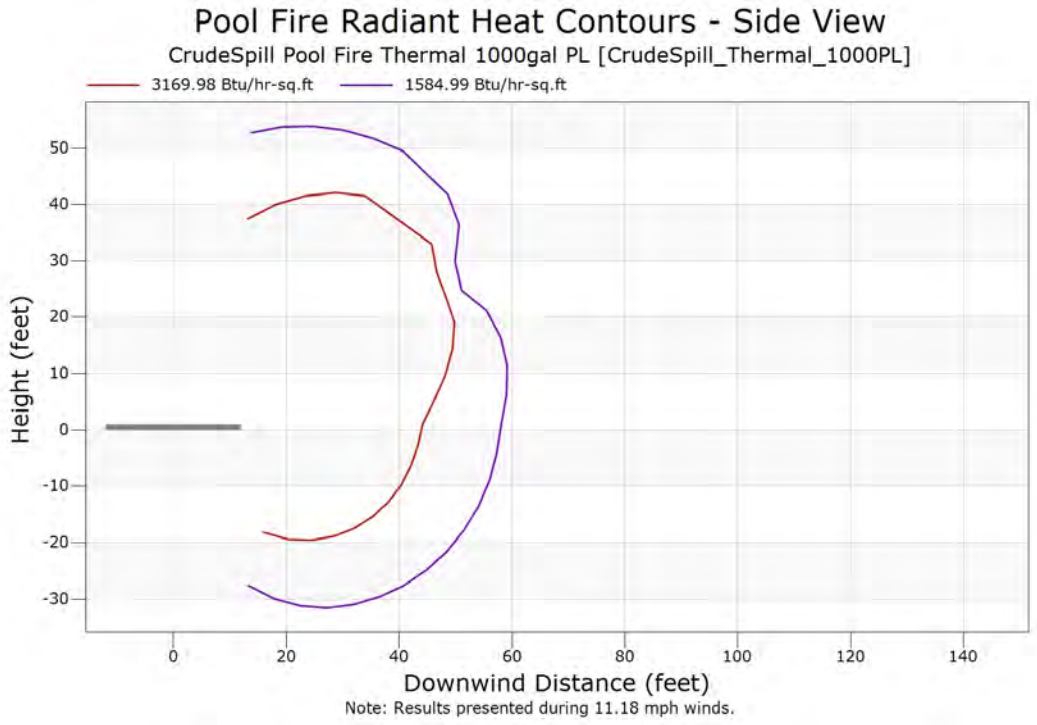
Length of Flame	:	34.1	feet
Flame Tilt from Vertical	:	44.2	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
27.5	9415	6138	11239
28.8	8379	5534	10041
30.1	7336	5026	8893
31.4	6470	4591	7933
32.9	5745	4202	7117
34.3	5135	3843	6414
35.9	4616	3503	5795
37.5	4174	3179	5247
39.2	3791	2863	4750
41.0	3455	2551	4295
42.8	3161	2246	3878
44.8	2895	1947	3489
46.8	2648	1661	3126
48.9	2407	1393	2781
51.1	2171	1148	2456
53.4	1945	933	2157
55.8	1729	748	1884
58.4	1527	594	1638
61.0	1343	469	1422
63.7	1176	369	1233
66.6	1028	289	1068
69.6	898	227	926
72.8	784	179	804
76.1	685	142	700
79.5	600	112	610
83.1	526	89	533
86.9	461	71	467
90.8	405	57	409
94.9	357	46	360
99.2	315	38	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
46.5	3170
59.0	1585
59.0	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 1000gal PL [CrudeSpill_Thermal_1000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 1000gal PL [CrudeSpill_Thermal_1000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL2000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                             80 lb/cu.ft
  Substrate heat Capacity                     0.22 Btu/lb-F
  Substrate delay time                           0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
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```
RELEASE MENU
Type of release:   Regulated
Release duration                                  10 min
Regulated flow rate                            19.49 lb/sec
Pipe inner diameter                             7.98 inches
Equivalent release diameter                     8.00 inches
Height of release point                          1.0 feet
Angle of release from horizontal                 0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                        LFL mol%
  Concentration endpoint 2                        LFL mol%
  Concentration endpoint 3                    1/2 LFL mol%
Dispersion coefficient averaging time              1 min


  NOTES:
```

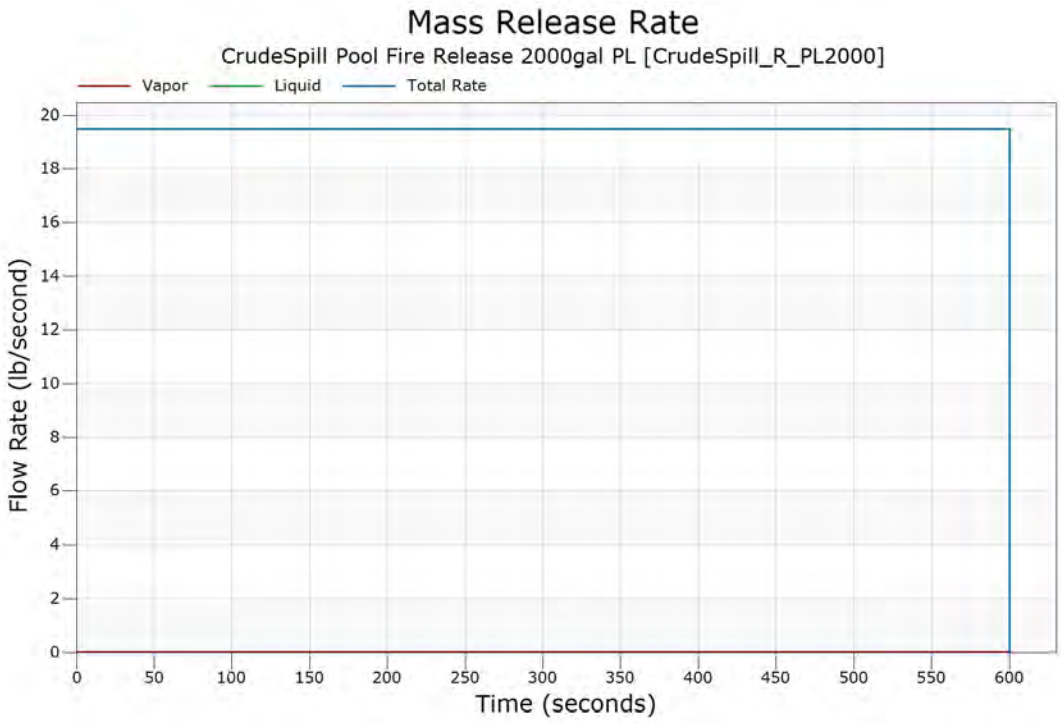
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.1472511E-01	0.000000	19.47527	19.49000
0.1000000	.1472511E-01	0.000000	19.47527	19.49000
0.3000000	.1472511E-01	0.000000	19.47527	19.49000
0.5000000	.1472511E-01	0.000000	19.47527	19.49000
0.7000000	.1472511E-01	0.000000	19.47527	19.49000
1.000000	.1472511E-01	0.000000	19.47527	19.49000
3.000000	.1472511E-01	0.000000	19.47527	19.49000
5.000000	.1472511E-01	0.000000	19.47527	19.49000
7.000000	.1472511E-01	0.000000	19.47527	19.49000
10.00000	.1472511E-01	0.000000	19.47527	19.49000
20.00000	.1472511E-01	0.000000	19.47527	19.49000
30.00000	.1472511E-01	0.000000	19.47527	19.49000
40.00000	.1472511E-01	0.000000	19.47527	19.49000
50.00000	.1472511E-01	0.000000	19.47527	19.49000
60.00000	.1472511E-01	0.000000	19.47527	19.49000
70.00000	.1472511E-01	0.000000	19.47527	19.49000
85.00000	.1472511E-01	0.000000	19.47527	19.49000
100.0000	.1472511E-01	0.000000	19.47527	19.49000
200.0000	.1472511E-01	0.000000	19.47527	19.49000
300.0000	.1472511E-01	0.000000	19.47527	19.49000
400.0000	.1472511E-01	0.000000	19.47527	19.49000
500.0000	.1472511E-01	0.000000	19.47527	19.49000
600.0000	.1472511E-01	0.000000	19.47527	19.49000
Totals (lb)	8.835064	0.000000	11685.16	11694.00

Flowrate for Jet Fire [1st minute] = 0.1472511E-01 lb/sec.
Jet Fire [2-3 minutes] = 0.1472511E-01 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
Time (seconds)
0
2
4
6
8
10
12
14
16
18
20
0
50
100
150
200
250
300
350
400
450
500
550
600

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

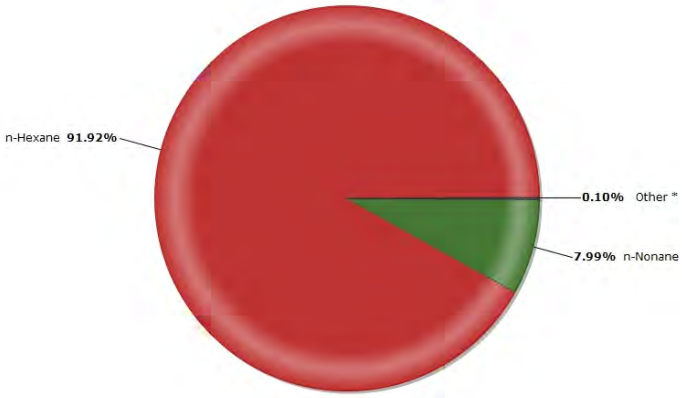
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

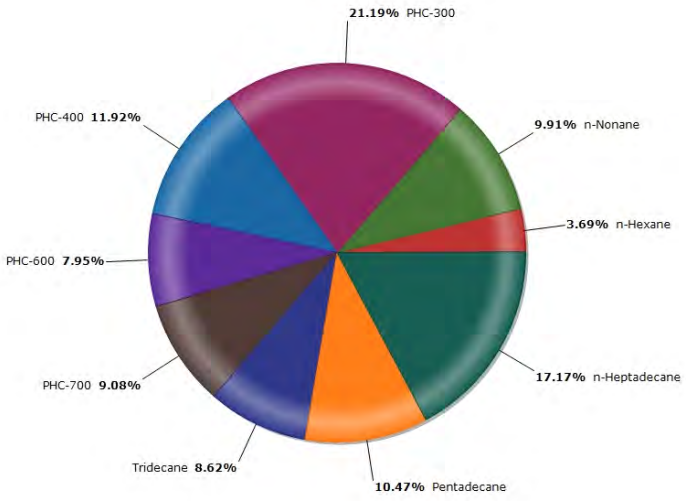
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

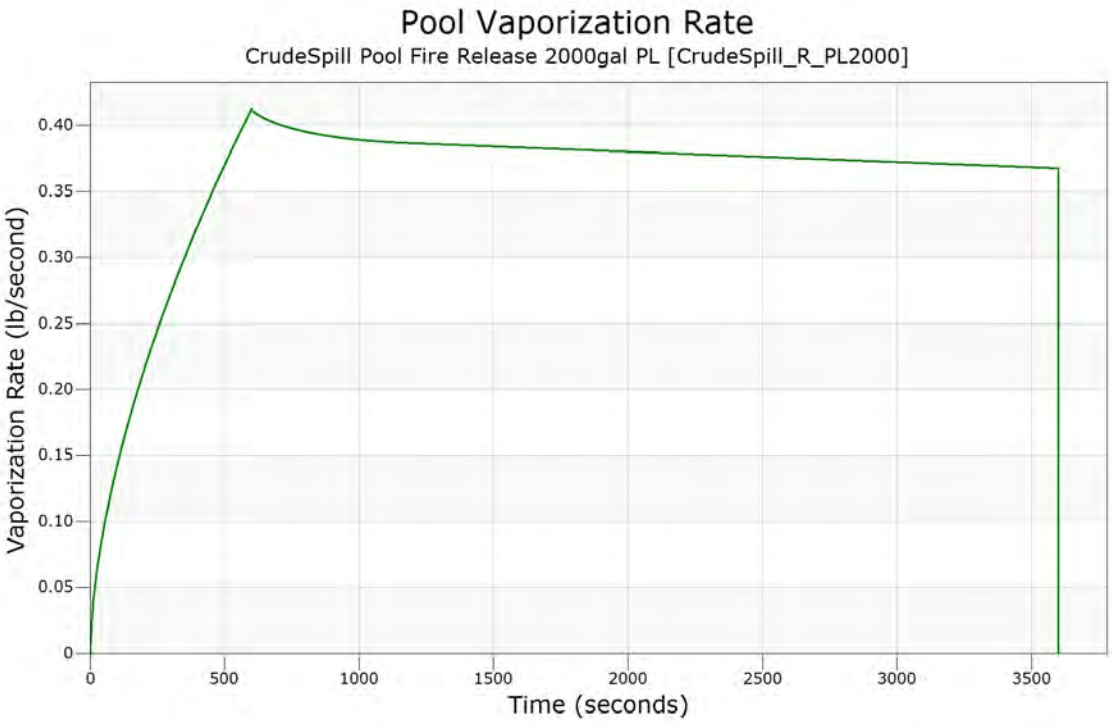
Liquid Pool Stream
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]

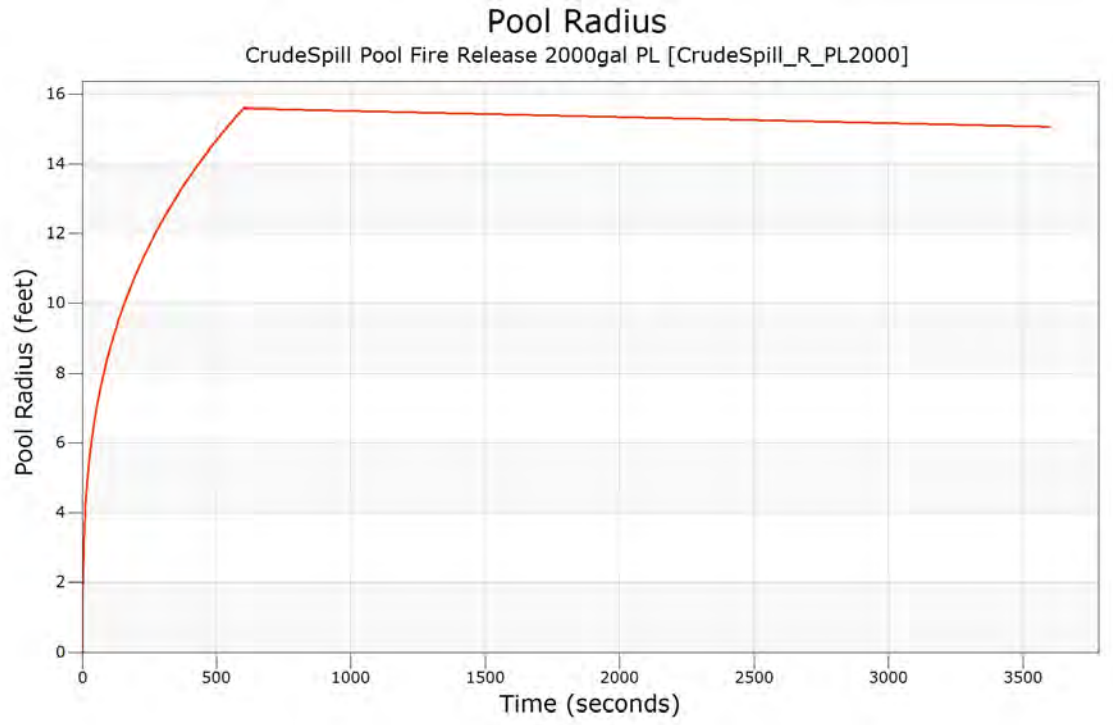


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	17.7643	6.34777	0.818135E-01
80.0000	35.4771	7.99541	0.123898
120.000	53.1592	9.14895	0.157917
160.000	70.8094	10.0663	0.187556
200.000	88.4350	10.8399	0.214303
240.000	106.036	11.5157	0.238959
280.000	123.615	12.1194	0.261953
320.000	141.177	12.6673	0.283647
360.000	158.718	13.1709	0.304260
400.000	176.238	13.6385	0.323969
440.000	193.743	14.0755	0.342885
480.000	211.231	14.4862	0.361117
520.000	228.701	14.8750	0.378732
560.000	246.157	15.2438	0.395774
600.000	263.596	15.5951	0.412353
640.000	263.221	15.5879	0.406378
680.000	262.851	15.5807	0.402630
720.000	262.483	15.5732	0.399720
760.000	262.120	15.5659	0.397339
800.000	261.759	15.5591	0.395355
840.000	261.396	15.5518	0.393679
880.000	261.039	15.5446	0.392246
1130.00	258.814	15.5003	0.387110
1380.00	256.607	15.4564	0.385059
1630.00	254.410	15.4121	0.383075
1880.00	252.228	15.3681	0.381113
2130.00	250.056	15.3238	0.379129
2380.00	247.895	15.2795	0.377167
2630.00	245.744	15.2352	0.375205
2880.00	243.604	15.1909	0.373243
3130.00	241.478	15.1467	0.371280
3380.00	239.363	15.1024	0.369340
3600.00	237.509	15.0633	0.367621

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
Vaporization Rate (lb/second)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
Pool Radius (feet)
16
14
12
10
8
6
4
2
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

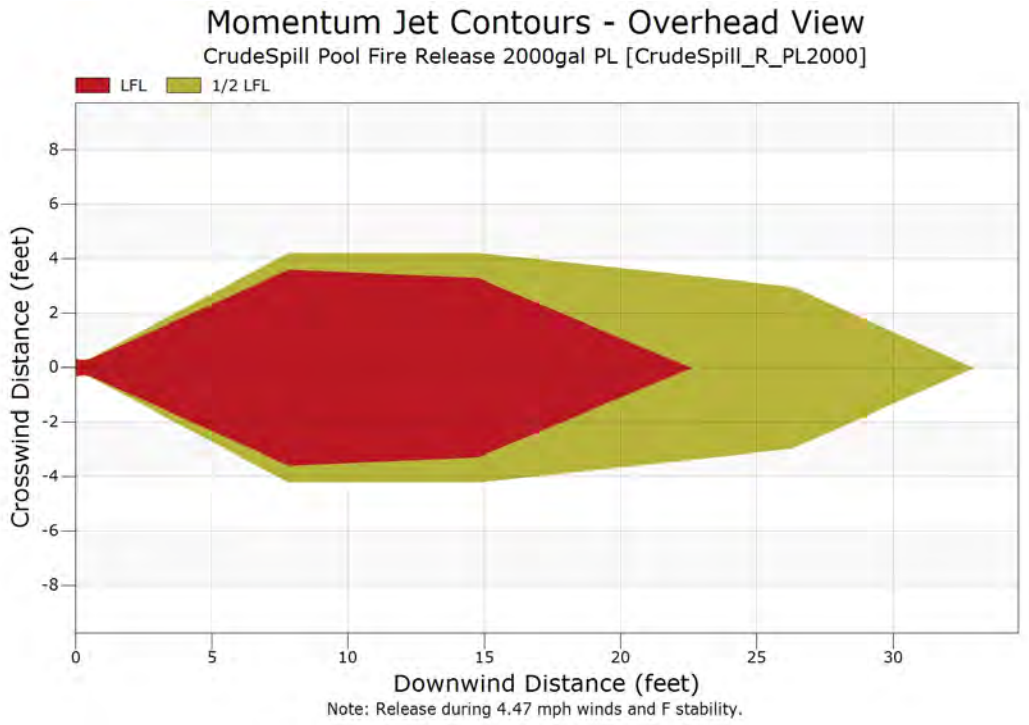
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

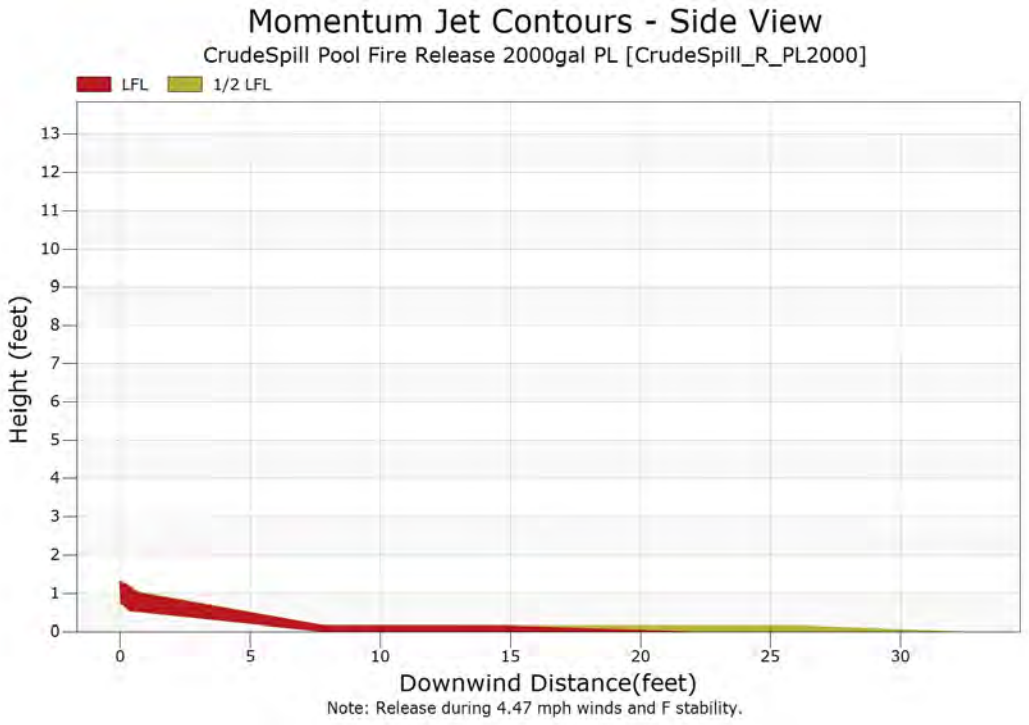
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.3	0.3	0.3	1.0
0.5	0.560256	0.000000	0.3	0.3	0.3	0.8
1.0	0.329507	0.329507	0.6	0.5	0.5	0.0
1.5	0.241282	0.241282	0.8	0.7	0.7	0.0
2.0	0.193420	0.193420	1.1	1.0	1.0	0.0
2.5	0.162936	0.162936	1.4	1.2	1.2	0.0
3.0	0.141632	0.141632	1.6	1.4	1.4	0.0
3.5	0.125808	0.125808	1.9	1.6	1.6	0.0
4.0	0.113537	0.113537	2.2	1.9	1.9	0.0
4.5	0.103711	0.103711	2.5	2.1	2.1	0.0
5.0	0.095643	0.095643	2.7	2.3	2.3	0.0
5.5	0.088888	0.088888	3.0	2.5	2.5	0.0
6.0	0.083138	0.083138	3.3	2.8	2.8	0.0
6.5	0.078177	0.078177	3.5	3.0	3.0	0.0
7.0	0.073849	0.073849	3.8	3.2	3.2	0.0
7.5	0.070035	0.070035	4.1	3.5	3.5	0.0
8.0	0.065218	0.065218	4.2	3.6	3.6	0.0
8.5	0.058797	0.058797	4.2	3.6	3.6	0.0
9.0	0.053323	0.053323	4.2	3.5	3.5	0.0
9.5	0.048614	0.048614	4.2	3.5	3.5	0.0
10.0	0.044533	0.044533	4.2	3.5	3.5	0.0
10.5	0.040969	0.040969	4.2	3.5	3.5	0.0
11.0	0.037836	0.037836	4.2	3.5	3.5	0.0
11.5	0.035067	0.035067	4.2	3.4	3.4	0.0
12.0	0.032606	0.032606	4.2	3.4	3.4	0.0
12.5	0.030408	0.030408	4.2	3.4	3.4	0.0
13.0	0.028436	0.028436	4.2	3.4	3.4	0.0
13.5	0.026659	0.026659	4.2	3.3	3.3	0.0
14.0	0.025052	0.025052	4.2	3.3	3.3	0.0
14.5	0.023593	0.023593	4.2	3.3	3.3	0.0
15.0	0.022239	0.022239	4.2	3.2	3.2	0.0
15.5	0.020968	0.020968	4.1	3.0	3.0	0.0
16.0	0.019807	0.019807	4.1	2.8	2.8	0.0
16.5	0.018743	0.018743	4.0	2.6	2.6	0.0
17.0	0.017766	0.017766	4.0	2.4	2.4	0.0

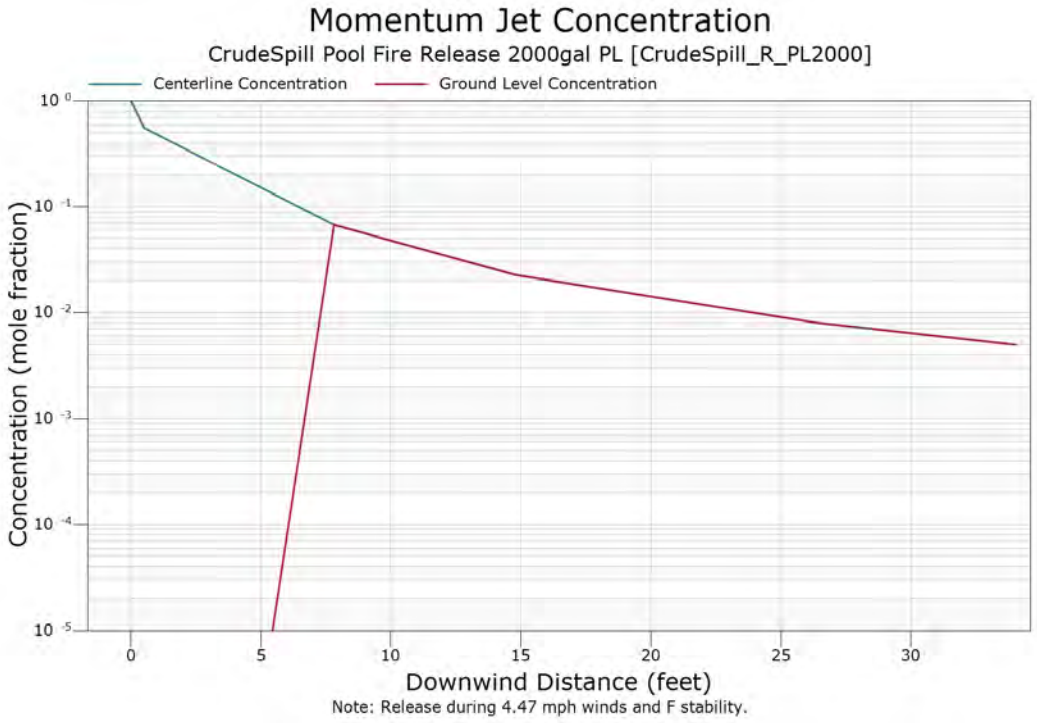
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
17.5	0.016865	0.016865	3.9	2.1	2.1	0.0
18.0	0.016034	0.016034	3.9	1.9	1.9	0.0
18.5	0.015265	0.015265	3.8	1.7	1.7	0.0
19.0	0.014552	0.014552	3.8	1.5	1.5	0.0
19.5	0.013889	0.013889	3.7	1.3	1.3	0.0
20.0	0.013272	0.013272	3.7	1.1	1.1	0.0
20.5	0.012697	0.012697	3.6	0.9	0.9	0.0
21.0	0.012160	0.012160	3.5	0.7	0.7	0.0
21.5	0.011657	0.011657	3.5	0.5	0.5	0.0
22.0	0.011186	0.011186	3.4	0.2	0.2	0.0
22.5	0.010744	0.010744	3.4	0.0	0.0	0.0
23.0	0.010328	0.010328	3.3	0.0	0.0	0.0
23.5	0.009937	0.009937	3.3	0.0	0.0	0.0
24.0	0.009569	0.009569	3.2	0.0	0.0	0.0
24.5	0.009221	0.009221	3.2	0.0	0.0	0.0
25.0	0.008893	0.008893	3.1	0.0	0.0	0.0
25.5	0.008583	0.008583	3.1	0.0	0.0	0.0
26.0	0.008289	0.008289	3.0	0.0	0.0	0.0
26.5	0.008006	0.008006	2.9	0.0	0.0	0.0
27.0	0.007731	0.007731	2.7	0.0	0.0	0.0
27.5	0.007471	0.007471	2.4	0.0	0.0	0.0
28.0	0.007224	0.007224	2.2	0.0	0.0	0.0
28.5	0.006989	0.006989	2.0	0.0	0.0	0.0
29.0	0.006766	0.006766	1.8	0.0	0.0	0.0
29.5	0.006553	0.006553	1.5	0.0	0.0	0.0
30.0	0.006351	0.006351	1.3	0.0	0.0	0.0
30.5	0.006158	0.006158	1.1	0.0	0.0	0.0
31.0	0.005974	0.005974	0.9	0.0	0.0	0.0
31.5	0.005798	0.005798	0.6	0.0	0.0	0.0
32.0	0.005630	0.005630	0.4	0.0	0.0	0.0
32.5	0.005469	0.005469	0.2	0.0	0.0	0.0
33.0	0.005316	0.005316	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 0.51 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	22.6	7
2 0.010670 (LFL)	22.6	7
3 0.005335 (1/2 LFL)	32.9	10


Momentum Jet Contours - Overhead View
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
LFL
1/2 LFL
Crosswind Distance (feet)
8
6
4
2
0
-2
-4
-6
-8
0
5
10
15
20
25
30
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Contours - Side View
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
LFL
1/2 LFL
Height (feet)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
5
10
15
20
25
30
Downwind Distance(feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
10 0
10 -1
10 -2
10 -3
10 -4
10 -5
0
5
10
15
20
25
30
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

concentration limits

Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

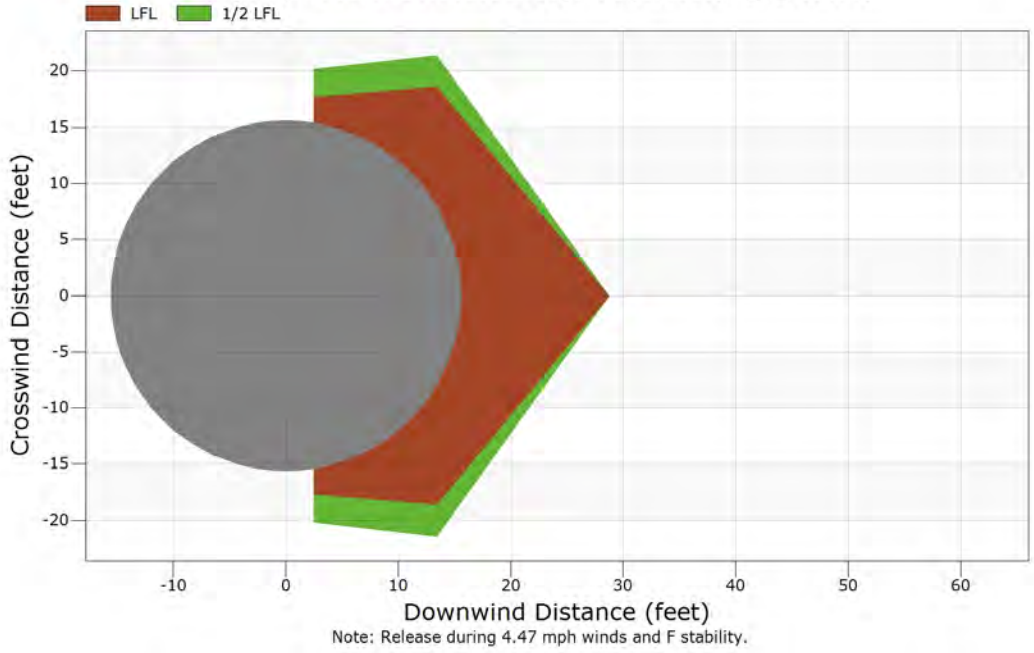
downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
0.50	0.002661	13.61	0.00	0.00
1.00	0.002800	15.26	0.00	0.00
1.50	0.002885	16.92	0.00	0.00
2.00	0.002946	18.58	0.00	0.00
2.50	0.002994	20.18	0.00	0.00
3.00	0.003010	20.24	0.00	0.00
3.50	0.003024	20.30	0.00	0.00
4.00	0.003036	20.35	0.00	0.00
4.50	0.003047	20.41	0.00	0.00
5.00	0.003056	20.47	0.00	0.00
5.50	0.003065	20.53	0.00	0.00
6.00	0.003073	20.58	0.00	0.00
6.50	0.003080	20.64	0.00	0.00
7.00	0.003087	20.70	0.00	0.00
7.50	0.003094	20.75	0.00	0.00
8.00	0.003099	20.81	0.00	0.00
8.50	0.003105	20.87	0.00	0.00
9.00	0.003110	20.93	0.00	0.00
9.50	0.003115	20.98	0.00	0.00
10.00	0.003120	21.04	0.00	0.00
10.50	0.003125	21.10	0.00	0.00
11.00	0.003129	21.15	0.00	0.00
11.50	0.003133	21.21	0.00	0.00
12.00	0.003137	21.27	0.00	0.00
12.50	0.003141	21.33	0.00	0.00
13.00	0.003144	21.38	0.00	0.00
13.50	0.003141	21.39	0.00	0.00
14.00	0.003085	21.39	0.00	0.00
14.50	0.003033	21.40	0.00	0.00
15.00	0.002991	21.40	0.00	0.00
15.50	0.002957	21.41	0.00	0.00
16.00	0.002925	21.41	0.00	0.00
16.50	0.002894	21.41	0.00	0.00
17.00	0.002865	21.42	0.00	0.00
17.50	0.002836	21.42	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
18.00	0.002809	21.43	0.00	0.00
18.50	0.002783	21.43	0.00	0.00
19.00	0.002757	21.44	0.00	0.00
19.50	0.002733	21.44	0.00	0.00
20.00	0.002709	21.44	0.00	0.00
20.50	0.002685	21.45	0.00	0.00
21.00	0.002662	21.45	0.00	0.00
21.50	0.002639	21.46	0.00	0.00
22.00	0.002618	21.46	0.00	0.00
22.50	0.002597	21.46	0.00	0.00
23.00	0.002576	21.47	0.00	0.00
23.50	0.002556	21.47	0.00	0.00
24.00	0.002537	21.48	0.00	0.00
24.50	0.002519	21.48	0.00	0.00
25.00	0.002500	21.49	0.00	0.00
25.50	0.002483	21.49	0.00	0.00
26.00	0.002465	21.64	0.00	0.00
26.50	0.002449	21.78	0.00	0.00
27.00	0.002432	21.93	0.00	0.00
27.50	0.002416	22.08	0.00	0.00
28.00	0.002401	22.22	0.00	0.00
28.50	0.002385	22.37	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	28.8	9

Heavier-than-Air Contours - Overhead View

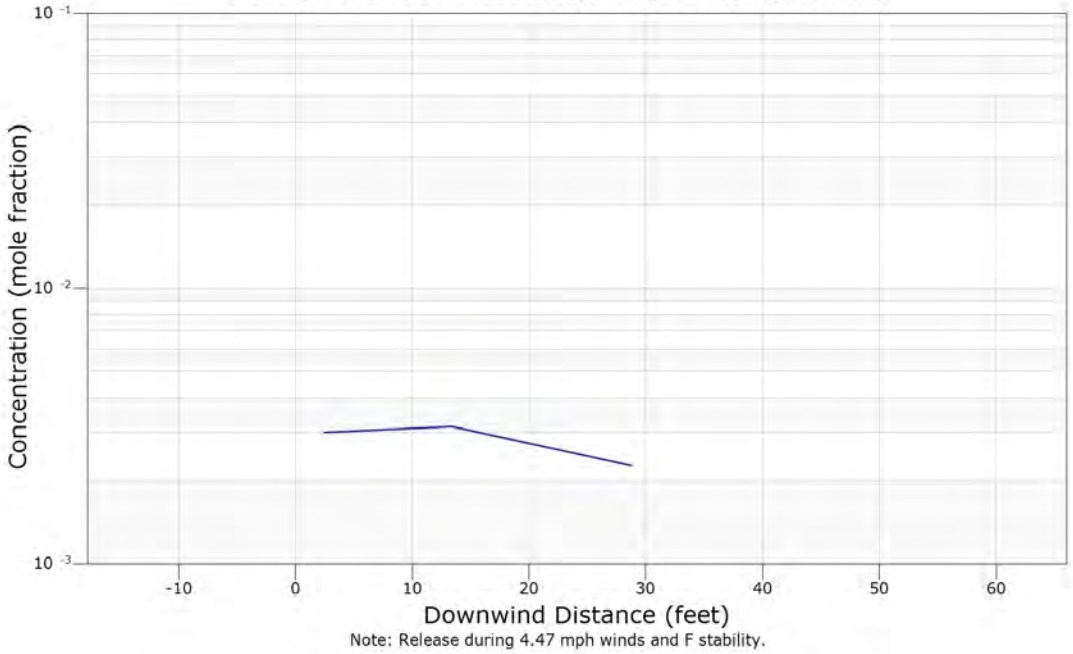
CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Centerline Concentration

CrudeSpill Pool Fire Release 2000gal PL [CrudeSpill_R_PL2000]



Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_2000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              31.2 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

Pool Fire Radiation

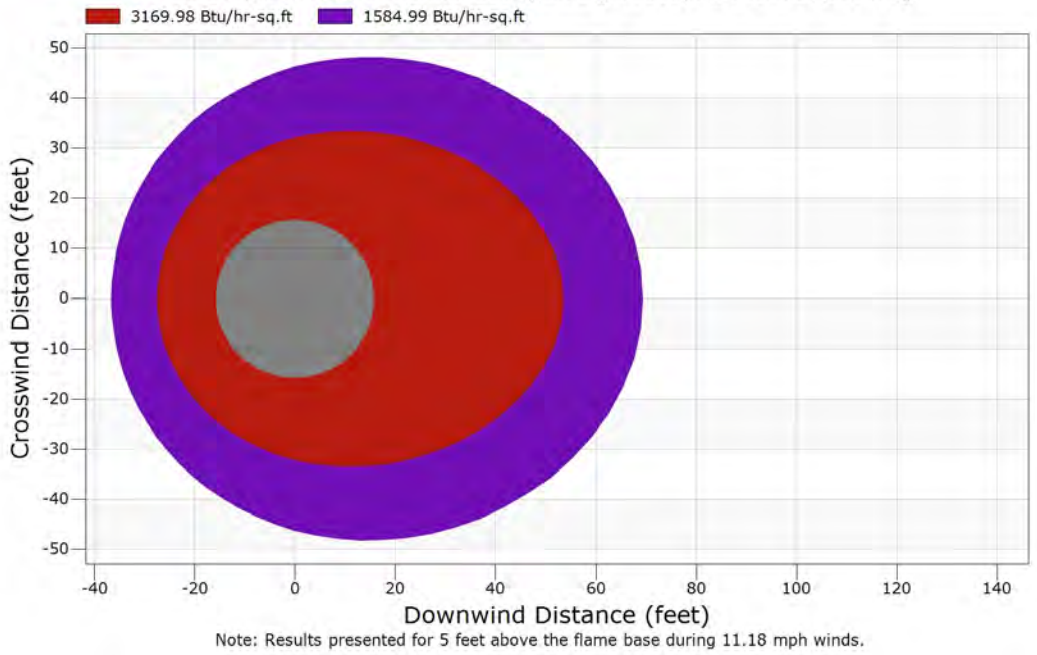
Length of Flame	:	40.9	feet
Flame Tilt from Vertical	:	41.0	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
33.0	8501	5238	9985
34.5	7651	4742	9002
36.1	6716	4310	7980
37.7	5912	3938	7104
39.4	5235	3604	6356
41.2	4666	3298	5714
43.0	4187	3011	5157
44.9	3780	2738	4667
47.0	3427	2473	4226
49.1	3123	2216	3830
51.3	2855	1966	3467
53.6	2617	1723	3133
56.0	2394	1490	2820
58.5	2184	1271	2527
61.1	1981	1069	2251
63.9	1787	887	1995
66.7	1602	728	1760
69.7	1428	592	1545
72.9	1266	477	1353
76.2	1119	383	1183
79.6	986	306	1033
83.2	868	245	902
86.9	762	196	787
90.8	670	157	688
94.9	589	126	602
99.1	518	101	528
103.6	456	82	464
108.3	402	66	408
113.1	355	54	359
118.2	314	44	317

Downwind Distances to Endpoints:

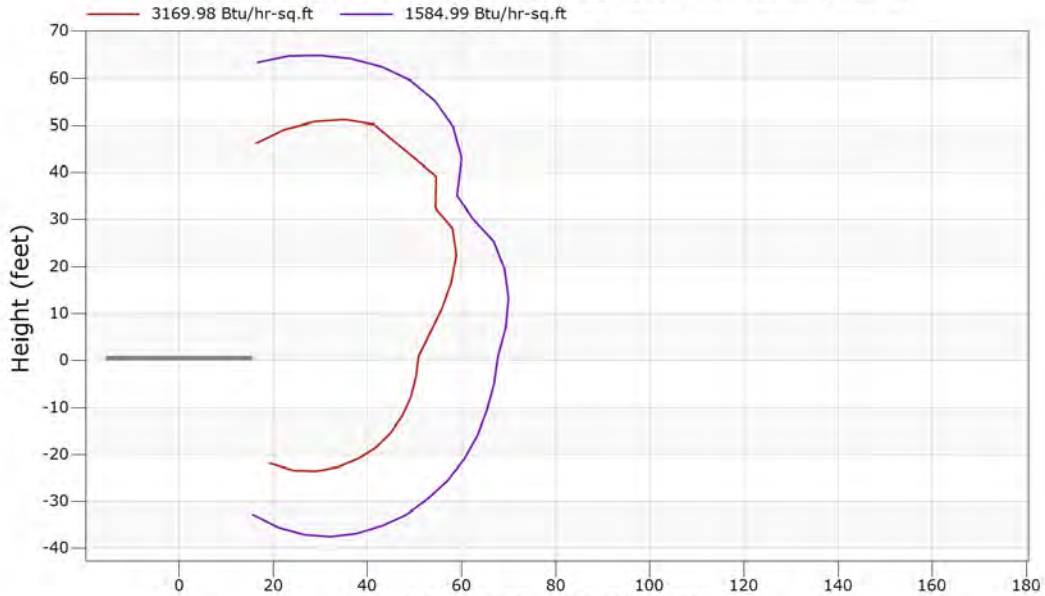
Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
53.3	3170
69.2	1585
69.2	1585

Pool Fire Radiant Heat Contours - Overhead View



Note: Results presented for 5 feet above the flame base during 11.18 mph winds.

Pool Fire Radiant Heat Contours - Side View



Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL5000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                             80 lb/cu.ft
  Substrate heat Capacity                     0.22 Btu/lb-F
  Substrate delay time                           0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
```

RELEASE MENU
Type of release: Regulated

Release duration	10	min
Regulated flow rate	48.72	lb/sec
Pipe inner diameter	7.98	inches
Equivalent release diameter	8.00	inches
Height of release point	1.0	feet
Angle of release from horizontal	0.0	degrees

NOTES:

IMPOUNDMENT MENU
Unconfined

NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints

Concentration endpoint 1		LFL mol%
Concentration endpoint 2		LFL mol%
Concentration endpoint 3	1/2	LFL mol%
Dispersion coefficient averaging time	1	min

NOTES:

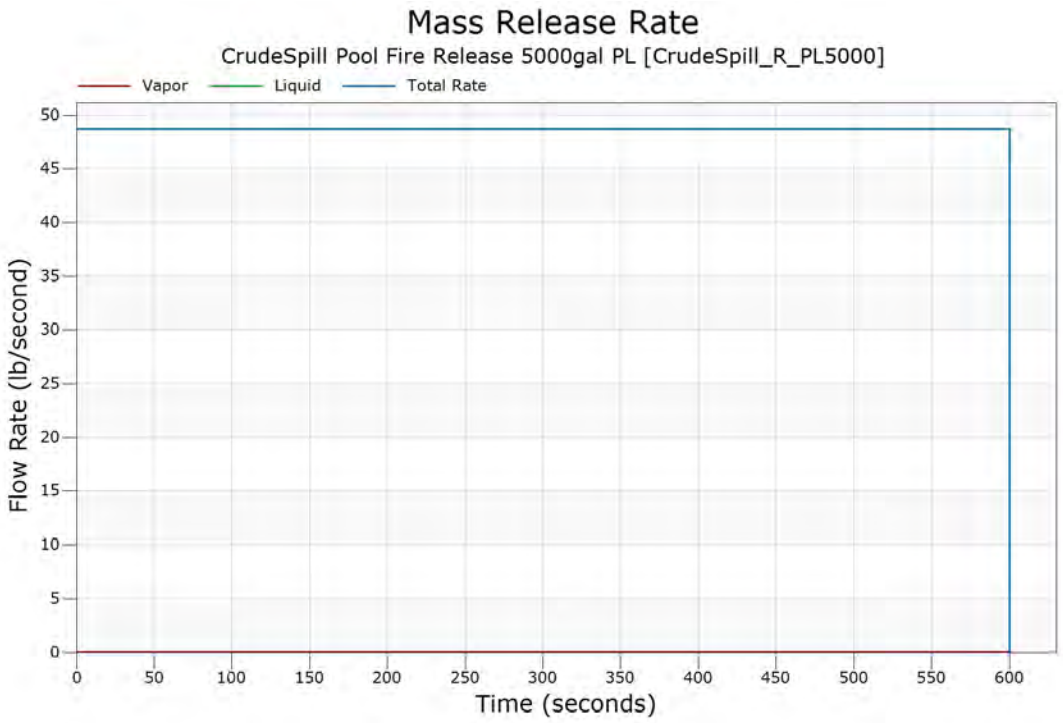
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.3680899E-01	0.000000	48.68319	48.72000
0.1000000	.3680899E-01	0.000000	48.68319	48.72000
0.3000000	.3680899E-01	0.000000	48.68319	48.72000
0.5000000	.3680899E-01	0.000000	48.68319	48.72000
0.7000000	.3680899E-01	0.000000	48.68319	48.72000
1.000000	.3680899E-01	0.000000	48.68319	48.72000
3.000000	.3680899E-01	0.000000	48.68319	48.72000
5.000000	.3680899E-01	0.000000	48.68319	48.72000
7.000000	.3680899E-01	0.000000	48.68319	48.72000
10.00000	.3680899E-01	0.000000	48.68319	48.72000
20.00000	.3680899E-01	0.000000	48.68319	48.72000
30.00000	.3680899E-01	0.000000	48.68319	48.72000
40.00000	.3680899E-01	0.000000	48.68319	48.72000
50.00000	.3680899E-01	0.000000	48.68319	48.72000
60.00000	.3680899E-01	0.000000	48.68319	48.72000
70.00000	.3680899E-01	0.000000	48.68319	48.72000
85.00000	.3680899E-01	0.000000	48.68319	48.72000
100.0000	.3680899E-01	0.000000	48.68319	48.72000
200.0000	.3680899E-01	0.000000	48.68319	48.72000
300.0000	.3680899E-01	0.000000	48.68319	48.72000
400.0000	.3680899E-01	0.000000	48.68319	48.72000
500.0000	.3680899E-01	0.000000	48.68319	48.72000
600.0000	.3680899E-01	0.000000	48.68319	48.72000
Totals (lb)	22.08539	0.000000	29209.91	29232.00

Flowrate for Jet Fire [1st minute] = 0.3680899E-01 lb/sec.
Jet Fire [2-3 minutes] = 0.3680899E-01 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
Time (seconds)
0
5
10
15
20
25
30
35
40
45
50
0
50
100
150
200
250
300
350
400
450
500
550
600

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

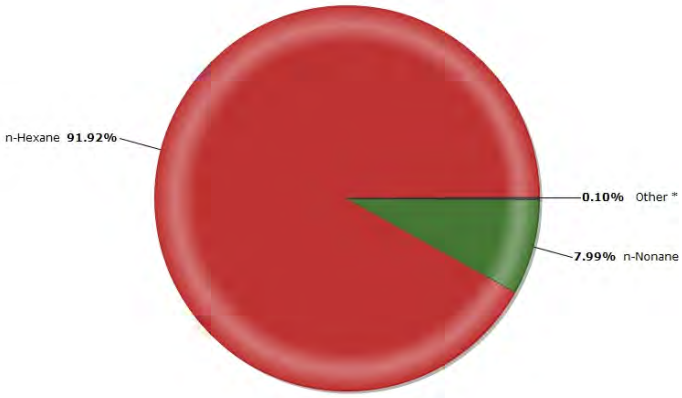
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

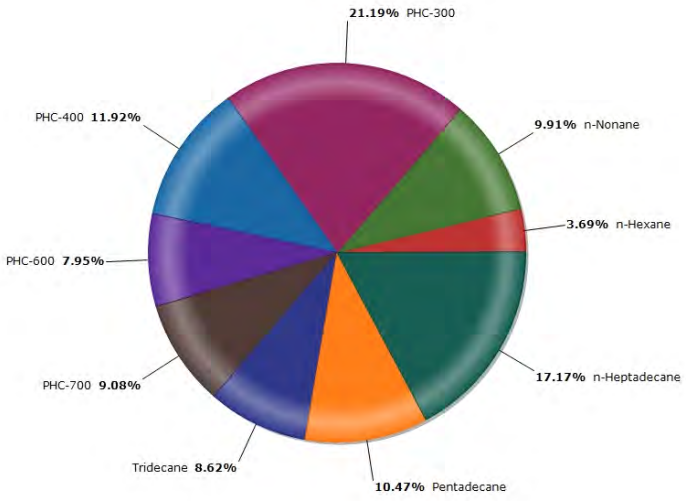
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

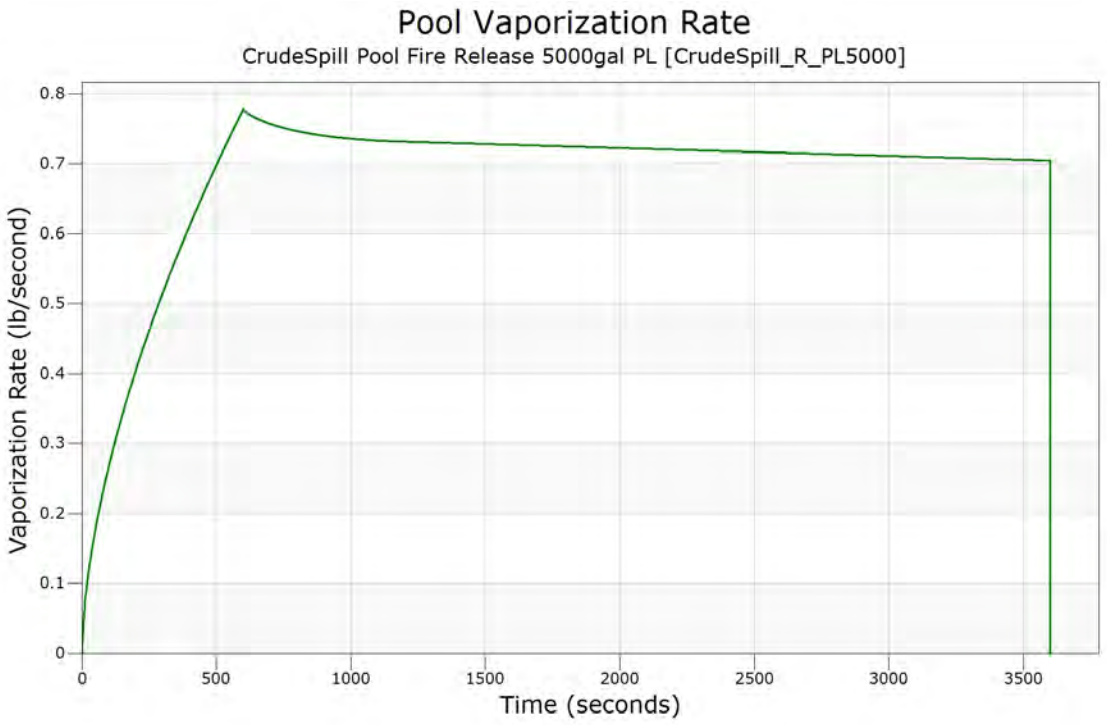
Liquid Pool Stream
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]

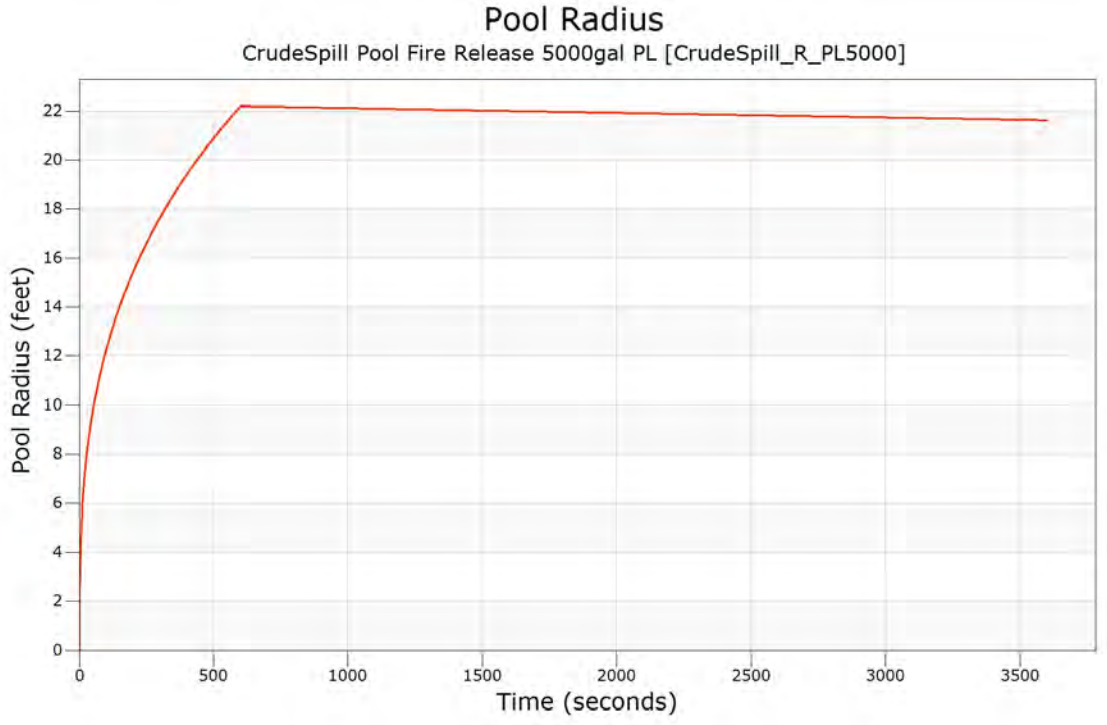


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	44.4329	9.02428	0.154110
80.0000	88.7740	11.3678	0.233447
120.000	133.048	13.0095	0.297602
160.000	177.269	14.3150	0.353511
200.000	221.441	15.4163	0.403975
240.000	265.566	16.3786	0.450471
280.000	309.653	17.2382	0.493902
320.000	353.712	18.0187	0.534886
360.000	397.714	18.7362	0.573841
400.000	441.681	19.4019	0.611033
440.000	485.647	20.0243	0.646770
480.000	529.543	20.6099	0.681206
520.000	573.440	21.1640	0.714518
560.000	617.265	21.6900	0.746794
600.000	661.091	22.1909	0.778099
640.000	660.384	22.1831	0.767010
680.000	659.678	22.1752	0.760088
720.000	659.007	22.1673	0.754753
760.000	658.301	22.1598	0.750409
800.000	657.630	22.1519	0.746816
840.000	656.959	22.1444	0.743796
880.000	656.252	22.1368	0.741260
1130.00	652.050	22.0892	0.732464
1380.00	647.883	22.0420	0.729465
1630.00	643.716	21.9948	0.726666
1880.00	639.584	21.9475	0.723844
2130.00	635.452	21.9003	0.721066
2380.00	631.320	21.8533	0.718266
2630.00	627.224	21.8058	0.715466
2880.00	623.163	21.7585	0.712688
3130.00	619.101	21.7113	0.709888
3380.00	615.040	21.6640	0.707111
3600.00	611.473	21.6220	0.704664

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
Vaporization Rate (lb/second)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
Pool Radius (feet)
22
20
18
16
14
12
10
8
6
4
2
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

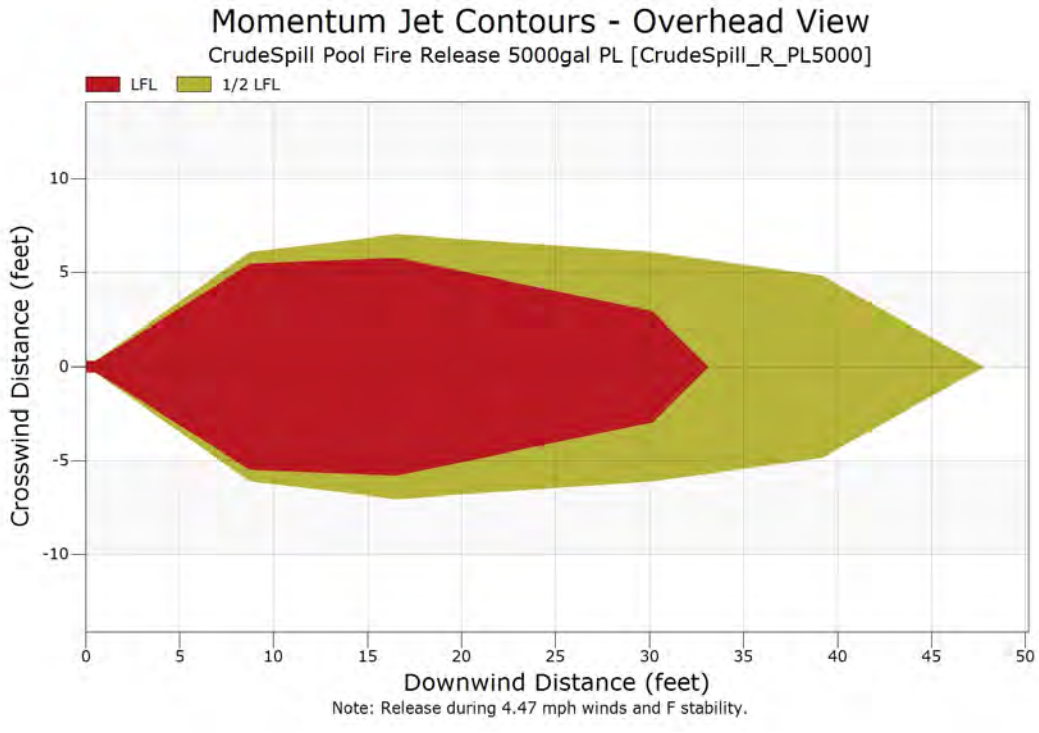
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

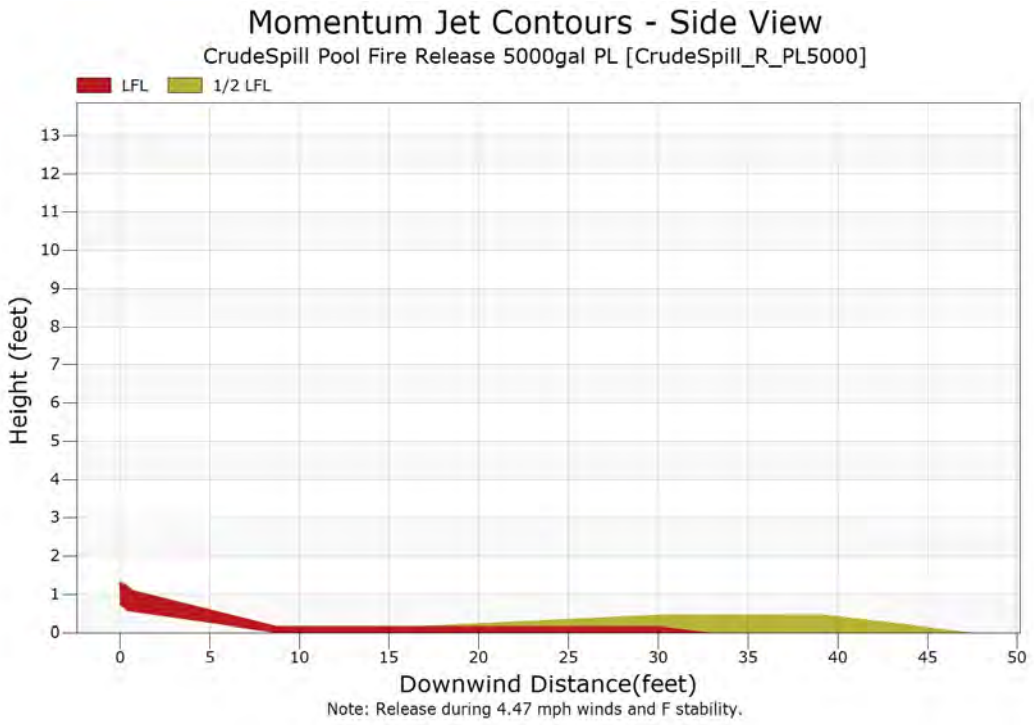
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.3	0.3	0.3	1.0
1	0.449320	0.449320	0.7	0.6	0.6	0.0
2	0.286819	0.286819	1.4	1.2	1.2	0.0
3	0.220583	0.220583	2.1	1.9	1.9	0.0
4	0.183088	0.183088	2.8	2.5	2.5	0.0
5	0.158453	0.158453	3.5	3.1	3.1	0.0
6	0.140807	0.140807	4.2	3.8	3.8	0.0
7	0.127429	0.127429	4.9	4.4	4.4	0.0
8	0.116873	0.116873	5.6	5.0	5.0	0.0
9	0.104928	0.104928	6.1	5.5	5.5	0.0
10	0.087740	0.087740	6.3	5.5	5.5	0.0
11	0.074630	0.074630	6.4	5.6	5.6	0.0
12	0.064380	0.064380	6.5	5.6	5.6	0.0
13	0.056198	0.056198	6.6	5.6	5.6	0.0
14	0.049554	0.049554	6.7	5.7	5.7	0.0
15	0.044076	0.044076	6.9	5.7	5.7	0.0
16	0.039501	0.039501	7.0	5.8	5.8	0.0
17	0.035540	0.035540	7.0	5.7	5.7	0.0
18	0.032075	0.032075	6.9	5.5	5.5	0.0
19	0.029109	0.029109	6.9	5.3	5.3	0.0
20	0.026549	0.026549	6.8	5.1	5.1	0.0
21	0.024323	0.024323	6.7	4.9	4.9	0.0
22	0.022375	0.022375	6.7	4.7	4.7	0.0
23	0.020659	0.020659	6.6	4.5	4.5	0.0
24	0.019140	0.019140	6.5	4.2	4.2	0.0
25	0.017788	0.017788	6.5	4.0	4.0	0.0
26	0.016579	0.016579	6.4	3.8	3.8	0.0
27	0.015493	0.015493	6.3	3.6	3.6	0.0
28	0.014514	0.014514	6.2	3.4	3.4	0.0
29	0.013628	0.013628	6.2	3.2	3.2	0.0
30	0.012824	0.012824	6.1	3.0	3.0	0.0
31	0.012067	0.012067	6.0	2.1	2.1	0.0
32	0.011372	0.011372	5.8	1.1	1.1	0.0
33	0.010737	0.010737	5.7	0.1	0.1	0.0
34	0.010155	0.010155	5.6	0.0	0.0	0.0

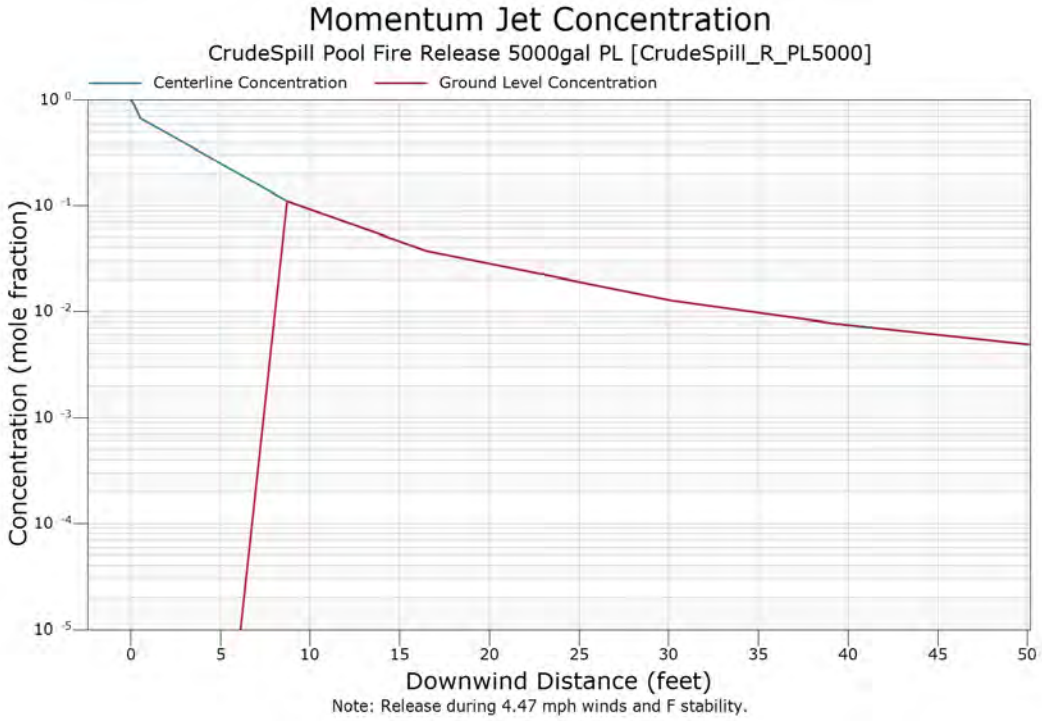
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
35	0.009620	0.009620	5.4	0.0	0.0	0.0
36	0.009127	0.009127	5.3	0.0	0.0	0.0
37	0.008672	0.008672	5.2	0.0	0.0	0.0
38	0.008251	0.008251	5.0	0.0	0.0	0.0
39	0.007860	0.007860	4.9	0.0	0.0	0.0
40	0.007491	0.007491	4.4	0.0	0.0	0.0
41	0.007145	0.007145	3.8	0.0	0.0	0.0
42	0.006823	0.006823	3.3	0.0	0.0	0.0
43	0.006522	0.006522	2.7	0.0	0.0	0.0
44	0.006241	0.006241	2.1	0.0	0.0	0.0
45	0.005978	0.005978	1.6	0.0	0.0	0.0
46	0.005732	0.005732	1.0	0.0	0.0	0.0
47	0.005501	0.005501	0.4	0.0	0.0	0.0
48	0.005284	0.005284	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 0.53 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	33.1	10
2 0.010670 (LFL)	33.1	10
3 0.005335 (1/2 LFL)	47.8	14




Momentum Jet Contours - Side View
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
LFL
1/2 LFL
Height (feet)
Downwind Distance(feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

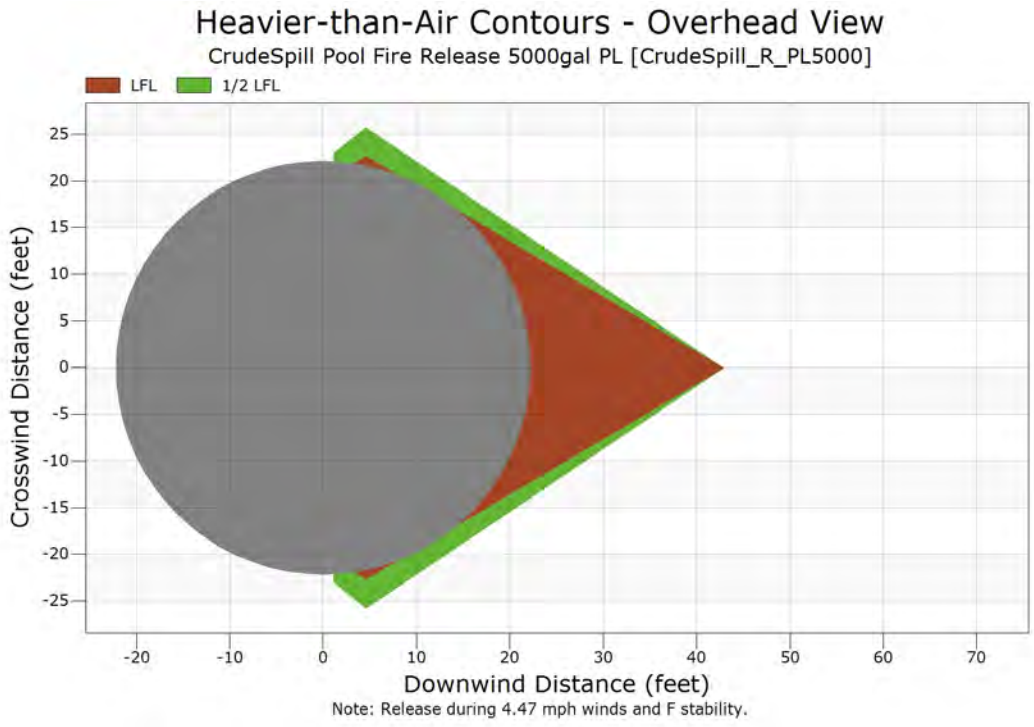
concentration limits

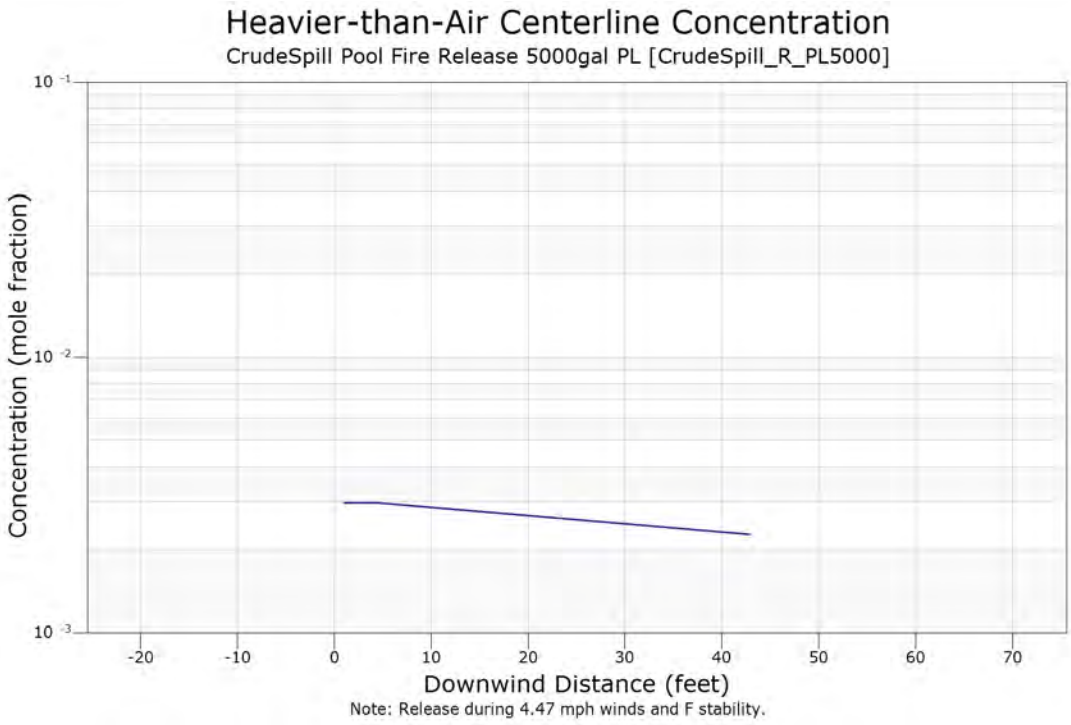
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
1.00	0.002952	22.35	0.00	0.00
2.00	0.002966	23.75	0.00	0.00
3.00	0.002966	24.55	0.00	0.00
4.00	0.002967	25.35	0.00	0.00
5.00	0.003002	25.37	0.00	0.00
6.00	0.003058	25.38	0.00	0.00
7.00	0.003095	25.39	0.00	0.00
8.00	0.003128	25.40	0.00	0.00
9.00	0.003156	25.41	0.00	0.00
10.00	0.003182	25.42	0.00	0.00
11.00	0.003199	25.43	0.00	0.00
12.00	0.003206	25.45	0.00	0.00
13.00	0.003212	25.46	0.00	0.00
14.00	0.003217	25.57	0.00	0.00
15.00	0.003223	25.68	0.00	0.00
16.00	0.003227	25.79	0.00	0.00
17.00	0.003232	25.90	0.00	0.00
18.00	0.003237	26.01	0.00	0.00
19.00	0.003241	26.12	0.00	0.00
20.00	0.003172	26.44	0.00	0.00
21.00	0.003104	26.77	0.00	0.00
22.00	0.003041	27.09	0.00	0.00
23.00	0.002982	27.42	0.00	0.00
24.00	0.002926	27.75	0.00	0.00
25.00	0.002874	28.08	0.00	0.00
26.00	0.002825	28.41	0.00	0.00
27.00	0.002778	28.74	0.00	0.00
28.00	0.002734	29.06	0.00	0.00
29.00	0.002692	29.39	0.00	0.00
30.00	0.002652	29.72	0.00	0.00
31.00	0.002614	30.05	0.00	0.00
32.00	0.002577	30.38	0.00	0.00
33.00	0.002543	30.70	0.00	0.00
34.00	0.002509	31.03	0.00	0.00
35.00	0.002477	31.36	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
36.00	0.002447	31.69	0.00	0.00
37.00	0.002417	32.02	0.00	0.00
38.00	0.002389	32.34	0.00	0.00
39.00	0.002362	32.67	0.00	0.00
40.00	0.002335	33.00	0.00	0.00
41.00	0.002310	33.33	0.00	0.00
42.00	0.002286	33.66	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	42.9	13




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 5000gal PL [CrudeSpill_R_PL5000]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-20
-10
0
10
20
30
40
50
60
70
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_5000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              44.4 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

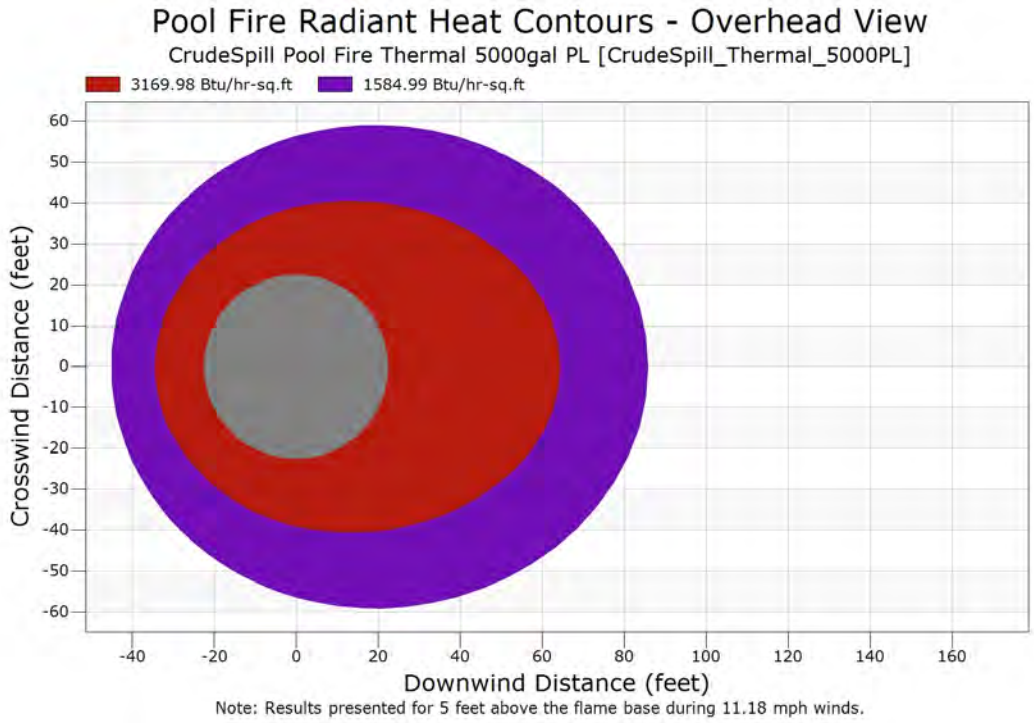
Pool Fire Radiation

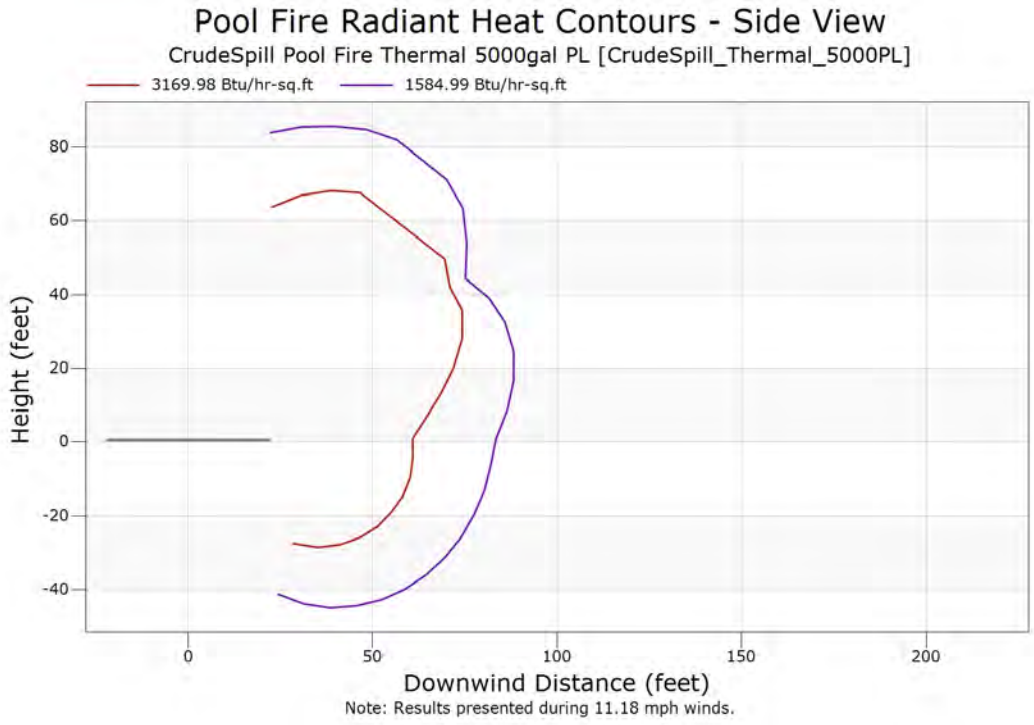
Length of Flame	: 52.3	feet
Flame Tilt from Vertical	: 36.5	degrees
Target Elevation	: 6.0	feet
Pool Elevation	: 1.0	feet
Wind Speed	: 11.2	mph
Substrate	: Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
43.1	6357	4572	7830
45.0	5889	4103	7178
46.9	5278	3716	6455
49.0	4715	3392	5808
51.1	4223	3103	5240
53.4	3804	2841	4748
55.7	3446	2596	4314
58.1	3136	2364	3927
60.7	2868	2142	3580
63.3	2633	1929	3264
66.1	2424	1723	2974
69.0	2236	1525	2706
72.0	2059	1336	2455
75.2	1890	1158	2217
78.4	1730	993	1994
81.9	1574	843	1786
85.5	1426	708	1592
89.2	1286	590	1415
93.1	1154	488	1253
97.2	1032	402	1107
101.4	920	329	977
105.9	818	269	861
110.5	726	220	758
115.3	643	179	668
120.4	570	146	589
125.6	505	120	519
131.1	448	98	459
136.9	397	80	405
142.9	352	66	359
149.1	313	55	318

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
64.2	3170
85.6	1585
85.6	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 5000gal PL [CrudeSpill_Thermal_5000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-40
-20
0
20
40
60
80
100
120
140
160
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 5000gal PL [CrudeSpill_Thermal_5000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
80
60
40
20
0
-20
-40
0
50
100
150
200
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL20000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                            80 lb/cu.ft
  Substrate heat Capacity                    0.22 Btu/lb-F
  Substrate delay time                          0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
```

```
RELEASE MENU
Type of release:   Regulated
Release duration                                    10 min
Regulated flow rate                             194.90 lb/sec
Pipe inner diameter                              10.02 inches
Equivalent release diameter                      10.00 inches
Height of release point                            1.0 feet
Angle of release from horizontal                   0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                          LFL mol%
  Concentration endpoint 2                          LFL mol%
  Concentration endpoint 3                      1/2 LFL mol%
Dispersion coefficient averaging time                1 min


  NOTES:
```

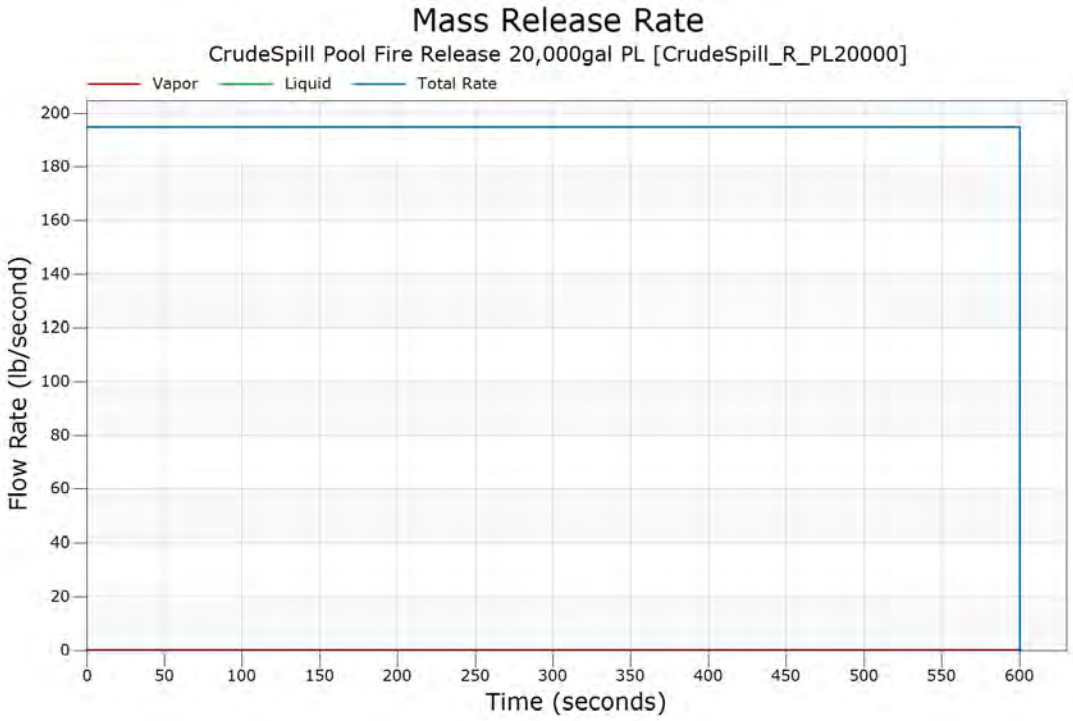
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.1472511	0.000000	194.7527	194.9000
0.1000000	.1472511	0.000000	194.7527	194.9000
0.3000000	.1472511	0.000000	194.7527	194.9000
0.5000000	.1472511	0.000000	194.7527	194.9000
0.7000000	.1472511	0.000000	194.7527	194.9000
1.000000	.1472511	0.000000	194.7527	194.9000
3.000000	.1472511	0.000000	194.7527	194.9000
5.000000	.1472511	0.000000	194.7527	194.9000
7.000000	.1472511	0.000000	194.7527	194.9000
10.00000	.1472511	0.000000	194.7527	194.9000
20.00000	.1472511	0.000000	194.7527	194.9000
30.00000	.1472511	0.000000	194.7527	194.9000
40.00000	.1472511	0.000000	194.7527	194.9000
50.00000	.1472511	0.000000	194.7527	194.9000
60.00000	.1472511	0.000000	194.7527	194.9000
70.00000	.1472511	0.000000	194.7527	194.9000
85.00000	.1472511	0.000000	194.7527	194.9000
100.0000	.1472511	0.000000	194.7527	194.9000
200.0000	.1472511	0.000000	194.7527	194.9000
300.0000	.1472511	0.000000	194.7527	194.9000
400.0000	.1472511	0.000000	194.7527	194.9000
500.0000	.1472511	0.000000	194.7527	194.9000
600.0000	.1472511	0.000000	194.7527	194.9000
Totals (lb)	88.35064	0.000000	116851.6	116940.0

Flowrate for Jet Fire [1st minute] = 0.1472511 lb/sec.
Jet Fire [2-3 minutes] = 0.1472511 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
200
180
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

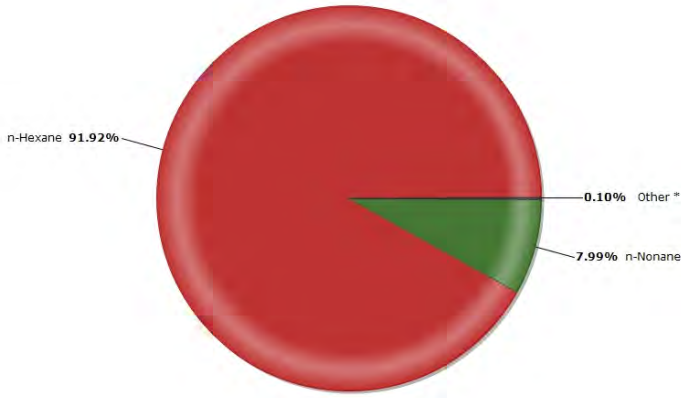
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171704
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

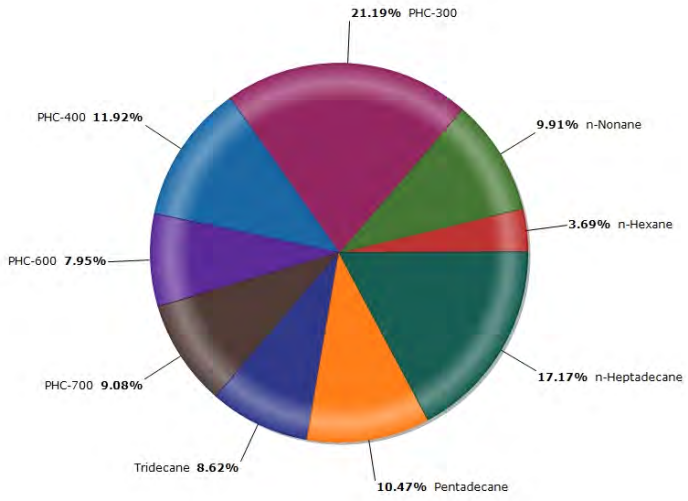
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

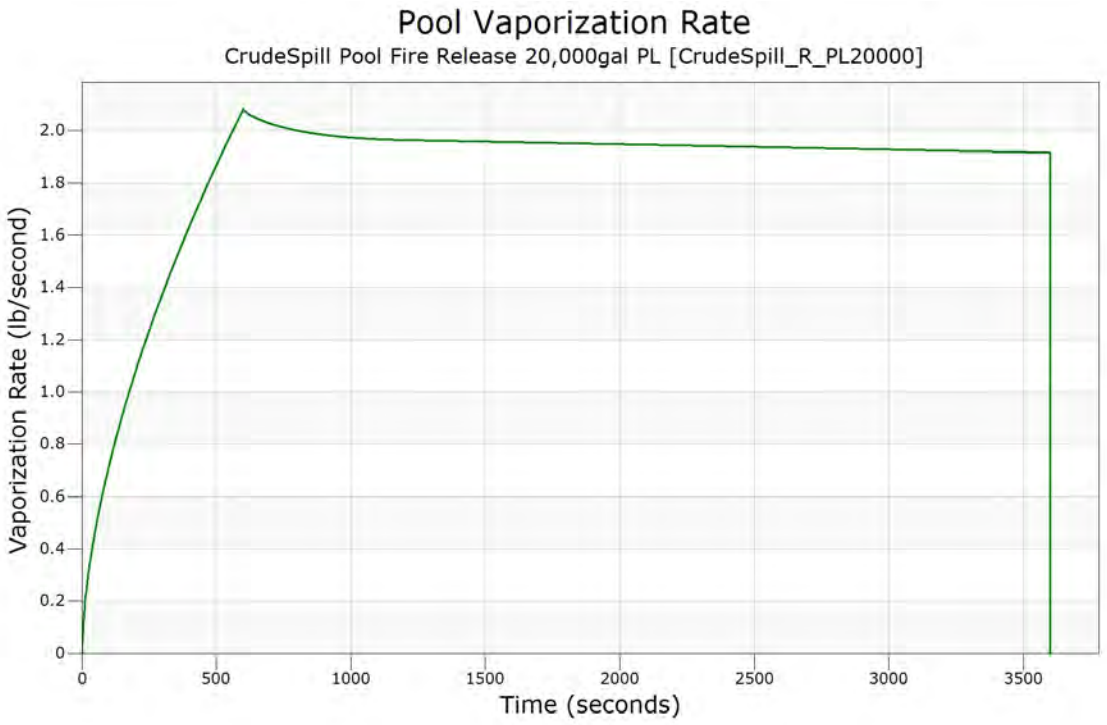
Liquid Pool Stream
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]

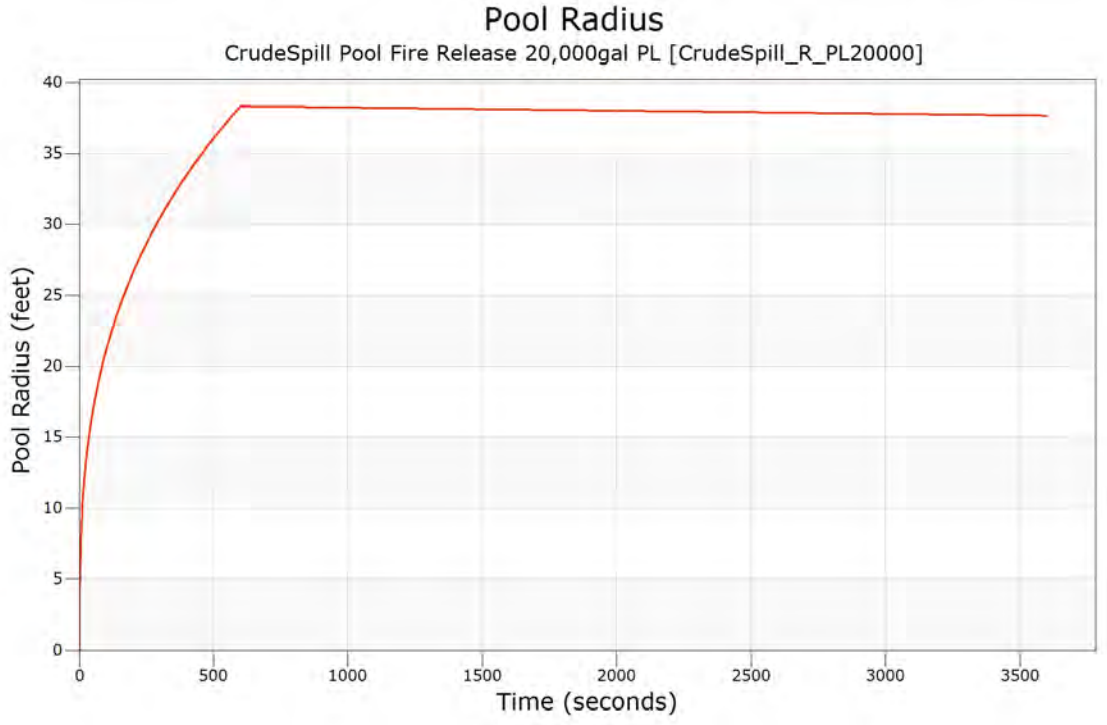


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	177.866	15.5781	0.411713
80.0000	355.477	19.6263	0.623776
120.000	532.934	22.4626	0.795384
160.000	710.213	24.7188	0.944923
200.000	887.387	26.6230	1.08000
240.000	1064.42	28.2871	1.20458
280.000	1241.35	29.7730	1.32081
320.000	1418.20	31.1224	1.43049
360.000	1594.92	32.3638	1.53484
400.000	1771.56	33.5171	1.63455
440.000	1948.13	34.5932	1.73034
480.000	2124.57	35.6070	1.82265
520.000	2300.96	36.5650	1.91185
560.000	2477.25	37.4738	1.99836
600.000	2653.47	38.3432	2.08233
640.000	2651.60	38.3333	2.05316
680.000	2649.73	38.3235	2.03511
720.000	2647.89	38.3136	2.02124
760.000	2646.02	38.3071	2.01006
800.000	2644.19	38.2972	2.00089
840.000	2642.38	38.2874	1.99324
880.000	2640.55	38.2808	1.98685
1130.00	2629.28	38.2251	1.96573
1380.00	2618.05	38.1726	1.96015
1630.00	2606.86	38.1168	1.95515
1880.00	2595.70	38.0610	1.95012
2130.00	2584.57	38.0085	1.94514
2380.00	2573.49	37.9528	1.94013
2630.00	2562.40	37.9003	1.93511
2880.00	2551.34	37.8445	1.93008
3130.00	2540.33	37.7887	1.92510
3380.00	2529.34	37.7362	1.92012
3600.00	2519.70	37.6870	1.91571

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]
Vaporization Rate (lb/second)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]
Pool Radius (feet)
40
35
30
25
20
15
10
5
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

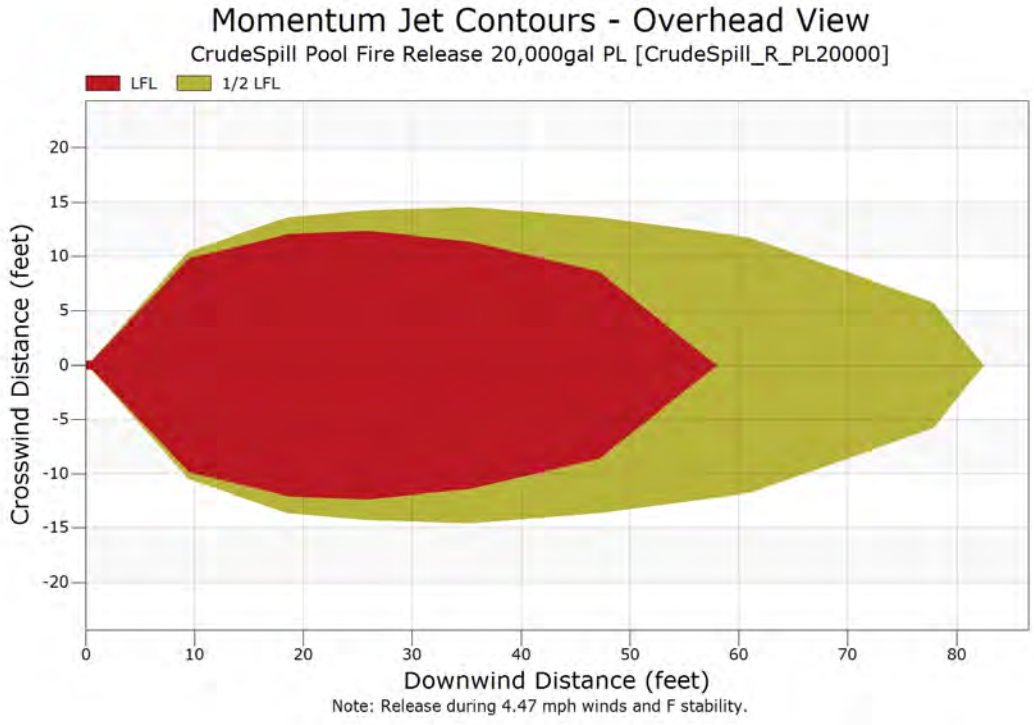
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.4	0.4	0.4	1.0
2	0.488293	0.488293	2.1	1.9	1.9	0.0
4	0.363929	0.363929	4.3	4.1	4.1	0.0
6	0.306434	0.306434	6.6	6.2	6.2	0.0
8	0.271239	0.271239	8.8	8.3	8.3	0.0
10	0.231373	0.231373	10.7	10.0	10.0	0.0
12	0.172965	0.172965	11.4	10.5	10.5	0.0
14	0.135246	0.135246	12.0	11.0	11.0	0.0
16	0.109291	0.109291	12.7	11.4	11.4	0.0
18	0.090564	0.090564	13.4	11.9	11.9	0.0
20	0.075632	0.075632	13.7	12.1	12.1	0.0
22	0.063999	0.063999	13.9	12.2	12.2	0.0
24	0.054949	0.054949	14.1	12.3	12.3	0.0
26	0.047737	0.047737	14.2	12.3	12.3	0.0
28	0.041709	0.041709	14.3	12.1	12.1	0.0
30	0.036782	0.036782	14.4	11.9	11.9	0.0
32	0.032702	0.032702	14.4	11.8	11.8	0.0
34	0.029283	0.029283	14.5	11.6	11.6	0.0
36	0.026361	0.026361	14.5	11.3	11.3	0.0
38	0.023816	0.023816	14.3	10.8	10.8	0.0
40	0.021629	0.021629	14.2	10.3	10.3	0.0
42	0.019735	0.019735	14.0	9.8	9.8	0.0
44	0.018084	0.018084	13.9	9.4	9.4	0.0
46	0.016636	0.016636	13.7	8.9	8.9	0.0
48	0.015346	0.015346	13.5	8.0	8.0	0.0
50	0.014186	0.014186	13.2	6.4	6.4	0.0
52	0.013154	0.013154	13.0	4.8	4.8	0.0
54	0.012232	0.012232	12.7	3.2	3.2	0.0
56	0.011405	0.011405	12.4	1.6	1.6	0.0
58	0.010659	0.010659	12.1	0.0	0.0	0.0
60	0.009986	0.009986	11.9	0.0	0.0	0.0
62	0.009369	0.009369	11.4	0.0	0.0	0.0
64	0.008801	0.008801	10.7	0.0	0.0	0.0
66	0.008284	0.008284	10.0	0.0	0.0	0.0
68	0.007811	0.007811	9.3	0.0	0.0	0.0

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
70	0.007378	0.007378	8.6	0.0	0.0	0.0
72	0.006980	0.006980	7.9	0.0	0.0	0.0
74	0.006613	0.006613	7.2	0.0	0.0	0.0
76	0.006275	0.006275	6.5	0.0	0.0	0.0
78	0.005962	0.005962	5.6	0.0	0.0	0.0
80	0.005666	0.005666	3.1	0.0	0.0	0.0
82	0.005392	0.005392	0.6	0.0	0.0	0.0
84	0.005138	0.005138	0.0	0.0	0.0	0.0

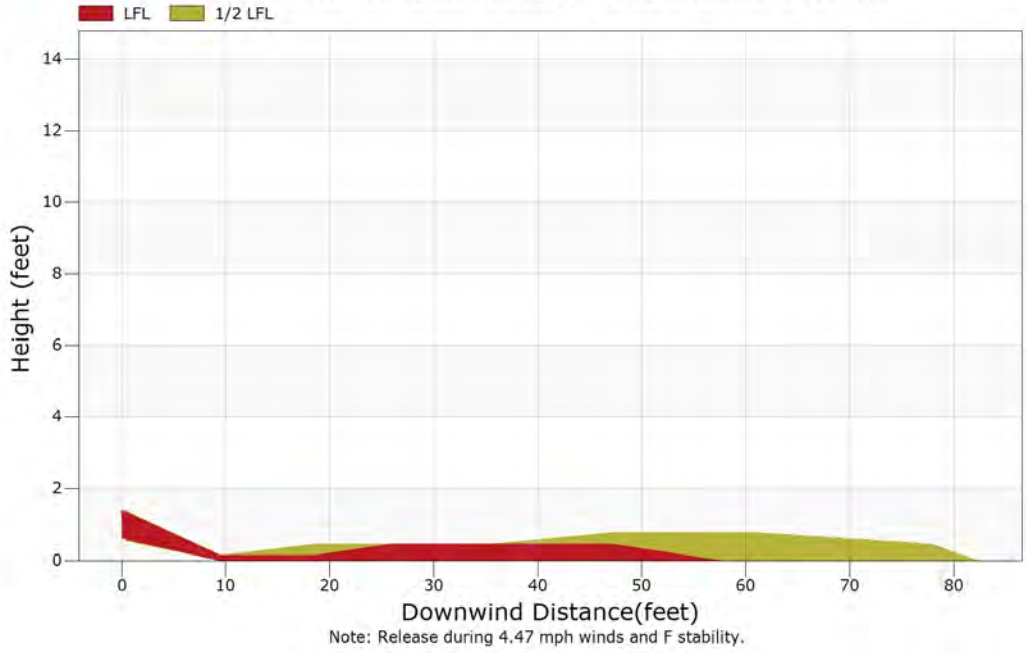
The momentum jet model coupled to the heavy gas model at 0.55 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	58.0	17
2 0.010670 (LFL)	58.0	17
3 0.005335 (1/2 LFL)	82.4	24



Momentum Jet Contours - Side View

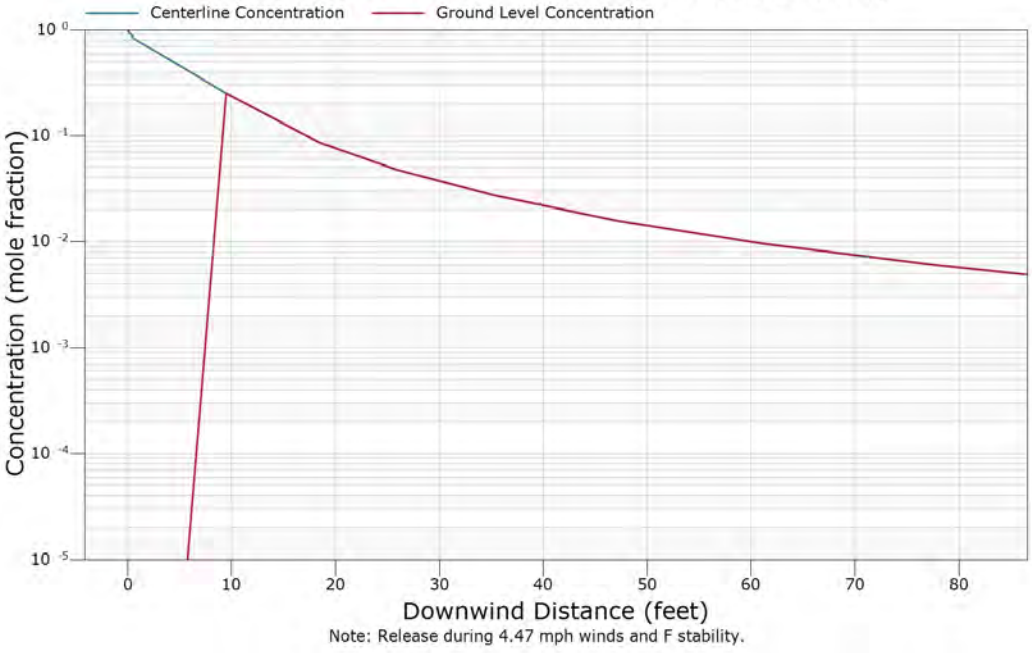
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]



Note: Release during 4.47 mph winds and F stability.

Momentum Jet Concentration

CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

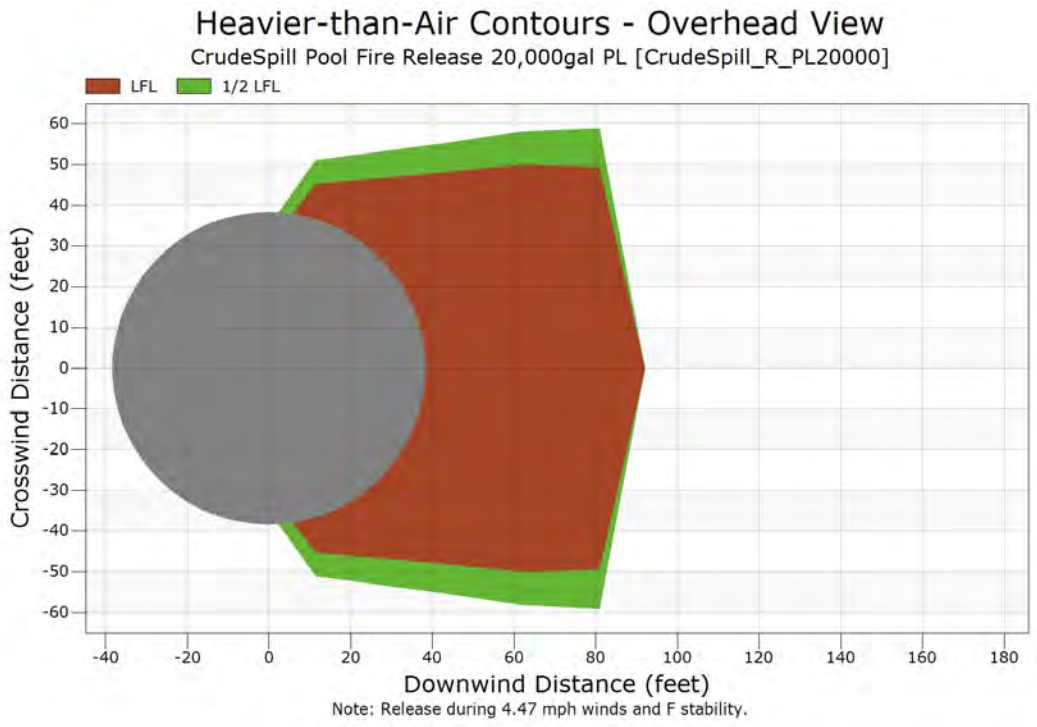
concentration limits

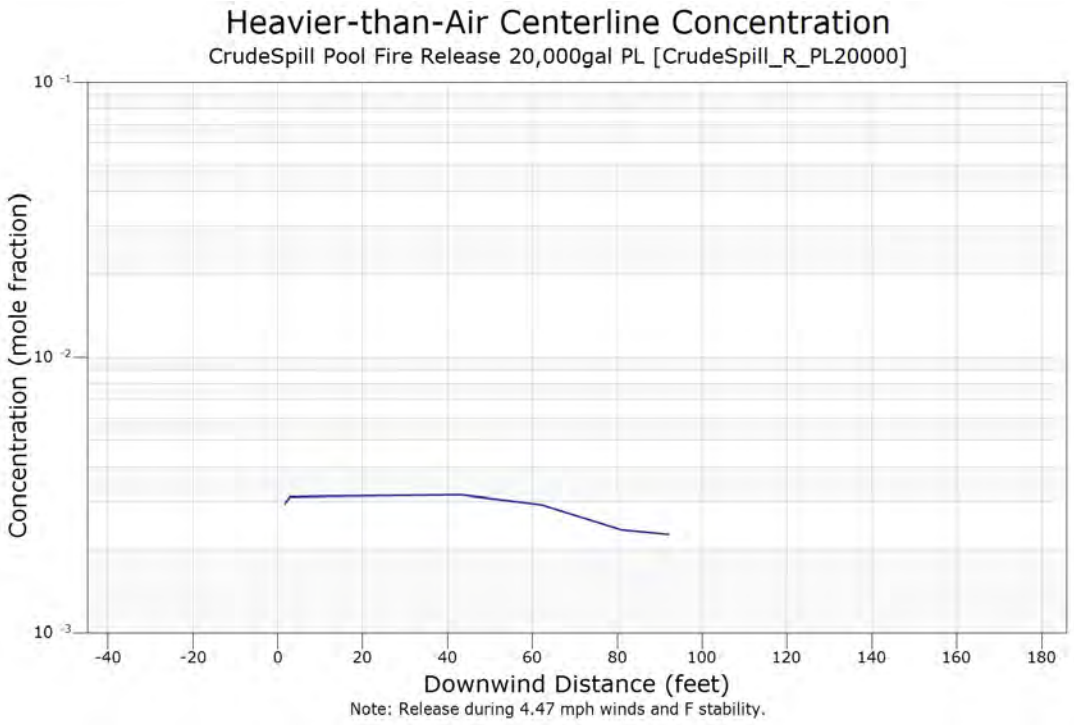
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
2.00	0.003005	36.79	0.00	0.00
4.00	0.003121	40.53	0.00	0.00
6.00	0.003126	43.35	0.00	0.00
8.00	0.003130	46.18	0.00	0.00
10.00	0.003133	49.00	0.00	0.00
12.00	0.003144	49.16	0.00	0.00
14.00	0.003179	49.33	0.00	0.00
16.00	0.003200	49.49	0.00	0.00
18.00	0.003219	49.65	0.00	0.00
20.00	0.003236	49.82	0.00	0.00
22.00	0.003251	49.98	0.00	0.00
24.00	0.003265	50.14	0.00	0.00
26.00	0.003278	50.31	0.00	0.00
28.00	0.003290	50.47	0.00	0.00
30.00	0.003300	50.63	0.00	0.00
32.00	0.003303	50.80	0.00	0.00
34.00	0.003305	50.96	0.00	0.00
36.00	0.003307	51.12	0.00	0.00
38.00	0.003310	51.29	0.00	0.00
40.00	0.003306	51.45	0.00	0.00
42.00	0.003214	53.79	0.00	0.00
44.00	0.003146	55.21	0.00	0.00
46.00	0.003111	55.25	0.00	0.00
48.00	0.003077	55.30	0.00	0.00
50.00	0.003045	55.35	0.00	0.00
52.00	0.003015	55.40	0.00	0.00
54.00	0.002986	55.44	0.00	0.00
56.00	0.002959	55.49	0.00	0.00
58.00	0.002939	55.54	0.00	0.00
60.00	0.002926	56.76	0.00	0.00
62.00	0.002913	57.99	0.00	0.00
64.00	0.002843	58.14	0.00	0.00
66.00	0.002775	58.23	0.00	0.00
68.00	0.002710	58.33	0.00	0.00
70.00	0.002648	58.43	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
72.00	0.002590	58.53	0.00	0.00
74.00	0.002534	58.63	0.00	0.00
76.00	0.002481	58.73	0.00	0.00
78.00	0.002431	58.83	0.00	0.00
80.00	0.002383	58.93	0.00	0.00
82.00	0.002351	59.46	0.00	0.00
84.00	0.002332	60.36	0.00	0.00
86.00	0.002315	61.26	0.00	0.00
88.00	0.002298	62.17	0.00	0.00
90.00	0.002281	63.07	0.00	0.00
92.00	0.002265	63.97	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	92.0	28




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 20,000gal PL [CrudeSpill_R_PL20000]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-40
-20
0
20
40
60
80
100
120
140
160
180
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_20000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                               70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)           1.0 feet
Elevation of target (from grade)               6.0 feet
Diameter of pool                              76.4 feet

Fire radiation flux endpoints
  Radiation endpoint 1                        3170 Btu/hr-sq.ft
  Radiation endpoint 2                        1585 Btu/hr-sq.ft
  Radiation endpoint 3                        1585 Btu/hr-sq.ft

  NOTES:
```

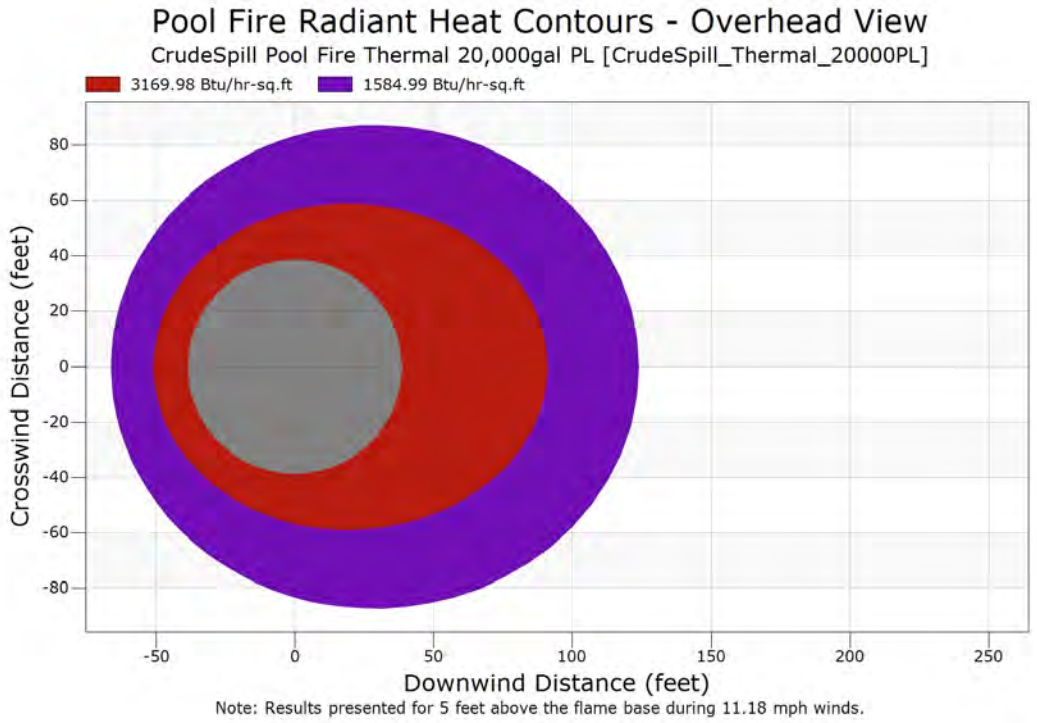
Pool Fire Radiation

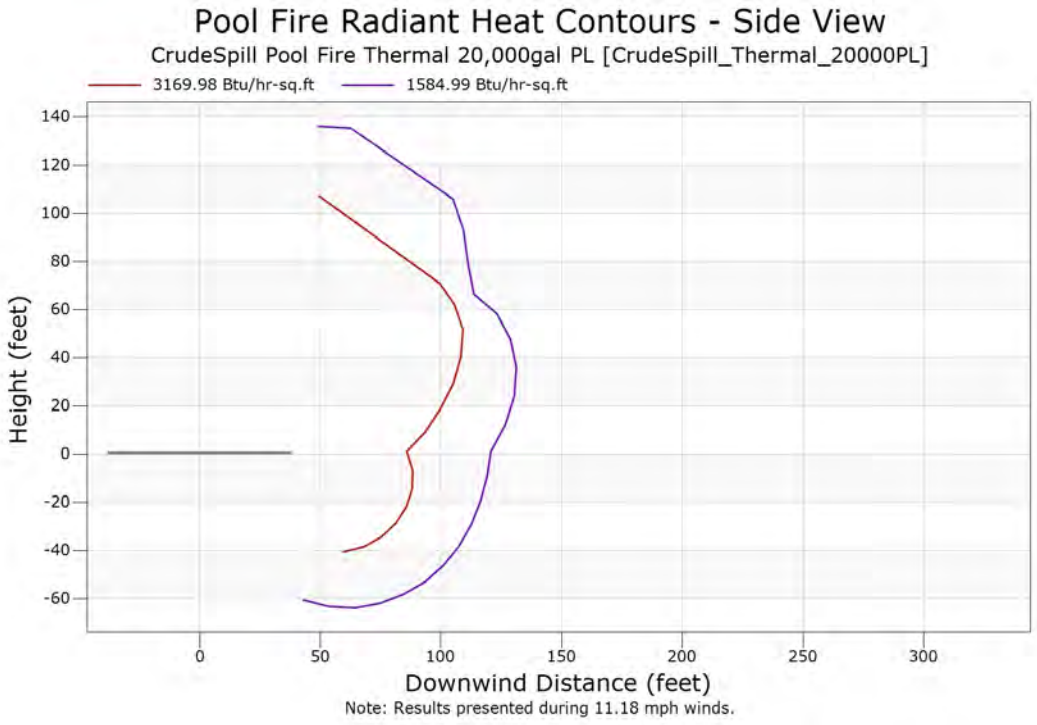
Length of Flame	:	76.2	feet
Flame Tilt from Vertical	:	29.6	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
66.8	5527	3937	6786
69.7	4868	3512	6002
72.6	4279	3172	5327
75.7	3803	2885	4773
78.9	3417	2633	4313
82.2	3097	2403	3920
85.7	2828	2190	3577
89.3	2598	1990	3272
93.1	2398	1801	2999
97.1	2219	1620	2747
101.2	2057	1449	2517
105.4	1905	1287	2299
109.9	1762	1134	2096
114.6	1626	991	1904
119.4	1494	860	1724
124.5	1369	740	1557
129.7	1250	633	1401
135.2	1136	538	1257
140.9	1029	454	1125
146.9	930	382	1005
153.1	837	321	897
159.6	752	268	799
166.4	675	224	711
173.4	605	187	633
180.7	542	156	564
188.4	484	130	501
196.4	433	108	447
204.7	388	91	398
213.3	347	76	355
222.4	310	63	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
90.8	3170
123.6	1585
123.6	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 20,000gal PL [CrudeSpill_Thermal_20000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
80
60
40
20
0
-20
-40
-60
-80
-50
0
50
100
150
200
250
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 20,000gal PL [CrudeSpill_Thermal_20000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
140
120
100
80
60
40
20
0
-20
-40
-60
0
50
100
150
200
250
300
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL50000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                          Medium density concrete
  Substrate thermal conductivity            0.2698 Btu/hr-ft-F
  Substrate density                            80 lb/cu.ft
  Substrate heat Capacity                    0.22 Btu/lb-F
  Substrate delay time                          0 sec
Surrounding terrain                     Long grass or crops > 15 cm (6 in)

  NOTES:
```

RELEASE MENU
Type of release: Regulated

Release duration	10	min
Regulated flow rate	487.20	lb/sec
Pipe inner diameter	10.02	inches
Equivalent release diameter	10.00	inches
Height of release point	1.0	feet
Angle of release from horizontal	0.0	degrees

NOTES:

IMPOUNDMENT MENU
Unconfined

NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints

Concentration endpoint 1	LFL	mol%
Concentration endpoint 2	LFL	mol%
Concentration endpoint 3	1/2 LFL	mol%
Dispersion coefficient averaging time	1	min

NOTES:

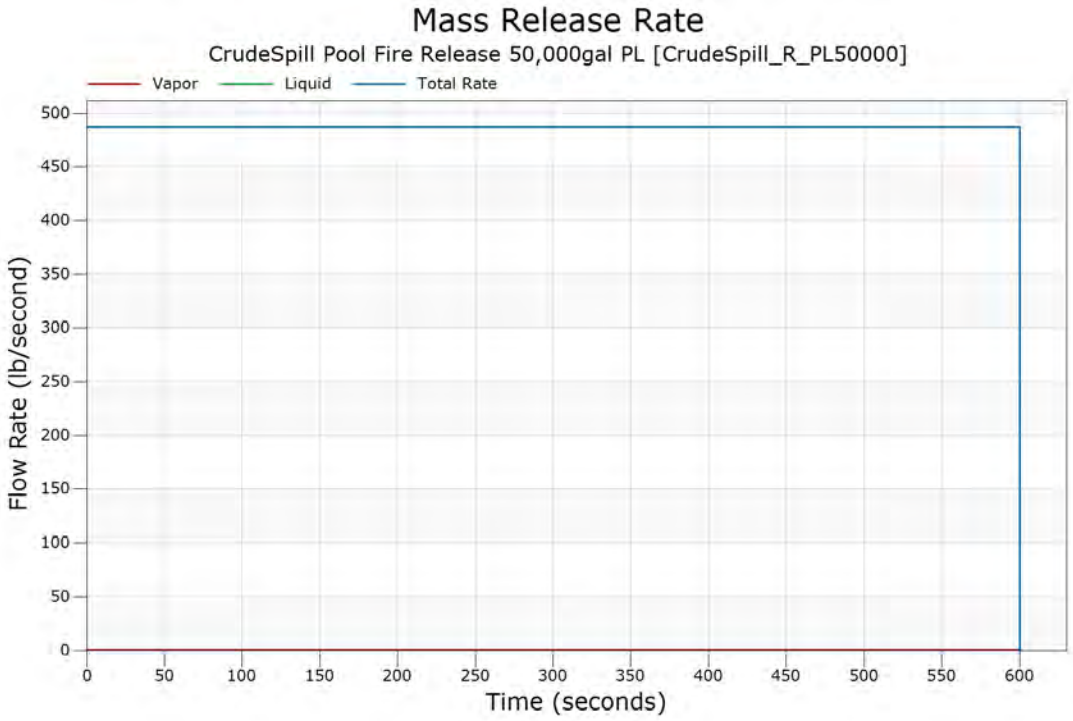
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.3665583	0.000000	486.8335	487.2000
0.1000000	.3665583	0.000000	486.8335	487.2000
0.3000000	.3665583	0.000000	486.8335	487.2000
0.5000000	.3665583	0.000000	486.8335	487.2000
0.7000000	.3665583	0.000000	486.8335	487.2000
1.000000	.3665583	0.000000	486.8335	487.2000
3.000000	.3665583	0.000000	486.8335	487.2000
5.000000	.3665583	0.000000	486.8335	487.2000
7.000000	.3665583	0.000000	486.8335	487.2000
10.00000	.3665583	0.000000	486.8335	487.2000
20.00000	.3665583	0.000000	486.8335	487.2000
30.00000	.3665583	0.000000	486.8335	487.2000
40.00000	.3665583	0.000000	486.8335	487.2000
50.00000	.3665583	0.000000	486.8335	487.2000
60.00000	.3665583	0.000000	486.8335	487.2000
70.00000	.3665583	0.000000	486.8335	487.2000
85.00000	.3665583	0.000000	486.8335	487.2000
100.0000	.3665583	0.000000	486.8335	487.2000
200.0000	.3665583	0.000000	486.8335	487.2000
300.0000	.3665583	0.000000	486.8335	487.2000
400.0000	.3665583	0.000000	486.8335	487.2000
500.0000	.3665583	0.000000	486.8335	487.2000
600.0000	.3665583	0.000000	486.8335	487.2000
Totals (lb)	219.9350	0.000000	292100.1	292320.0

Flowrate for Jet Fire [1st minute] = 0.3665583 lb/sec.
Jet Fire [2-3 minutes] = 0.3665583 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

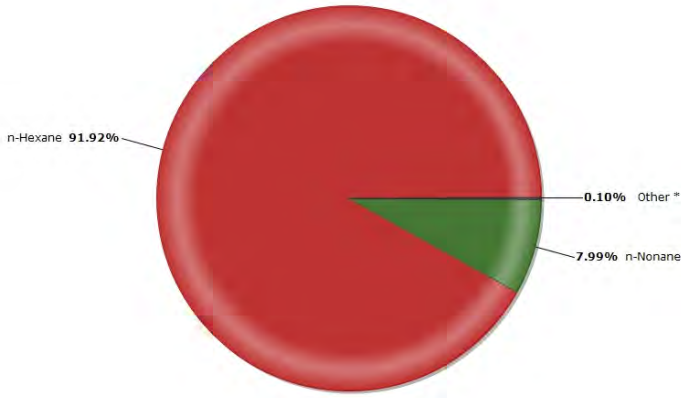
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919166	0.000000	0.919166	0.036882
11	0.099100	0.000000	0.079851	0.000000	0.079851	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171703
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

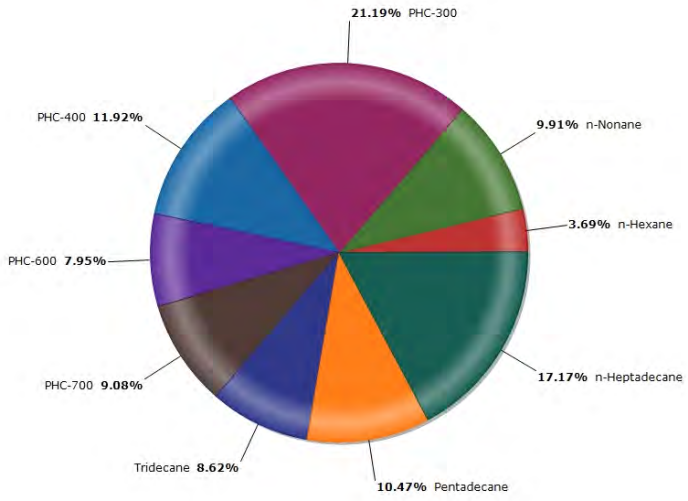
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

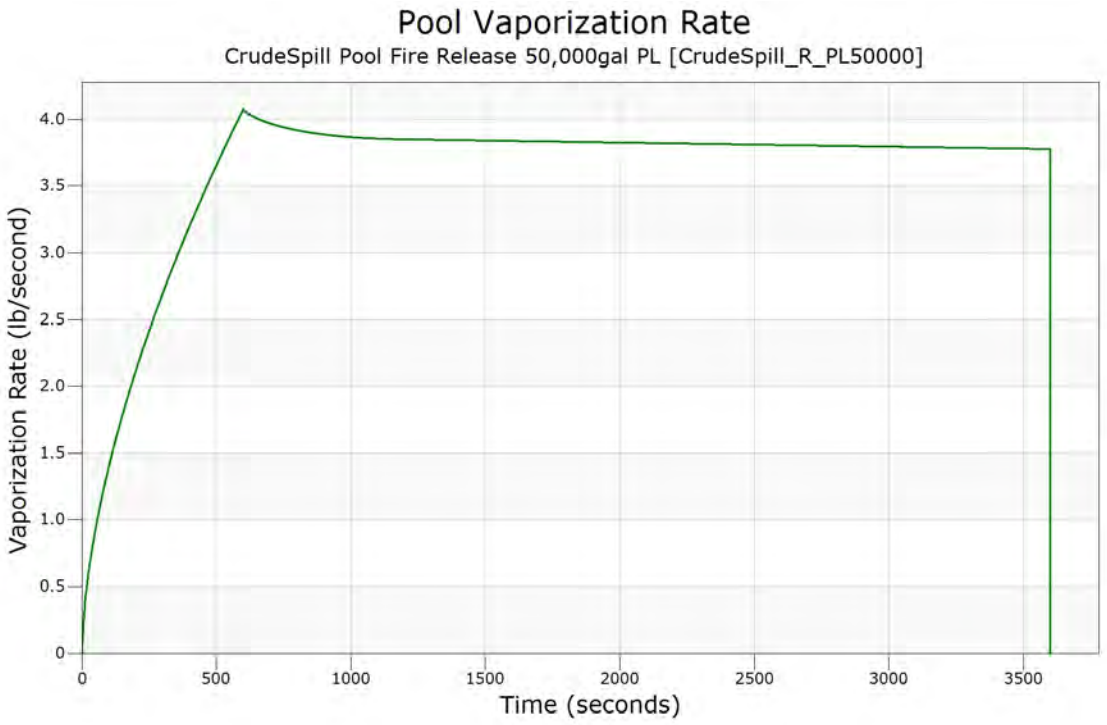
Liquid Pool Stream
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]

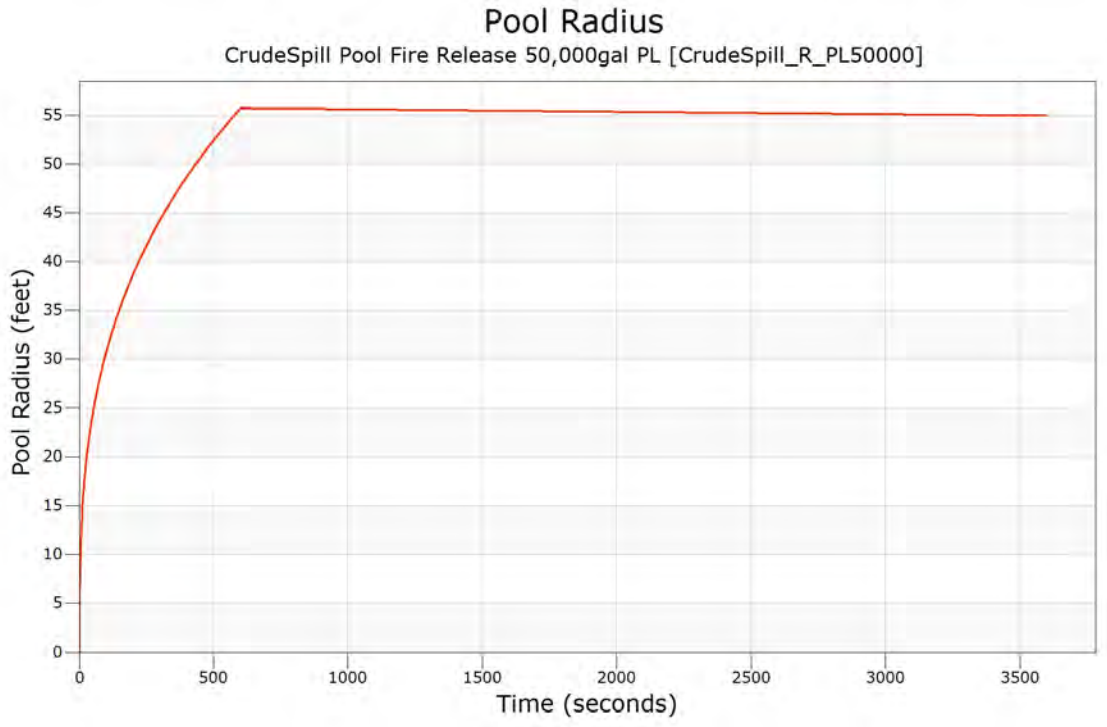


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	444.753	22.6152	0.805305
80.0000	888.976	28.4934	1.22026
120.000	1332.88	32.6132	1.55609
160.000	1776.50	35.8891	1.84877
200.000	2219.88	38.6549	2.11315
240.000	2663.04	41.0728	2.35696
280.000	3105.96	43.2316	2.58448
320.000	3548.77	45.1936	2.79921
360.000	3991.26	46.9948	3.00358
400.000	4433.40	48.6713	3.19891
440.000	4875.54	50.2362	3.38652
480.000	5317.68	51.7093	3.56730
520.000	5759.47	53.1004	3.74213
560.000	6201.26	54.4226	3.91166
600.000	6642.69	55.6857	4.07613
640.000	6639.16	55.6758	4.01947
680.000	6635.27	55.6660	3.98463
720.000	6631.74	55.6529	3.95774
760.000	6628.21	55.6430	3.93635
800.000	6624.68	55.6332	3.91872
840.000	6621.15	55.6234	3.90395
880.000	6617.26	55.6135	3.89182
1130.00	6595.37	55.5512	3.85258
1380.00	6573.47	55.4921	3.84376
1630.00	6551.22	55.4298	3.83604
1880.00	6529.33	55.3675	3.82833
2130.00	6507.79	55.3051	3.82061
2380.00	6485.89	55.2428	3.81311
2630.00	6464.00	55.1804	3.80540
2880.00	6442.45	55.1214	3.79768
3130.00	6420.56	55.0591	3.78997
3380.00	6399.02	54.9967	3.78225
3600.00	6379.95	54.9409	3.77564

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]
Vaporization Rate (lb/second)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]
Pool Radius (feet)
55
50
45
40
35
30
25
20
15
10
5
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

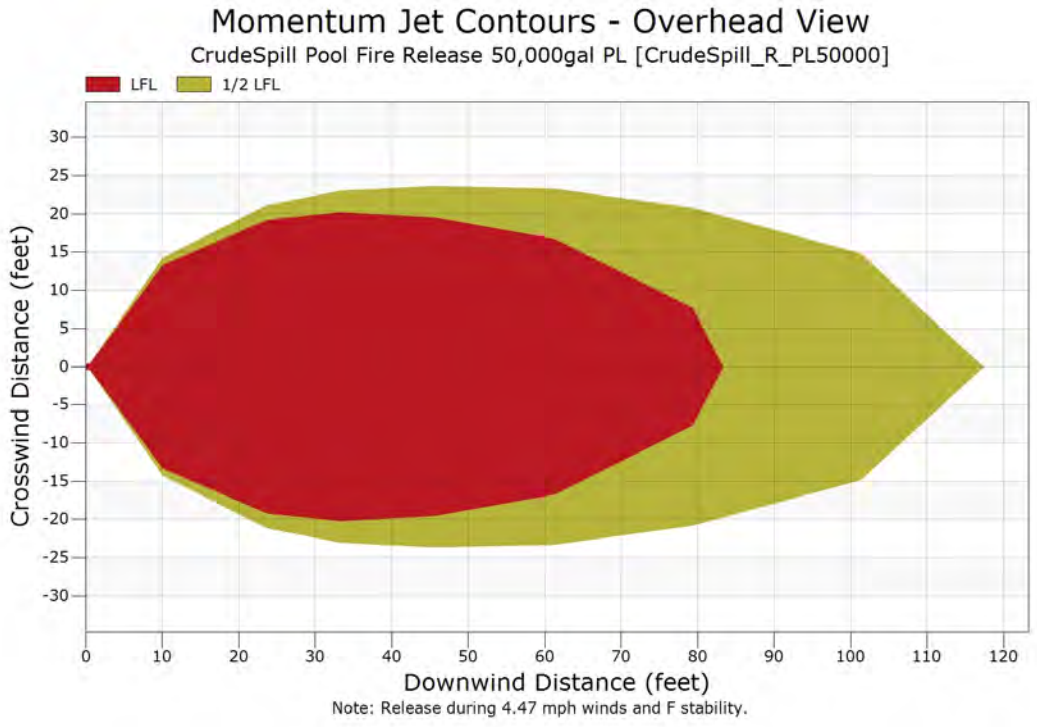
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.4	0.4	0.4	1.0
2	0.574196	0.574196	3.3	3.0	3.0	0.0
5	0.471491	0.471491	6.9	6.4	6.4	0.0
7	0.420153	0.420153	10.5	9.8	9.8	0.0
10	0.387156	0.387156	14.2	13.2	13.2	0.0
12	0.280990	0.280990	15.5	14.4	14.4	0.0
15	0.215341	0.215341	16.7	15.5	15.5	0.0
18	0.171957	0.171957	18.0	16.6	16.6	0.0
20	0.141508	0.141508	19.3	17.6	17.6	0.0
22	0.119158	0.119158	20.5	18.7	18.7	0.0
25	0.100671	0.100671	21.4	19.4	19.4	0.0
28	0.085367	0.085367	21.9	19.6	19.6	0.0
30	0.073436	0.073436	22.4	19.9	19.9	0.0
32	0.063939	0.063939	22.8	20.1	20.1	0.0
35	0.055949	0.055949	23.1	20.1	20.1	0.0
38	0.049294	0.049294	23.2	20.0	20.0	0.0
40	0.043788	0.043788	23.3	19.8	19.8	0.0
42	0.039177	0.039177	23.5	19.7	19.7	0.0
45	0.035276	0.035276	23.6	19.6	19.6	0.0
48	0.031843	0.031843	23.6	19.2	19.2	0.0
50	0.028869	0.028869	23.5	18.8	18.8	0.0
53	0.026298	0.026298	23.5	18.3	18.3	0.0
55	0.024061	0.024061	23.4	17.9	17.9	0.0
58	0.022101	0.022101	23.4	17.4	17.4	0.0
60	0.020374	0.020374	23.3	17.0	17.0	0.0
62	0.018824	0.018824	23.1	16.1	16.1	0.0
65	0.017426	0.017426	22.8	14.9	14.9	0.0
68	0.016179	0.016179	22.4	13.6	13.6	0.0
70	0.015062	0.015062	22.1	12.4	12.4	0.0
72	0.014057	0.014057	21.8	11.1	11.1	0.0
75	0.013150	0.013150	21.4	9.9	9.9	0.0
78	0.012328	0.012328	21.1	8.6	8.6	0.0
80	0.011578	0.011578	20.6	6.5	6.5	0.0
82	0.010884	0.010884	20.0	1.6	1.6	0.0
85	0.010250	0.010250	19.3	0.0	0.0	0.0

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
88	0.009670	0.009670	18.6	0.0	0.0	0.0
90	0.009138	0.009138	17.9	0.0	0.0	0.0
92	0.008648	0.008648	17.3	0.0	0.0	0.0
95	0.008197	0.008197	16.6	0.0	0.0	0.0
98	0.007780	0.007780	15.9	0.0	0.0	0.0
100	0.007394	0.007394	15.2	0.0	0.0	0.0
102	0.007033	0.007033	13.8	0.0	0.0	0.0
105	0.006695	0.006695	11.5	0.0	0.0	0.0
108	0.006381	0.006381	9.1	0.0	0.0	0.0
110	0.006088	0.006088	6.8	0.0	0.0	0.0
112	0.005815	0.005815	4.5	0.0	0.0	0.0
115	0.005560	0.005560	2.2	0.0	0.0	0.0
118	0.005321	0.005321	0.0	0.0	0.0	0.0

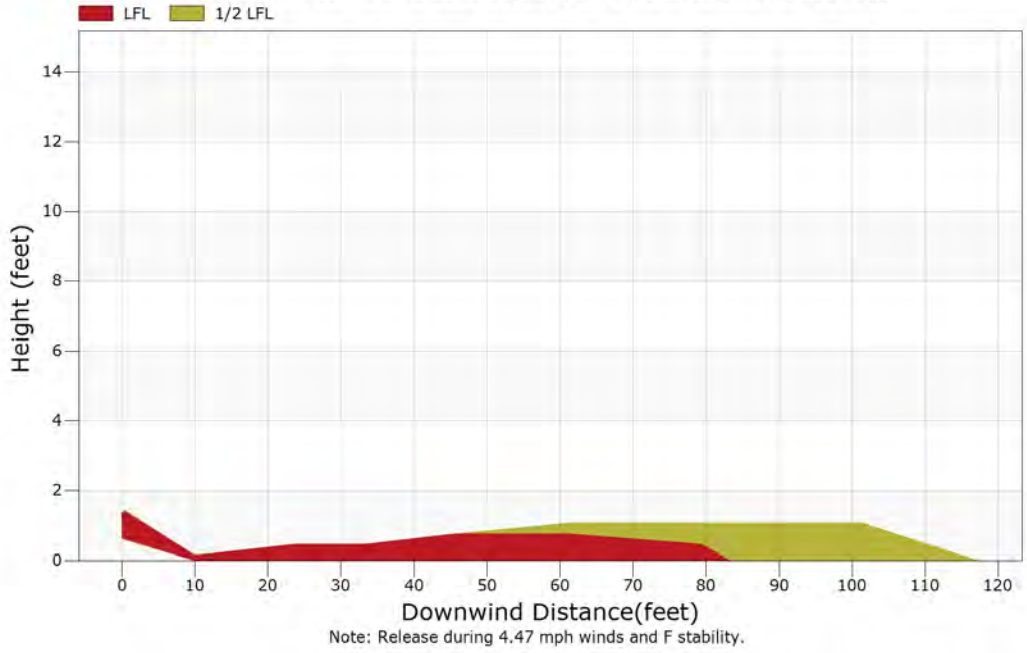
The momentum jet model coupled to the heavy gas model at 0.56 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	83.3	23
2 0.010670 (LFL)	83.3	23
3 0.005335 (1/2 LFL)	117.3	33



Momentum Jet Contours - Side View

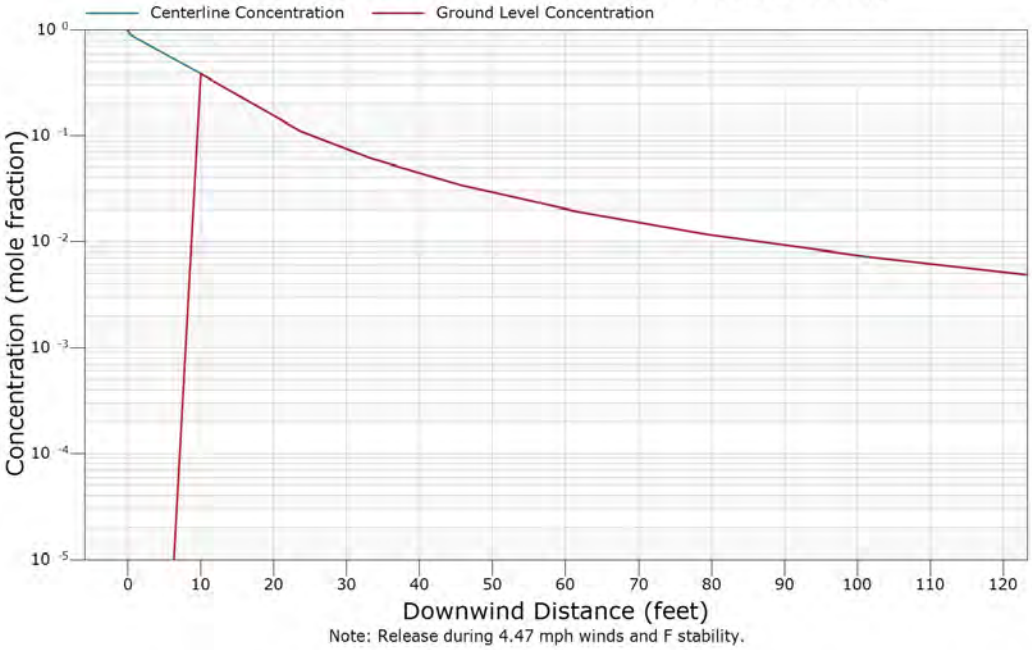
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]



Note: Release during 4.47 mph winds and F stability.

Momentum Jet Concentration

CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

concentration limits

Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

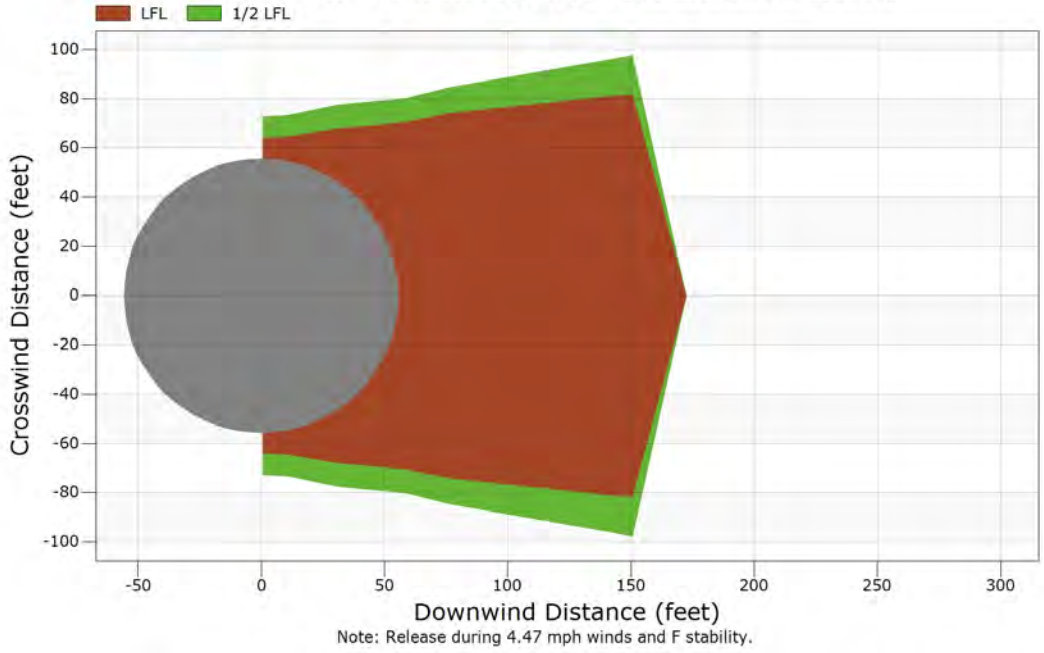
downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
2.50	0.003086	71.52	0.00	0.00
5.00	0.003089	71.71	0.00	0.00
7.50	0.003121	71.90	0.00	0.00
10.00	0.003132	72.09	0.00	0.00
12.50	0.003154	72.28	0.00	0.00
15.00	0.003180	72.47	0.00	0.00
17.50	0.003193	72.66	0.00	0.00
20.00	0.003205	72.85	0.00	0.00
22.50	0.003215	73.04	0.00	0.00
25.00	0.003226	73.23	0.00	0.00
27.50	0.003242	73.42	0.00	0.00
30.00	0.003257	73.61	0.00	0.00
32.50	0.003273	73.99	0.00	0.00
35.00	0.003293	74.38	0.00	0.00
37.50	0.003325	74.76	0.00	0.00
40.00	0.003355	75.15	0.00	0.00
42.50	0.003383	75.53	0.00	0.00
45.00	0.003462	75.91	0.00	0.00
47.50	0.003506	76.30	0.00	0.00
50.00	0.003510	76.68	0.00	0.00
52.50	0.003514	77.07	0.00	0.00
55.00	0.003517	77.45	0.00	0.00
57.50	0.003575	77.83	0.00	0.00
60.00	0.003526	79.84	0.00	0.00
62.50	0.003486	80.15	0.00	0.00
65.00	0.003448	80.45	0.00	0.00
67.50	0.003411	80.76	0.00	0.00
70.00	0.003391	81.06	0.00	0.00
72.50	0.003376	81.36	0.00	0.00
75.00	0.003362	83.46	0.00	0.00
77.50	0.003332	84.64	0.00	0.00
80.00	0.003281	84.64	0.00	0.00
82.50	0.003233	84.64	0.00	0.00
85.00	0.003187	84.65	0.00	0.00
87.50	0.003147	85.14	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
90.00	0.003108	85.64	0.00	0.00
92.50	0.003071	86.14	0.00	0.00
95.00	0.003035	86.63	0.00	0.00
97.50	0.003000	87.13	0.00	0.00
100.00	0.002967	87.62	0.00	0.00
102.50	0.002934	88.12	0.00	0.00
105.00	0.002903	88.61	0.00	0.00
107.50	0.002873	89.11	0.00	0.00
110.00	0.002844	89.60	0.00	0.00
112.50	0.002816	90.10	0.00	0.00
115.00	0.002789	90.59	0.00	0.00
117.50	0.002763	91.09	0.00	0.00
120.00	0.002737	91.58	0.00	0.00
122.50	0.002712	92.08	0.00	0.00
125.00	0.002688	92.57	0.00	0.00
127.50	0.002665	93.07	0.00	0.00
130.00	0.002642	93.57	0.00	0.00
132.50	0.002620	94.06	0.00	0.00
135.00	0.002598	94.56	0.00	0.00
137.50	0.002577	95.05	0.00	0.00
140.00	0.002557	95.55	0.00	0.00
142.50	0.002537	96.04	0.00	0.00
145.00	0.002511	96.56	0.00	0.00
147.50	0.002482	97.10	0.00	0.00
150.00	0.002454	97.64	0.00	0.00
152.50	0.002430	98.70	0.00	0.00
155.00	0.002408	99.95	0.00	0.00
157.50	0.002386	101.20	0.00	0.00
160.00	0.002364	102.45	0.00	0.00
162.50	0.002344	103.70	0.00	0.00
165.00	0.002323	104.95	0.00	0.00
167.50	0.002303	106.20	0.00	0.00
170.00	0.002284	107.45	0.00	0.00
172.50	0.002265	108.70	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	172.5	52

Heavier-than-Air Contours - Overhead View

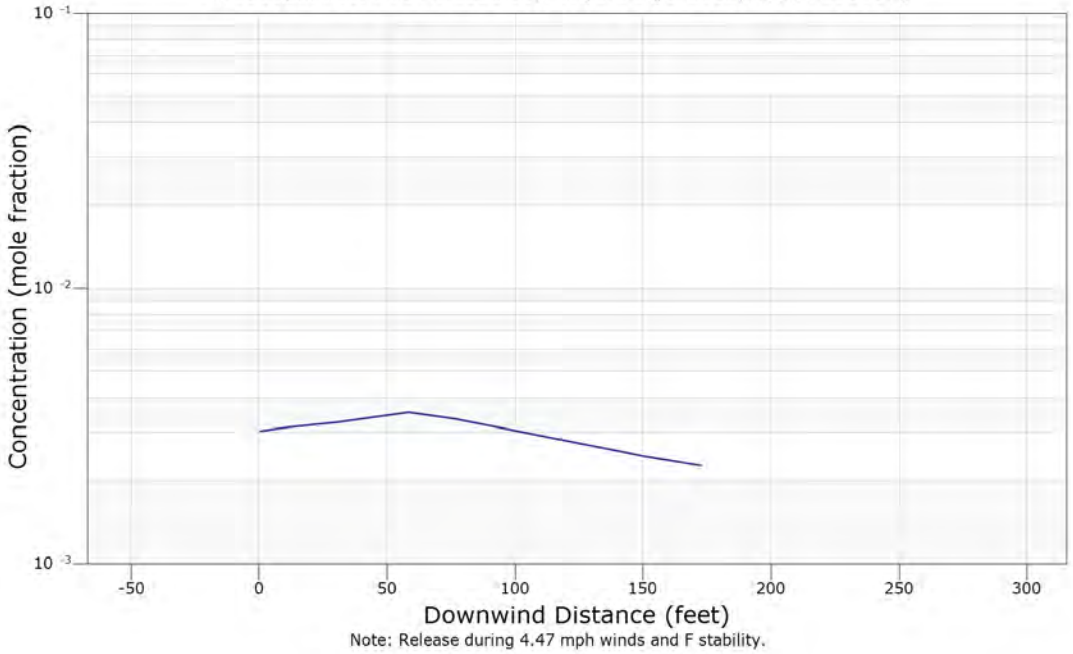
CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]



Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Centerline Concentration

CrudeSpill Pool Fire Release 50,000gal PL [CrudeSpill_R_PL50000]



Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_50000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                                70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)            1.0 feet
Elevation of target (from grade)                6.0 feet
Diameter of pool                              111.2 feet

Fire radiation flux endpoints
  Radiation endpoint 1                         3170 Btu/hr-sq.ft
  Radiation endpoint 2                         1585 Btu/hr-sq.ft
  Radiation endpoint 3                         1585 Btu/hr-sq.ft

  NOTES:
```

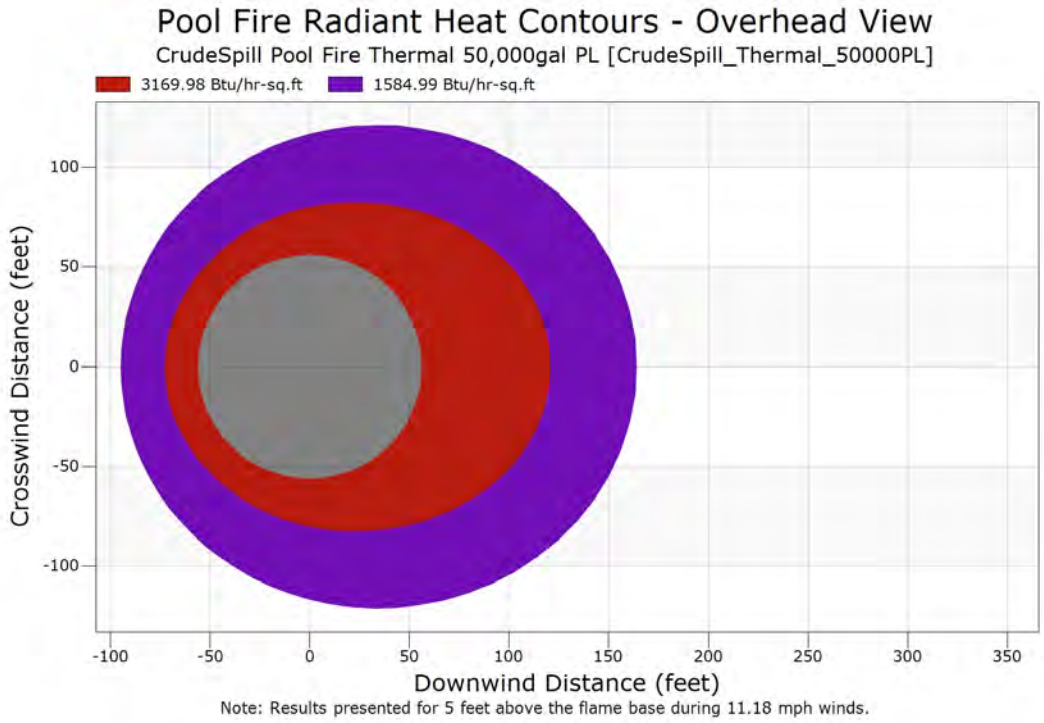
Pool Fire Radiation

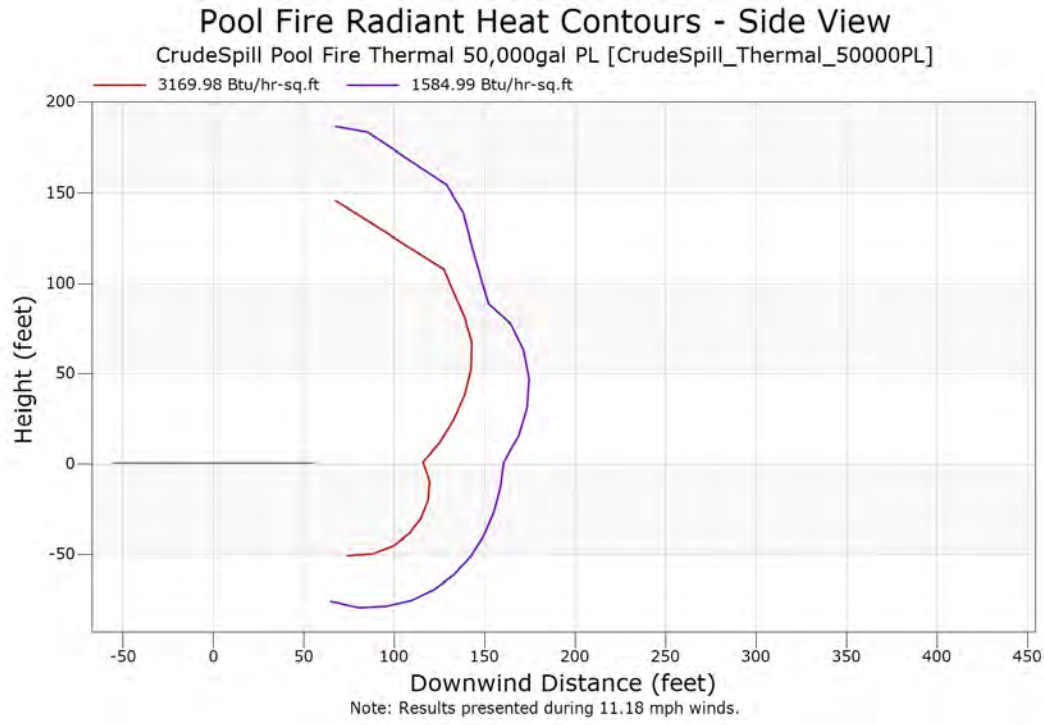
Length of Flame	:	98.9	feet
Flame Tilt from Vertical	:	25.1	degrees
Target Elevation	:	6.0	feet
Pool Elevation	:	1.0	feet
Wind Speed	:	11.2	mph
Substrate	:	Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
91.8	5771	3569	6785
95.6	4900	3182	5843
99.6	4218	2869	5101
103.8	3706	2604	4529
108.1	3310	2369	4070
112.6	2992	2156	3687
117.2	2727	1957	3357
122.1	2505	1774	3069
127.2	2310	1600	2810
132.5	2135	1436	2573
138.0	1974	1281	2354
143.7	1825	1136	2150
149.7	1684	1000	1959
155.9	1552	876	1782
162.3	1425	761	1616
169.1	1305	657	1462
176.1	1192	565	1319
183.4	1085	483	1188
191.0	985	411	1068
199.0	893	349	959
207.3	807	295	859
215.9	728	249	769
224.8	656	210	689
234.2	591	177	616
243.9	531	149	552
254.0	477	125	494
264.6	429	106	442
275.6	385	89	395
287.0	346	75	354
298.9	311	63	318

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
120.4	3170
163.7	1585
163.7	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 50,000gal PL [CrudeSpill_Thermal_50000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
100
50
0
-50
-100
-100
-50
0
50
100
150
200
250
300
350
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 50,000gal PL [CrudeSpill_Thermal_50000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
200
150
100
50
0
-50
-50
0
50
100
150
200
250
300
350
400
450
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL70000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                            Medium density concrete
  Substrate thermal conductivity              0.2698 Btu/hr-ft-F
  Substrate density                              80 lb/cu.ft
  Substrate heat Capacity                      0.22 Btu/lb-F
  Substrate delay time                            0 sec
Surrounding terrain                       Long grass or crops > 15 cm (6 in)

  NOTES:
```

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RELEASE MENU
Type of release:   Regulated
Release duration                                    10 min
Regulated flow rate                             682.00 lb/sec
Pipe inner diameter                              10.02 inches
Equivalent release diameter                      10.00 inches
Height of release point                            1.0 feet
Angle of release from horizontal                   0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                          LFL mol%
  Concentration endpoint 2                          LFL mol%
  Concentration endpoint 3                      1/2 LFL mol%
Dispersion coefficient averaging time                1 min


  NOTES:
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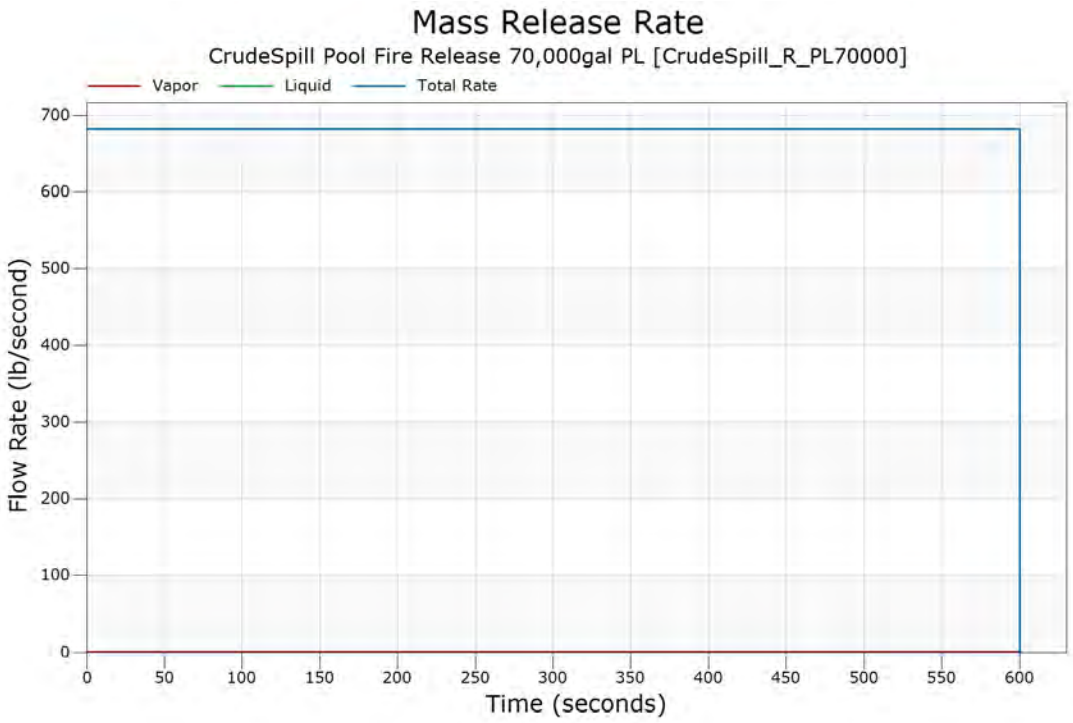
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.5065204	0.000000	681.4935	682.0000
0.1000000	.5065204	0.000000	681.4935	682.0000
0.3000000	.5065204	0.000000	681.4935	682.0000
0.5000000	.5065204	0.000000	681.4935	682.0000
0.7000000	.5065204	0.000000	681.4935	682.0000
1.000000	.5065204	0.000000	681.4935	682.0000
3.000000	.5065204	0.000000	681.4935	682.0000
5.000000	.5065204	0.000000	681.4935	682.0000
7.000000	.5065204	0.000000	681.4935	682.0000
10.00000	.5065204	0.000000	681.4935	682.0000
20.00000	.5065204	0.000000	681.4935	682.0000
30.00000	.5065204	0.000000	681.4935	682.0000
40.00000	.5065204	0.000000	681.4935	682.0000
50.00000	.5065204	0.000000	681.4935	682.0000
60.00000	.5065204	0.000000	681.4935	682.0000
70.00000	.5065204	0.000000	681.4935	682.0000
85.00000	.5065204	0.000000	681.4935	682.0000
100.0000	.5065204	0.000000	681.4935	682.0000
200.0000	.5065204	0.000000	681.4935	682.0000
300.0000	.5065204	0.000000	681.4935	682.0000
400.0000	.5065204	0.000000	681.4935	682.0000
500.0000	.5065204	0.000000	681.4935	682.0000
600.0000	.5065204	0.000000	681.4935	682.0000
Totals (lb)	303.9122	0.000000	408896.1	409200.0

Flowrate for Jet Fire [1st minute] = 0.5065204 lb/sec.
Jet Fire [2-3 minutes] = 0.5065204 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
0
100
200
300
400
500
600
700
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

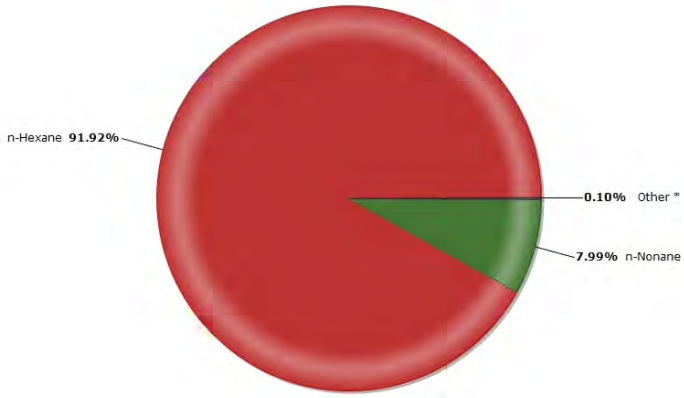
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919167	0.000000	0.919167	0.036882
11	0.099100	0.000000	0.079850	0.000000	0.079850	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171703
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

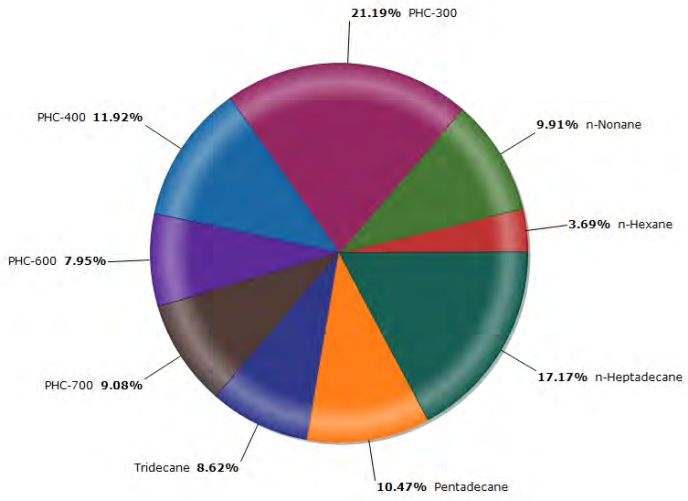
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

Liquid Pool Stream
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



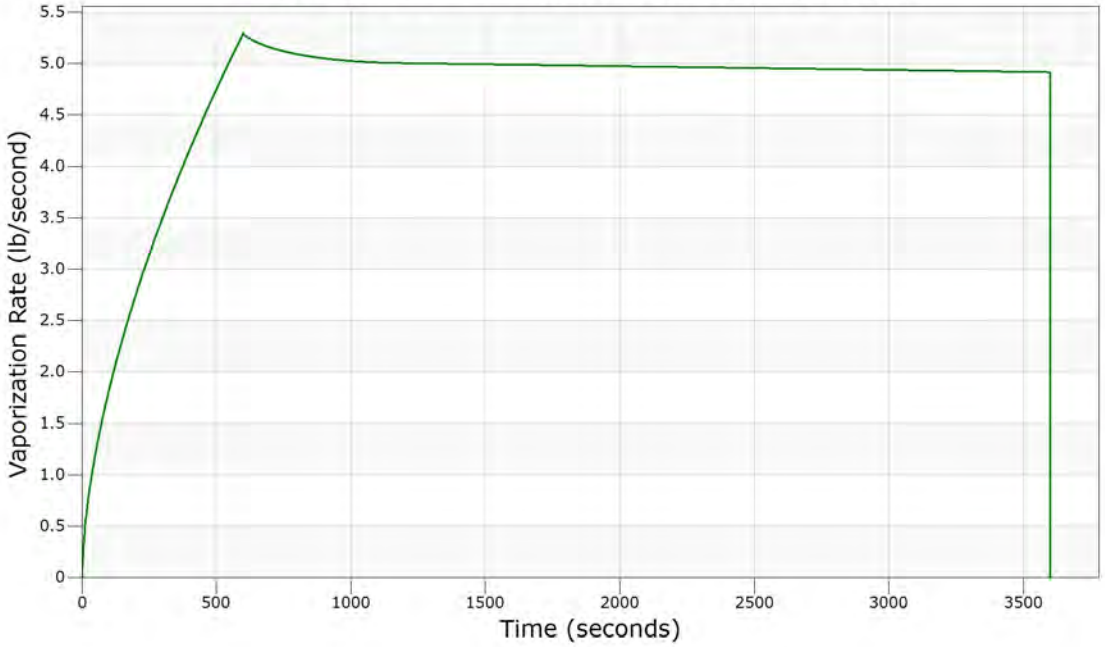
Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	622.598	26.1440	1.04543
80.0000	1244.59	32.9396	1.58413
120.000	1866.13	37.7034	2.02010
160.000	2487.28	41.4895	2.40017
200.000	3108.11	44.6883	2.74343
240.000	3728.52	47.4836	3.06002
280.000	4349.00	49.9770	3.35544
320.000	4968.77	52.2474	3.63432
360.000	5588.55	54.3307	3.89976
400.000	6207.96	56.2697	4.15351
440.000	6827.38	58.0774	4.39690
480.000	7446.45	59.7802	4.63169
520.000	8065.16	61.3911	4.85899
560.000	8683.88	62.9199	5.07879
600.000	9302.24	64.3799	5.29264
640.000	9297.65	64.3701	5.21922
680.000	9292.70	64.3570	5.17403
720.000	9288.11	64.3471	5.13942
760.000	9283.52	64.3373	5.11164
800.000	9278.93	64.3242	5.08871
840.000	9273.98	64.3143	5.06997
880.000	9269.39	64.3045	5.05432
1130.00	9240.79	64.2388	5.00383
1380.00	9212.18	64.1732	4.99325
1630.00	9183.58	64.1043	4.98399
1880.00	9155.33	64.0387	4.97473
2130.00	9126.72	63.9731	4.96547
2380.00	9098.47	63.9075	4.95621
2630.00	9070.22	63.8419	4.94695
2880.00	9041.97	63.7762	4.93769
3130.00	9013.72	63.7073	4.92865
3380.00	8985.46	63.6417	4.91939
3600.00	8961.10	63.5827	4.91124

Ending Message: Normal Ending

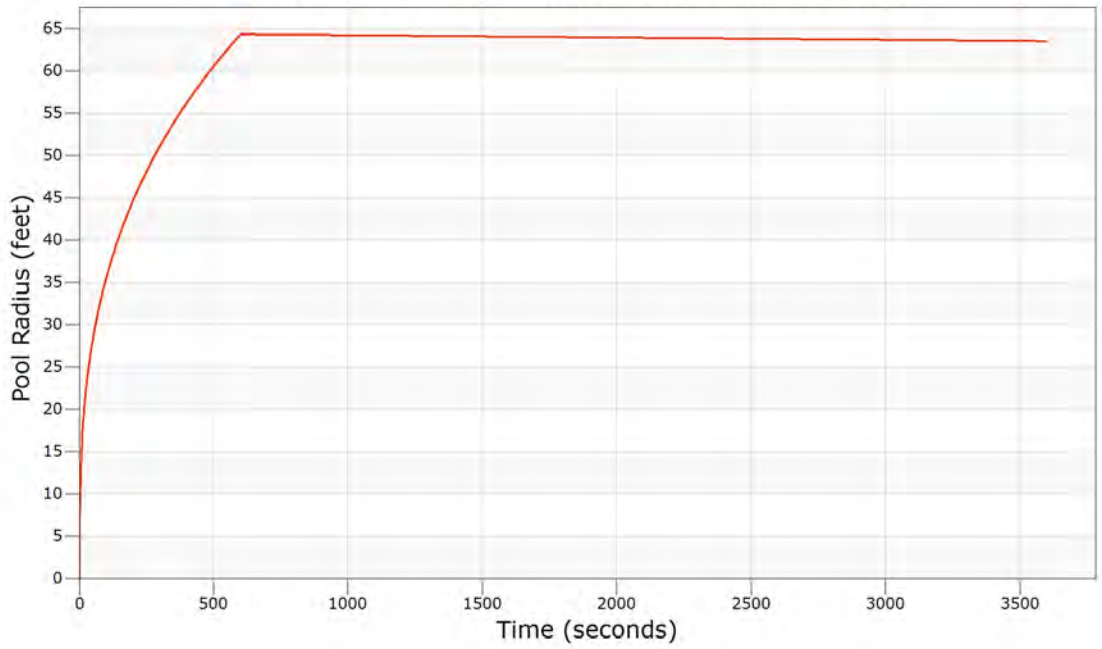
Pool Vaporization Rate

CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



Pool Radius

CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



Momentum Jet Dispersion

concentration limits

Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.4	0.4	0.4	1.0
2	0.728370	0.728370	3.4	3.2	3.2	0.0
5	0.665514	0.665514	7.6	7.2	7.2	0.0
7	0.593529	0.593529	11.5	10.8	10.8	0.0
10	0.423685	0.423685	13.8	12.9	12.9	0.0
12	0.326203	0.326203	16.1	15.0	15.0	0.0
15	0.263455	0.263455	18.4	17.1	17.1	0.0
18	0.219918	0.219918	20.7	19.2	19.2	0.0
20	0.180256	0.180256	22.0	20.3	20.3	0.0
22	0.149920	0.149920	23.1	21.1	21.1	0.0
25	0.127136	0.127136	24.2	22.0	22.0	0.0
28	0.109287	0.109287	25.3	22.7	22.7	0.0
30	0.093979	0.093979	25.8	23.0	23.0	0.0
32	0.081799	0.081799	26.3	23.3	23.3	0.0
35	0.071933	0.071933	26.7	23.6	23.6	0.0
38	0.063821	0.063821	27.2	23.9	23.9	0.0
40	0.056751	0.056751	27.5	23.9	23.9	0.0
42	0.050726	0.050726	27.7	23.7	23.7	0.0
45	0.045632	0.045632	27.8	23.6	23.6	0.0
48	0.041286	0.041286	28.0	23.5	23.5	0.0
50	0.037546	0.037546	28.2	23.4	23.4	0.0
53	0.034282	0.034282	28.3	23.2	23.2	0.0
55	0.031332	0.031332	28.2	22.8	22.8	0.0
58	0.028751	0.028751	28.1	22.3	22.3	0.0
60	0.026478	0.026478	28.0	21.8	21.8	0.0
62	0.024468	0.024468	27.9	21.3	21.3	0.0
65	0.022680	0.022680	27.9	20.8	20.8	0.0
68	0.021084	0.021084	27.8	20.3	20.3	0.0
70	0.019649	0.019649	27.7	19.8	19.8	0.0
72	0.018322	0.018322	27.4	18.5	18.5	0.0
75	0.017125	0.017125	27.1	17.3	17.3	0.0
78	0.016042	0.016042	26.8	16.0	16.0	0.0
80	0.015059	0.015059	26.5	14.8	14.8	0.0
82	0.014163	0.014163	26.2	13.5	13.5	0.0
85	0.013346	0.013346	25.8	12.3	12.3	0.0

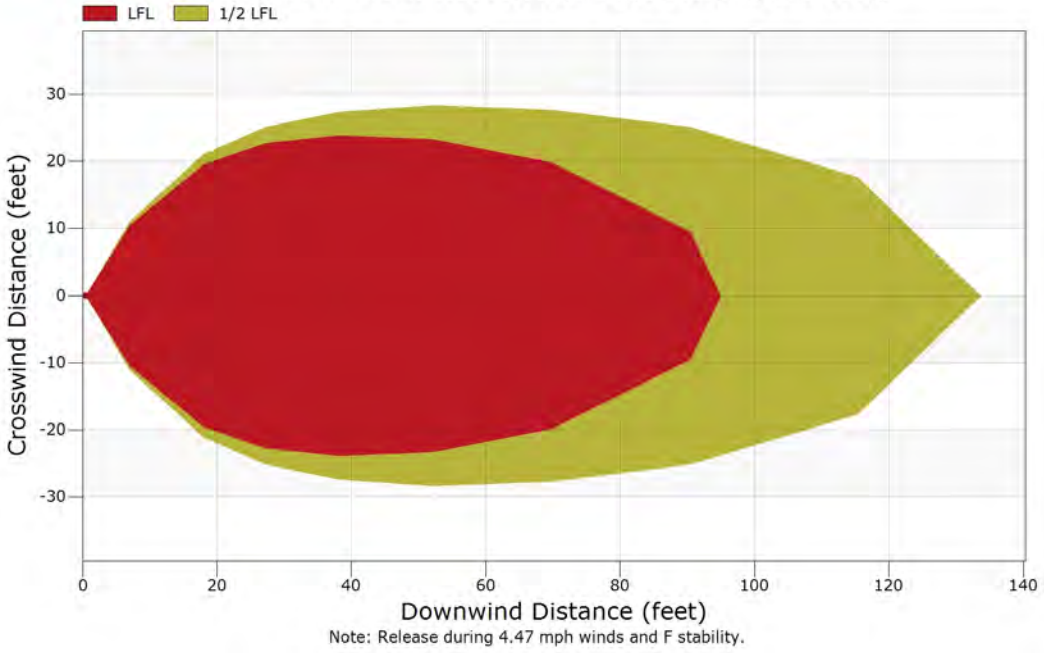
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
88	0.012597	0.012597	25.5	11.0	11.0	0.0
90	0.011909	0.011909	25.2	9.8	9.8	0.0
92	0.011266	0.011266	24.6	5.3	5.3	0.0
95	0.010671	0.010671	23.8	0.0	0.0	0.0
98	0.010122	0.010122	23.1	0.0	0.0	0.0
100	0.009614	0.009614	22.3	0.0	0.0	0.0
102	0.009143	0.009143	21.5	0.0	0.0	0.0
105	0.008706	0.008706	20.8	0.0	0.0	0.0
108	0.008299	0.008299	20.0	0.0	0.0	0.0
110	0.007920	0.007920	19.3	0.0	0.0	0.0
112	0.007566	0.007566	18.5	0.0	0.0	0.0
115	0.007235	0.007235	17.8	0.0	0.0	0.0
118	0.006926	0.006926	15.5	0.0	0.0	0.0
120	0.006635	0.006635	13.1	0.0	0.0	0.0
122	0.006363	0.006363	10.7	0.0	0.0	0.0
125	0.006107	0.006107	8.3	0.0	0.0	0.0
128	0.005866	0.005866	5.9	0.0	0.0	0.0
130	0.005639	0.005639	3.5	0.0	0.0	0.0
132	0.005425	0.005425	1.1	0.0	0.0	0.0
135	0.005222	0.005222	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 0.71 ft in 0 sec.

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.010670 (LFL)	95.0	27
2	0.010670 (LFL)	95.0	27
3	0.005335 (1/2 LFL)	133.6	38

Momentum Jet Contours - Overhead View

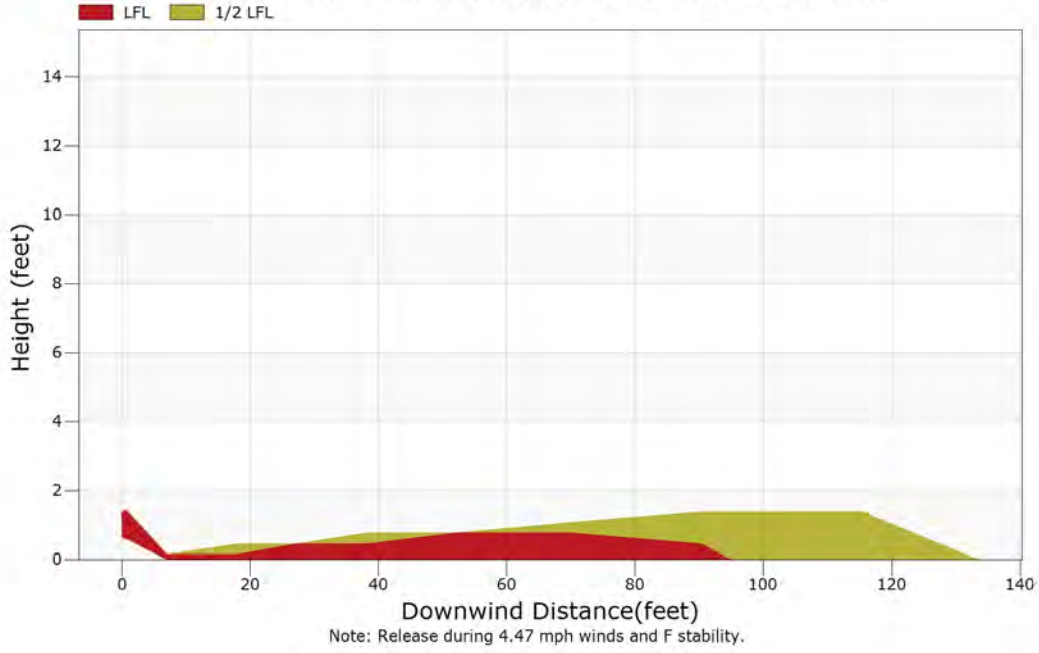
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



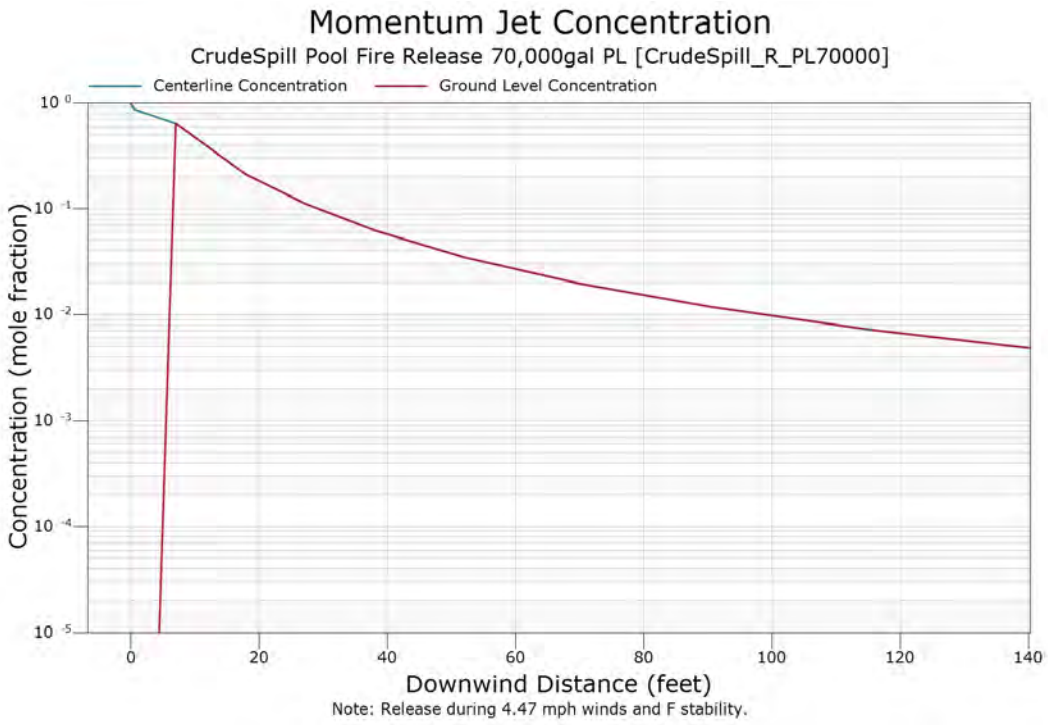
Note: Release during 4.47 mph winds and F stability.

Momentum Jet Contours - Side View

CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]



Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
10 0
10 -1
10 -2
10 -3
10 -4
10 -5
0
20
40
60
80
100
120
140
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

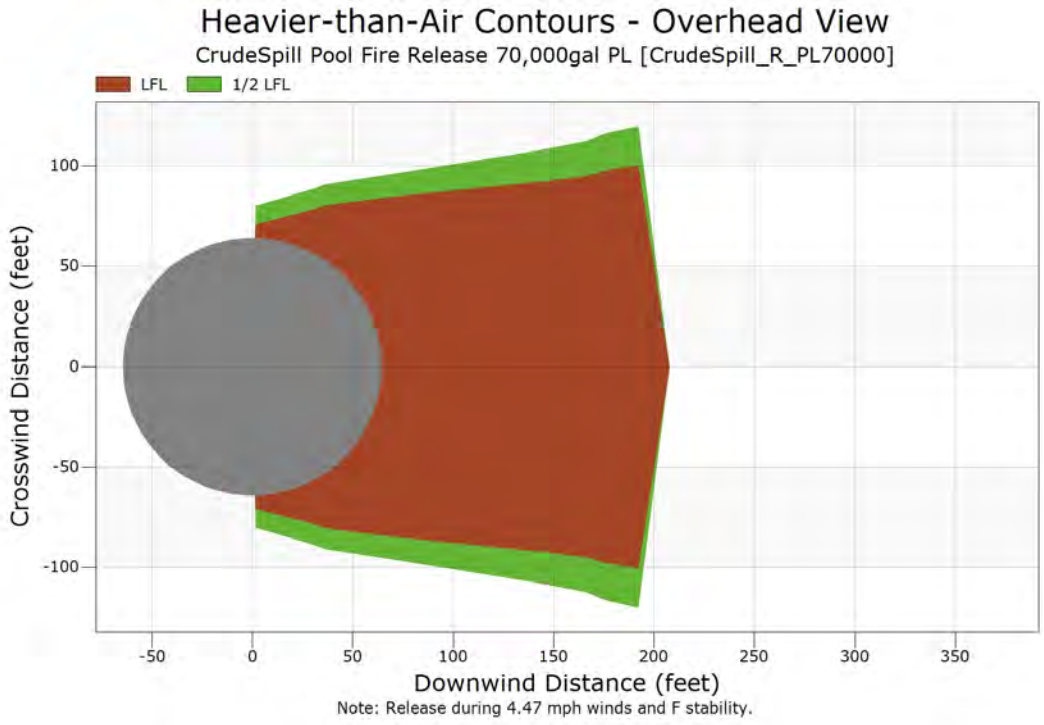
concentration limits

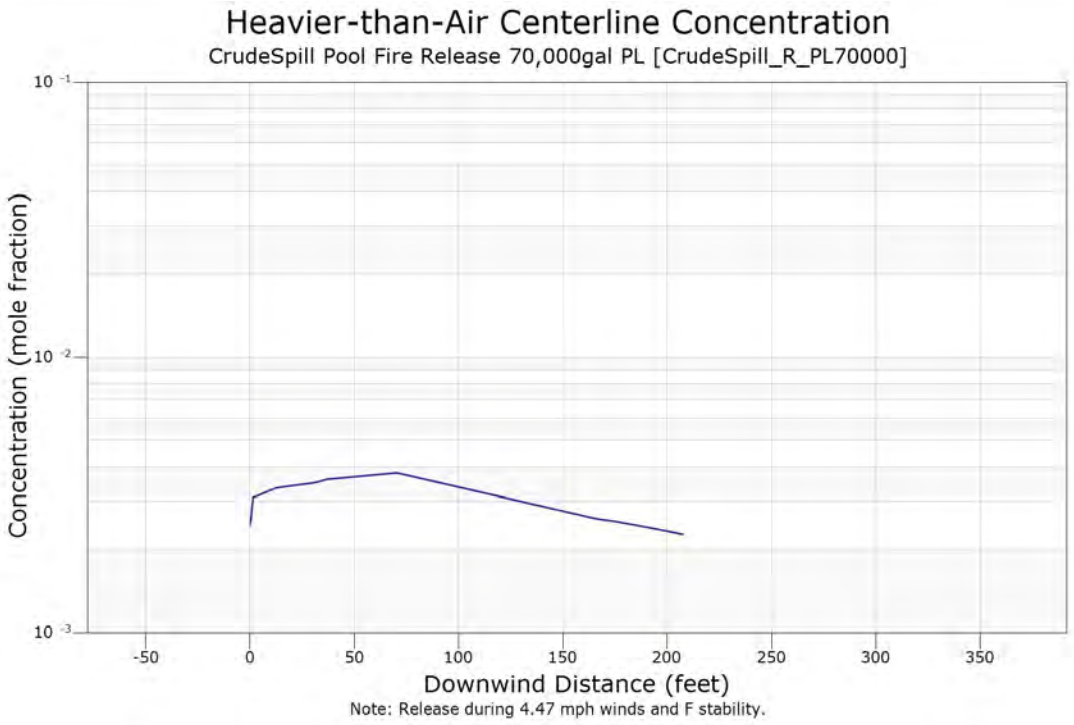
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
5.00	0.003151	48.95	0.00	0.00
10.00	0.003228	66.08	0.00	0.00
15.00	0.003372	82.22	0.00	0.00
20.00	0.003387	84.24	0.00	0.00
25.00	0.003391	86.26	0.00	0.00
30.00	0.003394	88.28	0.00	0.00
35.00	0.003570	90.31	0.00	0.00
40.00	0.003640	90.46	0.00	0.00
45.00	0.003694	90.68	0.00	0.00
50.00	0.003743	90.91	0.00	0.00
55.00	0.003777	91.14	0.00	0.00
60.00	0.003788	91.36	0.00	0.00
65.00	0.003796	91.59	0.00	0.00
70.00	0.003801	95.89	0.00	0.00
75.00	0.003672	95.96	0.00	0.00
80.00	0.003545	96.04	0.00	0.00
85.00	0.003450	96.12	0.00	0.00
90.00	0.003377	96.19	0.00	0.00
95.00	0.003310	96.27	0.00	0.00
100.00	0.003247	97.50	0.00	0.00
105.00	0.003189	98.73	0.00	0.00
110.00	0.003134	99.96	0.00	0.00
115.00	0.003083	101.19	0.00	0.00
120.00	0.003034	102.43	0.00	0.00
125.00	0.002988	103.66	0.00	0.00
130.00	0.002945	104.89	0.00	0.00
135.00	0.002904	106.12	0.00	0.00
140.00	0.002865	107.35	0.00	0.00
145.00	0.002808	108.35	0.00	0.00
150.00	0.002753	109.32	0.00	0.00
155.00	0.002700	110.29	0.00	0.00
160.00	0.002650	111.26	0.00	0.00
165.00	0.002602	112.23	0.00	0.00
170.00	0.002562	114.03	0.00	0.00
175.00	0.002526	116.11	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
180.00	0.002486	117.28	0.00	0.00
185.00	0.002446	118.40	0.00	0.00
190.00	0.002409	119.51	0.00	0.00
195.00	0.002368	127.94	0.00	0.00
200.00	0.002326	141.93	0.00	0.00
205.00	0.002286	155.92	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	207.7	63




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 70,000gal PL [CrudeSpill_R_PL70000]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-50
0
50
100
150
200
250
300
350
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_70000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                                70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)            1.0 feet
Elevation of target (from grade)                6.0 feet
Diameter of pool                              128.8 feet

Fire radiation flux endpoints
  Radiation endpoint 1                         3170 Btu/hr-sq.ft
  Radiation endpoint 2                         1585 Btu/hr-sq.ft
  Radiation endpoint 3                         1585 Btu/hr-sq.ft

  NOTES:
```

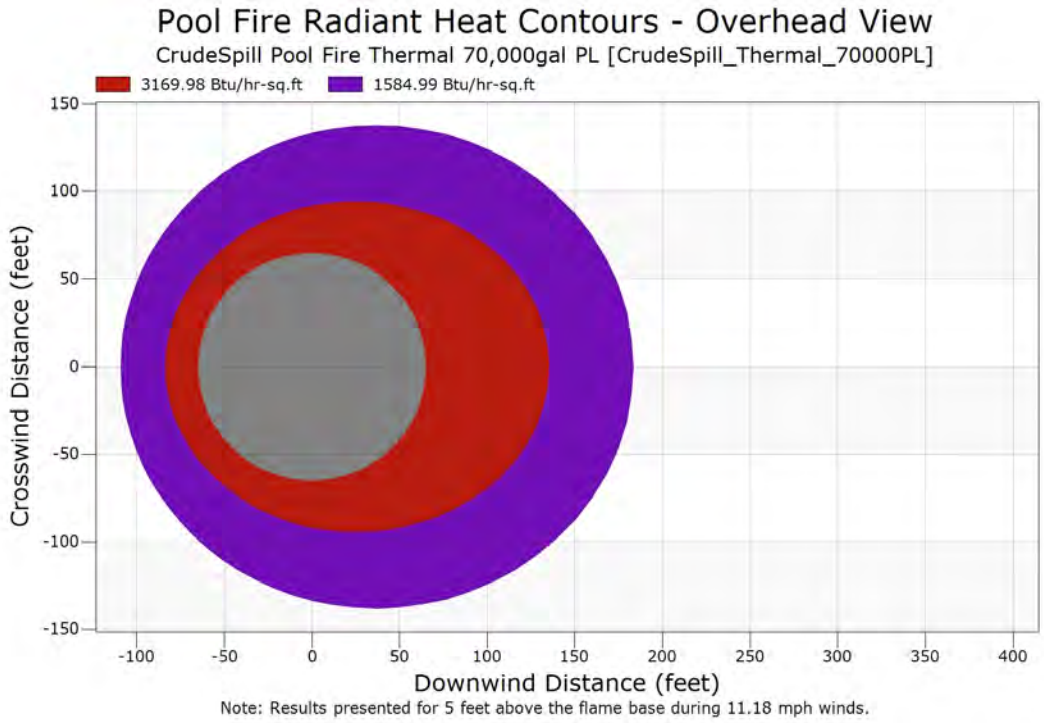
Pool Fire Radiation

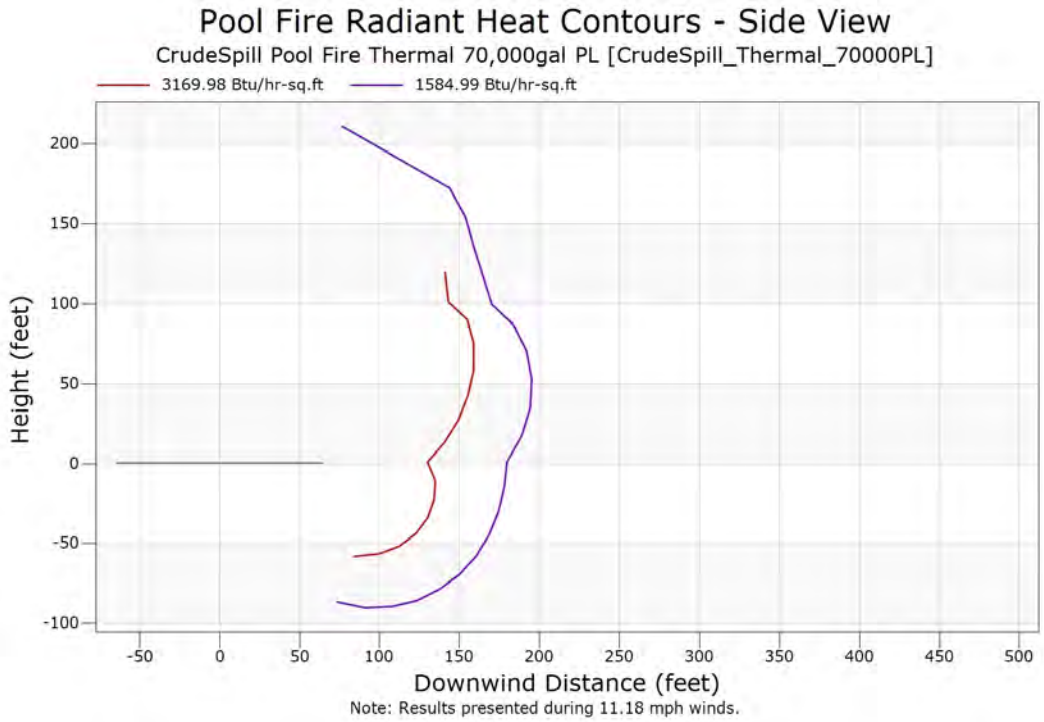
Length of Flame	: 109.6	feet
Flame Tilt from Vertical	: 23.4	degrees
Target Elevation	: 6.0	feet
Pool Elevation	: 1.0	feet
Wind Speed	: 11.2	mph
Substrate	: Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
104.2	5858	3456	6802
108.5	4887	3070	5771
112.9	4175	2763	5006
117.6	3656	2504	4432
122.4	3261	2276	3977
127.5	2946	2068	3599
132.7	2686	1875	3276
138.2	2467	1697	2994
143.9	2274	1528	2740
149.8	2101	1370	2508
156.0	1941	1222	2293
162.4	1793	1083	2095
169.1	1654	953	1909
176.1	1523	834	1737
183.3	1399	726	1576
190.9	1281	628	1426
198.7	1170	540	1289
206.9	1066	463	1162
215.4	968	395	1046
224.3	878	336	940
233.5	795	285	845
243.2	718	241	758
253.2	648	204	679
263.6	584	173	609
274.5	526	146	546
285.8	474	123	490
297.5	426	104	439
309.8	384	88	394
322.5	346	74	353
335.8	311	63	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
134.8	3170
182.9	1585
182.9	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 70,000gal PL [CrudeSpill_Thermal_70000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 70,000gal PL [CrudeSpill_Thermal_70000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R_PL100000
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                            Medium density concrete
  Substrate thermal conductivity              0.2698 Btu/hr-ft-F
  Substrate density                              80 lb/cu.ft
  Substrate heat Capacity                      0.22 Btu/lb-F
  Substrate delay time                            0 sec
Surrounding terrain                       Long grass or crops > 15 cm (6 in)

  NOTES:
```

```
RELEASE MENU
Type of release:   Regulated
Release duration                                    10 min
Regulated flow rate                             974.40 lb/sec
Pipe inner diameter                              10.02 inches
Equivalent release diameter                      10.00 inches
Height of release point                            1.0 feet
Angle of release from horizontal                   0.0 degrees

  NOTES:

IMPOUNDMENT MENU
Unconfined

  NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints
  Concentration endpoint 1                          LFL mol%
  Concentration endpoint 2                          LFL mol%
  Concentration endpoint 3                      1/2 LFL mol%
Dispersion coefficient averaging time                1 min


  NOTES:
```

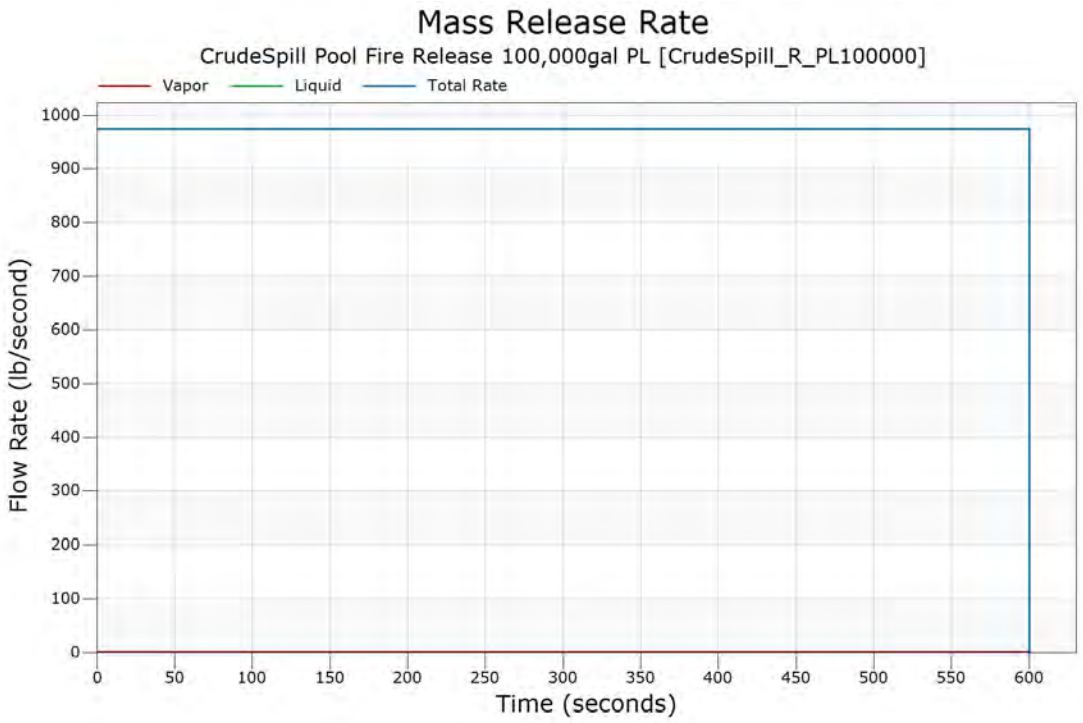
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.7012935	0.000000	973.6987	974.4000
0.1000000	.7012935	0.000000	973.6987	974.4000
0.3000000	.7012935	0.000000	973.6987	974.4000
0.5000000	.7012935	0.000000	973.6987	974.4000
0.7000000	.7012935	0.000000	973.6987	974.4000
1.000000	.7012935	0.000000	973.6987	974.4000
3.000000	.7012935	0.000000	973.6987	974.4000
5.000000	.7012935	0.000000	973.6987	974.4000
7.000000	.7012935	0.000000	973.6987	974.4000
10.00000	.7012935	0.000000	973.6987	974.4000
20.00000	.7012935	0.000000	973.6987	974.4000
30.00000	.7012935	0.000000	973.6987	974.4000
40.00000	.7012935	0.000000	973.6987	974.4000
50.00000	.7012935	0.000000	973.6987	974.4000
60.00000	.7012935	0.000000	973.6987	974.4000
70.00000	.7012935	0.000000	973.6987	974.4000
85.00000	.7012935	0.000000	973.6987	974.4000
100.0000	.7012935	0.000000	973.6987	974.4000
200.0000	.7012935	0.000000	973.6987	974.4000
300.0000	.7012935	0.000000	973.6987	974.4000
400.0000	.7012935	0.000000	973.6987	974.4000
500.0000	.7012935	0.000000	973.6987	974.4000
600.0000	.7012935	0.000000	973.6987	974.4000
Totals (lb)	420.7761	0.000000	584219.2	584640.0

Flowrate for Jet Fire [1st minute] = 0.7012935 lb/sec.
Jet Fire [2-3 minutes] = 0.7012935 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
1000
900
800
700
600
500
400
300
200
100
0
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

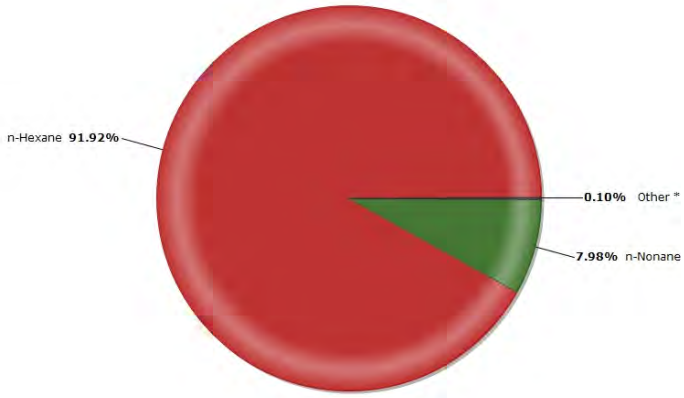
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919168	0.000000	0.919168	0.036883
11	0.099100	0.000000	0.079849	0.000000	0.079849	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171703
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

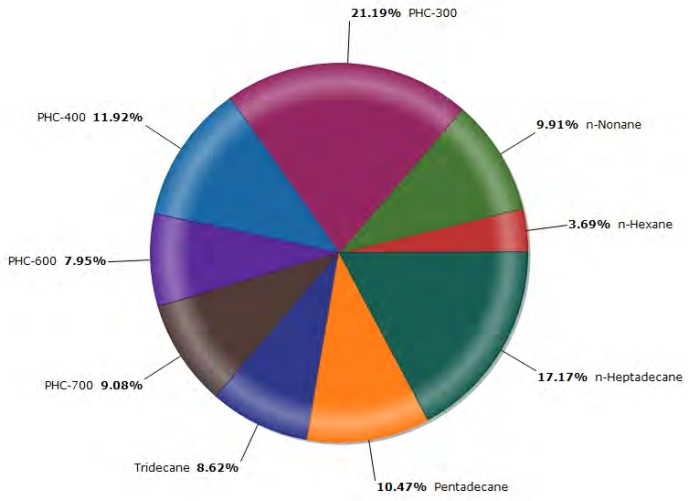
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

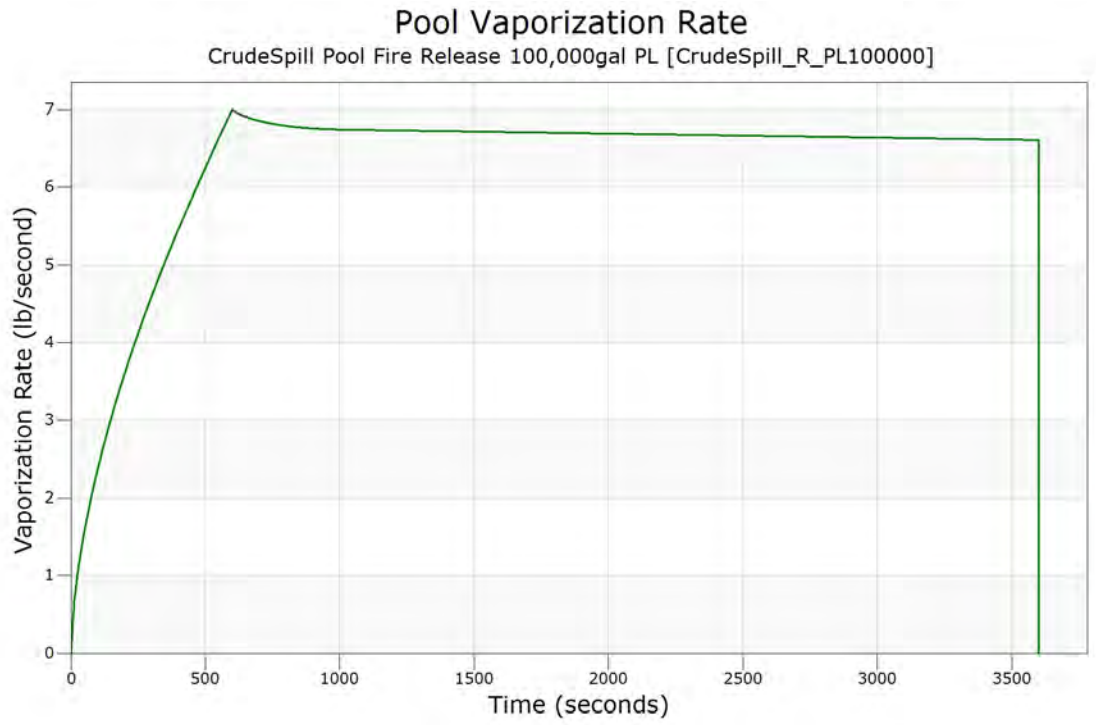
Liquid Pool Stream
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]

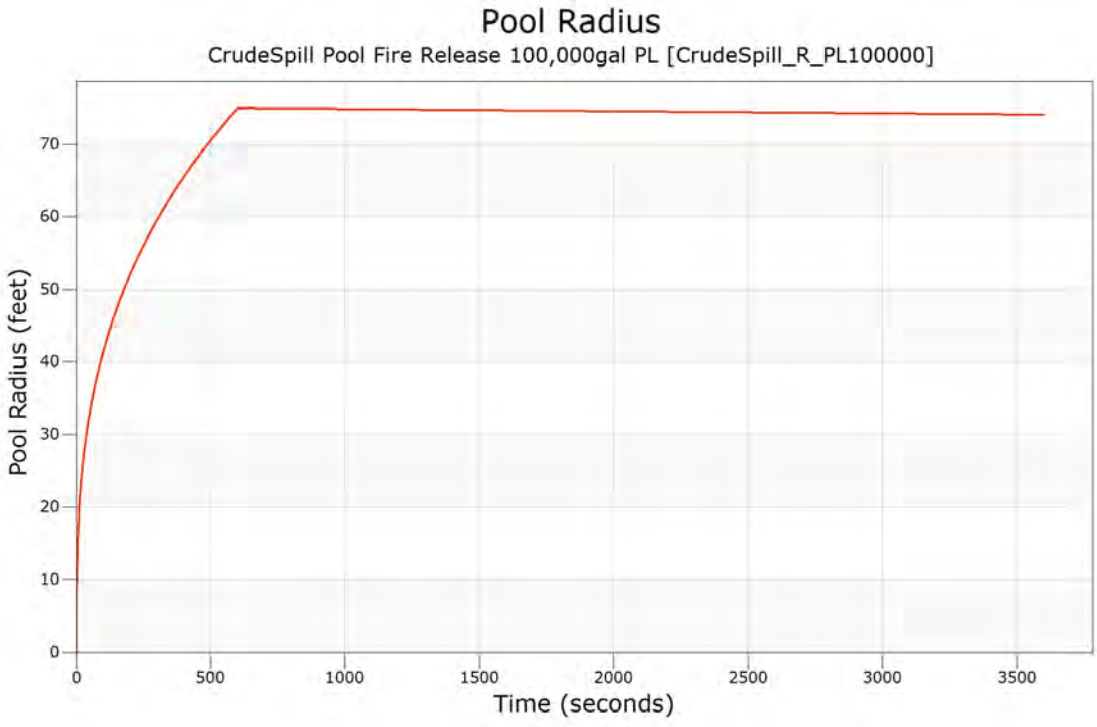


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	889.647	30.4432	1.37500
80.0000	1778.45	38.3563	2.08363
120.000	2666.65	43.9042	2.65701
160.000	3554.42	48.3169	3.15702
200.000	4441.53	52.0407	3.60875
240.000	5328.63	55.2953	4.02498
280.000	6215.03	58.1988	4.41365
320.000	7101.43	60.8432	4.78072
360.000	7987.12	63.2710	5.12972
400.000	8872.81	65.5249	5.46350
440.000	9757.80	67.6345	5.78515
480.000	10642.8	69.6194	6.10019
520.000	11527.4	71.4961	6.40862
560.000	12412.0	73.2776	6.71043
600.000	13296.0	74.9738	7.00585
640.000	13289.6	74.9639	6.92251
680.000	13283.3	74.9508	6.87445
720.000	13277.3	74.9409	6.83918
760.000	13270.9	74.9278	6.81228
800.000	13264.5	74.9147	6.79134
840.000	13258.5	74.9049	6.77525
880.000	13252.2	74.8917	6.76290
1130.00	13213.7	74.8196	6.73622
1380.00	13175.2	74.7474	6.72322
1630.00	13137.1	74.6752	6.70999
1880.00	13098.6	74.6030	6.69698
2130.00	13060.4	74.5308	6.68375
2380.00	13022.3	74.4587	6.67075
2630.00	12984.1	74.3832	6.65774
2880.00	12946.0	74.3110	6.64473
3130.00	12908.2	74.2388	6.63195
3380.00	12870.4	74.1667	6.61894
3600.00	12836.9	74.1011	6.60747

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
Vaporization Rate (lb/second)
0
1
2
3
4
5
6
7
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
Pool Radius (feet)
0
10
20
30
40
50
60
70
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

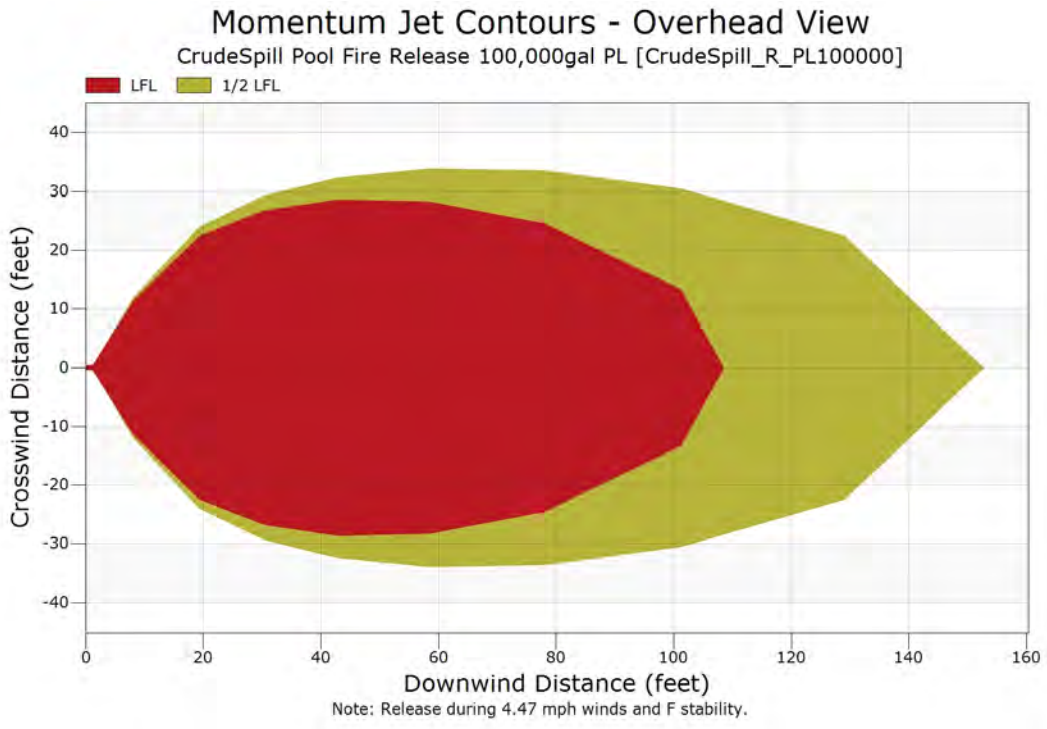
Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

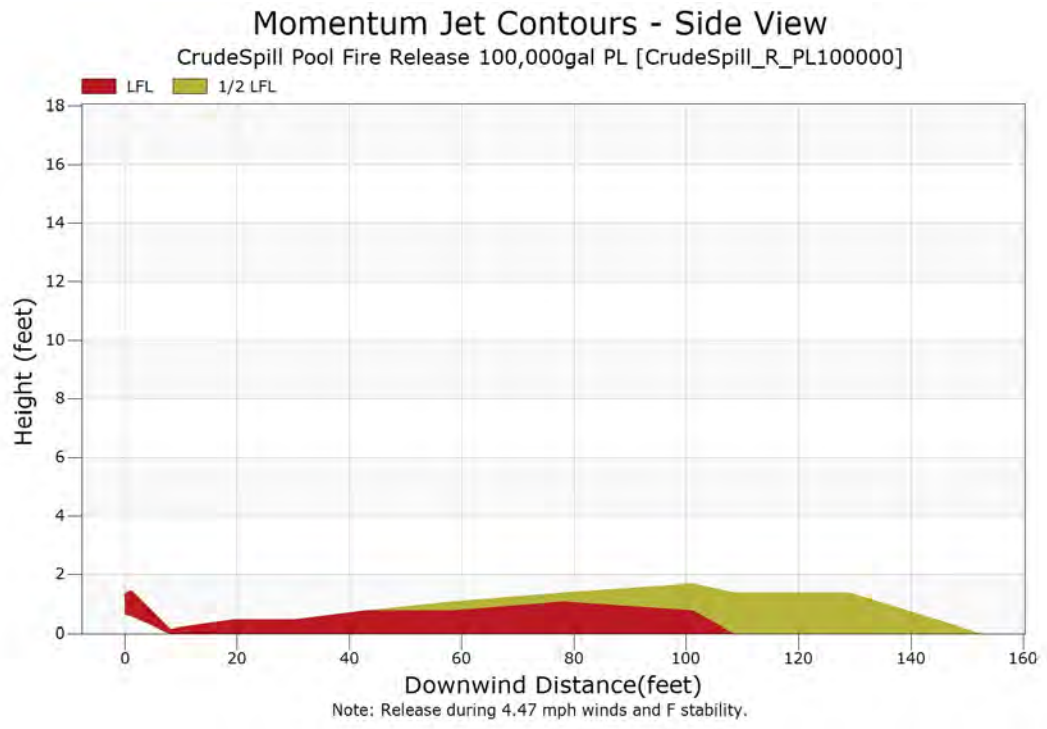
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.4	0.4	0.4	1.0
2	0.718031	0.718031	2.6	2.4	2.4	0.0
5	0.662070	0.662070	6.8	6.5	6.5	0.0
7	0.631379	0.631379	11.1	10.5	10.5	0.0
10	0.492736	0.492736	14.1	13.3	13.3	0.0
12	0.383491	0.383491	16.7	15.7	15.7	0.0
15	0.312471	0.312471	19.4	18.1	18.1	0.0
18	0.262789	0.262789	22.0	20.6	20.6	0.0
20	0.223162	0.223162	24.3	22.6	22.6	0.0
22	0.186441	0.186441	25.5	23.6	23.6	0.0
25	0.158745	0.158745	26.7	24.6	24.6	0.0
28	0.137252	0.137252	27.9	25.7	25.7	0.0
30	0.120182	0.120182	29.1	26.7	26.7	0.0
32	0.104834	0.104834	29.8	27.1	27.1	0.0
35	0.092255	0.092255	30.4	27.5	27.5	0.0
38	0.081904	0.081904	31.1	27.8	27.8	0.0
40	0.073275	0.073275	31.7	28.2	28.2	0.0
42	0.066000	0.066000	32.3	28.6	28.6	0.0
45	0.059397	0.059397	32.6	28.6	28.6	0.0
48	0.053716	0.053716	32.9	28.5	28.5	0.0
50	0.048830	0.048830	33.1	28.5	28.5	0.0
53	0.044595	0.044595	33.4	28.4	28.4	0.0
55	0.040900	0.040900	33.6	28.4	28.4	0.0
58	0.037655	0.037655	33.9	28.3	28.3	0.0
60	0.034700	0.034700	33.9	28.0	28.0	0.0
62	0.032042	0.032042	33.9	27.5	27.5	0.0
65	0.029681	0.029681	33.8	27.0	27.0	0.0
68	0.027572	0.027572	33.8	26.6	26.6	0.0
70	0.025683	0.025683	33.8	26.1	26.1	0.0
72	0.023982	0.023982	33.7	25.6	25.6	0.0
75	0.022446	0.022446	33.7	25.1	25.1	0.0
78	0.021054	0.021054	33.6	24.7	24.7	0.0
80	0.019759	0.019759	33.4	23.6	23.6	0.0
82	0.018571	0.018571	33.0	22.4	22.4	0.0
85	0.017487	0.017487	32.7	21.2	21.2	0.0

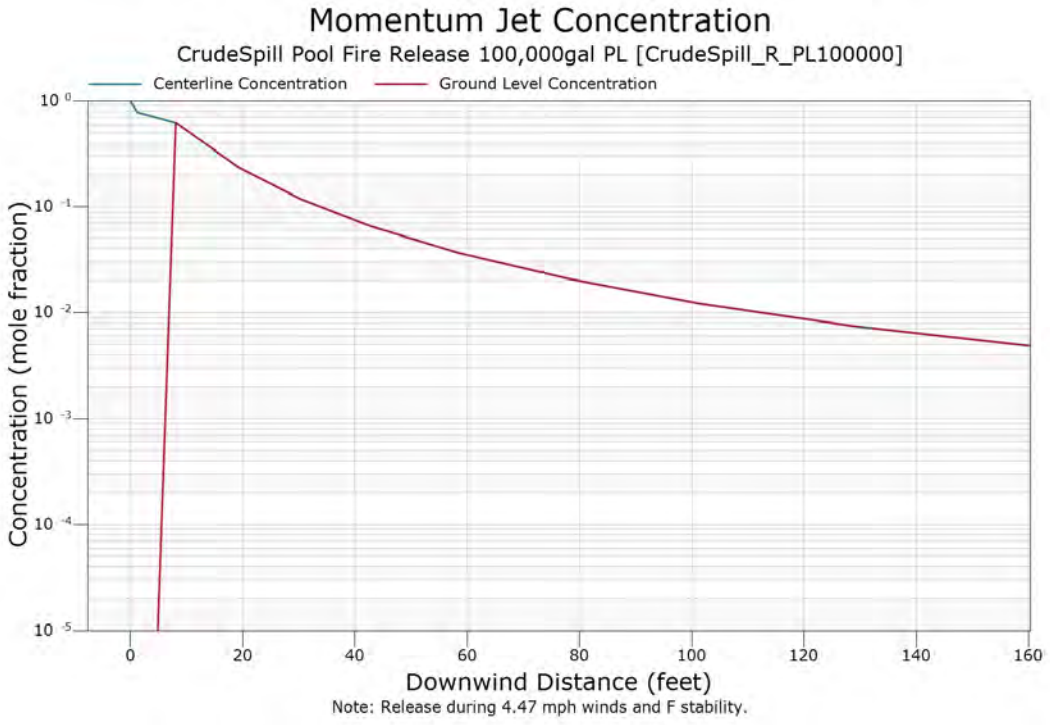
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
88	0.016495	0.016495	32.4	20.0	20.0	0.0
90	0.015585	0.015585	32.0	18.8	18.8	0.0
92	0.014748	0.014748	31.7	17.5	17.5	0.0
95	0.013977	0.013977	31.3	16.3	16.3	0.0
98	0.013264	0.013264	31.0	15.1	15.1	0.0
100	0.012605	0.012605	30.7	13.9	13.9	0.0
102	0.011987	0.011987	30.1	11.0	11.0	0.0
105	0.011407	0.011407	29.4	6.4	6.4	0.0
108	0.010869	0.010869	28.7	1.8	1.8	0.0
110	0.010367	0.010367	27.9	0.0	0.0	0.0
112	0.009899	0.009899	27.2	0.0	0.0	0.0
115	0.009461	0.009461	26.5	0.0	0.0	0.0
118	0.009052	0.009052	25.8	0.0	0.0	0.0
120	0.008669	0.008669	25.0	0.0	0.0	0.0
122	0.008309	0.008309	24.3	0.0	0.0	0.0
125	0.007971	0.007971	23.6	0.0	0.0	0.0
128	0.007653	0.007653	22.8	0.0	0.0	0.0
130	0.007356	0.007356	21.5	0.0	0.0	0.0
132	0.007081	0.007081	19.1	0.0	0.0	0.0
135	0.006821	0.006821	16.7	0.0	0.0	0.0
138	0.006575	0.006575	14.4	0.0	0.0	0.0
140	0.006342	0.006342	12.0	0.0	0.0	0.0
142	0.006121	0.006121	9.6	0.0	0.0	0.0
145	0.005912	0.005912	7.2	0.0	0.0	0.0
148	0.005713	0.005713	4.9	0.0	0.0	0.0
150	0.005524	0.005524	2.5	0.0	0.0	0.0
152	0.005344	0.005344	0.1	0.0	0.0	0.0
155	0.005173	0.005173	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 1.26 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	108.5	30
2 0.010670 (LFL)	108.5	30
3 0.005335 (1/2 LFL)	152.6	43


Momentum Jet Contours - Overhead View
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
LFL
1/2 LFL
Crosswind Distance (feet)
40
30
20
10
0
-10
-20
-30
-40
0
20
40
60
80
100
120
140
160
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Contours - Side View
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
LFL
1/2 LFL
Height (feet)
18
16
14
12
10
8
6
4
2
0
0
20
40
60
80
100
120
140
160
Downwind Distance(feet)
Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
10 0
10 -1
10 -2
10 -3
10 -4
10 -5
0
20
40
60
80
100
120
140
160
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

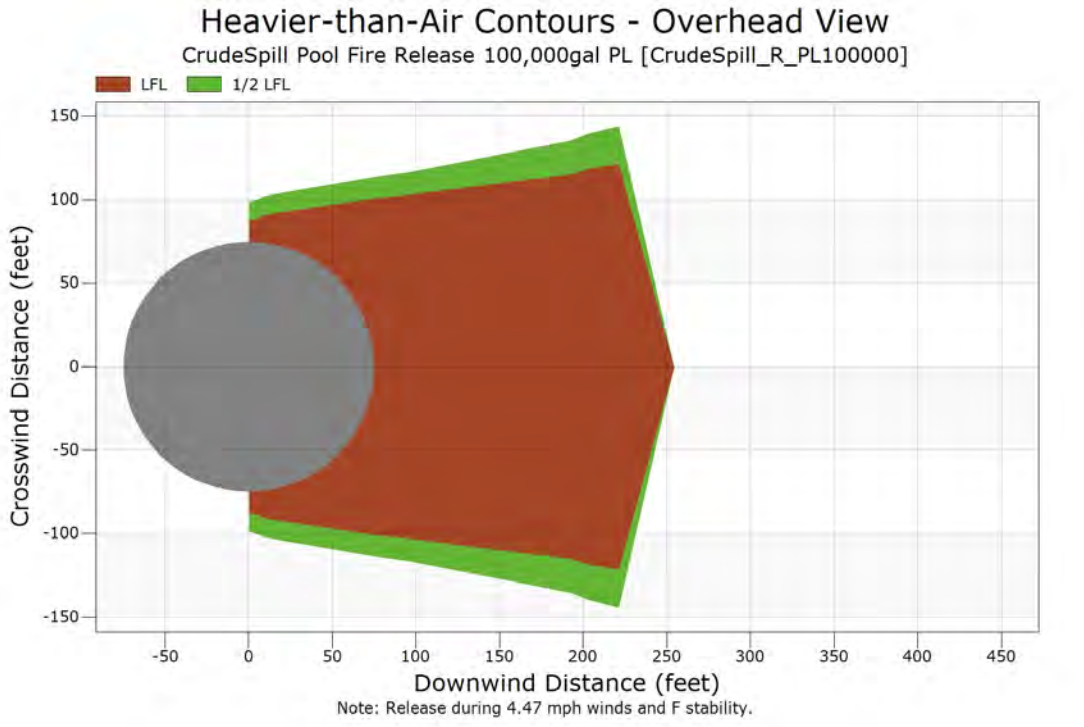
concentration limits

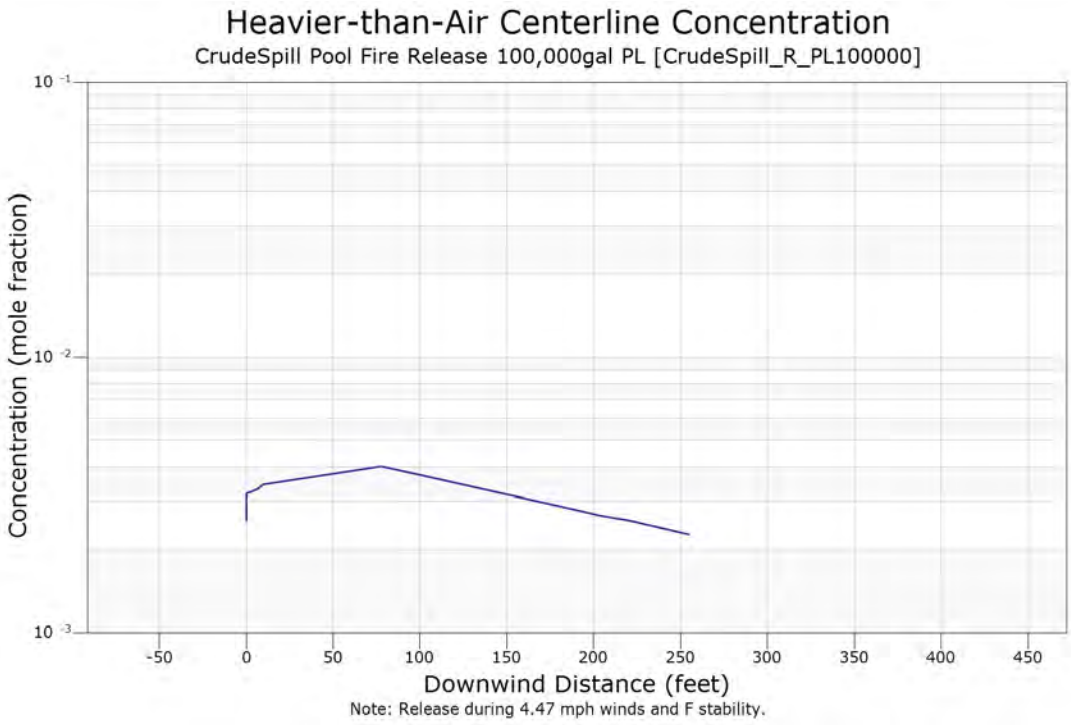
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
5.00	0.003302	99.00	0.00	0.00
10.00	0.003452	101.64	0.00	0.00
15.00	0.003477	101.64	0.00	0.00
20.00	0.003495	101.64	0.00	0.00
25.00	0.003509	101.65	0.00	0.00
30.00	0.003520	101.65	0.00	0.00
35.00	0.003530	101.66	0.00	0.00
40.00	0.003538	101.66	0.00	0.00
45.00	0.003546	101.66	0.00	0.00
50.00	0.003628	101.67	0.00	0.00
55.00	0.003741	101.67	0.00	0.00
60.00	0.003791	101.67	0.00	0.00
65.00	0.003848	101.68	0.00	0.00
70.00	0.003881	101.68	0.00	0.00
75.00	0.003972	109.18	0.00	0.00
80.00	0.003989	114.09	0.00	0.00
85.00	0.003923	114.83	0.00	0.00
90.00	0.003862	115.57	0.00	0.00
95.00	0.003804	116.31	0.00	0.00
100.00	0.003728	117.21	0.00	0.00
105.00	0.003645	118.18	0.00	0.00
110.00	0.003569	119.16	0.00	0.00
115.00	0.003497	120.14	0.00	0.00
120.00	0.003429	121.12	0.00	0.00
125.00	0.003366	122.10	0.00	0.00
130.00	0.003306	123.08	0.00	0.00
135.00	0.003249	124.05	0.00	0.00
140.00	0.003196	125.03	0.00	0.00
145.00	0.003145	126.01	0.00	0.00
150.00	0.003097	126.99	0.00	0.00
155.00	0.003050	127.97	0.00	0.00
160.00	0.003006	128.95	0.00	0.00
165.00	0.002964	129.92	0.00	0.00
170.00	0.002924	130.90	0.00	0.00
175.00	0.002886	131.88	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
180.00	0.002849	132.86	0.00	0.00
185.00	0.002813	133.84	0.00	0.00
190.00	0.002779	134.82	0.00	0.00
195.00	0.002738	136.29	0.00	0.00
200.00	0.002689	138.31	0.00	0.00
205.00	0.002645	139.34	0.00	0.00
210.00	0.002611	139.76	0.00	0.00
215.00	0.002580	141.67	0.00	0.00
220.00	0.002551	143.58	0.00	0.00
225.00	0.002508	144.95	0.00	0.00
230.00	0.002463	146.14	0.00	0.00
235.00	0.002419	147.32	0.00	0.00
240.00	0.002377	148.50	0.00	0.00
245.00	0.002337	149.68	0.00	0.00
250.00	0.002298	150.86	0.00	0.00

	Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1	0.004529 (LFL)	0.0	0
2	0.004529 (LFL)	0.0	0
3	0.002265 (1/2 LFL)	254.4	77




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 100,000gal PL [CrudeSpill_R_PL100000]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-50
0
50
100
150
200
250
300
350
400
450
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal_100000PL
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                                70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)            1.0 feet
Elevation of target (from grade)                6.0 feet
Diameter of pool                              150.0 feet

Fire radiation flux endpoints
  Radiation endpoint 1                         3170 Btu/hr-sq.ft
  Radiation endpoint 2                         1585 Btu/hr-sq.ft
  Radiation endpoint 3                         1585 Btu/hr-sq.ft

  NOTES:
```

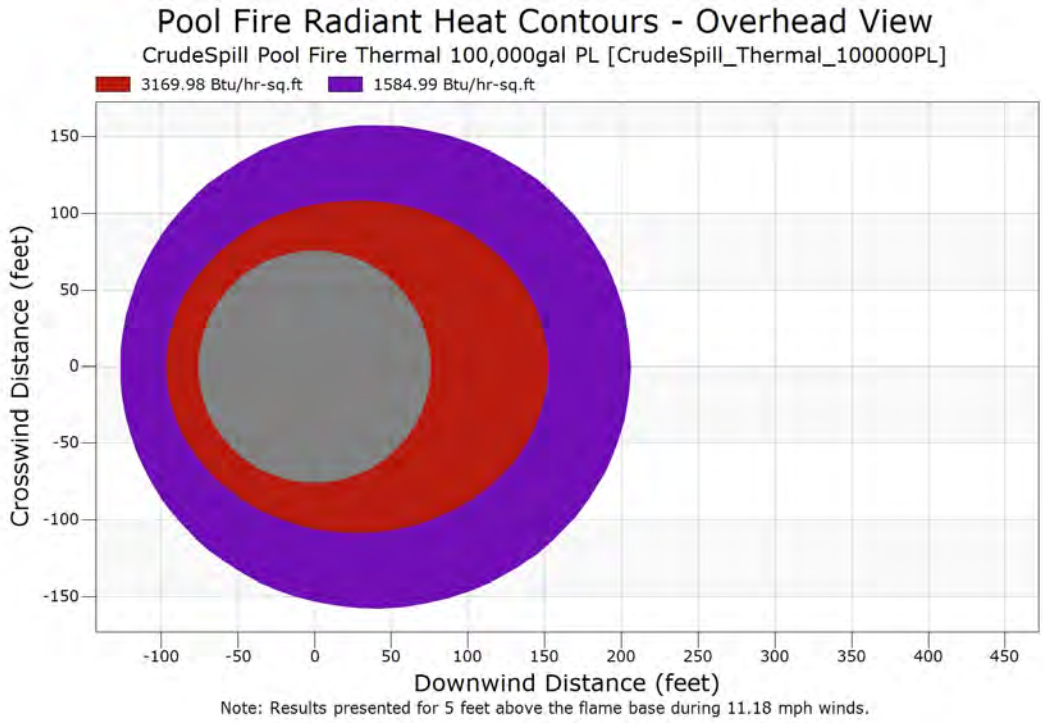
Pool Fire Radiation

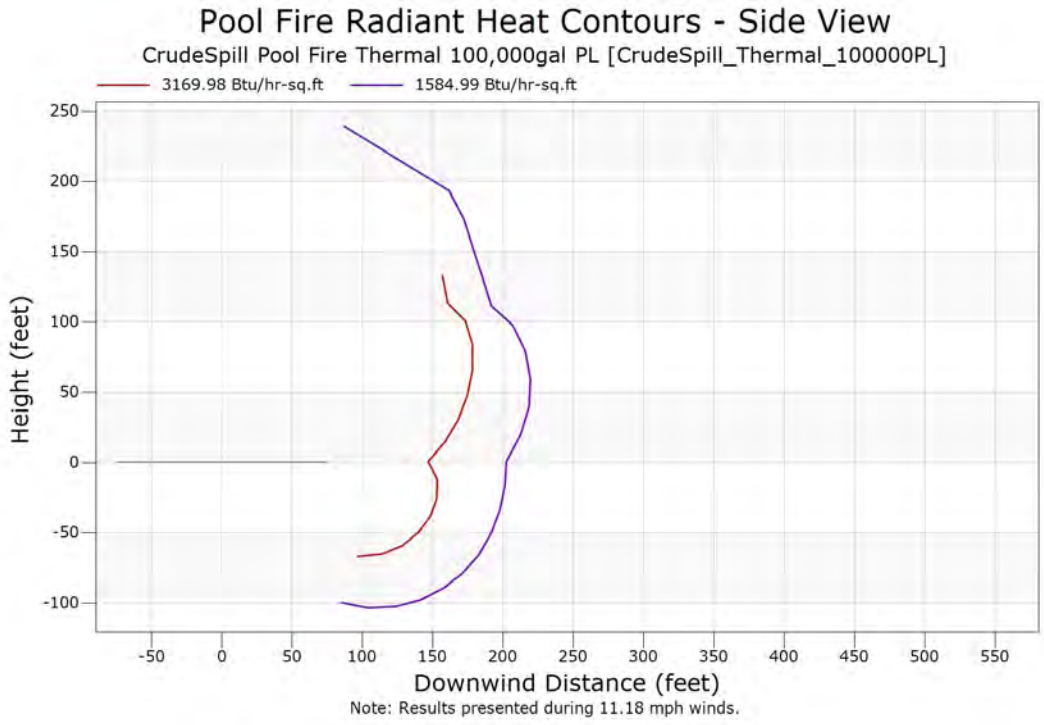
Length of Flame	: 121.8	feet
Flame Tilt from Vertical	: 21.7	degrees
Target Elevation	: 6.0	feet
Pool Elevation	: 1.0	feet
Wind Speed	: 11.2	mph
Substrate	: Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
118.9	5924	3319	6790
123.7	4853	2950	5680
128.7	4119	2654	4900
134.0	3598	2404	4328
139.5	3207	2182	3879
145.2	2897	1980	3509
151.1	2642	1794	3194
157.2	2427	1621	2918
163.7	2235	1459	2669
170.3	2064	1306	2443
177.3	1906	1163	2233
184.5	1760	1031	2040
192.0	1623	907	1859
199.9	1494	794	1692
208.0	1372	691	1536
216.5	1256	598	1391
225.4	1148	516	1259
234.5	1046	443	1136
244.1	951	378	1024
254.1	864	323	922
264.4	783	275	829
275.2	708	233	745
286.5	639	198	669
298.1	577	168	601
310.3	521	142	540
323.0	470	121	485
336.1	424	102	436
349.9	382	87	392
364.1	344	74	352
379.0	310	63	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
151.6	3170
205.5	1585
205.5	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal 100,000gal PL [CrudeSpill_Thermal_100000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
150
100
50
0
-50
-100
-150
-100
-50
0
50
100
150
200
250
300
350
400
450
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal 100,000gal PL [CrudeSpill_Thermal_100000PL]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
250
200
150
100
50
0
-50
-100
-50
0
50
100
150
200
250
300
350
400
450
500
550
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Case Inputs

```
Case Type           : Vapor Dispersion
Case Name           : CrudeSpill_R
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                        Fraction
Component  1        :     8 = C6H14     n-Hexane                    0.036900
Component  2        :    11 = C9H20     n-Nonane                    0.099100
Component  3        :    20 = C22H38    PHC-300                     0.211900
Component  4        :    21 = C28H42    PHC-400                     0.119200
Component  5        :    23 = C44H70    PHC-600                     0.079500
Component  6        :    24 = C51H82    PHC-700                     0.090800
Component  7        :    32 = C13H28    Tridecane                   0.086200
Component  8        :    34 = C15H32    Pentadecane                 0.104700
Component  9        :    36 = C17H36    n-Heptadecane               0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        15.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                      4.47 mph
Wind speed measurement height                   32.8 feet
Stability class <A-F>                              F
Relative humidity                                 70 %
Air temperature                                 70.0 °F
Spill surface temperature                       70.0 °F

Substrate name                            Medium density concrete
  Substrate thermal conductivity              0.2698 Btu/hr-ft-F
  Substrate density                              80 lb/cu.ft
  Substrate heat Capacity                      0.22 Btu/lb-F
  Substrate delay time                            0 sec
Surrounding terrain                       Long grass or crops > 15 cm (6 in)

  NOTES:
```

RELEASE MENU
Type of release: Regulated

Release duration	10	min
Regulated flow rate	65.48	lb/sec
Pipe inner diameter	3.07	inches
Equivalent release diameter	3.00	inches
Height of release point	1.0	feet
Angle of release from horizontal	0.0	degrees

NOTES:

IMPOUNDMENT MENU
Unconfined

NOTES:

VDVE MENU
Vapor generation and dispersion - Flammable endpoints

Concentration endpoint 1	LFL	mol%
Concentration endpoint 2	LFL	mol%
Concentration endpoint 3	1/2 LFL	mol%
Dispersion coefficient averaging time	1	min

NOTES:

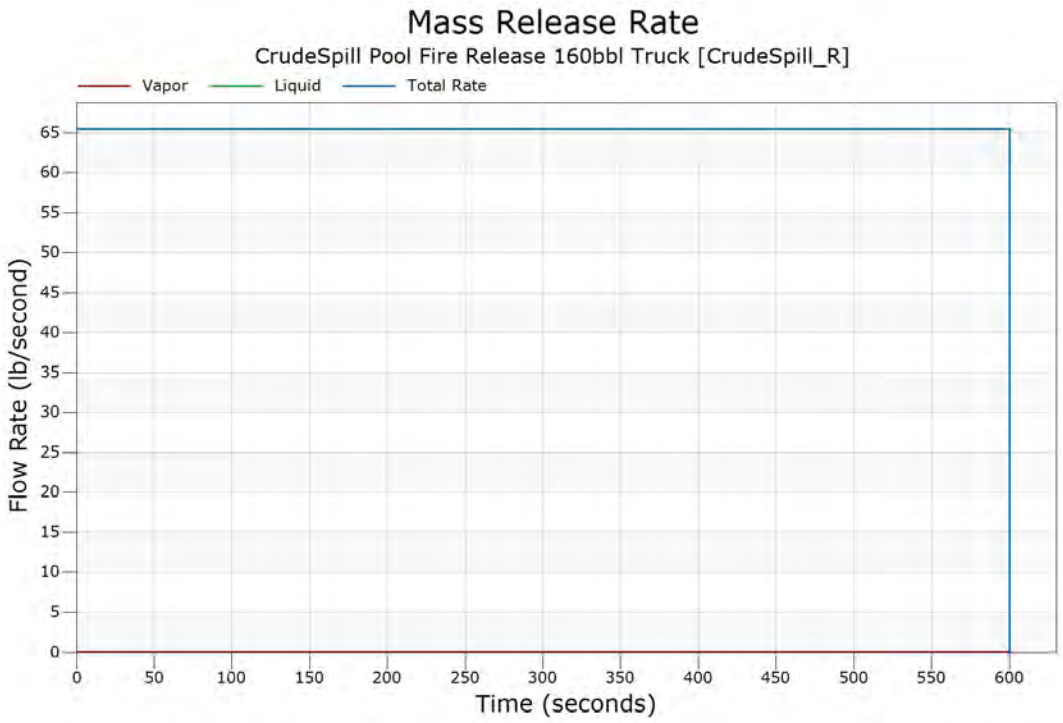
Release Model

WARNING USER ASSUMES RESPONSIBLIITY FOR INPUT CONSISTENCY IN REGULATED RELEASE CASE

Time (sec)	Vapor (lb/sec)	Aerosol Rate (lb/sec)	Liquid Rate (lb/sec)	Total Rate (lb/sec)
0.000000	.4828857E-01	0.000000	65.43171	65.48000
0.1000000	.4828857E-01	0.000000	65.43171	65.48000
0.3000000	.4828857E-01	0.000000	65.43171	65.48000
0.5000000	.4828857E-01	0.000000	65.43171	65.48000
0.7000000	.4828857E-01	0.000000	65.43171	65.48000
1.000000	.4828857E-01	0.000000	65.43171	65.48000
3.000000	.4828857E-01	0.000000	65.43171	65.48000
5.000000	.4828857E-01	0.000000	65.43171	65.48000
7.000000	.4828857E-01	0.000000	65.43171	65.48000
10.00000	.4828857E-01	0.000000	65.43171	65.48000
20.00000	.4828857E-01	0.000000	65.43171	65.48000
30.00000	.4828857E-01	0.000000	65.43171	65.48000
40.00000	.4828857E-01	0.000000	65.43171	65.48000
50.00000	.4828857E-01	0.000000	65.43171	65.48000
60.00000	.4828857E-01	0.000000	65.43171	65.48000
70.00000	.4828857E-01	0.000000	65.43171	65.48000
85.00000	.4828857E-01	0.000000	65.43171	65.48000
100.0000	.4828857E-01	0.000000	65.43171	65.48000
200.0000	.4828857E-01	0.000000	65.43171	65.48000
300.0000	.4828857E-01	0.000000	65.43171	65.48000
400.0000	.4828857E-01	0.000000	65.43171	65.48000
500.0000	.4828857E-01	0.000000	65.43171	65.48000
600.0000	.4828857E-01	0.000000	65.43171	65.48000
Totals (lb)	28.97314	0.000000	39259.03	39288.00

Flowrate for Jet Fire [1st minute] = 0.4828857E-01 lb/sec.
Jet Fire [2-3 minutes] = 0.4828857E-01 lb/sec.

Reason for Ending: Reached Stop Time


Mass Release Rate
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]
Vapor
Liquid
Total Rate
Flow Rate (lb/second)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
0
50
100
150
200
250
300
350
400
450
500
550
600
Time (seconds)

Release Compositions

Component Number	Component Name, Formula
8	n-Hexane, C6H14
11	n-Nonane, C9H20
20	PHC-300, C22H38
21	PHC-400, C28H42
23	PHC-600, C44H70
24	PHC-700, C51H82
32	Tridecane, C13H28
34	Pentadecane, C15H32
36	n-Heptadecane, C17H36

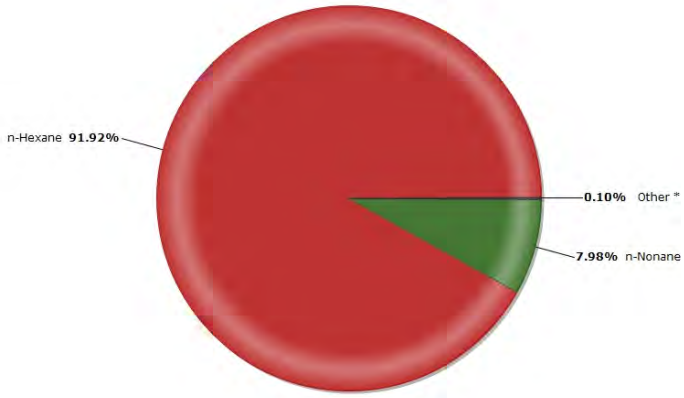
Composition (Mole Fraction) of Fluid Streams

Comp. No.	Feed Stream	Momentum Jet Stream				Liquid Pool Stream
		Flashed Vapor	Evaporated Vapor	Aerosol Liquid	Total Stream	Liquid to Ground
8	0.036900	0.000000	0.919167	0.000000	0.919167	0.036882
11	0.099100	0.000000	0.079850	0.000000	0.079850	0.099100
20	0.211900	0.000000	0.000001	0.000000	0.000001	0.211904
21	0.119200	0.000000	0.000000	0.000000	0.000000	0.119202
23	0.079500	0.000000	0.000000	0.000000	0.000000	0.079502
24	0.090800	0.000000	0.000000	0.000000	0.000000	0.090802
32	0.086200	0.000000	0.000840	0.000000	0.000840	0.086202
34	0.104700	0.000000	0.000116	0.000000	0.000116	0.104702
36	0.171700	0.000000	0.000026	0.000000	0.000026	0.171703
	1.000000	0.000000	1.000000	0.000000	1.000000	1.000000

Flammable Limits (Mole %) of Fluid Streams

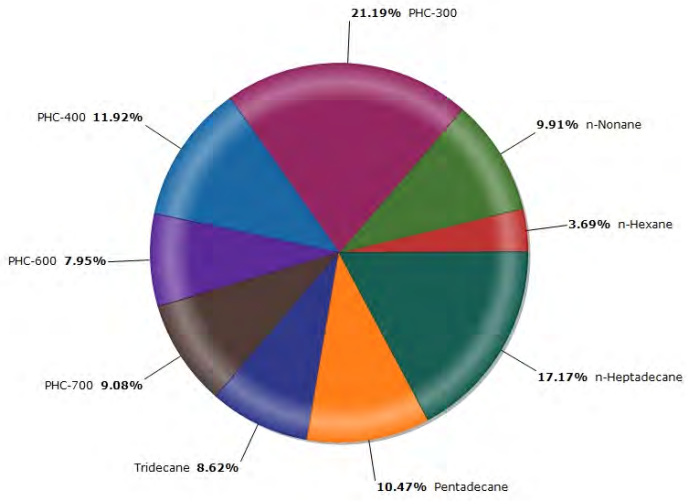
Limit	Feed Stream	Momentum Jet Stream	Liquid Pool Stream
LFL	0.45	1.07	0.45
UFL	5.82	6.65	5.82
LBV		0.42 m/s	0.40 m/s

Momentum Jet Stream
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]



* Other, PHC-300 0.00%, PHC-400 0.00%, PHC-600 0.00%, PHC-700 0.00%, Tridecane 0.08%, Pentadecane 0.01%, n-Heptadecane 0.00%

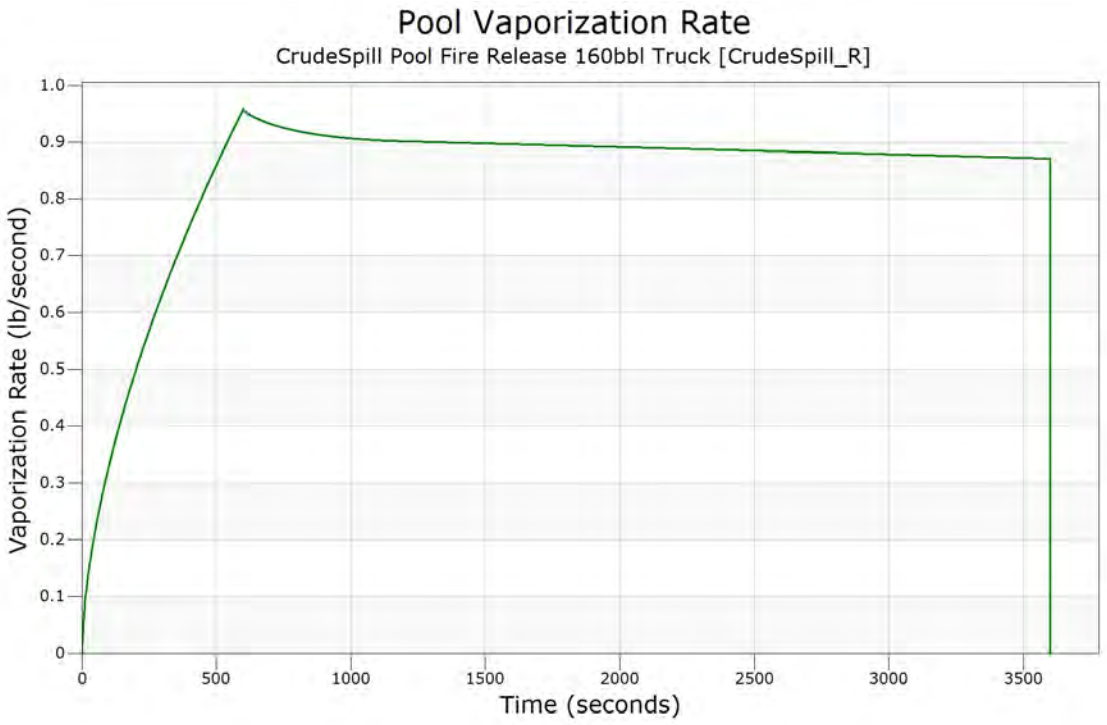
Liquid Pool Stream
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]

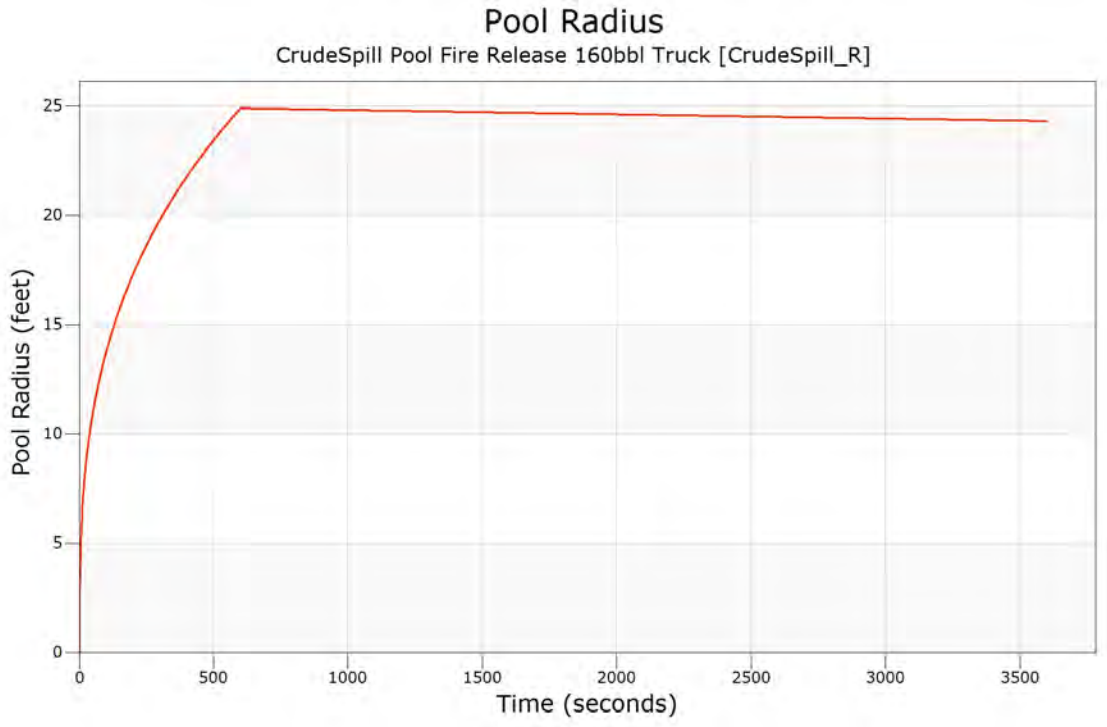


Pool Spreading and Vaporization

Time (sec)	Liquid Remaining (ft3)	Pool/Dike Radius (feet)	Vapor Rate (lb/sec)
0.00000	0.00000	0.00000	0.00000
40.0000	59.7312	10.1263	0.189631
80.0000	119.346	12.7569	0.287284
120.000	178.879	14.5994	0.366232
160.000	238.346	16.0646	0.435038
200.000	297.752	17.3012	0.497186
240.000	357.102	18.3812	0.554440
280.000	416.395	19.3461	0.607903
320.000	475.653	20.2221	0.658344
360.000	534.876	21.0279	0.706295
400.000	594.028	21.7756	0.752129
440.000	653.180	22.4747	0.796155
480.000	712.262	23.1325	0.838572
520.000	771.308	23.7543	0.879556
560.000	830.318	24.3448	0.919306
600.000	889.294	24.9072	0.957864
640.000	888.411	24.8990	0.944284
680.000	887.563	24.8911	0.935818
720.000	886.716	24.8832	0.929292
760.000	885.868	24.8753	0.924001
800.000	885.021	24.8675	0.919636
840.000	884.173	24.8596	0.915977
880.000	883.326	24.8517	0.912890
1130.00	878.170	24.8028	0.902352
1380.00	873.014	24.7543	0.898935
1630.00	867.893	24.7057	0.895760
1880.00	862.773	24.6572	0.892608
2130.00	857.687	24.6086	0.889433
2380.00	852.602	24.5597	0.886280
2630.00	847.552	24.5115	0.883128
2880.00	842.502	24.4626	0.879975
3130.00	837.487	24.4144	0.876844
3380.00	832.473	24.3658	0.873714
3600.00	828.094	24.3232	0.870980

Ending Message: Normal Ending


Pool Vaporization Rate
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]
Vaporization Rate (lb/second)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)


Pool Radius
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]
Pool Radius (feet)
25
20
15
10
5
0
0
500
1000
1500
2000
2500
3000
3500
Time (seconds)

Momentum Jet Dispersion

concentration limits

Endpoint 1 (highest) = 0.010670 mole fraction
Endpoint 2 (middle) = 0.010670 mole fraction
Endpoint 3 (lowest) = 0.005335 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
0	1.000000	0.000000	0.1	0.1	0.1	1.0
1	0.491499	0.491499	0.4	0.4	0.4	0.0
2	0.308974	0.308974	1.3	1.2	1.2	0.0
3	0.235501	0.235501	2.1	1.9	1.9	0.0
4	0.194232	0.194232	2.9	2.6	2.6	0.0
5	0.167271	0.167271	3.7	3.4	3.4	0.0
6	0.148044	0.148044	4.5	4.1	4.1	0.0
7	0.133523	0.133523	5.3	4.8	4.8	0.0
8	0.122101	0.122101	6.1	5.6	5.6	0.0
9	0.112840	0.112840	6.9	6.3	6.3	0.0
10	0.100441	0.100441	7.4	6.7	6.7	0.0
11	0.085538	0.085538	7.5	6.7	6.7	0.0
12	0.073872	0.073872	7.6	6.7	6.7	0.0
13	0.064550	0.064550	7.7	6.7	6.7	0.0
14	0.056972	0.056972	7.8	6.7	6.7	0.0
15	0.050719	0.050719	7.9	6.7	6.7	0.0
16	0.045492	0.045492	8.0	6.7	6.7	0.0
17	0.041074	0.041074	8.1	6.7	6.7	0.0
18	0.037302	0.037302	8.2	6.7	6.7	0.0
19	0.034054	0.034054	8.3	6.7	6.7	0.0
20	0.031118	0.031118	8.3	6.6	6.6	0.0
21	0.028546	0.028546	8.2	6.4	6.4	0.0
22	0.026291	0.026291	8.2	6.2	6.2	0.0
23	0.024304	0.024304	8.1	6.1	6.1	0.0
24	0.022542	0.022542	8.1	5.9	5.9	0.0
25	0.020972	0.020972	8.0	5.7	5.7	0.0
26	0.019567	0.019567	8.0	5.6	5.6	0.0
27	0.018286	0.018286	7.9	5.3	5.3	0.0
28	0.017116	0.017116	7.8	4.9	4.9	0.0
29	0.016059	0.016059	7.7	4.5	4.5	0.0
30	0.015099	0.015099	7.6	4.2	4.2	0.0
31	0.014226	0.014226	7.5	3.8	3.8	0.0
32	0.013428	0.013428	7.4	3.4	3.4	0.0
33	0.012698	0.012698	7.3	3.1	3.1	0.0
34	0.012028	0.012028	7.1	2.7	2.7	0.0

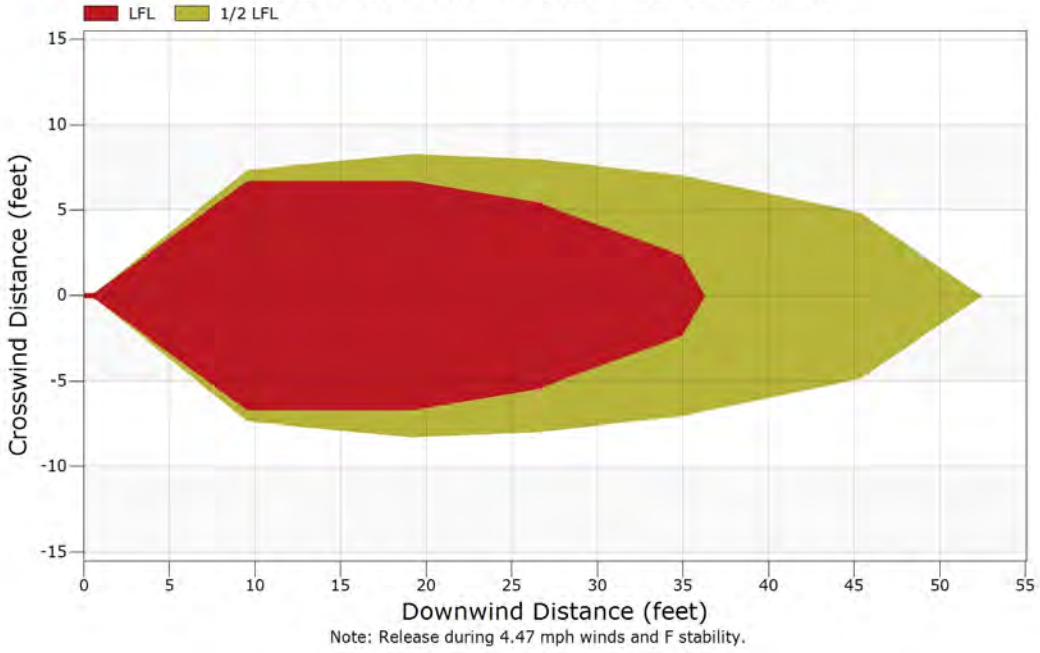
downwind distance (ft)	centerline conc. (mole frac.)	ground conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)	centerline height (ft)
35	0.011410	0.011410	7.0	2.3	2.3	0.0
36	0.010826	0.010826	6.8	0.5	0.5	0.0
37	0.010287	0.010287	6.6	0.0	0.0	0.0
38	0.009788	0.009788	6.4	0.0	0.0	0.0
39	0.009325	0.009325	6.2	0.0	0.0	0.0
40	0.008895	0.008895	6.0	0.0	0.0	0.0
41	0.008495	0.008495	5.8	0.0	0.0	0.0
42	0.008122	0.008122	5.6	0.0	0.0	0.0
43	0.007773	0.007773	5.4	0.0	0.0	0.0
44	0.007447	0.007447	5.1	0.0	0.0	0.0
45	0.007142	0.007142	4.9	0.0	0.0	0.0
46	0.006850	0.006850	4.4	0.0	0.0	0.0
47	0.006574	0.006574	3.7	0.0	0.0	0.0
48	0.006315	0.006315	3.0	0.0	0.0	0.0
49	0.006071	0.006071	2.4	0.0	0.0	0.0
50	0.005841	0.005841	1.7	0.0	0.0	0.0
51	0.005624	0.005624	1.0	0.0	0.0	0.0
52	0.005419	0.005419	0.3	0.0	0.0	0.0
53	0.005225	0.005225	0.0	0.0	0.0	0.0

The momentum jet model coupled to the heavy gas model at 0.65 ft in 0 sec.

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.010670 (LFL)	36.3	9
2 0.010670 (LFL)	36.3	9
3 0.005335 (1/2 LFL)	52.4	14

Momentum Jet Contours - Overhead View

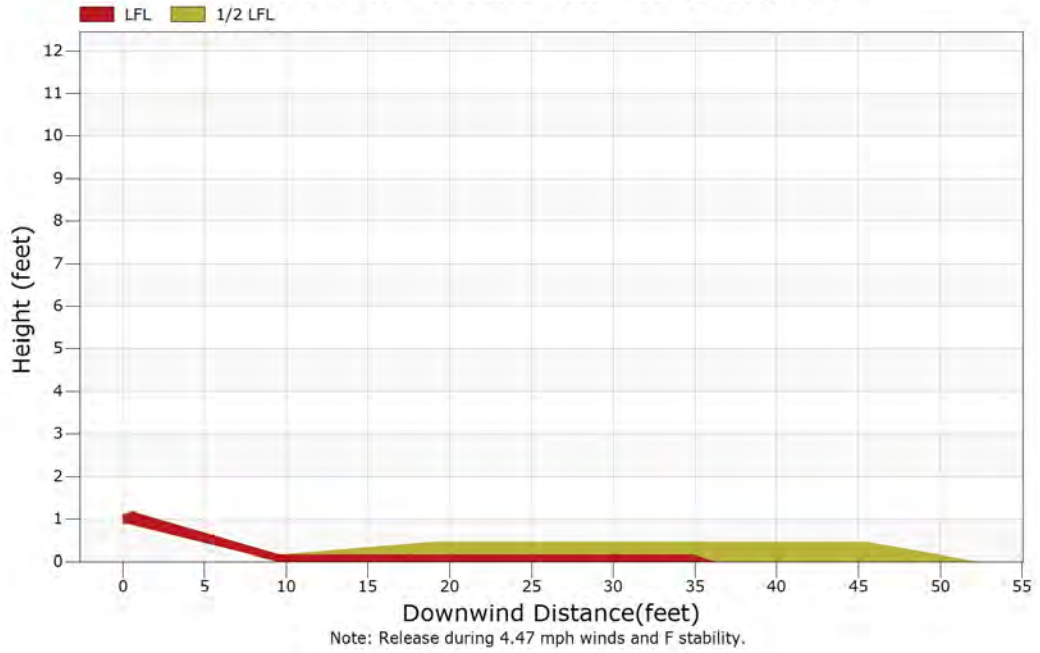
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]



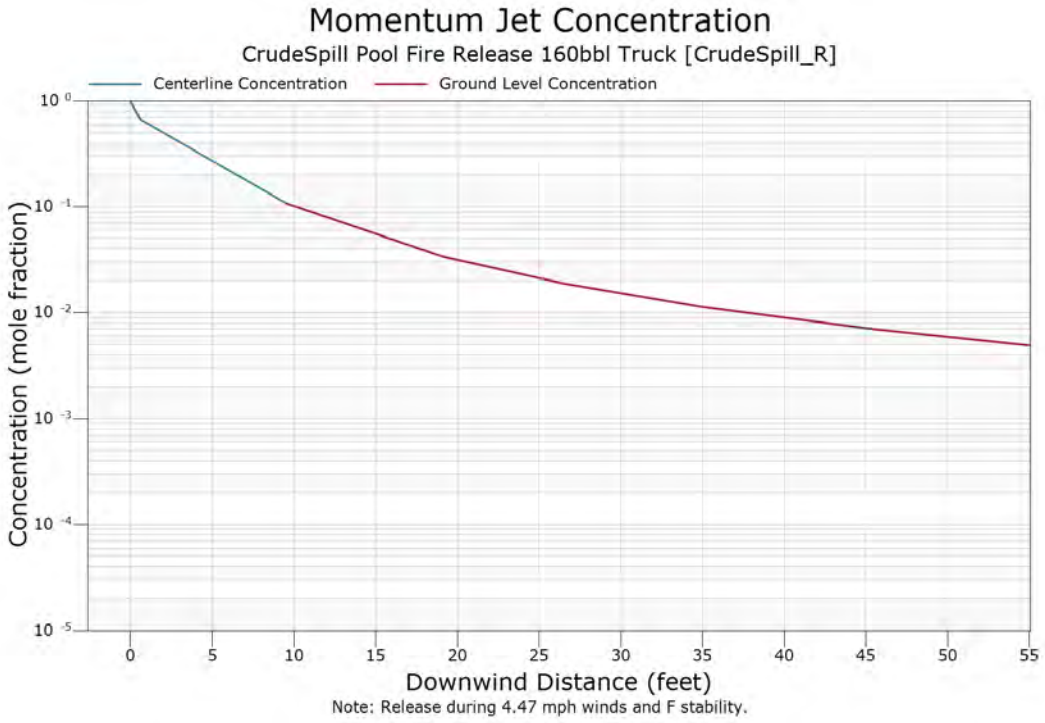
Note: Release during 4.47 mph winds and F stability.

Momentum Jet Contours - Side View

CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]



Note: Release during 4.47 mph winds and F stability.


Momentum Jet Concentration
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]
Centerline Concentration
Ground Level Concentration
Concentration (mole fraction)
10 0
10 -1
10 -2
10 -3
10 -4
10 -5
0
5
10
15
20
25
30
35
40
45
50
55
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Heavier-than-Air Dispersion

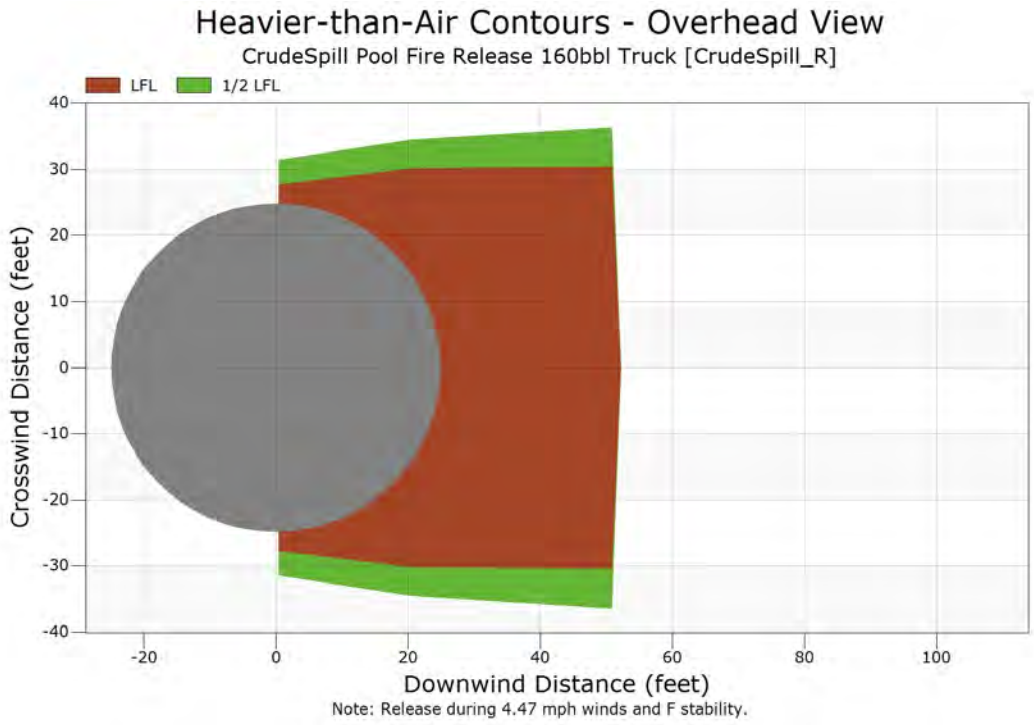
concentration limits

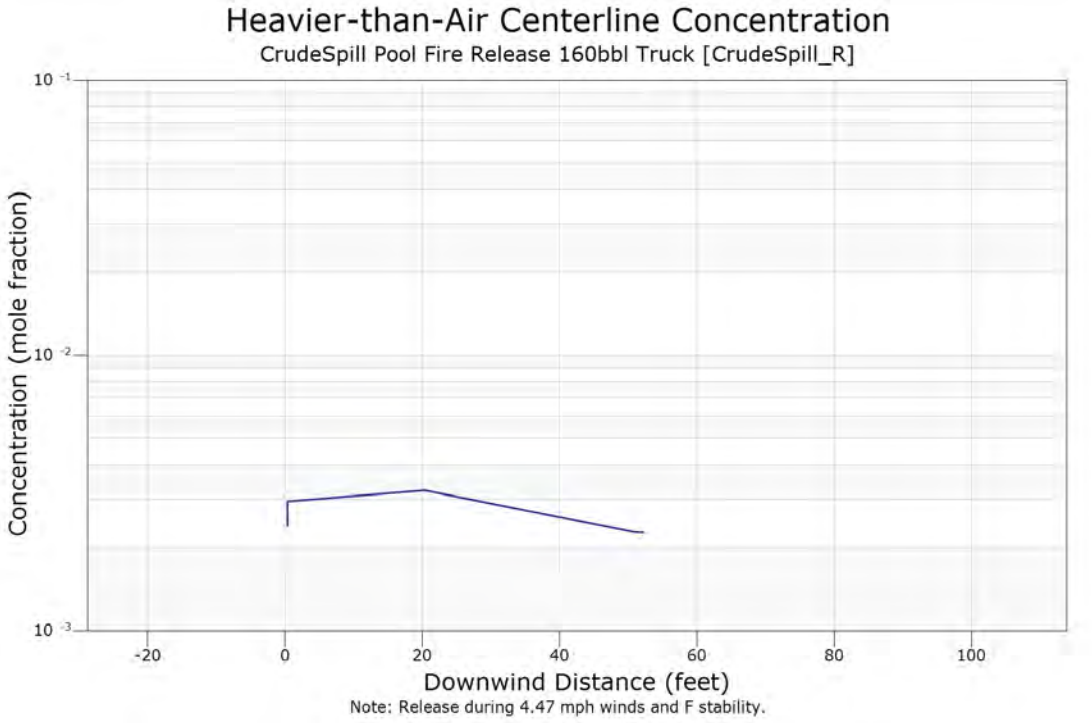
Endpoint 1 (highest) = 0.004529 mole fraction
Endpoint 2 (middle) = 0.004529 mole fraction
Endpoint 3 (lowest) = 0.002265 mole fraction

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
1.00	0.002964	31.05	0.00	0.00
2.00	0.002982	31.08	0.00	0.00
3.00	0.002993	31.10	0.00	0.00
4.00	0.003001	31.13	0.00	0.00
5.00	0.003007	31.15	0.00	0.00
6.00	0.003012	31.17	0.00	0.00
7.00	0.003016	31.20	0.00	0.00
8.00	0.003087	31.22	0.00	0.00
9.00	0.003133	31.25	0.00	0.00
10.00	0.003138	31.27	0.00	0.00
11.00	0.003142	31.30	0.00	0.00
12.00	0.003146	31.32	0.00	0.00
13.00	0.003150	31.35	0.00	0.00
14.00	0.003153	31.37	0.00	0.00
15.00	0.003159	31.39	0.00	0.00
16.00	0.003172	31.42	0.00	0.00
17.00	0.003185	31.44	0.00	0.00
18.00	0.003197	31.47	0.00	0.00
19.00	0.003209	31.49	0.00	0.00
20.00	0.003220	33.73	0.00	0.00
21.00	0.003203	34.32	0.00	0.00
22.00	0.003171	34.33	0.00	0.00
23.00	0.003147	34.34	0.00	0.00
24.00	0.003136	34.35	0.00	0.00
25.00	0.003126	34.36	0.00	0.00
26.00	0.003116	34.36	0.00	0.00
27.00	0.003106	34.37	0.00	0.00
28.00	0.003097	34.38	0.00	0.00
29.00	0.003088	34.52	0.00	0.00
30.00	0.002930	34.54	0.00	0.00
31.00	0.002888	34.56	0.00	0.00
32.00	0.002848	34.58	0.00	0.00
33.00	0.002810	34.61	0.00	0.00
34.00	0.002773	34.63	0.00	0.00
35.00	0.002738	34.65	0.00	0.00

downwind distance (ft)	centerline conc. (mole frac.)	Endpoint3 1/2 width (ft)	Endpoint2 1/2 width (ft)	Endpoint1 1/2 width (ft)
36.00	0.002704	34.67	0.00	0.00
37.00	0.002672	34.69	0.00	0.00
38.00	0.002641	34.71	0.00	0.00
39.00	0.002611	34.73	0.00	0.00
40.00	0.002582	34.75	0.00	0.00
41.00	0.002554	34.77	0.00	0.00
42.00	0.002527	34.79	0.00	0.00
43.00	0.002501	34.81	0.00	0.00
44.00	0.002476	34.83	0.00	0.00
45.00	0.002449	34.85	0.00	0.00
46.00	0.002419	34.87	0.00	0.00
47.00	0.002389	34.89	0.00	0.00
48.00	0.002361	35.30	0.00	0.00
49.00	0.002333	35.71	0.00	0.00
50.00	0.002307	36.12	0.00	0.00
51.00	0.002283	36.62	0.00	0.00
52.00	0.002268	37.51	0.00	0.00

Endpoint (mole frac., mixture)	Downwind Distance (feet)	Approximate Time (seconds)
1 0.004529 (LFL)	0.0	0
2 0.004529 (LFL)	0.0	0
3 0.002265 (1/2 LFL)	52.2	16




Heavier-than-Air Centerline Concentration
CrudeSpill Pool Fire Release 160bbl Truck [CrudeSpill_R]
Concentration (mole fraction)
10 -1
10 -2
10 -3
-20
0
20
40
60
80
100
Downwind Distance (feet)
Note: Release during 4.47 mph winds and F stability.

Case Inputs

```
Case Type           : Fire Radiation
Case Name           : CrudeSpill_Thermal
User ID             : GC
Project Number      :
Type of Units       : English Units

  NOTES:

MATERIAL MENU
Materials Released  : Number  Formula   Name                          Fraction
Component  1        :     8 = C6H14     n-Hexane                      0.036900
Component  2        :    11 = C9H20     n-Nonane                      0.099100
Component  3        :    20 = C22H38    PHC-300                       0.211900
Component  4        :    21 = C28H42    PHC-400                       0.119200
Component  5        :    23 = C44H70    PHC-600                       0.079500
Component  6        :    24 = C51H82    PHC-700                       0.090800
Component  7        :    32 = C13H28    Tridecane                     0.086200
Component  8        :    34 = C15H32    Pentadecane                   0.104700
Component  9        :    36 = C17H36    n-Heptadecane                 0.171700
Component 10        :

Temperature         :        70.00 °F
Pressure            :        14.70 psia
The material is LIQUID
The mixture is Crude Oil

  NOTES:

ENVIRONMENT MENU
Wind speed                                    11.18 mph
Relative humidity                               70 %
Air temperature                                70.0 °F

  NOTES:

FIRE TYPE MENU
Fire radiation division: Circular pool fires
Vertical and horizontal isopleths
Spill surface: land
Elevation of flame base (from grade)            1.0 feet
Elevation of target (from grade)                6.0 feet
Diameter of pool                               49.8 feet

Fire radiation flux endpoints
  Radiation endpoint 1                         3170 Btu/hr-sq.ft
  Radiation endpoint 2                         1585 Btu/hr-sq.ft
  Radiation endpoint 3                         1585 Btu/hr-sq.ft

  NOTES:
```

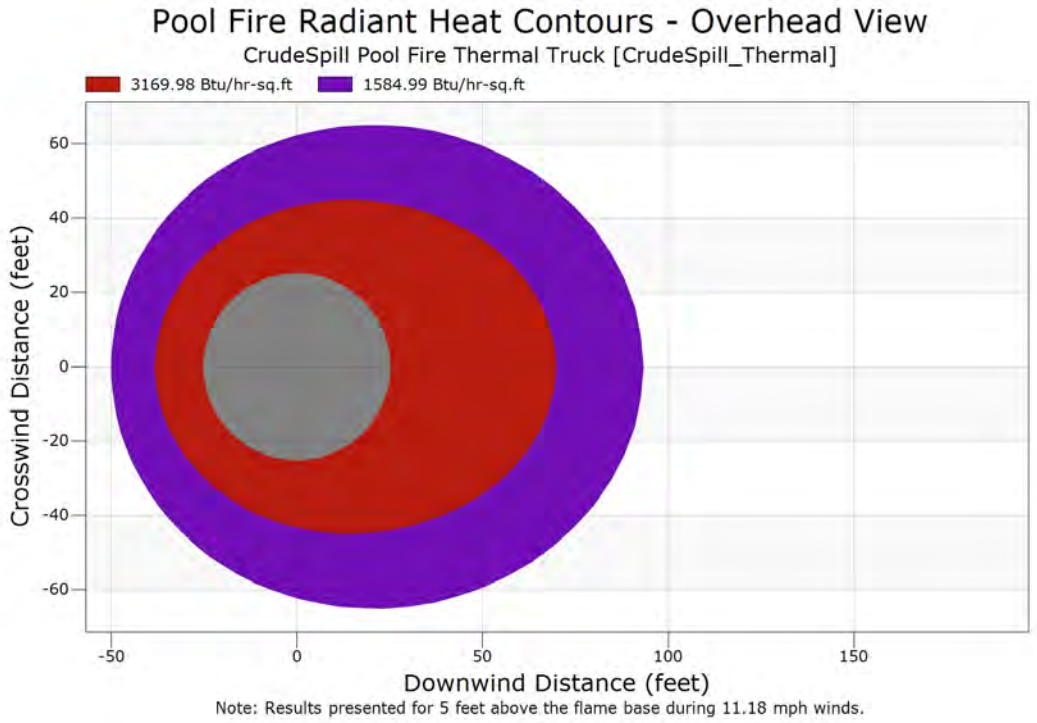
Pool Fire Radiation

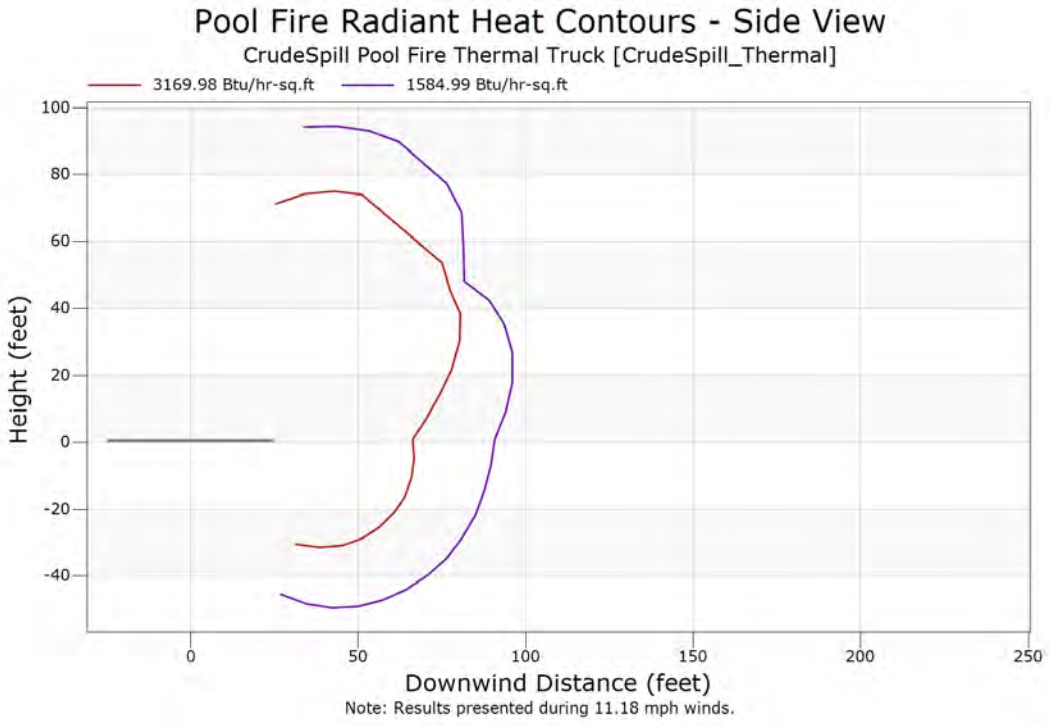
Length of Flame	: 56.6	feet
Flame Tilt from Vertical	: 35.0	degrees
Target Elevation	: 6.0	feet
Pool Elevation	: 1.0	feet
Wind Speed	: 11.2	mph
Substrate	: Land	

Downwind Distance from Center of Pool (feet)	Flux to Vertical Target (Btu/hr-sq.ft)	Flux to Horizontal Target (Btu/hr-sq.ft)	Maximum Flux (Btu/hr-sq.ft)
47.1	6725	4384	8028
49.2	6140	3941	7296
51.4	5423	3570	6493
53.6	4790	3255	5792
56.0	4258	2976	5195
58.4	3814	2722	4685
61.0	3440	2485	4243
63.6	3121	2260	3853
66.4	2847	2046	3506
69.3	2609	1841	3193
72.3	2398	1644	2907
75.5	2207	1455	2644
78.8	2029	1275	2397
82.3	1860	1106	2164
85.9	1701	950	1948
89.6	1547	808	1745
93.5	1401	681	1558
97.6	1264	569	1387
101.9	1136	473	1230
106.4	1016	390	1089
111.0	907	321	962
115.9	808	264	850
120.9	718	216	750
126.2	638	177	662
131.8	566	145	584
137.5	502	119	516
143.5	446	98	456
149.8	396	81	404
156.4	352	66	358
163.2	313	55	317

Downwind Distances to Endpoints:

Distance (feet)	Maximum Flux (Btu/hr-sq.ft)
69.6	3170
93.0	1585
93.0	1585


Pool Fire Radiant Heat Contours - Overhead View
CrudeSpill Pool Fire Thermal Truck [CrudeSpill_Thermal]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Crosswind Distance (feet)
60
40
20
0
-20
-40
-60
-50
0
50
100
150
Downwind Distance (feet)
Note: Results presented for 5 feet above the flame base during 11.18 mph winds.


Pool Fire Radiant Heat Contours - Side View
CrudeSpill Pool Fire Thermal Truck [CrudeSpill_Thermal]
3169.98 Btu/hr-sq.ft
1584.99 Btu/hr-sq.ft
Height (feet)
100
80
60
40
20
0
-20
-40
0
50
100
150
200
250
Downwind Distance (feet)
Note: Results presented during 11.18 mph winds.

Crude Oil Spills

Canary Inputs & Results

Crude oil, Regulated flow over 10 minutes, 1 foot elev, 3" pipe (truck), 8-10: pipeline, 15.7 psia
LFL: 2 m/s wind, F stab, 70F, concrete
Thermal: d/5 m/s

		Canary Results					
Spill Size, gal	Release rate, gal/min	Pool Size, radius, ft	Pool Size, Dia, ft	LFL	1/2 LFL	Flame, 10kW/m2	Flame, 5kW/m2
100	10	5.6	11.2	7	11	32	38
500	50	9.6	19.2	12	20	42	52
1000	100	12.0	24.0	17	25	47	59
2000	200	15.6	31.2	23	33	54	70
5000	500	22.2	44.4	32	47	65	86
20000	2000	38.2	76.4	48	102	91	124
50000	5000	55.6	111.2	83	173	121	164
70000	7000	64.4	128.8	95	208	135	183
100000	10000	75.0	150.0	109	255	152	206
6720	672	24.9	49.8	37	53	70	93